



**Instructions for Use and Installation of Cast-Iron Boilers**

**PROTHERM 20(30,40,50,60) KLO**  
**"BEAR" Version**

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## Instructions for Use

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## Definitions

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These Instructions indicate Warning, Caution and Comment to emphasise information or instructions we consider important. The indications are used along the following rules:

**Warning:** Information or instructions that may result in hazardous situations if not followed.

**Caution:** Information or instructions that may damage equipment or its parts if not followed.

1 **Comment:** Information or instructions that can simplify or facilitate maintenance, or important parts of the text that should be emphasised.

# Dear Customer,

You have become an owner of a cast-iron **PROTHERM KLO** boiler, for natural gas or LPG. We believe it will serve you to your full satisfaction – certain minimum requirements must be fulfilled to that end. That is why we are asking you to study and follow these instructions carefully.

Please, keep the following rules in mind:

1. The boiler and all accessories must be installed and used in compliance with the design, the applicable laws, technical regulations and the manufacturer's instructions.
2. The boiler can only be installed in the type of environment for which it is designed, and which is properly ventilated (cf. Boiler Installation below).
3. Only service centres authorised by the manufacturer are allowed to put the boiler into operation after installation.
4. In case of defects, call a service centre authorised by the manufacturer – incompetent intervention can damage the boiler (and/or the accessories)!
5. The service centre's employee who will initiate the boiler operation after the installation shall instruct the user about the boiler, its parts and operation.
6. Check to make sure the supplied boiler type complies with the expected manner of use.
7. If you feel uncertain about any activities related to the boiler operation, look up and study all relevant information in these instructions, and follow the recommended procedure.
8. Do not remove or damage any labels or markings on the boiler.
9. The boiler complies with all Czech applicable regulations. If it is to be used in another country, deviations in the regulations have to be identified and resolved.
10. When the life cycle of the boiler, or its parts, has expired, they should be disposed of in an environmentally friendly manner.

## 1. Boiler Characteristics

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The boiler is designed for heating up HCW (heating-circuit water) and, in combination with an external reservoir, for heating up DHW (domestic hot water). The types in this series have codes **PROTHERM 60 KLO, 50 KLO, 40 KLO, 30 KLO, 20 KLO**, both for natural gas and LPG.

The types are distinguished by power output (1<sup>st</sup> stage – full power, 2<sup>nd</sup> stage – reduced power), as shown in the table below:

Code	Rated output 1 <sup>st</sup> stage [kW]		Reduced output 2 <sup>nd</sup> stage [kW]	
	Natural gas	LPG	Natural gas	LPG
<b>20 KLO</b>	17	16	11.9	11.2
<b>30 KLO</b>	26	24.5	18.2	17.2
<b>40 KLO</b>	35	33	24.5	23
<b>50 KLO</b>	44.5	42	31	29
<b>60 KLO</b>	49.5	48	–	–

Switching between the stages (only for 20, 30, 40, 50 KLO) is done by the user (notation: one or two flames) on the control panel.

The HCW pump is thermostat-controlled – it is activated when the HCW temperature gets to the value set on the thermostat. Thus the heating-up time is reduced after a prolonged break in operation.

The boiler is able to "work in cooperation" with an external DHW reservoir. The standard equipment makes it possible to simply connect necessary electrical cables from the "cooperating" equipment to the boiler's terminal board.

Proper DHW function requires an 80- to 200-litre reservoir, with a thermostat and a switching contact.

**It is an absolute necessity, for combined heaters (HCW+DHW), to exclude bringing "foreign" voltage to the boiler – i.e., the thermostat contacts must be separated from the heater's internal electrical components.**

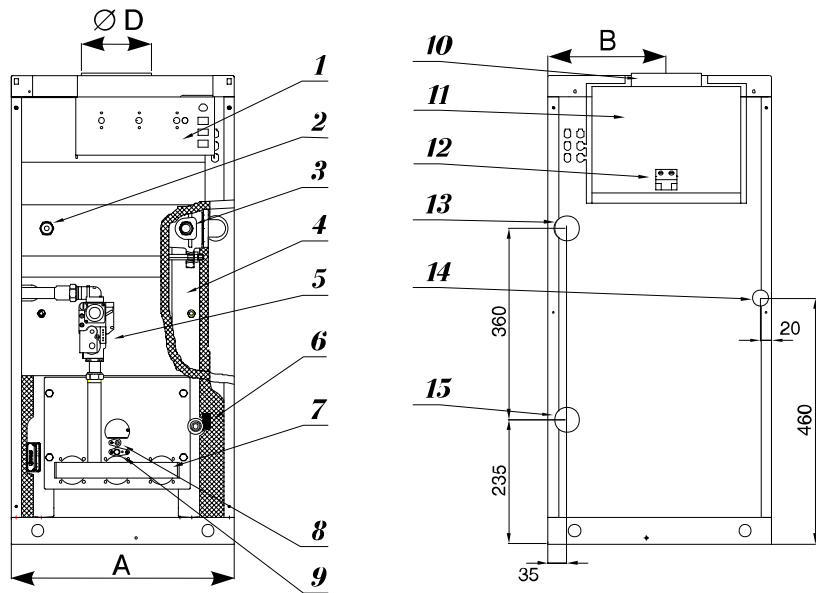
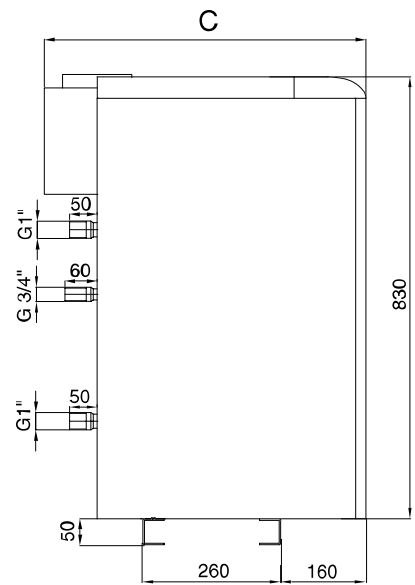
The DHW reservoir is heated by a separate circuit, controlled by a three-way distributing (not mixing!!!) valve. The valve must be equipped with an electric switching contact (applicable only to 20, 30, 40, 50 KLO), which is connected if the valve's motor is not active (gets no voltage).

The boiler's manufacturer supplies both DHW reservoirs (100, 150, 200 l) and suitable three-way distribution valves.

- 1 DHW heating takes preference over the heating circuit – in other words, the heating circuit water is only heated up after the DHW has reached the required temperature. Hence, if you set the DHW temperature to unusually high values (more than 50-60°C), the heat-up time is too long and heating of the house/flat may be erratic. The same applies to setting the boiler to a too low power output or a too low value of the HCW temperature.

The boiler can only be used for the purposes specified in these instructions.

TYPE	A	B	C	∅D
20	335	180	600	130
30	420	222	600	130
40	505	265	600	150
50	590	307	620	180
60	675	350	620	180



**Fig. 1 Basic and Connection Dimensions**

1. Control panel;
2. HCW pressure measuring point;
3. HCW temperature measuring point;
4. Boiler cast-iron body;
5. Combined gas armature;
6. Water filling and discharging;
7. Burner plate (distribution to nozzles);
8. Ionisation electrode;
9. Compound ignition electrode;
10. Flue-gas outlet;
11. Draft damper;
12. Safety thermostat;
13. Outgoing HCW;
14. Gas supply;
15. Incoming HCW.

