

used oil fired  
**MAC TYPE 17**  
**HOT AIR HEATING FURNACE**

----- SWW 0874-239 -----



# **INSTRUCTION MANUAL**

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# ***INTRODUCTION***

*Before starting to ignite and operate the MAC type furnace each worker should read carefully the instruction manual to get familiar with the furnace construction, its maintenance, fire precautions and to observe occupational safety rules.*

*This instruction manual should also be known to: the manager of the workshop and the owner of the plant in which the furnace has been installed.*

*In order to secure optimal usage of the furnace, extend the duration of its serviceability and reduce the costs to the maximum – the information contained herein should be observed.*

*We wish you a lot of warmth  
and  
a failure-free operation of the furnace*  
**MANUFACTURER**

## **TECHNICAL DESCRIPTION**

### **1. Intended Use.**

The MAC type heating furnace is intended for quick and cost effective heating up the workshops (particularly the automotive ones) as well as warehouses, small-sized halls etc. The approximate thermal power of 17 KW allows to heat effectively the rooms with the area of 100-150 m<sup>2</sup> and their approximate height of 4 m, that means with the volume of 450-600 m<sup>3</sup>.

### **2. Fuel.**

The MAC type hot air heating furnace equipped with a vapourising burner is adapted for burning fuel oils in an environment friendly manner.

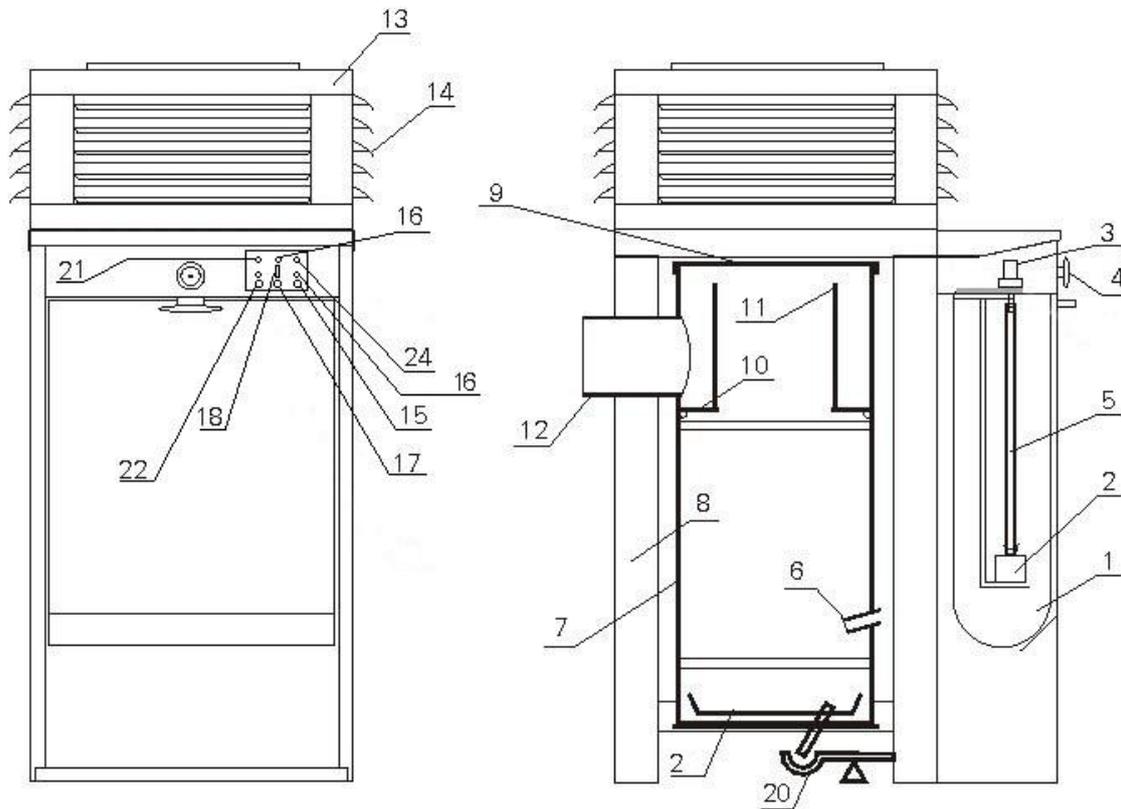
### **3. Description of the furnace construction.**

