THERMOSTAHL POLAND Sp. z o.o.

MULTI-FUEL BURNER
SERVICE AND INSTALLATION MANUAL
MULTIMAX
MTX-400 AND MTX-400 KTS (250-450 KW)

wer. 1/2018

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GENERAL INSTRUCTION MANUAL

THE PRESENT INSTRUCTION MANUAL IS SUPPLIED AS AN INTEGRAL COMPONENT OF THE APPLIANCE, AND MUST BE TRANSFERRED TO THE USED ALONG WITH THE BURNER. WE ASK THE USER TO STORE THIS MANUAL OVER THE TIME OF USE OF THE BURNER FOR REFERENCE.

1. GENERAL INFORMATION

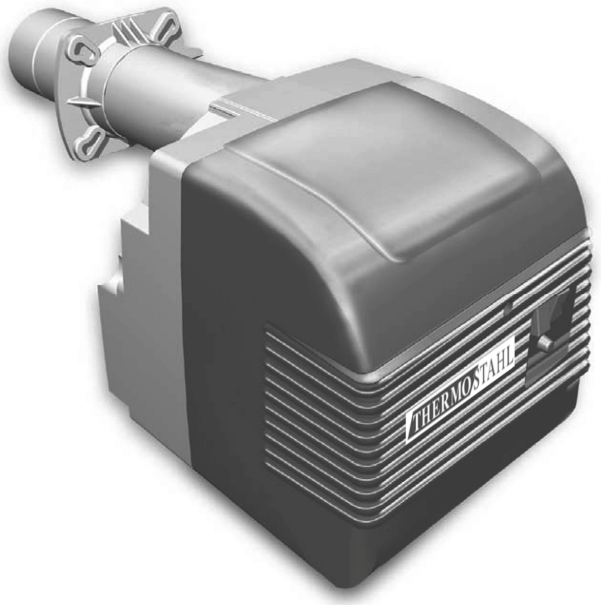
This manual is delivered to the user as an integral part of the burner.
A thorough read of the manual shall let the user obtain important information concerning the assembly, use, safety and maintenance of the burner. The burner may be installed only by qualified personnel, in line with the provisions in force, and according to this manual.
Improper installation shall cause injury to persons and material damage, for which the supplier will not be liable. Before commencement of any sort of maintenance or repair work, always shut off the electric power supply by pulling the power supply line plug.

- Make sure that the burner inlet and outlet meshes are not clogged.
- In case of sale of the burner or of the entire appliance, where it is installed, this manual needs to be transferred along, so that the subsequent user or installation specialist could get acquainted with it.
- In case of any changes ot amendments to the burner equipment only use original parts provided by the manufacturer.
- The burner may be used exclusively for the purpose, for which it was constructed. Any other sort of use shall be considered contrary to foreseen use, and, accordingly, hazardous. The burner supplied shall not be liable in any way for damage arisen as a result of improper assembly or use and for lack of adherence to this manual.

The MTX-400/400 KTS burners are adapted for operation on pure fuel oil as well as waste fuel such as spent oil, engine oil, crankcase oil, hydraulic oil and the synthetic material component - fraction (**KTS-F**)*.

*Only applies to model MTX-400 KTS.

NOTE!
The use of transformer oil, capacitor oil, petroleum and thinners **is strictly forbidden**!



