



## LMV51...

### **Burner Control with integrated Fuel / Air Ratio Control and Load Control for Forced-draft Burners**

#### **Basic Documentation**

Valid for the following software versions:

LMV51...: V01.90

Int. LC: V01.40

AZL51...: V01.70

# Technical data

## LMV51... and AZL51...

### Basic unit LMV51...

Mains voltage	AC 230 V -15 % / +10 %
Transformer AGG5.220	
- Primary side	AC 230 V
- Secondary side	AC 12 V 2 x AC 12 V
Mains frequency	50...60 Hz ±6 %
Power consumption (typically)	< 30 W
Degree of protection of housing	IP00, IEC 529
Safety class	I with parts according to II and III as per IEC 60 730-1
Environmental conditions	
• Transport	IEC 721-3-2
- Climatic conditions	class 2K2
- Temperature range	-20...+70 °C
- Humidity	< 95 % r.h.
• Operation	IEC 721-3-3
- Climatic conditions	class 3K5
- Temperature range	-20...+60 °C
- Humidity	< 95 % r.h.
• Mechanical conditions	class 2M2



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

CE conformity	according to the directives of the European Union Electromagnetic compatibility EMC 89 / 336 EEC incl. 92 / 31 EEC
Directive for low-voltage	73 / 23 EEC
Directive for gas appliances	90 / 356 EEC

### LMV51... / AZL51... (battery)

Manufacturer	Type
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

## Loads on terminals, cable lengths and cross-sectional areas

### Loads on terminals

General data	<ul style="list-style-type: none"> <li>• Max. perm. mains primary fuse (external) 16 AT</li> <li>• Unit fuse F1 (internal) 6.3 AT (IEC 60127 2 / 5)</li> </ul>
Mains supply	<ul style="list-style-type: none"> <li>• The mains input current depends on the status of the unit</li> </ul>
Undervoltage	<ul style="list-style-type: none"> <li>• Safety shutdown from operating position at mains voltage &lt; AC 186 V</li> <li>• Restart on increase of mains voltage &gt; AC 188 V</li> </ul>
Oil pump / magnetic clutch	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 2 A</li> <li>• Power factor <math>\cos\phi &gt; 0.4</math></li> </ul>
APS test valve	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 0.5 A</li> <li>• Power factor <math>\cos\phi &gt; 0.4</math></li> </ul>
Status inputs (CFN)	<p>Status inputs (with the exception of the safety loop) of the contact feedback network (CFN) are used for system supervision and require a mains-related input voltage.</p> <ul style="list-style-type: none"> <li>• Input safety loop refer to "Loads on terminals, outputs"</li> <li>• Input currents and input voltages <ul style="list-style-type: none"> <li>- UeMax UN +10 %</li> <li>- UeMin UN -15 %</li> <li>- IeMax 1.5 mA peak</li> <li>- IeMin 0.7 mA peak</li> </ul> </li> <li>• Recommended contact material for external signal sources (APS, PSmin, PSmax, etc.) gold-plated silver contacts</li> <li>• Transition / transient behavior / bouncing <ul style="list-style-type: none"> <li>- Max. perm. bounce time of contacts when switching on / off 50 ms (after the bounce time, the contact must be permanently closed or open)</li> </ul> </li> <li>• UN AC 230 V</li> </ul>

### Load on terminals "outputs"

Total load on contacts	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Unit input current* (safety loop) max. 5 A</li> </ul> <p>* Total contact current resulting from:</p> <ul style="list-style-type: none"> <li>- Fan motor contactor</li> <li>- Ignition transformer</li> <li>- Valves</li> <li>- Oil pump / magnetic clutch</li> </ul>
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## Load on individual con- tacts

Fan motor contactor	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 1 A</li> <li>• Power factor <math>\cos\phi &gt; 0.4</math></li> </ul>
Alarm output	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 1 A</li> <li>• Power factor <math>\cos\phi &gt; 0.4</math></li> </ul>
Ignition transformer	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 2 A</li> <li>• Power factor <math>\cos\phi &gt; 0.2</math></li> </ul>
Fuel valves (gas)	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 2 A</li> <li>• Power factor <math>\cos\phi &gt; 0.4</math></li> </ul>
Fuel valves (oil)	<ul style="list-style-type: none"> <li>• Nominal voltage AC 230 V +10 % / -15 %, 50-60 Hz</li> <li>• Nominal current 1 A</li> <li>• Power factor <math>\cos\phi &gt; 0.4</math></li> </ul>

## Cable lengths

Mains cable	max. 100 m (100 pF / m)
CFN cable	max. 100 m (100 pF / m) 1)
Analog cable	max. 100 m (100 pF / m)
Flame detectors	refer to data sheets CC1N7714 CC1N7716 CC1N7719
CAN bus	total length max. 100 m
When a certain cable length is exceeded, the actuators must be powered by a transformer located near the actuators.	

## Cross-sectional areas

The cross-sectional areas of the mains supply lines (L, N, PE) and, if applicable, the safety loop (SLT, shortage of water, etc.) must be sized for nominal currents in agreement with the selected external primary fuse.

The cross-sectional areas of the other cables must be sized in agreement with the internal unit fuse (max. 6.3 AT).

Min. cross-sectional area 0.75 mm<sup>2</sup>  
(single- or multi-core to VDE 0100)

Cable insulation must satisfy the requirements of the relevant temperature and environmental conditions.

The CAN (bus) cables have been specified by Siemens and can be ordered as accessory items.

**Other types of cables may not be used. Otherwise, the EMC characteristics of the LMV51... system will be unpredictable!**

## Fuses used in the basic unit LMV51...

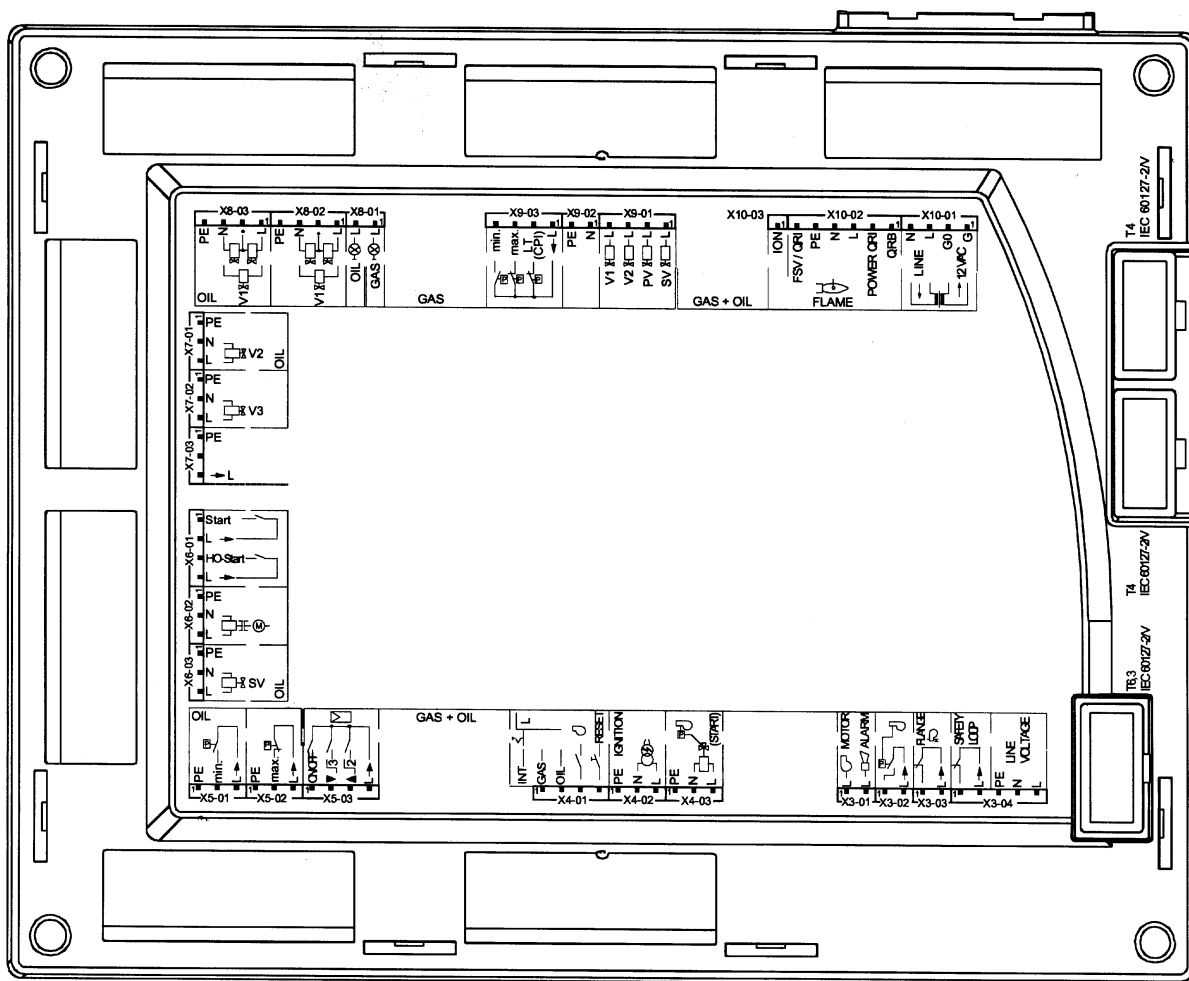
F1	6.3 AT	IEC 60127 2 / 5
F2	4 AT	IEC 60127 2 / 5
F3	4 AT	IEC 60127 2 / 5



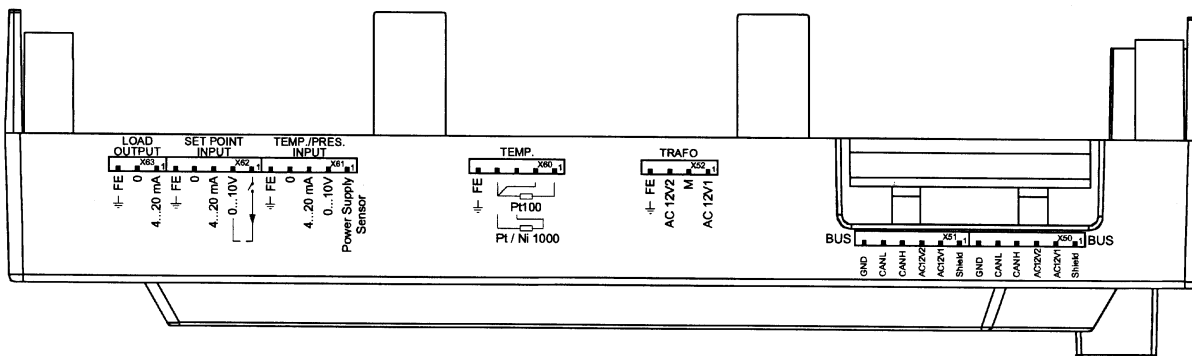
1) If the cable length exceeds 50 m, no additional loads may be connected to the stauts inputs

# Connection terminals / coding of connectors

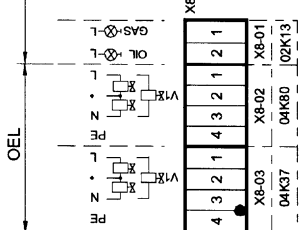
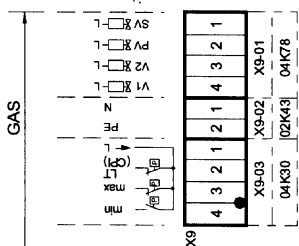
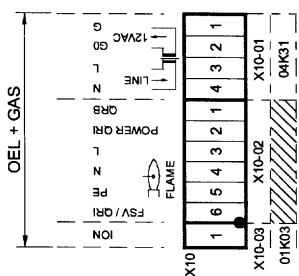
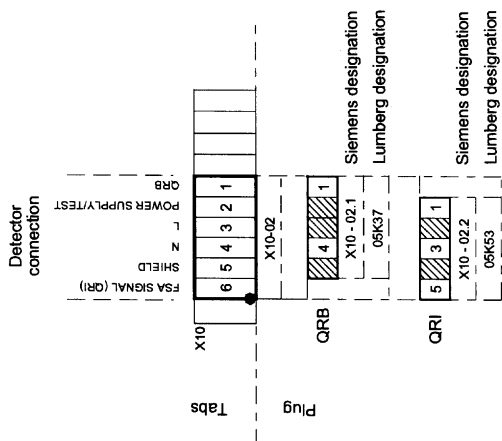
## Connection terminals of the LMV51...



