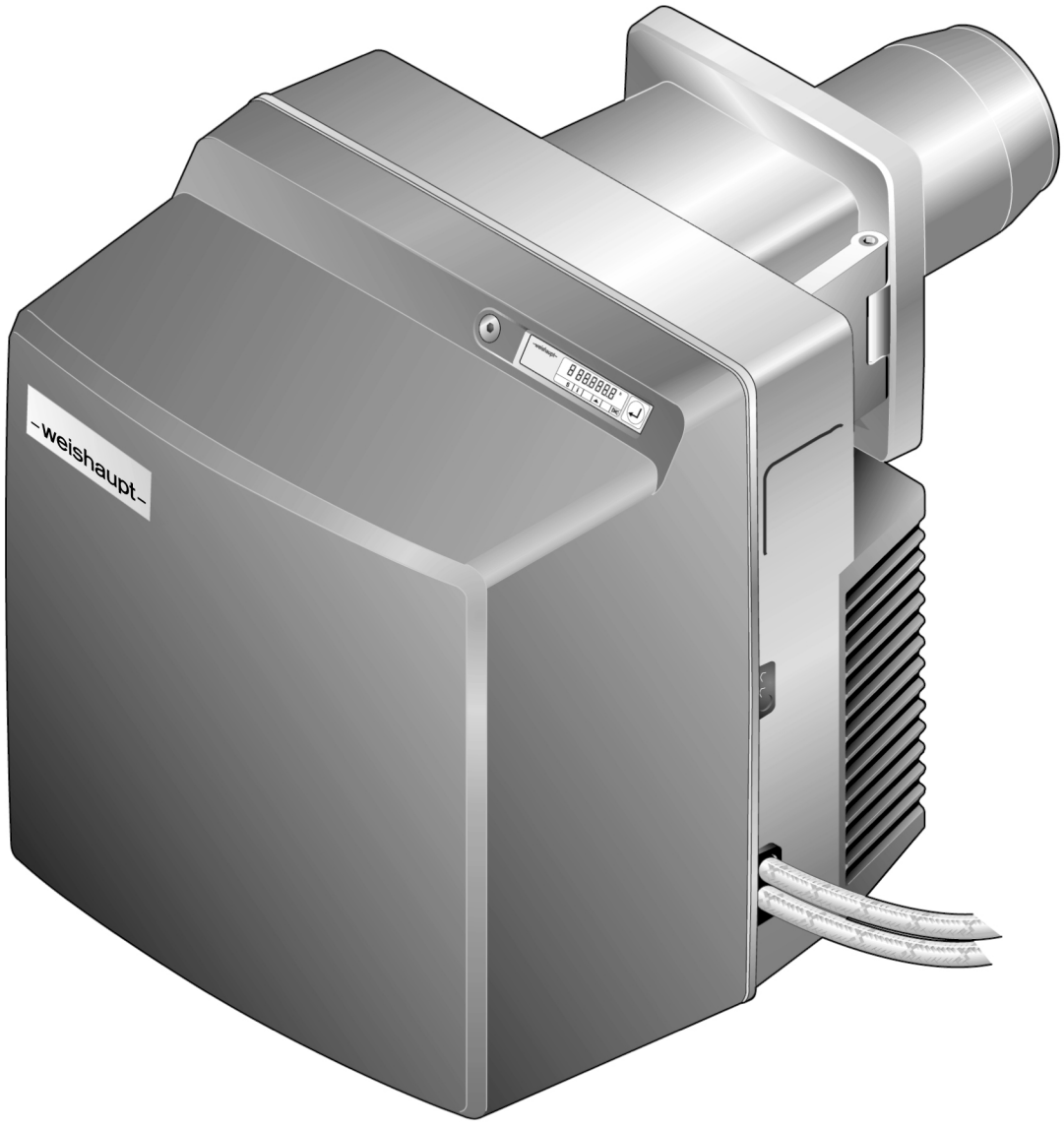
–weishaupt–

manual

Installation and operating instruction



Oil burner WL30/1-C Z-1LN-A

83325802 ▪ 1/2025-07

1 User instructions

This manual forms part of the equipment and must be kept on site.

Translation of original operating instructions

Carefully read the manual prior to working on the unit.

1.1 Target group

The manual is intended for the operator and qualified personnel. It should be observed by all personnel working with the unit.

Work on the unit must only be carried out by personnel who have had the relevant training and instruction.

Persons with limited physical, sensory or mental capabilities may only work on the unit if they are supervised or have been trained by an authorised person.

Children must not play with the unit.

1.2 Symbols in the manual

 **DANGER**	Danger with high risk. Non observance can lead to serious injury or death.
 **WARNING**	Danger with medium risk. Non observance can lead to serious injury or death.
 **CAUTION**	Danger with low risk. Non observance can cause injury to personnel.
 **NOTICE**	Non observance can cause damage to the equipment and environmental damage.
	Important information
▶	Requires direct action
✓	Result after an action
▪	Itemisation
…	Range of values or ellipsis
02	Replacement character for digits, e. g. language key for Print No.
`Display text`	Font for text that appears in the display

1.3 Guarantee and Liability

Guarantee and liability claims for personal and equipment damage are excluded, if they can be attributed to one or more of the following causes:

- non approved application
- non-observance of the manual
- operation with faulty safety equipment
- continual operation despite a fault
- improper installation, commissioning, operation and service
- repairs, which have been carried out incorrectly
- the use of non original Weishaupt parts
- force majeure
- unauthorised modifications made to the unit
- the installation of additional components, which have not been tested with the unit
- the installation of combustion chamber inserts, which impede full flame formation
- unsuitable fuels
- defects in the inlet lines

2 Safety

2.1 Designated application

The burner is suitable for operation on heat exchangers to EN 303 and combustion chambers to EN 267.

If the burner is not used on combustion chambers to EN 303 and EN 267, a safety assessment of combustion and flame stability during individual process conditions, as well as the shutdown limits of the combustion plant has to be carried out and documented.

The Technical data must be adhered to [ch. 3.4].

The combustion air must be free from aggressive compounds (e. g. Halogens).
If the combustion air is contaminated, increased cleaning and servicing will be required. In this case ducted air intake is recommended.

The burner should preferably be operated indoors.
If the burner is not operated indoors, weather protection is required to protect from rain and direct sunlight. The ambient conditions must be adhered to [ch. 3.4.3].

Improper use could:
- endanger the health and safety of the user or third parties
- cause damage to the unit or other material assets

2.2 Safety symbols on the device

Symbol	Description	Position
	Warning of electrical voltage	Frequency convertor(1
		Burner housing
	Dangerous electric voltage	Ignition unit

(1 Only for version frequency convertor mounted.

2.3 Safety measures

Safety relevant fault conditions must be eliminated immediately.

Components, which show increased wear and tear or whose design lifespan is or will be exceeded prior to the next service should be replaced as a precaution.

The design lifespan of the components is listed in the service plan [ch. 9.2].

2.3.1 Personal protective equipment (PPE)

Use the necessary personal protective equipment for all work.

Personal protective equipment protects the user when working on the device.

Safety shoes must be worn during all work carried out on the device.

Further necessary PPE is shown in the respective section by a mandatory symbol.

Symbol	Description	Information
	Use hand protection	▶ Wear suitable protective gloves.

2.3.2 Normal operation

- All labels on the unit must be kept in a legible condition and replace if necessary.
- Stipulated settings, service and inspection work should be carried out at regular intervals.
- Only operate the unit with its cover closed.
- Ensure combustion air supply is unimpeded.

2.3.3 Electrical work

When working on live components please ensure you:
- observe the accident prevention instructions (e. g. DGUV Regulation 3) and adhere to local directives
- use tools in accordance with EN IEC 60900

The device contains components, which could be damaged by electrostatic discharge (ESD).
When working on circuit boards and contacts:
- do not touch circuit boards or contacts
- if necessary, take ESD protective measures

2.4 Alterations to the construction of the equipment

All conversions require written approval from Max Weishaupt SE.

- No additional components may be fitted, which have not been tested for use with the equipment.
- Do not use combustion chamber inserts, which hinder flame burnout.
- Use only original Weishaupt replacement parts.

2.5 Noise emission

The noise emissions are determined by the acoustic behaviour of all components fitted to the combustion system.

Prolonged exposure to high noise levels can lead to loss of hearing. Provide operating personnel with protective equipment.

Noise emissions can further be reduced with a sound attenuator.

2.6 Disposal

Dispose of all materials and components in a safe and environmentally friendly way at an authorised location. Observe local regulations.

3 Product description

3.1 Type key

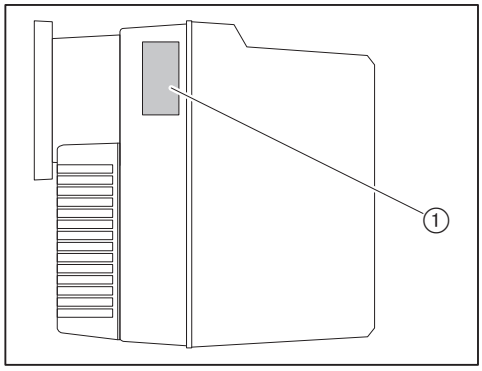
WL30/1-C Z-1LN-A

Type	
W	Series: Compact burner
L	Fuel: Oil EL
30	Size
1	Ratings size
C	Construction stage

Version	
Z	Type of control: two stage
1LN	Mixing head: LowNO_x
A	Mixing head version

3.2 Type and serial number

The type and serial number on the type plate clearly identify the product. They are required by Weishaupt's customer service department.



① Name plate

Mod.: _____	**Ser. Nr.:** _____

3.3 Function

3.3.1 Air supply

Air damper

The air damper regulates the air quantity required for combustion. The combustion manager drives the air damper via actuator. At burner shutdown the air damper closes automatically. This reduces heat loss in the heat exchanger.

Fan wheel

The fan wheel supplies the air from the air intake housing to the combustion head.

Diffuser

The air gap between flame tube and diffuser is adjusted by positioning the diffuser. This adjusts the mixing pressure and the air quantity required for combustion.

Air pressure switch (optional)

Depending on the burner application, optional equipment may be required for optimum operation [ch. 12.3].

The air pressure switch monitors the fan pressure. If the fan pressure is insufficient, the combustion manager initiates a lockout.

3.3.2 Oil supply

Oil pump

The pump draws the oil through the supply line and carries it under pressure to the oil nozzle. The pressure regulating valve keeps the oil pressure constant.

Solenoid valves

The solenoid valves open and close the oil supply.

For ignition, the combustion manager opens stage 1 solenoid valve. Stage 2 solenoid valve opens or closes depending on heat demand.

Minimum oil pressure switch

Depending on the burner application, optional equipment may be required for optimum operation [ch. 12.3].

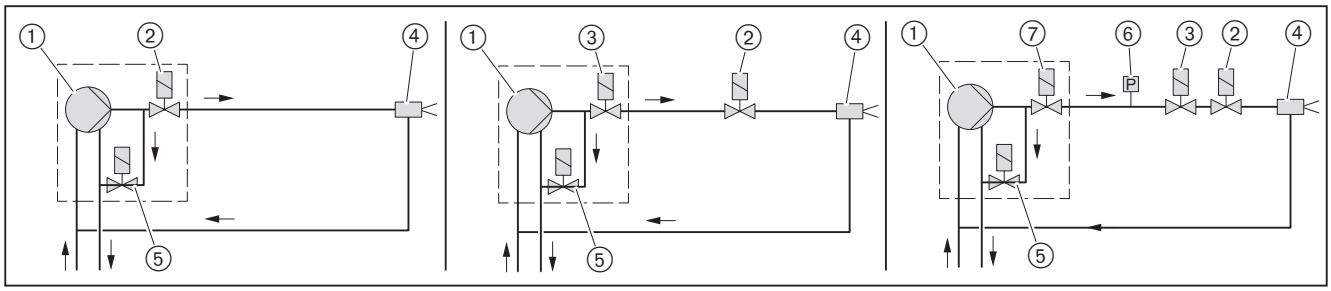
The minimum oil pressure switch monitors the pump pressure in the supply. If the preset pressure is not achieved, the combustion manager initiates a lockout.

Nozzle head with nozzle shut off

The nozzle shut off is integrated in the nozzle head. It prevents oil leaks after shutdown.

Sequence diagram

Standard	Continuous operation	PED (Pressure Equipment Directive)



① Oil pump on burner
② Stage 1 solenoid valve(1
③ Additional safety solenoid valve(1
④ Nozzle head with nozzle shut-off and nozzle
⑤ Stage 2 solenoid valve(2
⑥ Minimum oil pressure switch
⑦ Solenoid valve on the oil pump(1

(1 normally closed
(2 normally open

3.3.3 Electrical components

Combustion Manager

The combustion manager W-FM is the control unit of the burner.

It controls the sequence of operation and monitors the flame.

Operating panel

The values and parameters of the combustion manager can be displayed and changed at the operating panel.

Burner motor

The burner motor drives the fan wheel and the oil pump.

With variable speed drive, a frequency convertor is connected in series.

Ignition unit

The electronic ignition unit creates a spark at the electrode, which ignites the fuel/air mixture.

Flame sensor

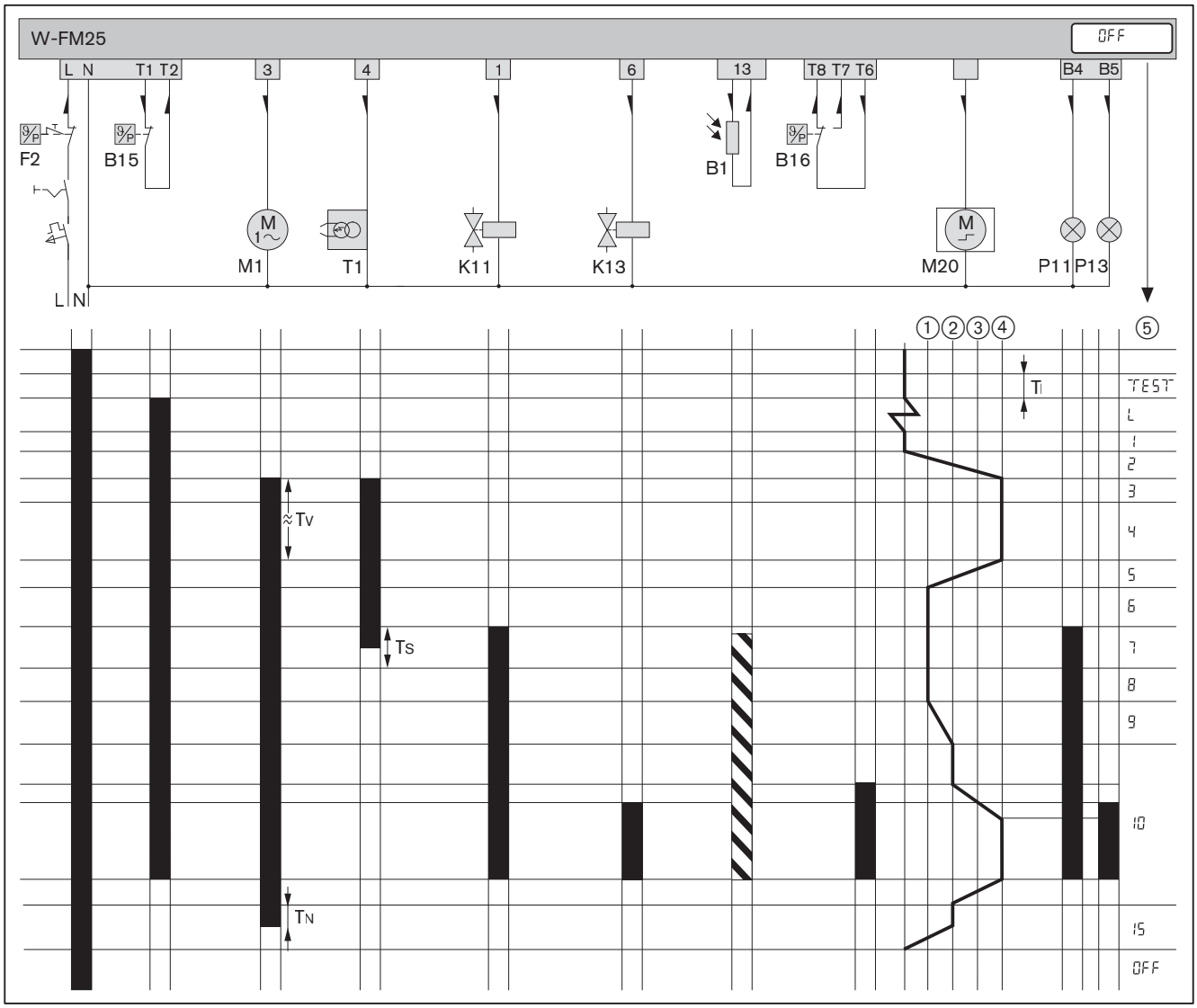
The combustion manager monitors the flame signal via the flame sensor.

If the flame signal becomes too weak, the combustion manager carries out a controlled shutdown.

3.3.4 Program sequence

The operating phases for commissioning the burner are shown on the display.

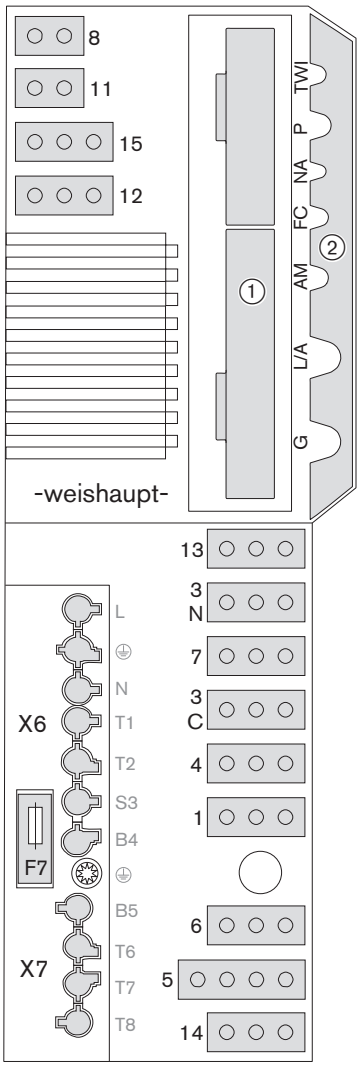
Phase	Function
TEST	After the power supply has been switched on the combustion manager performs a self-test.
L	At heat demand, the air damper actuator drives to the reference point.
1	The combustion manager monitors for extraneous light.
2	The air damper actuator drives to pre-purge, to air damper setting stage 2 (operating point P9).
3	Ignition and pre-purge is initiated.
4	Pre-purge. The remaining pre-purge time is displayed.
5	The air damper actuator drives to ignition position (operating point P0).
6	Waiting time in ignition position.
7	Stage 1 solenoid opens. The fuel is released. The safety time begins. The display shows symbol ⌲.
8	Stabilisation time
9	The air damper actuator drives to air damper setting stage 1 (operating point P1).
10	The burner is in operation. Depending on the regulator demand for stage 2, the stage 2 solenoid valve opens or closes.
15	If there is no longer a heat demand, the solenoid valves close and stop the fuel supply. Following the post-purge phase the burner motor switches off. The air damper actuator closes.
OFF	Standby, no heat demand.



B1	Flame sensor	①	Operating point P0 (ignition position)
B15	Temperature or pressure regulator	②	Operating point P1 (stage 1)
B16	Temperature or pressure regulator stage 2	③	Operating point P2 (solenoid valve stage 2)
F2	Temperature or pressure limiter	④	Operating point P9 (stage 2)
K11	Stage 1 solenoid valve	⑤	Operating phase
K13	Stage 2 solenoid valve	T_I	Initialisation time (Test): 3 s
M1	Burner motor	T_N	Post-purge time: 2 [ch. 6.2.3]
M20	Air damper actuator	T_S	Safety time: 3 s
P11	Control lamp operation (optional)	T_V	Pre-purge time: 20 s
P13	Control lamp stage 2 (optional)		Voltage is applied
T1	Ignition unit		Flame signal present
			Current path

3.3.5 Inputs and outputs

Observe wiring diagram supplied.



TWI	TWI interface (VisionBox, accessory)
P	O_2 sensor (accessory)
NA	Speed signal (Namur)
FC	Frequency convertor
AM	Operating panel
L/A	Air damper actuator
G	Coded plug (black)
①	Slot analogue module EM3/3 or Fieldbus module EM3/2
②	W-FM cover
1	Stage 1 solenoid valve (K11)
3C	Burner motor or frequency convertor for continuous running fan / voltage supply flame sensor LFS1 (continuous operation)
3N	Burner motor or frequency convertor
4	Ignition unit
5	Not used
6	Stage 2 solenoid valve (K13)
7	Bridging plug No. 7
8	Oil meter (impulse generator)
11	Air pressure switch
12	Oil pressure switch
13	Flame sensor QRB4
14	Remote reset or switch contact flame sensor LFS1 (continuous operation)
15	Air pressure switch for ducted air intake (APS2)
X6	7 pole connection plug
X7	4 pole connection plug
F7	Internal unit fuse (T6.3H, IEC 127-2/5)

3.4 Technical data

3.4.1 Approval data

DIN CERTCO	5G912
Basic standards	EN 267:2020 Additional standards, see EU Declaration of Conformity.

3.4.2 Electrical data

Mains voltage / Mains frequency	230 V/50 Hz
Consumption at start	max 692 W
Consumption during operation	max 592 W
Power consumption	max 3.1 A
Internal unit fuse	T6.3H, IEC 127-2/5
External fuse	max 16 A type B

3.4.3 Ambient conditions

Temperature in operation	–10(1 … +40 °C(2
Temperature during transport/storage	–20 … +70 °C
relative humidity	max 80 %, no dew point
Installation elevation	max 2000 m(3

(1 with the relevant suitable fuel oil and layout of oil supply.
(2 +50 °C with motor W-PM…
(3 Consultation with Weishaupt is required for higher installation elevation.

3.4.4 Permissible fuels

- Fuel oil EL to DIN 51603-1
- Fuel oil EL to ÖNORM-C1109 (Austria)
- Fuel oil EL to SN 181 160-2 (Switzerland)
- Green Fuels, see supplementary manual (Print No. 835910xx)

3.4.5 Emissions

Flue gas

In accordance with EN 267, the burner meets the requirements of emission class 3.

The NO_x values are influenced by:
- combustion chamber dimensions
- flue gas system
- Fuel
- combustion air (temperature and humidity)
- medium temperature
- Excess air

Combustion chamber dimensions, see Weishaupt Partner Portal (Documents and Applications → Online Applications → NO_X calculation for burner).

Sound levels

Dyad noise emission values	
Measured sound power level L_{WA} (re 1 pW)	76 dB(A)(1
Uncertainty value K_{WA}	4 dB(A)
Measured sound pressure level L_{pA} (re 20 µPa)	71 dB(A)(2
Uncertainty value K_{pA}	4 dB(A)

(1 Determined to ISO 9614-2.
(2 Determined at 1 metre distance from the front of the burner.
The measured noise levels plus uncertainty values form the upper limit value, which could occur when measuring.

3.4.6 Rating

Combustion heat rating

Combustion heat rating	72 … 300 kW 6.1 … 25.2 kg/h(1

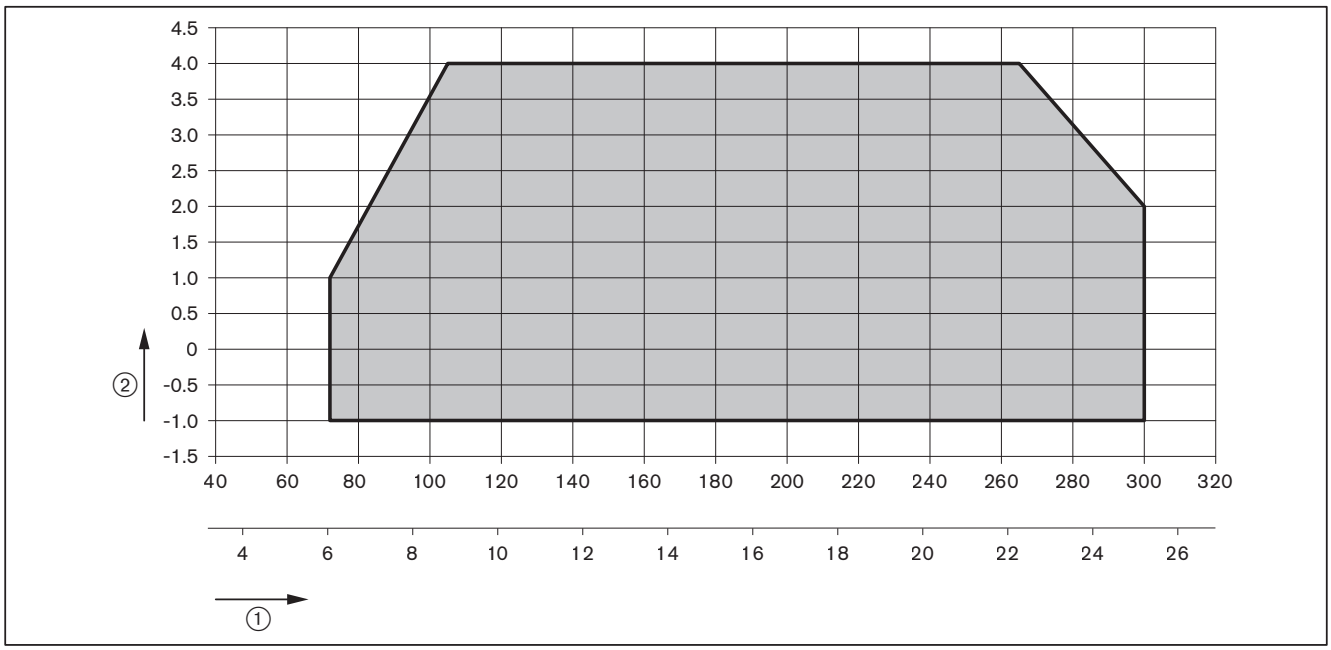
(1 The oil throughput data relates to a calorific value of 11.9 kWh/kg for fuel oil EL.

Capacity graph

Capacity graph to EN 267.

The capacity data given relates to an installation elevation of 500 m above sea level. For installation elevations above 500 m a capacity reduction of approx. 1 % per 100 m applies.

