SIEMENS

7118



LOA2...



LOA3...

Oil Burner Controls

LOA2...
LOA3...

Oil burner controls for the supervision, startup and control of 1- or 2-stage forced draft oil burners in intermittent operation.
Oil throughput of less than 30 kg/h.

The LOA2... / LOA3... and this Data Sheet are intended for use by OEMs which integrate the oil burner controls in their products.

Use, features

Use

The LOA... are used for the startup, supervision and control of 1- or 2-stage forced draft oil burners in intermittent operation.
Yellow-burning flames are supervised with photoresistive detectors QRB..., blue-burning flames with blue-flame detectors QRC...

- Applications in accordance with EN 267: Automatic forced draft burners for liquid fuels
- Type-tested and approved in accordance with DIN EN 230:1991

General features

- Undervoltage detection
- Bridging contact for oil preheater (not with LOA28.173A27)

Specific features

- Special versions including models for incinerator plants and flash-steam generators
- LOA36... with color display of flame intensity and operating

☞ Note!
Do not use for new designs.

CC1N7118en
19.05.2016

Building Technologies Division

ПРОМЭЛЕКТРОНИКА / sales@prom-elec.com

Warning notes



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

Do not open, interfere with or modify the unit!

- All activities (mounting, installation and service work, 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 not observed, there is a risk of electric shock hazard
- Ensure protection against electric shock hazard by providing adequate protection for the burner control's connection terminals. If not observed, there will be a risk of electric shock
- Each time work has been carried out (mounting, installation, service work, etc.), check to ensure that wiring is in an orderly state and make the safety checks as indicated in *Commissioning notes* above. If this is not observed, there is a risk of loss of safety functions and a risk of electric shock.
- Press the lockout reset button / operating button only manually (applying a force of no more than ≤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.
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage. If this is not observed, there is a risk of loss of safety functions and a risk of electric shock.



Attention!
Earth the burner in compliance with the relevant regulations; earthing the boiler alone does not suffice!

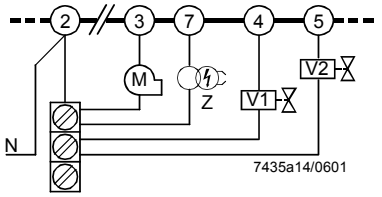
Mounting notes

Ensure that the relevant national safety regulations are complied with.

Installation notes

- Always run high-voltage ignition cables separately while observing the greatest possible distance to the unit and to other cables
- Make absolutely certain that live and neutral conductors are correctly connected to terminals 1 and 2 of the burner control
- Install switches, fuses, earthing, etc., in compliance with local regulations
- Ensure that the maximum permissible current load for the connecting terminals is not exceeded (refer to *Technical data)*
- Do not feed external mains voltage to the control outputs of the burner control. When testing the function of devices controlled by the burner control (fuel valves or similar), the burner control must not be connected
- To disconnect the unit from the mains, a complete shut-down must be carried out under overvoltage category III conditions in each pole
- Secure the earthing lug in the terminal base with a metric screw and a lockwasher or similar
- Switches, fuses, earthing, etc., must be in compliance with local regulations; primary fuse max. 10 A (fast)
- For safety reasons, feed the neutral conductor to the neutral distributor in the plug-in base, or to terminal 2. Connect the burner components (fan, ignition transformer and fuel valves) to the neutral distributor as shown in the figure 7435a14. The connection between the neutral conductor and terminal 2 is prewired in the terminal base

Example



Key

Vx	Fuel valve
M	Fan motor
Z	Ignition transformer

Correct wiring of neutral conductors!

Electrical connection of flame detectors

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

- Never run the detector cable together with other cables
  – Line capacitance reduces the magnitude of the flame signal
  – Use a separate cable
- Observe the permissible lengths of the detector cables, see *Technical data* and Data Sheet / Flame detector QRB (N7714) and QRC (N7716).

