

SIEMENS



Measuring Devices and Power Monitoring

SENTRON

Configu-
ration
Manual

Edition
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siemens.com/lowvoltage

Measuring Devices and Power Monitoring



¹⁾ Manuals and other technical product information are available from Siemens Industry Online Support, directly at <https://support.industry.siemens.com/cs/de/en/view/109477872>

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For further technical product information:

Siemens Industry Online Support:
www.siemens.com/lowvoltage/product-support

→ Entry type:
 Application example
 Certificate
 Characteristic
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 FAQ
 Manual
 Product note
 Software archive
 Technical data

Measuring Devices and Power Monitoring

Power Monitoring

Energy management in accordance with ISO 50001

Overview

A systematic approach to energy efficiency

The standard ISO 50001 supports companies with a specific process description for introducing a corporate energy management system. Standard-compliant energy management optimizes energy utilization, while continuously enhancing energy efficiency.

Defining energy policy objectives

A central management task is the formulation of an in-house energy policy. It defines relevant strategic and operational objectives. Ongoing planning will include the identification of additional optimization potential for the business areas under scrutiny, and the development of relevant improvement measures.

Introducing process optimization

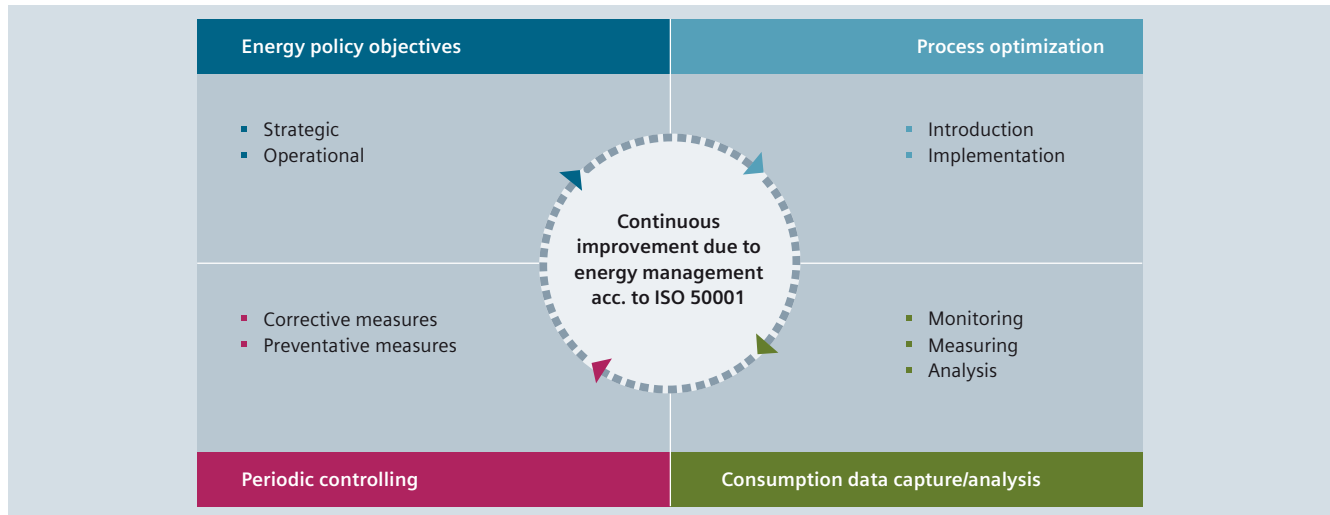
As a first step, an energy manager must be identified and nominated. He will then evaluate captured data, and derive and implement appropriate optimization measures. He will report the achieved results to corporate management.

Making energy flows transparent

As a second step, basic energy consumption and cost data, as well as information on in-house energy production, must be collected and documented clearly and verifiably. This requires the development of a reliable and precise system for the capture and analysis of consumption data. The objective is to recognize sustainable savings potential, to derive appropriate measures for that potential, and to implement these measures systematically.

Periodic controlling

Periodic checks will ensure that your energy management system functions correctly, and that objectives are reached. Corrective and preventative measures can then be implemented as needed.



Introduction of a corporate energy management system in accordance with ISO 50001 for continuous improvement of energy efficiency by reducing energy consumption and costs.

Providing the basis with power monitoring

The power monitoring system from the SENTRON portfolio is suitable for infrastructure, industrial applications, and buildings. The 7KT/7KM PAC measuring devices record the data of outgoing feeders or individual loads.

The 3WL/3VA/3VL circuit breakers supply measured values and important information for diagnostics, fault detection, and maintenance via standardized bus systems.

With the powermanager power monitoring software, the recorded measured values can be easily visualized, analyzed, archived, and monitored.

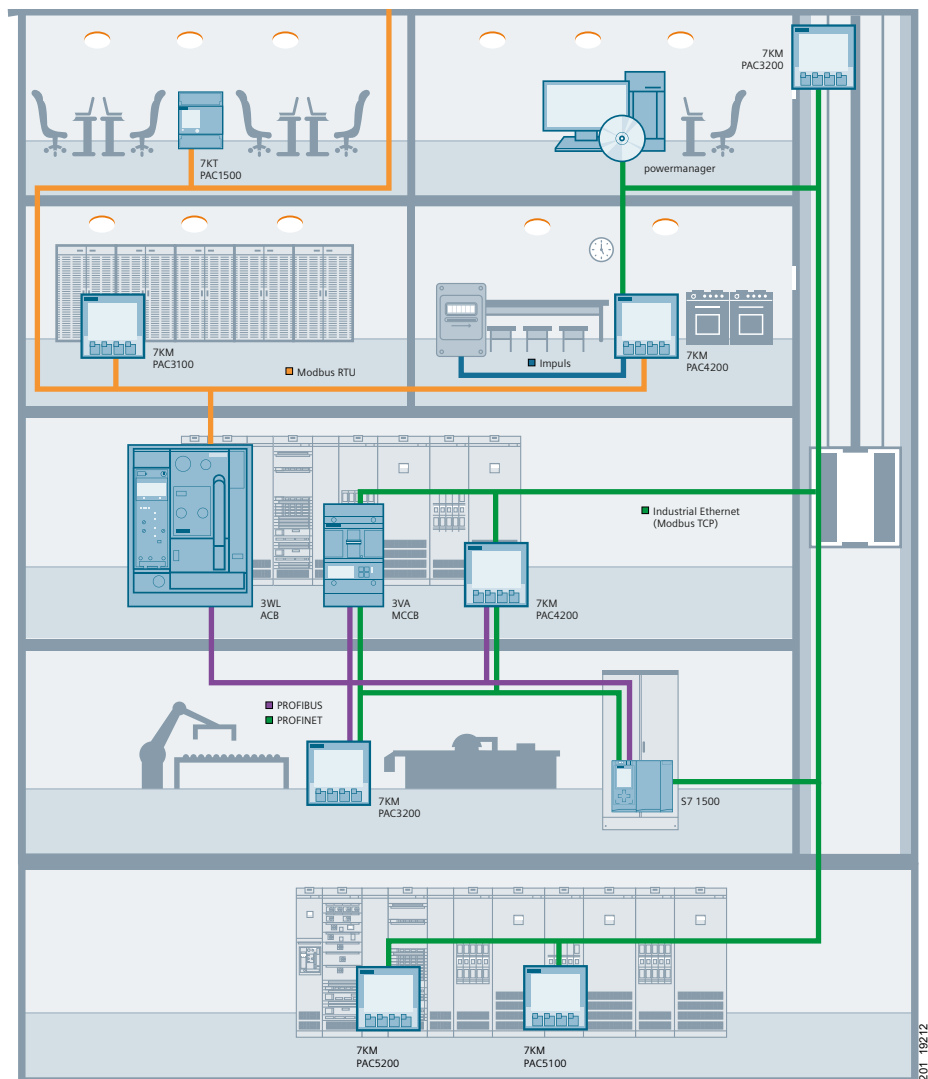
Recording of generated energy using measuring devices in MID version

Derivation of optimization measures through transparency of the energy flows

Increased availability of energy through monitoring of critical states in the power supply

Increased system availability through continuous monitoring of switching states

Increased productivity through optimization of energy consumption and energy costs



Measuring Devices and Power Monitoring

Power Monitoring

Energy management in accordance with ISO 50001

Continuously increasing energy efficiency

Precise cost center accounting for consumers



- Precise allocation of energy costs to cost centers
- Benchmarking between different cost centers
- Increased energy awareness

Detection of energy guzzlers, reduction of load peaks



- Detection of energy-intensive processes and loads
- Cost savings created by amending the power supply agreement
- Tax savings by seamless documentation of application-specific consumption

Protection of sensitive areas for high plant safety



- Avoidance of equipment failures due to overload
- Protection of sensitive devices against harmonics
- Early intervention possible by means of notifications

Monitoring of protective devices for high system availability



- Increased system availability
- Optimization of maintenance
- Fast response to service call-outs

Multi-site power monitoring



- Centralized, multi-site power monitoring via standard IT networks
- Benchmarking of various corporate units increases energy awareness
- Improvement of power supply conditions by bundling supply volumes

Measuring Devices and Power Monitoring

Power Monitoring

Hardware and software components

Overview

7KT PAC and 7KM PAC measuring devices and 3VA molded case circuit breakers with ETUs of the 8-series

	7KT PAC1500	7KM PAC3100	7KM PAC3200	7KM PAC4200	7KM PAC5100	7KM PAC5200	3VA ETU8..
							
	The entry-level solution when it comes to energy measurement	The cost-effective solution for digital measurement	The specialist solution for precise energy measurement	The professional solution for communication/monitoring	The specialist solution for measured value recording	The expert solution for power supply quality	The specialist solution for protection and energy measurement
Measuring range/connection							
Max. input voltage L-L/L-N	400 V/230 V	480 V/276 V	690 V/400 V ¹⁾	690 V/400 V ¹⁾	690 V/400 V	690 V/400 V	690 V/400 V ¹⁾
Transformer connection version	x/5 A	x/5 A	x/1 A/x/5 A	x/1 A/x/5 A	x/1 A/x/5 A	x/1 A/x/5 A	Integrated
Direct connection version	80 A/125 A	—	—	—	—	—	—
DC power supply unit with extra-low voltage version	—	—	22 ... 65 V	22 ... 65 V	—	—	24 V
Single-phase counter version	✓	—	—	—	—	—	—
Electrically isolated voltage inputs	—	—	—	—	✓	✓	—
Version without display (with web server)	—	—	—	—	✓	✓	—
Measured quantities							
Voltage, current, power, frequency, power factor	✓ ²⁾	✓	✓	✓	✓	✓	✓
Energy measurement							
• Apparent, active, reactive energy	— ✓ ✓	— ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Extended measured quantities							
• Distortion factor THD (voltage, current)	—	—	✓ ³⁾	✓	✓	✓	✓
• Harmonics (voltage, current)	—	—	—	3 ... 31.	2 ... 40.	2 ... 40.	—
• Phase angle/phase chart	—	—	—	✓	✓	✓	—
• Load profile record with time stamp for min/max values	—	—	—	✓	—	✓	✓
• Flicker acc. to IEC 61000-4-15	—	—	—	—	—	✓	—
Monitoring functions							
Operating hours counter	—	—	✓	✓	—	—	✓
Limit monitoring	—	—	✓	✓	✓	✓	✓
Logic functions	—	—	✓	✓	✓	✓	—
Event log	—	—	—	> 4000 events	✓	✓	✓
Gateway function	—	—	—	✓	✓	✓	—
Reporting acc. to EN 50160	—	—	—	—	—	✓	—
Integrated fault recorder	—	—	—	—	—	✓	—
System integration and communication							
Digital inputs (DI)/digital outputs (DO)	—	2/2	1/1	2/2	0/2	0/2	—
S0 interface	✓	✓	✓	✓	—	—	✓
4DI/2DO expansion module	—	—	—	Optional	—	—	Optional
M-Bus	Optional	—	—	—	—	—	—
Instabus KNX	Optional	—	—	—	—	—	—
Modbus RTU	Optional	✓	Optional	Optional	—	—	Optional
Ethernet with Modbus TCP	—	—	✓	✓	✓	✓	✓
PROFIBUS DPV1	—	—	Optional	Optional	—	—	Optional
PROFINET IO/ PROFINergy	—	—	Optional	Optional	—	—	Optional
Parameterization software	✓	powerconfig	powerconfig	powerconfig	—	—	powerconfig
Integration of power monitoring system	powermanager	—	—	—	—	—	powermanager
Web servers	—	—	—	—	✓	✓	—
General data							
Measuring accuracy, active energy, reactive energy	1 2	1 3	0.5 S 2	0.2 S 2	0.5 S 2	0.5 S 2	2 S 2
MID version	✓	—	—	—	—	—	—
Installation	Standard mounting rail	Front mounting	Front mounting	Front mounting	Front mounting/standard mounting rail	—	See 3VA
Dimensions in MW (1 MW = 18 mm) or in mm	2 / 4 / 6 MW	96 × 96 × 56	96 × 96 × 56	96 × 96 × 82	96 × 96 × 100	96 × 96 × 100	96 × 96 × 82 ⁴⁾

¹⁾ With the exception of devices with power supply units with extra-low voltage
²⁾ On the display – energy and power values only. Additional measured quantities are transmitted via the optional 7KT Modbus and 7KT M-Bus expansion modules.

³⁾ THD indication

⁴⁾ For display via DSP800; see manual

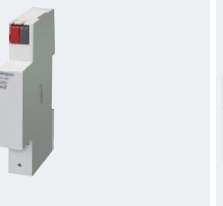
✓ Available/possible -- not available/not possible

Measuring Devices and Power Monitoring

Power Monitoring

Hardware and software components

Accessories for 7KT PAC measuring devices

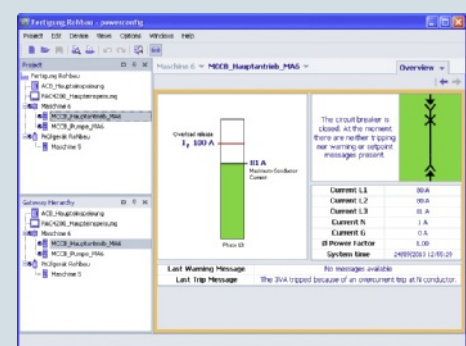
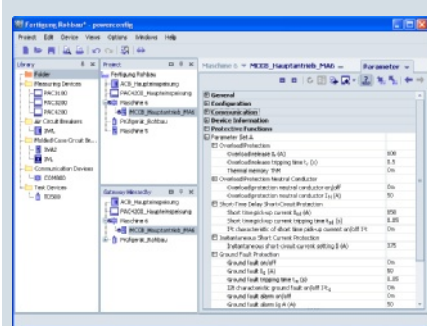
					
	7KT PAC expansion modules				7KT LAN couplers
	M-Bus	Modbus RTU	RS 485	KNX	Web servers
Specification	Up to 9,600 bit/s	Up to 115,200 bit/s	For connection to the 7KT LAN coupler	Up to 19,200 bit/s	For up to 30 7KT PAC1500 measuring devices

Accessories for 7KM PAC measuring devices

					
	7KM PAC expansion modules				Standard mounting rail adapters
	Switched Ethernet for 7KM PAC3200, 7KM PAC4200 and 3VA COM100/COM800	PROFIBUS DP for 7KM PAC3200, 7KM PAC4200 and 3VA COM100/COM800	RS 485 for 7KM PAC3200, 7KM PAC4200 and 3VA COM100/COM800	4DI/2DO for 7KM PAC4200 (number of digital inputs/outputs per module 4/2)	7KM PAC TMP2 for 7KM PAC3100 / 3200/4200 for mounting on a standard mounting rail
Protocol	PROFINET IO PROfinergy Modbus TCP	DPV1	Modbus RTU	S0 interface	--
Maximum number of connectable expansion modules of the same type	1	1	1	2	--

The powerconfig software for commissioning

	Software tool for the efficient commissioning and diagnosis of communication-capable SENTRON components
License	Free use
Supported devices	7KM PAC3100/3200/4200 measuring devices, incl. expansion modules 3WL/3VL/3VA/ATC5300 circuit breakers
General range of functions	The PC-based tool facilitates parameterization of the devices, resulting in substantial time savings, particularly when several devices have to be set up. The device settings can be stored in the PC and printed out. The tool enables monitoring of instantaneous measured quantities, which can be printed out if required. Execution of specific device functions, such as resetting of devices and setting of energy counters.
Supported languages	German, English, Chinese, Spanish, Portuguese
Service functions	Firmware updates and switching of language packs for 7KM PAC measuring devices
Functional scope with 7KM PAC4200 and 3VA	Readout of data stored in the device (events; load profile history; daily energy counters), which are saved in csv format



Setting parameter values

Display of current measured variables

Display of the circuit breaker state

For more information about powerconfig, see [chapter "Software"](#).

Overview



Hardware components of the PC-based power monitoring system

Power monitoring system with SENTRON components

The TÜV-certified power monitoring system from the SENTRON portfolio consists of the 7KT/7KM PAC measuring devices, the 3WL/3VA/3VL circuit breakers, and the powermanager power monitoring software. This forms the technical basis for supporting a corporate energy management system as specified by ISO 50001.

The hardware and software components are optimally coordinated with each other. For example, special drivers for the SENTRON devices are integrated in the powermanager power monitoring software. They enable energy data to be captured without any great configuration effort and they indicate the key measured values or the status by means of predefined views.

This reduces the engineering overhead. The device functions are optimally supported in the software.



Software component of the power monitoring software: powermanager

Features of the powermanager power monitoring software

The powermanager power monitoring software constitutes the optimum technical basis for supporting a corporate power monitoring system as specified by ISO 50001:

- Independent power monitoring software
- Can be operated using a Windows PC and measuring devices with Ethernet connection
- Easy getting started with basic license, can be extended with flexible licensing concept according to customer requirements
- Fully scalable, relative to number of devices and software functions
- Ensures optimum integration of 7KT/7KM PAC measuring devices, as well as 3WL/3VA/3VL circuit breakers and other Modbus devices
- Support of the various device and communication interfaces (Modbus RTU, Modbus TCP)
- Status display of devices
- Available languages: German, English, Spanish, Portuguese, Italian, French, Turkish, Chinese

Measuring Devices and Power Monitoring

Power Monitoring

PC-based power monitoring system

Application

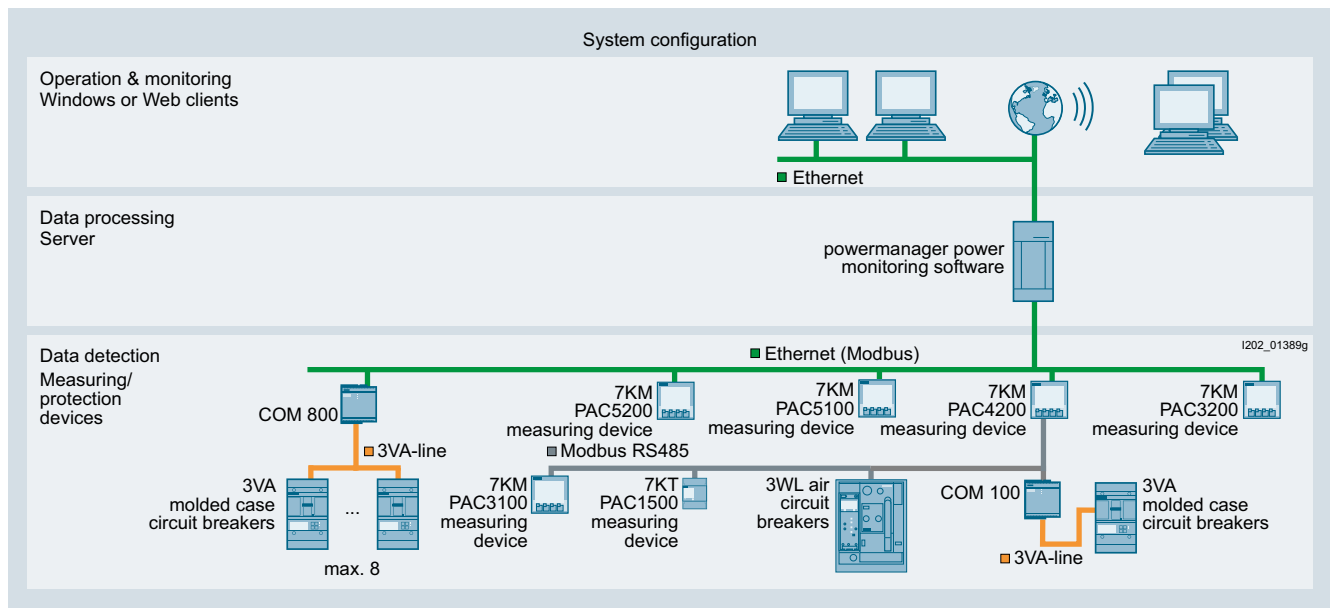
Industries

An energy-efficient production system enhances both the image and the productivity of the company, and thus its competitiveness.

Power monitoring as the technical basis for energy management for increasing a company's energy efficiency is thus of interest to all areas, from industrial applications to infrastructure, and buildings in the service sector.

System configuration

- Integration of measuring devices by means of predefined device templates for the 7KT/7KM PAC measuring devices and the 3WL/3VA/3VL circuit breakers
- Easy integration of existing Modbus-capable measuring devices
- Communication through Standard Ethernet
- Integration of devices with RS485 interface (ModbusRTU) through Modbus gateway, e.g. the 7KM PAC4200 measuring device can be used as the gateway



Typical topology of a power monitoring system

More information

TÜV certification



The TÜV certificate is available from

www.siemens.com/tuev-certificate-of-conformity

Hardware of the PC-based power monitoring system

The hardware components of the PC-based power monitoring system are

- 7KM PAC measuring devices
- 3WL air circuit breakers
- 3VL molded case circuit breakers
- 3VA molded case circuit breakers
- Software of the PC-based power monitoring system

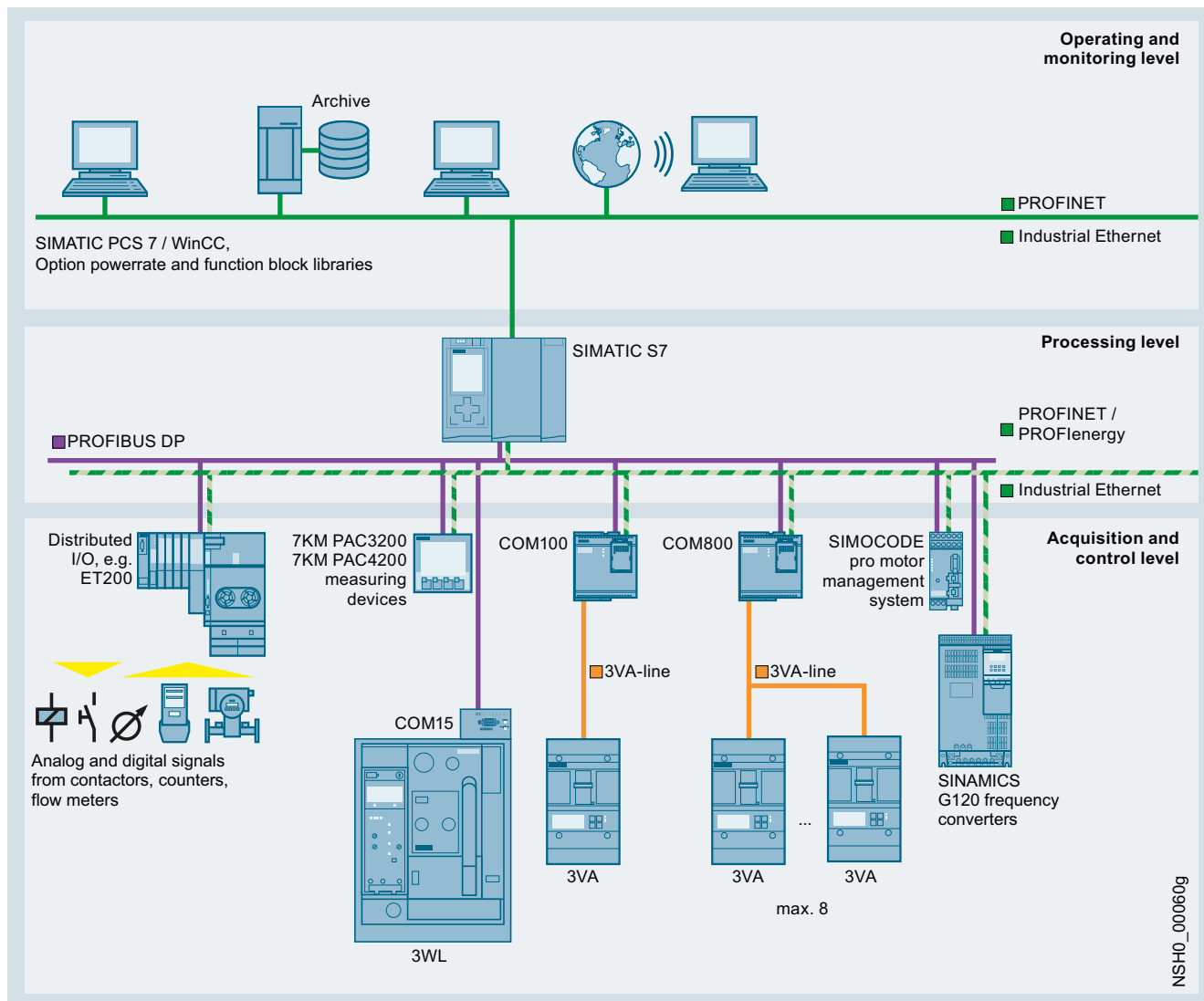
The software of the PC-based power monitoring system is powermanager.