In the frontal part of the heating burner there is an oil tank (1) with the approximate capacity of 25 litres, in which an oil gear pump with a filter is immersed (2). An electric motor (3) drives the oil pump (2) by a driving tube (5). The oil pump (2), through a set of the tubes ended with an open nozzle (6), supplies oil to the boiler (7), in which the oil is being burnt. During boiling, oil evaporates in the boiler bottom part, whilst in the upper part the oil vapours are completely burnt up. The amount of the oil supplied to the burner is controlled by the knob (17). Switching on the furnace is done by pressing the switch (15), and the diode (15) lights when the furnace is connected to the power. On the furnace housing (8) a fan tower (13) is mounted, inside which a fan is installed to draw air from above the furnace and through the air inlet grating (14) thus forcing air movement, to mix the hot air with the cold one and to distribute it at the bottom. Therefore, the entire room gets warm quicker.

The heating boiler is protected against overheating by a thermostat automatically limiting inflow of oil to the boiler, and by the LED diode which shows the level of furnace heating.

The ventilation fan is automatically switched on when the temperature of the upper part of the furnace reaches 50°C, and it is switched off after cutting off fuel and after cooling down the fan to 35°C. The exhaust gases are moved by a round 130 mm smoke tube beyond the room.

## Schematyczny rysunek pieca z wyszczególnieniem części składowych



- |                                                          |                                                  |
|----------------------------------------------------------|--------------------------------------------------|
| 1. Oil tank – for 24 hours with approx. capacity of 25 l | 13. Fan tower                                    |
| 2. Gear pump with a filter                               | 14. Air inlet grating                            |
| 3. Electric motor with gear motor                        | 15. Furnace switch on/off                        |
| 4. Lock opening the tank                                 | 16. LED diode signaling switching on and off     |
| 5. Tube – driving shaft                                  | 17. Oil dosing knob                              |
| 6. Nozzle                                                | 18. Temperature control diode                    |
| 7. Heating boiler made of steel sheet                    | 19. LED diode signaling overheating              |
| 8. Furnace housing                                       | 20. Protection against oil overfilling - “spoon” |
| 9. Furnace cover – made of steel                         | 21. LED diode signaling oil overfilling          |
| 10. Secondary combustion ring – made of cast iron        | 22. Thin oil switch                              |
| 11. Secondary combustion tube - made of steel            | 23. Hearth                                       |
| 12. Chimney outlet tube                                  | 24. Diode FAILURE                                |

On the forehead of the furnace appear :

**Nr 4:** the bolt opening a fuel tank

**nr 15:** launch button described as START and STOP

**nr 16:** LED diode lighting with red colour when the furnace is connected to the AC power. It turns into green colour when START button is pressed and when the engine of the pump turns on (**nr 5**)

**Nr 17:** knob regulating oil consumption – higher revolution level increase the amount of oil given to the hearst

**nr 18:** furnace heat level diode indicator – the more green marks on the scale, the warmer is the furnace. When one or two red marks enlighten, the amount of given oil has to be reduced by potentiometer(17). When third red mark appears and whole indicator flashes, this is the warning that the furnace is overheating and emergency exclusion can take place. In such situation red diode(19) will enlighten above the temperature indicator and the furnace can be started after it is completely cooled down.

**Nr 19:** red LED diode signaling overheating and emergency disconnection – the engine of the pump does not work – the furnace is impossible to start until the hearst is cool and the diode is off.

**Nr 21:** red LED diode signaling oil overfilling. When it enlightens, it switches off the pump engine simultaneously in the case of filling the spoon with oil (**nr 20**). The load of oil in the spoon automatically blocks the furnace running.

Overfilling occurs when:

- there is no fire and the engine of the pump will not be switched off
- oil comes to the hearst quicker that it is burnt. It happens when too much oil is given to the cool furnace.

