SIEMENS

7782



Flame safeguard LFS1...

LFS1 flame safeguard with approval for continuous operation for the supervision of oil flames and gas flames in applications with an ionization probe and RAR9 photocell detector. Flame safeguard for intermittent operating mode with UV flame detectors QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M.

LFS1 and this Data Sheet are intended for OEMs using the LFS1 in or on their products.

Use, features

Use

LFS1s are designed for the supervision of oil burners and gas burners in connection with the LME76 or LME39.xxxRP burner control, as well as with programmable logic controllers.
Typical fields of application range from industrial burners up to the highest security level SIL3 and in the field of ship burners.

Flame supervision is performed as follows:
- For oil-fired operation with LFS1.1: using the RAR9 photocell detector with approval for continuous operation
- For gas-fired operation with LFS1.2: using an ionization probe with approval for continuous operation or QRA2/QRA2M/QRA4/QRA4M/QRA10/QRA10M UV flame detectors in intermittent operation

The LFS1s are used in connection with the LME76 burner control or with freely programmable controllers in the following applications:
- **Dual supervision of burners**
  Supervision of the main flame, or of the ignition flame and main flame, by two LFS1s with identical or different flame detectors
- **Multiflame supervision**
  For plants with several burners whose flames must be supervised individually by one or more flame detectors, but whose startup and supervision are carried out centrally and simultaneously by just one LME76 or LME39.xxxRP burner control or by a programmable logic controller
- The LFS1s are also used as **flame indication units** in burner installations with manual startup

Use, features

Features

- Flame signal display via multicolor LED signal lamp
- Flame signal display via DC 0...10 V output signal (display only)
- Can be parameterized via BC interface communication interface
- Potential-free signal contacts with double insulation
- Undervoltage detection

Supplementary documentation

Type (ASN)	Title	Documentation number	Document type
AGK11.7	Connection accessories for small burner controls	CC1N7201	Data Sheet
AZL21 / AZL23	Display and operating units	CC1N7542	Data Sheet
LFS1	Flame safeguard	CC1A7782	User documentation
LME76	Burner control	CC1N7156	Data sheet
		CC1P7156	Basic documentation
ACS410	PC software for microprocessor controlled burner controls and flame safeguards	CC1J7352	Installation and Operating Instructions
OCI410	BC interface module between flame safeguard and PC	CC1N7616	Data Sheet
OCI460	Cloud gateway	CC1N7600 *)	Data Sheet
QRA4 / QRA4M	UV flame detector	CC1N7711	Data Sheet
QRA2 / QRA2M QRA10 / QRA10M	UV flame detector	CC1N7712	Data Sheet
RAR9	Photocell detector	CC1N7713	Data Sheet

*) On request

Disclaimer

Please note that this translation may not fully reflect all linguistic nuances, technical terminology, or cultural context of the original text. Although it has been prepared with due care, variations in content or interpretation cannot be entirely excluded. This translation is provided for general informational purposes only and shall **not** be regarded as legally binding or as the final version. For any official or legally binding matters, reference should always be made to the **original version** in German.



To avoid personal injury or damage to property or the environment, the following warning notes must be observed.

It is not permitted to open, interfere with, or modify the LFS1.

- All activities (mounting, installation, service, etc.) must be performed by qualified staff.
- Before making any wiring changes in the connection area, completely isolate the plant from mains supply (all-polar disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. If this is not observed, there is a risk of electric shock
- Take suitable measures to provide protection against accidental contact at the electrical connections. If this is not observed, there is a risk of electric shock
- Press the lockout reset button / operation button of the LFS1 or the AGK20 lockout reset button extension only manually (applying a force of ≤10 N) without using any tools or pointed objects. If this is not observed, there is a risk of loss of safety functions and a risk of electric shock
- The LFS1 must not be put into operation following impact or shock; even if it does not exhibit any visible damage, its safety functions may be impaired. Failure to observe this information poses a risk of compromising the safety functions and a risk of electric shock
- Each time work has been carried out (mounting, installation, service, etc.), check that the wiring is correct. If this is not observed, there is a risk of loss of safety functions and a risk of electric shock
- The mains-powered ionization probe does not offer protection against electric shock hazards. Protection against accidental contact must be ensured. If this is not observed, there is a risk of electric shock
- An ignited UV tube is a source of UV radiation.
  If the flame is supervised by optical flame detectors, both detectors must be placed in a way that ensures there is **no direct visual contact** between them. If this is not observed, there is a risk of loss of safety functions
- Connection of QRA2M and QRA10M UV flame detectors is only permitted if an AGK30 auxiliary module is used. The AGK30 auxiliary module must always be connected within the AGK11.7 plug-in base in terminal area 1…7. Failure to observe this information poses a risk of compromising the safety functions and a risk of electric shock
- The data line for the AZL2 display and operating unit or other accessories such as the OCI410 BC interface module (plugged into the BC interface) may only be connected or disconnected when the LFS1 is switched off (all-polar disconnection), since the BC interface has no safe separation from the mains voltage. Failure to observe this information poses a risk of electric shock
- Intermittent operation: For safety reasons – self-test of the flame supervision circuit, etc. – at least one controlled shutdown must take place every 24 hours for applications with LFS1.2... and UV flame detectors QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M. If this is not observed, there is a risk of loss of safety functions
- The separating plate supplied can be installed in the area between connection terminals 9 and 12, and the other terminals (1 to 7), as a means of achieving double insulation; refer to the *Installation notes* chapter. It is particularly important that the wiring is handled and installed correctly and as specified in the area around the terminals. Failure to observe these instructions poses a risk of loss of safety functions and a risk of electric shock
- The 0...10 V voltage output terminal 7 is not double-insulated from the mains voltage. It is important to bear this in mind when selecting measuring equipment (at least CAT III). If this is not observed, there is a risk of electric shock

Standards and certificates

Only in conjunction with the flame detectors

Applied directives:

- Low Voltage Directive 2014/35/EU
- Pressure Equipment Directive 2014/68/EC
- Gas Appliances Regulation (EU) (EU) 2016/426
- Electromagnetic Compatibility EMC (immunity) *) 2014/30/EU

*) The compliance with EMC emission requirements must be checked after the flame safeguard is installed in equipment

Compliance with the regulations of the applied directives is verified by the adherence to the following standards / regulations:

- Automatic burner control systems for burners and appliances burning gaseous or liquid fuels DIN EN 298
- Safety and control devices for burners and appliances burning gaseous and/or liquid fuels — General requirements DIN EN 13611
- Automatic electrical controls Part 2-5: Particular requirements for automatic electrical burner control systems DIN EN 60730-2-5

The edition of the standards that applies in each case can be found in the declaration of conformity.

Note on **DIN EN 60335-2-102**
Household and similar electrical appliances – Safety
Part 2-102: Particular requirements for gas, oil, and solid-fuel burning appliances having electrical connections. The electrical connections of the LFS1 and the AGK11.7 plug-in base comply with the requirements of EN 60335-2-102.

Note
Environmental Product Declaration (EPD).
The Environmental Product Declaration for the LFS1 includes a full life cycle assessment (LCA) and can be accessed via the following link:
www.siemens.com/bt/download

EAC Conformity (Eurasian Conformity)

UKCA conformity mark (UK compliance)

China RoHS
Hazardous substances table:
http://www.siemens.com/download?A6V10883536

LFS1.11Ax	●	●	●	●	●	---	●	●	●
LFS1.21Ax	●	●	●	●	●	●	●	●	●

Marine approvals:
Det Norske Veritas: Classification A A A A
Germanischer Lloyd: Classification A
Bureau Veritas EC Code: 31

Note
For use of the LFS1 in safety-related systems up to SIL3, the LFS1 is available with the corresponding safety manual (T7782) and certificate.

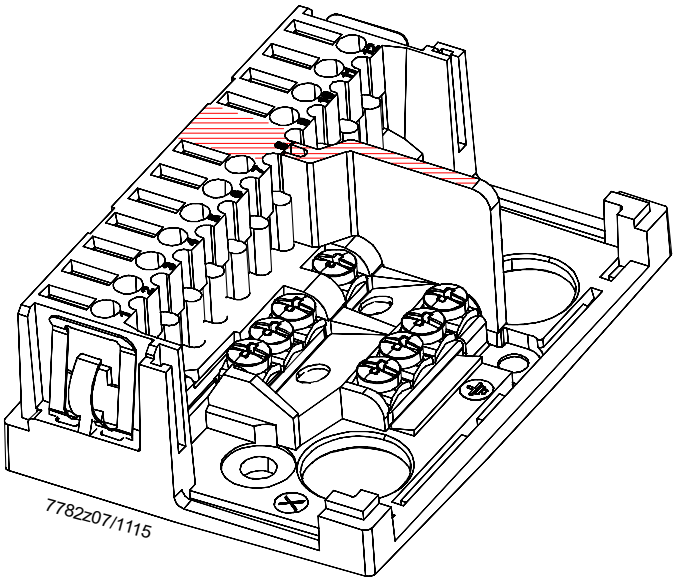
Life cycle

The LFS1 has a designed lifetime* of 250,000 burner startup cycles which, under normal operating conditions in heating mode and nominal switching loads, corresponds to approx. 10 years of usage (starting from the date of manufacture on the type label). For industrial applications with reduced switching loads of a maximum of 0.1 A, the LFS1 has an increased designed lifetime* of up to 1,000,000 burner startup cycles.

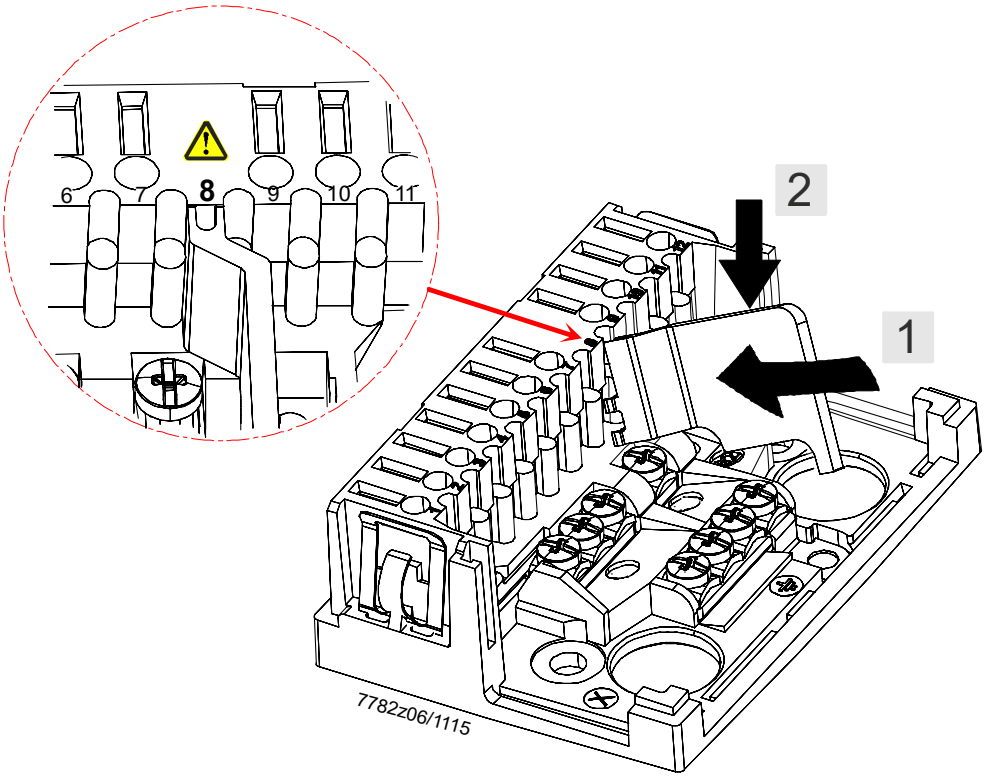
This life cycle is based on the endurance tests specified in standards EN 13611 and EN 298. A summary of the conditions has been published by the European Control Manufacturers Association (Afecor) (www.afecor.org).

* The designed lifetime is based on use of the LFS1 according to the manufacturer's data sheet. In this case, it is advisable to perform a safety check or replace the unit. The designed life cycle is not the warranty time specified in the Terms of Delivery.

- Ensure that the relevant national safety regulations are complied with
- LFS1s can be mounted in any position on the burner, in control panels, or on switchboards
- The plug-in base AGK11.7 is available for mounting and is designed for cable entry from the front, the side, or below.
  4 earth terminals provide connections for the earth conductors of burner plant components such as the ignition transformer. LFS1s themselves are double-insulated; refer to chapter ‘Installation notes’
- The separating plate element must be inserted so that it is flat/flush with the AGK11.7 plug-in base; refer to the red hatched area



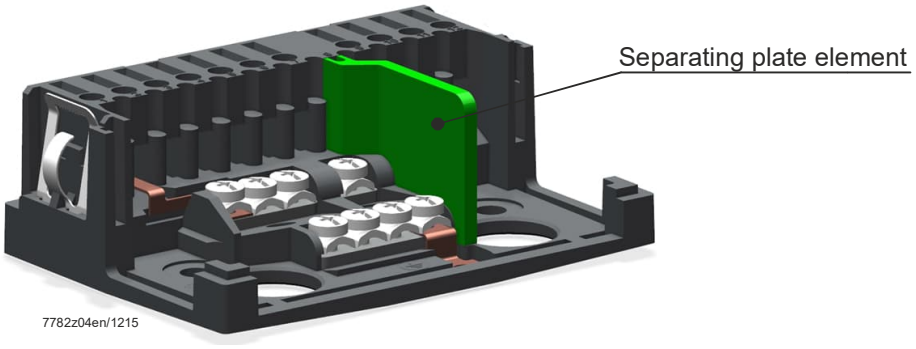
- The separating plate must only be plugged into terminal 8



- Always run the high-voltage ignition cables separately, keeping as much distance as possible from the LFS1 and other cables
- When wiring, ensure that there is enough free space for the BC interface connection jack
- Do not mix up phase and neutral conductors

Note!
For use in power supply systems with non-grounded neutral conductors!
Power supply systems with earthed neutral conductors form the basis of the diagrams and circuit diagrams of the LFS1 in this Data Sheet. In power supply systems with non-earthed neutral conductors, terminal 2 of the LFS1 must be connected to the earth conductor via the ARC466890660 RC unit for ionization current supervision. It must be made certain that local regulations are complied with (e.g., protection against electric shock) since 120 V AC (50 / 60 Hz) or 230 V AC (50 / 60 Hz) mains voltage produces peak leakage currents of 2.7 mA.

