SIEMENS

7422

ISO 9001

CE

Burner Controls LMG...

Series B

Burner controls for the supervision of single- or 2-stage forced draught gas or gas / oil burners of small to medium capacity (typically up to 350 kW) in intermittent operation.

The LMG… and this Data Sheet are intended for OEMs which integrate the burner controls in their products.

Use

The LMG... are designed for the start-up and supervision of single- or 2-stage forced draught gas or gas / oil burners in intermittent operation. The flame is supervised with an ionization probe or a UV flame detector QRA…. (with ancillary unit AGQ2 …A27). LMG21... / LMG22... in the same housing replace burner controls LGB21... / LGB22... (refer to «Type summary») and, using the adapters, burner controls LFI7... and LFM1... (refer to «Ordering»).

Application-specific features

- Detection of undervoltages
- Air pressure supervision with functional test of air pressure switch during start-up and operation
- Electrical remote reset
- Display of error code and flame signal by LEDs in the lock-out reset button
- Accurate program sequence owing to digital processing of signals
- LMG49... for use with atmospheric gas burners

Siemens Building Technologies
Landis & Staefa Division

Warning notes

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

Do not open, interfere with or modify the unit!

- Before performing any wiring changes in the connection area of the LMG…, completely isolate the burner control from the mains supply (all-polar disconnection)
- Ensure protection against electric chock hazard by providing adequate protection for the burner control's terminals
- Check wiring and all safety functions
- Check the connecting lines of the air pressure switch for short-circuits (terminals 3, 6 and 11)
- Press the lock-out reset button / operating button only manually (applying a force of no more than 10 N), without using any tools or pointed objects
- Fall or shock can adversely affect the safety functions. Such units may not be put into operation, even if they do not exhibit any damage

Planning notes

- On applications with actuators, the actuator does not deliver a position checkback signal to the burner control
- The actuator running times must be matched to the burner control's program. An additional safety check of the burner with the actuator must be made

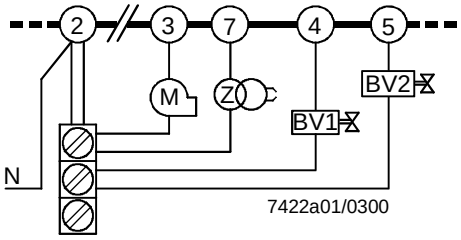
Mounting notes

- Ensure that the relevant national safety regulations are complied with
- Locate the ignition electrode and ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads) and that it cannot adversely affect the supervision of ionization

Installation notes

- Installation and commissioning work must be carried out by qualified staff
- Observe the permissible lengths of the detector cables (refer to«Technical data»)
- Always run the ignition cables separately while observing the greatest possible distances to the unit and to other cables
- Install switches, fuses, earthing, etc., in compliance with local regulations
- The connection diagrams shown apply to burner controls with an earthed neutral conductor. In the case of ionization current supervision in networks with a non-earthed neutral conductor, terminal 2 must be connected to the earth conductor via an RC unit (part no. ARC 4 668 90660)
- Make certain that the maximum permissible current rating of the connection terminals will not be exceeded
- Do not feed external mains voltage to the control outputs of the burner control. When testing the devices controlled by the LMG... (fuel valves, etc.), the burner control may never be plugged in
- In the case of burners with no fan motor, an AGK25 must be connected to terminal 3 of the unit, or else the burner cannot reliably be started up
- For safety reasons, feed the neutral conductor to terminal 2. As shown below, the burner components (fan, ignition transformer and gas valves) must be connected to the neutral distributor. The connection between neutral distributor and terminal 2 is pre-wired in the base of the unit

Example



Legend

BV...	Fuel valve
M	Fan motor
Z	Ignition transformer

Correct wiring of neutral conductors

Electrical connection of ionization probe and UV detector

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

- The cable length may not exceed 20 m
- Never run the detector cable together with other cables
  – Line capacitance reduces the magnitude of the flame signal
  – Use a separate cable
- Insulation resistance
  – Must be a minimum of 50 MΩ between ionization probe and ground
  – Soiled detector holders reduce the insulation resistance, thus supporting creepage currents
- Earth the burner in compliance with the relevant regulations; earthing the boiler alone does not suffice
- Observe the polarity
  Burner controls LMG… are able to detect wrong polarity of live and neutral conductors, in which case they initiate lock-out at the end of «TSA»
- The ionization probe is not protected against electric shock hazard

Commissioning notes

- Commissioning and maintenance work must be carried out by qualified staff
- When commissioning the plant, when doing maintenance work, or after longer off periods, make the following safety checks:

	Safety check	Anticipated response
a)	Burner start-up with open-circuit to the ionization probe	Lock-out at the end of «TSA»
b)	Burner operation with simulated loss of flame; for that purpose, cut off the gas supply	Immediate lock-out Only with LMG25...: restart followed by lock-out at the end of «TSA»
c)	Burner operation with simulated air pressure failure (not with atmospheric burners)	Immediate lock-out

Disposal notes

The unit contains electrical and electronic components and may not be disposed of as household garbage.
The local and currently applicable laws must be observed.

Mechanical design

LMG...

- Units of plug-in design like their predecessor types LGB2… (refer to «Dimensions»)
- Housing made of impact-proof and heat-resistant plastic
- The housing accommodates the
  – control of the microcontroller with the PCB relay for load control
  – electronic flame signal amplifier (ionization)
  – lock-out reset button with the integrated red signal lamp and the green flame signal lamp

Versions

- LMG21... / LMG22...: burner capacity unlimited (thermal output on start-up ≤ 120 kW)
  lock-out in the event of loss of flame during operation
- LMG25...: burner capacity ≤ 120 kW
  3 repetitions in the event of loss of flame during operation
- LMG49... burner capacity ≤ 120 kW
  lock-out in the event of loss of flame during operation

Plug-in base AGK11... Refer to Data Sheet 7201.

