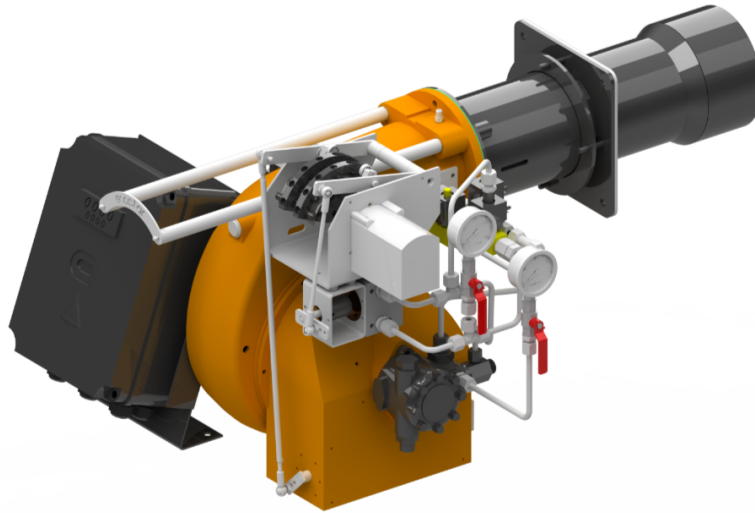
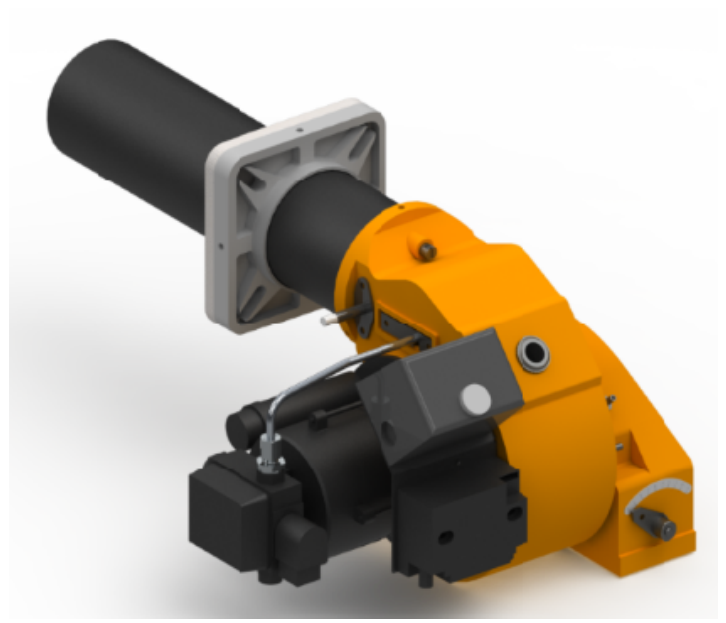
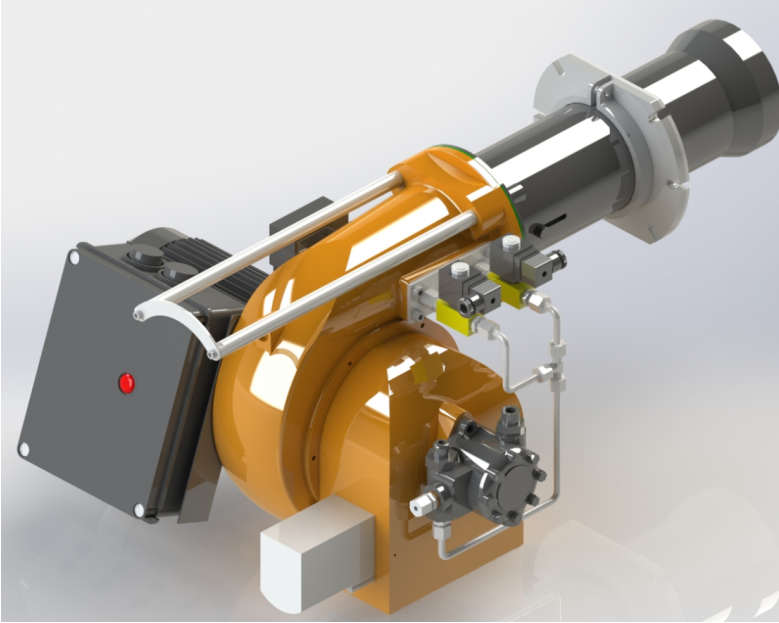


# MONOBLOCK LIGHT OIL BURNERS INSTALLATION, OPERATING AND MAINTENANCE MANUAL

ONE STAGE, TWO STAGE AND MODULATING OPERATION



ECO 1 O(L)  
ECO 2 O(L)  
ECO 30 O(L)  
ECO 45 O(L)

18.09.2024 Rev. 15



**DEAR USER,**

**ECOSTAR ECO 1 O(L), ECO 2 O(L), ECO 30 O(L), ECO 45 O(L) Light Oil** burners are prepared and manufactured according to the latest technical developments and safety rules. It is easy to use for our customers.

We recommend that you read this manual and safety warnings thoroughly before the use of the device in order to ensure safe, cost effective and environmental-friendly use.

If you encounter any issue that is not explained clearly in this manual or you could not understand, please contact with our service department.

We thank you for choosing ECOSTAR brand.

Ecostar LIGHT OIL Burners are manufactured in accordance with TS EN 267 standards.






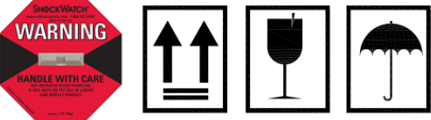
This Operating Manual is an integral part of the burner and must be maintained in a plastic dossier and hung at a clearly visible place in the burner room.

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## 1. WARNINGS

### 1.1. Warning Symbols and Descriptions

Symbols	Symbol Descriptions
	Important information and useful hints.
	Warning of danger to life or property.
	Warning of electrical voltage.
	Product handling information.
	Electric motor direction of rotation
	Carry in an upright position. Fragile Item. Protect against water.

## 1.2. General Safety Rules

- All personnel engaged in installation, disassembly, commissioning, operation, control, maintenance and repair should have received the necessary training, qualified and fully read and understood this manual.
- No changes that might damage the safety of the burner unit must be made by persons and/or organizations on the burner unit.
- All operation, commissioning and installation works (except for burning adjustment) should be carried out when the burner is not operating and after disconnecting the power supply. Noncompliance with these rules may lead to serious bodily injuries and even death by electrical shocks or uncontrolled flame formation.
- Repairs concerned with safety elements should be carried out only by the manufacturing company.
- The device should never be used by children, mentally handicapped and inexperienced persons.
- Children must not be allowed to play with the device.
- Keep the device away from explosive and flammable materials.
- Device must intake air, ventilation and air discharge holes must not be closed.



Do not store any inflammable materials in boiler room.



Wear hearing protectors if there is noise in boiler room.



**In case of fire or other emergency;**


- Switch off the main switch
- Take appropriate actions





The burner installation must be carried out in accordance with the instructions. Vibration can damage the burner and its components.




Keep boiler doors closed while starting burner and during burner operation.

 Check combustion values to be correct by using flue gas analyzer at the whole adjustment range between minimum, full load, and ignition load.

 Use lifting device or belt for lifting fan motor, if necessary.

 During the first commissioning of the burner or in case of any revision carried out in the electrical system or motor cables by any reason, direction of the fan rotation must certainly be checked by the authorized technical service.

 For products that have not been commissioned or started more than 6 months, before activating the servomotor;

In air dampers and oil regulators, servomotor and air damper connections must be checked to ensure that they are free running in spite of immobility and oil freezing.

## **BURNER ROOM**

Install the burner in a suitable room/floor with minimum external air openings and sufficient to ensure perfect combustion, in compliance with current regulations.

Never obstruct air openings of the burner room, burner fan intake vents or air ducts in order to prevent:

- a. The build up of toxic / explosive gas mixtures in the burner room,
- b. Combustion with insufficient air, resulting in hazardous, anti-economical and polluting operation.

The burner must be always protected from rain, snow and frost to prevent corrosion and paint deformations.

Keep the burner room clean and free of solid volatile substances, which could be sucked into the fan and clog the internal burner or combustion head air ducts.

## 2. TERMS OF WARRANTY

Main and auxiliary equipment and all components used in Ecostar light oil burners are guaranteed for 1 year by TERMO ISI SİST. A.Ş starting from the date of commissioning under the maintenance, adjustment, operating conditions and relevant mechanic, chemical and thermal effects explained herein.



Please note that this warranty is only valid if the device(s) is commissioned and maintained by our authorized services.



Our company reserves the right to make any modifications on the product and all instructions thereof for improvement purposes.

### 2.1. Out of Warranty Conditions

- Any damage arising out of or in relation to customers' non-compliance to their responsibilities with regards to installation, commissioning, operation and maintenance,
- Any damage arising out of or in relation to commissioning, repairs and maintenance carried out by unauthorized services,
- Any damage that may occur during transportation or storage of the product,
- Not preserving the product in its original packaging until the installation stage,
- Incorrect and poor electrical connections, Failures due to incorrect voltage applications, frequent repetition of voltage fluctuations,
- Any damage that may occur as a result of incorrect fuel usage or, foreign substances in the fuel used or using of the product without any fuel,
- Any damage that may occur due to foreign particles entered into the product during installation and operation,
- Failures due to incorrect device selection,
- Any damage to unit due to natural disasters,
- Devices without any warranty certificates,
- Warranty Certificates without the stamp and signature of the authorized dealer or service,
- Devices with any falsification on the warranty certificate or without an original serial number.
- The risks during transportation of device under the responsibility of customer belong to the customer.
- Presence of misuse faults are indicated in the reports issued by authorized service stations or our authorized agent, dealer, representative or our factory in case of unavailability of authorized service stations.
- Customers may apply consumer protection arbitrator committee with regards to this report and request for an expert report.

### 3. BURNER'S GENERAL FEATURES

ECOSTAR light oil burners are designed to operate with oil at 2.5 – 6 Cst (mm<sup>2</sup>/s) viscosity, at rated capacity and pressure ranges and -15% to +10% nominal voltage.

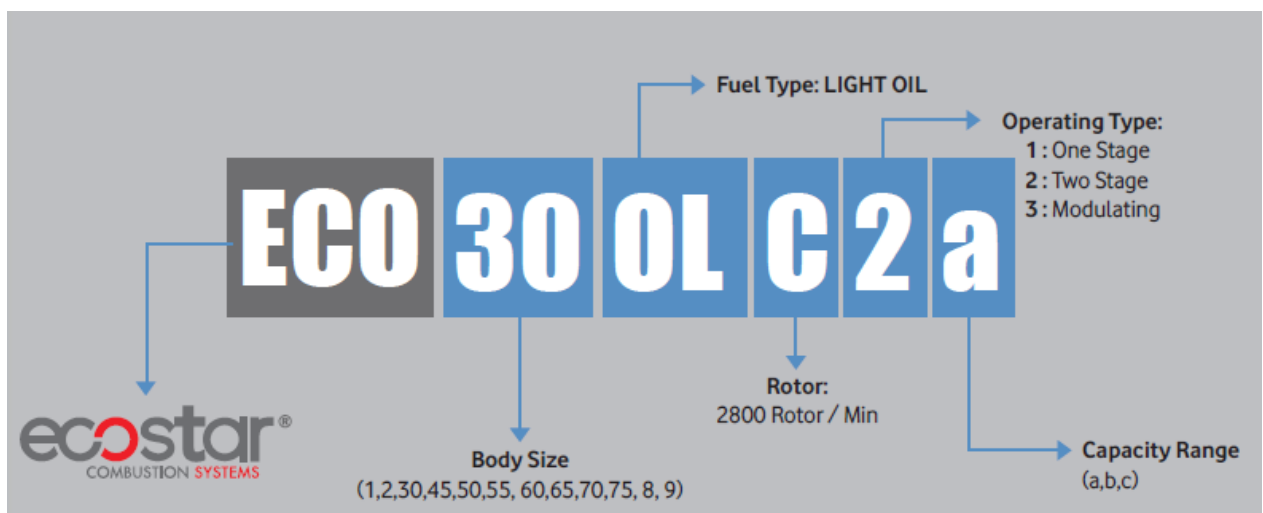
#### 3.1. Purpose of Use and Work Limits of Burners

- This product works at any load value equivalent to its max. capacity or covered by its capacity range;
  - In hot water and steam boilers,
  - In direct and indirect hot air generators,
  - Industrial appliances operating at temperature below 600 °C,
  - -15 °C...+60 °C ambient temperature range,
  - 1N 230 VAC/3N 400 VAC /50 Hz feed voltage (-%15...+%10) values,
  - Max. 95% relative humidity,
  - In well-ventilated open and closed spaces compatible with protection class IP 40.



This device must never be operated with open flame!

#### 3.2. Code Key



**Figure 1. Ecostar Cod Keys**



Ecostar burners, which have a very different and diverse product family have a code key system that everyone can easily understand, as shown in figure 1. This code key used comes from the name ECO ECOSTAR at the beginning of the key. Then the structural body size of the burner, according to fuel type for light oil O (L), Motor Revolutions Per minute (RPM) use to burner system. The operating mode of the product is coded as single, double and proportional capacity range by adding the necessary letters.

Whether the burner is suitable for the boiler or not is explained in the example below. A double stage burner was chosen for the example below. The burner used in the example was selected as double stage. Back pressure evaluation was made in figure 2 and figure 3 for burner selection.

Example ;

Boiler capacity : 470.000 kcal/h (547 kw)

Boiler back pressure: 3 mbar

Fuel : Motorin ( 10200 kcal/kg)

Boiler efficiency : %90

The capacity of the boiler will increase as in equation 1, Because the boiler efficiency is given as %90.

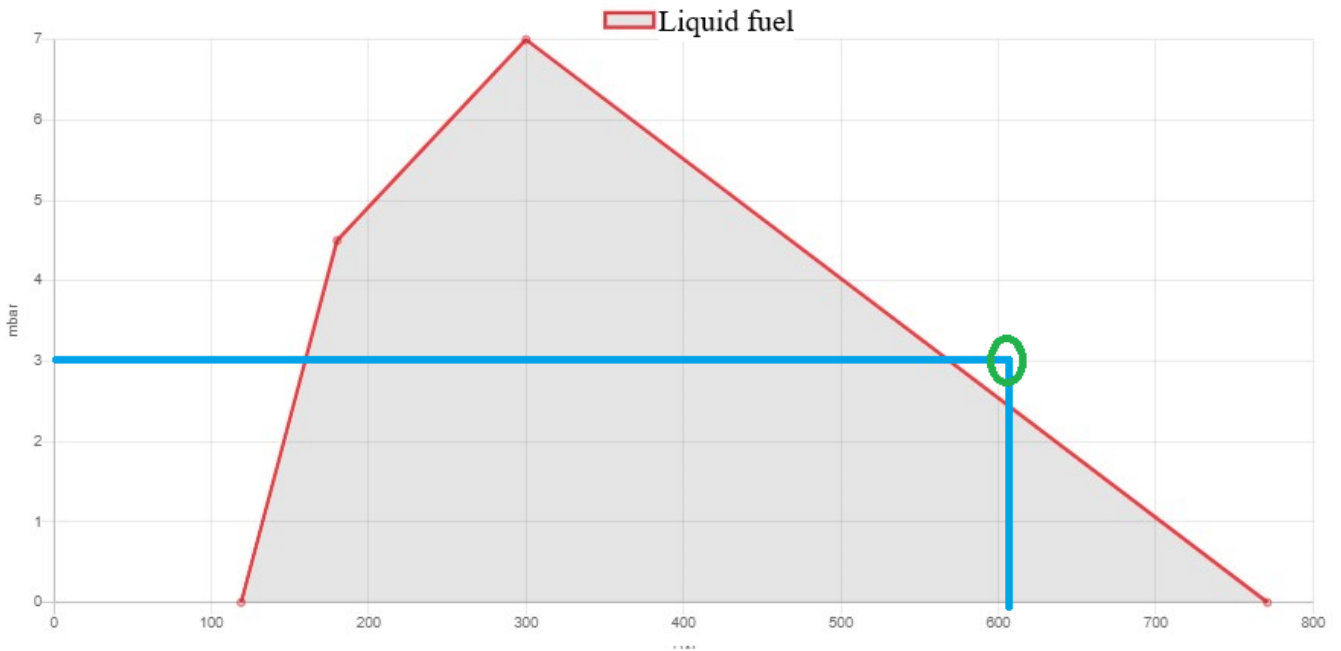
$$\frac{470.000 \text{ kcal/h}}{0.9} = 522.222 \text{ kcal/h} \quad (1)$$

The power of the burner is reached in equation 2. The power of the burner to be selected must be above this value.

$$\frac{522.000 \text{ kcal/h}}{860} = 607 \text{ kW} \quad (2)$$

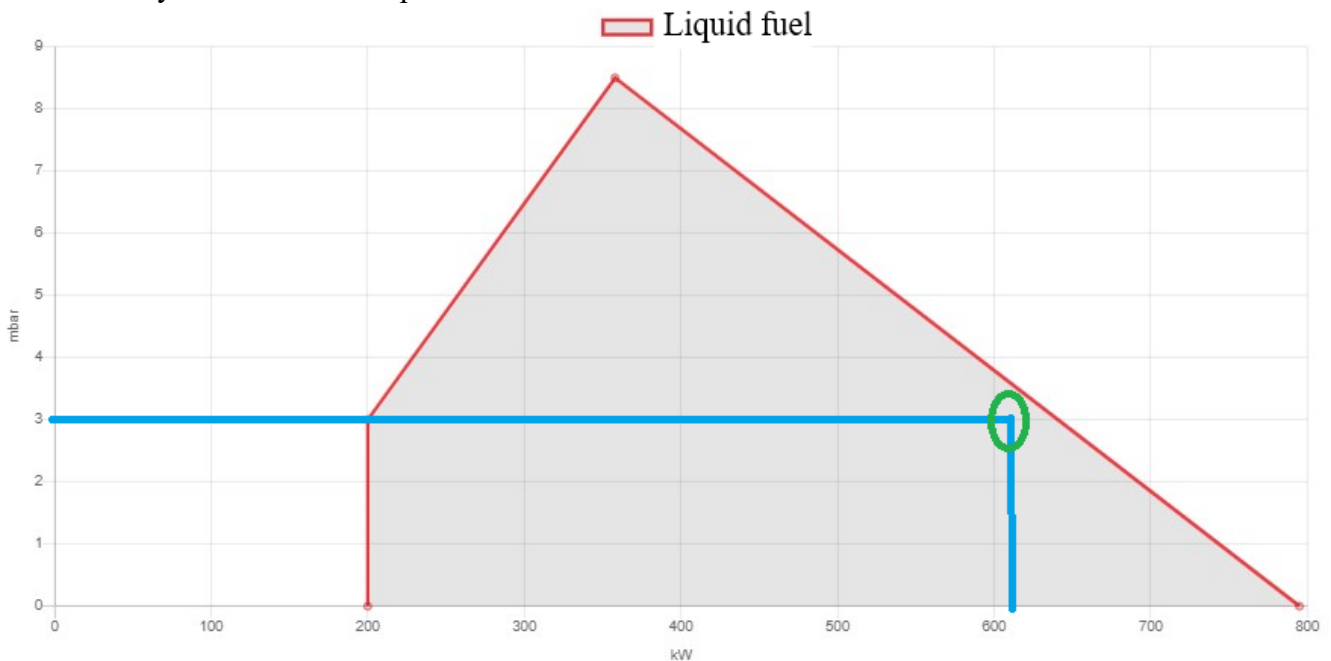
Burner research should be done on the ECOSTAR website according to burner power and fuel. In the example study, it corresponds to diesel fueled, 607 kw power value and double stage ECO 30 O (L) C 2a and ECO 45 O (L) C 2 products.