Note!
Double insulation.
The LFS1s and AGK11.7 plug-in bases, including the separating plate element, are double-insulated between terminal areas 1…7 and 9…12. This means that they are designed with reinforced insulation; also refer to chapter 'Technical data'. If the double insulation needs to extend to the connected components, the separating plate element included in the scope of delivery of the AGK11.7 plug-in base must always be mounted (marked with an arrow in the figure below). As an alternative, other suitable measures can also be put in place. Safe separation can only be ensured if all connected components are fitted with a safe separation facility and the components have been wired as specified. In particular, compliance with the relevant warning notes must be ensured.



Note!
Use of QRA2M and QRA10M UV flame detectors.
Connect the AGK30 auxiliary module in accordance with connection diagram 7782a14. The earth terminal of the AGK11.7 plug-in base (symbol ⏚) must be permanently connected to the burner ground. The AGK30 auxiliary module must always be connected within the AGK11.7 plug-in base in terminal area 1…7. Failure to observe this information poses a risk of compromising the safety functions and a risk of electric shock.

Electrical connection of the flame detectors

It is important to achieve practically disturbance-free and loss-free signal transmission:

- Never run detector cables together with other cables
  – Line capacitance has an impact on the flame signal
  – Use a separate cable
- The ionization probe does not offer protection against electric shock
- Position the ignition electrode and the ionization probe so that the ignition spark cannot arc over to the ionization probe, risk of electrical overloads
- Observe the permissible detector cable lengths; refer to chapter ‘Technical data’
- Mount and adjust the flame detector so that it only detects the flame to be supervised in each case
- Connection of QRA2M and QRA10M UV flame detectors is only permitted if the AGK30 auxiliary module is used
- Protect the UV cell adequately against the following UV sources: halogen lamps, welding equipment, special lamps, ignition sparks, as well as high-energy X-rays and gamma rays
- Reverse polarity or a short circuit at the connection terminals of the RAR9 photocell detector prevents a flame signal
- Polarity at the connection terminals of UV flame detectors QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M does not lead to a flame signal.
  A short circuit at the connection terminals of UV flame detectors QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M leads to:
  ⇨ Fault code Loc: 10: at operating level (terminal 6 of the LFS1 active)
  ⇨ No flame signal: test level (terminal 6 of the LFS1 inactive)
- As a general rule, terminal 5 of the LFS1 must not be earthed! When replacing an LFE10 flame safeguard with an LFS1.2, particular attention must be paid to connecting the earth connection of the QRA10 UV flame detector to protective earth (PE) to ensure protection class I.
- If the ionization probe short-circuits to the burner ground, there is no flame signal

Disposal notes

The LFS1 contains electrical and electronic components and must not be disposed of together with domestic waste. Local and currently valid legislation must be complied with.

Design

LFS1 features

Microprocessor-based LFS1s have a plug-in design and consist of the power supply section, flame signal amplifier, and flame relay with potential-free contacts. There is also a reset button with an integrated LED signal lamp, which is located under a viewing window. The LED is used to provide a multicolor indication of error status and operational status messages, concerning flame signal strength, for instance. The flame signal strength can also be measured as a 0...10 V DC signal using a commercially available voltmeter (at least CAT III) at terminal 7.

Communicating via the BC interface:
On the underside of the LFS1 in the base area, there is a communication interface (BC interface), which is used to change parameters or provide a numerical indication of the flame signal. When the display and operating unit AZL2 is connected, it is possible to change parameters such as the flame signal flame-on and flame-out response times. In addition, the flame signal strength can also be displayed permanently during continuous burner operation.

Use with the LME76 burner control
The circuit of the LFS1 is self-supervising and, in connection with the LME76 burner control, is tested for proper functioning at each burner startup. An automatic extraneous light test is performed by increasing the response sensitivity of the amplifier during the off times and purging times of the LME76 burner control. The QRA2/QRA4/QRA10 UV flame detector is tested automatically by increasing the operating voltage of the UV tube during the off times and purging times of the LME76 burner control.

Use with other control units
In connection with programmable logic controllers (PLCs), for example, the extraneous light test can be activated via the control input at terminal 6. This test is not required for ionization flame supervision.

Undervoltage

- Flame OFF signal: From operating position if mains voltage drops lower than approx. 80 V AC (at U_N = 120 V AC)
- Flame ON signal: Restart is initiated if mains voltage exceeds approx. 85 V AC (at U_N = 120 V AC)
- Flame OFF signal: From operating position if mains voltage drops lower than approx. 165 V AC (at U_N = 230 V AC)
- Flame ON signal: Restart is initiated if mains voltage exceeds approx. 170 V AC (at U_N = 230 V AC)

Overvoltage

No shutdown if the voltage limit exceeds U_N +10%.

Flame supervision

Flame detector	Data Sheet
Using ionization probe and QRA2/QRA4/QRA10 UV flame detector	N7712
Using ionization probe and QRA2/QRA4/QRA10 UV flame detector	N7711
Using ionization probe and QRA2/QRA4/QRA10 UV flame detector	N7713
Ionization probe (must be supplied by customer)	---

Using an ionization probe

Flame supervision by making use of the electrical conductivity of the flame in conjunction with the rectifying effect is only possible with gas and blue-flame burners. Since the flame signal amplifier responds only to the DC component of the flame signal (ionization current), a short circuit between the flame detector and functional earth cannot simulate a flame signal. Single-electrode operation, i.e., ignition and supervision with a single electrode, is not possible. Do not activate the test mode switchover using terminal 6 during flame supervision with ionization probes. Terminal 6 must be connected directly to the phase conductor at terminal 1 in this case.

Using ionization probe and QRA2 / QRA4 / QRA10 UV flame detector

An ionization probe and a QRA2/QRA4/QRA10 UV flame detector can be connected to the LFS1.2 at the same time.

The flame assessment behaves as follows:

Ionization probe	QRA2/QRA4/QRA10 UV flame detector	LFS1.2 flame assessment
OFF	OFF	OFF
ON	OFF	ON
OFF	ON	ON
ON	ON	ON

Type summary and ordering information

The type references apply to the LFS1 without an AGK11.7 plug-in base or flame detector. For ordering information for the AGK11.7 plug-in base and other accessories, refer to chapter ‘Accessories’.

Part no.	Type	Nominal voltage	Use	Flame detector	BC interface connection	Output 0...10 V	Times			Comparable flame safeguard types [2]
							tw max.	tan [1] min.	tab [1] max.	
BPZ:LFS1.11A2	**LFS1.11A2**	AC 230 V	Oil	RAR9...	•	•	5 s	0.3 s	1 s	LAE10
BPZ:LFS1.21A2	**LFS1.21A2**	AC 230 V	Gas / oil	ION QRA2 / QRA2M QRA4 / QRA4M QRA10 / QRA10M	•	•	5 s	0.3 s	1 s	LFE10
BPZ:LFS1.11A1	**LFS1.11A1**	AC 120 V	Oil	RAR9...	•	•	5 s	0.3 s	1 s	LAE10-110V
BPZ:LFS1.21A1	**LFS1.21A1**	AC 120 V	Gas / oil	ION QRA2 / QRA2M QRA4 / QRA4M QRA10 / QRA10M.C	•	•	5 s	0.3 s	1 s	LFE10-110V
						Range adjustment for times (those are added up to the hours indicated above)	From	(Parameter 217.00) 0 s	(Parameter 217.01) 0 s	
							To	(Parameter 217.00) 11.907 s	(Parameter 217.01) 11.907 s	
						Increment	---	0.147 s	0.147 s	
						Factory setting	---	0 s	0 s	

Key

tw	Waiting time
tan	Flame signal flame-on response time
tab	Flame signal flame-out response time
	Corresponds to the detection time in the event of a loss of flame (FFDT) EN 298
[1]	Factory setting: Refer to note on parameterization
[2]	LFS1s are intended to replace the respective comparable types

Note on parameterization:
Use the display and operating unit AZL2 to ensure that the exact value of the required time is always set as multiples of increments of 0.147 seconds. When parameterizing minimum or maximum times, a potential tolerance of ±7% must be taken into consideration.

The following applies to **min**imum values: At least one value which is 7% **greater** must be parameterized.
The following applies to **max**imum values: At least one value which is 7% **smaller** must be parameterized.



Example 1: The flame signal flame-out response time t_{ab} must not be set above 5 seconds
Calculation: (5 seconds – 1 second) – 7% = 3.65 seconds

Value to be parameterized
(parameter 217.01): Must be the same as or **smaller** than the calculated value (e.g., 3.528 seconds)

Example 2: The flame signal flame-on response time t_{an} must be set to at least 5 seconds
Calculation: (5 seconds – 0.3 seconds) + 7% = 5.05 seconds

Value to be parameterized
(parameter 217.00): Must be the same as or **greater** than the calculated value (e.g., 5.145 seconds)

Accessories

To be ordered separately:

Flame detector	UV flame detector **QRA2** Refer to Data Sheet N7712.	
	UV flame detector **QRA4.** Refer to Data Sheet N7711.	
	UV flame detector **QRA10** Refer to Data Sheet N7712.	
	Photocell detector **RAR9** Refer to Data Sheet N7713.	
	Ionization probe Flame detector for use with Siemens burner controls for the supervision of gas flames. Supplied by customer.	
Connection accessories for small burner controls	Plug-in base **AGK11.7** Article no.: **BPZ:AGK11.7** • For connecting the LFS1s to the burner plant • 11-pole screw terminals • With enclosed plastic separating plate to ensure safe separation between terminals 9 and 12 and terminals 1 and 7 • Black plastic Refer to Data Sheet N7201.	
	Cable gland holder **AGK65** Article no.: **BPZ:AGK65** For up to 5 Pg11 cable glands. Refer to Data Sheet N7201. Cable gland holder **AGK65.1** Article no.: **BPZ:AGK65.1** For up to 5 M16 x 1.5 cable glands. Refer to Data Sheet N7201.	

To be ordered separately:

Others

RC unit **ARC46689066 0**
Article no.: **BPZ:ARC466890660**
For the supervision of ionization currents in networks with non-earthed neutral conductor.



Mounting clip for support rail
(The suitability for the particular application has to be ensured by the user)
Order no. **2309.000**
Rittal GmbH & Co. KG
Auf dem Stützelberg
35745 Herborn, Germany
Phone: +49 (0) 2772 / 505-0
Fax: +49 (0) 2772 / 505-2319
www.rittal.de



Reset button extension **AGK20**
Article no.: **BPZ:AGK20**
Refer to chapter ‘Dimensions’.



Adapter **KF8896**
Article no.: **BPZ:KF8896**

- Adapter for replacing LAE10 and LFE10 flame safeguards with LFS1s
- Ensures mechanical height adjustment and correct terminal assignment

Refer to chapter ‘Dimensions’.



AGK30 auxiliary module
Article no.: **S55856-Z301-A100**

- For establishing compatibility of the LFS1.2 with QRA2M and QRA10M UV flame detectors
- With 4 connecting wires for connection in plug-in base AGK11.7



To be ordered separately:

Service tools

Optical interface **OCI400**
Article no.: **BPZ:OCI400**

- Optical interface between LFS1 and PC
- Facilitates viewing and recording of setting parameters on site using the ACS410 PC software

Refer to Data Sheet N7614.

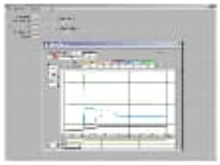


BC interface module between LFS1 and PC. Facilitates viewing, processing, and recording of setting parameters on site using the ACS410 PC software.
Refer to Data Sheet CC1N7616.

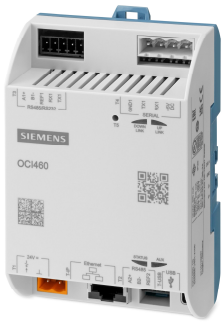
Article no.	Type	
BPZ:OCI410.30	**OCI410.30**	• Heating engineer version (standard) • Parameter change possible for the *Heating engineer* password level
BPZ:OCI410.31	**OCI410.31**	• OEM version • Parameterization using ACS410 PC software • Parameter change possible for the 'OEM' password level
BPZ:OCI410.40	**OCI410.40**	• OEM variant • Parameter change possible for the *OEM and heating engineer* password level



PC software **ACS410**
Article no.: **BPZ:ACS410**
PC software for parameterization and visualization of the LFS1.
On request.
Refer to Software Documentation J7352.



OCI460 cloud gateway
Climatix IC communication gateway and Modbus interface with galvanic separation for burner controls, burner management systems, or flame safeguards equipped with Modbus or BC interface communication.
Refer to Data Sheet N7600.



OCI460.10
Article no.: **S55666-J401-A100**

- European variant

OCI460.11
Article no.: **S55666-J402-A100**

- Chinese variant

To be ordered separately:

Display and operating unit

Display and operating unit **AZL21.00A9**
Article no.: **BPZ:AZL21.00A9**
Separate unit, choice of mounting methods, 8-digit LCD, 5 buttons, BC interface for LFS1, degree of protection IP40.
Refer to Data Sheet N7542.

