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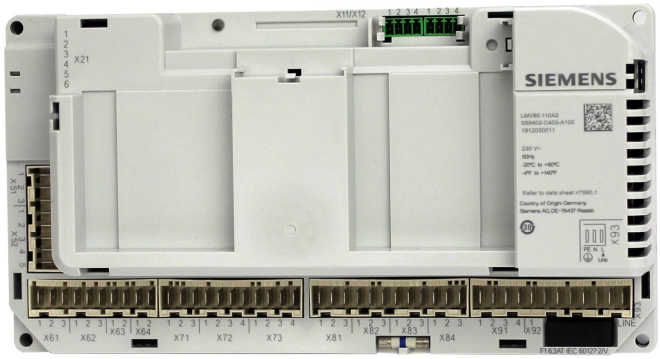


LMV60.110A2
LMV62.11xA2

Burner management system

Basic Documentation

The LMV6 and this basic documentation are intended for original equipment manufacturers (OEMs) using the LMV6 in or on their products.

Firmware version
LMV60.110A2: V1.100
LMV62.11xA2: V1.100
AZL66: V1.100

CC1P7560en
14.09.2021

Smart Infrastructure

Supplementary documentation

Product type	Designation	Type of documentation	Documentation number
LMV6	Burner management system	Environmental Declaration	E7560 *)
LMV60.110A2	Burner management system	Parameter list and error code list	I7560
LMV62.11xA2	Burner management system	Parameter list and error code list	I7560
LMV6	Burner management system	Installation Guide	J7560
LMV60.110A2	Burner management system	Data Sheet	N7560
LMV62.11xA2	Burner management system	Data Sheet	N7560
LMV6	Burner management system	Product Range Overview	Q7560

*) On request only

Note!
This document only refers to the product type – not the *product designation*. See the table below for details.

Product type	Product designation
ACS460	PC software
AGG5.310	Speed detection accessories set (∅50 mm)
AGG5.315	Speed detection accessories set (∅92 mm)
AGG6.200A5	230 V~ power supply unit
AGG6.500	CAN bus shielding plate for LMV6
AGG6.635	Ready-fitted CAN bus connecting cable
AGG6.641	CAN bus connecting cable
AGG9	Connector set
AGM23	Additional module for QRA
AGQ6.3	Flame signal amplifier for QRA7 and QRI
ASK33.1	Mounting kit
AZL66	Display and operating unit
LMV6	Burner management system
QGC	Oxygen sensor
QRA2	UV flame detector
QRA2M	UV flame detector
QRA4	UV flame detector
QRA10	UV flame detector
QRI	Infrared flame detector
SQM4	Actuators
VKF1	Butterfly valves
VKG	Gas damper
VKP40	Proportional controlling element

Contents

1 Typographical conventions

1.1 Safety notes

This basic documentation contains notes that must be observed to ensure your personal safety and to prevent material damage. The instructions and notes are highlighted by warning triangles or a hand symbol and are presented as follows, depending on the hazard level:

Warning means that death, severe personal injury or substantial damage to property **can** occur if adequate precautionary measures are not taken.

Caution means that minor personal injury or property damage **can** occur if adequate precautionary measures are not taken.

Note draws your attention to **important information** on the product, on product handling, or to a special part of the documentation.

1.2 Qualified personnel

Only **qualified personnel** are allowed to install and operate the unit. Qualified personnel in the context of the safety-related notes contained in this basic documentation are persons who are authorized to commission, ground, and label units, systems, and electrical circuits in compliance with established safety practices and standards.

1.3 Correct use

Note the following:

The unit may only be used on the applications described in the technical documentation and only in connection with units or components from other suppliers that have been approved or recommended by Siemens.

The product can only function correctly and safely if shipped, stored, set up and installed correctly, and operated and maintained as specified.

2 Overview

2.1 System makeup / Description of functions

The LMV6 carries out all supervision tasks associated with forced draft burners with a medium to large load, and features integrated communication interfaces that enable modular system extensions.

The following items are integrated into the LMV6:

- Burner control complete with gas valve proving system
- Plug-in space for additional AGQ6.x
- Electronic fuel-air ratio control for a maximum of 4 actuators and variable speed drives
- Flue gas recirculation (FGR): Started via time, temperature, mains input (thermostat) or temperature-compensated
- Green signal lamp (LED) for operating display *LMV6 live*

This documentation is a brief overview of the most important functions and components of the product family of the LMV6.

- Type-tested and approved in accordance with DIN EN 298

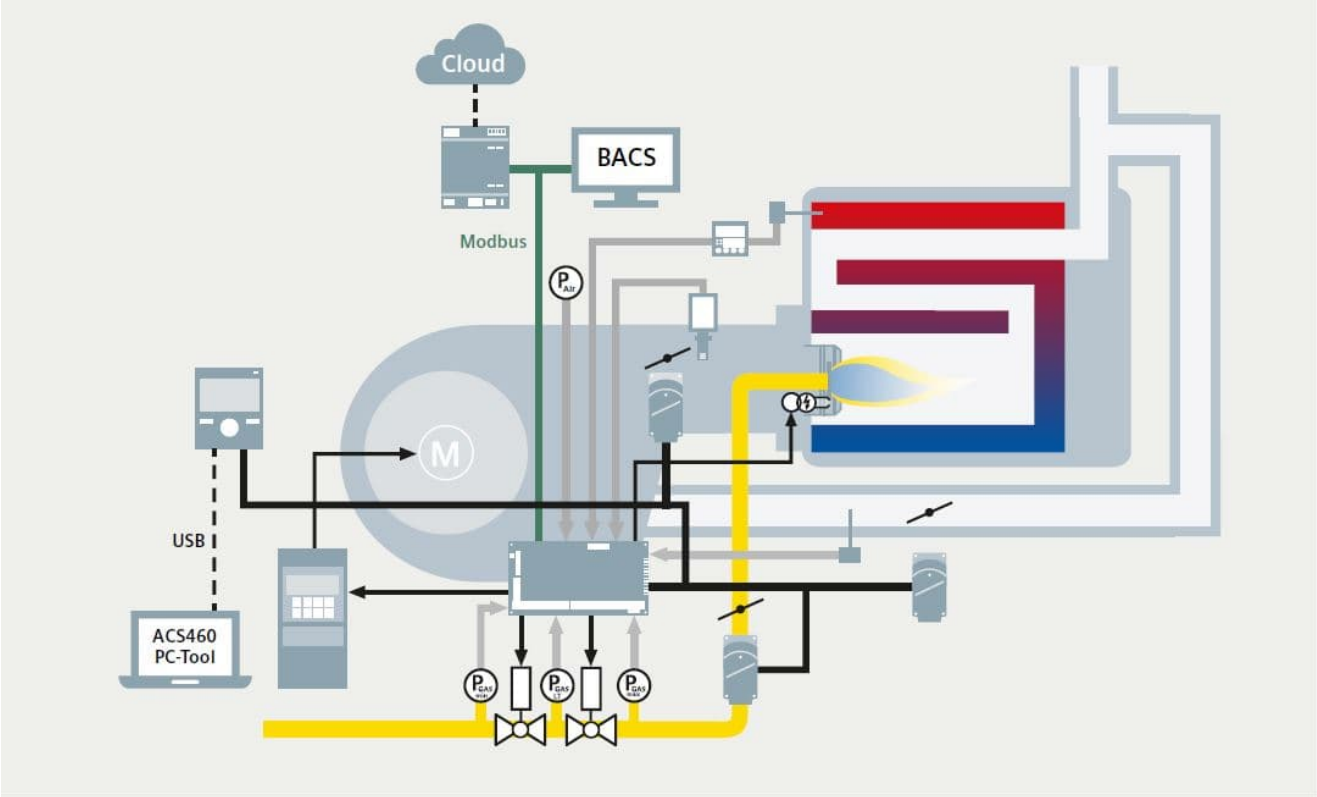


Figure 1: Example: Modulating gas burner

The system components for the LMV6 (e.g., AZL66) are connected directly to the LMV6 via the CAN bus. All safety-related digital inputs and outputs of the LMV6 are monitored via a contact-feedback network. The LMV6 is operated and parameterized via the AZL66. The AZL66 features menu-driven operation, offering straightforward operation and targeted diagnostics. When performing diagnostics, the display shows the operating statuses and type of error via the signal lamp (LED). The various parameterization levels of the burner/boiler manufacturer and heating engineer are password-protected against unauthorized access. Simple settings that the plant operator can make on site do not require a password.

2.2 Indication and diagnostics

- Extensive operating, fault, and status information via the AZL66

2.3 Features

- Burner control
- Electronic ratio control
- Gas pressure switch valve proving
- Flue gas recirculation (FGR)
- Fault status messages counter
- Error history
- Restart counter
- Program stop function
- Forced intermittent operation (can be deactivated)
- Low-fire shutdown
- Alarm in case of start prevention
- Parameterizable program times and functions

2.4 Type summary

Article no.	Type (ASN)	For forced draft gas burners	With dual-fuel operation	Actuators (max.)	With variable speed drive	With flue gas recirculation (FGR)		With load controller	With O2 control	Parameter set (country specific)	Mains voltage
						Temperature compensation					
						Without	With				
S55402-C403-A100	**LMV60.110A2**	●	---	3	---	●	---	---	---	EU	230 V~
S55402-C402-A100	**LMV62.110A2**	●	---	4	●	●	---	---	---	EU	230 V~
S55402-C404-A100	**LMV62.111A2**	●	---	4	●	---	●	---	---	EU	230 V~

Note!
Details on the accessories and required system components can be found in the LMV6 product range overview Q7560.

2.5 Compatibility

2.5.1 Firmware information

The firmware information can be found in the AZL66 under:

Main menu → Maintenance → 0201-0345 Factory identification

Example for the LMV6:

0201-0211 LMV6

Parameter	Information
0205	Firmware: Main version
0206	Firmware: Sub-version

The firmware – e.g., **V1.0** – is made up of:
1 for the firmware main version
0 for the firmware sub-version

The same rules apply for all system components (AZL66, SQM4, etc.).

2.5.2 Compatibility table

The firmware versions listed are compatible with each other.

Components	Compatible firmware versions
LMV60.110A2	V1.0 to V1.100
LMV62.11xA2	V1.100
AZL66	V1.0 to V1.100
SQM45 / SQM46 / SQM47	V1.0 to V1.100

3 Safety notes

3.1 Warning notes

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

The LMV6 is a safety device! Do not open, interfere with or modify the LMV6. Siemens does not assume responsibility for damage resulting from unauthorized interference!

This document also contains additional warning notes that must be observed.

After commissioning and after each service visit, check the flue gas values across the entire load range.

- All activities (mounting, installation, service work, etc.) must be performed by qualified staff
- The burner or boiler manufacturer must ensure degree of protection IP40 for the LMV6 as per EN 60529:1991 + A1:2000 + A2:2013 through proper installation. Failure to observe this information poses a risk of electric shock
- Before carrying out any wiring changes in the connection area, isolate the plant from the power supply (all-pole disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. Failure to observe this information poses a risk of electric shock
- Before carrying out any installation work, completely isolate the plant (all-polar disconnection). Ensure that it cannot be inadvertently switched on again and that it is indeed dead. Otherwise there is a risk of injury from hazards such as crushing, trapping, or shearing due to components that are still moving, (e.g., SQM4)
- Take suitable measures to provide protection against accidental contact at the electrical connections. All connections must be fitted with corresponding AGG6.9xx plugs. The plugging space is safe against accidental manual contact when the AGG6.9xx plugs are completely plugged in. Failure to observe this information poses a risk of electric shock
- Suitable measures must be taken during installation to prevent voltage transfer both within the mains side and from the low voltage side to the mains side. Failure to observe this poses a risk of impairing the safety functions and the risk of electric shock
- Ensure protection against electric shock on the LMV6 and on all connected electrical components through proper installation. In terms of design, stability, and protection, covers must conform to EN 60730-1:2016. Failure to observe this information poses a risk of electric shock
- Each time work has been carried out (mounting, installation, service work, etc.), check to ensure that wiring and parameterization is in an orderly state and perform the safety checks as described in chapter **17.1 *Commissioning notes***. Failure to observe this poses a risk of impairing the safety functions and the risk of electric shock
- Make sure that the voltage output terminal X92 pin 1 is not connected to live parts. The terminal must not be connected. Failure to observe this information poses a risk of the safety functions being impaired
- Only a simple button may be connected to terminal X92 pin 3. Units that can perform an automatic reset are not permitted. Make sure that the voltage output on terminal X92 pin 3 is not connected to live parts. Failure to observe this information poses a risk of the safety functions being impaired
- Take the LMV6 out of operation immediately if the housing is damaged. Failure to observe this information poses a risk of electric shock

- These LMV6 units must not be put into operation following impact or shock; even if they do not exhibit any visible damage, their safety functions may be impaired. Failure to observe this poses a risk of impairing the safety functions and the risk of electric shock
- While programming the ratio control curves, the commissioning engineer is obliged to constantly supervise the quality of the combustion process (e.g., by means of a flue gas analyzer) and, in the event of poor combustion values or dangerous conditions, take appropriate actions such as shutting down the LMV6 manually
- The adjustable times (e.g., prepurge time and postpurge time) may deviate from the set value by +/-5% in accordance with DIN EN 298
- This does not apply to safety times during operation (maximum 1 second).
- A local reset via the AZL66 must be within sight of the burner
- If forced intermittent operation has been deactivated (parameter 1146), only sensors that are suitable for continuous operation may be used

Sensor	Continuous operation	Intermittent operation
ION	•	•
QRA2	---	•
QRA4	---	•
QRA7	•	•
QRA10	---	•
QRI	•	•

Parameters	Function
1146	Forced intermittent • ON • OFF

To ensure safety and reliability of the LMV6, the following points must also be observed:

- Avoid condensation and damp environments. If such conditions do occur, make sure that the unit is completely dry before switching on again. Failure to observe this information poses a risk of electric shock
- Static charges must be avoided since they can damage the electronic components of the LMV6 on contact.
  Recommendation: Use ESD equipment
- If the unit fuse was blown due to overload or a short-circuit at the terminals, the LMV6 must be replaced since the switching contacts might have been damaged

3.2 Installation notes

- Always run the high-voltage ignition cables separately from the LMV6 and other cables while observing the greatest possible distances
- Do not mix up phase and neutral (midpoint) conductors
- Install switches, fuses, and grounding in accordance with local regulations
- The connection diagrams show the LMV6 with earthed neutral conductor. It is essential to ensure that local regulations are complied with (e.g., protection against electric shock)
- Do not exceed the maximum permissible current rating of the connection terminals
- Ensure that the electrical wiring inside the burner complies with national and local regulations
- Do not feed external mains voltage to the control outputs of the LMV6. When checking the functions of the burner components controlled by the LMV6 (fuel valves or similar), the LMV6 must not be connected to the burner components
- Mains power may only be supplied via *L* and *N*. There must be no difference in potential between the neutral conductor *N* and protective earth *PE*
- Circuit breakers should have a characteristic “C” when operated with the LMV6
- Make certain that strain relief of the connected cables is in compliance with the relevant standards (e.g., as per EN 60730-1:2016 and EN 60335)
- Ensure that spliced wires cannot come into contact with neighboring connections. Use suitable ferrules. Failure to observe this information poses a risk of loss of safety functions and a risk of electric shock
- Unused connections on the LMV6 must be fitted with a corresponding AGG9 connector by the burner manufacturer
- The AGG9 connectors on the connection cables for the LMV6 may only be removed or replaced when the plant is shut down (all-pole disconnection)
- The connection between the SQM4 and the controlling elements for fuel and combustion air, as well as any additional controlling elements, must be form-fitted
- The AZL66 must be used in a dry and clean environment
- Since the LMV6 does not support the remote lockout reset function, the AZL66 must always be installed within sight and earshot of the burner so that a reset can be performed from the LMV6 with the AZL66
- Check the connection cables for the supervision switch inputs (e.g., the air pressure switch) for signs of a short circuit
- It is not permitted to install spark suppressors at the voltage inputs
- After installing the LMV6 and its components (AZL66, SQM4, etc.), all connections must be checked for crushing, trapping, and shearing hazards. Failure to observe this poses a risk of damaging the safety functions and a risk of electric shock

3.3 Electrical connection of the flame detectors

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

- Never run the detector cable together with other cables
  – Line capacitance reduces the magnitude of the flame signal
  – Use a separate cable
- Observe the permissible detector cable lengths; refer to the *Technical data*
- The mains-powered ionization probe does not offer protection against electric shock hazards. Protection against accidental contact must be ensured. Failure to observe this information poses a risk of electric shock
- Position the ignition electrode and the ionization probe in such a way that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads) and adversely affect the ionization supervision process
- Insulation resistance
  – Must be > 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

3.4 Disposal notes

The LMV6 contains electrical and electronic components and must not be disposed of together with domestic waste. Local and currently valid legislation must be complied with.

3.5 Open Source Software (OSS) declaration

Due to the license terms of the software we use, Siemens AG wishes to note that the OEM is obligated to provide the following license text for the end user in the documentation:

Open Source Software (OSS) declaration

Embedded in – or bundled with – the LMV6 are open source software (OSS) components and other third-party components identified below. You will find the specific product type and the valid version in the OSS document. Title: Readme_OSS System LMV6 V01.

You may obtain, distribute, and/or modify a copy of the open source code for the component under the terms of their respective licenses. These may be a GNU General Public License, the GNU Lesser General Public License, a modified BSD license, or an MIT license.
In the event of conflicts between Siemens license conditions and the open-source software license conditions, the open-source software conditions shall prevail with respect to the open-source software portions of the software.

You are permitted to modify proprietary components originating from Siemens and make changes as part of a reverse engineering process for debugging purposes, to the extent that these are linked to libraries licensed under the GNU Lesser General Public License.

You are not permitted to distribute information resulting from this reverse engineering process of from the modified proprietary components. Your rights to modify proprietary components originating from parties other than Siemens are governed by the respective third-party license conditions.

On written request within three years from the date of product purchase and against payment of our expenses, Siemens will supply the source code for any OSS component identified below in line with the terms of the applicable license.

Please contact us in this regard at:

Siemens AG
Otto-Hahn-Ring 6
81739 Munich
Germany
Reference: Open Source Request

The identified OSS components are generally distributed in the hope that they will be useful, but WITHOUT ANY WARRANTY, without even implied warranty of merchantability or FITNESS FOR A PARTICULAR PURPOSE, and without liability for any Siemens entity other than as explicitly documented in your purchase contract.

All open source software components used within the product (including their copyright holders and the license conditions) can be found on the website at http://www.siemens.com/download?A6V11985963.

3.6 Lifetime

The LMV6 has a designed lifetime* of 250,000 burner startup cycles which, under normal operating conditions in heating mode, corresponds to approx. 10 years of service (starting from the date of manufacture on the unit type plate). This is based on the endurance tests specified in the DIN EN 298 standard. A summary of the conditions has been published by the European Control Manufacturers Association (Afecor) (www.afecor.org).

The designed lifetime is based on use of the LMV6 according to the manufacturer's data sheet and the basic documentation. After reaching the designed lifetime in terms of the number of burner startup cycles, or after the corresponding usage time, the LMV6 must be replaced by authorized personnel.

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

3.7 Notes on settings and parameterization

- When making the settings for the electronic fuel-air ratio control system integrated in the LMV6, it must be ensured that sufficient amounts of excess air are available because, over a period of time, the flue gas values are impacted by a number of factors (such as air density and wear of the actuators and controlling elements). For this reason, the initial settings for the flue gas values must be checked at regular intervals. The inspection intervals are determined by the OEM
- The parameter level is password-protected against unauthorized access. The OEM assigns individual passwords for each of the parameter levels that can be accessed. The default passwords used by Siemens must be changed by the OEM. These passwords are confidential and may only be assigned to authorized staff
- Responsibility for setting the parameters lies with the person who, in accordance with their access rights, has made changes at the respective setting level
- **In particular, the OEM is responsible for making certain that the parameter settings are correct in accordance with the standards covering the specific applications (e.g. EN 676, EN 267, EN 1643)**

4 Duties of the expert when carrying out the approval tests

As part of the approval tests, the manufacturer must state the product ID number confirming that the LMV6 complies with the type-tested system. Only components that form part of the LMV6 range (LMV6, AZL66, SQM4, QRA, QRI, AGG6.200A5, and AGG6.641) may be used.

Type	Description	Document type	Documentation
AZL66	Display and operating unit	Data sheet	N7562
AGG6.200A5	Power supply unit	Basic documentation	P7560
AGG6.641	CAN bus connecting cable	Basic documentation	P7560
LMV6	Burner management system	Data sheet	N7560
QRA	UV flame detector	Data sheet	N7712
QRI	Infrared flame detector	Data sheet	N7719
SQM4	Actuator	Data sheet	N7820

The connection between the SQM4 and the controlling elements for fuel and combustion air, or any other controlling elements, must be form-fitted.

It is also essential to check the following:

4.1 Correct parameterization of the system

Once the plant has been installed and commissioned, the parameterized values and settings (e.g., curve characteristics) that describe the fuel-air ratio control must be **documented** by the person responsible for the plant or the heating engineer. This data can be printed out using the ACS460 PC software, for example, or else written out by hand. These documents must be kept in a safe place and checked by an expert.

Please note!
Deviating parameter settings!
On the “OEM” access level of the LMV6, it is possible to make parameter settings that differ from application standards. For this reason, it is essential to check whether the parameter settings made are in compliance with the relevant application standards (e.g., DIN EN 298 or EN 676), or whether the respective plant requires special approval.

4.2 Fuel-air ratio control system

The setting values (curve parameters) for the controlling elements, the fuel(s), and the combustion air must be stored in adequate numbers across the burner load range. While considering the combustion chamber pressure and fuel pressure, as well as the temperature and pressure of the combustion air, the selected setting values of fuel and combustion air must be assigned to ensure correct operation with sufficient amounts of excess air ensured across the entire burner load range. This must be proven by the burner/boiler manufacturer by measuring the characteristic combustion process values.

4.3 Burner control section

Parameterization of the fuel trains (G, Gp1 and Gp2, refer to chapter 13.1 *Overview of fuel trains*) must be checked before commissioning for conformity with the fuel trains implemented on the burner and for correct assignment of the fuel valves to their outputs on the LMV6.

The following functions must be checked:

- The correct time parameter settings, especially the settings for the safety and prepurge times
- The correct selection of the flame detector for plants in continuous operation. Only the ionization probe, the QRA7 or the QRI may be connected
- The functioning of the flame detector in the event of loss of flame during operation and with extraneous light during the prepurge time and when there is no establishment of flame at the end of the safety time
- The functioning of all available or required input messages:
  - Air pressure
  - Minimum gas pressure
  - Maximum gas pressure
  - Gas pressure valve proving
  - Safety loop (e.g., safety limit thermostat (SLT))
  - Fan contactor contact in at least 2 phases (e.g., prepurging and operation)
- Is the “Gas valve proving” function activated if the application requires it? If yes, the correct leakage rate must be checked. For details, refer to chapter 17.3.2.6 „Setting valve proving“

5 Standards and certificates

Applied directives:

- Low Voltage Directive 2014/35/EU
- Gas Appliances Regulation (EU) 2016/426
- Electromagnetic compatibility EMC (immunity) *) 2014/30/EU

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

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

- Automatic burner control systems for burners and appliances burning gaseous or liquid fuels — DIN EN 298
- Safety and control devices for gas burners and gas-burning appliances – Valve proving systems for automatic shutoff valves — DIN EN 1643
- Safety and control devices for burners and appliances burning gaseous or liquid fuels – Control functions in electronic systems
  Part 2:
  Fuel-air ratio control/supervision of the electronic type — DIN EN 12067-2
- Safety and control devices for gas burners and gas-burning appliances – General requirements — DIN EN 13611
- Automatic electrical controls for household and similar use
  Part 2-5: Special requirements on automatic electric burner control and monitoring systems — DIN EN 60730-2-5
- Automatic electrical controls for household and similar use
  Parts 2–14:
  Particular requirements for electric actuators — DIN EN IEC 60730-2-14

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

Note!
Household and similar electrical appliances – Safety
Part 2-102: Particular requirements for gas, oil, and solid-fuel burning appliances having electrical connections. The electrical connections of the LMV6 comply with the requirements of EN 60335-2-102:2016.

ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007

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

6 Mounting notes

- Ensure that the relevant national safety regulations are complied with
- In the geographical areas where DIN regulations are in use for mounting and installation, the requirements of VDE must be complied with, especially DIN/VDE 0100, 0550 and DIN/VDE 0722

6.1 LMV6

6.1.1 Mounting on a mounting surface

The LMV6 must be secured using screw fittings with cheese-head screws (M5x35 thread (ISO 4762)), observing a maximum tightening torque of 1.8 Nm at all 4 fixing points. The additional mounting surfaces on the housing are provided to improve mechanical stability. These must fully rest on the mounting surface to which the unit is secured. The flatness of the mounting surface must be within a tolerance band of 0.2 mm.

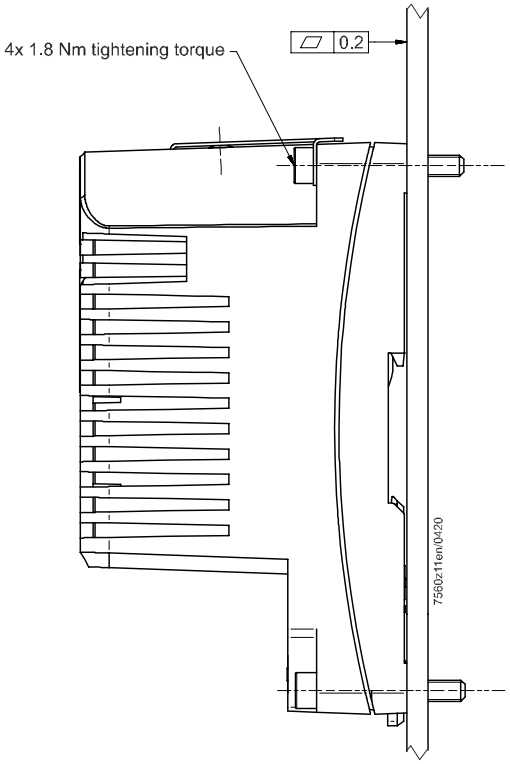


Figure 2: Mounting – Mounting surfaces

6.1.2 Mounting on a DIN rail

The LMV6 can also be mounted on a DIN rail.

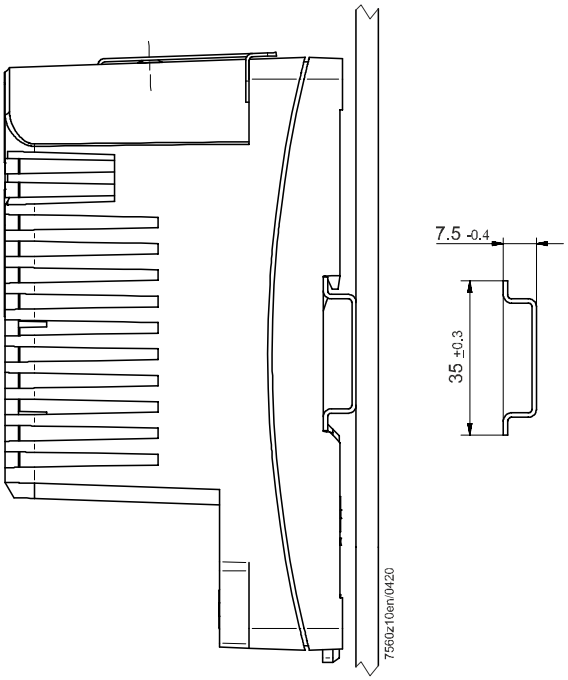


Figure 3: Mounting – DIN rail

6.2 AGG6.500

Note!
The AGG6.500 is not included in the scope of delivery and must be ordered separately.

Once the LMV6 has been installed in the equipment, a check must be carried out to ensure compliance with the EMC emission requirements!
If electromagnetic interference occurs (e.g., due to coupled interference voltages on the lines), the AGG6.500 must be mounted.
The AGG6.500 is screwed to the LMV6 with the help of the contact plate using a fillister-head screw (thread M3x5 (SN 213306)).
The tightening torque of the fillister-head screw (M3x5 thread (SN 213306)) must not exceed 1.8 Nm. The cable shielding must be connected to the AGG6.500 terminals.

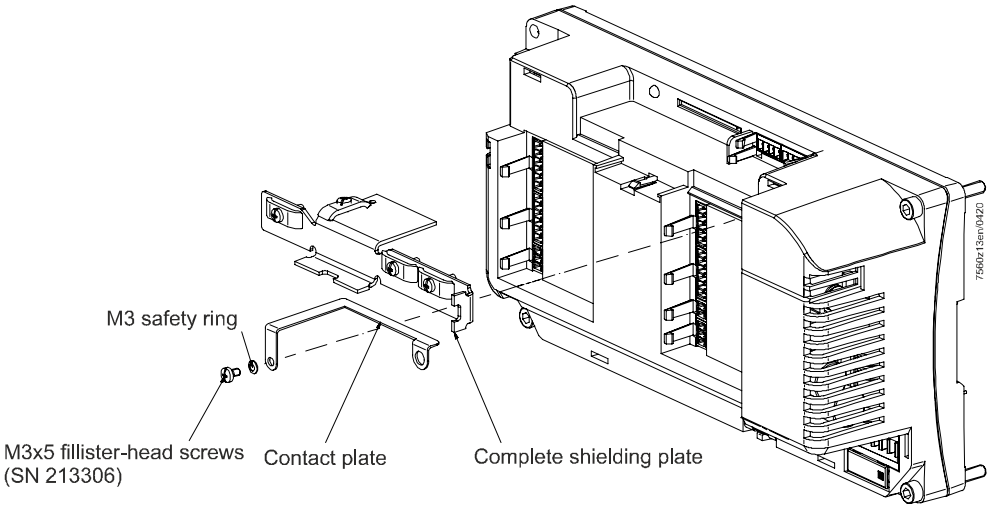


Figure 4: Cover – EMC interference

6.2.1 Covering the connection area of the AGQ6.x

When the AGQ6.x is not in use, this connection area must be closed off with a cover. The tightening torque of the cheese-head screw (M5x35 thread (ISO 4762)) must not exceed 1.8 Nm.

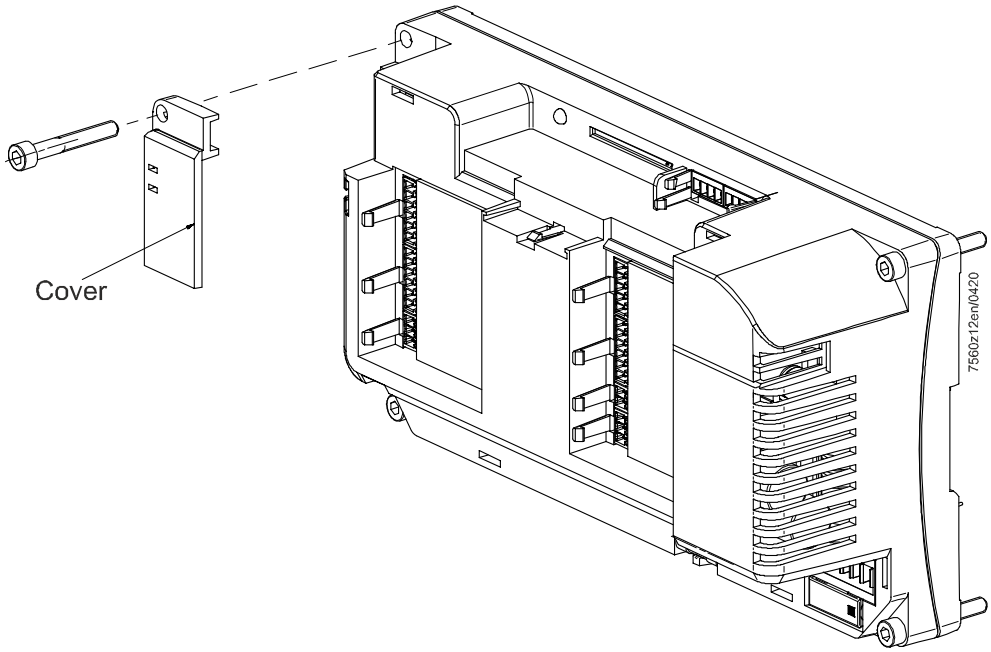


Figure 5: Cover – AGQ6.x connection area

6.2.2 Mounting the AGQ6.3 on the LMV6

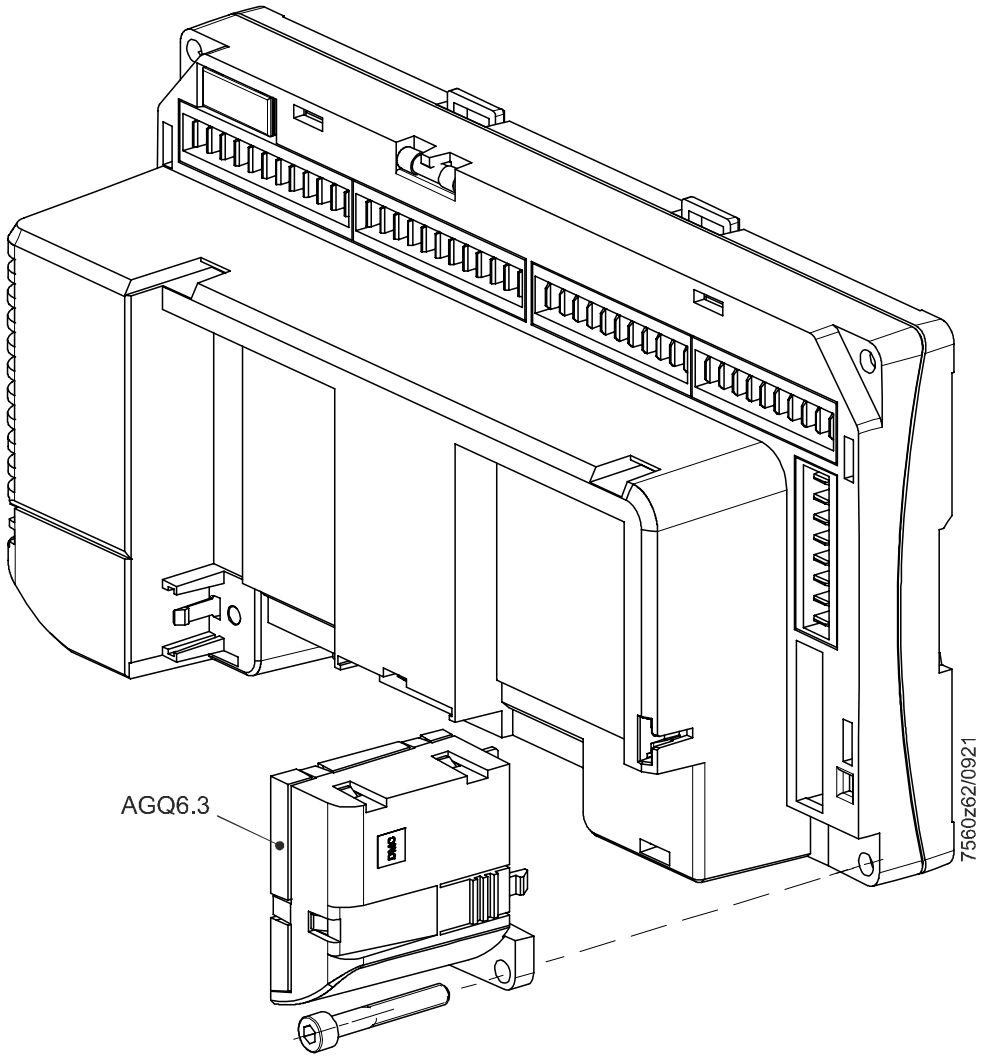


Figure 6: Mounting the AGQ6.3 on the LMV6

6.3 AGG6.200A5

6.3.1 Mounting on a mounting surface

The AGG6.200A5 must be secured using screw fittings with cheese-head screws (M5x35 thread (ISO 4762)), observing a maximum tightening torque of 1.8 Nm at all 3 fixing points. The additional mounting surfaces on the housing are provided to improve mechanical stability. These must fully rest on the mounting surface to which the unit is secured. The flatness of that mounting surface must be within a tolerance band of 0.2 mm.

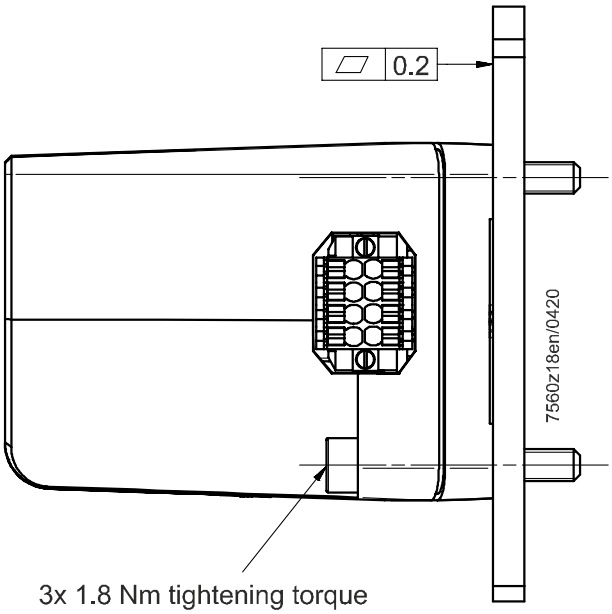


Figure 7: Mounting – Mounting surfaces

6.3.2 Mounting on a DIN rail

The AGG6.200A5 can also be mounted on a DIN rail.

