



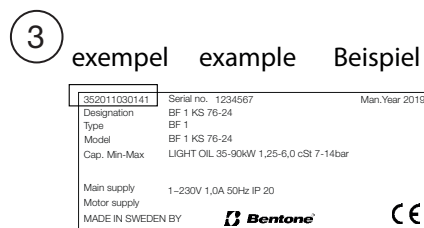
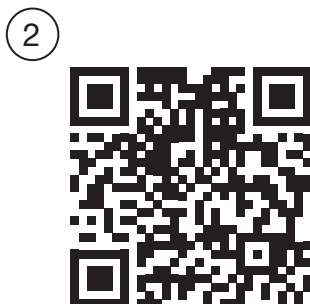
Providing sustainable energy solutions worldwide

Installation- and maintenance instruction

B 45i A2.2H J/K

LMV37

AS67



-sv

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1. General Information

The burner may only be used for its intended purpose in accordance with the product's technical data.

We reserve the right to make design changes and cannot be held liable for any misprints or typographical errors.

Modifying the design or using accessories or components that have not been approved by Enertech in writing is strictly prohibited.

This Installation and Maintenance manual:

- is to be regarded as part of the burner and must always be kept near the installation site.
- must be read prior to installation.
- is intended for use by authorised personnel.

1.1 Delivery inspection

- Make sure everything is delivered and the goods have not been damaged during transit.
Transport damage must be reported to the shipping company.
- If something is wrong with a delivery, report it to the supplier.

1.2 Safety

- before installation:

- Installation and work on the burner and associated system components may only be carried out by persons who have undergone relevant training.
- The product is packaged to prevent damage from occurring when handled – Handle the product with care! Lifting equipment must be used to lift larger packages.
- The products must be transported/stored on a level surface in a dry environment, max. 80% relative humidity, no condensation.
Temperature -20 to +60 °C.

- installation:

- The burner must be installed in accordance with local regulations for fire safety, electrical safety, and fuel distribution.
- The premises must comply with local regulations pertaining to use of the burner, and must have adequate air supply.
- The installation site must be free of chemicals.
- Fire extinguisher with Class BE recommended.
- Make sure when installing the burner that there is enough space to service the burner.
- The electrical installation must be professionally carried out in accordance with applicable high voltage regulations.
- Make sure that the burner is suitable for the application (see Technical Data).



- All components must be installed without being bent, twisted or subjected to mechanical or thermal forces that affect components.
- Care must be taken by the installer to ensure that no electrical cables or fuel lines are crushed or otherwise damaged during installation or service.
- Flame tubes, fan wheels and air dampers, for example, may contain sharp edges.

- before first start:

- The burner must not be put into operation without proper safety and protection devices.
- Permitted ambient temperature during operation -10 to +60 °C. Max. 80% relative humidity, no condensation.
- The surface temperature of the burner's components may exceed 60 °C.
- Handle with caution – the burner has moving parts, and there is risk of crushing injuries.
- Seal inspections must be performed during installation and servicing to prevent leakage.
- fitting and installation work has been completed and approved.
- electrical installation has been correctly performed.
- flue gas ducts and combustion air ducts are not blocked.
- all actuators and control and safety devices are in working order and correctly set.
- If the boiler is equipped with an access hatch, this must be equipped with a hatch opening switch connected to the burner's safety system.
- When in operation, the burner's noise level can exceed 85 dBA – use hearing protection!



- Operation:

- Carry out all stipulated settings, service and inspection work within the set time.
- If the oil burner control has a solid red light, contact your installer.

2. Technical data

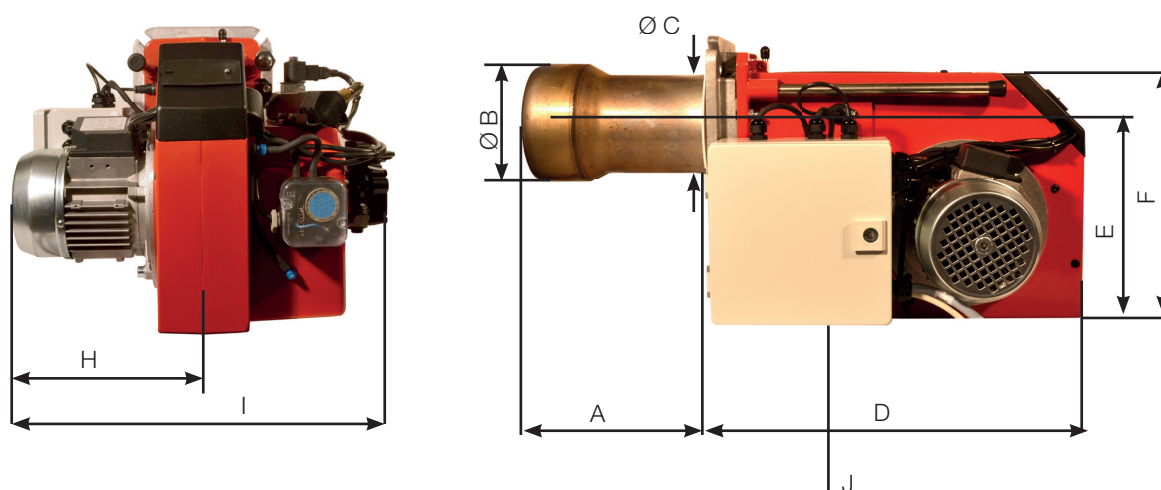
The burner is intended for:

- Light oil, B10 heating oil/biofuel blend (as defined in DIN V51603-6).

and is used for:

- Water heating generators
- Steam generators
- Industrial applications
- Hot air generators

2.1 Dimensions B 45i A2.2H



	A	Ø B	Ø C	D	E	F	H	I	*J
B 45i A2-2H	240/340	159	134	480	252	328	262	515	200

* Min. recommended distance to floor.

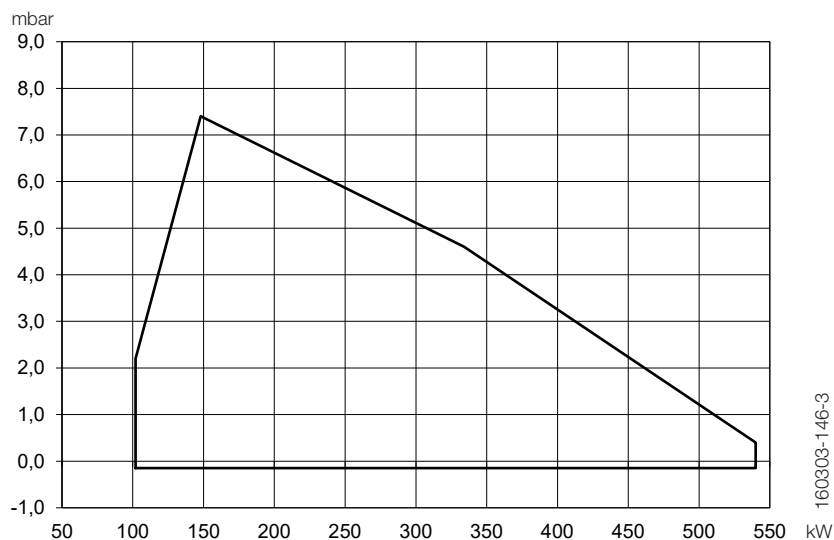
2.2 Electric Specification

Burner correspond to IP 54

Type	Motor	Complete burner	Ljud
B 45i A2.2H	650 W 230/400V 50/60Hz	230/400V 3,2/1,9A 50Hz	84 dBA ± 0,5 dBA

2.3 Working field B 45i A2.2H

8.6-45.5 kg/h
102-540 kW

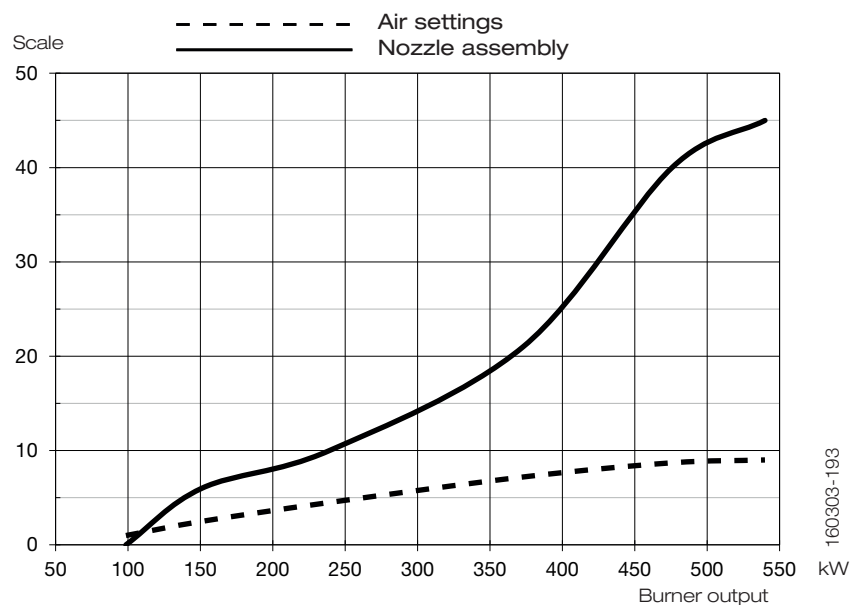


! Do not exceed working field.

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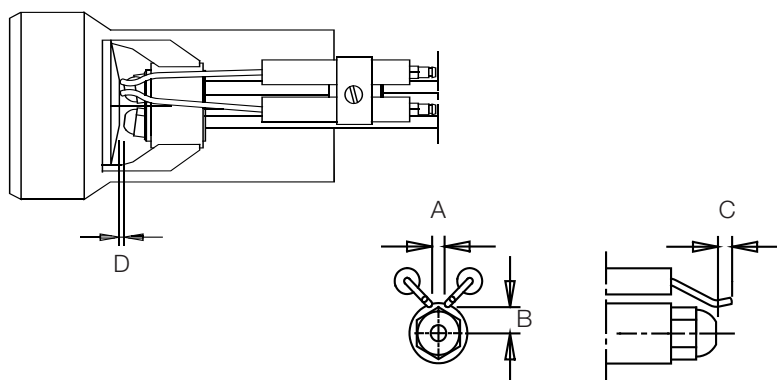
2.4 Setting for insert and air damper

Basic settings should only be seen as setting values to get burner to start. Once the burner has started and established flame, it is necessary to adjust the settings so that they are adapted to the installation and the fuel used.



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2.5 Setting of brake plate and air flow



! *NB It is important that the spark does not strike against the brake plate or nozzle

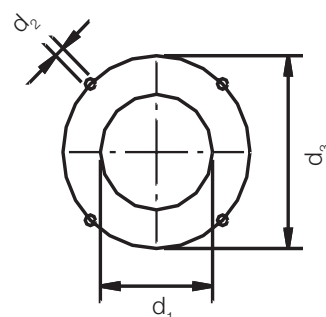
	a	b	c	d
B 45i A2-2H	3.5-4.0	7.0-9.0	2.0-3.0	5.0-6.0

2.6 Burner installation

2.6.1 Hole patten

Make sure the hole pattern on the boiler is designed for burner flange.

Combustion device	d_1	d_2	d_3
B 45i A2-2H	$\varnothing$ (135) 165	14	$\varnothing$ (200) 224-270



2.7 Nozzle and pressure

Due to different furnace geometries and capacities, it is not possible to recommend a nozzle model.

Nozzle:	45° Solid/semisolid
	60° Solid/semisolid
	80° Solid/semisolid
Pump pressure	14 bar (8-25 bar) depending on pump model

2.8 Nozzle table

Pump pressure bar

Gph	9			11			13			15		
	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
0,85	3,00	36	31	3,32	39	34	3,61	43	37	3,87	46	39
1,00	3,53	42	36	3,90	46	40	4,24	50	43	4,56	54	46
1,10	3,88	46	39	4,29	51	44	4,67	55	48	5,01	59	51
1,20	4,24	50	43	4,68	55	48	5,09	60	52	5,47	65	56
1,25	4,40	52	45	4,88	58	50	5,30	63	54	5,70	68	58
1,35	4,76	56	48	5,27	62	54	5,73	68	58	6,15	73	63
1,50	5,29	63	54	5,85	69	60	6,36	75	65	6,83	81	70
1,65	5,82	69	59	6,44	76	66	7,00	83	71	7,52	89	77
1,75	6,18	73	63	6,83	81	70	7,42	88	76	7,97	94	81
2,00	7,06	84	72	7,81	93	80	8,49	101	86	9,12	108	93
2,25	7,94	94	81	8,78	104	89	9,55	113	97	10,26	122	105
2,50	8,82	105	90	9,76	116	99	10,61	126	108	11,39	135	116
2,75	9,71	115	99	10,73	127	109	11,67	138	119	12,53	148	128
3,00	10,59	126	108	11,71	139	119	12,73	151	130	13,67	162	139
3,50	12,35	146	126	13,66	162	139	14,85	176	151	15,95	189	163
4,00	14,12	167	144	15,62	185	159	16,97	201	173	18,23	216	186
4,50	15,88	188	162	17,57	208	179	19,10	226	195	20,51	243	209
5,00	17,65	209	180	19,52	231	199	21,22	251	216	22,79	270	232
5,50	19,42	230	198	21,47	255	219	23,34	277	238	25,07	297	256
6,00	21,18	251	216	23,42	278	239	25,46	302	260	27,49	326	280
6,50	22,94	272	234	25,37	301	259	27,58	327	281	29,63	351	302
7,00	24,71	293	252	27,33	324	279	29,70	352	303	31,91	378	325
7,50	26,47	314	270	29,28	347	298	31,83	377	324	34,19	405	349
8,00	28,24	335	288	31,23	370	318	33,95	403	346	36,47	432	372
8,50	30,00	356	306	33,18	393	338	36,07	428	368	38,74	459	395
9,00	31,77	377	324	35,14	417	358	38,19	453	389	41,02	486	418

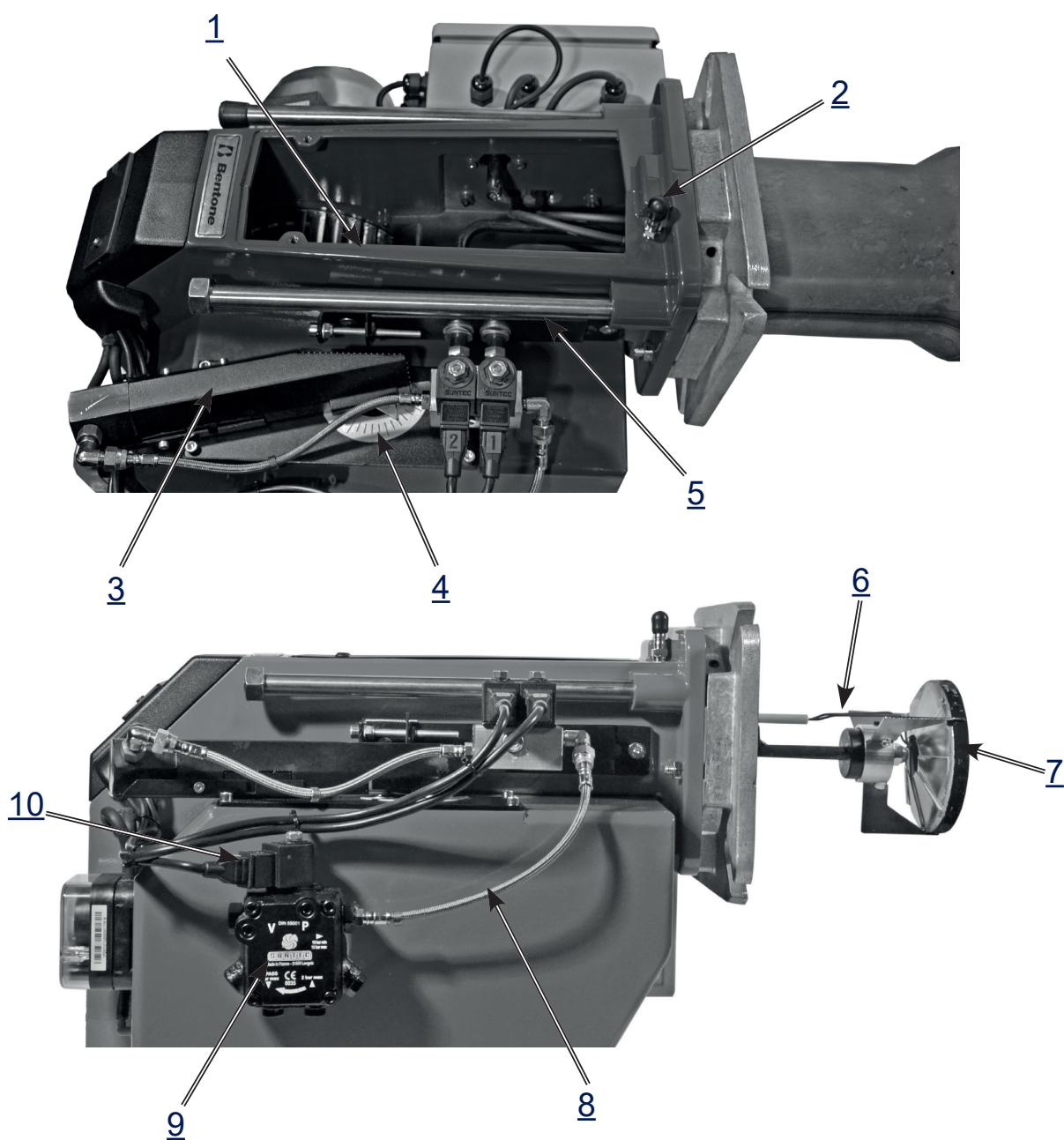
The table applies to oil with a viscosity of 4.4 mm²/s (cSt) at a density of 830 kg/m³.

Pump pressure bar

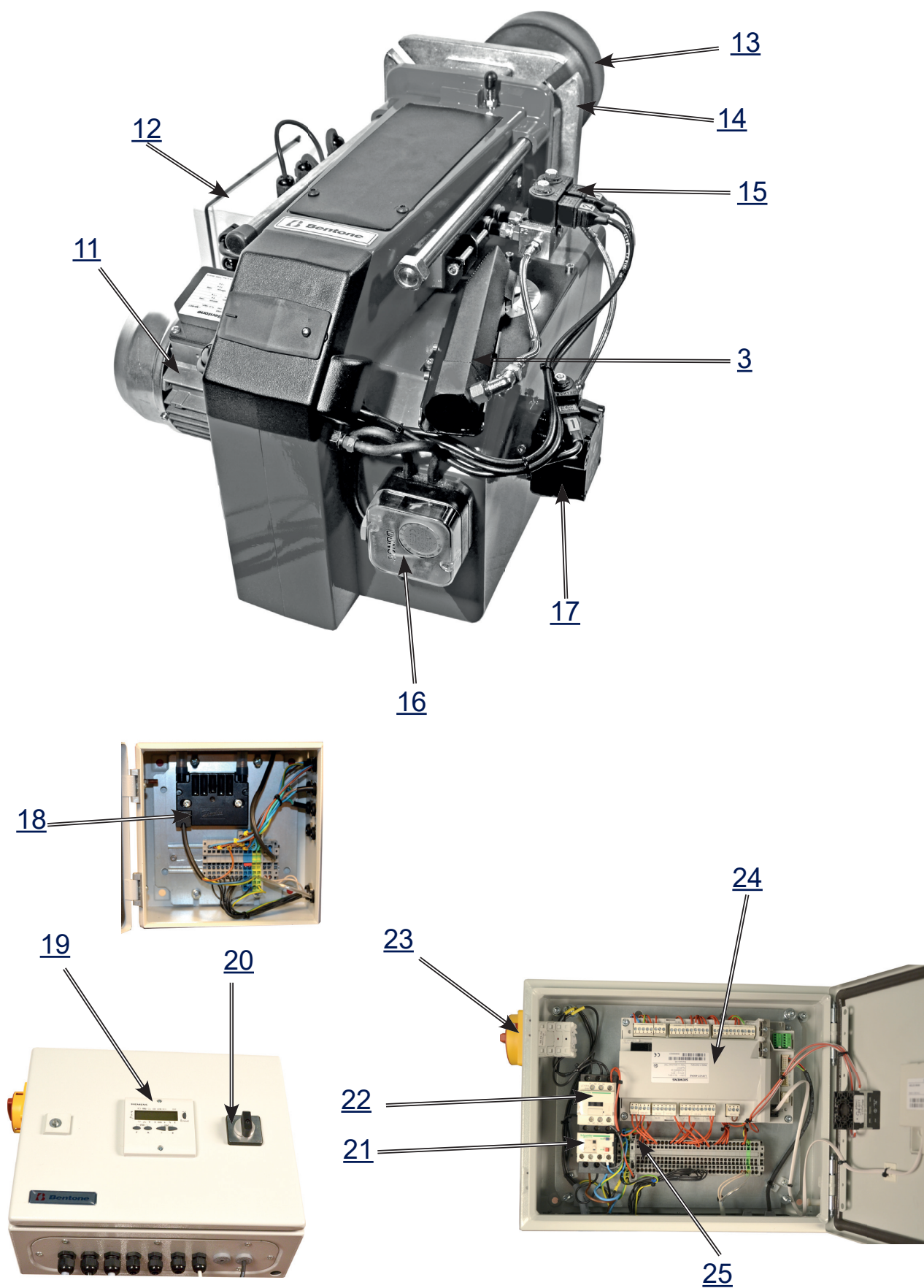
Gph	17			19			21			23			25		
	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h	kg/h	kW	Mcal/h
1,00	4,85	57	49	5,13	61	52	5,40	64	55	5,65	67	58	5,89	70	60
1,10	534	63	54	5,64	67	57	5,93	70	60	6,21	74	63	6,47	77	66
1,20	5,82	69	59	6,16	73	63	6,47	77	66	6,77	80	69	7,06	84	72
1,25	6,07	72	62	6,41	76	65	6,74	80	69	7,05	84	72	7,35	87	75
1,35	6,55	78	67	6,93	82	71	7,28	86	74	7,62	90	78	7,94	94	81
1,50	7,27	86	74	7,69	91	78	8,08	96	82	8,46	100	86	8,82	105	90
1,65	8,01	95	82	8,47	100	86	8,90	105	91	9,31	110	95	9,71	115	99
1,75	8,49	101	87	8,98	106	92	9,44	112	96	9,88	117	101	10,30	122	105
2,00	9,71	115	99	10,26	122	105	10,79	128	110	11,29	134	115	11,77	140	120
2,25	10,92	130	111	11,55	137	118	12,14	144	124	12,70	151	129	13,25	157	135
2,50	12,13	144	124	12,83	152	131	13,49	160	138	14,12	167	144	14,72	175	150
2,75	13,35	158	136	14,11	167	144	14,84	176	151	15,53	184	158	16,19	192	165
3,00	14,56	173	148	15,39	182	157	16,18	192	165	16,93	201	173	17,65	209	180
3,50	16,99	201	173	17,96	213	183	18,89	224	193	19,77	234	202	20,61	244	210
4,00	19,42	230	198	20,53	243	209	21,59	256	220	22,59	268	230	23,56	279	240
4,50	21,84	259	223	23,09	274	235	24,28	288	248	25,41	301	259	26,49	314	270
5,00	24,27	288	247	25,65	304	262	26,98	320	275	28,24	335	288	29,44	349	300
5,50	26,70	317	272	28,22	335	288	29,68	352	303	31,06	368	317	32,38	384	330
6,00	29,13	345	292	30,79	365	314	32,38	384	330	33,89	402	346	35,33	419	360
6,50	31,55	374	322	33,35	395	340	35,07	416	358	36,70	435	374	38,26	454	390
7,00	33,98	403	347	35,92	426	366	37,77	448	385	39,53	469	403	41,21	489	420
7,50	36,41	432	371	38,49	456	392	40,47	480	413	42,35	504	434	44,16	524	450
8,00	38,80	460	396	41,05	487	419	43,17	512	440	45,18	536	461	47,10	559	480
8,50	41,26	489	421	43,62	517	445	45,87	544	468	48,00	569	489	50,05	594	510
9,00	43,69	518	446	46,18	548	471	48,57	576	495	50,83	603	518	52,99	628	540
9,50	46,11	547	470	48,75	578	497	51,26	608	523	53,65	636	547	55,93	663	570
10,00	47,11	559	480	51,32	609	523	53,96	640	550	56,47	670	576	58,88	698	600
11,00	53,40	633	545	56,45	669	576	59,36	704	605	62,12	737	633	64,77	768	660
12,00	58,25	691	594	61,58	730	628	64,76	768	660	67,77	804	691	70,66	838	721
14,00	67,96	806	693	71,84	852	733	75,55	896	770	79,09	938	806	82,43	978	841
16,00	77,67	921	792	82,11	974	837	86,34	1024	880	90,36	1072	921	94,20	1117	961

The table applies to oil with a viscosity of 4.4 mm²/s (cSt) at a density of 830 kg/m³.

