Edition 10/2025

OPERATING INSTRUCTIONS

SINAMICS
SIMOTICS

S200 Compact servo drive system

PROFINET version (PN)
www.siemens.com

SIEMENS

Промэлектроника, sales@prom-elec.com

SIEMENS

SINAMICS/SIMOTICS

SINAMICS S200 Compact servo drive system with SIMOTICS S-1FL2 and S-1FL1

Operating Instructions

PROFINET version (PN), Firmware V6.5 HF1

Introduction 1

Fundamental safety instructions 2

Description 3

Application planning 4

Mounting 5

Connecting 6

Commissioning (web server) 7

Commissioning (Startdrive) 8

Series commissioning 9

Functions 10

Tuning 11

System message 12

Corrective maintenance 13

Technical data 14

Examples/applications 15

Appendix A

10/2025, FW V6.5 HF1

A5E54029715A AB

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ **DANGER**
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ **WARNING**
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ **CAUTION**
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

Proper use of Siemens products

Note the following:

⚠ **WARNING**
Siemens products may only be used for the application described in the catalog and the associated usage information. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E54029715A AB
Ⓟ 10/2025 Subject to change

Copyright © Siemens 2025.
All rights reserved

Table of contents

1 Introduction ... 13

1.1 About SINAMICS ... 13

1.2 About this manual ... 14
1.2.1 Content ... 14
1.2.2 Target group ... 14
1.2.3 What's new? ... 15
1.2.4 Standard scope ... 15
1.2.5 Use of third-party products in this documentation ... 15
1.2.6 Websites of third-party companies ... 16

1.3 Product documentation ... 17

1.4 Service and Support ... 18
1.4.1 ID link and Siemens Online Support ... 18
1.4.2 Spare parts services ... 19

1.5 Important product information ... 20
1.5.1 Intended use ... 20
1.5.2 Firmware updates and constraints ... 21
1.5.3 Open-source software (OSS) ... 21
1.5.4 Compliance with the General Data Protection Regulation ... 22

2 Fundamental safety instructions ... 23

2.1 General safety instructions ... 23

2.2 Equipment damage due to electric fields or electrostatic discharge ... 33

2.3 Warranty and liability for application examples ... 34

2.4 Cybersecurity information ... 35

2.5 Residual risks of power drive systems ... 36

3 Description ... 39

3.1 System overview ... 39
3.1.1 Converter ... 42
3.1.2 Motor ... 43
3.1.3 MOTION-CONNECT 100, 350 and 380 cables ... 43

3.2 Scope of delivery ... 44
3.2.1 Converter ... 44
3.2.1.1 Rating plate ... 45
3.2.1.2 Article numbers ... 46
3.2.1.3 Serial number explanation ... 47
3.2.2 Motor ... 47
3.2.2.1 1FL1 motor ... 48
3.2.2.2 1FL2 motor ... 51
3.2.3 MOTION-CONNECT cables ... 56
3.2.3.1 Overview ... 56

3.2.3.2 Article number explanation ... 56

3.3 Device combinations ... 58
3.3.1 S200 Compact servo drive system with 1FL1 motor ... 58
3.3.2 S200 Compact servo drive system with 1FL2 motor ... 59

3.4 Accessories ... 60
3.4.1 Connector kit ... 60
3.4.2 Cables and connectors ... 60
3.4.2.1 MOTION-CONNECT cables ... 60
3.4.2.2 I/O cable and connector ... 66
3.4.3 Line filter ... 66
3.4.3.1 Technical data of the line filter ... 67
3.4.3.2 Dimension drawing ... 68
3.4.3.3 Mounting instructions for the line filter ... 69
3.4.4 External 24 V DC power supply ... 70
3.4.5 Shield plate kit ... 71
3.4.6 IP65 degree of protection kit for 1FL2 motors SH20 and SH30 ... 72

3.5 Directives and standards ... 73
3.5.1 Directives, standards and certificates for the converter ... 73
3.5.2 Directives, standards and certificates for the motor ... 75
3.5.3 Directives, standards and certificates for the MOTION-CONNECT cable ... 77

4 Application planning ... 79

4.1 Fault protection for the motor circuit ... 79

4.2 Line connection conditions for the converter with the motor ... 80

4.3 Minimum cross-section of the protective conductors ... 81

4.4 Configuring the braking resistor ... 83
4.4.1 Internal braking resistor ... 83
4.4.2 External braking resistor ... 83
4.4.2.1 Overview ... 83
4.4.2.2 Selection and calculation ... 85
4.4.2.3 Recommended data of external braking resistors ... 88

4.5 Electromagnetic compatibility (EMC) ... 89
4.5.1 Electromagnetic compatibility (EMC) ... 89
4.5.2 Harmonic current emissions ... 89

4.6 EMC-compliant installation ... 90
4.6.1 Shielded cables for the converter ... 90
4.6.2 Achievable EMC category ... 91

5 Mounting ... 93

5.1 Converter ... 93
5.1.1 Mounting instructions for the converter ... 93
5.1.2 Mounting position ... 94
5.1.3 Dimension drawing and drilling dimensions ... 95
5.1.4 Minimum clearances ... 96

5.2 Motor ... 97
5.2.1 Checklist prior to mounting ... 97
5.2.2 Safety labels on the motor ... 97
5.2.3 Mounting instructions for the motor ... 98

5.2.4 Mounting position ... 99
5.2.5 Dimension drawings for the 1FL1 motors ... 100
5.2.5.1 Dimension drawing for the 1FL1 motor, shaft height 20 ... 100
5.2.5.2 Dimension drawing for the 1FL1 motor, shaft height 30 ... 101
5.2.5.3 Dimension drawing for the 1FL1 motor, shaft height 40 ... 102
5.2.6 Dimension drawings for the 1FL2 motors ... 103
5.2.6.1 Dimension drawing for the 1FL2 motor, shaft height 20 ... 103
5.2.6.2 Dimension drawing for the 1FL2 motor, shaft height 30 ... 104
5.2.6.3 Dimension drawing for the 1FL2 motor, shaft height 40 ... 105
5.2.6.4 Dimension drawing for the 1FL2 motor, shaft height 40 (New) ... 106
5.2.7 Mounting the feather key ... 107
5.2.8 Attaching output elements ... 109
5.2.9 Laying cables in cable carriers (for MOTION-CONNECT 380 only) ... 111

6 Connecting ... 115

6.1 System connection ... 116

6.2 Overview of the converter interfaces ... 117

6.3 Cables and connectors ... 118
6.3.1 Maximum permissible cable lengths ... 118
6.3.2 Conductor cross-sections and cable lugs ... 118

6.4 Connecting the mains supply ... 120
6.4.1 Interface description - X1 ... 120
6.4.2 Wiring ... 120

6.5 Connecting the motor ... 122
6.5.1 Routing cables in damp environments ... 122
6.5.2 Connecting the motor power ... 122
6.5.2.1 Interface description - X1 (converter side) ... 122
6.5.2.2 Interface description - power connector (motor side) ... 123
6.5.2.3 Wiring ... 124
6.5.3 Connecting the motor holding brake ... 125
6.5.3.1 Interface description (converter side) ... 125
6.5.3.2 Interface description (motor side) ... 126
6.5.3.3 Wiring ... 126
6.5.4 Connecting the encoder ... 129
6.5.4.1 Interface description - X120 (converter side) ... 129
6.5.4.2 Interface description (motor side) ... 130
6.5.4.3 Wiring ... 132

6.6 Connecting the braking resistor ... 135
6.6.1 Interface description - X1 ... 135
6.6.2 Wiring ... 135

6.7 Connecting the 24 V DC power supply ... 138
6.7.1 Interface description - X124 ... 138
6.7.2 Wiring ... 138

6.8 Connecting the inputs and outputs ... 140
6.8.1 Interface description - X130 ... 140
6.8.2 Wiring ... 141
6.8.2.1 Wiring of digital inputs ... 141
6.8.2.2 Wiring of digital outputs ... 142

6.9 Connecting to the fieldbus ... 143
6.9.1 Interface description - X150 ... 143
6.9.2 Wiring ... 144

7 Commissioning (web server) ... 145

7.1 Introduction ... 145

7.2 Fundamentals ... 146
7.2.1 Requirements for commissioning ... 146
7.2.2 Supported operating units ... 146
7.2.3 Supported browsers ... 146
7.2.4 Communication interface ... 147

7.3 Getting started ... 148
7.3.1 Calling the web server ... 148
7.3.2 Basic settings ... 148
7.3.3 Security settings ... 149
7.3.4 Home page ... 151
7.3.5 Making the operating instructions available for the web server information system ... 153
7.3.6 Using the web server information system ... 155
7.3.7 Reloading pages ... 157

7.4 Functions and menus ... 159
7.4.1 Commissioning ... 159
7.4.1.1 Complete commissioning workflow ... 159
7.4.1.2 Commissioning ... 161
7.4.1.3 Testing the converter configuration ... 165
7.4.1.4 Optimization ... 165
7.4.2 Monitoring and operation ... 168
7.4.2.1 Drive status ... 168
7.4.2.2 Inputs/outputs ... 170
7.4.3 Diagnostics ... 171
7.4.3.1 Messages ... 171
7.4.3.2 Diagnostics buffer ... 173
7.4.3.3 Connection overview ... 174
7.4.3.4 Communication ... 174
7.4.3.5 Status word and control word ... 175
7.4.4 Parameters ... 177
7.4.4.1 Parameter lists ... 177
7.4.4.2 User-defined parameter list ... 179
7.4.5 Backup and restore ... 179
7.4.6 System ... 181
7.4.6.1 Settings ... 181
7.4.6.2 User management ... 183
7.4.6.3 Protection & Security ... 184
7.4.6.4 Licenses ... 186
7.4.6.5 Firmware update ... 188
7.4.6.6 About web server ... 188
7.4.7 Support ... 189
7.4.8 Control panel ... 191

8 Commissioning (Startdrive) ... 193

8.1 Introduction ... 193

8.2 Basics ... 194
8.2.1 Communication interface ... 194
8.2.2 Protected communication ... 194
8.2.3 User administration and security ... 194
8.2.4 Loading data from the drive into the project ... 196
8.2.5 Loading project data into the drive ... 197
8.2.6 Saving changes in the project ... 198
8.2.7 Retentively saving changes to the memory card ... 199
8.2.8 Using parameter lists and user-defined lists ... 200

8.3 Procedures for device configuration and commissioning ... 202
8.3.1 Requirements ... 202
8.3.2 Simple basic parameterization (offline) ... 203
8.3.3 Simple basic parameterization (online) ... 204
8.3.4 Basic parameterization together with a SIMATIC controller ... 205

8.4 Combining and configuring devices in the project ... 206
8.4.1 Converter ... 206
8.4.1.1 Inserting a converter into the project ... 206
8.4.1.2 Optional: Replacing a converter ... 208
8.4.1.3 Making detailed converter settings ... 213
8.4.1.4 Specifying a motor ... 214
8.4.1.5 Replacing a motor ... 216
8.4.2 Control and technology object ... 218
8.4.2.1 Inserting a SIMATIC S7 controller into the project ... 218
8.4.2.2 Networking a controller and a converter ... 220
8.4.2.3 Inserting a technology object into the SIMATIC S7 controller ... 222
8.4.2.4 Interconnecting the technology object and a drive ... 225

8.5 Carrying out guided quick startup ... 227
8.5.1 Overview ... 227
8.5.2 User interface ... 228
8.5.3 Editing mode (online only) ... 230
8.5.4 Connection to PLC ... 232
8.5.5 Application ... 233
8.5.6 Limits ... 234
8.5.6.1 Configuring limits when "Speed control" is active ... 234
8.5.6.2 Configuring limits when "Positioning" is active ... 235
8.5.7 Application settings ... 239
8.5.7.1 Configuring active homing ... 240
8.5.7.2 Configuring absolute encoder adjustment ... 242
8.5.8 I/O configuration ... 243
8.5.9 Telegrams (offline only) ... 244
8.5.10 Rotate & optimize ... 245
8.5.11 Summary ... 247
8.5.11.1 Offline mode ... 247
8.5.11.2 Online mode ... 247

8.6 Configuring the converter ... 249
8.6.1 Fundamentals ... 249
8.6.2 Basic parameterization ... 250
8.6.3 Inputs/outputs ... 251
8.6.3.1 Optional: Configuring a measuring probe using the technology objects ... 251
8.6.3.2 Digital inputs and outputs ... 253

8.6.4 Technology functions ... 254
8.6.4.1 Basic positioner ... 254
8.6.4.2 Vibration suppression ... 256
8.6.5 Configuring telegrams ... 258
8.6.5.1 Calling the telegram configuration ... 258
8.6.5.2 Telegram settings ... 259
8.6.5.3 Adding telegrams ... 259

8.7 Optimizing commissioning ... 261
8.7.1 Establishing an online connection to the converter ... 261
8.7.2 Traversing the drive from the control panel with speed setpoint ... 262
8.7.3 Performing One Button Tuning ... 264
8.7.4 Terminating the online connection from the drive ... 266

8.8 Using online diagnostic functions ... 267
8.8.1 Diagnostic icons ... 267
8.8.2 Display messages ... 268
8.8.3 Online access ... 268
8.8.4 Diagnostics overview ... 269
8.8.5 Security ... 270
8.8.6 Communication ... 271
8.8.6.1 Receive direction ... 271
8.8.6.2 Send direction ... 272
8.8.7 Functions ... 273
8.8.7.1 Overview ... 273
8.8.7.2 Resetting PROFINET interfaces ... 273
8.8.7.3 Setting the time ... 274
8.8.7.4 Updating the firmware in the Startdrive project ... 276
8.8.8 Backup and restore ... 278
8.8.8.1 Restarting the drive ... 278
8.8.8.2 Retentively saving the drive data ... 279
8.8.8.3 Restore factory settings ... 279
8.8.9 Overview of licenses ... 280

8.9 Checking using the trace function ... 282

9 Series commissioning ... 285

9.1 Series commissioning ... 285

9.2 Series commissioning with memory card ... 286

9.3 Series commissioning using a commissioning tool ... 287

10 Functions ... 289

10.1 Overview of the functions ... 289

10.2 Inputs/outputs ... 291
10.2.1 Digital inputs ... 291
10.2.2 Digital outputs ... 292

10.3 Fieldbus communication ... 295
10.3.1 Communication via PROFINET IO ... 295
10.3.2 Configuring PROFINET IO operation ... 295
10.3.2.1 Connecting the PROFINET cable to the converter ... 295
10.3.2.2 Configuring communication using SIMATIC S7 control ... 296
10.3.2.3 Setting communication via PROFINET ... 296

10.3.3 PROFINET protocols ... 297
10.3.3.1 PROFINET protocols ... 297
10.3.3.2 Media redundancy ... 298
10.3.3.3 Connection-oriented communication protocols ... 299
10.3.3.4 Field Device Integration ... 300
10.3.4 Acyclic PROFIdrive communication ... 301
10.3.4.1 Acyclic communication via PROFINET ... 301
10.3.4.2 Reading parameter values ... 301
10.3.4.3 Changing parameter values ... 302
10.3.4.4 Error value 1 for read and change requests ... 304
10.3.5 Identification & Maintenance (I&M) data ... 305

10.4 Communication telegrams ... 307
10.4.1 Telegram structure ... 307
10.4.2 Supported telegrams ... 307
10.4.3 Telegrams for speed control ... 308
10.4.3.1 Telegram 1 ... 308
10.4.3.2 Telegram 2 ... 309
10.4.3.3 Telegram 3 ... 310
10.4.3.4 Telegram 5 ... 311
10.4.3.5 Telegram 102 ... 312
10.4.3.6 Telegram 105 ... 313
10.4.4 Telegrams for position control ... 313
10.4.4.1 Telegram 7 ... 313
10.4.4.2 Telegram 9 ... 315
10.4.4.3 Telegram 111 ... 316
10.4.4.4 Telegram 112 ... 317
10.4.4.5 Telegram 113 ... 318
10.4.5 Supplementary telegram 750 ... 319
10.4.6 Telegram extension ... 320
10.4.7 Control words, status words and message word ... 321
10.4.7.1 Control and status word 1 ... 321
10.4.7.2 Control and status word 2 ... 327
10.4.7.3 Control and status word for encoder 1 ... 329
10.4.7.4 Control word for block selection ... 330
10.4.7.5 Control word for MDI mode ... 331
10.4.7.6 Control and status word 1 for the positioner ... 332
10.4.7.7 Control and status word 2 for the positioner ... 334
10.4.7.8 Message word ... 336

10.5 General functions ... 337
10.5.1 Stopping method at servo-off ... 337
10.5.2 Speed limit ... 338
10.5.3 Torque limit ... 340
10.5.4 Vertical axis ... 341
10.5.5 Ramp-function generator ... 342
10.5.6 Setting motor overload protection in accordance with UL 61800-5-1 Ed.2 ... 345

10.6 Basic positioner (EPOS) ... 346
10.6.1 Mechanical system ... 347
10.6.1.1 Axis type ... 347
10.6.1.2 Units of measurement ... 348
10.6.1.3 Setting the backlash ... 349
10.6.1.4 Load gear position tracking ... 351

10.6.2 Limits ... 354
10.6.2.1 Limiting the traversing range ... 354
10.6.2.2 Limiting the traversing profiles ... 355
10.6.3 Position monitoring ... 356
10.6.3.1 Positioning and standstill monitoring ... 356
10.6.3.2 Following error monitoring ... 357
10.6.4 Homing ... 357
10.6.4.1 Terms for homing ... 358
10.6.4.2 Active homing ... 359
10.6.4.3 Passive homing ... 363
10.6.4.4 Absolute encoder for adjustment ... 363
10.6.5 Traversing blocks ... 364
10.6.5.1 Traversing block tasks ... 364
10.6.5.2 Travel to fixed stop ... 370
10.6.6 Direct setpoint input (MDI) ... 372
10.6.7 Jog ... 376
10.6.8 Measuring probe evaluation and homing mark search ... 378

11 Tuning ... 381

11.1 Tuning workflow ... 381

11.2 Autotuning ... 382
11.2.1 One Button Tuning ... 382
11.2.2 Real Time Tuning (Online Tuning) ... 385

11.3 Manual tuning ... 388
11.3.1 Manual tuning ... 388
11.3.2 Control loops ... 388
11.3.3 Servo gain adjustment ... 389

11.4 Resonance suppression ... 391

11.5 Low-frequency vibration suppression ... 394
11.5.1 Operating principle ... 394
11.5.2 Methods to determine the frequency ... 394

12 System message ... 399

12.1 SDI Status ... 399
12.1.1 SDI Status overview ... 399
12.1.2 Status display via LEDs ... 400
12.1.3 SDI Status display ... 403
12.1.4 Function buttons ... 405

12.2 System runtime ... 406

12.3 Faults and alarms ... 407
12.3.1 Overview of faults and alarms ... 407
12.3.2 Faults ... 408
12.3.3 Alarms ... 409
12.3.4 Explanation of the list of faults and alarms ... 409
12.3.5 List of fault codes and alarm codes ... 415

13 Corrective maintenance ... 547

13.1 Service and maintenance for the converter ... 547
13.1.1 Restoring the converter to factory settings ... 547

13.1.1.1 Restoring factory settings via a commissioning tool ... 547
13.1.1.2 Full reset of all device settings ... 547
13.1.2 Converter firmware update ... 549
13.1.2.1 Overview of firmware update ... 549
13.1.2.2 Firmware update via memory card ... 550
13.1.2.3 BIOS update via a memory card ... 551
13.1.3 Backing up and restoring drive data ... 553
13.1.3.1 Automatically backing up drive data using a memory card and restoring this data ... 553
13.1.3.2 Backing up drive data to the backup file ... 554
13.1.3.3 Save backup file to memory card ... 556
13.1.3.4 Restoring drive data from a backup file ... 558
13.1.3.5 Backup file with drive data encryption ... 560
13.1.4 Replacing the converter ... 562
13.1.5 Forming the DC link capacitors ... 564

13.2 Service and maintenance for the motor ... 566
13.2.1 Replacing the motor bearings ... 568
13.2.2 Replacing the motor ... 569

13.3 Spare parts and spare parts compatibility ... 571

13.4 Device disposal ... 572

14 Technical data ... 573

14.1 Technical data of the converter ... 573
14.1.1 Permissible environmental conditions for the converter ... 573
14.1.2 General technical data ... 574
14.1.3 Specific technical data ... 575
14.1.4 Overload capacity ... 576
14.1.5 Power derating as a function of the installation altitude and ambient temperature ... 578
14.1.6 Protection of persons from electromagnetic fields ... 578

14.2 Technical data of the motor ... 580
14.2.1 Permissible environmental conditions for the motor ... 580
14.2.2 General technical data ... 581
14.2.3 Protection against electromagnetic fields (motor) ... 583
14.2.4 Cooling ... 583
14.2.5 Derating factors ... 584
14.2.6 Degree of protection ... 586
14.2.7 Balancing ... 588
14.2.8 Vibrational behavior ... 588
14.2.9 Shaft extension ... 589
14.2.10 Radial eccentricity, concentricity, and axial eccentricity ... 590
14.2.11 Axial and radial forces ... 592
14.2.11.1 Axial and radial forces for 1FL1 ... 592
14.2.11.2 Axial and radial forces for 1FL2 ... 593
14.2.12 Available encoders ... 596
14.2.12.1 Technical data of encoders ... 596
14.2.12.2 Using the multiturn encoder with battery on the 1FL1 motor ... 596
14.2.13 Brake data ... 598
14.2.13.1 Overview of the holding brake ... 598
14.2.13.2 Technical data of the holding brake ... 598
14.2.14 Technical data and characteristics of the 1FL1 ... 600
14.2.14.1 1FL1102-2AG ... 600

14.2.14.2 1FL1102-4AG ... 602
14.2.14.3 1FL1103-2AG ... 603
14.2.14.4 1FL1103-4AG ... 604
14.2.14.5 1FL1104-2AG ... 605
14.2.15 Technical data and characteristics of the 1FL2 ... 606
14.2.15.1 1FL2102-2AG ... 606
14.2.15.2 1FL2102-4AG ... 608
14.2.15.3 1FL2103-2AG ... 609
14.2.15.4 1FL2103-4AG ... 610
14.2.15.5 1FL2104-2AG ... 611
14.2.15.6 1FL2104-2BG ... 612
14.2.15.7 1FL2203-2AG ... 613
14.2.15.8 1FL2203-4AG ... 614
14.2.15.9 1FL2204-2AG ... 615
14.2.15.10 1FL2204-2BG ... 616

14.3 Technical data of MOTION-CONNECT cables ... 617
14.3.1 Technical data of MOTION-CONNECT 100 ... 617
14.3.1.1 General technical data ... 617
14.3.1.2 Specific technical data ... 617
14.3.2 Technical data of MOTION-CONNECT 350 ... 618
14.3.2.1 General technical data ... 618
14.3.2.2 Specific technical data ... 618
14.3.3 Technical data of MOTION-CONNECT 380 ... 619
14.3.3.1 General technical data ... 619
14.3.3.2 Specific technical data ... 619
14.3.3.3 Acceleration characteristic curve ... 620

15 Examples/applications ... 621

A Appendix ... 623

A.1 Parameters ... 623
A.1.1 Explanation of the list of parameters ... 623
A.1.2 Parameter list ... 627

A.2 Assembling cables ... 804
A.2.1 Assembling connectors on the converter side ... 805
A.2.1.1 Assembling the cable lugs ... 805
A.2.1.2 Assembling the encoder connector for 1FL1 motors with single-turn encoder and 1FL2 motors ... 806
A.2.1.3 Assembling the encoder connector for 1FL1 motors with multiturn encoder ... 809
A.2.1.4 Assembling the I/O connector ... 811
A.2.2 Assembling the connectors for 1FL1 motors ... 812
A.2.2.1 Assembling the power plug ... 812
A.2.2.2 Assembling the encoder plug ... 815
A.2.3 Assembling the hybrid plug for 1FL2 motors ... 819
A.2.4 Disassembling the hybrid plug for 1FL2 motors ... 825

A.3 Motor selection ... 828
A.3.1 Selection procedure ... 828
A.3.2 Selection examples ... 829

A.4 Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30 ... 833

Introduction 1

1.1 About SINAMICS

Description

SINAMICS converters are the optimum solution for all drive applications extending from low voltage through to DC. All Siemens drive components, such as converters, motors, and controls, are matched to each other and can be integrated into your existing automation systems.

More information

You can find more information via the SINAMICS YouTube playlist:

YouTube playlist (https://www.youtube.com/playlist?list=PLw7lLwXw4H53rtHeTeifKtVMr2aXTYt0X)

1.2 About this manual

1.2.1 Content

Description

This manual provides a summary of all of the information required to operate the converter under safe conditions.

The manual enables the target groups being addressed to mount, install, connect, and commission the converter safely and in the correct manner.

To illustrate possible application areas for our products, typical use cases are listed in this product documentation and in the online help. These are purely exemplary and do not constitute a statement on the suitability of the respective product for applications in specific individual cases. Unless explicitly contractually agreed, Siemens assumes no liability for such suitability. Suitability for a particular application in specific individual cases must be assessed by the user, taking into account all technical, legal, and other requirements on a case-by-case basis. Always observe the descriptions of the technical properties and the relevant constraints of the respective product contained in the product documentation.

1.2.2 Target group

Description

This manual addresses the following target groups:

- Planning engineers
- Project engineers
- Technologists
- Installation personnel
- Programmers
- Commissioning engineers
- Machine operators
- Service and maintenance personnel

1.2.3 What's new?

Description

The most important supplements with respect to Edition 06/2025

- New multiturn encoder for 1FL1 motors
  Information about the new multiturn encoder is provided in the following sections:
  Interface description (motor side) (Page 130)
  Wiring (Page 132)
  Available encoders (Page 596)
- New encoder cable with battery for 1FL1 motors
  Information about the new encoder cable with battery is provided in the following sections:
  MOTION-CONNECT cables (Page 60)
  Assembling the encoder connector for 1FL1 motors with multiturn encoder (Page 809)
  Assembling the encoder plug (Page 815)
- New 1FL2 SH40 (New) motors
  Information about the new motors is provided in the following sections:
  S200 Compact servo drive system with 1FL2 motor (Page 59)
  Dimension drawing for the 1FL2 motor, shaft height 40 (New) (Page 106)
  1FL2104-2BG (Page 612)
  1FL2204-2BG (Page 616)

1.2.4 Standard scope

The functions of the system as delivered can only be found in the order documents.

Further functions may be executable in the system, which are not explained in this documentation. However, there is no entitlement to these functions in the case of a new delivery or service.

This documentation does not contain all detailed information on all types of the product. Furthermore, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

1.2.5 Use of third-party products in this documentation

This documentation contains recommendations relating to third-party products. Siemens accepts the fundamental suitability of these third-party products. You can use equivalent products from other manufacturers.

Siemens does not accept any warranty for the use of third-party products.

1.2.6 Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 Product documentation

Description

The product documentation for the servo drive system can be found on the Internet:

SiePortal SINAMICS S200 Compact (https://sieportal.siemens.com/su/blBgk)

You can display documents or download them in PDF and HTML5 formats.

The product documentation for the servo drive system comprises the following documents:

Table 1-1 Product documentation

Information	Document	Content
Information about the servo drive system	Operating Instructions for SINAMICS S200 Compact	Installing, commissioning, and maintaining the servo drive system
	Compact Operating Instructions for SINAMICS S200 Compact	Essential contents of the Operating Instructions in reduced and compressed form
	Protective Devices for SINAMICS S200 Compact	Suitable components for overcurrent protection of the servo drive system Expansion of components contained in the Operating Instructions
General information	Industrial Cybersecurity Configuration Manual	Industrial Cybersecurity functions and safe operation of the SINAMICS product

1.4 Service and Support

1.4.1 ID link and Siemens Online Support

You can find additional information about the product:

- via ID link
- using the Siemens Industry Online Support
  - Website: SIOS (https://support.industry.siemens.com/cs/ww/en/)
  - App Industry Online Support (for Apple iOS and Android)

Product-specific information via ID link

The QR code on your product and on the product packaging contains the ID link.

ID link is a globally unique identifier according to IEC 61406-1.

You can use the ID link to access product data, manuals, Declarations of Conformity, certificates and other information about your product.

Figure 1-1 QR code with ID link included

The ID link is characterized by a frame with a black corner at the bottom right.

Content of Siemens Online Support

- Product support
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via the contact person database (→ Contact)
- Product information
- FAQs (frequently asked questions)
- Application examples
- Manuals
- Downloads
- Compatibility tool
- Newsletter with product selection

- Catalogs/brochures
- Certificates

1.4.2 Spare parts services

The online spare part service "Spares on Web (https://www.sow.siemens.com/)" offers spare parts for the product.

1.5 Important product information

1.5.1 Intended use

Requirement

WARNING

Death or serious injury if not used as intended

Not using as intended can result in hazardous states.

- Carefully observe the description of intended use.

WARNING

Incorrect use of the motor

Incorrect use of the motor may cause death, serious injury (crushing) and/or property damage.

- Carefully observe the description of intended use.
- Do not use the motors in hazardous areas (where there is a risk of explosion), if the motors have not been expressly released and authorized for these types of applications. Carefully observe any special supplementary notes that may be attached.
- Make sure that the conditions at the location of use comply with all the rating plate data.
- Make sure that the conditions at the location of use comply with the conditions specified in this documentation. When necessary, take into account deviations regarding approvals or country-specific regulations.

Note

It cannot be guaranteed that EMC emission limits are complied with if the products are connected to an isolated line supply grounded through a high ohmic connection or a line supply with grounded line conductor.

- Draw-up an EMC plan to comply with the EMC requirements of the intended application.

Description

The products described in this manual, together with software, accessories and options, form an electric drive to supply low-voltage AC motors.

The products are professional equipment for stationary indoor use in industrial, light-industrial, and commercial applications and are intended for supply from non-public (industrial) low-voltage line supplies. The products are not intended for use in residential areas and are not intended for supply from public low-voltage networks.

The products must be properly transported and stored and must be installed, commissioned and maintained by professionals who have adequate knowledge to implement the safety, cybersecurity and EMC measures in accordance with the specifications described in this manual and with recognized state-of-the-art engineering practice.

You may only use the products when the following requirements are complied with:

- All regulations and directives that are applicable at the place of final use, especially with regard to electrical safety, functional safety and electromagnetic compatibility (EMC).
- All instructions, notes, technical data, safety information and cybersecurity information contained in this document and other supporting documentation.

The products are part of a machine or system. When designing the system, apply suitable measures to ensure that the products can provide intended safety to persons and material assets and achieve intended electromagnetic compatibility.

Perform a risk assessment of the complete application, including third-party products and implement adequate safety and cybersecurity measures before using the product.

Products without protective enclosure (IP00 or IP20) are intended for installation in control panels or control cabinets that provide the required level of protection.

Any other use that is not expressly permitted can result in malfunctions and unpredictable hazards.

The motors are intended for converter control and may not be connected directly to the line supply. The motors are not approved for use in explosive atmospheres.

1.5.2 Firmware updates and constraints

Description

Firmware updates and constraints for the converters with the current firmware are available in SIOS:

Updates and constraints for SINAMICS S200 Compact (https://sieportal.siemens.com/su/blBgk)

1.5.3 Open-source software (OSS)

Description

The license conditions and copyright information of the open-source software components used by the device are saved on the device itself. You can download license and copyright information onto your PC via the support page of the integrated web server.

1.5.4 Compliance with the General Data Protection Regulation

Description

Siemens complies with the principles of the **General Data Protection Regulation (EU),** in particular the principle of data minimization (privacy by design). For this SINAMICS product, this means:

- **User management and access control (UMAC)**
  The product processes or stores the following personal data:
  – Login data for user management and access control:
    User name, group, password, role, rights.

  The data for user management and access control is stored in the converter and optionally on a memory card.
- **Support data (optional)**
  For optimal support in service cases, the end user or machine manufacturer (OEM) can optionally store contact data (header, email address, telephone number, homepage) in the converter.
  If this data is created, the author must give thought to data protection consent for this optional data. Siemens takes no responsibility for this data.
  This support contact data can be read and is freely accessible in, for example, the user interface as well as in the diagnostics report. This data is not encrypted.

This data is used for user management and access control (UMAC) and for the support function. The storage of this data is appropriate and limited to what is necessary, as it is essential to identify the authorized operators and service contact.

The personal data is also available as part of the backup system to ensure fast recovery of use cases.

The above-mentioned personal data cannot be stored anonymously or pseudonymized, as it serves the purpose of identifying the operating personnel. The anonymization or pseudonymization, e.g. of the login data, must be performed using suitable login names and contact data by the plant/machine operator.

Our product does not provide any functions for automatically deleting personal data. Individual UMAC data can be deleted manually by authorized personnel as soon as this is deemed recommended/required.

Fundamental safety instructions 2

2.1 General safety instructions

WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.

WARNING

Risk of electric shock and fire from supply networks with an excessively high impedance

Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.

- In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the converter is connected to the line supply at least meets the minimum requirements for the response of the protective device used.
- You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.

⚠ WARNING

Risk of electric shock and fire from supply networks with an excessively low impedance

Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.

- Ensure that the prospective short-circuit current at the line terminal of the converter does not exceed the breaking capacity (SCCR or Icc) of the protective device used.

⚠ WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠ WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠ WARNING

Electric shock due to damaged motors or devices

Improper handling of motors or devices can damage them.

Hazardous voltages can be present at the enclosure or at exposed components on damaged motors or devices.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged motors or devices.

⚠ WARNING

Electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of cables that are not used at one end at the grounded housing potential.

⚠ WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

⚠ WARNING

Electric shock due to residual charges in power components

Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.

- Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.

NOTICE

Damage to equipment due to unsuitable tightening tools.

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Only use screw inserts that exactly match the screw head.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
- Adjust the tools used regularly.

⚠ WARNING

Electromagnetic interference due to inadequate shield support

A lack of adequate shield support for the power cables can cause malfunctions and impermissibly high levels of interference.

- Use the shield connection plates supplied or recommended.
- Use the shield connection clips recommended.

⚠ WARNING

Active implant malfunctions due to electromagnetic fields

Converters generate electromagnetic fields (EMF) in operation. Electromagnetic fields may interfere with active implants, e.g. pacemakers. People with active implants in the immediate vicinity of an converter are at risk.

- As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants.
- Observe the data on EMF emission provided in the product documentation.

⚠ WARNING

Active implant malfunctions due to permanent-magnet fields

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If this affects you, maintain the minimum distances specified in the Information for use.
- When transporting or storing permanent-magnet motors always use the original packing materials with the warning labels attached.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.

⚠ WARNING

Improper lifting and transportation operations

Improper lifting and transportation of the motor may cause death, severe bodily injury, or damage to property.

- When disassembling the motor, watch out for imminent movements when the motor is released.
- Use all lifting equipment, industrial trucks, and load handling devices in accordance with the regulations.
- Only use lifting equipment and load handling devices with maximum capacities which match the weight of the motor.
- Do not attach any additional loads to the lifting equipment.
- To hoist the motor, use suitable cable-guidance or spreading equipment, particularly if the motor is equipped with built-on assemblies.
- Do not attach lifting equipment to the power connector or signal connector of the motor.
- Do not stand in the slewing range of hoisting gear or under suspended loads.
- When placing down the motor, ensure that it cannot roll away.
- If anything is unclear, please contact the machine manufacturer, stating the machine type and serial number.

NOTICE

Shaft sealing rings damaged by solvent

Solvents can damage the shaft sealing rings of the motor.

- When removing preservation agents or when carrying out cleaning work, avoid that any solvent comes into contact with the shaft sealing rings.

CAUTION

Symptomatic respiratory and skin reaction to chemicals

A newly purchased product might contain traces of substances that are identified as sensitizers.

Sensitizers are substances which can cause sensitization in the lungs and skin after exposure to them.

Once sensitized, individuals can have severe reactions to further exposure, even in small amounts. In the most extreme cases, individuals might develop asthma or dermatitis respectively.

- If the product has a strong smell, keep it in a well-ventilated area for 14 days.

WARNING

Unexpected machine movement caused by radio devices or cellphones

Radio devices, cell phones or mobile WLAN devices in the immediate vicinity of a component can impair the function of the component or damage the component. The malfunction may impair the functional safety of machines and can therefore endanger persons or result in material damage.

- Avoid operating radio devices, cellphones and mobile WLAN devices in the direct vicinity of converters and operating units.
- Scan the machine readable code, e.g. a QR code at least 0.4 m away from the component or switch off the converter power supply before scanning.
- Only operate built-in devices with the control cabinet doors closed.
- When the control cabinet doors are open, only qualified personnel may perform service and maintenance work.

⚠ CAUTION

Radio frequency interference in residential areas

When you operate EMC category C2 devices in residential areas, the devices can cause radio frequency interference.

When you operate EMC category C3 or C4 devices in residential areas, it is to be expected that the devices will cause radio frequency interference.

- Do not operate EMC category C2 devices in residential areas.
- Do not operate EMC category C3 or C4 devices in public low-voltage networks supplying residential buildings.

NOTICE

Damage to motor insulation due to excessive voltages

When operated on systems with grounded line conductors or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage against ground. If you use motors that have insulation that is not designed for operation with grounded line conductors, you must perform the following measures:

- IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
- TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

⚠ WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

NOTICE

Overheating due to inadmissible mounting position

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.

⚠ WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect insulation resistance tests

High test voltages can damage the device.

- Measure the insulation resistance of low voltage circuits of machines or systems only with ≤ 500 V DC.
- Measure the insulation resistance of SELV circuits of machines or systems only with ≤ 250 V DC.

NOTICE

Device damage caused by incorrect voltage tests

High test voltages can damage the device. Capacitive leakage currents can distort the test results.

- Disconnect the components before carrying out a voltage test on the machine. [1)]

[1)] The components are voltage tested in accordance with the IEC 61800-5-1 product standard and must be disconnected during testing in accordance with IEC 60204-1:2021 Section 18.4.

⚠ WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

WARNING

Malfunctions of the machine as a result of incorrect or changed parameter settings

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. EMERGENCY STOP or EMERGENCY OFF.

WARNING

Injury caused by moving or ejected parts

Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

WARNING

Danger to life caused by machine movement and loose objects

Machine movement and loose objects that can fall out or be ejected can cause death or severe bodily injury.

- Be sure to complete all assembly and adjustment work on the machine.
- Ensure that there are no people in the danger zone of the machine before it is switched on.
- Before switching on, check that there are no loose objects in or on the motor that can fall or be flung off.
- Before switching on, check that all safety guard covers for touch protection are installed and all safety equipment functions correctly.

WARNING

Uncovered rotating or live parts

Covers over rotating or live parts and covers that ensure the motor degree of protection or are required for air guidance, and thus for cooling, must be closed during operation.

Death, serious bodily injury, or material damage may result if the required covers are removed.

- Do not remove covers while the motor is running.

⚠ WARNING

Danger to life due to a changed operating behavior of the machine

Changes in the operating behavior of the machine compared with normal operation indicate that the function of the machine is impaired. Changes in the operating behavior of the machine can be seen, for example, in one or more of the following effects:

- An increased power consumption
- Higher temperatures
- Vibration
- Unusual noises
- Unusual smells
- The monitoring devices respond

Impaired machine functioning can cause faults that may result directly or indirectly in death, serious bodily injury, or property damage.

- Immediately inform the maintenance personnel.
- If in doubt, shut down the motor immediately, taking into account the plant-specific safety regulations.

NOTICE

Motor damage in the event of uneven running or abnormal noises

Improper handling during transportation, storage, or assembly can damage the motor. A damaged motor may run unevenly or make abnormal noises during operation. If you operate a damaged motor, this may result in damage to the winding or bearings, or even total destruction of the system.

- Switch the motor off in case of uneven running or abnormal noises.
- Identify the cause.

NOTICE

Motor damage when the maximum speed is exceeded

The maximum speed n_{max} is the highest permissible motor operating speed. The maximum speed is specified on the rating plate (nameplate).

Impermissible speeds can cause damage to the motor.

- Enable speed setpoint monitoring in the control unit or drive so as not to exceed the maximum speed n_{max}.

⚠ WARNING

Fire due to incorrect operation of the motor

When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.

- Operate the motor according to the relevant specifications.
- Only operate the motors in conjunction with effective temperature monitoring.
- Immediately switch off the motor if excessively high temperatures occur.

NOTICE

Wear of the holding brake due to impermissible voltage supply

Operating the holding brake outside the permissible voltage range at the motor connection will damage the brake.

- Only operate the holding brake within its permissible voltage range.

⚠ CAUTION

Burns and thermal damage caused by hot surfaces

Temperatures above 100 °C may occur on the surfaces of motors, converters, and other drive components.

Touching hot surfaces may result in burns. Hot surfaces may damage or destroy temperature sensitive parts.

- Ensure that temperature-sensitive parts do not come into contact with hot surfaces.
- Mount drive components so that they are not accessible during operation.

Measures when maintenance is required:

- Allow drive components to cool off before starting any work.
- Use appropriate personnel protection equipment, e.g. gloves.

2.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment, or any eventuality which may arise. Application examples do not represent customer-specific solutions, but merely serve to provide assistance with typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.4 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Further information is provided on the Internet:

Configuration Manual Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109975311)

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

2.5 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system integrator must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware faults and/or software errors in the sensors, control system, actuators, and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
   - Short circuits or ground faults in the intermediate DC circuit of the converter
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.
7. Motors for use in potentially explosive areas:
   When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Description

3

3.1 System overview

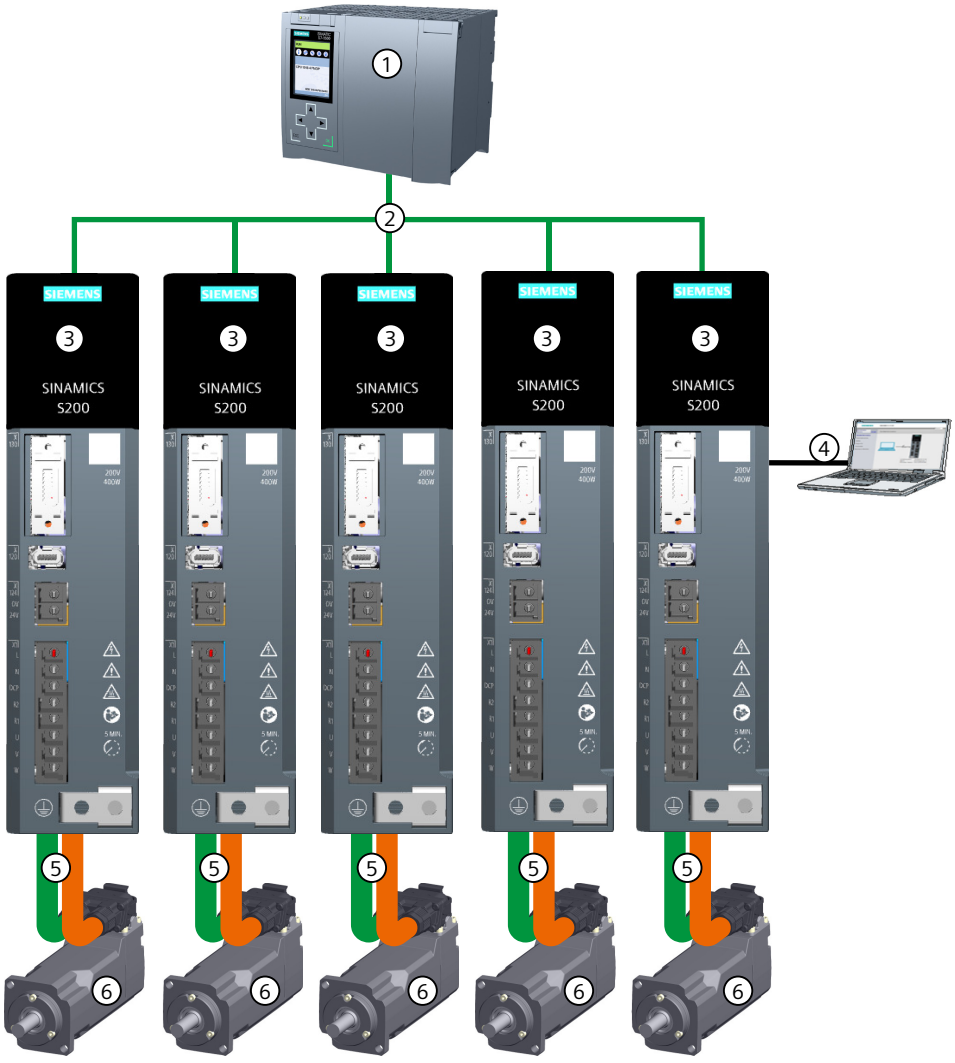
Description

The SINAMICS S200 Compact servo drive system (PN version) is a single-axis servo drive system. It includes the following components tailored to one another:

- SINAMICS S200 Compact converter (referred to as "S200 Compact")
- SIMOTICS S-1FL1 or S-1FL2 motor (referred to as "1FL1" and "1FL2" respectively)
- MOTION-CONNECT cable
  - MOTION-CONNECT 100 cable: for use with the 1FL1 motor
  - MOTION-CONNECT 350 standard cable or MOTION-CONNECT 380 drag chain cable: for use with the 1FL2 motor

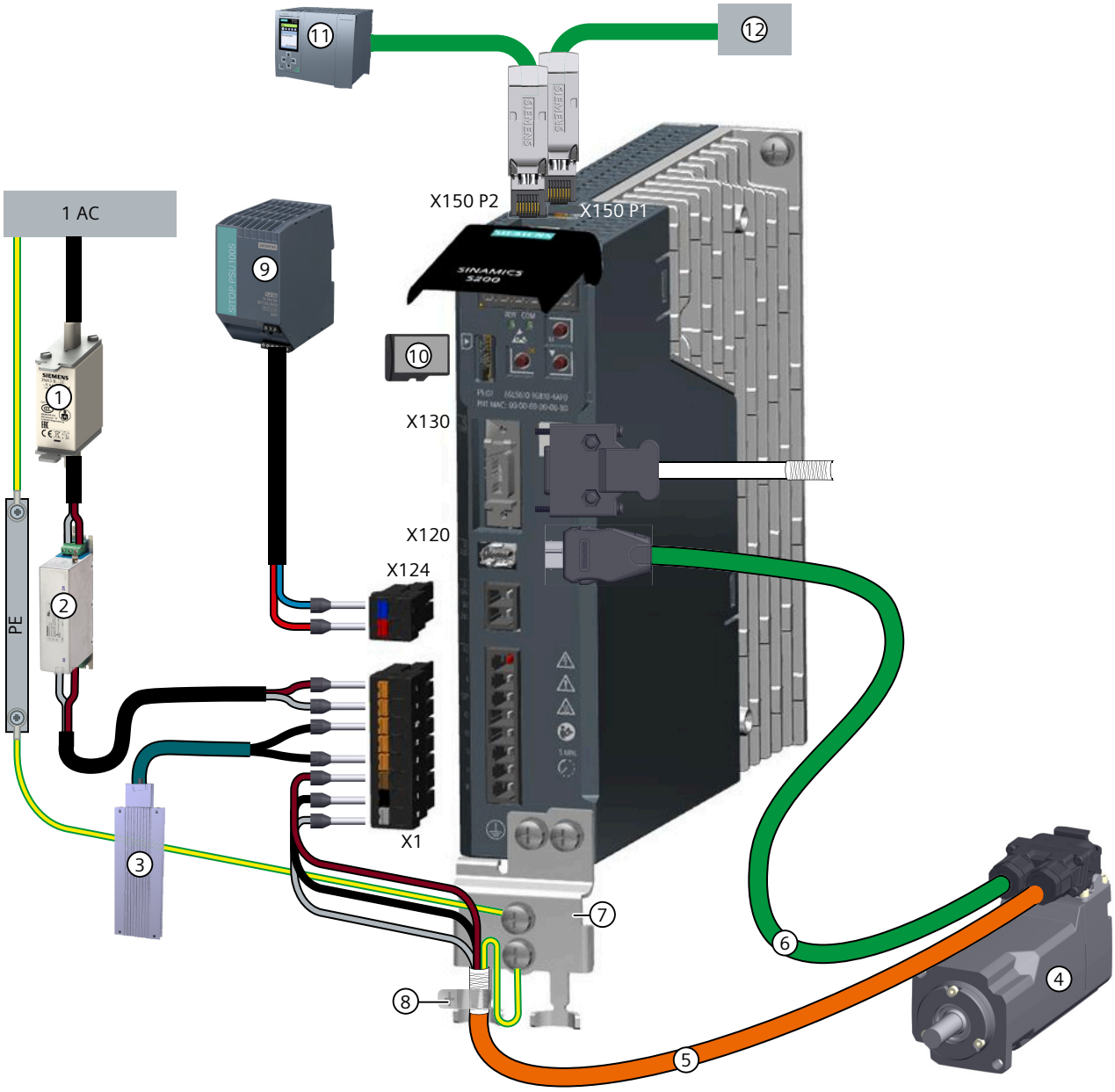
The converter and the motor are intended for use with a higher-level controller (PLC).

Prefabricated MOTION-CONNECT cables, available in various lengths, provide simple and reliable connections between the configurable motor and the converter.



① Controller (for example, SIMATIC S7-1500 or S7-1200 G2)
② Communication between the converter and the controller via PROFINET
③ SINAMICS S200 Compact converter
④ Engineering via LAN with the web server in the converter
⑤ MOTION-CONNECT 100, MOTION-CONNECT 350 or MOTION-CONNECT 380 cables for the motor power, the motor holding brake, and the encoder connections
⑥ SIMOTICS S-1FL1 motor or SIMOTICS S-1FL2 motor

Figure 3-1 System overview (example: converter with controller, 1FL2 motor, and configurable MOTION-CONNECT cables)



①	Fuse or motor starter protector	⑦	Shield plate
②	Line filter (optional)[1]	⑧	Shield clamp
③	External braking resistor (optional)[1]	⑨	24 V DC power supply
④	SIMOTICS S-1FL1 motor or SIMOTICS S-1FL2 motor	⑩	Memory card[2] (Micro SD card, optional)
⑤	Motor power cable	⑪	Controller (for example, SIMATIC S7-1500 or S7-1200 G2)
⑥	Encoder cable	⑫	The next PROFINET participant or a commissioning device

[1] When using the components, make sure that they are connected to the ground correctly.

[2] You can use an applicable memory card with a capacity of up to 128 GB from Siemens or a third-party manufacturer to backup/restore data, transfer converter settings, and update firmware.

Figure 3-2 System components and accessories for converters (example: converter with controller, 1FL2 motor, and configurable MOTION-CONNECT cables)

More information

For more information about the device combination, see Section "Device combinations (Page 58)".

For more information about the interface connection, see Section "Connecting (Page 115)".

3.1.1 Converter

Description

The SINAMICS S200 Compact converter is a new variant of the SINAMICS S200 converter product line (PN version). The converter can be used on the 1 AC 200 V mains supply network to control the 1FL1 motor with low moment of inertia or the 1FL2 motor with low or medium moments of inertia.

Table 3-1 S200 Compact converter variants

Frame size	Rated power (kW)	Mains supply network
FSAB	0.1, 0.2, 0.4	1 AC 200 V ... 240 V
FSAC	0.75	

More information

The SINAMICS S200 converter product line also includes the following two converter variants, in addition to the S200 Compact converter:

- SINAMICS S200 converter
- SINAMICS S200 Basic converter

You can find more information about SINAMICS S200 converter and SINAMICS S200 Basic converter on the Internet: SINAMICS S200 Operating Instructions (https://sieportal.siemens.com/su/bk29i)

3.1.2 Motor

Description

The 1FL1 and 1FL2 motors are intended for use with the S200 Compact converter on the 1 AC 200 V mains supply network.

The 1FL1 motor is available in a low-inertia version with different shaft heights.

The 1FL2 motor is available in both low-inertia and medium-inertia versions, and comes with different shaft heights.

Table 3-2 Motor variants

Motor	Shaft height	Moment of inertia	Rated power (kW)	Mains supply network
1FL1	SH20	Low inertia	0.05, 0.1	200 V
	SH30		0.2, 0.4	
	SH40		0.75	
1FL2	SH20		0.05, 0.1	
	SH30	Low inertia, medium inertia	0.2, 0.4	
	SH40		0.75	
	SH40 (New)		0.75	

3.1.3 MOTION-CONNECT 100, 350 and 380 cables

Description

Prefabricated MOTION-CONNECT cables are used to connect the 1FL1 or 1FL2 motor to the S200 Compact converter.

The cables are available in three variants:

- MOTION-CONNECT 100 cable, which is used for the 1FL1 motor and provides a connection solution for both fixed and drag chain installation applications
- MOTION-CONNECT 350 standard cable, which is used for the 1FL2 motor and provides a connection solution for fixed installation applications
- MOTION-CONNECT 380 drag chain cable, which is used for the 1FL2 motor and provides a connection solution for drag chain installation applications that require a high number of bending cycles

3.2 Scope of delivery

Description

You must order the converter, motor, and cable components individually.

3.2.1 Converter

Description

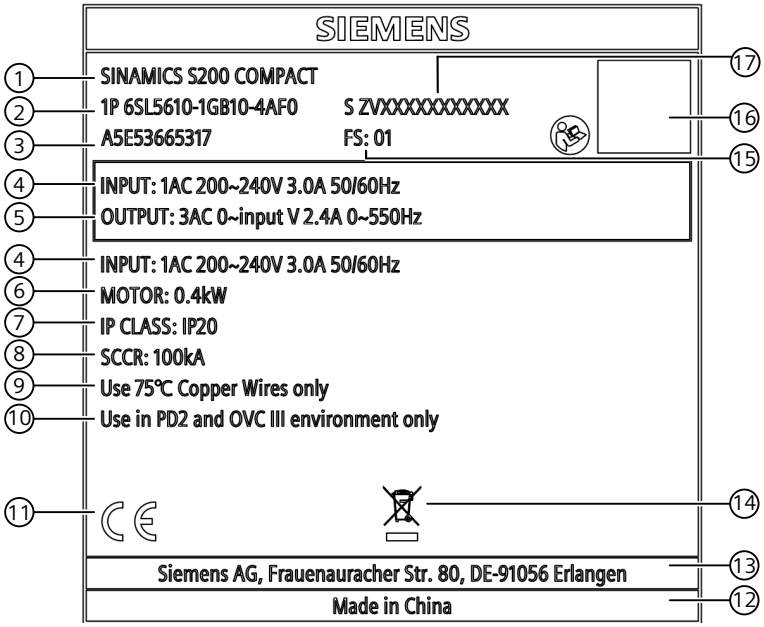
The converter delivery includes at least the following components:

- A ready-to-run converter with loaded firmware
- A connector kit:
  - X1 plug: connector for line connection and motor power connection
  - X124 plug: connector for external 24 V DC power supply
  - A shield plate and four fixing screws
- A "Safety instructions" sheet
- The converter contains open-source software (OSS).
  The OSS license terms are stored in the converter and can be displayed via web server.

3.2.1.1 Rating plate

Description

The rating plate contains the article number and the technical data of the converter.



1	Converter type	10	Pollution degree and overvoltage category
2	Article number	11	Certification
3	Material number	12	Country of origin
4	Mains input	13	Manufacturer's address
5	Output data	14	Note on disposal
6	Supported motor rated power	15	Function release/version
7	Degree of protection	16	QR code
8	Rated short-circuit current	17	Serial number
9	Copper wire		

Figure 3-3 Rating plate example

3.2.1.2 Article numbers

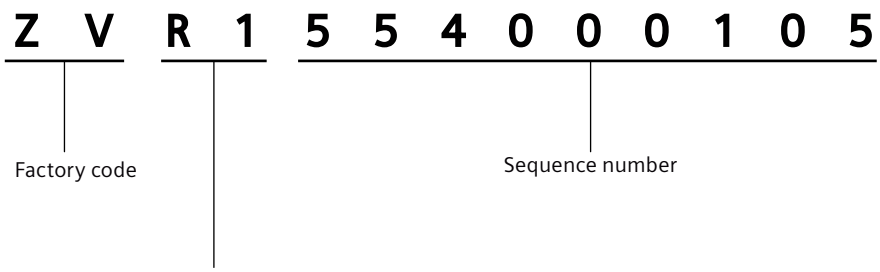
Description

Table 3-3 Article numbers for S200 Compact converters

Frame size	Rated power (kW)	Article number
FSAB	0.1	6SL5610-1GB10-1AF0
	0.2	6SL5610-1GB10-2AF0
	0.4	6SL5610-1GB10-4AF0
FSAC	0.75	6SL5610-1GB10-8AF0

3.2.1.3 Serial number explanation

Description



Production date (year/month)

Code	Calendar year	Code	Month
A	2010, 2030	1	January
B	2011, 2031	2	February
C	2012, 2032	3	March
D	2013, 2033	4	April
E	2014, 2034	5	May
F	2015, 2035	6	June
H	2016, 2036	7	July
J	2017, 2037	8	August
K	2018, 2038	9	September
L	2019, 2039	0	October
M	2020, 2040	N	November
N	2021, 2041	D	December
P	2022, 2042		
R	2023, 2043		
S	2024, 2044		
T	2025, 2045		
U	2026, 2046		
V	2027, 2047		
W	2028, 2048		
X	2029, 2049		

Figure 3-4 Serial number for S200 Compact converter

3.2.2 Motor

Description

The 1FL1 or 1FL2 motor is a servo motor with an integrated encoder and a high degree of protection.

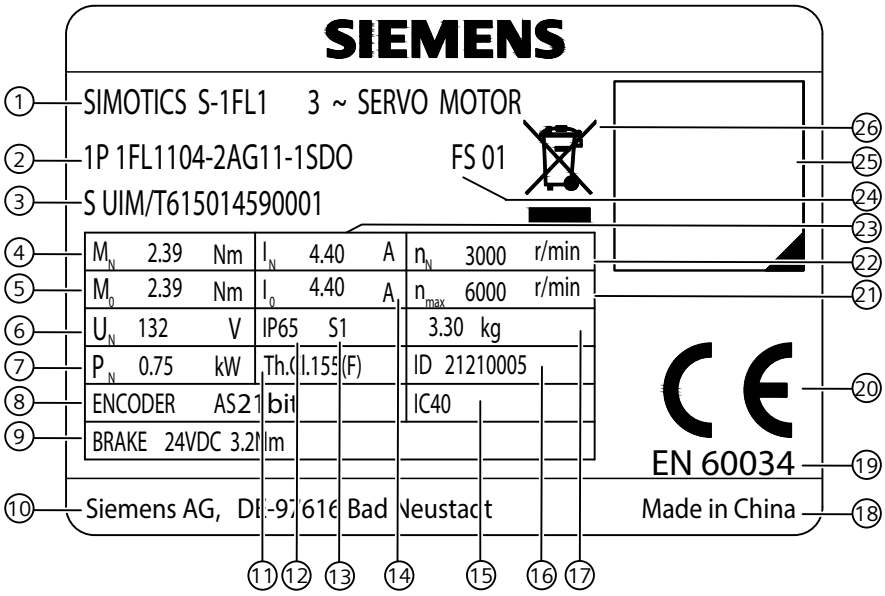
The motor delivery includes the following components:

- A ready-to-run motor
- A "Safety instructions" sheet

3.2.2.1 1FL1 motor

Rating plate

The rating plate contains the article number and the technical data of the motor.



1	Motor type	14	Stall current I_0
2	Article number	15	Cooling method according to EN 60034-6
3	Serial number	16	Motor ID
4	Rated torque M_N	17	Weight
5	Static torque M_0	18	Country of origin
6	Rated voltage U_N	19	Standard for all rotating electrical machines
7	Rated power P_N	20	Certification
8	Encoder type and resolution	21	Maximum speed n_{max}
9	Holding brake	22	Rated speed n_N
10	Manufacturer's address	23	Rated current I_N
11	Thermal class	24	Function release/version
12	Degree of protection	25	QR code
13	Motor operating mode	26	Note on disposal

Figure 3-5 Rating plate example for 1FL1 motors

Article number explanation

The following figure shows an explanation of the article number for the motor.

1 F L 1 1 0 2 - 2 A G 0 1 - 0 H D 0

Inertia

1	Low inertia

Shaft height (SH)

02	20 mm
03	30 mm
04	40 mm

Length/static torque

2	0.16 Nm, 0.05 kW, SH20
	0.64 Nm, 0.2 kW, SH30
	2.39 Nm, 0.75 kW, SH40
4	0.32 Nm, 0.1 kW, SH20
	1.27 Nm, 0.4 kW, SH30

A	Natural cooling

Winding design

G	3000 r/min @ 200 V

Brake

0	Without brake
1	With brake

Degree of protection

1	IP65, with shaft sealing ring

Shaft extension

0	Plain shaft
1	Shaft with feather key (half-key balancing)

Encoder

H	Absolute encoder, 17-bit single-turn
S	Absolute encoder, 21-bit single-turn
A	Absolute encoder, with battery, 21-bit single-turn + 12-bit multiturn

Connection technology

D	Plastic terminal connector

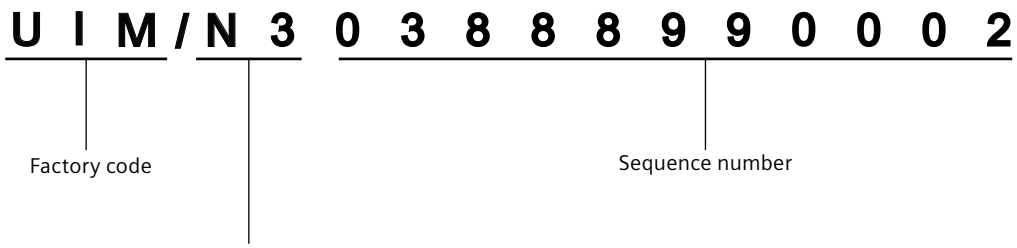
Version number

0	First version

Figure 3-6 Article number for 1FL1 motors

Serial number explanation

The following figure shows an explanation of the serial number for the motor.



Production date (year/month)

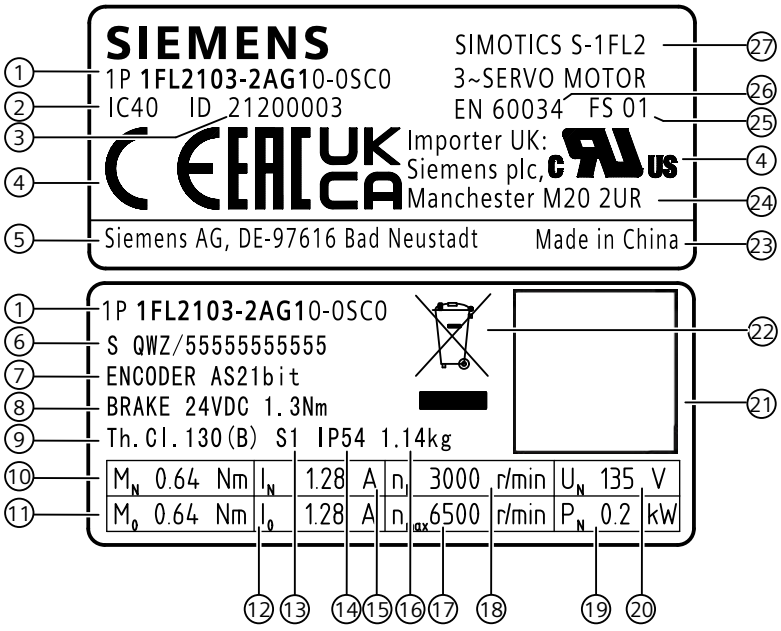
Code	Calendar year	Code	Month
A	2010, 2030	1	January
B	2011, 2031	2	February
C	2012, 2032	3	March
D	2013, 2033	4	April
E	2014, 2034	5	May
F	2015, 2035	6	June
H	2016, 2036	7	July
J	2017, 2037	8	August
K	2018, 2038	9	September
L	2019, 2039	O	October
M	2020, 2040	N	November
N	2021, 2041	D	December
P	2022, 2042		
R	2023, 2043		
S	2024, 2044		
T	2025, 2045		
U	2026, 2046		
V	2027, 2047		
W	2028, 2048		
X	2029, 2049		

Figure 3-7 Serial number for 1FL1 motors

3.2.2.2 1FL2 motor

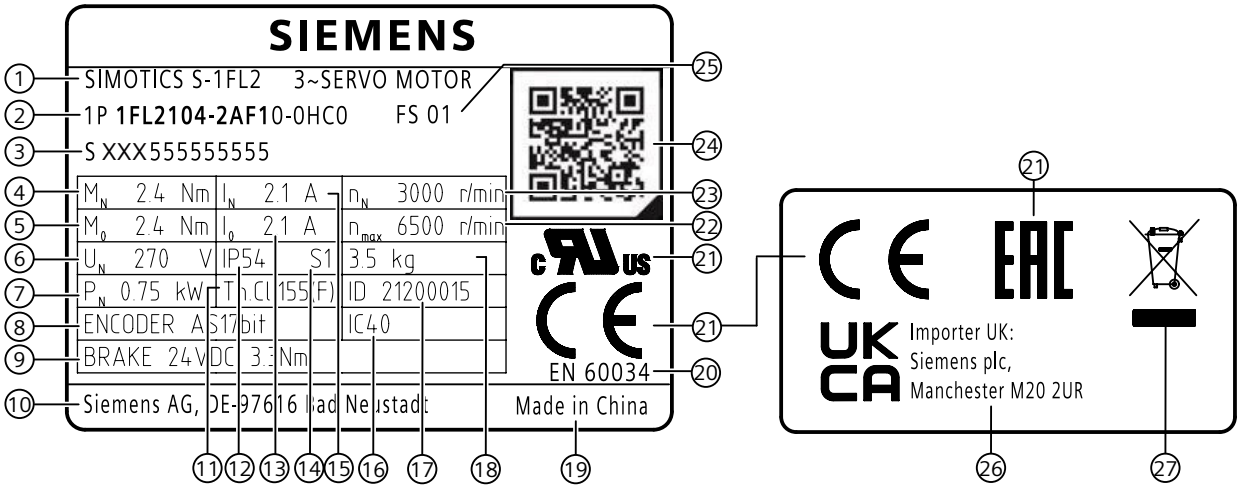
Rating plate

The rating plate contains the article number and the technical data of the motor.



1	Article number	15	Rated current I_N
2	Cooling method according to EN 60034-6	16	Weight
3	Motor ID	17	Maximum speed n_{max}
4	Certifications	18	Rated speed n_N
5	Manufacturer's address	19	Rated power P_N
6	Serial number	20	Rated voltage U_N
7	Encoder type and resolution	21	QR code
8	Holding brake	22	Note on disposal
9	Thermal class	23	Country of origin
10	Rated torque M_N	24	UK importer address
11	Static torque M_0	25	Function release/version
12	Stall current I_0	26	Standard for all rotating electrical machines
13	Motor operating mode	27	Motor type
14	Degree of protection		

Figure 3-8 Rating plate example for 1FL2 SH20 and SH30



1	Motor type	15	Rated current I_N
2	Article number	16	Cooling method according to EN 60034-6
3	Serial number	17	Motor ID
4	Rated torque M_N	18	Weight
5	Static torque M_0	19	Country of origin
6	Rated voltage U_N	20	Standard for all rotating electrical machines
7	Rated power P_N	21	Certifications
8	Encoder type and resolution	22	Maximum speed n_{max}
9	Holding brake	23	Rated speed n_N
10	Manufacturer's address	24	QR code
11	Thermal class	25	Function release/version
12	Degree of protection	26	UK importer address
13	Stall current I_0	27	Note on disposal
14	Motor operating mode		

Figure 3-9 Rating plate example for 1FL2 SH40/SH40 (New)

Article number explanation

The following figure shows an explanation of the article number for the motor.

1 F L 2 1 0 2 - 2 A G 0 1 - 0 H C 0

Inertia

1	Low inertia
2	Medium inertia

Shaft height (SH)

02	20 mm
03	30 mm
04	40 mm

Length/static torque

2	0.16 Nm, 0.05 kW, SH20
	0.64 Nm, 0.2 kW, SH30
	2.4 Nm, 0.75 kW, SH40/SH40 (New)
4	0.32 Nm, 0.1 kW, SH20
	1.27 Nm, 0.4 kW, SH30

A	Natural cooling
B	Natural cooling, compact

Winding design

G	3000 r/min @ 200 V

Brake

0	Without brake
1	With brake

Degree of protection

0	IP54
1	IP65, with shaft sealing ring

Shaft extension

0	Plain shaft
1	Shaft with feather key (half-key balancing)

Encoder

H	Absolute encoder, 17-bit single-turn
S	Absolute encoder, 21-bit single-turn
M	Absolute encoder, 21-bit single-turn + 12-bit multiturn

Connection technology

C	Metal hybrid connector

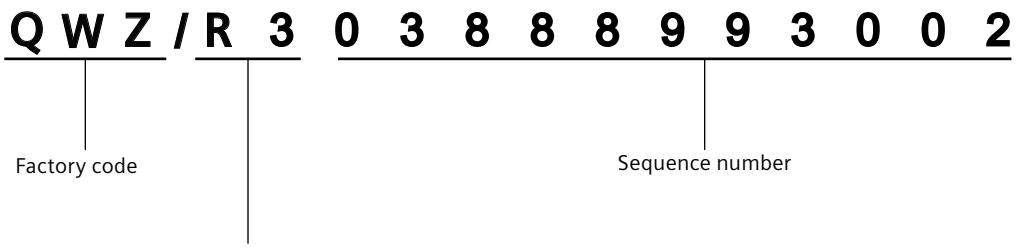
Version number

0	First version

Figure 3-10 Article number for 1FL2 motors

Serial number explanation

The following figures show the explanations of the serial numbers for the motors.



Production date (year/month)

Code	Calendar year	Code	Month
A	2010, 2030	1	January
B	2011, 2031	2	February
C	2012, 2032	3	March
D	2013, 2033	4	April
E	2014, 2034	5	May
F	2015, 2035	6	June
H	2016, 2036	7	July
J	2017, 2037	8	August
K	2018, 2038	9	September
L	2019, 2039	O	October
M	2020, 2040	N	November
N	2021, 2041	D	December
P	2022, 2042		
R	2023, 2043		
S	2024, 2044		
T	2025, 2045		
U	2026, 2046		
V	2027, 2047		
W	2028, 2048		
X	2029, 2049		

Figure 3-11 Serial number for 1FL2 SH20, SH30, and SH40 (New)

Z V R 1 5 5 4 0 0 0 1 0 5

Factory code

Sequence number

Production date (year/month)

Code	Calendar year	Code	Month
A	2010, 2030	1	January
B	2011, 2031	2	February
C	2012, 2032	3	March
D	2013, 2033	4	April
E	2014, 2034	5	May
F	2015, 2035	6	June
H	2016, 2036	7	July
J	2017, 2037	8	August
K	2018, 2038	9	September
L	2019, 2039	0	October
M	2020, 2040	N	November
N	2021, 2041	D	December
P	2022, 2042		
R	2023, 2043		
S	2024, 2044		
T	2025, 2045		
U	2026, 2046		
V	2027, 2047		
W	2028, 2048		
X	2029, 2049		

Figure 3-12 Serial number for 1FL2 SH40

3.2.3 MOTION-CONNECT cables

3.2.3.1 Overview

Description

The MOTION-CONNECT 100, 350 or 380 cable delivery includes the following components:

- The MOTION-CONNECT cable with assembled connectors for connecting the motor to the converter
- A shield clamp for connection of the power cable to the shield plate of the converter
- A "Safety instructions" sheet

3.2.3.2 Article number explanation

Description

Table 3-4 Article numbers for MOTION-CONNECT 100 cable

Description		Position of the article number																	
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
MOTION-CONNECT 100 cable		6	F	X	1	0	0	2											
Cable type	Power cable with brake conductors, drive-end outlet									5	D	D	3	2					
	power cable with brake conductors, non-drive-end outlet									5	D	N	3	2					
	Power cable without brake conductors, drive-end outlet									5	C	D	3	2					
	Power cable without brake conductors, non-drive-end outlet									5	C	N	3	2					
	Encoder cable, drive-end outlet									2	X	B	1	1					
	Encoder cable, non-drive-end outlet									2	X	B	1	2					
	Encoder cable with battery, drive-end outlet									2	X	B	1	3					
	Encoder cable with battery, non-drive-end outlet									2	X	B	1	4					
Cable length	3 m															1	A	D	0
	5 m															1	A	F	0
	7 m															1	A	H	0
	10 m															1	B	A	0
	15 m															1	B	F	0
	20 m															1	C	A	0
	30 m															1	D	A	0

Table 3-5 Article numbers for MOTION-CONNECT 350 and 380 cables

Description		Position of the article number																	
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
MOTION-CONNECT cables		6	F	X	3		0	2											
Cable variant	MOTION-CONNECT 350 standard cable					5													
	MOTION-CONNECT 380 drag chain cable					8													
Connector type	Hybrid connector									7									
Cable type	Power cable with brake conductors										D								
	Power cable without brake conductors										C								
	Dual cable with hybrid connector, drive-end outlet											D							
	Dual cable with hybrid connector, non-drive-end outlet											N							
Cable cross-section	Dual cable with hybrid connector (0.75 mm^2/18 AWG)												0	1					
Cable length	3 m															1	A	D	0
	5 m															1	A	F	0
	7 m															1	A	H	0
	10 m															1	B	A	0
	15 m															1	B	F	0
	20 m															1	C	A	0
	30 m															1	D	A	0

More information

For more information about the cable and connector combination, see Section "Cables and connectors (Page 60)".

3.3 Device combinations

3.3.1 S200 Compact servo drive system with 1FL1 motor

Description

Table 3-6 S200 Compact servo drive system with 1FL1 motor

1FL1 servo motors						S200 Compact converters		MOTION-CONNECT 100 prefabricated cables
Rated torque (Nm)	**Rated power (kW)**	**Rated speed (r/min)**	**Shaft height (mm)**	**Inertia**	**Article number 1FL1**	**Article number**	**Frame size**	**Article number 6FX1002-[1]**
0.16	0.05	3000	20	Low	102-2AG□□-□□D0[2]	6SL5610-1GB10-1AF0	FSAB	Power cable: 5□□32-□□□□ Encoder cable: 2XB1□-□□□□
0.32	0.1	3000			102-4AG□□-□□D0[3]			
0.64	0.2	3000	30	Low	103-2AG□□-□□D0	6SL5610-1GB10-2AF0		
1.27	0.4	3000			103-4AG□□-□□D0	6SL5610-1GB10-4AF0		
2.39	0.75	3000	40	Low	104-2AG□□-□□D0	6SL5610-1GB10-8AF0	FSAC	
Cable length								
3 m								1AD0
5 m								1AF0
7 m								1AH0
10 m								1BA0
15 m								1BF0
20 m								1CA0
30 m								1DA0

[1] The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code.

[2] Use only the cables with the non-drive-end outlets (article number: 6FX1002-5□N32-□□□□, 6FX1002-2XB12-□□□□ or 6FX1002-2XB14-□□□□) for this motor type to ensure reliable functionality.

[3] Siemens recommends that you use the cables with the non-drive-end outlets (article number: 6FX1002-5□N32-□□□□, 6FX1002-2XB12-□□□□ or 6FX1002-2XB14-□□□□) for this motor type to ensure reliable functionality.

3.3.2 S200 Compact servo drive system with 1FL2 motor

Description

Table 3-7 S200 Compact servo drive system with 1FL2 motor

1FL2 servo motors						S200 Compact converters		MOTION-CONNECT 350/380 prefabricated cables
Rated torque (Nm)	**Rated power (kW)**	**Rated speed (r/min)**	**Shaft height (mm)**	**Inertia**	**Article number 1FL2**	**Article number**	**Frame size**	**Article number 6FX3□02-7□□01-[1]**
0.16	0.05	3000	20	Low	102-2AG□□-□□C0	6SL5610-1GB10-1AF0	FSAB	□□□□
0.32	0.1	3000			102-4AG□□-□□C0			
0.64	0.2	3000	30	Low	103-2AG□□-□□C0	6SL5610-1GB10-2AF0		
				Medium	203-2AG□□-□□C0			
1.27	0.4	3000		Low	103-4AG□□-□□C0	6SL5610-1GB10-4AF0		
				Medium	203-4AG□□-□□C0			
2.4	0.75	3000	40	Low	104-2AG□□-□□C0	6SL5610-1GB10-8AF0	FSAC	
				Medium	204-2AG□□-□□C0			
2.4	0.75	3000	40 (New)	Low	104-2BG□1-□□C0			
				Medium	204-2BG□1-□□C0			
Cable length								
3 m								1AD0
5 m								1AF0
7 m								1AH0
10 m								1BA0
15 m								1BF0
20 m								1CA0
30 m								1DA0

[1] The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code.

3.4 Accessories

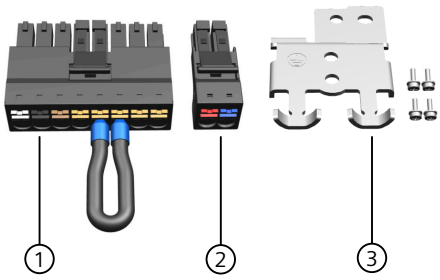
3.4.1 Connector kit

Description

If you need new connectors for the converter front panel, you can order the following connector kit from Siemens:

Description	Article number
Connector kit for S200 Compact	6SL5568-0XX00-0AB0

Scope of delivery



1. X1 plug (jumper for internal braking resistor is included)
2. X124 plug
3. Shield plate, with 4 fixing screws

3.4.2 Cables and connectors

3.4.2.1 MOTION-CONNECT cables

Overview

Siemens recommends that you use MOTION-CONNECT prefabricated cable assemblies and connectors for connecting the motor to the converter.

All Siemens cable assemblies and connectors are tested and compliant with CE standards and EMC requirements.

If you prefer to use non-Siemens cables, Siemens offers guidance on how to assemble your own cables to ensure compatibility and functionality.

Note that Siemens does not provide any guarantee or warranty regarding the functionality, reliability or quality of non-Siemens cables used with the S200 servo drive system, and is not

responsible for device (e.g. motor and converter) damages due to the use of non-Siemens cables.

Description

MOTION-CONNECT 100 cables

Siemens recommends that you use MOTION-CONNECT 100 prefabricated cable assemblies for connecting the 1FL1 motor to the converter.

Table 3-8 Overview of MOTION-CONNECT 100 cables

MOTION-CONNECT 100 cables for 1FL1 motors		
Type	**Article number 6FX1002-[1)]**	**Cross-section for conductors (mm^2)**
Power cable (with brake conductors)	5DD32-□□□□ 5DN32-□□□□	4 × 0.5 + 2 × 0.2
Power cable (without brake conductors)	5CD32-□□□□ 5CN32-□□□□	4 × 0.5
Encoder cable	2XB11-□□□□ 2XB12-□□□□	3 × 2 × 0.14

MOTION-CONNECT 100 cables for 1FL1 motors		
Type	**Article number 6FX1002-**[1]	**Cross-section for conductors (mm²)**
Encoder cable with battery	2XB13-□□□□	4 × 2 × 0.14
	2XB14-□□□□	

[1] The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code:
1AD0 = 3 m, 1AF0 = 5 m, 1AH0 = 7 m, 1BA0 = 10 m, 1BF0 = 15 m, 1CA0 = 20 m, 1DA0 = 30 m.

Ordering data and dimension drawing for the battery case

Table 3-9 Ordering data for the battery case

Description	Article number	Image
Battery case (without battery) for MOTION-CONNECT 100 encoder cable with battery	6FX2003-0BA01	

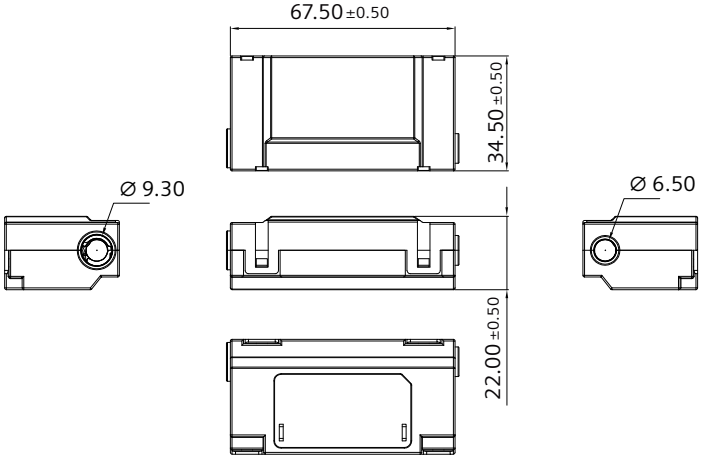


Figure 3-13 Battery case dimension, length in mm

Replacement battery

The battery, included in the delivery scope of MOTION-CONNECT 100 encoder cable with battery, has a minimum service life of three years under normal operating conditions.

Alarm A31442 occurs when a battery voltage lower than 3.1 V is detected during the converter startup. It indicates that the battery is approaching the end of its service life. To avoid potential encoder data loss, replace the battery immediately.

You can select a replacement battery based on the technical specification provided below. Siemens recommends that you use the primary Li-$SOCl_2$ battery.

Table 3-10 Technical specification for the replacement battery

Property	Description	Image
Battery type	Industrial AA battery	
Voltage	3.6 V	
Minimum capacity	2700 mAh	
Shape	Cylinder	
Dimensions	Ø 14.5 mm × H 50.5 mm	
Operating temperature	-55 °C ... +85 °C	
Connector for lead wires (+/- battery electrode)	2-pin socket, pitch 2.5 mm, conductor cross-section 0.08 mm^2 ... 0.32 mm^2	

Note

Data loss due to replacing the battery

To avoid data loss, replace the battery while the drive system is powered on.

NOTICE

Wire breakage caused by improper removal of the battery connector

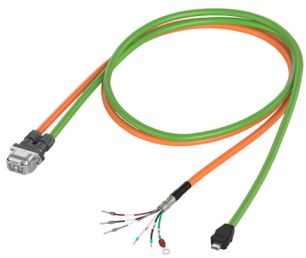
Removing the battery connector by pulling the connector wires can lead to wire breakage.

- Make sure that you remove the connector by holding and pulling the connector itself rather than the wires.

MOTION-CONNECT 350 and 380 cables and connectors

Siemens recommends that you use MOTION-CONNECT 350/380 prefabricated cable assemblies and connectors for connecting the 1FL2 motor to the converter.

Table 3-11 Overview of MOTION-CONNECT 350 and 380 cables

MOTION-CONNECT 350 and 380 cables for 1FL2 motors			Connectors	
Type	**Article number 6FX3□02-[1]**	**Cross-section for conductors (mm²)**	**Drive side 6FX2003-**	**Motor side 6FX2003-**
Dual cable with hybrid connector: Power cable (with brake conductors)[2] + encoder cable 	7DD01-□□□□	• Power cable (with brake conductors): – 4 × 0.75 + 2 × 0.38 (4 × 18 AWG + 2 × 22 AWG) • Encoder cable: – Cable length ≤ 15 m: 3 × 2 × 0.25 (3 × 2 × 24 AWG) – Cable length 20 m or 30 m: 2 × 2 × 0.25 + 2 × 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG)	0DE61	3HD00
	7DN01-□□□□			3HN00
Dual cable with hybrid connector: Power cable (without brake conductors) + encoder cable 	7CD01-□□□□	• Power cable (without brake conductors): – 4 × 0.75 (4 × 18 AWG) • Encoder cable: – Cable length ≤ 15 m: 3 × 2 × 0.25 (3 × 2 × 24 AWG) – Cable length 20 m or 30 m: 2 × 2 × 0.25 + 2 × 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG)		3HD00
	7CN01-□□□□			3HN00

[1] The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code: 1AD0 = 3 m, 1AF0 = 5 m, 1AH0 = 7 m, 1BA0 = 10 m, 1BF0 = 15 m, 1CA0 = 20 m, 1DA0 = 30 m.

[2] The conductors for the motor holding brake are integrated in the MOTION-CONNECT 350/380 power cable.

If you prefer to use non-Siemens cables, Siemens provides the following connectors for you to assemble your own cables.

Table 3-12 Overview of connectors and crimp contacts

Component	Article number 6FX2003-	Description	Connection type	Quantity per package	Illustration
Connector (connected to motor)	3HD00	Hybrid plug (drive end)	Crimping	5 pieces/pack	
	3HN00	Hybrid plug (non-drive end)	Crimping	5 pieces/pack	
Connector (connected to converter)	0DE61	IX-C connector	Crimping	5 pieces/pack	
Crimp contact	7HP00	Hybrid power contacts	Crimping	2000 pieces/reel	
	7HS00	Hybrid signal contacts	Crimping	2000 pieces/reel	

More information

For more information about the MOTION-CONNECT cable article number explanation, see Section "Article number explanation (Page 56)".

For more information about assembling cables, see Section "Assembling cables (Page 804)".

For more information about installing the battery case and replacing the battery, see Section "Assembling the encoder connector for 1FL1 motors with multiturn encoder (Page 809)".

For more information about using multiturn encoder with battery, see Section "Using the multiturn encoder with battery on the 1FL1 motor (Page 596)".

3.4.2.2 I/O cable and connector

Description

The cable is used to connect the converter to a controller for signal transmission on the interface X130.

Table 3-13 I/O cable and connector

Description	Article number
PROFINET I/O cable with a 14-pin MDR connector, length: 1 m	6SL5562-1XX00-0AE0
PROFINET I/O connector 14-pin MDR connector	6FX2003-0SB14

More information

For more information about the I/O cable and connector, see Section "Connecting the inputs and outputs (Page 140)".

For more information about how to assemble the I/O connector, see Section "Assembling the I/O connector (Page 811)".

3.4.3 Line filter

Description

Line filters limit the conducted interference emissions from the converters to the permissible limit values according to IEC 61800-3 Category C2.

Line filters are passive components used to expand the EMC properties of the servo drive system.

Siemens recommends that you use a line filter to protect the system from high frequency noise.

Table 3-14 Recommended line filter

Converter frame size	Rated current (A)	Article number
FSAB/FSAC	18	6SL5550-0XB21-8CA0

Note

For applications where EMC Category C2 or C3 is necessary, the use of the recommended line filter is mandatory to fulfill the local EMC directives.

3.4.3.1 Technical data of the line filter

Technical data

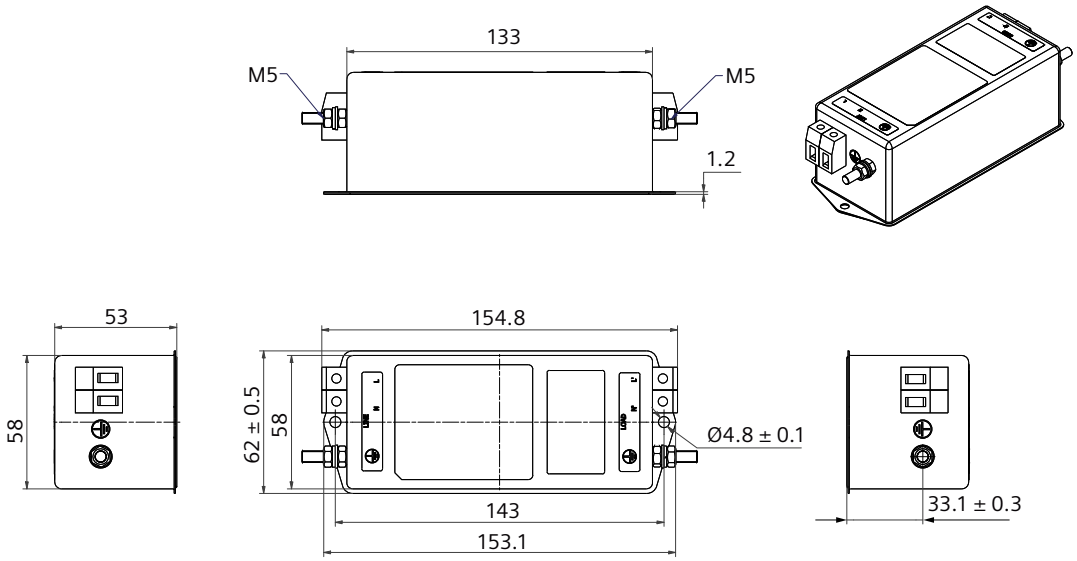
Table 3-15 Technical data of the line filter

Article number	**6SL5550-0XB21-8CA0**
Line voltage (V)	1 AC 200 ... 240
Rated current (A)	18
Power loss (W)	4.7
Type of connection	Screw terminals
Conductor cross-section (mm^2)	
For single-conductor connection	0.75 ... 6 (AWG 18 ... 10)
For flexible cable connection	0.75 ... 4 (AWG 18 ... 10)
Insulation stripping length (mm)	8 ... 9
Protective conductor connection	M5
Degree of protection	IP20
Dimensions (W × H × D, mm)	58 × 155 × 53
Weight (kg)	0.75
Leakage current (mA)	11.84

3.4.3.2 Dimension drawing

6SL5550-0XB21-8CA0

All dimensions are specified in millimeters.



Tightening torque for the mounting screws: 2.5 Nm

Tightening torque for the protective conductor fastening bolt: 2.0 Nm ... 2.2 Nm

Tightening torque for the line-side and load-side screw connection: 0.7 Nm ... 0.8 Nm

3.4.3.3 Mounting instructions for the line filter

Description

- Observe the requirements for "EMC-compliant installation (Page 90)" when mounting the line filter.
- To achieve a low-impedance connection, mount the line filter on the same metallic mounting plate as the converter. Mount these two components as close as possible.

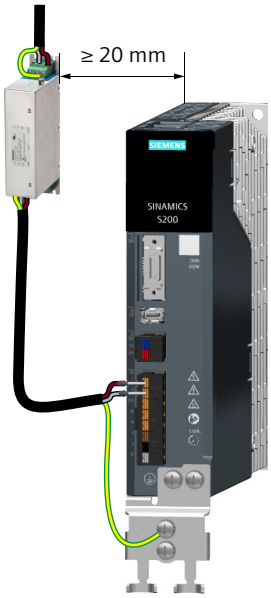


Figure 3-14 Connecting the line filter (example)

3.4.4 External 24 V DC power supply

Description

A 24 V DC power supply is needed to supply the converter. The following table provides the technical specifications of the required external 24 V DC power supply:

Table 3-16 Specifications of the required external 24 V DC power supply

Parameter	Description
Rated voltage (V)	24
Permissible voltage fluctuation (V)	When using a motor without brake: 20.4 ... 28.8 (-15% ... +20%) When using a motor with brake: 22.8 ... 28.8 (-5% ... +20%)
Maximum current (A)	When using a motor without brake: 1.2 When using a motor with brake: 2.2
Safety insulation class	SELV

Note

Siemens recommends that you use different 24 V DC power supplies for the converter and for the inductive loads such as relays or solenoid valves.

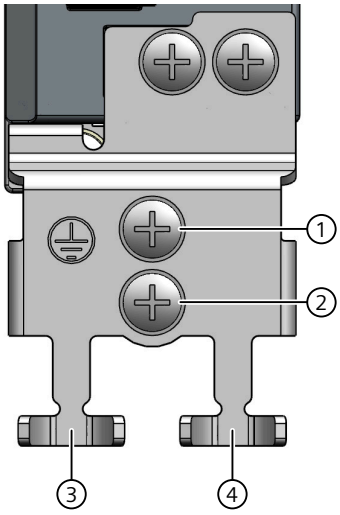
If you use the 24 V DC power supply to supply both the inductive loads and the converter at the same time, make sure that you connect surge protection devices to the load side.

3.4.5 Shield plate kit

Description

The shield plate kit (article number: 6SL5566-0AB00-0AB0) includes 3 shield plates and 12 fixing screws (M4 × 12). The shield plate can establish ground connections to both shielded cables and protective conductors.

You can use the supplied two M4 screws to fix the shield plate to a tightening torque of 2.2 Nm.



① Converter grounding
② Motor cable grounding
③ Fixing motor power cable
④ Reserved (recommended for fixing encoder cable)

Figure 3-15 Shield plate

For the connection of ① or ②, you can connect the protective conductor with a cable lug and an M4 screw to the shield plate.

3.4.6 IP65 degree of protection kit for 1FL2 motors SH20 and SH30

Description

The IP65 degree of protection kit can be used as spare part or for upgrading the degree of protection from IP54 to IP65.

The main part of the IP65 degree of protection kit is a shaft sealing ring.

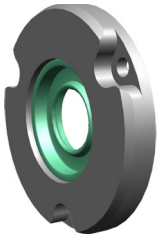
The motor satisfies IP65 degree of protection when the shaft sealing ring is installed.

Note

You can order a motor with IP65 degree of protection directly, in which the shaft sealing ring is already integrated.

More information about ordering IP65 degree of protection can be found in Section "1FL2 article number explanation (Page 51)".

Table 3-17 Ordering data for the IP65 degree of protection kit

Motor	Article number	Illustration
1FL2102	1FL2902-0GC00	
1FL2103 1FL2203	1FL2903-0GC00	

More information

For more information about how to install or replace the shaft sealing ring, see Section "Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30 (Page 833)".

For more information about the degree of protection of 1FL2 motors, see Section "Degree of protection (Page 586)".

3.5 Directives and standards

Table 3-18 Certification overview

Certificate	S200 Compact converter	1FL1 motor	1FL2 motor	MOTION-CONNECT 100 cable	MOTION-CONNECT 350/380 cable
CE	✓	✓	✓	✓	✓
cURus	-	-	✓	-	✓
UKCA	-	✓	✓	-	✓
EAC	-	-	✓	-	✓
REACH	✓	✓	✓	✓	✓
RoHS	✓	✓	✓	✓	✓
China RoHS	✓	✓	✓	✓	✓
ISO 9001 & ISO 14001	✓	✓	✓	✓	✓
WEEE	✓	✓	✓	✓	✓
China Energy Label	-	✓	✓	-	-

3.5.1 Directives, standards and certificates for the converter

The following directives and standards are relevant for the converter:

European Low Voltage Directive

The converter fulfills the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if it is covered by the application area of this directive.

European RoHS Directive

The converter complies with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

European EMC Directive

The compliance of the converter with the regulations of the Directive 2014/30/EU has been verified through full compliance with the IEC 61800-3.

Registration, Evaluation and Authorization of Chemicals

The converter complies with the requirements of Registration, Evaluation and Authorization of Chemicals (REACH).

China RoHS

The converter complies with the requirements of China RoHS. You can find additional information on the Internet:

China RoHS (https://sieportal.siemens.com/su/blK9o)

Quality systems

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Taking back and recycling waste electrical and electronic equipment (WEEE)

The converter complies with the requirements laid down in Directive 2012/19/EU with regard to returning and recycling scrap electrical and electronic equipment.

Certificates for download

You can find all relevant certificates for download on the Internet:

Certificates (https://sieportal.siemens.com/su/blK9o)

3.5.2 Directives, standards and certificates for the motor

The following directives and standards are relevant for the motors:

European Low Voltage Directive

The motors fulfill the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the application area of this directive.

European RoHS Directive

The motors comply with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

European EMC Directive

The compliance of the motors with the regulations of the Directive 2014/30/EU has been verified through full compliance with the IEC 61800-3.

Underwriters Laboratories (North American market)

The motors provided with the test symbol displayed fulfill the requirements stipulated for the North American market.

UKCA certification

The motors comply with the requirements for the market in Great Britain (England, Wales and Scotland).

Eurasian Conformity

The motors comply with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).

Registration, Evaluation and Authorization of Chemicals

The motors comply with the requirements of Registration, Evaluation and Authorization of Chemicals (REACH).

China RoHS

The motors comply with the requirements of China RoHS. You can find additional information on the Internet:

China RoHS for 1FL1 motor (https://support.industry.siemens.com/cs/us/en/view/109994251)

China RoHS for 1FL2 motor (https://support.industry.siemens.com/cs/ww/en/view/109823643)

Quality systems

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Taking back and recycling waste electrical and electronic equipment (WEEE)

The motors comply with the requirements laid down in Directive 2012/19/EU with regard to returning and recycling scrap electrical and electronic equipment.

China Energy Label

The motors comply with China Energy Label Grade 2 according to GB 30253, except for the 1FL2 SH40 (New) motor. The 1FL2 SH40 (New) motor achieves China Energy Label Grade 1.

Table 3-19 Specifications of China Energy Label

Name of the standard	Minimum allowable values for energy efficiency and energy efficiency class of permanent-magnet synchronous motors (GB 30253)
Date of entry into force	July 1, 2020
Affected motors	Permanent-magnet synchronous motors (without incorporated brake) with a rated power of 0.55 kW to 90 kW and a rated speed of 500 r/min to 3000 r/min driven by variable-frequency equipment on a power supply below 1000 V.
Motor requirements	As of the implementation date of the standard, all affected motors must be provided with the "China Energy Label".
Affected Siemens products	Affected Siemens motors are subject to the requirements of standard GB 30253: SIMOTICS S-1FL1 and S-1FL2 servo motors.

Figure 3-16 Example of the China Energy Label

The article number ① stated on the China Energy Label corresponds to the first 11 positions of the motor article number.

Certificates for download

You can find all relevant certificates for download on the Internet:

Certificates for 1FL1 motor (https://sieportal.siemens.com/su/blYrM)

Certificates for 1FL2 motor (https://sieportal.siemens.com/su/bl09o)

3.5.3 Directives, standards and certificates for the MOTION-CONNECT cable

The following directives and standards are relevant for the MOTION-CONNECT cables:

European Low Voltage Directive

The MOTION-CONNECT cables fulfill the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the application area of this directive.

European RoHS Directive

The MOTION-CONNECT cables comply with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

Underwriters Laboratories (North American market)

The MOTION-CONNECT cables provided with the test symbol displayed fulfill the requirements stipulated for the North American market.

UKCA certification

The MOTION-CONNECT cables comply with the requirements for the market in Great Britain (England, Wales and Scotland).

Eurasian Conformity

The MOTION-CONNECT cables comply with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).

Registration, Evaluation and Authorization of Chemicals

The MOTION-CONNECT cables comply with the requirements of Registration, Evaluation and Authorization of Chemicals (REACH).

China RoHS

The MOTION-CONNECT cables comply with the requirements of China RoHS. You can find additional information on the Internet:

China RoHS for MOTION-CONNECT 100 cable (https://support.industry.siemens.com/cs/cn/en/view/109994265)

China RoHS for MOTION-CONNECT 350/380 cable (https://support.industry.siemens.com/cs/ww/en/view/109994768)

Quality systems

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Taking back and recycling waste electrical and electronic equipment (WEEE)

The MOTION-CONNECT cables comply with the requirements laid down in Directive 2012/19/EU with regard to returning and recycling scrap electrical and electronic equipment.

Certificates for download

You can find all relevant certificates for download on the Internet:

Certificates for MOTION-CONNECT 100 cable (https://sieportal.siemens.com/su/bl08V)

Certificates for MOTION-CONNECT 350/380 cable (https://sieportal.siemens.com/su/bl09q)

Application planning

4

4.1 Fault protection for the motor circuit

Description

The converter provides short-circuit protection at the motor output terminals.

The manufacturer's declaration describes the conditions regarding protection against electric shock in the event of an insulation failure in the motor circuit.

More information

You can find more information on the Internet: Manufacturer's declaration (https://support.industry.siemens.com/cs/ww/en/view/109476638)

4.2 Line connection conditions for the converter with the motor

Description

The drive system is designed for connection to grounded TN/TT mains supply networks.

Depending on the planned installation altitude, the following constraints must be taken into account regarding the line connection.

Table 4-1 Line connection conditions for the converter with the motor

Motor	Converter input voltage	Permissible line system configurations for installation altitude no higher than 2000 m	Permissible line system configurations for installation between 2000 m and 4000 m
200 V	1 AC 200 V ... 240 V (-15% ... +10%)	TN and TT line systems with grounding at any potential	Install an isolating transformer and ground the secondary side at any potential.

4.3 Minimum cross-section of the protective conductors

Overview

A high leakage current flows through the protective conductor in converter operation. For reliable touch protection during operation, the protective conductor of the converter must not be interrupted. This primarily results in requirements for the minimum conductor cross-section of the protective conductor.

No restriction applies to the length of the protective conductor for touch protection; however, short protective conductors are advantageous for EMC-compliant installation.

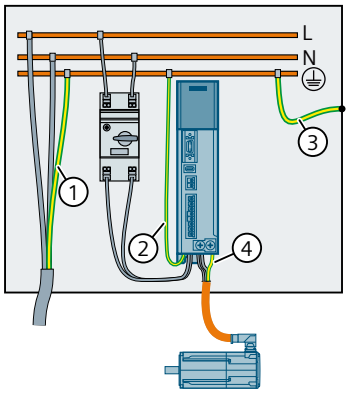
Description

WARNING

Electric shock due to interrupted protective conductor

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

- Comply with the requirements for the protective conductor.



① **Protective conductor for the mains supply cable**

The protective conductor must be dimensioned in compliance with local installation rules for equipment with high leakage currents (for example, IEC 61800-5-1).

The minimum cross-section of the protective conductor depends on the cross-section of the line conductor of the mains supply cable:

Cross-section of line conductor of the mains supply cable S in mm²	Minimum cross-section of the protective conductor[1)]
S ≤ 16 mm²	S
16 mm² < S ≤ 35 mm²	16 mm²

Cross-section of line conductor of the mains supply cable S in mm²	Minimum cross-section of the protective conductor[1)]
S > 35 mm²	S/2
[1)] The provided values are valid only if the protective conductor is made of the same material as the line conductor.	

Additionally, one or more of the following conditions must be satisfied:

- The protective conductor is routed so that along its complete length it is protected against mechanical damage.
  Cables routed inside electrical cabinets or enclosed machine housings are considered to be adequately protected against mechanical damage.
- The protective conductor has a cross-section ≥ 10 mm² Cu.
  For a cross-section < 10 mm² copper, a second protective conductor with the same cross-section is provided.
- When establishing the connection using an industrial plug connector according to IEC 60309, the protective conductor of a multi-conductor cable must have a cross-section ≥ 2.5 mm² Cu.
- The protective conductor of a multi-conductor cable has a cross-section ≥ 2.5 mm² Cu.

② **Protective conductor of the converter line supply cable**

The protective conductor must be dimensioned in compliance with local installation rules.

- If each converter is individually protected, the protective conductor with the same cross-section must be routed in the same way as the line connection cable to the converter.

③ **Protective conductor between PE and control cabinet**

The cable cross-section must be dimensioned in compliance with local installation rules.

④ **Protective conductor of the motor power cable**

The protective conductor has the same cross-section as the line conductor of the motor power cable.

4.4 Configuring the braking resistor

4.4.1 Internal braking resistor

Description

An internal braking resistor is designed in the FSAC converter to absorb regenerative energy from the motor.

The FSAB converters do not have an internal braking resistor.

The table below shows the information of the internal braking resistor:

Table 4-2 Internal braking resistor of the SINAMICS S200 Compact FSAC converter

Frame size	Resistance (Ω)	Maximum continuous power (P_{cont_int}) (W)	Maximum peak power (P_{max_int}) (W)	Maximum braking energy (E_{max_int}) (J)
FSAC (0.75 kW)	50	25	1334	223

More information

For more information about connecting the braking resistor, see Section "Connecting the braking resistor (Page 135)".

4.4.2 External braking resistor

4.4.2.1 Overview

Description

If the motor feeds back more energy than can be dissipated by the internal braking resistor, or when you use a converter without an internal braking resistor, you will require an external braking resistor. You can select a suitable external braking resistor according to your calculation result for the specific application.

When selecting a braking resistor, you must take into account the factors such as load inertia, deceleration time, speed variation, and braking period according to your specific application and technology.

Note

The minimum resistance of the selected external braking resistor is required for each frame size as follows:

- 100 Ω for the FSAB converter
- 50 Ω for the FSAC converter

WARNING

Risk of fire caused by continuous overload

An explosion or a fire could occur if the external braking resistor is continuously overloaded (for example as the result of a defective Braking Unit). This can result in severe injury or death and/or the enclosure could melt.

- Use only braking resistors that are intrinsically safe.

NOTICE

Damage to the converter due to its maximum load being exceeded

If the maximum permissible continuous power, peak power or braking energy is exceeded, the converter may be damaged.

- Only ever operate the converter within its maximum permissible working range.

More information

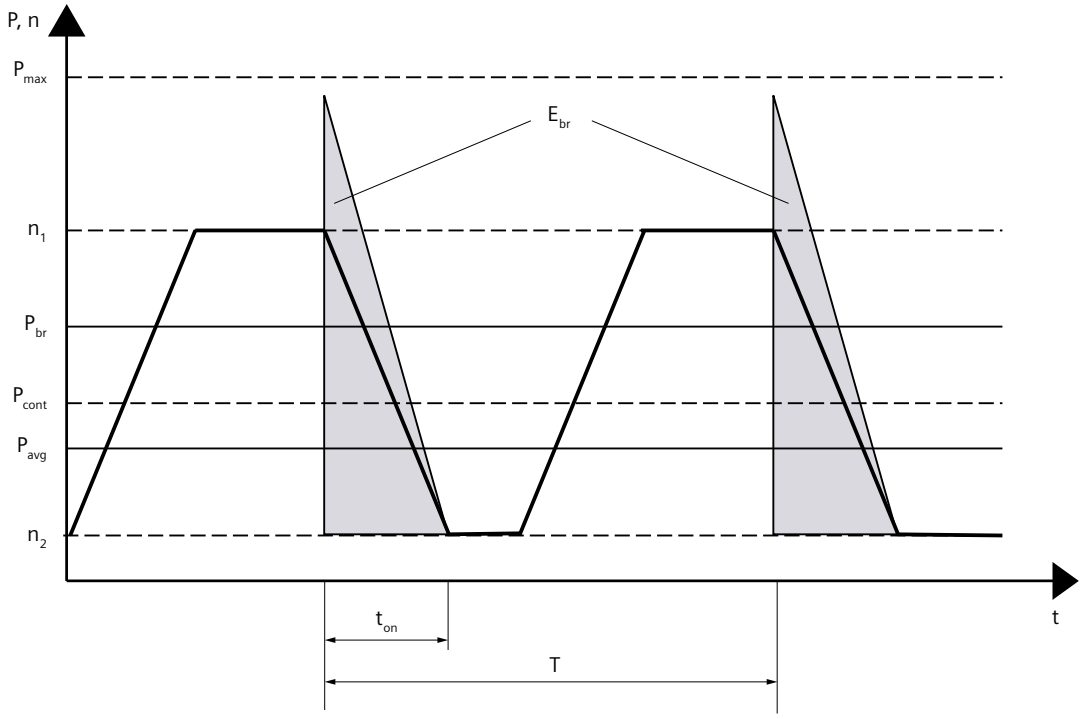
For more information about connecting the braking resistor, see Section "Connecting the braking resistor (Page 135)".

For the technical data and characteristics of the 1FL2 motors, see Section "Technical data and characteristics of the 1FL2 (Page 606)".

For more information about selecting a motor, see Section "Motor selection (Page 828)".

4.4.2.2 Selection and calculation

Load cycle for the braking resistor



P_{max} [W]: Maximum peak power
P_{cont} [W]: Maximum continuous power
P_{br} [W]: Application-specific braking power
P_{avg} [W]: Application-specific average braking power
E_{max} [J]: Maximum braking energy
E_{br} [J]: Application-specific braking energy
t_{on} [s]: Braking duration
T [s]: Cycle duration
n_1 [r/min]: Initial speed
n_2 [r/min]: Speed after braking

P_{max_int} [W]: Maximum peak power of internal braking resistor
P_{max_ext} [W]: Maximum peak power of external braking resistor
P_{cont_int} [W]: Maximum continuous power of internal braking resistor
P_{cont_ext} [W]: Maximum continuous power of external braking resistor
E_{max_int} [J]: Maximum braking energy of internal braking resistor
E_{max_ext} [J]: Maximum braking energy of external braking resistor

Figure 4-1 Peak power, continuous power and duty cycle of the braking resistor

Selection criteria

The following conditions must be met simultaneously when selecting the braking resistor:

- The calculated braking energy required in the application E_{br} must not exceed the maximum braking energy E_{max}. If $E_{br} < E_{max_int}$, you don't require an external braking resistor. If $E_{br} > E_{max_int}$, you must use the external braking resistor. Select the external braking resistor with $E_{max_ext} > E_{br}$.
- The braking power required in the application P_{br} must not exceed the maximum peak power P_{max}. When using the internal braking resistor, if $P_{br} > P_{max_int}$, you can adjust the braking duration t_{on}. If the requirement ($P_{br} < P_{max_int}$) of the specific application still can not be satisfied, you must use the external braking resistor. Select the external braking resistor with $P_{max_ext} > P_{br}$.
- The average braking power required in the application P_{avg} (arithmetic mean of the braking cycle) must not exceed the maximum continuous power P_{cont}. When using the internal braking resistor, if $P_{avg} > P_{cont_int}$, you can adjust the braking cycle duration T. If the requirement ($P_{avg} < P_{cont_int}$) of the specific application still can not be satisfied, you must use the external braking resistor. Select the external braking resistor with $P_{cont_ext} > P_{avg}$.

You can find the data of the internal braking resistor for the FSAC converter in Section "Internal braking resistor (Page 83)".

Calculating the braking energy, the braking power, and the average braking power

To find out whether you require an external braking resistor, proceed the following calculations:

- Calculate the braking energy according to the following formula:

$$E_{br} = \frac{1}{2}(J_{mot} + J)\frac{4\pi^2}{3600}(n_1^2 - n_2^2)$$

Note

As the friction is not taken into account in the above formula, less energy is fed back to the servo drive system in practice than that calculated in the formula.

- Calculate the braking power according to the following formula:
  $P_{br} = E_{br} / t_{on}$
- Calculate the average braking power according to the following formula:
  $P_{avg} = E_{br} / T$

E_{br} / J	Application-specific braking energy
J_{mot} / kgm²	Moment of inertia of the servo motor
J / kgm²	Moment of inertia of the driven mechanical system in relation to the shaft of the servo motor
n_1 / r/min	Initial speed
n_2 / r/min	Speed after braking
P_{br} / W	Application-specific braking power
P_{avg} / W	Application-specific average braking power

t_{on} / s Braking duration
T / s Cycle duration

Example for internal braking resistor application

A 1FL2104-2AG... servo motor with low moment of inertia (with integrated holding brake) with a mechanical system is fed from a SINAMICS S200 Compact 6SL5610-1GB10-8AF0. It is to be braked from 3000 r/min to 600 r/min with a braking duty cycle as t_{on} = 0.05 s, T = 2 s.

Moment of inertia of the servo motor 1FL2104-2AG... $J_{mot} = 0.5 \times 10^{-4}$ kgm²

Moment of inertia of the driven mechanical system $J = 4 \times 10^{-4}$ kgm²

n_1 = 3000 r/min n_2 = 600 r/min

⇒ E_{br} = 21.32 J < E_{max_int} = 223 J (1 J = 1 Ws)

⇒ P_{br} = 426.37 W < P_{max_int} = 1334 W

⇒ P_{avg} = 10.66 W < P_{cont_int} = 25 W

In this case, therefore, no external braking resistor is required.

Example for external braking resistor application

A 1FL2104-2AG... servo motor with low moment of inertia (with integrated holding brake) with a mechanical system is fed from a SINAMICS S200 Compact 6SL5610-1GB10-8AF0. It is to be braked from 6000 r/min to 600 r/min with a braking duty cycle as t_{on} = 0.05 s, T = 2 s.

Moment of inertia of the servo motor 1FL2104-2AG... $J_{mot} = 0.5 \times 10^{-4}$ kgm²

Moment of inertia of the driven mechanical system $J = 8 \times 10^{-4}$ kgm²

n_1 = 6000 r/min n_2 = 600 r/min

⇒ E_{br} = 166.10 J < E_{max_int} = 223 J (1 J = 1 Ws)

⇒ P_{br} = 3322.10 W > P_{max_int} = 1334 W

⇒ P_{avg} = 83.05 W > P_{cont_int} = 25 W

In this case, therefore, an external braking resistor is required. Select the external braking resistor according to the following table.

Frame size	Resistance (Ω)	Continuous power (W)	Peak power (W)	Braking energy (J)
FSAC (0.75 kW)	≥ 50	> 83.05	> 3322.10	> 166.10

4.4.2.3 Recommended data of external braking resistors

Technical data

Note

The following data of external braking resistors is calculated theoretically based on the drive system's permissible overload capacity, the maximum motor speed, and the maximum load inertia specified in this document.

Siemens recommends that you calculate the actual resistor data using the formula provided in Section "Selection and calculation (Page 85)" according to your practical application.

Table 4-3 Recommended data of external braking resistors

Frame size	Minimum resistance (Ω)	Maximum continuous power (P_{cont_ext}) (W)	Maximum peak power (P_{max_ext}) (W)	Maximum braking energy (E_{max_ext}) (J)
FSAB (0.1 kW, 0.2 kW, 0.4 kW)	100	110	2730	280
FSAC (0.75 kW)	50	260	6560	660

4.5 Electromagnetic compatibility (EMC)

4.5.1 Electromagnetic compatibility (EMC)

Description

Interference suppression measures increase the electromagnetic compatibility (EMC).

EMC interference suppression measures allow the device to function correctly. As a consequence, the device is neither a source of interference for other devices nor an interference sink that can be disturbed by other devices.

More information

Fundamental information for EMC-compliant planning and EMC-compliant installation is provided in the Internet:

EMC Design Guidelines Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/60612658)

4.5.2 Harmonic current emissions

Overview

IEC 61800-3 does not define any current harmonic limits when converters are operated on light industrial line supplies. A system evaluation according to IEC 61000-3-14 or IEC 61800-3 Annex B.4 is recommended.

Description

When operated with rated power, the converter generates the following typical current harmonics:

Table 4-4 Typical harmonic currents of the converter, 1 AC 200 V

Converter	Typical harmonic current (A) at U_k 4%								
	5th	7th	11th	13th	17th	19th	23rd	25th	THC
FSAB	0.71	0.21	0.09	0.08	0.05	0.03	0.02	0.02	1.94
FSAC	1.40	0.38	0.17	0.15	0.08	0.06	0.04	0.03	3.63

THC = Total Harmonic Current: sum of all harmonic currents

4.6 EMC-compliant installation

4.6.1 Shielded cables for the converter

Description

The following cables must be shielded to comply with EMC regulations:

- In the control cabinet:
  - Cable between the converter and an external line filter
  - Cable between the converter and the motor
  - Cable between the converter and an external braking resistor
  - Signal and data cables
  - Fieldbus cable
- Outside the control cabinet, all cables with the exception of the line supply cable

To achieve EMC-compliant installations of the converter, connect the shields of the power cable to the shield plate via the shield clamps. The shield plate is shipped with the converter.

For better EMC effects, Siemens recommends that you strip the encoder cable and connect the cable shields to earth. Make sure that the shield plate, the converter and the motor are properly grounded.

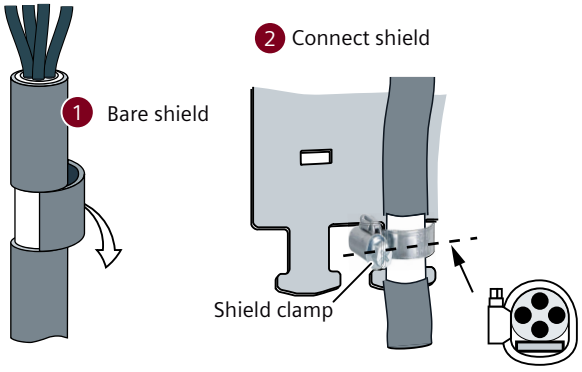


Figure 4-2 Correct EMC-compliant shield connection

4.6.2 Achievable EMC category

Overview

The servo drive system has been tested in accordance with the emission requirements of IEC 61800-3 Category C2.

- For a radiated emission test, an external line filter (between the mains supply network and the converter) is required to meet the EMC requirements. The converter needs to be installed inside a shielded metallic cabinet, while other parts of the motion control system (including the PLC, DC power supply, spindle drive, and motor) need to be put outside the shielded cabinet.
- For a conductive emission test, an external line filter (between the mains supply network and the converter) is required to meet the EMC requirements.
- For the radiated emission and conductive emission tests, the length of the line supply cable between the line filter and the converter must be shorter than 1 m.

Description

The achievable EMC category is dependent on the motor cable length and the line system configuration. The following conditions apply to the possible application environment.

Requirements		**Achievable EMC Category**	
		C2	**C3**
Converter		With line filters C2	With line filters C2 or C3
Maximum permissible cable length	Motor	30 m shielded	30 m shielded
	Line filter to the converter	1 m	1 m
Permissible application environment	Residential	No	No
	Light industrial	Yes	Yes
	Commercial	Yes	Yes
Permissible line system	Public	No	No
	Non-public	Yes	Yes
Line system configuration		TN or TT line system with a grounded neutral point	TN or TT line system with a grounded neutral point

Note

This device is not intended for use in residential environments and might not provide adequate protection to radio reception in such environments.

Note

Complying with Category C2 interference emission

When using a cable of more than 3 m to connect the converter to the PROFINET or Ethernet interface, electromagnetic interferences may occur. Use appropriate ferrite clamps, cabinet feedthrough, or fiber optic transceivers to minimize the interference emission.

Note

The conducted and radiated emissions of the PROFINET ports are in compliance with the standards of IEC 61800-6-8, Class A (CISPR 32), and IEC 61800-3 Category C3.

Mounting 5

5.1 Converter

⚠ WARNING

Spread of fire

Devices with an open construction (built-in devices) can cause a fire or a pressure wave in the event of a fault, which can result in severe personal injury and damage to property. The higher the power rating of a converter, the more dangerous the effects of an arc or pressure wave.

- Install the devices in a robust metal control cabinet that is designed to prevent fire from escaping.
- Only operate the devices with the control cabinet doors closed.
- When control cabinet doors are open, only qualified electrical personnel are allowed to carry out service and maintenance work.
- Comply with the minimum control cabinet volume.

Information on the minimum control cabinet volume is available on the Internet:

Protective devices for SINAMICS S200 Compact (https://support.industry.siemens.com/cs/cn/en/view/109989498)

5.1.1 Mounting instructions for the converter

Description

Observe the conditions listed below in order to guarantee reliable, continuous and trouble-free operation:

- The converter is designed for installation in a control cabinet.
- The converter is certified for use in environments with degree of pollution 2 without condensation; i.e. in environments where no conductive pollution/dirt occurs. Condensation is not permissible.
- The converter fulfills degree of protection IP20 according to IEC 60529.
- Ensure that all converters and cabinets are grounded according to Section "EMC-compliant installation (Page 90)".
- Use a conductive steel sheet with a thickness of not less than 2 mm as the mounting plate.

Note

Keep the cover of the integrated operator panel closed to protect the control buttons and the memory card.

Protection against condensation or electrically conductive contamination

Protect the device, e.g. by installing it in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12. Further measures may be necessary for particularly critical operating conditions.

If condensation or conductive pollution can be excluded at the installation site, a lower degree of control cabinet protection may be permitted.

5.1.2 Mounting position

Description

NOTICE
Overheating due to impermissible mounting position
The converter can overheat and therefore be damaged if mounted in an impermissible position. • Only mount the converter in a permissible position.

The converter supports vertical mounting only. Mount the converter vertically with the integrated operator panel at the top.

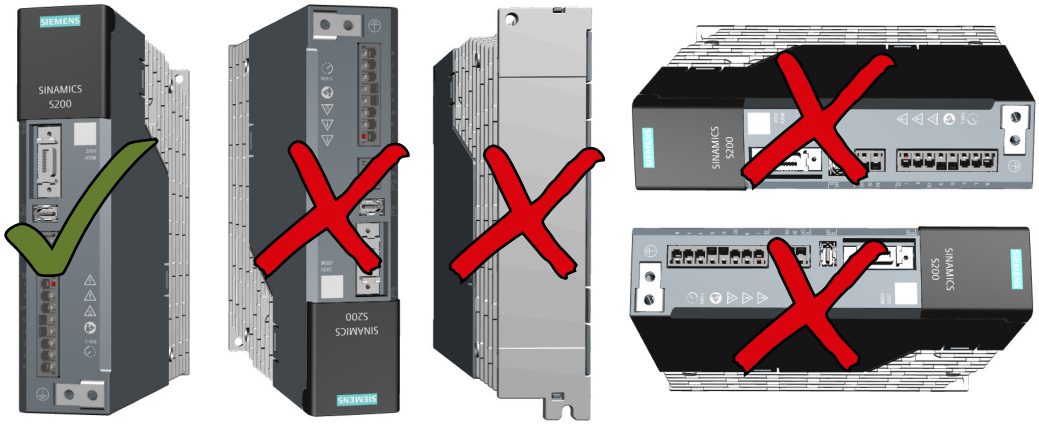


Figure 5-1 Converter mounting orientation

5.1.3 Dimension drawing and drilling dimensions

Dimension drawing

All dimensions are specified in millimeters.

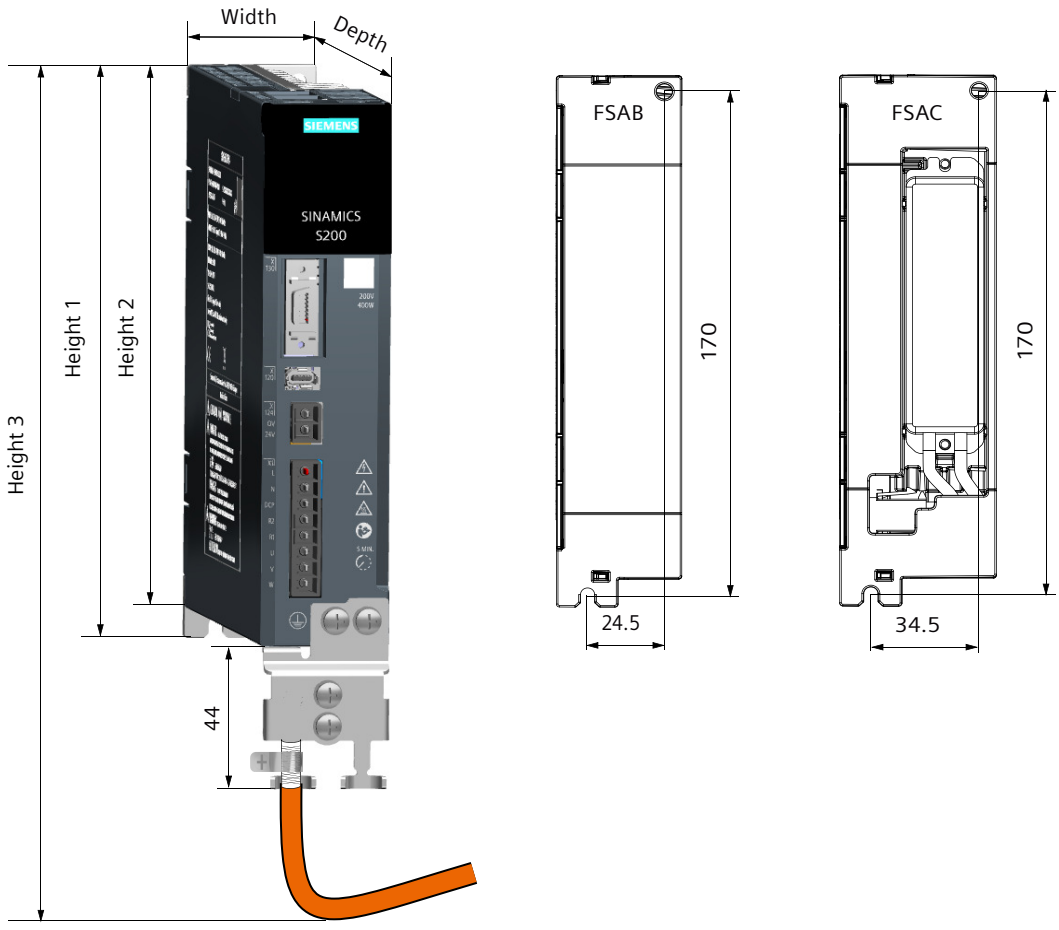


Table 5-1 Dimensions, FSAB and FSAC

Frame size	Width	Height 1	Height 2	Height 3[1]	Depth	Fixing
FSAB	40 mm	179.5 mm	170 mm	250 mm	180 mm	2 x M4 / 2.5 Nm
FSAC	50 mm	179.5 mm	170 mm	250 mm	195 mm	

[1] The data is applicable to the MOTION-CONNECT 100 cable.
For use with the MOTION-CONNECT 350 standard cable or the MOTION-CONNECT 380 drag chain cable, you can refer to the minimum bending radius of the MOTION-CONNECT 350/380 cable.

More information

For more information about the MOTION-CONNECT cables, see Section "Technical data of MOTION-CONNECT cables (Page 617)".

5.1.4 Minimum clearances

Description

Observe the following minimum mounting clearances.

Install cooling fans above the converter for sufficient heat dissipation.

Note

When the surrounding temperature in the cabinet is ≥ 45 °C, the airflow velocity above the converter must be greater than 0.5 m/s.

All dimensions are specified in millimeters.

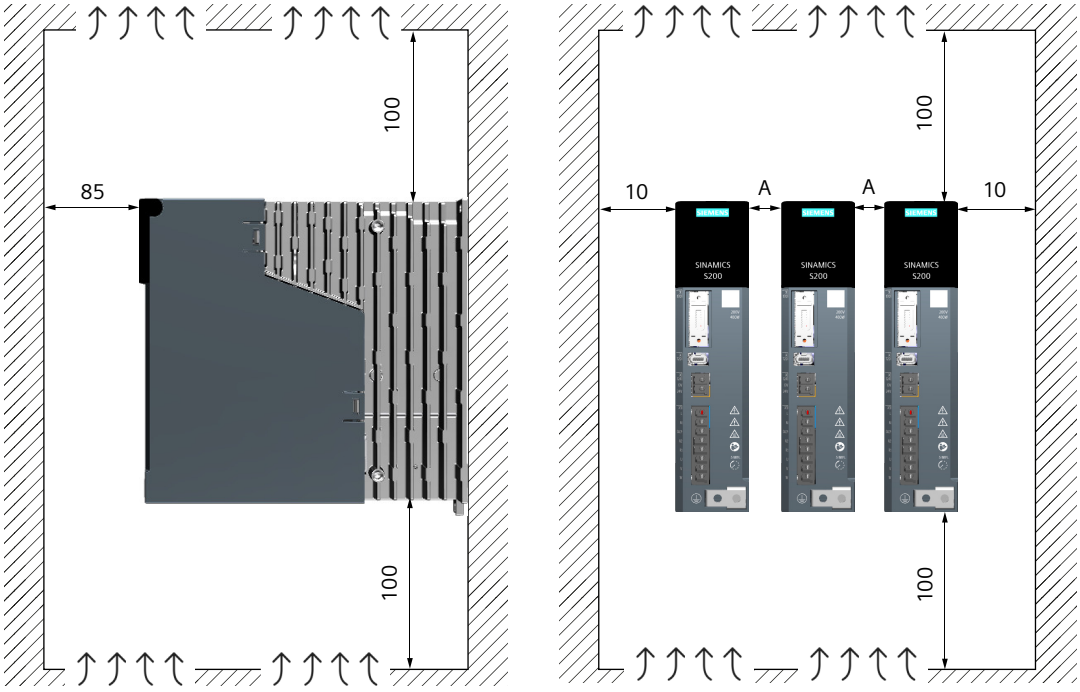


Table 5-2 Minimum clearances to other devices or components

	Single-converter installation	Side-by-side installation
Minimum clearance at top and bottom	100 mm	100 mm
Minimum clearance at front	85 mm	85 mm
Minimum lateral clearance (A) between multiple converters	-	1 mm
Minimum lateral clearance to other devices	10 mm	10 mm

5.2 Motor

5.2.1 Checklist prior to mounting

Description

The checklist below is a minimum benchmark and must be performed in any case. Further checks before, during, and after the installation of the motor depend on the system-specific conditions and are the responsibility of the plant or system manufacturer.

Table 5-3 Checklist before installing

Check	OK
General checks	
Are the environmental conditions in the permissible range?	
Checks regarding the mechanical system	
Is the motor free of visible damage?	
Have the mounting surfaces such as the flange and shaft on the customer machine and on the motor been cleaned?	
Are the mounting surfaces free of corrosion?	
Do the mounting dimensions such as the shaft diameter, shaft length, and radial eccentricity on the customer machine meet the specifications?	

5.2.2 Safety labels on the motor

Description

NOTICE
Damage to the encoder due to shocks Shocks at the motor shaft extension can cause an encoder damage. • Do not exert any shock at the shaft extension.

In the delivery state, the following two warning labels are attached to the motor.

	"Hot surface" warning label
	"No shocks at the shaft extension" warning label

5.2.3 Mounting instructions for the motor

Description

NOTICE
Damage to shaft sealing rings caused by solvent If shaft sealing rings come into contact with solvents when preservation coating is removed, the shaft sealing rings can be damaged. • Avoid contact between solvents and shaft sealing rings.

NOTICE
Damage to the motor due to radial eccentricity at the shaft extension Radial eccentricity and axial forces at the shaft extension can damage the motor. • Mount the motor in such a way that no radial eccentricity and axial forces at the shaft extension occur.

- Adhere to the specifications on the rating plate.
- Observe the warning and information plates on the motor.
- Check the installation site and ensure compliance with permissible environmental conditions such as temperature and installation altitude. See Section "Permissible environmental conditions for the motor (Page 580)".
- Thoroughly remove any anti-corrosion agents from the shaft extension with commercially available solvents.
- Ensure that power losses are adequately dissipated. See Section "Cooling (Page 583)".
- If the motor is installed vertically with the shaft extension facing up, ensure that no liquid can enter the upper bearing.
- Ensure that the flange is in even contact with the mounting surface.
- Use hexagon socket head cap screws with a property class of at least 8.8.
- Avoid any uneven stressing when tightening the fastening screws.
- Observe the tightening torques for the fastening screws given in the following table.
  The general tolerance for the tightening torque is 10%. The tightening torque is based on a friction coefficient of $\mu = 0.14$.

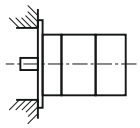
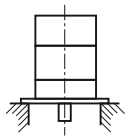
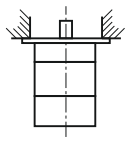
Motor shaft height	Screw DIN 7984	Washer ISO 7092 (mm)	Tightening torque for screws (not for electrical connections)
SH20	M4	4 ($d_{2\,max} = 8$)	2.4 Nm
SH30	M5	5 ($d_{2\,max} = 9$)	4.7 Nm
SH40	M6	6 ($d_{2\,max} = 11$)	8 Nm

5.2.4 Mounting position

Description

The 1FL1 and 1FL2 motors support flange mounting only. The motor can be installed in three orientations as shown in the following table.

Table 5-4 Type of construction according to IEC 60034-7

Designation	Representation	Description
IM B5		Standard
IM V1		The motor can be used in types of construction IM V1 and IM V3 without restriction.
IM V3		

Note

IM V3 type of construction

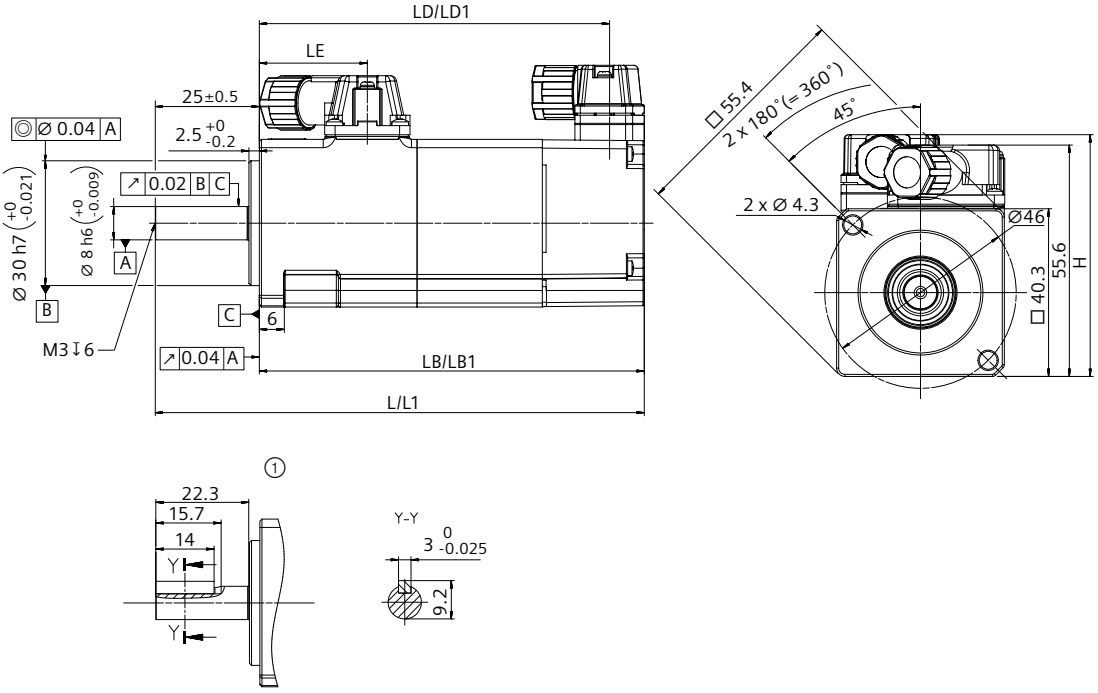
When configuring the IM V3 type of construction, pay attention to the permissible axial forces and especially to the necessary degree of protection.

5.2.5 Dimension drawings for the 1FL1 motors

5.2.5.1 Dimension drawing for the 1FL1 motor, shaft height 20

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

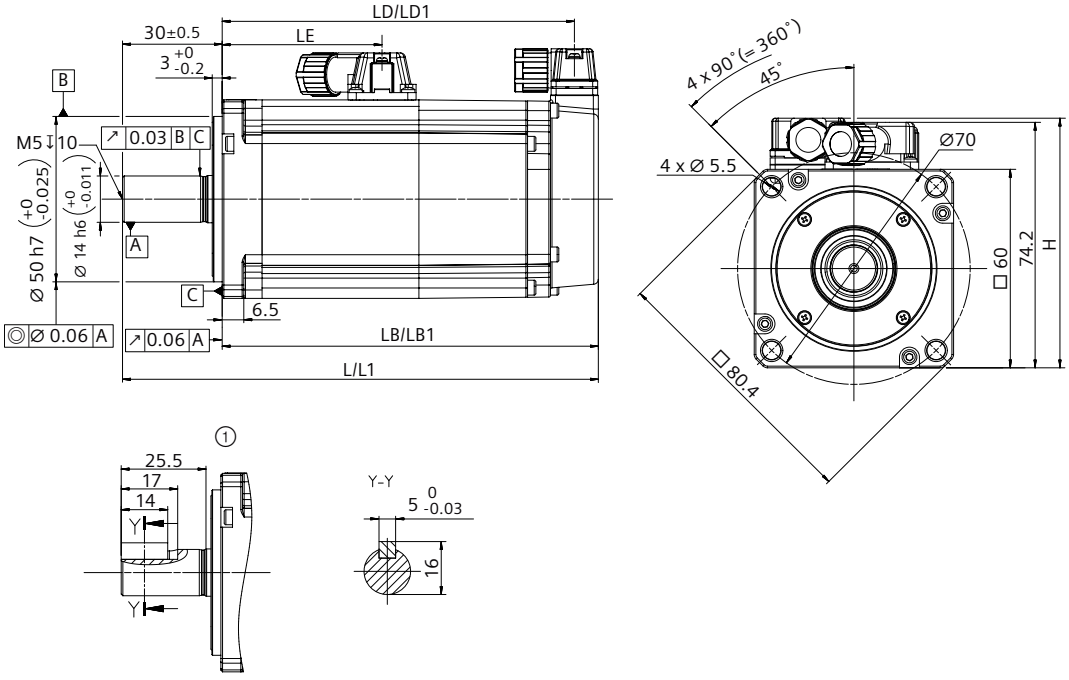
Table 5-5 Dimensions, 1FL1102

SIMOTICS S-1FL1 Shaft height 20	Motor length									
	Without brake					With brake				
	L	LB	LD	LE	H	L1	LB1	LD1	LE	H
1FL1102-2AG□□-□HD0 1FL1102-2AG□□-□SD0	92.4	67.4	60.7	26	58.1	117.5	92.5	85.8	26	58.1
1FL1102-2AG□□-□AD0	92.4	67.4	60.7	26	58.7	117.5	92.5	85.8	26	58.7
1FL1102-4AG□□-□HD0 1FL1102-4AG□□-□SD0	104.4	79.4	72.7	38	58.1	129.5	104.5	97.8	38	58.1
1FL1102-4AG□□-□AD0	104.4	79.4	72.7	38	58.7	129.5	104.5	97.8	38	58.7

5.2.5.2 Dimension drawing for the 1FL1 motor, shaft height 30

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

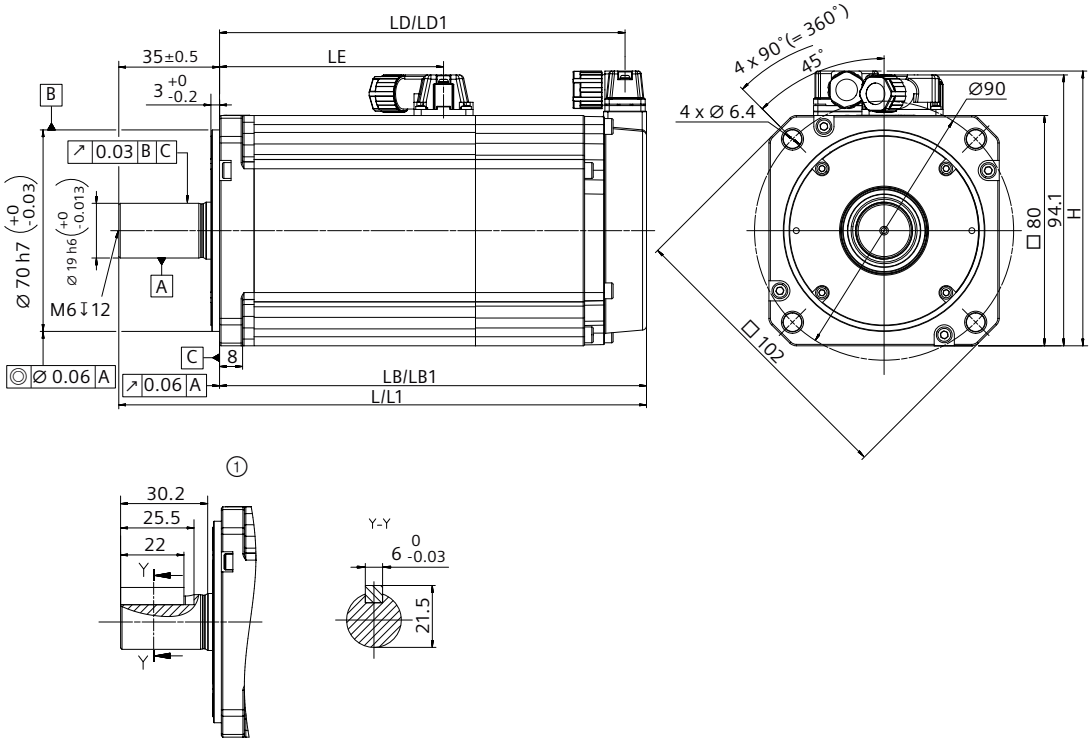
Table 5-6 Dimensions, 1FL1103

SIMOTICS S-1FL1 Shaft height 30	Motor length									
	Without brake					With brake				
	L	LB	LD	LE	H	L1	LB1	LD1	LE	H
1FL1103-2AG□□-□HD0 1FL1103-2AG□□-□SD0	114	84	76.8	48.1	75.5	143.2	113.2	106	48.1	75.5
1FL1102-2AG□□-□AD0	114	84	76.8	48.1	76.1	143.2	113.2	106	48.1	76.1
1FL1103-4AG□□-□HD0 1FL1103-4AG□□-□SD0	136.5	106.5	99.3	70.6	75.5	165.7	135.7	128.5	70.6	75.5
1FL1102-4AG□□-□AD0	136.5	106.5	99.3	70.6	76.1	165.7	135.7	128.5	70.6	76.1

5.2.5.3 Dimension drawing for the 1FL1 motor, shaft height 40

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

Table 5-7 Dimensions, 1FL1104

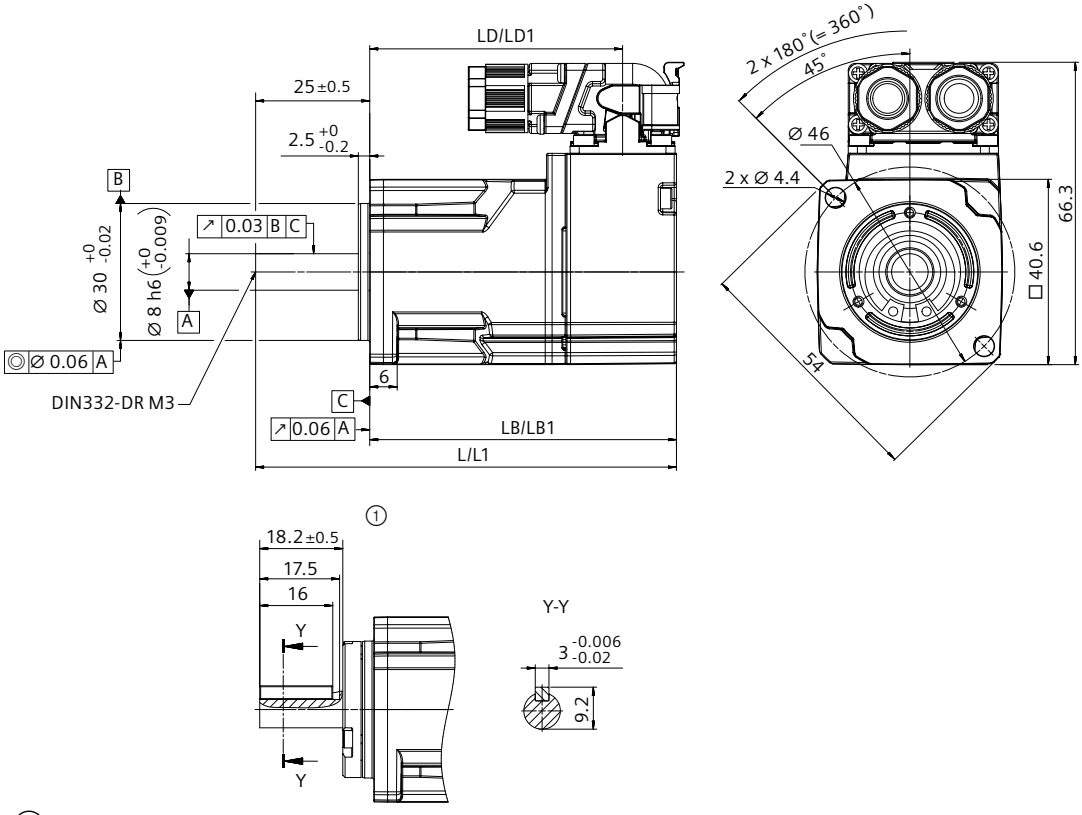
SIMOTICS S-1FL1 Shaft height 40	Motor length									
	Without brake					With brake				
	L	LB	LD	LE	H	L1	LB1	LD1	LE	H
1FL1104-2AG□□-□HD0 1FL1104-2AG□□-□SD0	149.1	114.1	106.7	77.8	95.5	183.3	148.3	140.9	77.8	95.5
1FL1104-2AG□□-□AD0	149.1	114.1	106.7	77.8	96.1	183.3	148.3	140.9	77.8	96.1

5.2.6 Dimension drawings for the 1FL2 motors

5.2.6.1 Dimension drawing for the 1FL2 motor, shaft height 20

Dimension drawing

All dimensions are specified in millimeters.



① With shaft sealing ring (IP65) and feather key

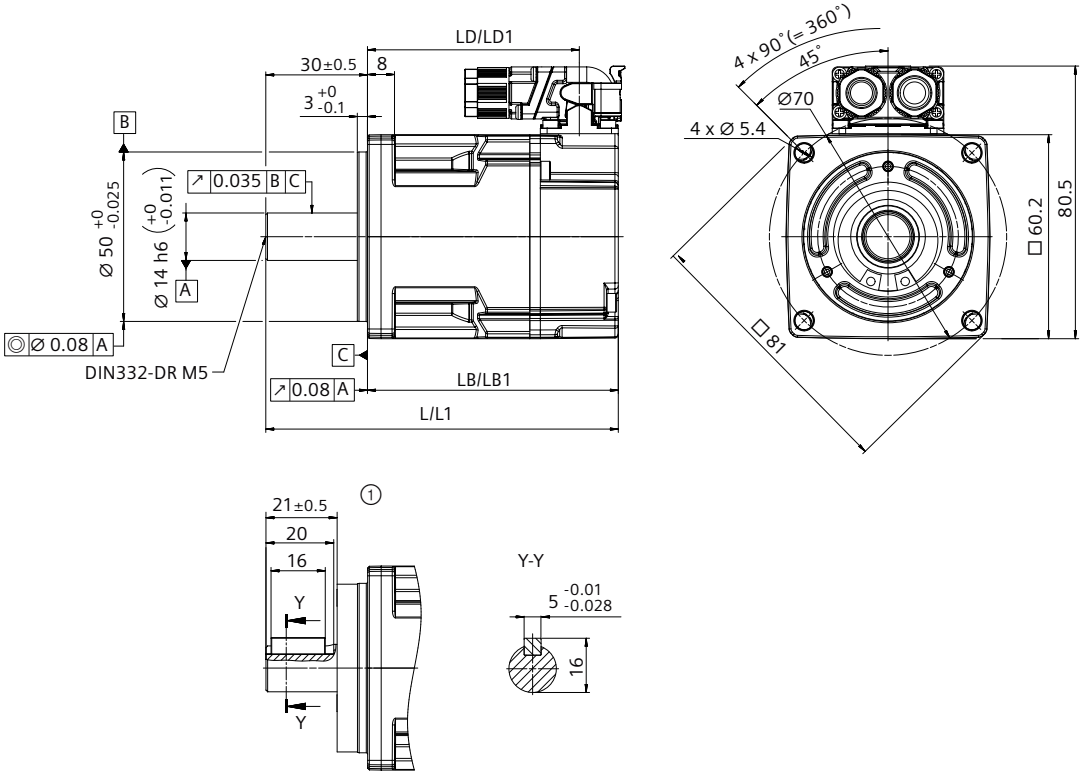
Table 5-8 Dimensions, 1FL2102

SIMOTICS S-1FL2 Shaft height 20	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2102-2	92.2	67.2	55.7	121.9	96.9	85.4
1FL2102-4	105.2	80.2	68.7	134.9	109.9	98.4

5.2.6.2 Dimension drawing for the 1FL2 motor, shaft height 30

Dimension drawing

All dimensions are specified in millimeters.



① With shaft sealing ring (IP65) and feather key

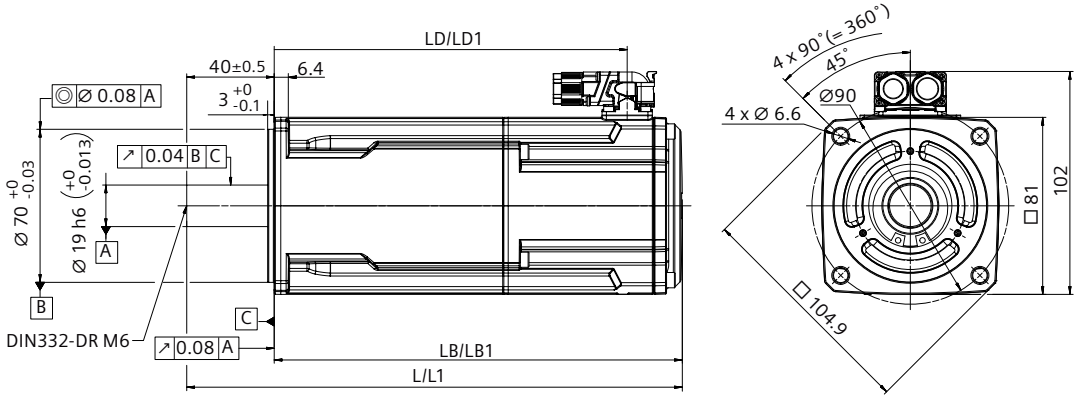
Table 5-9 Dimensions, 1FL2□03

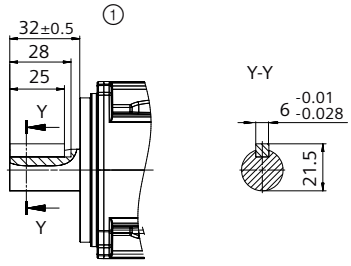
SIMOTICS S-1FL2 Shaft height 30	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2103-2	105.5	75.5	63.8	135.5	105.5	93.8
1FL2103-4	124.5	94.5	82.8	154.5	124.5	112.8
1FL2203-2	104	74	62.3	134	104	92.3
1FL2203-4	121.5	91.5	79.8	151.5	121.5	109.8

5.2.6.3 Dimension drawing for the 1FL2 motor, shaft height 40

Dimension drawing

All dimensions are specified in millimeters.