## 2. Boiler Accessories

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A **PROTHERM KLO** boiler consists of the following parts:

1. Cast-iron boiler body with thermal insulation and water-connection pipes;
2. Burner plate, including gas supply and ignition part;
3. Flue-gas duct, with draft dampener and SKKT thermostat;
4. Boiler casing, control panel, and terminal board;
5. Boiler body base.

**Cast-iron boiler body** consists of elements and serves as a combustion chamber (including the flue-gas outlet) and water chamber (including the water ways). There are side elements ("Left" and "right") and middle (of one type). The elements are put together to create a body of the corresponding size (of both the combustion and water chambers). A completed body is equipped with water pipes for connection of water, insulated to prevent heat radiation, and provided with fixtures for thermostat sensors and on the legs, fixtures for mounting on the base.

**Burner plate** is equipped with part of gas piping, burner tubes, and ignition equipment. Depending on the boiler (and body) size, it includes between 2 to 6 burner tubes and the gas pipe, which leads to the combined gas armature. This in turn regulates gas supply to the boiler, depending on the required and actual parameters (i.e., the state of the boiler and the heating circuit); the gas pipe leading out of the armature is part of the burner plate, with 2 to 6 nozzles, (one per each burner tube). Gas is ignited by an electric spark.

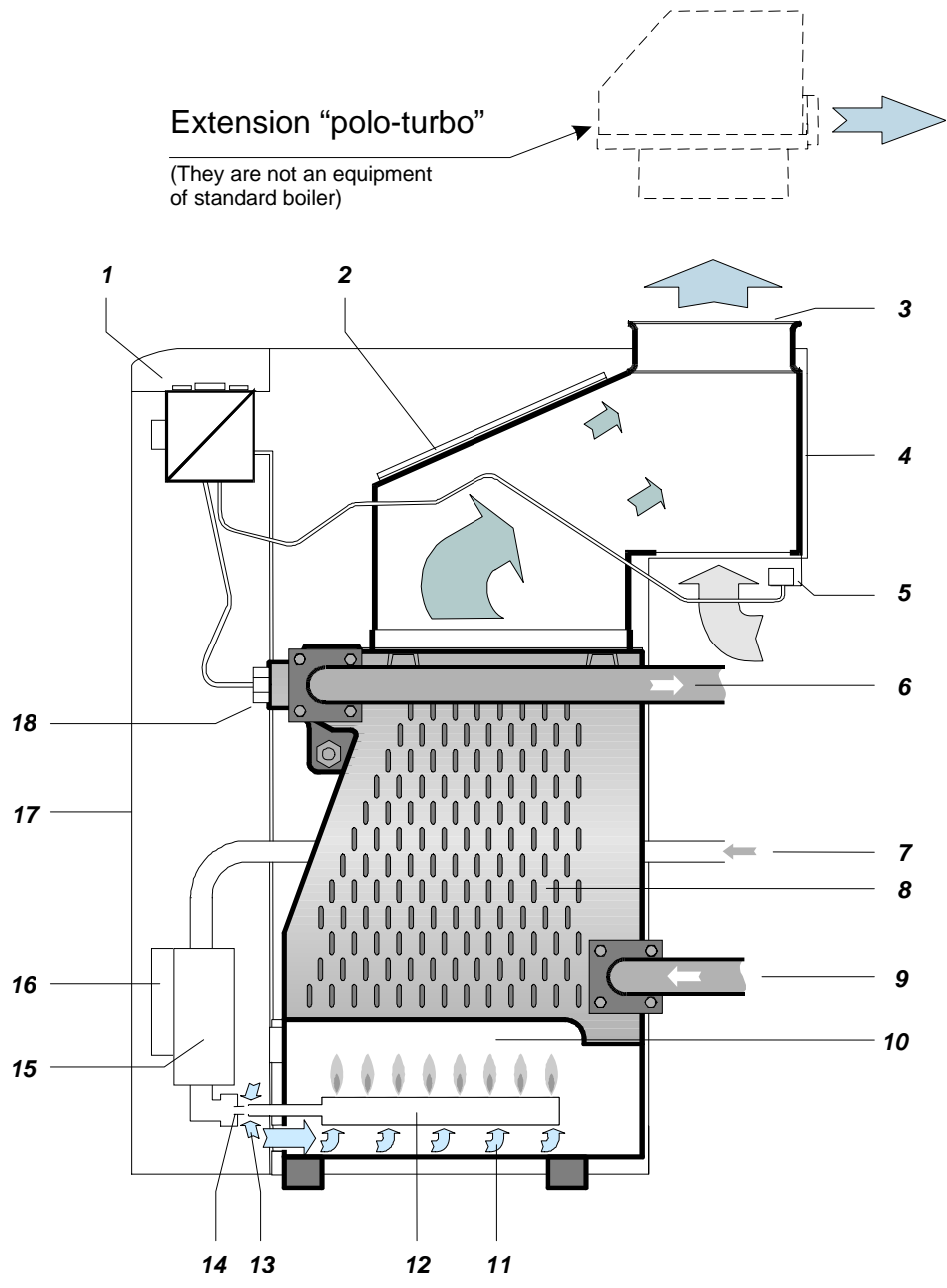
**Flue-gas duct** contains a draft dampener and flue-gas outlet (to which the flue duct is connected). It is equipped with a removable cleaning cover, which is accessible after the top casing panel of the boiler is removed.

The SKKT chimney-draft control system monitors flue-gas temperature in the duct. If the draft is worsened, the temperature rises, and the thermostat inserted in the duct will switch off the boiler (shut down gas supply to the boiler).

**Boiler casing** consists of covers, fixed back wall and side panels, removable front panel and removable top casing panel. The control panel is situated at the upper part of the boiler.

**Boiler body base** consists of two brackets connected to the bottom of the body, supporting the casing weight. It is also provided with holes for bars (approx. 1/2"), which make handling of the boiler possible without a pallet, if a sufficient number of people are available.

The base also includes reflexive sheet, which substantially reduces heating of the floor under the boiler. The reflexive sheet is inserted from the side into the base brackets, exactly under the cast-iron body; its bent edges must be directed downwards along the brackets.



**Fig. 2 Boiler Working Diagram**

1. Control panel;
2. Cleaning cover;
3. Chimney flange;
4. Flue gas duct with draft dampener;
5. SKKT chimney-draft control system;
6. Outgoing HCW;
7. Gas supply;
8. Cast-iron elements;
9. Incoming HCW;
10. Combustion chamber;
11. Secondary-air supply;
12. Atmospheric-pressure burner;
13. Primary-air supply;
14. Burner nozzles;
15. Combined gas armature;
16. Automatic ignition equipment;
17. Boiler casing;
18. Space for sensors of thermometer plus operational and emergency thermostats.

### 3. Boiler Assembly

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#### 3.1. General Rule

A **PROTHERM KLO** boiler can be put into operation only by an authorised installer. A network of the manufacturer's contractual service centres provides installation, maintenance and repairs.

#### 3.2. Connection to Gas Supply

**PROTHERM KLO – ZP** types are designed for natural gas, with 1.8 kPa (18 mbar) pressure in the distribution network; the calorific value of natural gas is about 9 to 10 kWh/m<sup>3</sup>. The user's gas piping and gas meter must be sufficient for all gas appliances used on the premises. The pipe branch supplying the boiler must have the diameter corresponding to the boiler size, but a diameter one degree higher is recommended.

**PROTHERM KLO – P** types are designed for LPG; the calorific value of natural gas is about 12.8 to 13 kWh/kg. Operation using cylinders would be problematic, due to both sufficient volume and handling of the cylinders; hence a prerequisite for the operation is an installation of an LPG tank near the heated premises and filling of the tank by an organisation authorised for such activities.