2.9 Components



- | | | |
|---|------------------------------|--|
| 1. Fan wheel | 9. Pump | 18. Ignition transformer |
| 2. Test point | 10. Solenoid valve | 19. AZL display for LMV automatic control unit |
| 3. Protective cover, Hydraulics Setting | 11. Motor | 20. Switch 0-1 |
| 4. Scale | 12. Electric box (burner) | 21. Thermal overload protection |
| 5. Geider | 13. Blast tube | 22. Contactor |
| 6. Ignition electrodes | 14. Burner flange | 23. Disconnecter |
| 7. Brake plate | 15. Solenoid valve with bloc | 24. Automatic control unit LMV |
| 8. Oil pipes | 16. Air pressure switch | 25. Fuse |
| | 17. Oil pressure adjustment | |



3. General instructions

3.1 General rules

The installation of an oil burner should be carried out in accordance with local regulations. The installer of the burner must therefore be aware of all regulations relating to oil and combustion.

Only oil suitable for the burner should be used and then in combination with a suitable oil filter before the oil pump of the burner.

If the burner is replacing an existing burner make sure that the oil filter is replaced or cleaned. The installation must only be undertaken by experienced personnel. Care should be taken by the installer to ensure that no electrical cables or fuel/gas pipes are trapped or damaged during installation or service/maintenance.

3.1.1 Installation and maintenance instructions

The maintenance instructions supplied with the burner must be kept at an easily accessible location in the boiler room.

3.1.2 Instructions

It is the installer's responsibility to instruct the user in detail in the functions of the burner and the entire system.

3.1.3 Inspection and maintenance

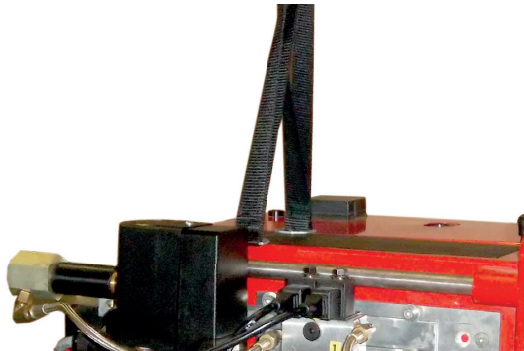
The boiler/burner should be examined regularly for any signs of malfunction or oil leakage. (See service schedule)

3.1.4 Start up

In order to obtain the correct setting, a flue gas analysis and temperature measurement must be carried out. Otherwise, there is a risk of soot build up, poor efficiency or condensation precipitation in the chimney. The system must be fine-tuned at start-up. The temperature in the chimney must be at least 60 °C at 0.5 m down in the chimney to prevent condensation.

4. Installation

4.1 Handling and lifting instruktion



! Option
The lifting aid we used
here are available as
spare parts.



4.2 Acceptance inspection

Make sure everything is delivered and the goods have not been damaged during transit. If something is wrong with the delivery, report it to the supplier. Transport damage must be reported to the shipping company.

4.3 Preparations for installation

Check that the burner's dimensions and capacity range are suitable for the boiler in question. The power data on the type sign refers to the burner's min. and max. power.

4.4 Distribution of oil

In order to achieve good reliability, it is important that the oil distribution system is designed correctly.

Take the following into account:

- Selection of pipe diameter, pipe length and height difference; see Pump instruction.
- Pipelines are to be laid with a minimal number of glands.
- The pipes are to be laid so that the oil supply hoses are not subjected to tensile stresses or are excessively bent when the burner is swung out or removed for service.
- The oil filter should be installed so that the filter cartridge can easily be replaced or cleaned. Self-cleaning filters are recommended for oils of a higher viscosity or oils that contain significant impurities.
- Oil-affected parts shall be selected in materials that are capable of withstanding the medium's physical properties.
- When installing oil hoses, check that the inlet and return hoses are fitted to the appropriate connection on the oil pump. The hoses shall be located so that they do not bend or become subject to tensile load.
- Bleed the oil system. The oil pump/oil preheater may be damaged if run dry. The vacuum should not fall below 0.3 bar in the suction line during start-up.

 The oil filter must be installed before the burner's oil pump.

 Be sure to fill the burner oil system before starting it for the first time.

4.5 Electrical connection

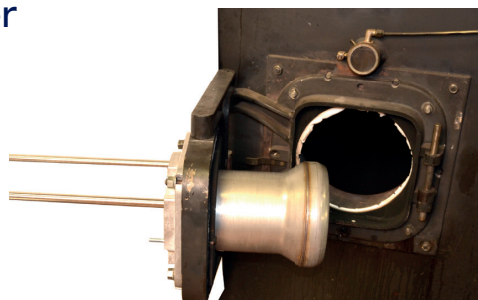
- Before work on the electrical connection, the current should be disconnected so that the installation is isolated.
- Electrical connection must be done in accordance with the applicable regulations.
- Burners should be connected to an isolator switch.
- The connection should be made in accordance with the wiring diagram.
- Fuse rating is as required



If any electrical connection is used other than that recommended by Bentone, there may be a danger of damage to property and personal injury.

4.6 Mounting the burner on the boiler

1. Separate fan housing and fixing flange.
2. Remove brake plate from nozzle line.
3. Install selected nozzle, (see Technical data).
4. Install brake plate on the nozzle line.
5. Remove flame tube from fixing flange.
6. Install fixing flange with gasket on boiler.
7. Install the flame tube on the fixing flange. Make sure that the holes in the front edge of the flame tube are pointing down (not on all flame tubes), allows any drops of oil to run out.



! If the flame tube must be installed from the inside of the boiler, this means that the boiler must be opened or have a spectacle flange that is designed so that it can be reconnected with the flame tube mounted.

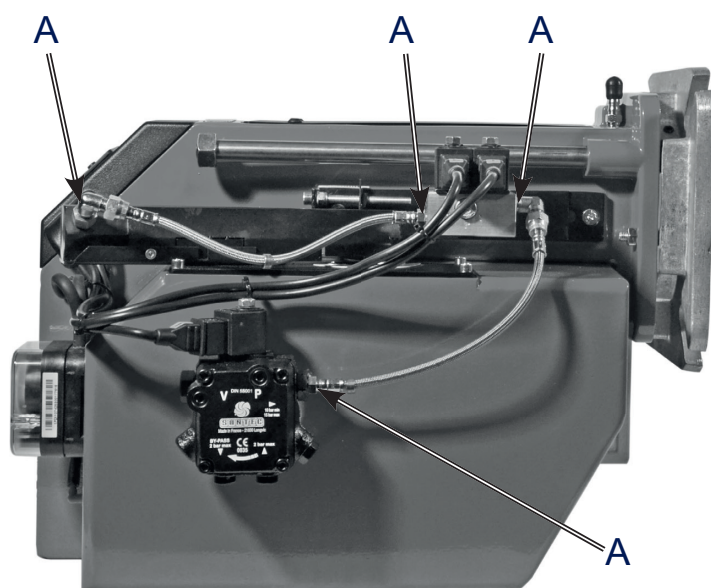


8. Insulate between burner and boiler door to reduce radiated heat.
9. Install fan housing on fixing flange and lock with nuts.
10. Connect the oil pipes to the pump, (see chapter Service).
11. Connect the burner electrically, (see chapter Service),

4.7 Check oil line seals

Once the burner has been installed and commissioned, the seals of the various coupling elements should be checked (A).

In the event of a leak, it is usually sufficient to tighten the coupling element.



4.8 Adjusting the air setting

Operate the burner as described in the “Manual output” chapter of the LMV section.

Step 1:

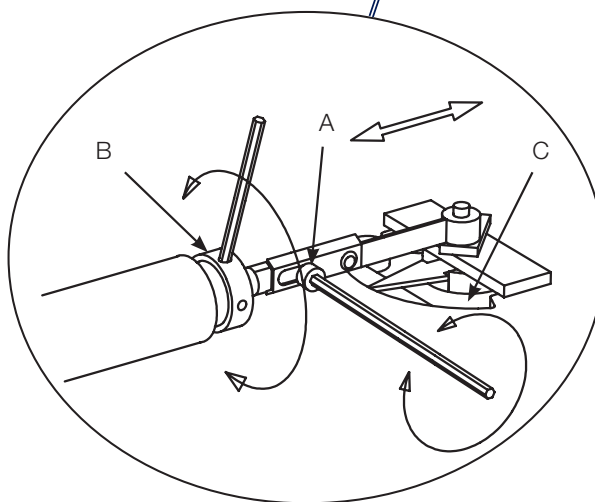
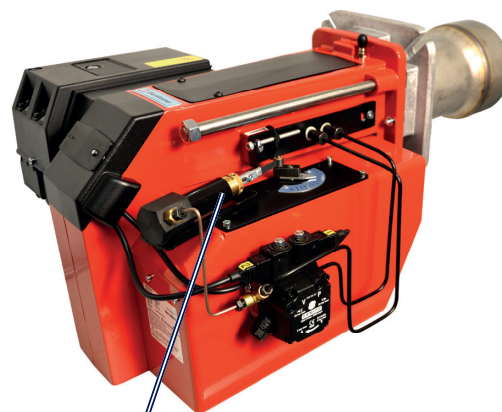
1. Set the output to low load.
2. Remove the guard (D) from the hydraulic adjuster.
3. Loosen the screw (A), turn the damper to the desired position, and retighten the screw (A).

Step 2:

4. Set the output to high load.
5. Use a hex key to screw the socket (B) in to decrease or out to increase
6. The damper position can be read on the damper scale (C).
7. Check/adjust combustion.
8. Reset the burner to automatic operation.

Recommended excess air

Excess air flue gases		Max. % CO ₂
% O ₂	% CO ₂ Lambda 1.2	
3–5	≈12.5	15.4



5. Setting the burner

5.1 Setting the combustion assembly

It may sometimes be necessary to adjust the combustion assembly, i.e. the position of the brake plate in the burner tube.

5.1.1 Setting the combustion assembly

The burner is equipped with a lever that changes the position of the brake plate in the combustion head. This is used to set the correct pressure drop across the combustion assembly and thereby obtain good combustion without ripples. Make the adjustment by turning screw X.



The best position is, among other things, dependent on the input power and overpressure in the boiler.

A general rule of thumb is that the smaller the capacity, the smaller the gap should be between the brake plate and the combustion assembly.

The position of the brake plate also has an impact on the quantity of air supplied for combustion.

This means that once the brake plate has been adjusted, the combustion should be checked and, if necessary, the setting of the air damper adjusted to obtain good combustion.

A left turn opens the brake plate, providing a lower pressure drop and more air to the combustion process.

A right turn closes the brake plate, providing a higher pressure drop and less air to the combustion process.

5.2 Setting the air pressure switch

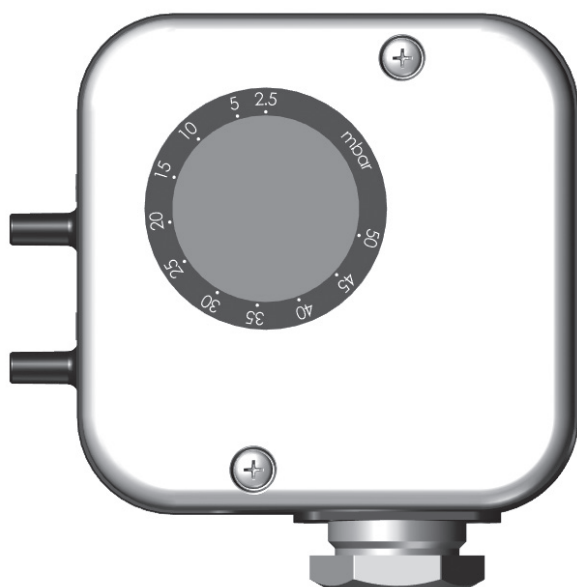
The air pressure switch must block the burner if the amount of air for combustion becomes too low. The air pressure switch must be set so that in the event of a lack of air supply at the burner's max. or min. capacity reacts before the monitored pressure drops so much that poor combustion occurs.

1. Remove protective cover.



Be careful when adjusting the air pressure switch; it contains a live component.

2. Start the burner.
3. Carefully turn the scale on the air pressure switch clockwise until the air pressure switch stops the burner.
4. Measure and note the lowest air pressure in the entire work area.
5. Set the air pressure switch to about 10-15% lower than the lowest noted pressure.
6. Test run the burner and check the function in the entire work area.
7. Refit protective cover.



5.3 Pressure switch for min. oil pressure

The burner control unit has a connection for a pressure switch for min. oil pressure. If the facility regulations do not require this switch, a jumper should be fitted between terminals 12 and 13 of the terminal block to close the circuit and enable the burner to be started.

5.4 Pressure switch for max. oil pressure

The burner control unit has a connection for a pressure switch for max. oil pressure. If the facility regulations do not require this switch, a jumper should be fitted between terminals 2 and 3 of terminal block X5-02 in the automatic control unit to close the circuit and enable the burner to be started.

5.5 Calculate prepurge time, Industrial applications

Prepurge time can be set on control unit LMV with parameter 265.

Formula symbol	Description	Example values
V	Volume fire box [m ³]	4.18 m ³
Q	Burner output [kW]	418 kW
T	Prepurge time [s] Industrial applications according to EN 746. The prepurge time must correspond to at least 5 complete air circulations in the fire box and adapted compartments.	

Calculate prepurge time using the following formula:

$$T = \frac{V \cdot 5}{Q \cdot 1.2 / 3600} \quad T = \frac{4.18 \text{ m}^3 \cdot 5}{418 \text{ kW} \cdot 1.2 / 3600} = 150 \text{ s}$$

5.6 Example of basic settings

Example - Nozzle selection B 45i A2.2H			
Burner output	418 kW		
Pump pressure	14 bar		
Nozzle selection according to table, (see Technical data).			
Step 1	62%	261 kW	5.0 Gph
Step 2	38%	157 kW	3.0 Gph

Example - Basic settings B 45i A2.2H		
Values can be determined from diagrams for air damper and insert setting values, (see Technical data).		
The different program steps are described in the LMV chapter.		
Insert setting	Step 1	27
	Step 2	27
Air setting	Step 1	5
	Step 2	8

This is an example of nozzle selection and air/insert setting.

Selection of output and connection between the different power stages must be selected and adjusted so that the system achieves good functionality.

6. Service

Service and maintenance work may only be performed by qualified personnel. Perform function control of all safety systems and components at each service. Only Enertech original parts should be used when replacing components.



Use caution when operating the burner.
Surfaces may be hot!



6.1 Combustion device

1. Switch off the main power.

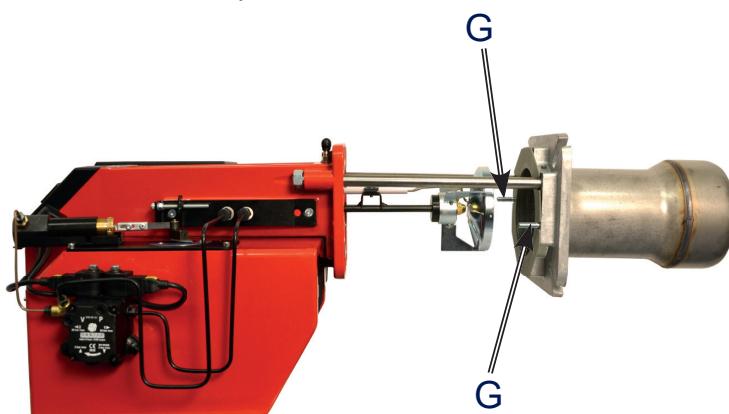


Before obtaining access to terminals,
all supply circuits must be disconnected.

2. Loosen the nuts (H) and pull out the fan housing on the guides from the burner flange.
3. Remove the brake plate from the oil pipe and clean.
4. Unscrew the nozzles and fit new ones.
5. Fit the brake plate and check the ignition electrodes (see Technical data). If necessary, replace the ignition electrodes.
6. Fit fan housing and burner flange, lock with the nuts (G).
7. Open the boiler/hinged flange to access the flame tube.
8. Remove and clean the flame tube.
9. Fit the flame tube, make sure you mount the drainage hole (not found on all burner pipes) facing downwards so that any spilled oil can drain out.
10. Close the boiler/hinged flange, refit the Euro plugs and switch on the main power supply.
11. Start burner and check/adjust combustion.



NB: When soiled,
always replace
nozzles with new
nozzles. Do not
clean.



When servicing/replacing components that affect combustion,
flue gas analysis and soot test must be carried out following installation.

165 105 74-2

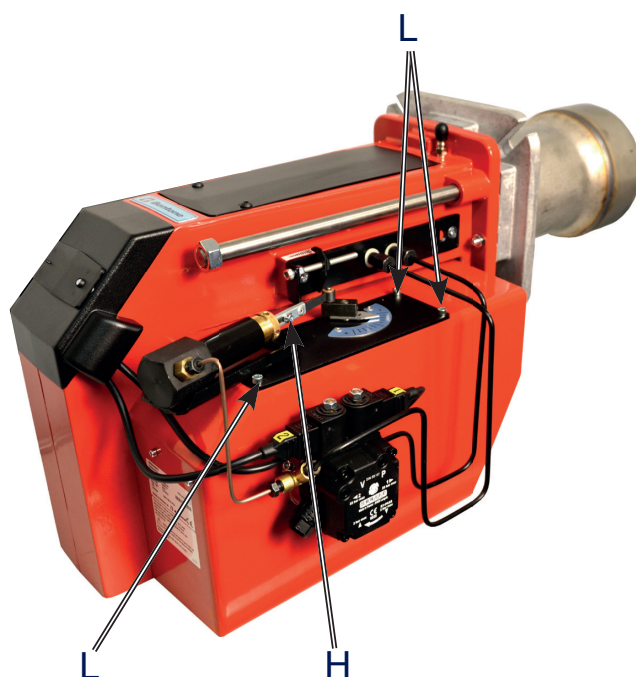
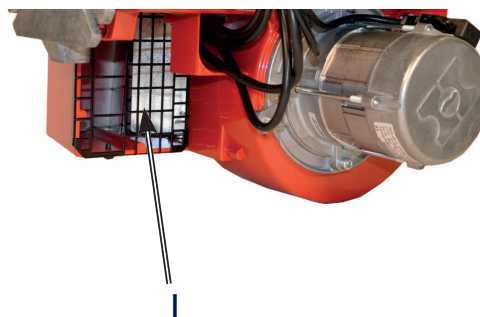
6.2 Air dampers

1. Switch off the main power.



Before obtaining access to terminals, all supply circuits must be disconnected.

2. Remove the guard from the hydraulic adjuster.
3. Note the position of the air damper and loosen the actuator locking screw (H).
4. Loosen the screws (L) securing the air damper.
5. Set the scale to 7 and lift up.
6. Clean the air damper (I) and the intake. Lubricate the damper axle bearings if necessary.
7. Refit the air damper and actuator.
8. Install the intake grille for the air intake.
9. Switch on the main power supply.
10. Start burner and check/adjust combustion.



When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

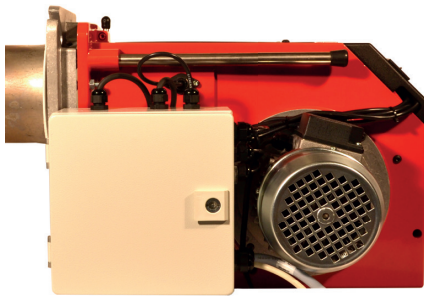
6.3 Fan

1. Make sure the power to the burner is switched off.



Before obtaining access to terminals, all supply circuits must be disconnected.

2. Disconnect the motor's electrical connection.
3. Detach and remove motor.
4. Check fan wheel to ensure it is firmly secured and not warped, replace if damaged.
5. Clean/replace fan wheel.
6. Refit the parts, test run and check combustion.



6.3.1 Replacing the drive shaft

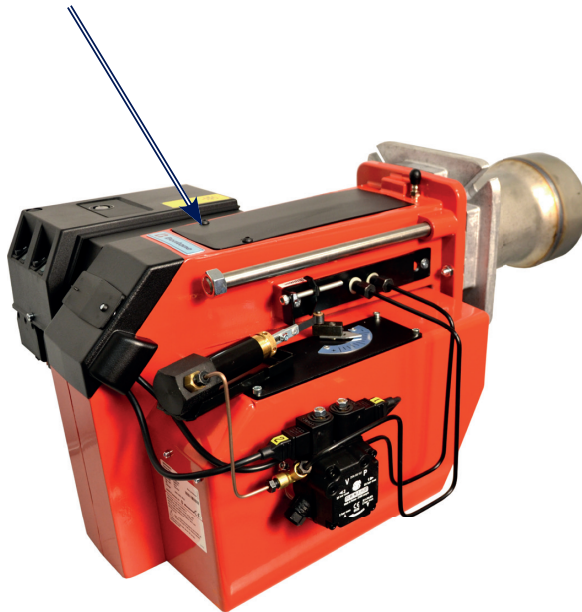
1. Make sure the power to the burner is switched off.
2. Disconnect the motor's electrical cable.
3. Remove motor.
4. Remove drive shaft and drive coupling from motor.
5. Disconnect drive coupling from pump.
6. Fit coupling, pump, and motor - make sure the drive shaft is connected correctly at both ends.

6.4 Vibration

Maximum vibration level are 5,0 mm/s.

- Check all bolts and nuts for correct torque.
- Check fan wheel for damage and contamination. Change when dirty/unbalanced.
- Check motor bearings. If worn change motor/bearings.

Use lid screw hole for sensor mounting.



6.5 Replacement of electrical components

1. Switch off the main power supply and disconnect the Euro plugs from the burner.



Before obtaining access to terminals, all supply circuits must be disconnected.

2. Note the connection of the existing component and remove.
3. Install the new component using the same wiring as the existing component or the specified alternative arrangement.
4. Turn on the main power.
5. Check the function of the new component.
6. Start the burner and check/adjust combustion.



When servicing/replacing components that affect combustion, a flue gas analysis and soot test shall be carried out on the installation.

6.6 Burner Service Schedule, Oil

Servicing must be carried out once a year or after 3,000 hours of operation.

