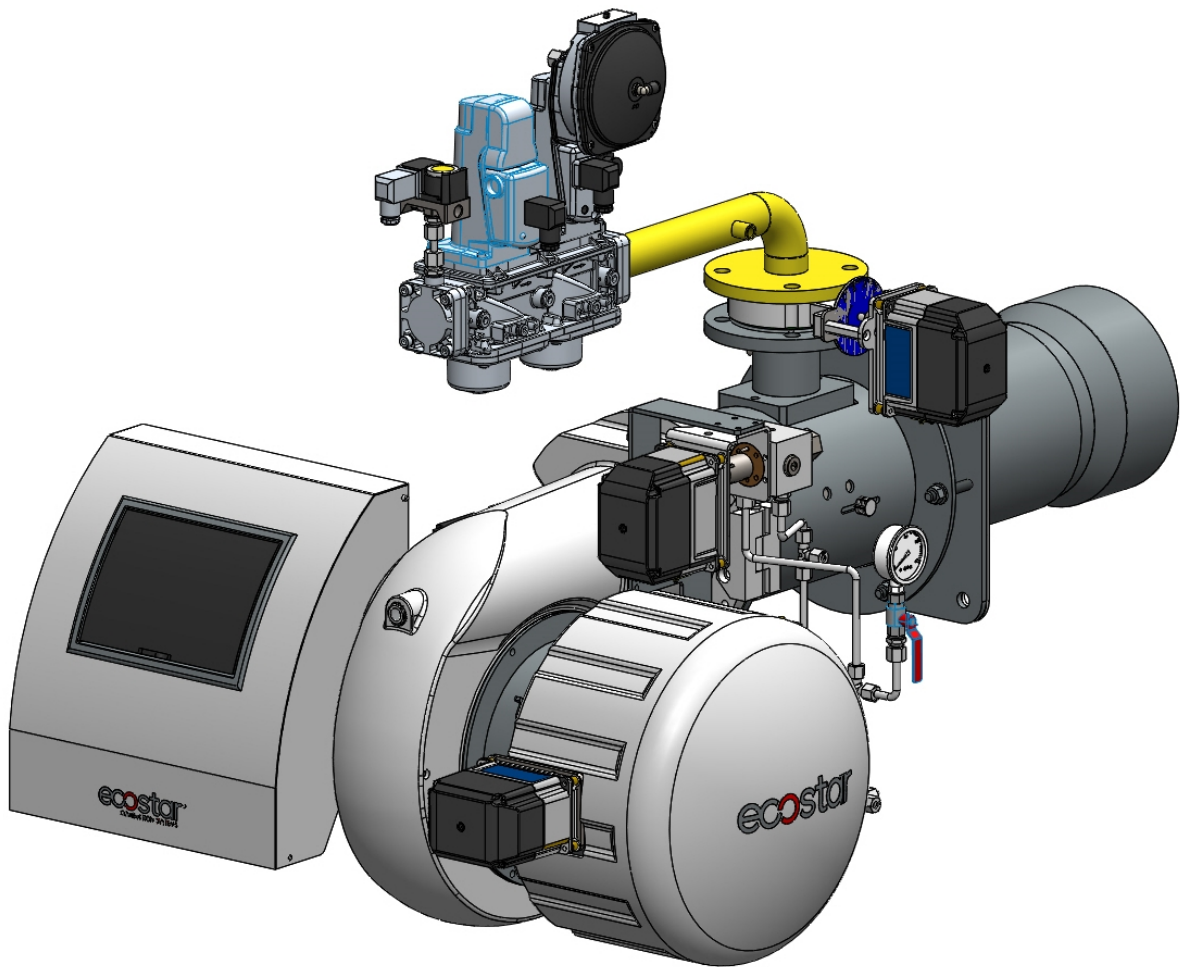


MONOBLOCK NG SERIES DUAL FUEL (GAS- LIGHT OIL) BURNERS INSTALLATION, OPERATING AND MAINTENANCE MANUAL

TWO STAGE AND MODULATING OPERATION



ECO 50 NG
ECO 55 NG
ECO 60 NG
ECO 65 NG
ECO 70 NG
ECO 75 NG



DEAR USER,

ECOSTAR ECO 50 NG, ECO 55 NG, ECO 60 NG, ECO 65 NG, ECO 70 NG, ECO 75 NG Dual Fuel (Gas-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.







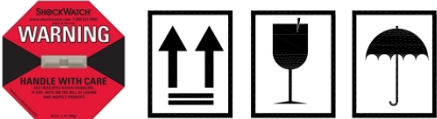
This Operating Manual is an integral part of the burner and must be maintained in a plastic dossier and hung at a clearly visible place in the burner room.

CONTENTS

| | |
|--|----|
| 1. WARNINGS..... | 3 |
| 1.1. Warning Symbols and Descriptions | 3 |
| 1.2. General Safety Rules | 4 |
| 2. TERMS OF WARRANTY | 6 |
| 2.1. Out of Warranty Conditions | 6 |
| 3. BURNER'S GENERAL FEATURES..... | 7 |
| 3.1. Purpose of Use and Work Limits of Burners | 7 |
| 3.2. Code Key | 7 |
| 3.3. Burner Components..... | 9 |
| 4. GAS, FLUE GAS AND HEATING WATER SCHEMA | 10 |
| 5. TECHNICAL DATA | 11 |
| 5.1. Capacity Table..... | 11 |
| 5.2. Back Pressure-Capacity Diagrams | 12 |
| 5.3. Burner Dimensions | 13 |
| 5.4. Gas Hood Pressure Loss Diagram..... | 14 |
| 5.5. Flame Length and Diameter | 17 |
| 5.6. Noise Level..... | 17 |
| 6. BURNER HANDLING INFORMATION | 18 |
| 7. INSTALLATION | 19 |
| 7.1. Burner Installation Picture..... | 19 |
| 7.2. In reverse flame front mirror boilers | 20 |
| 7.3. In cylindrical (straight flame) boilers | 20 |
| 8. COMMISSIONING..... | 21 |
| 8.1. Before Commissioning..... | 21 |
| 8.2. General Controls | 21 |
| 8.3. Combustion Adjustment..... | 23 |
| 8.4. Fuel Pumps | 23 |
| 8.5. Gas Adjustment | 27 |
| 8.5.1. VGD 40... Series Gas Valve | 27 |
| 8.6. Air Pressure Switch Adjustment | 27 |
| 8.7. BT 300..... | 28 |
| 8.7.1. Operating Control and Displays | 29 |
| 8.7.2. Menu Functions | 30 |
| 8.7.3. BT300 Connecting Diagram..... | 31 |
| 8.8. Leakage Test for Main Gas Valves | 32 |
| 8.9. Servomotors..... | 34 |
| 8.10. Function Controls and Adjustments | 35 |
| 8.11. Final Checks | 35 |
| 8.12. Pilot Ignition System | 38 |
| 8.13. Emission Measurement..... | 38 |
| 8.14. Light Oil Burner Fuel Ring Line | 40 |
| 8.15. Gas Pass Equipment Required in Gas Line | 41 |
| 9. MAINTENANCE..... | 42 |
| 9.1. Weekly Maintenance..... | 42 |
| 9.2. Monthly Maintenance..... | 42 |
| 9.3. Seasonal Maintenance | 43 |
| 10. TROUBLESHOOTING..... | 44 |
| 11. PERIODICAL FLUE GAS MEASUREMENT REPORT | 45 |
| 12. AFTER SALES SERVICES..... | 46 |
| 13. NOTES..... | 47 |

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. |
| <p data-bbox="363 1167 400 1196">P_F</p> | Impulse connection detecting combustion chamber pressure |
| <p data-bbox="363 1317 400 1346">P_L</p> | Impulse connection detecting combustion air pressure |
| <p data-bbox="357 1467 406 1496">P_{BR}</p> | Impulse connection detecting burner gas head |
|  <p data-bbox="320 1597 544 1671">CLEAN THE GAS BURNER. CLEAN GAS LINE. ЧИСТАЯ ЛИНИЯ ГАЗ.</p> | "Clean the gas line" warning on gas line. |
|  | 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 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.



If you sense gas leakage;

- Shut down valves of all gas devices.
- Open all doors and windows.
- Do not turn on electric devices or do not turn them off if they are working.
- Do not use burner derived tools such as match and lighter.
- Inform the gas company.



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
- Close the main fuel shut-off valve outside the plant.
- 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 gas, air dampers and oil regulators, servomotor and 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 Dual Fuel (Gas-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 Dual Fuel (Gas-Light Oil) burners are designed and manufactured to work with liquid fuel with max. 2.5- 6 Cst (mm²/s) viscosity. and Natural Gas and Liquid Petroleum Gas at gas pressures of min.20 mbar, max.300 mbar and at -%15 to +%10 of nominal voltages, under environmental temperature of max.60°C with rated capacity and burner pressure ranges.

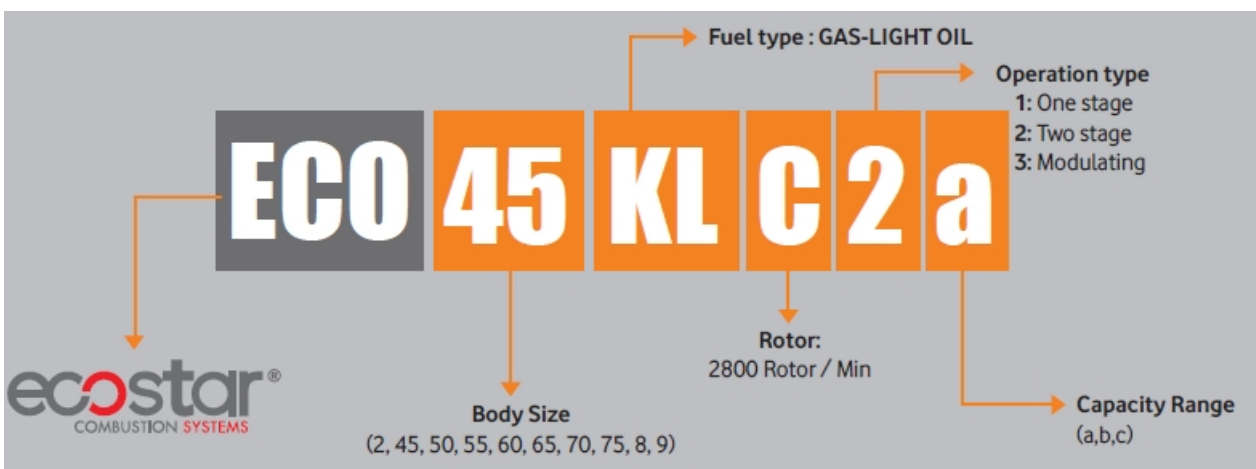
3.1. Purpose of Use and Work Limits of Burners

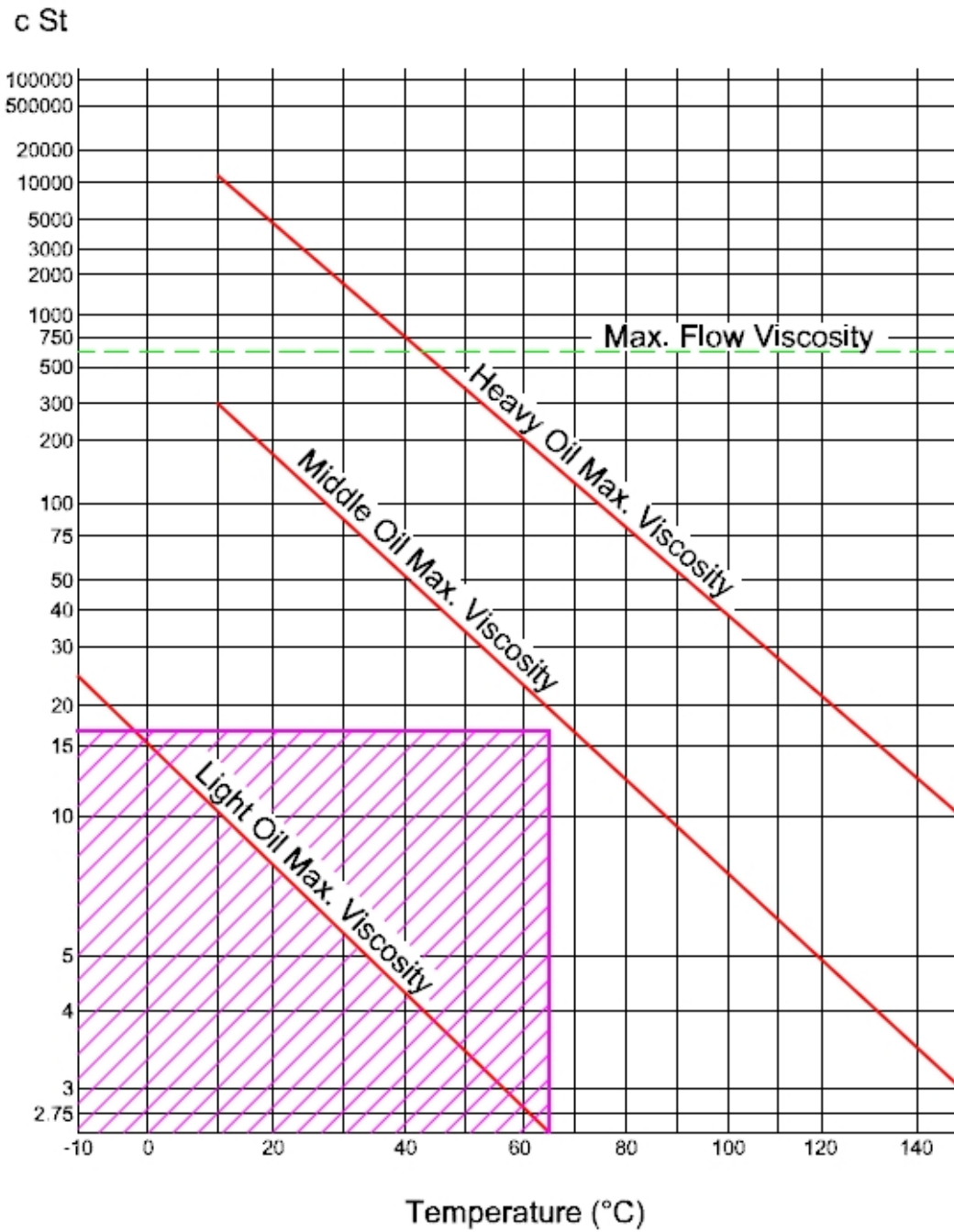
- This product works at any load value equivalent to its max. capacity or covered by its capacity range;
 - In hot water and steam boilers,
 - In direct and indirect hot air generators,
 - Industrial appliances operating at temperature below 600 °C,
 - -15 °C...+60 °C ambient temperature range,
 - 1N 230 VAC/3N 380VAC /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