Sufficient supply of LPG from the tank (and other gas appliances, if any) is part of the design and supply of the tank. For LPG boilers, a pressure-control valve must provide the pressure of exactly 3.0 kPa (30 mbar).

#### 3.3. Combustion Air Supply

Stationary cast-iron **PROTHERM KLO** boilers take combustion air from the space – the air in the room must not contain dust or aggressive or flammable substances (vapours of glue, paint thinner, etc.) There must be the possibility of direct ventilation of the space, at a minimum volume of 0.8 m<sup>3</sup> per each kW of the boiler's power output. If direct ventilation is impossible, the required volume is 2 m<sup>3</sup> per each kW of power output. Direct ventilation is by ventilation openings to the outside air, or to neighbouring rooms that can be ventilated to the outside. Insufficient space is solved by ventilation openings of sufficient size.

Gas appliances with flue gas removal to chimneys must not be in rooms in which negative air pressure is created by ventilation fans.

#### 3.4. Flue Gas Removal

The boiler's flue gases are led to a chimney with continuous draft, at least 2 Pa. Connection to the chimney is by a flue-gas duct, whose diameter corresponds to the outlet on the boiler (depending on the boiler size). The duct is not included in the delivery.

**No elements reducing the draft (such as various exchangers for using the residual heat) are allowed to be inserted in the flue-gas duct.**

Installation of both the boiler and the flue-gas duct must comply with applicable standards. The standards' requirements prevent appearance of adversary effects, such as excessive cooling of the flue gases, penetration of chimney wall by humidity, and variability of chimney draft, which would affect the boiler operation in an undesirable manner.

An extension, **PROTHERM PT 20 (30, 40, 50) POLO – TURBO**, can be used for forced removal of flue gases from **PROTHERM 20, 30, 40, 50 KLO** boilers. This makes it possible for the boilers (with the exception of the **PROTHERM 60 KLO** type) to be used on premises where a chimney cannot be used. The extension is directly connected to the boiler's flue-gas outlet. The extension fully replaces a chimney, for maximum length of the flue-gas duct up to 10 equivalent metres (1 equivalent metre: 1 m of straight duct or one 90° elbow).

Only authorised organisations may install the extension on a boiler and start its operation. Safety regulations and precautions must be adhered to when servicing the extension connected to the electric grid, even if switched off!

#### 3.5. Requirements for Heating Water Quality

**PROTHERM KLO** boilers are designed for water pressure up to 400 kPa (4 bar).

Water for filling and replenishment must be clear, colourless, without suspended solids, oil or chemically non-aggressive substances; the water mustn't be acidic (its pH must be above 7) and the carbonate hardness must be as low as possible.

Sodium phosphate or chelating agent may be added to the water for filling.



When filling the system with water, perfect purging of air in both the boiler and the heating circuit must be carried out. Depending on the water composition and the expected quantity of sludge, cleaning the boiler of sludge is recommended about a week after commencing operation.

- 1 Installation of a sludge separator is recommended in the incoming branch of heating water. The design of the separator should enable regular removal of sludge without necessity to discharge large quantities of heating water. The sludge separator can be combined with a filter; however, a filter itself is not a sufficient protection. Both the filter and the separator should be regularly checked and cleaned. The warranty does not cover mechanical defects caused by foreign bodies and impurities (cf. the Guarantee Conditions).

### **3.6. Anti-Freeze Mixtures**

The boilers are not designed for anti-freeze mixtures (even if water with prescribed parameters were used for preparation of such mixtures – care is necessary – chemical reactions between anti-freeze agents and the water-treatment agents can have adversary effects!)

All anti-freeze mixtures have the following undesirable features:

- a) Reduction of the heat transmission coefficient (thicker laminar film on internal walls) - up to a 20% reduction;
- b) Volume thermal expansion of mixtures is higher than that of water (for mixtures about 10%, water only 3 – 4%)
- c) The mixtures deteriorate in time, their anti-freeze resistance decreases as thy "age."

Last but not least, dealing with large quantities of chemicals is complicated. Most substances are not allowed to be discharged to the sewage system, the "harmless" deposits in the heating systems may get activated, etc. It is therefore necessary to consider the necessity of their use.

In general, it is always better to use anti-freeze mixtures than to let the system freeze – but the manufacturer is not liable for any defects implied by such use.

### **3.7. Heating System – Properties and Filling**

The boilers are connected to the heating circuit (G 1") and gas supply (G 3/4") pipes so that the pipe fixtures on the boiler should not be affected by any pressures or tensions. The fixtures on the boiler have outside (male) threads.

- 1 Closing valves are recommended to be installed on the pipe branches connected to the boiler – otherwise the water would have to be discharged from the heating circuit if repairs are needed.

The heating circuit must be designed so that the heating water is allowed to circulate through at least one radiator all the time.

The boiler itself is not equipped with an expansion vessel or safety valve – hence it can only be connected to heating systems that comply with the corresponding standards and regulations.

The boiler can be installed in systems with either open or closed (pressurised) expansion vessel – if the open expansion vessel is used, however, the temperature settings of the emergency thermostat must be adjusted and the range of the heating-water temperature must be restricted – only authorised service centres are authorised to adjust these settings!

The water level in an open expansion vessel must be correct (between the minimum and maximum operational limits). Closed expansion vessels must be adjusted during the water filling, depending on the heating circuit parameters.

The boiler is equipped with a filling/discharge valve. When filled, the system must be properly purged.

The boiler may be connected to the heating circuit by flexible elements (hoses) during reconstructions, if necessary because of the layout, etc. Such hoses must have parameters suitable for the purpose, should be as short as possible, protected from damages caused by mechanical load and chemical agents, and replacement must be arranged always prior to the end of the life-cycle and/or deterioration of their parameters (according to their manufacturer's instructions).

- 1 Prior to the final assembly, the heating-circuit pipes should be flushed by pressure water, several times. For older circuits (that have already been in use) the flushing stream direction must be opposite to that of the heating water.

### **3.8. Location of Boiler**

If there are any special requirements concerning transportation of the boiler (such as preventing the covers from damage when the boiler must be carried through narrow spaces), the boiler may be partially disassembled.

Sufficient clearance space must be provided around the boiler to enable manipulation of the boiler and its accessories, both when being installed and during operation.

The boiler is put on the floor (or a special base plate). The floor must have at least usual load capacity and must not be slippery. The area at the boiler must be dry-cleaned (such as vacuum cleaning). The boiler must not stand on a flammable base – if the floor is flammable, a special flameproof, thermally insulating base plate must be used; its dimensions must be, in all directions, at least 100 mm larger than the floor projection of the boiler.

The boiler with the casing needs a doorframe clearance width of at least 65 cm.

The following clearance distances are prescribed:

- 100 mm from flameproof to moderately flammable materials;
- 200 mm from flammable materials (such as chipboard, polyurethane, polystyrene, polyethylene, expanded PVC, synthetic fibre, cellulose, asphalt board, rubber, etc.).

The boiler is designed for operation in a normal environment (temperatures between +5 and +40°C, humidity up to 85%, depending on the temperature).

**The boiler must not be installed in rooms with a bathtub, or in bathrooms, washing areas and shower rooms, in zone 0, 1 or 2. It cannot be installed in zones 3 in which water streams are used for cleaning (such as bathhouses, shower and washing rooms in schools, factories, sporting facilities, public facilities, etc.)**

If the boiler is installed in allowed zones, the relevant standard also requires adequate protection from electric shock.