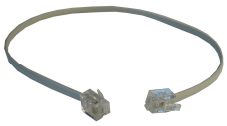


Display and operating unit **AZL23.00A9**
Article no.: **BPZ:AZL23.00A9**
Separate unit, choice of mounting methods, 8-digit LCD, 5 buttons, BC interface for LFS1, degree of protection IP54.
Refer to Data Sheet N7542.



Signal cable **AGV50.100**
Article no.: **BPZ:AGV50.100**
Signal cable for AZL2 display and operating unit, with RJ11 connector, cable length 1 m, pack of 10.

Signal cable **AGV50.300**
Article no.: **BPZ:AGV50.300**
Signal cable for AZL2 display and operating unit, with RJ11 connector, cable length 3 m, pack of 10.



Technical data

General unit data

Mains voltage (rated voltage) • LFSx.xxA1 • LFSx.xxA2	For grounded and non-grounded networks 120 V AC (also suitable for 100 V AC networks). 230 V AC
Mains frequency	50...60 Hz
Internal consumption	5 VA
Rated surge voltage	Overvoltage category III: 4 kV for the complete LFS1 unit 2.5 kV for the creepage distances or air gaps due to voltage limitation measures
Basis of calculation for air gaps and creepage distances	Overvoltage category III and degree of contamination 2 for 230 V AC in accordance with DIN EN 60730-1: - Reinforced insulation between terminal areas 1...7 and 9...12 - Normal insulation between terminal areas 9...10 and 11...12
External primary fuse (Si) (optional)	Max. T6.3H250V to IEC 60127-2

Caution!
Risk of damage to the switching contacts!
If the external primary fuse (Si) is blown due to overload or short-circuit at the terminals, the LFS1 must be replaced.

Internal fuse for terminals 11 and 12 (fuse cannot be replaced)	T1.6L250V to IEC 60127-4
External current limitation for terminals 9 and 10	Example: External fuse T1.6A
Permissible mounting position	Optional
Weight • LFS1.11A1 • LFS1.11A2 • LFS1.21A1 • LFS1.21A2	 115 g 115 g 148 g 144 g
Safety class • Safety class I • Safety class II	To DIN EN 60730-1: For applications without safe separation. Protection against electric shock is achieved through double or reinforced insulation. Provision for the protective earth connection is made in the plug-in base AGK11.7. When replacing an LAE10/LFE10 flame safeguard with a KF8896 adapter and an LFS1, the maximum protection class that can be achieved is I. For applications with safe separation. Protection against electric shock is achieved through double or reinforced insulation.
Degree of protection	IP40, to be ensured through mounting
Degree of contamination	Degree of contamination 2 to DIN EN 60730-1
Software class	Class C to DIN EN 60730-2-5 2-channel structure
Minimum self-test frequency of the LFS1	2x per second for continuous operation with ionization probe or RAR9 photocell detector
Detection time in the event of loss of flame	Max. 1 s for LFS1 (including flame detector)
Reaction time in the event of loss of flame	Typically 1.2 s Max. 2 s, for LFS1 with LME76 burner control
Voltage output at terminal 7	DC 0…10 V Increment DC 40 mV

Permissible cable lengths	At a line capacitance of 100 pF/m, unshielded For longer distances, use **low-capacitance** cables, maximum 2 nF total, unshielded
• Terminals 3	Max. 20 m Run detector cables separately, at least 5 cm away from other cables
• Terminals 4 and 5	Max. 20 m For >10 m, use a shielded cable and connect the shield to PE at one end. Run detector cables separately, at least 5 cm away from other cables.
• Terminal 6	Max. 20 m
• Terminal 7	Max. 3 m
• Terminals 9 to 12	Max. 20 m Max. 300 m For longer distances, use **low-capacitance** cables, maximum 2 nF total, unshielded. In the event of reduced current rating of max. 0.01 A, 24 V DC / 24 V AC and cosφ = 1. The Ölflex Smart cable type 108 / 4 x 0.75 mm² is ideal
• BC interface connection	Max. 3 m
Connectable cross-sectional areas for the AGK11.7 plug-in base	
• Terminals 1...7 and 9...12	Min. 0.5 mm² and max. 1.5 mm² Solid or stranded wire with ferrule
• Auxiliary terminals N, PE, 31	Min. 0.50 mm² and max. 1.5 mm² Solid or stranded wire with ferrule (when connecting 2 solid or stranded wires per terminal, the same cross-sectional areas must be used for each terminal)
Specifications as per EN 60730-1:	
Type of shutdown or interruption of each circuit	Shutdown with micro switch, 1-pole Mode of operation type 2 B

Perm. current rating	
Terminals 3 and 5 (flame detectors)	Refer to *Flame detectors* chapter
Terminal 6 (test mode switchover)	Max. 1 mA
Terminal 7 (voltage output 0...10 V)	Max. 0.1 mA
Terminals 11 and 12 (NO switching output)	Max. 1 A, cosφ ≥0.6
	For a maximum of 250,000 burner startup cycles
	Max. 0.1 A, cosφ = 1
	For a maximum of 1,000,000 burner startup cycles
Terminals 9 and 10 (NC switching output)	Max. 0.1 A, cosφ ≥0.6
	For a maximum of 250,000 burner startup cycles
	Max. 0.1 A, cosφ = 1
	For a maximum of 1,000,000 burner startup cycles

Permissible switching voltage	
Terminal 6 (test mode switchover)	Mains voltage +10%
Terminals 11 and 12 (NO switching output)	DC 125 V AC 250 V
Terminals 9 and 10 (NC switching output)	DC 125 V AC 250 V

Environmental conditions

Storage	
Temperature range	-20...+60°C
Humidity	<95% r.h.
Transport	
Temperature range	-20...+60°C
Humidity	<95% r.h.
Operation	
Temperature range	-20...+60°C
Humidity	<95% r.h.
Installation altitude	Max. 2,000 m above sea level



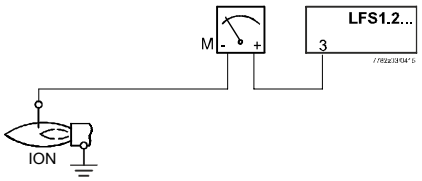
Attention!
Condensation, formation of ice, and ingress of water are not permitted. If this is not observed, there is a risk of loss of safety functions and a risk of electric shock.

AGV50 signal cable AZL2 display and operating unit → OCI410 BC interface module

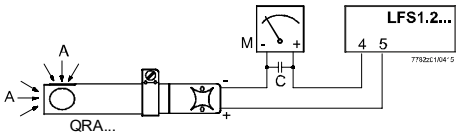
AGV50 signal cable	To connect display and operating unit AZL2 White, unshielded cable Internal conductor 4 x 0.141 mm² Each cable with 2 RJ11 connectors
Cable length	
• AGV50.100	1 m
• AGV50.300	3 m
Place of use of the AGV50 signal cable with connector	Under the burner hood (additional measures for SKII to EN 60730-1)

Measuring circuits for detector current measurement

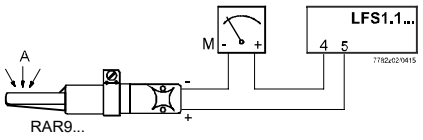
Ionization probe



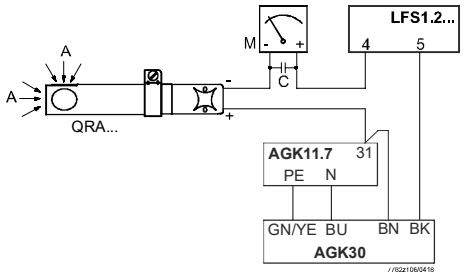
UV flame detector
QRA2 / QRA4 / QRA4M / QRA10



Photocell detector
RAR9



UV flame detector
QRA2M / QRA10M



Key

A	Incidence of light from the flame
C	Electrolytic capacitor 100 µF, 10 V DC
ION	Ionization probe
M	DC microammeter, internal resistance ≤5,000 Ω
QRAx	UV flame detector
RAR9	Photocell detector

Attention!
High-voltage ignition may affect the ionization current.
Possible remedy: Swap the ignition transformer's primary connection.

Flame supervision with ionization probe	**At mains voltage**	
Values apply to factory setting of parameters 182 = 0	**120 V AC**	**230 V AC**
Detector voltage between ionization probe and ground (AC voltmeter Ri ≥10 MΩ)	Approx. 270 V AC	Approx. 270 V AC
Switching threshold (limit values): Switching on (flame ON) (DC ammeter Ri ≤5 kΩ) Switching off (flame OFF) (DC ammeter Ri ≤5 kΩ)	 ≥DC 1.5 µA ≤DC 0.5 µA	 ≥DC 1.5 µA ≤DC 0.5 µA
Detector current required for reliable operation	≥DC 3 µA	≥DC 3 µA
Switching threshold in the event of poor flame during operation (LED flashes green)	Approx. DC 2 µA	Approx. DC 2 µA
Possible detector current with flame (typical)	20 µA DC	20 µA DC

Technical data (continued)

Flame supervision with UV flame detector QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M	**At mains voltage**	
Values apply to factory setting of parameters 182 = 0	**120 V AC**	**230 V AC**
Detector voltage at the QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M UV flame detector (no load)		
Terminal 6 OFF (test mode)	Approx. 290 V AC	Approx. 290 V AC
Terminal 6 ON (operating mode)	Approx. 250 V AC	Approx. 250 V AC
Switching threshold (limit values): Switching on (flame ON) Switching off (flame OFF)	 ≥20 µA DC ≤5 µA DC	 ≥20 µA DC ≤5 µA DC
Detector current required for reliable operation	≥24 µA DC	≥24 µA DC
Switching threshold in the event of poor flame during operation (LED flashes green)	Approx. 24 µA DC	Approx. 24 µA DC
Possible detector current with flame (typical): • Test mode • Operating mode	 700 µA 550 µA	 700 µA 550 µA

Notes
Lifetime of the UV cell.
UV cells and QRA2/QRA4/QRA10 UV flame detectors are subject to wear and tear and must be replaced as part of regular maintenance, at the latest at the end of the average lifetime of the UV cell. The lifetime of the UV cell corresponds to approx. 10,000 hours at a maximum of +50°C; higher ambient temperatures reduce the lifetime considerably. For details, refer to chapter ‘Technical data’ in data sheet N7712 for the QRA2/QRA10 UV flame detector.
For details, refer to chapter ‘Technical data’ in data sheet N7711 for the QRA4 UV flame detector.

Flame supervision with photocell detector RAR9	**At mains voltage**	
Values apply to factory setting of parameters 182 = 0	**120 V AC**	**230 V AC**
Switching threshold (limit values): • Switching on (flame ON) • Switching off (flame OFF)	 ≥6.5 µA DC ≤3.5 µA DC	 ≥6.5 µA DC ≤3.5 µA DC
Detector current required for reliable operation	≥10 µA DC	≥10 µA DC
Switching threshold in the event of poor flame during operation (LED flashes green)	Approx. 10 µA DC	Approx. 10 µA DC
Possible detector current with flame (typical)	65 µA DC	65 µA DC
Possible detector current in the event of glare, e.g., with artificial light (leads to lockout with error message Loc: 10)	70 µA DC	70 µA DC

The detector current values specified in the table only apply to the factory settings and under the following conditions:

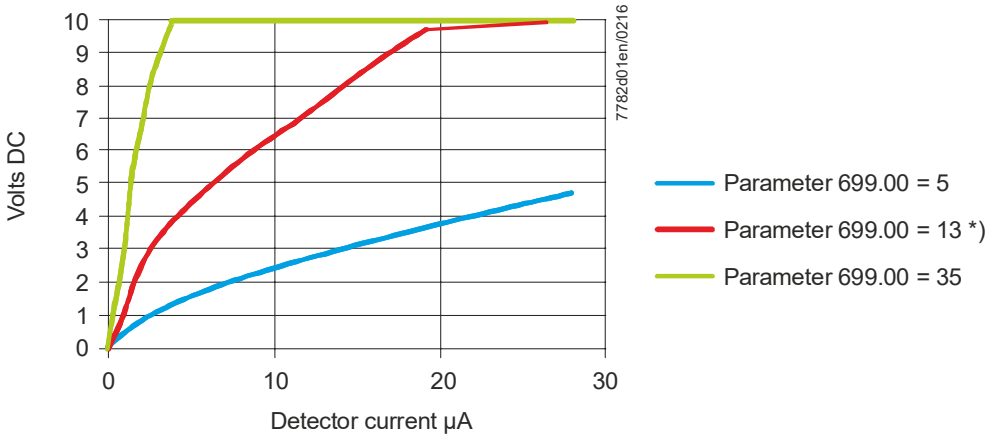
- Mains voltage 120 V AC / 60 Hz or 230 V AC / 50 Hz, depending on type
- Ambient temperature 23 °C
- Parameter 182 in accordance with the factory setting from the following table

Technical data (continued)

Range adjustment for flame sensitivity using parameter 182:	Switching threshold for switching on flame ON signal / Test level switching threshold for flame detector		
	Ionization probe	**QRA2/QRA2M/QRA4/QRA4M/QRA10/QRA10M UV flame detector**	**RAR9 photocell detector**
Parameter 182 = 0	**1 µA / 1 µA [1])**	**12 µA / 12 µA [1])**	**5 µA / 5 µA [1])**
Parameter 182 = 1	2 µA / 2 µA	12 µA / 12 µA	10 µA / 8 µA
Parameter 182 = 2	4 µA / 4 µA	12 µA / 12 µA	20 µA / 18 µA
Parameter 182 = 3	8 µA / 8 µA	12 µA / 12 µA	30 µA / 28 µA