Powermanager system packages with software and hardware are an easy and low-cost way to get started in a power monitoring system.

Internet

You can find more information on the Internet at:
www.siemens.com/powermonitoring

Overview



SIMATIC-based solutions for the process and manufacturing industries

A key feature of the process and manufacturing industry is frequently high energy consumption. It therefore makes sense to integrate a power data management system in existing systems.

Communication via PROFIBUS DP

PROFIBUS DP enables integration of a wide range of devices:

- For the protection of distribution boards and loads: Protective devices, such as circuit breakers
- For open-loop and closed-loop control: Frequency converters, motor management systems and soft starters
- For detection
 - Electrical measured quantities: Via the 7KM PAC3200/4200 measuring devices
 - Non-electrical measured quantities: Via analog/digital converters

PROFINET and PROflenergy

An increasing number of devices in automation technology offer PROFINET. The 7KM PAC Switched Ethernet PROFINET expansion module enables the 7KM PAC3200/PAC4200 measuring devices and 3VA circuit breakers to be connected to the automation systems.

PROflenergy is a "Common Application Profile" from PROFIBUS International. Thanks to PROflenergy it is possible to create a power data management system with standardized device interfaces.

Function block libraries for SIMATIC PCS 7 and WinCC

The function block library for SIMATIC PCS 7 and WinCC ensures device integration as follows:

- Measured quantities and states can be connected via CFC
- Structured display of measured quantities and protection parameters for the 3WL/3VA/3VL circuit breakers
- Limit value violations are displayed, archived and acknowledged in the relevant communications system in the usual way
- Circuit breakers can be program-controlled or manually operated with the appropriate user authorization

Measuring Devices and Power Monitoring

Power Monitoring

SIMATIC-based power data management system

Benefits

- Increased energy efficiency due to precise knowledge of the load profile
- Optimization of power supply agreements
- Allocation of power costs to cost centers
- Optimization of plant maintenance
- Identification of critical plant conditions
- Reliable monitoring of the power limit through automatic load management

Application

The SIMATIC-based power data management system is used in all industries in which PCS 7 and WinCC are used, and the transparency and monitoring of power flows is crucial.

More information

Hardware components

The hardware components of the SIMATIC-based power data management system are

- 7KM PAC measuring devices
- 3WL air circuit breakers
- 3VL molded case circuit breakers
- 3VA molded case circuit breakers

Software components

The software components of the SIMATIC-based power data management system are

- Library 7KM PAC3200 for SIMATIC PCS 7
- Library 7KM PAC3200 for SIMATIC WinCC

Information about all the software components

Internet

You can find more information on the Internet at:
www.siemens.com/powermonitoring

Measuring Devices and Power Monitoring

Measuring Devices

Introduction

Overview

Devices	Page	Application	Standards	Used in			
				Non-residential buildings	Residential buildings	Industry	
7KM PAC measuring devices							
	7KM PAC3100 measuring device AC/DC wide-range power supply unit, screw connection	15	Control panel instrument with graphics display, integrated digital inputs and outputs and an RS 485 interface for the transmission of measured values and configurations. Display of 30 electrical measured values and consumption values in switchgear assemblies, infeeds or outgoing feeders. International standards and multi-lingual displays for worldwide use.	Measuring accuracy for energy acc. to IEC 61557-12	✓	--	✓
	7KM PAC3200 measuring device 3 versions: - AC/DC wide-range power supply unit, screw connection - DC power supply unit with extra-low voltage, screw connection - AC/DC wide-range power supply unit, ring cable lug connection	15	Control panel instrument with graphics display, integrated digital inputs and outputs and an integrated Ethernet interface for the transfer of measured values and configurations. Display of over 50 electrical measured values for switchgear assemblies, infeeds or outgoing feeders. Dual-tariff measuring devices for precise energy measurement for power import and feedback. The following components are available: 7KM PAC Switched Ethernet PROFINET 7KM PAC RS 485 7KM PAC PROFIBUS DP	Measuring accuracy for energy acc. to IEC 62053-22/23 and IEC 61557-12	✓	--	✓
	7KM PAC4200 measuring device 3 versions: - AC/DC wide-range power supply unit, screw connection - DC power supply unit with extra-low voltage, screw connection - AC/DC wide-range power supply unit, ring cable lug connection	15	Control panel instrument with graphics display, user-defined displays, memory, clock and calendar function, digital inputs and outputs and an integrated Ethernet interface with gateway function to transfer measured values and configurations. Display of over 200 electrical measured values for switchgear assemblies, infeeds or outgoing feeders. Extensive functions for precise energy measurement for power import and feedback and assessment of the system quality. The following components are available: 7KM PAC Switched Ethernet PROFINET 7KM PAC RS 485 7KM PAC PROFIBUS DP 7KM PAC 4DI/2DO	Measuring accuracy for energy acc. to IEC 62053-22/23 and IEC 61557-12	✓	--	✓
	7KM PAC5100 measuring device 2 versions: - Control panel instrument with graphics display - Standard rail instrument without display	SIOS ¹⁾	Control panel instrument with graphics display and user-defined displays, or instrument for standard rail mounting in accordance with EN 60750, web server for parameterization, visualization and data management, 2 binary outputs, electrically isolated voltage inputs, synchronization via internal RTC clock or externally via NTP, 4 freely parameterizable LEDs for device status or limit violations, as well as integrated RJ45 Ethernet interface. Acquisition of over 250 electrical measurements for switchboard assemblies, infeeds or outgoing feeders, extensive functions for precise energy measurement for power import and feedback and assessment of the system quality.	Measuring accuracy for energy acc. to IEC 62053-22/23 and IEC 61557-12	✓	--	✓
	7KM PAC5200 measuring device 2 versions: - Control panel instrument with graphics display - Standard rail instrument without display	SIOS ¹⁾	Control panel instrument with graphics display and user-defined displays or instrument for standard rail mounting in accordance with EN 60750, web server for parameterization, visualization and data management, 2 binary outputs, electrically isolated voltage inputs, flicker in accordance with IEC 61000-4-15, synchronization via internal RTC clock or externally via NTP, 4 freely parameterizable LEDs for device status or limit violations, 2 GB memory, integrated fault recorder, reporting in accordance with EN 50160, rms recorder, as well as integrated RJ45 Ethernet interface. Acquisition of over 250 electrical measurements for switchboard assemblies, infeeds or outgoing feeders. Extensive functions for precise energy measurement for power import and feedback and assessment of the system quality.	Measuring accuracy for energy acc. to IEC 62053-22/23 and IEC 61557-12	✓	--	✓

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Measuring Devices

Introduction

Devices	Page	Application	Standards	Used in		
				Non-residential buildings	Residential buildings	Industry
 7KM PAC expansion modules	32	- The expansion module 7KM PAC Switched Ethernet PROFINET is used to connect the 7KM PAC3200 and 7KM PAC4200 measuring devices and 3VA molded case circuit breakers to Switched Ethernet PROFINET (PROFInergy). - The 7KM PAC PROFIBUS DP expansion module is used to connect the 7KM PAC3200 and 7KM PAC4200 measuring devices and 3VA molded case circuit breakers to PROFIBUS DPV1. - The 7KM PAC RS 485 expansion module is used to connect simple devices with RS 485 interface, such as the 7KM PAC3200 and 3VA molded case circuit breaker, and supports the Modbus RTU protocol. - The 7KM PAC 4DI/2DO expansion module is used to expand the 7KM PAC4200 measuring device to up to 10 digital inputs and 6 digital outputs.	IEC 62053-31	✓	--	✓
 7KT PAC1500 three-phase measuring device 7KT154	38	Measurement of consumption data in three-phase systems of plant sections, offices or holiday apartments.	EN 50470-1, EN 50470-3 EN 62052-23, EN 62053-31	✓	✓	✓
 7KT PAC1500 single-phase measuring device 7KT153	41	For the measurement of consumption data in single-phase systems, e.g. in industrial plants, offices and apartments in apartment blocks.	EN 50740-1, EN 50470-3, EN 62053-31	✓	✓	✓
 Expansion modules 7KT PAC 7KT19	44	Communication interfaces with IrDA infrared interface for 7KT PAC1500 measuring devices. Modules are available for the following bus systems: • M-Bus • Modbus RTU • RS 485 (7KT1391 LAN coupler connection) • KNX/EIB	EN 13321-1, EN 13757 ISO/IEC 14543-3 EN 50090	✓	✓	✓
 7KT LAN couplers	48	Web server with 2 GB internal storage, for up to 30 7KT15.. measuring devices. Global view and Excel export of actual consumption data via LAN or Internet using a web browser such as Firefox	IEEE 802	✓	--	✓

Measuring Devices and Power Monitoring

Measuring Devices

Introduction

Devices	Page	Application	Standards	Used in			
				Non-residential buildings	Residential buildings	Industry	
Other measuring devices							
	Digital measuring devices 7KT111, 7KT112	51	Voltage and current measurement with large 3-digit LEDs for monitoring incoming/outgoing currents and device currents in order to prevent plant overload.	DIN 43751-1, DIN 43751-2	✓	--	✓
	Time and pulse counters for standard rail mounting 7KT58	51	For monitoring operating hours and starting operations for the planning of preventative maintenance tasks and preventing sudden shutdowns.	IEC 60255-6, EN 60255-6 (VDE 0435-301) UL 94	✓	✓	✓
	Time counters for front-panel mounting 7KT55, 7KT56	55	For monitoring operating hours and starting operations for planning preventative maintenance tasks and preventing sudden shutdowns.	IEC 60255-6, EN 60255-6 (VDE 0435-301)	✓	✓	✓
Accessories							
	4NC current transformers	56	Window-type current transformers/pin-wound transformers, particularly suitable for long measuring leads, low cable losses	EN 60044-1, VDE 0414-44-1	✓	--	✓
	7KT12 current transformers	58	Straight-through transformers for installation in distribution boards and non-contact measuring of primary currents. Ideal for combination with switch disconnectors, measuring devices and counters.	IEC 60044-1, EN 60044-1 (VDE 0414 T 44-1)	✓	--	✓
	7KT90 measuring selector switches	59	For switching over the phases for voltmeters and ammeters.		✓	--	✓

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Introduction

Overview

Measuring precisely with 7KM PAC3100/3200/4200



The 7KM PAC measuring devices:
PAC3200 (left), PAC3100 (center) and PAC4200 (right)

The 7KM PAC measuring devices are used to measure and display all relevant system parameters in low-voltage power distribution. They can be used for both single-phase and multi-phase measurements in 3 and 4-conductor power supply systems (TN, TT, IT).

They record energy values for main distribution boards, electrical branches or individual loads precisely and reliably, and also supply key measured values for assessment of the state of the plant and the quality of the power supply.

Features

7KM PAC measuring devices, general

The measuring devices of the 7KM PAC series offer the following key features:

- Simple mounting and commissioning
- High IP65 degree of protection (front side, when installed) permits usage in extremely dusty and wet environments
- Intuitive operation using 4 function buttons and multilingual plain text displays
- Easy adaptation to different systems using integrated and optional
 - Digital inputs and outputs
 - Communication interfaces
- Worldwide use
 - At least 8 languages
 - International approvals
 - Developed and tested to European and international standards

- Low mounting depth

7KM PAC3200 and 7KM PAC4200 measuring devices

Additional performance characteristics of the 7KM PAC3200 and 7KM PAC4200:

- Precise energy measurement
- Versatile system integration
 - Integrated Ethernet interface
 - Optional communication modules available
 - Multifunctional digital inputs and outputs
 - Limit monitoring
- Can be connected directly to power supply networks up to 690 V AC (UL-L), CATIII without voltage transformers
- Easy-to-use configuration software included in the scope of delivery

7KM PAC4200 measuring device

Additional performance characteristics of the 7KM PAC4200:

- Monitoring the plant status and the power supply quality
 - Basic information for evaluating the power supply quality
 - Logging of plant history in the form of operation, control and system-related events
- Recording of the power range through power averaging (load profile)
- Daily energy meters for apparent, active and reactive energy across 365 days for cut-off date assessment
- Detection of gas, water, compressed air or other energy sources via pulse counter to the digital inputs
- Can be expanded using modules to up to 10 digital inputs and 6 digital outputs
- Counters for apparent, active and reactive energy for the precise detection of the power consumption of a partial process or manufacturing process
- 10/100 Mbit/s Ethernet interface with gateway function for the easy connection of devices with serial RS 485 interface via expansion module 7KM PAC RS 485 to an Ethernet network
- Comprehensive user-friendly indicators, such as user-defined displays, bar and status indicators, phase diagram and list and histogram graphics
- Satisfies the accuracy requirements of class 0.2S high-precision meters used by power supply companies according to IEC 62053-22, which are normally reserved for exacting industrial applications

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Technical specifications and project planning aids

Application

Three-phase measuring devices are used to measure and display all relevant network parameters of an electrical installation and they monitor these parameters permanently.

Applications

Wherever power has to be distributed, be it in industrial or infrastructural buildings, the 7KM PAC measuring device supplies important information to the building services system or the power controlling system.

The many different communication options offered by the 7KM PAC make it an indispensable supplier of data for power management systems and for plant and building automation.

Industries

Power distribution systems for the power supply are needed in all areas of industry. The 7KM PAC measuring devices are used accordingly in all areas where power consumption and electrical parameters are to be measured.

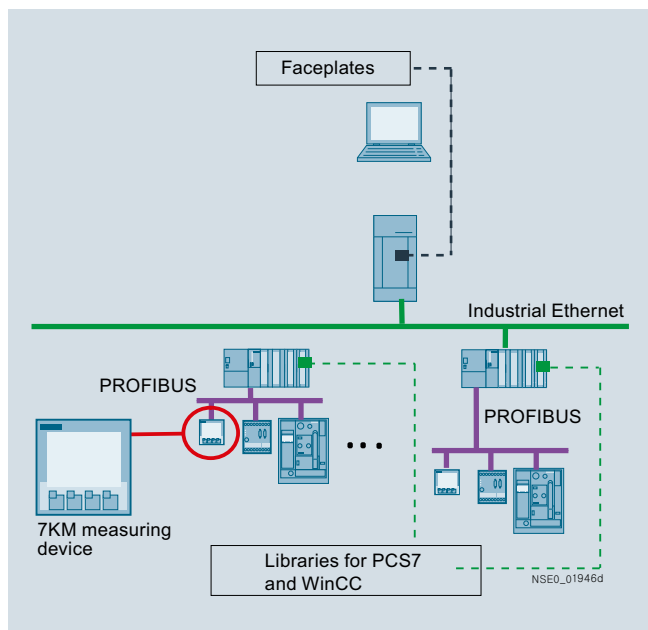
Integration of 7KM PAC3200 and 7KM PAC4200

When the 7KM PAC3200 and 7KM PAC4200 measuring devices are fully integrated into a power monitoring system, they monitor the power consumption and help to monitor the operating state of the plant. Measured values, limit value violations, operating hours of a connected load or power flows are supplied by the instruments quickly and reliably.

Using the optionally available interface modules, it is possible to integrate both instruments in every control system or every SIMATIC S7 environment.

System integration using function block libraries

Optionally available function block libraries make it easy to integrate the measuring devices in the SIMATIC PCS 7 process control system and the SIMATIC WinCC SCADA system. Together with the faceplates as user interface for the 7KM PAC3200, the driver blocks and diagnostics blocks in the control system enable the display and monitoring of technologically important values and functions of the measuring devices in the respective target system.



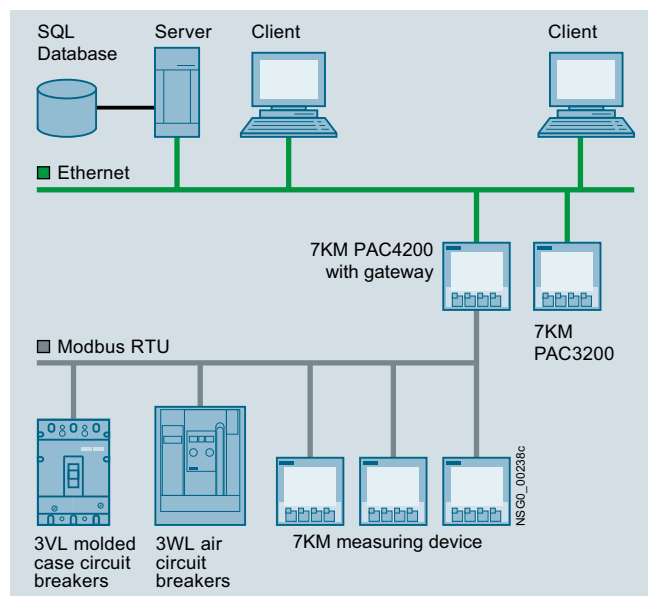
Integration of the 7KM PAC3200 in SIMATIC PCS 7/WinCC

System integration of RS 485 fieldbus devices through Ethernet

A special feature is the integrated gateway function of the 7KM PAC4200. It enables a cost-effective and simple connection of devices with a serial RS 485 interface to an Ethernet network.

Everything required is provided by the 7KM PAC RS 485 expansion module, to which a maximum of 31 lower-level devices can be connected without a repeater and as many as 247 with a repeater.

The gateway function of the 7KM PAC4200 supports the Modbus protocol and can be parameterized using powerconfig.



Connecting Modbus RTU devices to a power monitoring system through 7KM PAC4200

Measuring Devices and Power Monitoring

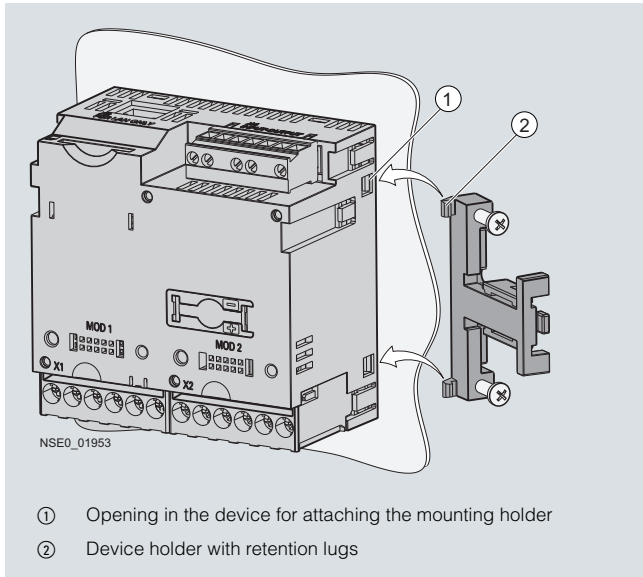
7KM PAC Measuring Devices

Technical specifications and project planning aids

Design

Installation

The 7KM PAC3100/3200/PAC4200 measuring devices come with a plastic enclosure for installation in control panels. It is fastened by one holder on the right side of the device and one on the left side.



Mounting of the 7KM PAC3100, 7KM PAC3200 and 7KM PAC4200

To mount the devices they are inserted from the front through the square cutout in the control cabinet door and secured with the supplied combination latching holders.

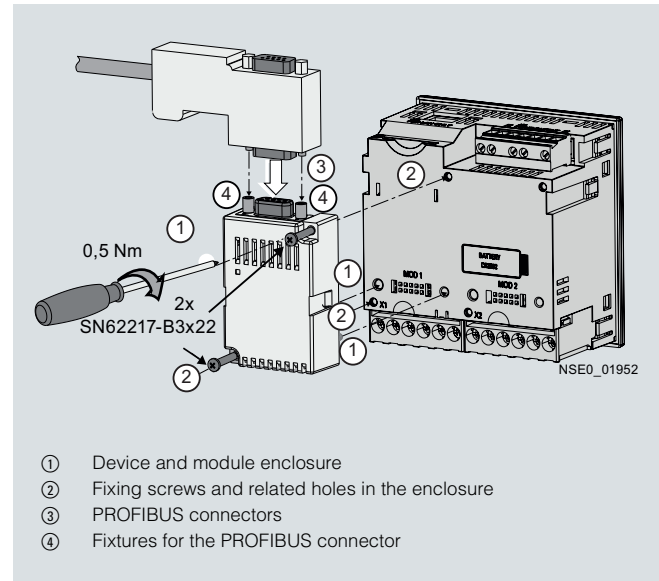
The pair of combination latching holders performs two functions:

- Thanks to the latching mechanism the fitter can fasten the device in the control panel quickly and without the use of any tools.
- If greater protection is required, the four latching holder screws can be used to increase contact pressure evenly on all sides so that the control panel cutout is completely sealed by the integrally molded gasket, which is a standard feature. It is no longer necessary to insert an accessory gasket in addition.

From the front, i.e. in the installed state, the device thus complies with safety class II with degree of protection IP65.

As the result of the easy-to-use combination latching holders and the small mounting depth it is easy to mount several devices side by side.

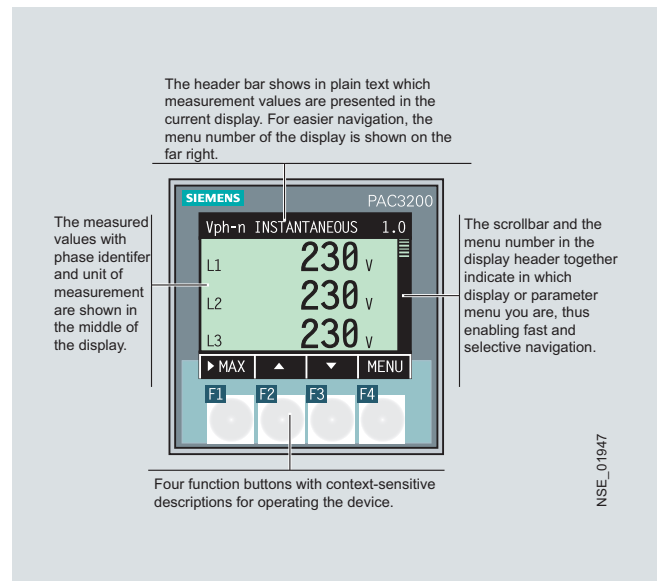
The following illustration of the rear view of the 7KM PAC3200 and top view of the expansion module (in this case: 7KM PROFIBUS DP) shows by way of example how the 7KM PAC3200 and the expansion module are joined together. An expansion module is mounted on a 7KM PAC4200 in similar manner.



Mounting the expansion module, for example the PAC PROFIBUS DP on the 7KM PAC3200 and 7KM PAC4200

Operator controls and displays

The following picture shows the device from the front, divided into the function blocks provided for operation and monitoring, including a description.



Device front of the 7KM PAC 3100, 7KM PAC3200 and 7KM PAC4200 measuring devices (here for example the 7KM PAC3200)

The devices are operated using 4 function keys, which correspond to the 4 text fields situated above them. The key is each assigned with several functions; their function at any time depends on the menu then displayed. Which function a key has in the respective menu is indicated by the text in the related display.

Function

Precise measurement of variables

7KM PAC3100 measuring device

The 7KM PAC3100 measuring device provides Class 1 measuring accuracy for voltages, currents, active power, apparent power, and active energy (in accordance with IEC 61557-12).

7KM PAC3200 measuring device

With its high accuracy, the 7KM PAC3200 meets the increasing demand for precise power measurement. It satisfies the accuracy requirements of Class 0.5S according to IEC 62053-22 for electronic active consumption meters.