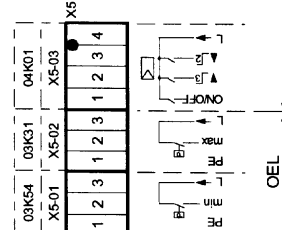
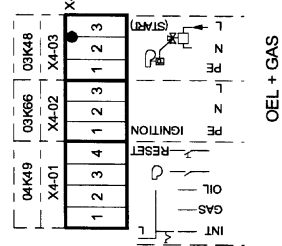
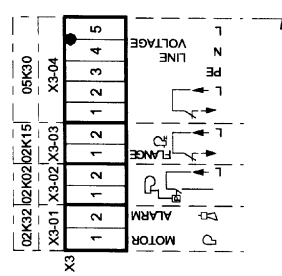
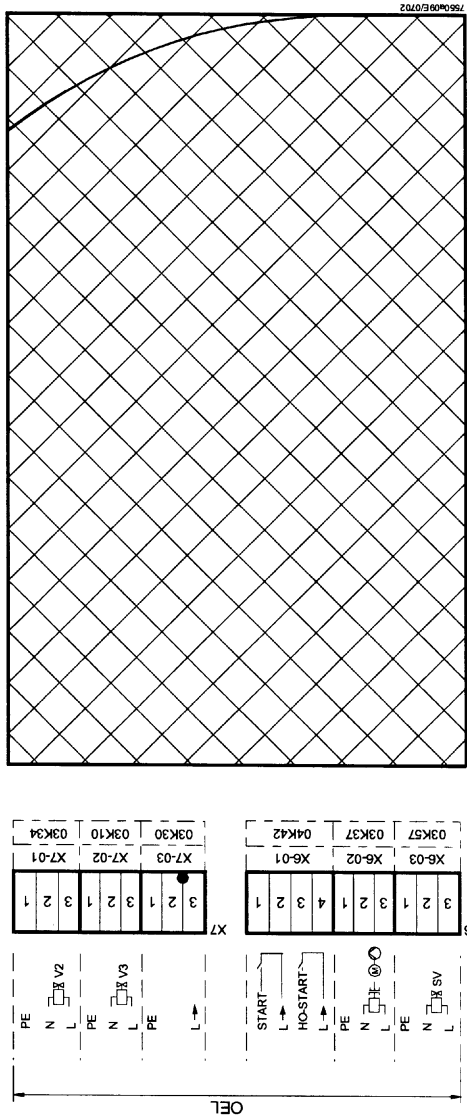
7550u01/1101



# Coding of connectors



Siemens designation X8-01  
Lumberg designation 02K13



Lumberg designation X5-03  
Siemens designation 04K01

## Product range overview

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<b>ACS450</b>	PC tool for convenient programming and burner settings, process visualization, data recording, selection of AZL51... language, software update AZL51...
<b>AGG5.110</b>	CAN bracket for connecting the CAN bus to the basic unit.
<b>AGG5.220</b>	Power transformer for CAN bus users with power characteristics matched to the requirements of the LMV51... .
<b>AGG5.630</b>	CAN bus connecting cable between basic unit and AZL51... and for short distances to the SQM4x. Shielded 5-core cable, 500 m.
<b>AGG5.631</b>	CAN bus connecting cable between basic unit and AZL51... and for short distances to the SQM4x. Shielded 5-core cable, 100 m.
<b>AGG5.640</b>	CAN bus connecting cable between basic unit and actuators or between actuators. Shielded 5-core cable, 500 m.
<b>AGG5.641</b>	CAN bus connecting cable between basic unit and actuators or between actuators. Shielded 5-core cable, 100 m.
<b>AZL51.00A1</b>	Display and operating unit. Detached unit for front panel mounting with text display, 4 x 16 characters, 4 silicon buttons. Real time clock and e-bus interface for BMS.
<b>KF8893</b>	Demo case including LMV51.100A2, AZL51.00A1, 2 x SQM45.295A9, and AGG5.220. Operating buttons for simulation. Electronic simulation of controlled system, burner graphics and LEDs.
<b>LMV51.000A2</b>	Microprocessor-based burner control for single- and dual-fuel burners of any capacity. Electronic fuel / air ratio control system on CAN bus basis with up to 4 actuators. Integrated gas valve proving system.
<b>LMV51.100A2</b>	Same as LMV51.000A2, plus load controller. Integrated digital PID boiler temperature or pressure controller (LC), limit sensor conforming to TRD (Technische Richtlinien Dampf = Technical Directives for Steam). Automatic adaption of the controller characteristics depending on operating mode (modulating or multistage).
<b>QRI2A2...</b>	Infrared flame detector. Universal flame detector for oil or gas flames. Suited for intermittent or continuous operation, with integrated flame amplifier and prefabricated connecting cable 180 cm. <b>Front illumination.</b>
<b>QRI2B2...</b>	Infrared flame detector. Universal flame detector for oil or gas flames. Suited for intermittent or continuous operation, with integrated flame amplifier and prefabricated connecting cable 180 cm. <b>Lateral illumination.</b>
<b>SQM45.291A9</b>	Actuator. Nominal torque 3 Nm, running time 10...120 seconds. Control and feedback via CAN bus. Stepper motor, flush panel mounting, Woodruff key.
<b>SQM45.295A9</b>	Actuator. Nominal torque 3 Nm, running time 10...120 seconds. Control and feedback via CAN bus. Stepper motor, flush panel mounting, D-shaft.
<b>SQM48.497A9</b>	Actuator. Nominal torque 20 Nm, running time 30...120 seconds. Control and feedback via CAN bus. Stepper motor, flush panel mounting, parallel key.

**AGG5.635**

CAN bus connecting cable between basic unit and AZL51..., complete with connector type 3.5 and Sub-D, 3 m.

**AGG5.720**

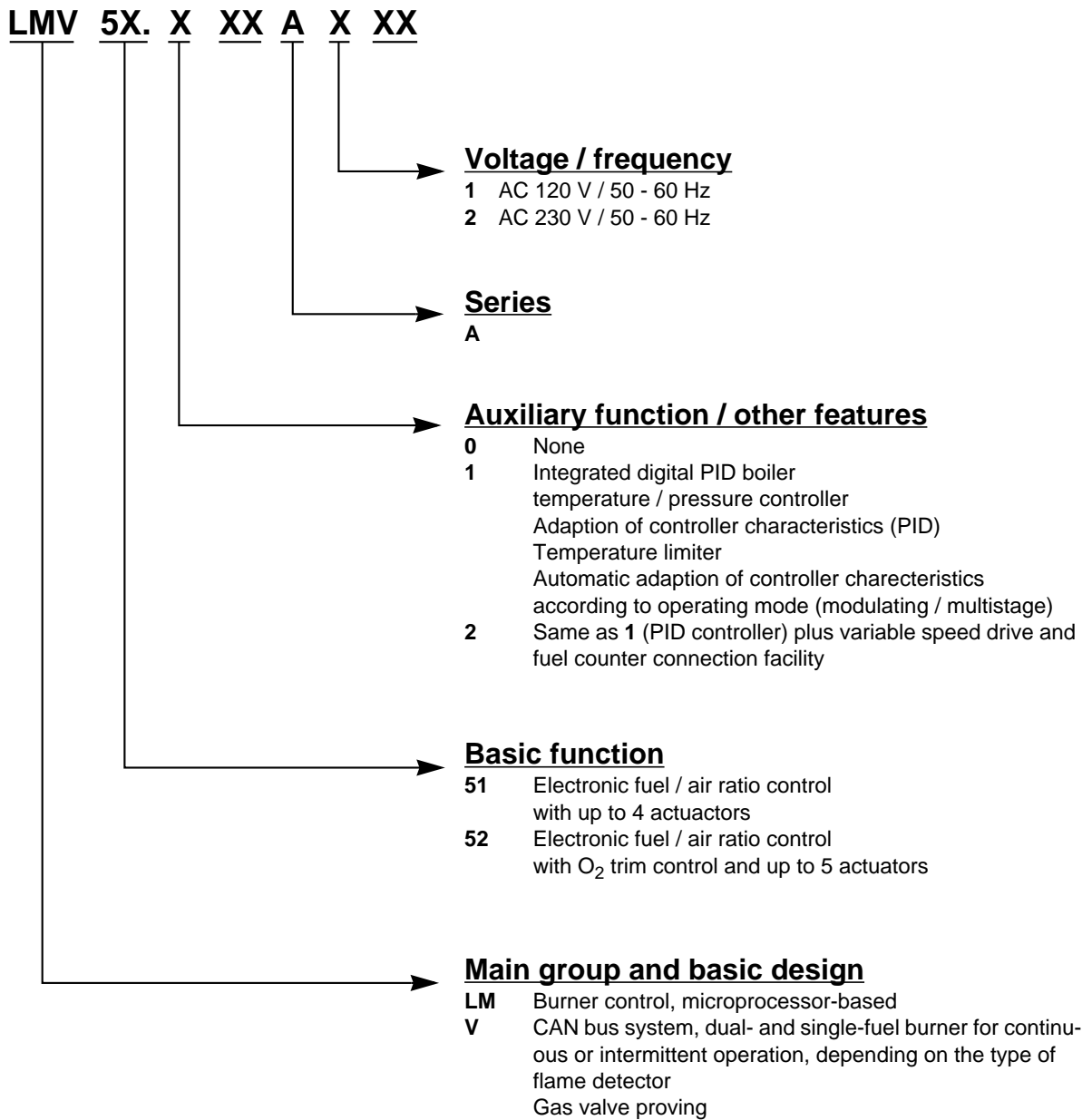
Standard connector set LMV51... for gas / oil applications with up to 3 actuators.

LMV51...	Terminal designation	Description
		<b>Rast 5</b>
1	X3-01	Alarm, fan
1	X3-02	Air pressure switch (APS)
1	X3-03	Burner flange
1	X3-04	Power supply safety loop
1	X4-01	Fuel selection, lockout reset
1	X4-02	Ignition
1	X4-03	Start signal / PS relieve valve
1	X5-01	Oil pressure switch min.
1	X5-02	Oil pressure switch max.
1	X5-03	Load controller external
1	X6-01	Direct heavy oil start
1	X6-02	Magnetic clutch / oil pump
1	X6-03	Safety valve SV (oil)
1	X7-01	Oil valve V2
1	X7-02	Oil valve V3
1	X7-03	Not used
1	X8-01	Operating on gas / oil
1	X8-02	Oil valve V1
1	X8-03	Oil valve V1
1	X9-01	Gas valves
1	X9-02	Protective earth, neutral conductor
1	X9-03	Gas pressure switch min., max.
1	X10-01	Power transformer (prim I, sec I)
1	X10-02	Flame detector - QRB..., QRI...
5	[ / ]	Plug
1	X10-03	Ionization probe ION
		<b>Transformer</b>
1	prim I	CDO
1	sec I	DFO
1	sec II	DEFL
		<b>Type 3.5</b>
2	X50, X51	CAN bus (6-pole)
1	X52	Transformer, secondary side (4-pole, low-voltage)
1	X60	Inputs 1 and 4 - temperature sensor (5 pins), TEMP.
1	X61	Input 2 - pressure input - temperature limiter (5 pins) TEMP/PRESS. INPUT
1	X62	Input 3, analog input (5 pins), SET POINT INPUT
1	X63	Load output (3 pins), LOAD OUTPUT
6	[ / ]	Actuator (5 pins)



LMV51...	Terminal designation	Description
		<b>Type 3.5</b>
2	[ / ]	Actuator (5 pins)
		Variable speed drive
2	[ / ]	4-pin connector 2 x
1	[ / ]	5-pin connector 1 x
1	[ / ]	6-pin connector 1 x
		<b>Rast 5</b>
		<b>Transformer</b>
1	prim I	CDO
1	sec II	DEFL
		<b>Cable</b>
		AZL51... cable, complete
	[ / ]	Cable AGG5.630
	[ / ]	Cable AGG5.640
1	[ / ]	Sub-D connector
1	[ / ]	6-pin connector type 3.5
		Actuator cable

# Type code LMV51...

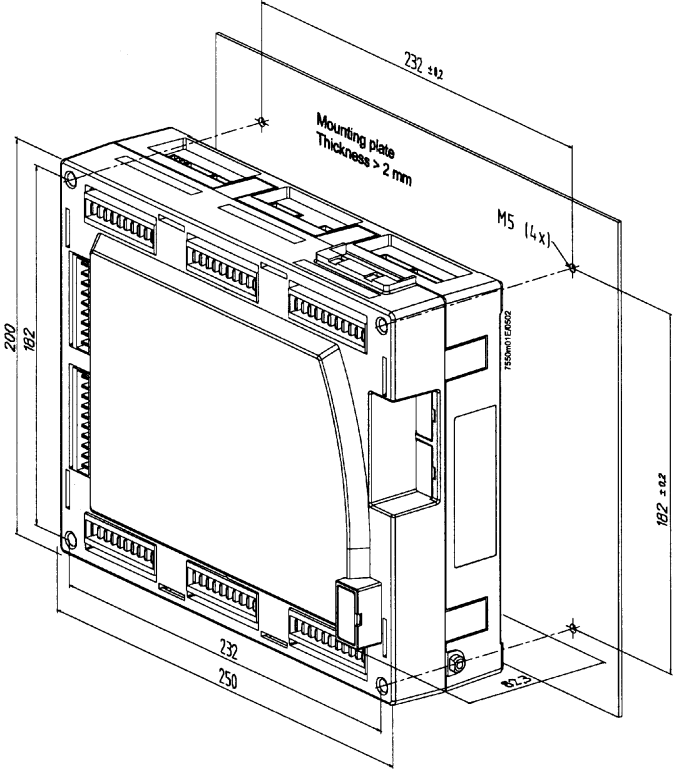


# Dimensions

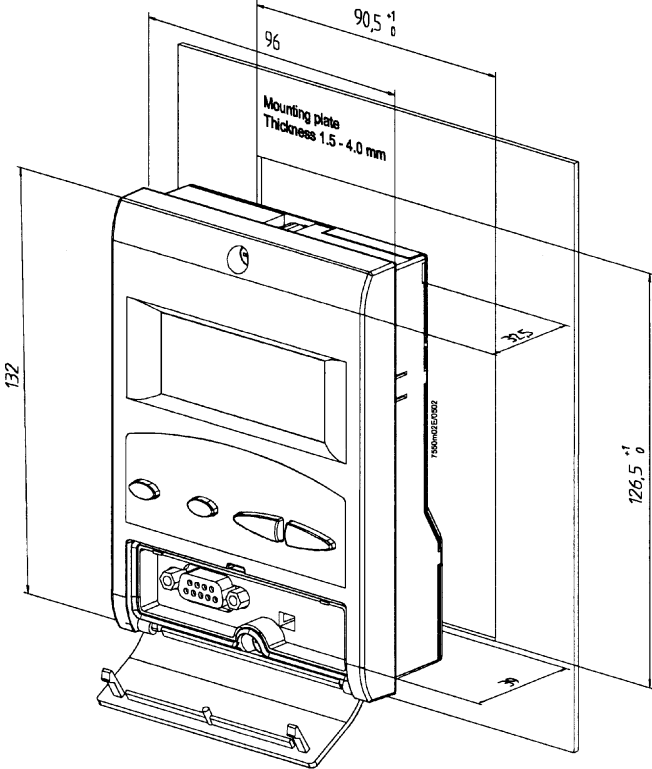
LMV51...