Type summary

The type references given below refer to the LMG… with no plug-in base and with no flame detector.
For ordering information about the plug-in bases and other accessories, refer to «Ordering».

Type of flame detector	Type reference of burner control	tw min. [1]	t1 min.	TSA max.	t3n ca.	t3 ca.	t4 ca.	T10 min. [1]	t11 max. [2]	t12 max. [2]	Behaviour in the event of loss of flame during operation
Burner controls for pre-purging with low-fire air volume, without actuator control											
Ionization probe (FE) or UV flame detector QRA…. (with ancillary unit AGQ2 …A27)	LMG21.130B27 [3]	2.5 s	7 s	3 s	2 s	2 s	8 s	5 s	---	---	Lock-out
	LMG21.230B27 [4]	2.5 s	20 s	3 s	2 s	2 s	8 s	5 s	---	---	Lock-out
	LMG21.330B27 [4]	2.5 s	30 s	3 s	2 s	2 s	8 s	5 s	---	---	Lock-out
	LMG21.350B27 [4]	2.5 s	30 s	5 s	4 s	2 s	10 s	5 s	---	---	Lock-out
	LMG21.530B27	2.5 s	50 s	3 s	2 s	2 s	8 s	5 s	---	---	Lock-out
	LMG21.550B27 [4]	2.5 s	50 s	5 s	4 s	2 s	10 s	5 s	---	---	Lock-out
Burner controls for pre-purging with nominal air volume, with actuator control											
Ionization probe (FE) or UV flame detector QRA…. (with ancillary unit AGQ2 …A27)	LMG22.130B27 [3]	2.5 s	7 s	3 s	2 s	3 s	8 s	3 s	12 s	12 s	Lock-out
	LMG22.230B27 [4]	2.5 s	20 s	3 s	2 s	3 s	8 s	3 s	16.5 s	16.5 s	Lock-out
	LMG22.233B27	2.5 s	20 s	3 s	2 s	3 s	8 s	3 s	30 s	30 s	Lock-out
	LMG22.330B27 [4]	2.5 s	30 s	3 s	2 s	3 s	8 s	3 s	12 s	11 s	Lock-out
Burner controls for pre-purging with low-fire air volume, without actuator											
Ionization probe (FE) or UV flame detector QRA…. (with ancillary unit AGQ2 …A27)	LMG25.230B27	2.5 s	20 s	3 s	2 s	2 s	8 s	5 s	---	---	Max. 3 repetitions
	LMG25.330B27	2.5 s	30 s	3 s	2 s	2 s	8 s	5 s	---	---	Max. 3 repetitions
	LMG25.350B27	2.5 s	30 s	5 s	4 s	2 s	10 s	5 s	---	---	Max. 3 repetitions
Burner controls for atmospheric burners											
Ionization probe (FE) or UV flame detector QRA…. (with ancillary unit AGQ2 …A27)	LMG49.030B27 [5]	3.5 s	---	3 s	2 s	0.5 s	0.5 s	---	---	---	Lock-out

Legend

tw	Waiting time	t4	Interval between establishment of flame and release of «BV2»
t1	Checked pre-purge time		
TSA	Ignition safety time	t10	Specified time for air pressure signal
t3	Pre-ignition time	t11	Programmed opening time for actuator «SA»
t3n	Post-ignition time	t12	Programmed closing time for actuator «SA»
1)	Max. 65 s	3)	Also suited for use with flash-steam generators
2)	Max. running time available for actuators «SA»; the actuator's running time must be shorter	4)	Also suited for use with direct fired air heaters
		5)	Unit without «LP» supervision, for burners with no fan assistance, up to 120 kW

Burner control refer to «Type summary»

Flame detector
- Ionization probe supplied by thirds
- UV detector QRA... refer to Data Sheet 7714

Plug-in base **AGK11**
(refer to Data Sheet 7201)

Cable gland holder **AGK65**
(refer to Data Sheet 7201)

Cable holder **AGK66**
(refer to Data Sheet 7201)

Cable holder **AGK67...**
(refer to Data Sheet 7201)

Actuator **SQN3...**
(refer to Data Sheet 7808)

Actuator **SQN7...**
(refer to Data Sheet 7804)

Actuator **SQN9...**
(refer to Data Sheet 7806)

Pedestal **AGK21**
For increasing the height to that of the LFM... or LFI7... (refer to «Dimensions»)

RC unit **ARC 4 668 9066 0**
For supervising the ionization current in networks with non-earthed neutral conductor

PTC resistor (AC 230 V) **AGK25**
For producing a burden on terminal 3 (used with burners with no fan motor, e.g. atmospheric gas burners)

Ancillary unit for UV supervision
- Cable length 500 mm **AGQ2.1A27**
- Cable length 300 mm **AGQ2.2A27**

Can be fitted under the plug-in base (for size, refer to «Dimensions»)

Test adapter **KF8872**
For checking the functioning of the burner in the plant
- Functional test with the signal lamps
  Note: with no load on the output terminals, the respective signal lamp may light up
- Detector current measurement with jacks of 4 mm diameter

Test case **KF8843**
For checking the functioning of the burner control away from the plant.

Adapters / replacement types
No rewiring required

New type of burner control	Type of adapter	Type of predecessor unit
LMG21... with adapter	KF8853-K	LFI7...
	KF8880	LFM1... / LFM1...-F
LMG2... with adapter	KF8853-K	LFI7...
	KF8880	LFM1...

