SIEMENS

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Burner Management System

LMV5...

LMV51... **Burner control with integrated fuel / air ratio control and load control for forced draft burners.**

LMV52... **Burner control with integrated fuel / air ratio control and load control for forced draft burners including oxygen trim control.**

The LMV5... and this Data Sheet are intended for use by OEMs which integrate the burner management systems in their products!

Use

The LMV5... burner management system is a microprocessor-based unit with matching system components for the control and supervision of forced draft burners of medium to high capacity.

Warning notes

For additional safety notes, refer to the Basic Documentation of the LMV5... system (P7550)!

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

The LMV5... is a safety device! Do not open, interfere with or modify the unit. Siemens will not assume responsibility for any damage resulting from unauthorized interference!

- All activities (mounting, installation and service work, etc.) must be performed by qualified staff
- Before making any wiring changes in the connection area of the LMV5..., completely isolate the unit from the mains supply (all-polar disconnection)
- Ensure protection against electric shock hazard by providing adequate protection for the burner control's connection terminals
- Check to ensure that wiring is in an orderly state
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage

Mounting notes

- Ensure that the relevant national safety regulations are complied with

Installation notes

- Always run high-voltage ignition cables separately while observing the greatest possible distance to the unit and to other cables
- Do not mix up live and neutral conductors

Electrical connection of the flame detectors

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

- Never run the detector cable together with other cables
  – Line capacitance reduces the magnitude of the flame signal
  – Use a separate cable
- Observe the maximum permissible detector cable lengths
- The ionization probe is not protected against electric shock hazard. It is mains-powered and must be protected against accidental contact
- Locate the ignition electrode and the ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads)

Commissioning notes

- Prior to commissioning, check to ensure that wiring is in an orderly state and that the parameters have been correctly set

Standards and certificates

Conformity to EEC directives

- Electromagnetic compatibility EMC (immunity)	89 / 336 EEC
- Directive for gas appliances	90 / 396 EEC
- Low-voltage directive	73 / 23 EEC

ISO 9001: 2000
Cert. 00739

ISO 14001: 1996
Cert. 38233

	DIN	DVGW	VDE	TÜV CERT	SP	FM APPROVED		UL
LMV51.000B1	x	---	---	---	---	---	---	---
LMV51.000B2	x	x	x	x	---	---	---	---
LMV51.040B1	---	---	---	---	x	x	x	x
LMV51.100B1	x	---	---	---	---	---	---	---
LMV51.100B2	x	x	x	x	---	---	---	---
LMV51.140B1	---	---	---	---	x	x	x	x
LMV51.200A1	x	---	---	---	---	---	---	---
LMV51.200A2	x	x	---	x	---	---	---	---
LMV52.200A1	x	---	---	---	---	---	---	---
LMV52.200A2	x	x	---	x	---	---	---	---
LMV52.240A1	---	---	---	---	x	x	x	x
LMV52.240A2	---	---	---	---	---	---	---	---

Service notes

- Each time a unit has been replaced, check to ensure that wiring is in an orderly state
- **If fuses are blown, the unit must be returned to Siemens**

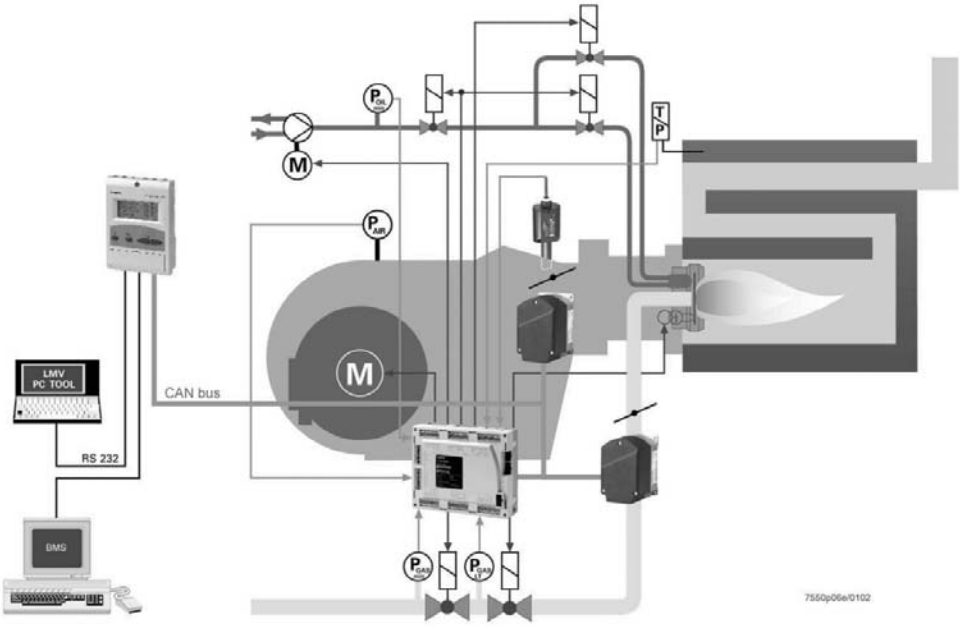
Disposal notes

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

The LMV5... is a microprocessor-based system with matching system components for the control and supervision of forced draft burners of medium to high capacity.

The following system components are integrated in the basic unit of the LMV5…:

- Burner control with gas valve proving system
- Electronic fuel / air ratio control in connection with a maximum of 4 actuators (LMV51...) or 6 actuators (LMV52...)
- Optional PID temperature / pressure controller (load controller)
- Optional variable speed drive module (VSD module)



Example:
Dual-fuel burner
- Gas: Modulating
- Oil: 2-stage

The system components (display and operating unit, actuators and O2 module) are interconnected via a CAN bus system. Communication between the bus users is ensured via a reliable, system-based data bus. All safety-related digital inputs and outputs of the system are continuously monitored by a contact feedback network (CFN). For flame supervision in connection with the LMV5... in continuous operation, the QRI infrared flame detector or an ionization probe is used and, in intermittent operation, the QRB... photoresistive flame detector.

The burner management system is operated and programmed with the help of the display and operating unit (AZL5...) or a PC. The AZL5... features clear-text display and menu-driven operation, thus offering straightforward operation and targeted diagnostics. To simplify diagnostics, the display shows operating states, the type of fault and the point in time the fault occurred. The different parameter setting levels for the burner / boiler manufacturer and the heating engineer are protected by passwords. Basic settings that the plant operator can make on site do not demand a password. Further, the display and operating unit serves as an interface to higher level systems such as building automation and control systems (BACS) or a PC which has the ACS450 software installed. Among other features, the unit affords convenient readout of settings and operating states, parameterization of the LMV5..., and trend logging.

When replacing the LMV5... basic unit (BU), all parameters can be saved in a backup memory of the AZL5… to be downloaded again when the new unit is installed. Hence, manual reprogramming is not required.

To develop specific fuel trains, the burner / boiler manufacturer can choose from a total of 7 valve families and – by making use of the large number of parameter setting choices (programming times, configuration of inputs and outputs, etc.) – fuel trains can be matched to individual needs.

The SQM4... actuators are driven by stepper motors and offer high-resolution positioning. The characteristics and settings of the actuators are defined by the LMV5... basic unit.

Type summary

Type reference	Mains voltage	Parameter set	Max. number of actuators	Integrated PID load controller	Control of VSD	O2 trim control	Safety time TSA max.	
							Gas	Oil
LMV51.000B1	AC 120 V	Europe	4	---	---	---	3 s	5 s
LMV51.000B2	AC 230 V	Europe	4	---	---	---	3 s	5 s
LMV51.040B1	AC 120 V	USA / Canada	4	---	---	---	10 s	15 s
LMV51.100B1	AC 120 V	Europe	4	x	---	---	3 s	5 s
LMV51.100B2	AC 230 V	Europe	4	x	---	---	3 s	5 s
LMV51.140B1	AC 120 V	USA / Canada	4	x	---	---	10 s	15 s
LMV51.200A1	AC 120 V	Europe	4 *)	x	x	---	3 s	5 s
LMV51.200A2	AC 230 V	Europe	4 *)	x	x	---	3 s	5 s
LMV52.200A1	AC 120 V	Europe	6	x	x	x	3 s	5 s
LMV52.200A2	AC 230 V	Europe	6	x	x	x	3 s	5 s
LMV52.240A1	AC 120 V	USA / Canada	6	x	x	x	10 s	15 s
LMV52.240A2	AC 230 V	USA / Canada	6	x	x	x	10 s	15 s

*) When the VSD module is activated, only 3 SQM4... actuators can be controlled!

Accessories

ACS450	PC tool for convenient programming and burner settings, process visualization, data logging, AZL5..., software update AZL5... (refer to Software Documentation J7550)
AGG5.110	CAN bus connection shield, angled, for connecting the CAN bus to the basic unit (refer to Basic Documentation P7550)
AGG5.220	Power transformer for CAN bus users with power characteristics tailored to the LMV5... (refer to Basic Documentation P7550)
AGG5.310	Accessory kit for acquisition of speed, for LMV51.2... and LMV52... systems, consisting of sensor disk (50 mm), sensor and mounting kit (refer to Mounting Instructions M7550.1)
AGG5.630	CAN bus connecting cable for connecting the basic unit to the AZL5... and for short distances to the SQM4..., shielded 5-core cable, 500 m (refer to Basic Documentation P7550)
AGG5.631	CAN bus connecting cable for connecting the basic unit to the AZL5... and for short distances to the SQM4..., shielded 5-core cable, 100 m (refer to Basic Documentation P7550)
AGG5.635	CAN bus connecting cable for connecting the basic unit to the AZL5..., complete with RAST3,5 connector and Sub-D, 3 m (refer to Basic Documentation P7550)
AGG5.640	CAN bus connecting cable for connecting the basic unit to the actuators or between actuators, shielded 5-core cable, 500 m (refer to Basic Documentation P7550)
AGG5.641	CAN bus connecting cable for connecting the basic unit to the actuators or between actuators, shielded 5-core cable, 100 m (refer to Basic Documentation P7550)
AGG5.720	Standard connector kit LMV51... for gas / oil applications with up to 3 actuators, standard connector kit LMV52... for gas / oil applications with up to 5 actuators (refer to Basic Documentation P7550)
AGG5.721	Extension connector kit LMV5... (in addition to the AGG5.720, all connector variants are covered) (refer to Basic Documentation P7550)
AGO20...	Flue gas collector, accessory item for the QGO20... oxygen sensor for use with LMV52... systems (refer to Data Sheet N7842)
AZL51...	Display and operating unit, detached for flush panel mounting with text display, 4 x 16 characters, 4 buttons, real time clock and bus interface for LMV51... system (refer to User Documentation A7550)
AZL52...	Display and operating unit, detached for flush panel mounting with text display, 4 x 16 characters, 4 buttons, real time clock and bus interface for LMV5... system (refer to User Documentation A7550)