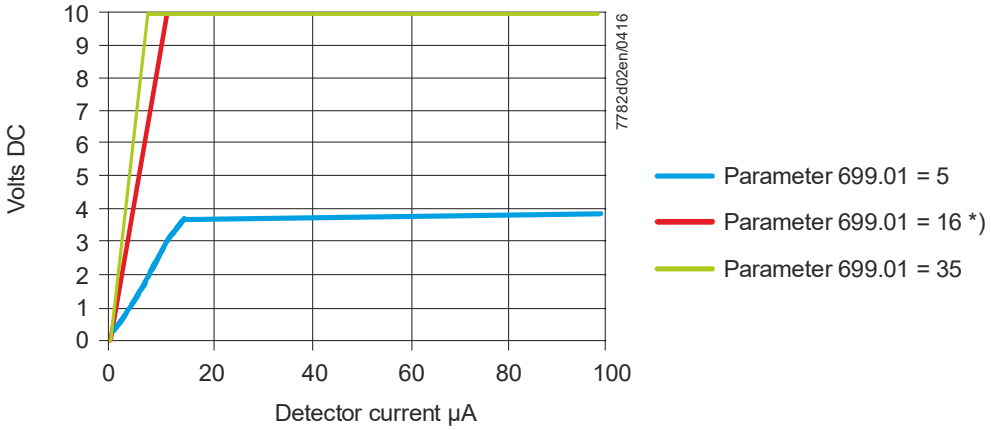
[1]) Values printed in bold are the same as the factory settings

LFS1.2 terminal 7 voltage output for flame supervision with ionization probe



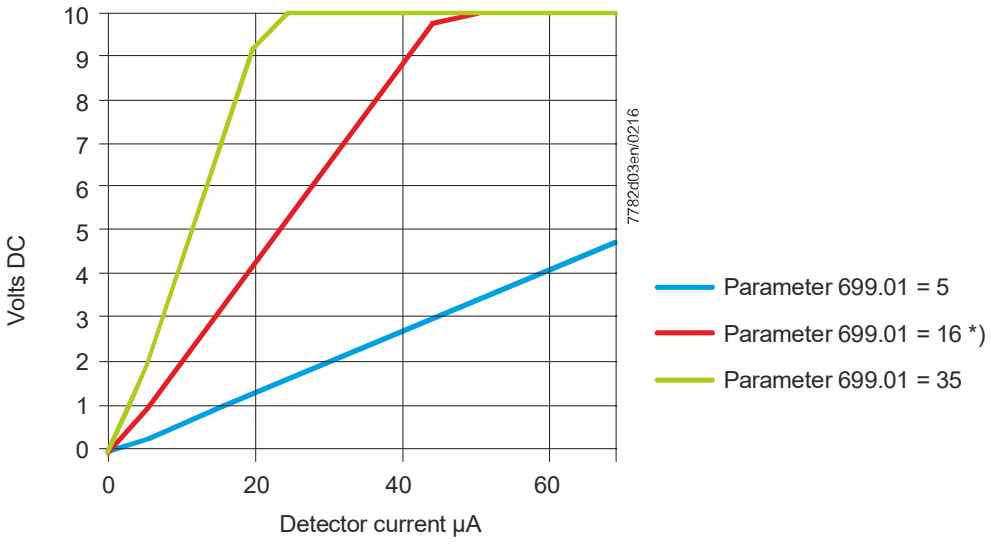
*) Factory setting

LFS1.2 terminal 7 voltage output for flame supervision with QRA2 / QRA2M / QRA4 / QRA4M / QRA10 / QRA10M UV flame detector



*) Factory setting

LFS1.1 terminal 7 voltage output for flame supervision with RAR9 photocell detector



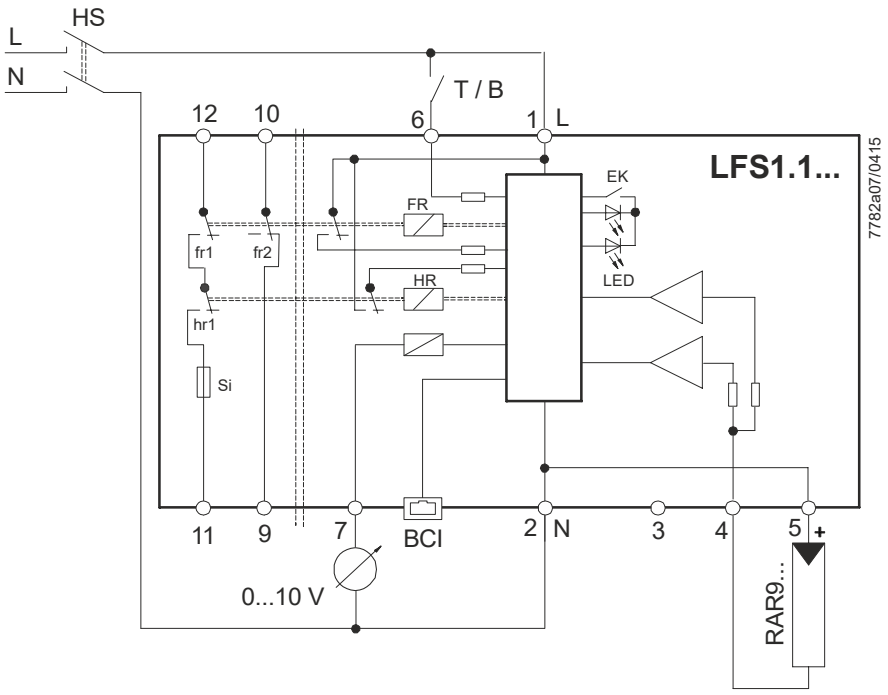
*) Factory setting

The information applies under the following conditions:

- Mains voltage 230 V AC / 50 Hz or 120 V AC / 60 Hz, depending on type
- Ambient temperature 23 °C

Connection diagram and internal diagram

LFS1.1 with RAR9 photocell detector



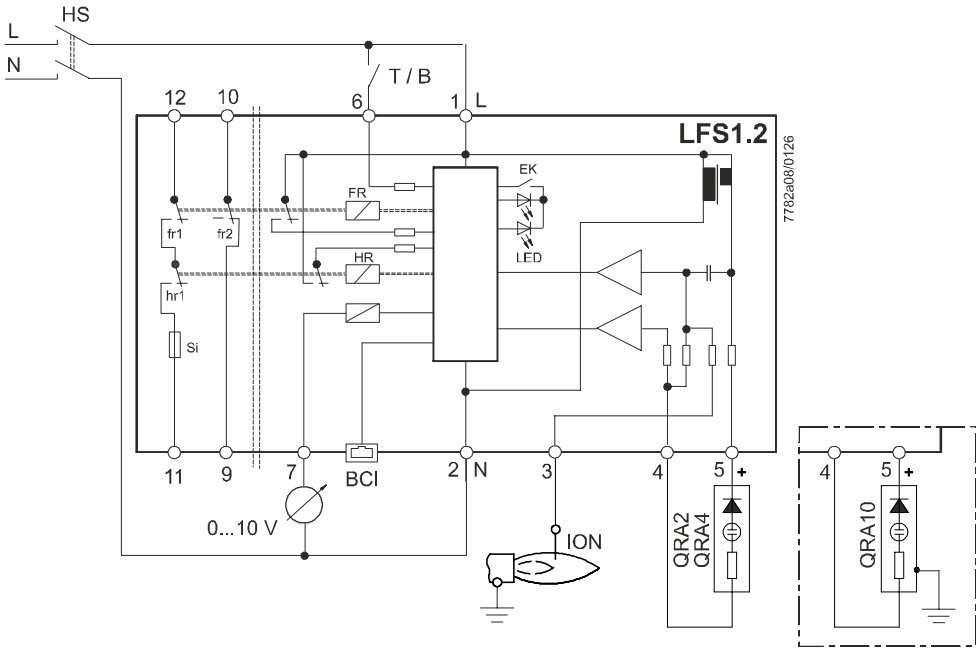
Note!
The test/operating mode changeover (T/B) is only required in connection with the LME76 burner control. Otherwise terminal 6 of the LFS1 must be connected directly to the phase conductor «L» at terminal 1 in this case.

Key

BCI	Communication interface (**B**urner **C**ommunication **I**nterface)
EK	Lockout reset button (internal)
FS	Flame signal
FSV	Flame signal amplifier
FR	Internal flame relay
fr1	Flame relay NO contact
fr2	Flame relay NC contact
HR	Internal auxiliary relay (test mode switchover)
hr1	Auxiliary relay NO contact
HS	All-polar main switch
ION	Ionization probe
LED	Internal LED (three-colored)
QRAx	UV flame detector
RAR9	Photocell detector
Si	Internal fuse
T/B	Flame signal amplifier test mode switchover (QRA2 / QRA4 / QRA10 UV flame detector, RAR9 photocell detector: Only required when used with the LME76 burner control)
0...10 V	Voltage output for outputting flame signal strength
+	Terminal marking on the QRA2/QRA4/QRA10 UV flame detector

Connection diagram and internal diagram

LFS1.2 with QRA2 / QRA4 / QRA4M / QRA10 UV flame detector

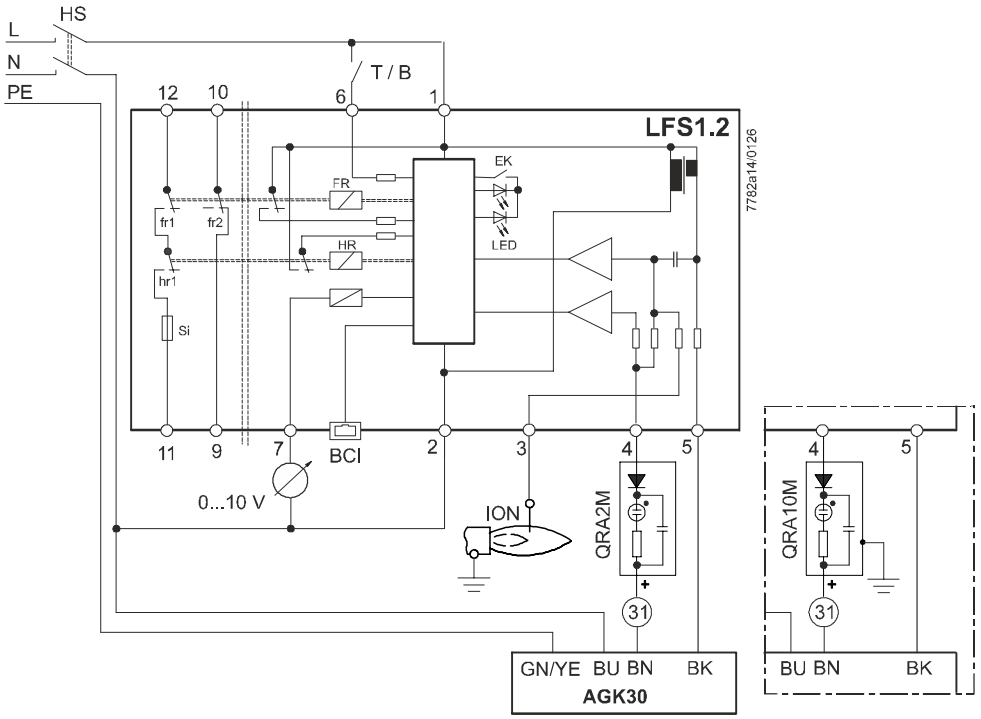


Key

BCI	Communication interface (**B**urner **C**ommunication **I**nterface)
EK	Lockout reset button (internal)
FS	Flame signal
FSV	Flame signal amplifier
FR	Internal flame relay
fr1	Flame relay NO contact
fr2	Flame relay NC contact
HR	Internal auxiliary relay (test mode switchover)
hr1	Auxiliary relay NO contact
HS	All-polar main switch
ION	Ionization probe
LED	Internal LED (three-colored)
QRAx	UV flame detector
RAR9	Photocell detector
Si	Internal fuse
T/B	Flame signal amplifier test mode switchover (QRA2 / QRA4 / QRA10 UV flame detector, RAR9 photocell detector: Only required when used with the LME76 burner control)
0...10 V	Voltage output for outputting flame signal strength
+	Terminal marking on the QRA2/QRA4/QRA10 UV flame detector

Connection diagram and internal diagram

LFS1.2 with QRA2M / QRA10M UV flame detector



Key

BCI	Communication interface (**B**urner **C**ommunication **I**nterface)
EK	Lockout reset button (internal)
FR	Internal flame relay
fr1	Flame relay NO contact
fr2	Flame relay NC contact
HR	Internal auxiliary relay (test mode switchover)
hr1	Auxiliary relay NO contact

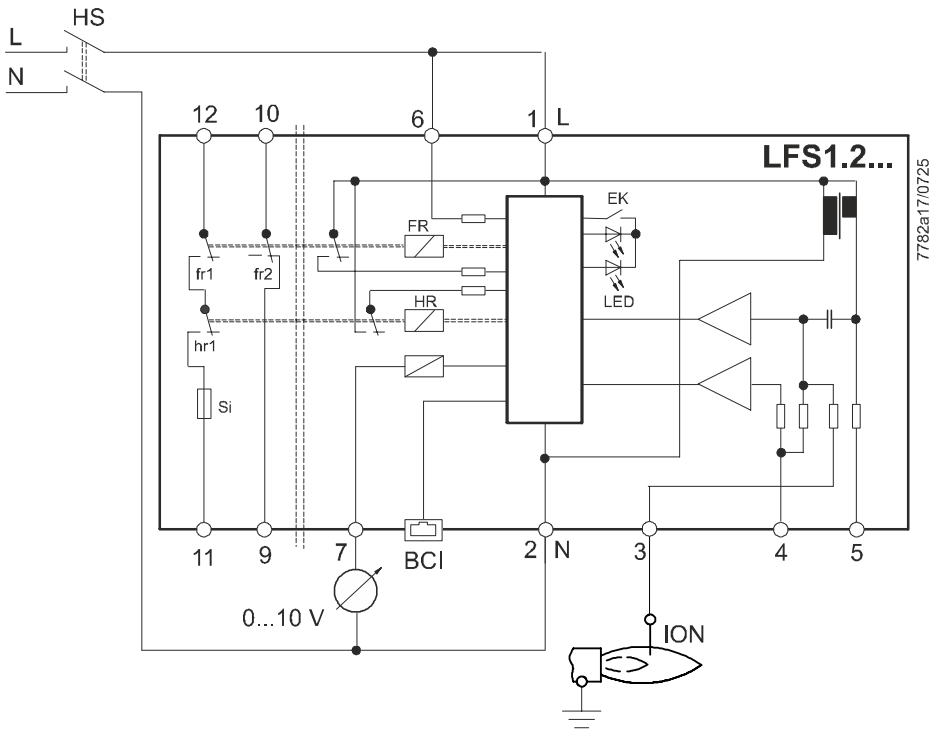
HS	All-polar main switch
ION	Ionization probe
LED	Internal LED (three-colored)
QRAx	UV flame detector
Si	Internal fuse
T/B	Flame signal amplifier test mode switchover (QRA2 / QRA4 / QRA10 UV flame detector, RAR9 photocell detector: Only required when used with the LME76 burner control)
0...10 V	Voltage output for outputting flame signal strength
+	Terminal marking on the QRA2/QRA4/QRA10 UV flame detector
1…31	Number of terminals in plug-in base AGK11.7