2. IMPORTANT REMARKS CONCERNING BURNERS

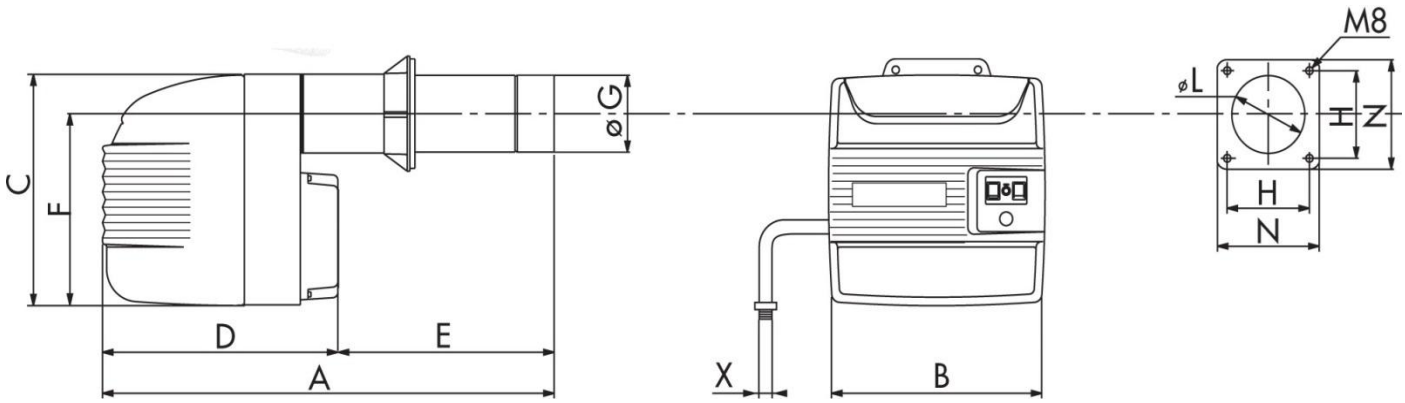
- The burner should be installed in an appropriate room with ventilation openings, according to requirements of provisions in force, ensuring a sufficient supply of combustion air.
- Before connecting the burner, make sure that it is adapted to the power supply conditions at hand (electric power, fuel).
- For safety reasons, the burner must be effectively earthed, and the electric power supply line executed according to current regulations.
- Before start-up of the burner and at least once per year, qualified personnel should execute the following activities:

a. Determine the amount of fuel supplied in accordance with the burner capacity.
b. Check the fuel feed system for tightness and lack of obstructions.
c. Determine the amount of air supplied for combustion in such a way so as to achieve a combustion efficiency that would be in accordance with relevant separate provisions.
d. Check the operation of the burner concerning the combustion quality so that one avoids the risk of exceeding permitted emission values of air pollutants.
e. Make sure that the control and security system operates properly.
f. Make sure that the combustion gas ventilation system operates properly.
g. Make sure that a copy of the burner instruction manual is available in the burner room.

WARNING! In case of repeating emergency burner shutdowns, do not attempt continued manual start-up procedures. Contact the manufacturer's service department to remove the fault. Non-adherence to this recommendation poses a risk of a grave failure of the entire heating appliance.

BURNER DIMENSIONS (MM)

Fig. 1.



TYP :	A	B	C	D	E	F	øG	H min max	L	N	X
MTX 400/400KTS	770	420	423	460	310	350	135	120 160	150	200	3/8″

SPECIFICATION:

Type		MTX 400 / MTX 400 KTS
Burner power - max.	kW	450
Burner power - min.	kW	250
Burner power - max.	kcal/h	387000
Burner power - min.	kcal/h	215000
Max. fuel consumption*	l/h	42
Power supply	V/Hz	230/50
Burner power consumption	W	850
Heater power consumption	W	900
Minimum compressor requirements	l/min.	130

* The fuel consumption measurement is based on synthetic material fraction fuel. The calorific value is 38.5 MJ/litre.

BURNER ASSEMBLY PROCEDURE

1. The box contains, beside the burner, the following accessories:

- burner power supply and control plug (7-pin Euro connector)
- burner mounting flange
- flange sealant made of asbestos-free material
- sealing cord for the assembly flange
- flange mounting bolts and spacers
- pump set (pump with electric motor)
- multi-use oil filter, filter with a 100 W heater (KTS model)
- this instruction manual and warranty card

