SIEMENS

7130

ISO 9001

CE

Oil Burner Controls

LMO14...
LMO24...
LMO44...

Microcontroller-based oil burner controls for the supervision, start-up and control of forced draught oil burners in intermittent operation. Oil throughput up to 30 kg / h with the LMO14... and LMO24..., and above 30 kg / h with the LMO44...

The LMO14..., LMO24..., LMO44... and this data sheet are intended for OEMs which integrate the burner controls in their products.

Use

The LMO... burner controls are designed for the start-up and supervision of single- or 2-stage forced draught oil burners in intermittent operation.
Yellow-burning flames are supervised with photoresistive detectors QRB..., blue-burning flames with blue-flame detectors QRC...
In terms of housing dimensions, electrical connections and flame detectors, the LMO... are identical to the LOA... oil burner controls.

Application-specific features

- Forced draught oil burners conforming to EN 267
- LMO44... for stationary direct-fired air heaters
- Burner controls for use with atomization oil burners of monoblock design conforming to EN 230
- Detection of undervoltages
- Electrical remote reset
- Contact for oil pre-heating
- Monitoring of time for oil pre-heating
- Accurate and reproducible program sequence thanks to digital signal handling
- Controlled intermittent operation after 24 hours of continuous operation
- Limitation of the number of repetitions
- Multicolour indication of fault and status messages

CC1N7130en
31.07.2000

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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 LMO..., 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 the lock-out reset 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

Mounting notes

- Ensure the relevant national safety regulations are complied with

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
- Ensure 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 LMO... may never be plugged in
- Make certain the live wires are correctly connected

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 flame detector darkened	Lock-out at the end of «TSA»
b)	Burner start-up with flame detector exposed to extraneous light	Lock-out after no more than 40 seconds
c)	Burner operation with simulated flame failure; for that purpose, darken the flame detector during operation and maintain that status	Restart followed by lock-out at the end of «TSA»

Mechanical design

The housing is made of impact-proof, heat-resistant and flame-retarding plastic.
It is of plug-in design and engages audibly in the base.

The housing accommodates the

- microcontroller, which controls the program sequence, and the relays for load control
- electronic flame signal amplifier
- lock-out reset button with its integrated 3-colour signal lamp for status and fault messages and the socket for connecting the interface adapter OCI400

Display and diagnosis

- Multicolour display of status and fault messages
- Transmission of status and fault messages as well as detailed service information by additional interface adapter OCI400 and PC Windows software ACS400

Type summary

Type reference	Mains voltage	Fuel valve stages	Burner capacity	Oil pre-heater contact	Remote reset	Times						Comparable type of LOA...
						tw max.	t1 min.	TSAmax.	t3 min.	t3n max.	t4 min.	
Standard versions												
LMO14.111A2	AC 230 V	1	< 30 kg / h	•	•	5 s	16 s	10 s	15 s	10 s	---	LOA24.171B27 LOA26.171B27 LOA36.171A27
LMO14.111A1	AC 110 V	1	< 30 kg / h	•	•	5 s	16 s	10 s	15 s	10 s	---	LOA24.171B17
LMO14.113A2	AC 230 V	1	< 30 kg / h	•	•	5 s	16 s	10 s	15 s	3 s	---	LOA24.173A27
LMO24.111A2	AC 230 V	2	< 30 kg / h	•	•	5 s	16 s	10 s	15 s	10 s	15 s	LOA24.171B27 LOA26.171B27 LOA36.171A27
LMO24.111A1	AC 110 V	2	< 30 kg / h	•	•	5 s	16 s	10 s	15 s	10 s	15 s	LOA24.171B17
LMO24.113A2	AC 230 V	2	< 30 kg / h	•	•	5 s	16 s	10 s	15 s	3 s	15 s	LOA24.173A27
Version for flash-steam generators												
LMO24.011A2	AC 230 V	2	< 30 kg / h	•	•	5 s	6 s	10 s	5 s	10 s	15 s	LOA24.571C27
Version for direct fired air heaters WLE												
LMO44.255A2	AC 230 V	2	> 30 kg / h	•	•	5 s	26 s	5 s	25 s	5 s	5 s	LOA44.252A27

Legend

TSAmax.	Maximum ignition safety time
tw	Waiting time
t1	Pre-purge time
t3	Pre-ignition time
t3n	Post-ignition time, maximum until the end of «TSAmax»
t4	Interval from flame signal to the release of «BV2»

Ordering

Oil burner control, without plug-in base — refer to «Type summary»

Electrical connections — refer to data sheet 7201
- Plug-in base AGK11
- Cable holders AGK65, AGK66, AGK67...
- Cable tension relief elements for AGK67...