Technical data

General unit data

Mains voltage	AC 230 V +10/–15 %
Mains frequency	50...60 Hz ±6 %
Power consumption	12 VA
Primary fuse	max. 10 A (slow)
Mounting orientation	optional
Input current at terminal 12	max. 5 A
Weight	approx. 160 g
Degree of protection	IP 40
Perm. cable length terminal 1	max. 1 m at 100 pF / m (max. 3 m at 15 pF / m)
Perm. cable length terminals 8 and 10	max. 20 m at 100 pF / m
Perm. cable length other terminals	max. 3 m at 100 pF / m

Norms and standards

Environmental conditions	
Transport	IEC 721-3-2
Climatic conditions	class 2K2
Mechanical conditions	class 2M2
Temperature range	-40...+60 °C
Humidity	< 95 % r.h.
Operation	IEC 721-3-3
Climatic conditions	class 3K5
Mechanical conditions	class 3M2
Temperature range	-20...+60 °C
Humidity	< 95 % r.h.

⚠ **Condensation, formation of ice and ingress of water are not permitted!**

CE conformity	
According to the directives of the European Union	
Electromagnetic compatibility EMC	89 / 336 EEC incl. 92 / 31 EEC
Directive for gas-fired appliances	90 / 396 EEC
Low voltage directive	73 / 23 EEC

Identification code to EN 298	
LMG21... / LMG22...	F T L L X N
LMG25...	F T C L X N
LMG49...	A T L L X N

Perm. amperage draw	At cosφ ≥ 0.6	At cosφ = 1
- Terminal 3	Max. 2.7 A (15 A during max. 0.5 s)	Max. 3 A
- Terminals 4, 5 and 7	Max. 1.7 A	Max. 2 A
- Terminal 10	Max. 1 A	Max. 1 A

Flame supervision with ionization probe

	At mains voltage U_N = AC 230 V
Detector voltage across terminals 1 and 2 or ground (AC voltmeter, Ri ≥ 10 MΩ)	≤ U_N
Switching thresholds (limit values) Switching on (flame on) (DC ammeter, Ri ≤ 5 kΩ) Switching off (flame off) (DC ammeter, Ri ≤ 5 kΩ)	 ≥ 2 µA ≤ 1.6 µA
Detector current required for reliable operation	≥ 3 µA
Max. short-circuit current across terminals 1 and 2 or ground (AC ammeter, Ri ≤ 5 kΩ)	100 µA

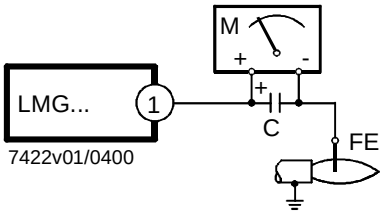
Note

With the same quality of flame, the detector current with the LMG… may be lower than that with the LGB2….

Flame supervision is accomplished by making use of the conductivity and rectifying effect of the flame.

The flame signal amplifier responds only to the DC current component of the flame signal.
A short-circuit between ionization probe and ground causes the burner to initiate lock-out.

Measurement circuit



For detector currents, refer to «Technical design».

Legend

C Electrolytic capacitor 100...470 µF; DC 10...25 V
FE Ionization probe
M Microammeter, Ri max. 5,000 Ω

Flame supervision with AGQ2...A27 and UV detector QRA...

Mains voltage	AC 230 V +10 % / -15 %
Mains frequency	50...60 Hz ±6 %
Perm. cable length from QRA... to AGQ2...A27 (lay separate cable)	max. 20 m
Perm. cable length from AGQ2...A27 to LMG...	max. 2 m
Weight of AGQ2...A27	approx. 140 g
Mounting position	optional
Degree of protection	IP 40
Power consumption	4.5 VA

	At mains voltage U_N	
	AC 220 V	AC 240 V
Detector voltage at QRA... (with no load)		
Until the end of «t10» and after controlled shut-down	DC 400 V	DC 400 V
From the start of «t1»	DC 300 V	DC 300 V
Detector voltage Load by DC measuring instrument Ri > 10 MΩ		
Until the end of «t10» and after controlled shut-down	DC 380 V	DC 380 V
From the start of «t1»	DC 280 V	DC 280 V
DC current detector signals with UV detector QRA...	Min. required	Max. possible
Measurement at UV detector	200 µA	500 µA

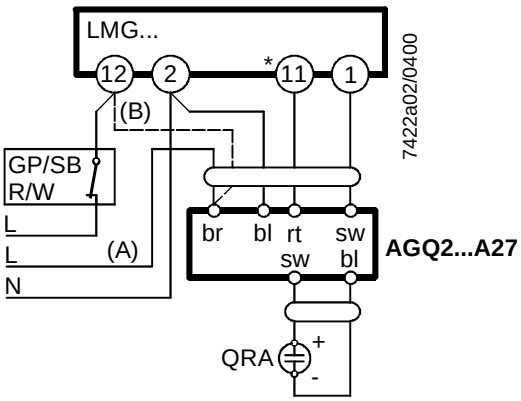
Ancillary unit AGQ2...A27

In connection with burner controls LMG..., use of the UV ancillary unit AGQ2...A27 is mandatory.