7KM PAC4200 measuring device

The 7KM PAC4200 measuring device supplies measurement data of far greater accuracy for determining and processing power data and for assessing the quality of the network:

- For voltage, current, active power and active energy the device achieves for example Class 0.2 according to IEC 61557-12.
- For active energy this corresponds to Class 0.2S according to the international meter standard IEC 62053-22.

The 7KM PAC4200 thus meets the accuracy requirements of the high-precision meters used by the power supply companies, which are normally reserved for exacting industrial applications.

Transparency in power matters

Altogether 10 power meters for active, reactive and apparent energy monitor the power import and power feedback continuously and separately according to high tariff and low tariff.

In addition to the continuous counters for apparent, active and reactive energy, the 7KM PAC4200 saves the power consumption levels per day for a period of 365 days. A cut-off date assessment accurate to the day is possible by entering the required calculation period. The power consumption for a preselected period can be called up either directly on the device or by using the communication interface.



Daily counter indicator of the 7KM PAC4200

The 7KM PAC3200 and 7KM PAC4200 measuring devices supply the required power demands for active and reactive power for load profile recording and serve as reliable suppliers of data for a higher-level power management system.

Load profile recording with the 7KM PAC4200

As soon as the power draw conditions per demand period or also reactive energy components affect the power costs it is important to obtain an exact picture of your own plant's load profile.

With its generously sized memory, the 7KM PAC4200 is ideal for this purpose. With a set demand period of 15 minutes it records the load profile for apparent, active and reactive power with minimum and maximum values for import and feedback over a period of 40 days. The recording duration can be increased or decreased depending on the demand period selected.

The demand period can be synchronized to the period of the power supply company so that the measured data can be compared with the power supply company's records. This can be done using either one of the digital inputs or a synchronization command via the communication interface. If no synchronization option is available, the device synchronizes itself with its internal clock.

For load profile recording the 7KM PAC4200 supports the fixed block method (only one demand period) or the rolling block method (division of the demand period into several sub-periods). In addition it is possible to choose between arithmetic or cumulated power demand calculation.

Load profile recording can be individually adapted with the powerconfig configuration software.

Powerful communication

7KM PAC3100 measuring device

The 7KM PAC3100 measuring device has an integrated RS 485 port and can be operated with the Modbus RTU protocol.

Ethernet interface (7KM PAC3200/4200 measuring devices)

The 7KM PAC3200/4200 measuring devices have an Ethernet interface as a standard feature which can be used not only for configuration purposes using powerconfig but also for system communication in a higher-level power management system. This makes additional hardware superfluous.

The 10 Mbit/s Ethernet interface of the 7KM PAC3200 permits one communication connection while the 10/100 Mbit/s Ethernet interface of the 7KM PAC4200 permits three such connections simultaneously. Both devices support the Modbus TCP protocol.

The Ethernet interface of the 7KM PAC4200 offers not only a higher data transmission rate but also additional functions:

- Auto MDI(X) (auto crossover) and auto negotiation
- Serial gateway for connecting devices with an RS 485 interface to an Ethernet network

PROFIBUS DP interface (7KM PAC3200/4200 measuring devices)

Use of the power monitoring devices in PROFIBUS DP is made possible by the optionally available 7KM PAC PROFIBUS DP expansion module.

Integration in PROFIBUS DP takes place using a standardized text file, the device master data file (GSD). This GSD file is read into the master with the help of the PROFIBUS configuration tool. The master thus receives the slave-specific communication framework of the PAC3200 or PAC4200 and can start cyclic operation immediately. With DP V1 the PAC PROFIBUS DP expansion module also supports acyclic data traffic.

Modbus RTU interface

Use of the power monitoring devices in Modbus RTU fieldbuses is made possible by the optionally available PAC RS 485 expansion module.

Integration in Modbus RTU systems takes place through parameterization of the device address and baud rate using the device keyboard or via powerconfig.

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

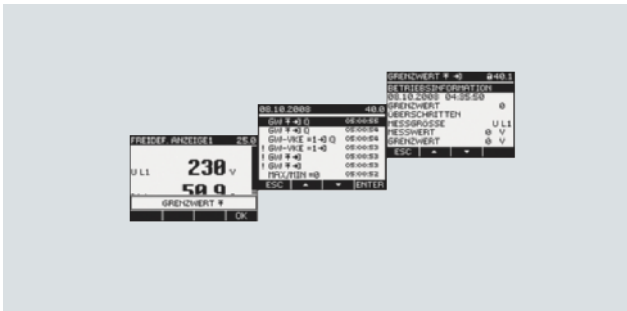
Technical specifications and project planning aids

The 7KM PAC4200 provides comprehensive information about events

Voltage failures, limit value violations, switching operations, device configuration changes, counter resets or deleting of the memory are just some of the possible events which the 7KM PAC4200 records and saves to the events list.

The integrated memory has space for more than 4000 operation, control and system-related events, which the user can organize according to his requirements.

For example, in addition to the three selectable alert levels for information, warning or alarm it is possible to choose the priority of each event independently of each other. And it is also possible of course to choose whether an event is to be recorded at all and in which order the events are to be shown on the display.



Three-level event displays on the 7KM PAC4200

Events are displayed in three levels:

- Popup window for signaling important events, e.g. in the case of alarm messages. Mandatory acknowledgment is selectable for particularly important events
- Events list for clear representation of the individual events with symbols indicating the alert level
- Detail window with particulars of the event, e.g. event class, date and time of occurrence, reason for triggering the event and, where applicable, the measurement variable in question with its measured value and limit value

Event recording can be configured with the powerconfig configuration software.

Plain-text displays

A large, fully graphic LCD display enables easy reading even from great distances. To make sure that this is also the case in poor light conditions, the backlighting can be individually adapted to the actual requirements.

In addition to the standard displays of the 7KM PAC3100/3200, the 7KM PAC4200 measuring device offers up to four user-definable displays. These displays can be used for individual arrangement of the desired measured variables and for their representation as bar or digital displays.

Operation, also multilingual

Operation is quick to learn thanks to the intuitive user guidance using the four function keys in conjunction with multilingual plain text displays. The experienced operator can also use direct navigation for quicker selection of the desired display menu.

Following languages can be selected: English, Chinese, French, German, Italian, Portuguese, Russian, Spanish and Turkish.

The product documentation is also available in 9 languages.

Multifunctional digital inputs and outputs

The 7KM PAC3200 measuring device is equipped with one digital input and output each, and the 7KM PAC3100 and 7KM PAC4200 measuring devices with two multifunctional digital inputs and outputs, to each of which various functions can be assigned.

Functions of the digital inputs:

7KM PAC measuring device	3100	3200	4200
Number of integrated digital inputs	2	1	2
Count input for energy pulses (kWh, kvarh) from third-party devices	--	✓	✓ + any energy form
Status monitoring of a switching device	✓	✓	✓
Tariff switching between high tariff and low tariff	--	✓	✓
Signal input for synchronization of the demand period	--	✓	✓
Time synchronization of the internal clock to a master clock	--	--	✓

Functions of the digital outputs:

7KM PAC measuring device	3100	3200	4200
Number of integrated digital outputs	2	1	2
Pulse output for sending energy pulses (kWh, kvarh)	✓	✓	✓
Alarm output for signaling limit value violations	--	✓	✓
Operating status display	--	✓	✓
Direction of rotation indicator	--	✓	✓
Switching output for remote control via system software	✓	✓	✓
Synchronization of third-party devices to own demand period	--	--	✓

✓ Available

-- Not available

Monitoring of measured variables for limit value violation (7KM PAC3200 and 7KM PAC4200 only)

The 7KM PAC3200 has a function for monitoring up to 6 measured variables, and the 7KM PAC4200 up to 12 measured variables, for violation of an adjustable upper or lower limit value.

The following variables can be monitored: Voltage, current, power, power factors, THD for voltage and current, frequency, unbalance of voltage and current.

In addition it is possible with the 7KM PAC4200 to monitor the phase angle, distortion current strength, individual line harmonics from the 3rd to the 31st harmonic, and sliding window demand values.

The following can be assigned to each limit value:

- A measured variable
- The monitoring mode (overshooting or undershooting)
- A limit value
- A delay time and
- A hysteresis

It is possible to select the action to be triggered by violation of a limit value.

For example, a signal can be sent through the digital output or the communication interface. The integrated universal counter can be used to total the number of limit value violations. Whether a limit value has been violated is indicated on the device.

Interconnected with logic operations ...

The 7KM PAC3200 and 7KM PAC4200 measuring devices have a function for interconnecting limit values using logic operations as follows:

- 7KM PAC3200: AND/OR
- 7KM PAC4200: AND/OR/NAND/NOR/XOR/XNOR

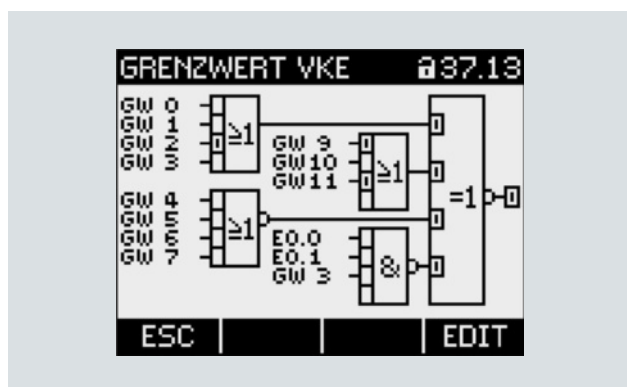
Like the individual limit values, the result of the logic operation can also trigger selective actions, which were previously described in the section "Monitoring of measured variables for limit value violations".

... and conveniently programmed with the 7KM PAC4200

In addition to the interconnection of limit values it is also possible with the 7KM PAC4200 to include the digital inputs in the logic operation.

On the 7KM PAC4200 the logic operations are configured in user-friendly manner using a graphic programming interface. To each of the 5 logic gates it is possible to assign 4 random inputs (limit value or digital input) and one logic function (AND, OR, NAND, ...).

From the small black bar at the inputs of the gates the user can see the state of the input at a glance.



Logic operations with limit value events on the 7KM PAC4200 measuring device

Monitoring of voltage and current for unbalance (7KM PAC4200 only)

The 7KM PAC4200 measuring device measures, among other things, the unbalance of voltage and current in the line. Now that a limit value can also be assigned to these two parameters, problems due to unsymmetrical loads in the installation can be detected early on and avoided.

Operating hours counter (7KM PAC3200 and PAC4200 measuring devices)

An important service function is performed by the integrated operating hours counter, which can be used to monitor e.g. pumps, motors or machines. The counter measures the runtime of a connected load, helping to ensure that important maintenance intervals are observed.

The count can be read out and evaluated by a PC. A higher-level power management system is thus able to generate relevant maintenance information.

Universal in use

The 7KM PAC3100, 7KM PAC3200 and 7KM PAC4200 can all be used for measuring in two, three and four-wire networks. Single-phase, two-phase and three-phase measurements are possible.

Thanks to their large measured voltage range, the devices can be directly connected in every low-voltage system up to a rated line voltage of 690 V (U_{L-L})¹⁾. Higher voltages can be measured using voltage transformers.

For measuring currents it is possible to use both x/1A and x/5A current transformers (for 7KM PAC3100 only x/5A x/5A current transformers). Transformer ratios and current direction can be programmed on the device for adaptation to local conditions.

Protection against unauthorized access

The 7KM PAC3100, 7KM PAC3200 and 7KM PAC4200 come with integrated password protection so that the energy and parameter data are safe from unauthorized access. Changes to the parameterization can be traced using a configuration counter which can be read out through the communication interface.

¹⁾ Max. 500 V (UL-L) for version with DC power supply unit with extra-low voltage (7KM2111-1BA00-3AA0)

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Technical specifications and project planning aids

Technical specifications

Device			7KM PAC3100	7KM PAC3200	7KM PAC4200
Measurement					
Systems					
Voltage types			Only for alternating voltage systems	Only for alternating voltage systems	Only for alternating voltage systems
Number of phases			Single-, two- or three-phase	Single-, two- or three-phase	Single-, two- or three-phase
Number of conductors			3 or 4 conductors	3 or 4 conductors	3 or 4 conductors
Load type			Same or any load	Same or any load	Same or any load
Quadrants			4 quadrants (import and export)		
Frequency of the relative fundamental			Hz	50/60	50/60
Signal detection			For E, U, I	Seamless	Seamless
Waveform				Sine or distorted	Sine or distorted
Measuring inputs for voltage					
Rated voltage 3 AC U_e (max.)					
Device with AC/DC wide-voltage power supply unit			7KM3133-0BA00-3AA0	7KM2112-0BA00-3AA0 -0BA00-2AA0	7KM4212-0BA00-3AA0 -0BA00-2AA0
	Phase/N	V AC	277 (max. 347 for UL) +20 %	400 (max. 347 for UL) +20 %	400 (max. 347 for UL) +20 %
	Phase/phase	V AC	480 (max. 600 for UL) +20 %	690 (max. 600 for UL) +20 %	690 (max. 600 for UL) +20 %
Device with DC power supply unit with extra-low voltage			--	7KM2111-1BA00-3AA0	7KM4211-1BA00-3AA0
	Phase/N	V AC	--	289 +20 %	289 +20 %
	Phase/phase	V AC	--	500 +20 %	500 +20 %
Minimum measurable voltage					
	Phase/N	V AC	11.6	40	11.5
	Phase/phase	V AC	20	69.3	20
Surge strength			1.2/50 μ s	kV	9.5
Input resistance			Phase/N	M Ω	0.84
Power consumption			Per phase	mW	131
Measuring category				CAT III	CAT III
Measuring of voltages > 690 or 500 V AC using a voltage transformer					
Measuring inputs for current					
Rated current 3 AC I_e per phase			Adjustable	A AC	5
Permanent load capacity			Permanent	A AC	10
Surge withstand capability			For 1 second	A AC	100
Power consumption			Per phase	mVA	500 at 6 A
Measuring category				CAT III	CAT III
Zero point suppression level			Adjustable		10 mA in the phases, 45 mA in the neutral conductor
Measuring of currents using current transformer				x/5 A	x/1 A or x/5 A
Supply voltage					
AC/DC wide-voltage power supply unit					
7KM3133-0BA00-3AA0				7KM2112-0BA00-3AA0 -0BA00-2AA0	7KM4212-0BA00-3AA0 -0BA00-2AA0
Primary operating range					
	V AC		100 ... 240 $\pm$ 10 %	95 ... 240 $\pm$ 10 %	95 ... 240 $\pm$ 10 %
	V DC		110 ... 250 $\pm$ 10 %	110 ... 340 $\pm$ 10 %	110 ... 340 $\pm$ 10 %
Rated frequency of the AC operating range			Hz	50/60	50/60
DC extra-low voltage power supply unit					
7KM2111-1BA00-3AA0					7KM4211-1BA00-3AA0
Primary operating range					
	V DC		--	22 ... 65 $\pm$ 10 %	22 ... 65 $\pm$ 10 %
Power consumption (max.)					
Without optional expansion module					
	AC VA		10	6	11
	DC W		5	3	5.5
Including optional expansion module					
	AC VA		--	8	32
	DC W		--	3.5	11
Overvoltage category				CAT III	CAT III

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Technical specifications and project planning aids

Device			7KM PAC3100	7KM PAC3200	7KM PAC4200
Error limits					
Accuracy class according to IEC 61557-12:2007			Yes	No	Yes
The accuracy class according to IEC 61557-12 is the value in % relative to the measured value under reference conditions.				--	
Voltage	Phase/N		1	±0.3 %	0.2
	Phase/phase		1	±0.3 %	0.2
Current			1	±0.2 %	0.2
Apparent power			1	±0.5 %	0.5
Active power			1	±0.5 %	0.2
Reactive power			3	±2 %	1.0
Frequency			0.1	±0.05 %	0.1
p.f.			--	--	0.2 % ¹⁾
Power factor			2	±0.5 %	2.0
Phase angle			--	--	±1° ¹⁾
Apparent energy			--	±0.5 %	0.5
Active energy			1	Class 0.5S according to IEC 62053-22	0.2
Reactive energy			3	Class 2 according to IEC 62053-23	2
When measuring on external current transformers or voltage transformers, the accuracy of the measurement depends on the quality of the transformer.					
Digital inputs					
Number			2	1	2
Rated value			V DC 24	24	24
Max. input voltage			V DC 30 (SELV or PELV supply)	30 (SELV or PELV supply)	30 (SELV or PELV supply)
Input threshold	Signal "1"	V DC	> 13	> 13	> 19
	Signal "0"	V DC	< 8	< 8	< 10
Input current	Signal "1"	mA DC	2.5 ... 10	7	4
Max. input delay	From "0" to "1"	ms	5	5	5
	From "1" to "0"	ms	5	5	5
Digital outputs					
Number			2	1	2
Function			Switching or pulse output	Switching or pulse output	Switching or pulse output
Required operational voltage			V DC 12 ... 24	12 ... 24	12 ... 24
Max. switched output voltage			V DC 30 (SELV or PELV supply)	30 (SELV or PELV supply)	30 (SELV or PELV supply)
Output current signal "1"					
Typical	Max.	mA DC	10 ... 27	10 ... 27	10 ... 27
Permanent		mA DC	50 (thermal overload protection)	100	100 (thermal overload protection)
Short-time overload for max. 100 ms		mA DC	130	300	
Resistive load		mA DC	100	100	
Switching frequency		Hz	17	17	
Max. output delay	From "0" to "1"	ms	5	5	5
	From "1" to "0"	ms	5	5	5
Pulse output function			Signal characteristics in accordance with IEC 62053-31	Signal characteristics in accordance with IEC 62053-31	Signal characteristics in accordance with IEC 62053-31
Adjustable pulse duration			ms 30 ... 500	30 ... 500	30... 500
Minimum adjustable time frame			ms 10	10	10
Short-circuit protection			Yes	Yes	Yes

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

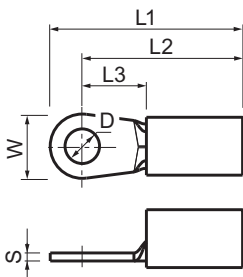
Technical specifications and project planning aids

Device		7KM PAC3100	7KM PAC3200	7KM PAC4200
Communication				
Ethernet		--		
Version		--	RJ45 (8P8C)	RJ45 (8P8C)
Usable cable types (ground necessary)		--	Twisted pair (CAT 5)	Twisted pair (CAT 5)
Protocol		--	Modbus TCP	Modbus TCP
Transmission rate max.	MBit/s	--	10	10/100
Supported functions		--	--	Auto negotiation and auto MDI(X)
TCP/IP ports		--	1	2
Max. number of simultaneous connections		--	1	3
Max. refresh time at the interface for instantaneous values	ms	--	200	200
Serial gateway				
Protocol (Ethernet)		--	--	Modbus TCP
Protocol (lower-level devices)		--	--	Modbus RTU
Use requirement		--	--	Expansion module 7KM PAC RS 485
Max. number of lower-level devices		--	--	Without repeater: 31 With repeater: 247
PROFIBUS DP				
Through the 7KM PAC PROFIBUS DP V1 expansion module		--	Yes	Yes
Transmission rate max.	MBit/s	--	12	12
Measured variables to be transferred		--	Definable using GSD file	Definable using GSD file
RS 485				
Through expansion module	7KM PAC RS 485	No, integrated	Yes	Yes
Transfer rates	kBd	Optionally 4.8/9.6/19.2/38.4	Optionally 4.8/9.6/19.2/38.4	Optionally 4.8/9.6/19.2/38.4
Protocol		Modbus RTU	Modbus RTU	Modbus RTU
Display and operator control				
Display type		LCD, monochrome	LCD, monochrome	LCD, monochrome
Displays/indicators		Alphanumeric and text	Alphanumeric and text	Full graphics
Resolution		Dots	128 x 96	128 x 96
Size		mm	72 x 54	72 x 54
Contrast		Adjustable	Adjustable	Adjustable
Representation		Display invertible, pos/neg mode	Display invertible, pos/neg mode	Display invertible, pos/neg mode
Backlighting				
Background color		White	White	White
Lighting intensity		Adjustable	Adjustable	Adjustable
Lighting intensity reduced		Adjustable	Adjustable	Adjustable
Time until reduction of lighting intensity	min	0 ... 99	0 ... 99	0 ... 99
Refresh time		s	0.33 ... 3, adjustable	
Keyboard		4 function keys F1 to F4 on the front		

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Technical specifications and project planning aids

Device			7KM PAC3100	7KM PAC3200	7KM PAC4200
Connection elements and terminals					
Measuring inputs and supply voltage			Screw connection		
			7KM3133-0BA00-3AA0	7KM2112-0BA00-3AA0 7KM2112-1BA00-3AA0	7KM4212-0BA00-3AA0 7KM4212-1BA00-3AA0
Conductor cross-sections	Solid	mm ²	1 x 0.5 ... 4	1 x 0.5 ... 4	1 x 0.5 ... 4
			AWG 1 x 20 ... 12	AWG 1 x 20 ... 12	AWG 1 x 20 ... 12
		mm ²	2 x 0.5 ... 2.5	2 x 0.5 ... 2.5	2 x 0.5 ... 2.5
	Finely stranded with end sleeve	mm ²	AWG 2 x 20 ... 14	AWG 2 x 20 ... 14	AWG 2 x 20 ... 14
			1 x 0.5 ... 2.5	1 x 0.5 ... 2.5	1 x 0.5 ... 2.5
		mm ²	AWG 1 x 20 ... 14	AWG 1 x 20 ... 12	AWG 1 x 20 ... 12
		2 x 0.5 ... 1.5	2 x 0.5 ... 1.5	2 x 0.5 ... 1.5	
		AWG 2 x 20 ... 16	AWG 2 x 20 ... 16	AWG 2 x 20 ... 16	
Tool size	± Screw, Pozidriv		2	2	2
Measuring inputs and supply voltage			Ring cable lug connection		
			--	7KM2112-0BA00-2AA0	7KM4212-0BA00-2AA0
Conductor cross-sections	Dependent on ring cable lug used	mm ²	--	1 x 1.0...6.0	1 x 1.0...6.0
			--	AWG 1 x 18...10	AWG 1 x 18...10
		mm	--	D: 3...4	D: 3...4
			S: 0.75 ... 1.0	S: 0.75 ... 1.0	
			W: ≤ 8	W: ≤ 8	
			L1: ≤ 24	L1: ≤ 24	
	L2: ≤ 20	L2: ≤ 20			
	L3: ≥ 8	L3: ≥ 8			
		--	D: 0.118 ... 0.157	D: 0.118 ... 0.157	
			S: 0.029 ... 0.039	S: 0.029 ... 0.039	
			W: ≤ 0.314	W: ≤ 0.314	
			L1: ≤ 0.944	L1: ≤ 0.944	
			L2: ≤ 0.787	L2: ≤ 0.787	
			L3: ≥ 0.314	L3: ≥ 0.314	
Tool size	± Screw, Pozidriv		--	2	2
Required tool			--	Crimping or fitting tool for ring terminal lugs	
Digital output, digital input			Screw connection (for all measuring device versions)		
Conductor cross-sections	Solid	mm ²	1 x 0.2 ... 2.5	1 x 0.2 ... 2.5	1 x 0.2 ... 2.5
			2 x 0.2 ... 1.0	2 x 0.2 ... 1.0	2 x 0.2 ... 1.0
		mm ²	AWG 1 x 24 ... 12	AWG 1 x 24 ... 12	AWG 1 x 24 ... 12
	Finely stranded with end sleeve	mm ²	1 x 0.25 ... 2.5	1 x 0.25 ... 2.5	1 x 0.25 ... 2.5
			2 x 0.25 ... 1.0	2 x 0.25 ... 1.0	2 x 0.25 ... 1.0
		mm ²	AWG 1 x 24 ... 12	AWG 1 x 24 ... 12	AWG 1 x 24 ... 12
Tool size	± Screw, Pozidriv		1	1	1
RS 485 connection			Screw connection (RS485 connection using 7KM PAC RS485 expansion module)		
Connection designations			Com, +/B, -/A	--	--
Conductor cross-sections	Solid	mm ²	1 x 0.2 ... 2.5	--	--
			2 x 0.2 ... 1.0	--	--
		mm ²	AWG 1 x 24 ... 12	--	--
	Finely stranded with end sleeve	mm ²	1 x 0.25 ... 2.5	--	--
			2 x 0.25 ... 1.0	--	--
		mm ²	AWG 1 x 24 ... 12	--	--
Tool size	± Screw, Pozidriv		1		