Figure 2 shows the back pressure diagram for the ECO 30 O(L) C 2a product. The vertical axis on the left side of the diagram shows back pressure and the horizontal axis on the bottom shows burner power. The back pressure curve 3 mbar and the power curve at 607 Kw must be intersected with line. If the intersecting point lies inside the graph, the burner is suitable but if it lies outside, the burner is not suitable. For this reason, the burner in figure 2 is not suitable.

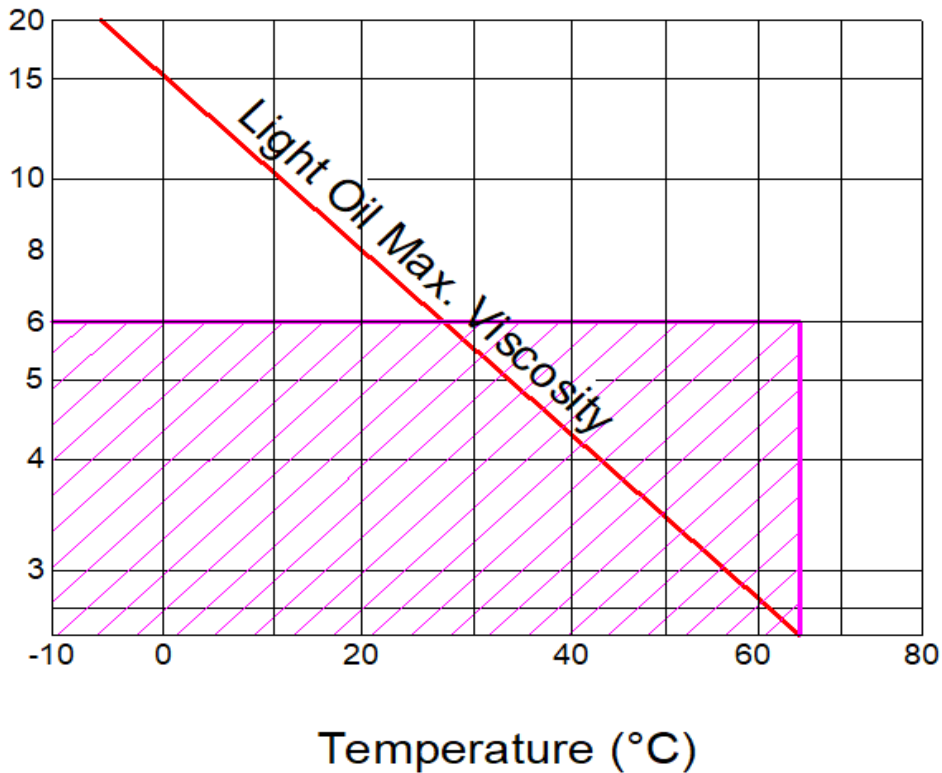


**Figure 2.** Back pressure curve burner selection

The same processes above were applied to the ECO 45 O (L) C 2 product. In figure 3, the burner is suitable because the intersection points fall within the graph. ECO 45 O (L) C 2 is a suitable product because it stays within the back pressure curve.



**Figure 3.** Back pressure curve burner selection



**Figure.4** Viscosity change depending on temperature



Temperature change of fuel used in ECOSTAR light oil burners dependent on viscosity

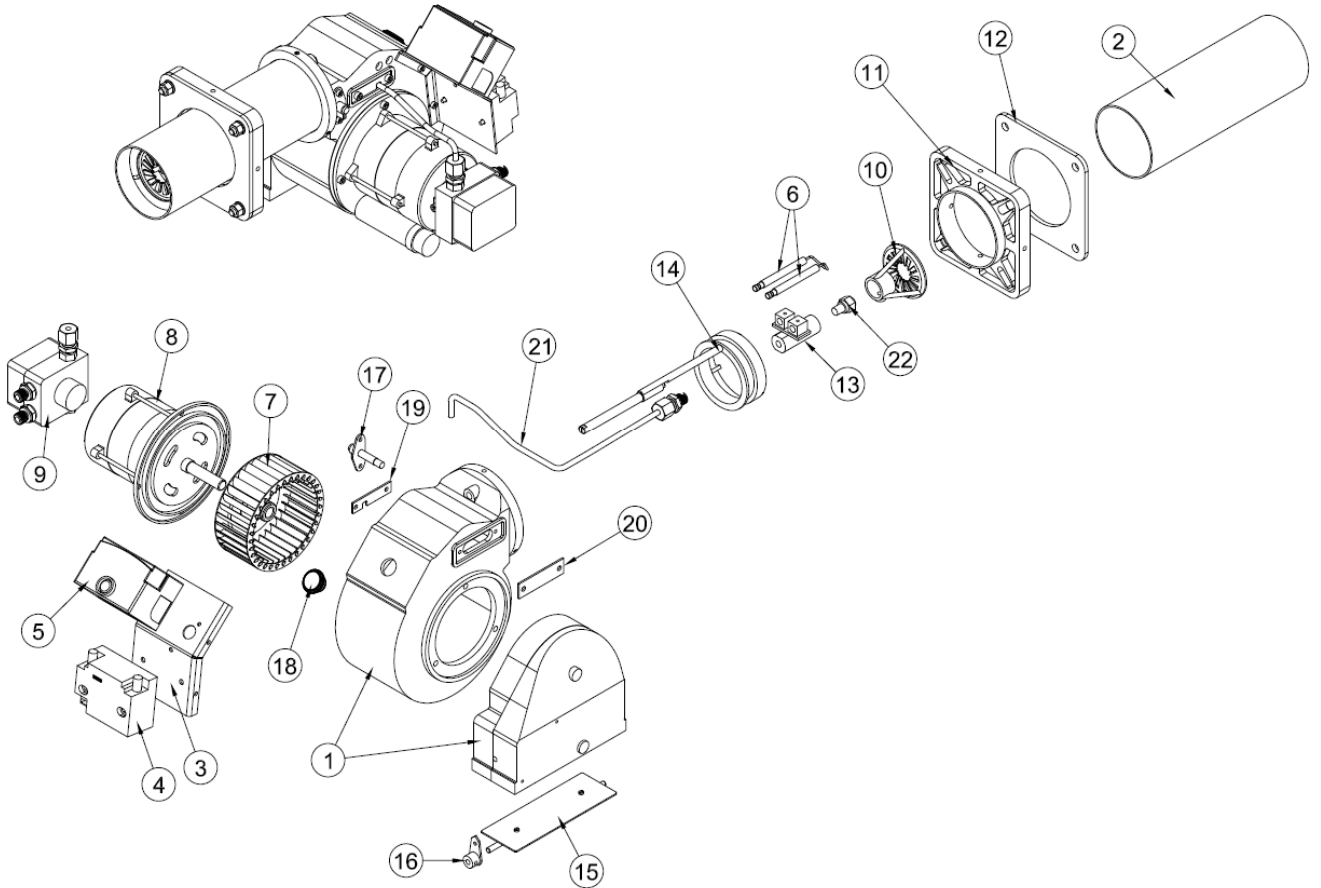


Operating Range

The temperature dependent viscosity change curve is shown in figure 4. (-10 – 80) °C and (0 – 20) Cst between values. The curve in figure 4. Used for diesel liquid fuels is suitable for combustion at (-10 – 65) °C and (2,5 – 6) Cst (mm<sup>2</sup>/s) values.

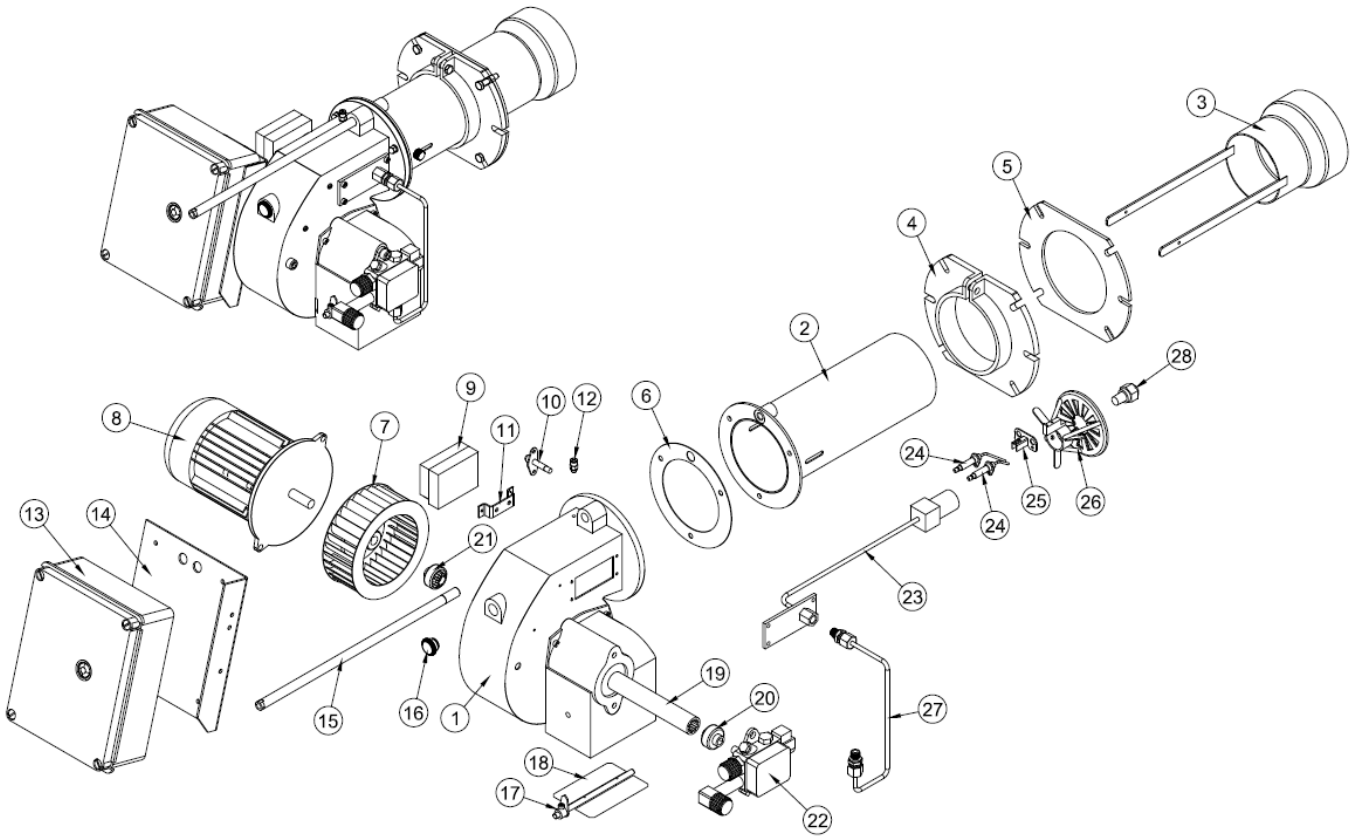
### 3.3. Burner Components

#### ECO 1 OLC1-1a



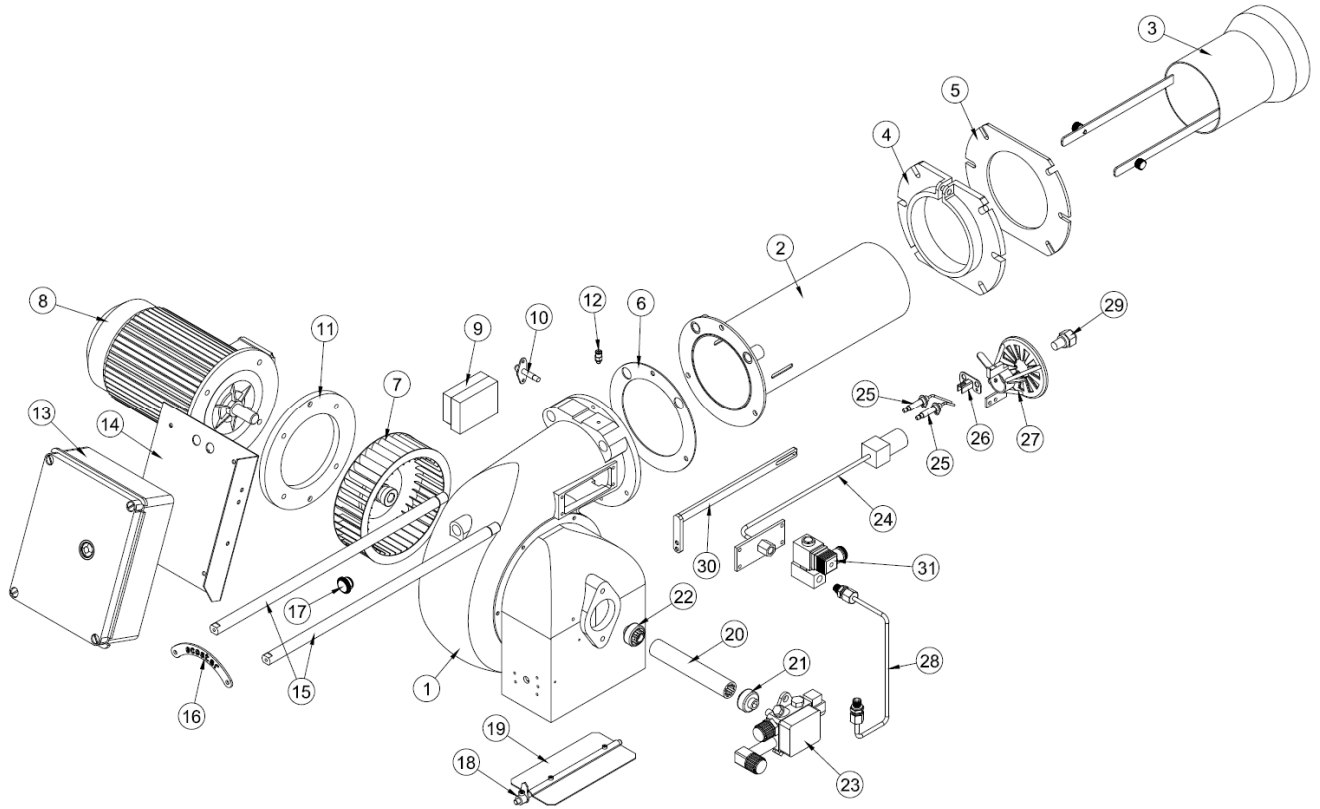
<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	12	Gasket
2	Flame Tube	13	Lance Mechanism
3	Transformer Mounting Plate	14	Air Adjustment Mechanism
4	Ignition Transformer	15	Air Damper
5	Control Relay	16	Air Damper Gauge
6	Ignition Electrode	17	Photocell
7	Fan	18	Observation Glass
8	Motor	19	Lance Cover
9	Pump	20	Lance Plate
10	Combustion Head	21	Fuel Pipe
11	Boiler Connection Flange	22	Fuel Nozzle

ECO 2 OLC1-1a



<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	15	Handling Shaft
2	Flame Tube	16	Observation Glass
3	Flame Tube Extension	17	Air Damper Gauge
4	Boiler Connection Flange	18	Air Damper
5	Gasket	19	Coupling Connection Pipe
6	Klingerit Gasket	20	Pump Coupling
7	Fan	21	Fan Coupling
8	Motor	22	Pump
9	Ignition Transformer	23	Lance
10	Photocell	24	Ignition Electrode
11	Transformer Mounting Plate	25	Electrode Connection Sheet Metal
12	Purger	26	Combustion Head
13	Electrical Panel	27	Fuel Pipe
14	Electrical Panel Mounting Plate	28	Fuel Nozzle