Connecting wire colors of the AGK30 auxiliary module

BU	Blue
BN	Brown
GN/YE	Green/yellow
BK	Black

Connection diagram and internal diagram

LFS1.2 with ionization probe



Key

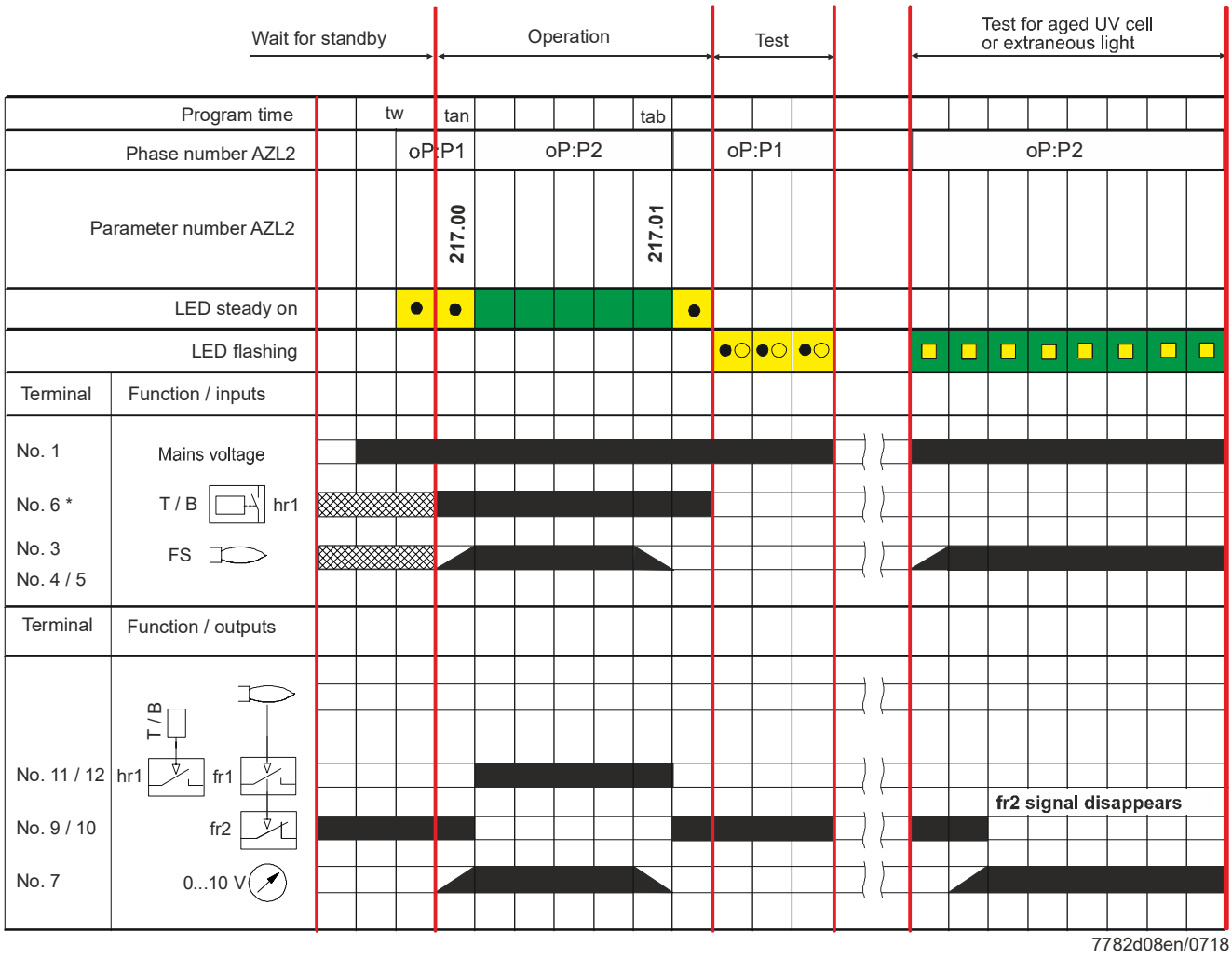
BCI	Communication interface (**B**urner **C**ommunication **I**nterface)
EK	Lockout reset button (internal)
FR	Internal flame relay
fr1	Flame relay NO contact
fr2	Flame relay NC contact

Connecting wire colors of the AGK30 auxiliary module

BU	Blue
BN	Brown
GN/YE	Green/yellow
BK	Black

HR	Internal auxiliary relay (test/operating mode changeover)
hr1	Auxiliary relay NO contact
HS	All-polar main switch
ION	Ionization probe
LED	Internal LED (three-colored)
Si	Internal fuse
0...10 V	Voltage output for outputting flame signal strength
1…31	Number of terminals in AGK11.7 plug-in base

LFS1 program sequence



Key

FS	Flame signal
fr1	Flame relay NO contact
fr2	Flame relay NC contact
hr1	Auxiliary relay NO contact
LED	Internal LED (three-colored)
T/B	Flame signal amplifier test mode switchover (QRA2/ QRA2M/QRA4/QRA4M/QRA10/QRA10M UV flame detector)
*	Extraneous light test for QRA2/QRA2M/QRA4/QRA4M/QRA10/QRA10M UV flame detectors (not required with RAR9 photocell detector or ionization current flame supervision)

tw	Waiting time
tan	Flame signal flame-on response time
tab	Flame signal flame-out response time
0...10 V	Voltage output for outputting flame signal strength
oP:P1	Flame signal OFF
oP:P2	Flame signal ON
■	Input / output signal 1 (ON)
□	Input / output signal 0 (OFF)
▨	Input permissible signal 1 (ON) or 0 (OFF)

Basic mode of operation of the LFS1 in connection with the LME76 burner control

In this application, the LFS1 inputs the flame signal into the control program of the LME76 burner control. In the event of non-ignition of the flame, loss of flame during operation, or a faulty flame signal (e.g., extraneous light) during the off times or purging times, the burner is shut down and the LME76 burner control initiates a lockout. The flame signal from the LFS1 is input to the LME76 burner control via terminal X10-05. The LME76 burner control evaluates the voltage states at pin 1 and pin 3 of terminal X10-05 to detect the flame status (flame ON, flame OFF, extraneous light).

Important notes on operation

- Compatibility:
  The LFS1 may only be connected to an LME76 burner control.
- Operating modes:
  ⇨ Continuous operation of the LME76 burner control with LFS1 is only permitted in connection with the RAR9 photocell detector (via LFS1.11Ax) or an ionization probe (via LFS1.21Ax)
  ⇨ When using QRA2/QRA4/QRA10 UV flame detectors (with LFS1.21Ax), only intermittent operation is permitted (continuous operation <24 hours)
- Display:
  Irrespective of the LED displays in the reset button of the LFS1, the LME76 burner control has its own 3-color signal lamp (LED) and a 3x7-segment display for showing operating, fault, and status information
- Note on QRA10/QRA10M UV flame detectors:
  The QRA10/QRA10M UV flame detector must be earthed; refer to chapter ‘Connection diagram and internal diagram’

Operation with ‘direct’ ionization probe

If an ionization probe is used ‘directly’ on the LME76 burner control without an intermediate LFS1, the following points must be observed:

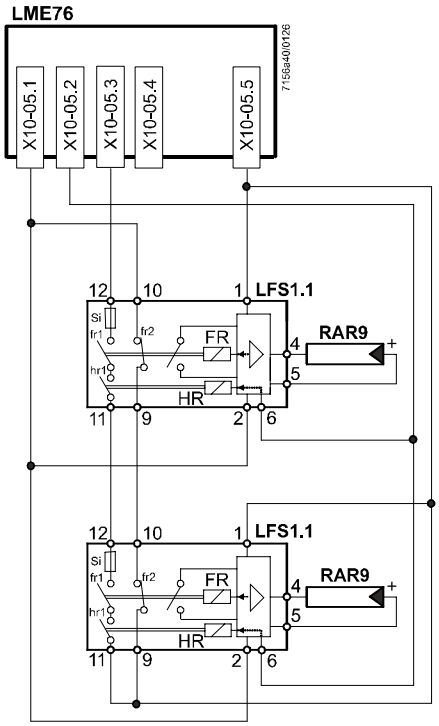
- The ionization probe is connected to terminal X10-06
- A wire link (DBR1) must be installed on the LME76 burner control between pin 1 and pin 5 of terminal X10-05

Mode of operation of the LFS1s with dual supervision (detailed connection diagram, e.g., for oil burners)

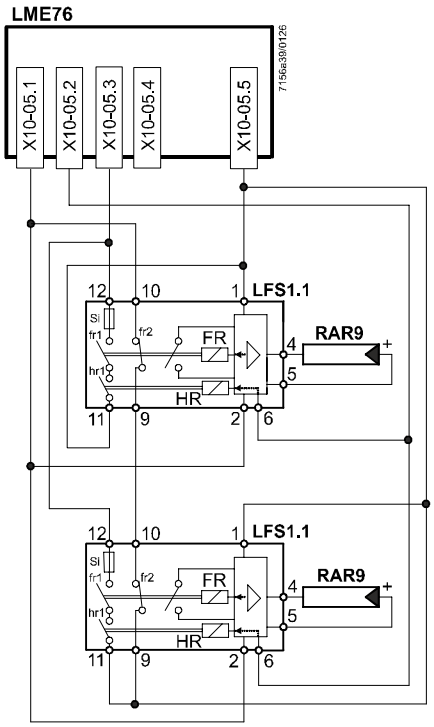
With this type of supervision, **1** flame is supervised by **2** independently operating LFS1s. The aim is to reduce the possibility of loss of flame during operation, in the event of simultaneous failure of **both** LFS1s, to an **unlikely coincidence**. With dual supervision, the control contacts of the flame relays of both LFS1s are connected in series so that loss of the **flame signal from either LFS1 is sufficient** to initiate a burner lockout. A faulty flame signal from just **one** of the two LFS1s during the off times or purging times also initiates a lockout.

Connection diagram ⇨ LME76 burner control with two …

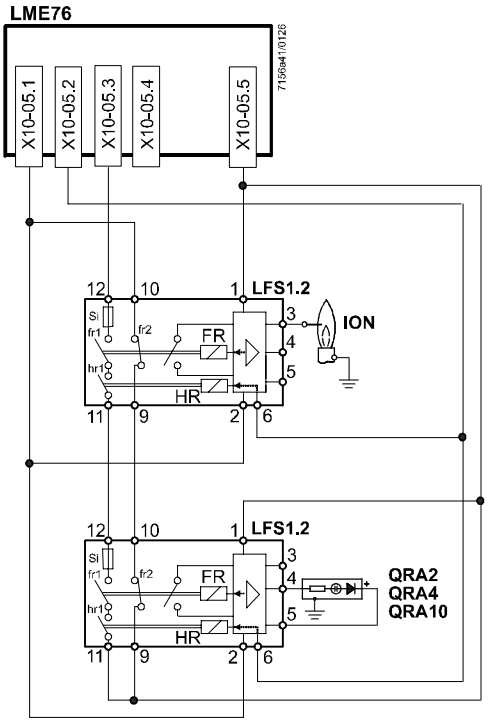
LFS1.1 AND link and RAR9 photocell detector



LFS1.1 OR link and RAR9 photocell detector

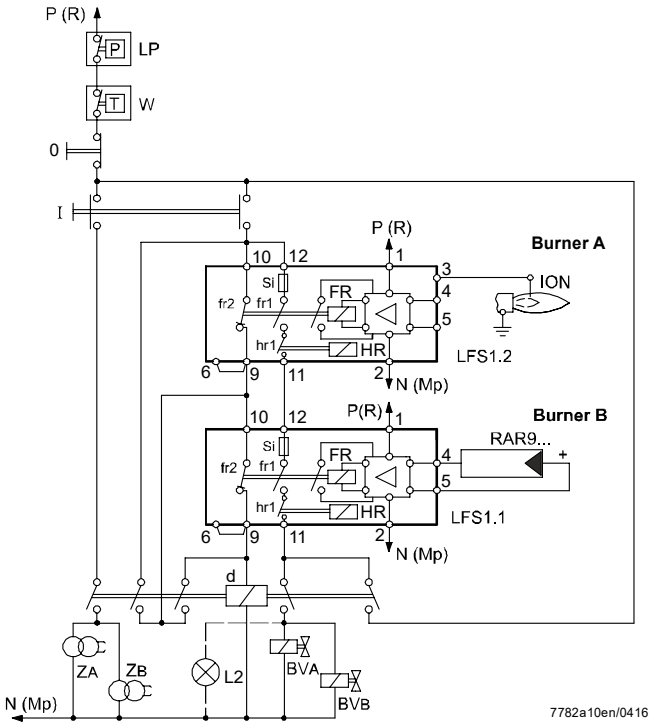


LFS1.2 AND link with QRA2/QRA4/QRA10 UV flame detector and ionization probe



Key	
FR	Internal flame relay
fr1	Flame relay NO contact
fr2	Flame relay NC contact
HR	Internal auxiliary relay (test mode switchover)
hr1	Auxiliary relay NO contact
ION	Ionization probe
QRAx	UV flame detector
BV1	1st fuel valve
BV2	2nd fuel valve
RAR9	Photocell detector
Si	Internal fuse
Z	Ignition transformer

Mode of operation of the LFS1s when used for the supervision of two manually controlled burners



With this application, the burner can only be started if the flame detector test or flame simulation test has been successful. This means that **neither** of the two LFS1s may detect a flame signal during the off times. When the burner is started up, the detector test will automatically be interrupted. When button (I) is pressed, relay (d) is energized via circuit path 9…10 of the flame relays, which is still closed, thereby switching on the ignition of both burners. At the same time, fuel is released. The duration of the start pulse generated by pressing button (I) should be limited by a time relay to act as a **safety time**. If a flame is established on **both** burners – indicated by the signal lamps in the housing of the LFS1s – relay (d) is now maintained in its energized condition via circuit path 11…12 of the two flame relays. When button (I) is released, the ignition is switched off, thus completing the startup sequence. In the event of loss of flame on **one** of the burners, the corresponding flame relay is de-energized, thereby interrupting the holding circuit for relay (d). This means that the fuel valves of **both** burners are closed immediately. The burners are switched off manually by pressing button (0) or automatically by the control thermostat or pressurestat / pressure switch in the phase wire connection. In the case of flame supervision with ionization probes, terminal 6 of the LFS1s must be connected directly to the phase since no detector test is required here.