Flame detectors
- Photoresistive detectors QRB1... — refer to data sheet 7714
- Blue-flame detector QRC1... — refer to data sheet 7716

Diagnostic tool — refer to data sheet 7614
- Interface adapter OCI400
- PC Windows software ACS400

Test case, for making functional tests — **KF8843**

Test adapter — **KF8833**
- With signal lamps for program indication
- With one pair of jacks for measuring the flame detector current

Test adapter — **KF8840**
- With signal lamps for program indication
- With holes for checking the control voltages at the tabs of the burner control
- With on / off switch for simulating the flame signal
- With one pair of jacks for measuring the flame detector current

Test adapter — **KF8885**
- With switch for manual start-up of burner
- With switch for simulating the oil pre-heater's release contact
- With 2 pairs of jacks for measuring the flame detector current

Technical data

General unit data

Mains voltage	AC 230 V +10 % / -15 % AC 110 V +10 % / -15 %
Mains frequency	50...60 Hz ±6 %
External primary fuse (Si)	5 A (slow)
Power consumption	12 VA
Mounting orientation	optional
Weight	approx. 200 g
Degree of protection	IP 40
Perm. cable lengths	max. 3 m at a line capacitance of 100 pF/m
Detector cable laid separately	20 m
Remote reset	20 m

Max. perm. amperage at cos φ ≥ 0.6	LMO14...	LMO24... / LMO44...
Terminal 1	5 A	5 A
Terminals 3 and 8	3 A	5 A
Terminals 4, 5, 6 and 10	1 A	1 A

Environmental conditions

Transport	IEC 721-3-2
Climatic conditions	class 2K2
Temperature range	-30...+70 °C
Humidity	< 95 % r.h.
Operation	IEC 721-3-3
Climatic conditions	class 3K5
Mechanical conditions	class 2M2
Temperature range	
- LMO14... / LMO24...	-5...+60 °C
- LMO44...	-20...+60 °C
Humidity	< 95 % r.h.

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

Norms and standards

CE conformity

According to the directives of the European Union

Electromagnetic compatibility EMC	89 / 336 EEC incl. 92 / 31 EEC
Low voltage directive	73 / 23 EEC

Flame supervision with QRB... and QRC...

Type reference	QRB...		
	Min. detector current required (with flame)	Max. detector current permitted (without flame)	Max. possible with flame (typically)
LMO14... LMO24... LMO44...	45 µA	5.5 µA	100 µA

Type reference	QRC...		
	Min. detector current required (with flame)	Max. detector current permitted (without flame)	Max. possible with flame (typically)
LMO14... LMO24... LMO44...	70 µA	5.5 µA	100 µA

Function

Preconditions for start-up

- Burner control is reset
- All contacts in the line are closed
- No undervoltage
- Flame detector is darkened, no extraneous light

Undervoltage

- Safety shut-down in the operating position takes place should the mains voltage drop below about AC 165 V
- Restart is initiated when the mains voltage exceeds about AC 175 V

Time supervision oil pre-heater

If the oil pre-heater's release contact does not close within 10 minutes, the burner control will initiate lock-out.

Controlled intermittent operation

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

Control sequence in the event of fault

If lock-out occurs, the outputs for the fuel valves and the ignition will immediately be deactivated (< 1 second).

Cause	Response
After a mains failure	Restart
After voltage has fallen below the undervoltage threshold	Restart
In the event of a premature, faulty flame signal during «t1»	Lock-out at the end of «t1»
In the event of a premature, faulty flame signal during «tw»	Prevention of start-up, lock-out after no more than 40 seconds
If the burner does not ignite during «TSA»	Lock-out at the end of «TSA»
In the event the flame is lost during operation	Max. 3 repetitions, followed by lock-out
Oil pre-heater's release contact does not close within 10 min.	Lock-out

Lock-out

In the event of lock-out, the LMO... remains locked (lock-out cannot be changed), and the red signal lamp will light up. This status is also maintained in the case of a mains failure.