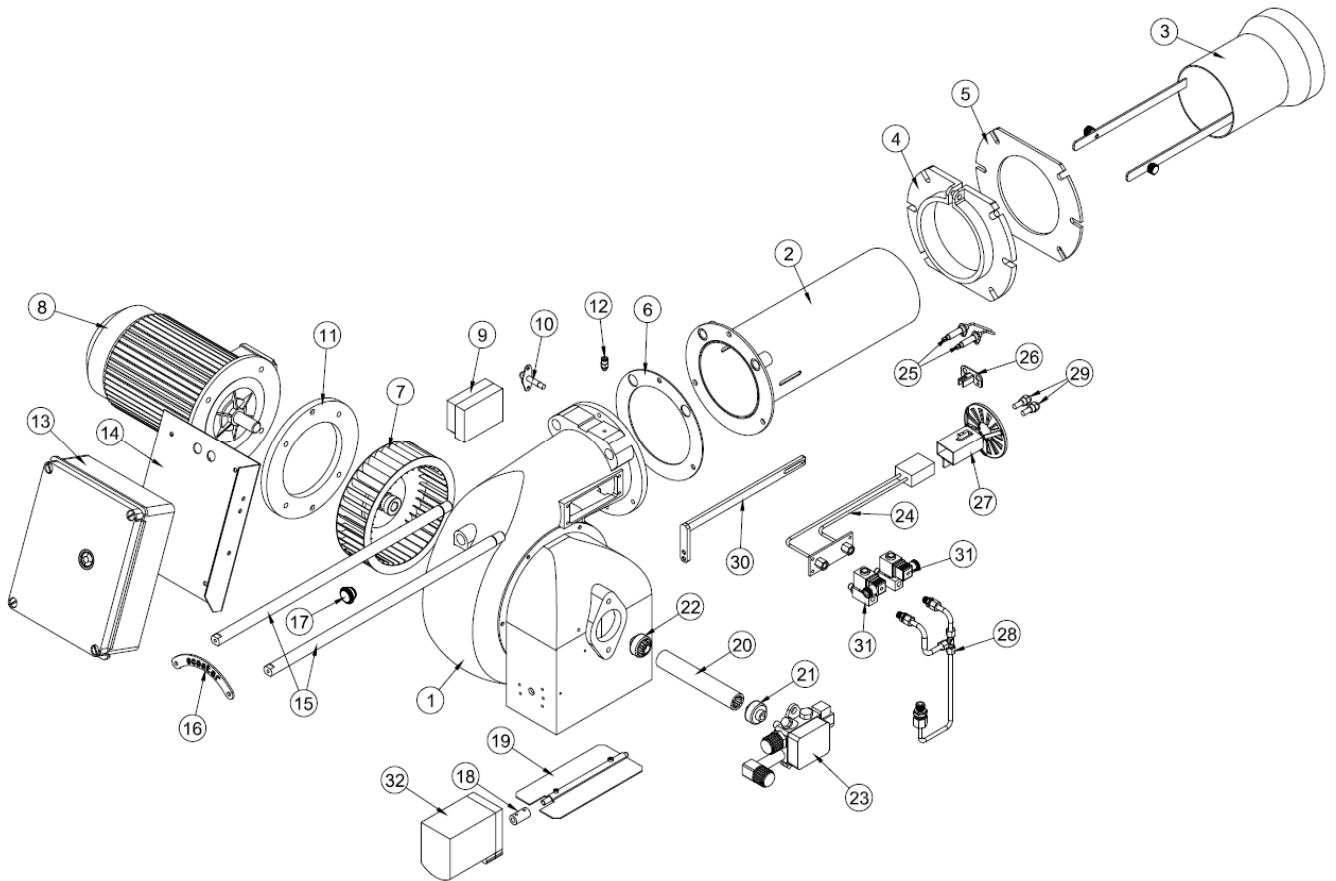
ECO 30 OLC1-1a





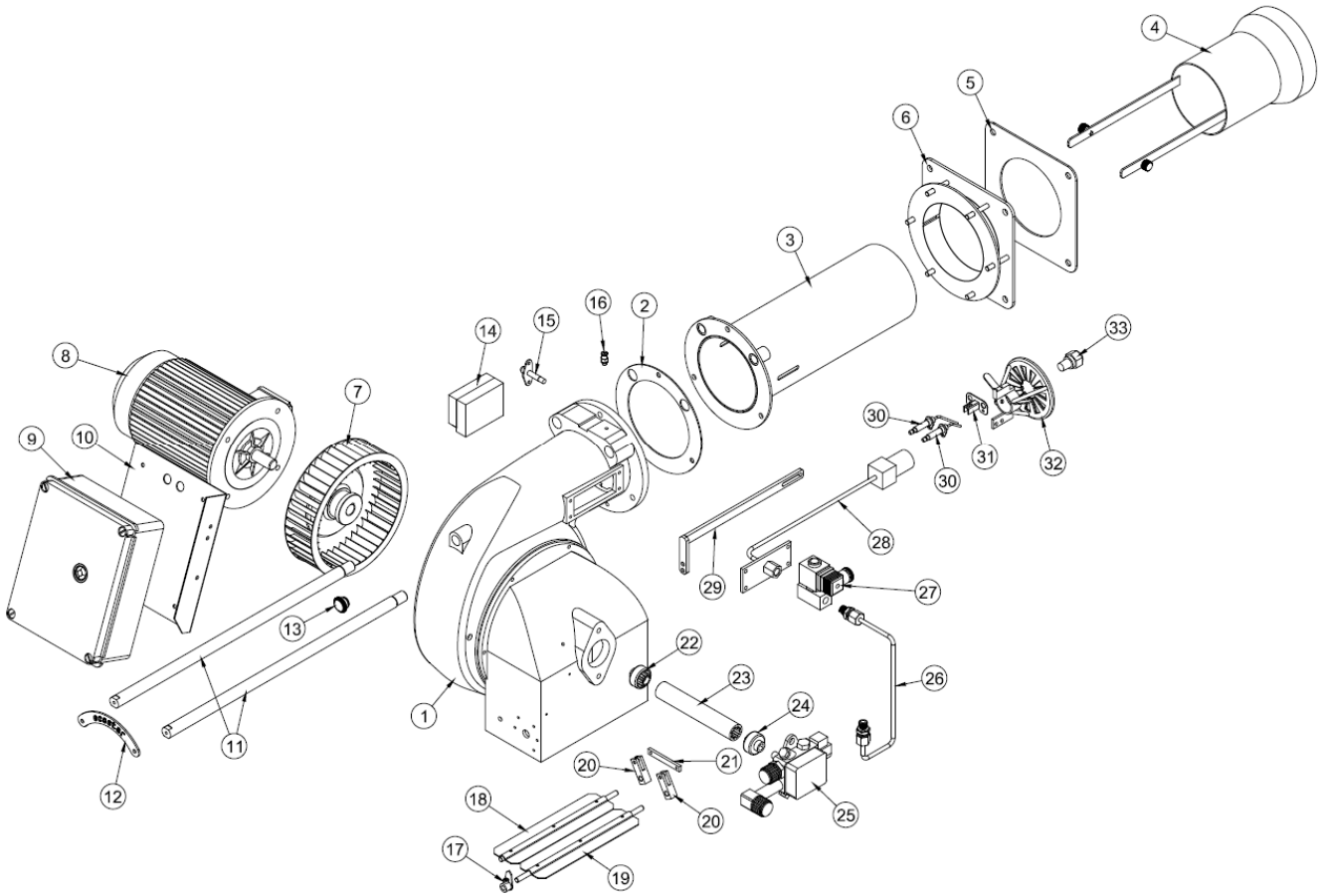
<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	17	Observation Glass
2	Flame Tube	18	Damper Gauge
3	Flame Tube Extension	19	Air Damper
4	Boiler Connection Flange	20	Coupling Connection Pipe
5	Gasket	21	Pump Coupling
6	Klingerit Gasket	22	Fan Coupling
7	Fan	23	Pump
8	Motor	24	Lance
9	Ignition Transformer	25	Ignition Electrode
10	Photocell	26	Electrode Connection Sheet Metal
11	Fan Motor Connection Flange	27	Combustion Head
12	Purger	28	Fuel Pipe
13	Electrical Panel	29	Fuel Nozzle
14	Electrical Panel Mounting Plate	30	Lance Centring Console
15	Handling Shaft	31	Solenoid Valve
16	Shaft Fixing Plate		

ECO 30 OLC2-2a



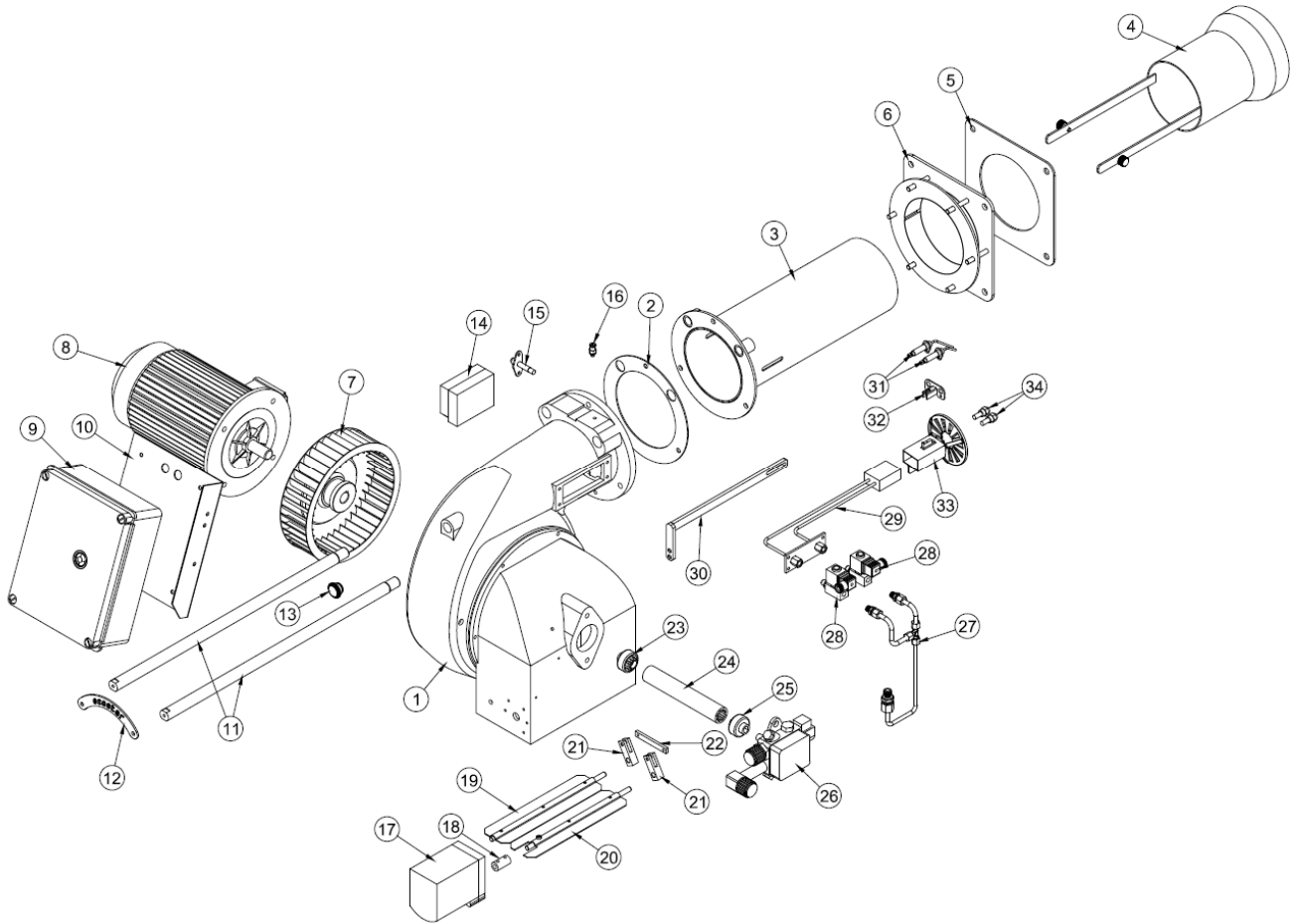
<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	17	Observation Glass
2	Flame Tube	18	Damper Gauge
3	Flame Tube Extension	19	Air Damper
4	Boiler Connection Flange	20	Coupling Connection Pipe
5	Gasket	21	Pump Coupling
6	Klingerit Gasket	22	Fan Coupling
7	Fan	23	Pump
8	Motor	24	Lance
9	Ignition Transformer	25	Ignition Electrode
10	Photocell	26	Electrode Connection Sheet Metal
11	Fan Motor Connection Flange	27	Combustion Head
12	Purger	28	Fuel Pipe
13	Electrical Panel	29	Fuel Nozzle
14	Electrical Panel Mounting Plate	30	Lance Centring Console
15	Handling Shaft	31	Solenoid Valve
16	Shaft Fixing Plate	32	Servomotor

ECO 45 OLC1



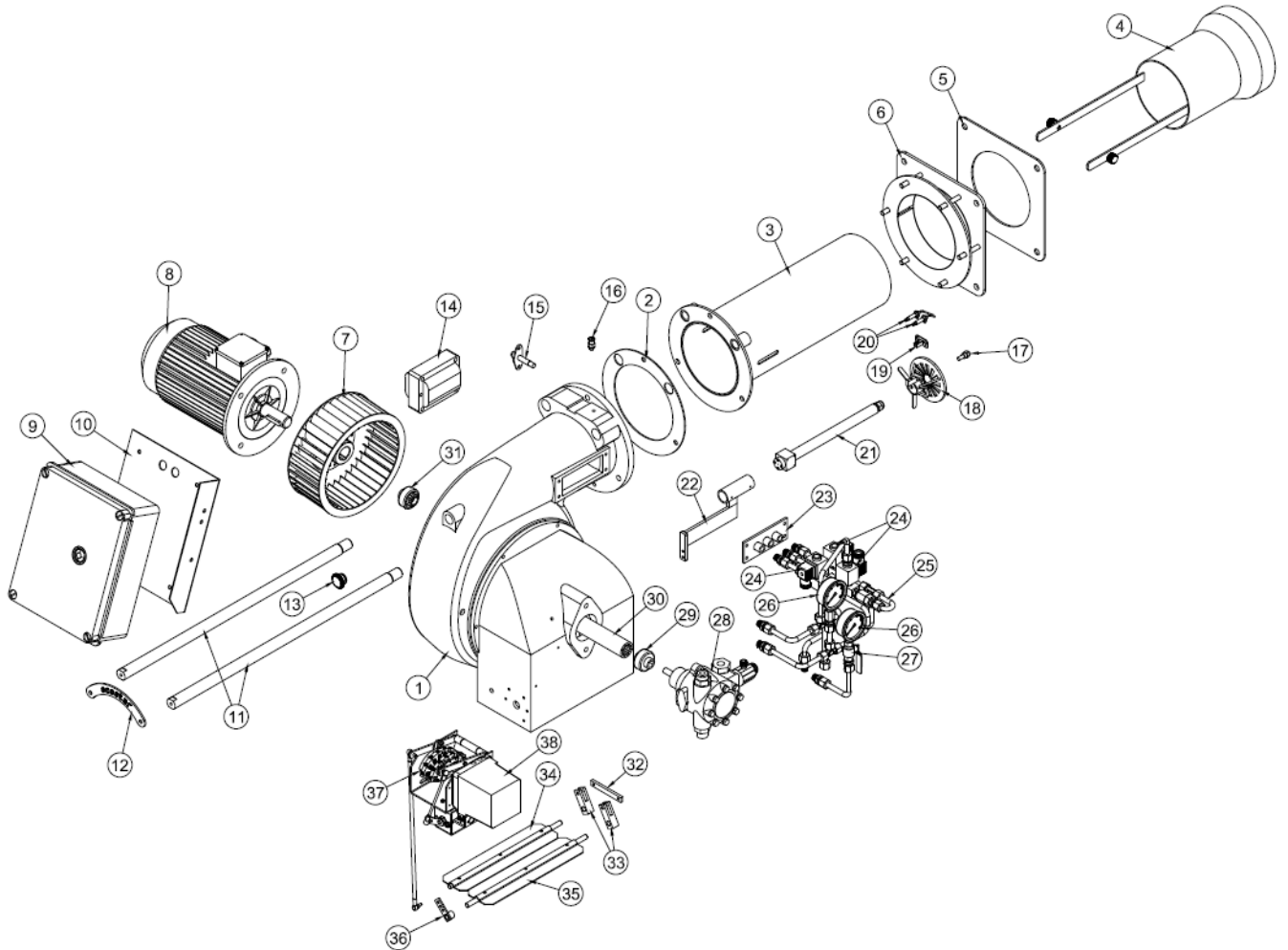
<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	18	Air Damper
2	Klingerit Gasket	19	Air Damper
3	Flame Tube	20	Air Damper Motion Rod
4	Flame Tube Extension	21	Air Damper Motion Transfer Rod
5	Gasket	22	Fan Coupling
6	Boiler Connection Flange	23	Coupling Connection Pipe
7	Fan	24	Pump Coupling
8	Motor	25	Pump
9	Electrical Panel	26	Fuel Pipe
10	Electrical Panel Mounting Plate	27	Solenoid Valve
11	Handling Shaft	28	Lance
12	Shaft Fixing Plate	29	Lance Centring Console
13	Observation Glass	30	Ignition Electrode
14	Ignition Transformer	31	Electrode Connection Sheet Metal
15	Photocell	32	Combustion Head
16	Purger	33	Fuel Nozzle
17	Damper Gauge		

ECO 45 OLC2-2a-2b



<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	18	Servomotor Coupling
2	Klingerit Gasket	19	Air Damper
3	Flame Tube	20	Air Damper
4	Flame Tube Extension	21	Air Damper Motion Rod
5	Gasket	22	Air Damper Motion Transfer Rod
6	Boiler Connection Flange	23	Fan Coupling
7	Fan	24	Coupling Connection Pipe
8	Motor	25	Pump Coupling
9	Electrical Panel	26	Pump
10	Electrical Panel Mounting Plate	27	Fuel Pipe
11	Handling Shaft	28	Solenoid Valve
12	Shaft Fixing Plate	29	Lance
13	Observation Glass	30	Lance Centring Console
14	Ignition Transformer	31	Ignition Electrode
15	Photocell	32	Electrode Connection Sheet Metal
16	Purger	33	Combustion Head
17	Servomotor	34	Fuel Nozzle

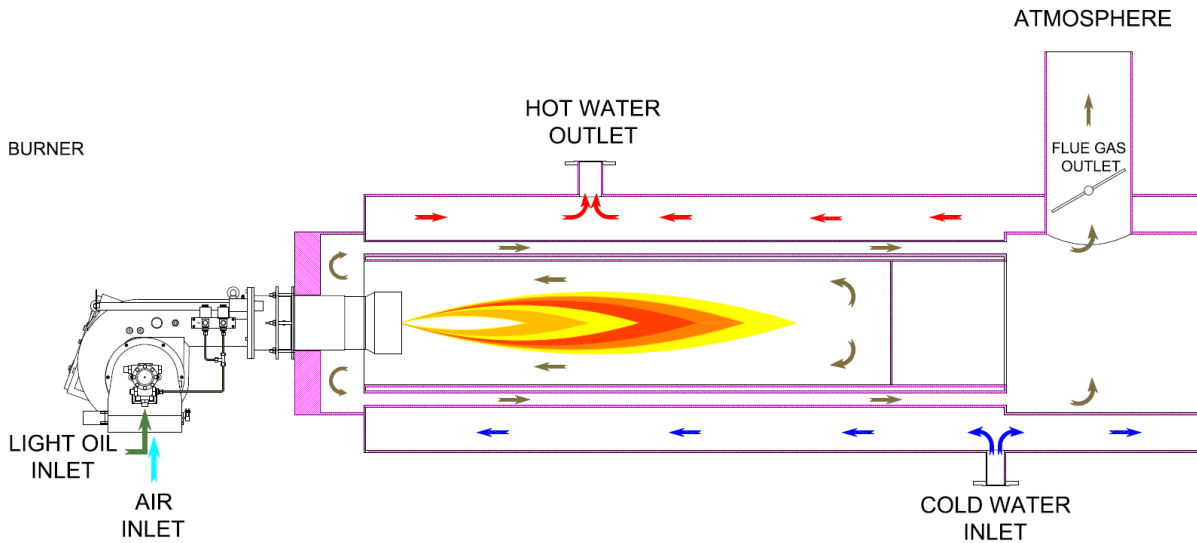
ECO 45 OLC3b





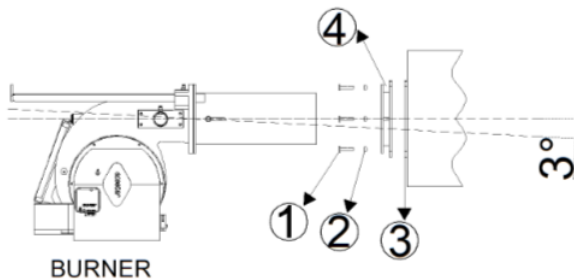
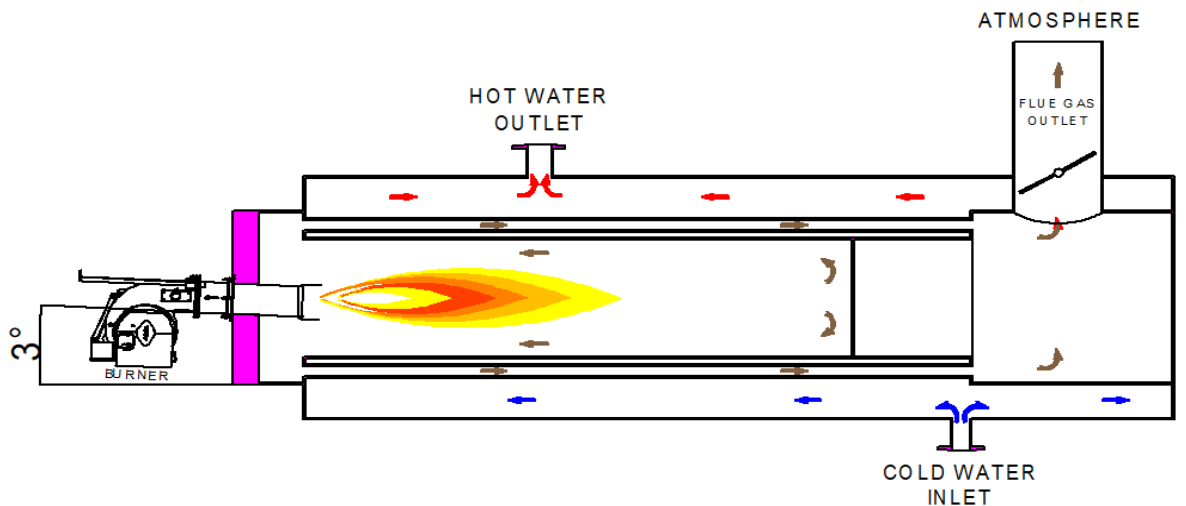
<b>Assembly No</b>	<b>Part Name</b>	<b>Assembly No</b>	<b>Part Name</b>
1	Body	20	Ignition Electrode
2	Klingerit Gasket	21	Lance
3	Flame Tube	22	Lance Centring Console
4	Flame Tube Extension	23	Solenoid Valve Connection Plate
5	Gasket	24	Solenoid Valve
6	Boiler Connection Flange	25	Fuel Pipes
7	Fan	26	Manometer
8	Motor	27	Ball Valve
9	Electrical Panel	28	Pump
10	Electrical Panel Mounting Plate	29	Pump Coupling
11	Handling Shaft	30	Coupling Connection Pipe
12	Shaft Fixing Plate	31	Fan Coupling
13	Observation Glass	32	Air Damper Motion Transfer Rod
14	Ignition Transformer	33	Air Damper Motion Rod
15	Photocell	34	Air Damper
16	Purger	35	Air Damper
17	Fuel Nozzle	36	Air Damper Adjustment Rod
18	Combustion Head	37	Disc Control Group
19	Electrode Connection Sheet Metal	38	Servomotor

#### 4. FLUE GAS AND HEATING WATER SCHEMA



**Figure 5.** The reversible front mirror boiler

When mounting the burner on the reversible front mirror boiler shown in figure 5, the flame pipe end should be (50 mm ≤ L ≤ 100 mm) distance from the smoke pipes. Otherwise, the flue gas temperature will rise and fuel consumption will increase.