① With shaft sealing ring (IP65) and feather key

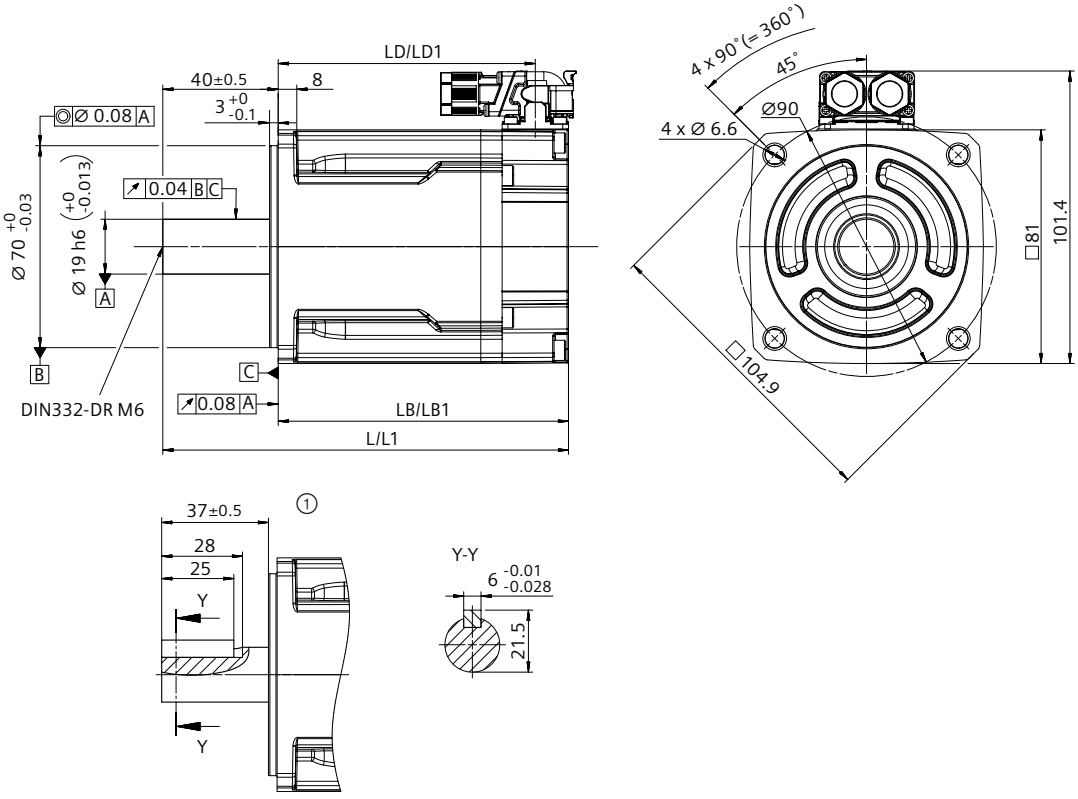
Table 5-10 Dimensions, 1FL2104-2A, 1FL2204-2A

SIMOTICS S-1FL2 Shaft height 40	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2104-2A	164.6	124.6	99.4	208.6	168.6	143.4
1FL2204-2A						

5.2.6.4 Dimension drawing for the 1FL2 motor, shaft height 40 (New)

Dimension drawing

All dimensions are specified in millimeters.



① With shaft sealing ring (IP65) and feather key

Table 5-11 Dimensions, 1FL2104-2B, 1FL2204-2B

SIMOTICS S-1FL2 Shaft height 40 (New)	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2104-2B	140.6	100.6	89.1	180.6	140.6	129.1
1FL2204-2B						

5.2.7 Mounting the feather key

Requirement

⚠ WARNING

Injuries due to feather key flung out

When a motor using a key is running, the feather key on the shaft can be thrown out by centrifugal force. This can result in personal injury or material damage.

- Before operating the motor, the feather key on the shaft must be firmly secured to prevent from being thrown out by the centrifugal force.

NOTICE

Damage to motor bearing due to improper operation

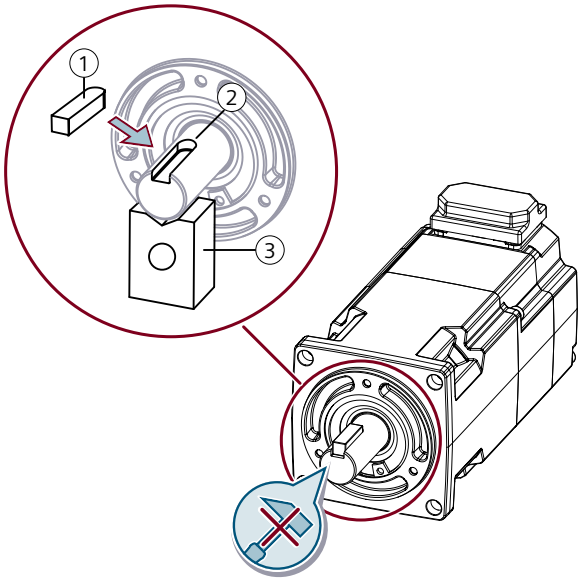
Never mount the feather key by hammering into the key slot; otherwise, there is a risk of bearing damage.

- Pay attention to the installation direction of the feather key.
- Mount the key without striking the key slot or the shaft extension.

Procedure

Proceed as follows to mount the feather key into the key slot:

1. Install the feather key ("①") to the key slot ("②") and make sure that the feather key and the key slot are fitted closely. Siemens recommends that you place the V-type block ("③") under the shaft extension for supporting.
2. Knock the feather key into the key slot by using a copper bar.



① Well-lubricated feather key
② Key slot
③ V-type block

Figure 5-2 Mounting the feather key

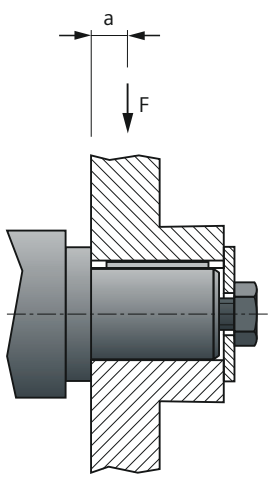
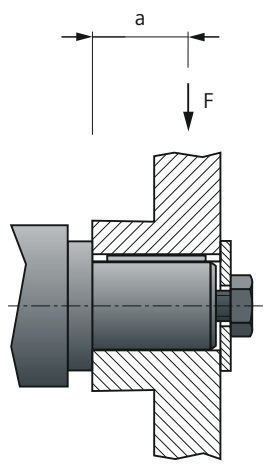
5.2.8 Attaching output elements

Overview

Appropriate arrangement of the output elements reduces the bending torque load applied to the shaft and the bearing.

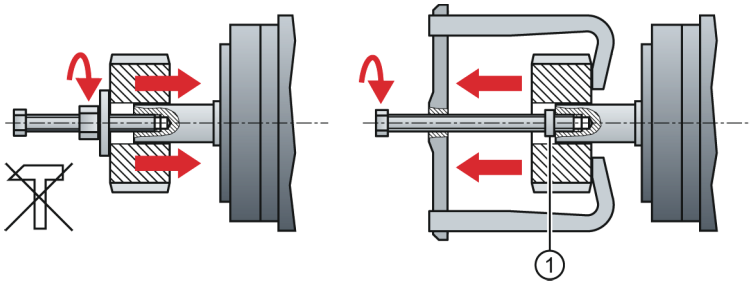
Requirement

Mount the output elements as close as possible to the motor bearing.

Optimum	Unfavorable
	
Low stress on shafts and bearings	High stress on shafts and bearings

Mount or remove the output elements (for example, couplings, gear wheels, and belt pulleys) by using suitable devices only.

- Use the threaded hole in the shaft extension.
- If required, heat up the output elements before mounting or removing.
- When removing the output elements, use an intermediate disk to protect the centering in the shaft extension.



① Intermediate washer/disk

Figure 5-3 Mounting and removing output elements

- If necessary, completely balance the motor together with the output elements according to ISO 1940.

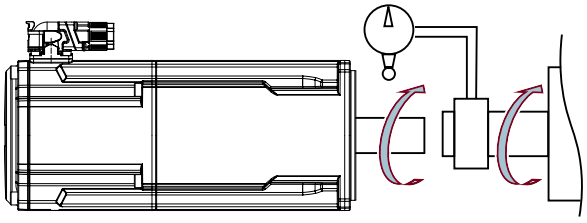
Note

Motors with feather key are half-key balanced. The motors have been balanced with half a feather key.

Procedure

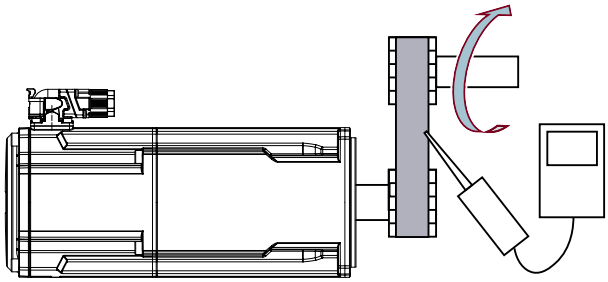
Proceed as follows to attach an output element (for example, a coupling) to the motor:

1. Select a coupling.
   Use a flexible coupling with high torsional rigidity specifically designed for servo motors, which can transfer the motor torque to the mechanics and compensate radial, axial, and angular misalignments.
2. Install the coupling.
   Do not strike the shaft when installing a coupling. Ensure that the radial and axial forces are smaller than the allowable maximum values specified in Section "Axial and radial forces (Page 592)".
3. Align the coupling.
   When a motor is used with a flange coupling, the radial deviation must be smaller than 0.03 mm; otherwise, the bearing will be damaged. The required alignment accuracy varies with the motor speed and the coupling type. Determine the accuracy according to actual applications.



   – Rotate the motor shaft and the machine shaft to align the coupling.
   – An alignment accuracy test is preferred. If unachievable, judge the accuracy by observing whether the coupling can slide smoothly on both shafts.

4. Realign the coupling.
   If the coupling gives out abnormal sounds, refer to Step 3 "Align a coupling" to realign the coupling until the sounds disappear.
5. Measure tension.
   The belt tension must be smaller than the allowable radial forces of the motor.



   – Measure the belt tension at multiple points using a tension meter while turning the motor shaft by 45°.
   – Reduce the axial misalignment of the belt-pulleys to keep the axial forces to the motor shaft to a minimum.

5.2.9 Laying cables in cable carriers (for MOTION-CONNECT 380 only)

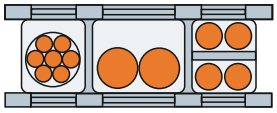
Requirement

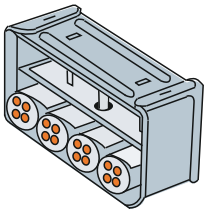
None

Procedure

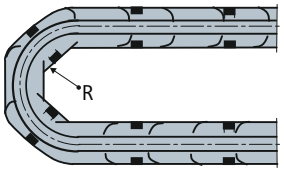
Proceed as follows to arrange cables in cable carriers:

1. Lay the cables.
   - Use spacers to separate cables with different outer diameters or cables made of different materials.
   - Fill the spacers evenly to ensure that the position of cables does not change during operation.
   - Distribute cables symmetrically according to their weights and dimensions.
   - Keep cables untwisted in the cable carrier.
   - When inserting prefabricated cables in the cable carrier, do not pull the connector, as this may damage the strain relief or cable clamping.





2. Move the cables.
   - Lay the cables loosely in the carrier, so that the cables are free to move in particular in the bending radii of the carrier.
   - Observe the specified minimum bending radii.



R Bending radius on the cable carrier

3. Fix the cables.
   - Make sure that cables in the carrier are unattached and movable.
   - Place cable fixings in a "dead" zone at each end, suitably far away from each end point of the moving parts.

Note

Additional fixing of the cable

If between the cable strain relief on the cable carrier and the terminal at the motor, part of the cable is hanging loose or is not routed, Siemens recommends that the cable is additionally fixed for vibration load and with horizontal or vertical cable entries.

- Additionally fix the cable where the motor is fixed so that machine vibrations are not transferred to the connector.

Connecting

6

Note

Fix all the connecting cables to the converter shield plate by using shield clamps or suitable cable ties.

6.1 System connection

Overview diagram

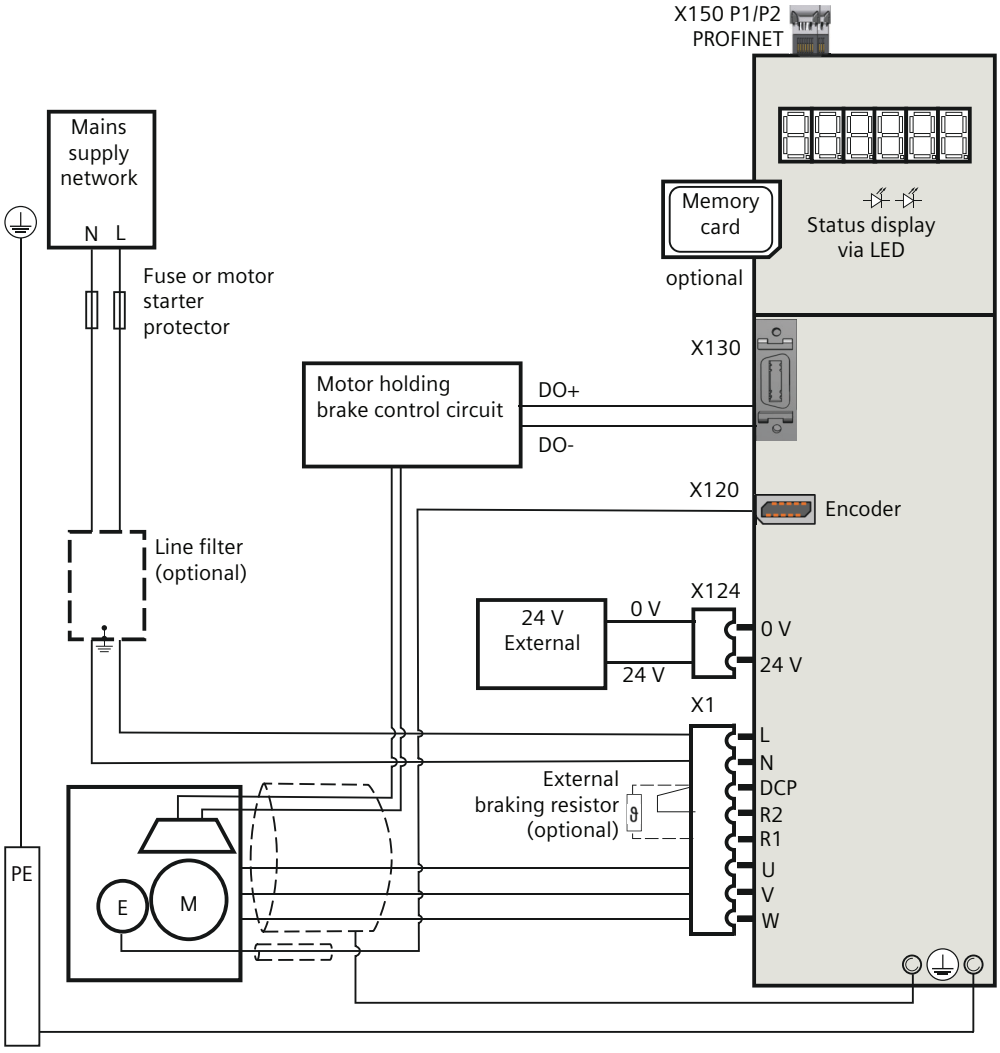
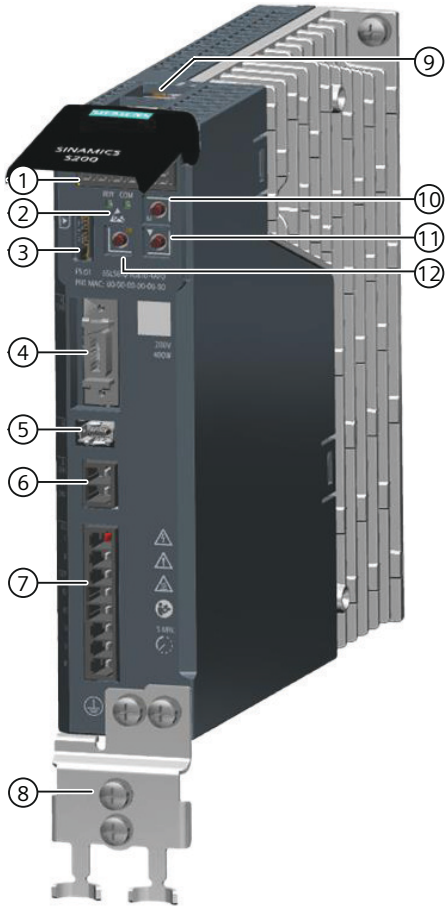


Figure 6-1 Connection example

6.2 Overview of the converter interfaces

Overview diagram



① 6-digit display
② LED status indicators
③ Memory card slot
④ Control/status inputs and outputs - X130
⑤ Encoder interface - X120
⑥ 24 V DC power supply - X124
⑦ Mains, braking resistor, and motor power interface - X1
⑧ Shield plate
⑨ PROFINET interface - X150
⑩ M button
⑪ DOWN button
⑫ OK button

Figure 6-2 Converter interfaces

6.3 Cables and connectors

6.3.1 Maximum permissible cable lengths

Technical data

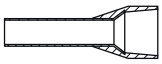
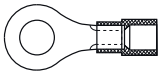
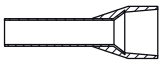
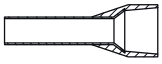
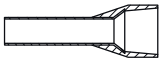
Table 6-1 Maximum permissible cable length

Connection type	Interface on the converter	Maximum permissible cable length (m)
Mains supply	X1 (L and N)	No restriction
External braking resistor	X1 (DCP and R1)	3
24 V DC power supply	X124	10
Motor power connection	X1	30
Encoder connection	X120	30
Control/status inputs and outputs	X130	3
PROFINET connection	X150	100

6.3.2 Conductor cross-sections and cable lugs

Description

Table 6-2 Conductor cross-sections and cable lugs

Connection type	Terminal type	Conductor cross-section	Stripping length	Cable lug
Mains supply (L, N)	Spring-loaded	0.5 mm² ... 2.5 mm² (AWG: 20 ... 12)	9 mm ... 11 mm	Pin-type 
Mains supply (PE)	Screw-type	0.75 mm² ... 2.5 mm² (AWG: 14 ... 12)	10 mm	Ring type 
24 V DC power supply	Spring-loaded	0.5 mm² ... 2.5 mm² (AWG: 20 ... 12)	9 mm ... 11 mm	Pin-type 
External braking resistor	Spring-loaded	0.5 mm² ... 2.5 mm² (AWG: 20 ... 12)	9 mm ... 11 mm	Pin-type 
Motor power connection	Spring-loaded	0.5 mm² ... 2.5 mm² (AWG: 20 ... 12)	9 mm ... 11 mm	Pin-type 

More information

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.4 Connecting the mains supply

6.4.1 Interface description - X1

Overview

The converter connects to the mains supply via terminals L and N on the interface X1.

Description

Table 6-3 Interface X1

X1	Terminal	Designation	Technical data
L N DCP R2 R1 U V W	L	Line phase L	Maximum current limit: 8 A
	N	Line phase N	

6.4.2 Wiring

Requirement

You have assembled the converter line supply cable.

Procedure

1. Assemble the X1 plug to the converter.
2. Attach the cable terminals to the plug as shown below:

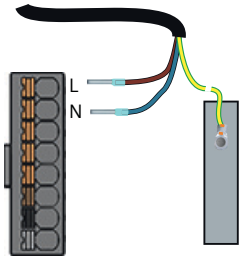


Figure 6-3 Connecting to the line supply

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.5 Connecting the motor

6.5.1 Routing cables in damp environments

Description

To operate the motor in a damp environment, follow the installation instructions below:

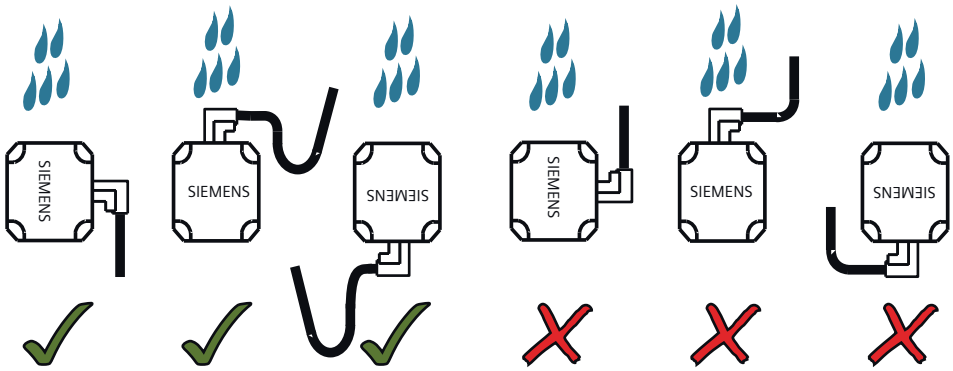


Figure 6-4 Routing cables in damp environments

6.5.2 Connecting the motor power

6.5.2.1 Interface description - X1 (converter side)

Overview

The converter connects to the motor via terminals U, V, and W on the interface X1.

Description

Table 6-4 Interface X1

X1	Terminal	Designation	Technical data
L N DCP R2 R1 U V W	U	Motor phase U	Maximum current limit: 8 A
	V	Motor phase V	
	W	Motor phase W	

6.5.2.2 Interface description - power connector (motor side)

Overview

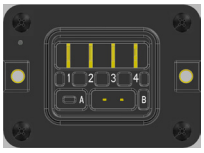
The power interface on the motor is used to connect the motor to the converter for power supply.

The 1FL1 motor uses a power connector that integrates power and holding brake interfaces.

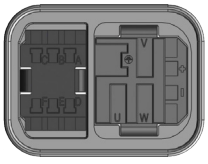
The 1FL2 motor uses a hybrid connector that integrates power, encoder, and holding brake interfaces.

Description

- 1FL1

Motor power interface	Pin	Designation
 Power interface	1	Phase V
	2	Phase W
	3	Phase U
	4	Protective grounding
	A	Holding brake, positive
	B	Holding brake, negative

- 1FL2

Motor power interface	Pin	Designation	Technical specifications
 Hybrid connector	U	Phase U	-
	V	Phase V	-
	W	Phase W	-
	PE	Protective grounding	-
	+	Holding brake, positive	-
	-	Holding brake, negative	-
	A	P_Supply	Encoder power supply, 5 V
	B	M	Encoder power supply, reference ground
	C	Clock_P	Absolute encoder clock signal, positive
	D	Clock_N	Absolute encoder clock signal, negative
	E	Data_P	Absolute encoder data signal, positive
	F	Data_N	Absolute encoder data signal, negative

6.5.2.3 Wiring

Connection example

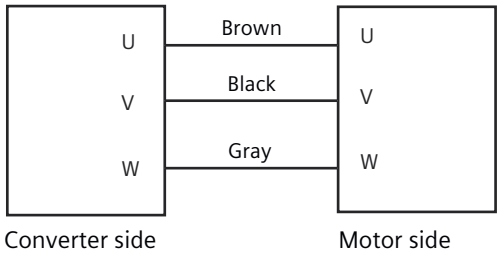
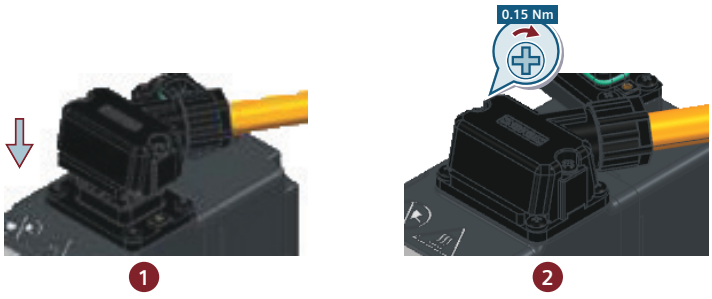


Figure 6-5 Motor power connection

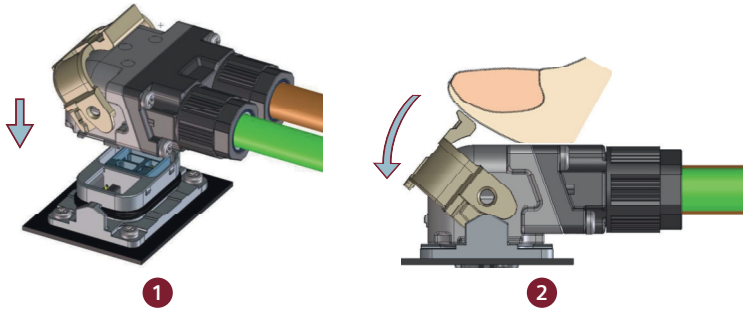
Connecting to 1FL1 motors using the power connector

Insert the power plug into the power interface on the motor, and tighten the M2 screws with a tightening torque of 0.15 Nm ± 0.015 Nm.

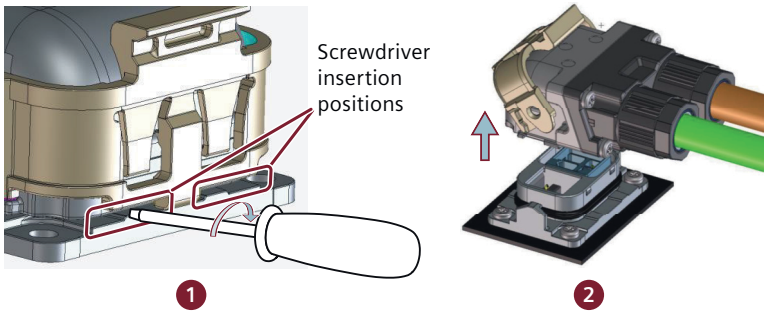


Connecting to 1FL2 motors using the hybrid connector

- Connecting the hybrid plug to the socket
  Insert the hybrid plug into the socket and push down the lever to secure the connection.



- Disconnecting the hybrid plug from the socket
  Insert a slotted screwdriver into the gap between the lever and the housing and slightly rotate the screwdriver to release the lever.



More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.5.3 Connecting the motor holding brake

6.5.3.1 Interface description (converter side)

Overview

The motor holding brake prevents the moving load from unexpected motions (for example, falling under the influence of gravity) when the servo drive system is deactivated.

The holding brake is activated once the motor power is cut off. Use the holding brake only when the motor is at a standstill. Do not use the holding brake to stop the load in motion.

Description

The converter does not have a designated interface for connecting to the holding brake. To use the holding brake, connect a third-party device via a digital output at the interface X130 and configure the holding brake function as follows:

- Set p1215 to 3.
- Interconnect the digital output signal to r0899.12.

6.5.3.2 Interface description (motor side)

Overview

The motor holding brake interface on the motor is used to connect the built-in holding brake to the converter.

Description

The holding brake interfaces for 1FL1 and 1FL2 are integrated into the power connector and the hybrid connector respectively. For more information, see Section "Interface description - power connector (motor side) (Page 123)".

6.5.3.3 Wiring

Connection example

Connecting the converter to the motor holding brake

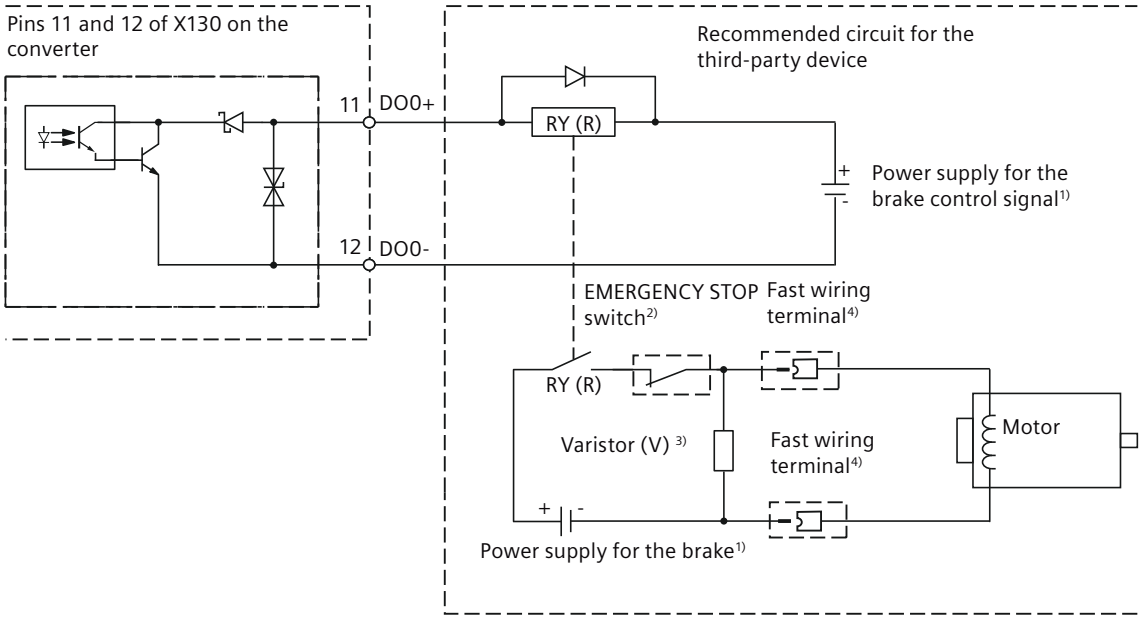


Figure 6-6 Motor holding brake connection (example 1)

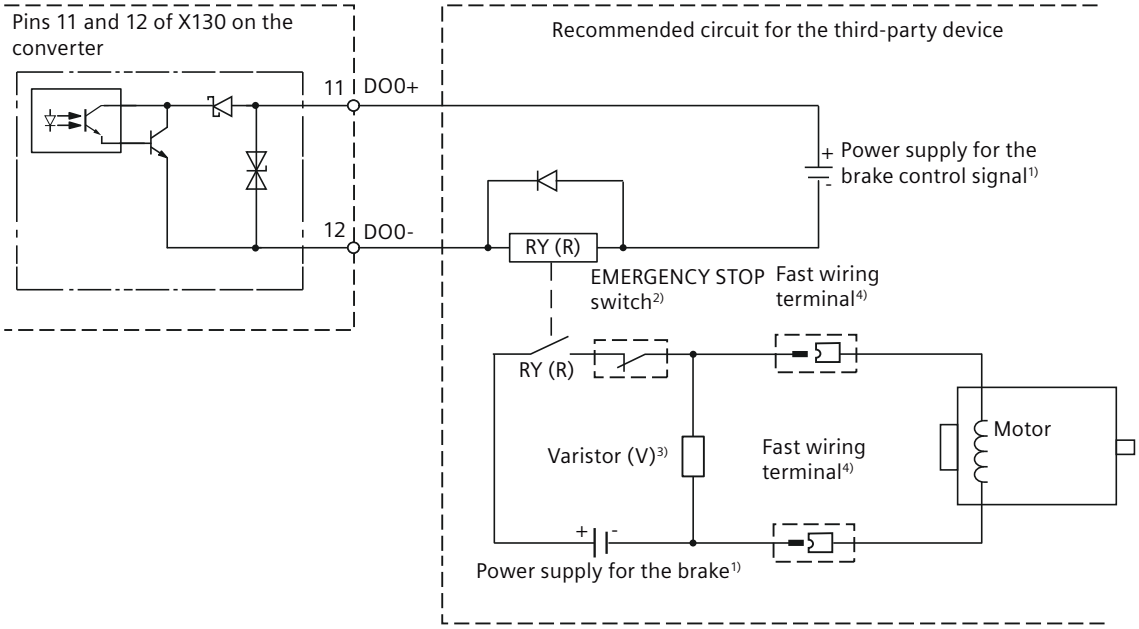


Figure 6-7 Motor holding brake connection (example 2)

Note

1) To avoid electro-magnetic interference to electronic components, make sure that you use different power supplies for the brake and the brake control signal.

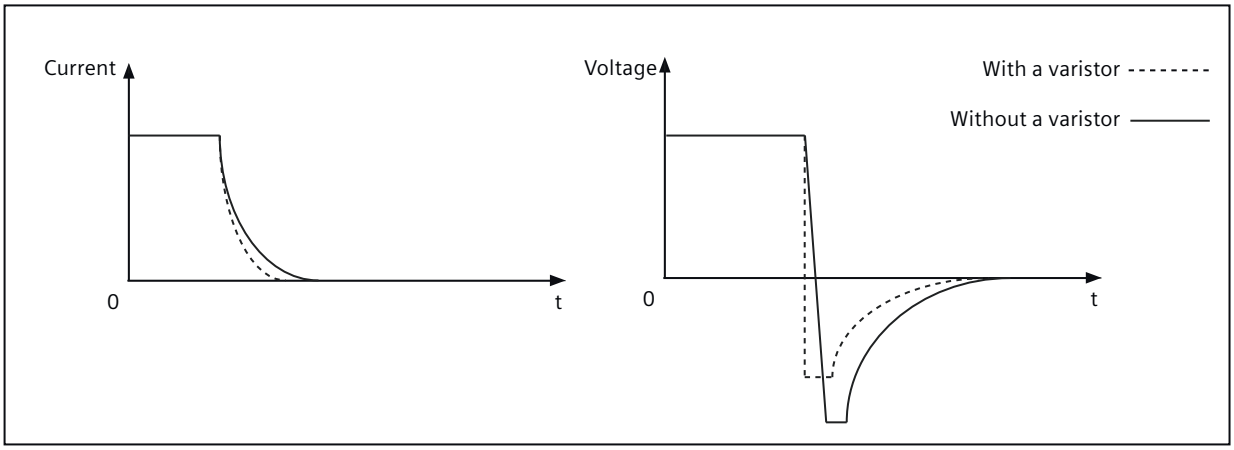
2) The motor holding brake can be controlled by the brake control signal from the digital output and an external EMERGENCY STOP device.

3) Install a varistor to suppress the surge voltage or surge current generated by the relay (RY) during its ON/OFF operation

4) To extend the connection of the holding brake to the relay, use appropriate fast wiring terminals.

Varistor (V) used for the power supply of the brake

Consider the following current-time and voltage-time characteristics when using a varistor to suppress the surge voltage or surge current:



You may select an appropriate varistor with reference to the table below:

Power supply voltage of the brake		24 V DC
Order information	Manufacturer	EPCOS
	Model	S20K20
Specification requirements	Operating temperature	-20 °C to 60 °C
	Delay switching frequency	< 10 times/min
	Maximum operating DC voltage	26 V
	Average power dissipation	0.2 W
	Voltage at 1 mA	33 V ± 10%
	Clamping voltage at 20 A (8/20 µs)	65 V
	Energy absorption (2 ms) at a time	18 J

Relay (R) used for the power supply of the brake

Siemens recommends that you choose a Siemens relay (article number: 3RQ2000-1AW00 or 3RQ2000-2AW00).

You can also select other appropriate relays with reference to the table below:

Insulation voltage for overvoltage category III according to IEC 60664 for pollution degree 3	300 V
Max. permissible voltage for protective separation between control circuit and auxiliary circuit according to IEC 60947-1	300 V
Control supply voltage	24 ... 240 AC/DC; 50/60 Hz
Operating range factor of control supply voltage	0.7 ... 1.1
Current-carrying capacity of the output relay • At DC-13 at 24 V	2 A

Fast wiring terminals used for connecting the relay

You can extend the connection of the holding brake to the relay by using a two-pole fast wiring terminal or two one-pole fast wiring terminals.

You may select appropriate fast wiring terminals with reference to the table below:

Terminal type	Spring-loaded
Materials	Insulated, flame-retardant cover, with electrolytic copper contacts
Nominal voltage	450 V
Rated current	32 A
Rated power	7040 W
Supported conductor cross-sections	• Solid conductors: 0.2 mm^2 ... 4 mm^2 (AWG: 24 ... 12) • Stranded conductors: 0.2 mm^2 ... 2.5 mm^2 (AWG: 14 ... 12)
Stripping length	10 mm

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.5.4 Connecting the encoder

6.5.4.1 Interface description - X120 (converter side)

Overview

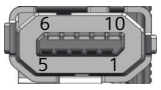
The servo drive system supports three types of encoders:

- Absolute encoder, 17-bit single-turn
- Absolute encoder, 21-bit single-turn
- Absolute encoder, 21-bit single-turn +12-bit multiturn

The converter connects to the encoder of the motor on the interface X120.

Description

Table 6-5 Interface X120

X120	Pin	Designation	Technical specifications
	1	DP1	Absolute encoder data signal, positive
	2	DN1	Absolute encoder data signal, negative
	3	Reserved	Reserved
	4	CLKP1	Absolute encoder clock signal, positive
	5	CLKN1	Absolute encoder clock signal, negative
	6	M	Reserved for reference ground
	7	Power_ENC1	Encoder power supply, 5 V DC
	8	M_ENC1	Encoder power supply, reference ground
	9	Reserved	Reserved
	10	Reserved	Reserved

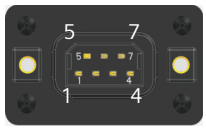
6.5.4.2 Interface description (motor side)

Overview

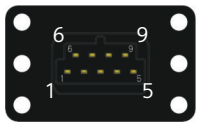
The encoder interface on the motor is used to transfer position data to the converter for real time control.

Description

- 1FL1, with single-turn encoder

Motor encoder interface	Pin	Designation	Technical specifications
 Encoder interface	1	Data_P	Absolute encoder data signal, positive
	2	Data_N	Absolute encoder data signal, negative
	3	Clock_P	Absolute encoder clock signal, positive
	4	Clock_N	Absolute encoder clock signal, negative
	5	P_Supply	Encoder power supply, 5 V
	6	M	Encoder power supply, 0 V
	7	FG	Functional grounding

- 1FL1, with multiturn encoder

Motor encoder interface	Pin	Designation	Technical specifications
 Encoder interface	1	Data_P	Absolute encoder data signal, positive
	2	Data_N	Absolute encoder data signal, negative
	3	Clock_P	Absolute encoder clock signal, positive
	4	Clock_N	Absolute encoder clock signal, negative
	5	P_Supply	Encoder power supply, 5 V
	6	M	Encoder power supply, 0 V
	7	FG	Functional grounding
	8	VB-	Encoder battery power supply, negative
	9	VB+	Encoder battery power supply, positive

- 1FL2
  The encoder interface is integrated into the hybrid connector. For more information, see Section "Interface description - power connector (motor side) (Page 123)".

6.5.4.3 Wiring

Connection example

Connecting to the 1FL1 motor with single-turn encoder

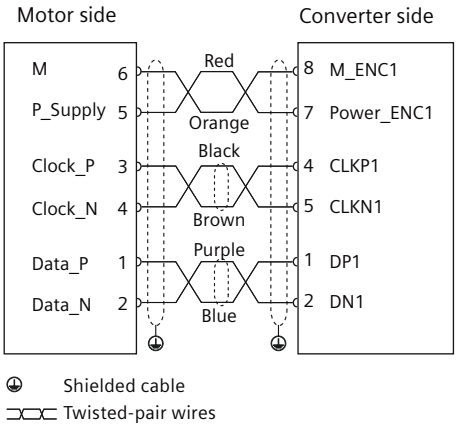
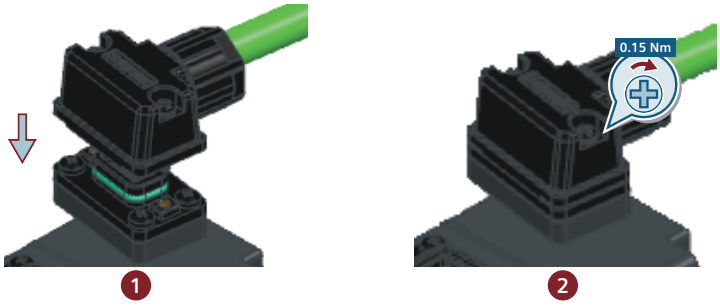


Figure 6-8 Wiring diagram

Insert the encoder plug into the encoder interface on the motor, and tighten the M2 screws with a tightening torque of 0.15 Nm ± 0.015 Nm.



Connecting to the 1FL1 motor with multiturn encoder

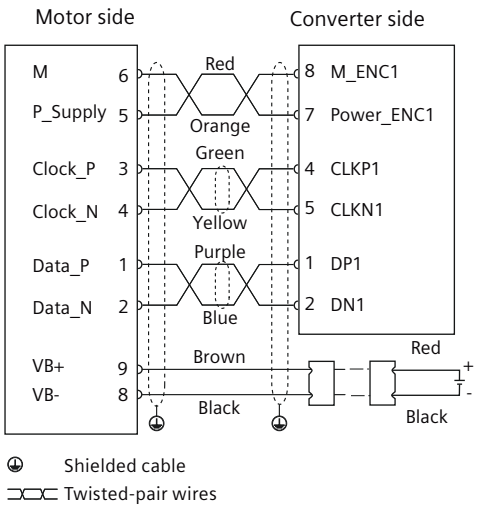
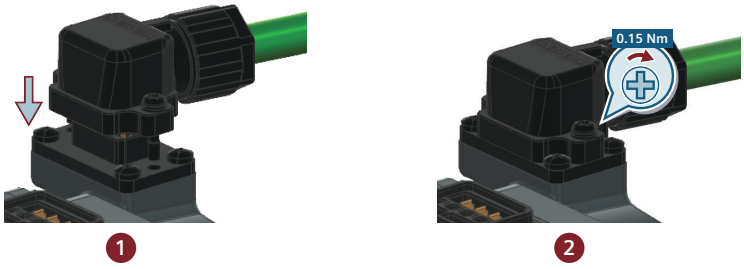
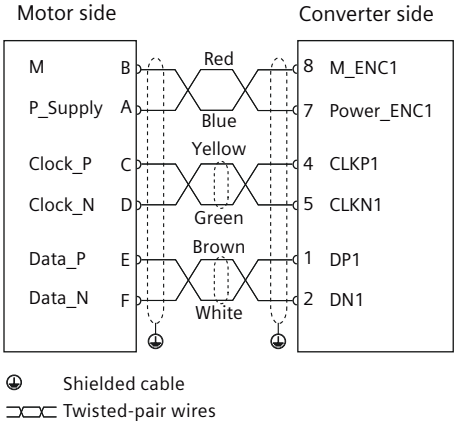


Figure 6-9 Wiring diagram

Insert the encoder plug into the encoder interface on the motor, and tighten the M2 screws with a tightening torque of 0.15 Nm ± 0.015 Nm.



Connecting to 1FL2 using the hybrid connector



For more information, see Section "Wiring (Page 124)".

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.6 Connecting the braking resistor

6.6.1 Interface description - X1

Overview

The converter connects to the braking resistor via terminals DCP, R1, and R2 on the interface X1.

Description

Table 6-6 Interface X1

X1	Terminal	Designation
L N DCP R2 R1 U V W	DCP	DC link positive (for connection to the braking resistor)
	R2	Connection to the internal braking resistor[1)]
	R1	Connection to the external braking resistor

[1)] Only for FSAC

6.6.2 Wiring

Overview

The S200 Compact FSAC has an integrated braking resistor for absorbing regenerative energy from the motor. To use the internal braking resistor, connect DCP and R2 with the jumper included in the scope of delivery.

To use an external braking resistor, connect the converter to an external braking resistor via terminals DCP and R1.

Requirement

⚠ WARNING

Electric shock as a result of a residual charge in power components

After the power supply has been switched off, it takes up to five minutes until the capacitors in the converter have discharged so that the residual charge is at a non-hazardous level. Touching the converter immediately after powering off can result in electric shock due to residual charge in the power components.

- Check the voltage at the converter connections before you connect the external braking resistor.

⚠ WARNING

Fire caused by an unsuitable or improperly installed braking resistor

Using an unsuitable or improperly installed braking resistor can result in fire and formation of smoke. Fire and smoke can cause severe personal injury or property damage.

- Only use braking resistors that are approved for the converter.
- Install the braking resistor in accordance with regulations.

Procedure

Connecting the internal braking resistor (only for FSAC)

1. Switch off all power supplies to the converter, including the mains supply and the 24 V DC power supply.
2. Connect DCP and R2 with the jumper included in the scope of delivery as shown below:

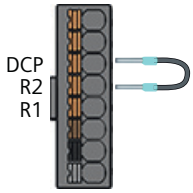


Figure 6-10 Connecting to an internal braking resistor

Connecting an external braking resistor

1. Switch off all power supplies to the converter, including the mains supply and the 24 V DC power supply.
2. Wait for five minutes to allow the converter to discharge and check that no voltage is present at the converter connections.

3. For FSAC, remove the jumper between DCP and R2, if present.
4. Connect the external braking resistor cable to terminals DCP and R1 as shown below:

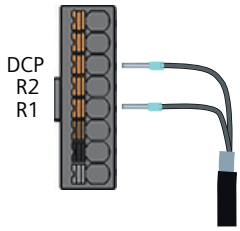


Figure 6-11 Connecting to an external braking resistor

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.7 Connecting the 24 V DC power supply

6.7.1 Interface description - X124

Overview

The converter connects to an external 24 V power supply via interface X124.

Description

Table 6-7 Interface X124

X124	Terminal	Designation	Technical data
0 V 24 V	0 V	Power supply, 0 V	Maximum current limit: 2.4 A
	24 V	Power supply, 24 V DC	

6.7.2 Wiring

Requirement

WARNING

Electric shock due to unsuitable power supply

When the converter is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use 24 V power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages (maximum 60 V DC briefly).

Procedure

1. Assemble the X124 plug to the converter.
2. Attach the cable to the plug as shown below:

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.8 Connecting the inputs and outputs

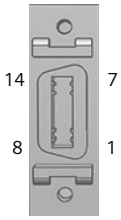
6.8.1 Interface description - X130

Overview

The converter connects to the controller for signal transmission on the interface X130.

Description

Table 6-8 Interface X130

X130	Pin	Designation	Technical specifications	Conductor color
 14-pin MDR connector Tightening torque: 0.2 Nm	1	DI0	Digital input 0 (high-speed digital input)	White
	2	DI1	Digital input 1 (high-speed digital input)	Brown
	3	DI2	Digital input 2	Green
	4	DI3	Digital input 3	Yellow
	5	M	Reference ground	Gray
	6	DI_COM	Common terminal for digital inputs	Pink
	7	DI_COM	Common terminal for digital inputs	Blue
	8	M	Reference ground	Red
	9	-	-	Black
	10	FE	Functional grounding	Purple
	11	DO0+	Digital output 0, positive	Gray-pink
	12	DO0-	Digital output 0, negative	Red-blue
	13	-	-	-
	14	-	-	-

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 804)".

6.8.2 Wiring

6.8.2.1 Wiring of digital inputs

Overview

The converter offers four digital inputs. DI0 and DI1 only support PNP wiring, and DI2 and DI3 support both NPN and PNP types of wiring.

Connection example

Connecting DI0 and DI1

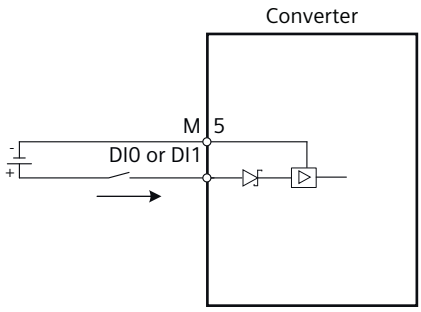
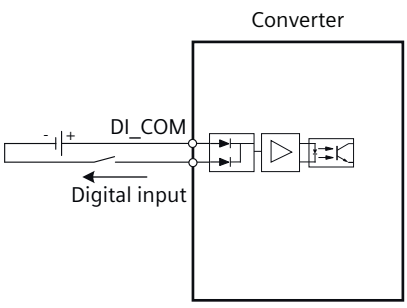
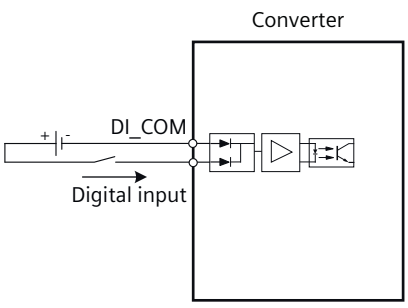


Figure 6-12 PNP wiring

Connecting DI2 and DI3



NPN wiring



PNP wiring

More information

For more information about the technical data of digital inputs, see Section "General technical data (Page 574)".

6.8.2.2 Wiring of digital outputs

Overview

The converter has one digital output, DO0. The digital output supports both NPN and PNP types of wiring.

Requirement

⚠ CAUTION

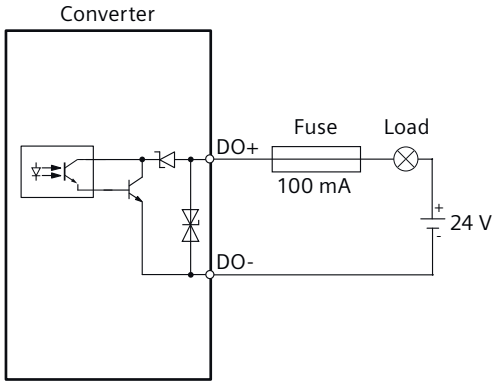
Damage to property due to overload of digital outputs

If digital outputs are overloaded, this can result in damage due to fire, device defects, or malfunctions.

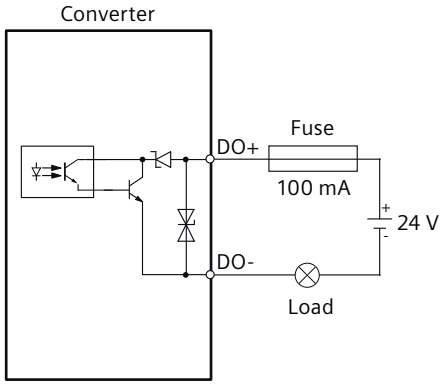
- Ensure that the digital outputs are not loaded in excess of 100 mA.
- Install a 100 mA fuse for connection to the digital output.

Connection example

You can connect the digital output as shown below:



NPN wiring



PNP wiring

More information

For more information about the technical data of digital outputs, see Section "General technical data (Page 574)".

6.9 Connecting to the fieldbus

6.9.1 Interface description - X150

Overview

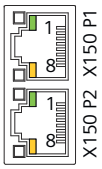
The converter connects to the PROFINET network via ports 1 and 2 of interface X150. The transmission rate on the interface is 10 Mbit/s or 100 Mbit/s.

Every PROFINET device on the network is uniquely identified by its PROFINET interface. For this purpose, a PROFINET interface has the following attributes:

- A MAC address (factory default)
- An IP address
- A device name (name of the station)

Description

Table 6-9 Interface X150

X150	Pin	Designation	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved	Reserved
	5	Reserved	Reserved
	6	RXN	Receive data -
	7	Reserved	Reserved
	8	Reserved	Reserved

LED states

For diagnostic purposes, the PROFINET interface X150 is equipped with a green LED and an orange LED.

Table 6-10 LED states of interface X150

LED	Color	Status	Description
Link port	-	Off	Missing or faulty link
	Green	Continuous light	10 or 100 Mbit link is available
Activity port	-	Off	Not connected
	Orange	Flashing light	Sending or receiving data

6.9.2 Wiring

Overview

The maximum length of cables between stations (L1 to Ln) is 100 m. Siemens recommends that you fix the cable on the cabinet to prevent connector damage caused by dragging. If a cable with a length of more than 3 m is connected to the PROFINET port, electromagnetic interference may occur. Minimization of the interference emission is possible by the use of ferrite cores, cabinet feedthrough or fiber optic transceiver.

Note

When connecting the ports P1 and P2, make sure that the physical input and output connections are the same with the connections in the topology.

Connection example

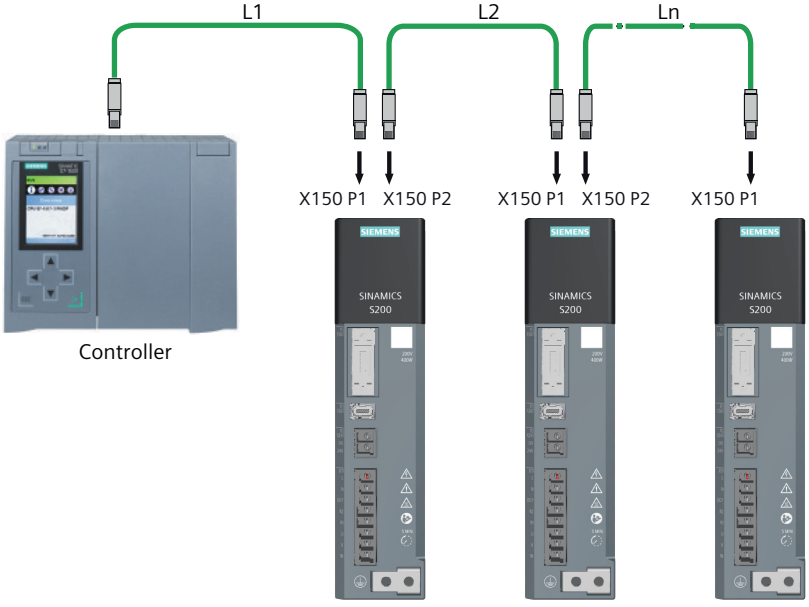


Figure 6-13 Connecting to the fieldbus

More information

For more information about cable requirements, see Section "Cables and connectors (Page 118)".

Commissioning (web server) 7

7.1 Introduction

Description

The web server commissioning tool is integrated in the converter.

The web server supports you throughout the service life of the application:

- Online commissioning
- Diagnostics
- Monitoring and operation
- Service and maintenance
- Support

After commissioning has been completed, the settings made are applied and transferred to the converter.

The web server has multi-level industrial cybersecurity functionality.

More information

For more information about security settings in the web server, see Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578).

7.2 Fundamentals

7.2.1 Requirements for commissioning

Description

- You have correctly installed the converter and the motor.
- You have mounted the motor including encoder onto the mechanical system.
- You have connected the motor to the converter.
- You have connected the converter and the operating unit via PROFINET interface X150.
- You have switched on the converter supply voltage.
- The converter has ramped up.

7.2.2 Supported operating units

Description

The following operating units are supported for the connection with the web server:

- Programming device, PC, notebook
- Smartphone, tablet PC
  Mobile devices can be connected to the converter via third-party Ethernet OTG adapters or external WLAN access points.

As a result of the responsive design, content is adapted to the screen size of the operating unit.

7.2.3 Supported browsers

Description

The web server supports the following browsers:

Table 7-1 Browsers supported by the web server

Browser[1)]	Version
Apple Safari	≥ Version 15.0
Google Chrome	≥ Version 83

Browser[1)]	Version
Microsoft Edge	≥ Version 88
Mozilla Firefox	≥ Version 91

[1)] Siemens recommends that you use the latest version of the browsers.

7.2.4 Communication interface

Description

The following interface is available for accessing the converter:

Interface	Information
PROFINET interface X150	The default access to the web server is via the interface X150 with HTTPS protocol.
	Interface X150 is intended for commissioning and diagnostics, which means that it must always be accessible.
	Defaults: • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0
	• Converters are connected to several components, such as an operating unit or a higher-level control system, via PROFINET interface X150. • The network at PROFINET interface X150 must be located in a secure protection zone. Access to cables and open connections must be implemented in a protected fashion, such as in a control cabinet.

7.3 Getting started

7.3.1 Calling the web server

Overview

The converter is commissioned via the user interface of the web server.

Requirement

- You have connected the converter to the operating unit via the interface X150.
- If you have configured security settings for the web server, make sure that guest access to the web server is active.
  If guest access is not permitted, you must log in with your user name and password when calling the web server.

Procedure

To access the web server, enter the IP address (default: https://169.254.11.22) of the converter in the browser.

Result

- If you call the web server for the first time, you are prompted to define the basic settings.
- If you have already made the basic settings, then the web server starts and opens the home page. You can commission the converter, troubleshoot it, operate it, monitor it or call up support.

7.3.2 Basic settings

Overview

Initial basic settings are defined in the function view.

Requirement

The web server is being called for the first time.

Description of function

The basic settings are as follows:

- Preferred language of the user interface
- Converter date and time; either manually or via NTP
  To synchronize the date and time with the NTP server of the control, the SNTP library must be integrated into the PLC.

After these entries have been made, using the "Next" button, you can continue to the Security Wizard.

7.3.3 Security settings

Overview

One of the following security options can be selected after the basic settings:

- "Configure security settings" in the Security Wizard
  The Security Wizard offers the following settings:
  - User Management & Access Control (UMAC)
  - Access to the integrated web server via the PROFINET interface with HTTPS protocol
  - Drive data encryption

  Comprehensive protection against data manipulation requires that security settings are configured.
- "Continue with low security settings"
  If you continue with low security settings, then UMAC is deactivated.

Siemens recommends that you configure the security settings before the converter goes into operation. You can also access the security settings via menu "Protection & Security (Page 184)".

Requirement

NOTICE
Data manipulation due to low protection An inadequately protected drive makes it easier for potential attackers to access the drive data. Data manipulation can cause the drive to malfunction or damage it. • Only use the low security settings in exceptional cases and only if an information security risk analysis finds that it is reasonable to do so. • Configure the settings for full protection immediately after adding a drive or several drives to the project.

Procedure

If you select "Configure security settings", proceed as follows to finish the security settings in the Security Wizard:

1. Define the settings for UMAC on the following pages:
   - "Activate User Management & Access Control"
     If UMAC is activated, it can only be deactivated by a full reset of the converter to factory settings.
     For more information about the full reset to factory settings, see Section "Protection & Security (Page 184)".
   - "Administrator setup"
     Specify the user name and password of the drive administrator, who has all available rights of the drive.
     Runtime role "Drive Administrator" is assigned to the administrator. You can change the assignment in "System > User management".
   - "Guest access configuration"
     Choose whether users have read-only guest access to the converter without user name and password.
     With guest access enabled, users may acknowledge messages without logging in.
2. Check the setting to access the web server:
   - "Web server activation"
     The factory setting to access the web server is PROFINET interface X150 with HTTPS protocol.
3. Configure the optional drive data encryption:
   - "Drive data encryption"
     Assign an additional password for encryption of the drive data if you enable the function.
     The function encrypts UMAC user data and passwords in the backup file and on the memory card of the converter.
     To use "Drive data encryption" independent of UMAC, deselect option "Activate UMAC for the drive" on page "Activate User Management & Access Control".
4. Check the configured settings:
   - "Summary"
     The summary provides an overview of the configured settings.
5. Click on "Finish".

Result

The settings are applied.

You can continue with one of the following options:

- Continue with quick setup
- Continue with advanced setup
- Continue with the web server home page

More information

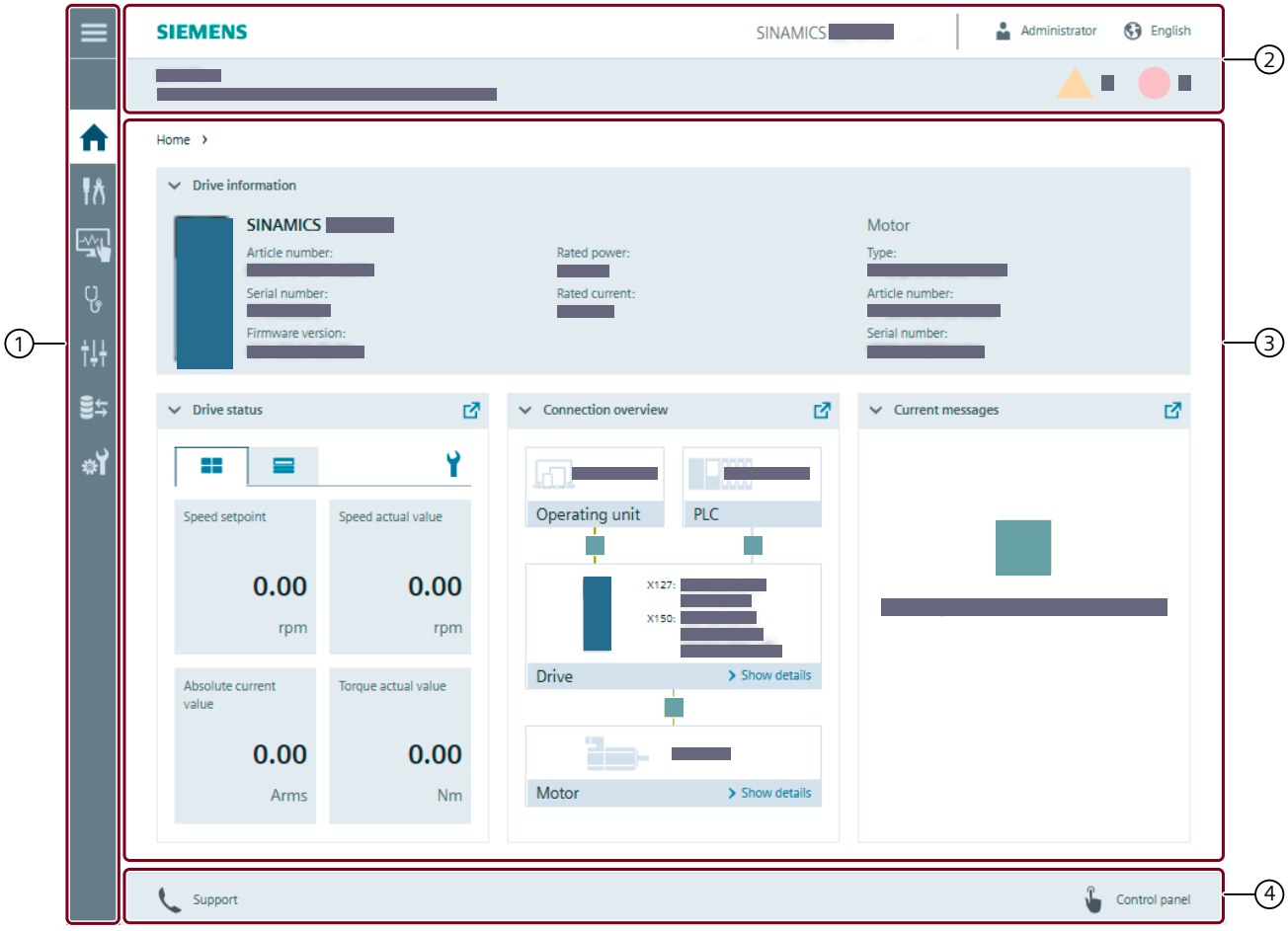
For more information about "Drive data encryption", see Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578)

7.3.4 Home page

Description

The web server interface depends on the converter. The web server view of your converter may vary from that shown here depending on your product and firmware version.

The following figure shows the basic structure of the web server pages.



① Navigation bar

The navigation bar provides access to converter functions and menus.

② Status bar

The status bar displays the converter product name and the converter status. Log in at the status bar and select the user interface language.

③ Main window

The main window provides information about converter functions and allows settings to be made.

④ Action bar

When manual saving is activated in menu "System" > "Settings", then symbol

is also shown in the action bar.

Figure 7-1 Structure of the web server (example)

7.3.5 Making the operating instructions available for the web server information system

Overview

For selected topics, you can use the information system of the web server to directly access the product documentation. To do this, you must make the product documentation available on a prepared memory card.

Requirement

- You have an empty memory card on which you can save the product documentation.
- You have connected a suitable memory card reader to your PC.

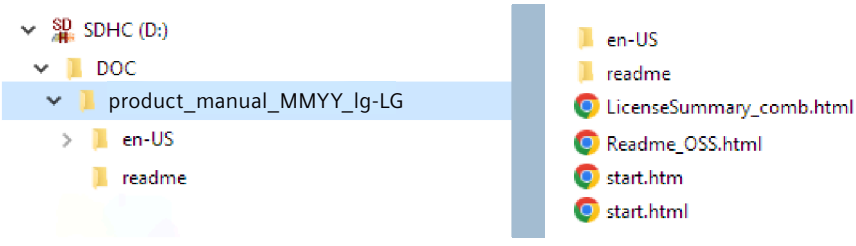
Procedure

To make the project documentation available for the web server information system, proceed as follows:

1. Download the product documentation to your PC
   The project documentation for the web server information system can be found on the Internet:
   Operating Instructions (https://sieportal.siemens.com/su/blEGt)
   ZIP archive "Multimedia document" is located under "Download".
   The multimedia document contains file "product_manual_MMYY_lg-LG.zip".

Explanation of file name "product_manual_MMYY_lg-LG.zip"		
	Example	**Explanation**
product	S200, G220	Abbreviated converter name
manual	op_instr (= operating instructions)	Abbreviated product documentation
MMYY	0324	Month and year that the manual was published
lg-LG	en-US (= US English)	Language code

2. Unzip the file into a folder with the ZIP file name, e.g. "product_manual_MMYY_lg-LG".
3. Insert a memory card into the memory card reader of your PC.
4. In the root directory of the memory card, create a folder called "DOC".
5. Copy the unzipped folder, e.g. "product_manual_MMYY_lg-LG", into directory "DOC" on the memory card.



6. Eject the memory card from the PC.

7. Remove the memory card from the reader.
8. Insert the memory card into the converter.

Result

You have made the product documentation in one language available for the web server information system.

For selected topics, you can access the content of the product documentation via the context-sensitive information system.

You can copy the product documentation in other languages to the memory card if there is sufficient space available on the memory card.

7.3.6 Using the web server information system

Overview

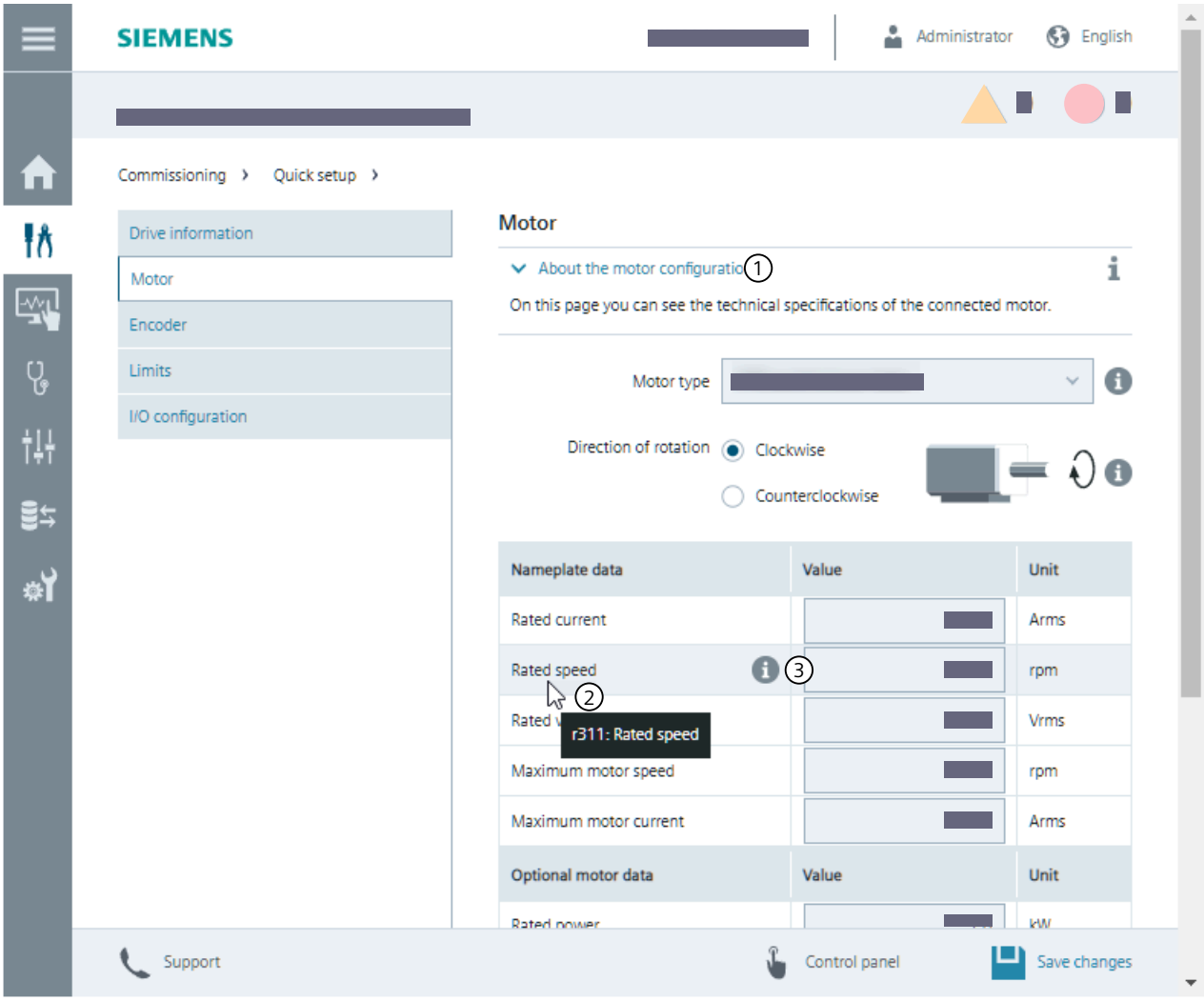
The web server supports you based on an integrated, multi-level information system.

Requirements

If you have provided the product documentation for the web server information system, then the web server also displays linked content of the manual.

Description of function

Product-specific information and settings are covered over in the following diagrams.



① Clicking or tapping on the header or on the associated icon displays or hides general information about the function of the current view.

② Point with the mouse pointer or tap on the setting you need information about.

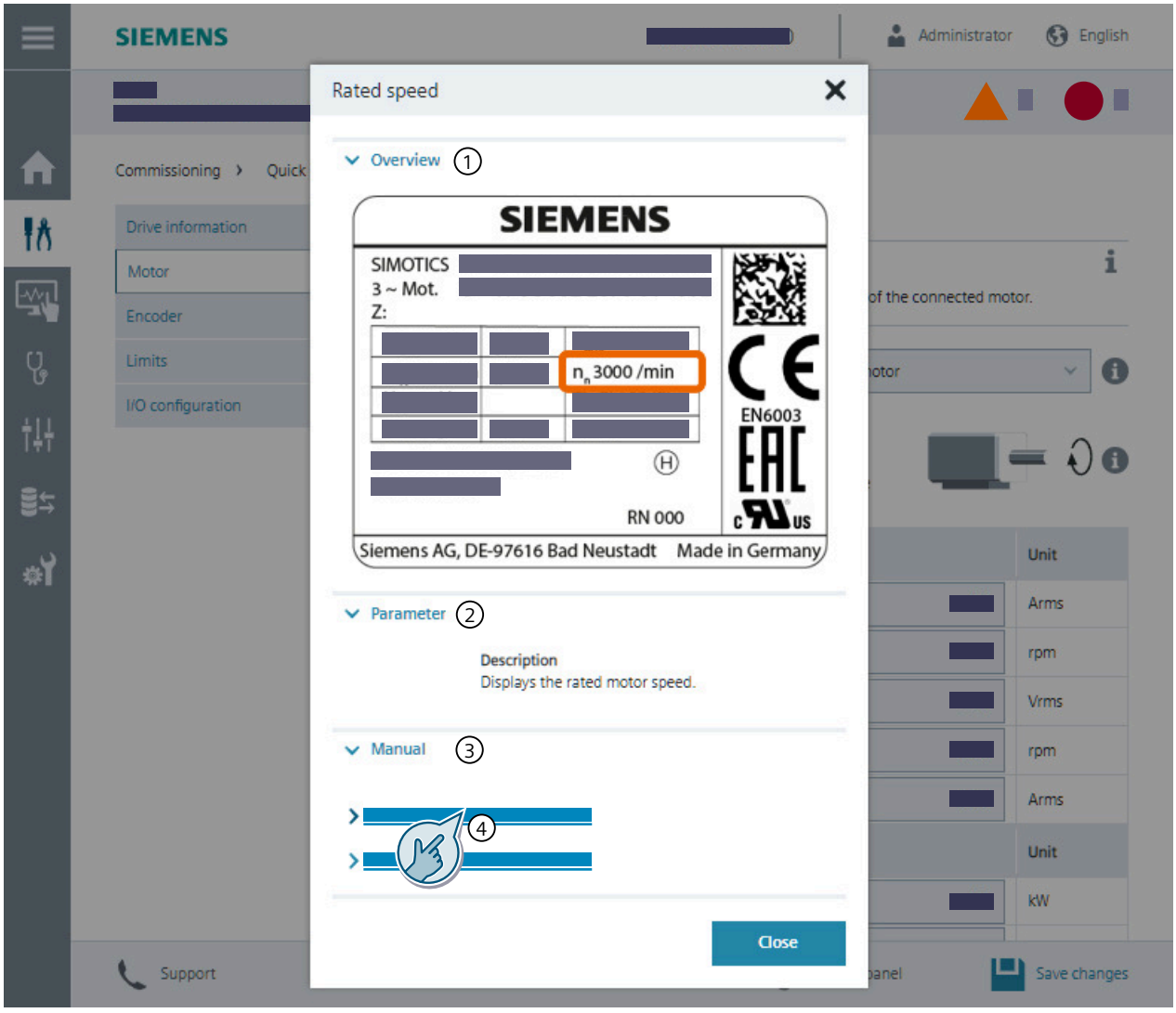
The setting is highlighted and the assigned info icon appears.

If you hold the mouse pointer or keep the tap pressed on the setting for longer, a tooltip ("③") with the context-sensitive short information is displayed.

When you move the mouse pointer to the info icon, the icon and the mouse pointer change their appearance.

If you now click or tap on the info icon, a context-sensitive help window appears with detailed information.

Figure 7-2 Information displayed in the current view



Clicking or tapping on the header or the associated icon does the following:

① Displays and hides general information about the meaning or function of the setting.

② Displays and hides detailed information about the parameter.

③ Displays and hides links to the operating instructions.

④ A click or tap on a link displays the linked information of the operating instructions.

Figure 7-3 Product-dependent information in a context-sensitive help window

7.3.7 Reloading pages

Procedure

If the web server does not respond, or if buttons are inactive or not labeled, although the converter is not fully utilized with internal calculations, then reload the web server pages.

Examples:

- At the PG/PC via <F5>
- At the tablet PC or smartphone via ↻

7.4 Functions and menus

7.4.1 Commissioning

7.4.1.1 Complete commissioning workflow

Overview

The web server guides users step-by-step through the drive commissioning.

Description of function

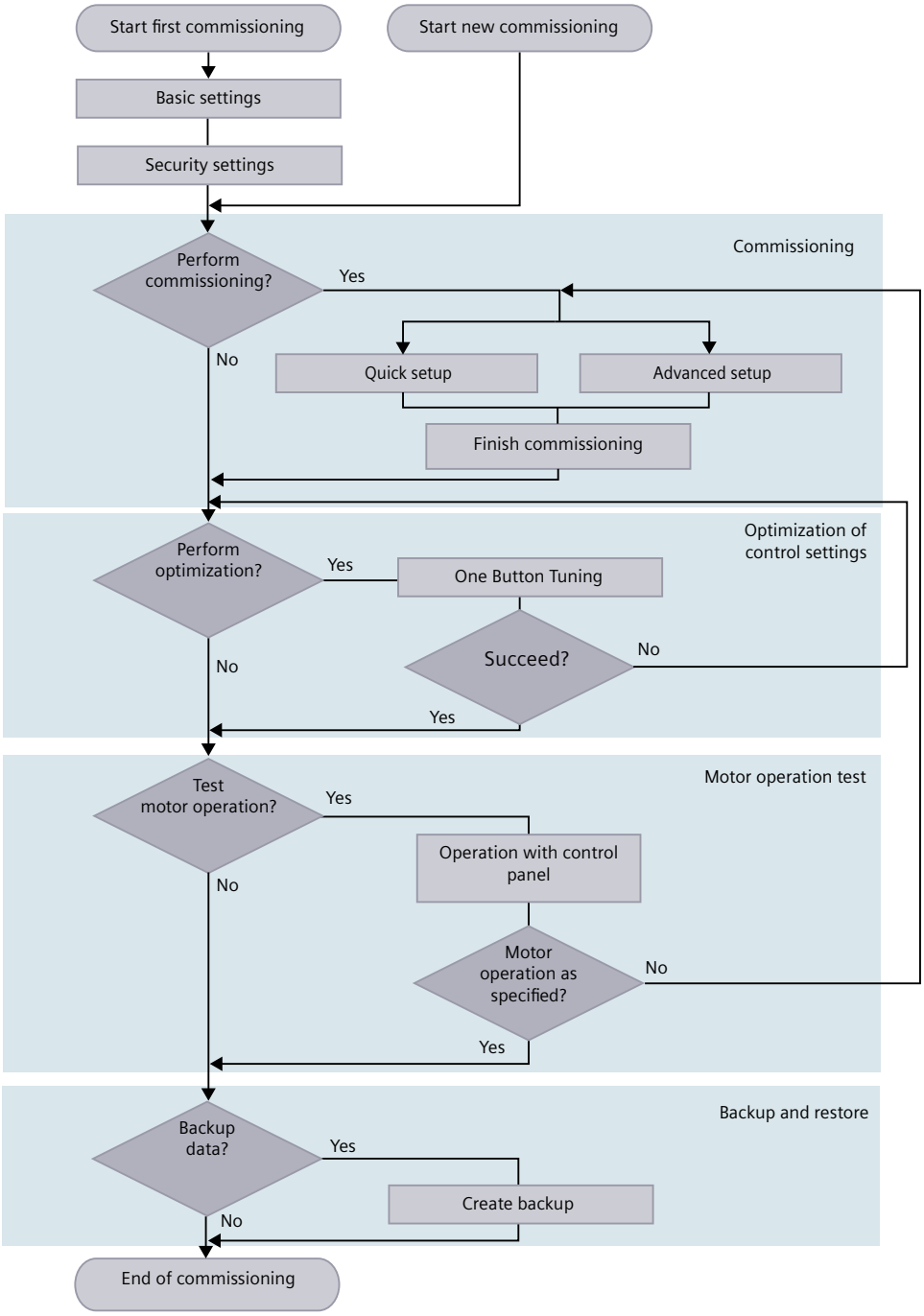


Figure 7-4 Commissioning sequence

Commissioning involves the following steps:

- Basic settings:
  If the converter has already been commissioned, then the web server jumps to the basic settings.
  The following settings are required for a brand-new converter:
  - Language, date, time
- Security settings:
  The settings are configured with the help of the Security Wizard.
  You can find more information in Section "Security settings (Page 149)".
- Commissioning
  Menu "Commissioning"
  The web server has 2 commissioning modes:
  - Quick setup
  - Advanced setup

  In the read mode, the web server provides an overview of the commissioning. This allows you to become familiar with the commissioning steps, individual drive options, and functions or to check settings. Configuration is not possible in the read mode.
- Optimization:
  Menu "Commissioning" > "Optimization"
  The Optimization function measures the mechanical drive train using short test signals and adapts the controller parameters to the mechanics installed.
- Motor operation test:
  Action bar > "Control panel"
  Test of motor operation using the control panel in jog mode or continuous operation
- Backup and restore:
  Menu "Backup and restore"
  Siemens recommends a backup of the drive settings after commissioning.

More information

For more information about user management and security settings, see Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578).

7.4.1.2 Commissioning

Overview

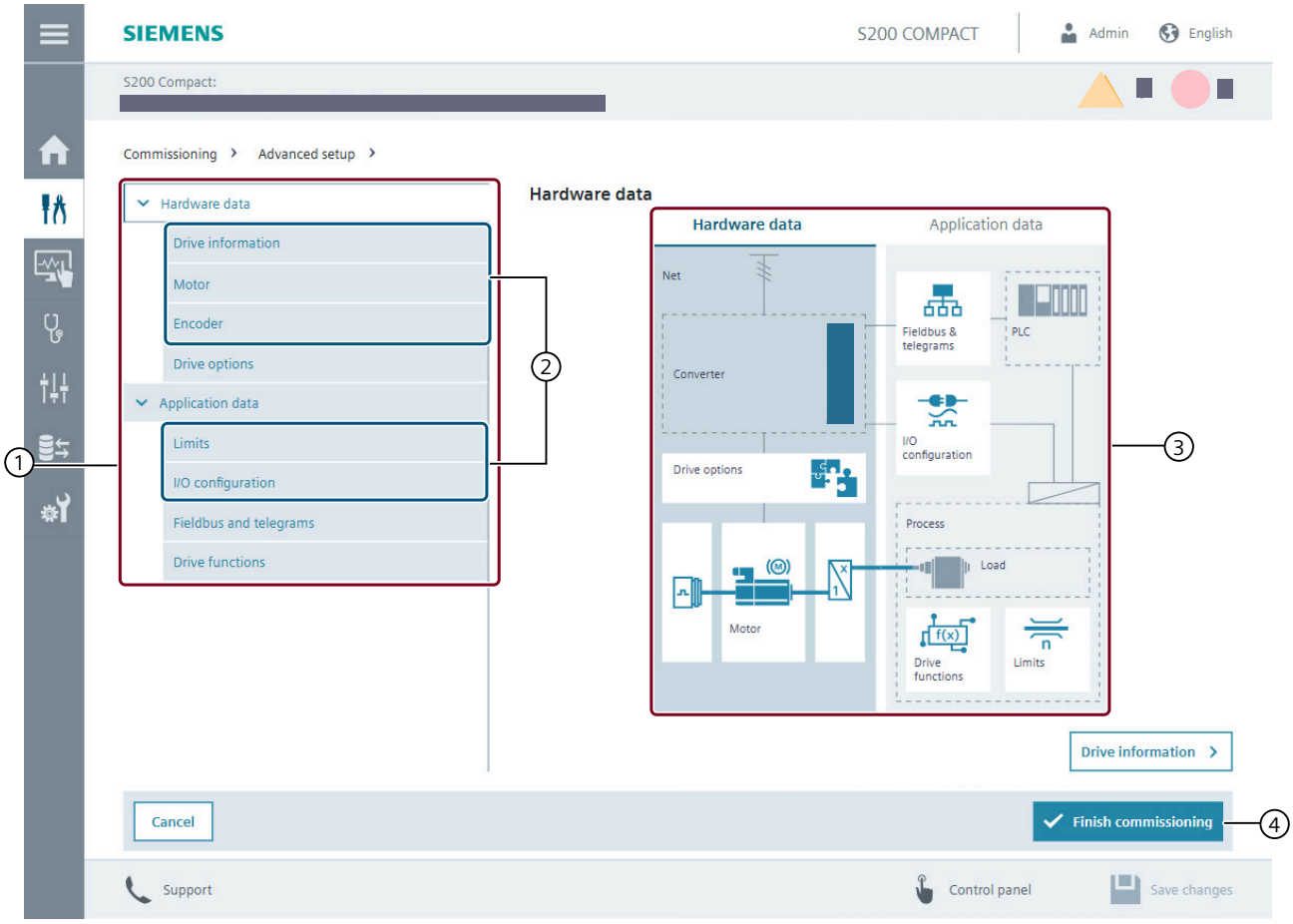
Important converter parameters are set during commissioning. After commissioning has been completed, the converter knows, for example, the data of the connected motor and has adapted its control interfaces to the specific requirements.

Requirement

- The drive system has been configured. The components are wired.
- Web server access is active.
- No other user controls the converter via the control panel.
- No other user has started commissioning.
- When UMAC is activated, then the required rights are assigned, for example, role "Drive Engineer and Service" is assigned.

Description

Product-specific information and settings are covered over in the diagram.



① Navigation through advanced commissioning
② Reduced navigation by quick commissioning
③ Function views of the individual commissioning steps
④ Control bar to cancel or complete commissioning

All values entered are valid.

The drive has overwritten the manually changed values.
Check values.

Once commissioning has been completed, at least one of the values will have to be changed.

Figure 7-5 Advanced commissioning using the web server

The web server has 2 commissioning modes:

- Quick setup
  Quick setup comprises the basic settings that are required to commission the converter. For example, this includes motor data, limit values and the configuration of inputs and outputs.
- Advanced setup
  The advanced setup contains all settings of the quick commissioning, plus additional options and functions.
  With advanced setup, drive options and functions that match the specific application can be configured.

The commissioning wizard runs through the commissioning menu.

The converter creates a restore point when commissioning is started. The converter saves the changes after every commissioning step. If you cancel commissioning before it has been completed, then the converter is reset to the restore point.

Table 7-2 Web server commissioning menu

Commissioning step	Description
Hardware data	
Drive information	The web server provides an overview of the drive system: • Converter • Motor • Encoder • Motor holding brake The drive name can be edited.
Motor	The data of the motor being used is displayed. The direction of rotation of the motor can be selected.
Encoder	The data of the encoder being used is displayed.
Drive options	If you use an external braking resistor with thermal model monitoring, manually enter the technical data of the braking resistor.
Application data	
Limits	Limit values can be set and adjusted in the table. Changes made are automatically reflected in the linked diagram.
I/O configuration	In the table, a function can be assigned to an input or output of the terminal. Specified functions can be selected. Do not assign a function to more than one input or output.
Fieldbus and telegrams	The PROFINET interface X150 can be configured and a PROFIdrive telegram can be selected.
Drive functions	The "Setup-functions" list is created and managed under "Parameters" > "Parameter List". You can add parameters to the list. This allows uniform access to the parameters of a drive function. Further configuration options are displayed by clicking on the tool icon .

The converter retentively saves the settings after commissioning has been successfully completed.

7.4.1.3 Testing the converter configuration

Overview

After commissioning, the web server allows you to test the converter configuration in jog mode or continuous motion via the control panel.

Description of function

To test the configuration, the control panel must be open and the speed setpoint entered.

There are two ways of opening the control panel:

- Button "Finish commissioning" > Dialog query with selection option "Open control panel"
- Action bar > "Control panel"

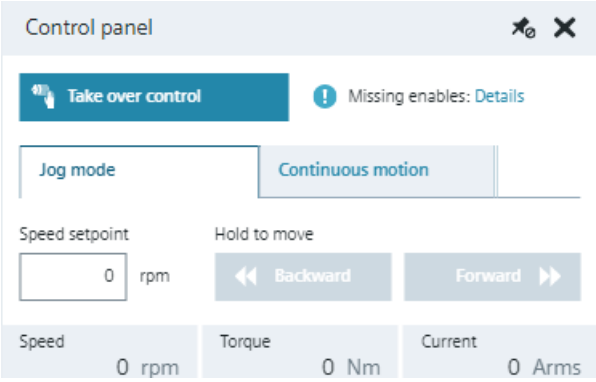


Figure 7-6 Testing the converter configuration via the control panel

More information

For more information, see Section "Control panel (Page 191)"

7.4.1.4 Optimization

Overview

After commissioning, you can use the function One Button Tuning (OBT) to optimize the converter settings.

With One Button Tuning, the mechanical drive train is measured using short test signals. In this way, the controller parameters are optimally adapted to the existing mechanical system.

Requirement

To reduce the stress on the mechanical system, the torque limit can be reduced before OBT. After OBT has been completed, the previous value can be set again.

NOTICE
Material damage caused by an impermissible direction of motion of the motor One Button Tuning runs the motor in both directions. Impermissible directions of motion can damage the machine or installation. • If a particular direction of motion of the motor is impermissible, do not carry out One Button Tuning.

Description of function

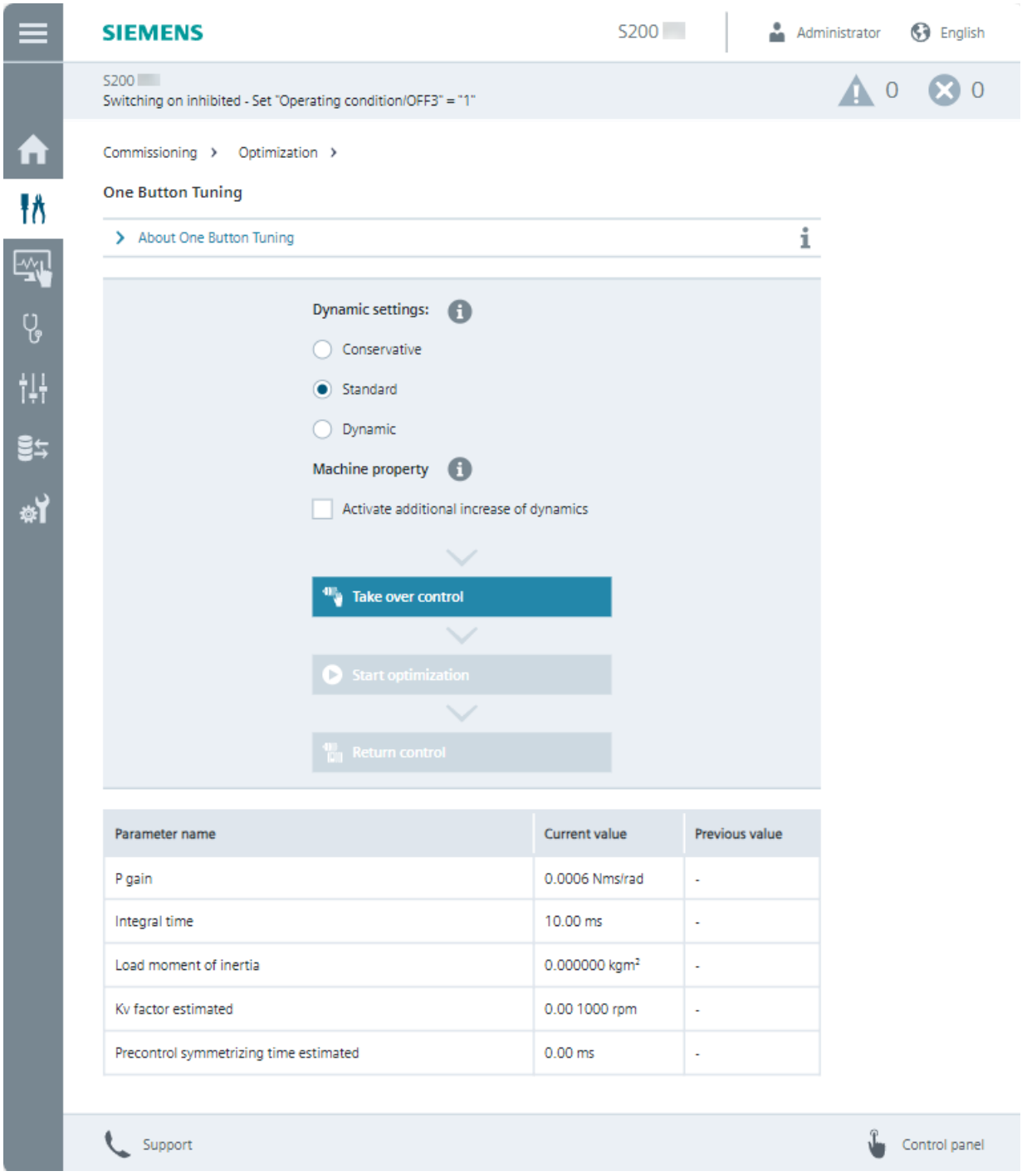


Figure 7-7 One Button Tuning

The controller settings are optimized using the following settings:

- "Dynamic settings"
  - Conservative
    60% dynamic response; speed precontrol without torque precontrol
  - Standard
    80% dynamic response; speed precontrol with torque precontrol
  - Dynamic
    100% dynamic response; speed precontrol with torque precontrol

  Note

  By default, the torque precontrol is implemented in the speed controller. You can also implement torque precontrol in the position controller. For more information, see "One Button Tuning (Page 382)".

- "Machine property"
  The "Activate additional increase of dynamics" option increases the proportional gain of the optimized speed control. The dynamic response is increased. The speed controller becomes faster.
  If the dynamic factor is increased too much, the speed controller may become unstable.
- "Take over control" and "Return control"
  Take over master control before starting to optimize the controller.
  Return master control back to the converter once the controller has been optimized.
- "Start optimization"
  - Enter the angle of rotation (rotation limit) through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged. Sensible controller parameters are obtained from an angle > 90°.
    When a negative angle is entered, then the motor moves in the opposite direction.
  - The table shows how the settings have been changed by OBT.

If OBT was not successful, then optimization must be repeated with other settings.

7.4.2 Monitoring and operation

7.4.2.1 Drive status

Overview

Function view "Drive status" shows the current status of the converter.

Description of function

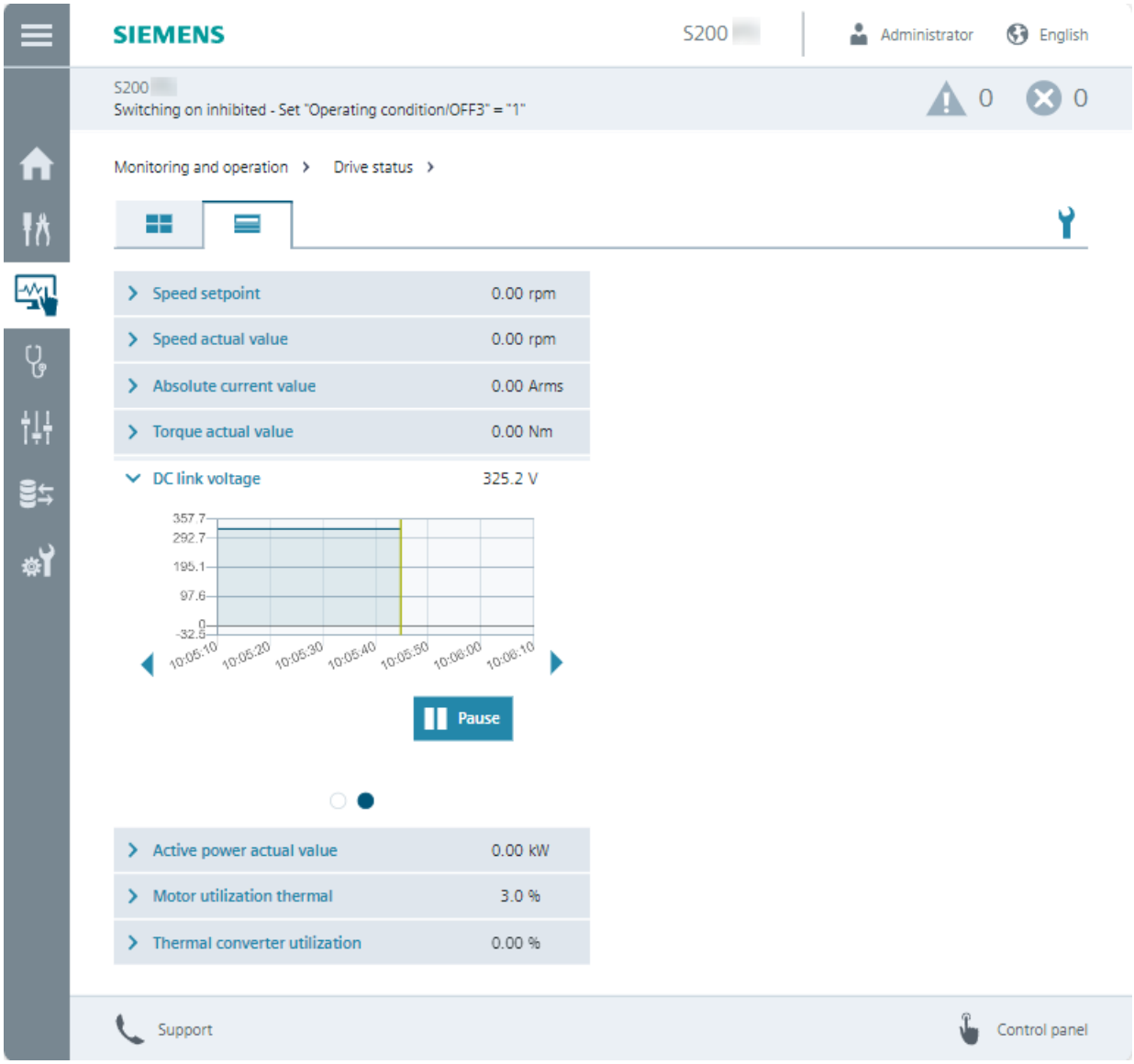


Figure 7-8 Drive status

The drive information displayed is preset in the factory setting, and when required, can be adapted using symbol . If user management is active, the "Edit web server configuration" right is required in order to make changes.

Values are indicated as follows:

- Factory setting: 8 values are displayed
- It is possible to display all values completely

The drive status is displayed as follows:

- : Individual values are continuously displayed
- : Individual values and trend diagrams are continuously displayed

7.4.2.2 Inputs/outputs

Overview

The function view "Inputs/outputs" shows the status of all inputs and outputs.

Description of function

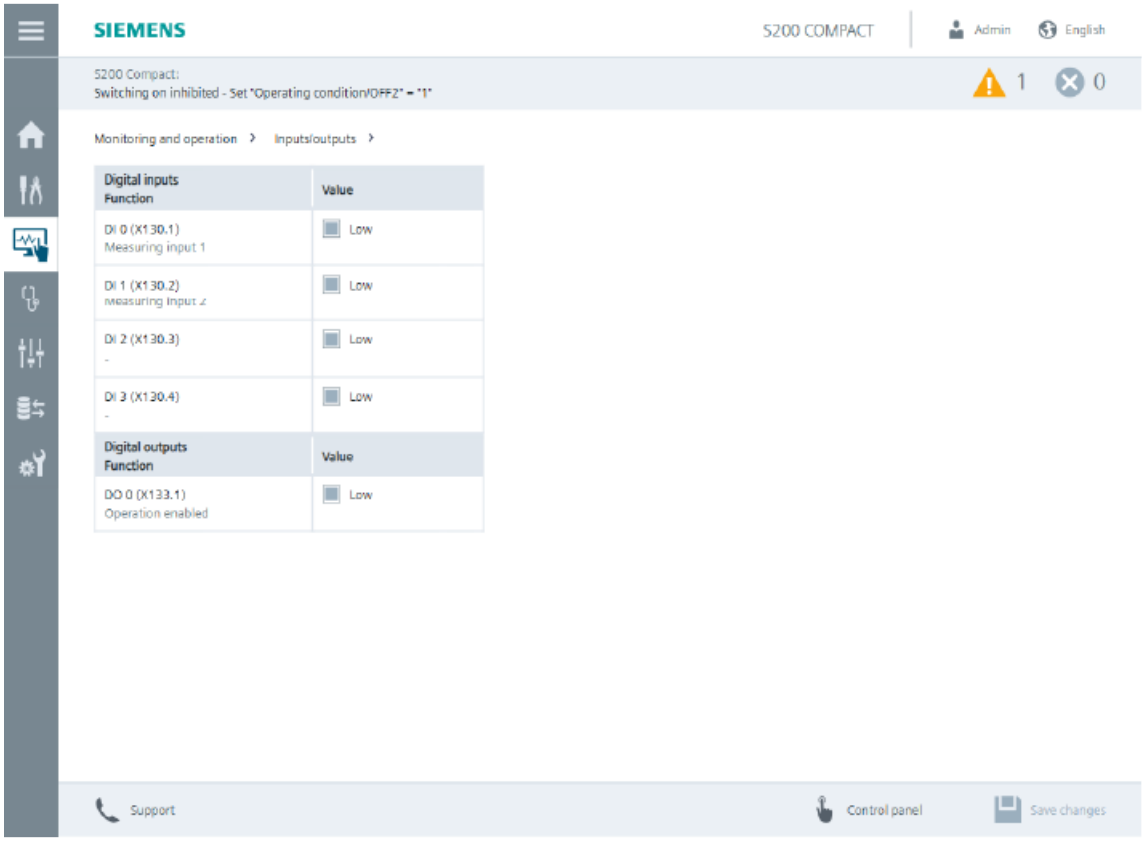


Figure 7-9 Inputs/outputs

The function view "Inputs/outputs" shows the following information:

- Name and terminal marking of the input and output
- Function of the input and output
- Actual value, e.g. "high" or "low" for a digital input

7.4.3 Diagnostics

7.4.3.1 Messages

Overview

The function view "Messages" shows active and historical messages.

Description of function

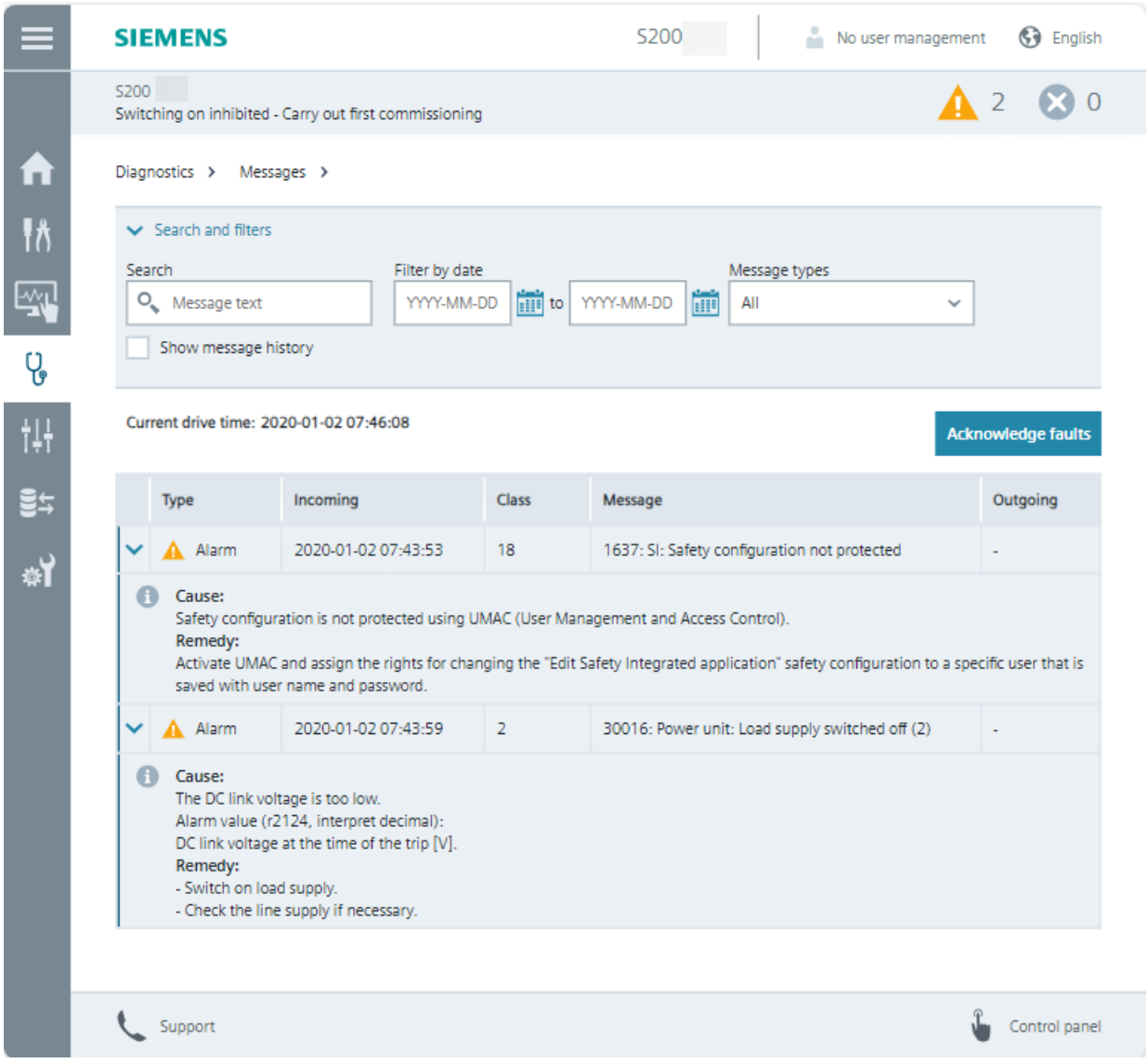


Figure 7-10 Messages

With search and filter options, the alarms and faults can be narrowed down.

The message history can be optionally displayed.

Selecting messages

Search	Enter a keyword
Filter by date	Select a date or time interval
Message types	Select the message type that should be displayed: • All • Fault • Alarm

Displaying messages

Type	Displaying the message type: • Alarm • Fault
Incoming	Time when the message was received
Class	Assigning the message to a message class according to PROFIdrive • The message number is output on all operating units, e.g. PC.
Message	Specification of the message number with message text
Outgoing	Time when the message went • Faults are given the status "Outgoing" if the following are true: – The causes have been eliminated. – The message has been acknowledged.
›	Selection for more information: • Description of the message with cause and remedy

7.4.3.2 Diagnostics buffer

Overview

Function view "Diagnostics buffer" provides information about all system-relevant operations, e.g. commissioning, new ramp-up, generation of a certificate.

Description of function

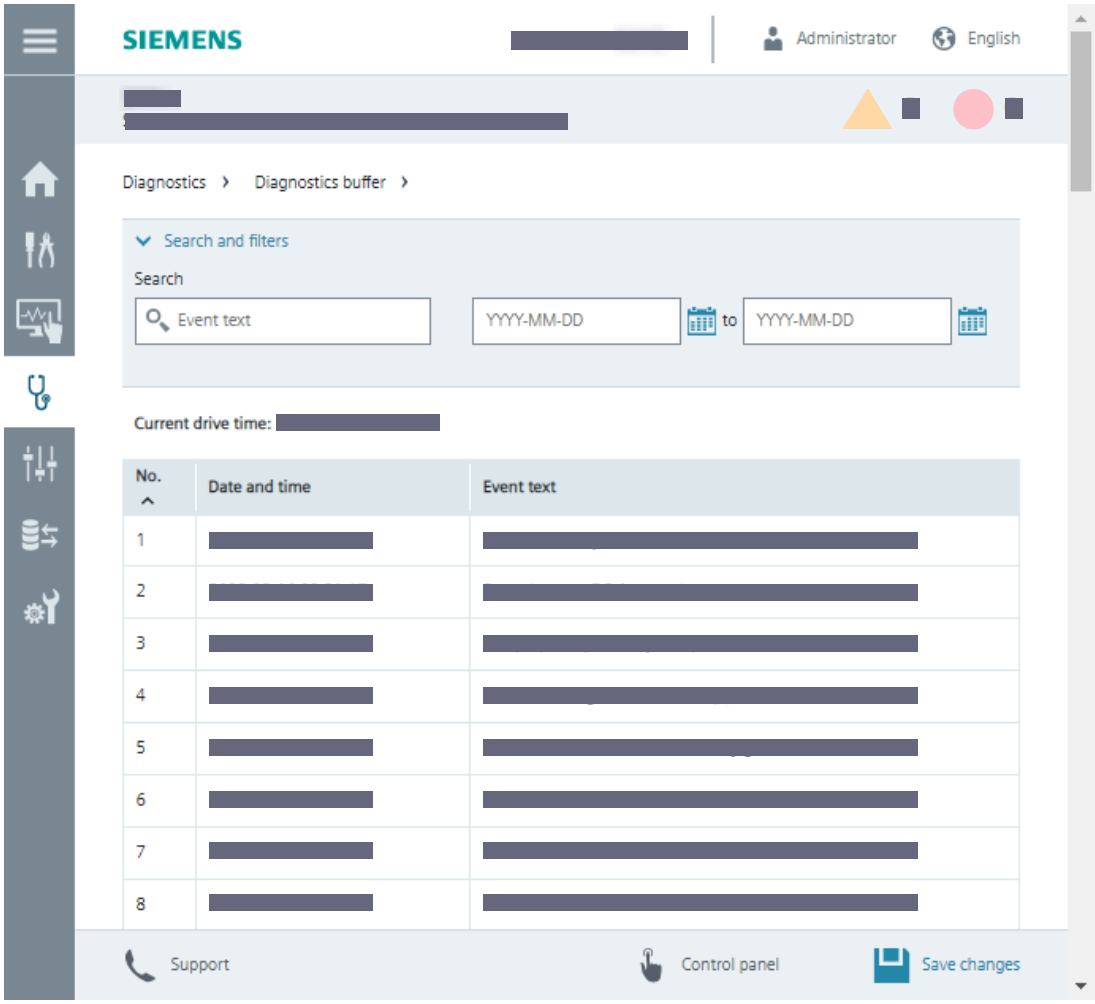


Figure 7-11 Diagnostics buffer

Reading out the diagnostics buffer facilitates converter diagnostics and supports fault analysis.

The search can be limited by searching for keywords and using the filter function according to date.

The diagnostics buffer can only be cleared by performing a manual reset to factory settings with a memory card. For more details, see Section "Full reset of all device settings (Page 547)" .

The diagnostics buffer is kept when restoring factory settings via menu "Backup and restore".

7.4.3.3 Connection overview

Overview

Function view "Connection overview" provides information about the connections in the drive system.

Description of function

The individual components with IP address and additional details are graphically displayed in the connection overview.

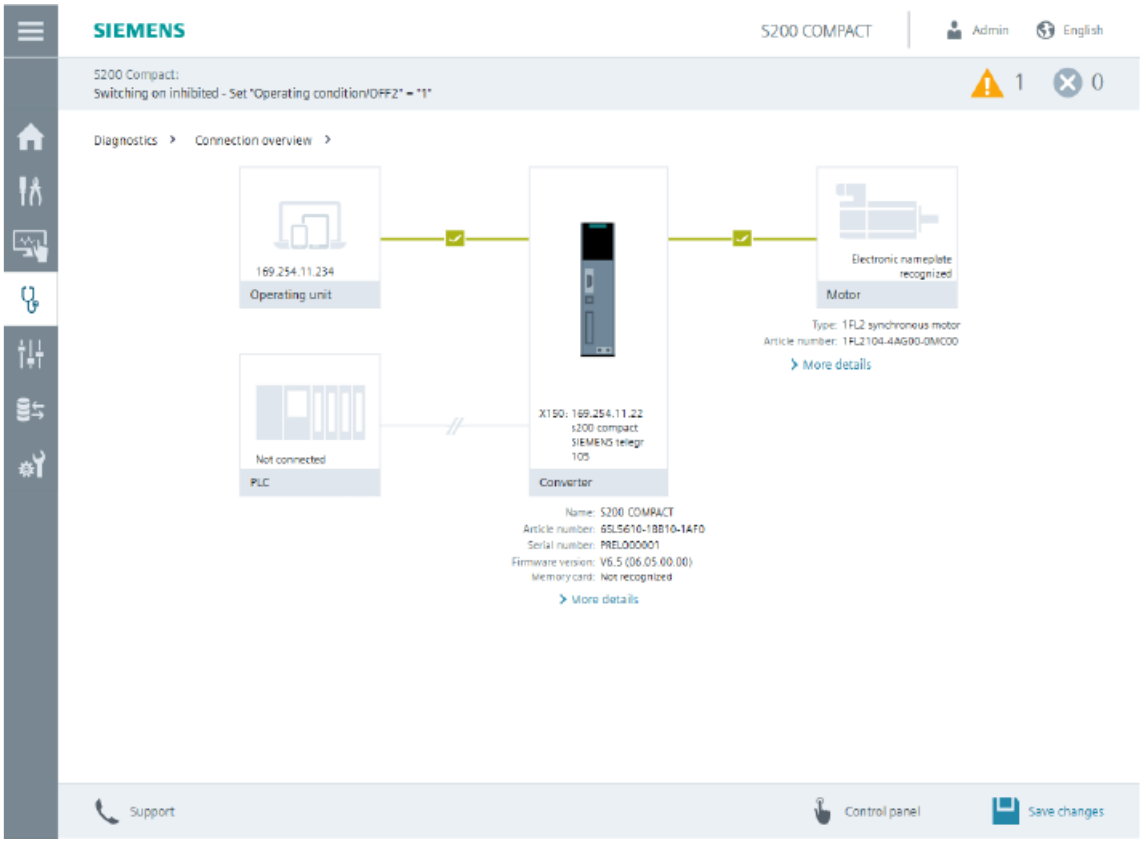


Figure 7-12 Connection overview

7.4.3.4 Communication

Overview

Function view "Communication" provides information about the activated fieldbus protocol.

Description of function

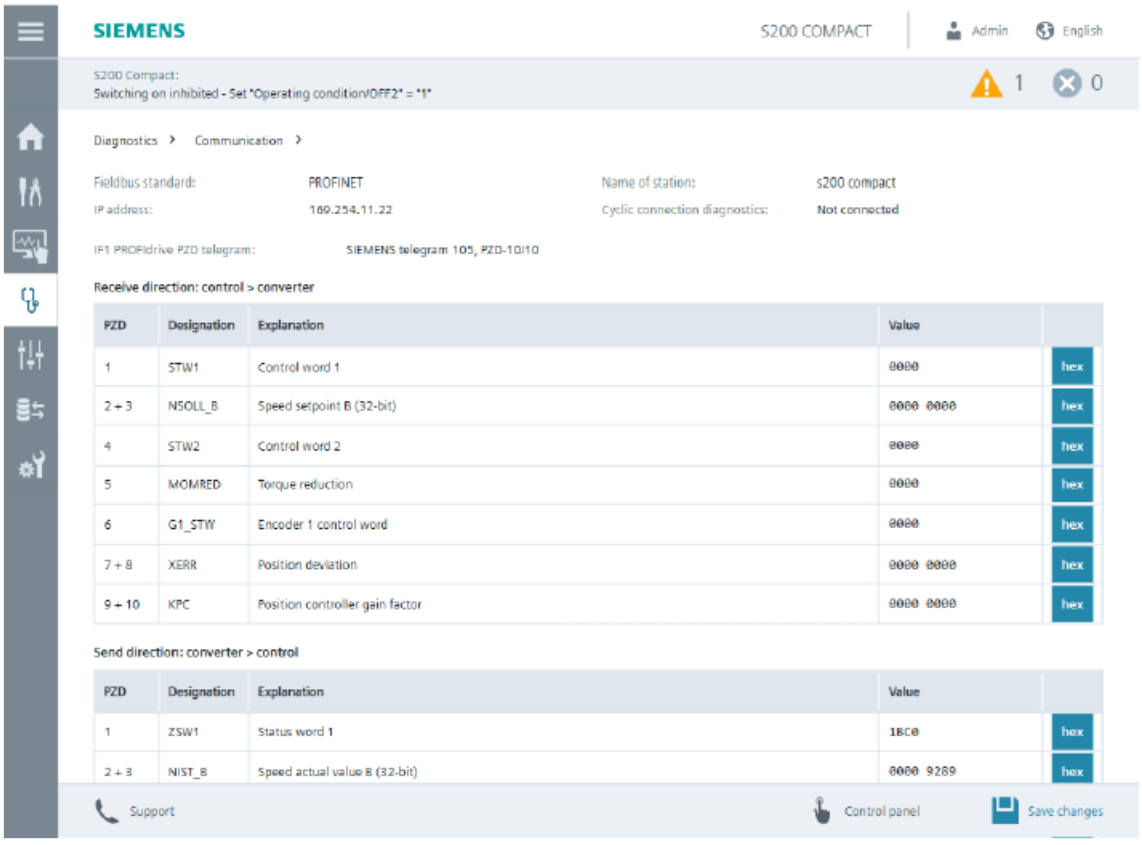


Figure 7-13 Communication

The following content is displayed:

- Connection status
- Process data of the set telegram in the send and receive directions.
  Telegrams are selected by users with corresponding function rights during converter commissioning as part of advanced setup.

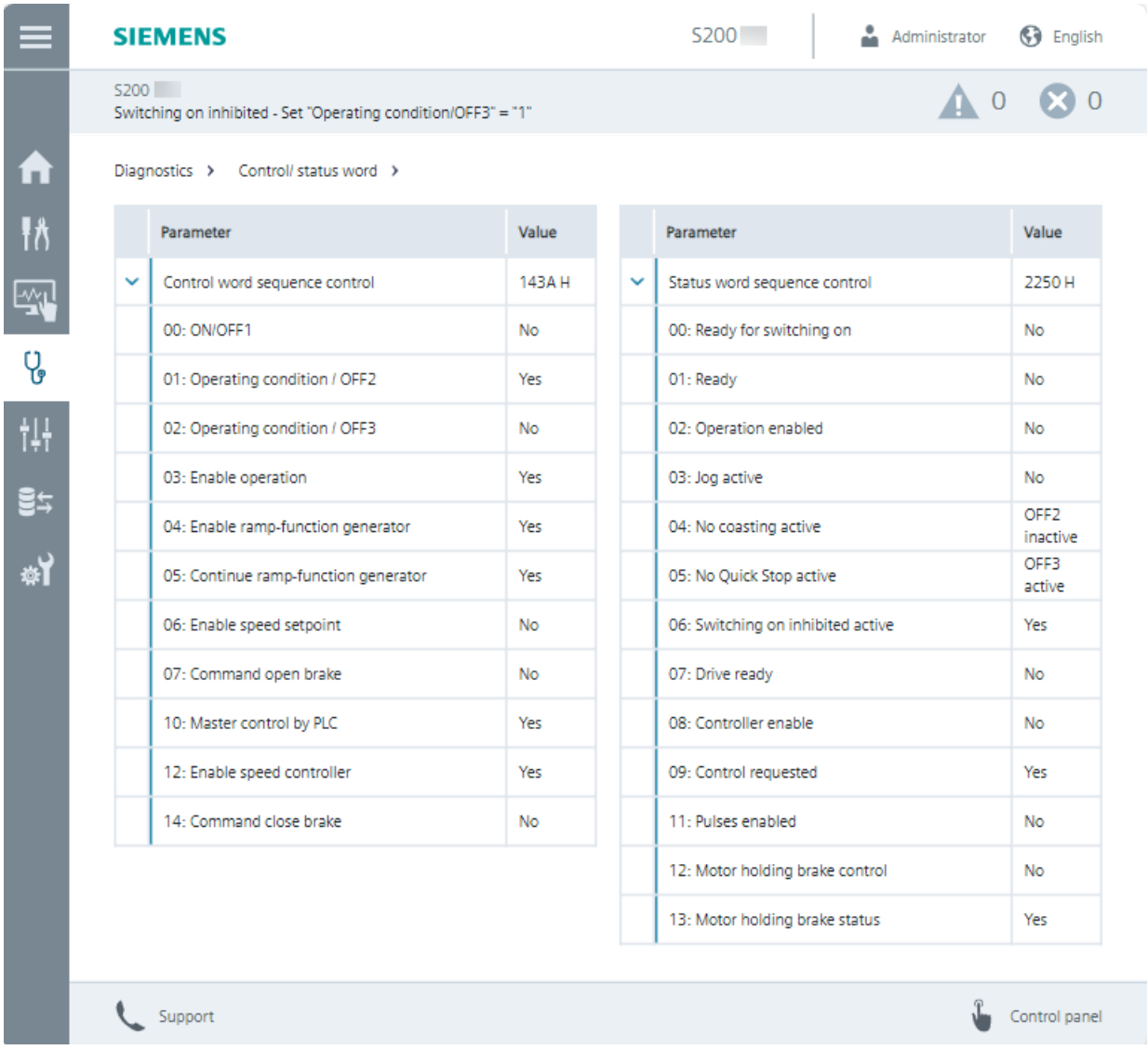
The values are shown in the hexadecimal format. The display of individual values is switched between the binary, decimal, and hex format by clicking on the button to the right of the value.

7.4.3.5 Status word and control word

Overview

Function view "Control/status word" provides information about the current status of the sequence control system.

Description of function



Parameter	Value
Control word sequence control	143A H
00: ON/OFF1	No
01: Operating condition / OFF2	Yes
02: Operating condition / OFF3	No
03: Enable operation	Yes
04: Enable ramp-function generator	Yes
05: Continue ramp-function generator	Yes
06: Enable speed setpoint	No
07: Command open brake	No
10: Master control by PLC	Yes
12: Enable speed controller	Yes
14: Command close brake	No

Parameter	Value
Status word sequence control	2250 H
00: Ready for switching on	No
01: Ready	No
02: Operation enabled	No
03: Jog active	No
04: No coasting active	OFF2 inactive
05: No Quick Stop active	OFF3 active
06: Switching on inhibited active	Yes
07: Drive ready	No
08: Controller enable	No
09: Control requested	Yes
11: Pulses enabled	No
12: Motor holding brake control	No
13: Motor holding brake status	Yes

Figure 7-14 Control and status word

Control and state word show all signals of the sequence control.

7.4.4 Parameters

7.4.4.1 Parameter lists

Overview

Function view "Parameter list" shows all the parameters of the converter. The parameter list allows specific parameters to be changed.

Description of function

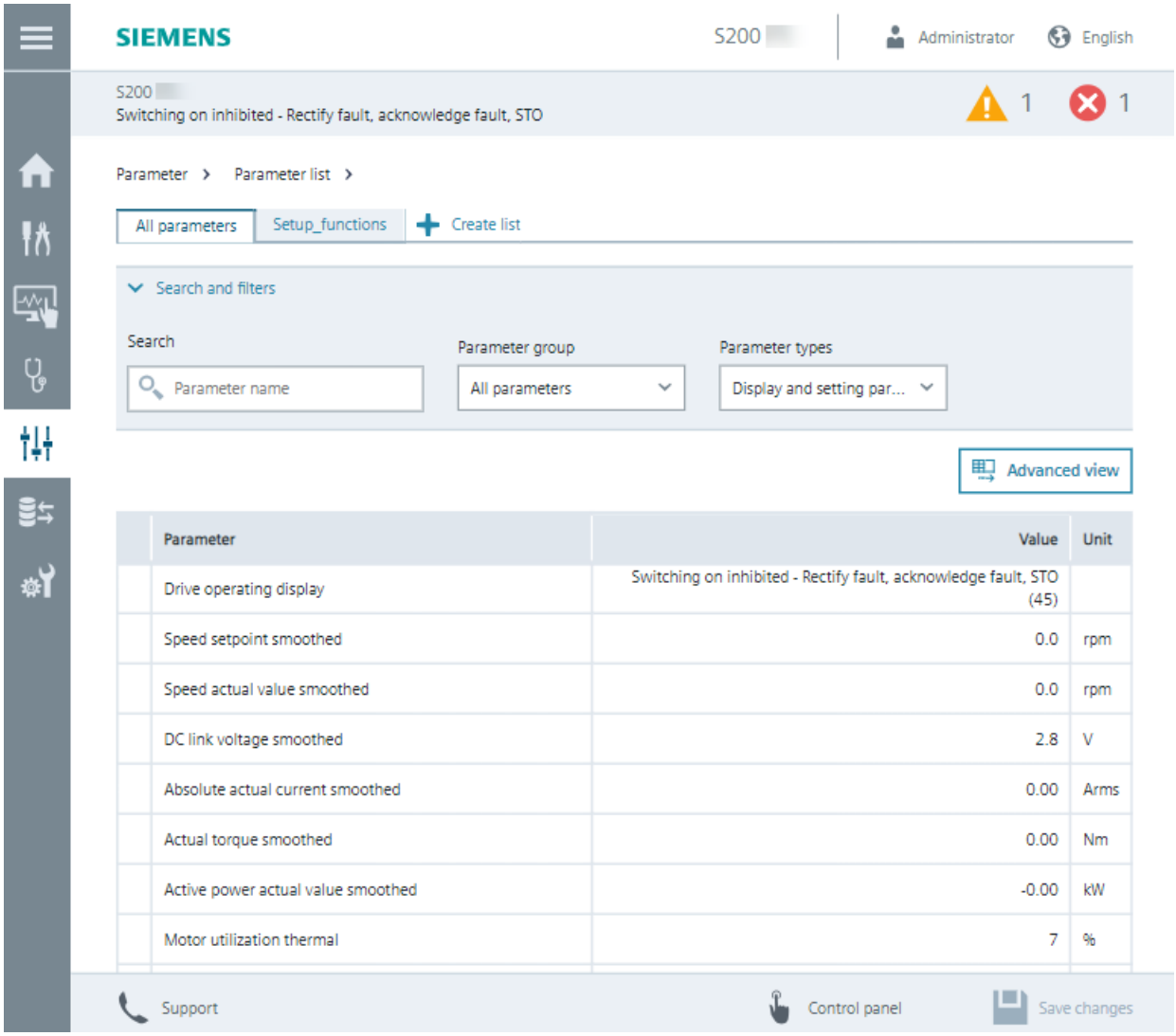


Figure 7-15 Parameter list

The function view shows the following tabs:

- Parameter list
  Depending on the setting in the "System" menu > Settings, the parameter list shows either all parameters or just the standard parameters.
- User-defined parameter list (optional)
  - The user-defined parameter list contains selected parameters and is created using the + Create list tab.
  - "Setup_functions" parameter list
    The "Setup_functions" list is created by default for advanced setup. The list does not contain any parameters. You can add parameters to the list. This allows uniform access to the parameters of a drive function.

  For more details, see Section "User-defined parameter list (Page 179)".

The parameter list offers the following options:

- Toggling between two list views
  - Show as "Simple view" and "Advanced view" with parameter numbers
- Managing user-defined parameter lists
  - Create a user-defined parameter lists
  - Copy the selected parameters to a designated user-defined parameter list
  - Import and export user-defined parameter lists
- Searching parameters
  - Search by parameter number or text search within parameter names
- Filtering the parameter list
  - Parameter groups: Only show the parameters that are assigned to a particular function.
  - Parameter types: display and/or setting parameters
- Changing parameter values directly in a parameter list
  - Exception: blocked parameters

p	Setting parameters	Can be read and edited.
		The setting parameter can only be parameterized in the active commissioning mode. Depending on the parameter, changes are possible in the quick setup.
		The setting parameter can only be parameterized when the user has the appropriate function rights.
r	Display parameters	Can only be read and cannot be edited.
c	Display parameters	Can only be read and cannot be edited.

7.4.4.2 User-defined parameter list

Overview

A user-defined parameter list is a combination of specific parameters from the standard parameter list of the converter. These can be used to configure frequently used user functions, for example.

Description of function

With the user-defined parameter lists, the web server provides the following functions:

- Creating up to 20 user-defined parameter lists
- Configuring list properties
  - Name
  - Position or sequence of the tabs
  - Comment
  - Delete list
- Exporting and importing user-defined parameter lists
  Export:
  - Export one or several user-defined parameter lists.
  - The web server exports the lists exclusively as a json file.
  - Export files generated by the web server can be imported into a Startdrive project.

  Import:
  - The list import function in the web server exclusively imports json files.
  - User-defined parameter lists exported via the web server or Startdrive as a json file can be imported into another drive of the same type via the web server.
    Requirement: same drive type and same firmware version

  If values are changed, the data must be saved retentively.

7.4.5 Backup and restore

Overview

With "Backup and restore" you can back up parameters and other settings and restore the settings again if necessary.

Description of function

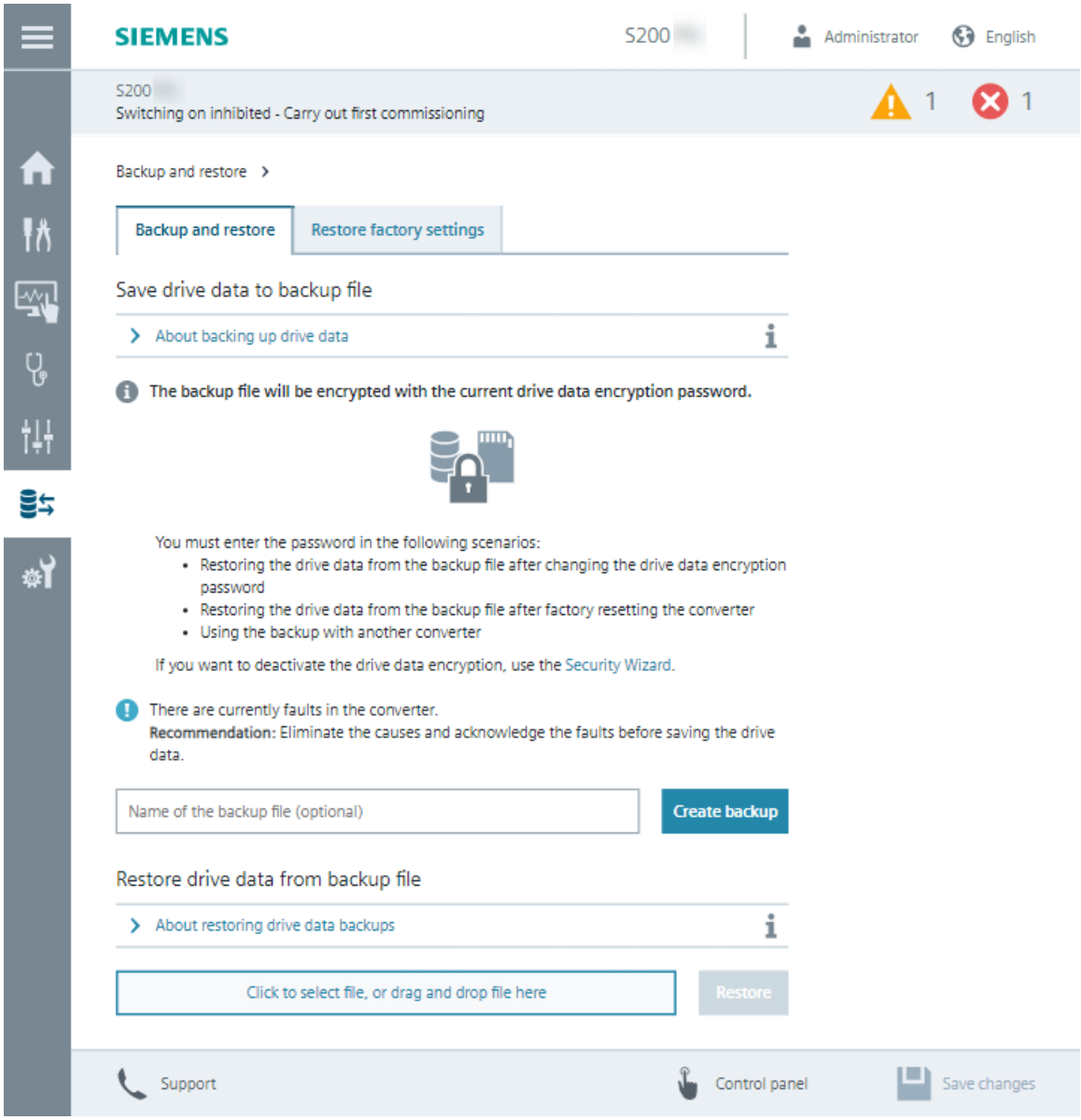


Figure 7-16 Backup and restore

Backup and restore

The following functions are available to back up data and settings:

- Save drive data to backup file
  Back up the settings to a file after commissioning.
  The drive data are encrypted in the backup file if function "Drive data encryption" is activated in the Security Wizard.
- Restore drive data from backup file
  When replacing a device or for series commissioning, load the backed-up parameter settings to the converter.
  To restore drive data from an encrypted backup file, the previously defined password for function "Drive data encryption" will be requested. For more details, see Section "Backup file with drive data encryption (Page 560)".

Restore factory settings

Almost all settings of the converter are reset to the factory values.

Exception: The following settings are retained after you restore factory settings via the web server:

- Settings of the communication interfaces
- UMAC and security data

To restore all settings, a memory card is required. For more details, see Section "Full reset of all device settings (Page 547)".

7.4.6 System

7.4.6.1 Settings

Overview

The function view "Settings" offers basic settings for the web server and the converter.

Requirement

- To edit the web server settings, you need the "Edit web server configuration" right.
- To edit the drive settings, you need the "Edit device configuration or drive applications" right.

Description of function

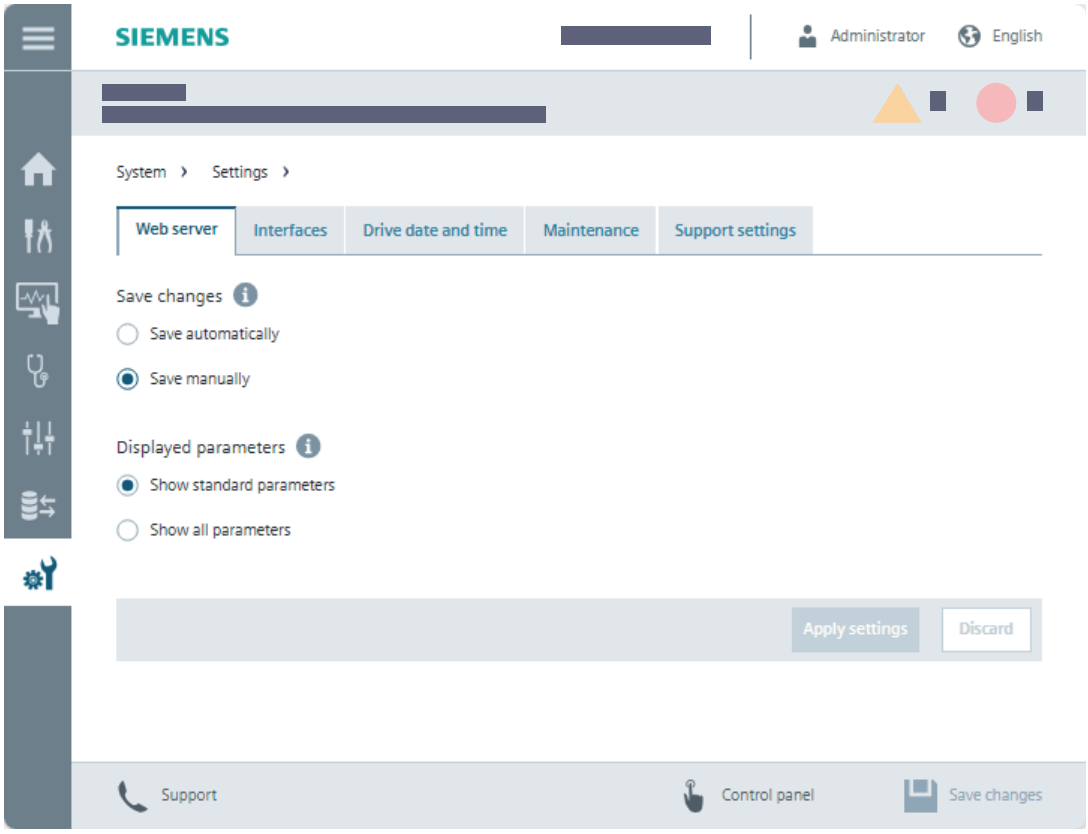


Figure 7-17 Web server system setting

Web server

Under "Web server", the web server offers options for saving changes and displaying parameters.

Interfaces

Under "Interfaces", the web server provides information about the status and the settings of the interfaces of the converter.

Drive date and time

Under "Drive date and time", the web server provides options for setting the date format and for obtaining the date, time and time zone of the converter.

Maintenance

The web server displays the wear of the converter fan. For converters that do not have a fan, a message is displayed specifying that no fan maintenance is required.

Support settings

Under "Support settings", the web server provides the option to store additional support and hotline data. The web server displays the data in the function view "Support".

7.4.6.2 User management

Overview

In "User management" you manage users and configure their roles and rights for accessing the converter.

Requirement

- You activated user management (UMAC) in Security Wizard at the step "Configure security settings (Page 149)" during first commissioning.
- You are logged into the web server and have the necessary rights to manage users.

Description of function

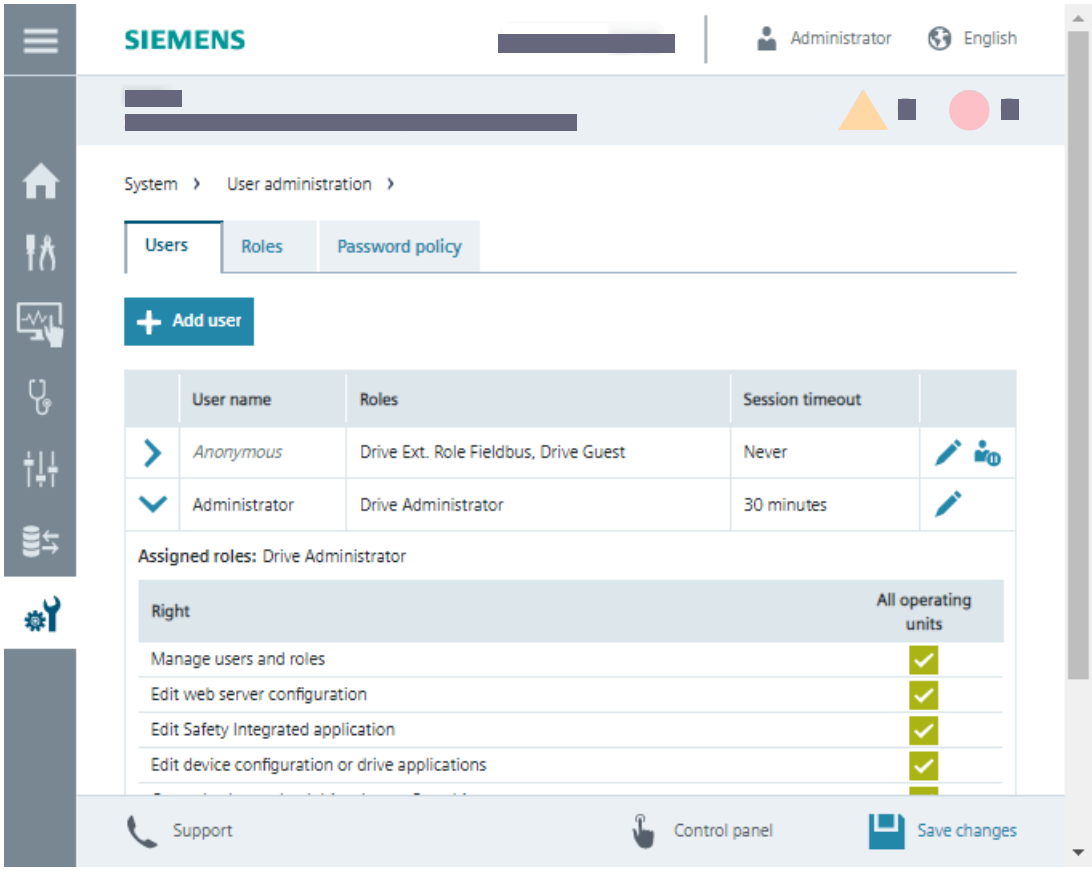


Figure 7-18 User management

Users

Under "Users", the web server provides a summary of the created users and offers the following functions:

- Create new user accounts
- Change existing user accounts
- Activate or deactivate user accounts

Roles are assigned to give users read or write access to certain functions.

Roles

Under "Roles", the web server provides a summary of the existing roles and the assigned rights.

Note

Extended role for access via fieldbus protocols

The "Drive Ext. Role Fieldbus" extended role is available for access via fieldbus protocols. If read and write access is required for fieldbus communication (cyclic communication excepted), the "Anonymous" user must be assigned the "Drive Ext. Role Fieldbus" role.

Password policy

Under "Password policy", you specify the requirements a password must meet. You define the password complexity and the time to password expiry (if any).

More information

More detailed information on user management and security settings is provided in Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578).

7.4.6.3 Protection & Security

Overview

In "Protection & Security", you configure basic security settings using the Security Wizard and the tables it contains.

Requirement

- You activated the security settings during first commissioning.
- You are logged into the web server and have the necessary rights to edit drive data.

Description of function

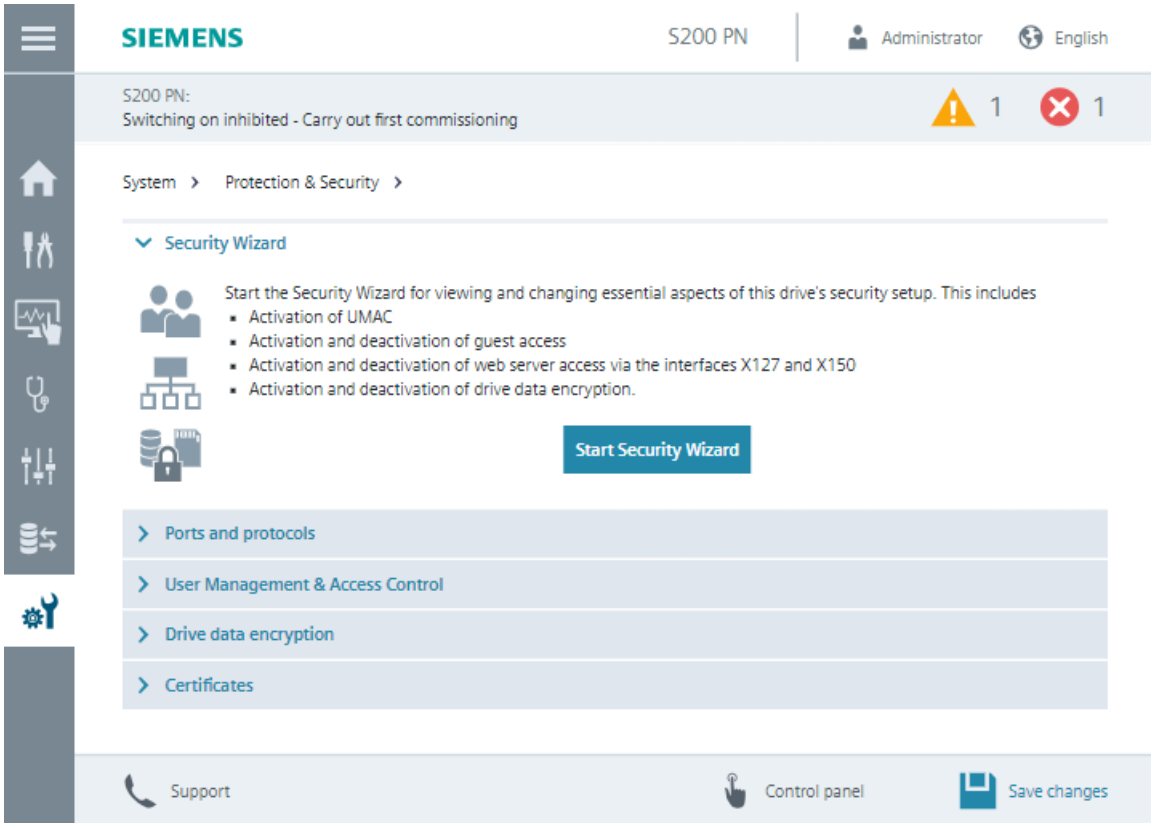


Figure 7-19 Protection & Security

Start Security Wizard

The Security Wizard guides you through the converter security settings, including User Management & Access Control, web server activation, and drive data encryption.

Ports and protocols

The web server provides an overview of the available ports and protocols and their status. This is where you activate or deactivate the communication interfaces.

User Management & Access Control

The web server provides an overview of the settings in user management.

Drive data encryption

The web server shows whether the converter encrypts sensitive drive data.

Certificates

The necessary certificate files are included in the firmware files of the converter. The web server provides an overview of the following certificates used:

- HTTPS certificate:
  Generated automatically when the web server is called for the first time.
  The HTTPS certificate is classified as not trusted when the web server is called for the first time. The browser establishes a non-secure HTTPS connection to the web server. The browser flags the non-secure connection with a security warning. The next time the web server is called, the HTTPS is classified as trusted if it is signed by the root certificate.
- Root certificate:
  Needed in order for the HTTPS certificate to be signed by a trusted root certification authority. If the root certificate has been imported into the certificate store of the operating unit, the HTTPS certificate will be signed when the web server is called. The browser then classifies the signed HTTPS certificate as valid and establishes a secure HTTPS connection to the web server.

Use "Download certificate to operating panel" to download a certificate to the operating unit. Please keep and install the downloaded certificates in the operating unit.

More information

More detailed information on configuring secure communication is provided in Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578).

7.4.6.4 Licenses

Overview

You must purchase licenses for supplementary functions and options.

Use the function view "Licenses" to manage the licenses for drive functions and options.

Requirement

- You are logged into the web server and have the necessary rights to edit drive data.
- The operating unit is connected online with the drive.

Description of function

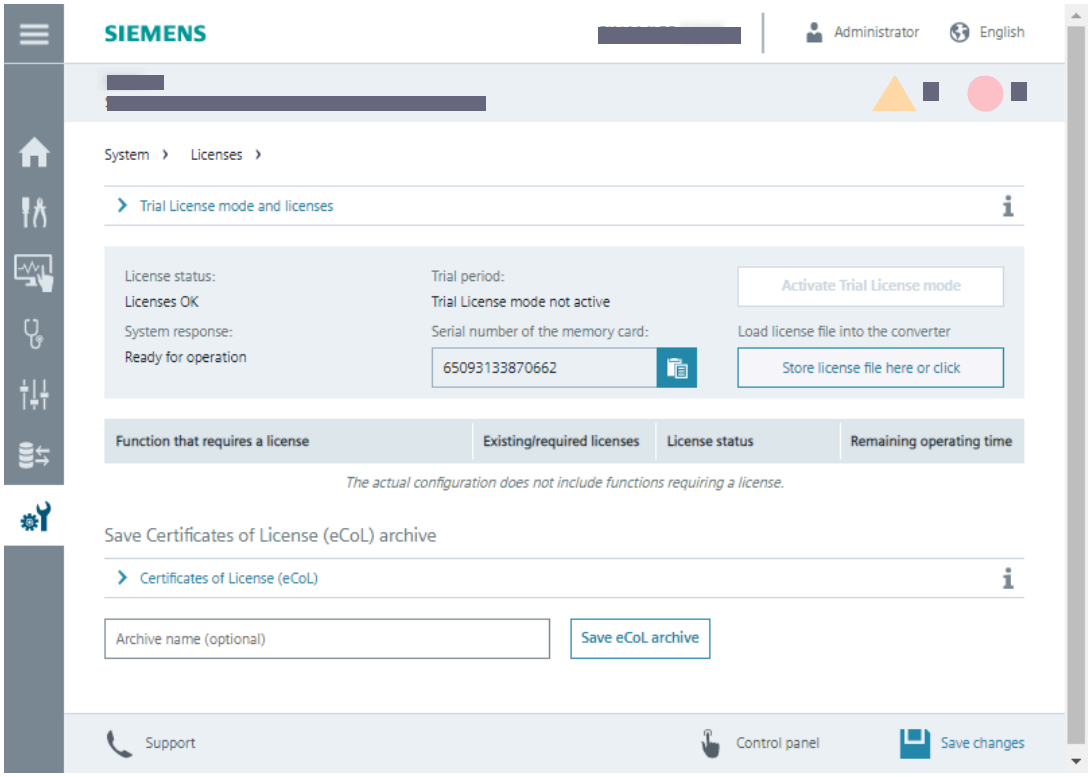


Figure 7-20 Licenses

The function view "Licenses" offers the following functions:

- Display the installed functions requiring licenses
- Read and copy the serial number of the Siemens memory card inserted into the converter
- Load and activate purchased licenses

Load and activate licenses

Under "Trial License mode and licenses", you upload license files created with the Web License Manager.

In Trial License mode, you can try out functions for a specified period.

Using functions/options requiring a license

The web server provides an overview of the options that require licensing and their license status.

Save Certificates of License (eCoL) archive

Under "Save Certificates of License (eCoL) archive", you transfer the eCoL from a memory card to the file system of the operating unit.

7.4.6.5 Firmware update

Overview

You can perform a firmware update in the web server:

- For an upgrade, the converter and web server settings are retained.
- For a downgrade, the converter and web server are reset to factory settings. All user-defined settings are reset to the factory settings, including:
  - Parameterization of the converter
  - Activation and settings of User Management & Access Control
  - "IP configuration" and "Device name" of the communication interface
  - Self-generated certificates
  - User-defined parameter lists in the web server

Requirement

You have saved the ZIP file with the firmware to a drive, which you can access using the operating panel.

Description of function

This function view "Firmware update" displays the current version of the firmware and of the web server.

To copy a different firmware version to the converter, load the ZIP file containing the firmware from the file system of the operating panel.

7.4.6.6 About web server

Overview

"About web server" contains information about the web server and links to additional information.

Description of function

Under "Versions" you can see the revision levels of the web server and the loaded firmware.

Under "Third-party software" there is a link to information about any third-party software used. The license conditions are loaded to the operating panel in the file "READ_OSS.ZIP". You can display the HTML file included in the ZIP file using your browser.