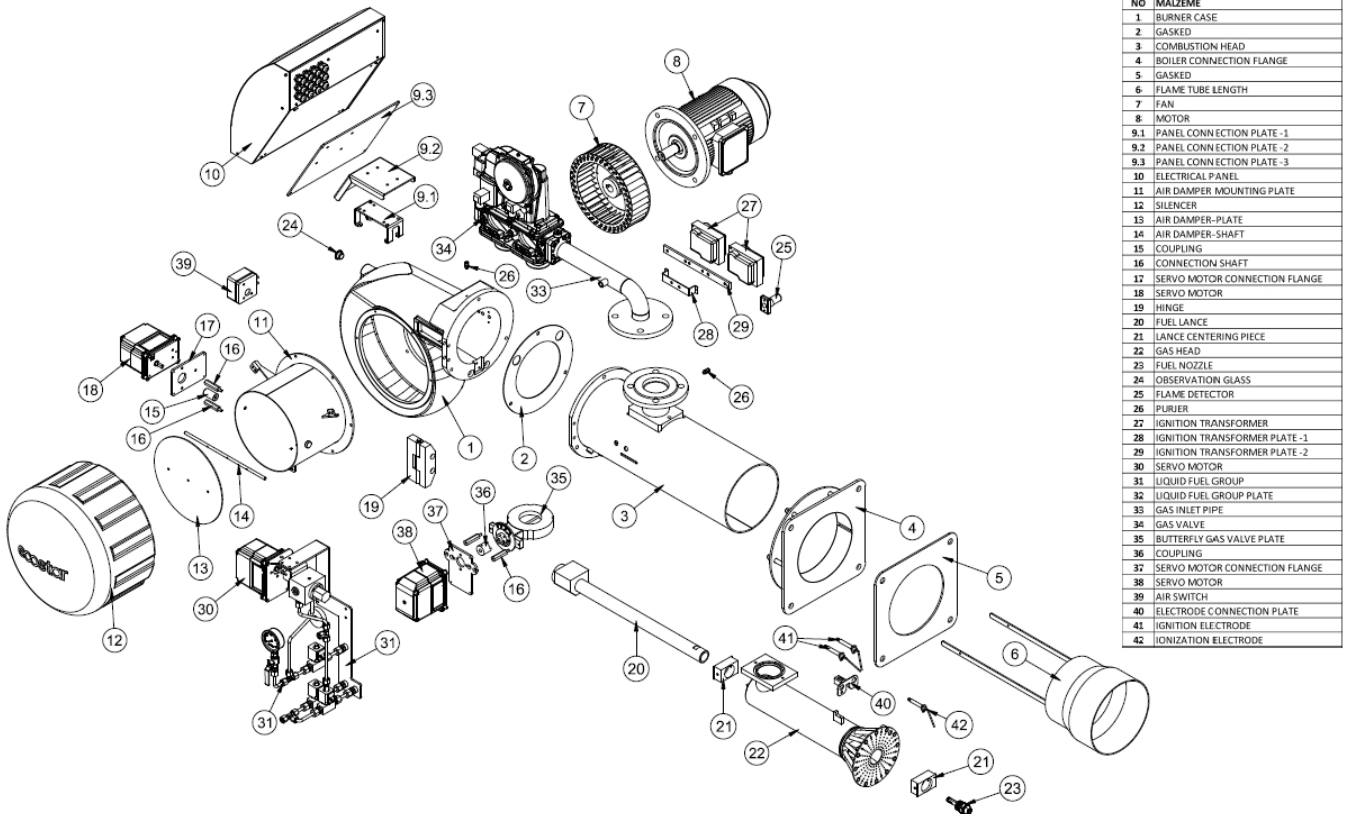
Temperature change of fuel used in ECOSTAR Dual Fuel (Gas-Light Oil) burners dependent on viscosity



Operating Range

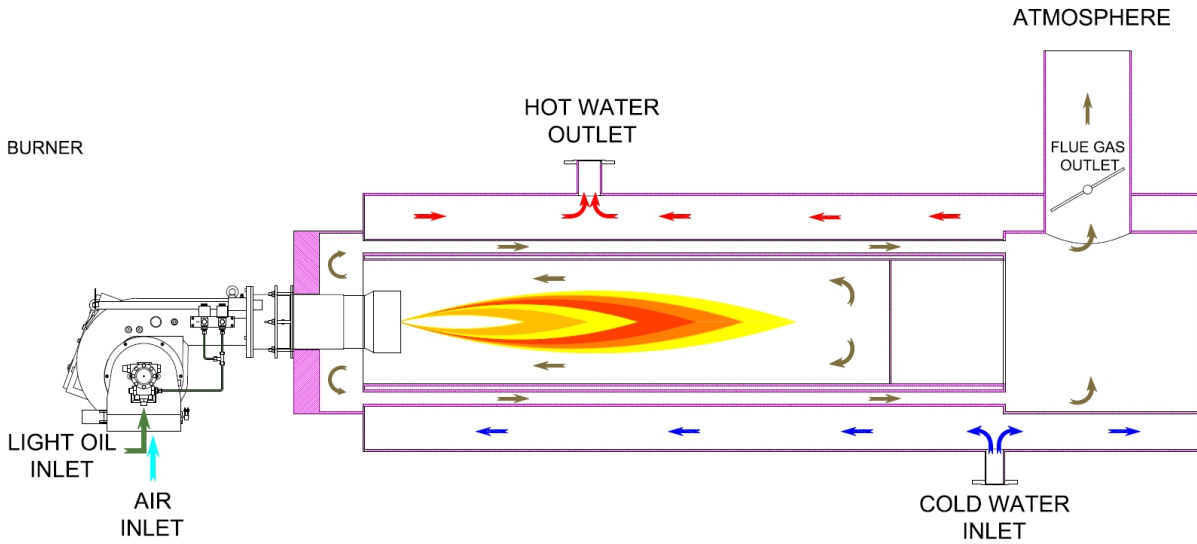
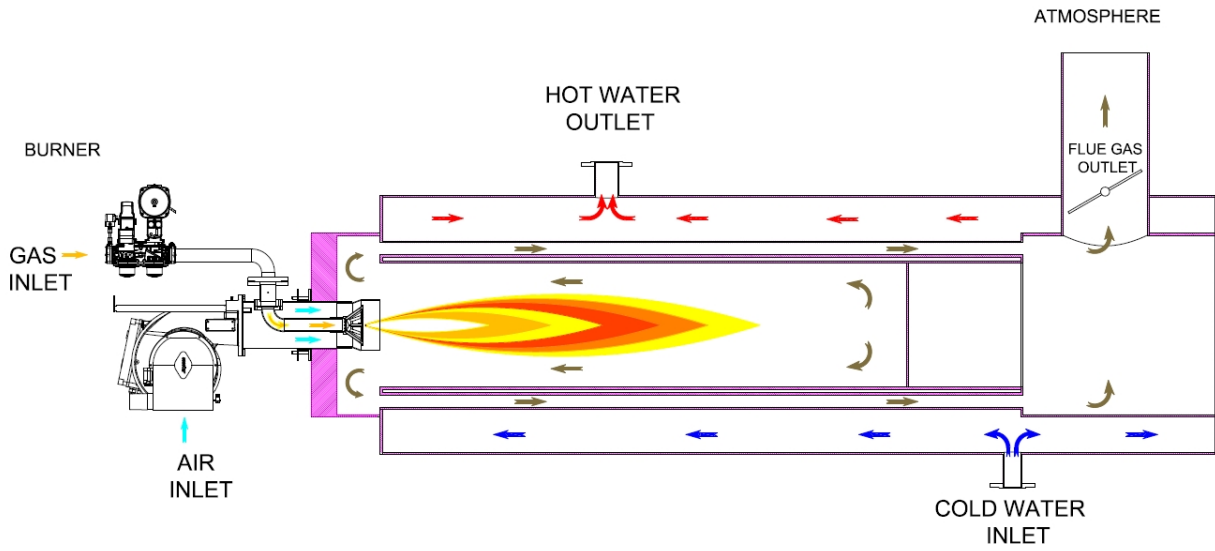
3.3. Burner Components

ECO 55 KL



| NO | MAIEME |
|-----|-------------------------------|
| 1 | BURNER CASE |
| 2 | GASKED |
| 3 | COMBUSTION HEAD |
| 4 | BOILER CONNECTION FLANGE |
| 5 | GASKED |
| 6 | FLAME TUBE LENGTH |
| 7 | FAN |
| 8 | MOTOR |
| 9.1 | PANEL CONNECTION PLATE -1 |
| 9.2 | PANEL CONNECTION PLATE -2 |
| 9.3 | PANEL CONNECTION PLATE -3 |
| 10 | ELECTRICAL PANEL |
| 11 | AIR DAMPER MOUNTING PLATE |
| 12 | SILENCER |
| 13 | AIR DAMPER-PLATE |
| 14 | AIR DAMPER-SHAFT |
| 15 | COUPLING |
| 16 | CONNECTION SHAFT |
| 17 | SERVO MOTOR CONNECTION FLANGE |
| 18 | SERVO MOTOR |
| 19 | HINGE |
| 20 | FUEL LANCE |
| 21 | LANCE CENTERING PIECE |
| 22 | GAS HEAD |
| 23 | FUEL NOZZLE |
| 24 | OBSERVATION GLASS |
| 25 | FLAME DETECTOR |
| 26 | PURJER |
| 27 | IGNITION TRANSFORMER |
| 28 | IGNITION TRANSFORMER PLATE -1 |
| 29 | IGNITION TRANSFORMER PLATE -2 |
| 30 | SERVO MOTOR |
| 31 | LIQUID FUEL GROUP |
| 32 | LIQUID FUEL GROUP PLATE |
| 33 | GAS INLET PIPE |
| 34 | GAS VALVE |
| 35 | BUTTERFLY GAS VALVE PLATE |
| 36 | COUPLING |
| 37 | SERVO MOTOR CONNECTION FLANGE |
| 38 | SERVO MOTOR |
| 39 | AIR SWITCH |
| 40 | ELECTRODE CONNECTION PLATE |
| 41 | IGNITION ELECTRODE |
| 42 | IONIZATION ELECTRODE |

4. GAS, FLUE GAS AND HEATING WATER SCHEMA



5. TECHNICAL DATA

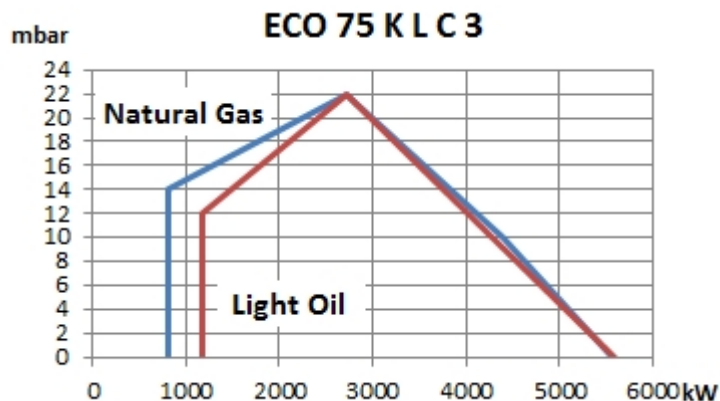
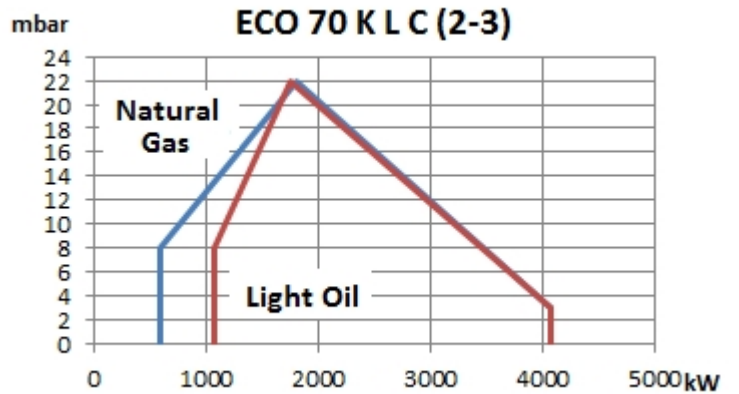
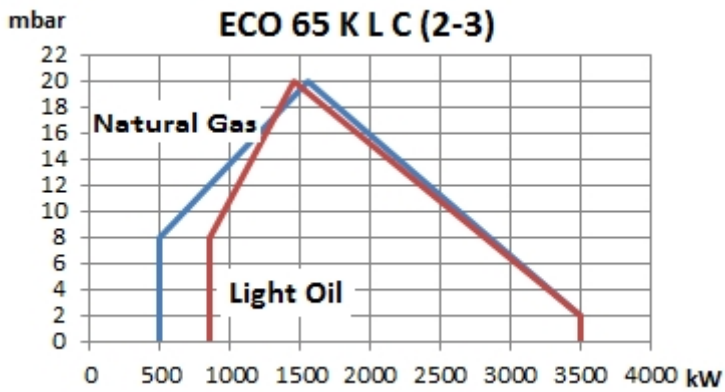
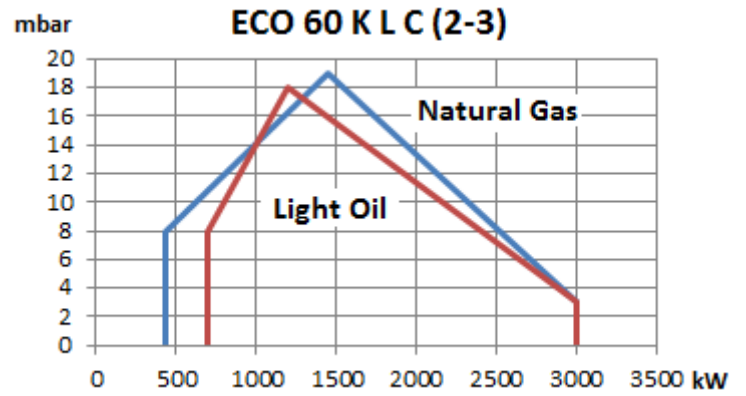
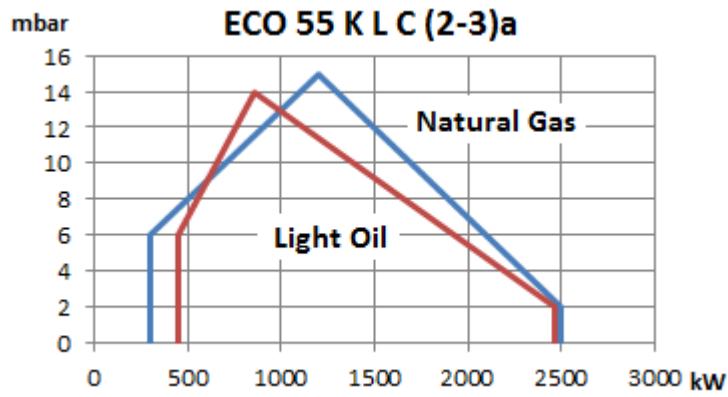
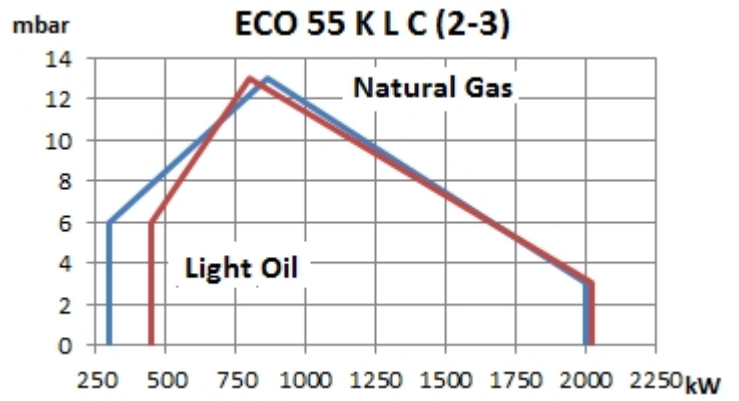
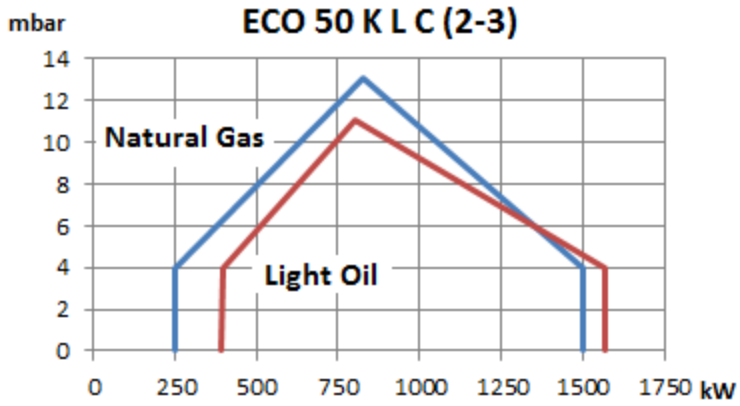
5.1. Capacity Table