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

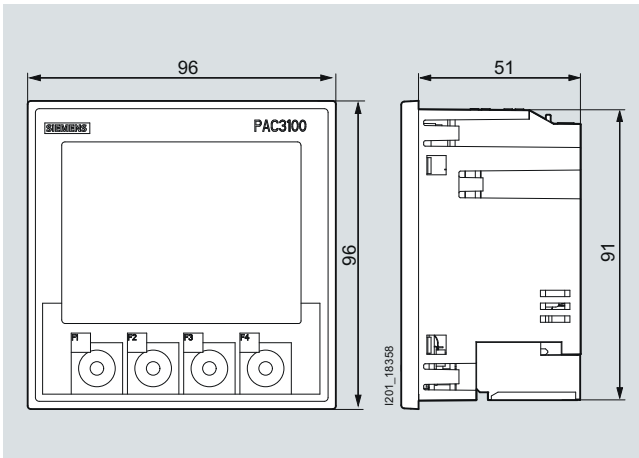
Technical specifications and project planning aids

Device			7KM PAC3100	7KM PAC3200	7KM PAC4200
Dimensions and weights					
Enclosure dimensions (W x H x D)					
Without expansion module	mm		96 x 96 x 56	96 x 96 x 56	96 x 96 x 82
With expansion module	mm		--	96 x 96 x 78	96 x 96 x 104
Mounting depth					
Without expansion module	mm		51	51	77
With expansion module	mm		--	73	99
Weight					
Without expansion module	Approx.	g	325	325	450
With expansion module	Approx.	g	--	370	540
Switchboard cutout			mm	92 ^{+0.8} x 92 ^{+0.8}	92 ^{+0.8} x 92 ^{+0.8}
Enclosure for panel mounting				Acc. to IEC 61554	Acc. to IEC 61554
Control panel thickness			mm	0.5 ... 4	0.5 ... 4
Mounting position				Vertical	Vertical
Degree of protection and safety class					
Safety class acc. to EN 61010-1					
From the front when installed			II	II	II
Degree of protection acc. to EN 60529					
All devices	Front		IP65	IP65	IP65
Device with screw terminals	Rear		IP20	IP20	IP20
Device with ring cable lug terminals	Rear		--	IP10	IP10
Ambient conditions					
Temperature range					
Operating temperature	°C		-10 ... + 55	-10 ... + 55	-10 ... + 55
Storage and transport temperature	°C		-25 ... + 70	-25 ... + 70	-25 ... + 70
Relative humidity					
At 25 °C without condensation	%		95	95	95
Altitude					
Above sea level up to max.	m		2000	2000	2000
Pollution degree			2	2	2
Battery for buffering measured variables					
Recommended battery types			Non-rechargeable types	--	BR2032 or CR2032
Approval			--	--	Acc. to UL1642
Nominal voltage/nominal discharge current			V/mA	--	3/0.2
Minimum permissible reverse current			mA	--	5
Suitable for ambient temperatures up to at least			°C	--	70
Access protection					
Password protection					
Password protection prevents the following:			4-digit numerical code	4-digit numerical code	4-digit numerical code
• Changing of device settings, including password			Effective through:	Effective through:	Effective through:
• Changing and deleting of values			• Direct input on the device	• Direct input on the device	• Direct input on the device
• Deleting of data and memory content					• Via the Ethernet interface
• Setting and resetting of counts					• Via the 7KM PAC RS 485 expansion module
Reading out of measured values and memory content			Possible without restriction	Possible without restriction	Possible without restriction
Standards and approvals					
CE			EU	Acc. to the CE Declaration of Conformity	Acc. to the CE Declaration of Conformity
cULus			USA/Canada	Acc. to UL File E314880	Acc. to UL File E314880
UL50				Type enclosure 5	Type enclosure 5
FCC				Class A, Part 15 Subpart B	Class A, Part 15 Subpart B
Environmental tests				IEC 60068	IEC 60068

¹⁾ The IEC 61557-12 standard does not specify any accuracy class for these variables. The specifications refer to the maximum deviation from the actual value.

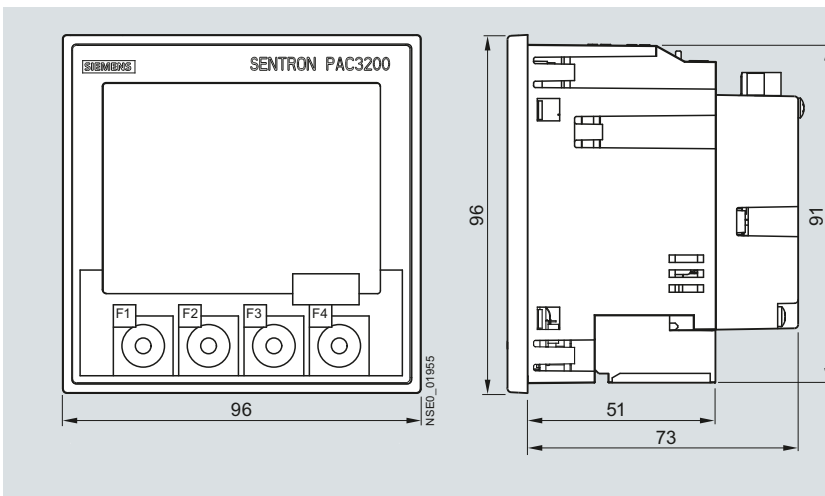
Dimensional drawings

Dimensions of the 7KM PAC3100



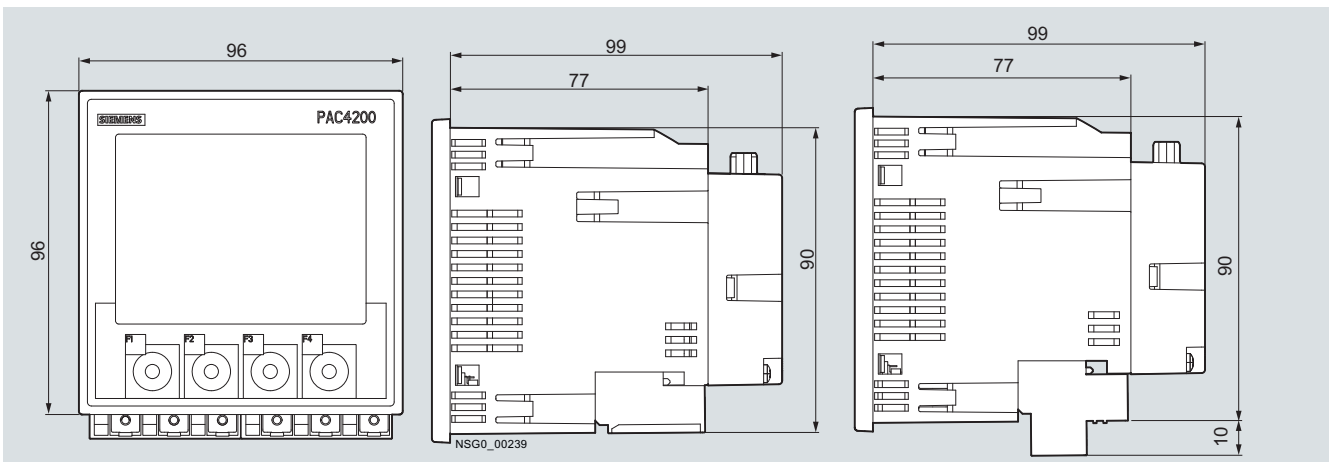
Left: Front view with screw terminals;
Right: Side view with screw terminals

Dimensions of the 7KM PAC3200



Left: Front view with screw terminals; Center: Side view with screw terminals; Right: Side view with ring cable lug terminals

Dimensions of the 7KM PAC4200



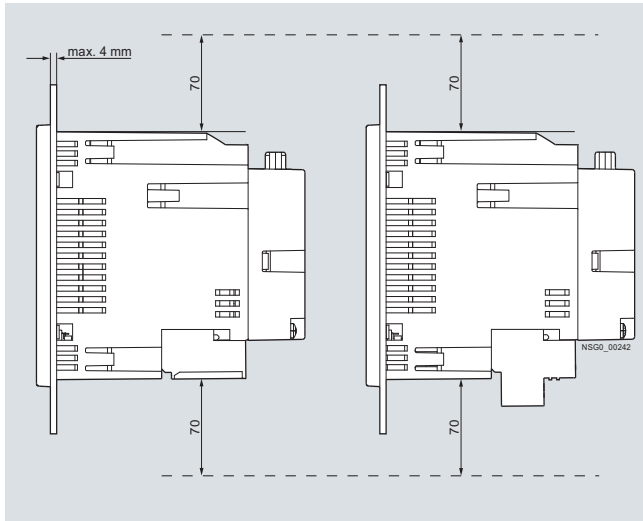
Left: Front view with ring cable lug terminals; Center: Side view with screw terminals; Right: Side view with ring cable lug terminals

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

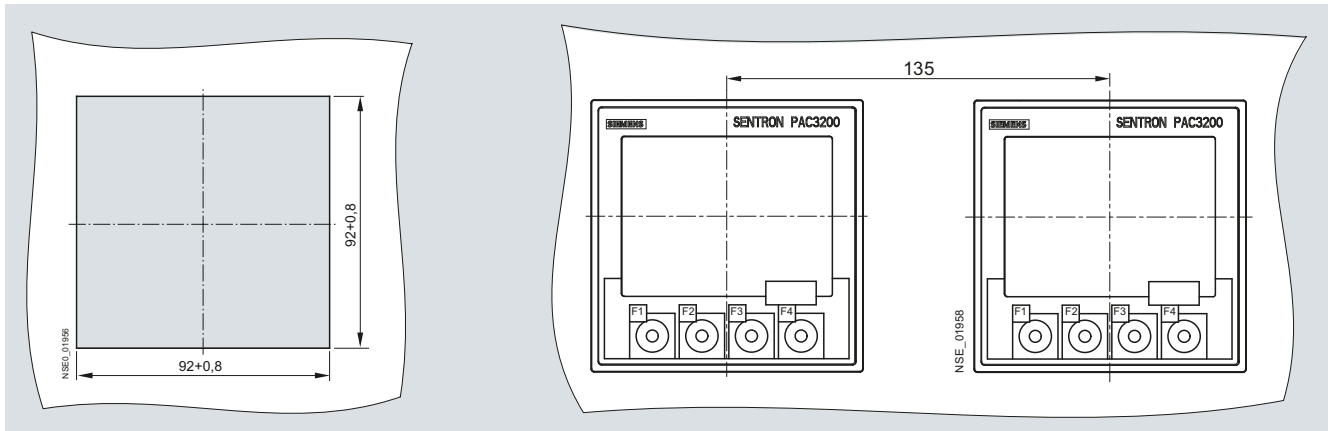
Technical specifications and project planning aids

Control panel cutout on the 7KM PAC4200, side



Left: 7KM PAC3200 with screw terminals
Right: 7KM PAC3200 with ring cable lug terminals

Control panel cutout and mounting clearances for 7KM PAC3100, PAC3200 and 7KM PAC4200



Left: Control panel cutout from the front (here for example the 7KM PAC3200)
Right: Mounting clearances of two devices

Circuit diagrams

Connection examples

Following connection examples apply for the measuring devices 7KM PAC3200, 7KM PAC4200 and partly for the 7KM PAC3100. More information can be found in the respective manuals.

Note

In the examples, some elements are shown with one asterisk (*) and/or two asterisks (**). Their meanings are as follows:

* Fuses must be provided by the user

** Connection of supply voltage

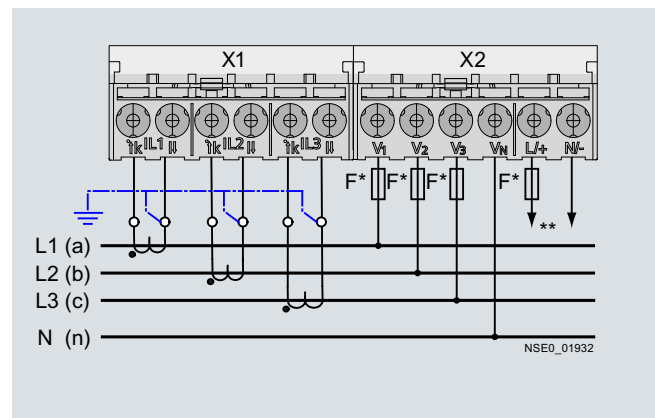
Fuses

Protection of the supply voltage input:

Fuse holders	Cylindrical fuse links
3NW7-5130HG	3NW1006-0HG (0.6A)

Connection example 1:

Three-phase measurement, four conductors, unbalanced load, without voltage transformer, with three current transformers



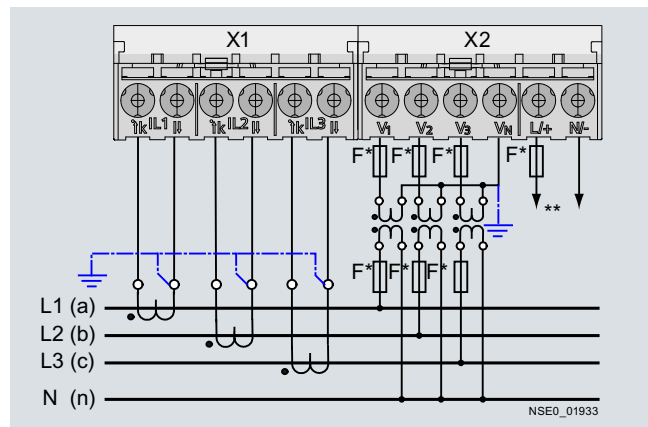
Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Technical specifications and project planning aids

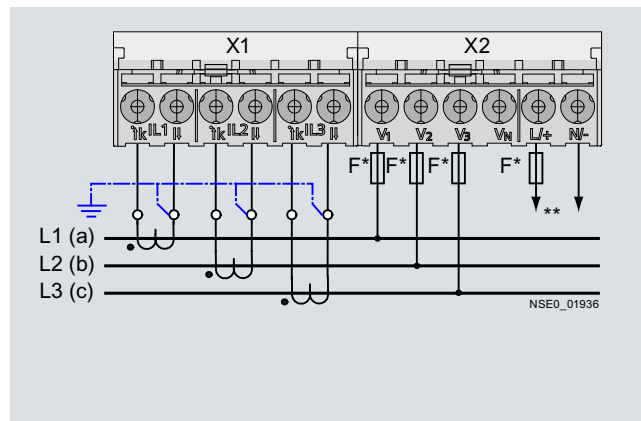
Connection example 2:

Three-phase measuring, four conductors, unbalanced load, with voltage transformer, with three current transformers



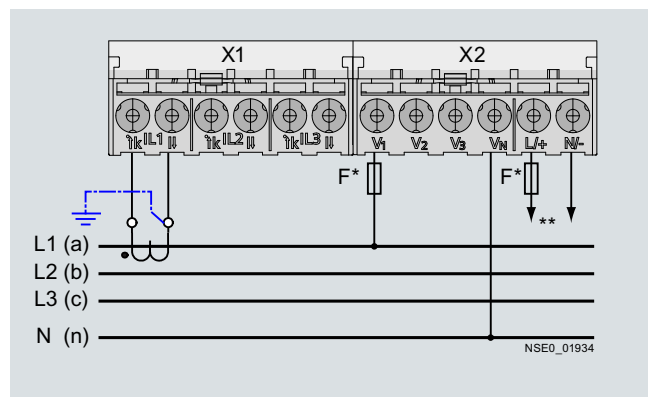
Connection example 5:

Three-phase measuring, three conductors, unbalanced load, without voltage transformers, with three current transformers



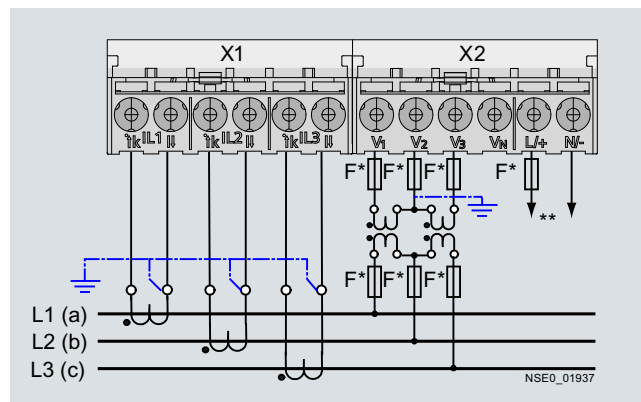
Connection example 3:

Three-phase measuring, four conductors, balanced load, without voltage transformers, with one current transformer



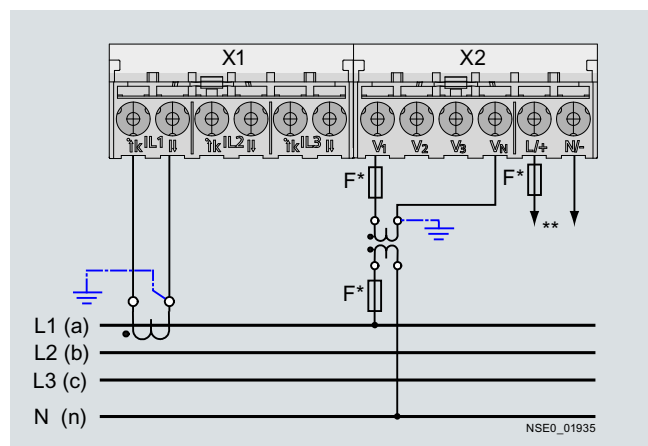
Connection example 6:

Three-phase measuring, three conductors, unbalanced load, with voltage transformers, with three current transformers



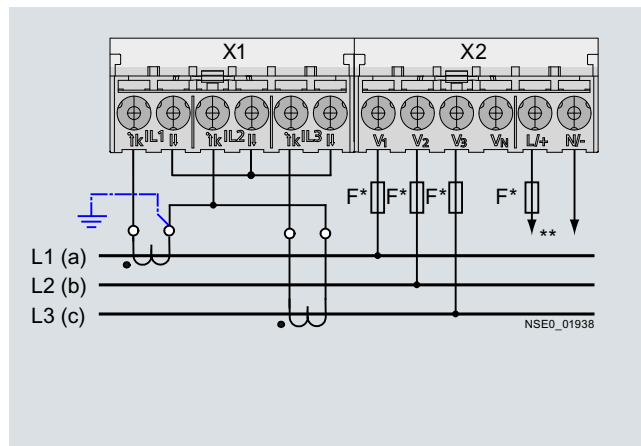
Connection example 4:

Three-phase measuring, four conductors, balanced load, with voltage transformers, with one current transformer



Connection example 7:

Three-phase measuring, three conductors, unbalanced load, without voltage transformers, with two current transformers



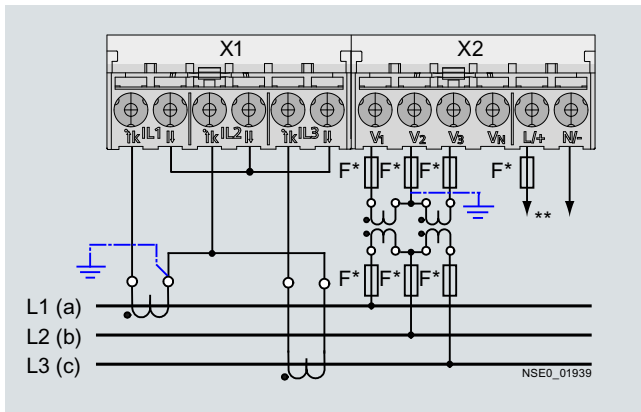
Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

Technical specifications and project planning aids

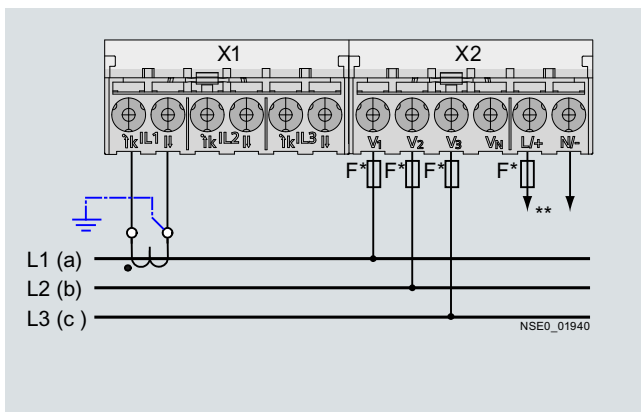
Connection example 8:

Three-phase measuring, three conductors, unbalanced load, with voltage transformers, with two current transformers



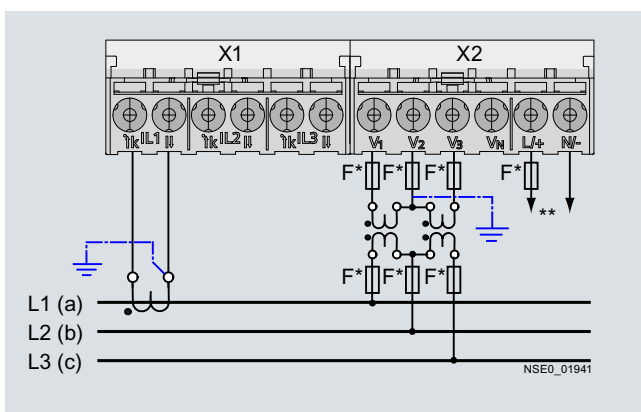
Connection example 9:

Three-phase measuring, three conductors, balanced load, without voltage transformers, with one current transformers



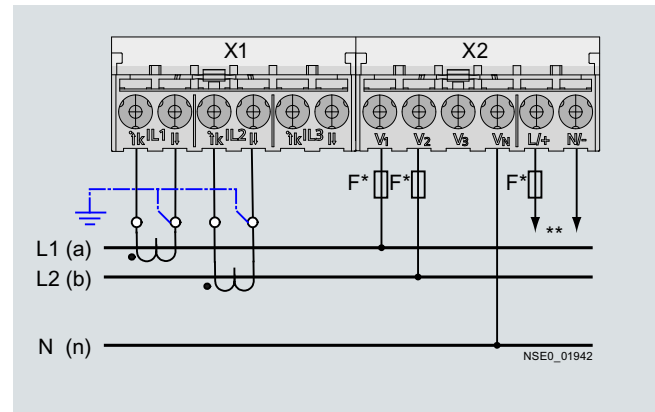
Connection example 10:

Three-phase measuring, three conductors, balanced load, with voltage transformers, with one current transformer



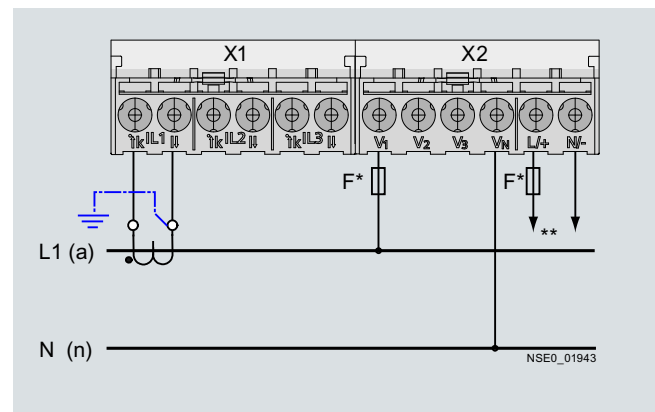
Connection example 11:

Two-phase measuring, three conductors, unbalanced load, without voltage transformers, with two current transformers



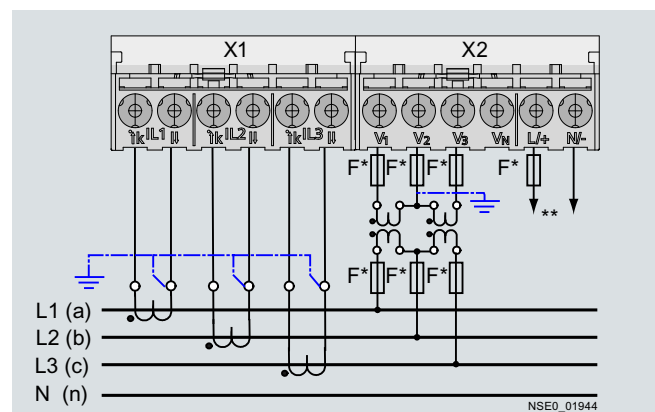
Connection example 12:

Single-phase measuring, two conductors, without voltage transformers, with one current transformer



Connection example 13:

Three-phase measuring, four conductors, unbalanced load, with voltage transformer, with three current transformers