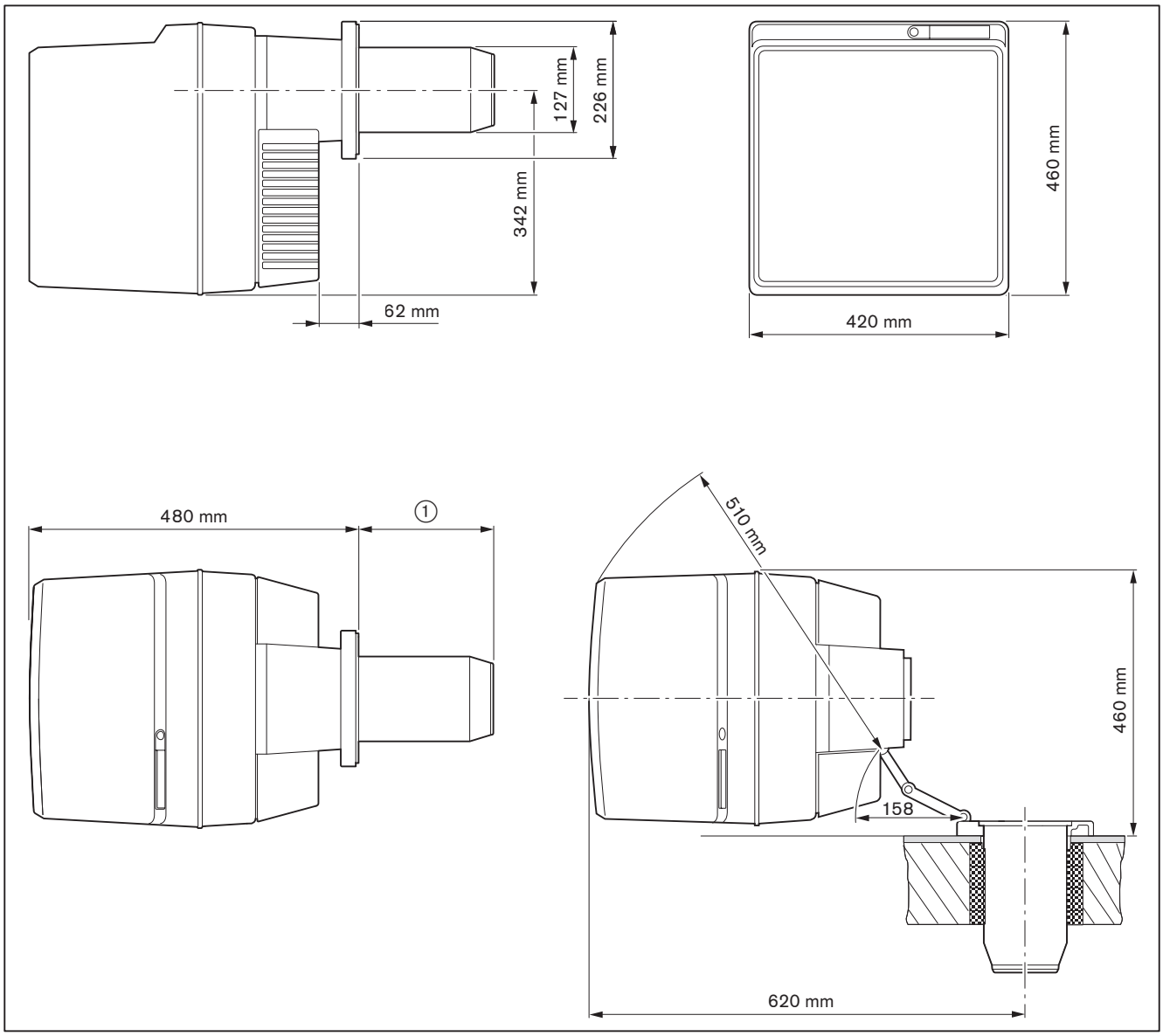
A limited capacity graph is valid for ducted air intake.



① Combustion heat rating [kW] or [kg/h]
② Combustion chamber pressure [mbar]

3.4.7 Dimensions

Burner



① 167 mm without combustion head extension
267 mm with combustion head extension (100 mm)
367 mm with combustion head extension (200 mm)

3.4.8 Weight

approx. 28 kg

4 Installation

4.1 Installation requirements

Burner type and capacity graph

Burner and heat exchanger must be matched.

► Check burner type and burner capacity.

Installation location

► Prior to installation ensure that:
- sufficient space is available for normal and service position [ch. 3.4.7]
- sufficient combustion air is available and, if necessary, a ducted air intake is installed

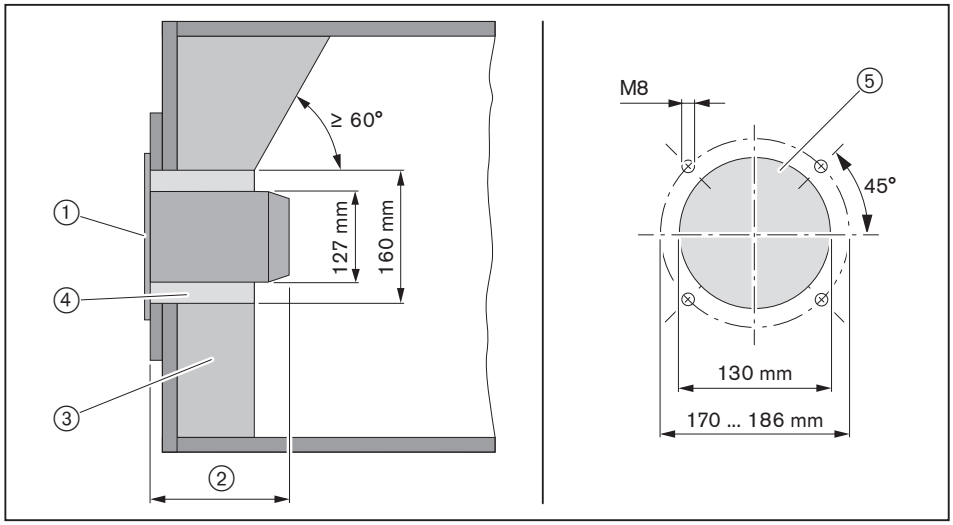
Prepare heat exchanger

The refractory ③ must not protrude beyond the front edge of the combustion head. The refractory can take a conical shape (min 60°).

Refractory may not be required on boilers with water-cooled front, unless the manufacturer gives other instructions.

Following installation, the aperture ④ between flame tube and refractory should be filled with flame-proof, resilient insulating material. Do not make solid.

Heat exchanger constructions with deep refractories or thick doors require a combustion head extension. Head extensions of 100 and 200 mm are available. Dimension ② than changes according to the head extension used.



① Flange gasket
② 167 mm
③ Refractory
④ Aperture
⑤ Boiler plate recess

4.2 Selecting a nozzle

► Determine nozzle size.

Load distribution

The load distribution of the burner is made via a pressure change-over on the oil pump.

Generally, stage 1 takes on approx. 65 % of the maximum oil throughput, a different distribution may be necessary.

Example

Burner capacity required: approx. 230 kW

65 % of burner capacity required: 230 kW × 0.65 = 150 KW

Nozzle size 3.50 gph, see nozzle selection table:
- Stage 1: 9 bar (149 kW)
- Stage 2: 22 bar (234 kW)

Recommended nozzles

Make	Characteristics
Fluidics	45°HF
Fluidics	60°HF(1

(1 Alternative for short combustion chambers or if the flame is unstable.

Pump pressure setting

Stage 1	Stage 2
9 … **11** … 12 bar	17 … **20** … 22 bar

Spray characteristic and spray angle varies depending on pump pressure.

Nozzle selection table

Different load values are possible due to tolerances.

Stage 1	Burner capacity [kW] at pump pressure			
Nozzle size [gph]	**9 bar**	**10 bar**	**11 bar**	**12 bar**
1.65	70	75	79	82
1.75	75	79	83	87
2.00	86	90	95	99
2.25	96	101	107	112
2.50	107	113	119	124
2.75	117	124	131	136
3.00	127	136	143	149
3.50	149	158	165	174
4.00	171	181	189	199
4.50	192	204	213	223
5.00	213	226	237	248

Stage 2	Burner capacity [kW] at pump pressure			
Nozzle size [gph]	**17 bar**	**18 bar**	**20 bar**	**22 bar**
1.65	97	100	106	111
1.75	103	106	112	118
2.00	117	121	129	135
2.25	132	136	144	151
2.50	146	151	160	169
2.75	162	166	175	183
3.00	176	181	192	201
3.50	206	211	224	234
4.00	235	241	256	267
4.50	264	271	287	301
5.00	293	301	–	–

Conversion of burner capacity to oil throughput see formula below.

$$\text{Oil throughput in kg/h} = \frac{\text{Burner capacity in kW}}{\text{11.9 kWh/kg}}$$

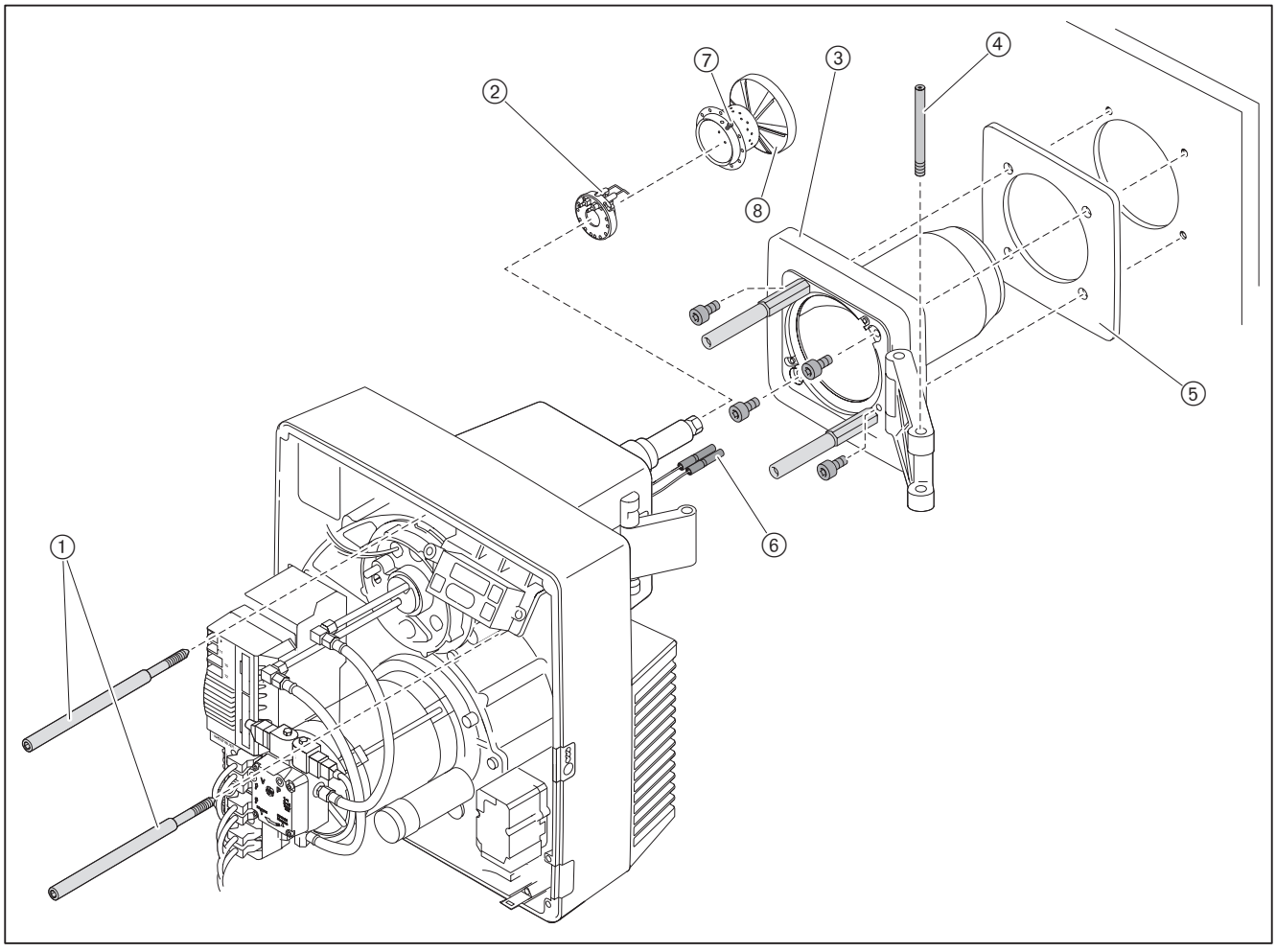
4.3 Burner installation

Observe health and safety regulations for lifting and carrying loads [ch. 3.4.8].

- ▶ Remove screws ①.
- ▶ Remove pin ④.
- ▶ Remove burner flange ③ from burner housing.

It is possible to install the burner rotated by 180° if space is limited. This requires conversion measures [ch. 4.3.1].

- ▶ Fit flange gasket ⑤ and burner flange ③ to the boiler using screws.
- ▶ The aperture between flame tube and refractory should be filled with flame-proof, resilient insulating material. Do not make solid.
- ▶ Unplug ignition cables ⑥.
- ▶ Remove screw ⑦ and remove diffuser ⑧.
- ▶ Undo screw ② and remove ignition electrode holder.
- ▶ Fit nozzle [ch. 9.4].
- ▶ Re-fit diffuser and ignition cables.
- ▶ Set ignition electrodes [ch. 9.6]
- ▶ Check nozzle distance and adjust if necessary [ch. 9.8].
- ▶ Push burner on to the stay bolts of the burner flange.
- ▶ Re-fit pin ④.
- ▶ Hinge burner closed and secure with screws ①.

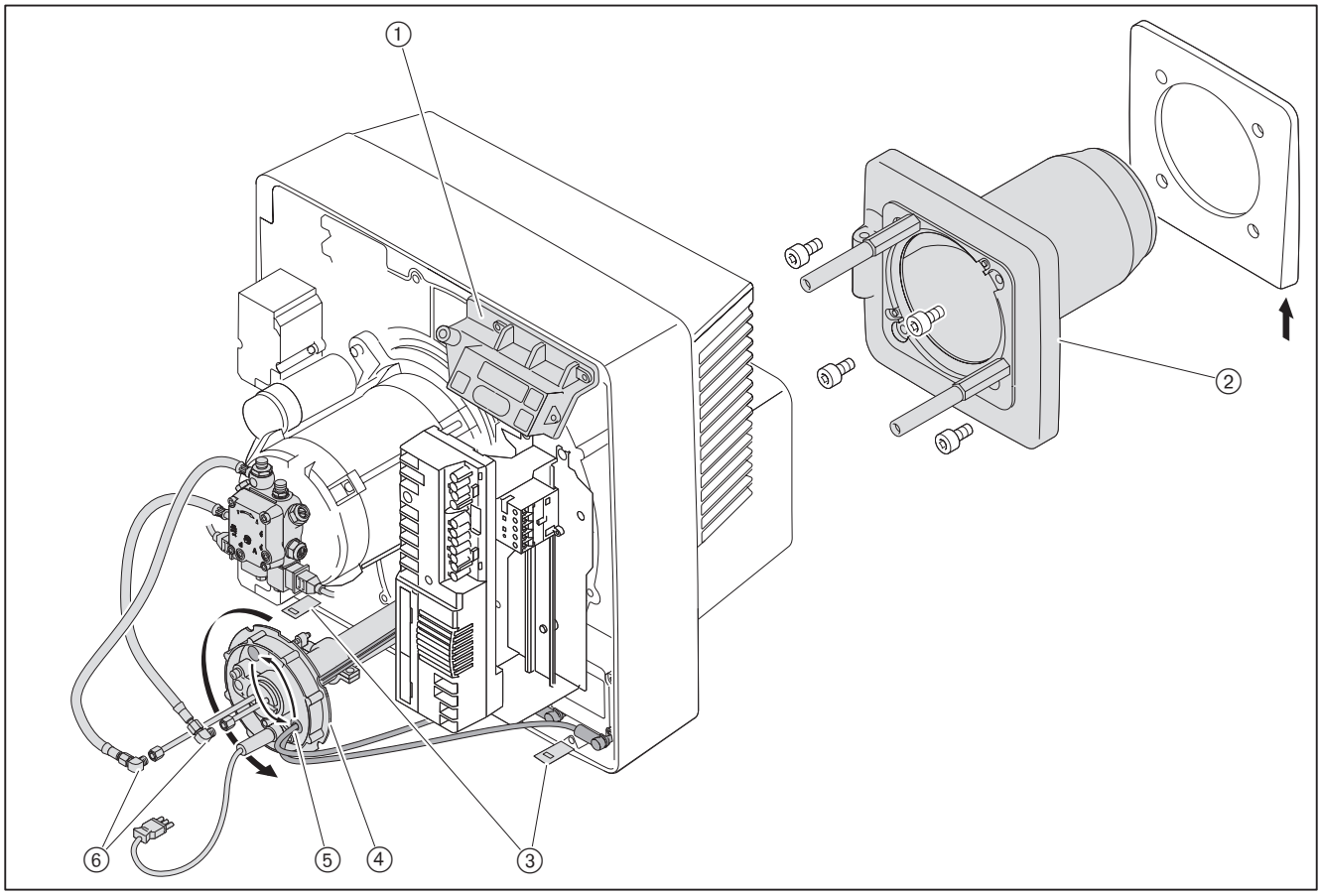


4.3.1 Rotate burner by 180° (optional)

- ► Mount operating panel ① on the opposite side of the housing.
- ► Mount fixing bracket ③ on the opposite side of the housing.
- ► Remove pressure hoses ⑥.
- ► Remove mixing head ④, see [ch. 9.7].
- ► Remove ignition cable ⑤ including grommet and guide it through the cable grommet opposite on the cover.
- ► Close open cable grommet with shut off grommet.
- ► Fit mixing head rotated by 180°.
- ► Connect pressure hoses ensuring correct allocation.

Wedge profile flange gasket required (Order No. 240 310 00 047).

- ► Rotate burner flange ② 180° and mount with flange gasket.



- ► Rotate burner by 180° and install [ch. 4.3].

5 Installation

5.1 Oil supply

The oil supply may only be installed by qualified personnel.

EN 12514-2, DIN 4755, Tyrol, work sheet DWA-A 791 (TRwS 791) and observe the local regulations.

Check conditions for oil pump

Suction resistance	max 0.4 bar(1
Flow pressure	max 2 bar(1
Flow temperature	max 60 °C(1

(1 Measured at the pump.

Check conditions for oil hoses

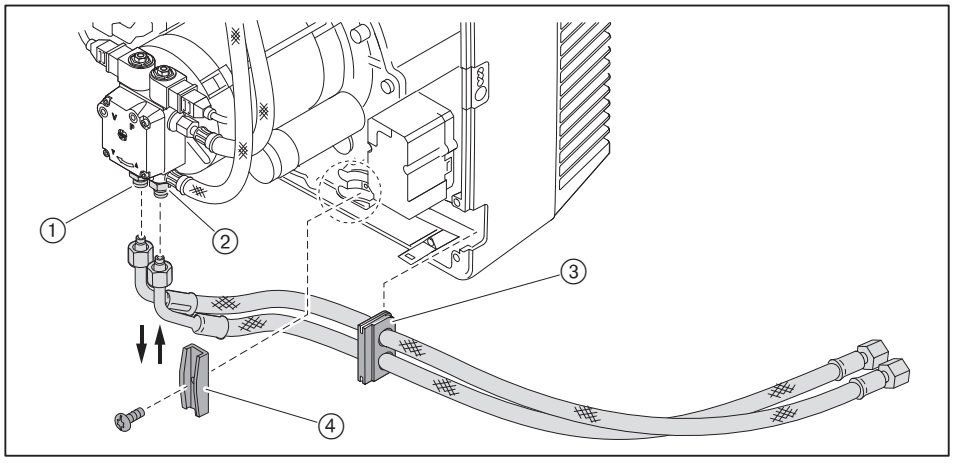
Length	1200 mm
Oil hose connection	G⅜
Nominal pressure	10 bar
Thermal load	max 100 °C

Connect oil supply

NOTICE

Damage to the oil pump due to incorrect connection
Mixing up supply and return can damage the oil pump.
► Ensure correct connection of oil hoses to the supply and return of the pump.

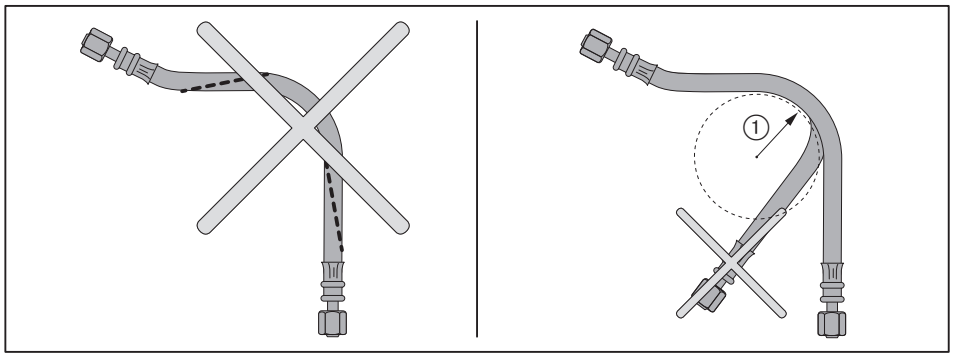
► Fit oil hoses with bracket ④ and grommet ③ to burner.



① Return
② Flow

► Connect oil supply and observe:
- do not twist oil hoses
- avoid mechanical tension
- consider length of hose required for the service position
- do not kink oil hoses (curve radius ① of 75 mm must be maintained)

If these conditions for connection can not be met:
► adapt oil supply on site.



Purge oil supply and ensure it is tight

NOTICE

Oil pump seized due to running dry
Pump could be damaged.
► Fill oil supply with oil and purge.

► Ensure oil supply is tight.

5.2 Electrical connection

WARNING

Risk of electric shock
Working on the device when voltage is applied can lead to electric shock.
► Isolate the device from the power supply prior to starting any work.
► Safeguard against accidental restart.

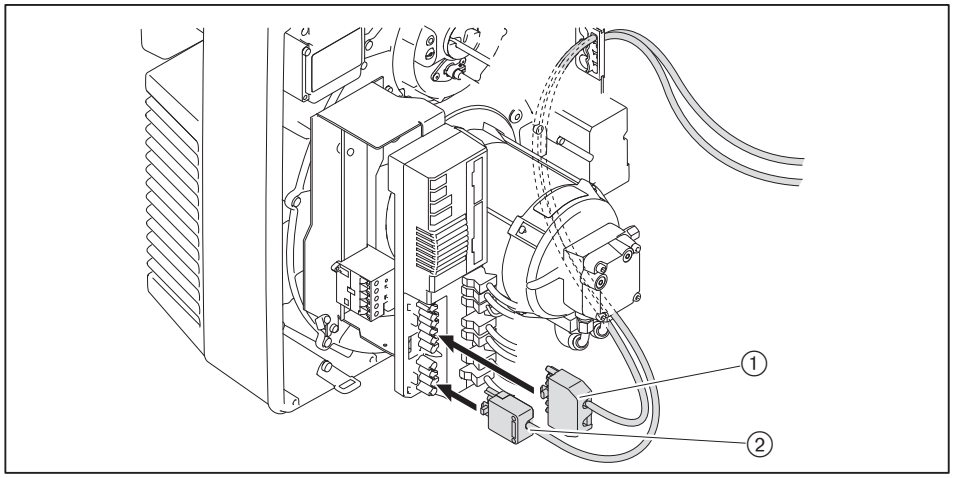
WARNING

Electric shock caused by frequency convertor
It is possible that electrical components continue to carry voltage and cause electric shock even after the voltage supply has been disconnected.
► Wait approx. 5 minutes before commencing work.
✓ Electric voltage has dissipated.

The electrical connection must only be carried out by qualified electricians.
Observe local regulations.

Observe wiring diagram supplied.

► Check polarity and wiring of 7 pole connection plug ① and 4 pole connection plug ②.
► Plug in connection plugs.

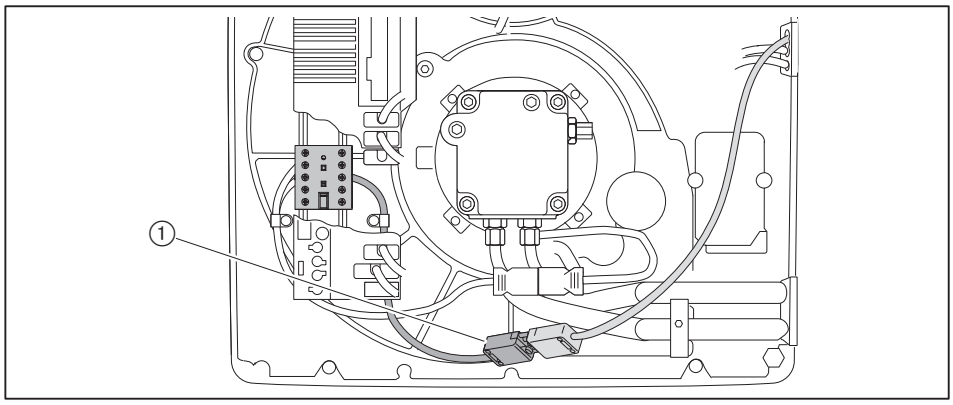


With remote reset, do not exceed maximum cable length of 50 metres.

Separate supply line for burner motor (not with variable speed drive)

Observe wiring diagram supplied.

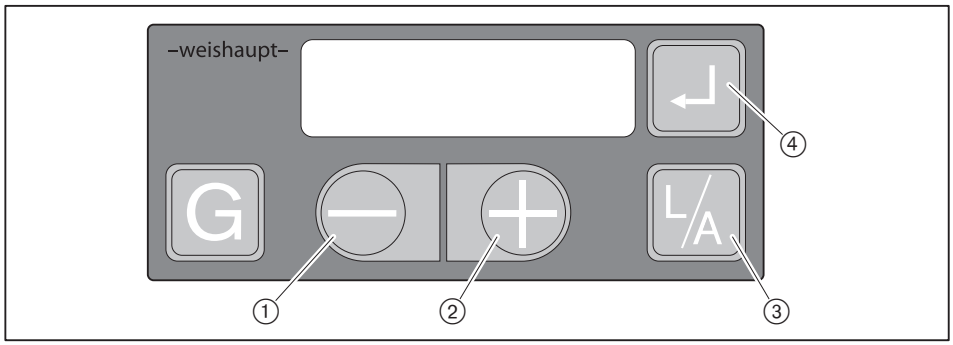
► Plug supply line for burner motor into connection plug ① of the contactor.



External fuse of separate supply line:
- min 10 AT
- max 16 AT

6 Operation

6.1 Operating panel



①	[–]	Change values
②	[+]	
③	[L/A] Air	Select air damper actuator
④	[Enter]	▪ Reset burner ▪ Call up information: - press for approx. 0.5 seconds: Info level - press for approx. 2 seconds: Service level
② and ④	[+] and [ENTER]	press simultaneously for approx. 2 seconds: Parameter level (only possible with display `OFF`)
③ and ④	[L/A] and [Enter]	press simultaneously: select fan speed (only in conjunction with variable speed drive)

Various actions are only triggered when the key is released, for example changing the display, reset.

OFF function

► Press [ENTER], [L/A] and [G] keys simultaneously.
✓ Immediate lockout with error `18h`.

Operating level

The current air damper setting and/or the fan speed can be displayed in the operating level (`10`).

Displaying air damper setting:
► Press key [L/A].

Displaying fan speed:
(only in conjunction with variable speed drive)
► Press [Enter] and [L/A] simultaneously.

Flame signal

The flame signal can be displayed during commissioning (setting level) by using a combination of keys.

► Press [Enter], [L/A] and [G] keys simultaneously.
✓ The flame signal is displayed.

Recommended flame signal, see Service level information `19` [ch. 6.2.2].

Operating status

The exact operating status of the combustion manager can also be displayed. This simplifies determining the cause of a fault during troubleshooting [ch. 11.1].

► Press and hold [–] and [+] simultaneously for approx. 3 seconds.
✓ The combustion manager changes to operating display. The display shows current operating status with a number.

Back to standard display:
► Press and hold [–] and [+] simultaneously for approx. 3 seconds.