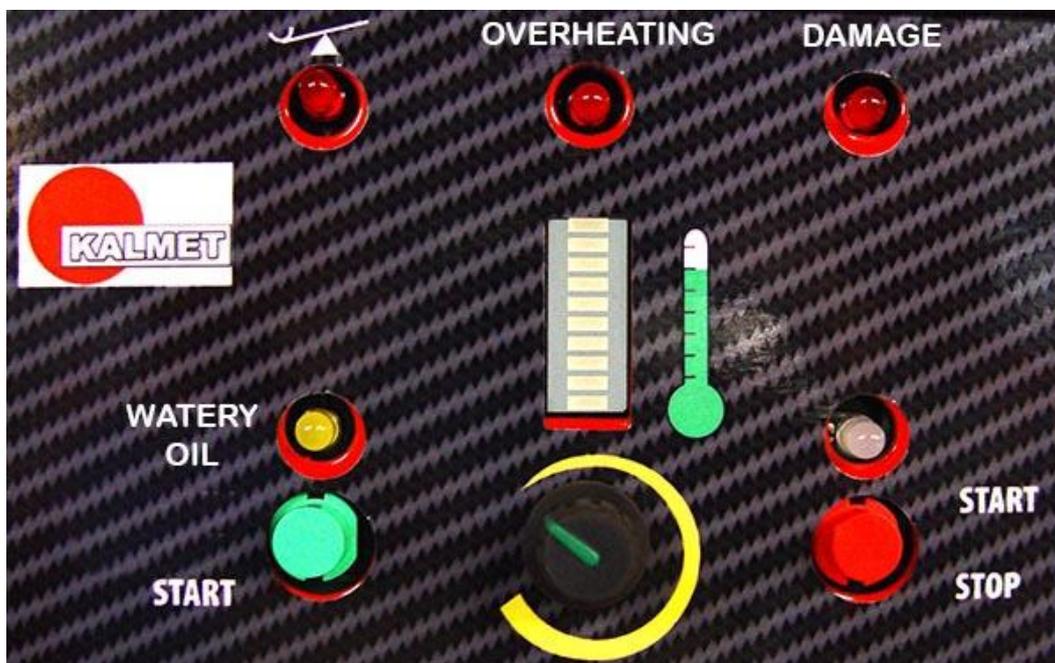
**Nr 22:** Button to switch the mode to “watery oil”

Watery oil – the pump works on faster revolutions (petroleum, fuel oil)

Thick oil – the pump works on slower revolutions because thick liquid seals and increases efficiency of the pump.

In both cases the potentiometer regulates the efficiency of the pump.

**Nr 24:** diode DAMAGE signalizes that the pump and the engine were stopped because of pump contamination.



#### 4. Technical and energy parameters of the fuel oil fired MAC type furnace.

<b>Power (KW)</b>	<b>17 KW max 25 KW</b>
<b>Power range (KW)</b>	<b>8,0 - 17,0 max 25 ( Do not use MAX position for a long time – it can cause deformation of the furnace )</b>
<b>Fuel consumption (l/h)</b>	<b>0,8 - 1,8 (max 2,8 l)</b>
<b>Chimney flue diameter</b>	<b>130 mm</b>
<b>Furnace dimensions:</b>	<b>Height mm 1250 widht mm 600 depht mm 750</b>
<b>Furnace weight</b>	<b>approx. 65 kg</b>
<b>The furnace is fed by 230V (20W)</b>	

#### 5. Furnace installation.

This operation is to position the furnace in an arbitrary place of a room and to provide the approximate chimney draft of 19.6 Pa (2 mm H<sub>2</sub>O). The exhaust gases may be let out by means of a chimney tube with the diameter of 130 mm – it is recommended to apply 5 to 8 m long tube inside the room to be warmed up, as it emits a lot of warmth. It should go outside in a vertical position to the minimum height of 4m, however not less 1 m above the roof.

If there is a need to connect the chimney directly, then it is to be done through an **exchanger** in order to take the heat from the exhaust gases. Such an exchanger may be purchased additionally from the manufacturer of the furnace.