The boiler must not be installed in an environment in which the burner tubes could be clogged with impurities or biological factors (such as small rodents, etc.).

In practice, situations may appear in which the users must apply necessary precautions:

- a) Preventing the boiler from switching on (also accidental) when inspecting the chimney, flue-gas duct, water and gas piping – i.e., electricity supply to the boiler must be stopped in addition to using the boiler switch (e.g., by unplugging);
- b) Stopping the boiler whenever flammable or explosive vapours appear (even if temporarily) – such as vapours of flooring glue, paints when surface finishing, gas leaks, etc.);
- c) If it is necessary to discharge water from the heating system, it must not be dangerously hot;
- d) If there is a stoppage of the heating system (boiler or circuit) which might lead to water leak from the boiler exchanger, or if the exchanger is filled with ice, no attempts to start the boiler should be made until normal operating conditions prevail.

### 3.9. Electric Connections of Boiler

Electric connection of the boiler to the grid is by three-wire flex and plug. The socket for the plug must comply with the relevant standard and have the grounding pin (connected to a PE or PEN cable (yellow-green)).

The boiler must be connected to the protective grounding wire; the plug in the socket must always be accessible without obstacles.

Use of adaptor plugs, extension cords, etc. is prohibited. The boiler is protected by a tube fuse (T 1.6 A / 250 V), installed under the front cover panel.

Only a person with adequate electrical-engineering qualifications can be allowed to install the socket and the thermostat (thermostat installation requires utilization of the boiler's internal electric cabling); the same requirements apply to servicing the electric part.

**Before any work commences on the electric part, the boiler must be unplugged.**

Only no-voltage thermostats or regulators can be used for regulating the boiler, i.e., they must not bring in any foreign voltage. A specialised service centre should assess suitability of a particular regulator.

### 3.10. Regulator Connection

There is a terminal board in the boiler, which is under the control panel. A room thermostat with no-voltage contact switch is connected to the boiler by a power cable. If a regulator requiring 230 V supply (bimetal with warm-up resistor) is used, it must be connected by a three-wire power cable to the boiler. The boiler manufacturer is able to supply suitable regulators, if required.

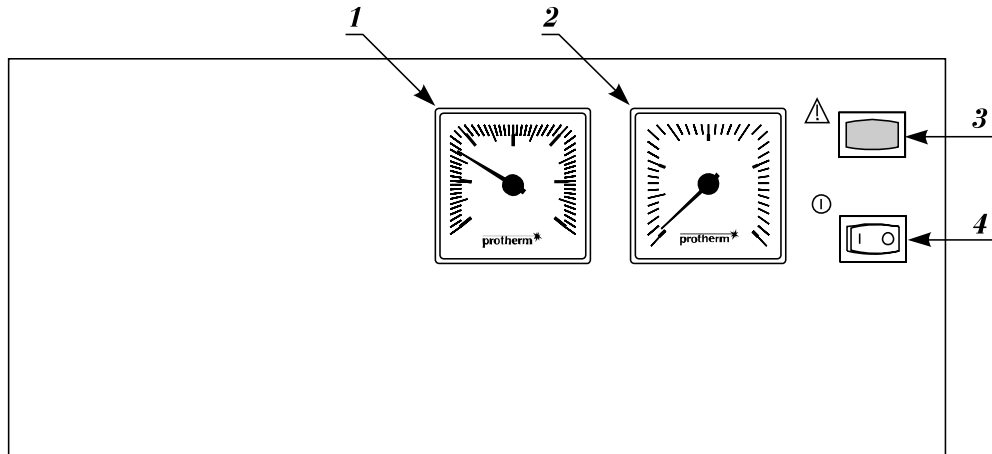
## 4. Description of Controls

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The controls and indicators are shown in diagrams of the control panels in Figures 3a and 3b below.

There are two control panels – one of them horizontal, under the plastic cover in the top panel, the other is vertical, under the front panel.

### 4.1 Horizontal Control Panel



**Fig. 3a Horizontal Control Panel**

- 1 - Thermometer
- 2 - Pressure gauge
- 3 - Emergency status indicator
- 4 - Main switch

**Thermometer, pressure gauge** – temperature and pressure of the heating water;

**Main switch** – switches on/off electric power supply to the boiler;

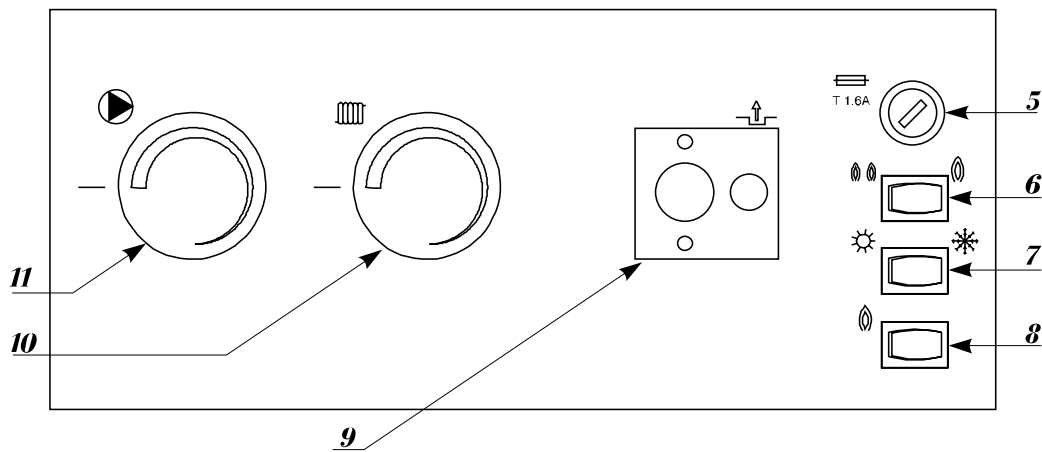
**Emergency status indicator** ("Warning Triangle") – when it is on, a "no-flame" defect is indicated – such defects may be caused by not igniting the flame (no gas), or the chimney draft control system (if there is none or too low a draft) or emergency thermostat (if the HCW temperature is above 100°C) may have switched the boiler off.

### 4.2 Vertical Control Panel

**RESET** button ("flame" icon) – to be pressed when a no-flame defect has been indicated (if the boiler was switched off by the flue-gas thermostat, the button will reset the state only after the boiler has cooled down, in about 10 minutes).

**If the defect persists, it is necessary to identify and remedy the chimney draft defect – if the cause is not clear (suspected clogging of chimney, etc.) a specialised service centre should be called!!!**

For defects caused by the emergency temperature thermostat, RESET button will not reset the state and a specialised service centre must be called to check the boiler and put it back into operation.



**Fig. 3b Vertical Control Panel**

- 5 – Electric fuse
- 6 – Full/reduced power switch (only for 20, 30, 40, 50 KLO)
- 7 – SUMMER/WINTER switch
- 8 – RESET button
- 9 – Emergency thermostat
- 10 – Heating operation regulator
- 11 – Pump thermostat

**Boiler power output switch** (only for 20, 30, 40, 50 KLO) ("two flames" / "one flame") serves for switching between the two degrees of power output – full or reduced.

**SUMMER/WINTER switch"**

SUMMER ("sun" icon) – the boiler cooperates with external DHW reservoir;

WINTER ("snowflake" icon) – the boiler provides heating water and cooperates with external DHW reservoir.

**Electric fuse** – protects the boiler's electric installation from overload and short circuits. The fuse must not be repaired or replaced with "provisional solutions" (wires, etc.). If the fuse has been replaced and after switching the boiler on it was burnt again, a specialised service centre must be called!