Burner	1 year	3,000 h
Filter	1 year replacement	3,000 h replacement
Oil hose	1 year inspection/replacement	
Nozzle	1 year replacement	3,000 h replacement
Electrodes	Replacement/cleaning 1 year	Replacement/cleaning 3,000 h
Brake disc	Replacement/cleaning 1 year	Replacement/cleaning 3,000 h
Motor	1 year	3,000 h
Drive shaft	Check/replace in the event of damage	Check/replace in the event of damage
Fan wheel	"1 year Replace if need for cleaning/ imbalance"	"3000 h Replace if need for cleaning/ imbalance"
Oil filter	Once a year	3,000 h replacement
Oil valve	Tightness check once a year	Replace if leakage detected

6.7 Component replacement intervals

Components	Service life Recommended replacement	Service life Recommended replacement Operating cycles
Control system	10 years	250,000 cycles
Pressure switch	10 years	250,000 cycles
Ignition system with flame guard	10 years	250,000 cycles
UV flame sensor	10,000 h	N/A
Damper motor		500,000 cycles
Contactator	10 years	500,000 cycles



The burner and its components must be recycled according to applicable regulations.

7. Pump

7.1 SUNTEC AS

Technical data AS47CK

One or two-pipe system

Viscosity range: 1-12 mm²/s

Pressure range: 7-14 bar

Rated voltage of coil: 220/240V 50/60 Hz

Oil temperature: max 60°C

Technical data AS67C

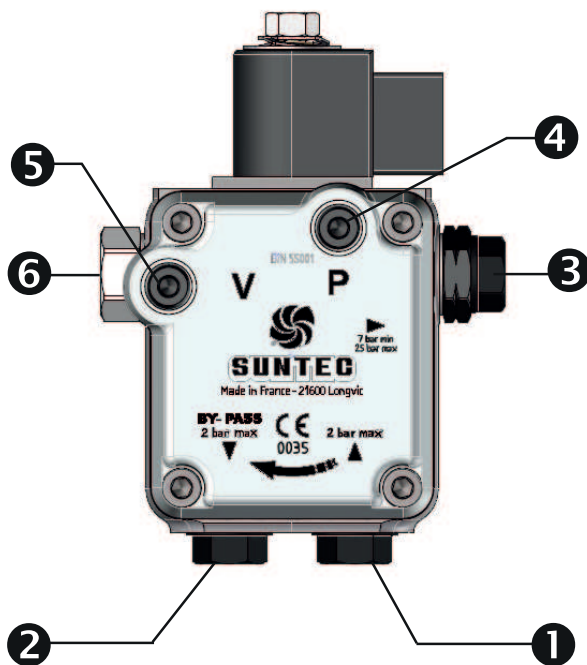
One or two-pipe system

Viscosity range: 1-12 mm²/s

Pressure range: 10-15 bar

Rated voltage of coil: 220/240V 50/60 Hz

Oil temperature: max 60°C



Components

1. Suction line G 1/4"
2. Return line G 1/4" and internal by-pass plug
3. Nozzle outlet G 1/8"
4. Pressure gauge port G 1/8"
5. Vacuum gauge port G 1/8"
6. Pressure adjustment

Applications for SUNTEC AS

The SUNTEC AS oil pump has a built in solenoid valve which controls the regulator cut-off valve giving fast cut-off and cut-on function independent of the rotational speed.

Applications

Light oil, B10 heating oil/biofuel blend (as defined in DIN V51603-6) and kerosene.

- One or two-pipe system.

Pump operating principle

The gear set draws oil from the tank through the built-in filter and transfers it to the valve that regulates the oil pressure to the nozzle line. All oil that does not go through the nozzle line will be dumped through the valve back to the return line in two pipe installation or, if it is a one-pipe installation, back to suction port in the gear set.

In that case, the by-pass plug must be removed from the return port, and the return port sealed by steel plug and washer.

The solenoid valve of the AS pump is of the "normally opened" type.

When the solenoid valve is non-activated, the by-pass channel between the pressure and return sides of the valve is open. No pressure will then be built up to open the valve; it does not matter which speed the gear set has.

When the solenoid is activated, this by-pass channel is closed and because of the full speed of the gear set, the pressure necessary to open the valve will be built up very rapidly, which gives a very sharp cut-on function.

Cut-off

When the burner stops, the solenoid opens the by-pass at the same moment, which drains all the oil down to the return, and the nozzle valve closes immediately.

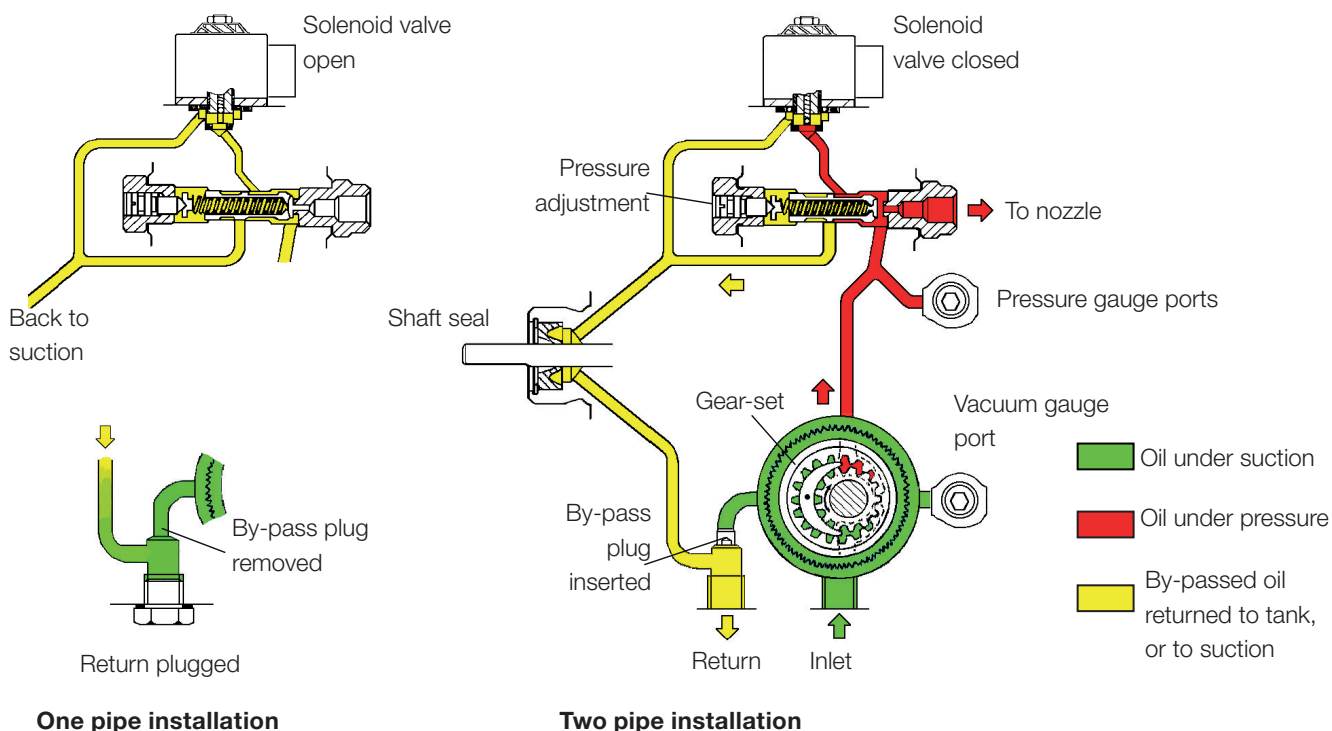
This gives a very sharp cut-off function. The cut-on and cut-off can be actuated regardless of motor speed and have an extremely fast response.

When the solenoid is not activated, the torque requirement is low up to full motor speed.

Bleeding

Bleeding of pumps with two-pipe systems takes place automatically, but bleeding can be accelerated by opening a pressure port.

On pumps with a single-pipe system, a pressure port must be opened to empty the system of air.



7.1.1 Suction line tables

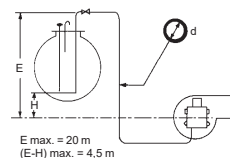
7.1.1.1 Overlying tank

1-pipe system

Nozzle*/Düse* Gicleur*/Ugello* (US GPH)	0,50		0,60	0,80	1,00	1,50		2,00		4,00			6,00			9,50			
d (mm)	4	4	4	4	4	6	4	6	4	6	8	4	6	8	4	6	8	10	
H (m)	4	4	4	4	4	6	4	6	4	6	8	4	6	8	4	6	8	10	
0	90	75	56	45	30	150	22	113	11	56	150	7	37	119	4	23	74	150	
0,5	100	83	63	50	33	150	25	126	12	63	150	8	41	133	4	26	83	150	
1	110	92	69	55	37	150	27	139	13	69	150	8	46	146	5	28	92	150	
2	131	109	82	65	44	150	33	166	16	82	150	10	55	150	6	34	109	150	
3	152	126	95	76	50	150	38	192	18	96	150	12	63	150	7	39	127	150	
4	172	144	108	86	57	150	43	218	21	109	150	14	72	150	8	45	144	150	

*A2L pumps : sum up the 2 nozzles / A2L-Pumpen : Summe der zwei Düsen
pompe A2L : somme des 2 gicleurs / Perle pompe A2L agglungere n.2 ugelli

One pipe siphon feed system
Einstranginstallation - Tank höher als Pumpe
Installation monotubo en charge
Impianti monotubo a sifone

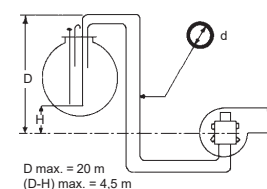


Two-pipe system

Pump/Pumpe Pompe/Pompa Q** (l/h)		35/45 60				55 77				65 102				75 130				95 150			
H (m)	d (mm)	4	6	8	10	6	8	10	12	6	8	10	12	8	10	12	14	8	10	12	14
0	2	15	50	124	11	38	96	150	7	27	71	150	20	54	116	150	16	46	100	150	
0,5	2	16	56	138	12	42	107	150	8	31	79	150	23	61	130	150	19	52	112	150	
1	2	18	61	150	13	47	118	150	9	34	88	150	26	68	144	150	21	57	124	150	
2	3	22	73	150	16	56	141	150	11	41	105	150	31	81	150	150	26	69	148	150	
3	4	26	85	150	19	66	150	150	13	48	122	150	36	94	150	150	31	81	150	150	
4	4	30	97	150	22	75	150	150	16	55	139	150	42	108	150	150	35	92	150	150	

**Q = pump capacity @ 0 bar / Pumpenleistung bei 0 bar
capacité de l'engrenage à 0 bar / portata della pompa a 0 bar.

Two pipe siphon feed system
Zweistranginstallation - Tank höher als Pumpe
Installation bitube en charge
Impianti bitubo a sifone



7.1.1.2 Underlying tank

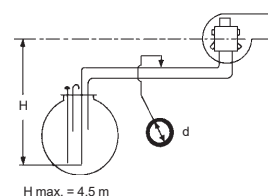
1-pipe system

With an underlying tank a 1-pipe-system is not recommended

Two-pipe system

Pump/Pumpe Pompe/Pompa Q** (l/h)	35/45 60				55 77				65 102				75 130				95 150			
H (m) \ d (mm)	6	8	10	12	6	8	10	12	6	8	10	12	8	10	12	14	8	10	12	14
0	15	50	124	150	11	38	96	150	7	27	71	150	20	54	116	150	16	46	100	150
0,5	13	44	109	150	9	33	84	150	6	24	62	132	17	48	103	150	14	40	88	150
1	11	38	95	150	8	29	73	150	4	20	54	115	15	41	89	150	12	34	76	144
2	7	26	66	138	5	19	51	107	2	13	37	80	9	28	61	116	7	23	52	100
3	3	14	37	79		10	28	60		6	20	44	4	14	33	65		11	28	55
4			8	19			5	14				9			6	14			4	11

Two pipe lift system
Zweistranginstallation - Tank tiefer als Pumpe
Installation bitube en aspiration
Impianti bitubo in aspirazione



The suction line tables consist of theoretically calculated values where the pipe dimensions and oil velocity have been matched so that tur-bulences will not occur. Such tur-bulences will result in increased pressure losses and in acoustic noise in the pipe system. In addition to drawn copper piping a pipe system usually comprises 4 elbows, a non-return valve, a cut-off valve and an external oil filter.

The sum of these individual resi-stances is so insignificant that they can be disregarded. The tables do not include any lengths exceeding 100 m as experience shows that longer lengths are not needed.

The tables apply to a standard fuel oil of normal commercial quality according to current standards. On commis- sioning with an empty tube system the oil pump should not be run without oil for more than 5 min. (a condition is that the pump is being lubricated during operation).

The tables state the total suction line length in metres at a nozzle capacity of 9,5 Gph. Max. permissible pressure at the suction and pressure side is 2,0 bar.

7.1.2 Check oil line seals

When the burner has been installed and put into operation, the tightness of the various coupling elements should be checked (A), in case of leakage - retighten the coupling elements.



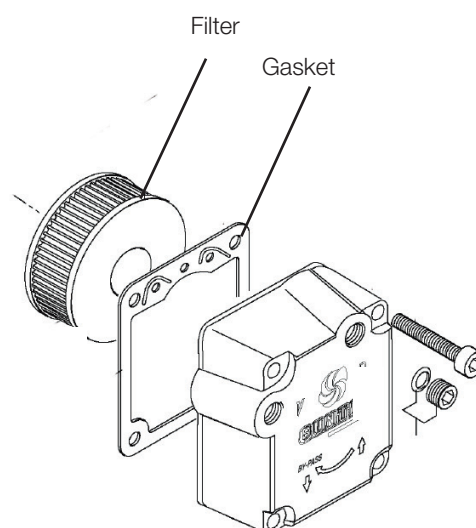
Use caution when operating the burner, surfaces may be hot.



When servicing oil bearing components, check for oil leakage when the burner are put into operation.

7.1.3 Replacement of pump filter

1. Close the oil supply to the burner.
2. Loosen the pump cover's screws.
3. Remove the filter and gasket.
4. Mount new gasket and filter.
5. Refit the cover.
6. Open the oil supply.
7. Start the burner, check seals and combustion.



When servicing/replacing components that affect combustion, flue gas analysis and soot test must be carried out following installation.

7.1.4 Replacing the solenoid valve (pump)

1. Switch off the main power supply and disconnect the Euro plugs from the burner.



Before obtaining access to terminals, all supply circuits must be disconnected.

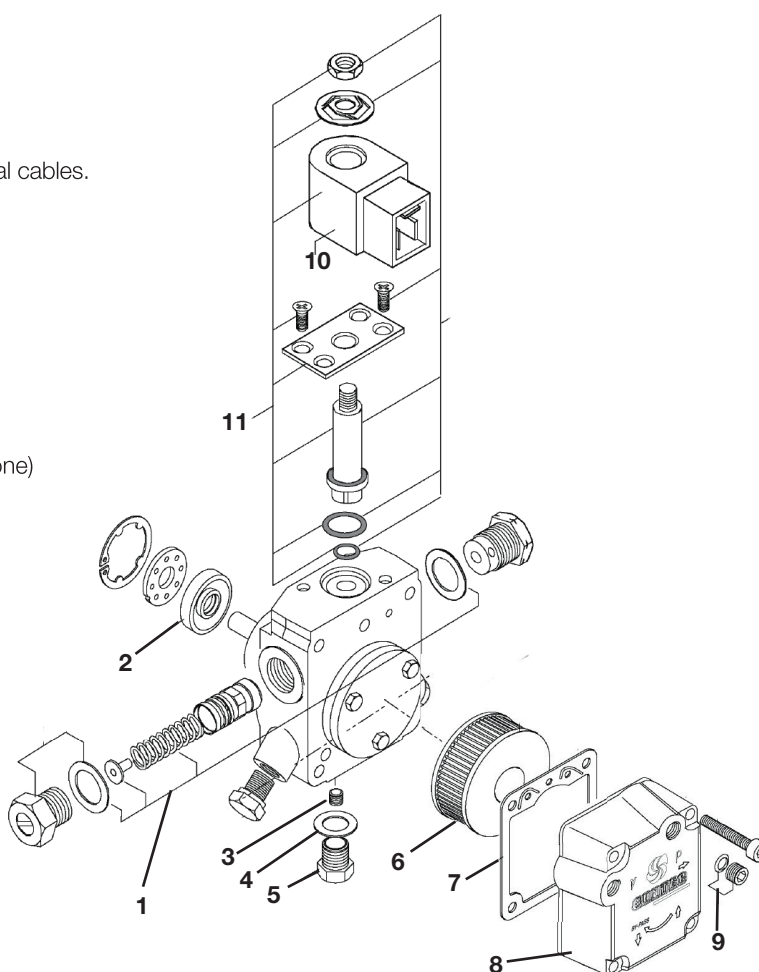
1. Disconnect power cables to solenoid valves.
2. Loosen nut holding the solenoid coil.
3. Loosen screws that secures the valve mounting plate.
4. Remove valve.
5. Check that it is the correct valve. NO
6. Install the new valve and refit the other parts in the reverse order.
7. Check functionality.

7.1.5 Replacing the gasket seal (pump)

1. Disconnect hoses, oil lines, and electrical cables.
2. Loosen pump (screw J).
3. Loosen locking rings for gasket seal.
4. Remove the old gasket seal (2).
5. Install the new gasket seal.
6. Connect hoses, oil lines, and electrical cables.
7. Test run and check seals.

Components Oil pump

1. Pressure regulator
2. Shaft seal kit (lip seal + protective cone)
3. By-pass plug
4. G 1/4 gasket
5. G 1/4 steel plug (1-pipe system)
6. Filter
7. Cover gasket
8. Cover
9. Pressure gauge port or vacuum gauge port screw, O-ring
10. Coil
11. Tube assy



8. Electric equipment

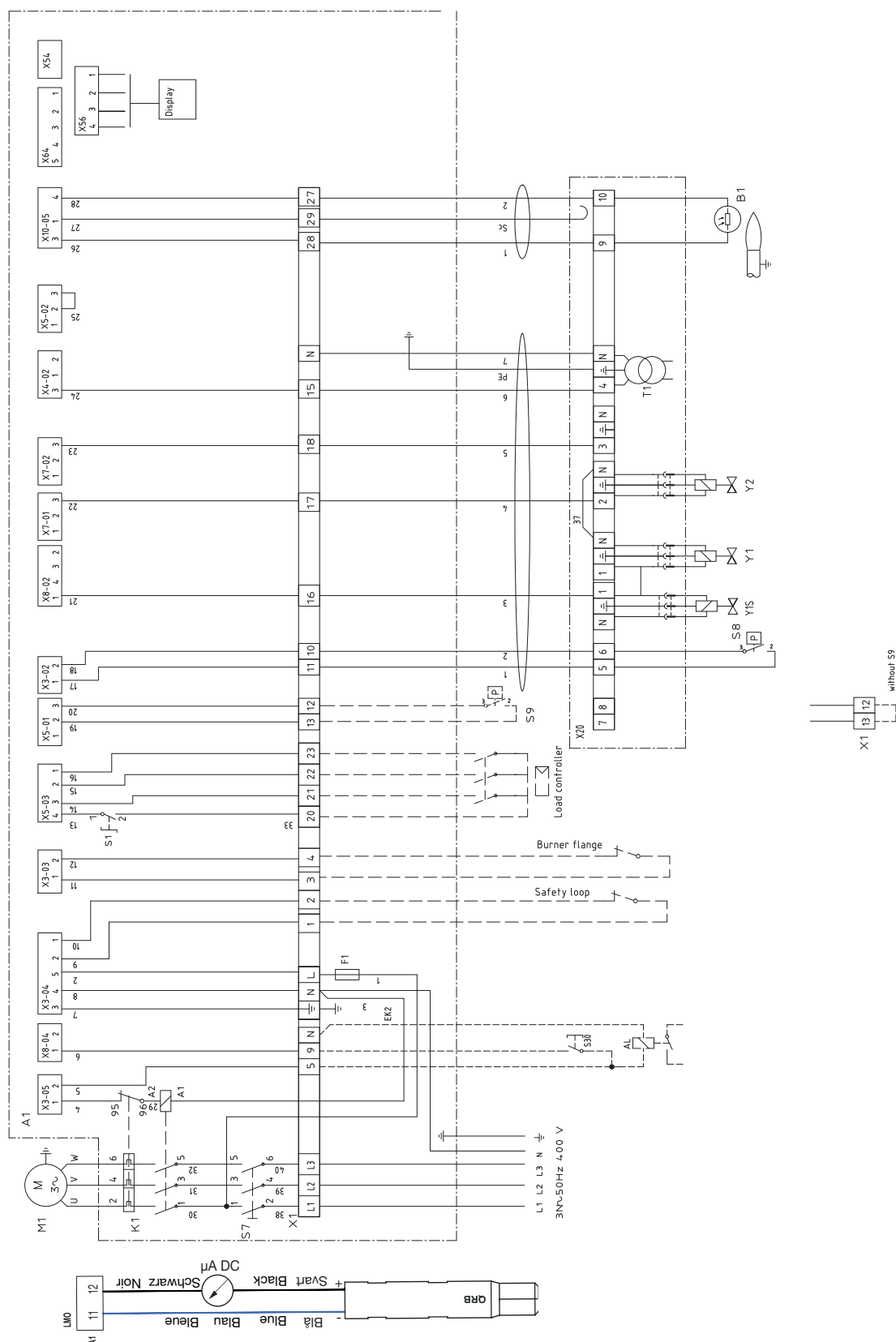
8.1 Safety system

The safety system (safety switch for hatches, doors, water level, pressure, temperature and other safety devices) must be installed in the safety circuit in accordance with current regulations for the system. If these safety requirements are met by other means, safety circuits must be bypassed/jumpered. This can differ between different systems in which the burner is installed, see rules and regulations that apply.

The cables of the safety system must be separated so that the outgoing signal is not placed in the same cable as the incoming signal.

Remote lockout reset button installation should be wired from plug X8-04.1 to X3-05.2 and reset button installed in preferred place.

8.2 Wiring diagram



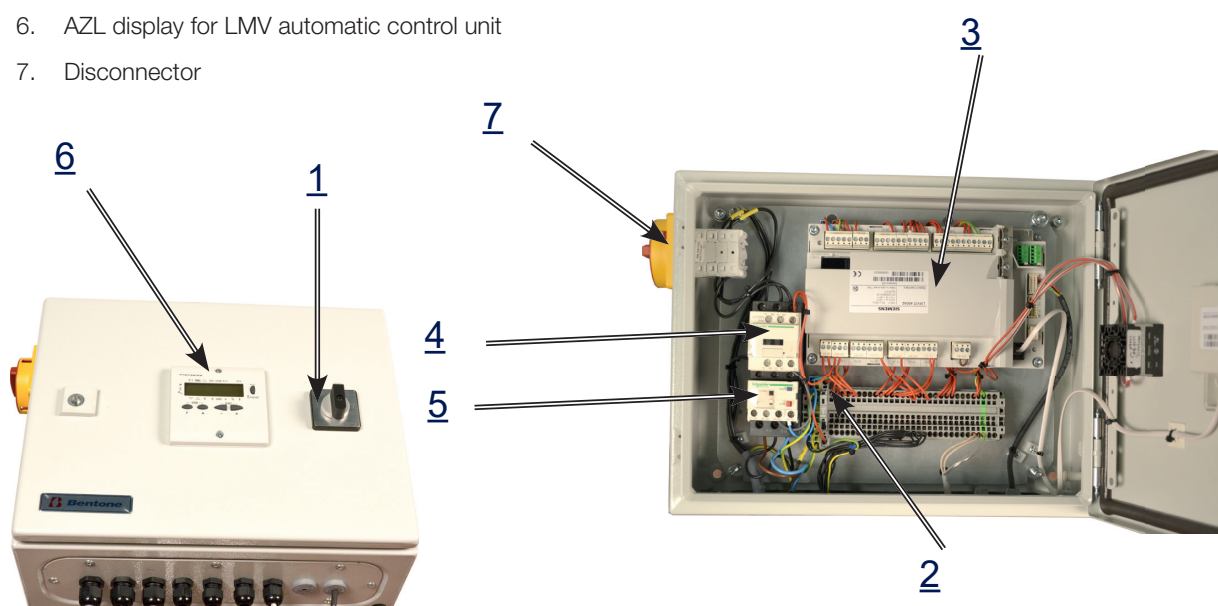
8.3 Component list LMV

A1	Gas burner control LMV37	S7	Main switch	X1	Connection terminal board
B1	Flame detector	S8	Air pressure switch	X20	Connection terminal board
F1	Fuse	S9	Oil pressure switch min (Accessories)	X56	Connection display
K1	Motor contactor with thermal overload protector	S10	Oil pressure switch max (Accessories)	Y1	Solenoid valve 1
M1	Burner motor	S30	External reset	Y2	Solenoid valve 2
S1	Operation switch	T1	Ignition transformer	Y1S	Safety solenoid valve

! Mains connection and fuse in accordance with local regulations.