Example:
By connecting it to terminal 1.

Note!
Ensure that the drop-out delay time of relay **d** does not exceed 50 ms; refer to connection example 7782a06.

Key	
BVx	Fuel valve
FR	Internal flame relay
fr1	Flame relay NO contact
fr2	Flame relay NC contact
HR	Internal auxiliary relay (test mode switchover)
hr1	Auxiliary relay NO contact
L2	Lockout warning lamp, external
LP	Air pressure switch
Rx	Control thermostat or pressurestat
Si	Internal fuse
W	Limit thermostat or pressure switch
Z	Ignition transformer

As with dual supervision, the control contacts of the flame relays of all LFS1s must also be connected in series with multiflame supervision.

One burner initiates a non-volatile lockout for all burners if:

- the flame is not established during the safety time

OR

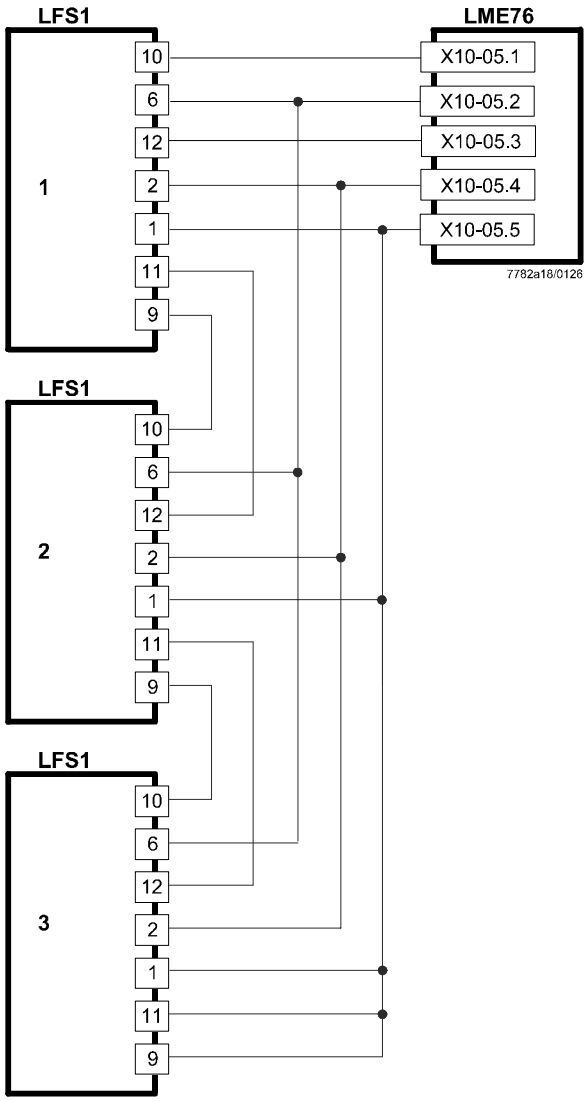
- the flame is lost during operation

After the LME76 burner control has been reset, the correctly operating burners can only be restarted once the faulty burner has been shut down. In this case, the operating switch must not only bridge the control contacts of the relevant LFS1, thereby closing the control chain again, but also interrupt the phase wire connection to the ignition transformer and the fuel valves. Likewise, after rectification of the fault, the burner can only be restarted together with the other burners; that is, only after all burners have previously been shut down.

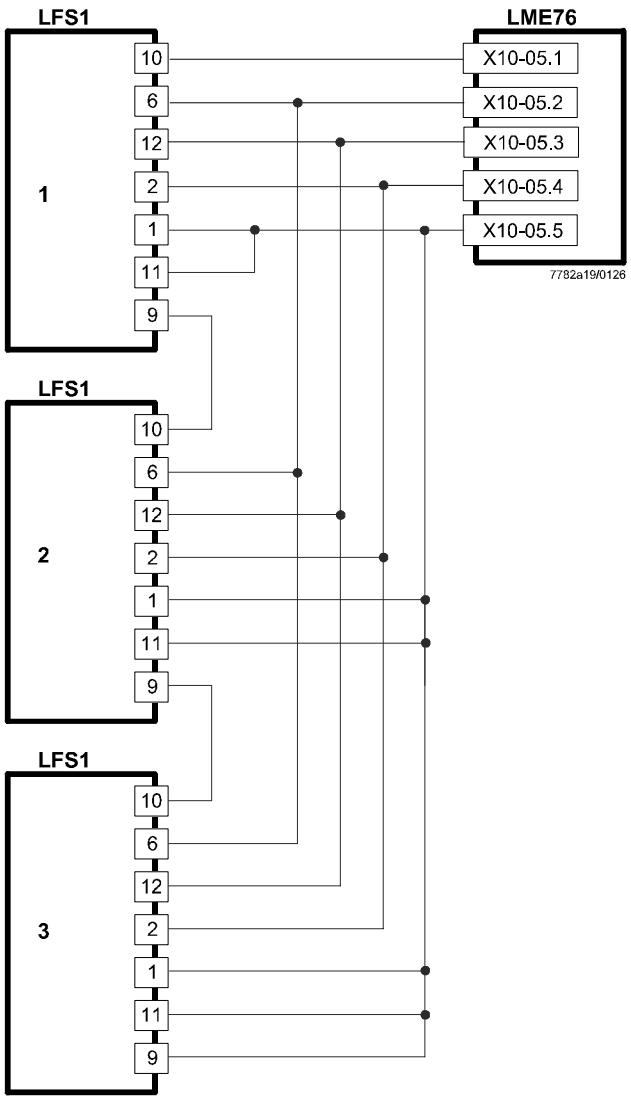
Several LFS1s can be connected for multiflame supervision; the connection diagram on the left is identical to the illustration on the right.

Connection diagram ⇨ Multiflame supervision with LME76 burner control and three LFS1s

AND link



OR link



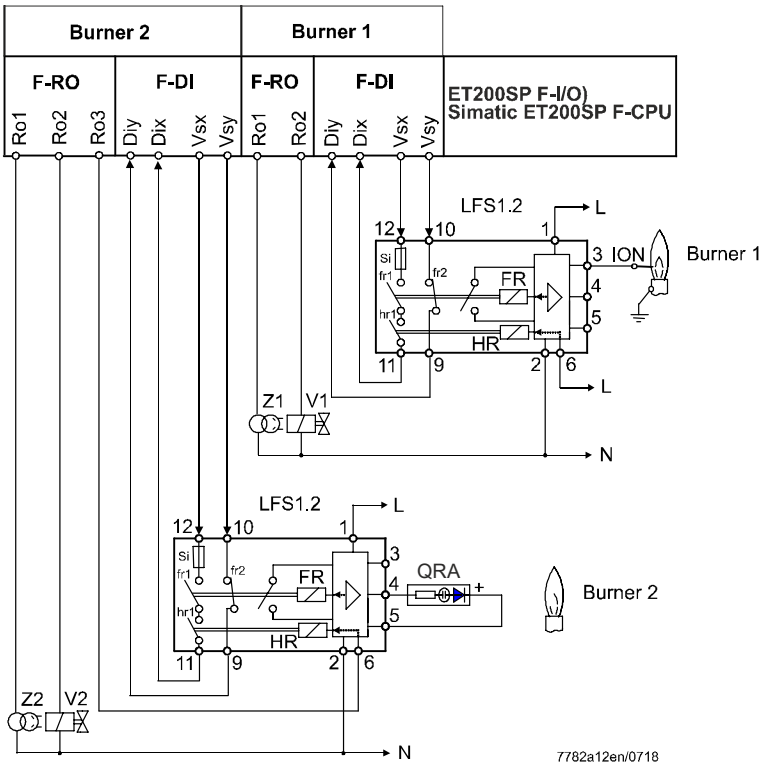
Attention!
An ignited UV tube is a source of UV radiation. In the case of flame supervision by means of flame detectors, the detectors must be placed in a way that ensures there is **no direct visual contact** between them. If this is not observed, there is a risk of loss of safety functions.

Please note!
When replacing an LFE10 flame safeguard with LFS1.2, the earth connection at terminal 10 in the AGK11.7 plug-in base must be connected; terminal 5 of LFS1.2 must not have an earth connection. The earth connection of the QRA10 UV flame detector remains unchanged to ensure protection class I.

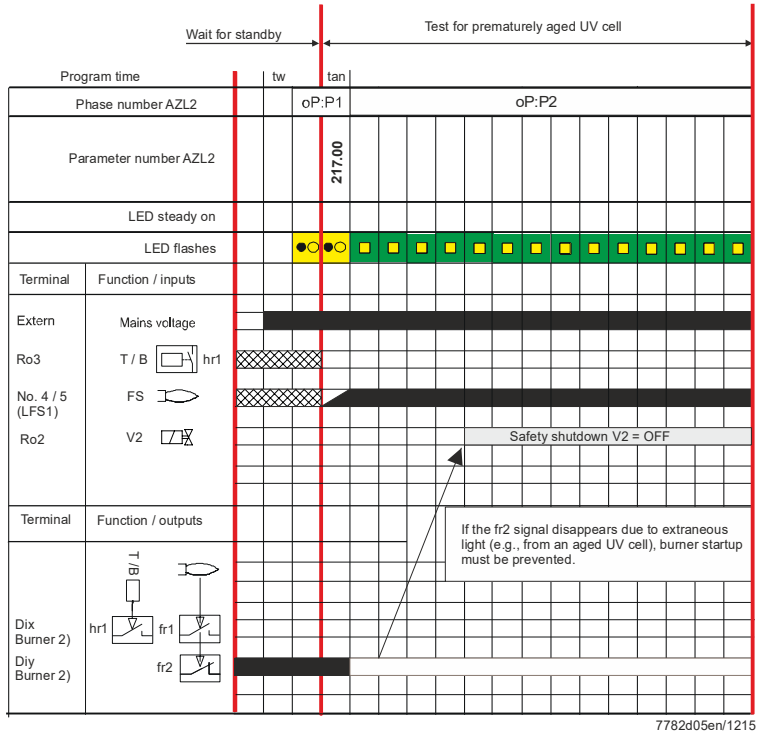
Key

BS	Operating switch OFF / ON → for each burner
FR	Internal flame relay
BV1 / BV2	Fuel valves for 1st and 2nd stage
fr1	Flame relay NO contact
fr2	Flame relay NC contact
HR	Internal auxiliary relay (test mode switchover)
hr1	Auxiliary relay NO contact
ION	Ionization probe
QRAx	UV flame detector
Si	Internal fuse
Z	Ignition transformer

Mode of operation of LFS1.2s with multiflame supervision in connection with a PLC, intermittent operating mode