| GAS-LIGHT OIL NG DUAL BURNERS CAPACITY TABLE | | | | | | | | | | | | | | | |
|---|--------------|-------------|--------------|---------|-------------------------|-------------------------|--------------------|-------------|--------------------|---------|-----------------------|-----------|-----------------|----------------|-------------|
| BURNER TYPE | GAS CAPACITY | | GAS CAPACITY | | NATURAL GAS CONSUMPTION | | LIGHT OIL CAPACITY | | LIGHT OIL CAPACITY | | LIGHT OIL CONSUMPTION | | FAN MOTOR POWER | OIL PUMP POWER | MAIN SUPPLY |
| | Min. kcal/h | Max. kcal/h | Min. kW | Max. kW | Min. Nm ³ /h | Max. Nm ³ /h | Min. kcal/h | Max. kcal/h | Min. kW | Max. kW | Min. kg/h | Max. kg/h | kW | kW | VAC |
| TWO STAGE GAS/LIGHT OIL DUAL BURNERS | | | | | | | | | | | | | | | |
| ECO 50 K L C 2 NG | 215.000 | 1.290.000 | 250 | 1.500 | 26,1 | 156,4 | 337.750 | 1.351.000 | 393 | 1.571 | 33,1 | 132,5 | 2,20 | 0,75 | 3N 380 |
| ECO 55 K L C 2 NG | 258.000 | 1.720.000 | 300 | 2.000 | 31,3 | 208,5 | 386.000 | 1.737.000 | 449 | 2.020 | 37,8 | 170,3 | 3,00 | 0,75 | 3N 380 |
| ECO 55 K L C 2a NG | 258.000 | 2.150.000 | 300 | 2.500 | 31,3 | 260,6 | 386.000 | 2.123.000 | 449 | 2.469 | 37,8 | 208,1 | 3,00 | 0,75 | 3N 380 |
| ECO 60 K L C 2 NG | 369.800 | 2.580.000 | 430 | 3.000 | 44,8 | 312,7 | 598.560 | 2.580.000 | 696 | 3.000 | 58,7 | 252,9 | 4,00 | 0,75 | 3N 380 |
| ECO 65 K L C 2 NG | 430.000 | 3.010.000 | 500 | 3.500 | 52,1 | 364,8 | 733.580 | 3.010.000 | 853 | 3.500 | 71,9 | 295,1 | 5,50 | 0,75 | 3N 380 |
| ECO 70 K L C 2 NG | 498.800 | 3.500.200 | 580 | 4.070 | 60,5 | 424,3 | 916.760 | 3.500.200 | 1.066 | 4.070 | 89,9 | 343,2 | 7,50 | 0,75 | 3N 380 |
| MODULATING GAS-LIGHT OIL DUAL BURNERS | | | | | | | | | | | | | | | |
| ECO 50 K L C 3 NG | 215.000 | 1.290.000 | 250 | 1.500 | 26,1 | 156,4 | 337.750 | 1.351.000 | 393 | 1.571 | 33,1 | 132,5 | 2,20 | 0,75 | 3N 380 |
| ECO 55 K L C 3 NG | 258.000 | 1.720.000 | 300 | 2.000 | 31,3 | 208,5 | 386.000 | 1.737.000 | 449 | 2.020 | 37,8 | 170,3 | 3,00 | 1,10 | 3N 380 |
| ECO 55 K L C 3a NG | 258.000 | 2.150.000 | 300 | 2.500 | 31,3 | 260,6 | 386.000 | 2.123.000 | 449 | 2.469 | 37,8 | 208,1 | 3,00 | 1,10 | 3N 380 |
| ECO 60 K L C 3 NG | 369.800 | 2.580.000 | 430 | 3.000 | 44,8 | 312,7 | 598.560 | 2.580.000 | 696 | 3.000 | 58,7 | 252,9 | 4,00 | 1,10 | 3N 380 |
| ECO 65 K L C 3 NG | 430.000 | 3.010.000 | 500 | 3.500 | 52,1 | 364,8 | 733.580 | 3.010.000 | 853 | 3.500 | 71,9 | 295,1 | 5,50 | 1,50 | 3N 380 |
| ECO 70 K L C 3 NG | 498.800 | 3.500.200 | 580 | 4.070 | 60,5 | 424,3 | 916.760 | 3.500.200 | 1.066 | 4.070 | 89,9 | 343,2 | 7,50 | 1,50 | 3N 380 |
| ECO 75 K L C 3 NG | 686.000 | 4.800.000 | 798 | 5.581 | 83,2 | 581,8 | 1.003.620 | 4.824.600 | 1.167 | 5.610 | 98,4 | 473,0 | 11,00 | 1,50 | 3N 380 |

H_u Natural Gas = 8250 kcal/Nm³

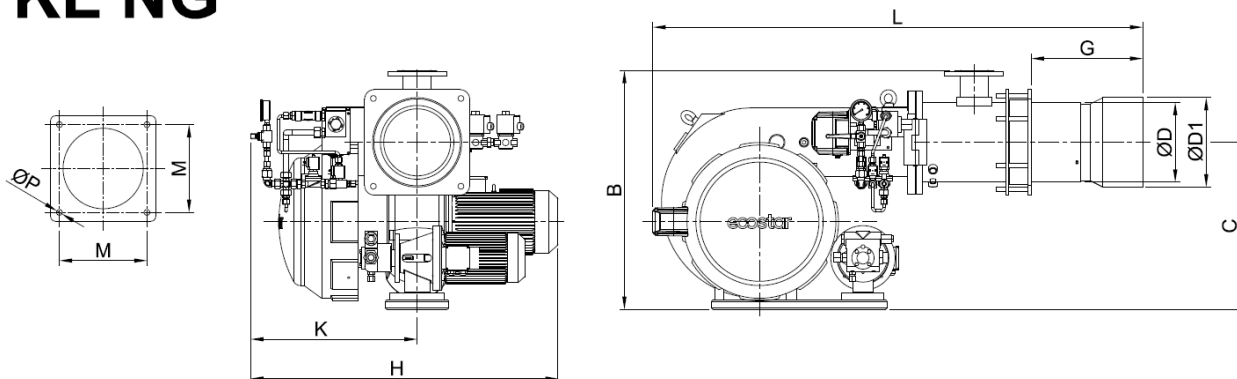
H_u Light Oil (L) = 10200 Kcal/kg

5.2. Back Pressure-Capacity Diagrams



5.3. Burner Dimensions

KL NG



| BURNER | L | Gmin | Gmax | H | K | B | C | ØP | M | ØD | ØD1 |
|----------------|------|------|------|------|-----|-----|-----|----|-----|-----|-----|
| | mm | mm | mm | mm | mm | mm | mm | Ø | mm | Ø | Ø |
| ECO 50 KLC3 NG | 1470 | 280 | 440 | 930 | 450 | 640 | 440 | 18 | 275 | 218 | 236 |
| ECO 55 KLC3 NG | 1470 | 280 | 440 | 930 | 450 | 640 | 440 | 18 | 275 | 218 | 236 |
| ECO 60 KLC3 NG | 1550 | 200 | 355 | 980 | 450 | 725 | 500 | 18 | 275 | 240 | - |
| ECO 65 KLC3 NG | 1650 | 200 | 440 | 980 | 450 | 725 | 500 | 18 | 275 | 250 | 280 |
| ECO 70 KLC3 NG | 1650 | 200 | 440 | 980 | 450 | 725 | 500 | 18 | 275 | 250 | 280 |
| ECO 75 KLC3 NG | 1600 | 200 | 340 | 1160 | 600 | 845 | 580 | 22 | 335 | 300 | - |

5.4. Gas Hood Pressure Loss Diagram



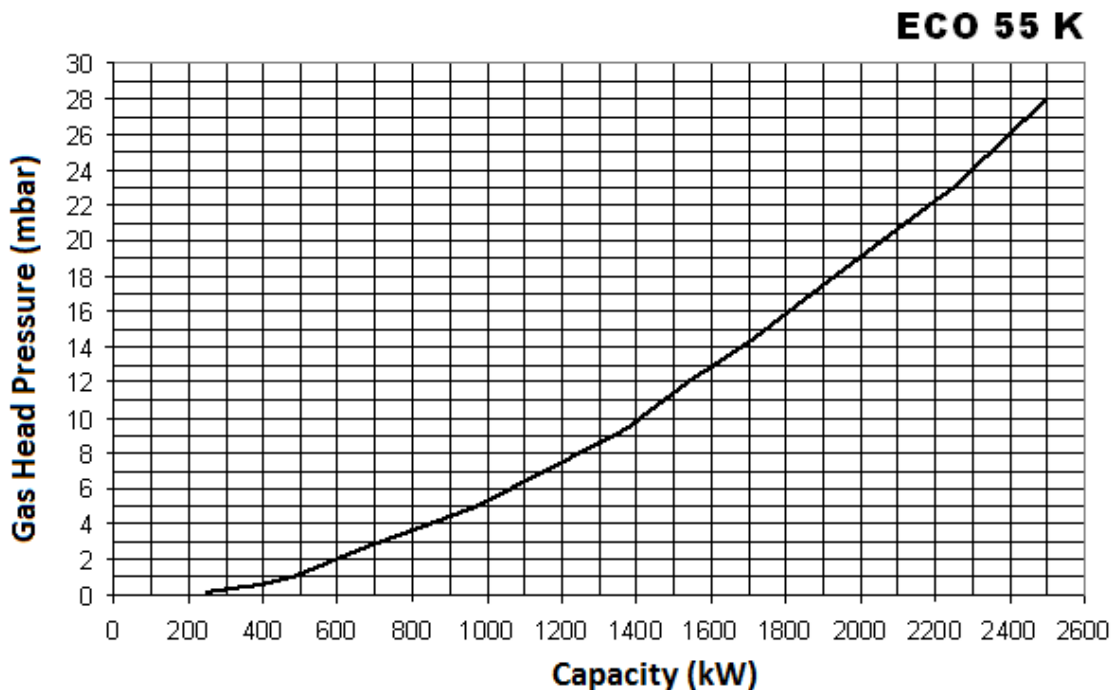
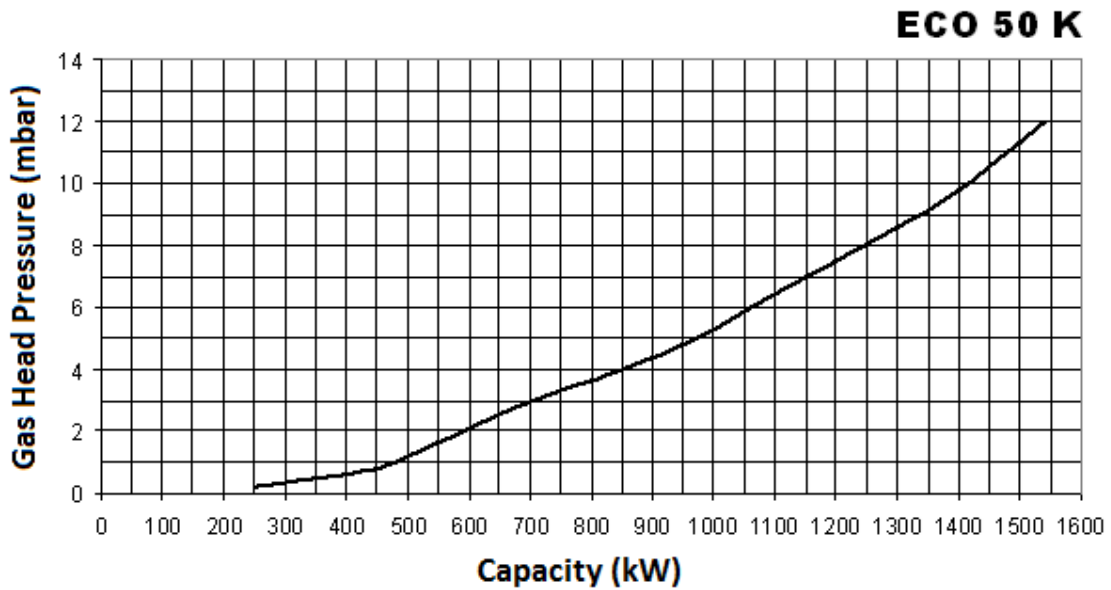
Gas hood pressure loss measurements are conducted in atmospheric pressure. Consider the below data while conducting measurement in counter pressure boilers.

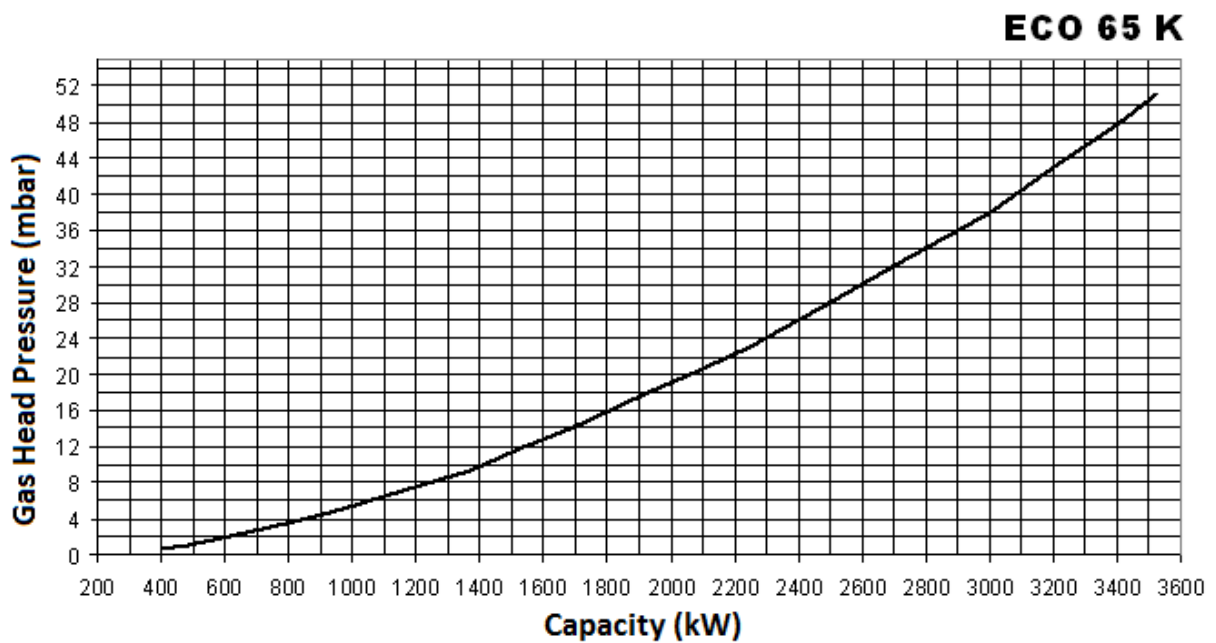
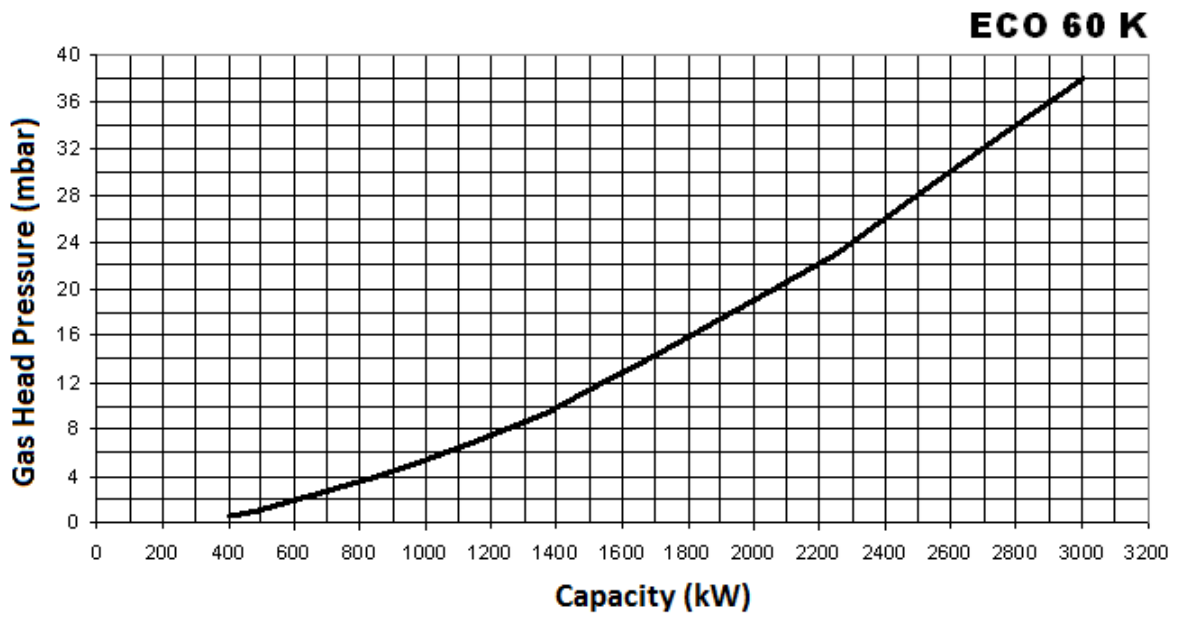
P_m : Gas hood pressure while burner is connected to the boiler and working