KF8893	Demo case for LMV5... system incl. LMV51.100A2, AZL51.00A1, 2 x SQM45.295A9, and AGG5.220, operating buttons for simulation, electronic simulation of controlled system, burner graphics and LEDs (refer to Operating Instructions B7988)
PLL52.110A100	CAN but module for O2 trim control with LMV52..., AC 120 V, for QGO20..., inputs for flue gas and combustion air temperature, US standard parameter set (refer to Basic Documentation P7550)
PLL52.110A200	CAN bus module for O2 trim control with LMV52..., AC 230 V, for QGO20..., inputs for flue gas and combustion air temperature (refer to Basic Documentation P7550)
QGO20...	Oxygen sensor for LMV52... systems (refer to Data Sheet N7842)
QRI2A2...	Infrared flame detector, universal detector for oil or gas flames, suited for intermittent or continuous operation, with integrated flame signal amplifier and prefabricated connecting cable 180 cm, **frontal illumination** (refer to Data Sheet N7719)
QRI2B2...	Infrared flame detector, universal detector for oil or gas flames, suited for intermittent or continuous operation, with integrated flame signal amplifier and prefabricated connecting cable 180 cm, **lateral illumination** (refer to Data Sheet N7719)
FGT-PT1000	Flue gas temperature sensor for acquiring the flue gas temperature in heating plant (refer to Data Sheet N1846)
SQM45.291A9	Actuator, nominal torque 3 Nm (reduced holding torque 1.5 Nm), running time 10...120 s, control and feedback via CAN bus, stepper motor, front mounting, groove for Woodruff key (refer to Data Sheet N7814)
SQM45.295A9	Actuator, nominal torque 3 Nm (reduced holding torque 1.5 Nm), running time 10...120 s, control and feedback via CAN bus, stepper motor, front mounting, D-shaft (refer to Data Sheet N7814)
SQM48.497A9	Actuator, nominal torque 20 Nm, running time 30...120 s, control and feedback via CAN bus, stepper motor, front mounting, groove for parallel key (refer to Data Sheet N7814)
SQM48.697A9	Actuator, nominal torque 35 Nm, running time 60...120 s, control and feedback via CAN bus, stepper motor, front mounting, groove for parallel key (refer to Data Sheet N7814)

Technical data

LMV5... basic unit

Mains voltage	AC 230 V -15 % / +10 %
Transformer AGG5.220	AC 230 V
- Primary side	AC 12 V
- Secondary side	2 x AC 12 V
Mains frequency	50...60 Hz ±6 %
Power consumption	< 30 W (typically)
Safety class	I, with parts according to II and III to DIN EN 60 730-1
Terminal loading «Inputs»	
• Perm. mains primary fuse (externally)	max. 16 AT
• Unit fuse F1 (internally)	6.3 AT (DIN EN 60 127 2 / 5)
• Mains supply: Input current depending on the operating state of the unit	
Undervoltage	
• Safety shutdown from operating position at mains voltage	< AC 186 V
• Restart on rise in mains voltage	> AC 188 V
Oil pump / magnetic clutch	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	2 A
• Power factor	cosφ > 0.4
LP test valve	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	0.5 A
• Power factor	cosφ > 0.4
Status inputs (KRN): Status inputs (with the exception of the safety loop) of the contact feedback network (CFN) are used for system supervision and require mains-related input voltage	
• Input safety loop	refer to «Terminal loading outputs»
• Input currents and input voltages	
- UeMax	
- UeMin	UN +10 %
- IeMax	UN -15 %
- IeMin	1.5 mA peak
	0.7 mA peak
• Contact material recommendation for external signal sources (LP, DWmin, DWmax, etc.)	gold-plated silver contacts
• Transition / settling behavior / bounce	
- Perm. bounce time of contacts when switching on / off	max. 50 ms (after the bounce time, the contact must stay closed or open)
• UN	AC 230 V
• Voltage detection	
- On	AC 180...253 V
- Off	< AC 80 V
Terminal loading «Outputs»	
Total contact loading:	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Unit input current (safety loop) from:	max. 5 A
- Fan motor contactor	
- Ignition transformer	
- Valves	
- Oil pump / magnetic clutch	

Individual contact loading:

Fan motor contactor	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	1 A
• Power factor	cosφ > 0.4
Alarm output	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	1 A
• Power factor	cosφ > 0.4
Ignition transformer	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	2 A
• Power factor	cosφ > 0.2
Gas valves	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	2 A
• Power factor	cosφ > 0.4
Oil valves	
• Nominal voltage	AC 230 V +10 % / -15 %, 50...60 Hz
• Nominal current	1 A
• Power factor	cosφ > 0.4
Cable lengths	
• Mains line	max. 100 m (100 pF / m)
• HCFN line	max. 100 m (100 pF / m) [1)]
• Analog line	max. 100 m (100 pF / m)
• Flame detector	refer to Data Sheets N7714, N7719
• CAN bus	total lengths max. 100 m

[1)] If the cable length exceeds 50 m, additional loads must not be connected to the status inputs

Above a certain cable length, the actuators must be powered by a separate power transformer installed near the actuators.

Cross-sectional areas

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

Min. cross-sectional area	0.75 mm² (single- or multi-core to VDE 0100)

Cable insulation must meet the relevant temperature requirements and environmental conditions.
The CAN (bus) cables have been specified by Siemens and can be ordered as accessory items.
Other cables must not be used. If this is not observed, the EMC characteristics of the LMV5... system cannot be predicted!

Fuses used in the LMV5... basic unit	
- F1	6.3 ATDIN EN 60 127 2 / 5
- F2	4 AT DIN EN 60 127 2 / 5
- F3	4 AT DIN EN 60 127 2 / 5

AZL5... operating and display unit

Operating voltage	AC 24 V -15 % / +10 %
Power consumption	< 5 W (typically)
Degree of protection of housing	
- Rear	IP 00 to IEC 529
- Front	IP 54 to IEC 529 when installed
Safety class	I, with parts according to II and III to DIN EN 60 730-1

Battery:

Supplier	**type reference**
VARTA	CR 2430 (LF-1 / 2 W)
DURACELL	DL 2430
SANYO ELECTRIC, Osaka / Japan	CR 2430 (LF-1 / 2 W)
RENATA AG, Itingen / CH	CR 2430

PLL52...

Mains voltage «X89-01»	AC 230 V –15 % / +10 %
Safety class	I, with parts according to II to DIN EN 60 730-1
Transformer AGG5.220	
- Primary side	AC 230 V
- Secondary side	AC 12 V (2x)
Mains frequency	50...60 Hz ±6 %
Power consumption	approx. 4 VA
Degree of protection	IP 54, housing closed

Cable lengths / cross-sectional areas:

• Electrical connection «X89»	screw terminals up to 2.5 mm²
• Cable lengths	≤ 10 m to QGO20...
• Cross-sectional areas	refer to RPO... / QGO... description, twisted pairs

Analog inputs:

• Supply air temperature sensor	Pt1000 / LG-Ni1000
• Flue gas temperature sensor	Pt1000 / LG-Ni1000
• QGO20...	refer to Data Sheet N7842
• Interface	communication bus for LMV52...

CAN bus

Cable types:	
AGG5.640 / 641	8 mm dia. ±0.2 mm bending radius 120 mm ambient temperature -30...+70 °C (no movements of cable) cable is resistant to almost all types of mineral oil
AGG5.630 / 631	7.5 mm dia. ±0.2 mm bending radius 113 mm ambient temperature -30...+70 °C (no movements of cable) cable is resistant to almost all types of mineral oil

Environmental conditions
(all LMV5... system components)

Storage	DIN EN 60 721-3-1
Climatic conditions	class 1K3
Mechanical conditions	class 1M2
Temperature range	-20...+60 °C
Humidity	< 95 % r.h.
Transport	DIN EN 60 721-3-2
Climatic conditions	class 2K2
Mechanical conditions	class 2M2
Temperature range	-30...+60 °C
Humidity	< 95 % r.h.
Operation	DIN EN 60 721-3-3
Climatic conditions	class 3K3
Mechanical conditions	class 3M3
Temperature range	-20...+60 °C
Humidity	< 95 % r.h.

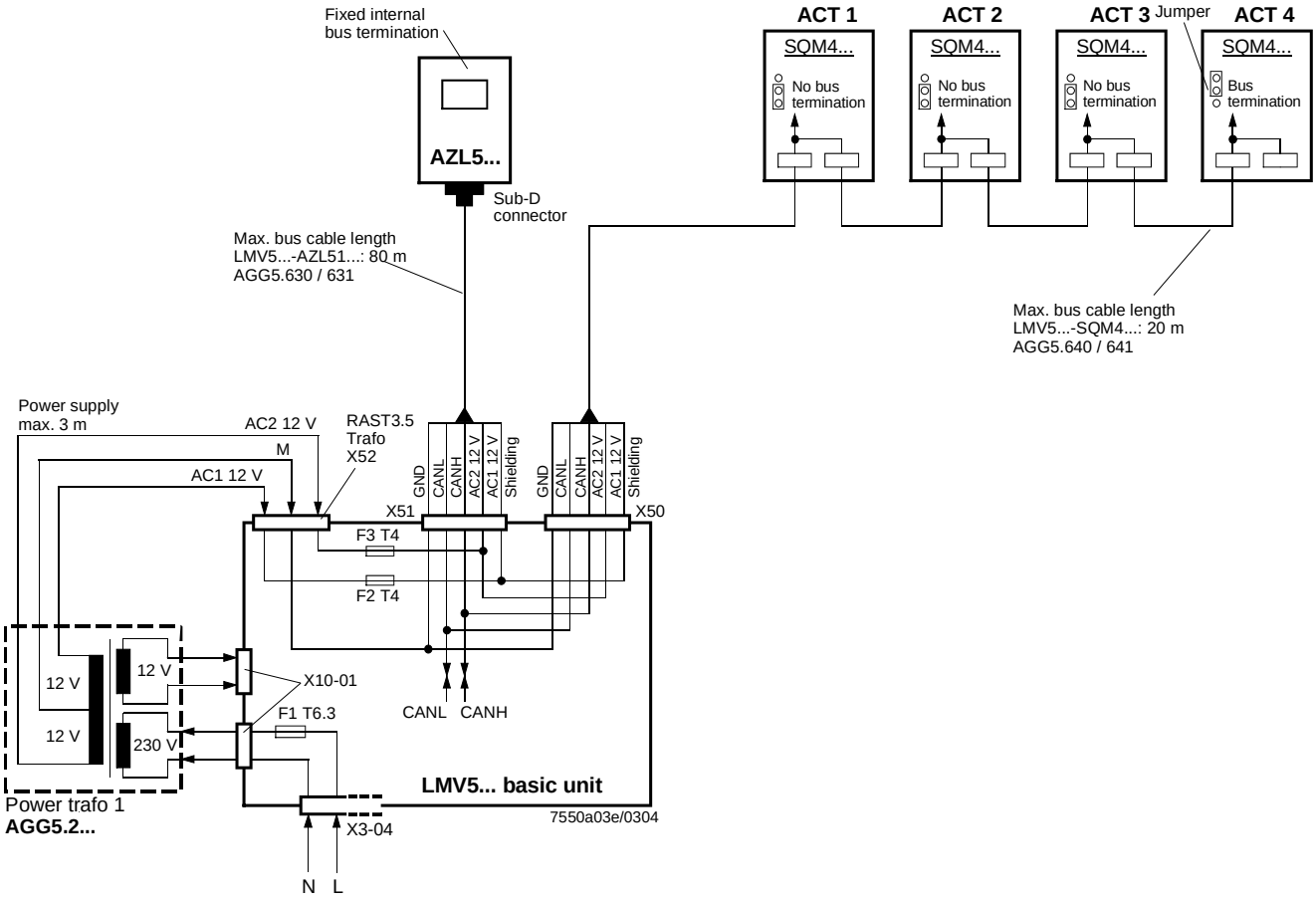
⚠ **Condensation, formation of ice and ingress of water are not permitted!**

Power supply for LMV5... system

Basically, the CAN bus topology always has a line structure and, therefore, has a start and an end node. The individual CAN bus users are connected in series, whereby the respective end nodes are terminated by CAN bus terminating resistors. The basic unit is a component of the communication line and looped in between the display and operating unit and the actuators. In this arrangement, the display and operating unit always assumes the function of a CAN bus end node. The required CAN bus terminating resistor is already integrated in that case. With the actuators, the last user becomes the CAN bus end node (in this case, the internal CAN bus termination must be activated via a connecting plug). The other node users within the line structure are to be configured without terminating resistor.