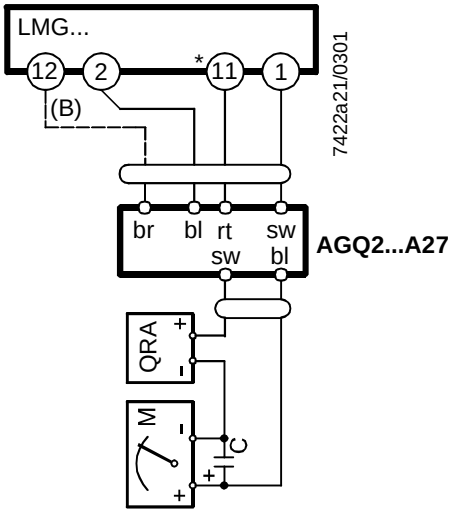
Using circuitry (A) or (B), the quench test on aging UV detectors can be made in 2 different ways:

1. (A) Operation with a permanent line.
   UV test with a higher supply voltage across the UV cell on start-up and after the controlled shut-down.
2. (B) Operation with a controlled line.
   UV test with a higher supply voltage only on start-up during the interval between controlled start-up and air pressure signal.
   - No voltage at UV cell after the controlled shut-down
   - No full substitute for mode (A) described above since an aged UV cell can regenerate itself

Connection diagram



Measurement circuit



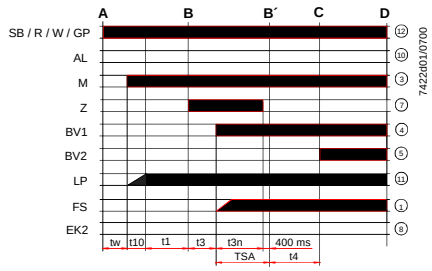
Measurement made on UV detector

Legend

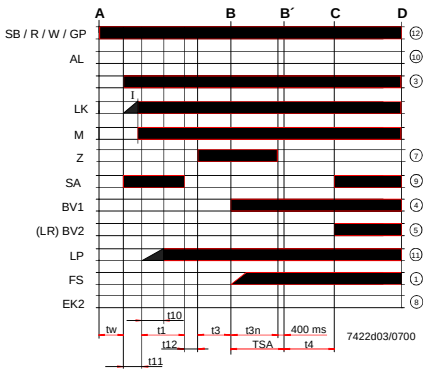
C	Electrolytic capacitor 100...470 µF; DC 10...25 V	bl	blue
M	Microammeter Ri max. 5,000 Ω	br	brown
QRA...	UV detector	gr	grey
GP	Gas pressure switch	rt	red
SB	Safety limit thermostat	sw	black
R	Control thermostat or pressurestat		
W	Control thermostat or pressurestat		

Function

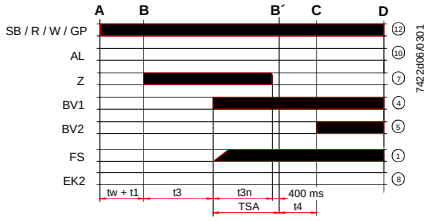
LMG21... / LMG25...



LMG22...



LMG49...



Legend

A	Start command (switching on by «R»)	D	Controlled shut-down by «R» • Burner will immediately be shut down • Burner control will immediately be ready for a new start-up
C	Operating position of burner reached		
B-B´	Interval for establishment of flame		
C-D	Burner operation (generation of heat)		
AL	Fault message (alarm)	M	Fan motor
BV...	Fuel valve	R	Control thermostat or pressurestat
EK2	Remote reset button	SA	Actuator
FS	Flame signal	SB	Safety limit thermostat
GP	Gas pressure switch	W	Limit thermostat or pressure monitor
LP	Air pressure switch	Z	Ignition transformer
LR	Load controller	I	Cam I actuator
t1	Pre-purge time	t11	Programmed opening time for actuator «SA»
t3	Pre-ignition time	t12	Programmed closing time for actuator «SA»
t3n	Post-ignition time	TSA	Ignition safety time
t4	Interval between establishment of flame and release of «BV2»	tw	Waiting time
t10	Specified time for air pressure signal		

Preconditions for start-up

- Burner control is reset
- All contacts in the line are closed
- Fan motor «M» or AGK25 is connected
- Air pressure switch «LP» is in the idle position
- No undervoltage

Undervoltage

Safety shut-down is the event

- mains voltage is lower than AC 180 V (typically)
- a restart is made when mains voltage exceeds AC 195 V

Controlled intermittent operation

After no more than 24 hours of continuous operation, the burner control will initiate automatic safety shut-down followed by a restart.

Reversed polarity protection

If the connections of line (terminal 12) and the neutral conductor (terminal 2) have been mixed up, the burner control will initiate lock-out at the end of «TSA».

Control program in the event of fault

- If a fault occurs, all outputs will immediately be deactivated (< 1 second)
- On restoration of power, a restart will be made with the full program sequence
- If mains voltage drops below the undervoltage threshold (for threshold, refer to «Functions»), a restart will be made with the full program sequence
- If there is a premature faulty flame signal during «t1», the burner control will initiate lock-out
- If the contacts of the air pressure switch «LP» have welded in their working position, start-up will be prevented and, after 65 seconds, lock-out initiated
- If there is no air pressure on completion of «t10», the burner control will initiate lock-out
- If the burner does not ignite during «TSA», lock-out will be initiated
- If the flame is lost during operation:
  → LMG21... / LMG22... / LMG49... lock-out
  → LMG25... 3 repetitions

Lock-out

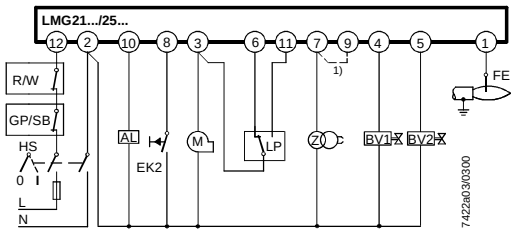
Lock-out cannot be changed and takes place 10 seconds after safety shut-down. A mains voltage failure during that period a time will lead to a restart.