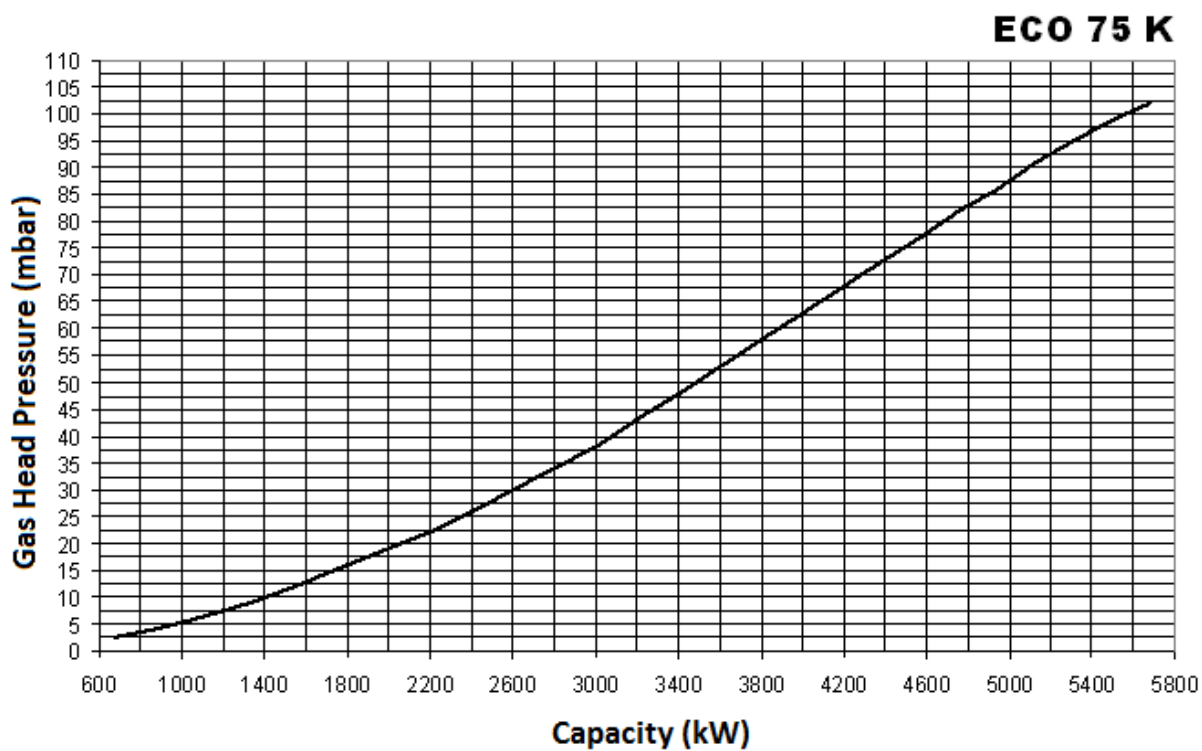
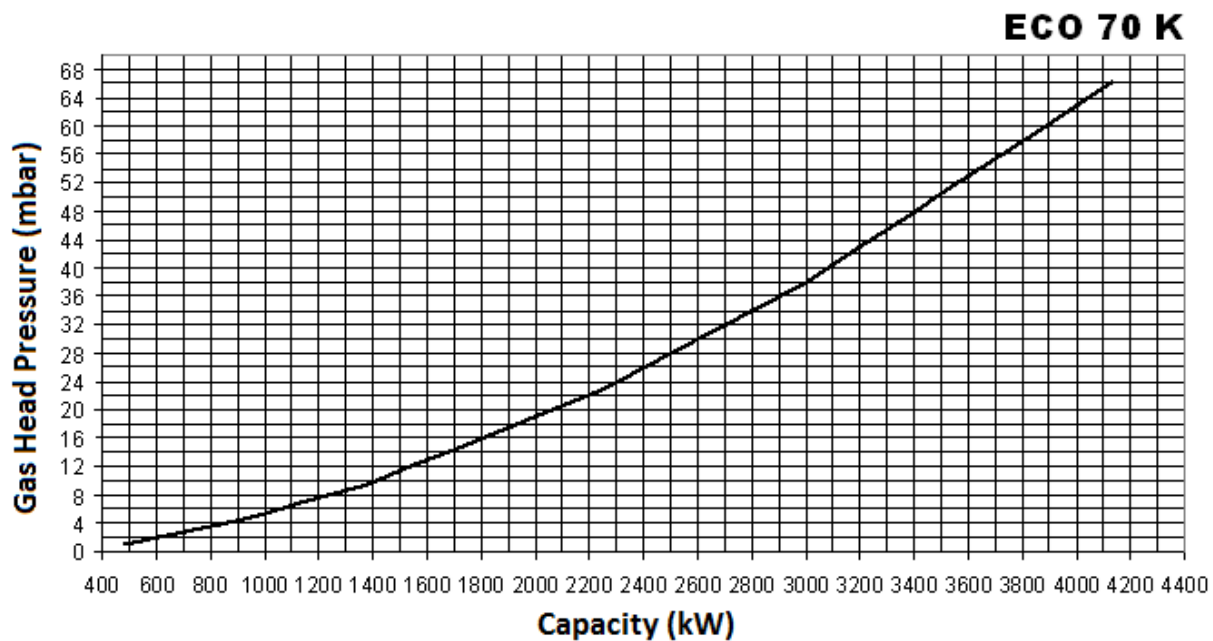
P_F : Combustion chamber pressure

P_{Br} : Burner net gas hood pressure

$$P_{Br} = P_m - P_F$$

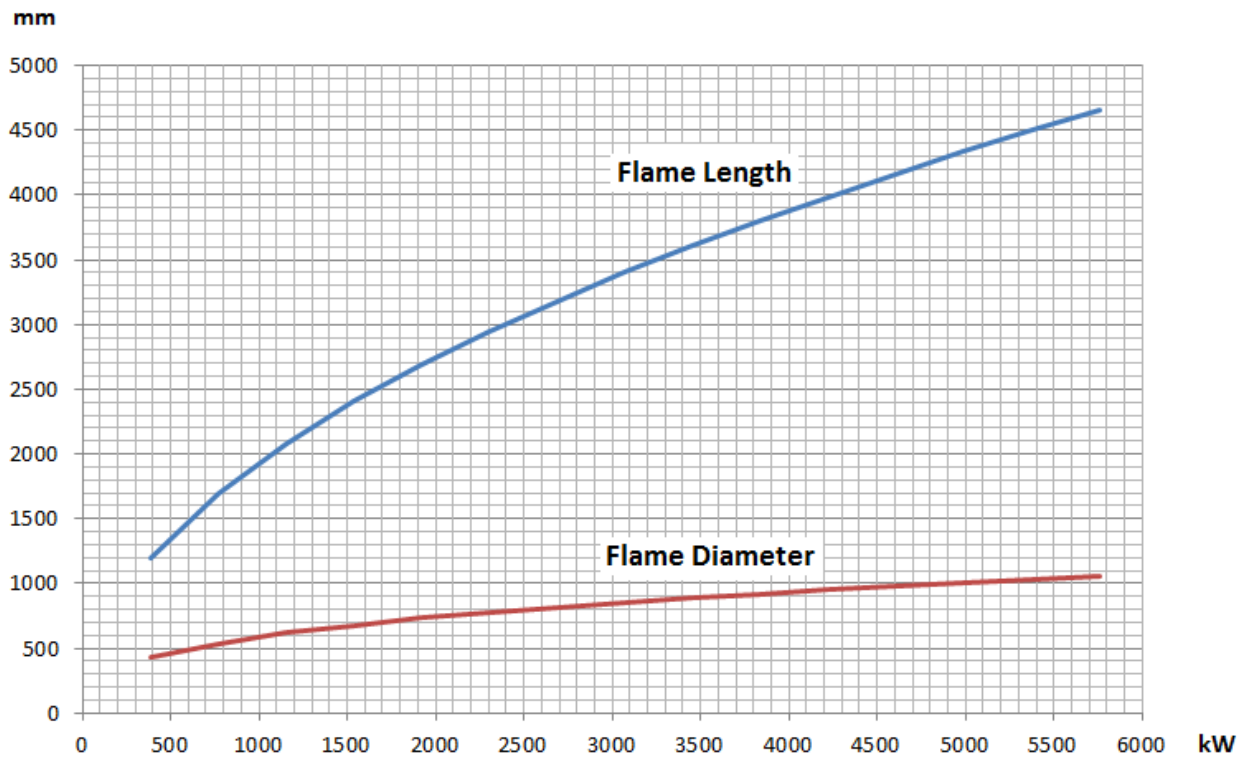




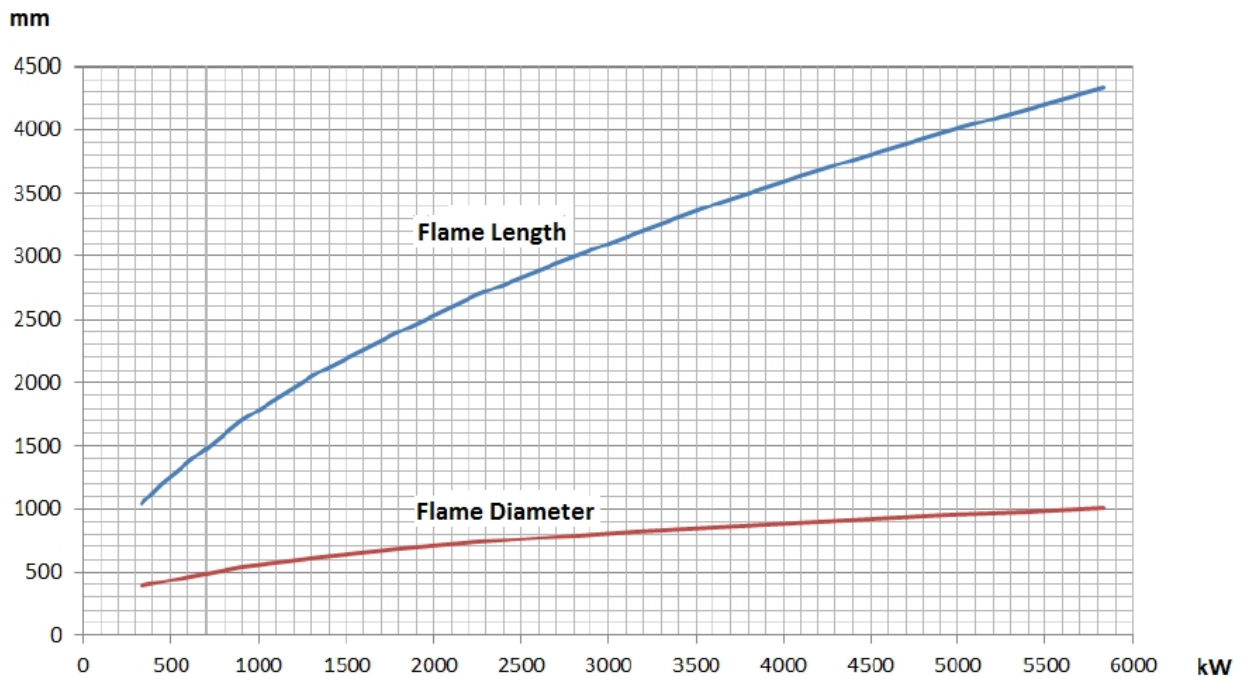


5.5. Flame Length and Diameter

Natural Gas



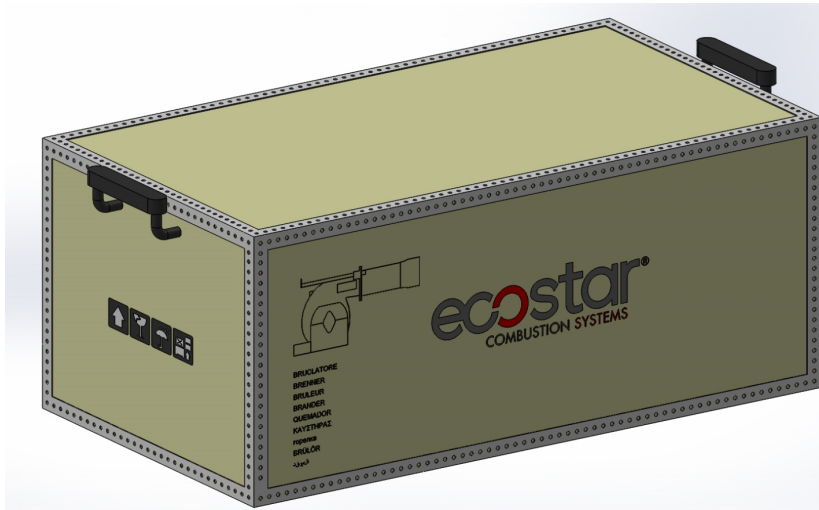
Light Oil



5.6. Noise Level

Product operates within the range of 75 decibels max. and 85 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.

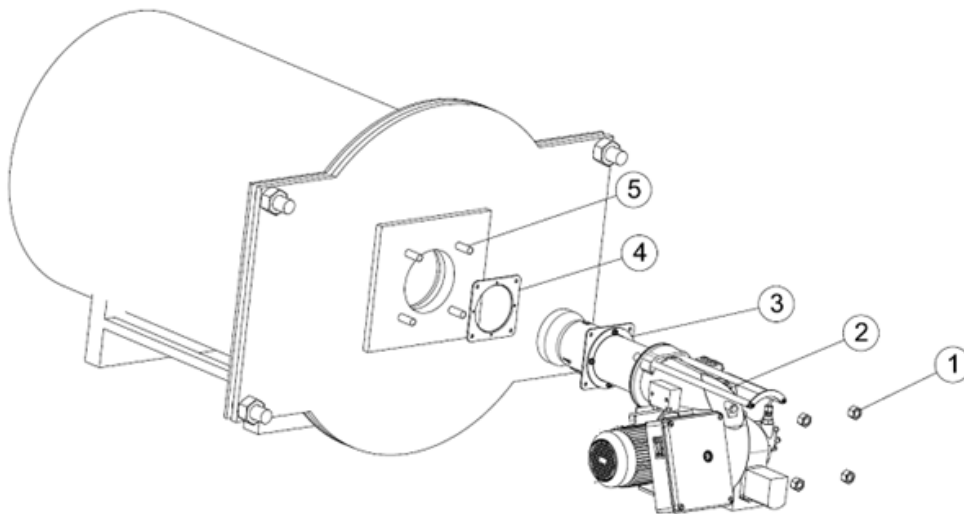


Dimensions of the box used for handling

| Burner | L x W x H (cm) | Weight (kg) |
|-----------------|----------------|-------------|
| ECO 50 KLC2 NG | 160 X 100 X 80 | 130 |
| ECO 50 KLC3 NG | 160 X 100 X 80 | 130 |
| ECO 55 KLC2 NG | 160 X 100 X 80 | 170 |
| ECO 55 KLC2a NG | 160 X 100 X 80 | 170 |
| ECO 55 KLC3 NG | 160 X 100 X 80 | 170 |
| ECO 55 KLC3a NG | 160 X 100 X 80 | 170 |
| ECO 60 KLC2 NG | 160 X 115 X 74 | 195 |
| ECO 60 KLC3 NG | 160 X 115 X 74 | 195 |
| ECO 65 KLC2 NG | 170 X 115 X 74 | 200 |
| ECO 65 KLC3 NG | 170 X 115 X 74 | 200 |
| ECO 70 KLC2 NG | 170 X 115 X 74 | 180 |
| ECO 70 KLC3 NG | 170 X 115 X 74 | 180 |
| ECO 75 KLC3 NG | 190 X 120 X 85 | 270 |

7. INSTALLATION

7.1. Burner Installation Picture



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

- Ø In the installation of the burner, use the installation materials supplied with the burner.
- Ø 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:

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



Device must be shipped in original packaging!

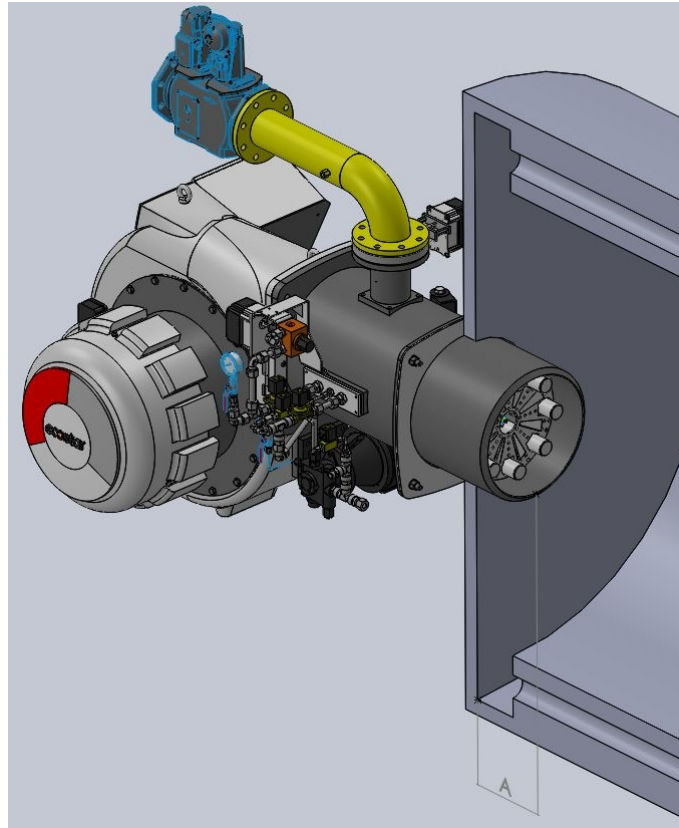


Do not lift the device holding from servomotor, gas valve, impulse pipes or pressure switch during installation!



