

Operation and maintenance manual  
Burner models: GKP-50 MH - 90 MH  
Burner equipment: WD34



Read these instructions carefully before installation, use, or maintenance



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# 1 Introduction

## 1.1 Liability disclaimer

Burner, with the delivered ancillary equipment, is always a part of a larger system. This manual does not include comprehensive instructions for planning, installing and operating a complete system. Thus, the designer, installer and operator of the equipment should have sufficient qualifications and knowledge to design, install, and operate the parts of the system, as well as the system as a whole. The system, including burner control system, must be designed and constructed according to local regulations and requirements.

The following information must be read and understood by the users of the appliance. The users must be trained and fully qualified according to local legislation for the specific work. The users of the appliances must also be capable to recognize possible hazards in the system and in the environment where the appliance is used.

This manual contains information and instructions based on product standards and regulations, and on our best knowledge. Failure to follow these instructions can lead to damage to the appliance. Erroneous use of the appliance or the failure to follow any instructions or warnings in the manual or this disclaimer can lead to property damage, personal injury or death.

Oilon is unable to accept any liability for damage in case of:

- failure to follow these instructions
- other use than what is explained in this manual
- use by unqualified personnel
- the use of spare parts not provided by Oilon.

Your legal rights are governed by a Limited warranty, the terms of which are incorporated herein by reference. Any modification at the product, if not approved by Oilon, is disclaimed and may void your rights under the Limited warranty.

## 1.2 Safety precautions

Read these instructions carefully before installation, commissioning, operation or maintenance of the device. The given instructions must be followed. Throughout this manual, the following three symbols are used to point out very important information:



Be careful. The DANGER symbol indicates a possible danger of bodily harm or lethal injury.



Pay attention. The CAUTION sign indicates a possible danger of damage to the device, components or surroundings.

**!** Note      Note indicates tips, hints, and other essential information.

**Keep these instructions as well as the electrical diagrams available near the device.**

Oilon products are manufactured according to general product standards and directives, and based on our best knowledge about product design, and technologies. Operation safety is one of the leading principles in our product development. However, it is wise to be prepared, and think about safety. Read the following principal safety warnings and instructions:



Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.

The equipment shall be installed in accordance with the Provincial Installation Requirements, or in their absence, the CGA B149.1 and B149.2 Installation Codes shall prevail.



**IN CASE OF FIRE OR OTHER EMERGENCY**

- Cut off power supply.
- Close main fuel shut-off valve.
- Take appropriate actions.
- Contact operation controller.



**IN CASE OF A GAS LEAKAGE**

- Do not light fire or touch electric equipment.
- Close main fuel shut-off valve.
- Make sure there are no people in the leakage area.
- Make sure the leakage area is properly ventilated.
- Contact operation controller.



Cut off power supply to burner and close manual shut-off valves always before any maintenance work. Cutting power is adequate when just inspecting the device.



Connectors in control box are under voltage. Only authorized users may open safety cover.



Fasten all safety covers, enclosures, and guards with all screws before start-up. Use appropriate tools.



Wear proper hearing protection and personal protective equipment, such as protection shoes and gloves when necessary.



Do not use Teflon tape in piping.



If burner start-up fails consecutively two times, do not restart burner before carefully investigating the reason for the failure.



Do not touch hot pipes or surfaces during operation or maintenance.

### Emergency shutdown

In an emergency, cut off power supply to the burner. Close the manual shut-off valves. After safety check you can restart the burner. Check settings, and monitor that operation continues as normal.

### Take care of the boiler room



Never use open fire while checking burner or boiler.  
Do not store any inflammable materials in boiler room.



Keep boiler door closed while starting burner, and during burner operation.

- Maintain tidiness in boiler room, and keep boiler room door closed.
- Make sure that there is always enough water and pressure in heating system.
- Make sure boiler and chimney are swept regularly.
- Check flue damper adjustment and gate valve regularly.
- Make sure burner room air-inlet gap is open.
- Make sure shut-off valves on pressure gauges are shut.
- Make sure pipeworks tightness, boiler system safety appliances, pipeworks, and burner are checked regularly according to the rules and regulations of public authorities.
- Check boiler and its components.

We recommend a maintenance contract.

### WARNING

IF YOU SMELL GAS, OPEN WINDOW, EXTINGUISH ANY OPEN FLAMES, STAY AWAY FROM ELECTRICAL SWITCHES, EVACUATE THE BUILDING AND IMMEDIATELY CALL THE GAS COMPANY.

IN ACCORDANCE WITH OSHA STANDARDS, ALL EQUIPMENT, MACHINES AND PROCESSES SHALL BE LOCKED OUT PRIOR TO SERVICING.

IF THIS EQUIPMENT IS NOT INSTALLED, OPERATED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS, THIS PRODUCT COULD EXPOSE YOU TO SUBSTANCES IN FUEL OR FROM FUEL COMBUSTION WHICH CAN CAUSE DEATH OR SERIOUS ILLNESS AND WHICH ARE KNOWN TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

IMPROPER SERVICING OF THIS EQUIPMENT MAY CREATE A POTENTIAL HAZARD TO EQUIPMENT AND OPERATORS.

SERVICING MUST BE DONE BY A FULLY TRAINED AND QUALIFIED PERSONNEL.

## **WARNING**

DO NOT ATTEMPT TO START, ADJUST OR MAINTAIN THIS BURNER WITHOUT PROPER TRAINING OR EXPERIENCE. FAILURE TO USE KNOWLEDGEABLE TECHNICIANS CAN RESULT IN EQUIPMENT DAMAGE, PERSONAL INJURY OR DEATH.

## **1.3 Product overview**

### **Intended use**

This is an automatic forced draught burner. The burner can be used on most heating appliances; for warm and hot water boilers, hot air generators, and various types of process heating. They are also designed to suit furnaces with high back pressure.

The burners can be mounted in horizontal, vertical and upward facing, or vertical and downward facing orientation. Our burners are designed for operation in covered areas, within the temperature range of 0 °C – +50 °C / + 32 °F – 105 °F. The standard setup is designed to operate in the altitude of max. 500 m / 1,640 ft above sea level.

See **Technical data** for the information on standard applicable fuels. Burners using other fuels are available upon request.

### **Construction**

The surface of the housing is finished with durable high-gloss paint. Electrical installations and burner service are easy to perform because the top cover is removable. The stainless steel alloy combustion head and the diffuser disc can withstand high temperatures.

The burner control system handles all burner operation sequences automatically. In the event of a burner failure, the unit stops the burner automatically.

Each burner is tested separately before delivery to the customer.

For more information on products, visit our web site at [www.oilon.com](http://www.oilon.com): **Oilon → Industries → Product material.**

Information on components can be found under the headline **Burner parts**.

## Type labelling

GRP-150 M-II



POLTINKOODI ver. 2

### Label element 1: Fuel

KP	Light fuel oil
RP	Heavy fuel oil
GP	Gas
GGP	Dual gas
GKP	Gas, light fuel oil
GRP	Gas, heavy fuel oil

### Label element 2: Burner size categorization

### Label element 3: Method of control


H	Two-stage
M	Modulating
MH	Modulating gas, two-stage oil
ME	Modulating with a separate fan

### Label element 4: Additional code, for example burner capacity I-III or automation, like WD34

WD32	BT 320 burner control (one fuel, non-permanent operation)
WD33	BT 330 burner control (one fuel, permanent operation)
WD34	BT 340 burner control (two fuels, permanent operation)
- capacity controller LCM100 as an option to LSB bus (WD32, WD33) - capacity controller LCM100 and dual-fuel burner module DFM300 are mandatory to LSB bus with WD34, when using a dual-fuel burner	

## Type plate

The following illustration shows an example of the type plate of Oilon burners:

1	Type	Serial No	10
2		Manufactured	11
3	Overfire pressure min	Capacity, Gas	12
4	Overfire pressure max	Capacity, Oil	13
5	Gas calorific value	Gas press min	14
6	Gas type	Gas press max	15
7	Oil quality		16
8	oilon® PL 5 15801 LAHTI FINLAND		
9			

Type plate US ver. 1

Pos.	Description	Pos.	Description
1	Burner type: KP = Light fuel oil RP = Heavy fuel oil GP = Gas GKP = Light fuel oil and gas GRP = Heavy fuel oil and gas	9	Degree of protection
2	Overfire pressure min, IN.WC	10	Serial number
3	Overfire pressure max, IN.WC	11	Month and year of manufacture
4	Gas calorific value, BTU/scf	12	Capacity, gas, MBTU/hr
5	Gas type	13	Capacity, light fuel oil, GPH
6	Oil quality / viscosity	14	Gas pressure min, IN.WC
7	Supply voltage, input power and current, V / Hz / A / kW	15	Gas pressure max, IN.WC
8	Manufacturer address	16	L LC US marking and certification institute code

## 1.4 Handling and storing

### Storing and recycling

Store device and its equipment in a dry and airy place. Protect device from dust and humidity. Follow storing and transporting instructions included in the package.

Documentation is part of the product, and it must be passed on together with device, also with a second hand product. Pass on documents delivered with device to owner at installation, and advise to keep them properly. Make sure that operating instructions are available near the device.

Recycle product package. The metal and plastic parts of the device are made of recyclable materials. Also all electrical components are recyclable, and should be handled according to local regulations.

## 2 Technical data

### 2.1 Burner technical data

#### Burner data

Burner	GKP-50 MH	GKP-90 MH
Capacity kW, gas	100–800	250–1460
Capacity MBtu, gas	341–2,730	853–4,981
Capacity kg/h, oil	17–68	30–130
Capacity lb/h, oil	37.5–149.9	66.1–286.6
Max. turndown ratio, gas use	1:8 (100–12.5%)	1:6 (100–16.5%)
Max. turndown ratio, oil use	1:2 (100–50%)	1:2 (100–50%)
Nominal motor output, kW	0.75	2.2
Nominal motor output, hp	1.00	2.95
Oil inlet pressure to pump, bar	0.5–2	0.5–2
Oil inlet pressure to pump, PSI	7.25–29	7.25–29
Oil operating pressure (atomizing pressure), kPa (bar)	1000–2000 (10–20)	1000–2000 (10–20)
Oil operating pressure (atomizing pressure) PSI	145–290	145–290

#### Other technical data and requirements

Fuel, gas use	Natural gas When using other gases than natural gas, the composition of the gas must be known. Consult burner manufacturer on the suitability of the burner for special gases.
Gas inlet pressure to burner max.	500 mbar
Gas inlet pressure to burner max.	7.25 PSI
Max. demand for combustion air, gas use	13 m³ / 10 kW
Max. demand for combustion air, gas use	459.09 ft³ / 13.5 MBtu

Fuel, oil use	#2 fuel oil
Efficiency, #2 fuel oil	2.20 lb ≈ 40.46 MBtu efficiency, when heat value is 1146.03 Btu/ft³
Max. demand for combustion air, oil use	15 m³/kg 529.72 cfh/lb

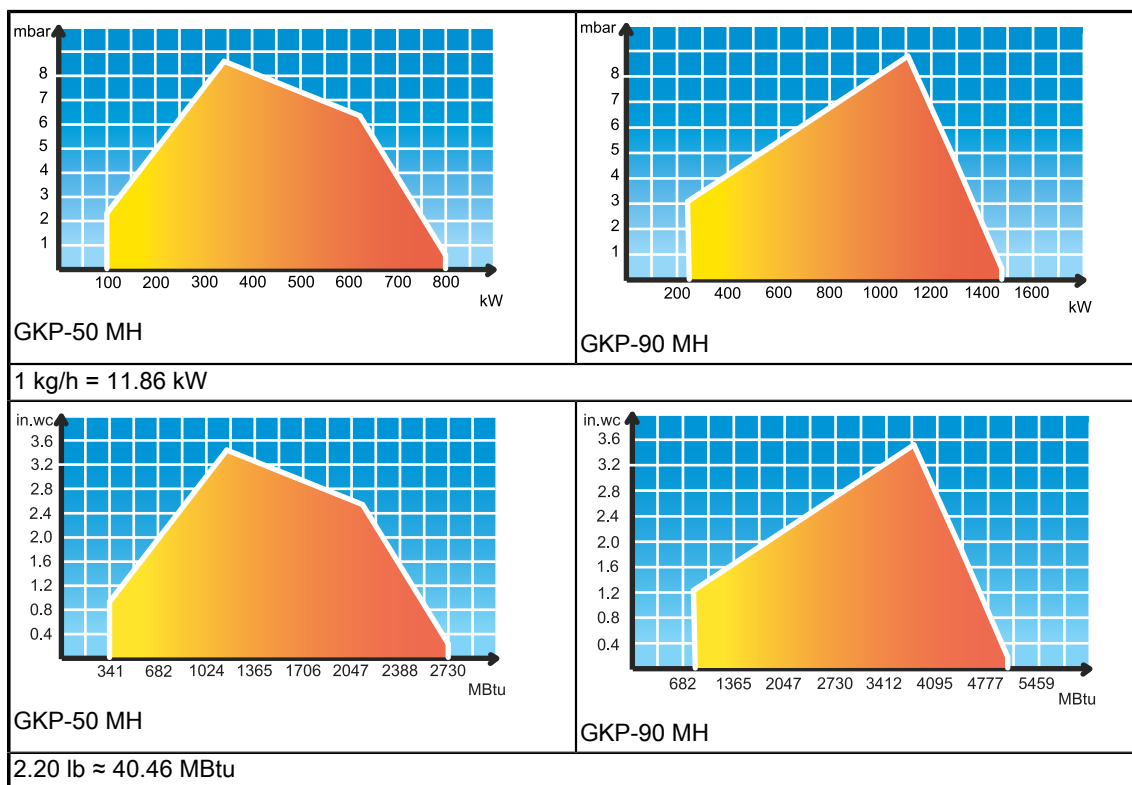
Control voltage	120 V (-15%...+10%) 50 Hz / 60 Hz 1-phase
Motor voltage options	220 V 60 Hz 3-phase 460 V 60 Hz 3-phase 575 V 60 Hz 3-phase

Degree of protection	NEMA 1
Ambient temperature range	0...+ 50 °C 32...+ 122 °F

Noise level	L <sub>pfA</sub> = 77.5 ± 0.5 dB
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**!** Note For reducing noise level, contact the manufacturer.

## Working diagrams



Usage of burner outside the heat input and pressure curves is forbidden.

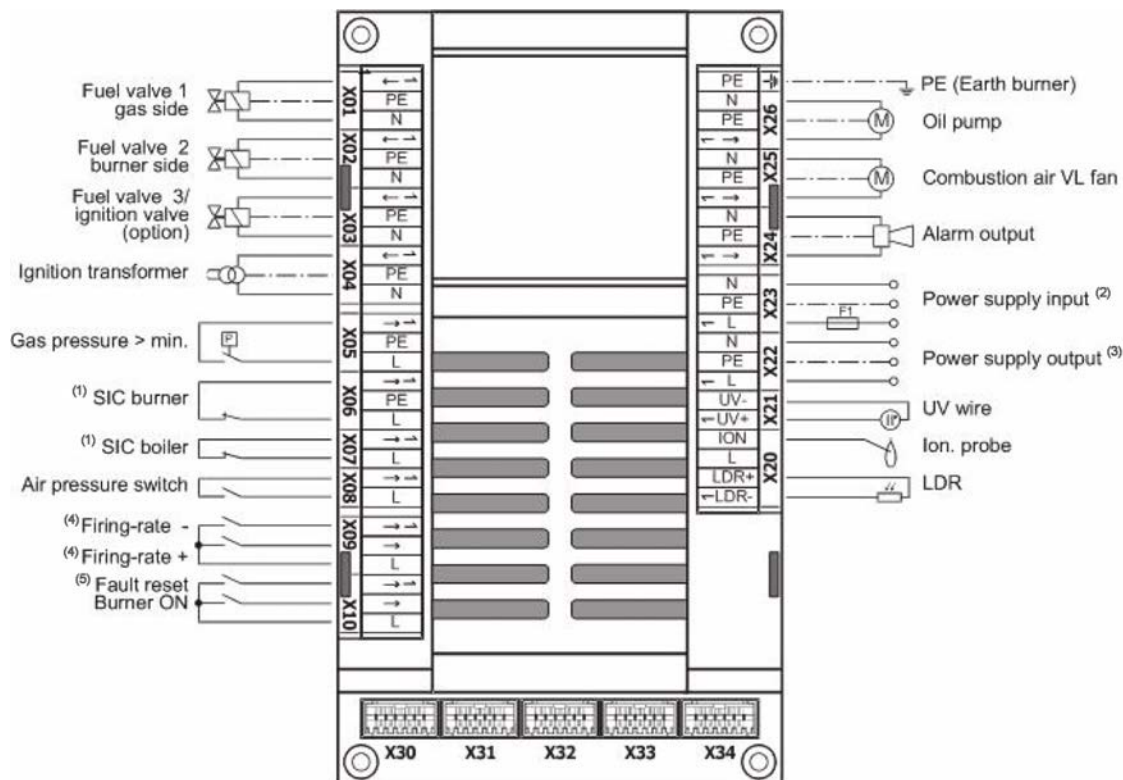
## 2.2 Burner control technical data

Burner control	BT 300 series
Power supply	115 VAC -15/+10 %
Locking from undervoltage	Less than 85 % of nominal
Mains frequency	50 Hz / 60 Hz
Power consumption	< 30 VA
Internal shielding	Safety equipment, do not self-service.
External fuse	max. 10 A slow
Input signals	Capacitance should be below 2.2mF.
Output signals	3 fuel valves max. 1 A cos 0.4 fan max. 2 A cos 0.4 oil pump max. 2 A cos 0.4 ignition transformer alarm output
Permissible ambient temperature	-20...+60 °C -4...+140 °F

## Main standards

- ANSI/UL 372
- ANSI/UL 60730-1
- ANSI/UL 60730-2-5

## Burner control BT 300 connector interface



BT300 connector interface ver. 3

X30	user interface UI 300
X31	LSB optional (LCM)
X32	continuous output 1, air damper
X33	continuous output 2, gas damper
X34	continuous output 3, oil damper
(1)	SIC = safety interlock chain
(2)	115 VAC 47–63Hz external fuse protection required (max 10A slow-blow)
(3)	115 VAC for power supply to external devices
(4)	Fuel selection for dual-fuel burners with BT340 + DFM300
(5)	Alternative CPI/POC connection

Cable	Maximum cable length, m	Maximum cable length, ft
X01–X10	10	32
X20–X21	3	9
X22–X23	unlimited	unlimited
X24–26	10	32
X30	1	3
X31	1	3
X32–X34	3	9

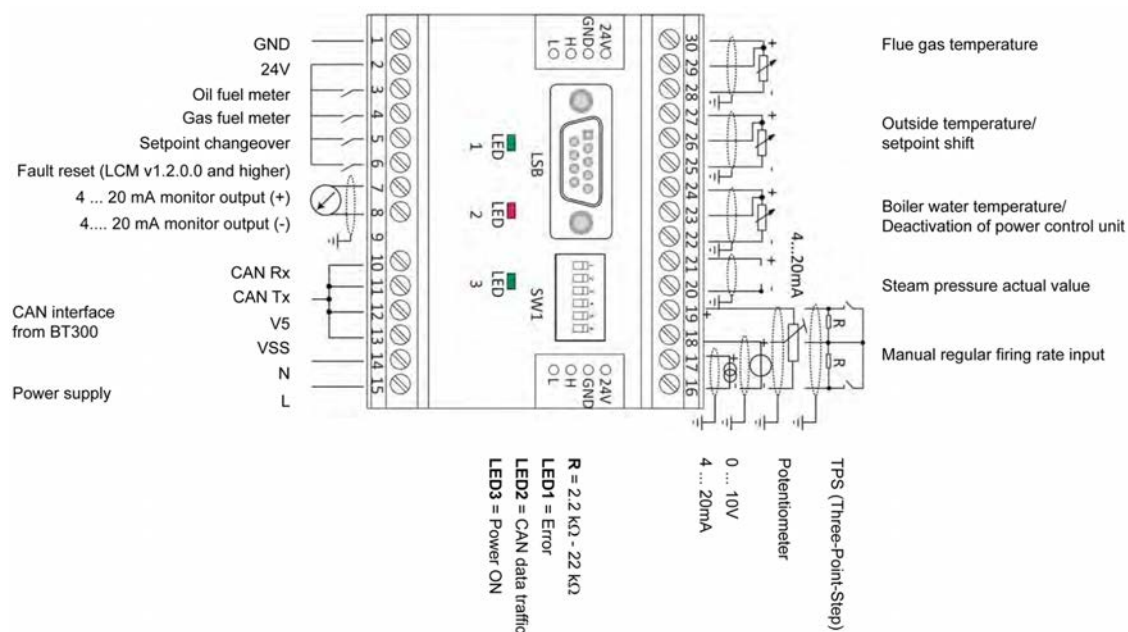
## 2.3 Load controller module technical data


**CAUTION**

Safety equipment, do not self-service.

Load controller module	LCM100
Power supply	90–250 VAC
Mains frequency	50–60 Hz 6 %
Power consumption	18.2 VA
Permissible ambient temperature	-20...+60 °C -4...+140 °F

### LCM connector interface



LCM connector interface ver. 3

Cable assembly	Type	Shield	Cable length, m	Cable length, ft
Network input	AC in	-	100	328
24 V external	DC out	-	100	328
LSB	IO	-	1	3
CAN	IO	X	100	328
Fuel measurement oil	I	-	10	32
Fuel measurement gas	I	-	10	32
Setpoint changeover	I	-	10	32
Extra input	I	-	10	32
Flue gas temperature	I	X	100	328
Ambient temperature	I	X	100	328
Boiler water temperature	I	X	10	32
Steam pressure	I	X	10	32

Cable assembly	Type	Shield	Cable length, m	Cable length, ft
Combination input 20 mA	I	X	100	328
Combination input term. 18	I	X	100	328
Analog output mA	O	X	100	328

I = Input

O = Output

**!** Note    Shielded cable must always be connected to TE terminal.


## 2.4 Servomotor technical data

Servomotor	662R5001	662R5003	662R5010
Interface	LSB (Lamtec system bus)	LSB (Lamtec system bus)	LSB (Lamtec system bus)
Turning angle	90°	90°	90°
Accuracy	±0.2°	±0.2°	±0.2°
Torque, operation/hold	1.2/0.8 Nm 10.62/7.08 lb-in	3/2.8 Nm 26.55/24.78 lb-in	9/6 Nm 79.65/53.10 lb-in
Running time/90 degrees	5 s	5 s	15 s
Protection degree	NEMA 12	NEMA 12	NEMA 12
Permissible ambient temperature	-20...+60 °C -4...+140 °F	-20...+60 °C -4...+140 °F	-20...+60 °C -4...+140 °F

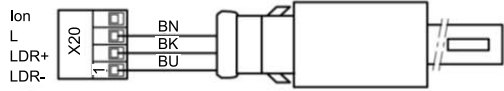
## 2.5 Control panel technical data

Control panel	UI 300
Interface	LSB bus
Display	128 x 64 pixel, backlighting
Protection degree	NEMA 1
Permissible ambient temperature	-20...+60 °C -4...+140 °F

## 2.6 Flame detector technical data

QRA	
 <p>UV-cell connection ver. 2</p>	
Measuring range	0–100%
Supply voltage	115 VAC –15/+10 %
Min. required detector current *	35 µA
Max. possible detector current *	50 µA

\* When supply voltage 230 V

KLC	
 <p>KLC connection ver. 1</p>	
Supply voltage	120 VAC -15/+10% Frequency 50 – 60 Hz
Output (FET)	Switch-on delay 0,5 s. Acceptable loss of flame ca. 0,2 s
Operating Temperature	-4 °F to +140 °F (temperatures >120 °F reduces the lifetime of the UV-tube)

## 2.7 Safety devices, technical data

### Gas pressure switch

Type	Dungs GMH/GML/GAO A4-4-...
Maximum operating pressure	7 PSI (500 mbar)
Adjustment range	See cover of switch
Hysteresis	in. W.C.
GAO-A4-4-2	≤ 0.12
GAO-A4-4-3	≤ 0.20
GAO-A4-4-5	≤ 0.40
GAO-A4-4-6	≤ 1.2
GAO-A4-4-8	≤ 4.0
Temperature range:	
- GAO-, GMH- and GML-A4-4	Ambient temperature -40 °F to +140 °F (-40 °C to +60 °C) Medium temperature -40 °F to +140 °F (-40 °C to +60 °C)
- GAO-, GMH- and GML-A4-4-8	Ambient temperature -22 °F to +140 °F (-30 °C to +60 °C) Medium temperature -22 °F to +140 °F (-30 °C to +60 °C)
Switching voltage	AC eff. min. 24 V max. 240 V DC min. 24 V max. 48 V
Switching current	AC 10 A resistive @ 120 VAC AC 8 A inductive @ 120 VAC DC min. 20 mA @ 24 VDC DC max. 1 A @ 24 VDC & 48 VDC

Type	Dungs GMH/GML/GAO A4-4-...
Degree of protection	NEMA 4
Installation position	Switch orientation has an effect on setting value. Standard orientation: sensing port horizontal. For other positions, refer to switch manufacturer's documentation.
Component standard	UL Listed <ul style="list-style-type: none"> <li>• UL 353</li> <li>• File # MH 16628</li> </ul> CSA Certified <ul style="list-style-type: none"> <li>• CSA C22.2 No. LR 53222</li> <li>• Certification file # 201527</li> </ul> FM Approved <ul style="list-style-type: none"> <li>• Class 3510, 3530</li> <li>• File # J.I. 1Y919.AF</li> </ul>

### Differential pressure switch

Type	Type Dungs AA-A2-4-5
Maximum operating pressure	7 PSI (500 mbar)
Adjustment range	2.00-20.00 in. W.C (5-50 mbar)
Hysteresis	≤ 0.40 in. W.C (1 mbar)
Allowed ambient and medium temperature	-40 °F to +140 °F (-40 °C to +60 °C)
Switching voltage	AC 24-250V DC 24-48V
Switching current	AC 5A resistive @ 120 VAC AC 3A inductive @ 120 VAC DC min. 20 mA @ 24 VDC DC max. 1A @ 12-48 VDC
Degree of protection	NEMA 12
Installation position	Multi-positioned
Component standard	UL Listed <ul style="list-style-type: none"> <li>• UL 353</li> <li>• File # MH 16628</li> </ul> CSA Certified <ul style="list-style-type: none"> <li>• CSA C22.2 No. 14</li> <li>• File # 201527</li> </ul> FM Approved <ul style="list-style-type: none"> <li>• Class 3510, 3530</li> <li>• File # J.I. 0D6A1.AF</li> </ul>

### SKP gas pressure regulator, gas valve actuator + VGD gas valve

Type	Siemens SKP25...
Operating voltage	110-120 VAC -15/+10 %
Adjustment range	0.2-100.37
Allowed ambient and medium temperature	-50 °F ... +140 °F
Degree of protection	NEMA 12
Closing time	<0.8 s
Opening time	3-6 s, depending on valve size
Installation position	Other positions possible except vertically upside down
Component standard	UL/429, FM/7400, ANSI Z21.21/CSA 6.5 C/I ANSI Z21.18/CSA 6.3

Type	Siemens SKP15...
Adjustment range	110–120 VAC –15/+10 %
Allowed ambient and medium temperature	–50 °F ... +140 °F
Degree of protection	NEMA 12
Closing time	<0.8 s
Opening time	3–6 s, depending on valve size
Installation position	Other positions possible except vertically upside down
Component standard	UL/429, FM/7400, ANSI Z21.21/CSA 6.5 C/I

Type	Siemens VGD 20/40
Maximum operating pressure	240.88 in.W.C
Allowed ambient and medium temperature	5 °F ... +140 °F
Group, according to EN 161	2
Installation position	Pressure regulator determines position
Component standard	UL/429, FM/7400 CSA/ANSI Z21.21/CGA 6.5 Commercial/Industrial

## Oil valve

Type	ASCO 8262H011V
Maximum operating pressure	350 PSI
Capacity	9.1 W
Allowed ambient temperature	5–131 °F
Allowed medium temperature	210 °F
Component standard	UL429

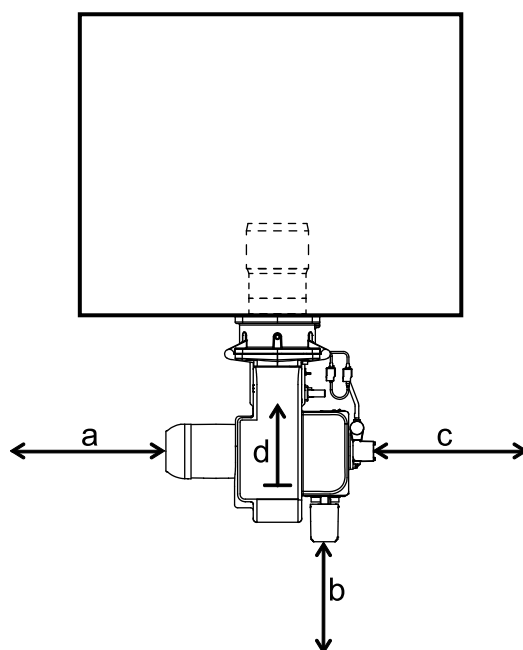
## 3 Installation

### 3.1 Space requirements

Leave enough space on each side of the burner for installation, commissioning, and maintenance purposes. The minimum space requirements are presented in the following.



Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.



Space requirements ver. 1

Legend	Minimum dimension, cm	Minimum dimension, ft
<b>a</b> (left)	80	2.6
<b>b</b> (front)	80	2.6
<b>c</b> (right)	80	2.6
<b>d</b> (top)	100	3.3

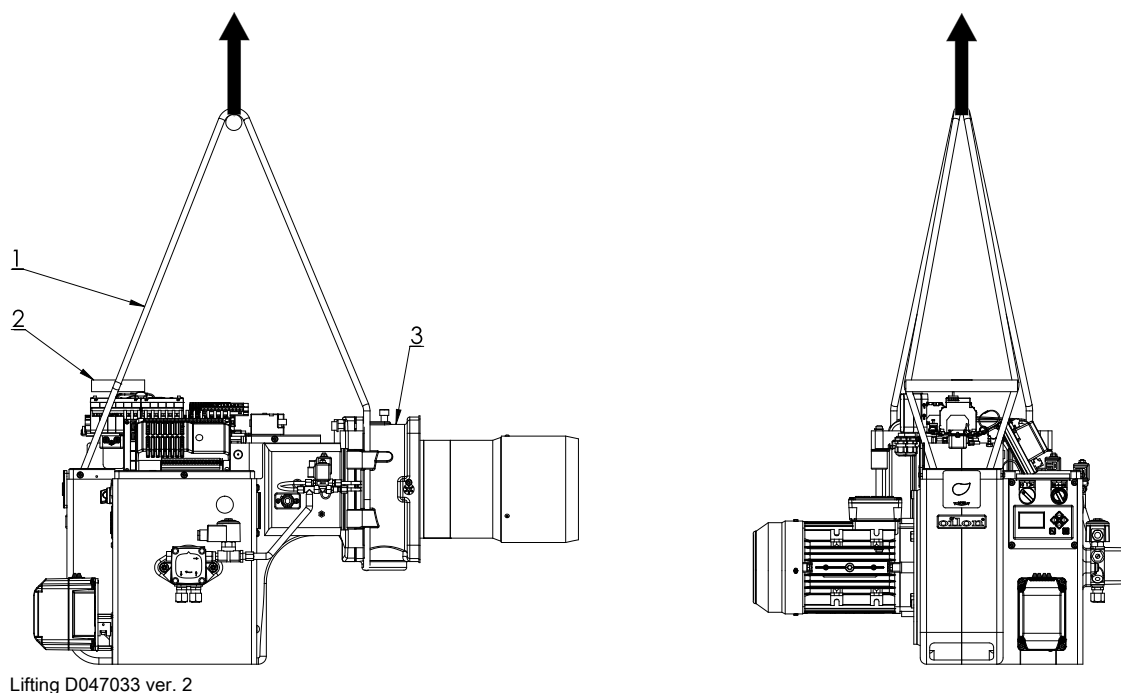
It is recommended to leave more space around the burner. These are only the minimum requirements.

### 3.2 Lifting burner



- Lifting the device can only be performed by a qualified person, who knows the regulations and safety instructions for lifting.
- Always use all lifting points of the lifting direction.
- Do not go under a supported device.

The burners are attached and supported to a transportation base. The base can be lifted from all sides with a forklift. When lifting the package, the center of gravity must be in the middle between the forks to avoid falling.



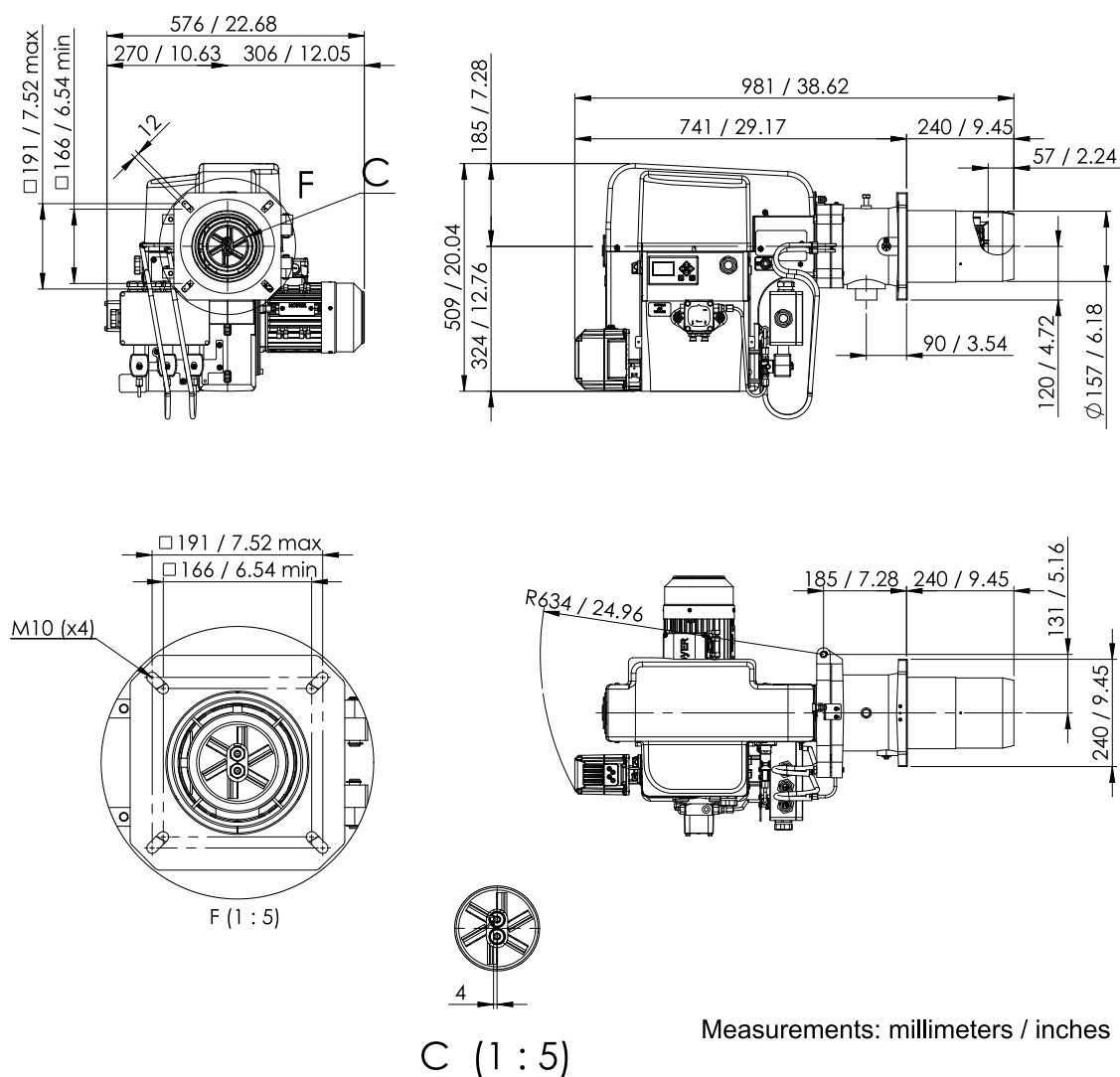
Pos.	Item
1	Lifting belt
2	Lifting support
3	Gas frame

#### To lift the burner:

1. Remove the burner cover.
2. Set the lifting belt (1) around the flame sight tube and the gas frame (3).
3. Place the lifting support (2) between belts according to the drawing. Make sure, that the lifting devices do not touch electrical devices.
4. Lift the burner as shown in the illustration.
5. After lifting, remove the lifting devices and fasten the cover on its place.

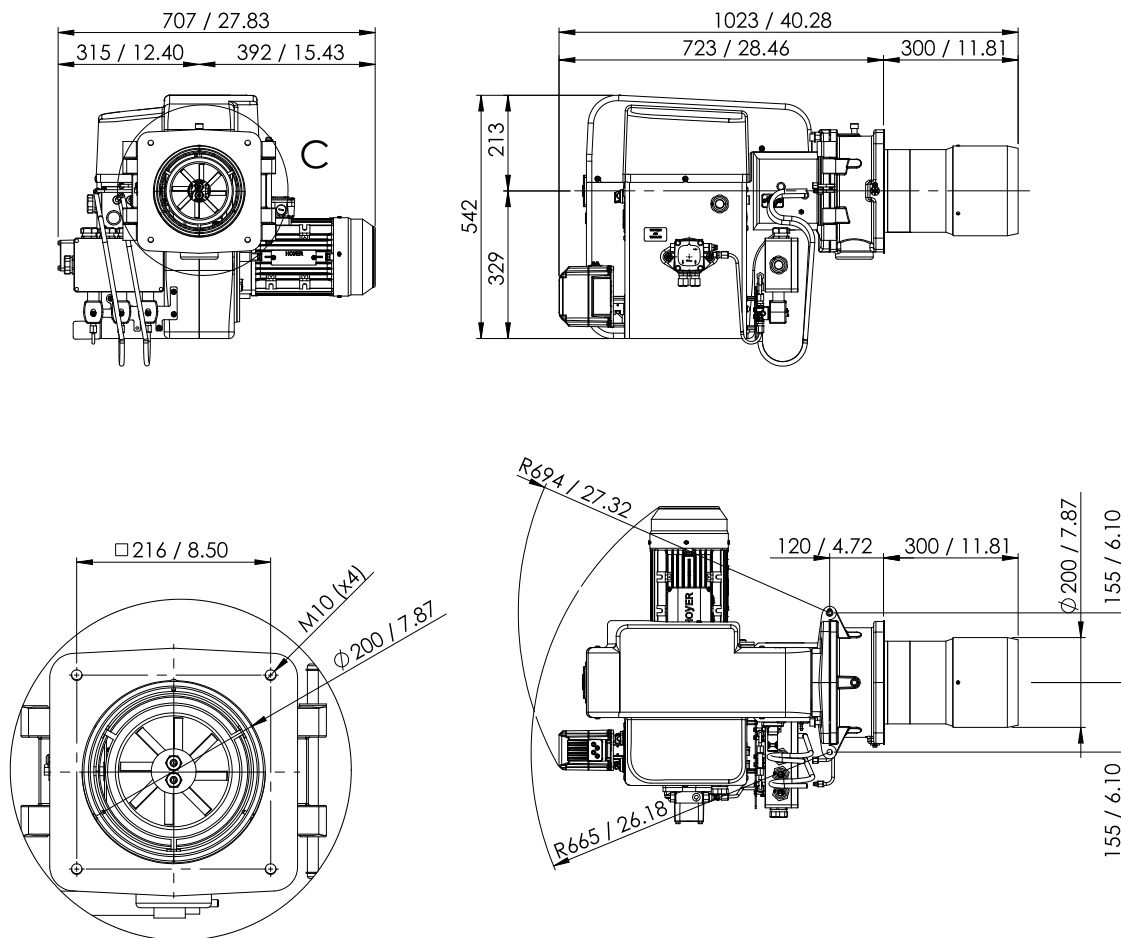
### 3.3 Installing burner

#### GKP-50 MH main dimensions



D048897 ver. 3

## GKP-90 MH main dimensions

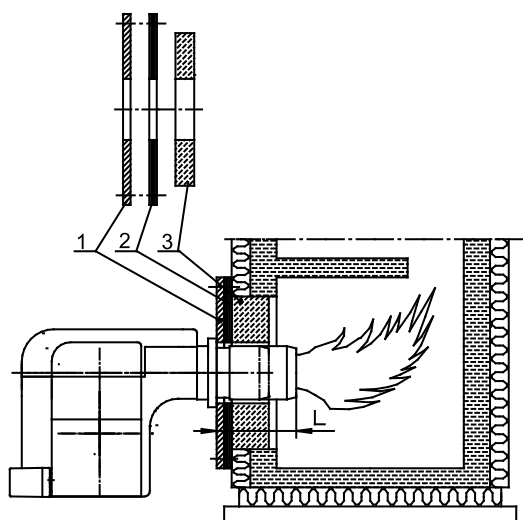


C (1 : 5)

D048844 ver. 3

Measurements: millimeters / inches

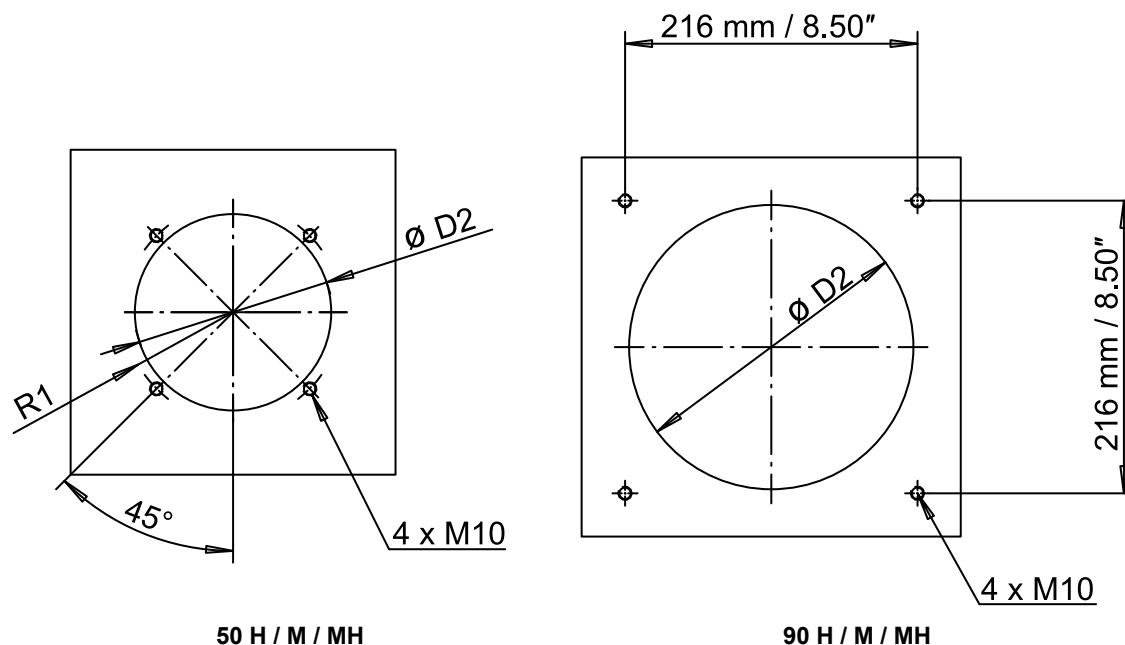
## Mounting dimensions



A-349A ver. 2

- 1 Mounting plate
- 2 Insulating plate
- 3 Ceramic wool or similar

Burner	L (mm)	L (inch)
	240 / 300 300 / 400	



Burner	Mounting dimensions, mm		
	$\varnothing D2$	R1	L
50 H / M / MH	165	117.5-135	240 / 300

Burner	Mounting dimensions, inches		
	$\varnothing D2$	R1	L
50 H / M / MH	6.50	4.63-5.31	9.45 / 11.81
90 H / M / MH	8.27		11.81 / 15.75

#### To mount the burner:

1. Prepare the boiler front plate according to the given dimensions.
2. Coat the bolt threads with graphite-bearing grease prior to fitting.
3. Install the burner so that the motor shaft lies horizontally.
4. Remove the transportation bracket after the burner is attached to the boiler.
5. Make sure there is enough free space on the side to allow the burner to swing fully open.

As standard, the burner swings to the left. The GKP-90 MH model can also be hinged to the right side.



CAUTION

Install burner firmly. Vibration may damage burner or its components.



CAUTION

Switch off electric power from the burner before burner swing-out.

**! Note** Do not install the burner upside down. Make sure the burner is firmly attached.

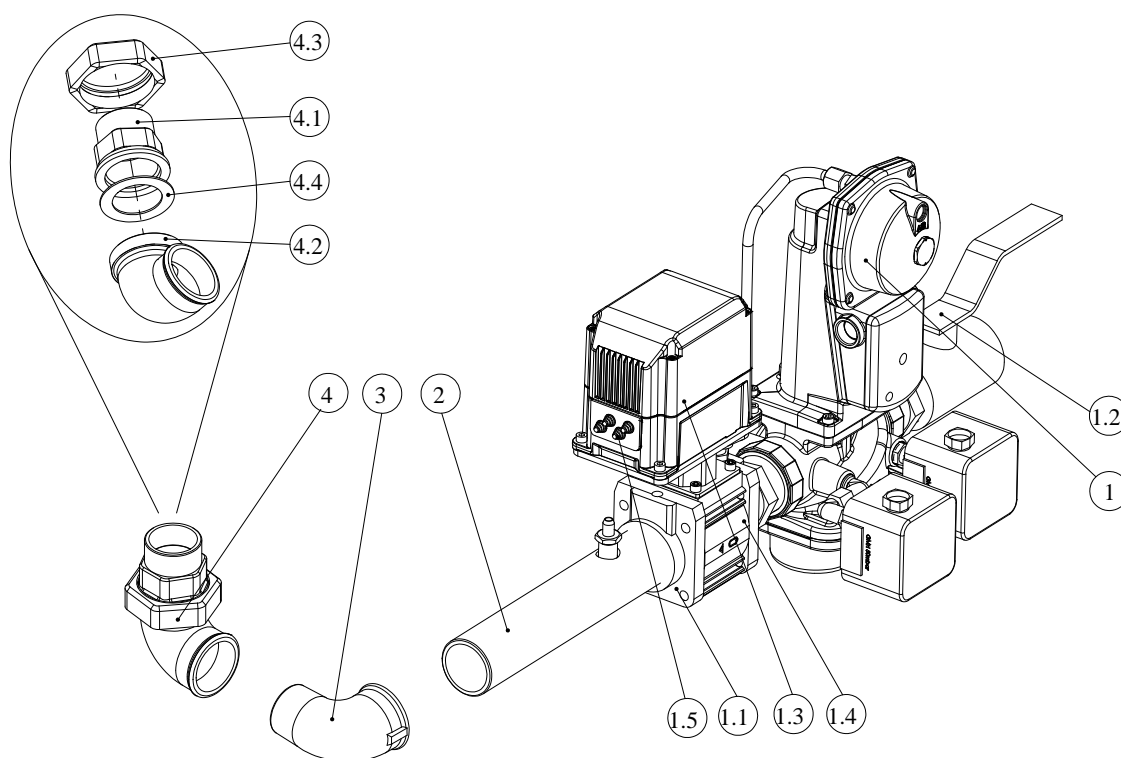
### 3.4 Gas valve selection table

**! Note** The max. capacities shown in the table are achieved when the boiler back pressure is 0.

### 3.5 Installing gas module to burner

The gas module consists of a double solenoid valve, gas pipe, elbow fitting, and an adjustable elbow fitting. The parts are delivered separately. The regulator valve, servomotor, and connection flange are ready-fitted to the double solenoid valve.

The following illustration describes the gas module parts.



D046558 US ver. 1

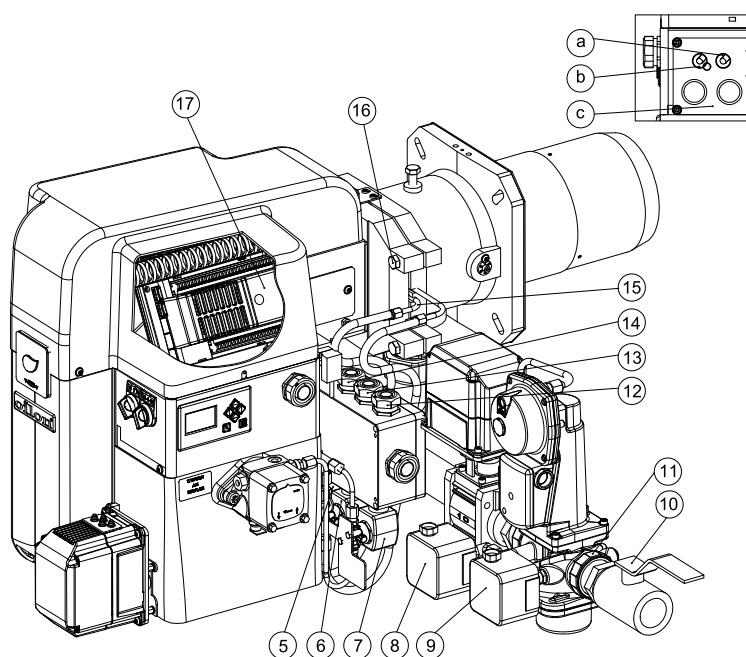
Pos.	Item	Pos.	Item
1	Gas valve assembly	2	Gas inlet pipe
1.1	Mounting flange, burner side	3	Elbow fitting
1.2	Manual shut-off valve	4	Adjustable elbow fitting
1.3	Servomotor	4.1	Coupling unit
1.4	Control valve	4.2	Elbow part
1.5	Servomotor cable	4.3	Nut
		4.4	Gasket

**! Note** The assembly may vary depending on the scope of delivery.

### To assemble the gas module:

Gas module parts are connected to each other with threaded connections. Use thread seal to seal the connections (for example Loctite 577).

1. Screw the gas inlet pipe to the mounting flange (1.1).
2. Screw the elbow fitting to the gas inlet pipe. Adjust the fitting to point straight to the right, in gas flow direction (when gas inlet to burner is on the right).
3. Screw the elbow part (4.2) of the adjustable elbow fitting and adjust it to point upwards.



a029409 ver. 1

Pos.	Item	Pos.	Item
5	2nd stage oil valve	13	Cable gland for gas high pressure switch
6	1st stage oil valve	14	Gas valve cable gland
7	Main oil valve	15	Injector hoses
8	Gas high pressure switch	16	Hinge locking screw
9	Gas low pressure switch	17	Control unit
10	Manual shut-off valve	a	Flame detector gland
11	Gas valve assembly with pressure regulator	b	Gas damper servo gland
12	Cable gland for gas low pressure switch	c	Lead in plate

### To mount the gas module to the burner:

1. Screw the coupling unit (4.1) of the adjustable elbow fitting to the burner gas frame.  
The nut (4.3) must be with the coupling unit.
2. Lift the mounted gas module to the adjustable elbow fitting.
3. Check that the gasket (4.4) is in its place and undamaged.
4. Connect the gas line by screwing the nut (4.3) to the elbow part (4.2).

No tape or glue is used in this threaded connection. When dismantling the burner from the boiler, the gas line is disconnected from this connection.