Commissioning notes

When commissioning the plant, when carrying out maintenance work, or after longer off periods, make the following safety checks:

	Safety check to be carried out	Anticipated response
a)	Burner startup with flame detector darkened	Lockout at the end of «TSA»
b)	Burner startup with flame detector exposed to extraneous light	Lockout after approx. 40 seconds
c)	Simulation of flame failure during operation. For that purpose, darken the flame detector during operation and maintain this state	Repetition followed by lockout at the end of «TSA»

Standards and certificates

CE

Applied directives:

- Low-voltage directive 2006/95/EC
- Electromagnetic compatibility EMC (immunity) *) 2004/108/EC

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

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

- Household and similar electrical appliances - Safety VDE 0700
- Electrical equipment of non-electric heated cooking and heating appliances VDE 0722

The relevant valid edition of the standards 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 LOA and the AGK11 comply with the requirements of EN 60335-2-102.

EAC Conformity mark (Eurasian Conformity mark)

ISO 9001:2008
ISO 14001:2004
OHSAS 18001:2007

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

Service notes

The service adapters can only be used for a short time. They may only be used in supervised operation by qualified staff.

Life cycle

Burner controls has a designed lifetime* of 250,000 burner startup cycles which, under normal operating conditions in heating mode, correspond to approx. 10 years of usage (starting from the production date given on the type field).

This lifetime is based on the endurance tests specified in standard EN 230.
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 burner controls according to the manufacturer's Data Sheet. After reaching the designed lifetime in terms of the number of burner startup cycles, or the respective time of usage, the burner control is to be replaced by authorized personnel.

* The designed lifetime is not the warranty time specified in the Terms of Delivery

Disposal notes



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

Mechanical design

The oil burner controls are of plug-in design, suitable for installation in any position on burners, in control cabinets or on control panels.

The housing is made of impact-proof, heat-resistant and flame-retarding plastic.
It is of plug-in design (measuring 91 x 62 x 63 mm, including the plug-in base) and engages audibly in the plug-in base.
The color of plastic material of burner controls LOA... are executed in black.

The housing includes ...
- the thermoelectric programmer acting on a multi-tilting switching system, compensated for ambient temperature
- flame signal amplifier with the flame relay
- ... lockout reset button with its integrated lockout indication lamp

Undervoltage detection

If mains voltage drops below about AC 165 V, an electronic circuit ensures that the oil burner control will prevent burner startup or – without releasing fuel – lockout will be initiated.

Type summary

The type references given in the table refer to oil burner controls with no plug-in base and no accessories. For ordering information for plug-in bases and other accessories, see *Accessories*.

Article no.	Type	Main voltage	Undervoltage detection	Times in seconds						Replacement types
				t1 min.	t3 approx.	TSA max.	t3n approx.	t3n‘ approx.	t4 approx.	
Standard version										
BPZ:LOA24.171B27	LOA24.171B27	AC 220 V	●	13	13	10	20	---	20	LMO14.111C2 LMO24.111C2
BPZ:LOA24.171B17	LOA24.171B17	AC 110 V	●	13	13	10	20	---	20	LMO24.111C1
BPZ:LOA24.173A27	LOA24.173A27	AC 220 V	●	13	13	10	20	2	20	LMO14.113C2
With remote reset facility										
BPZ:LOA26.171B27	LOA26.171B27	AC 220 V	●	13	13	10	20	---	20	LMO14.111C2 LMO24.111C2
BPZ:LOA36.171A27	LOA36.171A27	AC 220 V	●	13	13	10	20	---	20	LMO14.111C2 LMO24.111C2
For incinerator plant										
BPZ:LOA25.173C27	LOA25.173C27 [1])	AC 220 V	●	13	13	10	---	2	20	---
BPZ:LOA28.173A27	LOA28.173A27 [1])	AC 220 V	●	13	13	10	---	2	20	---

Legend

[1]) LOA25... and LOA28... are designed for use on incinerator plant where lockout by extraneous light is not desired. These types of oil burner controls are not covered by EN 230

t1 Prepurge time
t3 Preignition time
t3n Long postignition time
t3n´ Short postignition time
t4 Interval from establishment of flame to the release of «BV2»
TSA Ignition safety time

Test adapter (must be ordered separately)

Test adapter **KF8833**

- For checking the functions of burner controls on the burner
- With signal lamps for program indication
- With one pair of jacks for measuring the flame detector current