Example 1

Installation of all components in the burner:
CAN bus cable «LMV5... ↔ SA» < 20 m



Note

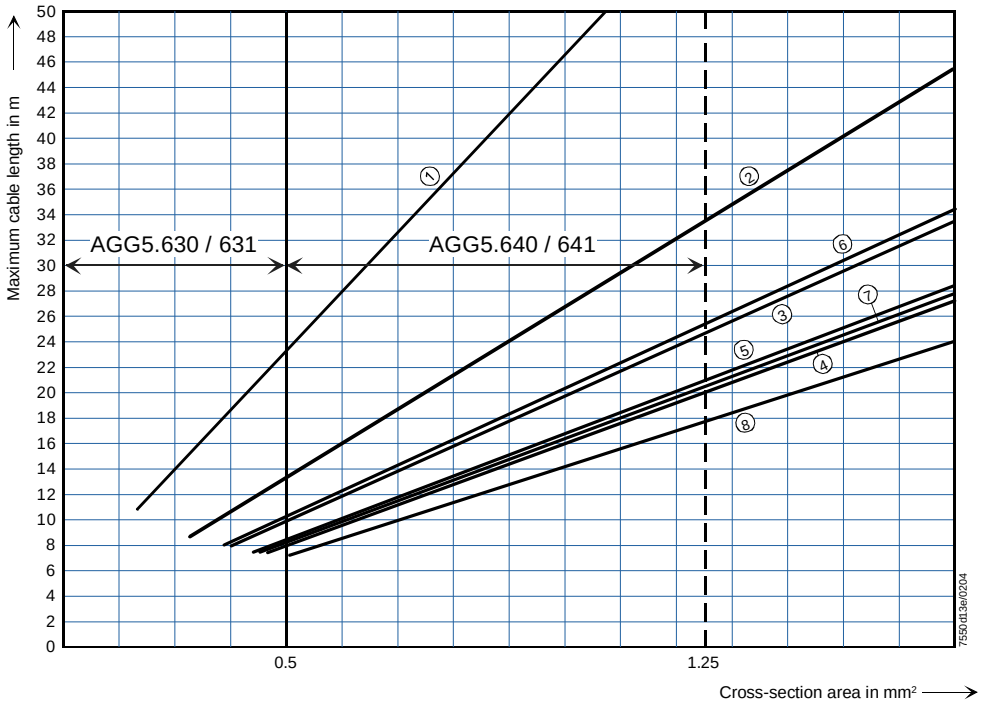
Total CAN bus cable length ≤ 100 m

For more application examples, refer to the Basic Documentation P7550!

Function

Determination of the maximum cable length

The maximum cable length between power transformer and CAN bus users is dependent on the type of cable (cross-sectional area), the number of actuators and the type of actuator used (supply current). The charts below can be used to determine the maximum CAN bus cable lengths between the transformer and the group of actuators or display and operating unit, depending on the relevant influencing factors. The assumption is made here that the actuators within the group are close to one another. The **minimum** cross-sectional area for the system examples shown results from the start of the curve. The **maximum** cable length for the specified system cables AGG5.640 and AGG5.630 result from the points of intersection with the curves in the chart.



AGG5.630 / 631 (cable type 2)
AGG5.640 / 641 (cable type 1)

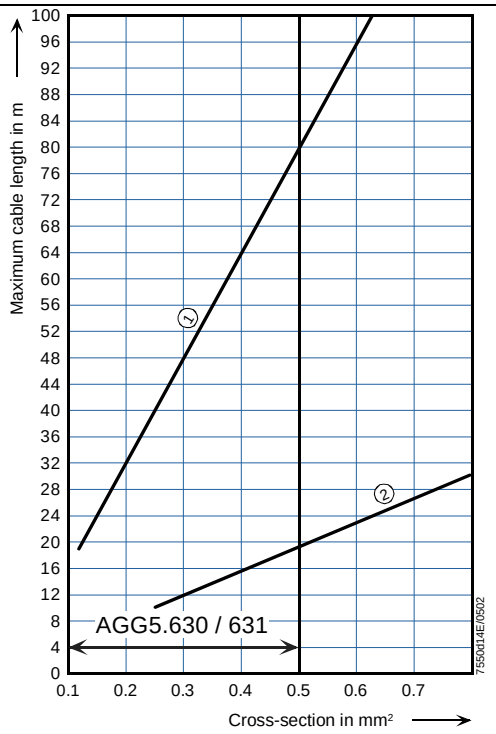
①	1 x SQM45	⑤	2 x SQM48
②	2 x SQM45	⑥	1 x SQM45 + 1 x SQM48
③	3 x SQM45	⑦	2 x SQM45 + 1 x SQM48
④	4 x SQM45	⑧	3 x SQM45 + 1 x SQM48

CAN bus connection between power transformer and actuator group

When using a PLL52..., the maximum permissible cable length of a network is to be reduced by 2 m.

Example:
- System cable: AGG5.640 (connecting cable to the actuators)
- Actuators: 2 x SQM45

The point of intersection of the vertical line for the AGG5.640 (1.25 mm^2) and curve ① (2 x SQM45...) gives a maximum cable length of 33.4 m between the power transformer and the group of actuators. The minimum cross-sectional area in this case is 0.33 mm^2.

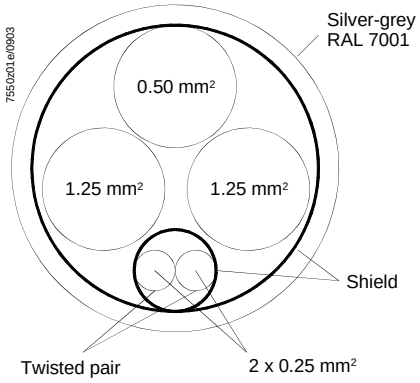


AGG5.630 / 631 (cable type 2)
① 1 x AZL
② 1 x AZL + 1 x SQM45

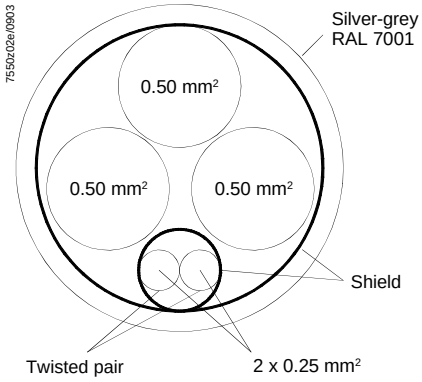
CAN bus connection between power transformer and AZL5... display and operating unit

Cable types

AGG5.640 / 641 (cable type 1) LMV5… ↔ SA



AGG5.630 / 631 (cable type 2) LMV5… ↔ AZL5...



Function of communication interfaces of AZL5...

The AZL5... is equipped with 3 different interfaces (connection facilities):

- Interface for LMV5... basic unit: CAN bus including power supply for AZL5... (Sub-D connector X70)
- Interface for PC / laptop: RS-232 (Sub-D connector X71)
  COM1 port for PC, for parameterization and visualization by means of PC tool software
- Interface RS-232 for building automation (RJ45 connector X72)
  COM2 port for building automation via external bus interface

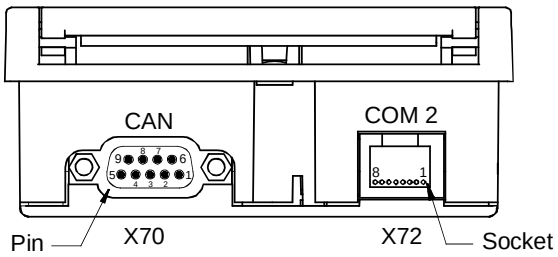
Note

COM1 and COM2 **cannot** simultaneously be active!

Assignment of terminals on AZL5…

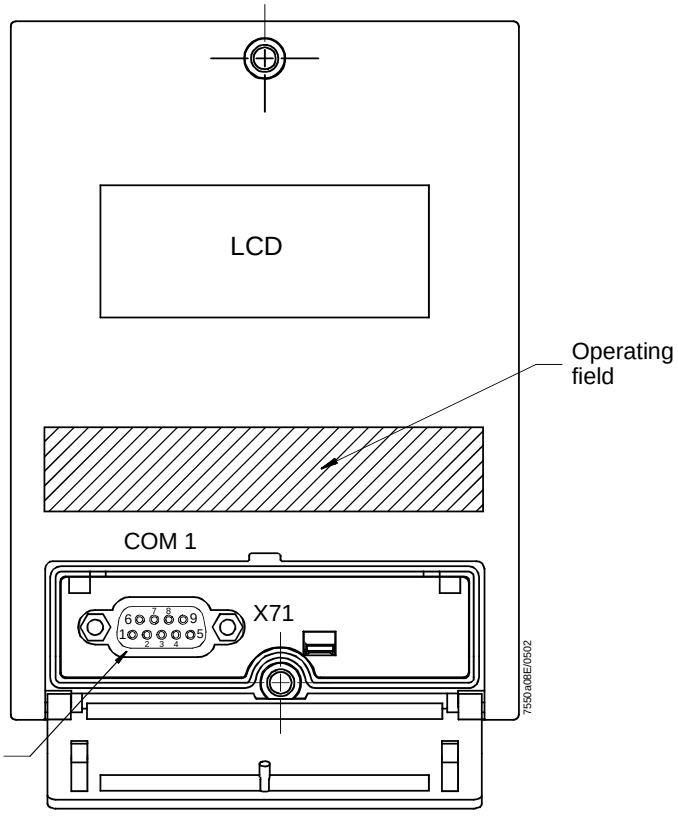
CAN X70

PIN	
2	CAN L
3	GND
4	VAC 2
7	CAN H
8	VAC 1



COM2 X72

PIN	
1	TXD
3	RXD
4, 6	GND
5	U 1
7	U 2



COM1 X71

PIN	
2	RXD
3	TXD
5	GND

Unknown pins = not connected

Connection to higher level systems

Communication to a building automation and control system takes place via data connection through an external bus interface with galvanic separation connected to the COM2 port of the AZL5... Depending on the configuration of the AZL5..., this port can be used to serve either Modbus or eBus.

Modbus

When using this bus protocol, the AZL5... operates as a slave. The transmission mode employed is the RTU Modbus (Remote Terminal Unit). For detailed information, refer to document «AZL5... Modbus A7550». Standardized coupling software is available on request.

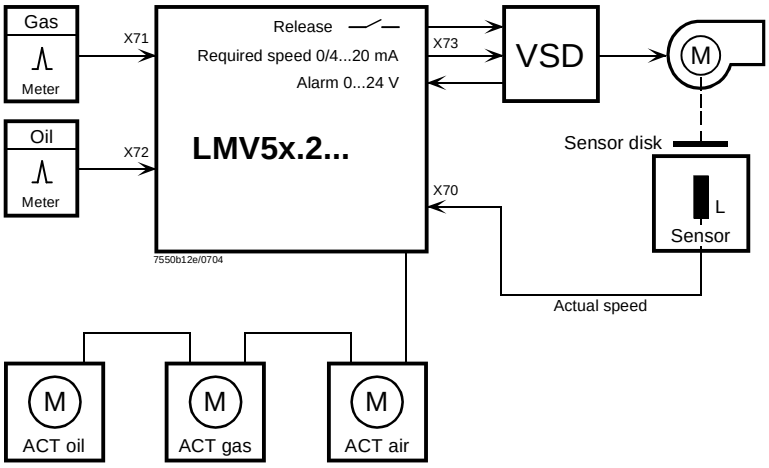
Function of variable speed drive (only for use with LMV5x.2... and AZL52.XXB)

General

The VSD module is an extension to the LMV5... and is used for the control of a variable speed drive that ensures safety-related supervision of the fan speed.
2 fuel meters (oil and gas) can be connected as an option.