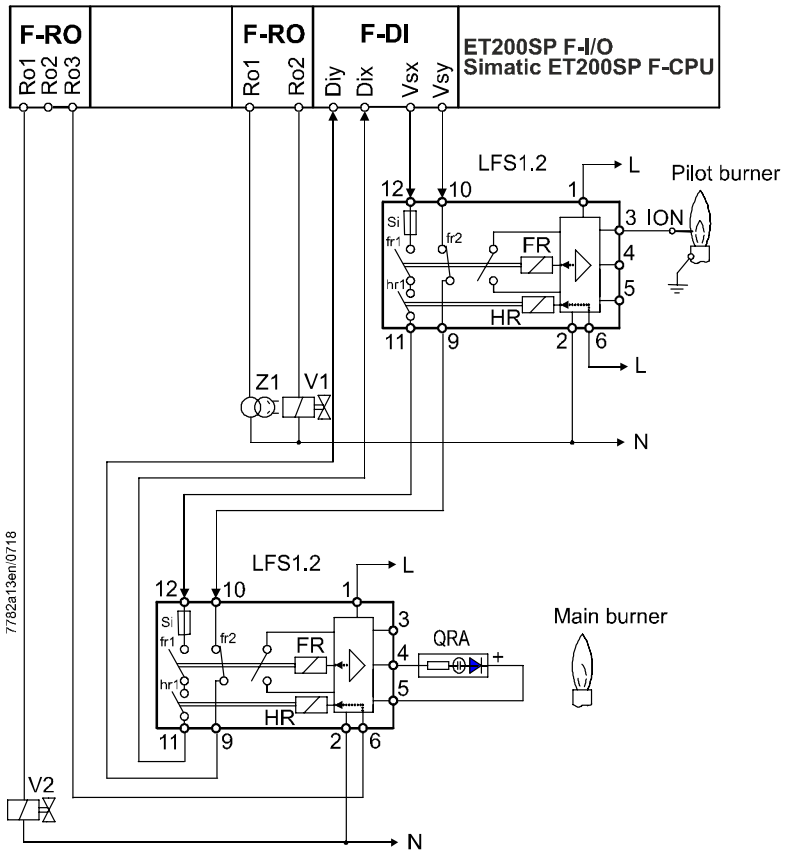


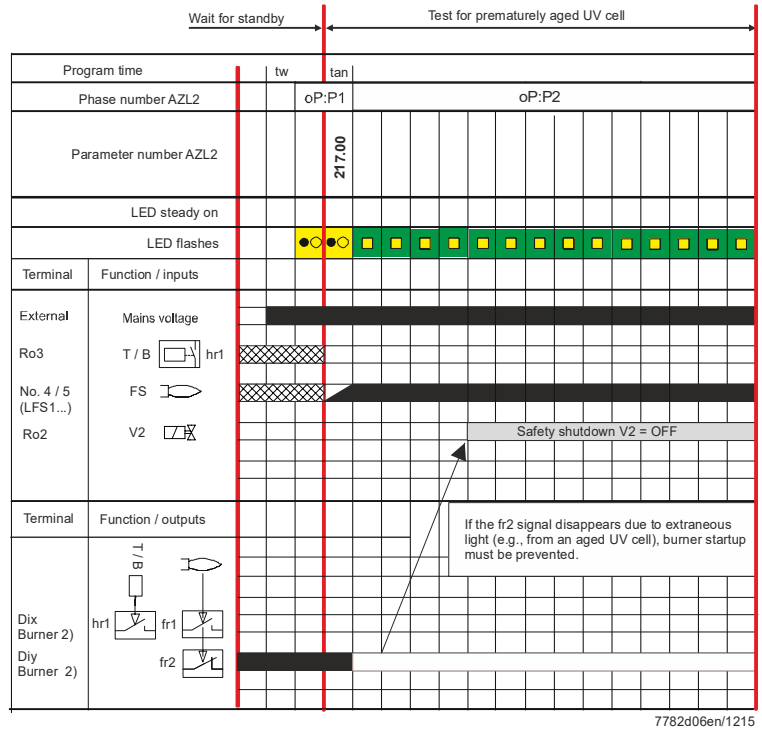
In the case of multiflame supervision, a fail-safe PLC performs the central control function (the example shown uses a Simatic ET200SP F-CPU and input / output modules ET200SP F-I/O). Each burner has its own ignition equipment, its own fuel valve, and its own flame supervision system (made up of an LFS1.2 and a flame detector). The control contacts of the flame relays of all LFS1.2s are connected in parallel. In other words, each burner can be switched on and off independently of the other burner. The flame signal is evaluated in the PLC on a non-equivalent basis in line with the evaluation principle 1oo2 (1-OFF-2). This means that the 2-way start pulse is tested at terminals **Dix** and **Diy**. In the event of a flame ON signal, the fr1 (NO) contact closes and the fr2 (NC) contact opens at the same time. In the event of a flame OFF signal, the fr2 (NC) contact closes and the fr1 (NO) contact opens at the same time.



The test/operating mode changeover of LFS1.2 for burner 1 is inactive (terminal 6 is permanently connected to line conductor ‘L’). The test/operating mode changeover of LFS1.2 for burner 2 is active. This means that terminal 6 is switched off by the PLC via a fail-safe relay output (Ro3) at set intervals or after 24 hours of uninterrupted burner operation at the very latest; refer to the adjacent control sequence. The PLC must prevent further burner operation until the cause of the error has been rectified.

Mode of operation of LFS1.2s with multiflame supervision with pilot burner and in connection with a PLC, intermittent operating mode





In the case multiflame supervision with a pilot burner, a fail-safe PLC performs the central control function (the example shown uses a Simatic ET200SP F-CPU and input / output modules ET200SP F-I/O). The pilot burner has its own ignition equipment (Z1), its own fuel valve (V1), and its own flame supervision system made up of an LFS1.2 and an ionization probe (ION). The main burner has its own fuel valve (V2) and its own flame supervision system made up of an LFS1.2 and a QRA2/QRA4/QRA10 UV flame detector. The main burner does not have its own ignition equipment (Z1) as its flame is reliably ignited by the pilot burner. The control contacts of the flame relays for both LFS1.2s are connected in series. This means that both burners can only be switched on and off together with the other burner in each case. The flame ON signal at terminals **Dix** / **Diy** on the digital input module F-DI can therefore only occur when both flame signals are present. Extinguishing 1 of the 2 flames, or even both flames, leads to a flame OFF signal. The flame signal is evaluated in the PLC on a non-equivalent basis in line with the evaluation principle 1oo2 (1-OFF-2). This means that the 2-way start pulse is tested at terminals *Dix* and *Diy*. In the event of a flame ON signal, the fr1 (NO) contact closes and the fr2 (NC) contact opens at the same time. In the event of a flame OFF signal, the fr2 (NC) contact closes and the fr1 (NO) contact opens at the same time.

The test/operating mode changeover of LFS1.2 for the pilot burner is inactive (terminal 6 is permanently connected to line conductor 'L'). The test/operating mode changeover of LFS1.2 for the main burner is active. This means terminal 6 is switched off by the PLC via a fail-safe relay output (Ro3) at set intervals or after 24 hours of uninterrupted burner operation at the very latest; refer to the adjacent control sequence. The PLC must prevent further burner operation until the cause of the error has been rectified.

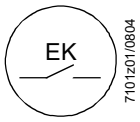
Attention!
A fail-safe PLC must be used!

Key

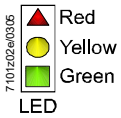
F-CPU	Fail-safe CPU (central processing unit) of PLC
F-DI	PLC fail-safe digital input modules
F-RO	PLC fail-safe digital relay output modules
ION	Ionization probe
L / N	Phase conductor / neutral conductor
FR / HR	Flame relay / auxiliary relay
V1 / V2	Fuel valve for burner 1 / burner 2
QRAx	UV flame detector
PLC	Programmable logic controller
Z1	Ignition transformer for pilot burner

Operation, indication, diagnostics

Operation



The lockout reset button (EK) is the key operating element for resetting the burner control and for activating / deactivating the diagnostics functions.



The multicolor signal lamp (LED) in the lockout reset button is the key indicating element for both visual diagnostics and interface diagnostics.

Both elements (EK / LED) are located under the transparent cover of the lockout reset button.

There are 2 diagnostics options:

1. Visual diagnostics: Operational status indication or diagnostics of the cause of error.
2. Interface diagnostics: Via the OCI400 optical interface and ACS410 PC software (in preparation).

A description of the visual diagnostics is provided below.

Operational status indication

In normal operation, the different operating states are indicated in the form of color codes according to the color code table below:

Color code table for the multicolor signal lamp (LED)

Status	Color code	Color
Waiting time (tw) or no operating voltage	○.....	OFF
Waiting for flame signal	●.....	Yellow
Test mode active, no extraneous light signal available	○●○●○●○●○●○	Flashing yellow
Test mode active, extraneous light signal available	●■●■●■●■●■●	Yellow-green
Operation, flame OK	■.....	Green
Operation, flame not OK	○■○■○■○■○■○	Flashing green
Undervoltage	●▲●▲●▲●▲●▲●▲	Yellow-red
Error, alarm	▲.....	Red
Fault code output; refer to chapter ‘Fault code table’	○▲○▲○▲○▲○▲○	Flashing red
Interface diagnostics	▲▲▲▲▲▲▲▲▲▲▲▲	Red flickering light
Warning message: 1 million switching cycles exceeded (switching cycle counter)	● x ● x ● x ● x ● x ● x	Also flashes yellow in addition to the current color “x”

Key

..... Permanent
○ OFF
▲ Red
● Yellow
■ Green

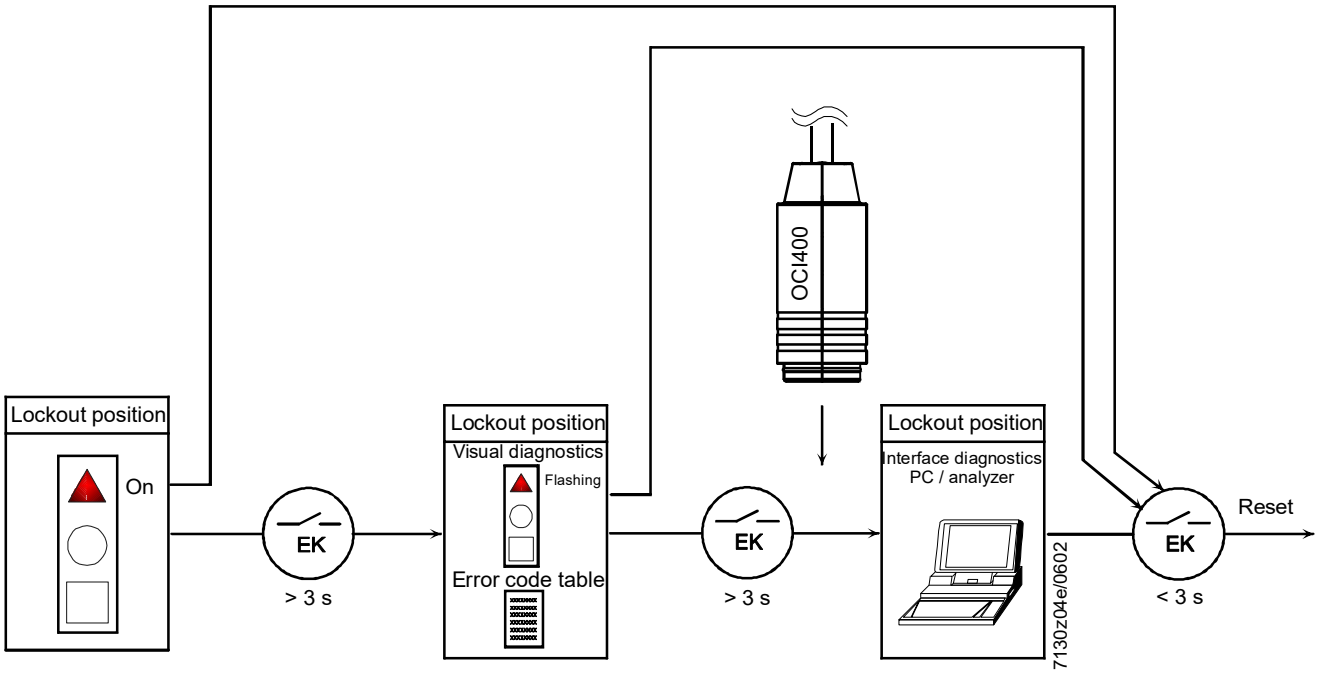
Service counter

Press the lockout reset button (EK) for 10 seconds to activate a yellow flashing warning signal when 1 million switching cycles have been performed. In this case, it is advisable to carry out a safety test or to replace the unit. If 1 million switching cycles have not yet been performed, there will be no yellow flashing warning signal. Press the lockout reset button (EK) for 10 seconds again to deactivate this function.

Diagnostics of cause of error

After a non-volatile lockout, the signal lamp (LED) lights up red. In this status, visual diagnostics of the cause of the error according to the error code table can be activated by pressing the lockout reset button for more than 3 seconds. By pressing the lockout reset button again for more than 3 seconds, the interface diagnostics will be activated. The interface diagnostics only work if the AGK20 lockout reset button extension is not fitted. If the interface diagnostics have been activated by accident – in which case the slightly red light of the signal lamp (LED) flickers – it can be deactivated by pressing the lockout reset button again for more than 3 seconds. The moment of switching over is indicated by a yellow light pulse.

The following sequence activates diagnostics of the cause of the error:



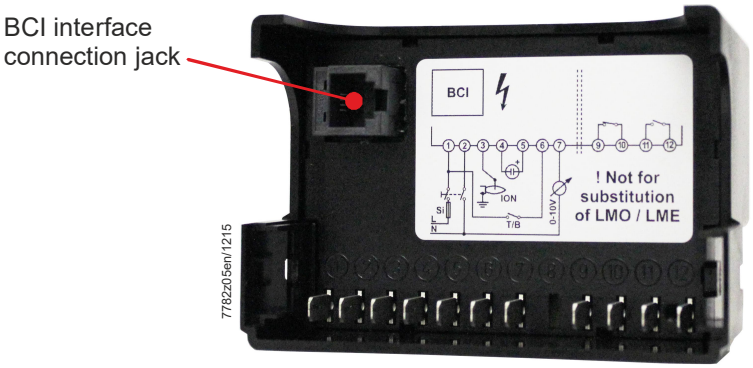
Signal lamp (LED) flashing code	Possible cause
1...9 flashes	Free
10 flashes	• Wiring error or internal error, output contact error, other errors. • Detector current of the RAR9 photocell detector outside the permissible range (defective RAR9 photocell detector or glare) • Short circuit at the connection terminals of the QRA2/QRA4/QRA10 UV flame detectors at operating level (terminal 6 of the LFS1 active)
15 flashes	Manual locking active (Loc: 167)

When diagnosing the cause of errors, the built-in relays **FR** and **HR** are in the no-load position.

Reset to quit diagnostics of the fault cause and switch the LFS1 on again. Press the lockout reset button for approx. 1 second (<3 seconds).