Test adapter **KF8840**

- For checking the functions of burner controls on the burner
- With signal lamps for program indication
- With on / off switch for simulating the flame signal
- With holes for checking the control voltages at the tabs of the burner control
- With one pair of jacks for measuring the flame detector's resistance



Test adapter **KF8885**

- For checking the functions of burner controls on the burner
- With switch for manual startup of burner
- With switch for simulating the oil preheater's release contact
- With 2 pairs of jacks for measuring the flame detector current

Refer to Mounting Instructions B7986



Accessories (must be ordered separately)

Connection accessories for small burner controls

Plug-in base **AGK11…**
To connect the small-capacity burner controls to the burner plant.
See Data Sheet N7201



Cable holder **AGK66…**
For plug-in base AGK11.
See Data Sheet N7201



Cable holder **AGK65…**
For plug-in base AGK11.
See Data Sheet N7201



Flame detectors

Photoresistive detectors **QRB...**
See Data Sheet N7714



Blue-flame detectors **QRC...**
See Data Sheet N7716

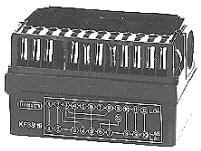
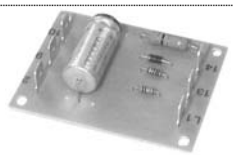
Frontal illumination:



Lateral illumination:



Accessories (must be ordered separately)

Actuators	Actuator **SQN3...** See Data Sheet N7808	
	Actuator **SQN7...** See Data Sheet N7804	
	Actuator **SQN9...** See Data Sheet N7806	
Adapters / replacement types	No rewiring required	
	Adapter **KF8819** • For replacing LAB1... / LAI... by LOA... • No rewiring of plug-in base required	
Others	Remote reset module **ARK21A27** For use with the LOA26... / LOA36... printed circuit board versions	

Technical data

General unit data	Mains voltage	AC 220 V –15 %...AC 240 V +10 % AC 100 V –15 %...AC 110 V +10 %
	Mains frequency	50...60 Hz ±6 %
	External primary fuse (Si)	Max. 10 A (fast)
	Power consumption	Approx. 3 VA
	Perm. mounting position	Optional
	Degree of protection	IP40, must be ensured through mounting
	Safety class	I (burner control with plug-in base)
	Input current to - Terminal 1 - Terminal 3	 Max. 5 A (short-time 15 A for max. 0.5 s) Max. 5 A (excl. current draw of burner motor and oil preheater)
	Perm. cable lengths - Detector cable laid separately - Remote reset laid separately	Max. 3 m with 100 pF/m line capacitance Max. 20 m Max. 20 m (refer to Flame supervision chapter)
	Weight	Approx. 180 g

Perm. current at cos φ ≥ 0.6	Terminal 4 max.	Terminal 5 max.	Terminal 6 max.	Terminal 7 max.	Terminal 8 max.	Terminal 10 max.
LOA24.171B17	1 A	1 A	2 A	2 A	5 A	1 A
LOA24.171B27	1 A	1 A	2 A	2 A	5 A	1 A
LOA24.173A27	1 A	1 A	2 A	1,5 A	5 A	1 A
LOA25.173C27	1 A	1 A	2 A	2 A	5 A	1 A
LOA26.171B27	1 A	1 A	2 A	0,1 A	5 A	1 A
LOA28.173A27	1 A	1 A	2 A	2 A	5 A	1 A
LOA36.171A27	1 A	1 A	---	---	---	---

Environmental conditions	**Storage**	DIN EN 60721-3-1
	Climatic conditions	Class 1K3
	Mechanical conditions	Class 1M2
	Temperature range	-20...+60 °C
	Humidity	<95 % r.h.
	Transport	DIN EN 60721-3-2
	Climatic conditions	Class 2K2
	Mechanical conditions	Class 2M2
	Temperature range	-50...+60 °C
	Humidity	<95 % r.h.
	Operation	DIN EN 60721-3-3
	Climatic conditions	Class 3K5
	Mechanical conditions	Class 3M2
	Temperature range	-20...+60 °C
	Humidity	<95 % r.h.
	Installation altitude	Max. 2,000 m above sea level



Warning!
Condensation, formation of ice and ingress of water are not permitted!
If not observed, the safety functions are no longer ensured and there will be a risk of electric shock.