8.4 Components Electric box

1. Switch 0-1
2. Fuse
3. Automatic control unit LMV
4. Contactor
5. Thermal overload protection
6. AZL display for LMV automatic control unit
7. Disconnecter



9. LMV37 Automatic control unit

The LMV37 automatic control unit is a piece of control equipment that can be used for many different types of burner.

In the following review of how this control equipment works and can be adjusted, the description will focus on the type of burner covered by this

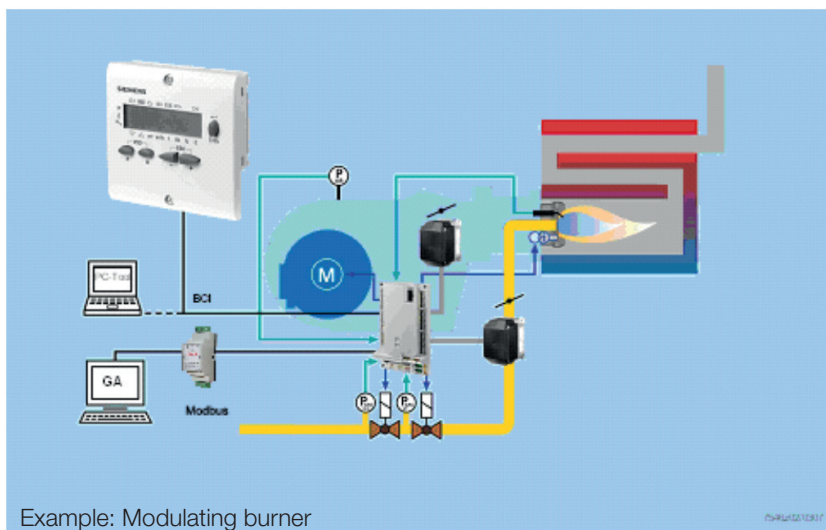
9.1 System structure/function description

The LMV37.4... is a microprocessor-based burner management system with matching system components for the control and supervision of forced draft burners of medium to high capacity.

Integrated in the basic unit of the LMV37.4... are:

- Burner management system complete with valve proving system
- Electronic air-fuel ratio control system for a maximum of 2 SQM3... or SQN1... actuators
- Control of VSD air fan
- Modbus interface

At the time of writing, of the parameters mentioned above, motor frequency control and communication via modbus are not available on the burner models described in this manual.



The system components (display and operating unit, actuators) are connected directly to the LMV37.4... basic unit. All safety-related digital inputs and outputs of the system are monitored by a contact feedback network.

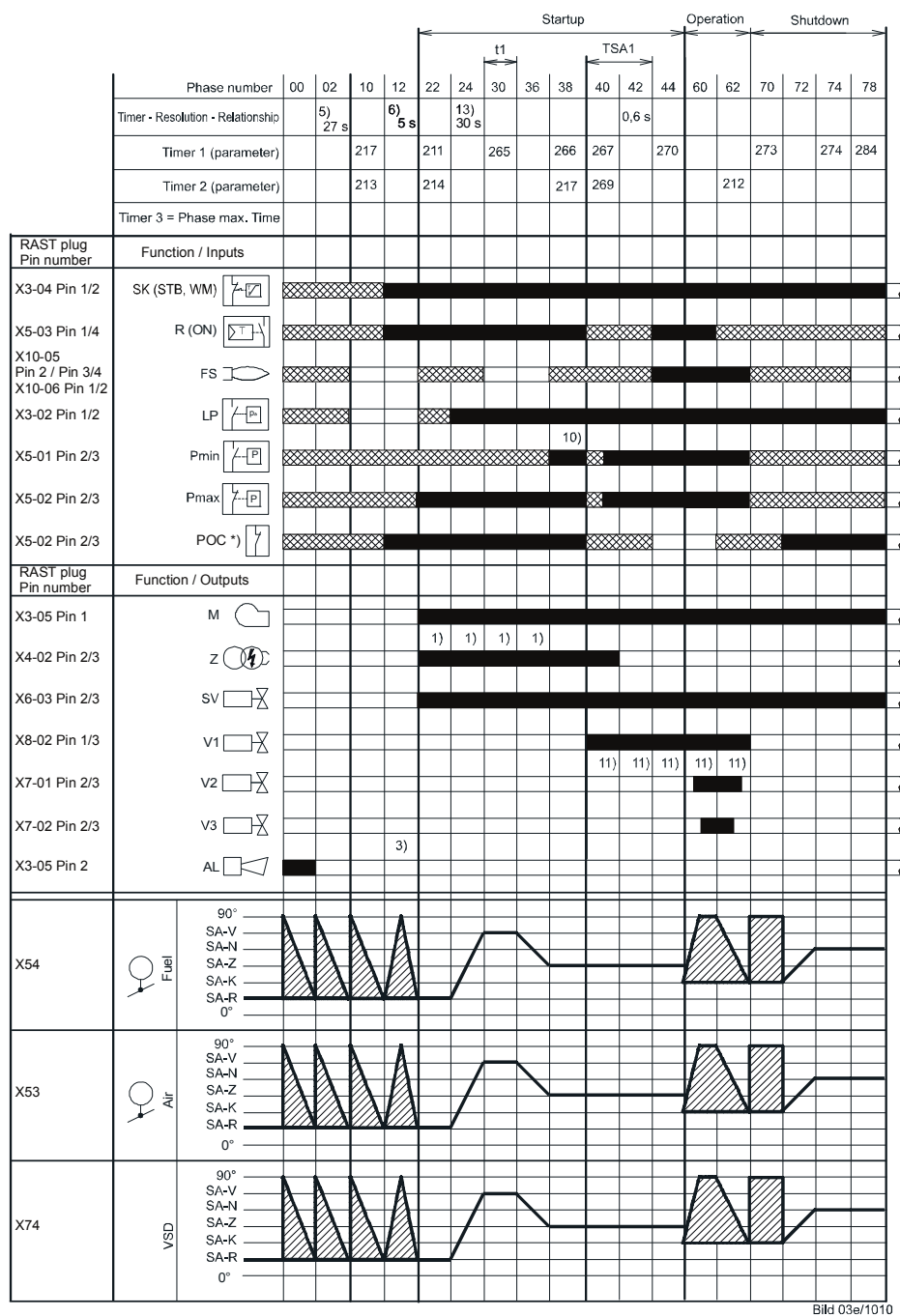
9.2 General information

The burner management system is operated and parameterized via the AZL2... display. The AZL2... with LCD and menu-driven operation facilitates straightforward use and targeted diagnostics. When making diagnostics, the display shows the operating states, the type of error and the point in time the error occurred. Passwords protect the different parameter levels of the burner against unauthorized access. It is possible to select from different types of fuel trains and make use of a wide choice of individual parameter settings (program times, configuration of inputs / outputs, etc.), enabling the installer to make optimum adaptations to the relevant application. A change of parameters varies in levels of authorization, this manual will give info on those that might be changed by the installer. The actuators are driven by stepper motors and can be positioned with high resolution. Specific features and actuator settings are defined by the LMV37.4... basic unit.

9.3 Technical Data Basic unit LMV37.4...

Mains voltage	
LMV37.400A2	AC 230 V -15 % / +10 %
Mains frequency	50 / 60 Hz $\pm$ 6 %
Safety class	I, with parts according to II and III to DIN EN 60730-1
Perm. mains primary fuse (externally)	Max. 16 AT
Unit fuse F1 (internally)	6.3 AT (DIN EN 60127 2 / 5)
Mains supply: Input current depending on the operating state of the unit	
Under voltage	
Safety shutdown from operating position at mains voltage	
LMV37.400A2	Approx. AC 186 V
Restart on rise in mains voltage	
LMV37.400A2	Approx. AC 195 V

Oil direct ignition Eo1 «Lo», «Lo mod», «Lo 2-stage», «Lo 3-stage»



Legend to the sequence diagrams



Not all phases, times, indices, abbreviations and symbols appear in the individual sequence diagrams or are needed there!

Phase numbers

00	Lockout phase
02	Safety phase
10	Home run
12	Standby (stationary)
22	Fan motor (M) = ON, safety valve (SV) = ON
24	Air damper (LK)  fuel valve (V) – position
30	Prepurging
36	Air damper (LK)  ignition (Z) – position
38	Preignition ignition (Z) = ON
39	Test pressure switch-min (Pmin)
40	Fuel valve (V) = ON
42	Ignition (Z) = OFF
44	Interval 1 (t44)
50	Safety time 2 (TSA2)
52	Interval 2 (t52)
60	Operation 1 (stationary)
62	Operation 2 air damper (LK)  low-fire (KL) – position
70	Afterburn time (t13)
72	Air damper (LK)  Rated load (NL) – position
74	Postpurge time (t8)
78	Postpurge time (t3)
80	Evacuation of test space
81	Atmospheric pressure test
82	Filling of test space
83	Gas pressure test
90	Gas shortage waiting time

Valve proving is performed depending on the parameter settings:
Simultaneously with the prepurge time and/or the afterburn time.

Times

TSA1	1st safety time
TSA2	2nd safety time
t1	Prepurge time
t3	Postpurge time
t8	Postpurge time
t13	Afterburn time
t44	Interval 1
t52	Interval 2

Indices

1)	Parameter:	Short/long prepurge time for oil only Short/long on time of oil pump – time
2)	Only with valve proving during startup	
3)	Parameter:	With/without alarm in the event of start prevention
4)	If signal is faulty in the startup phase, phase 10 is next, otherwise phase 70	
5)	Max. time safety phase, then lockout	
6)	Time from occurrence of start prevention to signaling	
7)	Only in case of valve proving during startup (valve proving via pressure switch-min)	
8)	Only in case of startup without valve proving (valve proving via pressure switch -min)	
9)	Inverse logic in case of valve proving via pressure switch-min	
10)	Parameter:	Oil pressure min-input 1 = active from phase 38 2 = active from safety time
11)	Only with fuel train Lo and 2 fuel valves	
12)	Parameter 223:	Repetition limit value gas pressure switch-min in connection with gas shortage program parameter 246 (phase 90)
13)	Max. drop-in/response time for air pressure switch	
14)	Alternative to valve proving	
15)	Alternative to pressure switch-max (Pmax) or POC	

Abbreviations

AL	Alarm
FS	Flame signal
GM	Fan motor contactor
LP	Air pressure switch
M	Fan motor
P LT	Pressure switch for valve proving
Pmax	Pressure switch-max
Pmin	Pressure switch-min
POC	Proof of closure
PV	Pilot valve
R	Temperature or pressure controller
SB	Safety limiter
SK	Safety loop
STB	Safety limit thermostat
SV	Safety valve
WM	Water shortage
V1	Fuel valve 1
V2	Fuel valve 2
VP	Combustion pressure switch
Z	Ignition transformer

SA	Actuator
SA-K	Low-fire position of actuator
SA-N	Postpurge position of actuator
SA-R	Home position of actuator
SA-V	Rated load position of actuator
SA-Z	Ignition load position of actuator

Symbols



Permissible position range



In Standby mode: Actuator is allowed to travel within the permissible position range, but is always driven to the home position; must be in the home position for phase changes

0°/10%

Position as supplied (0°)

90°/100%

Actuator fully open (90°)

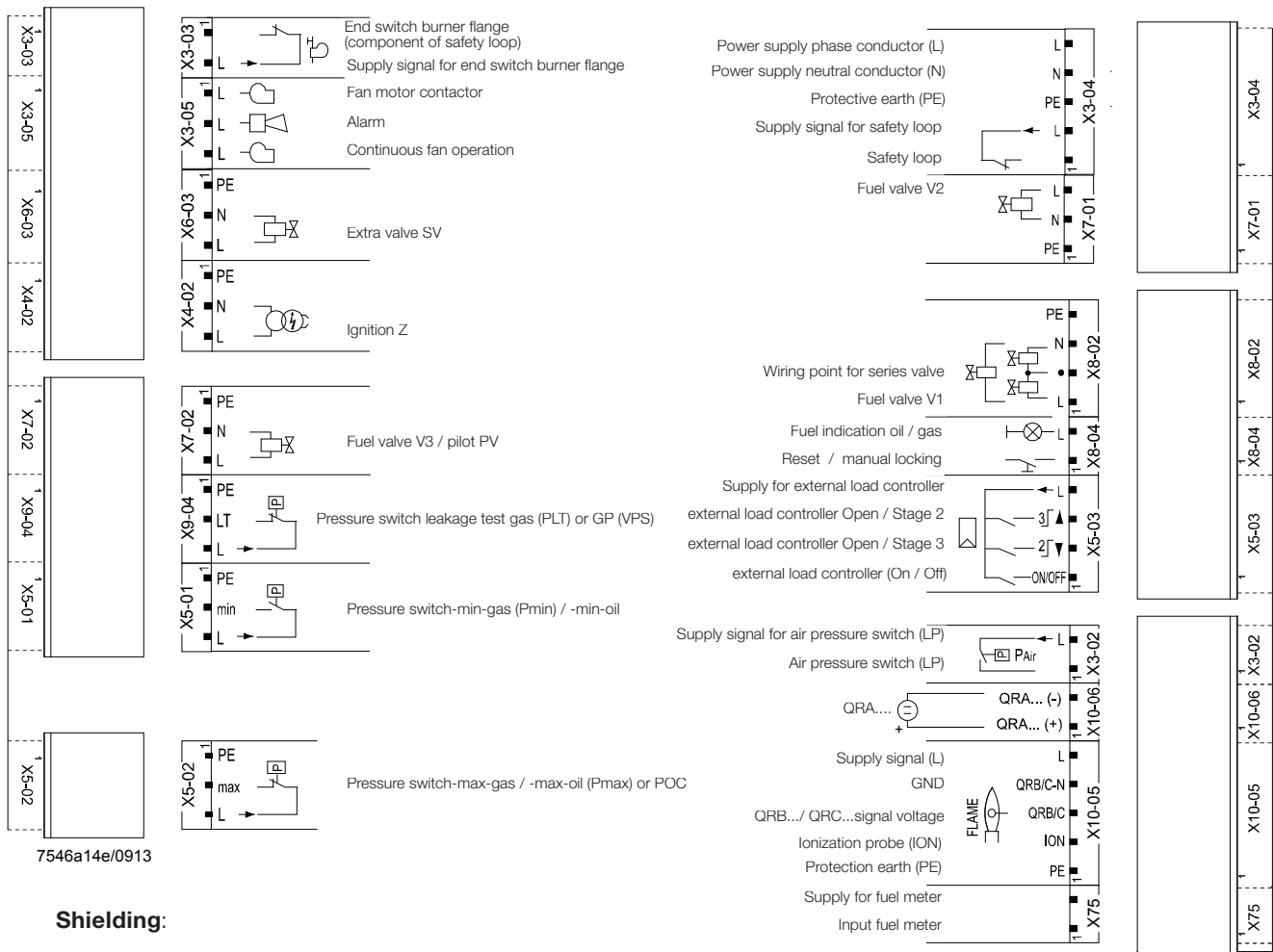


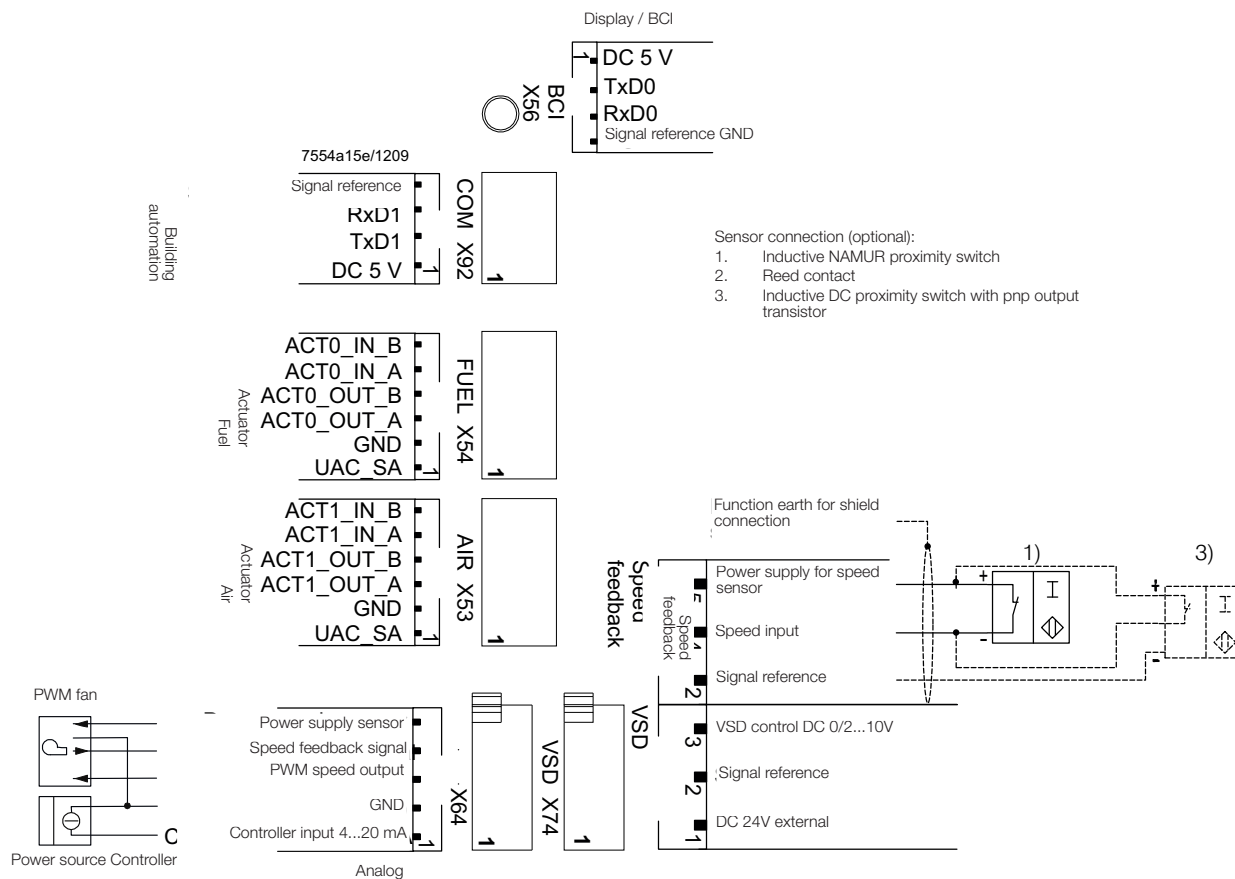
Input/output signal 1 (ON)

Input/output signal 0 (OFF)

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

9.4 Connection and internal diagram





10. Operation

10.1 LMV37 automatic control unit

10.1.1 Explanation of display and buttons

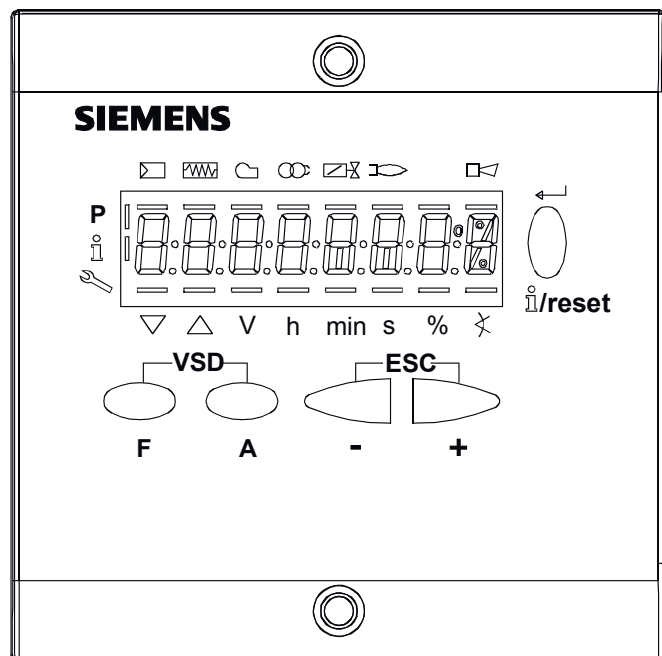
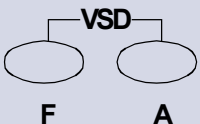
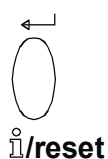


Figure 3: Description of unit/display and buttons

Button	Function
 F	Button F - For adjusting the fuel actuator (keep  depressed and adjust the value by pressing  or 
 A	Button A - For adjusting the air actuator (keep  depressed and adjust the value by pressing  or 
 F A	Buttons A and F: VSD function - For changing to parameter setting mode P (press simultaneously  and 



Info and Enter button

- For navigating in info or service mode
- Selection (symbol flashing) (press button for <1 s)
- For changing to a lower menu level (press button for 1...3 s)
- For changing to a higher menu level (press button for 3...8 s)
- For changing the operating mode (press button for >8 s)
- Enter in parameter setting mode
- Reset in the event of fault
- One menu level down

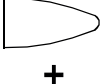
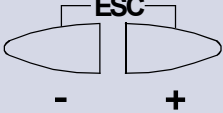
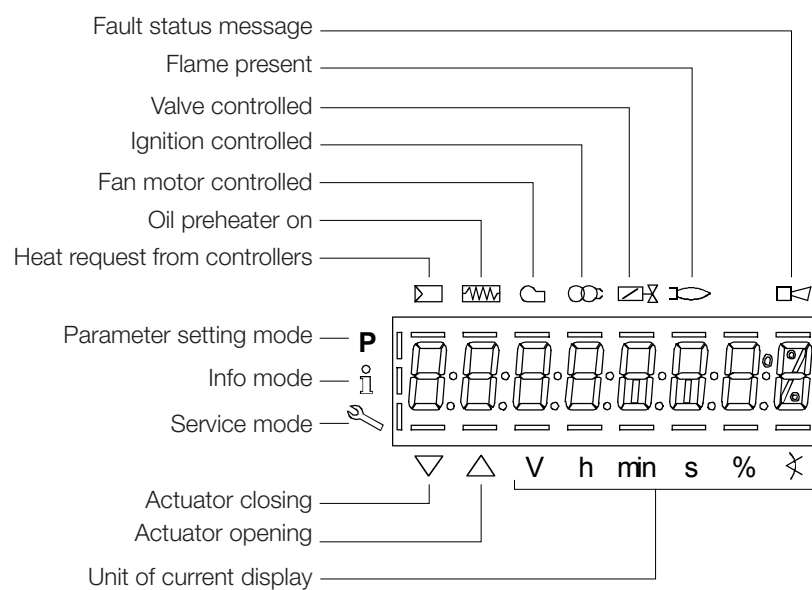
Button	Function
	- button - For decreasing the value - For navigating during curve adjustments in info or service mode
	+ button - For increasing the value - For navigating during curve adjustments in info or service mode
	+ and - button: Escape function (press  and  simultaneously) - No adoption of value - One menu level up

Figure 4: Meaning of display



10.2 List of phase displays

The display shows which phase the burner is in. The table below lists the codes and explains what these mean for the various phases. Not all the phases described in the table are shown or are suitable for the burners described in this manual.

