



ISO 9001



Gas Burner Controls

LGA...

The LGA... are used for the startup and supervision of atmospheric gas burners of low to medium capacity, without fan assistance, in intermittent operation.

The LGA... and this data sheet are intended for use by OEMs which integrate the gas burner controls in their products.

Use

The flame is supervised with an ionization current ionization electrode. Using the appropriate adapters, the LGA... can replace their predecessor types LFI7... and LFI5... in terms of both function and size (refer to «Ordering»). LGA41.173A27 and LGA52.171B27 can also be used on direct fired air heaters (WLE to DIN 4794).

Warning notes



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

Do not open, interface with or modify the unit.

- Before performing any wiring changes in the connection area of the LGA..., completely isolate the burner control from the mains supply (all-polar disconnection)
- Ensure protection against electric shock hazard by providing appropriate protection for the burner control's terminals
- Check wiring and all safety functions
- Press the lockout reset button only manually, 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

Mounting notes

The relevant national safety regulations must be complied with.

Siting the ionization electrode

- The ionization current ionization electrode and the ignition electrode must be positioned such that the ignition spark cannot arc over to the ionization electrode
- The position and the polarity of the ignition electrode can adversely affect the magnitude of the flame signal. Reversal of polarity of the ignition transformer's connections on the primary side usually solves the problem
- Since the burner bars form the earthed counter-electrode, the burner must be adjusted such that the flame is hot and stable and in firm contact with the burner bars. With pulsating flames or yellow-burning flames resulting from lack of air, a very low or even no ionization current is generated so that the burner control will initiate lockout

Installation notes

- Installation and commissioning work must be carried out by qualified staff
 - Observe the permissible length and shielding of the detector cable (refer to «Technical data»)
 - Always run the ignition cables separate from the unit and other cables while observing the greatest possible distances
 - To isolate the burner control from the mains supply, use an all-polar switch with a contact gap of at least 3 mm
 - 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 (slow)
 - Make absolutely certain that life conductor «L» is connected to terminal 1. Otherwise, no flame signal will be generated
 - Connect the gas pressure monitor and other monitoring devices - whose contacts must be closed from startup to controlled shutdown - in series with «R» and «W»
- Only with the LGA41...
- If the fully closed position of the main gas valve «BV2» shall be checked on startup, the closed position contact must be included in the loop between terminals 9 and 3. In addition, the connecting links between terminals 9 and 11 and 8 and 3 must be fitted
 - During the startup sequence, terminal 6 carries voltage and may not be used as an auxiliary terminal
 - The auxiliary contact of a gas valve for checking the fully closed position must be included in the loop between terminals 9 and 3
- Only with the LGA52... / LGA63...
- During the startup sequence, terminals 9 and 6 carry voltage and may not be used as auxiliary terminals
 - Connect the load controller of two-stage burners to terminal 5 in series with «BV2»
- Electrical connection of the ionization electrode
- It is important that signal transmission takes place with the smallest possible losses:**
- The cable length may not exceed 20 m
 - The detector line may not be run together with other conductors in the same cable since line capacitance reduces the magnitude of the flame signal
 - The insulation resistance between the ionization electrode and ground must be a minimum of 50 MΩ, even after a large number of operating hours. Prerequisite for this is not only high quality heat-resistant insulation of the electrode cable, but also of the ionization electrode itself (ceramic holder!)
 - A soiled ionization electrode holder offers favourable conditions for surface leakage currents which reduce the magnitude of the flame signal
 - The burner (acting as the counter-electrode) must be correctly earthed, or else no ionization current will flow



Earthing the boiler alone does not suffice!

In networks with unearthed neutral, use RC unit 4 668 9066 0.

- Live, neutral and central point conductors may not be incorrectly connected to terminals 1 and 2 of the burner control, or else no flame signal will be generated

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, perform the following safety checks:

a)	Burner startup with no flame signal; for that purpose, cut the connection between burner control and ionization electrode prior to burner startup and maintain this status	Lockout at the end of «TSA»
b)	Burner operation with simulated «flame failure» during operation; for that purpose, cut the connection between burner control and ionization electrode during burner operation	Repetition

Mechanical design

LGA...	<p>The gas burner controls are of plug-in design, suitable for installation in any position on burners, in control cabinets or on control panels.</p> <p>The housing is made of impact-proof, heat-resistant plastic and accommodates:</p> <ul style="list-style-type: none"> - The thermal sequencing device (ambient temperature-compensated) acting on a multiple snap action switching system - The flame signal amplifier with the flame relay, and - The lockout warning lamp and the lockout reset button (splash-proof)
AGK11 plug-in base	Refer to data sheet 7201.
Undervoltage detection	In the event of undervoltage (below approximately AC 165 V), an electronic circuit ensures that the burner control will prevent burner startup.
Only with the LGA63.191A27	<ul style="list-style-type: none"> • Undervoltage threshold: AC 178 V \pm10 V • «TSA»: smaller tolerance band • Flame signal amplifier: higher sensitivity, for typical applications with pilot flames

Type summary

The type references given in the table refer to burner controls with no base and no accessories.


Burner control with under-voltage detection	AC 220...240 V	LGA41.173A27	LGA41.153B27	LGA52.150B27	LGA52.171B27	LGA52.191B27	LGA63.191A27
	AC 100...110 V	---	---	LGA52.150B17	---	---	---
Connection facility for auxiliary fan ¹⁾		---	---	x	x	x	X
Connection facility for air pressure monitor		---	---	x	x	x	X
Control outputs for gas valves		2	2	2	2	2	2
Reversed polarity protection		x	x	x	x	x	x

1) Auxiliary fan not monitored to EN 298

Ordering

Gas burner control without plug-in base	refer to «Type summary»
Plug-in base (refer to data sheet 7201)	AGK11
Cable gland holder (refer to data sheet 7201)	AGK65
Cable holder (refer to data sheet 7201)	AGK66
Cable holder (refer to data sheet 7201)	AGK67...
Pedestal (empty housing) For increasing the height of the LGA... (62.5 mm) to that of the LFI1... or LFI5... (90 mm)	AGK21
Adapter for replacing LFI1... by LGA...	KF8828
Adapter for replacing LFI5... by LGA...	KF8829
RC unit for the supervision of ionization currents in networks with non-earthed neutral	ARC 4 668 9066 0

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 %
	Power consumption	3 VA
	Input current at terminal 1	max. 5 A
	Terminal rating	
	- Terminals 4 and 8	max. 4 A
	- Terminals 6, 7 and 9	max. 2 A
	- Terminals 5 and 10	max. 1 A
	Primary fuse	max. 10 A (slow)
	Degree of protection	IP 40
	Mounting orientation	optional
	Weight	
	- Without plug-in base	approx. 180 g
	- With plug-in base	approx. 260 g
Environmental conditions	Transport	IEC 721-3-2
	Climatic conditions	class 2K2
	Temperature range	-50...+60 °C
	Humidity	< 95 % r.h.
	Mechanical conditions	class 2M2
	Operation	IEC 721-3-3
	Climatic conditions	class 3K5
	Temperature range	0...+60 °C for LGA41.173A27 and LGA52.171B27: -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	
Directives for gas-fired appliances	90 / 396 EEC	
Flame rectification probe	Voltage between ionization electrode and ground	mains voltage
	Required detector current	min. 2 µA
	Possible detector current	max. approx. 100 µA
	Detector line length	max. 20 m (separate cable)
	Required insulation resistance between ionization electrode with its cable and ground	min. 50 MΩ
	Identification code to EN 298	
	A M C L X N	single-stage
A T C L X N	two-stage	

Function

Control sequence (times in seconds) ¹⁾

	AC 220...240 V	LGA41.173A27	LGA41.153B27	LGA52.150B27	LGA52.171B27	LGA52.191B27	LGA63.191A27
	AC 100...110 V	---	---	LGA52.150B17	---	---	---
t1	Pre-purging with auxiliary fan	15	10	approx. 13	approx. 13	approx. 13	approx. 13
t3	Pre-ignition time	15	10	---	---	---	---
t3'	Ignition time from start of «TSA»	---	---	max. 5	4.5...7.5	7...10	max. 10
TSA	Ignition safety time	10	5	5	4.5...7.5	7...10	10
TSAmax.	Max. ignition safety time	20	10	10	20	20	20
t3n	Ignition after flame establishment	max. 2	max. 1	---	---	---	---
t4	Interval «BV1 – BV2»	approx. 13	approx. 18	approx. 18	approx. 13	approx. 23	approx. 23

¹⁾ All times specified are valid for AC 220 V and AC 110 V respectively
For AC 240 V operation, the above times must be multiplied by 0.7

Control sequence in the event of fault

Erroneous flame signal during «t1» or «t3»	Lockout ²⁾ prior to the release of gas	Lockout ²⁾ prior to ignition and the release of gas
No flame on completion of «TSA»	Lockout ²⁾	Lockout ²⁾
Flame failure during operation	Repetition	Repetition
No air pressure signal during «t1»	---	No start
Air pressure failure during operation	---	Shutdown

²⁾ After lockout, the burner control can be reset after about 60...90 seconds

Flame supervision with ionization electrode

The conductivity and the rectifying effect of hot flame gases are used for flame supervision. For this purpose, an AC voltage is applied to the ionization electrode which projects into the flame.

The current that flows in the presence of a flame (ionization current) generates the flame signal which is then fed to the input of the flame signal amplifier.

The amplifier is designed such that it only responds to the DC current component of the flame signal, thus ensuring that a short-circuit between ionization electrode and ground cannot simulate a flame signal (since in that case, an AC current would flow).

Internal diagram
LGA41...