#### 6. Operation and maintenance

Occupational safety and health:

- the furnace should be installed in a place assuring comfortable access of an operator,
- the 230V electric socket supplying the furnace must be equipped with a grounding pin,
- the operator should read carefully this instruction manual,
- it is prohibited to use petrol, solvents or other explosive combustion agents to start fire,
- do not start fire in the hot furnace, as it may lead to an explosion of the oil vapours (wait till the furnace cools down),
- it is disadvised to disconnect the furnace from the power line, as although the oil dosing pump is switched off, the fire still is burning till all remainders in the boiler are completely burnt up, and the generated heat may damage the thermostat and the idle fan,
- do not store any flammable materials near the furnace, such as cloths, oils, solvents, paints, etc.

## Furnace cleaning:

The furnace is to be cleaned by removing the combustion process remainders from the cast iron pan and from the boiler bottom every two or three days. The tube (6) is to be removed every few days (as needed) and cleaned by removing the coke collected inside and by drilling with a 10 mm bit. Also the tank and the pump with a filter installed in it should be cleaned two or three times a heating season.

It is a frequent phenomenon that some water is collected at the bottom of the tank. If it reaches the pump level, it will cause problems to make fire burn inside the furnace. The water should be removed.

## 7. Starting fire and furnace regulation.

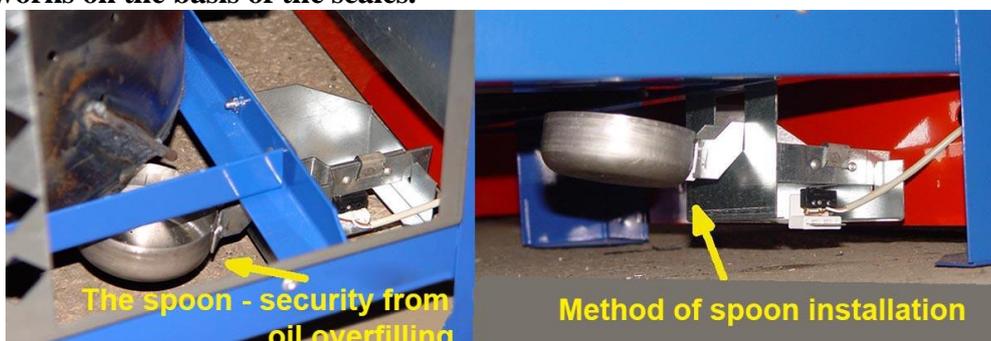
Actions done when starting fire:

- connect the furnace to the AC power, the red LED diode will light up
- deflect the fan tower (13),
- remove the cover (9),
- pour 100-150ml of the oil into the hearth pan and throw a burning wick made of a piece of cloth moistened with oil into the boiler inside which will work like a candle wick