5. Support the mounted gas assembly to eliminate any torsional tension.

**To connect the servomotor cable to the burner control unit:**

1. Remove gas damper servo gland (b) from the lead in plate (c).
2. Push the servomotor plug through the lead-in plate hole and lead the plug to the control unit terminal X33.
3. Push the plug into the connector.
4. Pull excess length of the cable into the burner but leave a loop of cable outside to enable the burner to be swung open.
5. Re-attach the gland (b)

**To open the burner:**

You can open the burner from its hinged joint, for example, to adjust the ignition electrodes or to change or clean nozzles.

1. Switch off the power from the burner by turning the control switch.
2. Close the gas supply from the gas shut-off valve.
3. Close the oil supply from the oil shut-off valve.
4. Detach the oil hoses (15) other end from the connector.  
Clean the possible oil dripping from the oil line with oil soaking fabric, for example.
5. Open the hinged flange locking screw (16).

Now you can open the burner from the hinged joint.

When closing the burner, perform the steps in reverse order.

**To detach the burner from the boiler:**

1. Switch off the power from the burner by turning the control switch
2. Close the gas supply from the gas shut-off valve.
3. Close the oil supply from the oil shut-off valve.  
If needed, open the burner oil line from the suction and return hoses. Clean the possible oil dripping from the oil line for example with oil soaking fabric.
4. Detach the electrical plugs from the gas valve.
5. Detach the servomotor cable (1.5) from the burner control unit (17).  
For more instructions, see step 2 in section To connect the servomotor cable to the burner control unit.
6. Open the gas supply line from the connection of the adjustable elbow fitting.  
For more instructions, see step 2 in section To mount the gas module to the burner.
7. Support the burner on solid platform and detach the burner tightening screws.
8. Pull the burner out from the boiler.

When attaching the burner to the boiler, perform the steps in reverse order.



**Note**

When pushing the burner to the boiler, check that the insulating material around the combustion head is undamaged and in its place.



**Note**

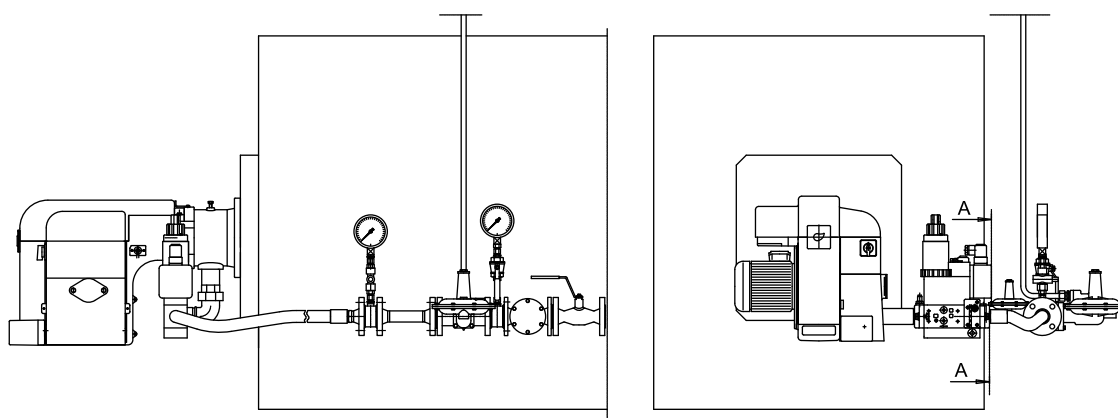
Check that gas and oil lines are leak-proof before taking the burner into use again.

## 3.6 Installing burner to gas supply line

### Supply line

If necessary, decrease the gas pressure with pressure regulating assembly. The gas supply line after the pressure regulator must be of the same size or one size larger than the burner's gas pressure regulating assembly. The gas valve capacity adjustment disc must be upwards. In installation, observe the valve manufacturer's instructions.

As standard, the gas connection to the burner is from the right side. The valves shown in the following example may vary from those delivered.



B352U ver. 3



CAUTION

- Install gas pipings according to the regulations of local public authority.
- Check that there is a separate filter before gas equipment.
- Prior to installing gas pressure regulator block to piping, use compressed air to blow supply piping clean.
- Clean and check piping prior to the installation of gas pressure regulating assembly.
- Install gas valve so that no mechanical stress is directed to it.
- Vent gas piping before the first start-up.

### To vent gas pipe:

1. Lead pipe to an open outdoor location either from the gas valve or from the blow-off valve fixed to the pipe.
2. Open the blow-off valve.
3. Open the ball valve slowly in main supply line and fill piping with gas.
4. Close the blow-off valve.

## 3.7 Installing gas pressure regulating assembly

### Installing pressure regulator

Consider the following factors when selecting pressure regulator:

- gas supply pressure
- secondary pressure
- the quantity of gas to be combusted
- type of gas

If the gas inlet pressure is higher than the  $P_{max}$  value given in the burner technical data, reduce the gas inlet pressure in regulating assembly. Also, if the gas inlet pressure is not stable, stabilize the pressure with pressure regulator. If pressure regulator is not equipped with safety relief valve and safety shut-off valve, they must be installed according to the instructions given by the manufacturer. Also any impulse tubes must be installed according to the instructions given by the regulator manufacturer.

### Installing safety relief valve and safety shut-off valve

Check that the safety relief valve is dimensioned so that the safety shut-off valve does not release if the burner shuts down at full load. The burner may be shut down for example due to mains interruption. Set the safety relief valve to open at an approx. 30% higher pressure than the secondary pressure aka pressure after the regulator.

Set the safety shut-off valve to closed position at an approx. 60 % higher pressure than the secondary pressure. Closing the pressure of the safety shut-off valve must not exceed the  $P_{max}$  pressure.

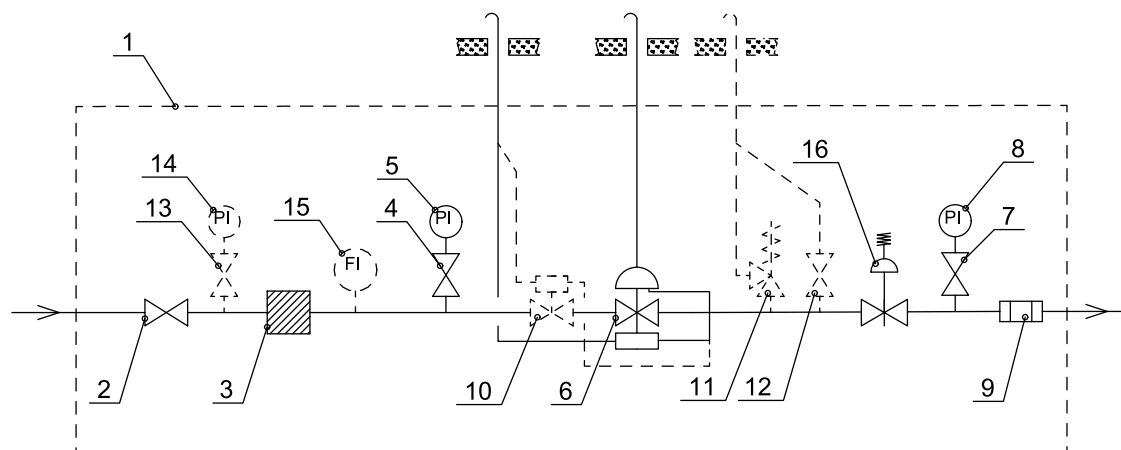
### Prerequisites for manual shut-off valve

The gas pressure regulating assembly must be equipped with a manual shut-off valve (pos. 2 in the diagram below). The valve must fulfill the following requirements:

- The flow cross-sectional area must be at least of the same size as the nominal size of the gas pressure regulating assembly.
- The valve must be of such type that it can be closed quickly (for example, inversion 90°). It must also be easily accessible but protected from unintentional use.
- Pressure endurance of the valve must be at least 1.5 times the supply pressure, and it must be equipped with mechanical limiters in open and closed positions.
- The open and closed positions must be marked separately, if it is not evident from the valve structure.

The valve is not necessarily included in the burner delivery.

### Example of gas pressure regulating assembly

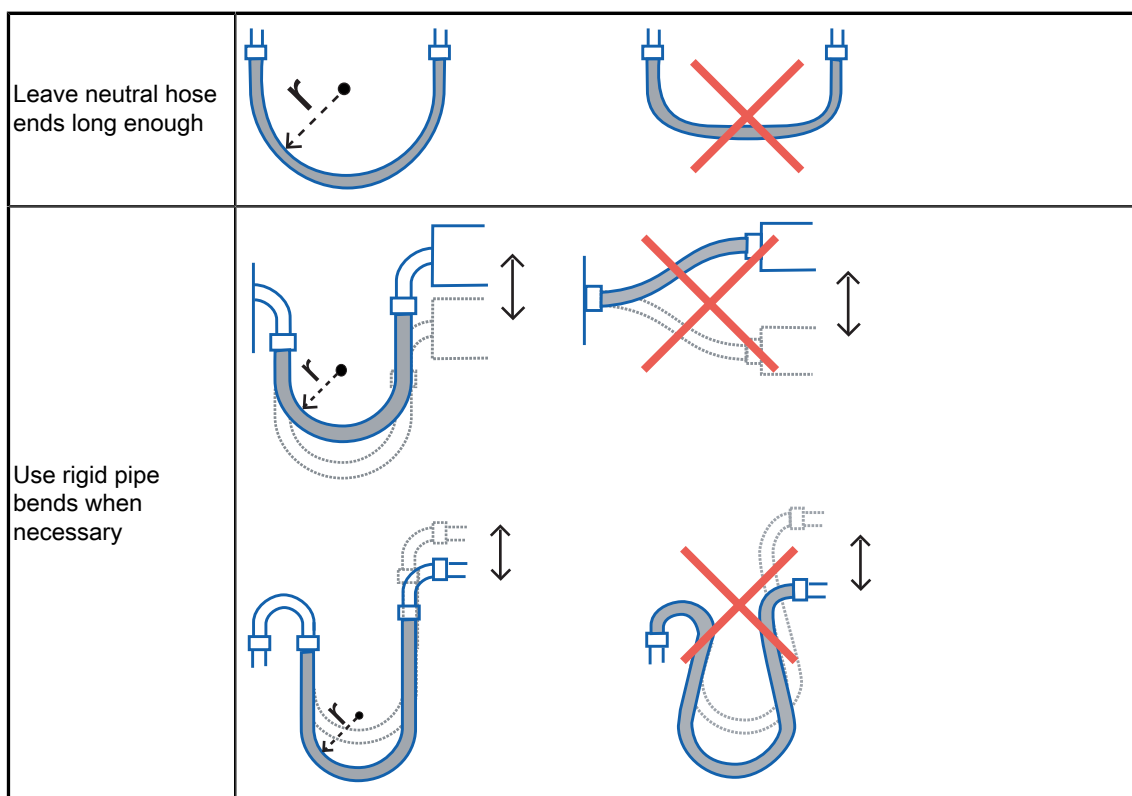


B311Z ver. 4

Pos.	Item	Pos.	Item
1	Gas pressure regulating assembly	9	Bellows compensator/gas hose
2	Ball valve	10	Safety shut-off valve, if not incl. in press. regulator
3	Gas filter	11	Safety relief valve, if not incl. in press. regulator
4	Pressure gauge valve	12	Blow-off, when necessary
5	Pressure gauge, high pressure	13	Pressure gauge valve, when necessary
6	Pressure regulator with safety shut-off valve and safety relief valve	14	Pressure gauge, high pressure, when necessary
7	Pressure gauge valve	15	Fuel flow meter, can also be on low pressure side, when necessary
8	Pressure gauge, low pressure	16	Pressure regulator

### 3.8 Installing hoses

#### Avoid torsion stress on hoses



#### Minimum bend radius

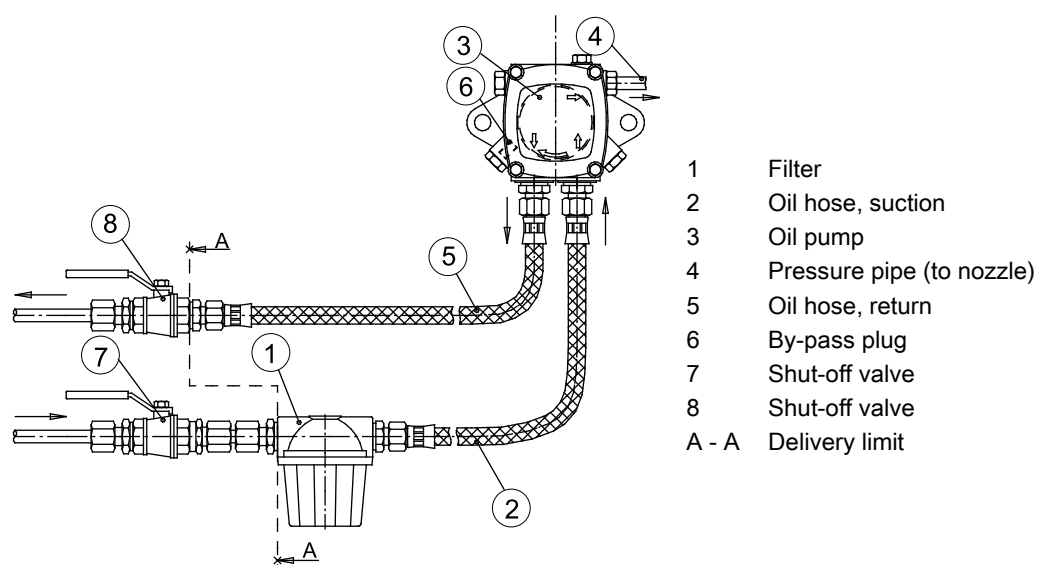
Hose diameter	Minimum bend radius ( r )
Ø 12	130 mm
Ø 15	130 mm
Ø 22	170 mm

## 3.9 Oil piping

### Oil piping manual shut-off valve

The oil supply piping must be equipped with a manual shut-off valve. The flow area of the valve must correspond to the remaining oil piping. The valve must be of quickly closable type (for example, inversion 90°). It must also be easily accessible but protected from unintentional use. The valve is not necessarily included in the burner delivery.

The manual shut-off valve must be according to UL 842, or equivalent nationally recognized manual valve safety standard.

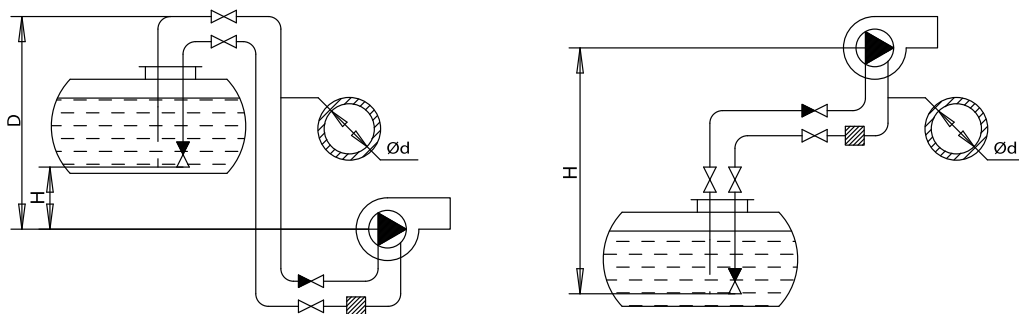


A-429T ver. 2

### Oil pipe dimensions for AJ pumps

The oil tank and the oil pipes must be installed to avoid the risk of the oil cooling below cloud point. The cloud point of heating oil depends on the oil quality. If the oil is allowed to cool to the cloud point, valves and filters will block. The most suitable oil temperature is +15°C–+25 °C / + 59 °F–77 °F.

**! Note** The viscosity of oil coming to the burner must be from 4 to 12 mm<sup>2</sup>/s (cSt).



A266Y ver. 3

The maximum lengths for other viscosities can be calculated by the simple ratio of viscosities. Refer to the following tables for lengths. If the table shows lengths for 20 mm<sup>2</sup>/s (cSt) viscosity, multiply the length by 20 and divide by the value of the new viscosity mm<sup>2</sup>/s (cSt).

Keep in mind that absolute tightness is the fundamental prerequisite for secure operation. A leaking suction line may cause, among other things, afterspraying of oil into the boiler. It is advisable to use ball valves instead of needle valves. The suction valve must be arranged min. 15 cm above the bottom of the tank.

The maximum lengths of the return and suction lines are described in the following tables.



Oil pump must not operate without oil. If there is no oil, detach the oil pump shaft coupling.

**Overlying oil tank**

SUNTEC AJ4 (150 l/h)				
H (ft)	ø 0.39"	ø 0.47"	ø 0.55"	ø 0.63"
0	0.43	0.94	1.81	3.15
1	0.47	1.06	2.01	3.54
3	0.55	1.18	2.24	3.90
6	0.67	1.42	2.68	4.65
9	0.79	1.65	3.11	5.35
13	0.87	1.89	3.54	6.10

2850 rpm, 20 mm<sup>2</sup>/s (cSt)  
D max. = 49 ft  
(D-H) max. = 14 ft

**Underlying oil tank**

SUNTEC AJ4 (150 l/h)				
H (ft)	ø 0.39"	ø 0.47"	ø 0.55"	ø 0.63"
0	0.43	0.94	1.81	3.15
1	0.35	0.83	1.61	2.80
3	0.31	0.71	1.38	2.40
6	0.20	0.47	0.94	1.65
9	0.08	0.24	0.51	0.94
13	0	0	0.08	0.20

2850 rpm, 20 mm<sup>2</sup>/s (cSt)  
H max. = 14 ft

SUNTEC AJ6 (250 l/h)				
H (ft)	ø 0.39"	ø 0.47"	ø 0.55"	ø 0.63"
0	0.20	0.51	1.06	1.85
0.5	0.24	0.59	1.18	2.05
1.0	0.28	0.67	1.30	2.28
2.0	0.35	0.83	1.57	2.76
3.0	0.39	0.94	1.85	3.15
4.0	0.47	1.10	2.09	3.62

2850 rpm, 20 mm<sup>2</sup>/s (cSt)  
D max. = 49 ft  
(D-H) max. = 14 ft

SUNTEC AJ6 (250 l/h)				
H (ft)	ø 0.39"	ø 0.47"	ø 0.55"	ø 0.63"
0	0.20	0.51	1.06	1.85
0.5	0.16	0.47	0.91	1.61
1.0	0.12	0.39	0.79	1.42
2.0	0.08	0.24	0.51	0.94
3.0	0	0.12	0.28	0.51
4.0	0	0	0	0.08

2850 rpm, 20 mm<sup>2</sup>/s (cSt)  
H max. = 14 ft

### 3.10 Electrical connections

Connect burner according to the electrical diagrams delivered with burner.

Adhere to general and local standards and regulations as well as requirements set on the connections of electrical equipment. Configure burner installation with a switch that allows it to be disconnected from the low-voltage supply mains.

Grounding must be in order before commissioning burner.

See electrical diagram for maximum cable lengths.

Connection to power supply is implemented with two separate supply connections. The supply of the control circuit of switching device directly to the burner switching base and supply to the fan motor output are implemented according to the site. The motor output is cabled both to the fan motor and control circuit to the burner wiring base.

Separate the base insulated wires of different voltage circuits from each other.

Boiler equipment and remote control connections are connected to the burner wiring base. Because of the limited number of N/PE connectors and cable gland billets, possible cascade connection of the appliance must be implemented outside the burner's wiring base.

- When using frequency converter, do cabling work and grounding according to manufacturer instructions.
- Locate frequency converter as near to motor as possible to avoid interference caused by long cabling.
- Separate supply cables from control and bus cables in cable rack if they cannot be installed in separate cable racks.
- Check that shielded cables have proper connections.

## 4 Commissioning

### 4.1 First start-up

**!** Note Vent fuel lines before first start-up.



After the first start-up check the cleanliness of the filter weekly and replace if necessary. If the filter remains clean, inspection period can be extended to one month.



Pump must not operate without oil. Vent the oil pump before initial start-up and when changing the pump.



While adjusting burner, make sure that minimum and maximum values for burner capacity are not exceeded. Values are marked on the type label.



Fasten all safety covers, enclosures, and guards with all screws before start-up. Use appropriate tools.



If burner start-up fails consecutively two times, do not restart burner before carefully investigating the reason for the failure.

#### First start-up check list

Check the following before first start-up:

- instructions from boiler and burner manufacturers are followed
- piping is done properly, and joints on pipes and components have been tested for leaks
- check that all screws are in their places and carefully tightened after installation
- boiler and its components are in proper working order and ready for use
- there is adequate air inlet to boiler room for burner to have sufficiently air for combustion
- connections are correct and motor rotation direction is correct
- valves in supply line(s) are open and fuel is available at a suitable pressure
- manual control valves are in correct positions
- fuel filter is installed
- oil temperature and viscosity are correct
- chimney is properly connected, unobstructed and flue gas damper is open

### To start the burner:

1. Open the fuel shut-off valves.
2. Switch on power supply.
3. Switch on the burner from the burner control switch.

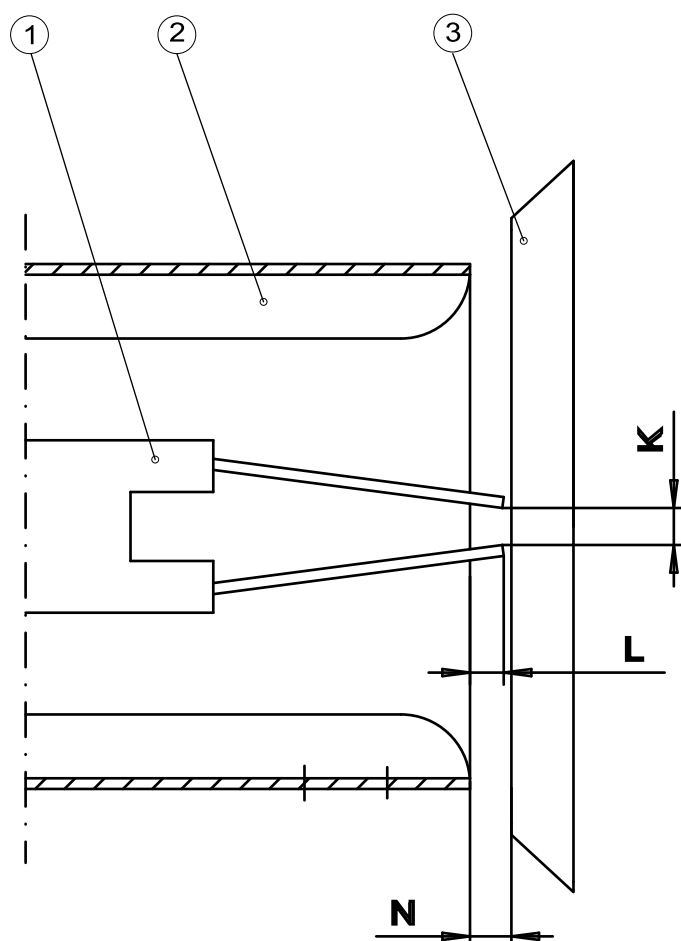
### To stop the burner:

Turn the burner control switch to OFF position.

## 4.2 Adjusting nozzle and ignition electrodes

Check and set the ignition electrode spark gap and the distance of the nozzle to the ignition electrodes and diffuser disc as show in the following illustration.

### Setting ignition electrodes



A405Y ver. 3

Pos.	Item
1	Ignition electrodes
2	Gas nozzle
3	Diffuser disc

Burner model	K	L	N
GKP-50	4 mm 0.16 inches	4 mm 0.16 inches	5 mm 0.20 inches
GKP-90	4 mm 0.16 inches	6 mm 0.24 inches	7 mm 0.28 inches

### 4.3 Oil pump pressure regulation

Fit a pressure gauge in the pressure gauge connection (see section *Oil pump*). Adjust the oil pressure by turning the pressure regulating screw. The pressure increases by turning the screw clockwise and decreases counter-clockwise.

When the pressure is altered, the oil flow and pressure follow the following formula:

$$\frac{V1}{V2} = \sqrt{\frac{P1}{P2}}$$

V1	capacity marked on the nozzle
V2	nozzle capacity at a pressure of P2
P1	7 bar gives USgal/h
P2	pressure to be used

#### Example

Nozzle capacity when the nozzle size is 9 kg/h (2.5 USgal/h) and pressure 13 bar is calculated as follows.

$$\frac{V1}{V2} = \sqrt{\frac{P1}{P2}} \Rightarrow V2 = V1 \times \sqrt{\frac{P2}{P1}} = 9 \text{ kg/h} \times \sqrt{\frac{188.55 \text{ PSI}}{145.04 \text{ PSI}}} = 9 \text{ kg/h} \times 1.14 = 10.3 \text{ kg/h}$$

According to USgal:

$$V2 = V1 \times \sqrt{\frac{P2}{P1}} = 2.5 \text{ USgal/h} \times \sqrt{\frac{188.55 \text{ PSI}}{101.53 \text{ PSI}}} = 2.5 \text{ USgal/h} \times 1.36 = 3.41 \text{ USgal/h}$$

### 4.4 Defining burner capacity

If you know the nozzle size, you can calculate the burner capacity as follows:

Nozzle size 6.55 kg/h

Pressure to be used 10 bar

- According to the CEN standard  
 $P = \text{kg/h} \times H_u \times k_p$   
 $P = 6.55 \text{ kg/h} \times 11.86 \times 1 \sim 77 \text{ kW}$
- According to USgal  
 $P = \text{USgal/h} \times H_u \times 3.2 \times k_p$   
 $P = 1.75 \text{ USgal/h} \times 11.86 \times 3.2 \times 1.2 \sim 79 \text{ kW}$

## 4.5 Adjusting combustion air

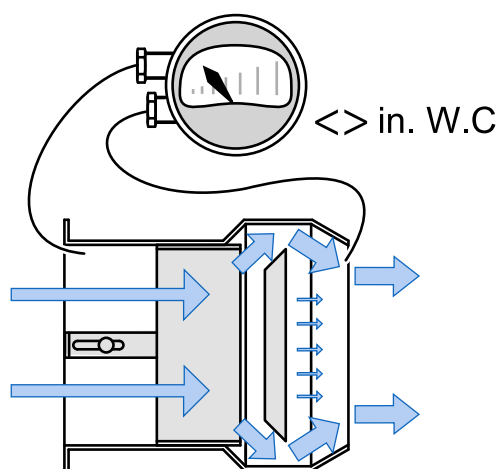
### Adjustment ring positioning

Adjustment ring position has an effect on pressure in combustion head. Adjust pressure by moving adjustment ring back and forth, thus altering the gap between adjustment ring and diffuser plate. For low capacity, adjustment ring is positioned to the front, and for high capacity to the rear.