Dimensions in mm

mm : 25.4 = inch

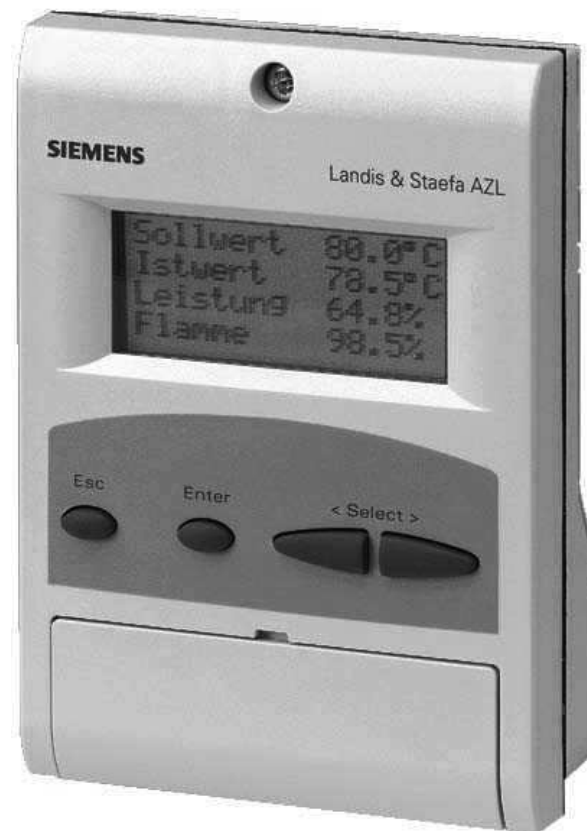


AZL51...



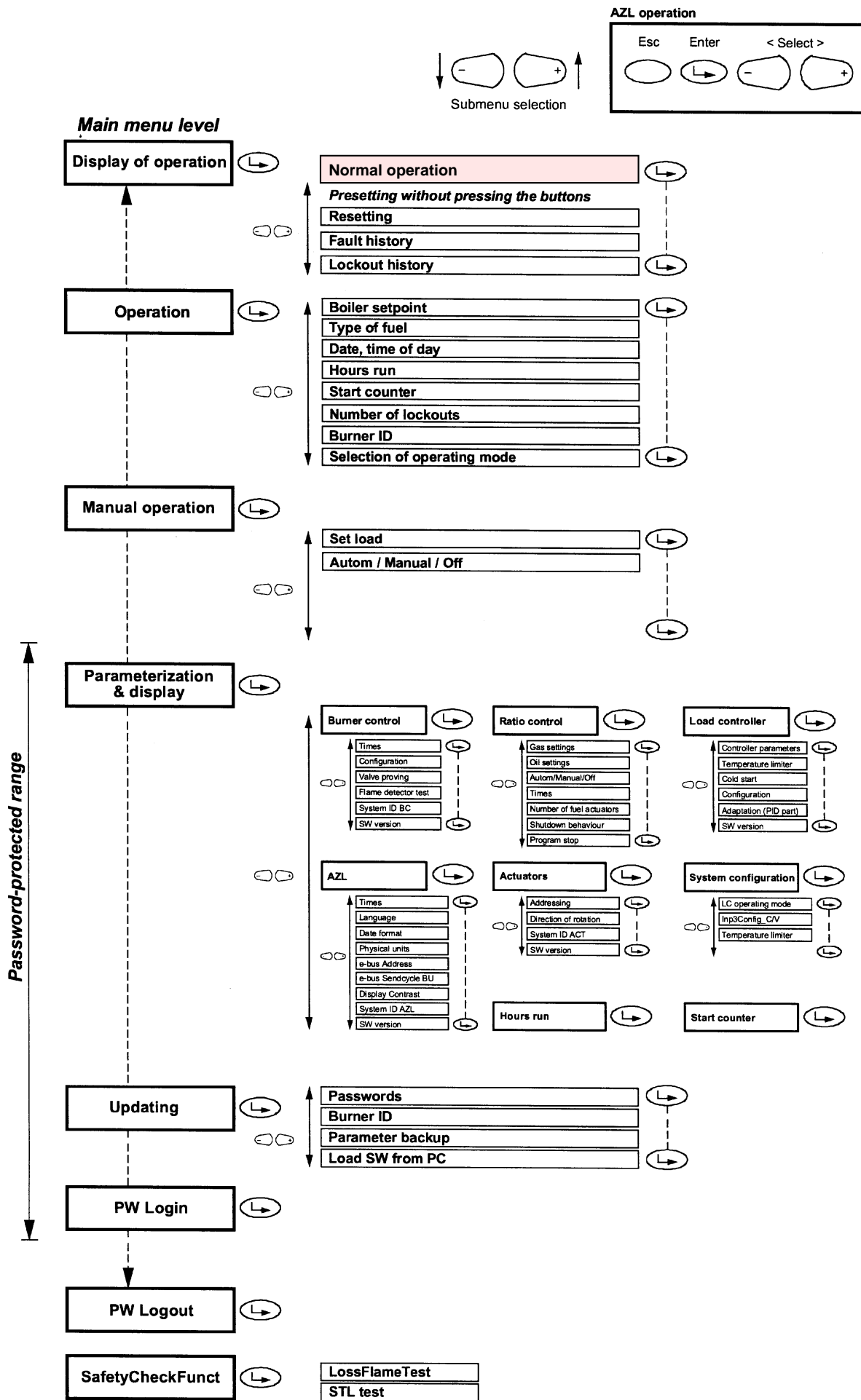
## Display and operating unit AZL51...

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Display and operating unit AZL51...

# Display and settings



Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting		
OperationalStat						Menu level for displaying normal operation		User			
	Normal Operation					Display of actual values, setpoints, load a. flame signal		User			
	Status/Unlock					Shows the current error (or no fault), lockout reset function		User			
	Fault History					Last 21 error messages		User			
Operation	LockoutHistory					Storing the last 6 lockout indications with date and time of day		User			
						Menu level for operating the key functions		User			
	Boiler Setpoint								User		
		Setpoint W1					Internal setpoint W1, in degrees Celsius Internal setpoint W1, in bar	0...2000 °C 0...100 bar	User	-	
		Setpoint W2					Internal setpoint W2 in degrees Celsius Internal setpoint W2, in bar	0...2000 °C 0...100 bar	User	-	
	Fuel						Displaying and selecting the type of fuel		User		
		Current Fuel					Information about the type of fuel currently burnt (read only)	Gas Oil	User	-	
		Fuel Select					Fuel selection via AZL when fuel selector is set to "Internal"	Gas Oil	User	Gas	
	Date/Tme Of Day						Displaying and setting the time of day and the date		User		
		Display Clock								User	
			Date					Display of date (Day.Month.Year or Month-Day-Year)	01.01.00..31.12.99 01-01-00..12-31-99	User	-
			Tme Of Day					Display of time of day (Hour:Minute)	00:00..23:59	User	-
			Weekday					Display of day of week	Sunday Monday Tuesday Wednesday Thursday Friday Saturday	User	-
		Set Clock								User	-
			Date					Setting the display of date (Day.Month.Year or Month-Day-Year)	01.01.00..31.12.99 01-01-00..12-31-99	User	-
			Tme Of Day					Setting the time of day (Hour:Minute)	00:00..23:59	User	-
			Weekday					Setting the display of day of week	Sunday Monday Tuesday Wednesday Thursday Friday Saturday	User	
		Hours Run						Displaying the current hours run readings		User	0
	Gas Firing						Hours run gas (selectable)	0..999999 h	User	0	
	Oil Stage1/Mod.						Hours run oil stage 1 or modulating (selectable)	0..999999 h	User	0	
Oil Stage2						Hours run oil stage 2 (selectable)	0..999999 h	User	0		
Oil Stage 3						Hours run oil stage 3 (selectable)	0..999999 h	User	0		
Total Hours Reset						Hours run total (can be reset)	0..999999 h	User	0		
Total Hours						Hours run total (read only)	0..999999 h	User	0		
System On Power						Hours run device under voltage (read only)	0..999999 h	User	0		
Start Counter						Displaying the start counter readings		User			
	Gas Start Count					Number of startups gas, start counter (selectable)	0..999999 h	User	0		
	Oil Start Count					Number of startups oil, start counter (selectable)	0..999999 h	User	0		
	Total Start Count R					Total number of startups, start counter (can be reset)	0..999999 h	User	0		
	Total Start Count					Total number of startups, start counter (read only)	0..999999 h	User	0		
Lockout Counter					Total number of lockouts that occurred (read only)	0..65535	User	0			
Burner ID					Identification of burner	4..15 characters	User	invalid			

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
	<b>OptgModeSelect</b>					Operating mode selection of AZL for serial port and eBus		User	
		InterfacePC				Setting the serial port (RS-232) of the AZL to interface operation for PC tool		User	
		GatewayDDCon				Activating the eBus port on the AZL for DDC		User	
		GatewayDDCoff				Deactivating the eBus port on the AZL		User	
<b>Manual Operation</b>						Menu level for activating manual operation with the preselected load		User	
	SetLoad					Set target load	0..100%, S1, S2, S3	User	-
	Autom/Manual/Off					Selection of manual or automatic operation	Automatic Burner on Burner off	User	Automatic
<b>Params &amp; Display</b>						Menu level for making the parameter settings		User	
	<b>Burner Control</b>					Setting the burner control parameters		User	
		<b>Times</b>						Service	
			<b>Times Startup1</b>			Burner control startup times 1		Service	
				MinTmeStartRel		Minimum time for start release	t21 0.2..63 s	OEM	1 s
				FanRunup Tme		Fan runup time	t22 0.2..63 s	OEM	2 s
				Prepurge TmeGas		Prepurge time gas	tv MinT_PrepurgeGas..63 min	Service	20 s
				Prepurge TmeOil		Prepurge time oil	tv MinT_PrepurgeOil..63 min	Service	15 s
				MinT_PrepurgeGas		Minimum prepurge time gas	tvmin 0.2..63 min	OEM	20 s
				MinT_PrepurgeOil		Minimum prepurge time oil	tvmin 0.2..63 min	OEM	15 s
				PrepurgeSafe-Gas		Prepurge time after safety shutdown gas	---- MinT_PrepurgeGas..63 min	OEM	20 s
				PrepurgeSafeOil		Prepurge time after safety shutdown oil	---- MinT_PrepurgeOil..63 min	OEM	15 s
				PreIgnition TGas		Preignition time gas	t38 0.2..63 min	OEM	2 s
				PreIgnition TOil		Preignition time oil	t38 0.2..44 s	OEM	2 s
				MinOnTme-OilPump		Minimum on time of oil pump	t36 0.2..63 s	OEM	1 s
			<b>Times Startup2</b>			Burner control startup times 2		Service	
				SafetyTime1Gas		Safety time 1 gas	ts1 1 s..MaxSafetyTGas	OEM	2 s
				SafetyTime1Oil		Safety time 1 oil	ts1 1 s..MaxSafetyTOil	OEM	2 s
				Interval 1 Gas		Interval 1 (ts1-ts2) gas	t44 0.2..63 min	Service	2 s
				Interval 1 Oil		Interval 1 (ts1-ts2) oil	t44 0.2..63 min	Service	2 s
				SafetyTime2Gas		Safety time 2 gas	t50 1 s..MaxSafetyTGas	OEM	2 s
				SafetyTime2Oil		Safety time 2 oil	t50 1 s..MaxSafetyTOil	OEM	2 s
				Interval 2 Gas		Interval 2 (ts2 operation) gas	t52 0.2..63 min	Service	2 s
				Interval 2 Oil		Interval 2 (ts2 operation) oil	t52 0.2..63 min	Service	2 s
				PressReactTime		Reaction time to lack of pressure in ts1 and ts2	--- 0.2 s..MaxSafetyTGas	OEM	1 s
			<b>TimesShutdown</b>			Burner control shutdown times		Service	
				MaxTmeLowFire		Maximum time to low-fire in operation 2	t62 0.2..630 s	Service	45 s
				AfterburnTme		Afterburn time	t70 0.2..63 s	OEM	8 s
				PostpurgeT1Gas		Postpurge time 1 gas	t74 0.2..63 min	OEM	0.2 s
				PostpurgeT1Oil		Postpurge time 1 oil	t74 0.2..63 min	OEM	0.2 s
				PostpurgeT3Gas		Postpurge time 3 gas	t78 0.2..63 min	Service	5 s
				PostpurgeT3Oil		Postpurge time 3 oil	t78 0.2..63 min	Service	5 s
				MinTme-HomeRun		Minimum time in home run phase	t10 0.2..63 s	OEM	1 s
				DelayLackGas		Basic waiting time in the event of lack of gas	--- MinTmeHomeRun..63s	OEM	10 s
			<b>Times General</b>			General times of burner control		Service	
				AlarmDelay		Time to alarm in the event of start prevention and heat demand	0.4..630 s	Service	35 s
				DelayStartPrev		Time until message on start prevention and heat demand is delivered	0.4..630 s	Service	35 s
				Postpurge Lockout		Postpurge in lockout position	0.2..63 min	OEM	0.2 s
		<b>Configuration</b>						Service	
			<b>Config General</b>			General parameters of burner control		Service	
				AlarmStartPrev		With/without alarm in the event of start prevention and heat demand	deactivated activated	Service	deactivated
				NormDirectStart		Normal/direct start in the event of heat demand in phase 78	Normal Start Direct Start	OEM	Normal Start
				IgnOilPumpStart		Switch-on time of ignition and oil pump	on in Ph38 on in Ph22	OEM	on in Ph38