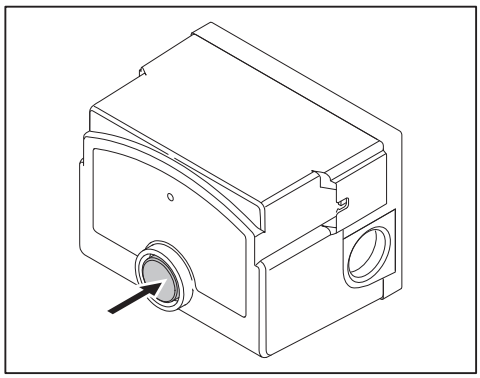
VisionBox Software (optional)

If the VisionBox Software is connected, change-over to the access level must be confirmed via the operating panel.

► Press [+].
✓ Software changes to the access level.

Flame sensor LFS1 (optional)

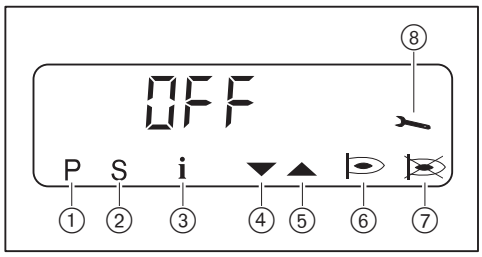
Only in conjunction with continuous operation.



Illuminated push button	Operating condition
yellow	Standby
Green	Flame signal OK
Flashing green	Flame signal too weak (< 10 µA) [ch. 10.3]
red	Lockout

6.2 Display

The display shows the current operating status and operating data.



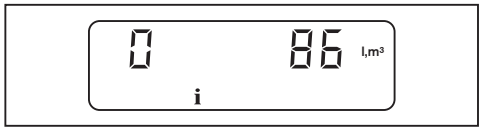
① Setting level activated
② Start phase activated
③ Info level activated
④ Actuator runs CLOSED
⑤ Actuator runs OPEN
⑥ Burner in operation
⑦ Lockout
⑧ Service level activated

TEST	Combustion manager performs self test [ch. 3.3.4]
OFF	Standby, no heat demand
OFF S	Shutdown via contact X3:7 (plug No. 7)
OFFUPr	Unprogrammed condition or programming not completed
OFF E	Standby, no heat demand, shutdown via fieldbus module
10	Current operating phase [ch. 3.3.4]
F1	Under-voltage in Standby or internal device error, see error memory
F9	Connection to Fieldbus faulty Acknowledge error: press [–] and [+] keys simultaneously.

6.2.1 Info level

Burner data can be interrogated in the Info level .

► Press [Enter] for approx. 0.5 seconds.
✓ The Info level is activated.
► Press [Enter] to reach the next information.



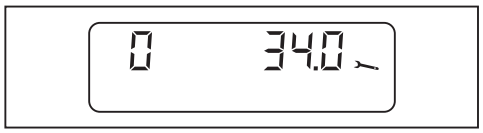
No.	Information
0	Total oil consumption in litres (via X3:8) Reset value: ► Press [L/A] and [+] simultaneously for approx. 2 seconds.
1	Hours run stage 1
2	Hours run stage 2
3	Burner starts
4	Device item number
5	Index of device item number
6	Device number
7	Production date (DDMMYY)
8	Fieldbus address
10	Oil pressure switch function
11	Current fan speed (only in conjunction with variable speed drive) Display of standardised speed: ► Press key [L/A].
12	Current oil consumption (0.1 l/h)
13	Analogue module EM3/3 or Fieldbus module EM3/2 available 0: no 1: yes

After information 13 or a waiting time of approx. 20 seconds the combustion manager changes over to the operating level.

6.2.2 Service level

The service level provides information about:
- actuator position of the individual operating points
- the most recent fault
- flame signal during burner operation

► Press [Enter] for approx. 2 seconds.
✓ The service level is activated.
► Press [Enter] to reach the next information.



Only in conjunction with variable speed drive
The speed set can be displayed at information 0 … 9.

Displaying the fan speed:
► Press key [L/A].

No.	Information	
0	Actuator position in operating point P0	
1	Actuator position in operating point P1	
2	Actuator position in operating point P2 (switch off point stage 2 when running closed)	
3	Actuator position in operating point P3 (switch on point stage 2 when running open)	
9	Actuator position in operating point P9	
10 … 18	Fault memory most recent fault … ninth last occurred fault Display additional information: 1. detailed error codes / operating status: ► Press [+] key. 2. detailed error codes: ► Press [–] and [+] keys simultaneously. Repetition counter: ► Press key [G].	
19	Flame signal	
	Flame sensor QRB4[1] (intermittent operation)	Flame sensor LFS1/RAR9 (continuous operation)
	▪ 255 … 121: no flame ▪ 30: high quality recommended value: < 40	▪ 1: flame present

[1] Flame sensor QRB4 is not suitable for continuous operation.

After information 19 or a waiting time of approx. 20 seconds the combustion manager changes over to the operating level.

6.2.3 Parameter level

Settings at parameter level must only be carried out by qualified personnel.

The parameter level can only be called up in Standby (OFF) mode.

► Press [+] and [Enter] keys simultaneously for approx. 2 seconds.
✓ The parameter level is activated.

► Press [+] key.
► Press [Enter] to reach the next parameter.
✓ Only then will the value be stored.

Pno.	Parameters	Setting range	Factory setting
1	Fieldbus address	0 … 254 / OFF Switch over to OFF and address: ► Briefly press [–] and [+] simultaneously.	OFF
2	Actuator position in Standby	0.0 … 90.0° Change air damper setting: ► Press [L/A] and [+] or [–].	0.0
		0.0 … 100 % Change fan speed: (only in conjunction with variable speed drive) ► Press [Enter] and [L/A] simultaneously and press [+] or [–].	0.0
3	Function fieldbus module –or– function analogue module	The parameter is dependent on the module used. Setting range of parameters, see installation and operating manual of module. Fieldbus module (response to heat demand): 2: Bus default and control circuit (T1/T2) activated Analogue module: 2: DIP switches activated	2
4	Post-purge time	0 … 4095 s	2
5	Fault memory	0: fault memory is empty 1: fault memory contains data Delete fault memory: ► Press [L/A] and [+] simultaneously for approx. 2 seconds.	–
6	Factor for oil consumption Impulse rate of meter per litre	1 … 65535 200 impulses ≙ 1 litre ► Adjust factor depending on impulse rate of oil meter.	200
7	Oil pressure switch (X3:12)	0: not activated 1: activated	0(1
8	Air pressure switch (X3:11)	0: not activated 1: activated	0(2
9	Operating mode output X3:1	1: Safety solenoid valve 2: tank valve	1

(1 If an oil pressure switch is fitted, set parameter 7 and parameter 8 to 1 and parameter 9 to 2.
(2 If an air pressure switch is fitted, set parameter 8 to 1.

6 Operation

Pno.	Parameters	Setting range	Factory setting
d	Flame sensor	0: ionisation electrode or flame sensor FLW 1: switch input X3:14, flame sensor LFS1/RAR9 2: flame sensor QRB4	2
E	Display mode	0: E-parameter is not activated in the access level 1: E-parameter is activated in the access level Settings 2 and 3 are required for O_2 trim, see supplementary sheet "O_2 trim W burner" (Print No. 835587xx).	0
F	Restart attempts following flame failure	0 … 1	1
H	Actuator setting for post-purge	0.0 … 90.0° Change air damper setting: ► Press [L/A] and [+] or [–].	20.0
		0.0 … 100 % Change fan speed: (only in conjunction with variable speed drive) ► Press [Enter] and [L/A] simultaneously and press [+] or [–].	50.0
L	Load shutdown	0.0 … 4095 seconds If there is no longer a demand for heat, the W-FM reduces the burner capacity and closes the fuel valves after the time set has elapsed. If partial load is reached before the time has elapsed, the fuel valves close immediately.	0
o	Operating mode O_2 trim (only in conjunction with O_2 trim)	0: not activated Additional parameters can be displayed with setting 1 to 4, see supplementary sheet "O_2 trim W-burner" (Print No. 835587xx).	0

(1 If an oil pressure switch is fitted, set parameter 7 and parameter 8 to 1 and parameter 9 to 2.
(2 If an air pressure switch is fitted, set parameter 8 to 1.

After the last parameter or a waiting time of approx. 20 seconds the combustion manager changes over to the operating level.

6.2.4 Access level

Settings at access level must only be carried out by qualified personnel.

The configuration can be adapted relative to the burner type and/or version in the access level.

In the parameter level, the display mode must be configured to `1`, to enable access to parameters E0 … E4.

► Press [G] and [L/A] simultaneously.
✓ The access level is activated.

► Press [+] key.
✓ Parameter `E0` is displayed.
► Press and hold [Enter] key and set the parameter using [+] or [–].
► Press [+] to reach the next parameter.

Parameters	Information	Setting range
`E0`	Burner type	`0`: single fuel burner `1`: dual fuel burner
`E1`	Operating mode (display only, no adjustment possible)	`0`: intermittent operation `1`: continuous operation
`E2`	Flame sensor type	`0`: Ionisation electrode or flame sensor KLC `1`: Switch input X3:14, flame sensor LFS1/RAR9 `2`: Flame sensor QRB4
`E3`	Fan configuration	`0`: Off `1`: fan control `2`: fan control with fan monitoring `3`: VSD `4`: fan control according to modulating degree specified `5`: DAU control `6 … 255`: off
`E4`	Pre-ignition delay	`0 … 4094`: the time (seconds) runs down from operating status `09`, then ignition starts `OFF`: ignition only from operating status `15`

7 Commissioning

7.1 Prerequisite

Commissioning must only be carried out by qualified personnel.

Only correctly carried out commissioning ensures the operational safety.

Do not operate the burner outside of the capacity graph [ch. 3.4.6].

► Prior to commissioning ensure that:
- all assembly and installation work has been carried out correctly
- sufficient combustion air is available and, if necessary, a ducted air intake is installed
- the annulus between flame tube and heat exchanger is filled
- the heat exchanger is filled with medium
- the regulating, control and safety devices are functioning and set correctly
- the flue gas ducts are unimpeded
- a measuring point conforming to standards is available to measure the flue gas
- the heat exchanger and flue gas ducting up to the test point are sound, as extraneous air influences the test results
- the operating instructions of the heat exchanger are complied with
- a heat demand is available

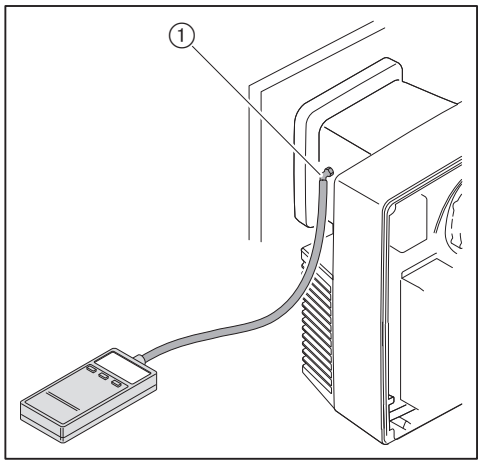
Additional system-related tests could be necessary. Please observe the operating guidelines for the individual components.

On installations with process equipment, the conditions for safe operation and commissioning must be met, see worksheet 8-1 (Print No. 831880xx).

7.1.1 Connect measuring devices

Pressure measuring device for mixing pressure

► Open test point for mixing pressure ① and connect pressure measuring device.



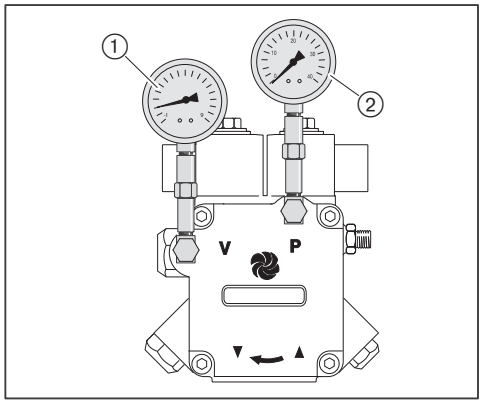
Oil pressure measuring devices on oil pump

- Vacuum gauge for suction resistance/flow pressure.
- Pressure gauge for pump pressure.

NOTICE

Oil leakage from oil pressure measuring devices due to constant load
Oil pressure measuring devices could be damaged and cause environmental pollution through leakage.
► Remove oil measuring devices once commissioning is complete.

► Close fuel shut off devices.
► Remove closing plug on the pump.
► Connect vacuum gauge ① and pressure gauge ②.

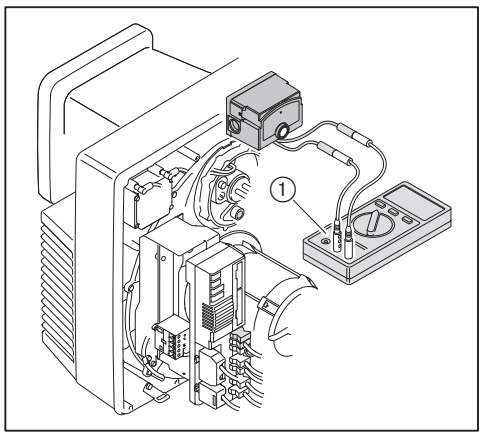


Measuring device for sensor current (continuous operation only)

- ► Disconnect plug coupling on flame sensor LFS1.
- ► Connect ammeter ① in series.

Flame signal flame sensor LFS1/RAR9

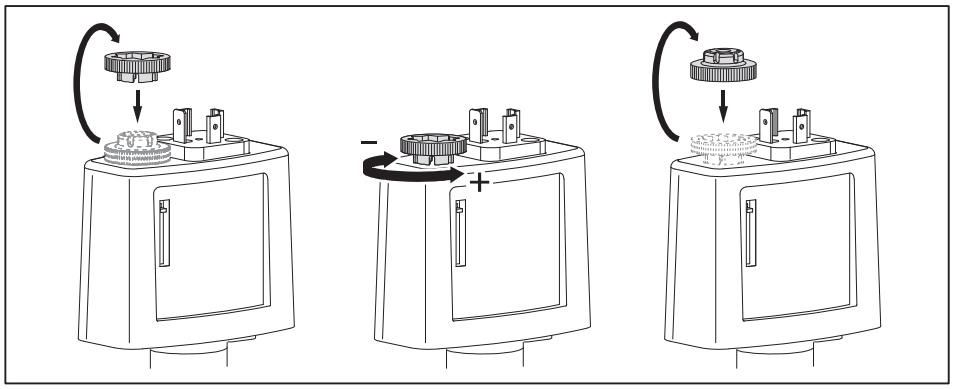
Extraneous light detection from	6.5 µA
Minimum flame signal	12 µA



7.1.2 Set minimum oil pressure switch (optional)

Depending on the burner application, optional equipment may be required for optimum operation [ch. 12.3].

- ► Remove end cap.
- ► Set minimum oil pressure switch to 8 bar using the setting screw.
- ► Refit end cap.



Check function

Pressure gauge for pump pressure must be connected.

- ► Drive to full load.
- ► Check and record the pump pressure.
- ► Slowly reduce the pump pressure, observing the combustion values and flame stability. Record the number of turns made on the pressure regulator screw.
- ✓ The oil pressure switch minimum switches off below the set value.
- ✓ The combustion manager initiates a controlled shutdown.
- ► Re-adjust the pressure regulating screw once it has been turned.
- ► Re-start the burner.
- ► Check combustion values, if necessary re-adjust the burner.

7.1.3 Setting values

Set mixing head relative to the combustion heat rating required. For this, the diffuser setting and the air damper setting should be matched.

Determine diffuser and air damper settings

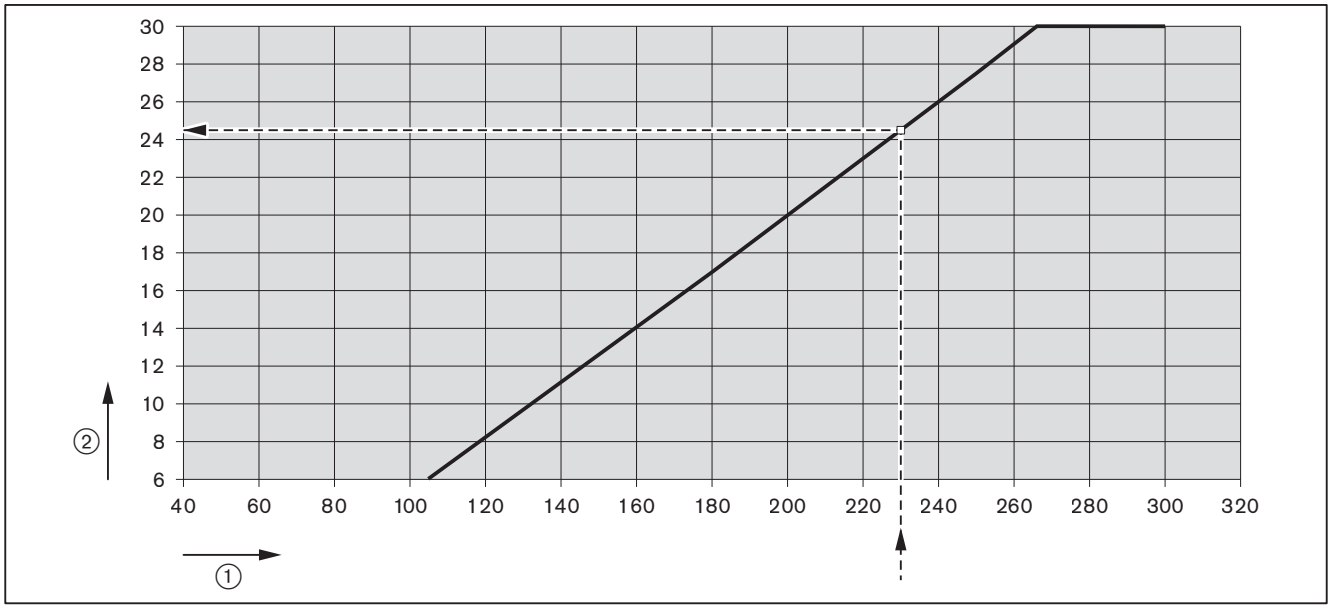
Do not operate the burner outside of the capacity graph [ch. 3.4.6].

► Determine the diffuser setting (dimension X) and air damper setting required from the diagram and note down.

Example

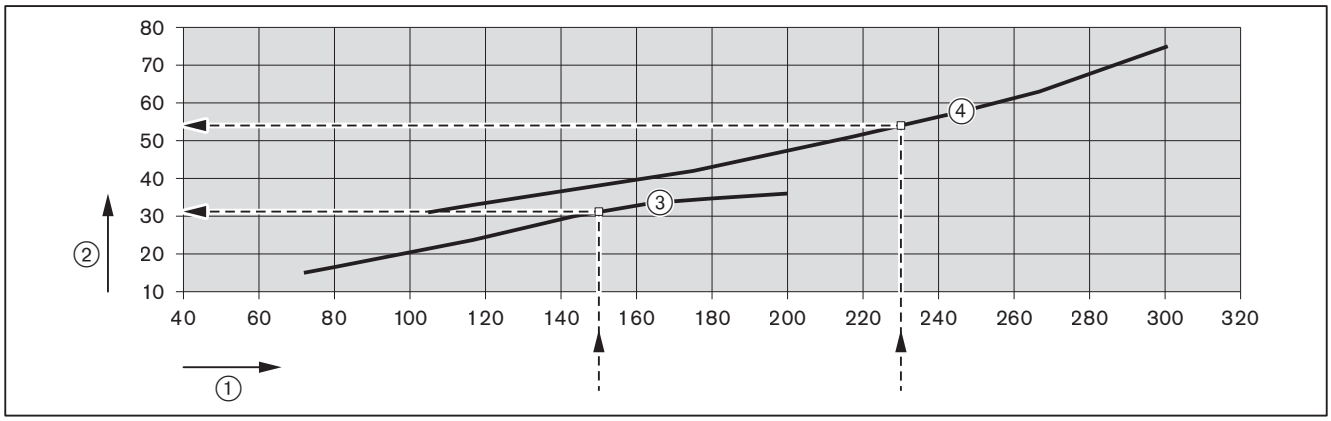
Burner capacity stage 2 / stage 1 required	230 kW / 150 kW
Diffuser setting (dimension X)	24.5 mm
Air damper setting stage 2 / stage 1	54° / 32°

Diffuser default settings



① Combustion heat rating [kW]
② Diffuser setting (dimension X) [mm]

Air damper default settings

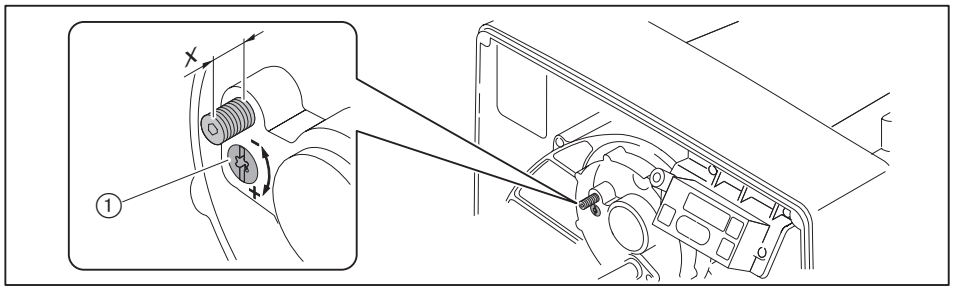


① Combustion heat rating [kW]
② Air damper setting [°]
③ Stage 1
④ Stage 2

Set diffuser

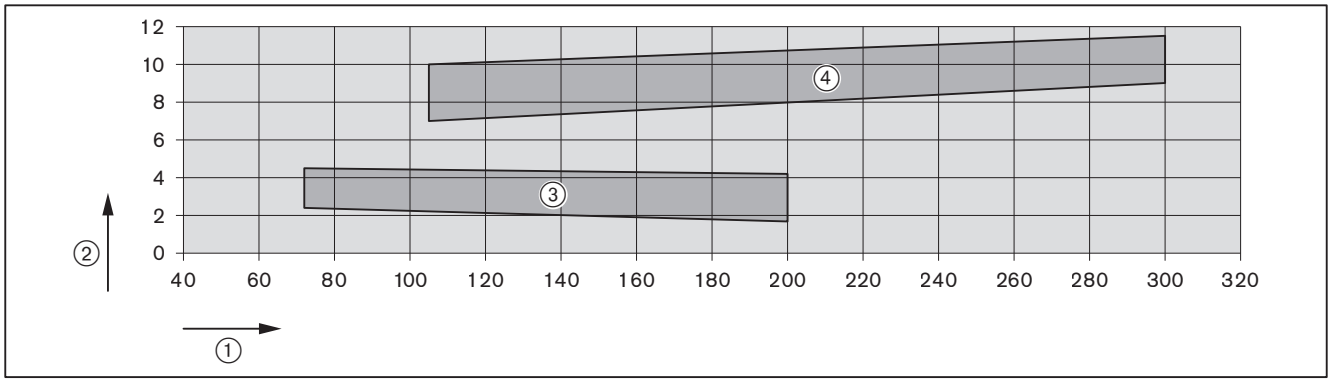
With dimension X = 0 mm the indicating bolt is flush with the cover of the nozzle assembly.

► Turn screw ①, until dimension X equals the value determined.



Determine mixing pressure

► Determine the mixing pressure required for the pre-set combustion heat rating from the diagram and note down.



① Combustion heat rating [kW]
② Mixing pressure [mbar]
③ Stage 1
④ Stage 2
Guide values, which may vary depending on combustion chamber resistance.

7.2 Adjusting the burner

7.2.1 Burner without variable speed drive

WARNING

Risk of electric shock
Touching the ignition device can lead to electric shock.
► Do not touch ignition device during the ignition process.

► During commissioning check:
  ▪ suction resistance or flow pressure of oil pump [ch. 5.1],
  ▪ mixing pressure [ch. 7.1.1].

1. Preset combustion manager

► Unplug bridging plug No. 7 on combustion manager.
► Switch on voltage supply.
✓ Combustion manager drives to Standby.

► Press [G] and [L/A] keys simultaneously.
✓ Combustion manager changes to access level.

► Press [+] key.
✓ Combustion manager changes into the setting level for step points.

Preset P9

► Press [+] key.
✓ Factory setting operating point P9 (stage 2) is displayed.

► Press and hold [L/A] key and set air damper setting determined using the [–] or [+] key [ch. 7.1.3].

Preset P1

► Press [+] key.
✓ Factory setting operating point P1 (stage 1) is displayed.

► Press and hold [L/A] key and set air damper setting determined using the [–] or [+] key [ch. 7.1.3].

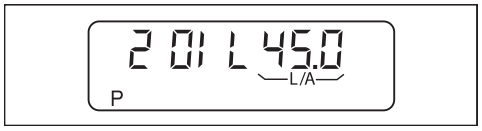
Preset P0

► Press [+] key.
✓ Factory setting operating point P0 (ignition position) is displayed.

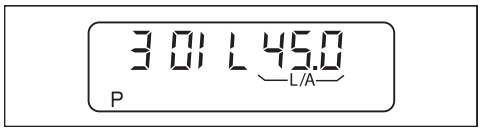
► Press and hold [L/A] key and set the same values as for P1 using the [-] or [+] key.

Preset P2 and P3

► Press [+] key.
✓ Factory setting operating point P2 (switch off point stage 2 when running closed) is displayed.



► Press and hold [L/A] key and set P2 approx. 3 … 8° above P1 using the [–] or [+] key.
► Press [+] key.
✓ Factory setting operating point P3 (switch on point stage 2 when running open) is displayed.



► Press and hold [L/A] key and set the same values as for P2 using the [-] or [+] key.
► Press [+] key.
✓ Combustion manager is preset.

2. Adjusting the operating points

► Open oil shut off devices.

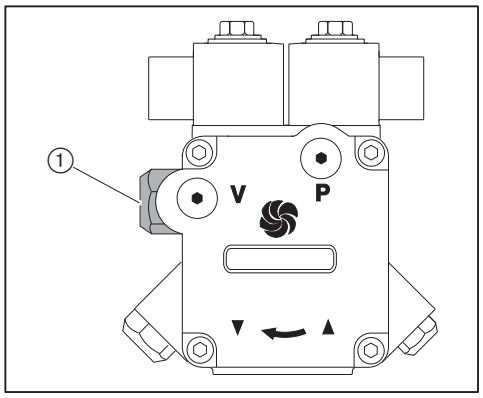
If a controlled shutdown or lockout occurs during setting:
► Briefly press [G] and [L/A] keys simultaneously.
► Press [+] key.
✓ Combustion manager changes to setting level.

► Plug in bridging plug No. 7 on combustion manager.
✓ Burner starts in accordance with program sequence and stops in operating point P0 (ignition position).

Set pump pressure for stage 1

The pump pressure must be set according to the nozzle selected [ch. 4.2].

► Check pump pressure at pressure gauge.
► Set pressure using pressure regulating screw ①:
- increase pressure: clockwise rotation
- decrease pressure: anticlockwise rotation



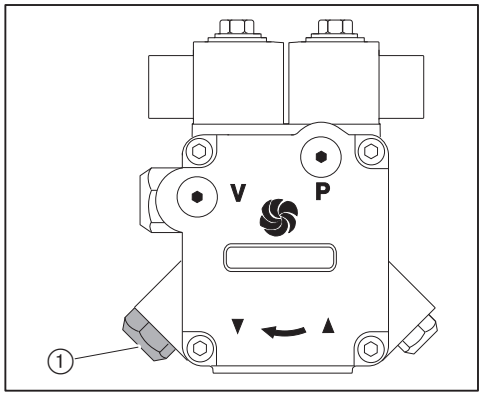
► Press [+] key.
✓ Burner drives to operating point P1.