Resetting the burner control

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

Ignition program with LMO14.113**A2 and LMO24.11**3**A2**

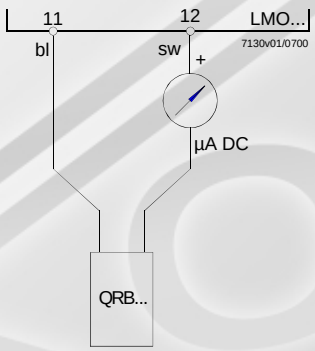
If the flame is lost during «TSA», the burner will be reignited, but not later than at the end of «TSAmax.». This means that several ignition attempts can be made during «TSA» (refer to «Program sequence»).

Limitation of repetitions

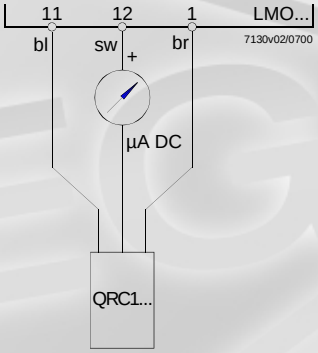
If the flame is lost during operation, a maximum of 3 repetitions can be made. If the flame is lost for the 4th time during operation, the burner will initiate lock-out. The repetition count is restarted each time controlled switching on by «R-W-SB» takes place.

Measurement circuit for detector current

QRB...



QRC...



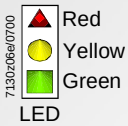
As an alternative to the detector current measurement, the diagnostic tool OCI400 / ACS400 can be used. In that case, connection of the DC microammeter is not required.

Legend µA DC DC microammeter with an internal resistance of Ri = max. 5 kΩ

bl	Blue
sw	Black
br	Brown

Operation

Lock-out reset button «EK...» is the key operating element for resetting the burner control and for activating / deactivating the diagnostic functions.

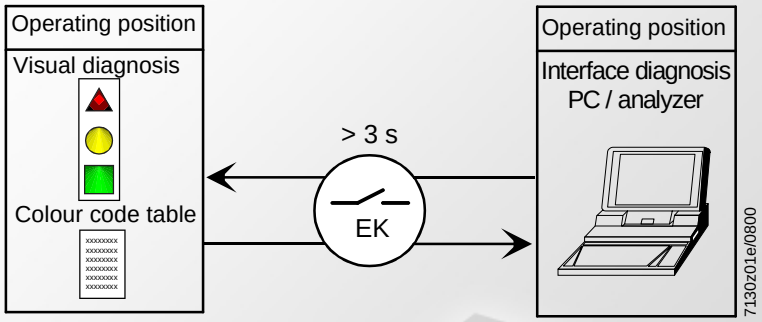


The multicolour «LED» is the key indicating element for both visual diagnosis and interface diagnosis.

Both «EK...» and «LED» are located under the transparent cover of the lock-out reset button.

There are 2 diagnostic choices available:
1. Visual diagnosis: operational status indication.
2. Interface diagnosis: with the help of the interface adapter OCI400 and PC software ACS400 or flue gas analyzers of different makes (refer to data sheet 7614).

Visual diagnosis:
In normal operation, the different operational statuses are displayed in the form of colour codes according to the colour code table. The interface diagnosis is activated by pressing the lock-out reset button for at least 3 seconds (refer to data sheet 7614). If, by accident, the interface diagnosis has been activated, in which case the slightly red light of the signal lamp flickers, it can be deactivated by pressing again the lock-out reset button for at least 3 seconds. The moment of switching over is indicated by a yellow light pulse.