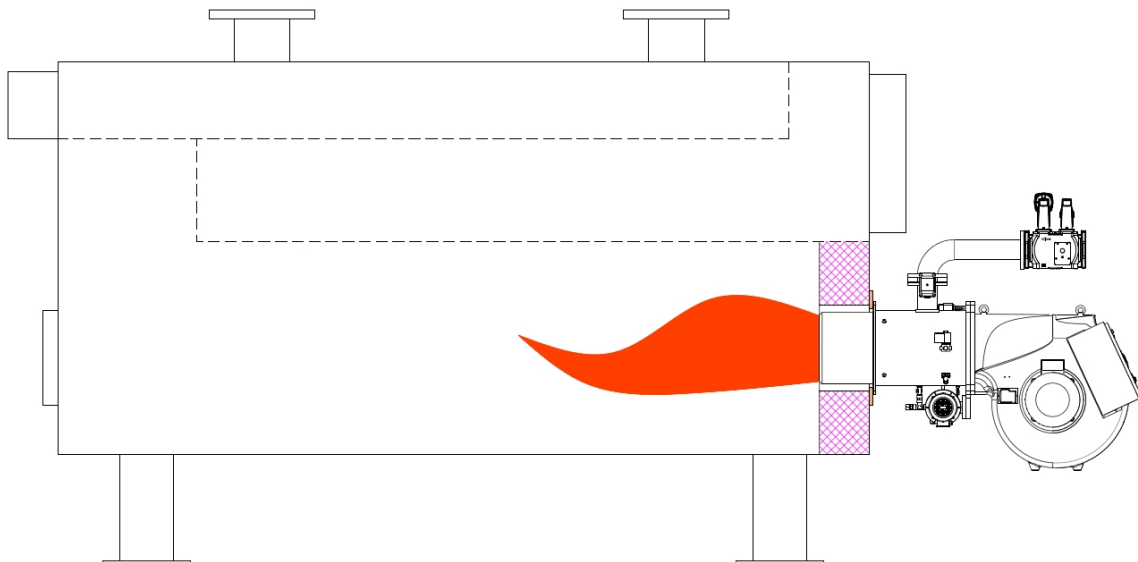
Clean the inside of fuel line thoroughly before installing the burner to the fuel line. Any damage that may occur due to solid objects and metal particles from the fuel line shall not be covered by our company.

7.2. In reverse flame front mirror boilers



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



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.

- Ø Installation of the burner to the boiler is checked.
- Ø Check the fuel line (are the pipe diameters and the pipe installation correct?).
- Ø Check energy input cables and voltages.
- Ø Check the boiler safety thermostats and, if it is a two-stage burner, then make sure that there are two thermostats.
- Ø Check the fuel nozzles according to the boiler capacity.
- Ø Prior to operating the burner, control the boiler water level.
- Ø Make sure water circulation system is turned on, and steam boiler and water feed pumps and boiler inlet - outlets are open.
- Ø Is there electricity current?
- Ø Is there gas?
- Ø Has the boiler explosion lid been controlled?
- Ø Is there sufficient air in boiler room (ventilation section $\text{cm}^2 = \text{boiler capacity kW} \times 7$)
- Ø Has the air of the gas line been removed? Has a sealing test been made?

Commissioning order

Operating with Light Oil ;

- Ø After performing the above mentioned controls, open the fuel tank valve.
- Ø Open the valve upstream of the fuel filter.
- Ø Check direction of motor rotation.
- Ø Open the pump's vent plug and place the manometer (0-40 bar).
- Ø Turn on the burner switch (turn to position 1).
- Ø When the burner starts up, the motor is activated and turns the pump at the same time.
- Ø 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.
- Ø It actuates pre-purge and discharges the residual gases remaining in the boiler from the funnel.
- Ø After the pre-purge, fuel is delivered from the nozzle. The fuel meets the flame from the ignition electrodes and the combustion starts.
- Ø After combustion of the burner, the pump pressure is adjusted (light oil: two stage; 14 bar, modulating; 25 bar).
- Ø 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.
- Ø The boiler thermostat is adjusted as desired (70-90°C for central heating boilers).
- Ø For the safety of the system, check the boiler thermostats and observe the deactivation of the burner.

Operating with Gas ;

Operation of two-stage burner

- Ø Open the main gas valve, check the gas pressure from the manometer at the valve. (max.300 mbar)
- Ø Check the boiler thermostat or pressure switch settings.
- Ø Bring the operating switch on the burner panel to position 2.
- Ø Burner fan motor will be activated.
- Ø Ignition will take place at the end of pre-purge process.
- Ø 3 sec. later, the gas valve will be opened and combustion will occur.
- Ø Flame control system (ionization) will start flame control.
- Ø Burner will switch to the second stage (max. capacity) according to the heat requirement.
- Ø After the boiler water heated up or the boiler pressure has risen, the burner will turn off.

Operation of a modulating burner

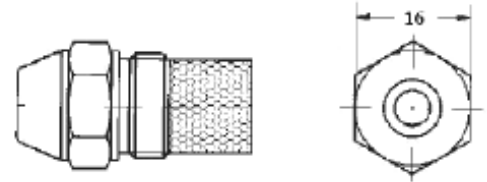
- Ø Open the main gas valve; check max 300 mbar gas pressure from the manometer.
- Ø Open operating switch on the burner panel.
- Ø Switch on the modulating control switch.
- Ø Switch automatic-hand switch to automatic.
- Ø Check the temperature and pressure set values from the modulating control unit.
- Ø Ignition will take place at the end of pre-purge process.
- Ø 3 sec. later, the gas valve will be opened and combustion will occur.
- Ø Flame control system (ionization) will start flame control.
- Ø In modulating burner, the burner goes into max. capacity according to the signal from the modulating control unit.
- Ø When the boiler water temperature or steam pressure increase, the modulating control unit will cause burner to run with min. capacity.
- Ø If the boiler water temperature or steam pressure increases despite the operation of burner with min. capacity, the modulating control unit will stop the burner.

8.3. Combustion Adjustment

Ø 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.



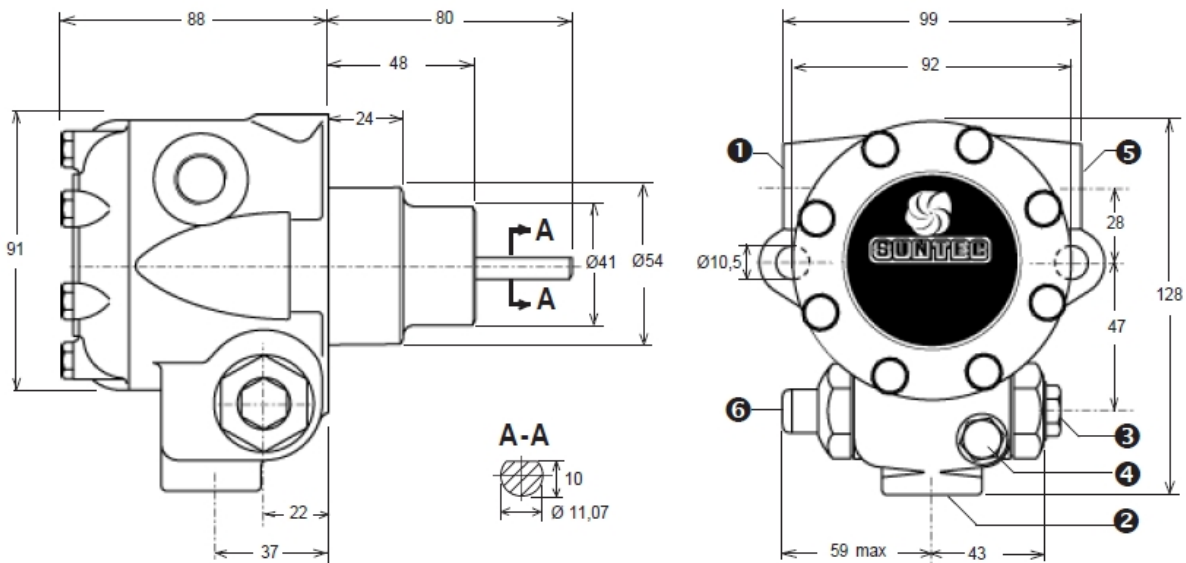
Ø Photocell

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



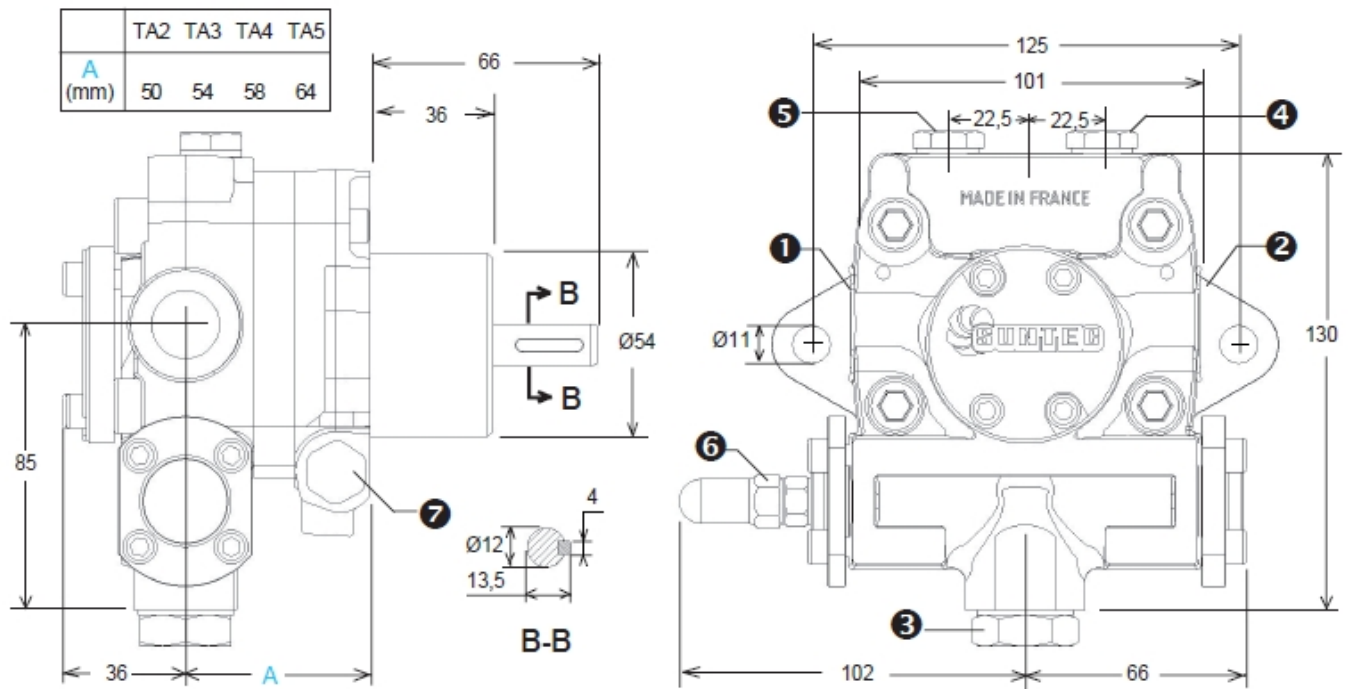
8.4. Fuel Pumps

E Type



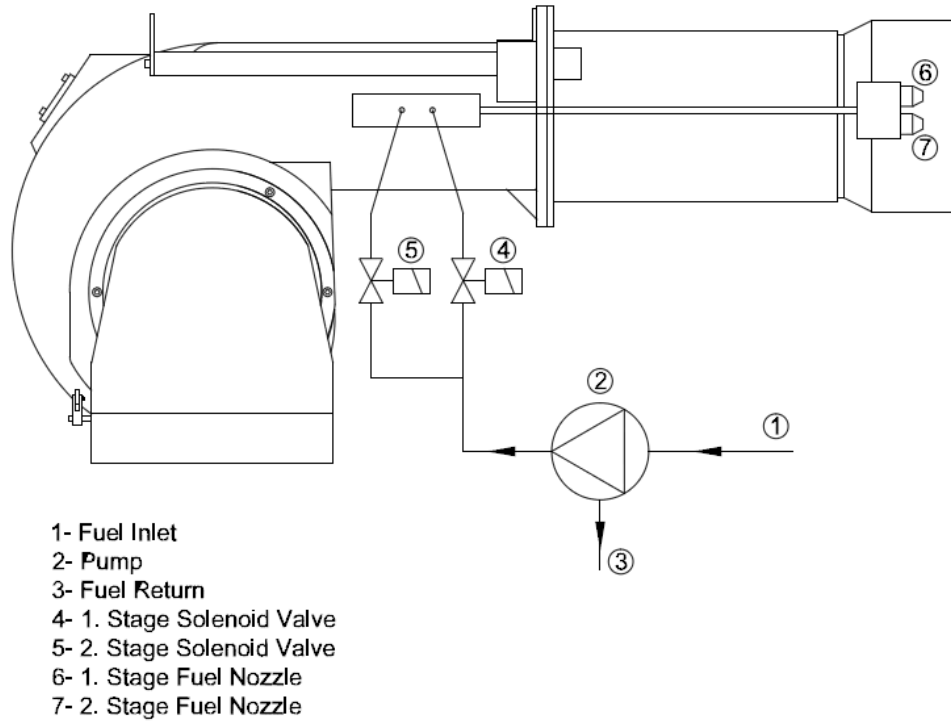
- 1- Suction or vacuum manometer connection
- 2- Return and internal bypass
- 3- Nozzle outlet
- 4- Manometer connection
- 5- Vacuum manometer connection
- 6- Pressure adjustment

TA Type

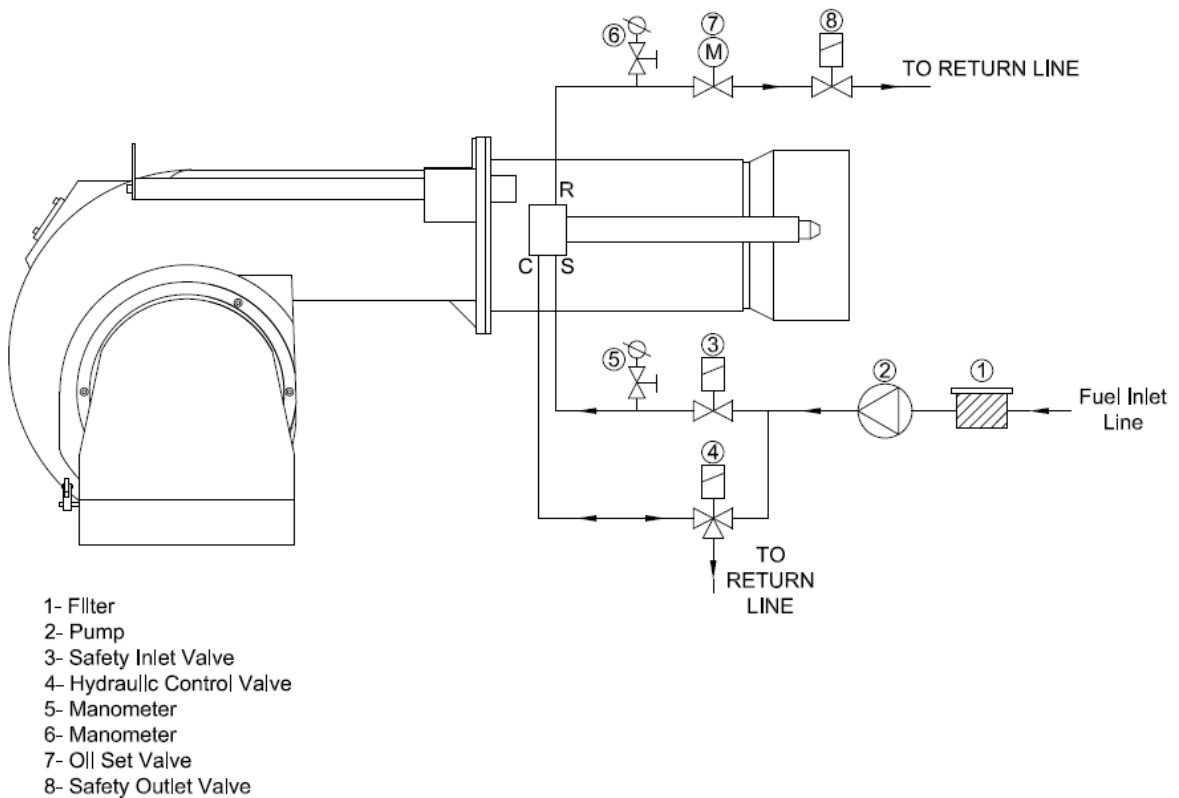


- 1-Suction
- 2-Nozzle outlet
- 3-Return
- 4-Manometer inlet
- 5-Vacuum or inlet manometer and internal return inlet
- 6-Pressure adjustment
- 7-Pre heater location

Ø Two Stages Light Oil Burner Fuel Circuit



Ø Modulating Light Oil Burner Fuel Circuit





CAUTION!