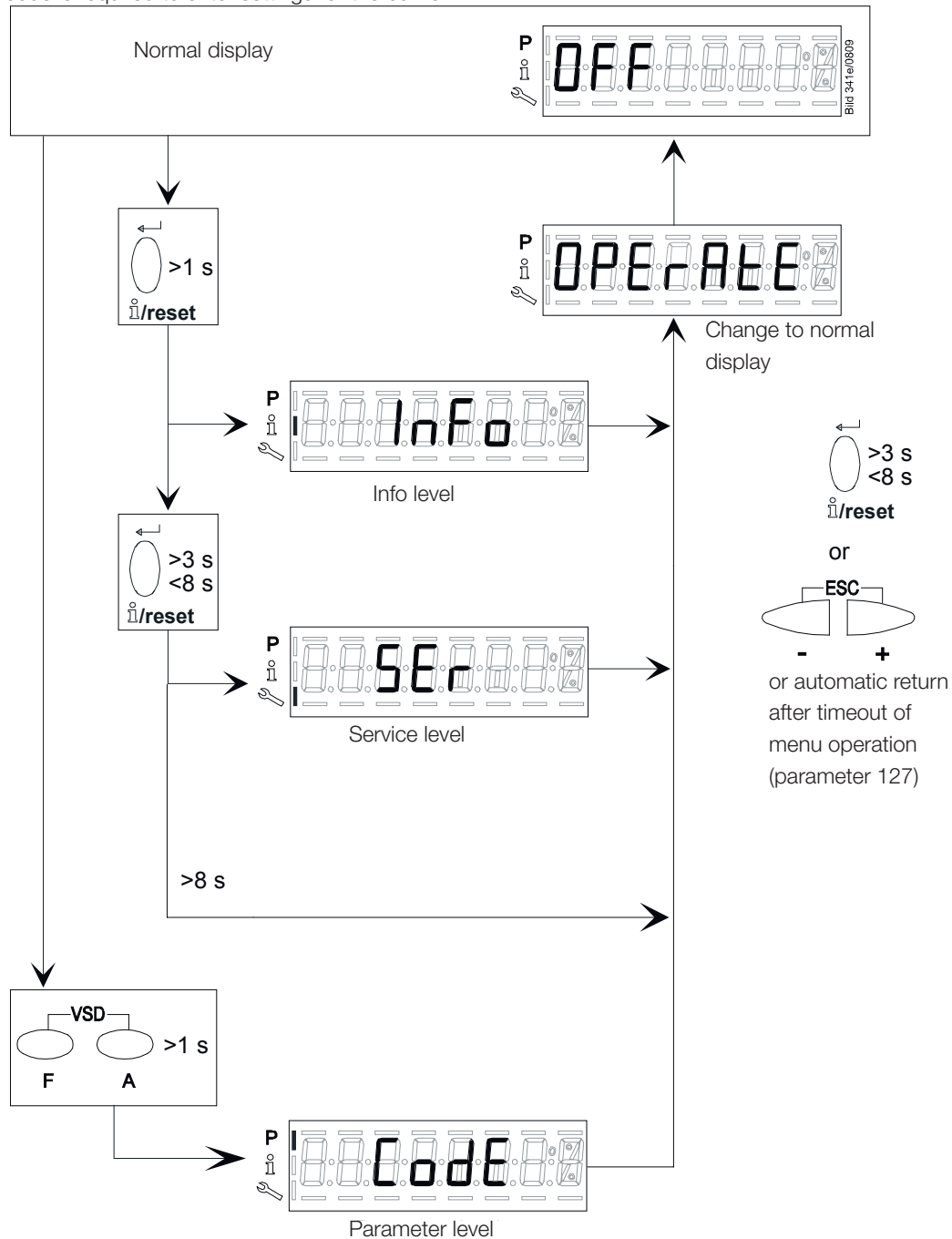
Phase	Function
Ph00	Lockout phase
Ph01	Safety phase
Ph10	Home run
Ph12	Standby (stationary)
Ph22	Fan ramp up time (fan motor = ON, safety valve = ON)
Ph24	Traveling to the prepurge position
Ph30	Prepurge time
Ph36	Traveling to the ignition position
Ph38	Preignition time
Ph39	Valve proving filling time (test of pressure switch-min when fitted between fuel valves V1 and V2)
Ph40	1st safety time (ignition transformer ON)
Ph42	1st safety time (ignition transformer OFF)
Ph44	Interval 1
Ph50	2nd safety time
Ph52	Interval 2
Ph60	Operation 1 (stationary)
Ph62	Max. time low-fire (operation 2, preparing for shutdown, traveling to low-fire)
Ph64	Switching back to pilot: Modulation to ignition load
Ph65	Switching back to pilot: Interval 2 waiting time
Ph66	Switching back to pilot: Reactivation of ignition + pilot
Ph67	Switching back to pilot: Shutdown of main valves
Ph68	Switching back to pilot: Pilot mode waiting phase
Ph69	Switching back to pilot: Pilot mode waiting phase for burner startup
Ph70	Afterburn time
Ph72	Traveling to the postpurge position
Ph74	Postpurge time (no extraneous light test)
Ph78	Postpurge time (t3) (abortion when load controller ON)
Ph80	Valve proving test evacuation time
Ph81	Valve proving test time atmospheric pressure, atmospheric test
Ph82	Valve proving filling test, filling
Ph83	Valve proving time gas pressure, pressure test
Ph90	Gas shortage waiting time

10.3 Automatic control unit levels

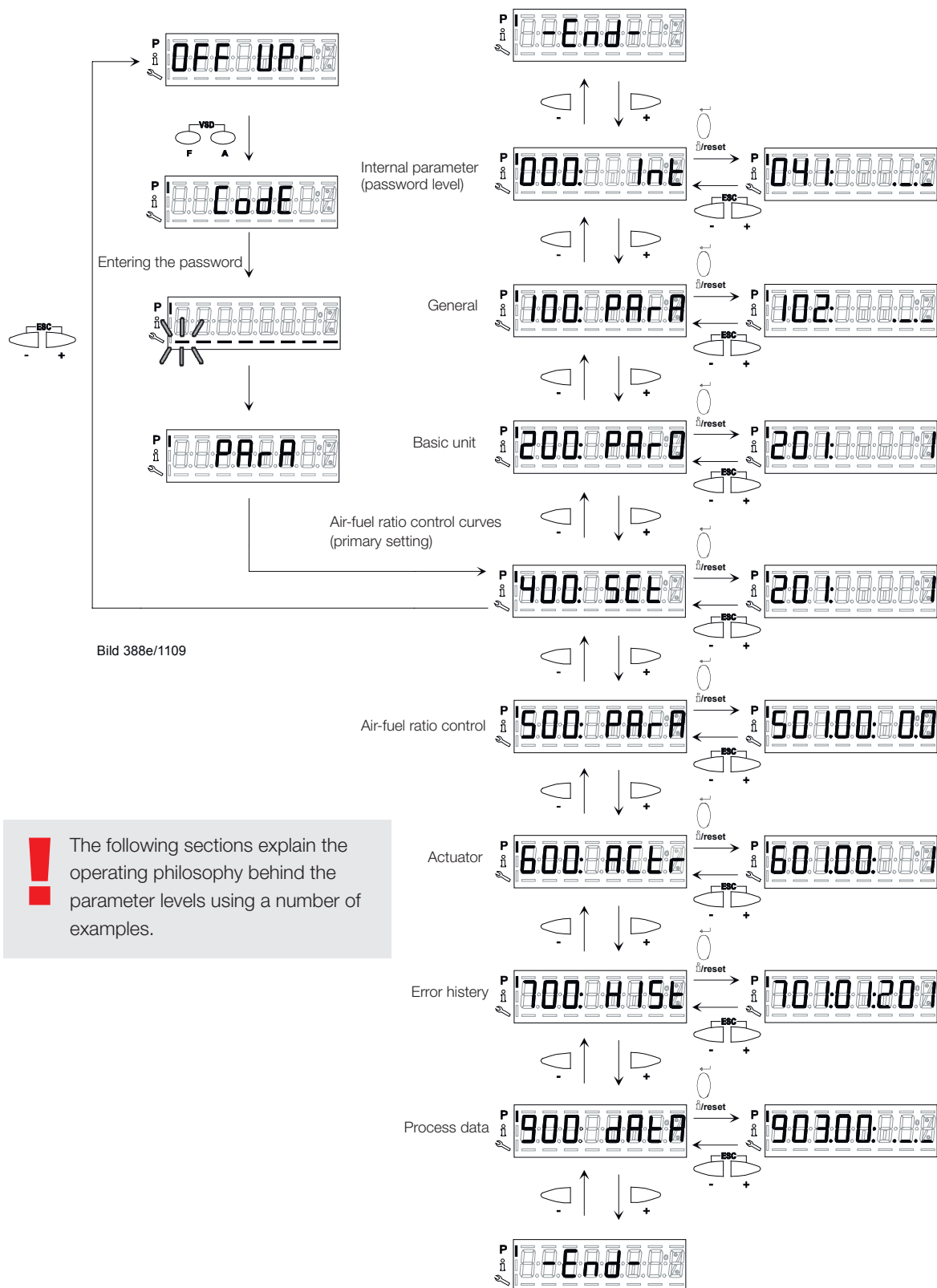
When working on burners there are different levels at which the automatic control unit can be accessed.

The info and service levels can be accessed without a password; error codes, error history and basic information about the burner can be viewed on these levels.

A code is required to enter settings for the burner.



10.3.1 Structure of parameter levels



! The following sections explain the operating philosophy behind the parameter levels using a number of examples.

10.3.2 Parameter of level info

No.	Parameter
167	Fuel volume resettable (m ³ , l, ft ³ , gal)
162	Operating hours resettable
164	Startups resettable
163	Operating hours when unit is live
166	Total number of startups
113	Burner identification
107	Software version
108	Software variant
102	Identification date
103	Identification number
104	Preselected parameter set: Customer code
105	Preselected parameter set: Version
143	Reserve

End

10.3.3 Parameter of level service

No.	Parameter
954	Flame intensity
960	Actual flow rate (fuel throughput in m³/h, l/h, ft³/h, gal/h)
121	Manual output
	Undefined = automatic operation
922	Incremental position of actuators
	Index 0 = fuel
	Index 1 = air
936	Standardized speed
161	Number of faults
701	Error history: 701-725.01.Code ex. 701. 01. xxx ↑ ↑ ↑ chronological error list index value of index
725	

Indexlista:

01 = error code

04 = error phase

02 = diagnostic code

05 = startup counter

03 = error class

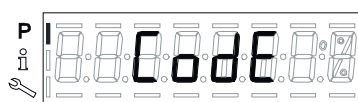
06 = output

10.3.4 Access code for service engineer level

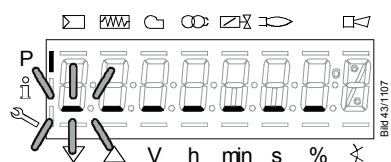


The code for logging into service level is found on the plate on the inside of the cover for the electrical connections box.

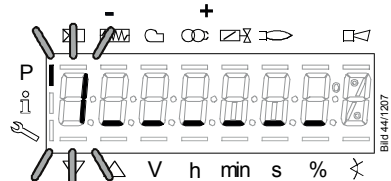
Press button combination   to display **CodE**



When releasing the buttons, 7 bars appear the first of whishes.

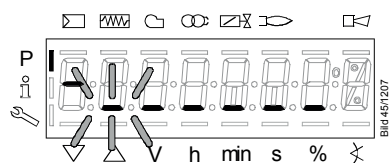


Press  or  to select a number or letter.



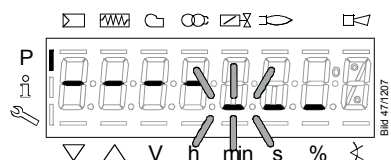
Press  to confirm the value

/reset



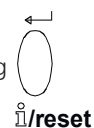
The value entered changes to a minus sign (-)
The next bar starts flashing.

Complete the rest of the password according to the principle described.



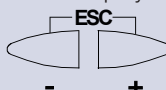
Example: Password consisting of 4 characters.

After entry of the last character the password must be confirmed by pressing

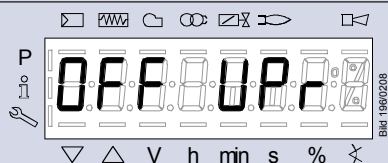


10.3.5 Manual

As long as the Manual OFF is active, **OFF** appears on the normal display flashing.

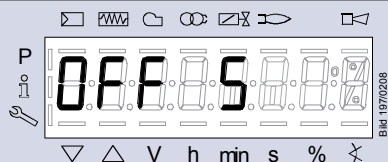
To deactivate and to change to automatic operation, press  for 3 seconds. Then OFF appears without flashing in the display.

10.3.6 Start prevention



A non-programmed or not completely parameterized unit, or a unit whose operating mode was reset or changed, displays **OFF UPPr**.

10.3.7 Safety loop



A unit whose safety loop and / or burner flange contact is open, and a controller ON signal is present, displays **OFF S**.

10.4 Setting the automatic control unit

To set the correct ratio between air and fuel, it is important to understand how this type of burner is controlled. This chapter will describe the procedure to follow when adjusting a burner with an LMV37 automatic control unit.



Note! When power is turned on for an unadjusted automatic control unit, “**OFF UPr**” is always shown in the display.

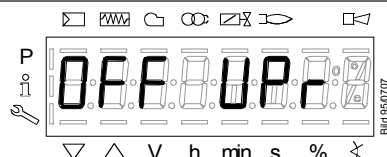
10.4.1 Setting an automatic control unit which has not previously been set or lost its settings

Check that the burner is receiving power and that oil is being supplied to the burner.

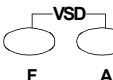
Move the switch (X) on the burner to the ON position.

The text “**OFF UPr**” is shown in the display.

Follow the procedure indicated below to set the automatic control unit.



An unprogrammed unit or a unit whose operating mode has been reset or changed displays **OFF UPr**.

Press  > 1 second to access login mode.

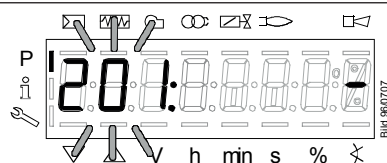
To continue with the setting work, you need to log into service engineer level. See 5.3.4.

After login is complete, continue with the setting work as shown below.



Press  to select parameter **400** for initial commissioning and for setting air-fuel control.

 /reset



201: appears flashing.

Press  to go to the settings for air-fuel ratio control and parameter

 /reset

201 for selecting the operating mode.

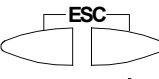


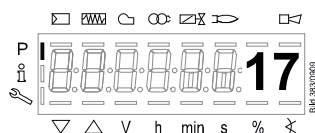
Ensure that the fuel train is correctly set in compliance with the type of burner used.

No	Parameter	Actuator controlled	
		Air	Fuel
201	Burner operating mode (fuel train, modulating / multistage, actuators, etc.)		
	-- = undefined (delete curves)	•	•
	1 = gas modulating (G mod)	•	•
	2 = gas modulating with pilot valve (Gp1 mod)	•	•
	3 = gas modulating with pilot valve (Gp2 mod)	•	•
	4 = oil modulating (Lo mod)	•	•
	5 = oil 2-stage (Lo 2 stage)	•	-
	6 = oil 3-stage (Lo 3 stage)	•	-
	7 = gas modulating (G mod pneu)	•	-
	8 = gas modulating (Gp1 mod pneu)	•	-
	9 = gas modulating (Gp2 mod pneu)	•	-
	10 = oil modulating with gas pilot (LoGp mod)	•	•
	11 = oil 2-stage with gas pilot (LoGp 2-stage)	•	-
	12 = oil modulating with 2 fuel valves (Lo mod 2V)	•	•
	13 = oil modulating with gas pilot and 2 fuel valves (LoGp mod 2V)	•	•
	14 = gas modulating (G mod pneu, 0 active)	-	-
	15 = gas modulating with pilot (Gp1 mod pneu, 0 active)	-	-
	16 = gas modulating with pilot (Gp2 mod pneu, 0 active)	-	-
	17 = oil 2-stage (Lo 2-stage, 0 active)	-	-
	18 = oil 3-stage (Lo 3-stage, 0 active)	-	-
	19 = gas modulating only when firing on gas (G mod fuel active)	-	•
	20 = gas modulating with pilot only when firing on gas (Gp1 mod fuel active)	-	•
	21 = gas modulating with pilot only when firing on gas (Gp2 mod fuel active)	-	•
	22 = oil modulating only when firing on oil (Lo mod fuel active)	-	•
	23 = HO mod with circulation	•	•
	24 = HO 2-stage with circulation	•	-
	25 = HO mod without circulation control	•	•
	26 = HO 2-stage without circulation control	•	-
	27 = HO 3-stage without circulation control	•	-

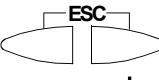


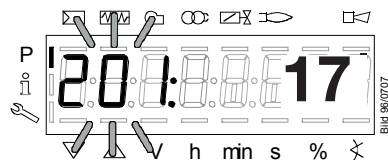
This manual describes “17=oil 3-stage burners (Lo 3-stage).

Press:  to return to parameter level.

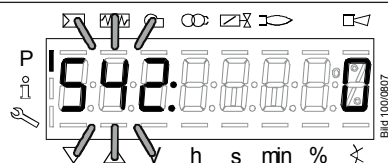


Press  to save selected setting.

Press:  to return to parameter level.



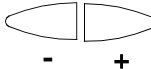
To the next parameter 



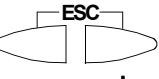
Parameter **542** to activate the VSD / PWM fan.
You can choose:
0 = VSD / PWM fan OFF
1 = VSD / PWM fan ON

If the parameter is set correctly, move directly to the next parameter with 

Press  to adjust parameter **542**.

Select your setting by pressing one of the buttons 

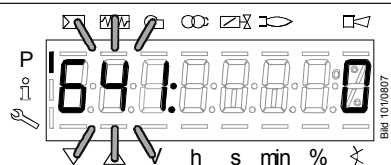
Press  to save the setting for parameter **542**: VSD

Press:  to return to parameter level.



This manual describes
“0=VSD OFF” type
burners.

To the next parameter  Back to the previous parameter 



Parameter **641** to control speed standardization of the VSD.

You can choose:

0 = speed standardization of VSD OFF

1 = speed standardization of VSD ON

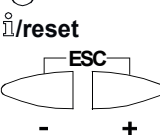
After setting speed standardization to 1, standardization of the VSD commences. If successful, the parameter is reset to 0. Negative values indicate errors (refer to chapter Automatic speed standardization).

If the parameter is set correctly, move directly to the next parameter with 

Press:  to adjust parameter **641**: speed standardization

Select your setting by pressing one of the buttons  

Press:  to save the setting for parameter **641**: VSD

Press:  to return to parameter level.

 This manual describes "0=speed standardization" type burners.

To the next parameter 

10.5 Multistage operation

This operating mode is only available when firing on oil. There is a choice of 2-stage and 3-stage operation. Hence, the burner's output can be modulated via 2 or 3 stages. Modulation is accomplished by adjustment of the air actuator or the VSD and by switching the fuel valves for adjusting the amount of fuel.

10.5.1 Definition of curves

Air-fuel ratio control is defined via the 2 or 3 static output points. To switch the valves on and off, switch-on and switch-off points must be defined.

The following assignments apply:

Curvepoint	Meaning	Valve
P0	Point of ignition (not approached in the operating position)	V1
P1	Stage 1	V1
P2on	Switch-on point stage 2. When the angle exceeds this point, the fuel valve for the second stage is switched on	V1
P2_d	Presetting of point P2 with no approach	V1
P2	Stage 2	V2
P2of	Switch-off point stage 2. When the angle falls below this point, the fuel valve for the second stage is switched off	V2
P3on	Switch-on point stage 3. When the angle exceeds this point, the fuel valve for the third stage is switched on	V2
P3_d	Presetting of point P3 with no approach	V2
P3	Stage 3	V3
P3of	Switch-off point stage 3. When the angle falls below this point, the fuel valve for the third stage is switched off	V3

The actuator positions can be set with a resolution of 0.1° , the speeds with a resolution of 0.1%.

10.5.2 Traveling speed

The VSD is regulated the same way as when operating mode is not used.

The defined ramping speeds are used.

The VSD speed can be adjusted separately for both increases and decreases in speed.

No	Parameter	
522	Ramp up	
523	523 Ramp down	

The setting also acts outside the operating position.

The running speed of the actuators is fixed at 5 seconds for a positioning angle of 90° for SQM33.4, SQM33.5, and SQN1.

The speed is 10 seconds for a positioning angle of 90° for SQM33.6.

The SQM33.7 requires 17 seconds for a positioning angle of 90° .

10.5.3 Adjustment of output

When the output increases, the system moves from the curvepoint of stage 1 (P1) to the switch-on point of stage 2 (P2on). If the switch-on point is exceeded, the valve for the second stage is switched on. Then, the system moves to the curvepoint for stage 2 (P2). When the output decreases, the system moves from the curvepoint of stage 2 (P2) to the switch-off point of stage 2 (P2of). If this point is crossed, the valve for the second stage is switched off. Then, the system moves to the curvepoint for stage 1 (P1). In 3-stage operation, the output between stage 2 and stage 3 is adjusted analogously to 2-stage operation. As static outputs, only P1, P2 and P3 can be approached.

The switch-on and switch-off points are crossed only when changing between stages. The traveling speeds are fixed. Depending on the positioning angles to be covered, air actuator and VSD do not reach the operating or switch-on/switch-off points at the same time. The valves are switched on/off only after both actuators have reached their correct positions.

When parameterizing the curves, the switch-on points can also be approached in a stationary manner. In addition, when setting the curve via P2_d (P3_d), curvepoint P2 (P3) can be readjusted without traveling to it. In that case, the system is at the respective switch-on point. This procedure is used to reduce the operating time if there is shortage of air.

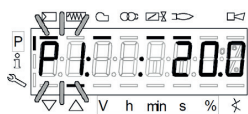
10.5.4 Entering the operating position

The burner is ignited at ignition position P0. When entering operating phase 60, the actuators are driven from ignition position P0 to the operating point of stage 1 (P1) at the respective traveling speed.

10.5.5 Operating position

In the operating position, the burner's output can be adjusted between operating points P1 and P2 or P3 in accordance with the load controller's presetting, as described in chapter Adjustment of output. Ignition position P0 is not approached anymore. It can only be reached via curve adjustment.


 and
 or 
 as well as
 and 
 and
 or 



Low-fire position **P1** can be set only when symbol ▲ or ▼ is no longer highlighted.

Set stage 1 **P1**.

Fuel valve **V1** is switched on.

Keep  depressed and, for VSD  and .

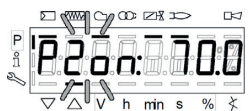
Press  or  to adjust the value.

When symbol ▲ or ▼ is no longer highlighted, the next curvepoint **P2on** can be selected with .

To the next curvepoint




 and
 or 
 as well as
 and 
 and
 or 



Curvepoint **P2on** can be set only when symbol ▲ or ▼ is no longer highlighted.

Set switch-on point stage 2 .

Fuel valve **V2** is still off.

Keep  depressed and, for VSD  and .

Adjust the value with  or .

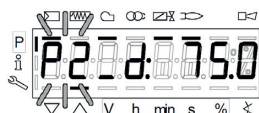
When symbol ▲ or ▼ is no longer highlighted, the next curvepoint **P2_d**

can be selected with .