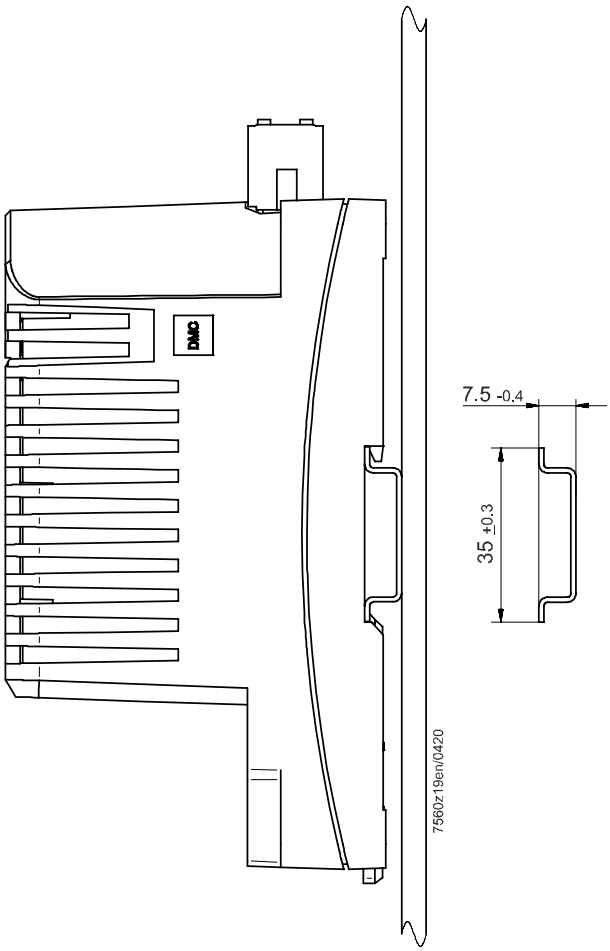


Figure 8: Mounting – DIN rail

7 Dimensions

7.1 LMV60.110A2 / LMV62.11xA2

Dimensions in mm

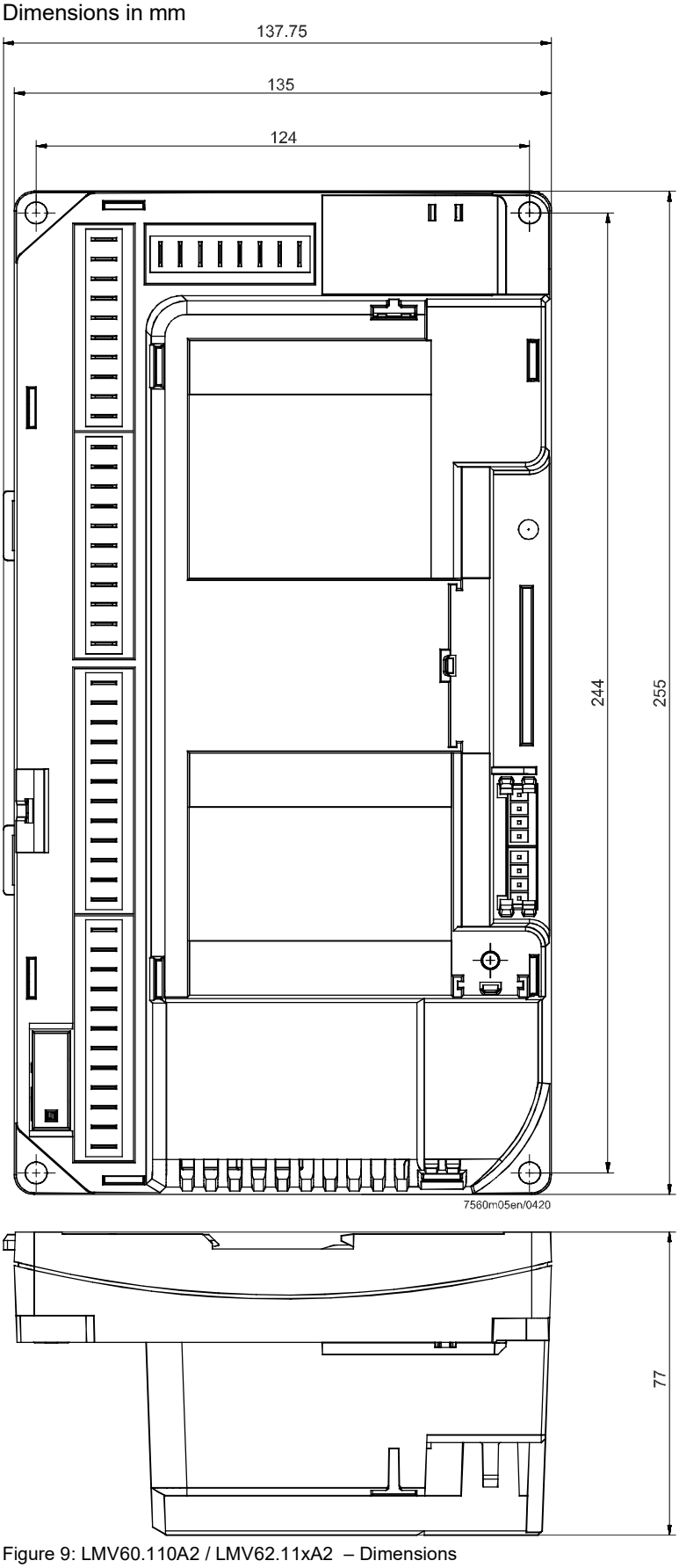


Figure 9: LMV60.110A2 / LMV62.11xA2 – Dimensions

7.2 AGG6.200A5

Dimensions in mm

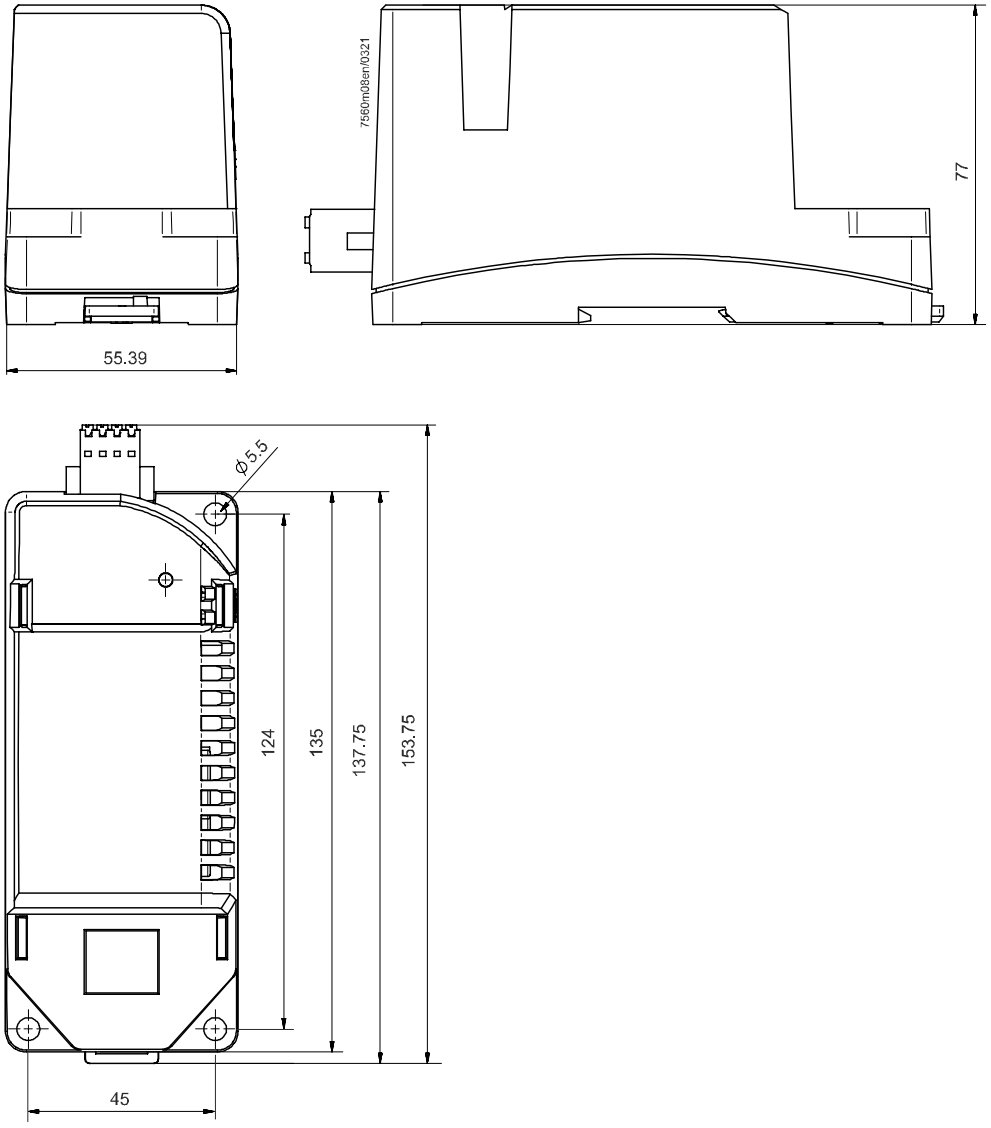
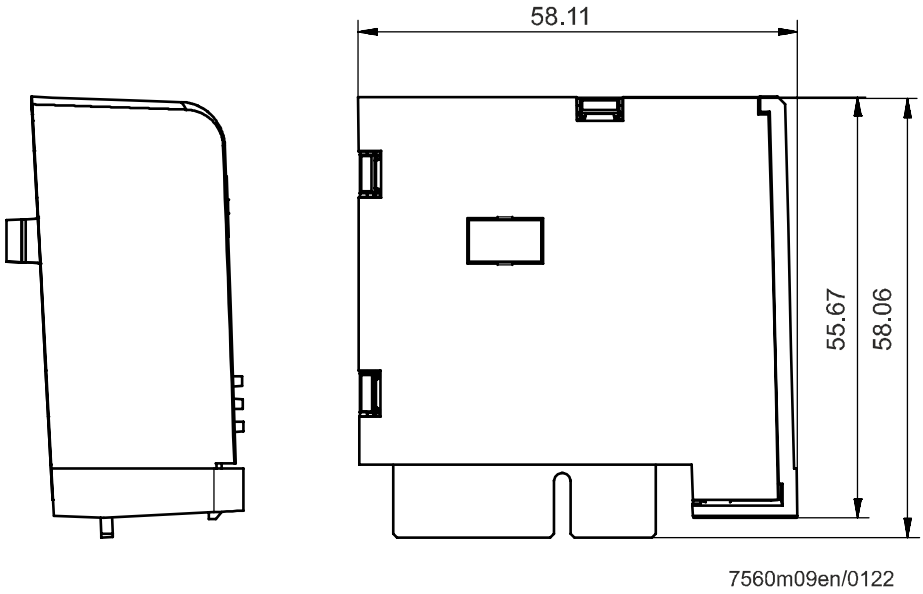


Figure 10: AGG6.200A5 – Dimensions

7.3 AGQ6.3

Dimensions in mm



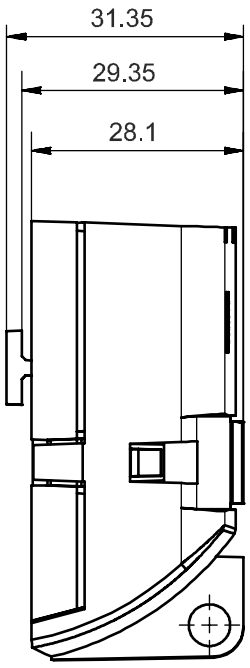


Figure 11: AGQ6.3 – Dimensions

8 Technical data

8.1 LMV6

Mains voltage	230 V AC -15% / +10%
Mains frequency	50 Hz ±6%
External primary fuse (Si)	Max. 6.3 A, slow

Caution!
Risk of damage to the switching contacts!
If the external primary fuse (Si) or internal fuse (F1) is blown due to overload or short-circuit at the terminals, the LMV6 must be replaced.

Internal consumption	< 35 W, typically
Protection class	I, with parts according to II in accordance with EN 60730-1:2016
Degree of protection	IP00
	Note! The burner or boiler manufacturer must ensure degree of protection IP40 for the LMV6 in accordance with EN 60529:1991 + A1:2000 + A2:2013 through adequate installation.
Rated surge voltage Category III (IEC 60664-1:2020)	4 kV
• Creepage distances and air gaps	2.5 kV due to voltage limitation measures
Pollution degree	2 in accordance with EN 60730-1:2016
Software class	Class C in accordance with EN 60730-1:2016 / DIN EN 60730-2-5:2015 + A1:2019
Permissible mounting position	Optional
Weight	Approx. 870 g
DIN rail	TH 35-7.5 in accordance with EN 60715:2017

8.2 Terminal loading: *Inputs*

Mains supply: The input current for the power supply is dependent on the operating status of the LMV6	
Rated voltage	U_{Mains} 230 V
• Safety shutdown from the operating position at mains voltage	≤ 185 V AC
• Restart is initiated when mains voltage exceeds	≥ 195 V AC
Status inputs (with the exception of the safety loop) of the contact feedback network are used for system supervision and require mains-related input voltage	
• Safety loop	Refer to *Terminal loading: Outputs*
• Contact material recommended for external signal sources (air pressure switch, gas pressure switch-min, gas pressure switch-max, etc.)	Gold-plated silver contacts
• Transition / settling behavior / bounce - Permissible bounce time of contacts when switching on/off	Max. 20 ms (after the bounce time, the contact must stay closed or open)
• Inputs for voltage detection	
- ON	> 160 V AC
- OFF	< 80 V AC
• Input currents	0.7 to 1.5 mA peak

8.3 Terminal loading: *Outputs*

Total contact loading:

• Rated voltage	230 V AC, 50 Hz
• LMV6 input current and safety loop	Max. 5 A

Note!
The input current at terminal X93 pin 5 also flows through safety loop terminal X93 pin 1 / pin 2. Fusing is provided via the unit fuse (F1) of the LMV6.

The components of the safety loop disconnect the energy supply to the following loads when tripped:
- Ignition transformer
- Fuel valves

Single contact loading:

Fan motor (M) terminal X72 pin 1	
• Rated voltage	230 V AC, 50 Hz
• Rated current	2 A
• Load factor	Cosφ ≥0.4
Alarm (AL) terminal X92 pin 2	
• Rated voltage	230 V AC, 50 Hz
• Rated current	1 A
• Load factor	Cosφ ≥0.6
Ignition transformer (Z) terminal X82 pin 3	
• Rated voltage	230 V AC, 50 Hz
• Rated current	2 A
• Load factor	Cosφ ≥0.2
Fuel valve (V1) terminal X84 pin 3 Fuel valve (V2) terminal X91 pin 4	
• Rated voltage	230 V AC, 50 Hz
• Rated current	2 A
• Load factor	Cosφ ≥0.4

Note!
Valve proving via fuel valve circuit!
With activated valve proving via fuel valve circuit
- Rated current 1 A
- Load factor Cosφ ≥0.4

Pilot valve (PV) terminal X83 pin 3	
• Rated voltage	230 V AC, 50 Hz
• Rated current	1 A
• Load factor	Cosφ ≥0.4
Operating light terminal X72 pin 2	
• Rated voltage	230 V~ 50 Hz
• Rated current	1 A
• Load factor	Cosφ ≥0.6

Variable speed drive (VSD)	
All voltages	SELV
Release contact terminal X46 pin 1 / pin 2	
• Rated voltage	24 V⎓ (SELV)
• Rated current	5 mA to 0.5 A
Alarm input terminal X46 pin 5	
• Rated voltage	Active: 12–24 V⎓ Inactive: <4 V⎓ Alarm ON or OFF adjustable via parameter 6015 (Variable speed drive (VSD): Alarm input logic)
• Input impedance	Approx. 2500 Ω
Analog output terminal X47 pin 1 / pin 2	
• Rated voltage	Max. 24 V (with no load)
• Rated current	4–20 mA regulated, corresponds to 0–105% (→ Speed standardization)
• Output load	Max. 550 Ω (load), short-circuit-proof
Speed input terminal X46	
Sensor input X46 pin 3 / pin 4	
• Rated voltage	10–12 V⎓ Max. 15 mA
Speed feedback X46 pin 4 / pin 6	
• Input impedance	Approx. 2 kΩ
• Motor speed	300 to 6300 rpm
• 100% speed	1350 to 6300 rpm
• Sensor	Inductive sensor according to DIN 19234 (Namur) or Open Collector (pnp) with UCEsat <4 V, UCEmin >15 V⎓
• Cable length	Max. 100 m (sensor cable must be laid separately)
• ON/OFF level	
○ ON	≥4.2 V or I ≥2.1 mA (max. 12 V or 10 mA)
○ OFF	≤1 V or I <1 mA

Note
Design of the cables!
Shielded cables are required for harsh industrial environments!
Cable lengths of up to 100 m are possible by fulfilling the voltage/current levels with defined ON/OFF levels (e.g., using a suitable sensor). The inductive sensor used must have double or reinforced insulation against the mains voltage.

8.4 Cable lengths

Mains supply line	Max. 100 m (100 pF/m)
Fan motor	Max. 50 m (100 pF/m), unshielded
Pressure switch valve proving	Max. 50 m (100 pF/m), unshielded
Remote lockout reset (laid separately)	Max. 50 m (100 pF/m), unshielded
Alarm	Max. 50 m (100 pF/m), unshielded
Air pressure switch	Max. 50 m (100 pF/m), unshielded
Burner flange	Max. 50 m (100 pF/m), unshielded
Safety loop	Max. 50 m (100 pF/m), unshielded
Ignition transformer	Max. 50 m (100 pF/m), unshielded
Gas pressure switch-max	Max. 50 m (100 pF/m), unshielded
Gas pressure switch-min	Max. 50 m (100 pF/m), unshielded
Load controller	Max. 50 m (100 pF/m), unshielded
Fuel valve	Max. 50 m (100 pF/m), unshielded
Pilot valve	Max. 50 m (100 pF/m), unshielded
Flame detector	Refer to *Flame supervision* chapter
SQM4	Refer to Data Sheet N7820
AZL66	Refer to Data Sheet N7562

Specifications as per EN 60730-1:2016	
Type of shutdown or interruption for each circuit	
Shutdown with micro switch	1-pole
Mode of operation	Type 2 B

8.5 Cross-sectional areas

The cross-sectional areas of the mains power lines (L, N, and PE) and, if required, the safety loop (safety temperature limiter, water shortage, etc.) must be sized for rated currents according to the selected external primary fuse. The cross-sectional areas of the other cables must be sized in accordance with the primary fuse for the LMV6 (max. 6.3 AT).

Minimum cross-sectional area	0.75 mm² (single-core or multi-core in accordance with IEC 60364-5-52:2009)

Cable insulation must be suitable for the respective temperatures and environmental conditions.

8.6 RAST3.5 connector

Mechanical data

Connection cross sections, conductor screw connection	
• Stranded conductor, fine-wired (flexible)	Cross section Min. 0.14 mm² Max. 1.5 mm²
• Stranded conductor, fine-wired (flexible) with ferrule	Cross section Min. 0.25 mm² Max. 1 mm²
• Stripping length	Approx. 7 mm
• Screw tightening torque	0.25 Nm

Note!
AGG9 connector sets!
The AGG9 connectors of the connection cables for the LMV6 may only be removed or replaced when the plant is shut down (all-pole disconnection)!

8.7 RAST5 connector

Mechanical data

Insertion force / contact	≤4 N
Withdrawal force / contact	≥1 N
Tightening torque / screw	0.5 Nm in accordance with EN 60335-1
Contacting with blade connector	6.3 x 0.8 mm in accordance with IEC 61210:2010 Male multipoint connector in accordance with RAST5 standard
Connection cross sections, conductor screw connection	
• Stranded conductor	Cross section max. 2.5 mm²
• Stranded conductor with ferrule	Cross section max. 2.5 mm²
• Stripping length	Approx. 8 mm

Note!
AGG9 connector sets!
The AGG9 connectors of the connection cables for the LMV6 may only be removed or replaced when the plant is shut down (all-pole disconnection)!

8.8 Environmental conditions

Warning!
Condensation, formation of ice, and ingress of water are not permitted.
Failure to observe this poses a risk of damaging the safety functions and a risk of electric shock.

8.8.1 Climatic conditions

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

8.8.2 Mechanical conditions

Vibration tests	According to IEC 60068-2-6:2008 with acceleration of 10 m/s²
Shock tests	According to IEC 60068-2-27:2010 with peak accelerations of 100 m/s²

8.9 Flame supervision

8.9.1 Ionization probe

With LMV6 at terminal X52.

Warning!
Provide protection to prevent people from coming into contact with the ionization probe (risk of electric shock)!

Short-circuit current	Max. AC 850 µA
Permissible length of detector cable (laid separately)	10 m (100 pF/m), unshielded

Note!
Display on the AZL66 in the event of a short-circuit!
In the event of a short-circuit, a flame signal of approx. 12% is displayed on the AZL66.

	At mains voltage	Flame intensity
	230 V AC	
Detector voltage between ionization probe and ground (AC voltmeter Ri ≥ 10 MΩ)	Approx. 230 V AC	---
Switching threshold (limit values):		
Switching on (flame ON) (DC ammeter Ri ≤ 5 kΩ)	3 µA	25%
Start prevention due to extraneous light	---	≥18%
Recommended flame intensity for reliable operation	---	> 40%
Switching threshold in the event of poor flame during operation	---	Approx. 30%
Possible detector current with flame (typical)	>15 µA	100%
Maximum detector current	60 µA DC	---

Note!
As the detector line capacitance (detector line length) increases, the voltage at the ionization probe – and thus the detector current – will drop. Long line lengths and very high-ohmic flames may necessitate the use of a low-capacitance detector cable. In spite of special electronic circuits designed to compensate possible adverse effects of the ignition spark on the ionization current, it is important to ensure that the minimum detector current required is already available during the ignition phase. If this is not the case, the primary ignition transformer connections must be interchanged and/or the electrodes relocated.

Connection diagram

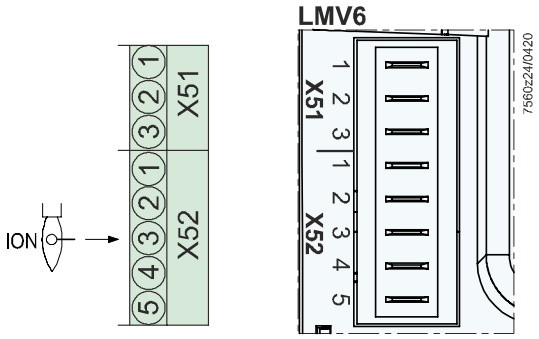


Figure 12: Ionization probe connection diagram

Measuring circuit for detector current measurement

Ionization probe

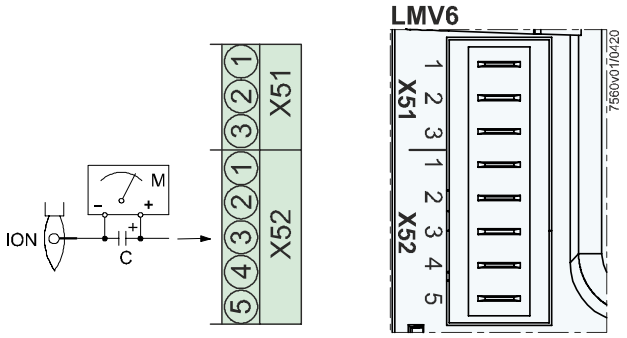


Figure 13: Measuring circuit for ionization probe

Key

C	Electrolytic capacitor 100 to 470 µF; 10 to 25 V DC
ION	Ionization probe
M	Micro-ammeter Ri max. 5000 Ω

8.9.2 QRA2 / QRA2M / QRA4 / QRA10

Caution!
If QRA2 / QRA2M / QRA4 / QRA10-UV tubes are used for flame supervision on the LMV6, it must be ensured that the LMV6 is permanently connected to power (DIN EN 298), thus enabling the LMV6 to detect flame detector failures during startup and shutdown. The LMV6 generally operates with QRA in intermittent operation. For *Technical data,* refer to Data Sheet N7712, UV flame detector QRA2 / QRA2M / QRA10! For *Technical Data,* refer to Data Sheet N7711, UV flame detector QRA4!

Operating voltage in operation	Max. 350 V peak
Possible detector current in operation	Max. 80 µA
Permissible length of the standard detector cable (laid separately)	Max. 10 m
Threshold values when flame is supervised by QRA	
• Start prevention (extraneous light)	Flame intensity ≥ 18%
• Operation	Flame intensity > 25%

For more detailed information on QRA2 / QRA2M / QRA10, refer to Data Sheet N7712.
For more detailed information about QRA4, refer to data sheet N7711.

Connection diagram QRA2 / QRA2M / QRA4 / QRA10

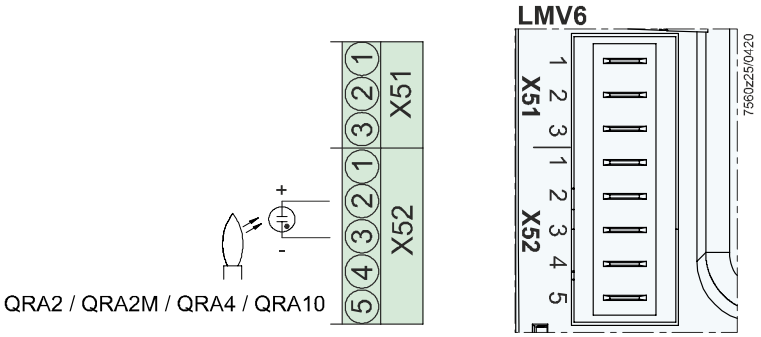


Figure 14: Connection diagram for QRA2 / QRA2M / QRA4 / QRA10

Measuring circuit for detector current measurement

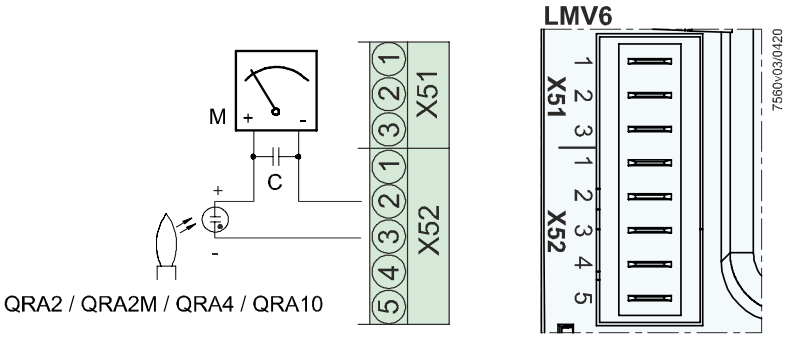


Figure 15: Measuring circuit QRA2 / QRA2M / QRA4 / QRA10

Key

C Electrolytic capacitor 100 to 470 µF; 10 to 25 V DC
M Micro-ammeter Ri max. 5000 Ω

Warning!
Simultaneous operation of the ionization probe and QRA2 / QRA2M / QRA4 / QRA10 is not permitted. Failure to observe this information poses a risk of damaging the safety functions.

8.9.3 QRA7 with AGQ6.3

The QRA7 is suitable for continuous operation.

Supply voltage • QRA73A27 • QRA75A27	 230 V~ 230 V~
Supply voltage tested by increasing the supply voltage for the QRA7 (terminal X51 pin 3)	From 14 V⎓ to 21 V⎓
Required signal voltage (terminal X51 pin 2)	Min. 3.5 V DC⎓ Flame display approx. 50% (with factory setting) – parameter number and % display must be checked in the respective application
Possible signal voltage (terminal X51 pin 2)	Max. 5.5 V⎓ Flame display approx. 100% (with factory setting) – parameter number and % display must be checked in the respective application
Permissible signal voltage during the extraneous light test (terminal X51 pin 2)	Max. 0.3 V⎓
Permissible length of detector cable • 6-core cable • Signal line no. 3, 4, and 5	 Max. 10 m Max. 100 m (laid separately from 'L', 'N' and 'PE' as a shielded cable)

QRA7 connection diagram

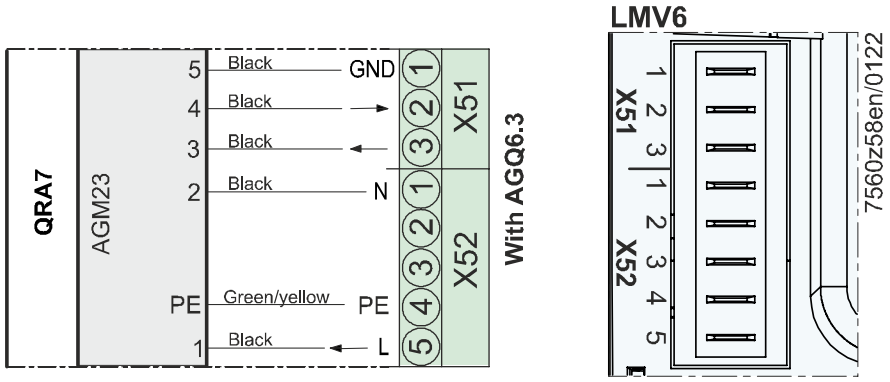


Figure 16: QRA7 connection diagram

Note
Simultaneous operation with ionization probe and QRA7!
If an ionization probe and a QRA7 are operated simultaneously, be sure to note the settings – refer to chapter 12.2.5.7 "Separate flame supervision"!
Failure to observe this information poses a risk of damaging the safety functions.

For more detailed information about QRA7, refer to data sheet N7712.

8.9.4 QRI with AGQ6.3

The QRI is suitable for continuous operation.

Supply voltage in operation/test (terminal X51 pin 3)	Approx. 14 V⎓ / 21 V⎓
Required signal voltage (terminal X51 pin 2)	Min. 3.5 V DC⎓ Flame display approx. 50% (with factory setting) – parameter number and % display must be checked in the respective application
Possible signal voltage (terminal X51 pin 2)	Max. 5.5 V⎓ Flame display approx. 100% (with factory setting) – parameter number and % display must be checked in the respective application
Permissible signal voltage during the extraneous light test (terminal X51 pin 2)	Max. 0.3 V⎓
Permissible length of detector cable	
Signal line	Max. 100 m (laid separately from 'L', 'N' and 'PE' as a shielded cable)

QRI connection diagram

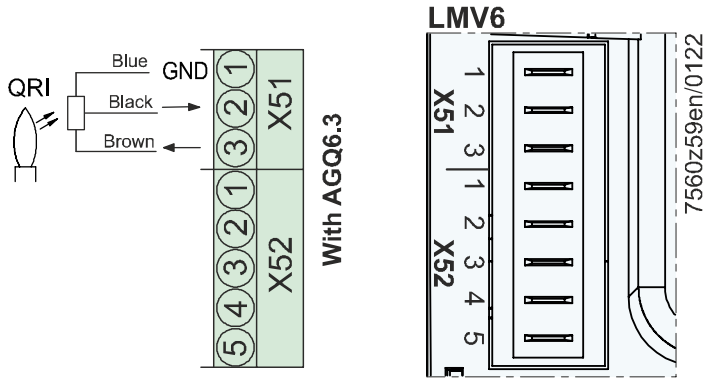


Figure 17: QRI connection diagram

Measuring circuit for detector current measurement

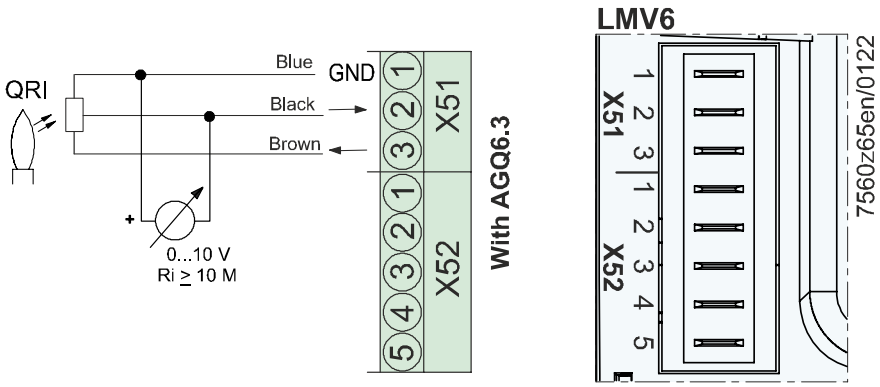


Figure 18: QRI measuring circuit

Key

C Electrolytic capacitor 100–470 µF; 10–25 V⎓

M Micro-ammeter Ri max. 5,000 Ω

For more detailed information about QRI, refer to data sheet N7719.

8.10 AGG6.200A5

Mains voltage	230 V AC -15%/+10%
Mains frequency	50 Hz ±6%
External primary fuse (Si)	Max. 6.3 A, slow
Output load	Max. 1.25 A / 30 W
Internal consumption	< 35 W, typically
Safety class	I, with parts according to II in accordance with EN 60730-1:2016
Degree of protection	IP00
	Note The burner or boiler manufacturer must ensure degree of protection IP40 for the AGG6.200A5 in accordance with EN 60529:1991 + A1:2000 + A2:2013 through adequate installation.
Rated surge voltage Category III (DIN EN 60664)	4 kV
• Creepage distances and air gaps	2.5 kV due to voltage limitation measures
Degree of contamination	2 in accordance with EN 60730-1:2016
Permissible mounting position	Optional
Weight	Approx. 400 g
DIN rail	TH 35-7.5 in accordance with EN 60715:2017

8.10.1 Environmental conditions

Warning!
Condensation, formation of ice, and ingress of water are not permitted.
Failure to observe this poses a risk of damaging the safety functions and a risk of electric shock.