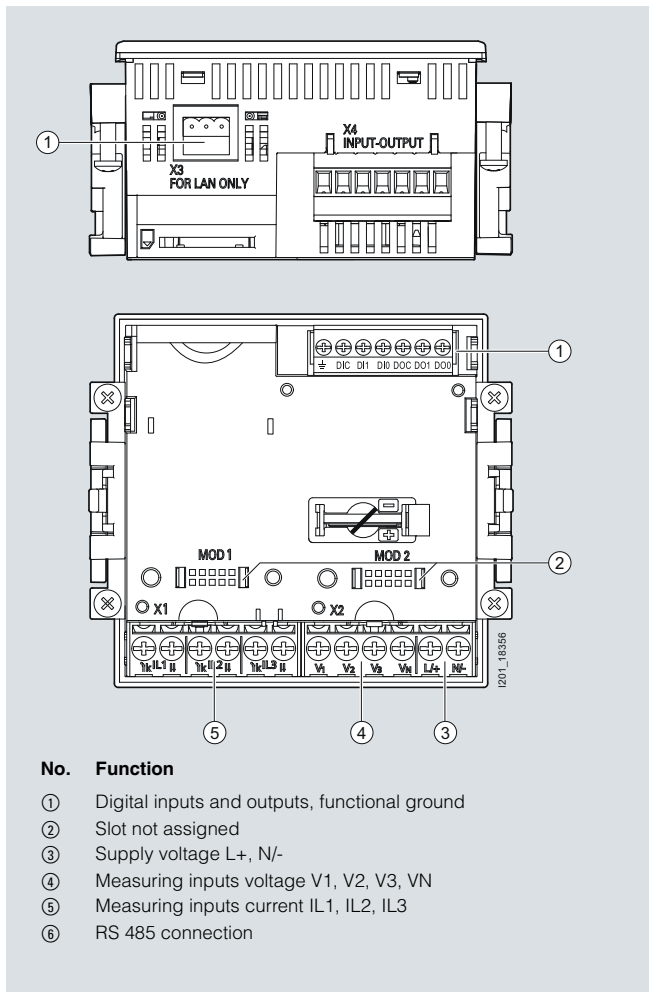
Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

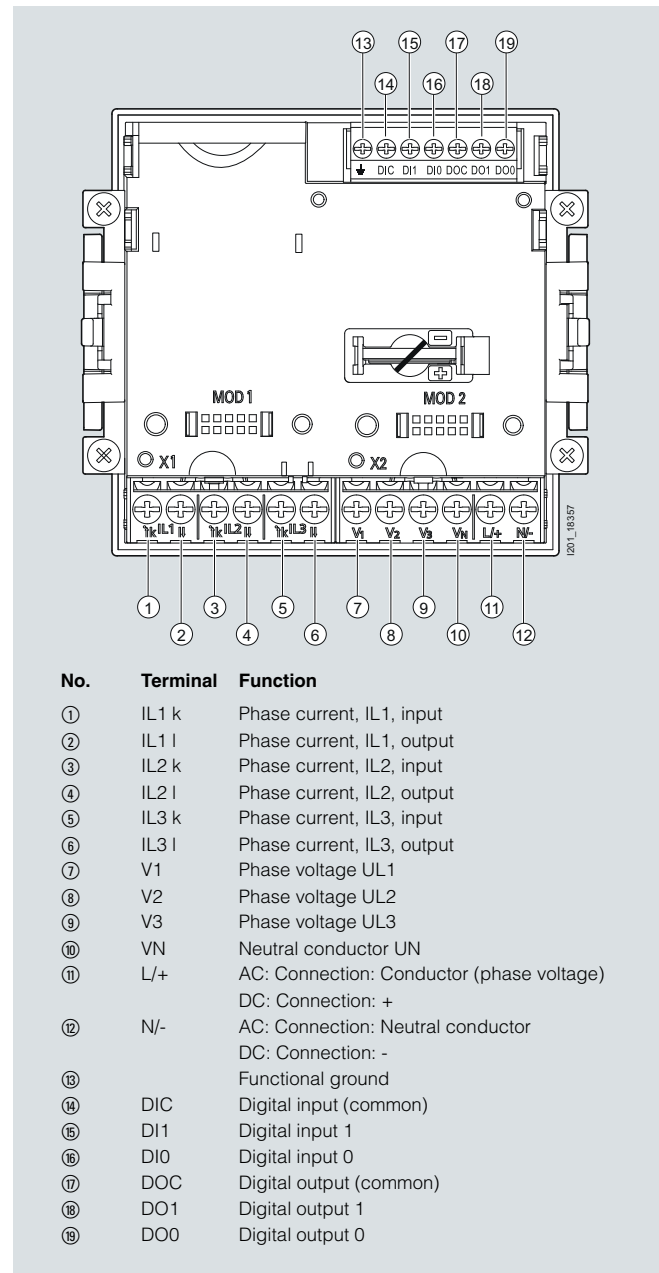
Technical specifications and project planning aids

Connection graphics

Connection graphics for 7KM PAC3100



Overview of 7KM PAC3100 terminal assignments
Top: Top side, Bottom: Rear
Device with screw terminals



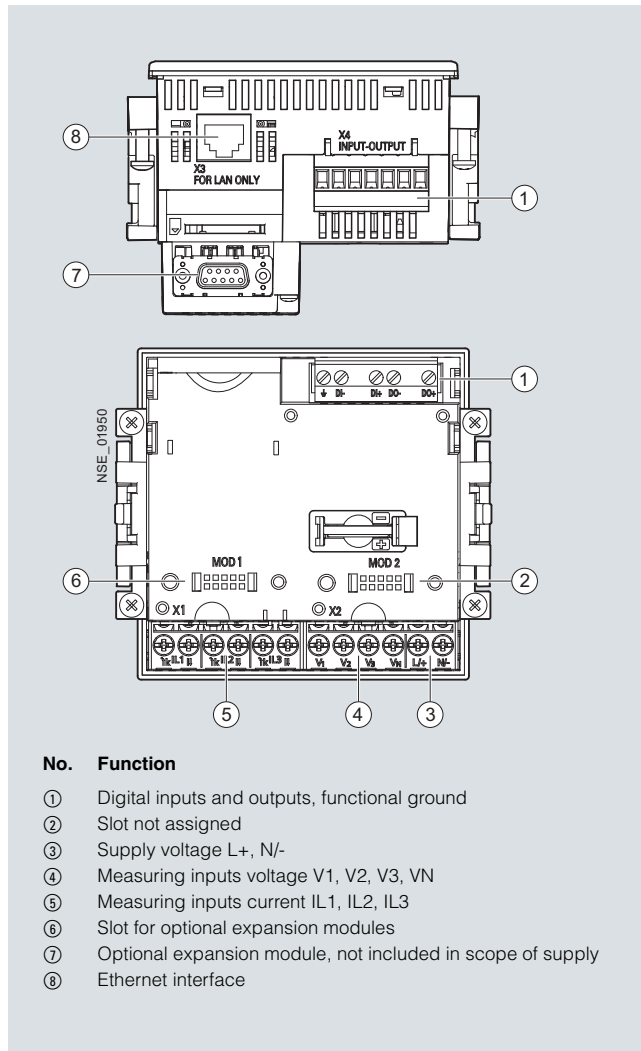
7KM PAC3100 terminal assignments in detail (rear)
Device with screw terminals

Measuring Devices and Power Monitoring

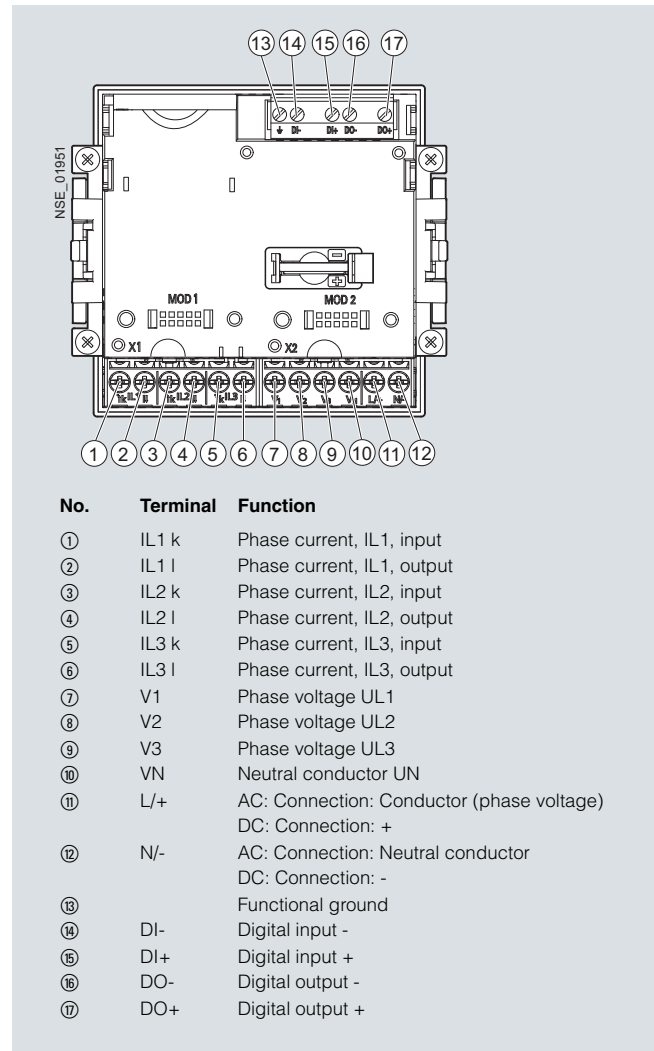
7KM PAC Measuring Devices

Technical specifications and project planning aids

Connection graphics for 7KM PAC3200



Overview of 7KM PAC3200 terminal assignments
Top: Top side, Bottom: Rear
Device with screw terminals



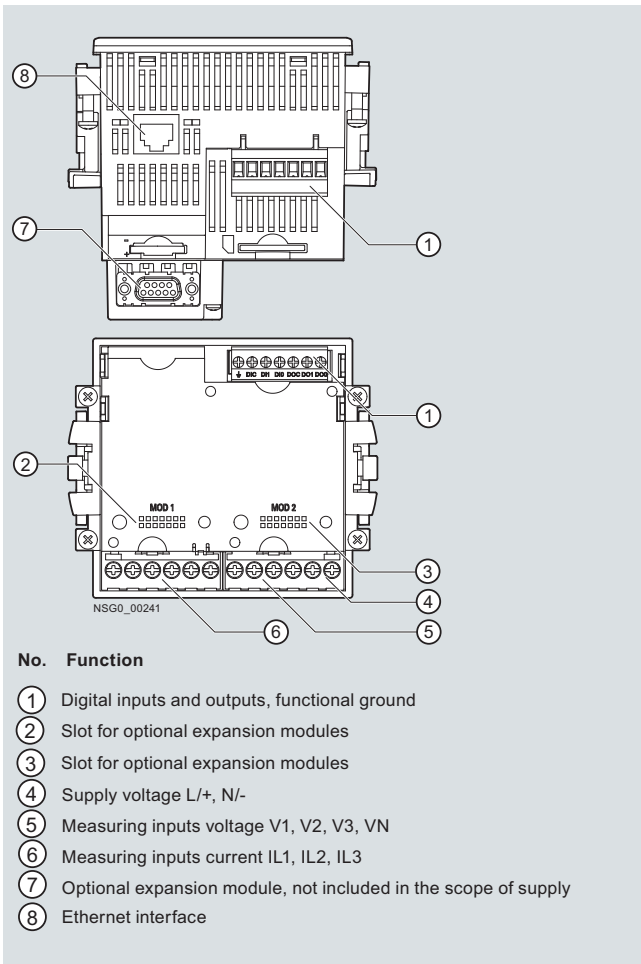
7KM PAC3200 terminal assignments in detail (rear)
Device with screw terminals

Measuring Devices and Power Monitoring

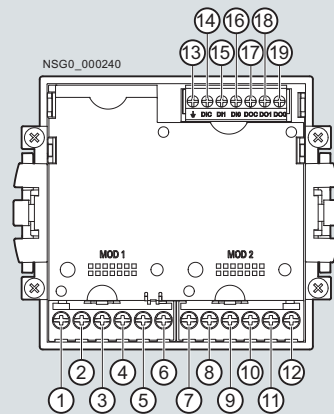
7KM PAC Measuring Devices

Technical specifications and project planning aids

Connection graphics for 7KM PAC4200



Overview of 7KM PAC4200 terminal assignments
Top: Top side, Bottom: Rear
Device with screw terminals



No. Terminals Function

- ① IL1 k Phase current, IL1, input
- ② IL1 l Phase current, IL1, output
- ③ IL2 k Phase current, IL2, input
- ④ IL2 l Phase current, IL2, output
- ⑤ IL3 k Phase current, IL3, input
- ⑥ IL3 l Phase current, IL3, output
- ⑦ V1 Phase voltage UL1
- ⑧ V2 Phase voltage UL2
- ⑨ V3 Phase voltage UL3
- ⑩ VN Neutral conductor UN
- ⑪ L/+ AC: Connection: Conductor (phase voltage)
DC: Connection: +
- ⑫ N/- AC: Connection: Neutral conductor
DC: Connection: -
- ⑬ Functional ground
- ⑭ DIC Digital inputs (common)
- ⑮ DI1 Digital input 1
- ⑯ DI0 Digital input 0
- ⑰ DOC Digital outputs (common)
- ⑱ DO1 Digital output 1
- ⑲ DO0 Digital output 0

7KM PAC4200 terminal assignments in detail (rear)
Device with screw terminals

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

7KM PAC expansion modules

Overview



Expansion modules are used as communication interfaces and for expanding the digital inputs/outputs for 7KM PAC measuring devices.

The expansion modules are plugged in at the back of the measuring device. The device identifies the module automatically and presents the relevant parameters for this module for selection in the parameterization menu.

The following expansion modules are available (shown from left to right in the figure on the left):

- 7KM PAC Switched Ethernet PROFINET expansion module
- 7KM PAC PROFIBUS DP expansion module
- 7KM PAC RS 485 expansion module
- 7KM PAC 4DI/2DO expansion module

Connection for 3VA molded case circuit breakers

The following expansion modules can be mounted on the front of the COM800/COM100 data concentrators of the 3VA molded case circuit breaker:

- 7KM PAC Switched Ethernet PROFINET and
- 7KM PAC PROFIBUS DP

For further details, see [Catalog LV 10, chapter "Molded case circuit breakers"](#) or the manual at <http://support.automation.siemens.com/DE/view/en/90318775>

More information

For more information about the software components see [Catalog LV 10, chapter "Software"](#), and on the Internet at www.siemens.com/lowvoltage/powermonitoring

Version

Use in

7KM PAC					3VA
PAC3100	PAC3200	PAC4200	PAC5100	PAC5200	COM800/ COM100

7KM PAC expansion modules



7KM PAC Switched Ethernet PROFINET expansion module

The 7KM PAC Switched Ethernet PROFINET expansion module is a plug-in communication module for 7KM PAC3200 and 7KM PAC4200 measuring devices and 3VA molded case circuit breakers.

It provides the following features:

- Standardized PROFINET interface to the measured quantities
- The measured quantities can be individually selected using a GSDML file. This permits use of cost-effective S7 CPUs
- Easy parameter assignment using the device display and STEP 7
- Integrated Ethernet switching allows networking with short cables without additional switches
- Direct integration in production machine networks using IRT (IRT = Isochronous-Real-Time)
- Full support of PROFINET IO (DHC, DNS, SNMP, SNTIP)
- Device replacement without PG in the PROFINET assembly using LLDP
- Deterministic reversing time through ring redundancy (MRP)
- Modbus TCP communication
- Communication with powermanager or powerconfig
- 2 x Ethernet (RJ45) sockets
- Transmission rates 10 and 100 Mbit/s
- Protocols PROFINET IO, PROFINET and Modbus TCP
- No external auxiliary power necessary
- Status display via the device display and via LEDs on the module

All measured variables from 7KM PAC3200 and 7KM PAC4200 can be individually selected and cyclically transmitted by means of the GSDML file. This enables optimum use of the process image of the PROFINET controller, e.g. CPU 315-2 PN/DP of SIMATIC S7.

The measured variables can be read out in acyclic mode using PROFINET, a PNO protocol profile. Thanks to PROFINET, it is possible to assemble a power monitoring system with devices from various manufacturers using PROFINET.

--	✓	✓	--	--	✓
----	---	---	----	----	---

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

7KM PAC expansion modules

Version		Use in					
		7KM PAC					3VA
		PAC3100	PAC3200	PAC4200	PAC5100	PAC5200	COM800/ COM100
	7KM PAC PROFIBUS DP expansion module The 7KM PAC PROFIBUS DP expansion module is a plug-in communication module for 7KM PAC3200 and 7KM PAC4200 measuring devices and 3VA molded case circuit breakers. The 7KM PAC PROFIBUS DP expansion module has the following features: • Plug-in communication module for measuring devices for connection to PROFIBUS DPV1 • 7KM PAC3200 and 7KM PAC4200 • Parameterizable via device front or using parameterization software • Data can be transferred both cyclically and acyclically via PROFIBUS DPV1 • Easy engineering thanks to integration in SIMATIC STEP 7 and/or simple integration via GSD file for other programming systems • Optimum use of process image of a control system for selection of individual measured quantities for cyclical transfer • Supports all baud rates from 9.6 kbit/s up to 12 Mbit/s • Connection through 9-pole Sub-D connector according to IEC 61158 • No external auxiliary power necessary • Status display via the device display and via LEDs on the module	--	✓	✓	--	--	✓
	7KM PAC RS 485 expansion module The 7KM PAC RS 485 expansion module has the following features: • 7KM PAC RS 485 plug-in communication module for 7KM PAC3200 and 7KM PAC4200 measuring devices and 3VA molded case circuit breakers • Parameterizable via device front or using parameterization software • Support for the Modbus RTU protocol • Plug and play • Supports transmission rates of 4.8/9.6/19.2 and 38.4 kbit/s • Connection by means of 6-pole screw terminals • No external auxiliary power necessary • Status indication by LED on the module • The 7KM PAC RS 485 expansion module is required for the gateway function of the 7KM PAC4200 for communication with simple devices with an RS 485 interface, such as the 7KM PAC3100, via Ethernet (Modbus TCP).	--	✓	✓	--	--	--
	7KM PAC 4DI/2DO expansion module The 7KM PAC 4DI/2DO expansion module is used to expand the 7KM PAC4200 measuring device to up to 10 digital inputs and 6 digital outputs and offers the following features: • Up to two 7KM PAC 4DI/2DO modules can be plugged onto a 7KM PAC4200 • The 7KM PAC 4DI/2DO expansion modules mean that the internal digital inputs and outputs can be expanded by up to 8 inputs and 4 outputs • The 7KM PAC 4DI/2DO expansion modules can be configured locally at the front of the device or via the powerconfig parameterization software • The digital inputs can be used without the need for an external power supply as they are self-powered. This is particularly useful for the integration of non-electric measuring devices, such as water or compressed-air counters • All functions of the integrated multifunctional inputs/outputs on the 7KM PAC4200 are also available in the 7KM PAC 4DI/2DO expansion module • Inputs and outputs can be used as an S0 interface conforming to IEC 62053-31 • The connection is made via a 9-pole screw terminal • No external auxiliary power supply is required	--	--	✓	--	--	--

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

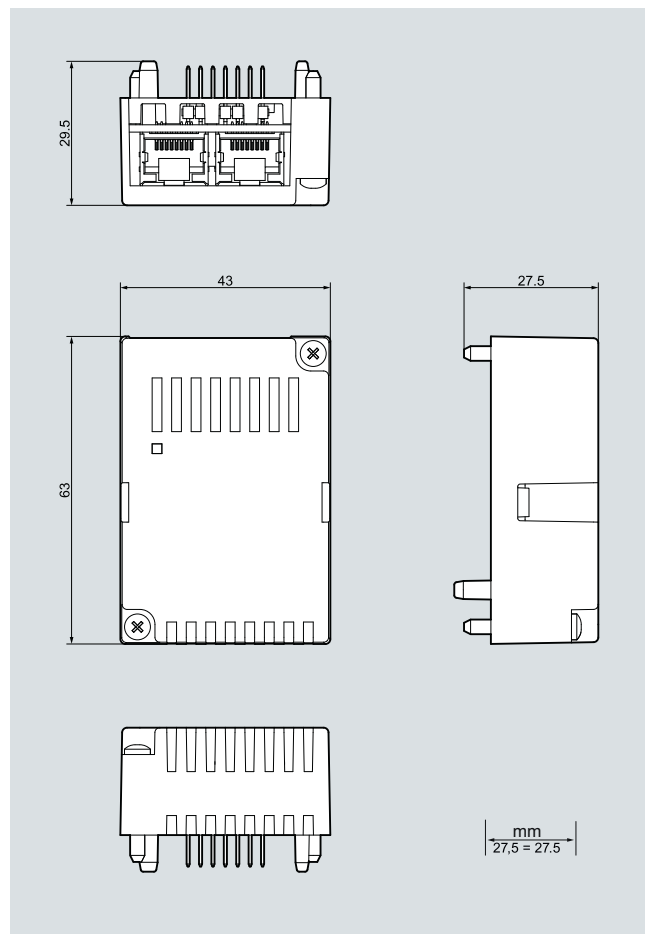
7KM PAC expansion modules – Switched Ethernet PROFINET expansion module

Technical specifications

Communication		
Industrial Ethernet		10/100 Mbit/s
Integrated IRT-enabled switch		Auto crossover
With 2 x 8-pole RJ45 sockets		Auto negotiation
Power supply		
		From 7KM PAC measuring device
Dimensions and weights		
Enclosure dimensions (W x H x D)		
Module enclosure for plug-in mounting	mm	43 x 63 x 22
Weight approx.	g	36
Degree of protection		
Degree of protection acc. to EN 60529		IP20
Ambient conditions		
Temperature range		
Operating temperature	°C	-10 ... + 55
Storage and transport temperature	°C	-25 ... + 70
Relative humidity		
At 25 °C without condensation	%	95
Altitude		
Above sea level up to max.	m	2000
Pollution degree		
		2

Dimensional drawings

Dimensions of Switched Ethernet PROFINET expansion module at the side and from above



Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

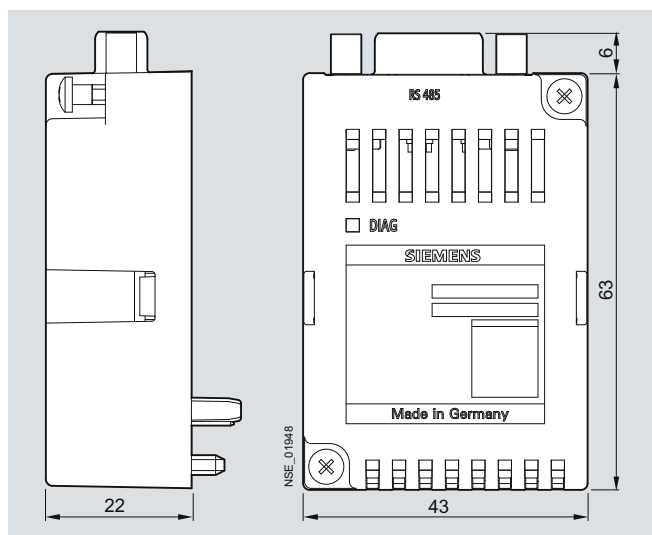
7KM PAC expansion modules – 7KM PAC PROFIBUS DP expansion module

Technical specifications

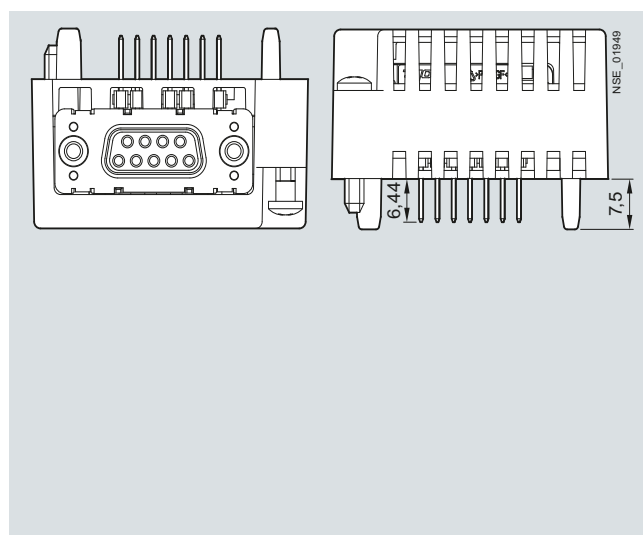
Communication		
PROFIBUS DP		
Transmission rate max.	Mbit/s	12
Protocol		PROFIBUS DPV1
Measured variables to be transferred		Definable using GSD file
Dimensions and weights		
Enclosure dimensions (W x H x D)		
Module enclosure for plug-in mounting	mm	43 x 63 x 22
Weight approx.	g	45
Degree of protection		
Degree of protection acc. to EN 60529		IP20
Ambient conditions		
Temperature range		
Operating temperature	°C	-10 ... + 55
Storage and transport temperature	°C	-25 ... + 70
Relative humidity		
At 25 °C without condensation	%	95
Altitude		
Above sea level up to max.	m	2000
Pollution degree		2