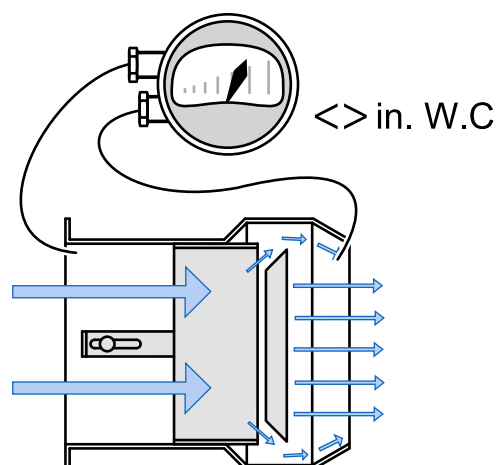
If...	Then...	And...
adjustment ring is not positioned rear enough with a full capacity	there is too much pressure drop in combustion head	ignition is poor OR burning improper due to inadequate amount of air (high CO-content) OR flame tear-off from diffuser disc when switching to higher capacity
adjustment ring is too rear with low capacity	there is not enough pressure drop	deficient combustion (O <sub>2</sub> values too high)

Control and adjust combustion head pressure drop at the minimum to:

- 2 mbar / 0.80 in. W.C in gas use
- 4 mbar / 1.6 in. W.C with heavy fuel oil
- 3 mbar / 1.20 in. W.C with #2 fuel oil.



Combustion air US ver. 1

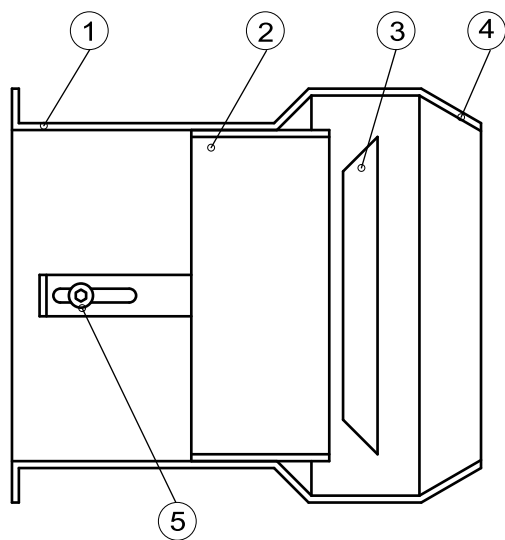


If you must alter the adjustment ring position in relation to diffuser disc, combustion air velocity and quantity in combustion head will change. Check combustion values by flue gas analysis and if necessary, adjust combustion air quantity to be adequate.



On sequential fuel use adjustment ring position is the same both on gas and on oil.

## Combustion head components



A492V ver. 3

Pos.	Item
1	Flame tube
2	Adjustment ring
3	Diffuser disc
4	Combustion head extension
5	Adjustment ring locking

### To adjust combustion air:

Combustion air volume is adjusted with adjusting cam.

1. Check the surplus oxygen level from gas flue after every adjustment with a flue gas analysator.
2. Set combustion air levels within servomotor operation range.

### Guideline values

Capacity	Fuel	O <sub>2</sub> level %	Soot index
Ignition, minimum- and part power	Light fuel oil	3.5–4.5	≤ 1 Bacharach
Full power	Light fuel oil	3–4	≤ 1 Bacharach
Ignition, minimum- and part power	Gas	3.5–4.5	
Full power	Gas	2–4	

## 4.6 Oil pump



**Note**

Check the oil pump model used in your burner from the manufacturing card or the information plate on the pump.

Fuel	Typical atomizing pressure	Oil hose connection
Light fuel oil #2 fuel oil	20–25 bar 290–261 PSI	suction R ½" return R ½"

### To adjust pump pressure:

- Use the pressure adjustment screw.
- Turn the screw clockwise to increase the pressure.
- Install a pressure gauge/valve assembly, if necessary.

### To vent the oil pump:

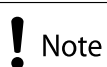
1. Loosen the plug of the pressure gauge port.

**!** Note Do not remove the plug.

2. Let the burner operate for a while. Air bubbles come out of the hole.
3. When no more bubbles come out, retighten the plug carefully.

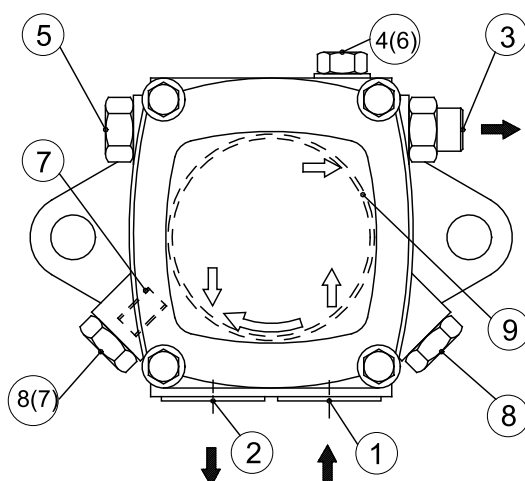


If the atomizing pressure during capacity change from max. to min. exceeds 2 bar / 29 PSI the pump must be replaced.



The pump is self-priming. The pump is intended for use in two-pipe system.

### Oil pump AJ



A203S ver. 2

Pos.	Item	Pos.	Item
1	Suction line connection	6	Air venting plug
2	Return line connection	7	Bypass plug
3	Nozzle connection	8	Vacuum meter connection
4	Pressure gauge connection	9	Filter
5	Pressure regulation		

**!** Note Do not remove the bypass plug from the oil pump.

Technical data		
Inlet oil viscosity range: Light fuel oil	2–75 mm <sup>2</sup> /s (cSt)	2–75 mm <sup>2</sup> /s (cSt)
Inlet oil maximum pressure	2 bar	29 PSI
Inlet oil maximum temperature	+ 60 °C	+ 140 °F
Vacuum in suction line max.	0.45 bar	6.5 PSI
Operating pressure (= atomizing pressure)	10–20 bar	145–290 PSI
Filtration degree to pump	max. 300 µm	max. 300 µm

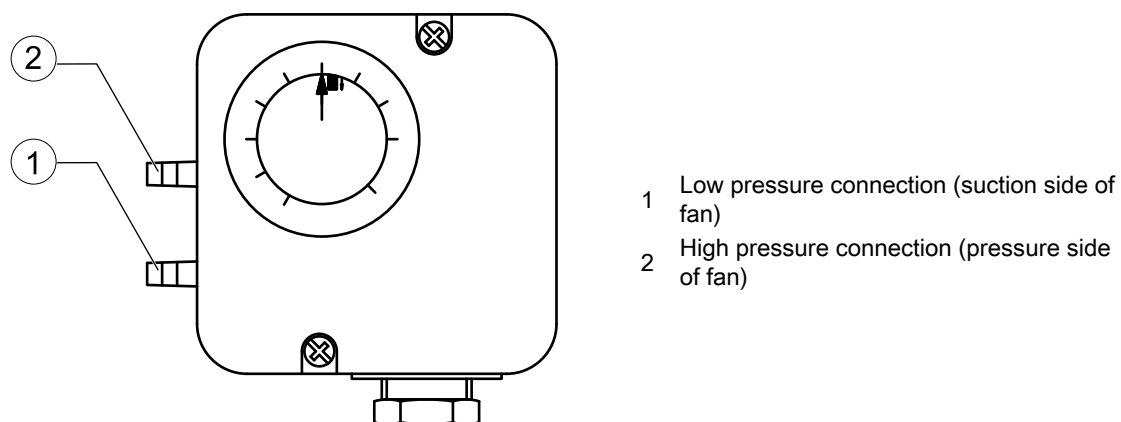
## 4.7 Adjusting differential air pressure switch

### Differential air pressure switch



Connectors in control box are under voltage. Only authorized users may open safety cover.

Differential air pressure switch monitors pressure difference generated by burner fan.



A406L ver. 3

If the pressure difference does not rise above the switch setting value, the burner shuts down.

Differential air pressure switch must be set to trigger before CO concentration of combustion product exceeds 1 vol %, 10,000 ppm.

Burner size	Factory setting, mbar	Factory setting, in. W.C
50	20	8.03
90	21	8.43

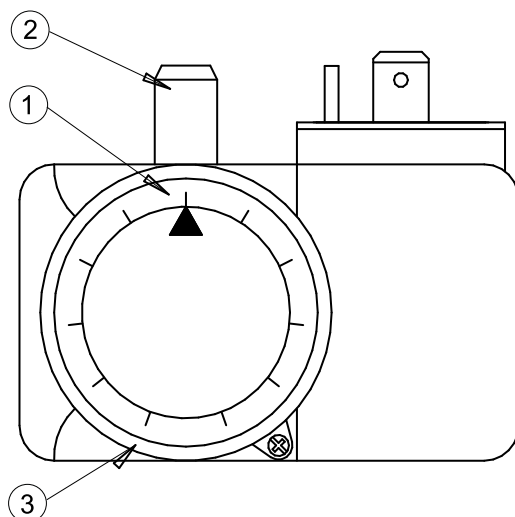
Because circumstances vary in different installation locations, the differential air pressure switch setting may have to be reset according to the current conditions to ensure burner function. Make sure not to exceed the given CO limit.

#### Adjusting at the present nominal burner capacity

1. Open the protective cover of the differential air pressure switch.
2. Start the burner.
3. Turn the switch slowly to the maximum until the burner shuts down.
4. Turn the switch 3 mbar / 1.20 in. W.C from this point backwards (to minimum).
5. Replace the protective cover and reset.

## 4.8 Adjusting gas pressure switch

### Gas pressure switch



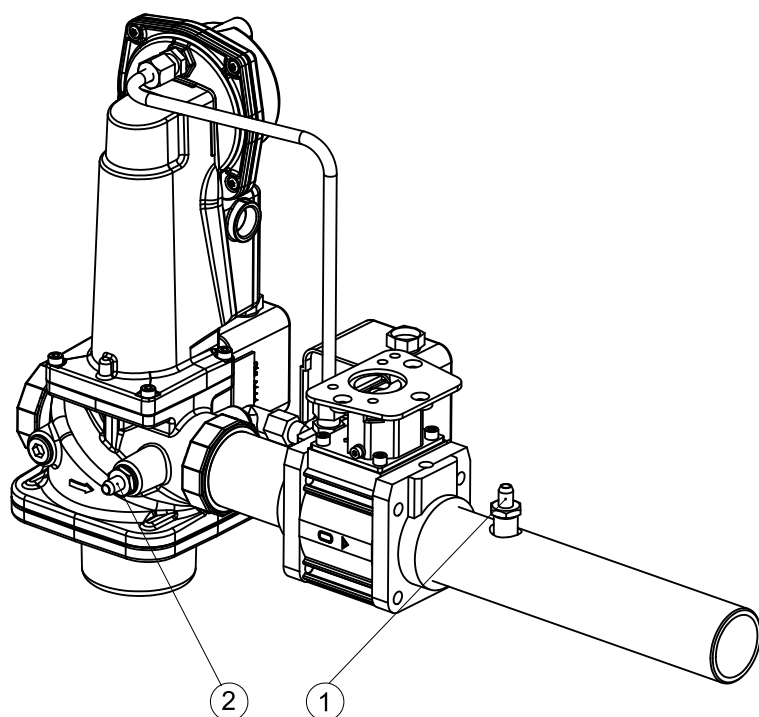
- |   |                               |
|---|-------------------------------|
| 1 | Adjusting scale               |
| 2 | Pressure measuring connection |
| 3 | Protective cover              |

A461R ver. 2

### To adjust gas pressure switch, minimum:

1. Adjust the gas pressure switch minimum on a 20–40 % lower pressure than the gas inlet pressure to burner during burner operation at full load.  
If the gas pressure switch causes a temporarily burner shutdown during burner start-up, set it on a lower pressure.
2. To adjust, open the protective cover of the gas pressure switch
3. Turn the adjustment knob on the scale.
4. Close the protective cover.

## Gas pressure measuring connection



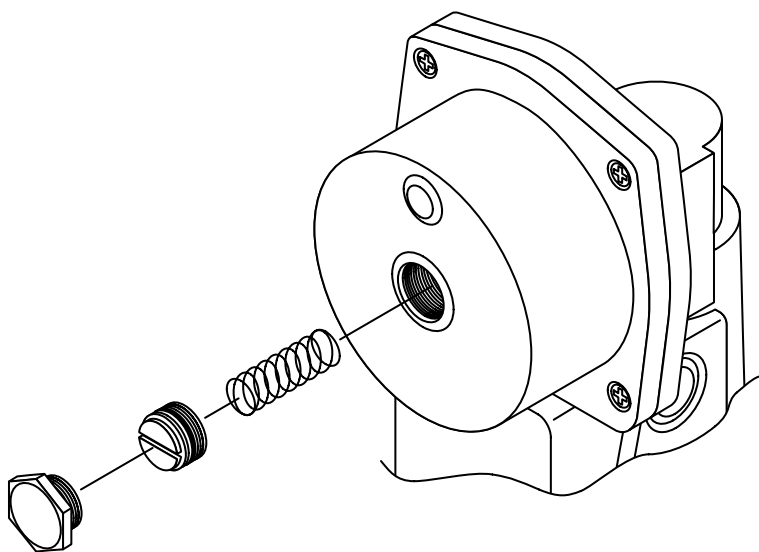
- 1 Measuring connection for nozzle pressure
- 2 Measuring connection for adjusted gas

D048233 ver. 1

## 4.9 Setting gas pressure regulator SKP

The operating area of the gas pressure regulator is determined by the spring installed inside the pressure regulator. There are three types of springs and their operating areas are described in the table below.

Springs can be ordered from Oilon Webshop.



SKP ver. 1


To change spring:


1. Remove the plug.
2. Remove the slot-head screw by turning counter-clockwise with a chisel-point screwdriver.
3. Replace the spring.

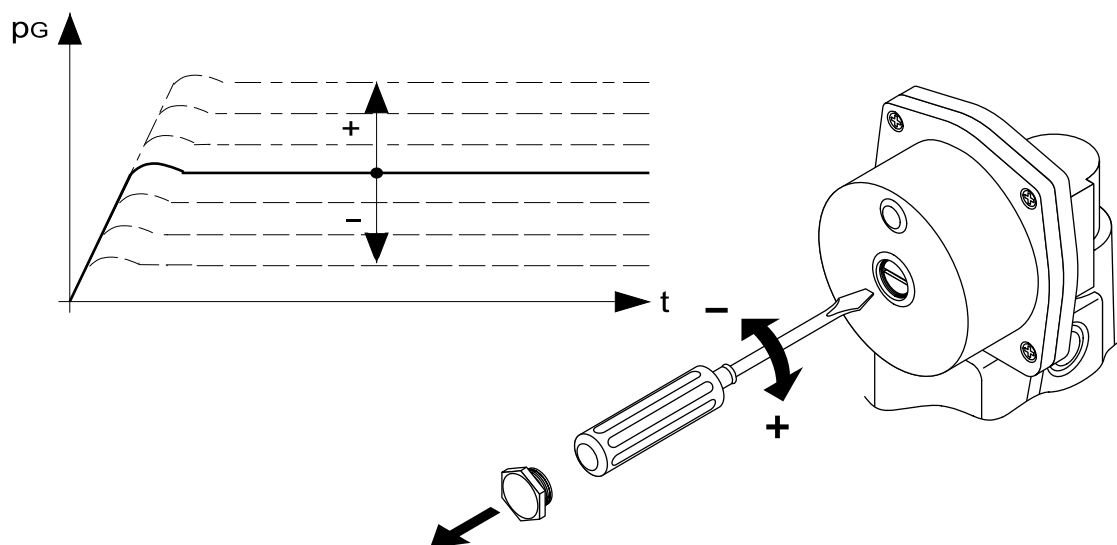
Assemble in reverse order.



Excessive tightening of screws may damage the component.

Spring type	pG (mbar)	$\Delta p /$  360	Color	Model
AGA29	$\leq 22$	2.2	blank	SKP25.0
AGA22	15 ... 120	11.9	yellow	SKP25.0
AGA23	100 ... 250	24.5	red	SKP25.0
AGA22	100 ... 700	-	yellow	SKP25.4
AGA23	$\leq 1500$	245	red	SKP25.4

Spring type	pG (in. W.C)	$\Delta p /$  360	Color	
AGA29	$\leq 8.8$	2.2	blank	SKP25.0
AGA22	6.0 ... 48.2	11.9	yellow	SKP25.0
AGA23	40.2 ... 100.4	24.5	red	SKP25.0
AGA23	$\leq 602.8$	245	red	SKP25.4



SKP2 ver. 1

To adjust gas pressure:

1. Remove the plug.
2. Adjust the outgoing pressure by turning the slot-head screw counter-clockwise with a chisel-point screwdriver.
  - When turning counter-clockwise, the pressure drops.
  - When turning clockwise, the pressure rises.

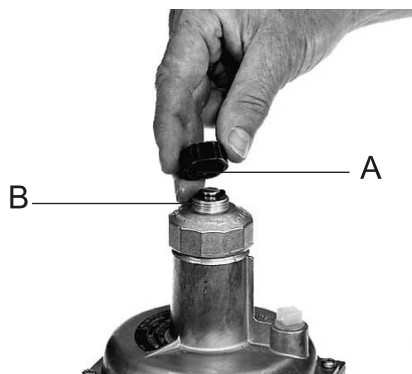
Measure the gas pressure with a pressure gauge when the burner is on.

## 4.10 Setting gas pressure regulator FRS

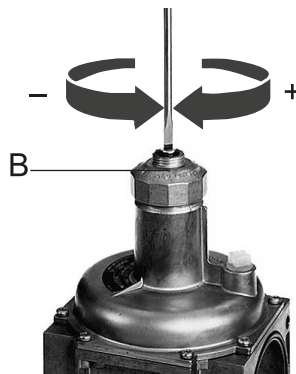
The operating area of the gas pressure regulator is determined by the spring installed inside the pressure regulator. The factory setting of standard spring  $p_2$  is 10-30 mbar.

Springs can be ordered from Oilon Webshop.

### To adjust outlet pressure

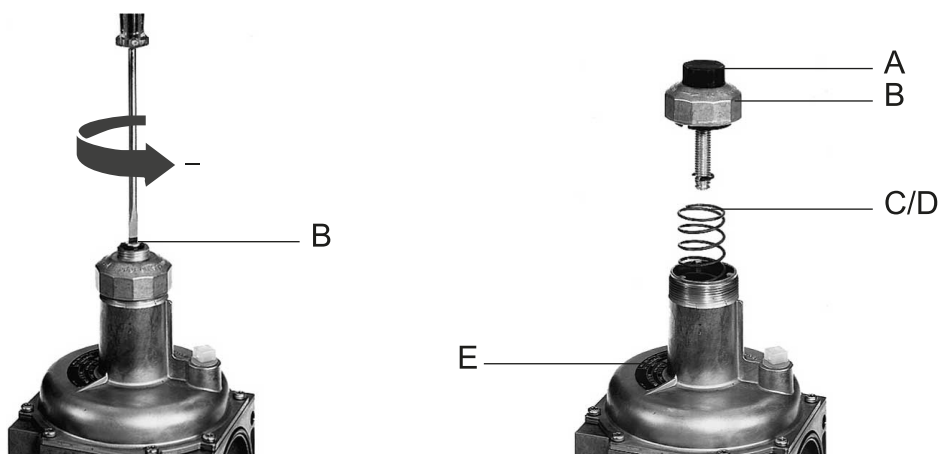


219598a ver. 1



1. Unscrew protective cap **A**.
2. Use a chisel-point screwdriver. to adjust spindle **B**:
  - a. Turn the spindle B clockwise. This increases the outlet pressure.
  - b. Turn the spindle B counterclockwise. This reduces the outlet pressure.
3. Check the setpoint.
4. Screw on the protective cap **A**.

## To replace setting spring



219598b ver. 1

1. Remove protective cap **A**. Release spring by turning adjustment spindle **B** counterclockwise. Turn spindle to stop.
2. Unscrew complete adjustment spindle **B** and remove spring **C**.
3. Insert new spring **D**.
4. Assemble complete adjustment spindle and adjust desired offset.
5. Screw on protective cap **A**. Stick adhesive label **E** onto typeplate.



Excessive tightening of screws may damage the component.

	Setpoint spring range (mbar)	Color	Nominal width Rp/DN					
			Rp 1 1/2, DN40	Rp 2, DN 50	Rp 2 1/2, DN65, 80	DN 100	DN 125	DN 150
Spring 1	2,5...9	brown	229 851	229 874	229 883	229 892	229 901	229 909
Spring 2	5...13	white	229 852	229 875	229 884	229 893	229 902	229 910
Spring 3	5...20	orange	229 853	229 876	229 885	229 894	229 903	229 911
Spring 4	10...30	blue	229 854	229 877	229 886	229 895	229 904	229 912
Spring 5	25...55	red	229 869	229 878	229 887	229 896	229 905	229 913
Spring 6	30...70	yellow	229 870	229 879	229 888	229 897	229 906	229 914
Spring 7	60...110	black	229 871	229 880	229 889	229 898	229 907	229 915
Spring 8	100...150	pink	229 872	229 881	229 890	229 899	229 908	229 916
Spring 9	140...200	grey	229 873	229 882	229 891	229 900	243 416	243 417

Measure the gas pressure with a pressure gauge when the burner is on.

## 4.11 Measuring gas pressure

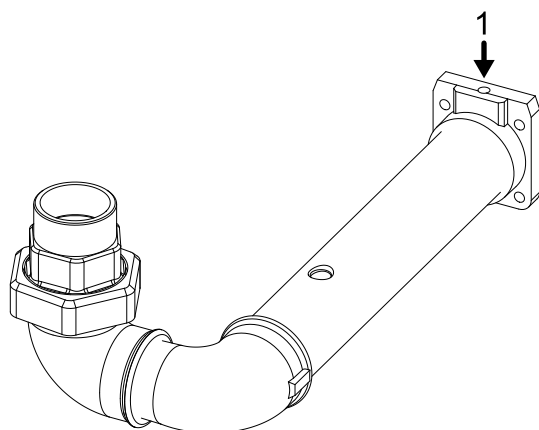
### General rules for gas pressure measurement

1. Shut off the burner.
2. Open the test point connection cover.
3. Attach a silicone hose to the test point connection. Attach a gauge to the other end of the hose.
4. Start the burner.
5. While the burner is running record gas pressure readings using the instructions below.
6. Perform adjustments if needed.
7. Shut off the burner.
8. Finally close all the test point connections and remove measurement equipment.

**!** Note Make all adjustments when the burner is running!

**!** Note All stated pressure values are only for reference. The actual values may vary depending on operating conditions.

### Measuring nozzle pressure



D046520 ver. 2

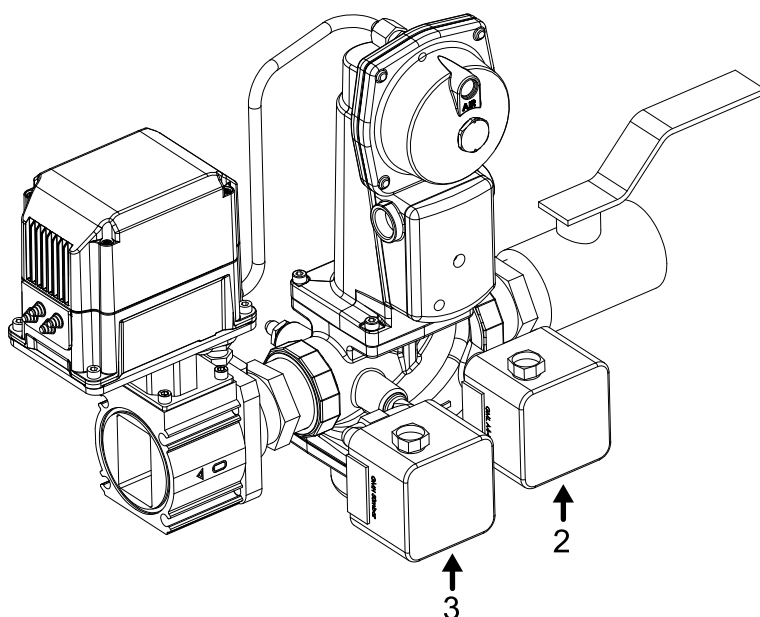
#### 1. Nozzle pressure at nominal capacity

Burner	Test point 1 (mbar)	Test point 1 (in.Wc)
50	19	7.6
90	29	11.7

Check the tables below, for adjusted pressure values.