Flame supervision with QRC...

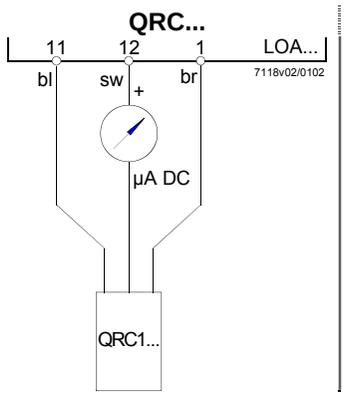
Measuring circuits and length of the detector cables in accordance with Data Sheet N7716.

Type of burner control	QRC... (typically)		
	Detector current required during operation (with flame)	Permissible detector current during the prepurge time (dark current)	Possible detector current in operation (with flame)
LOA24.171B17	Min. 70 µA	Max. 5,5 µA	Max. 90 µA
LOA24.171B27	Min. 70 µA	Max. 5,5 µA	Max. 110 µA
LOA24.173A27	Min. 45 µA	Max. 5,5 µA	Max. 45 µA
LOA25.173C27 [1])	---	---	---
LOA26.171B27	Min. 70 µA	Max. 5,5 µA	Max. 110 µA
LOA28.173A27 [1])	---	---	---
LOA36.171A27	Min. 70 µA	Max. 5,5 µA	Max. 110 µA

[1]) These types of LOA... must not be used in connection with QRC...blue-flame detectors

Data given in the above table only apply under the following conditions:
- Mains voltage depending on version AC 110 V or AC 220...240 V
- Ambient temperature 23 °C

Measuring circuit for detector current measurement



Legend

µA DC	DC microammeter with an internal resistance of Ri = max. 5 kΩ
bl	Blue
sw	Black
br	Brown

The QRC1 has been designed specifically for blue-burning flames. Incidence of light is from the front and side. The clamp is secured with a soft plastic plug. 3-core connection (preamplifier integrated in the detector casing). For the different types of flame detectors, engineering notes and technical data, refer to Data Sheet N7716.

Only with LOA36...
Indication of flame strength

Detector current LED on Min. 40 µA ±15 %

ПРОМЭЛЕКТРОНИКА / sales@prom-elec.com

Flame supervision

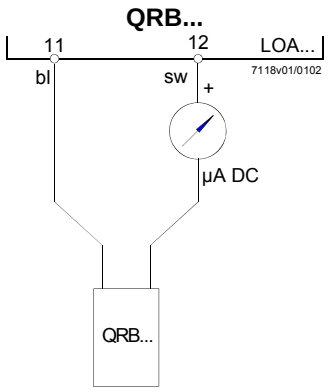
Flame supervision with QRB...

Measuring circuits and length of the detector cables in accordance with Data Sheet N7714.

Type of burner control	QRB... (typically)		
	Detector current required during operation (with flame)	Permissible detector current during the prepurge time (dark current) (without flame)	Possible detector current in operation (with flame)
LOA24.171B27 / LOA24.171B17	Min. 70 µA	Max. 5.5 µA	Max. 210 µA
LOA25.173C27			
LOA26.171B27			
LOA28.173A27			
LOA24.173A27	Min. 45 µA	Max. 5.5 µA	Max. 45 µA
LOA36.171A27	Min. 70 µA	Max. 5.5 µA	Max. 900 µA

Data given in the above table only apply under the following conditions:
- Mains voltage depending on version AC 110 V or AC 220...240 V
- Ambient temperature 23 °C

Measuring circuit for detector current measurement



Legend

µA DC	DC microammeter with an internal resistance of Ri = max. 5 kΩ
bl	Blue
sw	Black
br	Brown

Only with LOA36...
Indication of flame strength

Detector current LED on — Min. 60 µA ±15 %

Function

The relevant function diagram shows the required or permissible input signals to the control section and to the flame supervision circuit hatched (refer to Connection diagrams).
If these input signals are not present, the burner control will stop the startup sequence to trigger lockout where required by safety regulations.