Resetting the LMG...

Whenever a lock-out occurs, the burner control can immediately be reset. To do this, keep the lock-out reset button depressed for about 1 second (max. 3 seconds).

Connection diagram

LMG21... / LMG25...



1) Wire link required only with the LGB21..., not with the LMG21... / LMG25...

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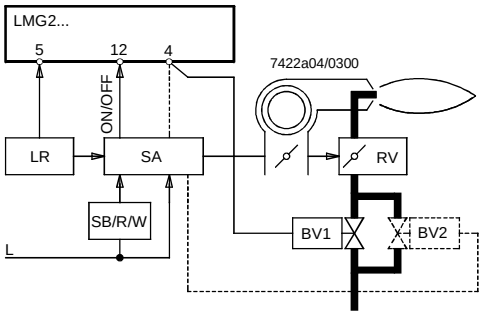
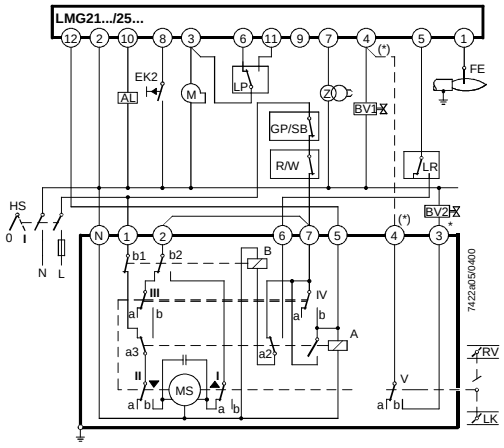
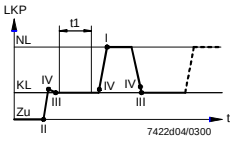
Application examples

Control of actuators of 2-stage or 2-stage modulating burners. Controlled pre-purging «t1» with low-fire air volume. Same low-fire actuator position during start-up and operation.

For information about actuators «SA»:
SQN3... refer to Data Sheet 7808
SQN7… refer to Data Sheet 7804
SQN9... refer to Data Sheet 7806



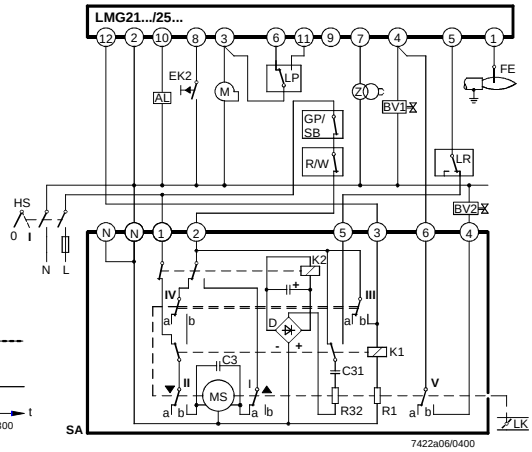




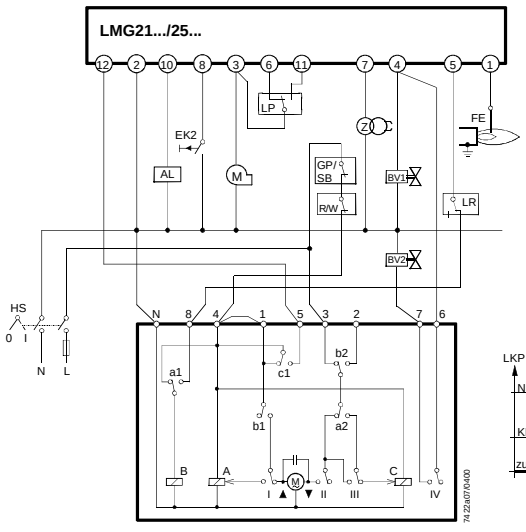
SQN3...121... / 2-stage control

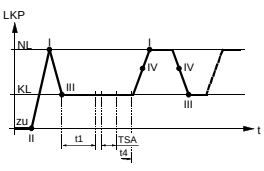
*** Note:**

With 2-stage modulating burners (with gas regulation damper «RV»), «BV2» and the dotted connection between terminals (*) are not required.



SQN91.140... / 2-stage control

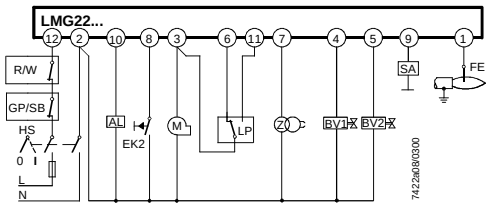




SQN7...244 / 2-stage control

Connection diagram

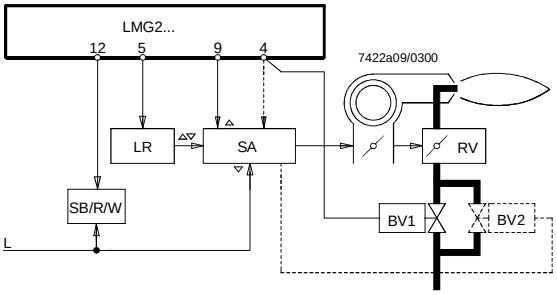
LMG22...