8.10.1.1 Climatic conditions

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

8.10.1.2 Mechanical conditions

Vibration tests	According to IEC 60068-2-6:2008 with acceleration of 10 m/s²
Shock tests	According to IEC 60068-2-27:2010 with peak accelerations of 100 m/s²

9 Assignment of connections

9.1 LMV60.110A2

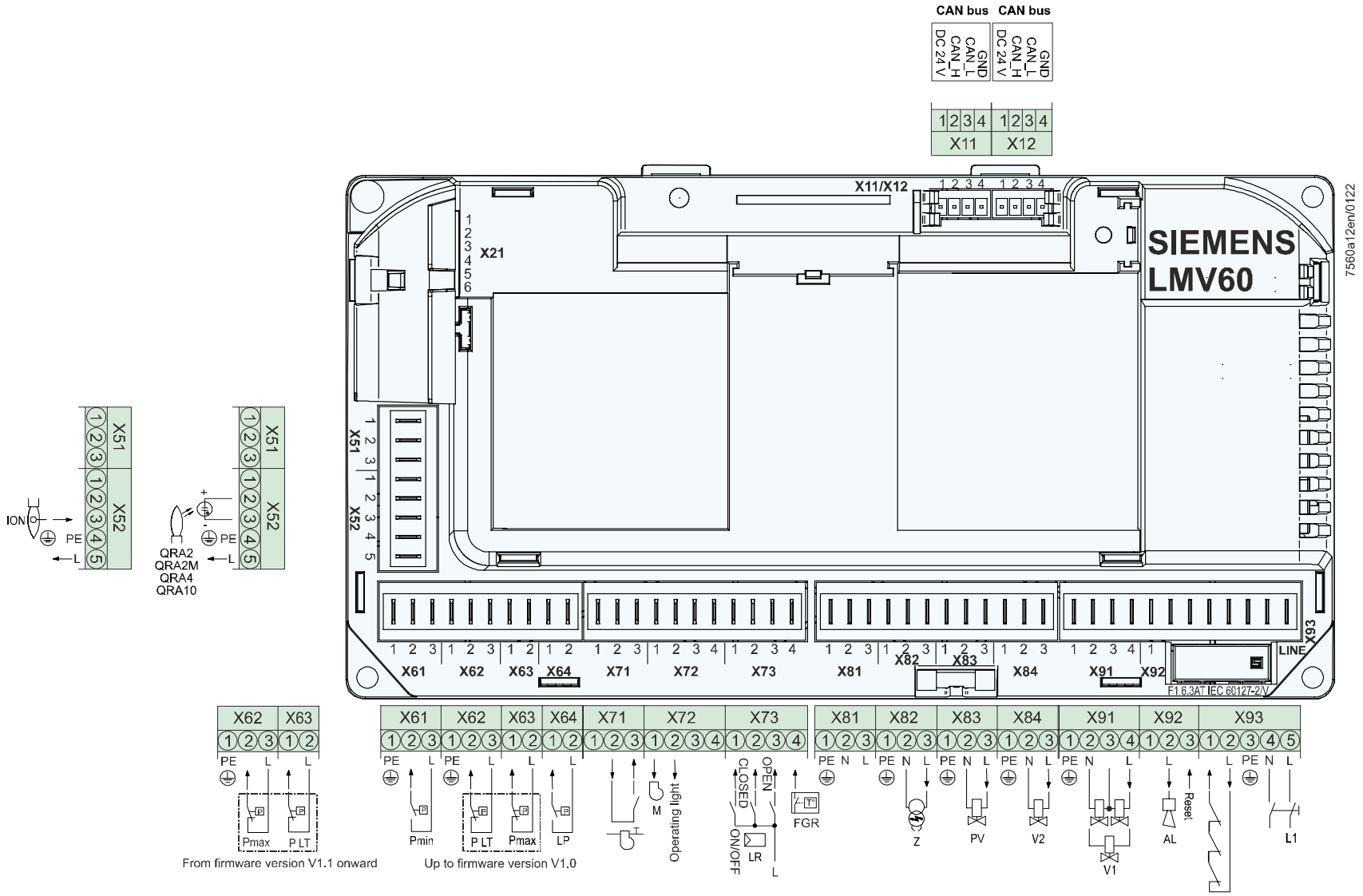


Figure 19: Assignment of LMV60.110A2 connections

9.2 LMV62

9.2.1 LMV62 assignment of terminals 1

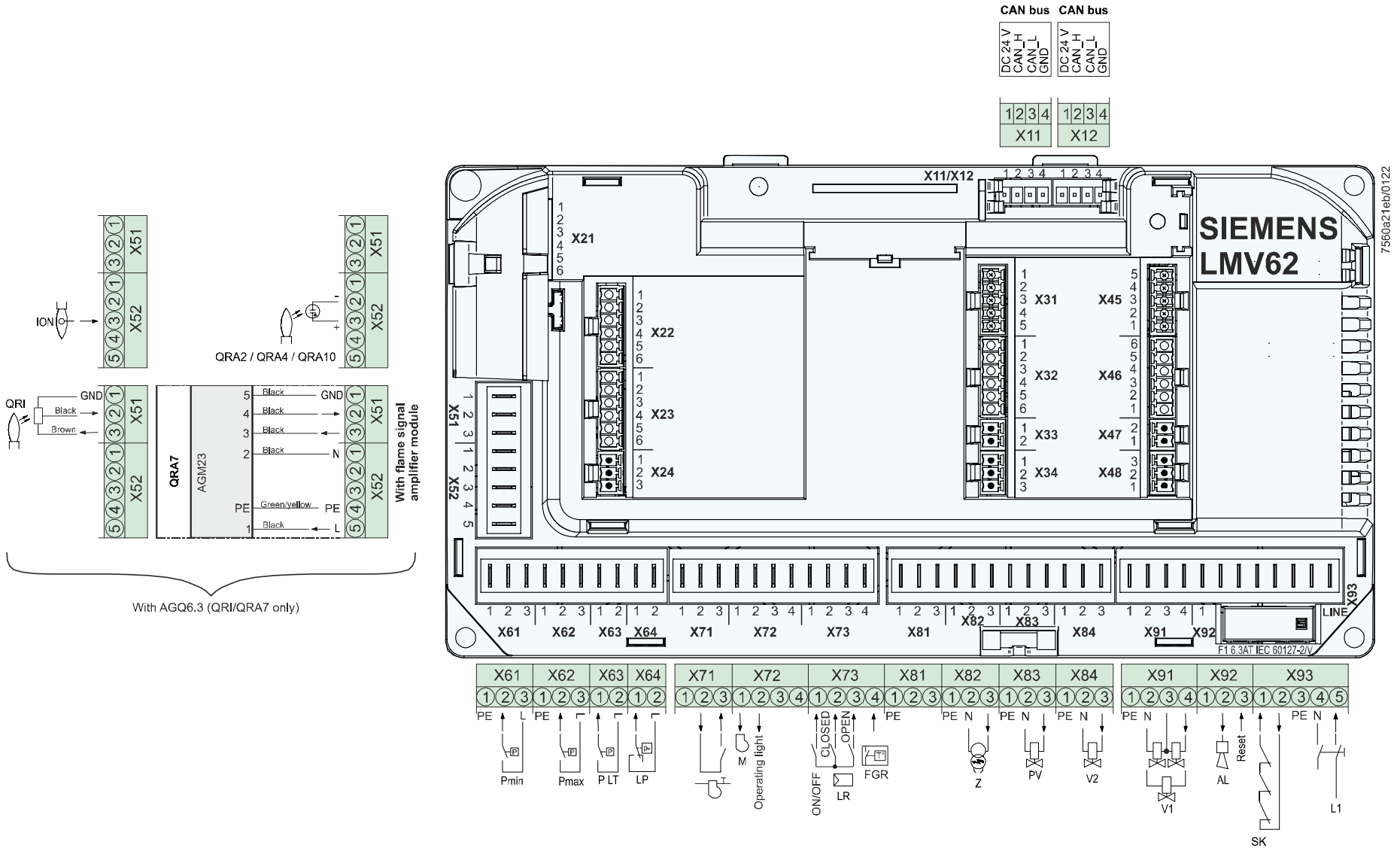


Figure 20: Assignment of terminals 1 for LMV62

9.2.2 LMV62 assignment of terminals 2

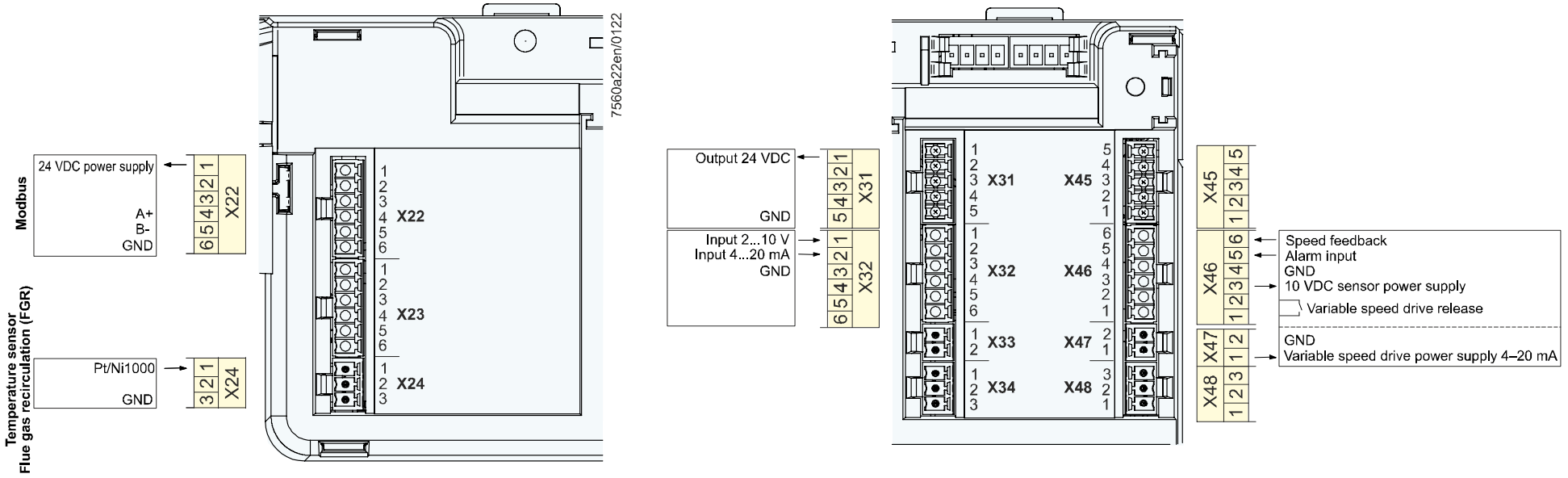


Figure 21: Assignment of terminals 2 for LMV62

Key

AGQ6.3	Flame signal amplifier
AL	Alarm device
FGR	Flue gas recirculation
ION	Ionization probe
L	Power supply 230 V AC
L1	Input phase 230 V AC
LP	Air pressure switch
LR	Load controller
LR-OPEN	Load controller OPEN position (increase load)
LR-CLOSED	Load controller CLOSED position (reduce load)
M	Fan motor
P LT	Valve proving pressure switch
Pmax	Pressure switch-max
Pmin	Pressure switch-min
PV	Pilot valve
QRA	UV flame detector
QRI	Infrared flame detector
SK	Safety loop
V1	Fuel valve
V2	Fuel valve
Z	Ignition transformer

10 Wiring

10.1 Introduction to wiring

10.1.1 Terminals

The connection terminals of the LMV6 are designed for RAST5 mains voltage plugs and RAST3.5 plugs (for low-voltage connections).
The mains voltage plugs are coded in such a way that they only fit into one terminal of the LMV6. A visual inspection must be carried out to check the correct plug-in space is in use.

Each plug is designed to connect an external unit or small group of external burner components, such as gas valves, with the LMV6. Each group of RAST5 plugs of the LMV6 supplies mains voltage.
This means no additional terminal strips are required for the neutral conductor (N) or protective earth (PE).

Note!
All cables, such as protective earth (PE), the neutral conductor (N), and phase conductor (L) are fed together inside the LMV6.

Example for RAST5

X61-	3
Connector group	Pin number

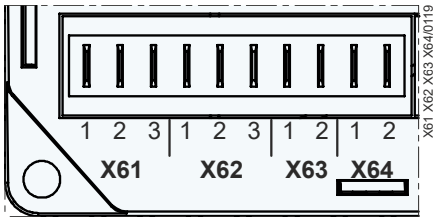


Figure 22: Diagram of the *mains voltage* (RAST5) terminal numbering on the LMV6

Example for RAST3.5

X11.	2
Connector group	Pin number

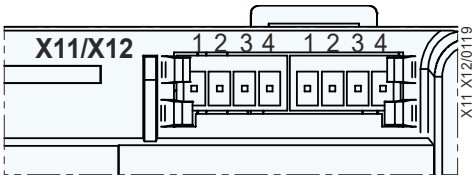


Figure 23: Diagram of the *low voltage* (RAST3.5) terminal numbering on the LMV6

The terminal descriptions are provided in a list that clearly indicates the cables and low-voltage plugs (refer to chapter 10.2 *Description of the terminals*).

The pin numbers are marked on the housing of the LMV6 for each plug.

10.1.2 Earthing

The LMV6 has 2 different types of earthing:
- Protective earth **PE**
- Functional earth **FE**

10.1.2.1 Protective earth (PE)

The protective earth (PE) of the LMV6 must be connected. The purpose of protective earth (PE) is to provide a protective conductor connection for all connected units/components. The protective conductor (PE) connection is also connected to the mounting plate via a short conductor.

10.1.2.2 Functional earth (FE)

The functional earth (FE) must be connected to a reference ground on the burner housing or in the control panel and is used to discharge interference current from the existing shielding. The functional earth (FE) connection can also be established via the AGG6.500.

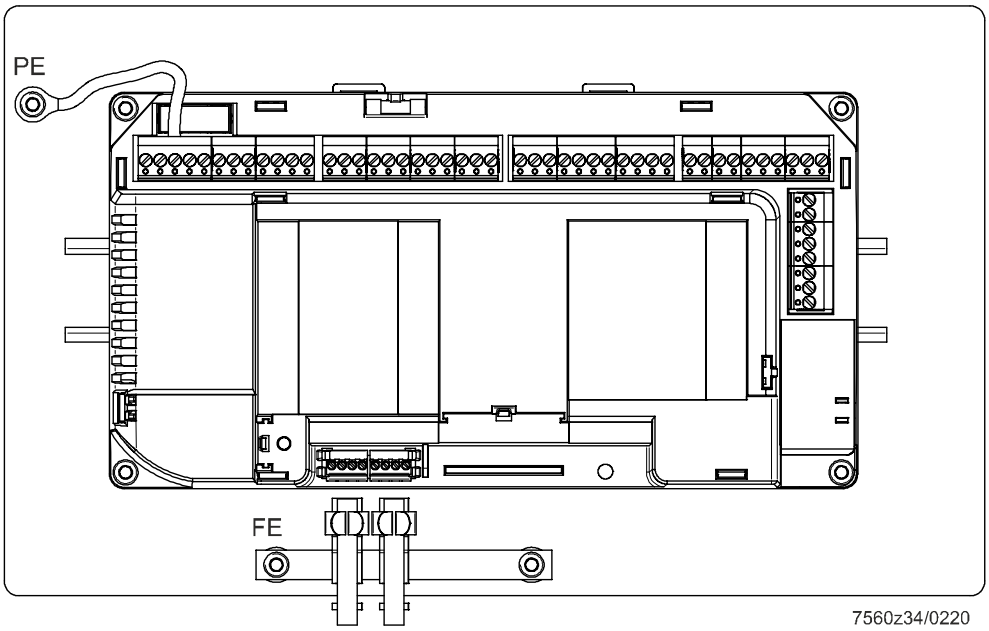


Figure 24: Connection of the protective earth (PE) / functional earth (FE) with the mounting plate

10.2 Description of the terminals

Note!
AGG9 connector sets!
The AGG9 connectors of the connection cables for the LMV6 may only be removed or replaced when the plant is shut down (all-pole disconnection)!

Key

Terminal	Terminal markings on LMV6 housing
Coding	Plug-in space coding
Type (ASN)	Product designation for 200 packaging units
Pin	Connection PIN
Input	Input terminals
Output	Output terminals
Function	Function description
Current	Maximum permissible current rating (refer to *Technical Data*)
Parameter	Parameter number impacting the function or behavior of the inputs/outputs

10.2.1 LMV6

10.2.1.1 Terminal X11, X12

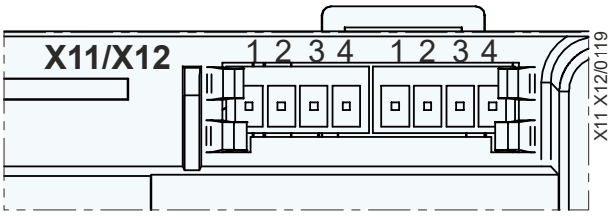


Figure 25: Terminal X11 / X12

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function		Electrical limit value
X11	---	AGG9.846	1	---	•	DC power supply for system components	24 V DC	Approx. 24 V DC Max. 1.25 A
			2	---	•	Communication signal	CAN_H	DC U ↔ 5 V, Rw = 120 Ω, Level according to the ISO 11898 standards series
			3	---	•	Communication signal	CAN_L	DC U ↔ 5 V, Rw = 120 Ω, Level according to the ISO 11898 standards series
			4	---	•	Signal reference	GND	
X12	---	AGG9.847	1	---	•	DC power supply for system components	24 V DC	Approx. 24 V DC Max. 1.25 A
			2	---	•	Communication signal	CAN_H	DC U ↔ 5 V, Rw = 120 Ω, Level according to the ISO 11898 standards series
			3	---	•	Communication signal	CAN_L	DC U ↔ 5 V, Rw = 120 Ω, Level according to the ISO 11898 standards series
			4	---	•	Signal reference	GND	---

10.2.1.2 Terminal X22 / X24

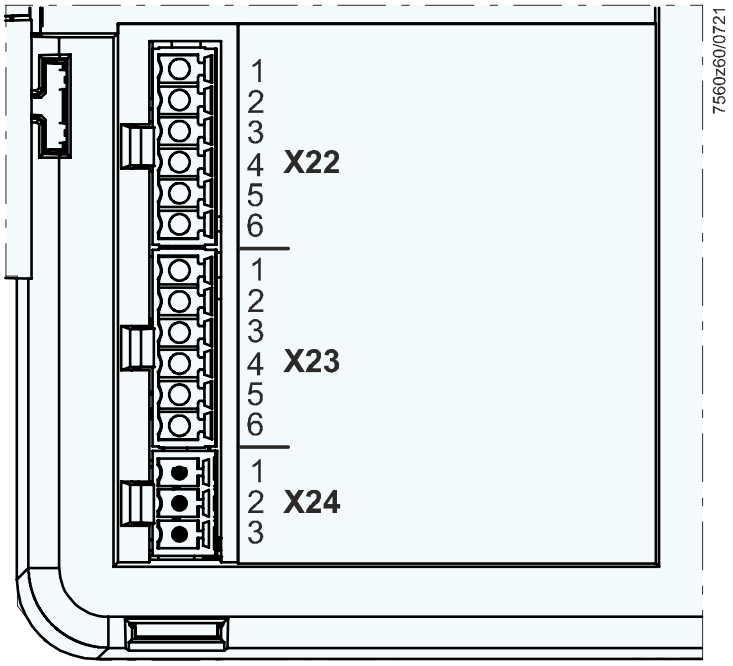


Figure 26: Terminal X22 / X24

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function		Electrical limit value	Parameters
X22	---	AGG9.866	1	---	•	DC power supply for system components	24 V DC	Approx. 24 V⎓ Max. 20 mA	0414
			2	---	---	---	---	---	
			3	---	---	---	---	---	
			4	---	---	Modbus A+	A+	---	
			5	---	---	Modbus B-	B-	---	
			6	---	---	Signal reference	GND	---	
X24	---	AGG9.836	1	•	---	Temperature sensor for flue gas recirculation (FGR)	Pt/Ni1000	---	0110 1706
			2	---	---	---	---	---	
			3	---	---	Signal reference	GND	---	

10.2.1.3 Terminal X31, X32

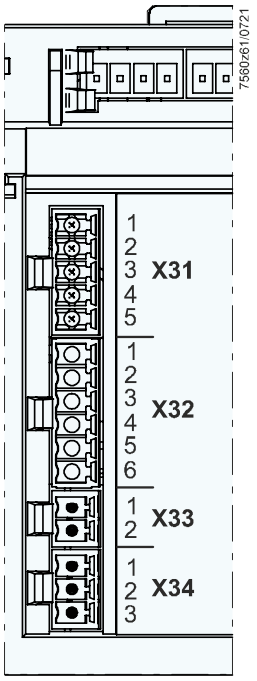


Figure 27: Terminal X31 / X32

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function		Electrical limit value
X31	---	AGG9.856	1	---	•	24 V DC output	24 V DC	Approx. 24 V⎓ Max. 20 mA
			2	---	---	---	---	---
			3	---	---	---	---	---
			4	---	---	---	---	---
			5	---	---	Signal reference	GND	---
X32	---	AGG9.863	1	•	---	'Voltage' analog load target	2–10 V	---
			2	•	---	'Current' analog load target	4–20 mA	---
			3	---	---	Signal reference	GND	---
			4	---	---	---	---	---
			5	---	---	---	---	---
			6	---	---	---	---	---

10.2.1.4 Terminal X46, X47

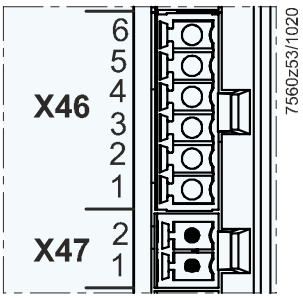


Figure 28: Terminal X46/X47

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function		Electrical limit value	Parameters
X46	---	AGG9.864	1	●	---	Variable speed drive release	24 V⎓	5 mA to 0.5 A	0110 1658
			2	●	---	Variable speed drive release	24 V⎓	5 mA to 0.5 A	
			3	---	●	Sensor power supply	10–12 V⎓	Max. 15 mA	---
			4	---	---	Signal reference	GND	---	---
			5	●	---	Input for alarm	---	Active: 12–24 V⎓ Inactive: <4 V⎓	Alarm ON or OFF adjustable via parameter 6015
			6	●	---	Speed feedback	---	---	6101 6025
X47	---	AGG9.827	1	---	●	Speed specification of the variable speed drive	4–20 mA	---	6016
			2	---	---	Signal reference	GND	---	---

10.2.1.5 Terminal X51 / X52

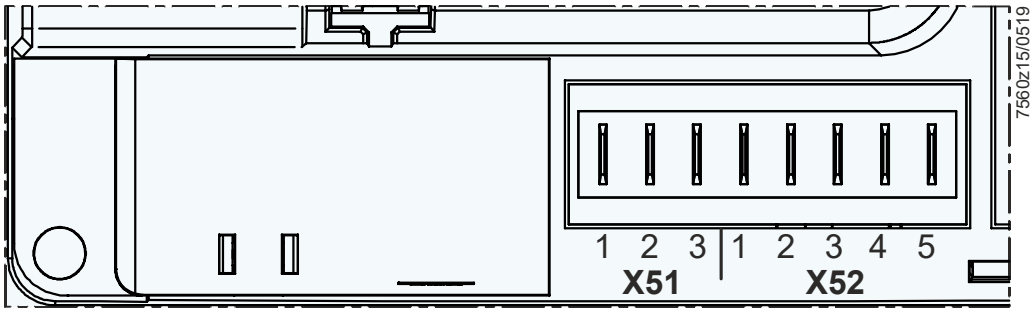


Figure 29: Terminal X51 / X52

Flame supervision with QRA2 / QRA4 / QRA10								
Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X52	05K53	AGG9.506	1	---	---	---	---	0901 0902 0903 0905
			2	---	•	QRA+	---	
			3	•	---	QRA-	---	
			4	---	---	---	---	
			5	---	---	---	---	

Flame supervision with QRA7 and AGQ6.3								
Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameters
X51	03K80	AGG9.326	1	---	---	Signal reference GND AGM23 → Pin 5 Black cable	---	---
			2	•	---	AGM23 → Pin 4 Black cable	---	
			3	---	•	AGM23 → Pin 3 Black cable	---	
X52	05K53	AGG9.506	1	---	---	Neutral conductor 'N' AGM23 → Pin 2 Black cable	---	---
			2	---	---	---	---	
			3	---	---	---	---	
			4	---	---	Protective earth (PE) AGM23 → PE Green/yellow cable	---	
			5	---	•	Power supply AGM23 → Pin 1 Black cable	---	

Flame supervision with QRI and AGQ6.3							
Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value
X51	03K80	AGG9.326	1	---	---	Signal reference GND, blue cable	---
			2	●	---	Signal, black cable	---
			3	---	●	Supply or test, brown cable	---

Flame supervision with ionization probe								
Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X52	05K53	AGG9.506	1	---	---	---	---	0901 0902 0903 0905
			2	---	---	---	---	
			3	●	---	Ionization probe feedback	Imax. 60 µA	
			4	---	---	---	---	
			5	---	---	---	---	

10.2.1.6 Terminal X61 / X62 / X63 / X64

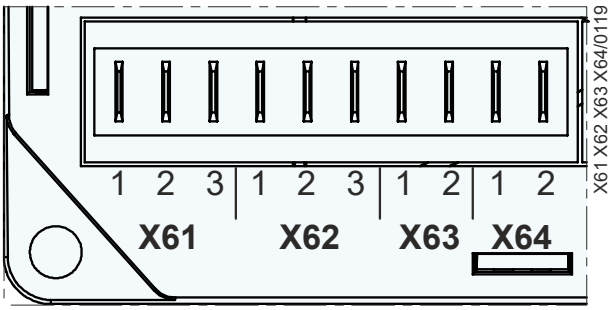


Figure 30: Terminal X61 / X62 / X63 / X64

Up to firmware version V1.0								
Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X61	03K54	AGG9.327	1	---	---	Protective earth (PE)	---	1137 1149
			2	●	---	Gas pressure switch-min (Pmin)	230 V~ +10% / -15% 50 Hz	
			3	---	●	Power supply	230 V~ +10% / -15% 50 Hz Imax 100 mA	
X62	03K31	AGG9.328	1	---	---	Protective earth (PE)	---	1201 1202 1203 1204 1205
			2	●	---	Pressure switch valve proving (P LT)	230 V~ +10% / -15% 50 Hz Imax 1.5 mA	
			3	---	●	Power supply	230 V~ +10% / -15% 50 Hz Imax 100 mA	
X63	02K43	AGG9.220	1	●	---	Gas pressure switch-max (Pmax)	230 V~ +10% / -15% 50 Hz Imax 100 mA	1137 1150
			2	---	●	Power supply	230 V~ +10% / -15% 50 Hz Imax 100 mA	
X64	02K02	AGG9.221	1	●	---	Air pressure switch (LP)	230 V~ +10% / -15% 50 Hz	0920 1130
			2	---	●	Power supply	230 V~ +10% / -15% 50 Hz Imax 100 mA	

From firmware version V1.1 onward								
Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X61	03K54	AGG9.327	1	---	---	Protective earth (PE)	---	1149
			2	●	---	Gas pressure switch-min (Pmin)	230 V~ +10%/-15% 50 Hz	
			3	---	●	Power supply	230 V~ +10%/-15% 50 Hz Imax 100 mA	
X62	03K31	AGG9.328	1	---	---	Protective earth (PE)	---	1150
			2	●	---	Gas pressure switch-max (Pmax)	230 V~ +10%/-15% 50 Hz Imax 1,5 mA	
			3	---	●	Power supply	230 V~ +10%/-15% 50 Hz Imax 100 mA	
X63	02K43	AGG9.220	1	●	---	Pressure switch valve proving (P LT)	230 V~ +10%/-15% 50 Hz Imax 1,5 mA	1201 1202 1203 1204 1205
			2	---	●	Power supply	230 V~ +10%/-15% 50 Hz Imax 100 mA	
X64	02K02	AGG9.221	1	●	---	Air pressure switch (LP)	230 V~ +10%/-15% 50 Hz	0920 1130
			2	---	●	Power supply	230 V~ +10%/-15% 50 Hz Imax 100 mA	

10.2.1.7 Terminal X71 / X72 / X73

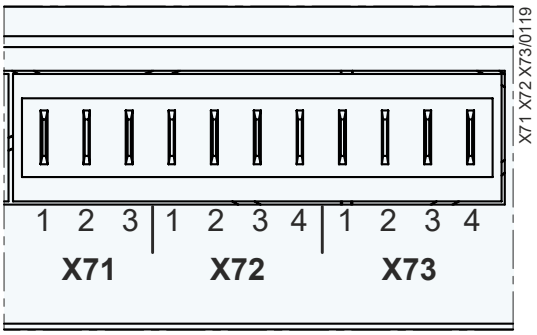


Figure 31: Terminal X71 / X72 / X73

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X71	03K48	AGG9.329	1	●	---	---	---	0925
			2	---	●	Power supply	230 V~ +10/-15% 50 Hz Imax 100 mA	
			3	●	---	From firmware version V1.100 onward: Burner flange	230 V~ +10/-15% 50 Hz	
X72	04K01	AGG9.418	1	---	●	Fan (M)	230 V~ +10/-15% 50 Hz 2 A, cosφ >0.4	1102
			2	---	●	From firmware version V1.100 onward: Operating light	230 V~ +10/-15% 50 Hz 1 A, cosφ >0.6	
			3	---	●	---	---	
			4	---	●	---	---	
X73	04K42	AGG9.419	1	●	---	Load controller ON/OFF	230 V~ +10% / -15% 50 Hz	1701 1702 1703 1705 1740 1750
			2	●	---	Load controller CLOSED	230 V~ +10% / -15% 50 Hz	
			3	●	---	Load controller OPEN	230 V~ +10% / -15% 50 Hz	
			4	●	---	Flue gas recirculation (FGR), thermostat contact	230 V~ +10% / -15% 50 Hz	

10.2.1.8 Terminal X81 / X82 / X83 / X84

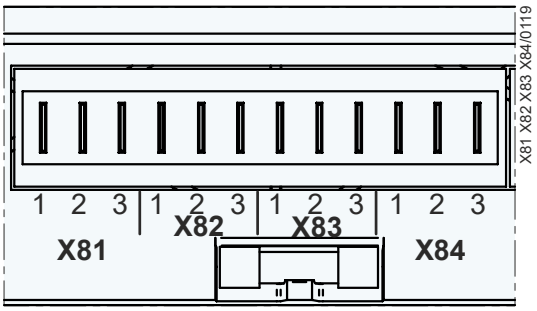


Figure 32: Terminal X81 / X82 / X83 / X84

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X81	03K30	AGG9.330	1	---	---	Protective earth (PE)	---	---
			2	---	---	Neutral conductor (N)	---	
			3	---	•	---	---	
X82	03K66	AGG9.331	1	---	---	Protective earth (PE)	---	1107
			2	---	---	Neutral conductor (N)	---	
			3	---	•	Ignition transformer (Z)	230 V~ +10% / -15% 50 Hz 2 A, cosφ 0.2	
X83	03K10	AGG9.332	1	---	---	Protective earth (PE)	---	---
			2	---	---	Neutral conductor (N)	---	
			3	---	•	Pilot valve PV	230 V~ +10% / -15% 50 Hz 1 A, cosφ 0.4	
X84 *)	03K34	AGG9.333	1	---	---	Protective earth (PE)	---	---
			2	---	---	Neutral conductor (N)	---	
			3	---	•	Fuel valve V2	230 V~ +10% / -15% 50 Hz 2 A, cosφ 0.4	

☞ *)

Note!
Valve proving via fuel valve circuit!
With activated valve proving via fuel valve circuit
- Rated current 1 A
- Load factor Cosφ ≥0.4

10.2.1.9 Terminal X91 / X92 / X93

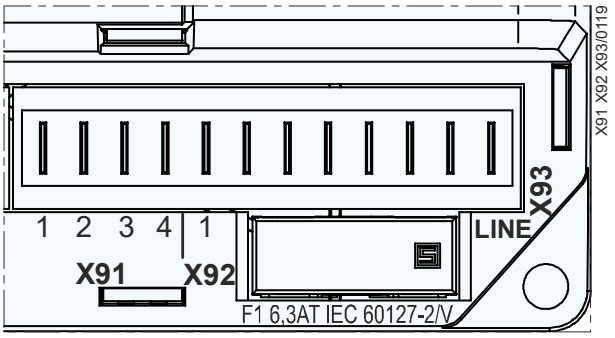


Figure 33: Terminal X91 / X92 / X93

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value	Parameter
X91 *)	04K77	AGG9.420	1	---	---	Protective earth (PE)	---	---
			2	---	---	Neutral conductor (N)	---	
			3	---	---	Auxiliary terminal	---	
			4	---	•	Fuel valve V1	230 V~ +10% / -15% 50 Hz 2 A, cosφ 0.4	
X92	03K15	AGG9.334	1	---	•			1135 1151
			2	---	•	Alarm (AL)	---	
			3	•	---	Reset	---	
X93	05K30	AGG9.507	1	•	---	Safety loop (SK)	230 V~ +10% / -15% 50 Hz max. 5 A	0925
			2	---	•	Power supply safety loop	---	
			3	---	---	Protective earth (PE)	---	
			4	---	---	Neutral	---	
			5	•	---	Mains power supply	5 A	

*) Note!
Valve proving via fuel valve circuit!
With activated valve proving via fuel valve circuit
- Rated current 1 A
- Load factor Cosφ ≥0.4

Note!
The total current of all components connected to the LMV6 flows via terminal X93 pin 1 or pin 2 and components of the safety loop.

Caution!
In the safety loop, temporarily switching (< 1 second) contacts, buttons or similar must not be wired.

Caution!
Terminal X92 pin 1!
Make sure that the voltage load on terminal X92 pin 1 is not connected to live parts. The terminal must not be connected. Failure to observe this information poses a risk of the safety functions being impaired.

Caution!
Terminal X92 pin 3!
Only a simple button may be connected to terminal X92 pin 3. Units that can perform an automatic reset are not permitted.

10.2.2 AGG6.200A5

10.2.2.1 Terminal X13

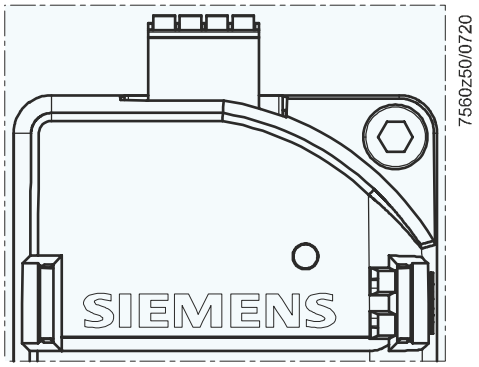


Figure 34: Terminal X13

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value
X13	---	AGG9.881	1	---	•	DC power supply for the system components (24 V DC)	Approx. 24 V DC Max. 1.25 A
			2	---	•	Communication signal (CAN_H)	DC U ↔ 5 V Rw = 120 Ω Level according to the ISO 11898 standards series
			3	---	•	Communication signal (CAN_L)	DC U ↔ 5 V Rw = 120 Ω Level according to the ISO 11898 standards series
			4	---	•	Reference ground (GND)	---

10.2.2.2 Terminal X161

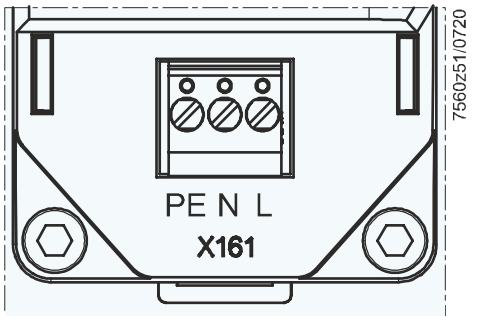


Figure 35: Terminal X161

Terminal	Coding	Type (ASN)	Pin	Input	Output	Function	Electrical limit value
X161	03K105	AGG9.335	1	---	---	Protective earth (PE)	---
			2	---	---	Neutral	---
			3	---	---	Mains power supply	5 A

11 Block diagram inputs / outputs

On request.

12 Description of inputs on LMV6

Note!
This chapter covers the basic features of the LMV6 inputs.
For an exact evaluation and activation of the inputs, see the program sequences.

12.1 Temperature sensor for flue gas recirculation (FGR) terminal X24

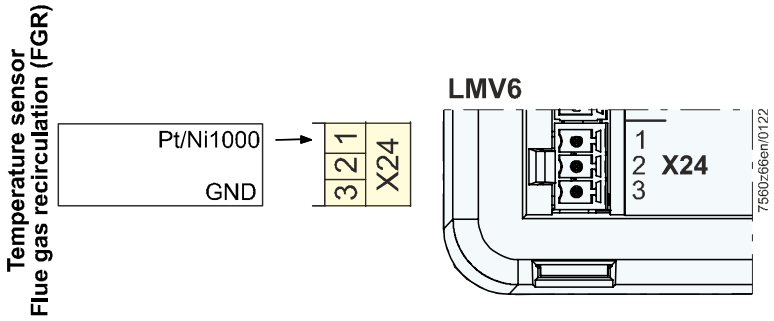


Figure 36: Terminal X24

Parameters	Function
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1706	R: Pt1000 / X24 temperature sensor • Deactivated • Pt1000
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

Error code	Significance for the LMV6
3162	Temperature is not valid Recommended measure: Check connector and cabling

12.2 Flame signal input and flame detector terminal X51 / X52

The following general conditions apply to the flame display on the AZL66:
- The display is subject to various component tolerances, with the result that deviations of ± 10% are perfectly possible
- It should furthermore be noted that, for physical reasons, there is no linear relationship between the display and detector signal values

The LMV6 can be connected to different types of flame detectors. The evaluation can be taken from the sequence diagrams (refer to chapter *Program sequences*).

12.2.1 QRA2 / QRA2M / QRA4 / QRA10 terminal X52

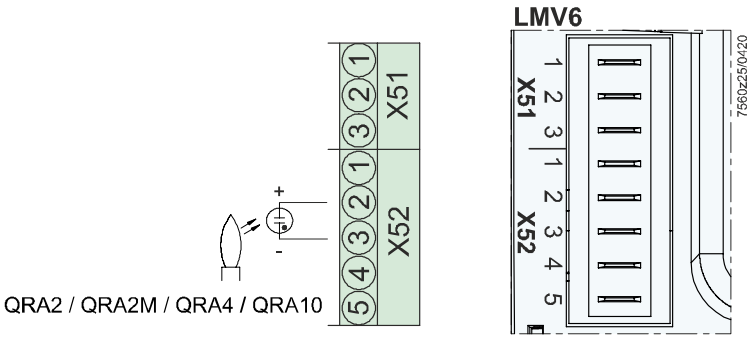


Figure 37: QRA2 / QRA2M / QRA4 / QRA10 terminal X52

Error code	Significance for the LMV6
1005	No flame in the first safety time (TSA1) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1006	Loss of flame in operation Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1007	Extraneous light during startup Recommended measure: Check flame detector
1008	Extraneous light during shutdown Recommended measure: Check flame detector
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1040	Restart counter elapsed: Extraneous light during startup Recommended measure: Check flame detector and application
1041	Restart counter elapsed: Extraneous light during shutdown Recommended measure: Check flame detector and application
1042	Fuel 1: Restart counter elapsed: No flame at the end of TSA1 + TSA2 Recommended measure: Check the error history for relevant entries
1048	Fuel 1: Restart counter elapsed: Loss of flame during operation Recommended measure: Check the error history for relevant entries
1067	No flame in the second safety time (TSA2) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement

12.2.2 QRA7 with AGQ6.3 terminal X51/X52

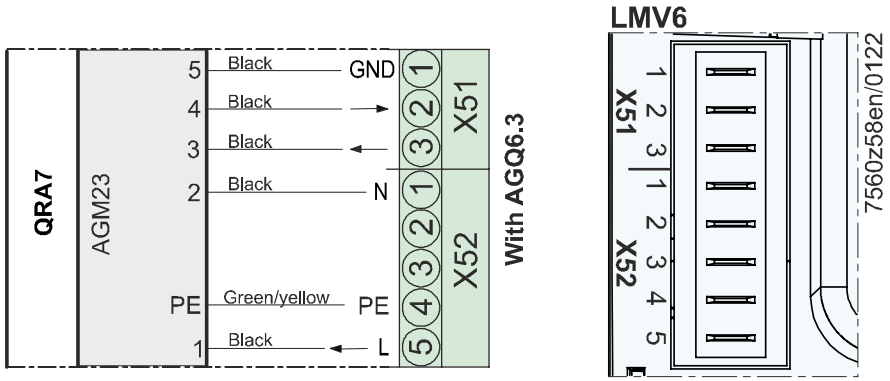


Figure 38: QRA7 terminal X51/X52

Error code	Significance for the LMV6
1005	No flame in the first safety time (TSA1) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1006	Loss of flame in operation Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1007	Extraneous light during startup Recommended measure: Check flame detector
1008	Extraneous light during shutdown Recommended measure: Check flame detector
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1040	Restart counter elapsed: Extraneous light during startup Recommended measure: Check flame detector and application
1041	Restart counter elapsed: Extraneous light during shutdown Recommended measure: Check flame detector and application
1042	Fuel 1: Restart counter elapsed: No flame at the end of TSA1 + TSA2 Recommended measure: Check the error history for relevant entries
1048	Fuel 1: Restart counter elapsed: Loss of flame during operation Recommended measure: Check the error history for relevant entries
1067	No flame in the second safety time (TSA2) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement

12.2.3 QRI with AGQ6.3 terminal X51

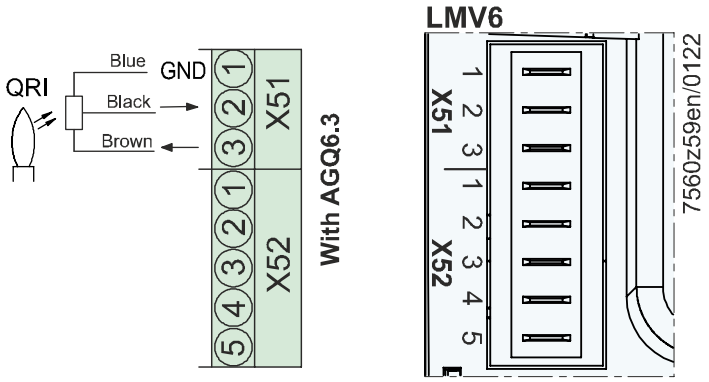


Figure 39: QRI terminal X51

Error code	Significance for the LMV6
1005	No flame in the first safety time (TSA1) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1006	Loss of flame in operation Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1007	Extraneous light during startup Recommended measure: Check flame detector
1008	Extraneous light during shutdown Recommended measure: Check flame detector
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1040	Restart counter elapsed: Extraneous light during startup Recommended measure: Check flame detector and application
1041	Restart counter elapsed: Extraneous light during shutdown Recommended measure: Check flame detector and application
1042	Fuel 1: Restart counter elapsed: No flame at the end of TSA1 + TSA2 Recommended measure: Check the error history for relevant entries
1048	Fuel 1: Restart counter elapsed: Loss of flame during operation Recommended measure: Check the error history for relevant entries
1067	No flame in the second safety time (TSA2) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement

12.2.4 Ionization probe terminal X52

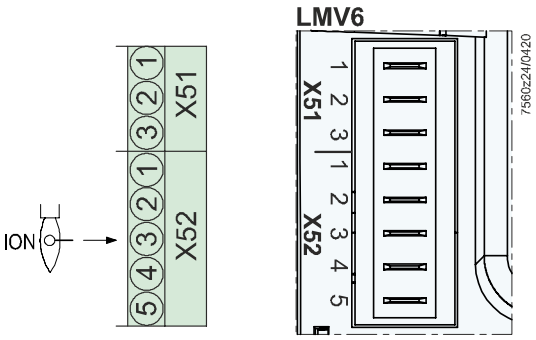


Figure 40: Ionization probe terminal X52

Error code	Significance for the LMV6
1005	No flame in the first safety time (TSA1) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1006	Loss of flame in operation Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1007	Extraneous light during startup Recommended measure: Check flame detector
1008	Extraneous light during shutdown Recommended measure: Check flame detector
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1040	Restart counter elapsed: Extraneous light during startup Recommended measure: Check flame detector and application
1041	Restart counter elapsed: Extraneous light during shutdown Recommended measure: Check flame detector and application
1042	Fuel 1: Restart counter elapsed: No flame at the end of TSA1 + TSA2 Recommended measure: Check the error history for relevant entries
1048	Fuel 1: Restart counter elapsed: Loss of flame during operation Recommended measure: Check the error history for relevant entries
1067	No flame in the second safety time (TSA2) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement

12.2.5 Extraneous light

12.2.5.1 *Extraneous light on startup* restart

Parameter	Function
0901	Extraneous light on startup

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

Extraneous light during a heat request in standby (Phase 12) leads to start prevention, followed by a restart.
Extraneous light during prepurging leads to immediate lockout. If extraneous light occurs during the shutdown, the LMV6 will switch to the safety phase.