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
				ForcedIntermit		With / without forced intermittent operation	deactivated activated	Service	activated
				ContinuousPurge		Configuration for normal or continuous fan operation	deactivated activated	OEM	deactivated
				FuelTrainGas		Fuel train when firing on gas	DirectIgnG Pilot Gp1 Pilot Gp2	OEM	invalid
				FuelTrainOil		Fuel train when firing on oil	Light Oil LO Heavy Oil HO LO w Gasp HO w Gasp	OEM	invalid
				FuelTrainReset		Resetting the fuel train to invalid value		OEM	
					FuelTrainGas				OEM
				FuelTrainOil				OEM	
				MainsFrequency		Selection of mains frequency 50 Hz / 60 Hz	50 Hz 60 Hz	OEM	50 Hz
			<b>Configin/Output</b>			Configuring the inputs and outputs		OEM	
				StartReleaseOil		Input start release oil active	deactivated activated	OEM	activated
				AirPressureTest		Assess / ignore air pressure signal	deactivated activated	OEM	activated
				PS-VP/CPI		Configuration of input on PM-VP or CPI	PS - VP CPI	OEM	PS-VP
				FGR-PS/FCC		Configuration of input for FCC or FGR-PS	FCC FGR-PS deactivated	OEM	FCC
				InputController		Input controller active	deactivated activated	OEM	activated
				GasPressureMin		Input minimum gas pressure (+ start release gas) active	deactivated activated	OEM	activated
				GasPressureMax		Input maximum gas pressure active	deactivated activated	OEM	activated
				OilPressureMin		Input minimum oil pressure active	deactivated activated	OEM	activated
				OilPressureMax		Input maximum oil pressure active	deactivated activated	OEM	activated
				HeavyOilDirStart		Input immediate heavy oil start active	deactivated activated	OEM	activated
				Start/PS-Valve		Configuration of output for start signal or PS relief valve	StartSignal PS Relief	OEM	StartSignal
			<b>ConfigFlameDet</b>			Configuring the flame detector		OEM	
				ReacExtrantLight		Reaction in the event of extraneous light in standby	Lockout Startblock	OEM	Startblock
				FlameSignal		Configuration the flame signal		OEM	
					Standardize StandardFactor		Standardizing the flame signal		OEM
						Reading / writing the standard factor		OEM	
			<b>RepetitCounter</b>			Displaying the repetition counters		OEM	
				Heavy oil		Rep. counter: immediate star heavy oil	1..16	OEM	3
				StartPrev		Rep. limit value: star prevention	1..16	OEM	10
				SafetyLoop		Rep. limit value: safety loop	1..16	OEM	16
		<b>ValveProving</b>				Settings for valve proving		OEM	
			ValveProvingType			Type and time of proving test	No VP VP startup VP shutdown VP stup/shd	OEM	VP shut- down
			Config_PM-VP/CPI			Configuration of input on PM-VP or CPI	PS-VP CPI	OEM	PS-VP
			VP_EvacTme			Proving test evacuation time	02..3 s	OEM	3 s
			VP_TmeAtmPress			Proving test time atmospheric pressure	MinT_VP_AtmosphPress..63 s	OEM	10 s



Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
			VP_FillTme			Proving test filling time	0.2...3 s	OEM	3 s
			VP_Tme_GasPress			Proving test time gas pressure	MinT_vp_gaspress..63 s	OEM	10 s
		<b>Prod_ID</b>				Displaying the burner control's HW version		User	
			ASN			Type reference	1..15 characters	User	"LMV51..100A2"
			ProductionDate			Production date	01.01.00..31.12.99 01-01-00..12-31-99	User	-
			SerialNumber			Serial number	0..65535	User	-
			ParamSet Code			Preselected parameter set: customer code	0..255	User	20
			ParamSetVers			Preselected parameter set: version	0..65535	User	103
		SW Version				SW version of burner control	0..65535	User	-
	<b>Ratio Control</b>					Parameter settings for ratio control		User	
		<b>Gas Settings</b>				Parameter settings for firing on gas		Service	
			<b>SpecialPositions</b>			Setting the special actuator positions for firing on gas		Service	
			<b>HomePos</b>			Setting the home positions for firing on gas		Service	
				HomePosGas		Home position of fuel damper (gas)	0..90°	Service	0°
				HomePosAir		Home position of air damper (gas)	0..90°	Service	0°
				HomePosAux		Home position of auxiliary damper (gas)	0..90°	Service	0°
			<b>PrepurgePos</b>			Setting the home positions for firing on gas		Service	
				PrepurgePosAir		Prepurge position of air damper (gas)	0..90°	Service	90°
				PrepurgePosAux		Prepurge position of auxiliary damper (gas)	0..90°	Service	90°
			<b>IgnitionPos</b>			Setting the ignition positions for firing on gas		Service	
				IgnitionPosGas		Ignition position of fuel damper (gas)	0..90°	Service	invalid
				IgnitionPosAir		Ignition position of air damper (gas)	0..90°	Service	invalid
				IgnitionPosAux		Ignition position of auxiliary damper (gas)	0..90°	Service	invalid
			<b>PostpurgePos</b>			Setting the prepurge positions for firing on gas		Service	
				PostpurgePosGas		Postpurge position of fuel damper (gas)	0..90°	Service	15°
				PostpurgePosAir		Postpurge position of air damper (gas)	0..90°	Service	15°
				PostpurgePosAux		Postpurge position of auxiliary damper (gas)	0..90°	Service	0°
			Program stop			Program stop	deactivated 24 PrePurgP 32 PreP FGR 36 IgnitPos 44 Interv 1 52 Interv 2 72 PostPPos 76 PostPFGR	Service	deactivated
			<b>ResetIgnitPos</b>			Resetting the ignition positions to invalid value		Service	
				IgnitionPosGas				Service	
				IgnitionPosAir				Service	
				IgnitionPosAux				Service	
		CurveParams						Service	
		<b>LoadLimits</b>				Setting the minimum and maximum load limits		Service	
			MinLoadGas			Minimum load "Low fire" (gas)	0..MaxLoadGas	Service	0 %
			MaxLoadGas			Maximum load "High fire" (gas)	MinLoadGas..100%	Service	100 %
		AuxActuator				Activation / deactivation of auxiliary actuator for gas	deactivated activated	OEM	activated
		<b>OilSettings</b>				Parameter settings for firing on oil		Service	
			<b>SpecialPositions</b>			Setting the special actuator positions for firing on oil		Service	
			<b>HomePos</b>			Setting the home positions for firing on oil		Service	
				HomePosOil		Home position of fuel damper (oil)	0..90°	Service	0°
				HomePosAir		Home position of air damper (oil)	0..90°	Service	0°
				HomePosAux		Home position of auxiliary damper (oil)	0..90°	Service	0°
			<b>PrepurgePos</b>			Setting the prepurge positions for firing on oil		Service	
				PrepurgePosAir		Prepurge position of air damper (oil)	0..90°	Service	90°
				PrepurgePosAux		Prepurge position of auxiliary damper (oil)	0..90°	Service	90°
			<b>IgnitionPos</b>			Setting the ignition positions for firing on oil		Service	
				IgnitionPosOil		Ignition position of fuel damper (oil)	0..90°	Service	invalid
				IgnitionPosAir		Ignition position of air damper (oil)	0..90°	Service	invalid
				IgnitionPosAux		Ignition position of auxiliary damper (gas)	0..90°	Service	invalid
			<b>PostpurgePos</b>			Setting the postpurge positions for firing on oil		Service	
				PostpurgePosOil		Postpurge position of fuel damper (oil)	0..90°	Service	0°

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
					PostpurgePosAir	Postpurge position of air damper (oil)	0..90°	Service	15°
					PostpurgePosAux	Postpurge position of auxiliary damper (oil)	0..90°	Service	0°
				ProgramStop		Program stop	deactivated 24 PrePurgP 32 PreP FGR 36 IgnitPos 44 Interv 1 52 Interv 2 72 PostPPos 76 PostPFGR	Service	deactivated
				ResetIgnitPos		Resetting the ignition positions to invalid value		Service	
					IgnitionPosOil			Service	
					IgnitionPosAir			Service	
					IgnitionPosAux			Service	
			CurveParams			Setting the curve parameters of ratio control for firing on oil		Service	
				Curve Settings				Service	
				Operation Mode		Selection of burner operation mode (multistage or modulating) for oil	Two-stage Three-stage Modulating	OEM	Modulating
			LoadLimits			Setting the minimum and maximum load limits		Service	
				MinLoadOil		Minimum load "Low fire" (oil)	0..MaxLoadOil	Service	0%
				MaxLoadOil		Maximum load "High fire" (oil)	MinLoadOil..100%	Service	100%
			AuxActuators			Activation/deactivation of auxiliary actuator for oil	deactivated activated	OEM	activated
		Autom/Manual/Off				Selection of manual or automatic operation	Automatic Burner on Burner off	User	Automatic
		Times						Service	
				OperatRampMod		Duration operating ramp ratio control modulating operation	30..120 s	Service	30 s
				OperatRampStage		Duration operating ramp ratio control multistage operation	10..30 s	Service	10 s
				TmeNoFlame		Duration ramp in prepurge and ignition position	10..120 s	Service	10 s
		NumFuelActuators				Number of fuel actuators	1..2	OEM	2
		ShutdownBehav				This parameter determines the way the ratio control system behaves in the lockout phase	Unchanged PostpurgeP HomePos	Service	HomePos
		Program stop				Program stop	deactivated 24 PrePurgP 32 PreP FGR 36 IgnitPos 44 Interv 1 52 Interv 2 72 PostPPos 76 PostPFGR	Service	deactivated
	Load Controller					Settings for the internal load controller		User	
		ControllerParam				Setting the controller parameters		User	
			ContrlParamList			PID control parameters		User	
				StandardParam		Selection of standards parameter sets for the load controller	Adaption very fast fast normal slow very slow	User	-
				P-Part (Xp)		Controller parameter proportional band	2..500 %	User	15%
				I-part (In)		Controller parameter integral part	0..2000 s	User	320 s
				D-Part (Tv)		Controller parameter differential part	0..1000 s	User	40 s
				MinActuatorStep		Minimum actuator step possible	0.5..10%	User	1%
				SW_FilterTmeCon		Software filter time constant	1..10 s	User	3 s
				SetpointW1		Internal setpoint W1, in degrees Celsius	0..2000 °C	User	-
						Internal setpoint W1, in bar	0..100 bar		
				SetpointW2		Internal setpoint W1, in degrees Celsius	0..2000 °C	User	-
						Internal setpoint W1, in bar	0..100 bar		

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
			SD_ModOn			Two-position controller switching differential burner ON modulating referred to the current setpoint (Waktuell)	-50..+50% Waktuell	User	-1,0%
			SD_ModOff			Two-position controller switching differential burner OFF modulating referred to the current setpoint (Waktuell)	0..+50% Waktuell	User	10%
			SD_Stage1On			Two-position controller switching differential burner ON multistage referred to the current setpoint (Waktuell)	-50..+50% Waktuell	User	10%
			SD_Stage1Off			Two-position controller switching differential stage 1 OFF referred to the current setpoint (Waktuell)	0..+50% Waktuell	User	10%
			SD_Stage2Off			Two-position controller switching differential stage 2 OFF referred to the current setpoint (Waktuell)	0..+50% Waktuell	User	8%
			SD_Stage3Off			Two-position controller switching differential stage 3_1 OFF referred to the current setpoint (Waktuell)	0..+50% Waktuell	User	6%
			ThreshStage2On			Reaction threshold Q2 for switching on stage 2 (integral control deviation * time)	0..1000	User	300
			ThreshStage3On			Reaction threshold Q3 for switching on stage 3 (integral control deviation * time)	0..1000	User	600
		<b>TempLimiter</b>				Settings for the temperature limiter function		Service	
			TL_ThreshOff			Temperature limiter OFF threshold, in degrees Celsius	0..2000 °C	Service	95 °C
			TL_SD_On			Temperature limiter switching differential ON	-50..0% TL_Thresh_Off	Service	-5%
		<b>ColdStart</b>				Settings for the cold start (thermal shock protection)		Service	
			ColdStartOn			Cold start thermal shock protection, activate / deactivate	deactivated activated	Service	deactivated
			ThresholdOn			Cold start thermal shock protection activation level referred to the current setpoint (Waktuell)	0..100% Waktuell	Service	20%
			StageLoad			Cold start thermal shock protection load step	0..100%	Service	15%
			StageStep_Mod			Cold start thermal shock protection setpoint step (modulating) referred to the current setpoint (Waktuell)	1..100% Waktuell	Service	5%
			StageStep_Stage			Cold start thermal shock protection setpoint step (multistage) referred to the current setpoint (Waktuell)	1..100% Waktuell	Service	5%
			MaxTmeMod			Cold start thermal shock protection, max. time per step (modulating)	1..63 min	Service	3 min
			MaxTmeStage			Cold start thermal shock protection, max. time per step (multistage)	1..63 min	Service	3 min
			ThresholdOff			Cold start thermal shock protection deactivation level referred to the current setpoint (Waktuell)	0..100% Waktuell	Service	80%
		<b>Configuration</b>				General configuration of the load controller		User	
			LC_OptgMode			Operating mode with load controller	ExtLC IntLC IntLC o.DDC IntLC DDCan ExtLCCanalg ExtLC o.DDC	User	IntLC
			Inp1/2/4Sel			Select actual value input E1->Pt100, TL act. E4->Pt1000, TL act. E4->Ni1000, TL act. E2->Temp, TL inact. E2->Pressure, TL inact E1->Pt100 for controller + TL and E4 -> Pt1000 for TL E1->Pt100 for controller + TL and E4 -> Ni1000 for TL No input	Pt100 Pt1000 Ni1000 TempSensor PressSensor Pt100Pt1000 Pt100Ni1000 NoSensor	Service	Pt100
			Inp1/4/MaxValue			End of measurement range for sensor at inputs 1 and 4	150°C / 302 °F 400°C / 752 °F	Service	150°C / 302°F
			Inp2Config_C/V			Configuration of input 2	4..20 mA 2..10 V 0..10 V	Service	0.. 10 V
			Inp2TempMaxValue			End of temperature measurement range for input 2 (4...20 mA; 0...10 V, 2...10 V)	0..2000 °C	Service	90 °C
			Inp2PresMaxValue			End of pressure measurement range for input 2 (4...20 mA; 0...10 V, 2...10 V)	0..99.9 bar	Service	2 bar