### Measuring inlet and adjusted pressure

VGG valve + SKP pressure regulator



- 2. Inlet pressure
- 3. Adjusted pressure

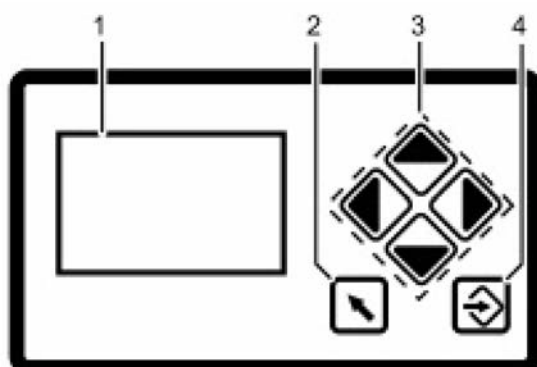
D049461 ver. 2

Burner	Test point 2 (mbar)	Test point 3 (mbar)	Test point 2 (in.Wc)	Test point 3 (in.Wc)
GKP-50 MH	30	21	12	8
GKP-90 MH	50	34	20	13.7

## 4.12 Operating and display unit

### User interface

For scrolling and changing the values, use the buttons shown on the display.



- 1 Display
- 2 **Back**
- 3 Arrow keys
- 4 **Enter**

Control panel ver. 2

Navigate in the menus using arrow keys. Select the desired submenu by pressing **Enter**. Return to the higher menu level by pressing **Back**.

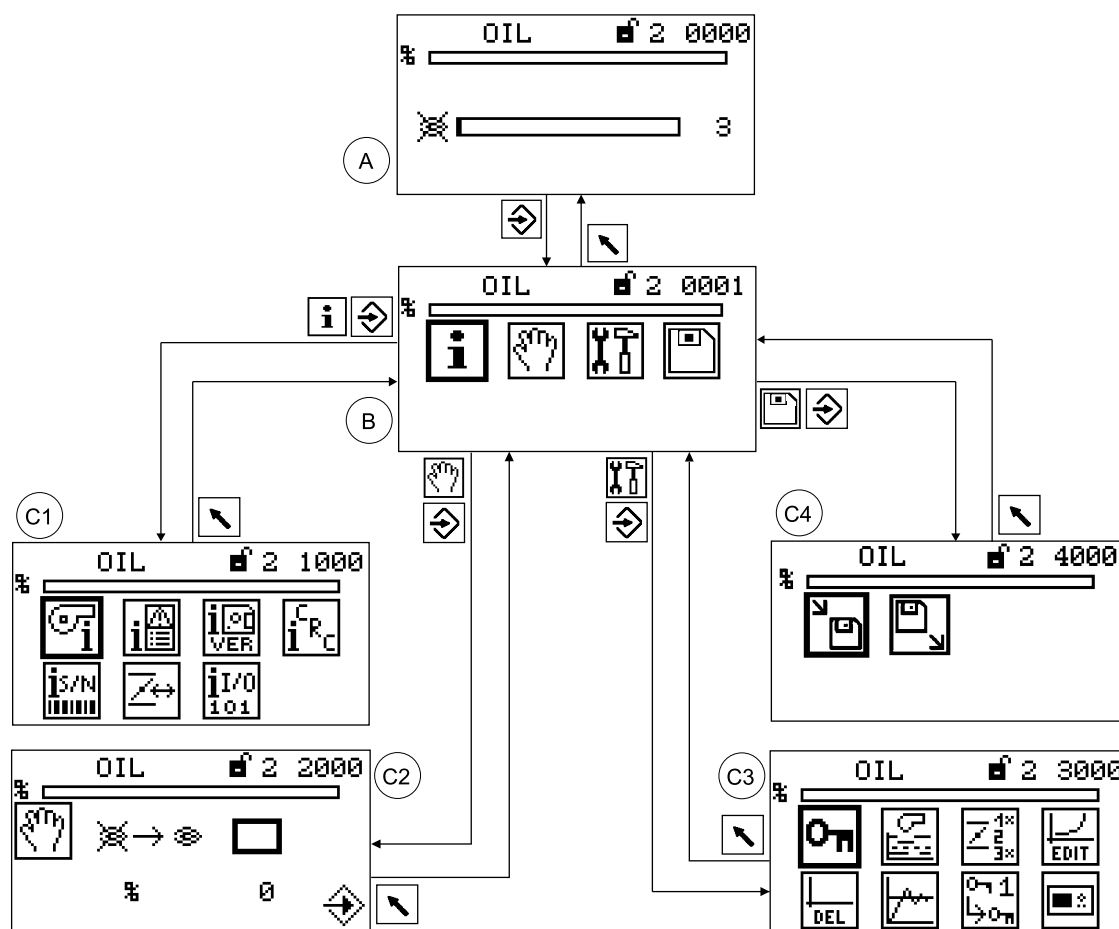
## Menu structure

Menus are divided into three operating levels:

- User level (0), does not require password.
- Service level (1), password-protected for commissioning and maintenance personnel.
- Burner manufacturer level (2), password-protected.

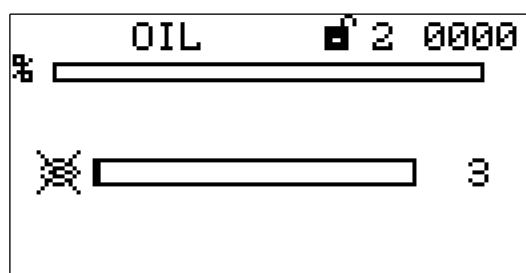
## 4.13 Display menus

### Menu structure



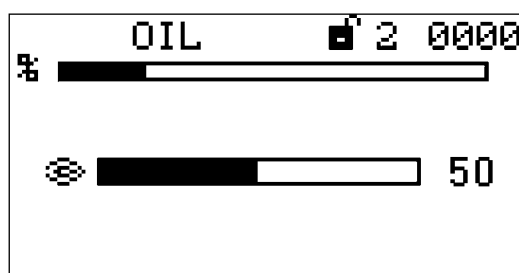
Menu structure ver. 4

### A. Main menu



0000 Burner stop ver. 3

Burner off

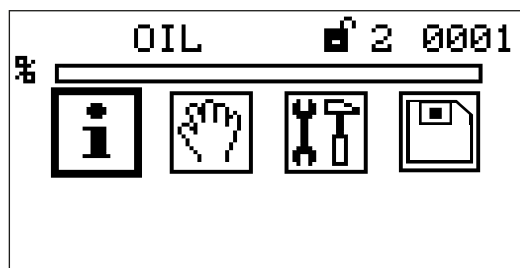


0000 Burner running ver. 3

Burner on

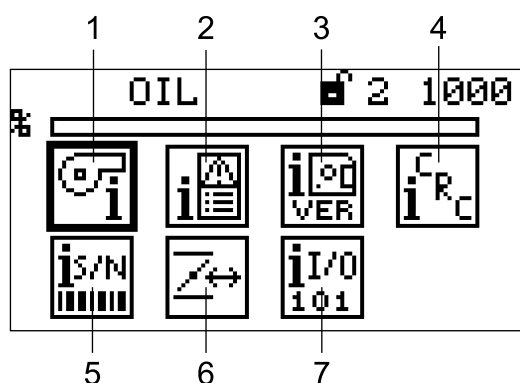
Menu code:	0000
Fuel:	OIL or GAS
User level:	locked (0) or open (1, 2)
Upper pillar:	burner capacity, %
Lower pillar:	flame on/off and intensity

## B Main menu path



0001 ver. 4

## C1 Information menu path



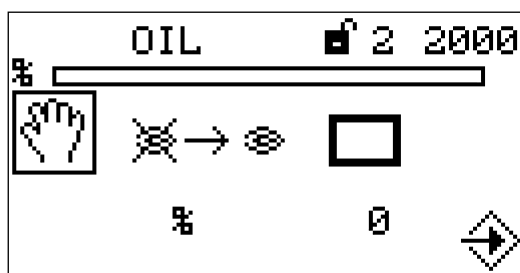
Info ver. 3

- 1 Selected burner information
- 2 Fault history
- 3 Software version
- 4 Check sum display
- 5 Serial number
- 6 Configuration of actual value of actuating outputs
- 7 Digital inputs/outputs

## C2 Manual menu path



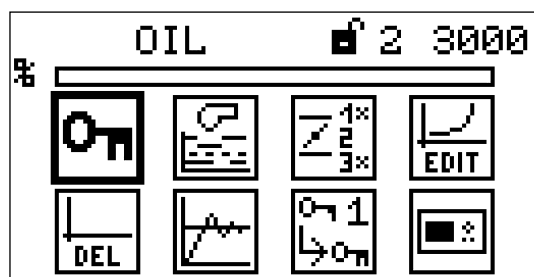
User can scroll and change values of burner's manual control.



2000 ver. 3

This function bypasses start-up input (X10) and is active only while staying in this menu.

### C3 service menu



3000 ver. 3

### Changing the user level



1. Enter password.
2. Press **Enter**.

To ensure safe burner operation some settings are protected by passwords that are granted to different user groups. Only authorized personnel can change these settings.

Password-protected settings are:

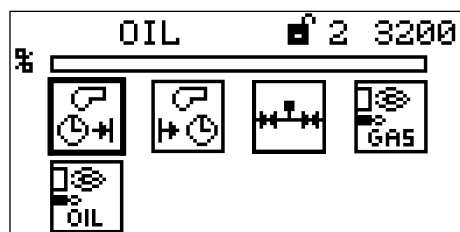
- Burner control
- Ratio, ratio curves

The system automatically returns from any user level to the basic user level after a delay. If you enter an incorrect password, the system also returns to the basic user level.

User interface features can be added with a PC application.

### Submenus of C3 service menu

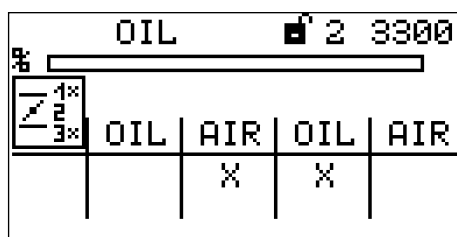
#### Program sequences



3200 ver. 4

- duration of pre-ventilation, post-ventilation and valve leakage test
- location of valve leakage test in sequence
- ignition gas valve selection

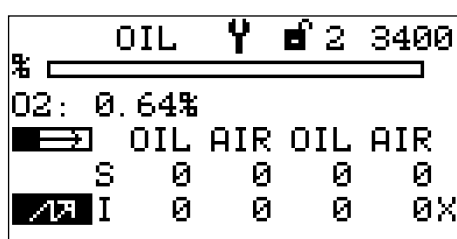
## Actuating outputs



3300 ver. 3

- configuration of actuating outputs

## Ratio curve-editor



3400 ver. 3

- editing the ratio curves

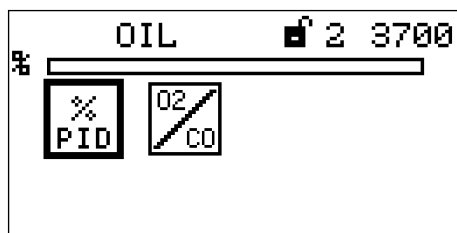
## Deleting ratio curves



3600 ver. 3

- deletes all curves

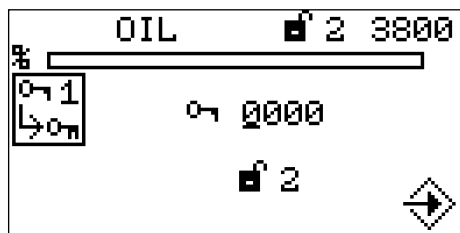
## Setting parameters for controllers



3700 ver. 4

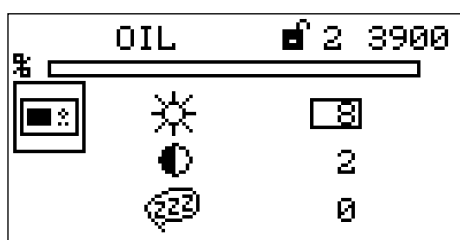
- parameters for load controller module (LCM)
- parameters for O2 and CO controllers

## Changing password, service level 1



3800 ver. 3

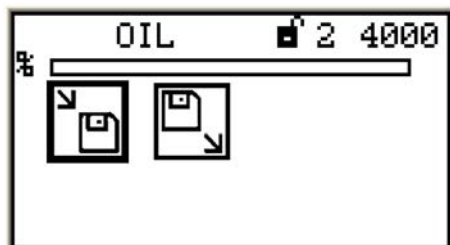
## Display settings



3900 ver. 3

- brightness, contrast, waiting time for screen saver



## C4 dataset processing menu path



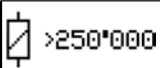


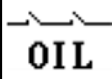
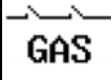

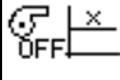

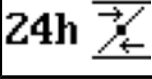
4000 ver. 1

## Saving and restoring dataset

During these actions, the burner should be shut down.

	To save the dataset from the burner control to the operating panel, press the saving dataset icon.
	To restore the dataset to the burner control from the operating panel, press the restoring dataset icon. This icon is visible only after the settings have been saved for the first time.

## Important symbols

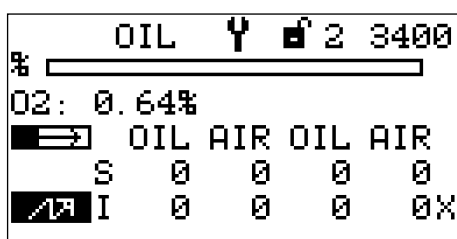
Symbol	Description
	Hint 6 Safety device needs replacement (250,000 burner starts).
	Hint 9 Boiler safety interlock chain is not closed (symbol is blinking).
	Hint 10 Differential air pressure information is received, although the fan is not in function (symbol is blinking).
	Hint 11 Oil safety interlock chain is not closed (symbol is blinking).
	Hint 12 Gas safety interlock chain is not closed (symbol is blinking).
	Hint 15 Differential air pressure information is not received, although the fan is functioning (symbol is blinking).
	Hint 38 Load controller module start-up limit missing (symbol is blinking).
	Hint 2001 Ignition happens only towards the end of safety time.
	Hint 2002 Intermittent operation automatic restart.

## 4.14 Manual start-up and servomotor position checking

As a factory setting in pre- and post-purges there is a full opening for every servomotor (999).

Check the servomotor positioning data from the operation panel as follows:

- See the servomotor positions on info display during start-up or shutdown.
- Check the actual and set values for all servomotors with curve points on ratio control menu.
- To drive the servomotor to a desired position, change the curve point in ratio control menu. This operation can be carried out also in standby position, without flame.



3400 ver. 3

## Start-up on manual drive



Check that interlocks and alarms are reset.

Activate burner start-up on manual drive from the control panel's point



## Pre-purge position checking

Factory setting of pre-purge position is fully open (999). Resetting is possible only by PC program.

Checking is automatic in every start-up sequence, because full opening is required.

If servomotors do not do full movement at full capacity point, burner start-up can be accelerated, because servomotor running times get shorter.

### Gas use

- with full capacity air amount the pre-purge time is at least 20 s
- 50% of air amount the pre-purge time is at least 40 s
- 33% of air amount the pre-purge time is at least 60 s



Note Pre-purge must ventilate combustion chamber to fresh air level.

### Oil use

- Pre-purge minimum duration is set at 15 s, when air amount should be 30% of full load air amount.
- Servomotor settings should be the half of full load settings.



Note If curve point setting for full load is changed, changes must be adapted to pre-purge position settings.



Note Pre-purge must ventilate combustion chamber to fresh air level.



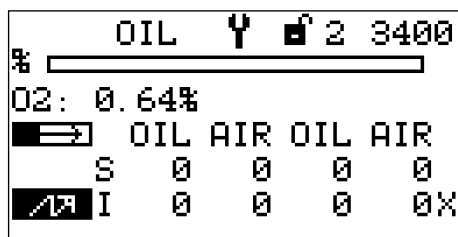
Note If servomotor Aux 3 is in use, it does not move until phase 32, when program stop is changed to phase 32.

## 4.15 Setting ignition position

The ignition position is set on the ratio control menu.

1. To set the condition, press **Enter**.
2. To change the setting, move to the setting with the arrow keys (S-row).  
The set values of the servomotors are shown in the following figure (I-row).
3. Select the set value with arrow keys.
4. To save the set value to be the curve point, press **Enter**.

Setting area: 0–999/ 90°



3400 ver. 3

For more information about adjusting combustion air, see section *Adjusting combustion air*.

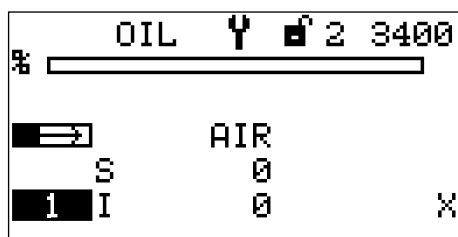
**!** Note Check combustion values of ignition capacity with flue gas analysis.

## 4.16 Setting ignition position, oil (2-stage)

The ignition position is set on the ratio control menu as the point 1 of the ratio curve (ignition position = 1-stage).

1. To set the condition, press **Enter**.
2. To change the setting, move to the setting with the arrow keys (S-row).  
The set values of the servomotor (air) are shown in the following figure (I-row).
3. Select the set value with arrow keys.
4. To save the set value to be the curve point, press **Enter**.

Setting area: 0–999/ 90°



3400 edit1 ver. 1

For more information about adjusting combustion air, see section *Adjusting combustion air*.

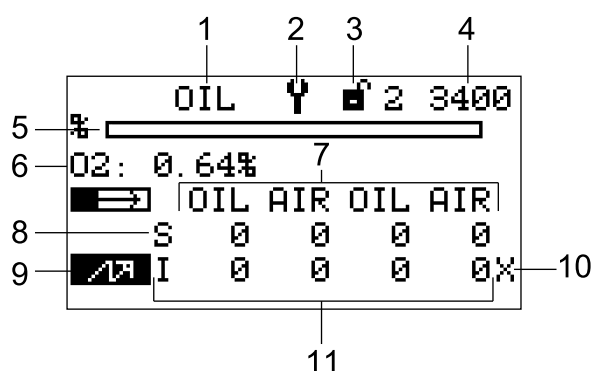
**!** Note Check combustion values of ignition capacity with flue gas analysis.

## 4.17 Setting ratio curve

### Creating curve point individually

There can be a maximum of 10 curve points.

Set the ratio curve in the control panel menu



3400 numbered ver. 3

Pos.	Item
1	fuel (set of curves)
2	set condition
3	level 2 password (burner manufacturer)
4	menu number
5	pillar display: capacity-%
6	O2: residual oxygen -%
7	actuators: CH1, CH2, CH3
8	S-row: set points/channel
9	selected curve point: ignition position
10	X-mark indicates the active "page"
11	I-row actual values/channel

1. Select the desired curve point page with arrow keys.
2. To enter the editing state, press **Enter**.
3. On the setting row, set the cursor with arrow keys to the desired point.
4. Change the value with arrow keys and save with **Enter**.  
When the settings are saved, an X mark appears in the lower corner on the right.  
Servomotors follow the new setting that is shown on the I-row.
5. Select the other curve point with arrow keys.
6. To exit the point editing, press **Esc**.

Edit the curve points by logging into the Service level (1).

Available curve points:

## Ignition



200, 250, 300, 400, 500, 600, 700, 800, 900, 999

On full capacity curve point:

1. Adjust the burner's capacity. Note the ratio control.
2. Check combustion values with flue gas analysis.
3. Check flame combustion.



Note

Measure fuel consumption on every adjusting point so that the set of curves correspond to the genuine load situation.



Note

Check combustion values of ignition capacity with flue gas analysis.

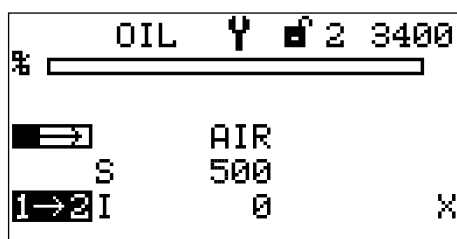
## 4.18 Setting ratio curve, oil (2-stage)

### Creating 2-stage operation curve points

1	1-stage point (same as the ignition point)
1 > 2	2-stage valve opening point when shifting from 1-stage to 2-stage
1 < 2	2-stage valve closing point when shifting from 2-stage to 1-stage
2	2-stage point

Point 1 > 2 set value is recommended to be set bigger than point 1 < 2.

Set the ratio curve in the control panel menu



3400 edit2 ver. 1

1	fuel (set of curves)
2	set condition
3	level 2 password (burner manufacturer)
4	menu number
5	pillar display: capacity-%
6	O2: residual oxygen -%
7	actuators: CH1, CH2, CH3
8	S-row: set points/channel

9	selected curve point: ignition position
10	X-mark indicates the active "page"
11	I-row actual values/channel

1. Select the desired curve point page with arrow keys.
2. To enter the editing state, press **Enter**.
3. On the setting row, set the cursor with arrow keys to the desired point.
4. Change the value with arrow keys and save with **Enter**.  
When the settings are saved, an X mark appears in the lower corner on the right.  
Servomotors follow the new setting that is shown on the I-row.
5. Select the other curve point with arrow keys.
6. To exit the point editing, press **Esc**.

Edit the curve points by logging into the Service level (1).

On full capacity curve point:

1. Adjust the burner's capacity. Note the ratio control.
2. Check combustion values with flue gas analysis.
3. Check flame combustion.

**!** Note Measure fuel consumption on every adjusting point so that the set of curves correspond to the genuine load situation.

**!** Note Check combustion values of ignition capacity with flue gas analysis.

## 4.19 Capacity range

The burner capacity range can be set at service level. The minimum capacity can be higher than the first curve point, and the maximum capacity lower than the last curve point. During the start-up, the burner always runs from ignition capacity to minimum capacity, and continues to normal operation. Ignition capacity can be lower, higher or the same as the first curve point capacity.

## 4.20 Capacity range, oil (2-stage)

Two capacity points are set to the burner, where points related to air amount and 2-stage valve control are set. Ignition point is the same as the 1-stage point.

In 2-stage use, the load control utilizes the same PID controller output (200–999), from which the shifting settings and hystereses for 1- and 2-stage are formed.

## 4.21 Setting load controller module operating mode

The load controller module (LCM) is connected to the control unit through an LSB bus. Electrical connections, such as sensors and counters, are performed according to the wiring diagram.

Basic settings of a control module are carried out with DIP switches (LCM) and other settings with a PC application (LSB-remote).

The DIP switches are placed on the cover of the module. In the following tables, the factory settings are underlined:

DIP-1

0 = no CAN terminator

1 = CAN terminator active

DIP-5–6, product family

DIP-5	DIP-6	Product family
<u>0</u>	<u>0</u>	1
0	1	2
1	0	3
1	1	4

DIP-2–4, choosing temperature sensor

DIP-2	DIP-3	DIP-4	Sensor
<u>0</u>	X	X	PT100, boiler water temperature
1	X	X	PT1000, boiler water temperature
X	<u>0</u>	X	PT100, outside temperature
X	1	X	PT1000, outside temperature
X	X	<u>0</u>	PT100, flue gas temperature
X	X	1	PT1000, flue gas temperature

## 4.22 Setting load controller parameters

In the following table, the marking (w) stands for water and (s) for steam.

Param. no.		Description	Factory setting
0040	BT300	Type of output regulator. 0-OFF / 1-constant regulator / 2-weather-controlled regulator	1
0048	BT300	Controller set value 1 minimum	0
0049	BT300	Controller set value 1 maximum	110 (w) / 10 (s)
0054	BT300	Burner start point	2 (w) / 0.5 (s)
0055	BT300	Upper control range	5 (w) / 1 (s)
0056	BT300	Burner off	7 (w) / 1.5 (s)
0057	BT300	P-term of the controller	120 (w) / 600 (s)
0058	BT300	I-term of the controller	60 (w) / 300 (s)
0059	BT300	D-term of the controller	20 (w) / 25 (s)
0060	BT300	Reset time	15 (w) / 20 (s)
0061	BT300	Representation of actual value and setpoint for load regulator	1 (w) / 2 (s)
0062	BT300	4 mA corresponds to x units	0
0063	BT300	20 mA corresponds to x units	Pressure transmitter max.

Param. no.		Description	Factory setting
0065	BT300	Adjustment of the input of the firing-rate controller is used for the manual presetting of the burner firing rate	2
527	BT300	2-stage valve opening point from 1-stage to 2-stage	0–999
528	BT300	2-stage valve closing point from 2-stage to 1-stage	0–999
531	BT300	Load controller module output set point, which enables shifting to 2-stage	200–999
532	BT300	Load controller module output set point, which enables returning to 1-stage	200–999
		0 = potentiometer 1 = Three-Point-Step (TPS) 2 = 4–20mA current loop signal 3 = 0-10V voltage input	

To generate adequate hysteresis, parameter 531 value should be set to an approx. 50 digits bigger value than what the parameter 532 value is.

### External guideline value

LCM connectors 25 and 26 are connected together. The 0/4..20 mA guideline value signal is connected to the LCM connectors 16 and 17. In this control mode, there must not be any conductor loops to connectors 22, 23, and 24.

In this control mode, LCM's own PID controller is not in operation. Hence the start-up and shutdown limits must be formed externally controlled to the start-up circuit (BURNER ON, X10).

### External set point value

LCM connectors 25, 26, and 27 are connected together. The 0/4..20 mA guideline value signal is connected to the LCM connectors 16 and 17.

Param. no	Description	Factory setting
40	Load controller module operation mode (setpoint shift)	2
52	mA-signal minimum (0 or 4 mA)	0 or 40
53	mA-signal maximum (20 mA)	200
48	Set point value 1 minimum vs 0/4 mA	for example 80
49	Set point value 1 maximum vs 20 mA	for example 100

With the sample setting, the set point value can be chosen with the mA-signal to be between 80–100. When necessary, set point value 2 and the external set point value (LCM connectors 2–5) can be changed according to the same procedure.

The PC application (LSB-Remote) gives a possibility to wider load controller parameter setting.



**Note**

See burner control manufacturer's instructions for use and setting parameters.