► Press [+] key.
✓ Burner drives to operating point P9.

Set pump pressure for stage 2

The pump pressure must be set according to the nozzle selected [ch. 4.2].

- ► Check pump pressure at pressure gauge.
- ► Set pressure using pressure regulating screw ①:
  - increase pressure: clockwise rotation
  - decrease pressure: anticlockwise rotation



Adjust P9

- ► Check combustion values.
- ► Determine combustion limit [ch. 7.5].
- ► Set excess air via air damper setting [L/A].

Adjust P1

- ► Press [-] key.
- ✓ Burner drives to stage 1 (P1).

- ► Check combustion values.
- ► Determine combustion limit [ch. 7.5].
- ► Set excess air via air damper setting [L/A].

Adjust P0

► Press [-] key.
✓ Burner drives to operating point P0 (ignition position).

► Press and hold [L/A] key and set P0 to the same value as P1 using the [-] or [+] key.
► Check mixing pressure

The mixing pressure in ignition position must be between 3.0 ... 5.0 mbar.

► If necessary, adjust mixing pressure via air damper setting [L/A].
► Press [-] key.
✓ Burner drives to stage 1 (P1).

► Press [+] key.
✓ Burner drives to stage 2 (P9).

Adjust P2 and P3

► Press [+] key.
✓ Switch off point stage 2 when running closed (P2) is displayed.

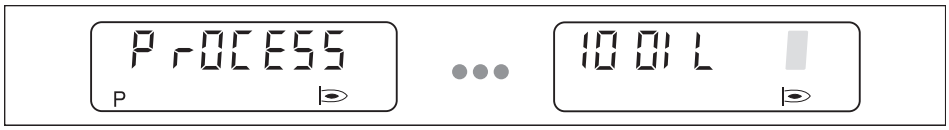
Set switch off point stage 2 when running closed (P2) to approx. ⅓ of the setting movement between P1 and P9.

Formula

$$P2 = (P9 - P1) \cdot 0.33 + P1$$

► Press and hold [L/A] key and set P2 using [–] or [+] key.
► Press [+] key.
✓ Switch on point stage 2 when running open (P3) is displayed.

► Press and hold [L/A] key and set the same values as for P2 using the [-] or [+] key.
► Press [G] and [L/A] keys simultaneously.
✓ Combustion manager changes to operating level (10), depending on heat demand stage 1 or stage 2 is displayed.



3. Check start behaviour and on/off switch points

► Switch off and restart burner.
► Check start behaviour
► Check on and off switch point stage 2:
  ▪ excess air phase (CO content) prior to switch over must not be too long,
  ▪ flame must not fail.
► If necessary correct ignition position P0.
► If necessary correct switch on point P3 and switch off point P2.

If the existing settings have been changed:
► re-check start behaviour and on and off switch points.

7.2.2 Burner with variable speed drive (optional)

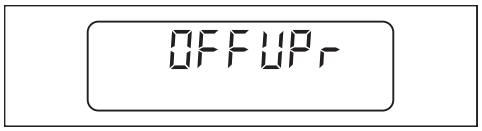
WARNING

Risk of electric shock
Touching the ignition device can lead to electric shock.
► Do not touch ignition device during the ignition process.

► During commissioning check:
  ▪ suction resistance or flow pressure of oil pump [ch. 5.1],
  ▪ mixing pressure [ch. 7.1.1].

1. Preset combustion manager

► Unplug bridging plug No. 7 on combustion manager.
► Switch on voltage supply.
✓ Combustion manager drives to Standby.



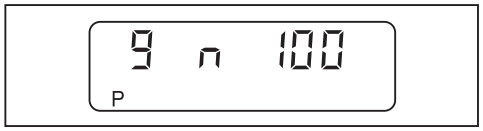
► Press [G] and [L/A] keys simultaneously.
✓ Combustion manager changes to access level.

► Press [+] key.
✓ Combustion manager changes into the setting level for step points.

Preset P9

► Press [+] key.
✓ Factory setting operating point P9 (stage 2) is displayed.

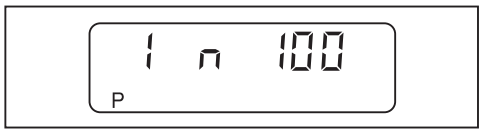
► Press and hold [L/A] key and set air damper setting determined using the [–] or [+] key [ch. 7.1.3].
► Press [Enter] and [L/A] simultaneously.
✓ Factory setting fan speed (100 %) is displayed.



Preset P1

► Press [+] key.
✓ Factory setting operating point P1 (stage 1) is displayed.

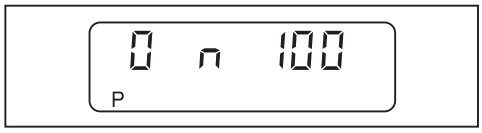
► Press and hold [L/A] key and set air damper setting determined using the [–] or [+] key [ch. 7.1.3].
► Press [Enter] and [L/A] simultaneously.
✓ Factory setting fan speed (100 %) is displayed.



Preset P0

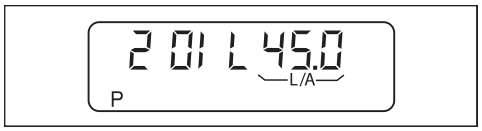
► Press [+] key.
✓ Factory setting operating point P0 (ignition position) is displayed.

► Press and hold [L/A] key and set the same values as for P1 using the [-] or [+] key.
► Press [Enter] and [L/A] simultaneously.
✓ Factory setting fan speed (100 %) is displayed.

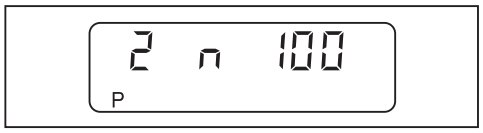


Preset P2 and P3

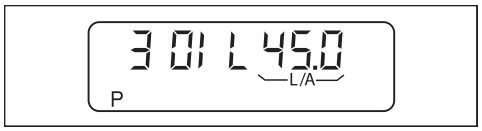
► Press [+] key.
✓ Factory setting operating point P2 (switch off point stage 2 when running closed) is displayed.



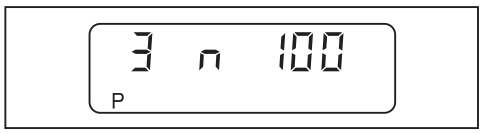
► Press and hold [L/A] key and set P2 approx. 3 … 8° above P1 using the [–] or [+] key.
► Press [Enter] and [L/A] simultaneously.
✓ Factory setting fan speed (100 %) is displayed.



► Press [+] key.
✓ Factory setting operating point P3 (switch on point stage 2 when running open) is displayed.



► Press and hold [L/A] key and set the same values as for P2 using the [-] or [+] key.
► Press [Enter] and [L/A] simultaneously.
✓ Factory setting fan speed (100 %) is displayed.



► Press [+] key.
✓ Combustion manager is preset.

2. Adjusting the operating points

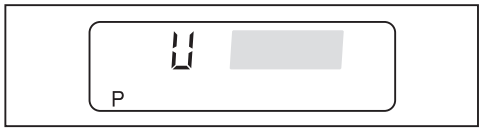
► Open oil shut off devices.

If a controlled shutdown or lockout occurs during setting:
► Briefly press [G] and [L/A] keys simultaneously.
► Press [+] key.
✓ Combustion manager changes to setting level.

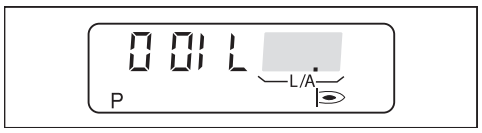
► Plug in bridging plug No. 7 on combustion manager.
✓ Burner starts.

Speed standardisation is started.

► Press [+] key within 20 seconds.
✓ Speed standardisation is carried out.
✓ U and the current fan speed are displayed.



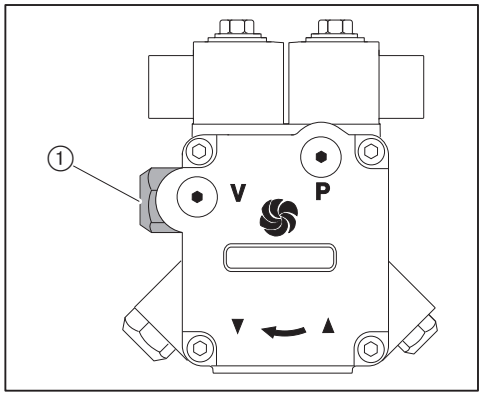
► Wait approx. 5 seconds, until the fan speed has stabilised.
► Press [+] key within 15 seconds.
✓ Speed standardisation is complete.
✓ Burner starts in accordance with program sequence and stops in operating point P0 (ignition position).



Set pump pressure for stage 1

The pump pressure must be set according to the nozzle selected [ch. 4.2].

- ► Check pump pressure at pressure gauge.
- ► Set pressure using pressure regulating screw ①:
  - increase pressure: clockwise rotation
  - decrease pressure: anticlockwise rotation



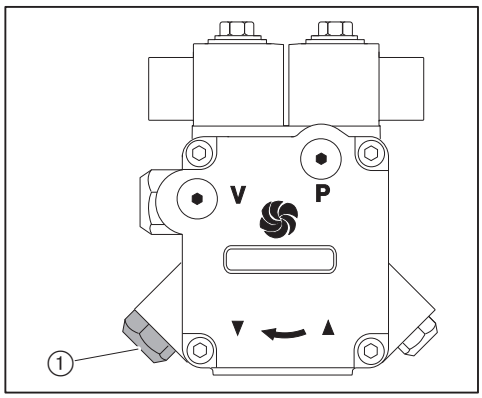
- ► Press [+] key.
- ✓ Burner drives to operating point P1.

- ► Press [+] key.
- ✓ Burner drives to operating point P9.

Set pump pressure for stage 2

The pump pressure must be set according to the nozzle selected [ch. 4.2].

- ► Check pump pressure at pressure gauge.
- ► Set pressure using pressure regulating screw ①:
  - increase pressure: clockwise rotation
  - decrease pressure: anticlockwise rotation



Adjust P9

Select speed at full load as low as possible, but not less than 80 %. In doing so:
- observe flame stability
- maintain required mixing pressure [ch. 7.1.3]
- maintaining pump pressure of 17 bar

- ► Check combustion values.
- ► Determine combustion limit [ch. 7.5].
- ► Set excess air via air damper setting and speed.

Adjust P1

- ► Press [-] key.
- ✓ Burner drives to stage 1 (P1).

Reduce speed only so far as to ensure safe operating behaviour whilst:
- maintaining speed of 55 %,
- maintaining pump pressure of 9 bar,
- and not operating burner outside of the capacity graph.

- ► Slowly reduce speed using [L/A] and [ENTER] key, whilst opening air damper setting alternately using the [L/A] key.
- ► Check combustion values.
- ► Determine combustion limit [ch. 7.5].
- ► Set excess air via air damper setting [L/A].

Adjust P0

The ignition speed should be 100 %.

► Press [-] key.
✓ Burner drives to operating point P0 (ignition position).

► Check mixing pressure

The mixing pressure in ignition position must be between 3.0 ... 5.0 mbar.

► If necessary, adjust mixing pressure via air damper setting [L/A].
► Press [-] key.
✓ Burner drives to stage 1 (P1).

► Press [+] key.
✓ Burner drives to stage 2 (P9).

Adjust P2 and P3

A speed of 100 % is recommended at the switch-off and switch-on point of stage 2.

► Press [+] key.
✓ Switch off point stage 2 when running closed (P2) is displayed.

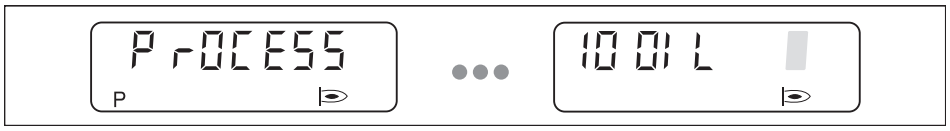
Set switch off point stage 2 when running closed (P2) to approx. ⅓ of the setting movement between P1 and P9.

Formula

$$P2 = (P9 - P1) \cdot 0.33 + P1$$

► Press and hold [L/A] key and set P2 using [–] or [+] key.
► Press [+] key.
✓ Switch on point stage 2 when running open (P3) is displayed.

► Press and hold [L/A] key and set the same values as for P2 using the [-] or [+] key.
► Press [G] and [L/A] keys simultaneously.
✓ Combustion manager changes to operating level (10), depending on heat demand stage 1 or stage 2 is displayed.



3. Check start behaviour and on/off switch points

- ► Switch off and restart burner.
- ► Check start behaviour
- ► Check on and off switch point stage 2:
  - excess air phase (CO content) prior to switch over must not be too long,
  - flame must not fail.
- ► If necessary correct ignition position P0.
- ► If necessary correct switch on point P3 and switch off point P2.

If the existing settings have been changed:

- ► re-check start behaviour and on and off switch points.

7.3 Set air pressure switch (optional)

Depending on the burner application, optional equipment may be required for optimum operation [ch. 12.3].

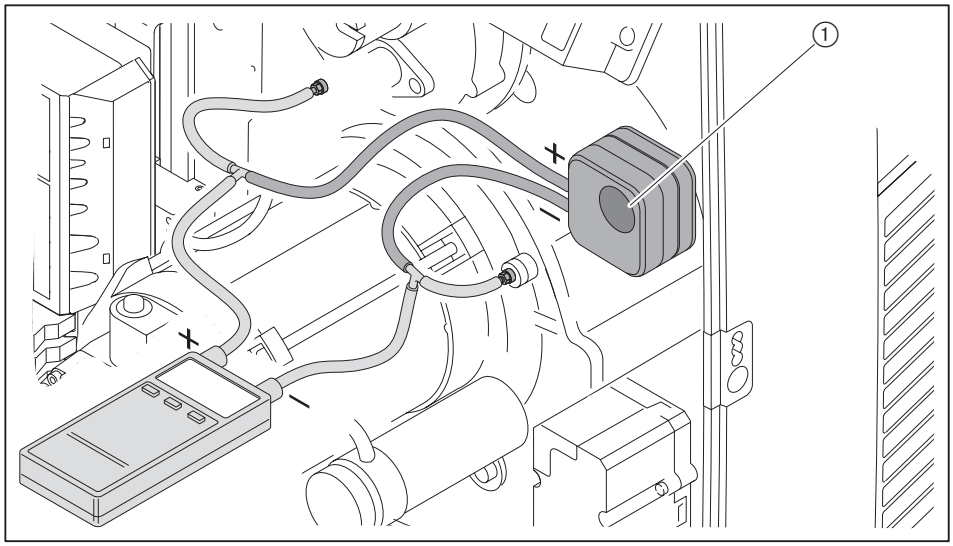
The switch point must be checked and if necessary adjusted during commissioning.

- ▶ Connect pressure measuring device for differential pressure measurement.
- ▶ Start the burner.
- ▶ Carry out differential pressure measurement across the whole capacity range of the burner and determine the lowest differential pressure.
- ▶ Calculate switch point (80 % of release pressure or lowest differential pressure).
- ▶ Set the switch point determined at the setting cam ①.

Example

Lowest differential pressure	6.3 mbar
Switch point air pressure switch (80 %)	6.3 mbar × 0.8 = 5.0 mbar

Site specific influences on the air pressure, (e. g. by the flue gas system, heat exchanger, installation location or air supply) may make it necessary to vary the setting of the air pressure switch.

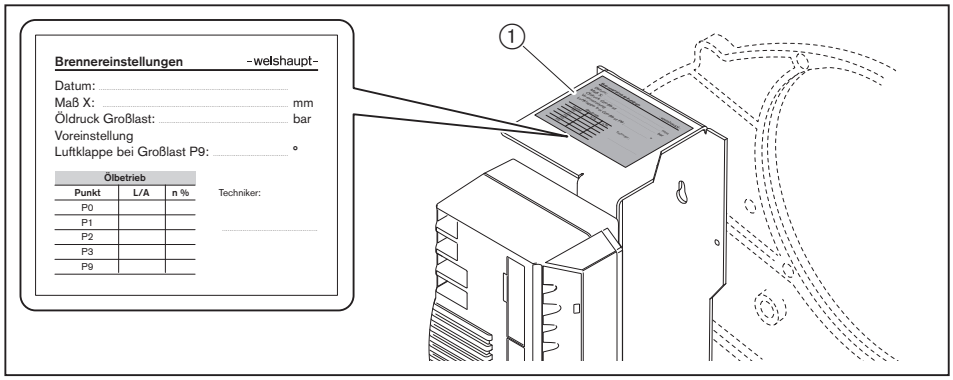


7.4 Concluding work

NOTICE

Oil leakage from oil pressure measuring devices due to constant load
Oil pressure measuring devices could be damaged and cause environmental pollution through leakage.
- ▶ Remove oil measuring devices once commissioning is complete.

- ▶ Check control and safety devices.
- ▶ Check tightness of oil carrying components.
- ▶ Enter type and serial number into the text box [ch. 3.2].
- ▶ Enter combustion values and settings in the commissioning record and/or test sheet.
- ▶ Enter setting values on the sticker ① supplied.
- ▶ Adhere sticker to the burner.
- ▶ Mount cover on burner.
- ▶ Inform the operator about the use of the equipment.
- ▶ Hand the installation and operating manual to the operator and inform him that this should be kept with the appliance.
- ▶ Point out to operator that the installation should be serviced annually.



7.5 Check combustion

Determine excess air

- ► Slowly close air damper(s) in the relevant operating point, until the combustion limit is reached (soot number approx. 1).
- ► Measure and document O_2 content.
- ► Read air number (λ).

Increase air number to ensure sufficient excess air:
- by 0.15 … 0.20 (equates to 15 … 20 % excess air)
- by more than 0.20 for more difficult conditions, such as:
  - dirty combustion air
  - fluctuating intake temperature
  - fluctuating chimney draught

Example

$$\lambda + 0.15 = \lambda^*$$

- ► Set air number (λ*), do not exceed CO content of 50 ppm.
- ► Measure and document O_2 content.

Check flue gas temperature

- ► Check flue gas temperature.
- ► Ensure that the flue gas temperature complies with the data provided by the boiler manufacturer.
- ► If necessary adjust flue gas temperature, e. g.:
  - increase burner capacity in partial load to avoid condensation in the flue gas ducts, except on condensing units
  - reduce burner capacity in full load to improve efficiency
  - adjust heat exchanger to the data provided by the manufacturer

Determine flue gas losses

- ► Drive to full load.
- ► Measure combustion air temperature (t_L) near the air damper(s).
- ► Measure oxygen content (O_2) and flue gas temperature (t_A) at the same time at one point.
- ► Determine flue gas losses using the following formula:

$$q_A = (t_A - t_L) \cdot \left(\frac{A_2}{21 - O_2} + B\right)$$

q_A Flue gas losses [%]

t_A Flue gas temperature [°C]

t_L Combustion air temperature [°C]

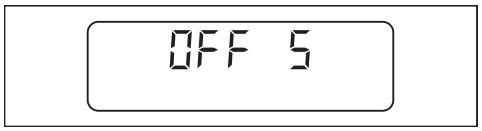
O_2 Volumetric content of oxygen in dry flue gas [%]

Fuel factors	Fuel oil
A2	0.68
B	0.007

7.6 Subsequent optimisation of operating points

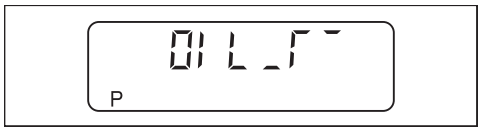
If necessary, the combustion values can subsequently be corrected.

► Unplug bridging plug No. 7 on combustion manager.
✓ Combustion manager drives to Standby.



► Briefly press [–] and [+] simultaneously.
✓ Combustion manager changes to access level.

► Press [+].
✓ Combustion manager changes to setting level.



► Plug in bridging plug No. 7 on combustion manager.
✓ Burner starts and stops in operating point P0 (ignition position).
► Initiate the other operating points using the [+] or [-] key and optimise if required.

Exit setting level

► Press [G] and [L/A] simultaneously.
✓ The combustion manager changes to operating level.

8 Shutdown

In the event of operational failure:
- ► Switch off burner.
- ► Close fuel shut off devices.

9 Servicing

9.1 Notes on servicing

WARNING

Risk of electric shock
Working on the device when voltage is applied can lead to electric shock.
► Isolate the device from the power supply prior to starting any work.
► Safeguard against accidental restart.

WARNING

Risk of electric shock
Touching the ignition device can lead to electric shock.
► Do not touch ignition device during the ignition process.

WARNING

Electric shock caused by frequency convertor
It is possible that electrical components continue to carry voltage and cause electric shock even after the voltage supply has been disconnected.
► Wait approx. 5 minutes before commencing work.
✓ Electric voltage has dissipated.

CAUTION

Danger of getting burned on hot components
Hot components can lead to burns.
► Do not touch the components.
► Allow components to cool.

CAUTION

Risk of injury from sharp edges
Sharp edges on components can cause injury.
► Wear protective gloves.
► Watch out for sharp edges.

NOTICE

Damage caused by objects in the burner housing
It is possible for objects to fall into the burner housing.
If these objects are not removed, they could damage the burner.
► Following servicing, ensure that there are no objects left in the burner housing.

Servicing must only be carried out by qualified personnel. The combustion plant should be serviced annually. Depending on site conditions more frequent checks may be required.

Components, which show increased wear and tear or whose design lifespan is or will be exceeded prior to the next service should be replaced as a precaution.

The design lifespan of the components is listed in the service plan [ch. 9.2].

Weishaupt recommends a service contract is entered into to ensure regular inspections.

The following components must only be replaced and must not be repaired:
- Combustion Manager
- Flame sensor
- Actuator
- Oil solenoid valve
- Pressure switch
- Oil nozzle

Prior to every servicing

- ► Inform the operator about the extent of service work to be carried out.
- ► Switch off mains switch of installation and safeguard against accidental reactivation.
- ► Close fuel shut-off devices and secure against being switched on again unexpectedly.
- ► Remove cover.
- ► Unplug boiler control connection plug from combustion manager.

Following servicing

- ► Check tightness of oil carrying components.
- ► Check function of:
  - Ignition
  - Flame monitoring
  - oil pump (pump pressure and suction resistance)
  - Pressure switch
  - Control and safety devices
- ► Check combustion values, if necessary re-adjust the burner.
- ► Enter combustion values and settings in the commissioning record.
- ► Enter setting values on the sticker supplied.
- ► Adhere sticker to the burner.
- ► Refit cover.

9.2 Service plan

Components	Criteria / design lifespan[1]	Service procedure
Oil nozzle	Soiling / wear	▶ Replace [ch. 9.4] Recommendation: at least every 2 years
Nozzle shut off	Soundness	▶ Replace [ch. 9.5] Recommendation: at least every 2 years
Ignition electrode	Soiling	▶ Clean
	Damage / wear	▶ Replace Recommendation: at least every 2 years
Ignition cable	Damage	▶ Replace
Flame tube / diffuser	Soiling	▶ Clean
	Damage	▶ Replace
Pressure hose nozzle assembly	Damage / oil escaping 5 years	▶ Replace [ch. 9.10]
Oil hose	Damage / oil escaping	▶ Replace [ch. 9.10] Recommendation: every 5 years
Oil solenoid valve	Soundness 250 000 burner starts or 10 years[2]	▶ Replace oil pump or solenoid valve [ch. 9.10].
Oil pump filter	Soiling	▶ Clean [ch. 9.13]
Fan wheel	Soiling	▶ Clean
	Damage	▶ Replace [ch. 9.11]
Air duct	Soiling	▶ Clean
Air damper	Soiling	▶ Clean
Combustion Manager	250 000 burner starts or 10 years[2]	▶ Replacement recommended [ch. 9.16].
Flame sensor QRB4 / Flame sensor RAR9	Soiling	▶ Clean
	Damage 250 000 burner starts or 10 years[2]	▶ Replace
Flame sensor LFS1	250 000 burner starts or 10 years[2]	▶ Replace
Air pressure switch	Switch point	▶ Check [ch. 7.3].
	250 000 burner starts or 10 years[2]	▶ Replace
Oil pressure switch	Switch point	▶ Check [ch. 7.1.2].
	500 000 burner starts	▶ Replace

[1] The specified design lifespan applies for typical use in heating, hot-water and steam systems as well as for thermal process systems to EN ISO 13577-2.
[2] If a criterion is reached, carry out maintenance measures.

9.3 Hinge open the burner

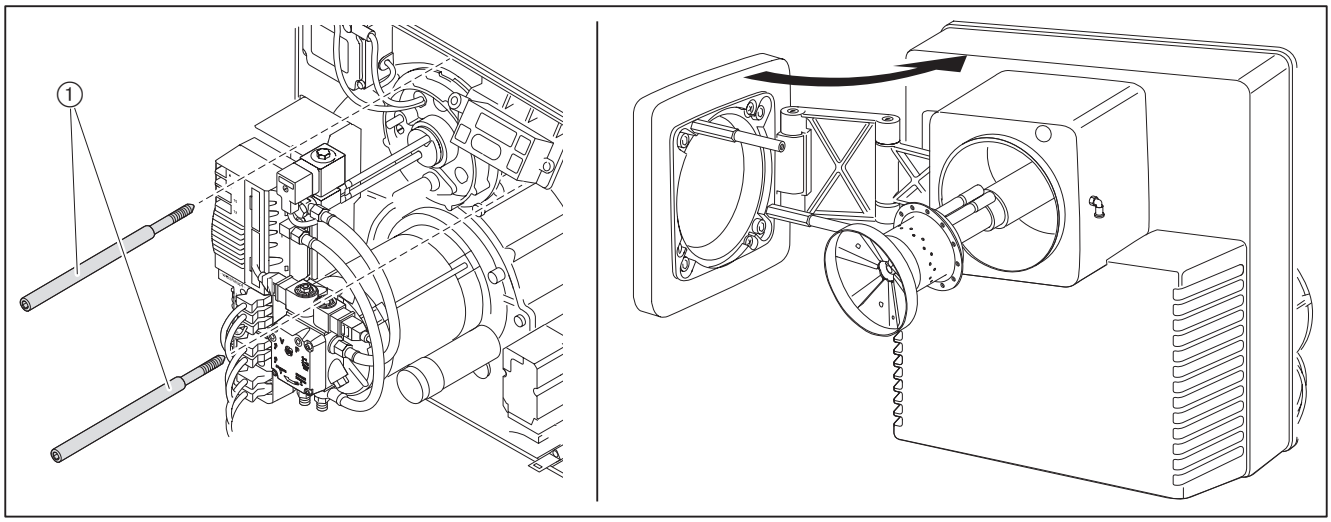
Observe notes on servicing [ch. 9.1].

Without combustion head extension

- ► Remove screws ①.
- ► Hinge open the burner.

With combustion head extension

- ► Remove mixing head [ch. 9.7].
- ► Remove screws ①.
- ► Hinge open the burner.