BC interface

The BC interface connection jacks are located on the underside in the LFS1 base area; refer to the figure. Parameters can be set in accordance with the parameter list below using the display and operating unit AZL2 and signal cable AGV50. The signal cable AGV50 is preassembled and fitted with a RJ11 connector. When connecting, ensure that the orientation is correct – the clip on the RJ11 connector must inserted into the notch on the connection jack. A click sound indicates that the clip has locked into place. To disconnect the connection, open the clip by gently tilting it towards the cable using your finger before pulling out the RJ11 connector.



The display and operating unit AZL2 with LCD display enables simple operation, parameterization, and targeted diagnostics via menu-driven operation. When performing diagnostics, the display shows the operating statuses, the type of error, and the startup counter (IBZ). Passwords protect the different parameter levels for OEM (burner / boiler manufacturer) and heating engineers (HF) against unauthorized access. Simple settings that the plant operator can make on site do not require a password.

For detailed information on parameterization, refer to the A7782 user documentation for the LFS1, chapter ‘Operation via the AZL2 display and operating unit’.

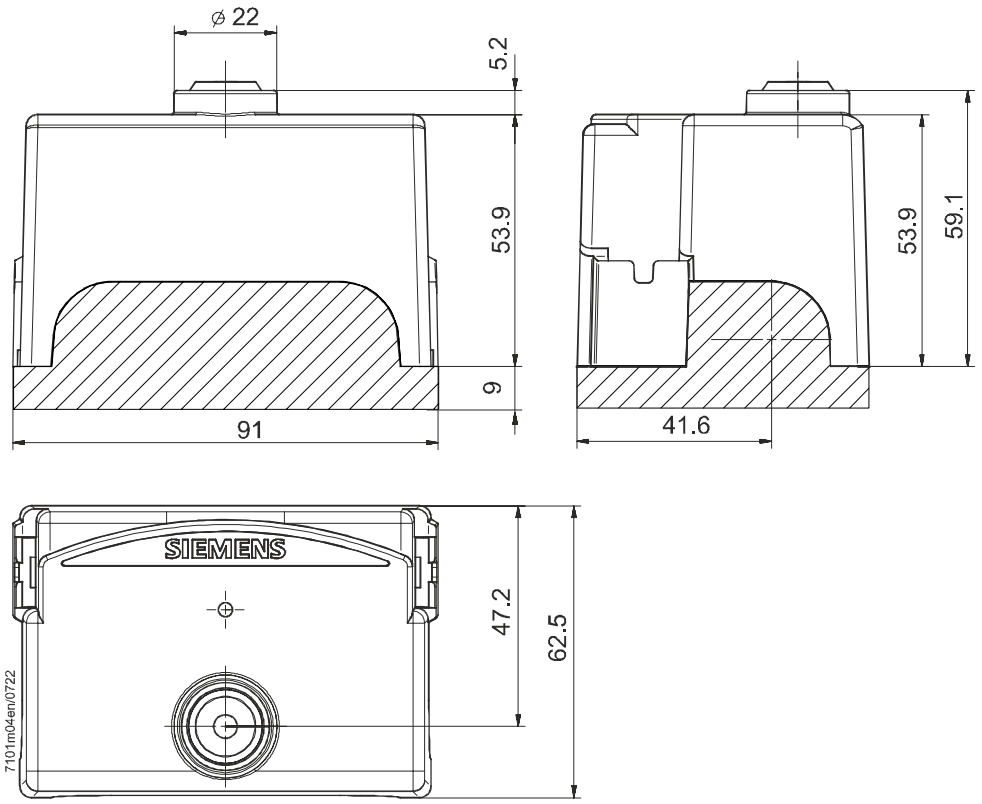
Dimensions

Dimensions in mm

LFS1



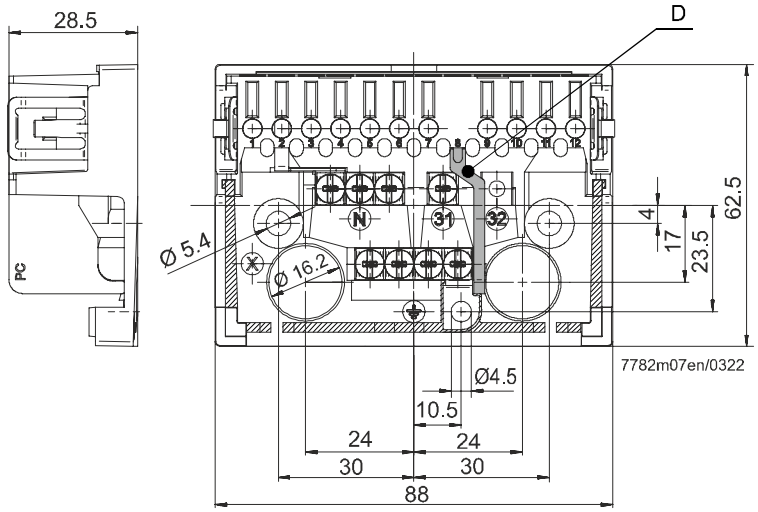
Plug-in base AGK11.7 and AGK65.1



Plug-in base AGK11.7 with separating plate element (D)

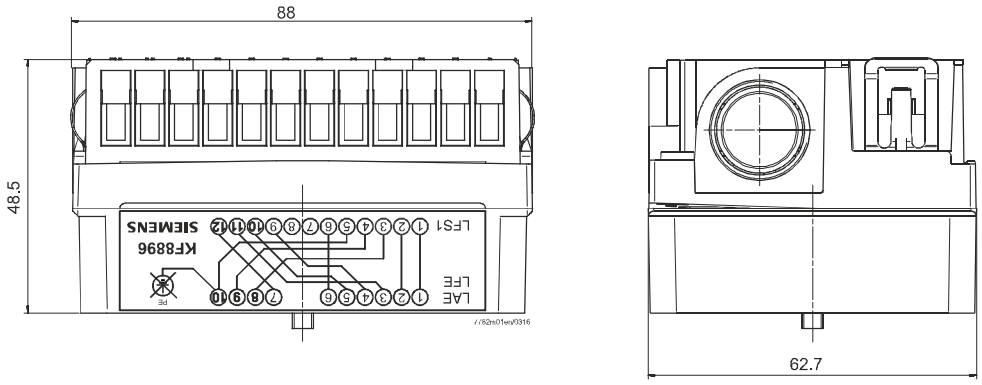


AGK11.7 plug-in base



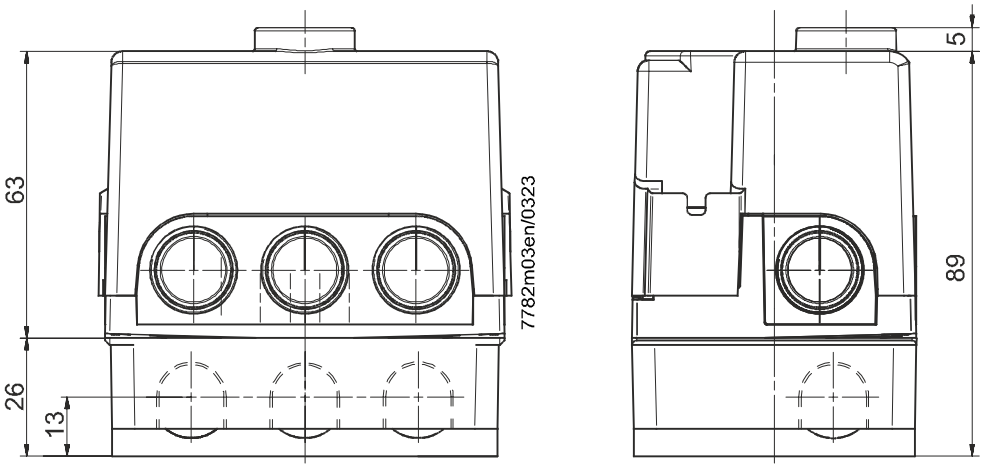
Dimensions in mm

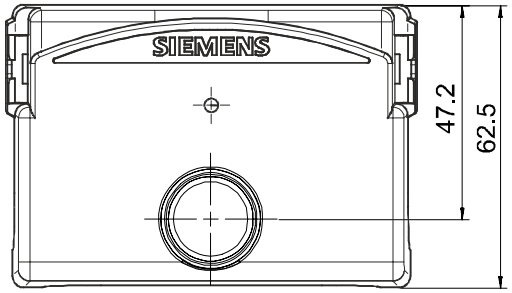
Adapter KF8896



When replacing LAE10 and LFE10 flame safeguards with LFS1, the KF8896 adapter ensures mechanical height compensation and correct terminal assignment.

LFS1 with KF8896 adapter and LAE10/LFE10 flame safeguard with low AGK410413450 plug-in base

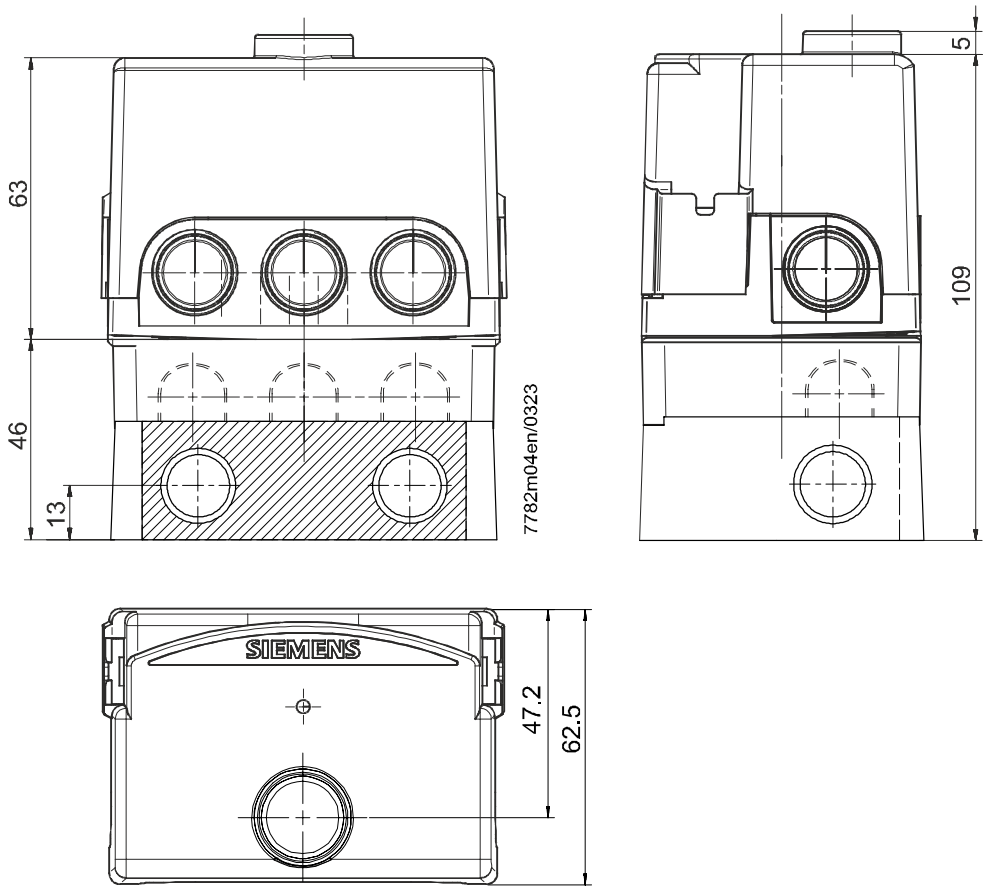




Dimensions (continued)

Dimensions in mm

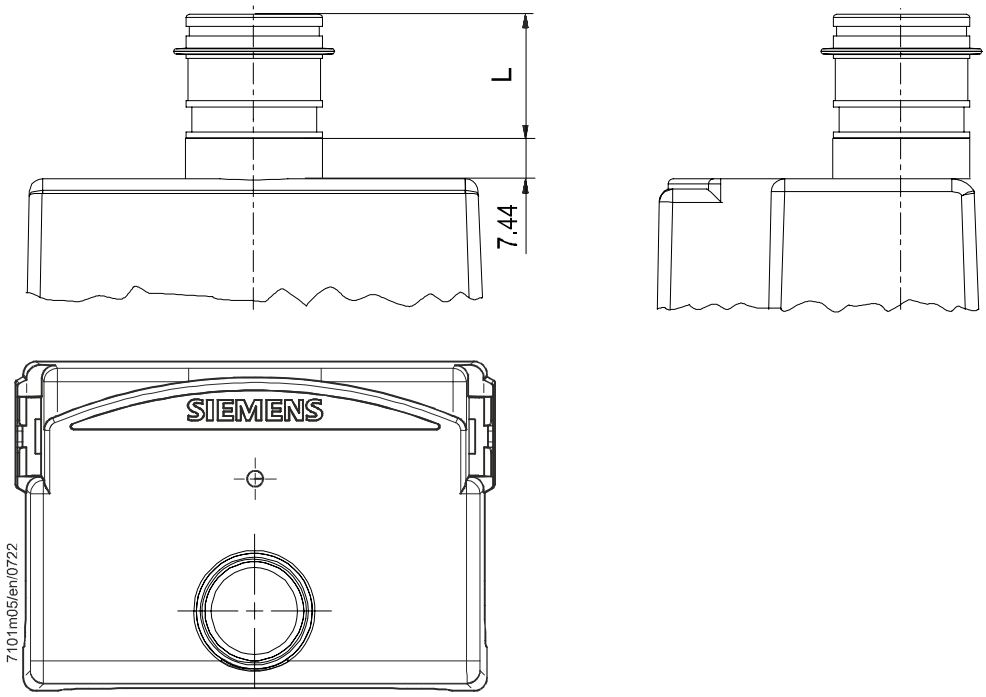
LFS1 with KF8896 adapter and LAE10/LFE10 flame safeguard with high AGK410490250 plug-in base



Dimensions (continued)

Dimensions in mm

LFS1 with lockout reset button extension
AGK20



Type (ASN)	Length (L) in mm
AGK20.19	19
AGK20.43	43
AGK20.55	55

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Subject to change!