To the next curvepoint




 and
 or 
 as well as
 and 
 and
 or 



Curvepoint **P2_d** can be set only when symbol ▲ or ▼ is no longer highlighted.

Fuel valve **V2** is still off and the system remains at curvepoint **P2on**. Presetting of operating stage **P2** with no travel, aimed at cutting the operating time if there is shortage of air.

Keep  depressed and, for VSD  and .

Press  or  to adjust the value.

When symbol ▲ or ▼ is no longer highlighted, the next curvepoint **P2** can be selected with .

To the next
curvepoint



Back to the previous curvepoint

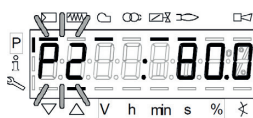
and

 or

 as well as

 F and A
 and

 or



Curvepoint **P2** can only be adjusted when symbol ▲ or ▼ is no longer highlighted.

Fuel valve **V2** is switched on. Keep depressed and, for VSD F and A. Press or to adjust the value.

When symbol ▲ or ▼ is no longer highlighted, the next curvepoint **P2of**

can be selected with



Back to the previous curvepoint

Curvepoint **P2of** is now adjusted.
The system remains at **P2**.

Adjust the switch-off point with no travel.

Now, the curvepoint is approached dynamically when traveling from **P2** to **P1**.

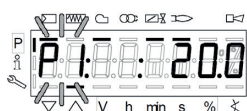
When symbol ▲ or ▼ is no longer highlighted, the next curvepoint **P1** can

be selected with

To the next
curvepoint



Back to the previous curvepoint

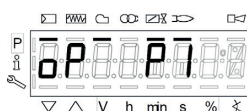
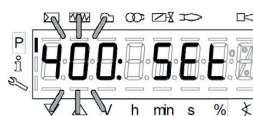


Automatic mode is released when, after reaching **P1**, the curve settings are quit with **ESC**.

If the settings are aborted earlier (**ESC** or shutdown due to fault), start prevention **OFF UPr** is still active until all curvepoints are set.



When symbol ▲ or ▼ is no longer highlighted, **ESC** can be pressed a second time.



The warm settings for air-fuel ratio control of the LMV37.4... have now been configured.

10.5.6 The parameters below may need to be set according to the nature of the installation.

10.5.6.1 No-flame positions air actuator

502 No-flame positions air actuator

Index 0 = no-load position

Index 1 = pre purge position

Index 2 = post purge position

Factory settings marked with bold text.

 This manual describes “2=valve proving via pressure switch-min (between fuel valves 1 and 2)” type burners.

 Depending on the type of burner, the automatic control unit should be set to either “0=no valve proving” or “1=valve proving on startup”.

 The automatic control unit should be set to “Index 0 = no-load position”.

10.5.6.2 Active detector flame evaluation

261 Oil: Active detector flame evaluation

0 = QRB / QRC

1 = ION / QRA

Factory settings marked with bald text.

When replacing detector flame between ionisation and UV-cell (QRA), no change to the setting parameters is required; simply disconnect and connect ionisation and UV-cell (QRA) respectively..

10.5.6.3 Prepurging

262 Oil: Prepurging

Index 0 = deactivated

Index 1 = activated

Factory settings marked with bald text

When using valve proving and 2 fuel valves of class A, prepurging is not required (conforming to EN 676).

If not activated, it is nevertheless performed if one or several of the following conditions apply:

- Alterable lockout position
- After an off time of >24 hours
- In the event of a power failure (power-on)
- In the event of shutdown due to an interruption of oil supply (safety shutdown)

10.5.6.4 Prepurging time

265 Oil: Prepurging time

20 s – 60 min

10.5.6.5 Postpurge time

274 Oil: Postpurge time (no external light test)

0,2 s – 108 min

10.5.6.6 Postpurging in lockout position

190 Postpurging in lockout position

0 = deactivate (no-load position)

1 = active (postpurge position)

Factory settings marked with bald text.



When the Purging in the lockout position function is used, the fan may only be powered via a contactor and must not be connected directly to LMV37.4 (X3-05 pin 1)!

When active, the Alarm in the event of start prevention function (parameter 210) is only possible to a limited extent!

The LMV37.4 system simply moves the actuators to the postpurge position. A fan release contact cannot be controlled, as the alarm relay of the LMV37.4 system cuts off the power supply to the outputs. With the Alarm in the event of start prevention function, an external circuit that may be present for controlling the fan release contact for purging in the lockout position is activated via start prevention in standby mode.

10.5.6.7 Continuous fan

A burner can be converted into a continuous fan using conversion kit 119 230 01. See the documentation provided with the kit for instructions on how to perform the conversion.

10.5.6.8 Continuous operation

The LMV37 automatic control unit permits continuous operation of the burner, provided that the burner's detector flame is an ionisation detector flame.

When forced intermittent operation is activated, the unit shuts down for a moment after 23 hours and 45 min of uninterrupted operation, followed by an automatic restart.

When forced intermittent operation is inactivated the burner will run continuously.

Forced intermittent operation is a standard feature.

279 Oil: Forced intermittent operation

0 = inactivate

1 = activated

Factory settings marked with bold text.

10.6 Backup and restore

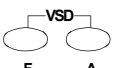
When adjustments to the burner are complete, it is a good idea to make a backup of the settings.

The backup ensures that the adjusted values are also saved in the display memory. This can be useful, e.g. if there are any problems with the LMV. The LMV can then be replaced and previous settings for the burner restored from the display memory to the new LMV.

Backup: Means that the parameters set on the LMV control unit are saved in the display memory.

Restore: Means that the settings saved in the display memory are transferred to the LMV and these overwrite any settings already in the LMV. The transferred parameter settings then act as operating parameters for the burner.

10.6.1 Backup

Press  > 1 second to access login mode.

To continue with the setting work, you need to log into service engineer level. See 5.3.4.
After login is complete, continue with the setting work as shown below.

Press  or  for parameter level **000**.

Press 
i/reset



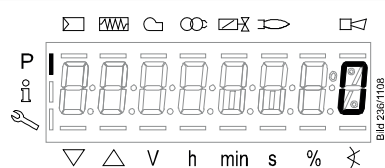
Display: Parameter **050**, flashes, index **00**, and value **0** do not.


i/reset



Display: Parameter **bAC_UP**


i/reset

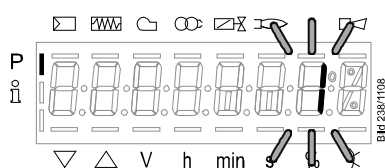


Display: Value 0

Press  to backup process.

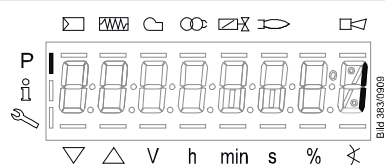
Press  to shift the value in change mode 1 position to the left.

Note! The value must be set to 1 if a backup is required, and to 0 if a backup is not required. The values higher than 1 which can be set must not be used.

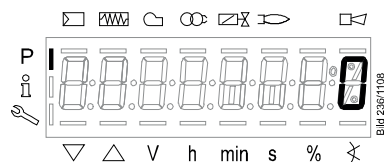


Display: Value 1 flashes

Press  to activate the backup process.



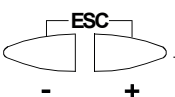
Display: 1 appears



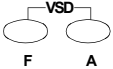
After about 5 seconds (depending on the duration of the program), 0 appears on the display, indicating the end of the backup process.

Display: 0

! If an error occurs during the backup process, a negativ value is displayed. For error diagnostics, the cause of the error can be determined from the diagnostic code of error message 137 (see Error code list)

Press  four times until the top menu is displayed.

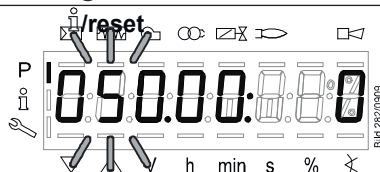
10.6.2 Restore

Press  > 1 second to access login mode.

To continue with the setting work, you need to log into service engineer level. See 5.3.4.
After login is complete, continue with the setting work as shown below.

Press  or  for parameter level **000**.

Press 



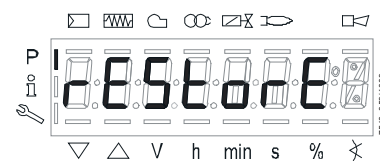
Display: Parameter **050**, flashes, index **00**, and value **0** do not.


/reset

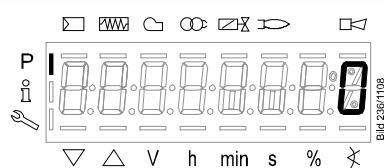


Display: Parameter **bAC_UP**

Press  to select parameter **rESstorE**



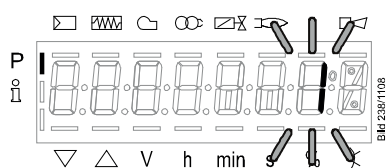

/reset



Display: Value **0**

Press  to select the restore process.
reset

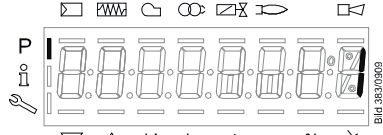
Press  to shift the value in change mode 1 position to the left.



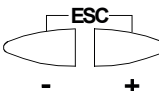
Display: Value **1** flashes

 To detect potential display errors, the value is displayed 1 place shifted to the left

Press  to activate the the restore process.
/reset

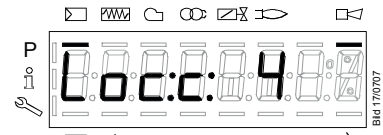
 Display: **1** appears

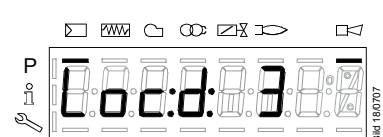
After about 8 seconds (depending on the duration of the program), **0** appears on the display, indicating the end of the backup process.
 Display: **0**

Press  four times until the top menu is displayed.

10.7 Fault status message, display of errors and info

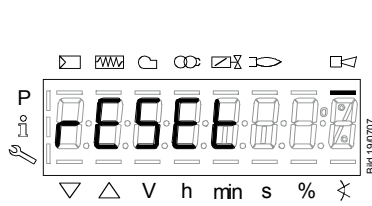
10.7.1 Display of errors (faults) with lockout

 The display shows Loc:, the bar under the fault status message  appears.
 The unit is in the lockout position.

 The display shows current error code c: alternating with diagnostic code d: (refer to Flash code list).
 Example: Error code 4/diagnostic code 3

When pressing  for 1...3 s, **rESEt** appears on the display.
/reset

When the button is released, the basic unit is reset.



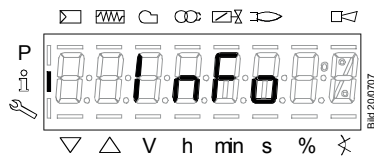
If the  button is pressed for a time other than the time indicated above, a change to the previous menu is made.

Exception

If an error occurred while setting the curve, a change back to the parameter setting level is made.

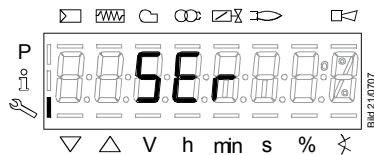
10.7.2 Activating info / service mode from lockout

 **/reset** >3 s



When pressing  for >3 s, the display shows InFo, **/reset**

 **/reset** >5 s



SEr and then **OPErAtE**.

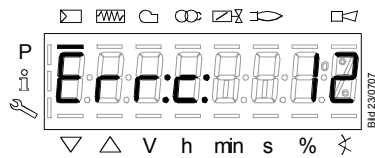
For a list of parameters, see table 5.3.3.

 **/reset** >8 s



When the button is released, a change to info / service mode is made.

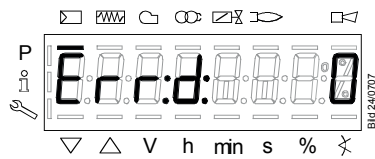
10.7.3 Error with safety shutdown



The display shows **Err:**.

The unit initiates safety shutdown.

The display shows current error code c:
alternating with diagnostic code d:.

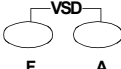


Press  1...3 s, to return to the normal display.

/reset

Example: Error code **12** / diagnostic code **0**

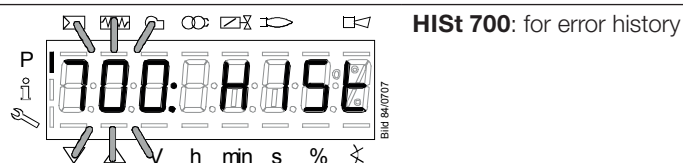
10.7.4 Error history

Press  > 1 second to access login mode.

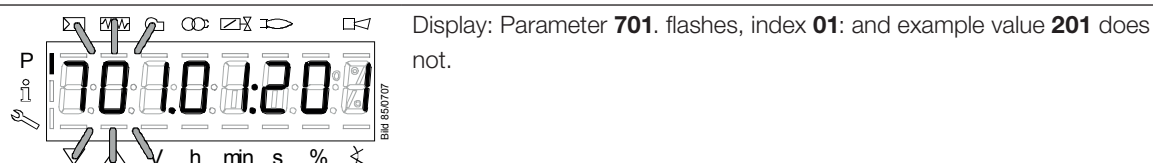
To continue with the setting work, you need to log into service engineer level. See 5.3.4.

After login is complete, continue with the setting work as shown below.

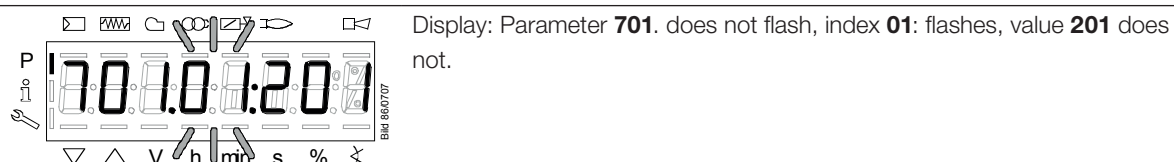
Press  or  for parameter level **700**.



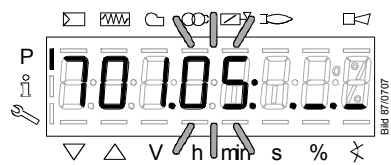
Press  to go to the parameter level.



Press  to go to index **01**:



To the next index  Back to the previous index. 

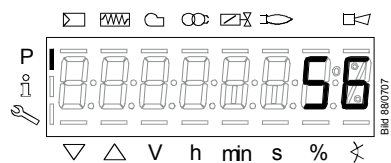
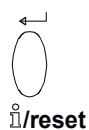


Press  to select the index:

- .01 = error code
- .02 = diagnostic code
- .03 = error class
- .04 = error phase
- .05 = startup counter
- .06 = output

Example:

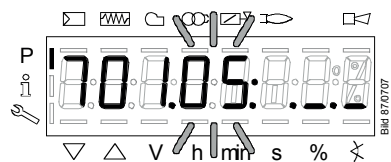
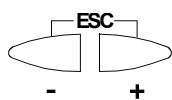
Parameter **701.**, index **05**: for startup counter, diagnostic code **._._**

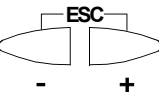


Press  to go to display mode.

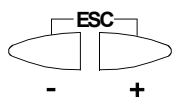
i/reset

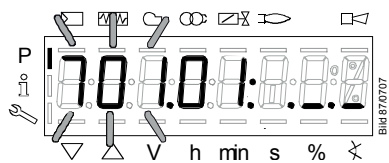
Display: Value **56** (number of startup)



Press  to return to the index.

Display: Parameter **701.** does not flash, index **05**: flashes, characters **._._** do not.



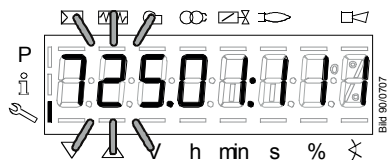


Press  to return to the parameter level.

Display: Parameter **701**. flashes index **01**: does not, characters **._._** do not.

To the next old error  +

Shows all saved error codes between 701 and 725.

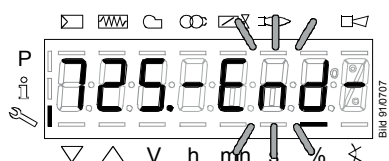


Parameters cover the period of time back to the last error since history was deleted (max. to parameter **725**.)

Example:

Parameter **725**., index **01**., error code **111**

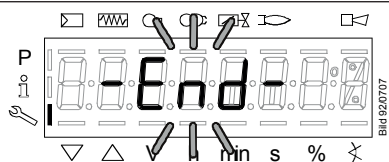
To the next parameter  Back to the previous parameter.  -



When this display appears, you have reached the end of the error history index.

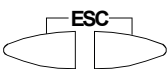
Display – **End** – appears flashing.

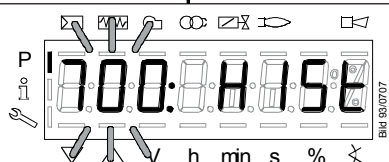
To the next index  Back to the previous index.  -



When this display appears, you have reached the end of the error history.

Display – **End** – appears flashing.

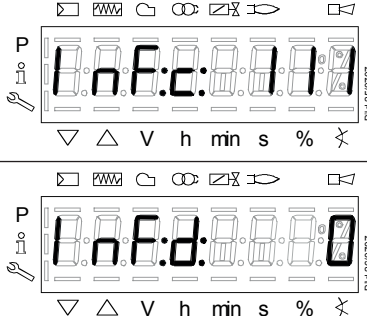
Press  twice.



HIST 700: for error history

10.8 Display message of info

10.8.1 General information



The unit displays an event which does not lead to shutdown.

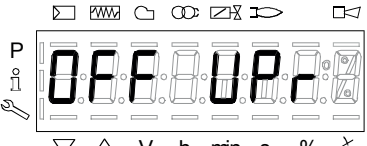
The display shows current error code c: alternating with diagnostic code d:.

Press  to return to the display of phases.

Example: Error code **111** / diagnostic code **0**

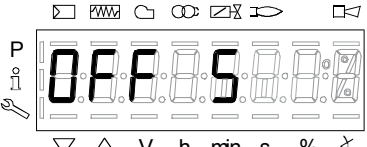
Note
For meaning of the error and diagnostic codes, refer to chapter Error code list. When an error has been acknowledged, it can still be read out from the error history.

10.8.2 Start prevention



A non-programmed or not completely parameterized unit, or a unit whose operating mode was reset or changed, displays **OFF UP.**

10.8.3 Safety loop



A unit whose safety loop and / or burner flange contact is open, and a controller ON signal is present, displays **OFF S.**

10.9 Resetting the automatic control unit

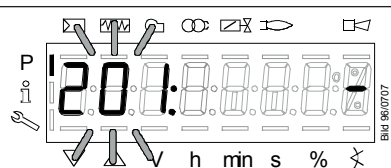


Press **F** **A** > 1 second to access login mode.

To continue with the setting work, you need to log into service engineer level. See 5.3.4.

After login is complete, move to parameter level **200** using or .

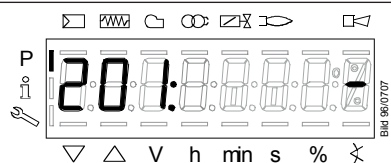
Press /reset



201: appears flashing

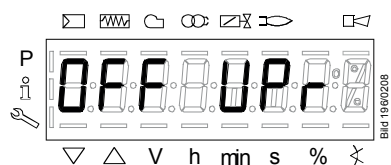
Press to go to the settings for air-fuel ratio control and parameter **201** for selecting the operating mode.

/reset



Select another burner type than the one already selected by pressing one of the buttons or .

Confirm this selection with The automatic control unit is now reset.



Restart the setting process for the LMV automatic control unit as specified in 3.2.1.

10.10 Manual output

A manual output can be set with the «Normal display» of the display and operating unit.

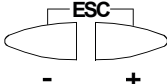
10.10.1 Activation of Manually OFF in standby via the display and operating unit

When the burner is in OFF position it can be set to Manually OFF which means that the burner will not start.

Manual OFF can be activated by pressing  for at least 1 second then **LoAd 0.0** appears flashing.

LoAd 0.0 means Manually OFF.

As long as the Manual OFF is active, **OFF** appears on the normal display flashing.

To deactivate and to change to automatic operation, press  for 3 seconds. Then OFF appears without flashing in the display.

10.10.2 Activation of Manually OFF in operation and adjustment of output via the display and operating unit

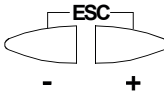
When the burner is in operation position it can be set to Manually OFF which means that the load of the burner can be manually set and will not start if the burner is shut down.

To activate Manually OFF, first run the system to the minimum output limit.

Manual OFF can be activated by pressing  for at least 1 second then **LoAd 0.0** appears flashing.

Adjustment of **LoAd** can now manually be done by pressing  and simultaneous pressing  or .

The burner will now stay in set input if none of the safety regulators stops the burner.

To deactivate and to change to automatic operation, press  for 3 seconds.

- ! If Manually OFF is activated, it is stored via mains OFF.
- On power return, the burner assumes the Manually OFF position (OFF flashing).

- ! Please note that the automatic control unit will not exit manual mode by itself.
- Make sure that the automatic control unit is reset to automatic mode.

- ! The unit can be changed to manual mode without login taking place. If the automatic control unit has been left in manual mode, no automatic burner control will take place, which in turn means that the installation is not operating satisfactorily. For this reason, make sure when servicing/troubleshooting that the automatic control unit is not in manual mode.

- ! Manually OFF must not be used just to put a burner out of operation when doing mounting work, or
- when the burner is not ready for operation. The safety notes contained in chapter Safety notes must be observed!