There are more links to information about:

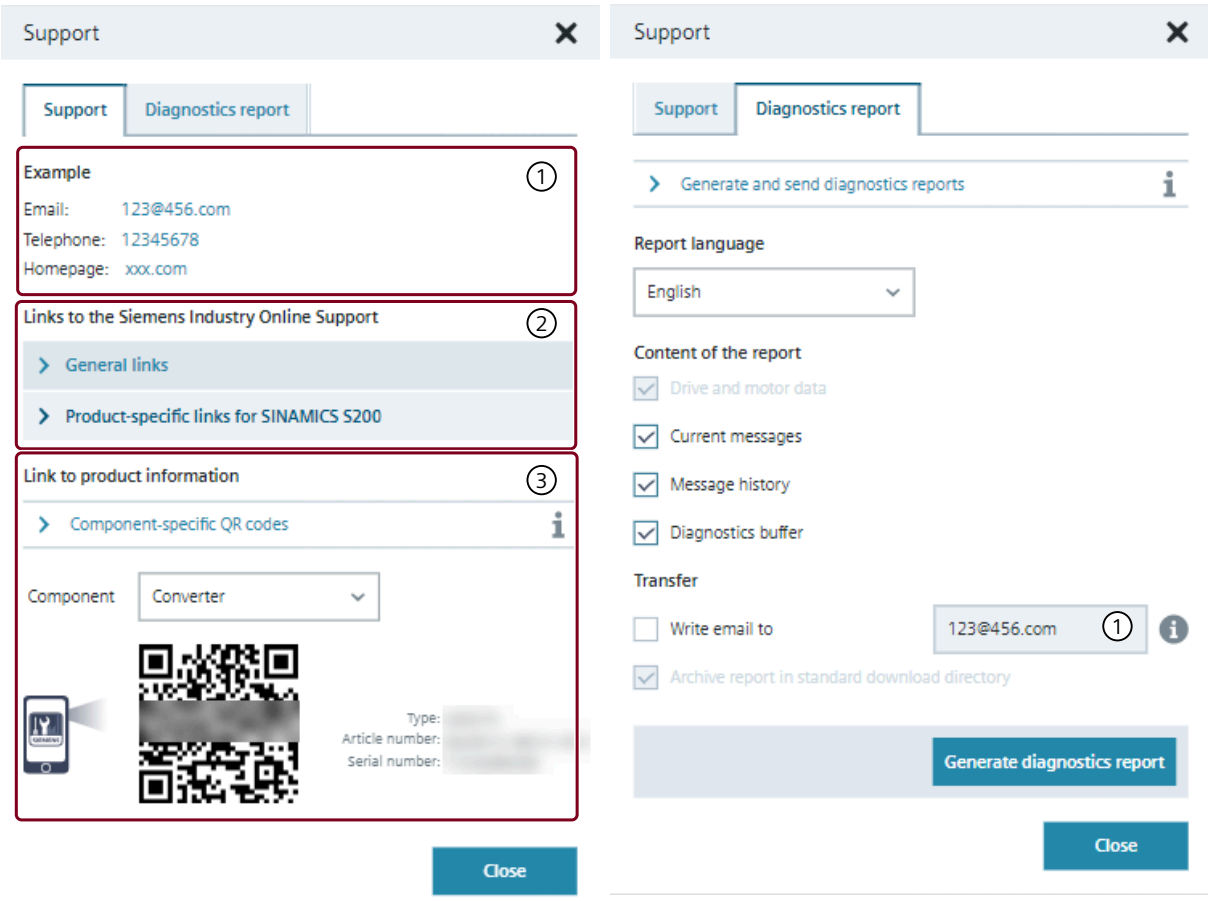
- Cookie policies
- Industrial Cybersecurity
- Privacy policy

7.4.7 Support

Overview

The action bar of the web server contains a support dialog.

Description of function



① Additional support and hotline data configured in "Settings (Page 181)"
② Links to product support websites
③ QR codes of online support pages for individual components

Figure 7-21 Support information

Support

Under "Support", you can access links to additional information for the converter.

Diagnostics report

By default, the storage location is the download folder of your operating unit.

The diagnostics report helps technical support by providing basic information on the current state of the converter, for example, in the event of a fault.

The diagnostics report always contains the drive, motor, and encoder data and optionally an overview with errors and messages that have occurred. The time stamps at the top of the report correspond to the local time at the operating panel with technical support and the local time at the converter.

The diagnostics report is provided for downloading and sending as a ZIP file in the Downloads folder of the operating unit used.

If you select the "Write email to" check box, an email with standard text is additionally generated. The email must be updated with the relevant letter text and the diagnostics report as an attachment and sent to the recipient. This function is only available on operating units that support an email application. An Internet connection is required to send emails.

The following figure shows a printout of a diagnostics report:

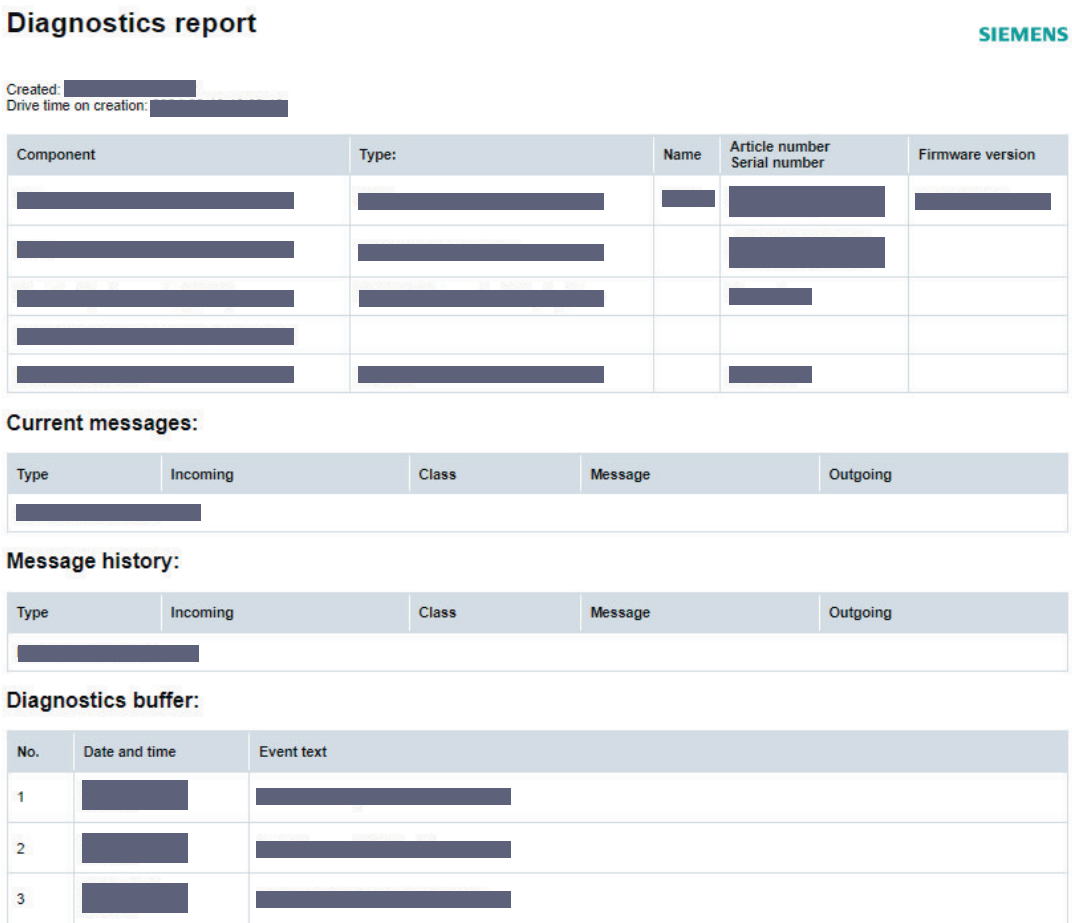


Figure 7-22 Diagnostics report printout

7.4.8 Control panel

Overview

The control panel moves the motor using the operating unit, bypassing the higher-level controller, for example to test the converter settings after commissioning.

Requirement

⚠ WARNING

Unexpected motor movement through incorrect operation

If the control panel is active, the safety shutdowns of the higher-level controller have no effect. The "Stop with space bar" function is not guaranteed in all operating states. Incorrect operation by untrained personnel may result in unexpected motor movement which can cause death or serious injuries.

- Only use the control panel for commissioning, diagnostics and service purposes.
- Only use the control panel if you are trained and authorized accordingly.
- Install an EMERGENCY STOP for the drive which is independent of the higher-level controller.

Description of function

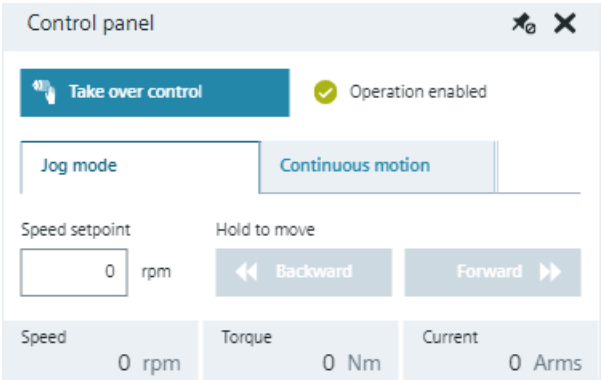


Figure 7-23 Control panel

The "Take over control" dialog deactivates the signals of the higher-level controller and switches the source for enables and the setpoint value to the control panel.

Note

Drive responds immediately

Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

The control panel offers the following operating modes to move the motor:

- Jog mode moves the motor while the direction buttons are pressed.
- Continuous motion starts the motor when a direction button is pressed.

Commissioning (Startdrive) 8

8.1 Introduction

Overview

You configure devices and commission your converter in the Startdrive commissioning tool.

Further information about the Startdrive commissioning tool can be found in the information system of the TIA Portal.

8.2 Basics

8.2.1 Communication interface

Overview

The following interfaces are available for accessing the converter:

Interface	Information
PROFINET interface X150	Defaults: • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0
	Requirements: • The converter and your operating unit must be located in the same subnet to ensure an effective online connection.

8.2.2 Protected communication

Description

If the Startdrive project and the converter are unprotected, access is possible via both interfaces. This enables unrestricted access from the project or a higher-level controller to the converter data.

Non-authorized users can manipulate the converter data. To avoid the risk of data manipulation, Siemens recommends that you protect access to the project and the converter.

Detailed information about security settings is provided in Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578).

8.2.3 User administration and security

Overview

Startdrive provides the possibility to use user management and access control (UMAC) for projects. This allows you to create and manage user accounts and roles in your project. The roles bundle different access rights for the project. Different users can be granted different access rights to functions. Once the project protection has been activated, the project can only be opened and edited by authorized users.

Requirement

- A project has been created or an existing project is open.

Description of function

You can define the following settings through the "Security settings" entry in the project tree.

- Project protection
  With the help of the user administration you can activate project protection for Startdrive projects.
  As soon as you specify a project administrator, your project will be protected. Users can then only access the project in Startdrive by logging in. The drive itself is also protected. In this case, you must always log in to access the drive online.
  Activated project protection cannot be canceled. Activated drive protection (runtime) can only be deactivated by completely restoring the factory settings (using a memory card).
- Users and roles
  You can create local and global user accounts in the user administration and specify the general roles and rights for these users.
  The following rules apply when you create user accounts:

Setting	Number
Maximum number of roles	In addition to the system-defined roles, you can create 20 user-defined roles.
Maximum number of user accounts	25 (excluding "Anonymous" user)
Maximum assignable roles to a user account	10
Role names (maximum number of characters)	32
User account name (maximum number of characters)	100
Maximum password length (maximum number of characters)	120

  Each user requires function rights to access protected drive data. These function rights are summarized in roles and define which data and functions the respective user can access. Each user can be assigned multiple system-defined roles. In addition, user-specific roles can also be created and assigned. This is done by a user who has the function right "Manage users and roles".
  In regard to function rights, a distinction must be made between two groups:
  - Engineering rights
    These always refer to a protected Startdrive project (UMAC for the project is enabled). However, these rights are also checked when accessing a protected drive.
  - Runtime rights
    These always refer to a protected device accessed in online mode (UMAC for the drive is enabled).
    SINAMICS Startdrive and web server use the same runtime rights.

More information

For more information about UMAC, see the information system of the TIA Portal.

8.2.4 Loading data from the drive into the project

Overview

If you change the configuration of a converter in the online mode, then the configuration deviates from the data in the Startdrive project. To update project data, load the drive data from the converter into the project.

Requirement

- A project with a matching drive is created and is open in Startdrive.
- The drive and SIMATIC S7 controller are in offline mode.
- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Procedure

Proceed as follows to load data from the drive into your project:

1. Open the "Upload from device (software)" shortcut menu or click the icon in the toolbar.
2. Establish an online connection to the required drive in the dialog box as follows:
   – Configure the connection interface.
   – Click "Start search" for target devices selection.
   – Select the desired target device.
   – Click the "Upload" button.

   Note
   Trustworthy device

   For secure communication between the operating unit and the drive, the drive must be classified as "trustworthy". A device is considered trustworthy and therefore secure if it is assigned a digital certificate accepted by Startdrive.

   For devices whose certificate cannot be verified as trustworthy by Startdrive, a message appears in the case of establishing online connection. Click "Connect" to confirm that you want to establish connection to the target device.

3. If there is a user authentication for the opened Startdrive project, the "Upload preview" dialog appears automatically. Skip this step and proceed to Step 4.
   If there is no user authentication yet, the "Log on to device" dialog appears. Proceed as follows to call the "Upload preview" dialog:
   – Enter the required user information.
   – Confirm with "OK".

4. Check the messages in the "Upload preview" dialog. If necessary, activate the actions in the "Action" column.
   As soon as uploading becomes possible, the "Upload from device" button is enabled.
5. Click the "Upload from device" button.

Result

The project data have been loaded from the drive into your Startdrive project of your operating unit.

8.2.5 Loading project data into the drive

Overview

Load the data from your Startdrive project into a drive.

Requirement

- A project has been created.
- A drive has been created and completely configured in the project.
- Optional: There is an active online connection between the converter and operating unit.
- With protection activated (UMAC):
  The function rights for editing and loading drive data are activated for the user account.

Procedure

Proceed as follows to load the project data into your converter:

1. Select a drive in the project tree.
2. Click the icon in the toolbar.
   – If you have already established an online connection, the "Load preview" dialog opens. This dialog displays alarms and proposes actions necessary for loading.
   – If you have not established an online connection, the "Extended download to device" dialog opens.
     Establish an online connection to the required drive.

3. Check the messages in the "Load preview" dialog. If necessary, activate the required actions in the "Action" column.

   Note

   Downloading protection settings to the device

   The current security settings of the user management (UMAC) can also be automatically downloaded to the device together with the project data.

   To transfer the UMAC data to the drive, ensure that option "Refresh UMAC" is activated in the "Load preview" dialog.

   As soon as downloading becomes possible, the "Load" button is enabled.

4. Click "Load".
   Loading starts. If there is a need for synchronization, the system automatically displays the "Synchronization" dialog. This dialog displays messages and suggests actions that are needed for the synchronization.
   - If you want to force the download without synchronization, click "Force download to device".
   - If you have performed the suggested actions, confirm that you want to continue with the download.
     The "Load results" dialog then opens. In this dialog, you check whether the load task was successful, and you can select additional actions.
5. Click "Finish".

Result

The selected project data have been downloaded to the drives.

Note

Loading process with protection activated

If protection settings were made for the selected drive in the project, these protection settings must be complete. Otherwise, loading into the device is canceled. The UMAC settings in the Security Wizard must be completed via the "Finish" command.

8.2.6 Saving changes in the project

Overview

Project data that are not saved are lost when closing the project. The entire project must be saved in order for the settings to take effect permanently.

Requirement

- With project protection activated:
  The following function rights for editing drive data are activated for your user account:
  - "Open and edit the project"
  - "Edit hardware configuration"
  - "Edit drive applications"
  - "Manage users and roles"

Procedure

Proceed in either of the following ways to save changes in the project:

- In the toolbar, click the icon.
- Select the "Project > Save" or "Project > Save as" menu.

8.2.7 Retentively saving changes to the memory card

Overview

Parameter assignments of your converter are always volatile and are lost when the converter is switched off. Information is subsequently provided as to how you can retentively save online data or offline data.

Requirement

- A project has been created.
- A drive has been created and completely configured in the project.
- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Procedure

Retentively saving online data

Proceed in either of the following ways to save online data retentively:

- In the function view of the active Startdrive project, click the icon.
- In the project tree of your drive device, double-click "Online & Diagnostics".
  - In the secondary navigation select the "Backup/Restore" menu.
  - In the "Retentively save RAM data" area, click "Save".

The system checks whether a memory card is available. If an appropriate memory card is detected, then the parameter values are retentively saved to the memory card.

Retentively saving offline data

When retentively saving data, it is important that the settings made are not only saved on your operating unit in the Startdrive project, but also permanently saved on the memory card. An online connection must be established to the drive for this purpose.

Proceed as follows to save offline data retentively:

1. Establish an online connection to your drive.
2. Load the project data into your drive.
3. Click the icon in the function view of the active Startdrive project.
   The current project settings are stored retentively on the memory card of the drive.

8.2.8 Using parameter lists and user-defined lists

Overview

Compared with the specific configuration views in Startdrive, experienced users preferably take the parameter lists or user-defined lists for drive configuration.

Requirement

- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Description of function

Parameter list

The parameter list provides the following functions:

- Monitoring parameter values
- Editing parameter values directly from the parameter view
  Only parameters with a light grey background can be directly edited in the parameter list. Other parameters are locked in the parameter list and cannot be edited in the current operating mode.
- Exporting parameters as CSV
- Comparing parameter settings:
  - Offline - Factory setting
  - Online - Offline
  - Online - Factory setting

User-defined list

The user-defined list is used to compile a list of specifically selected parameters. This involves an excerpt from a complete parameter list with specific parameters. The user-defined list can only be created and edited in the project tree.

You use user-defined lists for the following purposes:

- Compiling the most important parameters
- Assigning parameters to parameter groups with comments for users
- Carrying out series commissioning based on saved parameter values
- Documentation of the drive with listed parameters and setting values

The user-defined parameter lists can be exported in json format, and can also be read in the web server.

Example

In the following application, you create a user-defined list with the objective of accepting parameter values for an additional drive.

1. You create a user-defined list with parameter values for a configured drive.
2. You open the list in another drive with the same hardware configuration.
3. You compare the parameter values of the drive with the saved values.
4. You apply the required parameter values for the drive.

More information

For more information about parameter lists and use-defined lists, see the related TIA Portal information system.

8.3 Procedures for device configuration and commissioning

8.3.1 Requirements

Description

Note

Only in the offline mode

The drive components can only be combined and specified in the offline mode. In the online mode, all corresponding setting ranges are disabled in the device view and in the inspector window.

Note

User management and security

SINAMICS drives of the latest generation generally have extended protection. This usually has the effect that, as a user, you have to log in to view or edit the drive data offline as well as online.

The most important protective measures in brief:

- Project protection can be activated for Startdrive projects in the TIA Portal (offline). If project protection is activated, corresponding rights are required for access. Once project protection has been activated, it cannot be deactivated.
- A "Security Wizard" usually appears when creating new drives in the project. With the help of this wizard, you can already make the most important security settings for this drive within the project when creating the drive. After loading the project data into the drive, the protection settings become effective there.
- To access a protected drive online, you ALWAYS need the corresponding access rights. This also applies if no project protection is activated for the Startdrive project.

Detailed information on this topic is provided in the Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Note

Editing mode required for online commissioning

If you want to make important settings online, activation of the editing mode is mandatory. Restore points that are required as a return point following a cancellation of the current online parameterization are automatically created by the editing mode in the "guided quick startup" (and in the "Parameterization" area) during configuration.

A separate editing mode is not required in the "Rotating & optimizing" area.

Note

Telegram configuration offline

In the guided quick startup, telegram settings can be made offline only.

8.3.2 Simple basic parameterization (offline)

Overview

The following workflow represents the simplest form of commissioning.

Requirement

None

Procedure

Proceed as follows to perform basic parameterization in offline mode:

1. Create or open a project with Startdrive.
2. Create device configuration in Startdrive offline.
   - Insert and specify the SINAMICS drive in the project.
   - Optional: Configure user management and make protection settings for the drive.
   - Create and specify SINAMICS components.
   - Make detailed settings for the drive and components.
3. Make basic settings offline via the guided quick startup.
4. Load project data to the target device.
5. Establish an online connection between Startdrive and the target device.
6. Optimize commissioning.

Result

The motor rotates.

8.3.3 Simple basic parameterization (online)

Overview

The basic parameterization can be carried out in online mode as an alternative to offline mode.

Requirement

None

Procedure

Proceed as follows to perform basic parameterization in online mode:

1. Create or open a project with Startdrive.
2. Create device configuration in Startdrive offline.
   - Insert the specify the SINAMICS drive in the project.
   - Optional: Configure user management and make protection settings for the drive.
   - Create and specify SINAMICS components.
   - Make detailed settings for the drive and components.
3. Load project data to the target device.
4. Establish an online connection between Startdrive and the target device.
5. Make basic parameterization settings online via the guided quick startup in the editing mode.
   - Make basic settings in the quick startup steps.
   - Optimize commissioning.

Result

The motor rotates.

8.3.4 Basic parameterization together with a SIMATIC controller

Overview

SINAMICS drives are frequently operated with SIMATIC controls. To speed up commissioning the individual components, the drive and control can be commissioned together in a Startdrive project.

Requirement

None

Procedure

Proceed as follows to perform the basic parameterization for the drive together with a SIMATIC controller:

1. Create or open a project with Startdrive.
2. Create device configuration in Startdrive offline.
   - Insert and specify the SINAMICS drive in the project.
   - Optional: Configure user management and protection settings for the drive and control system.
   - Insert and specify the SIMATIC controller in the project.
   - Network the SIMATIC controller and the SINAMICS drive.
   - Insert a technology object into the SIMATIC controller.
   - Interconnect the technology object with the drive.
3. Load project data to the target devices.
4. Establish an online connection between Startdrive and the target device.
5. Make basic settings online via the guided quick startup in the editing mode.
   - Make basic settings in the quick startup steps.
   - Optimize commissioning.

Result

The motor rotates.

8.4 Combining and configuring devices in the project

8.4.1 Converter

8.4.1.1 Inserting a converter into the project

Overview

You either add a new converter to the project view or to the portal view. For the latest generation of SINAMICS converters, you can define the security settings for access to the drive data at the time of setup.

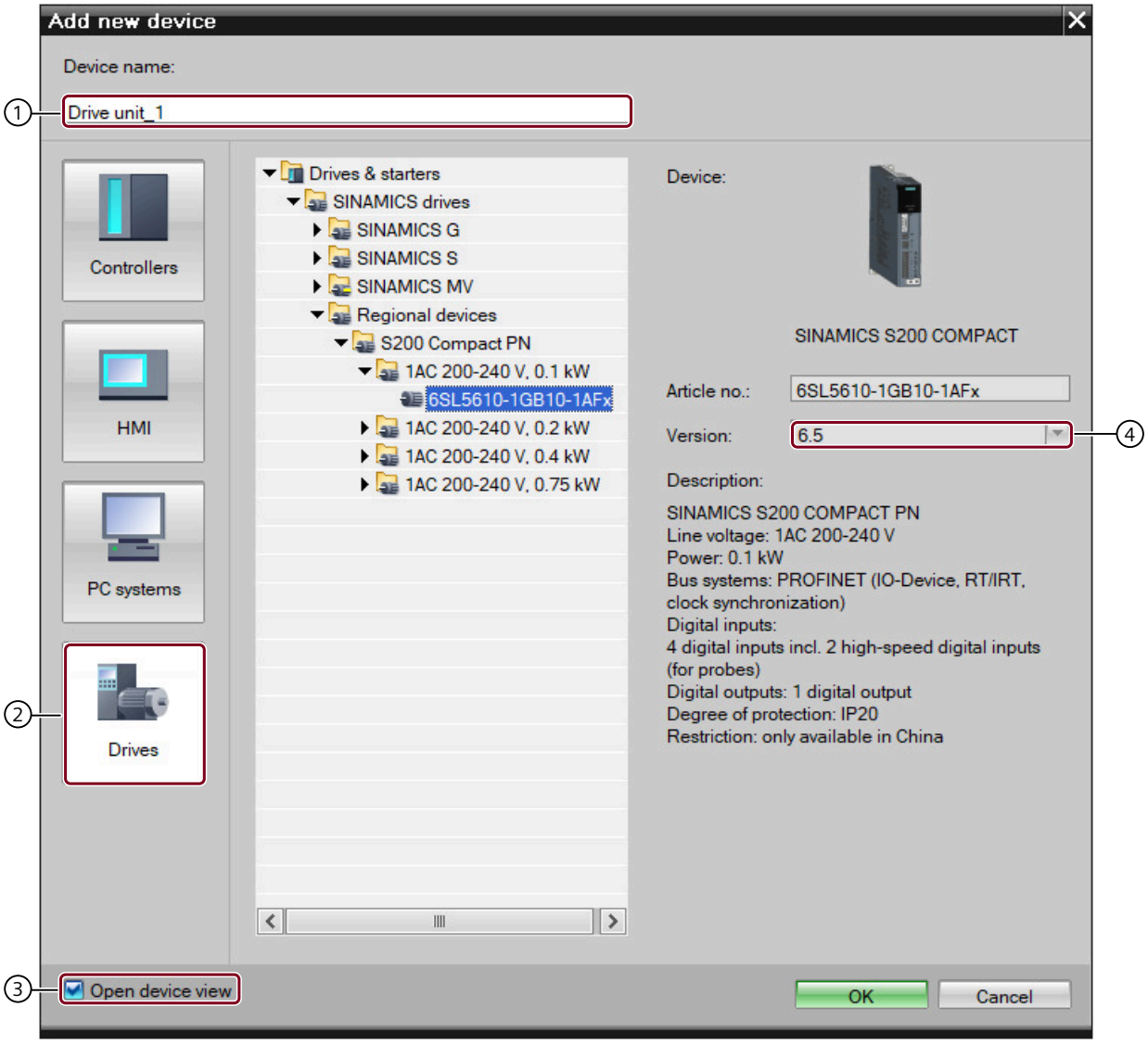
Requirement

- A new project has been created or an existing project is open.
- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Procedure

Proceed as follows to insert a converter into the project:

1. Double-click "Add new device" in the project tree.
   The corresponding dialog box opens.



① "Device name" input field ("Drive unit_xx" by default)
② "Drives" button
③ Enable/disable the "Open device view" option
④ Firmware version drop-down list

Figure 8-1 Inserting a converter into the project

2. Click "②" to display the available SINAMICS converters.
3. Expand the "SINAMICS S200 Compact" entry in the displayed list.
   A list of all available SINAMICS S200 Compact converters is displayed.
4. Expand the entry (e.g. 1AC 200-240 V, 0.1 kW) for the relevant converter.
   One matching device is displayed for each performance class of an S200 type.

5. Select the desired converter.
   When a converter is created, the latest firmware version is always suggested in "④".
6. Select the firmware version that is installed on your drive.
   If the firmware version on the converter memory card deviates from the displayed firmware version, then change the firmware version via "④". You can also install the corresponding firmware version on your converter.
   if the firmware versions (offline project in Startdrive compared with converter) do not match, the converter will not be possible to go online later.
7. Assign a different device name in "①" if required.
8. Click "OK".
   If "③" is enabled, the converter is automatically created in the project and displayed in the device view.
9. Enter a name and click "OK".
   If you leave the "Device view" option activated, the device view opens automatically.

Note

Security Wizard

In the factory setting of Startdrive, Security Wizard opens after a drive is created. In this case the "Security settings, Drive unit_X" dialog appears. You can use the wizard to specify the security settings for the drive when it is first created.

- Make the required security settings here for the new drive to be created.

You can deactivate automatic opening of the Security Wizard in the central properties of Startdrive.

Result

The inserted converter is displayed in the device view and can be configured.

8.4.1.2 Optional: Replacing a converter

Overview

In the device configuration and the project tree of a converter, you can replace the current device by a device:

- with different power
- with identical power, but newer firmware

When replacing the converter, previous configurations of the motor are kept.

Requirement

- A project has been created.
- A converter has been inserted in the device configuration.
- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Procedure

Replacing a device via the project tree

Proceed as follows to replace the current device via the project tree:

1. In the project tree, select the converter to be replaced. Open shortcut menu "Change device". The corresponding dialog box opens.

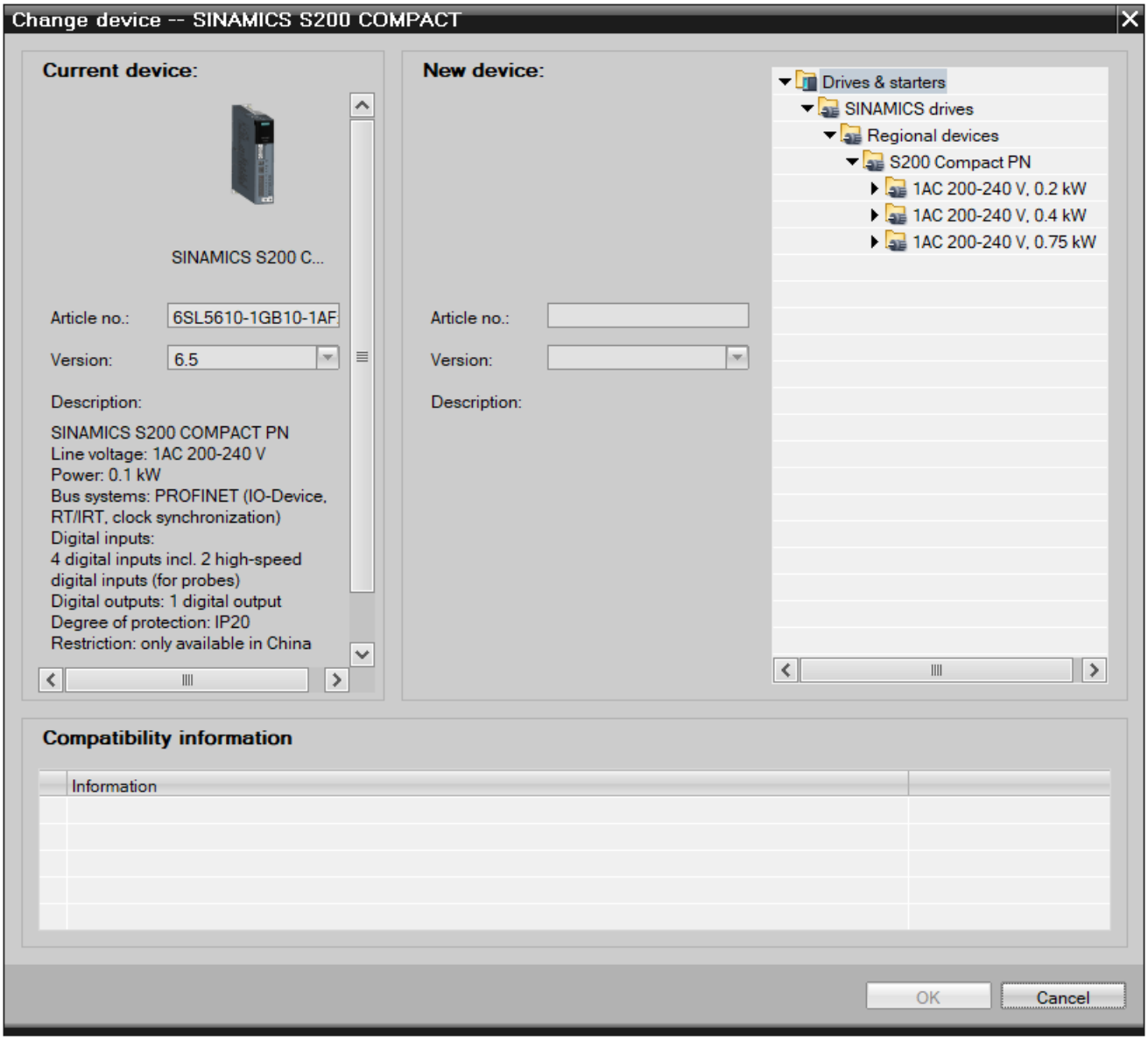


Figure 8-2 Changing the device via the project tree

The data of the current converter are displayed on the top left. At the top right, the replacement devices that are applicable are displayed in a hardware catalog.

2. Select the replacement device required in the hardware catalog of the dialog box.

Only the most important data of the new converter are displayed at the center of the dialog box in the "New device" field. You can compare this data with the data of the current converter (left-hand side).
If both converters are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field. This means that you may have to assign another motor if you still go ahead and accept the required replacement device.

3. Click "OK" to accept the new converter.

Replacing a device using the hardware catalog

Proceed as follows to replace the current device using the hardware catalog:

1. Select the new converter in the "Hardware catalog" task card. Drag the drive to the placeholder for the current drive in the "Device view" tab.
   The corresponding dialog box opens.

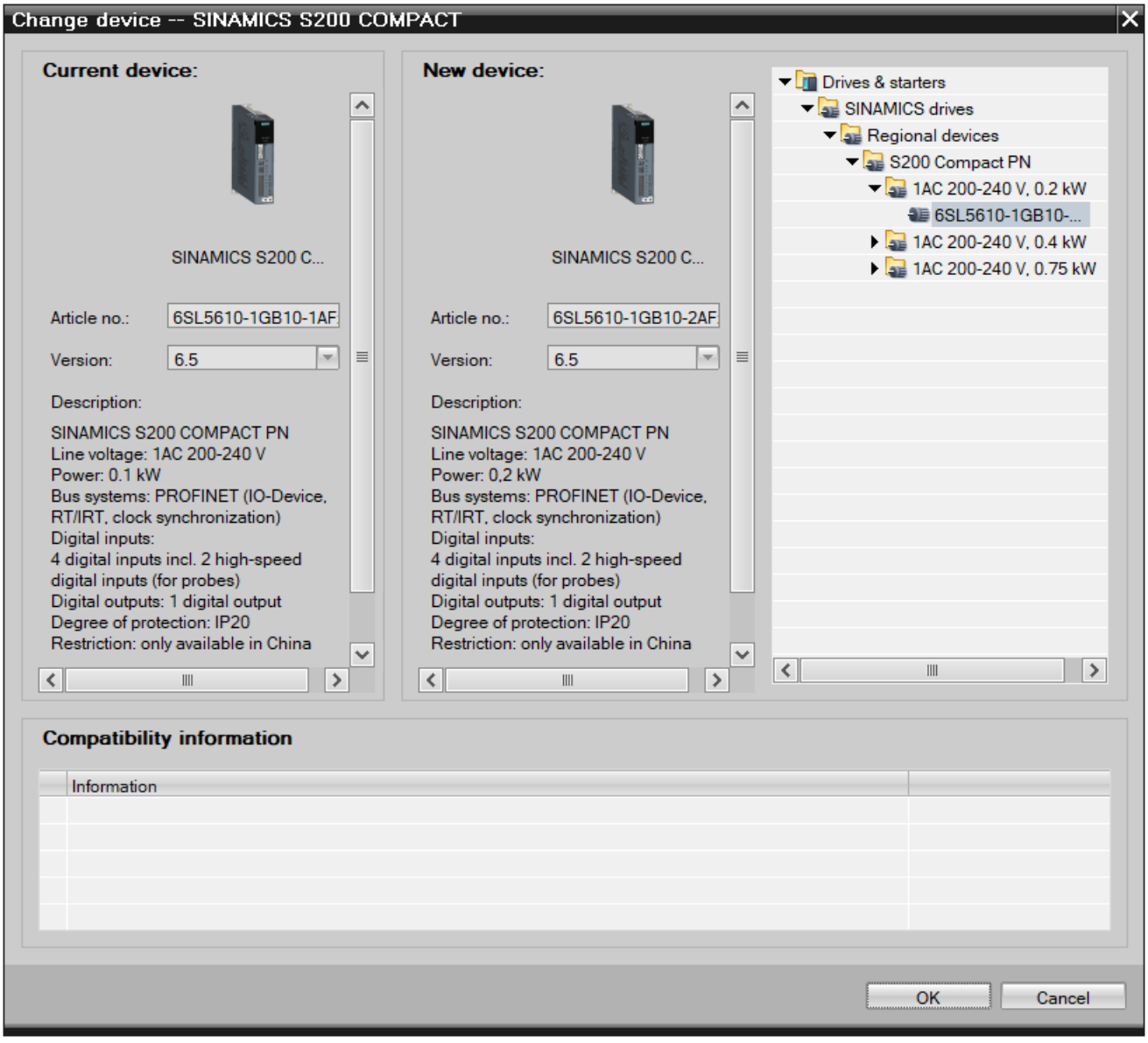


Figure 8-3 Changing the device using the hardware catalog

In the dialog box, the most important data of the existing converter and the new converter are compared.
If both converters are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field. This means that you may have to assign another motor if you still go ahead and accept the required replacement device.

2. Click "OK" to accept the new drive.

Result

The current device is replaced by the required replacement device.

If the two devices are not completely compatible with one another, then in the "Device view" tab, the placeholder for the motor is displayed unspecified. You must reassign an appropriate motor power.

8.4.1.3 Making detailed converter settings

Overview

You can configure the following details for the converter:

Table 8-1 Detailed converter settings in the inspector window

Group	Settings
General	• Product information Name data • Catalog information Brief description, description of the components included, firmware version used • Identification & Maintenance Information and data to identify and localize a drive within a plant or system.
PROFINET interface [X150]	• General • Ethernet addresses Subnet, IP address, subnet mask, PROFINET names • Telegram configuration – Telegrams of the closed-loop drive control: Send, receive Details are contained in Chapter "Configuring telegrams (Page 258)" • Advanced options – Interface options – Media redundancy – Isochronous mode (clock cycle synchronization for local modules) – Real time settings – Port [X150 P1] and port [X150 P2]
Module parameters	• Activation of channel diagnostics
Protection & Security	• Wizard for security settings • User Management & Access Control (UMAC) • Ports and protocols • Encryption of drive data • Syslog server • Certificate management **Note**: Information about these protection settings is provided in the Configuration Manual SINAMICS Industrial Cybersecurity or in the information system of the TIA Portal.

Group	Settings
Time synchronization/Time	• Option "Synchronize with NTP server" If the drive is connected to a controller in the device configuration, the option "Use PLC as NTP server" is activated automatically. If the drive is connected to a PLC, the IP address of the PLC is displayed. The following settings can be made: – IP address (only if option "Use PLC as NTP server" is deactivated) – Time zone of the NTP server (always) • Option "No synchronization" In this case, NTP synchronization is not managed in the project. You can configure this synchronization separately for the drive in online mode with the Online & Diagnostics function "Set time".
Hardware settings	• Supply voltage • Braking resistor
Web server	• Enabling access to the PROFINET interface [X150] via HTTPS.

Requirement

- A new project has been created or an existing project is open.
- A drive has been created in the project.
- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Procedure

1. Select the converter in the device view and open the inspector window.
2. In the secondary navigation of the inspector window, select the desired detail menu (see the table above).
3. Make the required detail settings in the white fields. The detailed settings are preassigned with the factory setting.
   The gray fields are corrected automatically in accordance with their setting and cannot be edited directly.

Result

You have made the detailed settings for the converter in your device configuration.

8.4.1.4 Specifying a motor

Overview

The drive that has just been inserted in the project has a placeholder for the required motor (standard motor type: "1FL1"). You must specify this placeholder in the configuration.

Requirement

- A project has been created.
- An S200 drive is inserted in the device configuration.
- With protection activated (UMAC):
  The function rights for editing drive data and configuring in the inspector window are activated for your user account.

Procedure

1. Double-click on the white motor placeholder (MOT) in the drive. The inspector window is displayed.
2. Select the "Motor - selection - 1FL1" entry in the secondary navigation in the inspector window.
3. In the list, select the motor power rating and an associated encoder based on the article number.
   If the motor is equipped with a motor holding brake, then you can configure this later as part of the basic parameterization.

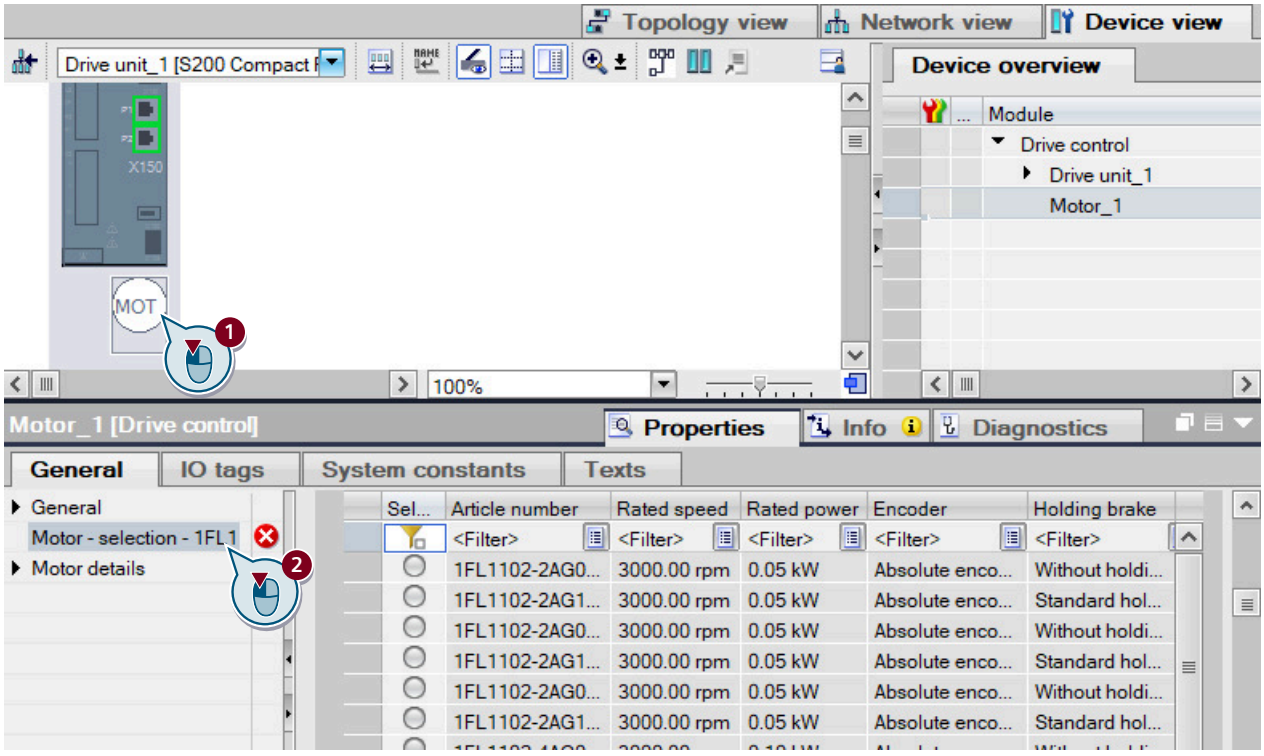


Figure 8-4 Selecting a motor in the inspector window

Result

The motor placeholder is assigned the data of the selected motor. The white area turns gray.

The motor has been added. The assigned encoder and the encoder evaluation are automatically also added and specified.

You can then carry out the basic parameterization (Page 250), or alternatively, you can carry out the guided quick startup (Page 227).

8.4.1.5 Replacing a motor

Overview

For the S200 Compact drive, the motor placeholder can be changed between 1FL1 and 1FL2 synchronous motors.

Requirement

- A project has been created.
- An S200 Compact converter is inserted in the device configuration.
- The converter is offline.
- For activated user management (UMAC):
  The function rights for editing converter data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security in Chapter "Security settings in Startdrive".

Procedure

Proceed as follows to replace a motor in the project:

1. Select the required motor type (1FL1 or 1FL2) in using either of the following ways:
   - Select the required motor type in the hardware catalog. Drag the selected motor type onto the motor placeholder in the device view.
     Dialog "Change device - 1FLx synchronous motor" opens.
     -OR-
   - Select the motor placeholder of the drive in the device view. Open shortcut menu "Change device". In the motor list of dialog "Change device - 1FLx synchronous motor", select the motor placeholder of the required motor type (1FL1 or 1FL2).

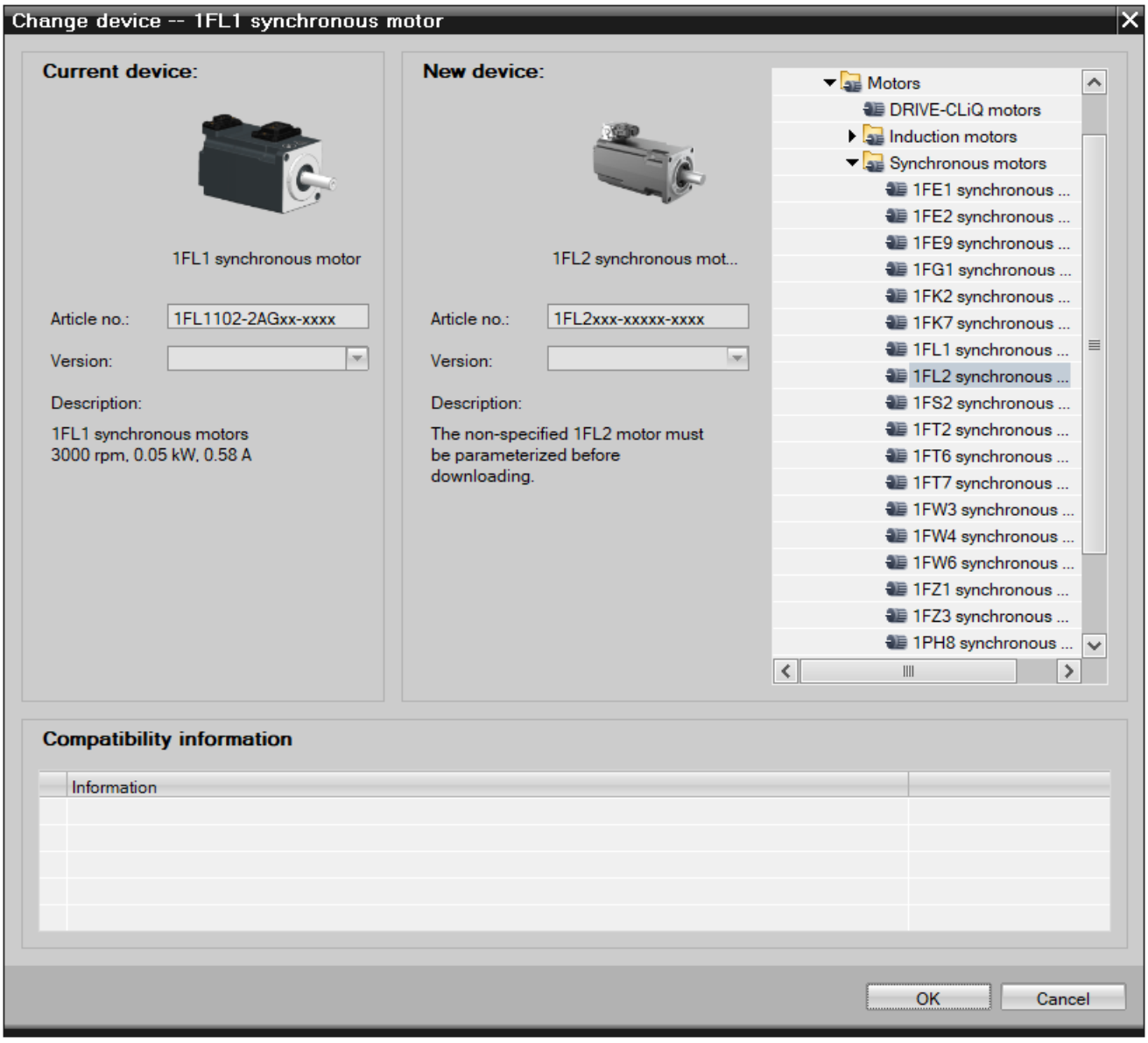


Figure 8-5 Replace the current motor in the project

If the selected motor type is not compatible with the drive, then the corresponding information is displayed in the "Compatibility information" field.

2. To confirm the new motor type, click "OK".
3. Click on the unspecified motor in the device view.
4. Select the "Motor - Selection" entry in the secondary navigation in the Inspector window.
5. In the list, select your motor based on the article number.
   The motor placeholder is assigned the data of the selected motor. The white area turns gray. The encoder and the encoder evaluation are also added automatically.

Result

The motor has been replaced.

8.4.2 Control and technology object

8.4.2.1 Inserting a SIMATIC S7 controller into the project

Overview

If, in addition to the SINAMICS drive, you also wish to use a SIMATIC S7 controller in the device configuration, then create an appropriate PLC in your project.

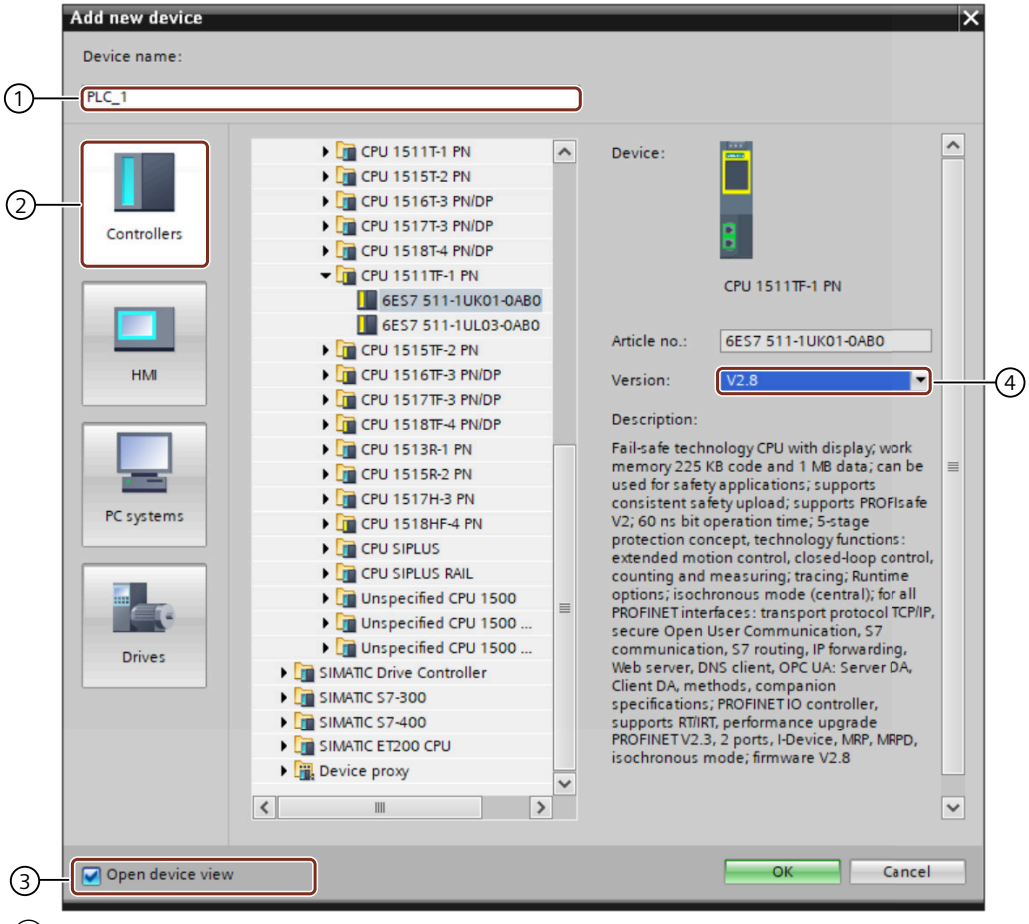
Requirement

- A new project has been created or an existing project is open.
- With protection activated (UMAC):
  The function rights for editing drive and control system data are activated for your user account.

Procedure

Proceed as follows to insert a SIMATIC S7 controller into the project:

1. Double-click "Add new device" in the project tree.
   The corresponding dialog opens.



① "Device name" input field ("PLC_xx" by default)
② "Controller" button
③ Enable/disable the "Open device view" option
④ Firmware version drop-down list

2. Click "②" to show the available controllers.
3. Expand the desired controller type (e.g. SIMATIC S7-1500) and select the desired CPU (e.g. CPU 1511TF-1 PN) in the list.
   When the CPU is expanded, the component is displayed with its article number.
   The current firmware version is always suggested in "④" when you create a SIMATIC S7 controller.
4. If the firmware version on the memory card of your SIMATIC S7 controller deviates from the displayed firmware version, then change the firmware version via "④".

5. Assign a different device name in "①" if required.
6. Click "OK".
   If "③" is activated, the SIMATIC S7 controller is automatically created in the project and then displayed in the device view.

Result

The inserted SIMATIC S7 controller is displayed in the device view and can be configured.

8.4.2.2 Networking a controller and a converter

Overview

After inserting a SIMATIC S7 controller and a drive into the project, network the components in the network and topology view.

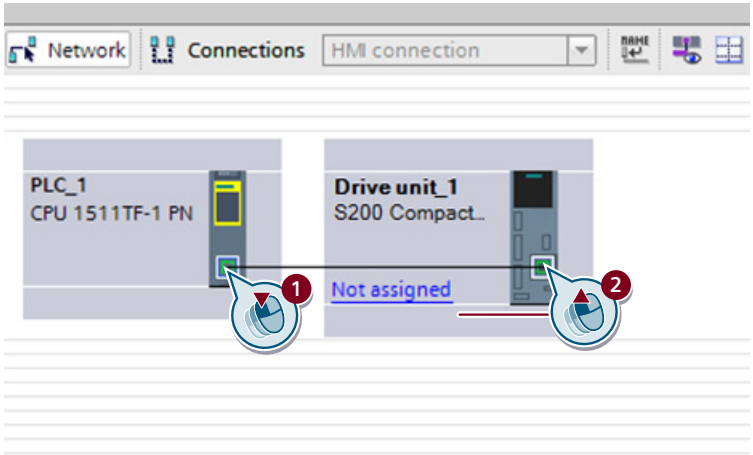
Requirement

- A project is open.
- The project includes at least one drive and one control system.
- With protection activated (UMAC):
  The function rights for editing drive and control system data are activated for your user account.

Procedure

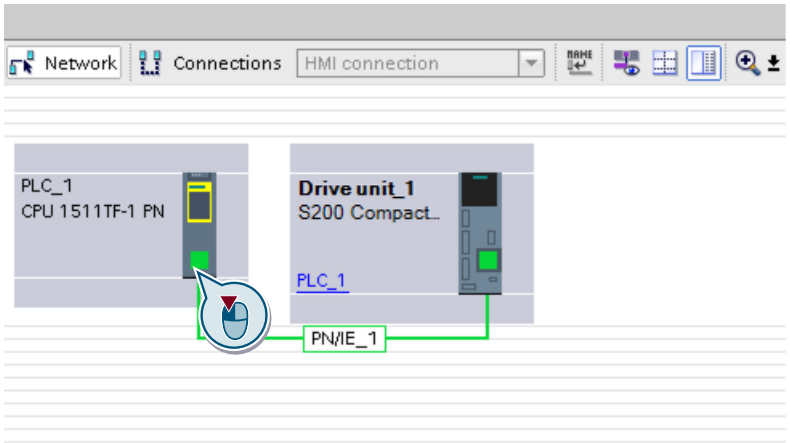
Proceed as follows to establish the connection between the controller and the drive.

1. Double-click "Devices & networks" in the project tree to open the network view.
2. Draw a connection between the PROFINET interface of the controller and the PROFINET interface X150 of the converter by pressing and holding the mouse button.

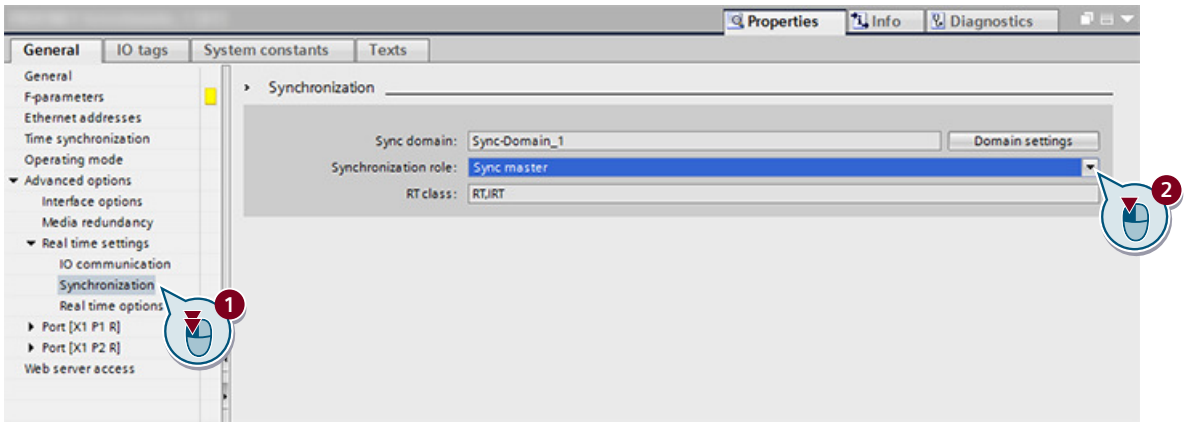


The PROFINET connection is established, and the drive is assigned to the controller.

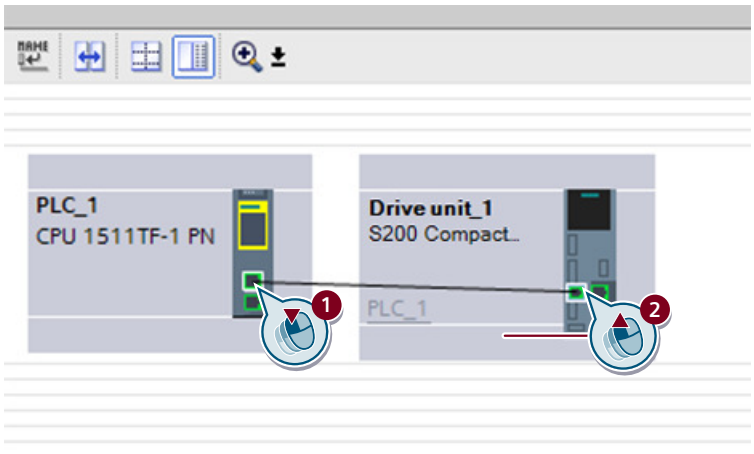
3. Click the PROFINET interface_1 [X1] of the controller.



4. Under the "General" tab, double-click on "Advanced options > Real time settings > Synchronization" menu.
5. Select the "Sync master" setting from the "Synchronization role" drop-down list.



6. Switch to the topology view.
7. Draw a connection between Port_1 [X1.P1] of the controller and Port_1 [X150.P1] of the converter.



Result

The SIMATIC S7 controller and the drive are networked with one another in the network and topology view.

8.4.2.3 Inserting a technology object into the SIMATIC S7 controller

Overview

Through the technology object, Motion Control functions such as positioning and synchronous axes are available to you. For this reason, insert a new technology object (TO) in the SIMATIC S7 controller. In the "Configuration" function view, you can directly assign the inserted SINAMICS drive and go to the drive configuration.

Positioning is the most frequent application for SINAMICS drives. To be able to perform positioning tasks in the SIMATIC S7 controller, you need to insert the Motion Control function "TO_PositioningAxis". Inserting a TO is described below based on the example of the Motion Control function "TO_PositioningAxis".

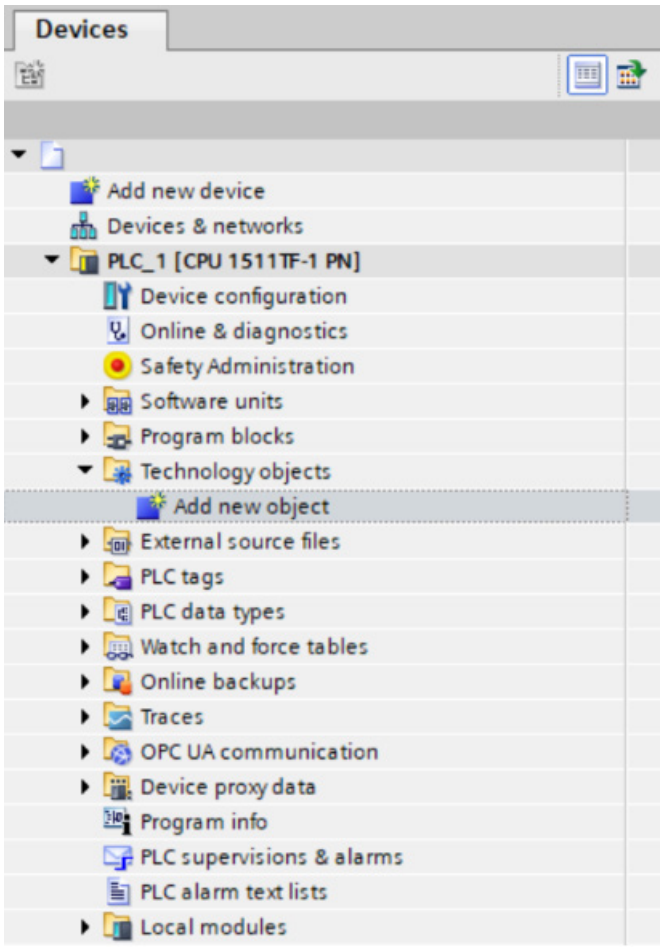
Requirement

- A SINAMICS drive is created and specified.
- A controller (e.g. SIMATIC S7-1500) is created and networked with the drive.
- With protection activated (UMAC):
  The function rights for editing drive and control system data are activated for your user account.

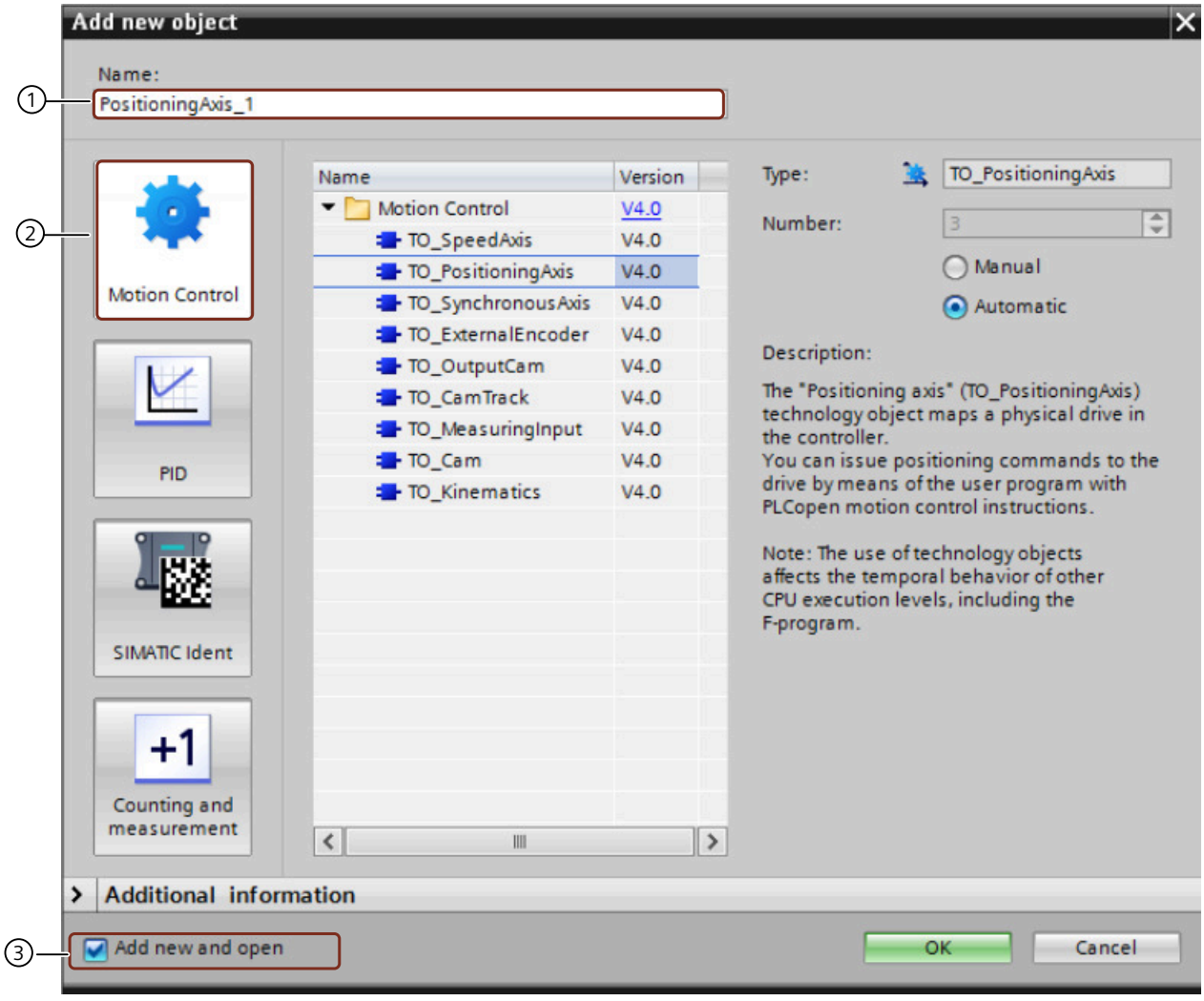
Procedure

Proceed as follows to insert a technology object into the controller:

1. In the project tree, expand the "Technology objects" entry under the menu for the SIMATIC S7 controller.



2. Double-click the "Add new object" entry.
   The corresponding dialog opens.



① "Object name" input field
② "Motion Control" button
③ Enable/disable "Add new and open" option

3. Click "②" to present the available technology objects.
4. Select the object "TO_PositioningAxis".
5. If required, assign a different name for the object in "①".
6. Click "OK".

Result

The "TO_PositioningAxis" technology object has been inserted and can be configured.

8.4.2.4 Interconnecting the technology object and a drive

Overview

The inserted technology object "TO_PositioningAxis" must be interconnected with the converter.

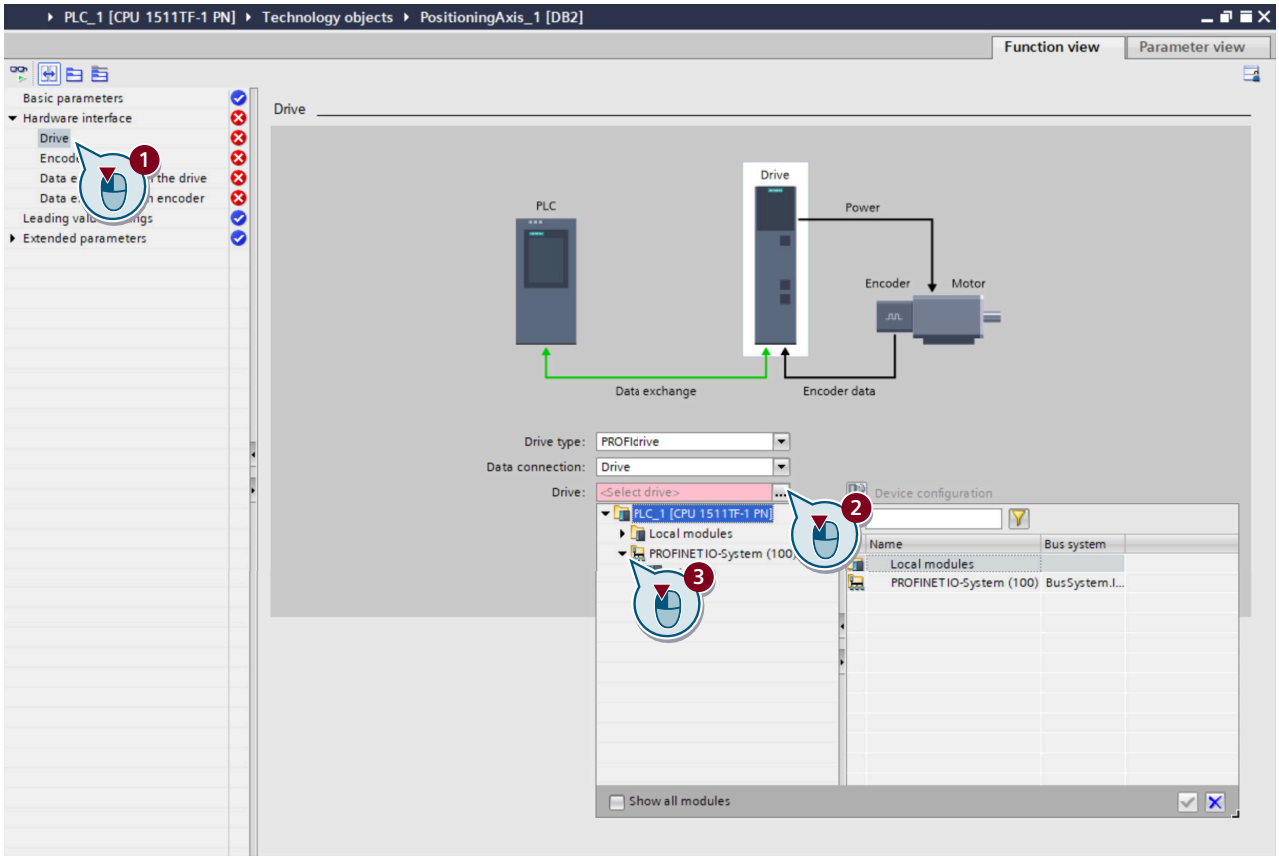
Requirement

- A SINAMICS drive is created and specified.
- A controller (e.g. SIMATIC S7-1500) is created and networked with the drive.
- With protection activated (UMAC):
  The function rights for editing drive and control system data are activated for your user account.

Procedure

Proceed as follows to manually interconnect the drive with the inserted TO:

1. In the project tree, double-click the "Configuration" entry under the created technology object.
2. Select the "Hardware interface" menu in the secondary navigation.
   The corresponding function view opens.



3. Open the selection list in the "Drive" selection box.
4. Expand the "PROFINET IO system (100)" entry.
5. Click on the displayed converter (in this case: "Drive unit_1").
6. Click on the checkmark icon to confirm the selection.
   The "Device configuration" setting option is enabled. In addition, the "Drive configuration" setting option is displayed and enabled.
7. Click to get to the basic parameter assignment of the converter.

8.5 Carrying out guided quick startup

8.5.1 Overview

Overview

Using the "guided quick startup", you perform the basic settings for the drive in Startdrive that are used to avoid the following detailed settings as far as possible. All drive settings are pre-assigned according to the required application use via these basic settings.

Requirement

- The drive has been completely created and specified in the device configuration.
  If the motor is not specified, the guided quick startup cannot be used. A corresponding message appears.
- Access if project protection is activated:
  If project protection is activated, authentication is required.
  The rights required in order to use the guided quick startup are assigned to your user account and activated.
- Use of a controller:
  If a controller is used, the connection between the devices must be configured.
- Optional: The operating unit is physically connected to the drive via a LAN cable.

Description of function

You can define the following basic settings in the quick startup steps with the same name:

- "Connection to PLC" (Page 232)
  This step shows that the converter in the project can be operated with a controller only. You specify whether motion control is carried out by the drive or the controller.
- "Application" (Page 233)
  You define the drive control mode in this step:
  - "Speed control"
  - "Positioning"
    With the "Positioning" control mode activated, you need to make detailed settings, for example the motion type, the measuring unit, encoder settings for the position control, and the values for a modulo correction.

- "Limits" (Page 234)
  The settings in this step depend on the control mode selected in step "Application".
  - "Speed control" control mode
    In this case, you define the minimum and maximum values of the motor used: torque, speed, and operating times.
  - "Positioning" control mode
    In this case, you make the settings for the dynamic limits, for alternative ramp-down times, for jerk limitation, and for position limits.
- "Application settings" (Page 239)
  This step is only active when the "Positioning" control mode is activated. You make the detailed settings for active homing and absolute encoder adjustment in this step.
- "I/O configuration"
  You specify the function of digital inputs and outputs of the converter.
- "Telegrams" (Page 244)
  The preferred telegrams are suggested based on the selected control mode. You can define different telegrams and make detailed settings. Telegram settings can be made in offline mode only.
- "Rotate & Optimize" (Page 245)
  You optimize the drive in the online mode. The control panel or One Button Tuning is available for this purpose.
- "Summary" (Page 247)
  You find a compilation of all settings made after completing the configuration in the guided quick startup.
  - Offline mode: When required, you can load these settings directly to the drive.
  - Online mode: When required, you can load these settings directly to the Startdrive project.

More information

For more information about guided quick startup, see the information system of the TIA Portal.

8.5.2 User interface

Overview

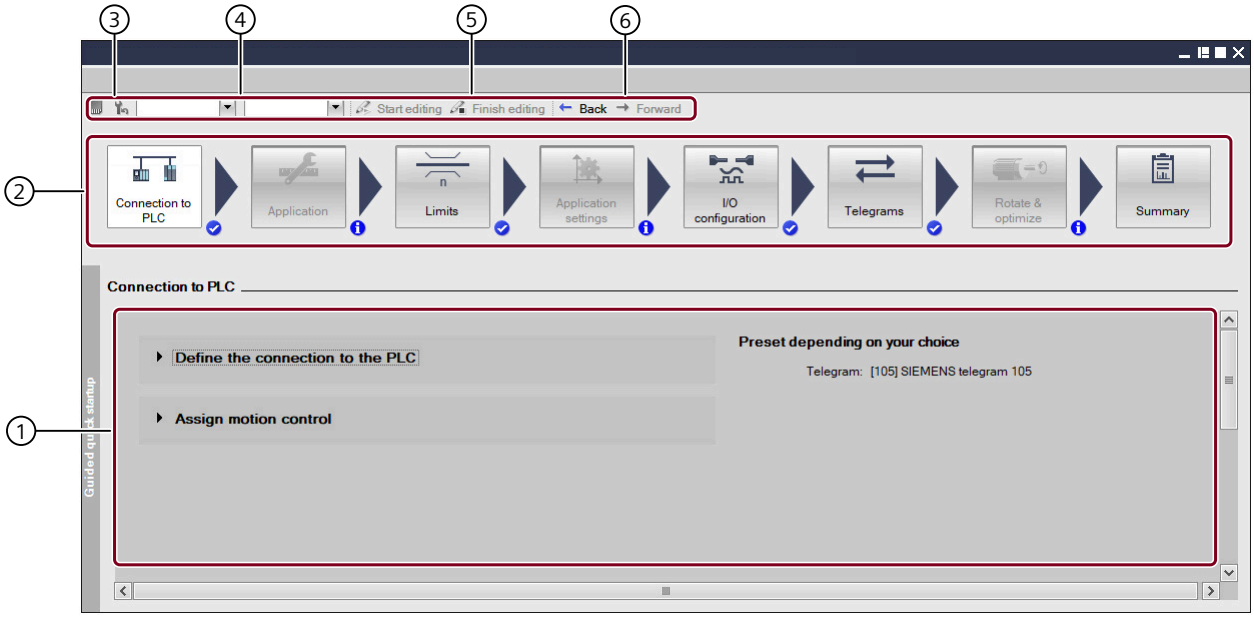
The "Guided quick startup" is a commissioning wizard that can be used to set the basic settings of the drive. It preassigns drive settings for the intended application.

Requirement

You need the following Engineering rights to run the guided quick startup if project protection is activated:

- Edit hardware configuration
- Edit drive applications

Description of function



① Make detailed settings for the active quick startup area
② Active quick startup area (highlighted)
③ Icons: store data in a power-independent manner, restore factory setting (each in online mode)
④ Select active data sets (CDS, DDS)
⑤ Icons: Start editing/Finish editing
⑥ Icons: one step forward or back

Figure 8-6 Example: Guided quick startup in offline mode

Status indicators

Settings changed in the quick startup might also apply to other setting areas in the quick startup.

Table 8-2 Status indicators after changes

Icon	Meaning
	The system defaults in this setting area are valid.
	The settings made in this setting area are valid. The settings were configured in this setting area or in another setting area.
	The program changed the settings in this setting area. Possible causes are: • Settings that are not automatically valid were configured in other setting areas. • The device configuration was changed. Check and adjust the settings in this setting area.

Settings in the quick startup areas might also apply to previously configured settings. Check and adjust the relevant settings.

Table 8-3 Status indicators for deviating settings

Icon[1]	Meaning
	Shows deviating settings
	Inputs possible
	Input required

[1] A note appears when you mouse over.

8.5.3 Editing mode (online only)

Overview

If you want to work with the guided quick startup in online mode, you need restore points in case commissioning is aborted. Restore points are stored retentively on the memory card of the converter.

Restore points are automatically created when activating or exiting the editing mode and also when switching from one step into the next step of the quick startup.

Note

Behavior when the online connection is terminated

If the connection to the drive is re-established after the online connection has been terminated, the program reverts to the stored data of the last restore point.

Requirement

- The drive has been completely created and specified in the device configuration.
- If a controller is also used, the connection between the devices must also be configured.
- There is an active online connection between the drive and the operating unit.
- No other access from another operating unit to the selected drive is active.

Description of function

Activating/exiting editing mode

Settings in the guided quick startup can be made online only in an "editing mode".

Table 8-4 Activating and exiting editing mode

Display	Status	Description
	The editing mode is not yet activated.	Proceed in either of the following ways to activate editing mode: • In the toolbar of the step, click on the button Start editing • Click in the step below the button Start editing You can configure the settings.
	The editing mode is active.	Proceed in either of the following ways to exit editing mode: • In the toolbar of the step, click on the button Finish editing • Click in the step below the button Finish editing Editing has been finished. A new restore point is assigned automatically. The current configuration is saved retentively.

Note

Message in case of multiple access

The editing mode can only be activated if the drive is not simultaneously accessed by another PC via Startdrive or the web server.

If another access is active, activation of the editing mode will be denied. An appropriate message is displayed.

Note

Message when editing factory settings in the online mode

A message is displayed if a drive still has the factory settings, and the editing mode of the guided quick startup is started. This states that the motor data are based on the rated power of a standard motor.

Therefore, check the motor data online in the "Show motor data" dialog box. When required, correct the motor data and close the dialog.

Completing online commissioning

To complete online commissioning in the guided quick startup, click on button Finish editing .

All settings made in the quick startup are then saved retentively. The last "Summary" step provides an overview of all of the settings made.

Canceling online commissioning

If you want to cancel online commissioning via the guided quick startup, click on the "Cancel" button.

All settings made in the quick startup are then discarded. Then the previous settings are restored via the last restore point.

8.5.4 Connection to PLC

Overview

The quick startup step "Connection to PLC" indicates that the drive can only be operated together with a PLC.

In this step, you specify whether motion control is carried out by the drive or the controller.

Requirement

- The drive has been completely created and specified in the device configuration.
- Optional: A control (PLC) is created in the device configuration and networked with the drive.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

The setting "Define the connection to PLC" is automatically set to "Yes". SINAMICS S200 drives can only be operated with a PLC. For this reason, this setting cannot be changed.

Proceed as follows to define whether motion control is executed by the drive or by the controller:

1. Specify whether the motion control is executed by the drive or by a connected controller. The activated area of the switch is marked blue ( ). Click the white part of the switch if you wish to change the active setting.
2. Save the setting in the project.
3. Click "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified.

Note

EPOS settings deactivated

In the "Assign motion control" section, if you define that "Ramp-function generator or position control are in the PLC or the SIMATIC technology object (TO) is used", EPOS settings are then not possible.

8.5.5 Application

Overview

In quick startup step "Application" you define in detail in which application area the drive is to be used. You define the following settings:

- Control mode of the application
- Motion type of the drive
- Detailed settings for the encoder used for position control
- Modulo correction

Requirements

- The drive has been completely created and specified in the device configuration.
- In quick startup step "Connection to the PLC", it is defined that the drive performs motion control.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

1. Select how you wish to control your drive in your application. Define the required control mode. Click the appropriate button:
   - Speed control
     The speed is controlled as precisely as possible to track a specified setpoint.
   - Positioning
     A "Basic positioner (EPOS)" calculates the traversing profile to traverse an axis as quickly as possible to a target position.

   It is impossible to select several control modes simultaneously. For control mode "Speed control" no other settings are possible.
   For control mode "Positioning", the following detailed settings are required:
2. Select the motion type that you wish to use for the drive when positioning.
   For more information about the motion type, see Section "Axis type (Page 347)".
3. Select the measurement units for position and velocity.
   The units that can be set depend on the motion type. All values are reset to the default values when changing the measurement unit and the axis type.
4. Define the settings for the motor encoder used for the position control:
   - Acquire the number of motor revolutions, load revolutions, and leadscrew pitch.
5. Optionally, activate option "Modulo correction activation" and define the modulo range.
6. Click "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified. The telegrams that match the selected application area are also preset.

When control mode "Positioning" is activated, then the additional quick startup step "Application settings" is activated.

Note

Alternatively, control mode "Positioning" can also be activated via the function view "Parameterization > Technology functions > Basic positioner > Function selection". You can also configure additional EPOS functions here.

8.5.6 Limits

8.5.6.1 Configuring limits when "Speed control" is active

Overview

When speed control is active, you define the basic properties of the closed-loop drive control in the "Limits" quick startup step.

When positioning is active, all other settings are visible (see Section "Configuring limits when "Positioning" is active (Page 235)").

Designation	Parameter	Description
Positive speed limit	p1083	Maximum speed for the positive direction. The set value must be less than or equal to the maximum speed (p1082).
Negative speed limit	p1086	Maximum speed for the negative direction. The set value must be less than or equal to the maximum speed (p1082).
Torque limit upper	p1520	Defines the upper torque limit or torque limit when motoring.
Torque limit lower	p1521	Defines the lower torque limit or the torque limit when generating.
OFF1 ramp-down time	p1121	After an OFF1 command, within this time, the speed setpoint is ramped down from the maximum speed (p1082) to standstill.
Quick stop (OFF3 ramp-down time)	p1135	The OFF3 ramp-down time is effective from the maximum speed down to the motor standstill.

Note

Displaying the actual motor data

The actual motor data of the drive are shown in dialog "Show motor data". You can open the dialog using button "Show motor data". The following values can be configured:

- Supply voltage
- Motor ambient temperature
- Direction of rotation

Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- Control mode "Speed control" is activated in the quick startup step "Application".
  When "Positioning" is active other settings are displayed.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

1. When required, adapt the specified default values (see the table above).
2. Click "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified.

8.5.6.2 Configuring limits when "Positioning" is active

Overview

The following settings are displayed in quick startup step "Limits" if a basic positioner is used in the drive for positioning. You define the following limits for EPOS in the lower part of the step:

- Dynamic limits
  Defines the maximum traversing profile limitation referred to the velocity.
- Ramp-down times
  Defines the maximum delay time referred to the maximum speed.
- Jerk
  Jerk limitation delays the acceleration.
- Position limits
  The traversing range is dynamically limited by the software limit switch, or alternatively, via the hardware limit switch.

Note

Displaying the actual motor data

The actual motor data of the drive are shown in dialog "Show motor data". You can open the dialog using button "Show motor data". The following values can be configured:

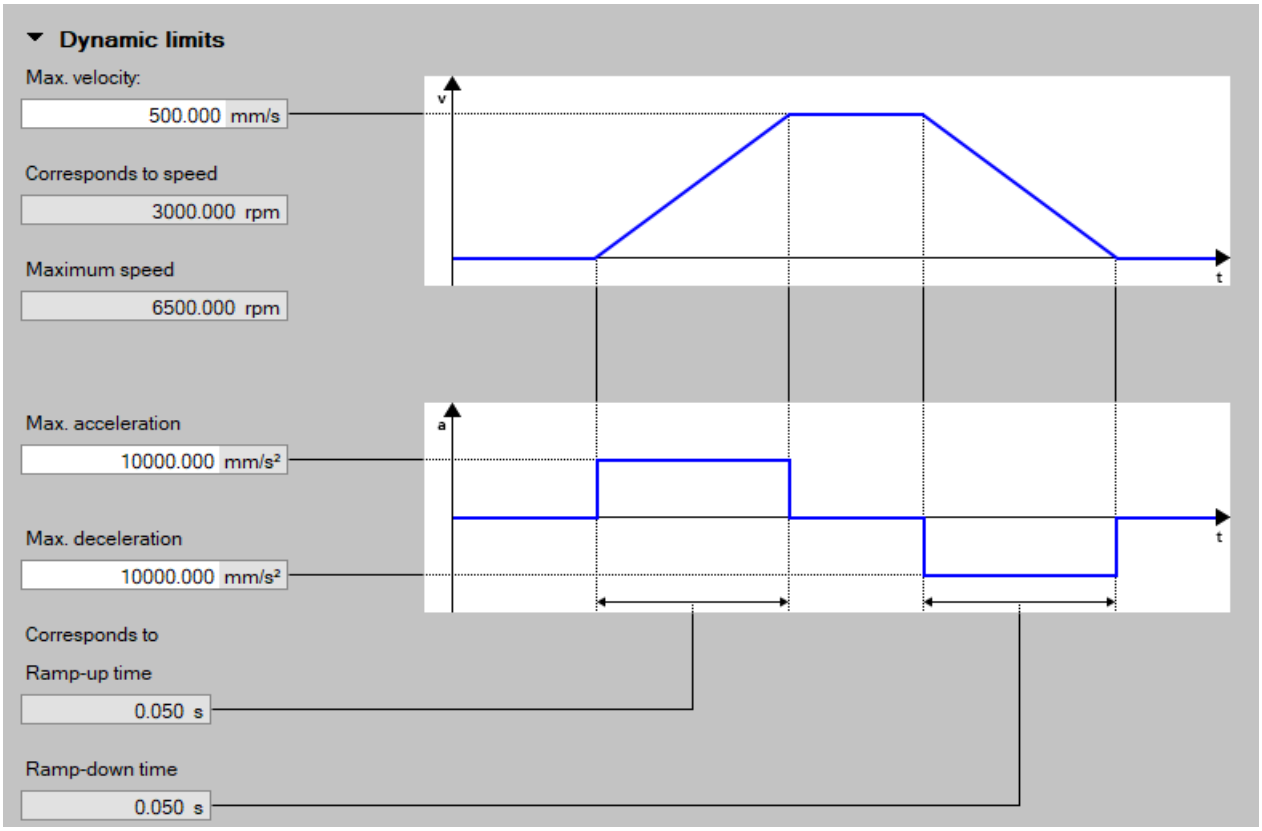
- Supply voltage
- Motor ambient temperature
- Direction of rotation

Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- Control mode "Positioning" is activated in the quick startup step "Application".
  When "Speed control" is active other settings are displayed.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

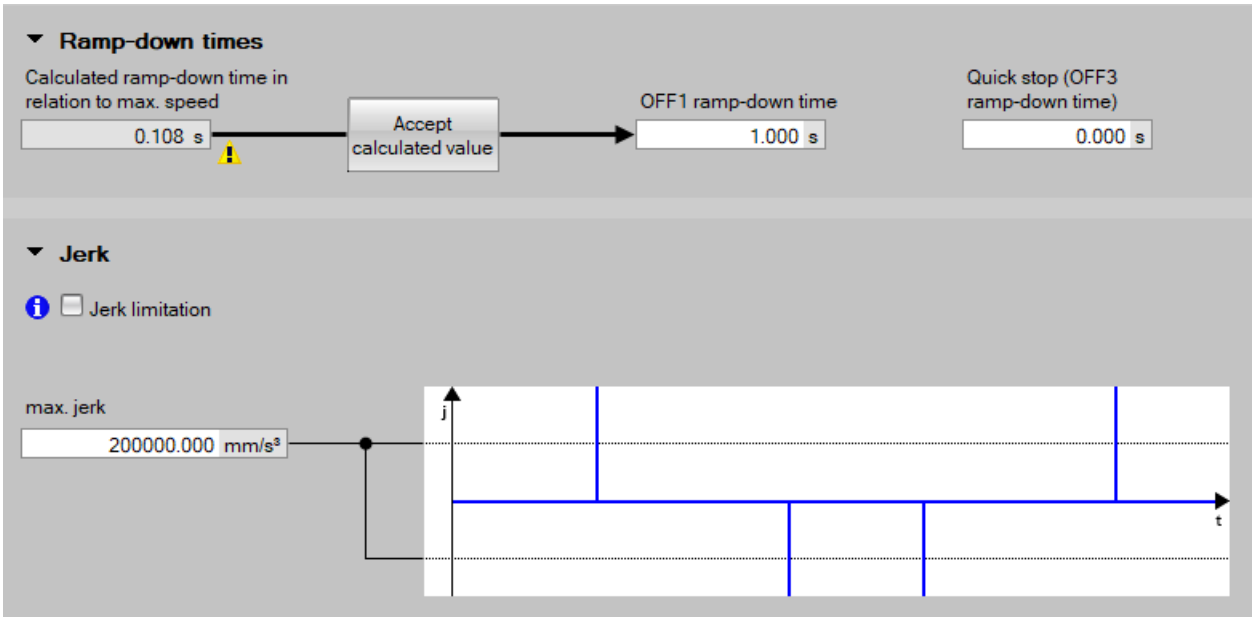
Step 1: Specifying the dynamic limits



Proceed as follows to specify the dynamic limits:

1. Correct the specified value for the maximum velocity in the "Max. velocity" field.
   The maximum velocity defines the maximum travel velocity. A change immediately limits the velocity of an active traversing block.
   The "Corresponds to speed" field displays the converted speed, the "Maximum speed" field displays the maximum speed.
   The limitation acts when positioning (jogging, processing the traversing blocks, direct setpoint input, home position approach).
2. Correct the specified value for the acceleration at "Max. acceleration".
   The field "Corresponds to ramp-up time" displays the converted ramp-up time.
3. Correct the specified value for the deceleration at "Max. deceleration".
   The field "Corresponds to ramp-down time" displays the converted ramp-down time.
   The maximum acceleration and maximum deceleration specify the maximum acceleration for increasing the velocity and the maximum deceleration for reducing the velocity. Both values act when positioning (jogging, processing the traversing blocks, direct setpoint input, home position approach).
4. Save the settings.

Step 2: Specifying the ramp-down times



The velocity, acceleration and deceleration limitation values do not apply for faults or for a safe stop. Instead, the ramp-down times for OFF1 and OFF3 are used. The proposed ramp-down time is displayed in the "Calculated ramp-down time in relation to the max. speed" field.

Proceed as follows to set the ramp-down times:

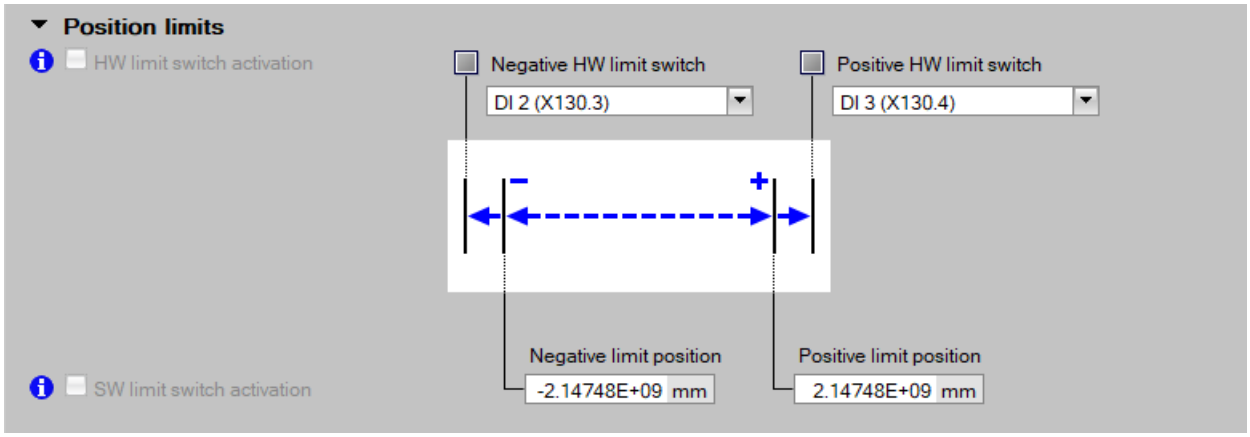
1. If you want to apply this ramp-down time to OFF1, click the "Accept calculated values" button. The ramp-down time is now applied to the "Ramp-down time" (p1121) field.
2. Enter the required value in field "Ramp-down time (OFF3)" (p1135).
3. Save the settings.

Step 3: Specifying the jerk limitation

A jerk limitation delays the acceleration. Proceed as follows to specify the jerk limitation:

1. Activate option "Jerk limitation" (p2575).
2. Enter a value for the maximum jerk limitation under "max. jerk" (p2574).
   The converted values for the rounding times are displayed in the fields below the diagram.
3. Save the settings.

Step 4: Defining the position limits



The settings of the position control words and position status words of telegrams 111 or 112 define whether a SW limit switch or a HW limit switch is active. Proceed as follows to set the position limits:

1. Enter the values for the negative end position and the positive end position of the SW limit switch.
   Both values are preassigned with the factory settings.
2. Save the settings.

Result

Startdrive defines the default settings of the setup based on what you have specified. These default settings have an impact on the following EPOS settings in the guided quick startup or under "Parameterization > Technology functions > Basic positioner".

8.5.7 Application settings

Overview

Make the positioning settings for EPOS in quick startup step "Application settings". The positioning settings listed depend on the defined application area.

Description of function

You can make the following EPOS settings:

- Active homing
- Absolute encoder adjustment

You can make the following additional EPOS settings via function view "Parameterization > Basic positioner":

- Passive homing
- Limitations
- Position monitoring functions
- Direct setpoint specification (MDI)
- Traversing blocks
- Jogging

In addition, in the same function view you can also see the status of all EPOS functions.

8.5.7.1 Configuring active homing

Overview

With an incremental measuring system, the drive can be homed without requiring a higher-level control. Active homing can be used to traverse to a home position.

The drive itself controls and monitors the homing cycle. There are three homing modes for active homing.

Requirements

- The drive has been completely created and specified in the device configuration.
- In quick startup step "Connection to the PLC", it is defined that the drive executes the motion control.
- Control mode "Positioning" is defined in quick startup step "Application".
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

1. In quick startup step "Application settings" open the detailed settings for homing mode "Active homing".
   The detailed settings are displayed. The approach direction and the home position are specified by the selected telegram.
2. Activate the required homing mode in field "Homing mode selection".

①	Use the encoder zero mark and reference cam
②	Use the encoder zero mark
③	Use the external zero mark via digital input

3. Optional (for ① and ③):
   For home position approach, enter the approach velocity to the reference cam in field "to the reference cam".

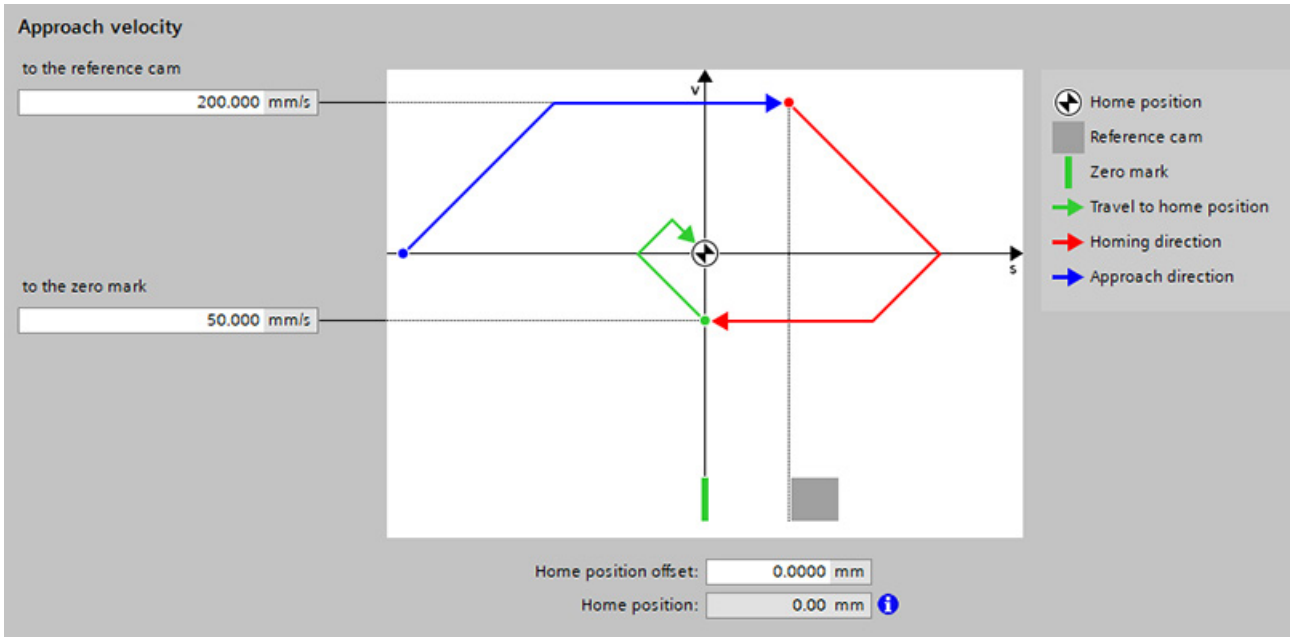


Figure 8-7 Example: configuring approach velocity in mode ①

4. Enter an approach velocity in field "to the zero mark".
   For home position approach, this approach velocity is applicable after detecting the reference cam to search for the zero mark.
5. Optional (for ③):
   From drop-down list "Digital input of the external zero mark" (p0494) select the input terminal to connect a zero mark replacement.
   This parameter supplies incorrect measured values during an active measurement. In this particular case, it is not permissible to write to the parameter.
6. Enter the required home position offset for the home position approach in field "Home position offset".
7. If you want to perform the adjustment immediately after the home position approach, activate the option of the same name.
8. Optional (for ①):
   If you want to acquire the reference cams via a digital input, activate the option of the same name.
9. Click on "Next" if you do not wish to make any additional EPOS settings.
   The quick setup step "I/O configuration" is displayed.

Result

Drive configuration continues based on the selected positioning settings.

8.5.7.2 Configuring absolute encoder adjustment

Overview

Absolute encoders must be adjusted during commissioning. When the machine is switched off, the position information of the encoder is retained. The absolute encoder is therefore first adjusted to the home position, e.g. by jogging.

Requirements

- The drive has been completely created and specified in the device configuration.
- In quick startup step "Connection to the PLC", it is defined that the drive performs motion control.
- Control mode "Positioning" is activated in the quick startup step "Application".
- An online connection to the drive has been established.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

Setting the home position coordinate

Proceed as follows to set the home position coordinate:

1. In quick startup step "Application settings", open the detailed settings for homing mode "Absolute encoder adjustment".
   The absolute encoder adjustment settings are displayed.
2. Correct the home position value in the field "Home position".
3. Click "Set".
   Status display "Home position set" is then updated. When the adjustment is correct, entry "Absolute encoder adjusted" is displayed in field "Absolute encoder adjustment state".

Resetting the home position coordinate

Proceed as follows to reset the home position coordinate:

1. In quick startup step "Application settings", open the detailed settings for homing mode "Absolute encoder adjustment".
   The absolute encoder adjustment settings are displayed.
2. Click "Reset".
   Status display "Home position set" is then updated. After the reset, entry "Absolute encoder not adjusted" is displayed in field "Absolute encoder adjustment state".
3. Optional: Set a new home position coordinate.

Result

Drive configuration continues based on the selected positioning settings. Click on "Next" if you do not wish to make any additional EPOS settings.

The quick setup step "I/O configuration" is displayed.

8.5.8 I/O configuration

Overview

In quick startup step "I/O configuration", you make the basic settings for the digital inputs and outputs of the converter:

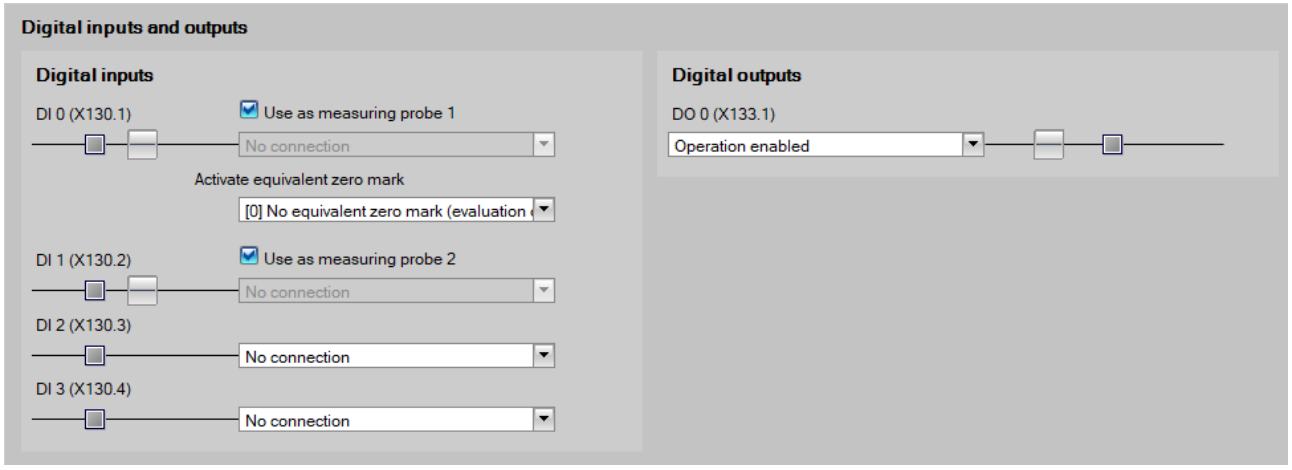


Figure 8-8 I/O configuration

- Digital input (DI 0 to DI 3)
  You can assign control signals (high/low) or functions to all digital inputs using drop-down lists. The program prevents the same signals or functions being assigned to different digital inputs.
  You can alternatively use digital inputs DI 0 and DI 1 as measuring probe and therefore evaluate in the control.
- Digital output (DO 0)
  You can assign status signal (high/low) or function to the digital output using drop-down lists.

Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- If you want to use measuring probes, the following requirements apply:
  - The project includes a controller, and is connected to the converter.
  - A technology object "PositioningAxis_1" is created for the controller and is active.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

1. If you wish to use the digital inputs as measuring probe, for DI 0 or DI 1 activate option "Use as measuring probe".
   Both digital inputs can be activated as measuring probe. The corresponding drop-down list is then deactivated.
   When activating a DI as measuring probe, option "Activate equivalent zero mark" is displayed.
2. Optional: Click the icon to invert the signal. When the signal is inverted, the icon changes to .
3. In the drop-down list "Activate equivalent zero mark", select whether you wish to use an equivalent zero mark or whether this equivalent zero mark should apply for DI 2 or DI 3.
4. If you want to additionally execute status signals of functions via digital inputs, in the digital input, select the appropriate signal or the required function.
   You can use all 4 digital inputs for this purpose. However, it is not permissible that the required digital input is activated as measuring probe (drop-down list deactivated).
   The program prevents the same signal being selected a multiple number of times or the same function for several digital inputs.
5. In the drop-down list under "Digital outputs", select the required status signal or function for digital output DO 0.
6. Click "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified.

8.5.9 Telegrams (offline only)

Overview

The telegrams of the drive were preconfigured by the specifications previously defined in the guided quick startup.

In quick startup step "Telegrams", you can optimize these default settings if this is necessary for your drive.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is no active online connection between the drive and operating unit.
  Telegrams can only be configured offline.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.

Procedure

Proceed as follows to configure the telegrams:

1. Select the desired standard telegram from the "Telegram" drop-down list.
2. Optional when "Speed control" is activated: Correct the preset reference speed in the field with the same name.
3. Click if you wish to optimize the settings of the telegrams used in the telegram configuration.
   Make the required settings under "Telegram settings (Page 259)".
4. Switch back to the quick startup step "Telegrams".
5. Click "Next" to display the next quick startup step.

Result

The telegrams for communication are configured.

8.5.10 Rotate & optimize

Overview

You optimize the converter online in quick startup step "Rotate & Optimize". To do this, use the "One Button Tuning". This step cannot be configured offline.

With "One Button Tuning" (OBT), the mechanical drive train is measured using short test signals. This procedure adapts the controller parameters to the existing mechanical system.

With this optimization procedure you determine the optimum controller settings with few entries.

Note

Alternatively: Operate the drive from the control panel

If you want to use the control panel in the "Rotate & Optimize" step, click the "Use control panel" button. Instead of One Button Tuning, the control panel is now displayed in the quick startup step. Proceed as described in the following chapter: "Traversing the drive from the control panel with speed setpoint (Page 262)".

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.
- The editing mode is activated.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup and using the control panel are activated for your user account.

Procedure

Proceed as follows to carry out the optimization settings:

1. Click the "Activate" button under "Master control".
2. In the "Distance limiting from 0° to" field, enter the angle through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged.
   The angle should be at least 60° in order to determine useful controller parameters. Longer traversing distances result in better optimization results.
3. Choose the dynamic response setting for the OBT based on the mechanical system of your machine.
   The OBT optimizes the converter based on the selected dynamic response setting.
   - Conservative
     Slow speed control – low mechanical load
   - Standard
     Best compromise between fast speed control and low mechanical load
   - Dynamic
     Fast speed control – high mechanical load
4. If you want to perform extended settings, click the "Extended settings" button.
   The "Machine property" dialog opens. You obtain information about the conditions under which you can increase the speed control dynamic performance. If you wish to increase the dynamic response, activate option "Set the current setpoint filter with loop compensation".
5. Click "Start" to start the optimization.
   If you want to perform OBT at a later time, skip and proceed to Step 8.
6. Check the optimization results.
7. Click "Deactivate" under "Master control".
8. Click on "Next" to display the next quick startup step.

Result

The result of the optimization is displayed in the "Status" area. The "Optimization result" list compares the settings changed by the optimization with the earlier settings prior to optimization.

If optimization was not successful, repeat the optimization, possibly with modified data.

More information

For more information about One Button Tuning, see Section "Performing One Button Tuning (Page 264)".

8.5.11 Summary

8.5.11.1 Offline mode

Overview

After completing the commissioning steps in the guided quick startup, here, you will find a compilation of all settings that were made offline.

If necessary, you can load the settings made offline from the "Overview" function view into the device.

Requirement

- The drive has been completely created and specified in the device configuration.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user account.

Procedure

Proceed as follows to download the project data to the device:

1. In the "Summary" function view, click "Perform a download".
   To transfer the protected project data, you must log into the device with your user data.
2. Proceed as described in Chapter "Loading project data into the drive (Page 197)".

8.5.11.2 Online mode

Overview

After completing the commissioning steps in the guided quick startup, you will find a compilation of all settings that were made online. You can sort and export the corresponding information or also compare it with the factory settings.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the converter and the operating unit.
- The online configuration was completed.
- With protection activated (UMAC):
  The function rights for configuring in the quick startup are activated for your user account.

Procedure

Proceed as follows to transfer the current project data into the TIA project of your operating unit after online commissioning has been completed:

1. Click "Finish".
   is subsequently displayed in function view "Summary".
2. Click and proceed as described in the following chapter: "Loading data from the drive into the project (Page 196)".

8.6 Configuring the converter

8.6.1 Fundamentals

Overview

After carrying out the basic configuration of devices in the project, make the extended settings for commissioning.

Description of function

The following areas are provided in display area "Parameterization":

- **Basic parameterization**
  Here you can view the preassigned basic parameters of the converter, and if necessary you can change individual values. If the motor brake is available, then you can also set that this brake is forced open.
  For the encoder evaluation function, you can set the fine resolution of the absolute position actual values in bits (p0419).
- **Inputs/outputs**
  Here you can configure the digital inputs and outputs of the converter.
- **Technology functions**
  Here you configure the basic positioner (EPOS), vibration suppression, and pulse train output (PTO).

Note

Guided quick startup

You can also easily configure the settings of the basic parameterization and the digital inputs and outputs using the guided quick startup (Page 227).

Note

Telegram configuration

You configure the telegrams used in the converter configuration in the inspector window in the telegram configuration. The most important settings are listed in Chapter "Configuring telegrams (Page 258)".

8.6.2 Basic parameterization

Overview

You can parameterize the following data in the basic setting of the function view:

- Device supply voltage
- Direction of rotation
- Motor ambient temperature

You can also define the fine resolution (p0419) for the encoder evaluation function.

Requirement

- The drive has been completely created and completely specified in the device configuration.
- With protection activated (UMAC):
  The function rights required to read the drive data are activated for your user account.

Procedure

Proceed as follows to carry out the basic parameterization:

1. The supply voltage is preset and depends on the selected drive version.
   If you want to specify another line voltage, correct the specified line voltage in the input field of the same name.
2. The motor ambient temperature is preassigned with 40 °C. Correct the value in the text box "Motor ambient temperature" if the ambient temperature is different.
   The underlying temperature model uses the motor ambient temperature to calculate the thermal motor utilization.
3. The direction of rotation last set for the motor is displayed in the "Direction of rotation" drop-down list. If you want to adjust the counter-rotational direction, select the desired direction of rotation from the drop-down list:
   - [0] Right
   - [1] Left
4. If you use control mode "Speed control", make adjustments to the preset limits if necessary. For details, see instructions below.
5. Save the project to accept the settings.

Adjusting limitations under control mode "Speed control"

When control mode "Speed control" is active, function view "Basic parameterization" displays the speed control limits. Proceed as follows to adjust the preset limits:

1. The positive and negative speed limits are preassigned.
   If you want to change this pre-assignment, correct the values in the "Positive speed limit " (p1083[0]) or "Negative speed limit" fields (p1086[0]).
2. If you want to define the fixed upper or motor torque limit, enter an appropriate value in the "Torque limit upper" field (p1520[0]).

3. If you want to define the fixed lower torque limit or torque limit when generating, enter an appropriate value in the "Torque limit lower" field (p1521[0]).
4. If you want to define the ramp-down time after an OFF1 command, enter an appropriate value in the "Ramp-down time" field (p1121).
5. A ramp-down time in which the speed setpoint is ramped down from maximum speed to standstill following an OFF3 can be specified for the down ramp.
   In this case, enter a ramp-down time in the "Ramp-down time (OFF3)" field (p1135).
6. Then save the project to accept the settings.

Result

Startdrive defines the default settings of the setup based on what you have specified.

8.6.3 Inputs/outputs

8.6.3.1 Optional: Configuring a measuring probe using the technology objects

Requirement

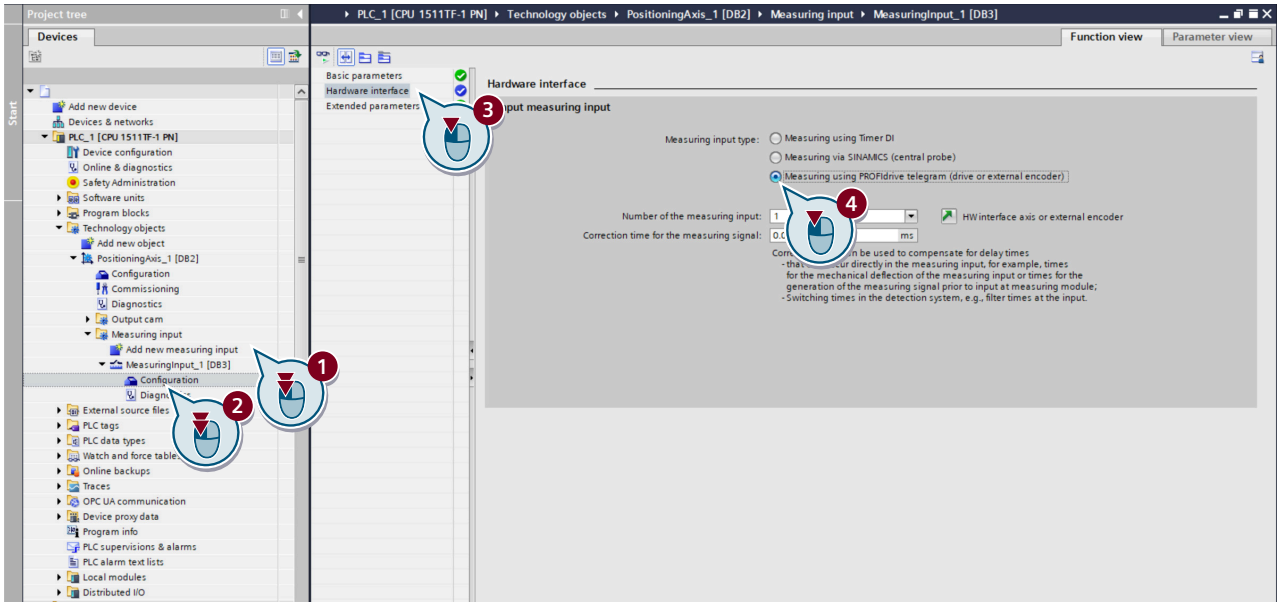
- The project includes a control system, and is connected to the converter.
- A technology object "PositioningAxis_1" is created for the control system and is active.
- With protection activated (UMAC):
  Your user account has the corresponding function rights.

Procedure

Proceed as follows to use a measuring input:

1. In the project navigation, expand the follow entries in the order specified below:
   - Technology objects
   - PositioningAxis_1
   - Measuring inputs

   The "Add new measuring input" entry is displayed.
2. Double-click the "Add new measuring input" entry ①.
   A new measuring input is created and additional functions are displayed.



3. Double-click the "Configuration" entry ②.
   The corresponding screen form opens in the device view.
4. Click the "Hardware interface" option ③ in the secondary navigation.
   The corresponding screen form opens.
5. Select the measuring input type "Measuring using PROFIdrive telegram (drive or external encoder)" ④.
   A measuring input of the type "Measuring using PROFIdrive telegram (drive or external encoder)" is created.
   With measurement using a PROFIdrive telegram, only one measuring input can be active at the same time on an actual value or encoder in the PROFIdrive telegram. A maximum of two measuring inputs can be configured using PROFIdrive on an actual value or encoder in the PROFIdrive telegram.
6. To correct the measuring time point, set a correction time.

Result

A measuring input of the type "Measuring using PROFIdrive telegram (converter or external encoder)" is created and can be used.

8.6.3.2 Digital inputs and outputs

Overview

In function view "Inputs/outputs", you make the basic settings for the digital inputs and outputs of the converter:

- Digital input (DI 0 to DI 3)
  You can assign control signals (high/low) or functions to all digital inputs using drop-down lists. The program prevents the same signals or functions being assigned to different digital inputs.
  You can alternatively use digital inputs DI 0 and DI 1 as measuring probe and therefore evaluate in the control.
- Digital output (DO 0)
  You can assign status signal (high/low) or function to the digital output using drop-down lists.

Requirement

- The drive has been completely created and completely specified in the device configuration.
- If you want to use measuring probes, the following requirements apply:
  - The project includes a controller, and is connected to the converter.
  - A technology object "PositioningAxis_1" is created for the controller and is active.
- With protection activated (UMAC):
  The function rights required to edit the drive data are activated for your user role.

Procedure

Proceed as follows to configure digital inputs and outputs:

1. If you wish to use the digital inputs as measuring probe, activate option "Use as measuring probe" for DI 0.
   Both digital inputs can be activated as measuring probe. The corresponding drop-down list is then deactivated.
   When activating a DI as measuring probe, option "Activate equivalent zero mark" is displayed.
2. Optional: Click the icon to invert the signal.
   When the signal is inverted, the icon changes to .
3. In the drop-down list "Activate equivalent zero mark", select whether you wish to use an equivalent zero mark or whether this equivalent zero mark should apply for DI 2 or DI 3.
4. If you want to additionally execute status signals of functions via digital inputs, in the digital input, select the appropriate signal or the required function.
   You can use all 4 digital inputs for this purpose. However, it is not permissible that the required digital input is activated as measuring probe (drop-down list deactivated).
   The program prevents the same signal being selected a multiple number of times or the same function for several digital inputs.
5. In the drop-down list under "Digital outputs", select the required status signal or function for digital output DO 0.
6. Click "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified.

8.6.4 Technology functions

8.6.4.1 Basic positioner

Overview

The basic positioner (EPOS) calculates the traversing profile for the time-optimized traversing of the axis to the target position.

Requirement

- The drive has been completely created and specified in the device configuration.
- The configuration in the guided quick startup has been completely executed.
- Control mode "Positioning" is activated in guided quick startup.
  - Or -
  "Basic positioner via telegram" is selected via function view "Parameterization > Technology functions > Basic positioner > Function selection".

  Note

  The option "No basic positioner function" deactivates the EPOS functions again and the control mode "Speed control" is active.

- With protection activated (UMAC):
  The function rights for editing drive data are activated for your user account.

Description of function

Function selection

When the basic positioner function is active, an overview of the existing EPOS functions is then displayed. Individual elements of this overview are directly linked to the individual functions.

When you activate the desired EPOS function, the function view for the detailed settings of the selected EPOS function appears in the secondary menu. You can click the button of the activated EPOS function to open the corresponding function view.

Available EPOS configurations

In general, you can define the following settings in the function view with the same name:

- Basic parameters / Mechanical system
  You define detailed settings for the "Positioning" control type:
  - Motion type of the drive
  - Encoder used for position control
  - Modulo correction
  - Backlash compensation
  - Load gearbox position tracking
- Limit
  - Position limits
    You can activate and configure the software and hardware limit switches to limit the traversing range.
  - Dynamic limits
    You can define the limitations of the traversing profile by specifying the maximum velocity, acceleration, deceleration, and jerk.
- Position monitoring functions
  - Position/standstill monitoring
    You specify the positioning window, positioning monitoring time, standstill window, and standstill monitoring time. The drive sets the "Setpoint stationary" signal to 1 as soon as the setpoint for the position within a positioning operation no longer changes. With this signal, the drive starts to monitor the actual position value.
  - Following error monitoring
    You specify the maximum following error for the actual position value. If this following error is violated, the position control cancels the current positioning operation and generates a fault message.
- Homing (when activated in "Function selection")
  Homing establishes the reference of the position measurement in the converter to the machine. You can select between two homing types:
  - Active homing
    You can select from three active homing modes to traverse the axis to a home position. The drive itself then controls and monitors the homing cycle. You can also decide whether absolute encoder adjustment should be automatically performed after home position approach.
  - Passive homing
    You select the input terminal for direct measuring probe 1 in the function view. When the measuring probe is detected, the difference between the home position and the determined measured value is corrected on-the-fly.
  - Absolute encoder adjustment
    Absolute encoders must be adjusted during commissioning. When the machine is switched off, the position information of the encoder is retained. The absolute encoder is therefore first adjusted to the home position, e.g. by jogging.

- Jog (when activated in "Function selection")
  You set the following parameters for incremental jogging:
  - Velocity setpoint (either for jog 1 or 2)
  - Traversing distances (either for jog 1 or 2)
- Traversing blocks (when activated in "Function selection")
  You can define a maximum of 32 traversing blocks in a configuration table in the function view. For each traversing block, you define the required settings (Page 364)and make fixed stop configuration. An external control can subsequently select a traversing block that has been selected.
- Direct setpoint specification (MDI) (when activated in "Function selection")
  The setpoints listed in the function view are entered via PLC communications. You check these setpoints in the function view for diagnostic purposes.
- Function status
  You view the active EPOS operating mode, existing enables, and the detailed status of individual EPOS functions.

More information

For more information about the basic positioner, see Section "Basic positioner (EPOS) (Page 346)".

For more information about configuring the basic positioner in Startdrive, see the information system of the TIA Portal.

8.6.4.2 Vibration suppression

Overview

The converter is equipped with a basic vibration suppression system designed to damp mechanical vibrations. You can use the vibration suppression function when oscillations are detected on the load side. The vibration suppression function reacts actively to the oscillations by absorbing the natural frequency of the mechanical oscillations.

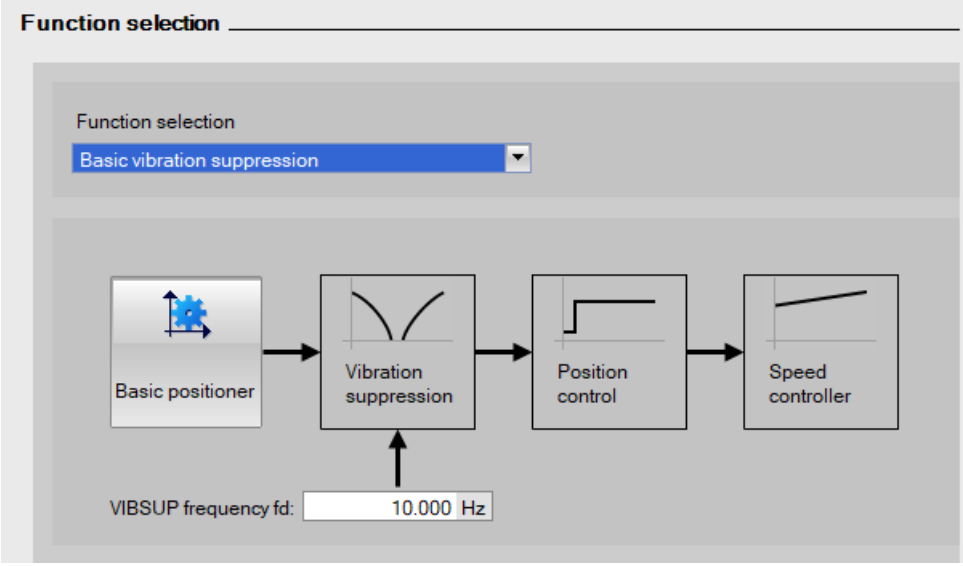
Requirement

- The drive has been completely created and specified in the device configuration.
- Control mode "Positioning" is activated in guided quick startup.
  - Or -
  "Basic positioner via telegram" is selected via function view "Parameterization > Technology functions > Basic positioner > Function selection".
- With protection activated (UMAC):
  Your user account has the corresponding function rights.

Procedure

Proceed as follows to use the vibration suppression function:

1. Open the "Function selection" function view via "Parameterization > Technology functions > Vibration suppression".
2. In the "Function Selection" drop-down list, select "Basic vibration suppression".
   In the function view, further basic settings are displayed.



3. In the field "VIBSUP Frequency fd", enter the natural frequency of the oscillations to be suppressed (p31585).
   The minimum permitted value for the natural frequency is 10 Hz. If the natural frequency of the oscillations is lower than 10 Hz, the oscillation may be inadequately damped.
4. Optional: Click on the button "Basic positioner" to modify the EPOS function settings in the linked function view.
5. Save the settings to the project.

Result

You have activated and configured vibration suppression.

More information

For more information about the vibration suppression function, see Section "Resonance suppression (Page 391)".

8.6.5 Configuring telegrams

8.6.5.1 Calling the telegram configuration

Overview

The "Telegram configuration" function is part of the device configuration, and is displayed in the inspector window.

You can either call this function via the project tree or via direct links from the communication screen forms.

Information about the telegrams used in the converter is provided in "Communication telegrams (Page 307)".

Requirement

- The converter has been completely created and specified in the device configuration.
- With protection activated (UMAC):
  The function rights required to configure telegrams in the inspector window are activated for your user role.

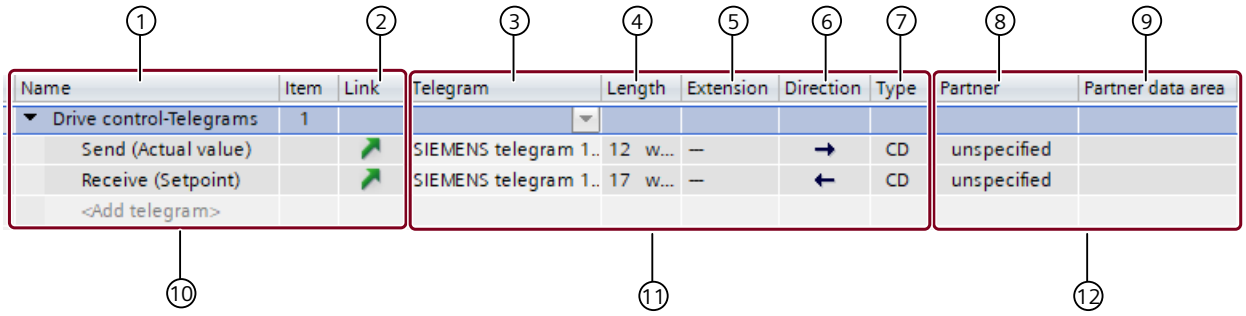
Procedure

1. Double-click the entry "Device configuration" in the project tree.
2. Click on the converter in the device configuration.
3. Click the entry "Telegram configuration" under "PROFINET interface [X150]" in the "Properties" tab of the inspector window.
   The settings for the telegram configuration are displayed below the respective fieldbus interface.

8.6.5.2 Telegram settings

Overview

The dialog box for the telegram configuration is structured as follows:



① Drive object display
② Link to the communication screen forms of the particular drive object
③ Drop-down list with the available telegrams
④ Length of the telegram
⑤ Telegram extension
⑥ Communication direction (send direction
→
/receive direction
←
)
⑦ Type of communication
CD = Controller - Device for PROFINET IO
⑧ Name of the partner (controller)
⑨ Partner data area
⑩ Area for drive objects (setpoints and actual values)
⑪ Area for the interfaces
⑫ Area for the communication partners of the drive (e.g. controller or another converter)

8.6.5.3 Adding telegrams

Overview

You can add the following telegrams once, as long as they are still not available in the telegram list of the drive object:

- Supplementary telegram 700
- Supplementary telegram 750

Requirement

- A drive and a partner are created in the project, and connected via a fieldbus. The drive is selected and the parameter editor is open.
- With protection activated (UMAC):
  The function rights required to configure telegrams in the inspector window are activated for your user role.

Procedure

Proceed as follows to add a telegram:

1. Open the following menu path from the secondary navigation of the inspector window: "Properties > PROFINET interface > Telegram configuration".
2. Click the "Add telegram" entry (at the required drive object).
   A drop-down list opens. All telegram types that have not been assigned yet can be used.
3. Select the required telegram type.
   The entries for the telegram are created.
4. If required, now change the telegram type, e.g. from telegram 3 to telegram 102.
5. Save the project.

8.7 Optimizing commissioning

8.7.1 Establishing an online connection to the converter

Overview

Before you traverse your drive with the control panel or perform optimization of the axis, you need to connect to your drive online.

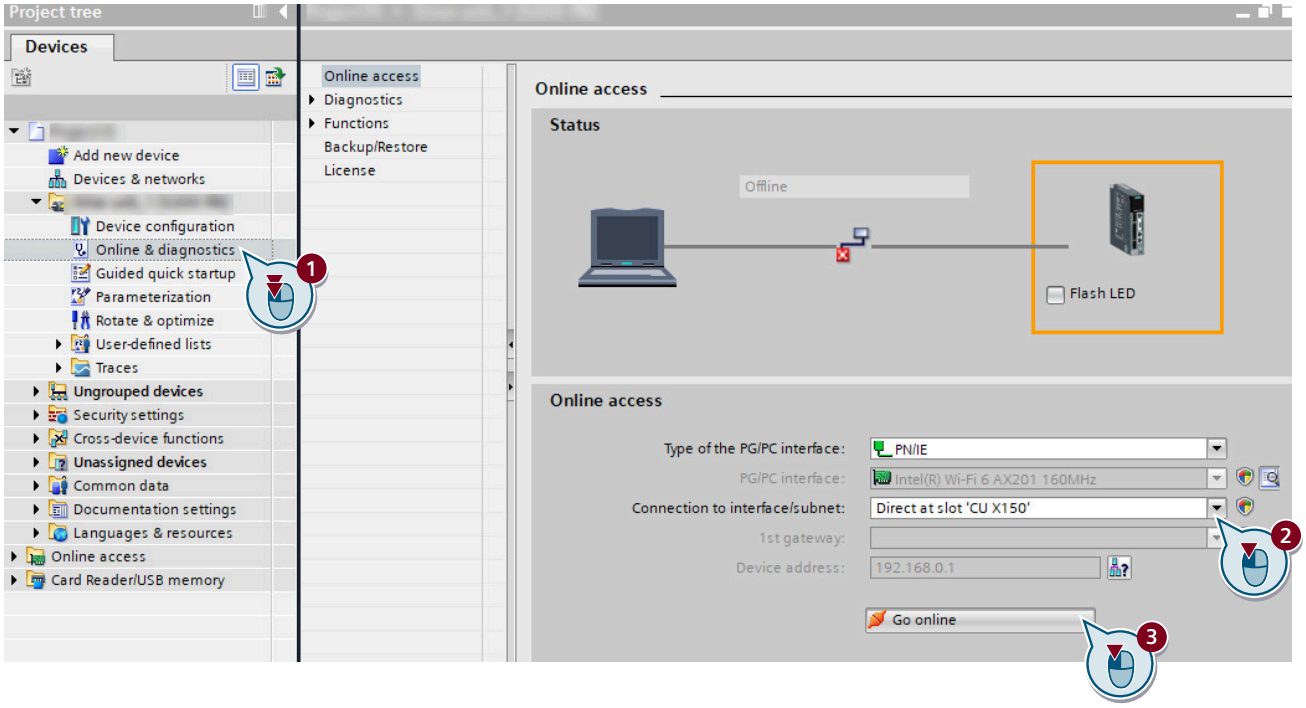
Requirement

- The configuration is loaded into the SIMATIC S7 controller.
  The converter can therefore be accessed in the PROFINET network via the SIMATIC S7 controller and your operating unit is connected to the corresponding PROFINET interface of the controller (e.g. X1).
- With protection activated:
  The function rights required to edit the drive data are activated for your user account.

Procedure

Proceed as follows to establish an online connection to your drive:

1. Double-click "Online & diagnostics" in the project navigation under the S200 drive.
   The "Online access" function view is displayed.
2. Select the PROFINET network in the "Connection to interface/subnet" drop-down list.
3. Click "Go online".



Result

The online connection to the drive is established.

8.7.2 Traversing the drive from the control panel with speed setpoint

Overview

Traverse the drive from the control panel and test the settings made. The control panel can only be activated for one drive.

By activating the control panel, you assume master control of the drive. Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

WARNING

Risk of death if the safety instructions for the control panel are not carefully complied with

The safety shutdowns from the higher-level controller have no effect with this function.
The **Stop with space bar** function is not guaranteed in all operating states. Incorrect operation by untrained personnel – without taking into account the appropriate safety instructions – can therefore result in death or severe injury.

- Make sure that this function is only used for commissioning, diagnostic and service purposes.
- Make sure that this function is only used by trained and authorized skilled personnel.
- Ensure that EMERGENCY OFF circuit is always implemented as hardware circuit.

Note

Drive responds immediately

Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the converter and the operating unit.
- Display area "Rotate & Optimize" was opened via the project tree.
- With protection activated (UMAC):
  The function rights required to edit the drive data and to use the control panel are activated for your user account.

Procedure

You can traverse the drive using both the control panel of the technology object and the control panel of the drive itself.

Proceed as follows to traverse the converter from the control panel of the drive:

1. Select the "Control panel" function in the secondary navigation.
   The corresponding function view is displayed.
2. Click the "Activate" button to enable master control for the drive.
   The "Activate master control" message window is displayed.

3. Read the alarms carefully. Check the value for the monitoring time and if required, correct it. The monitoring time specifies the time during which the connection from your operating unit to the drive is cyclically monitored. The monitoring time is preset to 2000 ms and should only be changed if required.
4. Confirm the monitoring time with "OK".
   The message window closes and the control panel is enabled. The master control is then active.
5. Click the "Set" button under "Drive enables" to set the required enable for the control panel.
6. Switch on the motor if the motor is off.
7. In the "Speed" input field, enter a value ≤ the maximum speed.
8. Traverse the drive in the desired direction using the control buttons.
   The motor does not accelerate until you click the "Backward" or "Forward" button:
   – Click the "Backward" button to rotate the motor backwards.
   – Click the "Forward" button to rotate the motor forward.
   – Click the "Jog forward" button to inch the motor forward.
   – Click the "Jog backward" button to inch the motor backward.
   – Click "Stop" to stop the drive.
   – Click the "Off" button to switch off the drive.
9. Click the "Deactivate" button to disable master control.
   The "Deactivate master control" dialog window is displayed.
10. Confirm deactivation of master control with "Yes".

Result

The current values of various parameters are displayed under "Actual values". Enables and faults are displayed under "Drive status". In addition to "Active fault", the currently pending fault is displayed.

8.7.3 Performing One Button Tuning

Overview

For One Button Tuning (OBT), the mechanical drive train is measured using short test signals. This means that you optimally adapt the controller parameters to the mechanical system being used. Using this optimization routine, you can determine the optimum controller settings with just a few entries.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.

- Display area "Rotate & Optimize" was opened via the project tree.
- With protection activated (UMAC):
  The function rights required to edit the drive data and to use the control panel are activated for your user account.

Procedure

1. Select the "One Button Tuning" function in the secondary navigation.
   The corresponding function view is displayed.
2. Click the "Activate" button under "Master control".
3. In the "Distance limiting from 0° to" field, enter the angle through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged.
   The angle should be at least 60° in order to determine useful controller parameters. Longer traversing distances result in better optimization results.
4. Choose the dynamic response setting for the OBT based on the mechanical system of your machine.
   The OBT optimizes the converter based on the selected dynamic response setting.
   - Conservative
     Slow speed control – low mechanical load
   - Standard
     Best compromise between fast speed control and low mechanical load
   - Dynamic
     Fast speed control – high mechanical load
5. If you want to perform extended settings, click the "Extended settings" button.
   The "Machine property" dialog opens. You obtain information about the conditions under which you can increase the speed control dynamic performance. If you wish to increase the dynamic response, activate option "Set the current setpoint filter with loop compensation".
6. Click "Start" to start the optimization.

NOTICE
Unpredictable drive response when making manual changes after One Button Tuning Manual changes of the calculated values can lead to unpredictable behavior of the drive. This can damage the drive. • After the One Button Tuning, carefully check that the optimized values are not subsequently changed manually. • Always first restore the factory settings if you do not want to use the values optimized using One Button Tuning.

   Optimization of the drive is performed. After optimization is completed successfully, the green status icon appears in the "Drive status" area and the changed values are shown in the "Actual values" area.
7. Check the optimization results.
8. Click "Deactivate" under "Master control".

Result

You have performed the optimization routine and saved the result of the optimization permanently in your drive and project.

8.7.4 Terminating the online connection from the drive

Overview

After you traverse your drive from the control panel or optimize the axis, you need to disconnect the online connection to the drive.

Requirement

- With protection activated (UMAC):
  The function rights required to edit the converter data are activated for your user account.

Procedure

Proceed as follows to terminate the online connection from the drive:

1. Click the drive in the project tree.
2. Click

in the menu bar.

Result

The online connection to the converter is disconnected.

8.8 Using online diagnostic functions

8.8.1 Diagnostic icons

Overview

Faults, alarms and any maintenance that is required are indicated using diagnostic icons.

Description of function

The diagnostics icons are displayed in the following areas of the TIA Portal:

- Project tree
- Device view
- Device overview

The icons are displayed in both the network as well as topology views.

Table 8-5 Overview of the possible diagnostic icons

Icon	Meaning
	No fault or maintenance required
	Maintenance required
	Maintenance requirement for a subordinate component
	Maintenance request
	Maintenance request for a subordinate component
	Fault/error
	Fault/error on a subordinate component
	Connection error to the device
	Establish a connection
	The diagnostic status is determined.
	The configured device and the actual device have incompatible types.
	The device is only available in the offline configured device configuration and has been deactivated.

8.8.2 Display messages

Overview

The diagnostic icons, which are displayed in the network and topology views, are assigned to specific messages.

Requirement

- With protection activated (UMAC):
  The function rights required to read the drive data are activated for your user account.

Procedure

Proceed as follows to display messages:

1. Double-click a diagnostics icon, for example .
   The inspector window opens.
2. Click the "Message display" tab.
   All current messages are displayed.

8.8.3 Online access

Overview

The "Online access" function view provides an interface for establishing an online connection between the drive and the operating unit.

Requirement

- Physical connection between the Ethernet interface of your operating unit and the PROFINET interface of your drive has been established.
- With protection activated (UMAC):
  The function rights required to read the drive data are activated for your user account.

Procedure

Proceed as follows to call online access:

1. In the project tree, double-click on menu "Online & 'Diagnostics".
   Diagnostics and diagnostic functions are displayed in the secondary navigation and can be called from here.
2. Select the "Online access" entry in the secondary navigation.
3. Select the network interface of your operating unit.

4. Click "Go online".
   The online connection to the drive is established.
5. Click "Go offline" in the menu bar.
   The online connection to the drive is disconnected.

8.8.4 Diagnostics overview

Overview

In the "Diagnostics" area, you can receive the following information via the secondary navigation:

- General
- Active alarms and message history
- Actual values
- Safety Integrated functional status
- PROFINET interface (X150)

A description of how you can use these functions on your converter is provided below.

Requirement

- There is an online connection between the converter and the operating unit.
  Diagnostic information can only be read out in the online mode.
- With protection activated (UMAC):
  The function rights required to read the drive data are activated for your user account.

Description of function

You call the individual diagnostic information in the secondary navigation of the diagnostics view.

The following information on the connected converter is provided in the diagnostics view:

- **General**
  Information about component, module and manufacturer
  - You can identify the converter, and the most important converter data are displayed.
- **Security**
  Information about security settings of the connected converter
  You can find more information in Chapter "Security (Page 270)".

- **Active alarms and faults**
  Information on active warnings and alarms
  In the event of a fault, the parameterized fault response is initiated and the ZSW1.3 status signal is issued. The fault is also entered in the fault buffer. Faults must be acknowledged after the cause has been resolved. To do this, use the function icon at the top of the function view (/).
  In the event of an alarm, status signal ZSW1.7 is set. The alarm is also entered in the alarm buffer.
- **Alarm and fault history**
  The individual drive components have an alarm history, in which all alarm messages and faults are recorded.
  Using the function icons on the function view, you can either clear the fault buffer ( ) or export it to a CSV file ( ).
- **Actual values**
  Information about the most important parameter actual values and status bits
- **PROFINET interface (X150)**
  - Ethernet address
    Information about IP parameters (IP address and subnet mask) and network connection (MAC address)
  - Communication
    Information about send and receive directions (PZDs of telegrams e.g. 105)
    More detailed information on PZDs and telegrams is provided in Section "Communication (Page 271)".
- **Maintenance**
  Information on motor power consumption and fan wear.
- **Overview of firmware versions**
  Shows the firmware used internally and externally for all components of the converter.

8.8.5 Security

Overview

The "Security" function, which are displayed in view "Diagnostics" to set security settings of the converter.

Requirement

- There is an online connection between the converter and the operating unit.
  Diagnostic information can only be read out in the online mode.
- With protection activated (UMAC):
  The function rights required to read the converter data are activated for your user account.

Description of function

A summary of the active security settings of the connected converter is displayed in diagnostics view "Security".

- Logged-in user:
  - The user that is logged into the converter.
    OR
  - No logged-in user, as UMAC is not active.
    In this case, Siemens recommends that you activate UMAC.
- Ports & protocols:
  Displays the activation state for the interfaces of the following areas:
  - Web server access
  - Fieldbus and associated protocols
  - S7 commissioning reports
  - DHCP configuration
- UMAC:
  Shows certain UMAC settings which are activated for the converter. Shows, for example, whether UMAC is active and what rights the user account "Anonymous" has.

You can only change the displayed security settings offline in the inspector window of the converter in the project.

8.8.6 Communication

8.8.6.1 Receive direction

Overview

As standard, the components and interconnections of PROFIdrive telegrams in the receive direction for the converter are displayed in this function view (e.g. 105 or 750).

You can add additional telegrams via the telegram configuration ( ). The content of the selected telegram is then displayed in the "Supplementary data" area.

Requirement

- With protection activated (UMAC):
  The function rights required to read the drive data are activated for your user account.

Description of function

The process data in the receive direction are created automatically.

Only those telegrams available for the converter are offered. The following information of the displayed telegrams is displayed:

Table 8-6 Telegram structure

Telegram type	PZD	Display of the value	Format switchover	Control words
	The numbering and arrangement of the process data.	**Value of the process data (PZD)**	**The value of the process data is switched to a different representation (hex, bin, dec).**	**List of the control words that are transmitted in the telegram.**
PROFIdrive 1, 2, 3, 5, 7, 9, 102, 105, 111, 112, 113	X	X	X	X
Supplementary telegram 700, 750	X	X	X	X

8.8.6.2 Send direction

Overview

As standard, the components and interconnections of PROFIdrive telegrams in the send direction for the converter are displayed in this function view (e.g. 105 or 750).

You can add additional telegrams via the telegram configuration ( ). The content of the selected telegram is then displayed in the "Supplementary data" area.

Requirement

- With protection activated (UMAC):
  The function rights required to read the converter data are activated for your user account.

Description of function

The interconnections for the process data in the send direction are created automatically for the standard and manufacturer-specific telegrams.

The following information of the displayed telegrams is displayed:

Table 8-7 Telegram structure

Telegram type	Status words	Value	Format switchover	PZD
	List of the status words that are transferred in the telegram.	**Value of the process data (PZD)**	**The value of the process data is switched to a different representation (hex, bin, dec).**	**Numbering and arrangement of the process data.**
PROFIdrive 1, 2, 3, 5, 7, 9, 102, 105, 111, 112, 113	X	X	X	X
Supplementary telegram 700, 750	X	X	X	X

8.8.7 Functions

8.8.7.1 Overview

Overview

In the "Functions" area, you can call the following functions via the secondary navigation of the diagnostic view and make settings within them:

- Assign IP address
- Firmware update
- Assign PROFINET device name
- Entering the password for encrypting drive data
- Reset PROFINET interface parameters
- Set time

8.8.7.2 Resetting PROFINET interfaces

Overview

To restore the converter to the delivery state, you need to reset the PROFINET interfaces of the converter in addition to restoring the factory settings.

If the converter is connected to a controller while the PROFINET interfaces are being reset, the controller assigns new interface parameters to the converter immediately after the reset. To prevent this, switch the controller to "Stop" mode before the reset or terminate the connection between controller and converter.

Requirement

- The connection between the converter and control system is disconnected.
- With protection activated (UMAC):
  The function rights required to edit drive data are activated for your user account.

Procedure

Proceed as follows to reset the parameter assignment of the PROFINET interfaces to the factory settings:

1. Expand the "Functions" entry in the secondary navigation.
2. Click the "Reset of PROFINET interface parameters" entry.
   The corresponding screen form opens.
3. Select one of the following options:
   – Retain I&M data
     If the option "Retain I&M data" is active, the I&M1 to I&M3 data are retained.
   – Delete I&M data
     If the option "Delete I&M data" is active, the I&M1 to I&M3 data are deleted.
4. Click the "Reset" button.

Result

The parameters of the PROFINET interfaces are reset. The reset data are displayed in the "Online access" function view.

More information

More information on restoring the factory settings is provided in Chapter "Restore factory settings (Page 279)".

8.8.7.3 Setting the time

Overview

For the operation of a drive, the definition of a drive time is important. The following options are available:

- Synchronize with NTP server
  If the drive is connected to other devices and a central NTP server is to provide the time for the connected devices. Alternatively, a controller can also act as NTP server.
  The option "Synchronize with an NTP server" is activated when the "Set time" diagnostics view is called up for the first time.
- No synchronization, set time manually
  if the drive is initially operated without control.

You set the drive time in the diagnostics view as a direct function. If a time has already been set, it is displayed in the "Current drive time" area. If it is a synchronized time, the NTP server used is also displayed in the "Time source" field.

Alternatively, you can set the time settings offline in the inspector window of the drive. However, these settings are only transferred to the drive when the drive data are loaded.

If you differentiate the time settings between the drive and the project, this is indicated by the . In this case, reload the drive data into the drive.

Requirement

- There is an online connection between the drive and the operating unit.
  The direct functions can only be performed in online mode.
- The function view "Online & diagnostics > Functions > Set time" is open.
- With protection activated (UMAC):
  Your user account has the corresponding function rights.

Procedure

Setting the time with synchronization (PLC as NTP server)

A synchronized time is always recommended when the drive is connected to a controller. Proceed as follows to set the time with synchronization (use PLC as NTP server):

1. If the "Synchronize with NTP server" option is not enabled, enable this option.
   By default, the "Use PLC as NTP server" option is now enabled. If the drive is connected to a PLC, the IP address of the PLC is displayed.
2. Select the time zone of your country in the "Time zone" area.
   Example: For Central Europe, use the time zone "GMT+01:00".
3. Click on "Apply".
4. Integrate the SNTP library into the PLC to synchronize the time.
   You will find more information on NTP server functionality of SIMATIC S7-CPUs on this Internet page (https://support.industry.siemens.com/cs/ww/en/view/82203451).

Setting the time with synchronization (any NTP server)

If you want to synchronize the time of the drive with any NTP server, proceed as follows.

1. If the "Synchronize with NTP server" option is not enabled, enable this option.
   By default, the "Use PLC as NTP server" option is now enabled. If the drive is connected to a PLC, the IP address of the PLC is displayed.
2. Disable the option "Use PLC as NTP server".
   The input field for the IP address is cleared.
3. Enter the IP address of the desired NTP server in the "IP address" field.
4. Select the time zone of your country in the "Time zone" area.
   Example: For Central Europe, use the time zone "GMT+01:00".
5. Click "Apply".

Setting the time without synchronization

A time of the drive without synchronization is used if the drive is operated for test purposes without a controller connected. If you want to set the time without synchronization, proceed as follows:

1. Activate the option "No synchronization, set time manually".
   You can then choose whether to copy the time from your operating unit or enter the time manually.
2. If you want to use the time from your operating unit, activate the option "Use time from PG/PC".
   Or
   If you want to set the time manually, proceed as follows:
   – In the "Drive time" area, set the current calendar day, the current year, and the desired time.
   – Select the time zone of your country in the "Time zone" area.
     Example: For Central Europe, use the time zone "GMT+01:00".
3. Click "Apply".

Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

8.8.7.4 Updating the firmware in the Startdrive project

Overview

You upgrade the converter firmware directly in the Startdrive project.

Note

Firmware version in Startdrive project and converter

Online connections between the Startdrive project and converter are only possible if the firmware versions in the project and the converter are the same.

- Create a new project if your current project works with a firmware version that is older than the firmware version of the converter. Set the firmware version of the project to the currently upgraded version of the converter. Apply all of the other settings from the old project.
- If you are using an old Startdrive version, it may be necessary to install a new Startdrive version that supports the firmware version.

Requirement

- A backup is made before updating the firmware.
- The ZIP file with the desired firmware is saved in the file directory of your operating unit.

Note

An empty memory card must be inserted into the converter during update progress for storing the user data temporarily.

- A physical connection between the Ethernet interface of your operating unit and the PROFINET interface of your converter.
- With protection activated (UMAC):
  The function rights required for the firmware update are activated for your user account.

Procedure

Proceed as follows to perform a firmware update directly from your project:

1. Open the Online access entry in the project tree.
2. Select the network interface of your operating unit.
3. Double-click "Update accessible devices".
   The accessible device is displayed with the IP address.
4. Call the "Online & diagnostics" function for the displayed device.
   An online connection to the selected participant is established and the "Online access" function view opens.
5. Expand the "Functions" entry in the secondary navigation.
6. Click the "Firmware update" entry.
   The corresponding function view opens.
   In the "Online data" area, the article number of the converter and the firmware version currently in use are displayed.
7. Click the "Browse" button in the "Firmware loader" area.
   A selection dialog opens.
8. Select the firmware file with the required version in the file system of your operating unit.
   The firmware file is displayed in the line with the same name in the "Firmware loader" area.
9. Check in the "Firmware version" field whether you have selected the required firmware version.
10. In the "Status" field, check that the firmware can be read.
11. Optional: Activate the option "Restart drive automatically".
    If this option is activated, there is no need to restart the converter manually after the firmware update. Step 13 is omitted in this case.

12. To load the firmware to the converter, click on "OK".
    The status of the firmware update is displayed in the "Status" field.
    The new firmware is installed. The installation may take up to 15 minutes or longer.

    Note

    Check that the firmware has been updated

    Startdrive displays an appropriate message when completing the update. After the message has been displayed, using the LEDs, check whether the converter update has been completed.

13. Optional: If you have not activated the option "Restart drive automatically...", switch the converter off and on again.
14. Optional: Call the catalog information using the secondary navigation in the inspector window. Check whether the new firmware version is installed.

8.8.8 Backup and restore

Overview

Perform the following actions in function view "Backup/Restore":

- Restart the drive now
- Retentively save the data in the converter
- Restore the drive data to factory settings
  Security and interface settings are excluded.

8.8.8.1 Restarting the drive

Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing an online connection to the converter (Page 261)").
- The drive is switched on and has voltage.
- With protection activated (UMAC):
  The function rights required to edit the converter data are activated for your user account.

Procedure

Proceed as follows to restart the converter:

1. In the secondary navigation, click menu "Backup/Restore".
   The corresponding function view opens.
2. In the "Restart the drive" field, click on "Restart".

8.8.8.2 Retentively saving the drive data

Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing an online connection to the converter (Page 261)").
- Optional: memory card is inserted (for a parameter backup).
- With protection activated (UMAC):
  The function rights required to edit and save the drive data are activated for your user account.

Procedure

Proceed as follows to save the drive data retentively:

1. In the secondary navigation, click on menu "Backup/Restore".
   The corresponding function view opens.
2. Click the "Save" button in the "Save RAM data retentively" field.

Result

Drive data are retentively saved in the drive.

If you have inserted a memory card in the converter, the drive data are stored on the memory card in addition.

8.8.8.3 Restore factory settings

Overview

With this function, you restore the user-specific parameterization of the converter to factory settings.

The following data are retained when the factory settings are restored:

- Communication interface settings
- Security settings
- Language setting
- Date and time

In the following cases it may be necessary to restore the converter to factory settings:

- Incomplete commissioning
- If the motor is changed
- If there is uncertainty regarding the previous parameterization and/or the previous use of the converter

Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing an online connection to the converter (Page 261)").
- With protection activated (UMAC):
  The function rights required for "Restore factory settings" are activated for your user account.