Preconditions for startup

- Burner control is reset
- The contacts of the limit thermostat / pressure switch, the control thermostat / pressurestat and the safety limit thermostat must be closed, heat request present on terminal 1
- No undervoltage
- Flame detector is darkened, no extraneous light

Undervoltage detection

An additional electronic circuit ensures that if mains voltage drops below approximately AC 165 V (at UN = AC 220...240 V), burner startup will be prevented, or – without release of oil – lockout will be triggered.

Control sequence in the event of fault

Whenever lockout occurs, the outputs for the fuel valves, the burner motor, oil preheater and ignition equipment will immediately be deactivated (<1 second).
The lockout indication lamp lights up red and terminal 10 («AL») for remote lockout indication receives voltage.
This state is also maintained in the event of mains voltage failure.

Cause	Response
Mains voltage failure	Restart
Extraneous light on burner startup	Lockout; with LOA25... / LOA28...: Prevention of start
No flame at the end of «TSA»	Lockout
Loss of flame during operation	Repetition

Lockout

After lockout, the LOA will remain locked (lockout cannot be changed).
This state will also be maintained in the event of power failures.

Reset of burner control

After lockout, the burner control can be reset after 60...90 seconds (also refer to «Warning notes»).

Indications

Lockout position

The lockout position is indicated with the lamp integrated in the lockout reset button.

Flame strength

Only with LOA36...



Indication of the flame strength (green LED) is used for checking the flame signal.
To ensure reliable burner operation, this LED must be lit.
If the green LED flickers or extinguishes during burner operation, the light conditions at the burner are poor, caused by dirt for instance.

Operation

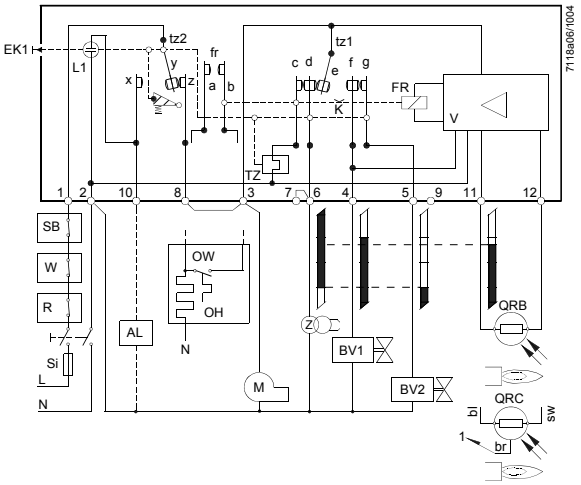
Only with LOA36...

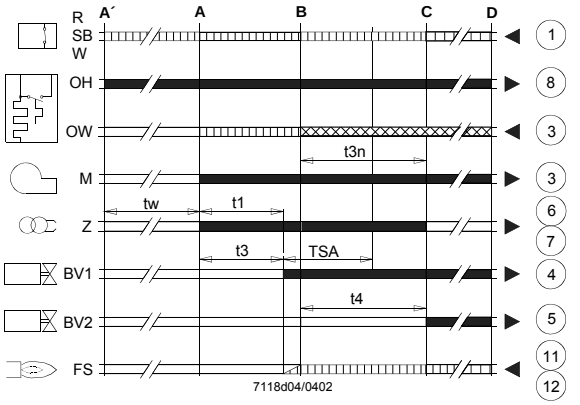


When the contacts of the control thermostat are closed, the orange LED is lit, indicating the start of the oil preheater's heating up phase (if present).