- 1-Bolt
- 2-Nut
- 3- Boiler connection gasket
- 4-Boiler connection flange

## 5. TECHNICAL DATA

### 5.1. Capacity Table

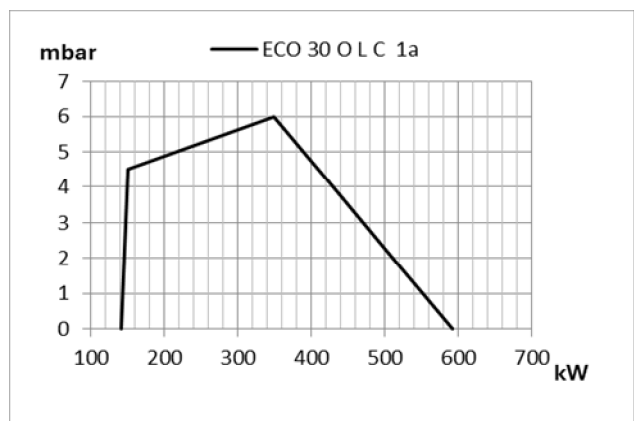
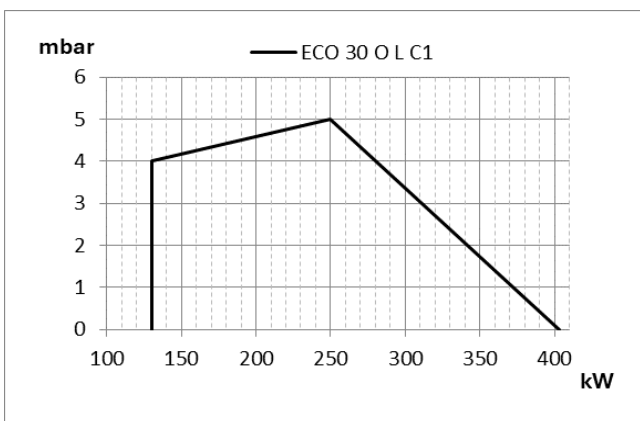
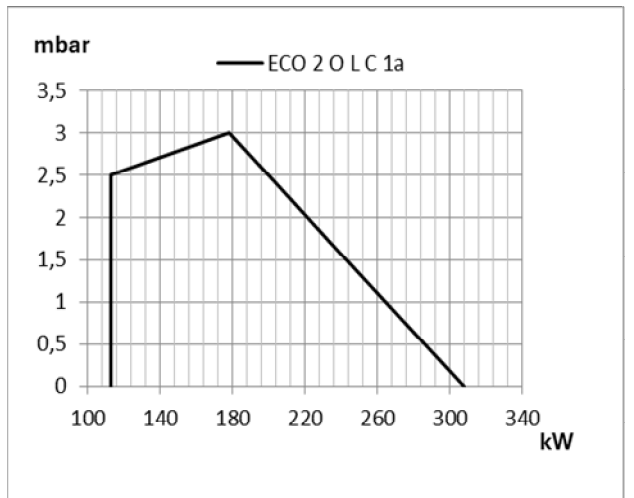
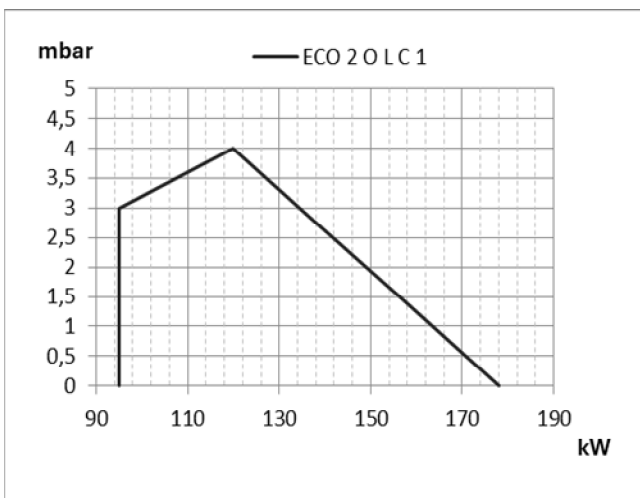
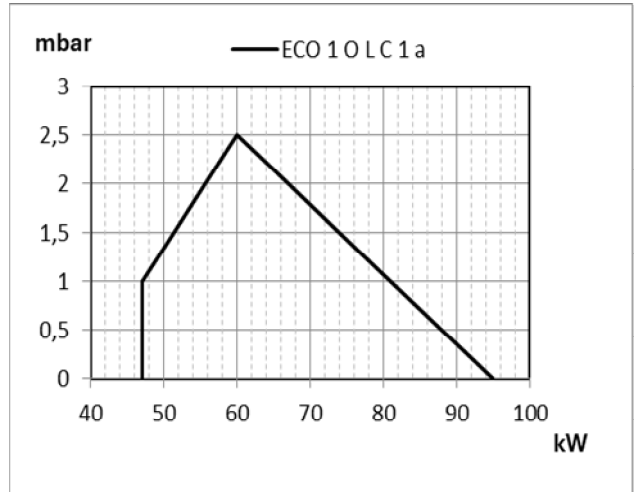
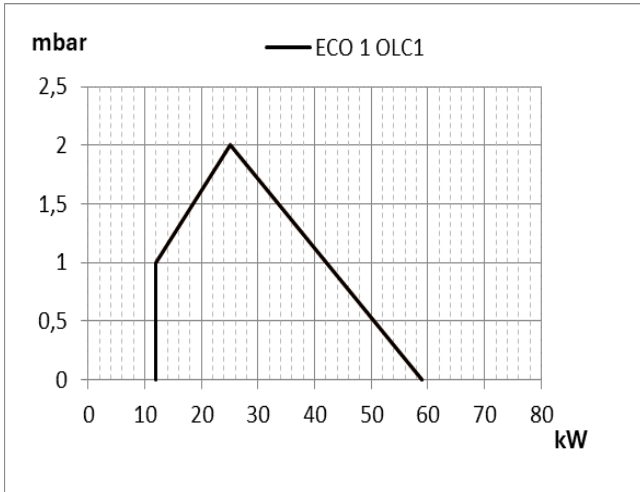
The capacity table of diesel burners is shown in figure 6. As single stage, double stage and modulating. Additionally, diesel consumption and fan motor power are indicated.

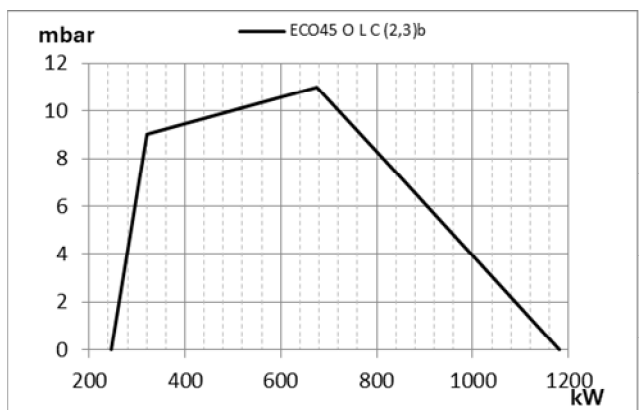
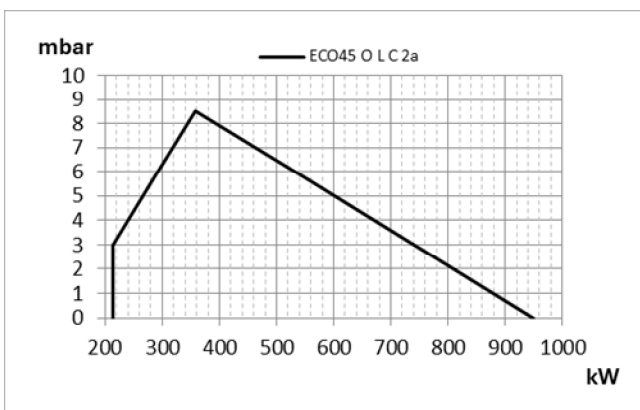
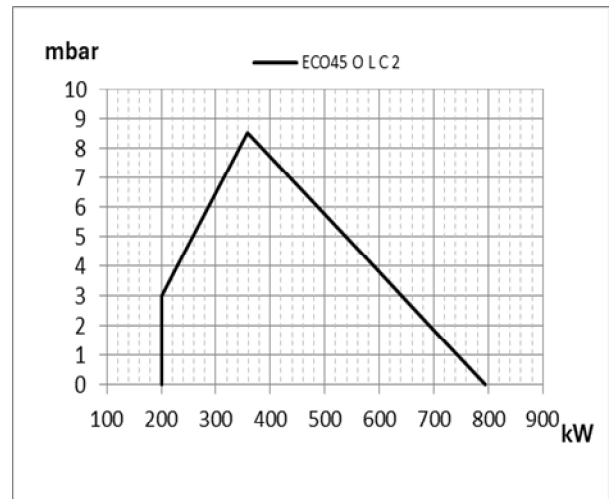
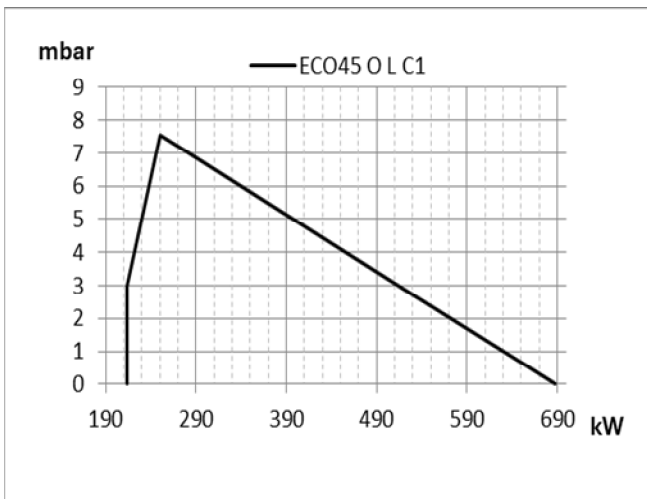
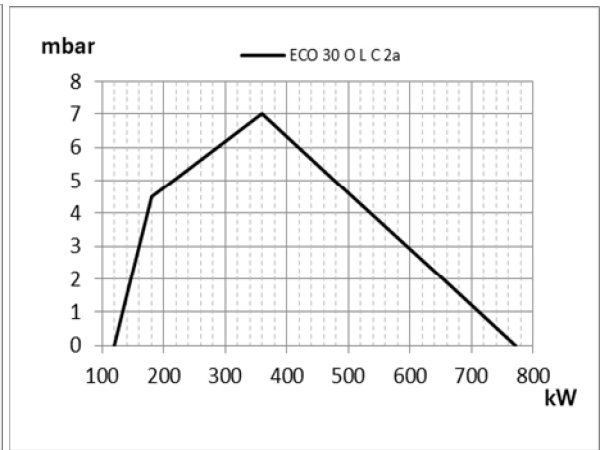
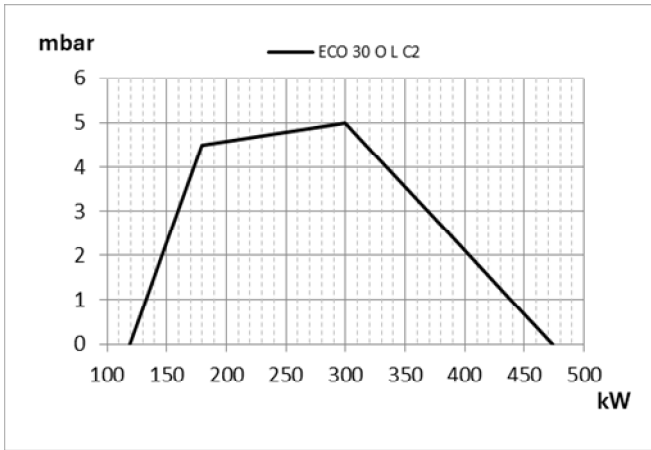
<b>LIGHT OIL BURNERS CAPACITY TABLE</b>									
BURNER TYPE	CAPACITY		CAPACITY		LIGHT OIL CONSUMPTION		FAN MOTOR POWER	OIL PUMP POWER	MAIN SUPPLY
	Min. kcal/h	Max. kcal/h	Min. kW	Max. kW	Min. kg/h	Max. kg/h	kW	kW	VAC
<b>ONE STAGE LIGHT OIL BURNERS</b>									
ECO 1 O (L) C 1	10.200	51.000	12	59	1	5	0,11	-	1N 240
ECO 1 O (L) C 1a	40.800	81.600	47	95	4	8	0,11	-	1N 240
ECO 2 O (L) C 1	81.600	153.000	95	178	8	15	0,37	-	3N 400
ECO 2 O (L) C 1a	96.900	265.200	113	308	10	26	0,37	-	3N 400
ECO 30 O (L) C 1	112.200	346.800	130	403	11	34	0,37	-	3N 400
ECO 30 O (L) C 1a	122.400	510.000	142	593	12	50	0,37	-	3N 400
ECO 45 O (L) C 1	183.600	591.600	213	688	18	58	1,1	-	3N 400
<b>TWO STAGE LIGHT OIL BURNERS</b>									
ECO 30 O (L) C 2	102.000	408.000	119	474	10	40	0,37	-	3N 400
ECO 30 O (L) C 2a	102.000	663.000	119	771	10	65	0,75	-	3N 400
ECO 45 O (L) C 2	173.400	683.400	200	795	17	67	1,1	-	3N 400
ECO 45 O (L) C 2a	183.600	816.000	213	949	18	80	1,1	-	3N 400
ECO 45 O (L) C 2b	214.200	1.020.000	247	1180	21	100	1,5	-	3N 400
<b>MODULATING LIGHT OIL BURNERS</b>									
ECO 45 O (L) C 3b	214.200	1.020.000	247	1180	21,00	100,00	1,5	-	3N 400

**Figure 6.** Diesel burner capacity table

$H_u$  Light Oil (L) = 10200 Kcal/kg ( Energy released from burning 1 kg of diesel)

## 5.2. Back Pressure-Capacity Diagrams

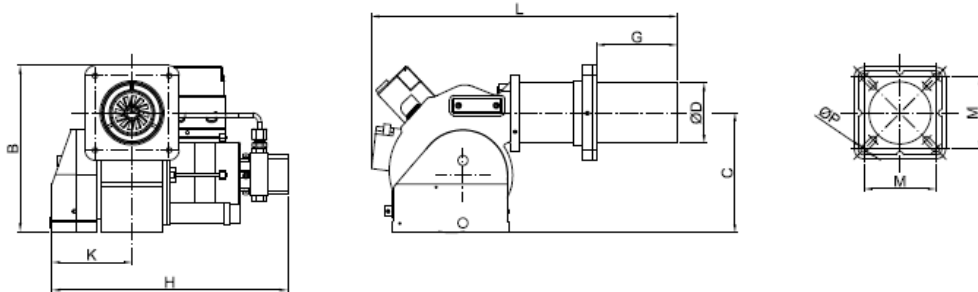




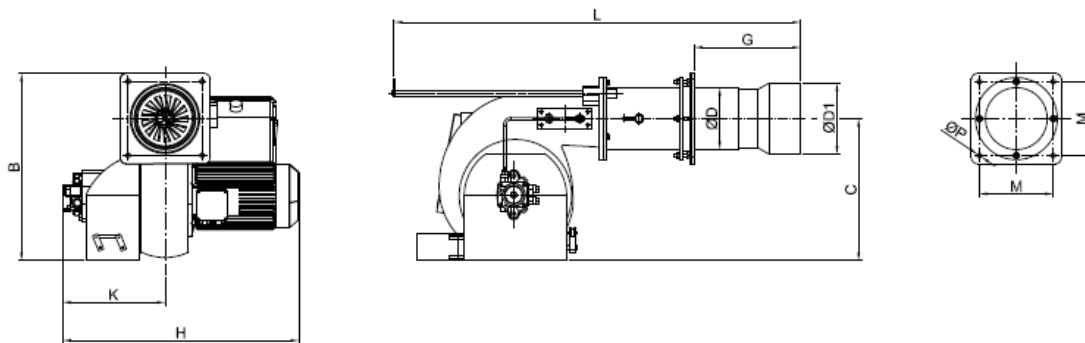
**Not:** Burner operating range curves; It shows the burner performance in the approval phase and laboratory tests. Minimum power may vary depending on the condition of the combustion chamber.