2. Assembly on the heating appliance

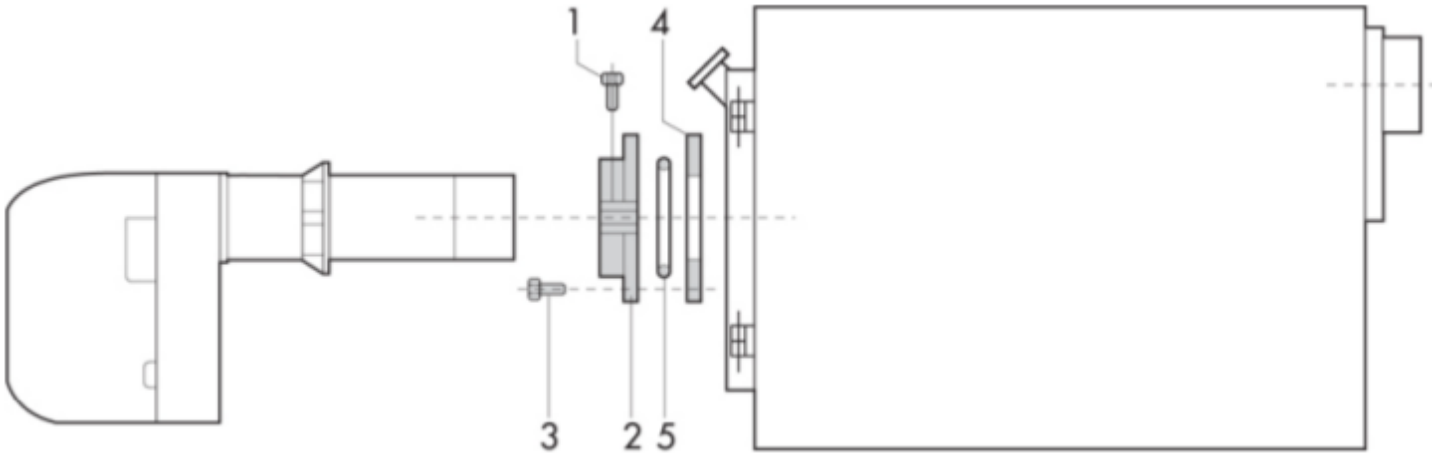


Fig. 2

The burner needs to be attached to the front face of a boiler or heater using the mounting flange (2) with adherence to the order of work indicated in the figure above (fig. 2). To ensure safety, after installation of the burner, tighten the counterbolt (1).

1. Counterbolt of the flame pipe
2. Mounting flange
3. Flange mounting bolt
4. Flange seal
5. Sealing cord

WARNING!
The burner may be mounted solely vertically with respect to the floor, on which the heating appliance is set.

3. **Connecting the compressed air line**

In order to provide the burner with compressed air, it needs to be connected to a hose terminating with an air connector of type DN 7.2 at the location marked in fig. 3.

Compressed air is necessary for the burner to operate properly. In order to prevent the burner from operating if the air pressure falls or if there is no compressed air supply, a sensor was used to cut the power to the fuel pump. Lack of pressure in the circuit shall cause the fuel pump to be shut off.

Warning!
The maximum permitted pressure of air connected to the burner **is 8 bar.**

Fig. 3

4. Fuel line connection

The fuel line, with a steel sheath, is delivered in bulk together with the mounting flange and sealing rings. The 3/8" hose connector needs to be screwed onto the fuel pressure reducer see fig. 4.

Fig. 4

5. **Forming the fuel line**

The fuel supply system should be designed and made according to Polish standards. Adhere to local provisions in force as well.
To create the fuel line, the use of soft or hard copper piping is recommended, with an inner diameter of at least 14 mm. Avoid the formation of siphons, in which air could collect. It is best to design the layout of the fuel line from the pump to the burner in such a way that it exhibits a steady rise, protecting the system from air collecting in the line.

WARNING!
In case of supplying the burner with the synthetic material component fraction, the fuel system, filter and pump must be thermally secured in a manner permitting the heating of the fuel system up to +40 °C (+/- 5 °C). Use a cable or heating mat with a control thermostat as the heating unit.

Suggested diameters of the fuel lines on the pumping side:
- 16 mm for line lengths up to 15 m
- 18 mm for line lengths upwards of 15 m

6. Electrical connection

230 V / 50 Hz power supply

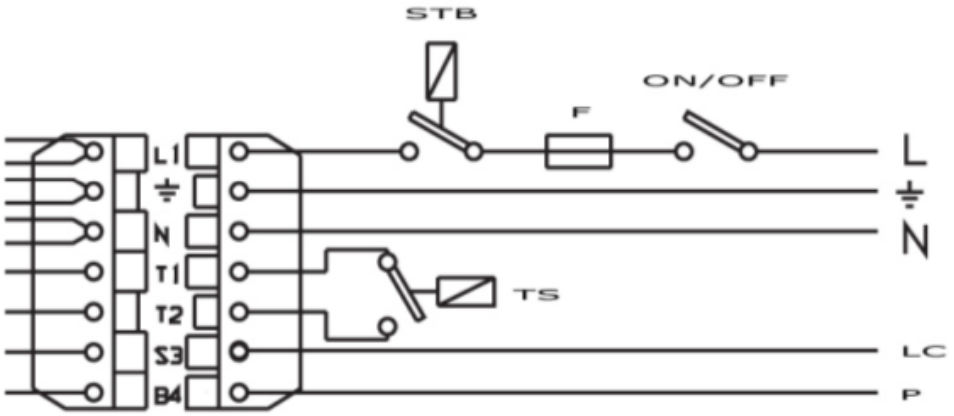


Fig. 5

STB	Overheat thermostat, 110 °C
ON/OFF	Main switch
TS	Water/air temperature thermostat
LC	Fault indicator control
F	Fuse
P	Pump and operating time power supply

Warning!
The electric system powering the heater needs to be protected with a B16 circuit breaker.