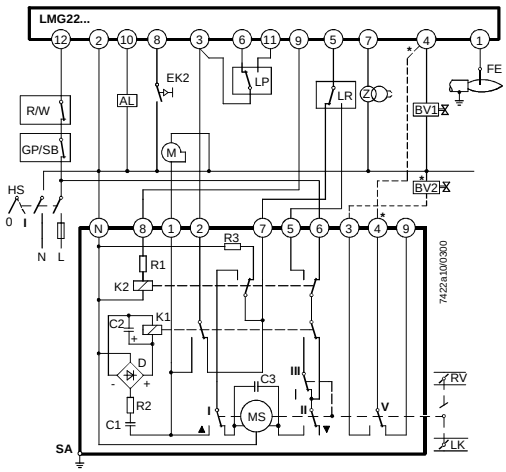


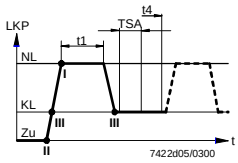
Application examples

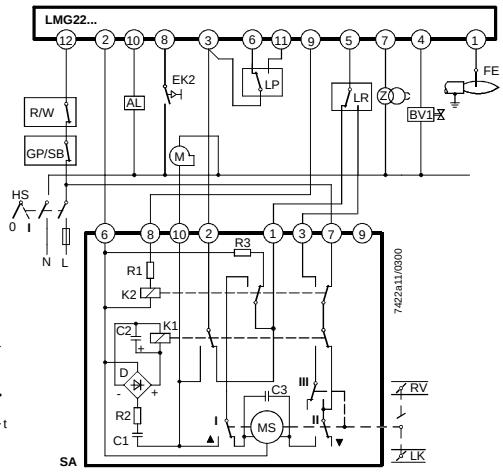
Control of actuators of 2-stage or 2-stage modulating burners.
Checked pre-purging «t1» with nominal load air volume.

For information about actuators «SA»:
SQN3... refer to Data Sheet 7808
SQN7... refer to Data Sheet 7804
SQN9... refer to Data Sheet 7806







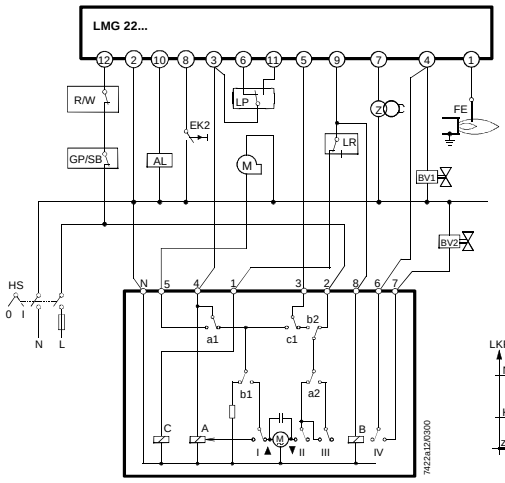


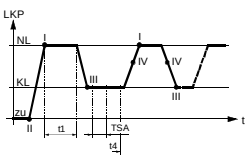
SQN3...151... or SQN3...251...

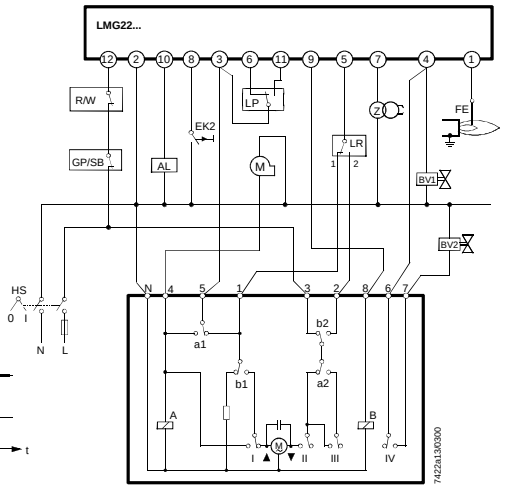
SQN90.220... / 2-stage modulating control

*** Note:**

With 2-stage modulating burners (with gas regulation damper «RV»), «BV2» and the dotted connection between terminals (*) are not required.





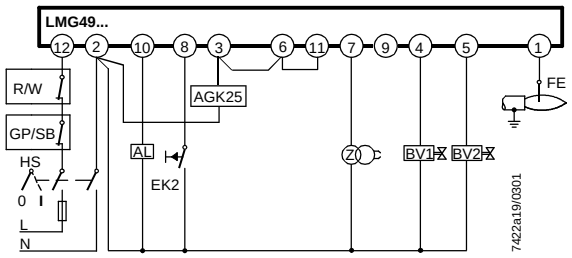


SQN7...454 / 2-stage control
single-wire control

SQN7...424 / 2-stage control
2-wire control

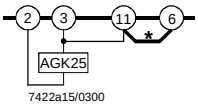
Connection diagram

LMG49...



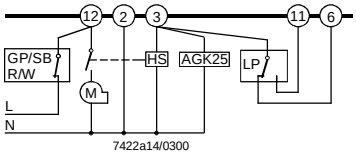
Other application examples

Burner without fan assistance and without «LP»



Not with LMG49...:

Burner with fan control via auxiliary contactor «HS» with «LP»

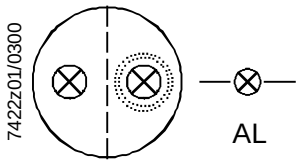
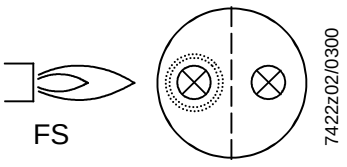