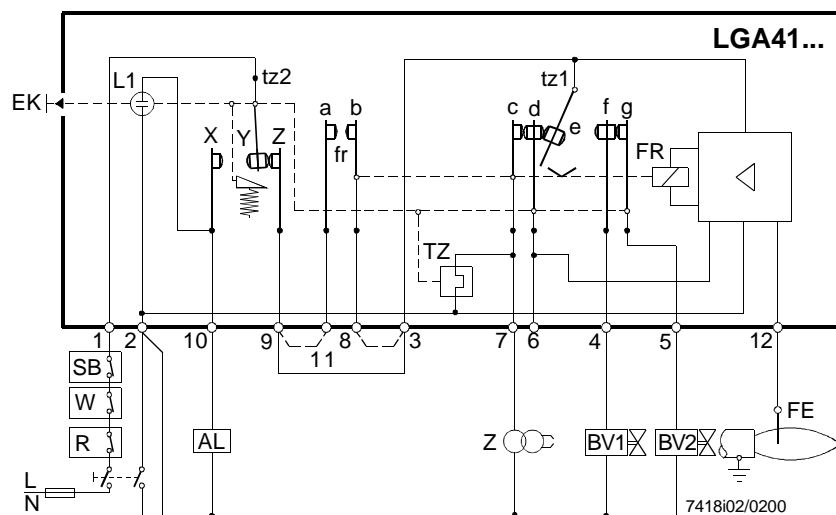
When the switch-on command is given, power is supplied to both the ignition transformer and the heating coil of the bimetal sequencing device.
The bimetal bends and pushes contact set «c, d, e» towards «f».
On completion of the pre-ignition time, the system tilts so that «e - f» closes and «f - g» opens.
Contacts «c - d» still remain closed («c» resting on «d»).

On flame establishment, the flame relay is energized, latching mechanically «e - f» in the position now assumed.
The relay also closes contact «f» and, at the same time, opens «c - d», so that the ignition transformer and the bimetal heating element will be switched off.
Then, «d» slowly returns to its starting position, also catching «g».

When tilting back, «g - f» closes, so that the main gas valve «BV2» will be energized.

If no flame signal is generated, the flame relay does not open «c - d», so that the bimetal will continue to be heated.
The bimetal thus continues to bend until – tilting – it actuates contact «tz2»: → Lockout.

In the event of an erroneous premature flame signal, the flame relay – by means of its latch - prevents «e - f» from making, which means no release of gas.
«TZ», however, remains under voltage, so that the bimetal continues to bend until, eventually, lockout is initiated by «tz2».



Legend

AL	Fault status signal	SB	Safety limit thermostat
BV...	Fuel valve	TZ	Electro-thermal timer (bimetal system) with contacts «tz»
EK	Lockout reset button	W	Thermal reset limit thermostat or manual reset safety limit thermostat
FE	Ionization electrode	Z	Ignition transformer
FR	Flame relay		
L1	Built-in lockout warning lamp		
R	Thermostat or pressurestat		

Internal diagram
LGA52... / LGA63...

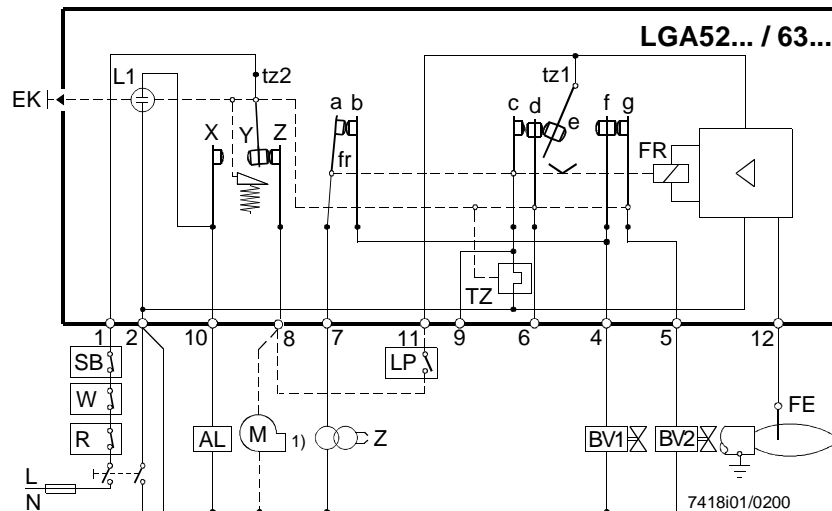
When the switch-on command is given, the auxiliary fan starts to run.
 When the air pressure monitor closes its contact, the heating coil of the bimetal sequencing device is energized and the bimetal pushes contact set «c, d, e» towards «f» (thereby opening «f - g»).

On completion of the pre-purge time, «e - f» is closed so that both the gas valve «BV1» and the ignition transformer receive voltage: the safety time starts.
 On flame establishment, the flame relay latches mechanically «e - f», pushes «c» back at the same time and opens «fr».

The ignition transformer is thus switched off and the heating coil de-energized, so that «d» can revert to its starting position.
 When tilting back, «g - f» closes, so that the main gas valve «BV2» receives voltage.

If no flame signal is generated, the flame relay does not open «c - d», so that the bimetal will continue to be heated.
 The bimetal thus continues to bend until – tilting – it actuates contact «tz2»: → Lockout

In the event of an erroneous premature flame signal, the flame relay – by means of its latch - prevents «e - f» from making, which means no release of gas.
 «TZ», however, remains under voltage, so that the bimetal continues to bend until, eventually, lockout is initiated by «tz2».

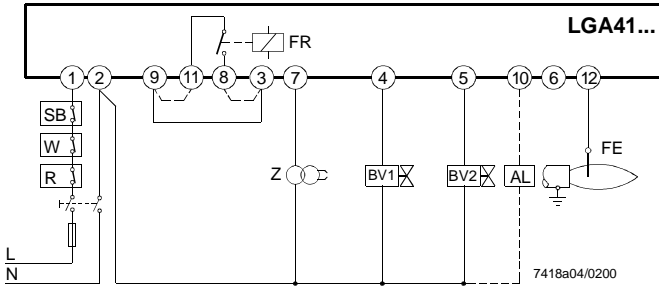


Legend

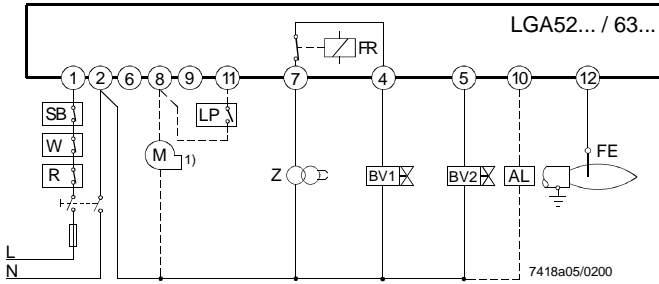
AL	Fault status signal	R	Thermostat or pressurestat
BV...	Fuel valve	SB	Safety limit thermostat
EK	Lockout reset button	TZ	Electro-thermal timer (bimetal system) with contacts «tz»
FE	Ionization electrode	W	Thermal reset limit thermostat or manual reset safety limit thermostat
FR	Flame relay	Z	Ignition transformer
L1	Built-in lockout warning lamp	1)	Not monitored to EN 298
LP	Air pressure monitor		
M	Auxiliary fan		

Connection diagram

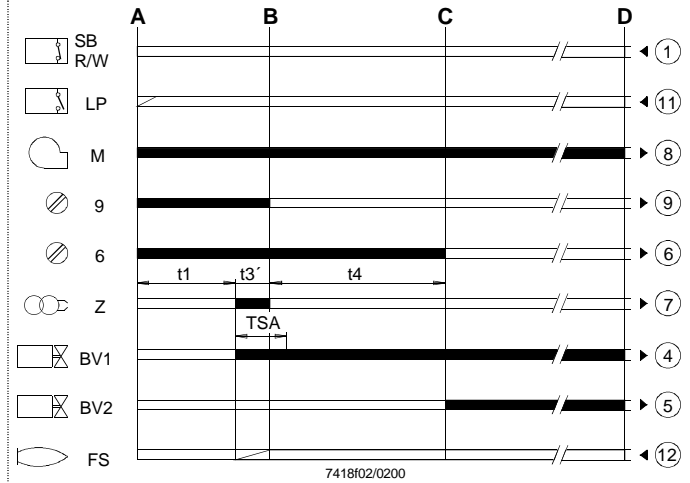
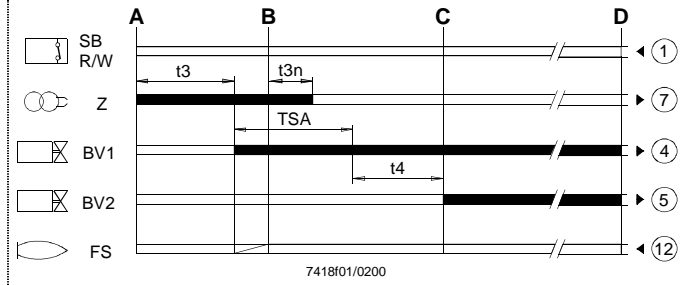
LGA41...



LGA52... / LGA63...