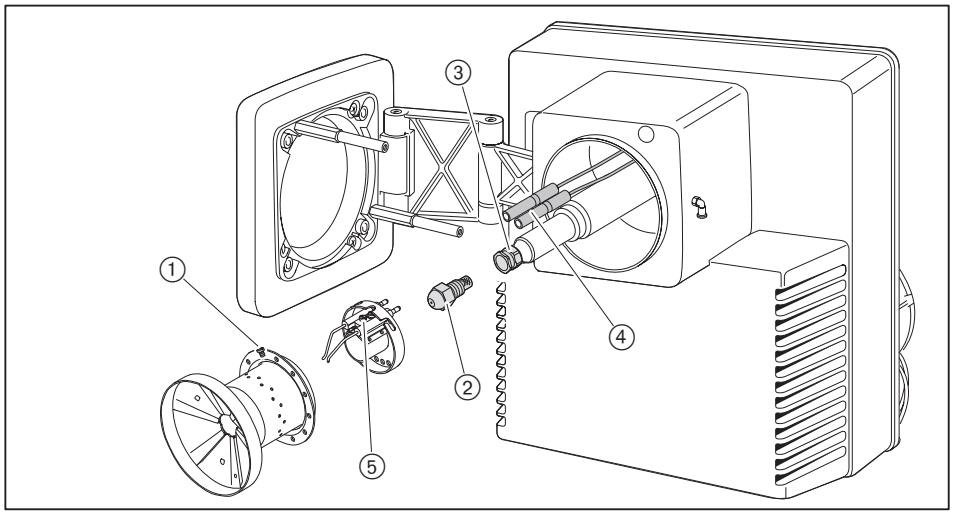


9.4 Replace nozzle

Observe notes on servicing [ch. 9.1].

Do not clean nozzles, always fit new nozzles.

- ► Hinge open the burner [ch. 9.3].
- ► Unplug ignition cable ④.
- ► Undo screw ① and remove diffuser.
- ► Undo screw ⑤ and remove ignition electrode holder.
- ► Counter-hold on the nozzle body ③ using a spanner and remove nozzle ②.
- ► Fit new nozzle ensuring it is seated tightly.
- ► Refit diffuser in reverse order.
- ► Set nozzle distance [ch. 9.8]
- ► Set ignition electrodes [ch. 9.6]

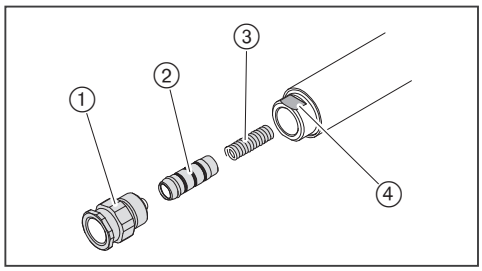


9.5 Removing and refitting nozzle shut off

Observe notes on servicing [ch. 9.1].

Removing

- ► Remove nozzle [ch. 9.4].
- ► Counter-hold the nozzle assembly ④ using a spanner and remove nozzle holder ①.
- ► Remove valve piston ② and compression spring ③ using a suitable tool (e. g. pliers), do not damage valve piston and O ring.



Refitting

Do not refit damaged valve pistons, and replace as necessary.

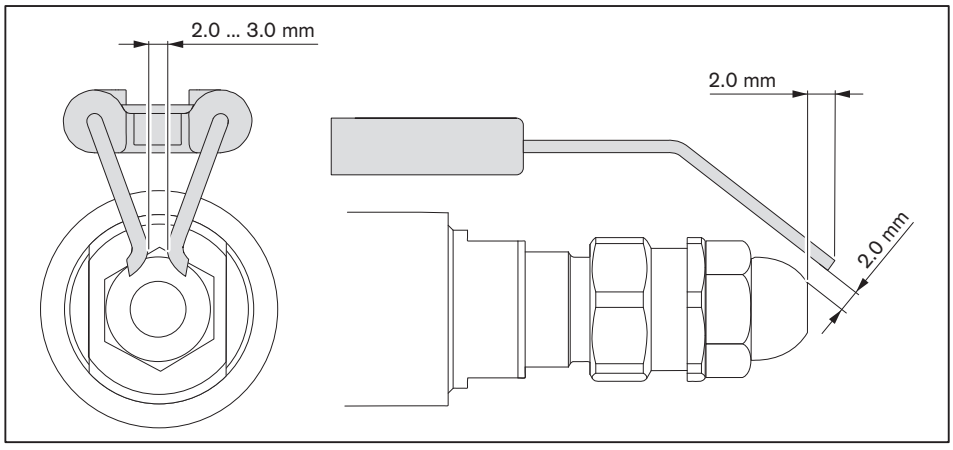
- ► Refit nozzle shut off in reverse order.
- ► Check nozzle distance [ch. 9.8].
- ► Set ignition electrodes [ch. 9.6]

9.6 Set ignition electrodes

Observe notes on servicing [ch. 9.1].

The ignition electrodes must not touch the nozzle's atomising spray cone.

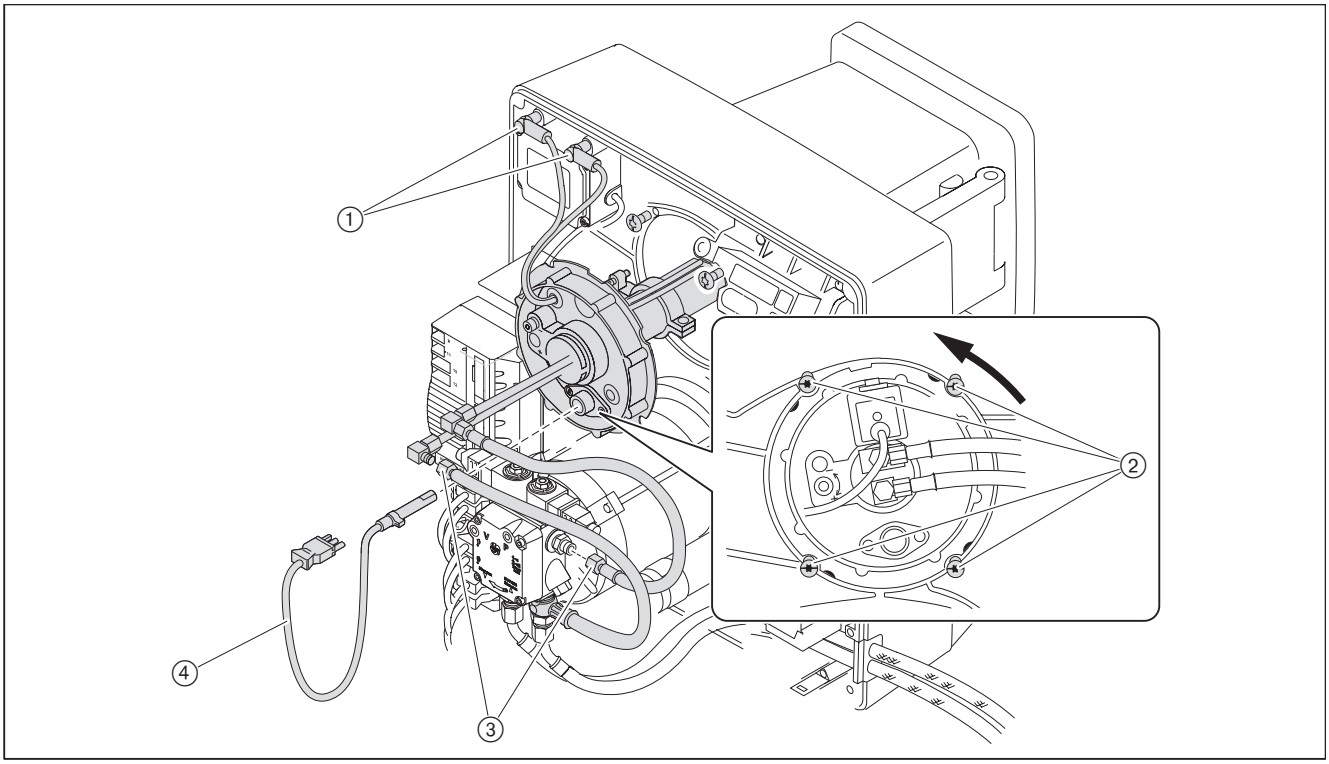
- ► Hinge open the burner [ch. 9.3].
- ► Check distance of ignition electrodes.
- ► If necessary adjust ignition electrodes by slightly bending.



9.7 Remove mixing head

Observe notes on servicing [ch. 9.1].

- ► Remove flame sensor QRB4 ④ or flame sensor RAR9 (optional).
- ► Unplug ignition cable ①.
- ► Remove pressure hoses ③.
- ► Undo screws ②.
- ► Turn mixing head to the left up to the recess and remove.



9.8 Set mixing head

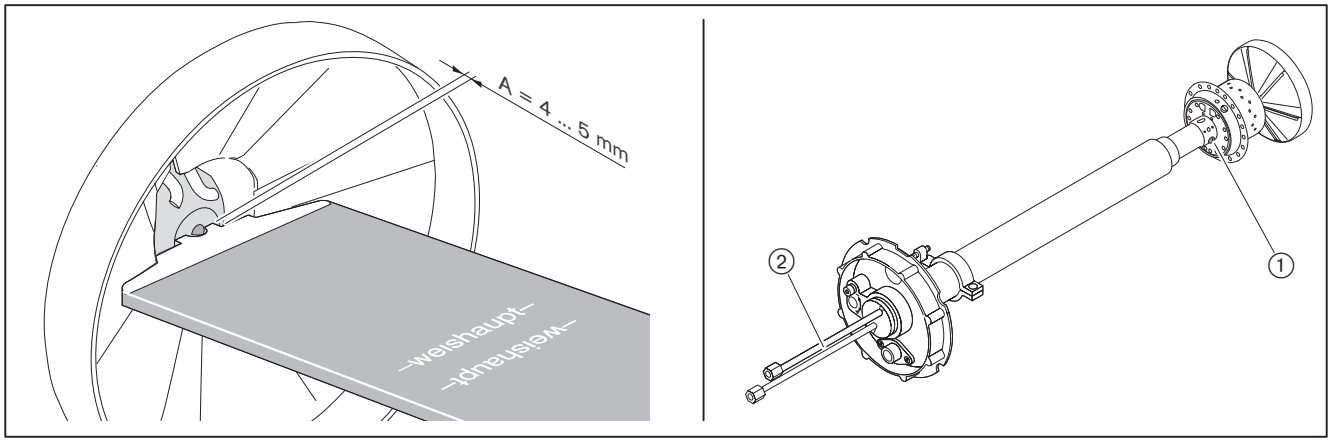
Observe notes on servicing [ch. 9.1].

Set nozzle distance

- ► Hinge open the burner [ch. 9.3].
- ► Insert setting gauge and check dimension A (4 … 5 mm).

If the value measured deviates from dimension A:

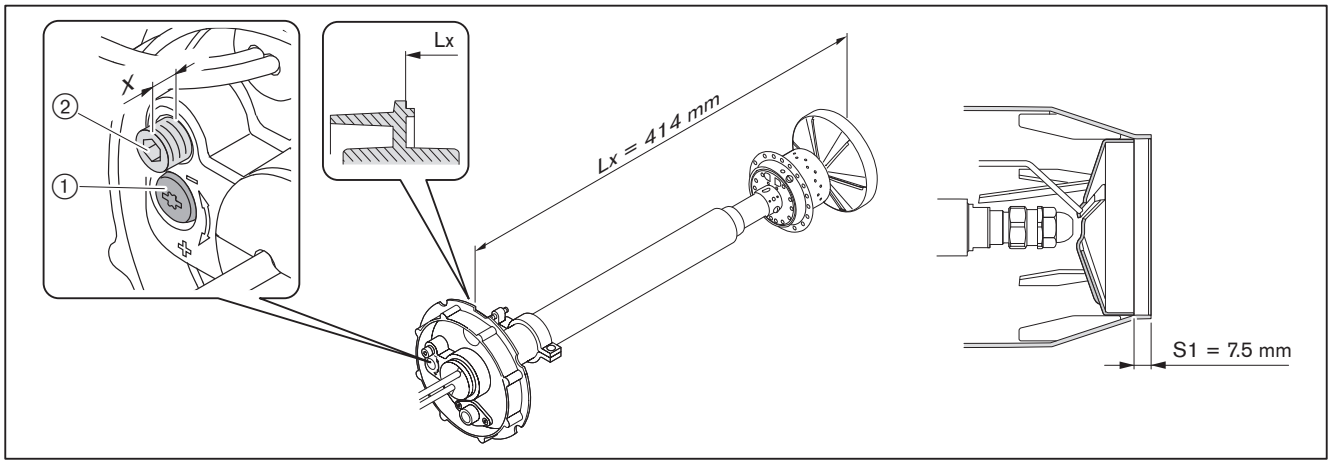
- ► Undo screw ①.
- ► Adjust nozzle body ② until dimension A is reached.
- ► Tighten screw ①.



Check basic setting

Dimension S1 can only be checked when the burner is mounted to a boiler door, which is hinged open.

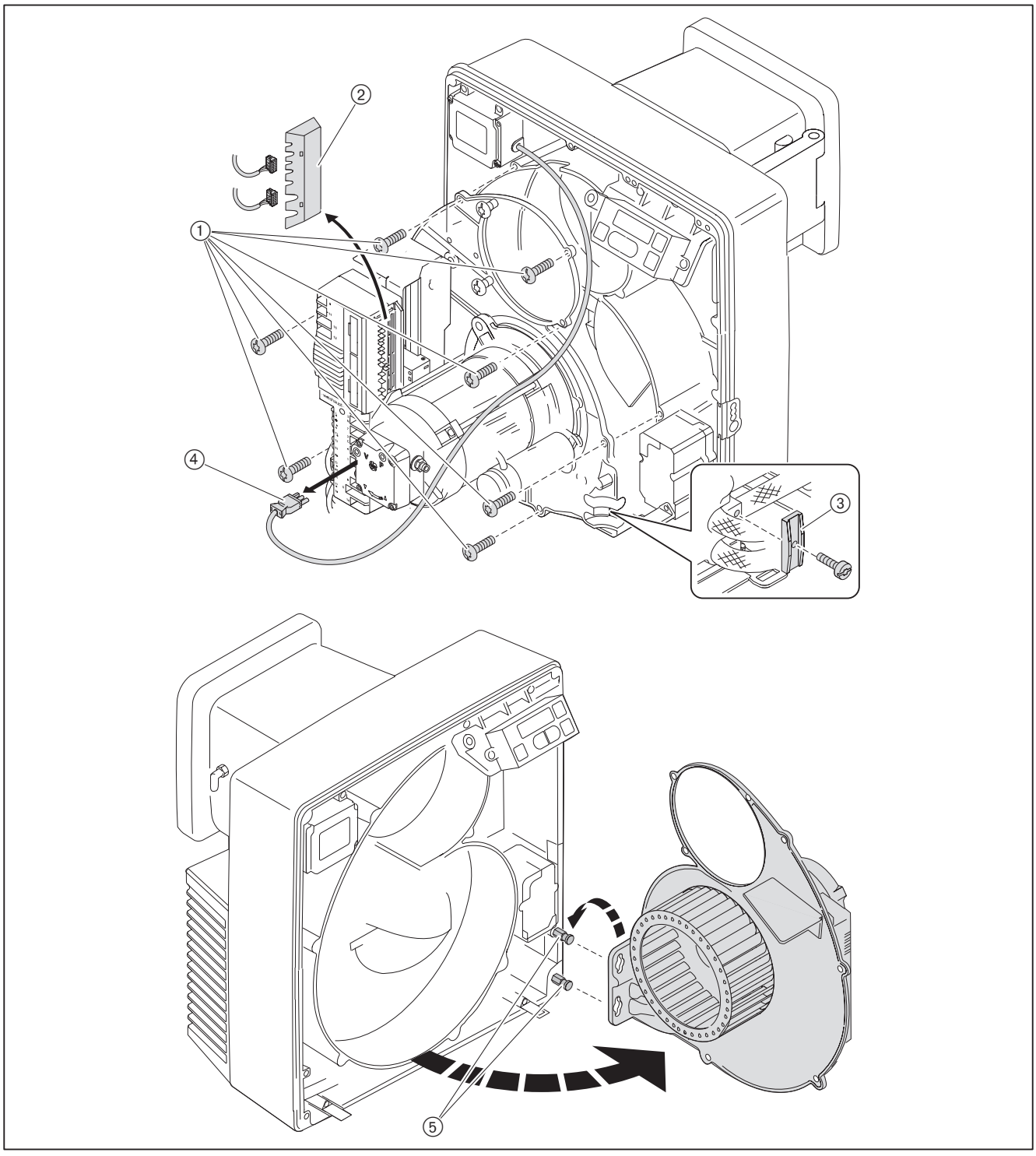
- ► Hinge open boiler door or if necessary remove mixing head [ch. 9.7].
- ► Turn setting screw ① until the indicating bolt ② is flush with the nozzle assembly cover (dimension X = 0 mm).
- ► Check dimension S1 and/or dimension Lx.
- ► Set dimension S1 and/or dimension Lx by turning setting ①.
- ► Remove plug from indicating bolt ②.
- ► Turn indicating bolt until it is flush with the nozzle assembly cover (dimension X = 0 mm).
- ► Replace plug.



9.9 Service position

Observe notes on servicing [ch. 9.1].

- ▶ Remove mixing head [ch. 9.7].
- ▶ Unplug plug ④ from ignition unit.
- ▶ Remove cover ② and remove plugs.
- ▶ Remove support ③ for oil hoses.
- ▶ Hold housing cover and remove screws ①.
- ▶ Place housing cover onto hanging bolts ⑤.



9.10 Removing and refitting oil pump

Observe notes on servicing [ch. 9.1].

Removing

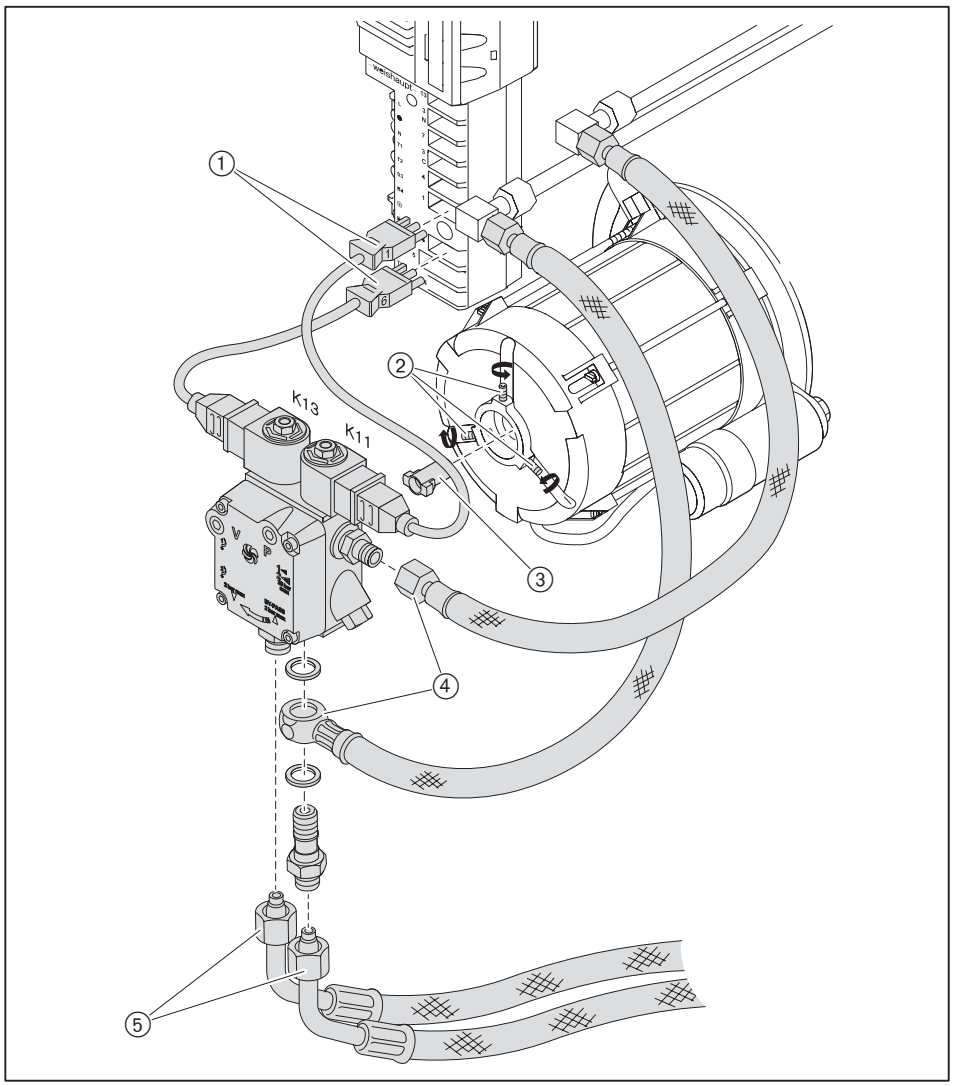
- ► Close fuel shut off devices.
- ► Unplug plug ①.
- ► Remove oil hoses ⑤ and pressure hoses ④.
- ► Undo screws ② and remove oil pump.

Refitting

- ► Install oil pump in reverse order and:
  - ensure correct alignment of coupling ③,
  - ensure correct allocation of flow and return of the oil hoses.

NOTICE

Damage to the oil pump due to incorrect connection
Mixing up supply and return can damage the oil pump.
- ► Ensure correct connection of oil hoses to the supply and return of the pump.



9.11 Removing and refitting fan wheel

Observe notes on servicing [ch. 9.1].

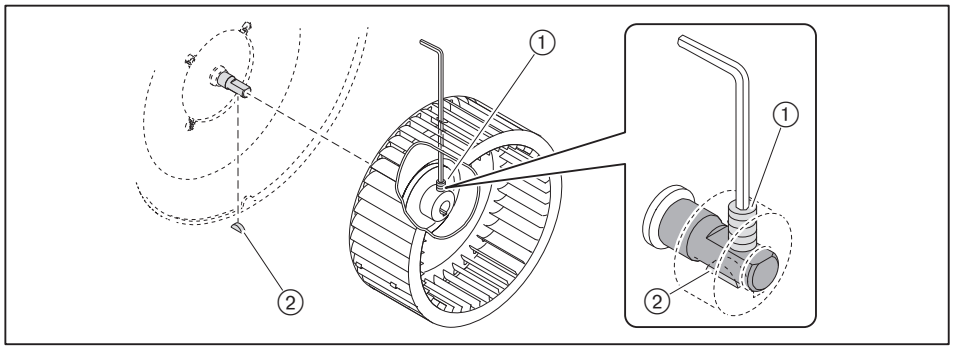
Personal protective equipment must be observed [ch. 2.3.1].

Removing

- ► Place housing cover into service position [ch. 9.9].
- ► Remove grub screw ① and remove fan wheel.

Refitting

- ► Refit fan wheel in reverse order and
  - ensure correct alignment of the spring washer ②
  - screw in new grub screw ①
  - turn fan wheel to ensure it moves freely

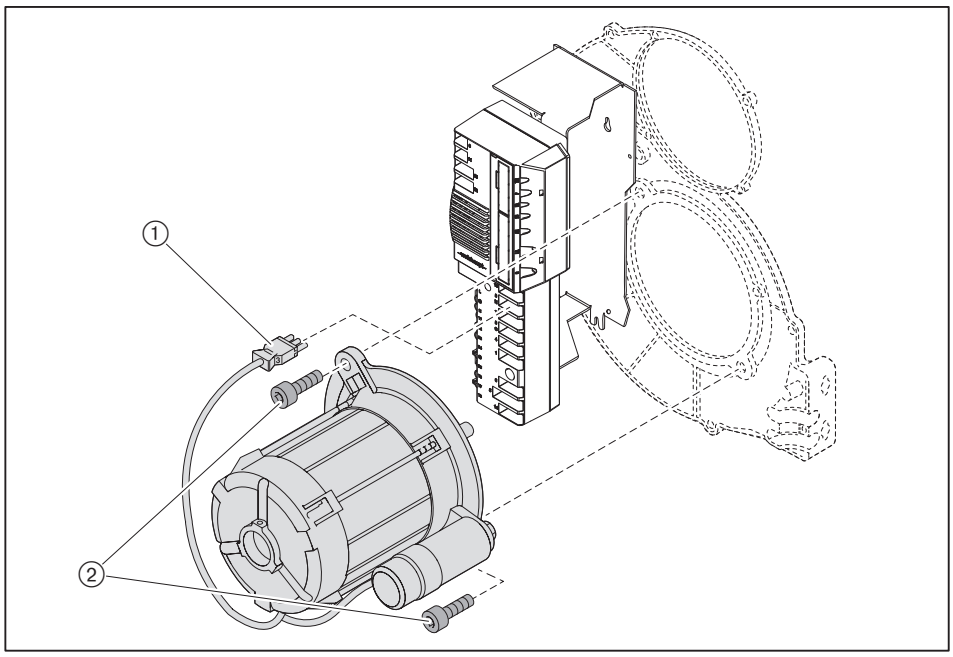


9.12 Remove burner motor

Observe notes on servicing [ch. 9.1].

- ► Remove the oil pump [ch. 9.10].
- ► Remove fan wheel [ch. 9.11].
- ► Unplug plug ①.
- ► Hold motor and remove screws ②.
- ► Remove motor.

Only in conjunction with variable speed drive
The variable speed drive sensor is fitted to the burner motor. If necessary remove variable speed drive sensor.

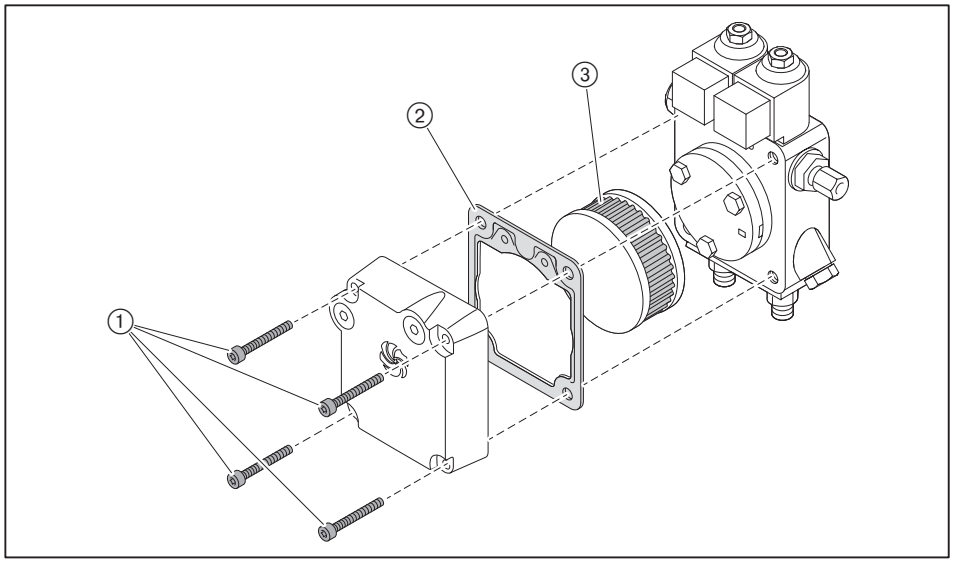


9.13 Removing and refitting oil pump filter

Observe notes on servicing [ch. 9.1].