*** Note:** different from LGB...

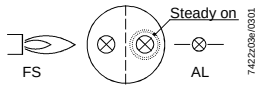
Legend

AGK25...	PTC resistor	LP	Air pressure switch
AL	Fault message (alarm)	LR	Load controller
BV...	Fuel valve	M	Fan motor
Dbr...	Wire link	MS	Synchronous motor
EK2	Remote lock-out reset button	NL	Nominal load
FE	Ionization probe	QRA...	UV detector
FS	Flame signal	R	Control thermostat / pressurestat
GP	Gas pressure switch	RV	Gas regulation damper
HS	Auxiliary contactor, relay	SA	Actuator SQN...
K1...4	Internal relays	SB	Safety limit thermostat
KL	Low-fire	t	Time
LK	Air damper	W	Limit thermostat / pressure monitor
LKP	Air damper position	Z	Ignition transformer

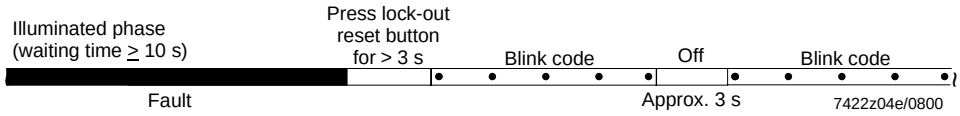
Operating concept

• Burner control has initiated lock-out → Red signal lamp illuminated  	• Reset Press lock-out reset button for 0.5...3 s
	• Diagnosis of cause of fault - Wait > 10 s - Press lock-out reset button for > 3 s - Read blink code of red signal lamp → «Error code table»
• Burner control in operation → Green flame signal lamp illuminated  	• Restart Press lock-out reset button for 0.5...3 s

Diagnosis of cause of fault



After lock-out, the red signal lamp is steady on.
For reading the cause of fault, refer to the blink code given in the following table:



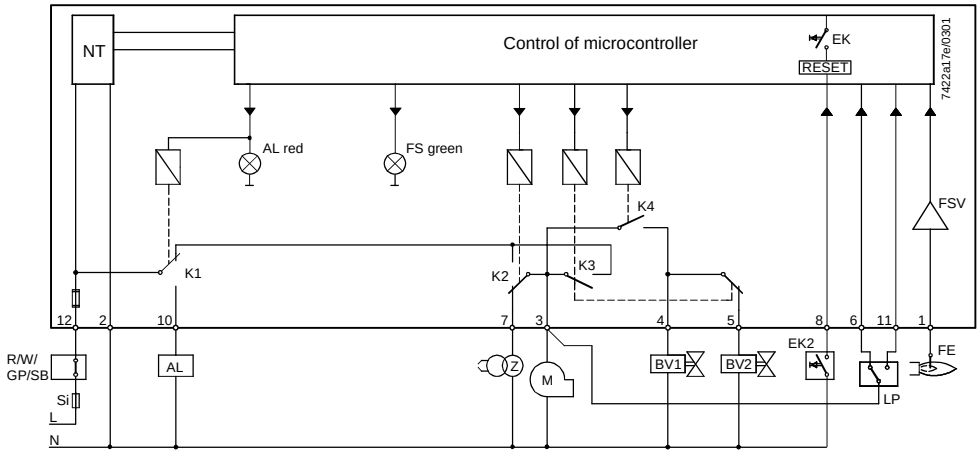
Error code table	
Blink code	Possible cause
2 blinks • •	• No establishment of flame at the end of «TSA» - Faulty or soiled ionization probe - Faulty or soiled fuel valves - Poor adjustment of burner
3 blinks • • •	• Air pressure switch does not close - «LP» faulty - «LP» incorrectly adjusted - Fan motor does not run
4 blinks • • • •	• Air pressure - «LP» faulty - «LP» incorrectly adjusted
5 blinks • • • • •	• Extraneous light during pre-purging - Or internal device fault
7 blinks • • • • • • •	• Loss of flame during operation - Poor adjustment of burner - Faulty or soiled fuel valves - Short-circuit between ionization probe and ground
8...17 blinks • • • • • • • • ..... • • • • • • • • • • • • • • • • • •	• Free
18 blinks • • • • • • • • • • • • • • • • • • •	• Air pressure switch opens during pre-purging or operation - «LP» incorrectly adjusted - Four times loss of flame during operation (LMG25...)
19 blinks •	• Faulty output contact - Wiring error - External power supply on output terminal
20 blinks •	• Internal device fault

During the time the cause of fault is diagnosed, the control outputs are deactivated.
- The burner remains shut down
- Exception: fault status signal «AL» at terminal 10

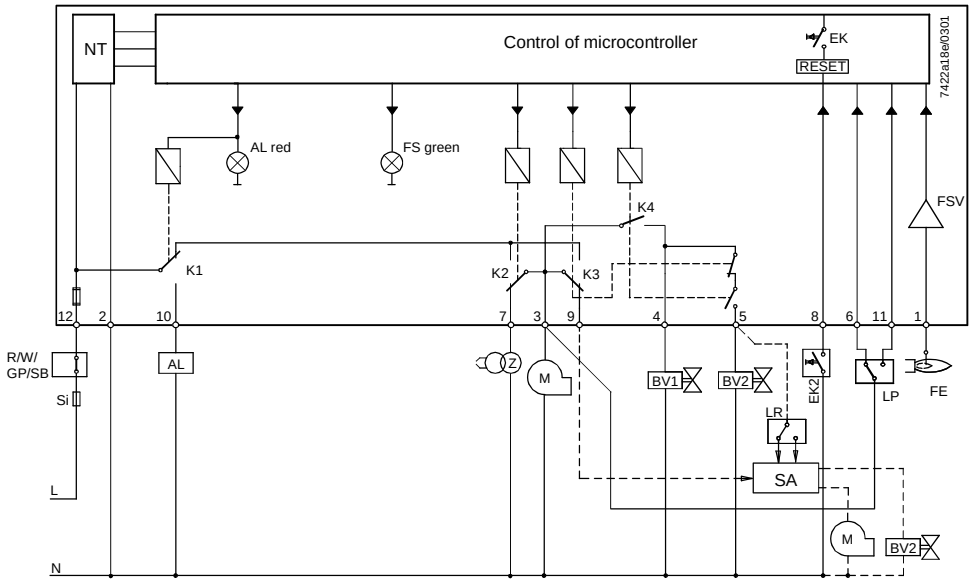
The burner is switched on only after a reset is made
- Press lock-out reset button for 0.5...3 s