Control sequence



Legend

AL Fault status signal
 BV... Fuel valve
 FE Ionization electrode
 FR Flame relay
 FS Flame signal
 LP Air pressure monitor

Required input signals
 Burner control's output signals

A Commencement of startup sequence
 B Time of flame establishment

 t1 Pre-purging with auxiliary fan
 t3 Pre-ignition time
 t3' Ignition time from the start of «TSA»

M Auxiliary fan
 R Thermostat or pressurestat
 SB Safety limit thermostat
 W Thermal reset limit thermostat or manual reset safety limit thermostat
 Z Ignition transformer

 1) Not monitored to EN 298

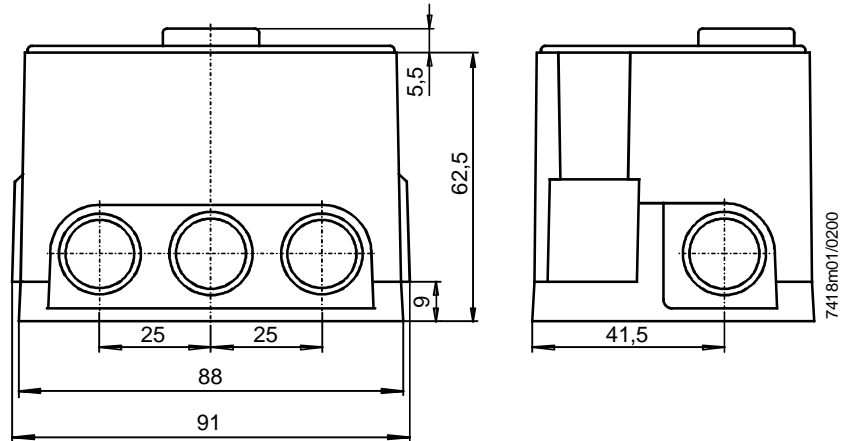
 C Operating position
 D Controlled shutdown by «R»

 t3n Ignition on flame establishment
 t4 Interval «BV1 – BV2»
 TSA Ignition safety time

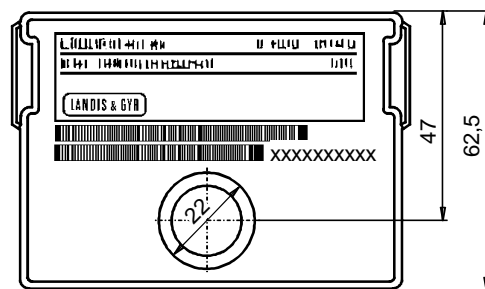
Dimensions

Dimensions in mm

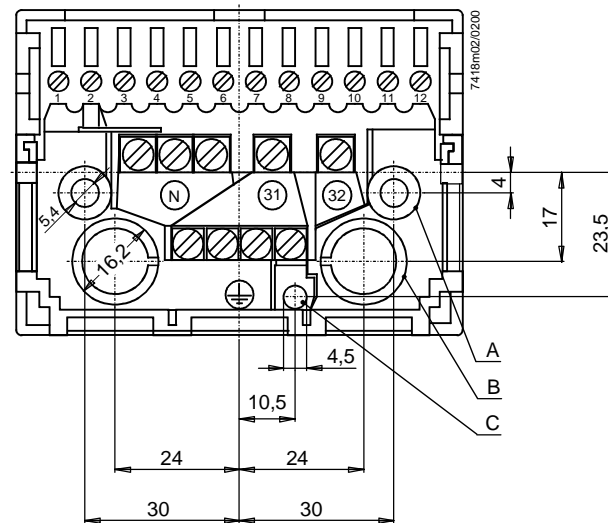
LGA...



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



AGK11 plug-in base



Plug-in base with screw terminals.
 Hatched: position of insertable cable gland holder or cable holder.
 «A»: holes for the fixing screws
 «B»: holes for cable entry
 «31 / 32»: auxiliary terminals
 «N»: neutral terminals, connected to neutral input (terminal 2)
 Underneath: 4 earth terminals, joining in a lug for earthing the burner
 Also refer to data sheet 7201.

Mandatory:

Earthing lug «C» and fixing screws in «A» must be connected to burner ground (using a metric screw with a lockwasher or similar).



ISO 9001
CE



Burner Controls

LGB...

Burner controls for the supervision of single- or 2-stage gas or gas / oil burners of small to medium capacity (typically up to 350 kW), with or without fan assistance in intermittent operation.

The LGB... and this Data Sheet are intended for use by OEMs which integrate the burner controls in their products!

Use

The LGB... burner controls are used for the startup and supervision of single- or 2-stage gas or gas / oil burners in intermittent operation.

Depending on the type of burner control used, the flame is supervised either by an ionization probe, a blue-flame detector QRC1... for forced draft gas / oil burners, or a UV detector QRA... (with auxiliary unit AGQ1...A27).

In connection with the respective adapters, the LGB... burner controls replace their predecessor types LFI7... and LFM1... (also refer to «Replacement types» under «Ordering»).

- Automatic forced draft burners for gaseous fuels to EN 676
- Gas burner controls to EN 298
- Undervoltage detection
- Air pressure supervision with functional check of the air pressure monitor during startup and operation
- Electrical remote reset facility
- LGB41... for use with atmospheric gas burners

Warning notes



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

Do not to open, interfere with or modify the unit!

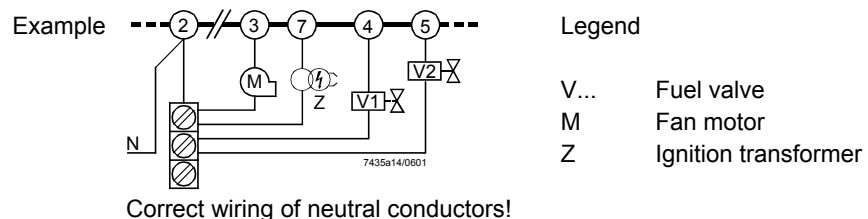
- Before performing any wiring changes in the connection area of the LGB..., completely isolate the burner control from the mains supply (all-polar disconnection)
- Ensure protection against electric shock hazard by providing adequate protection for the burner control's terminals
- Check wiring and all safety functions
- Press lockout reset button only manually, 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

Mounting notes

- Ensure that the relevant national safety regulations are complied with
- Locate the ignition electrode and the 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 work must be carried out by qualified staff
- Always run the ignition cables separate from the unit and other cables while observing the greatest possible distance
- Install switches, fuses, earthing, etc., in compliance with local regulations
- Ensure that the maximum permissible amperages will not be exceeded (refer to «Technical data»)
- Do not feed external mains voltage to the control outputs of the unit. When testing the devices controlled by the burner control (fuel valves, etc.), the LGB... may never be connected
- Make certain that live and neutral conductors are correctly connected to terminals 1 and 2, or else no flame signal will be generated
- To isolate the burner control from the mains supply, use an all-polar switch with a contact gap of at least 3 mm
- Secure the earthing lug in the base with a metric screw and a lockwasher
- The connection diagrams show the burner controls with an earthed neutral conductor. In networks with nonearthed neutral conductor and ionization current supervision, terminal 2 must be connected to the earth conductor via an RC unit (type reference ARC 4 668 9066 0)
- In the case of burners with no fan assistance, the AGK25 must be connected to terminal 3 as a burden, or else the burner cannot reliably start
- 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 gas valves) to the neutral distributor as shown below. The connection between neutral conductor and terminal 2 is prewired in the base



Electrical connection of ionization probe and flame detector

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

- With both ionization current and UV supervision, the cable length for flame detection may not exceed 20 m
- Observe the permissible length of the detector cables (refer to «Technical data»)
- Never run detector cables 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 creep currents
 - Prerequisite is not only high quality heat-resistant insulation of the probe's cable, but also of the ionization probe itself (ceramic holder)
- Earth the burner in compliance with the relevant regulations; earthing the boiler alone does not suffice
- The ionization probe and the ignition electrode are not protected against electric shock hazard

Commissioning notes

- Commissioning and maintenance work must be carried out by qualified staff
- When commissioning the plant for the first time or when doing maintenance work, make the following safety checks:

	Safety check to be carried out	Anticipated response
a)	Burner startup with previously interrupted line to the ionization probe	Lockout at the end of «TSA»
b)	Burner operation with simulated loss of flame; for that purpose, cut off the gas supply (e.g. disconnect the fuel valve while ensuring protection against electric shock hazard)	Immediate lockout
c)	Burner operation with simulated air pressure failure (not with atmospheric burners)	Immediate lockout

Disposal notes



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

Mechanical design

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 base) and engages audibly in the base.

The housing accommodates the

- programming mechanism with the synchronous motor
- electronic flame signal amplifier (ionization) with the flame relay and the other switching devices
- lockout reset button with its integrated fault indication lamp

Type summary

The type references given below apply to LGB... burner controls without plug-in base and without flame detector.

For ordering information on plug-in bases and other accessories, refer to «Mechanical design», «Ordering», «Flame supervision ...» and «Technical data».

Flame detector	Type reference	Approved in:	tw/s	t1/s	TSA/s	t3n/s	t3/s	t4/s	t9/s	t10/s	t11/s	t12/s	t20/s
			ca.	min.	max.	ca.	ca.	ca.	6) max.	min.	3) max.	3) max.	ca.
Burner controls for prepurging with low-fire air volume and control of the actuator													
Ionization probe (FE) or UV detector QRA... with AGQ1...A27	LGB21.130A27 4)7)	CH, EU, S, SF	8	7	3	2.4	2	8	---	5	---	---	6
	LGB21.230A27 5)	CH, EU, S, SF	8	15	3	2.4	2	8	---	5	---	---	38
	LGB21.330A27 5)	CH, EU, H, S, SF	8	30	3	2.4	2	8	---	5	---	---	23
	LGB21.350A27 5)7)	CH, EU, H, S, SF	8	30	5	4	2	10	---	5	---	---	21
	LGB21.550A27 5)	AUS, CH, EU	8	50	5	4	2	10	---	5	---	---	2
Burner controls for prepurging with nominal load air volume and control of the actuator													
Ionization probe (FE) or UV detector QRA... with AGQ1...A27	LGB22.130A27 4)	CH, EU, N, S	9	7	3	2.4	3	8	---	3	12	12	21
	LGB22.230B27 5)	CH, EU, N, S, SF	9	20	3	2.4	3	8	---	3	16.5	16.5	2
	LGB22.330A27 5)7)	AUS, CH, EU, H, N, S, SF	9	30	3	2.4	3	8	---	3	12	11	2
	LGB22.330A270 5)8)	EU	9	30	3	2.4	3	8	---	3	12	11	2
Blue-flame detector QRC1...	LGB32.130A27 4)1)	CH, EU	9	7	3	2.4	3	8	---	3	12	12	21
	LGB32.230A27 5)1)	CH, EU	9	20	3	2.4	3	8	---	3	16.5	16.5	2
	LGB32.330A27 5)	CH, EU	9	30	3	2.4	3	8	---	3	12	11	2
	LGB32.350A27 5)	CH, EU	9	30	5	4.4	1	10	---	3	12	9	2
Burner controls for atmospheric burners													
Ionization probe (FE) or UV detector QRA... with AGQ1...A27	LGB41.255A27	EU	18	---	5	4	2	10	5	---	---	---	10
	LGB41.258A27 2)5)7)	CH, EU, H, SF	18	---	5	4	2	10	9	---	---	---	10