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
			Inp3Config_C/V			Configuration of input 3	4..20 mA 0/2..10 V	Service	4..20 mA
			Inp3MinSetpoint			Input 3 (4..20 mA, 2..10 V) Accepted preselected minimum external setpoint	0..100% ScaleHlaktuell	Service	0%
			Inp3MaxSetpoint			Input 3 (4..20 mA, 2..10 V) Accepted preselected maximum external setpoint	0..100% ScaleHlaktuell	Service	60%
		<b>Adaption</b>				Adapting the controlled system		User	
			StartAdaption					User	
			AdaptionLoad			Adaption load	40..100%	User	100%
		SW Version				SW version of internal load controller	0..65535	User	-
	<b>AZL</b>					Settings for the display and operating unit		User	
		<b>Times</b>				AZL-specific time settings		User	
			PasswordTme			Validity of password	10..480 min	OEM	120 min
			Sum/WinterTme			Setting the summer-/ wintertime	Manual Automatic	User	Automatic
			Time EU/US			Setting the summer-/ wintertime US / EU	S / W time EU S / W time US	User	S/W time EU
		Language				Selection of language	Deutsch English Français	User	Deutsch
		DateFormat				Selection of date format (Day.Month.Year or Month-Day-Year)	TT.MM.JJ MM-DD-YY	User	TT.MM.JJ
		<b>PhysicalUnits</b>						User	
			UnitTemperature			Selection of display format °C or F	Display °C Display °F	User	Display °C
			UnitPressure			Selection of display format bar or psi	Display bar Display psi	User	Display bar
		eBUS Address				E-bus address of LMV	1..8	User	1
		eBUS SendCycleBU				Cycle time for sending the burner control's operating data to DDC	10..60 s	User	30 s
		Display Contrast						User	
		<b>System_ID</b>				Displaying the HW version of the AZL		User	
			ASN			Type reference	1..15 characters	User	"AZL51.*"
			ProductionDate			Production date	01.01.00..31.12.99 01-01-00..12-31-99	User	-
			SerialNumber			Serial number	0..65535	User	-
			ParamSet Code			Preselected parameter set: customer code	0..255	User	20
			ParamSet Vers			Preselected parameter set: version	0..65535	User	103
		SW Version				SW versions of AZL	0..65535	User	-
	<b>Actuators</b>							User	
		<b>Addressing</b>				Addressing unaddressed actuators		Service	
			1 AirActuator			The actuator to be addressed becomes the air actuator		Service	
			2 GasActuat (Oil)			The actuator to be addressed becomes the gas actuator, or the fuel actuator for dual fuel burners with one fuel actuator		Service	
			3 OilActuator			The actuator to be addressed becomes the oil actuator		Service	
			4 AuxActuator			The actuator to be addressed becomes the auxiliary actuator		Service	
		<b>DirectionRot</b>						Service	
			DeleteCurves					Service	
			1 AirActuator			Direction of rotation of the respective actuator	Standard Reversed	OEM	Standard
			2 GasActuat (Oil)			Direction of rotation of the respective actuator	Standard Reversed	OEM	Standard
			3 OilActuator			Direction of rotation of the respective actuator	Standard Reversed	OEM	Standard
			4 AuxActuator			Direction of rotation of the respective actuator	Standard Reversed	OEM	Standard

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting
		<b>ProductID</b>				Displaying the actuators' HW version		User	
			<b>1 AirActuator</b>					User	
				ASN		Type reference	1..15 characters	User	"SQM45.29"
				ProductionDate		Date of production	01.01.00..31.12.99 01-01-00..12-31-99	User	-
				SerialNumber		Serial number	0..65535	User	-
				ParamSatz Code		Preselected parameter set: customer code	0..255	User	0
				ParamSatz Vers		Preselected parameter set: version	0..65535	User	0
			<b>2 GasActuat(Oil)</b>					User	
				ASN		Type reference	1..15 characters	User	"SQM45.29"
				ProductionDate		Date of production	01.01.00..31.12.99 01-01-00..12-31-99	User	-
				SerialNumber		Serial number	0..65535	User	-
				ParamSatz Code		Preselected parameter set: customer code	0..255	User	0
				ParamSatz Vers		Preselected parameter set: version	0..65535	User	0
			<b>3 OilActuator</b>					User	
				ASN		Type reference	1..15 characters	User	"SQM45.29"
				ProductionDate		Date of production	01.01.00..31.12.99 01-01-00..12-31-99	User	-
				SerialNumber		Serial number	0..65535	User	-
				ParamSatz Code		Preselected parameter set: customer code	0..255	User	0
				ParamSatz Vers		Preselected parameter set: version	0..65535	User	0
			<b>4 AuxActuator</b>					User	
				ASN		Type reference	1..15 characters	User	"SQM45.29"
				ProductionDate		Date of production	01.01.00..31.12.99 01-01-00..12-31-99	User	-
				SerialNumber		Serial number	0..65535	User	-
				ParamSatz Code		Preselected parameter set: customer code	0..255	User	0
				ParamSatz Vers		Preselected parameter set: version	0..65535	User	0
		<b>SW Version</b>				Displaying the actuators' SW version		User	
			1 AirActuator			SW version of actuator	0..65535	User	-
			2 GasActuat(Oil)			SW version of actuator	0..65535	User	-
			3 OilActuator			SW version of actuator	0..65535	User	-
			4 AuxActuator			SW version of actuator	0..65535	User	-
	<b>System Config</b>					Settings for LMV51 system configuration		User	
		LC_OptgMode				Operating mode with load controller	ExtLC IntLC IntLC o.DDC IntLC DDCan ExtLC analg ExtLC o.DDC	User	IntLC
		Inp3Config_C/V				Configuration of input 3	4..20 mA 0/2..10 V	Service	4..20 mA
		<b>TempLimiter</b>						Service	
			TL_Thresh_Off			Temperature limiter OFF threshold, in degrees Celsius	0..2000 °C	Service	95°C
			TL_SD_On			Temperature limiter switching differential ON	-50..0% TL_Thresh_Off	Service	-5%
			Inp1/2/4Sel			Select actual value input E1->Pt100, TL act. E4->Pt1000, TL act. E4->Ni1000, TL act. E2->Temp, TL inact. E2->Pressure, TL inact E1->Pt100 for controller + TL and E4 -> Pt1000 for TL E1->Pt100 for controller + TL and E4 -> Ni1000 for TL No input	Pt100 Pt1000 Ni1000 TempSensor PressSensor Pt100Pt1000 Pt100Ni1000 NoSensor	Service	Pt100
			Inp1/4/Max Value			End of measurement range for sensor at inputs 1 and 4	150 °C / 302 °F 400 °C / 752 °F	Service	150 °C/302 °F

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6	Description	Value range	Access rights	Default parameter setting	
	<b>HoursRun</b>					Hours run gas (selectable)	0..999999 h	User	0	
						Hours run oil stage 1 or modulating (selectable)	0..999999 h	User	0	
						Hours run oil stage 2 (selectable)	0..999999 h	User	0	
						Hours run oil stage 3 (selectable)	0..999999 h	User	0	
						Hours run total (can be reset)	0..999999 h	User	0	
						Hours run total (read only)	0..999999 h	User	0	
						Hours run device under voltage (read only)	0..999999 h	User	0	
			<b>Reset</b>			Resetting the hours run counters		User		
			GasFiring			Hours run gas (selectable)	0..999999 h	User	0	
			OilStage1/Mod			Hours run oil stage 1 or modulating (selectable)	0..999999 h	User	0	
			OilStage2			Hours run oil stage 2 (selectable)	0..999999 h	User	0	
			OilStage3			Hours run oil stage 3 (selectable)	0..999999 h	User	0	
			TotalHoursReset			Hours run total (can be reset)	0..999999 h	User	0	
		<b>StartCounter</b>						User		
			GasStartCount			Number of startups gas, start counter (selectable)	0..999999 h	User	0	
		OilStartCount			Number of startups oil, start counter (selectable)	0..999999 h	User	0		
		TotalStartCountR			Total number of startups, start counter (can be reset)	0..999999 h	User	0		
		TotalStartCount			Total number of startups, start counter (read only)	0..999999 h	User	0		
		<b>Reset</b>			Resetting the start counters		User			
		GasStartCount			Number of startups gas, start counter (selectable)	0..999999 h	User	0		
		OilStartCount			Number of startups oil, start counter (selectable)	0..999999 h	User	0		
		TotalStartCountR			Total number of startups, start counter (can be reset)	0..999999 h	User	0		
<b>Updating</b>	<b>Passwords</b>					Changing the passwords		OEM		
		ServicePassword				Service passwords (not included in parameter backup)	3..8 characters	OEM	-	
		OEM Password				OEM password (not included in parameter backup)	4..8 characters	OEM	-	
		Burner ID				Identification of burner	4..15 characters	OEM	invalid	
		<b>ParamBackup</b>							User	
			<b>Backupinfo</b>						User	
				Date			Date of backup	01.01.00..31.12.99 01-01-00..12-31-99	User	0
				TmeOfDay			Time of day of backup	00:00..23:59	User	0
				BU included?			BU included in backup YES / NO	No Yes	User	No
				AZL included?			AZL included in backup YES / NO	No Yes	User	No
				LC included?			LC included in backup YES / NO	No Yes	User	No
				ACT1 included?			ACT1 included in backup YES / NO	No Yes	User	No
				ACT2 included?			ACT2 included in backup YES / NO	No Yes	User	No
				ACT3 included?			ACT3 included in backup YES / NO	No Yes	User	No
			ACT4 included?			ACT4 included in backup YES / NO	No Yes	User	No	
		LMV51 -> AZL			Saving the parameters of the system on the AZL		Service			
		AZL -> LMV51			Transferring the parameters saved on the AZL to the system		Service			
	Load_SW_from_PC				Updating the AZL software via the serial port with the PC tool		Service			
PW Login					Obtaining access right via the password (access times can be parameterized)		User			
PW Logout					Cancelling the last access right obtained via password		Service			
<b>SafetyCheck-Funct</b>					Safety check function		User			
		LossFlameTest			Loss of flame test		User			
		SLT Test			Safety limit thermostat test	deactivated activated	User	deactivated		

# Commissioning instructions for the LMV51... system

## Practice-oriented setting instructions for the system configuration, the burner control, and the electronic fuel / air ratio control system

These settings instructions serve for commissioning the LMV51... system as supplied by Siemens.

To access the parameter setting levels, a password must be entered.

After having entered the correct password, the data will appear on the AZL51... (backup for emergencies). Then, the unit can be parameterized.

After leaving the parameter setting level, we recommend to make a backup.

### Basic configuration

#### 1. Parameterizing the burner identification (burner ID)

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Updating</i>					
	<i>BurnerID</i>				

**Burner identification:** E.g. OEM13-10-02-003 (name of OEM = burner manufacturer; date 13-10-2002, production number 003); minimum 4 characters

#### 2. Selecting the fuel trains

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>BurnerControl</i>				
		<i>Configuration</i>			
			<i>ConfigGeneral</i>		
				<i>FuelTrainGas</i>	
				<i>FuelTrainOil</i>	

*FuelTrainGas from DirectIgniG to Pilot Gp2*  
*FuelTrainOil from LightOilLO to HO w Gasp*

#### 3. Setting gas valve proving

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>BurnerControl</i>				
		<i>ValveProving</i>			
			<i>ValveProvingType</i>		

*Selection of gas valve proving: No VP, VP startup, VP shutdown or VP stup/shd*

#### 4. Addressing the actuators

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

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>Actuators</i>				
		<i>Addressing</i>			
			1. <i>AirActuator</i> 2. <i>GasActuat.(Oil)</i> 3. <i>OilActuator</i> 4. <i>AuxActuator</i>		

For addressing an actuator, select the respective type of actuator:

1. *Air actuator*
2. *Gas actuator (oil) [for dual-fuel burners with only one fuel actuator]*
3. *Oil actuator*
4. *Auxiliary actuator*

Confirm by pressing **ENTER** ( -> "Display and operating unit AZL51...").

The AZL51... prompts you to operate the addressing switch on the actuator.

#### 5. Selecting the actuator's direction of rotation

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>Actuators</i>				
		<i>DirectionRot</i>			
			<i>DeleteCurves</i> 1. <i>AirActuator</i> 2. <i>GasActuat.(Oil)</i> 3. <i>OilActuator</i> 4. <i>AuxActuator</i>		

Select the direction of rotation with *Standard* or *Reversed*.

The standard direction of rotation is anticlockwise when facing the end of the drive shaft ( -> "Display and operating unit AZL51...").

**Note:** After setting the ignition positions / curves, the direction of rotation can only be changed after canceling the curves and the ignition positions on the setting menu "*DeleteCurves*".

#### 6. Activating and deactivating the auxiliary actuator

Depending on the application and the type of fuel (with or without auxiliary actuator), the auxiliary actuator can be activated or deactivated.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>AuxActuator</i>		
		<i>OilSettings</i>			
			<i>AuxActuator</i>		



**7. Setting the load controller (option)**

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>LoadController</i>				
		<i>Configuration</i>			
			<i>LC_OptgMode</i>		

- 8. Selecting a temperature or pressure sensor** If the internal load controller of the LMV51... is used, a temperature or pressure sensor must be connected to input 1, 2 or 4.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>LoadController</i>				
		<i>Configuration</i>			
			<i>Inp1/2/4Sel</i> <i>Inp1/4/MaxValue</i> <i>Inp2Config_C/V</i> <i>Inp2TempMaxValue</i> <i>Inp2PresMaxValue</i> <i>Inp3Config_C/V</i> <i>Inp3MinSetpoint</i> <i>Inp3MaxSetpoint</i>		

On the configuration level of the LC, select the required type of sensor.  
Then, define the sensor's measuring range.

## Settings for gas-fired operation

The next steps explain how the fuel / air ratio control system is to be set. Specific curves are required for each type of fuel.

### 9. Activating program stops in different program phases

Activate a program stop when startup shall be stopped to set the special positions.

Prepurging	Phases 24 - 34
Ignition position	Phase 36
Interval 1	Phase 44
Interval 2	Phase 52
Postpurging	Phases 72 - 78

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>ProgramStop</i>			
			<i>deactivated 24PrePurgP 32PreP FGR 36IgnitPos 44Interv1 52Interv2 72PostPPos 76PostPFGR</i>		

Activate a program stop in Phase 24.

### 10. Checking and presetting the actuators positions for gas ignition

The unit is supplied with presettings for the parameters "home position, prepurge and post-purge position". These positions should be checked and adapted if required, either now or during the following program stops.

The ignition positions are not predefined. In this section, a valid setting must be made or, otherwise, burner startup is **not** possible.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>SpecialPositions</i>		
				IgnitionPos	
					IgnitionPosGas IgnitionPosAir IgnitionPosAux

**Example:** Gas actuator: 32.5°      Air actuator: 25.6°

### 11. Manual startup

To start the burner, select "*Autom/Manual/Off*" and "*BurnerOn*".

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>ManualOperation</i>					
	<i>Autom/Manual/Off</i>				

If startup shall be watched, press simultaneously selection buttons "<" and ">" to switch the display to "Normal operation".

**12. Actuator positions during the prepurge time**

The burner control stops startup during the prepurge phase (Phase 24). The positions of the actuators for prepurging can thus be set very straightforwardly.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>SpecialPositions</i>		
				<i>PrepurgePos</i>	
					<i>PrepurgePosAir</i> <i>PrepurgePosAux</i>

After the settings have been made, the program stop in the prepurge position should be replaced by the program stop of the ignition position in Phase 36.