**Emergency thermostat** – protects the boiler from overheating

**The boiler must not be operated with the safety elements /flue gas and emergency temperature thermostats) disabled or replaced with elements different from those specified by the manufacturer! Users are not allowed to tamper with the safety elements.**

**Heating operation regulator** ("radiator" icon) – sets the heating water temperature

- 1 The set temperature of heating water must be higher than the value set on the pump thermostat – otherwise the pump will be permanently switched off.

**Pump thermostat**– it is a servicing element, set to 0°C in the manufacturing plant. The recommended value is 55°C – a different value can be set, depending on conditions on site (condensation at low-temperature mode, etc.) – the pump is activated only when the heating water in the boiler gets to the pre-set value. The settings can only be adjusted by a specialised service centre.

## 5. Boiler Operation

### 5.1. Boiler Preparation and Start

The preparation for and commencing of the boiler operation are carried out by a specialised service centre.

### 5.2. First Heating

The First Heating is a short-term operation of the boiler in order to verify the correct installation and functions of the heating system and boiler. It is included in the commencing of boiler operation by specialised service centre.

### 5.3. Boiler Operation

Boilers whose functionality has already been verified by the First Heating are started as follows:

- The power cord must be plugged into the socket.
- Set the heating water temperature regulator to about 2/3 of its range – the setting can later be adjusted according to the temperature of the heating water. The temperature setting of the heating water also affects the speed with which the DHW is heated up in the external reservoir.
- If the boiler will be used in cooperation with an external DHW reservoir, set the reservoir's regulator to about 1/2 of its range.
- Check the pressure of the heating water on the boiler's pressure gauge. If the water is cold, the pressure must not be lower than set by the red hand (set by the authorised service centre during the First Heating).
- The SUMMER/WINTER switch is set depending on the time of the year. LÉTO in summer, ZIMA in winter.
- If the room thermostat regulator is used for regulating the boiler, set the regulator following its instructions for use.
- Put the main switch to the "ON" position ("I"). Flame will be ignited and the DHW reservoir contents are heated up (if there is a reservoir). If the WINTER/SUMMER switch is set to WINTER, when the DHW is heated up, the heating water is warmed up and the heating is started, controlled by the heating regulator.

The HCW (heating-circuit water) heating process is stopped when its temperature has achieved the level pre-set on the heating operation regulator, or if the room temperature has achieved the level pre-set on the room thermostat (i.e. temperature of air in the room in which the thermostat is installed).

The DHW (domestic hot water) heating up is stopped when the temperature pre-set on the DHW reservoir regulator is achieved, or the HCW temperature has achieved the level pre-set on the heating operation regulator.

If the boiler does not ignite and the defect indicator is off, the operation is stopped due to one of the operational reasons we have just described; the heating will automatically start again as soon as the DHW or HCW cools down, or when air temperature decreases in the room in which the room thermostat is installed.

If the boiler does not start even after a long time and does not respond to increasing of the pre-set temperature value, there is a defect and a specialised service centre should be called.

If the boiler does not start and the defect indicator is on, follow the instructions in Description of Controls.

### 5.4. Breaks in Boiler Operation

If the operation of the boiler is to be stopped for a shorter period of time, simply set the main switch to the 'off' position. Before a longer break between operations, unplug the electrical cord and shut off the gas supply. You can leave water in the boiler if there is no risk of freezing, otherwise you should discharge water from the boiler and the heating circuit.

- 1 If at all possible, discharge water only from the boiler when disassembling the system – the heating circuit is protected from corrosion if the HCW is left in.

## 6. Boiler Maintenance

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### 6.1. Professional Maintenance

The boiler should be checked and adjusted by a professional organisation at least once a year, preferably before the beginning of the heating season. Such service inspection cost is not included in the guarantee. A list of recommended steps is specified in the Service Booklet.

Most of the steps are concerned with checking the condition and functions of the burner, adjustment of power output, checking the tightness of flue-gas duct connections (with repairs if necessary), cleaning of burner nozzles (if necessary – the cleaning must be done carefully, as the inner diameter of the nozzles must not be changed by the cleaning), and cleaning the heat exchanger in the boiler.

Checking the functionality of the emergency and flue-gas thermostats is very important – these elements must also be checked after each servicing on them.

## 6.2. Maintenance by User

- a) The boiler should be cleaned as necessary, without removing the cover panels. Before cleaning, put the main switch off and unplug the power cord. If the boiler surfaces are wet after the cleaning, the boiler should not be started until it dries.
- b) The HCW pressure should be checked once a week, with replenishment of water as necessary – before replenishing, the boiler temperature (the reading shown on the boiler thermometer) must cool down to below 40°C. Failing to meet this requirement may lead to leaks or ruptures in the boiler body (caused by thermal shrinkage).
- c) Checking tightness of the flue-gas duct.
- d) If there is a gas leak, shut the gas supply valve and call a specialised service centre.
- e) Checking and cleaning the filter and sludge separator:
  1. Immediately after the First Heating;
  2. After the first week of operation;
  3. Regularly once per month; or once per quarter if the sedimentation rate is lower.

## 7. Safety of Life and Property

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### 7.1. Technical Requirements for Boilers – Product Compliance and Safety of Use

Product compliance of the boilers is governed by the following Czech standards: ČSN EN 297, ČSN EN 437, ČSN EN 50 165, ČSN EN 60 335-1:1997.

In addition to these, the present Instructions and the manufacturer's documentation must be complied with. Children and persons under the influence of drugs or otherwise incapable must be prevented from operating the boiler.

### 7.2. Quality Compliance

The boiler's quality compliance is provided by and checked within the manufacturer's Quality Assurance System – by Certificate BSQI No. 43319 of December 14,1997, the Quality Assurance System complies with the BS EN ISO 9001:1994 Quality Standard.

Consistent levels of service quality for installations, maintenance and repairs are assured by the manufacturer's network of contractual service centres with necessary qualifications (cf. Item 3.1).

The use of the boiler must follow the present Instructions and the manufacturer's other documentation included the boiler's delivery. If you have any doubts, feel any data to be incomplete, any advice unclear, or think that there has been an inadequate servicing of the boiler, contact one of the contractual service centres.

## 8. Warranty

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The warranty on **PROTHERM KLO** boilers is provided as specified in the Guarantee Certificate, Service Booklet and under conditions specified in these Instructions.

## 9. Complete Delivery

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### 9.1. Boiler Delivery

**PROTHERM KLO** boilers are delivered completed and functionally tested.

The delivery includes documentation, consisting of:

- Instructions for Use
- Certificate of Quality and Completeness
- Warranty Certificate
- Service Booklet
- List of authorised service centres

### 9.2. Optional Accessories

On special request, a room regulator, a DHW accumulator heater reservoir, and a three-way distribution valve can be supplied by the boiler manufacturer.

## **10. Transportation and Storage**

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When leaving the manufacturing plant, the boiler is fixed (bolted) on a palette .Do not let any forces act on the casing when handling or when storing the boiler! For handling without a palette, the base can be used (cf. Chapter 2).

For storage, normal conditions have to be provided (non aggressive environment, air humidity up to 75%, temperatures between 5°C and 55 °C, low dust nuisance, no biological factors).

## **The following instructions are for specialised professionals only. Together with the "Instructions for Use" and the "Service Booklet," technical instructions for installation, setting and maintenance are provided.**

Numbers and headings of the chapters are the same as in the "Instructions for Use"

### **3. Boiler Assembly**

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When servicing the boiler that is plugged into the electrical grid (even if the main switch is off), all safety precautions for work on electric equipment must be adhered to.