7. Electric connection of the pump set

The pump unit is powered directly from the MTX burner Euro plug.
For the pump power supply, use a wire with a diameter of 3 x 2.5 mm^2.

The pump motor needs to be connected according to the following diagram (fig. 6):

- N - zero
- B4 - phase
- PN - earth

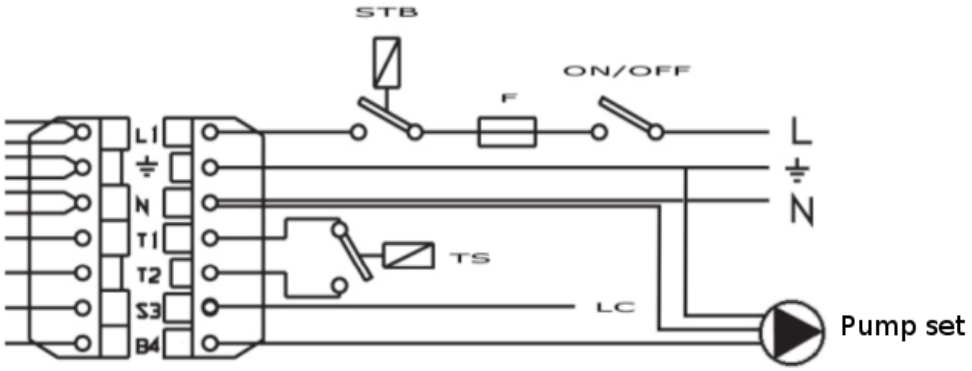


Fig. 6

Limitations concerning the length of the suction line and the raising height of the sucked oil.

- The height of the initial (suction) filter from the bottom to the fuel pump should not exceed (H) 3 m.
- The total length of the suction line may not exceed (L) 5 m (from pump to suction unit of floater).

In order to extend the intervals between fuel top-ups for the main fuel tank, the use of tanks not smaller than having a volume of 1000 litres is required. Less frequent fuel provision shall enable the contaminants to fall to the bottom of the tank. In order to improve on the purity of the fuel taken up, the suction mesh in the tank should be equipped with an inlet floater, thanks to which the fuel will be taken from the top part of the tank.