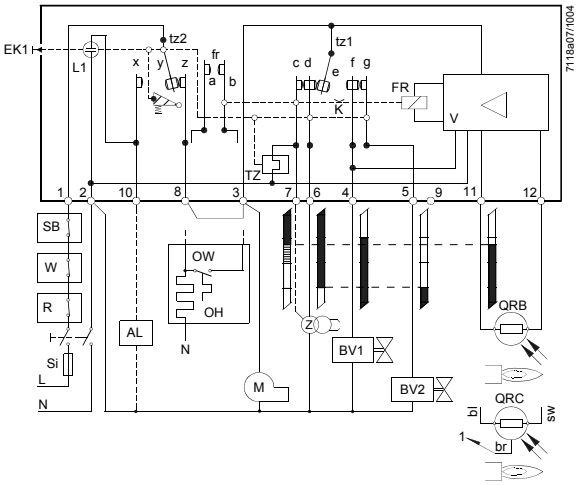
Connection diagram inclusive internal diagram | **Control sequence**

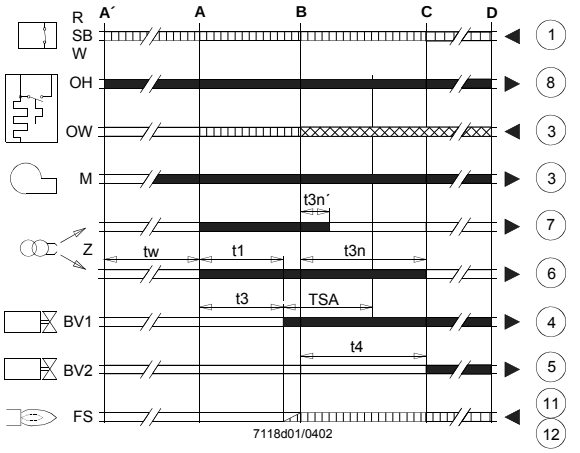
LOA24.171B27
LOA24.171B17



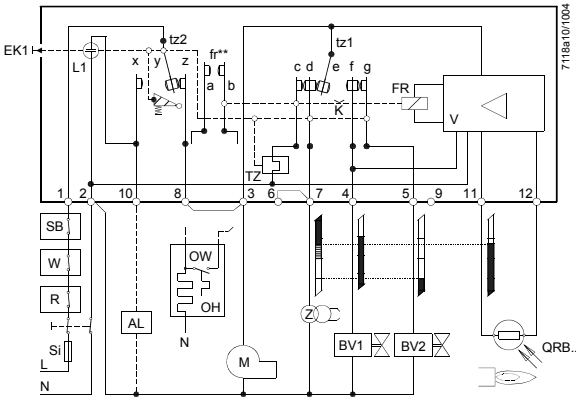


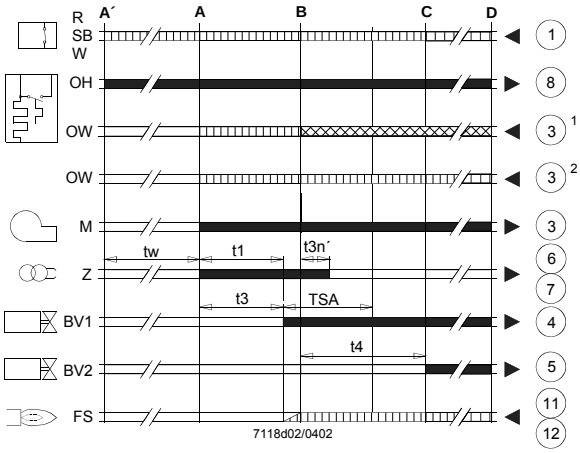
LOA24.173A27





LOA25.173C27
LOA28.173A27





fr** Not provided with the LOA28.173A27

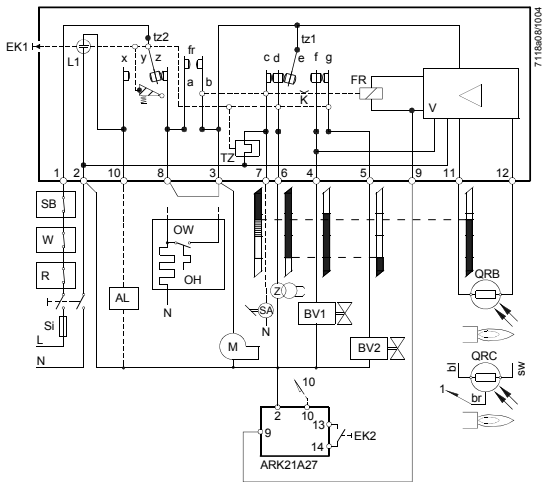
1) LOA25.173C27
2) LOA28.173A27

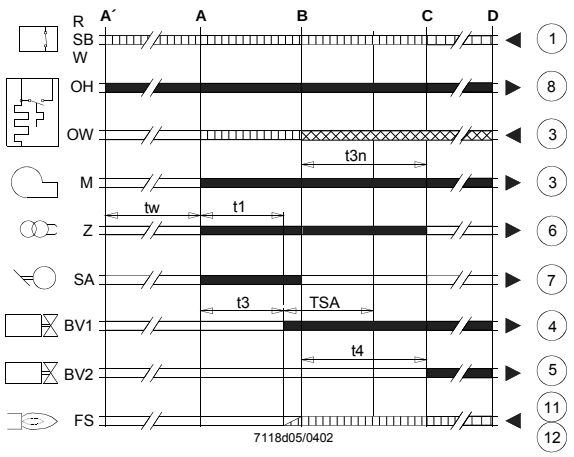
Connection diagram inclusive internal diagram

Control sequence

LOA26.171B27

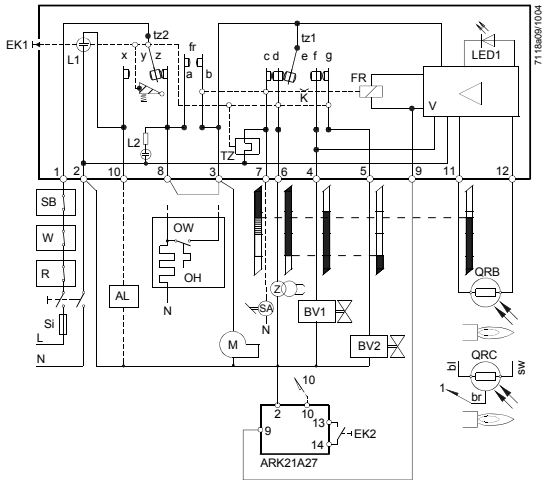
With ARK21 remote lockout reset module

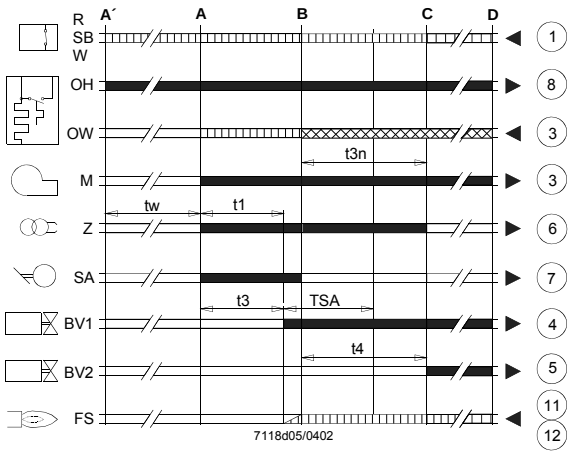




LOA36.171A27

With ARK21 remote lockout reset module





Legend

	AL	Alarm device	OW	Release contact of oil preheater
	BV...	Fuel valve	OH	Oil preheater
	EK1	Lockout reset button	QRB…	Photoresistive detector
	EK2	Remote lockout reset button	QRC…	Blue-flame detector
	FR	Flame relay with contacts «fr»		bl = blue, br = brown, sw = black
	fr	Bridging contact for release contact of the oil preheater	R	Control thermostat or pressurestat
			SA	Actuator with automatic setback
	FS	Flame signal	SB	Safety limit thermostat
	K	Catch of flame relay for locking contact «tz1» in the event of premature flame signals or for locking the contact when the flame signal is correct	Si	External primary fuse
			TZ	Thermal-electric sequence switch
			tz...	Contacts of the thermoelectric programmer
			W	Limit thermostat or pressure switch
	L1	Indication of faults (red)	V	Flame signal amplifier
	L2	Indication of operation (orange)	Z	Ignition transformer
	LED1	Indication of flame strength (green)		
	M	Burner motor	A´	Beginning of startup with burners using an oil preheater
	TSA	Ignition safety time	A	Beginning of startup with burners without an oil preheater
	tw	Waiting time		
	t1	Prepurge time	B	Time of flame establishment
	t3	Preignition time	C	Running position
	t3n	Long postignition time	D	Controlled shutdown by control thermostat / pressurestat
	t3n´	Short postignition time		
	t4	Interval between flame signal and release of «BV2»		Control signals delivered by the LOA...
				Required input signals
				Permissible input signals