Legend	tw	Waiting time
	t1	Prepurge time
	TSA	Ignition safety time
	t3	Preignition time
	t3n	Postignition time
	t4	Interval «BV1-BV2» or «BV1-LR»
	t9	Second safety time (only with LGB41...)
	t10	Specified time for air pressure signal
	t11	Programmed opening time for actuator «SA»
	t12	Programmed closing time for actuator «SA»
	t20	Interval up to self-shutdown of the programming mechanism

- 1) On request
- 2) For atmospheric burners up to 120 kW
- 3) Maximum running time available for actuator
- 4) Also suited for flash steam generators
- 5) Also suited for stationary direct fired air heaters
- 6) «t9» + reaction time of flame relay
- 7) Also available for AC 100...110 V; in that case, the last 2 digits read ...17 in place of ...27
- 8) Without internal microfuse; only to be used in connection with an external microfuse 6.3 A (slow)!

Burner control refer to «Type summary»

Electrical connections refer to Data Sheet 7201

- Plug-in base AGK11
- Cable holders AGK65, AGK66, AGK67...
- Cable strain relief elements for AGK67...

Electrical connections refer to Data Sheet 7203

- Plug-in base AGK13
- Plug-in housing AGK56
- Accessories AGK68

Flame detectors

- Ionization probe supplied by thirds
- UV detectors QRA... refer to Data Sheet 7714
- Blue-flame detectors QRC1... refer to Data Sheet 7716



RC unit **ARC 4 668 9066 0**
For the supervision of ionization currents in networks with nonearthed neutral conductor



PTC resistor (AC 230 V) **AGK25**
To burden terminal 3 (mandatory when using burners with no fan motor connected to terminal 3)



Auxiliary unit for UV supervision **AGQ1.1A27**
AGQ1.2A27
- Cable length 500 mm
- Cable length 300 mm
Can be fitted under the plug-in base (refer to «Dimensions»)



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








Service adapter **KF8872**
For checking the functioning of the burner controls on the burner plant
– Functional test with signal lamps
– Detector resistance measurement with a jack of 4 mm diameter



Test case **KF8843**
- For checking the functions of the burner control

Adapters / replacement types

No rewiring required

LGB21... with adapter	KF8852		LFI7...
	KF8880		LFM1... LFM1...-F
LGB22... with adapter	KF8853-K		LFI7...
	KF8880		LFM1...
LGB41... with adapter	KF8862		LFM1...

Technical data

General unit data LGB...	Mains voltage	AC 220 V –15 % ...AC 240 V +10 % (LGB2... / LGB4...) AC 230 V –15 % / +10 % (LGB32..!) AC 100 V –15 % ...AC 110 V +10 %
	Mains frequency	50...60 Hz ±6 %
	Input current at terminal 12	max. 5 A within the permissible voltage range AC 187...264 V or AC 195...253 V
	Current rating	
	- Terminal 3	max. 3 A (15 A for max. 0.5 s)
	- Terminals 4, 5 and 7	max. 2 A
	- Terminals 9 and 10	max. 1 A
	- Terminal 12	max. 5 A (at U _{max} . AC 264 V or AC 253 V)
	Cable length terminals 8 and 10	20 m at 100 pF / m
	Perm. cable lengths	max. 3 m at 100 pF / m line capacitance
	Detector cable laid separately	20 m
	Power consumption	3 VA
	Primary fuse	max. 10 A (slow)
	Degree of protection	IP 40
	Mounting position	optional
Weight	approx. 230 g	

Norms and standards

Environmental conditions

Transport IEC 721-3-2

Climatic conditions class 2K2

Mechanical conditions class 2M2

Temperature range -50...+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

LGB21... / LGB22... FTLLXN with 2-stage operation

LGB32... FMLLXN with 2-stage operation

LGB41... ABLLXN with 2-stage operation
(«BV1 + BV2» or «ZBV + BV2»)

AMLLXN with single-stage operation

Flame supervision

Flame supervision with ionization probe

	At mains voltage UN = AC 230 V
Detector voltage across terminals 1 and 2 or ground (AC voltmeter $R_i \geq 10 \text{ M}\Omega$)	$\leq U_N$
Detector current required for reliable operation	$\geq 3 \mu\text{A}$
Max. possible detector current in operation	100 μA

The conductivity and the rectifying effect of hot flame gases are used for flame supervision. For that purpose, an AC voltage is applied to the heat-resistant ionization probe which projects into the flame. The current that flows in the presence of a flame (ionization current) produces the flame signal which is fed to the input of the flame signal amplifier. The amplifier is designed such that it responds only to the DC current component of the flame signal, thereby ensuring that a short-circuit between ionization probe and ground cannot simulate a flame signal (since in that case an AC current would flow).

Basically, the flame supervision circuit is insensitive to adverse effects of the ignition spark.

However, should the disturbing effects of the ignition spark on the ionization current exceed a certain level, the electrical connections on the primary side of the ignition transformer must be changed and / or the siting of the ionization probe is to be checked.

Ionization current supervision with burner controls operating on AC 110 V

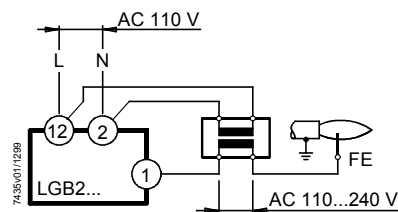
Since the ionization current with burner controls operating on AC 110 V is only about 50 % of those operating on AC 230 V, certain applications make it necessary to increase the ionization current with a transformer.

Capacity of transformer: min. 2 VA

Transforming ratio: approx. 1.1...1.5

The primary and secondary windings must be galvanically separated.

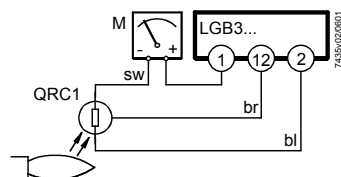
Connection of transformer



Flame supervision with
blue-flame detector
QRC1...

Perm. detector current during the prepurge time (dark current)	5 μ A
Min. detector current required during operation	50 μ A

Measurement circuit with the QRC1...



- Legend
- M Microammeter Ri max. 5000 Ω
 - sw Black wire
 - br Brown wire
 - bl Blue wire

The QRC1... has been designed specifically for blue-burning flames. Incidence of light from the front and laterally. The flame detector is secured by means of 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 7716.

Flame supervision with
UV detector QRA... and
AGQ... for LGB21... /
LGB22... / LGB41...

Mains voltage	AC 220 V -15% ...AC 240 V $+10\%$
Mains frequency	50...60 Hz $\pm 6\%$
Power consumption	4.5 VA
Degree of protection	IP 40
Perm. ambient temperature	
- In operation	$-20\text{...}+60\text{ }^\circ\text{C}$
- During transport and storage	$-40\text{...}+70\text{ }^\circ\text{C}$
Perm. length of cable from QRA... to AGQ1...A27 (use separate cable)	max. 20 m
Mounting position	optional
Perm. length of connecting cable from AGQ1...A27 to LGB...	max. 20 m
Weight of AGQ1...A27	approx. 140 g

	At mains voltage Un:	
	AC 220 V	AC 240 V
Detector voltage at QRA... (with no load)		
Up to the end of «t10» and after a controlled shutdown	DC 400 V	DC 400 V
From the beginning of «t1»	DC 300 V	DC 300 V
Detector voltage		
Load by DC measurement instrument Ri > 10 MΩ		
Up to the end of «t10» and after a controlled shutdown	DC 380 V	DC 380 V
From the beginning of «t1»	DC 280 V	DC 280 V
DC detector signals with UV detector QRA...	Min. required	Max. possible
Measurement on the QRA...	200 μ A	500 μ A

Flame supervision with UV detector QRA... and auxiliary unit AGQ... for LGB21... / LGB22... / LGB41...

UV detector QRA... Universal flame detector for use with gas and gas / oil burners. Incidence of light from the front and laterally. Total length 97 mm. Available with normal or, as QRA2M, with higher sensitivity. Secured with flange and clamp. Also available as a metal encapsulated version in the form of the QRA10... (for details, refer to Data Sheet 7712).

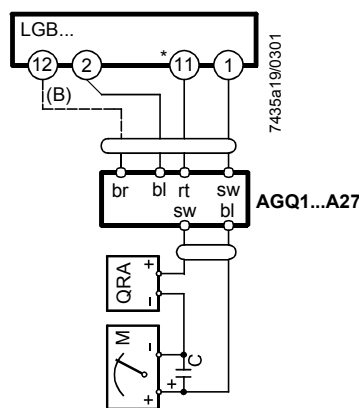
Auxiliary unit AGQ1...A27 A special UV auxiliary unit AGQ1...A27 is required in connection with LGB... burner controls.

That unit is to be connected to the mains supply via 2 cables, and to the burner control via terminals 1, 2 and 11.