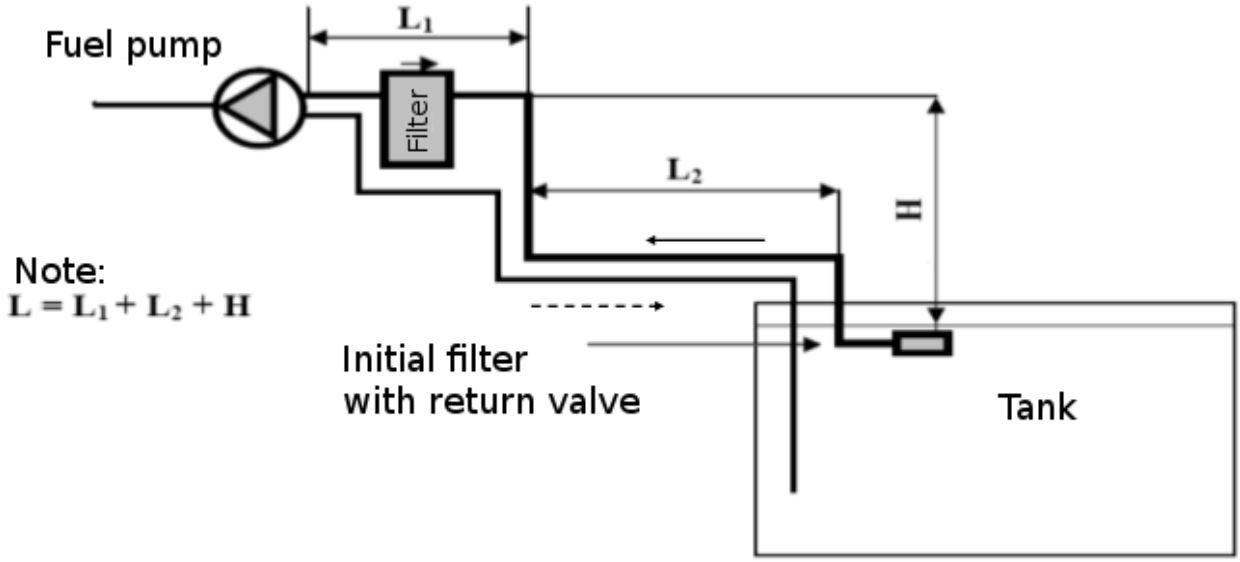


Fig. 7

WARNING!
When using synthetic material fraction as fuel, one needs to remember that the solidification of this fuel occurs at temperatures below 15 °C. In order to liquefy the fuel again, ensure fuel heating in the main tank to a value exceeding this temperature. A solution to ensure tank heating is the use of a heating coil within the central heating system of the boiler.

Boiler hydraulic system diagram, single-line system:

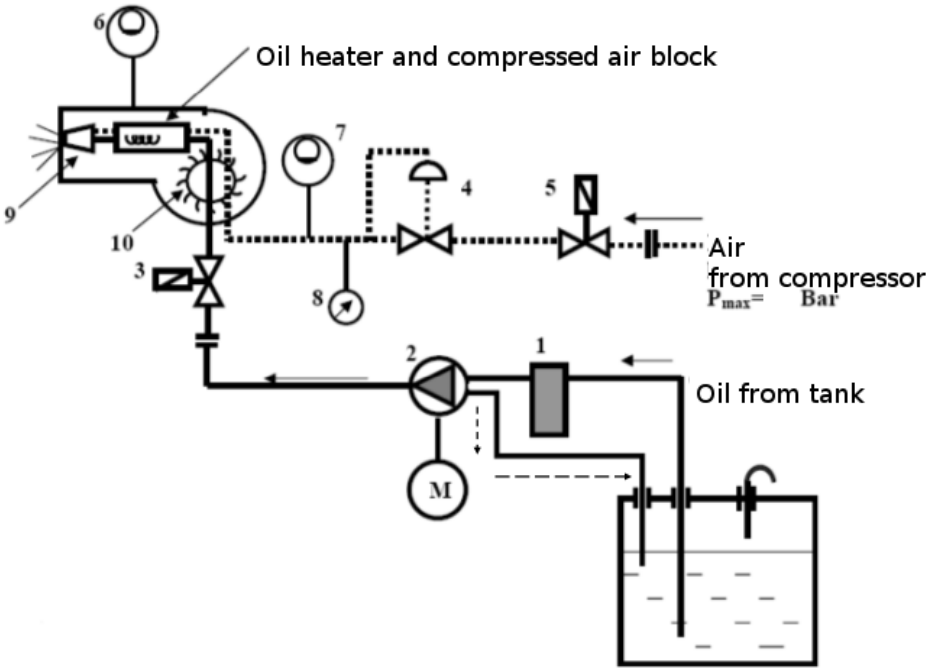


Fig. 8

Description of markings:

1. Oil filter
2. Fuel pump with motor
3. Oil solenoid valve
4. Spray air pressure reducer
5. Air solenoid valve
6. Differential pressure switch (turbine operation sensor)
7. Air pressure switch (spray air minimum pressure sensor)
8. Air pressure gauge
9. Spray nozzle
10. Burner fan providing combustion air

Chimney

The exhaust gas ventilation system is an important component of the entire heating system. For safety reasons, and to ensure proper operation of the burner and boiler, the chimney structure should be designed and built by persons properly authorised to do this. The construction and mode of execution of the chimney need to be in line with the relevant local provisions of construction laws in force.

Chimney line draught

In order to ensure proper operation of the burner, it is recommended that a chimney draught regulator be installed within the exhaust gas ventilation line. This regulator should be adjusted so that the underpressure in the combustion chamber during operation would not exceed the value of 0.1 mbar.

Exhaust gas temperature measurement

Exhaust gas temperature measurement should be done using a manual or electronic thermometer, or with the use of an exhaust gas analyser unit. The measurement is taken through an opening, diameter 8, executed on the exhaust gas ventilation duct, at a distance of double the duct diameter from the heating appliance.