**13. Ignition positions**

The burner control continues the startup sequence until the ignition position (Phase 36) is reached. Then, it stops again so that the actuator's ignition positions can be set.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>SpecialPositions</i>		
				<i>IgnitionPos</i>	
					<i>IgnitionPosGas</i> <i>IgnitionPosAir</i> <i>IgnitionPosAux</i>

To verify the ignition positions again, the program sequence can be stopped in interval phase 44 or 52 (interval with ignited flame on completion of the relevant safety time). On deactivation of the program stop, the burner continues its program until the operating phase (Phase 60) is reached. If no point for the fuel / air ratio control system has as yet been predefined, the first curvepoint "P1" to be adopted on a preliminary basis are the ignition positions of the actuators.

**14. Setting the curve**  
First setting

The burner travels to the ignition load. The burner's output should now be increased manually and in steps of the curve setting until the nominal capacity (100 %) is reached. During the manual procedure, the actuators travel on the interpolated straight line to the maximum position of 90° at 100 % output. The flue gas values and the stability of the flame must be constantly checked. It may be necessary to define provisional curvepoints, which can be canceled again later. As soon as the nominal capacity is reached, the burner should be optimized with regard to flue gas values.

*Note*

It is recommended to measure the gas throughput at **each curvepoint** in order to reflect the real burner output on the display in relation to the maximum gas throughput. Press the **ESC** button to leave the curvepoint setting. Store the point by pressing **ENTER**. Now, select the second curvepoint. The settings of the previous curvepoint will be adopted on a preliminary basis. Store the second curvepoint like the first one.

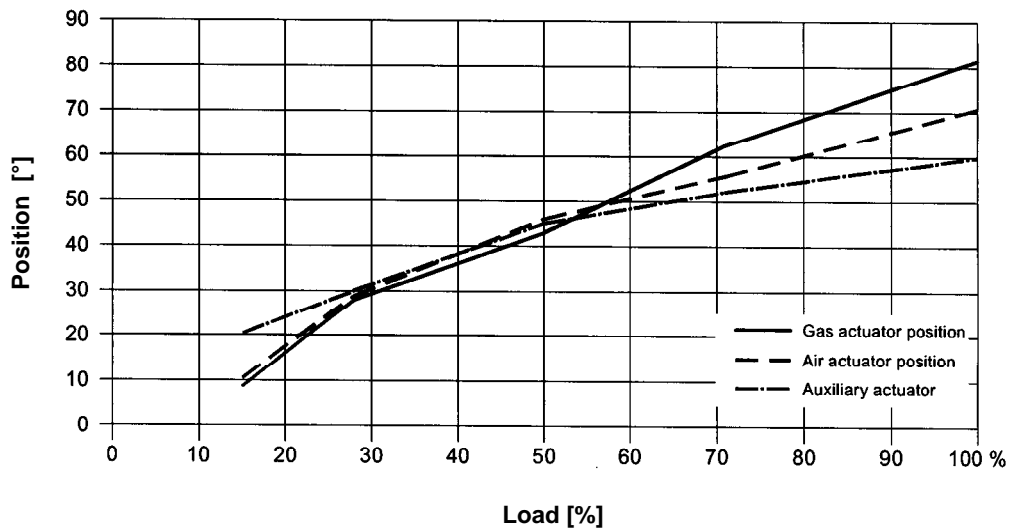
During storage, the LMV51... sorts the curvepoints based on rising output. This means that you can enter the curvepoints in any order you like as long as the output was correctly set. Proceed in this way point by point until the minimum output is reached. After storage of the minimum output point, leave the curve setting.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>CurveParams</i>		
				<i>Point</i>	
				<i>Manual</i>	

**Example:**

Point	1	2	3	4	5
Order of setting	5	4	3	2	1
Output	15 %	28 %	50 %	70 %	100 %
Gas	8.6°	28.0°	43.0°	62.5°	81.5°
Air	10.5°	28.8°	46.0°	55.7°	70.8°
Aux	20.3°	30.0°	45.0°	52.0°	60.0°

**Fuel / air ratio control**



Changing an existing curve

The curvepoints can be changed during burner off periods (Phase 12) or during burner operation (Phase 60).

To change an existing curve, select the curvepoint in "Point" mode. You are now able to change the point, or to cancel it.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>CurveParams</i>		
				<i>Point</i>	
				<i>Manual</i>	

Creating a new curvepoint

To create a new curvepoint, select "Manual". Set the output of the new point and acknowledge by pressing **ENTER**.

During the manual procedure, the actuators travel on the interpolated straight lines between the breakpoints.

After pressing **ENTER**, each individual actuating device can be selected to optimize the position.

To leave the curvepoint setting, press the **ESC** button and store the point by pressing **ENTER**.

**15. Load limits**

Finally, you can limit the burner output to a minimum and maximum in accordance with the boiler's requirements.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>GasSettings</i>			
			<i>LoadLimits</i>		
				<i>MinLoadGas</i> <i>MaxLoadGas</i>	

**16. Shutdown**

Choose "Autom/Manual/Off" to select "BurnerOff".

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>ManualOperation</i>					
	<i>Autom/Manual/Off</i>				

**Settings for multistage firing on oil**

**17. Fuel changeover for firing on oil**

Fuel changeover on the AZL51... is possible only if input "FuelSelect" is set to "internal". Set fuel selection to "Oil" or set the external fuel selector to "Oil".

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Operation</i>					
	<i>Fuel</i>				
		<i>FuelSelect</i>			

**18. Changing the burner operating mode from modulating to multi-stage (only when firing on oil)**

Here, the burner operating mode can be set to "2-stage" or "3-stage".

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>OilSettings</i>			
			<i>CurveParams</i>		
				<i>Operation Mode</i>	

**19. Activating the program stops in the different program phases**      Activate the program stop if startup shall be interrupted to continue setting the special positions.

Prepurge	Phases 24 - 34
Ignition position	Phase 36
Interval 1	Phase 44
Interval 2	Phase 52
Postpurge	Phases 72 - 78

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>ProgramStop</i>			
			<i>deactivated 24PrePurgP 32PreP FGR 36IgnitPos 44Interv1 52Interv2 72PostPPos 76PostPFGR</i>		

Activate a program stop in Phase 24.

**20. Checking and presetting the ignition positions for firing on oil**      For the parameters "home, prepurge and postpurge position", the parameter set as supplied contains presettings. These should be checked and, if necessary, adapted, either now or during the following program stops.

There is **no** presetting for the ignition position. In this section, a valid setting must be made because otherwise, the burner cannot be started up.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>OilSettings</i>			
			<i>SpecialPositions</i>		
				<i>IgnitionPos</i>	
					<i>IgnitionPosOil IgnitionPosAir IgnitionPosAux</i>

**Example:**      Gas actuator: 22.5°      Air actuator: 37.6°

These values are also transferred to operating point S1 even if it has not yet been set.

**21. Manual startup**      To start the burner, select "*Autom/Manual/Off*" to choose "*BurnerOn*".

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>ManualOperation</i>					
	<i>Autom/Manual/Off</i>				

If startup shall be watched, the display can be changed to "Normal operation" by pressing simultaneously selection buttons "<" and ">".

**22. Actuator positions during the prepurge time**

The burner control stops startup in the prepurge phase (Phase 24), so that the positions of the actuators for prepurging can be straightforwardly set.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>BurnerControl</i>				
		<i>OilSettings</i>			
			<i>SpecialPositions</i>		
				<i>PrepurgePos</i>	
					<i>PrepurgePosAir</i> <i>PrepurgePosAux</i>

After the settings are made, the program stop in the prepurge position should be replaced by the program stop of the ignition position in Phase 36.

**23. Ignition positions**

The burner control proceeds with the startup sequence until the ignition position (Phase 36) is reached. There, the burner control stops again for setting the ignition positions of the actuators.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>OilSettings</i>			
			<i>SpecialPositions</i>		
				<i>IgnitionPos</i>	
					<i>IgnitionPosOil</i> <i>IgnitionPosAir</i> <i>IgnitionPosAux</i>

To repeatedly verify the ignition positions, the program sequence can be stopped in interval phase 44 or 52 (interval with ignited flame on completion of the respective safety time). When the program stop is deactivated, the burner proceeds with its program until normal operation is reached (Phase 60).

If the switching points of the burner stages have not yet been defined, the ignition positions of the actuators will be used as the first stage for the moment.

**24. Setting the burner stages**

The burner runs at ignition load or at the first burner stage. The positions of the actuators can now be changed.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>RatioControl</i>				
		<i>OilSettings</i>			
			<i>CurveParams</i>		
				<i>Curve Settings</i>	
					<i>Actuator Positions followed not followed</i>

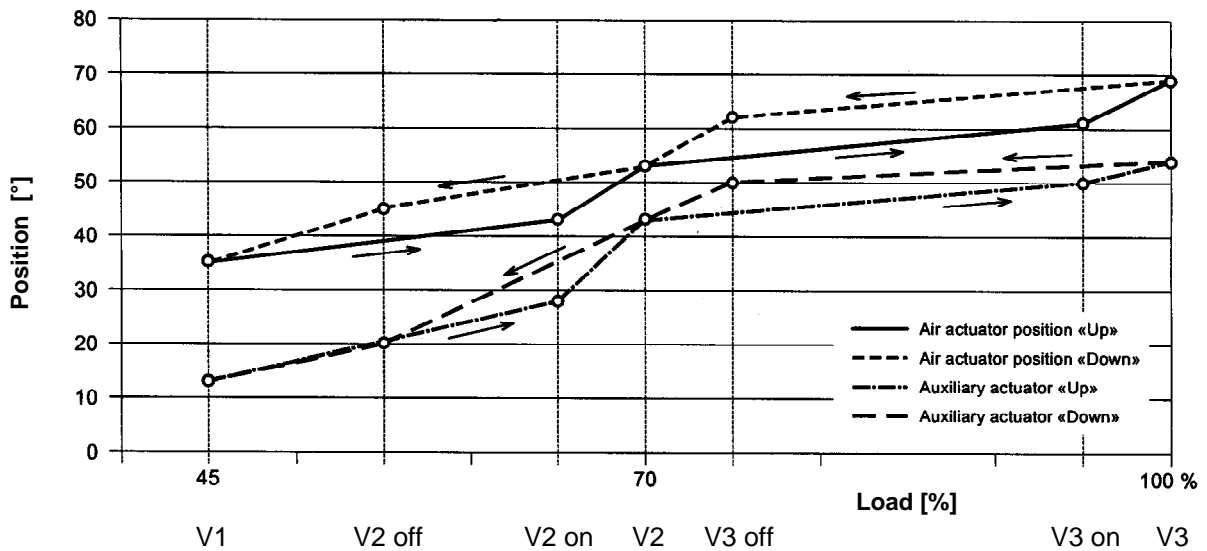
It is recommended to use the function "Actuator positions followed" to set the switching points and operating points of the second and third stage.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	RatioControl				
		OilSettings			
			CurveParams		
				Curve Settings	
					Actuator Positions followed not followed
					SetPointStage1 StartPointStage2 OffPointStage2 SetPointStage2 StartPointStage3 OffPointStage3 SetPointStage3

Example:

Stage	S1	S2 on	S2 off	S2	S3 on	S3 off	S3
Air	35.0°	43.0°	45.0°	53.0°	61.0°	62.0	69.0
Aux	13.0°	28.0°	20.0°	43.0°	50.0°	50.0	54.0

Fuel / air ratio control (multistage operation)



## 25. Shutdown

Select "Autom/Manual/Off" and choose "BurnerOff".

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
ManualOperation					
	Autom/Manual/Off				



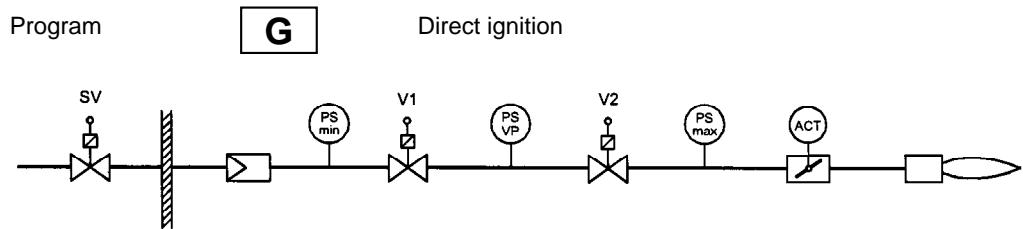
## Extra functions of the LMV51...

### 26. Valve proving (leakage test LT)

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	BurnerControl				
		ValveProving			
			ValveProvingType		
			Config_PM-VP/CPI		
			VP_EvacTme		
			VP_TmeAtmPress		
			VP_FillTme		
			VP_Tme_GasPress		

The gas volume contained in the piping between the valves (including the valve volume) must be calculated in accordance with the gas train.

Example of fuel train



**Determination of the test time with predefined leakage rate to be detected during valve proving:**

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

**Determination of the detected leakage rate during valve proving:**

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

Legend	Symbol	Unit	Description
	$Q_{Leck}$	in l / h	Leakage rate in liters per hour
	$P_G$	in mbar	<b>Overpressure</b> between the 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	<b>Absolute air pressure</b> (1,013 mbar normal pressure)
	$V$	in l	Volume between the valves (test volume) including valve volume and pilot path (Gp1) if present
	$t_{Test}$	in s	Test time

**Example 1**  
**(calculation of test time)**

$$\begin{aligned}P_G &= 30 \text{ mbar} \\P_W &= 15 \text{ mbar} \\P_{\text{atm}} &= 1013 \text{ mbar} \\V &= 3 \text{ l} \\Q_{\text{Leck}} &= 50 \text{ l/h}\end{aligned}$$

$$t_{\text{Test}} = \frac{(30 - 15) \text{ mbar} \cdot 3 \text{ l} \cdot 3600 \frac{\text{s}}{\text{h}}}{1013 \text{ mbar} \cdot 50 \frac{\text{l}}{\text{h}}} = 3.2 \text{ s}$$

**Result:** The test time to be set is 4 seconds

---

**Example 2**  
**(determination of the**  
**detectable leakage rate)**

$$\begin{aligned}P_G &= 30 \text{ mbar} \\P_W &= 15 \text{ mbar} \\P_{\text{atm}} &= 1013 \text{ mbar} \\V &= 3 \text{ l} \\t_{\text{Test}} &= 4 \text{ s}\end{aligned}$$

$$Q_{\text{Leck}} = \frac{(30 - 15) \text{ mbar} \cdot 3 \text{ l} \cdot 3600 \frac{\text{s}}{\text{h}}}{1013 \text{ mbar} \cdot 4 \text{ s}} = 40.0 \frac{\text{l}}{\text{h}}$$

**Result:** The detected leakage rate is 40 l/h

## Configuration of the load controller

Selection of operating mode

Example: Internal load controller with Pt1000 sensor.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	SystemConfig				
		LC_OptgMode			
			ExtLC IntLR IntLC o.DDC IntLC DDCan ExtLCCanalg ExtLC o.DDC		

Or, alternatively:

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	LoadController				
		Configuration			
			LC_OptgMode		
				ExtLC IntLR IntLC o.DDC IntLC DDCan ExtLCCanalg ExtLC o.DDC	

After the internal load controller has been activated, the sensor input must be selected and configured.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	LoadController				
		Configuration			
			Inp1/2/4Sel		
				Pt100 Pt1000 Ni1000 TempSens. PressSensor Pt100Pt1000 Pt100Ni1000 NoSensor	

Then, the temperature measuring range must be defined.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	LoadController				
		Configuration			
			Inp1/4/MaxValue		
				150°C/302°F 400°C/752°F	

## Control parameters of the load controller

The control parameters can be defined in 3 different ways.