- Ø **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.**

- Ø **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.**

- Ø **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.**

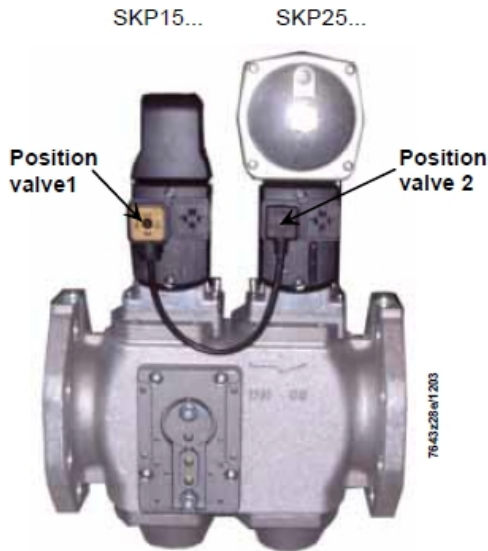
- Ø **Do not use solvent based materials (thinner and derivatives) during cleaning of the fuel nozzle; clean with gas oil or diesel oil. Fuel nozzle inner kit is very sensitive and even invisible deformations can reduce working performance; dismantling-installing work must be performed only by trained personnel.**

- Ø **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.**

- Ø **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. Gas Adjustment

8.5.1. VGD 40... Series Gas Valve



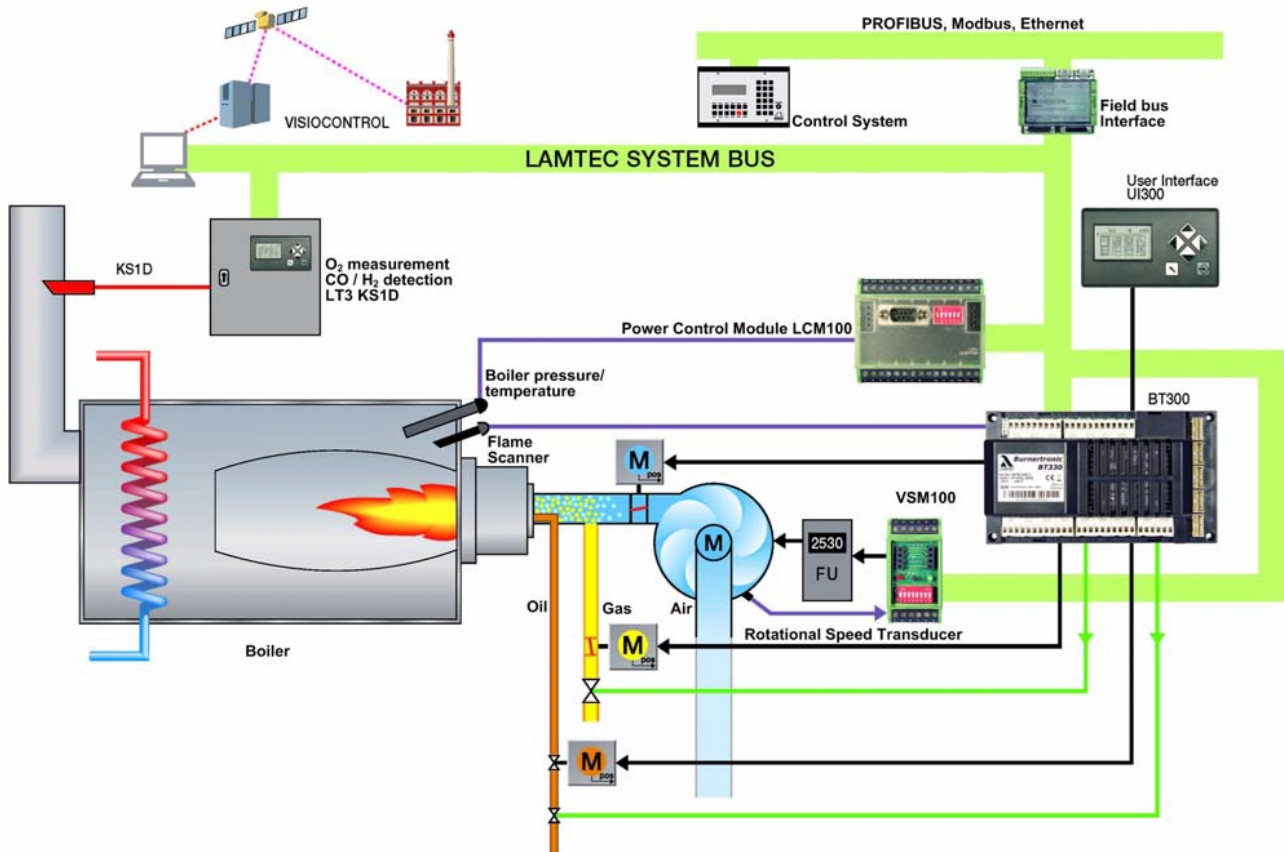
8.6. Air Pressure Switch Adjustment

While the burner is working without any problem, the air pressure switch is adjusted to desired minimum pressure as follows.

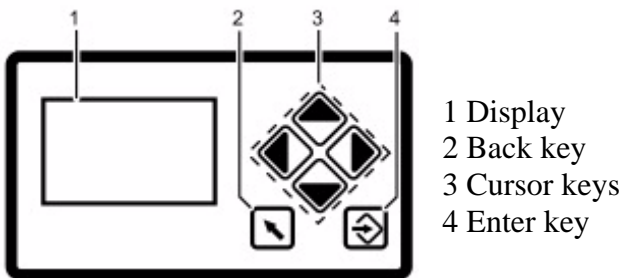
- Ø Unscrew the screw of the transparent cover and remove the cover.
- Ø Turn the adjustment wheel in the direction to increase the pressure, note the pressure value at which the burner is failed.
- Ø Set the pressure switch to a value 1 mbar lower than the pressure value at which the burner failed and close the pressure switch lid.
- Ø It is recommended that this adjustment is carried out when the burner is at minimum load.



8.7. BT 300



8.7.1. Operating Control and Displays



Display: The display shows in pictograms:

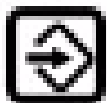
- 1 - the menu structure
- 2 - operating status
- 3 - parameters
- 4 - error messages



Back key: Jump to previous window.



Cursor keys: You navigate in the menu using the cursor keys. You use the "left" and "right" keys to move step by step to the selected row. At the end of the selected row, the cursor jumps to the next row down, if possible. If the menu has multiple rows, you can use the "up" and "down" keys to switch rows. To display the parameters, switch between the individual fields.



Enter key: Press ENTER to call up the menu on the start screen. You open the selected submenu from a menu window. By pressing the ENTER key, you transfer the setting values from a parameter window.

8.7.2. Menu Functions

The menu is divided into three paths:



INFO



MANUAL



SETTINGS

INFO



Select the INFO path for information about the following:

- the burner
- errors that have occurred
- the software version
- display of check sums
- the serial number
- actuating drive positions (current damper position for each channel)
- digital inputs/outputs

MANUAL



Select the MANUAL to

- start and stop the burner manually
- adjust the internal burner firing-rate

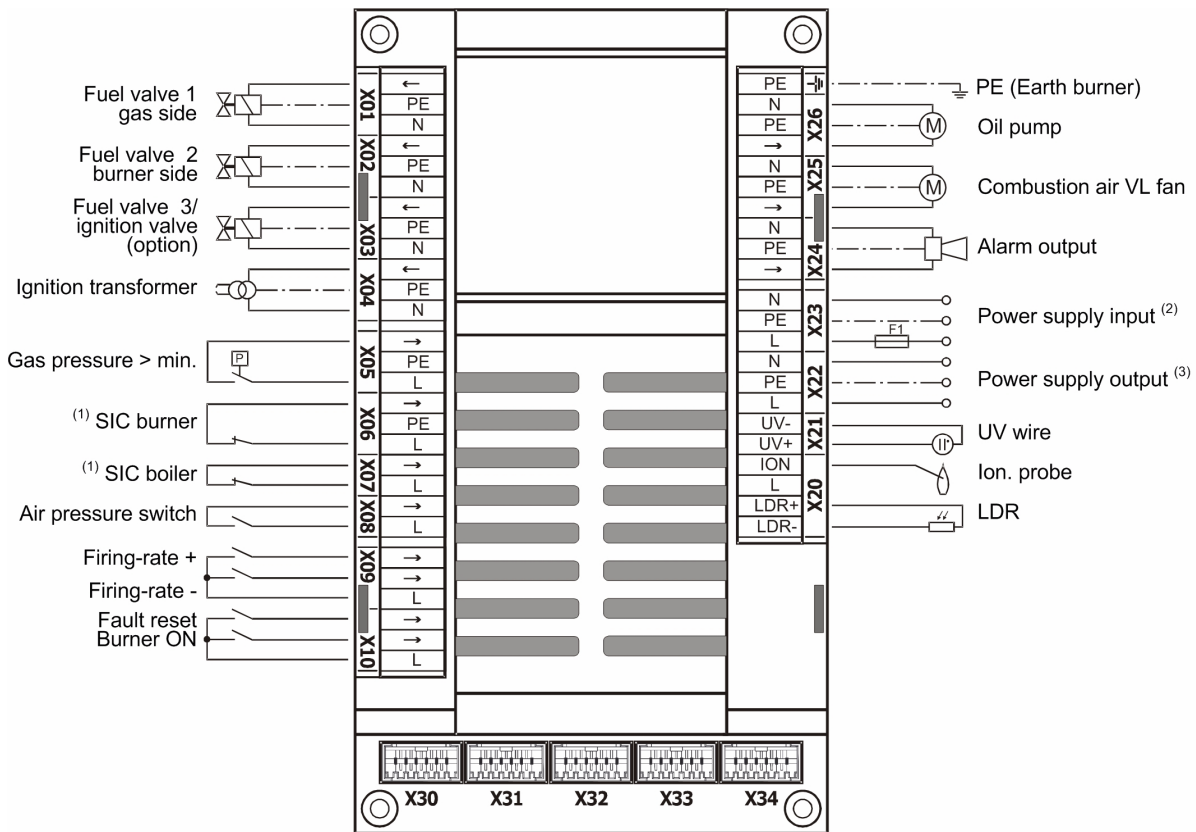
SETTINGS



Select the SETTINGS path for information on, and to make settings for, the following:

- the password
- the burner settings (display and settings)
- the actuator device settings (display)
- the air/fuel control system
- the "delete" curve
- the display settings

8.7.3. BT300 Connecting Diagram



X30 = User Interface UI 300

X31 = LSB Option

X32 = continuous output 1, e.g. air damper

X33 = continuous output 2, e.g. gas damper

X34 = continuous output 3 (optional)

- (1) SIC = safety interlock chain
- (2) 230V AC 47 - 63Hz external fuse protection required (max 10A slow-blow)
- (3) 230V AC for power supply to external devices

Maximum Cable Length:

X01-X10: 10m

X30: 1m

X20-X21: 3m

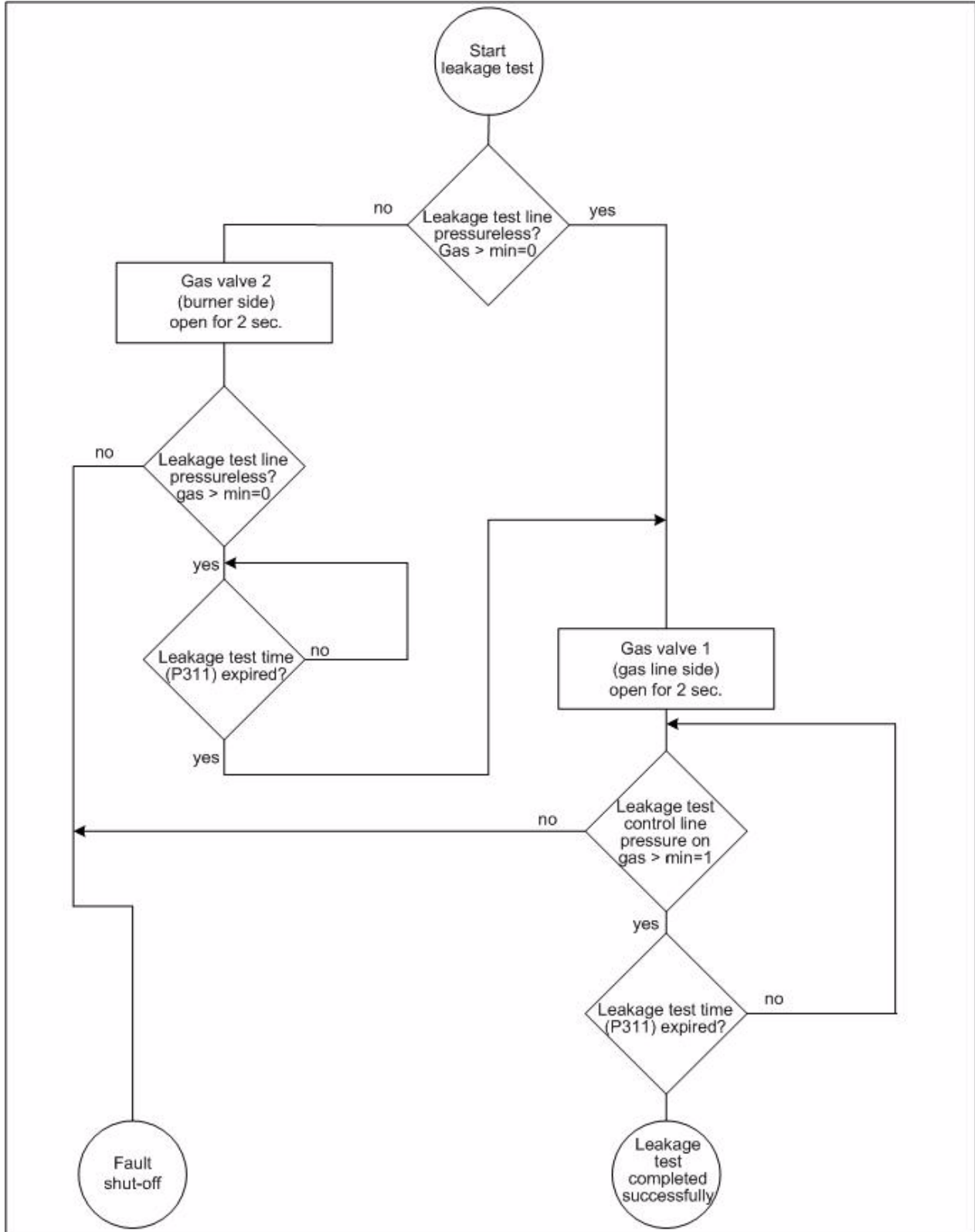
X31: 1m

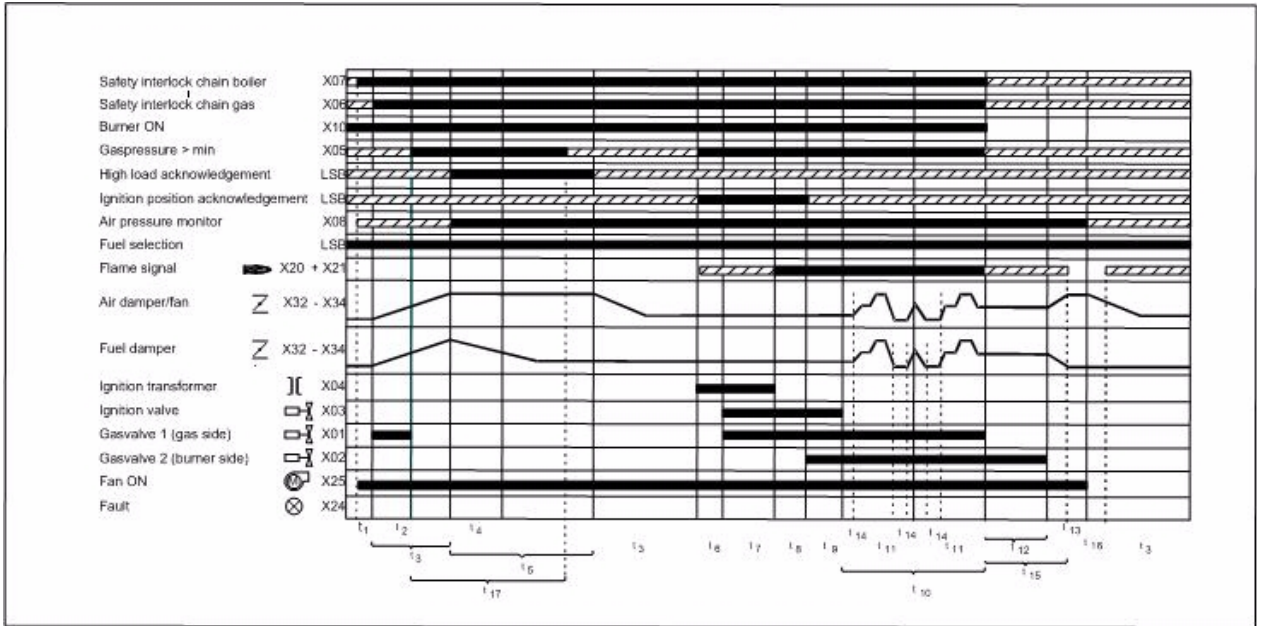
X22-X23: unlimited

X32-X34: 3m

X24-X26: 10m

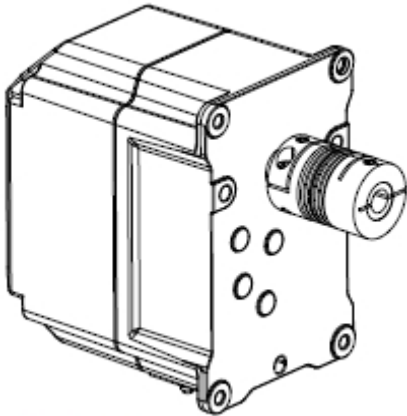
8.8. Leakage Test for Main Gas Valves





Gas with pilot burner and leakage test BT300

8.9. Servomotors



Lamtec motor ver. 2

Servomotors drive air dampers, gas butterfly valve and oil regulator. With the help of servomotors electronic air and fuel ratio control is carried out, controlled by burner control.



- Ø Static electricity can damage servomotor.
- Ø Do not open servomotor. Do not interfere with or modify unit or equipment connected to it. It may damage servomotor or change burner settings.
- Ø Completely isolate equipment from the main supply before performing any wiring changes in servomotor connection area.
- Ø Check that wiring is in an orderly state.
- Ø Protect equipment from condensation, water and ice.
- Ø Fall or shock can adversely affect safety functions. Such servomotors may not be put into operation.



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

8.10. Function Controls and Adjustments

The BT300 combines the benefits of an electronic fuel-air ratio control system with up to three motorised actuating devices and an optional modules like an analogue output for speed control of the combustion air fan with an electronic burner control unit. The leakage test, flame monitoring system, power control unit and (optional) CO/O₂ controller for control and optimisation of an oil or gas-fired forced-draught burner are all integrated. The BT300 is suitable for virtually all combustion plants. Safety interlock chains, monitors (e.g. gas and air pressure) and sensors are wired directly to the BT300. This greatly reduces the cost of additional relays and wiring. The BT300 was designed to be attached to the burner. The short wiring paths also save money. As a result, the BT300 is particularly suitable as standard equipment for monoblock burners. The compact design of the BT300 burner control system also has its advantages during commissioning. Standardising the wiring and the unified operator interface minimises sources of errors from the start, while intelligent information in the display makes searching for errors much easier.

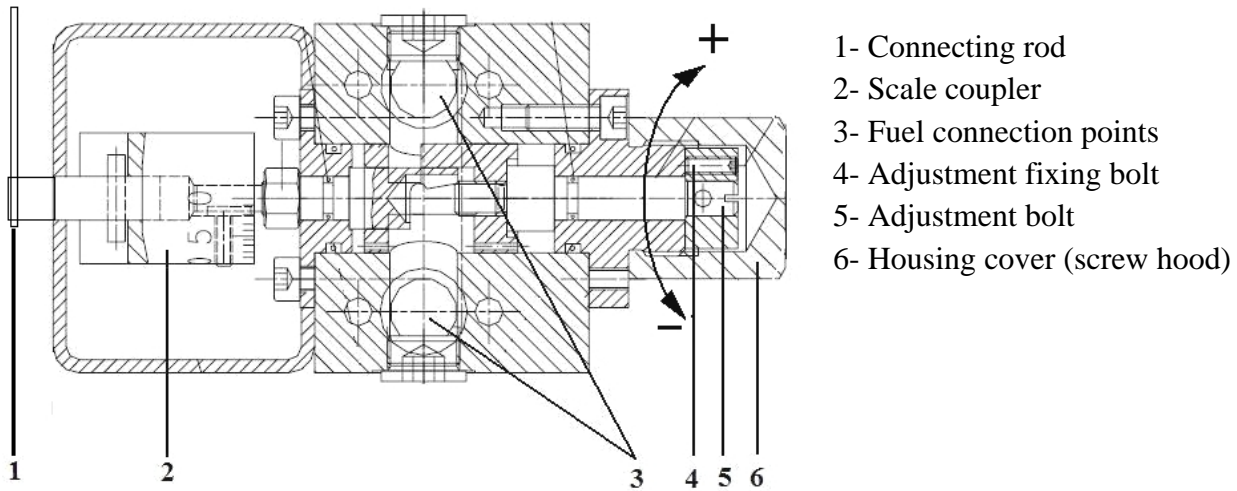


Magnetic valves must not be energized during pre-purge. Check if valves are in closed position!

8.11. Final Checks

- Ø Switch of all purges after completion of all necessary measurements.
- Ø Start and stop the burner at least 3 times to check the operation of the program.
- Ø Make sure that all safety circuits on the burner and boiler operate properly before leaving the installation site.

Ø Oil adjustment regulator



- 1- Connecting rod
- 2- Scale coupler
- 3- Fuel connection points
- 4- Adjustment fixing bolt
- 5- Adjustment bolt
- 6- Housing cover (screw hood)

Fuel regulator adjustment

- 1- Remove the housing cover number 6
- 2- Loosen the fixing bolt number 4
- 3- When you rotate the shaft number 5 (when looked from the shaft end) clockwise, the pressure value you observe from return manometer will increase, and burner consumption will also increase since nozzle pressure increases.
- 4- When you rotate the shaft number 5 (when looked from the shaft end) anti-clockwise, the pressure value you observe from return manometer will decrease, and burner consumption will also decrease since nozzle pressure decreases.
- 5- When the adjustment is completed, make sure that the adjustment you have made is permanent by tightening the fixing bolt number 4.
- 6- Place the housing cover number 6.

- Ø Set the burner to the correct capacity required by the boiler by considering the below nozzle pressure and consumption values.

Diagram valid for fuel nozzles having 45° spraying angle

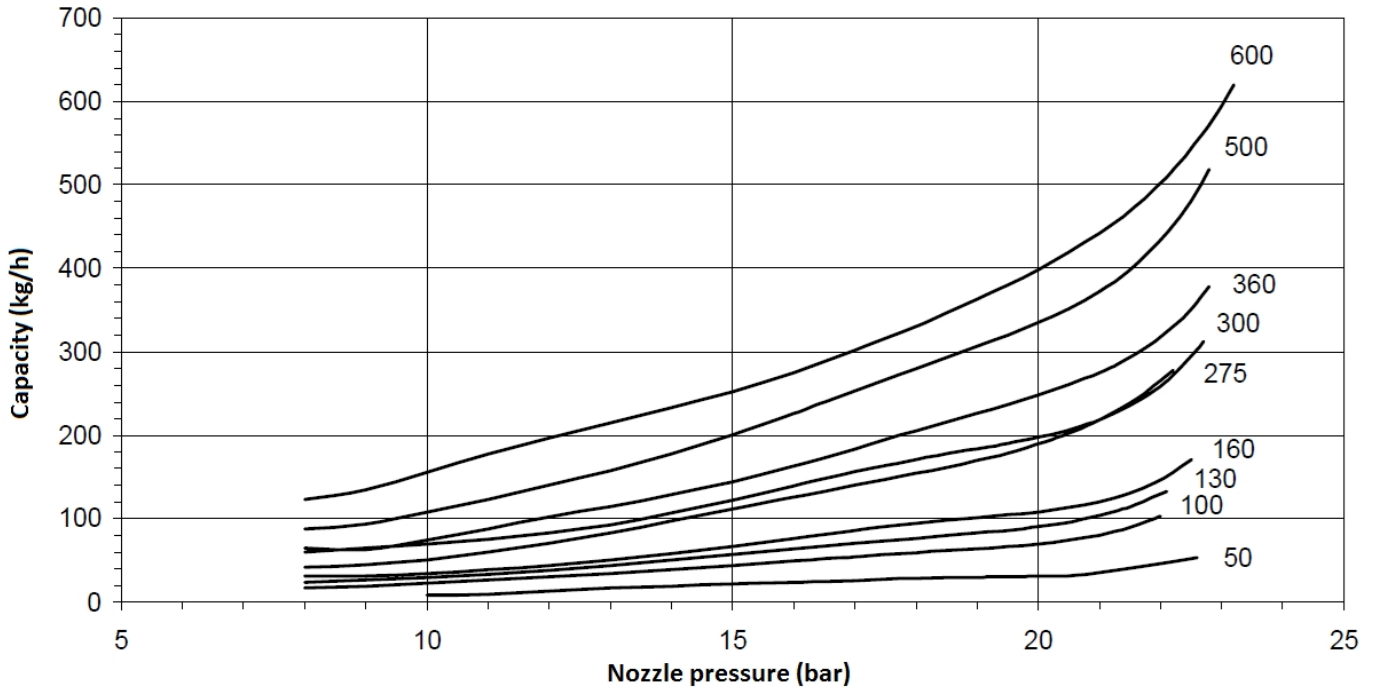
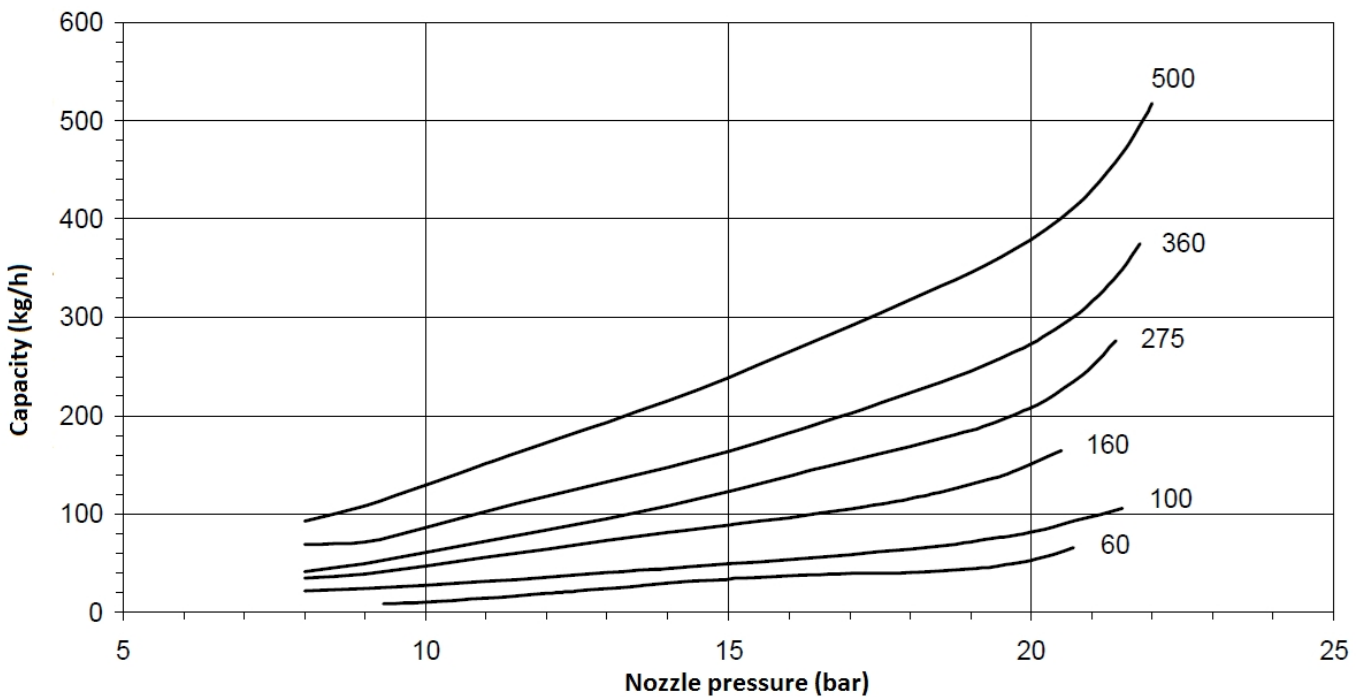
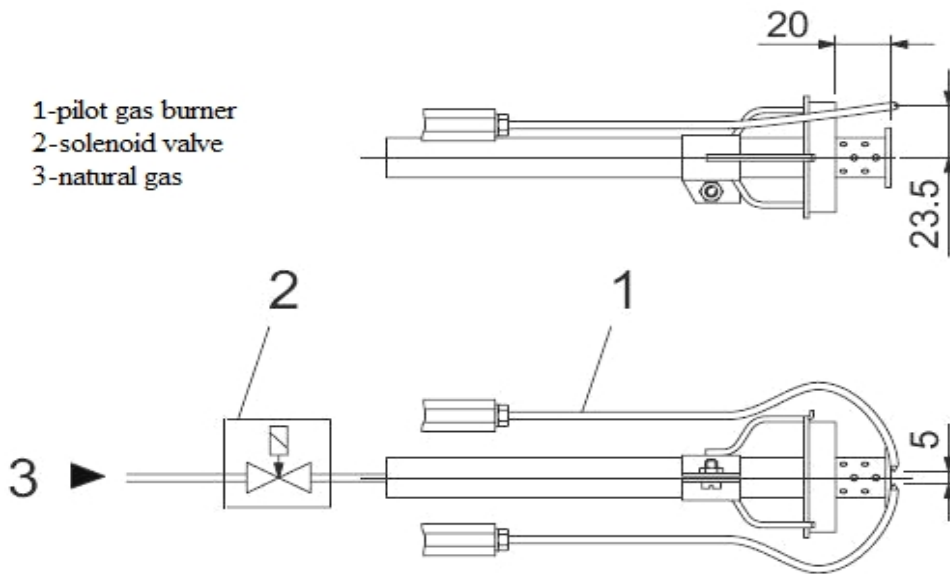


Diagram valid for fuel nozzles having 60° spraying angle



- Ø Once the burner modulating adjustment is completed, set modulating control device to automatic position, change set values and observe capacity changes. Air and fuel will increase and decrease simultaneously according to the adjustment you previously made.

8.12. Pilot Ignition System



Pilot gas burner inlet pressure $P_{max} = 200$ mbar

8.13. Emission Measurement

In emission measurements, the following values are accepted as reference according to TS EN 676 +A2 standard.