The temperature sensor should be placed in the centre of the gas stream, where the temperature is highest. the measured temperature value should be between 160 °C and 240 °C. Above this range, chimney losses begin to increase and the device efficiency falls.

Basic adjustment procedures of the burner

The burner adjustment work should be done necessarily using results of analyses of the exhaust gases. Only in this way may it be guaranteed that the best values of combustion are ensured, at the same time adhering to a maximum purity of the exhaust gases, in order to protect the environment.
In order to execute the exhaust gas analysis correctly, it is necessary to have the following devices at hand:

- precise chimney draught sensor
- soot analysis pump
- carbon dioxide analyser
- exhaust gas thermometer.

All the measurement values should be recorded in the burner inspection form. The measurements need to be taken at the operating temperature of the heating appliance. In case of water-based boilers, the water temperature in the boiler must be at least 60 °C. A condition of achievement of proper measurement results is tightness of the boiler and the exhaust gas ventilation line. The measurement opening, diameter 8, should be made downstream from the heating appliance on the exhaust gas ventilation duct, at a distance of double the diameter of the duct, in which it is made

Spray air pressure setting

The spray air pressure should be set on the reducer, fig. 9, following the start-up phase. The correct air pressure value is 1.2 bar. This value is appropriate for the full burner power capacity range.

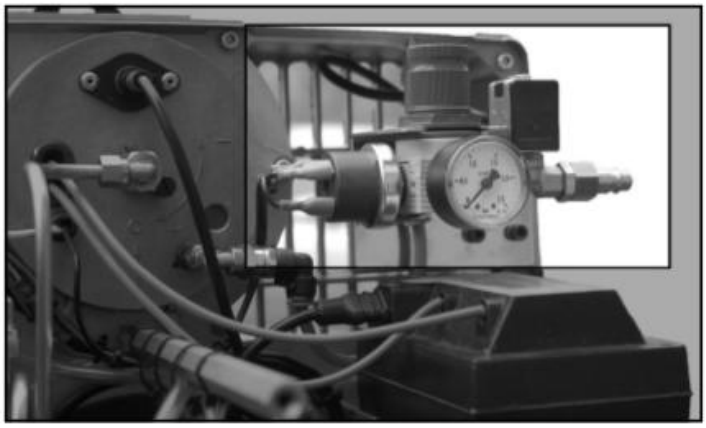


Fig. 9

Combustion air throttle setting

In every burner, depending on the type of nozzle used in it, the factory setting of the throttle controlling the air supply to the combustion chamber allows start-up of the burner. Precise adjustment should be made during the first start-up of the burner, taking into account measurements of soot and carbon dioxide.

A wrong setting of the air throttle may prevent the burner from igniting or cause it to work erratically.

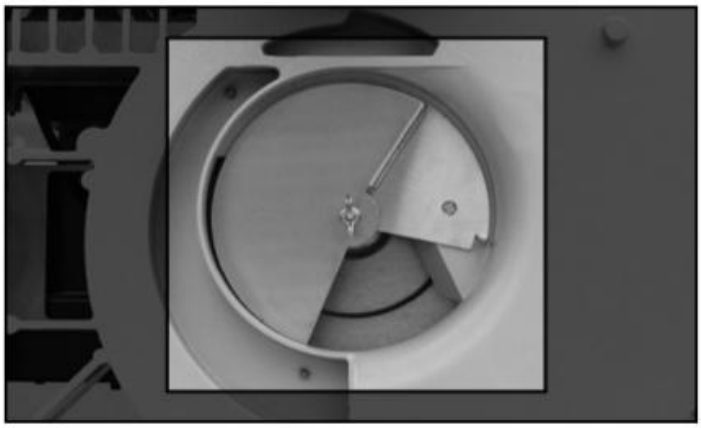


Fig. 10

Adjustment of the riser plate and the air flap

The plate and air flap settings permit the user to precisely control the mix. Factory settings should allow the achievement of a proper mix without the necessity to change them, using only the combustion air throttle, fig. 10.

It is not recommended to change the factory setting.