A variable speed drive can be connected to the VSD module integrated in the LMV5x.2… The variable speed drive is controlled via an analog current output and a potential-free release contact. Evaluation of the alarm feedback signal from the variable speed drive is accomplished with a 0…24 V input. When activated, the LMV5.x2… will enter the safety phase. Both motor speed and direction of rotation are acquired by an inductive sensor. In addition, the asymmetric speed signal is checked for direction of rotation and plausibility.

Basic diagram



The auxiliary actuator can be parameterized on the basic unit, depending on the type of fuel.

Speed feedback signal

The motor's speed can be acquired with different types of sensors. To detect the motor's direction of rotation with a sensor, a sensor disk with angular steps of 60°, 120° and 180° is used. The sensor disk generates pulse intervals of 3 different lengths.

The acquisition of speed is safety-related!

We recommend to use the AGG5.310 accessory kit.

For more detailed information about the AGG5.310, refer to the Basic Documentation P7550 or Mounting Instructions M7550!

Fuel meter

To acquire the amount of fuel consumed, up to 2 fuel meters can be connected. Assignment to the type of fuel is fixed. To adapt the system to different types of fuel meters, assignment of the number of pulses and the resulting fuel throughput must be parameterized.

Fuel meter input	Type of sensor:	inductive sensor to DIN 19234 (Namur) or open collector (pnp) with $U_{CE\text{-}sat}$ < 4 V, U_{CEmin} > DC 15 V or Reed contact
	Frequency:	≤ 300 Hz
	Pulses / l or gal, m^3:	≤ 9999.9999 (to be parameterized)
	Pulses / ft^3:	≤ 999.99999 (to be parameterized)
	Power supply:	DC 10 V, max. 15 mA
	Switching current:	> 10 mA

Configuration of interface

The variable speed drive is controlled via a current interface, which can be switched between 0...20 mA and 4...20 mA.

Note

If the variable speed drive requires a DC 0...10 V input signal, a resistor of 500 Ω ±1 % must be connected to its input in parallel.

EMC

LMV5... system → Variable speed drive

Both functional and EMC tests of the LMV5... system were conducted and successfully completed with the following types of variable speed drives:

Siemens: - SED2-1.5 / 35 B
Danfoss: - VT2807

In operation, variable speed drives produce electromagnetic interference.

For this reason – to ensure EMC of the entire system – the instructions given by the manufacturers must be observed:

Siemens: - Operating Instructions
→ EMC-compatible installation
Danfoss: - Technical Brochure → Radio Interference Suppression Filters
- Data Sheet of Danfoss EMC filter for long motor cables

When using other types of variable speed drives, compliance with EMC regulations and correct functioning are not ensured!

Function of LMV52... with O2 trim control

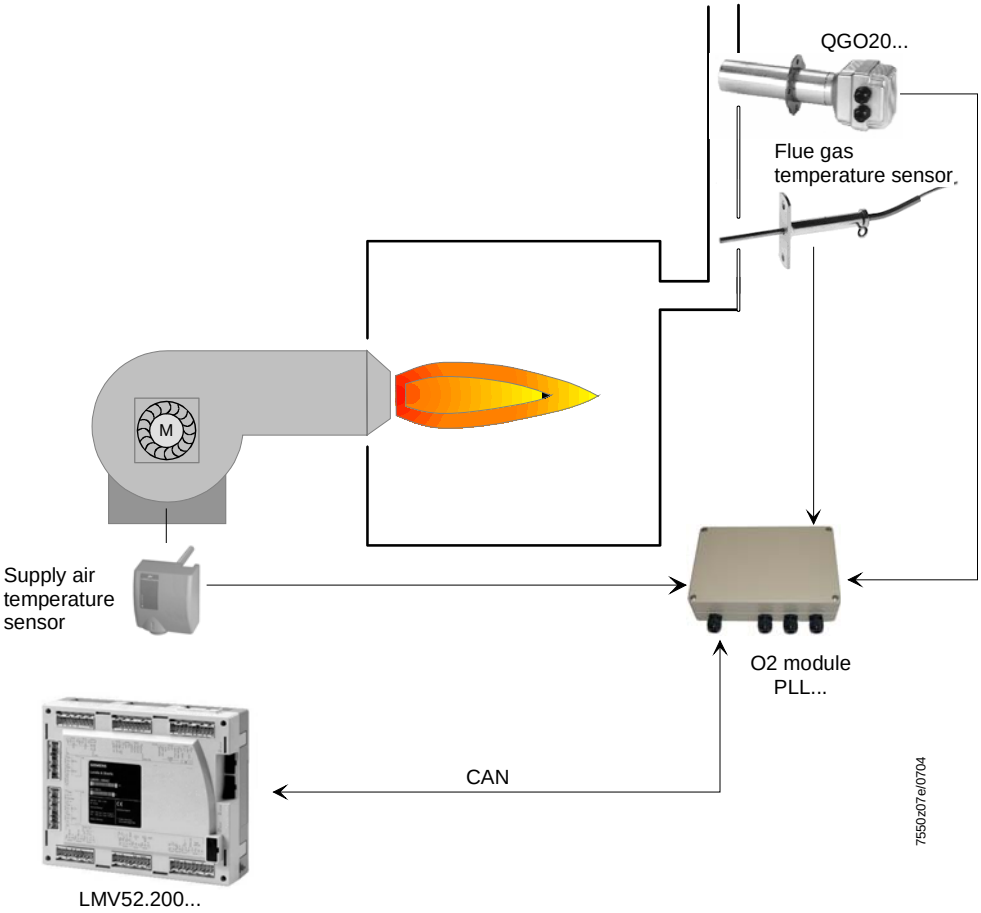
General

The LMV52... system is an extended LMV51... system. A special feature of the LMV52… is control of the residual oxygen content to increase the boiler's efficiency.

In addition to the features of the LMV51..., the LMV52... provides O2 trim control, control of a maximum of 6 actuators, control of a variable speed drive, and acquisition of cumulated fuel consumption and current fuel throughput. The LMV52... system uses an O2 sensor (QGO20...), an external O2 module, and the standard components of the LMV51... system.

The PLL... O2 module is a detached measuring module for use with the QGO20... sensor with a connection facility for 2 temperature sensors (Pt1000 / LG-Ni 1000). With the help of the temperature sensors (flue gas and combustion air temperature), the combustion performance can be determined, depending on the type of fuel. The module communicates via CAN bus with the LMV52... basic unit. The O2 module is to be located near the QGO... (< 10 m) to keep the impact on sensitive sensor lines as low as possible. To power the sensor heating element, the O2 module requires its own mains connection.

The fuel meters must be connected directly to the fuel-related inputs of the basic unit. On the AZL5... display and operating unit, the individual consumption values can be read out and the meter readings can be reset.



O2 trim control
O2 trim controller /
O2 monitor

The O2 trim controller or O2 monitor can be deactivated or activated in various operating modes by setting a parameter.

The ratio curves must always be adjusted such that there are sufficient amounts of excess O2 available, irrespective of environmental conditions!

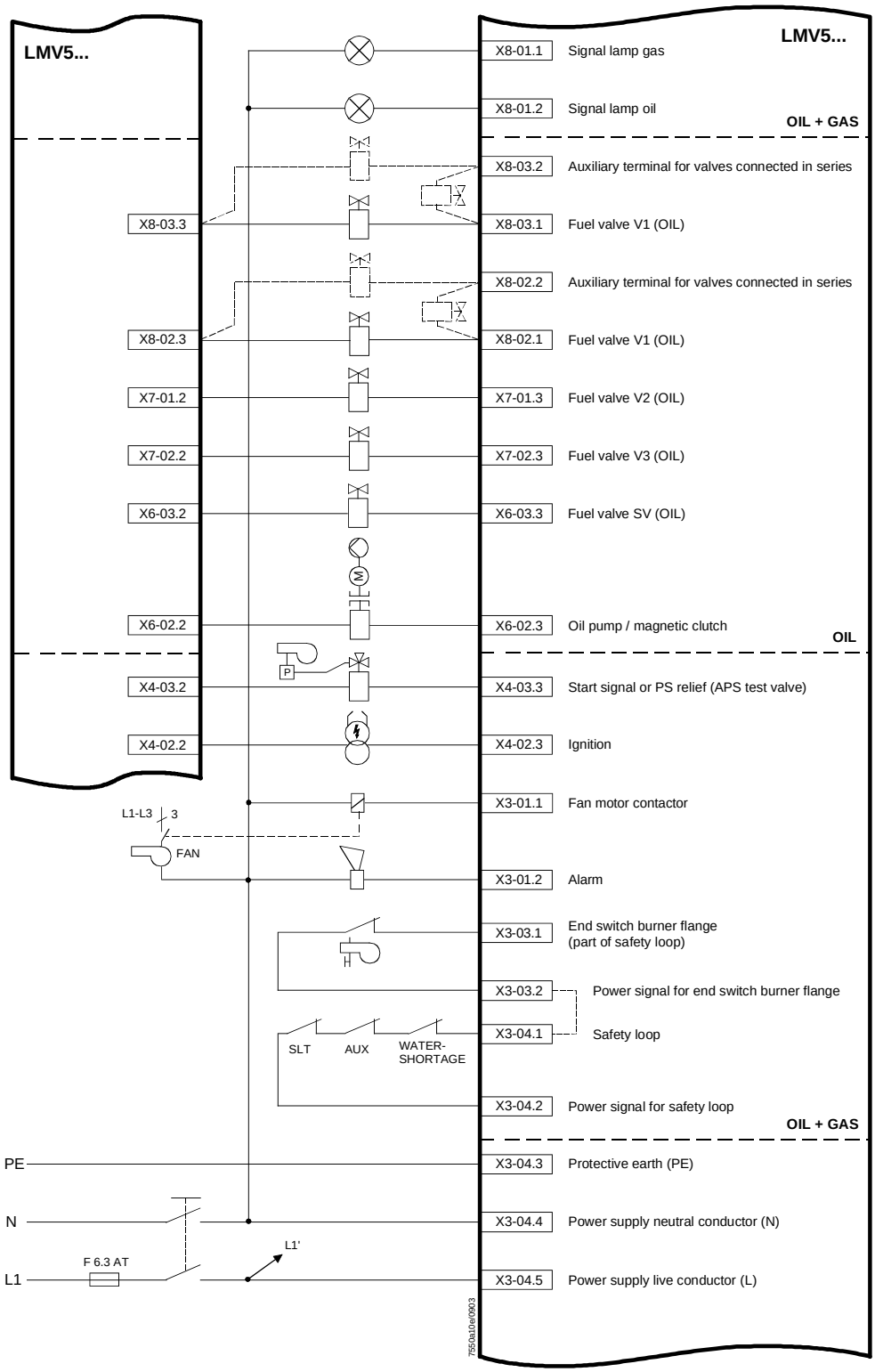
Parameter:	*O2 Ctrl/Guard (man deact / O2-guard/ O2-control / conAutoDeac / auto deact)*
man deact	Both the O2 trim controller and the O2 monitor are deactivated. The system operates along the parameterized ratio curves.
O2-guard	Only the O2 monitor is active. Prior to startup, the O2 sensor must have reached its operating temperature. If not, startup will be prevented. If the O2 monitor responds, or if an error occurs in connection with O2 measurement, the O2 module or O2 sensor, safety shutdown will take place, followed by a repetition if possible, otherwise lockout.
O2-control	Both the O2 trim controller and the O2 monitor are active. Prior to startup, the O2 sensor must have reached its operating temperature. If not, startup will be prevented. If the O2 monitor responds, or if an error occurs in connection with O2 measurement, the O2 module or O2 sensor, safety shutdown will take place, followed by a repetition if possible, otherwise lockout.
conAutoDeac	Both the O2 trim controller and the O2 monitor are active (option «automatic deactivation»). Startup takes place before the O2 sensor has reached its operating temperature. O2 trim control in operation is activated only when the operating temperature is reached and the sensor test has been successfully completed. If the O2 monitor responds, or if an error occurs in connection with O2 measurement, the O2 module, the O2 sensor or the sensor test, both the O2 trim controller and the O2 monitor will automatically be deactivated. The system operates along the parameterized ratio curves and this parameter will be set to *auto deact*. The AZL5... indicates automatic deactivation. The error code is maintained until O2 trim control is manually deactivated or activated.
auto deact	O2 trim control has automatically been deactivated and the system operates along the parameterized ratio curves (do not select this system parameter). To deactivate the O2 trim controller / O2 monitor, use parameter setting «man deact».