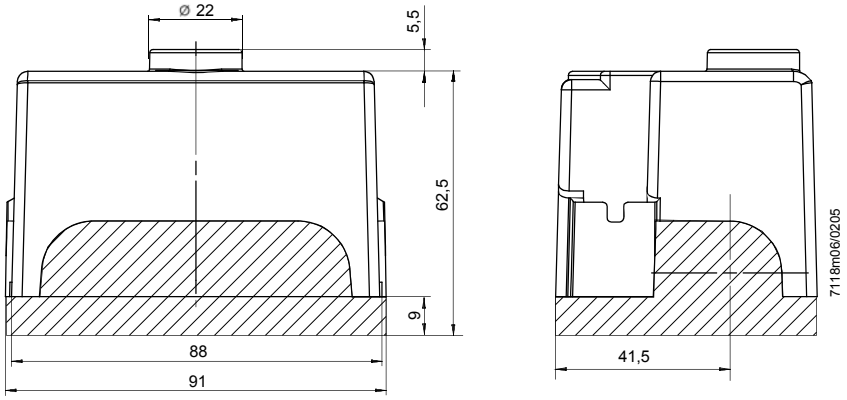
Dimensions

Dimensions in mm

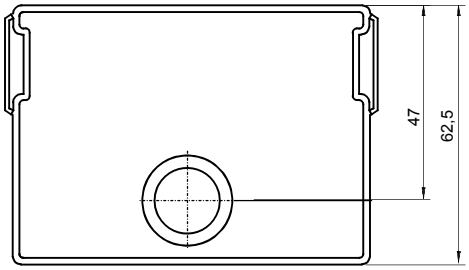
LOA...



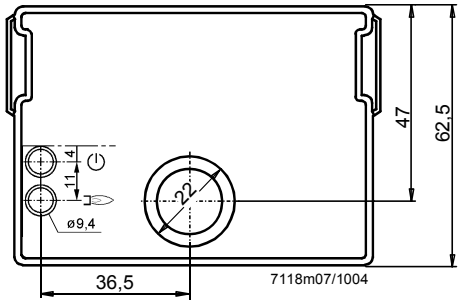
Plug-in base AGK11...



LOA2...



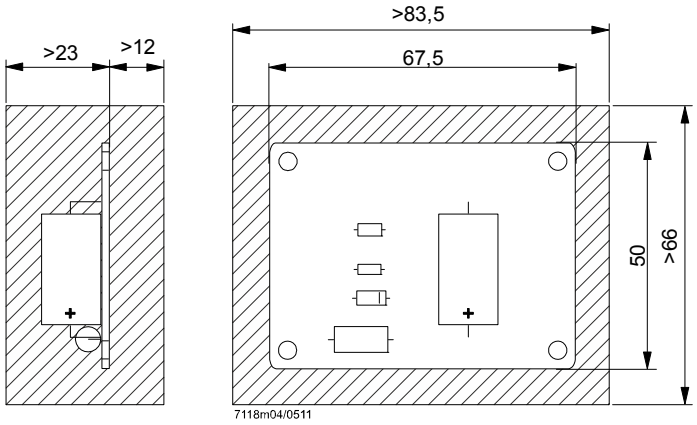
LOA3...



Status indication (orange)

Indication of flame strength (green)

Remote lockout reset module ARK21A27



Remote lockout reset module for use with the LOA26... / LOA36...
Printed circuit board with no housing.
Degree of protection IP00, which means that protection against electric shock hazard, must be ensured through mounting.
Do not place any metal objects in the hatched area.
The module must be fitted with the help of spacers made of plastic.
Do not use spacers made of metal.

© 2016 Siemens AG Building Technologies Division, Berliner Ring 23, D-76437 Rastatt
Subject to change!