The boiler casing can be dismantled. The top and front cover panels are removable, fixed by spring clamps in their corners. The front panel is removed by pulling forward, the top panel by pulling upward. Removal requires overcoming the force of the spring clamps. The remaining casing panels are fixed to the body by pins and bolts. All parts of the casing are connected to the boiler electrical installation by protective wires.

The pipe connections of the boiler (water or gas) should never be used as manipulation handles!!!

#### **3.7. Heating System – Properties and Filling**

The emergency thermostat settings must be adjusted according to the type of the expansion vessel used (closed or open): for open to 95°C, for closed to 110°C.

The HCW regulator must be pre-set to max. 85°C for open vessels, to prevent undesirable overlapping of temperature ranges caused by value tolerances and adversary responses of the emergency thermostat.

The range of the HCW operation regulator is done by a locking wire clamp, which is in the bottom part of the regulator's knob. The clamp is accessible when the knob is taken off the thermostat shaft. The setting must be verified by an operational test.

After filling the heating system with water, purging and setting the pressure expansion vessel (if there is one), the final HCW pressure value is set by the red needle on the boiler pressure gauge.

#### **3.9. Electrical Connections of Boiler**

The electrical installation cabinet and the service part of the control panel are accessible when the top panel of the boiler is removed. The front part of the cabinet consists of the control panel, fixed by two screws. When the panel is tilted forward, the terminal board for connection of external equipment becomes accessible. The panel remains connected to the boiler by the wires and tubes of the measurement devices.

If the boiler is to be operated with a room thermostat, the jumper between the contacts on the terminal board is removed; otherwise the jumper must remain on the board.

A room thermostat is connected by a power cable to contacts No. Pr 19 and 20 – the recommended cross-section of the cable wires is between 0.5 and 1.5 mm<sup>2</sup>.

The no-voltage rule must be fulfilled by the room thermostat regulator!

If a bimetal regulator is used, which requires 230 V supply for its function, then the phase (L) and null (N) contact of the regulator are connected to Pr 19 and N contacts on the boiler terminal board; the output contact of the regulator is connected to Pr 20 on the boiler terminal board. The minimum allowed load of the regulator's contacts should be 230 V A.C. /2A (inductive load).

**Pump connection** – if the load is higher than the value allowed by the fuse of the boiler, an additional switching element (contactor) must be used.

**Connections of parts for cooperation with external DHW reservoir** (i.e., electric-motor-driven three-way valve and reservoir thermostat) – they have to be connected to the boiler terminal board: the middle switching contact of the reservoir is connected to TbC (No. 6). The outside contacts are connected to Tb1 and Tb2 (No. 7 and 8) so that TbC and Tb1 have conductive connection when the DHW is cold in the reservoir. The three-way valve drive is connected to N (No. 10) and L (No. 11) contacts; the switching contact of the three-way valve (only for 20, 30, 40, 50 KLO) is connected to W1, W2 (No. 12, 13). The contact must be interconnected when the valve's drive has no voltage.



**Mechanical connection of the valve:** the HCW output from the boiler is connected to the input of the electric-motor-driven three-way valve; if the drive motor is inactive (has no voltage), the outputs from the valve to the boiler and to the heating circuit must be closed. If a three-way valve is used that has not been supplied by the boiler manufacturer, the electric and water connections must act and be oriented exactly as described here!!!

If the three-way valve used has no switchover contact, the DHW heating may be with the reduced power (if the switch is set to the "one flame" icon) and the time of the heating up will be unnecessarily long. The maximum power input of the three-way valve can be up to 10 W, the pump's power input up to 100 W:

## 4. Description of Controls

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(Cf. Fig. 3a, 3b)

Sensors of the emergency thermostat, HCW operation regulators and the HCW pump thermostat are in the boiler body near the HCW outlet. The emergency thermostat and the HCW pump thermostat are located on the left hand side, on the service part of the control panel. The emergency thermostat is equipped with a reset button and range for temperature setting. The reset button can be pressed when the HCW temperature setting has been reduced.

1 The HCW pump thermostat is set to 0°C by a wire locking clamp. The recommended setting is 55°C.

Next to the thermostat there is the electric fuse.

**After the safety elements' response (emergency and flue-gas thermostat), the boiler's operation can only be re-started after identifying the reasons for their activation. The boiler must not be operated if the safety elements are disabled or replaced with elements different from those specified by the manufacturer. These elements must also be checked after each servicing on them.**

## 5. Boiler Operation

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### 5.1. Boiler Preparation and Start

Check water pressure on the boiler pressure gauge. Turn the gas supply valve on. Plug the boiler's power cord into the socket. Set the HCW and DHW thermostats to about one half of their ranges. Put the SUMMER/WINTER switch to the WINTER position. Put the main switch on. The boiler is ignited and heats up the DHW, then HCW.

Check the boiler for gas leaks when operated (e.g., by a testing foam) – if any leaks are found (caused by transportation), they must be sealed and the check repeated.

At the end of this procedure, the boiler's power output is checked and, if necessary, adjusted by setting the gas pressure on the gas armature.

Such setting is done by the controls on the combined gas armature (cf. Fig. 5a, 5b), in the order: maximum (i.e., rated), reduced (only for 20, 30, 40, 50 KLO). The pressure is measured by a "U" manometer (against the atmospheric pressure).

Before setting, switch the boiler off and unplug its power cord. Then:

- Remove the plugs (A - Fig. 5a, 4a - Fig. 5b)
- Unfasten the closing screw (2 - Fig. 5a, 6 - Fig. 5b) of the gas output pressure measurement point and insert the "U" manometer's tube.

#### **Full Power (all types)**

- Start the boiler and let it run at full power, heating up either DHW or HCW. The measurement should not be interfered with by switching off when the pre-set temperature of water is achieved.
- Turn the adjustment screw (B - Fig. 5a, 4b - Fig. 5b) to set the gas pressure 125 mm water column for natural gas, 270 mm water column for LPG.

The gas pressure is increased when the screw is turned clockwise.

#### **Reduced Power (only 20, 30, 40, 50 KLO)**

- Set the power switch ("one flame" or "two flames" icon) to reduced power ("one flame");
- Turn the screw (C) counter-clockwise to set the left extreme position – for minimum power output.
- Turn the knob (D) on the automatic part: a 55 mm water column for natural gas, 130 mm water column for LPG.

When the setting process is finished, switch the boiler off, remove the "U" manometer's tube and (without excessive force) fasten the closing screw of the measurement point. Put in the metal plug. Re-start the boiler and check whether the ignition is activated properly for both power stages; check tightness of the measurement point to the gas armature.

## 5.2. First Heating

The First Heating is a short-term operation of the boiler after its installation and final connection to the heating circuit.

The boiler controls (on the boiler and the room thermostat) should be set to achieve the highest possible HCW temperature and the fewest possible (operational) stops. Keep the system (the boiler plus the heating circuit) on until it stabilises (i.e., the temperature at the most distant radiator is stationary) and then for one more hour.

Stop the boiler and write down the reading on the boiler pressure gauge. Carefully purge the entire system and bring the pressure to the recorded value.

Then let the system cool down and watch whether the pressure does not decrease too fast – if yeas, you have to find the leaks, seal them and repeat the First Heating procedure.

## 6. Boiler Maintenance

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### 6.1. Professional Maintenance

The professional preventive maintenance is described in the "Instructions" and in the "Service Booklet."

If fuel conversion (from natural gas to LPG or vice versa) is necessary, the following procedure must be followed. Only authorised service centres are allowed to carry out the conversion.