Auxiliary function

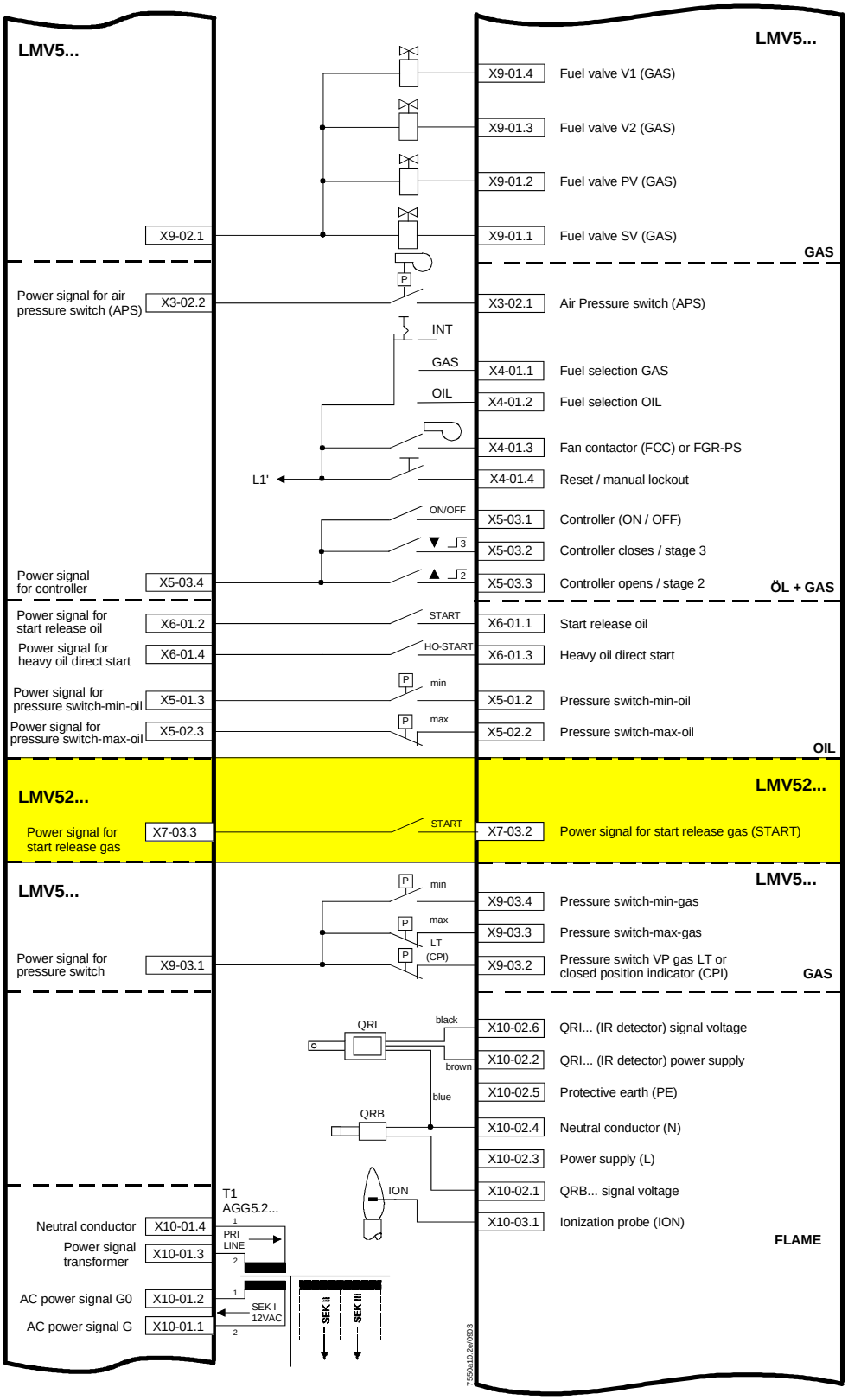
Warning when flue gas temperature exceeds a certain level.

If a flue gas temperature sensor is connected and activated, a warning signal will be delivered when a preset flue gas temperature is exceeded. High flue gas temperatures are an indication of higher boiler losses ⇒ Boiler should be cleaned. The warning threshold can be set separately for firing on gas and oil.