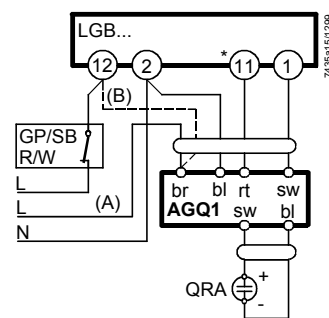
Using circuitry (A) or (B), there are 2 ways to make the quench test on ageing UV detectors and to detect UV light:

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

Measurement circuit



Connection diagram



Measurement made on the flame detector

Legend

- GP Gas pressure monitor
- R Temperature or pressure controller
- SB Safety limit thermostat
- W Temperature limiter or pressure monitor
- * With LGB41...: terminal 3
- (A) Operation with a permanent line
- (B) Operation with a controlled line

Functions

The function diagrams show 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 missing, the burner control will stop the startup sequence to trigger lockout where required by safety regulations.

Preconditions for burner startup

- Burner control must be reset
- The contacts of gas pressure monitor «GP», limit thermostat / pressure monitor «W», control thermostat / pressure controller «R» and safety limit thermostat «SB» must be closed
- Fan motor «M» or AGK25 must be connected
- Air pressure monitor «LP» must be in its idle position

Undervoltages

LGB... burner controls are capable of detecting **undervoltages**. This means that load relay «AR» will be deenergized if the mains voltage drops below AC 160 V (for nominal AC 220...240 V) or AC 75 V (for nominal AC 100...110 V). The burner control will automatically make a restart attempt when the supply voltage returns to a level above AC 160 V and AC 75 V respectively.

Reversed polarity protection

If the connections of live conductor (terminal 12) and neutral conductor (terminal 2) are mixed up, the burner control will initiate lockout at the end of «TSA».

Startup sequence

A – C Startup sequence

A **Start command** (switching on)

This command is triggered by control thermostat / pressure controller «R». Terminal 12 receives voltage and the programming mechanism starts running. On completion of waiting time «tw» with the LGB21..., or after air damper «SA» has reached the nominal load position (on completion of «t1») with the LGB22... / LGB32..., fan motor «M» will be started.

TSA **Ignition safety time**

On completion of «TSA», a flame signal must be present at terminal 1. That flame signal must be continuously available until shutdown occurs, or else flame relay «FR» will be deenergized, resulting in lockout.

tw **Waiting time**

During the waiting time, air pressure monitor «LP» and flame relay «FR» are tested for correct contact positions.

t1 **Prepurge time**

Purging the combustion chamber and the secondary heating surfaces: required with low-fire air volumes when using the LGB21... and with nominal load air volumes when using the **LGB22... / LGB32...** The «Type summary» and the «Function and sequence diagrams» show the so-called **prepurge time «t1»** during which air pressure monitor «LP» must indicate that the required air pressure is available. The effective prepurge time «t1» comprises interval end «tw» through «t3».

t3 **Preignition time**

During «t3» and up to the end of «TSA», flame relay «FR» is forced to close. On completion of «t3», the release of fuel is triggered at terminal 4 or at terminal 11 of the LGB41...

- t3n **Postignition time**
 Ignition time during «TSA»
 Just before reaching the end of «TSA», ignition transformer «Z» will be switched off.
 This means that «t3n» is somewhat shorter than «TSA».
 This is necessary in order to give the forcedly closed flame relay «FR» sufficient time to drop out if there is no flame.
- t4 **Interval**
LGB21... / LGB41...: time to the release of the second fuel valve «BV2»
LGB22... / LGB32...: on completion of «t4», the heat source is controlled depending on the load (release of load controller «LR»)
- t9 **Second safety time**
 (Only with LGB41...)
 For pilot burners with main flame supervision equipped with a pilot gas valve «ZV1».
- t10 **Specified time for air pressure signal**
 On completion of this period of time, the set air pressure must have built up, or else lockout will occur.
- t11 **Programmed opening time for actuator «SA»**
 (Only with LGB22... / LGB32...)
 The air damper opens until the nominal load position is reached. Only then will fan motor «M» be switched on.
- t12 **Programmed closing time for actuator «SA»**
 (Only with LGB22... / LGB32...)
 During «t12», the air damper travels to the low-fire position.
- B – B' **Interval for establishment of flame**
- C **Burner operating position reached**
- C – D **Burner operation** (generation of heat)
 Nominal output or, in connection with a load controller «LR», part load operation.
- D **Shutdown by «R»**
 The burner is immediately shut down and the programming mechanism is ready for a new start.

Control sequence in the event of fault

In principle, whenever lockout occurs, the fuel supply will immediately be shut down. If that takes place between startup and preignition, which is not indicated by a symbol, the usual cause is air pressure monitor «LP» shutting down, or a premature, faulty flame signal.

• After a mains failure or in the event of undervoltage:	New startup with full program sequence on power restoration
• Premature flame signal from the start of «t1»:	Immediate lockout
• Contacts of air pressure monitor «LP» have welded during «tw»:	Prevention of startup
• No air pressure signal:	Lockout on completion of «t10»
• Air pressure failure on completion of «t10»:	Immediate lockout
• Burner does not ignite:	Lockout on completion of «TSA»
• Flame is lost during operation:	Immediate lockout

Lockout











After lockout, the LGB... will remain locked (lockout cannot be changed). This status will also be maintained in the event of a mains voltage failure.

Resetting the LGB...

Whenever lockout occurs, the burner control can immediately be reset.

Lockout and control sequence indication

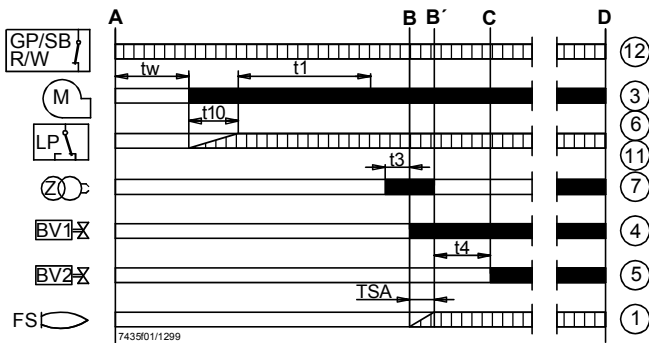
The position of the programming mechanism can be seen through the viewing window on the front of the unit. In the event of fault, the programming mechanism stops and thus the lockout indicator also. The symbol in the viewing window indicates both the position in the control sequence and the type of fault according to the following legend:

	No startup since the start control loop is open
	Interval «tw» or «t10» (LGB21...) Interval «tw» or «t11» (LGB22... / LGB32...) Interval «tw», «t3» or «TSA» (LGB41...)
	Air damper fully open (LGB22... / LGB32...)
	Lockout due to absence of air pressure signal
	Interval «t1», «t3» and «TSA» (LGB21...) Interval «t1», «t3» («t12») (LGB22... / LGB32...)
	Release of fuel
	Lockout since there is no flame signal on completion of the first safety time
	Release of second fuel valve (LGB21... / LGB41...) Release of load controller (LGB22... / LGB32...)
	Lockout since there is no flame signal on completion of the second safety time (LGB41...)
	Part load or nominal load operation (or return to the operating position)

Connection diagrams

LGB21...

Burner controls for single- or 2-stage forced draft burners.
Air damper control for prepurging with **low-fire air volume**.

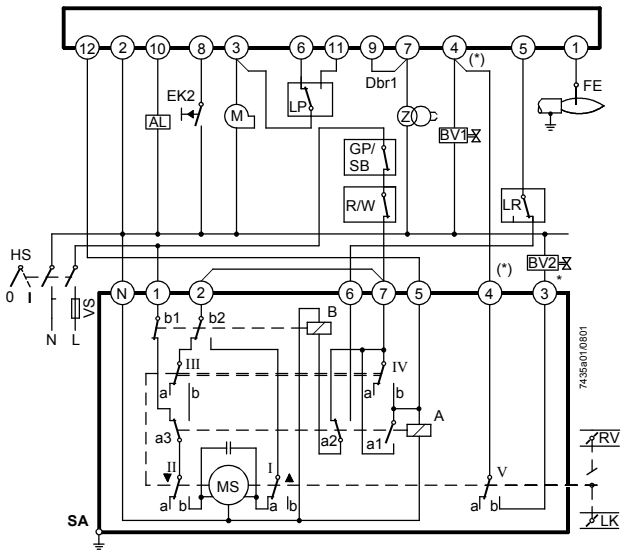
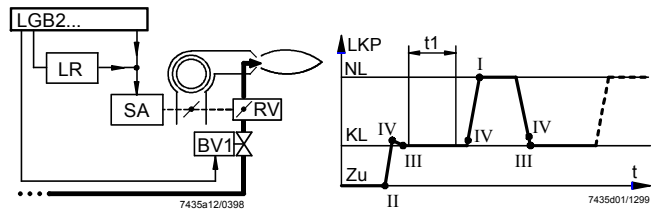
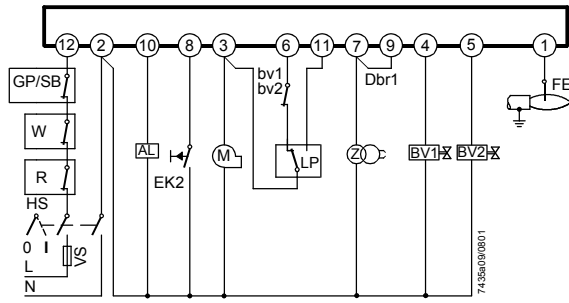


Application examples
Control of actuators of 2-stage or 2-stage modulating burners.
Purpurging (« t_1 ») with low-fire air volume.
Same low-fire actuator position (switching cam III) during startup and operation!