- Ø $CO < 100$ mg/ kWh
- Ø $\%3 \leq O_2 \leq \%5$
- Ø $NO_x < 170$ mg/ kWh
- Ø Excess air ratio $1,2 \leq \lambda \leq 1,3$

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

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



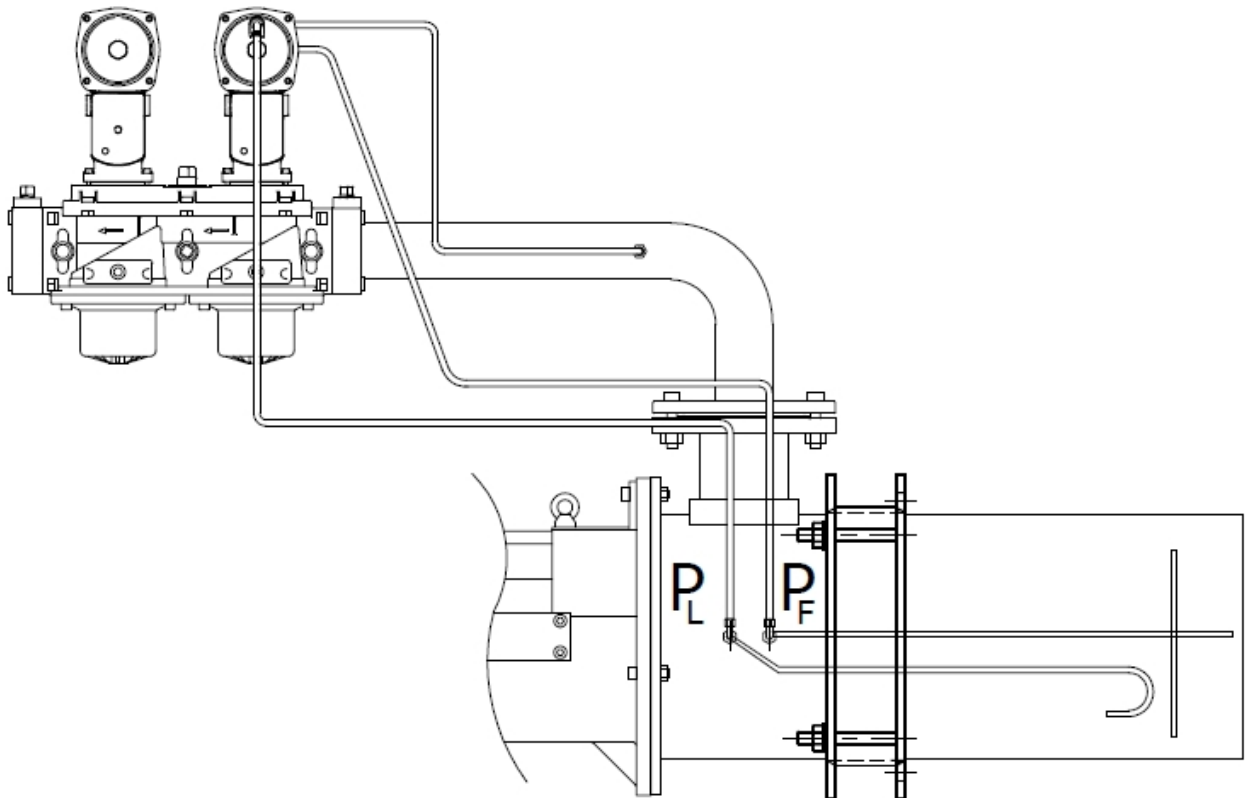
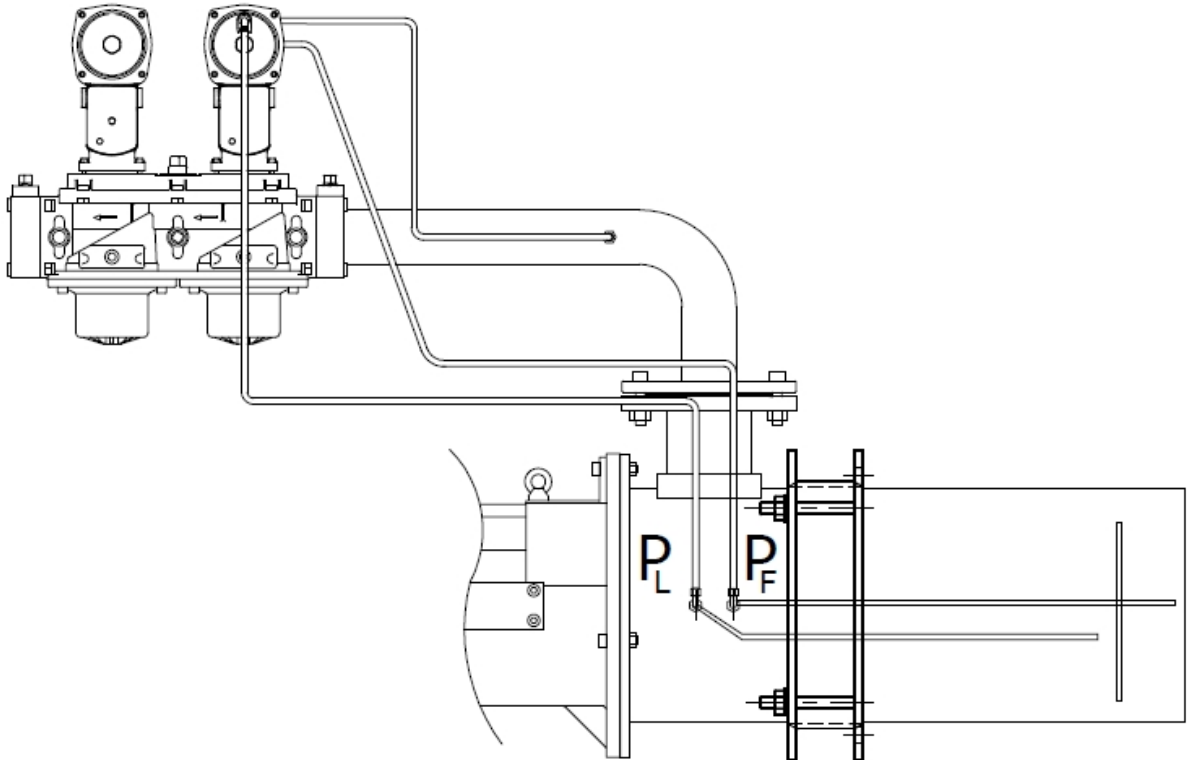
It is important for the boiler to be sealed in order to avoid incorrect measurements during emission measurements.



Boiler temperature must be between 40 C° and 80 C° while making emission measurement in hot water boilers.

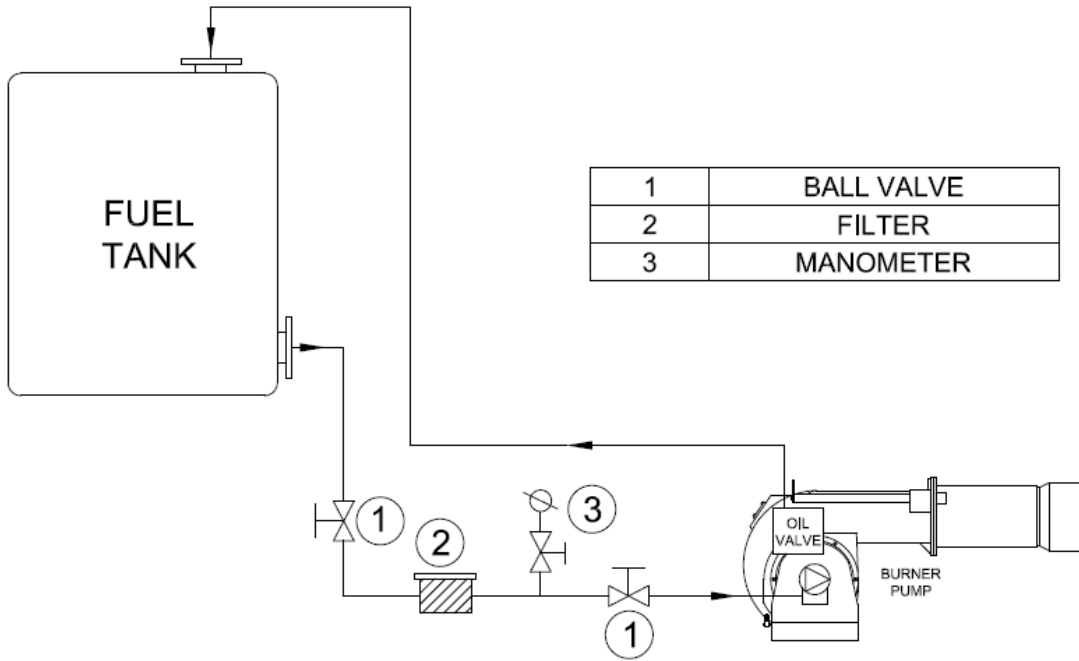


If the value measure from PL point is below 0.5 bar, set the impulse pipe as follows.

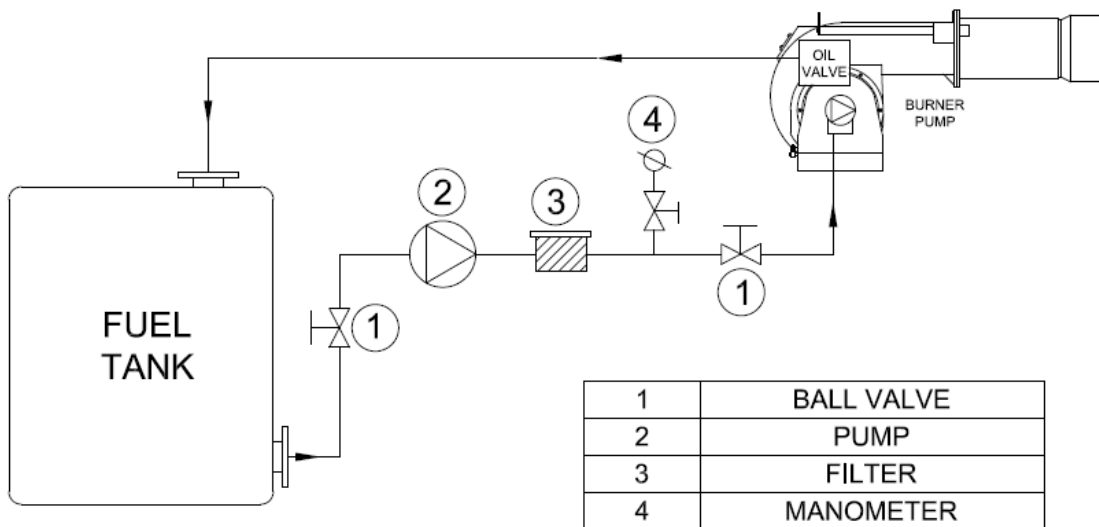


8.14. Light Oil Burner Fuel Ring Line

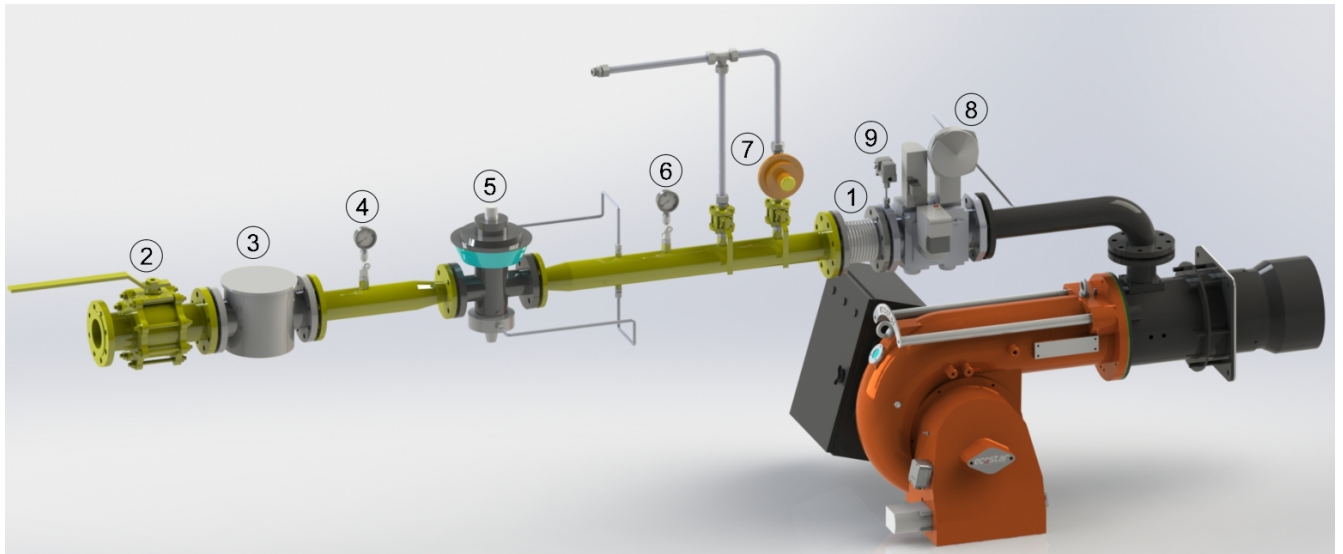
Tank is above the burner level.



Tank is below the burner level.



8.15. Gas Pass Equipment Required in Gas Line



| Pe < 300 mbar Q<1200kW | Pe > 300 mbar Q<1200kW | Pe < 300 mbar Q>1200kW | Pe > 300 mbar Q>1200kW |
|--|--|---|--|
| 1- Compensator | 1- Compensator | 1- Compensator | 1- Compensator |
| 2- Ball valve | 2- Ball valve | 2- Ball valve | 2- Ball valve |
| 3- Gas filter | 3- Gas filter | 3- Gas filter | 3- Gas filter |
| 4- Inlet manometer + valve | 4- Inlet manometer + valve | 4- Inlet manometer + valve | 4- Inlet manometer + valve |
| 8 – Multi-block (safety and operation solenoids) | 5- Regulator | 8 – Multi-block (safety and operation solenoids)) | 5- Regulator |
| 9- Sealing Control Set | 6- Outlet manometer + valve | 9- Sealing Control Set | 6- Outlet manometer + valve |
| | 7- Safety discharge valve | | 7- Safety discharge valve |
| | 8 – Multi-block (safety and operation solenoids) | | 8 – Multi-block (safety and operation solenoids) |
| | 9- Sealing Control Set | | 9- Sealing Control Set |



Threaded and flanged connections may vary depending on the gas pressure and consumption.

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.

- Ø Clean all filters in fuel ring system.
- Ø Clean fuel nozzle of the burner.
- Ø If the fin spaces and surface of the diffuser are covered with particles and formed a layer, clean it with a wire brush.
- Ø 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.

- Ø Clean the filters on the fuel line to the burner.
- Ø Clean fuel nozzle of the burner.
- Ø Clean the surface of the diffuser.
- Ø Clean flame pipe.
- Ø Check all wiring points. Tighten loose connections.
- Ø Clean the solenoid valves.
- Ø Clean the photocell.
- Ø Clean the dust and layers accumulated on the fan and air valves.
- Ø Check pump pressure. Check if necessary (Light Oil: Two stage 14 bar, modulating; 25 bar)
- Ø Check ignition electrodes. Adjust it if necessary. Check ignition cables and sockets.
- Ø Perform cleanliness control of inside panel. Clean if necessary.
- Ø Check all bolts of the burner. Tighten loose bolts.
- Ø Clean the filters on the main line and multiblock.
- Ø Check the burner gas tip.
- Ø Check gas line pressure, it must be the same with the first adjusted pressure, otherwise burner load and emission values will also have changed.
- Ø 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 re-started after long periods of shut-down or interruptions. After completion of maintenance and adjustment processes, make sure to perform a combustion analysis.

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

10. TROUBLESHOOTING

| Problem | Cause | Explanation-Suggestion |
|---|---|---|
| Burner cannot be commissioned | Light Oil or Gas is cut or does not come | Light Oil or Gas 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. | Light Oil or Gas pressure error | Circuit light oil or gas 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. |
| | Air pressure switch adjustment | Air pressure switch might be adjusted to a high value. There may be dirt in the air pressure switch. Air pressure switch might be broken. |
| | Fan motor failure | Check fan motor coils, motor contactor and outlet from program relay. |
| Burner starts up, but fails after 30 seconds. | Light Oil or Gas valve, fuel oil or gas pressure drop | Light Oil or Gas valve might be closed. Circuit fuel oil or gas pressure might have dropped. Check Light Oil or Gas 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. |

| 11. PERIODICAL FLUE GAS MEASUREMENT REPORT | | | | | | | | | |
|---|---|---------------------|------------------------------|---------------------------------|---------------------------------|----------------------|----------------------------|-------------|------------------|
| Fuel Consumption (kg/h) | Fuel Consumption (m³/h) | CO (ppm) | O₂ (%) | CO₂ (ppm) | NO_x (ppm) | Yield (%) | Flue Temp. (°C) | Date | Signature |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

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.

Our contact details for your requests and complaints

Esentepe Mah.Milangaz Cad. No:75 K:3

Kartal Monumento Plaza

KARTAL/İSTANBUL/TÜRKİYE

Tel: +90 216 442 93 00

Fax: +90 216 370 45 03

Factory Contact Details

Türkgücü OSB

Bülent Ecevit Bulvarı No:11

ÇORLU/TEKİRDAĞ/TÜRKİYE

Tel: +90 282 685 44 80-81

Fax: +90 282 685 42 09

Also you can contact with us:

Web site : www.ecostar.com.tr

E - mail : 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.