Operational status indication

Colour code table		
Status	Colour code	Colour
Oil pre-heater heats, waiting time «tw»	● ● ● ● ● ● ● ● ● ●	Yellow
Ignition phase, ignition controlled	● ❍ ● ❍ ● ❍ ● ❍ ● ❍ ●	Yellow-off
Operation, flame o.k.	❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑	Green
Operation, flame not o.k.	❑ ❍ ❑ ❍ ❑ ❍ ❑ ❍ ❑ ❍ ❑	Green-off
Undervoltage	● ▲ ● ▲ ● ▲ ● ▲ ● ▲ ●	Yellow-red
Fault, alarm	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲	Red
Output of fault code (refer to «Fault code table»)	▲❍ ▲❍ ▲❍ ▲❍ ▲❍	Red-off
Extraneous light prior to burner start-up	❑ ▲ ❑ ▲ ❑ ▲ ❑ ▲ ❑ ▲ ❑	Green-red
Interface diagnosis	▲▲▲▲▲▲▲▲▲▲▲▲▲	Red flicker light

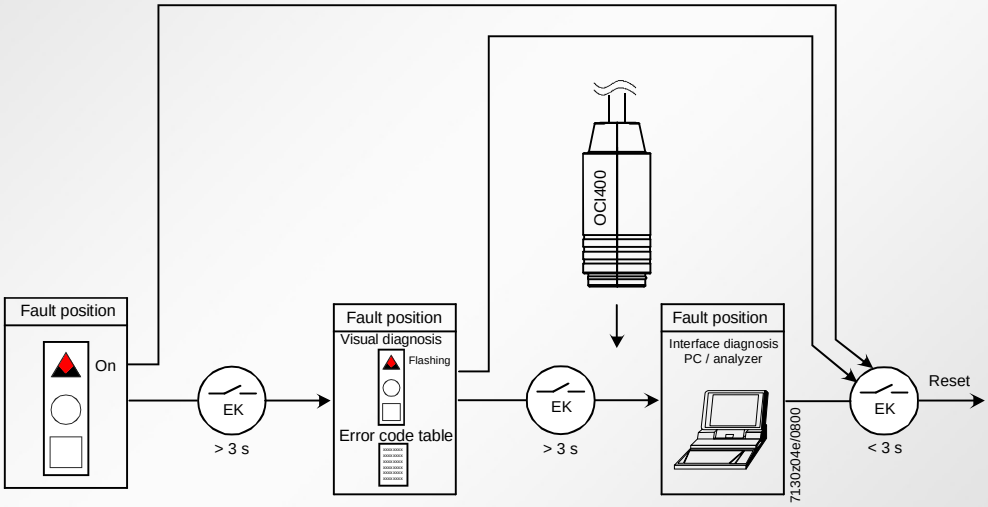
Legend

❍ Off
● Yellow
❑ Green
▲ Red

Diagnosis of cause of fault

After lock-out, the red fault signal lamp remains steady on.
In that condition, the visual diagnosis of the cause of fault according to the error code table can be activated by pressing the lock-out reset button for more than 3 seconds. Pressing the reset button again for at least 3 seconds, the interface diagnosis will be activated (for more detailed information, refer to data sheet 7614).

The following sequence activates the diagnosis of the cause of fault:



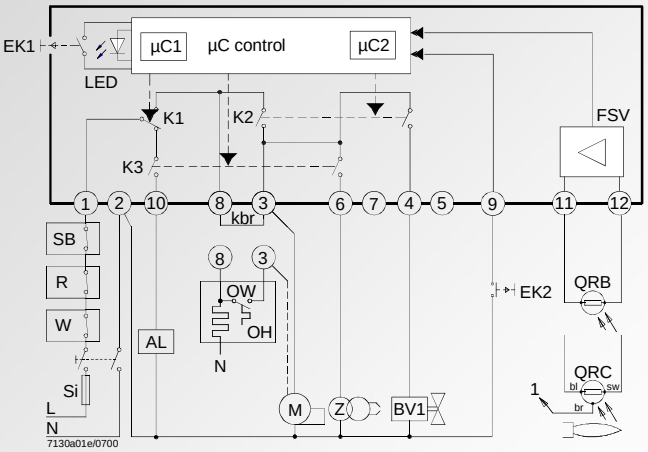
Error code table	
Blink code	**Possible cause**
2 blinks • •	No establishment of flame at the end of «TSA» - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner, no fuel - Faulty ignition
3 blinks • • •	Free
4 blinks • • • •	Extraneous light on burner start-up
5 blinks • • • • •	Free
6 blinks • • • • • •	Free
7 blinks • • • • • • •	Too many losses of flame during operation (limitation of the number of repetitions) - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner
8 blinks • • • • • • • •	Time supervision oil pre-heater
9 blinks • • • • • • • • •	Free
10 blinks • • • • • • • • • •	Wiring error or internal error, output contacts