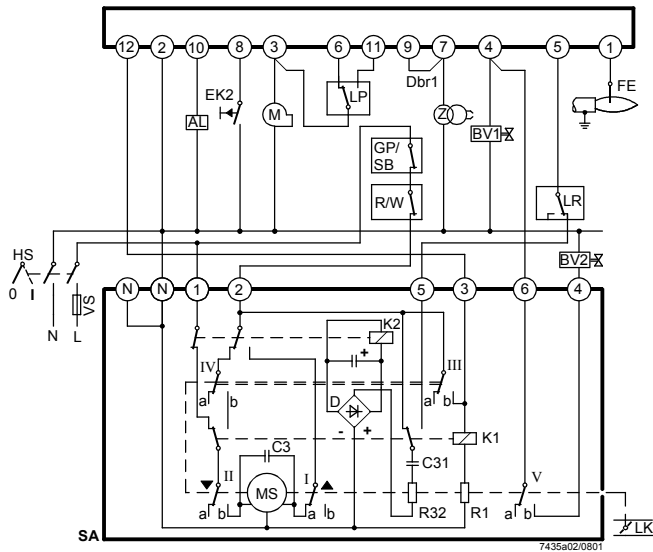
For information about actuators «SA»:
SQN3...: refer to Data Sheet 7808
SQN7...: refer to Data Sheet 7804
SQN9...: refer to Data Sheet 7806

Flame supervision

LGB21...: with ionization probe or auxiliary unit AGQ1...A27 for UV detector QRA...

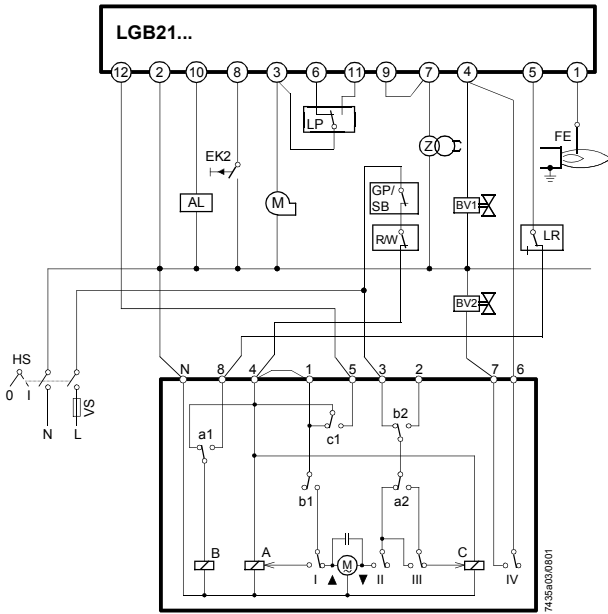


SQN3...121...

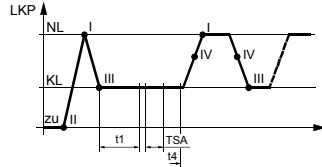


SQN91.140... / 2-stage control

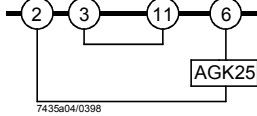
* Note:
With 2-stage modulating burners (with gas regulation damper «RV»),
«BV2» and the dotted connection between terminals (*) are not required



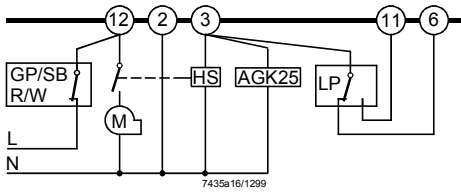
SQN7...244 / 2-stage control



Burner without fan assistance and without «LP»

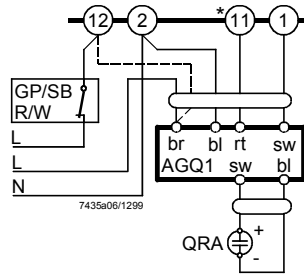
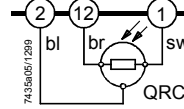


Burner with fan control via auxiliary contactor («HS») with «LP» (does not apply to LGB41...)



QRC1... with LGB3... (diagram 7435a02)

QRA... with auxiliary unit AGQ1... with LGB2... / LGB4... (diagram 7435a06)



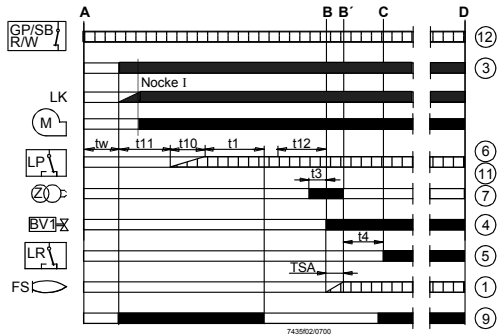
Legend

- bl Blue wire
- br Brown wire
- rt Red wire
- sw Black wire
- * With LGB41... terminal 3

Connection diagrams

LGB22... / LGB32...

Burner controls for single- or 2-stage forced draft burners.
Air damper control for prepurging with **nominal load air volume**.



Application examples
Control of actuators of 2-stage or 2-stage modulating burners.
Purpurging («t1») with nominal load air volume.

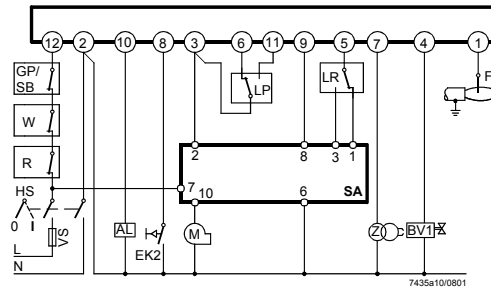
For information about the actuators:
SQN3...: refer to Data Sheet 7808
SQN7...: refer to Data Sheet 7804
SQN9...: refer to Data Sheet 7806

Flame supervision

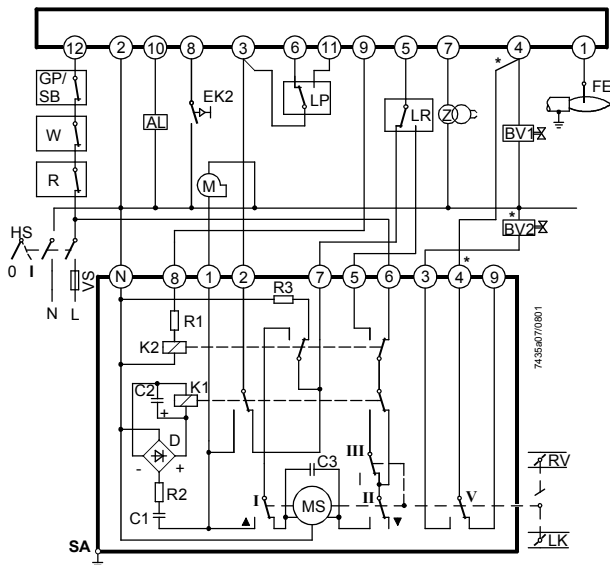
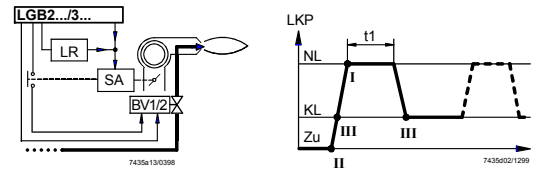
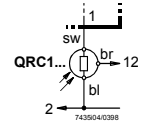
LGB22...: with ionization probe or auxiliary unit AGQ1... for UV detector QRA...

LGB32...: with blue-flame detector QRC1...

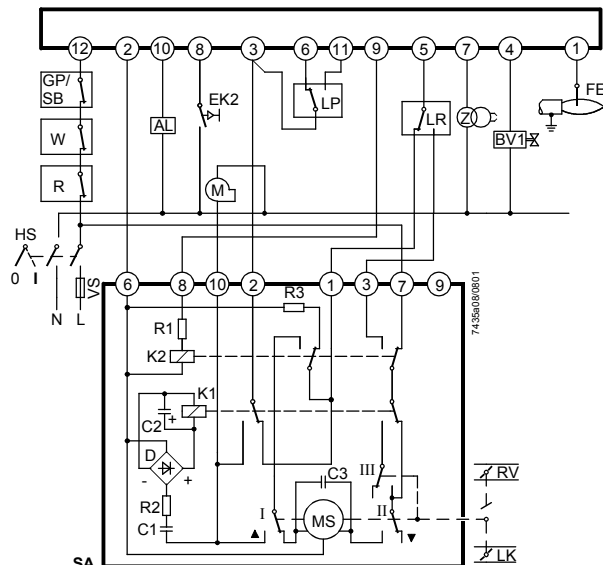
Only LGB22...



Only LGB32...

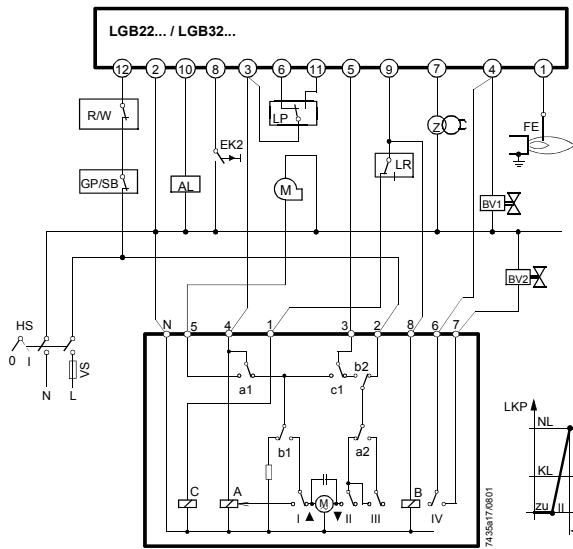


SQN3...151... or SQN3...251...