Procedure

Proceed as follows to restore factory settings:

1. In the secondary navigation, click on menu "Backup/Restore".
   The corresponding function view opens.
2. Click the "Start" button in the "Restore factory setting" field.

Result

The converter is reset and then restarted. If the "RDY" LED on the converter lights up green, resetting is complete.

More information

For a full reset of the converter, see Section "Full reset of all device settings (Page 547)"

8.8.9 Overview of licenses

Overview

In the online mode, in function view "License", you can view information about options/ functions that require licensing and also perform the following actions:

- View status of individual licenses.
- Load license file.
- Display and copy serial number of the SD card being used.
- Activate Trial License mode.

Requirement

- With protection activated (UMAC):
  The function rights required to edit the drive data are activated for your user account.

Description of function

Element	Description
General license status	Indicates the current license status (e.g. you do not have all of the licenses you need).
System response	Displays the system response to the current license status, e.g. "Blocks the drive from being switched on again."
Trial period	Displays of the Trial License status; e.g. "Trial License mode not active".
Serial number of the SD card	Serial number of the SD card and button to copy the serial number
Activate Trial License mode	Button for activating Trial License mode
Activate the license key file	Button for loading a license file
Save eCoL archive	Button for saving the license certificates to the file system of the operating unit
Table columns	
Status	The following icons indicate the status: License is complete. Trial License mode is active. License is not available or the SD card with license is not inserted (under licensed).
Function that requires licensing	List of all used system options/functions subject to licensing
Existing/required licenses	The required number of licenses compared with the number of licenses included with the license key. For operation, the number of available licenses ≥ the number of licenses required.
License status	Displays the current status of the function subject to licensing.
Remaining operating time	Displays the remaining operating time of a trial period.

8.9 Checking using the trace function

Overview

In a trace configuration, depending on the SINAMICS S drive being used, define the following:

- Signals to be recorded
- Recording duration
- Trigger conditions

Requirement

- With protection activated (UMAC):
  The function rights required for trace configuration are activated for your user account.

Description of function

The trace configuration for S200 drives is characterized by the following special features and device-specific default settings:

- Preset trace signals:
  For the first trace that you create for an S200 drive, the first four signals are preassigned with the following parameters, which are typical for Motion Control applications:
  - r0062 (Speed setpoint after filter)
  - r0061[0] (Actual speed unsmoothed: Encoder 1)
  - r0080 (Torque actual value)
  - r0479[0] (Diagnostics encoder position actual value Gn_XIST1: Encoder 1)

  No signals are preset for other traces you create for an S200 drive. Up to eight signals can be selected.
- Possible cycle times:
  In the "Cycle" input field of the trace configuration, you can enter the cycle time with which the trace should be recorded. The minimum cycle time for an S200 drive is 0.125 ms.
- Selecting signal bits based on plain text descriptions:
  By selecting a trigger variable, you can display individual signal bits based on plain text descriptions (e.g. "Drive control.control word sequence control.ON / OFF1") in the trace configuration and select them directly. A description of how you can select an individual signal bit and set a trigger event is provided below using the "Drive control.control word sequence control" trigger variable as an example.

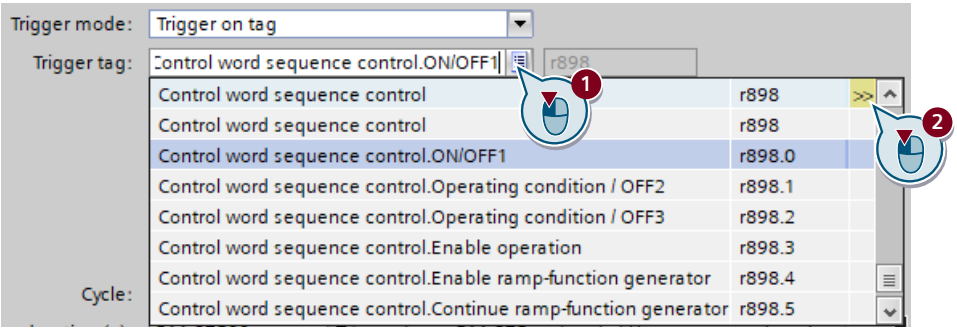
More information

More information about the trace function and configuration in the TIA Portal, see TIA Portal information system.

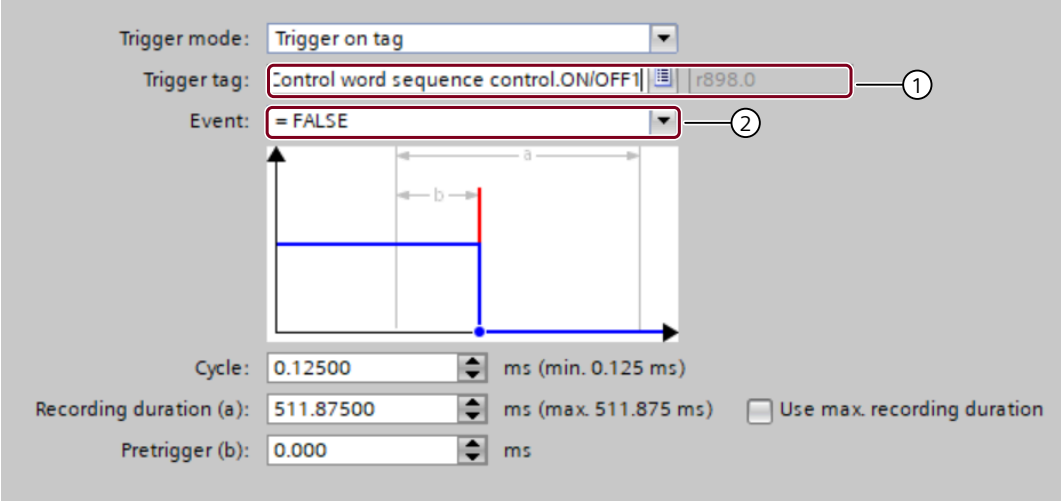
Example

In the following application, you want to make the basic settings for evaluating a trace.

1. Define a trigger mode (e.g. "Trigger on tag") via the "Trigger mode" drop-down list.
2. To open the signal selection table, click the in the "Trigger tag" input field.
   The signal selection table is displayed.
3. In the signal selection table, scroll to the desired signal (e.g. "control word sequence control").
4. Click >> in the row with the desired signal to select the required bit.
   The bit selection table shows the bits of the selected signal in plain text (e.g. "control word sequence control.ON / OFF1").



5. To show the "Event" input field, press <Enter>.
   The input field is displayed with a preset trigger event.



① Displays the selected bit
② Displays the trigger event

6. Select the desired trigger event, if necessary, using the drop-down list in "②".
   The selected trigger event is displayed in "②".

Series commissioning

9

9.1 Series commissioning

Overview

For series commissioning, transfer the data and settings of converter 1 to converter 2 or other converters.

Requirement

Converter 2 must comply with the following requirements:

- The rated power of converter 2 corresponds to the rated power of converter 1.
- The firmware version of converter 2 is higher than or equal to the firmware version of converter 1.
- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.
- Converter 2 has the factory setting.

Description of function

There are two options when carrying out series commissioning of the converter:

- Series commissioning with memory card
- Series commissioning using commissioning tools

9.2 Series commissioning with memory card

Overview

"Series commissioning using a memory card" transfers the settings of converter 1 using a memory card to converter 2 or to additional converters.

Procedure

Proceed as follows to perform series commissioning using a memory card:

1. Switch off all power supplies to converter 1.
2. Insert an empty memory card with a maximum capacity of 128 GB into the card slot of converter 1.
3. Switch on all power supplies to converter 1.
4. Commission the converter.
5. Save the settings retentively at the end of commissioning.
   This means that you save the settings retentively not only in converter 1 but also to the memory card.
6. Switch off all power supplies to converter 1.
7. Remove the memory card from converter 1.
8. Switch off all power supplies to converter 2.
9. Insert the memory card into converter 2.
10. Switch on all power supplies to converter 2 and wait until the RDY LED lights green.
    Converter 2 takes the settings of converter 1 from the memory card, including the following settings:
    - User management
    - Access control
    - IP configuration
    - Device name
11. Switch off all power supplies to converter 2.
12. Remove the memory card from converter 2.

Repeat steps 8 to 12 for all additional converters to which you wish to transfer these settings.

9.3 Series commissioning using a commissioning tool

Overview

For the series commissioning using a commissioning tool, transfer the settings of converter 1 using the commissioning tool to converter 2 or to additional converters.

Procedure

Proceed as follows to perform series commissioning using a commissioning tool:

1. Switch on the supply voltage of converter 1.
2. Commission the converter using your operating unit, e.g. a PC.
3. Save the settings retentively at the end of commissioning.
4. Save the drive data to a backup file.
5. Switch on the supply voltage of converter 2.
6. Restore the drive data from the backup file.
   Converter 2 takes the settings from the backup file.
   After a restart, the security settings configured in converter 1, e.g. drive password, UMAC data, become active in converter 2.

Repeat steps 5 and 6 for all additional converters to which you wish to transfer the settings of converter 1.

Functions

10

10.1 Overview of the functions

Overview

The converter receives its commands from the higher-level controller via the PROFINET fieldbus interface. It uses different telegrams to realize different control functions.

Description of function

Supported telegrams

- Telegram 1
- Telegram 2
- Telegram 3
- Telegram 5
- Telegram 7
- Telegram 9
- Telegram 102
- Telegram 105
- Telegram 111
- Telegram 112
- Telegram 113
- Supplementary telegrams

Control functions

- Stopping method at servo-off
- Vertical axis
- Speed limit
- Torque limit
- Ramp-function generator

- Motor overload protection
- **Basic positioner (EPOS)**
  - Mechanical system
  - Limits
  - Position monitoring
  - Homing
  - Traversing blocks
  - Direct setpoint input (MDI)
  - Jogging

10.2 Inputs/outputs

10.2.1 Digital inputs

Overview

A digital input detects a signal coming from outside. The function of a digital input is adjustable.

Description of function

The converter has four digital inputs, DI0 ... DI3. A parameter r0722.x is assigned to each digital input. You can adjust the function of digital inputs by interconnecting the signals to r0722.x in commissioning tools.

The following signals are assignable to the digital inputs.

Table 10-1 Assignable signals

Parameter	Signal	Type	Description	Available control mode	
				EPOS	S
c2104	Acknowledge all faults (RESET)	Edge 0→1	0→1: reset alarms	✓	✓
c2569	EPOS negative hardware limit switch	Edge 1→0	• 1: condition for operation • 1→0: quick stop (OFF3)	✓	-
c2570	EPOS positive hardware limit switch	Edge 1→0	• 1: condition for operation • 1→0: quick stop (OFF3)	✓	-
c0849	No quick stop OFF3 (EMGS)	Level	• 0: OFF3 • 1: no OFF3	✓	✓
c29048	Torque limit selection bit 0 (TLIM0)	Level	TLIM1 : TLIM0 • 0 : 0: internal torque limit 0 • 0 : 1: internal torque limit 1 • 1 : 0: internal torque limit 2 • 1 : 1: internal torque limit 3	✓	✓
c29049	Torque limit selection bit 1 (TLIM1)	Level			
c29063	Speed limit selection bit 0 (SLIM0)	Level	SLIM1 : SLIM0 • 0 : 0: internal speed limit 0 • 0 : 1: internal speed limit 1 • 1 : 0: internal speed limit 2 • 1 : 1: internal speed limit 3	✓	✓
c29064	Speed limit selection bit 1 (SLIM1)	Level			
c2596	EPOS set home position (SREF)	Level	• 0: do not set home position • 1: set home position	✓	-
c2612	EPOS active homing reference cam (REF)	Level	1: reference cam active	✓	-

The following signals are assigned to the digital inputs by default.

Table 10-2 Default configuration of digital inputs

Digital input	Parameter	Default signal
DI0	r0722.0	Measuring probe 1
DI1	r0722.1	Measuring probe 2
DI2	r0722.2	-
DI3	r0722.3	-

More information

For more information about wiring digital inputs, see Section "Wiring of digital inputs (Page 141)".

Parameters

The following list includes the parameters of the "Digital inputs" function.

Number	Name	Unit
r0722.0...3	Digital inputs status	
c0849[0]	No Quick Stop / Quick Stop (OFF3) signal 2	
c2104[0]	2nd acknowledge faults	
c2569	EPOS negative hardware limit switch	
c2570	EPOS positive hardware limit switch	
c2596	EPOS set home position	
c2612[0...1]	EPOS active homing reference cam	
c29048	Torque limit selection bit 0	
c29049	Torque limit selection bit 1	
c29063	Speed limit selection bit 0	
c29064	Speed limit selection bit 1	

10.2.2 Digital outputs

Overview

A digital output reports signal states of the converter to the outside. The function of a digital output is adjustable.

Description of function

The converter offers one digital output, DO0.

You can adjust the function of the digital output by interconnecting the signal parameters to c730 in commissioning tools.

The following signals are assignable to the digital output.

Table 10-3 Assignable signals

Parameter	Signal	Available control mode	
		EPOS	S
r899.2	Operation enabled (RDY) • 1: the converter is ready. • 0: the converter is not ready (a fault occurs or the enable signal is missing).	✓	✓
r29404.0	Ready for servo-on (RDY_ON) • 1: the converter is ready for servo-on. • 0: the converter is not ready for servo-on.	✓	✓
r2139.3	Fault present (FAULT) • 1: in the fault state. • 0: no fault.	✓	✓
r2684.10	Target position reached • 1: the converter has reached target position. • 0: the converter has not reached target position.	✓	-
r2199.0	|n_act| < p2161: zero speed detection (ZSP) • 1: motor speed ≤ zero speed (can be set with p2161). • 0: motor speed > zero speed + hysteresis (10 r/min).	✓	✓
r1407.7	Torque limit reached (TLR) • 1: the generated torque has nearly (internal hysteresis) reached the value of the positive torque limit or negative torque limit. • 0: the generated torque has not reached any torque limit.	✓	✓
r899.12	Motor holding brake control • 1: release the motor holding brake. The motor can rotate. • 0: engage the motor holding brake. The motor cannot rotate.	✓	✓
r899.13	Motor holding brake status • 1: the motor holding brake is active. The motor cannot rotate. • 0: the motor holding brake is released. The motor can rotate.	✓	✓
r29404.2	Overload level reached (OLL) • 1: the motor has reached the parameterizable output overload level (p29080 in % of the rated torque). • 0: the motor has not reached the overload level.	✓	✓
r2684.11	Home position set (REFOK) • 1: homing is completed. • 0: homing is not completed.	✓	-
r2683.10	Direct output 1 via traversing block	✓	-
r2683.11	Direct output 2 via traversing block	✓	-

The default signal for DO0 is RDY.

More information

For more information about wiring digital outputs, see Section "Wiring of digital outputs (Page 142)".

Parameters

The following list includes the parameters of the "Digital outputs" function.

Number	Name	Unit
r0899.0...13	Status word sequence control	
r1407.0...28	Status word speed controller	
r2139.0...15	Status word faults/alarms 1	
r2199.0...11	Status word monitoring 3	
r2683.0...14	EPOS status word 1	
r2684.0...15	EPOS status word 2	
r29404.0...5	DO status word	

10.3 Fieldbus communication

10.3.1 Communication via PROFINET IO

Overview

You can integrate the converter into a PROFINET network.

Description of function

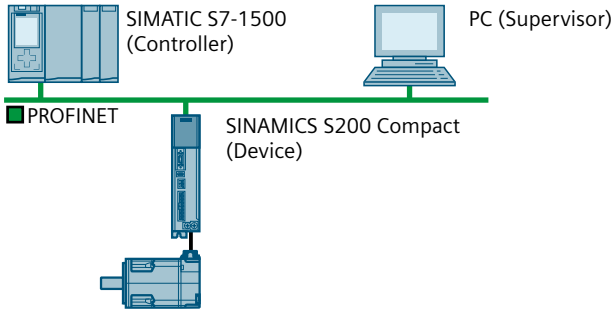


Figure 10-1 The converter in PROFINET IO operation (example)

The converter supports the following functions:

- RT (Real-Time)
- IRT (Isochronous Real-Time)
- MRP (Media Redundancy Protocol): Media redundancy, with transition bump.
- MRPD (Media Redundancy Planned Duplication): Media redundancy, bumpless.
- DFP (Dynamic Frame Packing)
- Diagnostic alarms in accordance with the error classes specified in the PROFIdrive profile.
- Device replacement without removable data storage medium: The replacement converter is assigned the device name from the IO controller, not from its memory card or from the programming device.

10.3.2 Configuring PROFINET IO operation

10.3.2.1 Connecting the PROFINET cable to the converter

Requirement

You have set up a PROFINET network for connecting the converter.

Procedure

1. Connect the PROFINET cables to the two PROFINET sockets X150-P1 and X150-P2 on the converter.
   The maximum permitted cable length from the previous station and to the next station is 100 m.
2. Connect the external 24 V power supply to the terminal X124. The external 24 V power supply is only required if communications with the controller is also intended to run when the line voltage is disconnected.

Result

You have connected the PROFINET cable to the converter.

10.3.2.2 Configuring communication using SIMATIC S7 control

Procedure

Proceed as follows to configure communication with a SIMATIC S7 controller in PROFINET:

- Install the current TIA version.
  OR
- Install the GSDML of the converter using "Option/Manage general station description (GSD)" in the components catalog.

10.3.2.3 Setting communication via PROFINET

Overview

For PROFINET communication between the IO controller and the converter, you must set a device, an IP address, and a telegram.

Requirement

None

Procedure

1. Assign a device name that is unique in the PROFINET network.
   PROFINET uses a device name in addition to the MAC address and the IP address to identify the PROFINET devices.
2. Specify an IP address.
   You have the following options to specify the IP address of the converter:
   – The IP address is specified using the engineering software.
   – The IO controller assigns an IP address to the converter.

3. Set the same telegram in the IO controller as in the converter.
   If you have not set a telegram in the converter, the converter assumes the telegram setting of the IO controller.
4. Interconnect the telegram in the control program of the IO controller with the signals of your choosing.

Result

You have set communication via PROFINET.

10.3.3 PROFINET protocols

10.3.3.1 PROFINET protocols

Overview

The converter supports the PROFINET protocols listed in the table.

The information contained is required to set Industrial Cybersecurity measures such as the firewall to protect the system.

Description of function

The address parameters, the relevant communication layer, and the communication role and communication direction are specified for each protocol.

Table 10-4 PROFINET protocols

Protocol	Port number	Layer (2) Link layer (4) Transport layer	Description
DCP: Discovery and Configuration Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 0x8892 (PROFINET)	**Accessible stations, PROFINET Discovery and Configuration** DCP detects PROFINET devices and enable basic settings. DCP uses the special multicast MAC address: xx-xx-xx-01-0E-CF, xx-xx-xx = Organizationally Unique Identifier
LLDP: Link Layer Discovery Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 0x88CC (PROFINET)	**PROFINET Link Layer Discovery Protocol** LLDP determines and manages neighbor relationships between PROFINET devices. LLDP uses the special multicast MAC address: 01-80-C2-00-00-0E

Protocol	Port number	Layer (2) Link layer (4) Transport layer	Description
MRP: Media Redundancy Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 0x88E3 (PROFINET)	**PROFINET Medium Redundancy** MRP enables the control of redundant routes through a ring topology. MRP uses the special multicast MAC address: xx-xx-xx-01-15-4E, xx-xx-xx = Organizationally Unique Identifier
PTCP: Precision Transparent Clock Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 0x8892 (PROFINET)	**PROFINET send clock and time synchronization, based on IEEE 1588** PTCP enables the send clock synchronization and time synchronization between RJ45 ports required for IRT operation. PTCP uses the special multicast MAC address: xx-xx-xx-01-0E-CF, xx-xx-xx = Organizationally Unique Identifier
PROFINET IO data	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 0x8892 (PROFINET)	**PROFINET cyclic IO data transfer** The PROFINET IO telegrams transfer process data cyclically between the PROFINET IO controller and IO devices via Ethernet.
PROFINET Context Manager	34964	(4) UDP	**PROFINET connection less RPC** The PROFINET Context Manager provides an endpoint mapper in order to establish an application relationship (PROFINET AR).

10.3.3.2 Media redundancy

Overview

The converter supports media redundancy based on MRP (Media Redundancy Protocol). Media redundancy is a function to increase system availability through redundant communication paths.

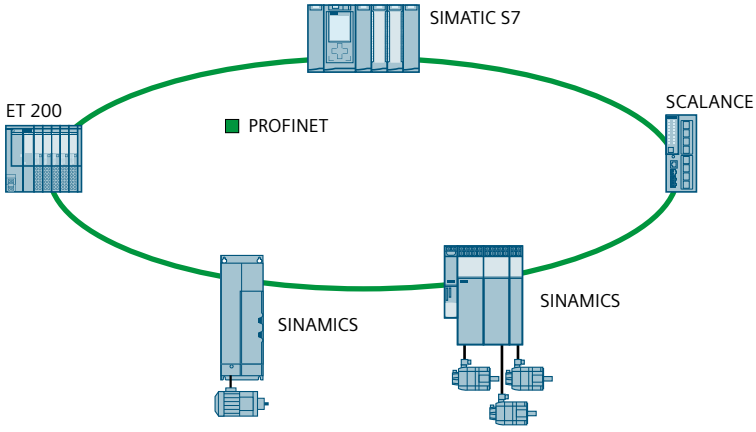
MRP can be expanded to MRPD (Media Redundancy with Planned Duplication of frames).

Requirement

The following preconditions apply regarding media redundancy:

- PROFINET as ring topology with redundancy manager
- Each device in the ring topology supports MRP or MRPD
- Maximum of 50 devices for each ring topology
- MRPD requires a suitable controller. In addition, a topology must be configured.

Description of function



SIMATIC S7	PROFINET controller
ET 200	Distributed I/O
SINAMICS	Converter
SCALANCE	Redundancy manager

Figure 10-2 Example of a ring topology

Ethernet as basis for PROFINET only permits a single, unique data path from the controller to a device via a line-type topology or a star-type topology. MRP allows a line-type topology to be closed using a redundancy manager to create a ring-type topology. This means that every device can be accessed via 2 data paths.

When a device fails or if a cable is interrupted, the redundancy manager informs the device that the ring-type topology has now been switched over to a linear-type topology. The devices can be accessed again once a switchover has been made to a linear-type topology.

When the cable is interrupted, a short-time interruption (0 ... 200 ms) of the data transfer may occur until the redundant data path is switched.

If a short-time interruption is not allowed, there are two alternative ways:

- Set the watchdog time in the hardware configuration above 200 ms.
- Set the data transfer to IRT High Performance.

10.3.3.3 Connection-oriented communication protocols

Overview

The converter supports connection-oriented communication protocols.

Connection-oriented communication ensures that data arrives in the correct order.

Description of function

Table 10-5 Connection-oriented communication protocols

Protocol	Port number	Layer (2) Link layer (4) Transport layer	Description
DHCP Dynamic Host Configuration Protocol	68	(4) UDP	Is used to query an IP address. Is closed when delivered, and is opened when selecting the DHCP mode.
ISO on TCP (according to RFC 1006)	102	(4) TCP	ISO on TCP (according to RFC 1006) is used for the message-oriented data exchange to a remote CPU, WinAC or devices of other suppliers. Communication with engineering system, human machine interface, etc. Is activated in the factory setting.
SNMP Simple network management protocol	161	(4) UDP	SNMP enables network management data to be read out and set (SNMP managed objects) by the SNMP manager. SNMP is deactivated in the factory setting and can be activated by the user.
https Secure Hypertext Transfer Protocol	443	(4) TCP	https is used for communication with the CU-internal web server via Transport Layer Security (TLS). Is open in the as-supplied state and can be deactivated.
Reserved	49152 ... 65535	(4) TCP (4) UDP	Dynamic port area that is used for the active connection endpoint if the application does not specify the local port number.

10.3.3.4 Field Device Integration

Overview

The converter supports the standardized "Field Device Integration (FDI)" via PROFINET.

Requirement

The data set protocol of fieldbus interface X150 is configured using a commissioning tool, for example, in the web server via "System" → "Protection and security".

Description of function

Using data sets DS102 and DS103, the converter exchanges commands and configuration data with the higher-level control.

10.3.4 Acyclic PROFIdrive communication

10.3.4.1 Acyclic communication via PROFINET

Description of function

The converter supports acyclic communication via B02E hex and B02F hex for PROFINET. The maximum data length per job is 240 bytes.

10.3.4.2 Reading parameter values

Overview

To read a parameter value, the higher-level control sends a read job to the converter. After receiving the read job, the converter sends its response to the higher-level control.

Description of function

Values in italics in the following tables mean that these values must be adapted to the specific request.

Table 10-6 Request to read parameters

Data block	Byte n	Bytes n + 1	n
Header	**Reference** *01 hex ... FF hex*	**01 hex**: Read job	0
	01 hex (drive object)	**Number of parameters (m)**	2
Address, parameter 1	**Attribute** *10 hex:* Parameter value *20 hex:* Parameter description	**Number of the indices** *00 hex ... EA hex* (For parameters without index: 00 hex)	4
	Parameter number *0001 hex ... FFFE hex*		6
	Number of the 1st index *0000 hex ... FFFE hex* (for parameters without index: 0000 hex)		8
	...		...
Address, parameter 2	...		...
...	...		...
Address, parameter m	...		...

Table 10-7 Converter response to a read job

Data block	Byte n	Bytes n + 1	n
Header	**Reference** (identical to a read job)	**01 hex**: Converter has executed the read job. **81 hex**: Converter was not able to completely execute the read job.	0
	01 hex (ID of drive objects)	**=Number of parameters (m)** (identical to the read job)	2

Data block	Byte n	Bytes n + 1	n
Values, parameter 1	**Format** *02 hex*: Integer8 *03 hex*: Integer16 *04 hex*: Integer32 *05 hex*: Unsigned8 *06 hex*: Unsigned16 *07 hex*: Unsigned32 *08 hex*: FloatingPoint *0A hex*: OctetString *0D hex*: TimeDifference *34 hex*: TimeOfDay without date indication *35 hex*: TimeDifference with date indication *36 hex*: TimeDifference without date indication *41 hex*: Byte *42 hex*: Word *43 hex*: Double word *44 hex*: Error	**Number of index values** or - for a negative response - **number of error values**	4
	Value of the 1st index or - in case of negative response - **error value 1**		6
	...		...
Values, parameter 2	...		
...	...		
Values, parameter m	...		

10.3.4.3 Changing parameter values

Overview

To change a parameter value, the higher-level control sends a change request to the converter. After receiving the change request, the converter changes the parameter value and sends its response to the higher-level control.

Description of function

Values in italics in the following tables mean that these values must be adapted to the specific request.

Table 10-8 Request to change parameters

Data block	Byte n	Bytes n + 1	n
Header	**Reference** *01 hex ... FF hex*	**02 hex**: Change request	0
	01 hex (drive object)	**Number of parameters (m)** *01 hex ... 27 hex*	2
Address, parameter 1	**10 hex**: Value of the parameter	**Number of indices** *00 hex ... EA hex* (00 hex and 01 hex are equivalents)	4
	Parameter number *0001 hex ... FFFF hex*		6
	Number of the 1st index *0000 hex ... FFFE hex*		8
	...		...
Address, parameter 2	...		

Data block	Byte n	Bytes n + 1	n
...	...		...
Address, parameter m	...		
Values, parameter 1	**Format** *02 hex:* Integer 8 *03 hex:* Integer 16 *04 hex:* Integer 32 *05 hex:* Unsigned 8 *06 hex:* Unsigned 16 *07 hex:* Unsigned 32 *08 hex:* Floating Point *0A hex:* Octet String *0D hex:* Time Difference *34 hex*: TimeOfDay without date indication *35 hex*: TimeDifference with date indication *36 hex*: TimeDifference without date indication *41 hex:* Byte *42 hex:* Word *43 hex:* Double word	**Number of index values** *00 hex ... EA hex*	
	Value of the 1st index		
	...		
Values, parameter 2	...		
...	...		
Values, parameter m	...		

Table 10-9 Response, if the converter has executed the change request

Data block	Byte n	Bytes n + 1	n
Header	**Reference** (identical to a change request)	**02 hex** (change request successful)	0
	01 hex (ID of drive objects)	**Number of parameters** (identical to a change request)	2

Table 10-10 Response if the converter was not able to completely execute the change request

Data block	Byte n	Bytes n + 1	n
Header	**Reference** (identical to a change request)	**82 hex:** (Converter was not able to completely execute the write request)	0
	01 hex (ID of drive objects, for G120 always = 01 hex)	**Number of parameters** (identical to a change request)	2
Values, parameter 1	**Format** 40 hex: Zero (change request for this data block executed) 44 hex: Error (change request for this data block not executed)	**Number of error values** 00 hex 01 hex or 02 hex	4
	Only for "Error" - **error value 1**		6
	Only for "Error" - **error value 2** Error value 2 is either zero, or it contains the number of the first index where the error occurred.		8
Values, parameter 2	...		

Data block	Byte n	Bytes n + 1	n
...	...		...
Values, parameter m	...		

10.3.4.4 Error value 1 for read and change requests

Overview

If the converter receives an erroneous request to read or change parameter values, then the response from the converter will contain one or two error values. Error value 1 provides information about the type of faulty request.

Description of function

Table 10-11 Error value 1

Error value 1	Meaning
00 hex	Illegal parameter number (access to a parameter that does not exist)
01 hex	Parameter value cannot be changed (change request for a parameter value that cannot be changed)
02 hex	Lower or upper value limit exceeded (change request with a value outside the value limits)
03 hex	Incorrect subindex (access to a parameter index that does not exist)
04 hex	No array (access with a subindex to non-indexed parameters)
05 hex	Incorrect data type (change request with a value that does not match the data type of the parameter)
06 hex	Setting not permitted, only resetting (change request with a value not equal to 0 without permission)
07 hex	Descriptive element cannot be changed (change request to a descriptive element that cannot be changed)
09 hex	Description data not available (access to a description that does not exist, parameter value is available)
0B hex	No master control (change request but with no master control)
0F hex	Text array does not exist (although the parameter value is available, the request is made to a text array that does not exist)
11 hex	Request cannot be executed due to the operating state (access is not possible for temporary reasons that are not specified)
14 hex	Inadmissible value (change request with a value that is within the limits but which is illegal for other permanent reasons, i.e. a parameter with defined individual values)
15 hex	Response too long (the length of the actual response exceeds the maximum transfer length)
16 hex	Illegal parameter address (illegal or unsupported value for attribute, number of elements, parameter number, subindex or a combination of these)
17 hex	Illegal format (change request for an illegal or unsupported format)
18 hex	Number of values not consistent (number of values of the parameter data to not match the number of elements in the parameter address)
19 hex	Drive object does not exist (access to a drive object that does not exist)
20 hex	Parameter text cannot be changed
21 hex	Service is not supported (illegal or not support request ID).
6B hex	A change request for a controller that has been enabled is not possible. (The converter rejects the change request because the motor is switched on. Observe the "Can be changed" parameter attribute in the parameter list.)

Error value 1	Meaning
6C hex	Unknown unit.
6E hex	Change request is only possible in the "Motor commissioning" state.
6F hex	Change request is only possible in the "Power unit commissioning" state.
70 hex	Change request is only possible in the "Quick commissioning" ("Basic commissioning") state.
71 hex	Change request is only possible if the converter is in the "ready" state.
72 hex	Change request is only possible for a parameter reset (restore factory settings).
73 hex	Change request is only possible in the "Safety Integrated commissioning" state.
74 hex	Change request is only possible in the "Commissioning the technological application/units" state
75 hex	Change request is only possible in a commissioning state.
76 hex	Change request is not possible for internal reasons.
77 hex	Change request is not possible during download.
81 hex	Change request is not possible during download.
82 hex	Accepting the master control is inhibited.
83 hex	Desired interconnection is not possible (signal source does not supply float value, but the signal sink requires float)
84 hex	Converter does not accept a change request (the converter is busy with internal calculations)
85 hex	No access methods defined.
86 hex	Write access only during commissioning of the data records (the operating status of the converter prevents a parameter change)
87 hex	Know-how protection active: access inhibited
88 hex	Write access only in the commissioning state Safety Integrated device
89 hex	Access blocked due to missing UMAC function right
C8 hex	Change request below the currently valid limit (change request for a value that lies within the "absolute" limits, but is below the currently valid lower limit)
C9 hex	Change request above the currently valid limit (example: a parameter value is too large for the converter power)
CC hex	Change request not permitted (change is not permitted as the access code is not available)
CD hex	Converter temporarily does not accept a change request (example: the converter is currently storing drive data in its internal memory)

10.3.5 Identification & Maintenance (I&M) data

Overview

I&M data are identification and maintenance data that are stored in a device. The higher-level controller has access to the I&M data of all devices on the fieldbus.

Using the I&M data, the plant operator can identify and label devices and define maintenance measures.

The converter supports the identification and maintenance (I&M) data listed in the table.

Description of function

Table 10-12 I&M data

I&M data	Format	Explanation	Example for the content
I&M0	u8[54] PROFINET	Converter-specific data, read only	See below
I&M1	Visible String [32]	Plant/system identifier	"ak12-ne.bo2=fu1"
	Visible String [22]	Location code	"sc2+or45"
I&M2	Visible String [16]	Date	"2013-01-21 16:15"
I&M3	Visible String [54]	Any comment or remark	-
I&M4	Octet String[54]	Check signature to track changes for Safety Integrated.	Values of r9781[0] and r9782[0]

When requested, the converter transfers its I&M data to a higher-level control or to a PC/PG with installed TIA Portal.

Table 10-13 I&M0

Designation	Format	Example for the content
MANUFACTURER_ID	u16	42d hex (=Siemens)
ORDER_ID	Visible String [20]	"6SL3246-0BA22-1FA0"
SERIAL_NUMBER	Visible String [16]	"T-R32015957"
HARDWARE_REVISION	u16	0001 hex
SOFTWARE_REVISION	char, u8[3]	"V" 04.70.19
REVISION_COUNTER	u16	0000 hex
PROFILE_ID	u16	3A00 hex
PROFILE_SPECIFIC_TYPE	u16	0000 hex
IM_VERSION	u8[2]	01.02
IM_SUPPORTED	bit[16]	001E hex

10.4 Communication telegrams

10.4.1 Telegram structure

Overview

Converter and higher-level control system exchange data via a fieldbus using telegrams.

Description of function

The converter receives data from the higher-level control cyclically and returns data to the control cyclically.

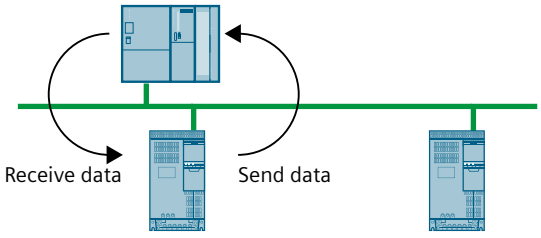


Figure 10-3 Cyclic data exchange

Converter and higher-level control system package their data in telegrams.

Specific telegrams are defined for typical applications in the PROFIdrive profile and are provided with a fixed PROFIdrive telegram number. Behind every PROFIdrive telegram number is thus a fixed composition of signals. This means that a telegram number provides an unambiguous description of the cyclic data exchange.

10.4.2 Supported telegrams

Overview

The converter supports standard telegrams and Siemens telegrams for speed control and position control.

All supported standard telegrams and Siemens telegrams (supplementary telegrams excluded) can be used with the telegram extension.

Description of function

From the perspective of the converter, the received process data represents the receive words and the process data to be sent represents the send words.

Table 10-14 Overview of supported telegrams

Telegram	Maximum number of PZD[1]	
	Received word	Send word
Standard telegram 1	2	2
Standard telegram 2	4	4
Standard telegram 3	5	9
Standard telegram 5	9	9
Standard telegram 7	2	2
Standard telegram 9	10	5
Siemens telegram 102	6	10
Siemens telegram 105	10	10
Siemens telegram 111	12	12
Siemens telegram 112	17	12
Siemens telegram 113	21	14
Siemens telegram 750 (supplementary telegram)[2]	3	1

[1] One PZD = one word

[2] The supplementary telegram can only be used with a main telegram (a standard telegram or a non-supplementary Siemens telegram). It cannot be used separately.

10.4.3 Telegrams for speed control

10.4.3.1 Telegram 1

Overview

The telegram is suitable for closed-loop speed control of a drive.

Description of function

Process data	Telegram 1			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_A	16-bit speed setpoint	NIST_A	Speed actual value 16-bit

10.4.3.2 Telegram 2

Overview

The telegram is suitable for closed-loop speed control of a drive.

Description of function

Process data	Telegram 2			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2

10.4.3.3 Telegram 3

Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 1 position encoder.

Description of function

Process data	Telegram 3			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD06	---	Not assigned	G1_XIST1	Position actual value 1 from encoder 1
PZD07	---			
PZD08	---		G1_XIST2	Position actual value 2 from encoder 1
PZD09	---			

10.4.3.4 Telegram 5

Overview

The telegram is suitable for the closed-loop speed control and closed-loop position control of a drive and to control 1 position encoder.

Requirement

PROFINET with IRT (Isochronous Real-Time)

Description of function

Process data	Telegram 5			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD06	XERR	Position controller deviation	G1_XIST1	Position actual value 1 from encoder 1
PZD07				
PZD08	KPC	Gain factor for the position controller	G1_XIST2	Position actual value 2 from encoder 1
PZD09				

10.4.3.5 Telegram 102

Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 1 position encoder.

Description of function

Process data	Telegram 102			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD07	---	Not assigned	G1_XIST1	Position actual value 1 from encoder 1
PZD08	---			
PZD09	---		G1_XIST2	Position actual value 2 from encoder 1
PZD10	---			

10.4.3.6 Telegram 105

Overview

The telegram is suitable for the closed-loop speed control and closed-loop position control of a drive and to control 1 position encoder.

Requirement

PROFINET with IRT (Isochronous Real-Time)

Description of function

Process data	Telegram 105			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD07	XERR	Position controller deviation	G1_XIST1	Position actual value 1 from encoder 1
PZD08				
PZD09	KPC	Gain factor for the position controller	G1_XIST2	Position actual value 2 from encoder 1
PZD10				

10.4.4 Telegrams for position control

10.4.4.1 Telegram 7

Overview

The telegram is suitable for the basic positioner with selection of the traversing block.

Description of function

Process data	Telegram 7			
	Control → Converter		Converter → Control	
	Signal	**Explanation**	**Signal**	**Explanation**
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	SATZANW	Selects the traversing block	AKTSATZ	Currently selected traversing block

10.4.4.2 Telegram 9

Overview

The telegram is suitable for the basic positioner with direct setpoint input (MDI).

Description of function

Process data	Telegram 9			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	SATZANW	Selects the traversing block	AKTSATZ	Currently selected traversing block
PZD03	STW2	Control word 2	ZSW2	Status word 2
PZD04	MDI_TARPOS	Position setpoint for direct setpoint input (MDI)	XIST_A	Actual position value (32 bits)
PZD05				
PZD06	MDI_VELOCITY	MDI velocity	---	Not assigned
PZD07			---	
PZD08	MDI_ACC	MDI accelerating torque	---	
PZD09	MDI_DEC	MDI braking torque	---	
PZD10	MDI_MOD	Selects the positioning mode in the case of direct setpoint input (MDI)	---	

10.4.4.3 Telegram 111

Overview

The telegram is suitable for the basic positioner with direct setpoint input (MDI).

Description of function

Process data	Telegram 111			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex ≙ 100%)	MELDW	Status word for messages
PZD06	MDI_TARPOS	MDI target position in INT32	XIST_A	Position actual value in INT32
PZD07				
PZD08	MDI_VELOCITY	MDI velocity in INT32	NIST_B	Actual speed value in INT32
PZD09				
PZD10	MDI_ACC	MDI acceleration in INT16 (4000 hex ≙ 100%)	FAULT_CODE	Number of the actual fault
PZD11	MDI_DEC	MDI deceleration in INT16 (4000 hex ≙ 100%)	WARN_CODE	Number of the actual alarm
PZD12	Not assigned	---	Not assigned	---

10.4.4.4 Telegram 112

Overview

The telegram is suitable for basic positioners with direct setpoint input (MDI) with physical and LU units, override, position actual value and velocity actual value.

Description of function

Process data	Telegram 112			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex ≙ 100%)	Reserved	---
PZD06	MDI_TARPOS_F	MDI target position in Float32	XIST_F	Position actual value in Float32
PZD07				
PZD08	MDI_VELOCITY_F	MDI velocity in Float32	VIST_F	Velocity actual value in Float32
PZD09				
PZD10	MDI_ACC_F	MDI acceleration in Float32	MELDW	Message word
PZD11			FAULT_CODE	Fault code
PZD12	MDI_DEC_F	MDI deceleration in Float32	WARN_CODE	Alarm code
PZD13			---	---
PZD14	Reserved	---	---	---
PZD15		---	---	---
PZD16	REF_COORDINATE_F	Homing position in Float32	---	---
PZD17			---	---

10.4.4.5 Telegram 113

Overview

The telegram is suitable for basic positioners with direct setpoint input (MDI) with physical and LU units, override, position actual value and velocity actual value.

Description of function

Process data	Telegram 113			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex ≙ 100%)	Reserved	---
PZD06	MDI_TARPOS_D	MDI target position in Float64	XIST_D	Position actual value in Float64
PZD07				
PZD08				
PZD09				
PZD10	MDI_VELOCITY_F	MDI velocity in Float32	VIST_F	Velocity actual value in Float32
PZD11				
PZD12	MDI_ACC_F	MDI acceleration in Float32	MELDW	Message word
PZD13			FAULT_CODE	Fault code
PZD14	MDI_DEC_F	MDI deceleration in Float32	WARN_CODE	Alarm code
PZD15			---	---
PZD16	Reserved	---	---	---
PZD17		---	---	---
PZD18	REF_COORDINATE_D	Homing position in Float64	---	---
PZD19			---	---
PZD20			---	---
PZD21			---	---

10.4.5 Supplementary telegram 750

Overview

Telegram 750 is suitable to control the drive torque, e.g. for an electronic counterweight of a vertical axis.

Description of function

Process data	Telegram 750			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZDn+1	M_ADD1	Additional torque	M_ACT	Actual torque
PZDn+2	M_LIMIT_POS	Upper torque limit	---	Not assigned
PZDn+3	M_LIMIT_NEG	Lower torque limit	---	

Note

Before setting the supplementary telegram, you must select a main telegram firstly. If you change the main telegram, the supplementary telegram will be disabled automatically. So after changing the main telegram, you must set the supplementary telegram again.

However, if you change the control mode of the converter, the supplementary telegram keeps the same state as that in the former control mode. The available supplementary telegram will not be disabled automatically. For example, if you enabled the supplementary telegram 750 before you change the control mode, the supplementary telegram 750 keeps enabled after the control mode change.

Note

After you enabled the supplementary telegram, the PZDs of the supplementary telegram follow after the PZDs of the main telegram.

Note

When you use the telegram 750 in application of rewinding and unwinding, the built-in braking resistor of the converter is not sufficient to absorb the excess regenerative energy.

Note

When you use the telegram 750, if either of the following settings is done, the motor will accelerate in an uncontrollable manner:

- Setting a negative value of the upper torque limit via the PZD M_LIMIT_POS
- Setting a positive value of the lower torque limit via the PZD M_LIMIT_NEG

10.4.6 Telegram extension

Overview

The telegram extension can be added to a main telegram via Startdrive. The length (≤ 6 words) and the signal assignment of the telegram extension can be configured freely.

Description of function

Table 10-15 Telegram extension

Process data	Telegram extension			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	---	---	Digital inputs status	
. . .	---	---	Freely assignable	Freely assignable
PZD06	---	---		

The first PZD of the telegram extension must be configured as "Digital inputs status" and the other PZDs are configured as "Fixed value (0) selected" as default. You can configure the other PZDs freely from the provided drop-down list.

Table 10-16 Overview of the drop-down list

Parameter	Description	Unit
r0026	DC link voltage smoothed	V
r0027	Absolute actual current smoothed	A
r0032	Active power actual value smoothed	W
r0034	Motor utilization thermal	%
r0044	Thermal converter utilization	%
r0081	Torque utilization	%
r0722	Digital inputs status	-
r0747	Digital outputs status	-
r2131	Actual fault code	-
r2132	Actual alarm code	-

Example

Adding the telegram extension to a main telegram

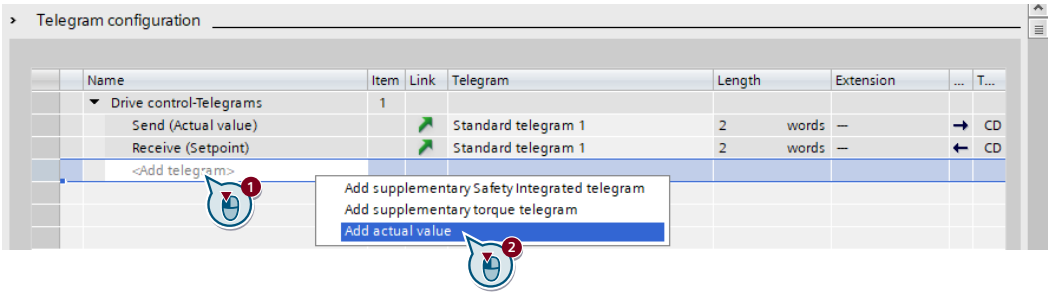


Figure 10-4 Adding the telegram extension

Configuring the PZD of the telegram extension

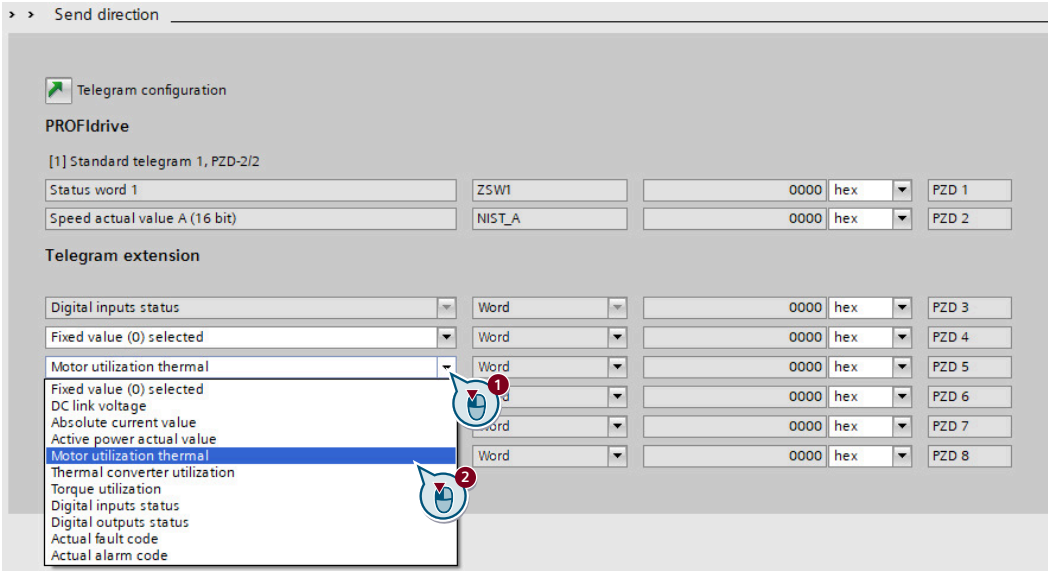


Figure 10-5 Configuring the PZD

10.4.7 Control words, status words and message word

10.4.7.1 Control and status word 1

Overview

Control word 1 (STW1) activates the converter drive functions.

Status word 1 (ZSW1) signals the status of the converter to the higher-level control.

Description of function

For speed control (telegrams 1, 2, 3, 5, 102, 105)

Note

When telegram 5 and telegram 105 are used, STW1.4 and STW1.6 must be set to 0.

Note

STW1.10 must be set to 1 to allow the PLC to control the converter.

Control word 1 (STW1)				
Control → Converter				
Bit	**Drive function**		**Explanation**	
	Telegrams 102, 105	**Telegrams 1, 2, 3, 5**	**Telegrams 102, 105**	**Telegrams 1, 2, 3, 5**
00	0 = OFF1		The motor brakes with the ramp-down time p1121 of the ramp-function generator. The converter switches off the motor at standstill.	
	0 → 1 = ON		The converter goes into the "ready" state. If, in addition, bit 3 = 1, the converter switches on the motor.	
01	0 = OFF2		Switch off the motor immediately, the motor then coasts down to a standstill.	
	1 = No OFF2		The motor can be switched on (ON command).	
02	0 = Quick stop (OFF3)		Quick stop: The motor brakes to a standstill with the OFF3 ramp-down time p1135.	
	1 = No quick stop (OFF3)		The motor can be switched on (ON command).	
03	0 = Inhibit operation		Immediately switch off motor (cancel pulses).	
	1 = Enable operation		Switch on motor (pulses can be enabled).	
04	0 = Inhibit RFG		The converter immediately sets its ramp-function generator output to 0.	
	1 = Do not inhibit RFG		The ramp-function generator can be enabled.	
05	0 = Stop RFG		The output of the ramp-function generator stops at the current value.	
	1 = Enable RFG		The output of the ramp-function generator follows the setpoint.	
06	0 = Inhibit setpoint		The converter brakes the motor with the ramp-down time p1121 of the ramp-function generator.	
	1 = Enable setpoint		Motor accelerates to the setpoint with the ramp-up time p1120.	
07	0 → 1 = Acknowledge faults		Acknowledge fault. If the ON command is still active, the converter switches to the "switching on inhibited" state.	
08	Reserved			

Control word 1 (STW1)				
Control → Converter				
Bit	**Drive function**		**Explanation**	
	Telegrams 102, 105	**Telegrams 1, 2, 3, 5**	**Telegrams 102, 105**	**Telegrams 1, 2, 3, 5**
09	Reserved			
10	0 = No control by PLC		Converter ignores the process data from the fieldbus.	
	1 = Control via PLC		Control via fieldbus, converter accepts the process data from the fieldbus.	
11	Reserved			
12	1 = Open holding brake	Reserved	Unconditionally open motor holding brake	--
13	Reserved			
14	1 = Torque control active 0 = Closed-loop speed control active	Reserved	Switch-over from speed to torque control	--
15	Reserved			

Status word 1 (ZSW1)				
Converter → Control				
Bit	**Status**		**Explanation**	
	Telegrams 102, 105	**Telegrams 1, 2, 3, 5**	**Telegrams 102, 105**	**Telegrams 1, 2, 3, 5**
00	1 = Ready for switching on		Power supply switched on; electronics initialized; pulses inhibited.	
01	1 = Ready for operation		Motor is switched on (ON/OFF1 = 1), no fault is active. With the command "Enable operation" (STW1.3), the converter switches on the motor.	
02	1 = Operation enabled		Motor follows setpoint. See control word 1, bit 3.	
03	1 = Fault present		The converter has a fault. Acknowledge fault using STW1.7.	
04	1 = OFF2 inactive		Coast down to standstill is not active.	
05	1 = OFF3 inactive		Quick stop is not active.	
06	1 = "Switching on inhibited" active		It is only possible to switch on the motor after an OFF1 followed by ON.	
07	1 = Alarm active		Motor remains switched on; no acknowledgement is necessary.	
08	1 = Speed deviation within the tolerance range		Setpoint / actual value deviation within the tolerance range.	
09	1 = Control requested		The automation system has been requested to take over control of the converter.	
10	1 = Comparison speed reached or exceeded		Speed is greater than or equal to the corresponding maximum speed.	

Status word 1 (ZSW1)				
Converter → Control				
Bit	**Status**		**Explanation**	
	Telegrams 102, 105	**Telegrams 1, 2, 3, 5**	**Telegrams 102, 105**	**Telegrams 1, 2, 3, 5**
11	1 = Alarm class bit 0	1 = Torque limit reached	Internal diagnostics for automation systems with integrated SINAMICS functionality	Comparison value for current or torque has been reached or exceeded.
12	1 = Alarm class bit 1	1 = Holding brake open		Signal to open and close a motor holding brake.
13	Reserved	0 = Alarm, motor overtemperature	--	Motor temperature alarm threshold reached
14	1 = Torque control active	1 = Motor rotates clockwise	Switched over from speed to torque control	Internal converter actual value > 0.
		0 = Motor rotates counter-clockwise		Internal converter actual value < 0.
15	Reserved	0 = Alarm, converter thermal overload	--	Converter temperature alarm threshold reached

For position control (telegrams 7, 9, 111, 112, 113)

Note

STW1.10 must be set to 1 to allow the PLC to control the converter.

Control word 1 (STW1)		
Control → Converter		
Bit	**Drive function**	**Explanation**
00	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The converter switches off the motor at standstill.
	0 → 1 = ON	The converter goes into the "ready" state. If, in addition, bit 3 = 1, the converter switches on the motor.
01	0 = OFF2	Switch off the motor immediately, the motor then coasts down to a standstill.
	1 = No OFF2	The motor can be switched on (ON command).
02	0 = Quick stop (OFF3)	Quick stop: The motor brakes to a standstill with the OFF3 ramp-down time p1135.
	1 = No quick stop (OFF3)	The motor can be switched on (ON command).
03	0 = Inhibit operation	Immediately switch off motor (cancel pulses).
	1 = Enable operation	Switch on motor (pulses can be enabled).
04	0 = Reject a traversing task	The converter rejects a traversing task. The motor brakes with the maximum deceleration rate.
	1 = Do not reject a traversing task	The converter accepts a traversing task.
05	0 = Intermediate stop	The converter stops performing the traversing task.
	1 = No intermediate stop	The converter continues to perform the traversing task.

Control word 1 (STW1)		
Control → Converter		
Bit	**Drive function**	**Explanation**
06	0 → 1 = Activate traversing task	The traversing task is activated.
07	0 → 1 = Acknowledge faults	Acknowledge fault. If the ON command is still active, the converter switches to the "switching on inhibited" state.
08	1 = Jog 1 signal source	Jog 1 is activated.
09	1 = Jog 2 signal source	Jog 2 is activated.
10	0 = No control by PLC	Converter ignores the process data from the fieldbus.
	1 = Control via PLC	Control via fieldbus, converter accepts the process data from the fieldbus.
11	1 = Start homing	The converter starts homing.
	0 = Stop homing	The converter stops homing.
12	Reserved	
13	0 → 1 = External block change	The external block is changed.
14	Reserved	
15	Reserved	

Status word 1 (ZSW1)			
Converter → Control			
Bit	**Status**		**Explanation**
	Telegrams 7, 9	**Telegrams 111, 112, 113**	
00	1 = Ready for switching on		Power supply switched on; electronics initialized; pulses inhibited.
01	1 = Ready for operation		Motor is switched on (ON/OFF1 = 1), no fault is active. With the command "Enable operation" (STW1.3), the converter switches on the motor.
02	1 = Operation enabled		Motor follows setpoint. See control word 1, bit 3.
03	1 = Fault present		The converter has a fault. Acknowledge fault using STW1.7.
04	1 = OFF2 inactive		Coast down to standstill is not active.
05	1 = OFF3 inactive		Quick stop is not active.
06	1 = "Switching on inhibited" active		It is only possible to switch on the motor after an OFF1 followed by ON.
07	1 = Alarm present		Motor remains switched on; no acknowledgement is necessary.
08	1 = Following error in tolerance		The actual difference between the actual position and the position setpoint is within the permissible tolerance p2546.
09	1 = Control requested		The automation system has been requested to take over control of the converter.
10	1 = Target position reached		The axis has reached the target position.
11	1 = Home position set		---

Status word 1 (ZSW1)			
Converter → Control			
Bit	**Status**		**Explanation**
	Telegrams 7, 9	**Telegrams 111, 112, 113**	
12	0 → 1 = Acknowledgement, traversing block active		---
13	1 = Setpoint fixed		---
14	Reserved	1 = Axis accelerated	---
15	Reserved	1 = Axis decelerated	---

10.4.7.2 Control and status word 2

Overview

Control word 2 (STW2) activates the converter drive functions.

Status word 2 (ZSW2) signals the status of the converter to the higher-level control.

Description of function

Control word 2 (STW2)		
Control → Converter		
Bit	**Drive function**	
	Telegrams 102, 105	**Telegrams 2, 3, 5, 9, 111, 112, 113**
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	Reserved	
06	1 = Speed controller integrator disable	Reserved
07	Reserved	
08	1 = Travel to fixed stop	
09	Reserved	
10	Reserved	
11	Reserved	
12	Controller sign-of-life bit 0	
13	Controller sign-of-life bit 1	
14	Controller sign-of-life bit 2	
15	Controller sign-of-life bit 3	

Status word 2 (ZSW2)		
Converter → Control		
Bit	**Status**	
	Telegrams 102, 105	**Telegrams 2, 3, 5, 9, 111, 112, 113**
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	1 = Open holding brake	1 = Alarm class bit 0
06	1 = Speed controller integrator disable	1 = Alarm class bit 1
07	Reserved	
08	1 = Travel to fixed stop active	

Status word 2 (ZSW2)		
Converter → Control		
Bit	**Status**	
	Telegrams 102, 105	**Telegrams 2, 3, 5, 9, 111, 112, 113**
09	Reserved	
10	Reserved	1 = Pulses enabled
11	Reserved	
12	Device sign-of-life bit 0	
13	Device sign-of-life bit 1	
14	Device sign-of-life bit 2	
15	Device sign-of-life bit 3	

10.4.7.3 Control and status word for encoder 1

Overview

The encoder control word (G1_STW) activates encoder functions.

The encoder status word (G1_ZSW) signals the status of the encoder to the higher-level control.

Description of function

Control word 1 (G1_STW)		Status word 1 (G1_ZSW)	
Control → Converter		Converter → Control	
Bit	**Encoder function**	**Bit**	**Encoder status**
00	Request function 1	00	Function 1 active
01	Request function 2	01	Function 2 active
02	Request function 3	02	Function 3 active
03	Request function 4	03	Function 4 active
04	Request command bit 0	04	Value 1
05	Request command bit 1	05	Value 2
06	Request command bit 2	06	Value 3
07	Mode	07	Value 4
08	Reserved	08	Measuring probe 1 deflected
09	Reserved	09	Measuring probe 2 deflected
10	Reserved	10	Reserved
11	Reserved	11	Acknowledge encoder fault active
12	Reserved	12	Reserved
13	Request absolute value cyclically	13	Cyclic absolute value
14	Request parking encoder	14	Parking encoder active
15	Acknowledge encoder fault	15	Encoder fault

10.4.7.4 Control word for block selection

Overview

The block selection control word (SATZANW) activates the traversing block selection functions.

Description of function

Bit	Function
0	1 = Traversing block selection, bit 0
1	1 = Traversing block selection, bit 1
2	1 = Traversing block selection, bit 2
3	1 = Traversing block selection, bit 3
4	1 = Traversing block selection, bit 4
5	1 = Traversing block selection, bit 5
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	1 = Activate MDI 0 = Deactivate MDI

10.4.7.5 Control word for MDI mode

Overview

The MDI mode control word (MDI_MOD) activates the positioning type selection.

Description of function

Bit	Function
0	1 = Absolute positioning is selected 0 = Relative positioning is selected
1	00, 11 = Absolute positioning for a rotary axis through the shortest distance
2	01 = Absolute positioning for rotary axes in the positive direction 10 = Absolute positioning for rotary axes in the negative direction
3	Reserved
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

10.4.7.6 Control and status word 1 for the positioner

Overview

Positioning control word 1 (POS_STW1) activates the converter drive functions.

Positioning status word 1 (POS_ZSW1) signals the status of the converter to the higher-level control.

Description of function

Positioning control word 1 (POS_STW1)	
Control → Converter	
Bit	**Function**
0	1 = Traversing block selection, bit 0
1	1 = Traversing block selection, bit 1
2	1 = Traversing block selection, bit 2
3	1 = Traversing block selection, bit 3
4	1 = Traversing block selection, bit 4
5	1 = Traversing block selection, bit 5
6	Reserved
7	1 = Unconditionally open the holding brake
8	1 = Absolute positioning is selected 0 = Relative positioning is selected
9	00, 11 = Absolute positioning for a rotary axis through the shortest distance
10	01 = Absolute positioning for rotary axes in the positive direction 10 = Absolute positioning for rotary axes in the negative direction
11	Reserved
12	1 = Continuous transfer 0 = Activate MDI block change with of a traversing task (STW1.6)
13	Reserved
14	1 = Signal setting-up selected 0 = Signal positioning selected
15	1 = MDI selection

Positioning status word 1 (POS_ZSW1)	
Converter → Control	
Bit	**Status**
0	Active traversing block bit 0
1	Active traversing block bit 1
2	Active traversing block bit 2
3	Active traversing block bit 3
4	Active traversing block bit 4
5	Active traversing block bit 5

Positioning status word 1 (POS_ZSW1)	
Converter → Control	
Bit	**Status**
6	Reserved
7	1 = Open the holding brake
8	1 = Negative hardware limit switch active
9	1 = Positive hardware limit switch active
10	1 = Jogging active
11	1 = Home position approach active
12	1 = Passive homing active
13	1 = Traversing block active
14	1 = Set-up active
15	1 = MDI active 0 = MDI inactive

10.4.7.7 Control and status word 2 for the positioner

Overview

Positioning control word 2 (POS_STW2) activates the converter drive functions.

Positioning status word 2 (POS_ZSW2) signals the status of the converter to the higher-level control.

Description of function

Positioning control word 2 (POS_STW2)		
Control → Converter		
Bit	**Function**	
	Telegram 112, 113	**Telegram 111**
0	1 = Tracking mode active	
1	1 = Set home position	
2	1 = Reference cam active	
3	1 = Initiate absolute encoder adjustment	Reserved
4	Reserved	
5	1 = Jogging, incremental active 0 = Jogging, velocity active	
6	Reserved	
7	Reserved	
8	1 = Select homing using passive homing 0 = Select homing via the home position approach	
9	1 = Start the search for homing in the negative direction 0 = Start the search for homing in the positive direction	
10	1 = Select measuring probe 2 0 = Select measuring probe 1	
11	1 = Falling edge of the measuring probe 0 = Rising edge of the measuring probe	
12	Reserved	
13	Reserved	
14	1 = Software limit switch active	
15	1 = Hardware limit switch active	

Positioning status word 2 (POS_ZSW2)		
Converter → Control		
Bit	**Status**	
	Telegram 112, 113	**Telegram 111**
0	1 = Tracking mode active	
1	1 = Velocity limiting active	
2	1 = Set position reached	1 = Setpoint fixed

Positioning status word 2 (POS_ZSW2)		
Converter → Control		
Bit	**Status**	
	Telegram 112, 113	**Telegram 111**
3	1 = Printing mark outside outer window	
4	1 = Axis moves forward	
5	1 = Axis moves backwards	
6	1 = Negative software limit switch reached	
7	1 = Positive software limit switch reached	
8	1 = Position actual value ≤ cam switching position 1	
9	1 = Position actual value ≤ cam switching position 2	
10	1 = Direct output 1 via traversing block	
11	1 = Direct output 2 via traversing block	
12	1 = Fixed stop reached	
13	1 = Fixed stop clamping torque reached	
14	1 = Travel to fixed stop active	
15	1 = Traversing command active	

10.4.7.8 Message word

Overview

The message word (MELDW) signals the status of the converter to the higher-level control.

Description of function

Message word (MELDW)	
Converter → Control	
Bit	**Status**
00	Reserved
01	Torque utilization < threshold 2
02	|n_actual| < speed threshold 3
03	|n_actual| < speed threshold 2
04	Reserved
05	Reserved
06	No warning motor overtemperature
07	No warning converter overtemperature
08	n-target/actual deviation within tolerance
09	Reserved
10	Reserved
11	Servo enable
12	Drive ready
13	"Pulses enabled"
14	Reserved
15	Reserved

10.5 General functions

10.5.1 Stopping method at servo-off

Overview

You can select a stopping method when the converter is in "servo-off" state. The following stopping methods are available:

- Ramp-down (OFF1)
- Coast-down (OFF2)
- Quick stop (OFF3)

Description of function

Ramp-down (OFF1) and coast-down (OFF2)

The ramp-down and coast-down can be configured with the PROFINET control words STW1.0 and STW1.1:

- **Ramp-down (OFF1)**

Control word	Setting	Description
STW1.0	Rising edge (0 → 1)	Power circuit is powered on and the servo motor is ready to run.
	0	Motor ramps down.

Note

The control word STW1.0 can be used to control the start and stop of the motor.

- **Coast-down (OFF2)**

Control word	Setting	Description
STW1.1	1	The servo motor is ready to run.
	0	Motor coasts down.

Quick stop (OFF3)

The quick stop can be configured with the PROFINET control word STW1.2 or the digital input signal EMGS:

- **Configuring with STW1.2**

Control word	Setting	Description
STW1.2	1	The servo motor is ready to run.
	0	Quick stop.

- **Configuring with EMGS**

DI signal	Setting	Description
EMGS	1	The servo motor is ready to run.
	0	Quick stop.

More information

For more information about the PROFINET control word and the digital input signal EMGS, see Sections "Control words, status words and message word (Page 321)" and "Inputs/outputs (Page 291)".

10.5.2 Speed limit

Overview

The following four sources are available for the speed limit selection. You can select one of them via a combination of digital input signals SLIM0 and SLIM1 and switch among them when the converter is running.

Table 10-17 Combinations of SLIM0 and SLIM1 signals

Digital input		Speed limit
SLIM1	SLIM0	
0	0	Internal speed limit 0
0	1	Internal speed limit 1
1	0	Internal speed limit 2
1	1	Internal speed limit 3

In addition to the above four sources, the overall speed limit is also valid.

Note

Fault F07901 occurs when the actual speed exceeds the positive speed limit + hysteresis speed (p2162) or the negative speed limit - hysteresis speed (p2162).

Description of function

Internal speed limit

Select an internal speed limit by setting the following parameters. The default parameter value depends on the maximum motor speed.

Table 10-18 Parameter - internal speed limit

Parameter	Value range	Default	Unit	Description	Digital input	
					SLIM1	SLIM0
p29070[0]	0 ... 210000	210000	r/min	Internal speed limit 0 (positive)	0	0
p29070[1]	0 ... 210000	210000	r/min	Internal speed limit 1 (positive)	0	1
p29070[2]	0 ... 210000	210000	r/min	Internal speed limit 2 (positive)	1	0
p29070[3]	0 ... 210000	210000	r/min	Internal speed limit 3 (positive)	1	1
p29071[0]	-210000 ... 0	-210000	r/min	Internal speed limit 0 (negative)	0	0
p29071[1]	-210000 ... 0	-210000	r/min	Internal speed limit 1 (negative)	0	1
p29071[2]	-210000 ... 0	-210000	r/min	Internal speed limit 2 (negative)	1	0
p29071[3]	-210000 ... 0	-210000	r/min	Internal speed limit 3 (negative)	1	1

Overall speed limit

The overall speed limit can be configured by setting the following parameters.

Table 10-19 Parameter - overall speed limit

Parameter	Value range	Default	Unit	Description
p1083	0 ... 210000	210000	r/min	Overall speed limit for positive direction
p1086	-210000 ... 0	-210000	r/min	Overall speed limit for negative direction

Note

After the motor is commissioned, the internal speed limit is set to the default value and the overall speed limit is set to the maximum speed of the motor automatically.

Parameters

The following list includes the parameters of the "Speed limit" function.

Number	Name	Unit
p1083[0]	Speed limit in positive direction of rotation	[rpm]
p1086[0]	Speed limit in negative direction of rotation	[rpm]
p2162[0]	Hysteresis speed n_act > n_max	[rpm]
p29070[0...3]	Speed limit in positive direction of rotation	[rpm]
p29071[0...3]	Speed limit in negative direction of rotation	[rpm]

10.5.3 Torque limit

Overview

The following four sources are available for the torque limit in all control modes. You can select one of them via a combination of digital input signals TLIM0 and TLIM1 and switch among them when the converter is running.

Table 10-20 Combinations of TLIM0 and TLIM1 signals

Digital input		Torque limit
TLIM1	**TLIM0**	
0	0	Internal torque limit 0
0	1	Internal torque limit 1
1	0	Internal torque limit 2
1	1	Internal torque limit 3

In addition to the above four sources, the overall torque limit is also valid.

Note

When the motor torque exceeds the torque limit of the selected group determined by TLM0 and TLM1, fault F07900 occurs.

Description of function

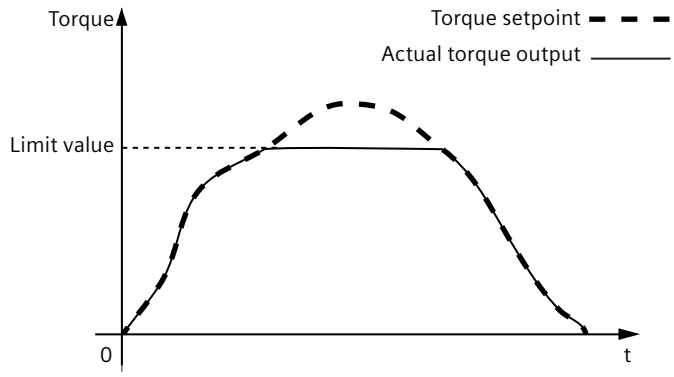
Internal torque limit

Select an internal torque limit by setting the following parameters.

Table 10-21 Parameter - internal torque limit

Parameter	Value range	Default	Unit	Description	Digital input	
					TLIM1	**TLIM0**
p29050[0]	-150 ... 350	350	%	Internal torque limit 0 (upper)	0	0
p29050[1]	-150 ... 350	350	%	Internal torque limit 1 (upper)	0	1
p29050[2]	-150 ... 350	350	%	Internal torque limit 2 (upper)	1	0
p29050[3]	-150 ... 350	350	%	Internal torque limit 3 (upper)	1	1
p29051[0]	-350 ... 150	-350	%	Internal torque limit 0 (lower)	0	0
p29051[1]	-350 ... 150	-350	%	Internal torque limit 1 (lower)	0	1
p29051[2]	-350 ... 150	-350	%	Internal torque limit 2 (lower)	1	0
p29051[3]	-350 ... 150	-350	%	Internal torque limit 3 (lower)	1	1

The following diagram shows how the internal torque limit functions. When the torque setpoint reaches the torque limit, the actual torque output is limited to the value selected by TLIM0/TLIM1.



Overall torque limit

The overall torque limit takes effect when a quick stop (OFF3) happens. In this case, the servo drive brakes with a maximum torque.

Table 10-22 Parameter - overall torque limit

Parameter	Value range	Default	Unit	Description
p1520	-1000000.00 ... 20000000.00	0	Nm	Overall torque limit (upper)
p1521	-20000000.00 ... 1000000.00	0	Nm	Overall torque limit (lower)

Torque limit reached (TLR)

When the generated torque has nearly (internal hysteresis) reached the value of the upper torque limit, lower torque limit or analog torque limit, the signal TLR is output.

Parameters

The following list includes the parameters of the "Torque limit" function.

Number	Name	Unit
p1520[0]	Torque limit upper	[Nm]
p1521[0]	Torque limit lower	[Nm]
p29050[0...3]	Upper torque limit	[%]
p29051[0...3]	Lower torque limit	[%]

10.5.4 Vertical axis

Requirement

The vertical axis function cannot be used in torque control mode.

Description of function

With a vertical axis without mechanical weight compensation, electronic weight compensation can be set by offsetting the torque limits (p1532). The torque limits specified in p1520 and p1521 are shifted by this offset value. The offset value can be read in r0031 and transferred in p1532.

To reduce compensation after a brake has been released, the torque offset can be interconnected as a supplementary torque setpoint. As a result, the holding torque is immediately specified after the brake is released.

Automatically configuring weight compensation

Siemens recommends that this function is used for vertical axes with an almost constant force due to weight. Start the automatic determination of the force due to weight using p1558 = 1. As soon as the technique has been started, the torque, which is required to hold the axis, is measured and entered into p1532. Further, interconnection between supplementary torque setpoint and p1532 is established for the precontrol, and the scaling of the precontrol channel is set to 100%.

The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If the measurement was started with the pulses inhibited, it is only executed after the pulses have been enabled. In both cases, after starting, alarm A07991 (Drive: motor data identification activated) is output. The alarm is automatically withdrawn after the motor data identification routine has been successfully completed.

If the force due to weight is not constant: To prevent the axis from dropping after the brake is released, specify the torque offset as an additional torque setpoint (M_ADD) via the supplementary telegram 750. The supplementary telegram 750 must be configured in the PLC. As a result, the holding torque is specified when the brake is released.

Parameters

The following list includes the parameters of the "Vertical axis" function.

Number	Name	Unit
r0031	Actual torque smoothed	[Nm]
p1520[0]	Torque limit upper	[Nm]
p1521[0]	Torque limit lower	[Nm]
p1532[0]	Torque limit offset	[Nm]
p1558	Measure/precontrol hanging/suspended axis force due to weight	

10.5.5 Ramp-function generator

Overview

The "ramp-function generator" function is used to limit acceleration in the event of abrupt setpoint changes and thus helps prevent load surges during drive operation.

Description of function

The ramp-up time p1120 and ramp-down time p1121 can be used to set mutually independent acceleration and deceleration ramps. This allows a controlled transition to be made in the event of setpoint changes.

The maximum speed p1082 is used as a reference value for calculating the ramps from the ramp-up and ramp-down time. For a quick stop (OFF3), a special adjustable ramp is available via the ramp-down time p1135 (for example, for quick, controlled stopping after an EMERGENCY OFF button has been pressed).

The following versions are available:

- Basic ramp-function generator (p1115 = 0)
- Extended ramp-function generator (p1115 = 1)

Basic ramp-function generator

The basic ramp-function generator is characterized by the following features:

- Ramp-up time T_{up} (p1120)
- Ramp-down time T_{dn} (p1121)

You can see the properties of the ramp-function generator from the diagram below:

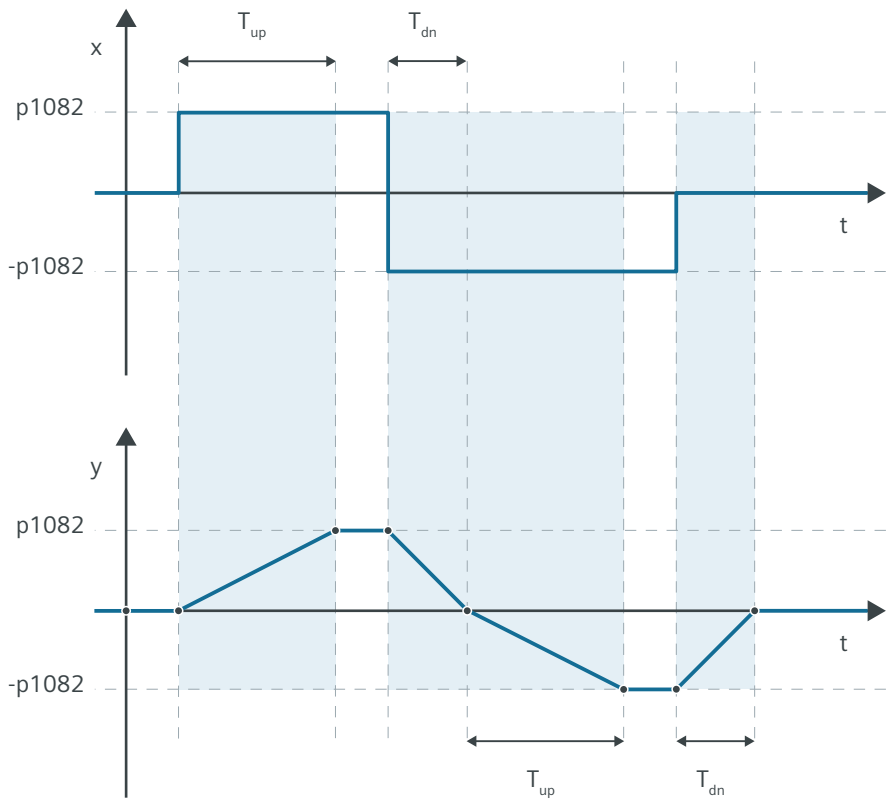


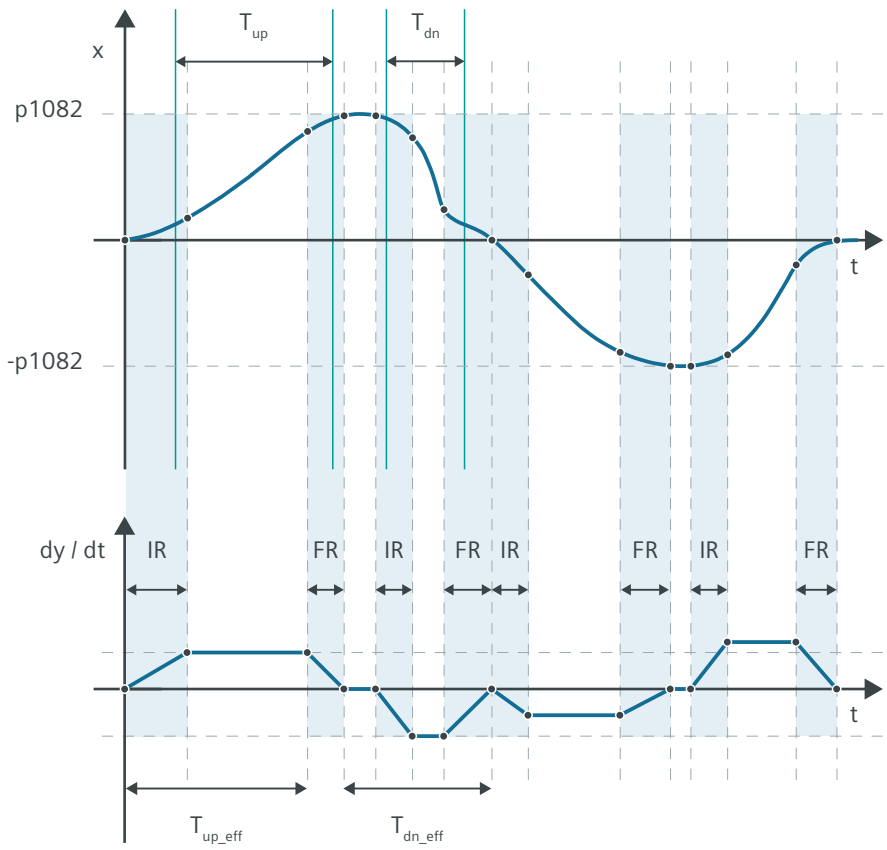
Figure 10-6 Basic ramp-function generator

Extended ramp-function generator

The extended ramp-function generator is characterized by the following features:

- Ramp-up time T_{up} (p1120)
- Ramp-down time T_{dn} (p1121)
- Initial rounding IR (p1130)
- Final rounding FR (p1131)
- Effective ramp-up time
  $T_{up_eff} = T_{up} + (IR/2 + FR/2)$
- Effective ramp-down time
  $T_{dn_eff} = T_{dn} + (IR/2 + FR/2)$

You can see the properties of the extended ramp-function generator from the diagram below:



$T_{up_eff} = T_{up} + (IR/2 + FR/2)$

$T_{dn_eff} = T_{dn} + (IR/2 + FR/2)$

Figure 10-7 Extended ramp-function generator

Parameters

The following list includes the parameters of the "Ramp-function generator" function.

Number	Name	Unit
p1082[0]	Maximum speed	[rpm]
p1115	Ramp-function generator selection	
p1120[0]	Ramp-function generator ramp-up time	[s]
p1121[0]	OFF1 ramp-down time	[s]
p1130[0]	Ramp-function generator initial rounding-off time	[s]
p1131[0]	Ramp-function generator final rounding-off time	[s]
p1135[0]	OFF3 ramp-down time	[s]

10.5.6 Setting motor overload protection in accordance with UL 61800-5-1 Ed.2

Overview

The motor overload protection function works without temperature sensors in the 1FL2 motors.

To comply with UL 61800-5-1 Ed.2, you must make some additional settings when operating the converter with a 1FL2 motor.

Requirement

- You have completed quick commissioning with the correct motor data.

Procedure

Proceed as follows to activate the motor overload protection according to UL 61800-5-1 Ed.2:

1. Set p5375.0 = 1
2. Set p5375.1 = 1

10.6 Basic positioner (EPOS)

Overview

Position control means controlling the position of an axis. An "axis" is a machine or system component that comprises the converter with active position control and the driven mechanical system.

The basic positioner (EPOS) is a positioner integrated in the converter and calculates the traversing profile for the time-optimized traversing of the axis to the target position for the position controller. With the basic positioner (EPOS), the positioning tasks can be transferred to the converter and thus relieve the higher-level control system.

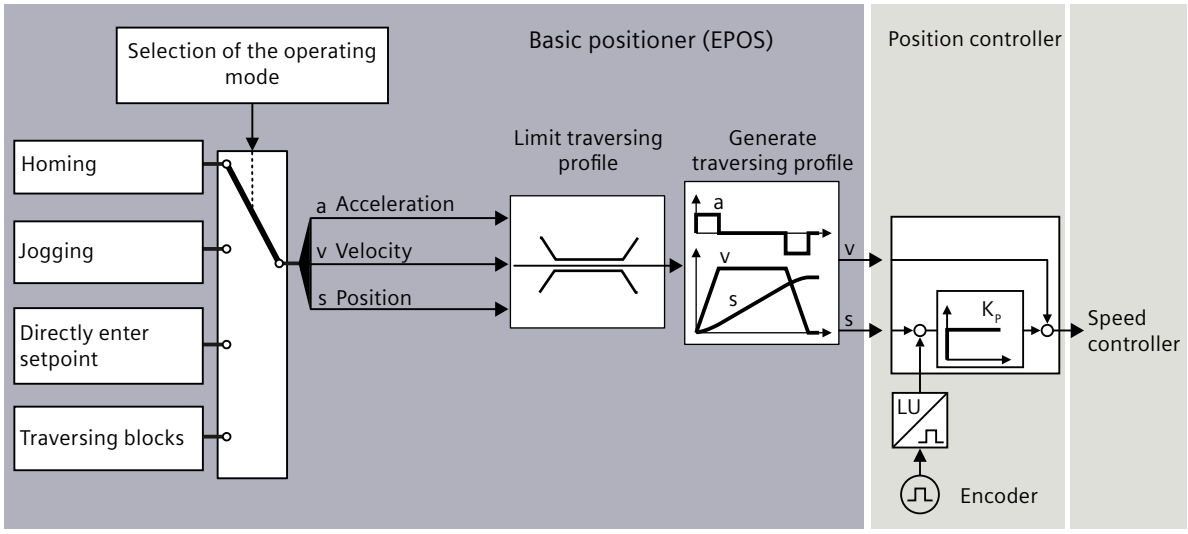


Figure 10-8 Basic positioner and position control

Description of function

The following functions can be carried out by using the basic positioner:

- **Limits**
  - Limiting the traversing range: specification of the possible traversing range through the configuration of positive and negative software limit switches, and positive and negative hardware limit switches
  - Limiting the traversing profiles: restriction of the dynamic travel response through limitation of the maximum velocity, acceleration, deceleration, and jerk
- **Monitoring**
  - Position/standstill monitoring: monitoring of the axis positioning motion and monitoring of the axis position after a traversing motion
  - Following error monitoring: monitoring of the maximum deviation between the actual value and the setpoint

- **Homing**
  Homing establishes the home position measurement in the converter to the machine. Possible homing types are:
  - Active homing
  - Passive homing
  - Absolute encoder adjustment
- **Traversing blocks**
  Position, velocity, and acceleration are saved in different traversing blocks in the converter. The external control selects a traversing block.
- **Direct setpoint input (MDI)**
  The external control specifies the setpoints (position, velocity, and acceleration) for the axis.
- **Jogging**
  This function is used to traverse the axis in jog mode.

More information

For more information about configuring the basic positioner (EPOS) in Startdrive, see the information system of the TIA Portal.

10.6.1 Mechanical system

10.6.1.1 Axis type

Overview

Axes in your actual application can be configured with different motion control applications:

- For speed control applications: flexible control of the speed and direction of rotation of rotary axes
- For positioning control applications: relative/absolute positioning of rotary or linear axes (depending on mechanics)

Description of function

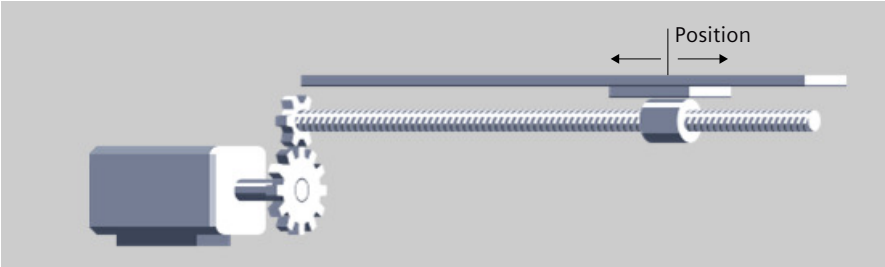
Linear axis

A linear axis is an axis whose traversing range is limited in both motor directions of rotation by the mechanical system of the machine, for example:

- Stacker crane
- Elevating platform
- Tilting station
- Gate/door drive

- Conveyor belt
- Roller conveyor

For linear axes, the position of the axis is specified as a linear measure, for example, millimeters (mm).



Rotary axis

A rotary axis is an axis with an infinite traversing range, for example:

- Rotary table

For rotary axes, the position of the axis is specified as an angular measure, for example, degrees (°).

10.6.1.2 Units of measurement

Overview

In addition to physical units, the converter also supports the length unit (LU) for positioning operation.

Description of function

- **Physical units (default setting)**
  The converter provides the physical units for position, speed, acceleration/deceleration, and jerk. You can select the desired physical units according to the actual axis type via relevant parameters during commissioning.

Axis type	Available physical units	
	Position	**Velocity**
Linear axis	km, m, **mm**, µm, nm, in, ft, mi	km/h, km/min, m/h, m/min, m/s, mm/h, mm/min, **mm/s**, in/min, in/s, ft/min, ft/s, mi/h
Rotary axis	**degree (°)**	**degree (°)/s**

Note:

Units in bold are the default units.

The acceleration is set accordingly as the position/s^2 measurement unit.

The jerk is set accordingly as the position/s^3 measurement unit.

Note

If you have moved the motor axis after servo-off, make sure that you set POS_STW2.0 to 1 before you enable servo-on; otherwise, the motor may overspeed and the fault F07452 occurs.

- **Length Unit**
  The converter calculates the position actual value of the axis using the neutral position unit LU (Length Unit). The length unit LU is independent of whether the converter controls the position of an elevating platform or the angle of rotary table.

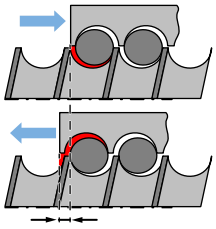
Note

If you change the axis type from linear axis to rotary axis or vice versa, the units will be set to default units automatically.

The settings you made will not be converted when changing the units.

10.6.1.3 Setting the backlash

Overview



Backlash: p2583

Backlash (also called play, dead travel on reversing) is the distance or the angle that a motor must travel through when the direction of rotation reverses until the axis actually moves in the other direction.

Description of function

Backlash measurement

Proceed as follows to measure the backlash:

1. Move the axis to position A in the machine. Mark this position in the machine and note down the actual position value in the converter.
2. Move the axis a little bit more in the same direction.
3. Move the axis in the opposite direction until the actual position value in the converter shows the same value as at position A. Due to the backlash when reversing, the axis is now at position B.
4. Measure the position difference Δ = A - B in the machine.

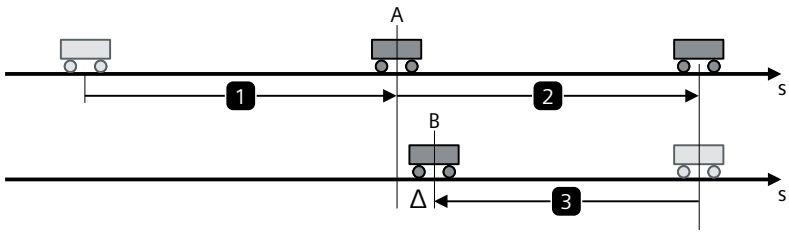


Figure 10-9 Measuring backlash

Backlash compensation

When mechanical force is transferred between a machine part and its drive, generally backlash occurs. If the mechanical system was to be adjusted/designed so that there was absolutely no backlash, this would result in high wear. Thus, backlash can occur between the machine component and the encoder.

When the axis with the motor encoder is operated in a process that the traversing direction is reversed, the mechanical backlash can increase or decrease the traversing distance and thus result in an error of the traversing distance.

Note

Precondition for backlash compensation

The backlash compensation is active with the precondition that the axis has been homed.

In order to compensate the backlash, the determined backlash must be specified in p2583 with the correct polarity. At each direction of rotation reversal, the actual axis value is corrected dependent on the actual traversing direction and displayed in r2667. This value is taken into account in the actual position value using p2516 (position offset).

If a stationary axis is homed by setting the home position or an adjusted axis is powered-up with an absolute encoder, then the parameter c2604 (home position approach, starting direction) is relevant for switching-in the compensation value.

10.6.1.4 Load gear position tracking

Overview

Position tracking enables the load position to be reproduced when using gearboxes. It can also be used to extend the position range.

Requirement

- Using an absolute encoder

Description of function

Position tracking of the load gear is activated via parameter p2720.0 = 1 and is only relevant for a motor encoder. The load gear ratio is entered via parameters p2504 and p2505. Position tracking can be activated with rotary axes (modulo) and linear axes.

Position tracking for the load gear can only be activated once for each motor data set MDS.

The load actual position value in r2723 (must be requested via G1_STW.13) comprises the following information:

- Encoder pulses per revolution (p0408)
- Fine resolution per revolution (p0419)
- Virtual number of stored revolutions of a rotary absolute encoder (p2721)
- Load gear ratio (p2504/p2505)

Note

The sum of p0408, p0419 and p2721 is limited to 32 bits.

Features

- Configuration of p2720
- Virtual multiturn via p2721
- Tolerance window for monitoring the position at switching on p2722
- Input of the load gear via p2504 and p2505
- Display via r2723

Commissioning the function

You can commission the load gearbox via parameter p2720 as follows:

- p2720.0: Activation of position tracking
- p2720.2: Reset position
  The position values stored in a non-volatile fashion are reset for the following events:
  - When encoder replacement is detected.
  - When the configuration of the encoder data set (EDS) is modified.
  - When the absolute encoder is adjusted again.

Note

If position tracking of the load gear is activated with parameter p2720[0] = 1 (position gear load tracking) after the encoder is adjusted (p2507 = 3), the adjustment will be reset.

If the encoder is adjusted again when load position tracking is active, the load gear position will be reset (overflows).

The permissible position tracking range is mapped on the reproducible encoder range of EPOS.

It is possible to activate position tracking for several DDS.

Virtual multiturn (p2721)

The virtual multiturn resolution is used to set the number of resolvable load rotations for an absolute encoder with activated position tracking.

With activated position tracking (p2720.0 = 1), parameter p2721 is preset with p0421 and can be changed.

Note

If the gear ratio is not equal to 1, then p2721 always refers to the load side. The virtual resolution, which is required for the load, is then set here.

Example: Single-turn encoder

The value for p2721 is preset to 1. However, parameter p2721 can be altered subsequently, e.g. the user can program p2721 = 5. As a result, the encoder evaluation initiates five load rotations before the same absolute value is achieved again.

Example: Multiturn encoder

The value for p2721 is set to 4096 for an encoder with p0421 = 4096. If, as a result of extension of the multiturn information, the displayable area of r2723 (32 bits) is exceeded, the fine resolution (p0419) must be reduced accordingly.

Tolerance window (p2722)

After switching on, the difference between the stored position and the current position is determined and initiated depending on the following:

Difference within the tolerance window -> the position is reproduced based on the current actual encoder value.

Difference outside the tolerance window -> an appropriate fault (F07449) is output.

Note

When the fault F07449 occurs, click the reset button in Startdrive to reset the position tracking first and then acknowledge the fault.

The tolerance window is preset to quarter of the encoder range and can be changed.

Note

The position can only be reproduced if, in the powered-down state, the encoder was moved through less than half of the range that it can represent. For the standard encoder, this is 2048 revolutions or half a revolution for single-turn encoders.

Note

The ratio stamped on the gear rating plate is often just a rounded-off value (e.g. 1:7.34). If, for a rotary axis, it is not permissible to have any long-term drift, then the actual ratio of the gearbox teeth must be requested from the gearbox manufacturer.

Example

Position range extension

With absolute encoders without position tracking, it must be ensured that the traversing range around 0 is less than half the encoder range, because beyond this range, no unique reference remains after switching on and off (see description on parameter p2507). This traversing range can be extended using the virtual multiturn (p2721).

The following diagram illustrates an absolute encoder that can represent eight encoder revolutions (p0421 = 8).

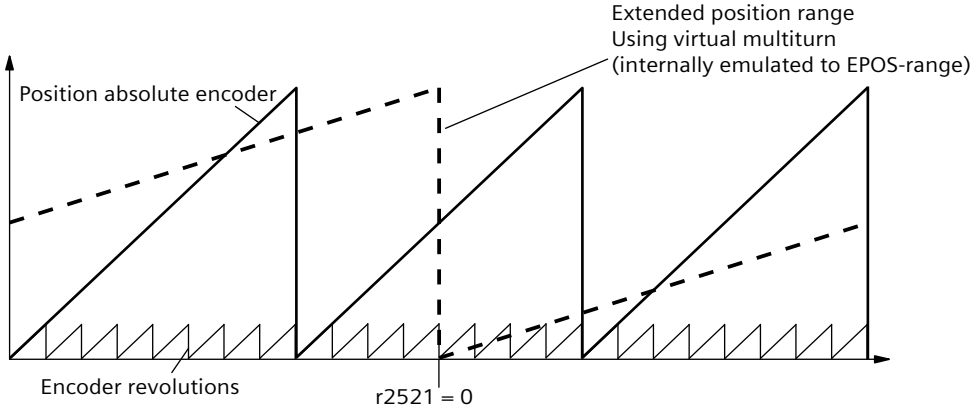


Figure 10-10 Position tracking (p2721 = 24), setting p2504 = p2505 =1 (gear ratio = 1)

In this example, this means:

- Without position tracking, the position for +/- 4 encoder revolutions around r2521 = 0 LU can be reproduced.
- With position tracking, the position for +/- 12 encoder revolutions (+/- 12 load revolutions with load gear) can be reproduced (p2721 = 24).

10.6.2 Limits

10.6.2.1 Limiting the traversing range

Overview

The traversing range of a linear axis can be limited using either the software limit switch or the hardware limit switch.

Requirement

NOTICE
Damage to the machine when passing a hardware limit switch The machine can be damaged when a hardware limit switch is passed. • Monitor axis motion, and manually stop the axis in time, e.g. by issuing an EMERGENCY STOP.

The traversing range limiting by using hardware limit switch is only active when the hardware limit switches are activated (c2568 = 1).

The traversing range limiting by using software limit switch is only active when the following preconditions are met:

- The software limit switches are activated (c2582 = 1).
- The home position is set (r2684.11 = 1).
- The modulo correction is not active (c2577 = 0).

Description of function

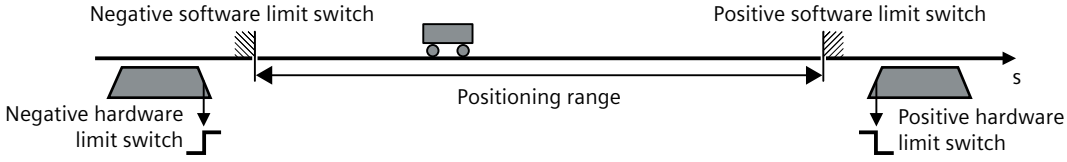


Figure 10-11 Software and hardware limit switches

If the position setpoint is beyond a software limit switch, the motor stops according to the travel profile before the software limit switch. During the braking process, the converter signals the warning A07479 or A07480.

Activated hardware limit switches are evaluated on the converter using c2569 (negative hardware limit switch) and c2570 (positive hardware limit switch) and they are low active. When triggering the hardware limit switch, the converter brakes the axis with the OFF3 ramp-down time, switches the motor off and outputs fault F07491 or F07492. After the fault is acknowledged, the motor is switched on again. In order to bring the axis back into the valid traversing range, you must move the axis away from the hardware limit switch, for example, by using the jogging function.

10.6.2.2 Limiting the traversing profiles

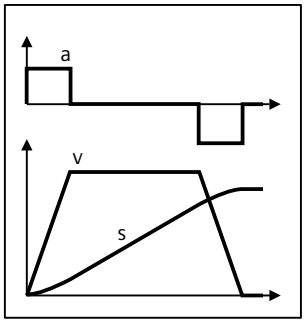
Overview

The traversing profile is the acceleration, velocity and position characteristics of an axis when being positioned. You can influence the traversing profile by limiting the velocity, the acceleration, or the jerk (= change of the acceleration over time).

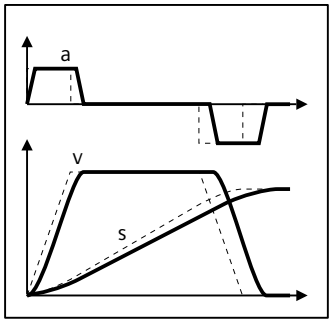
Description of function

If the axis must traverse more slowly or must accelerate at a lower rate or "softly", then you must set the relevant limits to lower values. The lower that one of the limits is, the longer the converter needs to position the axis.

- **Without jerk limitation**



- **With jerk limitation**



Jerk limitation is not active when messages are generated with stop responses OFF1/OFF2/OFF3.

In the event of a fault with stop response OFF1, the motor brakes with the OFF1 ramp-down time p1121. The acceleration in the event of a fault can therefore be greater than the acceleration in positioning. In order to comply with the mechanical boundary conditions even in the event of a fault, we recommend that the OFF1 ramp-down time p1121 is not related to the maximum speed p1082, but to the maximum positioning speed.

10.6.3 Position monitoring

The converter supports the following position monitoring functions:

- Standstill and positioning monitoring
- Following error monitoring

10.6.3.1 Positioning and standstill monitoring

Overview

Positioning and standstill monitoring is used to monitor the axis positioning motion and the axis position after a traversing motion.

Description of function

As soon as the setpoint for the position within a positioning operation no longer changes, then the converter sets the "Setpoint stationary" signal to 1. With this signal, the converter starts to monitor the position actual value:

- As soon as the axis has reached the positioning window, the converter signals that the target has been reached, and maintains the axis in closed-loop control.
- If the axis does not come to a standstill within the standstill monitoring time, the converter reports fault F07450.
- If the axis does not enter the positioning window within the positioning monitoring time, the converter reports fault F07451.

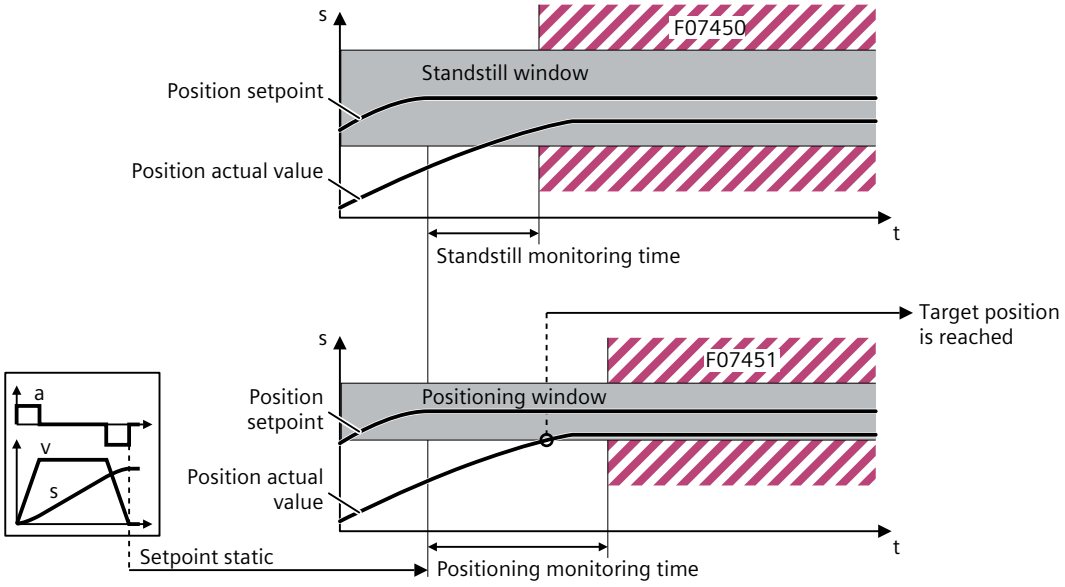


Figure 10-12 Standstill monitoring and positioning monitoring

10.6.3.2 Following error monitoring

Overview

Following error monitoring is used to monitor the maximum deviation between the actual value and the position setpoint.

Description of function

The following error is the deviation between the position setpoint and the position actual value while the converter is positioning the axis. The converter reports fault F07452 if the following error is too high. If you set the tolerance to 0, monitoring is deactivated.

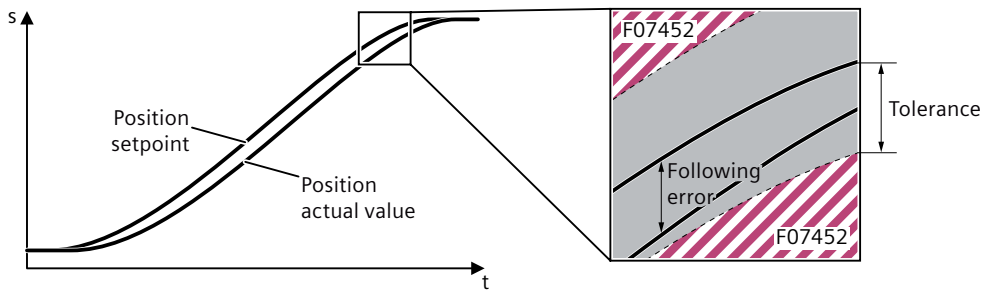


Figure 10-13 Following error monitoring

10.6.4 Homing

Overview

Homing establishes the reference between the coordinate origin of the drive axis and the machine zero point. Homing is a requirement for display of the correct position for the technology object and for absolute positioning.

Absolute encoders retain their position information, even after the supply has been switched off.

The converter offers various ways of homing the axis:

- Active homing - with all encoder types
- Passive homing - with all encoder types
- Absolute encoder adjustment - with absolute encoders

Description of function

Homing can occur by means of an independent homing motion (active homing), the detection of a homing mark during a motion initiated (passive homing) or a direct position assignment.

- **Active homing**
  The converter automatically traverses the axis to a defined home position.
- **Passive homing**
  The converter corrects its position actual value while traversing (homing during traversing).
- **Absolute encoder adjustment**
  The converter takes the reference point coordinate as the new axis position.

10.6.4.1 Terms for homing

Overview

After switching on the machine, the reference between the coordinate origin of the drive axis and the machine zero point must be established for positioning. This progress is called homing. The following terms are relevant to the homing.

Description

Homing mark

A homing mark is an input signal, on whose occurrence a known mechanical position can be assigned to the actual values.

A homing mark can be the zero mark of an encoder or an external zero mark via digital input.

Reference cam

If there are several zero marks in the traversing range, the reference cam is used to select a specific zero mark before or after the reference cam.

The reference cam is evaluated with the settings of the telegrams 111, 112 and 113 via the higher-level control system. Alternatively, there is also the possibility to evaluate the reference cam via a digital input of the converter. For this purpose, a digital input must be parameterized as the reference cam selection 2 (p11550 = 1).

Homing mark position

This is the position assigned to the homing mark.

With active homing, the homing mark position corresponds to the home position minus home position offset.

With passive homing, the homing mark position corresponds to the home position.

Reversing cam

A reversing cam causes the converter to change the search direction when referencing. After reaching a reversing cam, the converter continues to search for the reference cam in the opposite direction.

Home position

At the end of the active homing motion, the axis arrives at the home position.

Home position offset

The difference between the home position and the homing mark position is the home position offset.

Approach velocity

Up to three parameterizable approach velocities are available:

- to the reference cam
- to the zero mark
- to the home position

10.6.4.2 Active homing

Overview

Three homing modes are available for active homing:

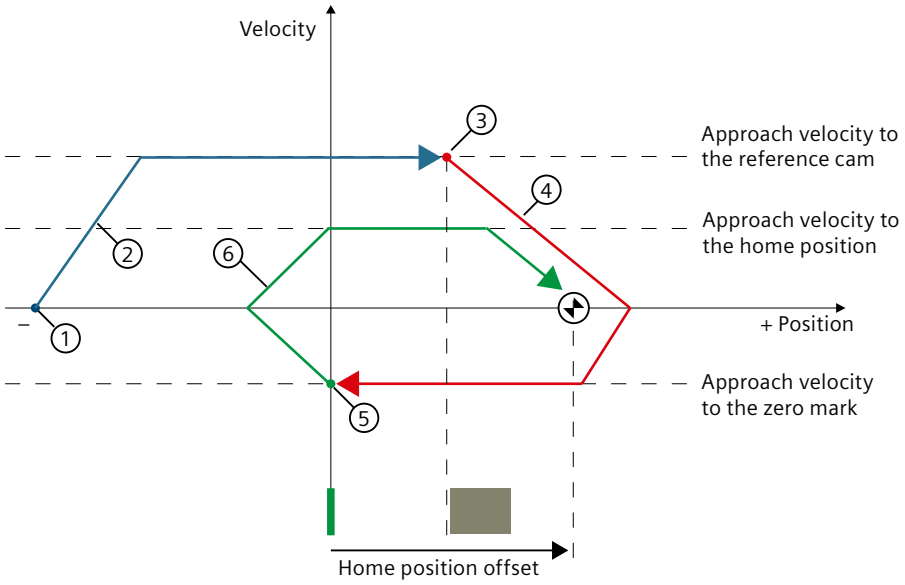
- Use encoder zero mark and reference cam
- Use encoder zero mark
- Use external zero mark via digital input

Description of function

Active homing by using encoder zero mark and reference cam

The following figure shows an example of the homing motion with the following settings:

- Active homing with reference cam and encoder zero mark
- Homing in the positive direction
- Positive home position offset



Home position

Encoder zero mark (Homing mark)

Reference cam

Motion sequence

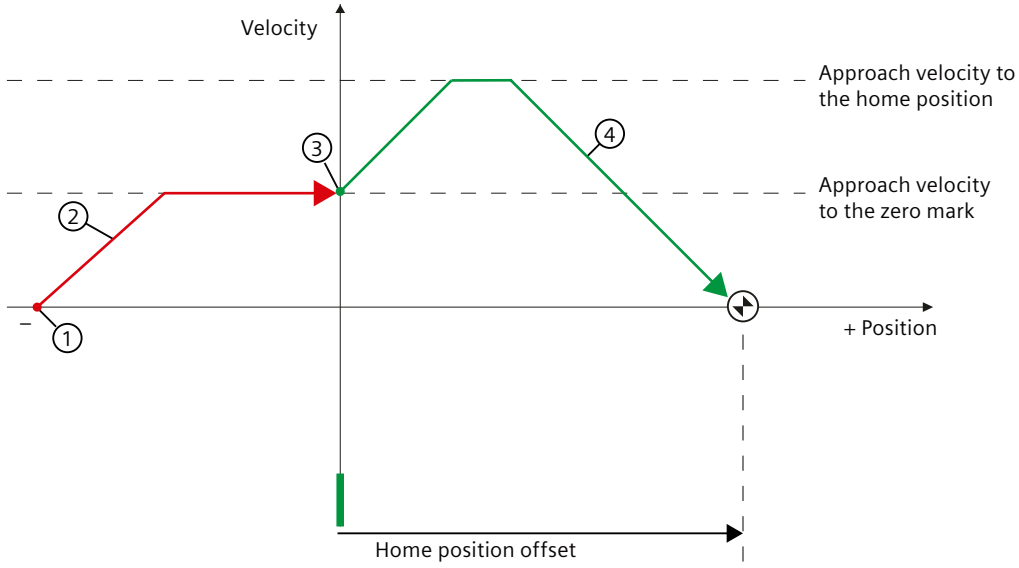
1. Start of active homing
2. Approach to the reference cam in approach direction with the corresponding approach velocity
3. Enable detection of the reference cam and homing mark detection
4. Approach to the homing mark with the corresponding approach velocity
5. Detection of the homing mark
6. Approach to the home position with the corresponding approach velocity

Figure 10-14 Example: active homing in positive direction by using encoder zero mark and reference cam

Active homing by using encoder zero mark

The following figure shows an example of the homing motion with the following settings:

- Active homing with encoder zero mark
- Homing in the positive direction
- Positive home position offset



Home position

Encoder zero mark (Homing mark)

Motion sequence

1. Start of active homing
2. Approach to the homing mark in the homing direction with the corresponding approach velocity to the zero mark
3. Detection of the homing mark
4. Approach to the home position with the corresponding approach velocity to the home position

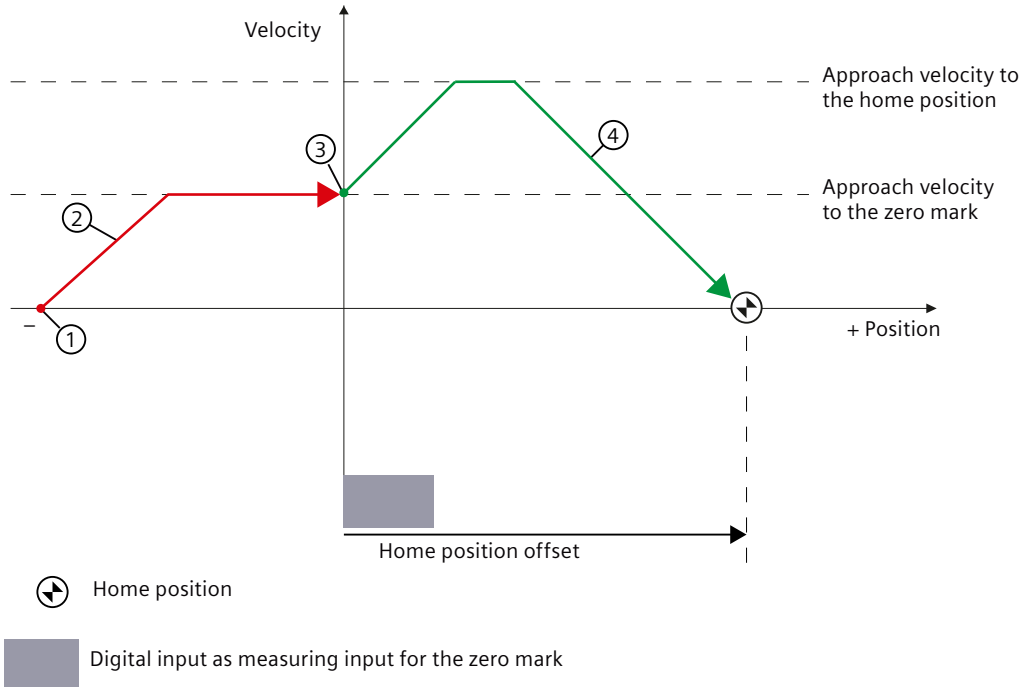
Figure 10-15 Example: active homing in positive direction by using encoder zero mark

Active homing by using external zero mark via digital input

The following figure shows an example of the homing motion with the following settings:

- Active homing with digital input
- Approach in the positive direction

- Homing mark on the negative side of the digital input
- Positive home position offset



Motion sequence

① Start of active homing

② Approach to the homing mark in the homing direction with the corresponding approach velocity to the zero mark

③ Detection of the homing mark via digital input

④ Approach to the home position with the corresponding approach velocity to the home position

Figure 10-16 Example: active homing in positive direction by using external zero mark via digital input

Reversing cam

If a signal of c2613 (EPOS active homing negative reversing cam) or c2614 (EPOS active homing positive reversing cam) is detected during active homing, the search direction is reversed.

If the negative reversing cam is approached in the positive traversing direction, or the positive reversing cam is approached in the negative traversing direction, fault F07499 (EPOS: Reversing cam approached with the incorrect traversing direction) is output. In this case, the wiring of the reversing cam (c2613, c2614) or the traversing direction to approach the reversing cam must be checked.

The reversing cams are low active. If both reversing cams are active (c2613 = 0 and c2614 = 0), the axis remains at a standstill. As soon as the reference cam is found, synchronization to the zero mark is immediately started.

10.6.4.3 Passive homing

Overview

Passive homing is used to dynamically modify the current position value to zero when the axis is working in any positioning state. The function can be used in every mode (jog, traversing block, direct setpoint specification for positioning / setup) and is superimposed over the active operating mode.

Description of function

Note

The "Passive homing" function is superimposed on an active operating mode, it is therefore not an active mode. In contrast to the home position approach, the function can be carried out superimposed by the machine process.

As standard, for passive homing, measuring probe evaluation is used; when enabled, the measuring probe is selected and the measuring probe edge evaluation is active. (In the default settings, measuring probe 1 is always the measuring probe and the measuring probe evaluation is always the 0/1 edge.)

10.6.4.4 Absolute encoder for adjustment

Overview

The function is only available when using a motor with the absolute encoder. When commissioning the absolute encoder for the first time, a mechanical axis position is aligned with the encoder absolute position and then the system is synchronized.

After the drive has been switched off, the encoder position information is retained. This means that the axis does not have to be readjusted when the drive powers up.

Note

The 1FL1 motors with multiturn absolute encoder retain the position information using the battery power after the drive has been switched off. For more information, see Section "Using the multiturn encoder with battery on the 1FL1 motor (Page 596)".

Description of function

Absolute encoder adjustment (via telegram 112 or 113)

Requirement

The absolute encoders must be adjusted the first time that they are commissioned.

For the absolute encoder adjustment, the machine axis must be moved to the desired position first. This can be done as follows:

- In jog mode or manually.
  A position marking, a fixed stop, or the measuring distance between the axis and the fixed home position can be used as a reference. Once the desired position of the axis is reached, the absolute encoder adjustment can be performed. You must save the settings in the device permanently.
- With the active homing.
  You must select the option during configuration of the active homing.

When using the telegram 112 or 113, the absolute encoder adjustment can be initiated via the position control word 2, bit 3 (POS_STW2.3).

Note

After being commissioned for the first time, carefully ensure that the drive train and its configuration cannot be mechanically changed or modified. When mechanical changes are made, the synchronization between the encoder actual value and the machine zero is lost. In this particular case, it is crucial that the axis is readjusted.

Absolute encoder adjustment (via Startdrive)

Requirement

The function is only available when the converter is online in Startdrive.

- Setting the absolute encoder adjustment status
  You can perform the absolute encoder adjustment (p2507 = 2) and the status "Home position set" (r2684.11) is updated. When the adjustment is correct, "Absolute encoder adjusted" is displayed.
- Resetting the absolute encoder adjustment status
  You can also reset the status "Absolute encoder adjusted" and the status display for the absolute encoder adjustment is then updated. The adjustment is deactivated. After the reset, "Absolute encoder not adjusted" is displayed.

10.6.5 Traversing blocks

10.6.5.1 Traversing block tasks

Overview

A traversing block describes a positioning instruction for the drive. Up to 32 different traversing blocks can be saved in the converter. All parameters which describe a traversing task are effective during a block change.

Description of function

Activating the traversing block function

When telegrams 111, 112, and 113 are used, the traversing block function can be configured with the PROFINET control word POS_STW1.15:

Control word	Signal	Description
POS_STW1.15	1	MDI selection.
	0	Traversing block selection.

When telegrams 7 and 9 are used, the traversing block function can be configured with the PROFINET control word SATZANW.15:

Control word	Signal	Description
SATZANW.15	1	MDI selection.
	0	Traversing block selection.

Traversing blocks are parameterized using parameter sets that have a fixed structure:

- **Traversing block number (p2616[0...31])**
  Each traversing block must have a traversing block number assigned to it. The traversing blocks are executed in the sequence of the traversing block numbers. Numbers containing the value "-1" are ignored so that the space can be reserved for subsequent traversing blocks, for example.
- **Task (p2621[0...31])**
  1: POSITIONING
  2: FIXED ENDSTOP
  3: ENDLESS_POS
  4: ENDLESS_NEG
  5: WAIT
  6: GOTO
  7: SET_O
  8: RESET_O
  9: JERK
- **Motion parameters**
  - Target position or traversing distance (p2617[0...31])
  - Velocity (p2618[0...31])
  - Acceleration override (p2619[0...31])
  - Deceleration override (p2620[0...31])

- **Task mode (p2623[0...31])**
  Processing a traversing task can be affected by the parameter p2623 (task mode).
  Value = 0000 cccc bbbb aaaa
  - aaaa: Identifiers
    000x → hide/show block (x = 0: show, x = 1: hide)
  - bbbb: Continuation condition
    0000, END: 0/1 edge at STW1.6
    0001, CONTINUE_WITH_STOP:
    The exact position parameterized in the block is approached (brake to standstill and positioning window monitoring) before block processing can continue.
    0010, CONTINUE_ON-THE-FLY:
    The system switches to the next traversing block "on the fly" when the braking point for the current block is reached (if the direction needs to be changed, this does not occur until the drive stops within the positioning window).
    0011, CONTINUE_EXTERNAL:
    Same as "CONTINUE_ON-THE-FLY", except that an instant block change can be triggered up to the braking point by a 0/1 edge. If an external block change is not triggered, a block change is triggered at the braking point.
    0100, CONTINUE_EXTERNAL_WAIT:
    Control signal "External block change" can be used to trigger a flying changeover to the next task at any time during the traveling phase. If "External block change" is not triggered, the axis remains in the parameterized target position until the signal is issued. The difference here is that with CONTINUE_EXTERNAL, a flying changeover is carried out at the braking point if "External block change" has not been triggered, while here the drive waits for the signal in the target position.
    0101, CONTINUE_EXTERNAL_ALARM:
    This is the same as CONTINUE_EXTERNAL_WAIT, except that alarm A07463 "External traversing block change in traversing block x not requested" is output when "External block change" is not triggered by the time the drive comes to a standstill. The alarm can be converted to a fault with a stop response so that block processing can be canceled if the control signal is not issued.
  - cccc: positioning mode
    The POSITIONING task (p2621 = 1) defines how the position specified in the traversing task is to be approached.
    0000, ABSOLUTE:
    The position specified in p2617 is approached.
    0001, RELATIVE:
    The axis is traveled along the value specified in p2617
    0010, ABS_POS:
    For rotary axes with modulo offset only. The position specified in p2617 is approached in a positive direction.
    0011, ABS_NEG:
    For rotary axes with modulo offset only. The position specified in p2617 is approached in a negative direction.
- **Task parameter (command-dependent significance) (p2622[0...31])**

Traversing block tasks

- **POSITIONING**
  The POSITIONING task initiates motion. The following parameters are evaluated:
  - p2616[x] Block number
  - p2617[x] Position
  - p2618[x] Velocity
  - p2619[x] Acceleration override
  - p2620[x] Deceleration override
  - p2623[x] Task mode

  The task is executed until the target position is reached. When the task is activated, the converter is already located at the target position, then for the block change enable (CONTINUE_ON-THE-FLY or CONTINUE_EXTERNAL), the next task is selected in the same interpolation cycle. For CONTINUE_WITH_STOP, the next block is activated in the next interpolation cycle. CONTINUE_EXTERNAL_ALARM causes a message to be output immediately.
- **FIXED STOP**
  The FIXED STOP task triggers a traversing movement with reduced torque to fixed stop. The following parameters are relevant:
  - p2616[x] Block number
  - p2617[x] Position
  - p2618[x] Velocity
  - p2619[x] Acceleration override
  - p2620[x] Deceleration override
  - p2623[x] Task mode
  - p2622[x] Task parameter clamping torque [0.01 Nm] with rotary motors.

  Possible continuation conditions include END, CONTINUE_WITH_STOP, CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT.

- **ENDLESS POS, ENDLESS NEG**
  Using these tasks, the axis is accelerated to the specified velocity and is moved until:
  - A software limit switch is reached.
  - A hardware limit switch signal has been issued.
  - The traversing range limit is reached.
  - Motion is interrupted by the control signal "no intermediate stop / intermediate stop" (STW1.5).
  - Motion is interrupted by the control signal "do not reject traversing task / reject traversing task" (STW1.4).
  - An external block change is triggered (with the appropriate continuation condition).

  The following parameters are relevant:
  - p2618[x] Velocity
  - p2619[x] Acceleration override
  - p2623[x] Task mode

  All continuation conditions are possible.
- **JERK**
  Jerk limitation can be activated (command parameter = 1) or deactivated (task parameter = 0) by means of the JERK task. p2575 "Active jerk limitation" must be set to zero. The value parameterized in "jerk limit" p2574 is the jerk limit.
  A precise stop is always carried out here regardless of the parameterized continuation condition of the task preceding the JERK task.
  The following parameters are relevant:
  - p2622[x] Task parameter = 0 or 1

  All continuation conditions are possible.
- **WAIT**
  The WAIT task can be used to set a waiting period which should expire before the following task is processed.
  The following parameters are relevant:
  - p2622[x] Task parameter = delay time in milliseconds ≥ 0 ms, but is rounded-off to a multiple of numeral 8
  - p2623[x] Task mode

  Regardless of the parameterized continuation condition which is parameterized for the task that precedes the WAIT task, a precise stop is always executed before the waiting time expires. The WAIT task can be executed by an external block change.
  Possible continuation conditions include END, CONTINUE_WITH_STOP, CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT, and CONTINUE_EXTERNAL_ALARM.
  The fault message is triggered when "External block change" has still not been issued after the waiting time has elapsed.

- **GOTO**
  Using the GOTO task, jumps can be executed within a sequence of traversing tasks. The block number which is to be jumped to must be specified as task parameter. A continuation condition is not permissible. If there is no block with this number, then alarm A07468 (jump destination does not exist in traversing block x) is output and the block is designated as being inconsistent.
  The following parameters are relevant:
  – p2622[x] Task parameter = Next traversing block number

  Any two of the SET_O, RESET_O and GOTO tasks can be processed in an interpolation cycle and a subsequent POSITION and WAIT task can be started.
- **SET_O, RESET_O**
  The tasks SET_O and RESET_O allow up to two binary signals (output 1 or 2) to be simultaneously set or reset. The number of the output (1 or 2) is specified bit-coded in the task parameter.
  The following parameters are relevant:
  – p2616[x] Block number
  – p2622[x] Task parameter = bit-coded output:
    – 0x1: Output 1
    – 0x2: Output 2
    – 0x3: Output 1 and output 2

  Possible continuation conditions are END, CONTINUE_ON-THE-FLY and CONTINUE_WITH_STOP, and CONTINUE_EXTERNAL_WAIT.
  Any two of the SET_O, RESET_O and GOTO tasks can be processed in an interpolation cycle and a subsequent POSITIONING and WAIT task can be started.

Intermediate stop and reject a traversing task

When telegrams 7, 9, 111, 112, and 113 are used, perform an intermediate stop with the PROFINET control word STW1.5:

Control word	Signal	Description
STW1.5	1	No intermediate stop.
	0	Intermediate stop.

When telegrams 7, 9, 111, 112, and 113 are used, reject a traversing task with the PROFINET control word STW1.4:

Control word	Signal	Description
STW1.4	1	Do not reject a traversing task.
	0	Reject a traversing task (ramp-down with the maximum deceleration).

Parameters

The following list includes the parameters of the "Traversing block" function. The parameters displayed twice indicate that they may have different properties and descriptions depending on the selected axis type. For more information, see Section "Parameter list (Page 627)".

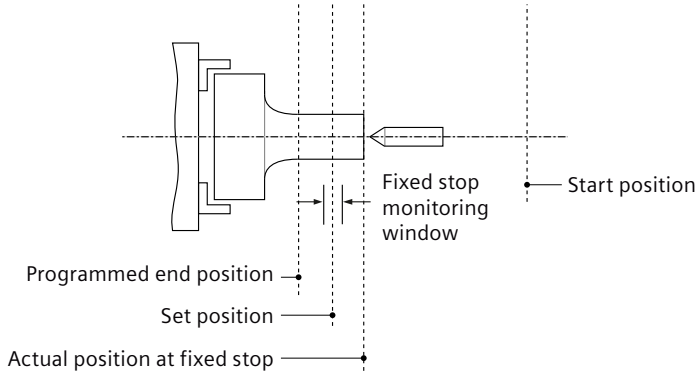
Number	Name	Unit

p2615	EPOS maximum number of traversing blocks	
p2616[0...n]	EPOS traversing block block number	
p2617[0...n]	EPOS traversing block position	[mm]
p2617[0...n]	EPOS traversing block position	[°]
p2618[0...n]	EPOS traversing block velocity	[mm/s]
p2618[0...n]	EPOS traversing block velocity	[°/s]
p2619[0...n]	EPOS traversing block acceleration override	[%]
p2620[0...n]	EPOS traversing deceleration override	[%]
p2621[0...n]	EPOS traversing block task	
p2622[0...n]	EPOS traversing block task parameter	
p2623[0...n]	EPOS traversing block task mode	

10.6.5.2 Travel to fixed stop

Overview

The function can be used to move the motor to a fixed stop at a specified torque without a fault being signaled. The specified torque is built up and remains applied after the motor reaches the fixed stop.



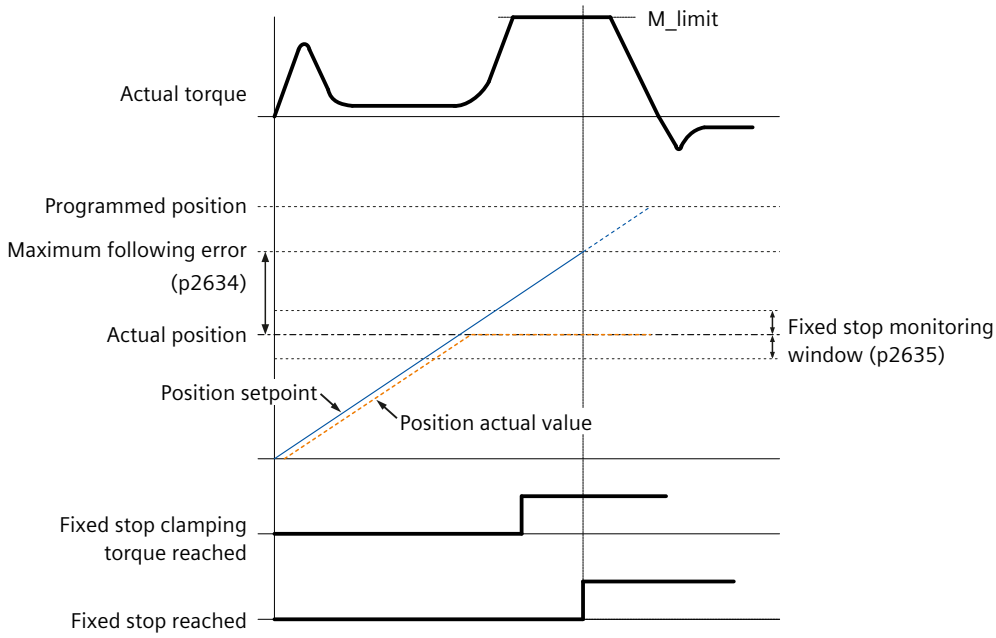
Description of function

In positioning mode, travel to fixed stop is started when a traversing block is processed with the FIXED STOP task. You can set the required clamping torque of the FIXED STOP function by the task parameter p2622.

An adjustable monitoring window for travel to fixed stop prevents the drive from traveling beyond the window if the fixed stop should break away.

From the start position onwards, the target position is approached with the parameterized speed. The fixed stop (the workpiece) must be between the start position and the braking point of the axis; that is, the target position is placed inside the workpiece. The preset torque limit is effective from the start, i.e. travel to fixed stop also occurs with a reduced torque. The preset acceleration and delay overrides and the current speed override are also effective.

Dynamic following error monitoring (p2546) in the position controller is not effective when traveling to the fixed stop. As long as the drive travels to the fixed stop or is in fixed stop, the "Travel to fixed stop active" status bit r2683.14 is set.



Fixed stop is reached

As soon as the axis comes into contact with the mechanical fixed stop, the closed-loop control in the drive raises the torque so that the axis can move on. The torque increases up to the value specified in the task and then remains constant. If the actual position following error exceeds the value set in parameter p2634 (Fixed stop: maximum following error), fixed stop is reached.

Once the "Fixed stop reached" status has been detected, the traversing task "Travel to fixed stop" is ended. The program advances to the next block depending on the task parameterization.

If the axis leaves the position that has been detected as the fixed stop by more than the selected monitoring window for the fixed stop (p2635), the speed setpoint is set to 0, and fault F07484 "Fixed stop outside of the monitoring window" is triggered with the reaction OFF3 (quick stop). The monitoring window can be set using the parameter p2635 ("Fixed stop monitoring window"). It applies to both positive and negative traversing directions and must be selected such that it will only be triggered if the axis breaks away from the fixed stop.

Fixed stop is not reached

If the brake application point is reached without the "Fixed stop reached" status being detected, then the fault F07485 "Fixed stop is not reached" is output with fault reaction OFF1, the torque limit is canceled and the drive cancels the traversing block.

10.6.6 Direct setpoint input (MDI)

Overview

The "direct setpoint input (MDI, Manual Data Input)" function allows for positioning (absolute, relative) and setting-up (endless position-controlled) by means of direct setpoint inputs (e.g. via the PLC using process data). A higher-level control provides the converter with the position setpoint and traversing profile.

Description of function

During traversing, the motion parameters can also be influenced (on-the-fly setpoint acceptance) and an on-the-fly change can be undertaken between the "setting-up" and "positioning" modes. The "direct setpoint specification" mode (MDI) can also be used if the axis is not homed in the "setting-up" or "relative positioning" modes.

"Setting-up" mode

The higher-level control selects the mode "Set-up":

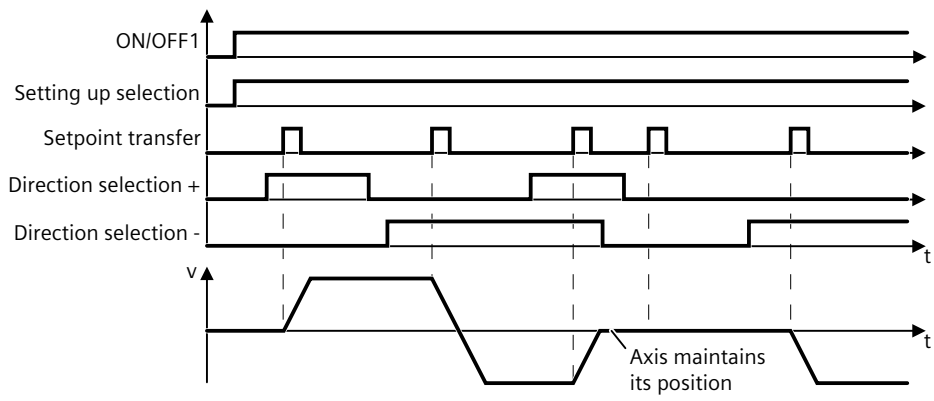


Figure 10-17 Set up axis with direct setpoint input (MDI)

"Positioning" mode

The higher-level control specifies the value of the setpoint either as a relative or an absolute position setpoint:

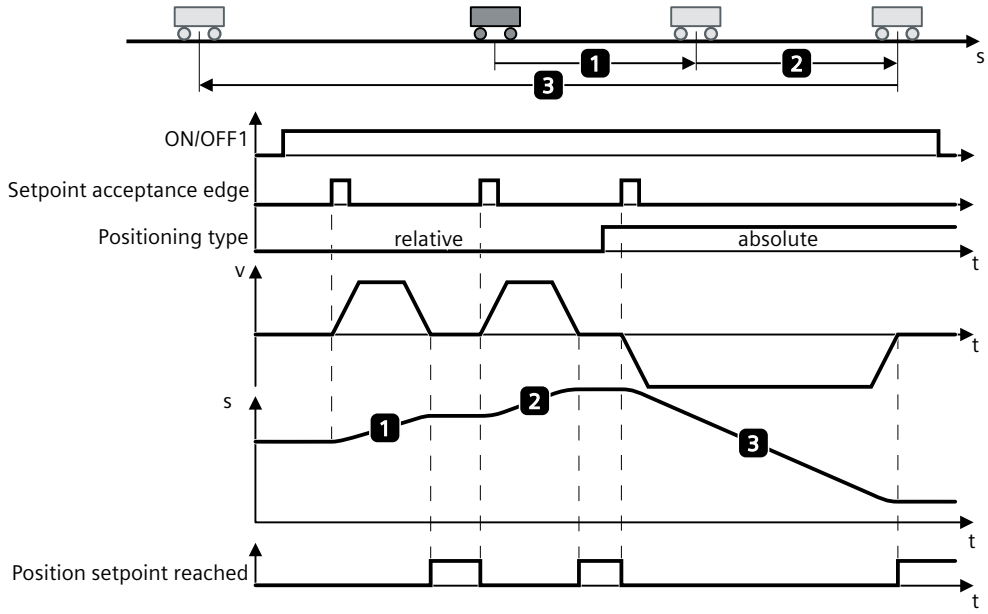


Figure 10-18 Position axis with direct setpoint input (MDI)

Activating the direct setpoint input function

When telegrams 111, 112, and 113 are used, the direct setpoint input function can be configured with the PROFINET control word POS_STW1.15:

Control word	Signal	Description
POS_STW1.15	1	MDI selection.
	0	Traversing block selection.

When telegrams 7 and 9 are used, the direct setpoint input function can be configured with the PROFINET control word SATZANW.15:

Control word	Signal	Description
SATZANW.15	1	MDI selection.
	0	Traversing block selection.

Selecting a working mode

In "Positioning" mode, the parameters (position, velocity, acceleration and deceleration) can be used to carry out absolute or relative positioning.

In "Setting-up" mode, using parameters (velocity, acceleration and deceleration) endless closed-loop position control behavior can be carried out.

When telegrams 111, 112, and 113 are used, select a working mode with the PROFINET control word POS_STW1.14:

Control word	Signal	Description
POS_STW1.14	1	Select "setting-up" mode.
	0	Select "positioning" mode.[1)]

[1)] Telegrams 7 and 9 can only work in "positioning" mode.

Selecting a positioning type in "positioning" mode

When telegrams 111, 112, and 113 are used, select a positioning type with the PROFINET control word POS_STW1.8:

Control word	Signal	Description
POS_STW1.8	1	Select absolute positioning.
	0	Select relative positioning.

When telegram 9 is used, select a positioning type with the PROFINET control word MDI_MOD.0:

Control word	Signal	Description
MDI_MOD.0	1	Select absolute positioning.
	0	Select relative positioning.

Selecting an absolute positioning direction in "positioning" mode

When telegrams 111, 112, and 113 are used, select an absolute positioning direction with the PROFINET control words POS_STW1.9 and POS_STW1.10:

Control word		Description
POS_STW1.9	POS_STW1.10	
0	0	Absolute positioning through the shortest distance.
0	1	Absolute positioning/MDI direction selection, positive.
1	0	Absolute positioning/MDI direction selection, negative.
1	1	Absolute positioning through the shortest distance.

When telegram 9 is used, select an absolute positioning direction with the PROFINET control words MDI_MOD.1 and MDI_MOD.2:

Control word		Description
MDI_MOD.1	MDI_MOD.2	
0	0	Absolute positioning through the shortest distance.
0	1	Absolute positioning/MDI direction selection, positive.
1	0	Absolute positioning/MDI direction selection, negative.
1	1	Absolute positioning through the shortest distance.

Selecting a direction in "setting-up" mode

When telegrams 111, 112, and 113 are used, select a direction with the PROFINET control words POS_STW1.9 and POS_STW1.10

Control word		Description
POS_STW1.9	POS_STW1.10	
0	1	MDI direction selection, positive.
1	0	MDI direction selection, negative.

Selecting an MDI transfer type

When telegrams 111, 112, and 113 are used, select an MDI transfer type with the PROFINET control word POS_STW1.12:

Control word	Signal	Description
POS_STW1.12	1	Continuous transfer.
	0	Activate MDI block change with of a traversing task (STW1.6).

Setting MDI setpoints

When telegrams 9, 111, 112, and 113 are used, set MDI setpoints with the following PROFINET control words:

- Position setpoint
  - MDI_TARPOS in telegrams 9, 111: 1 hex = 1 LU
  - MDI_TARPOS_F in telegram 112: LU or MU as floating-point number
  - MDI_TARPOS_D in telegram 113: LU or MU as double integer
- Velocity setpoint
  - MDI_VELOCITY in telegrams 9, 111: 1 hex = 1000 LU/min
  - MDI_VELOCITY_F in telegrams 112, 113: floating-point number
- Acceleration override
  - MDI_ACC in telegrams 9, 111: 4000 hex = 100%
  - MDI_ACC_F in telegrams 112, 113: floating-point number
- Deceleration override
  - MDI_DEC in telegrams 9, 111: 4000 hex = 100%
  - MDI_DEC_F in telegrams 112, 113: floating-point number

Intermediate stop and reject an MDI task

When telegrams 7, 9, 111, 112, and 113 are used, perform an intermediate stop with the PROFINET control word STW1.5:

Control word	Signal	Description
STW1.5	1	No intermediate stop.
	0	Intermediate stop with parameterized deceleration MDI_DEC (telegrams 9, 111, 112, and 113).

When telegrams 7, 9, 111, 112, and 113 are used, reject an MDI task with the PROFINET control word STW1.4:

Control word	Signal	Description
STW1.4	1	Do not reject a traversing task.
	0	Reject a traversing task (ramp-down with the maximum deceleration).

10.6.7 Jog

Overview

It is possible to change over between jog incremental and jog velocity. The traversing distances p2587 and p2588 and velocities p2585 and p2586 are entered according to the jog signals c2589 and c2590. The traversing distances are only effective for a "1" signal at p2591 (jog incremental). For p2591 = "0", the axis moves with the specified velocity.

Description of function

Jog incremental

In the case of incremental jogging, input a relative traversing distance and a velocity setpoint into the converter. With the signals "Jogging 1" or "Jogging 2" the converter positions the axis by the respective travel path.

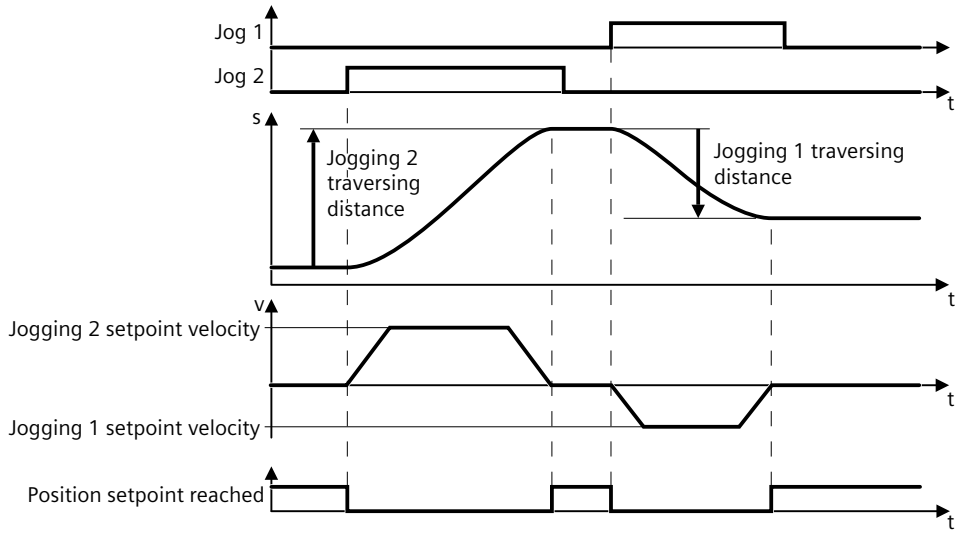


Figure 10-19 Jog incremental

Jog velocity

Only input a setpoint velocity for the converter for velocity jog. With the signal "Jogging 1" or "Jogging 2", the converter accelerates the axis to the relevant setpoint velocity. The converter stops the axis when the respective "Jog" signal returns to zero.

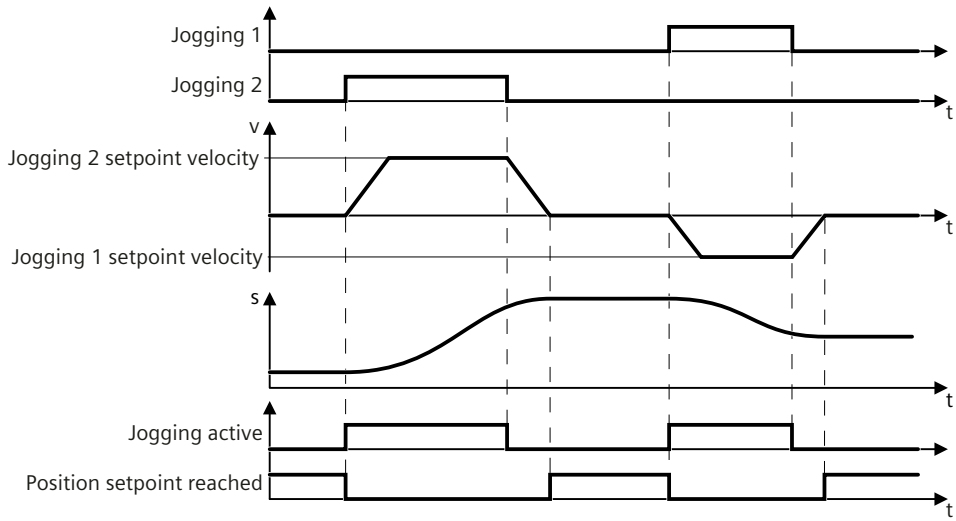


Figure 10-20 Jog velocity

Selecting a jogging channel

When telegrams 7, 9, 111, 112 and 113 are used, select a jogging channel with the control words STW1.8 and STW1.9:

Control word		Description
STW1.8	**STW1.9**	
0	0	No jogging channel activated
1	0	Activate Jog 1 signal source rising edge
0	1	Activate Jog 2 signal source rising edge
1	1	Keep old setpoint

Selecting a jogging mode

Note

When telegrams 7 and 9 are used, "Jog velocity" is activated.

When telegrams 111, 112 and 113 are used, select a jogging mode with the control word POS_STW2.5:

Control word	Signal	Description
POS_STW2.5	1	Activate "Jog incremental"
	0	Activate "Jog velocity"

Setting jogging setpoints

When telegrams 7 and 9 are used, set the following jogging setpoint with the appropriate parameters:

- Velocity (p2585, p2586)

When telegrams 111, 112 and 113 are used, set the following jogging setpoints with the appropriate parameters:

- Velocity (p2585, p2586)
- Traversing distance (p2587, p2588)

Parameters

The following list includes the parameters of the "Jog" function. The parameters displayed twice indicate that they may have different properties and descriptions depending on the selected axis type. For more information, see Section "Parameter list (Page 627)".

Number	Name	Unit
p2585	EPOS jog 1 setpoint velocity	[mm/s]
p2585	EPOS jog 1 setpoint velocity	[°/s]
p2586	EPOS jog 2 setpoint velocity	[mm/s]
p2586	EPOS jog 2 setpoint velocity	[°/s]
p2587	EPOS jog 1 traversing distance	[mm]
p2587	EPOS jog 1 traversing distance	[°]
p2588	EPOS jog 2 traversing distance	[mm]
p2588	EPOS jog 2 traversing distance	[°]
c2589	EPOS jog 1	
c2590	EPOS jog 2	
c2591	EPOS jogging incremental	

10.6.8 Measuring probe evaluation and homing mark search

Overview

The converter supports the "homing mark search" and the "measuring probe evaluation" in position control.

Description of function

The "homing mark search" and the "measuring probe evaluation" functions mode can be defined via c2510 (measuring probe evaluation selection) and c2511 (measuring probe evaluation edge). In the default settings, measuring probe 1 is always the measuring probe and the measuring probe evaluation is always the 0/1 edge.

The probe signals are recorded via the encoder status and control word. To speed up signal processing, direct measuring probe evaluation can be activated by selecting the input terminals for probes 1 or 2.

The system outputs a message if the same probe input is already being used (see also p0488, p0489).

The appropriate function is started using a 0/1 edge via the encoder control word. Status bit r2526.1 (homing active) signals that the function is active (feedback from the encoder

status word). Status bit r2526.2 (measured value valid) shows the presence of the required measurement r2523.

Once the function is completed (position determined for homing mark or measuring probe), r2526.1 (homing active) and r2526.2 (measured value valid) remain active and the measurement is provided by r2523 until the corresponding encoder control word is reset (0 signal).

If the function (homing mark search or measuring probe evaluation) has not been completed yet, while the encoder control word is reset, then the function is interrupted and the status bit r2526.1 (homing active) is reset via the encoder status word.

If the homing mark search and the measuring probe evaluation functions are simultaneously set, this causes the active function to be interrupted or no function is enabled. Alarm A07495 "homing function interrupted" occurs and remains until the signals at the inputs are reset. The alarm is also generated if a fault is signaled using the encoder status word during an activated function (homing mark search or measuring probe evaluation).

If the "position control" function is activated, these parameters (c2510 to c2511) are preassigned with "0". If the "basic positioner" function is activated, the "homing mark search" (for the homing position searching) and "measuring probe evaluation" (for the passive homing function) functions are initiated by the "basic positioner" function and feedback (r2526, r2523) returned to this.

Parameters

The following list includes the parameters of the "Homing mark search" and "Measuring probe evaluation" functions.

Number	Name	Unit
c2510[0...3]	LR selecting measuring probe evaluation	
c2511[0...3]	LR measuring probe evaluation edge	
r2523[0...3]	LR measured value	[mm]
r2523[0...3]	LR measured value	[°]
r2526.0...12	LR status word	

Tuning

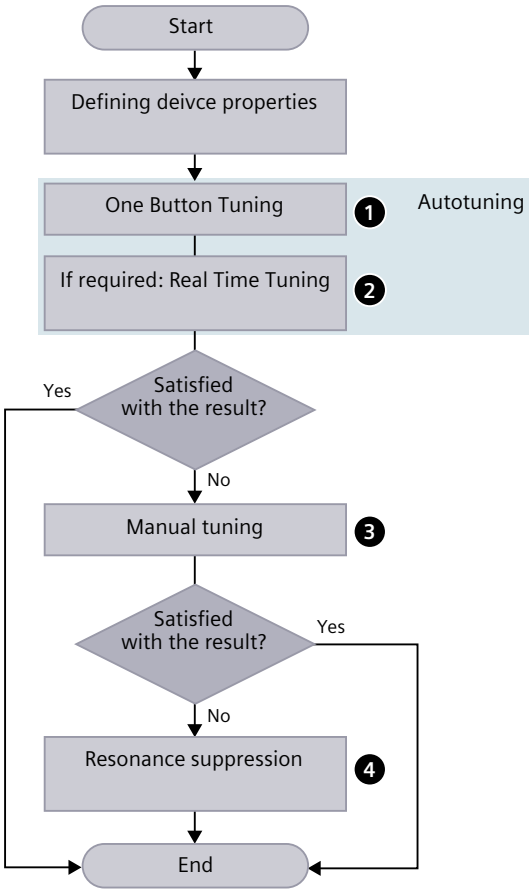
11

11.1 Tuning workflow

Overview

Tuning is a process of adjusting servo gains in the control loops of the converter to achieve desired performance.

Description of function



① One Button Tuning (Page 382)
② Real Time Tuning (Online Tuning) (Page 385)
③ Manual tuning (Page 388)
④ Resonance suppression (Page 391)

11.2 Autotuning

Overview

The term "Autotuning" comprises all converter-internal functions that adapt controller parameters during operation based on internal measured variables. The settings are written to the parameters, but are not saved permanently.

Description of function

Applications

The autotuning function is applicable to the following scenarios:

- Support of the commissioning
- Adaptation of the controller to major changes in the mechanical system

Available modes

The autotuning function is activated/deactivated with parameter p5300. The following autotuning modes are available for the converter:

- **One Button Tuning**
  With this procedure, the speed controller and position controller can be automatically tuned (optimized). In this regard, the servo drive system is measured once and the controller is then set.
- **Real Time Tuning**
  With this procedure, controller parameters are determined from the constantly estimated or parameterized moments of inertia.
  Deactivate Real Time Tuning as soon as the controller data has been calculated and the established values for controller optimization, as well as the filter settings have been saved in a non-volatile memory.

11.2.1 One Button Tuning

Requirement

NOTICE
Changing the controller parameters manually Manually changing controller parameters that were set automatically by One Button Tuning can result in an unstable controller and therefore material damage. • Do not change the following parameters during One Button Tuning: p0430, p1160, p1400, p1413 to p1426, p1428, p1429, p1433 to p1435, p1441, p1460 to p1465, p1498, p1513, p1656 to p1676, p2533 to p2539, p2567, p2572, p2573, p5280

Note

If EPOS is required, perform One Button Tuning after EPOS is activated; otherwise, the tuning results of EPOS relevant parameters will be incomplete.