The restart counter is set to 0 (factory setting), which means a lockout takes place in the event of an error.

Error code	Significance for the LMV6
1007	Extraneous light during startup Recommended measure: Check flame detector
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1040	Restart counter elapsed: Extraneous light during startup Recommended measure: Check flame detector and application

12.2.5.2 *Extraneous light on shutdown* restart

Parameter	Function
0902	Extraneous light on shutdown
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

The restart counter is set to 0 (factory setting), which means a lockout takes place in the event of an error.

Error code	Significance for the LMV6
1008	Extraneous light during shutdown Recommended measure: Check flame detector
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1041	Restart counter elapsed: Extraneous light during shutdown Recommended measure: Check flame detector and application

12.2.5.3 Restart in the event of extraneous light

Parameter	Function
0901	Extraneous light on startup
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.
0902	Extraneous light on shutdown
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

If extraneous light is detected during startup or shutdown, 0 to 5 (setting value 0) restarts can be set per controlled startup via the temperature controller or pressurestat. A non-volatile lockout is then performed.

The restart counter is reloaded…
- when leaving the operating position (controlled shutdown)
- after 24 hours in the operating position
- after power ON
- after a reset

Error code	Significance for the LMV6
1040	Restart counter elapsed: Extraneous light during startup Recommended measure: Check flame detector and application
1041	Restart counter elapsed: Extraneous light during shutdown Recommended measure: Check flame detector and application

12.2.5.4 No flame at end of safety time

Parameter	Function
0903	No flame at the end of TSA1 + TSA2

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

If no flame has been established by the end of the first safety time, a lockout will be initiated.

Error code	Significance for the LMV6
1005	No flame in the first safety time (TSA1) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1042	Fuel 1: Restart counter elapsed: No flame at the end of TSA1 + TSA2 Recommended measure: Check the error history for relevant entries
1067	No flame in the second safety time (TSA2) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement

12.2.5.5 No flame during operation

Parameter	Function
0905	Loss of flame in operation

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

In the event of loss of flame during operation, a safety shutdown will be initiated followed by a restart if required. A restart counter can be used to select after how many losses of flame a lockout should be initiated.

Error code	Significance for the LMV6
1006	Loss of flame in operation Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1048	Fuel 1: Restart counter elapsed: Loss of flame during operation Recommended measure: Check the error history for relevant entries

12.2.5.6 Flame intensity

The flame's intensity can be read out.

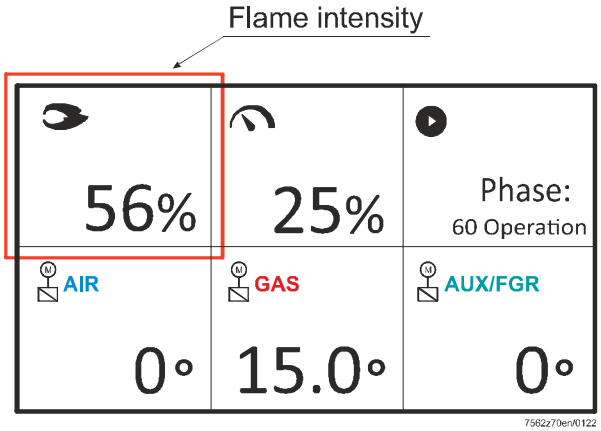


Figure 41: Flame intensity

12.2.5.7 Separate flame supervision

Parameters	Function
1801	Flame detector 1: Selection for logic • Internal • Flame module
1802	Flame detector 2: Selection for logic • Internal • Flame module
1803	Flame logic: Extraneous light • Flame 1 • Flame 2 • Flame 1 or 2
1804	Flame logic: Pilot • Flame 1 • Flame 2 • Flame 1 and not 2 • Flame 2 and not 1 • Flames 1 and 2 • Flame 1 or 2
1805	Flame logic: Operation • Flame 1 • Flame 2 • Flame 1 and not 2 • Flame 2 and not 1 • Flames 1 and 2 • Flame 1 or 2
1806	Afterburn time: Pilot

The source of the flame signals to be linked is selected with parameters 1801 and 1802. For parameters 1801 and 1802, if 'Internal' is selected, an ionization probe or alternatively a QRA2/QRA4 or QRA10 can be used on the LMV6. When selecting 'Flame signal amplifier', the installed AGQ6.3 can be used. A QRI or a QRA7 can be connected to the AGQ6.3. The linking/processing of the individual flame signals is selected depending on the phase via the pilot phase, operating phase or extraneous light phase. The pilot phase covers phase 40 through phase 50 and operating phase 52 through 62. In all the other phases, the flame signal(s) is/are determined via parameter 1803.

Parameters 1803, 1804, and 1805 offer the following setting options depending on the phase:

Flame detector	Pilot phase	Operating phase	Extraneous light phase
Internal (ION or QRA2/QRA4/QRA10)	•	•	•
AGQ6.3 (QRI or QRA7)	•	•	•
Internal and not AGQ6.x	•	•	---
AGQ6.x and not internal	•	•	---
Internal and AGQ6.x	•	•	---
Internal or AGQ6.x	•	•	•

Note
Detector combinations with a ‘NOT’ link!
In the case of the detector combinations with a ‘NOT’ link (e.g., main flame and not pilot flame), once the pilot valve is closed, the afterburn time can be set via parameter 1806. There is no evaluation of the pilot flame during this time.

Note
Simultaneous operation with ionization probe and QRA7!
If an ionization probe and a QRA7 are operated simultaneously, be sure to note the settings! Failure to observe this information poses a risk of damaging the safety functions.

12.3 Gas pressure switch-min terminal X61

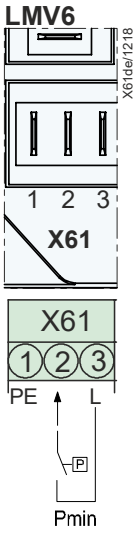


Figure 42: Gas pressure switch-min terminal X61

Parameter	Function
1137	Pressure switch: Tolerance time
1149	R: Check: Minimum gas pressure • OFF • ON

Note!
Changing the parameter settings!
If the parameter setting is changed, a manual reset is required.

Input for connecting a gas pressure switch-min.

Error code	Significance for the LMV6
1020	Check the gas supply Recommended measure: Gas pressure switch-min: Check gas supply and setting
1030	Check gas supply Recommended measure: Gas pressure switch-min: check pressure setting, cabling and gas supply
1032	Check gas supply Recommended measure: Gas pressure switch-min: check pressure setting, cabling and gas supply
5001	Internal error Recommended measure: Replace LMV6 if error occurs constantly

Warning!
Internal error!
In the event of internal errors, a safety check must be carried out following a reset.
Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.

Caution!
The OEM must check to see whether the burner can be operated without a gas pressure switch-min. This may necessitate a special approval depending on the application.

The minimum gas pressure is expected at all gas trains from phase 20 until the end of operation and during valve proving. The gas pressure switch-min is evaluated with a delay during the safety times (parameter 1137) in order to ignore pressure shocks that occur when the fuel valves open. If the gas pressure fails, at least a shutdown will be initiated.

If there is no minimum gas pressure, the LMV6 initiates start prevention in the event of a heat request in phase 12.

12.4 Gas pressure switch-max terminal X62 / X63

Note!
Up to firmware version V1.0.

Note!
From firmware version V1.1 onward.

Figure 43: Gas pressure switch-max terminal X63

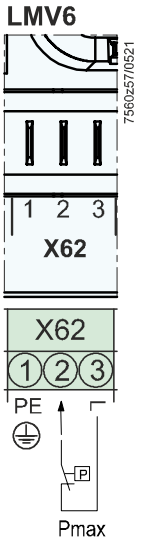


Figure 44: Gas pressure switch-max terminal X62

Parameter	Function
1137	Pressure switch: Tolerance time
1150	R: Check: Maximum gas pressure • OFF • ON

Note!
Changing the parameter settings!
If the parameter setting is changed, a manual reset is required.

Input for connecting a gas pressure switch-max. The signal sources must be designed as normally closed contacts – i.e., the contact opens when the pressure is exceeded.

Caution!
The OEM must check to see whether the burner can be operated without a gas pressure-max. This may necessitate a special approval depending on the application.

Error code	Significance for the LMV6
1031	Check gas supply Recommended measure: Gas pressure switch-max: check pressure setting, cabling and gas supply
5001	Internal error Recommended measure: Replace LMV6 if error occurs constantly
	**Warning!** **Internal error!** **In the event of internal errors, a safety check must be carried out following a reset.** **Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.**

In all types of gas trains, the maximum gas pressure is monitored from phase 40 until the end of operation. If the maximum gas pressure is exceeded, the LMV6 initiates a lockout.
The gas pressure switch-max is evaluated with a delay during the safety times around the pressure switch tolerance time (parameter 1137) in order to ignore pressure shocks that occur when the fuel valves open.

12.5 Pressure switch valve proving terminal X62 / X63

Note! Up to firmware version V1.0.	Note! From firmware version V1.1 onward.

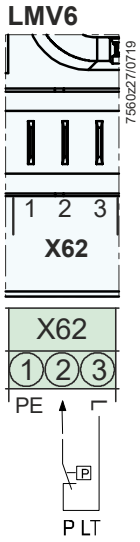


Figure 45: Pressure switch valve proving terminal X62

Figure 46: Pressure switch valve proving terminal X63

Parameter	Function
1201	R: Valve proving – type and time • No valve proving • Valve proving during startup • Valve proving during shutdown • Valve proving during startup and shutdown
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1202	Valve proving – evacuation time
1203	Valve proving – test time atmospheric
1204	Valve proving – filling time
1205	Valve proving – test time gas pressure

Input for connecting valve proving with its own pressure switch. The input is only active when firing on gas and when valve proving is activated.

Valve proving is only active when firing on gas. It is employed to detect leaking fuel valves and, if necessary, to prevent the fuel valves from opening or ignition from being switched on. A non-volatile lockout will be initiated in these cases. With valve proving, the fuel valve on the burner side is opened first to bring the test space to atmospheric pressure. When the fuel valve has closed, the pressure in the test space must not exceed a certain level. Then, the fuel valve on the mains side is opened to fill the gas space. After closing the fuel valve, the gas pressure must not drop below a certain level. Valve proving can be parameterized to take place either on startup or on startup and shutdown. The type of valve proving is selected via parameter 1201.

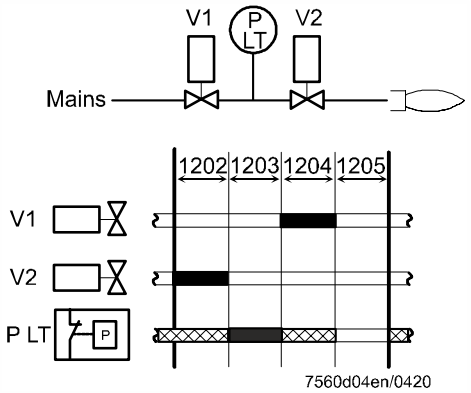


Figure 47: Gas valve proving

Step 1: Test space evacuating (parameter 1202)
With valve proving, the fuel valve on the burner side is opened first to bring the test space to atmospheric pressure.

Step 2: Test time atmospheric pressure (parameter 1203)
After closing the fuel valve, the pressure in the test space must not rise above the switching point of the pressure switch valve proving (e.g., gas pressure during operation x 0.5).

Step 3: Test space filling (parameter 1204)
Fuel valve on the mains side opens to fill the test space.

Step 4: Test time gas pressure (phase 1205)
After closing the fuel valve, the gas pressure in the test space must not fall below the switching point of the pressure switch valve proving (e.g., gas pressure during operation x 0.5).

Key	
1202	Valve proving – evacuation time
1203	Valve proving – test time atmospheric
1204	Valve proving – filling time
1205	Valve proving – test time gas pressure
Vx	Fuel valve
P LT	Pressure switch valve proving
■	Input/output signal 1 (ON)
□	Input/output signal 0 (OFF)
▨	Input permissible signal 1 (ON) or 0 (OFF)

Query logic of pressure switch for valve proving:
Gas pressure present ➔ Pressure switch open
Gas pressure not present ➔ Pressure switch closed

Valve proving is parameterizable:
- During startup in phase 30
- During startup and shutdown

Caution!
The evacuation and filling times as well as the test times at atmospheric pressure or mains pressure must be set by the OEM for each individual plant and in accordance with the requirements of EN 1643.

In particular, it must be ensured that both test times will be set correctly. It must also be checked whether – in the specific application – it is permitted to introduce into the combustion chamber the gas required for testing. The test times are safety-relevant. After a reset, unlock, and in the case of aborted or prevented valve proving, the LMV6 will perform valve proving during the next startup sequence (only when valve proving is activated).

Example of aborted valve proving:
When the safety loop or the gas start prevention input (containing gas pressure switch-min) opens during valve proving

Valve proving - determination of the leakage amount

$$Q_{leak} = \frac{(P_G - P_W) \bullet V \bullet 3600}{P_{atm} \bullet t_{Test}}$$

Key		
Q_{leak}	in l/h	Leakage rate in liters per hour
P_G	in mbar	**Overpressure** between the fuel valves at the beginning of the test phase
P_W	in mbar	Overpressure set on the pressure switch (normally 50% of the gas inlet pressure)
P_{atm}	in mbar	**Absolute air pressure** (1013 mbar normal pressure)
V	in l	Volume between the fuel valves (test volume) including valve volume and pilot path (Gp1) if present
t_{Test}	in s	Test time

Examples:
Refer to chapter 17.3 “Commissioning instructions for the LMV6 / Valve proving / Leak test”.

Error code	Significance for the LMV6
1020	Check the gas supply Recommended measure: Gas pressure switch-min: Check gas supply and setting
1022	Valve proving: Gas side leaking Recommended measure: Check gas side fuel valve
1023	Valve proving: Burner side leaking Recommended measure: Check burner side fuel valve
1024	Pressure switch valve proving: Invalid signal: Recommended measure: Check connector and cabling. Replace LMV6 if error occurs constantly

12.6 Air pressure switch terminal X64

Figure 48: Air pressure switch terminal X64

Parameter	Function
0920	Air pressure fault during prepurging
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.
1130	Maximum time until air pressure OFF in home run

When the input is activated, the air pressure is expected after switching on the fan.
A missing signal leads to a safety shutdown as a minimum.

A restart counter can be parameterized for the input. The restart counter can be used to set the number of errors permitted until lockout occurs.

Error code	Significance for the LMV6
1001	Air pressure OFF Recommended measure: Check pressure setting of air pressure switch and cabling
1002	Air pressure OFF during prepurging Recommended measure: Check pressure setting of air pressure switch and cabling
1003	Air pressure ON Recommended measure: Check pressure setting of air pressure switch and cabling
1004	Start prevention due to air pressure Recommended measure: Check pressure setting of air pressure switch and cabling
1051	Restart counter elapsed: Air pressure in prepurging Recommended measure: Check air flow and settings of air pressure switch

12.7 Burner flange terminal X71

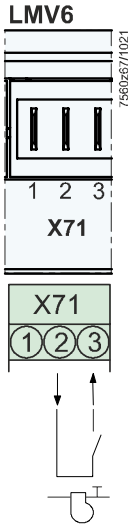


Figure 49: Burner flange terminal X71

Parameters	Function
0925	Safety loop
☞	Note Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only adopted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

Parameter 0925 determines the restarts of the burner flange.

Contact input for the burner flange, which switches off the energy supply to the fuel valves, fan, and ignition.

Error code	Significance for the LMV6
1110	Burner flange open Recommended measure: Check connector and cabling.
3152	Variable speed drive (VSD): Standardization not possible Recommended measure: Close the burner flange

12.8 Load controller terminal X73

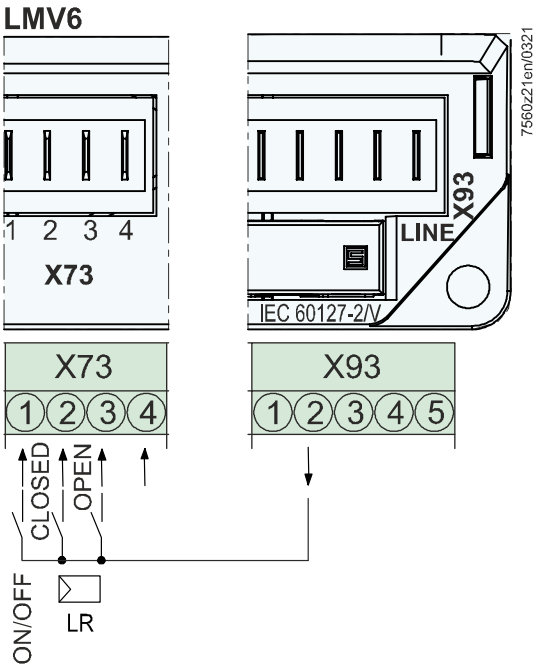


Figure 50: Load controller terminal X73

12.8.1 Inputs for external load controller (ON/OFF) terminal X73 pin 1

When the external control circuit is closed, the internal input message “Heat request” is generated. A heat request exists when the external load controller signal is pending and, depending on the configuration, a load controller calls for heat. When there are no more requests for heat, the burner shuts down. Depending on the parameterization, the fuel valves are closed either immediately when the timer has elapsed or when the low-fire position is reached (refer to *End of operating position* chapter). Power is supplied via terminal X93 pin 2 or terminal X71 pin 2.

Note!
Burner startup can take place only when this input is closed.

12.8.2 Inputs for external load controller (OPEN/CLOSED), modulating operation, terminal X73 pin 2 / pin 3

Inputs for connecting an external load controller with contact outputs (refer to chapter 15.5 “Connecting the load controller”.

12.8.3 Load target via building automation terminal X22

To control the LMV62, a load can be specified by the building automation system via a bus system. The building automation system is connected to the LMV62 via interface X22. The burner can only be started when contact X73 pin 1 is closed (load controller ON/OFF). Further information on the connection of the building automation system to the LMV62 can be found in the *Modbus A7560* user documentation.

12.8.3.1 Behavior in case of building automation failure

If no more data is requested from the building automation system for longer than the time set in parameter 0414, the LMV62 switches to the next low-priority power source (e.g., '3-point step controller' input – lowest priority). The time until a communication interruption is detected can be set via parameter 0414.

Parameters	Function
0414	Timeout

12.8.4 Manual control (manual load requirement)

Main menu → Maintenance → Manual control

Parameters	Function
0370	Manual operation

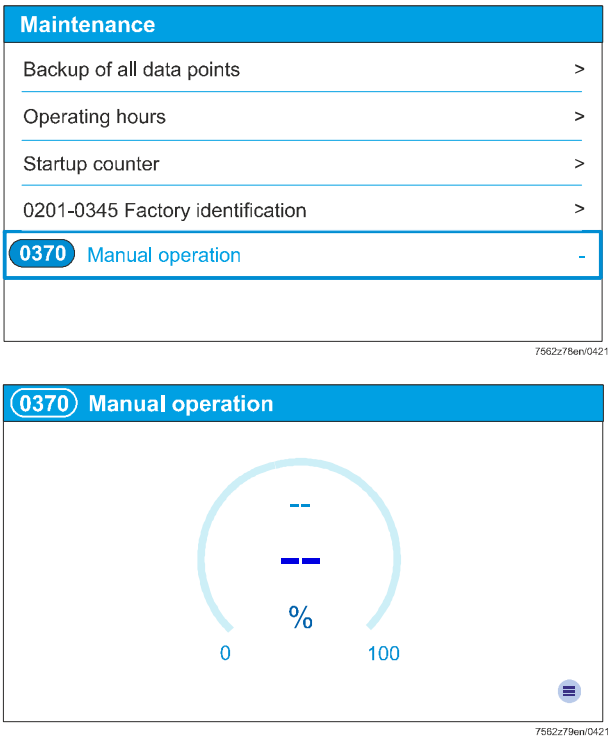


Figure 51: Manual control / manual operation

Parameter 0370 is used to determine whether the burner runs in manual or automatic mode (control mode):

Target load equal to 0:
The LMV6 remains in or goes into standby regardless of whether or not heat is requested from the boiler controller. An error message is not displayed.

Target load between 1 and 100%:
The burner is switched on if the load controller release is present at terminal X73 pin 1.

The burner load can then be set with parameter 0370. If the set load is above the working range, the burner moves to its maximum load. If the set load is below the working range, the burner moves to its minimum load.

Target load equal to ' – – ' (not defined):
This means that the LMV6 is in automatic mode. The burner is started depending on the heat demand of the load controller (terminal X73 pin 1) and modulated according to the status of the inputs terminal X73 pins 2 and 3.

Note
Set load value!
The load can be set from any value (not defined) to ' - - ' using the menu button.

12.8.5 Load with curve setting

A special parameterization load is used for curve setting via the AZL66. In the curve setting, the load target can be manually adjusted numerically by the user from 0.1 to 100%. The system moves to the curve points even if curve points are not defined for all loads. This load target takes precedence over all other load sources. Also refer to chapter 17.4.2 “Curve commissioning”.

12.8.6 External load controller via analog input terminal X32 pin 1–3

An analog input with 0–10 V or 2–10 V respectively or 0–20 mA or 4–20 mA respectively is provided for specifying an external load. The burner can only be started when contact X73 (load controller ON/OFF) is closed.

Note
Use of an isolating transformer!
If the release contact of the variable speed drive is not routed via a SELV connection, an isolating transformer must be used to supply the variable speed drive. Failure to observe this information results in the connection losing its SELV properties.

12.8.6.1 Switching thresholds / minimum positioning step

An interruption at a 4–20 mA setting of the current input or a current signal ≤2 mA leads to deactivation of the analog input’s external load target. To avoid unnecessary travel of the actuators in case of input signal fluctuations, the minimum positioning step of 0.2% load is fixed (not adjustable).

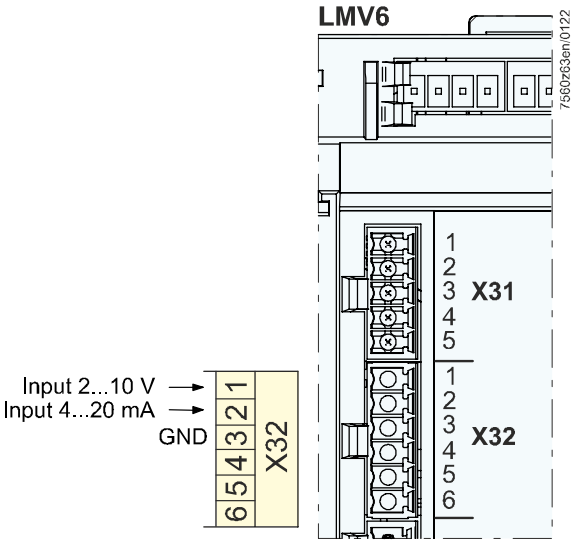


Figure 52: Input 2–10 V / 4–20 mA X32

12.8.7 Load target via current input in modulating operation

Actual value	Current	Display / Load value
Low-fire	4 mA	Depending on the curve setting and the minimum load (parameter 1602), e.g., 20%
High-fire	20 mA	Depending on the curve setting and the maximum load (parameter 1603), e.g., 100%

Parameters	Function
1602	Minimum load
1603	Maximum load

12.8.8 Prioritization of the load controller sources

The load controller source does not need to be selected to simplify the configuration of the LMV62. The LMV62 independently detects which load controller sources are present and automatically selects them. If several sources are connected, they are selected according to the following prioritization:

Priority	Active load controller source
1 (highest)	Load controller terminal X73 If the input is active, the other load controller sources are evaluated according to their priority. If the input is deactivated, the burner is off
2	Load with curve setting
3	Manual control (manual load requirement)
4	Load target via building automation terminal X22
5	Load target via analog input terminal X32 pin 1–3, if this input has been activated via parameter 5115
6 (lowest)	External load controller via contacts X73 pin 2 / pin 3

Note
Load controller source with lowest priority!
If the lowest priority does not provide a valid signal, the LMV62 shuts down and remains in standby.

The active load controller source can be read out via parameter 3498.

Parameters	Function
3498	Active load source
5115	External input X32 • Deactivated • 4...20 mA • 0...20 mA • 2...10 V • 0...10 V

Note
Load controller source with priority 5!
Automatic prioritization to the active load controller source with priority 5 is not possible when the 0–10 V / 0–20 mA analog input is selected.

12.9 Flue gas recirculation (FGR) terminal X73

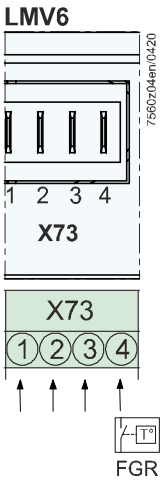


Figure 53: Flue gas recirculation (FGR) terminal X73

Parameter	Function
1701	R: FGR operating mode • Auxiliary actuator 3 / ARF on curve • Trigger activated • Deactivated • Temperature compensated
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
☞	Note! Auxiliary actuator 3 / FGR behavior If flue gas recirculation (FGR) is active, auxiliary actuator 3 / FGR follows the parameterized ratio control curve, taking into consideration the specific parameters for flue gas recirculation (FGR) (e.g., 1702, 1455, 1535). Auxiliary actuator 3 / FGR is always kept in the MIN flue gas recirculation (FGR) position after the ignition position until a certain time or temperature is reached. If flue gas recirculation (FGR) is deactivated, auxiliary actuator 3 / FGR follows the ratio control curve (e.g., 1415, 1450–1461).
1702	Trigger • External contact • Time • Temperature
1703	Time until trigger ON
1704	Temperature until trigger ON
1705	Debouncing time on contact
1740	Auxiliary actuator 3 / FGR: MIN position
1750	Flue gas recirculation (FGR): manual operation • AUTO • OFF • ON

The ‘Flue gas recirculation (FGR)’ operating mode determines in which way and when the auxiliary actuator 3 / FGR is moved to the ratio control curve or to the positions calculated from flue gas temperature and ratio control curve.

Without the trigger conditions being fulfilled, parameter 1740 can be used to position the flue gas recirculation (FGR) damper in a minimally open position in order to preheat the flue gas recirculation (FGR) channel.

The MIN auxiliary actuator 3 / FGR position (parameter 1740) is only approached during operation if there is no trigger (parameter 1702) active.

The behavior of auxiliary actuator 3 / FGR can be manually influenced by parameter 1750.

If manual operation of flue gas recirculation (FGR) (parameter 1750) is set to AUTO, auxiliary actuator 3 / FGR follows the parameterized ratio control curve, taking into consideration the specific parameters for flue gas recirculation (FGR) (e.g., 1702, 1450–1461). If manual operation of flue gas recirculation (FGR) (parameter 1750) is set to ON, auxiliary actuator 3 / FGR immediately follows the parameterized ratio control curve after the ignition position. If manual operation of flue gas recirculation (FGR) (parameter 1750) is set to OFF, auxiliary actuator 3 / FGR is always kept in the flue gas recirculation (FGR) MIN position (parameter 1740) after the ignition position.

The *flue gas recirculation (FGR)* function serves to reduce the NOx values in the flue gas. This is achieved by recirculating a certain proportion of the flue gas to the combustion process, which causes the flame to cool down. The amount of the recirculated flue gas that goes beyond the load range is set using auxiliary actuator 3 / FGR.

Without the trigger conditions being fulfilled, parameter 1740 can be used to position the flue gas recirculation (FGR) damper in a minimally open position in order to preheat the flue gas recirculation (FGR) channel.

The MIN auxiliary actuator 3 / FGR position (parameter 1740) is only approached during operation if there is no trigger (parameter 1702) active.

The behavior of auxiliary actuator 3 / FGR can be manually influenced by parameter 1750.

If manual operation of flue gas recirculation (FGR) (parameter 1750) is set to AUTO, auxiliary actuator 3 / FGR follows the parameterized ratio control curve, taking into consideration the specific parameters for flue gas recirculation (FGR) (e.g., 1702, 1450–1461). If manual operation of flue gas recirculation (FGR) (parameter 1750) is set to ON, auxiliary actuator 3 / FGR immediately follows the parameterized ratio control curve after the ignition position. If manual operation of flue gas recirculation (FGR) (parameter 1750) is set to OFF, auxiliary actuator 3 / FGR is always kept in the flue gas recirculation (FGR) MIN position (parameter 1740) after the ignition position.

Caution!
When making the settings, it is important to remember that, if the flue gas recirculation quantity is too high, the flame may lift off the burner (stability limit of the flame).

Error code	Significance for the LMV6
1016	Auxiliary actuator 3 / ARF: Position error Recommended measure: Check whether auxiliary actuator 3 / FGR is overloaded. Replace actuator if error occurs constantly.
3008	Auxiliary actuator 3 / ARF: No ignition position Recommended measure: Check parameter 1475
3026	Auxiliary actuator 3 / ARF: Main flame - No ignition position Recommended measure: Check parameter 1495
3035	Auxiliary actuator 3 / FGR not compatible with LMV6 Recommended measure: Check type (ASN) and version of the actuator
3115	Auxiliary actuator 3 / FGR: Ratio control curve – Invalid values Recommended measure: Auxiliary actuator 3 / FGR: Check ratio control curve
3160	Undefined temperature value in the curve Recommended measure: Complete the setting of the temperature-compensated flue gas recirculation (ARF)
5011	Auxiliary actuator 3 / ARF: No feedback Recommended measure: Check connector and cabling
5019	Auxiliary actuator 3 / FGR error Recommended measure: Check connector and cabling. Replace actuator if error occurs constantly.
5055	Auxiliary actuator 3 / FGR error Recommended measure: Check parameter 0106 is “ON”. Check addressing, connector, and cabling. Replace actuator if error occurs constantly.

12.9.1 Functional principle of flue gas recirculation (FGR)

Caution!
Flue gas recirculation (FGR) settings!
When making the settings, it is important to remember that, if the flue gas recirculation (FGR) amount is too high, the flame may lift off the burner (stability limit of the flame). The amount of flue gas during the flue gas recirculation (FGR) is determined by parameterizing the curves. The temperature of the flue gas recirculation (FGR) is determined based on the operating mode used.

Note
Condensation in the intake area!
The hot, wet flue gas is mixed with the cold supply air in the intake area. Depending on the flue gas and supply air temperature, condensation is produced by the recirculated flue gas in the burner intake area.

Consequence!
Water escapes from the burner.

Note
Reduction of the maximum burner load!
The maximum burner load can be limited through the use of flue gas recirculation (FGR) or by introducing the recirculation mass via the supply air paths. This results in a reduction in the maximum volume of combustion air that can be supplied. As a result, the fuel supply must be reduced in the high-fire range in order to obtain correct combustion values.

LMV60.110A2 and LMV62.110A2 only have non-temperature-compensated flue gas recirculation (FGR).

LMV62.111A2 also offers temperature-compensated flue gas recirculation (FGR).

The LMV6 supports 2 different flue gas recirculation (FGR) function types:

1. Non-temperature-compensated flue gas recirculation (FGR) (parameter 1701 = activated)
   With these modes of operation, the positions of auxiliary actuator 3 / FGR can only change between *CLOSED* (ignition position) and the positions on the ratio control curves. The time of transition from the ignition position to the position on the ratio control curve depends on either the completion of the parameterized time (parameter 1703*)* or the achievement of the parameterized temperature threshold (parameter 1702*)*. A trigger can also be determined (parameter 1704). Flue gas recirculation (FGR) remains activated even if the temperature falls below the set value (parameter 1704).
2. Temperature-compensated flue gas recirculation (FGR) (parameter 1701*)*.
   With temperature-compensated flue gas recirculation (FGR), the recirculated flue gas volume is also influenced by the flue gas temperature. With this mode of operation, the positions of the auxiliary actuator 3 / FGR can be between the parameterized minimum position (parameter 1740) and the calculated positions. Positions are calculated based on the *operating temperature and associated positions of the ratio control curve* and the *current flue gas temperature* value pairs.

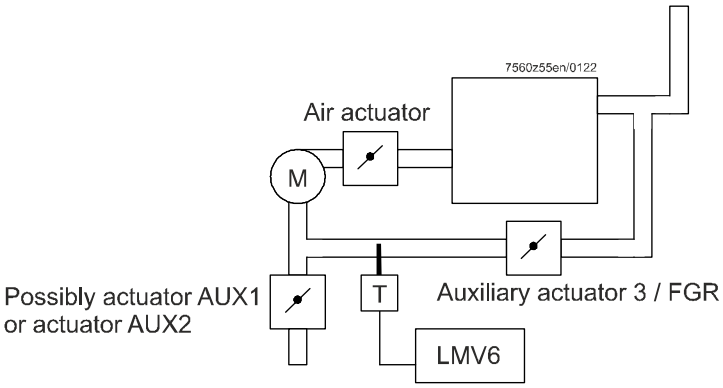


Figure 54: Flue gas recirculation (FGR): Typical application example

Key

M	Fan motor
SA	Actuator
SA-AUX	Auxiliary actuator
ARF	Flue gas recirculation (FGR)

Parameters	**Description**	**Effective with flue gas recirculation**	
		Not temperature-compensated	Temperature compensated
Parameter 1701 → R: FGR operating mode	Selection between 4 operating modes: • Auxiliary actuator 3 / FGR on curve The actuator only follows the curve • Trigger activated Flue gas recirculation (FGR) is activated via the trigger • Deactivated The actuator remains at its parameterized MIN position (parameter 1740) • Temperature-compensated The current flue gas temperature influences the damper position of the auxiliary actuator 3 / FGR	●	●
Parameter 1702 → Trigger	Selection between 3 operating modes: • External contact The connection is made via terminal X73 pin 4 • Time Current time plus the set delay time from parameter 1703 • Temperature Current temperature plus the set temperature from parameter 1704	●	---
Parameter 1703 → Time until trigger ON	The adjustment of the delay time of how long the auxiliary actuator 3 / FGR is held at the ignition position after entering the ‘OPERATION1’ phase	●	---
Parameter 1704 → Temperature until trigger ON	The adjustment of the temperature to be achieved so that auxiliary actuator 3 / FGR moves from the ignition position to the flue gas recirculation (FGR) position.	●	---

Parameters	Description	Effective with flue gas recirculation	
		Not temperature-compensated	Temperature compensated
Parameter 1740 → Auxiliary actuator 3/FGR: MIN position	Lower limit of the auxiliary actuator 3 / FGR position for the 'Temperature compensation activated', 'Automatic', or 'Manual deactivated' operating modes. The setting is made as an absolute value and ensures that a minimum flow through the flue gas recirculation (FGR) is guaranteed. The position is also used to ensure a defined damper position for emergency operation or automatically deactivated flue gas recirculation (FGR).	---	●
Parameter 1761 → Operating mode: Temperature-compensated FGR	**Manually deactivated** The auxiliary actuator 3 / FGR is always held at the minimum position of the flue gas recirculation (FGR) after the ignition position, and the temperature of the flue gas recirculation (FGR) is not evaluated. This allows the LMV6 to be moved to a safe state if the flue gas recirculation (FGR) setting could not be fully made. It is recommended to commission the burner before setting the curve for flue gas recirculation (FGR). **Activated** The position of auxiliary actuator 3 / FGR is determined based on the flue gas temperature and the ratio control curve. It is also possible to hold the auxiliary actuator 3 / FGR at the ignition position until an adjustable time (parameter 1764) is reached. **Automatically deactivated** This setting must not be activated manually. The auxiliary actuator 3 / FGR is always held at the minimum position of the flue gas recirculation (FGR) after the ignition position, and the temperature of the flue gas recirculation (FGR) is not evaluated. This allows the LMV6 to be moved to a safe state if the flue gas recirculation (FGR) setting could not be fully made. It is recommended to commission the burner before setting the curve for flue gas recirculation (FGR). This setting is reached automatically if the 'Activated with auto-deactivation' operating mode has been set for the flue gas recirculation (FGR) and an error (e.g., sensor interruption) has occurred. In the event of an error message, the auxiliary actuator 3 / FGR is moved to the minimum position and a warning message is issued. Service personnel must change parameter 1761 back to 'Activated with auto deactivation'. **Activated with auto-deactivation** The operation mode is the same as for 'Activated'; however, in the event of a flue gas sensor error, the function is automatically deactivated. The auxiliary actuator 3 / FGR is moved to the minimum position of the flue gas recirculation (FGR) and a warning message is issued.	---	●

Parameters	Description	Effective with flue gas recirculation	
		Not temperature-compensated	Temperature compensated
Parameter 1762 → FGR adjustment factor	Adjustment of the calculated temperature-dependent position of the auxiliary actuator 3 / FGR. The setting is made in 1% increments. A value of 100% means no adjustment. A value of <100% reduces the recirculated flue gas amount (closing the flue gas damper). The FGR factor is only effective if the actual value temperature deviates from the setpoint temperature of the flue gas recirculation (FGR). This means that when the originally measured flue gas recirculation (FGR) temperature is reached, the stored position is approached regardless of the flue gas recirculation (FGR) factor (refer to the following example tables 'Damper positions with flue gas recirculation (FGR)').	---	●
Parameter 1763 → FGR factor: Maximum position	Upper limit of the setpoint position for auxiliary actuator 3 / FGR calculated from the actual temperature and the hot position. The setting is made in 1% increments and is based on the relevant curve point. Linear interpolation occurs between the curve points.	---	●

Caution!
Stability limit of the flame!
When setting the flue gas recirculation (FGR), be aware that the flame may lift off the burner if the amount of flue gas recirculation is too high.