Dimensional drawings

Dimensions of 7KM PAC PROFIBUS DP expansion module at the side and from above



Dimensions of the plug connector between the 7KM PAC PROFIBUS DP expansion module and the 7KM PAC measuring device



More information

Software components

For more information about the software components, see Catalog LV 10, chapter "Software", and on the Internet at www.siemens.com/lowvoltage/powermonitoring

Measuring Devices and Power Monitoring

7KM PAC Measuring Devices

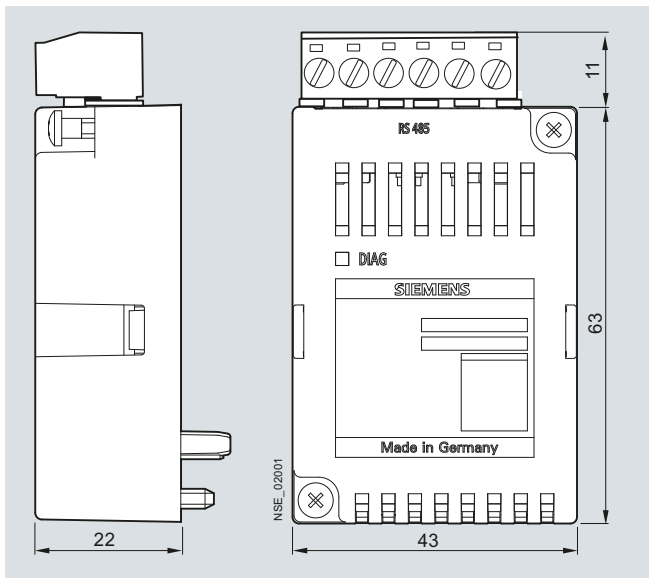
7KM PAC expansion modules – 7KM PAC RS 485 expansion module

Technical specifications

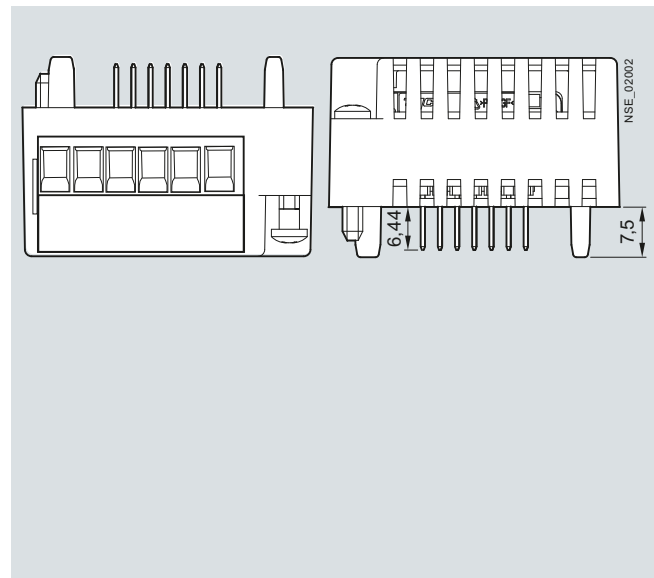
Communication		
RS 485		
Transfer rates	kBd	Optionally 4.8/9.6/19.2/38.4
Protocol		Modbus RTU
Dimensions and weights		
Enclosure dimensions (W x H x D)		
Module enclosure for plug-in mounting	mm	43 x 63 x 22
Weight approx.	g	41
Degree of protection		
Degree of protection acc. to EN 60529		IP20
Ambient conditions		
Temperature range		
Operating temperature	°C	-10 ... + 55
Storage and transport temperature	°C	-25 ... + 70
Relative humidity		
At 25 °C without condensation	%	95
Altitude		
Above sea level up to max.	m	2000
Pollution degree		2

Dimensional drawings

Dimensions of 7KM PAC RS 485 expansion module at the side and from above



Dimensions of the plug connector between the 7KM PAC RS 485 expansion module and the 7KM PAC measuring device



More information

Software components

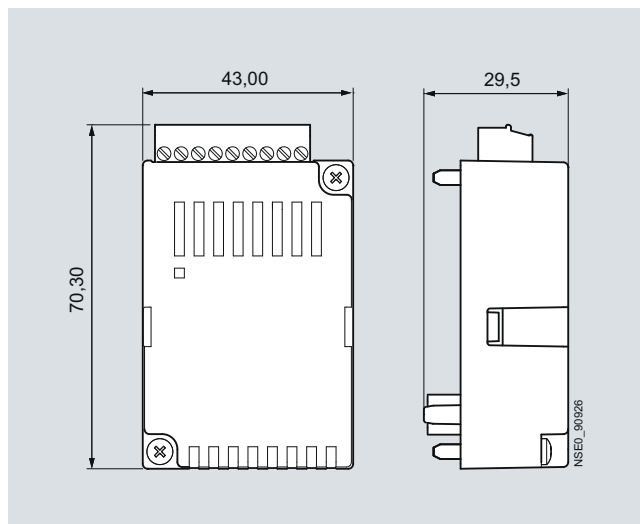
For more information about the software components, see Catalog LV 10, chapter "Software", and on the Internet at www.siemens.com/lowvoltage/powermonitoring

Technical specifications

Inputs/outputs		
Digital outputs		
Number		4
Type		Internal power supply
Design/function		Switching output or pulse output according to IEC 62053-31 Class B
External operating voltage		0 ... 30 V DC, (optional)
Input resistance		
• "1" signal detection		$\leq 1 \text{ k}\Omega$
• "0" signal detection		$\geq 100 \text{ k}\Omega$
Input resistance		
• "1" signal detection		$\geq 2.5 \text{ mA}$
• "0" signal detection		$\leq 0.5 \text{ mA}$
Digital outputs		
Number		2
Type		Bidirectional
Design/function		Switching output or pulse output according to IEC 62053-31 Class B
Rated voltage		0 ... 30 V DC, typical 24 V DC (SELV or PELV supply)
Output current for "1" signal		
• Continuous load		$\leq 50 \text{ mA}$ (internal resistance 55Ω)
• Transient overload		$\leq 130 \text{ mA}$ for 100 ms
Output current for "0" signal		
• Continuous load		$\leq 0.2 \text{ mA}$
• Transient overload		$\leq 130 \text{ mA}$ for 100 ms
Dimensions and weights		
Enclosure dimensions (W x H x D)		
Module enclosure for plug-in mounting	mm	43 x 63 x 22
Weight approx.	g	38
Degree of protection		
Degree of protection acc. to EN 60529		IP20
Ambient conditions		
Temperature range		
Operating temperature	°C	-10 ... + 55
Storage and transport temperature	°C	-25 ... + 70
Relative humidity		
At 25 °C without condensation	%	95
Altitude		
Above sea level up to max.	m	2000
Pollution degree		2

Dimensional drawings

Dimensions of 7KM PAC 4DI/2DO expansion module at the side and from above



Measuring Devices and Power Monitoring

7KT PAC Measuring Devices

7KT PAC1500 three-phase measuring devices

Overview



7KT PAC1500 measuring devices, three-phase, for direct connection up to 80 A / 125 A

The measuring devices (power meters) are used to record the amount of electrical energy and power exported and imported. Siemens compact measuring devices are designed as modular devices for alternating current and can be mounted on standard mounting rails. They comply with the metering equipment standard EN 50470 (Part 1 and 3) and come with an LCD display.

The three-phase measuring devices for direct connection are available up to 125 A and in versions with transformer connections (.../5 A to 10000/5 A).

The measuring devices store active and reactive energy and all comply with accuracy class 1 (for active energy).

All measuring devices have a pulse output (S0) and are designed for 2-tariff measurements. The MID versions comply with the new Measuring Instruments Directive 2004/22/EC. The measuring devices also have an integrated optical interface (IrDA) for connecting communication modules, which enables their integration in a range of other systems, such as power management systems.

Technical specifications

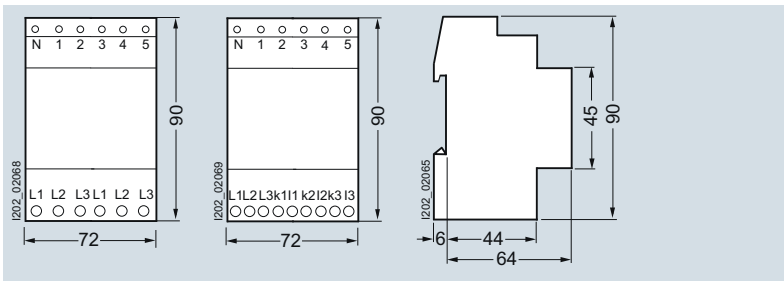
7KT PAC1500 three-phase measuring device				7KT1540 7KT1542	7KT1543 7KT1545	7KT1546 7KT1548
Standards				EN 50470-1, EN 50470-3, EN 62053-23, EN 62053-31		
Connection						
• Direct connection				--	80 A	125 A
• Transformer current connection				.../5 A	--	--
General data						
• Enclosures	Acc. to DIN 43880	MW (1 MW = 18 mm)		4	4	6
• Mounting	Acc. to EN 60715			35 mm		
• Mounting height		mm		70		
Function						
• Connection	Single-phase or three-phase	No. of conductors		4	2 ... 4	2 ... 4
• Storage of setting and counter reading	Via (EEPROM)			Yes	Yes	Yes
• Tariffs	For active and reactive energy			T1/T2	T1/T2	T1/T2
Supply (through measuring terminals)						
• Rated control supply voltage U_n		V AC		230		
• Voltage range		V		110 ... 276		
• Rated frequency f_n		Hz		50		
Measuring accuracy (at 23 ± 1 °C)						
• Active energy and active power	Based on nominal value			Class B		
• Reactive energy and reactive power	Acc. to EN 50470-3			Class 2		
Measuring inputs						
• Connection type				Transformer TA-TC .../5 A	Direct	Direct
• Terminal capacitance, operational and main current paths	Rigid, min. (max.)	mm ²		1.5 (6)	1.5 (35)	5 (50)
	Flexible min. (max.)	mm ²		1.5 (6)	1.5 (35)	5 (50)
• Voltage U_n	Phase/phase	V		400		
	Phase/N	V		230		
• Operating range voltage	Phase/phase	V		190 ... 480		
	Phase/N	V		110 ... 276		
• Current I_{ref}		A		--	5	5
• Current I_n		A		5	--	--
• Current I_{min}		A		0.05	0.25	0.25
• Current operating range ($I_{st} ... I_{max}$)	Direct connection	A		--	0.015 ... 80	0.020 ... 125
	Transformer connection	A		0.003 ... 6	--	--
• Transformer current	Primary current of the transformer	A		5 ... 10000	--	--
	Smallest input step	A		5	--	--
• Input ripple form				Sinusoidal		
• Operating starting current I_{st}		mA		3	15	20
S0 interface						
• Pulse outputs for absorbed active and reactive energy T1 + T2	Acc. to EN 62053-31			Yes		
• Pulse count	For input current I_{max}	Pulses/kWh		--	500	500
	Automatic for transformers	Pulses/kWh		100 - 10 - 1	--	--
IR interface						
• At the side for connecting communication modules				M-Bus/Modbus RTU/RS 485/KNX		

Measuring Devices and Power Monitoring

7KT PAC Measuring Devices

7KT PAC1500 three-phase measuring devices

Dimensional drawings

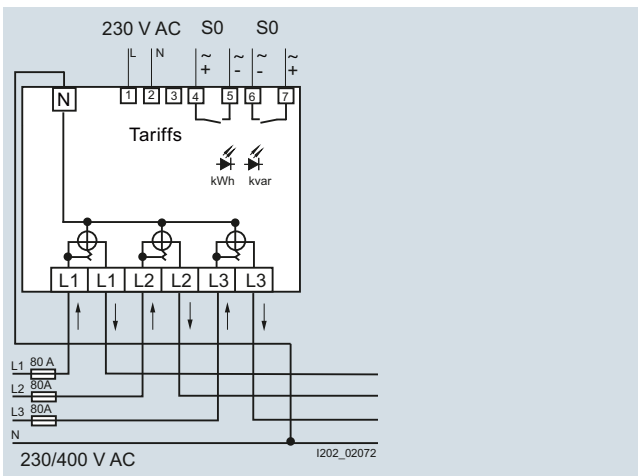


7KT1543
7KT1545

7KT1540

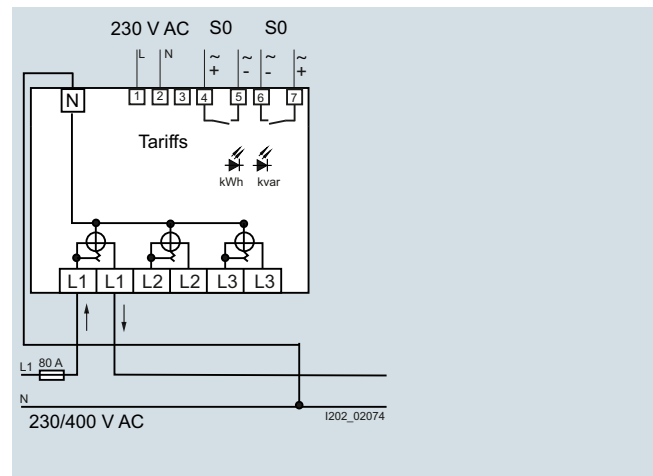
7KT1543, 7KT1545, 7KT1540,
view from the left

Circuit diagrams



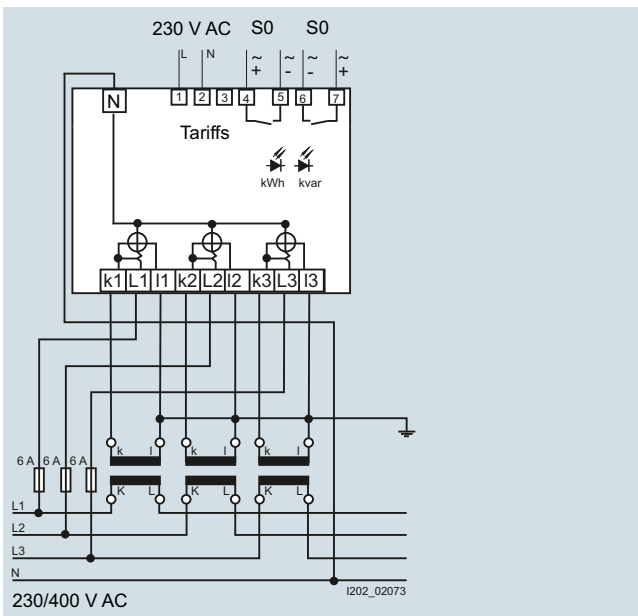
7KT543, 7KT545, three-phase connection

To achieve the specified accuracy, the N conductor must be connected to the counter.



7KT543, 7KT545, single-phase connection

With single-phase connection the display lighting cannot be activated.



7KT540

Measuring Devices and Power Monitoring

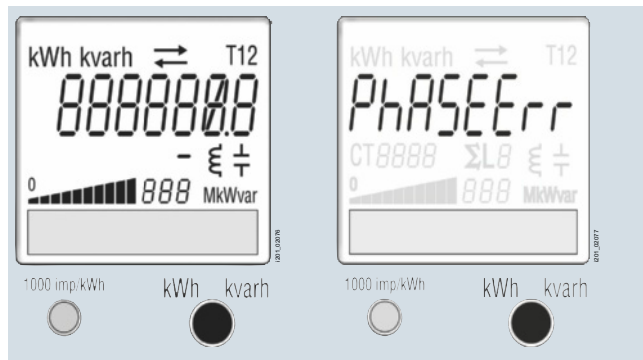
7KT PAC Measuring Devices

7KT PAC1500 three-phase measuring devices

More information

Display representation

- Green, backlit LCD
- The control button is used to select the different display levels.



Connection error and phase failure

kWh	kWh display
kvarh	kvarh display
↔	Power import display Power export display
T12	Selected/active tariff
LB	Phase value of energy display (L1-2-3) and SL
ΣL	Phase total value of energy display
⌚	Display for inductive power
⌚	Display for capacitive power
888	Display for active and reactive power
CT8888	Display for the current transformer ratio, primary side
▬▬▬▬▬	Bar diagram (as a percent of I_{max})
▬▬▬▬▬	Device name and approval data
●	LED accuracy check display
●	Control button

Operation

The large number of measured variables makes it necessary to present the data in 2 display levels:

- Default and
- Energy counter states

A) Default display level

- The default display level shows the sum of the active and reactive energy:
 - Sum of active energy (E1-E2+E5-E6)
 - Sum of reactive energy (E3-E4+E7-E8)
 - Software version
 - Checksum
- The various measured variables can be called up by briefly pressing the control button.
- A 3-digit display indicates the instantaneous power. A bar display indicates the instantaneous current in steps of 10 % in relation to the maximum load rating (I_{max}) (transformer connection in relation to $I_{secondary}$). The bar display is refreshed every 2 s.
- Note:
In this display level the symbol indicator (import/export) refers to the actual power and not to the energy consumption value.

Display test control button

- If the control button is pressed and held for longer than 10 s, a display test will be activated.
- This test takes 30 s to complete. The DEFAULT display level then appears.

B) E-counter states display level

- This display level presents the energy values E1 to E8.
- To switch to the E1 to E8 energy values, press and hold the control button until the red LED lights up (approx. 4 s). The power indicators go out and the display shows the energy values E1 to E8.
- A brief press of the control button enables these measured values to be shown in a loop.
- To return to the default display level, press and hold the control button for approx. 4 s or wait approx. 30 s for automatic switchover to the initial display.
- To view all the energy registers per phase (active and reactive energy for consumed and supplied energy for T1 and T2) in a loop, press the control button for 2 s.
- The display lighting is switched off automatically after 40 s of inactivity.

Resetting all energy registers

- If the control button is pressed and held for longer than 20 s, the word "rESEt" will appear.
- After the control button is pressed again for at least another 4 seconds, all the energy registers are set to ZERO.

Measuring Devices and Power Monitoring

7KT PAC Measuring Devices

7KT PAC1500 single-phase measuring devices

Overview



The 7KT PAC1500 single-phase measuring devices (power meters) are used to record the amount of electrical energy and power exported and imported. They comply with the metering equipment standard EN 50470 (Part 1 and 3) and come with an LCD display.

The 7KT PAC1500 single-phase measuring devices for direct connection are available up to 80 A. They store active and reactive energy, and all comply with accuracy class 1 (for active energy).

All measuring devices have a pulse output (S0) and are designed for 1-tariff or 2-tariff measurements, depending on the version.

The MID versions comply with the new Measuring Instruments Directive 2004/22/EC. The measuring devices (with the exception of 7KT1530) also have an integrated optical interface (IrDA) for connecting communication modules.

Technical specifications

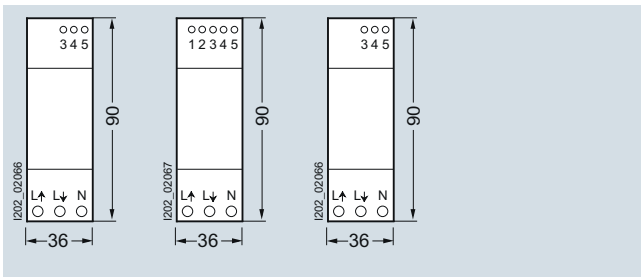
7KT PAC1500 single-phase measuring device Direct connection up to 80 A			7KT530	7KT531 7KT533
Standards			EN 50470-1, EN 50470-3, EN 62053-23, EN 62053-31	
General data				
• Enclosures	Acc. to DIN 43880	MW	2	
• Mounting	Acc. to EN 60715		35 mm	
• Mounting height		mm	70	
Function				
• Operating mode	Single-phase loads	Conductors	2	
• Storage of setting and counter reading	Via (EEPROM)		Yes	
• Tariff	For active energy		T1	T1 + T2
	For reactive energy		T1	T1 + T2
Supply (through measuring terminals)				
• Rated control supply voltage U_n		V AC	230	
• Voltage range		V	184 ... 276	
• Rated frequency f_n		Hz	50	
Measuring accuracy (at $23 \pm 1^\circ\text{C}$)				
• Active energy and active power	Based on nominal value		Class B	
• Reactive energy and reactive power	Acc. to EN 50470-3		Class 2	
	Acc. to EN 62053-23			
Measuring inputs				
• Connection type	Phase/N		Direct	
• Terminal capacitance, operational and main current paths	Rigid, min. (max.)	mm ²	1.5 (35)	1.5 (35)
	Flexible min. (max.)	mm ²	1.5 (35)	1.5 (35)
• Operating range voltage	Phase/N	V AC	184 ... 276	
• Current I_{ref}		A	15	
• Current I_{min}		A	0.75	
• Current operating range ($I_{\text{st}} \dots I_{\text{max}}$)	Direct connection	A	0.025 ... 80	
• Current waveform			Sinusoidal	
• Operating starting current I_{st}		mA	25	
S0 interface				
• Pulse outputs for consumed active and reactive energy	Acc. to EN 62053-31		Yes	
• Pulse count		Pulses/kWh	1000	
IR interface				
• At the side for connecting communication modules (M-Bus/Modbus RTU/RS 485/KNX)			--	Yes

Measuring Devices and Power Monitoring

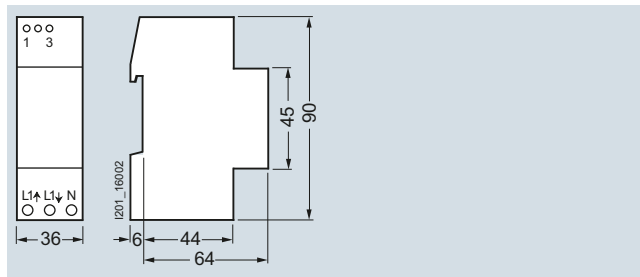
7KT PAC Measuring Devices

7KT PAC1500 single-phase measuring devices

Dimensional drawings

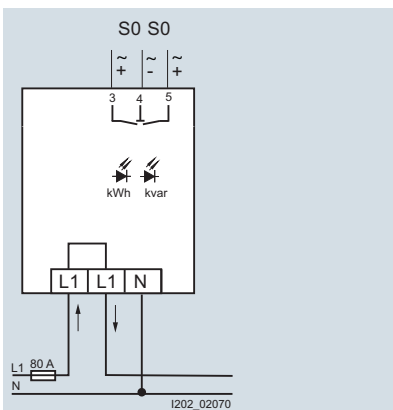


7KT530

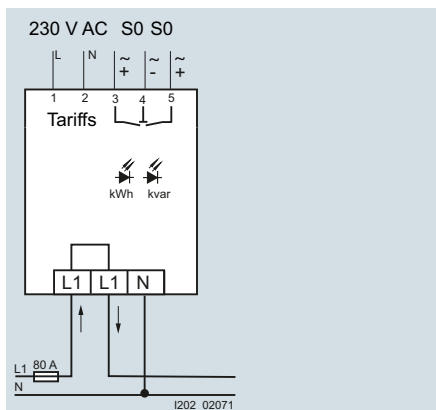
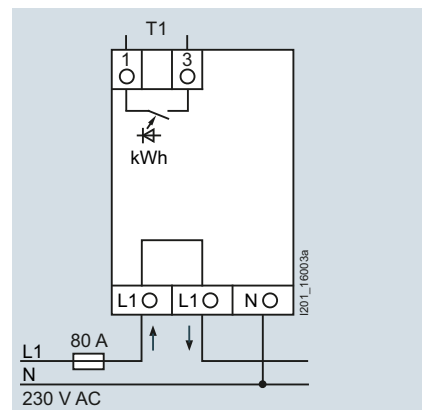
7KT531,
7KT533

7KT140

Circuit diagrams



7KT530

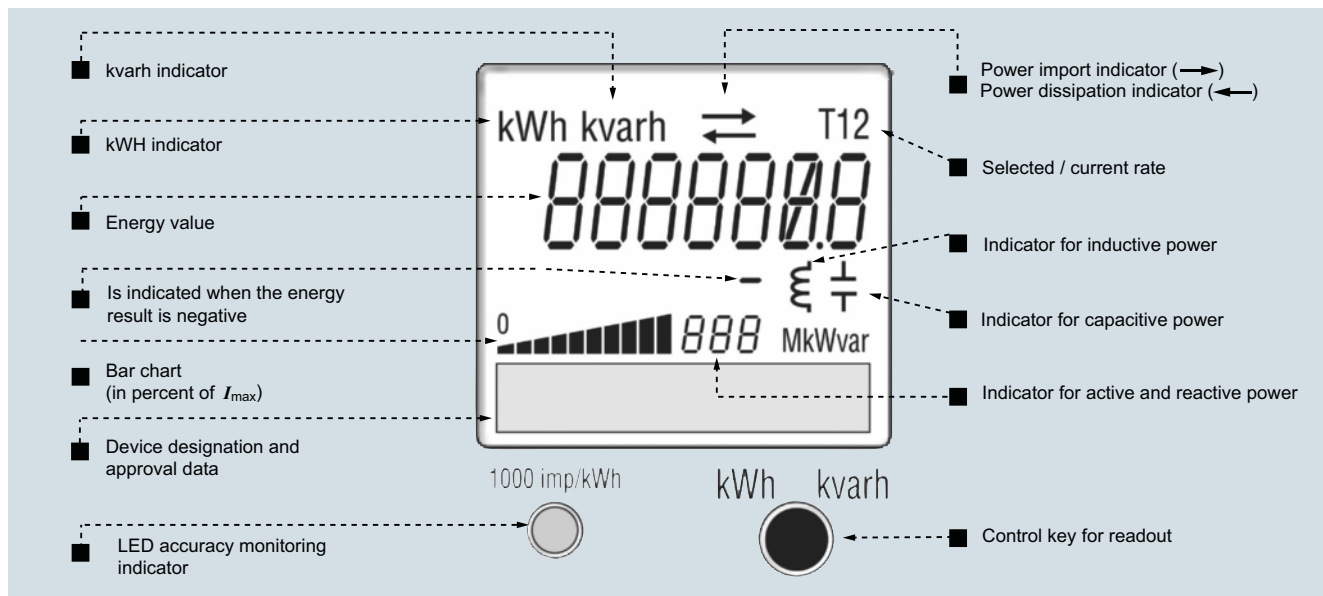
7KT531,
7KT533

7KT140

More information

Digital 7KT53. single-phase E-counters, display representation

- Green, backlit LCD
- The control button is used to select the different display levels.