### Parameter evaluation

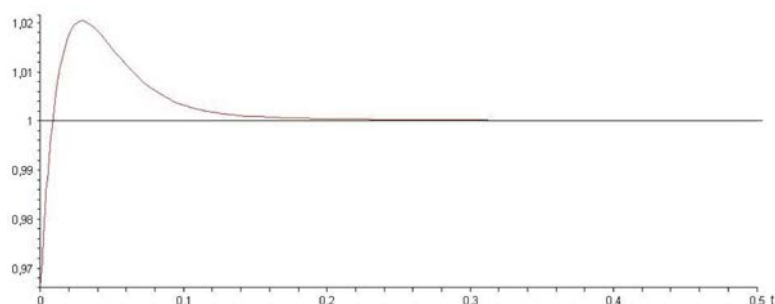
Capacity control does not cause variation in boiler temperature or pressure with optimum PID parameters.

After changing a setting, boiler temperature or pressure should stabilize to the new value. If the values fluctuate, the parameters must be checked. Pressure and temperature should not go under or exceed the set values.

Examples of typical incorrect settings:

Characteristic	Control process	Control mode	Start-up procedure
P-term higher	decrease of attenuation	stronger reaction with overshoot	faster start-up with overshoot
P-term lower	increase of attenuation	weaker reaction less tendency to oscillate	slower start-up

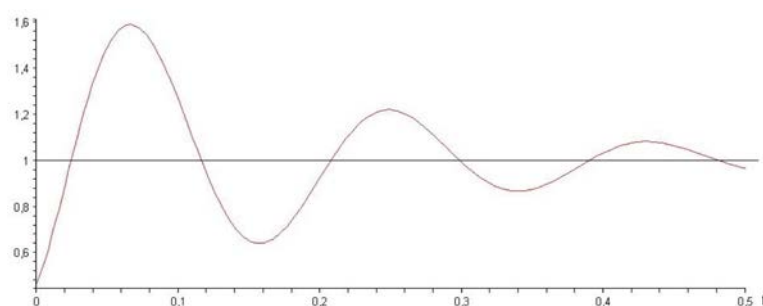
P-term too high



P-term diagram ver. 1

Characteristic	Control process	Control mode	Start-up procedure
I-term higher	decrease of attenuation	stronger reaction with tendency to oscillate	faster start-up with tendency to oscillate
I-term lower	increase of attenuation	weaker reaction less tendency to oscillate	slower start-up

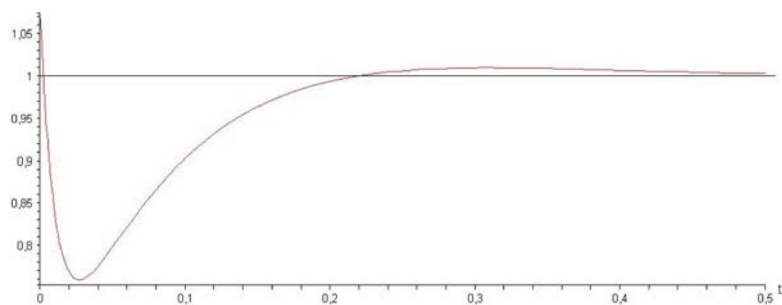
I-term too high



I-term diagram ver. 1

Characteristic	Control process	Control mode	Start-up procedure
D-term higher	decrease of attenuation	stronger reaction	slower start-up earlier decrease of power
D-term lower	increase of attenuation	weaker reaction	faster start-up later decrease of power

D-term too high

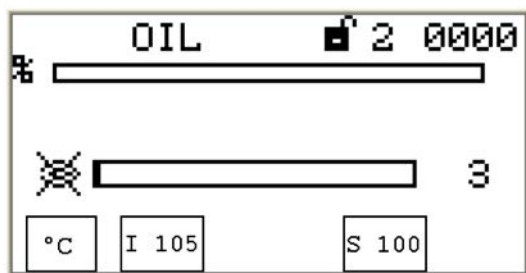


D-term diagram ver. 1

## 4.23 Load controller use

The load controller functions are available on the control panel.

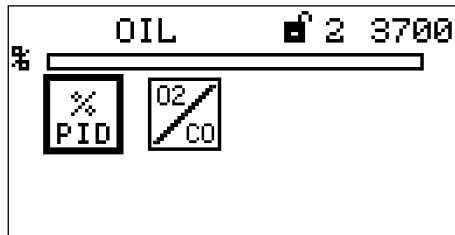
### Main menu



0000 modified ver. 1

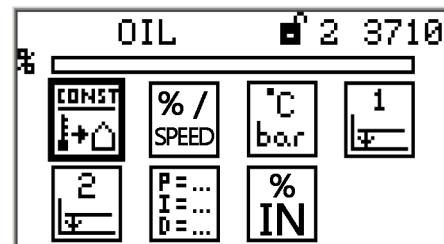
- measurement unit, °C/bar
- load controller actual value, I = 105 °C
- load controller set value, S = 100 °C

## Setting parameters for load controller



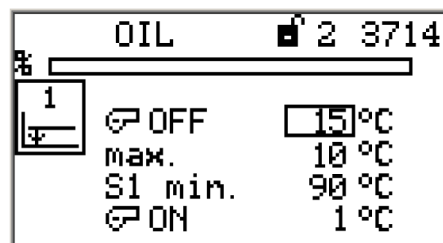
3700 ver. 4

- %-PID load controller settings



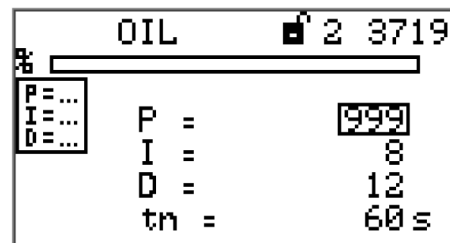
3710 modified ver. 2

- CONST, controller type selection
- °C/ bar, measurement unit
- 1 and 2 settings and limit settings
- PID terms



3714 ver. 2

- OFF, shut-off limit (in this example 15 + 90)
- max., setting (in this example 10 + 90)
- S1 min. setting (90)
- ON, start limit setting (in this example 90-1)



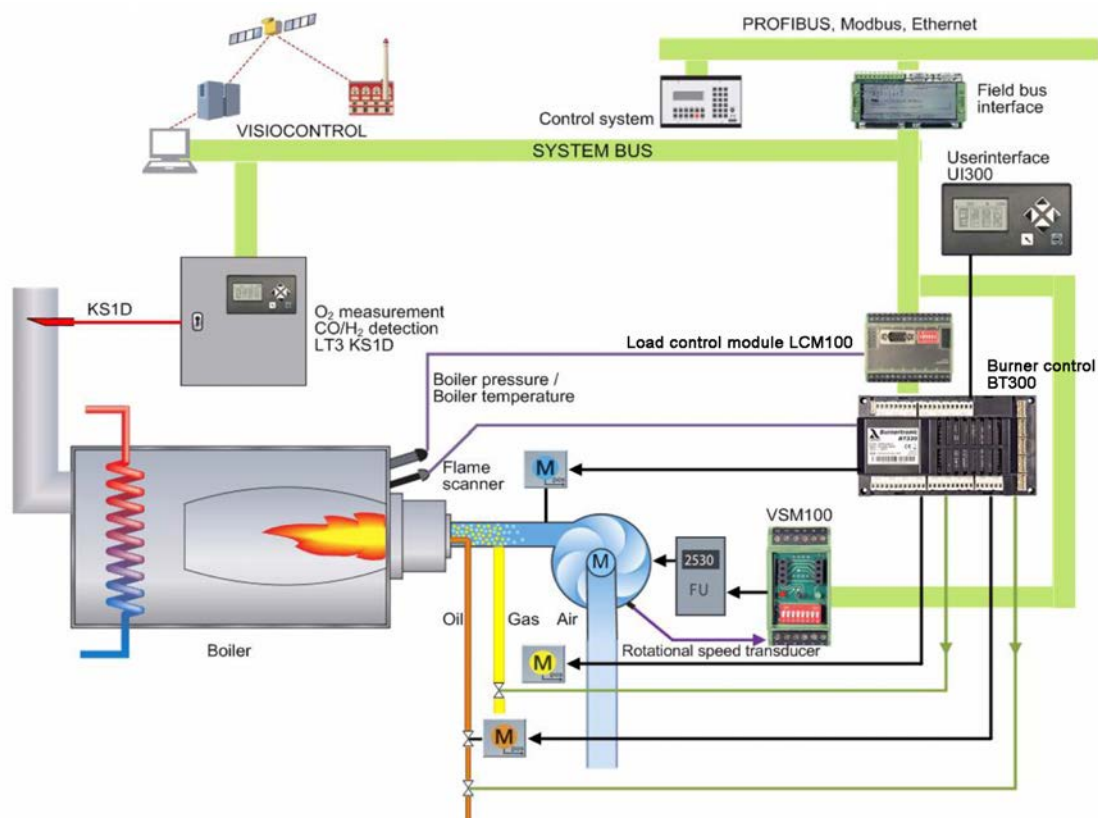
3719 ver. 1

- P, gain
- I, integration
- D, derivation
- tn, setting interval

## 5 Operation

### 5.1 Burner operation

The following illustration describes the WiseDrive system overview. System alternatives for the GKP-50 MH – 90 MH burners are described in the following sections.



WD32-34 system ver. 1

The assembly may vary depending on the scope of delivery.

#### WiseDrive system

In the WiseDrive system, burner operation is controlled and supervised by burner control integrated to the burner.

In dual-fuel burners, a separate dual-fuel module (DFM) as well as a load control module (LCM) are needed. The burner control with the dual-fuel module adjust air and fuel ratio.

The system includes an operating and display unit for local use. In commissioning and in service, it is possible to use a remote PC application.

GKP-50 MH–90 MH burners are implemented with intermittent flame monitoring.

See also control system manufacturer's instructions for setting parameters.

## PC application

The main functions of the remote PC application are:

- setting parameters,
- creating ratio curves,
- data collection,
- fault diagnostics,
- backup copying, and
- manual control.

The communication between PC and the WiseDrive system is executed with LSB bus interface to USB connection. The application software and connection cables are provided separately.

For more precise software user instructions, see control program manufacturer's instructions.

## Burner control

Burner control is a microprocessor-based burner control and safety system.



Burner control is a safety device. Do not open it or interfere with it.



BT330 ver. 2

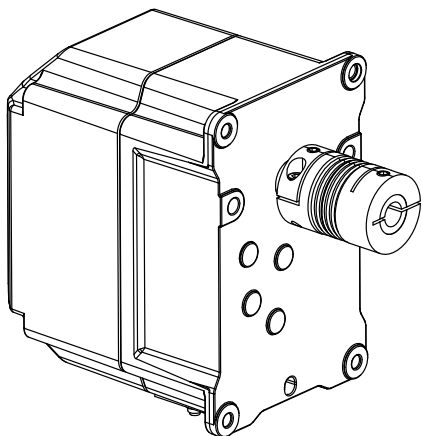
The burner control has the following features:

- burner control and safety functions
- electronic fuel/air ratio
- gas valve proving
- boiler safety circuit
- start-up and running time counters
- fault and lockout history
- bus interface.

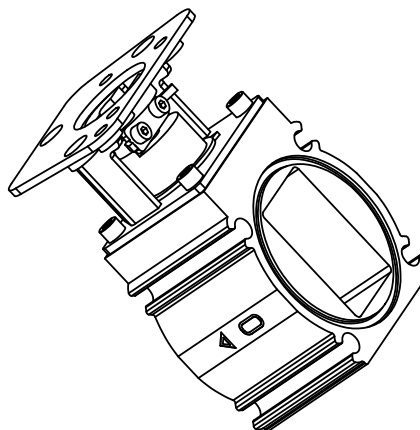


**Note** The model in use may differ from what is depicted in the illustration.

## Servomotor and gas regulator valve



Lamtec motor ver. 2

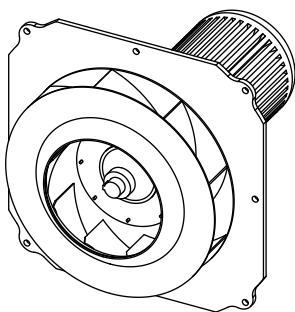


D045314 ver. 1

Servomotors drive air dampers and gas regulator valve.  
The servomotor, controlled by the burner control, regulates the air and fuel ratio electronically.

## Combustion air fan

A fan attached to the burner provides sufficiently high and even air pressure for efficient combustion.



Fan group 4 ver. 3

## Operating and display unit



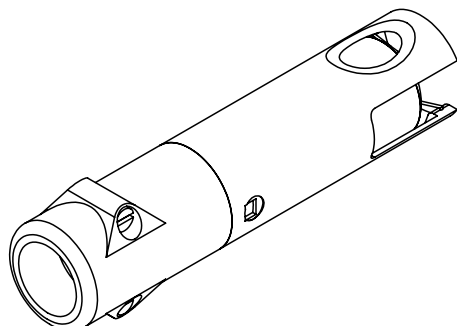
Control panel photo ver. 2

The WiseDrive system operating and display unit for local use is used for monitoring and adjusting settings.  
The user interface is implemented with graphics and animated symbols.  
Backup copying and restoring of files is possible with the operating and display unit.

## Flame detectors

The burner can be equipped either with an ionization electrode or with a UV/IR detector.

UV detector QRA2 for non-permanent operation



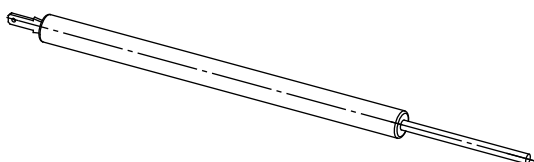
QRA2 ver. 2

UV detector KLC for non-permanent operation



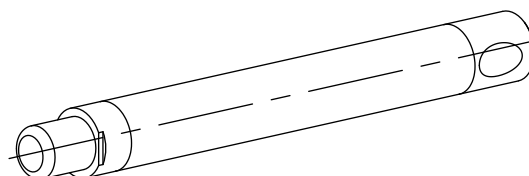
KLC ver. 1

Ionization electrode for permanent operation  
Shape of the ionization electrode can vary depending on burner type.



D043884 ver. 2

UV sensor FFS 08 for permanent operation

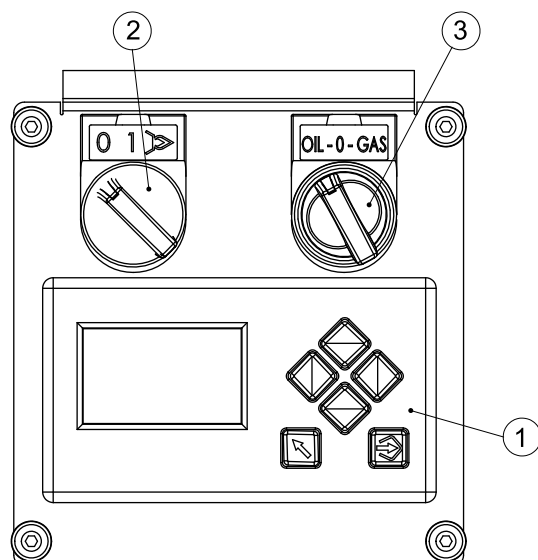


FFS08 ver. 2

## 5.2 Switch panel

In standard delivery, the burner control system and switch panel are integrated to the burner.


The information in this section is for reference. For the burner specific data, see the electric diagram delivered with the burner.



D044670 ver. 1

- 1 A100 Control panel
- 2 Control switch S1/H1
- 3 Fuel selector switch S2 (GKP)

### Control switch S1

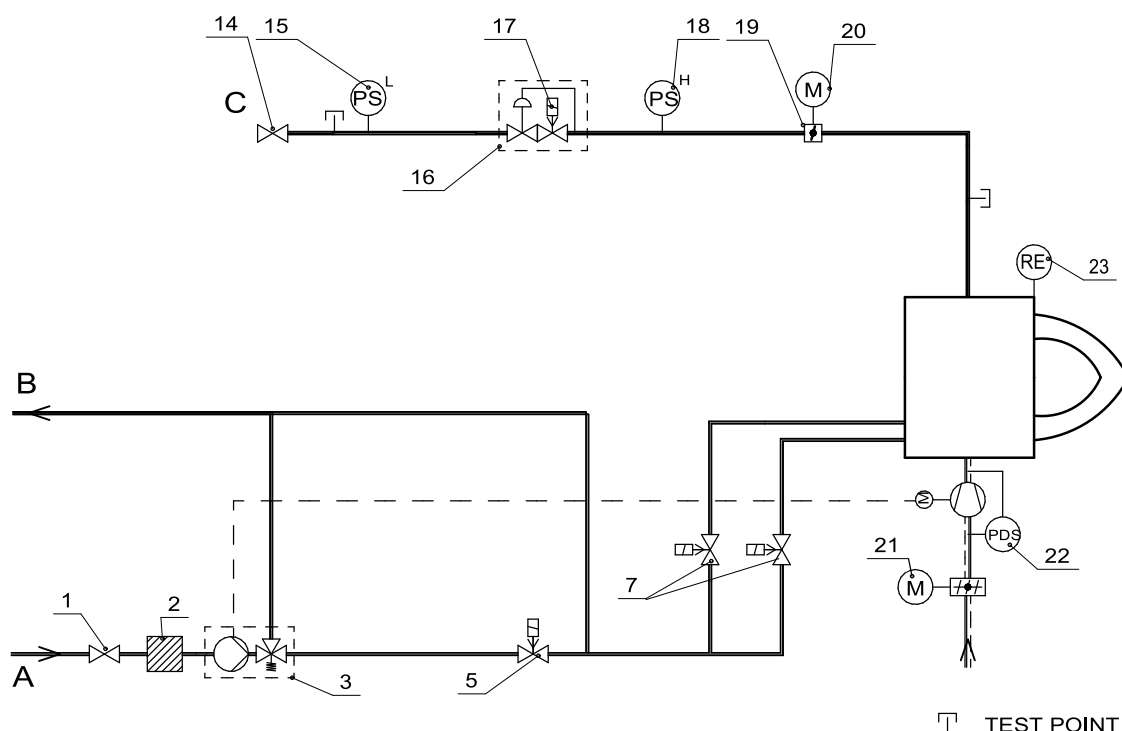
Switch position	State
0 - STOP	Control voltage is cut off from burner automation and burner is shut down.
1 - CONTROL	Control voltage is switched on to burner automation (burner control, servomotors). Burner control is ready for control and monitoring functions, but burner start-up by control device is prevented.
2 /  - AUTOMATIC	Burner starts as the start signal is received from control device. Burner control start-up program begins. Burner operates controlled by the capacity controller or on a manually preset load. Burner control supervises burner operation and results in a controlled shutdown or if necessary, safety shutdown and lockout. During burner operation the green LED illuminates the switch.

### Fuel selector switch S2 (in dual-fuel GKP burner)

Switch position	State
1 - OIL	Burner control chosen to oil use.
0	No fuel chosen.
2 - GAS	Burner control chosen to gas use.

## 5.3 General description of burner operation

### PI diagram, oil and gas use



B-535V+O ver. 2

Pos.	Item	Pos.	Item
1	Ball valve	18	Pressure switch
2	Oil filter	19	Butterfly valve
3	Oil pump	20	Servomotor
5	Solenoid valve	21	Servomotor
7	Solenoid valve	22	Differential air pressure switch
14	Ball valve	23	Flame detector
15	Pressure switch	A	Oil to burner
16	Solenoid valve	B	Oil to tank
17	Actuator	C	Gas to burner

### Burner start-up: Pre-purging, ignition

During pre-purge, the burner fan ventilates the boiler and chimney. At the time, the fuel valves are closed. The fan creates a full air pressure before fuel inlet. Air in the boiler and in the smoke flue will be circulated, which reduces the pressure, developing in combustion chamber during flame ignition.

After the pre-purge, the servomotors run to the ignition position, the ignition begins, and the fuel valves open. Fuel releases to the nozzle, and ignites by spark. Ignition ends after time determined by the burner control. The flame burns with set ignition load.

## Burner operation

During burner operation, the capacity controller controls the burner control, which controls the servomotors. Servomotors adjust the gas regulator valve and air dampers between partial load and full load according to the capacity demand (modulating gas use). In oil use, the load controller module controls the burner at high-low control (2-stage). The oil pump pressure is directed to the oil nozzles that generate the oil spray.

Incoming oil pressure to burner is mentioned in section *Oil pump*.

## Burner shutdown

When the burner shuts down, the burner fuel valves close. Fuel supply closes. Finally, the burner post-purge phase starts for a defined time period.



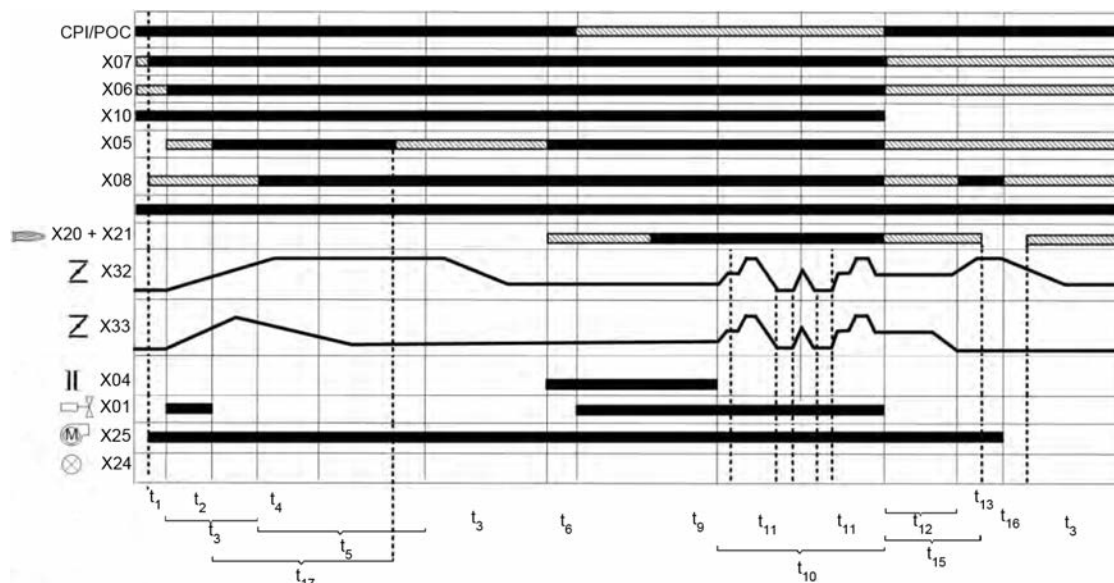
**Note**

The burner must be connected to the oil circulation system according to the oil supply diagram.

## 5.4 Legend to time sequence diagram symbols and safety times

Pos.	Description	Factory setting
t1	Waiting time safety interlock chain (X06, burner)	-
t2	Leakage test of gas valves, V1 (filling the interspace)	2 s
t3	Actuators driving time	-
t5	Pre-purge (0 – 999 s)	30 s
t6	Pre-ignition (2 – 40 s)	3 s
t7	First safety time (ignition flame)	3 s
t8	Time of stabilization (ignition flame, 3 – 30 s)	3 s
t9	Second safety time (main flame)	3 s (gas) 5 s (oil)
t10	Operation phase	-
t11	Control phase (increases/decreases capacity)	-
t12	Emptying time of gas block interspace, V2	3 s
t13	Post-purge (0 – 999 s)	20 s
t14	Basic load-phase	-
t15	Afterburning time (0 – 180 s)	10 s
t16	Check-out time of flame extinction	5 s
t17	Leakage test time (5 – 999 s)	20 s

## 5.5 Time sequence diagram, gas use, without ignition gas



Time sequence diagram for gas US ver. 1

CPI	Closed Position Indicator	X20 + X21	Flame signal
POC	Proof of Closure	X32	Air damper
X07	Boiler safety locking circuit	X33	Gas regulating valve
X06	Gas-firing safety locking circuit	X04	Ignition transformer
X10	Burner ON	X01	Gas valve 1 (gas side)
X05	Gas pressure > min.	X25	Fan ON
X08	Air pressure monitor	X24	Fault

## 5.6 Operation description, gas use

### Prerequisites for start-up

- Control switch is in flame position  
➤  
or in position 2.
- Fuel selector switch in position 2 (GAS).
- Failures and interlocks are reset.
- Limit switch on burner flange and gas pressure switch (X06) are closed.
- Boiler safety equipment is reset (X07: temperature and pressure limit switch, dry-boiling preventer, boiler flange limit switch).
- The control unit is in standby state.
- Remote control contacts are closed (X10).
- Boiler thermostat/pressure switch contact is closed (X10).
- Differential air pressure switch contact is open (X8).
- Load controller module start-up limit reached.

### Start-up

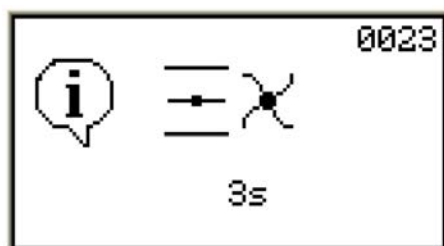
- Control unit safety features are activated.
- Fan motor starts (X25).
- Servomotors drive to the pre-purge position.



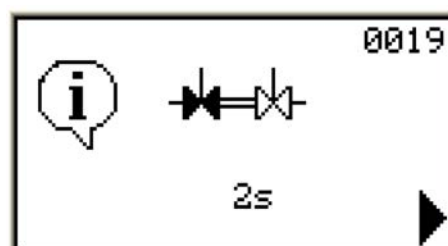
0021 ver. 2

- The differential air pressure switch contact closes when the required air pressure is reached. If the required air pressure is not reached, a safety shutdown will be initiated. Control is active until a controlled shutdown.

### Pre-purge



0023 ver. 2



0019 ver. 2

- Pre-purge begins.
- **Models with double gas valve:** Automatic leak test for gas valves begins if it is selected to be run during pre-purge, or if the burner is powered down.
- If the control unit receives a flame detection signal, it will initiate a safety shutdown. Control is active until a controlled shutdown.
- Servomotors drive to the ignition position.