Note
Safe handling of the temperature input!
Without taking further measures, the current implementation in the LMV62 is only suitable for applications corresponding to class B according to EN 60730-1:2016. This is because the safe detection of the temperature for the temperature-compensated FGR is only implemented up to terminal X24 of the LMV6. If the temperature is recorded incorrectly, there is a risk that the position of the auxiliary actuator 3 / FGR will be calculated and approached incorrectly and thus the flue gas recirculation rate will be so high that the flame may be lifted off the burner head. With this in mind, it is essential to use a temperature sensor capable of reliably detecting the actual temperature, for example. It is also possible to enable safe operation at any measured temperature by configuring the parameters of the temperature-compensated flue gas recirculation (FGR) (e.g., parameters 1762 and 1763) and/or setting the curves of the electronic ratio control.
If the aforementioned possibilities are not possible or purposeful, any incidences of the flame lifting off the burner head can be detected by, for example, the use of a suitably positioned ionization electrode as a flame detector and therefore suitable measures can be taken in the event of an error to ensure the burner shuts down safely.
Only the OEM or, if necessary, a heating engineer are authorized to assess whether the application enables safe operation in all stations / error cases with the measures taken.

Caution!
Safe use of the temperature sensor for flue gas recirculation (FGR)!
The temperature may drift during flue gas recirculation (FGR) within the limits of 'Detect short circuit' and 'Detect interruption'. If hazards such as unstable combustion conditions arise due to drifting, additional measures must be taken into account – e.g., flame supervision by means of an appropriately mounted flame detector (to reliably detect the flame shift). The temperature sensor must be selected with the appropriate operating data and failure data (e.g., Siemens FGT-Pt1000 Class A). The temperature sensor must be checked annually to ensure proper and safe operation of the temperature sensor.

Note
LMV62.111A2 only
Example tables: 'Damper positions with flue gas recirculation (FGR)'.

Table of setting values:

Load	37.5%	62.5%	75%	100%
Flue gas recirculation (FGR) curve	19.3°	25°	28.5°	37°
Flue gas recirculation (FGR) temperature	72°C	105°C	121°C	150°C

The LMV62.111A2 calculates a zero curve from these setting values:

Example of flue gas recirculation (FGR) positions calculated by LMV62.111A2 at a factor of 100%:

Position of the flue gas recirculation (FGR) when T = 0°C (zero curve)	15.2°	18°	19.7°	23.8°

Example of the flue gas recirculation (FGR) positions calculated from the identical setting values at a factor of 50%:

Position of the flue gas recirculation (FGR) when T = 0°C (zero curve)	7.6°	9°	9.8°	11.9°

This shows that a 50% flue gas recirculation (FGR) factor on the zero curve results in a halving of the damper positions.

Depending on the current flue gas temperature, the LMV62.111A2 linearly interpolates the damper positions between the set values and the zero curve. At flue gas temperatures above the set values, the calculated damper positions become larger than the set values.

12.9.2 Setting with ‘Temperature-compensated’ operating mode (LMV62.11xA2 only)

Recommendation!
Setting up the initial commissioning without the influence of flue gas recirculation (FGR).

This makes it possible to make a ratio control setting, as in the case of a system without flue gas recirculation (FGR).

To do this, set the flue gas recirculation (FGR) mode to ‘Deactivated’ in parameter 1701 and to ‘Activated’ or ‘Activated with auto-deactivation’ in parameter 1761. This means that auxiliary actuator 3 / FGR is always kept in the minimal flue gas recirculation (FGR) position.

The I/O module with variable speed drive must be set to ON in parameter 0110 and the Pt1000 sensor must be set to ‘Activated’ in parameter 3506.

After setting the ratio control curves without flue gas recirculation (FGR), the actual setting can now be made with the active auxiliary actuator 3 / FGR. To do this, set the flue gas recirculation (FGR) mode to ‘Temperature-compensated’ in parameter 1701.

When setting the ratio control curve of the auxiliary actuator 3 / FGR in the ‘Temperature-compensated flue gas recirculation (FGR)’ operating mode (parameter 1701), the current temperature of the flue gas recirculation (FGR) is also displayed.

Parameters	Function
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
☞	Note Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1701	R: FGR operating mode • Auxiliary actuator 3 / FGR on curve • Trigger activated • Deactivated • Temperature-compensated
☞	Note Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
☞	Note Deleting the temperature curve! If parameter 1701 is reset to the ‘Auxiliary actuator 3 / FGR on curve’ setting, the temperature curve or temperature values entered are deleted. The ratio control curve of the auxiliary actuator 3 / FGR is retained.
☞	Note Auxiliary actuator 3 / FGR behavior! If flue gas recirculation (FGR) is active, auxiliary actuator 3 / FGR follows the parameterized ratio control curve, taking into consideration the specific parameters for flue gas recirculation (FGR) (e.g., 1702, 1455, 1535). Auxiliary actuator 3 / FGR is always kept in the MIN flue gas recirculation (FGR) position after the ignition position until a certain time or temperature is reached. If flue gas recirculation (FGR) is deactivated, auxiliary actuator 3 / FGR follows the ratio control curve (e.g., 1415, 1450–1461).
1706	R: Pt1000 / X24 temperature sensor • Deactivated • Pt1000
1761	Flue gas recirculation (ARF): Operating mode - temperature compensated • Manually deactivated • Activated • Automatically deactivated • Activated with auto-deactivation

Please note!
Correct adjustment of the temperature-compensated flue gas recirculation (FGR) can only be performed during operation and with the ‘Followed’ selection in the curve setting mode!
Changing the curve point without the associated flue gas recirculation (FGR) temperature will result in an incorrect pairing of the ‘Flue gas recirculation (FGR) position’ and ‘Flue gas recirculation (FGR) temperature’ values (e.g., in the ‘Not followed’ curve setting mode in operation or standby).

Stability limit of the flame!
When setting the flue gas recirculation (FGR), be aware that the flame may lift off the burner if the amount of flue gas recirculation is too high.

12.10 Reset terminal X92 pin 3

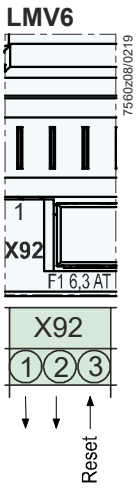


Figure 55: Reset terminal X92 pin 3

Input for connection of a lockout reset button.
The LMV6 can be reset or manually locked via this input (refer to chapter 15.8 *Reset / Manual lockout of the LMV6*).

Caution!
Terminal X92 pin 3!
Only a simple button may be connected to terminal X92 pin 3. Units that can perform an automatic reset are not permitted.

12.11 Safety loop terminal X93

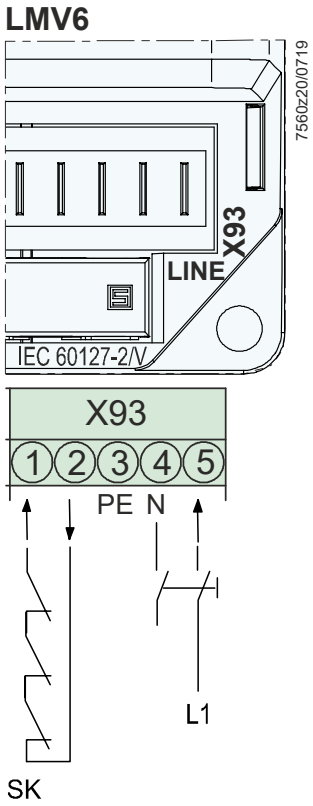


Figure 56: Safety loop terminal X93

Parameter	Function
0925	Safety loop

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

Parameter 0925 determines the restarts for the safety loop.

Input for looping the safety loop. All of the series-connected encoder contacts cut off the power supply to the fuel valves, the fan, and the ignition directly.

The following contacts, for example, are included in the safety loop:
- Safety limiter / safety pressure limiter
- External limit thermostat and/or pressure switch, if required
- Water shortage switch

A missing signal leads to a safety shutdown as a minimum. A restart counter can be parameterized for the input. Here, it is possible to set the number of errors that are permitted until lockout occurs (refer to chapter 15.10.3 *Limitation of restarts, restart counter*).

Caution!
Temporarily switching (< 1 second) contacts (buttons or similar) must not be wired in the safety loop.

Error code	Significance for the LMV6
1033	Start prevention: Safety loop Recommended measure: Check cabling and components in the safety loop
1034	Safety loop open Recommended measure: Check cabling and components in the safety loop
1056	Restart counter elapsed: Start prevention Recommended measure: Check the error history for relevant entries
1057	Restart counter elapsed: Safety loop Recommended measure: Check cabling and components in the safety loop

13 Description of outputs on LMV6

Note!
This chapter covers the basic features of the LMV6 outputs.
For an exact evaluation and activation of the outputs, refer to the program sequences for the respective LMV6 program sequence.

Safety-related outputs, type SI

Using a contact feedback network, these contacts are read back by the microcomputers and checked for their correct positions.

Non-safety-related outputs, type No-SI

These outputs are not supervised by the contact feedback network and, for this reason, can only be used for non-safety-related actuators, or actuators made safe in some other form (e.g., alarm).

13.1 Alarm terminal X46 pin 5

Parameters	Function
6015	Variable speed drive (VSD): Alarm input logic • Alarm when OFF • Alarm when ON

Parameter 6015 can be used to define whether the signal from the variable speed drive is evaluated as being ‘High-active’ or ‘Low-active’. The use of ‘Low-active’ allows an open circuit to be recognized by this signal. The alarm input of the variable speed drive will be connected to the alarm output of the variable speed drive. In the event of an alarm, a safety shutdown is triggered.

Note
Use of an isolating transformer!
If the release contact of the variable speed drive is not routed via a SELV connection, an isolating transformer must be used to supply the variable speed drive. Failure to observe this information results in the connection losing its SELV properties.

Error code	Significance for the LMV6
1080	Alarm from variable speed drive (VSD) Recommended measure: Variable speed drive (VSD): Check the setting of the parameters: ramp times, motor settings

13.1.1 Quick shutdown in the event of large speed deviations during operation

Parameters	Function
6002	Tolerance: Quick shutdown

The quick shutdown is used to trigger a safety shutdown as quickly as possible (approx. 1 second) when large speed deviations are detected or a speed equal to **0** during operation (e.g., when the connection cable of the speed sensor is cut). This speed check is performed during the phases when the fuel valves are open.

The tolerance value of the speed at which the quick shutdown is to take place can be set via parameter 6002.

Speed checking is deactivated when 100% is entered as the tolerance value.

Error code	Significance for the LMV6
1068	Variable speed drive (VSD): Quick shutdown Recommended measure: Variable speed drive (VSD): Check connectors, cabling and speed feedback

13.1.2 Speed feedback terminal X46 pin 6

Parameters	Function
6101	Absolute speed
6025	Determined speed = 100%

A sensor disk with angular offsets of 60°, 120°, and 180° is used for reliable detection of the direction of rotation with a signal source. The sensor disk generates 3 pulse intervals of different lengths.

Warning!
Speed detection!
Speed detection is safety-relevant!

Use of the AGG5.310 accessory kit is recommended. To enable the detected speed to be standardized to the range of 0–100%, the speed that corresponds to 100% must be parameterized (→ 'Speed standardization').

Error code	Significance for the LMV6
1019	Variable speed drive (VSD): Speed error Recommended measure: Check whether the fan motor can follow the specifications of the LMV6

13.1.3 Analog output terminal X47 pin 1 / pin 2

Parameters	Function
6016	Current output; Scaling • 4–20 mA • 0–20 mA • 0/4–20 mA

The analog output is used to deliver the preselected speed setpoint to the variable speed drive.

Note
Maximum cable length of the speed sensor!
The cable length must not exceed 50 meters and must be laid separately from other cables (e.g., power supply cables).

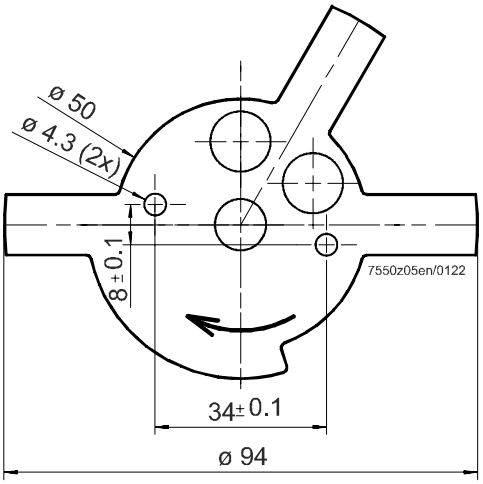
Note
Use of an isolating transformer!
If the release contact of the variable speed drive is not routed via a SELV connection, an isolating transformer must be used to supply the variable speed drive. Failure to observe this information results in the connection losing its SELV properties.

13.1.4 Safe isolation between mains voltage and safety extra-low voltage

Warning!
Inputs/outputs of the variable speed drive!
All inputs and outputs of the variable speed drive are designed for safety extra-low voltage. For this reason, the mains voltage section must be kept strictly separate!

13.1.4.1 Sensor disk

The sensor disk and speed sensor can be ordered as accessory set AGG5.310.



Number of cams:	3
Angular offsets:	60°, 120°, 180°
Accuracy:	±2°

Figure 57: Sensor disk

13.1.4.2 Speed sensor

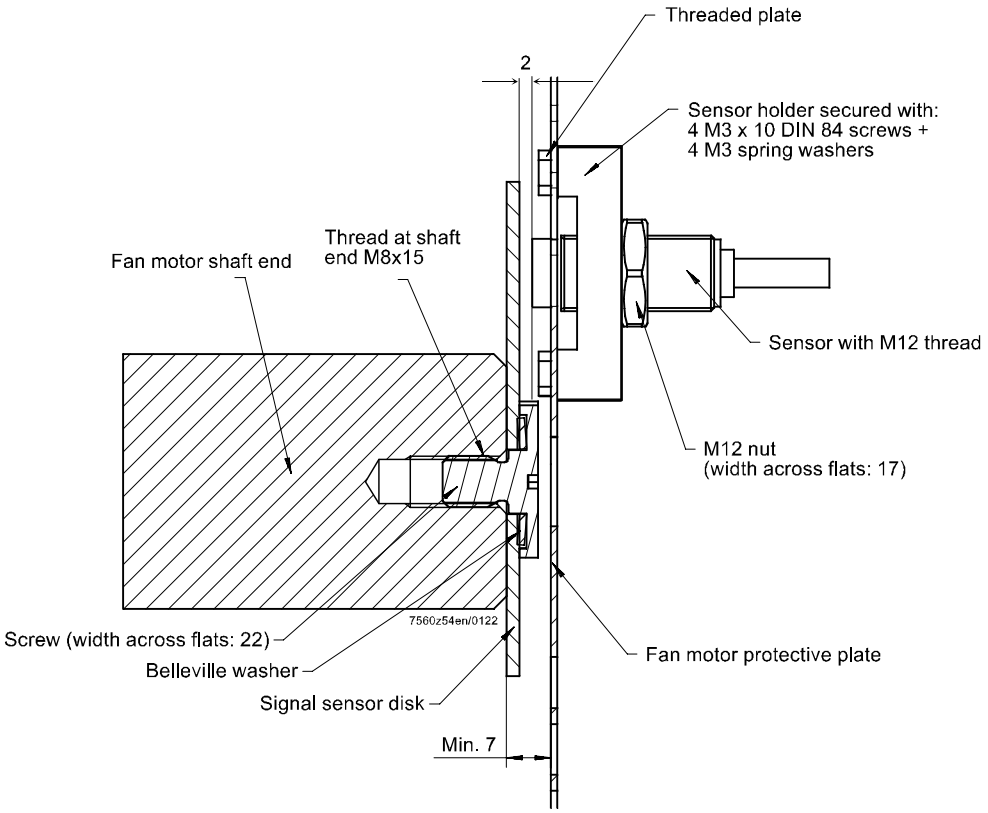


Figure 58: Speed sensor

Note
Structure of the speed sensor!
The assembly must be carried out according to the following mounting instructions:
- German version: 74 319 0322 0 (M7550.4)
- English version: 74 319 0335 0 (M7550.5)

13.1.4.3 Selection of the fan motor

1. **Fan motor supplier:** Variant **with** M8 x 15 threaded hole
2. **Standard motor:** In this variant, the M8 x 15 thread must be cut into the hole by the customer.

13.1.5 Configuration of the variable speed drive

Parameters	Function
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
☞	Note Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1658	Variable speed drive (VSD) • Deactivated • Activated
6050	Ramp time down
6051	Ramp time up

The variable speed drive must be configured according to the type of fan motor connected. The speed standardization is detected automatically. The acceleration ramps or braking ramps are calculated automatically as part of the standardization process. Siemens recommends not changing the automatically recorded values manually, otherwise reliable operation with the variable speed drive is no longer guaranteed.

The fan motor must be able to follow the parameterized ramp of the variable speed drive. If this is not the case, the predefined speeds will not be reached within the respective periods of time. The configuration of the current/voltage interfaces of the variable speed drive must be in accordance with the configuration of the LMV62.

The minimum output frequency of the variable speed drive must be set to 0 Hz. To ensure that the fan motor will reach the required speed under all operating conditions, the variable speed drive will be controlled with a maximum of only 95% of the positioning signal during configuration. If the burner's rated capacity calls for full fan speed, the maximum output frequency must be set to 105.2% of the mains frequency.

It is recommended to disable the internal control of the variable speed drive (such as slippage/load compensation), as these may interfere with the speed control in the LMV62.

Error code	Significance for the LMV6
3013	Variable speed drive (VSD) Recommended measures: Variable speed drive (VSD): Check the connector, cabling and installation of the speed sensor

13.1.6 Speed standardization

Parameters	Function
6020	Standardization activated • ON • OFF
6021	Standardization status
6022	Absolute speed
6025	Determined speed = 100%

Note
Prerequisite for speed standardization!

- The speed should be standardized in standby mode
- Speed standardization is only carried out when parameter 6020 is set to ON
- For speed standardization to start, both the safety loop and the burner flange contact must be closed
- All actuators are moved to the prepurge position during the standardization process
- Parameter 6021 provides information about the speed standardization status

All actuators are first moved to the prepurge position when speed standardization is activated. The prepurge position of the air actuator or actuators determining the amount of air should be set so that the damper is fully open.

In the second step, the variable speed drive is controlled at 95%. This accounts for a reserve of 5%, enabling the variable speed drive to safely reach the 100% speed in operations where environmental conditions may change. Once the fan motor speed has stabilized, that current speed will then be standardized. This means that this speed that speed will correspond to 100% in the future (parameter 6025). This current speed can be read using parameter 6022.

Speed standardization should not be parameterized manually.

Note
Rated load of the burner!
The fan motor is controlled with a maximum of 47.5 Hz. If the rated load of the burner is not reached by following the above steps, the following procedure can be adopted:

- Set the maximum frequency to 105.2% of the fan motor's rated speed.
  In the case of a fan motor frequency of 50 Hz, this means:
  Parameterize the maximum frequency of the variable speed drive to 50 Hz x 1.052 = 52.6 Hz (set on the variable speed drive)
- Then carry out the speed standardization process

There is no risk of overloading the fan motor since only 95% of the maximum control signal is delivered during the standardization process and, later in operation, the actual speed is controlled and supervised.

Warning!
Automatic speed standardization!
If automatic speed standardization is activated, or if the standardized speed is changed, the burner must be readjusted and the combustion values must be checked respectively! Any change to the standardized speed changes the assignment between the parameterized percentages on the curves and the speed.

Error code	Significance for the LMV6
3150	Variable speed drive (VSD): Standardization not possible Recommended measure: Bring the system into standby
3152	Variable speed drive (VSD): Standardization not possible Recommended measure: Close the burner flange
3154	Variable speed drive (VSD): Standardization not possible Recommended measure: Activate the variable speed drive (FI) in parameter 1658

Note

Use of an isolating transformer!

If the current input/output, alarm output, and release contact of the variable speed drive is not routed via a SELV connection, an isolating transformer must be used to supply the variable speed drive. Failure to observe this information results in the connection losing its SELV properties.

13.2 Fan motor contactor, terminal X72

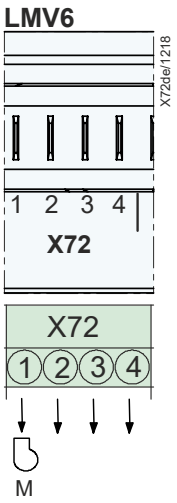


Figure 59: Fan motor contactor terminal X72

Parameter	Function
1102	Fan run-up time

Output for connection of a fan motor. In accordance with the sequence diagrams, the fan is on in phase 20.

The signal from the air pressure switch is expected when the prepurge positions are reached at the latest. Otherwise, a safety shutdown occurs.

The fan run-up time is the time required for the fan to start up before the actuators are driven to the prepurge position. The air pressure must then be detected after the maximum time until the air pressure is available.

13.3 Operating light terminal X72

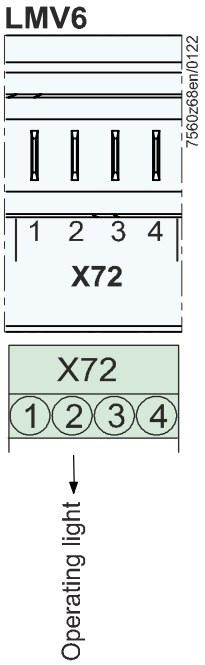


Figure 60: Operating light terminal X72

Output for connection of an operating light. The output is activated in phase 54 (low-fire position) when switched on and deactivated in phase 62 (low-fire position) when switched off.

13.3.1 Ignition transformer, type SI, terminal X82

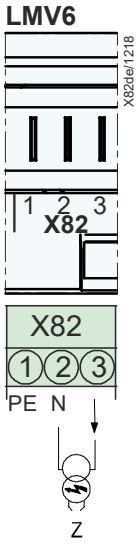


Figure 61: Ignition transformer terminal X82

Parameter	Function
1107	Preignition time

Output for the connection of ignition transformers or electronic ignition modules. When firing on gas, the ignition is switched on just prior to the first safety time. The preignition time can be parameterized.

Error code	Significance for the LMV6
5070	Internal error: Ignition relay supervision Recommended measure: Check signals and wiring of terminal X82. Replace LMV6 if error occurs constantly.
	**Warning!** **Internal error!** **In the event of internal errors, a safety check must be carried out following a reset.** **Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.**

13.4 Pilot valve PV, type SI, terminal X83

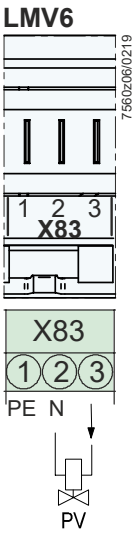


Figure 62: Pilot valve PV terminal X83

Output for connecting the pilot valve PV (refer to chapter *Program sequences*).

Error code	Significance for the LMV6
5069	Internal error: PV relay supervision Recommended measure: Check signals and wiring of terminal X83. Replace LMV6 if error occurs constantly.
	**Warning!** **Internal error!** **In the event of internal errors, a safety check must be carried out following a reset.** **Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.**

13.5 Fuel valve V2, terminal X84

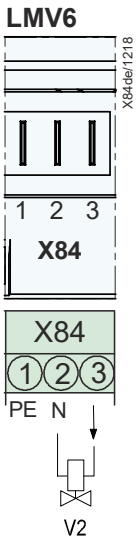


Figure 63: Fuel valve V2 terminal X84

Output for connecting the burner-side fuel valve V2 (refer to chapter *Program sequences*).

Error code	Significance for the LMV6
5072	Internal error: V2 relay supervision Recommended measure: Check signals and wiring of terminal X72 pin 3. Replace LMV6 if error occurs constantly.
	**Warning!** **Internal error!** **In the event of internal errors, a safety check must be carried out following a reset.** **Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.**

13.6 Fuel valve V1, type SI, terminal X91

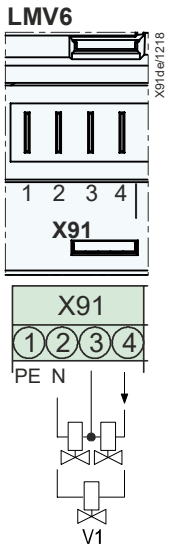


Figure 64: Fuel valve V1 terminal X91

Output for connecting the gas-side fuel valve V1 (refer to chapter *Program sequences*).

Error code	Significance for the LMV6
5071	Internal error: V1 relay supervision Recommended measure: Check signals and wiring of terminal X72 pin 4. Replace LMV6 if error occurs constantly.
	**Warning!** **Internal error!** **In the event of internal errors, a safety check must be carried out following a reset.** **Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.**

13.7 Terminal X92 pin 1

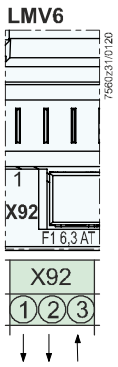


Figure 65: Terminal X92 pin 1

No function.

Caution!
Terminal X92 pin 1!
Make sure that the voltage output on terminal X92 pin 1 is not connected to live parts. The terminal must not be connected. Failure to observe this information poses a risk of the safety functions being impaired.

13.8 Alarm, type No-SI terminal X92 pin 2

Figure 66: Alarm terminal X92 pin 2

Parameter	Function
1135	Time until alarm in standby
1151	Alarm in case of start prevention • OFF • ON

Output for connection of an alarm lamp or horn. The output is activated when the LMV6 is in the lockout position (phase 00).

If the start prevention is longer than the *Time until alarm in standby* request (parameter 1135), the start prevention can be signaled at the alarm output (parameter 1151) (optional).

14 Description of the inputs and outputs for the variable speed drive (VSD) terminal X46

Note
Only for LMV62.

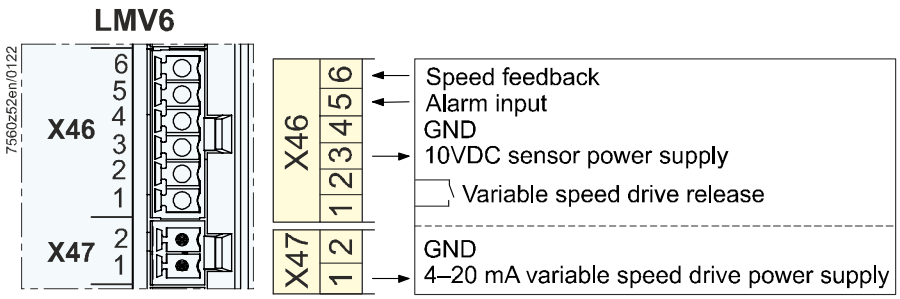


Figure 67: Variable speed drive (VSD) terminal X46

The LMV6 can control a variable speed drive (VSD) with safety-related supervision of the fan speed.

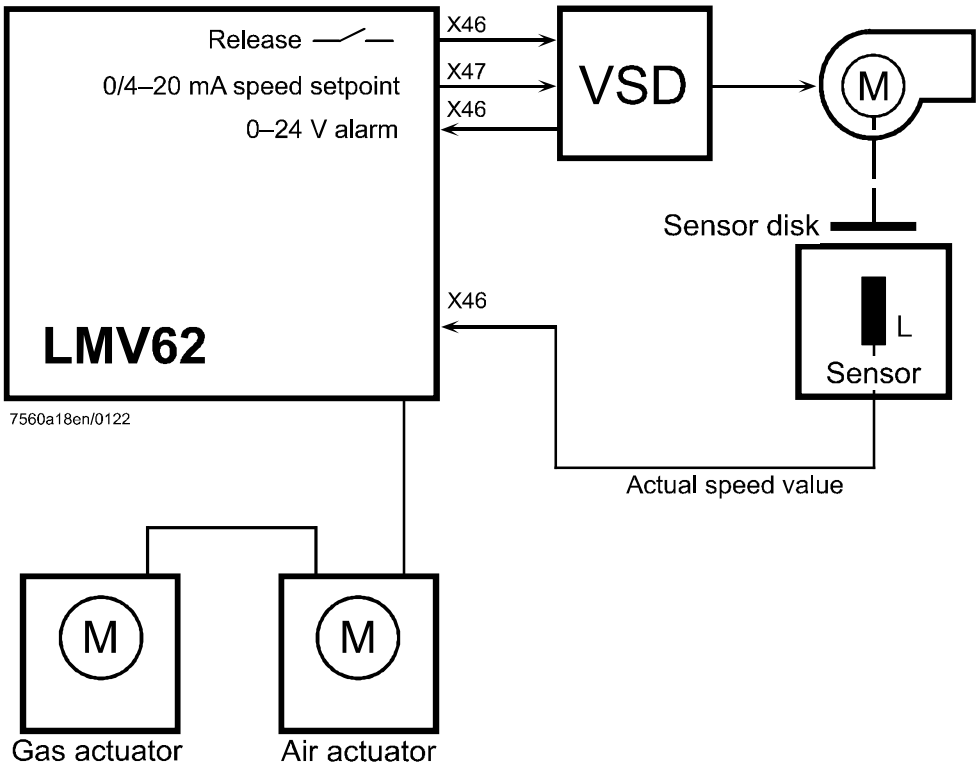


Figure 68: Connection of a variable speed drive (VSD)

Key

FU	Variable speed drive (VSD)
M	Fan motor
SA	Actuator

Parameters	Function
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1658	Variable speed drive (VSD) • Deactivated • Activated

The option is also available to select the connection of a variable speed drive on the LMV6 in addition to the actuators. This requires the internal PCB (I/O module) in the LMV6 with variable speed drive to be activated first via parameter 0110 and then configured again via parameter 1658.

Error code	Significance for the LMV6
3013	Variable speed drive (VSD): Speed error Recommended measure: Variable speed drive (VSD): Check connector, cabling and installation of the speed sensor

14.1 General

The variable speed drive is controlled via an analog current output and a potential-free release contact. The alarm feedback from the variable speed drive is evaluated with a 0–24 V input. Once activated, the LMV6 enters the safety phase. Both the speed and direction of rotation are detected by an inductive signal source. In addition, the asymmetric speed signal is checked for direction of rotation and plausibility.

The variable speed drive generates acceleration/deceleration ramps in accordance with the parameterization of the LMV6. The motor speed is adjusted based on the same principle as that used for actuator adjustments. For this reason, the characteristic of the variable speed drive must be linear.

☞ Note
Avoid additional delays!
To avoid additional delays between the control signal and the feedback from the variable speed drive, no filtering elements, delay elements, or attenuators may be used.

The variable speed drive controls the motor speed to the setpoint. If the display in the AZL66 remains active for an extended period, the LMV6 shuts down with the message *Special position not reached* or *Speed not reached*. Speed control is only active for speeds of ≥8%. The speed is only supervised at speeds above 10%.

14.2 Release contact terminal X46 pin 1 / pin 2

The variable speed drive has a potential-free release contact. This release contact will always be activated whenever a speed other than **0** is required.

Note
Use of an isolating transformer!
If the release contact of the variable speed drive is not routed via a SELV connection, an isolating transformer must be used to supply the variable speed drive. Failure to observe this information results in the connection losing its SELV properties.

15 Functions of the LMV6

15.1 Overview of fuel trains

15.1.1 Gas direct ignition (G)

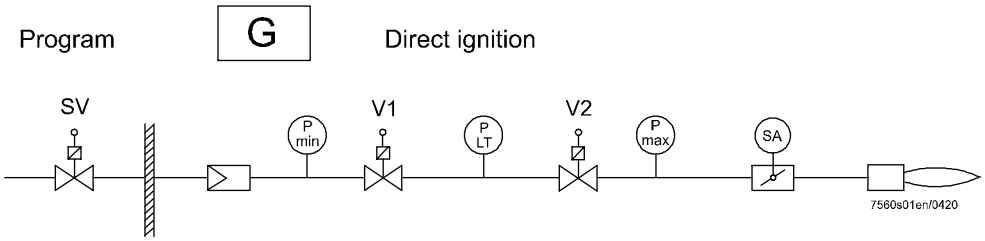


Figure 69: Fuel train gas direct ignition (G)

Parameter	Function
1145	R: Fuel train • No fuel train • Gas direct ignition • Gas pilot ignition 1 • Gas pilot ignition 2

Note!
Changing the parameter settings!
If the parameter setting is changed, a manual reset is required.

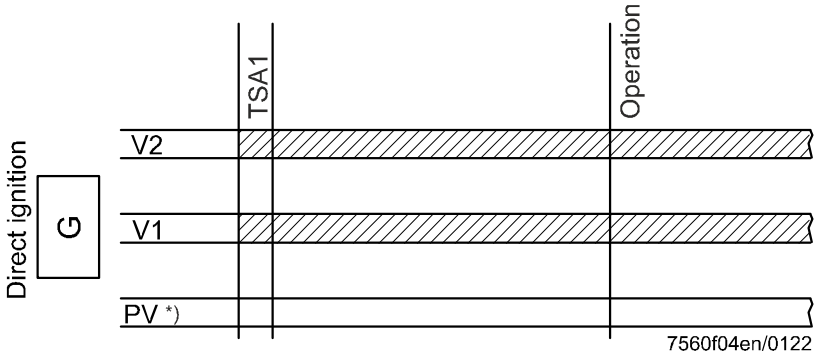


Figure 70: Fuel train with fuel valve control

Key

G	Gas direct ignition
P LT	Pressure switch valve proving
Pmin	Gas pressure switch-min
Pmax	Gas pressure switch-max
PV	Pilot valve
SA	Actuator
SV	Shutoff valve (outside the building)
Vx	Fuel valve

15.1.2 Gas pilot ignition (Gp1)

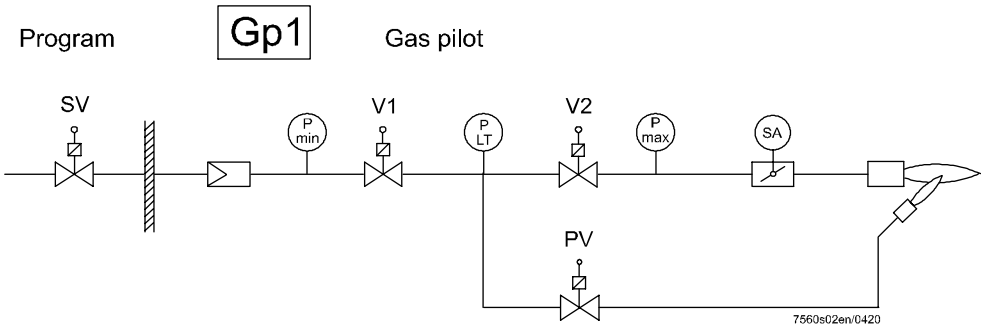


Figure 71: Fuel train gas pilot ignition (Gp1)

Parameter	Function
1145	R: Fuel train • No fuel train • Gas direct ignition • Gas pilot ignition 1 • Gas pilot ignition 2
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

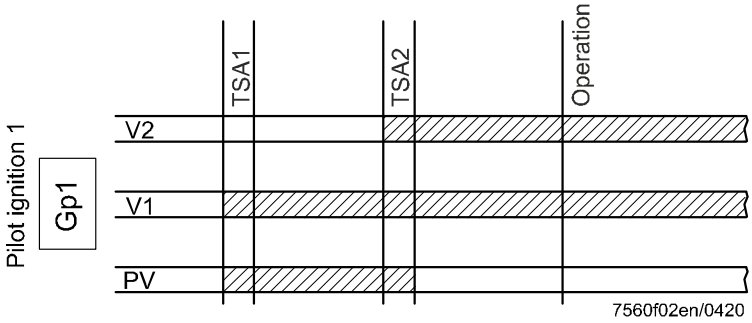


Figure 72: Fuel train with fuel valve control

Key

Gp1	Gas pilot ignition
P LT	Pressure switch valve proving
Pmin	Gas pressure switch-min
Pmax	Gas pressure switch-max
PV	Pilot valve
SA	Actuator
SV	Shutoff valve (outside the building)
Vx	Fuel valve

15.1.3 Gas pilot ignition (Gp2)

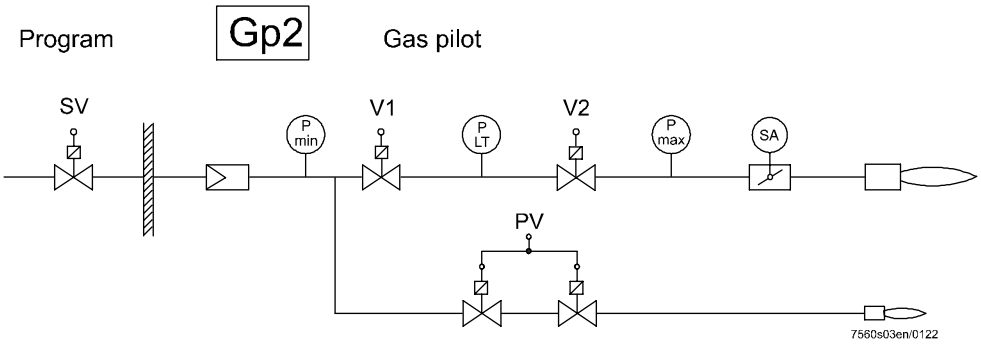


Figure 73: Fuel train gas pilot ignition (Gp2)

Parameters	Function
1145	R: Fuel train • No fuel train • Gas direct ignition • Gas pilot ignition 1 • Gas pilot ignition 2

Note
Changing the parameter settings!
If the parameter setting is changed, a manual reset is required.