Internal diagram

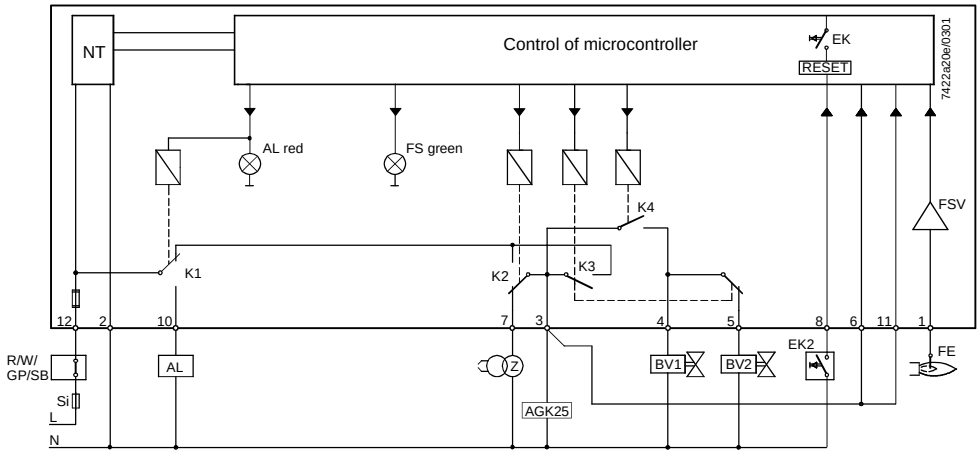
LMG21... / LMG25...



LMG22...



LMG49...



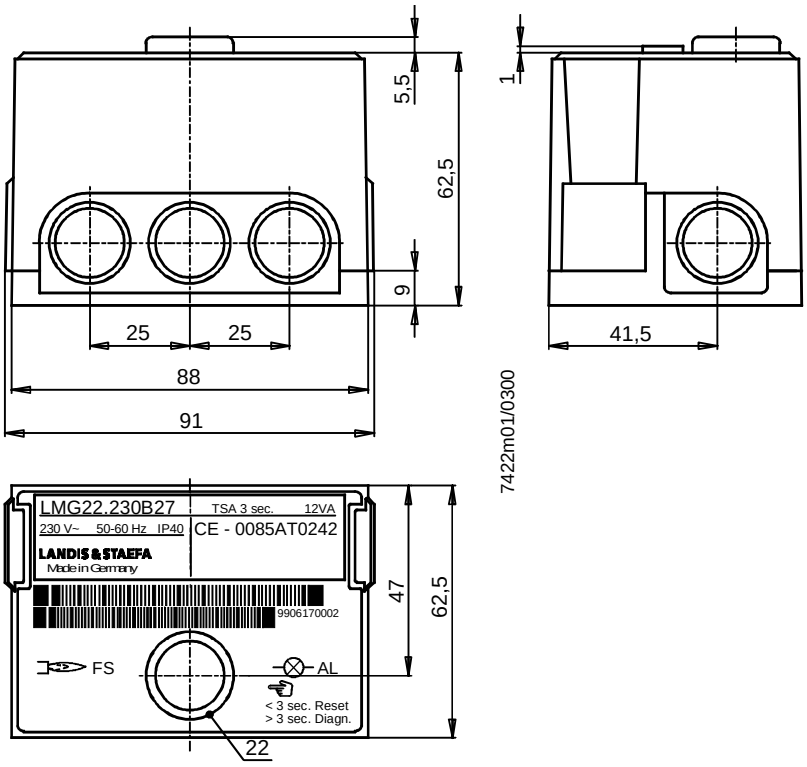
Legend

AL	Alarm	LP	Air pressure switch
BV...	Fuel valve	LR	Load controller
EK...	Lock-out reset button (internal)	R	Control thermostat or pressurestat
FE	Ionization probe	SA	Actuator
FS	Flame signal	SB	Safety limit thermostat
FSV	Flame signal amplifier	Si	Internal fuse
GP	Gas pressure switch	W	Limit thermostat or pressure monitor
M	Fan motor	Z	Ignition transformer
NT	Power section		

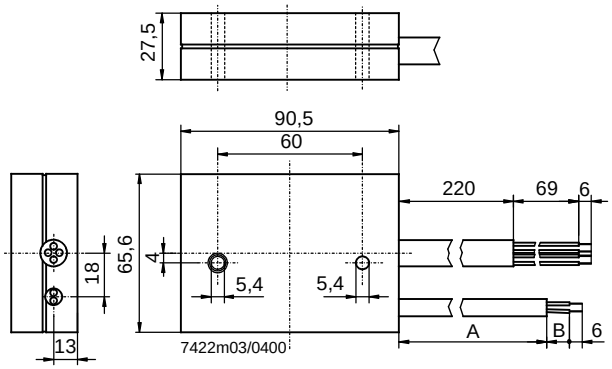
Dimensions

Burner control with plug-in base AGK11... and cable gland holder AGK65...

Dimensions in mm



Ancillary unit AGQ2...A27



Type reference	Dimensions	
	A	B
AGQ2.1A27	500	19