The following steps are to be followed:

1. Dismount the burner from the boiler.
2. Replace the nozzles with the type suitable for the required fuel.

Number / diameter of nozzles (mm)

	20 KLO	30 KLO	40 KLO	50 KLO	60 KLO
Natural gas	2 / 2.65	3 / 2.65	4 / 2.65	5 / 2.65	6 / 2.65
LPG	2 / 1.7	3 / 1.7	4 / 1.7	5 / 1.7	6 / 1.7

3. If converting from natural gas to LPG, for the 20, 30, 40 and 50 KLO types, cooling rods are mounted on the tubes, including holders – three rods per tube. The rod in the axis of the ignition electrode is to be shortened by about 35 mm. If converting from LPG to natural gas, the cooling rods are to be removed from 20, 30, 40 and 50 KLO boilers.

Ends of the electrodes must be above the gap in the burner tube! Check the distance between the electrode ends – it must be 3 mm.

4. Mount the burner back into the boiler.
5. Set the pressure as prescribed for operation – cf. "Boiler Preparation and Start."
6. Check tightness of the gas piping. Take the following precautions:
  - a. Indicate on the boiler, in a suitable manner, the type of fuel for which it has been converted;
  - b. Record the conversion, date and identification of the centre that converted the boilers, in the technical documentation.

**Only original parts supplied by the manufacturer or a party authorised by the manufacturer may be used for the conversion. When converting, the workers must respect requirements for thread connections, specifically, sealing by materials suitable for the type of work and resistant to the fuel used.**

**Settings of all elements are to be permanently marked by, e.g., a drop of paint.**

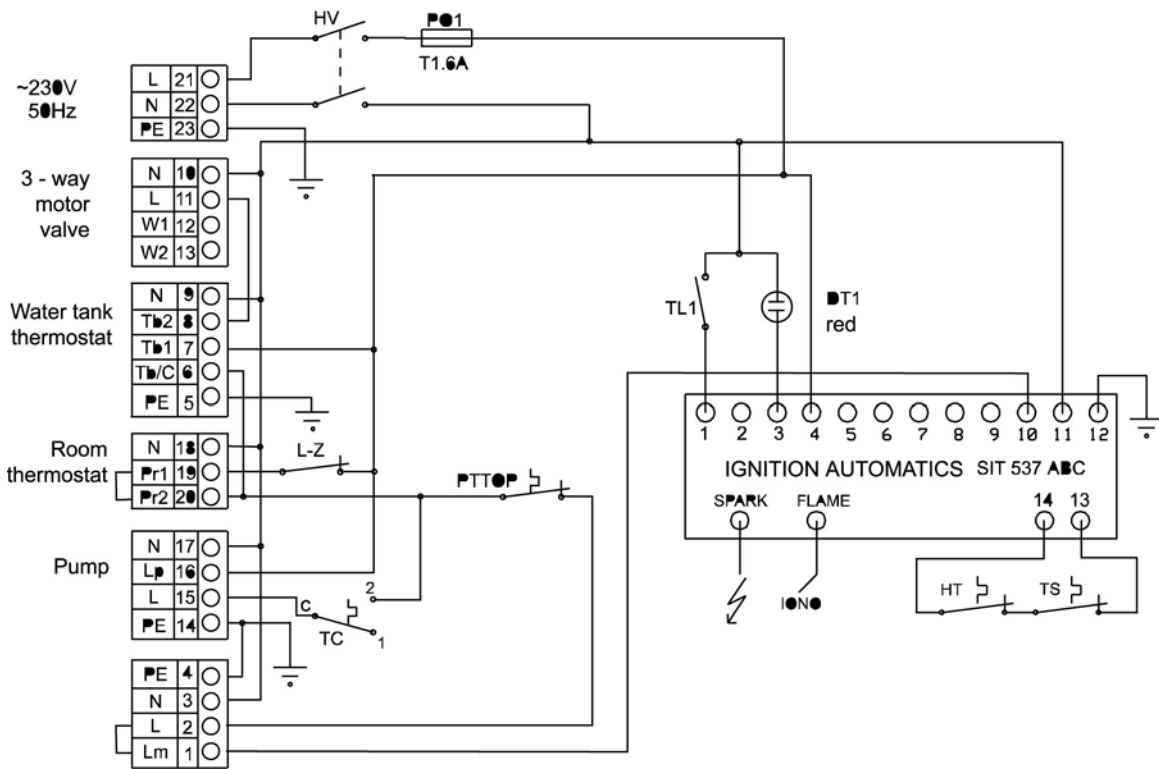


Fig. 4a Electric Wiring Diagram of PROTHERM 60 KLO

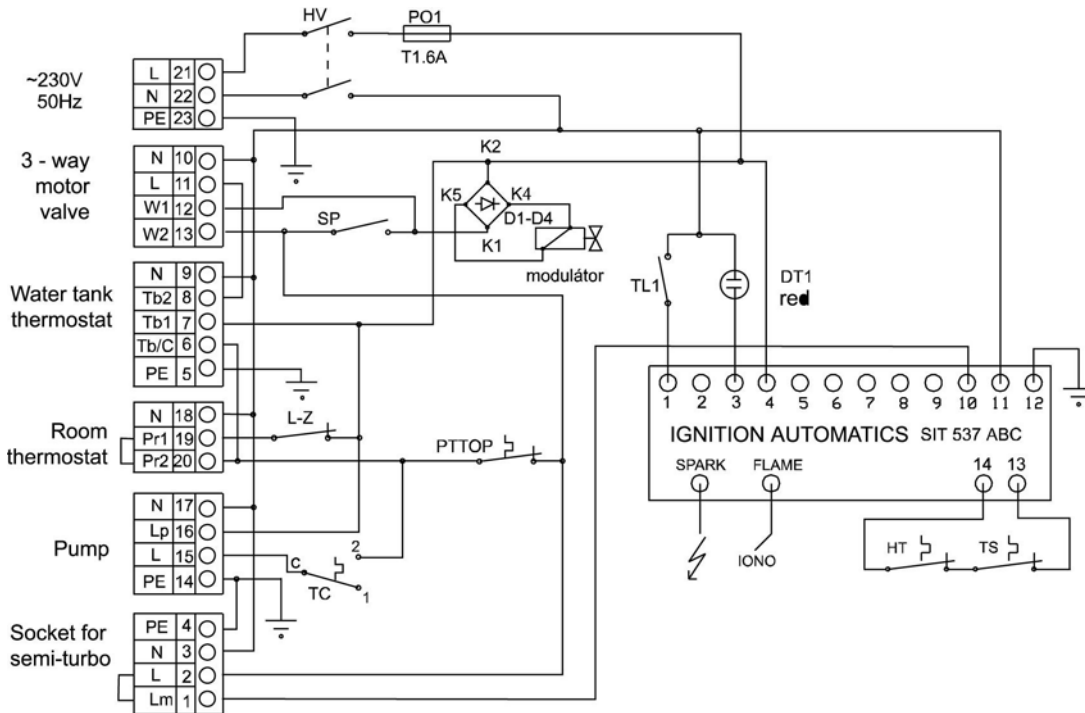
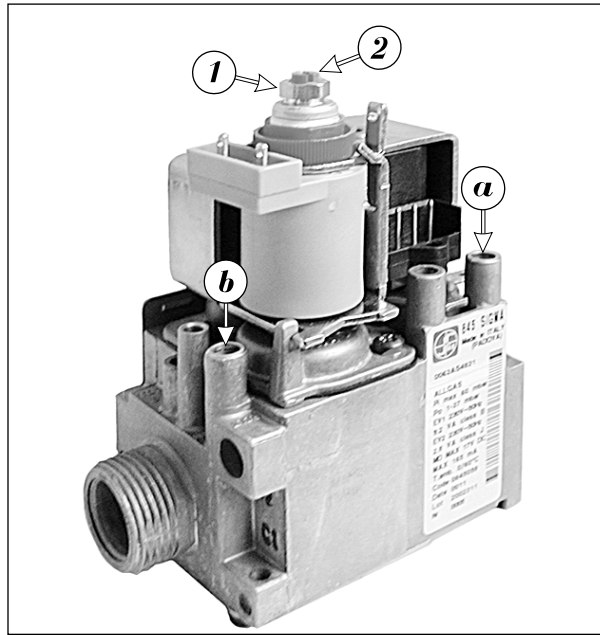