During the time the cause of fault is diagnosed, the control outputs are deactivated.
- Burner remains shut down
- Fault status signal «AL» at terminal 10 is activated

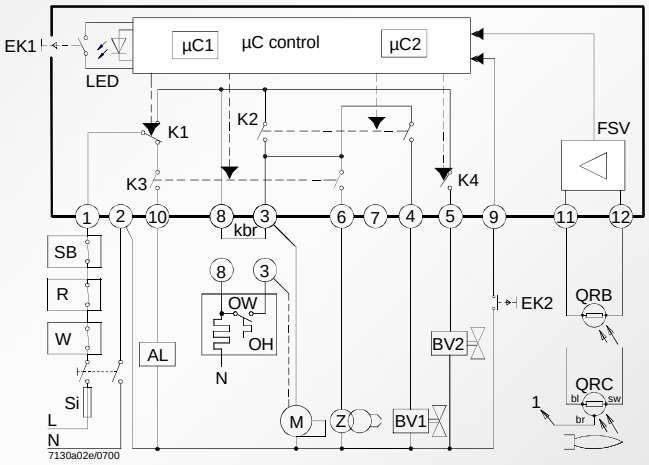
The diagnosis of the cause of fault is quit and the burner switched on again by resetting the burner control.
Press lock-out reset button for about 1 second (< 3 seconds).

Connection diagram and internal diagram

LMO14...

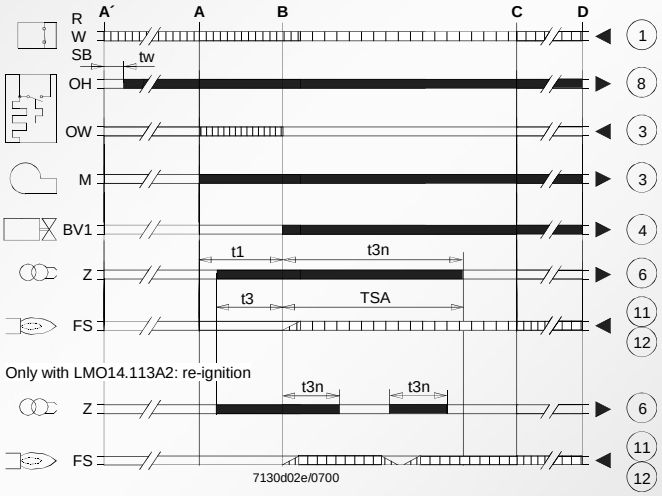


LMO24... / LMO44...

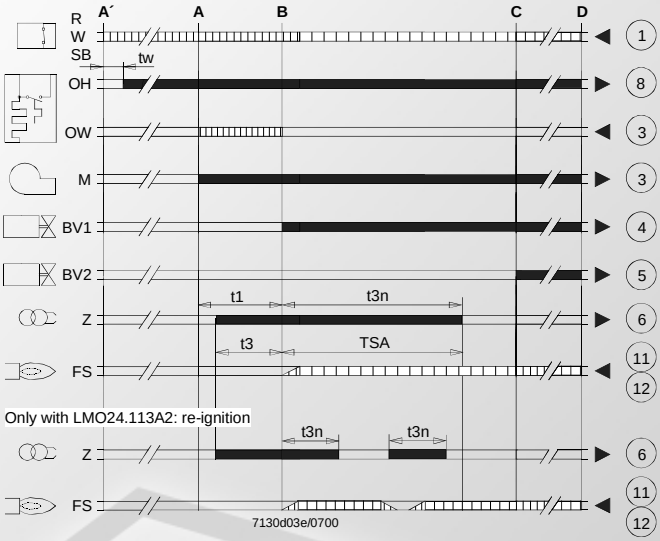


Control sequence

LMO14...



LMO24... / LMO44...