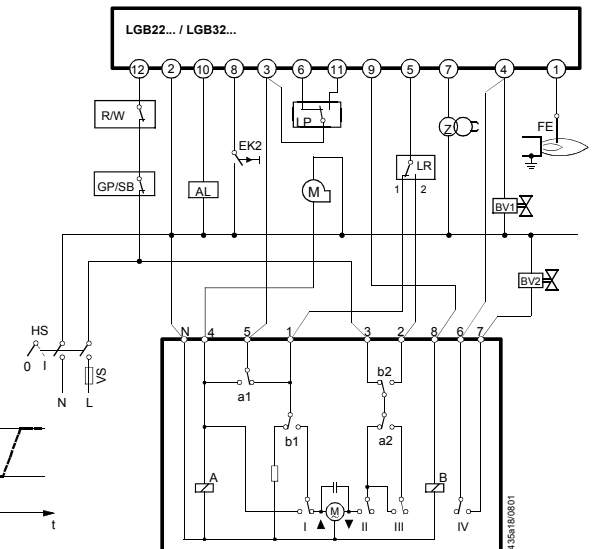


SQN90.220... / 2-stage modulating control

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



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



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

Legend

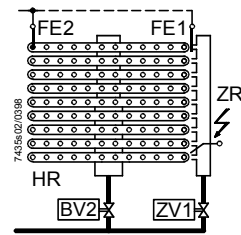
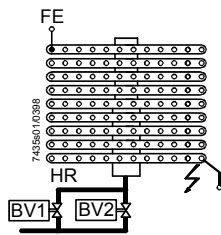
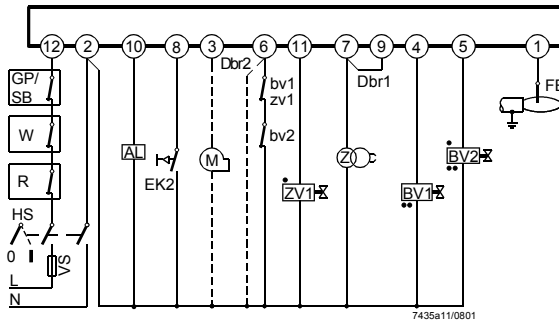
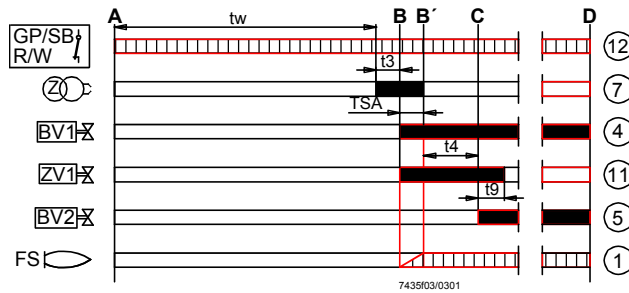
TSA Ignition safety time
t1 Prepurge time
t4 Interval «BV1 – BV2»
LGB22... / LGB32...: interval «BV1 - LR»

- | | |
|-------------------------|---|
| AL Alarm | LR Load controller |
| BV... Fuel valve | M Fan motor |
| EK2 Remote reset button | NL Nominal load |
| FE Ionization probe | R Control thermostat or pressure controller |
| GP Gas pressure monitor | SB Safety limit thermostat |
| HS Mains isolator | VS Primary fuse |
| KL Low-fire | W Limit thermostat |
| LKP Air damper position | Z Ignition transformer |
| LP Air pressure monitor | |



Connection diagrams

LGB41...

Burner controls for atmospheric gas burners with or without fan assistance. No actuator control. Flame supervision with ionization probe

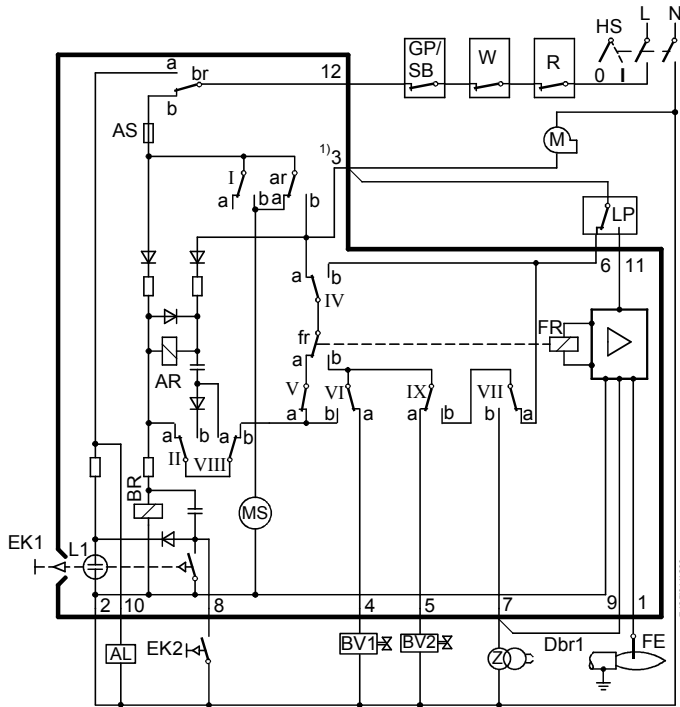


Legend

- | | | | |
|---|---|-------|--|
| A | Startup (switching on by «R») | AL | Alarm |
| B – B' | Interval for establishment of flame | BV... | Fuel valve |
| C | Operating position of burner or release of the second stage by load controller«LR» | bv... | Auxiliary switch in the fuel valves (for checking the fully closed position) |
| D | Shutdown by «R» | Dbr1 | Wire link |
| tw | Waiting time | Dbr2 | Wire link, required when contact «bv» or «zv1» is missing |
| TSA | Ignition safety time | EK2 | Remote reset button |
| t3 | Prepurge time | FE... | Ionization probe |
| t4 | Interval «BV1 – BV2» | FS | Flame signal |
| t9 | Second safety time | GP | Gas pressure monitor |
|  | Required input signals | HR | Main burner |
|  | Burner control's output signals | HS | Mains isolator |
| • | Connection of valves with pilot burners with main flame supervision | M | (Auxiliary) fan motor |
| •• | Connection of valves with 2-stage atmospheric burners with supervision of the first stage («BV1») | R | Control thermostat or pressure controller |
| | | SB | Safety limit thermostat |
| | | VS | Primary fuse |
| | | W | Limit thermostat |
| | | Z | Ignition transformer |
| | | ZR | Pilot burner |
| | | ZV1 | Pilot gas valve |
| | | zv1 | Auxiliary switch in the pilot gas valve |

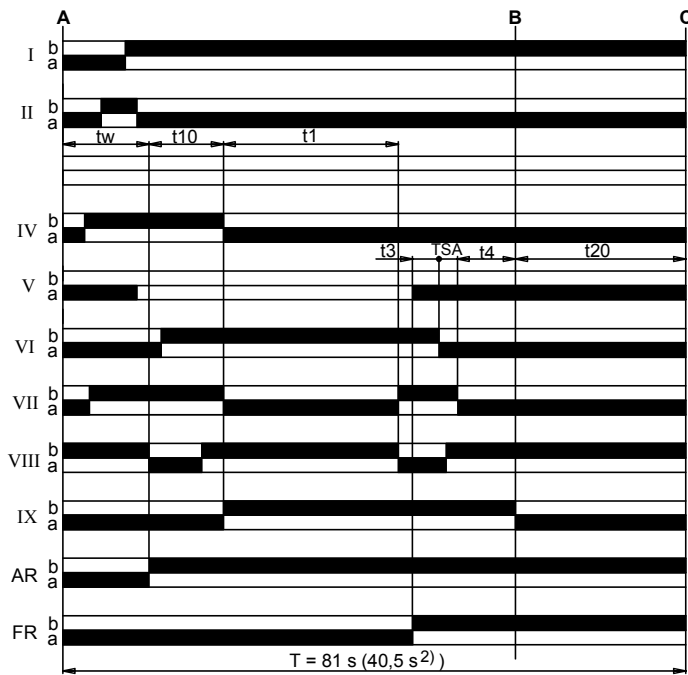
Internal diagram and time diagram of the programming mechanisms

LGB21...



Legend

- AL Alarm
- AR Load relay with contact «ar»
- AS Unit fuse
- BR Locking relay with contact «br»
- BV... Fuel valve
- Dbr1 Wire link
- EK... Lockout reset button
- FE Ionization probe
- FR Flame relay
- GP Gas pressure monitor
- HS Mains isolator
- L1 Lockout warning lamp
- LP Air pressure monitor
- M Fan motor
- MS Synchronous motor
- R Control thermostat or pressure controller
- SB Safety limit thermostat
- W Limit thermostat or pressure monitor
- Z Ignition transformer

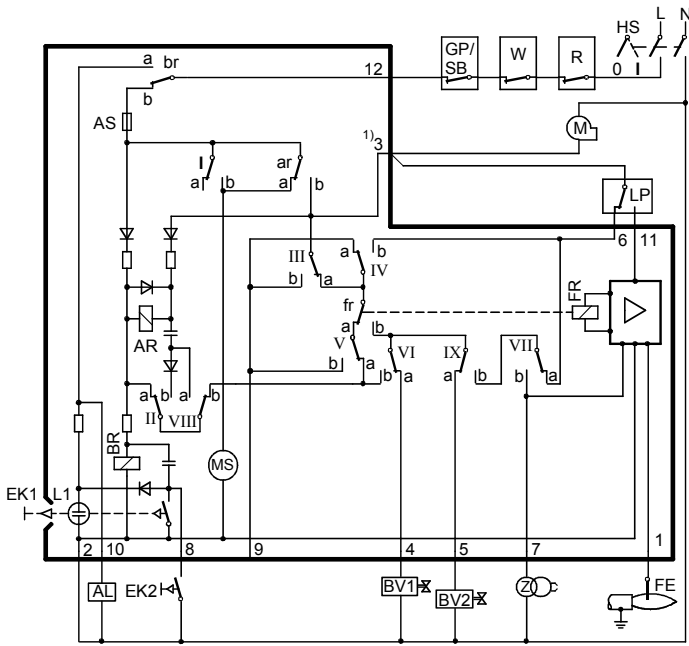


- A Start position (switching on)
- B Operating position of burner
- C Operating position of programming mechanism or start position