### 5.3. Burner Dimensions

ECO 1



ECO 2 ECO 30 ECO 45



	L	Gmin	Gmax	H	K	B	C	ØP	M	ØD	ØD1
<b>ECO 1 O (L)</b>	560	50	310	340	125	250	175	10	110	89	-
<b>ECO 2 O (L)</b>	820	106	290	390	220	320	230	10	142	120	139
<b>ECO 30 O (L)</b>	790	130	245	545	240	400	305	10	142	130	153
<b>ECO 45 O (L)</b>	1040	150	310	600	300	460	350	12	180	148	172

#### 5.4. Flame Length and Diameter

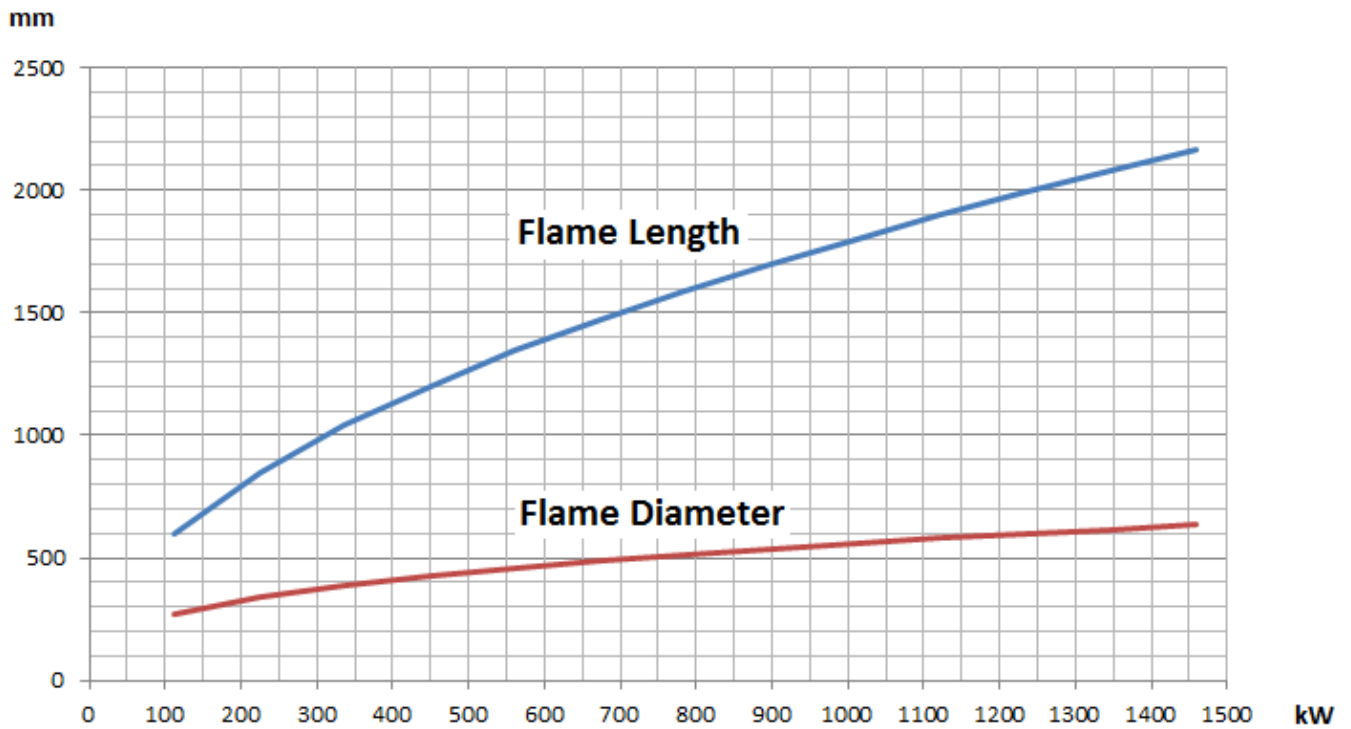


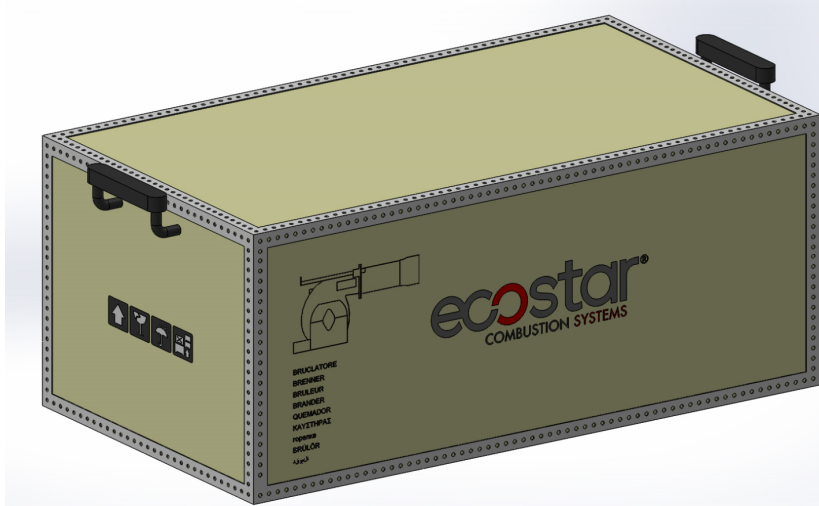
Figure 7. Flame length and diameter

The burner capacity suitable to the furnace length and diameter of the boiler should be selected. According to the burner capacity from figure 7, flame length and diameter can be accessed.

#### 5.5. Noise Level

Product operates within the range of 75 decibels max. and 80 decibels.

## 6. BURNER HANDLING INFORMATION



- Lift the product by holding the handles as seen in the picture.
- Prevent strong impacts on top of the product and vibration while handling the product.
- Do not leave the product in wet environment.



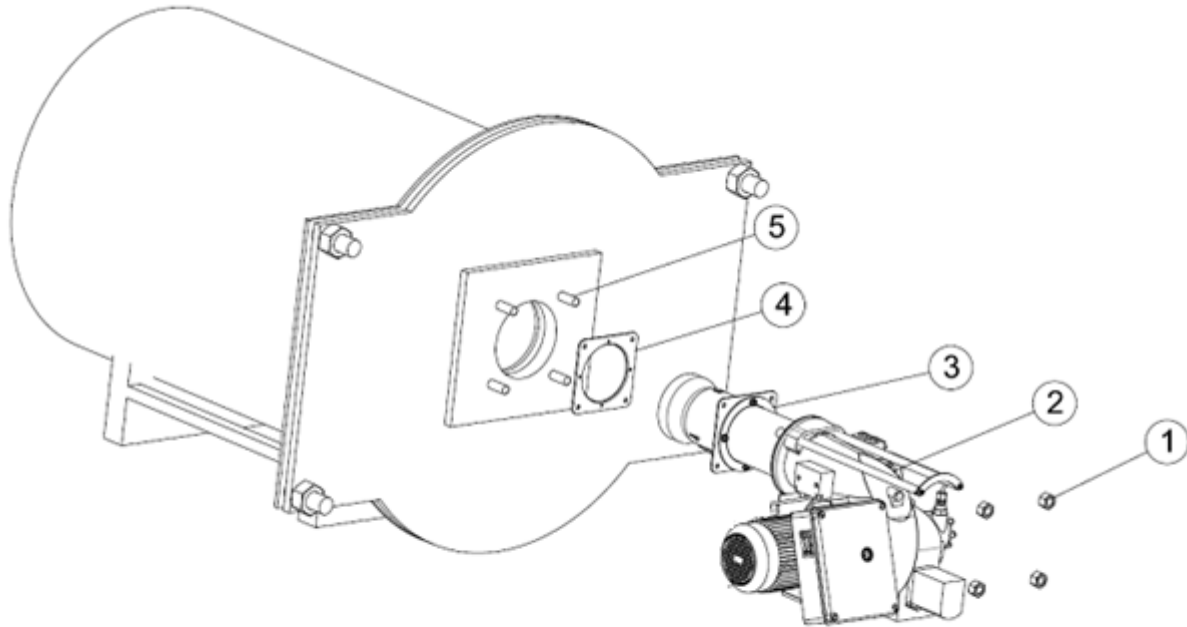
Dimensions of the box used for handling

Burner	L x W x H (cm)	Weight(kg)
ECO 1 OLC1	65 X 43 X 37	20
ECO 2 OLC1	71 X 50 X 37	30
ECO 30 OLC1	80 X 54 X 40	36
ECO 30 OLC2	80 X 54 X 40	44
ECO 30 OLC2a	80 X 54 X 40	46
ECO 45 OLC1	105 X 60 X 46	58
ECO 45 OLC2	110 X 66 X 46	66
ECO 45 OLC2a	110 X 66 X 46	66
ECO 45 OLC2b	110 X 66 X 46	66
ECO 45 OLC3b	110 X 66 X 46	66



## 7. INSTALLATION

### 7.1. Burner Installation Picture



- 1- Drift Bolts
- 2- Burner
- 3- Boiler Connection Flange
- 4- Gasket
- 5- Boiler Studs

- In the installation of the burner, use the installation materials supplied with the burner.
- Secure the burner connection flange onto the burner cover by 4 bolts. Gasket must be connected such that it will remain between connecting flange and boiler cap.

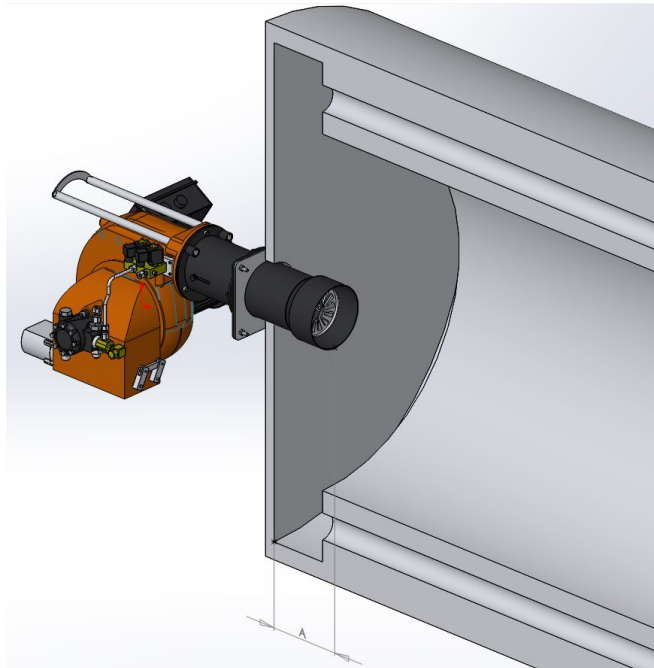
#### **After completing the installation of the burner on the boiler:**

- Connect the oil feed pipes.
- Connect the burner panel to the mains by a cable suitable for the rated power.



Clean the inside of fuel line thoroughly before installing the burner to the fuel line. Any damage that may occur due to solid objects and metal particles from the fuel line shall not be covered by our company.

## 7.2. In reverse flame front mirror boilers

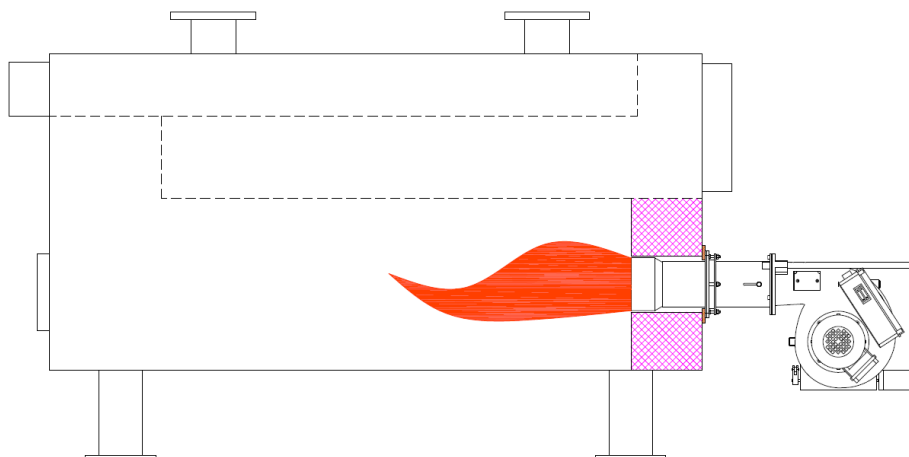


**Figure 8.** The reversible front mirror boiler



While installing the burner in reverse flame front mirror boilers, flame tube tip must be adjusted such that it gets inside by 50 mm-100 mm from flue pipes ( $50\text{mm} \leq A \leq 100\text{mm}$ ). Otherwise flue gas temperature will rise and fuel consumption will increase.

## 7.3. In cylindrical (straight flame) boilers



**Figure 9.** Cylindrical (Flat Flame) Boilers



When mounting the burner in cylindrical (flat flame) boilers, the flame pipe end should be in line with the refractory shown in figure 9.

## 8. COMMISSIONING

### 8.1. Before Commissioning



#### Electrical Connection

Perform electrical connections according to the diagram provided with the burner. Follow general security rules during installation of electric wiring and making connections. Connect the earthing terminal in electric panel to the earthing installation.

### 8.2. General Controls



Make sure to perform the following controls before commissioning the burner.

- Installation of the burner to the boiler is checked.
- Check the fuel line (are the pipe diameters and the pipe installation correct?).
- Check energy input cables and voltages.
- Check the boiler safety thermostats and, if it is a two-stage burner, then make sure that there are two thermostats.
- Check the fuel nozzles according to the boiler capacity.
- Prior to operating the burner, control the boiler water level.
- Make sure water circulation system is turned on, and steam boiler and water feed pumps and boiler inlet - outlets are open.

#### **Commissioning order**

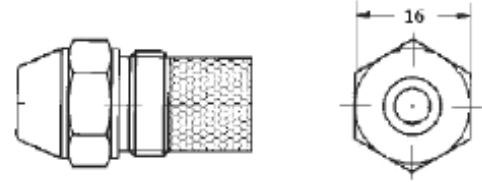
- After performing the above mentioned controls, open the fuel tank valve.
- Open the valve upstream of the fuel filter.
- Check direction of motor rotation.
- Open the pump's vent plug and place the manometer (0-40 bar).
- Turn on the burner switch (turn to position 1).
- When the burner starts up, the motor is activated and turns the pump at the same time.
- The pump filter should be cleaned frequently (every 30 minutes) during the first commissioning, and please ensure that the fuel reaches the pump without interruption.
- It actuates pre-purge and discharges the residual gases remaining in the boiler from the funnel.
- After the pre-purge, fuel is delivered from the nozzle. The fuel meets the flame from the ignition electrodes and the combustion starts.
- After combustion of the burner, the pump pressure is adjusted (Light oil: 14 bar).
- If the burner has two stages, the switch is brought to position "2", and the capacity of the burner is increased through servomotor. Ideal combustion is obtained by increasing the amount of air by the fuel given according to analyses value.
- The boiler thermostat is adjusted as desired (70-90°C for central heating boilers).
- For the safety of the system, check the boiler thermostats and observe the deactivation of the burner.

### 8.3. Combustion Adjustment

#### ➤ Fuel nozzle

Use proper wrench in installation and dismantle of the fuel nozzle.

Use diesel oil to clean the fuel nozzle. Do not use thinner and its derivatives.



If the product is single stage; Looking how many gallons of fuel nozzles you are assembled from manufacture card. Then for a ir flap position;

Burner type and capacity status	Pump pressure							Air flap position
	Boiler power matching			12 bar		14 bar		
	(kW)	(kcal/h)	(kg/h)	I. Stage	II.Stage	I. Stage	II.Stage	
ECO 1 O (L) C 1 (min)	12	10320	1	0,4		0,3		7-13°
ECO 1 O (L) C 1 (max)	59	50740	5	1,25		1,1		11-19°
ECO 1 O (L) C 1 a (min)	47	40420	4	0,9		0,85		8-16°
ECO 1 O (L) C 1 a (max)	95	81700	8	2		1,75		22-28°
ECO 2 O (L) C 1 (min)	95	81700	8	2		1,75		22-28°
ECO 2 O (L) C 1 (max)	178	153080	15	3,5		3,5		26-40°
ECO 2 O (L) C 1 a (min)	113	97180	10	2,5		2		25-33°
ECO 2 O (L) C 1 a (max)	308	264880	26	6,5		5,5		25-40°
ECO 30 O (L) C 1 (min)	130	111800	11	2,75		2,5		25-38°
ECO 30 O (L) C 1 (max)	403	346580	34	8,5		7,5		30-44°
ECO 30 O (L) C 1 a (min)	142	122120	12	3		2,75		26-39°
ECO 30 O (L) C 1 a (max)	593	509980	50	12		11		38-55°
ECO 45 O (L) C 1 (min)	213	183180	18	4,5		4		20-34°
ECO 45 O (L) C 1 (max)	688	591680	58	14		13		40-65°

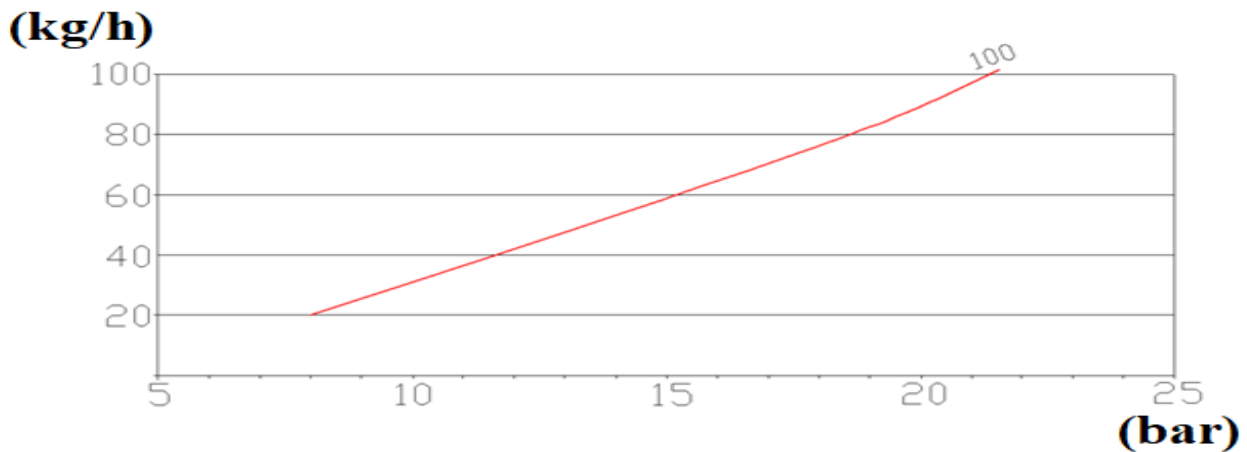
**Table 1.**

The table 1. Shows the capacity, diesel consumption per hour, pump pressure and angular position of the air flap for ECO 1 O (L) C 1 – ECO 45 O (L) C 1 single stage products.

Pump pressure									
Burner type and capacity status	Boiler power matching			12 bar		14 bar		Air flap position	
	(kW)	(kcal/h)	(kg/h)	I. Stage	II. Stage	I. Stage	II. Stage		
ECO 1 O (L) C 2 (min)	12	10320	1	0,3	0,3	0,3	0,3	10°	24°
ECO 1 O (L) C 2 (max)	59	50740	5	0,5	0,75	0,3	0,8	10°	35°
ECO 1 O (L) C 2 a (min)	47	40420	4	0,3	0,65	0,35	0,5	10°	30°
ECO 1 O (L) C 2 a (max)	95	81700	8	0,3	1,75	0,5	1,25	10°	40°
ECO 2 O (L) C 2 (min)	95	81700	8	0,3	1,75	0,5	1,25	10°	40°
ECO 2 O (L) C 2 (max)	178	153080	15	1	2,5	1,35	2	15°	40°
ECO 2 O (L) C 2 a (min)	113	97180	10	0,65	2,25	0,9	1,35	15°	33°
ECO 2 O (L) C 2 a (max)	308	264880	26	2	4,5	2,25	3,25	25°	42°
ECO 30 O (L) C 2 (min)	130	111800	11	1	1,75	1	1,65	15°	38°
ECO 30 O (L) C 2 (max)	403	346580	34	3	5,5	3,25	4,5	30°	45°
ECO 30 O (L) C 2 a (min)	142	122120	12	1	2	1	1,75	15°	39°
ECO 30 O (L) C 2 a (max)	593	509980	50	4	8	4,5	6,5	38°	58°
ECO 45 O (L) C 2 (min)	213	183180	18	1,5	3	1,5	2,5	20°	38°
ECO 45 O (L) C 2 (max)	688	591680	58	4,5	8,5	5	8	40°	67°

**Table 2.**

The table 2. Shows the capacity, diesel consumption per hour, pump pressure and angular position of the air flap for ECO 1 O (L) C 2 – ECO 45 O (L) C 2 double stage products.