Operation

The large number of measured variables makes it necessary to present the data in 2 display levels:

- A) Default
- B) Energy counter states

A) Default display level

- The default display level shows the sum of the active and reactive energy:
 - Sum of active energy (E1-E2 for 7KT1530 and E1-E2+E5-E6 for 7KT1531, 7KT1533)
 - Sum of reactive energy (E3-E4 for 7KT1530 and E3-E4+E7-E8 for 7KT1531, 7KT1533)
 - Software version
 - Checksum
- The various measured variables can be called up by briefly pressing the control button.
- A 3-digit display indicates the instantaneous power. A bar display indicates the instantaneous current in steps of 10 % in relation to the maximum load rating (I_{max}). The bar display is refreshed every second.
- Note:

In this display level the symbol indicator (import/export) refers to the actual power and not to the energy consumption value.

Display test control button

If the control button is pressed and held for longer than 10 s, a display test will be activated.

This test takes 30 s to complete. The DEFAULT display level then appears.

B) E-counter states display level

- This display level presents the energy values E1 to E8.
- To switch to this display level, press and hold the control button until the red LED lights up (approx. 4 s). The power indicators disappear and the display shows the energy values E1-E8.
- A brief press of the control button enables the loop display of these measured values.
- To return to the default display level, press and hold the control button for 4 seconds.
- The display lighting is switched off automatically after 40 s of inactivity.

Resetting of all energy registers (except for 7KT1533)

If the control button is pressed and held for longer than 20 s, the word "rESEt" will appear.

Pressing the control button again for at least another 4 seconds, resets all the energy registers to ZERO.

Measuring Devices and Power Monitoring

7KT PAC Measuring Devices

7KT PAC expansion modules

Overview



7KT PAC expansion modules, from left to right:
Expansion modules for M-Bus, Modbus RTU, RS 485, Instabus KNX

The 7KT PAC expansion modules are used as communication interfaces for 7KT PAC1500 measuring devices. They have the following features:

- The expansion modules can be selected independently of the measuring device. This means they can also be retrofitted in already installed measuring devices.
- Data transmission between the measuring devices and expansion modules is executed via the IrDA infrared interface.
- The expansion modules are placed alongside the measuring devices in the installation direction so that their IrDA interfaces are exactly opposite each other.

M-Bus expansion module (7KT1908)

- Power supply through bus cable
- Baud rates: 300 to 9,600 kbit/s
- Status indication by LED on the module
- Can be parameterized using M-Bus Master software

Modbus RTU expansion module (7KT1907)

- Power supply: 230 V AC
- Baud rates: 4.8 / 9.6 / 19.2 and 38.4 kbit/s are supported
- Status indication by LED on the module
- Configurable via RS 485 master software

RS 485 expansion module (7KZ1903)

- Power supply: 230 V AC
- Status indication by LED on the module

7KNX/EIB expansion module (7KT1900)

- Power supply through the KNX/EIB bus cable
- Status indication by LED on the module

Dimensional drawings

M-Bus expansion module

For dimensional drawings, see

<http://support.automation.siemens.com/WW/view/en/39963313/td>

Modbus RTU expansion module

For dimensional drawings, see

<http://support.automation.siemens.com/WW/view/en/42261531/td>

RS 485 expansion module

For dimensional drawings, see

<http://support.automation.siemens.com/WW/view/en/45510722/td>

7KNX/EIB expansion module

For dimensional drawings, see

<http://support.automation.siemens.com/WW/view/en/46373272/td>

Overview



7KT PAC3000 measuring device

Features

- Measuring devices with LED display
- For direct connection (80A) and transformer connection (/5A)
- Indication of 38 measured values possible
- 9 display levels, each with 6 display blocks (one level is freely configurable)
- Password-protected menu setting
- S0 pulse output
- Integrated RS 485 interface (for connection to the 7KT1391 LAN coupler or for communication using Modbus RTU)

Technical specifications

7KT PAC3000 measuring device without communication			7KT310	7KT311
7KT PAC3000 measuring device with RS 485 interface (Modbus RTU/LAN coupler)			7KT340	7KT341
Standards			EN 50470-1, EN 50470-3, EN 62053-23, EN 62053-31, IEC 61010-1	
General data			6 modules	
• Enclosures	Acc. to DIN 43880		35 mm	
• Mounting	Acc. to EN 60715		70	
• Mounting height		mm		
Supply				
• Rated control supply voltage U_C		V AC	230	
• Primary operating range		$\times U_C$	0.8 ... 1.2	
• Rated frequency		Hz	50	
• Rated power loss P_V		VA	< 5	
Measuring accuracy				
• Voltage		%	± 1	
• Current		%	± 2	
• Services		%	± 1	
• Active energy	Acc. to EN 50470-3		Class B	
• Reactive energy	Acc. to IEC 62053-23		Class 2	
• p.f.		%	± 2	
• Frequency		%	± 0.2	
Measuring inputs				
• Connection type			Direct	Transformer /5 A
• Voltage U_n	Phase/phase Phase/N	V V	400 230	
• Operating range voltage	Phase/phase Phase/N	V V	87 ... 480 50 ... 276	
• Current I_n/I_{ref}		A	5	1 or 5
• Operating range current		A	0.0015 ... 80	0.003 ... 6
• Transformer current	Primary current of the transformer Smallest input step	A A	-- --	5 ... 10000 1 or 5
• Frequency		Hz	50	
S0 interface			Class A	
• Pulse outputs	For active and reactive energy T1 and T2		Yes	Yes
• Pulse count	At 80 A, max. Depending on the transformer factor, adjustable, max.	Pulses/kWh Pulses/kWh	500 --	-- 10000
Modbus RTU interface (for 7KT1340 - 7KT1341 only)				
• Transmission rate		kbit/s	9.6-19.2	9.6-19.2
Ambient conditions				
• Mechanical environment			M1	
• Electromagnetic environment			E2	
• Operating temperature		°C	-10 ... +55	
• Temperature limits for storage and transport		°C	-25 ... +70	
• Relative humidity (without condensation)		%	< 80	
• Vibrations	Sine amplitude at 50 Hz	mm	± 0.075	
• Degree of protection	Installed device front side/terminals		IP51 ¹⁾ /IP20	

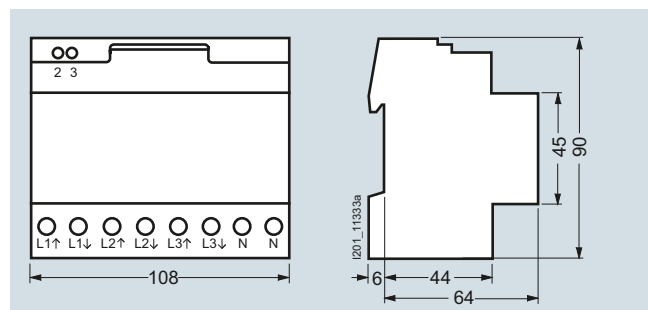
¹⁾ For installation in a distribution board with at least IP51 degree of protection.

Measuring Devices and Power Monitoring

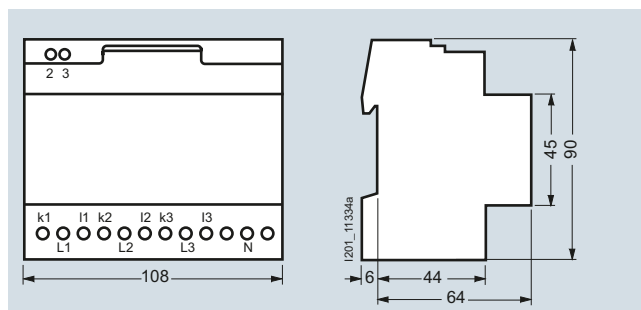
7KT PAC Measuring Devices

7KT PAC3000 measuring devices

Dimensional drawings



7KT300



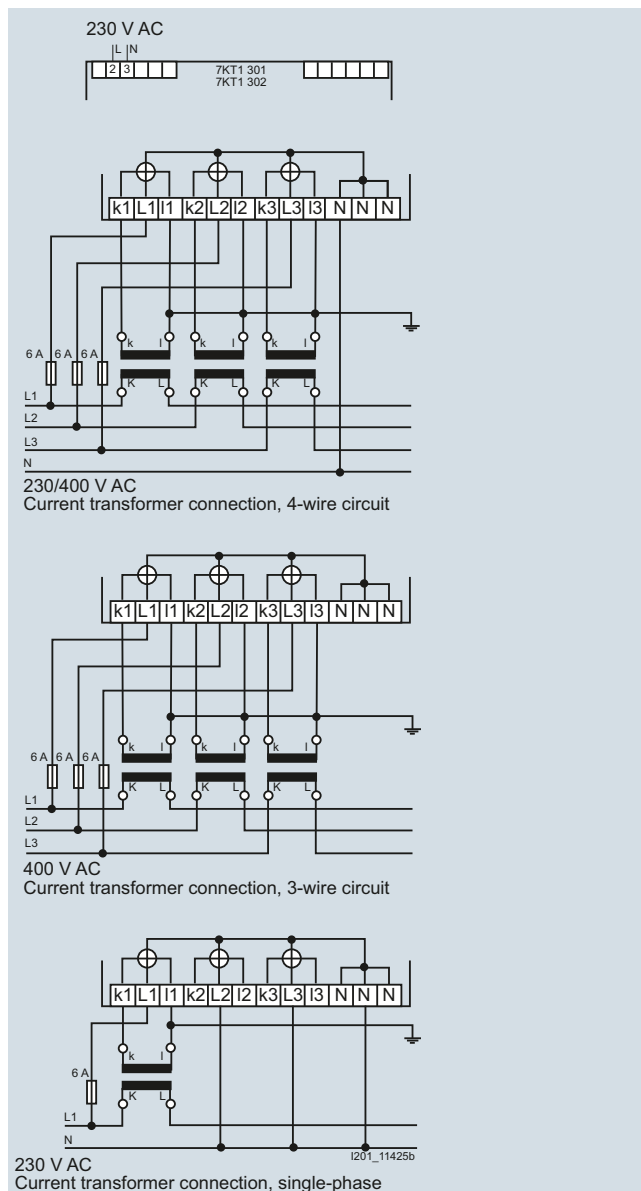
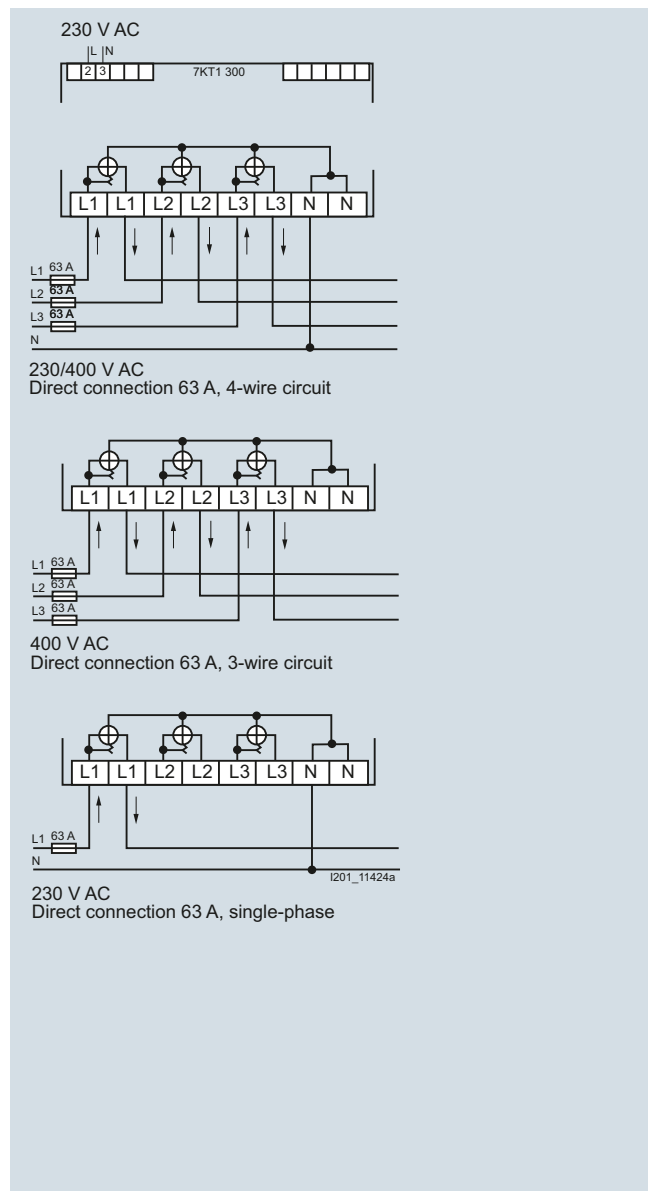
7KT301

Circuit diagrams

Information on the connection of transformer counters:

In the case of cross-section reduction, a short-circuit resistant cable is required for the power supply of terminal 2, depending on the fusing for phases L1, L2, L3. A fuse of 6 A is recommended for line protection.

Current transformers must not be operated with open terminals as this can result in dangerously high voltages, which may cause personal injury and/or property damage. It can also lead to a thermal overload of the transformers.



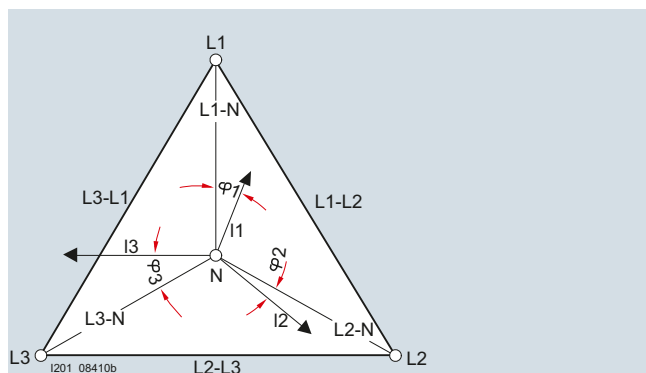
More information

Voltage measurement

The multimeter measures the delta voltages L1 to L2; L2 to L3 and L3 to L1 or the star voltages L1, L2, L3 to N.

ΣL symbol for the three-phase system

This indicates that all physical units shown under this symbol are always 3-phase.



Display values

You can continuously display 5 measured variables from the following 23 options:

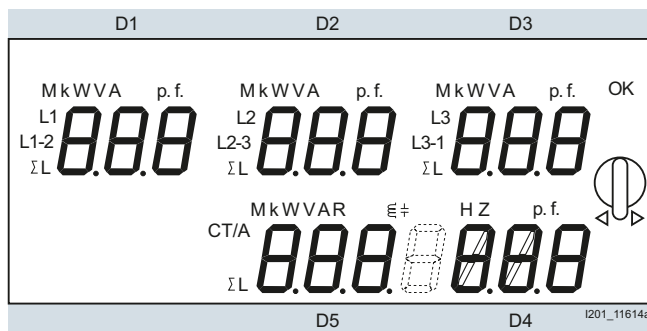
No.	Measured value	Display	Unit	Assignment
1	Active power	D1	W	L1
2	Voltage	D1	V	L1
3	Current	D1	A	L1
4	Apparent power	D1	VA	L1
5	p.f.	D1	p.f.	L1
6	Voltage	D1	V	L1 – L2
7	Active power	D2	W	L2
8	Voltage	D2	V	L2
9	Current	D2	A	L2
10	Apparent power	D2	VA	L2
11	p.f.	D2	p.f.	L2
12	Voltage	D2	V	L2 – L3
13	Active power	D3	W	L3
14	Voltage	D3	V	L3
15	Current	D3	A	L3
16	Apparent power	D3	VA	L3
17	p.f.	D3	p.f.	L3
18	Voltage	D3	V	L3 – L1
19	Active power	D1, D2, D3, D5	W	ΣL
20	Apparent power	D1, D2, D3, D5	VA	ΣL
21	Reactive power	D5	var	ΣL
22	Frequency	D4	Hz	ΣL
23	p.f.	D1, D2, D3, D4	p.f.	ΣL

2 set values are also displayed:

24	Transformer setting	D5	CT/A	/5
25	Transformer setting		CT/A	5 ... 5000

Display

The multimeters have a covered, brightly lit LED display. The measured values are indicated on an 11-mm high, green 7-segment LED, the physical units are indicated by orange text abbreviations. Both colors are easier to recognize than the red LEDs used for conventional displays. Capacitive loads are automatically indicated by a capacitor symbol, inductive loads by a coil symbol – also in orange.



Matrix selection

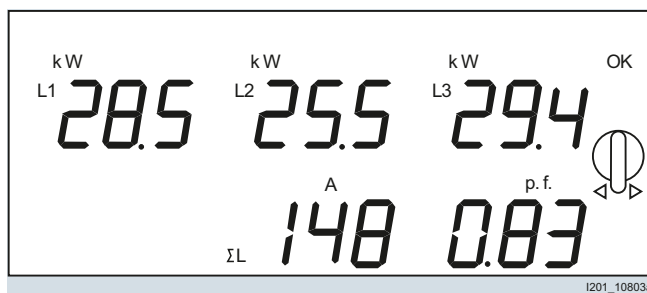
Conventional measuring instruments display voltages, currents, powers, etc. in a rigid sequence on several "screens". These multimeters allow users to define their own standard for measured variables per display field, so that they can be implemented far more universally and flexibly.

A special feature is the analysis of the different loads on the phases. Phase displacement and unsymmetrical or unbalanced loads can cause partial overloads. These multimeters offer a range of different options for combining and assessing measured values.

The display fields are selected using rotary pushbuttons and the desired indications confirmed with OK. By making the horizontal selection e.g. W, V, A or p.f., and the vertical selection, e.g. L1, L1–L2 or ΣL, users can then define the desired measured variables for this display field.

The vertical data on the display can be assigned to any measured value in the horizontal data. The letters M(ega) and k(ilo) are automatically assigned according to measuring range, i.e. measured value, e.g. kW or MW. Capacitive loads are automatically indicated by a capacitor symbol, inductive loads by a coil.

The following diagram shows an example of what your matrix selection might look like.



Measuring Devices and Power Monitoring

7KT PAC Measuring Devices

7KT LAN couplers

Overview



7KT 391 LAN coupler

A LAN coupler supports worldwide data retrieval from 7KT PAC measuring devices, as long as there is a LAN link to the Internet.

Up to 30 devices can be connected to a LAN coupler via a web browser, such as Firefox. In turn, the LAN coupler is connected to a LAN.

Data communication between the LAN coupler and the PC takes place using the TCP/IP protocol.

Application

Suitable 7KT PAC measuring devices

The following measuring devices can be connected to the LAN coupler:

	Order No.
Energy measuring devices	
7KT PAC1500 digital three-phase counters	
• For direct connection 80 A, double tariff	7KT1543
• For direct connection 80 A, double tariff calibrated version	7KT1545
• For transformer connection .../5 A, double tariff	7KT1540
• For transformer connection .../5 A, double tariff calibrated version	7KT1542
• For direct connection 125 A, double tariff	7KT1546
• For direct connection 125 A, double tariff, calibrated version	7KT1548
• For direct connection 63 A, double tariff	7KT1520
• For transformer connection .../5 A, double tariff	7KT1521
• Digital 1-phase counters	
• For direct connection 80 A, double tariff	7KT1531
• For direct connection 80 A, double tariff calibrated version	7KT1533
7KT PAC3000 measuring devices	
• 7KT PAC3000, for direct connection	7KT1340
• 7KT PAC3000, for transformer connection .../5 A	7KT1341

Technical specifications

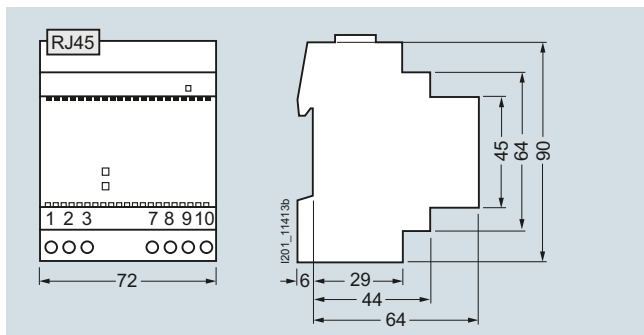
				7KT1391 LAN couplers
Standards				IEEE 802.3 AS, IEC 60950, EN 61000-6-2, EN 61000-6-3
General data				
• Enclosures	Acc. to DIN 43880			4 modules
• Mounting	Acc. to EN 60715			Mounting on standard mounting rail (35 mm)
• Mounting height		mm		70
Supply				
• Rated power loss P_v		VA	≤ 10	
• Rated control supply voltage U_c		V AC	230	
• Primary operating range		× U_c	0.9 ... 1.10	
• Rated frequency		Hz	50	
• Frequency ranges		Hz	45 ... 65	
Function				
• System start				Automatic upon switching on
• LAN server identification				Over the IP address of the PC
• Transmission rate	Limitation by LAN	Mbit/s	100	
• Operating system				Windows XP/Vista/7
• Browser				IE 7.8; Mozilla Firefox 3.09 / 3.5.3 / 3.6; Opera 9.64 / 10 / 10.5; Safari 3.2.2 / 4.0.5; Google Chrome 3.0.195.27.
LAN interface				
• HW interface				Connection RJ 45
• SW interface				TCP/IP
Interface to measuring devices				
• HW interface	RS 485 terminals	Number	3 (+/-/shielded twisted pair)	
• Line	Version		STP (shielded twisted pair)	
	Minimum cross-section	mm ²	2 × 0.2 or 2 × AWG 24	
	Maximum line capacitance	pF/m	< 50	
	Impedance	W	100	
	Maximum overall cable length	m	≤ 1200	
	Type of installation		Serial	
Measuring devices can be connected directly				Number 30
Environmental conditions				
• Temperatures	In operation	°C	-10 ... +55	
	Storage and transport	°C	-25 ... +70	
• Relative humidity	In operation	%	≤ 80	
• Vibrations	Sine amplitude at 50 Hz	mm	± 0.25	
• Safety class	Acc. to IEC 60950		III	
• Degree of protection	Installed device front side (terminals)		IP20	

Measuring Devices and Power Monitoring

7KT PAC Measuring Devices

7KT LAN couplers

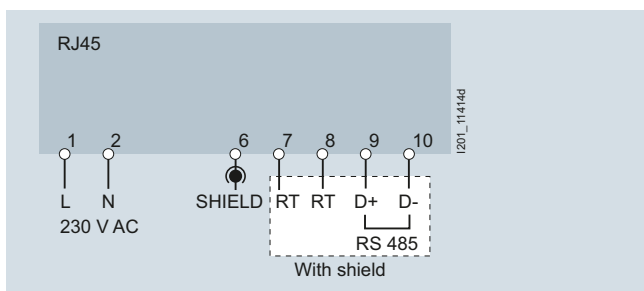
Dimensional drawings



7KT1391

Circuit diagrams

Graphic symbols

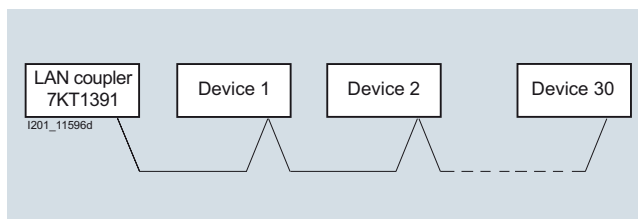


Grounding potential

Both the LAN cable with the RJ45 connector and the shielded cable of the RS 485 bus system must be grounded. This also applies to the devices connected to the LAN coupler.