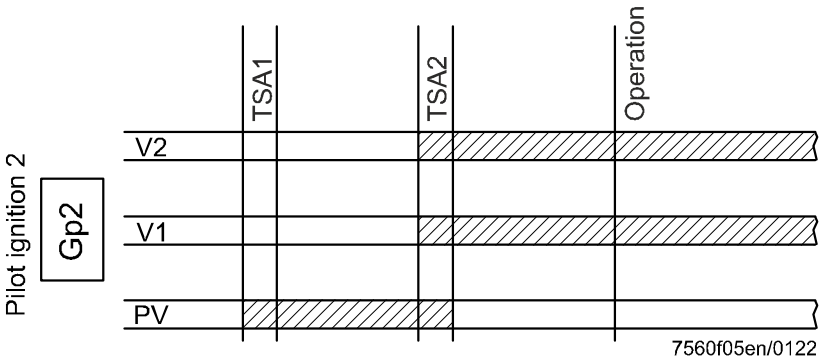


Figure 74: Fuel train with fuel valve control

Key

Gp2	Gas pilot ignition
P LT	Pressure switch valve proving
Pmin	Gas pressure switch-min
Pmax	Gas pressure switch-max
PV	Pilot valve
SA	Actuator
SV	Shutoff valve (outside the building)
Vx	Fuel valve

15.2 LMV60 / LMV62 program sequences

15.2.1 For fuel trains G with valve proving and flue gas recirculation (FGR)

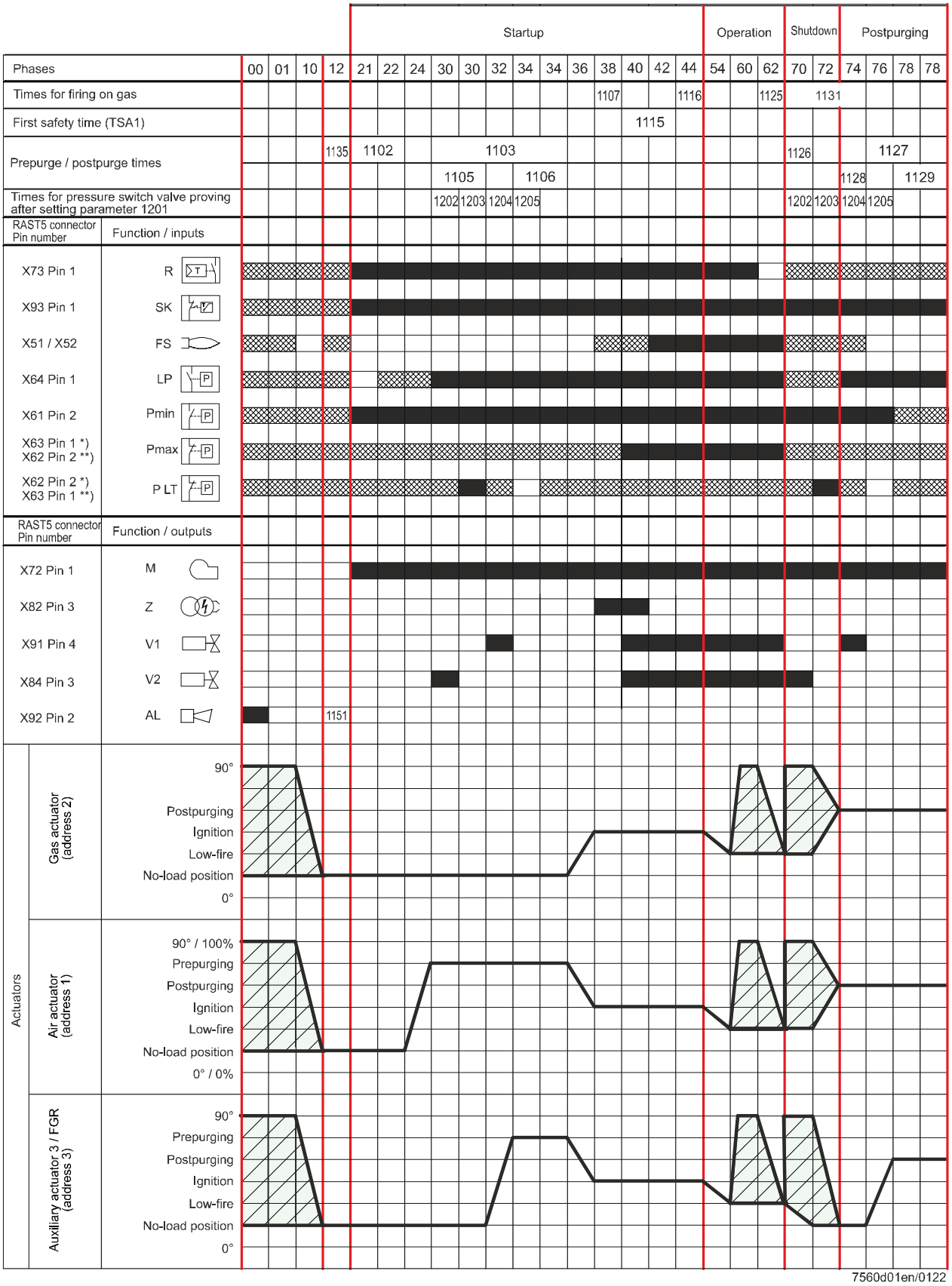


Figure 75: Program sequence for fuel trains G with valve proving and flue gas recirculation (FGR)

Key

AL	Alarm or horn
FGR	Flue gas recirculation
FS	Flame signal
LP	Air pressure switch (fan)
M	Fan motor
Pmin	Gas pressure switch-min
Pmax	Gas pressure switch-max
P LT	Valve proving pressure switch
R	Load controller
SK	Safety loop
TSA1	First safety time
TSA2	Second safety time
V1	Fuel valve 1
V2	Fuel valve 2
Z	Ignition

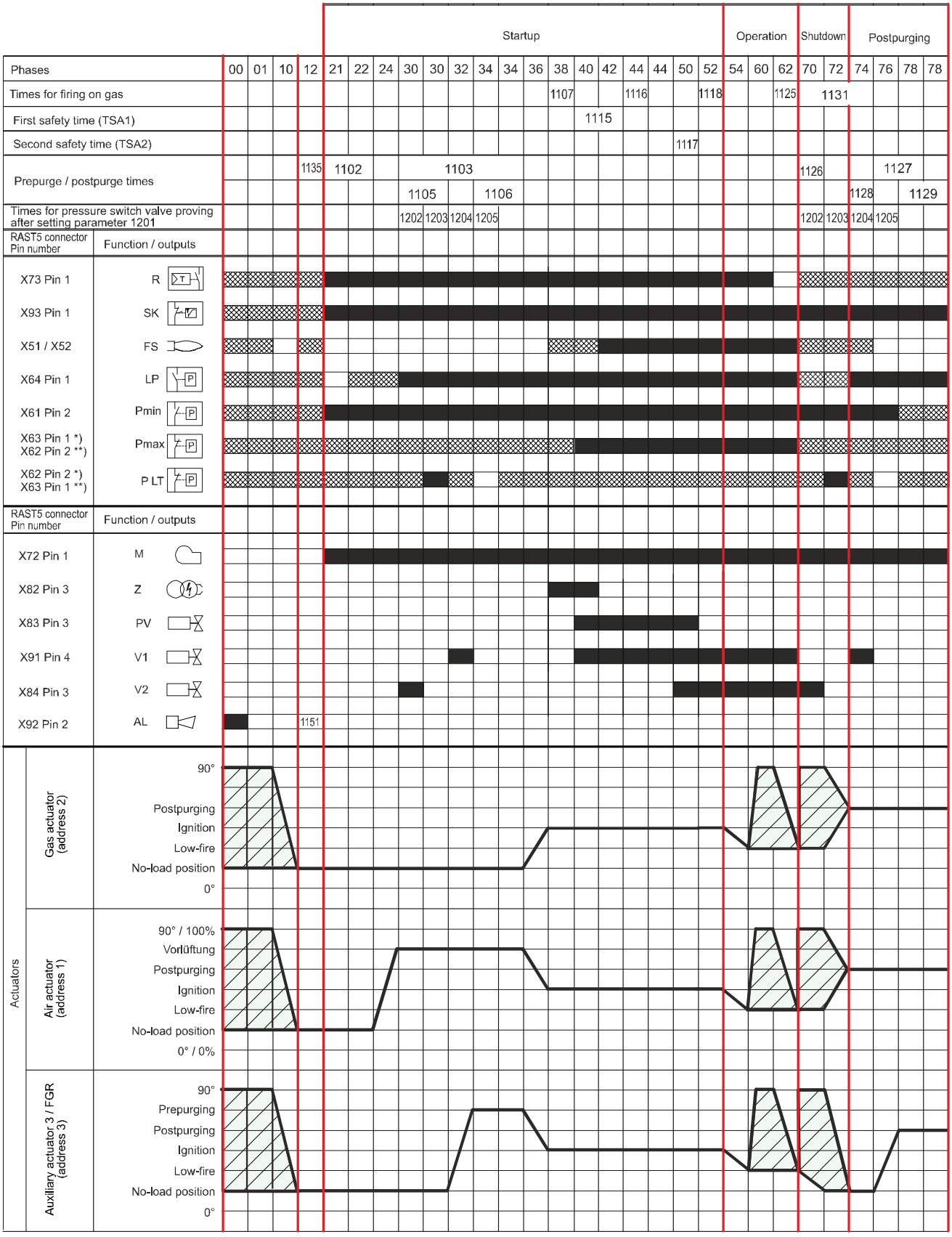
*)	Up to firmware version V1.0
**)	From firmware version V1.1 onward

Input/output signal 1 (ON)

Input/output signal 0 (OFF)

Input permissible signal 1 (ON) or 0 (OFF)

15.2.2 For fuel trains Gp1 with valve proving and flue gas recirculation (FGR)



7560d03en/0122

Figure 76: Program sequence for fuel trains Gp1 with valve proving and flue gas recirculation (FGR)

Key

AL	Alarm or horn
FGR	Flue gas recirculation
FS	Flame signal
LP	Air pressure switch (fan)
M	Fan motor
Pmin	Gas pressure switch-min
Pmax	Gas pressure switch-max
P LT	Valve proving pressure switch
R	Load controller
SK	Safety loop
TSA1	First safety time
TSA2	Second safety time
V1	Fuel valve 1
V2	Fuel valve 2
Z	Ignition

*)	Up to firmware version V1.0
**)	From firmware version V1.1 onward

Input/output signal 1 (ON)

Input/output signal 0 (OFF)

Input permissible signal 1 (ON) or 0 (OFF)

15.2.1 For fuel trains Gp2 with valve proving and flue gas recirculation (FGR)

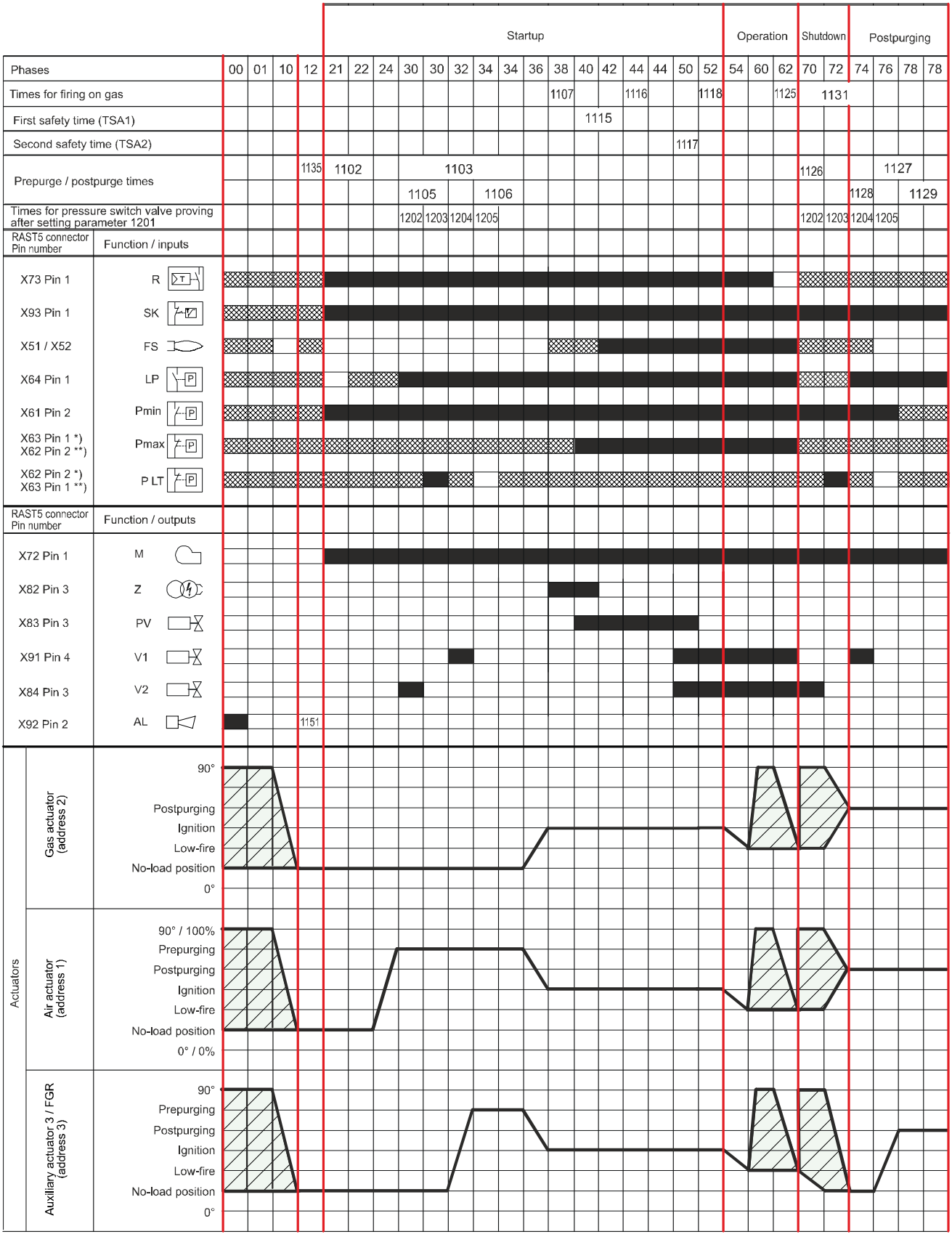


Figure 77: Program sequence for fuel trains Gp2 with valve proving and flue gas recirculation (FGR)

Key

AL	Alarm or horn
ARF	Flue gas recirculation (FGR)
FS	Flame signal
LP	Air pressure switch (fan)
M	Fan motor
Pmin	Gas pressure switch-min
Pmax	Gas pressure switch-max
P LT	Pressure switch valve proving
R	Load controller
SK	Safety loop
TSA1	First safety time
TSA2	Second safety time
V1	Fuel valve 1
V2	Fuel valve 2
Z	Ignition

*)	Up to firmware version V1.0
**)	From firmware version V1.1 onward

Input/output signal 1 (ON)

Input/output signal 0 (OFF)

Input permissible signal 1 (ON) or 0 (OFF)

15.3 List of phase display

The LMV6 LED lights up green when the unit is live.

Display of phase numbers in the AZL66	Function
Fault	
Phase 00	Lockout phase
Phase 01	Safety phase
Standby	
Phase 10	Home run
Phase 12	Standby (stationary)
Startup	
Phase 21	Shutoff valve ON (start release)
Phase 22	Fan motor ON
Phase 24	Prepurge position
Phase 30	Prepurge time
Phase 32	Prepurge position (flue gas recirculation (FGR))
Phase 34	Prepurge time (flue gas recirculation (FGR))
Phase 36	Ignition position
Phase 38	Preignition ON
Phase 40	Fuel valve ON
Phase 42	Ignition OFF
Phase 44	Interval 1
Operation	
Phase 50	Second safety time
Phase 52	Interval 2
Phase 54	Low-fire position
Phase 60	Operation 1 (stationary)
Phase 62	Operation 2 (low-fire position)
Shutdown	
Phase 70	Afterburn time
Phase 74	Postpurge time
Phase 76	Postpurge position (flue gas recirculation (FGR))
Phase 78	Postpurge time (flue gas recirculation (FGR))

Display of phase numbers in the AZL66	Function
Valve proving	
Phase 80	Valve proving – evacuation time
Phase 81	Valve proving – test time atmospheric pressure
Phase 82	Valve proving – filling time
Phase 84	Valve proving – test time gas pressure

15.3.1 Phase display in the AZL66

The LMV6 phase display appears after activating the AZL66 display on the tile shown.

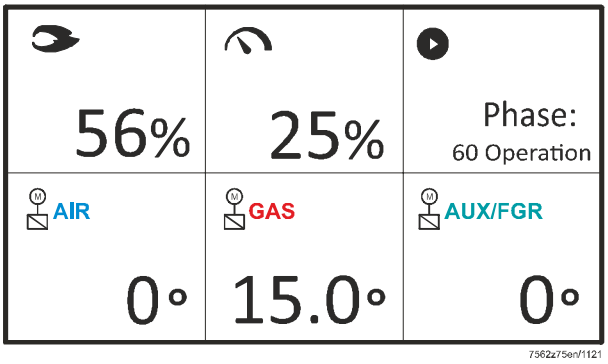


Figure 78: Phase display in the AZL66

15.4 Time table

Parameter for times	Setting	Remark
1102	Fan run-up time	Time period in which the fan can accelerate to the nominal speed. Time runs out before the actuators are moved to the prepurge position.
1103	Prepurge time	Time period between reaching and leaving the prepurge positions.
1105	Prepurging without *Flue gas recirculation (FGR*	This prepurge time is only active in *Flue gas recirculation (FGR)* operating mode (parameter 1701). Auxiliary actuator 3 / FGR is closed.
1106	Prepurge time with *Flue gas recirculation (FGR*	This prepurge time is only active in *Flue gas recirculation (FGR)* operating mode (parameter 1701). Auxiliary actuator 3 / FGR is open.
1107	Preignition time	Time period between activating the ignition and opening the gas valves
1115	Safety time 1 (TSA1)	Time period between switching the pilot gas valve or main gas valve on and off if no flame is detected
1116	Interval 1	Operation with pilot ignition: Interval between the end of the first safety time (TSA1) and the start of the second safety time (TSA2) Operation without pilot ignition: Interval between the end of the first safety time (TSA1) and before phase 54
1117	Safety time 2 (TSA2)	Only effective for operation with pilot ignition: Time period between switching the main gas valves on and off if no flame is detected (in accordance with EN 676)
1118	Interval 2	Interval between the end of the second safety time (TSA2) and before phase 54. Only effective for operation with pilot ignition
1125	Maximum time to low-fire in operation	To prevent the boiler from shutting down when operating at high load, the electronic ratio control will first change to low-fire when the load controller is shut down. Parameter 1125 defines the maximum time for traveling to low-fire position before closing the fuel valves.
1127	Postpurge time	Time period between reaching and leaving the postpurge positions.
1128	Postpurge time without *Flue gas recirculation (FGR*	This postpurge time is only active in *Flue gas recirculation (FGR)* operating mode (parameter 1701). Auxiliary actuator 3 / FGR is closed.
1129	Postpurge time with *Flue gas recirculation (FGR*	This postpurge time is only active in *Flue gas recirculation (FGR)* operating mode (parameter 1701). Auxiliary actuator 3 / FGR is open for ventilating the flue gas recirculation (FGR) channel.
1130	Maximum time until air pressure OFF in home run	Time period between switching off the fan and actively supervising the air pressure switch for OFF
1131	Maximum time until flame OFF	Time period after closing the gas valves which allows afterburning/annealing in the combustion chamber
1135	Time until alarm in standby	Time period after a start prevention until the alarm relay is switched on. This also requires parameter 1151 (alarm in case of start prevention) to be activated.
1136	Time until display message in standby	Time period after a start prevention until a message appears on the display.

Parameter for times	Setting	Remark
1137	Pressure switch: Tolerance time	Time period during which the gas pressure switches are not evaluated when switching the fuel valves.
1202	Valve proving – evacuation time	Fuel valve on the burner side is opened to bring the test space to atmospheric pressure.
1203	Valve proving – test time atmospheric	When the fuel valve has closed, the gas pressure in the test space must not exceed a certain level.
1204	Valve proving – filling time	Fuel valve on the mains side opens to fill the test space.
1205	Valve proving – test time gas pressure	When the fuel valve has closed, the gas pressure in the test space must not drop below a certain level.
1670	Running speed outside the operation	Fastest possible time outside operation for actuators to travel from 0° to 90°
1672	Running speed in operation	Fastest possible modulation time during operation, from 0% to 100% load
1703	Time until trigger ON	Time period until the *Flue gas recirculation (FGR)* function is activated after entering operation
1705	Debouncing time on contact	Time period until the contact closes again after opening the contact for flue gas recirculation (FGR)

Note!
Adjustable times!
The adjustable times (e.g., prepurge time and postpurge time) may deviate from the set value by +/-5% in accordance with DIN EN 298. This does not apply to safety times during operation (maximum 1 second).

15.5 Connecting the load controller

The LMV62 can be connected to different load controllers. The heat request and the required burner load are determined in accordance with the priorities of the different sources.

15.5.1.1 Load controller contact ON terminal X73 pin 1

This contact has priority over all load controller sources. A heat request can be made only when this contact is closed. The contact is safety-related and can also be used in connection with load controllers featuring an integrated temperature limiter function.

15.5.1.2 External load controller via contacts X73 pin 2 / pin 3

The heat request is carried out via pin 1. Modulation of the burner load is carried out via pin 2 and pin 3. Modulating operation terminal X73 (CLOSED pin 2 / OPEN pin 3). If the OPEN input is active, the burner load will be increased. If the CLOSED input is active, the burner load will be decreased. If neither of the two inputs is active, or if both inputs are active at the same time, the burner load remains constant. The ramp-up time is 30 seconds as standard for a load change from low-fire to high-fire or vice versa.

15.6 Controlled intermittent operation

Parameter	Function
1146	Forced intermittent • OFF • ON

Regardless of whether the LMV6 is used for continuous operation or intermittent operation (e.g., when connecting a QRA2), controlled intermittent operation can also be activated, which means automatic controlled shutdown with subsequent restart (< 24 hours). As a general rule, it is recommended to activate controlled intermittent operation or else leave it activated.

15.7 Control program in the event of fault

If a non-volatile lockout occurs, the outputs for the fuel valves, the burner motor and the ignition equipment are always deactivated.

Selection of key application errors:	
Cause	**Response**
Mains voltage failure	Restart
Voltage below undervoltage threshold	Safety shutdown
Voltage above undervoltage threshold	Reset and restart
Extraneous light before safety time	Non-volatile lockout
Extraneous light during standby	Start prevention
No flame at end of safety time	Depending on the respective parameterization: • Non-volatile lockout • Restart
Loss of flame during operation	Depending on the respective parameterization: • Non-volatile lockout • Restart
Air pressure switch has welded in working position	In operation: Lockout after home run In standby: Start prevention (permanently until the signal is OK again)
Air pressure switch has welded in no-load position	Non-volatile lockout
Gas pressure switch-min: Failure during operation	Depending on the respective parameterization: • Shutdown and start prevention • A safety shutdown takes place in the event of gas pressure switch-min OFF

In the event of a non-volatile lockout, the LMV6 remains locked and the AZL66 display lights up red permanently. This state is also maintained in the event of mains voltage interruptions. The cause of the fault is output on the AZL66.

15.8 Reset / Manual lockout of the LMV6

15.8.1 Reset

After a non-volatile lockout, a reset can be carried out immediately. It is only possible to reset the LMV6 if the LMV6 is connected to phase.

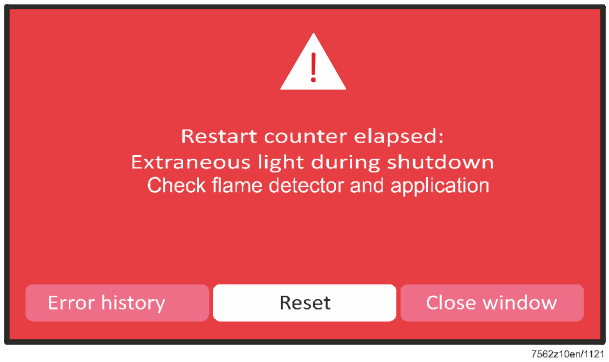


Figure 79: “LMV6 in lockout position” error screen

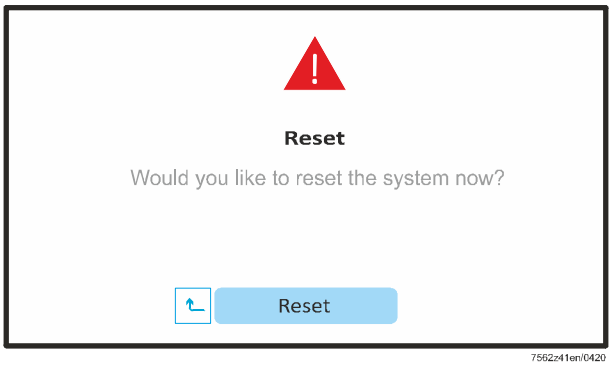


Figure 80: Safety query: “Do you really want to reset the LMV6?”

The following actions are performed during a reset:

- The alarm relay and the fault display will be switched off
- The lockout position will be canceled
- The LMV6 will perform a reset and then change to standby

There are 2 reset options available:

1. Via the AZL66
2. Via the external switching contact (> 1 to 3 s)

Warning!
Internal error!
In the event of internal errors, a safety check must be carried out following a reset.
Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.

15.8.2 Manual lockout

The LMV6 can be locked manually. This requires both the “Menu ☰” and “Return ⮌” buttons to be pushed simultaneously on the AZL66.

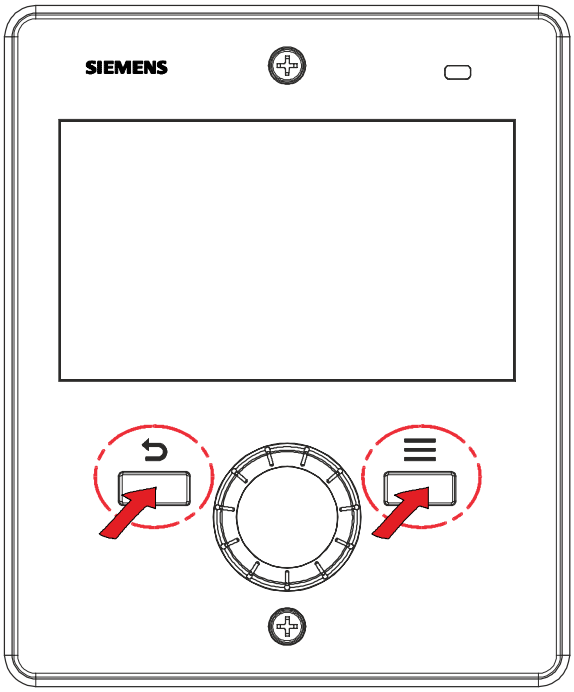


Figure 81: “Menu ☰” and “Return ⮌” buttons

This function allows the user to lock the LMV6 from any operating level, i.e., trigger a non-volatile lockout.
Due to the makeup of the system, this is not an emergency stop function.

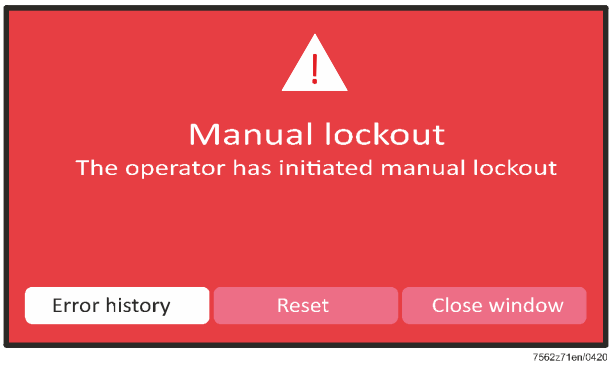


Figure 82: “Manual lockout” error screen

15.9 Backup

15.9.1 Create backup

The AZL66 can be used to save LMV6 settings (backup).

Main menu → Maintenance → Backup of all data points

15.9.2 Create backup

Note!
Creating a backup!
To ensure that all data contents of the parameters have been saved, the USB stick may only be removed once the process has been completed. This may take a few minutes.

To create a backup, the USB stick first has to be connected to the AZL66. As soon as a USB stick is detected by the AZL66, this is shown on the display.

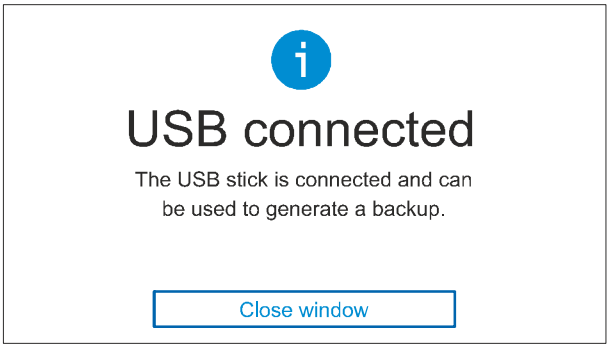


Figure 83: USB stick connected

The backup function can be found under the “Maintenance” tile.

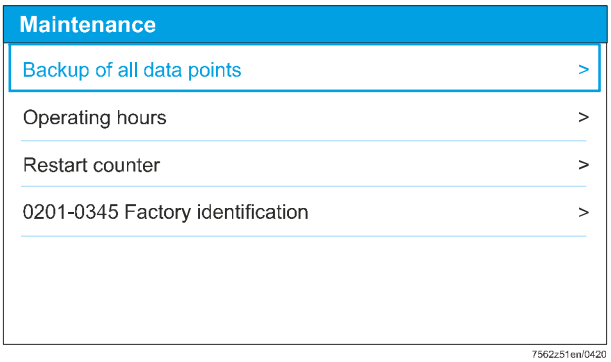


Figure 84: Backup

Prior to backing up, you must confirm the creation of the backup once again.

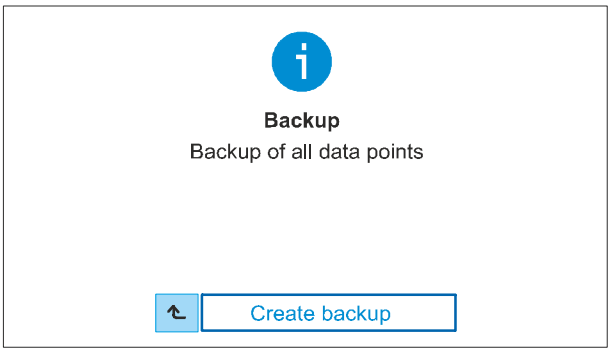


Figure 85: Create backup

The data content of all LMV6 parameters and all actuators is saved on the connected USB stick.

Once the backup is complete, the AZL66 automatically reverts to the “Maintenance” menu. As soon as the USB stick is removed from the AZL66, this is shown on the display.

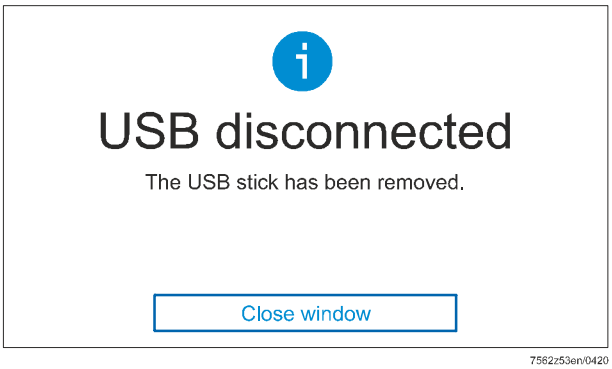


Figure 86: USB stick removed

15.10 Special phases in the program sequence

15.10.1 Lockout phase (phase 00)

The safety loop relays are switched off, the alarm relay is activated, and a lockout takes place. This means that phase 00 can only be excited by means of a manual reset. Phase 00 runs indefinitely. The fan motor is in lockout phase OFF.

15.10.2 Safety phase (Phase 01)

The safety phase represents a safety shutdown and is activated as soon as a corresponding error is detected. All relays are switched off (alarm is inactive). If possible or permitted, safety checks or restart counter checks are carried out, the results of which determine the transition to lockout phase or standby.

Warning!
Internal error!
In the event of internal errors, a safety check must be carried out following a reset.
Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.

15.10.3 Limitation of restarts, restart counter

Restart limitation is dependent on the respective parameterization and configuration of the LMV6.

15.10.3.1 Restart in the event of loss of flame

Parameter	Function
0905	Loss of flame in operation

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

If the flame is lost during operation, any number of restarts – from 0 to infinite (setting value 127) – can be set per controlled startup via the temperature controller or pressurestat. A non-volatile lockout is then performed.

The restart counter is reloaded…
- when leaving the operating position (controlled shutdown)
- after 24 hours in the operating position
- after power ON
- after a reset

Error code	Significance for the LMV6
1006	Loss of flame in operation Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1048	Restart counter elapsed: Loss of flame – Operation with fuel 1 Recommended measure: Check the error history for relevant entries

15.10.3.2 Air pressure fault during prepurging

Parameter	Function
0920	Air pressure fault during prepurging

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

In the event of an air pressure fault during prepurging, a maximum of 1 restart can be performed per controlled shutdown.

Error code	Significance for the LMV6
1002	Air pressure OFF during prepurging Recommended measure: Check pressure setting of air pressure switch and cabling
1051	Restart counter elapsed: Air pressure in prepurging Recommended measure: Check air flow and settings of air pressure switch

15.10.3.3 Restart in the event of no establishment of flame at the end of safety time

Parameter	Function
0903	No flame at the end of TSA1 + TSA2
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

If *No flame is established by the end of the safety time*, a maximum of 3 restarts can be performed per controlled shutdown.

The restart counter is reloaded…
- when the operating position is reached
- after power ON
- after a reset

Error code	Significance for the LMV6
1005	No flame in the first safety time (TSA1) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement
1042	Fuel 1: Restart counter elapsed: No flame at the end of TSA1 + TSA2 Recommended measure: Check the error history for relevant entries
1067	No flame in the second safety time (TSA2) Recommended measure: Check gas supply, gas mixture, pressure setting, fuel valve cabling, and flame detector arrangement

15.10.3.4 Restart in the event of start prevention

Parameter	Function
0924	Start prevention

Note!
Changing the parameter setting!
If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.

In the event of start prevention, the restart counter (parameter 0924) can be set from 0 to infinite (setting value 127).

The restart counter is reloaded…
- when leaving the operating position (controlled shutdown)
- after power ON
- after a reset

Error code	Significance for the LMV6
1004	Start prevention due to air pressure Recommended measure: Check pressure setting of air pressure switch and cabling
1009	Start prevention due to extraneous light Recommended measure: Check flame detector
1033	Start prevention: Safety loop Recommended measure: Check cabling and components in the safety loop
1056	Restart counter elapsed: Start prevention Recommended measure: Check the error history for relevant entries

15.10.3.5 Safety loop restart counter

The restart counter is reloaded…
- cyclically after 24 hours of being live
- after power ON
- after a reset

Error code	Significance for the LMV6
1034	Safety loop open Recommended measure: Check cabling and components in the safety loop
1057	Restart counter elapsed: Safety loop Recommended measure: Check cabling and components in the safety loop

15.10.4 Program stop

Parameter	Function
1599	Program stop • Deactivated • Stop in prepurging part 1 (phase 30) • Stop in prepurging part 2 / FGR (phase 34) • Stop in ignition 1 (phase 38) • Stop in interval 1 (phase 44) • Stop in interval 2 (phase 52) • Stop in postpurging part 1 (phase 74) • Stop in postpurging part 2 (phase 78)

To simplify burner adjustments during commissioning or in connection with maintenance work, the LMV6 program sequence can be stopped at the following points:

Phase	Function
30	Air damper in prepurge position
30	Travel to “Flue gas recirculation (FGR)” prepurge position
36	Ignition position
40	Interval 1
40	Interval 2
74	Air damper in the postpurge position
74	Travel to “Flue gas recirculation (FGR)” postpurge position

Activation takes place via the relevant menu items on the AZL66. The *program stop* function is maintained until manual deactivation takes place. If the LMV6 halts at one of the program stops, a message appears on the display of the AZL66.

15.10.5 Low-fire shutdown

To prevent the boiler from shutting down when operating at high load, the electronic ratio control will first change to low-fire when there are no further requests from the load controller. Only then will the fuel valves be closed.

Parameter	Function
1125	Maximum time to low-fire in operation

15.10.6 Hours run counter

The LMV6 records the number of operating hours and stores them permanently (via mains voltage OFF).

The operating hours counter (parameters 9030 and 9031) starts from the first safety time (TSA1) and is stopped at the end of operation.

The following hours run counters are available and can be displayed and also partially set with the AZL66 via the following menu:

Main menu → Maintenance → Operating hours

Parameter	Function
9030	Total operation (h) read only
9031	Total operation (h) adjustable
9035	LMV6 is live (h)

15.10.7 Startup counter

The LMV6 records the number of startups and stores them permanently (via mains voltage OFF).

The relevant startups are counted up with each burner start cycle. This takes place even if the startup is subsequently aborted.

The following startup counters are available and can be displayed and also partially set with the AZL66 via the following menu:

Main menu → Maintenance → Startup counters

Parameter	Function
9040	Total number of startups read only
9041	Total number of startups adjustable

15.11 Electronic ratio control

The LMV6 only supports a modulating mode of operation. In the operating position, the actuators are driven to the defined ratio control curves in accordance with the required load. Up to 15 curve points can be defined. The spacing of the curve points (difference in load) can be freely selected. The positions of the curve points are calculated by making linear interpolations. To ensure the ratio control at all times, each actuator travels at an individual speed so that all actuators reach the positions at the same time. The position control takes place while driving and while stationary. If there is a support curve point on the way to the target, it will definitely be approached.

15.11.1 Actuator addresses

Parameter	Function
0151	Actuators: Addressing • Air actuator • Gas actuator • Auxiliary actuator 1 • Auxiliary actuator 3 / FGR

The actuator functions are permanently assigned to the addresses. The corresponding type is selected for addressing an actuator. De-addressing is carried out by pressing and holding the button on the actuator.

Note!
Up to 3 actuators can be connected to the LMV6.

The actuators are controlled with a resolution of 0.1°. The actuators can be adjusted between 0° and 90°. Details on addressing the actuators can be found in chapter 17.3 *Commissioning instructions for the* LMV6.

Error code	Significance for the LMV6
1059	Duplicate addresses Recommended measure: Check and correct the actuator addresses using the blink code.
	Note! Actuators addressed incorrectly! If the actuator is addressed incorrectly, press and hold the addressing button (approx. 10 seconds) until the actuator LED lights up permanently and then address the actuator correctly.