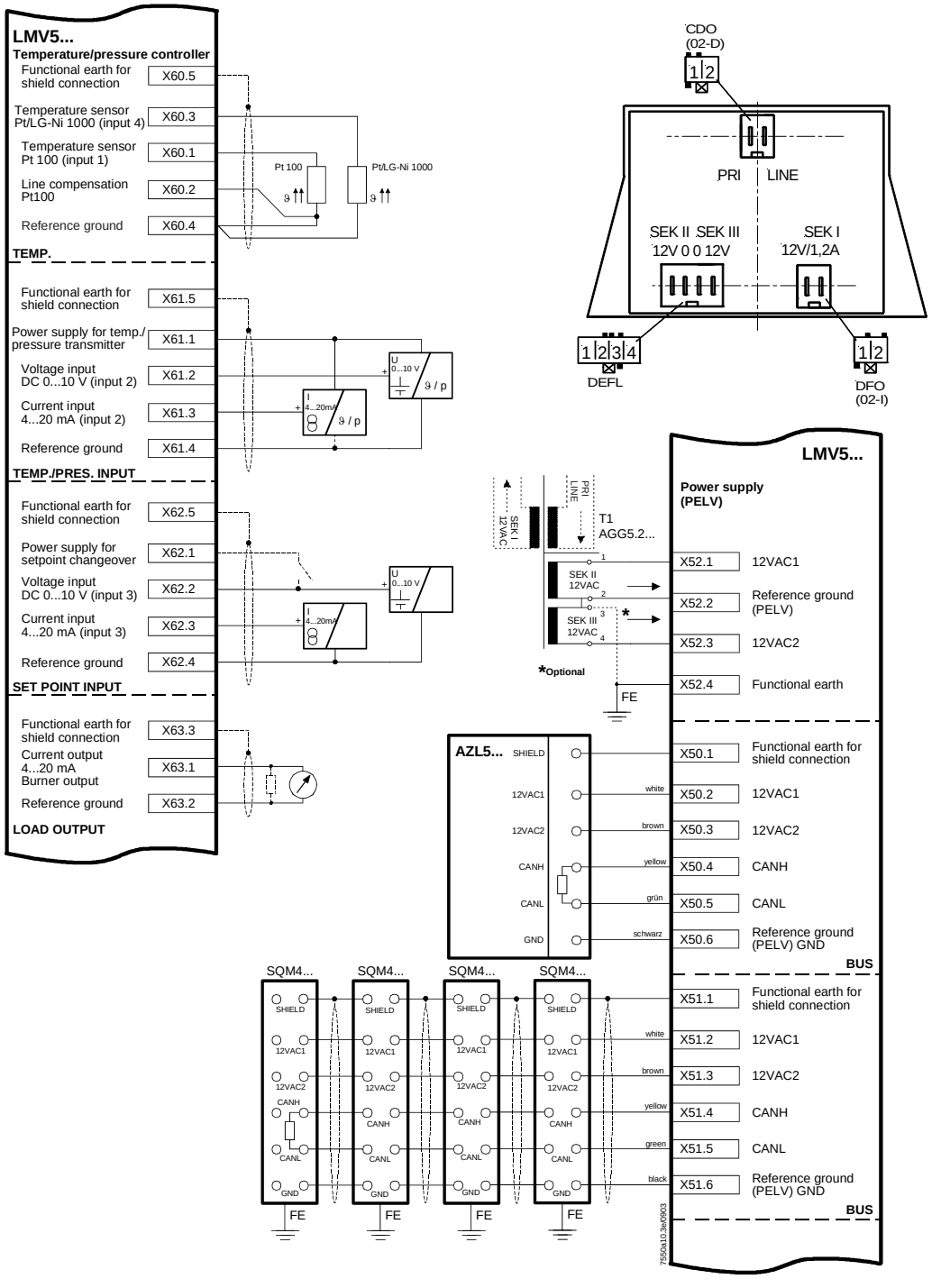
Block diagram inputs / outputs



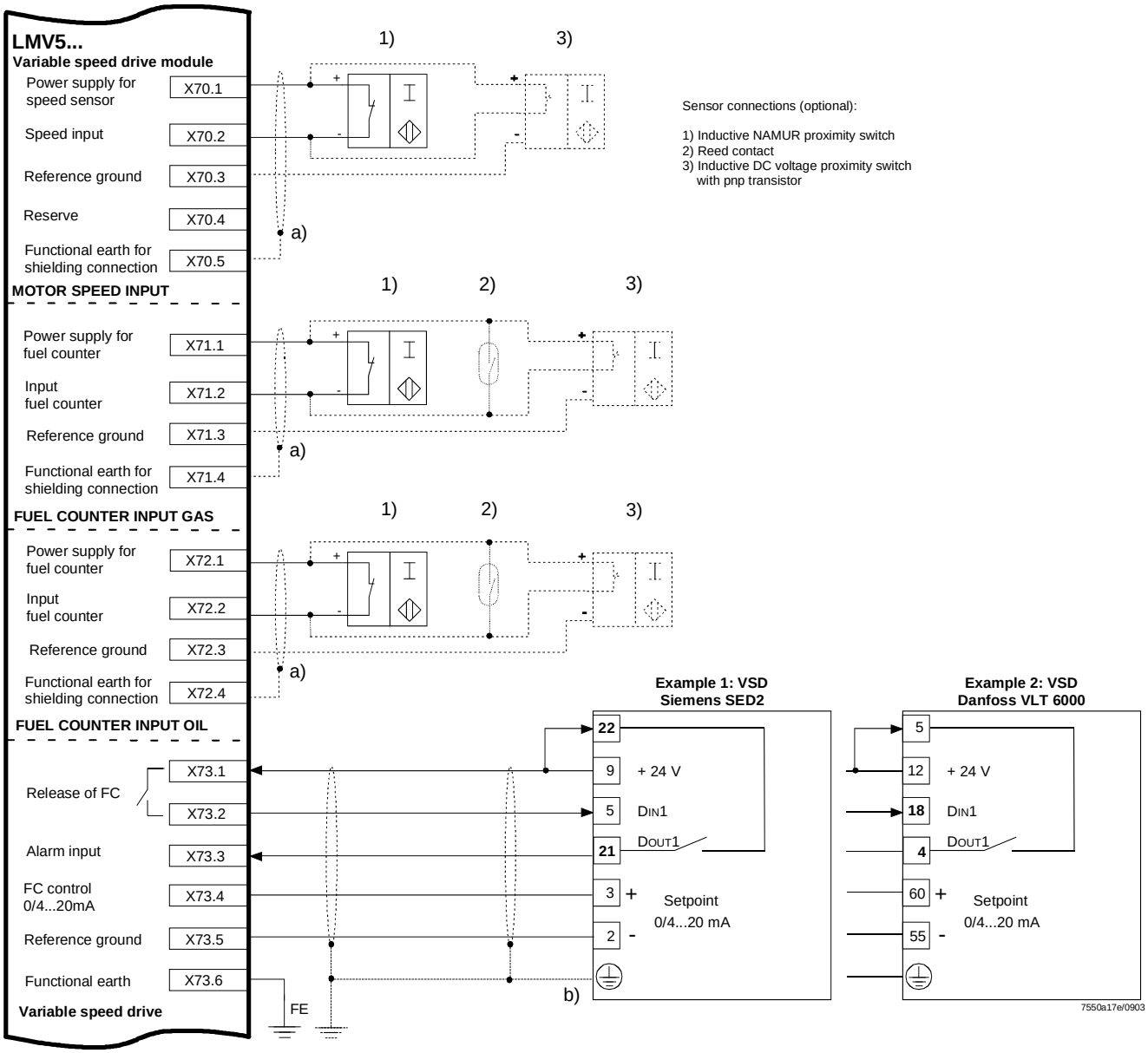
Block diagram
inputs / outputs
(cont'd)



Block diagram
inputs / outputs
(cont'd)



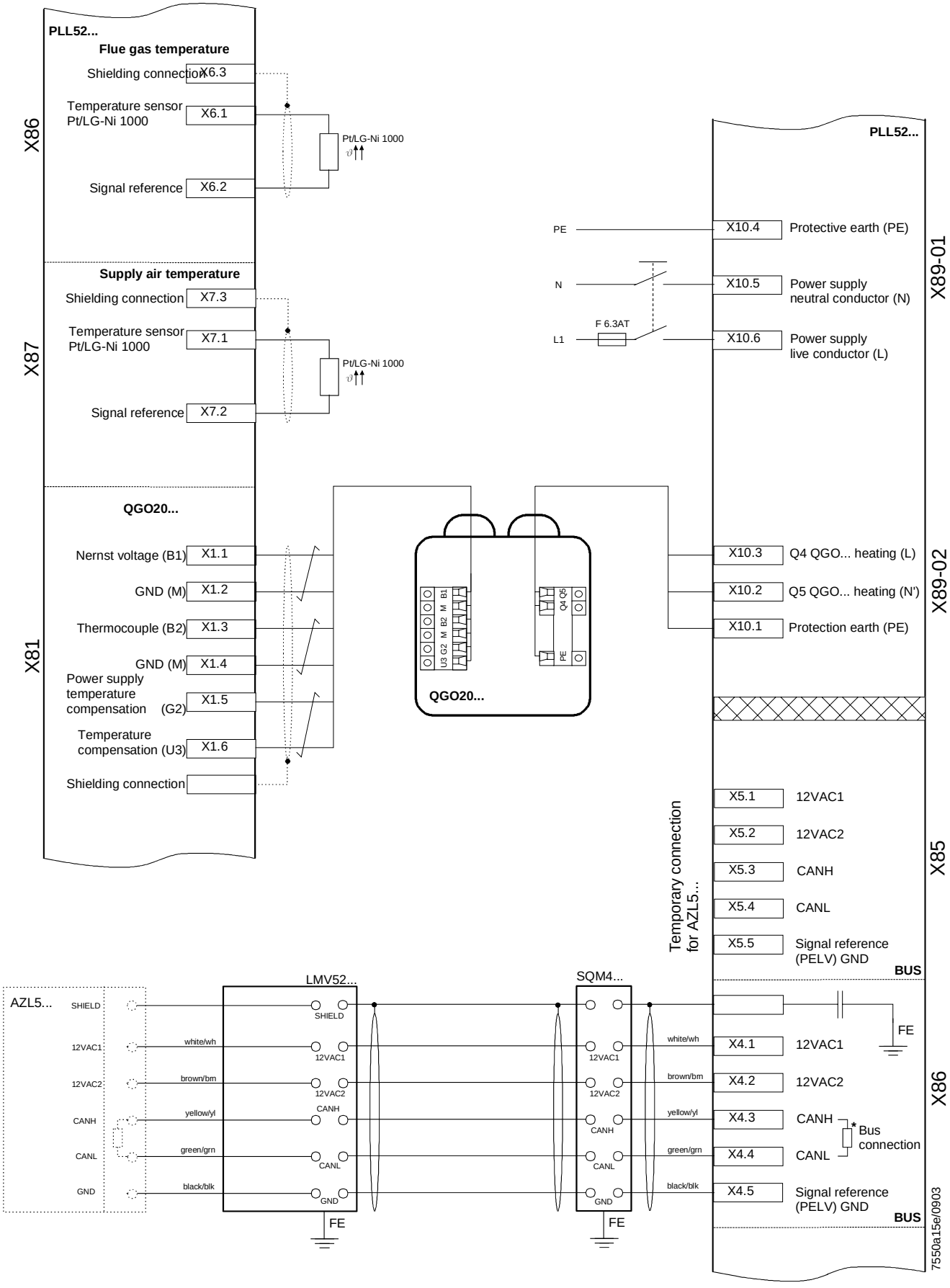
Connection terminals



Shielding:

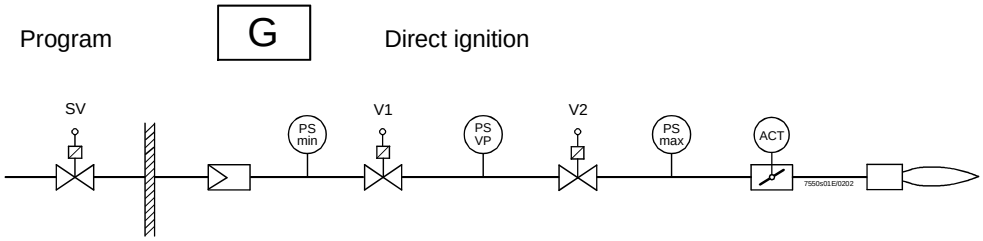
a) + b)	Optional shield connection for rough environmental conditions
b)	For shielding the cables on the variable speed drive, refer to the following pieces of documentation: • Siemens SED2 VSD Commissioning Instructions (CM1G5192), chapters 4 and 7, or • Danfoss Operating Instructions VLT 6000 (MG60A703), chapter «Installation»

Terminal markings

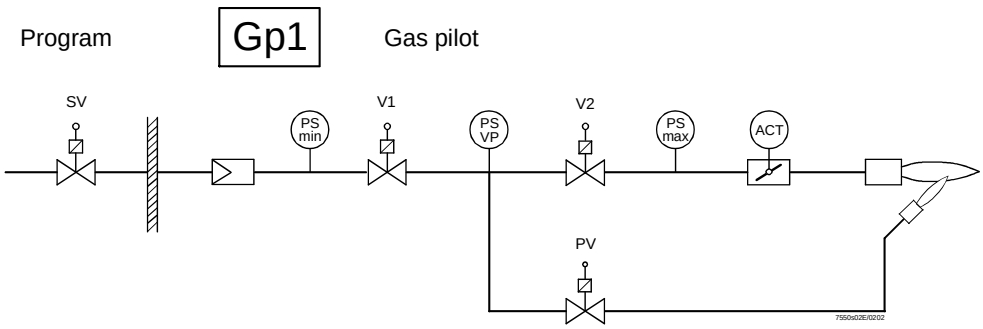


Fuel train applications (examples)