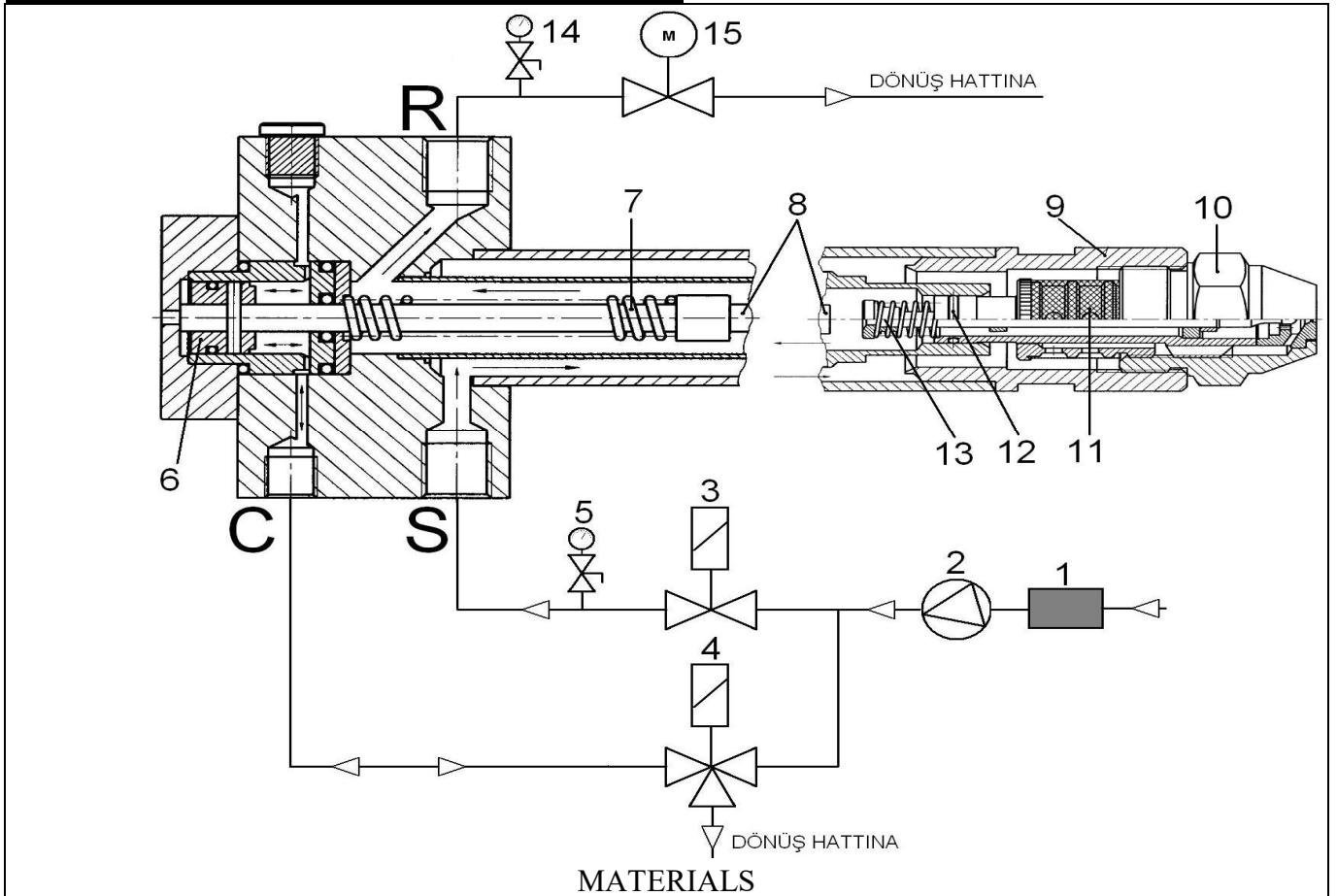


**Table 3.**

ECO 45 O (L) C 1 is shown in table 3, per hour diesel consumption according to pressure for diesel products. According to Table 3, while 20 kg/h diesel consumption occurs at 7-8 bars, maximum consumption goes up to 100 kg/h at 21-22 bars.

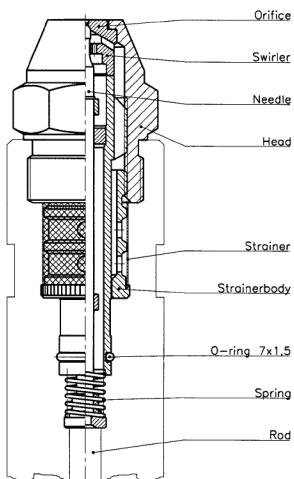
	Pump (fuel supply pressure)	Maximum (Return pressure in flame)	Minimum (Return pressure in flame)
Fuel nozzle	25 bar	18-21 bar (advised)	7 bar (advised)

**“H” TYPE REVERSIBLE HYDRAULIC LANCE**



**MATERIALS**

No.		No.	
1	Fuel oil filter	9	Nozzle housing
2	Pump	10	Fuel nozzle
3	Inlet casing	11	Nozzle filter
4	Hydraulic actuator valve	12	O-ring
5	Inlet manometer	13	Nozzle mechanism
6	Piston	14	Return manometre
7	Nozzle closing spring	15	Oil adjusting valve
8	Rod		



12-W model fuel nozzle is used in the “H” type lance.

**When the hydraulic circuit is followed in order:**

- The fuel given to the fuel inlet at a maximum pressure of 1 bar passes through filter and arrives pump.
- The fuel pressurized in the pump comes to the inlet of solenoids 3 and 4 number at constant pressure values of 25-30 bar.
- Solenoid number 3 (2 way NC main line valve) is the safety solenoid and is energized together with the pump motor.
- Solenoid number 4 (3 way control valve) is the operating solenoid and is energized at the moment of ignition (when fuel comes out of the nozzle).
- Valve number 3 which is normally closed, it opens when power is applied and fuel enters the nozzle. The fuel entering from the 'S' inlet passes through the wall between two concentric pipes and comes the filter number 11. The fuel passing through the holes under the filter strainer enters the inner pipe of the nozzle from the middle pipe of the fuel nozzle. Fuel comes to the oil adjustment valve number 15, through the 'R' return connection. Then, the fuel return pressure before the oil adjustment valve is followed from manometer number 14. It goes to the tank through fuel return line.
- While the described to occurred circulation, piston number 6, which is fixed to rod number 8, stands in the forward position with the pressure of spring number 7. When T<sub>ij</sub> applies to pressure on fuel nozzle, It keeps the fuel nozzle closed, At that moment Solenoid number 4 is without current.
- When solenoid valve number 4 is energized, it transmits the fuel at 25-30 bar pressure to the hydraulic chamber marked "C". Due to influence of fuel pressure, piston number 6 moves and retracts. The spring of number (7) stretches and pulls the rod number (8) back.
- By retracting the nozzle rod number (8), the needle (13) on the fuel nozzle is retracted due to the push spring. Fuel exit occurs by opening the nozzle orifice.
- As long as high pressure is applied to the hydraulic chamber whose inlet is marked "C", the nozzle continues to spray fuel.
- When the energy of the solenoid valve number (4) is cut off, the pressurized fuel with the effect of the pushing spring number (7), As a result of the piston number (6) moving forward by leaving from "C" fuel leaves the system through the 3rd path connected to the return line of the solenoid number (4). By ensured the forward movement of the rod, the fuel nozzle orifice is closed.
- By energizing valve (4), fuel exits from the nozzle takes less than 1 second. Likewise, by de-energizing from valve (4), fuel is cut off in less than 1 second.

## **WARNINGS!**



### **CAUTION!**

- **The end of the line going to the main tank must be open to the atmosphere and the line pressure must be zero, otherwise. Since the pressure that will occur during the return will also effect the nozzle pressure, there will be no healthy proportional operation. Fuel dripping from the nozzle end may occur during stops.**
- **For good pulverization, periodically check the integrity of O-ring number 12. If the O-ring number 12 wears out, the fuel entering the lance may by-pass and go directly to the return. This situation reduces the operating performance of the lance.**
- **The maximum working pressure of the lance is 30 bar, the maximum working temperature is 140 °C . These values should not be exceeded during operation. If these values are exceeded the lance should be taken to emergency care and all O-rings replaced.**
- **Do not use solvent-based substances when cleaning the fuel nozzle (thinner etc.) , clean with kerosene or diesel oil. The fuel nozzle internal assmebly is extremely sensitive an deven unnoticeable deformations can reduce operating performance. Disassembly and assembly should only be carried out by trained personnel.**
- **If dripping or large-scale fuel exit from the fuel nozzle is observed while the nozzle is circulating, spring number 7 has lost its function. It needs to be checked and replaced.**



➤ **Photocell**

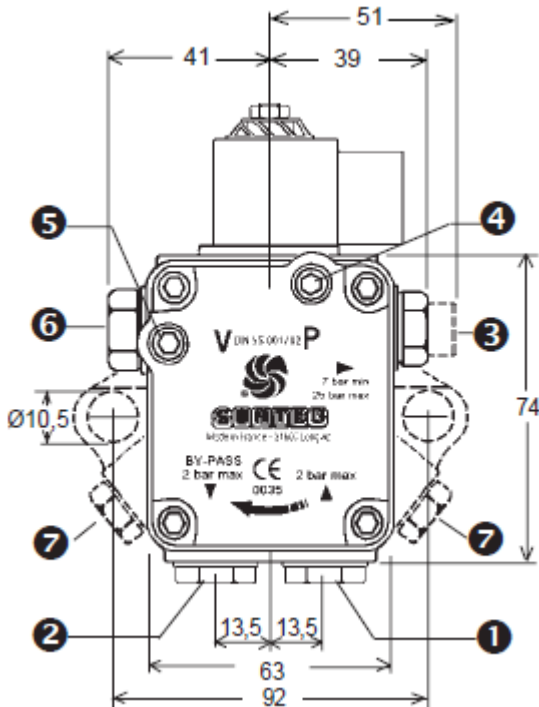
Check the photocell weekly. Clean the dust or fume stains on the glass of photocell by a dry cloth.



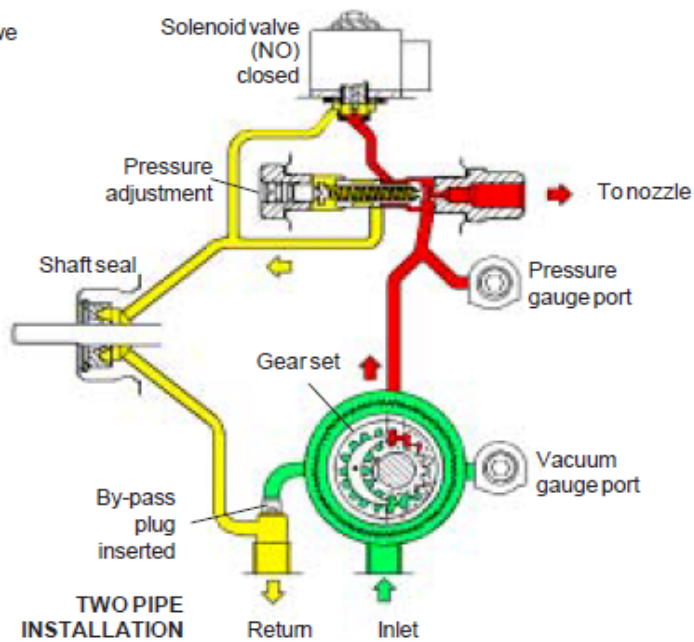
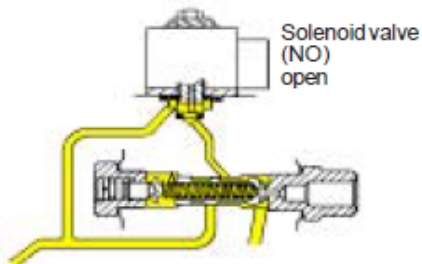
Burner Brain	Photocell	Minimum signal level
LOA 24	QRB1	45µA
LMO24	QRB1 & QRB4	45µA & 95µA
LMO44	QRB1 & QRB4	45µA & 95µA
LAL2.	QRB4	95µA

## 8.4. Fuel Pumps

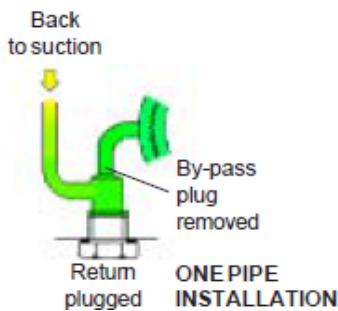
### AS Type



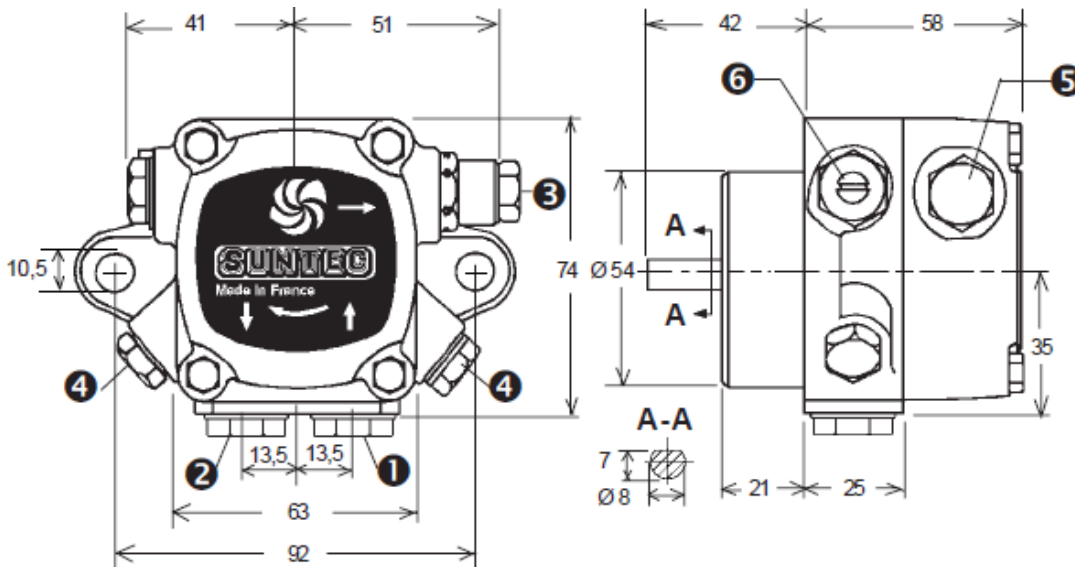
- 1- Suction
- 2- Return and internal bypass
- 3- Nozzle outlet
- 4- Manometer connection
- 5- Vacuum manometer connection
- 6- Pressure adjustment
- 7- Pressure port (in 7000 series)



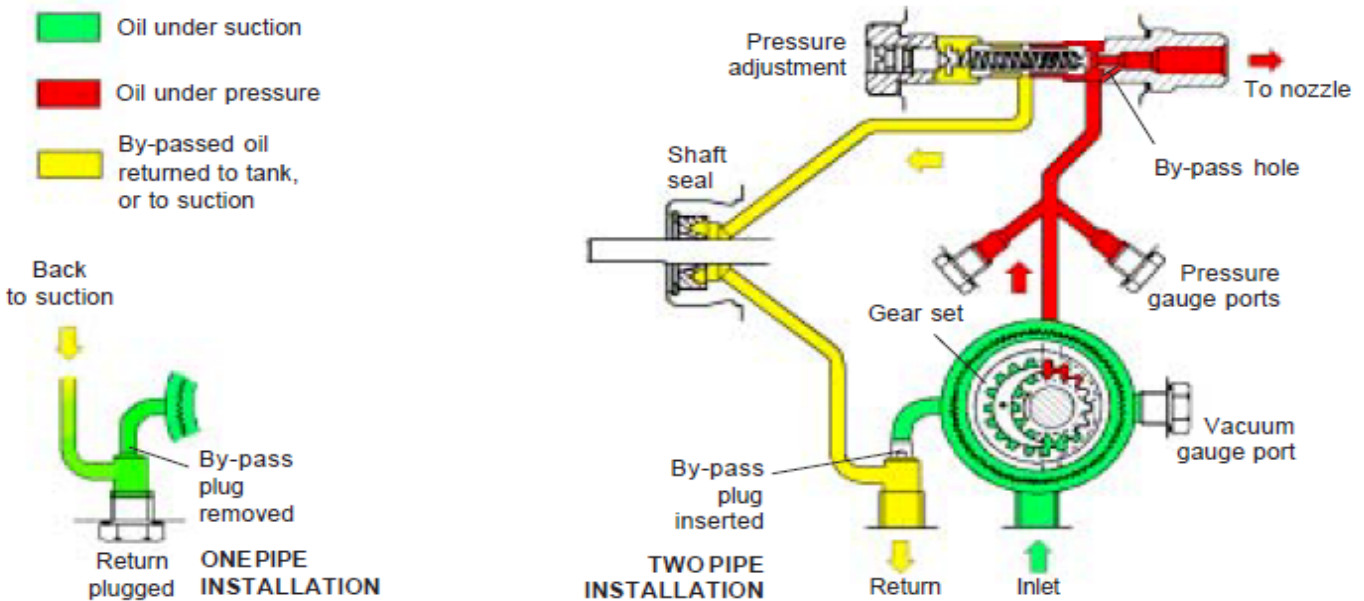
- Oil under suction
- Oil under pressure
- By-passed oil returned to tank, or to suction