Removing

- ► Close fuel shut off devices.
- ► Remove bolts ①.
- ► Remove pump cover.
- ► Replace filter ③ and gaskets ②.



Refitting

- ► Refit filter in reverse order ensuring sealing surfaces are clean.

9.14 Removing and refitting air damper actuator

Observe notes on servicing [ch. 9.1].

Removing

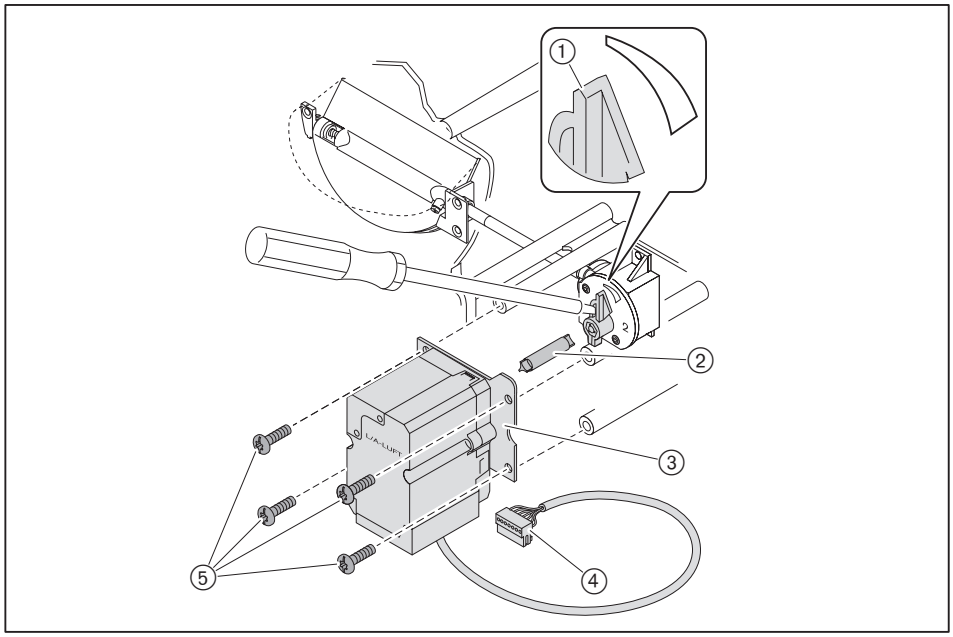
- ► Remove actuator plug ④ from combustion manager.
- ► Remove screws ⑤.
- ► Remove actuator with fixing plate ③ and shaft ②.

Refitting

NOTICE

Damage to the actuator caused by turning the hub
Actuator could be damaged.
- ► Do not turn hub manually or with tool.

- ► Plug in actuator plug ④ at the combustion manager.
- ► Unplug bridging plug No. 7 on combustion manager.
- ► Switch on voltage supply.
- ✓ The combustion manager checks the actuator and drives to the reference point.
- ► Interrupt voltage supply.
- ► Fit shaft ② to actuator.
- ► Set indicator ① on angle drive to 0 (air damper Closed) and hold.
- ► Fit shaft with actuator to angle drive.
- ► Secure actuator.
- ► Plug in bridging plug No. 7 on combustion manager.



9.15 Removing and refitting angle drive

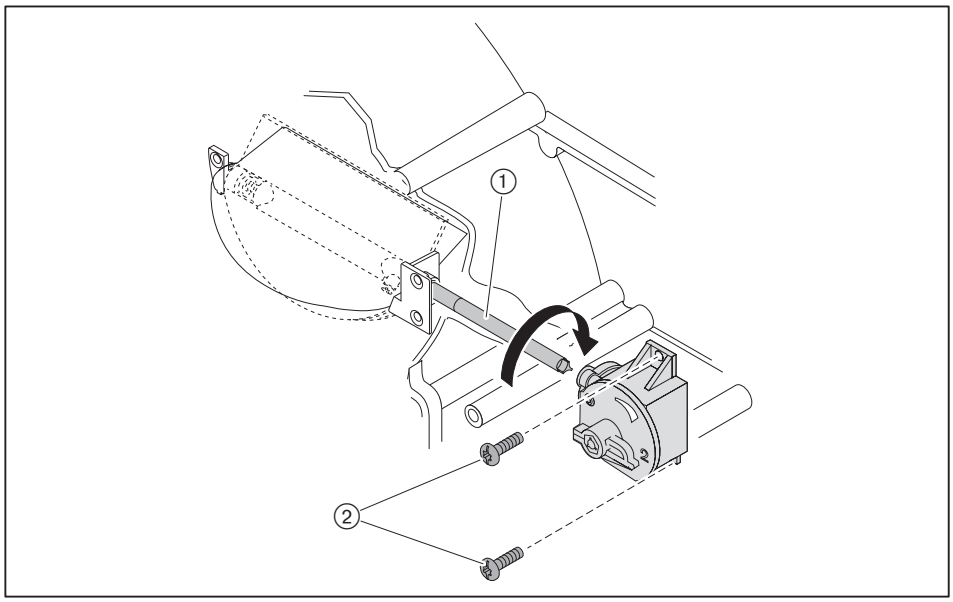
Observe notes on servicing [ch. 9.1].

Removing

- ► Remove air damper actuator [ch. 9.14].
- ► Remove screws ②.
- ► Remove angle drive.

Refitting

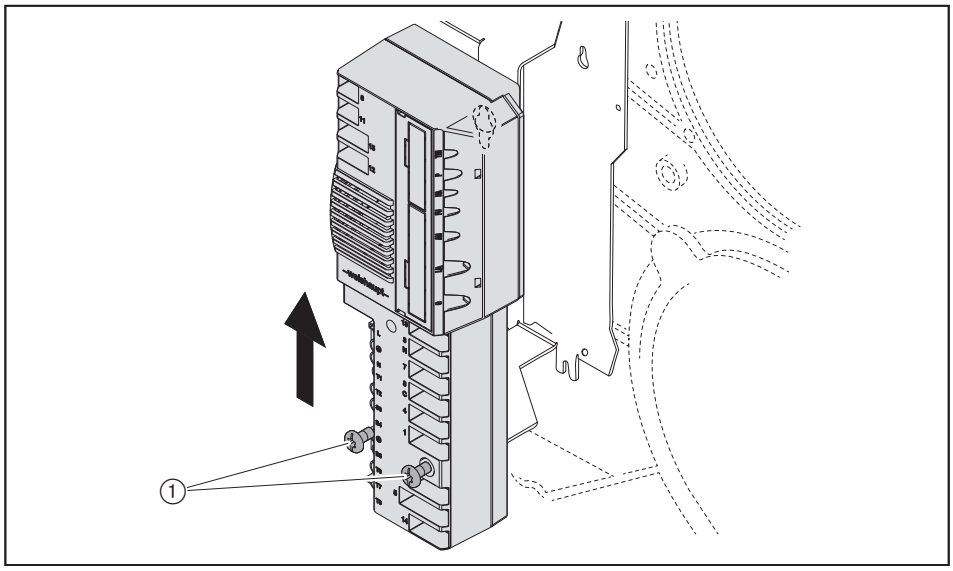
- ► Turn shaft ① to its stop (air damper Open) and hold.
- ► Fit angle drive to shaft.
- ► Secure angle drive.



9.16 Replacing the combustion manager

Observe notes on servicing [ch. 9.1].

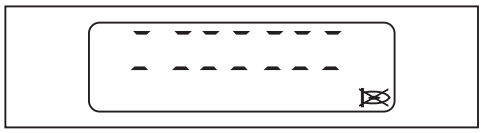
- ► Unplug all plugs.
- ► Undo screws ①.
- ► Push combustion manager upwards and replace.



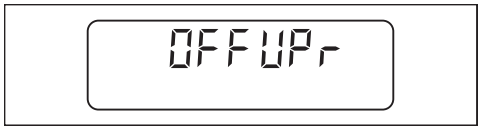
- ► Connect all plugs again.

Preset combustion manager

- ► Unplug bridging plug No. 7 on combustion manager.
- ► Switch on voltage supply.
- ✓ The unprogrammed condition of the combustion manager is indicated by a flashing display.
  The burner goes to lockout.



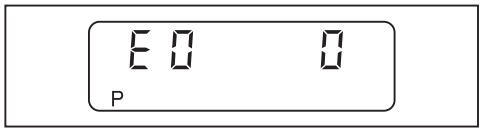
- ► Press [Enter].
- ✓ Burner has been reset.
- ✓ Combustion manager drives to Standby.



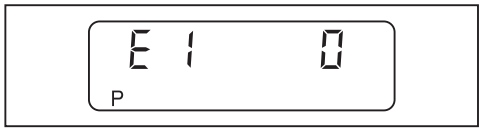
If an oil pressure switch is fitted, set parameter 7 and 8 to 1, see [ch. 6.2.3].
If an air pressure switch is fitted, set parameter 8 to 1, see [ch. 6.2.3].

- ► Press [G] and [L/A] simultaneously.
- ✓ Combustion manager changes to access level.

► Press [+].
✓ Setting level (parameter E0) is displayed.



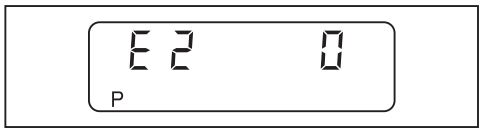
► Adopt value 0 (single fuel burner) and if necessary adjust using [Enter] and [–] key.
► Press [+].
✓ E1 is displayed.



The value of parameter E1 can not be altered.

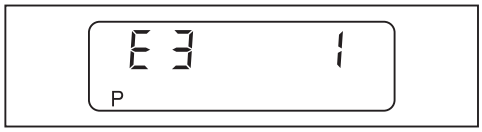
- 0: intermittent operation (Standard)
- 1: continuous operation

► Press [+].
✓ E2 is displayed.



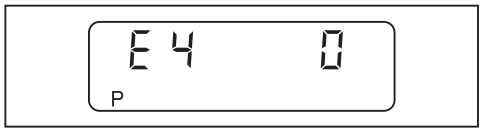
► Set value using [Enter] and [+].
- 1: switch input X3:14, flame sensor LFS1/RAR9
- 2: flame sensor QRB4

► Press [+].
✓ E3 is displayed.



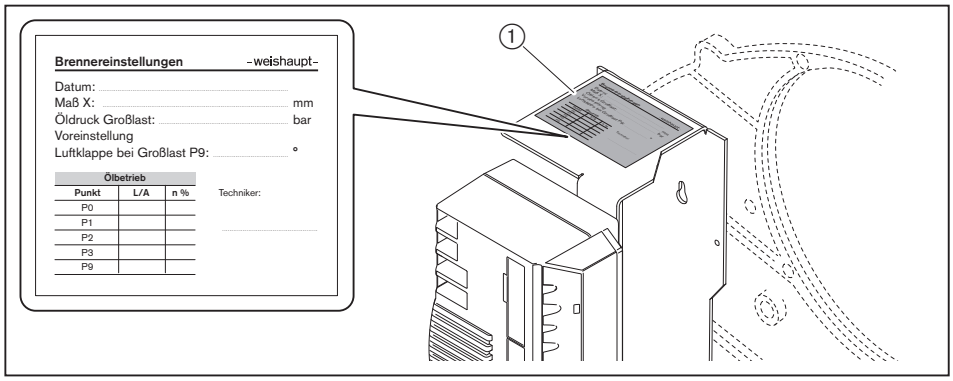
► If required, set value using [ENTER] and [+] keys.
- 1 (fan control): burner without variable speed drive
- 3 (variable speed drive): burner with variable speed drive

► Press [+].
✓ E4 is displayed.



► Adopt value 0 (no ignition delay), and if necessary set using [Enter] and [-].
► Press [+].
✓ Combustion manager changes into the setting level for step points.

► Determine the operating points from the sticker ①.
► Set the burner using these operating points and adjust [ch. 7.2].



Deactivate E-Parameters

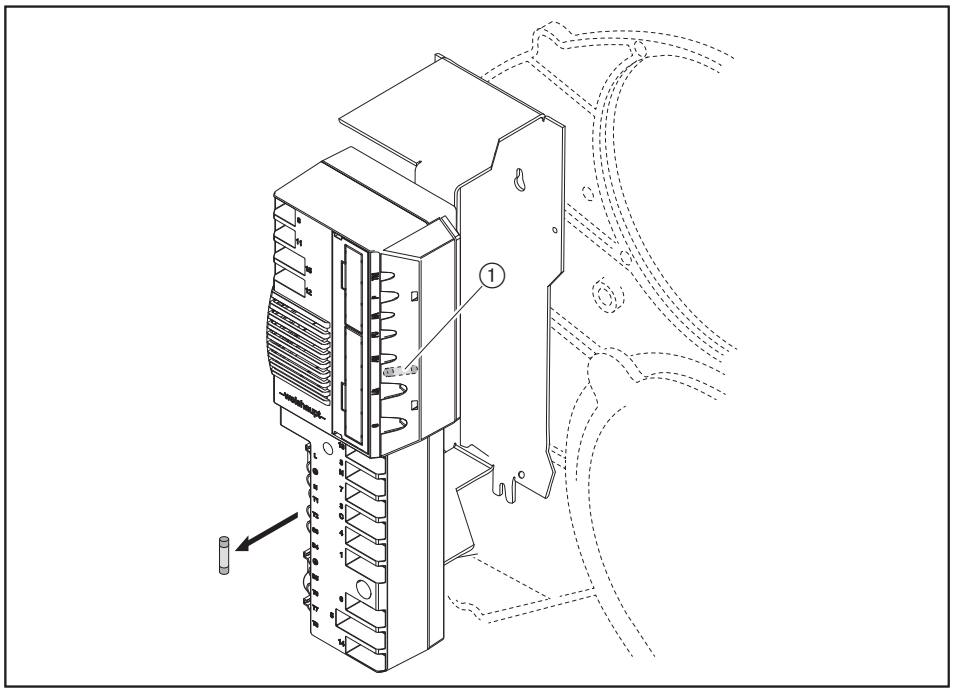
Following commissioning, set parameter E to 0.

► Press [Enter] and [+] keys simultaneously for approx. 2 seconds.
✓ The parameter level is activated.
► Press [+].
► Press [Enter] key until parameter E is displayed.
► Set parameter E to 0 .
✓ E-Parameters are not shown in the setting level.
► Press [Enter] key twice.
✓ The combustion manager returns to the operating level.

9.17 Replacing the fuse

Observe notes on servicing [ch. 9.1].

- ▶ Unplug connection plug from combustion manager.
- ▶ Replace fuse (T6.3H, IEC 127-2/5).



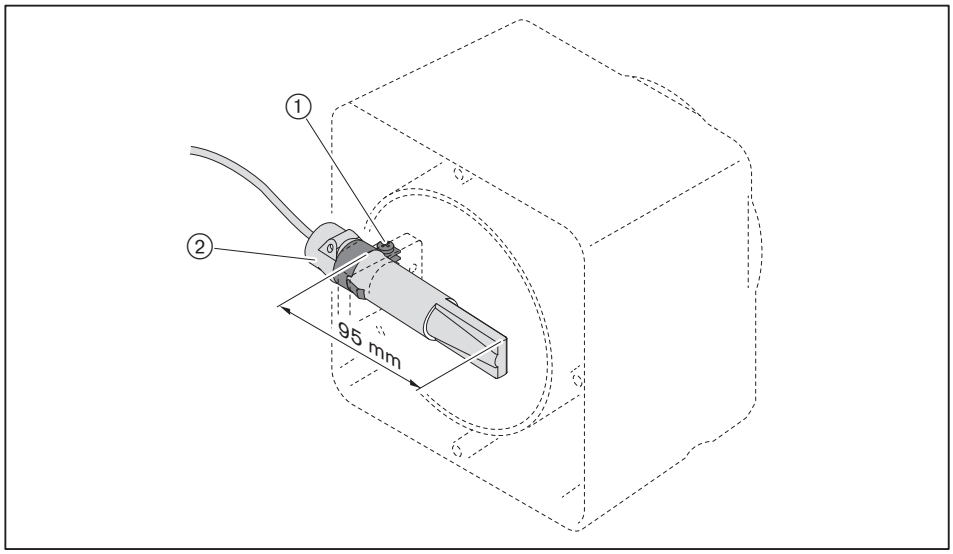
① Replacement fuse

9.18 Set flame senor RAR9 (optional)

Only in conjunction with continuous operation.

Observe notes on servicing [ch. 9.1].

- ► Remove flame sensor.
- ► Undo screw ①.
- ► Set flame sensor ②.
- ► Tighten screw ①.

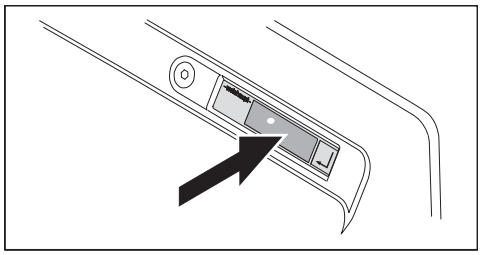


10 Troubleshooting

10.1 Procedures for fault conditions

The combustion manager recognises irregularities of the burner and displays these on the display.

The following conditions can occur:
- Display off [ch. 10.1.1]
- Display OFF [ch. 10.1.2]
- Display flashes [ch. 10.1.3]



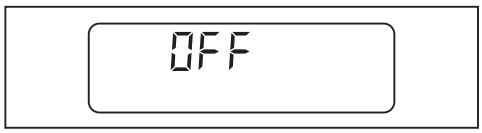
10.1.1 Display off

The following faults may be corrected by the operator:

Fault	Cause	Rectification
Burner not operating	External fuse has tripped(1	▸ Check fuse.
	Heating switch is set to Off	▸ Switch on heating switch.
	Temperature limiter or pressure limiter on heat exchanger has triggered(1	▸ Reset temperature limiter or pressure limiter on heat exchanger.
	Low water safety interlock on heat exchanger has triggered(1	▸ Top up water. ▸ Reset low water safety interlock on heat exchanger.

(1 Notify your heating contractor or Weishaupt Customer Service if the problem occurs repeatedly.

10.1.2 Display OFF

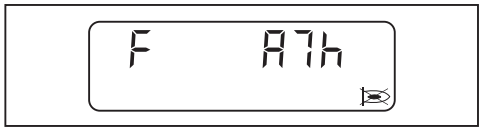


The following faults may be corrected by the operator:

Fault	Cause	Rectification
Burner not operating	Temperature regulator or pressure regulator on heat exchanger has been set incorrectly	▸ Adjust temperature regulator or pressure regulator on heat exchanger.
	Boiler or heating circuit control is not functioning or has not been set correctly	▸ Check function and setting of boiler or heating circuit control.

10.1.3 Display flashes

A burner fault has occurred. The burner is in lockout. The error code is displayed flashing.



- ► Read error code, e. g. `A7h`.
- ► Rectify cause of fault [ch. 10.2].

Reset

WARNING

Danger resulting from incorrect fault repair
Incorrect fault repair can cause damage to the equipment and injure personnel.
- ► Do not carry out more than 2 lockout resets successively.
- ► Faults must be rectified by qualified personnel.

- ► Press [Enter].
- ✓ Burner has been reset.

Fault memory

The last 9 faults are saved in the fault memory [ch. 6.2.2].

10.1.4 Detailed fault codes

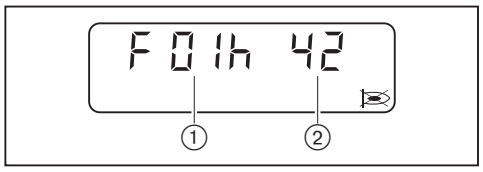
Additional information, which breaks down the error in more detail, can be displayed by pressing a button.

The first detailed fault code and the second detailed fault code are only relevant for the following faults:

- 03h
- 18h
- 41h
- 65h

1. detailed error codes / operating status

► Press [+] key.



① First detailed fault code

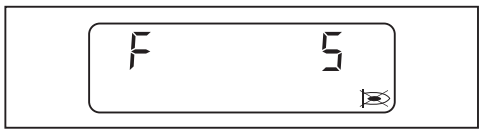
② Operating status

Second detailed fault code

► Press [–] and [+] keys simultaneously.

Repetition counter

► Press key [G].



10.2 Rectifying faults

Faults must only be rectified by qualified personnel:

Fault codes	Cause	Rectification
01h … 02h 05h … 0bh 0Eh … 10h 13h … 15h 17h 19h … 1Ch 1Eh 43h 45h 50h 56h 69h … A0h A4h … A5h ACh b0h … b2h b9h	Internal unit fault	▶ Interrupt the voltage supply temporarily ▶ Reset the burner, if fault reoccurs replace the combustion manager [ch. 9.16]

Faults must only be rectified by qualified personnel:

Fault codes	Cause	Rectification
03h	First detailed fault code: 09h Ambient temperature too high	▶ Interrupt the voltage supply temporarily ▶ Check ambient temperature [ch. 3.4.3] ▶ Reset the burner, if fault reoccurs replace the combustion manager [ch. 9.16]
	Internal unit fault	▶ Interrupt the voltage supply temporarily ▶ Reset the burner, if fault reoccurs replace the combustion manager [ch. 9.16]
04h	More than 5 resets in the last 15 minutes	▶ Press and hold reset key for 5 seconds. ✓ Display flashes. ▶ Reset burner
0Ch	Burner configuration incorrect	▶ Check burner configuration ▶ Check values in parameter level [ch. 6.2.3] ▶ Check parameter E0 … E4 [ch. 6.2.4]
	Pre-purge phase less than 5 seconds (sum from parameters 60 and 61).	▶ Increase pre-purge phase (only possible with VisionBox).
11h	Low voltage	▶ Check voltage supply
12h	Voltage supply was temporarily interrupted	▶ Check voltage supply
16h	Communication with TWI interface (VisionBox) incorrect	▶ Plug in and unplug participants on the TWI Bus only when de-energised ▶ Reduce the number of participants on the TWI Bus ▶ Reduce cable length

10 Troubleshooting

Faults must only be rectified by qualified personnel:

Fault codes	Cause	Rectification
18h	Switch off via PC Software	–
	Second detailed fault code: A1h Invalid Bus address	▶ Check Bus address
	Second detailed fault code: A5h Configuration at output B4 incorrect	▶ Check configuration at output B4
	Second detailed fault code: A6h No keystrokes where made for 30 minutes in the setting mode	–
	Second detailed fault code: A7h Off function was activated	–
	Second detailed fault code: A8h No calibration values were stored in the EEPROM	–
	Second detailed fault code: A9h No Bus connection	▶ Check Bus connection
	Second detailed error code: AAh Communication to the expansion module failed	▶ Interrupt the voltage supply temporarily ▶ Check analogue module or Fieldbus module slot.
	Second detailed fault code: C1h Operating mode O_2 trim not permitted	▶ Check operating mode O_2 trim [ch. 6.2.3].
	Second detailed fault code: 01h … 1Bh Internal unit fault	▶ Interrupt the voltage supply temporarily ▶ Reset the burner, if fault reoccurs replace the combustion manager [ch. 9.16]
	Second detailed fault code: E1h … E7h Calibration values in EEPROM incorrect	–
	Second detailed fault code: EEh Communication to W-FM25 failed	–
	Second detailed fault code: EFh Extension module to W-FM25 not compatible	▶ Check version
1dh	EMC interference	▶ Optimise EMC measures.
40h	Speed standardisation outside of limits set	▶ Carry out speed standardisation
41h	First detailed fault code: 01h Speed differs for too long	▶ Check parameters 44 and 45
	First detailed fault code: 02h Speed difference is too great	▶ Check speed signal
	First detailed fault code: 03h Speed setting value outside of tolerance for too long	▶ Re-adjust burner ▶ Check parameters 44 and 45
42h	Speed signal (Namur) not plugged in	▶ Plug in speed signal
44h	Operating points were changed without approval	▶ Re-adjust burner
	Parameter E3 set incorrectly	▶ Check parameter E3 [ch. 6.2.4].
	Parameter 46 was changed and speed was not re-standardised	▶ Re-adjust burner
46h	Rotational direction of burner incorrect	▶ Check rotation direction of burner motor
47h	Type of air actuator invalid	▶ Check parameter 34 (only possible with VisionBox).