11. Parameter list

Par. no.	Parameter	Number of elements	Type	Edit	Value range Min	Value range Max	Resolution	Default setting	Password level
000	Internal parameters								
050	Start backup / restore via AZL2.../ PC software (set parameter to 1) Index 0: Create backup Index 1: Execute restore Error diagnostics via negative values (see error code 137)	2	Std_s8	edit	-99	50	1	0; 0	SO
055	Burner identification of AZL2... backup data set	1	Std_s32	read only	0	999999999	1	0	SO
056	ASN extraction of AZL2... backup data set	8	Std_u8	read only	0	127	1	0	SO
057	Software version when creating the AZL2... backup data set	1	Hex_16	read only	0x100	0xFFFF9	1	0	SO
100	General								
102	Identification date	1	Date	read only	0	255	1		Info / Service
103	Identification number	1	Std_u16	read only	0	65535	1		Info / Service
104	Preselected parameter set: Customer code	1	Std_u8	read only	0	255	1	9	Info / Service
105	Preselected parameter set: Version	1	Hex_16	read only	0	0xFFFF	1	LMV37.400...: V 01.05 LMV37.420...: V 01.06	Info / Service
107	Software version	1	Hex_16	read only	0x100	0xFFFF9	1	V 03.30	Info / Service
108	Software variant	1	Std_u8	read only	0	255	1	LMV37.400...: 1 LMV37.420...: 2	Info / Service
111	ASN extraction for verification with the AZL2... backup data set	8	Std_u8	read only	0	127	1	0	SO
113	Burner identification	1	Std_s32	edit	0	999999999	1	undefined	SO
121	Manual output Undefined = automatic mode	1	Output	edit / clear	0%	100%	0.1%	undefined	Info / Service
123	Minimum output positioning step Index 0: BACS output Index 1: Output of external load controller, analog Index 2: Output of external load controller contacts	3	Output	edit	0%	100%	0.1%	Index 0 1 2 Value 0% 1% 0%	SO
124	Start loss-of-flame test (TÜV test) (set parameter to 1) (shutdown of fuel valves → loss of flame) Error diagnostics via negative values (see error code 150)	1	Std_s8	edit	-6	1	1	0	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range Min Max		Resolution	Default setting	Password level
125	Mains frequency 0 = 50 Hz 1 = 60 Hz	1	Selection	edit	0	1	1	LMV37.400....: 0 LMV37.420....: 1	SO
126	Display brightness	1	Std_u8	edit	0%	100%	1%	LMV37.400....: 75 % LMV37.420....: 100 %	SO
128	Fuel meter: Pulse valency [pulses / volume unit]	1	Std_u16	edit	0	400	0.01	0	SO
130	Delete display of error history To delete the display: Set parameter to 1, then to 2 Return value 0: Job successfully completed Return value -1: Timeout of 1_2 sequence	1	Std_s8	edit	-5	2	1	0	SO
133	Default output for TÜV test Invalid = TÜV test when output is active 2.000...10.000 = low-fire...high-fire or stage 1 / stage 2 / stage 3	1	Output	edit / clear	20 %	100 %	0.1 %	undefined	SO
141	Operating mode BACS 0 = off 1 = Modbus 2 = reserved	1	Selection	edit	0	2	1	0	SO
142	Setback time in the event of communication breakdown Setting values 0 = inactive 1....7200 s	1	Std_u16	edit	0 s	7200 s	1 s	120 s	SO (BA)
143	Reserved	1	Std_u8	edit	1	8	1	1	Info / Service
144	Reserved	1	Std_u16	edit	10 s	60 s	1 s	30 s	SO
145	Device address for Modbus of basic unit Setting values 1....247	1	Std_u8	edit	1	247	1	1	SO
146	Setting of Baud rate for Modbus communication Setting values 0 = 9600 1 = 19200	1	Selection	edit	0	1	1	1	SO
147	Parity for Modbus 0 = none 1 = odd 2 = even	1	Selection	edit	0	2	1	0	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range Min Max		Resolution	Default setting	Password level
148	Default output if communication with building automation is interrupted Setting values: For modulation operation the setting range is as follows: 0...19.9 = burner off 20...100 = 20...100% burner rating For multistage operation apply to setting range: 0 = burner OFF, P1, P2, P3 Invalid = no default output predefined by building automation Default setting: Invalid	1	Output	edit / clear	0%	100%	0.1%	undefined	SO (BA)
161	Number of faults	1	Std_u16	read only	0	65535	1	0	Info / Service
162	Operating hours resettable	1	Std_s32	reset	0 h	9999999 h	1 h	0 h	Info / Service
163	Operating hours when unit is live	1	Std_s32	read only	0 h	9999999 h	1 h	0 h	Info / Service
164	Number of startups resettable	1	Std_s32	reset	0	9999999	1	0	Info / Service
166	Total number of startups	1	Std_s32	read only	0	9999999	1	0	Info / Service
167	Fuel volume resettable [m³, l, ft³, gal]	1	Std_s32	reset	0	999999999	1	0	Info / Service
176	Switching back to pilot switching cycles	1	Std_s32	read only	0	9999999	1	0	Info / Service
190	Postpurging in lockout position 0 = deactivate (no-load position) 1 = active (postpurge position) When active, the Alarm in the event of start prevention function is only possible to a limited extent!	1	Selection	edit	0	1	1	0	SO
191	Function Switching back to pilot 0 = deactivate 1 = active (low active) 2 = active (high active) Load controller contacts X5-03 are deactivated when function is active!	1	Std_u8	edit	0	2	1	0	SO
192	Switching back to pilot minimum time	1	Time	edit	5 s	120 s	0,2 s	30 s	SO
193	Switching back to pilot maximum time	1	Time	edit	30 s	108 min.	0,2 s	60 min.	SO
195	Repetition limit heavy oil direct start 1 = no repetition 2...15 = 1...14 number of repetitions 16 = constant repetition	1	Std_u8	edit	1	16	1	3	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range Min Max	Resolution	Default setting	Password level
200	Basic unit							
201	Burner operating mode (fuel train, modulating / multistage, actuators, etc.) -- = undefined (delete curves) 1 = G mod 2 = Gp1 mod 3 = Gp2 mod 4 = Lo mod 5 = Lo 2-stage 6 = Lo 3-stage 7 = G mod pneu 8 = Gp1 mod pneu 9 = Gp2 mod pneu 10 = LoGp mod 11 = LoGp 2-stage 12 = Lo mod 2 fuel valves 13 = LoGp mod 2 fuel valves 14 = G mod pneu without actuator 15 = Gp1 mod pneu without actuator 16 = Gp2 mod pneu without actuator 17 = Lo 2-stage without actuator 18 = Lo 3-stage without actuator 19 = G mod only gas actuator 20 = Gp1 mod only gas actuator 21 = Gp2 mod only gas actuator 22 = Lo mod only oil actuator 23 = Ho mod. sep. circulation 24 = Ho 2-stage sep. circulation 25 = Ho mod. without circulation 26 = Ho 2-stage without circulation 27 = Ho 3-stage without circulation	1	Selection	edit / clear	1 27	1	undefined	SO
204	Analog output invalid (4...20 mA) 0 = default load low-fire 1 = safety shutdown + start prevention	1	Std_u8	edit	0 1	1	1	SO
208	Program stop 0 = inactive 1 = PrePurgP (Ph24) 2 = IgnitPos (Ph36) 3 = interval 1 (Ph44) 4 = interval 2 (Ph52)	1	Selection	edit	0 4	1	0	SO (BA)
210	Alarm in the event of start prevention 0 = deactivated 1 = activated	1	Selection	edit	0 1	1	LMV37.400....: 0 LMV37.420....: 1	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range		Resolution	Default setting	Password level
211	Fan ramp up time	1	Time	edit	2 s	60 s	0.2 s	2 s	SO
212	Max. time down to low-fire	1	Time	edit	0.2 s	10 min	0.2 s	45 s	SO
215	Repetition limit safety loop 1 = no repetition 2...15 = 1...14 number of repetitions 16 = constant repetition	1	Std_u8	edit	1	16	1	LMV37.400...: 16 LMV37.420...: 1	SO
261	Oli: Active detector flame of evaluation 0 = QRB / QRC 1 = ION / QRA	1	Selection	edit	0	1	1	LMV37.400...: 0 LMV37.420...: 1	SO
262	Oli: Prepurgig 0 = deactivated 1 = activated	1	Selection	edit	0	1	1	1	SO
265	Oli: Prepurge time	1	Time	edit	LMV37.400Ax: 15 s LMV37.420Ax: 5 s	60 min	0.2 s	LMV37.400...: 15 s LMV37.420...: 30 s	SO
266	Oli: Preignition time	1	Time	edit	0,6 s	60 min	0.2 s	2 s	SO
267	Oli: First safety time	1	Time	edit	1 s	15 s	0.2 s	5 s	SO
269	Oli: Time to respond to pressure faults within first and second safety time	1	Time	edit	0.4 s	14.6 s	0.2 s	1.8 s	SO
270	Oli: Interval 1	1	Time	edit	0,4 s	60 min	0.2 s	2 s	SO
271	Oli: Second safety time	1	Time	edit	1 s	15 s	0.2 s	LMV37.400...: 5 s LMV37.420...: 10 s	SO
272	Oli: Interval 2	1	Time	edit	0.4 s	60 s	0.2 s	2 s	SO
273	Oli: Afterburn time	1	Time	edit	0.2 s	60 s	0.2 s	8 s	SO
274	Oli: Postpurge time (no extraneous light test)	1	Time	edit	0.2 s	108 min	0.2 s	LMV37.400...: 0,2 s LMV37.420...: 15 s	SO
276	Oli: Input pressure switch-min 1 = active from phase 38 2 = active from safety time	1	Selection	edit	1	2	1	1	SO
277	Oli: Input pressure switch-max/POC 1 = pressure switch-max 2 = POC 3 = not used 4 = additional speed-dependent air pressure switch	1	Selection	edit	1	4	1	1	SO
279	Oli: Forced intermittent operation 0 = inactive 1 = activated	1	Selection	edit	0	1	1	1	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range Min Max		Resolution	Default setting	Password level
280	Repetition limit value loss of flame 1 = no repetition 2 = 1 repetition Recharging time: After the Operation phase	1	Std_u8	edit	1	2	1	LMV37.400...: 2 LMV37.420...: 1	SO
281	Oli: Point in time oil is ignited 0 = short preignition (phase 38) 1 = long preignition (with fan) (phase 22)	1	Selection	edit	0	1	1	LMV37.400...: 1 LMV37.420...: 0	SO
284	Oli: Postpurge time (abortion if load controller ON)	1	Time	edit	1 s	108 min	0.2 s	1 s	SO
286	Oli: Evaluation of heavy oil direct start 0 = only start signal in phase 38 1 = evaluation in phase 38...62	1	Selection	edit	0	1	1	1	SO
287	Oli: Maximum time heavy oil start signal	1	Time	edit	1 s	45 s	0.2 s	45 s	SO
400	Ratio curves								
401	Ratio control curve fuel actuator (only curve settings)	13	Std_s16	edit	0°	90°	0.1°	0°; 0°; 15°; undefined	SO
402	Ratio control curve air actuator (only curve settings)	13	Std_s16	edit	0°	90°	0.1°	0°; 90°; 45°; undefined	SO
403	Ratio control curve VSD (only curve settings)	13	Std_s16	edit	15 %	100%	0.1%	0°; 100%; 50%; undefined	SO
500	Ratio control								
501	No-flame positions fuel actuator Index 0 = home position Index 1 = prepurge position Index 2 = postpurge position	3	Std_s16	edit	0°	90°	0.1°	Index 0 0° 1 0° 2 15°	SO
502	No-flame positions air actuator Index 0 = home position Index 1 = prepurge position Index 2 = postpurge position	3	Std_s16	edit	0°	90°	0.1°	Index 0 0° 1 90° 2 45°	SO
503	No-flame speeds VSD Index 0 = no-load speed Index 1 = prepurge speed Index 2 = postpurge speed	3	Std_s16	edit	0%	100%	0.1%	Index 0 0% 1 100% 2 50%	SO
522	Ramp up	1	Std_u8	edit	5 s	40 s	1 s	10 s	SO
523	Ramp down	1	Std_u8	edit	5 s	40 s	1 s	10 s	SO
542	Activation of VSD / PWM fan 0 = inactive 1 = active	1	Selection	edit	0	1	1	0	SO
544	Ramp modulating	1	Std_u8	edit	32 s	80 s	1 s	32 s	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range		Resolution	Default setting	Password level
					Min	Max			
545	Lower output limit undefined = 20 %	1	Output	edit / clear	20%	100%	0.1%	undefined	SO (BA)
546	Upper output limit undefined = 100 %	1	Output	edit / clear	20%	100%	0.1%	undefined	SO (BA)
600	Actuators								
601	Selection of reference point Index 0 = fuel Index 1 = air 0 = close (<0°) 1 = open (>90°)	2	Selection	edit	0	1	1	Index 0 1 Value 0 1	SO
602	Actuator's direction of rotation Index 0 = fuel Index 1 = air 0 = counterclockwise 1 = clockwise (exclusively for SQM3...)	2	Selection	edit	0	1	1	Index 0 1 Value 0 1	SO
606	Tolerance limit of position monitoring [0.1°] Index 0 = fuel Index 1 = air Greatest position error where a fault is securely detected → error detection band: (parameter 606-0.6°) to parameter 606	2	Std_u8	edit	0.5°	4°	0.1°	Index 0 1 Value 1.7° 1.7°	SO
611	Type of referencing Index 0 = fuel Index 1 = air 0 = standard 1 = stop within usable range 2 = internal stop (SQN1...) 3 = both	2	Std_u8	edit	0	3	1	Index 0 1 Value 0 0	SO
613	Type of actuator Index 0 = fuel Index 1 = air 0 = 5 s / 90° (1 Nm, 1,2 Nm, 3 Nm) 1 = 10 s / 90° (6 Nm) 2 = 17 s / 90° (10 Nm)	2	Std_u8	edit	0	2	1	0; 0	SO
641	Control of speed standardization of VSD Error diagnostics of negative values (refer to error code 82) 0 = no speed standardization 1 = speed standardization active	1	Std_s8	edit	-25	1	1	0	SO
642	Standardized speed Index 0 = speed 1 Index 1 = speed 2 (internal supervision)	2	Std_u16	read only	650	6500	0.1	undefined	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range		Resolution	Default setting	Password level
645	Configuration of analog output 0 = DC 0...10 V 1 = DC 2...10 V 2 = DC 0/2...10 V	1	Std_u8	edit	0	2	1	0	SO
652	VSD behavior when safety loop / burner flange is open 0 = no VSD control when safety loop / burner flange is open 1 = VSD control independent of safety loop / burner flange	1	Std_u8	edit	0	1	1	1	HF
653	VSD standstill supervision in standby mode 0 = deactivate 1 = active	1	Std_u8	edit	0	1	1	1	HF
700	Error history								
701	Error history: 701-725.01.Code	25	Std_u8	read only	0	255	1	0	Info / Service
•	Error history: 701-725.02.Diagnostic code	25	Std_u8	read only	0	255	1	0	Info / Service
•	Error history: 701-725.03.Error class	25	Std_u8	read only	0	6	1	0	Info / Service
•	Error history: 701-725.04.Phase	25	Std_u8	read only	0	255	1	0	Info / Service
•	Error history: 701-725.05.Startup counter	25	Std_s32	read only	0	99999999	1	0	Info / Service
725	Error history: 701-725.06.Output	25	Output	read only	0%	100 %	0.1%	0%	Info / Service
900	Process data								
903	Current output Index 0 = fuel Index 1 = air	2	Output	read only	0%	100%	0.1%	0%	Info / Service
922	Incremental position of actuators Index 0 = fuel Index 1 = air	2	Std_s16	read only	-50°	150°	0.01°	0°	Info / Service
935	Absolute speed	1	Std_u16	read only	0	6553.5	0.1	0	SO
936	Standardized speed	1	Std_s16	read only	-200%	200%	0.1%	0%	Info / Service
942	Active load source 1 = output during curve settings 2 = manual output 3 = default output via building automation 4 = default output via analog input 5 = external load controller via contacts	1	Selection	read only	0	255	1	0	SO

Par. no.	Parameter	Number of elements	Type	Edit	Value range Min	Value range Max	Resolution	Default setting	Password level
947	Result of contact sensing (bit-coded) Bit 0.0 = 1: Pressure switch-min Bit 0.1 = 2: Pressure switch-max Bit 0.2 = 4: Pressure switch valve proving Bit 0.3 = 8: Pressure switch air pressure switch Bit 0.4 = 16: Load controller OPEN Bit 0.5 = 32: Load controller ON Bit 0.6 = 64: Load controller CLOSE Bit 0.7 = 128: Safety loop Bit 1.0 = 1: Safety valve Bit 1.1 = 2: Ignition Bit 1.2 = 4: Fuel valve 1 Bit 1.3 = 8: Fuel valve 2 Bit 1.4 = 16: Fuel valve 3 / pilot valve Bit 1.5 = 32: Reset	2	Std_u8	read only	0	255	1	0	Info / Service
948	Contact feedback network counter register	14	Std_u8	read only	0	255	1	0	SO
950	Required relay state (bit-coded) Bit 0 = 1: Alarm Bit 1 = 2: Safety valve Bit 2 = 4: Ignition Bit 3 = 8: Fuel valve 1 Bit 4 = 16: Fuel valve 2 Bit 5 = 32: Fuel valve 3 / pilot valve	1	Std_u8	read only	0	255	1	0	Info / Service
951	Mains voltage (normalized) AC 230 V: Voltage = value x 1.683 AC 120 V: Voltage = value x 0.843	1	Std_u8	read only	0 V	255 V	1 V	0 V	SO
954	Intensity of flame	1	Std_u8	read only	0%	100%	1%	0%	Info / Service
960	Actual flow rate (m³/h, l/h, ft³/h, gal/h)	1	Std_u16	read only	0	6553.5	0.1	0	Info / Service
961	Phase (state for external modules and display)	1	Std_u8	read only	0	255	1	0	Info / Service
981	Error memory: Code	1	Std_u8	read only	0	255	1	0	Info / Service
982	Error memory: Diagnostic code	1	Std_u8	read only	0	255	1	0	Info / Service
992	Error flags	10	Hex_32	reset	0	0xFFFFFFFF	1	0	SO

Std_u8

8 bit integer, **not** signed

Std_s8

8 bit integer, signed

Std_u16

16 bit integer, **not** signed

Std_s16

16 Bit integer, signed

Std_u32

32 bit integer, **not** signed

Std_s32

32 Bit integer, signed

Note

This data type is also used to mark an invalid or non-signed value by using the value of -1!

12. Error code list

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
no Comm			
2	#	No communication between LMV37.4... basic unit and AZL2...	Check wiring for line interruption/loose contact
	1	No flame at the end of safety time 1 (TSA1)	
	2	No flame at the end of safety time 2 (TSA2)	
	4	No flame at the end of safety time 1 (TSA1) (software version ≤ V02.00)	
3	#	Air pressure failure	
	0	Air pressure off	
	1	Air pressure on	
	2	Evaluation of air pressure	Correct the setting of parameter 235 or 335 (Deactivation of the air pressure check in operation only allowed in pneumatic operation!)
	4	Air pressure on – start prevention	
	20	Air pressure, combustion pressure – start prevention	
	68	Air pressure, POC – start prevention	
	84	Air pressure, combustion pressure, POC – start prevention	
4	#	Extraneous light	
	0	Extraneous light during startup	
	1	Extraneous light during shutdown	
	2	Extraneous light during startup – start prevention	
	6	Extraneous light during startup, air pressure – start prevention	
	18	Extraneous light during startup, combustion pressure – start prevention	
	24	Extraneous light during startup, air pressure, combustion pressure – start prevention	
	66	Extraneous light during startup, POC – start prevention	
	70	Extraneous light during startup, air pressure, POC – start prevention	
	82	Extraneous light during startup, combustion pressure, POC – start prevention	
	86	Extraneous light during startup, air pressure, combustion pressure, POC – start prevention	
7	#	Loss of flame	
	0	Loss of flame	
	3	Loss of flame (software version ≤ V02.00)	

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	3...255	Loss of flame due to TÜV test (loss-of-flame test)	
12	#	Valve proving	
	0	Fuel valve 1 (V1) leaking (fuel valve 2 with valve proving via X5-01)	For valve proving via X5-01 (gas pressure switch-min) - Check to see if the valve on the burner side is leaking - Check to see if the pressure switch for the valve proving is closed when gas pressure is present - Check wiring to see if there is a short-circuit
	1	Fuel valve 2 (V2) leaking (fuel valve 1 with valve proving via X5-01)	For valve proving via X5-01 (gas pressure switch-min) - Check to see if the valve on the gas side is leaking - Check wiring to see if there is a short-circuit
	2	Valve proving not possible	Valve proving activated, but pressure switch-min selected as input function for X9-04 (check parameters 238 and 241)
	3	Valve proving not possible	Valve proving activated, but no input assigned (check parameters 236 and 237)
	4	Valve proving not possible	Valve proving activated, but 2 inputs assigned (set parameter 237 to pressure switch-max or POC)
	5	Valve proving not possible	Valve proving activated, but 2 inputs assigned (check parameters 236 and 237)
	81	V1 leaking	Check to see if the valve on the gas side is leaking Check wiring to see if there is an open-circuit
	83	V2 leaking	Check to see if the valve on the burner side is leaking Check to see if the pressure switch for the leakage test is closed when gas pressure is present Check wiring for short-circuit
14	#	POC	
	0	POC open	Check to see if the valve's closing contact is closed
	1	POC close	Check wiring Check to see if the valve's closing contact opens when valve is controlled
	64	POC open – prevention of startup	Check wiring to see if there is a line interruption. Check to see if the valve's closing contact is closed
19	80	Combustion pressure, POC – start prevention	Check to see if pressure switch has closed with no combustion pressure present Check wiring for short-circuit
20	#	Pressure switch-min (Pmin)	
	0	No minimum gas /oil pressure	Check wiring for line interruption
	1	Gas shortage – start prevention	Check wiring for line interruption
21	#	Pressure switch-max (Pmax) / POC	
	0	Pressure switch-max (Pmax): Max. gas / oil pressure exceeded POC: POC open (software version ≤ V02.00)	Check wiring to see if there is a line interruption. POC: Check to see if the valve's closing contact is closed.