In case of necessity of changing the factory settings, follow the instructions below:

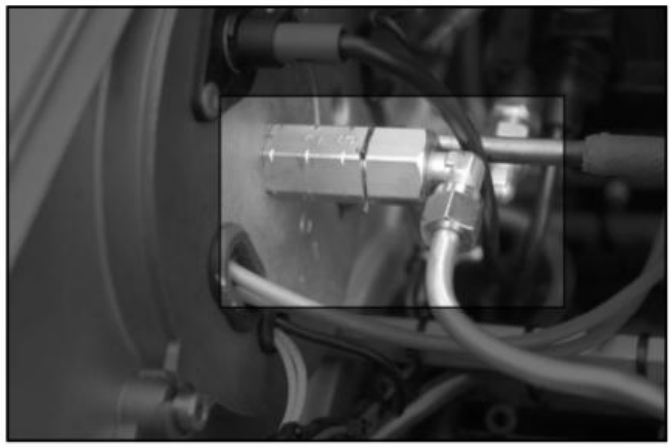


Fig. 11

Changing the plate position

The position is changed by screwing in or out of the bolt found on the right side of the regulator, see fig. 11. In order to determine the placement of the plate, the adjustment part has a scale describing the position. Position 1 denotes minimum extension of the plate, position 3 denotes maximum extension.

Change of placement of the combustion air flap

The air flap is adjusted using the adjustment screw, see fig. 12. Before the position is changed, loosen the counternut.

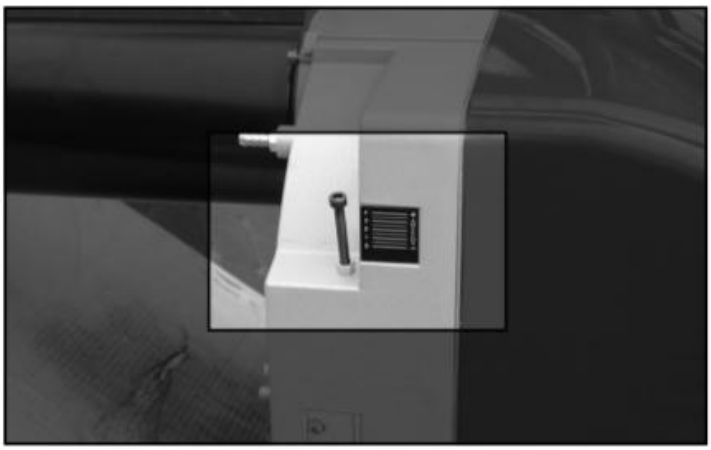


Fig. 12

Warning!
The exhaust gases ventilated to the atmosphere should be checked and analysed concerning their content twice during the heating period, or every one thousand hours of burner operation.

Control thermostat units

The function of the capillary thermostats is the maintenance of the imposed temperature of the individual heating blocks in the burner and its actuation as required.

Thermostat functions:
1. Nozzle rod temperature
2. Main block temperature
3. Control thermostat (burner initiation)

Thermostat settings

Pure fuel oil, waste and spent oil:
1 - 60 °C, 2 - 60 °C, 3 - 55 °C

Synthetic material fraction
1 - 40 °C, 2 - 40 °C, 3 - 35 °C

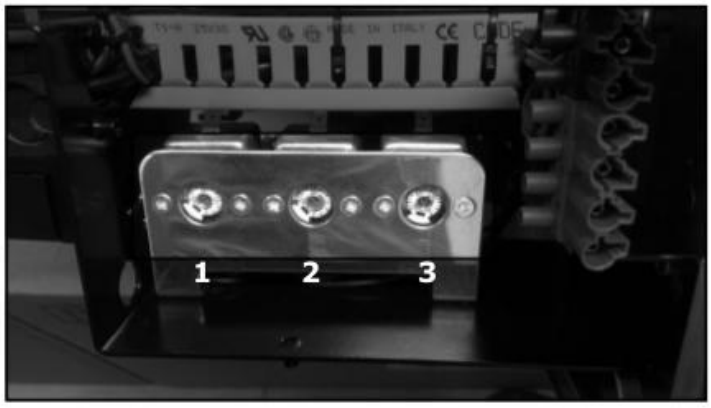


Fig. 13

Warning!
Thermostats are adjusted using a flat head screwdriver. Excessive temperature of the heating blocks may permanently damage heating components and prevent the boiler from operating altogether.