Faults must only be rectified by qualified personnel:

Fault codes	Cause	Rectification
48h	Tolerance fault actuator	▶ Check freedom of movement of air damper and / or angle drive ▶ Replace actuator [ch. 9.14]
49h	Actuator does not drive to reference point correctly	▶ Check freedom of movement of air damper and / or angle drive ▶ Replace actuator [ch. 9.14]
4Ah	Set parameter E0 to 1 and plug in coded plug	▶ Check parameter E0 [ch. 6.2.4].
63h	Speed learning curve incorrect	▶ Re-adjust burner
65h	First detailed fault code:00h Tolerance fault air actuator or frequency convertor	▶ Check freedom of movement of air damper and / or angle drive ▶ Replace actuator [ch. 9.14] ▶ Check frequency convertor or fan, replace if necessary
	First detailed fault code: 01h Tolerance fault air actuator	▶ Check freedom of movement of air damper and / or angle drive ▶ Replace actuator [ch. 9.14]
	First detailed fault code: 02h Tolerance fault frequency convertor	▶ Check frequency convertor or fan, replace if necessary
	First detailed fault code: 04h Tolerance fault air actuator or frequency convertor	▶ Check freedom of movement of air damper and / or angle drive ▶ Replace actuator [ch. 9.14] ▶ Check frequency convertor or fan, replace if necessary
	First detailed fault code: 05h Tolerance fault air actuator	▶ Check freedom of movement of air damper and / or angle drive ▶ Replace actuator [ch. 9.14]
	First detailed fault code: 06h Tolerance fault frequency convertor	▶ Check frequency convertor or fan, replace if necessary
	First detailed fault code: 07h Time run out during speed standardisation Time in setting mode run out	▶ Press [+] key within 20 seconds during speed standardisation ▶ Press key within 30 minutes in setting mode
67h	Flame sensor short circuit	▶ Replace flame sensor
A2h	Safety circuit is open	▶ Check safety circuit
A6h	Flame simulation/extraneous light	▶ Find and eliminate extraneous light source ▶ Check flame sensor
A7h	No flame signal after safety time	▶ Check oil nozzles, if necessary replace ▶ Set ignition electrodes [ch. 9.6] ▶ Check the ignition unit and replace if necessary ▶ Check solenoid valve coil and cable, replace if necessary ▶ Check flame sensor and cable, if necessary replace ▶ Check mixing pressure, if necessary reduce ▶ Check burner setting ▶ Replace combustion manager [ch. 9.16]
A8h	Flame failure during operation	▶ Check burner setting ▶ Check oil supply ▶ Check oil nozzles, if necessary replace ▶ Check flame sensor, if necessary replace
A9h	Flame failure during stabilisation time	▶ see A7h

10 Troubleshooting

Faults must only be rectified by qualified personnel:

Fault codes	Cause	Rectification
AAh	Switch contact of air pressure switch not in Standby	▶ Check air pressure influences ▶ Check air pressure switch setting ▶ Check air pressure switch and cable, replace if necessary ▶ Replace combustion manager [ch. 9.16]
Abh	Air pressure switch does not react	▶ Check air pressure switch setting ▶ Check hoses on air pressure switch ▶ Check air pressure switch and cable, replace if necessary ▶ Check burner motor and cable, replace if necessary [ch. 9.12]
bAh	Flame simulation/extraneous light at start-up	▶ Find and eliminate extraneous light source ▶ Check flame sensor
bbh	Burner shutdown via contact X3:7 (plug No. 7)	–
CCh	Oil pressure switch does not switch	▶ Check oil supply ▶ Check oil pump, if necessary replace ▶ Check oil pressure switch and cable, if necessary replace ▶ Check burner motor and cable, replace if necessary [ch. 9.12]
Cdh	Air pressure switch 2 does not react	▶ Check air pressure switch setting ▶ Check hoses on air pressure switch ▶ Check air pressure switch and cable, replace if necessary
CEh	Bridging plug No. 15 is missing	▶ Plug in bridging plug
CFh	No start release (X3:14)	▶ Check start release
d1h	Connection to actuator faulty	▶ Rectify the fault using the following procedure: ▪ Interrupt voltage supply. ▪ Plug in plug on combustion manager correctly ▪ Fit W-FM cover [ch. 3.3.5].
	Coded plug on actuator slot missing	▶ Plug in coded plug
	Parameter E0 not configured correctly	▶ Check configuration of parameter E0 see [ch. 6.2.4].
d2h	More than 5 resets in the past 15 minutes by remote reset (X3:14)	▶ Rectify cause of fault ▶ Reset via operating panel on burner. ▶ Press and hold reset key for 5 seconds. ✓ Display flashes. ▶ Reset burner
d4h	External voltage at operating signal X7:B5	▶ Find and eliminate external voltage source
	Internal unit fault	▶ Interrupt the voltage supply temporarily ▶ Reset the burner, if fault reoccurs replace the combustion manager [ch. 9.16]

10.3 Operating problems

Faults must only be rectified by qualified personnel:

Observation	Cause	Rectification
Poor start behaviour of burner	Mixing pressure too high	▸ Correct mixing pressure in ignition load, if necessary set P0 different to P1
	Ignition electrodes set incorrectly	▸ Set ignition electrodes [ch. 9.6]
	Mixing head set incorrectly	▸ Set mixing head [ch. 9.8]
Oil pump makes severe mechanical noise	Oil pump sucks air	▸ Ensure oil supply is tight
	Suction resistance in oil line too high	▸ Clean filter ▸ Check oil supply
Oil nozzle atomisation uneven	Nozzle blocked/soiled	▸ Replace nozzle [ch. 9.4]
	Nozzle worn	
Flame tube/diffuser has heavy soot deposit	Oil nozzle defective	▸ Replace nozzle [ch. 9.4]
	Mixing head set incorrectly	▸ Set mixing head [ch. 9.8]
	Incorrect combustion air quantity	▸ Adjust burner
	Boiler room ventilated insufficient	▸ Ensure sufficient boiler room ventilation
	Wrong oil nozzle	▸ Check nozzle type [ch. 4.2]
Combustion pulsating and/or burner booming	Mixing head set incorrectly	▸ Set mixing head [ch. 9.8]
	Incorrect combustion air quantity	▸ Adjust burner
	Wrong oil nozzle	▸ Check nozzle type [ch. 4.2]
CO content too high	Nozzle distance too big	▸ Check nozzle distance, adjust if necessary [ch. 9.8]
Stability problems	Nozzle distance incorrect	▸ Check nozzle distance, adjust if necessary [ch. 9.8]
	Wrong oil nozzle	▸ Check nozzle type [ch. 4.2]
No display at operating panel	Plug from operating panel not properly plugged in	▸ Plug in plug on combustion manager correctly
	Operating panel defective	▸ Replace operating panel
Flame sensor LFS1 (optional) flashes green	Burner operation with weak flame signal (< 10 µA)	▸ Decrease mixing pressure ▸ Increase diffuser setting (increase air gap between flame tube and diffuser) ▸ Fit larger nozzle and reduce pump pressure. ▸ Check setting dimension flame sensor RAR9 [ch. 9.18], adjust if required. ▸ Check combustion head extension, maximal 200 mm.

11 Technical documentation

11.1 Program sequence

The exact operating status of the combustion manager can also be displayed.
Activate operating status [ch. 6].

Operating phase	Operating status	Condition / function
F ..	00	Fault present
OFFUPr	01	Unprogrammed condition or programming not completed
OFF	02	Standby, no heat demand
1	03	Extraneous light check
2	04	Shutdown check air pressure switch
	05	Initialisation W-FM
	06	Waiting for start release / waiting time O_2 trim
	07	Internal sequence
	08	Driving air damper actuator to pre-purge
3	09	Waiting for speed standardisation confirmation
	10	Start burner motor and ignition oil operation
	11	Waiting for air pressure
4	12	Pre-purge
	13	Internal sequence
5	14	Driving to ignition position
6	15	Waiting time in ignition position.
	16	Waiting time in ignition position.
7	17	First safety time - fuel release
	18	First safety time - flame detection
8	19	First stabilisation time
	20	Stop setting mode: P0 -A
	21	Second safety time
	22	Second stabilisation time
	23	End setting mode: P0 -B
9	24	Driving to air damper setting stage 1 (operating point P1)
10	25	Operation (load control is activated)
15	26	Internal sequence
	27	Driving to stage 1
	28	Close fuel valves
	29	Internal sequence
	30	Start post burn time / post-purge
	31	Post-purge contact dependent (X3:14)
	32	Post burn time
16	33	Restart interlock
L	40	Reference search air damper actuator
	42	Drive to Standby position
	43	Internal sequence
OFF S	46	Safety circuit open (X3:7)

11.2 Conversion table unit of pressure

Bar	Pascal			
	Pa	**hPa**	**kPa**	**MPa**
0.1 mbar	10	0.1	0.01	0.00001
1 mbar	100	1	0.1	0.0001
10 mbar	1 000	10	1	0.001
100 mbar	10 000	100	10	0.01
1 bar	100 000	1 000	100	0.1
10 bar	1 000 000	10 000	1 000	1

12 Project planning

12.1 Oil supply

EN 12514-2, DIN 4755, Tyrol, work sheet DWA-A 791 (TRwS 791) and observe the local regulations.

General information relating to the oil supply

- Do not use cathode protection system with steel tanks.
- With oil temperatures < 5 °C the separation of paraffin can cause oil lines, oil filters and nozzles to be come blocked. Avoid placing oil tanks and pipelines in areas subject to frost.
- The oil supply should be installed in such a way that the oil hoses can be connected free of tension.
- Fit oil filter in front of pump, maximum mesh aperture 70 µm.

Suction resistance and supply pressure

NOTICE

Pump damage due to excessive suction resistance
A suction resistance greater than 0.4 bar can damage the pump.
► Reduce suction resistance – or – install oil supply pump or suction unit, whilst observing the maximum supply pressure at the oil filter.

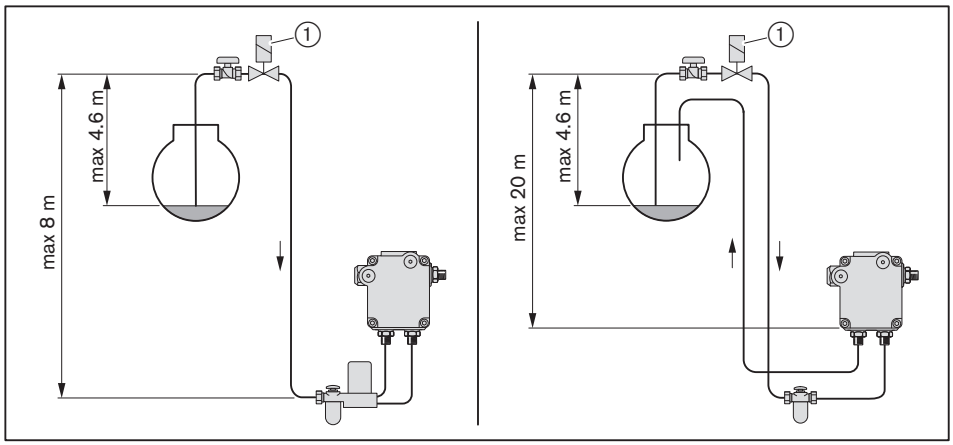
The suction resistance depends on:
- suction line length and diameter
- pressure loss of oil filter and other components
- lowest oil level in the oil storage tank (max 3.5 m below the oil pump)

If an oil feeder pump is installed:
- max 1.5 bar flow pressure at oil filter
- max 0.7 bar flow pressure upstream of automatic de-aerator

Elevated oil level

- If the suction line is leaking the tank can be siphoned dry. An electric anti siphon valve ① can prevent this.
- Observe manufacturers instructions regarding pressure loss caused by anti siphon valve.
- The anti siphon valve must close with a delay and show a pressure relief towards the oil storage tank.

Maintain height differences:
- max 4.6 m between oil level and anti siphon valve
- on single pipe system max 8 m between anti siphon valve and automatic de-aerator
- on two pipe system max 20 m between anti siphon valve and oil pump

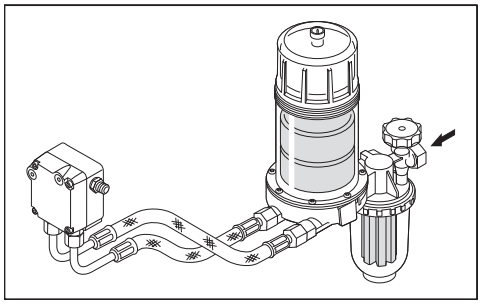


Single pipe oil supply

NOTICE

Damage to the oil pump due to incorrect connection
Mixing up supply and return can damage the oil pump.
► Ensure correct connection of oil hoses to the supply and return of the pump.

On single pipe systems, an automatic de-aerator must be fitted in front of the oil pump.



Two pipe system

In a two pipe system the oil pump is vented automatically.

Ring main operation

Weishaupt recommends the use of a ring main when operating several burners.

12.2 Continuous running fan or post-purge

WARNING

Fire hazard due to failure of the combustion air fan
Failure of the combustion air fan (e.g. due to a power failure or defective motor) during operation with continuous running fan or increased post-purge may result in back radiation or hot flue gases flowing back into the burner housing. This could cause a fire.

If fail-safe continuous ventilation or post-purge is required, take appropriate measures, such as:

- ► installing compressed air flushing on site with:
  - sufficiently large compressed air tank
  - normally open compressed air valve

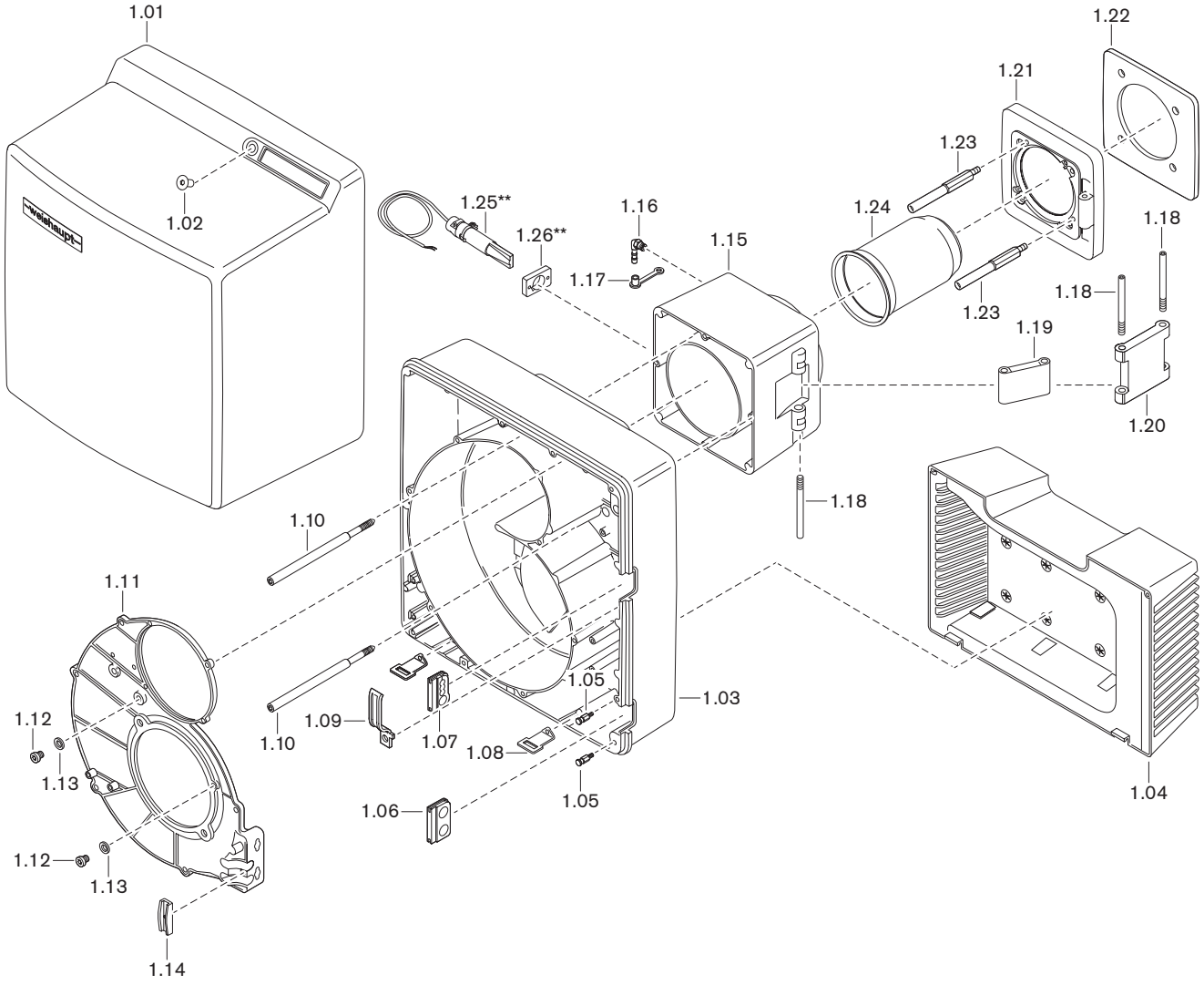
12.3 Additional requirements

Additional requirements for burners for liquid and gaseous fuels to EN 267:
- the pressure equipment operates in accordance with the Pressure Equipment Directive 2014/68/EU
- as a component of an industrial thermo-processing system to EN ISO 13577-2
- on steam and hot-water water-tube boilers to EN 12952-8

2014/68/EU	EN ISO 13577-2	EN 12952-8	Components	Requirement
X			Burner control, combustion manager	Designed for continuous operation greater than 1200 kW
		X	Flame monitor, flame sensor	self-checking
X			Control device air/fuel ratio	ISO 23552-1
X	X	X	Air monitoring device	Min. air pressure switch to EN 1854
X(2	X	X	Monitoring device minimum fuel pressure	Minimum oil pressure switch
X	X	X	Monitoring device maximum fuel pressure	Max. oil pressure switch(1
		X	Oil solenoid valve	2 x flow, 2 x return, ISO 23553-1
	X		Manual shut off device for all fuels	Ball valve
	X		Safety devices for save operation	Connected to the input of the combustion manager in the closed circuit current principle
		X	Electrical equipment	EN 50156

(1 Only for burners with return flow nozzle.
(2 Only for continuous operation without monitoring.

13 Spares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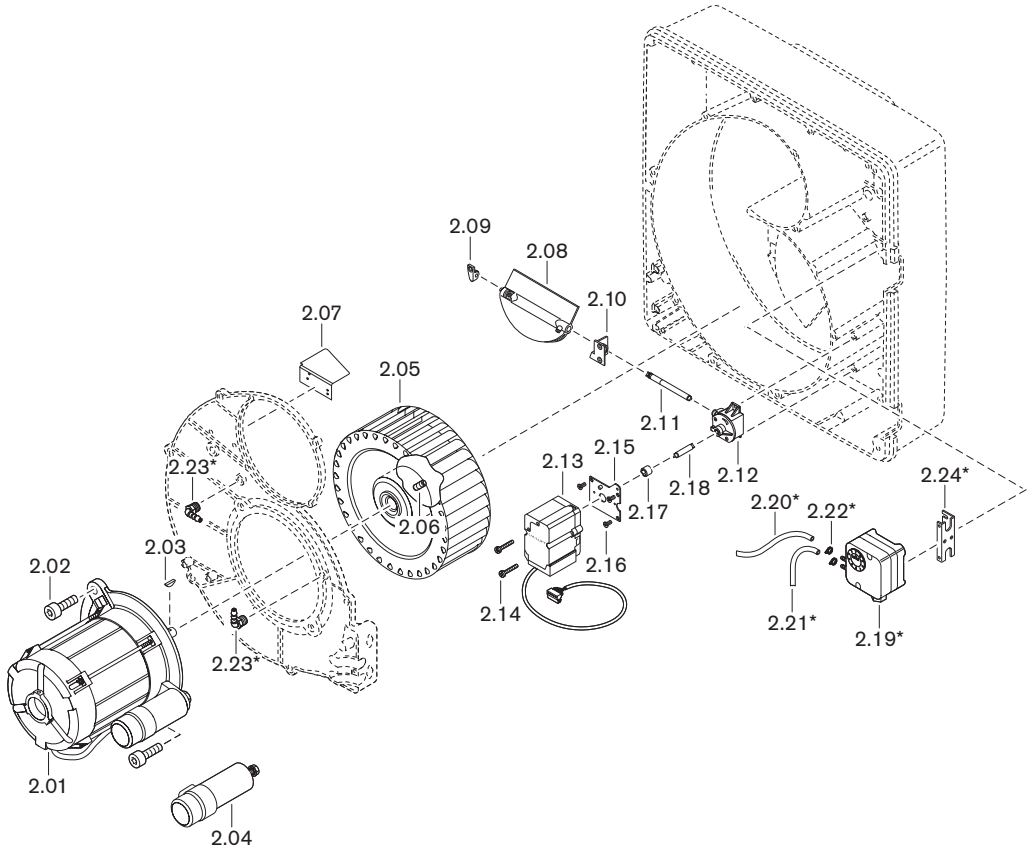
13 Spares

Pos.	Description	Order No.
1.01	Cover	241 310 01 112
1.02	Screw M8 x 16 ISO 10642	404 412
1.03	Burner housing	241 310 01 017
1.04	Intake housing complete	241 310 01 082
	– Screw 4 x 22 Torx-Plus Remform	409 307
1.05	Hanging bolt	241 400 01 327
1.06	Grommet for oil hose	241 400 01 177
1.07	Grommet for connection cable	241 200 01 247
1.08	Mounting bracket for cover	241 400 01 207
1.09	Clamp	241 400 01 357
1.10	Screw M8 burner housing	241 310 01 257
1.11	Housing cover	241 310 01 037
1.12	Screw G$^{1}/_{8}$A DIN 908	409 004
1.13	Sealing ring 10 x 13.5 x 1.5 DIN 7603	441 033
1.14	Bracket for oil hose	241 400 01 367
1.15	Intermediate flange	241 310 01 047
1.16	Threaded socket R$^{1}/_{8}$ WES6	453 010
1.17	Protective cap DN 6 SELF 50/2 CF	232 300 01 047
1.18	Pin M12 x 110	241 310 01 267
1.19	Joint 70 x 59.75	241 310 01 067
1.20	Joint 87.9 x 110	241 310 01 077
1.21	Burner flange	241 310 01 057
	– Screw ISO 4762 M8 x 30- 8.8	402 517
	– Washer A8.4 DIN 125	430 506
1.22	Flange gasket 8 x 219.5 x 219.5	241 310 01 147
1.23	Stay bolt M10 x 90 burner flange	241 310 01 247
1.24	Flame tube WL30/1-C Z-1LN-A	
	– Standard	241 310 14 242
	– extended by 100 mm*	240 310 14 172
	– extended by 200 mm*	240 310 14 182
	– Screw M5 x 12 Combi-Torx-Plus 20IP	409 247
	– Washer 5.5 x 12 oval	241 400 14 077
1.25	Flame sensor RAR9**	240 310 12 222
1.26	Flange for RAR9**	600 602

* Only in conjunction with combustion head extension.
** Only in conjunction with continuous operation.

13 Spares

Burner without variable speed drive

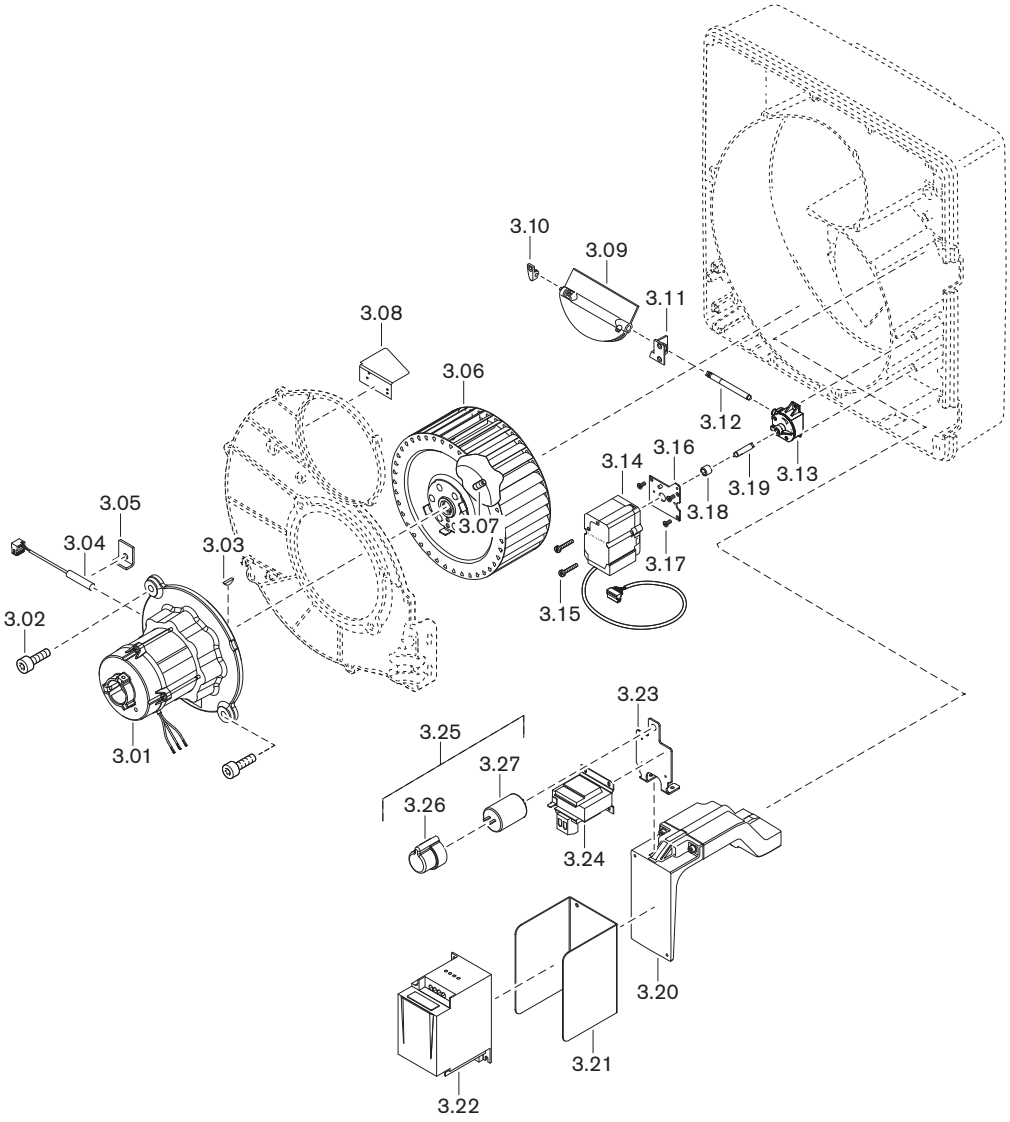


Pos.	Description	Order No.
2.01	Motor ECK05/W-2 230V 50Hz with cable	240 310 07 032
	– Ball bearing 6202LLUC3 NTN BQH 72-102	460 134
2.02	Screw ISO 4762 M8 x 20- 8.8	402 511
2.03	Shaft key 4 x 5 DIN 6888	490 154
2.04	Capacitor set 12.0 µF 420 V	713 478
2.05	Fan wheel TLR-S 180 x 71.6-L S1 50-60Hz	241 310 08 022
2.06	Grub screw M8x8 w. ann. cut. edge (Tuflok)	420 550
2.07	Air guide	232 400 01 047
2.08	Air damper complete	241 310 02 162
2.09	Bearing left	241 400 02 037
2.10	Bearing right with bearing bush	241 210 02 032
2.11	Shaft air damper - angle drive	241 310 02 147
2.12	Angle drive	241 110 02 062
2.13	Air actuator STE 4.5 24 V	651 103
2.14	Screw M4 x 30 Torx-Plus metric	409 245
2.15	Fixing plate	241 400 02 222
2.16	Screw M4 x 10 Torx-Plus 20IP	409 236
2.17	Guide sleeve	241 400 02 207
2.18	Shaft angle drive - actuator	241 310 02 157
2.19	Pressure switch LGW 10 A2 1 - 10 mbar*	691 370
2.20	Hose 4.0 x 1.75 220 mm*	232 050 24 067
2.21	Hose 4.0 x 1.75 140 mm*	232 050 24 047
2.22	Hose clamp 7.5*	790 218
2.23	Threaded socket R⅛ WES4*	453 003
2.24	Pressure switch bracket*	230 200 24 017

* Only in conjunction with air pressure switch.