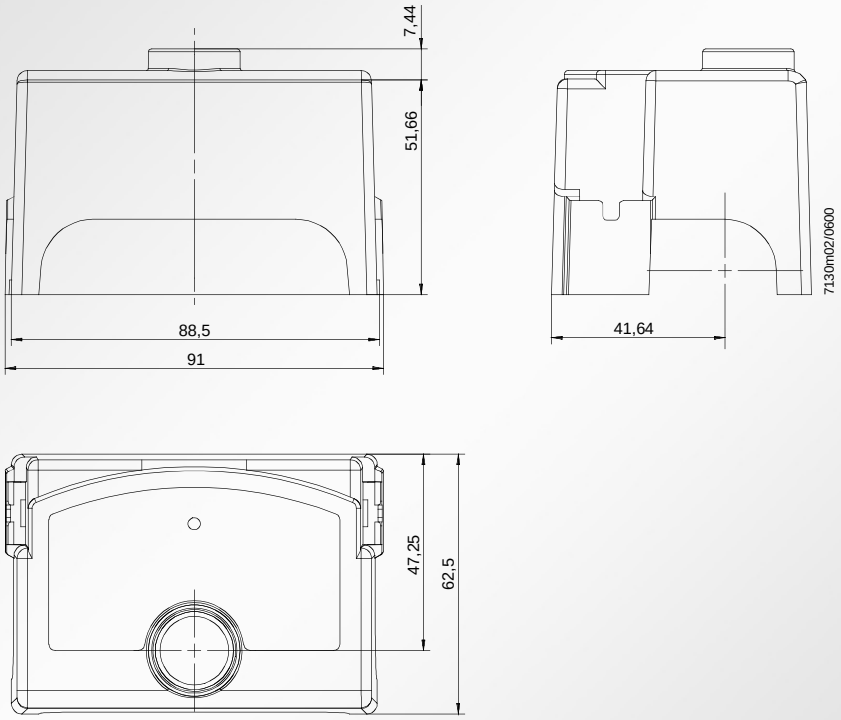
Legend

AL	Alarm device	OH	Oil pre-heater
kbr...	Cable link (required only when no oil pre-heater is used)	QRB	Photoresistive detector
BV...	Fuel valve	QRC	Blue-flame detector
EK1	Lock-out reset button		bl = blue
EK2	Remote lock-out reset button		br = brown
FS	Flame signal		sw = black
FSV	Flame signal amplifier	R	Control thermostat or pressurestat
K...	Contacts of control relay	SB	Safety limit thermostat
LED	3-colour signal lamps	Si	External primary fuse
M	Burner motor	W	Limit thermostat or pressure switch
OW	Release contact of oil pre-heater	Z	Ignition transformer
t1	Pre-purge time	t4	Interval from flame signal to release «BV2»
t3	Pre-ignition time	TSA	Ignition safety time
t3n	Post-ignition time	tw	Waiting time for oil pre-heating
A´	Beginning of start-up sequence with burners using an oil pre-heater	B	Time of flame establishment
A	Beginning of start-up sequence with burners using no oil pre-heater	C	Operating position
		D	Controlled shut-down by «R»
	Control signals	µC1	Microcontroller 1
	Required input signals	µC2	Microcontroller 2

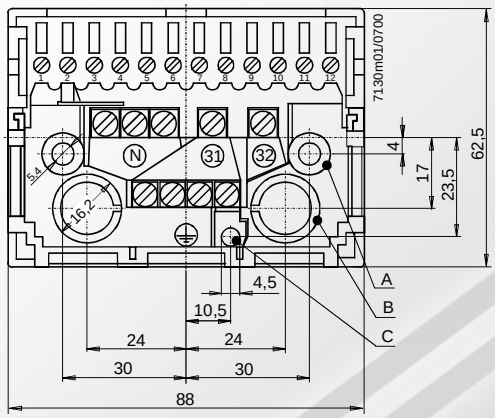
Dimensions

Dimensions in mm

LMO...



Plug-in base AGK11



Plug-in base with screw terminals
«A»: holes for the fixing screws
«B»: holes for the cable entry
«C»: earthing lug
«31» and «32»: auxiliary terminals

«N»: neutral terminals, connected to the neutral input (terminal 2)

Underneath:
4 earth conductor terminals, joining in a lug for earthing the burner

Hatched:
Position of cable gland holder AGK65 and cable holder AGK66

Connection of earthing lug «C» and fixing screws in «A» to burner ground
→ Use a metric screw with a lockwasher or similar!