If EPOS is no longer required, perform One Button Tuning after EPOS is deactivated; otherwise, the tuning results of previously optimized parameters will be incorrect.

Procedure

Proceed as follows to perform One Button Tuning with your operating unit:

1. Configure the dynamic response setting (p5292).
   The higher the dynamic factor, the faster and more unstable the control. You should find a desired dynamic factor within a resonance-free range.
2. Set the traversing distance for the test signal (p5308).
   Generally, longer traversing distances result in better tuning results.
   The traversing distance of the motor equals to the distance of the test signal (p5308) plus the distance generated from the configured setpoint. For example, if you have configured a valid speed setpoint (other than 0 rpm) via the control panel, the actual traversing distance of the motor equals to the distance of the test signal (p5308) plus the distance traversed by the motor at the set velocity.
3. Configure the One Button Tuning function (p5301).
   The following settings are possible:

Bit	Explanation
00	Determining the speed controller gain: • The speed controller gain is determined and set with the aid of a noise signal.
01	Determining the current setpoint filter: • Any required current setpoint filters are determined and set with the aid of a noise signal. In this way, a higher dynamic response can be achieved in the speed control loop.
02	Determining the moment of inertia: • The moment of inertia is determined and set with the aid of a test signal. • Requirements: – Distance limiting has been set in p5308. – The duration of the test signal has been set in p5309. • If this bit is not set, the moment of inertia must be set manually in p1498.
07	Activating synchronized axes: • Activation of this function is required for interpolating axes. • With this function, the axes are adapted to the dynamic response set in p5275. The time in p5275 should be set with the lowest dynamic response in accordance with the axis.
08	Determining the moment of inertia from the frequency response: • With this function, the moment of inertia is determined from the frequency response using a test signal. When bit 02 is inactive, the moment of inertia is transferred to p1498. • To determine the moment of inertia with greater accuracy, we recommend setting the traversing distance via p5308 before the measurement.

4. Set the controllers via p5271.
   The following table shows only the commonly used bits:

Bit	Explanation
03	Activates speed precontrol • Only relevant for EPOS.
04	Activates torque precontrol • If EPOS is active, then the torque precontrol from EPOS is used (p2567). • If EPOS is not active, – when the supplementary telegram 750 is not selected, the torque precontrol of the speed controller is used (r0341, p1498). The automatic calculation of the torque precontrol depends primarily on the settings of p1498. – when the supplementary telegram 750 is selected, the torque precontrol should be from the high-level controller via PZD: M_ADD1.

   For more information about p5271, see Section "Parameter list (Page 627)".
5. Activate the One Button Tuning function (p5300 = 1).

More information

For the detailed One Button Tuning procedures in the web server, see Section "Optimization (Page 165)".

Parameters

The following list includes the parameters of the "One Button Tuning" function.

Number	Name	Unit
p5271[0].0...7	Real Time / One Button Tuning configuration	
p5292	FFT tuning dynamic factor	[%]
p5300[0]	Autotuning selection	
p5301[0].0...8	One Button Tuning configuration 2	
p5308[0]	One Button Tuning distance limiting	[°]

11.2.2 Real Time Tuning (Online Tuning)

Requirement

NOTICE
Changing the controller parameters manually Manually changing controller parameters that were set automatically by Real Time Tuning can result in an unstable controller and therefore material damage. • Do not change the following parameters during Real Time Tuning: p0430, p1160, p1400, p1413 to p1426, p1428, p1429, p1433 to p1435, p1441, p1460 to p1465, p1498, p1513, p1656 to p1676, p2533 to p2539, p2567, p2572, p2573, p5280

Procedure

Proceed as follows to perform Real Time Tuning with your operating unit:

1. Configure the Real Time Tuning function (p5302).
   The following settings are possible:

Bit	Explanation
02	The moment of inertia is determined using the inertia estimator. If this bit is not set, the load moment of inertia must be parameterized manually in p1498. The test signal must have been previously set in p5308 and p5309.
03	If "Once" is set, the inertia estimator is deactivated after successful determination of the moment of inertia by p1498. The parameters must then be saved in non-volatile memory (p0977 = 1).
	If "Cyclically" is parameterized, the moment of inertia is determined continuously and the controller parameters are adapted. As soon as the moment of inertia has been successfully established (r1407.26 = 1), we recommend saving the parameters. The necessity for resettling of the controllers following a POWER ON will thus be avoided.
06	The function current setpoint filter adaptation is enabled. This function can be useful for damping a variable resonance in the mechanical system.
07	The axes are adapted to the dynamic response set in p5275. This setting is required for interpolating axes. Recommendation: Set the time in p5275 according to the axis with the lowest dynamic response.

2. Set the controllers via p5271.
   The following table shows only the commonly used bits:

Bit	Explanation
03	Activates speed precontrol • Only relevant for EPOS.
04	Activates torque precontrol • If EPOS is active, then the torque precontrol from EPOS is used (p2567). • If EPOS is not active, – when the supplementary telegram 750 is not selected, the torque precontrol of the speed controller is used (r0341, p1498). The automatic calculation of the torque precontrol depends primarily on the settings of p1498. – when the supplementary telegram 750 is selected, the torque precontrol should be from the high-level controller via PZD: M_ADD1.

   For more information about p5271, see Section "Parameter list (Page 627)".

3. Activate Real Time Tuning (p5300 = 2). Run the drive system to start tuning.

4. If Real Time Tuning cannot achieve desired tuning results, adjust the Real Time Tuning dynamic factor (p5272); otherwise, skip this step.
   The speed controller gain Kp is proportional to both the moment of inertia and the dynamic factor p5272. Higher dynamic factor makes the speed control more sensitive to vibrations but less stable. Set a desired dynamic factor within a resonance-free range.
5. To save the determined values for speed and position controllers, save the parameters in a non-volatile memory (RAM to ROM or p0977 = 1).
   In this way, the start values for Real Time Tuning are retained, for example, after POWER ON. Through deactivation and reactivation of Real Time Tuning, the estimated load moment of inertia and the load torques are reset.

Note

When the EPOS function is active, operating the motor during Real Time Tuning may trigger faults F07450, F07451, F07452 due to inappropriate initial closed-loop control gains. To avoid the occurrence of these faults, temporarily set p2542, p2544, and p2546 each to 0 or set them all to a value greater than the current value. Before saving the Real Time Tuning relevant parameters, change the aforesaid three parameters back to the values suitable for your particular application.

Note

If you want to minimize the vibrations of the mechanical system while keeping a high dynamic factor, perform One Button Tuning or manually configure current setpoint filters before Real Time Tuning; otherwise, proceed and activate current setpoint filter adaptation (p5302.6) during Real Time Tuning configuration. For more information about resonance suppression methods, see Section “Resonance suppression (Page 391)”.

Parameters

The following list includes the parameters of the "Real Time Tuning" function.

Number	Name	Unit
p2542	LR standstill window	[mm]
p2542	LR standstill window	[°]
p2544	LR positioning window	[mm]
p2544	LR positioning window	[°]
p2546[0]	LR dynamic following error monitoring tolerance	[mm]
p2546[0]	LR dynamic following error monitoring tolerance	[°]
p5271[0].0...7	Real Time / One Button Tuning configuration	
p5272[0]	Real Time Tuning dynamic factor	[%]
p5300[0]	Autotuning selection	
p5302[0].2...8	Real Time Tuning configuration	

11.3 Manual tuning

11.3.1 Manual tuning

Overview

When the autotuning function cannot achieve your expected tuning results, you can manually perform tuning.

Description of function

To perform tuning manually, you can disable the autotuning function by setting the parameter p5300:

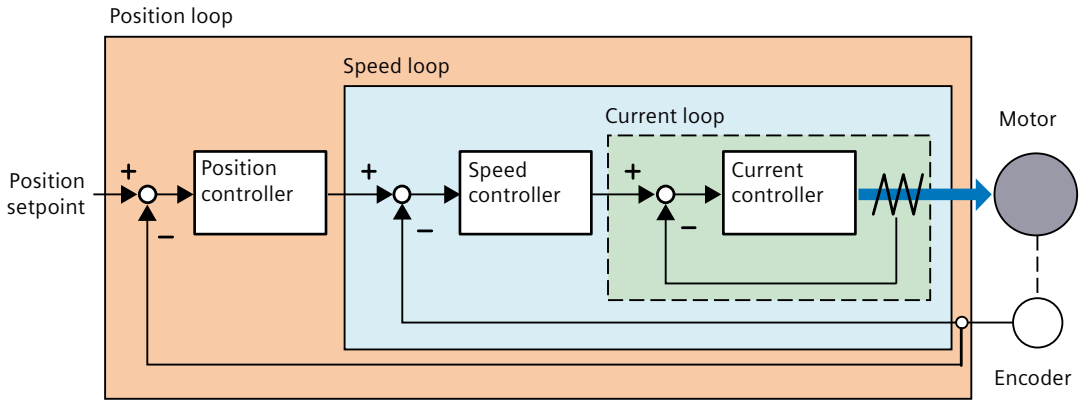
- p5300 = -1: The autotuning function is disabled and the default values for the speed and position controller are restored.
- p5300 = 0: The autotuning function is disabled and the existing controller parameters are not changed.
  To store the determined values for the speed and position controller retentively, set p0977 = 1 or execute the "Copy RAM to ROM" command.

11.3.2 Control loops

Description

The converter consists of three control loops:

- Current control loop
- Speed control loop
- Position control loop



The control loops monitor the feedback of the controlled machines and correct the commands given to the converter.

In theory, frequency width of the inside control loop must be wider than that of the outer control loop; otherwise, the whole control system might vibrate or show low responsiveness. The relationship between the frequency widths of these three control loops is as follows:

Current loop > speed loop > position loop

11.3.3 Servo gain adjustment

Overview

You can set the loop servo gains in the control loops to optimize the responsiveness of a machine.

The servo gains are set through a combination of parameters. These parameters influence each other so you must consider the balance between the set values when tuning.

Description of function

Generally, the responsiveness of a machine with high rigidity can be improved by increasing the servo gains; however, if the servo gains of a machine with low rigidity are increased, the machine may vibrate and the responsiveness cannot be improved.

Since the current loop gain is automatically set by the system according to the detected motor data, you can adjust the following control parameters for servo gain adjustment:

- **Position loop gain**
  The position loop gain directly influences the responsiveness of the position loop. If the mechanical system does not vibrate or produce noises, you can increase the position loop gain to increase the responsiveness of the position loop and shorten the positioning time.
- **Position loop feed forward gain**
  You can slowly increase the position loop feed forward gain to increase the responsiveness and reduce the position deviation.
  An inappropriately high position loop feed forward gain may lead to overshoots in the motor speed and a repeated ON/OFF switch of the digital output signal INP.
- **Speed loop gain**
  The speed loop gain directly influences the responsiveness of the speed loop. If the mechanical system does not vibrate or produce noises, you can increase the speed loop gain to increase the responsiveness of the speed loop.
- **Speed loop integral time**
  With the integral component added to the speed loop, the converter can eliminate the steady-state error of speed and respond to small speed changes.
  If the mechanical system does not vibrate or produce noises, you can decrease speed loop integral time to increase the system rigidity.
  For mechanical systems with a resonance factor or a high load inertia ratio, you can increase the speed loop integral time to suppress resonance.

Parameters

The following list includes the parameters of the "Servo gain adjustment" function.

Number	Name	Unit
p1460[0]	Speed controller P gain	[Nms/rad]
p1462[0]	Speed controller integral time	[ms]
p2534[0]	LR speed precontrol factor	[%]
p2538[0]	LR proportional gain	[1000 rpm]

11.4 Resonance suppression

Overview

The resonance suppression functions suppresses mechanical resonance at a frequency higher than 100 Hz.

The function is achieved by setting the current setpoint filters as bandstop filters. Four current setpoint filters are available for the converter.

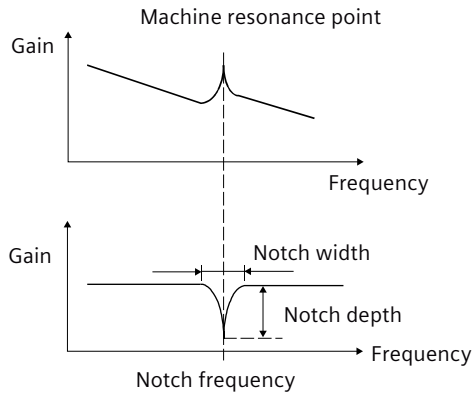


Figure 11-1 Working principle of a bandstop filter

Description of function

Resonance suppression with autotuning

During the autotuning process, resonance suppression is activated by default.

- Resonance suppression with One Button Tuning (p5300 = 1, p5291.1 = 1)
  The current setpoint filters are automatically determined and set once with the aid of a noise signal. Four current setpoint filters can be activated at most after One Button Tuning is completed.
- Resonance suppression with Real Time Tuning (p5300 = 2, p5302.6 = 1)
  Filter 4 is automatically parameterized as a bandstop filter and activated as an adaptive resonance filter. To use the other three current setpoint filters in this case, you must manually configure their settings.
  When there is no resonance in the machine, Siemens recommends that the resonance suppression function is deactivated (p5302.6 = 0) in Real Time Tuning to get a high dynamic performance.

Resonance suppression with manual tuning

When resonance suppression with autotuning cannot reach the suppression effect, you can proceed as follows to suppress the resonance manually:

1. Activate the current setpoint filters that you want to use (p1656[0].0...3).
2. For the activated current setpoint filters, parameterize the following values:
   - Type: general 2nd order filter
   - Denominator natural frequency
   - Denominator damping
   - Numerator natural frequency
   - Numerator damping

Note

Assume the notch frequency is $\mathbf{f}_{sp}$, notch width is $\mathbf{f}_{BB}$, and notch depth is **K**, then the filter parameters can be calculated as follows:

- Denominator natural frequency = Numerator natural frequency = $\mathbf{f}_{sp}$
- Denominator damping = $\mathbf{f}_{BB}/(2 \times \mathbf{f}_{sp})$
- Numerator damping = $(\mathbf{f}_{BB} \times 10^{(k/20)})/(2 \times \mathbf{f}_{sp})$

Parameters

The following list includes the parameters of the "Resonance suppression" function.

Number	Name	Unit
p1656[0].0...3	Activates current setpoint filter	
p1657[0]	Current setpoint filter 1 type	
p1658[0]	Current setpoint filter 1 denominator natural frequency	[Hz]
p1659[0]	Current setpoint filter 1 denominator damping	
p1660[0]	Current setpoint filter 1 numerator natural frequency	[Hz]
p1661[0]	Current setpoint filter 1 numerator damping	
p1662[0]	Current setpoint filter 2 type	
p1663[0]	Current setpoint filter 2 denominator natural frequency	[Hz]
p1664[0]	Current setpoint filter 2 denominator damping	
p1665[0]	Current setpoint filter 2 numerator natural frequency	[Hz]
p1666[0]	Current setpoint filter 2 numerator damping	
p1667[0]	Current setpoint filter 3 type	
p1668[0]	Current setpoint filter 3 denominator natural frequency	[Hz]
p1669[0]	Current setpoint filter 3 denominator damping	
p1670[0]	Current setpoint filter 3 numerator natural frequency	[Hz]
p1671[0]	Current setpoint filter 3 numerator damping	
p1672[0]	Current setpoint filter 4 type	
p1673[0]	Current setpoint filter 4 denominator natural frequency	[Hz]
p1674[0]	Current setpoint filter 4 denominator damping	
p1675[0]	Current setpoint filter 4 numerator natural frequency	[Hz]
p1676[0]	Current setpoint filter 4 numerator damping	

p5291.0...16	FFT tuning configuration
p5302[0].2...8	Real Time Tuning configuration

11.5 Low-frequency vibration suppression

11.5.1 Operating principle

Overview

The low-frequency vibration suppression function uses a configurable setpoint filter to minimize vibrations in the natural frequency range of the moving mechanism.

Requirement

- The basic positioner (EPOS) function is enabled.
- The Basic Vibration Suppression function is activated.

Description of function

To absorb oscillations, the configurable setpoint filter changes the command variable of an axis so that there is as little oscillation as possible excited in the damped natural frequency range of the moving mechanical system. While this does slightly delay the motion sequence, with correct parameterization, the additional travel time is significantly less than the wait time for the oscillation levels in the mechanical system to be within the tolerance range.

Low-frequency natural frequency oscillations above 10 Hz can be eliminated.

11.5.2 Methods to determine the frequency

Overview

The natural frequency is set in p31585. This value cannot be changed during motion. Frequency f_d must be determined by making the appropriate measurements.

Requirement

License is required if you want to determine the frequency using the measuring function via Startdrive.

Procedure

You can use the following three methods to determine the natural frequency of the mechanical system via Startdrive.

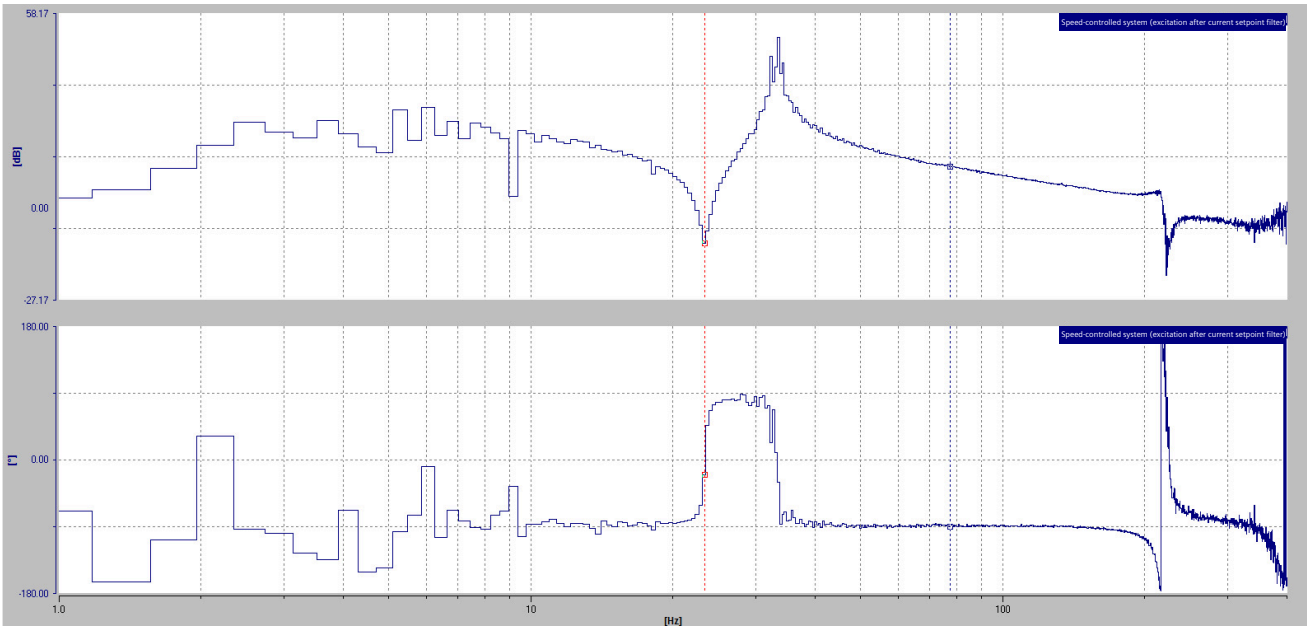
Empirically determining the frequency if the natural frequency to be absorbed is approximately known

1. Set the estimated frequency (p31585).
2. Check the effect of the filter while traveling with different load levels.
3. Repeat step 1 and step 2 with a different frequency until the frequency with the optimum filter effect has been found.

Use the lowest value if you determine several values for the frequency.

Determining the frequency using the measuring function in the frequency domain

1. Double-click "Add new measuring function".
2. Select "Speed-controlled system (excitation after current setpoint filter)" in the drop-down list.
3. Parameterize the measuring function:
   - Amplitude
     From experience, practical values lie in the range 1% ... 5%. The value is scaled to p2003.
   - Offset
     From experience, values in the range 0.5% ... 1% of the maximum axis velocity are sufficient.
   - Ramp-up time
     This value should be generously dimensioned corresponding to the offset that has been set (e.g. 200 ms ... 500 ms).
   - Measuring period
     Set the highest possible number of measuring periods (e.g. number = 4). Ensure that the available travel distance of the axis is sufficient for the offset velocity that has been set. Observe displayed measuring time.
   - Bandwidth
     Select this value so that the expected natural frequency can be displayed with a good resolution (e.g. bandwidth < 400 Hz).
4. Perform the measuring function.
   - Assuming control priority
   - Switch on the drive
   - Start the measuring function
5. Evaluate the result.
   After the measuring function has been completed, the result is automatically displayed in the Bode diagram.



The Bode diagram shows the absolute value (top) and the phase (bottom) of the complex transfer function in a logarithmic scale.

The natural frequency f_d to be damped can be identified by the notch in the absolute value diagram (zero position). A positive phase rotation also occurs at this position. You can shift to the notch with a colored measuring cursor, which displays the natural frequency to be damped.

Determining the frequency in the time domain using traversing motion

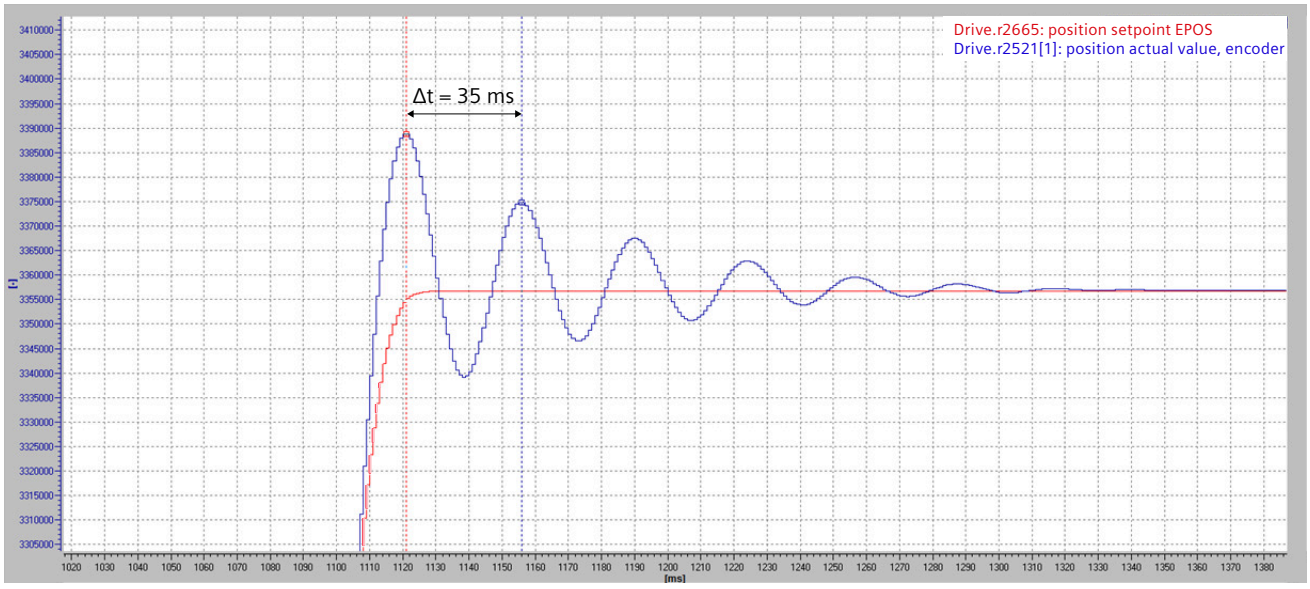
Use the dynamic positioning method to determine the natural frequency to be absorbed. The actual values with respect to time are recorded in a trace.

Then, calculate the low-frequency natural frequency, which is determined from the inverse of the time period of the oscillation at the motor, namely f_d = 1 / time period.

The following parameters are recommended as measuring variables:

- r2665: EPOS position setpoint
- r2521[1]: LR position actual value, encoder

The following diagram shows a positioning operation to determine the frequency.



In the diagram above, the time period is marked using a colored measuring cursor, which shows dT = 34.966 ms (≈ 35.0 ms).

The frequency of the natural oscillation to be damped is calculated as follows:

fd = 1 / time period = 1 / 0.0350 s = 28.6 Hz

Alternatively, you can use the velocity or the torque as measurement variables.

- Recommended parameter for velocity:
  - r2666: EPOS velocity setpoint
  - r0061[0]: Unsmoothed speed actual value, encoder
- Recommended parameter for current:
  - r0080: Actual torque value

System message 12

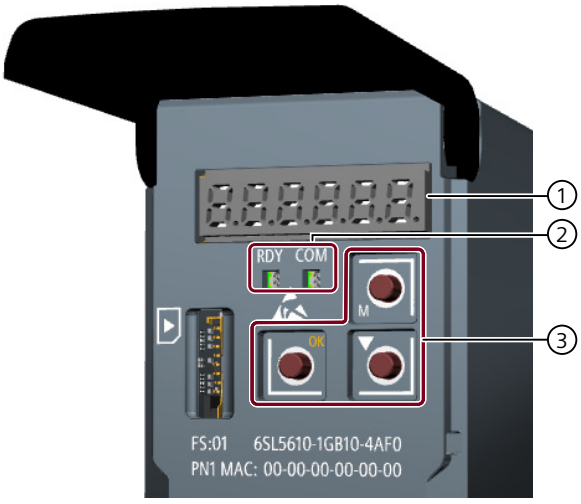
12.1 SDI Status

12.1.1 SDI Status overview

Description

SINAMICS S200 Compact is designed with a SINAMICS SDI (Smart Drive Interface) Status panel behind the front flap of the converter.

To access the panel, gently lift the front flap from the lower right corner.



① 6-digit 7-segment display
② LED display
③ Function buttons

Figure 12-1 SDI Status layout

You can use the SDI Status panel for the following operations:

- Monitoring
  The SINAMICS SDI Status enters the monitoring mode when the servo state changes from OFF to ON. In this mode, it displays the actual speed, actual torque, actual position, actual DC link voltage, and position following error. You can press the DOWN button to navigate to the next item.
- Diagnostics
  The SINAMICS SDI Status enters the diagnostics mode when a new fault, alarm, or safety message appears. You can press the OK button to acknowledge the faults after eliminating the causes.
  You can press the M button to switch between the monitoring mode and the diagnostics mode.

  Note

  If you failed to configure UMAC as required, A01637 will be triggered. In this case, the monitoring mode does not switch to the diagnostics mode automatically unless you press the M button. To exit the diagnostics mode, press the M button again.

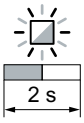
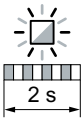
- Converter restart
  You can press the key combination of the M button and the OK button for four seconds to restart the converter.

12.1.2 Status display via LEDs

Description

The following tables explain the LED icons and states:

Table 12-1 Explanation of LED icons

LED	Explanation
	LED is ON.
	LED is OFF.
	LED flashes slowly.
	LED flashes quickly.
	LED flashes with variable frequency.

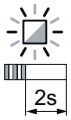
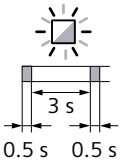
LED	Explanation
	LED flashes in alternating order 3 times quickly - 2 s pause - ...
	LED flashes briefly every 3 s

Table 12-2 Signal states of RDY and COM LEDs during converter ramp-up and operation

RDY	COM	Description	Remedy
Orange	Orange	Possible causes: • Temporary state after the supply voltage is switched on • Restart	-
Green	Green	Temporary state after the supply voltage is switched on: firmware being loaded and initialized.	-
Not rele-vant	Green	Cyclic communication in progress	-
□	Red	No fieldbus connection: • No data exchange or configuration error • Data exchange lost • Data exchange in progress, but there are no setpoints (controller in stop state)	Possible remedies: • Check message display and rectify cause of fault. • Check operating mode of controller (PLC).
Red	□	Possible causes: • Converter signals a fault. • Firmware error	Possible remedy: Check message display, rectify cause of fault.
Green	Not rele-vant	Converter is ready for operation and error-free.	-

RDY	COM	Description	Remedy
☐	Red	Possible causes: • BIOS error: – General error – Loading error • File error: – Memory card is not available or is faulty. – File corrupt • CRC error	Possible remedies: • Switch the converter supply voltage off and on. • Check memory card if available. • Reload firmware. • Contact Hotline/Support.
Orange	Not relevant	Converter detection via DCP flashing	-
Orange	☐	Commissioning or restore factory settings via commissioning tool	-

Table 12-3 Signal states of RDY and COM LEDs during firmware update

RDY	COM	Description	Remedy
Green	Green	Firmware update in progress	-
☐	Red	Firmware update signals an error.	Possible remedies: • Switch the converter supply voltage off and on, and repeat the firmware update. • Firmware update via memory card: Replace memory card and repeat firmware update. • Contact Support/Hotline.
Green	☐	Firmware update is completed. The converter is waiting.	Switch the converter supply voltage off and on.

Table 12-4 Signal states of RDY and COM LEDs during full reset to factory settings

RDY	COM	Description	Remedy
Green	Green	All user-defined settings are being reset to factory settings.	-
Green		All user-defined settings have been reset to factory settings.	Switch the converter supply voltage off and on.
	Red	Reset of all user-defined settings to factory settings is unsuccessful.	Possible remedies: • Check the memory card with the empty file called RESET.TXT • Switch off and switch on the converter supply voltage and reset all user-defined settings to the factory setting. • Contact Support/Hotline.

Please contact Technical Support for LED states that are not described above.

12.1.3 SDI Status display

Description

Note

The SDI Status displays the values in a 32-bit floating-point format, with a maximum of seven effective digits.

Display	Example	Description	Remarks
S 200	S 200	Converter is in initialization state	-
-xxxxx	- - - - - -	Converter is in startup state	The illuminated "-" symbols indicate the startup progress. Once all the "-" symbols are lit, the startup process is complete.
L24	L 24	24 V DC supply voltage is too low.	"L24" appears when the voltage (including transient voltage) of the external 24 V DC power supply drops below required voltage under normal converter operation. Remedy: Check the external 24 V DC power supply and restart the converter.
Fxxxxx	F 7955	Fault code	In the case of a single fault

Display	Example	Description	Remarks
F.xxxxx.	F. 7955.	Fault code of the first fault	In the case of multiple faults
Fxxxxx.	F 7955.	Fault code	In the case of multiple faults
Axxxxx	A30016	Alarm code	In the case of a single alarm
A.xxxxx.	A.30016.	Alarm code of the first alarm	In the case of multiple alarms
Axxxxx.	A30016.	Alarm code	In the case of multiple alarms
Cxxxxx	C 1600	Safety message code	In the case of a single safety message
C.xxxxx.	C. 1600.	Safety message code of the first safety message	In the case of multiple safety messages
Cxxxxx.	C 1600.	Safety message code	In the case of multiple safety messages
S Off	S oFF	Operating display: servo-off	-
r xxx	r 40	Actual speed (positive direction)	-
r -xxx	r -40	Actual speed (negative direction)	-
T x.x	t 0.4	Actual torque (positive direction)	-
T -x.x	t -0.4	Actual torque (negative direction)	-
P.xxxxx	P.13427	Actual position (positive direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Px.xxxx	P1.3427	Actual position (positive direction)	The remaining digits have been fully displayed.
P.-xxxx	P.-1342	Actual position (negative direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Px.xxxx	P1.3427	Actual position (negative direction)	The remaining digits have been fully displayed.
DCxxx.x	dC549.0	Actual DC link voltage	-
E.xxxxx	E.18531	Position following error (positive direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Ex.xxxx	E1.8531	Position following error (positive direction)	The remaining digits have been fully displayed.
E.-xxxx	E.-1853	Position following error (negative direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Ex.xxxx	E1.8531	Position following error (negative direction)	The remaining digits have been fully displayed.

Display	Example	Description	Remarks
Restart	rStArt	Restart the converter	-
P-----	P -----	The parameter does not exist.	The symbol "P" could be other parameter symbols, like "T", "E", etc.

12.1.4 Function buttons

Description

Button	Description	Functions
M	M button	Switch between the diagnostics mode and the monitoring mode
OK	OK button	Acknowledge faults in the diagnostics mode
▼	DOWN button	Navigate to the next item
OK + M	Press the key combination for four seconds to restart the converter[1)]	

[1)] The converter cannot be restarted with this key combination when it is in the “servo-on” state.

12.2 System runtime

Overview

By evaluating the system runtime of the converter, you can decide when you should replace components (such as fans and motors) subject to wear in time before they fail.

Description of function

The system runtime starts once the power supply of the converter is switched on. The system runtime stops when the power supply is switched off.

The system runtime includes r2114[0] (milliseconds) and r2114[1] (days). It is calculated as follows:

System runtime = r2114[1] × days + r2114[0] × milliseconds

If r2114[0] has reached a value of 86400000 ms (24 hours), r2114[0] is set to the value 0 and the value of r2114[1] is increased by 1.

You cannot reset the system runtime.

Parameters

The following list includes the parameters of the "System runtime" function.

Number	Name	Unit
r2114[0...1]	System runtime total	

12.3 Faults and alarms

12.3.1 Overview of faults and alarms

Description

Definitions

A message includes a letter and a relevant number.

The letters have the following meaning:

- A means "Alarm"
- F means "Fault"
- N means "No message" or "Internal message"
- C means "Safety message"
  In the delivery state (p3117 = 0), safety messages correspond to message type "C" and the safety message buffer is active. With p3117 = 1, safety messages correspond to the message types "A" or "F" and are stored in the fault buffer or the alarm buffer.

Differences between faults and alarms

An alarm reports an operating state which is non-critical at present. A fault means that it is normally no longer possible to run the motor. The converter therefore responds to alarms and faults differently.

Table 12-5 Differences between faults and alarms

Type	Description
Faults	How does a converter respond when a fault occurs? • Initiate the appropriate fault reaction. • Set the status signal ZSW1.3. • Enter the fault into the fault buffer. How are faults eliminated? • Remove the cause of the fault. • Acknowledge the fault. What happens when the converter is switched off and switched on? • Faults are saved retentively.
Alarms	How does a converter respond when an alarm occurs? • Set the status signal ZSW1.7. • Enter the alarm into the alarm buffer. How are alarms eliminated? • Alarms are self-acknowledging. If the cause of the alarm is no longer present, the converter resets the alarm. What happens when the converter is switched off and switched on? • The alarm buffer is lost when the supply voltage is switched off.

Note:

Messages from encoders whose signal is not used for control purposes are output by the converter as a warning.

12.3.2 Faults

Overview

A fault indicates that the reliable operation of the motor by the converter is at risk.

Description of function

Properties of faults

Faults have the following properties:

- Faults may cause the motor to be switched off.
- Faults must be acknowledged.
- Faults are displayed as follows:
  - On the converter via the LEDs
  - On the SINAMICS SDI Status panel via the 6-digit 7-segment display
  - In the web server
    You can find more information on the display of faults in Section "Messages (Page 171)"
  - In Startdrive
    You can find more information on the display of faults in Section "Display messages (Page 268)".

Acknowledge faults

You need to resolve the cause of the fault before you can acknowledge a fault.

To acknowledge a fault, you have the following options:

- Acknowledging via the OK button on the SINAMICS SDI Status panel
- Switching off the converter power supply and switch on again
- Acknowledging via the web server or Startdrive

You can only acknowledge faults detected by the internal converter monitoring of hardware and firmware by switching the supply voltage off and on again. In the list of faults, you will find the information on limitations when acknowledging at the corresponding fault codes.

More information

You can find more information on faults in Section "Overview of faults and alarms (Page 407)".

12.3.3 Alarms

Overview

An alarm indicates that the reliable operation of the motor by the converter is at risk.

Description of function

Properties of alarms

Alarms have the following properties:

- Incoming alarms have no direct influence on the drive system.
- When the cause is eliminated, the alarm is no longer displayed.
- Alarms do not have to be acknowledged.
- Alarms are displayed as follows:
  - On the converter via the LEDs
  - On the SINAMICS SDI Status panel via the 6-digit 7-segment display
  - In the web server
    You can find more information on the display of alarms in Section "Messages (Page 171)".
  - In Startdrive
    You can find more information on the display of alarms in Section "Display messages (Page 268)".

Alarm code or alarm value describe the cause of the alarm.

More information

You can find more information on alarms in Section "Overview of faults and alarms (Page 407)".

12.3.4 Explanation of the list of faults and alarms

Overview

The representation of a message includes as a maximum the information listed below. Depending on the message, some information can be omitted.

The messages are displayed according to the following pattern:

Fxxxxx	Fault location (optional): Name
Message class:	Text of the message class (number according to PROFIdrive)
Message value:	Component number: %1, fault cause: %2
Variant:	Product variant
Component:	Hardware component
Response:	NONE
Acknowledgment:	POWER ON
Explanation of the message value:	For %2

Value	Cause	Remedy
11	Fault cause for value = 11	Remedy for value = 11
15	Fault cause for value = 15	Remedy for value = 15

Cause:	Description of possible causes. Fault value (r0949, interpret <format>): or alarm value (r2124, interpret <format>): (optional) Information about fault and alarm values (optional).
Remedy:	Description of possible remedies.

Description of function

Fault location (optional): Name

The fault location (optional), the name of the fault or alarm and the message number are all used to identify the message (e.g. with the commissioning software).

Message class

Every message is assigned a message class using the following structure:

Text of the message class (number according to PROFIdrive)

The message classes are transferred at different interfaces to higher-level control systems and their associated display and operating units.

The message classes that are available are listed in the following table. In addition to the text of the message class and its number according to PROFIdrive – as well as a brief help text regarding the cause and remedy – they also include information about the various diagnostic interfaces:

- PN (hex)
  Specifies the "Channel error type" of the PROFINET channel diagnostics.
  When activating the channel diagnostics, using the GSDML file, the texts listed in the table can be displayed.
- DS1 (dec)
  Specifies the bit number in data set DS1 of the diagnostic alarm for SIMATIC S7.
  When the diagnostic alarms are activated, the texts listed in the table can be displayed.

Table 12-6 Message classes and coding of various diagnostic interfaces

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Hardware/software fault A hardware or software malfunction was detected. • Carry out a POWER ON for the relevant component. • If it occurs again, contact the hotline. • Replace device.	(1)	9000	0
Line fault A line supply fault has occurred (phase failure, voltage level...). • Check the line supply/fuses. • Check the supply voltage. • Check the wiring.	(2)	9001	1
Supply voltage fault An electronics supply voltage fault (48 V, 24 V, 5 V...) was detected. • Check the wiring. • Check the voltage level.	(3)	9002	2
DC link overvoltage The DC link voltage has assumed an inadmissibly high value. • Check the dimensioning of the system (line supply, reactor, voltages). • Check the infeed settings.	(4)	9003	3
Power electronics fault An inadmissible operating state of the power electronics has been identified (overcurrent, overtemperature, IGBT failure...). • Check that the permissible duty cycles are complied with. • Check the ambient temperatures (fan).	(5)	9004	4
Electronic component overload The temperature in the component has exceeded the highest permissible limit. • Check the ambient temperature /control cabinet cooling.	(6)	9005	5
Ground fault/inter-phase short-circuit detected A ground fault/interphase short-circuit was detected in the power cables or in the motor windings. • Check the power cables (connection). • Check the motor.	(7)	9006	6
Motor overload The motor was operated outside the permissible limits (temperature, current, torque...). • Check the duty cycles and set limits. • Check the ambient temperature/motor cooling.	(8)	9007	7

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Communication error to the higher-level controller The communication to the higher-level controller (internal coupling, PROFIBUS, PROFINET...) is faulted or interrupted. • Check the state of the higher-level control system. • Check the communication connection/wiring. • Check the bus configuration/clock cycles.	(9)	9008	8
Safety monitoring channel has identified an error A safe operation monitoring function (Safety) has detected an error.	(10)	9009	9
Actual position value/actual speed value incorrect or not available An illegal signal state was detected while evaluating the encoder signals (track signals, zero marks, absolute values...). • Check the encoder/status of the encoder signals. • Observe the maximum permissible frequencies.	(11)	900A	10
Internal (DRIVE-CLiQ) communication error The internal communication between the SINAMICS components is faulted or interrupted. • Check the DRIVE-CLiQ wiring. • Ensure an EMC-compliant design. • Observe the maximum quantity structure/cycles.	(12)	900B	11
Infeed fault The infeed is faulted or has failed. • Check the infeed and its environment (line supply, filters, reactors, fuses...). • Check the infeed control.	(13)	900C	12
Braking controller/Braking Module faulted The internal or external Braking Module is faulted or overloaded (temperature). • Check the connection/state of the Braking Module. • Comply with the permissible number of braking operations and their duration.	(14)	900D	13
Line filter faulted The line filter monitoring has identified an excessively high temperature or other inadmissible state. • Check the temperature/temperature monitoring. • Check the configuration to ensure that it is permissible (filter type, infeed, thresholds).	(15)	900E	14

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
External measured value/signal state outside of the permissible range A measured value/signal state read in via the input area (digital/analog/temperature) has assumed an inadmissible value/state. • Determine and check the relevant signal. • Check the set thresholds.	(16)	900F	15
Application/technology function faulted The application/technological function has exceeded a (set) limit (position, speed, torque...). • Determine and check the relevant limit. • Check the setpoint specified by the higher-level controller.	(17)	9010	16
Error in the parameterization/configuration/commissioning sequence An error has been identified in the parameterization or in a commissioning procedure, or the parameterization does not match the actual device configuration. • Determine the precise cause of the fault using the commissioning tool. • Adapt the parameterization or device configuration.	(18)	9011	17
General drive fault Group fault. • Determine the precise cause of the fault using the commissioning tool.	(19)	9012	18
Auxiliary unit faulted The monitoring of an auxiliary unit (incoming transformer, cooling unit...) has identified an inadmissible state. • Determine the exact cause of the fault and check the device involved.	(20)	9013	19

Message value

Provides information about the composition of the fault/alarm value.

Example:

Message value: Component number: %1, fault cause: %2

In this example, the message value contains information about the component number and cause of the fault. Entries %1 and %2 are placeholders. If the commissioning software is connected to the converter, then these placeholders are populated with the appropriate values.

Variant

Specifies the product variant in which the message exists. This information is not applicable if an alarm is the same for all product variants.

Component

Type of hardware component that has triggered the fault or alarm. For "None", it is not possible to assign the message to a hardware component.

Explanation of the message value

Explains the possible values of the placeholders (%n) in the message value. In this case, detailed information can be specified regarding the cause and remedy for specific values.

Response

Specifies the response in the event of a fault.

The following table lists all fault responses and their meanings used for the entire SINAMICS drive family.

Table 12-7 Fault responses

List	PROFIdrive	Response	Description
NONE	–	None	No response when a fault occurs.
OFF1	ON/OFF	Brake along the ramp-function generator deceleration ramp followed by pulse inhibit	**Closed-loop speed control** • The motor is braked by immediately specifying n_set = 0 at the ramp-function generator deceleration ramp (p1121). • The pulses are suppressed when standstill has been identified. • "Switching on inhibited" is activated. **Torque control** • The following applies for torque control: Response as for OFF2. • When switching into torque control, the following applies: There is no dedicated braking response. The pulses are suppressed when standstill has been identified. • "Switching on inhibited" is activated.
OFF2	COASTSTOP	Internal/external pulse inhibit	**Closed-loop speed and torque control** • Immediate pulse cancellation, the motor "coasts down " to a standstill. • "Switching on inhibited" is activated.
OFF3	QUICKSTOP	Braking along the OFF3 deceleration ramp followed by pulse inhibit	**Closed-loop speed control** • The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering n_set = 0. • The pulses are suppressed when standstill has been identified. • "Switching on inhibited" is activated. **Torque control** • Switchover to closed-loop speed control and other responses as described for closed-loop speed control.
STOP2	–	STOP2	• The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering n_set = 0. • The drive remains in closed-loop speed control.
ENCODER	–	Internal/external pulse inhibit	The ENCODER fault response occurs because of a sensor error and results in OFF2.

Acknowledgment

A fault can only be acknowledged if the cause has been resolved.

The acknowledgment specifies when the fault can be acknowledged.

An alarm is self-acknowledging.

Table 12-8 Acknowledging faults

Acknowledg-ment	Description
IMMEDIATELY	Acknowledgment can be immediately realized after the cause has been resolved.
PULSE INHIBIT	Once the cause has been resolved, the fault can only be acknowledged when the pulses are inhibited (r0899.11 = 0).
POWER ON	The fault can only be acknowledged using POWER ON (the converter is switched-off/ switched-on).
NONE	For alarms (type "A"), an acknowledgment is not required.

Cause

Describes the possible causes of the fault or alarm. Optionally, a message value, fault value or alarm value can be additionally specified.

Remedy

Generally explains possible procedures to resolve the cause of this active fault or alarm.

12.3.5 List of fault codes and alarm codes

Note

Inapplicable descriptions for the S200 Compact servo drive system

The list of faults and alarms contains some generic descriptions for SINAMICS products that are not applicable to the S200 Compact servo drive system. These inapplicable descriptions include but may not limit to the following:

- DRIVE-CLiQ
- Motor Module
- Line Module
- Hydraulic Module
- Hydraulic cylinder
- Hydraulic valve
- Controller Extension
- CX32 module
- Sensor Module
- Voltage Sensing Module

Product: SINAMICS S200, Version: 605022002, Language: eng
Objects: S200 Compact

F01000 Internal software error

Message class: Hardware/software error (1)
Message value: Module: %1, line: %2
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: - Evaluate fault buffer (r0945).
- Carry out a POWER ON (switch-off/switch-on) for all components.
- If required, check the data on the non-volatile memory (e.g. memory card).
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the converter.

F01001 FloatingPoint exception

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: An exception occurred for an operation with the FloatingPoint data type.
The error can be caused by the basic system or a technology function.
Fault value (r0949, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Check configuration and signals of the blocks in FBLOCKS.
- Check configuration and signals of DCC charts.
- Check configuration and signals of TEC charts.
- Upgrade firmware to later version.
- Contact Technical Support.

F01002 Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: An internal software error has occurred.
Fault value (r0949, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01003	Acknowledgment delay when accessing the memory
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A memory area was accessed that does not return a "READY". Fault value (r0949, interpret hexadecimal): Only relevant for internal fault diagnostics.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Contact Technical Support.

N01004 (F, A)	Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	An internal software error has occurred. Fault value (r0949, hexadecimal): Only relevant for internal fault diagnostics.
Remedy:	- Contact Technical Support.
Response upon: F:	OFF2
Acknowl. upon F:	POWER ON
Response upon: A:	NONE
Acknowl. upon A:	NONE

A01009 (N)	Control Unit overtemperature
Message class:	Overtemperature of the electronic components (6)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	The temperature of the converter has exceeded the specified limit value.
Remedy:	- Check the ambient temperature at the converter installation location - Check the converter air intake. - Check the converter fan. Note: The alarm is automatically withdrawn once the limit value has been fallen below.
Response upon: N:	NONE
Acknowl. upon N:	NONE

F01011 (N)	Download interrupted
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY

Cause: The project download was interrupted.
Fault value (r0949, interpret decimal):
1: The user prematurely interrupted the project download.
2: The communication cable was interrupted (e.g. cable breakage, cable withdrawn).
3: The project download was prematurely exited by the commissioning tool.
100: Different versions between the firmware version and project files which were loaded by loading into the file system "Download from memory card".
Note:
The response to an interrupted download is the state "first commissioning".

Remedy: - Check the communication cable.
- Download the project again.
- Boot from previously saved files (switch-off/switch-on or p0976).
- When loading into the file system (download from memory card), use the matching version.

Response upon: N: NONE

Acknowl. upon N: NONE

F01014 Topology: Component property changed

Message class: Hardware/software error (1)

Message value: Component number: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The properties of the component have fundamentally changed.
Fault value (r0949, interpret hexadecimal):
Component number.

Remedy: - Carry out a restart, reload parameters.

F01015 Internal software error

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: OFF2

Acknowledgment: POWER ON

Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Only relevant for internal fault diagnostics.

Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

A01019 Writing to the removable data medium unsuccessful

Message class: Hardware/software error (1)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The write access to the removable data medium was unsuccessful.

Remedy: - Check the removable data medium and if required replace.
- Repeat the data backup.

A01020 Writing to RAM disk unsuccessful

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: Write access to the internal RAM disk was unsuccessful.
Remedy: Adapt the file size for the system logbook to the internal RAM disk (p9930).

F01022 BIOS update required

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: The current firmware is not compatible with the installed BIOS. A BIOS update is required to use the device with this firmware.
Remedy: - Updating the BIOS to the current version
- Alternatively, downgrade to the previous firmware

F01023 Software timeout (internal)

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An internal software timeout has occurred.
Fault value (r0949, interpret decimal):
Only relevant for internal fault diagnostics.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01030 Sign-of-life failure for master control

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: For active PC master control of the PC, no sign-of-life was received within the monitoring time.
The master control was returned to the drive.
Remedy: Set the monitoring time higher at the PC or, if required, completely disable the monitoring function.
The monitoring time is set as follows using the commissioning tool:
<Drive> -> Commissioning -> Control panel -> Button "Fetch master control" -> A window is displayed to set the monitoring time in milliseconds.
Notice:
The monitoring time should be set as short as possible. A long monitoring time means a late response when the communication fails!

A01032 (F) All parameters must be saved

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: Data backup is incomplete
The partially saved parameters are not loaded the next time the system runs up.
For the system to successfully power up, all of the parameters must have been completely backed up.
Alarm value (r2124, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: Save all parameters.
See also: p0977 (Save all parameters)
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY

F01033 Units changeover: Reference parameter value invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: When changing over the units to the referred representation type, it is not permissible for any of the required reference parameters to be equal to 0.0
Fault value (r0949, parameter):
Reference parameter whose value is 0.0.
Remedy: Set the value of the reference parameter to a number different than 0.0.
See also: p0304, p0305, p2000, p2001, p2002, p2003, p2004

F01034 Units changeover: Calculation parameter values after reference value change unsuccessful

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The change of a reference parameter meant that for an involved parameter the set value was not able to be re-calculated in the per unit representation. The change was rejected and the original parameter value restored.
Fault value (r0949, parameter):
Parameter whose value was not able to be re-calculated.
See also: p0304, p0305, p2000, p2001, p2002, p2003, p2004
Remedy: - Select the value of the reference parameter such that the parameter involved can be calculated in the per unit representation.

A01035 (F) Parameter backup files corrupted

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE

Cause: When the converter runs up, no complete data set was found from the parameter backup files. The last time that the parameterization was saved, it was not completely carried out.

It is possible that the backup was interrupted by switching off or withdrawing the memory card.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

aa = 01 hex:

Run-up was realized without data backup. The drive is in the factory setting.

aa = 02 hex:

The last available backup data record was loaded. The parameterization must be checked. It is recommended that the parameterization is downloaded again.

aa = 03 hex: An external card with valid parameter backup was found and copied to the converter. Run-up is realized from this project.

aa = 04 hex: An external card with incomplete or defective parameter backup was found. Run-up was realized without data backup. The drive is in the factory setting.

dd, cc, bb:

Only for internal Siemens troubleshooting.

See also: p0977 (Save all parameters)

Remedy: - Download the project again using the commissioning tool.

- Retentively save parameters (save all parameters p0977 = 1)

See also: p0977 (Save all parameters)

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

F01036 (A) Parameter backup file missing

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: When loading the device parameterization, a parameter backup file cannot be found.

Remedy: If the project data are backed up using the commissioning tool, then the project must be downloaded again.

Retentively save parameters (save all parameters, p0977 = 1), as a consequence, parameter files are completely written back to the non-volatile memory.

Note:

If the project data have not been backed up, then a new first commissioning is required.

Response upon: A: NONE

Acknowl. upon A: NONE

F01038 (A) Loading the parameter backup file unsuccessful

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: An error has occurred when loading parameter backup files from the non-volatile memory.

Remedy: - If you have saved the project data using the commissioning tool, then download the project again. Retentively save the data or set p0977 = 1. This means that the parameter files are again completely written to the non-volatile memory.

- Replace the memory card or the converter.

Response upon: A: NONE

Acknowl. upon A: NONE

F01039 (A)	Writing to the parameter back-up file unsuccessful
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	Writing to at least one parameter backup file in the non-volatile memory was unsuccessful. - A parameter backup file has the "read only" file attribute and cannot be overwritten. - There is not sufficient free memory space available. - The non-volatile memory is defective and cannot be written to.
Remedy:	- Check the free memory space in the non-volatile memory. - Replace the memory card or the converter.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F01040	Save parameter settings and carry out a POWER ON
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	A parameter was changed, which means that it is necessary to save the parameters and reboot.
Remedy:	- Back up parameters. - Carry out a POWER ON (switch-off/switch-on) for all components. Then: - Upload the drive in the commissioning tool.

F01041	Parameter save necessary
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	Defective or missing files were detected on the memory card when booting. Fault value (r0949, interpret decimal): 1: Source file cannot be opened. 2: Source file cannot be read. 3: Target directory cannot be set up. 4. Target file cannot be set up/opened. 5. Target file cannot be written to. Additional values: Only relevant for internal fault diagnostics.
Remedy:	- Save the parameters. - Reload the project into the converter. - Update the firmware - If required, replace the converter and/or memory card.

F01042	Parameter error during project download
Message class:	Error in the parameterization / configuration / commissioning procedure (18)

Message value:	Parameter: %1, index: %2, fault cause: %3
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause:

An error was detected when downloading a project using the commissioning software (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.

The detailed cause of the fault can be determined using the fault value.

Fault value (r0949, interpret hexadecimal):

ccbbaaaa hex

aaaa = Parameter

bb = Index

cc = fault cause

0: Parameter number illegal.

1: Parameter value cannot be changed.

2: Lower or upper value limit exceeded.

3: Sub-index incorrect.

4: No array, no sub-index.

5: Data type incorrect.

6: Setting not permitted (only resetting).

7: Descriptive element cannot be changed.

9: Descriptive data not available.

11: No master control.

15: No text array available.

17: Task cannot be executed due to operating state.

20: Illegal value.

21: Response too long.

22: Parameter address illegal.

23: Format illegal.

24: Number of values not consistent.

25: Drive object does not exist.

101: Presently deactivated.

104: Illegal value.

107: Write access not permitted when controller enabled.

108: Unit unknown.

109: Write access only in the commissioning status, encoder.

110: Write access only in the commissioning status, motor.

111: Write access only in the commissioning status, power unit.

112: Write access only in the quick commissioning mode.

113: Write access only in the ready mode.

114: Write access only in the commissioning status, parameter reset.

115: Write access only in the Safety Integrated commissioning status.

116: Write access only in the commissioning status, technological application/units.

117: Write access only in the commissioning status.

118: Write access only in the commissioning status, download.

119: Parameter may not be written in download.

120: Write access only in the commissioning status, drive basis configuration.

121: Write access only in the commissioning status, define drive type.

122: Write access only in the commissioning status, data set basis configuration.

123: Write access only in the commissioning status, device configuration.

124: Write access only in the commissioning status, device download.

125: Write access only in the commissioning status, device parameter reset.

126: Write access only in the commissioning status, device ready.

127: Write access only in the commissioning status, device.

129: Parameter may not be written in download.

131: Requested signal interconnection not possible as the signal source does not supply float value.

132: Free signal interconnection via PROFIdrive telegram setting inhibited.

133: Access method not defined.
200: Below the valid values.
201: Above the valid values.
202: Cannot be accessed from the Basic Operator Panel (BOP).
203: Cannot be read from the Basic Operator Panel (BOP).
204: Write access not permitted.

Remedy:
- Correct the parameterization in the commissioning tool and download the project again.
- Enter the correct value in the specified parameter.
- Identify the parameter that restricts the limits of the specified parameter.

F01043 Fatal error at project download

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Fault cause: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A fatal error was detected when downloading a project using the commissioning tool.
Fault value (r0949, interpret decimal):
14: Drive status cannot be changed to "ready for operation" (r0947 and r0949).
Additional values:
Only relevant for internal fault diagnostics.

Remedy:
- Use the current version of the commissioning tool.
- Modify the offline project and carry out a new download (e.g. compare the number of drive objects, motors, encoders, power units in the offline project and at the drive).
- Change the drive state (is a drive rotating or is there a message/signal?).
- Observe additional active messages/signals and remove their cause (e.g. correct any incorrectly set parameters).
- Automatically calculate the control parameters.
- Boot from previously saved files (switch-off/switch-on or p0976).
- Before a new download, restore the factory setting.

F01044 Descriptive data error

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: OFF2

Acknowledgment: POWER ON

Cause: An error was detected when loading the descriptive data saved in the non-volatile memory.

Remedy: Replace the memory card or the converter.

F01045 Configuring data invalid

Message class: Hardware/software error (1)

Message value: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The run-up from the loaded project was unsuccessful.
Possible projects:
- Download with commissioning tool
- Run-up from data backup after retentively saving
- Run-up from data backup after cloning created from external card
- Restart

Fault value (r0949, interpret hexadecimal):
Only relevant for internal fault diagnostics.

Remedy: - Restore the factory setting (p0976 = 1) and reload the project into the converter.
Then retentively save the parameterization or set p0977 = 1. This overwrites the incorrect parameter files in the non-volatile memory – and this alarm is withdrawn.

F01046 Parameter value from the project not accepted

Message class: Hardware/software error (1)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: When running up from the loaded project, a parameter value was not accepted.
Possible projects:
- Download with commissioning tool
- Run-up from data backup after retentively saving
- Run-up from data backup after cloning created from external card
- Run-up from an old project or upgrade the firmware
- Restart

Fault value (r0949, interpret decimal):
Parameter number whose value was not accepted.

Remedy: Check the parameter value of the parameter that was not accepted and, if required, correct.

F01047 It is not possible to restore the drive data from the backup file

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An error occurred when restoring the drive data from the backup file.
An unsuitable or incorrect backup file was detected under path BACKUPFILE_NEXT_START on the memory card.

Fault value (r0949, interpret decimal):
1: The backup file has the incorrect format. Only files are supported with extension .zip or .ZIP.
2: Several files were found in path BACKUPFILE_NEXT_START. It cannot be determined from which backup file the drive data should be restored.
3: The backup file name is too long.
4: The backup file was unsuccessfully unzipped.
5, 6, 7, 8 or 9: The content of the backup file is invalid or the backup file was generated with encryption.
10: The backup file was generated with an incompatible (older) firmware version. Restoring the drive data is not supported.
11: The backup file version is newer than the converter firmware version being used.
12: The backup file was generated for a different converter family.
Additional values: Only relevant for internal fault diagnostics.

Remedy: For fault value = 1: Use a file with .zip or .ZIP extension.
For fault value = 2: Only save the required backup file under BACKUPFILE_NEXT_START, remove other files.
For fault value = 3: Rename backup file Notice: Special characters can be longer than a visible character.
For fault value = 4, 5, 6, 7, 8 or 9: Use the backup file which was created using a SIEMENS commissioning tool (Startdrive, web server).
Before a backup file is created, encryption of the drive data must be deactivated.
For fault value = 10: Only converter backup files with firmware versions greater than or equal to V6.1 are supported. Use a suitable backup file.
For fault value = 11: Use the converter backup file that was created with a lower firmware version or the same firmware version.
For fault value = 12: Use the backup file for the matching converter family.

A01049 CU: It is not possible to write to file

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: It is not possible to write to a write-protected parameter backup file. The write request was interrupted.
Alarm value (r2124, interpret decimal):
Number drive object
Remedy: Check whether the "write protected" attribute has been set for the files in the non-volatile memory.
When required, remove write protection and repeat the save operation (e.g. set p0977 = 1).

F01050 Memory card and device incompatible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The memory card and the device type do not match (e.g. a memory card for SINAMICS S is inserted in SINAMICS G).
Remedy: - Insert the matching memory card.
- Use the matching converter or power unit.

F01054 CU: System limit exceeded

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: At least one system overload has been identified.
Fault value (r0949, interpret decimal):
1: Computing time load too high.
5: Peak load too high.
Note:
As long as this fault is present, it is not possible to save the parameters (p0977).
Remedy: - Reduce the computing time load of the converter to less than 100 %.
- Deactivate functions.

F01068	CU: Data memory memory overflow
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The utilization for a data memory area is too large. Fault value (r0949, interpret binary): Bit 0 = 1: High-speed data memory 1 overloaded Bit 1 = 1: High-speed data memory 2 overloaded Bit 2 = 1: High-speed data memory 3 overloaded Bit 3 = 1: High-speed data memory 4 overloaded
Remedy:	- Deactivate function. - Deactivate drive object. - Remove drive object from the target topology.

A01069	Parameter backup and device incompatible
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	The parameter backup on the memory card and in the converter do not match. The module boots with the factory settings. Example: Devices A and B. are not compatible and a memory card with the parameter backup for device A is inserted in device B.
Remedy:	- Insert a memory card with compatible parameter backup and carry out a POWER ON. - Insert a memory card without parameter backup and carry out a POWER ON. - Save the parameters (p0977 = 1).

A01073 (N)	POWER ON required for backup copy on memory card
Message class:	General drive fault (19)
Message value:	-
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	The parameter assignment on the visible partition of the memory card has changed. In order that the backup copy on the memory card is updated on the non-visible partition, it is necessary to carry out a POWER ON or hardware reset (p0972) of the converter. Note: A new POWER ON can be requested via this alarm (e.g. after retentively saving).
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Carry out a hardware reset (RESET button, p0972).
Response upon: N:	NONE
Acknowl. upon N:	NONE

F01082	Parameter error when running up from data backup
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1, index: %2, fault cause: %3

Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause:

Parameterizing errors have been detected (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.

The detailed cause of the fault can be determined using the fault value.

Fault value (r0949, interpret hexadecimal):

ccbbaaaa hex

aaaa = Parameter

bb = Index

cc = fault cause

0: Parameter number illegal.
1: Parameter value cannot be changed.
2: Lower or upper value limit exceeded.
3: Sub-index incorrect.
4: No array, no sub-index.
5: Data type incorrect.
6: Setting not permitted (only resetting).
7: Descriptive element cannot be changed.
9: Descriptive data not available.
11: No master control.
15: No text array available.
17: Task cannot be executed due to operating state.
20: Illegal value.
21: Response too long.
22: Parameter address illegal.
23: Format illegal.
24: Number of values not consistent.
25: Drive object does not exist.
101: Presently deactivated.
104: Illegal value.
107: Write access not permitted when controller enabled.
108: Unit unknown.
109: Write access only in the commissioning status, encoder.
110: Write access only in the commissioning status, motor.
111: Write access only in the commissioning status, power unit.
112: Write access only in the quick commissioning mode.
113: Write access only in the ready mode.
114: Write access only in the commissioning status, parameter reset.
115: Write access only in the Safety Integrated commissioning status.
116: Write access only in the commissioning status, technological application/units.
117: Write access only in the commissioning status.
118: Write access only in the commissioning status, download.
119: Parameter may not be written in download.
120: Write access only in the commissioning status, drive basis configuration.
121: Write access only in the commissioning status, define drive type.
122: Write access only in the commissioning status, data set basis configuration.
123: Write access only in the commissioning status, device configuration.
124: Write access only in the commissioning status, device download.
125: Write access only in the commissioning status, device parameter reset.
126: Write access only in the commissioning status, device ready.
127: Write access only in the commissioning status, device.
129: Parameter may not be written in download.
131: Requested signal interconnection not possible as the signal source supplies non-float value.
132: Free signal interconnection via PROFIdrive telegram setting inhibited.

133: Access method not defined.
200: Below the valid values.
201: Above the valid values.
202: Cannot be accessed from the Basic Operator Panel (BOP).
203: Cannot be read from the Basic Operator Panel (BOP).
204: Write access not permitted.

Remedy:
- Based on the fault value, identify the parameter that caused the fault.
- Correct the value in the specified parameter.
- Download the project again using the commissioning tool and retentively save parameters. Or retentively save parameters and carry out a POWER ON (switch-off/switch-on).

A01100 CU: Memory card withdrawn

Message class: General drive fault (19)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The memory card (non-volatile memory) was withdrawn during operation.
Notice:
It is not permissible for the memory card to be withdrawn or inserted under voltage.
Remedy:
- Switch off the drive system.
- Re-insert the memory card that was withdrawn - This card must match the drive system.
- Switch on the drive system again.

F01107 CU: Save to memory card unsuccessful

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: A data save in the non-volatile memory was not able to be successfully carried out.
- Non-volatile memory is defective.
- Insufficient space in the non-volatile memory.

Fault value (r0949, interpret decimal):
Only relevant for internal fault diagnostics.
Remedy:
- Try to save again.
- Replace the memory card or Control Unit.

F01122 (A) Frequency at the measuring probe input too high

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY

Cause: The frequency of the pulses at the measuring probe input is too high.
Fault value (r0949, interpret decimal):
1: DI/DO 9 (X122.8)
2: DI/DO 10 (X122.10)
4: DI/DO 11 (X122.11)
8: DI/DO 13 (X132.8)
16: DI/DO 14 (X132.10)
32: DI/DO 15 (X132.11)
64: DI/DO 8 (X122.7)
128: DI/DO 12 (X132.7)

Remedy: Reduce the frequency of the pulses at the measuring probe input.

Response upon: A: NONE

Acknowl. upon A: NONE

F01151 CU: Number of drive objects of a category exceeded

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Drive object category: %1, number permitted: %2, actual number: %3

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The maximum permissible number of drive objects of a category was exceeded.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
ddccbbaa hex:
aa = drive object category:
- Drive object category, for which the maximum permissible number of drive objects was exceeded.
bb = number permitted:
- Maximum permissible number for this drive object category.
cc = actual number:
- Actual number for this drive object category.
dd = no significance

Remedy: - Switch off the unit.
- Suitably restrict the number of drive objects of the specified category by reducing the number of inserted components.
- Re-commission the unit.

F01200 CU: Time slice management internal software error

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: A time slice management error has occurred.
It is possible that the sampling times have been inadmissibly set.
Fault value (r0949, interpret hexadecimal):
998:
Too many time slices occupied by technology functions (e.g. DCC).
999:
Too many time slices occupied by the basic system. Too many different sampling times may have been set.
Additional values:
Only relevant for internal fault diagnostics.

Remedy: - Contact Technical Support.

F01205 CU: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: OFF2
Acknowledgment: POWER ON
Cause: Insufficient processing time is available for the existing topology.
Fault value (r0949, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: - Reduce the number of drives.

F01250 EEPROM incorrect read-only data

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: POWER ON
Cause: Error when reading the read-only data of the EEPROM in the converter.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Replace the converter.

A01251 CU: CU-EEPROM incorrect read-write data

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: Error when reading the read-write data of the EEPROM in the converter.
Alarm value (r2124, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: For alarm value r2124 < 256, the following applies:
- Carry out a POWER ON (switch-off/switch-on).
- Replace the converter.
For alarm value r2124 >= 256, the following applies:
- For the converter with this alarm, clear the fault memory (p0952 = 0).
- Replace the converter.

F01255 CU: Option Board EEPROM read-only data error

Message class: Hardware/software error (1)
Message value: %1
Component: None
Response: NONE
Acknowledgment: POWER ON

Cause: Error when reading the read-only data of the EEPROM in the Option Board.
Fault value (r0949, interpret decimal):
Only relevant for internal fault diagnostics.

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Replace the Control Unit.

A01256 CU: Option Board EEPROM read-write data error

Message class: Hardware/software error (1)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: Error when reading the read-write data of the EEPROM in the Option Board.
Alarm value (r2124, interpret decimal):
Only relevant for internal fault diagnostics.

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Replace the Control Unit.

A01314 Topology: Component must not be present

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1, to %2, %3, connection: %4

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1, %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %3

Component in target topology

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	

41	X401
42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: For a component, "deactivate and not present" is set but this component is still in the topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
aa = component number
bb = component class of the component
cc = connection number
Note:
Component class and connection number are described in F01375.

Remedy: - Remove the corresponding component.
- Change the setting "deactivate and not present".
Note:
Under "Topology --> Topology view", the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01319 Inserted component not initialized

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: Initialization is required for at least one inserted component.
This is only possible if the pulse inhibit is active on all drive objects.
Remedy: Activate pulse inhibit for all drive objects.

F01325 Topology: Component number not included in target topology

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component number: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The component referenced in a data set is not contained in the target topology.
Fault value (r0949, interpret decimal)
Remedy: Establish consistency between the topology and data set configuration.

A01330 Topology: Quick commissioning not possible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Fault cause: %1, supplementary information: %2, preliminary component number: %3
Component: None
Response: NONE

Acknowledgment: NONE
Cause: Unable to carry out a quick commissioning. The existing actual topology does not fulfill the requirements.
Remedy: - Check the motor connection.
- Carry out a POWER ON (switch-off/switch-on).

F01356 Topology: There is a defective component

Message class: Hardware/software error (1)
Message value: Fault cause: %1, component number: %2, connection number: %3
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The actual topology indicates at least one defective component.
Note:
Pulse enable is withdrawn and prevented.
Remedy: Replace the defective component and restart the system.

F01380 Topology: Actual topology EEPROM defective

Message class: Hardware/software error (1)
Message value: Preliminary component number: %1
Component: None
Response: NONE
Acknowledgment: POWER ON
Cause: When detecting the actual topology, a component with a defective EEPROM was detected.
Fault value (r0949, interpret hexadecimal):
bbbbaaaa hex:
bbbb = reserved
aaaa = preliminary component number of the defective components
Remedy: Output the fault value and remove the defected component.

A01388 Topology: Encoder incorrectly inserted

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component: %1, to %2, %3, connection: %4
Component: None
Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %3

Component in actual topology

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	

40	X400
41	X401
42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause:

The topology comparison has detected an EnDat encoder in the actual topology that has been incorrectly inserted with respect to the target topology.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

dd = connection number (%4)

cc = component number (%3)

bb = component class (%2)

aa = component number of the incorrectly inserted component (%1)

Note:

The component is described in dd, cc and bb, where the component involved is incorrectly inserted.

Component class and connection number are described in F01375.

The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy:

Adapting topologies:

- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).
- Automatically resolve the topology error.

Note:

Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01420 Topology: Component different

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, target: %2, actual: %3, difference: %4

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1

Component in target topology

For %2, %3

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
1	Different component type	
2	Different article number	
3	Different manufacturer	
4	Incorrect subcomponent connected	
5	NX10 or NX15 used instead of CX32.	
6	CX32 used instead of NX10 or NX15.	
7	Different number of connections	

Cause:

The topology comparison has detected differences in the actual and target topologies in the electronic nameplate component.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

aa = component number (%1),

bb = component class of the target topology (%2),

cc = component class of the actual topology (%3),

dd = difference (%4)

Note:

The component class is described in F01375.

The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy:

Adapting topologies:

- Connect the expected component (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).

Note:

Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01422 Topology: Required data rate cannot be set

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, connection: %2, difference: %3

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1

Component in target topology

For %2

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	
42	X402	
50	X500	
51	X501	
52	X502	
53	X503	
54	X504	
55	X505	
56	X506	
57	X507	

For %3

Value	Cause	Remedy
1	Incorrect cable	Correct cable
2	Incorrect socket	Correct socket

Cause: The topology comparison identified differences in the data rate for the connection between two components.
Note:
The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy: Load a project that matches the hardware.

A01425 Topology: Serial number different

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, %2, differences: %3

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1
Component in target topology
For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

Cause: The topology comparison has detected differences in the actual and target topologies in relation to one component. The serial number is different.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
dd = reserved
cc = number of differences (%3)
bb = component class (%2)
aa = component number (%1)
Note:
The component class is described in F01375.
The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy: Adapting topologies:
- Change over the actual topology to match the target topology.
- Load the target topology that matches the actual topology (commissioning tool).
Note:
Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

F01451	Topology: Target topology is invalid
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	An error was detected in the target topology. The target topology is invalid. Fault value (r0949, interpret hexadecimal): ccccbbaa hex: cccc = index error, bb = component number, aa = fault cause aa = 1B hex = 27 dec: Error not specified. aa = 1C hex = 28 dec: Value illegal. aa = 1D hex = 29 dec: Incorrect ID. aa = 1E hex = 30 dec: Incorrect ID length. aa = 1F hex = 31 dec: Too few indices left. aa = 20 hex = 32 dec: component is not connected to the converter.
Remedy:	Download the target topology again using the commissioning tool.

A01481 (N)	Topology: Internal communications faulted
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Component: %1, to %2, %3, connection: %4
Component:	None
Response:	NONE

Acknowledgment: NONE

Explanation of the message value: For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

	42 X402
	50 X500
	51 X501
	52 X502
	53 X503
	54 X504
	55 X505
	56 X506
	57 X507
Cause:	Internal communications faulted.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Replace the device.
Response upon: N:	NONE
Acknowl. upon N:	NONE

A01486 Topology: Component not connected

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Component: %1, to %2, %3, connection: %4
Component:	None
Response:	NONE

Acknowledgment: NONE

Explanation of the message value:

For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause:

The topology comparison has detected a component that is missing in the actual topology with respect to the target topology.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

dd = connection number (%4)

cc = component number (%3)

bb = component class (%2)

aa = component number of the component that has not been inserted (%1)

Note:

The component is described in dd, cc and bb, where the component has not been inserted.

Component class and connection number are described in F01375.

Remedy:

Adapting topologies:

- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).

Check the hardware:

- Check the 24 V supply voltage.
- Check cables for interruption and contact problems.
- Check that the component is working properly.

Note:

Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01488 Topology: Encoder not connected

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, to %2, %3, connection: %4

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause:

The topology comparison has detected an encoder that is missing in the actual topology with respect to the target topology.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

dd = connection number (%4)

cc = component number (%3)

bb = component class (%2)

aa = component number of the component that has not been inserted (%1)

Note:

The component is described in dd, cc and bb, where the component has not been inserted.

Component class and connection number are described in F01375.

Remedy:

Adapting topologies:

- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).

Check the hardware:

- Check the 24 V supply voltage.
- Check cables for interruption and contact problems.
- Check that the component is working properly.

Note:

Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01489 Topology: Motor not connected

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, to %2, %3, connection: %4

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: The topology comparison has detected a motor that is missing in the actual topology with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
dd = connection number (%4)
cc = component number (%3)
bb = component class (%2)
aa = component number of the component that has not been inserted (%1)
Note:
The component is described in dd, cc and bb, where the component has not been inserted.
Component class and connection number are described in F01375.

Remedy: Adapting topologies:
- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).
Check the hardware:
- Check the 24 V supply voltage.
- Check cables for interruption and contact problems.
- Check that the component is working properly.
Note:
Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

F01512 No scaling available

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: OFF2
Acknowledgment: POWER ON
Cause: An attempt was made to determine a conversion factor for a scaling that does not exist.
Fault value (r0949, interpret decimal):
Unit (e.g. corresponding to SPEED) for which an attempt was made to determine a factor.
Remedy: Apply scaling or check the transfer value.

A01514 (F) Error when writing during a reconnect

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause: During a reconnect operation (e.g. while booting or downloading - but can also occur in normal operation) a parameter was not able to be written to.
The parameter is then reset to the factory setting.

Alarm value (r2124, interpret decimal):
Parameter number

Remedy: Not necessary.

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

A01550 Security: Drive data encryption invalid

Message class: Hardware/software error (1)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The password for drive data encryption (DDE) does not match the password configured in the converter or no password was configured.
The DDE password protects sensitive data on the SD card.
It is not possible to transfer the data backup from the SD card.

Remedy: To be able to restore the data backup on the SD card, the DDE password must correspond to the password that was originally configured for the data backup in the original converter:
- With the SD card inserted, enter the correct DDE password in the Security Wizard of the web server and restart the converter.
- In Startdrive, with the SD card inserted, under Online & Diagnostics, enter the correct DDE password in screen form "Specify password for encryption of the drive data" and restart the converter.

If the data backup on the SD card is not be used:
- Remove the SD card from the converter and restart the converter.

Notice: Not observing this and continuing to work at the converter can lead to the data backup on the SD card being lost.

F01800 (A) Internal communications faulted

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause:

Remedy: Replace the component involved.

Response upon: A: NONE

Acknowl. upon A: NONE

A01900 (F) PN: Configuration telegram error

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A controller attempts to establish a connection using an incorrect configuring telegram.
Alarm value (r2124, interpret decimal):
2:
Too many PZD data words for output or input. The number of possible PZD is specified by the number of indices in r2050/c2053.
3:
Uneven number of bytes for input or output.
4:
Setting data for synchronization not accepted. For more information, see A01902.
211:
Unknown parameterizing block.
Additional values:
Only for internal Siemens troubleshooting.

Remedy: Check the bus configuration on the controller and device sides.

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

A01902 PN: Isochronous operation parameterization not permissible

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: Parameterization for isochronous operation is not permissible.
Alarm value (r2124, interpret decimal):
0: Bus cycle time Tdp < 0.5 ms.
1: Bus cycle time Tdp > 32 ms.
2: Bus cycle time Tdp is not an integer multiple of the current controller sampling time.
3: Instant of the actual value sensing Ti > Bus cycle time Tdp or Ti = 0.
4: Instant of the actual value sensing Ti is not an integer multiple of the current controller sampling time.
5: Instant of the setpoint acceptance To >= Bus cycle time Tdp or To = 0.
6: Instant of the setpoint acceptance To is not an integer multiple of the current controller sampling time.
7: Controller application cycle time Tmapc is not an integer multiple of the speed controller sampling time.
8: Bus reserve bus cycle time Tdp - Data exchange time Tdx less than two current controller sampling times.
10: Instant of the setpoint acceptance To <= data exchange time Tdx + current controller sampling time
11: Controller application cycle time Tmapc > 14 x Tdp or Tmapc = 0.
12: PLL tolerance window Tpll_w > Tpll_w_max.
13: Bus cycle time Tdp is not a multiple of the speed controller clock cycle.

Remedy: - Adapt the bus parameterization Tdp, Ti, To.
- Adapt the sampling time for the current controller or speed controller.
For alarm value = 10:
- Reduce Tdx by using fewer bus participants or shorter telegrams.
Note:
PN: PROFINET

A01904 (F, N) PN: Controller setting of the PZD telegram rejected

Message class: Communication error to the higher-level control system (9)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A controller attempts to set a PZD telegram. The setting is not applied.
Alarm value (r2124, interpret decimal):
1: Project contains free telegram interconnections.
2: Controller specifies a combination of fixed and free telegrams.
3: Controllers have no function rights for making changes.
4: Telegram cannot be set as a result of the drive configuration.
See also: r0922 (IF1 PROFIdrive PZD telegram)

Remedy: Check and align the telegram settings in the drive project and in the controller.
For alarm value = 4:
- Align telegram and control mode (closed-loop speed control/basic positioner).

Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A01905 (N) PN: Controller setting to activate the channel diagnostics rejected

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: A controller attempted to change the activation of the channel diagnostics. The setting is not applied as the controller does not have the function rights to make a change.
Alarm value (r2124, interpret decimal):
1: Channel diagnostics are activated. Controller attempts to deactivate them.
2: Channel diagnostics are not activated. Controller attempts to activate them.
Remedy: Activate channel diagnostics in the bus configuration and check and align function rights in the drive.
Response upon: N: NONE
Acknowl. upon N: NONE

F01910 (N, A) Fieldbus: Setpoint timeout

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: The reception of setpoints from the fieldbus interface (PROFINET) is interrupted.
- Bus connection interrupted.
- Controller switched off.
- Controller set into the STOP state.

Remedy: Restore the bus connection and set the controller to RUN.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F01911 (N, A) PN: Isochronous operation, clock cycle failure

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None

Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The telegram to synchronize the clock cycles has failed for several bus clock cycles or in several bus clock cycles has consecutively violated the specified time grid (see bus cycle time, Tdp and Tpllw).
Remedy:
- Check the physical bus configuration (cable, connector, terminating resistor, shielding, etc.).
- Check whether communication was briefly or permanently interrupted.
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).

Note:
PN: PROFINET

Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F01912 (N, A) PN: Isochronous operation sign-of-life missing

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible number of errors in the controller sign-of-life (isochronous operation) has been exceeded in cyclic operation.
Remedy:
- Check the physical bus configuration (cables, connectors, etc.).
- Check whether the controller correctly sends the sign-of-life (e.g. create a trace with STW2.12 ... STW2.15 and trigger signal ZSW1.3).
- Check the permissible telegram failure rate (p0925).
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).

Note:
PN: PROFINET

Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F01916 Internal communications error

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: An internal Ethernet communications error has occurred.
Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01917 Internal communications error

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1

Acknowledgment: IMMEDIATELY
Cause: An internal PROFINET communications error has occurred.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

A01932 PN: Isochronous mode missing for DSC

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: There is no isochronous mode or isochronous sign of life and DSC is selected.
Note:
DSC: Dynamic Servo Control
See also: r0922 (IF1 PROFIdrive PZD telegram)
Remedy: Set isochronous mode across the bus configuration and transfer isochronous sign-of-life.

A01940 PB/PN: Clock cycle synchronism not reached

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. Synchronization with the clock cycle specified by the controller was still not able to be performed.
- The controller does not send an isochronous telegram, although isochronous operation was selected when configuring the bus.
- The controller uses another isochronous bus clock cycle than was transferred to the device in the parameterizing telegram.
Remedy: - Check the controller application and bus configuration.
- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.
Note:
PB: PROFIBUS
PN: PROFINET

A01941 PN: Clock cycle signal missing when the bus is being established

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. The synchronization telegram is not received.
Remedy: Check the controller application and bus configuration.
Note:
PN: PROFINET

A01943 PN: Clock cycle signal error when the bus is being established

Message class: Communication error to the higher-level control system (9)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.

The synchronization telegram is irregularly received.

- The controller sends an irregular synchronization telegram.

- The controller uses another isochronous bus clock cycle than was transferred to the device in the parameterizing telegram.

Remedy: - Check the controller application and bus configuration.

- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.

Note:

PN: PROFINET

A01944 PN: Sign-of-life synchronism not reached

Message class: Communication error to the higher-level control system (9)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.

Synchronization with the controller sign-of-life (STW2.12 ... STW2.15) could not be completed because the sign-of-life changes differently to how it was configured in the Tmapc time grid.

Remedy: - Ensure that the controller correctly increments the sign-of-life in the controller application clock cycle Tmapc.

Note:

PN: PROFINET

F01950 (N, A) PN: Isochronous operation, synchronization unsuccessful

Message class: Communication error to the higher-level control system (9)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: Synchronization of the internal clock cycle to the controller clock cycle has failed. The internal clock cycle exhibits an unexpected shift.

Remedy: Only for internal Siemens troubleshooting.

Note:

PN: PROFINET

Response upon: N: NONE

Acknowl. upon N: NONE

Response upon: A: NONE

Acknowl. upon A: NONE

A01980 PN: Cyclic connection interrupted

Message class: Communication error to the higher-level control system (9)

Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The cyclic connection to the PROFINET controller is interrupted.
See also: r8936 (PN cyclic connection state)
Remedy: Establish the PROFINET connection and activate the PROFINET controller in the cyclic mode.
Check parameters "Name of Station" and "IP of Station".

A01981 PN: Maximum number of controllers exceeded

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Info 1: %1, info 2: %2
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A controller attempts to establish a connection to the drive, and as a consequence exceeds the permitted number of PROFINET connections.
The alarm is automatically withdrawn after approx. 30 seconds.
Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy = info. 1, xxxx = info. 2
Info 1 = 0: Number of RT connections exceeded
Info 1 > 0: Number of IRT connections exceeded
Info 2: permitted number of connections
Remedy: Check the PROFINET controller configuration.

A01989 PN: Internal cyclic data transfer error

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The cyclic actual values and/or setpoints were not transferred within the specified times.
Alarm value (r2124, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: Correctly set T_io_input or T_io_output.

A02000 Function generator: Start not possible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The function generator has already been started.
Remedy: Stop the function generator and restart again if necessary.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02006 Function generator: No drive specified for connection

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: No drive specified for connection was specified.
Remedy: At least one drive to be connected must be specified.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02010 Function generator: Speed setpoint from the drive is not zero

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The speed setpoint of a drive selected for connection is greater than the value for the standstill detection set using p1226.
Remedy: For all of the drives specified for connection, set the speed setpoints to zero.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02020 Function generator: Parameter cannot be changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: This parameter setting cannot be changed when the function generator is active.
Remedy: - Stop the function generator before parameterizing.
- Possibly start the function generator.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02026 Function generator: Pulse width too high

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The selected pulse width is too high.
The pulse width must be less than the period duration.

Remedy: Reduce pulse width.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02030 Function generator: Physical address equals zero

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The specified physical address is zero.
Remedy: Set a physical address with a value other than zero.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02040 Function generator: Illegal value for offset

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The value for the offset is higher than the value for the upper limit or lower than the value for the lower limit.
Remedy: Adjust the offset value accordingly.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02041 Function generator: Illegal value for bandwidth

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The bandwidth referred to the time slice clock cycle of the function generator has either been set too low or too high.
Depending on the time slice clock cycle, the bandwidth is defined as follows:
Bandwidth_max = 1 / (2 x time slice clock cycle)
Bandwidth_min = Bandwidth_max / 100000
Example:
Assumption: Time slice clock cycle = 125 µs
--> Bandwidth_max = 1 / (2 x 125 µs) = 4000 Hz
--> Bandwidth_min = 4000 Hz / 100000 = 0.04 Hz

Remedy: Check the value for the bandwidth and adapt accordingly.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02047 Function generator: Time slice clock cycle invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The time slice clock cycle selected does not match any of the existing time slices.
Remedy: Enter an existing time slice clock cycle. The fastest cycle time can be read out using the commissioning tool.
Note:
The alarm is reset as follows:
- Remove the cause of this alarm.
- Restart the function generator.

A02050 Trace: Start not possible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The trace has already been started.
Remedy: Stop the trace and, if necessary, start again.

A02055 Trace: Recording time too short

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The trace duration is too short.
The minimum is twice the value of the trace clock cycle.
Remedy: Check the selected recording time and, if necessary, adjust.

A02056 Trace: Recording cycle too short

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The selected recording clock cycle is shorter than the selected basic clock cycle 0.
Remedy: Increase the value for the trace cycle. The fastest cycle time can be read out using the commissioning tool.

A02057 Trace: Time slice clock cycle invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The time slice clock cycle selected does not match any of the existing time slices.
Remedy: Enter an existing time slice clock cycle. The fastest cycle time can be read out using the commissioning tool.

A02059 Trace: Time slice clock cycle for 2 x 8 recording channels not valid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The selected time slice clock cycle cannot be used for more than 4 recording channels.
Remedy: Enter the clock cycle of an existing time slice with a cycle time >= 4 ms or reduce the number of recording channels to 4 per trace.
The fastest cycle time can be read out using the commissioning tool.

A02060 Trace: Signal to be traced missing

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: - A signal to be traced was not specified.
- The specified signals are not valid.
Remedy: - Specify the signal to be traced.
- Check whether the relevant signal can be traced.

A02062 Trace: Invalid trigger signal

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: - A trigger signal was not specified.
- The specified signal does not exist.
- The specified signal is not a fixed-point signal.
- The specified signal cannot be used as a trigger signal for the trace.
Remedy: Specify a valid trigger signal.

A02063 Trace: Invalid data type

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The specified data type to select a signal using a physical address is invalid.
Remedy: Use a valid data type.

A02070 Trace: Parameter cannot be changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The trace parameter settings cannot be changed when the trace is active.
Remedy: - Stop the trace before parameterization.
- If required, start the trace.

A02075 Trace: Pretrigger time too long

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The selected pretrigger time must be shorter than the trace time.
Remedy: Check the pretrigger time setting and change if necessary.

F02080 Trace: Parameterization deleted due to unit changeover

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The trace parameterization in the converter was deleted due to a unit changeover or a change in the reference parameters.
Remedy: Restart trace.

A02085 Message function: Parameterization error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1, index:%2
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: A parameterization error was identified when starting the variable message function.
Alarm value (r2124, interpret decimal):
yyxxxx dec: yy = index, xxxx = parameter
Remedy: Correct the parameter and restart.
Note:
The alarm is automatically withdrawn when stopping, or when successfully starting the variable message function.

A02096 MTrace 0: Cannot be saved

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause: It is not possible to save the measurement results of a multiple trace on the memory card (trace recorder 0).
A multiple trace is not started or is canceled.
Alarm value (r2124, interpret decimal):
1: Memory card cannot be accessed.
- Card is not inserted or is blocked by a mounted USB drive.
3: Data save operation to slow.
- A second trace has been completed before the measurement results of the first trace were able to be saved.
- Writing the measurement result files to the card is blocked by the parameter save.
4: Data save operation canceled.
- For instance, the file required for the data save operation was not able to be found.

Remedy:
- Insert or remove the memory card.
- Use a larger memory card.
- Configure a longer trace time or use an endless trace.
- Avoid saving parameters while a multiple trace is running.
- Check whether other functions are presently accessing measurement result files.

A02098 MTrace 1: Cannot be saved

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause: It is not possible to save the measurement results of a multiple trace on the memory card (trace recorder 1).
A multiple trace is not started or is canceled.
Alarm value (r2124, interpret decimal):
1: Memory card cannot be accessed.
- Card is not inserted or is blocked by a mounted USB drive.
3: Data save operation to slow.
- A second trace has been completed before the measurement results of the first trace were able to be saved.
- Writing the measurement result files to the card is blocked by the parameter save.
4: Data save operation canceled.
- For instance, the file required for the data save operation was not able to be found.

Remedy:
- Insert or remove the memory card.
- Use a larger memory card.
- Configure a longer trace time or use an endless trace.
- Avoid saving parameters while a multiple trace is running.
- Check whether other functions are presently accessing measurement result files.

A02099 Trace: Insufficient Control Unit memory

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE

Cause: The memory space still available on the Control Unit is no longer sufficient for the trace function.

Remedy: Reduce the memory required, e.g. as follows:
- Reduce the trace time.
- Increase the trace clock cycle.
- Reduce the number of signals to be traced.

F02151 (A) TEC: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: An internal software error has occurred within a Technology Extension.
Fault value (r0949, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the Control Unit.
Note:
TEC: Technology Extension
Response upon: A: NONE
Acknowl. upon A: NONE

F02152 (A) TEC: Insufficient memory

Message class: Hardware/software error (1)
Message value: %1
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The functionality on the converter is too extensive (e.g. functions, data sets, Technology Extensions, blocks, etc.).
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: Contact Technical Support.
Response upon: A: NONE
Acknowl. upon A: NONE

F02153 TEC: Technology function does not exist

Message class: Hardware/software error (1)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A technology function does not exist on the converter or the particular version is too old.
When configuring, a technology function is activated, which either does not exist on the converter or is only available in an outdated version. This can occur when downloading a project or when powering up.
Remedy: - Load the required technology function or version to the converter.
- If required, deactivate the technology function not required in the configuration.

F03001 NVRAM checksum incorrect

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A checksum error occurred when evaluating the non-volatile data (NVRAM) on the converter.
The NVRAM data affected was deleted.

Remedy: Carry out a POWER ON (switch-off/switch-on) for all components.

F06310 (A) Supply voltage (p0210) incorrectly parameterized

Message class: Line supply fault (2)

Message value: -

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: For AC/AC drive units, the measured DC link voltage lies outside the tolerance range after precharging has been completed.
The following applies for the tolerance range: 1.16 * p0210 < r0070 < 1.6 * p0210
Note:
The fault can only be acknowledged when the drive is switched off.
See also: p0210 (Device supply voltage)

Remedy: - Check the parameterized supply voltage and if required change (p0210).
- Check the line voltage.
See also: p0210 (Device supply voltage)

Response upon: A: NONE

Acknowl. upon A: NONE

F07011 Drive: Motor overtemperature

Message class: Motor overload (8)

Message value: %1

Component: Motor

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The calculated motor temperature is too high.
Possible causes:
- Motor overloaded.
- Motor ambient temperature too high.
- Sensor wire breakage.
Fault value (r0949, interpret decimal):
200:
Motor temperature model 1 (I2t): temperature too high.
300:
Motor temperature model 3: after the monitoring time has expired, the temperature is still higher than the alarm threshold.
301:
Motor temperature model 3: temperature is too high, or the model has not been parameterized.
302:
Motor temperature model 3: Encoder temperature is not within the valid range.
400:
Additional motor overload protection: the load is too high.

Remedy: - Reduce the motor load.
- Check the ambient temperature and the motor ventilation.
- Check the wiring and temperature sensor connection.
- Check monitoring limits.
- Check activation of the additional motor overload protection (5375).

A07012 (N) Drive: Motor temperature model overtemperature

Message class: Motor overload (8)

Message value: %1

Component: Motor

Response: NONE

Acknowledgment: NONE

Cause: Motor temperature model 1/3 or the additional motor overload protection identified that the alarm threshold was exceeded.

Hysteresis:2K

Alarm value (r2124, interpret decimal):

200:

Motor temperature model 1 (I2t): temperature too high.

300:

Motor temperature model 3: temperature too high.

400:

Additional motor overload protection: the load is too high. If the load remains at this level, the drive is shut down with fault F07011.

See also: r0034, p0613

Remedy: - Check the motor load and if required, reduce.

- Check the motor ambient temperature.

- Check activation of the additional motor overload protection (p5375).

See also: r0034 (Motor utilization thermal)

Response upon: N: NONE

Acknowl. upon N: NONE

F07082 Macro: Execution not possible

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Fault cause: %1, supplementary information: %2, preliminary parameter number: %3

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The macro cannot be executed.
Fault value (r0949, interpret hexadecimal):
ccccbbaa hex:
cccc = preliminary parameter number, bb = supplementary information, aa = fault cause
Fault causes for the trigger parameter itself:
19: Called file is not valid for the trigger parameter.
20: Called file is not valid for parameter 15.
21: Called file is not valid for parameter 700.
22: Called file is not valid for parameter 1000.
23: Called file is not valid for parameter 1500.
24: Data type of a TAG is incorrect (e.g. Index, number or bit is not U16).
Fault causes for the parameters to be set:
25: Error level has an undefined value.
26: Mode has an undefined value.
27: A value was entered as string in the tag value that is not "DEFAULT".
31: Entered drive object type unknown.
32: A device was not able to be found for the determined drive object number.
34: A trigger parameter was recursively called.
35: It is not permissible to write to the parameter via macro.
36: Check, writing to a parameter unsuccessful, parameter can only be read, not available, incorrect data type, value range or assignment incorrect.
37: Source parameter for a signal interconnection was not able to be determined.
38: An index was set for a non-indexed (or CDS-dependent) parameter.
39: No index was set for an indexed parameter.
41: A bit operation is only permissible for parameters with the parameter format DISPLAY_BIN.
42: A value not equal to 0 or 1 was set for a bit operation.
43: Reading the parameter to be changed by the bit operation was unsuccessful.
51: Factory setting for DEVICE may only be executed on the DEVICE.
61: The setting of a value was unsuccessful.

Remedy: - Check the parameter involved.
- Check the macro file and signal interconnection.

F07084 Macro: Condition for WaitUntil not fulfilled

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Only for internal Siemens troubleshooting.
Remedy: Not necessary.

F07085 Drive: Open-loop/closed-loop control parameters changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: Open-loop/closed-loop control parameters have had to be changed.
Possible causes:
1. As a result of other parameters, they have exceeded the dynamic limits.
2. They cannot be used due to the fact that the hardware detected not having certain features.
3. The value is estimated as the thermal time constant is missing.
4. Motor temperature model 1 is activated as thermal motor protection is missing.
See also: p1082 (Maximum speed)

Remedy: Not necessary.
It is not necessary to change the parameters as they have already been correctly limited.

F07086 Units changeover: Parameter limit violation due to reference value change

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Parameter: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A reference parameter was changed in the system. This resulted in the fact that for the parameters involved, the set value was not able to be written in the per unit notation.
The values of the parameters were set to the corresponding violated minimum limit/maximum limit or to the factory setting.
Possible causes:
- The steady-state minimum limit/maximum limit or that defined in the application was violated.
Fault value (r0949, parameter):
Diagnostics parameter to display the parameters that were not able to be re-calculated.
See also: p0304, p0305, p2000, p2001, p2002, p2003, p2004

Remedy: Check the adapted parameter value and if required correct.

F07088 Units changeover: Parameter limit violation due to units changeover

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Parameter: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A changeover of units was initiated. This resulted in a violation of a parameter limit
Possible causes for the violation of a parameter limit:
- When rounding off a parameter corresponding to its decimal places, the steady-state minimum limit or maximum limit was violated.
- Inaccuracies for the data type "FloatingPoint".
In these cases, when the minimum limit is violated then the parameter value is rounded up and when the maximum limited is violated the parameter value is rounded down.
Fault value (r0949, interpret decimal).

Remedy: Check the adapted parameter values and if required correct.

A07089 Unit switchover: Function activation is blocked because the units have been switched over

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: An attempt was made to activate a function. This is not permissible if the units have already been changed over.

Remedy: Restore units that have been changed over to the factory setting.

F07090 Drive: Upper torque limit less than the lower torque limit

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The upper torque limit is lower than the lower torque limit.
Remedy: When setting the torque limits via telegram 750, the positive torque limit must be >= the negative torque.

A07091 Drive: Determined current controller dynamic response invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: When One Button Tuning is activated (p5300 = 1), the current controller is measured after the pulses have been enabled. Evaluation has indicated that the current control loop was not appropriately set.
Possible causes:
- Incorrectly set current controller.
- PRBS amplitude set too high (p5296).
Alarm value (r2124, interpret hexadecimal):
1: Dynamic response too low.
2: Current controller unstable.
Note:
PRBS: Pseudo Random Binary Signal (binary noise)
Remedy: - The measurement can be repeated with a smaller excitation amplitude (p5296).

A07092 Drive: Moment of inertia estimator still not ready

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The moment of inertia estimator has still not determined any valid values.
The acceleration cannot be calculated.
The moment of inertia estimator has stabilized, if the frictional values as well as the moment of inertia were determined and the corresponding status signal is set.
Remedy: Traverse the axis until the moment of inertia estimator has stabilized.
This alarm is automatically withdrawn after the moment of inertia estimator has stabilized.

F07093 (A) Drive: Test signal error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Response: OFF3
Acknowledgment: IMMEDIATELY

Cause: An error was identified when executing the "Test signal" function.
The function was not executed or was canceled.
Fault value (r0949, interpret decimal):
1: No distance limit has been defined (p5308 = 0).
2: The moment of inertia estimator has not stabilized in the parameterized time (p5309).
3: The parameterized distance (p5308) was exceeded.
4: No motor encoder parameterized (closed-loop speed control without encoder).
6: Pulse enable was withdrawn while traversing.
7: Speed setpoint not equal to zero.
See also: p5308, p5309

Remedy: For fault value = 1:
- Define distance limiting (p5308).
For fault value = 2:
- Increase the duration, distance limit or speed limit (p5309, p5308, p1082, p1083, p1086).
For fault value = 3:
- Check distance limiting (p5308).
For fault value = 4:
- Configure speed control with encoder.
For fault value = 6:
- Keep the drive switched on until the "Test signal" function has been completely exited.
For fault value = 7:
- Set the speed setpoint to zero. It is possible that the setpoint was specified from the control panel.

Response upon: A: NONE

Acknowl. upon A: NONE

F07094 General parameter limit violation

Message class: Hardware/software error (1)

Message value: Parameter: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: As a result of the violation of a parameter limit, the parameter value was automatically corrected.
Minimum limit violated --> parameter is set to the minimum value.
Maximum limit violated --> parameter is set to the maximum value.
Invalid Enum value --> parameter is set to the default value.
Fault value (r0949, interpret decimal):
Parameter number, whose value had to be adapted.

Remedy: Check the adapted parameter values and if required correct.

A07095 (N) Drive: One Button Tuning activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The One Button Tuning function is active.
One Button Tuning is performed at the next switch-on command.
See also: p5300 (Autotuning selection)

Remedy: Not necessary.
The alarm is automatically withdrawn after One Button Tuning has been exited (p5300 = 0).

Response upon: N: NONE
Acknowl. upon N: NONE

F07097 (A) Drive: Test signal error distance limiting

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Fault cause: %1, traversing distance: %2
Component: Control Unit (CU)
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: An error was identified when executing function "Test signal" or One Button Tuning selection (p5300 = 1).
The function was not executed or was canceled.
Fault value (r0949, interpret decimal):
yyyyxxxx hex: yyyy = fault cause, xxxx = traversing distance.
See also: p5308, p5309
Remedy: - Enter the traversing path in parameter p5308 - or deselect the function involved in p5301.
- For fault cause = 1, 2, shorter traversing paths may be possible.
For fault cause = 1:
- Deselect bit 0 and bit 1 in parameter p5301.
For fault cause = 2:
- Deselect bit 2 in parameter p5301.
For fault cause = 3:
- Deselect bit 4 and bit 5 in parameter p5301.
Response upon: A: NONE
Acknowl. upon A: NONE

A07200 Drive: Master control ON command present

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The ON/OFF1 command is present (no 0 signal).
The command is influenced via control word bit 0 via the master control.
Remedy: Switch the signal via control word bit 0 via the master control to 0.

F07220 (N, A) Drive: Control by PLC missing

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The "Control by PLC" signal was missing in operation.
- The higher-level control has withdrawn the "Control by PLC" signal.
- Data transfer via the fieldbus (controller/drive) was interrupted.
Remedy: - Check the "Control by PLC" signal and, if required, switch in.
- Check data transfer via the fieldbus (controller/drive).
Note:
If the drive should continue to operate after withdrawing "Control by PLC", then the fault response must be parameterized to NONE or the message type should be parameterized as alarm.
Response upon: N: NONE

Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

A07350 (F) Drive: Measuring probe parameterized to a digital output

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The measuring probe is connected to a parameterizable digital input/output and the terminal is set as output.
Alarm value (r2124, interpret decimal):
8: DI/DO 8 (X122.9/X132.1)
9: DI/DO 9 (X122.10/X132.2)
10: DI/DO 10 (X122.12/X132.3)
11: DI/DO 11 (X122.13/X132.4)
12: DI/DO 12 (X132.9)
13: DI/DO 13 (X132.10)
14: DI/DO 14 (X132.12)
15: DI/DO 15 (X132.13)
Regarding the terminal designation:
The first designation is valid for CU320, the second for CU305.
Remedy: - Deselect measuring probe (p0488, p0489).
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

F07410 Drive: Current controller output limited

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The condition "I_act = 0 and Uq_set_1 longer than 16 ms at its limit" is present and can be caused by the following:
- Motor not connected or motor contactor open.
- Phase failure in the motor feeder cable.
- No DC link voltage present.
- Power unit defective.
Remedy: - Connect the motor, check the motor feeder cable or check the motor contactor.
- Check the DC link voltage (r0070).
- Check the power unit.

F07412 Drive: Commutation angle incorrect (motor model)

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: None
Response: ENCODER
Acknowledgment: IMMEDIATELY

Cause: An incorrect commutation angle was detected, which can result in a positive coupling in the speed controller.
Possible causes:
- The phase sequence of the output phases for the motor is incorrect (e.g. the phases are interchanged).
- The motor encoder is incorrectly adjusted with respect to the magnet position.
- The motor encoder is damaged.
- The motor encoder speed signal is faulted.
- The control loop is instable due to incorrect parameterization.
- Phase failure in the motor feeder cable.

Remedy:
- Check the phase sequence for the motor, and if required, correct.
- Check the motor feeder cable.
- If the encoder mounting was changed, re-adjust the encoder.
- Replace the defective motor and/or motor encoder.

F07419 Drive: Current setpoint filter adaptation error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY

Cause: An error has occurred when configuring or when using the "Current setpoint filter adaptation" function.
Fault value (r0949, interpret binary):
Bit 2: the assigned filter is a type or has a characteristic, which is unsuitable for adaptation.
Bit 3: the assigned filter has not been activated (p1656).
Bits 0, 1, 4 ... 31: internal fault occurred.

Remedy: The remedy should be applied depending on the fault value.
For bit 2:
Set the filter type "General filter 2nd order" and set the characteristic of a bandstop filter.
For bit 3:
Activate filter (p1656).
For bits 0, 1, 4 ... 15:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.

F07420 Drive: Current setpoint filter natural frequency > Shannon frequency

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: One of the filter natural frequencies is greater than the Shannon frequency.
The Shannon frequency is calculated according to the following formula: 0.5 / current controller sampling time
Fault value (r0949, interpret binary):
Bit 0: Filter 1 (p1658, p1660)
Bit 1: Filter 2 (p1663, p1665)
Bit 2: Filter 3 (p1668, p1670)
Bit 3: Filter 4 (p1673, p1675)

Remedy:
- Reduce the numerator or denominator natural frequency of the current setpoint filter involved.
- Deactivate the filter involved (p1656).

F07421 Drive: Speed filter natural frequency > Shannon frequency

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: One of the filter natural frequencies is greater than the Shannon frequency.
The Shannon frequency is calculated according to the following formula: 0.5 / speed controller sampling time.
Fault value (r0949, interpret binary):
Bit 0: Filter 1 (p1417, p1419)
Bit 1: Filter 2 (p1423, p1425)

Remedy: - Reduce the numerator or denominator natural frequency of the speed setpoint filter involved.
- Deactivate the filter involved (p1414).

F07422 Drive: Reference model natural frequency > Shannon frequency

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The natural filter frequency of the PT2 element for the reference model (p1433) is greater than the Shannon frequency.
The Shannon frequency is calculated according to the following formula: 0.5 / speed controller sampling time.

Remedy: - Reduce the natural frequency of PT2 element for reference model (p1433).

F07432 Drive: Motor without overvoltage protection

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: In the case of a fault at maximum speed, the motor can generate an overvoltage that can destroy the converter.

Remedy: Limit the maximum speed (p1082) without any additional protection.
Note:
The maximum speed is calculated as follows:
p1082 <= 11.695 * DC link voltage overvoltage threshold/r0316
DC link voltage overvoltage threshold:
- Line connection 1 AC: 410 V
- Line connection 3 AC: 820 V
See also: r0316 (Motor torque constant), p1082 (Maximum speed)

F07434 Drive: It is not possible to change the direction of rotation with the pulses enabled

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: With the pulses enabled, a drive data set that has a different parameterized direction of rotation was selected (p1821).
It is only possible to change the motor direction of rotation using p1821 when the pulses are inhibited.

Remedy:
- Change over the drive data set with the pulses inhibited.
- Ensure that the changeover to a drive data set does not result in the motor direction of rotation being changed (i.e. for these drive data sets, the same value must be in p1821).

See also: p1821 (Direction of rotation)

A07440 EPOS: Jerk time is limited

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The calculation of the jerk time Tr = max(p2572, p2573) / p2574 resulted in an excessively high value so that the jerk time is internally limited to 1000 ms.

Note:

The alarm is also output if jerk limiting is not active.

Remedy:
- Increase the jerk limiting (p2574).
- Reduce maximum acceleration or maximum deceleration (p2572, p2573).

See also: p2572, p2573, p2574

A07441 LR: Save the position offset of the absolute encoder adjustment

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The status of the absolute encoder adjustment has changed.

To permanently accept the determined position offset, it must be retentively saved (p0977).

Possible causes:
- Motor or encoder were replaced (applies to EQN and DQI).
- Position-relevant parameters were changed.
- A non-adjusted encoder was adjusted (retentively save the project).

Note:

This message is not output when switching-on the axis after having first moved it in the switched-off state, as long as the parameterizable monitoring window was not exited.

Remedy: Readjust the encoder.

See also: p2507 (LR absolute encoder adjustment status)

F07442 (A) LR: Multiturn does not match the modulo range

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The ratio between the multiturn resolution and the modulo range (p2576) is not an integer number.

This results in the adjustment being set back, as the position actual value cannot be reproduced after switch-off/ switch-on.

Remedy: Make the ratio between the multiturn resolution and the modulo range an integer number.
The ratio v is calculated as follows:
1. Without position tracking for the load gearbox
v = (p0421 * p2506 * p2505) / (p2504 * p2576)
2. With position tracking for the load gearbox
v = (p2721 * p2506) / p2576
See also: p0421, p2504, p2505, p2506, p2576, p2721

Response upon: A: NONE

Acknowl. upon A: NONE

F07443 (A) LR: Home position not in the permissible range

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The home position received when adjusting the encoder (p2599) lies outside the half of the encoder range and cannot be set as actual axis position.
Fault value (r0949, interpret decimal):
Maximum permissible value for the home position

Remedy: Set the home position to a lower value than was specified in the fault value.
See also: c2598 (EPOS home position signal), p2599 (EPOS home position value)

Response upon: A: NONE

Acknowl. upon A: NONE

F07446 (A) Load gearbox: Position tracking cannot be reset

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The position tracking cannot be reset.

Remedy: Reset the position tracking as follows:
- Select encoder commissioning.
- Reset position tracking, position (p2720.2 = 1).
- Deselect encoder commissioning.
Then acknowledge the fault and, if necessary, re-adjust the absolute encoder (p2507).

Response upon: A: NONE

Acknowl. upon A: NONE

F07447 Load gearbox: Position tracking, maximum actual value exceeded

Message class: Application/technological function faulted (17)

Message value: Component number: %1, encoder data set: %2, drive data set: %3

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: When the position tracking of the load gearbox is configured, the drive/encoder (motor encoder) identifies a maximum possible absolute position actual value (r2723) that can no longer be represented within 32 bits.

Maximum value: p0408 * p2721 * 2^p0419

Fault value (r0949, interpret hexadecimal):

ccbbaa hex

aa = encoder data set

bb = component number

cc = drive data set

See also: p0408, p0419, p2721

Remedy: - Reduce the fine resolution (p0419).

- Reduce the multiturn resolution (p2721).

See also: p0419 (Fine resolution absolute value Gx_XIST2 (in bits)), p2721 (Load gear rotary absolute encoder revolutions virtual)

F07448 (A) Load gearbox: Position tracking, linear axis has exceeded the maximum range

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: For a configured linear axis/no modulo axis, the currently active motor encoder has exceeded the maximum possible traversing range.

For the configured linear axis, the maximum traversing range is defined to be 64x (+/- 32x) of p0421. It should be read in p2721 and interpreted as the number of load revolutions.

Remedy: The fault should be resolved as follows:

- Select commissioning.
- Reset position tracking, position (p2720.2 = 1).
- Deselect commissioning.

The fault should then be acknowledged and the absolute encoder adjusted.

Response upon: A: NONE

Acknowl. upon A: NONE

F07449 (A) Load gearbox: Position tracking actual position outside tolerance window

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: When switched off, the currently effective motor encoder was moved through a distance greater than was parameterized in the tolerance window. It is possible that there is no longer any reference between the mechanical system and encoder.

Fault value (r0949, interpret decimal):

Deviation (difference) to the last encoder position in increments of the absolute value after the measuring gearbox - If one is being used. The sign designates the traversing direction.

Note:

The deviation (difference) found is also displayed in r2724.

See also: p2722 (Load gear position tracking tolerance window), r2724 (Load gear position difference)

Remedy: Reset the position tracking as follows:
- Select commissioning.
- Reset position tracking, position (p2720.2 = 1).
- Deselect commissioning.

The fault should then be acknowledged and, if necessary, the absolute encoder adjusted (p2507).
See also: p2507 (LR absolute encoder adjustment status)

Response upon: A: NONE
Acknowl. upon A: NONE

F07450 (A) LR: Standstill monitoring has responded

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: After the standstill monitoring time (p2543) expired, the drive left the standstill window (p2542).
- Standstill window set too small (p2542).
- Standstill monitoring time set too low (p2543).
- Position loop gain too low (p2538).
- Position loop gain too high (instability/oscillation, p2538).
- Mechanical overload.
- Connecting cable, motor/drive converter incorrect (phase missing, interchanged).

Remedy: Check the causes and resolve.
Response upon: A: NONE
Acknowl. upon A: NONE

F07451 (A) LR: Position monitoring has responded

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: When the position monitoring time (p2545) expired, the drive had still not reached the positioning window (p2544).
- Positioning window parameterized too small (p2544).
- Position monitoring time parameterized too short (p2545).
- Position loop gain too low (p2538).
- Position loop gain too high (instability/oscillation, p2538).
- Drive mechanically locked.

Remedy: Check the causes and resolve.
Response upon: A: NONE
Acknowl. upon A: NONE

F07452 (A) LR: Following error too high

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY

Cause: The difference between the position setpoint position actual value (following error dynamic model, r2563) is higher than the tolerance (p2546).
- The drive torque or accelerating capacity exceeded.
- Position measuring system fault.
- Encoder cable interrupted.
- Position control sense incorrect.
- Mechanical system locked.
- Excessively high traversing velocity or excessively high position reference value (setpoint) differences.

Remedy: Check the causes and resolve.

Response upon: A: NONE

Acknowl. upon A: NONE

F07453 LR: Position actual value preprocessing error

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: - A fault of the position measuring system selected in p2502 (e.g.: F3x110, F3x111) has occurred or this encoder has been parked (G1_ZSW.14).

Remedy: - Remove the causes of the faults of the position measuring system selected in p2502 and acknowledge.
- Unpark the encoder.

See also: p2502 (LR encoder assignment)

A07454 LR: Position actual value preprocessing does not have a valid encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: One of the following problems has occurred with the position actual value preprocessing:
- An encoder is not assigned for the position actual value preprocessing (p2502 = 0).
- An encoder and an encoder data set have been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

Remedy: Check the drive data sets, encoder data sets and encoder assignment.

See also: p0400 (Encoder type selection), p2502 (LR encoder assignment)

A07455 EPOS: Maximum velocity limited

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The maximum velocity (p2571) is too high to correctly calculate the modulo correction.

Within the sampling time for positioning, at the maximum velocity, a maximum of the half modulo length must be moved through. p2571 was limited to this value.

Remedy: - Reduce the maximum velocity (p2571).

A07456 EPOS: Setpoint velocity limited

Message class: Application/technological function faulted (17)

Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The actual setpoint velocity is greater than the parameterized maximum velocity (p2571) and is therefore limited.
Remedy: - Check the specified setpoint velocity.
- Reduce the velocity override (c2646).
- Increase the maximum velocity (p2571).

A07457 EPOS: Combination of input signals illegal

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: An illegal combination of input signals that are simultaneously set was identified.
Alarm value (r2124, interpret decimal):
0: Jog 1 and jog 2 (c2589, c2590).
1: Jog 1 or jog 2 and direct setpoint input/MDI (c2589, c2590, c2647).
2: Jog 1 or jog 2 and start homing (c2589, c2590, c2595).
3: Jog 1 or jog 2 and activate traversing task (c2589, c2590, c2631).
4: Direct setpoint input/MDI and starting homing (c2647, c2595).
5: Direct setpoint input/MDI and activate traversing task (c2647, c2631).
6: Start homing and activate traversing task (c2595, c2631).
Remedy: Check the appropriate input signals and correct.

F07458 EPOS: Reference cam not found

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: After the active homing starts, the axis moved through the maximum permissible distance to search for the reference cam without actually finding the reference cam.
Remedy: - Check signal "Reference cam" (c2612).
- Check the maximum permissible distance to the reference cam (p2606).
- If axis does not have any reference cam, then set p2607 to 0.
See also: p2606 (EPOS active homing reference cam maximum distance), p2607 (EPOS active homing reference cam available), c2612 (EPOS active homing reference cam)

F07459 EPOS: No zero mark

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: After leaving the reference cam, the axis has traversed the maximum permissible distance between the reference cam and zero mark without finding the zero mark.

Remedy: - Check the encoder regarding the zero mark.
- Check the maximum permissible distance between the reference cam and zero mark (p2609).
- Use an external encoder zero mark (equivalent zero mark) (p0494).
See also: p2609 (EPOS active homing max distance reference cam and zero mark)

F07460 EPOS: End of reference cam not found

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: In the "active homing" mode, when approaching the zero mark, the axis reached the end of the traversing range without detecting an edge at binary signal "Reference cam" (c2612).
Maximum traversing range: -2147483648 [LU] ... -2147483647 [LU]
Remedy: - Check signal "reference cam" (c2612).
- Repeat active homing.
See also: c2612 (EPOS active homing reference cam)

A07461 EPOS: Home position not set

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: When starting a traversing block/direct setpoint input, a home position is not set (r2684.11 = 0).
Remedy: Carry out homing (active homing, passive homing, set home position).

A07462 EPOS: Selected traversing block number does not exist

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A traversing block selected via binector input c2625 ... c2629 was started via binary signal c2631 = 0/1 edge "Activate traversing task".
- The number of the started traversing block is not contained in p2616[0...n].
- The started traversing block is suppressed.
Alarm value (r2124, interpret decimal):
Number of the selected traversing block that is also not available.
Remedy: - Correct the traversing program.
- Select an available traversing block number.

A07463 (F) EPOS: External block change not requested in the traversing block

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause: For a traversing block with the block change enable CONTINUE_EXTERNAL_ALARM, the external block change was not requested.
Alarm value (r2124, interpret decimal):
Number of the traversing block.

Remedy: Resolve the reason why the signal edge at the measuring probe is missing.

Response upon: F: OFF1

Acknowl. upon F: IMMEDIATELY

F07464 EPOS: Traversing block is inconsistent

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The traversing block does not contain valid information.
Fault value (r0949, interpret decimal):
Number of the traversing block with invalid information.

Remedy: Check the traversing block and where relevant, take into consideration alarms that are present.

A07465 EPOS: Traversing block does not have a subsequent block

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: There is no subsequent block in the traversing block.
Alarm value (r2124, interpret decimal):
Number of the traversing block with the missing subsequent block.

Remedy: - Parameterize this traversing block with the block change enable END.
- Parameterize additional traversing blocks with a higher block number and for the last block, using the block change enable END.

A07466 EPOS: Traversing block number assigned a multiple number of times

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The same traversing block number was assigned a multiple number of times.
Alarm value (r2124, interpret decimal):
Number of the traversing block that was assigned a multiple number of times.

Remedy: Correct the traversing blocks.

A07467 EPOS: Traversing block has illegal task parameters

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The task parameter in the traversing block contains an illegal value.
Alarm value (r2124, interpret decimal):
Number of the traversing block with an illegal task parameter.

Remedy: Correct the task parameter in the traversing block.

A07468 EPOS: Traversing block jump destination does not exist

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: In a traversing block, a jump was programmed to a non-existent block.
Alarm value (r2124, interpret decimal):
Number of the traversing block with a jump destination that does not exist.

Remedy: - Correct the traversing block.
- Add the missing traversing block.

A07469 EPOS: Traversing block target position < negative software limit switch

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: In the traversing block the specified absolute target position lies outside the range limited by the negative software limit switch.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.

Remedy: - Correct the traversing block.
- Change the negative software limit switch (c2578, p2580).

A07470 EPOS: Traversing block target position > positive software limit switch

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: In the traversing block the specified absolute target position lies outside the range limited by the positive software limit switch.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.

Remedy: - Correct the traversing block.
- Change the positive software limit switch (c2579, p2581).

A07471 EPOS: Traversing block target position outside the modulo range

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: In the traversing block the target position lies outside the modulo range.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.

Remedy: - In the traversing block, correct the target position.
- Change the modulo range (p2576).

A07472 EPOS: Traversing block ABS_POS/ABS_NEG not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the positioning mode ABS_POS or ABS_NEG were parameterized with the modulo correction not activated.
Alarm value (r2124, interpret decimal):
Number of the traversing block with the illegal positioning mode.
Remedy: Correct the traversing block.

A07473 (F) EPOS: Beginning of traversing range reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: When traversing, the axis has moved to the traversing range limit.
Remedy: Move away in the positive direction.
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07474 (F) EPOS: End of traversing range reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: When traversing, the axis has moved to the traversing range limit.
Remedy: Move away in the negative direction.
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

F07475 (A) EPOS: Target position < start of traversing range

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The target position for relative traversing lies outside the traversing range.
Remedy: Correct the target position.
Response upon: A: NONE

Acknowl. upon A: NONE

F07476 (A) EPOS: Target position > end of the traversing range

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The target position for relative traversing lies outside the traversing range.
Remedy: Correct the target position.
Response upon: A: NONE
Acknowl. upon A: NONE

A07477 (F) EPOS: Target position < negative software limit switch

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the actual traversing operation, the target position is less than the negative software limit switch.
Remedy: - Correct the target position.
- Change the negative software limit switch (c2578, p2580).
See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07478 (F) EPOS: Target position > positive software limit switch

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the actual traversing operation, the target position is greater than the positive software limit switch.
Remedy: - Correct the target position.
- Change the positive software limit switch (c2579, p2581).
See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07479 EPOS: Negative software limit switch reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The axis is at the position of the negative software limit switch. An active traversing block was interrupted.

Remedy: - Correct the target position.
- Change the negative software limit switch (c2578, p2580).
See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)

A07480 EPOS: Positive software limit switch reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The axis is at the position of the positive software limit switch. An active traversing block was interrupted.
Remedy: - Correct the target position.
- Change the positive software limit switch (c2579, p2581).
See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)

F07481 (A) EPOS: Axis position < negative software limit switch

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The actual position of the axis is less than the position of the negative software limit switch.
Remedy: - Correct the target position.
- Change the negative software limit switch (c2578, p2580).
See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)
Response upon: A: NONE
Acknowl. upon A: NONE

F07482 (A) EPOS: Axis position > positive software limit switch

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The actual position of the axis is greater than the position of the positive software limit switch.
Remedy: - Correct the target position.
- Change the positive software limit switch (c2579, p2581).
See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)
Response upon: A: NONE
Acknowl. upon A: NONE

A07483 EPOS: Travel to fixed stop clamping torque not reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE

Acknowledgment: NONE
Cause: The fixed stop in the traversing block was reached without the clamping torque/clamping force having been achieved.
Remedy: - Check the torque limits (p1520, p1521).

F07484 EPOS: Fixed stop outside the monitoring window

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: In the "fixed stop reached" state, the axis has moved outside the defined monitoring window (p2635).
Remedy: - Check the monitoring window (p2635).
- Check the mechanical system.

F07485 (A) EPOS: Fixed stop not reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: In a traversing block with the task FIXED STOP, the end position was reached without detecting a fixed stop.
Remedy: - Check the traversing block and locate the target position further into the workpiece.
- If required, reduce the maximum following error window to detect the fixed stop (p2634).
Response upon: A: NONE
Acknowl. upon A: NONE

A07486 EPOS: Intermediate stop missing

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In operating mode "traversing blocks" or "direct setpoint input/MDI", at the start of motion, c2640 is set to an intermediate stop, i.e. to a 0 signal.
Remedy: Set c2640 to "No intermediate stop" (1 signal) and restart motion.
See also: c2640 (EPOS intermediate stop (0 signal))

A07487 EPOS: Reject traversing task missing

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the modes "Traversing blocks" or "Direct setpoint input/MDI" at the start of motion, the binary signal sink "Do not reject traversing task/reject traversing task" (c2641) does not have a 1 signal.
Remedy: Connect a 1 signal to the binary signal sink "Do not reject traversing task/reject traversing task" (c2641) and restart motion.
See also: c2641 (EPOS reject traversing task (0 signal))

F07488	EPOS: Relative positioning not possible
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	In the mode "direct setpoint input/MDI", for continuous transfer (c2649 = 1) relative positioning was selected (c2648 = 0 signal).
Remedy:	Check the control.

A07489	EPOS: Home position correction outside the window
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	For the function "passive homing" the difference between the measured position at the measuring probe and the home position lies outside the parameterized window.
Remedy:	- Check the mechanical system.

F07490 (N)	EPOS: Enable signal withdrawn while traversing
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	- For a standard assignment, another fault may have occurred as a result of withdrawing the enable signals. - The drive is in the "switching on inhibited" state (for a standard assignment).
Remedy:	- Set the enable signals or check the cause of the fault that first occurred and then result (for a standard assignment). - Check the assignment to enable the basic positioning function.
Response upon: N:	NONE
Acknowl. upon N:	NONE

F07491 (A)	EPOS: Negative hardware limit switch reached
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	A 0 signal was detected at c2569, i.e. the negative hardware limit switch was reached. For a positive traversing direction, the negative hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect. See also: c2569 (EPOS negative hardware limit switch)
Remedy:	- Leave the negative hardware limit switch in the positive traversing direction and return the axis to the valid traversing range. - Check the wiring of the hardware limit switch.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07492 (A) EPOS: Positive hardware limit switch reached

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF3

Acknowledgment: IMMEDIATELY

Cause: A 0 signal was detected at c2570, i.e. the positive hardware limit switch was reached.

For a negative traversing direction, the positive hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect.

See also: c2570 (EPOS positive hardware limit switch)

Remedy: - Leave the positive hardware limit switch in the negative traversing direction and return the axis to the valid traversing range.

- Check the wiring of the hardware limit switch.

Response upon: A: NONE

Acknowl. upon A: NONE

F07493 LR: Overflow of the value range for position actual value

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.

When the overflow occurs, the "homed" or "adjustment absolute measuring system" status is reset.

Fault value (r0949, interpret decimal):

1: The position actual value (r2521) has exceeded the value range.

2: The encoder position actual value Gn_XIST2 has exceeded the value range.

3: The maximum encoder value times the factor to convert the absolute position Gn_XIST2 from increments to length units (LU) has exceeded the value range for displaying the position actual value.

Remedy: If required, reduce the traversing range or position resolution (p2506).

Note for fault value = 3:

If the value for the maximum possible absolute position (LU) is greater than 4294967296, then it is not possible to make an adjustment due to an overflow.

For rotary encoders, the maximum possible absolute position (LU) is calculated as follows:

p2506 * p2505 / p2504

p2506 * p2505 * p0421 / p2504 for multiturn encoders

A07495 (F, N) LR: Homing function interrupted

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: An activated homing function (homing mark search or measuring probe evaluation) was canceled.

Possible causes:

- An encoder fault has occurred (Gn_ZSW.15 = 1).
- Position actual value was set during an activated homing function.
- Homing mark search and measuring probe evaluation simultaneously activated.
- Activated homing function (homing mark search or measuring probe evaluation) was deactivated.

Remedy: - Check the causes and resolve.
- Reset the control and activate the required function.
- Set the input terminal for the measuring probe.

Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A07496 EPOS: Enable not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: It is not possible to enable the basic positioner because at least one condition is missing.
Alarm value (r2124, interpret decimal):
1: EPOS enable missing.
2: Position actual value, valid feedback signal missing.
Remedy: Check the corresponding missing condition.

A07498 (F) LR: Measuring probe evaluation not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: When evaluating the measuring probe, an error occurred.
Alarm value (r2124, interpret decimal):
6:
The input terminal for the measuring probe is not set.
4098:
Error when initializing the measuring probe.
4100:
The measuring pulse frequency is too high.
> 50000:
The measuring clock cycle is not a multiple integer of the position controller clock cycle.
Remedy: Deactivate measuring probe evaluation.
For alarm value = 6:
Set the input terminal for the measuring probe (p0488, p0489).
For alarm value = 4098:
Check the converter hardware.
For alarm value = 4100:
Reduce the frequency of the measuring pulses at the measuring probe.
For alarm value > 50000:
Set the clock cycle ratio of the measuring clock cycle to the position controller clock cycle to an integer multiple.
To do this, the currently effective measuring clock cycle can be determined from the alarm value as follows:
Tmeas [125 µs] = alarm value - 50000
With PROFIdrive, the measuring clock cycle corresponds to the bus clock cycle.
Without PROFIdrive, the measuring clock cycle is an internal cycle time that cannot be influenced.
Response upon: F: OFF1

Acknowl. upon F: IMMEDIATELY

F07499 (A) EPOS: Reversing cam approached with the incorrect traversing direction

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF3

Acknowledgment: IMMEDIATELY

Cause: The negative reversing cam was approached in the positive traversing direction, or the positive reversing cam was approached in the negative traversing direction.

See also: c2613 (EPOS active homing negative reversing cam), c2614 (EPOS active homing positive reversing cam)

Remedy: - Check the wiring of the reversing cam (c2613, c2614).

- Check the traversing direction to approach the reversing cam.

Response upon: A: NONE

Acknowl. upon A: NONE

F07503 EPOS: Hardware limit switch approached with the incorrect traversing direction

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The negative hardware limit switch was approached in the positive traversing direction, or the positive hardware limit switch was approached in the negative traversing direction.

Remedy: - Check the wiring of the hardware limit switch (c2569, c2570).

- Check the traversing direction when approaching the hardware limit switch.

A07507 EPOS: Home position cannot be set

Message class: Application/technological function faulted (17)

Message value: -

Component: Motor

Response: NONE

Acknowledgment: NONE

Cause: After the home position correction, the position setpoint lies outside the traversing range limits.

Remedy: - Optimize the position controller.

- Due to a possible position controller deviation, home position p2599 should not be directly placed at the traversing range limits.

A07550 (F, N) Drive: Not possible to reset encoder parameters

Message class: Hardware/software error (1)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: When restoring a factory setting, it was not possible to reset the encoder parameters. The encoder parameters are directly read out of the encoder.

Alarm value (r2124, interpret decimal):

Component number of the encoder involved.

Remedy: - Repeat the operation.
- Check the encoder connection.

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

Response upon: N: NONE

Acknowl. upon N: NONE

F07555 (A) Drive encoder: Configuration position tracking

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component number: %1, encoder data set: %2, drive data set: %3, fault cause: %4

Component: Encoder 1

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: For position tracking, the configuration is not supported.
Position tracking can only be activated for absolute encoders.
For linear axes, it is not possible to simultaneously activate the position tracking for load and measuring gears.
Fault value (r0949, interpret hexadecimal):
ddccbbaa hex
aa = encoder data set
bb = component number
cc = drive data set
dd = fault cause
dd = 00 hex = 0 dec
An absolute encoder is not being used.
dd = 01 hex = 1 dec
Position tracking cannot be activated because the memory of the internal NVRAM is not sufficient or a Control Unit does not have an NVRAM.
dd = 02 hex = 2 dec
For a linear axis, the position tracking was activated for the load and measuring gearbox.
dd = 03 hex = 3 dec
Position tracking cannot be activated because position tracking with another gear ratio, axis type or tolerance window has already been detected for this encoder data set.
dd = 04 hex = 4 dec
A linear encoder is being used.
See also: p0404 (Encoder configuration effective)

Remedy: For fault value 0:
- Use an absolute encoder.
For fault value 1:
- Use a Control Unit with sufficient NVRAM.
For fault value = 2, 4:
- If necessary, deselect the position tracking (p2720 for the load gearbox).
For fault value 3:
- Only activate position tracking of the load gearbox in the same encoder data set if the gear ratio (p2504, p2505), axis type (p2720.1) and tolerance window (p2722) are also the same. These parameters must be the same in all drive data sets, which use the same motor encoder.

Response upon: A: NONE

Acknowl. upon A: NONE

A07557 (F) Motor encoder: Home position not in the permissible range

Message class: Application/technological function faulted (17)

Message value: %1

Component: None
Response: NONE
Acknowledgment: NONE
Cause: The home position received via p2599 when adjusting the encoder lies outside half of the encoder range and cannot be set as actual axis position.
The maximum permissible value is displayed in the supplementary information.
Remedy: Set the home position less than the value from the supplementary information.
See also: c2598 (EPOS home position signal)
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07565 (F, N) Drive: Encoder error in PROFIdrive encoder interface 1

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: Sensor Module Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: An encoder error was signaled for encoder 1 via the PROFIdrive encoder interface (G1_ZSW.15).
Alarm value (r2124, interpret decimal):
Error code from G1_XIST2.
Remedy: Acknowledge the encoder error using the encoder control word (G1_STW.15 = 1).
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A07569 (F) Enc identification active

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: During encoder identification (waiting) with p0400 = 10100, the encoder could still not be identified.
There is possibly an incorrect encoder or no encoder available, an incorrect encoder cable inserted or no encoder cable inserted.
Remedy: - Check the encoder cable and if necessary connect it.
- Enter the corresponding encoder type in p0400.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY

F07575 Drive: Motor encoder not ready

Message class: Position/speed actual value incorrect or not available (11)
Message value: -
Component: Sensor Module Encoder 1
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The motor encoder signals that it is not ready.
- Initialization of encoder 1 (motor encoder) was unsuccessful.
- The function "parking encoder" is active (encoder control word G1_STW.14 = 1).
- The Sensor Module is defective.

Remedy: Evaluate other active faults via the motor encoder.

A07577 (F) Motor encoder: Measuring probe evaluation not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: When evaluating the measuring probe, an error occurred.
Alarm value (r2124, interpret decimal):
6: The input terminal for the measuring probe is not set.
4098: Error when initializing the probe.
4100: The measuring pulse frequency is too high.
4200: The bus cycle time is not a multiple integer of the position controller clock cycle.
Remedy: Deactivate measuring probe evaluation.
For alarm value = 6:
Set the input terminal for the measuring probe (p0488, p0489).
For alarm value = 4098:
Check the converter hardware.
For alarm value = 4100:
Reduce the frequency of the measuring pulses at the measuring probe.
For alarm value = 4200:
Set the clock cycle ratio between the bus cycle time and the position controller clock cycle to an integer multiple.
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07580 (F, N) Drive: No Sensor Module with matching component number

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Encoder data set: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: A Sensor Module with the specified component number was not found.
Alarm value (r2124, interpret decimal):
Encoder data set involved.
Remedy: Correct the component number of the Sensor Module.
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A07581 (F) Motor encoder: Position actual value preprocessing error

Message class: Position/speed actual value incorrect or not available (11)
Message value: -
Component: Encoder 1
Response: NONE

Acknowledgment: NONE
Cause: An error has occurred during the position actual value preprocessing.
Remedy: Check the encoder for the position actual value preprocessing.
See also: p2502 (LR encoder assignment)
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07587 Motor encoder: Position actual value preprocessing has no valid encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: The following problem has occurred during the position actual value preprocessing:
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).
Remedy: Check the drive data sets, encoder data sets.
See also: p0400 (Encoder type selection), p2502 (LR encoder assignment)

A07593 (F, N) Motor encoder: Value range for position actual value exceeded

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.
When the overflow occurs, the "homed" or "absolute encoder adjusted" status is reset.
Alarm value (r2124, interpret decimal):
1: The position actual value (r2521) has exceeded the value range.
2: The encoder position actual value Gn_XIST2 has exceeded the value range.
3: The maximum encoder value multiplied by the factor to convert the absolute position Gn_XIST2 from increments to length units (LU) has exceeded the value range for displaying the position actual value.
Remedy: If required, reduce the traversing range or position resolution.
For alarm value = 3:
Reducing the position resolution and conversion factor:
- Reduce the length unit (LU) per load revolution for rotary encoders (p2506).
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A07596 (F, N) Motor encoder: Homing function interrupted

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE

Cause: An activated homing function (homing mark search or measuring probe evaluation) was canceled.
- An encoder fault has occurred (Gn_ZSW.15 = 1).
- Position actual value was set during an activated homing function.
- Homing mark search and measuring probe evaluation simultaneously activated.
- Activated homing function (homing mark search or measuring probe evaluation) was deactivated.

Remedy:
- Check the causes and resolve.
- Reset the control and activate the required function.

Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

F07801 Drive: Motor overcurrent

Message class: Motor overload (8)
Message value: -
Component: Motor
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The permissible motor limit current was exceeded.
- Active current limit too low.
- Current controller not correctly set.
- Load is too high.
- Short-circuit in the motor cable or ground fault.
- Motor current does not match the drive current.

Remedy:
- Reduce the load.
- Check the motor and motor cables for short-circuit and ground fault.
- Check the drive and motor combination.

F07802 Drive: Infeed not ready

Message class: Infeed faulted (13)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The drive does not signal a ready state after an internal switch-on command.
- DC link voltage not available or jumper not inserted at X1/X4.
- Supply voltage incorrectly set.
- Defective drive.

Remedy:
- Switch on the load supply.
- Check the line connection and supply voltage (p0210).
- Insert the jumper for the internal braking resistor.
- Connect an external braking resistor (X1/X4)
- Replace the drive.

F07810 Drive: Power unit EEPROM without rated data

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: No rated data are stored in the power unit EEPROM.

Remedy: Replace the power unit or inform Siemens Customer Service.

F07815 Drive: Power unit has been changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Parameter: %1

Component: Power Unit

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The code number of the actual power unit does not match the saved number. This occurs if a saved configuration (SD card, backup file) of a converter with another power rating is used.

Fault value only for internal Siemens diagnostics.

See also: p0201 (Power unit code number)

Remedy:
- Reset to the factory settings, which corresponds to recommissioning the converter.
- Use an SD card or backup file with the configuration correct for the drive being used and switch-off/switch-on the drive.
- In case of doubt, before using an SD card, delete the existing configuration of the USER folder.
- For a series commissioning, only use the same converter types (order number, power class).

F07860 (A) External fault 1

Message class: External measured value / signal state outside the permissible range (16)

Message value: -

Component: None

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The condition for "External fault 1" is active.

Note:

"External fault 1" is initiated by a 1/0 edge via c2106.

See also: c2106 (External fault 1)

Remedy:
- Eliminate the causes of this fault.
- Acknowledge fault.

Response upon: A: NONE

Acknowl. upon A: NONE

F07900 (N, A) Drive: Motor blocked/speed controller at its limit

Message class: Application/technological function faulted (17)

Message value: -

Component: Motor

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The motor operates longer than 0.2 seconds at the torque limit and below the speed threshold in p2175.

This signal can also be initiated if the speed actual value oscillates and the speed controller output repeatedly and briefly goes to its limit.

This message can also be output for a phase failure in the motor feeder cable.

See also: p2175, p2177

Remedy:
- Check that the motor can freely move.
- Check the effective torque limit (r1538, r1539).
- Check the parameter of the "Motor blocked" signal and possibly correct (p2175).
- Check the motor feeder cable.

Response upon: N: NONE

Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F07901 Drive: Motor overspeed

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible speed was either positively or negatively exceeded (p1082).
Remedy: - Check the speed controller (p1460, p1462).
- Check the moment of inertia (p1498).
- Check the maximum speed (p1082).

A07920 Drive: Torque/speed too low

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: NONE
Acknowledgment: NONE
Cause: The torque deviates from the torque/speed envelope characteristic (too low).
Remedy: - Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

A07921 Drive: Torque/speed too high

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: NONE
Acknowledgment: NONE
Cause: The torque deviates from the torque/speed envelope characteristic (too high).
Remedy: - Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

A07922 Drive: Torque/speed out of tolerance

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: NONE
Acknowledgment: NONE
Cause: The torque deviates from the torque/speed envelope characteristic.
Remedy: - Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

F07923 Drive: Torque/speed too low

Message class: Application/technological function faulted (17)
Message value: -

Component: Motor
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The torque deviates from the torque/speed envelope characteristic (too low).
Remedy: - Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

F07924 Drive: Torque/speed too high

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The torque deviates from the torque/speed envelope characteristic (too high).
Remedy: - Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

F07925 Drive: Torque/speed out of tolerance

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The torque deviates from the torque/speed envelope characteristic.
Remedy: - Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

F07955 Drive: Motor has been changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Motor
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The code numbers of the bearings, gearbox or brake do not match the saved numbers.
Fault value (r0949, interpret decimal):
Number of the incorrect parameter
See also: p0301, r0302
Remedy: Connect the original motor and switch on the converter again (POWER ON) - or restore the factory settings.
Note:
The data for bearings, gearbox and brake are reloaded.

F07956 (A) Drive: Motor code does not match the list (catalog) motor

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Motor
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: The motor code of the connected motor does not match the possible list motor types (see selection in p0300).
It is possible that this firmware version does not support the connected motor.
Fault value (r0949, interpret decimal):
Motor code of the connected motor.
Note:
The first three digits of the motor code generally correspond to the list motor type.

Remedy: Use a motor with matching motor code.

Response upon: A: NONE

Acknowl. upon A: NONE

F07990 Drive: Incorrect motor data identification

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: Motor

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: A fault has occurred during the identification routine.
Fault value (r0949, interpret decimal):
151: The determined force due to weight is higher than the rated motor torque (r0333).
152: The torque precontrol channel (c1511) is already interconnected.
190: Speed setpoint not equal to zero.

Remedy: For fault value = 151:
- The motor cannot continuously hold the force due to weight. Either reduce the force due to weight or use a motor with a higher rated torque.
For fault value = 152:
- Add the measured force due to weight (p1532) to the signal source of c1511.
- If required withdraw the signal interconnection from c1511 (c1511 = 0) and repeat the measurement.
For fault value = 190:
- Set speed setpoint to zero.

A08560 IE: Syntax error in configuration file

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A syntax error has been detected in the configuration file for the Industrial Ethernet interface (X127). The saved configuration file has not been loaded.
Note:
IE: Industrial Ethernet

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08561 IE: Consistency error affecting adjustable parameters

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A consistency error was detected when activating the configuration for the Industrial Ethernet interface (X127).
Alarm value (r2124, interpret decimal):
0: General consistency error
1: Error in the IP configuration (IP address, subnet mask or standard gateway).
2: Error in the station names.
5: Standard gateway is also set at the PROFINET interface.
6: The station name is also set at the PROFINET interface.
7: The IP address is located in the same subnet as the IP address of the PROFINET interface.
Note:
For alarm value = 0, 1, 2, 5, 7 the following applies: the configuration was not changed.
For alarm value = 6 the following applies: The new configuration was however activated.
IE: Industrial Ethernet

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08562 PROFINET: Syntax error in configuration file

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A syntax error has been detected in the configuration file for the PROFINET interface (X150). The saved configuration file has not been loaded.

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08563 PROFINET: Consistency error affecting adjustable parameters

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A consistency error was detected when activating the configuration for the PROFINET interface (X150).
Alarm value (r2124, interpret decimal):
0: General consistency error
1: Error in the IP configuration (IP address, subnet mask or standard gateway).
2: Error in the station names.
3: DHCP was not able to be activated, as a cyclic PROFINET connection already exists.
5: Standard gateway is also set at the Industrial Ethernet interface (X127).
6: Standard station name is also set at the Industrial Ethernet interface (X127).
7: IP address is located in the same subnet as the IP address of the Industrial Ethernet interface (X127).
Note:
For alarm value = 0, 1, 2, 3, 4, 5, 7, the following applies: the configuration was not changed.
For alarm value = 6 the following applies: The new configuration was however activated.
DHCP: Dynamic Host Configuration Protocol

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

F13000 License not adequate

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: Control Unit (CU)

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause:
- The converter uses options that require a license and the licenses are not sufficient.
- An error has occurred when checking the licensing.

Fault value (r0949, interpret decimal):

0: Adequate licensing was not able to be determined as there is no licensing data available on the memory card.

1: Adequate licensing was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card is defective.

2: Adequate licensing was not able to be determined as there is no licensing data available on the memory card.

3: Adequate licensing was not able to be determined as the licensing data does not match the serial number of the memory card being used.

4, 5, 6, 7: Adequate licensing was not able to be determined as the licensing data were manipulated and are therefore invalid.

8, 9: An internal error occurred when checking the license.

Remedy:

For fault value = 0:

Transfer a license file with the required licenses to the converter.

For fault value = 1:

Reinsert the memory card into the converter. If you have to replace a defective memory card, contact Technical Support.

For fault value = 2:

Transfer a license file with the required licenses to the converter.

For fault value = 3:

Compare the license file name (after "LK_" to ".ZIP") with the serial number of the memory card.

Transfer the appropriate license file to the converter.

For fault value = 4, 5, 6, 7, 8, 9:
- Carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.

Note:

An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

A13002 Licensing not sufficient in operation

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause:
- For the converter, the options that require a license are being used but the licenses are not sufficient.
- An error occurred when checking the existing licenses.

Alarm value (r2124, interpret decimal):

0: The existing license is not sufficient.

1: An adequate license was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card has developed a defect.

2: An adequate license was not able to be determined as there is no licensing data available on the memory card.

3: An adequate license was not able to be determined as there is no licensing data available on the memory card.

4, 5, 6, 7: An adequate license was not able to be determined as the licensing data were manipulated and are therefore invalid.

8,9: An internal error occurred when checking the license.

Remedy:
For alarm value = 0:
Additional licenses are required and must be activated.
For alarm value = 1:
Reinsert or replace the memory card that matches the system.
For alarm value = 2:
Transfer the license file to the converter.
For alarm value = 3:
Compare the license file name (after "LK_" to ".ZIP") with the serial number of the memory card.
Transfer the appropriate license file to the converter.
For alarm value = 4, 5, 6, 7, 8, 9:
- Carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
Note:
An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

A13030 Trial License activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The "Trial License" function was activated. One of the available periods is expiring.
Remedy: Not necessary.
The alarm is automatically withdrawn after the periods have expired.

A13031 Trial License period expired

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: One of the available periods of the "Trial License" function has expired.
Remedy:
- If required, start an additional period.
- Deactivate functions requiring a license.
- Appropriately license the converter.
Note:
A license that is not adequate will only become evident after the next time the system runs up.

A13032 Trial License last period activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The "Trial License" function was activated. The last of the available periods is expiring.
Remedy: Not necessary.
The alarm is automatically withdrawn after the last period has expired.

A13033 Trial License last period expired

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The last period of the "Trial License" function has expired. No additional periods available.
Remedy:
- Deactivate functions requiring a license.
- Appropriately license the converter.

Note:
A license that is not adequate will only become evident after the next time the system runs up.

F30001 Drive: Overcurrent

Message class: Power electronics faulted (5)
Message value: Fault cause: %1 bin
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive has detected an overcurrent condition.
- Closed-loop control is incorrectly parameterized.
- Motor has a short-circuit or fault to ground (frame).
- The rated motor current is significantly higher than that of the drive.
- Infeed: High discharge and post-charging currents for line voltage dip.
- Infeed: High post-charging currents for overload when motoring and DC link voltage dip.
- Infeed: Short-circuit currents at switch-on as there is no line reactor.
- Power cables are not correctly connected.
- The power cables exceed the maximum permissible length.
- Defective drive.
- Line phase interrupted.

Fault value (r0949, interpret bitwise):
Bit 0: Phase U.
Bit 1: Phase V.
Bit 2: Phase W.

Remedy:
- Check the motor data, carry out commissioning if required.
- Check the assignment of the rated currents of the motor and converter.
- Infeed: Check the line quality.
- Infeed: Reduce the motor load.
- Infeed: Check that the line filter and line reactor are correctly connected.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace drive.
- Check the line phases.

F30002 Drive: DC link overvoltage

Message class: DC link overvoltage (4)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The drive has detected an overvoltage condition in the DC link.
- Motor regenerates too much energy.
- Device supply voltage too high.
- Line phase interrupted.
- Ground fault
- Short-circuit

Fault value only for internal Siemens diagnostics.

Remedy:
- Increase the ramp-down time.
- Use a braking resistor.
- Use a drive with a higher power rating.
- Check the device supply voltage (p0210).
- Check the line phases.
- Check for a ground fault and short-circuit.

See also: p0210 (Device supply voltage)

F30003 Power unit: DC link voltage undervoltage

Message class: Infeed faulted (13)

Message value: -

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The power unit has detected an undervoltage condition in the DC link.
- Line supply failure.
- Line voltage below the permissible value.
- Line infeed failed or interrupted.
- Line phase interrupted.

Note:
The monitoring threshold for undervoltage in the DC link is indicated in r0296.

Remedy:
- Check the line voltage.
- Check the line infeed and observe the fault messages relating to it (if there are any).
- Check the line phases.
- Check the supply voltage setting (p0210).

See also: p0210 (Device supply voltage)

F30004 Power unit: Overtemperature heat sink inverter

Message class: Power electronics faulted (5)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The temperature of the power unit heat sink has exceeded the permissible limit value.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret decimal):
Temperature [0.01 °C].

Remedy:
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

Notice:
This fault can only be acknowledged after the alarm threshold for alarm A30250 has been fallen below.

F30005 Power unit: Overload I2t (AC)

Message class: Power electronics faulted (5)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The fault threshold for the I2t overload on the AC side of the power unit has been exceeded. The permissible duty cycle or the continuous load was not maintained.
Fault value (r0949, interpret decimal):
I2t (AC) [100 % = 16384]
See also: r0036 (Power unit overload)

Remedy:
- Reduce the continuous load.
- Adapt the duty cycle.
- Check the rated currents of the motor and power unit.

See also: p0307 (Rated motor power)

F30011 Power unit: Line phase failure in main circuit

Message class: Line supply fault (2)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: At the power unit, the DC link voltage ripple has exceeded the permissible limit value.
Possible causes:
- A line phase has failed.
- The 3 line phases are inadmissibly asymmetrical.
- The capacitance of the DC link capacitor forms a resonance frequency with the line inductance and the reactor integrated in the power unit.
- The fuse of a phase of a main circuit has ruptured.
- A motor phase has failed.
- For power units operated on a single phase, the permissible active power was exceeded.

Only for internal Siemens troubleshooting.

Remedy:
- Check the main circuit fuses.
- Check whether a single-phase load is distorting the line voltages.
- Detune the resonant frequency with the line inductance by using an upstream line reactor.
- Dampen the resonant frequency with the line inductance by switching over the DC link voltage compensation in the software or increase the smoothing. However, this can have a negative impact on the torque ripple at the motor output.
- Check the motor feeder cables.