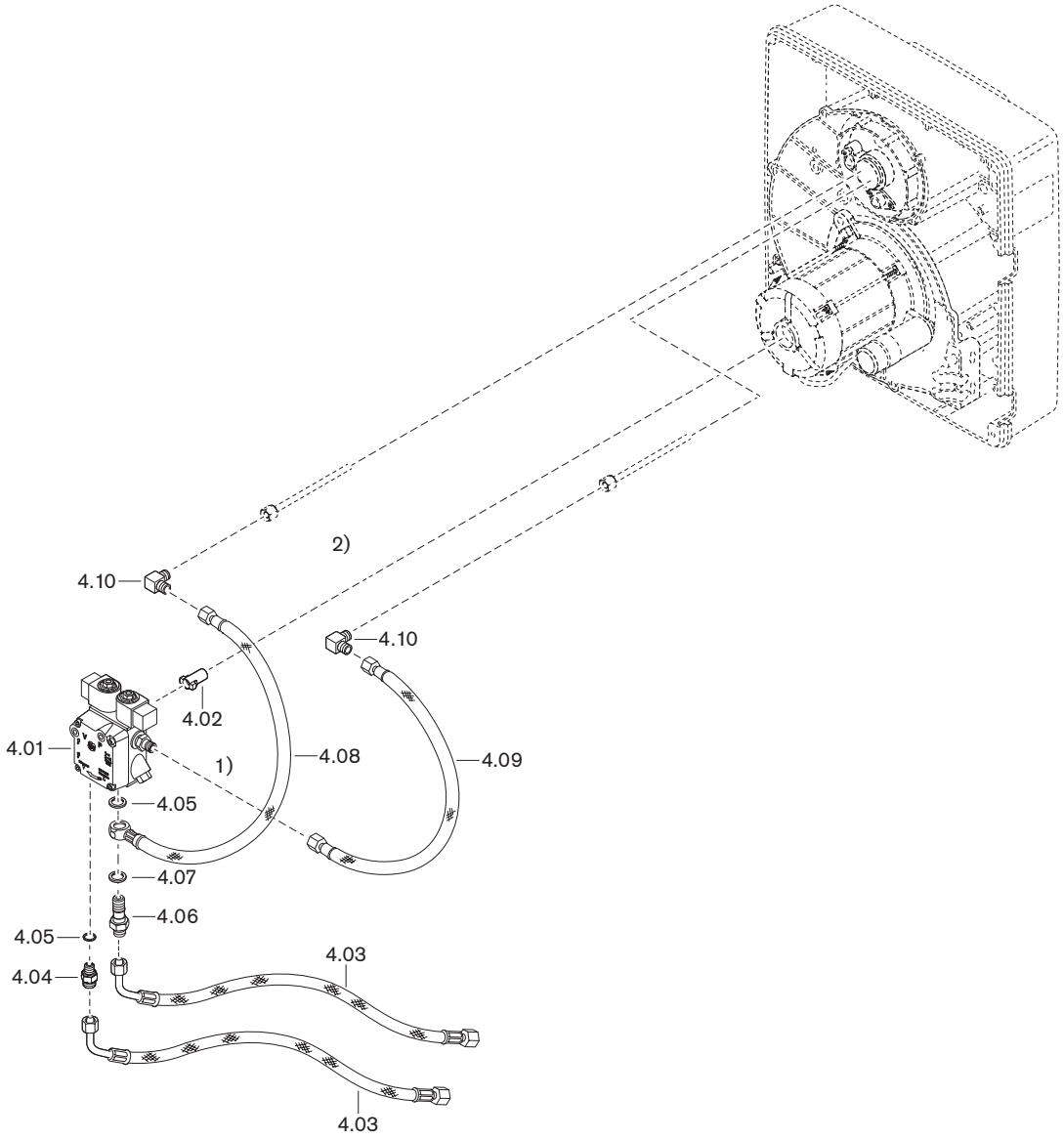
13 Spares

Burner with variable speed drive



Pos.	Description	Order No.
3.01	Motor W-PM05 S-4 complete	232 310 07 182
	– Motor W-PM05 S-4	652 164
	– Ferrite sleeve WE 19 x 11.5 x 50.8	737 036
3.02	Screw ISO 4762 M8 x 20- 8.8	402 511
3.03	Shaft key 4 x 5 DIN 6888	490 154
3.04	VSD sensor KJ1.5 motor W-PM63 complete	230 310 12 782
3.05	Clamping piece	218 104 14 247
	–Screw M5 x 12 Torx-Plus 20IP	409 239
3.06	Fan wheel VSD TLR-S 180 x 71.6-L S1	230 310 08 012
3.07	Grub screw M8x8 w. ann. cut. edge (Tuflok)	420 550
3.08	Air guide	232 400 01 047
3.09	Air damper complete	241 310 02 162
3.10	Bearing left	241 400 02 037
3.11	Bearing right with bearing bush	241 210 02 032
3.12	Shaft air damper - angle drive	241 310 02 147
3.13	Angle drive	241 110 02 062
3.14	Air actuator STE 4.5 24 V	651 103
3.15	Screw M4 x 30 Torx-Plus metric	409 245
3.16	Fixing plate	241 400 02 222
3.17	Screw M4 x 10 Torx-Plus 20IP	409 236
3.18	Guide sleeve	241 400 02 207
3.19	Shaft angle drive - actuator	241 310 02 157
3.20	Bracket complete for frequency convertor	230 310 01 072
3.21	Shielding plate FC	232 310 12 037
3.22	Frequency convertor parameterised	232 310 12 092
3.23	Fixing plate for power choke	232 310 12 027
3.24	Choke coil	710 614
3.25	Capacitor set 6.0 Fu 420 V 2.8	713 475
3.26	Protective cap capacitor	713 485
3.27	Capacitor	713 511

13 Spares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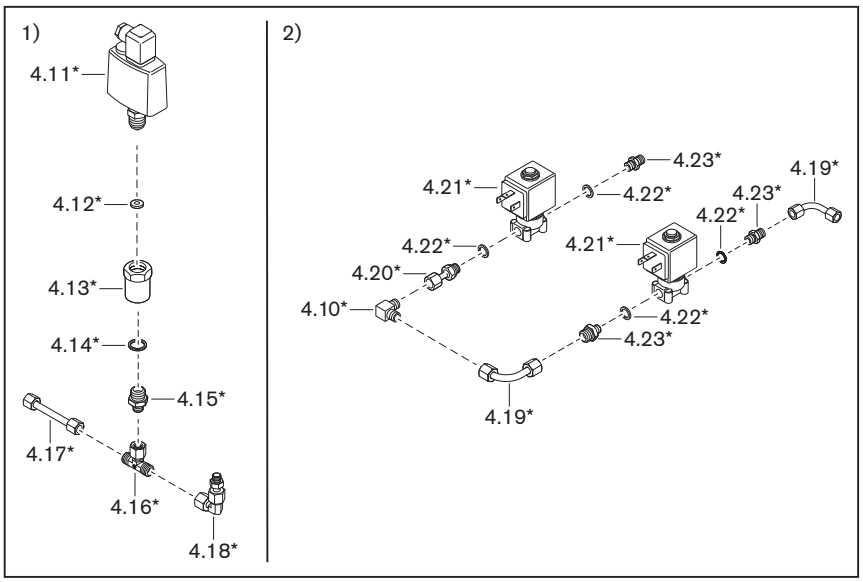
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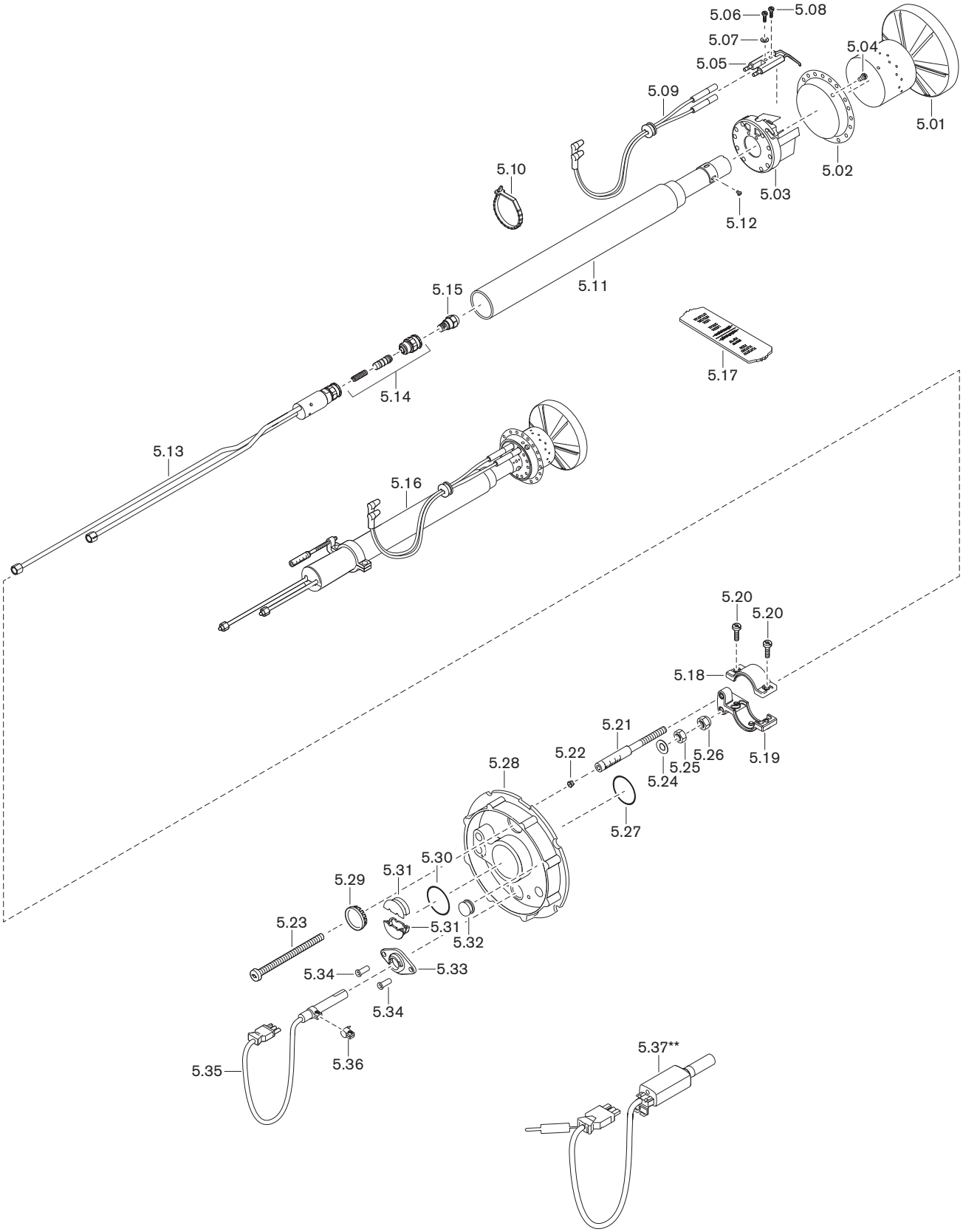
13 Spares

Pos.	Description	Order No.
4.01	Pump AT2V55CK 9605 4P0700	601 866
	– Solenoid coil T80 Suntec 220-240 V 50-60 Hz	604 495
	– Filter set with cover seal	601 107
4.02	Plug coupling	
	– for motor ECK…	652 135
	– for motor W-PM…	652 161
4.03	Oil hose	
	– Standard (DN 8, 1200 mm)	491 128
	– Fuel GF-B30 (DN 8 x 1300 mm PTFE)**	491 320
	– Fuel GF-B30 (DN 8, 10 bar, 1200 mm)**	491 328
4.04	Screwed union 24-SDSX-LL08-G⅛A-ST-CH60	452 292
4.05	Sealing ring A13.5 x 17 x 1.5 DIN 7603 Cu	440 010
4.06	Swivel screw G¼ x M12 x 1	241 400 06 097
4.07	Sealing ring A14 x 20 x 1.5 DIN 7603 Cu	440 041
4.08	Pressure hose DN 4 x 410	
	– Standard	491 248
	– Fuel GF-B30**	491 282
4.09	Pressure hose DN 4, 380 mm, 6-LL/M10 x 1	491 130
4.10	Screwed union 24-EX-LL06-P-ST	452 050
4.11	Pressure switch DSF 158 F001 0-25 bar*	640 109
4.12	Sealing ring C6.2 x 17.5 x 2 DIN16258 Cu*	440 007
4.13	Threaded socket IG ¼" x IG ½" x 40*	290 504 13 037
4.14	Sealing ring A13.5 x 17 x 1.5 DIN 7603 Cu*	440 010
4.15	Screwed union 24-SDSX-L08-G¼A-ST-CH60*	452 264
4.16	Screwed union 24-SWT-L08-ST*	452 500
4.17	Oil line 8 x 1.0 x 70 pump-VZ08*	110 564 06 118
4.18	Elbow union complete DSF158*	240 310 13 062
4.19	Oil line 6 x 1.0 pump solenoid valve*	241 403 06 108
4.20	Threaded socket cpl. 6 x G⅛ x 35*	111 351 85 022
4.21	Solenoid valve 121Z2323 230V50Hz, 240V60Hz*	604 480
	– Solenoid coil 483764 T1 230V50Hz, 240V60Hz*	604 453
4.22	Sealing ring A10 x 13.5 x 1 DIN 7603 Cu*	440 027
4.23	Screwed union 24-SDSX-LL06-G⅛A-ST-CH60*	452 291

* Only in conjunction with min. oil pressure switch
** Green Fuels, see supplementary manual (Print No. 835910xx)

13 Spares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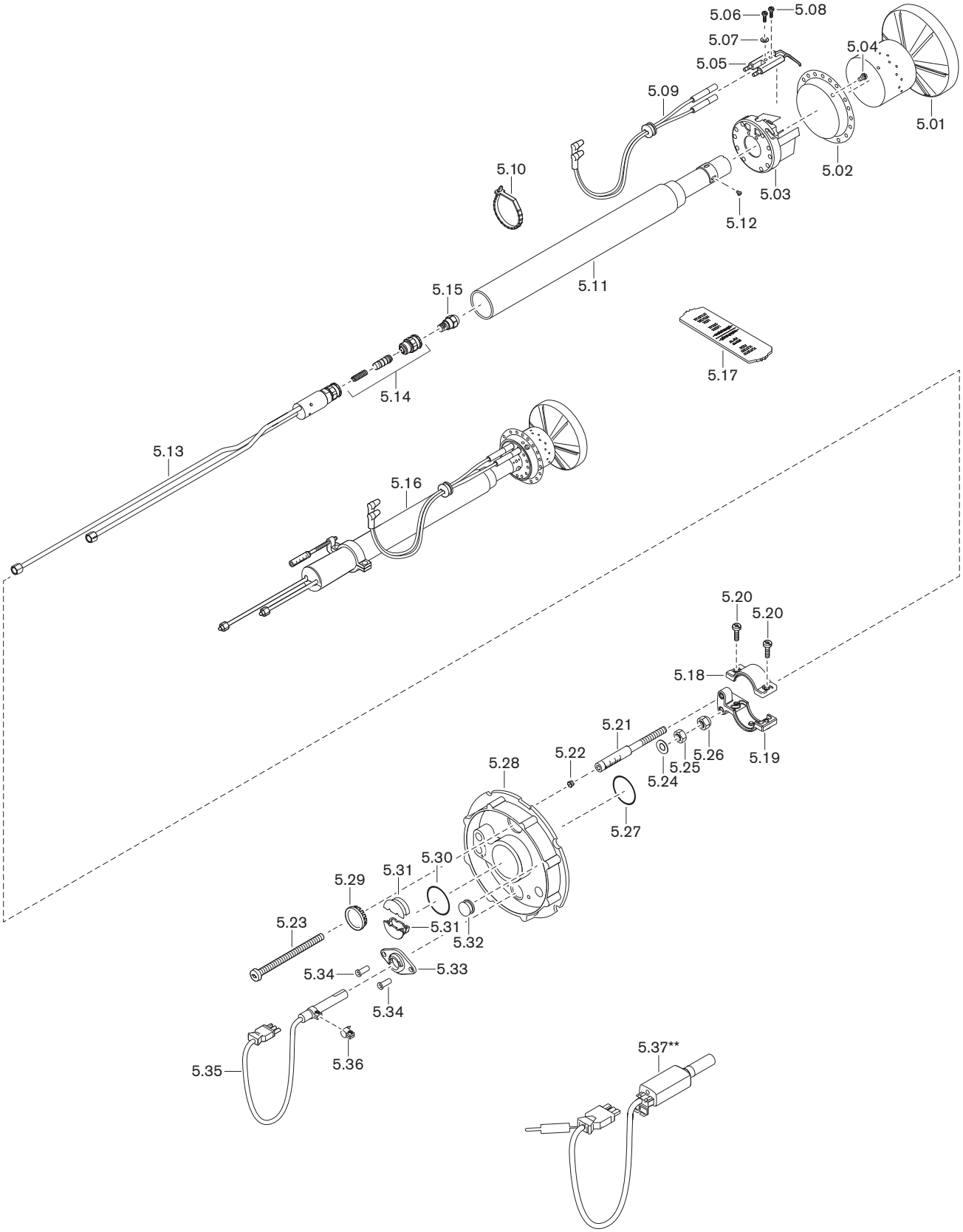
13 Spares

Pos.	Description	Order No.
5.01	Diffuser WL30/1-C Z-1LN-A	241 310 14 232
5.02	Aperture WL30/1-C Z-1LN-A	241 310 14 237
5.03	Ignition electrode holder WL30/1-C Z-1LN-A	241 310 14 222
5.04	Screw M4 x 6 Torx-Plus 20IP	409 362
5.05	Ignition electrode	241 300 10 187
5.06	Screw M4 x 10 Torx-Plus 20IP	409 236
5.07	Circlip S4	490 001
5.08	Screw M4 x 12 Torx-Plus 20IP	409 237
5.09	Ignition cable	
	– 600 mm (Standard)	241 310 11 042
	– 700mm (for 100 mm extension)*	241 400 11 042
	– 800mm (for 100 mm extension)*	240 310 11 092
5.10	Reopening belt 4.7 x 200	794 089
5.11	Guide tube	
	– Standard	241 310 10 042
	– extended by 100 mm*	241 400 10 042
	– extended by 200 mm*	240 400 10 072
5.12	Screw M4 x 6 Combi-Torx-Plus 20IP	409 362
5.13	Nozzle head with nozzle shut off	
	– Standard	241 310 10 212
	– extended by 100 mm*	240 310 10 042
	– extended by 200 mm*	240 310 10 112
5.14	Nozzle shut off set	240 100 10 042
5.15	Oil nozzle	
	– 1.65 gph 45°HF Fluidics	602 716
	– 1.75 gph 45°HF Fluidics	602 717
	– 2.00 gph 45°HF Fluidics	602 718
	– 2.25 gph 45°HF Fluidics	602 719
	– 2.50 gph 45°HF Fluidics	602 685
	– 2.75 gph 45°HF Fluidics	602 686
	– 3.00 gph 45°HF Fluidics	602 687
	– 3.50 gph 45°HF Fluidics	602 688
	– 4.00 gph 45°HF Fluidics	602 689
	– 4.50 gph 45°HF Fluidics	602 690
	– 5.00 gph 45°HF Fluidics	602 692
	– 1.65 gph 60°HF Fluidics	602 733
	– 1.75 gph 60°HF Fluidics	602 734
	– 2.00 gph 60°HF Fluidics	602 735
	– 2.25 gph 60°HF Fluidics	602 736
	– 2.50 gph 60°HF Fluidics	602 737
	– 2.75 gph 60°HF Fluidics	602 738
	– 3.00 gph 60°HF Fluidics	602 739
	– 3.50 gph 60°HF Fluidics	602 760
	– 4.00 gph 60°HF Fluidics	602 761
	– 4.50 gph 60°HF Fluidics	602 762
	– 5.00 gph 60°HF Fluidics	602 763

* Only in conjunction with combustion head extension.

13 Spares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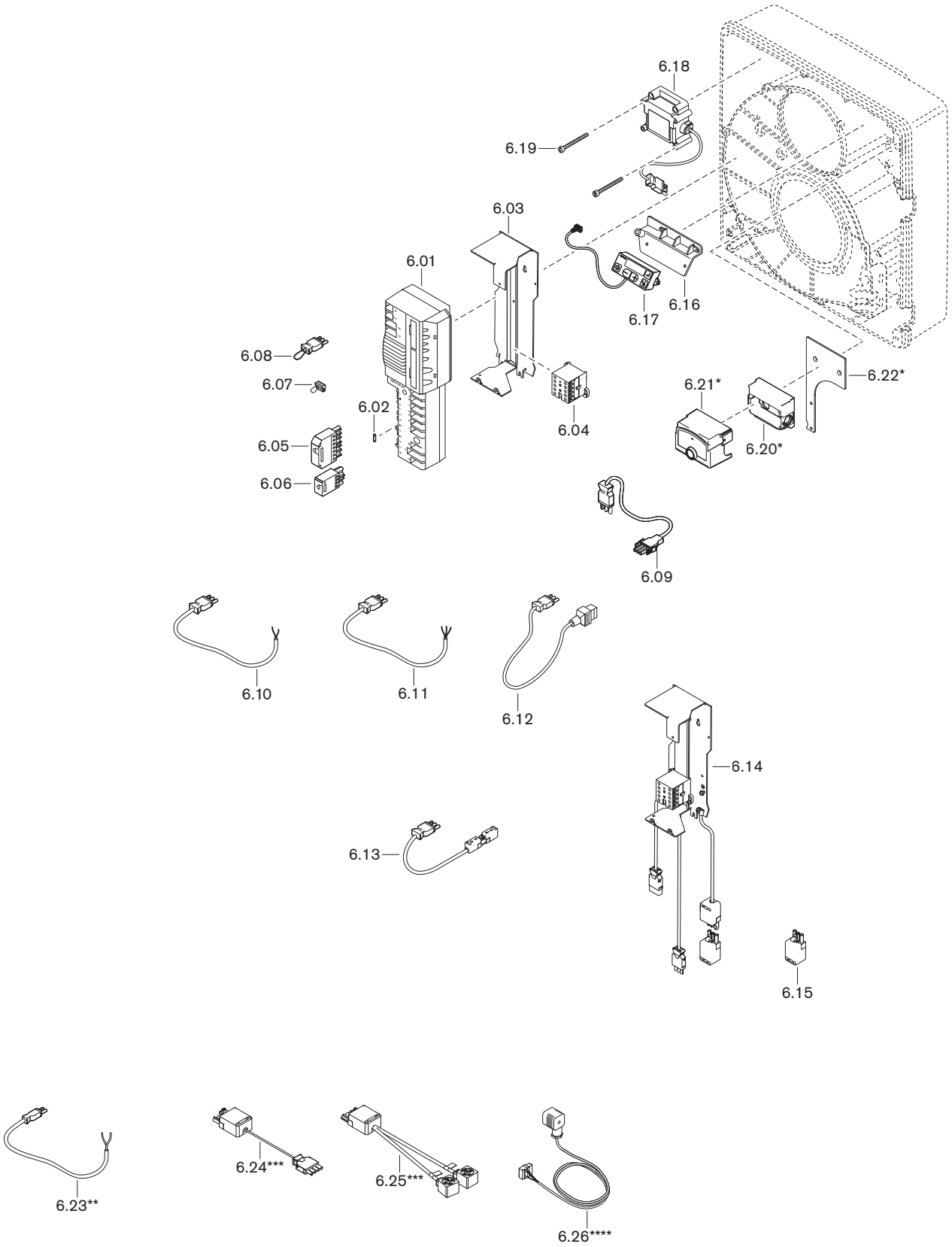
13 Spares

Pos.	Description	Order No.
5.16	Nozzle assembly complete WL30/1-C Z-1LN-A	
	– Standard	241 310 10 010
	– extended by 100 mm*	240 310 10 070
	– extended by 200 mm*	240 310 10 080
5.17	Setting gauge	241 110 00 017
5.18	Adjusting lever top part	241 400 10 077
5.19	Adjusting lever bottom part	241 400 10 067
5.20	Screw M4 x 12 Torx-Plus 20IP	409 237
5.21	Indicating bolt M6 x 90	241 110 10 097
5.22	Cap 5.25 natural	241 110 10 087
5.23	Adjusting screw M6 x 88	241 400 10 097
5.24	Spring washer A6 DIN 137	431 615
5.25	Hexagonal nut M6 ISO 4032	411 301
5.26	Hexagonal nut M6 DIN 985	411 302
5.27	O ring 42 x 3 NBR70 ISO 3601	445 128
5.28	Nozzle assembly cover complete	
	– for flame senor QRB4	241 310 01 152
	– for flame sensor KLC (fuel GF-P)**	240 310 01 112
5.29	View port glass	241 400 01 377
5.30	O ring 33.5 x 3.55 NBR70 ISO 3601	445 177
5.31	Bracket for oil lines	241 310 14 067
5.32	Shut off grommet	756 159
5.33	Flange	
	– for flame senor QRB4	600 682
	– for flame sensor KLC (fuel GF-P)**	600 637
5.34	Blind rivet F4 x 10 Al	426 331
5.35	Flame sensor QRB4A***	241 210 12 052
5.36	Strap AKG43 for QRB4	600 681
5.37	Flame sensor KLC (fuel GF-P)**	240 310 12 182
	– Ionisation cable No. 13	232 310 12 012
	– Extension No. 3 flame sensor KLC	240 310 12 192

* Only in conjunction with combustion head extension.
** Green Fuels, see supplementary manual (Print No. 835910xx)
*** Flame sensor QRB4 is not suitable for continuous operation.

13 Spares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13 Spares

Pos.	Description	Order No.
6.01	Combustion manager W-FM25 / 230 V	
	– intermittent operation with O_2 trim	600 491
	– Continuous operation with O_2 trim (PO-O2)	600 489
6.02	Micro fuse T6.3H, IEC 127-2/5	483 011 22 457
6.03	Bracket with carrier rail	232 310 12 022
6.04	Contactor B 6-30-10 220-240V	701 915
6.05	Plug unit ST18/7	716 549
6.06	Plug unit ST18/4	716 546
6.07	Coded plug 7 pole (black)	716 190
6.08	Intermediate plug No. 7	241 400 12 042
6.09	Plug cable No. 3 motor	241 050 12 062
6.10	Plug cable No. 3/N frequency convertor	230 310 12 122
6.11	Plug cable No. 3 motor supply (VSD)	230 310 12 142
6.12	Plug cable	
	– No. 1 stage 1 solenoid valve	241 400 12 052
	– No. 6 stage 2 solenoid valve	241 400 12 142
6.13	Plug cable No. 14 for remote reset	230 110 12 362
6.14	Contactor 230 V with bracket	230 310 12 512
6.15	Plug unit ST18/3	716 543
6.16	Fixing bracket	241 400 12 017
6.17	ABE for W-FM20 / 25 with 0.58 m cable	600 481
6.18	Ignition unit W-ZG01 230V 100VA Termal	603 201
6.19	Screw M4 x 42 Combi-Torx-Plus 20IP	409 260
6.20	Terminal socket AGK11.7 for LFS1*	600 678
6.21	Flame sensor LFS1.11A2 230V 50/60Hz*	600 674
6.22	Bracket for flame sensor LFS*	240 310 12 027
6.23	Plug cable No.11 for air pressure switch**	232 400 12 032
6.24	Adapter cable No.5 for branching***	230 310 12 152
6.25	Plug cable additional solenoid valve***	240 310 12 162
6.26	Plug cable No.12 for oil pressure switch****	240 310 12 072

* Only in conjunction with continuous operation.
** Only in conjunction with air pressure switch.
*** Only in conjunction with additional solenoid valve.
**** Only in conjunction with min. oil pressure switch

14 Notes

15 Key word index

T

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W

–weishaupt–

Max Weishaupt SE · 88475 Schwendi

Weishaupt close by? Addresses, telephone numbers etc. can be found at www.weishaupt.de

Das ist Zuverlässigkeit. C'est la fiabilité. That's reliability. Questa è affidabilità. 信頼性とは、ころいろものです。Това е надеждност. Ez a megbízhatóság. Đó là sự đáng tin cậy. تسا نانیمطلا تدابقا نیا To je zanesljivost. Güvence budur. Αυτό σημαίνει αξιοπιστία. 그것은 바로 신뢰성입니다. To je spoľahlivosť. Dat is betrouwbaarheid. Tämä on luotettavuutta. ةيقوقوثلا يه هذه See on usaldusväärsus. Pouzdana tvrtka. To jest niezawodność. นั่นคือความเชื่อถือได้ Це надійність. Isto é fiabilidade. To je spolehlivost. यही वशि्वसनीयता है. Det är pålitlighet. .זאת אמינות Esto es fiabilidad. Это надежность. Itulah kepercayaan. 值得信赖。 Is é sin iontaofacht. Iyan ang maaasahan. Aceasta este fiabilitatea. ۔ہے وشوسنیتا یہ Tai - patikimumas. Det er pålitelighet. Tā ir uzticamība. Sa se fyab. To je pouzdanost. La fiabilité avant tout. Det er pålidelighed.

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