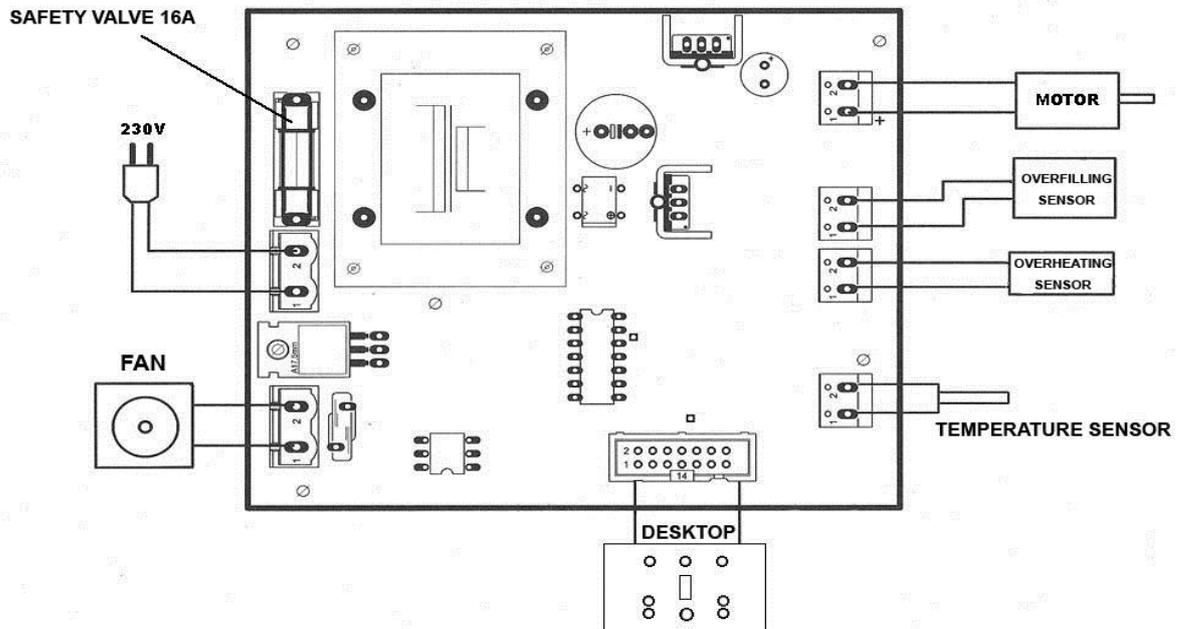
**ATTENTION! DO NOT USE GASOLINE, DENATURED ALCOHOL, PAINTING SOLVENT AND OTHER SUBSTANCES WHICH MAY CAUSE EXPLOSION. NEVER LIGHT A FURNACE WHEN IT IS OFF WHILE BEING STILL HOT!**

- place the boiler cover onto and move the fan tower down. Wait 5-8 minutes for warming the furnace and press START-STOP button(15) – the red diode(16) changes from red to green colour and the pump will start to give the oil to the hearth. Set the potentiometer(17) on  $\frac{1}{4}$  of the scale. When the oil is watery (petroleum or fuel oil), use the button(22) to fasten revolutions – the diode above the button will light up. Watery oil needs faster revolutions of the pump in aim to balance oil reversing between pump rotors. Wait a couple of minutes as burning becomes stable and set the potentiometer in such position, so that the furnace will not become overheated (the heating boiler must not be in a colour of dark red which corresponds with the temp. 600-700oC, but also it shouldn't be in a lighter colour than red, because it can cause a deformation or of the boiler or getting it burned).
- Excessive heating up will cause premature burning off the inserts. Giving off soot indicates that the flow of the oil to the hearth must be reduced, so that it will not overflow the spoon of a sensor(20) and so that the chimney tubes will not get blocked by the soot (soot is an effect of incomplete combustion of the oil).
- Enlighting DAMAGE diode means that the pump stopped as a result of a rotor blocked by dirt which reached the pump – the pan, the pump and the oil filter have to be cleaned.

**Attention! The method of installation of the “spoon” (overflowing sensor) which works on the basis of the scales.**



## 8. Schemat Aplikacyjny Sterowania Piecem



## 9. Final remarks.

- The MAC type hot air heating furnace is not subject to the regulations of the technical supervision.
- Neither it is subject to the safety mark certification obligations – pursuant to the Decree of the Director of the Polish Centre for Testing and Certification dated 28 December 1995 – the Polish Monitor No. 28, item 295.
- The MAC furnace is provided with a power engineering certificate issued by the Ministry of Economy – Decision No. OW/3400/839/WBB dated 15 December 1997.
- The fire protection and sanitary safety are guaranteed if observing the requirements of correct operation and maintenance - the burning products remain inside the furnace or they are exhausted by means of the smoke tube and they cannot get through to the room being warmed up.
- The measurement results confirm very good burning quality and small emission of CO, NO<sub>x</sub> and SO<sub>2</sub>. The emission rate meets the requirements provided for in the EEC Directive, regarding the emission limits since 1995, as well as the admissible values specified in the Decree of the Minister of Environmental Protection (Journal of Laws of 14 March 1990, item 92)
- The radioelectric tests prove that the requirements of the standard PN-69/E 02031 are fulfilled – Report No. 22/3/97 issued by the National Radiocommunication Agency in Bydgoszcz.



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