### 1. Selection of the standard parameter set

The memory of the load controller contains 5 standard parameter sets.

Depending on the characteristics of the controlled system, a PID triple value can be selected and activated.

The following standard parameter sets can be chosen:

	P [%]	I [s]	D [s]
Very fast	40	55	15
Fast	4	35	17
Normal	7	90	50
Slow	15	320	40
Very slow	30	400	10

### 2. Individual setting of the PID parameters

Alternatively, the PID parameters can be directly selected and set within the predefined value range.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>LoadController</i>				
		<i>ControllerParam</i>			
			<i>ContrlParamList</i>		
				<i>StandardParam</i>	
					<i>Adaption very fast fast normal slow very slow</i>

Or

				<i>P-Part (Xp) I-Part (Tn) D-Part (Tv)</i>	
--	--	--	--	--	--

### 3. Autoamtic adaption

With the method of adapting the control parameters, the characteristic data of the controlled system are acquired with an adaption procedure whereupon matching PID parameters will be calculated.

If possible, the adaption load should be 100 %.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>LoadController</i>				
		<i>Adaption</i>			
			<i>StartAdaption</i>		
			<i>AdaptionLoad</i>		

**Temperature limiter function**

The integrated temperature limiter observes a separate temperature limit.

After the switch-off point in °C for the temperature limiter has been entered, the relative switch-on point in % will be given.

**Example:** TW\_Threshold\_Off: 80 °C  
 TW\_SwiDiff\_On -10 % (= 8 K)  
 Temperature limitation on at 72 °C

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	LoadController				
		TempLimiter			
			TL_Thresh_Off		
			TL_SD_On		

Or

	SystemConfig				
		TempLimiter			
			TL_Thresh_Off		
			TL_SD_On		

**Boiler setpoints W1 and W2**

2 boiler setpoints can be adjusted which, however, may not lie above the current limit value of the temperature limiter function.

Changeover from setpoint W1 to setpoint W2 is accomplished by means of an external, potentialfree contact at input 3.

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	LoadController				
		ControllerParam			
			Setpoint W1		
			Setpoint W2		

Or

Operation					
	BoilerSetpoint				
		Setpoint W1			
		Setpoint W2			

**2-position controller (C = ON / OFF)**

**Example:** Modulating control

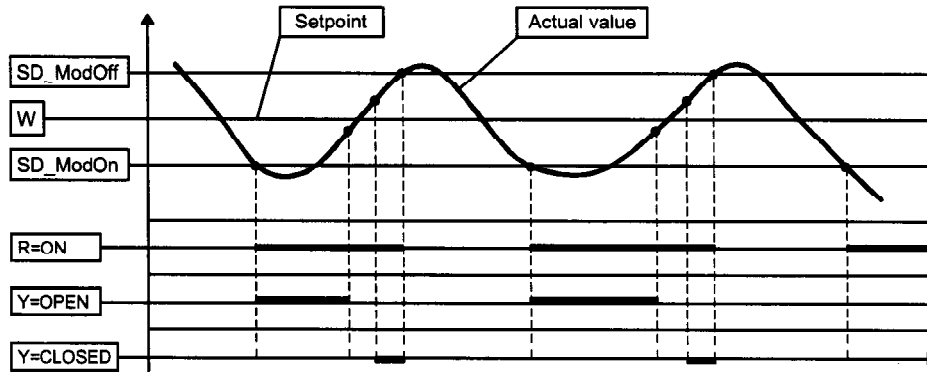
After the boiler setpoint in °C has been entered, the switch-on and switch-off point of the 2-position controller in % will be given.

The switching points will be calculated in relation to the current setpoint.

**Example:** Setpoint: 70 °C  
 SD\_ModOn +5 % (= 3.5 K)  
 SD\_ModOff +10 % (= 7 K)  
 Controller loop open (Off) 70 + 3.5 = 73.5 °C  
 Controller loop closed (On) 70 - 7 = 63 °C

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
Params & Display					
	LoadController				
		ControllerParam			
			SD_ModOn		
			SD_ModOff		

## Diagram



### Cold start thermal shock protection (CSTP)

When the cold start thermal protection has been activated, a boiler - after having dropped below a predefined switch-on threshold - will be heated up in multistage operation.

This approach ensures that when cold, the boiler does not have to satisfy the maximum demand for heat within a very short period of time. Thermal strain on the boiler will thus be prevented.

### Description

The cold start sequence will be activated when, on startup, the actual value lies below the switch-on threshold. When cold start thermal shock protection is activated, the manipulated variable - on cold start - will be increased in a stepwise fashion using the adjusted output step (or the next stage will be switched on).

Start output for the cold start is the minimum load. The increase of the output by the output step depends on 2 criteria:

1. If the predefined change of the actual value is not reached with the current output (setpoint step modulating or setpoint step multistage), the output will be increased by this step (output step) when the maximum time has elapsed.
2. If the predefined change of the actual value is reached with the current output within the maximum time, the output will be increased by one output step.

When the switch-off threshold is reached, the cold start sequence will be terminated and normal control operation started.

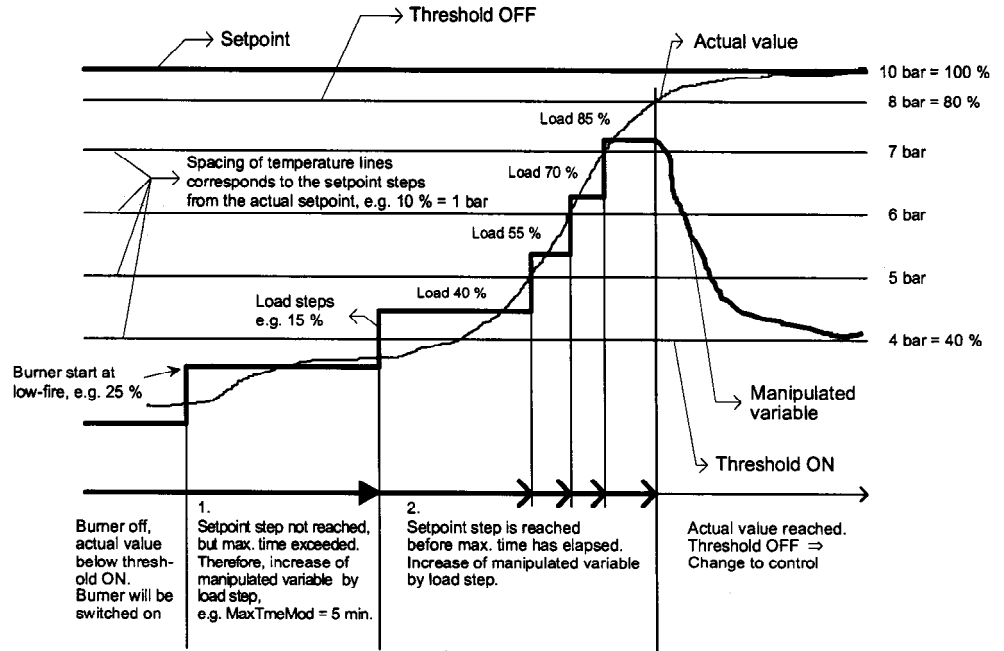
### Example

#### Modulating burner with pressure control

For the output step, any output value in % can be predefined. 100 % divided by the output step gives the number of possible steps.

Parameters:	Shock protection on / off	<b>ColdStartOn</b>	activated
	Shock protection activation level	<b>ThresholdOn</b>	40% of setpoint
	Output step (only for modulating operation)	<b>StageLoad</b>	10% of burner output
	Setpoint step modulating	<b>StageStep_Mod</b>	10% of setpoint
	Max. time modulating per step	<b>MaxTmeMod</b>	5 minutes
	Shock protection deactivation level	<b>ThresholdOff</b>	80% of setpoint

Example (cont'd)



Menu level 1	Menu level 2	Menu level 3	Menu level 4	Menu level 5	Menu level 6
<i>Params &amp; Display</i>					
	<i>LoadController</i>				
		<i>ColdStart</i>			
			<i>ColdStartOn</i> <i>ThresholdOn</i> <i>StageLoad</i> <i>StageStep_Mod</i> <i>StageStep_Stage</i> <i>MaxTmeMod</i> <i>MaxTmeStage</i> <i>ThresholdOff</i>		

## Addendum: List of error messages of LMV51... system

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
1	1	BU	Internal Faul Basic Unit	ROM fault	*1)
2	#	BU	Internal Faul Basic Unit	RAM fault	*1)
3	#	BU	Internal Faul Basic Unit	Fault when making the data comparison (internal communication) of $\mu$ C1 and $\mu$ C2	*1)
4	-	BU	Internal Faul Basic Unit	Unsuccessful synchronization of the 2 $\mu$ Cs	*1)
5	1	BU	Fault Flame Detector Test	Fault during test of the flame signal amplifier	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the flame detector or the faulty basic unit
6	#	BU	Internal Faul Basic Unit	Fault HW TEST (IR, SR, voltage supervision)	*1)
10	#	BU	Internal Faul Basic Unit	Basic unit has detected a diode fault or a shortcircuit in the supply line of the contact feedback network. The diagnostic code indicates the input affected.	*1)
11	1	BU	Internal Faul Basic Unit	Basic unit has detected a short-circuit in the contact feedback network	*1)
15	#	ACT	Fault Positioning Actuator	Basic unit has detected a positioning fault of one or several actuators	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the respective actuators (see diagnostic code)
	1	ACT	Fault Positioning Actuator	Positioning fault of air actuator	
	2	ACT	Fault Positioning Actuator	Positioning fault of fuel actuator	
	3	ACT	Fault Positioning Actuator	Positioning fault of air actuator and fuel actuator	
	4	ACT	Fault Positioning Actuator	Positioning fault of auxiliary actuator	
	5	ACT	Fault Positioning Actuator	Positioning fault of auxiliary actuator and air actuator	
	6	ACT	Fault Positioning Actuator	Positioning fault of auxiliary actuator and fuel actuator	
	7	ACT	Fault Positioning Actuator	Positioning fault of auxiliary actuator, air actuator and fuel actuator	
16	#	BU	Internal Faul Basic Unit	Basic unit has detected a plausibility fault in FARC. The diagnostic code indicates the cause of the fault	
17	-	BU	Internal Faul Basic Unit	(Internal) communication fault of FARC	*1)
18	-	BU	Invalid Curve Data	Invalid curve data	Check the curve data for invalid entries: Valid output range: 0.0% - 100.0% Valid positioning range 0.0° - 90.0° In case of departure from the valid range when commissioning the unit for the first time: Readjust to ensure valid value range If fault occurs after operation has been correct: Replace the faulty basic unit



Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
19	#	ACT	Internal Fault Actuator	Basic unit (FARC) has detected a fault when comparing potentiometer channels A and B. The diagnostic code indicates the actuator on which the fault occurred (see diagnostic code)	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the respective actuator (see diagnostic code)
	1	ACT	Internal Fault Actuator	Air actuator is faulty when comparing potentiometer channels A and B	
	2	ACT	Internal Fault Actuator	Active fuel actuator is faulty when comparing potentiometer channels A and B	
	4	ACT	Internal Fault Actuator	Auxiliary actuator is faulty when comparing potentiometer channels A and B	
1A	1	BU	Slope too steep	Slope of a curve section is too steep	Check the curve's data. If, between 2 curvepoints, the slope exceeds - 3.6° per 0.1 % (30-s ramp) - 1.8° per 0.1 % (60-s ramp) - 0.9° per 0.1 % (120-s ramp) output change -> Change output assignment of the curvepoints such that the above condition will be satisfied
1B	#	BU	Operation in Parameter Setting Mode quit	Programming mode in Phase 62 is still active and the required positions (normal operation) have not been reached	When setting the curve parameters, the plant should be operated with "Burner on" in manual operation. This prevents the load controller from triggering the change to shutdown. If the TL responds, the effect can be the same, however, but the value currently handled (curvepoint) can still be saved in standby or lockout
1C	#	BU	Ignition Pos not defined	The relevant ignition positions are not parameterized	Set the ignition positions
	1	BU	Ignition Pos not defined	Ignition position of air actuator	
	2	BU	Ignition Pos not defined	Ignition position of active fuel actuator is not parameterized	
	4	BU	Ignition Pos not defined	Ignition position of auxiliary actuator is not parameterized	It may be necessary to deactivate the auxiliary actuator that is not required
1D	#	BU		Running time fault of actuators	Check actuators for mechanical overload, or replace the faulty actuator
	1	BU	Fault Running Time Air Actuator	Running time fault of air actuator	
	4	BU	Fault Running Time Aux Actuator	Running time fault of auxiliary actuator	
1E	#	ACT	Special Pos not reached	Basic unit has detected that one or several actuators have not reached the special position associated with the phase	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the respective actuators (see diagnostic code)
	1	ACT	Special Pos not reached	Positioning fault of air actuator	
	2	ACT	Special Pos not reached	Positioning fault of gas actuator	
	3	ACT	Special Pos not reached	Positioning fault of air actuator and fuel actuator	
	4	ACT	Special Pos not reached	Positioning fault of auxiliary actuator	
	5	ACT	Special Pos not reached	Positioning fault of auxiliary actuator and air actuator	
	6	ACT	Special Pos not reached	Positioning fault of auxiliary actuator and fuel actuator	
	7	ACT	Special Pos not reached	Positioning fault of auxiliary actuator, air actuator and fuel actuator	
21	-	BU	Safety Loop open	Safety loop open	
22	-	BU	Internal Temp Limiter has responded	Internal temperature limiter has cut out since the parameterized value has been exceeded	