0035 ver. 2

### Ignition

- **A** - with ignition gas
- **B** - without ignition gas

Follow the equivalent sequence.

## B – Ignition without ignition gas

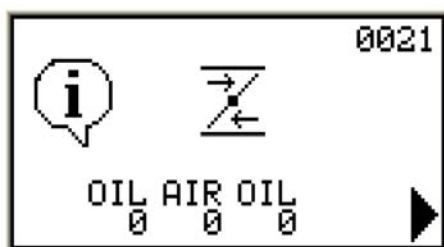


0036 ver. 1

- Preignition starts (X04).
- Safety time t9, 3s begins.
- Gas releases to nozzle.
- Gas valves 1 (X01) and 2 (X02) open (Gas valve 2 optional).
- Main flame ignites from ignition spark.
- Safety time t9 ends.
- Ignition ends (X04).
- Flame signal must be available from the end of safety time to controlled shutdown.
- Main flame burns at the ignition load position.

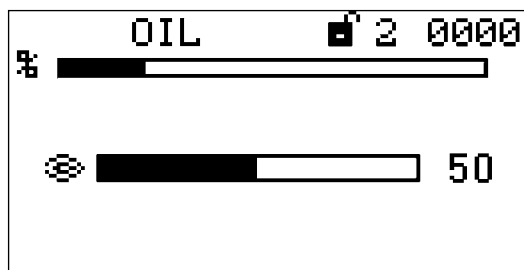
## A and B –

Servomotors drive to the minimum capacity position



0021 ver. 2

## Operation



0000 Burner running ver. 3

During operation display indicates flame intensity as percentages (QRA), as microamps (ionization electrode) or as ON/OFF status (KLC, FFS).

- Control unit during normal operation: the control unit adjusts the capacity controller on its modulating range to correspond to the burner load. It does this by controlling the air dampers and gas regulator.
- Control unit during manual operation: the burner operates at the capacity set by the operator. The control unit shuts down the burner if it receives a shutdown signal from boiler thermostat/pressure switch.
- Safety shutdown if the flame detection signal or air pressure is lost during operation.
- Safety shutdown if the gas pressure becomes too high during operation.
- Safety shutdown if the servomotors do not reach their position feedbacks during operation.
- Safety shutdown if the gas pressure drops too much during operation.
- Safety shutdown if the safety circuit opens during operation.
- Safety shutdown if the boiler temperature or pressure limit switch is activated during operation.

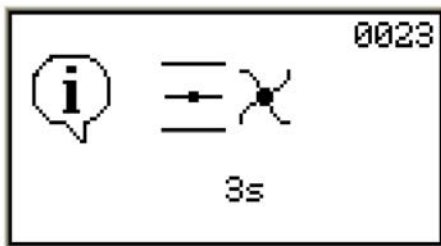
### Controlled shutdown

- Servomotors drive to their minimum capacity position.

### Afterburning begins

- Gas valve 1 closes (X01).
- Gas valve 2 closes (X02) with a delay (t12) after gas valve 1. Leak testing begins when both valves are closed and the piping between them is emptied. (Gas valve 2 optional)

### Post-purge begins



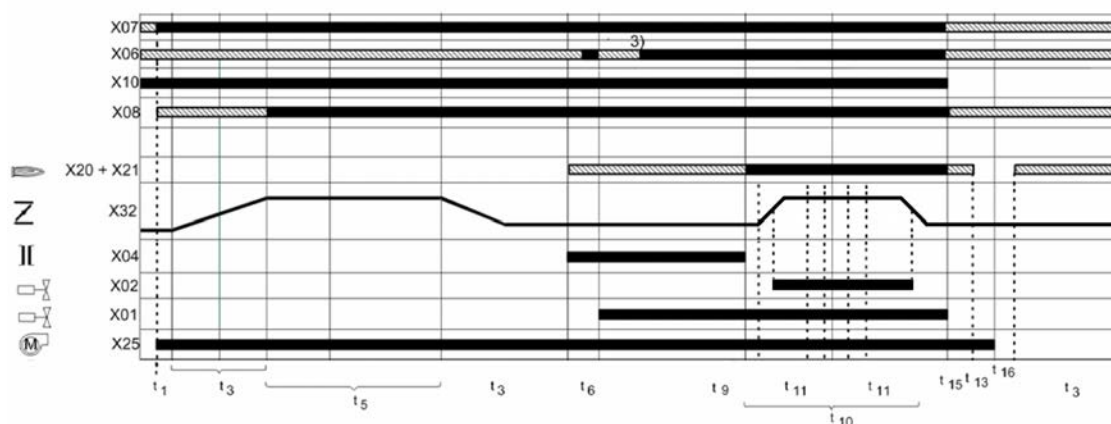
0023 ver. 2

- Leak testing for gas valves begins, if it is selected to be run during post-purge.
- Servomotors drive to their post-purge position.
- Safety shutdown if the control unit receives a flame detection signal.
- Fan motor stops at the end of the post-purge phase.
- The safety functions of the control unit are powered down at the end of the post-purge phase.
- Servomotors drive to their standby position. Restart is possible when servomotors have reached their standby position.

### Lockout

- Servomotors drive to their standby position.
- Burner lockout is activated.
- After lockout, a manual reset is required in order to restart the burner.

## 5.7 Time sequence diagram, oil use, 2-stage



Time sequence diagram for oil (two stage) ver. 1

3) Irrelevance time oil P 765 affects safety interlock chain oil and oil pressure min. when ignition valve or oil valve opens.

X07	Safety interlock chain boiler	X04	Ignition transformer
X06	Safety interlock chain burner	X01	Main oil valve and 1-stage valve
X10	Burner ON	X02	Main oil valve and 2-stage valve
X08	Monitoring air pressure	X25	Fan ON
X20 + X21	Flame signal	X24	Fault
X32	Air damper		

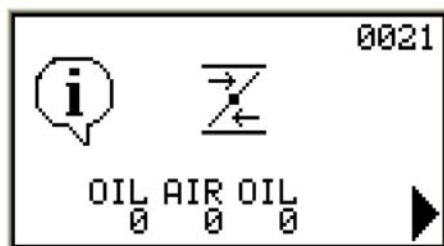
## 5.8 Operation description, oil use

### Prerequisites for start-up

- Fuel selector switch in position 1 (OIL).
- Failures and interlocks are reset.
- Limit switch on burner flange and oil pressure switch (X06) are closed.
- Boiler safety equipment is reset (X07: temperature and pressure limit switch, dry-boiling preventer, boiler flange limit switch and so on).
- The control unit is on standby.
- Remote control contacts are closed (X10).
- Boiler thermostat/pressure switch contact is closed (X10).
- Differential air pressure switch contact is open (X8).
- Load controller module start-up limit reached.

### Start-up

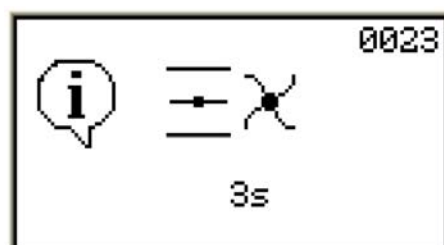
- Control unit safety features are activated.
- Fan motor is started (X25).
- Servomotors drive to the pre-purge position.



0021 ver. 2

- The differential air pressure switch contact closes when the required air pressure is reached. If the required air pressure is not reached, a safety shutdown will be initiated. Control is active until a controlled shutdown.

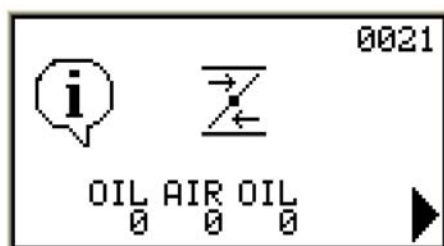
### Pre-purge



0023 ver. 2

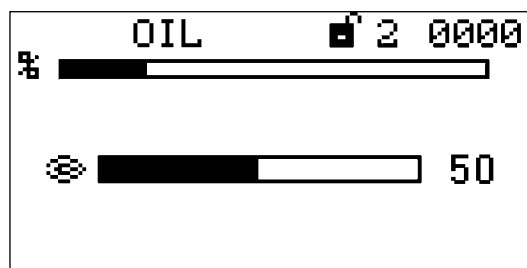
- Pre-purge begins.
- If the control unit receives a flame detection signal, it will initiate a safety shutdown. Control is active until a controlled shutdown.

### Servomotors drive to the minimum capacity position



0021 ver. 2

### Operation



0000 Burner running ver. 3

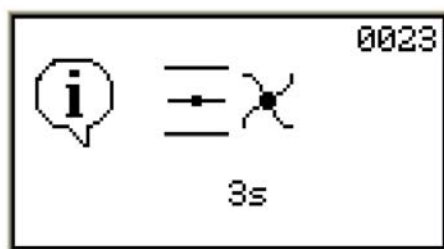
- Control unit during normal operation: the control unit adjusts the capacity controller with two stages.
- Control unit during manual operation: the burner operates at the capacity set by the operator. The control unit shuts down the burner if it receives a shutdown signal from boiler thermostat/pressure switch.
- Safety shutdown if the flame detection signal or air pressure is lost during operation.
- Safety shutdown if the return oil pressure rises too high during operation.
- Safety shutdown if the servomotors do not reach their position feedbacks during operation.
- Safety shutdown if the safety circuit opens during operation.
- Safety shutdown if the boiler temperature or pressure limit switch is activated during operation.

### Controlled shutdown

Servomotors drive to their minimum capacity position.

- Oil valves close (X01 + X02).
- Flame extinguishes.

### Post-purge begins



0023 ver. 2

- Servomotors drive to post-purge position.
- Lockout, if the burner control receives flame signal.
- Fan motor stops at the end of the phase.
- The safety functions of burner control are powered down at the end of the post-purge phase.

### Servomotors drive to their standby position

Restart is possible when servomotors have reached their standby position.

### Safety shutdown

- Servomotors drive to their standby position.
- Burner lockout is activated.
- After a safety shutdown, a manual reset is required to restart the burner.

## 6 Maintenance

### 6.1 Burner maintenance



**DANGER!**

Cut off power supply to burner and close manual shut-off valves always before any maintenance work. Cutting power is adequate when just inspecting the device.



**CAUTION**

- Completely isolate burner control system from the mains before performing any work on it.
- Check all safety functions before use.

Correct installation, adjustments, and regular maintenance ensure trouble-free burner operation:

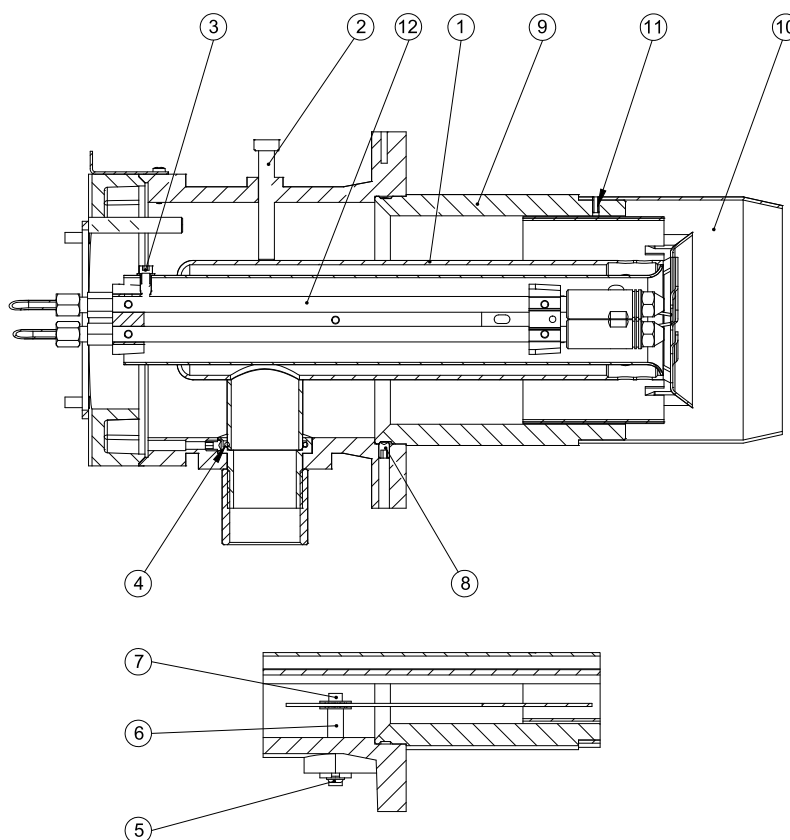
- Service burner annually.
- Use only original spare parts. When ordering spare parts, give the burner type and serial number. This data is indicated on the burner name plate.
- In maintenance issues, contact your nearest representative or Oilon customer service.

**To maintain correct operation, do the following at least once a year:**

1. Check the burner head extension and change it, if necessary.
2. Check the diffuser disc and change it, if necessary.
3. Check the ignition cable condition from the whole length. Change if necessary.
4. Clean and check the ignition electrodes and check the correct position. Change if necessary.
5. Check the flame detector position, condition, and clearness.
6. Clean and change the filter, if necessary.
7. Check the fixing screws of air dampers axles and servomotor axle locking. Retighten if necessary.
8. If in use, check and lubricate the adjustment rods joints.
9. Check the pump output.
10. Clean the burner from dust and moisture.
11. Check combustion characteristics by flue gas measurements regularly or when sooting the boiler.
12. Check if the oil tank needs to be cleaned. The oil tank must be cleaned on demand and at least every 4–5 years.
13. Check the gas pipings for leaks.

## 6.2 Dismounting combustion head and gas nozzle

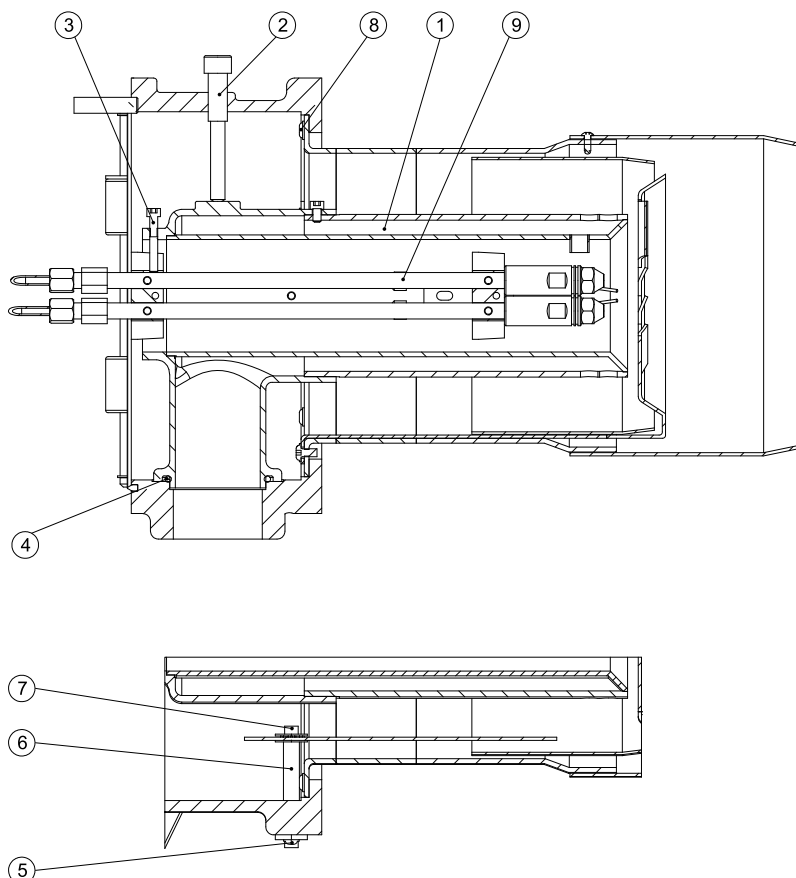
### Combustion head structure in 50-model



D046304 ver. 1

Pos.	Item	Pos.	Item
1	Gas nozzle	7	Fixing screw of adjusting shaft
2	Gas nozzle fixing screw	8	Combustion head fixing screw (3 pcs)
3	Locking screw of oil nozzle / ignition electrode holder	9	Combustion head body
4	O-ring	10	Combustion head extension and diffuser disc
5	Locking screw of adjusting shaft (indicator)	11	Combustion head extension locking pin (3 pcs)
6	Adjusting shaft	12	Oil nozzle/Ignition electrode assembly

## Combustion head structure in 90-model



D046308 ver. 1

Pos.	Item	Pos.	Item
1	Gas nozzle	6	Adjusting shaft
2	Locking screw of gas nozzle	7	Fixing screw of adjusting shaft
3	Locking screw of oil nozzle/ignition electrode assembly	8	Fixing screw of combustion head
4	O-ring	9	Oil nozzle/ignition electrode assembly
5	Locking screw of adjusting shaft (indicator)		

## Dismounting combustion head from the burner

1. Swing the burner open.
2. Remove ignition electrode holder.
3. Remove gas nozzle.
4. Remove combustion head adjusting mechanism.
5. Detach the fixing screw of the combustion head and withdraw the combustion head.
6. Reassemble in reverse order.
7. Adjust the distance between the nozzle and the ignition electrodes according to the given instructions.



**CAUTION**

Check that gas nozzle is centralized in relation to the adjustment ring.

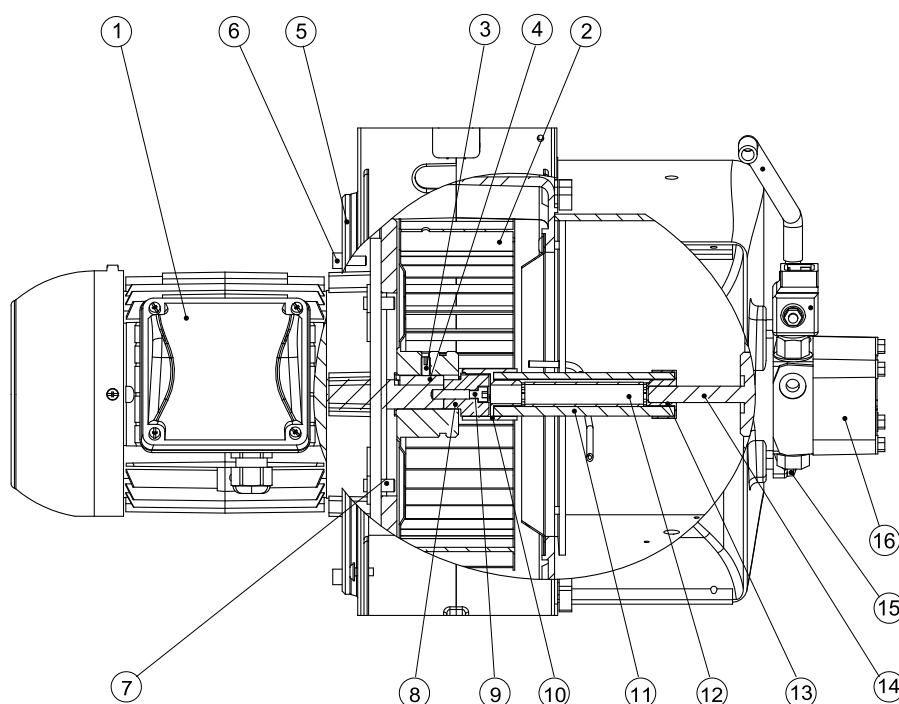
**!** Note Check O-ring when assembling. Change if necessary.

### 6.3 Dismounting and changing burner motor



Cut off electricity from burner and ensure the motor has no voltage. Burner control switch does not function as isolating switch to the fan motor circuit.

#### Fan cross section



D045714\_US ver. 1

Pos.	Item	Pos.	Item
1	Motor	10	Coupling head, on motor shaft
2	Fan wheel	11	Coupling rubber
3	Fan wheel fixing screw	12	Coupling rubber support pipe
4	Wedge	13	Coupling head, to pump shaft
5	Mounting flange	14	Pump shaft
6	Fixing screw of mounting flange	15	Pump fixing screw
7	Motor fixing screw	16	Pump
8	Coupling frame, on motor shaft		
9	Fixing screw of coupling frame, on motor shaft		

#### To dismount motor and fan wheel:

1. Switch off the burner from the mains.
2. Disconnect the electrical cable of the motor.
3. If in use, detach the rotation speed sensor from the motor's fan casing.

4. Screw off screws in the motor mounting flange and lift the motor away  
The coupling rubber remains on the pump shaft.
5. Screw off the fixing screw of the coupling frame and detach the coupling frame from the shaft end.
6. Detach the fan wheel fixing screw.
7. Pull out the fan wheel from the motor shaft using an extractor.
8. Loosen the wedge.
9. Detach the motor from the mounting flange.
10. Loosen the oil pump fixing screws and pull out the pump and the coupling rubber from the frame.

You don not need to detach the solenoid valve and the flexible oil hose.

#### **To mount motor and fan wheel:**

1. Attach the motor into the mounting flange.
2. Place the fan wheel to its place so that the wedge is located approx. 10 mm outside the motor shaft end.
3. Place the fan wheel to its place so that the distance between the fan wheel and the motor mounting flange is 1.5 ... 2.5 mm.
4. Screw down the fan wheel to the motor shaft so that the wedge is locked in.
5. Set the wedge into the shaft slot of the coupling frame, and lock the coupling frame to the motor shaft end with a fixing screw.
6. Place the motor and attach mounting flange screws.
7. Set the motor-side coupling teeth of the pump coupling rubber and the coupling frame slots opposite each other.
8. Attach the oil pump to the frame with fixing screws.
9. If in use, attach the rotation speed sensor.
10. Connect the electrical cable to the motor.
11. Connect the burner to the mains. Check motor rotation direction

## **6.4 Dismounting and changing servomotors**

#### **To disconnect cables:**

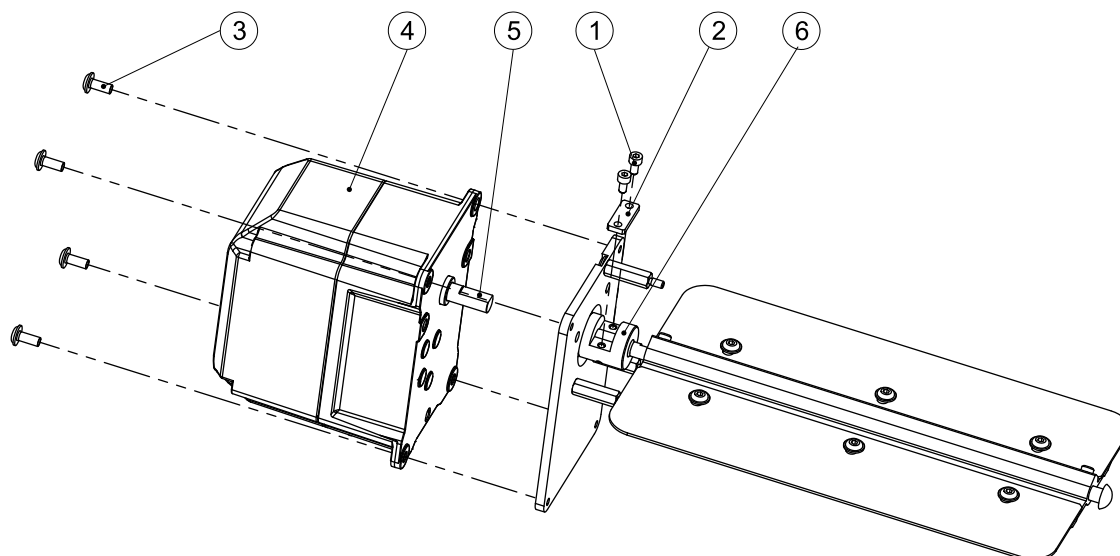
1. Switch off the power from the burner by turning the control switch.
2. Detach the connector from the burner control's side.
3. Remove the cable with connector out from the burner housing.



**Note** Servomotor's cover screw is sealed, do not open it.

Connect in reverse order.

## Removing the air damper servomotor



D044675 ver. 1

Pos.	Item	Pos.	Item
1	Locking plate fixing screw	4	Servomotor
2	Shaft coupling locking plate	5	Aligning surface of servomotor's shaft
3	Servomotor fixing screw	6	Shaft coupling

1. Disconnect the cables according to the instructions.
2. Loosen the shaft coupling locking plate fixing screws (shaft coupling is left attached to the air damper).
3. Remove the servomotor fixing screws and remove the servomotor.
4. Fasten the new servomotor to the shaft coupling. Make sure that
  - the locking plate is aligned with the aligning surface of servomotor's shaft.
  - the air damper turns freely by turning the servomotor
5. Tighten the locking plate fixing screws.
6. Tighten the servomotor fixing screws.
7. Connect the cables according to the instructions.

**! Note** Make sure that the shaft coupling fixing screws are adequately tightened.

## Addressing servomotor

The address is determined by connector position (X32-X34). Determination can be changed with a PC tool.

## 6.5 Testing safety and control devices

Perform safety tests for the following components always during burner maintenance or checking. Perform tests at least once a year.

The following components should be tested:

- flame detector
- differential pressure switch
- gas pressure switches
- gas shut-off valves
- oil shut-off valves
- servomotors
- O<sub>2</sub> /CO trim control (if equipped)
- Variable Speed Module (if equipped)
- boiler safety devices

The burner control allows four (4) alarm resets during 15 minutes. When the limit is exceeded, fault code H889 is generated. To reset the fault, switch off burner control voltage by turning the control switch S1 to position "0". When control voltage is restored, reset the fault normally.