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	1	POC close (software version ≤ V02.00)	Check wiring. Check to see if the valve's closing contact opens when the valve is controlled
	64	POC open – start prevention (software version ≤ V02.00)	Check wiring. Check whether valve's make contact opens when valve is controlled
22 OFF S	#	Safety loop / burner flange	
	0	Safety loop / burner flange open	
	1	Safety loop / burner flange open – start prevention	
	3	Safety loop/burner flange, extraneous light – start prevention	
	5	Safety loop/burner flange, air pressure – start prevention	
	17	Safety loop/burner flange, combustion pressure – start prevention	
	19	Safety loop/burner flange, extraneous light, combustion pressure – start prevention	
	21	Safety loop/burner flange, air pressure, combustion pressure – start prevention	
	23	Safety loop/burner flange, extraneous light, air pressure, combustion pressure – start prevention	
	65	Safety loop/burner flange, POC – start prevention	
	67	Safety loop/burner flange, extraneous light, POC – start prevention	
	69	Safety loop/burner flange, air pressure, POC – start prevention	
	71	Safety loop/burner flange, extraneous light, air pressure, POC – start prevention	
	81	Safety loop/burner flange, combustion pressure, POC – start prevention	
	83	Safety loop/burner flange, extraneous light, combustion pressure, POC – start prevention	
	85	Safety loop/burner flange, air pressure, combustion pressure, POC – start prevention	
	87	Safety loop/burner flange, extraneous light, air pressure, combustion pressure, POC – start prevention	
23	#	Gas pressure switch-min (Pmin) / heavy oil direct start	
	0	No minimum gas pressure	Check wiring to see if there is an open-circuit (X5-01)
	1	Gas shortage – start prevention	Check wiring to see if there is an open-circuit (X5-01)
	2	Heavy oil direct start	Check wiring to see if there is an open-circuit (X9-04) Check that the oil is preheated correctly
51	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
55	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
56	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
57	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
58	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
60	0	Internal error: No valid output source	Make a reset; if error occurs repeatedly, replace the unit
65	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
66	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
67	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
70	#	Error air-fuel ratio control: Position calculation modulating	
	23	Output invalid	No valid output
	26	Curvepoints undefined	Adjust the curvepoints for all actuators
71	#	Special position undefined	
	0	Home position	Parameterize the home position for all actuators used
	1	Prepurge position	Parameterize the prepurge position for all actuators used
	2	Postpurge position	Parameterize the postpurge position for all actuators used
	3	Ignition position	Parameterize the ignition position for all actuators used
72	#	Internal error air-fuel ratio control	Make a reset; if error occurs repeatedly, replace the unit
73	#	Internal error air-fuel ratio control: Position calculation multistep	
	23	Output invalid	No valid output
	26	Curvepoints undefined	Adjust the curvepoints for all actuators
75	#	Internal error air-fuel ratio control: Data clocking check	
	1	Current output different	
	2	Target output different	
	4	Target positions different	
	16	Different positions reached	Can be caused by different standardized speeds (e.g. after restore of data set) when the VSD is activated —> standardize again and check adjustment of the air-fuel ratio control system
76	#	Internal error air-fuel ratio control	Make a reset; if error occurs repeatedly, replace the unit

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
80	#	Control range limitation of VSD	Basic unit could not correct the difference in speed and reached a control range limit. 1. Basic unit is not standardized for this motor → repeat standardization.  Caution! Settings of air-fuel ratio control must be checked! 2. Ramp time settings of the VSD are not shorter than those of the basic unit (parameters 522, 523) or the setting for the modulating operating ramp is incorrect (parameter 544) 3. Characteristic of the VSD is not linear. Configuration of the voltage input at the VSD must accord with that of the basic unit (parameter 645). 4. VSD does not follow quickly enough the changes of the basic unit. Check settings of the VSD (input filter, slippage compensation, hiding different speeds)
	1	Control range limitation at the bottom	VSD speed was too high
	2	Control range limitation at the top	VSD speed was too low
81	1	Interrupt limitation speed input	Too much electromagnetic interference on the sensor line → improve EMC
82	#	Error during VSD's speed standardization	
	1	Timeout of standardization (VSD ramp down time too long)	Timeout at the end of standardization during ramp down of the VSD → ramp time settings of the VSD are not shorter than those of the basic unit (parameter: 523)
	2	Storage of standardized speed not successful	Error during storage of the standardized speed → lock the basic unit, then reset it and repeat the standardization
	3	Line interruption speed sensor	Basic unit receives no pulses from the speed sensor: 1. Motor does not turn. 2. Speed sensor is not connected. 3. Speed sensor is not activated by the sensor disk (check distance)
	4	Speed variation / VSD ramp up time too long / speed below minimum limit for standardization	Motor has not reached a stable speed after ramp up. 1. Ramp time settings of the VSD are not shorter than those of the basic unit (parameters 522, 523). 2. Characteristic of the VSD is not linear. Configuration of the voltage input at the VSD must accord with that of the basic unit (parameter 645). 3. VSD does not follow quickly enough the changes of the basic unit. Check settings of the VSD (input filter, slippage compensation, hiding different speeds) 4. Speed of VSD lies below the minimum for standardization (650 1/min)

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	5	Wrong direction of rotation	Motor's direction of rotation is wrong. 1. Motor turns indeed in the wrong direction → change parameterization of the direction of rotation or interchange 2 live conductors. 2. Sensor disk is fitted the wrong way → turn the sensor disk.
	6	Unplausible speed sensor signals	The required pulse pattern (60°, 120°, 180°) has not been correctly identified. 1. Speed sensor does not detect all tappets of the sensor disk → check distance 2. As the motor turns, other metal parts are detected also, in addition to the tappets → improve mounting. 3. Electromagnetic interference on the sensor lines → check cable routing, improve EMC
	7	Invalid standardized speed	The standardized speed measured does not lie in the permissible range → motor turns too slowly or too fast
	15	Speed deviation $\mu C1 + \mu C2$	The speeds of microcomputer 1 and 2 deviated too much. This can be caused by wrong standardized speeds (e.g. after restoring a data set to a new unit) → repeat standardization and check the air-fuel ratio
	20	Wrong phase of phase manager	Standardization was made in a wrong phase. Permitted are only phases ≤ 12 → controller OFF, start standardization again
	21	Safety loop / burner flange open	Safety loop or burner flange is open → repeat standardization with safety loop closed
	22	Air actuator not referenced	Air actuator has not been referenced or has lost its referencing. 1. Check if the reference position can be approached. 2. Check if actuators have been mixed up. 3. If error only occurs after the start of standardization, the actuator might be overloaded and cannot reach its destination.
	23	VSD deactivated	Standardization was started with VSD deactivated → activate the VSD and repeat standardization
	24	No valid operating mode	Standardization was started without valid operating mode → activate valid operating mode and repeat standardization
	25	Pneumatic air-fuel ratio control	Standardization was started with pneumatic air-fuel ratio control → standardization with pneumatic air-fuel ratio control not possible
	128	Running command with no preceding standardization	VSD is controlled but not standardized → make standardization
	255	No standardized speed available	Motor turns but is not standardized → make standardization
83	#	Speed error VSD	Required speed has not been reached
	Bit 0 Valency 1	Lower control range limitation	Speed has not been reached because control range limitation has become active → for measures, refer to error code 80

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	Bit 1 Valency 2...3	Upper control range limitation	Speed has not been reached because control range limitation has become active → for measures, refer to error code 80
	Bit 2 Valency 4...7	Interrupt shutdown due to electromagnetic interference	Speed has not been reached due to too much electromagnetic interference on the sensor line → for measures, refer to error code 81
	Bit 3 Valency ≥ 8	Curve too steep in terms of ramp speed	Check speed differential between the curvepoints and the modulating operating ramp setting (parameter 544). 1. Modulating operating ramp 32 seconds Curve slope max. 10% for LMV37.4 ramp of 20 seconds (20% for 10 seconds or 40% for 5 seconds) 2. Modulating operating ramp 48 seconds Curve slope max. 10% for LMV37.4 ramp of 30 seconds (20% for 15 seconds or 30% for 10 seconds) 3. Modulating operating ramp 64 seconds Curve slope max. 10% for LMV37.4 ramp of 40 seconds (20% for 20 seconds or 40% for 10 seconds) → Between the ignition point (P0) and the low-fire point (P1), the speed change in modulating mode may be a maximum of 40%, independent of the LMV3... ramp. 2. The setting of the VSD ramp must be about 20% faster than the ramps in the basic unit (parameters 522, 523).
	Bit 4 Valency ≥ 16	Interruption of speed signal	No speed detected in spite of control. 1. Check if the motor turns. 2. Check if the speed sensor delivers a signal (LED / check distance from the sensor disk). 3. Check wiring of the VSD.
	Bit 5 Valency ≥ 32	Quick shutdown due to excessive speed deviation	Speed deviation was for about 1 s >10% outside the anticipated range. 1. Check ramp times of the LMV37.4... and VSD. 2. Check wiring of the VSD.
84	Curve slope actuators		
	Bit 0 Valency 1	VSD: Curve too steep in terms of ramp speed	Check speed differential between the curvepoints and the modulating operating ramp setting (parameter 544). 1. Modulating operating ramp 32 seconds Curve slope max. 10% for LMV37.4 ramp of 20 seconds (20% for 10 seconds or 40% for 5 seconds) 2. Modulating operating ramp 48 seconds Curve slope max. 10% for LMV37.4 ramp of 30 seconds (20% for 15 seconds or 30% for 10 seconds) 3. Modulating operating ramp 64 seconds Curve slope max. 10% for LMV37.4 ramp of 40 seconds (20% for 20 seconds or 40% for 10 seconds) → Between the ignition point (P0) and the low-fire point (P1), the speed change in modulating mode may be a maximum of 40%, independent of the LMV3... ramp. 2. Setting of the VSD ramp must be about 20% shorter than the ramps in the basic unit (parameters 522 and 523)

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	Bit 1 Valency 2..3	Fuel actuator: Curve too steep in terms of ramp rate	Check position differential between the curvepoints and the modulating operating ramp setting (parameter 544). 1. Modulating operating ramp 32 seconds The slope of the curve may be a maximum position change of 31° (15° for SQM33.6 and 9° for SQM33.7) between 2 curve points in modulating mode. 2. Modulating operating ramp 64 seconds The slope of the curve may be a maximum position change of 62° (30° for SQM33.6 and 18° for SQM33.7) between 2 curve points in modulating mode.
	Bit 2 Valency 4..7	Air actuator: Curve too steep in terms of ramp rate	Check position differential between the curvepoints and the modulating operating ramp setting (parameter 544). 1. Modulating operating ramp 32 seconds The slope of the curve may be a maximum position change of 31° (15° for SQM33.6 and 9° for SQM33.7) between 2 curve points in modulating mode. 2. Modulating operating ramp 64 seconds The slope of the curve may be a maximum position change of 62° (30° for SQM33.6 and 18° for SQM33.7) between 2 curve points in modulating mode.
85	#	Referencing error ones actuators	
	0	Referencing error of fuel actuator	Referencing of fuel actuator not successful. Reference point could not be reached. 1. Check the setting of the actuator type (parameter 613.0 or 614) 2. Check to see if actuators have been mixed up 3. Check to see if actuator is locked or overloaded
	1	Referencing error of air actuator	Referencing of fuel actuator not successful Reference point could not be reached. 1. Check the setting of the actuator type (parameter 613.1) 2. Check to see if actuators have been mixed up 3. Check to see if actuator is locked or overloaded
	Bit 7 Valency ≥ 128	Referencing error due to parameter change	Parameterization of an actuator (e.g. the reference position) has been changed. To trigger new referencing, this error is set
86	#	Error fuel actuator	
	0	Position error	Target position could not be reached within the required tolerance band → check to see if actuator is locked or overloaded
	Bit 0 Valency 1	Line interruption	Line interruption detected at actuator's terminals → check wiring (voltage X54 across pin 5 or 6 and pin 2 >0.5 V)
	Bit 3 Valency ≥ 8	Curve too steep in terms of ramp rate	Check position differential between the curvepoints and the modulating operating ramp setting (parameter 544). 1. Modulating operating ramp 32 seconds The slope of the curve may be a maximum position change of 31° (15° for SQM33.6 and 9° for SQM33.7) between 2 curve points in modulating mode. 2. Modulating operating ramp 64 seconds The slope of the curve may be a maximum position change of 62° (30° for SQM33.6 and 18° for SQM33.7) between 2 curve points in modulating mode.

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	Bit 4 Valency ≥ 16	Step deviation in comparison with last referencing	Actuator was overloaded or mechanically twisted. 1. Check the setting of the actuator type (parameter 613.0 or 614) 2. Check to see if the actuator is blocked somewhere along its working range. 3. Check to see if the torque is sufficient for the application.
87	#	Error air actuator	
	0	Position error	Target position could not be reached within the required tolerance band → check to see if actuator is locked or overloaded
	Bit 0 Valency 1	Line interruption	Line interruption detected at actuator's terminals → check wiring (voltage X53 across pin 5 or 6 and pin 2 >0.5 V)
	Bit 3 Valency ≥ 8	Curve too steep in terms of ramp rate	Check position differential between the curvepoints and the modulating operating ramp setting (parameter 544). 1. Modulating operating ramp 32 seconds The slope of the curve may be a maximum position change of 31° (15° for SQM33.6 and 9° for SQM33.7) between 2 curve points in modulating mode. 2. Modulating operating ramp 64 seconds The slope of the curve may be a maximum position change of 62° (30° for SQM33.6 and 18° for SQM33.7) between 2 curve points in modulating mode.
	Bit 4 Valency ≥ 16	Sectional deviation in comparison with last referencing	Actuator was overloaded or mechanically twisted. 1. Check the setting of the actuator type (parameter 613.1) 2. Check to see if the actuator is blocked somewhere along its working range. 3. Check to see if the torque is sufficient for the application
90	#	Internal error basic unit	
91	#	Internal error basic unit	
93	#	Error flame signal acquisition	
	3	Short-circuit of sensor	Short-circuit at QRB... 1. Check wiring. 2. Flame detector possibly fault
95	#	Error relay supervision	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	External power supply active contact	Check wiring
96	#	Error relay supervision	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	Relay contacts have welded	Test the contacts: 1. Unit connected to power: Fan output must be dead. 2. Disconnect power: Disconnect fan. No resistive connection between fan output and neutral conductor allowed. If one of the 2 tests fails, release the unit since contact have definitively welded and safety can no longer be ensured.

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
97	#	Error relay supervision	
	0	Safety relay contacts have welded or external power supply fed to safety relay	Test the contacts: 1. Unit connected to power: Fan output must be dead. 2. Disconnect power: Disconnect fan. No resistive connection between fan output and neutral conductor allowed. If one of the 2 tests fails, release the unit since contacts have definitively welded and safety can no longer be ensured.
98	#	Error relay supervision	
	2 Safety valve 3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	Relay does not pull in	Make a reset; if error occurs repeatedly, replace the unit
99	#	Internal error relay control	Make a reset; if error occurs repeatedly, replace the unit
	3	Internal error relay control	Make a reset. If error occurs repeatedly, replace the unit Software version V03.10: If error C:99 D:3 occurs during standardization of the VSD, deactivate temporarily function Alarm in case of start prevention (parameter 210 = 0, when using a release contact) or interrupt the controller-ON signal
100	#	Internal error relay control	Make a reset; if error occurs repeatedly, replace the unit
105	#	Internal error contact sampling	
	0 Pressure switch min 1 Pressure switch max / POC 2 Pressure switch valve proving 3 Air pressure 4 Load controller open 5 Load controller on / off 6 Load controller close 7 Safety loop / Burner flange 8 Safety valve 9 Ignition transformer 10 Fuel valve 1 11 Fuel valve 2 12 Fuel valve 3 13 Reset	Stuck-At failure	Can be caused by capacitive loads or supply of DC voltage to the mains voltage inputs. The diagnostic code indicates the input where the problem occurred
106	#	Internal error contact request	Make a reset; if error occurs repeatedly, replace the unit

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
107	#	Internal error contact request	Make a reset; if error occurs repeatedly, replace the unit
108	#	Internal error contact request	Make a reset; if error occurs repeatedly, replace the unit
110	#	Internal error voltage monitor test	Make a reset; if error occurs repeatedly, replace the unit
111	#	Mains undervoltage	Mains voltage to low Conversion factor diagnostic code —> voltage value (AC 230 V: 1,683; AC 120 V: 0,843)
112	0	Mains voltage recovery	Error code for triggering a reset on power restoration (no error)
113	#	Internal error mains voltage supervision	Make a reset; if error occurs repeatedly, replace the unit
115	#	Internal error system counter	
116	0	Designed lifecycle exceeded (250,000 startups)	Warning threshold has been reached. The unit should be replaced
117	0	Life time exceeded Operation no longer allowed	Switch-off threshold has been reached
120	0	Interrupt limitation fuel counter input	Too many disturbance pulses at the fuel meters input —> Improve EMC
121	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
122	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
123	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
124	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
125	#	Internal error EEPROM read access	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
126	#	Internal error EEPROM write access	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
127	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
128	0	Internal error EEPROM access - synchronization during initialization	Make a reset; if error occurs repeatedly, replace the unit
129	#	Internal error EEPROM access – command synchronization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
130	#	Internal error EEPROM access - timeout	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
131	#	Internal error EEPROM access - page on abort	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
132	#	Internal error EEPROM register initialization	Make a reset; if error occurs repeatedly, replace the unit
133	#	Internal error EEPROM access – Request synchronization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
134	#	Internal error EEPROM access – Request synchronization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
135	#	Internal error EEPROM access – Request synchronization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
136	#	Restore	
	1	Restore started	Restore of a backup has been started (no error) New devices require resetting following restore!
		for further diagnostic codes for error code 136, refer to error code 137	For measures, refer to error code 137
137	#	Internal error – backup / restore	
	157 (-99)	Restore – ok, but backup < data set of current system	Restore successful, but backup data set is smaller than in the current system
	239 (-17)	Backup – storage of backup in AZL2... faulty	Make reset and repeat backup
	240 (-16)	Restore – no backup in AZL2...	No backup in AZL2...
	241 (-15)	Restore – interruption concerning unpassable ASN	The Backup has a unpassable ASN and may not restore of the unit
	242 (-14)	Backup – backup made is inconsistent	Backup is faulty and cannot be transferred back
	243 (-13)	Backup – data comparison between µCs faulty	Repeat reset and backup
	244 (-12)	Backup data are incompatible	Backup data are incompatible with the current software version, restore not possible
	245 (-11)	Access error to parameter Restore_Complete	Repeat reset and backup
	246 (-10)	Restore – timeout when storing in EEPROM	Repeat reset and backup
	247 (-9)	Data received are inconsistent	Backup data set invalid, restore not possible
	248 (-8)	Restore cannot at present be made	Repeat reset and backup
	249 (-7)	Restore – abortion due to unsuitable burner identification	Backup has an unsuitable burner identification and must not be transferred to the unit
	250 (-6)	Backup – CRC of one page is not correct	Backup data set invalid, restore not possible
	251 (-5)	Backup – burner identification is not defined	Define burner identification and repeat backup
	252 (-4)	After restore, pages still on ABORT	Repeat reset and backup
	253 (-3)	Restore cannot at present be made	Repeat reset and backup
	254 (-2)	Abortion due to transmission error	Repeat reset and backup
	255 (-1)	Abortion due to timeout during restore	Make a reset, check the connections and repeat the backup
146	#	Timeout building automation interface	Refer to User Documentation Modbus (A7541)
	1	Modbus timeout	
150	#	TÜV test	
	1 (-1)	Invalid phase	TÜV test may only be started in phase 60 (operation)

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
	2 (-2)	TÜV test default output too low	TÜV test default output must be lower than the lower output limit
	3 (-3)	TÜV test default output too high	TÜV test default output must be higher than the upper output limit
	4 (-4)	Manual abortion	No error: Manual abortion of TÜV test by the user
	5 (-5)	TÜV test timeout	No loss of flame after fuel valves have been shut 1. Check for extraneous light 2. Check wiring for short-circuit 3. Check to see if one of the valves is leaking
165	#	Internal error	
166	0	Internal error watchdog reset	
167	#	Manual locking	Unit has been manually locked (no error)
	1	Manual locking by contact	
	2	Manual locking by AZL2...	
	3	Manual locking by PC software	
	8	Manual locking by the AZL2... Timeout / communication breakdown	During a curve adjustment via the AZL2..., the timeout for menu operation has elapsed (setting via parameter 127), or communication between the LMV37.4... and the AZL2... has broken down
	9	Manual locking by the PC software Communication breakdown	During a curve adjustment via the ACS410, communication between the LMV37.4... and the ACS410 was interrupted for more than 30 seconds
	33	Manual locking after PC software reset attempt	PC software made a reset attempt although the system worked correctly
168	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
169	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
170	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
171	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
200 OFF	#	System error-free	No error
201 OFF UPr	#	Start prevention	Start prevention due to unparameterized unit Go to error history, entry 702, for initial cause of the error with shutdown in connection with the first curve settings
	Bit 0 Valency 1	No operating mode selected	
	Bit 1 Valency 2..3	No fuel train defined	
	Bit 2 Valency 4..7	No curves defined	
	Bit 3 Valency 8..15	Standardized speed undefined	
	Bit 4 Valency 16..31	Backup / restore was not possible	

Error code	Diagnostic code	Meaning for the LMV37.4... system	Remedy
202	#	Internal error operating mode selection	Redefine the operating mode (parameter 201)
203	#	Internal error	Redefine the operating mode (parameter 201). Make a reset; if error occurs repeatedly, replace the unit
204	Phase number	Program stop	Program stop is active (no error)
205	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
206	0	Inadmissible combination of units (basic unit - AZL2...)	
207	#	Version compatibility basic unit - AZL2...	
	0	Basic unit version too old	
	1	AZL2... version too old	
208	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
209	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
210	0	Selected operating mode is not released for the basic unit	
240	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
245	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
250	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit

13. Fault Location

13.1 Burner will not start

Symptom	Causes	Remedies
Motor starts	Unstable flame	Adjust the damper
Burner pre-ventilates	Excess air	Check the oil pressure
	Low oil pressure	Check the nozzle in relation to the combustion apparatus dimensions and the ignition electrode position
Flame formed	Incorrect combustion apparatus settings	Check the flame monitor is clean and can register light
Burner trips	Flame monitor does not register light	Check with using new photocell
	Defective flame monitor	Check using new oil burner control (Note: replacement of photocell recommended if oil burner control replaced)
Motor starts	Defective oil burner control	Check the oil supply to the burner and that there are no air bubbles in the pump
Burner pre-ventilates		Check function of solenoid
No flame formed	No oil	Check flame monitor does not register ambient light
Burner trips	False light	Check high voltage wiring and ignition electrodes
	No spark	Check preheater function
Motor does not start	Preheater does not get up to temperature.	

13.2 Burner will not start after normal use

Symptom	Causes	Remedies
Burner does not start	Fuse blown	Check and replace fuse as necessary. Investigate cause of fault
	Boiler thermostat has not reset	Adjust thermostat
	Preheater does not get up to temperature	Check preheater function
Burner pre-ventilates	Overheating protection has deployed	Reset the overheating protection. Investigate the cause of its deploying. Remedy fault
	Defective preheater	Check by replacing with new
	Defective oil burner control or flame monitor	Check that tank, oil lines, solenoid valves, pump and nozzle are in good condition
Burner stops	No oil supply	Adjust the burner
	Too great a pressure drop at brake plate	Correct the boiler draught
	Too strong draught prevents flame forming	Check the ignition transformer. Check the ignition electrode settings and ceramics
	No spark	Check preheater function
	Preheater temperature too low	Adjust the preheater's set operating temperature
	New oil type	Check that the oil used has the physical parameters that the burner is rated for. If not, change the oil.

13.3 Delayed ignition

Symptom	Causes	Remedies
Burner pulsates at start with hot flue gases	Excessively strong draught	Correct boiler draught
	Excessive pressure drop across the brake plate	Adjust the burner
	Preheater temperature too low	Check preheater function
	New oil type	Adjust the preheater's set operating temperature
		Ensure that the new oil's physical parameters are within the limits for which the burner is designed. If not, change the oil.
Burner pulsates at start	Nozzle partially blocked	Replace nozzle
	Oil pressure too low	Check and adjust
	Flue is blocked or damaged	Check and correct
	The fan wheel is slipping on the shaft	Check and tighten
	Pump coupling loose or worn	Replace
	Preheater blocked	Check the ignition electrode setting, (see technical data)
	Delayed ignition	Check that the ignition electrodes are not damaged
	Excessively strong draught	Check high voltage cables
		Check position of nozzle assembly setting
		Correct boiler draught
	Excessive pressure drop across the brake plate	Adjust the burner
	Preheater temperature too low	Check preheater function
	New oil type	Adjust the preheater's set operating temperature
		Ensure that the new oil's physical parameters are within the limits for which the burner is designed. If not, change the oil.

13.4 Noise in pump

Symptom	Causes	Remedies
The burner pump emits noise during start	Insufficient negative pressure on the suction side pump	Check the oil system in order to reduce pressure drop
The burner pump emits noise during operation		Rebuild the oil system to form a solution with a transport oil pump
		Check that the oil used has the physical parameters that the burner is rated for. If not, change the oil.
		Temperature of the oil from the tank is too low, increase the temperature of oil from tank
		Clean the pump filter

13.5 Pump pressure

Symptom	Causes	Remedies
The burner pump can not build up pressure	No oil	Check that there is oil and that it reaches the pump
	Oil viscosity too low	Check that the oil reaching the pump has the physical parameters that the pump can handle. Change the oil or the pump's oil parameters
	Pump worn	Replace the pump
	Pump run using impure oil that has worn the pump out prematurely	Replace pump and install self-cleaning filter in the oil system
	Blocked pump filter	Check, clean pump filter

14. Log of flue gas analysis

Owner	Adresss	Tel. no:
Installation		Tel. no:

Boiler

Type	Make	Power kW
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Bentone Burner

Type	Model	Serial no.	Fuel
------	-------	------------	------

	Step 1	Step 2	Step 3
Draught in fireplace			
Fan Press mbar			
Filter smoke number			
CO ₂			
O ₂			
NOx			
CO			
Flue gas temp. °C			
Setting brake disc			
Setting Air damper			
Pump pressure bar			
Nozzle			

Test performed / 20	Address
Test performed by:	Postal address
Company name:	Tel. no:

EU Declaration of conformity



Bentone Oil Burners

Type

BF 1	B 45	B 80
ST 146	B 55	
B 30	B 65	
B 40	B 70	

This declaration of conformity is issued under the sole responsibility of the manufacturer.

The object of the declaration described above is in conformity with:

Machinery Directive 2006/42/EC

EMC 2014/30/EU

Restriction of the use of certain hazardous substances (RoHS) Directive 2011/65/EU

References to the relevant harmonised standards used or references
to the other technical specifications in relation to which conformity is declared:

EN 267:2009+A1:2011 Fullfills the requirements of Annex J/K. Automatic forced draught burners for liquid fuels

Additional information can be downloaded at:

www.bentone.com

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Ljungby, January 26th 2021

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