F30015 (N, A) Power unit: Phase failure motor cable

Message class: Application/technological function faulted (17)

Message value: -

Component: Motor
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A phase failure in the motor feeder cable was detected.
The signal can also be output in the following case:
- The motor is correctly connected, however the closed-speed control is instable and therefore an oscillating torque is generated.
Note:
Chassis power units do not feature phase failure monitoring.
Remedy: - Check the motor feeder cables.
- Check the speed controller settings.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

A30016 (N) Power unit: Load supply switched off

Message class: Line supply fault (2)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The DC link voltage is too low.
Alarm value (r2124, interpret decimal):
DC link voltage at the time of the trip [V].
Remedy: - Switch on the load supply.
- Check the line supply if necessary.
Response upon: N: NONE
Acknowl. upon N: NONE

F30017 Power unit: Hardware current limit has responded too often

Message class: Power electronics faulted (5)
Message value: Fault cause: %1 bin
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The hardware current limitation in the relevant phase (see A30031, A30032, A30033) has responded too often. The number of times the limit has been exceeded depends on the design and type of power unit.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Fault value (r0949, interpret binary):
Bit 0: Phase U
Bit 1: Phase V
Bit 2: Phase W
Additional bits:
Only for internal Siemens troubleshooting.
Note:
Fault value = 0 means that the phase with current limiting is not recognized (e.g. for blocksize device).

Remedy:
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

F30021 Drive: Ground fault

Message class: Ground fault / inter-phase short-circuit detected (7)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive has detected a ground fault.
Possible causes:
- Ground fault in the power cables.
- Ground fault at the motor.
- When the brake closes, this causes the hardware DC current monitoring to respond.
- Short-circuit at the braking resistor.

Fault value (r0949, interpret decimal):
0:
- The hardware DC current monitoring has responded.
- Short-circuit at the braking resistor.

> 0:
Absolute value summation current amplitude.

Remedy:
- Check the power cable connections.
- Check the motor.
- Check the cables and contacts of the brake connection (a wire is possibly broken).
- Check the braking resistor.

F30022 Power unit: Monitoring U_ce

Message class: Ground fault / inter-phase short-circuit detected (7)
Message value: Fault cause: %1 bin
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: In the power unit, the monitoring of the collector-emitter voltage (U_ce) of the semiconductor has responded.
Possible causes:
- The power supply for power semiconductor gating missing.
- Short-circuit at the power unit output.
- Defective semiconductor in the power unit.

Fault value (r0949, interpret binary):
Bit 0: Short-circuit in phase U
Bit 1: Short-circuit in phase V
Bit 2: Short-circuit in phase W
Bit 3: Short-circuit in phase N
See also: r0949 (Fault value)

Remedy:
- Check the power cable connections.
- Select the defective semiconductor and replace.
- When alarm 30269 simultaneously occurs, then the power supply for the power semiconductor gating is overloaded. A hardware defect must be assumed. Contact Technical Support.

F30024 Power unit: Overtemperature thermal model

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible fault threshold.
- The permissible duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C
See also: r0037 (Power unit temperatures)

Remedy:
- Adapt the duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

F30025 Power unit: Chip overtemperature

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The chip temperature of the power semiconductor involved has exceeded the permissible fault threshold.
- The permissible duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

Remedy:
- Adapt the duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

Note:
This fault can only be acknowledged after the alarm threshold for alarm A030252 has been fallen below.
See also: r0037 (Power unit temperatures)

F30026 (A) Power unit: DC link precharging asymmetry

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Asymmetry has occurred during DC link precharging.
This message can occur in the following cases:
- Asymmetrical line voltage dips, interruptions (possibly even very briefly for just a few milliseconds)
- One or several line phases failed / not connected
- Device damage

Fault value only for internal Siemens diagnostics.

Remedy: Caution: Continuous operation with F30026 is not permissible, and can damage the converter.
- Check the line supply and connection

Response upon: A: NONE
Acknowl. upon A: NONE

A30030 Power unit: Internal overtemperature alarm

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The temperature inside the drive converter has exceeded the permissible temperature limit.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.

Alarm value (r2124, interpret decimal):
Only for internal Siemens troubleshooting.

Remedy:
- Possibly use an additional fan.
- Check whether the ambient temperature is in the permissible range.

Notice:
This alarm is automatically withdrawn once the permissible temperature limit value has been fallen below minus 5 K.

A30031 Power unit: Hardware current limiting in phase U

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: Hardware current limit for phase U responded. The pulsing in this phase is inhibited for one pulse period.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30032 Power unit: Hardware current limiting in phase V

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: Hardware current limit for phase V responded. The pulsing in this phase is inhibited for one pulse period.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30033 Power unit: Hardware current limiting in phase W

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: Hardware current limit for phase W responded. The pulsing in this phase is inhibited for one pulse period.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30034 Power unit: Internal overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for internal overtemperature has been reached.
If the temperature inside the power unit increases up to the fault threshold, then fault F30036 is triggered.
- Ambient temperature might be too high.
- Insufficient cooling, fan failure.

Remedy:
- Check the ambient air temperature.
- Check the fan for the inside of the unit.

F30036 Power unit: Internal overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The temperature inside the converter has exceeded the permissible limit value.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.

Remedy:
- Check the internal fan.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.

Notice:
This fault can only be acknowledged once the permissible temperature limit minus 5 K has been fallen below.

F30037 Power unit: Rectifier overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The temperature in the rectifier of the power unit has exceeded the permissible temperature limit.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Line phase failure.

Fault value (r0949, interpret decimal):
Temperature [0.01 °C].

Remedy:
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Check the line phases.

Notice:
This fault can only be acknowledged after the alarm threshold for alarm A05004 has been undershot.

A30042 (N) Power unit: Fan has reached the maximum operating hours

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: The maximum operating time of at least one fan will soon be reached, or has already been exceeded.
Alarm value (r2124, interpret binary):
Bit 0 = 1:
The wear counter of the heat sink fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 0 is cleared and bit 2 is set in the alarm value.
Bit 2 = 1:
The wear counter of the heat sink fan has exceeded 100 %.
Bit 8 = 1:
The wear counter of the 1st internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 8 is cleared and bit 10 is set in the alarm value.
Bit 10 = 1:
The wear counter of the 1st internal fan has exceeded 100 %.
Bit 16 = 1:
The wear counter of the 2nd internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 16 is cleared and bit 18 is set in the alarm value.
Bit 18 = 1:
The wear counter of the 2nd internal fan has exceeded 100 %.

Remedy: For the fan involved, carry out the following:
1. Replace the fan.
2. Reset the wear counter using the appropriate button in Startdrive or the web server.

See also: r0277 (Power unit fan wear counter)

Response upon: N: NONE
Acknowl. upon N: NONE

A30046 (F) Power unit: Undervoltage alarm

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: Before the last restart, a problem occurred at the power unit power supply.
The voltage monitor in the internal FPGA of the PSA signals an undervoltage fault on the module.
Alarm value (r2124, interpret decimal):
Register value of the voltage fault register.

Remedy:
- Check the 24 V DC voltage supply to power unit.
- Carry out a POWER ON (switch-off/switch-on) for the component.
- Replace the module if necessary.

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

F30050 Power unit: 24 V supply overvoltage

Message class: Supply voltage fault (overvoltage) (3)

Message value: -

Component: Power Unit

Response: OFF2

Acknowledgment: POWER ON

Cause: The voltage monitor signals an overvoltage fault on the module.

Remedy:
- Check the 24 V power supply.
- Replace the module if necessary.

F30051 Power unit: Motor holding brake short-circuit detected

Message class: External measured value / signal state outside the permissible range (16)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: A short-circuit at the motor holding brake terminals has been detected.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.

Remedy:
- Check the motor holding brake for a short-circuit.
- Check the connection and cable for the motor holding brake.

F30052 EEPROM data error

Message class: Hardware/software error (1)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: POWER ON

Cause: The EEPROM data of the power unit module are incorrect.
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.

Remedy: Replace the power unit module or update the EEPROM data.

F30053 FPGA data faulty

Message class: Hardware/software error (1)

Message value: %1

Component: Power Unit

Response: NONE

Acknowledgment: POWER ON

Cause: The FPGA data of the power unit are faulty. This can be caused, for example, if a firmware update is interrupted.

Remedy: Replace the power unit or update of the FPGA data by updating the firmware.
Note:
If this fault occurs after a firmware update, then update the firmware again.

F30055 Power unit: Braking chopper overcurrent

Message class: Braking Module faulted (14)

Message value: -

Component: None

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: An overcurrent condition has occurred in the braking chopper.

Remedy: - Check whether the braking resistor has a short-circuit.
- For an external braking resistor, check whether the resistor may have been dimensioned too small.
Note:
The braking chopper is only enabled again at pulse enable after the fault has been acknowledged.

A30057 Power unit: Line asymmetry

Message class: Line supply fault (2)

Message value: %1

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: Frequencies have been detected on the DC link voltage that would suggest line asymmetry or failure of a line phase.
It is also possible that a motor phase has failed.
If these frequencies occur with the same or even higher amplitudes, then after a device-specific time elapses, fault F30011 is output
Alarm value, only for internal Siemens troubleshooting.

Remedy: - Check the line phase connection.
- Check the motor feeder cable connections.
If there is no phase failure of the line or motor, then line asymmetry is involved.
- Reduce the power in order to avoid fault F30011.

F30058 (N, A) Power unit: Heat sink fan defective

Message class: External measured value / signal state outside the permissible range (16)

Message value: Fault cause: %1 bin

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The feedback signal of the heat sink fan signals a fault, or there is a communication error with the fan.
- Fan defective.
- Fan blocked.
- Feedback signal error.
Fault value (r0949, interpret binary):
Value in bits 0 to 15:
0: Feedback signal of the fan signals a fault
1: Internal communication error to the fan
Bits 16 to 31 are only for internal Siemens diagnostics.

Remedy: - Check the heat sink fan and replace if necessary.
- For communication errors, update the software or replace the power unit.
Note:
- If the fault can be acknowledged, this does not necessarily mean that the cause of the fault has been resolved. It is also possible that the software switched off the fan, and therefore can no longer evaluate the feedback signal.

Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F30059 Power unit: Internal fan 1 defective

Message class: Auxiliary unit faulted (20)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The feedback signal of internal fan 1 signals a fault, or there is a communication error with the fan.
Fault value (r0949, interpret decimal):
0: Feedback signal of the fan signals a fault
1: Internal communication error to the fan
Remedy: - Check internal fan 1 and replace if necessary.
- For communication errors, update the software or replace the power unit.
Note:
If the fault can be acknowledged, this does not necessarily mean that the cause of the fault has been resolved. It is also possible that the software switched off the fan, and therefore can no longer evaluate the feedback signal.

F30062 Bypass contactor opened under current

Message class: Infeed faulted (13)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The bypass contactor of the precharging unit has been opened under current.
Possible causes:
- A defect at the bypass contactor
Remedy: It is urgently recommended that the components involved are replaced to prevent serious damage to the entire converter line-up.

F30068 Power unit: Undertemperature inverter heat sink

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The actual inverter heat sink temperature is below the permissible minimum value.
Possible causes:
- The power unit is being operated at an ambient temperature that lies below the permissible range.
- The temperature sensor evaluation is defective.
Fault value (r0949, interpret decimal):
Inverter heat sink temperature [0.1 °C].

Remedy:
- Ensure that higher ambient temperatures prevail.
- Replace the power unit.

A30076 (N) Power unit: Thermal overload braking resistor alarm

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: The energy absorbed by the braking resistor has exceeded the alarm threshold of 80 %. If the power unit is still operated in the generator mode, then this can reach the shutdown threshold. To avoid overheating of the braking resistor, use of the braking resistor is inhibited and alarm A30077 is output.
Alarm value (r2124, interpret decimal):
Energy absorbed by the braking resistor [Ws].

Remedy: Reduce the power when generating.
Note:
For a DC link coupling, the generating power of all of the coupled power units must be taken into consideration.

Response upon: N: NONE
Acknowl. upon N: NONE

A30077 (N) Power unit: Thermal overload braking resistor

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: The braking resistor is thermally overloaded. This is the reason that its use was inhibited.
Alarm value (r2124, interpret decimal):
Energy absorbed by the braking resistor [Ws].

Remedy: Reduce the power when generating.
Note:
- Once the braking resistor has thermally recovered, it is enabled for further use.
- For a DC link coupling, the generating power of all the coupled power units must be taken into consideration.

Response upon: N: NONE
Acknowl. upon N: NONE

A30079 (N) Power unit: Referred to the supply voltage, the DC link voltage is too high

Message class: Infeed faulted (13)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: The alarm is output if the following conditions are simultaneously satisfied:
1. The device supply voltage (p0210) was reduced.
2. A DC link voltage is present, which is too high when referred to the new supply voltage.
DC link precharging cannot be completed as this could place some converter components at risk.
Alarm value (r2124, interpret decimal):
Voltage value to which the DC link voltage must, in the meantime, be reduced in order to complete precharging [V].
See also: p0210 (Device supply voltage)

Remedy: As a minimum, reduce the DC link voltage to the voltage specified in the alarm value.
Note:
The alarm is automatically withdrawn if the DC link voltage drops below the voltage specified in the alarm value.
Fault F07802 is output if an attempt is made to enable the pulses even though an alarm is active.

Response upon: N: NONE

Acknowl. upon N: NONE

F30081 Power unit: Switching operations too frequent

Message class: Power electronics faulted (5)

Message value: Fault cause: %1 bin

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The power unit has executed too many switching operations for current limitation.
- Closed-loop control is incorrectly parameterized.
- Motor has a short-circuit or fault to ground (frame).
- U/f operation: Up ramp set too low.
- U/f operation: Rated motor current is significantly higher than that of the power section.
- Infeed: High discharge and post-charging currents for line voltage dip.
- Infeed: High post-charging currents for overload when motoring and DC link voltage dip.
- Infeed: Short-circuit currents at switch-on as there is no line reactor.
- Power cables are not correctly connected.
- Power cables exceed the maximum permissible length.
- Power unit defective.

Fault value (r0949, interpret bitwise):
Bit 0: Phase U.
Bit 1: Phase V.
Bit 2: Phase W.

Remedy:
- Check the motor data, carry out commissioning if required.
- Check the motor circuit configuration (star-delta)
- U/f operation: Increase up ramp.
- U/f operation: Check the rated currents of the motor and power unit.
- Infeed: Check the line quality.
- Infeed: Reduce the motor load.
- Infeed: Correct connection of the line reactor.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace power unit.

F30105 PU: Actual value sensing fault

Message class: Power electronics faulted (5)

Message value: -

Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: At least one incorrect actual value channel was detected on the Power Stack Adapter (PSA).
The incorrect actual value channels are displayed in the following diagnostic parameters.
Remedy: Evaluate the diagnostic parameters.
If the actual value channel is incorrect, check the components and if required, replace.

A30250 (N) Power unit: Overtemperature heat sink inverter

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for overtemperature at the inverter heat sink has been reached.
Fault F30004 is initiated if the temperature of the heat sink increases by 5 K.
Remedy: Check the following:
- Is the ambient temperature within the defined limit values?
- Have the load conditions and the duty cycle been appropriately dimensioned?
- Has the cooling failed?

Response upon: N: NONE
Acknowl. upon N: NONE

A30251 (N) Power unit: Rectifier overtemperature

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for the overtemperature of the rectifier has been reached. The response is set using p0290.
If the temperature of the rectifier increases by an additional 5 K, then fault F30037 is triggered.
Remedy: Check the following:
- Is the ambient temperature within the defined limit values?
- Have the load conditions and the duty cycle been appropriately dimensioned?
- Has the fan failed? Check the direction of rotation.
- Has a phase of the line supply failed?
- Is an arm of the supply (incoming) rectifier defective?

Response upon: N: NONE
Acknowl. upon N: NONE

A30252 Power unit: Chip overtemperature alarm

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Response: NONE
Acknowledgment: NONE

Cause: The chip temperature of the power semiconductor involved has exceeded the permissible alarm threshold.
Note:
- If the chip temperature of the power semiconductor involved increases by 5K, then fault F30025 is initiated.

Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

Remedy: Check the following:
- Is the ambient temperature within the defined limit values?
- Have the load conditions and the duty cycle been appropriately dimensioned?
- Has the cooling failed?
- Pulse frequency too high?

A30253 Power unit: Overtemperature thermal model alarm

Message class: Power electronics faulted (5)

Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible alarm threshold.
The maximum output current is reduced as overload response.

Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

Remedy: Not necessary.
The alarm is automatically withdrawn once the alarm threshold has been fallen below.
Note:
If the temperature continues to increase, this can result in fault F30024.

A30256 Power unit: Overload I2t (AC)

Message class: Power electronics faulted (5)

Message value: -

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: The alarm threshold for the I2t overload on the AC side of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30005.
See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
- Check the rated currents of the motor and power unit.
See also: p0290 (Power unit overload response)

A30257 Power unit: Overload I2t (DC)

Message class: Power electronics faulted (5)

Message value: -

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: The alarm threshold for the I2t overload on the DC side of the power unit has been exceeded.
Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30258.
See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0290 (Power unit overload response)

F30258 Power unit: Overload I2t (DC)

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The fault threshold for the I2t overload on the DC side of the power unit has been exceeded.
The permissible duty cycle or the continuous load was not maintained.
Fault value (r0949, interpret decimal):
I2t (DC) [100 % = 16384]
See also: r0036 (Power unit overload)
Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0307 (Rated motor power)

A30259 Braking resistor value too low

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The braking resistor value used in p0216 is too low.
This can result in an excessively high braking current.

Alarm value (r2124, interpret decimal):
Minimum limit value of the braking resistor [0.1 Ohm]
See also: p0216 (Braking resistance value)
Remedy: - Use a braking resistor with the appropriate resistance value
- Observe the product documentation

F30260 Power unit: Fault in the driver supply for the power semiconductor

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A fault has occurred in the driver supply of the power semiconductor.
Remedy: There is a hardware defect. The device must be replaced.

F30262 Power unit: Braking chopper defective

Message class: Power electronics faulted (5)

Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The braking chopper is defective.
Remedy: Replace the converter.

F30263 Power unit: Braking chopper upper defective

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The upper braking chopper is defective.
Remedy: Replace the converter.

F30264 Power unit: Braking chopper inhibited due to implausible DC link voltage

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The braking chopper was inhibited because the unloaded DC link voltage continuously reaches or exceeds the chopper activation threshold. This prevents the braking chopper from being permanently active and possibly damaged.

Possible causes:
The value of parameter p0210 does not match the line voltage.

Fault value (r0949, interpret decimal): DC link voltage [V]
Remedy: Replace the converter.

F30265 Power unit: Line voltage failure detected

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: Line voltage failure was detected
Remedy: - Switch on the line voltage.
- To increase the degree of ruggedness, the delay time in p3234 can be increased.
- If necessary, line voltage failure detection can be deactivated using p2149.16.
See also: p2149, p3234

A30267 Power unit: Active power overload

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE

Acknowledgment: NONE

Cause: The alarm threshold for the active power overload of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30268.
See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0290 (Power unit overload response)

F30268 Power unit: Active power overload

Message class: Power electronics faulted (5)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The fault threshold for the active power overload of the power unit has been exceeded.
The permissible duty cycle or the continuous load was not maintained.
Fault value (r0949, interpret decimal):
Active power [100 % = 16384]
See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0307 (Rated motor power)

A30269 Power unit: Internal hardware fault

Message class: Power electronics faulted (5)

Message value: Fault cause: %1 bin

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: Frequent occurrence can mean that there is a hardware defect.
The component involved is specified in the alarm value.

Alarm value (r2124, interpret binary):
Bit 0 = 1: Power supply board
Bit 1 = 1: IGBT gate drive
Bit 2 - bit 31: Reserved

Remedy: - Contact Technical Support.

A30502 Power unit: DC link overvoltage

Message class: DC link overvoltage (4)

Message value: %1

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: The power unit has detected overvoltage in the DC link on a pulse inhibit.
- Device supply voltage too high.
- Line reactor incorrectly dimensioned.

Alarm value (r2124, interpret decimal):
DC link voltage [1 bit = 100 mV].
See also: r0070 (Actual DC link voltage)

Remedy: - Check the device supply voltage (p0210).
- Check the dimensioning of the line reactor.

See also: p0210 (Device supply voltage)

F30524 SI: Safety EEPROM data error

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: POWER ON
Cause: Safety relevant EEPROM data are not correct.
This message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy: Replace the module

F30526 SI: Safety HW version of the Motor Module incorrect

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: POWER ON
Cause: Safety relevant hardware version is not compatible with this software.
This fault results in an STO (Safe Torque Off).

Fault value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy: Update the software or exchange the module for this software.

N30800 (F) Power unit: Group signal

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: NONE
Cause: The power unit has detected at least one fault.
Remedy: Evaluate the other messages that are presently available.
Response upon: F: OFF2
Acknowl. upon F: IMMEDIATELY

F30801 Power unit: Sign-of-life missing

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Control Unit (CU)

Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Internal communications error.
The computing time load might be too high.
Message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
xx = 0A hex (10 dec):
The sign-of-life bit in the received telegram is not set.
Remedy: Contact Technical Support.

F30802 Power unit: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A time slice overflow has occurred.
Fault value (r0949, interpret decimal):
xx: Time slice number
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F30804 (N, A) Power unit: Checksum error occurred

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A checksum error (CRC error) has occurred for the power unit.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F30805 Power unit: EEPROM checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Internal parameter data is corrupted.
Fault value (r0949, interpret hexadecimal):
01: EEPROM access error.
02: Too many blocks in the EEPROM.
Remedy: Replace the module.

F30809 Power unit: Switching information not valid

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: For 3P gating unit, the following applies:
The last switching status word in the setpoint telegram is identified by the end ID. Such an end ID was not found.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F30810 Power unit: Watchdog timer expired

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The watchdog timer has expired. This can only be caused by a fatal software error.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F30815 Power unit: Processor clock signal error

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Response: OFF2
Acknowledgment: POWER ON
Cause: The processor clock signal monitoring has signaled an error. This can involve the signal itself or its PLL.
Remedy: - Replace the hardware.
- Contact Technical Support.

F30820 Power unit: Telegram error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: Internal communications error.
Error cause:
1 (= 01 hex):
Checksum error (CRC error).
2 (= 02 hex):
Telegram is shorter than specified in the length byte or in the receive list.
3 (= 03 hex):
Telegram is longer than specified in the length byte or in the receive list.
4 (= 04 hex):
The length of the received telegram does not match the receive list.
5 (= 05 hex):
The type of the received telegram does not match the receive list.
6 (= 06 hex):
The address of the component in the telegram and in the receive list do not match.
7 (= 07 hex):
A SYNC telegram is expected - but the received telegram is not a SYNC telegram.
8 (= 08 hex):
No SYNC telegram is expected - but the received telegram is one.
9 (= 09 hex):
The error bit in the received telegram is set.
16 (= 10 hex):
The received telegram is too early.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.

F30835 Power unit: Cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: Internal communications error. The nodes do not send and receive in synchronism.
Error cause:
33 (= 21 hex):
The cyclic telegram has not been received.
34 (= 22 hex):
Timeout in the telegram receive list.
64 (= 40 hex):
Timeout in the telegram send list.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Carry out a POWER ON.
- Replace the component involved.

F30836 Power unit: Send error

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Internal communications error. Data were not able to be sent.
Error cause:
65 (= 41 hex):
Telegram type does not match send list.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
Remedy: Carry out a POWER ON.

F30845 Power unit: Cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Internal communications error.
Error cause:
11 (= 0B hex):
Synchronization error during alternating cyclic data transfer.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
Remedy: Carry out a POWER ON (switch-off/switch-on).

F30850 Power unit: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: OFF1
Acknowledgment: POWER ON
Cause: An internal software error has occurred in the power unit.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Replace power unit.
- If required, upgrade the firmware in the power unit.
- Contact Technical Support.

F30851 Power unit (CU): Sign-of-life missing

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: Internal communications error.
The component did not set the sign-of-life.
Message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
xx = 0A hex (10 dec):
The sign-of-life bit in the received telegram is not set.

Remedy: - Deselect functions that are not required.
- Replace the component involved.

A30853 Power unit: Sign-of-life error cyclic data

Message class: General drive fault (19)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The cyclic setpoint telegrams of the power unit were not refreshed on time.
Remedy: - Check the power unit and if required replace.

F30860 Power unit (CU): Telegram error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: Internal communications error.
Error cause:
1 (= 01 hex):
Checksum error (CRC error).
2 (= 02 hex):
Telegram is shorter than specified in the length byte or in the receive list.
3 (= 03 hex):
Telegram is longer than specified in the length byte or in the receive list.
4 (= 04 hex):
The length of the received telegram does not match the receive list.
5 (= 05 hex):
The type of the received telegram does not match the receive list.
6 (= 06 hex):
The address of the power unit in the telegram and in the receive list do not match.
9 (= 09 hex):
The internal communications from the component involved signals a failure of the supply voltage.
16 (= 10 hex):
The received telegram is too early.
17 (= 11 hex):
CRC error and the received telegram is too early.
18 (= 12 hex):
The telegram is shorter than that specified in the length byte or in the receive list and the received telegram is too early.
19 (= 13 hex):
The telegram is longer than that specified in the length byte or in the receive list and the received telegram is too early.
20 (= 14 hex):
The length of the received telegram does not match the receive list and the received telegram is too early.
21 (= 15 hex):
The type of the received telegram does not match the receive list and the received telegram is too early.
22 (= 16 hex):
The address of the power unit in the telegram and in the receive list does not match and the received telegram is too early.
25 (= 19 hex):
The error bit in the received telegram is set and the received telegram is too early.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.

F30875 Power unit: Supply voltage failed

Message class: Supply voltage fault (undervoltage) (3)
Message value: Component number: %1, fault cause: %2
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The component involved has signaled that the 24 V supply has failed.
Error cause:
9 (= 09 hex):
The supply voltage for the component has failed.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Check the supply voltage wiring (interrupted cable, contacts, ...).
- Check the dimensioning of the 24 V supply, check cable lengths.

F30885 Power unit CU (CU): Cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: Internal communications error.
The nodes do not send and receive in synchronism.
Error cause:
26 (= 1A hex):
Sign-of-life bit in the received telegram not set and the received telegram is too early.
33 (= 21 hex):
The cyclic telegram has not been received.
34 (= 22 hex):
Timeout in the telegram receive list.
64 (= 40 hex):
Timeout in the telegram send list.
98 (= 62 hex):
Error at the transition to cyclic operation.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Check the supply voltage of the component involved.
- Carry out a POWER ON.
- Replace the component involved.

F30886 Power unit (CU): Error when sending

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: Internal communications error.
Data were not able to be sent.
Error cause:
65 (= 41 hex):
Telegram type does not match send list.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: Carry out a POWER ON.

F30895 Power unit (CU): Alternating cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: Communications error.
Error cause:
11 (= 0B hex):
Synchronization error during alternating cyclic data transfer.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: Carry out a POWER ON (switch-off/switch-on).

F30896 Power unit (CU): Inconsistent component properties

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Explanation of the message value: For %1
Component in target topology

Cause: The properties of the component (power unit), specified by the fault value, have changed in an incompatible fashion with respect to the properties when running up.
Fault value (r0949, interpret decimal):
Component number.

Remedy: - Carry out a POWER ON.

F30899 (N, A) Power unit: Unknown fault

Message class: Power electronics faulted (5)

Message value: New message: %1

Component: Power Unit

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A fault occurred on the power unit, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
Fault value (r0949, interpret decimal):
Fault number.
Note:
If required, the significance of this new fault can be read about in a more recent description of the converter.

Remedy: - Replace the firmware on the power unit by an older firmware version.
- Upgrade the converter firmware.

Response upon: N: NONE

Acknowl. upon N: NONE

Response upon: A: NONE

Acknowl. upon A: NONE

F30903	Power unit: I2C bus error occurred
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	Communications error with an EEPROM or an analog/digital converter. Fault value (r0949, interpret hexadecimal): 80000000 hex: - Internal software error. 00000001 hex ... 0000FFFF hex: - Module fault.
Remedy:	For fault value = 80000000 hex: - Upgrade firmware to later version. For fault value = 00000001 hex ... 0000FFFF hex: - Replace the module.

F30907	Power unit: FPGA configuration unsuccessful
Message class:	Hardware/software error (1)
Message value:	-
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	During initialization within the power unit, an internal software error has occurred.
Remedy:	- If required, upgrade the firmware in the power unit. - Replace power unit. - Contact Technical Support.

A30919	Power unit: Temperature monitoring failed
Message class:	Overtemperature of the electronic components (6)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	The temperature monitoring in the power unit has failed. Fault-free operation of the drive system is no longer guaranteed. Alarm value (r2124, interpret binary): Bit 0: Sensor 1 for the internal temperature can no longer be evaluated. Bit 1: Sensor 2 for the internal temperature can no longer be evaluated.
Remedy:	Replace the power unit immediately.

F30950	Power unit: Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	POWER ON

Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.

Remedy: - If necessary, upgrade the firmware in the power unit to a later version.
- Contact Technical Support.

A30999 (F, N) Power unit: Unknown alarm

Message class: Power electronics faulted (5)

Message value: New message: %1

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: An alarm has occurred on the power unit, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the firmware on the converter.
Alarm value (r2124, interpret decimal):
Alarm number.
Note:
If required, the significance of this new alarm can be read about in a more recent description of the converter.

Remedy: - Replace the firmware on the power unit by an older firmware version.
- Upgrade the converter firmware.

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

Response upon: N: NONE

Acknowl. upon N: NONE

F31110 (N, A) Motor encoder: Serial communication faulted

Message class: Position/speed actual value incorrect or not available (11)

Message value: Fault cause: %1 bin

Component: Encoder 1

Response: ENCODER

Acknowledgment: PULSE INHIBIT

Cause: There is an error in the transfer of the serial communication protocol between the encoder and internal or external evaluation module.
Fault value (r0949, interpret binary):
Bit 0: Alarm bit in the position protocol.
Bit 2: Encoder does not respond (does not supply a start bit within 50 ms).
Bit 3: CRC error: The checksum in the protocol from the encoder does not match the data.
Bit 6: Timeout when cyclically reading.
Bit 7: Timeout for the register communication.
Bit 14: Register communication error.

Remedy: For fault value, bit 0 = 1:
- Encoder defect F31111 may provide further details.
For fault value, bit 2 = 1:
- Incorrect encoder type / replace the encoder or encoder cable.
For fault value, bit 3 = 1:
- EMC / connect the cable shield, replace the encoder or encoder cable.
For fault value, bit 6 = 1:
- Update the firmware
For fault value, bit 7 = 1:
- Incorrect encoder type / replace the encoder or encoder cable.
For fault value, bit 14 = 1:
- Incorrect encoder type / replace the encoder or encoder cable.

Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31111 (N, A) Motor encoder: Encoder signals an internal error (detailed information)

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin, additional information: %2
Component: Encoder 1
Response: ENCODER
Acknowledgment: PULSE INHIBIT
Cause: The encoder error word provides detailed information (error bit).
Fault value (r0949, interpret binary):
yyyyxxxx hex: yyyy = supplementary information, xxxx = fault cause
Bit 0: Error in the multiturn block.
Bit 1: EEPROM error.
Bit 2: Singleturn position incorrect.
Bit 3: Multiturn position incorrect.
Bit 4: MLS generation error.
Bit 5: Reserved.
Bit 6: Overtemperature.
Bit 7: Internal fault.
Remedy: Encoder is defective. Replace the encoder or motor.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31112 (N, A) Motor encoder: Encoder signals an internal error

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: Encoder 1
Response: ENCODER
Acknowledgment: PULSE INHIBIT
Cause: The encoder signals an internal error via serial protocol.
Fault value (r0949, interpret binary):
Bit 0: Fault bit in the position protocol.

Remedy: For fault value, bit 0 = 1:
In the case of an EnDat encoder, F31111 may provide further details.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31150 (N, A) Motor encoder: Initialization error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: PULSE INHIBIT
Cause: Encoder functionality selected in p0404 cannot be executed.
Fault value (r0949, interpret hexadecimal):
Encoder malfunction.
The bit assignment corresponds to that of p0404 (e.g. bit 5 set: Error track C/D).
See also: p0404 (Encoder configuration effective)
Remedy: - Check that p0404 is correctly set.
- Check the encoder type used (incremental/absolute) and for SMCxx, the encoder cable.
- If relevant, note additional fault messages that describe the fault in detail.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

A31407 (F, N) Motor encoder: Function reserve low

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: The encoder function reserve is too low.
Alarm value (r2124, interpret decimal):
1: Incremental signals
3: Absolute track
4: Code connection
Remedy: - For open measuring systems, clean the encoder.
- If required, replace the encoder.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A31410 (F, N) Motor encoder: Communication error (encoder and Sensor Module)

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin
Component: Encoder 1
Response: NONE

Acknowledgment: NONE

Cause: There is an error in the transfer of the serial communication protocol between the encoder and internal or external evaluation module.
Fault value (r0949, interpret binary):
Bit 0: Alarm bit in the position protocol.
Bit 2: Encoder does not respond (does not supply a start bit within 50 ms).
Bit 3: CRC error: The checksum in the protocol from the encoder does not match the data.
Bit 6: Timeout when cyclically reading.
Bit 7: Timeout for the register communication.
Bit 14: Register communication error.

Remedy:
- Check that the encoder cables are routed in compliance with EMC.
- Check the plug connections.
- Replace encoder.

Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A31411 (F, N) Motor encoder: Encoder signals an internal alarm (detailed information)

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin, additional information: %2
Component: Encoder 1
Response: NONE
Acknowledgment: NONE

Cause: The encoder error word provides detailed information (alarm bit).
Alarm value (r2124, interpret binary):
yyyyxxxx hex: yyyy = supplementary information, xxxx = fault cause
Bit 0: LED current incorrect.
Bit 1: Signal amplitude outside the control range.
Bit 2: Overtemperature.

Remedy: Replace encoder.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A31412 (F, N) Motor encoder: Encoder signals an internal alarm

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: Encoder 1
Response: NONE
Acknowledgment: NONE

Cause: The encoder signals an internal alarm via serial protocol.
Alarm value (r2124, interpret binary):
Bit 0: Fault bit in the position protocol.
Bit 1: Alarm bit in the position protocol.

Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Check that the encoder cables are routed in compliance with EMC.
- Check the plug connections.
- Replace encoder.

Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

F31503 (N, A) Motor encoder: Position tracking cannot be reset

Message class: Position/speed actual value incorrect or not available (11)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The position tracking for the measuring gearbox cannot be reset.
Remedy: The fault should be resolved as follows:
- Select commissioning.
- Deselect commissioning.
The fault should then be acknowledged and the absolute encoder adjusted.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31802 (N, A) Motor encoder: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: A time slice overflow for the motor encoder has occurred.
Fault value (r0949, interpret hexadecimal):
yx hex:
y = function involved (only relevant for internal fault diagnostics.),
x = time slice involved
x = 9:
Time slice overflow of the fast (current controller clock cycle) time slice.
x = A:
Time slice overflow of the average time slice.
x = C:
Time slice overflow of the slow time slice.
yx = 3E7:
Timeout when waiting for SYNO (e.g. unexpected return to non-cyclic operation).
Remedy: Increase the current controller sampling time
Note:
For a current controller sampling time = 31.25 µs, use an SMx20 with Article No. 6SL3055-0AA00-5xA3.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31804 (N, A) Motor encoder: Sensor Module checksum error

Message class: Hardware/software error (1)

Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: POWER ON
Cause: A checksum error has occurred when reading-out the program memory on the Sensor Module.
Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex
yyyy: Memory area involved.
xxxx: Difference between the checksum at POWER ON and the actual checksum.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Check whether the permissible ambient temperature for the component is being maintained.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31805 (N, A) Motor encoder: EEPROM checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: Data in the EEPROM corrupted .
Fault value (r0949, interpret hexadecimal):
01: EEPROM access error.
02: Too many blocks in the EEPROM.
Remedy: Replace the module.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31850 (N, A) Motor encoder: Encoder evaluation internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: POWER ON
Cause: An internal software error has occurred in the Sensor Module of the motor encoder.
Fault value (r0949, interpret decimal):
1: Background time slice is blocked.
2: Checksum over the code memory is not correct.
10000: OEM memory of the EnDat encoder contains data that cannot be interpreted.
11000 ... 11499: Description data from EEPROM incorrect.
11500 ... 11899: Calibration data from EEPROM incorrect.
11900 ... 11999: Configuration data from EEPROM incorrect.
12000 ... 12008: Communications error with analog/digital converter.
Remedy: - If required, upgrade the firmware.
- Contact Technical Support.

Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31899 (N, A) Motor encoder: Unknown fault

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: A fault has occurred on the Sensor Module for the motor encoder, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
Fault value (r0949, interpret decimal):
Fault number.
Note:
If required, the significance of this new fault can be read about in a more recent description.
Remedy: - Replace the firmware on the Sensor Module by an older firmware version.
- Upgrade the converter firmware
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

A31902 (F, N) Motor encoder: SPI-BUS error occurred

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: Error when operating the internal SPI bus.
Alarm value (r2124, interpret hexadecimal):
Only relevant for internal fault diagnostics.
Remedy: - Replace motor.
- Contact Technical Support.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A31903 (F, N) Motor encoder: I2C-BUS error occurred

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: NONE
Acknowledgment: NONE

Cause: Error when operating the internal I2C bus.
Alarm value (r2124, interpret hexadecimal):
Only relevant for internal fault diagnostics.

Remedy: - Replace motor.
- Contact Technical Support.

Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

F31905 (N, A) Motor encoder: Encoder parameterization error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1, supplementary information: %2
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: IMMEDIATELY

Cause: An error was identified in the encoder parameterization.
It is possible that the parameterized encoder type does not match the connected encoder.
Determine the parameter number using the fault value (r0949).

Fault value (r0949, interpret decimal):
yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter
yyyy = 0:
No additional information available.
yyyy = 10:
The connected encoder is not supported.

Remedy: - Check whether the connected encoder type matches the encoder that has been parameterized.
- Correct the parameter specified by the fault value (r0949).

Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F31950 Motor encoder: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Response: ENCODER
Acknowledgment: POWER ON

Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
The fault value contains information regarding the fault source.
Only relevant for internal fault diagnostics.

Remedy: - If necessary, upgrade the firmware in the Sensor Module to a later version.
- Contact Technical Support.

A31999 (F, N) Motor encoder: Unknown alarm

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 1

Response: NONE
Acknowledgment: NONE
Cause: An alarm has occurred on the Sensor Module for encoder 1, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
Alarm value (r2124, interpret decimal):
Alarm number.
Note:
If required, the significance of this new alarm can be read about in a more recent description of the converter.
Remedy: - Replace the firmware on the Sensor Module by an older firmware version.
- Upgrade the converter firmware.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

F32805 (N, A) Encoder 2: EEPROM checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: Data in the EEPROM corrupted .
Fault value (r0949, interpret hexadecimal):
01: EEPROM access error.
02: Too many blocks in the EEPROM.
Remedy: Replace the module.
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F32950 Encoder 2: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2
Response: OFF1
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only relevant for internal fault diagnostics.
Remedy: - If necessary, upgrade the firmware in the Sensor Module to a later version.
- Contact Technical Support.

F34950 VSM: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Voltage Sensing Module (VSM)

Response: OFF2
Acknowledgment: POWER ON
Cause: An internal software error in the Voltage Sensing Module (VSM) has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.
Remedy: - If necessary, upgrade the firmware in the Voltage Sensing Module to a later version.
- Contact Technical Support.

F35220 (N, A) PTO: Frequency limit reached for signal output

Message class: Application/technological function faulted (17)
Message value: %1
Component: Terminal Module (TM)
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The signals output from the PTO for tracks A/B have reached the limit frequency. The output signals are no longer in synchronism with the specified setpoint.
The signal at c4420 has an excessively high actual speed.
Remedy: - Enter a lower speed setpoint (c4420).
- Reduce the pulse number (p4408).
Response upon: N: NONE
Acknowl. upon N: NONE
Response upon: A: NONE
Acknowl. upon A: NONE

F35950 TM: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Terminal Module (TM)
Response: OFF2
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.
Remedy: - If necessary, upgrade the firmware in the Terminal Module to a later version.
- Contact Technical Support.

F53430 VIBSUP EPOS not activated

Message class: General drive fault (19)
Message value: -
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: It was identified that the "Basic positioner, EPOS" is not activated.
Remedy: Activate function "Basic positioner, EPOS".
Note:
VIBSUP: VIBration SUPpression

F53432	VIBSUP frequency fd > Shannon frequency
Message class:	General drive fault (19)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The VIBSUP filter frequency is higher than the Shannon frequency.
Remedy:	Reduce the VIBSUP filter frequency (p31585). Note: VIBSUP: VIBration SUPpression

Corrective maintenance 13

13.1 Service and maintenance for the converter

13.1.1 Restoring the converter to factory settings

13.1.1.1 Restoring factory settings via a commissioning tool

Description

The restoring to factory settings with a commissioning tool (web server, Startdrive) only deletes the user-specific parameterization of the converter, for example motor data.

The following settings are retained with the restoring:

- Activation and settings of User Management & Access Control
- The "IP configuration" and "Device name" communication settings of the PROFINET interface (X150)
- Installed firmware on the converter

The restoring to factory settings with the commissioning tool is described in the following sections:

- Web server: Backup and restore (Page 179)
- Startdrive: Restore factory settings (Page 279)

13.1.1.2 Full reset of all device settings

Overview

The following user-defined settings are stored in the converter:

- Parameterization of the converter
- Activation and settings of User Management & Access Control
- "IP configuration" and "Device name" communication settings of the PROFINET interface (X150)
- Self-generated certificates
- User-defined parameter lists in the web server

In the following cases it may be necessary to reset all user-defined converter settings to the factory setting:

- The available credentials do not allow the necessary configuration of the converter (no password for example).
- Before recommissioning of the converter, for example if the application use of the converter changes.
- Before the converter is sold or disposed of, in order to erase all user-defined settings.

Requirement

The following preconditions apply when completely resetting all device settings:

- You can access the converter manually.
- All electrical connections from the converter to the motor are disconnected.
- The PROFINET connection to the control system and other devices is disconnected.
- You have an empty writable memory card with a maximum of 128 GB.

Procedure

Proceed as follows to perform a full reset of all device settings of the converter:

1. Create an empty file called RESET.TXT in the root directory of the memory card.
   When you write text KEEP_COMM to file RESET.TXT, then the settings for the communications interfaces are kept after the reset.
2. Switch off all power supplies to the converter.
3. Wait until all the LEDs on the converter are dark.
4. Insert the memory card into the converter.
5. Switch on all power supplies to the converter.
6. The converter deletes the user-defined settings.
7. The user-defined settings are deleted.

RDY	COM	Description
		Factory settings are being restored.
	□	Factory settings have been restored.
□		Restoring factory settings is unsuccessful.

8. Remove the memory card.
9. Switch off all power supplies to the converter.

Result

The result depends on the content of file RESET.TXT:

File RESET.TXT is empty	File RESET.TXT contains text KEEP_COMM
All user-defined converter settings are deleted. The converter firmware is unchanged. After the manual reset to the factory setting, access to the web server is possible via the PROFINET interface (X150).	The converter firmware is unchanged. The setting of the PROFINET interface (X150) is unchanged. All other user-defined converter settings are deleted.

13.1.2 Converter firmware update

13.1.2.1 Overview of firmware update

Requirement

NOTICE
Damage to equipment during firmware update due to voltage supply interruption When the firmware is being updated, interrupting the power supply or disconnecting the motor can result in defects or cause the devices to malfunction. • Do not switch off the converter's supply voltage during firmware update.

Description of function

Firmware updates change the settings in the converter according to the relative firmware version:

- If the converter is upgraded to a more recent firmware version, the converter settings are retained.
- Downgrading to an older firmware version resets all user-defined settings to factory settings, including:
  - Parameterization of the converter
  - Activation and settings of User Management & Access Control
  - "IP configuration" and "Device name" communication settings of the PROFINET interface (X150)
  - Self-generated certificates
  - User-defined parameter lists in the web server

The following options are available for a firmware update:

- Firmware update via memory card (Page 550)
- Firmware update via web server (Page 188)
- Firmware update via Startdrive (Page 276)

13.1.2.2 Firmware update via memory card

Overview

The converter firmware can be updated using a memory card.

Requirement

You have performed a BIOS update if a BIOS update is required for the firmware update.

We recommend that you use an empty memory card for the firmware update.

NOTICE
Damage to equipment during firmware update due to voltage failure
A voltage failure during a firmware update can lead to defects or malfunctions of the converter. • Do not switch off the converter power supply during a firmware update. • If the power supply was interrupted during a firmware update, restart the firmware update.

Procedure

Proceed as follows to update the firmware using a memory card:

1. Download the required firmware to your PC from the Internet.
2. Extract the files to a directory of your choice on your PC.
3. Copy the unzipped files to the root nodes of an empty memory card.

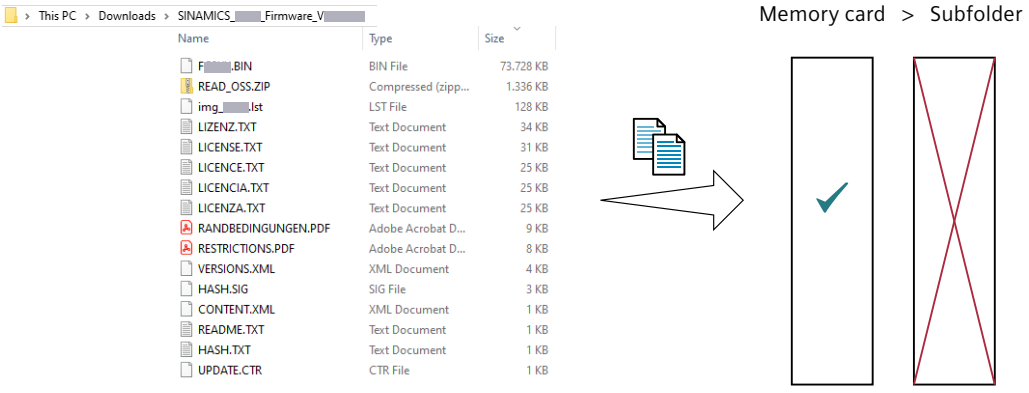


Figure 13-1 Copy the files for the firmware update to the root nodes of the memory card

4. Switch off the converter supply voltage.

5. Insert the memory card with the downloaded firmware into the converter.
6. Switch on the converter supply voltage.
7. The new firmware is installed. The procedure takes a few minutes.

RDY	COM	Explanation of LED displays
		The firmware is being updated. Do not switch off the converter supply voltage.
	-	Firmware update completed

8. Switch off the converter supply voltage.
9. Remove the memory card.
10. Switch on the converter supply voltage.

Result

The converter firmware has been updated.

The commissioning tool displays the firmware version of the converter.

More information

A BIOS update may be required for a firmware update. If a BIOS update is also required for a firmware update, you will find the BIOS update next to the firmware update on the same website.

For more information about the firmware versions, see Section "Firmware updates and constraints (Page 21)".

13.1.2.3 BIOS update via a memory card

Overview

A BIOS update of the converter is only possible with a memory card.

Requirement

We recommend that you use an empty memory card for the BIOS update.

NOTICE
Damage to equipment during BIOS update due to voltage failure A voltage failure during a BIOS update can lead to defects or malfunctions of the converter. • Do not switch off the converter power supply during a BIOS update. • If the power supply was interrupted during a BIOS update, restart the BIOS update.

Procedure

Proceed as follows to update the BIOS using a memory card:

1. Download the required BIOS to your PC from the Internet.
2. Extract the files to a directory of your choice on your PC.
3. Copy the unzipped files to the root nodes of an empty memory card.

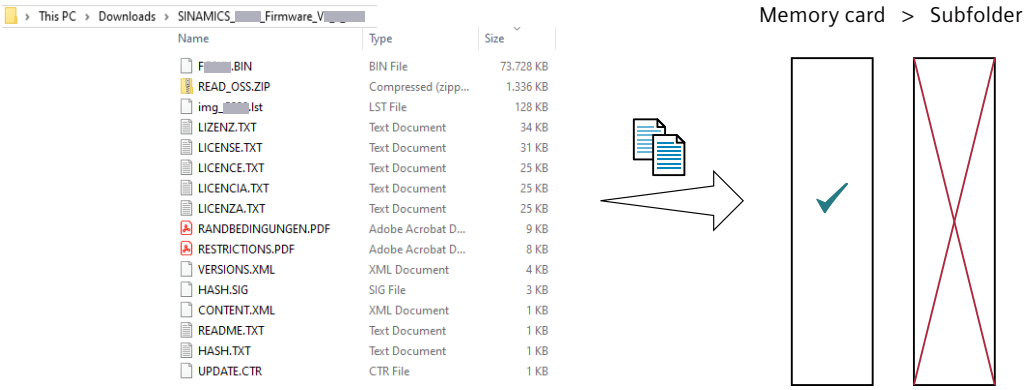


Figure 13-2 Copy the files for the BIOS update to the root nodes of the memory card

4. Switch off the converter supply voltage.
5. Insert the memory card into the converter.
6. Switch on the converter supply voltage.
7. The new BIOS is installed. The procedure takes several seconds.

RDY	COM	Explanation of LED displays
		BIOS is being updated. Do not switch off the converter supply voltage.
	-	BIOS update completed

8. Switch off the converter supply voltage.
9. Remove the memory card.
10. Switch on the converter supply voltage.

Result

The converter BIOS has been updated.

More information

The BIOS of the converter is backwards compatible with the firmware. Therefore, no BIOS update is required after a firmware update from a newer to an older firmware version.

For more information about BIOS update, see Section "Firmware updates and constraints (Page 21)".

13.1.3 Backing up and restoring drive data

13.1.3.1 Automatically backing up drive data using a memory card and restoring this data

Overview

An inserted memory card backs up all drive data and in the case of service, after a converter has been replaced, guarantees that the system or machine is immediately ready for operation again.

Description of function

The drive backs up changed drive data both in its internal memory as well as on the inserted memory card.

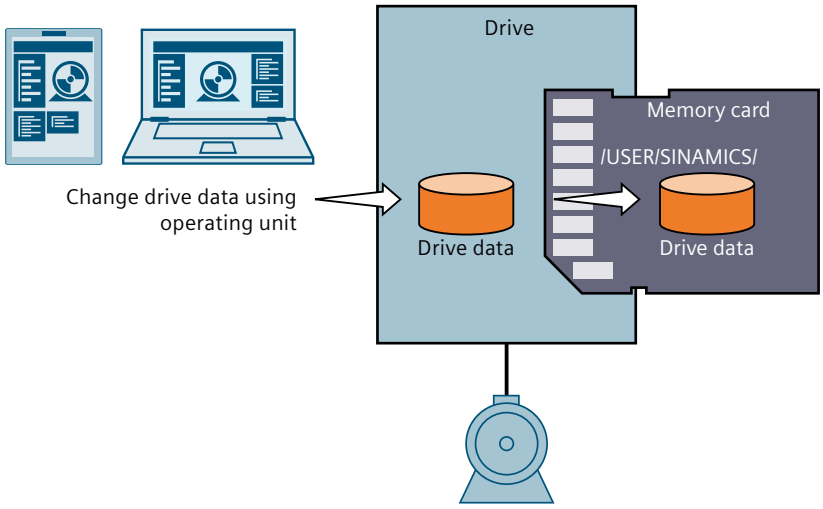


Figure 13-3 Drive data backed up on the memory card

The drive data comprises the following components:

- Changed parameters
- UMAC settings

The drive data is on the memory card in directory /USER/SINAMICS/.

After inserting an empty memory card for the first time, the drive creates directory /USER/SINAMICS/.

After the supply voltage has been switched on, the drive loads the drive data from the memory card into its internal memory.

Automatically loading the drive data from the memory card allows a converter to be replaced without using an operating unit.

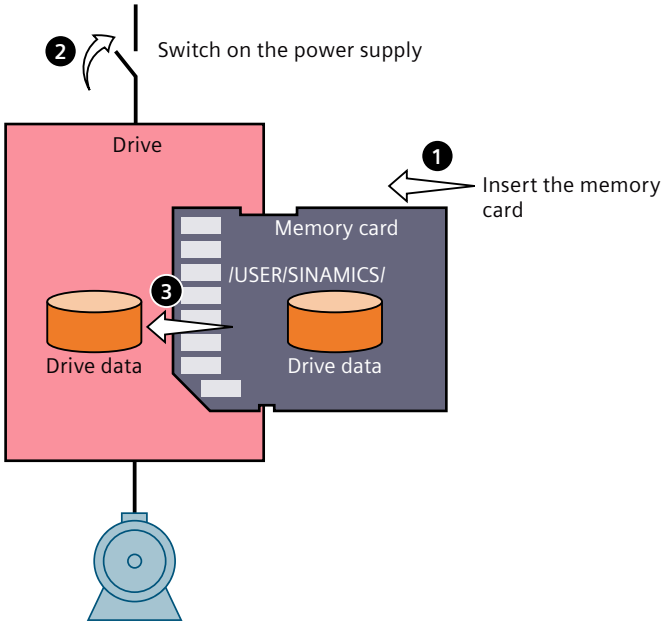


Figure 13-4 Automatically loading drive data from a memory card after a converter has been replaced

13.1.3.2 Backing up drive data to the backup file

Overview

A backup file backs up the drive data and allows the drive data to be restored if service is required. A backup file can be created by loading from the drive and offline from the TIA project.

Requirement

You have either configured the drive in a TIA project or you are connected online with the drive using a commissioning tool.

Procedure

The following options are available to save the drive data to a backup file:

- Load backup file online via web server or Startdrive from the drive:
  Using function "Backup/restore" → "Save drive data to backup file", back up the drive data in a backup file on the operating unit, e.g. on a PC.

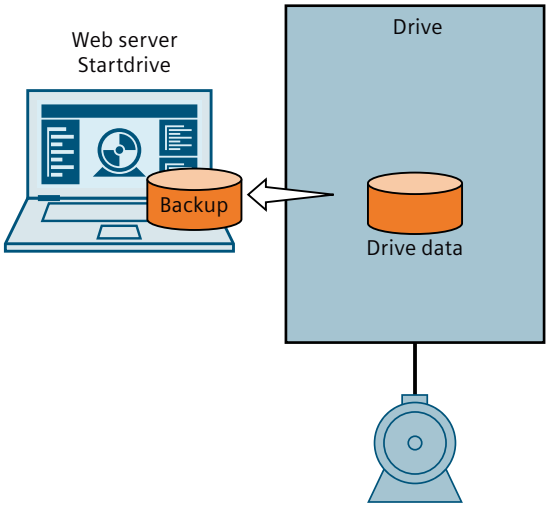


Figure 13-5 Creating a backup file online

- Exporting a backup file from the TIA project offline:
  In the TIA project, drag and drop the configured drive to "Card Reader/USB Memory" in the project tree. There, drag and drop the drive to a subdirectory in the "Removable Data Media" folder or a subdirectory in the "Reader_x" folder and follow the instructions.

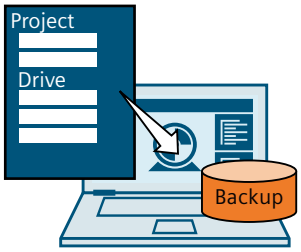


Figure 13-6 Creating a backup file from the TIA project offline:

Result

The backup file contains the following drive data:

- Changed parameters
- UMAC settings

13.1.3.3 Save backup file to memory card

Overview

A memory card with backup file allows drive data to be automatically restored after the card is inserted into the drive. The memory card with a backup file can be created with and without Startdrive.

Requirement

Requirements:

- A memory card is inserted in the card reader of your PC.
- You have either configured the drive using Startdrive or you already have the backup file of your drive.

Procedure

The following options are available to create a memory card with a backup file:

- Create a memory card with backup file offline using Startdrive:
  In the TIA project, drag and drop the configured drive to "Card Reader/USB Memory" in the project tree. There, drag and drop the drive to a subdirectory in the "Reader_x" folder and follow the instructions.
  Startdrive creates directory /BACKUPFILE_NEXT_START/ and saves the backup file there.

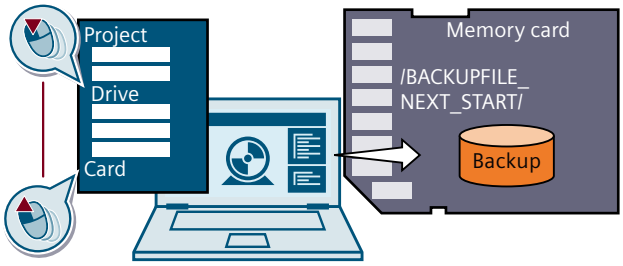


Figure 13-7 Creating a memory card with backup file using Startdrive

- Create a memory card with backup file without Startdrive:
  The backup file can be received by email, stored in a cloud or locally.
  Create directory /BACKUPFILE_NEXT_START/ on the memory card and copy the backup file to this directory.

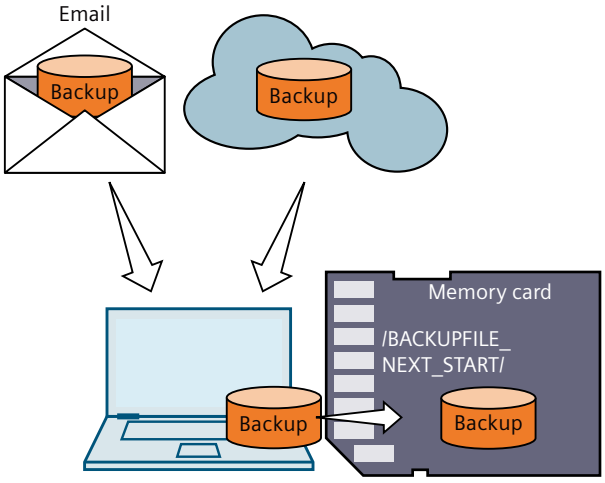


Figure 13-8 Saving the backup file to the memory card without using Startdrive

Result

The memory cards contains the backup file with the following drive data:

- Changed parameters
- UMAC settings

13.1.3.4 Restoring drive data from a backup file

Overview

A backup file backs up the drive data and allows the drive data to be restored if service is required. The drive data can be restored online using a commissioning tool or via a memory card.

Requirement

You have either configured the drive using Startdrive or you already have the backup file of your drive.

Procedure

The following options are available to restore the drive data from a backup file:

- Restore drive data online using a web server or Startdrive:
  Using function "Backup/restore" → "Restore drive data from backup file", transfer the backup file from an operating unit to the drive. The drive accepts the content of the backup file into the drive data on its internal memory.

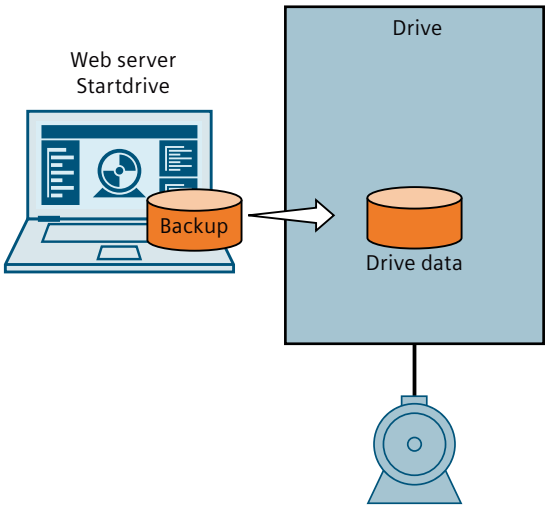


Figure 13-9 Restoring drive data from a backup file online

- Restoring drive data using a memory card:
  After the supply voltage has been switched on, the drive accepts the drive data from a backup file into its internal memory.

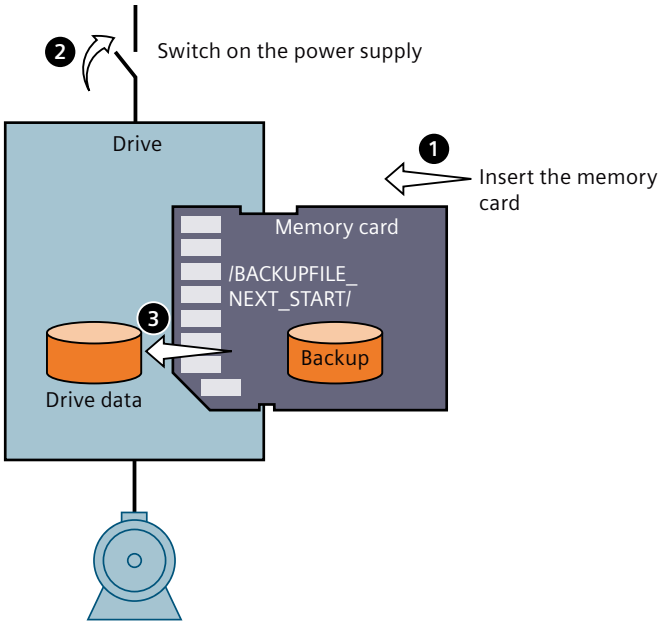


Figure 13-10 Restoring drive data using a backup file on a memory card

After accepting the drive data:

– The drive deletes the backup file and directory /BACKUPFILE_NEXT_START/

– The drive backs up the drive data from the memory card in directory /USER/SINAMICS/

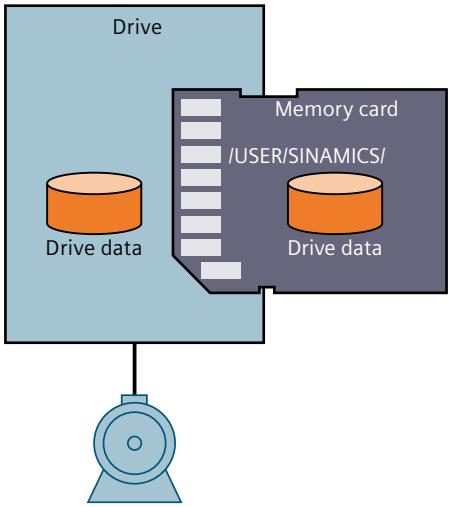


Figure 13-11 Memory card after restoring the drive data

Result

The LEDs signal the drive status:

RDY	COM	Explanation
	not relevant	The drive has accepted the following drive data from the backup file into its internal memory: • Changed parameters • UMAC settings
	☐	The drive signals a fault. Check the cause of the fault.

13.1.3.5 Backup file with drive data encryption

Overview

Restoring drive data from a backup file with encrypted data is only possible if you know the backup password.

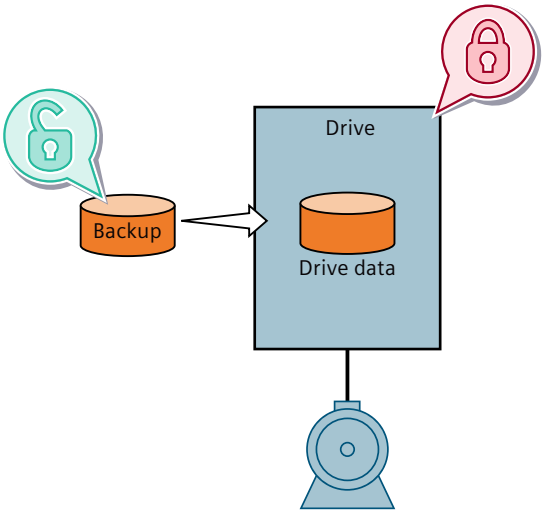
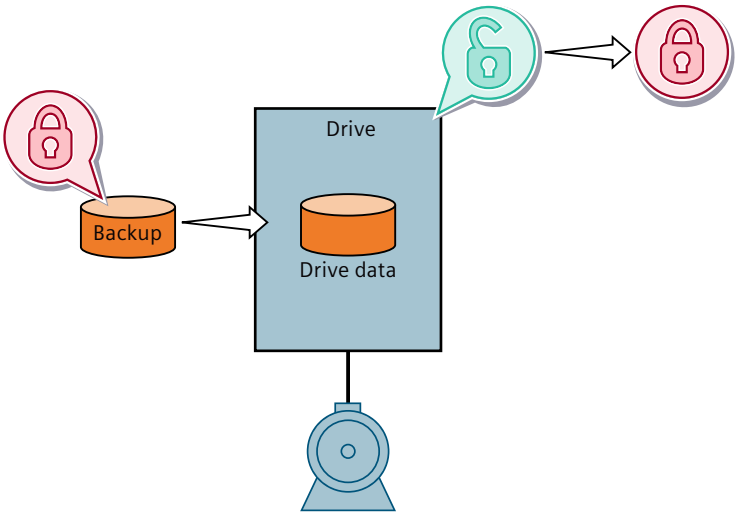
Requirement

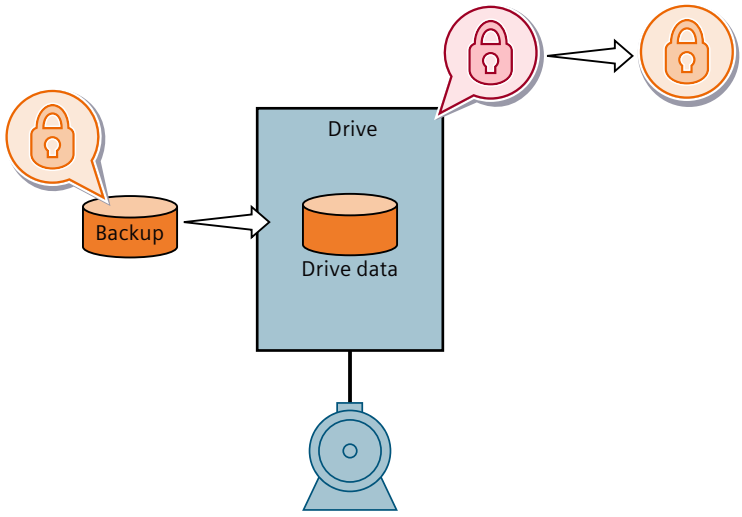
Required runtime authorizations with active user management (UMAC):

- "Create backup or load drive data to Startdrive"
- If the backup file contains Safety Integrated Functions settings:
  "Edit Safety Integrated application"

Description of function

Procedures vary depending on which of the following drive data encryption scenarios applies:

Encryption	Password to be entered to restore the drive data	Result
The backup file is unencrypted. The drive data is encrypted. 	None	The drive data is restored from the backup file data. The drive password is retained after the drive data has been restored.
The backup file is encrypted. The drive data is unencrypted. 	Backup password	The drive data is restored from the backup file data. The drive data is encrypted. The drive handles the backup file password.

Encryption	Password to be entered to restore the drive data	Result
The backup file and the drive data are encrypted. The backup password and the drive password are different, or the backup file was created with a different drive.  	Backup password	The drive data is restored from the backup file data. The drive data remains encrypted. The drive handles the backup file password.

13.1.4 Replacing the converter

Overview

You may only replace a converter with another converter if certain requirements are adhered to.

Requirement

The following requirements apply to a replacement:

- The new converter has the same or more recent firmware version than that of the converter being replaced.
- The two converters must also satisfy one of the following conditions:
  - The new and replaced converters have the same article number.
  - The new converter has a different article number to the converter it replaced but the same frame size.
    In this case, the ratio of the rated motor power to the rated converter power must be within the following range: 0.25 ... 1.

WARNING

Fire or electric shock after tripping of overcurrent protection devices

If an overcurrent protection device is tripped, the converter may be defective. A defective converter can cause a fire or electric shock.

- Have the converter and the overcurrent protection device checked by a specialist.

WARNING

Electric shock as a result of a residual charge in power components

After the power supply has been switched off, it takes up to five minutes for the capacitors in the converter to discharge enough that the residual charge is safe.

- Check the voltage at the converter connections before removing the connecting cables.

WARNING

Unexpected machine movement caused by incorrect converter type

If a replacement is made with a converter of a different type, this can result in incomplete or unsuitable converter settings. This can result in unexpected machine movements, e.g. speed oscillation, overspeed or incorrect direction of rotation. Unexpected machine movements can result in death, injury or property damage.

- In all cases not permitted according to the above requirements, you must recommission the drive after replacing the converter.

WARNING

Unexpected machine movement caused by unsuitable converter settings

Missing or unsuitable converter settings can lead to unexpected operating states or machine movements, e.g. a non-functioning EMERGENCY STOP or an incorrect direction of rotation. This can result in damage to machine components or system sections or in death or bodily injury.

- Back up the settings of the converter to be replaced by uploading them to an external storage medium, e.g. a memory card.
- Transfer the settings of the converter to be replaced by downloading them to the new converter.
- If you do not have a backup of the converter settings, recommission the new converter.
- Check the new converter for proper functioning.

NOTICE

Damage caused by interchanging the motor cables

The direction in which the motor rotates switches if the two phases of the motor cable are interchanged. An incorrect direction of rotation can lead to damage in the machine or system.

- Connect the three phases of the motor cables in the correct sequence.

Procedure

Proceed as follows to replace a converter:

1. Disconnect all the power supplies to the converter.
2. Remove all the connecting cables to the converter.
3. Remove the defective converter.
4. Install the new converter.
5. Connect all the connecting cables to the converter.
6. Switch on all the power supplies to the converter.
7. Set the new converter to suit the application:
   – You have backed up the settings of the converter that was replaced to an external storage medium, e.g. a memory card:
   If the new converter has the same article number as the converter replaced, transfer the settings to the new converter.
   – If there is no backup of the data for the converter replaced or if the new converter has a different article number, commission the converter as a new converter.

13.1.5 Forming the DC link capacitors

Overview

If the converter has been out of operation for too long, you must form the DC link capacitors before connecting the full line voltage to the converter. Non-formed DC link capacitors can damage the converter in operation.

Forming can be omitted if the line voltage is applied to the converter once a year for one hour.

Requirement

Form the DC link capacitors in the following cases:

- The converter has been out of operation for more than one year.
- It has been more than one year since converter production when the converter is commissioned for the first time.
  The production date of the converter is coded in the 3rd and 4th digits of the serial number on the rating plate: S . . ③④...
  Example: Serial number S ZV**F1**Y54000105 → Production date January 2015

Table 13-1 Production year and production month

Digit ③	Production year	Digit ④	Production month
A	2010, 2030	1 ... 9	January ... September
B	2011, 2031	0	October

Digit ③	Production year	Digit ④	Production month
C	2012, 2032	N	November
...	...	D	December

Procedure

You form the DC link capacitors by supplying the converter with an input voltage of ≤ 100% of the rated voltage for a defined time. The figure below shows the voltage and duration required for the forming process. For example, if the converter has been out of operation for one to two years, form the DC link capacitors by supplying the converter with an input voltage of 100% of the rated voltage for one hour.

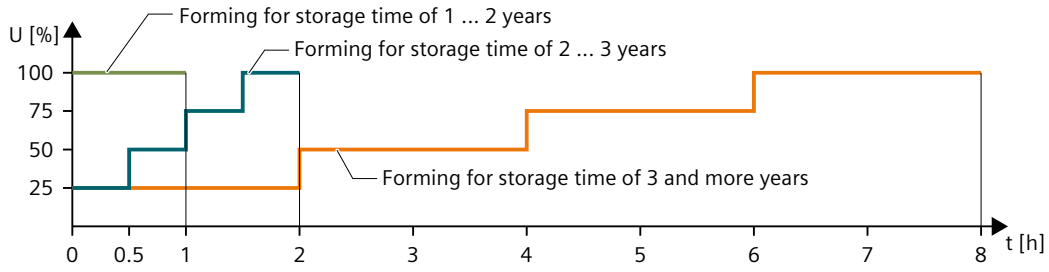


Figure 13-12 Forming the DC link capacitors

13.2 Service and maintenance for the motor

Requirement

⚠ WARNING
Risk of injury if protective devices are removed. Operation without functioning protective devices can cause death or severe injury. • Operate the motor, even in test operation, only with functioning protective devices.

Procedure

If there are deviations from normal operation or if faults occur, proceed as follows.

1. Identify the fault using the following table.
   You should also take account of the messages of the converter.

Fault	Fault cause														
Motor does not start	A	B													
Motor starts slowly	A		C		F										
Humming sound when starting			C		F										
Humming sound in operation	A		C		F										
High temperature rise under no-load operation				D		I									
High temperature rise under load	A		C			I									
High temperature rise of individual winding sections					F										
Uneven running							J	K							
Grinding sound, running noise									L						
Radial vibrations										M	N	O	P		R
Axial vibrations												O		Q	R

2. Rectify the fault using the following table.

No.	Fault cause	Remedial measures
A	Overload	Reduce load
B	Interrupted phase in the converter line supply cable or motor winding	Check the converter and converter line supply cable, measure the winding resistance and insulation resistance, repair after consultation with manufacturer
C	Interrupted phase in the converter line supply cable after switching on	Check the converter, converter line supply cable, and the winding resistance
D	Converter output voltage too high, frequency too low	Check the settings on the converter, perform automatic motor identification
F	Winding short-circuit or phase short-circuit in stator winding	Measure the winding resistances and insulation resistances, repair after consultation with the manufacturer, replace the motor if required
I	Heat dissipation impeded by deposits	Clean the surface of the servo drive system and ensure that the cooling air can flow in and out unimpeded
	Cooling air inlet or outlet is blocked by foreign bodies	Remove the things that block the inlet or outlet and ensure that the cooling air can flow in and out unimpeded
J	Insufficient shielding for motor and/or encoder cable	Check the shielding and grounding
K	Excessive drive controller gain	Adjust the controller
L	Rotating parts are grinding	Determine cause and adjust parts
	Foreign bodies inside the motor	Replace the motor
	Bearing damage	For low or medium inertia motors, replace the motor; for high inertia motors, replace the bearings
M	Rotor not balanced	Replace the motor

No.	Fault cause	Remedial measures
N	Rotor out of true, shaft bent	Consult the manufacturer
O	Poor alignment	Align motor set, check coupling
P	Coupled machine not balanced	Re-balance coupled machine
Q	Shocks from coupled machine	Check coupled machine
R	Fault originating from the gear-box	Adjust or repair the gearbox

If the fault still cannot be resolved after taking the measures stated above, contact the manufacturer or the Siemens Service Center.

13.2.1 Replacing the motor bearings

Description

Motor bearings are wearing parts. They must be replaced after a defined number of operating hours. At medium loads, the motor bearings last approximately 20000 hours.

Especially favorable ambient conditions, such as low average speed, low radial force (transverse force) and vibration load, can prolong the interval until motor replacement.

Note

Premature bearing and motor replacement

Harsh operating conditions (for example, continuous operation at n_{max}, high vibration or shock loads, frequent reversing duty) reduce the bearing or motor replacement interval by up to 50%.

For low or medium inertia motors, it is not possible to replace the motor bearings. Replace the motors in their entirety.

The maintenance and repair of the motor can be performed in authorized Siemens Service Centers all over the world. Contact your personal Siemens representative if you need this service.

13.2.2 Replacing the motor

Requirement

The new motor has the same article number as the motor to be replaced. If you want to replace the motor with another motor with a different article number, you must commission the converter again after replacing the motor.

WARNING

Danger to life due to unintentional starting of the drive unit

Unintentional starting of the drive unit can cause death or severe injury.

- Make sure that the drive unit cannot be started accidentally.
- Post a warning notice at the point where the switch is located.

CAUTION

Burns as a result of touching hot surfaces

In operation, the motor enclosure can reach a high temperature, which can cause burns if touched.

- Do not touch any hot surfaces.
- Allow the motor to cool down before starting any work.
- Use the appropriate personnel protection equipment, for example, gloves.

Procedure

Replacing the motor with a motor with the same article number

1. Switch off all power supplies to the converter.
2. Replace the motor.
   - Disconnect the motor from the converter. You can find detailed information in Section "Connecting the motor (Page 122)".
   - Release the motor mounting screws.
   - Remove the motor.
   - Mount and install the new motor. You can find detailed information in Section "Mounting the motor (Page 97)".
3. Switch the converter on.

Replacing the motor with a motor with another article number

If you are using a different motor type, after performing the three steps above, you must also carry out the following steps:

1. Reset the converter to factory settings.
   You can find more information in Section "Restoring the converter to factory settings (Page 547)".
2. Commission the converter. You can find more information in the following sections:
   "Commissioning (web server) (Page 145)"
   "Commissioning (Startdrive) (Page 193)"
   "Series commissioning (Page 285)"

Result

You have now replaced the motor.

13.3 Spare parts and spare parts compatibility

Overview

Spare parts can be ordered on the Internet via the spare parts service Spares on Web (https://www.sow.siemens.com/).

Spares on Web also gives you the option of determining the article numbers of spare parts.

Description

Converter components are being continuously developed within the scope of product maintenance.

Product maintenance includes, for example, measures to increase the ruggedness or hardware changes that become necessary as components are discontinued.

In the scope of such spare parts-compatible ongoing development, connectors or connection positions are sometimes slightly modified. This does not cause any problems when the component is used as intended. Take this fact into consideration in special installation situations (for example, allow sufficient reserve regarding the cable length).

13.4 Device disposal

Description

For environmentally-friendly recycling and disposal of your old device, contact a company certified for the disposal of waste electrical and electronic equipment, and dispose of the old device as prescribed in the respective country of use.

Technical data

14

14.1 Technical data of the converter

14.1.1 Permissible environmental conditions for the converter

Technical data

Table 14-1 Environmental conditions

Property	Description
Environmental conditions for transport in the transport packaging	
Climatic environmental conditions	• Surrounding air temperature: -40 °C ... +70 °C Suitable according to Class 2K4 to IEC 60721-3-2:1997 • Humidity: Max. 95% at 45 °C according to IEC 60721-3-2:1997
Mechanical environmental conditions	Vibrations permissible according to Class 2M3 to IEC 60721-3-2:1997 Vibration: • 2 Hz ... 9 Hz: 7.5 mm displacement amplitude • 9 Hz ... 200 Hz: 2 g acceleration amplitude
Protection against chemical substances	Protected according to Class 2C2 to IEC 60721-3-2:1997
Biological environmental conditions	Suitable according to Class 2B2 to IEC 60721-3-2:1997
Environmental conditions for long-term storage in the product packaging	
Climatic environmental conditions	• Surrounding air temperature: -40 °C ... +70 °C • Relative humidity: Max. 95%, condensation not permissible
Mechanical environmental conditions	Vibrations permissible according to Class 1M2 to IEC 60721-3-1:1997
Protection against chemical substances	Protected according to Class 1C2 to IEC 60721-3-1:1997
Biological environmental conditions	Suitable according to Class 1B2 to IEC 60721-3-1:1997
Environmental conditions in operation	
Installation altitude	• ≤ 2000 m above sea level without power derating • > 2000 m ... 4000 m above sea level with power derating
Climatic environmental conditions	• Surrounding air temperature: 0 °C ... 55 °C, > 45 °C with power derating • Relative humidity: Max. 95%, condensation not permissible

Property	Description
Mechanical environmental conditions	Shocks and vibrations permissible according to Class 3M1 to IEC 60721-3-3:2002 • Shock: – Peak acceleration: 5 g – Duration of shock: 30 ms • Vibration: – 10 Hz ... 58 Hz: 0.075 mm displacement amplitude – 58 Hz ... 200 Hz: 1 g acceleration amplitude
Protection against chemical substances	Protected according to Class 3C2 to IEC 60721-3-3:2002
Biological environmental conditions	Suitable according to Class 3B1 to IEC 60721-3-3:2002
Pollution	Suitable for environments with degree of pollution 2 according to IEC 61800-5-1

14.1.2 General technical data

Technical data

Table 14-2 General technical data of the converter

Property	Description
Overload capability	350% overload
Output frequency (Hz)	0 ... 550
IGBT pulse frequency without derating (kHz)	8
Control system	Servo control
Protective functions	Grounding fault protection, output short-circuit protection[1)], overvoltage/ undervoltage protection[2)], converter I^2t protection, motor overtemperature protection[3)], IGBT overtemperature protection
Surge voltage	Fulfill the requirement of the standard IEC 61800-3
Overvoltage category	Category III according to IEC 61800-5-1
Minimum prospective short-circuit current	To prevent fire in the event of a fault, a minimum value must be ensured for the prospective short-circuit current so that the upstream protective device trips quickly enough. A typical value when dimensioning is 20 to 25 times[4)] the rated current of the protection device used.
Cooling type	Natural cooling
Degree of protection according to IEC 60529	IP20
Mains supply	
Permissible mains supply network	TN, TT
Line voltage	1 AC 200 V ... 240 V
Line frequency (Hz)	50/60
Permissible line voltage fluctuation	-15% ... +10%
Permissible line frequency fluctuation	-10% ... +10%
24 V DC power supply	

Property	Description
Voltage (V)	24
Permissible voltage fluctuation (V)	When using a motor without a brake: 20.4 ... 28.8 (-15% ... +20%) When using a motor with a brake: 22.8 ... 28.8 (-5% ... +20%)
Maximum current (A)	When using a motor without a brake: 1.2 When using a motor with a brake: 2.2
Safety insulation class	SELV
Inputs and outputs	
Digital inputs	Type 3 according to IEC 61131-2 Maximum input current: 4 mA (for "1" signal: > 1.5 mA) General delay time: • DI 0 → 1: < 10 µs • DI 1 → 0: < 150 µs Fast digital input delay time: • Fast DI 0 → 1: < 5 µs • Fast DI 1 → 0: < 5 µs
Digital outputs	Maximum output current: 100 mA Delay time: < 2 ms

1) Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

2) The converter has an overvoltage threshold of 410 V DC and an undervoltage threshold of 155 V DC.

3) Motor temperature is calculated by motor thermal model and protected by the output current from the converter.

4) To comply with permissible line harmonics, depending on the line connection conditions, different values may be required.

14.1.3 Specific technical data

Technical data

Table 14-3 Specific technical data of FSAB

Article No. 6SL5610-1GB10-	**1AF0**	**2AF0**	**4AF0**
Frame size	**FSAB**	**FSAB**	**FSAB**
Rated input current (A)	1.2	2.0	3.0
Rated output current (A)	0.81	1.33	2.4
Maximum output current (A)	3.3	5.1	9.2
Maximum supported motor power (kW)	0.1	0.2	0.4
Power loss (W)	11.0	15.0	24.0
Inrush current (A)	10.94	10.94	10.94
Fuse according to IEC	3NA3804 (4 A) 3NW6304-1 (4 A)	3NA3804 (4 A) 3NW6304-1 (4 A)	3NA3801 (6 A) 3NW6301-1 (6 A)
Leakage current (mA)	21.0	21.0	21.0

Article No. 6SL5610-1GB10-	1AF0	2AF0	4AF0
Outline dimensions (W x H x D, mm)	40 x 170 x 180	40 x 170 x 180	40 x 170 x 180
Weight (g)	910.0	910.0	910.0

Table 14-4 Specific technical data of FSAC

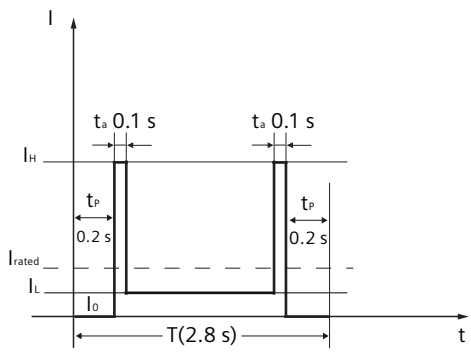
Article No. 6SL5610-1GB10-	8AF0
Frame size	**FSAC**
Rated input current (A)	7.0
Rated output current (A)	4.4
Maximum output current (A)	16.8
Maximum supported motor power (kW)	0.75
Power loss (W)	36.0
Inrush current (A)	5.47
Fuse according to IEC	3NA3805 (16 A) 3NW6006-1 (12 A)
Leakage current (mA)	20.0
Outline dimensions (W x H x D, mm)	50 x 170 x 195
Weight (g)	1243.0

14.1.4 Overload capacity

Description

SINAMICS S200 Compact can work with a certain overload capacity for a specific time period. 350% overload capacity is supported.

The typical load cycle can be repeated without limitation.



I_H	Maximum current	t_a	Acceleration time
I_{rated}	Rated current	t_p	Preset time
I_L	Minimum current	T	Total cycle period
I_0	Stall current		

Figure 14-1 Typical load cycle

The other duty cycle can be calculated by the following formula:

$I_{rated}^2 \times T = I_0^2 \times t_p \times 2 + I_H^2 \times t_a \times 2 + I_L^2 \times (T - t_p \times 2 - t_a \times 2)$

$I_H = n \times I_{rated}$ $(3 < n < 3.5)$

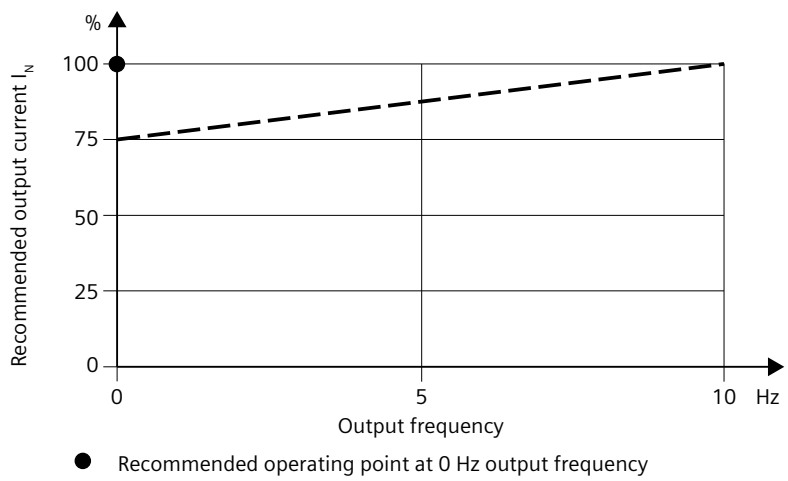


Figure 14-2 Recommended output current at low frequencies

A current derating is only applicable for output frequencies < 10 Hz.

A current derating must be taken into account if the percentage time of operation at frequencies < 10 Hz is more than 2 % of the total daily operating time.

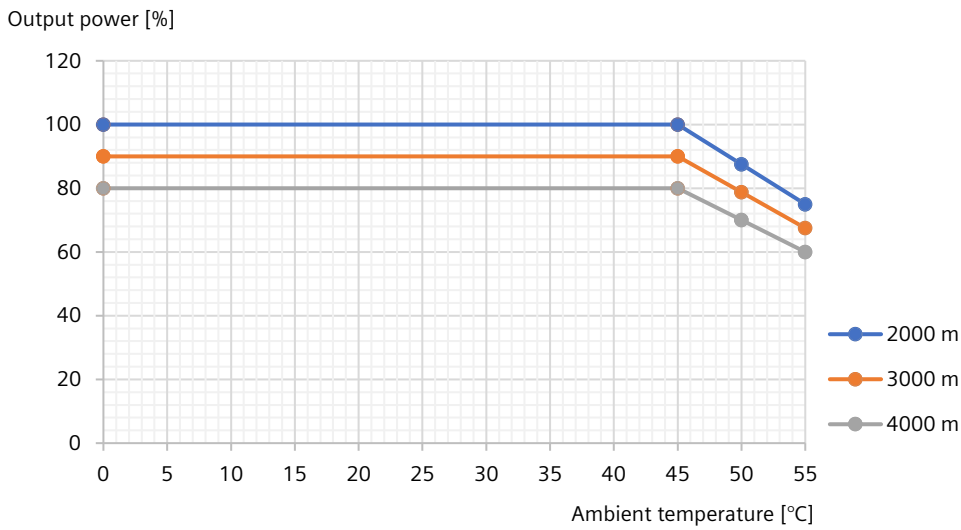
The current specified here must also not be exceeded during load cycles.

When quickly passing through frequencies 0 to 10 Hz, derating can be ignored (e.g. for positioning applications).

14.1.5 Power derating as a function of the installation altitude and ambient temperature

Description

Power derating as a function of the installation altitude and ambient temperature



14.1.6 Protection of persons from electromagnetic fields

Overview

Protection of workers from electromagnetic fields is specified in the European EMF Directive 2013/35/EU. This directive is implemented in national law in the European Economic Area (EEA). Employers are obligated to design workplaces in such a way that workers are protected from impermissibly strong electromagnetic fields.

To this end, assessments and/or measurements must be performed for workplaces.

Requirement

The following general conditions apply for the evaluations and measurements:

1. The laws for protection from electromagnetic fields in force in individual EU member states can go beyond the minimum requirements of the EMF Directive 2013/35/EU and always take precedence.
2. The ICNIRP 2010 limits for the workplace are the basis for the assessment.

3. The 26th BImSchV (German Federal Emission Protection Regulation) defines 100 µT (RMS) for the assessment of active implants.
   According to Directive 2013/35/EU, 500 µT (RMS) at 50 Hz is applicable here.
4. The routing of power cables has a significant impact on the electromagnetic fields that occur. Install and operate the components inside metallic cabinets in compliance with the documentation and use shielded motor cables (see "EMC-compliant installation (Page 90)").

Description

The converters are normally used in machines. The assessment and testing is based on DIN EN 12198-1 and IEC 62311.

Compliance with the limit values was assessed for the following frequencies:

- Line frequency 47 ... 63 Hz
- 8 kHz pulse frequency

The indicated minimum distances apply to the head and complete torso of the human body. Shorter distances are possible for extremities.

Table 14-5 Minimum distances to the converter

Individuals without active implants		Individuals with active implants	
Control cabinet closed	**Control cabinet open**	**Control cabinet closed**	**Control cabinet open**
0 cm	Forearm length (approximately 35 cm)	Must be separately assessed depending on the active implant.	

14.2 Technical data of the motor

14.2.1 Permissible environmental conditions for the motor

Technical data

Table 14-6 Environmental conditions for transport

Environmental conditions for transport in the transport packaging according to Class 2K3 to IEC 60721-3-2:1997, except for environmental variables "air temperature" and "condensation"	
Climatic environmental conditions	• Temperature: -15 °C ... +70 °C • Highest relative humidity: < 90% at 30 °C, condensation not permissible
Mechanical environmental conditions	Vibrations permissible according to Class 2M5 to IEC 60721-3-2:1997 Vibration: • 2 Hz ... 9 Hz: 7.5 mm displacement amplitude • 9 Hz ... 200 Hz: 2 g acceleration amplitude
Protection against chemical substances	Protected according to Class 2C2 to IEC 60721-3-2:1997
Biological environmental conditions	Suitable according to Class 2B2 to IEC 60721-3-2:1997

Table 14-7 Environmental conditions for long-term storage

Environmental conditions for long-term storage in the product packaging according to Class 1K3 to IEC 60721-3-1:1997, except for environmental variables "air temperature", "highest relative humidity" and "condensation"	
Climatic environmental conditions	• Temperature: -20 °C ... +65 °C • Highest relative humidity: < 90% at 30 °C, condensation not permissible
Mechanical environmental conditions	Vibration-free storage space, v_{rms} < 0.2 mm/s
Protection against chemical substances	Protected according to Class 1C2 to IEC 60721-3-1:1997
Biological environmental conditions	Suitable according to Class 1B2 to IEC 60721-3-1:1997
Duration	• Six months for the above-mentioned conditions. • Special preservation measures are required for storage periods of six months up to a maximum of two years. For more information, please contact your local sales partner.

Table 14-8 Environmental conditions during operation

Environmental conditions during operation according to 3K4 to IEC 60721-3-3:2002, except for environmental variables "low air temperature", "condensation" and "low air pressure"	
Installation altitude	Up to 1000 m above sea level without limitations You can get additional information in Section "Derating factors (Page 584)".
Climatic environmental conditions[1]	• Temperature: -15 °C ... +40 °C, power derating at higher temperatures • Relative humidity: < 90% at 30 °C, condensation not permissible • Absolute air humidity: 1 g/m³ ... 29 g/m³ • Rate of temperature change[2]: 0.5°C/min • Atmospheric pressure: 89 kPa[1) 3)] ... 106 kPa[4)] • Solar radiation: 700 W/m² [2)] • Movement of the air: 1.0 m/s • Water (other than rain): see Section "Degree of protection (Page 586)"
Mechanical environmental conditions	• Vibration severity grade: A (according to IEC 60034-14:2003) • Shock resistance (m/s²): 50 (continuous in axial direction), 50 (continuous in radial direction), 300 (in a short time of 11 ms)
Protection against chemical substances	Protected according to 3C2 to IEC 60721-3-3:2002
Biological environmental conditions	Suitable according to 3B2 to IEC 60721-3-3:2002
Pollution	Suitable for environments with degree of pollution 2 according to IEC 61800-5-1
Cooling air	Clean and dry air
The motors are not suitable for operation under the following circumstances: • In a vacuum[5)] • In salt-laden or aggressive atmospheres • Outdoors	

1) Increased ruggedness with regard to low air temperature and low atmospheric pressure better than 3K3 according to IEC 60721-3-3:2002

2) Averaged over a period of 5 min

3) The limit value of 89 kPa covers applications at altitudes up to 1000 m.

4) Conditions in mines are not considered.

5) Operation in a vacuum is not permissible because of the low dielectric strength and poor heat dissipation.

14.2.2 General technical data

Technical data

Table 14-9 General technical data of the motor

Property	**Description**
Type of motor	Servo motor
Rotor inertia	• 1FL□1: motor with low rotor inertia • 1FL22: motor with medium rotor inertia

Property	Description
Cooling	Natural cooling
Thermal class	• 1FL2102, 1FL2□03, 1FL2104-2B, 1FL2204-2B: B • 1FL1, 1FL2104-2A, 1FL2204-2A: F
Operating temperature	-15 °C ... +40 °C, power derating at higher temperatures
Relative humidity	< 90% at 30 °C, condensation not permissible
Installation altitude according to IEC 60034-6	≤ 1000 m above sea level; otherwise power derating
Type of construction according to IEC 60034-7	IM B5 (IM V1, IM V3)
Degree of protection according to IEC 60034-5	• 1FL1, 1FL2104-2B, 1FL2204-2B: IP65 • 1FL2102, 1FL2□03, 1FL2104-2A, 1FL2204-2A: IP54 for the shaft extension (without shaft sealing) and IP65 for the motor body, optionally IP65 for the whole motor (with shaft sealing)
Temperature monitoring	Thermal motor model
Paint finish	Anthracite (614 Anthrazit)
Shaft extension according to DIN 748-3 and IEC 60072-1	Plain shaft, optionally shaft with feather key (half-key balancing)
Radial eccentricity, concentricity, and axial eccentricity according to DIN 42955 and IEC 60072-1	Tolerance N (normal)
Vibration severity grade according to IEC 60034-14	Grade A
Sound pressure level L_{pA} (1 m) according to ISO 1680, max. tolerance +3 dB(A)	60 dB(A)
Encoder	• Absolute encoder single-turn, 17-bit • Absolute encoder single-turn, 21-bit • Absolute encoder, with battery, 21-bit single-turn + 12-bit multiturn (for 1FL1 only) • Absolute encoder, 21-bit single-turn + 12-bit multiturn (for 1FL2 only)
Holding brake	Optional integrated holding brake
Connection	• 1FL1: two-cable connections with two connectors • 1FL2: dual-cable connections with a hybrid connector

14.2.3 Protection against electromagnetic fields (motor)

Description

⚠ WARNING

Malfunction of active implants due to magnetic and electrical fields

Electric motors pose a danger to people with active medical implants, e.g. heart pacemakers, who come close to these motors.

- If you are affected, stay a minimum distance of 30 cm away from the motors (tripping threshold for static magnetic fields of 0.5 mT according to Directive 2013/35/EU).

NOTICE

Damage to the absolute encoder due to the magnetic interference from the magnetic field

The magnetic interference from the magnetic field can cause a damage to the absolute encoder.

- To avoid magnetic interference to the absolute encoder, keep the motor at least 15 mm away from devices that produce a magnetic field stronger than 10 mT.

14.2.4 Cooling

Description

The 1FL1 and 1FL2 motors are non-ventilated motors.

To ensure sufficient heat dissipation when installed, the motor requires a minimum clearance of 100 mm from adjacent components on three sides.

Maintain the clearance irrespective of the following mounting variants.

Non-thermally insulated mounting

Some of the motor power loss is dissipated through the flange when the motor is connected to the mounting surface.

Table 14-10 Mounting conditions for non-thermally insulated mounting

Motor	Steel plate: width x height x thickness (mm)
1FL□102	200 x 200 x 6
1FL1103 1FL1104 1FL2□03 1FL2□04	250 x 250 x 6

The data in the table refers to an ambient temperature of +40 °C and an installation altitude up to 1000 m above sea level. If the environmental conditions are different, derating may be required. You can find information on this in Section "Derating factors (Page 584)".

Larger mounting surfaces improve heat dissipation.

Thermally insulated mounting without additional mounted components

For naturally cooled motors, you must reduce the S1-characteristic curve as follows:

- Reduce the motor static torque by a range of 20% to 30%.
- Reduce the torque at 3000 r/min by a range of 40% to 50%.

Thermal motor protection

The converter monitors the motor temperature based on a thermal motor model and issues the alarm "Motor overtemperature" before the maximum temperature is reached. If the motor exceeds the maximum temperature, the converter switches off the motor with the fault message "Motor overtemperature".

If the ambient temperature exceeds 40 °C, you need to set the ambient temperature at the converter so that the motor is reliably protected.

- To do this, select parameter p0613 at the converter.
- Set the maximum ambient temperature that occurs.

Parameter r0034 indicates the thermal load of the motor as a percentage. The reading is influenced by the ambient temperature selected in parameter p0613.

You can find additional information in Section "Parameter list (Page 627)".

14.2.5 Derating factors

Overview

Due to the decreasing air pressure in higher installation altitudes, the cooling of the motor deteriorates. Therefore, reduce the power of the motor as the installation altitude increases.

Multiply the permissible torques or powers by the factors from the following table.

Reduce the torques and powers according to the values determined.

Description

Factors for power derating depending on the installation altitude and the ambient temperature for 1FL1 and 1FL2

Table 14-11 Power derating factors for 1FL1 and 1FL2

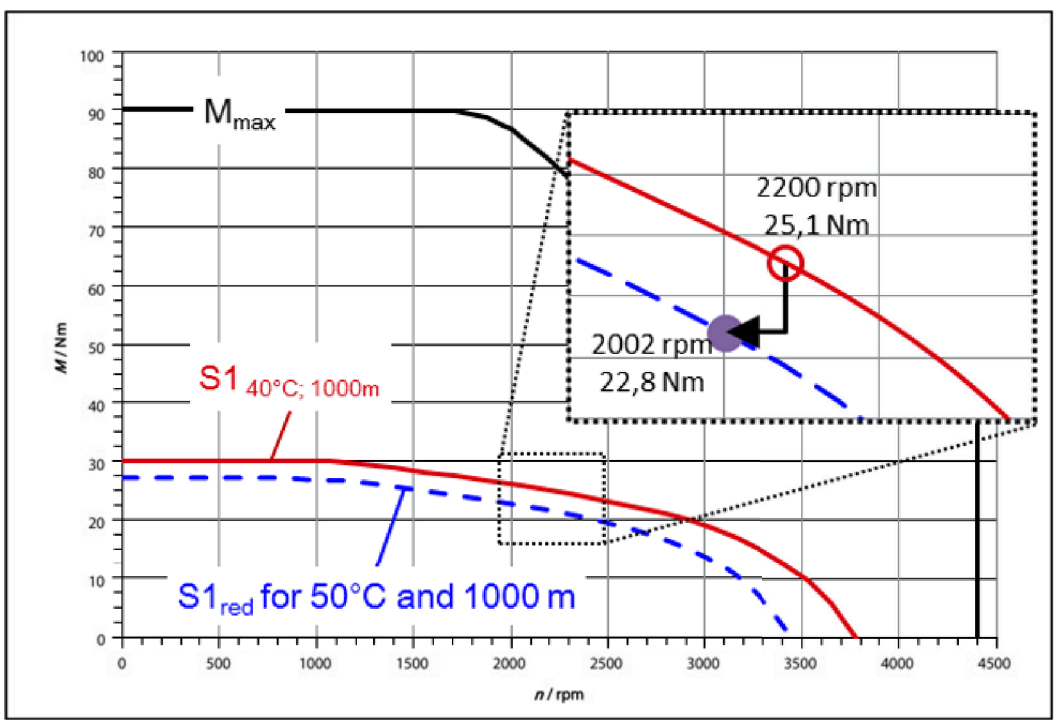
Installation altitude above sea level in m	Ambient temperature in °C					
	30	40	45	50	55	60
1000	1.08	1.00	0.96	0.91	0.87	0.82
2000	1.02	0.93	0.89	0.84	0.79	0.73
3000	0.95	0.86	0.81	0.75	0.70	0.63
4000	0.88	0.77	0.72	0.66	0.59	0.52
5000	0.80	0.68	0.62	0.55	0.47	0.37

Calculating the reduced characteristic curve

$M_{S1\ red}(n) = x_d \bullet M_{S1}(n / x_d)$

$M_{S1\ red}$	Reduced motor torque for S1 operation at the required installation altitude and ambient temperature
M_{S1}	Motor torque for S1 operation at ambient temperature of 40 °C and 1000 m above sea level
n	Motor speed
x_d	Derating factor from the table above

Graphic display of the derating factors



Factors for reducing the DC link voltage depending on the installation altitude

The voltage strength of the motor insulation is reduced for installation altitudes exceeding 2000 m above sea level. Check whether it is necessary to limit the DC link voltage.

Reduce the permissible DC link voltage with increasing installation altitude due to the decreasing air pressure.

For 1FL1 or 1FL2 motors at installation altitudes below 2000 m mean sea level, the maximum permissible converter DC link voltage is 375 V.

Table 14-12 Typical DC link voltage of the SINAMICS converters

Network	Infeed	DC link voltage in V
1 AC 200 V	Non-regulated	230
1 AC 240 V	Non-regulated	276

As the DC link voltage is reduced, the converter output voltage also decreases. This reduces the operating range in the M-n diagram.

The M-n diagrams are provided in Section "Technical data and characteristics of the 1FL1 (Page 600)" and "Technical data and characteristics of the 1FL2 (Page 606)".

14.2.6 Degree of protection

Overview

The degree of protection of a motor is marked, for example, using "IP65".

The motor degree of protection is classified according to IEC 60034-5.

IP = International Protection
1st digit = protection against the ingress of foreign bodies
2nd digit = protection against water

IEC 60034-5 is valid for water as potentially occurring medium, not for oil or other creeping fluids.

Configure the motor in the required degree of protection.

Description

Table 14-13 Degree of protection

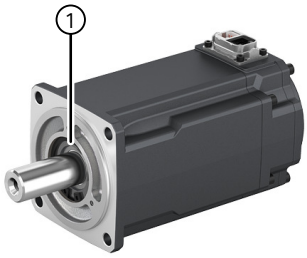
Motor	IP54	IP65
1FL1 1FL2104-2B 1FL2204-2B	-	X
1FL2102 1FL2□03 1FL2104-2A 1FL2204-2A	X	X

Note

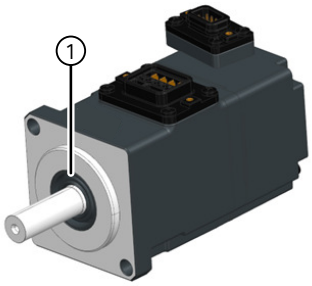
For 1FL2 motors SH20/SH30 with IP54, you can install an optional shaft sealing ring to upgrade the degree of protection from IP54 to IP65.

To order a shaft sealing ring, see Section "IP65 degree of protection kit for 1FL2 motors SH20 and SH30 (Page 72)".

To install a shaft sealing ring, see Section "Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30 (Page 833)".



1FL2



1FL1

① Radial shaft sealing ring

The radial shaft sealing ring shortens the length of shaft extension that can be used.

Note

The radial shaft sealing ring should be used with sufficient lubricant oil splashed on it. Do not use a motor with a radial shaft sealing ring submerged in oil.

It is permissible that the radial shaft sealing ring runs dry for a short time.

With degrees of protection IP65, it is not permissible for liquid to collect on the flange.

The service life of the radial shaft sealing ring is approximately 5000 operating hours.

More information

For more information, see Section "Shaft extension (Page 589)".

14.2.7 Balancing

Description

The motors are balanced according to IEC 60034-14.

Motors with feather key in the shaft are half-key balanced.

A mass equalization for the protruding half key must be taken into account for the output elements.

14.2.8 Vibrational behavior

Description

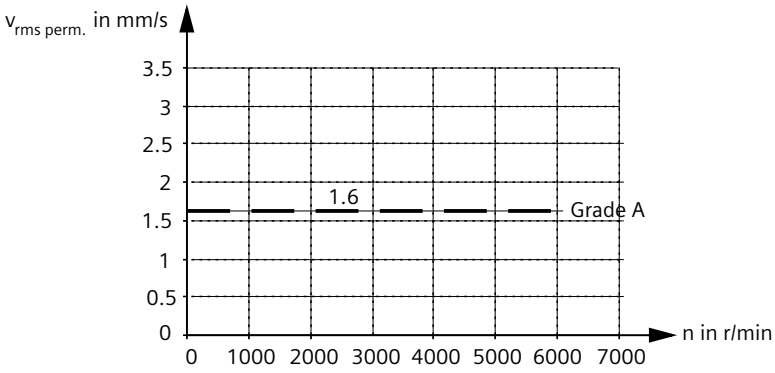
Vibration severity grade

The vibration response of the system at the location of use is influenced by output elements, any built-on parts, the alignment, the installation, and external vibrations. This can change the vibration values of the motor.

The motors conform to vibration severity grade A according to IEC 60034-14:2003.

The specified values refer only to the motor. The conditions at the installation location can influence the system vibration response and increase the vibration values on the motor.

The vibration severity grade is maintained up to the rated speed (n_N).



Vibration response

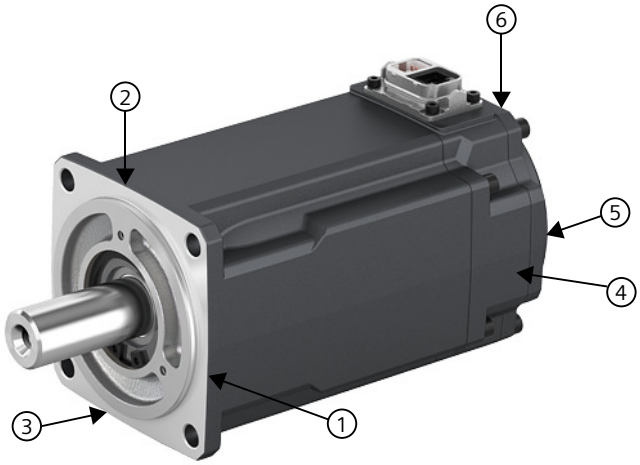
Comply with the vibration values in the following tables to ensure perfect functioning of the motor and a long service life.

Table 14-14 Vibration values

Vibration velocity V_{rms} to ISO 10816	Vibration acceleration a_{peak} axial	Vibration acceleration a_{peak} radial
Max. 4.5 mm/s	50 m/s²	50 m/s²

To evaluate the vibration velocity, the measuring equipment must meet the requirements of ISO 2954.

Select the measuring locations according to ISO 10816-1, Section 3.2. See the illustration below for more information on the measuring points.



①	End shield DE radial	④	End shield NDE radial
②	End shield DE radial	⑤	End shield NDE axial
③	End shield DE axial	⑥	End shield NDE radial

The vibration acceleration is evaluated in the frequency range from 10 Hz to 2000 Hz. The maximum peak in the measurement time range is considered.

The vibration values must not exceed the specified limits at any measuring location.

14.2.9 Shaft extension

Technical data

The motors are supplied with cylindrical shaft extensions.

Optionally, a shaft extension with key slot and feather key is available.

For 1FL2 motors with IP65 degree of protection, the usable shaft extension is reduced by the radial shaft sealing ring.

Table 14-15 Dimension values

Motor	Shaft dimensions with IP54 Diameter x length in mm	Shaft dimensions with IP65 Diameter x length in mm	Feather key Width x height x length in mm	Centering thread
1FL1102	-	8 (h6) × 22.3	3 × 3 × 14	M3
1FL1103	-	14 (h6) × 25.5	5 × 5 × 14	M5
1FL1104	-	19 (h6) × 30.2	6 × 6 × 22	M6
1FL2102	8 (h6) × 22.5	8 (h6) × 18.2	3 × 3 × 16	DIN 332-DR M3
1FL2□03	14 (h6) × 27	14 (h6) × 21	5 × 5 × 16	DIN 332-DR M5
1FL2104-2A 1FL2204-2A	19 (h6) × 37	19 (h6) × 32	6 × 6 × 25	DIN 332-DR M6
1FL2104-2B 1FL2204-2B	-	19 (h6) × 37	6 × 6 × 25	DIN 332-DR M6

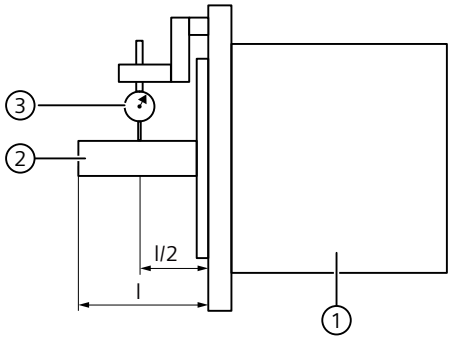
14.2.10 Radial eccentricity, concentricity, and axial eccentricity

Technical data

The shaft and flange accuracies for 1FL1 or 1FL2 motors are implemented according to DIN 42955 and IEC 60072-1 as standard (Normal class).

Table 14-16 Radial eccentricity tolerance of the shaft to the frame axis (referring to cylindrical shaft extensions)

Motor	Standard (Normal class)
1FL1102 1FL2102	0.03 mm
1FL1103 1FL2□03	0.035 mm
1FL1104 1FL2□04	0.04 mm

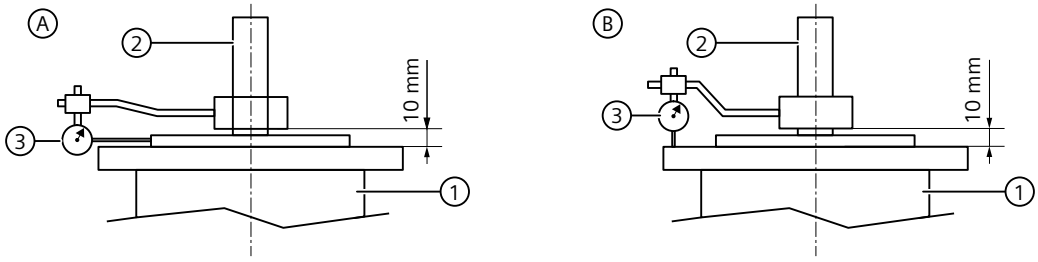


1 Motor
2 Motor shaft
3 Dial gauge

Figure 14-3 Checking the radial eccentricity

Table 14-17 Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis (referring to the centering diameter of the mounting flange)

Motor	Standard (Normal class)
1FL1102 1FL2102	0.06 mm
1FL1103 1FL1104 1FL2□03 1FL2□04	0.08 mm



A Check for concentricity
B Check for axial eccentricity

1 Motor
2 Motor shaft
3 Dial gauge

Figure 14-4 Checking the concentricity and axial eccentricity

14.2.11 Axial and radial forces

14.2.11.1 Axial and radial forces for 1FL1

Axial forces

Table 14-18 Permissible axial forces

Type	Axial force, static[1)] $F_{A\ stat}$ / N
1FL1102	54
1FL1103	74
1FL1104	147

1) The specified axial forces are determined by the spring loading and therefore also apply to motors with holding brake.

Note

Applications with an angular toothed pinion directly on the motor shaft are not permitted if the permissible axial forces are exceeded.

Radial forces

As a result of the bearing arrangement, the 1FL1 motor is designed for aligned forces. Forces such as these occur for belt drives, for example.

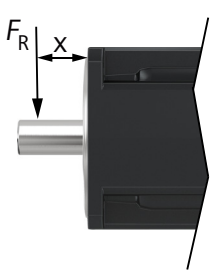
All radial forces always refer to aligned forces.

Note

Motor damage caused by circulating forces

Circulating forces can cause bearing motion, and therefore damage the motor.

- Avoid rotating forces.



F_R Point of application of the radial force

x Distance between where the radial force is applied and the shaft shoulder in mm

Figure 14-5 Point of application of radial forces F_R at the shaft extension

Recommended radial forces

Table 14-19 Recommended radial forces

Type	Distance x / mm	Radial force F_R / N
1FL1102	20	78
1FL1103	25	245
1FL1104	35	392

14.2.11.2 Axial and radial forces for 1FL2

Axial forces

Table 14-20 Permissible axial forces

Type	Axial force, static[1] $F_{A\ stat}$ / N
1FL2102	50
1FL2□03	98
1FL2104 1FL2204	100

[1] The specified axial forces are determined by the spring loading and therefore also apply to motors with holding brake.

Note

Applications with an angular toothed pinion directly on the motor shaft are not permitted if the permissible axial forces are exceeded.

Radial forces

As a result of the bearing arrangement, the 1FL2 motor is designed for aligned forces. Forces such as these occur for belt drives, for example.

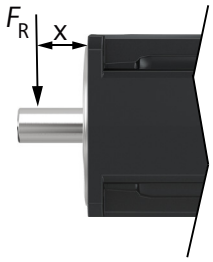
All radial forces always refer to aligned forces.

NOTICE

Motor damage caused by circulating forces

Circulating forces can cause bearing motion, and therefore damage the motor.

- Avoid rotating forces.



F_R Point of application of the radial force

x Distance between where the radial force is applied and the shaft shoulder in mm

Figure 14-6 Point of application of radial forces F_R at the shaft extension

Radial force diagrams

The following diagrams indicate the maximum permissible radial force for the corresponding 1FL2 motor frame size. It depends on the force application point and the average speed for a nominal bearing service life (L10h) of 20000 h.

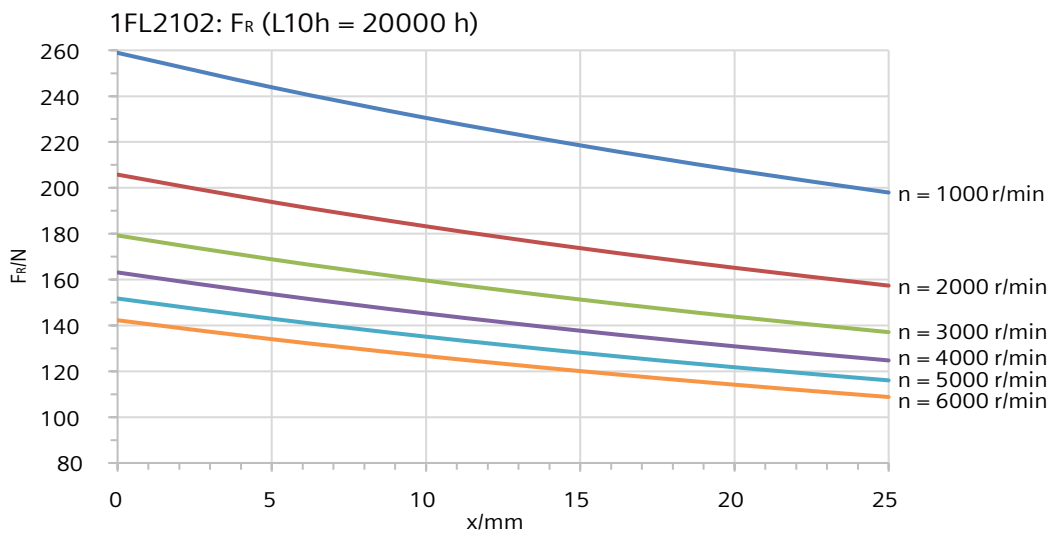


Figure 14-7 Radial force diagram 1FL2102

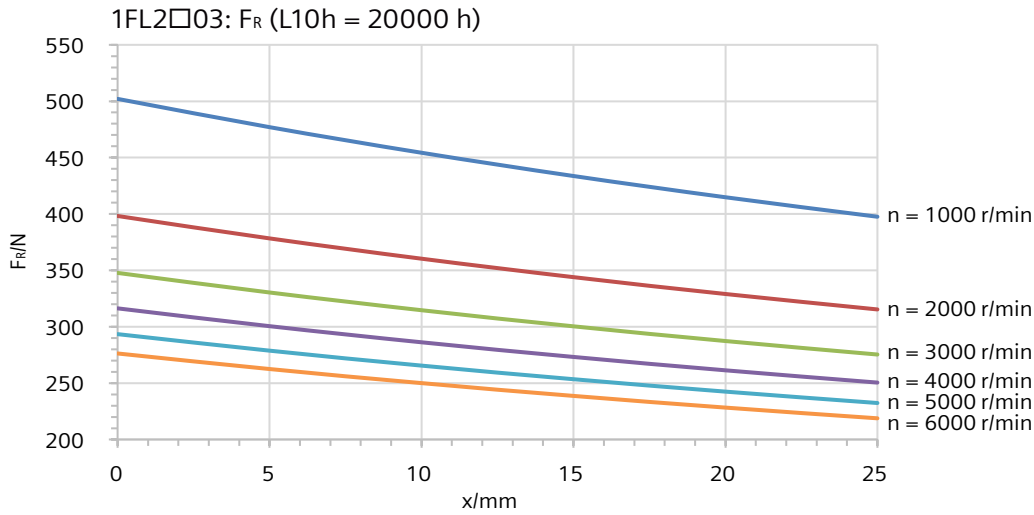


Figure 14-8 Radial force diagram 1FL2□03

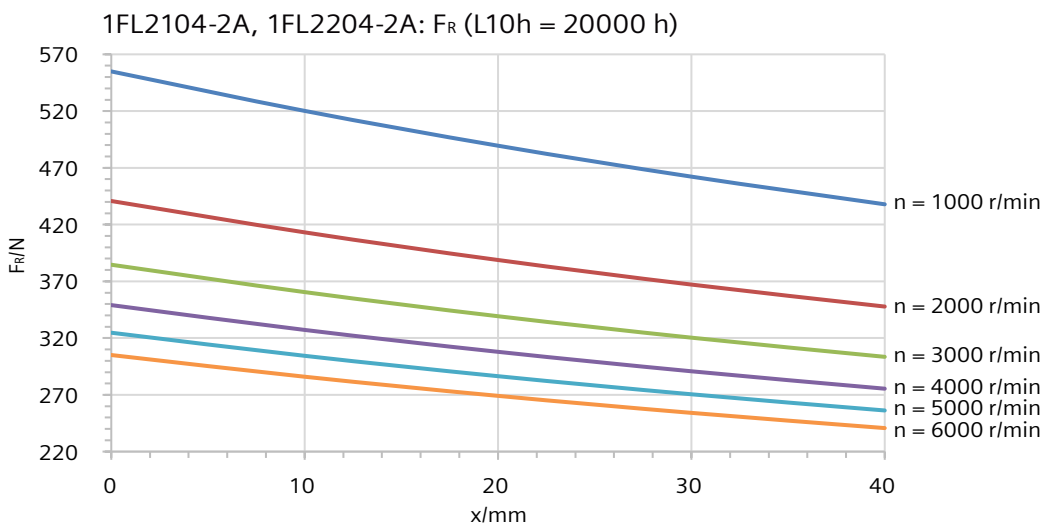


Figure 14-9 Radial force diagram 1FL2104-2A, 1FL2204-2A

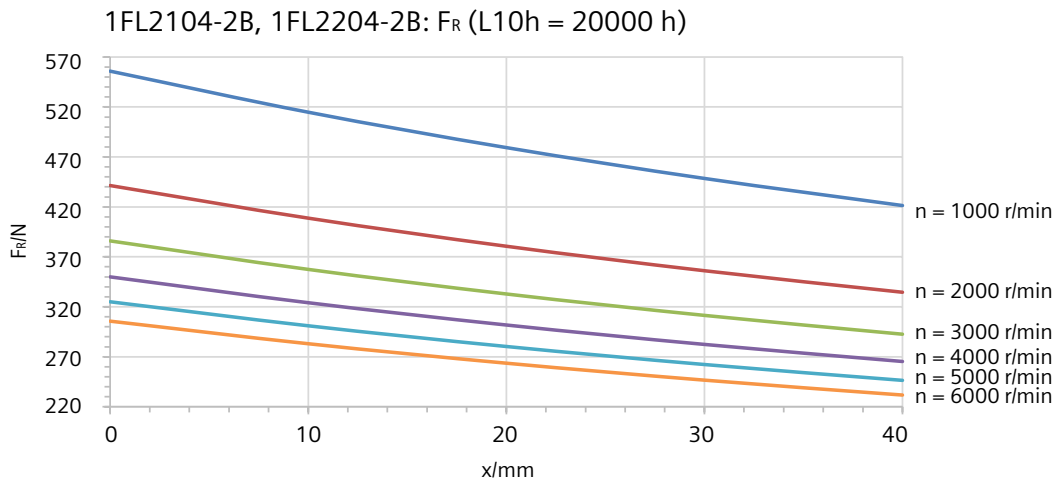


Figure 14-10 Radial force diagram 1FL2104-2B, 1FL2204-2B

14.2.12 Available encoders

14.2.12.1 Technical data of encoders

Technical data

Table 14-21 Encoders that can be ordered

	Absolute encoder single-turn, 17-bit	**Absolute encoder single-turn, 21-bit**	**Absolute encoder, 21-bit single-turn + 12-bit multiturn (for 1FL2 only)**	**Absolute encoder, with battery, 21-bit single-turn + 12-bit multiturn (for 1FL1 only)**
14th position in the Article No. of the motor	H	S	M	A
Resolution	131072 = 17-bit	2097152 = 21-bit	2097152 = 21-bit	2097152 = 21-bit
Absolute position	One revolution	One revolution	4096 revolutions (12-bit)	4096 revolutions (12-bit)
Angle error	± 120"	± 120"	± 120"	± 120"

14.2.12.2 Using the multiturn encoder with battery on the 1FL1 motor

Description

The multiturn encoder retains position information using battery power while the S200 Compact converter is switched off.

When using the multiturn encoder with battery, pay attention to the following warnings.

Fault F31142

Fault F31142 may occur in the following cases:

- When the multiturn encoder is powered on for the first time
- When the multiturn encoder is reconnected by reinserting the encoder connector on the motor side
- When a battery voltage lower than 2.9 V is detected during the converter startup

When the fault occurs, perform the following actions to eliminate possible causes:

- Verify the connections of the encoder cable.
- Check the battery level and replace the battery if necessary.
- Carry out absolute position homing before operating the drive system again to prevent unexpected motor movements.

Alarm A31442

Alarm A31442 may occur in the following case:

- When a battery voltage lower than 3.1 V is detected

When the alarm occurs, replace the battery while the drive system is powered on. The alarm will disappear after replacement.

Acknowledging faults F31112 and F31111

Faults F31112 and F31111 are usually acknowledged with the acknowledgment of fault F31142. If faults F31112 and F31111 remain after acknowledging fault F31142, perform the following steps:

1. Switch off the converter power supply.
2. Remove and then reinsert the encoder plug into the encoder interface on the motor.
3. Switch on the converter supply voltage. Fault F31142 will be output again.
4. Acknowledge fault F31142.

⚠ CAUTION

Unexpected movement of machines caused by lack of prior adjustment for the multiturn encoder

When F31142 occurs, the multiturn encoder position information is reset. If the mechanical axis position is unsynchronized with the encoder absolute position, unexpected machine movements can be triggered. This can result in minor personal injury or property damage.

- Perform absolute position homing before you operate the drive system again.

More information

For more information about replacing the battery, see Section "Assembling the encoder connector for 1FL1 motors with multiturn encoder (Page 809)".

14.2.13 Brake data

14.2.13.1 Overview of the holding brake

Description

The holding brake is used to clamp the motor shaft when the motor is at a standstill. The holding brake is not a working brake for braking the rotating motor. When the motor is at a standstill, the holding brake is designed for at least five million switching cycles.

Limited EMERGENCY STOP operation is permissible. Take into account the maximum permissible single operating energy as well as total operating energy (service life) of the brake.

⚠ WARNING

Unintentional movements through inadequate braking effect

If you use the holding brake incorrectly, for example, as an operating brake or you ignore the permissible operating energy of the brake, then the brake will be subject to excessive and impermissible wear. As a consequence, there may be no brake effect. Unintentional movements of the machine or system can result in death or serious injury.

- Observe the permissible number of operating cycles and EMERGENCY STOP properties.
- Operate the motor only in conjunction with an intact brake.
- Avoid repeated brief acceleration of the motor against a holding brake that is still closed.

For 1FL1 motors, the holding brakes have a torsional backlash of less than 1° at 20% rated torque. For 1FL2 motors, the holding brakes have a torsional backlash of less than 1°.

14.2.13.2 Technical data of the holding brake

Technical data

Table 14-22 Technical data of the spring-loaded brake

Motor type	Holding torque	Opening time	Closing time	Maximum permissible single operating energy[1)]	Total operating energy (service life)	Holding current
	M_4 / Nm	t_{open_f} / ms	t_{close_f} / ms	W_{max} / J	W_{tot} / kJ	I_h / A
1FL1102	0.32	40	20	0.67	2	< 1 A
1FL1103	1.3	60	20	6.3	23	< 1 A
1FL1104	3.3	60	40	21.7	73.2	< 1 A
1FL2102	0.32	35	10	1	2	< 1 A

Motor type	Holding torque	Opening time	Closing time	Maximum permissible single operating energy[1]	Total operating energy (service life)	Holding current
	M_4 / Nm	t_{open_f} / ms	t_{close_f} / ms	W_{max} / J	W_{tot} / kJ	I_h / A
1FL2□03	1.3	60	10	10	20	< 1 A
1FL2□04	3.3	110	30	43	86	< 1 A

[1] Maximum of three consecutive EMERGENCY STOP procedures. Maximum 25% of all EMERGENCY STOP procedures as high-energy stops with W_{max}.

Holding torque M_4: The holding torque M_4 is the highest permissible torque for the closed brake in steady-state operation without slip (holding function when motor is at standstill). The data applies to the state at operating temperature (120 °C).

Dynamic braking torque M_{1m}: The dynamic braking torque M_{1m} is the smallest mean dynamic braking torque that can occur for an EMERGENCY STOP.

Opening time t_o and closing time t_{cl}: The delay times that occur when switching the brake t_o and t_{cl} are saved in the motor and are automatically taken into consideration. After activation of the holding brake (opening), the speed/velocity setpoint remains at "Zero" during the opening time t_o. The speed/velocity setpoint is only enabled after the opening time t_o has elapsed. After OFF1 or OFF3 and activation of the holding brake (closing), the motor still remains in closed-loop control with speed/velocity setpoint "Zero" during closing time t_{cl}. The pulses are only deleted after this.

Maximum permissible single operating energy W_{max}: The maximum permissible single operating energy of an individual EMERGENCY STOP operation. After an EMERGENCY STOP with the maximum single operating energy, allow a cooling time of at least three minutes before you operate the motor again.

Total operating energy (service life) W_{total}: The total operating energy is the sum of the single operating energy (operating energy for each EMERGENCY STOP procedure). If you exceed the total operating energy, problem-free functioning of the brake can no longer be guaranteed.

Holding current I_h: The holding current I_h keeps the holding brake open. The holding current I_h continues to load the 24 V power supply of the converter after overexcitation until the brake is released.