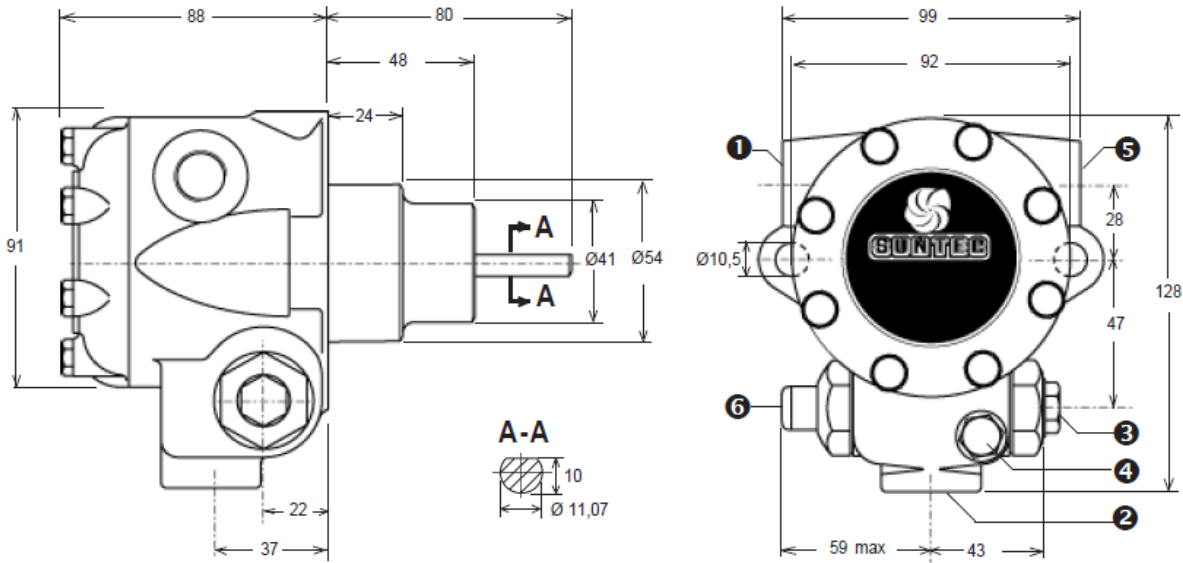
D Type



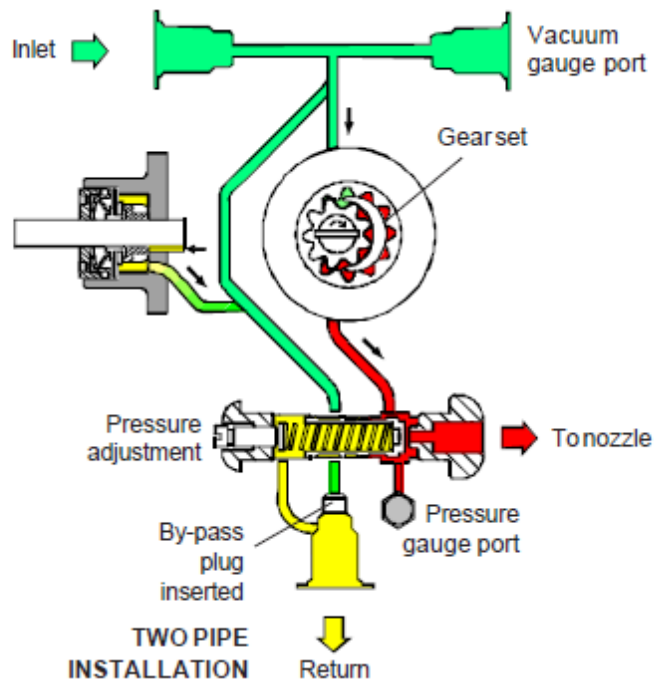
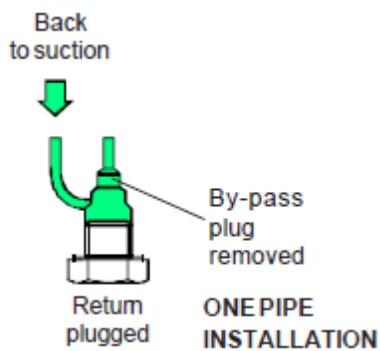
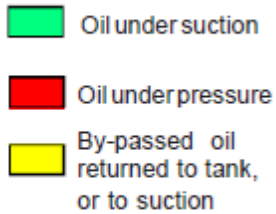
- 1- Suction
- 2- Return and internal bypass
- 3- Nozzle outlet
- 4- Manometer connection
- 5- Vacuum manometer connection
- 6- Pressure adjustment



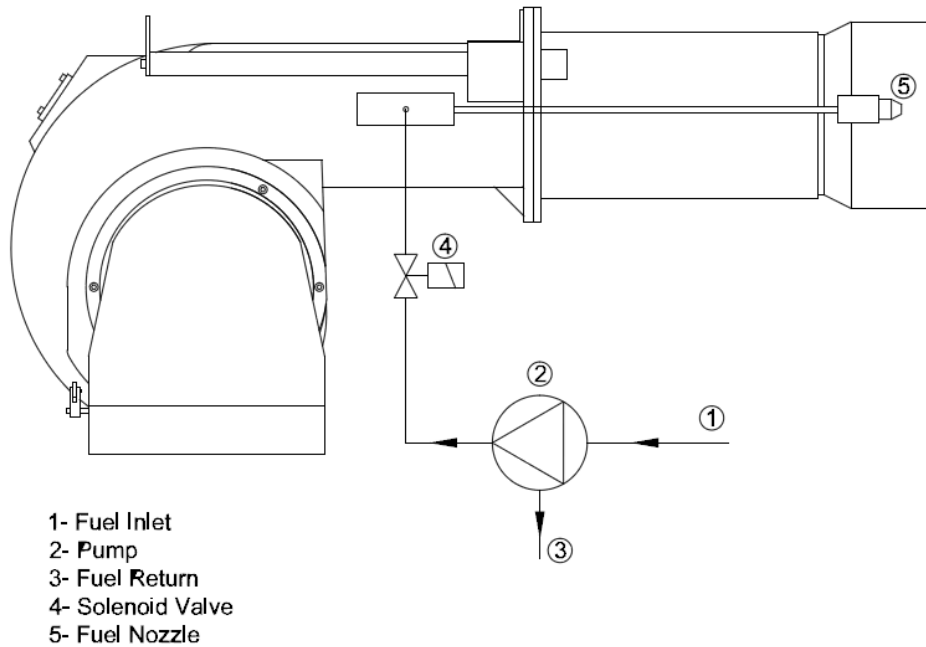
**E Type**



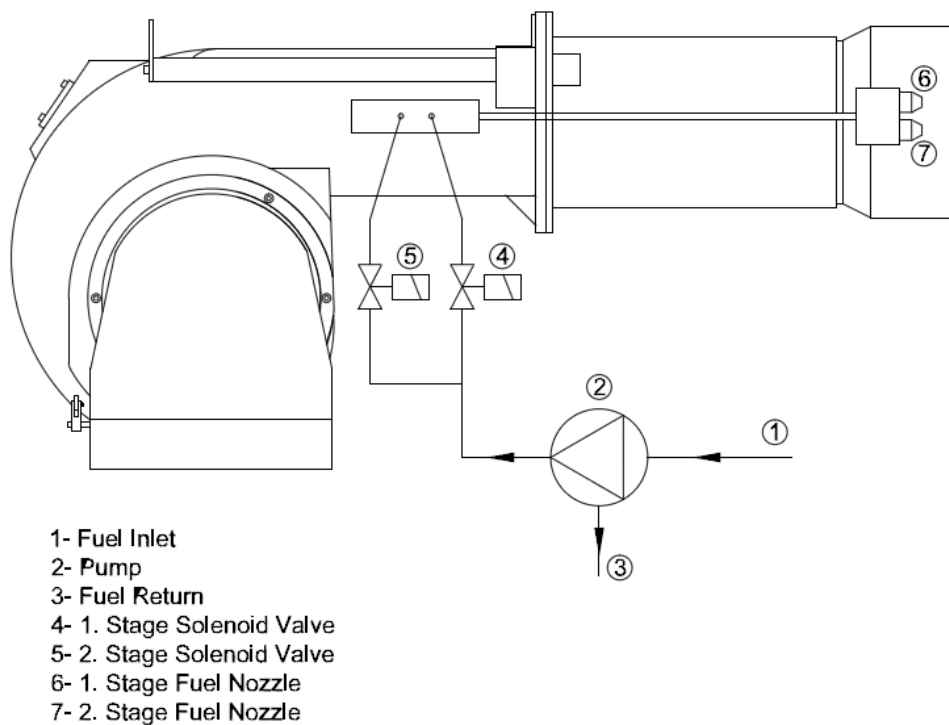
- 1- Suction or vacuum manometer connection
- 2- Return and internal bypass
- 3- Nozzle outlet
- 4- Manometer connection
- 5- Vacuum manometer connection
- 6- Pressure adjustment



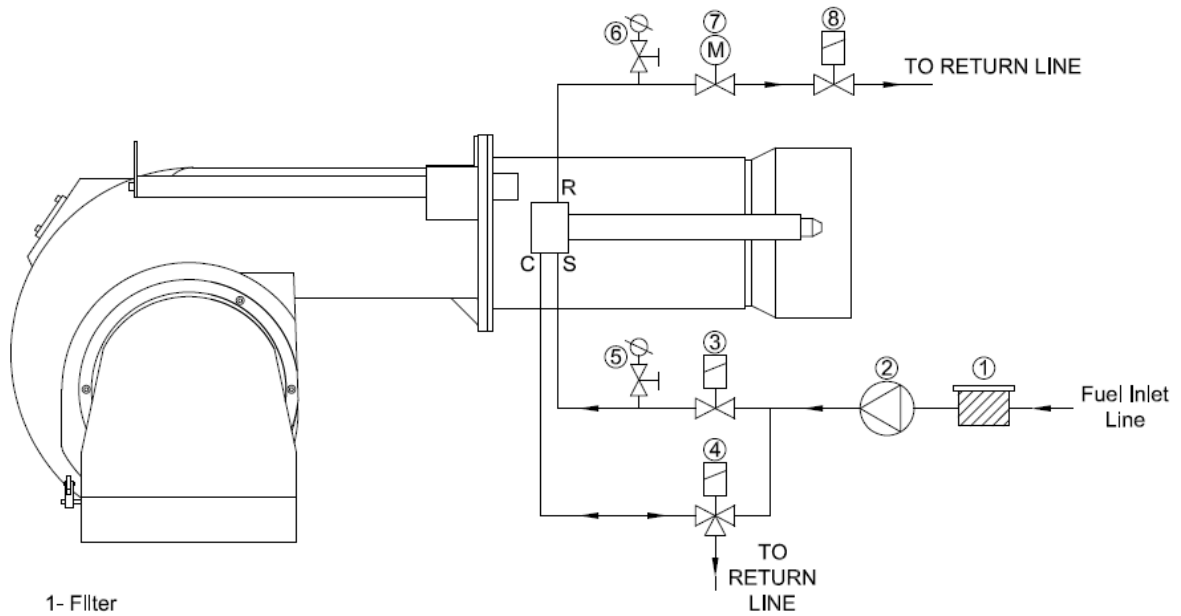
➤ **One Stage Light Oil Burner Fuel Circuit**



➤ **Two Stages Light Oil Burner Fuel Circuit**



➤ **Modulating Light Oil Burner Fuel Circuit**



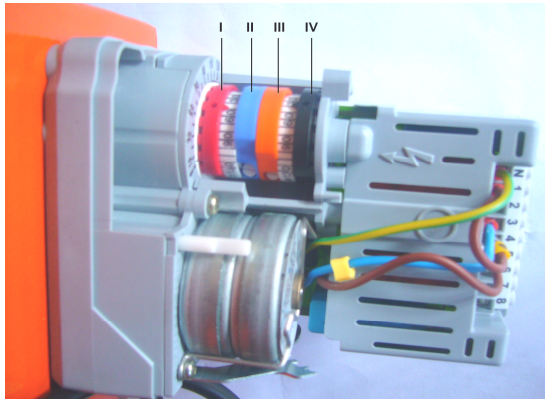


**CAUTION!**

- **End of the line to the main tank must be open to the atmosphere and line pressure must be zero, otherwise no healthy modulating operation can be ensured since the pressure, which is to form in return, will also affect nozzle pressure. Fuel may drop from nozzle end during stops.**
- **For good pulverization, periodically check durability of the o-ring. In the event of earing of the o-ring, fuel to the nozzle can by-pass and go directly to the return and reduces the working performance of the nozzle.**
- **Maximum operating pressure of the nozzle is 30 bars. This value should not be exceeded during working. Even if these out of control value are exceeded, nozzle must be taken to emergency maintenance and all O-rings must be replaced.**
- **Do not use solvent based materials (thinner and derivatives) during cleaning of the fuel nozzle; clean with gas oil or diesel oil. Fuel nozzle inner kit is very sensitive and even invisible deformations can reduce working performance; dismantling-installing work must be performed only by trained personnel.**
- **Spring has lost its function if dropping from fuel nozzle or fuel exit at large scale is observed when the nozzle performs circulation. It must be checked and replaced if necessary.**
- **During fuel supply, the pressure at the burner fuel pump must be max. 0,40 +0,05 bar for light oil . When the burner is not operating or operating at the maximum fuel flow required, fuel supply pressure value should not changed in the burner pump.**

## 8.5. Servomotor Adjustment

### ➤ SQN70



#### At Two-stage Burners;

- I. Red Cam: Adjusts 2nd level max. air.
- II. Blue Cam: Resets the clamp.
- III. Orange Cam: Adjusts 1st level min. air.
- IV. Black Cam: Adjusts 2nd level valve opening degree.

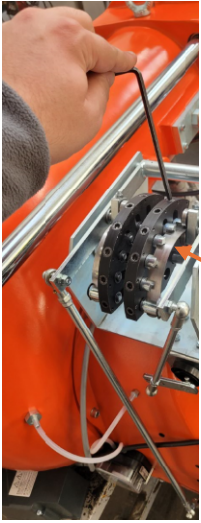
#### At Modulating Burners;

- I. Red Cam: Performance max. air adjustment.
- II. Blue Cam: Resets the clamp.
- III. Orange Cam: Performs min. air adjustment.
- IV. Black Cam: Not used.



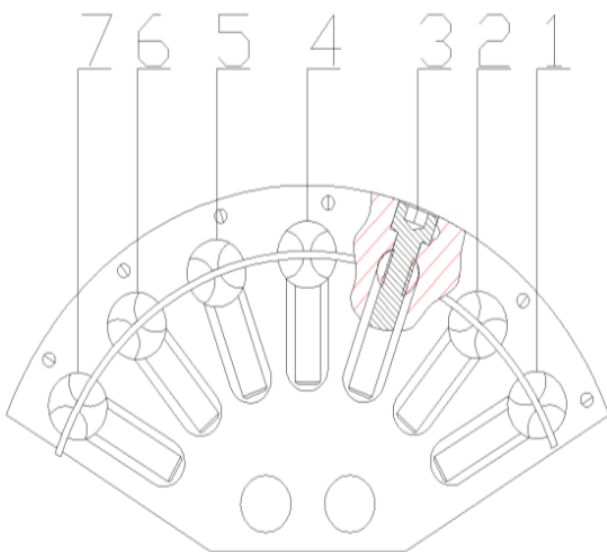
Do not open servomotor. Do not interfere with. It may damage servomotor or change burner settings.



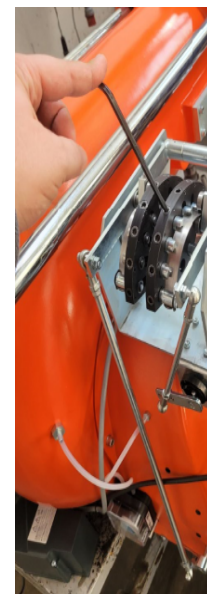


When the pump pressure is 25 bar;  
\*The pressure on the manometer should be kept at 7 bar first startup.

Adjust the capacity by following the return pressure on the nozzle in table 3 on page 36.  
It is possible to control the air and flue drum separately.  
(On the sample drum) change the curve between imbus screw number 1 and imbus number 2 according to the air-fuel ratio.



Sample drum



While burner capacity are increased, You must follow to changing fuel gas emission. It is recommended to not to exceed for oil fuel burner O<sub>2</sub> %4-5,5 and CO 93 ppm.

Untill 100kg/h fuel consumption return pressures for fuel nozzles	
kg/h	pressure
20	7
40	11,5
60	15
80	19
100	21,9

## 8.6. Emission Measurement

In emission measurements, the following values are accepted as reference according to TS EN 267 standard.

- $CO < 110 \text{ mg/kWh}$
- $\%3 \leq O_2 \leq \%5$
- $NO_x < 250 \text{ mg/kWh}$
- Excess air ratio  $1,2 \leq \lambda \leq 1,3$



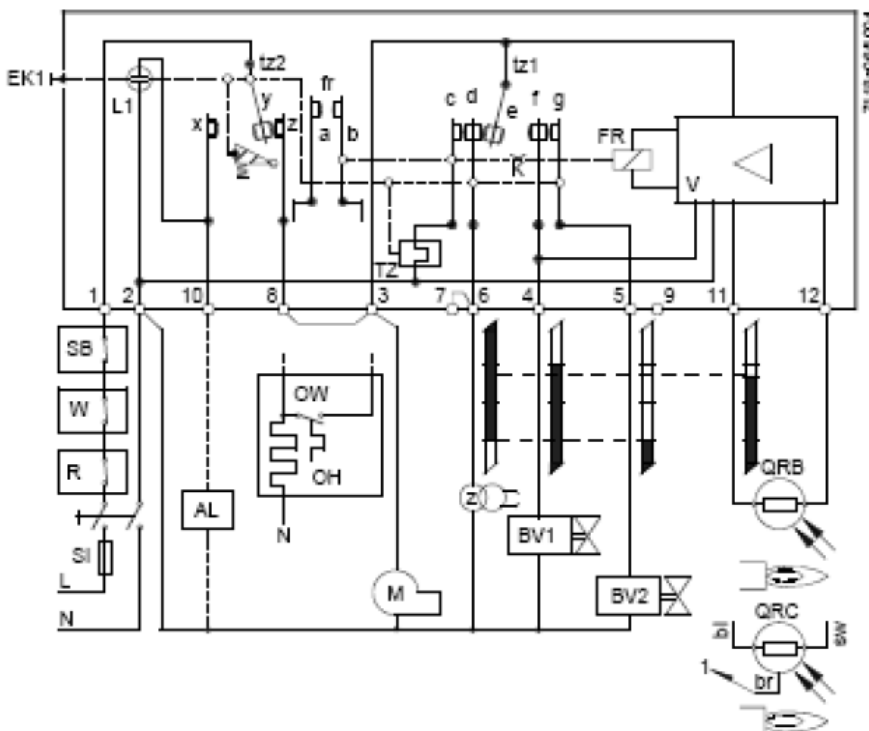
It is important for the boiler to be sealed in order to avoid incorrect measurements during emission measurements.



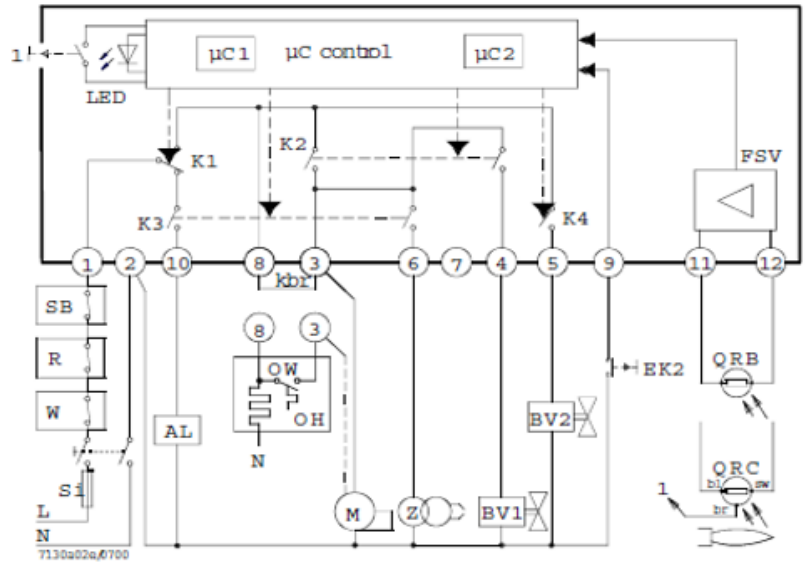
Boiler temperature must be between  $40 \text{ C}^\circ$  and  $80 \text{ C}^\circ$  while making emission measurement in hot water boilers.