### Flame detector

Test method	Outcome
<b>Step 1</b> 1. Prevent any light from reaching the detector and start the burner. 2. Start the burner.	The burner must shut down and lockout at the end of safety time. Fault code H009.
<b>Step 2</b> 1. Start the burner. 2. Activate the flame detector with a light source during pre-purge.	The burner must shut down and lockout at pre-purge program phase. Fault code H002.
<b>Step 3</b> 1. Start the burner. Wait until the start-up sequence is finished. 2. Remove the flame detector from the burner, and prevent any light from reaching the detector.	The burner shuts down. Fault code H004.

### Differential pressure switch

For the physical location of the ports and for adjusting the switch, see section *Adjusting combustion differential air pressure switch*.

Test method	Outcome
<b>Step 1</b> 1. Disconnect the high pressure hose (+) from the switch. 2. Start the burner. After testing, reconnect the high pressure hose.	Boiler pre-purging begins. The burner must shut down before the pre-purge cycle is completed. Symbol "Hint 15" blinks for the time period set to the parameter 304 (factory setting 600 s). Fault code H613.
<b>Step 2</b> 1. Disconnect the low pressure hose (-) from the switch. 2. Start the burner. After testing, reconnect the low pressure hose.	Boiler pre-purging begins. The burner must shut down before the pre-purge cycle is completed. Symbol "Hint 15" blinks for the time period set to the parameter 304 (factory setting 600 s). Fault code H613.
<b>Step 3</b> 1. Start the burner. Wait until the start-up sequence is finished. 2. After the start-up is completed, rotate the setting wheel on the switch towards the maximum setting. After testing, return the setting wheel to its original position.	The burner should shut down before the maximum setting. Fault code H613.
<b>Step 4</b> 1. Start the burner. Wait until the start-up sequence is finished. 2. After the start-up is completed, disconnect both pressure hoses from the switch. After testing, reconnect both hoses to the original positions.	The burner should shut down immediately after hoses are disconnected. Fault code H613.

## Gas pressure switches

For instructions on adjusting the switches, see section *Adjusting gas pressure switches*.

### Gas pressure, minimum

Test method	Outcome
<b>Step 1</b> 1. Rotate the setting wheel on the switch to its maximum value. 2. Start the burner. After testing, return the setting wheel to its original position and reset the switch.	Boiler pre-purging begins. The burner must shut down before the pre-purge cycle is completed. Fault code H611.
<b>Step 2</b> 1. Start the burner. Wait until the start-up sequence is finished. 2. Rotate the setting wheel on the switch towards the maximum value while the burner is running. After testing, return the setting wheel to its original position and reset the switch.	The burner should shut down before the maximum setting. Fault code H611.

### Gas pressure, maximum

Test method	Outcome
1. Start the burner. Wait until the start-up sequence is finished. 2. Drive the burner to maximum capacity. 3. Rotate the setting wheel on the switch towards the minimum value while the burner is running. After testing, return the setting wheel to its original position and reset the switch.	The burner will shut down before the minimum setting. Fault code H609.

## Gas shut-off valves

If the burner is equipped with an automatic valve proving system the valves are tested to be leak free during each start-up sequence.

To prove the valves manually:

1. Install a pressure gauge between the fuel shut-off valves. Refer to the valve manufacturer's instructions for the exact location of the measuring port.
2. Start the burner. Wait until the start-up sequence is finished.
3. Rotate the dial on the gas minimum pressure switch towards the maximum value. Wait for the burner to shut down.
4. After the burner has shut down observe the reading on the pressure gauge for a few minutes. The indicated pressure must not lower during that time.

## Gas shut-off valves

To manually test the tightness of a single valve gas train please follow this procedure.

Prerequisites for the test: fuel gas is available, gauge for measuring gas pressure, a length of flexible tube (ID 1/8") and a flat head screwdriver

### Test method

1. Open the test nipple located on the side of the gas low pressure switch
2. Attach the other end of the tube to the nipple and the gauge to the other end
3. Open the manual gas shutoff valve and notice a pressure rise on the gauge
4. Close the manual shutoff valve and disconnect the gas line from the manual valve
5. Observe the gauge for a period of time that no pressure drop occurs
6. If a pressure drop occurs either the manual or automatic valve is leaking and must be replaced
7. Remove testing equipment and close the test nipple

## Oil shut-off valves



**Note**

Read the instructions carefully before starting the oil shut-off valve leak testing.

Check the following before the test:

- Prevent formation of ignition spark by detaching the ignition transformer secondary wires.
- Block the oil line to prevent oil entry to nozzles.

Make sure that you have all needed equipment: tools for opening the oil line connectors, drainage container, and detachable conductor or switch with conductors.

After the test, disassemble all test arrangements carefully and return the burner to its original state.

## Main valve leak testing

Test method	Outcome
<b>Step 1</b> 1. Detach the hose that leads to the 1- and 2-stage capacity valves, and is lead to the drainage container. 2. Detach the main valve conductors.	
<b>Step 2</b> Start the burner and pay attention to oil that is possibly dripping from the disconnected hoses.	The burner enters lockout after pre-purge, because flame does not form. If the valve is proven to be leak-proof, connect the hose back to its place. If oil is dripping, change the valve.

### 1- and 2-stage valve leak testing

The main oil valve is kept open longer than the normal safety time, by creating an simulated flame signal during the ignition phase. The simulated flame signal enables longer testing time for valves.

The creation of the simulated flame signal has to be timed to the ignition phase, that follows the pre-purge phase. Premature timing leads to a burner failure due to a foreign flame observation, and delayed timing leads to a burner lockout due to missing flame signal. The action must be performed within the safety time (5 s).

The safety time starts when the main oil valve opens. You can observe the opening of the valve from a clicking sound. If you cannot observe the sound, you can verify the valve opening from valve coil magnetization. You can verify this easily by keeping an ferrous object (for example a screw or tool) near the valve coil.

Test method
<b>Step 1</b> 1. Detach the 1- and 2-stage capacity valve outputs and electrical terminals. If needed, mark the valves with conductors to facilitate reconnecting of them. 2. Place the drainage container under the valve outputs.
<b>Step 2</b> 1. Detach the flame detector terminal (X20) from the control unit and install the permanent loop to the terminal according to the figure below. <div data-bbox="328 510 778 840" data-label="Image"> </div> 2. Start the burner and wait until the ignition phase after the pre-purge phase begins (factory setting 30 s). When the ignition phase has begun, install the flame detector terminal back to the control unit. 3. Short out the control unit terminal (X20) pins within the safety time (5 s) by installing the terminal (X20) equipped with the permanent loop to its place to form an artificial flame signal. 4. Oil may drip for approx. 30 seconds. <b>If the dripping continues, change valves.</b>
<b>Step 3</b> End testing by turning the control switch S1 off from the “fire” position or by removing the connection that creates the artificial flame signal.
<b>Step 4</b> 1. Disassemble the test arrangement by connecting the flame detector terminal (X20) back to the control unit. 2. Connect the oil valve pipes and electrical terminals back to their places. 3. Make sure that the valves are correctly connected. 4. Connect the ignition transformer secondary cable.

## Servomotors

During burner start-up the burner control drives the servomotors to maximum position and during shutdown to 0-position. The burner control supervises the correlation of the position settings and back coupling.

During burner shutdown, check the air damper and the locking screws of the fuel adjusting valve. Push air damper lightly to make sure they are firmly attached.

### O<sub>2</sub>/CO trim control (if equipped)

- The system is self-checking during start-up.
- Confirm proper fuel/air ratio with flue gas analysis.

## Variable Speed Module (if equipped)

Test method	Outcome
<ol style="list-style-type: none"> <li>1. Turn the control switch S1 to position 0 to switch off control voltage.</li> <li>2. Detach speed sensor cables from VSM100 module.</li> <li>3. To start the burner, turn the control switch to flame position.</li> </ol>	During prepurge the burner stops to a fault. Fault code is H141.

## Boiler safety devices

Test method	Outcome
<p>When the burner is in standby position, activate, for example, the temperature limiter switch from the boiler safety chain (X07) and start the burner. Perform this test to all safety circuit devices one by one.</p> <p>Devices connected to the safety circuit are described in the electrical diagram.</p>	The burner does not start and hint 9 is flashing.

## 6.6 Resetting fault and reading fault history

### Resetting fault

Press the lit **Enter** button until the the fault is reset.

Example



1211 ver. 2

- 01: fault code H333
- D1: diagnostic code (additional information)
- D2: diagnostic code (additional information)
- clock: running hours counter in fault situation

### Reading fault situation from the control panel

Active fault situation is shown on the display. The **Enter** button is lit.

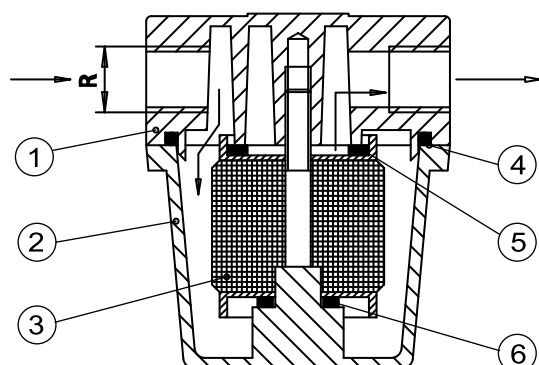
Fault history can be read from the control panel.

See more precise fault codes in the brochure on burner control.

Burner control can be reset immediately after lockout. After resetting the actuators drive to stand by position. In standby position the control unit allows the burner to restart.

**!** Note Lockout means emergency shutdown.

## 6.7 Cleaning oil filter



A346A ver. 3

- |   |              |
|---|--------------|
| 1 | Cover        |
| 2 | Cup          |
| 3 | Element      |
| 4 | O-ring       |
| 5 | Upper gasket |
| 6 | Lower gasket |

**!** Note Make sure oil flow to the filter is cut off before starting cleaning.

1. Unscrew the cup off the cover.
2. Clean the element and the cup.
3. Place the lower gasket on the bolt of the cup and reassemble the element. Check that the holes at the end of the element point towards the cover.
4. Place the upper gasket on the element.
5. Place the O-ring in its place.
6. Screw the cup and check tightness.

## 6.8 Troubleshooting

First check the following basic operation requirements:

- Control and supply voltage.
- All regulating and control devices are correctly set.
- Safety devices are in normal operating condition.
- Burner is getting fuel.
- There is sufficiently water in the heating system.
- Motor rotation direction is correct.

After you have confirmed that the fault is not due to any of the above mentioned, check the individual burner functions. Reset the burner control if it is in lockout position.

The burner goes to standby position. When the prerequisites for start are fulfilled, the burner starts. Observe the burner functions, program phase, and possible faults from the operating and display unit. Use measuring instruments for identifying the fault.

For further information, refer to fault codes in the burner control fault code listing.

## Start failure

Condition	Possible cause	Action
Burner does not start. Burner control remains in stand-by position.	Break in control circuit. Required start-up signal from burner control terminal X10-L does not transfer to terminal X10- ↑.	Find out the cause of the break.
	Burner control is damaged. Fault code 999	Check the code. Change.
	Boiler actual value has not reached required capacity controller start limit.	Wait for boiler to cool down.
	Safety loop open (burner). Display 0006.	Find out cause of break from burner control terminals X6-L and X6- ↑.
	Safety loop open (burner). Display 0009.	Find out cause of break from burner control terminals X7-L and X7- ↑.
	Faulty differential air pressure switch. Display 10, 15	Change.
	Fuel selector switch S2 in position 0.	Choose fuel.
Fan motor starts, lockout during pre-purge.	Jammed servomotor. Servomotors do not reach desired position. Fault code 241, 251, 261, 271, 281	Check and adjust.
	Faulty differential air pressure switch Fault code 613	Change.

## Lack of air pressure , fault code 613

Condition	Possible cause	Action
Fan motor starts, but during pre-purge period lockout occurs.	Faulty differential air pressure switch setting	Check setting, adjust if necessary.
	Dirty differential air pressure switch impulse hoses or pipe	Clean hoses or pipe.
	Faulty differential air pressure switch	Change.
	Dirty fan	Clean.
	Incorrect motor rotation direction	Reconnect motor.

## Ignition failure, fault code 3, 4

Condition	Possible cause	Action
Fan motor starts, control voltage from burner control to ignition transformer is switched on, no ignition, and after a short time lockout occurs.	Dirty or worn-out ignition electrodes, damaged insulator	Clean or change.
	Ignition electrodes too far apart	Adjust electrodes according to instructions.
	Damaged ignition cable	Change.
	Faulty ignition transformer	Change.

## Motor failure

Condition	Possible cause	Action
Fan or oil pump motor does not start. Lockout occurs.	Break in main circuit	Find out cause of the break.
	Motor overload relay released	Check setting, reset.
	Faulty motor contactor	Change.
	Faulty motor	Change.
	Break in control circuit	Find out cause of the break, see circuit diagram. Check burner control operation. Replace faulty burner control.

## Flame does not form, fault code 6, 9, 10

Condition	Possible cause	Action
Oil use: Fan motor starts, ignition is in order. After a short period of time lockout occurs.	Solenoid valve does not function. Cause: faulty solenoid valve or coil.	Replace faulty part.
	Solenoid valve does not function. Cause: damaged cable.	Replace faulty part.
	Solenoid valve does not function. Cause: faulty burner control Fault code 921	Replace faulty part.
	Too low ignition load	Check.
	Too large air amount	Adjust.
	Too high pressure loss in combustion head	Adjust.
Nozzle does not spray.	Too low atomizing pressure	See section <i>Oil pump</i>

## Lockout occurs after flame establishment

Condition	Possible cause	Action
Flame forms. Occurs lockout and restart. Fault code 611	Gas pressure too low because of an inoperative pressure regulator.	Repair or change regulator.
	Gas pressure too low because min. gas pressure switch released.	Check operation and regulations.
	Blocked filter	Clean or repair filter.
Oil use: Flame forms. Flame extinguishes and lockout occurs when burner runs to full load. Fault code 4.	Incorrect burner adjustment	Adjust.
	Clogged nozzle	Change.

## Oil use – oil leaks to combustion chamber

Condition	Possible cause	Action
Oil leaks to combustion chamber during idle time.	Solenoid valves do not close.	Clean, repair or replace.
Oil leaks to combustion chamber during start-up.	Leaking valves	Clean, repair or replace.

## Flame monitoring fault, lockout

Condition	Possible cause	Action
Fan motor starts, flame forms, then lockout occurs. Fault code 9, 10	Incorrect flame detector position	Repair.
	Dirty flame detector	Clean.
	Too weak flame (light)	Check burner adjustments.
	Faulty flame detector	Change.
	Faulty burner control	Check fault code. Replace.
Lockout during pre-purge.	Faulty flame detector	Change.
	Faulty burner control	Check fault code. Replace.
	Incorrect flame signal because of extraneous light	Block extraneous light.
Lockout in shut-down period.	Faulty or aged flame detector (UV cell)	Change.
	Faulty burner control	Check fault code. Replace.
	Incorrect flame signal because of extraneous light (UV cell)	Block extraneous light.
Gas use: Lockout during shutdown period.	Flame does not extinguish: leaking gas valves.	Replace.
Oil use: Lockout during shutdown period.	Oil or carbon deposits in combustion head	See section Combustion head.
	Solenoid valves do not close.	Repair or change faulty part.

## Combustion head

Condition	Possible cause	Action
Gas use: Diffuser disc burned out.		Change diffuser disc if necessary.
	Faulty combustion air setting	Adjust.
	Insufficient boiler room ventilation	Increase air supply.
	Too low combustion air velocity: incorrect adjustment ring position	Adjust.
	Too low partial load	Adjust.
Oil use: Inside oily or has heavy carbon deposits.	Incorrect distance between nozzle and diffuser disc	Adjust.
	Incorrect nozzle type or size	Change.
	Worn-out nozzle	Change.

## Leakage test failure, fault code 601, 602

Condition	Possible cause	Action
Burner failure	Gas block failure	See section "Gas valve proving".
	Gas inlet pressure to burner too low	Find out cause and repair.
	Faulty pressure switch	Change.
	Faulty gas valve	Change.

## Gas pressure switch max., fault code 609

Condition	Possible cause	Action
Burner shuts down.	Gas pressure to nozzle too high	Find out cause and repair.
	Faulty pressure switch	Change.
	Incorrect pressure switch setting	Adjust.

## Oil pump

Condition	Possible cause	Action
No oil supply or too low atomizing pressure.	Dirty filter	Clean or replace.
	Leaking transfer pump suction line	Fix leakage.
	Pump capacity decreases. Faulty or worn-out pump.	Change.
Loud mechanical noise.	Pump is sucking air.	Tighten joints.
	Too low inlet pressure to burner	Clean filter. Check and adjust pressure.

## 6.9 Maintenance during shutdown



Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.



- Completely isolate burner control system from the mains before performing any work on it.
- Check all safety functions before use.



While operating, the manual purging valve between automatic fuel oil shut-off valves must be closed. At burner shutdown, open the manual purging valve.



Note

ALWAYS KEEP THE FUEL OIL SUPPLY VALVE SHUT OFF IF THE BURNER IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME.

During a longer shutdown externally check for cleanliness, and the general condition of the appliance.

Follow these general instructions:

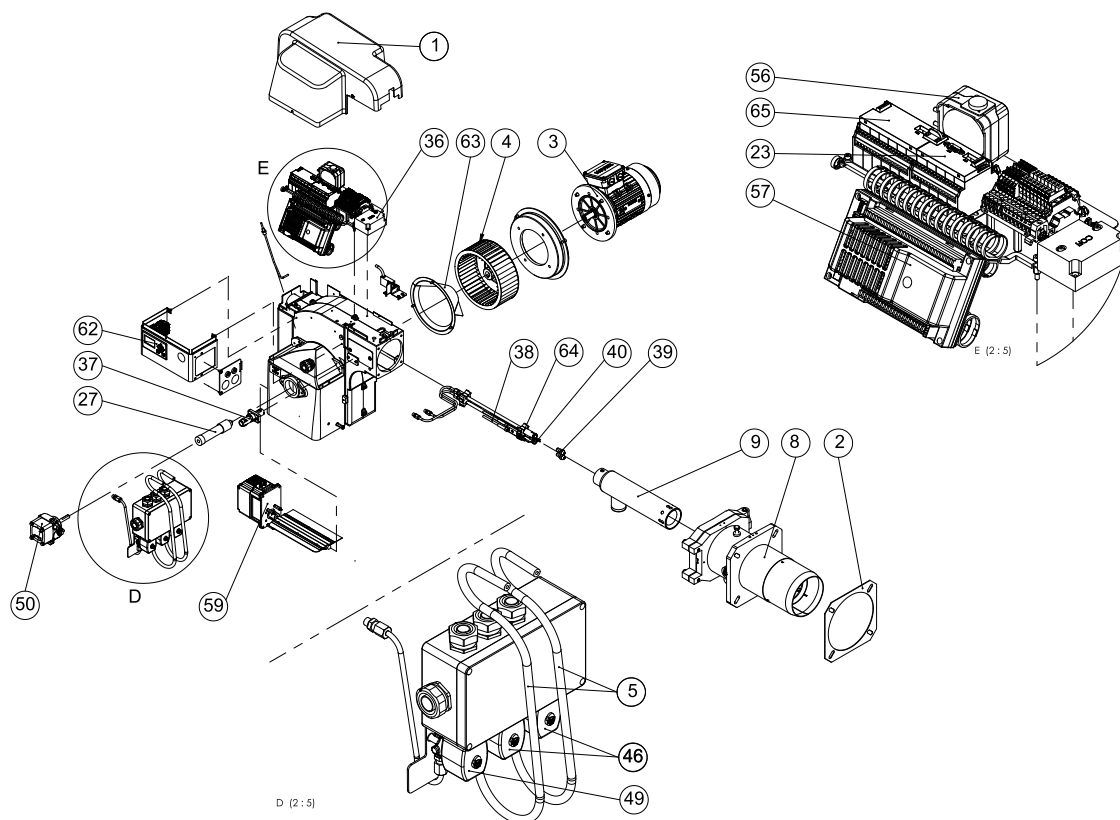
- check and clean nozzles
- check the condition and function of actuators, handles, levers etc.
- check piping, function of valves, filters, and gaskets.

Start operation only after a thorough control. Before start-up make sure that the appliance is in proper operation condition.

If you need help with maintenance and service, contact your nearest representative or Oilon customer service at <http://www.oilon.com/customer-service/>.

## 6.10 Burner parts

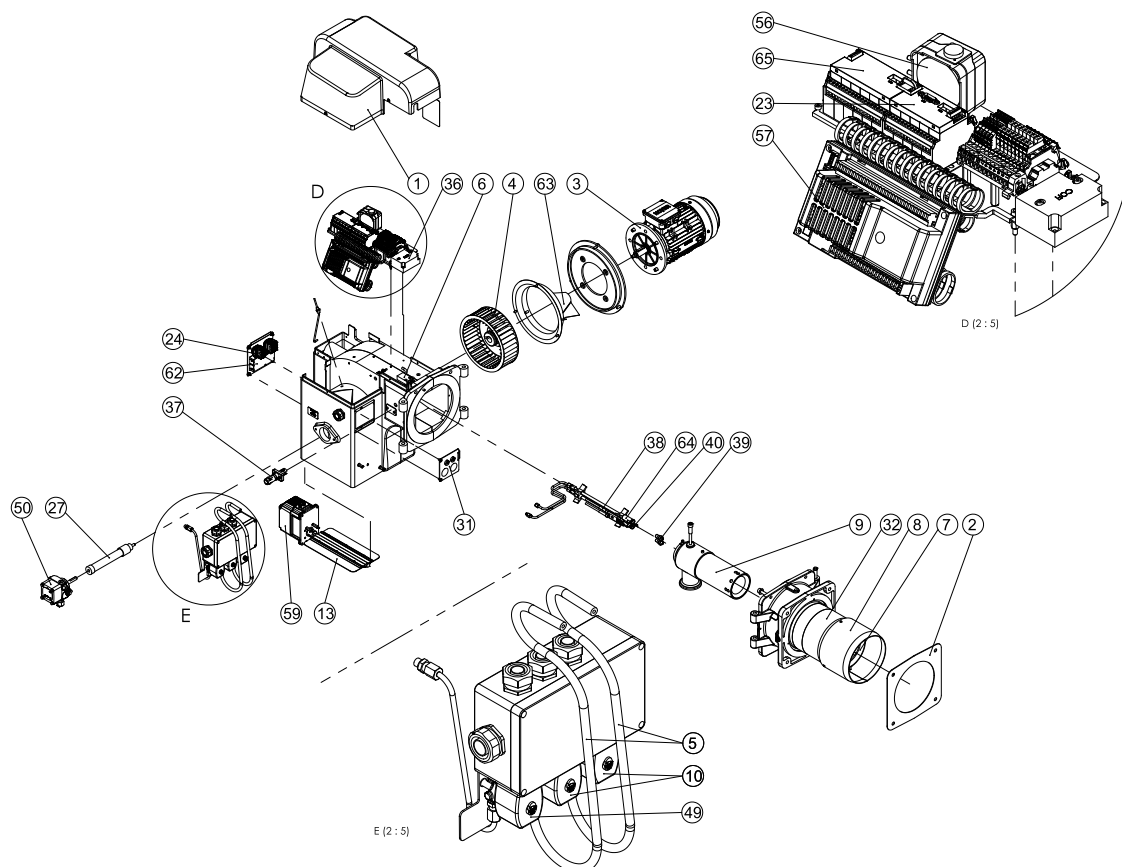
### GKP-50 MH



Exploded view D048897 ver. 1

**!** Note The assembly may vary depending on the scope of delivery.

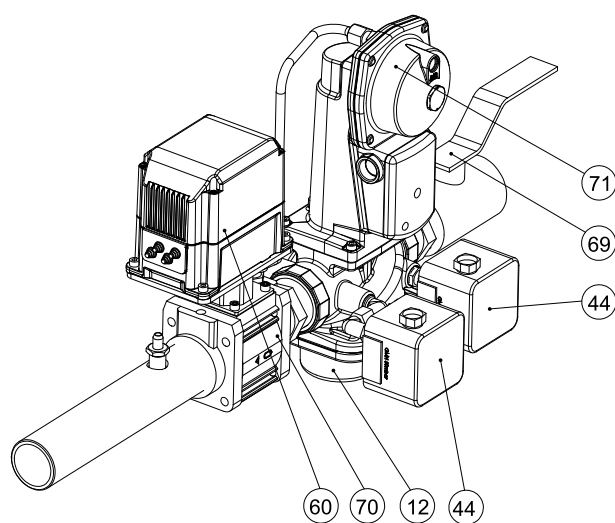
## GKP-90 MH



Exploded view D048844 ver. 1

**!** Note The assembly may vary depending on the scope of delivery.

## Gas valve



VGG ver. 1

## 6.11 Burner part list

#	Part name	Recommended change interval			
		1-2 year	3-5 years	10 years	on demand/ start-up max.
1	Protective cover				X
2	Flange gasket				X
3	Fan motor				X
4	Fan wheel				X
5	Oil hose to nozzle valve			X	
6	Limit switch				X
7	Diffuser disc				X
8	Head extension				X
9	Gas nozzle				X
10	Nozzle valve			X	250 000
12	Gas valve block			X	250 000
13	Air dampers				X
23	Capacity controller			X	
24	Control switch				X
27	Coupling, complete				X
31	Lead in flange				X
32	Combustion head				X
36	Ignition transformer		X		
37	Flame detector				
	QRA	X			
	KLC	X			
38	Ignition cable		X		
39	Nozzle	X			
40	Ignition electrode		X		
44	Pressure switch, gas			X	
46	Control solenoid valve		X		
49	Main solenoid valve		X		
50	Oil pump		X		
56	Differential air pressure switch			X	
57	Control unit			X	250 000
59	Servomotor, air			X	
60	Servomotor, gas			X	
62	Operating panel				X
63	Air cone				X
64	Nozzle holder				X
65	Dual-fuel module			X	
69	Manual shut-off valve				X
70	Regulating valve			X	
71	Valve actuator with pressure regulator		X		







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