Formula to calculate the operating energy per braking operation

$$W_{br} = (J_{mot\,br} + J_{load}) \bullet n_{mot}^2 / 182.4$$

W_{br} / J	Operating energy per braking operation
n_{mot} / r/min	Speed at which the brake is engaged
$J_{mot\,br}$ / kgm²	Rotor moment of inertia of the motor with brake (see Technical data and characteristics of the 1FL1 (Page 600) and Technical data and characteristics of the 1FL2 (Page 606))
J_{load} / kgm²	Load moment of inertia of the mounting part on the motor with brake
182.4	Constant for calculating the circular frequency and SI units

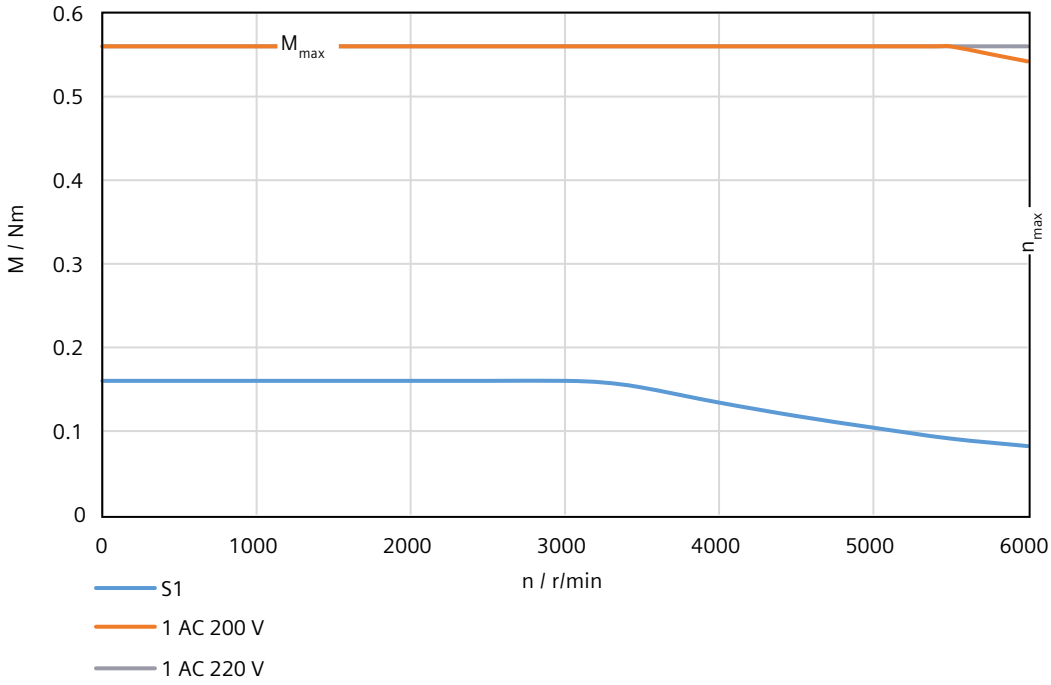
14.2.14 Technical data and characteristics of the 1FL1

14.2.14.1 1FL1102-2AG

Technical data

Table 14-23 Technical data of 1FL1102-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.16
Stall current	I_0	A	0.7
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	0.56
Maximum current	I_{max}	A	2.25
Thermal time constant	T_{th}	min	3.1
Moment of inertia	J_{mot}	$kgcm^2$	0.018
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.021
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	0.3
Weight (with brake)	$m_{mot\ br}$	kg	0.47
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.16
Rated current	I_{rated}	A	0.7
Rated power	P_{rated}	kW	0.05

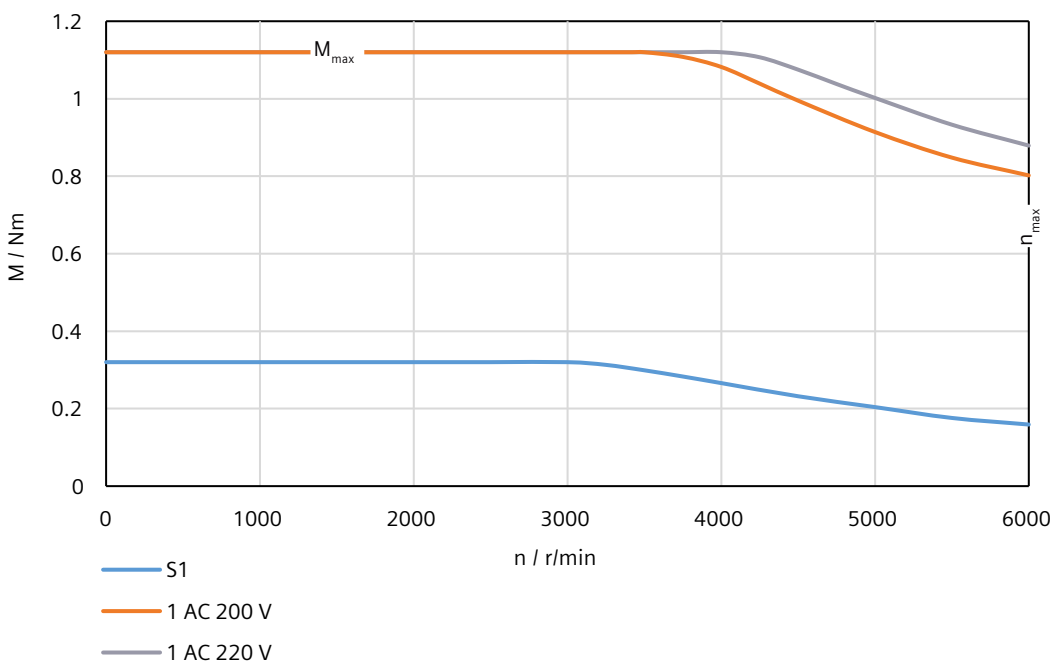

0.6
0.5
0.4
0.3
0.2
0.1
0
M / Nm
M max
n max
0
1000
2000
3000
4000
5000
6000
n / r/min
S1
1 AC 200 V
1 AC 220 V

14.2.14.2 1FL1102-4AG

Technical data

Table 14-24 Technical data of 1FL1102-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.32
Stall current	I_0	A	0.84
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	1.12
Maximum current	I_{max}	A	3.076
Thermal time constant	T_{th}	min	4.7
Moment of inertia	J_{mot}	$kgcm^2$	0.031
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.034
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	0.4
Weight (with brake)	$m_{mot\ br}$	kg	0.57
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.32
Rated current	I_{rated}	A	0.84
Rated power	P_{rated}	kW	0.1

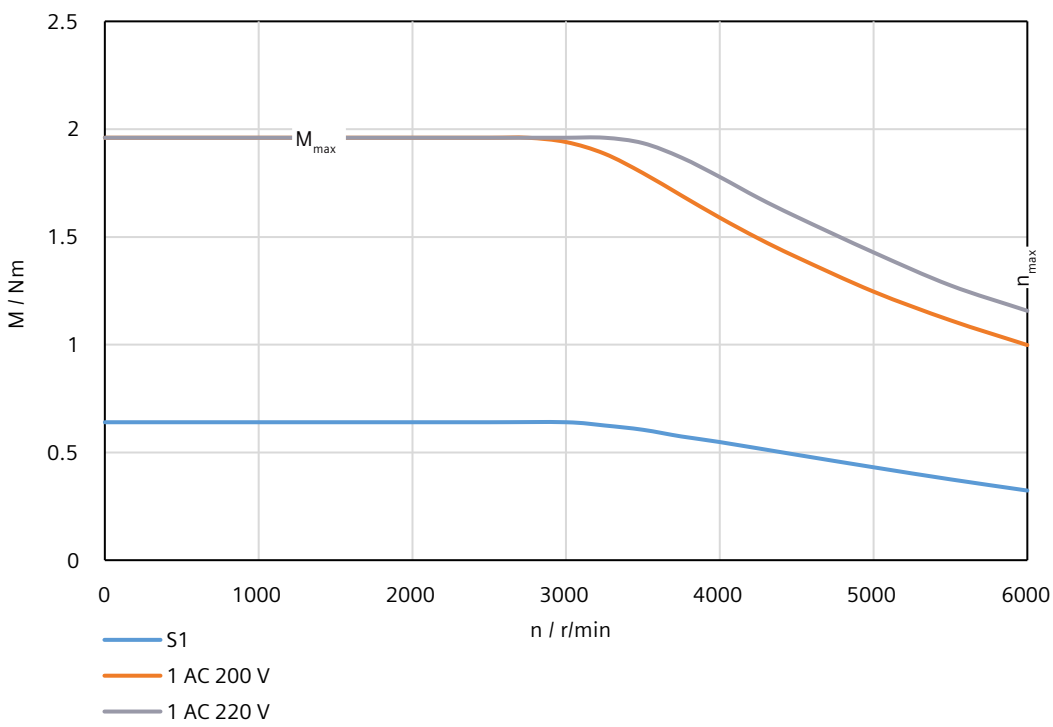


14.2.14.3 1FL1103-2AG

Technical data

Table 14-25 Technical data of 1FL1103-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.26
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	1.96
Maximum current	I_{max}	A	3.86
Thermal time constant	T_{th}	min	4.8
Moment of inertia	J_{mot}	$kgcm^2$	0.19
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.20
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	1
Weight (with brake)	$m_{mot\ br}$	kg	1.3
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.26
Rated power	P_{rated}	kW	0.2

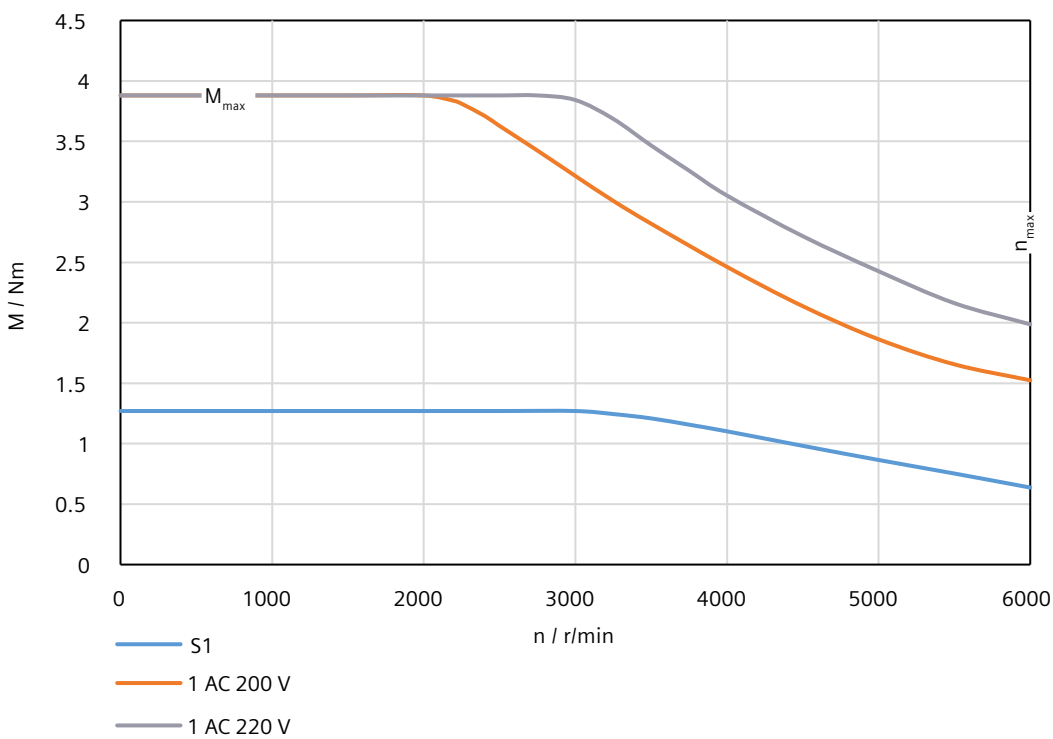


14.2.14.4 1FL1103-4AG

Technical data

Table 14-26 Technical data of 1FL1103-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	3.88
Maximum current	I_{max}	A	7.26
Thermal time constant	T_{th}	min	9.3
Moment of inertia	J_{mot}	$kgcm^2$	0.31
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.32
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	1.4
Weight (with brake)	$m_{mot\ br}$	kg	1.7
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4

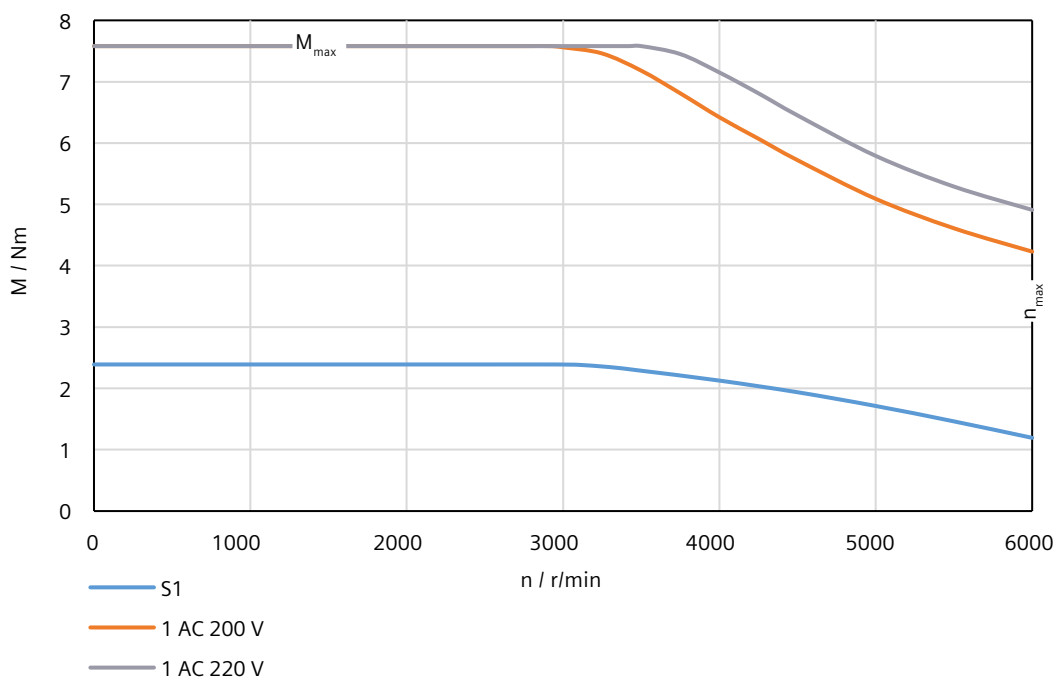


14.2.14.5 1FL1104-2AG

Technical data

Table 14-27 Technical data of 1FL1104-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.39
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	7.58
Maximum current	I_{max}	A	13.79
Thermal time constant	T_{th}	min	12.8
Moment of inertia	J_{mot}	$kgcm^2$	1.05
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.10
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	2.6
Weight (with brake)	$m_{mot\ br}$	kg	3.3
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.39
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75



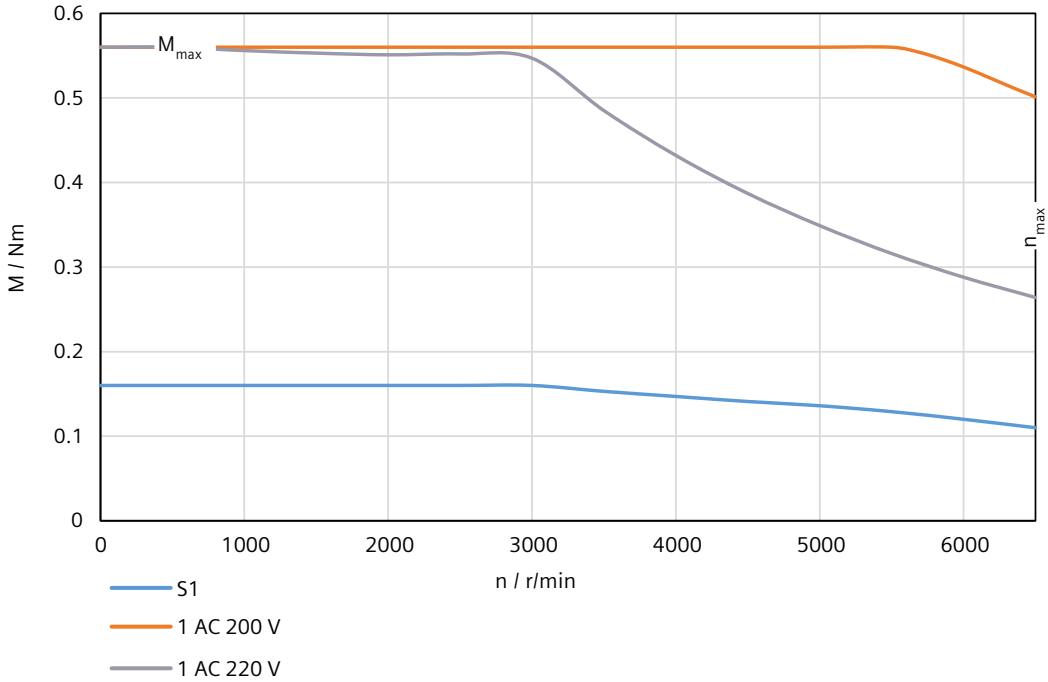
14.2.15 Technical data and characteristics of the 1FL2

14.2.15.1 1FL2102-2AG

Technical data

Table 14-28 Technical data of 1FL2102-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.16
Stall current	I_0	A	0.81
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	0.56
Maximum current	I_{max}	A	3.1
Thermal time constant	T_{th}	min	6.2
Moment of inertia	J_{mot}	$kgcm^2$	0.017
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.022
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	0.29
Weight (with brake)	$m_{mot\ br}$	kg	0.46
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.16
Rated current	I_{rated}	A	0.81
Rated power	P_{rated}	kW	0.05

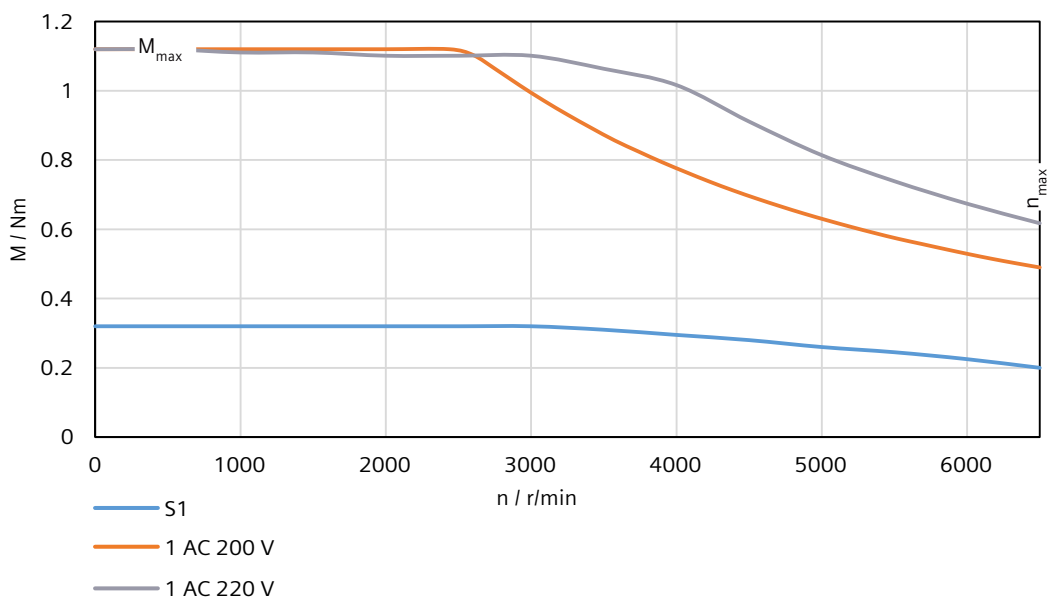

0.6
0.5
0.4
0.3
0.2
0.1
0
M / Nm
M max
n max
0
1000
2000
3000
4000
5000
6000
n / r/min
S1
1 AC 200 V
1 AC 220 V

14.2.15.2 1FL2102-4AG

Technical data

Table 14-29 Technical data of 1FL2102-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.32
Stall current	I_0	A	0.76
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	1.12
Maximum current	I_{max}	A	2.95
Thermal time constant	T_{th}	min	6.2
Moment of inertia	J_{mot}	$kgcm^2$	0.029
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.034
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.39
Weight (with brake)	$m_{mot\ br}$	kg	0.56
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.32
Rated current	I_{rated}	A	0.76
Rated power	P_{rated}	kW	0.1

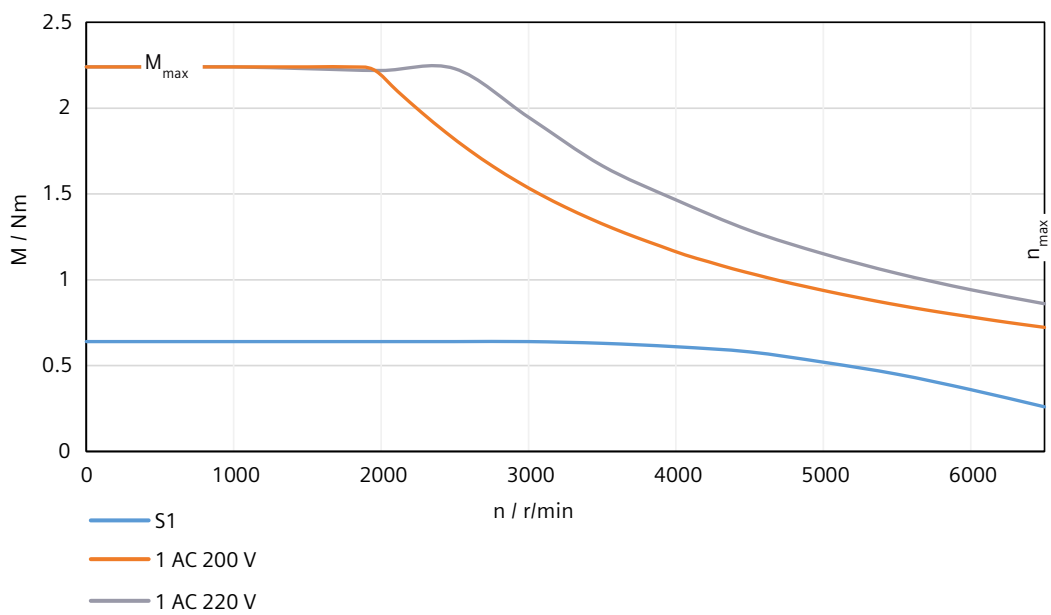


14.2.15.3 1FL2103-2AG

Technical data

Table 14-30 Technical data of 1FL2103-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.28
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	2.24
Maximum current	I_{max}	A	4.8
Thermal time constant	T_{th}	min	10.2
Moment of inertia	J_{mot}	$kgcm^2$	0.080
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.110
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.79
Weight (with brake)	$m_{mot\ br}$	kg	1.14
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.28
Rated power	P_{rated}	kW	0.2

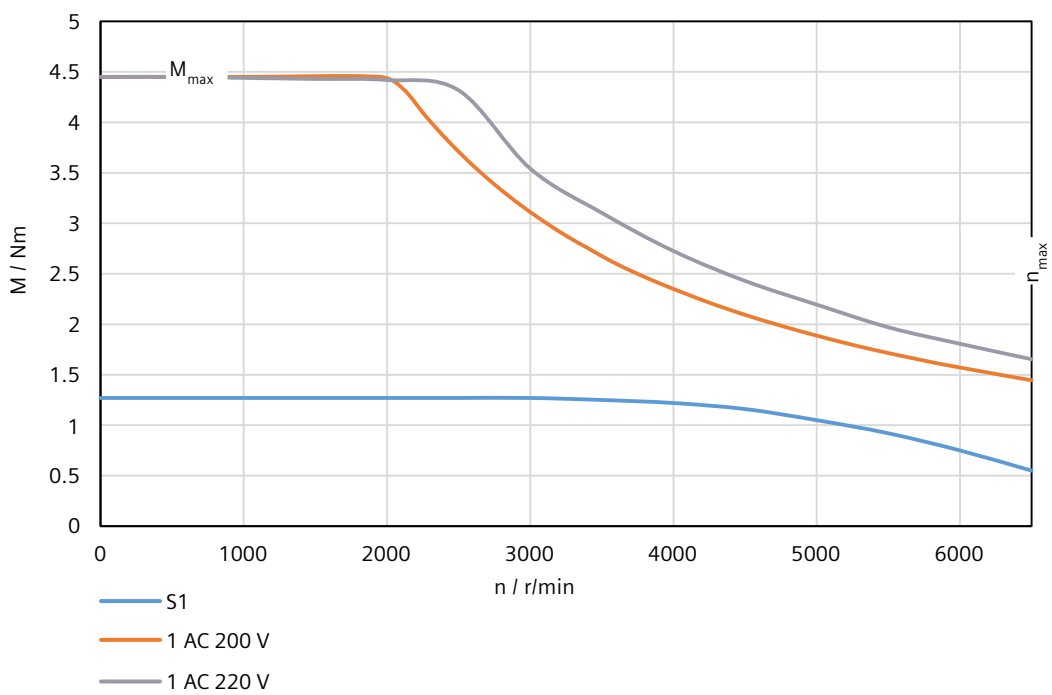


14.2.15.4 1FL2103-4AG

Technical data

Table 14-31 Technical data of 1FL2103-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	4.45
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	13
Moment of inertia	J_{mot}	$kgcm^2$	0.155
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.185
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	1.16
Weight (with brake)	$m_{mot\ br}$	kg	1.5
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4

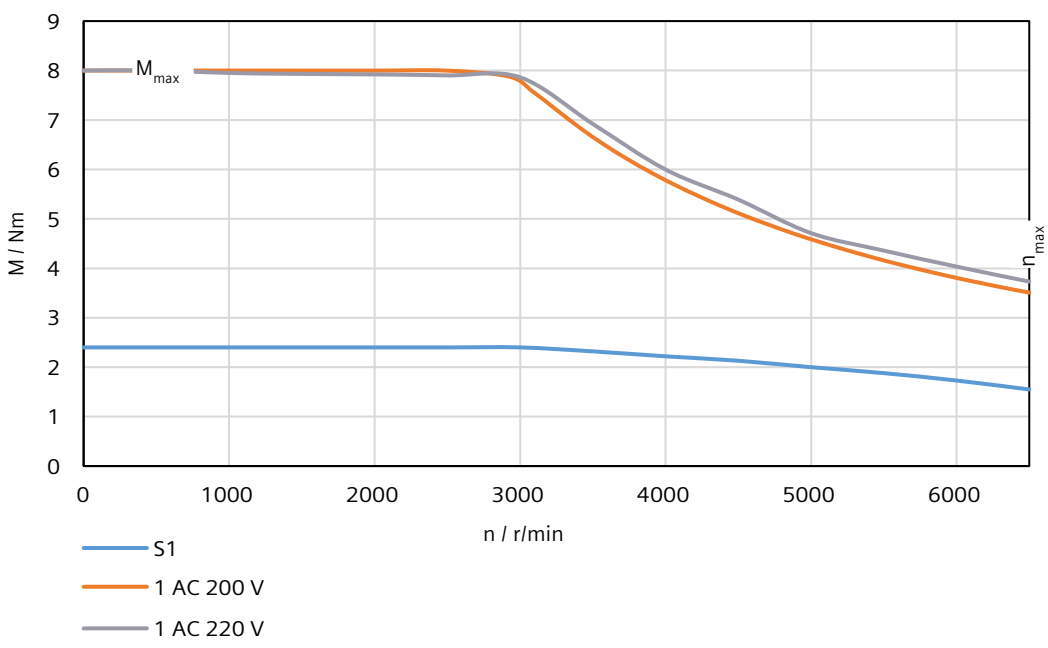


14.2.15.5 1FL2104-2AG

Technical data

Table 14-32 Technical data of 1FL2104-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	8
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	23.4
Moment of inertia	J_{mot}	$kgcm^2$	0.50
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.58
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.7
Weight (with brake)	$m_{mot\ br}$	kg	3.5
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75

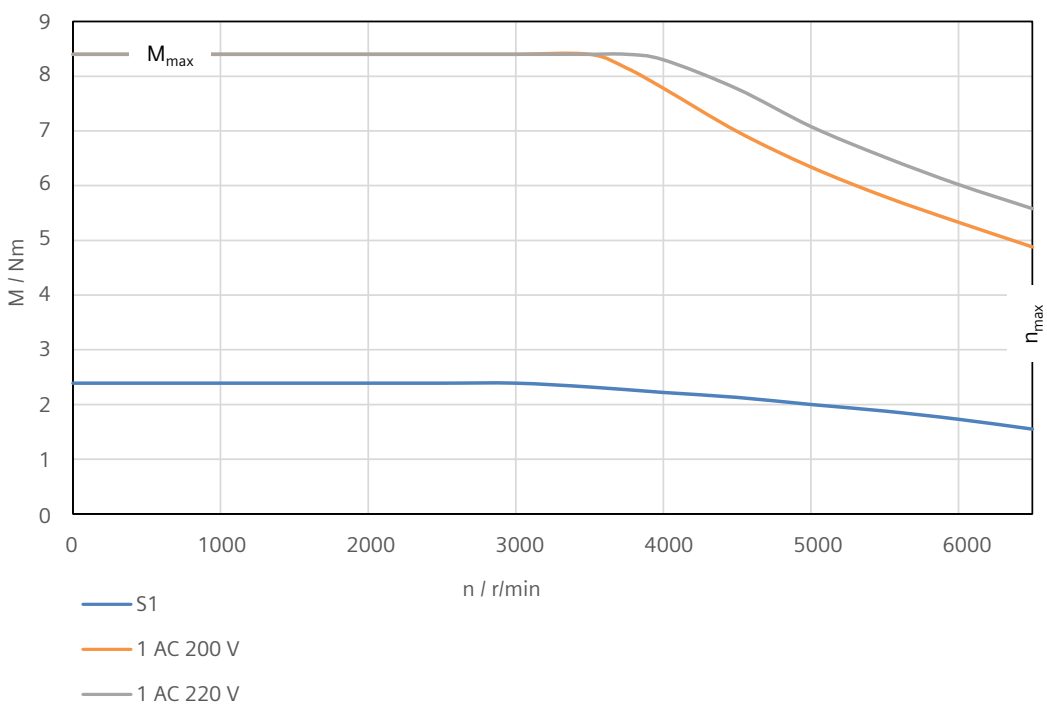


14.2.15.6 1FL2104-2BG

Technical data

Table 14-33 Technical data of 1FL2104-2BG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.2
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	8.4
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	10
Moment of inertia	J_{mot}	$kgcm^2$	0.67
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.77
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.0
Weight (with brake)	$m_{mot\ br}$	kg	2.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.2
Rated power	P_{rated}	kW	0.75

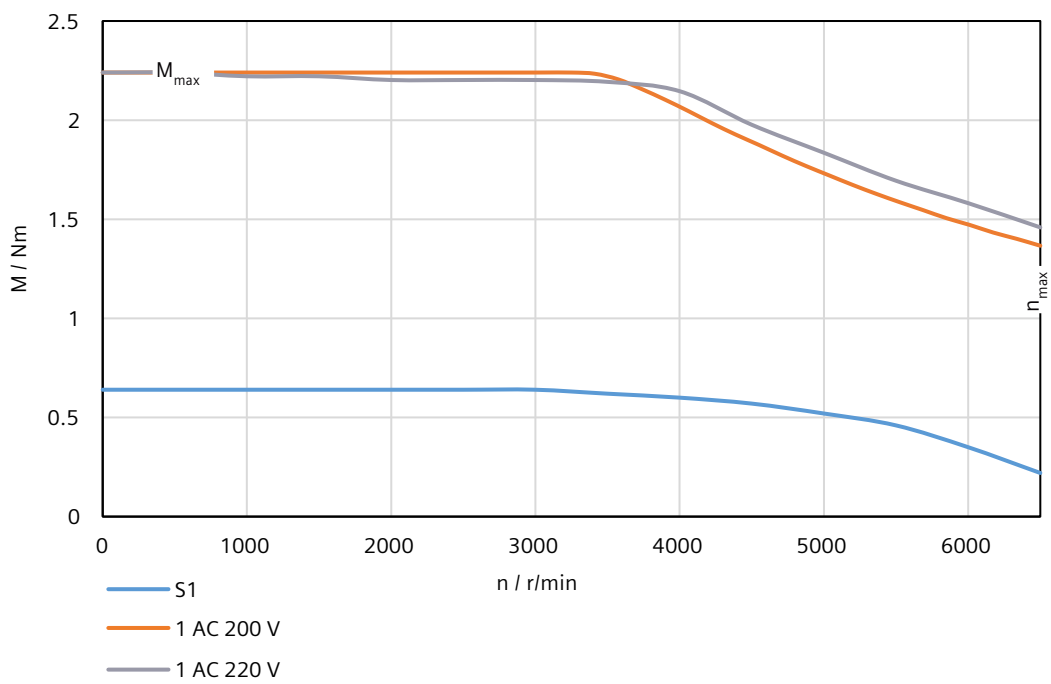


14.2.15.7 1FL2203-2AG

Technical data

Table 14-34 Technical data of 1FL2203-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.33
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	2.24
Maximum current	I_{max}	A	4.8
Thermal time constant	T_{th}	min	11.5
Moment of inertia	J_{mot}	$kgcm^2$	0.180
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.210
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.76
Weight (with brake)	$m_{mot\ br}$	kg	1.11
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.33
Rated power	P_{rated}	kW	0.2

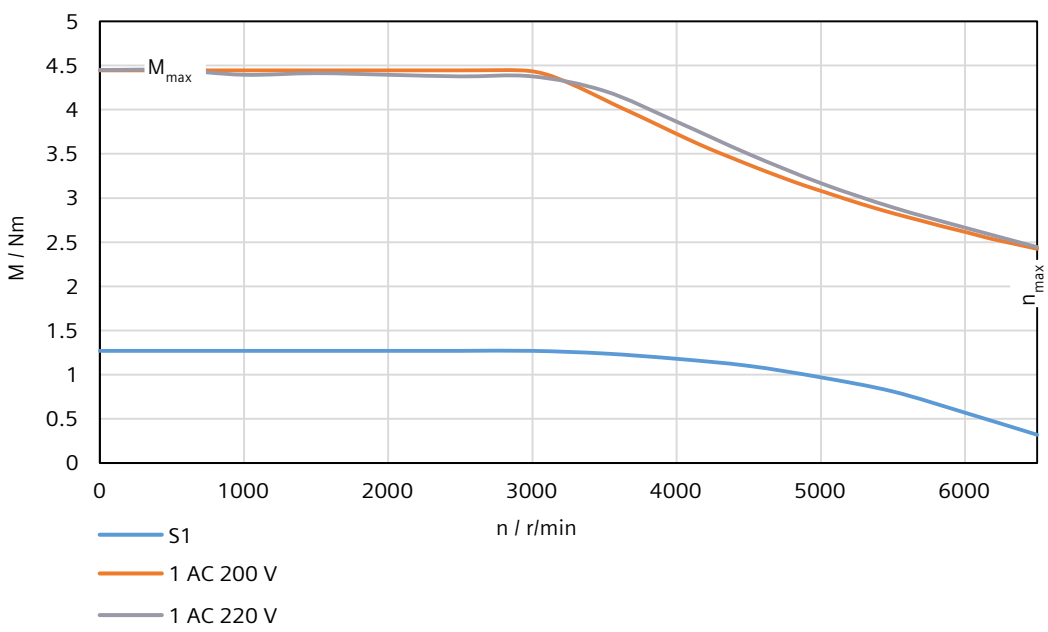


14.2.15.8 1FL2203-4AG

Technical data

Table 14-35 Technical data of 1FL2203-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	4.45
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	12.8
Moment of inertia	J_{mot}	$kgcm^2$	0.350
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.380
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	1.11
Weight (with brake)	$m_{mot\ br}$	kg	1.46
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4

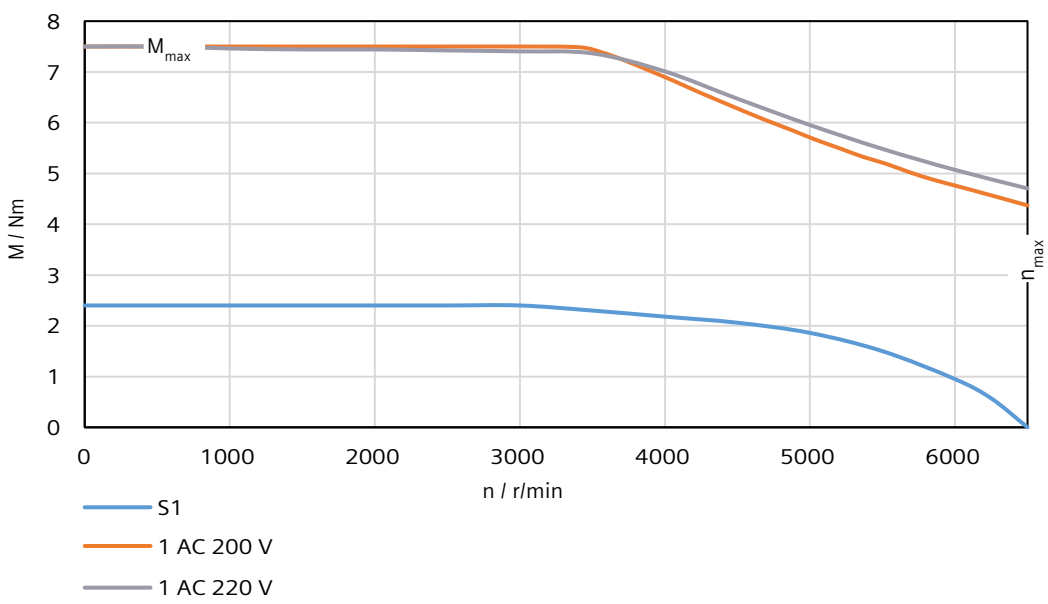


14.2.15.9 1FL2204-2AG

Technical data

Table 14-36 Technical data of 1FL2204-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	7.5
Maximum current	I_{max}	A	14.2
Thermal time constant	T_{th}	min	25.1
Moment of inertia	J_{mot}	$kgcm^2$	1.23
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.6
Weight (with brake)	$m_{mot\ br}$	kg	3.4
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75

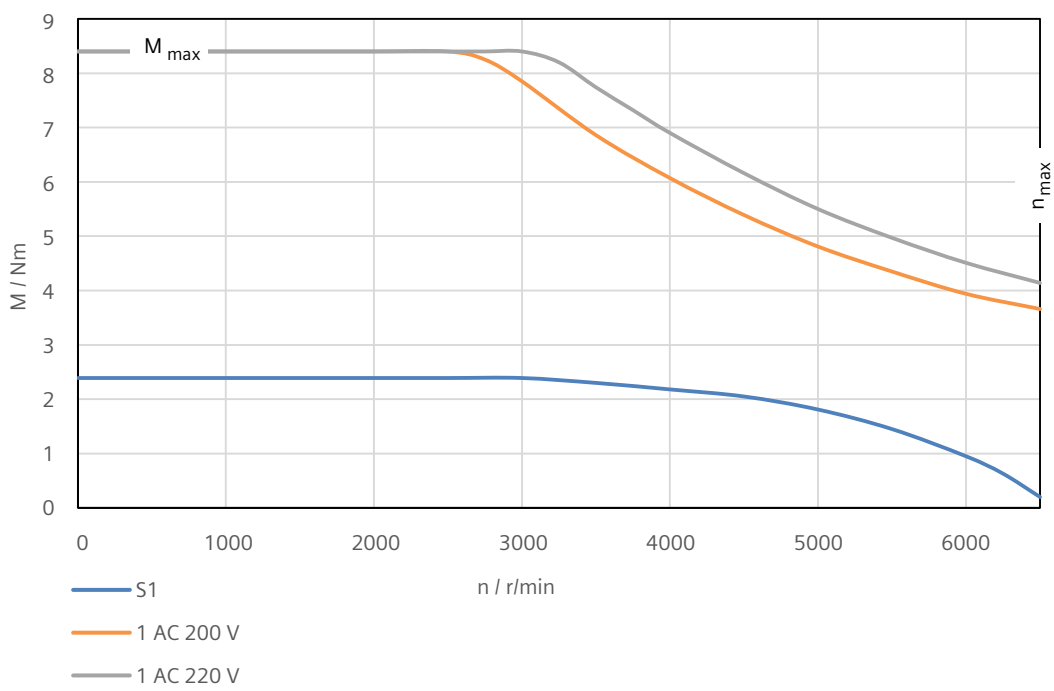


14.2.15.10 1FL2204-2BG

Technical data

Table 14-37 Technical data of 1FL2204-2BG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	8.4
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	10
Moment of inertia	J_{mot}	$kgcm^2$	1.27
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.37
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.0
Weight (with brake)	$m_{mot\ br}$	kg	2.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75



14.3 Technical data of MOTION-CONNECT cables

14.3.1 Technical data of MOTION-CONNECT 100

14.3.1.1 General technical data

Technical data

Table 14-38 General technical data of MOTION-CONNECT 100

Property	MOTION-CONNECT 100 power cable	MOTION-CONNECT 100 encoder cable
Jacket material	PVC	PVC
Number of conductors	• With brake conductors: 6 • Without brake conductors: 4	6
Operating temperature, static (°C)	-20 ... +105	-20 ... +80
Operating temperature, dynamic (°C)	-10 ... +105	-10 ... +80
Shielding	Braided shield; coverage ≥ 80%	Braided shield; coverage ≥ 85%
Oil resistance	EN 60811-2-1	EN 60811-2-1
Flame retardancy	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3
Coolant resistance	EN 60811-2-1	EN 60811-2-1
Degree of protection (motor-side only)	IP65	IP65
Bending cycles	10 million	10 million
Rated voltage (V)	300	30

14.3.1.2 Specific technical data

Technical data

Property	MOTION-CONNECT 100 power cable	MOTION-CONNECT 100 encoder cable
Cross-section of conductors (mm^2)	• With brake conductors: 4 x 0.5 + 2 x 0.2 • Without brake conductors: 4 x 0.5	3 x 2 x 0.14
Outer diameter (mm)	• With brake conductors: ø (6.6 ± 0.2) • Without brake conductors: ø (6.5 ± 0.2)	ø (6 ± 0.2)
Minimum bending radius, static (mm)	6 x outer diameter	6 x outer diameter
Minimum bending radius, dynamic (mm)	8 x outer diameter	8 x outer diameter
Maximum traversing velocity (m/min)	120	120

14.3.2 Technical data of MOTION-CONNECT 350

14.3.2.1 General technical data

Technical data

Table 14-39 General technical data of MOTION-CONNECT 350

Property	MOTION-CONNECT 350 power cable	MOTION-CONNECT 350 encoder cable
Jacket material	PVC	PVC
Number of conductors	• With brake conductors: 6 • Without brake conductors: 4	6
Operating temperature (°C)	-20 ... +80	-20 ... +80
Shielding	Braided shield; coverage ≥ 85%	Braided shield; coverage ≥ 85%
Oil resistance	EN 60811-2-1	EN 60811-2-1
Flame retardancy	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3
Coolant resistance	EN 60811-2-1	EN 60811-2-1
Degree of protection (motor-side only)	IP65	IP65
Bending cycles	1 million	1 million
Rated voltage U_0/U (V)	300/1000	30/300

14.3.2.2 Specific technical data

Technical data

Property	MOTION-CONNECT 350 power cable	MOTION-CONNECT 350 encoder cable
Cross-section of conductors (mm^2)	• With brake conductors: 4 x 0.75 + 2 x 0.38 (4 × 18 AWG + 2 × 22 AWG) • Without brake conductors: 4 x 0.75 (4 × 18 AWG)	• Cable length up to 15 m: 3 x 2 x 0.25 (3 × 2 × 24 AWG) • Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG)
Outer diameter (mm)	ø (7.5 ± 0.2)	ø (7 ± 0.2)
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter
Minimum bending radius, dynamic (mm)	7.5 x outer diameter	7.5 x outer diameter
Maximum acceleration (m/s^2)	3	3
Maximum traversing velocity (m/min)	40	40

14.3.3 Technical data of MOTION-CONNECT 380

14.3.3.1 General technical data

Technical data

Table 14-40 General technical data of MOTION-CONNECT 380

Property	MOTION-CONNECT 380 power cable	MOTION-CONNECT 380 encoder cable
Jacket material	PUR	PUR
Number of conductors	• With brake conductors: 6 • Without brake conductors: 4	6
Operating temperature (°C)	-20 ... +80	-20 ... +80
Shielding	Braided shield; coverage ≥ 85%	Braided shield; coverage ≥ 85%
Oil resistance	EN 60811-2-1	EN 60811-2-1
Flame retardancy	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3
Coolant resistance	EN 60811-2-1	EN 60811-2-1
Degree of protection (motor-side only)	IP65	IP65
Bending cycles	5 million	5 million
Rated voltage U_0/U (V)	300/1000	30/300

14.3.3.2 Specific technical data

Technical data

Property	MOTION-CONNECT 380 power cable	MOTION-CONNECT 380 encoder cable
Cross-section of conductors (mm^2)	• With brake conductors: 4 x 0.75 + 2 x 0.38 (4 × 18 AWG + 2 × 22 AWG) • Without brake conductors: 4 x 0.75 (4 × 18 AWG)	• Cable length up to 15 m: 3 x 2 x 0.25 (3 × 2 × 24 AWG) • Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG)
Outer diameter (mm)	ø (7.5 ± 0.2)	ø (7 ± 0.2)
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter
Minimum bending radius, dynamic (mm)	7.5 x outer diameter	7.5 x outer diameter
Maximum acceleration (m/s^2)	5	5
Maximum traversing velocity (m/min)	180	180

14.3.3.3 Acceleration characteristic curve

Description

The acceleration characteristic curve of MOTION-CONNECT 380 is as follows:

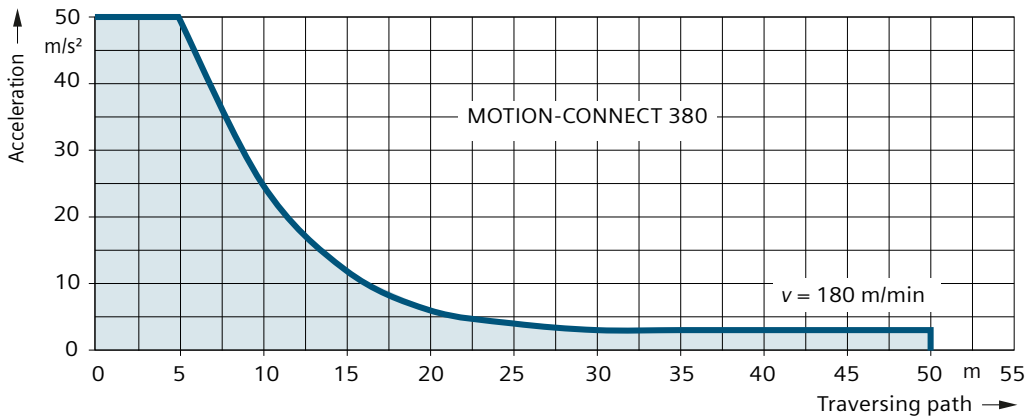


Figure 14-11 Acceleration characteristic curve of MOTION-CONNECT 380

Examples/applications

15

Description

You can find SINAMICS application examples in the Application examples (https://sieportal.siemens.com/su/bkbaa).

Appendix

A

A.1 Parameters

A.1.1 Explanation of the list of parameters

Overview

The representation of a parameter includes as a maximum the information listed below. Depending on the specific parameter, some of the listed information is not applicable.

The parameters are displayed according to the following example:

---

rxxxx **Parameter name**

Variant:		Product variant	
Data type: Integer16		**Visible in:** Standard display	
Read permission:		Read drive data or acknowledge messages	
Write permission:		Edit device configuration or drive applications	
Can be changed in the operating state:		Ready for operation	
Parameter group:		Name of the group(s)	
Unit: -			
Min:	**Max:**		**Factory setting:**
-	-		-

Description: Text

Value:
0: Name of value 0
10: Name of value 10

Recommendation: Text

Index:
[0] = Name and meaning of index 0
[1] = Name and meaning of index 1

Bit array:

Bit	Signal name	1 signal	0 signal
00	Name of bit 0	Yes	No
01	Name of bit 1	Yes	No

Dependency: Text
See also: pxxx, rxxx
See also: Fxxxxx, Axxxxx, Cxxxxx

Danger/Caution/Warning/Notice: Safety-related note corresponding to the warning note concept

Note: Text

Note

Some parameters may have different properties and descriptions depending on the selected axis type. And those parameters are displayed twice in the parameter list with additional labels. You need to refer to the specific parameters according to your actual axis type.

Description of function

Parameter number

The parameter number is made up of a "p", "r" or "c", followed by several numbers and optionally an index and bit array.

The parameter number has the following syntax: pxxxx[0...n], rxxxx[0...n], cxxxx[0...n], pxxxx.0...15 or rxxxx.0...15, cxxxx.0...15, pxxxx[0...n].0...15 or rxxxx[0...n].0...15, cxxxx[0...n].0...15.

Examples of representation in the parameter list:

- p... Adjustable parameters (read and write)
- r... Display parameters (read-only)
- c... Display parameters (read-only)
- p0972 Adjustable parameter 972
- p0489[0...2] Adjustable parameter 489, index 0 to 2
- r0945 Display parameter 945
- r0196[0...255].0...15 Display parameter with index 0 to 255 and bit array from bit 0 to bit 15
- r5613.0...1 Display parameter 5613 with bit array from bit 0 to bit 1
- c8997[0...2] Display parameter 8997, index 0 to 2

Other examples of the notation in the documentation:

- p9563[1] Adjustable parameter 9563, index 1
- r0196[1].5 Display parameter 196, index 1, bit 5
- r0964[2] Display parameter 964, index 2
- p5611.1 Adjustable parameter 5611, bit 1

Parameter name

Shows the parameter name in the long form.

Variant

Specifies the product variant for which the parameter is valid. This information is not applicable if a parameter is the same for all product variants used in the parameter list.

Data type

Each parameter is assigned one of the following data types:

- Integer8 8-bit integer
- Integer16 16-bit integer
- Integer32 32-bit integer
- Unsigned8 8-bit without sign
- Unsigned16 16-bit without sign
- Unsigned32 32-bit without sign
- FloatingPoint32 32-bit floating-point number
- FloatingPoint64 64-bit floating-point number

Visible in

You change the number of parameters displayed in the commissioning tool via:

- Standard display
  Only the basic parameters are displayed.
- Extended display
  The full scope of parameters is displayed.

Permission

The user and rights management (UMAC) controls access to the parameters.

You require runtime function rights to read and set parameters.

The following read permissions are available:

- Read drive data or acknowledge messages

The following write permissions are available:

- Control drive in manual mode
- Perform drive diagnostics
- Perform firmware update
- Create backup or load drive data to Startdrive
- Edit device configuration or drive applications
- Edit Safety Integrated application
- Edit web server configuration
- Manage users and roles
- Edit drive data encryption
- Edit other security settings
- Read security events

Runtime function rights depend on user roles, which are assigned in the commissioning tool being used. As a consequence, setting parameters can be write-protected.

The commissioning tool provides additional support.

Can be changed in the operating state

A parameter can only be changed in this operating state. The change only becomes active after exiting the state.

The following states exist:

- Operation
  The pulses have been enabled.
- Ready for operation
  The pulses are not enabled and state "Commissioning" is not active.
- Commissioning
  Commissioning takes place.
  The pulses cannot be enabled.

Parameter group

A parameter group contains parameters that are functionally associated with one another.

Unit

Shows the default unit of the parameter. For adjustable parameters, the unit is additionally specified according to the values (Min, Max, Factory setting) in square brackets.

Min, Max, Factory setting

The parameter value "when shipped" is specified under "Factory setting" with the relevant unit in square parentheses.

The value can be adjusted within the range defined by "Min" and "Max".

This information is not applicable for display parameters.

Min	Minimum value of the parameter [unit]
Max	Maximum value of the parameter [unit]
Factory setting	Value when delivered [unit]

Description

Explanation of the function of a parameter.

Value

List of the possible values of a parameter.

Recommendation

Information about recommended settings.

Index

Indexed parameters represent the name and its significance for each individual index.

The following applies to the values (Min, Max, Factory setting) of indexed adjustable parameters:

- Min, Max:
  The adjustment range and the unit apply to all indices.
- Factory setting:
  When all indices have the same factory setting, index 0 is specified with the unit to represent all indices.
  When the indices have different factory settings, they are all listed individually with the unit.

Bit array

For parameters with bit fields, the following information is provided about each bit:

- Bit number and signal name
- Meaning for signal states 0 and 1
- Function diagram (optional)
  The signal is shown in the function diagram.

Dependency

Specification of interactions that this parameter can potentially have:

- Effect on other parameters
- Dependent on other parameter settings (dependent on the selected functions)
- List of other parameters to be considered
- List of faults and alarms to be considered

Danger/Caution/Warning/Notice

The safety-relevant notes correspond to the warning note concept and contain the following information:

- Important information that must be observed to avoid the risk of physical injury or material damage.
- Information that must be observed to avoid any problems.
- Information that the user may find useful.

Note

Additional explanations about parameters

A.1.2 Parameter list

Product: SINAMICS S200, Version: 605022002, Language: eng
Objects: S200 Compact

r0002 Drive operating display

	Data type: Integer16	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Status parameters, Diagnostics general, Drive enable signals
	Unit: -	
Description:	Operating display for the drive.	
Value:	0:	Operation - Everything enabled
	10:	Operation - Set "enable setpoint" = "1"
	11:	Operation - Set "Enable speed controller" = "1"
	12:	Operation - RFG frozen, set "RFG start" = "1"
	13:	Operation - Set "enable RFG" = "1"
	14:	Operation - MotID, excitation running or brake opens, SS2
	15:	Operation - Open brake (p1215)
	16:	Operation - Withdraw braking with OFF1 using "ON/OFF1" = "1"
	17:	Operation - Braking with OFF3 can only be interrupted with OFF2
	18:	Operation - Brake on fault, remove fault, acknowledge
	21:	Ready for operation - Set "Enable operation" = "1"
	23:	Ready for operation - Set "Infeed operation" = "1"
	31:	Ready for switching on - Set "ON/OFF1" = "0/1"
	35:	Switching on inhibited - Carry out first commissioning
	41:	Switching on inhibited - Set "ON/OFF1" = "0"

42: Switching on inhibited - Set "Operating condition/OFF2" = "1"
43: Switching on inhibited - Set "Operating condition/OFF3" = "1"
44: Switching on inhibited - Supply STO terminal w/ 24 V (hardware)
45: Switching on inhibited - Rectify fault, acknowledge fault, STO
46: Switching on inhibited - Exit commissioning mode
60: Drive deactivated/not operational
70: Initialization
200: Wait for run-up
250: Device signals a topology error

Dependency: See also: r0046

NOTICE
For several missing enable signals, the corresponding value with the highest number is displayed.

Note
OC: Operating condition
EP: Enable Pulses (pulse enable)
RFG: Ramp-function generator
COMM: Commissioning
MotID: Motor data identification

r0020 Speed setpoint smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Unit: rpm

Description: Displays the currently smoothed speed setpoint at the input of the speed controller or U/f characteristic (after the interpolator).

Dependency: See also: r1438

Note
Smoothing time constant = 100 ms
The signal is not suitable as a process quantity and may only be used as a display quantity.
The speed setpoint is available smoothed (r0020) and unsmoothed (r1438).

r0021 Speed actual value smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics, Mode signals / displays
Unit: rpm

Description: Display for the smoothed actual value of the motor speed.

Dependency: See also: r0063

Note
Smoothing time constant = 100 ms
The speed actual value is available smoothed (r0021) and unsmoothed (r0063).

r0026 DC link voltage smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Brake control, Mode signals / displays
Unit: V

Description: Displays the smoothed actual value of the DC link voltage.

Dependency: See also: r0070

NOTICE
This smoothed signal is not suitable for diagnostics or evaluation of dynamic operations. In this case, the unsmoothed value should be used.

Note
Smoothing time constant = 100 ms
The signal is not suitable as a process quantity and may only be used as a display quantity.
The DC link voltage is available smoothed (r0026) and unsmoothed (r0070).

r0027 Absolute actual current smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Power unit
Unit: Arms

Description: Displays the smoothed absolute current actual value.

Dependency: See also: r0068

NOTICE
This smoothed signal is not suitable for diagnostics or evaluation of dynamic operations. In this case, the unsmoothed value should be used.

Note
ALM_S120, S_INF, VECTOR: Smoothing time constant = 300 ms
SERVO: Smoothing time constant = 100 ms
The signal is not suitable as a process quantity and may only be used as a display quantity.
The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).

r0031 Actual torque smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Brake control, Mode signals / displays
Unit: Nm

Description: Displays the smoothed torque actual value.

Dependency: See also: r0080

Note
Smoothing time constant = 100 ms
The signal is not suitable as a process quantity and may only be used as a display quantity.
The torque actual value is available smoothed (r0031) and unsmoothed (r0080).

r0032 Active power actual value smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Unit: kW

Description: Display for the smoothed actual value of the active power.

Dependency: See also: r0082

Note
The active power is available smoothed (r0032 with 100 ms, r0082[1] with 1 ms) and unsmoothed (r0082[0]).

r0034 Motor utilization thermal

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor temperature, Mode signals / displays
Unit: %

Description: Displays the thermal motor utilization taking into account the ambient temperature set in p0613.

Dependency: See also: p0613
See also: F07011, A07012

NOTICE
After the drive is switched on, the system starts to determine the motor temperature with an assumed model value. This means that the value for the motor utilization is only valid after a stabilization time.

r0035 Motor temperature

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor temperature, Mode signals / displays
Unit: °C

Description: Displays the actual temperature in the motor.

r0036[0...2] Power unit overload

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Power unit
Unit: %

Description: Display when the power unit is overloaded.
A reference value is defined for the monitoring functions.
An overload (0 %) is not displayed if the reference value is not exceeded.
The display value increases if the reference value is exceeded.
An alarm is output if an overload is active over a certain time period; a fault is output when 100% is reached.

Index: [0] = I2t (AC)
[1] = Reserved
[2] = Reserved

Dependency: See also: p0290
See also: F30005, A30256, A30257, F30258, A30267, F30268

Note
For index [0]:
This index shows the actual state of the I2t monitoring on the AC side.
The reference value represents the AC current that the power unit can permanently provide, without the influence of switching losses (e.g. the continuously permissible current of capacitors, inductances, busbars, etc.).

For index [1]:
This index shows the actual state of the active power monitoring.
The reference value represents the active power that the power unit can continuously provide.

For index [2]:
This index shows the actual state of the I2t monitoring on the DC side.
The reference value represents the DC current that can continuously flow in the DC link.

r0037[0...10] Power unit temperatures

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Power unit
Unit: °C

Description: Displays the temperatures in the power unit.

Index:
[0] = Inverter maximum value
[1] = Depletion layer maximum value
[2] = Reserved
[3] = Reserved
[4] = Interior of power unit
[5] = Reserved
[6] = Reserved
[7] = Depletion layer maximum value 1
[8] = Depletion layer maximum value 2
[9] = Reserved
[10] = Reserved

Note
r0037[0]: Maximum value of the inverter temperatures.
r0037[1]: Maximum value of the depletion layer temperatures.
In the case of a fault, the particular shutdown threshold depends on the power unit, and cannot be read out.

r0039[0...2] Energy display

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Power loss optimization
Unit: kWh

Description: Display for the energy values at the drive output terminals.

Index:
[0] = Energy balance (sum)
[1] = Energy drawn
[2] = Energy fed back

Note
For index [0]:
Difference between the energy drawn and energy that is fed back.

r0044 Thermal converter utilization

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Power unit
Unit: %

Description: Displays the thermal converter utilization as a percentage.
With this value, various thermal monitoring functions are taken into account.

Dependency: See also: r0034

Note
The thermal motor utilization is displayed in parameter r0034.

r0046.0...30 Missing enable signals

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Control/status words, Drive enable signals
Unit: -

Description: Displays the missing enable signals. All enable signals are required to operate the drive. The enable signals are set by the control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	OFF1 enable missing	Yes	No
01	OFF2 enable missing	Yes	No
02	OFF3 enable missing	Yes	No
03	Operation enable missing	Yes	No
08	Safety enable missing	Yes	No
10	Ramp-function generator enable missing	Yes	No
12	Speed setpoint enable missing	Yes	No
16	OFF1 enable internal missing	Yes	No
17	OFF2 enable internal missing	Yes	No
18	OFF3 enable internal missing	Yes	No
19	Pulse enable internal missing	Yes	No
21	STOP2 enable internal missing	Yes	No
24	License missing	Yes	No
26	Drive inactive or not operational	Yes	No
28	Brake open missing	Yes	No
30	Speed controller enable missing	Yes	No

Dependency: See also: r0002

Note
The value r0046 = 0 indicates that all enable signals for this drive are present.
Bit 00 = 1 (enable signal missing), if:
- OFF1 from the PROFINET interface missing.
- Switching on inhibited is active.

Bit 01 = 1 (enable signal missing), if:
- OFF2 from the PROFINET interface missing.

Bit 02 = 1 (enable signal missing), if:
- OFF3 from the PROFINET interface missing.

Bit 03 = 1 (enable signal missing), if:
- "Enable operation" from the PROFINET interface missing.

Bit 08 = 1 (enable signal missing), if:
- Safety functions have been enabled and STO is active.
- A safety-relevant message with STO as response is active.
STO enabled via terminals:
- Pulse enable via the STO terminals has a 0 signal.
- Additional details relating to the reason that STO was selected, see parameter r10352.

Bit 10 = 1 (enable signal missing), if:
- "Enable ramp-function generator" from the PROFINET interface missing.

Bit 12 = 1 (enable signal missing), if:
- "Enable setpoint" from the PROFINET interface missing.

Bit 16 = 1 (enable signal missing), if:
- There is an OFF1 fault response. The system is only enabled if the fault is removed and was acknowledged and the "switching on inhibited" withdrawn with OFF1 = 0.

Bit 17 = 1 (enable signal missing), if:
- The commissioning mode is selected.
- There is an OFF2 fault response.
- The drive is inactive or not capable of operation.

Bit 18 = 1 (enable signal missing), if:
- OFF3 has still not been completed or an OFF3 fault response is present.

Bit 19 = 1 (internal pulse enable missing), if:
- Synchronization still not completed.

Bit 21 = 1 (enable signal missing), if:
The pulses have been enabled and the speed setpoint has still not been enabled, because:
- The holding brake opening time has still not elapsed.
- The encoder has not been calibrated (synchronous motor).

Bit 26 = 1 (enable signal missing), if:
- The drive is inactive or not capable of operation.
- The drive is in the "PROFIenergy energy-saving mode".

Bit 28 = 1 (enable signal missing), if:
- The holding brake is closed or has still not been opened.

Bit 30 = 1 (speed controller inhibited), if one of the following reasons is present:
- Pulse enable missing

- The function generator with current setpoint is active.
- The measuring function "current controller reference frequency characteristic" is active.

r0060 Speed setpoint before the setpoint filter

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Speed setpoint filter
Unit: rpm

Description: Displays the actual, unsmoothed speed setpoint at the speed controller input.

r0061[0...1] Actual speed unsmoothed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Encoder evaluation, Mode signals / displays
Unit: rpm

Description: Displays the unsmoothed speed actual value sensed by the encoder.
Index: [0] = Motor encoder
[1] = Reserved

r0062 Speed setpoint after the filter

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Speed controller, Mode signals / displays, Speed setpoint filter
Unit: rpm

Description: Displays the speed setpoint after the setpoint filters.

r0063 Speed actual value smoothed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Speed controller, Speed actual value filter, Mode signals / displays
Unit: rpm

Description: Display for the smoothed speed actual value.
Dependency: See also: r0021, r0061, p1441

Note
The smoothing time is set in p1441.
The speed actual value is available strongly smoothed (r0021) and unsmoothed (r0061).

r0068 Absolute current actual value

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Unit: Arms

Description: Displays actual absolute current.
Dependency: See also: r0027

NOTICE
The value is updated with a sampling time of 1 ms.

Note
Absolute current value = sqrt(Iq^2 + Id^2)
The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).

r0070 Actual DC link voltage

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Vdc-min/max controller, Mode signals / displays, Power unit, Vdc controller
Unit: V

Description: Display for the measured actual value of the DC link voltage.
Dependency: See also: r0026

Note
The DC link voltage is available smoothed (r0026) and unsmoothed (r0070).

r0072 Output voltage

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Current controller, Mode signals / displays, Power unit
Unit: Vrms

Description: Display for the actual output voltage of the power unit.

r0076 Current actual value field-generating

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Current controller
Unit: Arms

Description: Display for the field-generating current actual value.

r0077[0...1] Current setpoint torque-generating

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Current controller, Mode signals / displays
Unit: Arms

Description: Displays the torque/force-generating current setpoint.
Index: [0] = Current setpoint
[1] = Current setpoint model

r0078[0...1] Current actual value torque-generating

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Unit: Arms

Description: Display for the actual value of the torque-generating current Iq.
Index: [0] = Unsmoothed
[1] = Smoothed with 1 ms

r0079[0...1] Torque setpoint total

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages
Parameter group: Torque limiting, Mode signals / displays
Unit: Nm

Description: Displays the torque setpoint at the output of the speed controller.

Index: [0] = Unsmoothed
[1] = Smoothed with 1 ms

r0080 Torque actual value

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor model, Mode signals / displays
Unit: Nm

Description: Displays the actual torque value.

Dependency: See also: r0031

Note
The value is available smoothed (r0031) and unsmoothed (r0080).

r0081 Torque utilization

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Torque limiting, Mode signals / displays
Unit: %

Description: Displays the torque utilization as a percentage.
The torque utilization is obtained from the required smoothed torque referred to the torque limit.

Note
The torque utilization is obtained from the required torque referred to the torque limit as follows:
- Positive torque: r0081 = ((r0079 + p1532) / (r1538 - p1532)) * 100 %
- Negative torque: r0081 = ((-r0079 + p1532) / (-r1539 + p1532)) * 100 %
The calculation of the torque utilization depends on the selected smoothing time constant (1 ms).

r0082[0...3] Active power actual value

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Unit: kW

Description: Displays the actual active power.

Index: [0] = Unsmoothed
[1] = Smoothed with 1 ms
[2] = Power drawn
[3] = Power drawn smoothed

Dependency: See also: r0032

Note
The mechanical active power is available smoothed (r0032 with 100 ms, r0082[1] with 1 ms) and unsmoothed (r0082[0]).
For index [3]:
Smoothing time constant = 0.25 ms

r0196[0...255].0...15 Topology component status

Data type: Unsigned32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics general
Unit: -

Description: Displays the status of the components.
r0196[0]: Group status of all components
r0196[1]: Status of component with component number 1
...
r0196[255]: Status of component with component number 255

Bit array:

Bit	Signal name	1 signal	0 signal
00	Component status bit 0	High	Low
01	Component status bit 1	High	Low
02	Component status bit 2	High	Low
03	Component status bit 3	High	Low
04	Component state	Active	Inactive/parking
06	Topology problem active	Yes	No
07	Part of the target topology	Yes	No only act topo
08	Alarm present	Yes	No
09	Safety message present	Yes	No
10	Fault present	Yes	No
11	Alarm class bit 0	High	Low
12	Alarm class bit 1	High	Low
13	Maintenance required	Yes	No
14	Maintenance urgently required	Yes	No
15	Fault gone/can be acknowledged	Yes	No

Note
For bit 03 ... 00:
Bit 3, 2, 1, 0 = 0, 0, 0, 0 --> component not available.
Bit 3, 2, 1, 0 = 0, 0, 0, 1 --> run up, acyclic communications (LED = orange).
Bit 3, 2, 1, 0 = 0, 0, 1, 0 --> operating mode, cyclic communications (LED = green).
Bit 3, 2, 1, 0 = 0, 0, 1, 1 --> alarm (LED = green).
Bit 3, 2, 1, 0 = 0, 1, 0, 0 --> fault (LED = red).
Bit 3, 2, 1, 0 = 0, 1, 0, 1 --> detection via LED and operating mode (LED = green/orange).
Bit 3, 2, 1, 0 = 0, 1, 1, 0 --> detection via LED and alarm (LED = green/orange).
Bit 3, 2, 1, 0 = 0, 1, 1, 1 --> detection via LED and fault (LED = red/orange).
Bit 3, 2, 1, 0 = 1, 0, 0, 0 --> firmware being downloaded (LED = green/red with 0.5 Hz).
Bit 3, 2, 1, 0 = 1, 0, 0, 1 --> firmware download completed, wait for POWER ON (LED = green/red with 2.0 Hz).
For bits 12 ... 11:
These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.

p0201[0] Power unit code number

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Power unit
Unit: -

Min:	Max:	Factory setting:
0	65535	0

Description: Sets the actual code number of the power unit being used.

p0210 Device supply voltage

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Power unit, Quick commissioning	
Unit: V		
Min:	**Max:**	**Factory setting:**
1 [V]	63000 [V]	400 [V]

Description: Sets the device supply voltage.
The voltage between two phases should be entered as the device supply voltage.
This setting is important for operating with voltages that are less than the voltage range for which the drive is designed.

Note
Setting ranges for p0210 as a function of the rated power unit voltage:
U_rated = 230 V:
- p0210 = 200 ... 240 V
U_rated = 400 V:
- p0210 = 380 ... 480 V (wide voltage range, in addition to 200 ... 240 V)

p0215 Braking resistor selection

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Unit: -		
Min:	**Max:**	**Factory setting:**
3	10	10

Description: Sets the external braking resistor.

Value:
3: Third-party braking resistor (with software monitoring)
10: No monitoring (external braking resistor)

Dependency: See also: p0216, p0218, p0219

Note
p0215 = 3:
An externally connected braking resistor is controlled and also thermally monitored per software.
Parameters p0216, p0218 and p0219[0] and p0219[1] must be set in order that the monitoring functions. Chopper operation is not possible if the values are not set.
p0215 = 10:
The externally connected braking resistor is not monitored.
If the power unit has an internal braking resistor, then this is monitored.

p0216 Braking resistance value

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning

Parameter group: Dynamic braking, Quick commissioning
Unit: ohm

Min:	Max:	Factory setting:
0.0 [ohm]	1000.0 [ohm]	0.0 [ohm]

Description: Sets the resistance value of a connected external braking resistor.
Dependency: The parameter is only relevant for p0215 = 3.

p0218 Braking resistor duration at maximum power

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Dynamic braking, Quick commissioning
Unit: s

Min:	Max:	Factory setting:
0.00 [s]	2000.00 [s]	0.00 [s]

Description: Sets the maximum duration when operating the braking resistor at its maximum power level.
Dependency: The parameter is only relevant for p0215 = 3.

p0219[0...1] Braking resistor braking power

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Dynamic braking, Quick commissioning
Unit: kW

Min:	Max:	Factory setting:
0.00 [kW]	20000.00 [kW]	0.00 [kW]

Description: Sets the braking power of the connected braking resistor.
Index: [0] = Maximum power
[1] = Rated power

r0277[0...2] Power unit fan wear counter

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Power unit
Unit: %

Description: Displays the wear counter of the fan in the power unit.
After a fan has been replaced, using an appropriate button, the value can be reset in the commissioning tool to 0.
Index: [0] = Heat sink fan
[1] = Auxiliary fan 1
[2] = Auxiliary fan 2
Dependency: See also: A30042

r0289 Maximum power unit output current

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group: Torque limiting, Power unit

Unit: Arms

Description: Display and numerical signal source for the actual maximum output current of the power unit.
Derating factors must be taken into account for this value.

p0290 Power unit overload response

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Power unit	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the response to a thermal overload condition of the power unit.
The following quantities can result in a response to thermal overload:
- Heat sink temperature (r0037[0]).
- Chip temperature (r0037[1]).
- Power unit overload I2t (r0036).

Possible measures to avoid thermal overload:
- Reduction of the output current limit (for closed-loop speed/velocity or torque/force control).
- Reduction of the pulse frequency.

A reduction, if parameterized, is always realized after an appropriate alarm is output.

For p0290 = 0:
When a temperature alarm threshold is exceeded, the output current is reduced, and in turn, the output frequency. If the current reduction is not sufficient to thermally relieve the power unit, when the drive reaches the temperature fault threshold it switches off.
This setting is not suitable for drives that require a constant torque.
Application:
Pumps, fans

For p0290 = 1:
The power unit operates at the required operating point. When the fault threshold is reached, the drive switches off and an appropriate fault is output.
Application:
Drive applications where, as a result of the underlying process, no setpoint deviations of individual drives in the group are permitted - or where the pulse frequency must be strictly maintained.

Value:
0: Reduce output current
1: No reduction shutdown when overload threshold is reached

Dependency: For a thermal power unit overload, an appropriate alarm or fault is output.
See also: r0036, r0037

NOTICE
If the thermal overload of the power unit is not sufficiently reduced by the actions taken, the drive is always shut down. This means that the power unit is always protected irrespective of the setting of this parameter.

Note
When the motor data identification routine is selected, parameter p0290 cannot be changed.
For p0290 = 0:
This is setting is only practical if the load decreases with decreasing speed (e.g. for applications with variable torque such as for pumps and fans).

r0296 DC link voltage undervoltage threshold

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Power unit
Unit: V

Description: Threshold to detect a DC link undervoltage.
If the DC link voltage falls below this threshold, the drive unit is tripped due to a DC link undervoltage condition.

Dependency: See also: F30003

Note
The actual threshold value depends on the device type and the selected device supply voltage (p0210).

r0297 DC link voltage overvoltage threshold

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Power unit
Unit: V

Description: Threshold to detect a DC link overvoltage.
If the DC link voltage exceeds the threshold specified here, the drive device is tripped due to DC link overvoltage.

Dependency: See also: F30002

p0300[0] Motor type selection

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Motor data, Quick commissioning
Unit: -

Min:	Max:	Factory setting:
0	10000	0

Description: Selects the motor type or start to read in the motor parameters for a motor with self-identifying data (p0300 = 10000).
For p0300 < 10000 the following applies:
The first digit of the parameter value always defines the general motor type and corresponds to the third-party motor belonging to a motor list:
2 = rotating synchronous motor

Value:
0: No motor
2: Synchronous motor
2120: 1FL2 synchronous motor
2121: 1FL1 synchronous motor
10000: Motor with data set

Dependency: See also: p0301

p0301[0] Motor code number selection

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning

Parameter group:	Motor data, Quick commissioning	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	99999999	0

Description: Code number of the connected motor, whose data was accepted when commissioning.

Dependency: Code numbers are only possible for motor types that correspond to the motor type selected in p0300.
See also: p0300

Note
For a motor with self-identifying data, p0301 cannot be changed. p0301 is automatically written to the code number of the motor parameter read in (r0302) if p0300 is set to 10000. For other values, the commissioning routine cannot be exited.

r0302[0] Motor code (identified)

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Motor data, Quick commissioning
Unit: -	

Description: Displays the identified motor code number.
When the drive powers up, the motor code is read out the motor. For r0302 = 0, the motor data were not identified.

p0304[0] Rated motor voltage

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data, Quick commissioning	
Unit: Vrms		
Min:	**Max:**	**Factory setting:**
0 [Vrms]	20000 [Vrms]	0 [Vrms]

Description: Displays the rated motor voltage.

p0305[0] Rated motor current

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data, Quick commissioning	
Unit: Arms		
Min:	**Max:**	**Factory setting:**
0.00 [Arms]	10000.00 [Arms]	0.00 [Arms]

Description: Displays the rated motor current.

p0307[0] Rated motor power

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning

Parameter group:	Motor data, Quick commissioning	
Unit: kW		
Min:	**Max:**	**Factory setting:**
0.00 [kW]	100000.00 [kW]	0.00 [kW]

Description: Displays the rated motor power.

p0311[0] Rated motor speed

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data, Quick commissioning	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
0.0 [rpm]	210000.0 [rpm]	0.0 [rpm]

Description: Displays the rated motor speed.

p0312[0] Rated motor torque

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data	
Unit: Nm		
Min:	**Max:**	**Factory setting:**
0.00 [Nm]	1000000.00 [Nm]	0.00 [Nm]

Description: Displays the rated motor torque.

p0316[0] Motor torque constant

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor data, Quick commissioning	
Unit: Nm/A		
Min:	**Max:**	**Factory setting:**
0.000 [Nm/A]	4000.000 [Nm/A]	0.000 [Nm/A]

Description: Sets the torque constant of the synchronous motor.
r0316 = 0:
The torque constant is calculated from p0312 or p0307.
r0316 > 0:
The set value is used as torque constant.

p0318[0] Motor stall current

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data	
Unit: Arms		
Min:	**Max:**	**Factory setting:**
0.00 [Arms]	10000.00 [Arms]	0.00 [Arms]

Description: Displays the rated motor stall current.

p0319[0] Motor static torque

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data	
Unit: Nm		
Min:	**Max:**	**Factory setting:**
0.00 [Nm]	100000.00 [Nm]	0.00 [Nm]

Description: Displays the motor standstill/static torque.

p0322[0] Maximum motor speed

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data, Quick commissioning	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
0.0 [rpm]	210000.0 [rpm]	0.0 [rpm]

Description: Displays the maximum motor speed.

Dependency: See also: p1082

p0323[0] Maximum motor current

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data, Quick commissioning	
Unit: Arms		
Min:	**Max:**	**Factory setting:**
0.00 [Arms]	20000.00 [Arms]	0.00 [Arms]

Description: Displays the maximum permissible motor current.

p0341[0] Motor moment of inertia

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor data, Speed controller	
Unit: kgm²		
Min:	**Max:**	**Factory setting:**
0.000000 [kgm²]	100000.000000 [kgm²]	0.000000 [kgm²]

Description: Displays the motor moment of inertia (without load).

p0400[0] Encoder type selection

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation, Quick commissioning	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	10100	0

Description: Selects the encoder from the list of encoder types supported.

Value:

0:	No encoder
801:	Digital encoder interface AS17, singleturn
802:	Digital encoder interface AS21, singleturn
803:	Digital encoder interface AM21, multiturn 4096
9999:	User defined
10100:	Identify encoder (waiting)

NOTICE

An encoder type with p0400 < 9999 defines an encoder for which there is an encoder parameter list.
When selecting a catalog encoder (p0400 < 9999) the parameters from the encoder parameter list cannot be changed (write protection).

Note

The connected encoder can be identified using p0400 = 10100. This means that the encoder must support this.

For p0400 = 10100 the following applies:
The connected encoder is identified. If identification is not possible, then p0400 remains set = 10100, and the system waits until identification is possible.

p0404[0].1...20 Encoder configuration effective

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Unit: -		
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 0000 0000 0000 0000 0000 bin

Description: Settings for the basic encoder properties.

Bit array:

Bit	Signal name	1 signal	0 signal

01	Absolute encoder	Yes	No
02	Multiturn encoder	Yes	No
07	Digital Encoder Interface	Yes	No
20	Voltage level 5 V	Yes	No

NOTICE
This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note
For bit 01, 02 (absolute encoder, multiturn encoder):
These bits can only be selected for a DEI encoder.

p0408[0] Rotary encoder pulse number

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation
Unit: -

Min:	Max:	Factory setting:
0	16777215	1024

Description: Sets the number of pulses for a rotary encoder.
In conjunction with the fine resolution, the pulse number defines the transfer format for position actual values Gn_XIST1 (r0479).

NOTICE
This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note
The smallest permissible value is 1 pulse.
This value does not always correspond to the pulse number of the measuring device. For a DEI encoder, a value is entered here that facilitates optimum transfer of the resolution (p0423).

p0419[0] Fine resolution absolute value Gx_XIST2 (in bits)

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation
Unit: -

Min:	Max:	Factory setting:
0	18	9

Description: Sets the fine resolution in bits of the absolute position actual values.

Note
This parameter applies to process data Gx_XIST2 when reading the absolute value.

p0421[0] Absolute encoder rotary multiturn resolution

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation
Unit: -

Min:	Max:	Factory setting:
0	4294967295	4096

Description: Sets the number of revolutions that can be resolved for a rotary absolute encoder.

NOTICE
This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).

p0423[0] Absolute encoder rotary singleturn resolution

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation
Unit: -

Min:	Max:	Factory setting:
0	1073741823	8192

Description: Sets the number of measuring steps per revolution for a rotary absolute encoder.
The resolution refers to the absolute position.

NOTICE
This parameter is automatically preset for encoders from the encoder list and for "Encoder type selection" (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).

r0479[0...2] Diagnostics encoder position actual value Gn_XIST1

Data type: Integer32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Encoder evaluation
Unit: -

Description: Display for the encoder position actual value Gn_XIST1 according to PROFIdrive for diagnostics.
The value is displayed with sign.

Index: [0] = Motor encoder
[1] = Reserved
[2] = Reserved

p0488[0...2] Measuring probe 1 input terminal

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Measuring probe, Traversing blocks
Unit: -

Min:	Max:	Factory setting:
0	210	[0] 210 [1] 0 [2] 0

Description: Sets the input terminal to connect probe 1.

Value:
0: No measuring probe
210: DI 0 (X130.1)

Index:
[0] = Motor encoder
[1] = Reserved
[2] = Reserved

Dependency: See also: p0489, p0490

> ⚠ **CAUTION**
> In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
DI: Digital Input
Refer to the encoder interface for PROFIdrive.

p0489[0...2] Measuring probe 2 input terminal

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Measuring probe, Traversing blocks
Unit: -

Min:	Max:	Factory setting:
0	211	[0] 211 [1] 0 [2] 0

Description: Sets the input terminal to connect probe 2.

Value:
0: No measuring probe
211: DI 1 (X130.2)

Index:
[0] = Motor encoder
[1] = Reserved
[2] = Reserved

Dependency: See also: p0488, p0490

> ⚠ **CAUTION**
> In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
DI: Digital Input
Refer to the encoder interface for PROFIdrive.

p0490.0...1 Invert measuring probe or equivalent zero mark

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation

Parameter group: Measuring probe

Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Setting to invert the digital input signals to connect a measuring probe or an equivalent zero mark.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130.1)	Inverted	Not inverted
01	DI 1 (X130.2)	Inverted	Not inverted

Dependency: See also: p0488, p0489, p0494

Note
The terminal must be set as input.
When the measuring probe or the equivalent zero mark is inverted, this has no effect on the status displays of the digital inputs (r0721, r0722).
DI: Digital Input

p0494[0] Equivalent zero mark input terminal

Data type: Integer16 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Encoder evaluation, Homing

Unit: -

Min:	Max:	Factory setting:
0	211	0

Description: Selects the input terminal for connecting an equivalent zero mark (external encoder zero mark).

Value:
0: No equivalent zero mark (evaluation of the encoder zero mark)
210: DI 0 (X130.1)
211: DI 1 (X130.2)

Dependency: See also: p0490

⚠ CAUTION
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
Refer to the encoder interface for PROFIdrive.

p0550[0] Brake version

Data type: Integer16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Commissioning

Parameter group: Motor holding brake, Quick commissioning

Unit: -

Min:	Max:	Factory setting:
0	2	0

Description: Sets the brake version.

Value:
0: No data
1: Holding brake
2: High performance holding brake

NOTICE
After entering a corresponding code number (p0551), this parameter is automatically pre-assigned and write protected. The information in p0551 should be observed when removing write protection.

Note
For p0550 = 1:
The default value for opening time/closing time applies.
For p0550 = 2:
A shorter opening time/closing time is realized if the power unit supports the function.

p0551[0] Brake code number

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor holding brake, Quick commissioning	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	4294967295	1

Description:
Setting the code number for the brake.
0 = No data
1 = Manual entry
> 1 = valid code number
For value = 0:
- Parameters listed under Dependent are set to a value of zero and are write protected.
- Parameters p1216, p1217 are set to a value of zero.
For value = 1:
- Write protection for the parameters listed under Dependent is withdrawn.
For value > 1:
- Parameters listed under Dependent are automatically pre-assigned and are write protected.
- Parameters p1216, p1217 are automatically appropriately pre-assigned.

Dependency:
See also: p0550

Note
Only code numbers can be set that are permitted for the selected motor code (p0301).

p0613[0] Motor temperature model ambient temperature

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor temperature	
Unit: °C		
Min:	**Max:**	**Factory setting:**
-40 [°C]	100 [°C]	20 [°C]

Description:
Sets the motor ambient temperature.
Based on this value, the motor temperature model calculates the thermal motor utilization (r0034).

Dependency:
See also: r0034
See also: F07011, A07012

Note
If the thermal motor model is activated for permanent-magnet synchronous motors, then the parameter is incorporated in the model calculation if a temperature sensor is not being used.
For thermal motor model 1, the factory setting is based on an ambient temperature of 40 °C.

r0721.0...3 CU digital inputs terminal actual value

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Digital inputs
Unit: -

Description: Displays the actual value at the digital inputs.
This means that the actual input signal can be checked at terminal DI x prior to switching from the simulation mode (p0795.x = 1) to the terminal mode (p0795.x = 0).

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130.1)	High	Low
01	DI 1 (X130.2)	High	Low
02	DI 2 (X130.3)	High	Low
03	DI 3 (X130.4)	High	Low

Note
DI: Digital Input

r0722.0...3 Digital inputs status

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Digital inputs
Unit: -

Description: Displays for the status of the digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130.1)	High	Low
01	DI 1 (X130.2)	High	Low
02	DI 2 (X130.3)	High	Low
03	DI 3 (X130.4)	High	Low

Dependency: See also: p0488, p0489

Note
For bits 00, 01: DI 0 and DI 1 are fast digital inputs and can be used as measuring probe (p0488, p0489).
DI: Digital Input

c0730 Signal for terminal DO 0

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Digital outputs
Unit: -

Description: Signal for terminal DO 0 (X130.11/12).

Note
DO: Digital Output

r0747.0 Digital outputs status

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Digital outputs
Unit: -

Description: Displays the status of digital outputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DO 0 (X130.11/12)	High	Low

Note
Inversion using p0748 has been taken into account.
DI/DO: Parameterizable digital input/output

p0748.0 Invert digital outputs

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital outputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Setting to invert the signals at the digital outputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DO 0 (X130.11/12)	Inverted	Not inverted

Note
DI/DO: Parameterizable digital input/output

p0795.0...3 Digital inputs simulation mode

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital inputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Sets the simulation mode for digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130.1)	Simulation	Terminal eval
01	DI 1 (X130.2)	Simulation	Terminal eval
02	DI 2 (X130.3)	Simulation	Terminal eval
03	DI 3 (X130.4)	Simulation	Terminal eval

Dependency: The setpoint for the input signals is specified using p0796.
See also: p0796

Note
This parameter is not saved when backing up data (p0977).
DI: Digital Input

p0796.0...3 Digital inputs simulation mode setpoint

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Digital inputs
Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Sets the setpoint for the input signals in the digital input simulation mode.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130.1)	High	Low
01	DI 1 (X130.2)	High	Low
02	DI 2 (X130.3)	High	Low
03	DI 3 (X130.4)	High	Low

Dependency: The simulation of a digital input is selected using p0795.
See also: p0795

Note
This parameter is not saved when backing up data (p0977).
DI: Digital Input

c0849[0] No Quick Stop / Quick Stop (OFF3) signal 2

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Enable logic, Drive enable signals
Unit: -

Description: Second signal for command "No Quick Stop / Quick Stop (OFF3)"
The following signals are AND'ed:
- OFF3 enable via PROFIdrive
- c0849 "No Quick Stop / Quick Stop (OFF3) signal 2"

For the PROFIdrive profile, the result of the AND logic operation corresponds to control word 1 bit 2 (STW1.2).
No OFF3 enable via PROFIdrive or c0849 = 0 signal
- OFF3 (braking along the OFF3 ramp (p1135), then pulse cancellation and switching on inhibited)
OFF3 enable via PROFIdrive and c0849 = 1 signal
- No OFF3 (enable possible)

⚠ CAUTION
This signal also remains active when "master control from PC" is activated.

Note
After switching over to closed-loop torque control via telegram (see r1407.2 = 1 signal), Quick Stop (OFF3) does not have a dedicated braking response; however, pulses are canceled when standstill is detected (p1226, p1227).

r0898.0...14 Control word sequence control

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Control/status words
Unit: -

Description: Display for the control word of the sequence control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	ON/OFF1	ON	OFF
01	No coast-down / coast-down (OFF2)	No OFF2	OFF2
02	No Quick Stop / Quick Stop (OFF3)	No OFF3	OFF3
03	Enable operation	Yes	No
04	Enable ramp-function generator	Yes	No
05	Continue ramp-function generator	Yes	No
06	Enable speed setpoint	Yes	No
07	Command open brake	Yes	No
10	Control by PLC	Yes	No
12	Enable speed controller	Yes	No
14	Command close brake	Yes	No

Note
For bit 10:
This bit is only relevant for telegram types that cyclically send the associated bit in the control word. Otherwise, r0898.10 is always "Yes".

r0899.0...13 Status word sequence control

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Control/status words
Unit: -

Description: Display for the status word of the sequence control.
The status word is cyclically sent from the drive to the higher-level control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Ready for switching on	Yes	No
01	Ready	Yes	No
02	Operation enabled	Yes	No
03	Jog active	Yes	No
04	No coasting active	OFF2 inactive	OFF2 active
05	No Quick Stop active	OFF3 inactive	OFF3 active
06	Switching on inhibited active	Yes	No
07	Drive ready	Yes	No
08	Controller enable	Yes	No
09	Control requested	Yes	No
11	Pulses enabled	Yes	No
12	Motor holding brake control	Yes	No
13	Motor holding brake status	Yes	No

Note
For bits 00, 01, 02, 04, 05, 06, 09:
For PROFIdrive, these signals are used for status word 1.

r0922 IF1 PROFIdrive PZD telegram

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Quick commissioning, Configuration
Unit: -

Description: Displays the PROFIdrive telegram.

Value:

1:	Standard telegram 1, PZD-2/2
2:	Standard telegram 2, PZD-4/4
3:	Standard telegram 3, PZD-5/9
5:	Standard telegram 5, PZD-9/9
102:	SIEMENS telegram 102, PZD-6/10
105:	SIEMENS telegram 105, PZD-10/10

Note
The telegram is set in the commissioning tool or by the control.

r0922 IF1 PROFIdrive PZD telegram

Variant: S200 Compact
Values for: Basic positioner
Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Quick commissioning, Configuration
Unit: -

Description: Displays the PROFIdrive telegram.

Value:

7:	Standard telegram 7, PZD-2/2
9:	Standard telegram 9, PZD-10/5
111:	SIEMENS telegram 111, PZD-12/12
112:	SIEMENS telegram 112, PZD-17/12
113:	SIEMENS telegram 113, PZD-21/14

Note
The telegram is set in the commissioning tool or by the control.

r0924[0...1] ZSW bit pulses enabled

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the position of the "Pulses enabled" status signal in the PROFIdrive telegram.

Index:
[0] = Signal number
[1] = Bit position

p0925 PROFIdrive clock synchronous sign-of-life tolerance

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Configuration
Unit: -

Min:	Max:	Factory setting:
0	65535	1

Description: Sets the number of tolerated consecutive sign-of-life errors of the isochronous controller.
The sign-of-life signal is normally received in PZD4 (control word 2) from the controller.

Dependency: See also: F01912

Note
The sign-of-life monitoring is disabled for p0925 = 65535.

r0930 PROFIdrive operating mode

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the operating mode.
1: Closed-loop speed controlled operation with ramp-function generator
2: Closed-loop position controlled operation
3: Closed-loop speed controlled operation without ramp-function generator

r0944 Counter for fault buffer changes

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Display and numerical signal source for the counter for changes of the fault buffer.
This counter is incremented every time the fault buffer changes.

Recommendation: Used to check whether the fault buffer has been read out consistently.

Dependency: See also: r0945, r0947, r0948, r0949, r2109

r0945[0...63] Fault code

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the codes of faults that have occurred.

Dependency: See also: r0947, r0948, r0949, r2109, r2130, r2133, r2136, r3122

NOTICE
The properties of the fault buffer should be taken from the corresponding product documentation.

Note
The buffer parameters are cyclically updated (states are indicated in r2139).
Fault buffer structure (general principle):
r0945[0], r0949[0] or r2133[0], r2130[0], r0948[0], r2136[0], r2109[0]
--> Fault 1 (oldest active fault) of the active incident
. . .
r0945[7], r0949[7] or r2133[7], r2130[7], r0948[7], r2136[7], r2109[7]
--> fault 8 (latest active fault) of the active incident

For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).

History of acknowledged faults:
If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.
The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.

r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8]
--> fault 1 of the 1st acknowledged incident
. . .
r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16]
--> fault 1 of the 2nd acknowledged incident
. . .
r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56]
--> fault 1 of the 7th acknowledged incident
. . .
r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63]
--> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

r0947[0...63] Fault number

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the numbers of faults that have occurred.

Dependency: See also: r0945

NOTICE
The properties of the fault buffer should be taken from the corresponding product documentation.

Note
The buffer parameters are cyclically updated (states are indicated in r2139).
Fault buffer structure (general principle):
r0945[0], r0949[0] or r2133[0], r2130[0], r0948[0], r2136[0], r2109[0] --> fault 1 (oldest active fault) of the active incident
. . .
r0945[7], r0949[7] or r2133[7], r2130[7], r0948[7], r2136[7], r2109[7] --> fault 8 (latest active fault) of the active incident
For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).

History of acknowledged faults:
If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.
The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.

r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8] --> fault 1 of the 1st acknowledged incident
. . .
r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16] --> fault 1 of the 2nd acknowledged incident
. . .
r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56] --> fault 1 of the 7th acknowledged incident
. . .
r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63] --> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

r0948[0...63] Fault time received in milliseconds

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: ms

Description: Displays the system runtime in milliseconds when the fault occurred.

Dependency: See also: r0945, r0947, r0949, r2109, r2114, r2130, r2133, r2136, r3122

NOTICE
The time comprises r2130 (days) and r0948 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the fault buffer and the assignment of the indices is shown in r0945.
When the parameter is read via PROFIdrive, the TimeDifference data type applies.

r0949[0...63] Fault value

Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the fault that occurred (as integer number).

Dependency: See also: r0945, r0947, r0948, r2109, r2130, r2133, r2136, r3122

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the fault buffer and the assignment of the indices is shown in r0945.

p0952 Fault cases counter

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Faults / alarms
Unit: -

Min:	Max:	Factory setting:
0	65535	0

Description: Number of fault situations that have occurred since the last reset.

Dependency: The fault buffer is deleted (cleared) by setting p0952 to 0.
In order that faults with "POWER ON" acknowledgment can also be cleared from the fault buffer, POWER ON must first be carried out.
See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136

r0964[0...6] Device identification

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification
Unit: -

Description: Displays the device identification.

Index:
[0] = Company (Siemens = 42)
[1] = Device type
[2] = Firmware version
[3] = Firmware date (year)
[4] = Firmware date (day/month)
[5] = Reserved
[6] = Firmware patch/hot fix

Note
Example:
r0964[0] = 42 --> SIEMENS
r0964[1] = device type, see below
r0964[2] = 602 --> first part firmware version V06.02 (second part, refer to index 6)
r0964[3] = 2023 --> year 2023
r0964[4] = 1706 --> June 17
r0964[5] = 1 --> 1 (fixed value)
r0964[6] = 0 --> second part firmware version (complete version: V06.02.00.00)
Device type:
r0964[1] = 11200 --> SINAMICS S200 PN
r0964[1] = 11202 --> SINAMICS S200 PTI
r0964[1] = 11210 --> SINAMICS S200 Basic PN
r0964[1] = 11212 --> SINAMICS S200 Basic PTI

r0965 PROFIdrive profile number profile version

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the PROFIdrive profile number and profile version.
Constant value = 032A hex.
Byte 1: Profile number = 03 hex = PROFIdrive profile
Byte 2: profile version = 2A hex = 42 dec = version 4.2

Note
When the parameter is read via PROFIdrive, the Octet String 2 data type applies.

p0972 Drive reset

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Save & reset	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	3	0

Description: Sets the required procedure to execute a hardware reset for the drive.

Value:
0: Inactive
1: Hardware-Reset immediate
2: Hardware reset preparation
3: Hardware reset after cyclic communication has failed

⚠ DANGER
It must be absolutely ensured that the system is in a safe condition.
The memory card/device memory of the converter must not be accessed.

Note
For value = 1:
The reset is immediately executed and communications interrupted.
The reset operation should be checked once communications have been established.
This value cannot be set in operation.
For value = 2:
Help to check the reset operation.
- Firstly, set p0972 = 2 and then read back.
- Secondly, set p0972 = 1 (it is possible that this request is no longer acknowledged). The communication is then interrupted.
- The reset operation should be checked once communications have been established.
For value = 3:
The reset is executed after interrupting cyclic communication. This setting is used to implement a synchronized reset by a control for several drives.
The reset is immediately executed if cyclic communications is not active.
The reset operation should be checked once communications have been established.

Checking the reset operation:
After the drive has been restarted and communications have been established, read parameter p0972 and check the following:
p0972 = 0 --> the reset was successfully executed.
p0972 > 0 --> the reset was not executed.

r0975[0...10] Converter identification

Data type: Unsigned16	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages

Parameter group: System identification

Unit: -

Description: Displays the identification of the converter. The drive internally comprises components, device and converter. Both components require their own identification parameters according to PROFIdrive.

Index:
[0] = Company (Siemens = 42)
[1] = Converter type
[2] = Firmware version
[3] = Firmware date (year)
[4] = Firmware date (day/month)
[5] = PROFIdrive converter type class
[6] = PROFIdrive converter subtype class
[7] = Reserved
[8] = Reserved
[9] = Reserved
[10] = Firmware patch/hot fix

Dependency: See also: r0964

Note
Example:
r0975[0] = 42 --> SIEMENS
r0975[1] = 311 --> SERVO converter type
r0975[2] = 602 --> first part firmware version V06.02 (second part refer to index 10)
r0975[3] = 2023 --> year 2023
r0975[4] = 1706 --> 17th of June
r0975[5] = 1 --> PROFIdrive type class = 1 (axis)
r0975[6] = 8 --> PROFIdrive subtype class = 4 (application class)
r0975[7] = 1 --> 1 (fixed value)
r0975[8] = 0 (reserved)
r0975[9] = 0 (reserved)
r0975[10] = 0 --> second part firmware version (complete version: V06.02.00.00)

p0976 Reset all parameters

Data type: Unsigned16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Ready for operation

Parameter group: Save & reset

Unit: -

Min:	Max:	Factory setting:
0	1	0

Description: Resets all drive system parameters to the factory settings.

Value:
0: Inactive
1: Start to reset all parameters

NOTICE
Writing to parameters is inhibited during the reset operation.

p0977 Save all parameters

Data type: Unsigned16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Save & reset	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Retentively saves all parameters of the drive system to the non-volatile memory.
When saving, only the adjustable parameters intended to be saved are taken into account.

Value:
0: Inactive
1: Save in non-volatile memory - Loaded at POWER ON

Dependency: See also: p0976

NOTICE
The converter supply voltage may only be switched off after saving has been completed (i.e. after saving has started, wait until the parameter again has a value of 0). Writing to parameters is inhibited while saving.

r0979[0...30] PROFIdrive encoder format

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification, Configuration
Unit: -

Description: Displays the actual position encoder used according to PROFIdrive.

Index:
[0] = Header
[1] = Motor encoder type
[2] = Motor encoder resolution
[3] = Shift factor G1_XIST1
[4] = Shift factor G1_XIST2
[5] = Distinguishable revolutions motor encoder
[6...10] = Reserved
[11] = Type encoder 2
[12] = Resolution encoder 2
[13] = Shift factor G2_XIST1
[14] = Shift factor G2_XIST2
[15] = Distinguishable revolutions encoder 2
[16...20] = Reserved
[21] = Type encoder 3
[22] = Resolution encoder 3
[23] = Shift factor G3_XIST1
[24] = Shift factor G3_XIST2
[25] = Distinguishable revolutions encoder 3
[26...30] = Reserved

Note
Information about the individual indices can be taken from the following literature:
PROFIdrive Profile Drive Technology

r0980[0...299] List of existing parameters 1

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification
Unit: -

Description: Displays the parameters that exist for this drive.

Note
Modified parameters are displayed in indices 0 to 298. If an index contains the value 0, then the list ends here. In a long list, index 299 contains the parameter number at which position the list continues.
This list consists solely of the following parameters:
r0980[0...299], r0981[0...299] ... r0989[0...299]
The parameters in this list are not displayed in the parameter lists of the commissioning tool. However, they can be read from a higher-level control system.

p1082[0] Maximum speed

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Speed limiting, Speed controller, Limits	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
0.000 [rpm]	210000.000 [rpm]	1500.000 [rpm]

Description: Sets the maximum motor speed to a value less than or equal to the maximum motor speed (p0322).
The set value is valid for both directions of rotation.

Dependency: See also: p0322

p1083[0] Speed limit in positive direction of rotation

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed limiting, Speed controller, Limits	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]

Description: Sets the maximum speed for the positive direction.

p1086[0] Speed limit in negative direction of rotation

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed limiting, Speed controller, Limits	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
-210000.000 [rpm]	0.000 [rpm]	-210000.000 [rpm]

Description: Sets the speed limit for the negative direction.

p1115 Ramp-function generator selection

Variant: S200 Compact

Available when function is active:	Extended setpoint channel	
Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Ramp-function generator	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the ramp-function generator type.

Value:
0: Basic ramp-function generator
1: Extended ramp-function generator

Note
Another ramp-function generator type can only be selected when the motor is at a standstill.

p1120[0] Ramp-function generator ramp-up time

Variant:	S200 Compact	
Available when function is active:	Extended setpoint channel	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Ramp-function generator, Limits	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.000 [s]	999999.000 [s]	10.000 [s]

Description: Setting the ramp-up time of the ramp-function generator.
The ramp-function generator ramps-up the speed setpoint from standstill (setpoint = 0) up to the maximum speed (p1082) in this time.

Dependency: See also: p1082

p1121[0] OFF1 ramp-down time

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Quick commissioning	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.000 [s]	999999.000 [s]	1.000 [s]

Description: Sets the ramp-down time after an OFF1 command.
The value is referred to the maximum speed (p1082).
After an OFF1 command, within this time, the speed setpoint is ramped down from the maximum speed (p1082) to standstill.

Dependency: See also: p1082

p1130[0] Ramp-function generator initial rounding-off time

Variant:	S200 Compact	
Available when function is active:	Extended setpoint channel	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Ramp-function generator	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.000 [s]	30.000 [s]	0.000 [s]

Description: Sets the initial rounding-off time for the extended ramp-function generator.
The value applies to ramp-up and ramp-down.

Note
Rounding-off times avoid an abrupt response and prevent damage to the mechanical system.

p1131[0] Ramp-function generator final rounding-off time

Variant:	S200 Compact	
Available when function is active:	Extended setpoint channel	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Ramp-function generator	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.000 [s]	30.000 [s]	0.000 [s]

Description: Sets the final rounding-off time for the extended ramp generator.
The value applies to ramp-up and ramp-down.

Note
Rounding-off times avoid an abrupt response and prevent damage to the mechanical system.

p1135[0] OFF3 ramp-down time

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Ramp-function generator, Enable logic, Setpoint addition, Limits	
Unit: s		
Min:	**Max:**	**Factory setting:**
0.000 [s]	600.000 [s]	0.000 [s]

Description: Sets the ramp-down time from the maximum speed down to zero speed for the OFF3 command.

r1196 DSC position setpoint

Data type: Integer32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Speed precontrol
Unit: -

Description: Displays the position setpoint of DSC in fine pulses.

Note
DSC: Dynamic Servo Control

p1215[0] Motor holding brake configuration

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Motor holding brake, Basic functions
Unit: -

Min:	Max:	Factory setting:
0	3	0

Description: Sets the holding brake configuration.

Value:
0: No motor holding brake available
3: Motor holding brake like seq control, conn via interconnection

Dependency: See also: p1216, p1217, p1226, p1227, p1228

⚠ CAUTION
For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake.

NOTICE
If p1215 was set to 3, then when the pulses are canceled, the brake is closed even if the motor is still rotating. Pulses can be canceled as a result of an OFF2 or "Enable operation" via fieldbus or a fault with OFF2 response.

Note
If p1215 is set = 0 (no holding brake available) when running up, then the motor holding brake is automatically identified.
If an external motor holding brake is being used, then p1215 should be set to 3 and r0899.12 should be interconnected to a freely selectable digital output as control signal. This digital output must control the brake via a coupling relay or contactor relay.

p1216[0] Motor holding brake opening time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor holding brake
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	10000 [ms]	100 [ms]

Description: Displays the opening time for the motor holding brake.
The speed setpoint is kept at 0 for this time. The speed setpoint is then enabled.

Dependency: See also: p1215, p1217

p1217[0] Motor holding brake closing time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor holding brake
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	10000 [ms]	100 [ms]

Description: Sets the time to apply the motor holding brake.

After OFF1 or OFF3 and the holding brake is controlled (the brake closes), then the drive remains closed-loop controlled for this time stationary with a speed setpoint/velocity setpoint of zero. The pulses are canceled when the time expires.

Recommendation: This time should be set longer than the actual closing time of the brake. This ensures that the pulses are only canceled after the brake has closed.

Dependency: See also: p1215, p1216

NOTICE

If the selected closing time is too short with respect to the actual closing time of the brake, then the load can sag.
If the closing time is selected to be too long with respect to the actual closing time of the brake, the control works against the brake and therefore reduces its lifetime.

Note

The time is preassigned with the value saved in the motor.

p1226[0] Threshold for standstill detection

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor holding brake, Enable logic
Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	20.00 [rpm]

Description: Sets the speed threshold for the standstill detection.

Acts on the actual value and setpoint monitoring.

When braking with OFF1 or OFF3, when the threshold is undershot, standstill is identified.

The following applies when the brake control is activated:

When the threshold is undershot, the brake control is started and the system waits for the brake closing time in p1217. The pulses are then canceled.

If the brake control is not activated, the following applies:

When the threshold is undershot, the pulses are canceled and the drive coasts down.

Dependency: See also: p1215, p1216, p1217, p1227

Note

Standstill is identified in the following cases:
- The speed actual value falls below the speed threshold in p1226 and the time started after this in p1228 has expired.
- The speed setpoint falls below the speed threshold in p1226 and the time started after this in p1227 has expired.

The actual value sensing is subject to measuring noise. For this reason, standstill cannot be detected if the speed threshold is too low.

p1227[0] Standstill detection monitoring time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor holding brake, Enable logic
Unit: s

Min:	Max:	Factory setting:
0.000 [s]	300.000 [s]	4.000 [s]

Description: Sets the monitoring time for the standstill detection.
When braking with OFF1 or OFF3, standstill is identified after the time set here has expired, after the setpoint speed has fallen below the threshold p1226.
After this, the brake control is started, the system waits for the closing time in p1217 and then the pulses are canceled.

Dependency: See also: p1215, p1216, p1217, p1226

Note
Standstill is detected if at least one of the following conditions is satisfied:
- The speed actual value falls below the speed threshold in p1226 and the time started after this in p1228 has expired.
- The speed setpoint falls below the speed threshold in p1226 and the time started after this in p1227 has expired.

For p1227 = 300.000 s the following applies:
Monitoring is deactivated.
For p1227 = 0.000 s, the following applies:
With OFF1 or OFF3 and a ramp-down time = 0, the pulses are immediately canceled and the motor "coasts" down.

p1228[0] Pulse cancellation delay time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor holding brake, Enable logic
Unit: s

Min:	Max:	Factory setting:
0.000 [s]	299.000 [s]	0.000 [s]

Description: Sets the delay time for pulse cancellation.
After OFF1 or OFF3, the pulses are canceled, if at least one of the following conditions is fulfilled:
- The speed actual value falls below the threshold in p1226 and the time started after this in p1228 has expired.
- The speed setpoint falls below the threshold in p1226 and the time started after this in p1227 has expired.

Dependency: See also: p1226, p1227

NOTICE
When the motor holding brake is activated, pulse cancellation is additionally delayed by the brake closing time (p1217).

r1407.0...28 Status word speed controller

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Torque setpoints, Torque limiting, Speed actual value filter, Control/status words, Acceleration model, Setpoint addition, Speed precontrol, Speed setpoint filter
Unit: -

Description: Displays the status word of the speed controller.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Reserved	Yes	No
01	Reserved	Yes	No
02	Torque control active	Yes	No
04	Speed setpoint from DSC	Yes	No
05	Speed controller I component frozen	Yes	No
06	Speed controller I component set	Yes	No
07	Torque limit reached	Yes	No
08	Upper torque limit active	Yes	No
09	Lower torque limit active	Yes	No
11	Speed setpoint limited	Yes	No
13	Reserved	Yes	No
19	Reserved	Yes	No
20	Reserved	Yes	No
21	Reserved	Yes	No
22	Reserved	Yes	No
23	Torque-speed precontrol with encoder on	Yes	No
24	Moment of inertia estimator active	Yes	No
25	Load estimate active	Yes	No
26	Moment of inertia estimator stabilized	Yes	No
28	Speed precontrol	For symmetrizing	For setp_filter 2

Note
For bit 04:
For bit 04 = 1 signal, the following conditions must be fulfilled:
- A telegram type that supports DSC must be selected (r0922 = 5 or 105)
- OFF1, OFF3 or STOP2 must not be active.
- Master control must not be active.
The following conditions can mean that the DSC function is not active in spite of the fact that the bit is set:
- DSC is not switched in on the control side; this means that KPC = 0 is transferred.

p1414[0].0...1 Speed setpoint filter activation

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Setting for activating/deactivating the speed setpoint filter.
Recommendation: If only one filter is required, filter 1 should be activated and filter 2 deactivated, to avoid excessive processing time.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate filter 1	Yes	No
01	Activate filter 2	Yes	No

Dependency: The individual speed setpoint filters are parameterized from p1415.

p1415[0] Speed setpoint filter 1 type

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the type for speed setpoint filter 1.

Value:
0: Low pass: PT1
1: Low pass: PT2
2: General 2nd order filter

Dependency:
PT1 low pass: p1416
PT2 low pass: p1417, p1418
General filter: p1417 ... p1420

p1416[0] Speed setpoint filter 1 time constant

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Unit: ms		
Min:	**Max:**	**Factory setting:**
0.00 [ms]	5000.00 [ms]	0.00 [ms]

Description: Sets the time constant for the speed setpoint filter 1 (PT1).

Dependency: See also: p1414, p1415

Note
This parameter is only effective if the filter is set as a PT1 low pass.

p1417[0] Speed setpoint filter 1 denominator natural frequency

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Unit: Hz		
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the denominator natural frequency for speed setpoint filter 1 (PT2, general filter).

Dependency: See also: p1414, p1415

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1418[0] Speed setpoint filter 1 denominator damping

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.001	10.000	0.700

Description: Sets the denominator damping for speed setpoint filter 1 (PT2, general filter).
Dependency: See also: p1414, p1415

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.

p1419[0] Speed setpoint filter 1 numerator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the numerator natural frequency for speed setpoint filter 1 (general filter).
Dependency: See also: p1414, p1415

Note
This parameter is only effective if the speed filter is set as a general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1420[0] Speed setpoint filter 1 numerator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.000	10.000	0.700

Description: Sets the numerator damping for speed setpoint filter 1 (general filter).
Dependency: See also: p1414, p1415

Note
This parameter is only effective if the speed filter is set as a general filter.

p1421[0] Speed setpoint filter 2 type

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation

Parameter group:	Speed setpoint filter	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the type for speed setpoint filter 2.

Value:
- 0: Low pass: PT1
- 1: Low pass: PT2
- 2: General 2nd order filter

Dependency:
PT1 low pass: p1422
PT2 low pass: p1423, p1424
General filter: p1423 ... p1426

p1422[0] Speed setpoint filter 2 time constant

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Unit: ms		
Min:	**Max:**	**Factory setting:**
0.00 [ms]	5000.00 [ms]	0.00 [ms]

Description: Sets the time constant for the speed setpoint filter 2 (PT1).

Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is set as a PT1 low pass.

p1423[0] Speed setpoint filter 2 denominator natural frequency

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Unit: Hz		
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the denominator natural frequency for speed setpoint filter 2 (PT2, general filter).

Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1424[0] Speed setpoint filter 2 denominator damping

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation

Parameter group: Speed setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.001	10.000	0.700

Description: Sets the denominator damping for speed setpoint filter 2 (PT2, general filter).
Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.

p1425[0] Speed setpoint filter 2 numerator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the numerator natural frequency for speed setpoint filter 2 (general filter).
Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is set as a general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1426[0] Speed setpoint filter 2 numerator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.000	10.000	0.700

Description: Sets the numerator damping for speed setpoint filter 2 (general filter).
Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is set as a general filter.

p1433[0] Speed controller reference model natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed controller
Unit: Hz

Min:	Max:	Factory setting:
0.00 [Hz]	8000.00 [Hz]	0.00 [Hz]

Description: Sets the natural frequency of a PT2 element for the reference model of the speed controller.

Recommendation: The reference model is finely set using p1433.

r1438 Speed controller speed setpoint

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Speed controller

Unit: rpm

Description: Displays the speed setpoint after setpoint limiting for the P component of the speed controller.

p1441[0] Actual speed smoothing time

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Speed controller, Speed actual value filter

Unit: ms

Min:	Max:	Factory setting:
0.00 [ms]	50.00 [ms]	0.00 [ms]

Description: Sets the smoothing time constant (PT1) for the speed actual value.

Dependency: See also: r0063

Note
The speed actual value should be smoothed for encoders with a low pulse number or for resolvers.
After this parameter has been changed, we recommend that the speed controller is adapted and/or the speed controller settings checked Kp (p1460) and Tn (p1462).

p1460[0] Speed controller P gain

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Speed controller

Unit: Nms/rad

Min:	Max:	Factory setting:
0.00000 [Nms/rad]	5e+08 [Nms/rad]	0.30000 [Nms/rad]

Description: Sets the P gain of the speed controller.
The drive determines the P gain for One Button Tuning and writes the value to p1460.
The value can be changed.

Dependency: See also: p1462

Note
The higher the set P gain, the faster and more unstable the control.

p1462[0] Speed controller integral time

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Unit: ms		
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100000.00 [ms]	10.00 [ms]

Description: Sets the integral time for the speed controller
The drive determines the integral time for One Button Tuning - and writes the value to p1462.

Dependency: See also: p1460

Note
The shorter the integral time, the faster and more unstable the control.

p1498[0] Load moment of inertia

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Unit: kgm²		
Min:	**Max:**	**Factory setting:**
0.000000 [kgm²]	100000.000000 [kgm²]	0.000000 [kgm²]

Description: Sets the load moment of inertia.
The setting is made during commissioning while the One Button Tuning is being performed.

p1520[0] Torque limit upper

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting, Limits	
Unit: Nm		
Min:	**Max:**	**Factory setting:**
-1000000.00 [Nm]	2e+07 [Nm]	0.00 [Nm]

Description: Setting the upper torque limit.
This setting is made as part of the basic commissioning.

Dependency: See also: p1521, p1532, r1538, r1539

p1521[0] Torque limit lower

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting, Limits	
Unit: Nm		
Min:	**Max:**	**Factory setting:**
-2e+07 [Nm]	1000000.00 [Nm]	0.00 [Nm]

Description: Sets the lower torque limit
This setting is made as part of the basic commissioning.

Dependency: See also: p1520, p1532, r1538, r1539

p1532[0] Torque limit offset

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Torque limiting
Unit: Nm

Min:	Max:	Factory setting:
-100000.00 [Nm]	100000.00 [Nm]	0.00 [Nm]

Description: Sets the torque offset for the torque limit.
The setting allows electronic weight equalization to be used for vertical axes.

Recommendation: The torque offset can also be used for torque precontrol or as integrator setting value for the speed controller.

Dependency: See also: p1520, p1521

> ⚠ **DANGER**
> If the offset is set higher/lower than the lower/upper torque limit, then the unloaded drive can accelerate up to the maximum speed.

r1538 Upper effective torque limit

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Torque limiting
Unit: Nm

Description: Displays the currently effective upper torque limit.

> **Note**
> The value in r1538 may not exceed the value in p1520.

r1539 Lower effective torque limit

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Torque limiting
Unit: Nm

Description: Displays the currently effective lower torque limit.

> **Note**
> The value in r1539 may not exceed the value in p1521.

p1558 Measure/precontrol hanging/suspended axis force due to weight

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor data identification routine
Unit: -

Min:	Max:	Factory setting:
-1	1	0

Description: Setting to start/reset the measurement of the force due to weight for a hanging axis.

The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If it was started when the pulses were inhibited, then it is only executed after the pulses have been enabled.

For the measurement, the torque to hold the axis is determined and entered into p1532.

Further, this value is used internally for the precontrol.

Value:
-1: Reset values
0: Inactive
1: Start measurement and activate precontrol

Dependency: The pulse enable is withdrawn at the end of the measurement.

See also: p1532

Note
For master control with speed setpoint input from the commissioning tool, the torque precontrol channels are deactivated, so that the weight equalization entered here is not active.

r1651 Torque setpoint function generator

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Current setpoint filter
Unit: Nm

Description: Displays the torque setpoint of the function generator.

p1656[0].0...3 Activates current setpoint filter

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter, Supplementary closed-loop control
Unit: -

Min:	Max:	Factory setting:
-	-	0001 bin

Description: Setting for activating/deactivating the current setpoint filter.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Filter 1	Active	Inactive
01	Filter 2	Active	Inactive
02	Filter 3	Active	Inactive
03	Filter 4	Active	Inactive

Dependency: The individual current setpoint filters are parameterized as of p1657.

Note
If not all of the filters are required, then the filters should be used consecutively starting from filter 1.

p1657[0] Current setpoint filter 1 type

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: -

Min:	Max:	Factory setting:
1	2	1

Description: Sets the current setpoint filter 1 as low pass (PT2) or general 2nd-order filter.

Value:
1: PT2 low pass
2: General 2nd order filter

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

Note
For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, then a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.
The denominator damping can be determined from the equation for the 3 dB bandwidth:
f_3dB bandwidth = 2 * D_denominator * f_bandstop frequency

p1658[0] Current setpoint filter 1 denominator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 1 (PT2, general filter).

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1659[0] Current setpoint filter 1 denominator damping

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: -

Min:	Max:	Factory setting:
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 1.

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1660[0] Current setpoint filter 1 numerator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 1 (general filter).

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1661[0] Current setpoint filter 1 numerator damping

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: -

Min:	Max:	Factory setting:
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 1.

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1662[0] Current setpoint filter 2 type

Data type: Integer16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: -

Min:	Max:	Factory setting:
1	2	1

Description: Sets current setpoint filter 2 as lowpass filter (PT2) or general 2nd order filter.

Value:
1: PT2 low pass
2: General 2nd order filter

Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

Note
For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, then a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.
The denominator damping can be determined from the equation for the 3 dB bandwidth:
f_3dB bandwidth = 2 * D_denominator * f_bandstop frequency

p1663[0] Current setpoint filter 2 denominator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Current setpoint filter

Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 2 (PT2, general filter).

Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1664[0] Current setpoint filter 2 denominator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 2.
Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1665[0] Current setpoint filter 2 numerator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 2 (general filter).
Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1666[0] Current setpoint filter 2 numerator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 2.
Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1667[0] Current setpoint filter 3 type

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
1	2	1

Description: Sets current setpoint filter 3 as lowpass filter (PT2) or general 2nd order filter.

Value:
1: PT2 low pass
2: General 2nd order filter

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1668[0] Current setpoint filter 3 denominator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 3 (PT2, general filter).

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1669[0] Current setpoint filter 3 denominator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: -

Min:	Max:	Factory setting:
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 3.

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1670[0] Current setpoint filter 3 numerator natural frequency

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Unit: Hz

Min:	Max:	Factory setting:
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 3 (general filter).

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1671[0] Current setpoint filter 3 numerator damping

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: -		
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 3.

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1672[0] Current setpoint filter 4 type

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: -		
Min:	**Max:**	**Factory setting:**
1	2	1

Description: Sets current setpoint filter 4 as lowpass filter (PT2) or general 2nd order filter.

Value:
1: PT2 low pass
2: General 2nd order filter

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1673[0] Current setpoint filter 4 denominator natural frequency

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: Hz		
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 4 (PT2, general filter).

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1674[0] Current setpoint filter 4 denominator damping

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: -		
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 4.

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1675[0] Current setpoint filter 4 numerator natural frequency

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: Hz		
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 4 (general filter).

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1676[0] Current setpoint filter 4 numerator damping

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: -		
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 4.

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1703[0] Isq current controller precontrol scaling

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current controller	
Unit: %		
Min:	**Max:**	**Factory setting:**
0.0 [%]	200.0 [%]	0.0 [%]

Description: Sets the scaling of the dynamic current controller precontrol for the torque/force-generating current component Isq.

p1821[0] Direction of rotation

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Setting to change the direction of rotation.
If the parameter is changed, it reverses the direction of rotation of the motor and the encoder actual value without changing the setpoint.

Value:
0: Clockwise
1: Counterclockwise

Dependency: See also: F07434

NOTICE
After changing parameter p1821, the direction of rotation is not automatically adapted in the safety area.

p2000 Reference speed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: rpm

Min:	Max:	Factory setting:
6.00 [rpm]	210000.00 [rpm]	3000.00 [rpm]

Description: Sets the reference quantity for the speed values.
All speeds specified as relative values refer to this reference quantity.
The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Dependency: See also: p2003

p2001 Reference voltage

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: Vrms

Min:	Max:	Factory setting:
10 [Vrms]	100000 [Vrms]	1000 [Vrms]

Description: Sets the reference quantity for the voltage values. All voltages specified as relative value are referred to this reference quantity. The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

p2002 Reference current

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: Arms

Min:	Max:	Factory setting:
0.10 [Arms]	100000.00 [Arms]	100.00 [Arms]

Description: Sets the reference quantity for currents.
All currents specified as relative value are referred to this reference quantity.
The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Note
Default value is 2 * p0305 or the motor current limit.

p2003 Reference torque

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: Nm

Min:	Max:	Factory setting:
0.01 [Nm]	2e+07 [Nm]	1.00 [Nm]

Description: Sets the reference quantity for the torque values.
All torques specified as relative value are referred to this reference quantity.
The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

p2004 Reference power

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Reference variables
Unit: kW

Min:	Max:	Factory setting:
0.01 [kW]	20000.00 [kW]	20000.00 [kW]

Description: Sets the reference quantity for the power values. All power ratings specified as relative value are referred to this reference quantity. The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Dependency: See also: p2000, p2001, p2002, p2003

r2043.0...2 PROFIdrive PZD state

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the PROFIdrive PZD state.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Setpoint failure	Yes	No
01	Isochronous operation active	Yes	No
02	Fieldbus running	Yes	No

Note
When using the "setpoint failure" signal, the bus can be monitored and an application-specific response triggered when the setpoint fails.

r2050[0...31].0...15 PROFIdrive PZD receive word

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

Parameter group: Receive direction

Unit: -

Description: Displays the PZD (setpoints) in the word format received from the fieldbus controller.

Index:
[0] = PZD 1
[1] = PZD 2
[2] = PZD 3
[3] = PZD 4
[4] = PZD 5
[5] = PZD 6
[6] = PZD 7
[7] = PZD 8
[8] = PZD 9
[9] = PZD 10
[10] = PZD 11
[11] = PZD 12
[12] = PZD 13
[13] = PZD 14
[14] = PZD 15
[15] = PZD 16
[16] = PZD 17
[17] = PZD 18
[18] = PZD 19
[19] = PZD 20
[20] = PZD 21
[21] = PZD 22
[22] = PZD 23
[23] = PZD 24
[24] = PZD 25
[25] = PZD 26
[26] = PZD 27
[27] = PZD 28
[28] = PZD 29
[29] = PZD 30
[30] = PZD 31
[31] = PZD 32

Bit array:

Bit	Signal name	1 signal	0 signal
00	Bit 0	On	Off
01	Bit 1	On	Off
02	Bit 2	On	Off
03	Bit 3	On	Off
04	Bit 4	On	Off
05	Bit 5	On	Off
06	Bit 6	On	Off
07	Bit 7	On	Off
08	Bit 8	On	Off
09	Bit 9	On	Off
10	Bit 10	On	Off
11	Bit 11	On	Off
12	Bit 12	On	Off
13	Bit 13	On	Off
14	Bit 14	On	Off

	15 Bit 15	On	Off

Dependency: See also: r2060

c2053[0...31] PROFIdrive PZD send word

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Send direction
Unit: -

Description: Displays the PZD (actual values) in the word format that are sent to the fieldbus controller.

Index:
[0] = PZD 1
[1] = PZD 2
[2] = PZD 3
[3] = PZD 4
[4] = PZD 5
[5] = PZD 6
[6] = PZD 7
[7] = PZD 8
[8] = PZD 9
[9] = PZD 10
[10] = PZD 11
[11] = PZD 12
[12] = PZD 13
[13] = PZD 14
[14] = PZD 15
[15] = PZD 16
[16] = PZD 17
[17] = PZD 18
[18] = PZD 19
[19] = PZD 20
[20] = PZD 21
[21] = PZD 22
[22] = PZD 23
[23] = PZD 24
[24] = PZD 25
[25] = PZD 26
[26] = PZD 27
[27] = PZD 28
[28] = PZD 29
[29] = PZD 30
[30] = PZD 31
[31] = PZD 32

Dependency: See also: c2063

r2060[0...30] PROFIdrive PZD receive double word

Data type: Integer32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Receive direction
Unit: -

Description: Displays the PZD (setpoints) in the double word format received from the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

Dependency: See also: r2050

c2063[0...30] PROFIdrive PZD send double word

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Send direction
Unit: -

Description: Displays the PZD (actual values) in the double word format that are sent to the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

Dependency: See also: c2053

c2104[0] 2nd acknowledge faults

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Signal 2 to acknowledge faults.

Note
A fault acknowledgment is triggered with a 0/1 signal.

c2106[0] External fault 1

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Faults / alarms
Unit: -

Description: Signal for external fault 1.

Dependency: See also: F07860

Note
An external fault is triggered with a 1/0 edge.

r2109[0...63] Fault time removed in milliseconds

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: ms

Description: Displays the system runtime in milliseconds when the fault was removed.

Dependency: See also: r0945, r0947, r0948, r0949, r2114, r2130, r2133, r2136, r3122

NOTICE
The time comprises r2136 (days) and r2109 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the fault buffer and the assignment of the indices is shown in r0945.

r2111 Alarm counter

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Number of alarms that have occurred.

Dependency: See also: r2122, r2123, r2124, r2125

Note
The parameter is reset to 0 at POWER ON.

r2114[0...1] System runtime total

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics general
Unit: -

Description: Displays the total system runtime of the converter.
The time comprises r2114[0] (milliseconds) and r2114[1] (days).
After r2114[0] has reached a value of 86.400.000 ms (24 hours) this value is reset and r2114[1] is incremented.

Index: [0] = Milliseconds
[1] = Days

Note
The counter values are saved when the power supply is switched off.
After the converter is switched on, the counter continues to run with the last value that was saved.

p2118[0...19] Change message type message number

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation

Parameter group: Faults / alarms

Unit: -

Min:	**Max:**	**Factory setting:**
0	65535	0

Description: Selects faults or alarms for which the message type should be changed.

Dependency: Selects the fault or alarm selection and sets the required type of message realized under the same index.
See also: p2119

Note
Re-parameterization is also possible if a message is present. The change only becomes effective after the message has gone.

p2119[0...19] Change message type type

Data type: Integer16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Faults / alarms

Unit: -

Min:	**Max:**	**Factory setting:**
1	3	1

Description: Sets the message type for the selected fault or alarm.

Value:
1: Fault (F)
2: Alarm (A)
3: No message (N)

Dependency: Selects the fault or alarm selection and sets the required type of message realized under the same index.
See also: p2118

Note
Re-parameterization is also possible if a message is present. The change only becomes effective after the message has gone.
The message type can only be changed for messages with the appropriate identification (exception, value = 0).
Example:
F12345(A) --> Fault F12345 can be changed to alarm A12345.

r2121 Counter alarm buffer changes

Data type: Unsigned16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms

Unit: -

Description: This counter is incremented every time the alarm buffer changes.

Dependency: See also: r2122, r2123, r2124, r2125

r2122[0...63] Alarm number

Data type: Unsigned16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms

Unit: -

Description: Displays the numbers of the last 64 alarms.

Dependency: See also: r2123, r2124, r2125, r2134, r2145, r2146, r3123

NOTICE
The properties of the alarm buffer should be taken from the corresponding product documentation.

Note
The buffer parameters are cyclically updated in the background.
Alarm buffer structure (general principle):
Currently active alarms (not gone):
r2122[0], r2124[0], r2123[0], r2125[0] --> alarm 1 (the oldest)
. . .
r2122[7], r2124[7], r2123[7], r2125[7] --> Alarm 8 (the latest)

History of alarms that have gone:
r2122[8], r2124[8], r2123[8], r2125[8] --> Alarm 1 (the latest)
. . .
r2122[63], r2124[63], r2123[63], r2125[63] --> alarm 56 (the oldest)

r2123[0...63] Alarm time received in milliseconds

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: ms

Description: Displays the system runtime in milliseconds when the alarm occurred.
Dependency: See also: r2114, r2122, r2124, r2125, r2134, r2145, r2146, r3123

NOTICE
The time comprises r2145 (days) and r2123 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

r2124[0...63] Alarm value

Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the active alarm (as integer number).
Dependency: See also: r2122, r2123, r2125, r2134, r2145, r2146, r3123

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

r2125[0...63] Alarm time removed in milliseconds

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: ms

Description: Displays the system runtime in milliseconds when the alarm was removed.
Dependency: See also: r2114, r2122, r2123, r2124, r2134, r2145, r2146, r3123

NOTICE
The time comprises r2146 (days) and r2125 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

r2130[0...63] Fault time received in days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the system runtime in days when the fault occurred.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2114, r2133, r2136, r3122

NOTICE
The time comprises r2130 (days) and r0948 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2131 Actual fault code

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the code of the oldest active fault.

Note
0: No fault present.

r2132 Actual alarm code

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the code of the last alarm that occurred.

Note
0: No alarm present.

r2133[0...63] Fault value for float values

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the fault that occurred for float values.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2130, r2136

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2134[0...63] Alarm value for float values

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the active alarm for float values.

Dependency: See also: r2122, r2123, r2124, r2125, r2145, r2146, r3123

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2136[0...63] Fault time removed in days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the system runtime in days when the fault was removed.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2114, r2130, r2133, r3122

NOTICE
The time comprises r2136 (days) and r2109 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2139.0...15 Status word faults/alarms 1

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays status word 1 of faults and alarms.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Being acknowledged	Yes	No
01	Acknowledgment required	Yes	No
03	Fault present	Yes	No
05	Safety message present	Yes	No
07	Alarm present	Yes	No
11	Alarm class bit 0	High	Low
12	Alarm class bit 1	High	Low
13	Maintenance required	Yes	No
14	Maintenance urgently required	Yes	No
15	Fault gone/can be acknowledged	Yes	No

Note
For bit 03, 05, 07:
These bits are set if at least one fault/alarm or safety message occurs. The entry in the fault/alarm buffer or safety message buffer is delayed. This is the reason that the fault/alarm buffer or safety message buffer should only be read if, after "Fault active", "Alarm active" or "Safety message active" occurs, a change is also identified in the buffer (r0944, r2121, r60044).
For bits 11, 12:
These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.

r2145[0...63] Alarm time received in days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms
Unit: -

Description: Displays the system runtime in days when the alarm occurred.

Dependency: See also: r2114, r2122, r2123, r2124, r2125, r2134, r2146, r3123

NOTICE
The time comprises r2145 (days) and r2123 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2146[0...63] Alarm time cleared in days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the system runtime in days when the alarm was cleared.

Dependency: See also: r2114, r2122, r2123, r2124, r2125, r2134, r2145, r3123

NOTICE
The time comprises r2146 (days) and r2125 (milliseconds).

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

p2153[0] Speed actual value filter time constant

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed messages
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	1000000 [ms]	0 [ms]

Description: Sets the time constant of the PT1 element to smooth the speed / velocity actual value.
The smoothed actual speed/velocity is compared with the threshold values and is only used for messages and signals.

p2161[0] Speed threshold 3

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed messages
Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	5.00 [rpm]

Description: Sets the speed threshold value for signal "|n_act| < speed threshold 3".

Dependency: See also: r2199

p2162[0] Hysteresis speed n_act > n_max

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed messages
Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	60000.00 [rpm]	0.00 [rpm]

Description: Sets the hysteresis speed (bandwidth) for signal "n_act > n_max".

NOTICE
For p0322 = 0, the following applies: p2162 <= 0.1 * p0311
For p0322 > 0, the following applies: p2162 <= 1.02 * p0322 - p1082
If one of the conditions is violated, p2162 is appropriately and automatically reduced when exiting the commissioning mode.

Note
For a negative speed limit, the hysteresis is effective below the limit value and for a positive speed limit, above the limit value.
If significant overshoot occurs in the maximum speed range (e.g. due to load shedding), you are advised to increase the dynamic response of the speed controller (if possible). If this is insufficient, the hysteresis p2162 can only be increased by more than 10% of the rated speed when the maximum speed (p0322) of the motor is sufficiently greater than the speed limit p1082.

p2175[0] Motor blocked speed threshold

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed messages
Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	120.00 [rpm]

Description: Sets the speed threshold for message "Motor blocked".
Monitoring is deactivated with p2175 = 0.

Dependency: See also: p2177
See also: F07900

Note
If the motor speed is less than the threshold value set in p2175 - and the motor is operated for longer than 200 ms at the torque limit - then the motor is shut down and a fault is output.

p2177[0] Motor blocked delay time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed messages
Unit: s

Min:	Max:	Factory setting:
0.000 [s]	65.000 [s]	1.000 [s]

Description: Sets the delay time for the message "Motor blocked".

Dependency: See also: p2175
See also: F07900

r2199.0...11 Status word monitoring 3

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Speed messages, Control/status words
Unit: -

Description: Displays the third status word of the monitoring functions.

Bit array:

Bit	Signal name	1 signal	0 signal
00	|n_act| < p2161	Yes	No
01	f or n comparison value reached or exceeded	Yes	No
04	Speed setpoint - actual value deviation in tolerance t_on	Yes	No
05	Ramp-up/ramp-down completed	Yes	No
11	Torque utilization < torque threshold value 2	Yes	No

Note
For bit 00:
The speed threshold value 3 is set in p2161.
For bit 01:
The comparison value is permanently set to 5 rpm.
For bit 11:
Torque threshold value 2 is permanently set to 90 %.

p2496 LR measurement unit length physical

Variant: S200 Compact
Available when function is active: Position control
Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Position control, Basic parameters / mechanical system
Unit: -

Min:	Max:	Factory setting:
0	8	3

Description: Sets the physical measurement unit (MU) for the length.

Value:
0: LU (user-defined)
1: km
2: m
3: mm
4: µm
5: nm
6: in
7: ft
8: mi

Note
This parameter is only of significance for visualization (e.g. using the commissioning tool).
Internally in the drive, the neutral length unit (LU) without dimensions is used for calculations.
MU: measurement unit

p2496 LR measurement unit length physical

Variant:	S200 Compact	
Available when function is active:	Position control	
Values for:	Basic positioner for rotary motion	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	10	10

Description: Sets the physical measurement unit (MU) for the length.

Value:
0: LU (user-defined)
10: °

Note
This parameter is only of significance for visualization (e.g. using the commissioning tool).
Internally in the drive, the neutral length unit (LU) without dimensions is used for calculations.
MU: measurement unit

p2497 LR measurement unit velocity physical

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	15	8

Description: Sets the physical measurement unit (MU) for velocities.

Value:
0: 1000LU/min (user-defined)
1: km/h
2: km/min
3: m/h
4: m/min
5: m/s
6: mm/h
7: mm/min
8: mm/s

11: in/min
12: in/s
13: ft/min
14: ft/s
15: mi/h

Note
MU: measurement unit

p2497 LR measurement unit velocity physical

Variant:	S200 Compact	
Available when function is active:	Position control	
Values for:	Basic positioner for rotary motion	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	18	18

Description: Sets the physical measurement unit (MU) for velocities.

Value:
0: 1000LU/min (user-defined)
18: °/s

Note
MU: measurement unit

p2498 LR measurement unit acceleration physical

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	11	7

Description: Sets the physical measurement unit (MU) for acceleration.

Value:
0: 1000LU/s² (user-defined)
6: m/s²
7: mm/s²
10: in/s²
11: ft/s²

Note
MU: measurement unit

p2498 LR measurement unit acceleration physical

Variant:	S200 Compact	
Available when function is active:	Position control	
Values for:	Basic positioner for rotary motion	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	18	18

Description: Sets the physical measurement unit (MU) for acceleration.

Value:
0: 1000LU/s² (user-defined)
18: °/s²

Note
MU: measurement unit

p2499 LR measurement unit jerk physical

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	11	7

Description: Sets the physical measurement unit (MU) for jerk.

Value:
0: 1000LU/s³ (user-defined)
7: mm/s³
10: in/s³
11: ft/s³

Note
MU: measurement unit

p2499 LR measurement unit jerk physical

Variant:	S200 Compact
Available when function is active:	Position control
Values for:	Basic positioner for rotary motion
Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	18	18

Description: Sets the physical measurement unit (MU) for jerk.

Value:
0: 1000LU/s³ (user-defined)
18: °/s³

Note
MU: measurement unit

p2502[0] LR encoder assignment

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Unit: -		
Min:	**Max:**	**Factory setting:**
1	1	1

Description: Setting to assign the encoder.
The actual value preprocessing and the closed-loop position control are carried out using the assigned encoder.

Value:
1: Motor encoder

p2503[0] LR measurement unit MU per 10 mm

Variant:	S200 Compact	
Available when function is active:	Mechanical data configuration for APC or LR	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000001 [mm]	2.1474837e+09 [mm]	10.000000 [mm]

Description: Sets the measurement unit MU per 10 mm set by the user.
When selecting a physical unit (p2496 not equal to 0), then the drive automatically preassigns the parameter and it cannot be changed.

For p2496 = 0, a reference is established between the physical arrangement and the neutral length unit LU used in the drive.
Example, linear scale:
p2503 = 10000 means: 10 mm should be resolved to µm (this means that 1 LU = 1 µm).

Note
MU: measurement unit

p2503[0] LR measurement unit MU per 10 mm

Variant:	S200 Compact	
Available when function is active:	Mechanical data configuration for APC or LR	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000001 [°]	2.1474837e+09 [°]	10.000000 [°]

Description:
Sets the measurement unit MU per 10 mm set by the user.
When selecting a physical unit (p2496 not equal to 0), then the drive automatically preassigns the parameter and it cannot be changed.

For p2496 = 0, a reference is established between the physical arrangement and the neutral length unit LU used in the drive.
Example, linear scale:
p2503 = 10000 means: 10 mm should be resolved to µm (this means that 1 LU = 1 µm).

Note
MU: measurement unit

p2504[0] LR motor/load motor revolutions

Variant:	S200 Compact	
Available when function is active:	Mechanical data configuration for APC or LR	
Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
1	1048576	1

Description:
Sets the motor revolutions for the gearbox factor between the motor shaft and load shaft.
Gearbox factor = motor revolutions (p2504) / load revolutions (p2505)

Dependency:
See also: p2505

p2505[0] LR motor/load load revolutions

Variant:	S200 Compact
Available when function is active:	Mechanical data configuration for APC or LR
Data type: Integer32	**Visible in:** Standard display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: -		
Min:	**Max:**	**Factory setting:**
-1048576	1048576	1

Description: Sets the load revolutions for the gearbox factor between the motor shaft and load shaft.
Gearbox factor = motor revolutions (p2504) / load revolutions (p2505)

Dependency: See also: p2504

p2506[0] LR measurement unit MU per load distance

Variant:	S200 Compact	
Available when function is active:	Mechanical data configuration for APC or LR	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000001 [mm]	2.1474837e+09 [mm]	10.000000 [mm]

Description: Sets the measurement unit MU per load distance set by the user.
For a rotary encoder, this establishes a reference between the actual physical situation and the user-specific measurement unit MU.
Example:
Rotary encoder, ballscrew with 10 mm/revolution, 10 mm should be broken down to units of µm.
Length unit LU (p2496 = 0)
--> One load distance corresponds to 10000 LU (i.e. 1 LU = 1 µm)
--> p2506 = 10000

Physical unit µm (2496) = 4
--> One load distance corresponds to 10000 µm
--> p2506 = 10000

Dependency: See also: p2496

p2506[0] LR length unit MU per load revolution

Variant:	S200 Compact	
Available when function is active:	Mechanical data configuration for APC or LR	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: °		

Min:	Max:	Factory setting:
0.000001 [°]	2.1474837e+09 [°]	360.000000 [°]

Description: Sets the rotary unit MU per load revolution set by the user. For a rotary encoder, this establishes a reference between the physical arrangement and the user-specific rotating unit MU.

Example:

Rotating unit LU (p2496 = 0)

Rotary encoder, 1 revolution should be broken down into mdegrees, (i.e. 1 LU = 1 mdegrees).

--> One load revolution corresponds to 360000 LU

--> p2506 = 360000

Dependency: See also: p2496

Note
When selecting a physical length unit, the drive automatically preassigns the parameter and it cannot be changed.

p2507[0] LR absolute encoder adjustment status

Variant: S200 Compact

Available when function is active: Position control

Data type: Integer16 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Position control

Unit: -

Min:	Max:	Factory setting:
0	3	1

Description: Activates the adjustment and display of the status of the adjustment for absolute encoders.

For p2507 = 2:

This initiates encoder adjustment. The status is displayed using the other values.

Value:

0: Error occurred while adjusting

1: Absolute encoder not adjusted

2: Absolute encoder not adjusted and encoder adjustment initiated

3: Absolute encoder adjusted

Dependency: See also: c2598, p2599, c11500

⚠ CAUTION

For rotating absolute encoders, when adjusting, a range is set up symmetrically around zero with half of the encoder range, within which the position must be re-established after switch-off/switch-on. In this range, it is only permissible that the encoder overflows.

After the adjustment has been completed, it must be guaranteed that the range is not exited. The reason for this is that outside the range, there is no clear reference any longer between the encoder actual value and mechanical system.

If the home position (c2598) lies in this range, then the position actual value is set when adjusting to the home position. Otherwise, adjustment is canceled with F07443.

There is no overflow for linear absolute encoders. This means that after the adjustment, the position can be re-established in the complete traversing range after switch-off/switch-on. When adjusting, the position actual value is set to the home position.

Note
To permanently accept the determined position offset, it must be retentively saved (p0977).
This adjustment can only be initiated for an absolute encoder.

c2510[0...3] LR selecting measuring probe evaluation

Variant: S200 Compact

	Available when function is active:	Position control
	Data type: Unsigned8	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Homing, Traversing blocks, Position control
	Unit: -	
Description:	Signal to select the measuring probe. 0 signal, measuring probe 1 is used. 1 signal, measuring probe 2 is used.	
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved	
Dependency:	See also: p2502, c2511	

Note
When function "Basic positioner" is activated, the measuring probe is selected at the 0/1 edge at r2684.1 (passive homing active).

c2511[0...3] LR measuring probe evaluation edge

	Variant:	S200 Compact
	Available when function is active:	Position control
	Data type: Unsigned8	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Homing, Traversing blocks, Position control
	Unit: -	
Description:	Signal to evaluate the measuring probe edge. 1 signal: The falling edge of the measuring probe (c2510) is used. 0 signal: The rising edge of the measuring probe (c2510) is used.	
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved	
Dependency:	See also: p2502, c2510	

r2521[0...3] LR position actual value

	Variant:	S200 Compact
	Available when function is active:	Position control
	Data type: FloatingPoint64	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
	Unit: mm	
Description:	Display for the position actual value determined by the position actual value processing.	

Index: [0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note
r2526.0 = 1 --> The position actual value in r2521[0] for the position control is valid.

r2521[0...3] LR position actual value

Variant: S200 Compact
Available when function is active: Position control
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
Unit: °

Description: Display for the position actual value determined by the position actual value processing.

Index: [0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note
r2526.0 = 1 --> The position actual value in r2521[0] for the position control is valid.

r2522[0...3] LR velocity actual value

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
Unit: mm/s

Description: Display for the velocity actual value determined by the position actual value processing.

Index: [0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note
r2526.0 = 1 --> The velocity actual value in r2522[0] for the position control is valid.

r2522[0...3] LR velocity actual value

Variant: S200 Compact
Available when function is active: Position control
Values for: Basic positioner for rotary motion

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
Unit: °/s

Description: Display for the velocity actual value determined by the position actual value processing.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note
r2526.0 = 1 --> The velocity actual value in r2522[0] for the position control is valid.

r2523[0...3] LR measured value

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint64 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position control
Unit: mm

Description: Displays the measured values that were determined using functions "Homing mark search" and "Measuring probe evaluation".

Index:
[0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note
r2526.2 = 1 --> The measured value in r2523[0] for the closed-loop position control is valid.

r2523[0...3] LR measured value

Variant: S200 Compact
Available when function is active: Position control
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position control
Unit: °

Description: Displays the measured values that were determined using functions "Homing mark search" and "Measuring probe evaluation".

Index:
[0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note
r2526.2 = 1 --> The measured value in r2523[0] for the closed-loop position control is valid.

r2526.0...12 LR status word

Variant: S200 Compact
Available when function is active: Position control
Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Actual position value preprocessing
Unit: -

Description: Displays the status word of the position controller.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Position actual value valid	Yes	No
01	Homing active	Yes	No
02	Measured value valid	Yes	No
03	Position control active	Yes	No
04	Fixed stop reached	Yes	No
05	Fixed stop outside window	Yes	No
06	Position controller output limited	Yes	No
07	Request tracking mode	Yes	No
08	Clamping active when traveling to fixed stop	Yes	No
09	Setting value for adjustment valid	Yes	No
10	Absolute encoder adjusted	Yes	No
11	Absolute encoder adjustment unsuccessful	Yes	No
12	Absolute encoder being adjusted	Yes	No

Dependency: See also: r2521, r2522, r2523

Note
For bit 04:
The signal is influenced via p2634.
For bit 05:
The signal is influenced via p2635.

c2530 LR position setpoint

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Position controller
Unit: mm

Description: Signal for the position setpoint of the position controller.

Dependency: See also: r2665

c2530 LR position setpoint

Variant: S200 Compact
Available when function is active: Position control
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

	Write permission:	Edit device configuration or drive applications
	Parameter group:	Position controller
	Unit: °	
Description:	Signal for the position setpoint of the position controller.	
Dependency:	See also: r2665	

c2531 LR velocity setpoint

	Variant:	S200 Compact
	Available when function is active:	Position control
	Data type: FloatingPoint32	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Position controller
	Unit: mm/s	
Description:	Signal for the velocity setpoint of the position controller.	
Dependency:	See also: r2666	

c2531 LR velocity setpoint

	Variant:	S200 Compact
	Available when function is active:	Position control
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint32	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Position controller
	Unit: °/s	
Description:	Signal for the velocity setpoint of the position controller.	
Dependency:	See also: r2666	

p2533[0] LR position setpoint filter time constant

	Variant:	S200 Compact	
	Available when function is active:	Position control	
	Data type: FloatingPoint32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Can be changed in the operating state:	Operation	
	Parameter group:	Position controller	
	Unit: ms		
	Min:	**Max:**	**Factory setting:**
	0.00 [ms]	1000.00 [ms]	0.00 [ms]
Description:	Sets the time constant for the position setpoint filter (PT1).		

Note
The effective Kv factor (position loop gain) is reduced with the filter. This allows a softer control behavior with improved tolerance with respect to noise/disturbances.
Applications:
- Reduces the precontrol dynamic response.
- Jerk limiting.

p2534[0] LR speed precontrol factor

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: %		
Min:	**Max:**	**Factory setting:**
0.00 [%]	200.00 [%]	0.00 [%]

Description: Setting for activation and weighting of the speed precontrol value.
Value = 0 % --> The precontrol is deactivated.

Dependency: See also: p2535, p2536, r2563

Note
When the axis control loop is optimally set as well as a precisely determined equivalent time constant of the speed control loop, the precontrol factor is 100%.

p2535[0] LR speed precontrol symmetrizing filter dead time

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: -		
Min:	**Max:**	**Factory setting:**
0.00	2.00	0.00

Description: Sets the "fractional" dead time to emulate the timing behavior of the speed control loop.
The selected multiplier refers to the position controller sampling time (dead time= p2535 * position controller clock cycle).

Dependency: See also: p2536

NOTICE
When speed precontrol is active (p2534 > 0 %), the following applies:
In addition to the set dead time (p2535), internally two position controller sampling times are effective.
When speed precontrol is inactive (p2534 = 0 %), the following applies:
No dead time is effective (p2535 and internal).

Note
Together with p2536, the time response of the closed speed control loop can be emulated.

p2536[0] LR speed precontrol symmetrizing filter PT1

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: ms		
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100.00 [ms]	0.00 [ms]

Description: Sets a PT1 filter to emulate the time response of the closed speed control loop.

Dependency: See also: p2535

NOTICE
When speed precontrol is inactive (p2534 = 0 %), the following applies:
If a PT1 filter has been set, it is not effective.

Note
Together with p2535, the time response of the closed speed control loop can be emulated.

p2538[0] LR proportional gain

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: 1000 rpm		
Min:	**Max:**	**Factory setting:**
0.000 [1000 rpm]	300.000 [1000 rpm]	1.000 [1000 rpm]

Description: Sets the proportional gain (P gain, position loop gain, Kv factor) of the position controller.

Dependency: See also: p2539, r2557, r2558

Note
The proportional gain is used define at which traversing velocity which following error is obtained (without precontrol)
Low proportional gain:
Slow response to a setpoint - actual value difference, the following error becomes large.
High proportional gain:
Fast response to the setpoint - actual value difference, the following error becomes small.

p2539[0] LR integral time

Variant: S200 Compact

Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: ms		
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100000.00 [ms]	0.00 [ms]

Description: Setting to activate the integral time of the position controller.
Value = 0 ms --> The I component of the position controller is deactivated.

Dependency: See also: p2538, r2559

p2540 LR position controller output speed limit

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]

Description: Sets the speed limit of the position controller output.

Dependency: See also: c2541

c2541 LR position controller output speed limit signal

Variant:	S200 Compact
Available when function is active:	Position control
Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position controller
Unit: rpm	

Description: Signal for limiting the position controller output.

Dependency: See also: p2540

p2542 LR standstill window

Variant:	S200 Compact
Available when function is active:	Position control
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474839e+09 [mm]	0.250000 [mm]

Description: Sets the standstill window for the standstill monitoring function.

After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.

Value = 0 --> The standstill monitoring is deactivated.

Dependency: See also: p2543, p2544

Note
The following applies for the setting of the standstill window and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2542 LR standstill window

Variant:	S200 Compact	
Available when function is active:	Position control	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474839e+09 [°]	10.000000 [°]

Description: Sets the standstill window for the standstill monitoring function.

After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.

Value = 0 --> The standstill monitoring is deactivated.

Dependency: See also: p2543, p2544

Note
The following applies for the setting of the standstill window and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2543 LR standstill monitoring time

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Unit: ms		

Min:	Max:	Factory setting:
0.00 [ms]	100000.00 [ms]	200.00 [ms]

Description: Sets the standstill monitoring time for the standstill monitoring function.

After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.

Dependency: See also: p2542, p2545

Note
The following applies for the setting of the standstill and positioning monitoring time:
Standstill monitoring time (p2543) <= positioning monitoring time (p2545)

p2544 LR positioning window

Variant: S200 Compact

Available when function is active: Position control

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Position monitoring

Unit: mm

Min:	Max:	Factory setting:
0.000000 [mm]	2.1474839e+09 [mm]	0.050000 [mm]

Description: Sets the positioning window for the positioning monitoring function.

After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.

Value = 0 --> The positioning monitoring function is deactivated.

Dependency: See also: p2542, p2545, r2684

Note
The following applies for the setting of the standstill and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2544 LR positioning window

Variant: S200 Compact

Available when function is active: Position control

Values for: Basic positioner for rotary motion

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Position monitoring

Unit: °

Min:	Max:	Factory setting:
0.000000 [°]	2.1474839e+09 [°]	2.000000 [°]

Description: Sets the positioning window for the positioning monitoring function.

After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.

Value = 0 --> The positioning monitoring function is deactivated.

Dependency: See also: p2542, p2545, r2684

Note
The following applies for the setting of the standstill and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2545 LR positioning monitoring time

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Unit: ms		
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100000.00 [ms]	1000.00 [ms]

Description: Sets the positioning monitoring time for the positioning monitoring.
After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.

Dependency: See also: p2543, p2544, r2684

Note
The following applies for the setting of the standstill and positioning monitoring time:
Standstill monitoring time (p2543) <= positioning monitoring time (p2545)

p2546[0] LR dynamic following error monitoring tolerance

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474839e+09 [mm]	1.000000 [mm]

Description: Sets the tolerance for the dynamic following error monitoring.
If the dynamic following error (r2563) exceeds the selected tolerance, then an appropriate fault is output.
Value = 0 --> The dynamic following error monitoring is deactivated.

Dependency: See also: r2563, r2684

Note
The tolerance bandwidth is intended to prevent the dynamic following error monitoring incorrectly responding due to operational control sequences (e.g. during load surges).

p2546[0] LR dynamic following error monitoring tolerance

Variant:	S200 Compact
Available when function is active:	Position control

Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474839e+09 [°]	36.000000 [°]

Description: Sets the tolerance for the dynamic following error monitoring.
If the dynamic following error (r2563) exceeds the selected tolerance, then an appropriate fault is output.
Value = 0 --> The dynamic following error monitoring is deactivated.

Dependency: See also: r2563, r2684

Note
The tolerance bandwidth is intended to prevent the dynamic following error monitoring incorrectly responding due to operational control sequences (e.g. during load surges).

r2556 LR position setpoint after setpoint smoothing

Variant:	S200 Compact
Available when function is active:	Position control
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position controller
Unit: mm	

Description: Displays the position setpoint after the setpoint smoothing.

r2556 LR position setpoint after setpoint smoothing

Variant:	S200 Compact
Available when function is active:	Position control
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position controller
Unit: °	

Description: Displays the position setpoint after the setpoint smoothing.

r2557 LR position controller input system deviation

Variant:	S200 Compact
Available when function is active:	Position control
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position controller
Unit: mm	

Description: Displays the difference between the position setpoint and the position actual value at the position controller input.

r2557 LR position controller input system deviation

Variant: S200 Compact
Available when function is active: Position control
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: °

Description: Displays the difference between the position setpoint and the position actual value at the position controller input.

r2558 LR position controller output P component

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: rpm

Description: Displays the P component at the output of the position controller (speed setpoint).

r2559 LR position controller output I component

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: rpm

Description: Displays the I component at the output of the position controller (speed setpoint).

r2560 LR speed setpoint

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: rpm

Description: Displays the speed setpoint after limiting (c2541).

r2561 LR speed precontrol value

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: rpm

Description: Displays the speed setpoint due to the precontrol.

r2562 LR total speed setpoint

Variant:	S200 Compact
Available when function is active:	Position control
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position controller
Unit: rpm	

Description: Displays the total speed setpoint

This value is obtained from the sum of the speed precontrol and position controller output.

Dependency: See also: r2560, r2561

r2563 LR following error dynamic model

Variant:	S200 Compact
Available when function is active:	Position control
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring
Unit: mm	

Description: Displays the dynamic following error.

This value is the deviation, corrected by the velocity-dependent component, between the position setpoint and the position actual value.

Note

For p2534 >= 100 % (precontrol activated) the following applies:

The dynamic following error (r2563) corresponds to the system deviation (r2557) at the position controller input.

For 0 % < p2534 < 100 % (precontrol activated) or p2534 = 0 % (precontrol deactivated) the following applies:

The dynamic following error (r2563) is the deviation between the measured position actual value and a value that is calculated from the position setpoint via a PT1 model. This compensates the system-related velocity-dependent system deviation for a P controller.

r2563 LR following error dynamic model

Variant:	S200 Compact
Available when function is active:	Position control
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring
Unit: °	

Description: Displays the dynamic following error.

This value is the deviation, corrected by the velocity-dependent component, between the position setpoint and the position actual value.

Note
For p2534 >= 100 % (precontrol activated) the following applies:
The dynamic following error (r2563) corresponds to the system deviation (r2557) at the position controller input.
For 0 % < p2534 < 100 % (precontrol activated) or p2534 = 0 % (precontrol deactivated) the following applies:
The dynamic following error (r2563) is the deviation between the measured position actual value and a value that is calculated from the position setpoint via a PT1 model. This compensates the system-related velocity-dependent system deviation for a P controller.

r2564 LR torque precontrol value

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: Nm

Description: Displays the torque precontrol value.

Note
The torque precontrol value is the derivation over time of the speed precontrol value and is referred to a moment of inertia of 1 kgm^2/2 PI. When using the precontrol, then this should be evaluated corresponding to the actual moment of inertia.

r2565 LR following error actual

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: mm

Description: Displays the actual following error.
This value is the deviation between the position setpoint - after fine interpolation - and the position actual value.

NOTICE
When speed precontrol is active (p2534 > 0 %), the following applies:
To calculate this value, the position setpoint is delayed by two position controller sampling times.
When speed precontrol is inactive (p2534 = 0 %), the following applies:
To calculate this value, the position setpoint is delayed by two position controller clock cycles.

r2565 LR following error actual

Variant: S200 Compact
Available when function is active: Position control
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: °

Description: Displays the actual following error.
This value is the deviation between the position setpoint - after fine interpolation - and the position actual value.

NOTICE
When speed precontrol is active (p2534 > 0 %), the following applies: To calculate this value, the position setpoint is delayed by two position controller sampling times. When speed precontrol is inactive (p2534 = 0 %), the following applies: To calculate this value, the position setpoint is delayed by two position controller clock cycles.

p2567[0] LR torque precontrol moment of inertia

Variant:	S200 Compact	
Available when function is active:	Position control	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Unit: kgm²		
Min:	**Max:**	**Factory setting:**
0.000000 [kgm²]	100000.000000 [kgm²]	0.000000 [kgm²]

Description: Sets the moment of inertia for the torque precontrol.

Dependency: See also: p2534, r2564

Note
When calculating the torque precontrol value (c2654), the time derivation of the speed precontrol value is multiplied by 2 PI * p2567.
For reasons associated with the compatibility to earlier firmware versions, the factory setting for p2567 = 1 kgm^2/2 PI. This means that r2564 remains as standard the derivation over time of the speed precontrol value and is referred, as before, to a moment of inertia of 1 kgm^2/2 PI. For torque precontrol, the moment of inertia can now be directly entered into p2567 (instead of subsequently evaluating the precontrol value).

c2568 EPOS hardware limit switch activation

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position limits
Unit: -	

Description: Signal to activate the hardware limit switch.
For c2568 = 1 signal:
Negative hardware limit switch (c2569) and positive hardware limit switch (c2570) are activated.
For c2568 = 0 signal:
Negative hardware limit switch (c2569) and positive hardware limit switch (c2570) are not evaluated.

Dependency: See also: c2569, c2570

Note
The traversing range can also be limited using software limit switches.

c2569 EPOS negative hardware limit switch

Variant: S200 Compact

Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position limits
Unit: -	

Description: Signal for the hardware limit switch in the negative direction of travel.

Recommendation: Set the OFF3 ramp-down time (p1135) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.

Sets message 07491 as alarm (A07491):

Set the maximum deceleration (p2573) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.

Dependency: See also: p1135, c2568, c2570, p2573, r2684

⚠ CAUTION

The hardware limit switch is low active.

Sets message 07491 as fault (F07491):

For a 0 signal, the drive stops with the OFF3 ramp-down time (p1135), status signal r2684.13 = 1 is set, saved and the corresponding fault is output. After the fault has been acknowledged, only motion moving away from the hardware limit switch is permitted.

For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.13 is set to 0.

Sets message 07491 as alarm (A07491):

For a 0 signal, the axis is stopped with the maximum deceleration (p2573), status signal r2684.13 is set to 1, saved and the appropriate alarm is output. Only motion away from the hardware limit switch is permitted.

For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.13 is set to 0 and the alarm is cleared.

c2570 EPOS positive hardware limit switch

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position limits
Unit: -	

Description: Signal for the hardware limit switch in the positive direction of travel.

Recommendation: Set the OFF3 ramp-down time (p1135) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.

Dependency: See also: p1135, c2568, c2569, p2573, r2684

⚠ CAUTION

The hardware limit switch is low active.

For a 0 signal

the drive stops with the OFF3 ramp-down time (p1135), status signal r2684.14 = 1 is set, saved and the corresponding fault is output. After the fault has been acknowledged, only motion moving away from the hardware limit switch is permitted.

For a 0/1 signal

and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.14 is set to 0.

p2571 EPOS maximum velocity

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Unit: mm/s		
Min:	**Max:**	**Factory setting:**
0.010 [mm/s]	4e+07 [mm/s]	500.000 [mm/s]

Description: Sets the maximum velocity for the "basic positioner" function (EPOS).

Dependency: See also: p2503, p2504, p2505, p2506

Note

The maximum velocity is active in all of the operating modes of the basic positioner.

The maximum velocity for the basic positioner should be aligned with the maximum speed/velocity of the speed/velocity controller:

Rotary encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[rpm] x p2505/p2504 x p2506/1000

Linear encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[m/min] x p2503/10[m]

p2571 EPOS maximum velocity

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Unit: °/s		
Min:	**Max:**	**Factory setting:**
0.010 [°/s]	4e+07 [°/s]	18000.000 [°/s]

Description: Sets the maximum velocity for the "basic positioner" function (EPOS).

Dependency: See also: p2503, p2504, p2505, p2506

Note

The maximum velocity is active in all of the operating modes of the basic positioner.

The maximum velocity for the basic positioner should be aligned with the maximum speed/velocity of the speed/velocity controller:

Rotary encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[rpm] x p2505/p2504 x p2506/1000

Linear encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[m/min] x p2503/10[m]

p2572 EPOS maximum acceleration

Variant:	S200 Compact

Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Unit: mm/s²		
Min:	**Max:**	**Factory setting:**
0.001 [mm/s²]	2e+06 [mm/s²]	10000.000 [mm/s²]

Description: Sets the maximum acceleration for the "basic positioner" function (EPOS).

Dependency: See also: p2619, c2644

Note
The maximum acceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed acceleration override (p2619) acts on the maximum acceleration.
"Direct setpoint input/MDI" operating mode:
The acceleration override is effective (c2644, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No acceleration override is active. The axis starts with the maximum acceleration.

p2572 EPOS maximum acceleration

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Unit: °/s²		
Min:	**Max:**	**Factory setting:**
0.001 [°/s²]	2e+06 [°/s²]	360000.000 [°/s²]

Description: Sets the maximum acceleration for the "basic positioner" function (EPOS).

Dependency: See also: p2619, c2644

Note
The maximum acceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed acceleration override (p2619) acts on the maximum acceleration.
"Direct setpoint input/MDI" operating mode:
The acceleration override is effective (c2644, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No acceleration override is active. The axis starts with the maximum acceleration.

p2573 EPOS maximum deceleration

Variant:	S200 Compact
Available when function is active:	Basic positioner

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Unit: mm/s²		
Min:	**Max:**	**Factory setting:**
0.001 [mm/s²]	2e+06 [mm/s²]	10000.000 [mm/s²]

Description: Sets the maximum deceleration for the "basic positioner" function (EPOS).

Dependency: See also: p2620, c2645

Note
The maximum deceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed deceleration override (p2620) acts on the maximum deceleration.
"Direct setpoint input/MDI" operating mode:
The deceleration override is effective (c2645, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No deceleration override is effective. The axis breaks with the maximum deceleration.

p2573 EPOS maximum deceleration

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Unit: °/s²		
Min:	**Max:**	**Factory setting:**
0.001 [°/s²]	2e+06 [°/s²]	360000.000 [°/s²]

Description: Sets the maximum deceleration for the "basic positioner" function (EPOS).

Dependency: See also: p2620, c2645

Note
The maximum deceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed deceleration override (p2620) acts on the maximum deceleration.
"Direct setpoint input/MDI" operating mode:
The deceleration override is effective (c2645, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No deceleration override is effective. The axis breaks with the maximum deceleration.

p2574 EPOS jerk limiting

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Unit: mm/s³		
Min:	**Max:**	**Factory setting:**
0.001 [mm/s³]	1e+08 [mm/s³]	200000.000 [mm/s³]

Description: Sets the jerk limiting

Dependency: See also: p2572, p2573, c2575

Note

The jerk limiting is internally converted into a jerk time as follows:

Jerk time Tr = max(p2572, p2573) / p2574

The jerk time is internally limited to 1000 ms, and is rounded off to an integer multiple of the sampling time of the basic positioner cycle.

The jerk time is valid for the acceleration and deceleration phases also for unequal maximum acceleration (p2572) and maximum deceleration (p2573).

For unequal maximum acceleration and maximum deceleration, the motion is not optimal from a time perspective as the jerk limit cannot be used for the lower of the two values.

If, in the traversing profile, the acceleration time without jerk limiting is shorter than jerk time Tr, then motion with jerk limiting is not time-optimized.

For traversing motion with a direct transition between acceleration and deceleration (i.e. jerk time is greater than the constant velocity phase), jerk can increase up to twice the parameterized jerk.

CONTINUE_FLYING with direction reversal acts internally just like a CONTINUE_WITH_STOP without the "position reached" being set. Without jerk limiting, this behavior can hardly be noticed as, when reversing, the position setpoint is only kept at zero for one interpolator clock cycle.

For block change enable CONTINUE_WITH_STOP, jerk limiting results in a longer delay time.

p2574 EPOS jerk limiting

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Unit: °/s³		
Min:	**Max:**	**Factory setting:**
0.001 [°/s³]	1e+08 [°/s³]	7.2e+06 [°/s³]

Description: Sets the jerk limiting

Dependency: See also: p2572, p2573, c2575

Note
The jerk limiting is internally converted into a jerk time as follows:
Jerk time Tr = max(p2572, p2573) / p2574
The jerk time is internally limited to 1000 ms, and is rounded off to an integer multiple of the sampling time of the basic positioner cycle.
The jerk time is valid for the acceleration and deceleration phases also for unequal maximum acceleration (p2572) and maximum deceleration (p2573).
For unequal maximum acceleration and maximum deceleration, the motion is not optimal from a time perspective as the jerk limit cannot be used for the lower of the two values.
If, in the traversing profile, the acceleration time without jerk limiting is shorter than jerk time Tr, then motion with jerk limiting is not time-optimized.
For traversing motion with a direct transition between acceleration and deceleration (i.e. jerk time is greater than the constant velocity phase), jerk can increase up to twice the parameterized jerk.
CONTINUE_FLYING with direction reversal acts internally just like a CONTINUE_WITH_STOP without the "position reached" being set. Without jerk limiting, this behavior can hardly be noticed as, when reversing, the position setpoint is only kept at zero for one interpolator clock cycle.
For block change enable CONTINUE_WITH_STOP, jerk limiting results in a longer delay time.

c2575 EPOS jerk limiting activation

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Dynamic response limits, Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: -	

Description: Signal to activate jerk limiting.
Activating/deactivating:
- Using c2575 = 1 signal or 0 signal.
- Using the JERK command in the traversing block (only for c2575 = 0 signal).

Dependency: See also: p2574

Note
A change to the signal state is only accepted at zero speed.

p2576 EPOS modulo correction modulo range

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000100 [mm]	2.1474828e+09 [mm]	360.000000 [mm]

Description: Sets the modulo range for axes with modulo correction.

Dependency: See also: c2577

p2576 EPOS modulo correction modulo range

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000100 [°]	2.1474828e+09 [°]	360.000000 [°]

Description: Sets the modulo range for axes with modulo correction.

Dependency: See also: c2577

c2577 EPOS modulo correction activation

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing
Unit: -	

Description: Signal to activate modulo correction.

Dependency: See also: p2576

Note

When the signal state changes, this only becomes effective in the "ready for switching on" state.

Selecting modulo correction:

The actual position setpoint in the modulo range is corrected. The position actual value differs from the position setpoint by the following error and can also leave the modulo range.

Deselecting modulo correction:

It is based on the actual position actual value.

c2578 EPOS negative software limit switch

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position limits
Unit: mm	

Description: Signal for the negative software limit switch.

Dependency: See also: c2579, p2580, p2581, c2582

NOTICE

A change to the software limit switch immediately becomes effective.

If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note
The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2578 EPOS negative software limit switch

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position limits
Unit: °	

Description: Signal for the negative software limit switch.

Dependency: See also: c2579, p2580, p2581, c2582

NOTICE
A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note
The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2579 EPOS positive software limit switch

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Dynamic response limits
Unit: mm	

Description: Signal for the positive setpoint limit switch.

Dependency: See also: c2578, p2580, p2581, c2582

NOTICE
A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note
The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2579 EPOS positive software limit switch

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Parameter group: Dynamic response limits
Unit: °

Description: Signal for the positive setpoint limit switch.

Dependency: See also: c2578, p2580, p2581, c2582

NOTICE
A change to the software limit switch immediately becomes effective. If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note
The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

p2580 EPOS negative software limit switch

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Position limits
Unit: mm

Min:	Max:	Factory setting:
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	-2.1474828e+09 [mm]

Description: Sets the software limit switch, in the negative direction of travel.

Dependency: See also: c2578, c2579, p2581, c2582

p2580 EPOS negative software limit switch

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Position limits
Unit: °

Min:	Max:	Factory setting:
-2.1474828e+09 [°]	2.1474828e+09 [°]	-2.1474828e+09 [°]

Description: Sets the software limit switch, in the negative direction of travel.

Dependency: See also: c2578, c2579, p2581, c2582

p2581 EPOS positive software limit switch

Variant: S200 Compact
Available when function is active: Basic positioner

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Unit: mm		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	2.1474828e+09 [mm]

Description: Sets the software limit switch, in the positive direction of travel.

Dependency: See also: c2578, c2579, p2580, c2582

p2581 EPOS positive software limit switch

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Unit: °		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	2.1474828e+09 [°]

Description: Sets the software limit switch, in the positive direction of travel.

Dependency: See also: c2578, c2579, p2580, c2582

c2582 EPOS software limit switch activation

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Position limits
Unit: -	

Description: Signal to activate the software limit switch.

Dependency: See also: c2578, c2579, p2580, p2581

⚠ CAUTION

Software limit switch is effective for:
- Axis is homed (r2684.11 = 1) and
- c2582 = 1 signal.

Software limit switch is ineffective for:
- Modulo correction active (c2577 = 1 signal) or
- "Active homing" is executed.