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
23	-	BU	Extraneous Light on Startup	Basic unit has detected extraneous light during startup	
24	-	BU	Extraneous Light on Shutdown	Basic unit has detected extraneous light during shutdown	
25	-	BU	No flame at End of Safety Time	No flame detected at the end of the safety time "ts1"	
26	-	BU	Loss of Flame	Loss of flame detected during operation	
27	-	BU	Air Pressure on	Air pressure detected = on, but should be off	
28	-	BU	Air Pressure off	Air pressure detected = off, but should be on	
29	-	BU	Fan Contactor Contact energized	FCC signal detected = on, but should be off	
2A	-	BU	Fan Contactor Contact deenergized	FCC signal detected = off, but should be on	
2B	-	BU	Flue Gas Recirculation Pressure Switch on	FGR-APS detected = on, but should be off	
2C	-	BU	Flue Gas Recirculation Pressure Switch off	FGR-APS detected = off, but should be on	
2D	-	BU	Valve not open	Valve closing contact (CPI) detected = on, but should be off	
2E	-	BU	Valve or Closed Position Indicator (CPI) open	Valve closing contact (CPI) detected = off, but should be on	
2F	-	BU	Gas Pressure has dropped below minimum Limit	Gas pressure < minimum	
30	-	BU	Gas Pressure has exceeded maximum Limit	Gas pressure > maximum	
31	-	BU	Gas Pressure w Valve Proving: Valve on Gas Side leaking	Gas pressure VP = high	
32	-	BU	No Gas Pressure Valve proving: Valve on Burner Side leaking	Gas pressure VP = low	
33	-	BU	Oil Pressure on although Oil Pump off	Oil pressure > minimum	
34	-	BU	Oil Pressure below Minimum	Oil pressure < minimum	
35	-	BU	Oil Pressure above Maximum	Oil pressure < maximum	
36	-	BU	No Start Release for Oil	Start release oil = off	
37	-	BU	No direct Heavy Oil Start	Direct start heavy oil	
38	-	BU	Lack of Gas Program	Gas shortage program running	
39	#	BU	Internal Fault Basic Unit	Parameter "Maximum safety time" faulty	
3A	-	BU	No Burner ID defined	No burner identification defined	Parameterize the burner identification
3B	-	BU	No Service Passport defined	No service password defined	Enter the service password
40	-	BU	Internal Fault Basic Unit	Wrong contact position of SR relay	
41	-	BU	Internal Fault Basic Unit	Wrong contact position of ignition	
42	#	BU	Internal Fault Basic Unit	Wrong contact position of fuel valve relays	
43	#	BU		Fault in connection with plausibility check. For cause of fault, refer to the diagnostic code	*1)
	2	BU	No Fuel Train defined	No defined fuel train parameterized	

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
44	#	BU		Fault with inputs deactivated	
	1	BU	Controller connected but deactivated	Controller connected but deactivated	
	2	BU	APS connected but deactivated	APS connected but deactivated	
	3	BU	FCC / FGR - APS connected but deactivated	FCC / FGR - APS connected but deactivated	
	4	BU	Gas Pressure min connected but deactivated	GP min connected but deactivated	
	5	BU	Gas Pressure max connected but deactivated	GP max connected but deactivated	
	6	BU	Oil Pressure min connected but deactivated	OP min connected but deactivated	
	7	BU	Oil Pressure max connected but deactivated	OP max connected but deactivated	
	8	BU	Start Signal Oil connected but deactivated	Start signal oil connected but deactivated	
	9	BU	HO Start connected but deactivated	HO start connected but deactivated	
45	-	BU	Locked by SLT	Shutdown after SLT test	
50	#	BU	Internal Fault Basic Unit	Key error	*1)
51	-	BU	Internal Fault Basic Unit	Time block overrun	*1)
52	#	BU	Internal Fault Basic Unit	Stack fault	*1)
58	-	BU	Parameter Set damaged	Internal communication ( $\mu C1 < > \mu C2$ )	*1)
59	#	BU	Parameter Set damaged	EEPROM page on ABORT after initialization (last parameter setting has possibly been interrupted by a power failure)	
5A	#	BU	Parameter Set damaged	Parameter page with CRC fault	Reset the unit. !Caution! If this fault occurred while setting the parameters: Check the parameters changed last to ensure they are correct. If resetting does not solve the problem: Restore the parameters of the AZL51... Otherwise, replace the basic unit.
5B	#	BU	Parameter Set damaged	Page is on ABORT	Reset the unit. !Caution! If this fault occurred while setting the parameters: Check the parameters changed last to ensure they are correct. If resetting does not solve the problem: Restore the parameters of the AZL51... Otherwise, replace the basic unit.
5C	#	BU	Parameter Backup Restore	Page is on WR_RESTO	Reset the unit.
5D	#	BU	Internal Fault Basic Unit	Page open for too long	Reset the unit. !Caution! If this fault occurred while setting the parameters: Check the parameters changed last to ensure they are correct. If resetting does not solve the problem: Restore the parameters of the AZL51... Otherwise, replace the basic unit.

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
5E	#	BU	Internal Fault Basic Unit	Page has an undefined status	Reset the unit. !Caution! If this fault occurred while setting the parameters: Check the parameters changed last to ensure they are correct. If resetting does not solve the problem: Restore the parameters of the AZL... Otherwise, replace the basic unit.
5F	-	BU	Parameter Set damaged	Last backup restore invalid (was interrupted)	Repeat backup restore
60	#	BU	Internal Fault Basic Unit	Fault when copying a parameter page	1. Make a reset 2. Restore data with the AZL51...
61	#	BU	Internal Fault Basic Unit	Fault in connection with EEPROM initialization	1. Make a reset 2. Restore data with the AZL51...
70	#	BU	Internal Fault Basic Unit	Fault when restoring the lockout information	
71	-	BU	Manual Lockout	Lockout was made manually via contact	Lockout by external reset / lockout contact can be negated by pressing the button again
72	#	BU	Internal Fault Basic Unit	Plausibility fault during fault entry	*1)
81	#	ACT	Fault Feedback Air Actuator	Basic unit has detected a wrong status of the air actuator	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty air actuator
82	#	ACT	Fault Feedback Gas (Oil) Actuator	Basic unit has detected a wrong status of the gas actuator	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty gas actuator
83	#	ACT	Fault Feedback Oil Actuator	Basic unit has detected a wrong status of the oil actuator	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty oil actuator
84	#	ACT	Fault Feedback Aux Actuator	Basic unit has detected a wrong status of the auxiliary actuator	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty auxiliary actuator
86	#	LC	Fault Feedback Load Controller	Basic unit has detected a wrong status of the internal load controller	*1)
87	#	AZL	Fault Feedback AZL	Basic unit has detected a wrong status of the AZL51...	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty AZL51...
88	#	All		Plausibility fault network management	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty unit (see diagnostic code) or the basic unit
	1	All	Fault Feedback Actuator	Undefined fault class of ACT	
	2	All	Fault Feedback Load Controller	Undefined fault class of LC	
	3	All	Fault Feedback AZL	Undefined fault class of AZL51...	
91	-	ACT	Fault Feedback Air Actuator	Basic unit has detected a ROM-CRC fault in the air actuator when checking the actuator's feedback signal	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty air actuator
92	-	ACT	Fault Feedback Gas (Oil) Actuator	Basic unit has detected a ROM-CRC fault in the gas actuator when checking the actuator's feedback signal	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty gas actuator
93	-	ACT	Fault Feedback Oil Actuator	Basic unit has detected a ROM-CRC fault in the oil actuator when checking the actuator's feedback signal	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty oil actuator
94	-	ACT	Fault Feedback Aux Actuator	Basic unit has detected a ROM-CRC fault in the auxiliary actuator when checking the actuator's feedback signal	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty auxiliary actuator

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
96	-	LC	Fault Feedback Load Controller	Basic unit has detected a ROM-CRC fault in the load controller when checking the load controller's feedback signal	*1)
97	-	AZL	Fault Feedback AZL	Basic unit has detected a ROM-CRC fault in the AZL51... when checking the unit's feedback signal	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty AZL51...
98	-	All	Fault two equal Addresses	CAN overrun	Check if several partners (e.g. actuators) with the same address are connected to the CAN bus and correct this condition (e.g. readdress the actuators by using their correct address)
99	-	All	Internal Fault Basic Unit	CAN in bus off	*1)
9A	-	All	Internal Fault Basic Unit	CAN warning level Fault probably occurred when connecting or disconnecting a CAN bus user	*1) Replace the faulty AZL51... if necessary
9B	#	All	Internal Fault Basic Unit	CAN queue overrun	*1)
A1	#	ACT		Air actuator has detected own fault and has reported it to the basic unit Type of fault: See diagnostic code	If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty actuator
	0C	ACT	Internal Fault Air Actuator	Temperature warning and shutdown	Check the housing's temperature (max. 60 °C)
	13	ACT	Position Fault Air Actuator	Actuator outside the permitted angular rotation (0 - 90°) or wrong linearization data	Check if actuator is in its valid positioning range (0 - 90°)
	15	ACT	Internal Fault Air Actuator	CAN fault	Check wiring of CAN bus; check terminating resistors
A2	#	ACT		Gas actuator has detected own fault and has reported it to the basic unit Type of fault: See diagnostic code	
	See A1	See A1	See A1	See A1	See A1
A3	#	ACT		Oil actuator has detected own fault and has reported it to the basic unit Type of fault: See diagnostic code	
	See A1	See A1	See A1	See A1	See A1
A4	#	ACT		Auxiliary actuator has detected own fault and has reported it to the basic unit Type of fault: See diagnostic code	
	See A1	See A1	See A1	See A1	See A1
A6	#	LC		Internal load controller has detected own fault and has reported it to the basic unit Type of fault: See diagnostic code	*1)
	10	LC	No actual Value Slope at End of Identification		
	12	LC	Adaption invalid	Invalid XP identified	
	13	LC	Adaption invalid	Invalid TN identified	
	14	LC	Adaption invalid	TU greater than identification time	
	15	LC	Adaption invalid	Invalid TV identified	
	16	LC	Timeout with Adaption	Timeout during observation time	

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
	17	LC	Cold Start thermal Shock Protection active		
	18	LC	Timeout with Adaption	Timeout while adaption output is delivered and process is observed	
	22	LC	Setpoint Temp Controller above maximum Limit		
	33	LC	Parameter Set damaged	Invalid CRC when reading in a page	Reset the unit; repeat backup restore, if required
	44	LC	Parameter Set damaged	Page was set on ABORT	Reset the unit; repeat backup restore, if required
	45	LC	Parameter Backup Restore	Page was set on RESTO	Reset the unit; repeat backup restore, if required
	4A	LC	Internal Fault Load Controller	CAN fault	
	4B	LC	Internal Fault Load Controller	CAN fault	
	4C	LC	Internal Fault Load Controller	CAN fault	
	4D	LC	Internal Fault Load Controller	CAN fault	
	4E	LC	Internal Fault Load Controller	CAN fault	
	50	LC	Short-circuit Pt100 Sensor		
	51	LC	Open-circuit Pt100 Sensor		
	52	LC	Short-circuit Pt100 Sensor (Line Compens)		
	53	LC	Short-circuit Pt1000 Sensor		
	54	LC	Open-circuit Pt1000 Sensor		
	55	LC	Short-circuit Ni1000 Sensor		
	56	LC	Open-circuit Ni1000 Sensor		
	57	LC	Overvoltage at Input 2		
	58	LC	Open-circuit / Short-circuit at Input 2		
	59	LC	Overvoltage at Input 3		
	5A	LC	Open-circuit / Short-circuit at Input 3		
A7	#	AZL		AZL51... has detected own fault and has reported it to the basic unit Type of fault: See diagnostic code	Follow the measures listed below and: If fault occurs sporadically: Improve EMC If fault occurs permanently: Replace the faulty AZL51...
	9	AZL	Manual Lockout AZL	Fault message for emergency off function via AZL51...	
	0B	AZL	> 250 000 Startup Cycles Service required		
	0D	AZL	Menu for Firing on Oil. Current Fuel is Gas	While firing on gas, it was attempted to change data on a menu for oil	Change to menu "Settings for gas"
	0E	AZL	Menu for Firing on Gas. Current Fuel is Oil	While firing on oil, it was attempted to change data on a menu for gas	Change to menu "Settings for oil"
	15	AZL	Internal fault AZL	CAN queue fault	
	16	AZL	Internal fault AZL	CAN overrun fault	
	17	AZL	Internal fault AZL	CAN bus off	
	18	AZL	Internal fault AZL	CAN warning level	
	1B	AZL	No valid Parameter Backup	Fault when copying a parameter page	Reset the unit; repeat backup restore, if required

Error code	Diagnostic code	Unit	Display	Meaning for the LMV51... system	Troubleshooting
	30	AZL	Fault Communication eBus	A fault occurred in connection with eBus communication	
	38	AZL	Internal Fault AZL	Interface mode could not be terminated	
	40	AZL	Communication AZL with PC Tool	Parameter setting fault PC tool detection through key test in the AZL51...	
	88	AZL	Internal Fault AZL	RAM fault with redundant inverse variables	
B0	#	BU		Fault check of port outputs	*1)
	1	BU	Internal Fault Basic Unit	Fault when reading back the set outputs	
	2	BU	Internal Fault Basic Unit	Fault during the IR test	
B1	1	BU	Internal Fault Basic Unit	Fault short-circuit test inputs / outputs	*1)
C5	#	AZL		When comparing the versions of the individual units, the AZL51... has detected old data	Replace the relevant units by new versions
	#	AZL	Version Conflict	The relevant units are bit-coded Bit / unit 0 / BU 1 / LC 2 / AZL 3 / air actuator 4 / gas actuator 5 / oil actuator 6 / auxiliary actuator 7 / not used	

\*1)

If fault occurs sporadically: Improve EMC

If fault occurs permanently: Replace the faulty basic unit



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