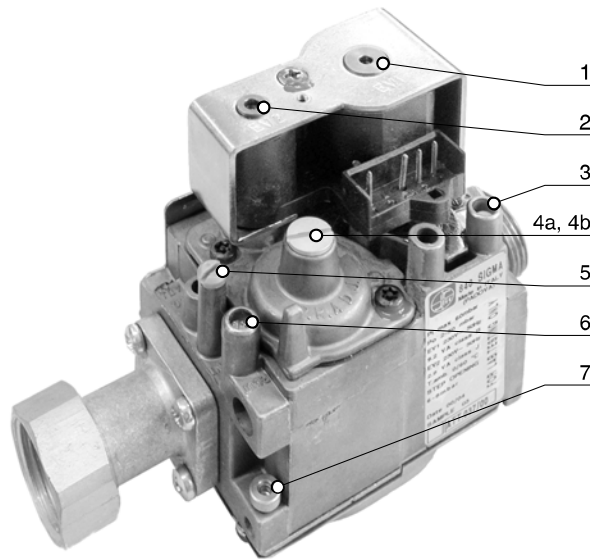
Fig. 4b Electric Wiring Diagram of PROTHERM 20, 30, 40, 50 KLO

- |     |                             |        |                                    |
|-----|-----------------------------|--------|------------------------------------|
| HV  | - Main switch               | PO1    | - Electrical fuse                  |
| SP  | - Power-stage switch        | TL1    | - RESET button                     |
| DT1 | - Emergency state indicator | HT     | - Emergency temperature thermostat |
| TS  | - Flue-gas thermostat       | L-Z    | - SUMMER/WINTER switch             |
| TC  | - PUMP thermostat           | PT-TOP | - Heating operation regulator      |



**Fig. 5a Regulation elements of "SIT 843" combined gas armature (for boilers 20, 30, 40, 50 KLO)**

- a – Input
- b – Output
- 1 – Setting screw for maximum
- 2 – Setting screw for minimum



**Fig. 5b Regulation elements of "SIT 840 SIGMA" combined gas armature**

## Technical Parameters of PROTHERM "BEAR" 20 (30) KLO Boilers

Type		Unit.	20 KLO	30 KLO
Category			II <sub>2H3P</sub>	
Design			B <sub>11BS</sub>	
Ignition			el. spark	
Fuel / input pressure			natural gas / 1.8 kPa	
			LPG / 3.0 kPa	
Power output 1 <sup>st</sup> / 2 <sup>nd</sup> stage	- natural gas	kW	17/11.9	26/18.2
	- LPG	kW	16/11.2	24.5/17.2
Power input 1 <sup>st</sup> / 2 <sup>nd</sup> stage	- natural gas	kW	18.5/13	28.5/20
	- LPG	kW	17.5/12.2	26.5/18.5
Consumption 1 <sup>st</sup> / 2 <sup>nd</sup> stage	- natural gas*	m <sup>3</sup> /hour	2/1.4	3/2.1
	- LPG*	kg/hour	1.6/1	2.4/1.4
Burner nozzle diameter	- natural gas	mm	2.65	
	- LPG	mm	1.7	
Elements of body		pieces	3	4
Number of burner tubes		pieces	2	3
Flue gas removal	- manner		to chimney	to chimney
	- diam. outlet	mm	130	130
Min. required draft in chimney		Pa	2	
Flue gas temperature	- natural gas	°C	~ 100	
	- LPG	°C	~ 95	
Weight flowrate – flue gas		g/s	13.3	19.8
Efficiency	- natural gas	%	90 – 92	
	- LPG	%	89 – 91	
Water volume in boiler body		l	9.1	11.6
Max. operational temperature		°C	90	
Max. operational pressure		kPa	400	
Gas connection branch			G 3/4"	
Heating water connection branch			G 1"	
Pressure loss at Delta t 20 °C		kPa	0.28	0.42
El. voltage / frequency		V/Hz	230 / 50	
El. protection class			IP 40	
Noise level		dB	up to 55	
El. power input (without pump and three-way valve)		W	20	
Dimensions	- width	mm	335	420
	- height	mm	880	880
	- depth	mm	600	600
Weight (without water)		kg	90	110

\* Fuel consumption re-calculated according to the ČSN EN 297 Standard (at 15 °C)

**Comment:** 100 kPa corresponds to 1 bar

## Technical Parameters of PROTHERM "BEAR" 40 (50, 60) KLO Boilers

Type		Unit.	40 KLO	50 KLO	60 KLO
Category			II <sub>2H3P</sub>		
Design			B <sub>11BS</sub>		
Ignition			el. spark		
Fuel / input pressure			natural gas / 1.8 kPa		
			LPG / 3.0 kPa		
Power output 1 <sup>st</sup> / 2 <sup>nd</sup> stage	- natural gas	kW	35/24.5	44.5/31	49.5
	- LPG	kW	33/23	42/29	48
Power input 1 <sup>st</sup> / 2 <sup>nd</sup> stage	- natural gas	kW	38.5/27	49/34.2	54.7
	- LPG	kW	36.5/25.4	46.6/32	53
Consumption 1 <sup>st</sup> / 2 <sup>nd</sup> stage	- natural gas*	m <sup>3</sup> /hour	4.1/2.9	5.2/3.7	5.8
	- LPG*	kg/hour	3.2/2.2	4.2/2.9	5
Burner nozzle diameter	- natural gas	mm	2.65		
	- LPG	mm	1.7		
Elements of body		pieces	5	6	7
Number of burner tubes		pieces	4	5	6
Flue gas removal	- manner		to chimney	to chimney	to chimney
	- diam. outlet	mm	150	180	180
Min. required draft in chimney		Pa	2		
Flue gas temperature	- natural gas	°C	~ 100		
	- LPG	°C	~ 95		
Weight flowrate – flue gas		g/s	26.6	33.8	41.5
Efficiency	- natural gas	%	90 – 92		
	- LPG	%	89 – 91		
Water volume in boiler body		l	14.1	16.6	19.1
Max. operational temperature		°C	90		
Max. operational pressure		kPa	400		
Gas connection branch			G 3/4"		
Heating water connection branch			G 1"		
Pressure loss at Delta t 20 °C		kPa	0,58	0.72	0.88
El. voltage / frequency		V/Hz	230 / 50		
El. protection class			IP 40		
Noise level		dB	up to 55		
El. power input (without pump and three-way valve)		W	20		
Dimensions	- width	mm	505	590	675
	- height	mm	880	880	880
	- depth	mm	600	620	620
Weight (without water)		kg	130	150	170

\* Fuel consumption re-calculated according to the ČSN EN 297 Standard (at 15 °C)

**Comment:** 100 kPa corresponds to 1 bar