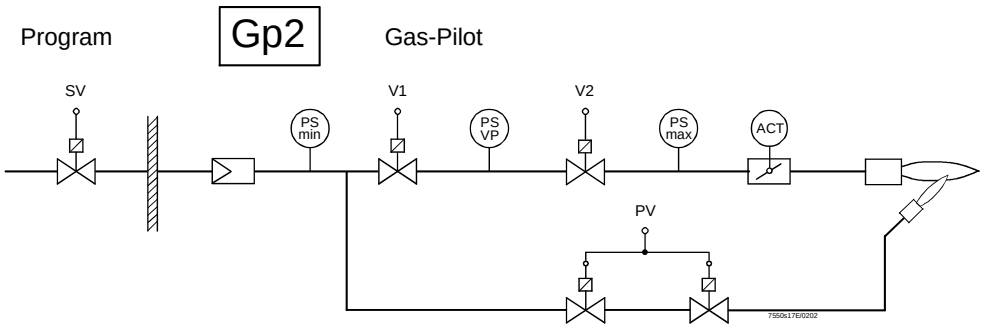
Direct gas ignition



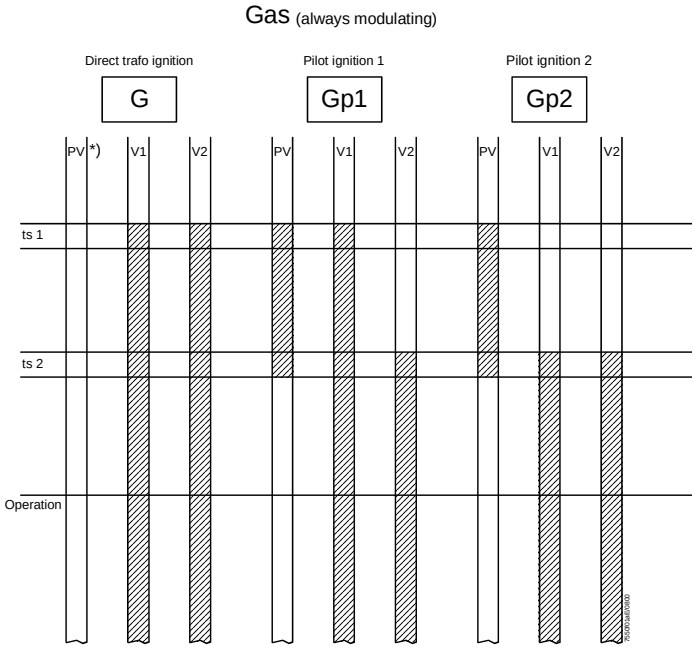
Gas pilot ignition 1



Gas pilot ignition 2



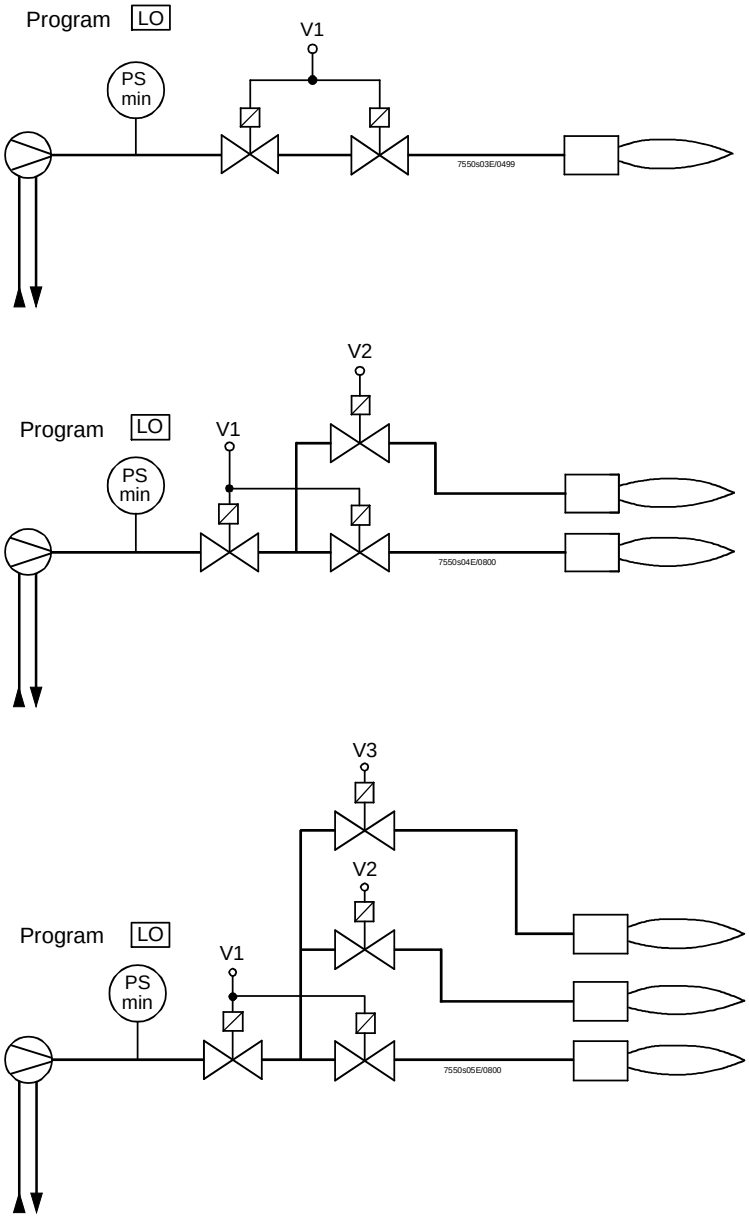
Fuel valve control program



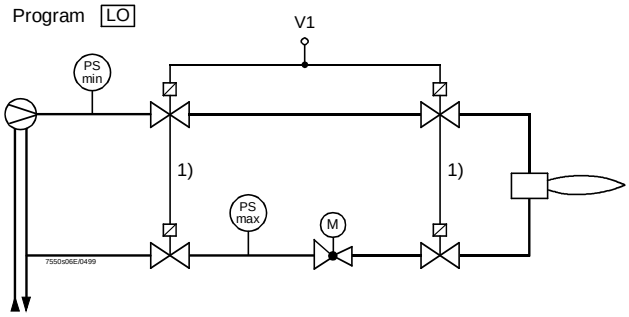
Legend to fuel trains:

*)	Not used
1)	Series connection of two 115 V-valves (each requiring approx. 25 VA control power)
2)	Preheating device
V	Fuel valve
DK	Gas valve proving
DW	Pressure switch
HE	Heating element
HO	Heavy oil
LO	Light oil
SA	Actuator
No	**Normally Open**
SV	Shutoff valve (outside the building)
PV	Pilot valve

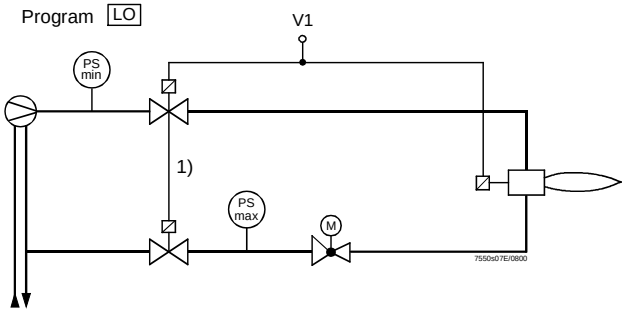
Direct ignition with light oil, multistage



Direct ignition with light oil, modulating



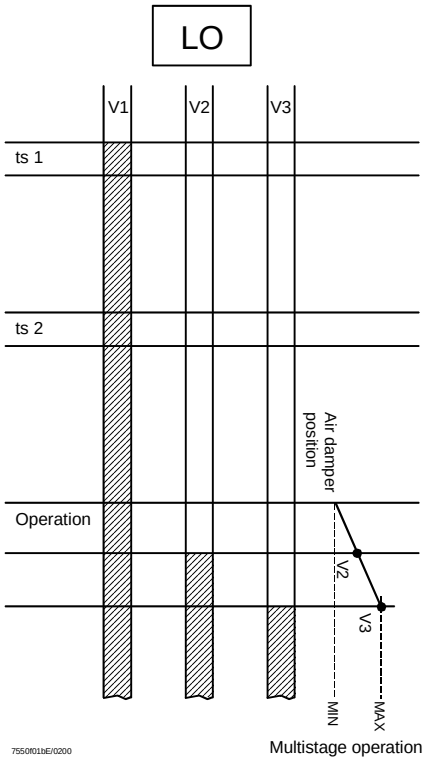
Modulating burner (without shutdown facility for adjustable head)



Modulating burner (with shutdown facility for adjustable head)

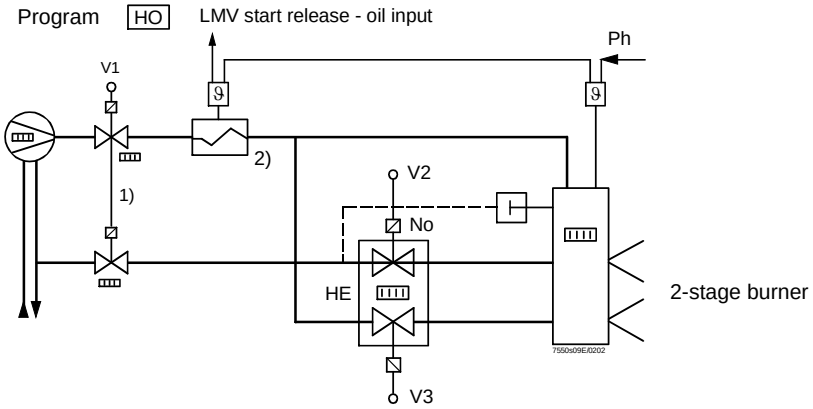
Fuel valve control program

Light oil (direct trafo ignition)

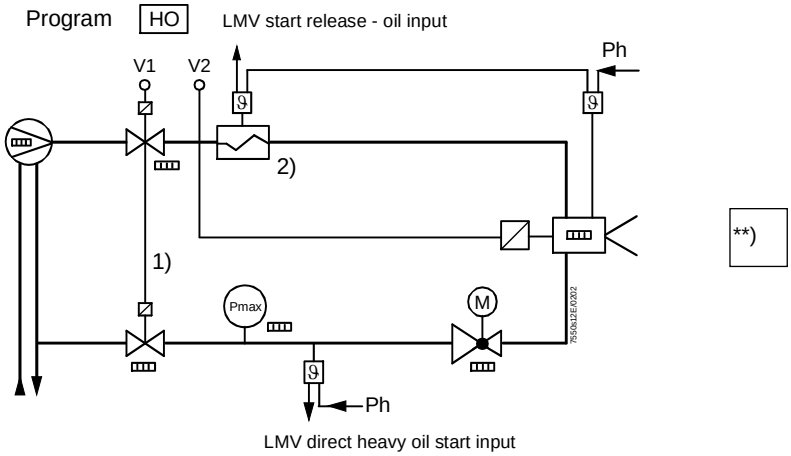


Multistage operation

Direct ignition with heavy oil, multistage

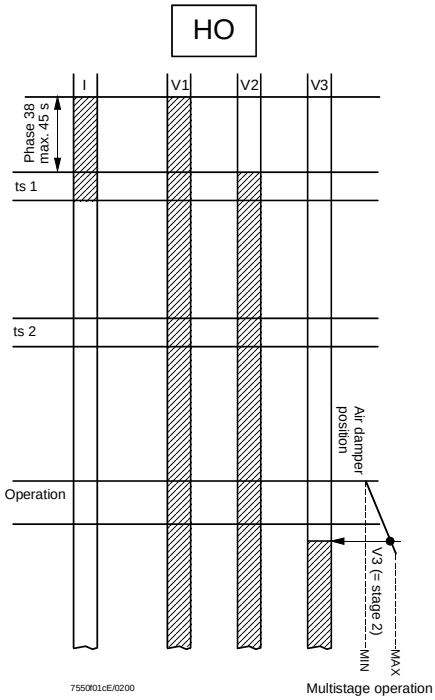


Direct ignition with heavy oil, modulating



Fuel valve control program

Heavy oil (direct trafo ignition)



) **Modulating burner

Circulation from Phase 38, max. 45 s as soon as direct heavy oil start = ON in phase 40

Direct heavy oil start= OFF at the end of Phase 38
→ Repetition (max. 3 times in total)

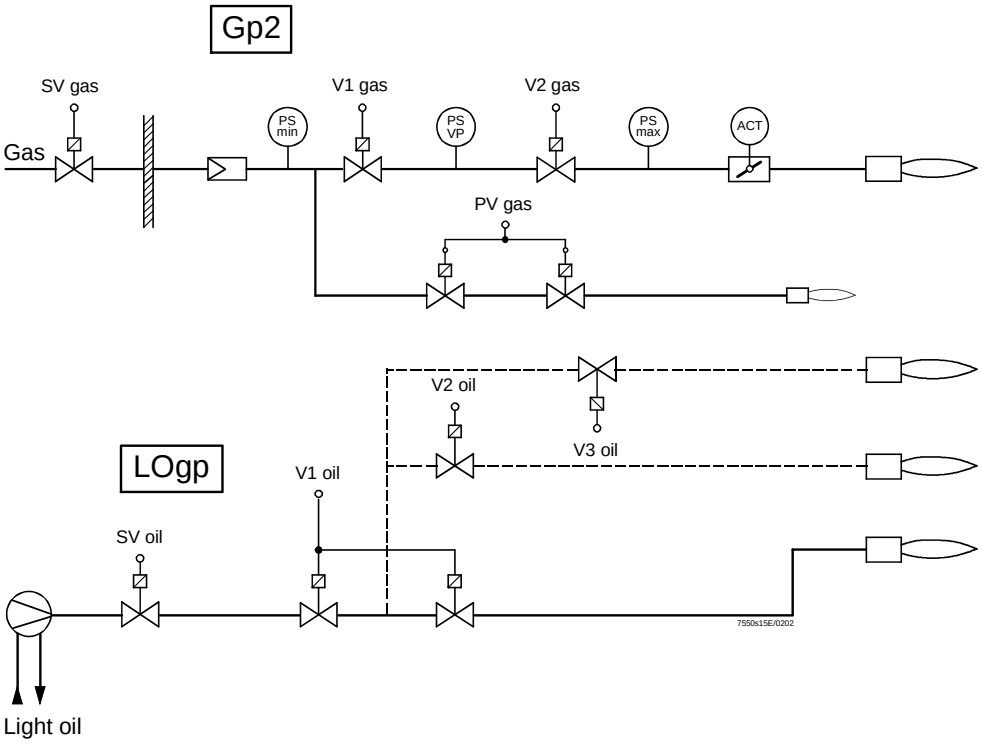
Note on dual-fuel burners

Gas trains **G**, **Gp1** and **Gp2** [1] can be randomly combined with oil trains **LO** and **HO** for operation with dual-fuel burners since these fuel trains operate independently.