## 8.7. Program Relay

### LOA 24



## LMO24-LMO44



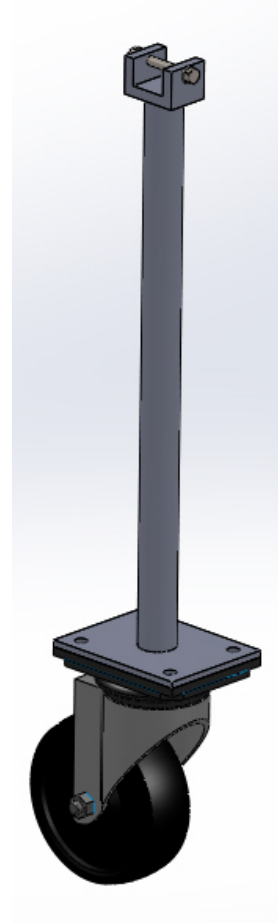
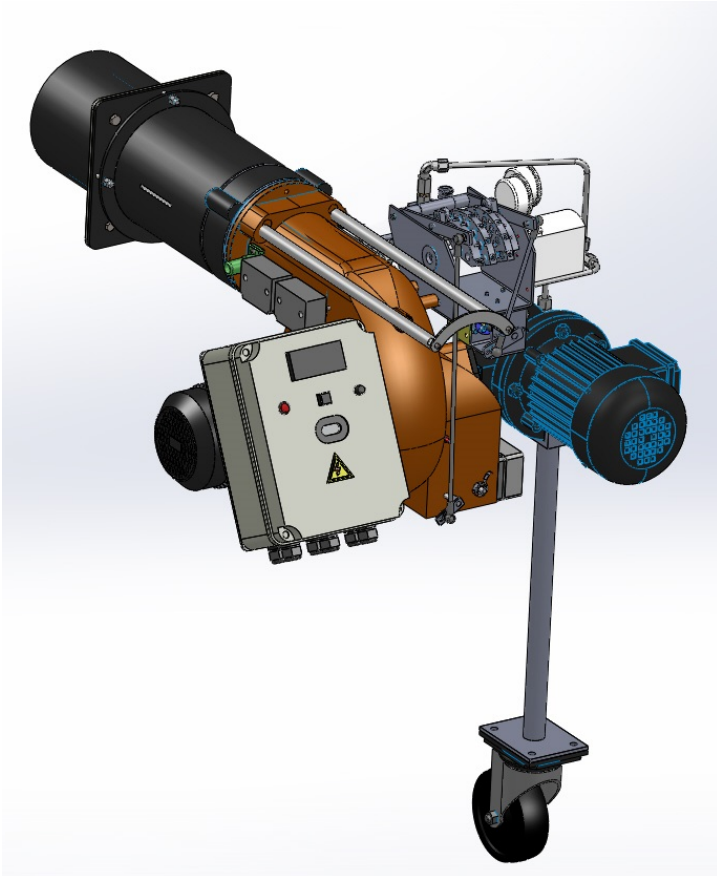
- Red led on: Indicates burner malfunction.
- If the burner switches to the fault mode, please wait at least 30 seconds and reset the program relay.



Press and hold the light button for 2 sec. to reset the program relay.

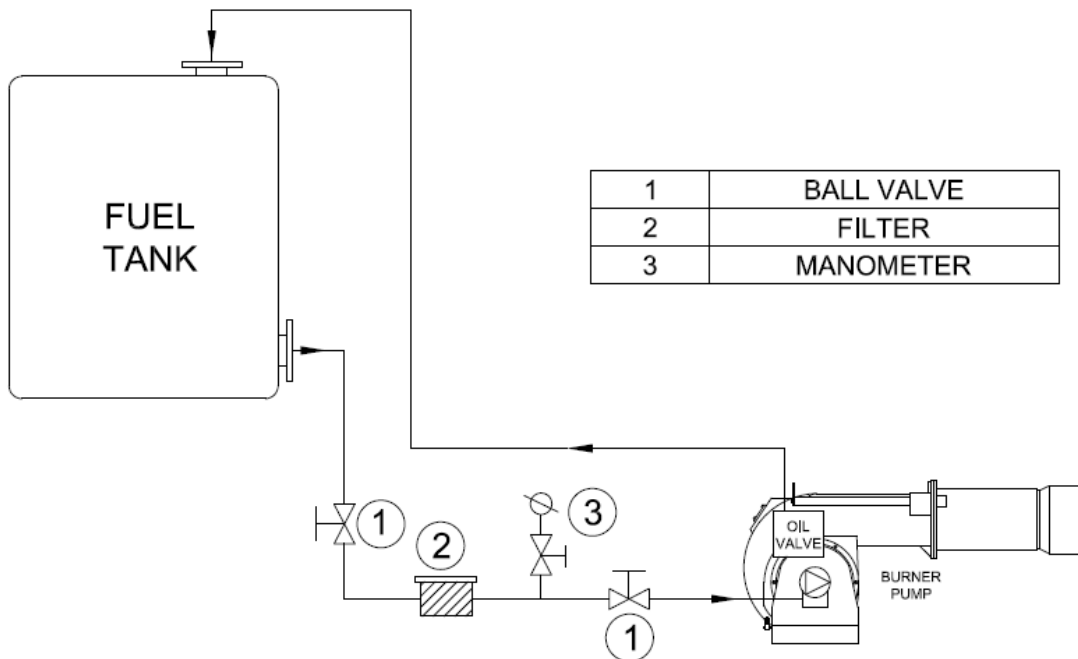


If the flame tube of the burner is longer than standard (standard flame tube length of the burner), please do not forget to support burner body during maintenance and installation/commissioning.

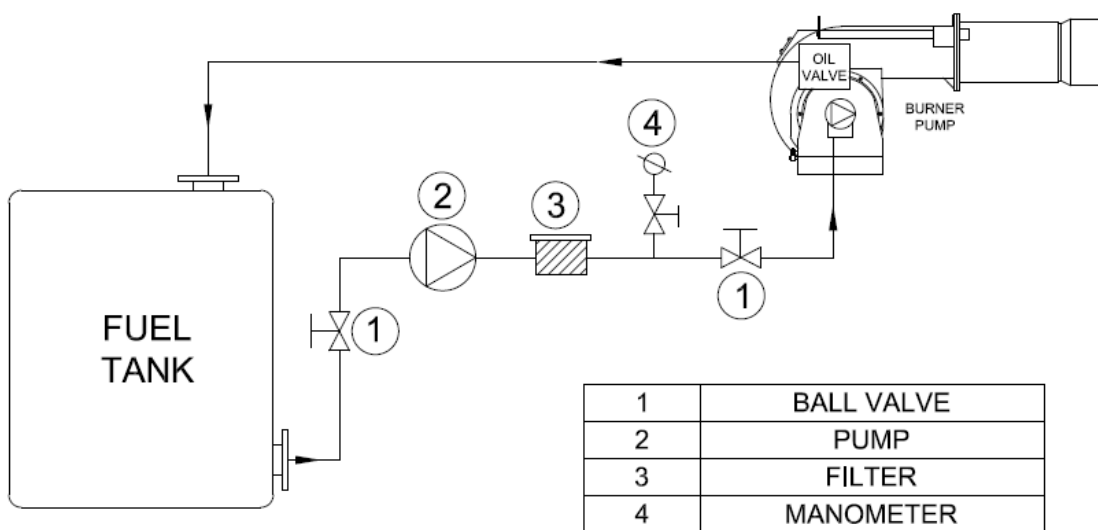


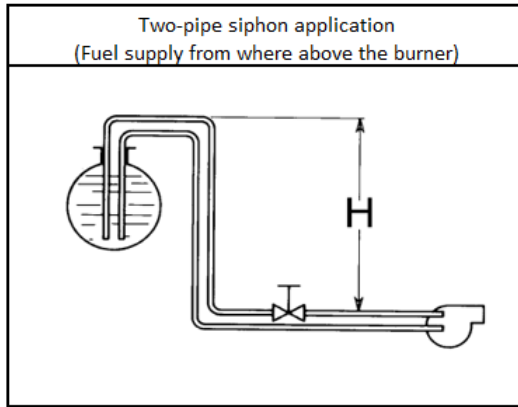
### 8.8. Light Oil Burner Fuel Ring Line

Tank is above the burner level.



Tank is below the burner level.





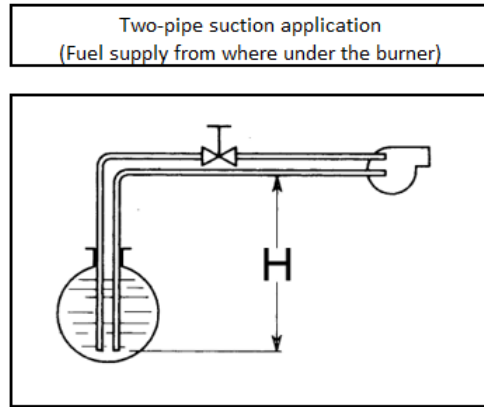
SUNTEC AS47 B				
H (m)	L (m)			
	Ø6	Ø8	Ø10	Ø12
0	9	36	80	120
0,5	11	40	90	120
1	12	42	109	120
2	18	60	120	120
3	18	60	120	120
4	21	65	120	120

SUNTEC AS57-C				
H (m)	L (m)			
	Ø10	Ø12	Ø14	Ø16
0	6	20	60	100
0,5	7	29	62	105
1	8	34	64	115
2	12	41	66	125
3	13	41	90	135
4	15	41	90	145

SUNTEC D57C				
H	L			
	Ø10	Ø12	Ø14	Ø16
0	5	24	60	120
0,5	6	30	78	120
1	7	31	80	120
2	12	45	110	120
3	12	45	110	120
4	14	50	120	120

SUNTEC J4-J6 (E4-E6)				
H (m)	L (m)			
	Ø10	Ø12	Ø14	Ø16
0	5	12	26	44
0,5	6	14	29	49
1	7	16	30	54
2	9	21	40	59
3	10	24	45	61
4	12	28	51	83

SUNTEC J7 (E7)				
H (m)	L (m)			
	Ø10	Ø12	Ø14	Ø16
0	5	12	26	44
0,5	6	14	29	49
1	7	16	30	54
2	9	21	40	59
3	10	24	45	61
4	12	28	51	83



SUNTEC AS47 B				
H (m)	L (m)			
	Ø6	Ø8	Ø10	Ø12
0	9	35	89	120
0,5	8	30	74	120
1	6	25	62	120
2	3	18	42	91
3	1	10	22	54
4	0	0	5	11

SUNTEC AS57-C				
H (m)	L (m)			
	Ø10	Ø12	Ø14	Ø16
0	6	20	50	135
0,5	5	19	44	91
1	4	17	39	60
2	2	12	30	42
3	0	5	11	35
4	0	0	2	8

SUNTEC D57C				
H	L			
	Ø10	Ø12	Ø14	Ø16
0	6	28	69	110
0,5	5	22	61	90
1	4	19	53	85
2	2	12	34	79
3	2	6	17	44
4	0	0	2	9

SUNTEC J4-J6 (E4-E6)				
H (m)	L (m)			
	Ø10	Ø12	Ø14	Ø16
0	5	13	27	47
0,5	4	12	23	41
1	3	10	20	36
2	2	6	13	24
3	0	3	7	13
4	0	0	0	2

SUNTEC J7 (E7)				
H (m)	L (m)			
	Ø10	Ø12	Ø14	Ø16
0	7	16	29	76
0,5	6	14	26	67
1	5	12	22	58
2	2	7	14	40
3	0	3	7	21
4	0	0	0	3

**L= Piping Length**

## 9. MAINTENANCE

### 9.1. Weekly Maintenance

Weekly maintenance is a routine cleaning and adjustment procedure which is performed to ensure smooth and continuous operation of the system. Burner components must be adjusted after each maintenance work in accordance with the instructions. Otherwise, the burner cannot be operated efficiently.

- Clean all filters in fuel ring system.
- Clean fuel nozzle of the burner.
- If the fin spaces and surface of the diffuser are covered with particles and formed a layer, clean it with a wire brush.
- Clean heads of ignition electrodes. Check by performing manual ignition; adjust the distance between the ignition electrode and diffuser according to the adjustment instructions.

### 9.2. Monthly Maintenance

Monthly maintenance is a more comprehensive maintenance compared to weekly maintenance, where general checks of burner and peripheral components are performed to prevent possible faults. After completion of maintenance and adjustment processes, make sure to perform a combustion analysis.

- Clean the filters on the fuel line to the burner.
- Clean fuel nozzle of the burner.
- Clean the surface of the diffuser.
- Clean flame pipe.
- Check all wiring points. Tighten loose connections.
- Clean the solenoid valves.
- Clean the photocell.
- Clean the dust and layers accumulated on the fan and air valves.
- Check pump pressure. Check if necessary (Light Oil: 14 bar)
- Check ignition electrodes. Adjust it if necessary. Check ignition cables and sockets.
- Perform cleanliness control of inside panel. Clean if necessary.
- Check all bolts of the burner. Tighten loose bolts.
- After starting the burner and adjusting air klappe, perform flue gas analysis and check if there is an ideal combustion.

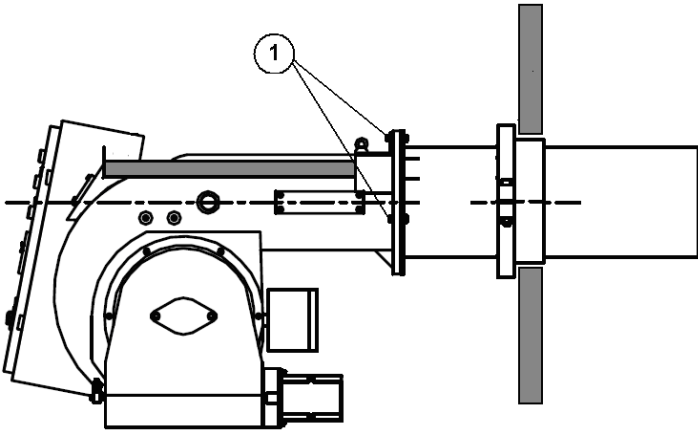
### 9.3. Seasonal Maintenance

Comprehensive maintenance work when the burner is restarted after long periods of shut-down or interruptions. After completion of maintenance and adjustment processes, make sure to perform a combustion analysis.

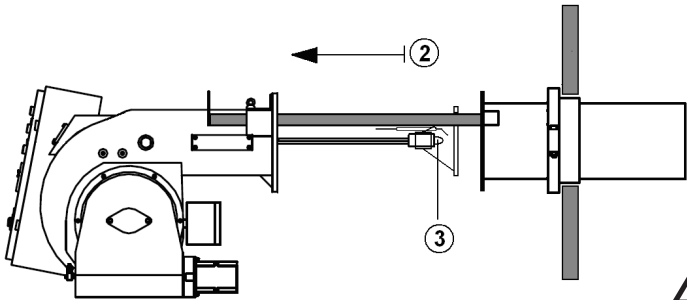
- Check insulation resistance of electric motor.
- Make surface cleaning of ignition electrodes and porcelains. Replace cracked or broken porcelains.
- Clean air fan and clamps.
- Check the operating function.
- Check cleanliness of the nozzle. Replace it if necessary.
- Clean the N.C. solenoid valve. Measure the coil winding resistance.
- Clean the strainer (filter) under the pump cover.
- Clean the photocell.
- Clean fuel filter. Replace it if necessary.
- Check boiler thermostats.
- Check cleanliness of boiler inside and clean if necessary.



### 9.4. Installation and Disassembly Instructions for Maintenance Purposes



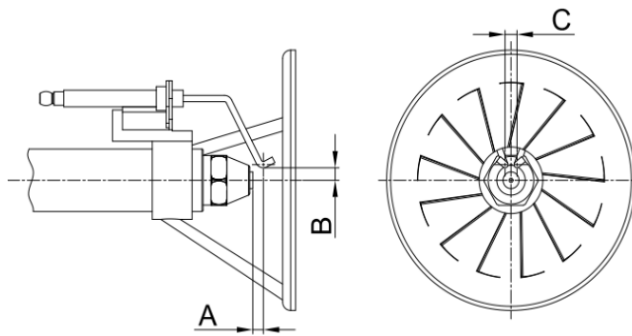
1. Remove 3 bolts connecting the burner body to the flame tube



2. Pull the burner body back
3. Remove and perform maintenance of fuel nozzle, diffuser and ignition electrodes.



Be careful to connect the components correctly during installation after maintenance.



	A (mm)	B (mm)	C (mm)
ECO 1 O(L)	3-4	3-5	3-4
ECO 2 O(L)	3-5	3-6	3-4
ECO 30 O(L)	3-5	4-6	3-5
ECO 45 O(L)	3-6	4-7	3-5



Perform the installation by following the reverse of the method you have followed during disassembly.

## 10. TROUBLESHOOTING

Problem	Cause	Explanation-Suggestion
Burner cannot be commissioned	Fuel is cut or does not come	Fuel valve might be closed. Open the valve.
	Fuse failure	Check burner power supply. The fuse on the main panel or the fuse on the burner might be tripped.
	Relay failure	Reset the thermal relay. Check adjustment of the thermal relay according to the current in motor label. If the failure is not removed, replace the thermal relay.
	Boiler thermostat, pressure switch failure	If there is a problem with the burner thermostats, pressure switches and steam tank this may be due to an unadjusted or faulty water level device; adjust it and if broken, replace it.
Flame appears and goes into failure mode.	Fuel pressure error	Circuit fuel pressure might have dropped.
	Photocell failure	Photocell may be faulty or contaminated. Remove and clean..
	Program relay failure	Replace it with a new one.
Burner starts up, but fails after 10 seconds.	Program relay failure	Replace it with a new one.
	Fan motor failure	Check fan motor coils, motor contactor and outlet from program relay.
Burner starts up, but fails after 30 seconds.	Fuel valve, fuel pressure drop	Fuel valve might be closed. Supply fuel pressure might be low. Check fuel inlet manometer.
	Ignition electrode failure	Ignition electrodes might be misadjusted or ignition cables might have come out of their terminals. Adjust ignition electrodes with a distance of 3-5 mm. between them.
Boiler cover is overheating.	Sealing problem	Ensure sealing between the boiler cover and burner. If required, use insulating material between the boiler connecting flange and boiler cover.

<b>11. PERIODICAL FLUE GAS MEASUREMENT REPORT</b>								
<b>Fuel Consumption (kg/h)</b>	<b>CO (ppm)</b>	<b>O<sub>2</sub> (%)</b>	<b>CO<sub>2</sub> (ppm)</b>	<b>NO<sub>x</sub> (ppm)</b>	<b>Yield (%)</b>	<b>Flue Temp. (°C)</b>	<b>Date</b>	<b>Signature</b>

## 12. AFTER-SALES SERVICES

Dear Customer,

We believe that providing a good service is as important as providing a good product. Therefore, we continue offering wide range of comprehensive services to our conscious customers.

For your suggestions, complaints and service requests  
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**Kartal Monumento Plaza**  
**KARTAL/İSTANBUL/TÜRKİYE**  
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**E - mail : [servis@ecostar.com.tr](mailto:servis@ecostar.com.tr)**



Please observe the following recommendations.

- Use the product in accordance with the principles of this manual.
- For any service demands regarding the product, please contact our Service Center from the abovementioned phone numbers.
- Upon your purchase, register your warranty certificate during installation.