- I...IX Cam switches
- tw Waiting time
- TSA Ignition safety time
- T Total running time of programming mechanism
- t1 Prepurge time
- (4) t3 Preignition time
- (7) t4 Interval «BV1 – BV2»
- t10 Specified time for air pressure signal
- t20 Interval up to self-shutdown of the programming mechanism

- 1) Resistance between terminal 3 and «N» may not exceed 1.6 kΩ
- 2) Only with LGB21.130A27

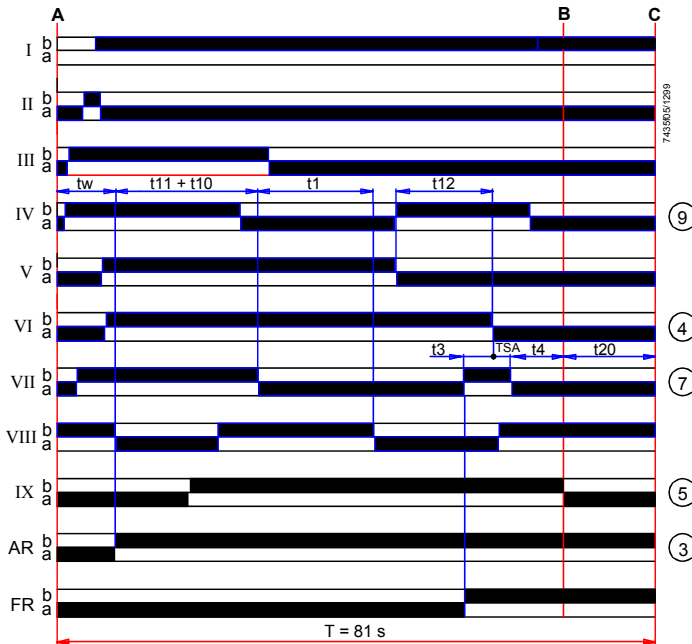
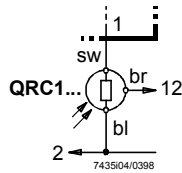
LGB22... / LGB32...



Legend

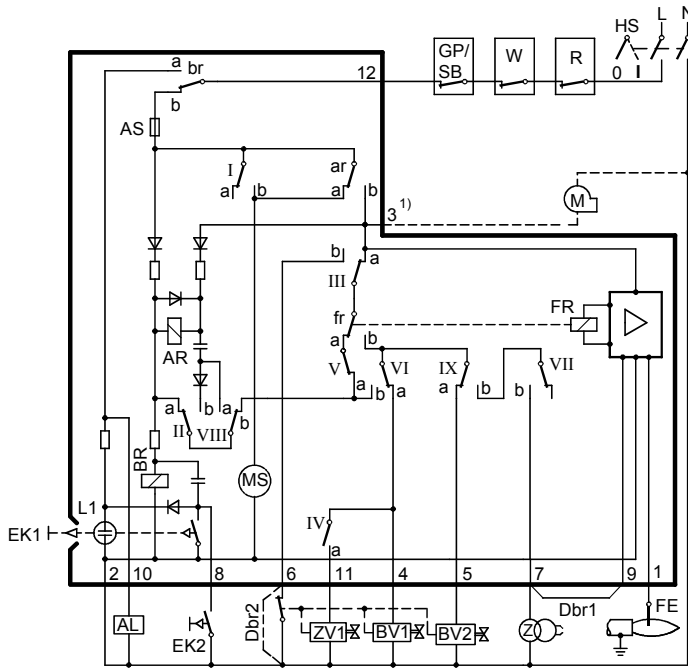
- AL Alarm
- AR Load relay with contact «ar»
- AS Unit fuse
- BR Locking relay with contact «br»
- BV... Fuel valve
- EK... Lockout reset button
- FE Ionization probe
- FR Flame relay
- GP Gas pressure monitor
- HS Mains isolator
- L1 Lockout warning lamp
- LP Air pressure monitor
- M Fan motor
- MS Synchronous motor
- R Control thermostat or pressure controller
- SB Safety limit thermostat
- W Limit thermostat or pressure monitor
- Z Ignition transformer

Only LGB32...



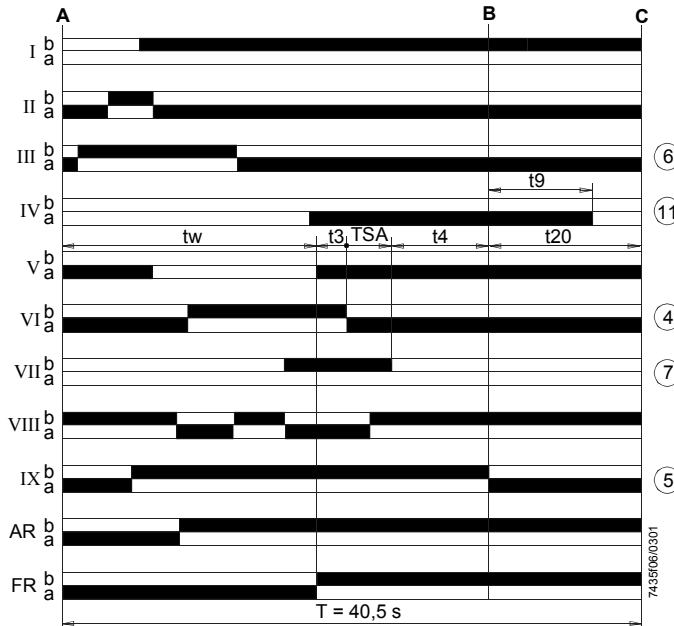
- A Start position (switching on)
 - B Operating position of burner
 - C Operating position of programming mechanism or start position
-
- I...IX Cam switches
 - tw Waiting time
 - TSA Ignition safety time
 - T Total running time of programming mechanism
 - t1 Pre-purge time
 - t3 Pre-ignition time
 - t4 Interval «BV1 – BV2» or «BV1 – LR»
 - t10 Specified time for air pressure signal
 - t11 Programmed opening time for actuator «SA»
 - t12 Programmed closing time for actuator «SA»
 - t20 Interval up to self-shutdown of the programming mechanism
-
- 1) Resistance between terminal 3 and «N» may not exceed 1.6 kΩ

Only LGB41...

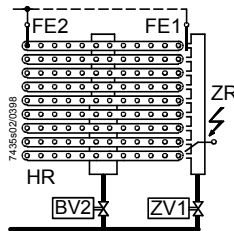
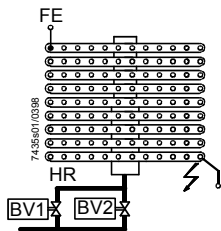


Legend

- AL Alarm
- AR Load relay with contact «ar»
- AS Unit fuse
- BR Locking relay with contact «br»
- BV... Fuel valve
- Dbr1 Wire link
- Dbr2 Wire link terminal 6-2 required when contact «bv» or «zv1» is missing
- EK... Lockout reset button
- FE Ionization probe
- FR Flame relay
- GP Gas pressure monitor
- HR Main burner
- HS Mains isolator
- L1 Lockout warning lamp
- M Fan motor
- MS Synchronous motor
- R Control thermostat or pressure controller
- SB Safety limit thermostat
- W Limit thermostat or pressure monitor
- Z Ignition transformer
- ZR Pilot burner
- ZV1 Pilot gas valve in place of «BV1» in the case of pilot burners with main flame supervision



- tw Waiting time
- TSA Ignition safety time
- T Total running time of programming mechanism
- t3 Preignition time
- t4 Interval «BV1 – BV2»
- t9 Second safety time
- t20 Interval up to self-shutdown of the programming mechanism
- A Start position (switching on)
- B Operating position of burner
- C Operating position of programming mechanism or start position



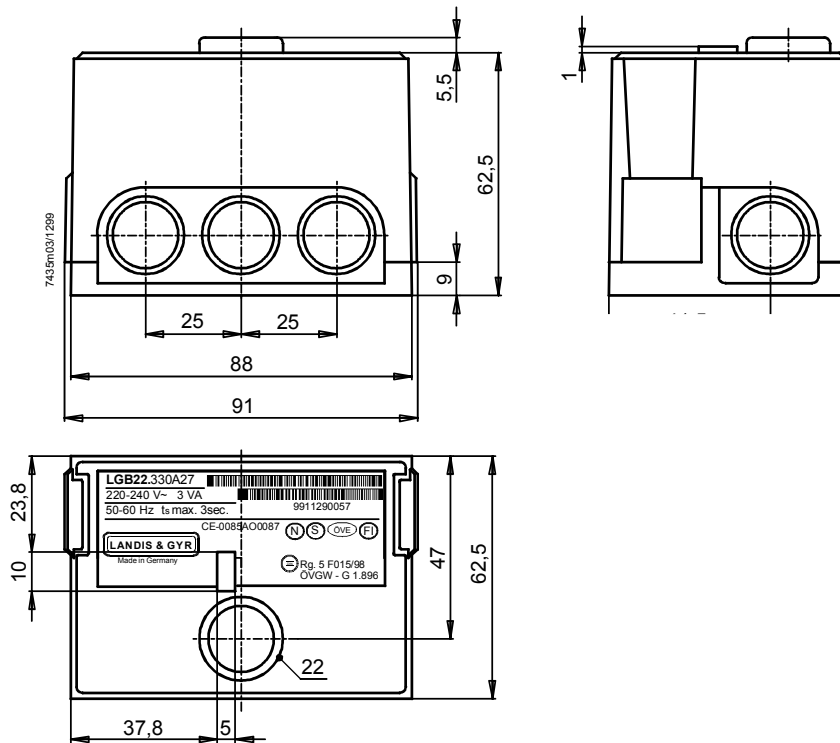
I...IX Cam switches

1) Resistance between terminal 3 and «N» may not exceed 1.6 kΩ

Dimensions

Dimensions in mm

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



Auxiliary unit
AGQ1...A27