NOTICE
Target position for relative positioning outside software limit switch: The traversing block is started and the axis comes to a standstill at the software limit switch. An appropriate alarm is output and the traversing block is interrupted. Traversing blocks with valid position can be activated. Target position for absolute positioning outside software limit switch: In the "traversing blocks" mode, the traversing block is not started and an appropriate fault is output. Axis outside the valid traversing range: If the axis is already outside the valid traversing range, then an appropriate fault is output. The fault can be acknowledged at standstill. Traversing blocks with valid position can be activated.

Note
The traversing range can also be limited using hardware limit switches.

p2583 EPOS backlash compensation

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Unit: mm		
Min:	**Max:**	**Factory setting:**
-200000.000000 [mm]	200000.000000 [mm]	0.000000 [mm]

Description:
Sets the amount of play (backlash) for positive or negative play.
0: backlash compensation is deactivated.
> 0: Positive backlash (normal case)
When the direction is reversed, the encoder actual value leads the actual value.
< 0: Negative backlash
When the direction is reversed, the actual value leads the encoder actual value.

Dependency:
If a stationary axis is referenced by "setting the home position", or an adjusted with absolute encoder is switched on, then the setting of c2604 is relevant for entering the compensation value.
c2604 = 1:
Traveling in the positive direction -> A compensation value is immediately entered.
Traveling in the negative direction -> A compensation value is not entered
c2604 = 0:
Traveling in the positive direction -> A compensation value is not entered
Traveling in the negative direction -> A compensation value is immediately entered.
When again setting the home position (a homed axis) or for "passive homing", c2604 is not relevant but instead the history of the axis.
See also: c2604

p2583 EPOS backlash compensation

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	**Visible in:** Extended display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Unit: °		
Min:	**Max:**	**Factory setting:**
-200000.000000 [°]	200000.000000 [°]	0.000000 [°]

Description:

Sets the amount of play (backlash) for positive or negative play.

0: backlash compensation is deactivated.

> 0: Positive backlash (normal case)

When the direction is reversed, the encoder actual value leads the actual value.

< 0: Negative backlash

When the direction is reversed, the actual value leads the encoder actual value.

Dependency:

If a stationary axis is referenced by "setting the home position", or an adjusted with absolute encoder is switched on, then the setting of c2604 is relevant for entering the compensation value.

c2604 = 1:

Traveling in the positive direction -> A compensation value is immediately entered.

Traveling in the negative direction -> A compensation value is not entered

c2604 = 0:

Traveling in the positive direction -> A compensation value is not entered

Traveling in the negative direction -> A compensation value is immediately entered.

When again setting the home position (a homed axis) or for "passive homing", c2604 is not relevant but instead the history of the axis.

See also: c2604

p2584.0...3 EPOS functions configuration

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Basic positioner	
Unit: -		
Min:	**Max:**	**Factory setting:**
-	-	0100 bin

Description:

Sets the configuration for additional functions for the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate position feedback signal	Yes	No
01	Hardware limit switch evaluation	Level evaluation	Edge evaluation
02	Travel to fixed stop - torque calculation based on the offset	Yes	No
03	Active homing with absolute encoder adjustment	Yes	No

Note
For bit 00:
When the bit is set, for traversing blocks with absolute target positions (p2617[x]) when the tolerance window (p2688) is reached, the traversing block number (p2616[x]) is output bit-coded (r2689).
For bit 01:
When the bit is set, the hardware limit switch is evaluated, level-triggered.
This setting is recommended for a poor position actual value resolution, as in this case the direction does not have to be evaluated.
For bit 02:
When the bit is set, for "Travel to fixed stop", the torque setpoints are calculated based on the offset for the torque limit (p1532).
For bit 03:
After successful active homing, an absolute encoder is adjusted (p2507).

p2585 EPOS jog 1 setpoint velocity

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: mm/s		
Min:	**Max:**	**Factory setting:**
-4e+07 [mm/s]	4e+07 [mm/s]	-5.000 [mm/s]

Description: Sets the setpoint velocity for jog 1.

Dependency: See also: p2587, c2589, c2591

p2585 EPOS jog 1 setpoint velocity

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: °/s		
Min:	**Max:**	**Factory setting:**
-4e+07 [°/s]	4e+07 [°/s]	-180.000 [°/s]

Description: Sets the setpoint velocity for jog 1.

Dependency: See also: p2587, c2589, c2591

p2586 EPOS jog 2 setpoint velocity

Variant:	S200 Compact
Available when function is active:	Basic positioner

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: mm/s		
Min:	**Max:**	**Factory setting:**
-4e+07 [mm/s]	4e+07 [mm/s]	5.000 [mm/s]

Description: Sets the setpoint velocity for jog 2.

Dependency: See also: p2588, c2590, c2591

p2586 EPOS jog 2 setpoint velocity

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: °/s		
Min:	**Max:**	**Factory setting:**
-4e+07 [°/s]	4e+07 [°/s]	180.000 [°/s]

Description: Sets the setpoint velocity for jog 2.

Dependency: See also: p2588, c2590, c2591

p2587 EPOS jog 1 traversing distance

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]

Description: Sets the traversing distance for incremental jog 1.

Dependency: See also: p2585, c2589, c2591

Note
Incremental jog 1 is started with c2591 = 1 signal and c2589 = 0/1 signal.
With c2589 = 0 signal, incremental jogging is interrupted.

p2587 EPOS jog 1 traversing distance

Variant: S200 Compact

Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]

Description: Sets the traversing distance for incremental jog 1.

Dependency: See also: p2585, c2589, c2591

Note
Incremental jog 1 is started with c2591 = 1 signal and c2589 = 0/1 signal.
With c2589 = 0 signal, incremental jogging is interrupted.

p2588 EPOS jog 2 traversing distance

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]

Description: Sets the traversing distance for incremental jog 2.

Dependency: See also: p2586, c2590, c2591

Note
Incremental jog 2 is started with c2591 = 1 signal and c2590 = 0/1 signal.
Incremental jogging is interrupted with c2590 = 0 signal.

p2588 EPOS jog 2 traversing distance

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Unit: °		

Min:	Max:	Factory setting:
0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]

Description: Sets the traversing distance for incremental jog 2.

Dependency: See also: p2586, c2590, c2591

Note
Incremental jog 2 is started with c2591 = 1 signal and c2590 = 0/1 signal.
Incremental jogging is interrupted with c2590 = 0 signal.

c2589 EPOS jog 1

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Jog
Unit: -

Description: Signal for jog 1.

Dependency: When jogging, the axis is accelerated or braked with the maximum acceleration/deceleration (p2572/p2573).
c2591 = 0 signal
The axis endlessly moves with the setpoint velocity, jog 1 (p2585).
c2591 = 1 signal
The axis traverses through a parameterized distance (p2585) with the setpoint velocity, jog 1 (p2587).
See also: p2572, p2573, p2585, p2587, c2591

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

c2590 EPOS jog 2

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Jog
Unit: -

Description: Signal for jog 2.

Dependency: When jogging, the axis is accelerated or braked with the maximum acceleration/deceleration (p2572/p2573).
c2591 = 0 signal
The axis endlessly moves with the setpoint velocity, jog 2 (p2586).
c2591 = 1 signal
The axis traverses through a parameterized distance (p2586) with the setpoint velocity, jog 2 (p2588).
See also: p2572, p2573, p2586, p2588, c2591

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

c2591 EPOS jogging incremental

Variant: S200 Compact

	Available when function is active:	Basic positioner
	Data type: Unsigned8	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Jog
	Unit: -	
Description:	Signal for incremental jogging.	
Dependency:	See also: p2585, p2586, p2587, p2588, c2589, c2590	

c2595 EPOS homing start

	Variant:	S200 Compact
	Available when function is active:	Basic positioner
	Data type: Unsigned8	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Homing
	Unit: -	
Description:	Signal to start "Active homing" or "Passive homing". 0/1 signal edge: Homing is started. 1/0 signal edge: Homing is interrupted.	
Dependency:	See also: c2597, c2598, p2599, r2684	

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Active homing (c2597 = 0 signal):
Active homing can only be activated (0/1 edge) after traversing motion that is being processed has been completed.
With the start, where relevant, the state signal "home position set" (r2684.11) is reset.
Passive homing (c2597 = 1 signal):
With the start, the state signal "home position set" (r2684.11) is not reset.

c2596 EPOS set home position

	Variant:	S200 Compact
	Available when function is active:	Basic positioner
	Data type: Unsigned8	**Visible in:** Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Homing
	Unit: -	
Description:	Signal for "Set home position".	
Dependency:	See also: c2598, p2599, r2684	

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Home position setting is effective in the following operating states:
- In the basic state.
- For FIXED STOP with progress condition END (corresponds to the initial state).
- For traversing block interrupted via c2640 = 0 signal (intermediate stop).
- For EPOS not enabled and position actual value valid

c2597 EPOS homing type selection

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Homing
Unit: -	

Description:
Signal to select homing type.
1 signal: Passive homing
0 signal: Active homing

Dependency:
See also: c2595

Note
Homing is activated as follows:
- Select homing type (c2597)
- Start homing (c2595 = 0/1 signal edge)

c2598[0...3] EPOS home position signal

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Homing
Unit: mm	

Description:
Signal for the home position.
This value is used as reference for the following homing operations:
- Active homing
- Set home position
- Passive homing
- Absolute value adjustment

Index:
[0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency:
See also: p2502, p2507, c2595, c2596, c2597, p2599

Note
Absolute encoder:
When adjusting the encoder, the position received is set as the actual axis position.

c2598[0...3] EPOS home position signal

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Homing
Unit: °	

Description:
Signal for the home position.
This value is used as reference for the following homing operations:
- Active homing
- Set home position
- Passive homing
- Absolute value adjustment

Index:
[0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency:
See also: p2502, p2507, c2595, c2596, c2597, p2599

Note
Absolute encoder:
When adjusting the encoder, the position received is set as the actual axis position.

p2599 EPOS home position value

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: mm		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]

Description:
Sets the position value for the home position.
This value is set as the actual axis position after homing or adjustment.

Dependency:
See also: p2507, c2595, c2596, c2597, c2598

p2599 EPOS home position value

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: °		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]

Description: Sets the position value for the home position.
This value is set as the actual axis position after homing or adjustment.

Dependency: See also: p2507, c2595, c2596, c2597, c2598

p2600 EPOS active homing home position offset

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: mm		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]

Description: Sets the home position shift for active homing.

Dependency: See also: c2598

p2600 EPOS active homing home position offset

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: °		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]

Description: Sets the home position shift for active homing.

Dependency: See also: c2598

c2604 EPOS active homing start direction

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Parameter group: Homing
Unit: -

Description: Signal for the start direction for active homing.
1 signal: Start in the negative direction.
0 signal: Start in the positive direction.

Dependency: See also: p2583, c2595, c2597

p2605 EPOS active homing approach velocity reference cam

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Unit: mm/s

Min:	Max:	Factory setting:
0.0001 [mm/s]	4e+07 [mm/s]	100.0000 [mm/s]

Description: Sets the approach velocity to the reference cam for active homing.

Dependency: Active homing only starts with the approach velocity to the reference cam when there is a reference cam (p2607 = 1).
See also: c2595, c2597, c2604, p2606, p2607

Note
When traversing to the reference cam, the velocity override is effective.
If, at the start of active homing, the axis is already at the reference cam, then the axis immediately starts to traverse to the zero mark.

p2605 EPOS active homing approach velocity reference cam

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Unit: °/s

Min:	Max:	Factory setting:
0.0001 [°/s]	4e+07 [°/s]	3600.0000 [°/s]

Description: Sets the approach velocity to the reference cam for active homing.

Dependency: Active homing only starts with the approach velocity to the reference cam when there is a reference cam (p2607 = 1).
See also: c2595, c2597, c2604, p2606, p2607

Note
When traversing to the reference cam, the velocity override is effective.
If, at the start of active homing, the axis is already at the reference cam, then the axis immediately starts to traverse to the zero mark.

p2606 EPOS active homing reference cam maximum distance

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint64 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Unit: mm

Min:	Max:	Factory setting:
0.000000 [mm]	2.1474828e+09 [mm]	2.1474828e+09 [mm]

Description: Sets the maximum distance after starting active homing when traversing to the reference cam.
Dependency: See also: c2595, c2597, c2604, p2605, p2607

Note
When using a reversing cam, the maximum distance must be set appropriately long.

p2606 EPOS active homing reference cam maximum distance

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Unit: °

Min:	Max:	Factory setting:
0.000000 [°]	2.1474828e+09 [°]	2.1474828e+09 [°]

Description: Sets the maximum distance after starting active homing when traversing to the reference cam.
Dependency: See also: c2595, c2597, c2604, p2605, p2607

Note
When using a reversing cam, the maximum distance must be set appropriately long.

p2607 EPOS active homing reference cam available

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Unit: -

Min:	Max:	Factory setting:
0	1	1

Description: Sets whether or not a reference cam is available for active homing.
Value = 1: Reference cam present.
Value = 0: No reference cam present.

Dependency: See also: c2595, c2597, c2604, p2605, p2606

p2608 EPOS active homing approach velocity zero mark

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: mm/s		
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	25.0000 [mm/s]

Description: Sets the approach velocity after detecting the reference cam to search for the zero mark for active homing.

Dependency: If there is no reference cam (p2607 = 0), active homing starts immediately with the axis traversing to the zero mark.
See also: c2595, c2597, c2604, p2607, p2609, p2610

⚠ CAUTION

If the reference cam is not adjusted so that for each active homing the same zero mark for synchronization is detected, then an "incorrect" axis reference point is obtained.
After the reference cam has been left, the search for the zero mark is activated with a time delay due to internal factors. This is the reason that the reference cam should be adjusted in this center between two zero marks and the approach velocity should be adapted to the distance between two zero marks.

Note
The velocity override is not effective when traversing to the zero mark.

p2608 EPOS active homing approach velocity zero mark

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: °/s		
Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	900.0000 [°/s]

Description: Sets the approach velocity after detecting the reference cam to search for the zero mark for active homing.

Dependency: If there is no reference cam (p2607 = 0), active homing starts immediately with the axis traversing to the zero mark.
See also: c2595, c2597, c2604, p2607, p2609, p2610

⚠ CAUTION

If the reference cam is not adjusted so that for each active homing the same zero mark for synchronization is detected, then an "incorrect" axis reference point is obtained.
After the reference cam has been left, the search for the zero mark is activated with a time delay due to internal factors. This is the reason that the reference cam should be adjusted in this center between two zero marks and the approach velocity should be adapted to the distance between two zero marks.

Note
The velocity override is not effective when traversing to the zero mark.

p2609 EPOS active homing max distance reference cam and zero mark

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	20.000000 [mm]

Description: Sets the maximum distance after leaving the reference cam when traversing to the zero mark.

Dependency: See also: c2595, c2597, c2604, p2607, p2608, p2610

p2609 EPOS active homing max distance reference cam and zero mark

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	720.000000 [°]

Description: Sets the maximum distance after leaving the reference cam when traversing to the zero mark.

Dependency: See also: c2595, c2597, c2604, p2607, p2608, p2610

p2610 EPOS active homing tolerance band for distance to zero mark

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	2.1474828e+09 [mm]

Description: Sets the tolerance bandwidth for the distance to the zero mark

The zero mark is evaluated within the maximum distance between the reference cam and zero mark (p2609) minus the tolerance bandwidth for the distance to the zero mark (p2610).

Dependency: See also: p2609

p2610 EPOS active homing tolerance band for distance to zero mark

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	2.1474828e+09 [°]

Description: Sets the tolerance bandwidth for the distance to the zero mark

The zero mark is evaluated within the maximum distance between the reference cam and zero mark (p2609) minus the tolerance bandwidth for the distance to the zero mark (p2610).

Dependency: See also: p2609

p2611 EPOS active homing approach velocity home position

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: mm/s		
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	25.0000 [mm/s]

Description: Sets the approach velocity after detecting the zero mark to approach the home position.

Dependency: See also: c2595, c2597, c2604, p2607, p2609, p2610

Note
When traversing to the home position, the velocity override is not effective.

p2611 EPOS active homing approach velocity home position

Variant: S200 Compact

Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Unit: °/s		
Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	900.0000 [°/s]

Description: Sets the approach velocity after detecting the zero mark to approach the home position.

Dependency: See also: c2595, c2597, c2604, p2607, p2609, p2610

Note
When traversing to the home position, the velocity override is not effective.

c2612[0...1] EPOS active homing reference cam

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Homing
Unit: -	

Description: Signal for the reference cam.

Index: [0] = Reference cam selection 1
[1] = Reference cam selection 2

Dependency: See also: r0922, p2607

NOTICE
Parameter c2612[0] may be protected as a result of r0922 and cannot be changed.

Note
The selection of reference cam 1 or 2 can be configured using p11550.

c2613 EPOS active homing negative reversing cam

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Homing
Unit: -	

Description: Signal for the reversing cam in the negative direction of travel.
1 signal: Reversing cam not reached.
0 signal: Reversing cam reached.

Dependency: See also: c2614

Note
If, during active homing of the positive and negative reversing cam, a 0 signal is detected, then the axis remains at a standstill.

c2614 EPOS active homing positive reversing cam

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Homing
Unit: -

Description: Signal for the reversing cam in the positive direction of travel.
1 signal: Reversing cam not reached.
0 signal: Reversing cam reached.

Dependency: See also: c2613

Note
If, during active homing of the positive and negative reversing cam, a 0 signal is detected, then the axis remains at a standstill.

p2615 EPOS maximum number of traversing blocks

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Traversing blocks
Unit: -

Min:	Max:	Factory setting:
1	32	32

Description: Sets the maximum number of traversing blocks that are available.

Dependency: See also: p2616, p2617, p2618, p2619, p2620, p2621, p2622, p2623

p2616[0...n] EPOS traversing block block number

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Traversing blocks
Unit: -

Min:	Max:	Factory setting:
-1	31	-1

Description: Sets a block number.
-1: Invalid block number. These blocks are not taken into account.
0 ... 31: Valid block number.

Dependency: The number of indices depends on p2615.
See also: p2615, p2617, p2618, p2619, p2620, p2621, p2622, p2623

p2617[0...n] EPOS traversing block position

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: mm		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]

Description: Sets the target position for the traversing block.

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2618, p2619, p2620, p2621, p2622, p2623

Note
The target position is approached in either relative or absolute terms depending on p2623.

p2617[0...n] EPOS traversing block position

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: °		
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]

Description: Sets the target position for the traversing block.

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2618, p2619, p2620, p2621, p2622, p2623

Note
The target position is approached in either relative or absolute terms depending on p2623.

p2618[0...n] EPOS traversing block velocity

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: mm/s		
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	100.0000 [mm/s]

Description: Sets the velocity for the traversing block.

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2617, p2619, p2620, p2621, p2622, p2623, c2646

Note
The velocity can be influenced using the velocity override (c2646).

p2618[0...n] EPOS traversing block velocity

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: °/s		
Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	3600.0000 [°/s]

Description: Sets the velocity for the traversing block.

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2617, p2619, p2620, p2621, p2622, p2623, c2646

Note
The velocity can be influenced using the velocity override (c2646).

p2619[0...n] EPOS traversing block acceleration override

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: %		
Min:	**Max:**	**Factory setting:**
1.0 [%]	100.0 [%]	100.0 [%]

Description: Sets the acceleration override for the traversing block.
The override refers to the maximum acceleration (p2572).

Dependency: The number of indices depends on p2615.
See also: p2572, p2615, p2616, p2617, p2618, p2620, p2621, p2622, p2623

p2620[0...n] EPOS traversing deceleration override

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: %		
Min:	**Max:**	**Factory setting:**
1.0 [%]	100.0 [%]	100.0 [%]

Description: Sets the deceleration override for the traversing block.
The override refers to the maximum deceleration (p2573).

Dependency: The number of indices depends on p2615.
See also: p2573, p2615, p2616, p2617, p2618, p2619, p2621, p2622, p2623

NOTICE
If, when calculating the traversing profile, it is identified that the target position of the next block with the programmed deceleration override will not be reached without direction reversal (flying block change), then the old (actual) deceleration override remains effective.

p2621[0...n] EPOS traversing block task

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: -		
Min:	**Max:**	**Factory setting:**
1	9	1

Description: Sets the required task for the traversing block.

Value:
1: POSITIONING
2: FIXED STOP
3: ENDLESS_POS
4: ENDLESS_NEG
5: WAITING
6: GOTO
7: SET_O
8: RESET_O
9: JERK

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2622, p2623

p2622[0...n] EPOS traversing block task parameter

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: -		
Min:	**Max:**	**Factory setting:**
-2147483648	2147483647	0

Description: Sets additional information/data of the appropriate task for the traversing block.

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2621, p2623

Note
The following should be set depending on the task:
FIXED STOP: Clamping torque and clamping force (rotary 0...65536 [0.01 Nm], linear 0...65536 [N])
WAIT: Wait time [ms]
GOTO: Block number
SET_O: 1, 2 or 3 - set direct output 1, 2 or 3 (both)
RESET_O: 1, 2 or 3 - reset direct output 1, 2 or 3 (both)
JERK: 0 - deactivate, 1 - activate

p2623[0...n] EPOS traversing block task mode

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	65535	0

Description: Sets the influence of the task for the traversing block.
Value = 0000 cccc bbbb aaaa
cccc: Positioning mode
cccc = 0000 --> ABSOLUTE
cccc = 0001 --> RELATIVE
cccc = 0010 --> ABS_POS (only for a rotary axis with modulo correction)
cccc = 0011 --> ABS_NEG (only for a rotary axis with modulo correction)
bbbb: Progression condition
bbbb = 0000 --> END
bbbb = 0001 --> CONTINUE_WITH_STOP
bbbb = 0010 --> CONTINUE_FLYING
bbbb = 0011 --> CONTINUE_EXTERNAL
bbbb = 0100 --> CONTINUE_EXTERNAL_WAIT
bbbb = 0101 --> CONTINUE_EXTERNAL_ALARM
aaaa: IDs
aaaa = 000x --> show/hide block (x = 0: show, x = 1: hide)

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2621, p2622

c2625 EPOS traversing block selection bit 0

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Traversing blocks
Unit: -	

Description: Signal to select the traversing block, bit 0.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2626, c2627, c2628, c2629

c2626 EPOS traversing block selection bit 1

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Traversing blocks
Unit: -	

Description: Signal to select the traversing block, bit 1.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2625, c2627, c2628, c2629

c2627 EPOS traversing block selection bit 2

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display

Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Unit: -

Description: Signal to select the traversing block, bit 2.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2625, c2626, c2628, c2629

c2628 EPOS traversing block selection bit 3

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Unit: -

Description: Signal to select the traversing block, bit 3.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2625, c2626, c2627, c2629

c2629 EPOS traversing block selection bit 4

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Unit: -

Description: Signal to select the traversing block, bit 4.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2625, c2626, c2627, c2628

c2631 EPOS activate traversing task (0 -> 1)

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Unit: -

Description: Signal for "Activate traversing task".
c2631 = 0/1 signal
The traversing task, selected using c2625 ... c2629, is started.

Dependency: See also: c2625, c2626, c2627, c2628, c2629, c2640, c2641

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
To start a traversing block, the axis must be homed (r2684.11 = 1).
The status signal r2684.12 = 0/1 signal is used for acknowledgment.
A traversing task can be influenced using the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

p2632 EPOS external block change evaluation

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Traversing blocks	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the mode to evaluate "external block change".

Value:
0: External block change via a measuring probe
1: External block change via c2633

Dependency: See also: p2623, c2633, r2677, r2678

Note
In the mode "external block change via measuring probe" (p2632 = 0), the following applies:
When starting a traversing block with the block change enable CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT and CONTINUE_EXTERNAL_ALARM, an activated "passive homing" is interrupted.
After ending the block, "Passive homing" must be reactivated using a 0/1 edge in c2595.

c2633 EPOS external block change (0 -> 1)

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Traversing blocks
Unit: -	

Description: Signal for the "External block change" for a positive signal edge.

Dependency: The evaluation of the signal is only active p2632 = 1.
See also: p2623, p2632, c2640, c2641, r2677, r2678

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
A positive signal edge initiates a flying block change in the subsequent traversing block.
When the external block change is identified, the actual position is saved in r2678.
A traversing task can be influenced using the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

p2634[0] EPOS fixed stop maximum following error

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]

Description: Sets the following error to detect the "fixed stop reached" state (r2526.4).

Dependency: See also: r2526, p2621, r2675

Note
The state "fixed stop reached" is detected if the following error exceeds the theoretically calculated following error value by p2634.

p2634[0] EPOS fixed stop maximum following error

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]

Description: Sets the following error to detect the "fixed stop reached" state (r2526.4).

Dependency: See also: r2526, p2621, r2675

Note
The state "fixed stop reached" is detected if the following error exceeds the theoretically calculated following error value by p2634.

p2635 EPOS fixed stop monitoring window

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation
Parameter group:	Traversing blocks
Unit: mm	

Min:	Max:	Factory setting:
0.000000 [mm]	2.1474828e+09 [mm]	0.125000 [mm]

Description: Sets the monitoring window of the actual position after the fixed stop is reached.

Dependency: See also: r2526, r2683

Note
If, after the fixed stop is reached, the end stop shifts in either the positive or negative direction by more than the value set here, then r2526.5 is set to 1 and an appropriate message is output.

p2635 EPOS fixed stop monitoring window

Variant: S200 Compact

Available when function is active: Basic positioner

Values for: Basic positioner for rotary motion

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Traversing blocks

Unit: °

Min:	Max:	Factory setting:
0.000000 [°]	2.1474828e+09 [°]	3.600000 [°]

Description: Sets the monitoring window of the actual position after the fixed stop is reached.

Dependency: See also: r2526, r2683

Note
If, after the fixed stop is reached, the end stop shifts in either the positive or negative direction by more than the value set here, then r2526.5 is set to 1 and an appropriate message is output.

c2640 EPOS intermediate stop (0 signal)

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: Unsigned8 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Traversing blocks, Direct setpoint input (MDI)

Unit: -

Description: Signal for "No intermediate stop/intermediate stop".
1 signal: No intermediate stop
0 signal: Intermediate stop.

Dependency: See also: c2631, c2641, c2647, c2649

⚠ CAUTION
For c2649 = 1 signal, the following applies:
Motion starts without any explicit control signal.

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
This signal is only effective in the modes "traversing blocks" and "direct setpoint input/MDI".
When the intermediate stop is activated, then the axis brakes with the parameterized deceleration (p2620 or c2645).

c2641 EPOS reject traversing task (0 signal)

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks, Direct setpoint input (MDI)
Unit: -

Description: Signal for "Do not reject traversing task/reject traversing task".
1 signal: Do not reject traversing task.
0 signal: Reject traversing task

Dependency: See also: c2631, c2640, c2647, c2649

⚠ CAUTION
For c2649 = 1 signal, the following applies:
Motion starts without any explicit control signal.

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
This signal is only effective in the modes "traversing blocks" and "direct setpoint input/MDI".
When activating reject traversing tasks, then the axis brakes with the maximum deceleration (p2573).

c2642 EPOS direct setpoint input/MDI position setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Unit: mm

Description: Signal for the position setpoint in the mode "direct setpoint input/MDI".

Dependency: See also: c2648, c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the position setpoint is either transferred continuously or edge-triggered.
The position setpoint input is interpreted as length unit [LU].

c2642 EPOS direct setpoint input/MDI position setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Parameter group: Direct setpoint input (MDI)

Unit: °

Description: Signal for the position setpoint in the mode "direct setpoint input/MDI".

Dependency: See also: c2648, c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the position setpoint is either transferred continuously or edge-triggered.
The position setpoint input is interpreted as length unit [LU].

c2643 EPOS direct setpoint input/MDI velocity setpoint

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Direct setpoint input (MDI)

Unit: mm/s

Description: Signal for the velocity setpoint in the mode "Direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the velocity setpoint is either transferred continuously or edge-triggered.
The velocity setpoint input is interpreted as [1000 LU/min].

c2643 EPOS direct setpoint input/MDI velocity setpoint

Variant: S200 Compact

Available when function is active: Basic positioner

Values for: Basic positioner for rotary motion

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Direct setpoint input (MDI)

Unit: °/s

Description: Signal for the velocity setpoint in the mode "Direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the velocity setpoint is either transferred continuously or edge-triggered.
The velocity setpoint input is interpreted as [1000 LU/min].

c2644 EPOS direct setpoint input/MDI acceleration override

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Direct setpoint input (MDI)

Unit: %

Description: Signal for acceleration override in the operating mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650, c11560

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the acceleration override is either transferred continuously or edge-triggered.
The signal value 4000 hex (16384 dec) corresponds to 100 %.

c2645 EPOS direct setpoint input/MDI deceleration override

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Traversing blocks

Unit: %

Description: Signal for the deceleration override in the operating mode "Direct setpoint input/MDI".

Dependency: See also: c2649, c2650, c11561

NOTICE
If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration override cannot be reached without reversing the direction, then when accepting the dynamic values, the larger deceleration override is accepted and becomes effective. The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the deceleration override is either transferred continuously or edge-triggered.
The signal value 4000 hex (16384 dec) corresponds to 100 %.

c2646 EPOS velocity override

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)

Unit: %

Description: Signal for the velocity override.

This velocity override is effective in the following operating modes "Direct setpoint input/MDI", "Traversing blocks", "Jogging" and "Active homing" (when approaching a reference cam).

Dependency: See also: p2571, p2585, p2586, p2605, p2618, c2643, r2681

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
The effective override (r2681) can differ from the specified override due to limits (e.g. maximum velocity).

c2647 EPOS direct setpoint input/MDI selection

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: -	

Description: Signal to select operating mode "Direct setpoint input/MDI".

Dependency: See also: c2640, c2641, c2642, c2643, c2644, c2645, c2646, c2648, c2649, c2650, c2651, c2652, c2653

Note
In this mode, using c2653, a flying changeover can be made between setting-up and positioning.
In this mode, even if the axis is not referenced (r2684.11 = 0) relative positioning is possible.

c2648 EPOS direct setpoint input/MDI positioning type

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: -	

Description: Signal for the positioning type in mode "Direct setpoint input/MDI".
1 signal: Absolute positioning is selected.
0 signal: Relative positioning is selected.

Dependency: See also: c2649, c2650, c2654

NOTICE
Absolute positioning: To traverse, the home position must be set (r2684.11 = 1). Relative positioning: To traverse, "Home position set" is not required.

Note
Depending on c2649, the positioning type is either transferred continuously or edge-triggered.
This parameter is only evaluated for c2654 = 0.
This parameter is possibly not evaluated as a result of the selected telegram.

c2649 EPOS direct setpoint input/MDI transfer type selection

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Unit: -

Description: Signal to define how values are transferred in operating mode "Direct setpoint input/MDI".
1 signal: Values are continually transferred (refer to parameter under dependency).
0 signal: The values are transferred for c2650 = 0/1 signal.

Dependency: See also: c2642, c2643, c2644, c2645, c2648, c2650, c2651, c2652

⚠ CAUTION
For a 1 signal, the following applies:
Motion starts without any explicit control signal.

Note
Parameter c2649 can only be changed when r0922 = 999.

c2650 EPOS direct setpoint input/MDI setpoint acceptance edge

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Unit: -

Description: Signal to accept the values for edge-triggered selection (c2649 = 0 signal) in the operating mode "Direct setpoint input/MDI".
c2650 = 0/1 signal and c2649 = 0 signal
Values are accepted, edge-triggered (refer to parameter under dependency).

Dependency: See also: c2640, c2641, c2642, c2643, c2644, c2645, c2648, c2649, c2651, c2652, r2684

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
The status signal r2684.12 = 0/1 signal is used for acknowledgment.
The operating mode "direct setpoint input/MDI" can be influenced via the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

c2651 EPOS direct setpoint input/MDI direction selection, positive

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Unit: -

Description: Signal for the positive direction selection in operating mode "Direct setpoint input/MDI".

Dependency: See also: p2576, c2648, c2649, c2650, c2652, c2653, c2654

Note
The following applies for "setting-up":
- The traversing direction can be specified using this parameter.
- If both directions (c2651, c2652) are selected, then the axis remains stationary (zero speed).
- If both directions (c2651, c2652) are deselected, then the axis remains stationary (zero speed).
The following applies for "positioning":
Using parameters c2651 and c2652, when the modulo correction (c2577 = 1 signal) is activated and absolute positioning (c2648 = 1 signal), the travel direction is specified as follows:
c2651 / c2652
0 signal / 0 signal: Absolute positioning through the shortest distance.
1 signal / 0 signal: Absolute positioning in the positive direction.
0 signal / 1 signal: Absolute positioning in the negative direction.
1 signal / 1 signal: Absolute positioning through the shortest distance.

c2652 EPOS direct setpoint input/MDI direction selection negative

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: -	

Description: The signal for the negative direction selection in the operating mode "Direct setpoint input/MDI".

Dependency: See also: p2576, c2648, c2649, c2650, c2651, c2653, c2654

Note
The following applies for "setting-up":
- The travel direction is specified using this signal.
- If both directions (c2651, c2652) are selected, then the axis remains stationary (zero speed).
- If both directions (c2651, c2652) are deselected, then the axis remains stationary (zero speed).
The following applies for "positioning":
Using c2651 and c2652, when the modulo correction (c2577 = 1 signal) is activated and absolute positioning (c2648 = 1 signal), the travel direction can be specified as follows:
c2651 / c2652
0 signal / 0 signal: Absolute positioning through the shortest distance.
1 signal / 0 signal: Absolute positioning in the positive direction.
0 signal / 1 signal: Absolute positioning in the negative direction.
1 signal / 1 signal: Absolute positioning through the shortest distance.

c2653 EPOS direct setpoint input/MDI setting-up selection

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: -	

Description: Signal for setting-up in operating mode "Direct setpoint input/MDI".
1 signal: Setting-up selected.
0 signal: Positioning selected.

Dependency: See also: c2651, c2652

Note
In the operating mode "direct setpoint input/MDI", it is possible to make a flying changeover between setting-up and positioning.
For "setting up" (c2653 = 1 signal), the following applies:
A traversing direction must be selected using parameters c2651 and c2652.

c2654 EPOS direct setpoint input/MDI mode adaptation

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: -	

Description:
The signals are evaluated and this involves the following signals:
- c2648 (positioning type)
- c2651 (positive direction selection)
- c2652 (negative direction selection)

Dependency:
See also: c2648, c2651, c2652

Note
The parameter is not relevant for S200.

c2655[0...1] EPOS select tracking mode

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned8	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Basic positioner
Unit: -	

Description:
Signal to select tracking operation.
c2655[0] or c2655[1] = 1 signal
Tracking mode after withdrawing the enable signal.
c2655[0] and c2655[1] = 0 signal
No tracking mode after withdrawing the enable signal.

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
For the following events, independent of the signal that is present, the tracking mode is selected:
- After running up.
- After r2526.0 = 0/1 edge.
- While a fault is active.

r2665 EPOS position setpoint

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint64	**Visible in:** Standard display

Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: mm

Description: Displays the actual absolute position setpoint.

Dependency: See also: c2530

Note
As default, c2530 is interconnected with r2665.

r2665 EPOS position setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: °

Description: Displays the actual absolute position setpoint.

Dependency: See also: c2530

Note
As default, c2530 is interconnected with r2665.

r2666 EPOS velocity setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: mm/s

Description: Displays the actual velocity setpoint.

Dependency: See also: c2531

Note
As default, c2531 is interconnected with r2666.

r2666 EPOS velocity setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: °/s

Description: Displays the actual velocity setpoint.

Dependency: See also: c2531

Note
As default, c2531 is interconnected with r2666.

r2669.0...5 EPOS actual operating mode

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: Unsigned32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)

Unit: -

Description: Displays the actual active operating mode.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Jog operating mode	Active	Not active
01	Operating mode active homing	Active	Not active
02	Operating mode traversing blocks	Active	Not active
03	Operating mode positioning for direct setpoint input / MDI	Active	Not active
04	Operating mode setting up for direct setpoint input / MDI	Active	Not active
05	Option passive homing	Active	Not active

Dependency: See also: c2589, c2590, c2595, c2631, c2647, c2653

r2670.0...15 EPOS status word active traversing block

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: Unsigned32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Traversing blocks

Unit: -

Description: Displays the status word for the active traversing block.
r2670.0: Active traversing block, bit 0
...
r2670.5: Active traversing block, bit 5
r2670.15: MDI active

Bit array:

Bit	Signal name	1 signal	0 signal
00	Active traversing block bit 0	Active	Not active
01	Active traversing block bit 1	Active	Not active
02	Active traversing block bit 2	Active	Not active
03	Active traversing block bit 3	Active	Not active
04	Active traversing block bit 4	Active	Not active
05	Active traversing block bit 5	Active	Not active
15	MDI active	Active	Not active

Dependency: See also: c2631, c2647

Note
For bit 00 ... 05:
Displays the active traversing block in the traversing blocks operating mode.
For bit 15:
For a 1 signal, the operating mode - direct setpoint input/MDI - is active

r2671 EPOS actual position setpoint

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: mm

Description: Displays the position setpoint presently being processed.

Note
A position of 0 is displayed for non position-related tasks (e.g. ENDLESS_POS, ENDLESS_NEG).

r2671 EPOS actual position setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: °

Description: Displays the position setpoint presently being processed.

Note
A position of 0 is displayed for non position-related tasks (e.g. ENDLESS_POS, ENDLESS_NEG).

r2672 EPOS actual velocity setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: mm/s

Description: Displays the velocity setpoint presently being processed.

r2672 EPOS actual velocity setpoint

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: °/s

Description: Displays the velocity setpoint presently being processed.

r2673 EPOS actual acceleration override

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)

Unit: %

Description: Displays the acceleration override presently being processed.

Note
An override of 100% is effective in the "Jogging" and "Active homing" operating modes.

r2674 EPOS actual deceleration override

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)

Unit: %

Description: Displays the deceleration override presently being processed.

Note
An override of 100% is effective in the "Jogging" and "Active homing" operating modes.

r2675 EPOS actual task

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: Integer16 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Traversing blocks

Unit: -

Description: Display for the task presently being processed.

Value:

0:	Inactive
1:	POSITIONING
2:	FIXED STOP
3:	ENDLESS_POS
4:	ENDLESS_NEG
5:	WAITING
6:	GOTO
7:	SET_O
8:	RESET_O
9:	JERK

Dependency: See also: p2621

r2676 EPOS actual task parameter

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: Integer32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Traversing blocks

Unit: -

Description: Displays the task parameter presently being processed in the "traversing blocks" operating mode.

Dependency: See also: p2622

Note
The following is displayed depending on the task:
FIXED STOP: Clamping torque (0 ... 65536 [0.01 Nm]) or clamping force (0 ... 65536 [N])
WAIT: Wait time [ms]
GOTO: Block number
SET_O: 1, 2, 3 --> direct output 1, 2 or 3 (both) is set
RESET_O: 1, 2, 3 --> direct output 1, 2 or 3 (both) is reset
JERK: 0 --> deactivate, 1 --> activate

r2677 EPOS actual task mode

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Traversing blocks
Unit: -	

Description: Displays the task mode presently being processed.

Dependency: See also: p2623

r2678 EPOS external block change actual position

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Traversing blocks, Direct setpoint input (MDI)
Unit: mm	

Description: Displays the actual position for the following events:
- External block change via measuring probe (p2632 = 0).
- External block change via c2633 (p2632 = 1, c2633 = 0/1 signal).
- Activate traversing task (c2631 = 0/1 signal).

Dependency: See also: c2631, p2632, c2633

r2678 EPOS external block change actual position

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Traversing blocks, Direct setpoint input (MDI)
Unit: °	

Description: Displays the actual position for the following events:
- External block change via measuring probe (p2632 = 0).
- External block change via c2633 (p2632 = 1, c2633 = 0/1 signal).
- Activate traversing task (c2631 = 0/1 signal).

Dependency: See also: c2631, p2632, c2633

r2680 EPOS clearance reference cam and zero mark

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Homing
Unit: mm

Description: Display for the distance (clearance) between the reference cam and zero mark.
The value is determined for active homing.

r2680 EPOS clearance reference cam and zero mark

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Homing
Unit: °

Description: Display for the distance (clearance) between the reference cam and zero mark.
The value is determined for active homing.

r2681 EPOS velocity override effective

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: %

Description: Displays the actual effective velocity override.
Dependency: See also: p2571, c2646

Note
The effective override can differ from the specified override due to limits (e.g. p2571, maximum velocity).

r2682 EPOS residual distance to go

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: mm

Description: Displays the current residual distance.
The remaining distance is the distance to still to be moved through up to the end of the actual positioning task.
Dependency: See also: r2665, r2671, r2678

r2682 EPOS residual distance to go

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: °

Description: Displays the current residual distance.
The remaining distance is the distance to still to be moved through up to the end of the actual positioning task.

Dependency: See also: r2665, r2671, r2678

r2683.0...14 EPOS status word 1

Variant: S200 Compact
Available when function is active: Position control
Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Control/status words, Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring
Unit: -

Description: Display for status word 1 of the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Tracking mode active	Yes	No
01	Velocity limiting active	Yes	No
02	Setpoint fixed	Yes	No
03	Set position reached	Yes	No
04	Axis moves forward	Yes	No
05	Axis moves backward	Yes	No
06	Negative software limit switch reached	Yes	No
07	Positive software limit switch reached	Yes	No
10	Direct output 1 via traversing block	Yes	No
11	Direct output 2 via traversing block	Yes	No
12	Fixed stop reached	Yes	No
13	Fixed stop clamping torque reached	Yes	No
14	Travel to fixed stop active	Yes	No

Dependency: See also: r2684

Note
For bit 02, 04, 05, 06, 07:
This signals designate the state after jerk limiting.
For bits 08, 09:
These signals are generated in function "Closed-loop position control".

r2684.0...15 EPOS status word 2

Variant: S200 Compact
Available when function is active: Position control
Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

Parameter group: Position limits, Dynamic response limits, Control/status words, Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Basic parameters / mechanical system, Position monitoring

Unit: -

Description: Display for status word 2 of the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Active homing active	Active	Not active
01	Passive homing active	Active	Not active
02	Homing active	Active	Not active
03	Printing mark outside outer window	Yes	No
04	Axis accelerating	Yes	No
05	Axis decelerating	Yes	No
06	Jerk limiting active	Yes	No
07	Activate correction	Yes	No
08	Following error in tolerance	Yes	No
09	Modulo correction active	Yes	No
10	Target position reached	Yes	No
11	Home position set	Yes	No
12	Acknowledgment traversing block activated	Yes	No
13	Negative hardware limit switch reached	Yes	No
14	Positive hardware limit switch reached	Yes	No
15	Traversing command active	Yes	No

Note
For bit 02:
The "homing active" signal is an OR logic operation of "active homing active" and "passive homing active"
For bit 08:
The signal is generated in function "Closed-loop position control".

r2685 EPOS corrective value

Variant: S200 Compact

Available when function is active: Basic positioner

Data type: FloatingPoint64 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Basic positioner

Unit: mm

Description: Display for the correction value of the position actual value.

Dependency: See also: r2684

Note
Using this value, for example, modulo corrections are carried out.

r2685 EPOS corrective value

Variant: S200 Compact

Available when function is active: Basic positioner

Values for: Basic positioner for rotary motion

Data type: FloatingPoint64 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Basic positioner

Unit: °

Description: Display for the correction value of the position actual value.

Dependency: See also: r2684

Note
Using this value, for example, modulo corrections are carried out.

r2686[0...1] EPOS torque limiting effective

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Basic positioner
Unit: %	

Description: Displays the active torque limit.
r2686[0]:
Displays the active upper torque limiting when traveling to fixed stop.
r2686[1]:
Displays the active lower torque limiting when traveling to fixed stop.

Index: [0] = Upper
[1] = Lower

Dependency: See also: p1520, p1521, r2676

r2687 EPOS torque setpoint

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Traversing blocks
Unit: Nm	

Description: Displays the active torque setpoint when reaching the fixed stop.

Dependency: See also: p1520, p1521, r2676

p2688 EPOS position feedback signal tolerance window

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Unit: mm		
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	0.050000 [mm]

Description: Sets the tolerance window for the position feedback signal.
If, for a positioning operation, the actual position (r2521) lies within this tolerance window of the target position, then the traversing block number is displayed in r2689.

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).
See also: p2584, r2689

p2688 EPOS position feedback signal tolerance window

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Unit: °		
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	1.500000 [°]

Description: Sets the tolerance window for the position feedback signal.
If, for a positioning operation, the actual position (r2521) lies within this tolerance window of the target position, then the traversing block number is displayed in r2689.

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).
See also: p2584, r2689

r2689[0...1] EPOS position feedback signal display

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: Unsigned32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Basic positioner
Unit: -	

Description: Displays the traversing block numbers for position feedback signal.
Here, the block numbers of the traversing blocks are displayed bit-coded whose absolute target positions lie within the tolerance window around the actual position.

Index: [0] = Position feedback signal low
[1] = Position feedback signal high

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).
See also: p2584, p2688

Note
r2689[0]:
Bit-coded display of traversing block numbers 0 to 31
r2689[1]:
Bit-coded display of traversing block numbers 32 to 63

p2720[0].0...2 Load gear configuration

Variant:	S200 Compact
Available when function is active:	Position control
Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation, Basic parameters / mechanical system
Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Sets the configuration for position tracking for a load gear.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Load gear activate position tracking	Yes	No
02	Load gear reset position	Yes	No

Note
For the following events, the non-volatile, saved position values are automatically reset:
- When an encoder replacement has been identified.
- When changing the configuration of the Encoder Data Set (EDS).
- When adjusting the absolute encoder again.

p2721[0] Load gear rotary absolute encoder revolutions virtual

Variant: S200 Compact
Available when function is active: Position control
Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation, Basic parameters / mechanical system
Unit: -

Min:	Max:	Factory setting:
0	4194303	0

Description: Sets the number of rotations that can be resolved for a rotary absolute encoder with activated position tracking of the load gear.

Dependency: This parameter is only of significance for an absolute encoder (p0404.1 = 1) with activated position tracking of the load gear (p2720.0 = 1).

Note
The resolution that is set must be able to be represented using r2723.
For rotary axes/modulo axes, the following applies:
This parameter is preset with p0421 when activating position tracking and can be changed.
For linear axes, the following applies:
This parameter is pre-assigned with p0421 when activating position tracking, expanded by 6 bits for multiturn information (maximum number of overflows) and cannot be changed.

p2722[0] Load gear position tracking tolerance window

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning

Parameter group: Encoder evaluation, Basic parameters / mechanical system

Unit: -

Min:	**Max:**	**Factory setting:**
0.00	4.2949673e+09	0.00

Description: Sets a tolerance window for position tracking.
After the system is switched on, the difference between the saved position and the actual position is determined.
The following response is initiated:
- Difference within the tolerance window: The position is reproduced based on the encoder actual value.
- Difference outside the tolerance window: An appropriate message is output.

⚠ CAUTION
Rotation, for example through a complete encoder range is not detected.

Note
The value is entered in complete encoder pulses.
For p2720.0 = 1, the value is automatically pre-assigned one quarter of the encoder range.
Example:
Quarter of the encoder range = (p0408 * p0421) / 4
It is possible that the tolerance window may not be able to be precisely set due to the data type (floating point number with 23 bit mantissa).

r2723[0] Load gear absolute value

Variant: S200 Compact

Available when function is active: Position control

Data type: Unsigned32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Encoder evaluation, Basic parameters / mechanical system

Unit: -

Description: Displays the absolute value after the load gear.

NOTICE
The encoder position actual value must be requested using the encoder control word Gn_STW.13.

Note
The increments are displayed in the format the same as Gx_IST2.

r2724[0] Load gear position difference

Variant: S200 Compact

Available when function is active: Position control

Data type: Integer32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Encoder evaluation, Basic parameters / mechanical system

Unit: -

Description: Displays the position difference before the load gear between switching off and switching on.

Note
The increments are displayed in the format the same as Gx_IST2 or r2723.
If the measuring gearbox of the motor encoder is not activated, the position difference should be read in encoder increments.
If the measuring gear of the motor encoder is activated, the position difference is converted using the measuring gear ratio.

r2741 LR acceleration precontrol value

Variant: S200 Compact
Available when function is active: Position control
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Unit: rev/s²

Description: Displays the acceleration precontrol value.

Note
The acceleration precontrol value is a derivation of the speed precontrol value with respect to time.

r3122[0...63].0...20 Diagnostic attribute fault

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the diagnostic attribute of the fault which has occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	Yes	No
15	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the fault buffer and the assignment of the indices is shown in r0945.
Bit 20, 19, 18, 17, 16 =
0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

r3123[0...63].0...20 Diagnostic attribute alarm

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the diagnostic attribute of the alarm which has occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	Yes	No
11	Alarm class bit 0	High	Low
12	Alarm class bit 1	High	Low
13	Maintenance required	Yes	No
14	Maintenance urgently required	Yes	No
15	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Dependency: See also: r2122, r2123, r2124, r2125, r2134, r2145, r2146

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.
For bit 12, 11:
These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.
Bit 20, 19, 18, 17, 16 =
0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

r3988 Final boot state

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group: System identification
Unit: -

Description: Displays the final boot states.
001 - Software error
200 - Carry out first commissioning
250 - Topology error (check the connected hardware)
800 - Ready
The following options are available to reach the "Ready" state:
- Check the project and load again.
- Restore factory setting.
- Check the hardware.
- Carry out a POWER ON (switch-off/switch-on).

p5271[0].0...7 Real Time / One Button Tuning configuration

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: -

Min:	Max:	Factory setting:
-	-	0000 1100 bin

Description: Sets the configuration for Real Time Tuning / One Button Tuning.

Bit array:

Bit	Signal name	1 signal	0 signal
00	PD controller for large load moments of inertia	Yes	No
01	Reduce gain at low speeds	Yes	No
02	Load adaptation Kp	Yes	No
03	Setting the speed precontrol	Yes	No
04	Setting the torque precontrol	Yes	No
05	Setting the maximum acceleration for the basic positioner	Yes	No
06	Do not change Kp	Yes	No
07	Setting the voltage precontrol	Yes	No

Dependency: See also: p5272, r5274, p5275

Note
For bit 00:
For significant differences between the motor moment of inertia and load moment of inertia - or for a low controller dynamic response - the P controller in the position control loop is transformed into a PD controller. As a consequence, the dynamic performance of the position controller is increased.
This function should only be set when the speed precontrol (bit 3 = 1) or the torque precontrol (bit 4 = 1) is active.
For bit 01:
At low speeds, the controller gain factors are automatically reduced in order to avoid noise and oscillation at standstill.
For bit 02:
The estimated load moment of inertia is taken into account for the speed controller gain.
For bit 03:
Activates the speed precontrol for the basic positioner (EPOS).
For bit 04:
Activation of the torque precontrol for the basic positioner (EPOS); if this is not active, then the internal drive speed/ torque precontrol is parameterized.
For bit 05:
The maximum acceleration (p2572) and maximum deceleration (p2573) for the basic positioner (EPOS) are determined using the estimated moment of inertia. This is only realized once by setting the bit.
Precondition:
The drive pulses are inhibited and the moment of inertia was previously determined.
For bit 06:
The speed controller gain set in p1460 is not changed when calculating the controller data.
For bit 07:
Activation of the voltage precontrol.

p5272[0] Real Time Tuning dynamic factor

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group:
Unit: %

Min:	Max:	Factory setting:
5.0 [%]	1000.0 [%]	100.0 [%]

Description: Sets the dynamic factor for the proportional gain of the speed controller for Real Time Tuning.

Dependency: See also: p5271, r5274, p5275

NOTICE
The speed control can become unstable for excessively high values.

Note
The stiffer the mechanical load coupling, the higher the dynamic factor can be set.

r5274 Real Time / One Button Tuning estimated dynamic response

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: ms

Description: Display for the estimated dynamic response of the speed control loop as PT1 time constant for Real Time Tuning/One Button Tuning.
This position controller setting is required if the closed-loop position control is in an external control system.

Dependency: See also: p5271, p5272, p5275

p5275[0] Real Time / One Button Tuning dynamic response time constant

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group:
Unit: ms

Min:	Max:	Factory setting:
0.0 [ms]	60.0 [ms]	7.5 [ms]

Description: Sets the time constant for the precontrol symmetrization for Real Time Tuning / One Button Tuning.
As a consequence, the drive is allocated a defined, dynamic response via its precontrol.
Examples:
0 ms = travel without following error (Kv factor is infinity)
5 ms = settling behavior as for PT1 with 5 ms (Kv factor = 12 [1000/min])

Dependency: See also: p5271, p5272, r5274

Note
This time constant is only active if p5301.7 is set = 1 or p5302.7 is set = 1.
Otherwise, the precontrol symmetrization is adapted to the estimated dynamic response, therefore setting positioning without any overshoot.
For axes, which must interpolate with one another, the same value must be entered.

r5276[0] Real Time / One Button Tuning maximum Kv factor estimated

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: 1000 rpm

Description: Displays the estimated maximum position controller gain for Real Time Tuning / One Button Tuning.

Dependency: See also: p5271, p5272, p5275

⚠ WARNING
The calculation assumes that the DSC is activated in the drive and is controlled on the motor measuring system.
If this is not the case, then excessively high values are displayed.
The value that is displayed does not take into account low-frequency resonance effects in the drive train. If necessary, the value must be significantly reduced.

Note
The value for the closed-loop position control is required by a higher-level control system.

r5277[0] Real Time / One Button Tuning prectr symmetrizing time estimated

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: ms

Description: Displays the estimated time constant for symmetrization of the speed precontrol.
This is required to symmetrize the position controller for Real Time Tuning / One Button Tuning if the closed-loop position control is realized in an external control system.

Dependency: See also: p5271, p5272, p5275

⚠ WARNING
The calculation assumes that the DSC is activated in the drive and is controlled on the motor measuring system.
If this is not the case, then the time is not correctly calculated.

p5291.0...16 FFT tuning configuration

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group:
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 0000 0000 0000 0000 0011 1001 bin

Description: Sets the configuration for the "FFT tuning" function.
This function is used for One Button Tuning (p5300 = 1).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Noise excitation after pulse enable	Yes	No
01	Set current setpoint filter (HF)	Yes	No
02	Set speed controller gain (HF)	Yes	No
03	Length of FFT window bit 0 (LF, HF)	Yes	No
04	Length of FFT window bit 1 (LF, HF)	Yes	No
05	Windowing the time signals using a Hamming window (LF, HF)	Yes	No
06	Measure current controller	Yes	No
07	Bandwidth bit 0 (LF)	Yes	No
08	Bandwidth bit 1 (LF)	Yes	No
09	Bandwidth bit 2 (LF)	Yes	No
10	Measuring periods bit 0	Yes	No
11	Measuring periods bit 1	Yes	No
12	Inject noise onto speed setpoint	Yes	No
13	Do not reduce Kp for measurement	Yes	No
14	Set the current setpoint filter with loop compensation	Yes	No
16	Torque in front of the current setpoint filter	Yes	No

Dependency: See also: r5293, r5294, r5295, p5296

Note
HF: high frequency
LF: low frequency
For bit 00:
A PRBS signal (pseudo random binary signal) is superimposed on the current setpoint to be able to better identify the mechanical controlled system.
For bit 01:
The identified mechanical resonance points are suppressed using current setpoint filters.
For bit 02:
The maximum speed controller gain is determined from the identified mechanical controlled system.
For bits 03, 04:
The measured value buffer length is set using these bits:
Bit 04 = 0 and bit 03 = 0 -> buffer length = 256
Bit 04 = 0 and bit 03 = 1 -> buffer length = 512
Bit 04 = 1 and bit 03 = 0 -> buffer length = 1024
Bit 04 = 1 and bit 03 = 1 -> buffer length = 2048
For bit 05:
A Hamming window is used to filter the measured time signals.
For bit 06:
The measurement checks the current controller frequency response and this is taken into account in the speed controller loop.
For bits 07, 08, 09:
The measurement bandwidth is set using these bits:
Bit 09 = 0, bit 08 = 0, bit 07 = 0 -> bandwidth = 50 Hz
Bit 09 = 0, bit 08 = 0, bit 07 = 1 -> bandwidth = 100 Hz
Bit 09 = 0, bit 08 = 1, bit 07 = 0 -> bandwidth = 200 Hz
Bit 09 = 0, bit 08 = 1, bit 07 = 1 -> bandwidth = 400 Hz
Bit 09 = 1, bit 08 = 0, bit 07 = 0 -> bandwidth = 800 Hz
Bit 09 = 1, bit 08 = 0, bit 07 = 1 -> bandwidth = 1600 Hz
For bits 10, 11:
Number of measuring periods.
Bit 11 = 0 and bit 10 = 0 -> number of measurements = 1
Bit 11 = 0 and bit 10 = 1 -> number of measurements = 2
Bit 11 = 1 and bit 10 = 0 -> number of measurements = 4
Bit 11 = 1 and bit 10 = 1 -> number of measurements = 8
For bit 12:
The PRBS signal is switched to the speed setpoint (in front of the filter).
For bit 13:
The input signal for the torque actual value is taken from in front of the current setpoints filters.
For bit 14:
For unfavorable mechanical relationships between the motor and load torques, the loop compensation allows the P gain of the speed controller to be increased. This means that the controller has a better control behavior.
Loop compensation with the current setpoint filter is only possible under the following preconditions:
- The motor is connected to the load with zero backlash.
- In the traversing range, the mechanical properties are predominantly constant.

Loop compensation is not applied for a low ratio of load moment of inertia to motor moment of inertia.

p5292 FFT tuning dynamic factor

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation

Parameter group:
Unit: %

Min:	Max:	Factory setting:
25.0 [%]	125.0 [%]	80.0 [%]

Description: Sets the dynamic factor for the proportional gain of the speed controller for FFT tuning.
This function is used for One Button Tuning (p5300 = 1).

Dependency: See also: p5291

r5293 FFT tuning speed controller P gain identified

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: Nms/rad

Description: Displays the determined proportional gain Kp of the speed controller before FFT tuning.
This function is used for One Button Tuning (p5300 = 1).

Dependency: See also: p5291

r5294[0...5] FFT tuning zero position identified

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: Hz

Description: Displays the identified mechanical zero points.
One Button Tuning must be carried out beforehand (p5300 = 1).

Dependency: See also: p5291

Note
For r5294[0...2]:
Displays the zero positions for the "Load oscillation detection" function (p5301.4 = 1) or "Suppress detected load oscillation" (p5301.5 = 1).
For r5294[3...5]:
Displays the zero positions for the "Set proportional gain Kp" function (p5301.0 = 1) or "Set current setpoint filter" (p5301.1 = 1).

r5295[0...5] FFT tuning pole position identified

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: Hz

Description: Displays the identified mechanical pole positions.
One Button Tuning must be carried out beforehand (p5300 = 1).

Dependency: See also: p5291

Note
For r5295[0...2]:
Displays the pole positions for the "Load oscillation detection" function (p5301.4 = 1) or "Suppress detected load oscillation" (p5301.5 = 1).
For r5295[3...5]:
Displays the pole positions for the "Set proportional gain Kp" function (p5301.0 = 1) or "Set current setpoint filter" (p5301.1 = 1).

p5296[0...2] Controller optimization noise amplitude

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group:
Unit: %

Min:	Max:	Factory setting:
1.0 [%]	300.0 [%]	[0] 10.0 [%] [1] 30.0 [%] [2] 5.0 [%]

Description: The drive determines the noise amplitude for One Button Tuning and writes the value to p5296.

Dependency: See also: p5291

p5300[0] Autotuning selection

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: -

Min:	Max:	Factory setting:
-1	2	0

Description: Activating/deactivating autotuning functions "One Button Tuning" and "Real Time Tuning".
For p5300 = 1:
Function "One Button Tuning" is configured using p5271 and p5301.
For p5300 = 2:
Function "Real Time Tuning" is configured using p5302.

Value:
-1: Reset controller parameters
0: Inactive
1: One Button Tuning
2: Real Time Tuning

Dependency: The motor must have already been commissioned so that One Button Tuning functions perfectly.
The "One Button Tuning" function is configured using p5271 and p5301.
The required dynamic performance of the control loop is set in p5292.
The traversing path for the test signal is parameterized in p5308.
Real Time Tuning:
Function "Real Time Tuning" is configured using p5302.
p5272 if the required dynamic response of the control loops is set.
Other relevant parameters: p5271, p5275, r5274
See also: p5271, p5272, r5274, p5275, p5292, r5293, r5294, r5295, p5296, p5301, p5302, p5308, p5309

⚠ CAUTION
For some drive trains, the "Real Time Tuning" function can result in unstable settings (motor makes a whistling sound). This is especially the case for high load moments of inertia, which are coupled to the motor through a low-frequency connection/coupling. In this case, the value in parameter p5272 must be reduced.

Note

For p5300 = -1:

Autotuning is deactivated, and p5300 is automatically set to 0. In addition, the default setting values for the speed and position controller are restored.

For p5300 = 0:

Autotuning is inactive.

To permanently save the values determined for the speed and position controllers, the parameters must be saved in a non-volatile memory (p0977 = 1 or retentively save in the commissioning tool).

For p5300 = 1:

One Button Tuning is active.

The moment of inertia is determined once using a test signal. The controller parameters and current setpoint filters are additionally determined once using a noise signal as excitation source. The steps to be executed can be configured using p5301.

For p5300 = 2:

Real Time Tuning is active.

The moment of inertia is estimated. The controller parameters are recalculated if the moment of inertia noticeably changes. The steps to be executed can be configured using p5302.

p5301[0].0...8 One Button Tuning configuration 2

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:		
Unit: -		
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 0111 bin

Description: Setting the functions for One Button Tuning (p5300 = 1).

A test signal is required for some functions. To do this, observe parameters p5308 and p5309.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Setting the proportional gain Kp	Yes	No
01	Setting current setpoint filter	Yes	No
02	Estimate moment of inertia	Yes	No
07	Activating synchronized axes	Yes	No
08	Moment of inertia determination from frequency response	Yes	No

Dependency: It is only possible to change the configuration if One Button Tuning is not active (p5300 = 0).

See also: p5292, r5293, r5294, r5295, p5296, p5300, p5308, p5309

Note

For bit 00:

The speed controller gain is determined and set using a noise signal.

For bit 01:

Possibly required current setpoint filters are determined and set using a noise signal.

As a consequence, a higher dynamic performance can be achieved in the speed control loop.

For bit 02:

Using this bit, the moment of inertia is determined using a test signal. If this bit is not set, then the load moment of inertia must be manually set using parameter p1498. The test signal must have been previously set using parameters p5308 and p5309.

For bit 08:

Using this bit, the moment of inertia is determined from the frequency characteristic using a test signal, and is transferred to p1498. The traversing path must first be set using parameter p5308.

p5302[0].2...8 Real Time Tuning configuration

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group:
Unit: -

Min:	Max:	Factory setting:
-	-	0000 0000 0000 1100 bin

Description: Setting the functions for Real Time Tuning (p5300 = 2).

Bit array:

Bit	Signal name	1 signal	0 signal
02	Estimate moment of inertia	Yes	No
03	Configuring the moment of inertia estimator	Cyclic	Once
06	Activating the current setpoint filter adaptation	Yes	No
07	Activating synchronized axes	Yes	No
08	Moment of inertia determination from frequency response	Yes	No

Dependency: It is only possible to change the configuration if autotuning is not active (p5300 = 0).
See also: p5271, p5272, r5274, p5275, p5300

Note
For bit 00:
The speed controller gain is determined and set using a noise signal.
For bit 01:
Possibly required current setpoint filters are determined and set using a noise signal.
As a consequence, a higher dynamic performance can be achieved in the speed control loop.
For bit 02:
Using this bit, the moment of inertia is determined using a test signal. If this bit is not set, then the load moment of inertia must be manually set using parameter p1498. The test signal must be previously set via parameters p5308
and p5309.
For bit 08:
Using this bit, the moment of inertia is determined from the frequency characteristic using a test signal, and is transferred to p1498.
The traversing path must first be set using parameter p5308.

r5306[0].0...14 Autotuning status

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: -

Description: Displays the status of the autotuning functions performed "Real Time Tuning" and "One Button Tuning".
The functions can be activated via p5300.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Proportional gain Kp set	Yes	No
01	Current setpoint filter set	Yes	No
02	Moment of inertia estimation carried out	Yes	No
04	Load vibration detection performed	Yes	No
05	Detected load oscillation set	Yes	No
06	Current setpoint filter adaptation active	Yes	No
07	EPOS set	Yes	No
12	Real Time Tuning active	Yes	No

13	One Button Tuning successfully completed	Yes	No
14	Controller parameters reset due to fault	Yes	No

Dependency: See also: p5300, p5301, p5302

Note
For bit 00 = 1: The speed controller gain was set using One Button Tuning.
For bit 01 = 1: The current setpoint filter was set using One Button Tuning
For bit 02 = 1: The moment of inertia was determined.
For bit 04 = 1: Load oscillation detection was performed using One Button Tuning
For bit 05 = 1: Detected load oscillation suppression was set using One Button Tuning.
For bit 06 = 1: Adaptive resonance filters of the Real Time Tuning are active.
For bit 12 = 1: Real Time Tuning is active and modifies the controller.

p5308[0] One Button Tuning distance limiting

Data type: Integer32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: °

Min:	Max:	Factory setting:
-30000 [°]	30000 [°]	0 [°]

Description: Setting the distance limiting (permissible traversing range of the motor).
The traversing range is limited in the positive and negative directions.

Note
A value of 360 degrees corresponds to one motor revolution.
The position before the pulse enable is used as zero point.

p5309[0] One Button Tuning test signal duration

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group:
Unit: ms

Min:	Max:	Factory setting:
0 [ms]	5000 [ms]	2000 [ms]

Description: Sets the test signal sequence duration (several acceleration operations).
This function is used for One Button Tuning (p5300 = 1) to identify the total moment of inertia of the drive train.

Dependency: See also: F07093

p5375[0].0...1 Additional motor overload protection configuration

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Motor temperature
Unit: -

Min:	Max:	Factory setting:
-	-	0000 bin

Description: Sets the configuration for additional motor overload protection.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate monitoring	Yes	No
01	Activation of speed dependency	Yes	No

Note
To comply with standard UL 61800-5-1 Ed. 2, bit 0 and bit 1 must be set.
These bits activate electronic motor overload protection according to IEC 61800-5-1 Ed. 3 / UL 61800-5-1 Ed. 2, with the emulation of an electronic overload relay, Class 20 and the speed sensitivity.
For bit 00:
This bit activates electronic motor overload protection with emulation of an electronic overload relay, Class 20.
For bit 01:
This bit activates the speed dependency of the electronic motor overload protection. Not active, if bit 00 is also set.

r7700[0...63] Hash value for the integrity of UMAC data

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: -

Description: Display of the hash value for the integrity of UMAC data in the ASCII format (Base64 Encoding)

Note
The index contains the value at the corresponding position in the string

r7727[0] Power unit heat sink fan wear counter

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Power unit
Unit: %

Description: Displays the wear counter of the heat sink fan in the power unit.
Dependency: See also: A30042

r8400[0...2] Date

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics general
Unit: -

Description: Displays the actual date in year, month and day.
Index:
[0] = Year (YYYY)
[1] = Month (1 ... 12)
[2] = Day (1 ... 31)

Note
The time in r8400 and r8401 is used to display the fault and alarm times.

r8401[0...2] Time

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics general
Unit: -

Description: Displays the current time in hours, minutes and seconds.

Index:
[0] = Hour (0 ... 23)
[1] = Minute (0 ... 59)
[2] = Second (0 ... 59)

Note
The time in r8400 and r8401 is used to display the fault and alarm times.
The time is displayed in the 24-hour format.

r8600[0...30] PROFIdrive PZD receive Float32

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Receive direction
Unit: -

Description: Displays the PZD (setpoints) in the Float32 format received from the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

c8601[0...30] PROFIdrive PZD send Float32

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Parameter group: Send direction
Unit: -

Description: Displays the PZD (actual values) in the Float32 format that are sent to the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

r8602[0...28] PROFIdrive PZD receive Float64

Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Receive direction
Unit: -

Description: Displays the PZD (setpoints) in the Float64 format received from the fieldbus controller.

Index:
[0] = PZD 1...4
[1] = PZD 2...5
[2] = PZD 3...6
[3] = PZD 4...7
[4] = PZD 5...8
[5] = PZD 6...9
[6] = PZD 7...10
[7] = PZD 8...11
[8] = PZD 9...12
[9] = PZD 10...13
[10] = PZD 11...14
[11] = PZD 12...15
[12] = PZD 13...16
[13] = PZD 14...17
[14] = PZD 15...18
[15] = PZD 16...19
[16] = PZD 17...20
[17] = PZD 18...21
[18] = PZD 19...22
[19] = PZD 20...23
[20] = PZD 21...24
[21] = PZD 22...25
[22] = PZD 23...26
[23] = PZD 24...27
[24] = PZD 25...28
[25] = PZD 26...29
[26] = PZD 27...30
[27] = PZD 28...31
[28] = PZD 29...32

c8603[0...28] PROFIdrive PZD send Float64

Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Send direction
Unit: -

Description: Displays the PZD (actual values) in the Float64 format that are sent to the fieldbus controller.

Index: [0] = PZD 1...4
[1] = PZD 2...5
[2] = PZD 3...6
[3] = PZD 4...7
[4] = PZD 5...8
[5] = PZD 6...9
[6] = PZD 7...10
[7] = PZD 8...11
[8] = PZD 9...12
[9] = PZD 10...13
[10] = PZD 11...14
[11] = PZD 12...15
[12] = PZD 13...16
[13] = PZD 14...17
[14] = PZD 15...18
[15] = PZD 16...19
[16] = PZD 17...20
[17] = PZD 18...21
[18] = PZD 19...22
[19] = PZD 20...23
[20] = PZD 21...24
[21] = PZD 22...25
[22] = PZD 23...26
[23] = PZD 24...27
[24] = PZD 25...28
[25] = PZD 26...29
[26] = PZD 27...30
[27] = PZD 28...31
[28] = PZD 29...32

r8936[0...1] PN cyclic connection state

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: -

Description: Displays the state of the cyclic PROFINET connection.

Value:
0: Canceled
1: Not connected
2: Connection starts to be established
3: Module information expected
4: Module information received
5: Module address expected
6: Module address received
7: Parameterization data expected
8: Parameterization data received
9: Evaluate parameterization data
10: Connection being established completion expected
12: Configured controller STOP
13: Configured controller RUN

Index: [0] = Controller 1
[1] = Reserved

Dependency: See also: r8961

Note
For value = 10:
If the connection remains in this state, then when using PROFINET IRT the following can apply:
- Topology error (incorrect port assignment).
- Synchronization missing.

r8937[0...5] PN cyclic connection diagnostics

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: -

Description: Display to diagnose the cyclic PROFINET connection.

Index:
[0] = Number of cyclic connections
[1] = Number of send subslots of all connections
[2] = Number of send net data (bytes) of all connections
[3] = Number of receive subslots of all connections
[4] = Number of receive net data (bytes) of all connections
[5] = Connection type (RT, IRT)

Note
For index [5]:
Bit 0 = 1: There is an RT connection.
Bit 1 = 1: there is an IRT connection.

r8961[0...3] PN controller IP address

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the IP address of the PROFINET controller.

c8997[0...3] PROFINET X150 enable

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit other security settings
Parameter group: Configuration
Unit: -

Description: Signal to enable PROFINET interface X150 for applications.

Index:
[0] = Secure S7 Protocol Startdrive
[1] = Web server HTTPS
[2] = S7 protocol PCS7
[3] = Data set protocol for commands and configuration

Note
The parameter influences the access from applications.
1 signal:
PROFINET interface X150 is enabled for access.
0 signal:
PROFINET interface X150 is inhibited for access.
The signal is not influenced by restoring the factory settings.

r9750[0...63].0...20 SI diagnostic attributes

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Unit: -

Description: Displays the diagnostic attributes of the safety messages that have occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	Yes	No
15	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the safety message buffer and the assignment of the indices is shown in r60045.
Bit 20, 19, 18, 17, 16 =
0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

c11500[0...3] LR initiate absolute encoder adjustment

Variant: S200 Compact
Available when function is active: Position control
Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Position control
Unit: -

Description: Initiate adjustment for absolute encoder
A 0/1 signal starts the absolute encoder adjustment.

Index: [0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2507, r2526, c2598, p2599

> ⚠ **CAUTION**
> For rotating absolute encoders, when adjusting, a range is set up symmetrically around zero with half of the encoder range, within which the position must be re-established after switch-off/switch-on. In this range, it is only permissible that the encoder overflows.
> After the adjustment has been completed, it must be guaranteed that the range is not exited. The reason for this is that outside the range, there is no clear reference any longer between the encoder actual value and mechanical system.
> If the home position (c2598) lies in this range, then the position actual value is set when adjusting to the home position. Otherwise, adjustment is canceled with F07443.
> There is no overflow for linear absolute encoders. This means that after the adjustment, the position can be re-established in the complete traversing range after switch-off/switch-on. When adjusting, the position actual value is set to the home position.

Note
The status of the absolute encoder adjustment is indicated via p2507 and in status word r2526.
To permanently accept the determined position offset, it must be retentively saved (p0977).
This adjustment can only be initiated for an absolute encoder.

p11550 EPOS active homing reference cam selection

Variant:	S200 Compact	
Available when function is active:	Basic positioner	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Homing	
Unit: -		
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Signal to evaluate "Active homing reference cam".

Value:
0: Reference cam selection 1
1: Reference cam selection 2

Dependency: See also: p2607, c2612

c11560 EPOS direct setpoint input/MDI acceleration setpoint

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: mm/s²	

Description: Signal for the acceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the acceleration setpoint is either transferred continuously or edge-triggered.

c11560 EPOS direct setpoint input/MDI acceleration setpoint

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: °/s²	

Description: Signal for the acceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the acceleration setpoint is either transferred continuously or edge-triggered.

c11561 EPOS direct setpoint input/MDI deceleration setpoint

Variant:	S200 Compact
Available when function is active:	Basic positioner
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Direct setpoint input (MDI)
Unit: mm/s²	

Description: Signal for the deceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration setpoint cannot be reached without reversing the direction, then when accepting the dynamic response values, the higher deceleration setpoint is accepted and becomes effective. The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the deceleration setpoint is either transferred continuously or edge-triggered.

c11561 EPOS direct setpoint input/MDI deceleration setpoint

Variant:	S200 Compact
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Unit: °/s²

Description: Signal for the deceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration setpoint cannot be reached without reversing the direction, then when accepting the dynamic response values, the higher deceleration setpoint is accepted and becomes effective. The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the deceleration setpoint is either transferred continuously or edge-triggered.

r11570 EPOS actual acceleration

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: mm/s²

Description: Displays the acceleration value currently being processed.

Dependency: See also: p2572

Note
The maximum acceleration from p2572 is effective in operating mode "Jog" and "Active homing".

r11570 EPOS actual acceleration

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: °/s²

Description: Displays the acceleration value currently being processed.

Dependency: See also: p2572

Note
The maximum acceleration from p2572 is effective in operating mode "Jog" and "Active homing".

r11571 EPOS actual deceleration

Variant: S200 Compact
Available when function is active: Basic positioner
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: mm/s²

Description: Displays the deceleration value currently being processed.

Dependency: See also: p2573

Note
The maximum deceleration from p2573 is effective in operating mode "Jog" and "Active homing".

r11571 EPOS actual deceleration

Variant: S200 Compact
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: °/s²

Description: Displays the deceleration value currently being processed.

Dependency: See also: p2573

Note
The maximum deceleration from p2573 is effective in operating mode "Jog" and "Active homing".

c29048 Torque limit selection bit 0

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Torque limiting
Unit: -

Description: Signal of bit 0 for the torque limit.

c29049 Torque limit selection bit 1

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Torque limiting
Unit: -

Description: Signal of bit 1 for the torque limit.

p29050[0...3] Upper torque limit

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Torque limiting
Unit: %

Min:	Max:	Factory setting:
-150.0 [%]	350.0 [%]	350.0 [%]

Description: Sets the upper torque limit.
Three internal torque limits in total are available.
With the combination of the digital input signals "Torque limit selection bit 0" and "Torque limit selection bit 1", you can select one of the three internal torque limits as the source of the upper torque limit.

Index: [0] = Upper torque limit 0
[1] = Upper torque limit 1
[2] = Upper torque limit 2
[3] = Upper torque limit 3

p29051[0...3] Lower torque limit

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Torque limiting	
Unit: %		
Min:	**Max:**	**Factory setting:**
-350.0 [%]	150.0 [%]	-350.0 [%]

Description: Sets the lower torque limit.
Three internal torque limits in total are available.
With the combination of the digital input signals "Torque limit selection bit 0" and "Torque limit selection bit 1", you can select one of the three internal torque limits as the source of the lower torque limit.

Index: [0] = Lower torque limit 0
[1] = Lower torque limit 1
[2] = Lower torque limit 2
[3] = Lower torque limit 3

c29063 Speed limit selection bit 0

Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Speed limiting
Unit: -	

Description: Signal of bit 0 for the speed limit.

c29064 Speed limit selection bit 1

Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Speed limiting
Unit: -	

Description: Signal of bit 1 for the speed limit.

p29070[0...3] Speed limit in positive direction of rotation

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Speed limiting	
Unit: rpm		
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	210000.00 [rpm]	210000.00 [rpm]

Description: Sets the maximum speed for the positive direction.
Three internal speed limits in total are available.
With the combination of the digital input signals "Speed limit selection bit 0" and "Speed limit selection bit 1", you can select one of the three internal speed limits as the source of the speed limit.

Index: [0] = Speed limit for positive direction 0
[1] = Speed limit for positive direction 1
[2] = Speed limit for positive direction 2
[3] = Speed limit for positive direction 3

Dependency: The default value depends on the maximum motor speed.

p29071[0...3] Speed limit in negative direction of rotation

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Speed limiting
Unit: rpm

Min:	Max:	Factory setting:
-210000.00 [rpm]	0.00 [rpm]	-210000.00 [rpm]

Description: Sets the maximum speed for the negative direction.
Three internal speed limits in total are available.
With the combination of the digital input signals "Speed limit selection bit 0" and "Speed limit selection bit 1", you can select one of the three internal speed limits as the source of the speed limit.

Index: [0] = Speed limit for negative direction 0
[1] = Speed limit for negative direction 1
[2] = Speed limit for negative direction 2
[3] = Speed limit for negative direction 3

Dependency: The default value depends on the maximum motor speed.

r29404.0...5 DO status word

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Digital outputs
Unit: -

Description: Displays the status word of the digital outputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Ready for servo on	Yes	No
01	Current control mode	Yes	No
02	Overload level reached	Yes	No
03	Speed reached	Yes	No
04	Warning1	Yes	No
05	Warning2	Yes	No

p31585 VIBSUP frequency fd

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation

Parameter group:	Technology functions	
Unit: Hz		
Min:	**Max:**	**Factory setting:**
10.000 [Hz]	10000.000 [Hz]	10.000 [Hz]

Description: Sets the frequency of the damped natural vibration of the mechanical system.
This frequency can be determined by making the appropriate measurements.

Dependency: See also: r31613
See also: F53432

r31600.2...15 VIBSUP status word

Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Technology functions
Unit: -	

Description: Displays the status word of VIBSUP.

Bit array:

Bit	Signal name	1 signal	0 signal
02	"Filter ready" state	Yes	No
03	"Filter being activated" state	Yes	No
04	"Filter active" state	Yes	No
05	"Filter being deactivated" state	Yes	No
06	Axis moves forward	Yes	No
07	Axis moves backward	Yes	No
08	Setpoint fixed	Yes	No
12	Immediate coupling-in possible	Yes	No
13	Tracking active	Yes	No
14	Axis accelerating	Yes	No
15	Axis decelerating	Yes	No

Note
For bit 02:
The setpoint filter is ready and can be coupled in.
For bit 03:
The filter is being coupled into the setpoint channel.
For bit 04:
The setpoint filter is activated.
For bit 05:
The filter is being coupled out of the setpoint channel.
For bit 06:
The axis moves forward.
The filtered speed setpoint is used to determine the direction of travel.
For bit 07:
The axis moves backward.
The filtered speed setpoint is used to determine the direction of travel.
For bit 12:
The filter can be immediately coupled-in.
For bit 13:
Filter tracking mode is activated.
For bit 14:
The axis accelerates.
The filtered speed setpoint is used for the calculation.
For bit 15:
The axis brakes.
The filtered speed setpoint is used for the calculation.

r31613 VIBSUP frequency fd active

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Technology functions
Unit: Hz

Description: Display for the active frequency fd.

Dependency: See also: p31585

r60000 PROFIdrive reference speed

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: rpm

Description: Sets the reference quantity for the speed values.
All speeds specified as relative values refer to this reference quantity.
The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Dependency: See also: p2000

Note
Parameter r60000 is an image of parameter p2000 in conformance with PROFIdrive.

r60100[0...5] PROFIdrive telegram display total

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the send and receive telegrams.

Index:
[0] = Subslot 1: MAP
[1] = Subslot 2: Reserved
[2] = Subslot 3: standard/SIEMENS
[3] = Subslot 4: supplementary telegram
[4] = Subslot 5: supplementary telegram
[5] = Subslot 6: supplementary telegram

Dependency: See also: r0922, r60122

Note
Value = 65534: No telegram
Value = 65535: MAP "Module Access Point"

r61000[0...239] PROFINET NameOfStation

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays "PROFINET NameOfStation". This is the device name of the PROFINET interface.

r61001[0...3] PROFINET IP of Station

Data type: Unsigned8 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group: Configuration

Unit: -

Description: Displays "PROFINET IP of Station". This is the IP address of the PROFINET interface.

A.2 Assembling cables

Description

Cables are important components of a servo drive system. They are essential to the stable and reliable operation of the system.

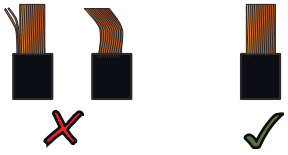
Siemens recommends that you use Siemens cable assemblies and connectors. All Siemens cable assemblies and connectors are tested and compliant with CE standards and EMC requirements. If you use non-Siemens cable assemblies, for example, cables made by yourself or third-party cables, Siemens does not guarantee that the servo drive system meets CE standards. In this case, if the drive system is required to be operated in a CE-compliant environment, you should reapply for the certification.

Siemens does not provide any guarantee or warranty regarding the functionality, reliability or quality of non-Siemens cables used with the servo drive system, and is not responsible for device (e.g. motor and converter) damages due to use with non-Siemens cables.

Siemens allows you to assemble your own cables in case that, for example, cables of special length are needed; therefore, Siemens provides instructions for assembling cables and connectors. Siemens does not guarantee that your cables meet CE standards, EMC requirements, or requirements for the degree of protection of the connected devices.

When assembling the cables, observe the following instructions:

- The assembly must be performed by qualified personnel.
- Prepare appropriate tools, raw cables, and Siemens connectors.
- To avoid splaying or fraying of the strands, strip the wires squarely and evenly.



- To avoid short-circuiting between wires and unused pins on the connector, cover the unused pins with heat-shrinkable tubes.

More information

For more information about Siemens cables and connectors, see Section "Cables and connectors (Page 118)".

A.2.1 Assembling connectors on the converter side

A.2.1.1 Assembling the cable lugs

Overview

This section offers general assembly instructions for cable lugs and is applicable to the following cables:

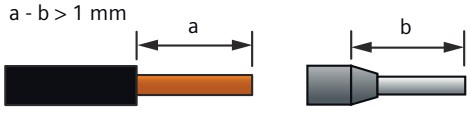
- Mains supply cable
- 24 V DC power supply cable
- Motor holding brake cable
- Motor power cable
- External braking resistor cable

Requirement

You have prepared appropriate tools, raw cables, and cable lugs.

Procedure

1. Remove the outer sheath of the cable.
2. Remove the insulation from the conductor. For more information about stripping length, see Section "Cables and connectors (Page 118)".



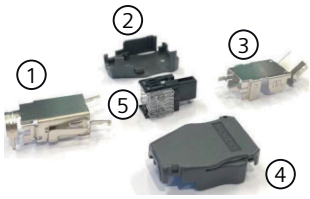
3. Insert the stripped end into the cable end sleeve.

4. Crimp the cable end sleeve.

A.2.1.2 Assembling the encoder connector for 1FL1 motors with single-turn encoder and 1FL2 motors

Overview

The Siemens IX-C connector is used for encoder connection to the converter. It consists of the following components:



① Shielding A
② Back cover
③ Shielding B
④ Front cover
⑤ Insulation-displacement contact (IDC) terminal

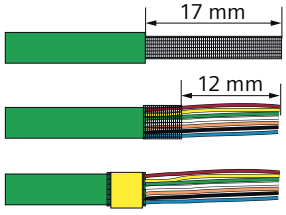
Figure A-1 IX-C connector

Requirement

You have prepared appropriate tools, a raw cable, and the Siemens IX-C connector.

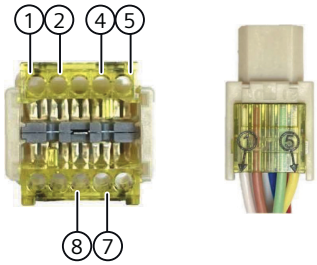
Procedure

1. Prepare the cable.
   - Remove the outer sheath of the cable by 17 mm.
   - Remove the cable shield by 12 mm.
   - Fold the remaining cable shield backward over the cable sheath, and wrap the folded cable shield with copper tape.



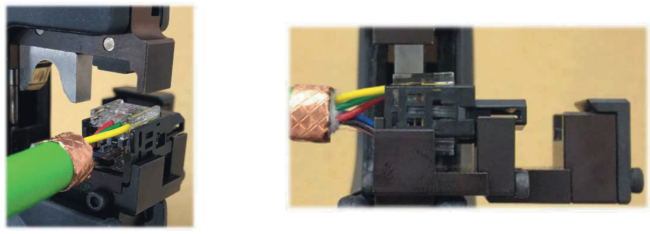
2. Arrange the conductors. The image below is for illustration purpose only. For detailed instructions on the conductor signals and colors, refer to Step 3 and Chapter "Wiring (Page 132)".

3. Insert the conductors into the connector with the correct order, pushing through until the conductor ends reach the end of the connector.

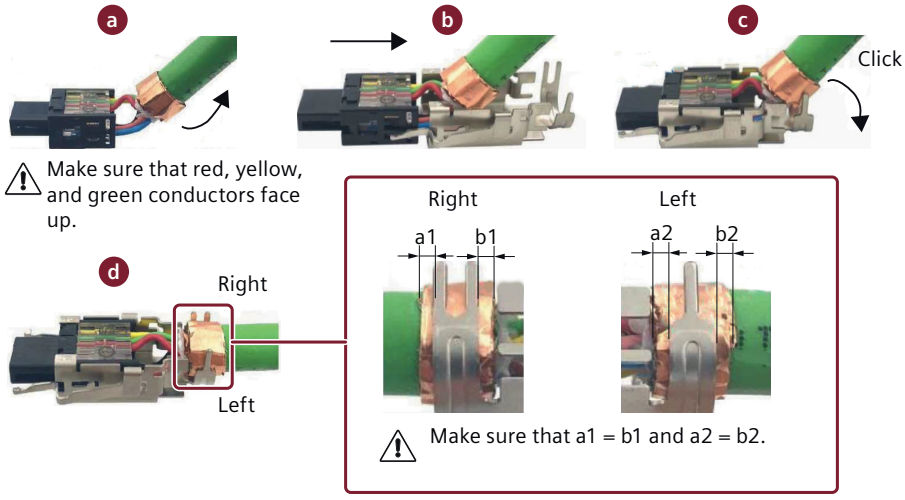


Pin	Signal	Pin	Signal
1	Data_P	5	Clock_N
2	Data_N	7	P_Supply
4	Clock_P	8	M

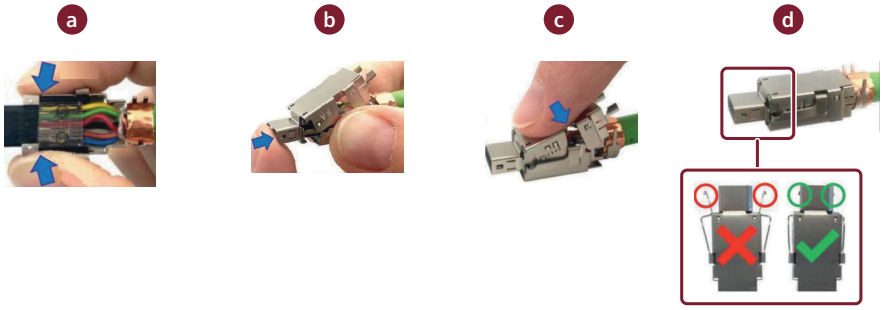
4. Insert the connector into the IDC slot in the crimping tool and crimp the connector. Make sure that red, yellow, and green conductors face up.



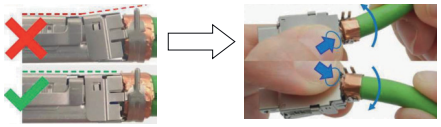
5. Assemble the shielding A.



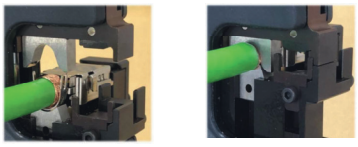
6. Assemble the shielding B.



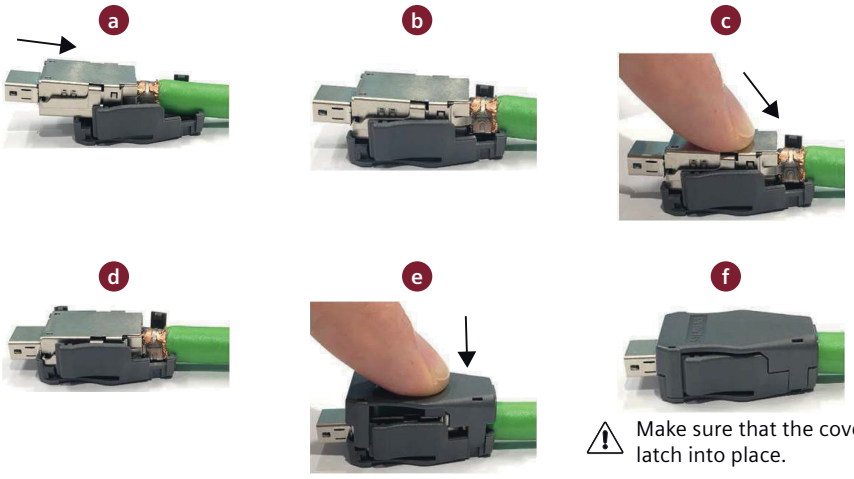
Make sure that the installed shielding B is level. If it tilts upward, adjust as follows.



7. Insert the connector into the cable crimp slot in the crimping tool and crimp the cable shield.



8. Install the housing.



⚠ Make sure that the covers latch into place.

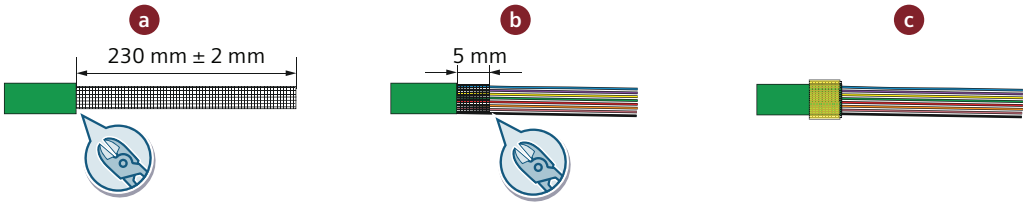
A.2.1.3 Assembling the encoder connector for 1FL1 motors with multiturn encoder

Requirement

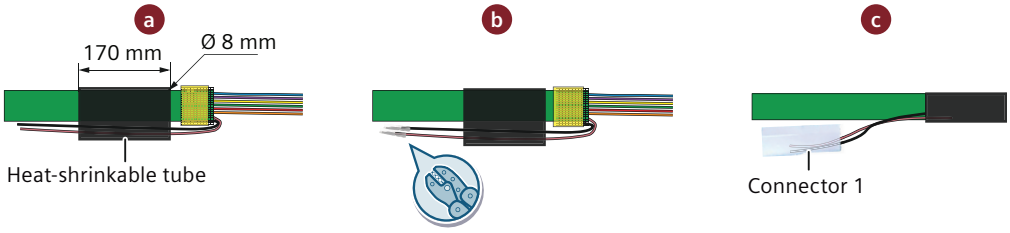
You have prepared appropriate tools, a raw cable, the Siemens IX-C connector, and the battery case.

Procedure

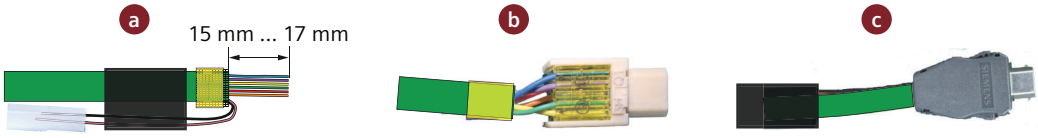
1. Prepare the cable shield.
   - Remove the outer sheath of the cable by 230 mm ± 2 mm.
   - Remove the shield, leaving approximately 5 mm intact.
   - Fold the remaining cable shield backward over the cable sheath, and wrap the folded cable shield with copper tape.



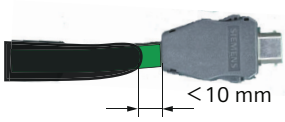
2. Prepare the black and the brown conductors.
   - Fold the black and the brown conductors backward over the cable sheath, and wrap the conductors with a heat-shrinkable tube.
   - Crimp the conductors.
   - Insert the conductors into Connector 1.



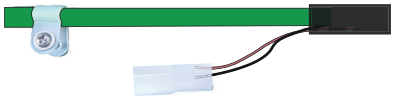
3. Trim the remaining conductors and assemble the encoder connector.
   - Trim the other conductors. Make sure their exposed length is 15 mm to 17 mm.
   - Assemble the Siemens IX-C encoder connector. For detailed instructions, see relevant steps in Chapter “Assembling the encoder connector for 1FL1 motors with single-turn encoder and 1FL2 motors (Page 806)”.



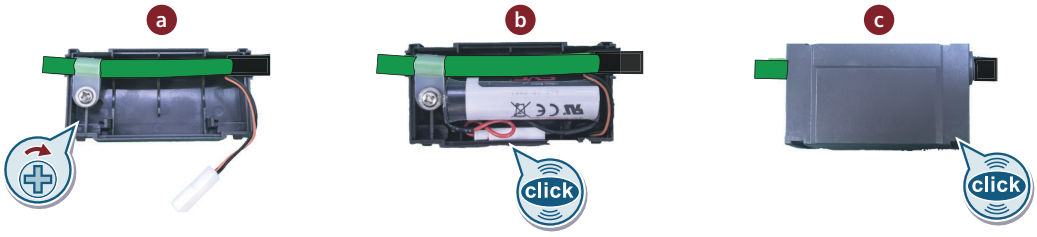
4. Move the heat-shrinkable tube close to the end of encoder connector. Make sure that the gap between the tube and the connector is less than 10 mm.



5. Assemble the clamp and the screw onto the cable.



6. Install the battery case onto the encoder cable.
   - Attach the back cover of the battery case to the cable and tighten the screw.
   - Insert the battery into the case, and connect the battery's connector to Connector 1. Arrange the brown and the black conductors neatly within the case.
   - Complete the assembly of the battery case. Make sure that the covers latch into place.



A.2.1.4 Assembling the I/O connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens 14-pin MDR connector.

Procedure

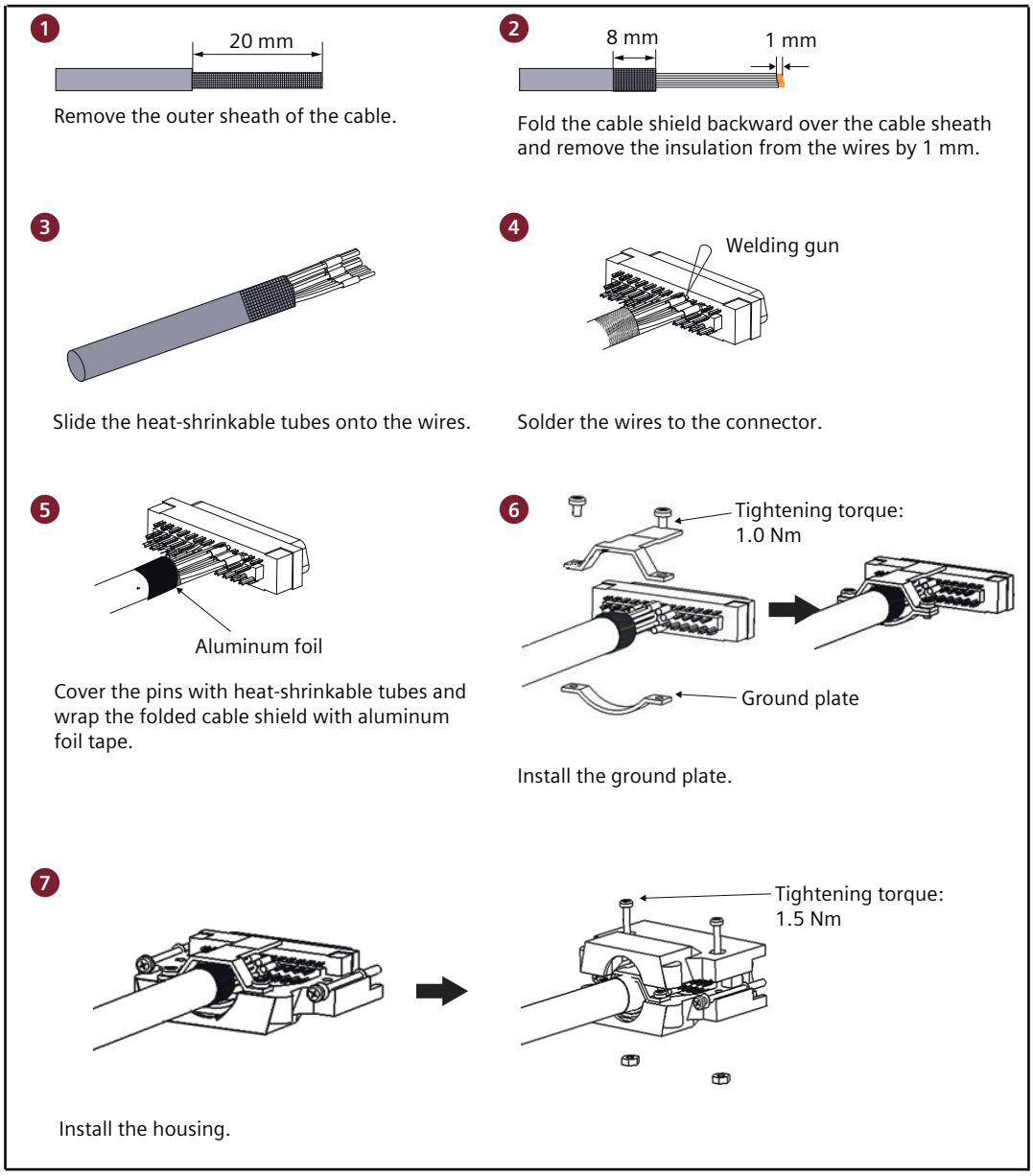


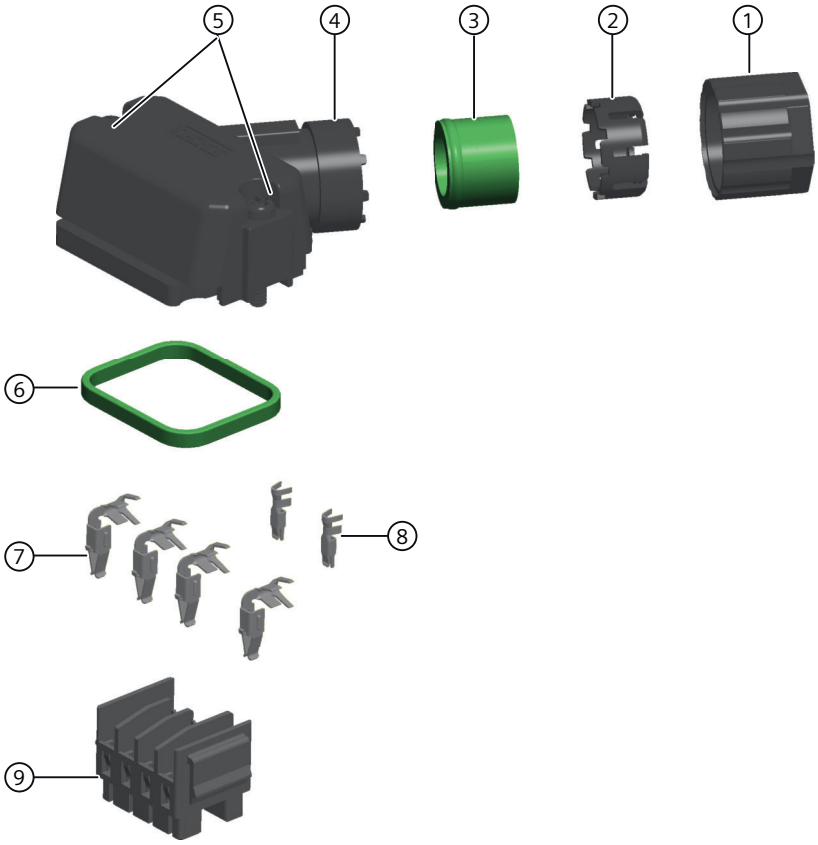
Figure A-2 Assembling the I/O cable

A.2.2 Assembling the connectors for 1FL1 motors

A.2.2.1 Assembling the power plug

Overview

The power plug is used for power connection between the converter and the 1FL1 motor. Depending on the motor you order, the plug may integrate holding brake interfaces. It consists of the following components:



1	Nut	4	Housing	7	Power contact
2	Clip	5	M2 screw	8	Brake contact
3	Seal	6	Gasket	9	Insert

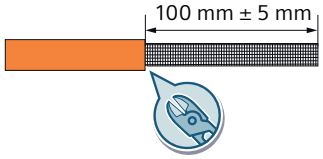
Figure A-3 Power plug overview

Requirement

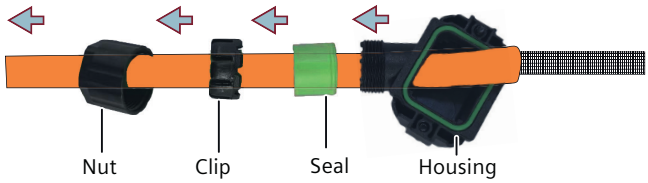
You have prepared appropriate tools, raw cables, and connectors.

Procedure

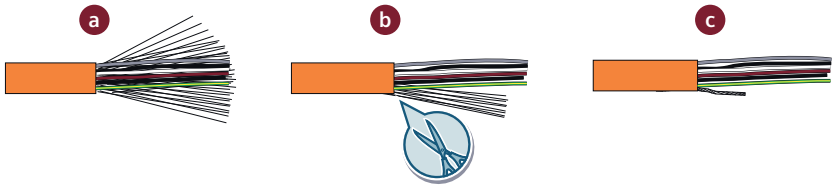
1. Remove the outer sheath of the power cable by 100 mm ± 5 mm.



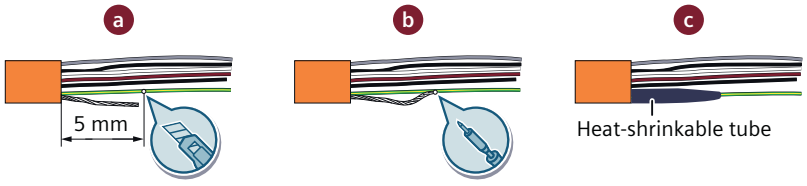
2. Slide the nut, the clip, the seal, and the housing onto the power cable.



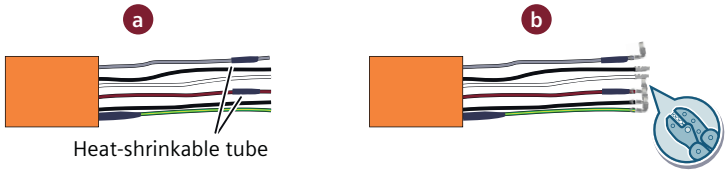
3. Prepare the braided shield of the cable.
   - Loosen the braided shield.
   - Trim the shield until only two or three strands are left.
   - Twist the remaining strands together into one strand.



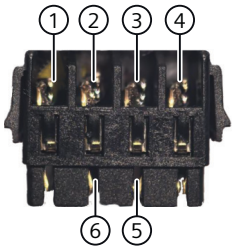
4. Connect the shield to the PE conductor.
   - Remove a small section of insulation from the PE conductor, approximately 5 mm away from the cut end of the sheath, to expose the metal core.
   - Solder the shield strands to the exposed area using tin solder.
   - Protect the soldered area with a heat-shrinkable tube.



5. Crimp the contacts onto the conductors.
   - Protect the gray and the brown conductors with heat-shrinkable tubes.
   - Crimp the power and the brake contacts onto the conductors.

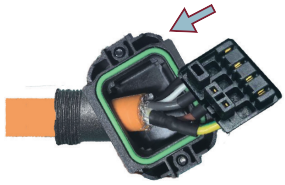


6. Insert the contacts into the power plug insert.

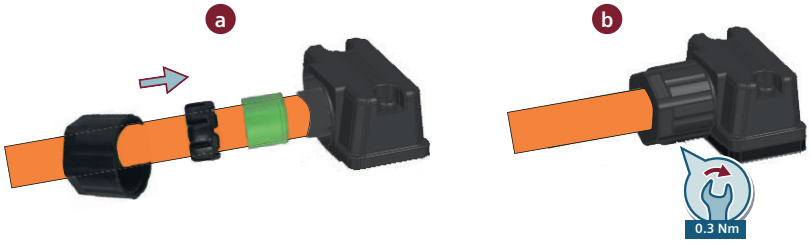


	Conductor color		Conductor color
1	Yellow-green	4	Black
2	Brown	5	White
3	Gray	6	Black

7. Place the insert into the housing.



8. Assemble the seal, the clip, and the nut.
   - Slide the seal, the clip, and the nut onto the housing.
   - Tighten the nut to a torque of 0.3 Nm ± 0.05 Nm.



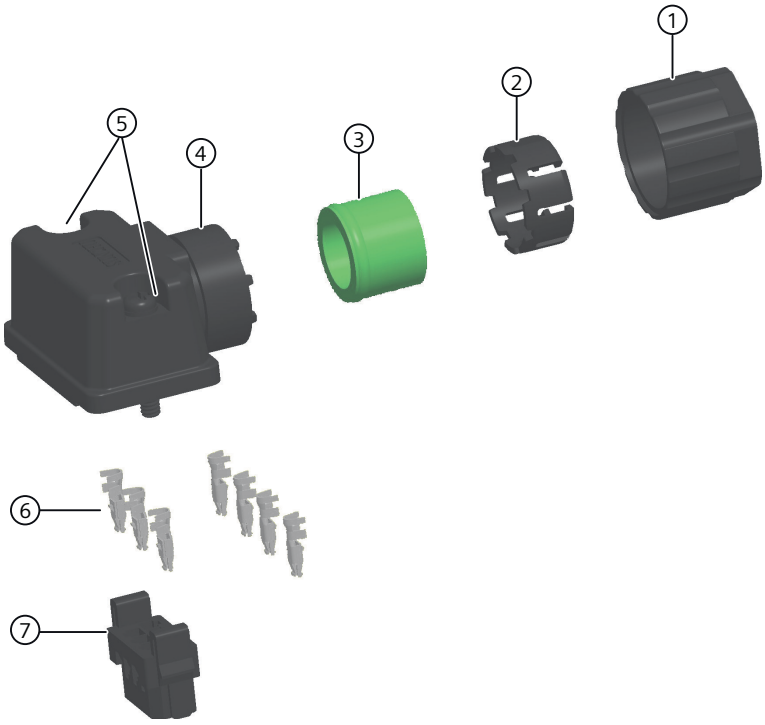
More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 122)".

A.2.2.2 Assembling the encoder plug

Overview

The encoder plug is used for encoder connection between the converter and the 1FL1 motor. It consists of the following components:



① Nut ③ Seal ⑤ M2 screw ⑦ Insert
② Clip ④ Housing ⑥ Signal contact

Figure A-4 Encoder plug overview

Note

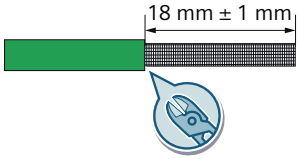
The number of signal contacts varies depending on the specific motor type. For 1FL1 motors with multiturn encoder, two additional signal contacts are required.

Requirement

You have prepared appropriate tools, raw cables, and connectors.

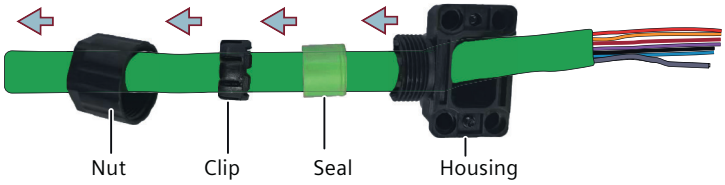
Procedure

1. Remove the outer sheath of the encoder cable by 18 mm ± 1 mm.



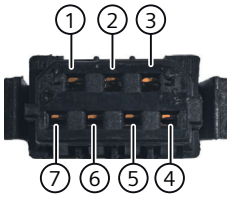
2. Prepare the braided shield of the cable.
   - Loosen the braided shield and twist the strands together into one strand.
   - Cover the strand with a heat-shrinkable tube.

3. Slide the nut, the clip, the seal, and the housing onto the encoder cable.



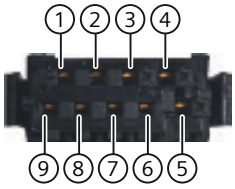
4. Crimp the contacts onto the conductors.

5. Insert the contacts into the encoder plug insert.
   - For 1FL1 motors with single-turn encoder, arrange the conductors as follows:



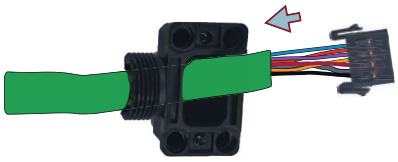
	Signal	Conductor color
1	Functional grounding	-
2	M	Orange
3	P_Supply	Red
4	Data_P	Blue
5	Data_N	Purple
6	Clock_P	Brown
7	Clock_N	Black

   - For 1FL1 motors with multiturn encoder, arrange the conductors as follows:

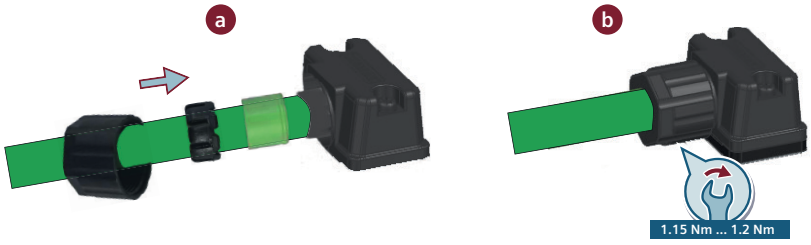


	Signal	Conductor color
1	VB+	Brown
2	VB-	Black
3	Functional grounding	-
4	M	Orange
5	Data_P	Blue
6	Data_N	Purple
7	Clock_P	Yellow
8	Clock_N	Green
9	P_Supply	Red

6. Place the insert into the housing.



7. Assemble the seal, the clip, and the nut.
   - Slide the seal, the clip, and the nut onto the housing.
   - Tighten the nut to a torque of 1.15 Nm ... 1.2 Nm.



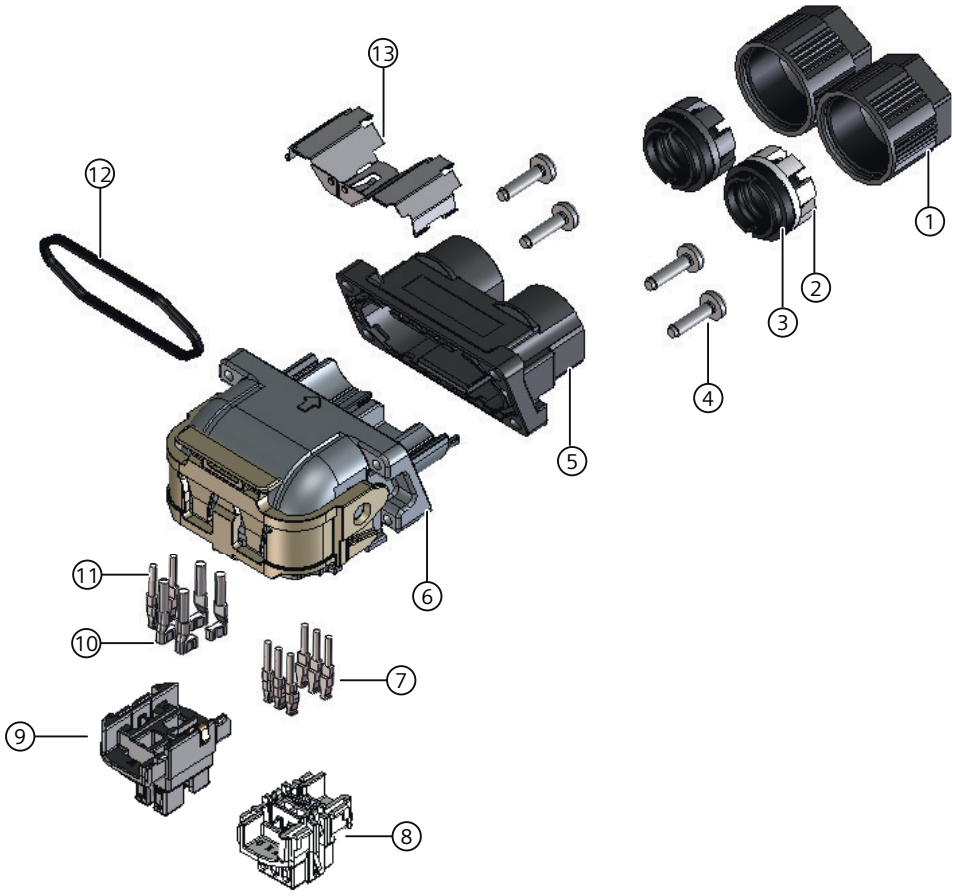
More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 122)".

A.2.3 Assembling the hybrid plug for 1FL2 motors

Overview

The Siemens hybrid plug is used for connecting the converter to the motor and the encoder in the motor. It consists of the following components:



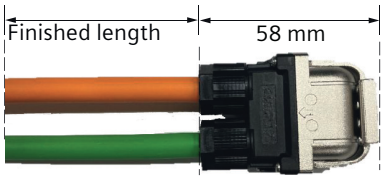
①	Cap	⑧	Signal unit case
②	Clamp	⑨	Power unit case
③	Gasket	⑩	Hybrid power contact
④	M2 screw	⑪	Hybrid brake contact
⑤	Seal case	⑫	Sealing ring
⑥	Housing	⑬	Shield holding plate
⑦	Hybrid signal contact		

Figure A-5 Hybrid plug overview

Requirement

You have prepared the following items:

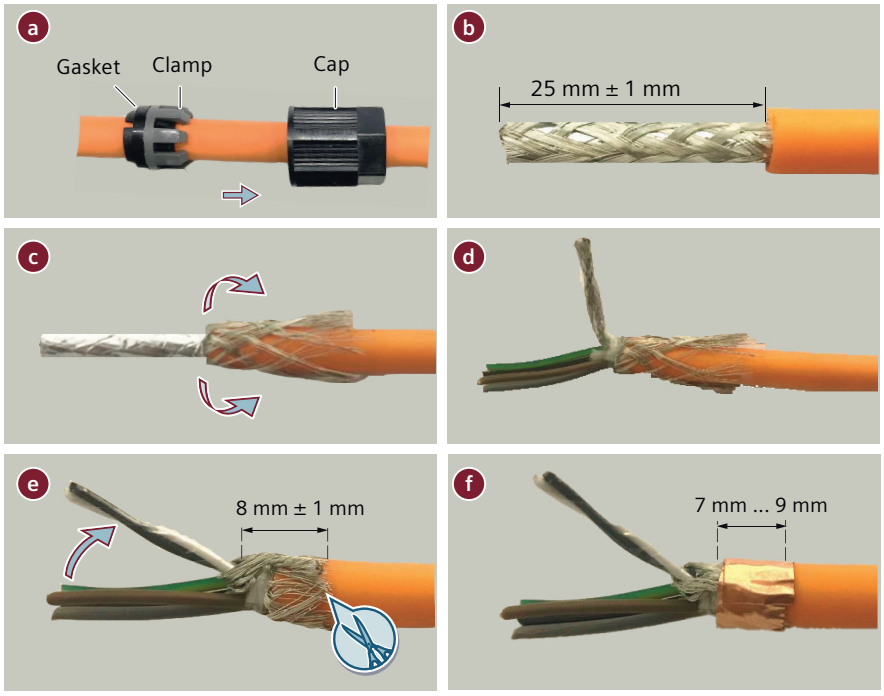
- Raw cables
  Reserve 58 mm at the ends of the cables for termination into the hybrid connector.



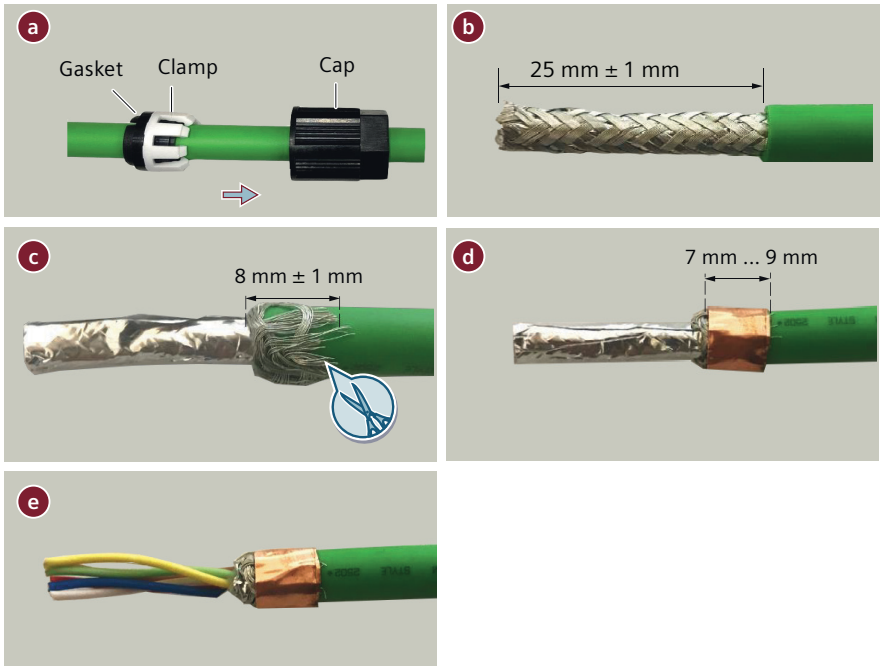
- Siemens hybrid plug
- Copper tapes
- Scissor
- Screwdriver
- Crimping tool

Procedure

1. Prepare the power cable.
   - Slide the cap, the clamp, and the gasket onto the power cable.
   - Remove the outer sheath of the cables by 25 mm ± 1 mm.
   - Loosen the braided shield of the cable and fold the shield backward over the cable sheath.
   - Remove the foil shield. If the power cable is integrated with the brake conductors, additionally loosen the braided shield of the brake cable and fold its shield backward over the cable sheath.
   - Cut the folded shield to make sure that the length of the folded shield is 8 mm ± 1 mm. Remove the debris to ensure cable insulation.
   - Wrap around the shield 1.5 to 2 times with copper tapes.



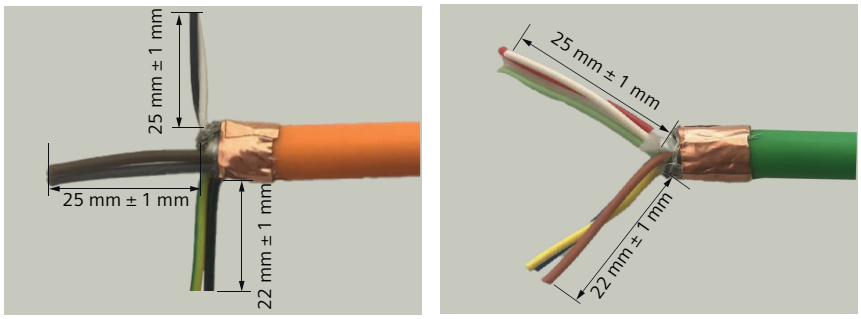
2. Prepare the encoder cable.
   - Slide the cap, the clamp, and the gasket onto the encoder cable.
   - Remove the outer sheath of the cables by 25 mm ± 1 mm.
   - Loosen the braided shield of the cable and fold the shield backward over the cable sheath. Cut the folded shield to make sure that the length of the folded shield is 8 mm ± 1 mm. Remove the debris to ensure cable insulation.
   - Wrap around the shield 1.5 to 2 times with copper tapes.
   - Remove the foil shield.



3. Arrange and cut the conductors.
   The conductor length required for termination into the hybrid plug varies depending on the variant of the hybrid plug and the contacts. Conductors that are close to the cable outlet should be cut 3 mm more.

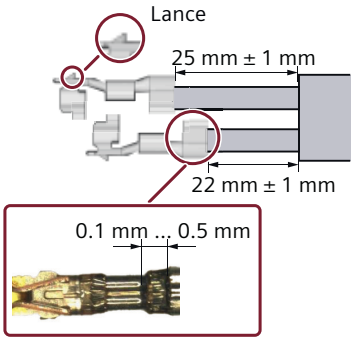
Conductor	Conductor length requirement (mm)	
	Drive-end variant	Non-drive end variant
Power conductor U	25 ± 1	22 ± 1
Power conductor V	22 ± 1	25 ± 1
Power conductor W	25 ± 1	22 ± 1
PE conductor	22 ± 1	25 ± 1
Brake conductor +	25 ± 1	25 ± 1
Brake conductor -	25 ± 1	25 ± 1
Signal conductors A, B, and C	22 ± 1	25 ± 1
Signal conductors D, E, and F	25 ± 1	22 ± 1

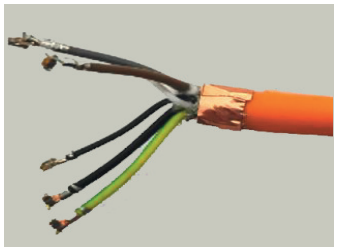
The following images show the conductor length requirement of the drive-end hybrid plug.

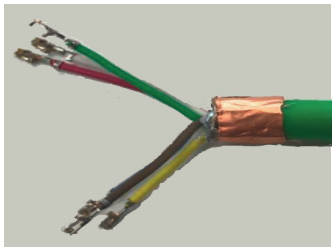


4. Strip the power and PE conductors by 2.4 mm ± 0.5 mm, and encoder and brake conductors by 2.2 mm ± 0.5 mm.

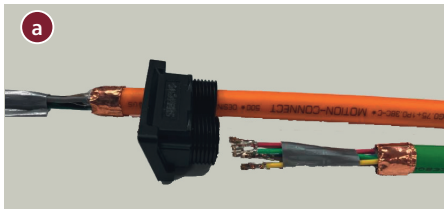
5. Crimp the contacts onto the conductors. Make sure that the lance side of the contacts face outwards.

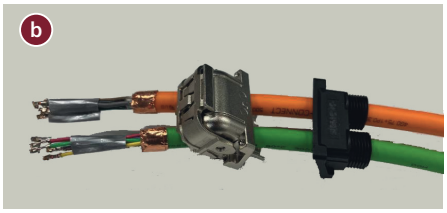




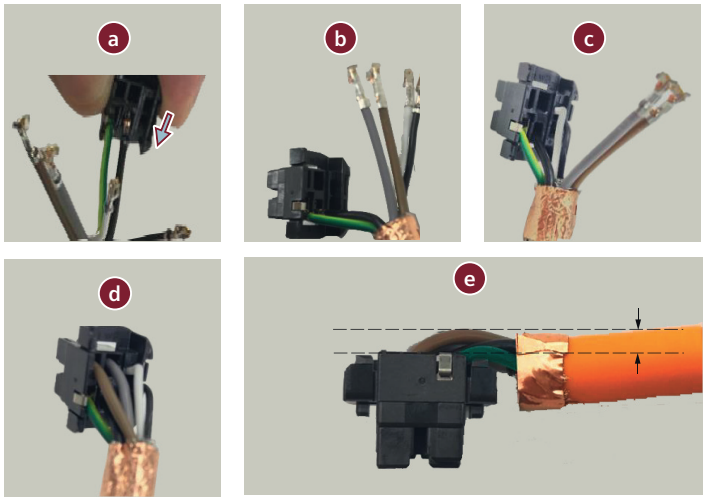


6. Slide the power and signal cables through the seal case and the housing.
   Avoid deforming the contact tips. Siemens recommends that you protect the conductors with a tape during the process.

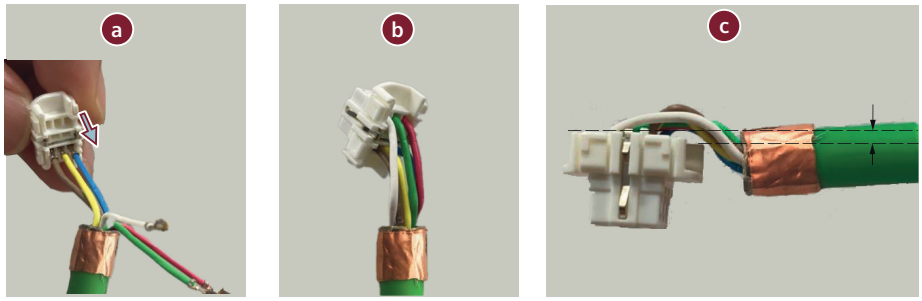




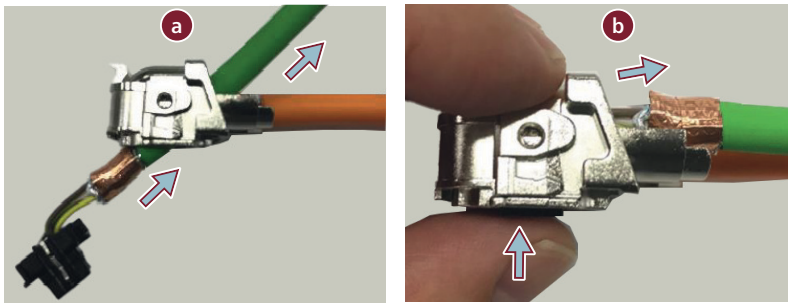
7. Insert the power and brake contacts into the power unit case and adjust the conductors to make sure that the cable does not rise up.



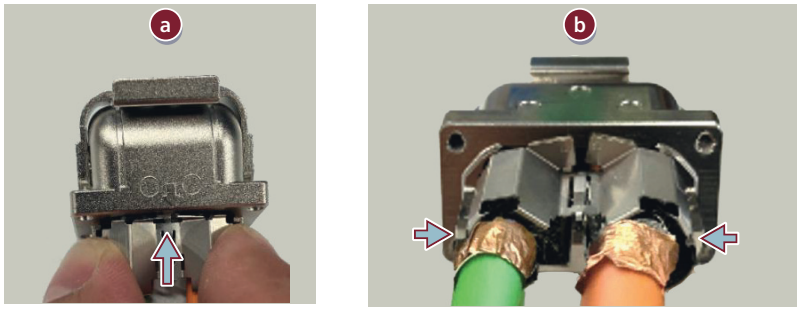
8. Insert the signal contacts into the signal unit case and adjust the conductors to make sure that the cable does not rise up.



9. Insert the signal and the power unit cases into the housing by pulling the cables back. Make sure that the signal and the power unit cases are latched to the housing.

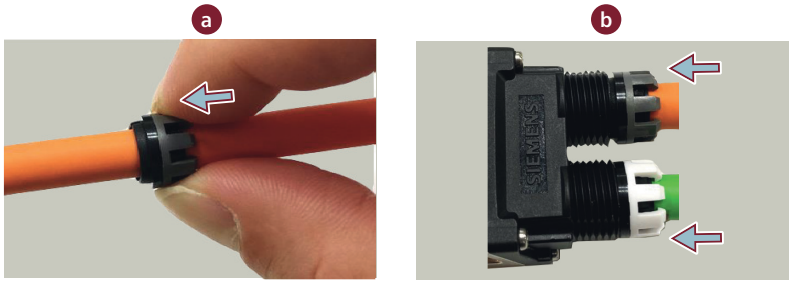


10. Insert the shield holding plate into the housing.

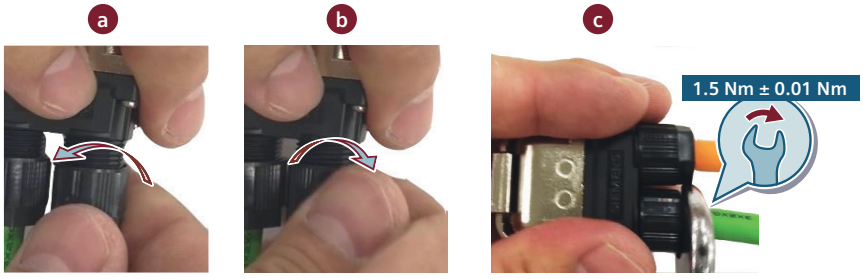


11. Assemble the housing and the seal case.
    - Hold the shield holding plate and slide the seal case to the housing.
    - Tighten the M2 screws with a tightening torque of 0.18 Nm ± 0.01 Nm.

12. Insert the gaskets and the clamps to the seal case.



13. Tighten the caps.
    - Rotate the caps in the counterclockwise direction to match the threads of the seal case and the caps.
    - Rotate the caps in the clockwise direction.
    - Tighten the caps by wrench with a tightening torque of 1.5 Nm ± 0.01 Nm.



More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 122)".

A.2.4 Disassembling the hybrid plug for 1FL2 motors

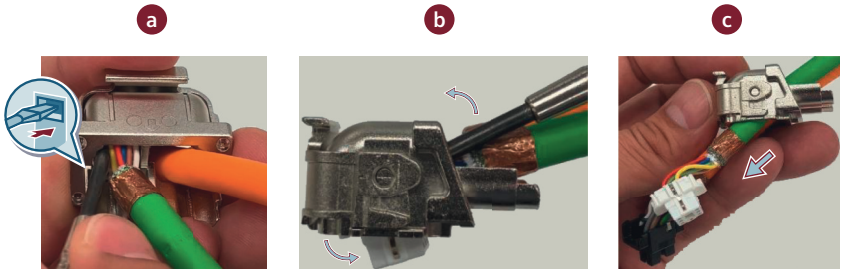
Requirement

You have prepared the following items:

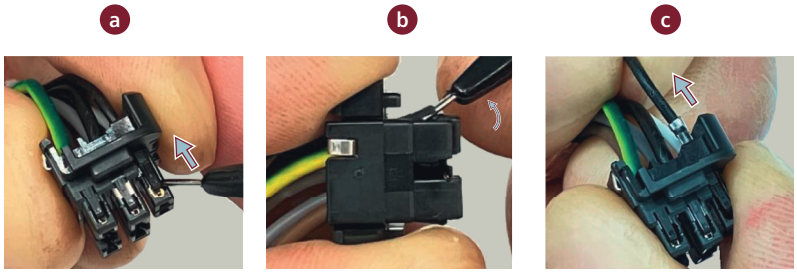
- Assembled Siemens hybrid plug
- Pin removal tool
- Screwdriver

Procedure

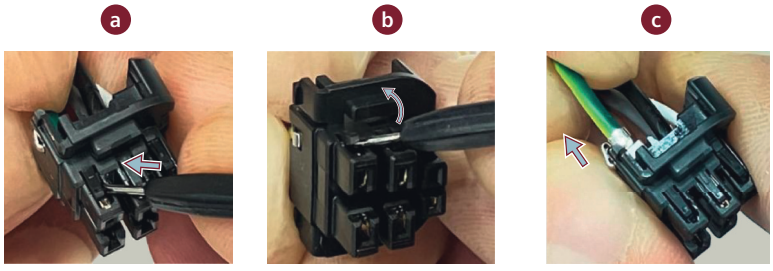
1. Remove the signal and the power unit cases from the housing.
   - Insert the screwdriver into the unit cases from the side of the cable outlet.
   - Press down the tip of the screwdriver to remove the unit cases from the housing.



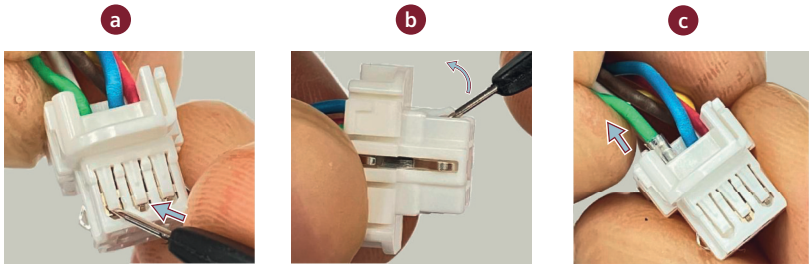
2. Remove the hybrid brake contacts from the power unit case.
   - Insert the tip of the pin removal tool into the gap between the contact and its latch.
   - Lift up the latch and pull out the contact.



3. Repeat Step 2 to remove the hybrid power contacts from the power unit case.



4. Repeat Step 2 to remove the hybrid signal contacts from the signal unit case.



Result

You have disassembled the hybrid plug.

Note

The removal of contacts deforms the signal unit case; therefore, the disassembled signal unit case cannot be reused.

Siemens does not recommend that you reuse the disassembled power unit case. Before reusing the power unit case, check to make sure that there is no deformation or damage.

A.3 Motor selection

A.3.1 Selection procedure

Overview

The following section shows the principal steps for selecting a suitable motor. Then you can calculate the moment of inertia of your system and the braking energy accordingly.

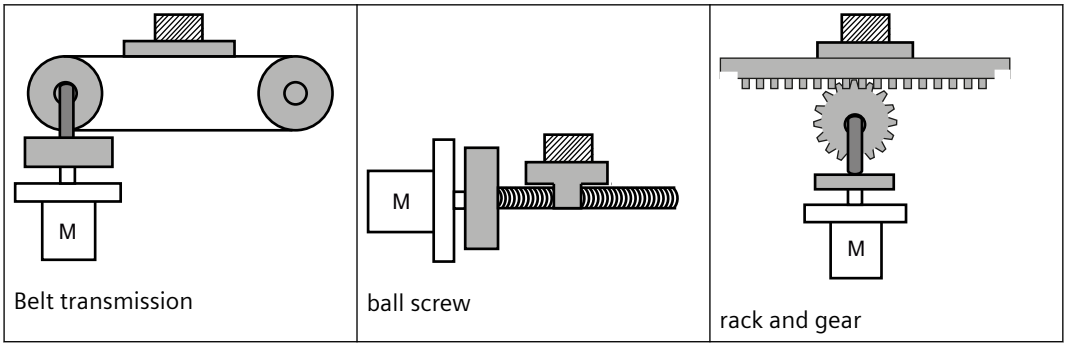
Requirement

None

Procedure

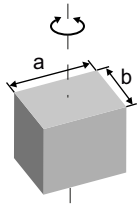
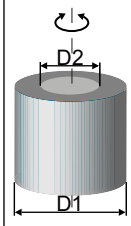
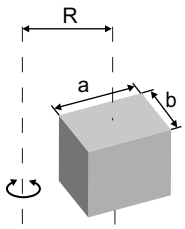
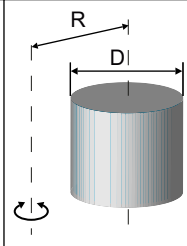
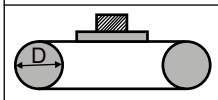
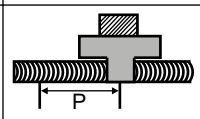
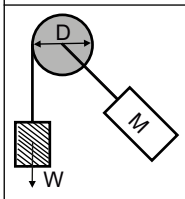
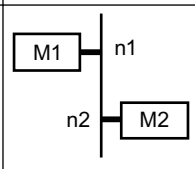
Proceed as follows to select a motor:

1. Determine the mechanism type as well as the detailed data of the related mechanical parts, such as ball screw lead, diameter, lead, and gear diameter. Three mechanism types are shown below:



2. Determine the operation pattern including such parameters as acceleration time (ta), constant motion time (tu), deceleration time (td), stopping time (ts), cycle time (tc), and travel distance (L).
3. Calculate load inertia and inertia ratio.
   The inertia ratio can be obtained by dividing the load inertia by the rotor inertia of the selected motor. The unit of inertia is x 10^{-4} kg·m^2.
4. Calculate the speed.
   Calculate the speed according to the travel distance, acceleration time, deceleration time, and constant motion time.
5. Calculate the torque.
   Calculate the torque according to the load inertia, acceleration time, deceleration time, and constant motion time.
6. Select the motor.
   Select the motor that matches the data in step 3 to step 5.

Typical load inertia equations

Mechanism	Equation	Mechanism	Equation
 Axis of rotation on center	$J = \frac{W}{12}(a^2 + b^2)$ W: Mass (kg) a: Length (m) b: Width (m)	 Axis of rotation on center	$J = \frac{W}{8}(D_1^2 + D_2^2)$ W: Mass (kg) D_1: External diameter (m) D_2: Internal diameter (m)
 Axis of rotation off center	$J = W \cdot \left(\frac{a^2 + b^2}{3} + R^2\right)$ W: Mass (kg) a: Length (m) b: Width (m) R: Rotational diameter (m)	 Axis of rotation off center	$J = \frac{W}{8}(D^2 + 8R^2)$ W: Mass (kg) D: Workpiece diameter (m) R: Rotational diameter (m)
 Conveyor	$J = \frac{W \cdot D^2}{4}$ W: Mass (kg) D: Pulley wheel diameter (m)	 Ball screw	$J = \frac{W \cdot P^2}{4\pi^2} + J_b$ W: Mass (kg) P: Lead (m) J_b: Ball screw inertia (kg·m²)
 Object hung with pulley	$J = W \cdot \left(\frac{D}{2}\right)^2 + J_p$ W: Mass (kg) D: Pulley wheel diameter (m) J_p: Pulley inertia (kg·m²)	 Reducer	$J = J_1 \cdot \frac{n_1^2}{n_2^2} \cdot J_2$ W: Mass (kg) n_1/n_2: Speed of each motor (rpm) J_1 /J_2: Inertia of each motor (kg·m²)

A.3.2 Selection examples

Description

This section uses a ball screw mechanism as an example to illustrate the motor selection procedure.

Exemplary data
The following table lists the data related to the ball screw mechanism and operation pattern.

Workpiece weight	W	10 kg
Material density of the ball screw	ρ	7.9×10^3 kg/m³

Ball screw length	B_l	0.5 m
Ball screw diameter	B_d	0.02 m
Ball screw pitch	B_p	0.02 m
Mechanical efficiency	B_η	0.9
Coupler inertia (refer to the supplier's product catalog)	J_c	20×10^{-6} kgm^2
Acceleration time	t_a	0.15 s
Constant motion time	t_u	0.5 s
Deceleration time	t_d	0.15 s
Cycle time	t_c	2 s
Travel distance	L	0.5 m
Gravitational acceleration	g	9.81 m/s^2
Frictional coefficient	μ	0.025

Calculating velocity

Maximum traveling velocity:

$$V_{max} = \frac{2 \cdot L}{t_a + 2 \cdot t_u + t_d} = \frac{2 \times 0.5}{0.15 + 2 \times 0.5 + 0.15} = 0.769 m/s$$

Calculating forces, pitch angle and friction angle

Frictional force:

$$F_R = \mu \cdot W \cdot g = 0.025 \times 10 \times 9.81 = 2.45N$$

Accelerating force/decelerating force:

$$F_a = F_d = W \cdot \frac{V_{max}}{t_a} = 10 \times \frac{0.769}{0.15} = 51.3N$$

Pitch angle of the ball screw:

$$\alpha_B = arctan \frac{B_p}{\pi \cdot B_d} = arctan \frac{0.02}{3.14 \times 0.02} = 0.308 rad$$

Friction angle of the ball screw:

$$\beta = arctan \frac{B_p}{\pi \cdot B_d \cdot B_\eta} - \alpha_B = arctan \frac{0.02}{3.14 \times 0.02 \times 0.9} - 0.308 = 0.0318 rad$$

Calculating torques for the ball screw and the coupling when accelerating and decelerating

Angular velocity of the ball screw at V_{max}:

$$\omega_{\max B} = \frac{2 \cdot \pi \cdot V_{max}}{B_p} = \frac{2 \times 3.14 \times 0.769}{0.02} = 241.538 s^{-1}$$

Maximum rotating velocity:

$$n_{motor\ max} = \frac{\omega_{\max B} \cdot 60}{2 \cdot \pi} = \frac{241.538 \times 60}{2 \times 3.14} = 2308rpm$$

Angular acceleration of the ball screw:

$$\alpha_{aB} = \frac{\omega_{\max B}}{t_a} = \frac{241.538}{0.15} = 1610.26s^{-2}$$

Ball screw weight:

$$B_W = \rho \cdot \pi \cdot \left(\frac{B_d}{2}\right)^2 \cdot B_l = 7.9 \times 10^3 \times 3.14 \times \left(\frac{0.02}{2}\right)^2 \times 0.5 = 1.24kg$$

Moment of inertia of the ball screw:

$$J_B = \frac{B_W}{8} \cdot B_d^2 = \frac{1.24}{8} \times 0.02^2 = 0.00006kgm^2$$

Moment of inertia of the ball screw + coupling:

$$J_{B+c} = J_B + J_c = 0.00006 + 0.00002 = 0.00008kgm^2$$

Accelerating torque and decelerating torque for the ball screw + coupling:

$$M_{aB+c} = M_{dB+c} = J_{B+c} \cdot \alpha_{aB} = 0.00008 \times 1610.26 = 0.13Nm$$

Preselecting the motor

Based on the calculated torques, if we select the 1FL2203-4AG motor:

n_n = 3000 rpm, M_n = 1.27 Nm, J_{motor} = 0.038 × 10^{-3} kgm^2

Then the inertia ratio:

$$\frac{J_{load}}{J_{motor}} = \frac{J_{B+c} + J_W}{J_{motor}} = \frac{0.00008 + 0.0001}{0.038 \times 10^{-3}} = 4.74$$

Wherein, J_W is the moment of inertia of the workpiece:

$$J_W = W \cdot \frac{B_p^2}{4 \cdot \pi^2} = 10 \times \frac{0.02^2}{4 \times 3.14^2} = 0.0001kgm^2$$

Calculating the motor torques during the constant motion phase

$$M_{motor} = F_R \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta) = 2.45 \times \frac{0.02}{2} \times \tan(0.308 + 0.0318) = 0.009Nm$$

Calculating the motor torques when accelerating and decelerating

$$M_{amotor} = M_{dmotor} = J_{motor} \cdot \alpha_{aB} = 0.038 \times 10^{-3} \times 1610.26 = 0.06Nm$$

Accelerating torque and decelerating torque for the motor:

Motor torque when accelerating:

$$M_{motor} = M_{amotor} + M_{aB+c} + (F_a + F_R) \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta)$$
$$= 0.06 + 0.13 + (51.3 + 2.45) \times \frac{0.02}{2} \times \tan(0.308 + 0.0318) = 0.383Nm$$

Motor torque when decelerating:

$$M_{motor} = -M_{dmotor} - M_{dB+c} + (-F_a + F_R)^* \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta \cdot sign(+)^*)$$
$$= -0.06 - 0.13 + (-51.3 + 2.45) \times \frac{0.02}{2} \times \tan(0.308 - 0.0318) = -0.332Nm$$

* If the expression in brackets has a negative sign, the sign of β changes to minus.

Final selection

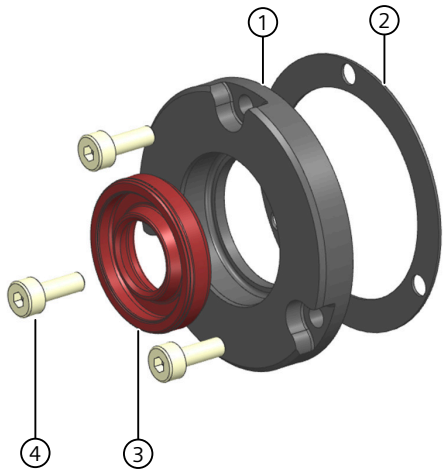
According to the above calculated speed, torque, and inertia ratio, 1FL2203-4AG motor is suitable.

A.4 Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30

Overview

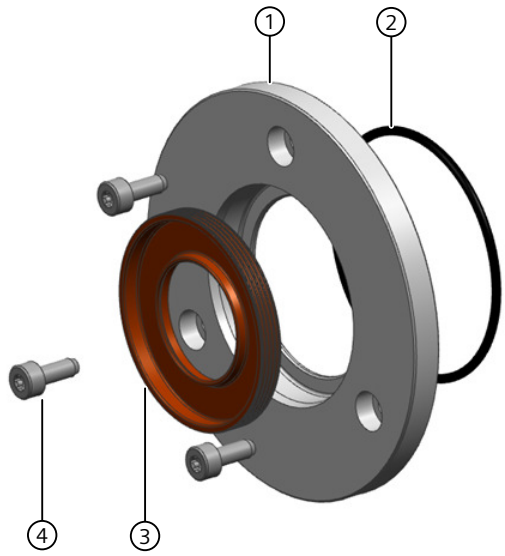
The IP65 degree of protection kit can be used by the end customer either to replace the shaft sealing ring or to upgrade the degree of protection from IP54 to IP65.

It consists of the following components:



① Adapter flange × 1
② Gasket × 1
③ Shaft sealing ring × 1
④ Screw × 3

Figure A-6 IP65 degree of protection kit of SH20



① Adapter flange × 1
② O-ring × 1
③ Shaft sealing ring × 1
④ Screw × 3

Figure A-7 IP65 degree of protection kit of SH30

Requirement

You have prepared appropriate tools and the IP65 degree of protection kit.

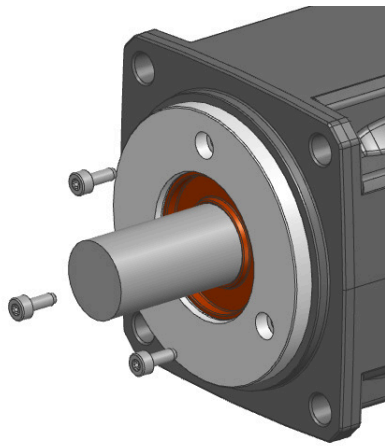
Procedure

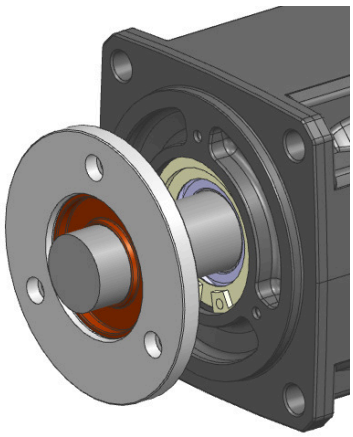
The following instructions take 1FL2 motors SH30 as an example.

Disassembly

To disassemble the old components, proceed as follows:

1. Remove three fixing screws of the adapter flange.
2. Take apart the adapter flange with the shaft sealing ring pressed.

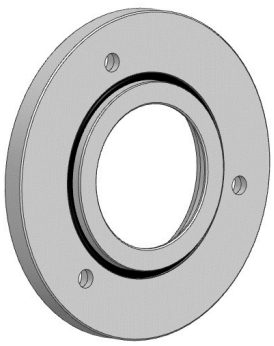


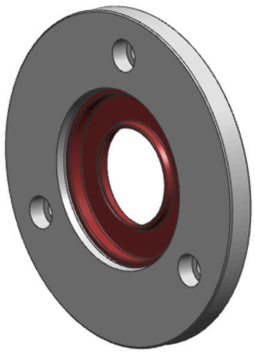


Assembly

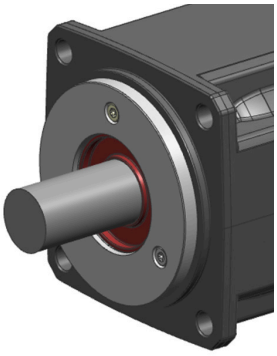
To assemble the new components, proceed as follows:

1. Insert an O-ring in the groove of the adapter flange.
   Make sure that the O-ring is not clamped between DE end shield and adapter flange.





2. After applying grease onto the sealing area, fix the adapter flange with the shaft sealing ring already pressed on with three screws.



Get more information

SINAMICS:
www.siemens.com/sinamics

SIMOTICS:
www.siemens.com/simotics

Industry Mall:
www.siemens.com/industrymall

Industry Online Support:
www.siemens.com/online-support