15.11.2 Activating / deactivating the actuators

Parameter	Function
0101	R: Air actuator • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0102	R: Gas actuator • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0104	R: Auxiliary actuator 1 • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0106	R: Auxiliary actuator 3 / FGR • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1650	Air actuator • Deactivated • Activated
1651	Gas actuator • Deactivated • Activated
1653	Auxiliary actuator 1 • Deactivated • Activated • Activated FGR
1655	Auxiliary actuator 3 / FGR • Deactivated • Activated • Activated FGR

The LMV6 is operated with a fuel actuator and an air actuator as standard. Auxiliary actuator 3 / FGR (for flue gas recirculation (FGR)) is available as an option. If auxiliary actuator 3 / FGR is not required, it must be deactivated. The actuators on the LMV6 can be activated with parameter 0101, 0102, and 0106. A second activation via parameter 1650, 1651, or 1655 is necessary for the respective fuel train. The actuators are only available for use for the application once both parameterizations have been completed.

Error code	Significance for the LMV6
5075	Error: Actuator data access Recommended measure: Check connector and cabling. Replace actuator if error occurs constantly.

15.11.3 Actuator direction of rotation

Parameter	Function
0161	R: Air actuator • Counterclockwise • Clockwise
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0162	R: Gas actuator • Counterclockwise • Clockwise
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0164	R: Auxiliary actuator 1 • Counterclockwise • Clockwise
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0166	R: Auxiliary actuator 3 / FGR • Counterclockwise • Clockwise
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

The actuator direction of rotation can be adjusted to match the mounting method.

Note!
Actuator direction of rotation!
The direction of rotation must be set before defining the ignition position and the curve points.

The standard direction of rotation is counterclockwise when facing the end of the drive shaft.

15.11.4 Actuator positions / program sequence (special positions for actuators in program sequence)

Special positions can be defined for the actuators at various program phases.

15.11.4.1 No-load positions

Parameter	Function
1410	Air actuator
1411	Gas actuator
1413	Auxiliary actuator 1
1415	Auxiliary actuator 3 / FGR
1418	Variable speed drive (VSD)

In standby, the actuators are driven to their no-load positions. A deviation from the target position only results in start prevention, not a lockout. The no-load position is defined all actuators.

15.11.4.2 Prepurge positions

Parameter	Function	
	Prepurge positions 1	Prepurge positions 2 / Flue gas recirculation (FGR)
1430	Air actuator	---
1431	Gas actuator	---
1433	Auxiliary actuator 1	---
1435	Auxiliary actuator 3 / FGR	---
1438	Variable speed drive (VSD)	---
1450	---	Air actuator
1451	---	Gas actuator
1453	---	Auxiliary actuator 1
1455	---	Auxiliary actuator 3 / FGR
1458	---	Variable speed drive (VSD)

In phase 20, the actuators are driven to prepurge position 1.
If the actuator does not reach the target position within the maximum time, a safety shutdown will take place. The prepurge time starts only when the actuators have reached the prepurge position. The prepurge position is defined for each actuator.

If the *Flue gas recirculation (FGR)* function is activated, the actuators in the second part of the prepurging process are also moved to prepurge position 2 for flue gas recirculation (FGR) (parameters 1450, 1451, 1455). Without flue gas recirculation (FGR), prepurge positions 2 are not relevant.

15.11.4.3 Ignition positions

Parameter	Function	
	Ignition positions 1 (TSA1)	Ignition positions 2 (TSA2)
1470	Air actuator	---
1471	Gas actuator	---
1473	Auxiliary actuator 1	---
1475	Auxiliary actuator 3 / FGR	---
1478	Variable speed drive (VSD)	---
1490	---	Air actuator
1491	---	Gas actuator
1493	---	Auxiliary actuator 1
1495	---	Auxiliary actuator 3 / FGR
1498	---	Variable speed drive (VSD)

In phase 36, all actuators are driven to ignition position 1. Actuators are supervised continuously. Ignition takes place only when the target position is reached.

The values can be set for pilot trains for ignition position 2 (second safety time TSA2) independently of ignition position 1.

Error code	Significance for the LMV6
3003	Air actuator: No ignition position Recommended measure: Check parameter 1470
3004	Gas actuator: No ignition position Recommended measure: Check parameter 1471
3006	Auxiliary actuator 1: No ignition position Recommended measure: Check parameter 1475
3008	Auxiliary actuator 3 / FGR: No ignition position Recommended measure: Check parameter 1475
3021	Air actuator: Main flame - No ignition position Recommended measure: Check parameter 1490
3022	Gas actuator: Main flame - No ignition position Recommended measure: Check parameter 1491
3024	Auxiliary actuator 1: Main flame – No ignition position Recommended measure: Check parameter 1495
3026	Auxiliary actuator 3 / FGR: Main flame – No ignition position Recommended measure: Check parameter 1495

15.11.4.4 Operation

In the operating position, the actuators are adjusted according to the performance load. The ratio control curves are defined for fuel 1 (gas). In modulating operation, the load can be adjusted in increments of 0.1%. The actuators travel to the defined ratio control curves.

15.11.4.5 End of operating position

Parameter	Function
1125	Maximum time to low-fire in operation

Once there are no further load requirements, the LMV6 runs to the low-fire position (phase 62). Parameter 1125 limits the time taken for this process. This either means that the fuel valves are closed when the low-fire position has been reached or the maximum time has elapsed for the low-fire position to be reached during operation.

15.11.4.6 Postpurge positions

Parameter	Function	
	Postpurge positions 1	Postpurge positions 2 / Flue gas recirculation (FGR)
1510	Air actuator	---
1511	Gas actuator	---
1513	Auxiliary actuator 1	---
1515	Auxiliary actuator 3 / FGR	---
1518	Variable speed drive (VSD)	---
1530	---	Air actuator
1531	---	Gas actuator
1533	---	Auxiliary actuator 1
1535	---	Auxiliary actuator 3 / FGR
1538	---	Variable speed drive (VSD)

When the burner is shut down, the actuators will be driven to their postpurge position in phase 70. The actuators are supervised continuously.

If the *Flue gas recirculation (FGR)* function is activated, the actuators in the second part of the postpurging process are also moved to postpurge positions 2 for flue gas recirculation (FGR) (parameters 1530, 1531, 1535). Without flue gas recirculation (FGR), postpurge positions 2 are not relevant.

15.11.4.7 Travel time (drive ramp)

Parameter	Function
1670	Running speed outside the operation

The travel time is the speed of the actuators when traveling to the no-load, prepurge, ignition, or postpurge position. A setting of 30 seconds generates a maximum speed of 90° in 30 seconds (3°/s). The travel times can be extended with parameter 1670. The travel time is extended automatically if the actuators are not able to travel with the set travel ramp due to their maximum speed.

15.11.4.8 Travel time during modulating operation (operating ramp)

Parameter	Function
1672	Running speed in operation

The travel time is the speed of the actuators during modulating operation.
A setting of 30 seconds creates a load adjustment of maximum 100% load in 30 seconds. The travel times can be extended with parameter 1672. The travel time is extended automatically if the actuators are not able to travel with the set travel ramp due to their maximum speed.

15.11.5 Position tolerance of the actuators

Parameter	Function
1620	Position tolerance

It may be necessary to adjust parameter 1620 in the event of changing loads (e.g., fluttering damper). Parameter 1620 can be used to set the tolerated deviation between the actual position and the target position specified by the electronic ratio control. This means that the previous neutral zone of 0.3° (factory setting) can be increased to 1.2°.

Note!
Influence of the position tolerance of the actuators!
Parameter 1620 influences the tolerance of the position evaluation of **all** actuators at the same time.

Caution!
Impact on combustion!
Parameter 1620 may only be set in a way that means the new value has no impact on combustion.
If the value of parameter 1620 is increased compared to the delivery state, a higher residual oxygen content may have to be set on the plant.

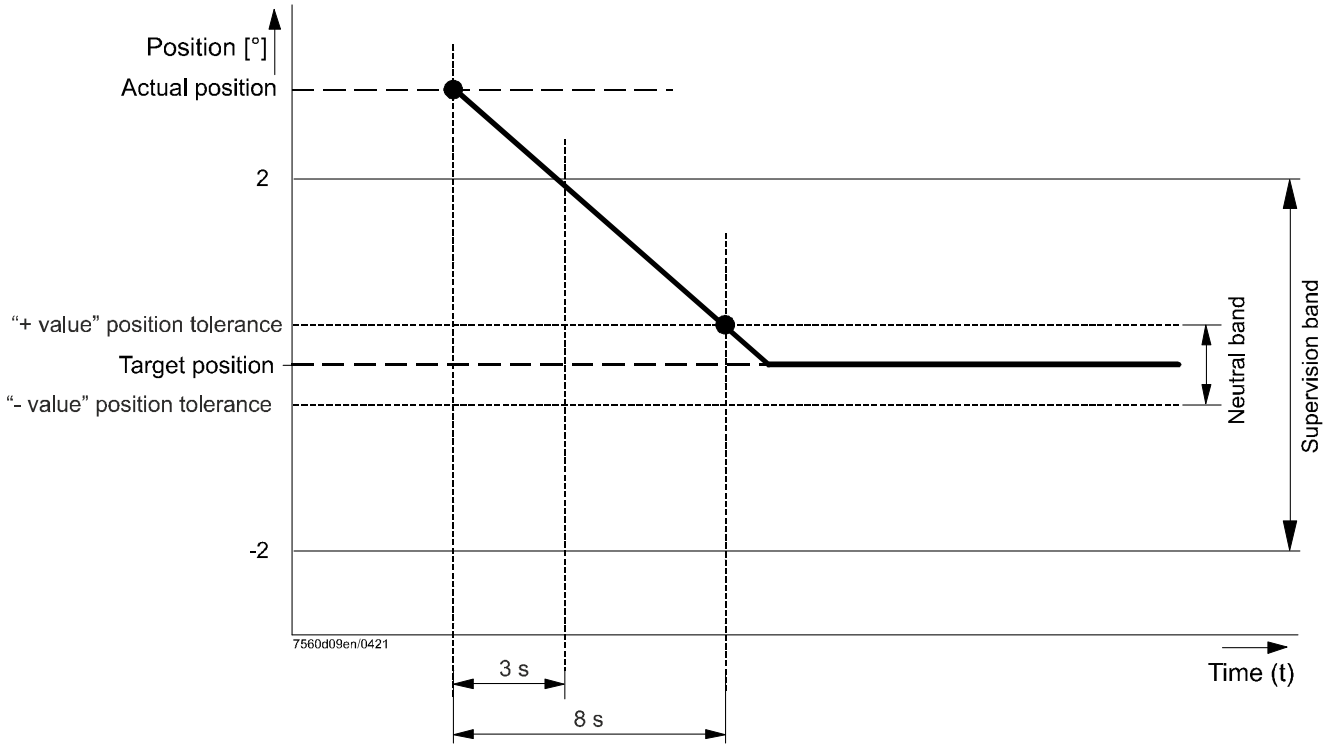


Figure 87: Successful change of position

If the actual position is outside the supervision band, a safety shutdown is executed in < 3 seconds.
If the actual position is outside the neutral band, a safety shutdown is executed in < 8 seconds.

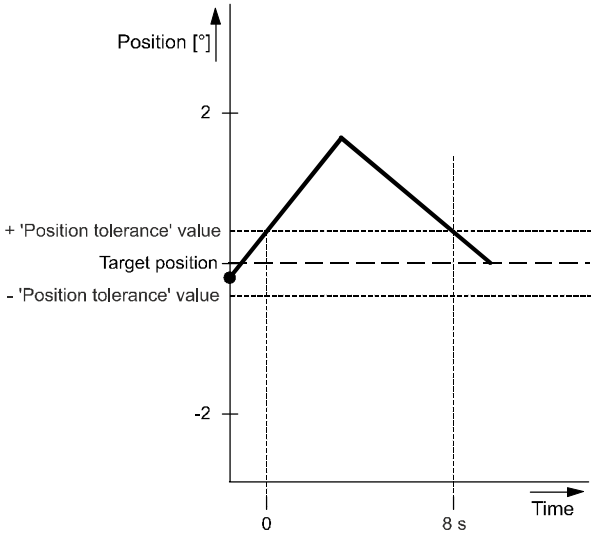
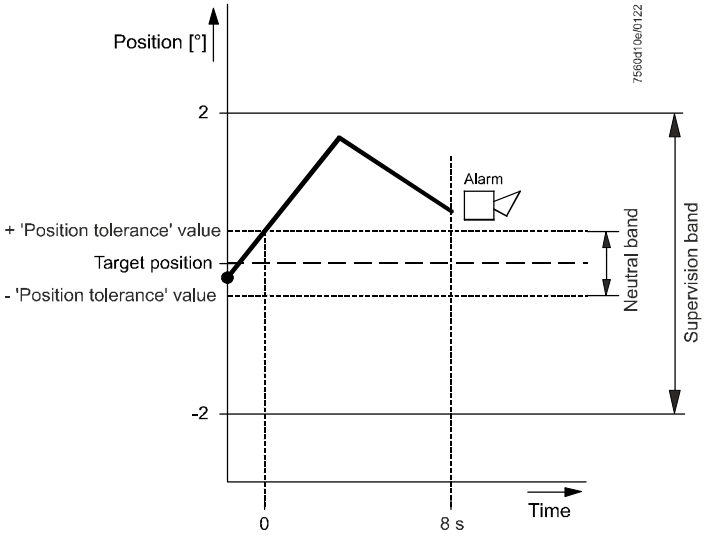


Figure 88: Successful correction < 2°



Fault < 2° (stall point at constant load)

16 Configuration and parameterization

16.1 Authorization levels

- Access levels
- Menu levels

16.2 Access levels

There are 3 access levels available for configuration and parameterization of the LMV6:

Operators		Authorization
AB (PO)	Plant operator	**Without password entry** All parameters required by the burner operator can be viewed or changed at this level.
HF (SO)	Heating engineer	**With password entry** All parameters associated with the heating engineer level can be viewed and changed at this level. Parameters required to start up and service the burner can also be changed here.
OEM	OEM (original equipment manufacturer)	**With password entry** All parameters associated with the end user and heating engineer levels can be viewed and changed at this level. The OEM can also adjust safety-related parameters required for configuring the burner.

Parameter	Function	Value range		Increment	Factory setting	Access rights	
		MIN	MAX			Read	Write
0903	No flame at the end of TSA1 + TSA2	0	3	1	0	OEM	OEM
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.						
0905	Loss of flame in operation	0	127	1	1	HF (SO)	HF (SO)
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.						

Figure 89: Example: “Access levels”

The passwords are linked to the access levels (HF (SO), OEM). This means that the only parameters available for editing are those associated with the access level.

☞ Note!
Settings and parameterization!
You must observe the information outlined in chapter 16.3 *Safety instructions for settings and parameterization*!

16.3 Safety instructions for settings and parameterization

Caution!
Parameters and settings may only be changed by **qualified personnel**. If parameters are changed, responsibility for the new parameter settings is assumed by the person who – in accordance with the access rights – has made parameter changes on the respective access level. After parameterization, the OEM must check to ensure that safe burner operation is guaranteed. The OEM that made the settings is always responsible for the parameters, their settings, and compliance of the respective application with the relevant national and international standards and safety regulations (e.g., EN 267 and EN 1643). Siemens, its suppliers and other Group companies of Siemens AG do not assume responsibility for special or indirect damage, consequential damage, other damage, or damage resulting from wrong parameterization.

Warning!
If the factory settings are changed, all changes made must be documented and checked by the OEM.

The OEM is obliged to mark the LMV6 accordingly and to include at least the list of unit parameters and settings in the burner documentation.

Siemens also recommends attaching an additional mark on the LMV6 in the form of an adhesive label. As specified in DIN EN 298, the label should be easy to read and wipe proof.

The password can be entered via the AZL66. Once the password has been entered, it remains valid until the end of the identification period or until the identification period is manually deactivated.

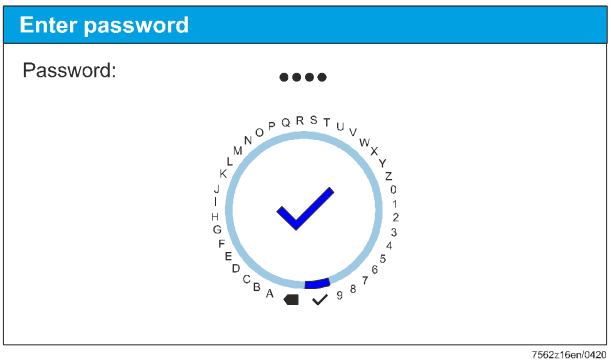


Figure 90: Example: “Entering the password”

The password may include numbers and letters. Select the symbol (check) to confirm the password entered.

Once parameterization and configuration are complete, the OEM or HF (SO) access level should be deactivated. **Deactivate password (log out)** appears in the **Password** menu. After confirming with **Enter**, the HF (SO) and OEM user levels are no longer accessible without entering a password.

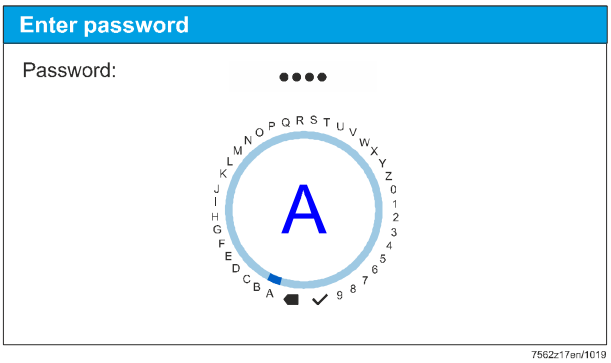


Figure 91: Example: “Password”

16.4 Parameterization

The LMV6 can only be parameterized via the AZL66.

16.4.1 Meaning of buttons on the AZL66

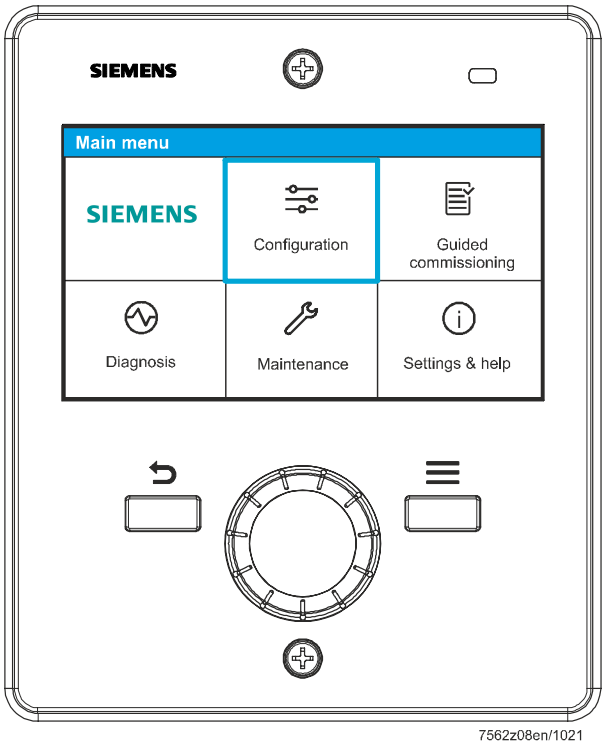


Figure 92: Meaning of buttons

Graphics	Button	Function
None	Rotary knob TURN	• Navigate through tile views or list views • Can be turned clockwise to the right or down • Can be turned counterclockwise to the left or up • Change parameter values
None	Rotary knob PUSH	• Select a tile / menu item • Confirm a change to a parameter value • Acknowledge messages
	Back (Return)	Exit a tile / menu item / value adjuster without making further changes
	Menu	• Jump to the top level of the menu tree (possible from anywhere) • Access to additional functions (if available)

16.4.2 Parameterization via AZL66

Details on changing the program times, commissioning the ratio control curves, and adjusting the functionality using the relevant parameters can be found in the corresponding sections of chapter 15 *Functions of the LMV6*, and chapter 17 *Commissioning*.

The operating philosophy of the AZL66 is described in User Manual U7562. Every parameter has a unique parameter number, parameter name, and a value or text.

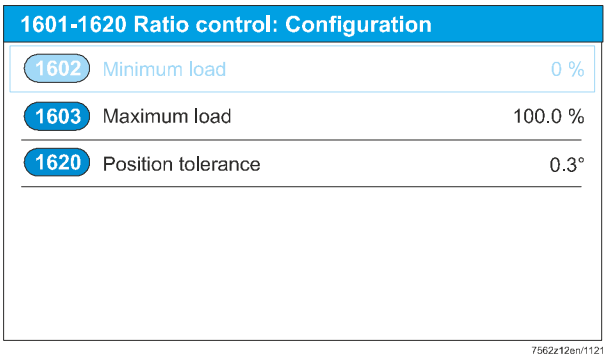


Figure 93: Parameterization via AZL66

The display shows superordinate parameter levels with the ranges of the parameter numbers. The parameters are displayed by selecting the relevant parameter range and confirming with **Enter**.

Example:

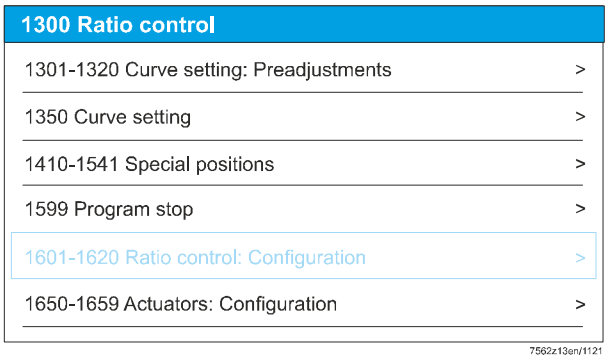


Figure 94: Ratio control parameterization

16.5 General system configuration

The system configuration is determined by the burner manufacturer. These parameters are used to determine the type-specific settings (e.g., the definition of the fuel train).

The parameter setting choices are defined and determined in the parameter list:

- Value range
- Increment
- Factory setting
- Access rights

Parameter	Function	Value range		Increment	Factory setting	Access rights	
		MIN	MAX			Read	Write
0903	No flame at the end of TSA1 + TSA2	0	3	1	0	OEM	OEM
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.						
0905	Loss of flame in operation	0	127	1	1	HF	HF
☞	Note! Changing the parameter setting! If the parameter settings are changed, the new parameter settings are only accepted when the LMV6 has been manually locked and unlocked (reset) by means of a subsequent manual reset.						

Figure 95: Example: “System configuration”

☞ Note!
A reset is required for parameters marked “R:” for system configuration!
The LMV6 locks out automatically when changes are made to a parameter marked “R:”. Changes become effective following a reset.

17 Commissioning

17.1 Commissioning notes

The following points must be checked prior to commissioning:

- The correct assignment of the fuel valves to the valve outputs on the LMV6 → depending on the respective parameterization
- The correct time parameter settings, especially the settings of the safety and prepurge times
- There is no absolute protection against incorrect use of the RASTx connectors. For this reason, prior to commissioning the plant, the correct assignment of the plug connectors must be checked

The following points must be checked after commissioning:

- The correct functioning of the flame detector in the event of loss of flame during operation (including the response time); with extraneous light during the prepurge time and when there is no establishment of flame at the end of the safety time
- During commissioning, check **all safety functions**
- Electromagnetic emissions must be checked on an application-specific basis

The following general conditions apply to the flame display on the AZL66:

- The display is subject to various component tolerances, with the result that deviations of ±10% are possible
- It should furthermore be noted that, for physical reasons, there is no linear relationship between the display and detector signal values

The functions of the following available or required input messages must be checked:

- Air pressure
- Minimum gas pressure and maximum gas pressure
- Safety loop (e.g., safety temperature limiter)

Duties of the expert when carrying out the approval tests

	Action	Check / response
a)	Burner startup with disconnected flame detector	Non-volatile lockout at the end of the first safety time
b)	Burner startup with flame detector exposed to extraneous light, e.g., to incandescent light with flame detectors for visible radiation, quartz-halogen bulb or cigarette lighter flame with flame detectors for UV radiation	Non-volatile lockout during the prepurge time
c)	Simulation of loss of flame during operation, which involves disconnecting the flame detector in the operating position and maintaining that state	Non-volatile lockout or restart depending on the configuration of the LMV6
d)	Check the plant response time with loss of flame during operation, which involves manually disconnecting the fuel valves from power and checking the time from this moment to the time required by the LMV6 to turn off power to the fuel valve	Turning off power to the fuel valves by the LMV6 within the period of time permitted for the respective plant

Further checks may be required depending on the field of use and the relevant standards.

After installation and commissioning of a plant, the parameterized values and settings must be **documented** by the person/heating engineer responsible for the plant. This data must be written down. This document must be kept in a safe place and checked by an expert.

Warning!
On the OEM access level of the LMV6, it is possible to make parameter settings that differ from application standards. When setting the parameters, it is important to ensure that the application will run safely in accordance with legal requirements. If not observed, there is a risk of impairment of safety functions.

17.2 Prerequisites for startup

- LMV6 is reset
- All contacts in the line are closed
- Heating request
- No undervoltage
- Air pressure switch in the no-load position
- Flame detector darkened, no extraneous light
- All contacts in the safety loop are closed

17.3 Commissioning instructions for the LMV6

Practical settings instructions for the system configuration, LMV6, and electronic fuel-air ratio control.
These settings instructions are designed to accompany the initial commissioning of an LMV6 system as supplied. To access the parameter setting levels, a password must be entered. Once you have entered the correct password, the data should be saved in the AZL66 (backup of delivery state for emergencies). You can then parameterize the LMV6. We recommend backing up after leaving the parameter setting level (ending the adjustment process).

Note!
A reset is required for parameters marked “R:” for system configuration!
The LMV6 locks out automatically when changes are made to a parameter marked “R:”. Changes become effective following a reset.

17.3.1 Checking the inputs / outputs

The inputs/outputs must be tested taking into account the burner and plant conditions.

17.3.2 Basic configuration

17.3.2.1 Setting the language

Main menu → Settings & help → 0001 Language

Parameter	Function
0001	Language • German • English • 中文 • Italiano • Español • Suomalainen • Français • Magyar • 한국어 • Nederlands • Português • Русский • Türk

17.3.2.2 Entering the password

Main menu → Settings & Help → Password → Enter password

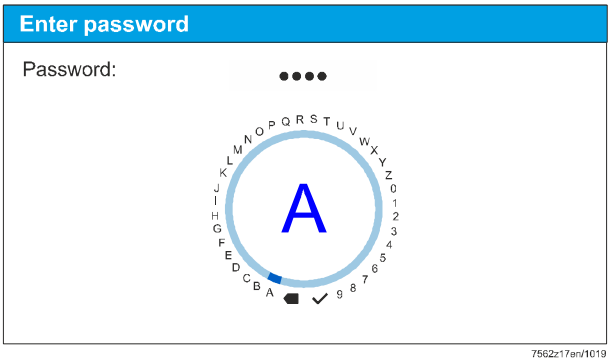


Figure 96: Entering the password

The password entered determines which access level is enabled. If, for example, the password assigned to the heating engineer is entered, the heating engineer access level will also be enabled.

17.3.2.3 Selecting the fuel trains

Main menu → Guided commissioning → 1145 R: Fuel train

Parameter	Function
1145	R: Fuel train • No fuel train • Gas direct ignition • Gas pilot ignition 1 • Gas pilot ignition 2
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

Error code	Significance for the LMV6
5001	Internal error Recommended measure: Replace LMV6 if error occurs constantly
	**Warning!** **Internal error!** **In the event of internal errors, a safety check must be carried out following a reset.** **Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.**

Set the fuel train according to chapter 15.1 *Overview of fuel trains* or confirm the fuel train settings if they have already been defined.

17.3.2.4 Setting the variable speed drive (VSD)

Main menu → Guided commissioning → 6001-6061 Variable speed drive (VSD)

Parameters	Function
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1658	Variable speed drive (VSD) • Deactivated • Activated

The option is also available to select the connection of a variable speed drive on the LMV6 in addition to the actuators. This requires the internal PCB (I/O module) in the LMV6 to be activated first via parameter 0110 and then configured again via parameter 1658.

17.3.2.5 Setting the flue gas recirculation (FGR)

Main menu → Guided commissioning → 1701 R: FGR operating mode

Parameter	Function
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
1701	R: FGR operating mode • Auxiliary actuator 3 / FGR on curve • Trigger activated • Deactivated • Temperature-compensated
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
☞	Note Deleting the temperature curve! If parameter 1701 is reset to the 'Auxiliary actuator 3 / FGR on curve' setting, the temperature curve or temperature values entered are deleted. The ratio control curve of the auxiliary actuator 3 / FGR is retained.
☞	Note! Auxiliary actuator 3 / FGR behavior If flue gas recirculation (FGR) is active, auxiliary actuator 3 / FGR follows the parameterized ratio control curve, taking into consideration the specific parameters for flue gas recirculation (FGR) (e.g., 1702, 1455, 1535). Auxiliary actuator 3 / FGR is always kept in the MIN flue gas recirculation (FGR) position after the ignition position until a certain time or temperature is reached. If flue gas recirculation (FGR) is deactivated, auxiliary actuator 3 / FGR follows the ratio control curve (e.g., 1415, 1450–1461).
1706	R: Pt1000 / X24 temperature sensor • Deactivated • Pt1000
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

If the 'Temperature-compensated' operating mode has been selected, the internal PCB (I/O module) in the LMV6 must be activated via parameter 0110 and then the temperature sensor via parameter 1706.

Error code	Significance for the LMV6
3013	Variable speed drive (VSD): Speed error Recommended measure: Variable speed drive (VSD): Check the connector, cabling and installation of the speed sensor

17.3.2.6 Setting valve proving

Main menu → Guided commissioning → 1201 R: Valve proving – type and time

Parameter	Function
1201	R: Valve proving – type and time • No valve proving • Valve proving during startup • Valve proving during shutdown • Valve proving during startup and shutdown
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

Error code	Significance for the LMV6
1020	Check the gas supply Recommended measure: Gas pressure switch-min: Check gas supply and setting
1022	Valve proving: Gas side leaking Recommended measure: Check gas side fuel valve
1023	Valve proving: Burner side leaking Recommended measure: Check burner side fuel valve
1024	Pressure switch valve proving: Invalid signal Recommended measure: Check connector and cabling. Replace LMV6 if error occurs constantly.

17.3.2.7 Addressing the actuators

Main menu → Guided commissioning → 0151 Actuators: Addressing

Parameter	Function
0151	Actuators: Addressing • Air actuator • Gas actuator • Auxiliary actuator 1 • Auxiliary actuator 3 / FGR

Prior to programming the actuators, the connector for the bus termination on the last CAN bus element must be plugged in.

Note!
Number of actuators!
Up to 3 actuators can be connected to the LMV60 and up to 4 actuators to the LMV62.

The corresponding type is selected for addressing an actuator.

The addressing command is issued on the CAN bus by selecting a value, e.g., *Air actuator* and confirming with **Enter**.
Pressing the addressing button on the actuator determines which actuator receives the selected function.

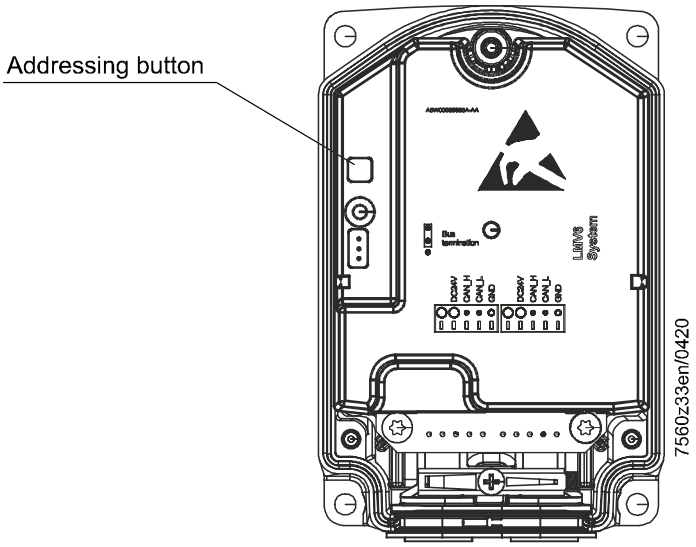


Figure 97: Addressing button on the actuator

This allows all necessary actuators to be addressed in sequence.

Error code	Significance for the LMV6
1059	Duplicate addresses Recommended measure: Check and correct the actuator addresses using the blink code.
	Note! Actuators addressed incorrectly! If the actuator is addressed incorrectly, press and hold the addressing button (approx. 10 seconds) until the actuator LED lights up permanently and then address the actuator correctly.

17.3.2.8 Selecting the actuator direction of rotation

Main menu → Guided commissioning → 0161–0169 Actuators: Direction of rotation

Parameter	Function
0161	R: Air actuator • Counterclockwise • Clockwise
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0162	R: Gas actuator • Counterclockwise • Clockwise
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0164	R: Auxiliary actuator 1 • Counterclockwise • Clockwise
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0166	R: Auxiliary actuator 3 / FGR • Counterclockwise • Clockwise
☞	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

The standard direction of rotation is counterclockwise when facing the end of the drive shaft (AZL66).

☞ Note!
Check the direction of rotation!
To check the direction of rotation, every actuator can be moved when in the no-load position (parameter 1410–1421).

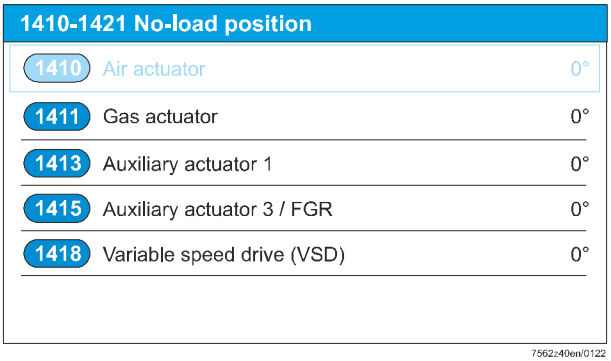


Figure 98: Example: “Actuator direction of rotation”

17.4 Activating / deactivating actuators

Main menu → Guided commissioning → 0101-0149 Activate system components

Parameter	Function
0101	R: Air actuator • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0102	R: Gas actuator • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0104	R: Auxiliary actuator 1 • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0106	R: Auxiliary actuator 3 / FGR • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0110	R: I/O module with variable speed drive (VSD) • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.
0130	R: QGC • OFF • ON
	Note! Changing the parameter settings! If the parameter setting is changed, a manual reset is required.

This is where the evaluation and supervision of the relevant actuators are activated. Every actuator to be used must be activated here.

The actuators must be addressed according to chapter 17.3.2.7 *Addressing the actuators*.

Error code	Significance for the LMV6
5075	Error: Actuator data access Recommended measure: Check connector and cabling. Replace actuator if error occurs constantly.

17.4.1 Settings for gas-fired operation

The following steps describe how the fuel-air ratio is set. Specific curves must be set for each fuel type.

17.4.1.1 Actuator configuration

The actuators required for fuel 1 are activated first:

Main menu → Guided commissioning → 1650–1659 Actuators: Configuration

Parameter	Function
1650	Air actuator • Deactivated • Activated
1651	Gas actuator • Deactivated • Activated
1653	Auxiliary actuator 1 • Deactivated • Activated
1655	Auxiliary actuator 3 / FGR • Deactivated • Activated • Activated FGR
1658	Variable speed drive (VSD) • Deactivated • Activated

Error code	Significance for the LMV6
5075	Error: Actuator data access Recommended measure: Check connector and cabling. Replace actuator if error occurs constantly.

17.4.1.2 Activating program stops in different program phases

Main menu → Guided commissioning → 1599 Program stop

Parameter	Function
1599	Program stop • Deactivated • Stop in prepurging part 1 (phase 30) • Stop in prepurging part 2 / FGR (phase 34) • Stop in ignition 1 (phase 38) • Stop in interval 1 (phase 44) • Stop in interval 2 (phase 52) • Stop in postpurging part 1 (phase 74) • Stop in postpurging part 2 (phase 78)

The program stop must be activated if startup has to be interrupted to continue setting the special positions.

17.4.1.3 Actuator positions during the prepurge time

Main menu → Guided commissioning → 1430-1441 Prepurge positions 1

Parameter	Function
1430	Air actuator
1431	Gas actuator
1433	Auxiliary actuator 1
1435	Auxiliary actuator 3 / FGR
1438	Variable speed drive (VSD)

Prepurge positions 1 take effect for applications without flue gas recirculation (FGR). First prepurge positions 1 and then prepurge positions 2 take effect for applications with active flue gas recirculation (FGR).

Main menu → Guided commissioning → 1450-1461 Prepurge positions 2 / FGR

Parameter	Function
1450	Air actuator
1451	Gas actuator
1453	Auxiliary actuator 1
1455	Auxiliary actuator 3 / FGR
1458	Variable speed drive (VSD)

17.4.1.4 Actuator positions during the ignition

Main menu → Guided commissioning → 1470-1481 Ignition positions 1 (TSA1)

Parameter	Function
1470	Air actuator
1471	Gas actuator
1473	Auxiliary actuator 1
1475	Auxiliary actuator 3 / FGR
1478	Variable speed drive (VSD)

Only ignition positions 1 take effect for applications with direct ignition. First ignition positions 1 and then ignition positions 2 take effect for applications with pilot ignition.

Error code	Significance for the LMV6
3003	Air actuator: No ignition position Recommended measure: Check parameter 1470
3004	Gas actuator: No ignition position Recommended measure: Check parameter 1471
3006	Auxiliary actuator 1: No ignition position Recommended measure: Check parameter 1473
3008	Auxiliary actuator 3 / FGR: No ignition position Recommended measure: Check parameter 1475

Main menu → Guided commissioning → 1490-1501 Ignition positions 2 (TSA2)

Parameter	Function
1490	Air actuator
1491	Gas actuator
1493	Auxiliary actuator 1
1495	Auxiliary actuator 3 / FGR
1498	Variable speed drive (VSD)

Only effective with gas pilot ignition:
To verify the ignition positions again, the program sequence can be stopped in phase 44 or 52 (interval with ignited flame on completion of the relevant safety time). When the program stop is deactivated, the burner proceeds with its program until normal operation is reached (phase 60). If no point for the fuel-air ratio control has been defined beforehand, the ignition positions of the actuators are adopted as the first curve point (P1).