Oil trains **LOgp** and **HOgp** are designed for ignition with a gas pilot. They must **always** be combined with a special gas train **Gp2** for operation with a dual-fuel burner.

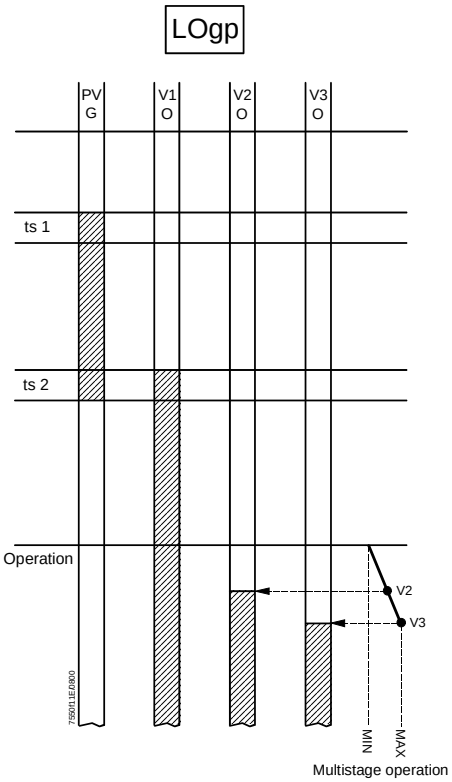
[1] With **Gp2** permitted with HW 01.C0, SW V01.40 or higher.

Dual-fuel burner gas / light oil with gas pilot ignition

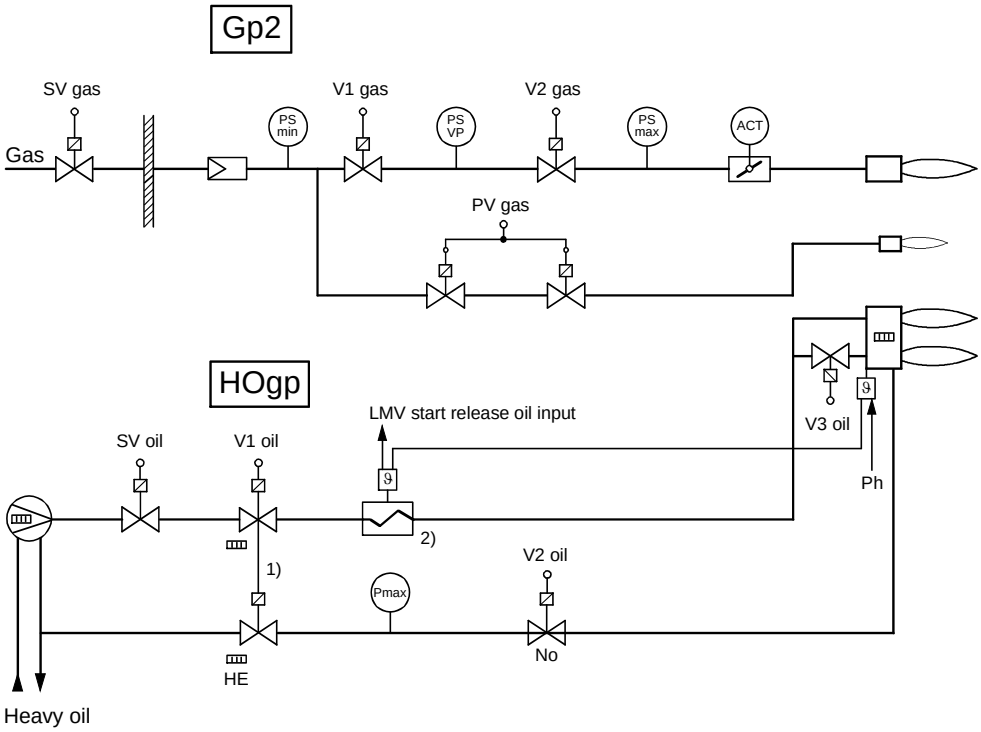


Fuel valve control program

Light oil (with gas pilot ignition)

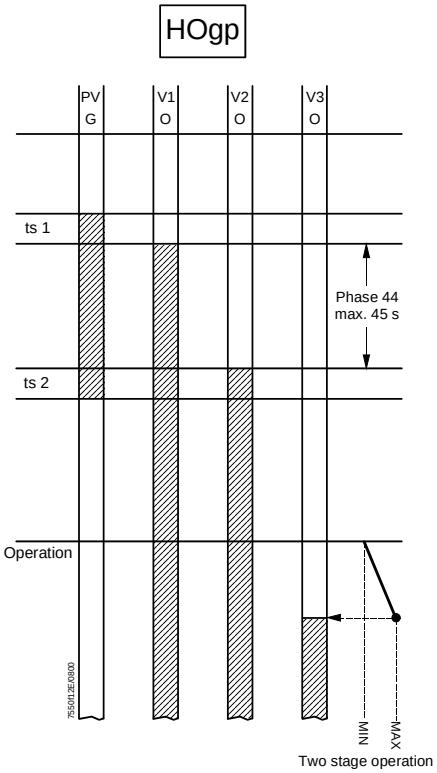


Dual-fuel burner gas / heavy oil with gas pilot ignition



Fuel valve control program

Heavy oil (with gas pilot ignition)



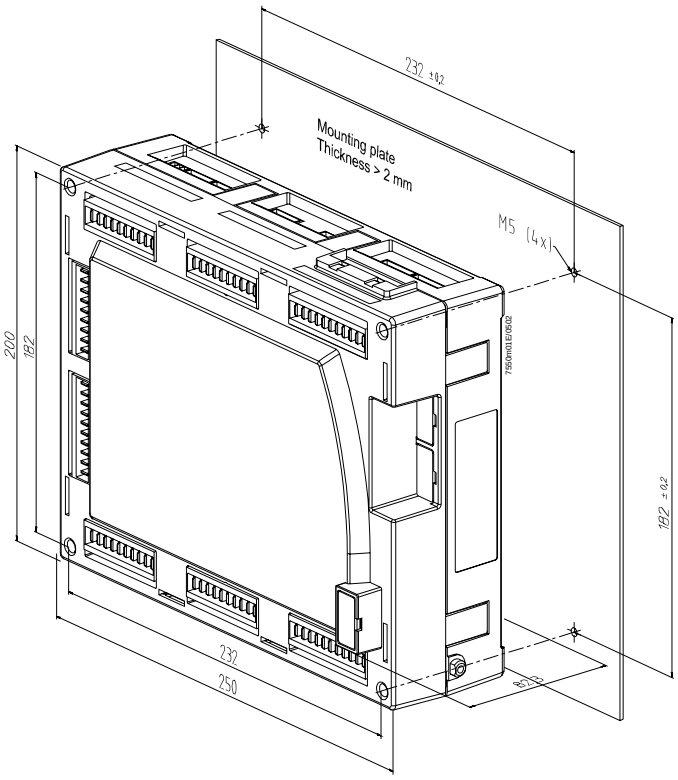
Circulation from Phase 44, max. 45 s as soon as direct heavy oil start = ON in Phase 44:
→ Phase change in Phase 40

Direct heavy oil start = OFF at the end of Phase 44
→ Repetition (max. 3 times in total)

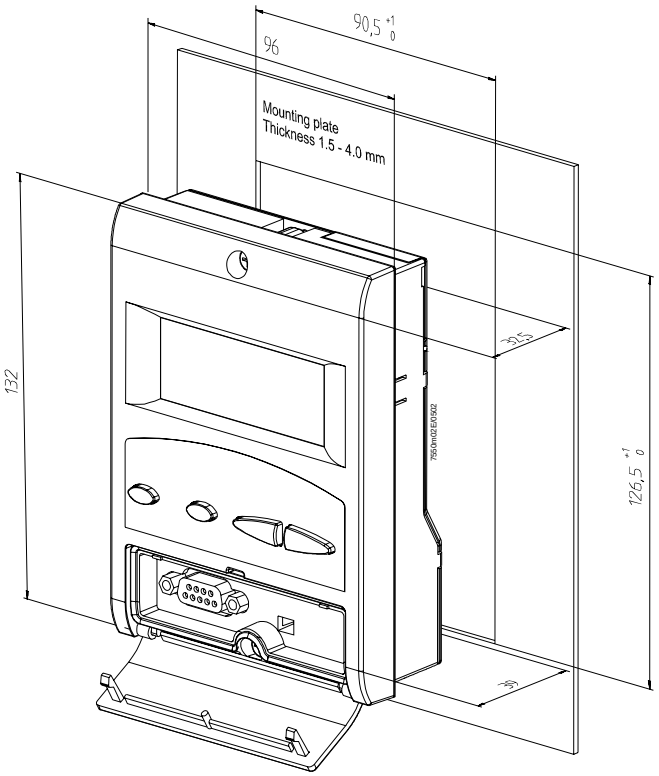
Dimensions

Dimensions in mm

LMV5...

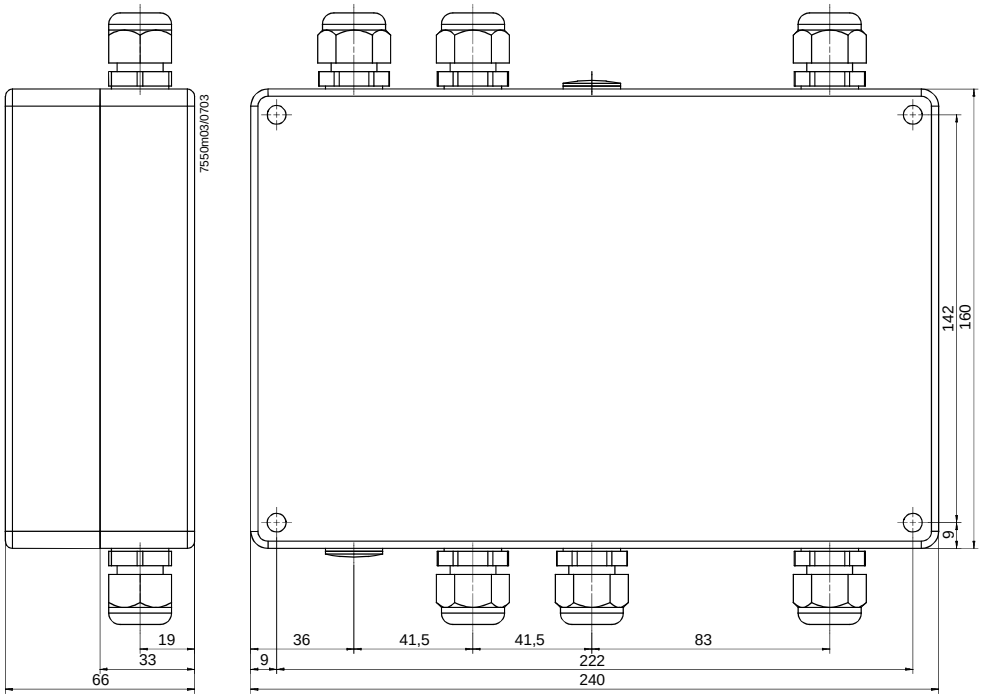


AZL5...



Dimensions in mm

PLL52...



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Subject to change!