Burner periodic inspections

The MTX 400 and MTX 400 KTS burners are devices foreseen for continuous operation throughout the entire year, and do not require daily maintenance. However, due to normal wear of burner components, it is recommended to have service personnel maintain the appliances at least once per year before the start of the heating period. In case of burners operating all year long without a seasonal brake, service the burner following up to 2500 hours of operation. The fuel system requires maintenance in terms of cleaning of filters found in the fuel tank and the precision cleaning filter placed just upstream from the pump. The filter cleaning frequency depends on the type of fuel used for combustion. For light fuel oil (i. e. Ekoterm and similar), this time may be extended to several heating seasons. The manufacturer, despite this, recommends cleaning of filters before each heating period. In case of use of waste fuel, mineral oils or plant oils, filter cleaning is recommended every 700 hours of operation. Note the condition of used plant oils, whether they do not contain excess solids, as these shall cause the filter cleaning periods to shorten drastically. It is recommended to place a vacuum meter on the fuel filter clean side to control the filter cleanliness on a continuous basis, and will allow one to prevent emergency burner shutdowns. The usual maintenance procedures for the burner also entail checking the combustion chamber condition in the device, in which the burner operates. The combustion chamber condition lets one determine, whether the mix combustion process runs correctly. A wet combustion chamber or dark colouring of the walls all point to bad combustion of the mix, while a dry chamber with a beige hue covering it indicates a correct combustion process.

Emergency conditions:

Symptoms	Causes	Remedies
The burner does not start up, no indication of fault	Burner automatic unit failed	Replace burner automatic unit
	No power supply on burner plug	Replace fuse or damaged pins
The fan does not turn during the start-up cycle	Burner automatic unit failed	Replace
	Motor capacitor or fan motor damaged	
The fan turns, the burner locks in the deaeration phase	Burner automatic unit or photoresistor failed	Replace
	Photoresistor wiring faulty	
No fuel ignition following the start-up cycle, no electric arc	No ignition transformer power supply, transformer damaged, ignition wires broken or shorted, damage to insulation or contamination of electrodes, wrong electrode arrangement	Replace
		Adjust electrodes
	Low spray air pressure, below 0.7 bar	Adjust spray air pressure , fig. 9

Emergency conditions, continued

No fuel ignition following the start-up cycle with electric arc (no fuel in nozzle, fuel pump does not operate)	No pressure in compressed air system (compressor failure, closed ball cutoff valve)	Check compressed air line
	Air solenoid valve fault	Replace
No fuel ignition following the start-up cycle with electric arc (no fuel on nozzle, fuel pump operates)	No fuel in tank	Check fuel level
	Clogged general cleaning filter Clogged precision cleaning filter	Check and clean fuel filters
	Suction line contains air	Deaerate the fuel pump, locate the leak and remove
	Oil solenoid valve fault	Replace solenoid valve
	Nozzle clogged	Screw out and clean the nozzle
	Oil line in heater block clogged	Service burner
	Pump fault	Replace
No fuel ignition following the start-up cycle with electric arc (fuel is sprayed into combustion chamber)	Non-combustible substance in fuel (i. e. water, coolant or brake fluid)	Check fuel
	Bad configuration or contamination of ignition electrodes	Adjust
	Too low oil temperature on nozzle exit	Check and replace 'TC' thermostat
	Air-fuel mix ratio wrong	Adjust burner

Emergency conditions, continued

Mix ignites and detonates	Air-fuel mix ratio wrong, wrong arrangement or contamination of ignition electrodes	Adjust the burner, check whether the fuel does not contain petrol, thinners and other easily combustible or explosive substances
Burner works in impulses (flame disappears, unit restarts)	Clogged fuel system, fuel lines contain air	Clean, deaerate, tighten or replace components of the fuel system
Following start-up and ignition, burner shutdown and repeated start-up attempts	Too weak signal from photoresistor	Clean or replace photoresistor
	Bad burner adjustment Too little air (smoking flame) Too much spray air (flame is extinguished)	Adjust burner, check CO and CO_2 levels
	Too much combustion air (separation of flame from plate)	Clean or replace nozzle, or clean the plate
	Irregular flame shape	

WARNING!

Finding and repairing faults of the burner is very important for the health and life of the users. Always strictly adhere to occupational health and safety rules. The burner, following repairs, must be completely functional, checked and absolutely safe. In case of doubts, submit the burner to the manufacturer for appraisal and repair.

The diagram curve describes approximate values of pressure in the combustion chamber, proportional to the burner achieved capacity values. The values from the diagram were measured on a test bed system. Start-up resistance and burner operating resistance are dependent on the combustion chamber design, exhaust gas ventilation type and start-up load.
Precise values may in this regard be calculated for a particular installation only based on values from experience.