Error code	Significance for the LMV6
3021	Air actuator: Main flame – No ignition position Recommended measure: Check parameter 1490
3022	Gas actuator: Main flame – No ignition position Recommended measure: Check parameter 1491
3024	Auxiliary actuator 1: Main flame – No ignition position Recommended measure: Check parameter 1493
3026	Auxiliary actuator 3 / FGR: Main flame – No ignition position Recommended measure: Check parameter 1495

17.4.1.5 Actuator positions during the postpurge time

Main menu → Guided commissioning → 1510-1521 Postpurge positions 1

Parameter	Function
1510	Air actuator
1511	Gas actuator
1513	Auxiliary actuator 1
1515	Auxiliary actuator 3 / FGR
1518	Variable speed drive (VSD)

Postpurge positions 1 take effect for applications without flue gas recirculation (FGR). First postpurge positions 1 and then postpurge positions 2 take effect for applications with active flue gas recirculation (FGR).

Main menu → Guided commissioning → 1530-1541 Postpurge positions 2 / FGR

Parameter	Function
1530	Air actuator
1531	Gas actuator
1533	Auxiliary actuator 1
1535	Auxiliary actuator 3 / FGR
1538	Variable speed drive (VSD)

17.4.1.6 Standardization of the variable speed drive

Main menu → Guided commissioning → 6001-6061 Variable speed drive (VSD)

Parameters	Function
6020	Standardization activated • ON • OFF

17.4.2 Curve commissioning

17.4.2.1 Preadjusted curve commissioning

Main menu → Guided commissioning → 1301-1320 Curve setting: Preadjustments

Parameter	Function
1301	Air actuator: Angle at 0%
1302	Air actuator: Angle at 100%
1303	Gas actuator: Angle at 0%
1304	Gas actuator: Angle at 100%
1307	Auxiliary actuator 1: Angle at 0%
1308	Auxiliary actuator 1: Angle at 100%
1311	Auxiliary actuator 3 / FGR: Angle at 0%
1312	Auxiliary actuator 3 / FGR: Angle at 100%
1317	Variable speed drive (VSD): Speed at 0%
1318	Variable speed drive (VSD): Speed at 100%

These values determine “where” the actuators outside the defined curve are driven to by the ratio control in the curve parameterization.

Example → Flue gas recirculation (FGR) with 3 actuators
The following 2 points are parameterized:

	Curve point	
	P0	P1
Load in percent (%)	25	50
Air actuator: Angle in degrees (°)	31	45
Gas actuator: Angle in degrees (°)	15	40
Auxiliary actuator 3 / FGR: Angle in degrees (°)	10	25

Target positioned are set as follows:

	Value
Air actuator: Angle at 0%	0°
Air actuator: Angle at 100%	90°
Gas actuator: Angle at 0%	0°
Gas actuator: Angle at 100%	70°
Auxiliary actuator 3 / FGR: Angle at 0%	0°
Auxiliary actuator 3 / FGR: Angle at 100%	55°

The actuators are driven according to the following diagram in the curve parameterization:

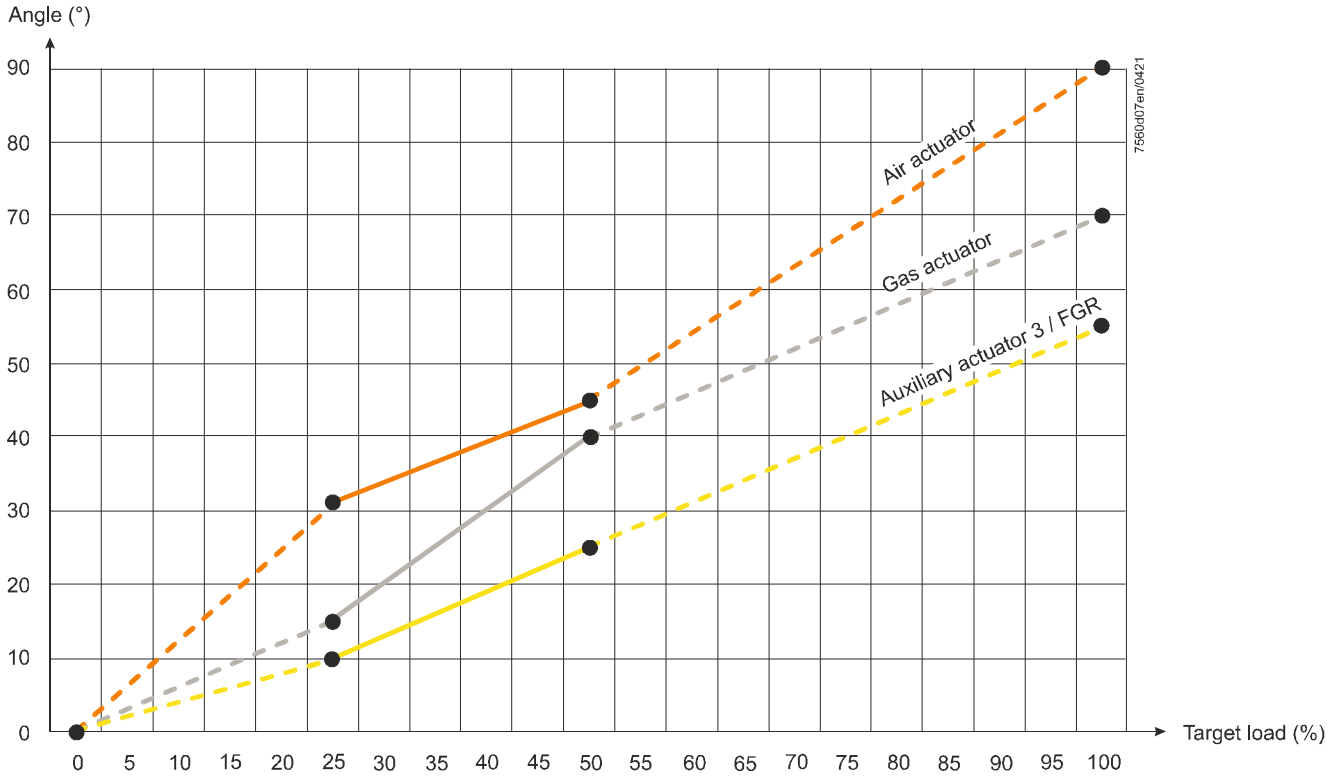


Figure 99: Example: “Actuator settings”

17.4.2.2 Initial settings

Main menu → Guided commissioning → Minimum load

Main menu → Guided commissioning → Maximum load

Parameter	Function
1602	Minimum load
1603	Maximum load

***Subsequent commissioning* function**

The burner travels to the ignition load and adopts the first curve point P0.

Ignition position 1 is adopted for direct ignition and ignition position 2 for pilot ignition.

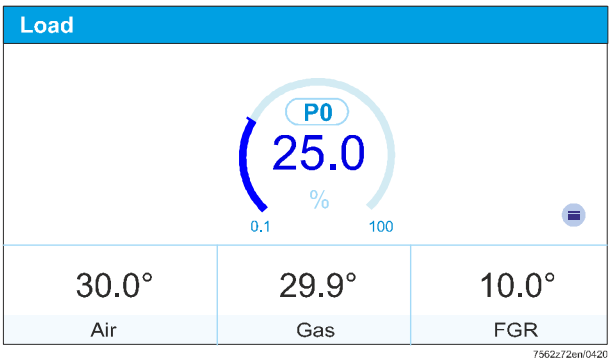


Figure 100: Example: “Ignition position”

This point can be changed by pushing and rotating the rotary knob on the AZL66.

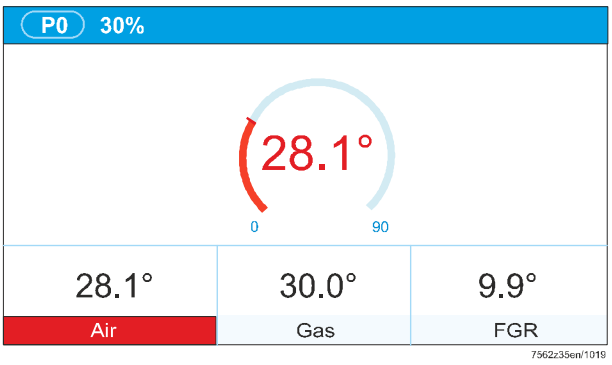


Figure 101: Example: “Changing the ignition position”

After pressing the menu button ☰ and pushing the rotary knob, the next position P0 can then be set for the gas actuator.

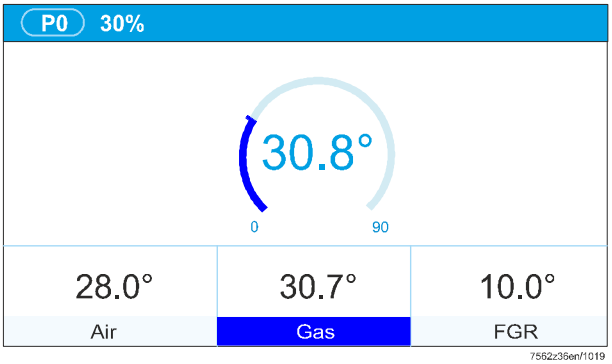


Figure 102: Example: “Setting the next position”

After pushing the rotary knob, additional curve points can be defined via the **Load** submenu.

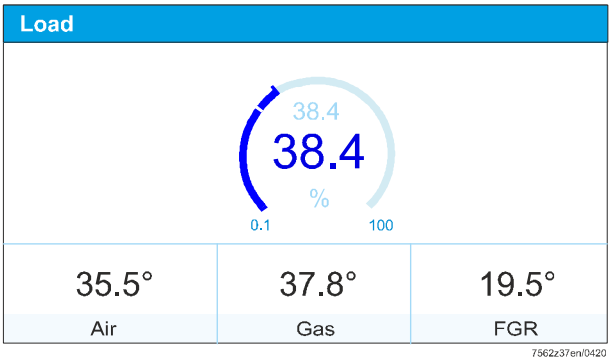


Figure 103: Example: “Setting additional curve points”

This makes it possible to increase the burner load step by step until nominal load (100%) is reached via the **Load** submenu.
As part of this process, the actuators travel on the interpolated straight lines to the set position of 90° (factory setting) until 100% actuator load is achieved.
Flue gas values and flame stability must be constantly checked. It may be necessary to define provisional curve points, which can be canceled again later. As soon as the nominal load is reached, the burner should be optimized with regard to flue gas values.

The settings for the following curve point P1 are made in the same way as for the previous curve point P0.

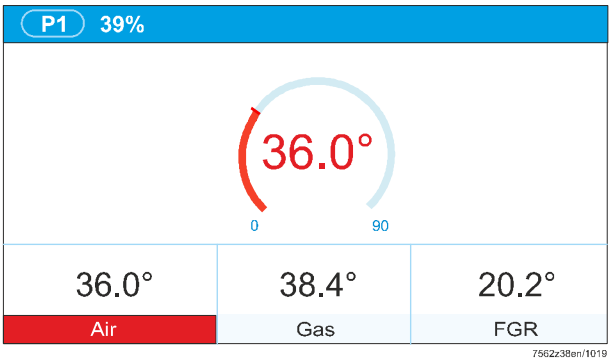


Figure 104: Example: “Setting additional curve points”

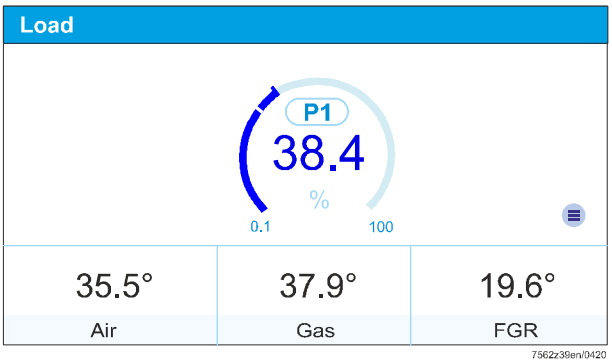


Figure 105: Example: “Setting additional curve points”

Curve point P1 is now defined. These methods allow all curve points to be defined up to a load of 100%.

***Non-subsequent commissioning* function**

The ‘Non-subsequent commissioning’ function launches if the LMV6 is in lockout position. This is indicated by the text ‘Non-subsequent’ on the display. If the LMV6 is in operation, it is possible to switch between the functions ‘Subsequent commissioning’ and ‘Non-subsequent commissioning’.

Note!
Changing the curve point!
An existing curve point can be changed and deleted without starting the actuator.

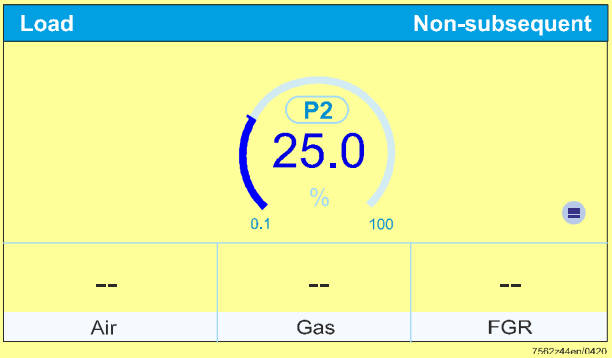


Figure 106: Example: “Changing the curve point”

Pressing ↩ (Back) and ☰ (Menu) on the AZL66 at the same time triggers a manual lockout.

Error code	Significance for the LMV6
3040	Curve setting: Curve is in an as yet undefined zone Recommended measure: Set curve commissioning for the entire working range
5074	Lack of feedback from AZL66 during curve commissioning Recommended measure: Check cabling of the AZL66

17.4.3 Canceling curve points

A curve point can be canceled by pressing the menu button ☰ as soon as the menu symbol appears on the right-hand side.

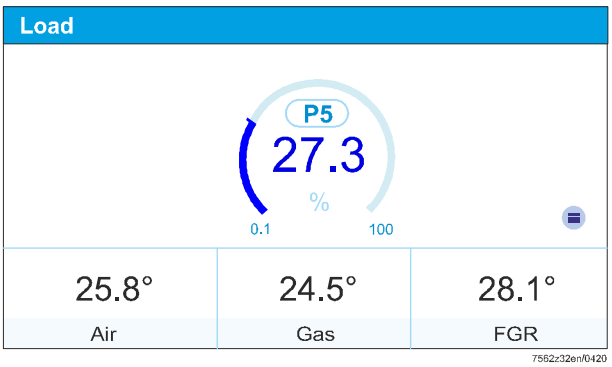


Figure 107: Canceling a curve point

The curve point can be canceled by subsequently pressing *Delete* using the rotary knob.

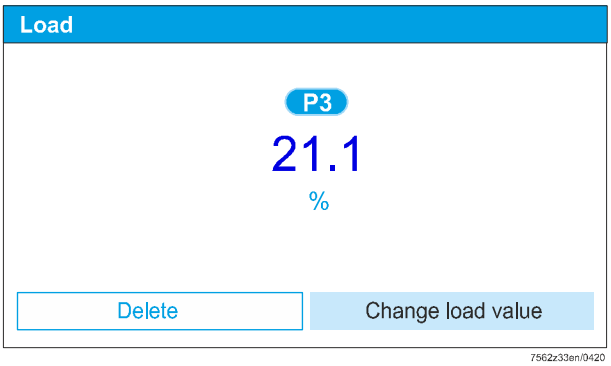


Figure 108: Canceling a curve point

17.4.3.1 Load limits

Main menu → Guided commissioning → Minimum load

Parameter	Function
1602	Minimum load

The burner load can ultimately be limited to a minimum load according to the boiler requirements.

Main menu → Guided commissioning → Maximum load

Parameter	Function
1603	Maximum load

The burner load can ultimately be limited to a maximum load according to the boiler requirements.

18 LMV6 power supply

General

Power to the LMV6 is supplied via the internal power supply unit. This internal power supply unit supplies the internal assemblies, SQM4 and AZL66 via terminal X11/X12. Power to the bus users is supplied together with the communication lines in a common cable. As the power load for the internal power supply unit is limited, an additional power supply unit is required when operating with more than two SQM45s and one SQM46 (or over greater distances). The bus topology is designed as a line structure and has a start and an end node. The individual bus users are connected in series, whereby the respective end nodes are terminated by a bus terminating resistor. The LMV6 is a component of the communication line and is looped in between the AZL66 and the SQM4. In this arrangement, the AZL66 always assumes the function of a bus end node. The required bus terminator is already integrated. With the SQM4, the last user becomes the bus end node (internal bus terminating resistor must be activated via a jumper). The other node users within the line structure are configured without terminating resistor.

18.1 Example: “Operation with 3 actuators”

Installation of all components in the burner: CAN bus cable “LMV6 ↔ last SQM4” ≤20 m

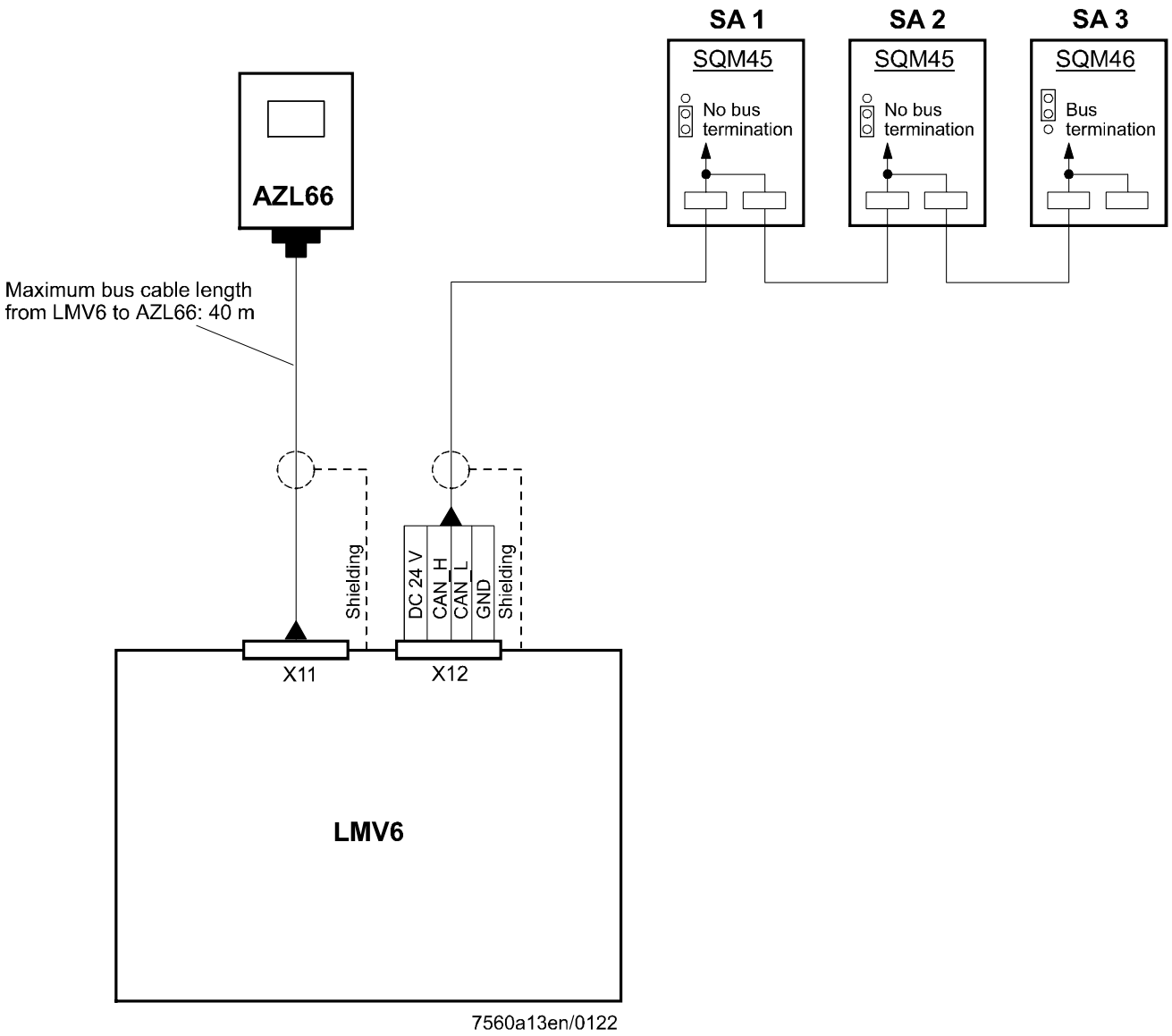


Figure 109: Installation of all components in the burner: CAN bus cable LMV6 ↔ last SQM4 < 20 m

Note on example!
Total length of CAN bus cable ≤60 m

18.2 Example: ‘Operation with 3 actuators’

Installation of all components in the burner: CAN bus cable ‘LMV62 ↔ last SQM4’ ≤20 m

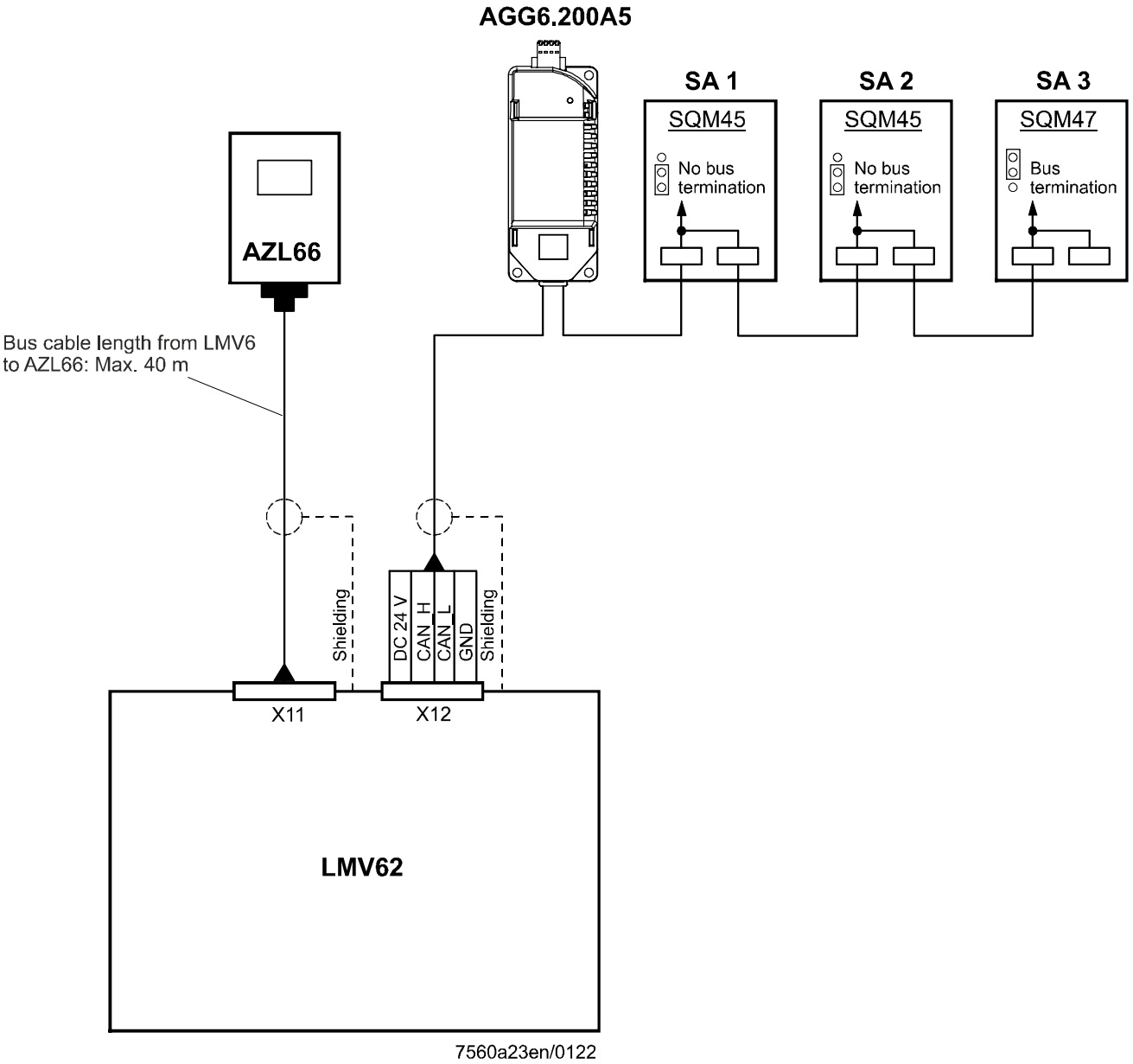


Figure 110: Installation of all components in the burner: CAN bus cable ‘LMV62 ↔ last SQM4’ ≤20 m

Note on example!
Total length of CAN bus cable ≤60 m

18.3 Example: ‘Operation with 4 actuators’

Installation of all components in the burner: CAN bus cable ‘LMV62 ↔ last SQM4’ ≤20 m

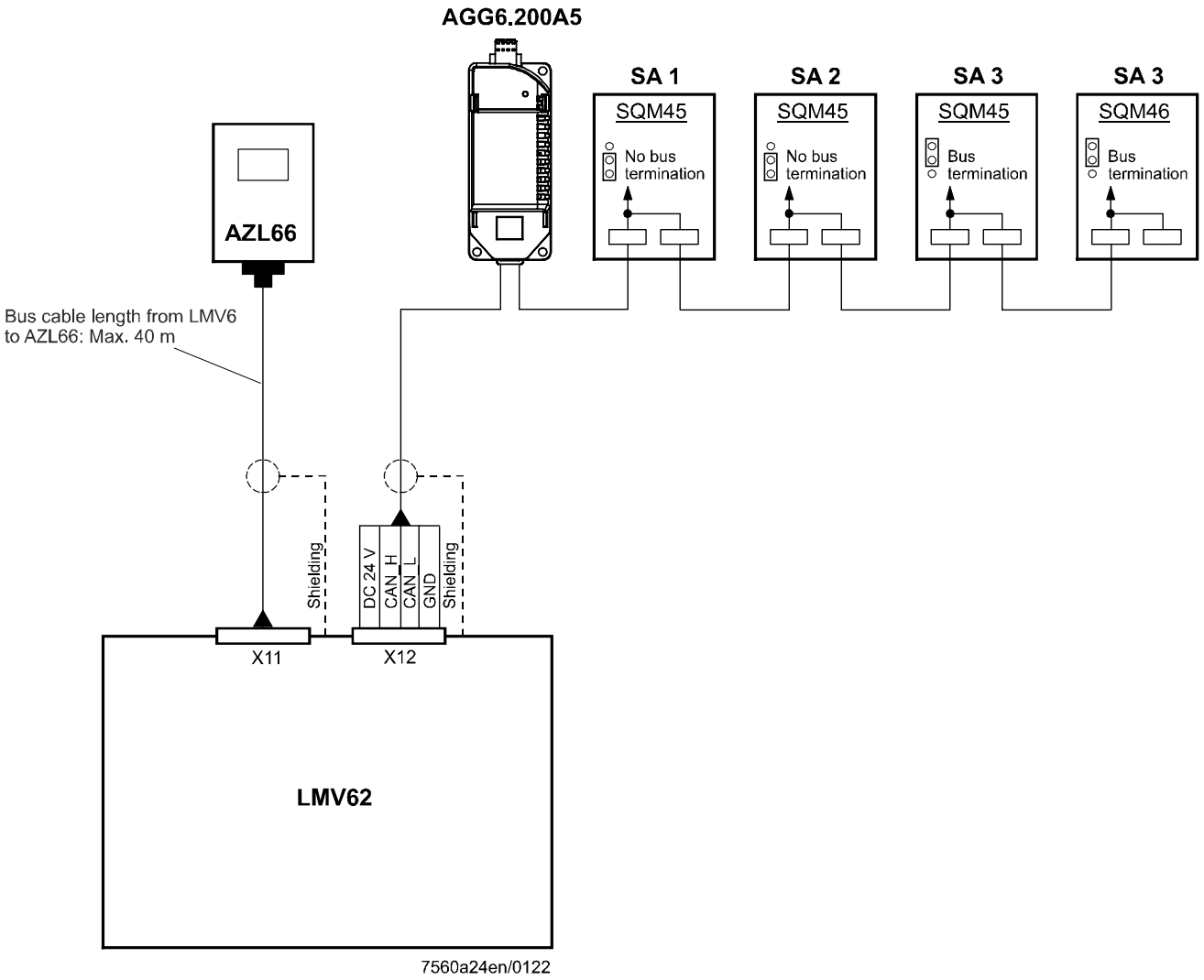


Figure 111: Installation of all components in the burner: CAN bus cable ‘LMV62 ↔ last SQM4’ ≤20 m

Note on example!
Total length of CAN bus cable ≤60 m

18.4 Example: ‘Operation with 2 actuators and O2 sensor’

Installation of all components in the burner: CAN bus cable ‘LMV62 ↔ last SQM4’ ≤20 m

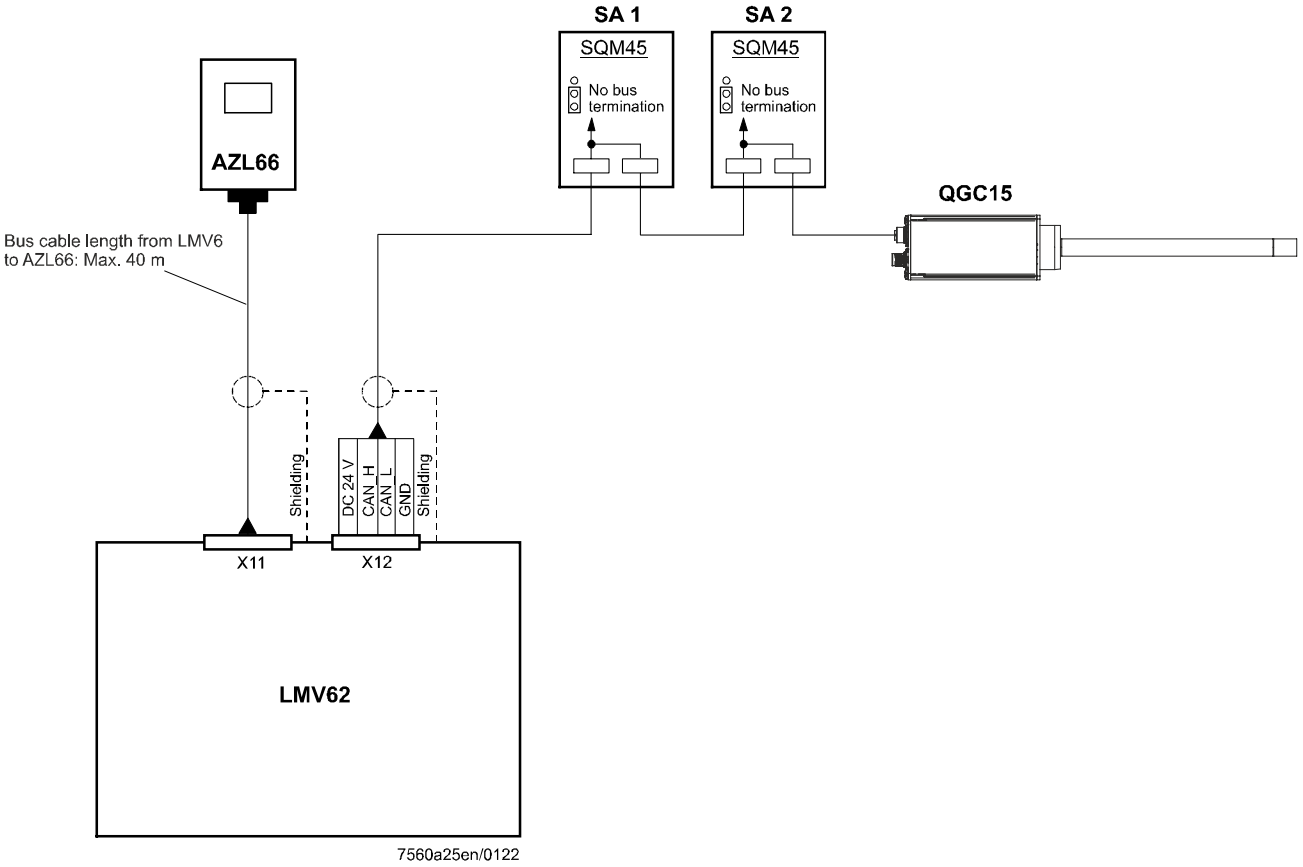


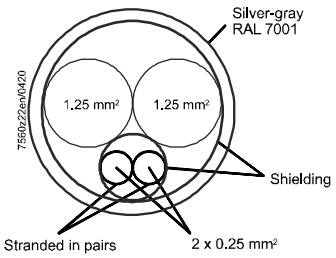
Figure 112: Installation of all components in the burner: CAN bus cable ‘LMV62 ↔ last SQM4’ ≤20 m

Note on example!
Total length of CAN bus cable ≤60 m

Warning!
Maximum permissible output currents!
When configuring the system, the maximum permissible output currents for the supply sources (LMV6x and AGG6.200A5) of 1.25 A, for example, must be observed. Overloading can result in the maximum permissible temperatures in the feed sources being exceeded.

18.5 Cable types

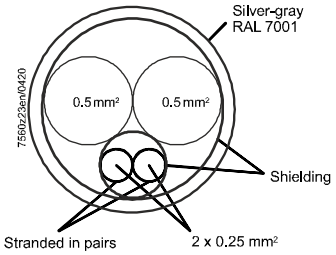
AGG6.641 (cable type 1) LMV6 ↔ system components



Connection	Color	Wire cross-section in mm²
24 V DC	White	1.25
CAN_H	Yellow	0.25
CAN_L	Green	0.25
GND	Brown	1.25

Figure 113: AGG6.641

AGG6.635 (cable type 2) LMV6 ↔ AZL66



Connection	Color	Wire cross-section in mm²
24 V DC	White	0.5
CAN_H	Yellow	0.25
CAN_L	Green	0.25
GND	Brown	0.5

Figure 114: AGG6.635

19 Operation, indication, diagnostics

19.1 Operation

The reset and diagnostics are performed via the AZL66.

For more information, refer to AZL66 User Manual U7562.

19.2 LMV6 operating display

If the LMV6 is live, the green signal lamp (LED) integrated into the LMV6 lights up. This applies to all operating statuses and fault statuses of the LMV6.

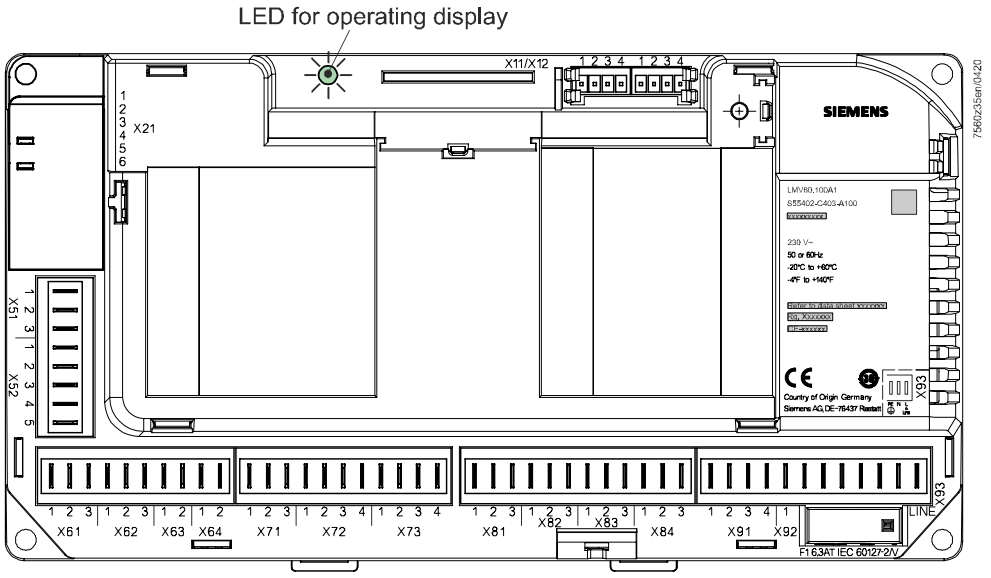


Figure 115: LED for operating display

19.3 Diagnostics of cause of error

The error code can be read from the AZL66. The error messages can be read from the AZL66 for information on the cause of the fault.

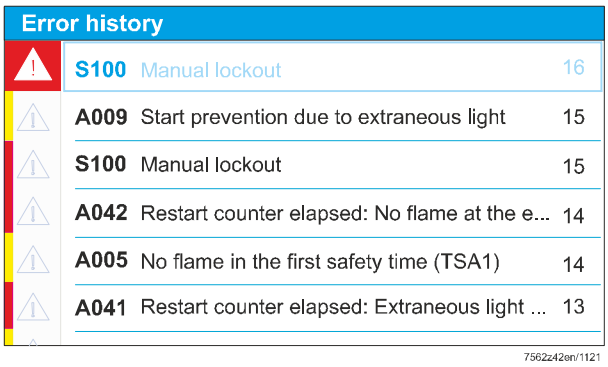


Figure 116: Example: “Error history”

Color code of the error or warning	Meaning
Yellow	Error or warning still active
Red	Error or warning still active
Gray	Error or warning no longer active

Error code	AZL66 display	
	Short text	Long text (recommended measures)
1009	Start prevention due to extraneous light	Check flame detector

Figure 117: Example: “Error codes”

20 Parameter list

Note!
Display dependent on LMV6 and the respective parameterization.

21 Error code list

Note!
Display dependent on LMV6 and the respective parameterization.

Warning!
Internal error!
In the event of internal errors, a safety check must be carried out following a reset.
Failure to observe this information poses a risk of the safety functions being impaired. Also refer to entries listed previously in the error history.

22 Unit history

Firmware version readable from "Main menu → Maintenance → 0201-0334 Factory identification"

- Current firmware version
  LMV60.110A2: V1.100
  LMV62.11xA2: V1.100
  AZL66: V1.100

23 Revision history

Software version V1.1

- The 'Pressure switch valve proving (P LT)' and 'Pressure switch-max (Pmax)' inputs have been switched.

Software version V1.100

LMV60
- Burner flange at terminal X71 pin 2 and pin 3
- Operating light at terminal X72 pin 2

LMV62
- Modbus at terminal X22
- Temperature sensor at terminal X24
- Variable speed drive (VSD) with speed feedback at terminal X46 and terminal X47
- Power supply for system components at terminal X31
- Analog input 4–20 mA and 0–10 V at terminal X32
- LMV62.110A2: Temperature of the flue gas recirculation (FGR) is triggered via a temperature sensor
- LMV62.111A2: Temperature of the flue gas recirculation (FGR) is compensated via a temperature sensor

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