Connecting the devices to the LAN coupler

All the devices are connected in parallel with a shielded two-wire cable. Point-to-point installations, junctions or ring installations are not possible.



Overview



Digital measuring devices: Left: 7KT1 voltmeter, Right: 7KT1 ammeter

These devices for measuring voltages and currents can be used for monitoring incoming and outgoing currents or device currents in electric plants.

They are suitable for direct connection in a single-phase system or with measuring transducers in three-phase systems.

The measuring ranges of the ammeter are set locally at the device using a coding switch.

Technical specifications

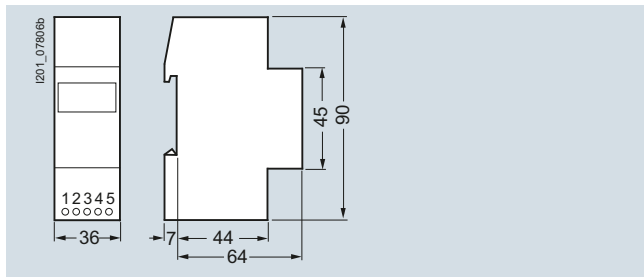
			7KT1110	7KT1120
Standards			DIN 43751-1, -2	
Rated operational voltage U_e			V AC	230
Primary operating range			$\times U_e$	0.9 ... 1.15
Rated frequency			Hz	50/60
Rated operational power P_S			VA	<2
7+1-segment display				3-digit
Measuring range				
• Voltage	Direct measurement	V AC	12 ... 600 (U_n)	--
	Direct measurement	A AC	--	0.4 ... 20 (I_n)
	Transformer measurement	A AC	--	25, 40, 50, ... 1000/5
Lower display value			Of the scale-end value	%
Measuring shunt				
• Current	Direct measurement 20 A	mΩ	--	5
	Transformer measurement	mΩ	--	10
	Direct measurement 600 V	MΩ	1	--
Measuring frequency			Hz	45 ... 65
Measurement cycle			/s	4
Measuring accuracy			at 23 °C ±1 °C	%
Temperature influence			%/°C	±0.5 ±1 digit
Overload capability				
• Voltage	Continuous	V	1.2 × U_n	--
	Short-time for 1 s	V	1.3 × U_n	--
	Continuous, direct	A	--	1.1 × I_n
	Short-time for 1 s, direct	A	--	10 × I_n
Terminals			± Screw (Pozidriv)	1
• Stripped length			mm	7
Conductor cross-sections			Rigid, max.	mm ²
			Flexible, with end sleeve, min.	mm ²
Degree of protection				IP20, with connected conductors
Permissible ambient temperature				IP20, with connected conductors
• Operation			°C	-10 ... +55
• Storage			°C	-40 ... +70

Measuring Devices and Power Monitoring

Other Measuring Devices

Digital voltmeters and ammeters

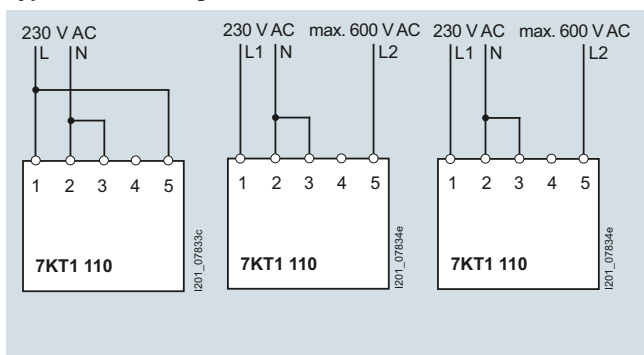
Dimensional drawings



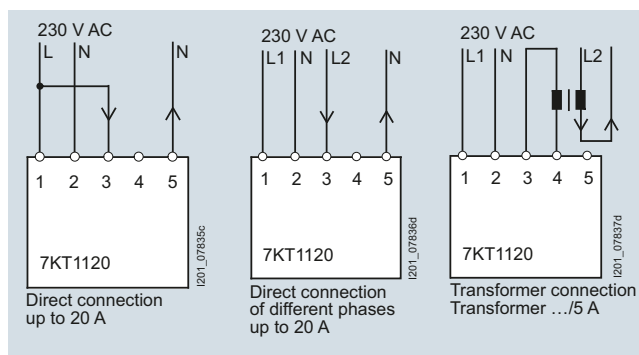
7KT110, 7KT120

Circuit diagrams

Typical circuit diagrams



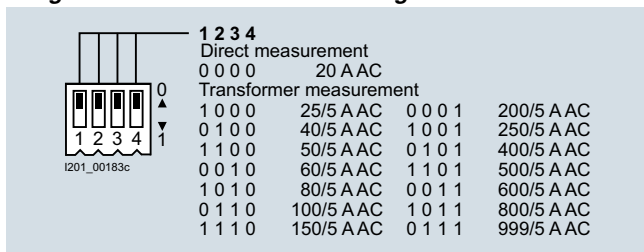
Digital voltmeters



Digital ammeters

More information

Range selector switch for 7KT120 digital ammeter

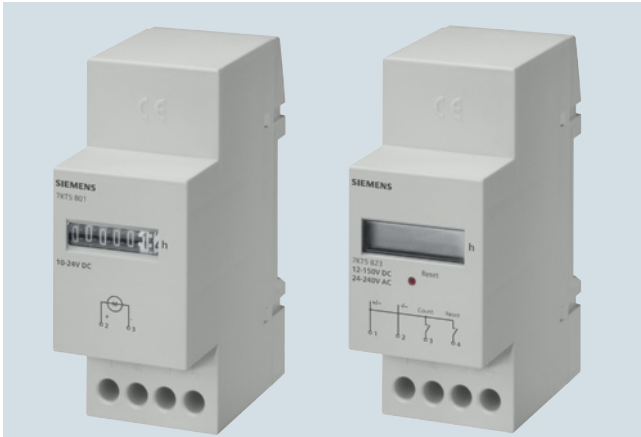


Measuring Devices and Power Monitoring

Other Measuring Devices

Time and pulse counters for standard rail mounting

Overview



Time counters: Left: Electromechanical, Right: Electronic

Time and pulse counters are used for the reliable monitoring of production and service times, which enables the exact planning and monitoring of production sequences, maintenance cycles and warranty times.

As well as the proven electromechanical time and pulse counters for mounting in distribution boards, we also supply digital time and pulse counters.

The fields of application for both counter types are very diverse, such as the recording of operating hours of machines, systems or building management systems, as well as pulse counting for general volume flow counting, registration of starting frequencies, starting cycles or production quantities in systems and machines.

Technical specifications

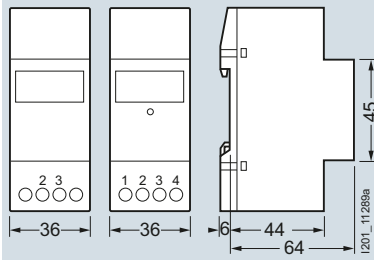
			7KT5801	7KT5802	7KT5803	7KT5804	7KT5806	7KT5807	
Standards Approvals			DIN VDE 0435-110; EN 60255-6; UL 863 UL 863, UL File No. E300537, CSA C22.2 No. 6 and 55						
Rated control supply voltage U_c		V AC V DC	-- 12 ... 24	24 --	115	230	115	230	
Primary operating range		At 50/60 Hz	$\times U_c$ 0.9 ... 1.1						
Rated frequency		Hz	-- 50					60	
Rated power loss P_v		VA	< 1		< 2				
Method of operation		Counting of	Hours						
Display		Drum-type register	h 00000.00						
Terminals		$\pm$ Screw (Phillips)	1						
Conductor cross-sections		Rigid Flexible, with end sleeve, min.	mm ² mm ²	1.5 0.75					
Permissible ambient temperature		°C	-10 ... +70						
Degree of protection		Acc. to EN 60529	IP20, with connected conductors						
Safety class		Acc. to EN 61140/VDE 0140-1	II						
Permissible humidity		%	< 80						
			7KT5811	7KT5812	7KT5814	7KT5821	7KT5822	7KT5823	7KT5833
Standards Approvals			DIN VDE 0435-110; EN 60255-6; UL 863 UL 863, UL File No. E300537, CSA C22.2 No. 6 and 55						
Rated control supply voltage U_c		V AC V DC	-- 12 ... 24	24 --	230 --	24 ... 240 12 ... 150			
Primary operating range		At 50/60 Hz	$\times U_c$ 0.9 ... 1.1						
Rated frequency		Hz	-- 50/60						
Rated power loss P_v		VA	< 1		< 2	< 1			
Method of operation		Counting of	Pulses			Hours		Pulses	
Display		Drum-type register LCD	 h 	0000000 -- --		-- 000000.0 --		-- -- 0000000	
Counting frequency		Hz	10			--			10
Pulse duration		ms	50			--			50
Resetting		Electrical Mechanical	-- --				Yes Yes		
Terminals		$\pm$ Screw (Phillips)	1						
Conductor cross-sections		Rigid Flexible, with end sleeve, min.	mm ² mm ²	1.5 0.75					
Permissible ambient temperature		°C	-10 ... +70						
Degree of protection		Acc. to EN 60529	IP20, with connected conductors						
Safety class		Acc. to EN 61140/VDE 0140-1	II						
Permissible humidity		%	< 80						

Measuring Devices and Power Monitoring

Other Measuring Devices

Time and pulse counters for standard rail mounting

Dimensional drawings



7KT580.
7KT581.

7KT582.
7KT5833

More information

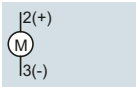
Time counters count the time in hours with an accuracy of two decimal places (hundredths of hours). The pulse counter adds the number of pulses, e.g. the making operations of devices.

A power supply is required at terminals 1 and 2 of the electronic counters so that the device can constantly display the measured values. Once terminal 3 is supplied with voltage (for DC "+"), the counting procedure starts. If terminal 4 is supplied short-time with voltage (for DC "+"), the counter is reset.

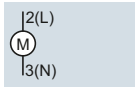
In the case of electronic counters, the counting result is saved indefinitely in the event of a power failure (EEPROM). On recovery of the power, the counting is continued from the saved value. As well as a modern design, the electronic counter has a 7-digit LCD, which can be reset electrically or manually.

Circuit diagrams

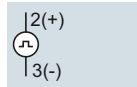
Connections



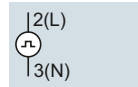
7KT5801



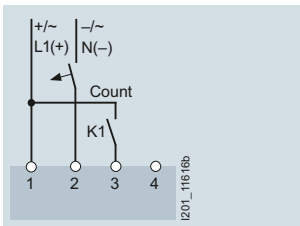
7KT5802
7KT5803
7KT5804
7KT5806
7KT5807



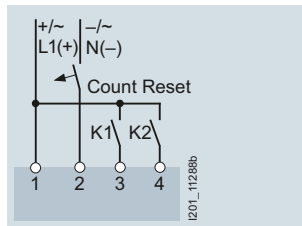
7KT5811



7KT5812
7KT5814



7KT5821



7KT5822, 7KT5823, 7KT5833

Overview



Time counters: Left: Counting mechanism, Right: Counting mechanism with front frame

Time and pulse counters for control cabinets, control systems and mechanical engineering are used, e.g. in boilers, machine tools or compressors. The pulse counters count the starting frequencies. This supports planning for preventative maintenance.

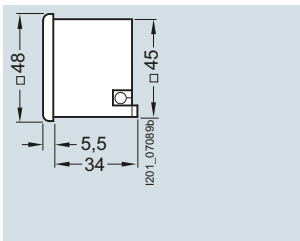
In-time and regular maintenance is the best protection against unexpected shutdowns.

Technical specifications

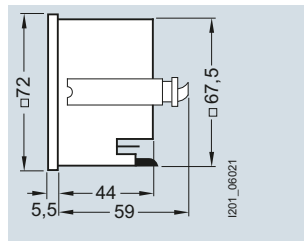
		7KT5500	7KT5501	7KT5502	7KT5503	7KT5504	7KT5505
Standards		DIN VDE 0435-110; EN 60255-6					
Rated control supply voltage U_c	V AC	--	115	230	115	230	24
	V DC	10 ... 80	--	--	--	--	--
Rated frequency	Hz	--	50	--	60	--	50
Front-panel mounting		Switchboard cutout					
• Without masking frame 55 × 55 mm • With masking frame 55 × 55 mm	mm × mm	45.2 × 45.2 ^{+0.3}					
	Ø mm	50.2 ^{+0.3}					

		7KT5600	7KT5601	7KT5602	7KT5603	7KT5604
Standards		DIN VDE 0435-110; EN 60255-6				
Rated control supply voltage U_c	V AC	--	115	230	115	230
	V DC	10 ... 50	--	--	--	--
Rated frequency	Hz	--	50	--	60	--
Front-panel mounting	Switchboard cutout	mm × mm	68 ^{+0.5} × 68 ^{+0.5}			

Dimensional drawings



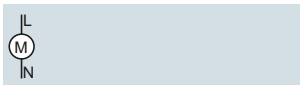
7KT55



7KT56

Circuit diagrams

Connections



7KT55, 7KT56

Measuring Devices and Power Monitoring

Accessories

4NC current transformers

Overview



4NC53 current transformers

Technical specifications

4NC current transformers for measuring purposes

Standards	EN 60044-1, VDE 0414-44-1
Window-type current transformers	The conductor to be measured (busbar or cable) is passed through the window opening and constitutes the primary circuit of the window-type current transformer. Pin-wound transformers: An economical solution especially for small primary currents of 5 ... 75 A are window-type current transformers when the conductor to be measured is pin-wound several times.
Primary rated operational current I_{pn}	Current transformers can be continuously loaded with 1.3 times the primary rated current (I_{pn}).
Secondary rated operational current I_{sn} 1 A 5 A	Particularly suitable for longer measuring leads. Cable losses of only 4 % in contrast to 5 A current transformers. 5 A current transformers generate 25 times the power losses on measuring leads as compared with 1 A current transformers. These stray losses result in higher power in the case of long cables. Only recommended for use with short measuring leads.
Accuracy class Class 1 Class 3	Operation measurement, internal metering Current error $\pm 1\%$ at $1 \times I_{pn}$ and $1.2 \times I_{pn}$ Coarse measurement Current error $\pm 3\%$ at $0.5 \times I_{pn}$ and $1.2 \times I_{pn}$
Rated power P_n	The rated power of transformers is specified in VA. The actual load rating should be similar to the rated power; a lower actual load rating (underburden) increases the overcurrent factor and measuring devices are not sufficiently protected in case of a short-circuit, a higher actual load rating (overburden) has a negative effect on the accuracy. With a frequency of 60 Hz the rated power increases to 1.2 times. With $16^{2/3}$ Hz the output power decreases to $1/3$ of the rated power.
Maximum voltage for equipment U_m	This is the rms value of the maximum voltage between the conductors of a system. For this voltage the insulation must be rated at normal operating conditions. 4NC5 current transformers are suitable for 720 V.
Overcurrent limiting factor FS	The overcurrent limiting factor is expressed using the characters FS and a factor, e.g. FS5 or FS10. When a short-circuit current flows through the primary winding of a current transformer, the stress on the measuring devices connected to the current transformer is the lower the smaller the overcurrent limiting factor is.
Thermal rated short-time current I_{th}	The thermal rated short-time current I_{th} is the rms value of the primary current with a duration of one second, whose heat effect the current transformer can resist without being damaged in the event of a short-circuited secondary winding.
Rated impulse current I_{dyn}	The rated impulse current I_{dyn} is the highest instantaneous value of the current after a short-circuit whose force the current transformer can resist without being damaged. The rated impulse current is specified as peak value.

4NC51 window-type current transformers, used as pin-wound transformers, Classes 1 and 3, from 5 A to 75 A

Pin-winding increases the primary current of the current transformer. Consequently, window-type current transformers can also be used for low primary currents.

Basic type		4NC5112	4NC5113	4NC5115	4NC5117	4NC5121	4NC5122	4NC5123
Rated primary current	A	50	60	75	100	150	200	250
Power	VA	2.5	2.5	2.5	2.5	2.5	5	5
Primary current to be measured	Number of required pin windings							
	A	Class 3			Class 1			
	5	10	--	--	--	--	--	--
	10	5	6	--	10	--	--	--
	15	--	4	5	--	10	--	--
	20	--	3	--	5	--	10	--
	25	2	--	3	4	6	8	10
	30	--	2	--	--	5	--	--
	40	--	--	--	--	--	5	--
	50	--	--	--	2	3	4	5
	75	--	--	--	--	2	--	--



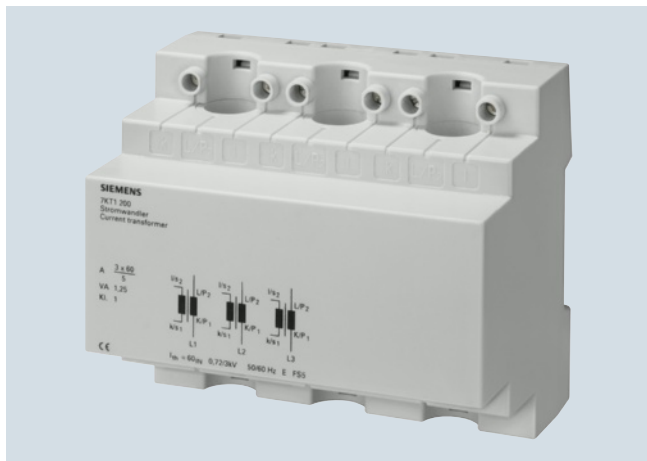
4NC51 used as pin-wound transformer

Measuring Devices and Power Monitoring

Accessories

7KT12 current transformers

Overview



7KT12 current transformers

The three-phase 7KT12 current transformer can be used in distribution boards according to DIN 43880. The measuring leads are routed vertically through to the standard mounting rail.

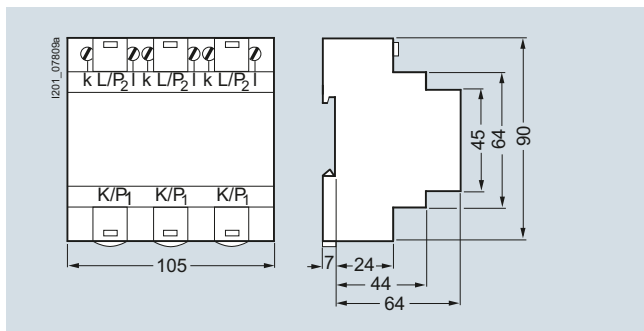
This type of current transformer is suitable for infeeds or outgoing lines in connection with the installation of a 5TE8 switch or a 5TE1 disconnector, as the primary connecting leads do not have to be interrupted.

The current transformer is designed for cables of up to 13 mm in diameter, e.g. H07V-R with 50 mm² conductor cross-section.

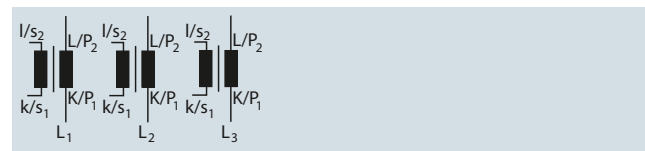
Technical specifications

		7KT1200	7KT1201	7KT1202
Standards		EN 60044-1		
Secondary rated current strength	A	5		
Accuracy class	Cl.	1		
Rated power	VA	1.25	2.5	3.75
Rated frequency f_n	Hz	50/60		
Thermal current limit I_{th}	Short-time	A $60 \times I_e$		
Thermal continuous current	A	$1 \times I_e$		
Overcurrent limit factor	FS	5		
Rated impulse withstand voltage U_{imp}	kV	> 3		
Creepage distances and clearances	mm	> 3		
Rated operational voltage U_e	V AC	720		
Rated operational current I_e	A AC	3×60	3×100	3×150
Terminals $\pm$ Screw (Pozidriv)		PZ 1		
Conductor cross-sections				
- Rigid	mm ²	0.5 ... 4		
- Flexible, with end sleeve	mm ²	0.5 ... 2.5		
Permissible ambient temperature	°C	-5 ... +60		
Resistance to climate	Acc. to EN 60068-1	20/60/4		

Dimensional drawings

7KT200
7KT201
7KT202

Circuit diagrams

7KT200
7KT201
7KT202

Note:

Current transformers must not be operated with open terminals, as this can result in dangerously high voltages, which may cause personal injury and/or property damage. It also exposes the transformer to thermal overload.

Overview

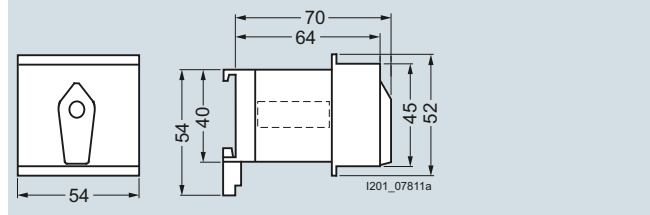


Measuring selector switch (voltmeter selector switch)

Measuring selector switches are used as CO contacts of the phases for voltages and currents in three-phase systems for voltmeters and ammeters.

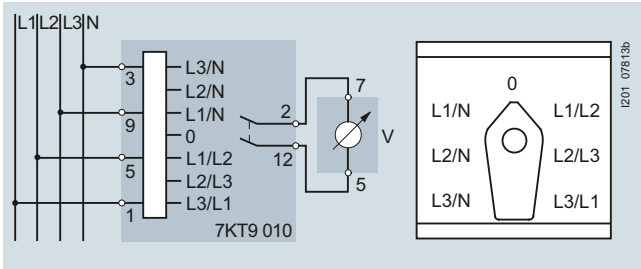
The design of these switches is adapted to match the modular installation devices. They support use in compliance with EN 60947-3.

Dimensional drawings

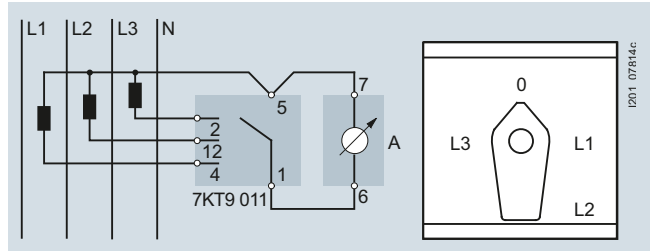


7KT9010
7KT9011

Circuit diagrams



Voltmeter switching



Ammeter switching

Internal interconnection of the phases in the ammeter selector switch for the prevention of glitches at the connections of the current transformers:

Switch position	Short-circuited phases		
	L1	L2	L3
0	✓	✓	✓
L1	--	✓	✓
L2	✓	--	✓
L3	✓	✓	--

Measuring Devices and Power Monitoring

Accessories

Notes

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Energy Management
Low Voltage & Products
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93009 REGENSBURG
GERMANY

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