

VIADRUS

LIGNATOR MANUAL FOR BOILER OPERATION AND INSTALLATION



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Dear customer

*We thank you that you have bought **LIGNATOR**, a boiler thus having shown your confidence in ŽDB GROUP a.s., VIADRUS division.*

For you to get used to a correct way of handling your new product from the beginning please read at first this manual for its usage (first of all the chapter no. 7 – Boiler operation by user and chapter no. 9 – IMPORTANT WARNING). Please follow the stated information whereby a longstanding and trouble-free boiler operation will be guaranteed to both your and our satisfaction.

1. Boiler use and advantages

LIGNATOR is a cast-iron sectional low-pressure boiler designated for combustion of wood. **Combustion of other materials like plastics is impermissible.**

Five-sectional size of **LIGNATOR** boiler is suitable for heat sources reconstructions in independent tenements, for smaller residential premises and leisure amenities. Bigger sizes of boilers meet the demands on heating the houses, shops, schools etc.

The boiler is manufactured in warm-water design with forced heating water circulation and working overpressure up to 400 kPa. Before dispatch the boiler is tested for tightness by applying 800 kPa overpressure.

The boiler is designated for heating both closed heating systems.

Boiler advantages:

1. A high lifetime of the cast-iron heat exchanger and all other parts with regard to the quality of used materials.
2. Long-term verified construction.
3. Sophisticated manufacturing technology on the automatic forming lines with a constant and verified quality of the manufacturing process. (ISO 9001, ISO 14 001).
4. Combustion efficiency 89,6 %
5. Simple operation and maintenance.
6. Output graduation by the number of sections.

2. LIGNATOR boiler technical data

Tab. no. 1 Dimensions, technical parameters – wood as the fuel
fuel moisture max 20 % fuel efficiency: 14 – 18 MJ. kg⁻¹

Number of sections	ks	5	6	7	8	9	10
Rated power	kW	13,5	17,5	22,5	25,5	30	34
Fuel consumption	kg/h	3,74	4,68	6,04	6,83	8,2	9,28
Fuel efficiency	MJ.kg ⁻¹	15,01					
Combustion chamber volume	dm ³	23	37	51	64,5	78	91,5
Burning time	h	2					
Flue gases temperature	°C	130 - 160					
Flue gases mass flow rate at the rated power	g/sec	10,85	13,6	17,52	19,81	23,81	26,93
	kg/sec	0,01085	0,0136	0,01752	0,01981	0,02381	0,02693
Efficiency	%	86,6	89,6	89,4	87,7	87,1	87,9
Boiler category according to EN 303 - 5	-	3					
Water space volume	l	35	44,7	50,4	56,1	61,8	67,5
Weight	kg	369	421	472	524	576	628
Combustion chamber depth	mm	260	360	480	580	680	780
Diameter of smoke socket	mm	160					
Boiler dimensions: - height x width	mm	1221 x 600					
- depth L	mm	609	720	831	942	1053	1164
- depth L1	mm	1133	1244	1355	1466	1577	1688
Filling hole dimensions	mm	310 x 236					
Maximum water operating overpressure	kPa	400					
Minimum water operating overpressure	kPa	50					
Water test overpressure	kPa	800					
Hydraulic loss	-	see Fig. No.1					
Recommended heating water operating temperature	°C	60 – 85					
Noise level	dB	Does not exceed the level 65 dB (A)					
Chimney draught	Pa	15	16	15	16	17	16
Boiler connections - heating water		DN 50					
- reverse water		DN 50					
Maximum fuel weight in the chamber	kg	9	11	13	15	19	23
Temperature of cooling water for safety after-cooling exchanger	°C	5 – 20					
Overpressure of cooling water for safety after-cooling exchanger	kPa	200 – 600					
Electric voltage		1/N/PE AC 230 V ~ 50 Hz, TN-S					
Electric input	W	180					
IP code		IP 40					

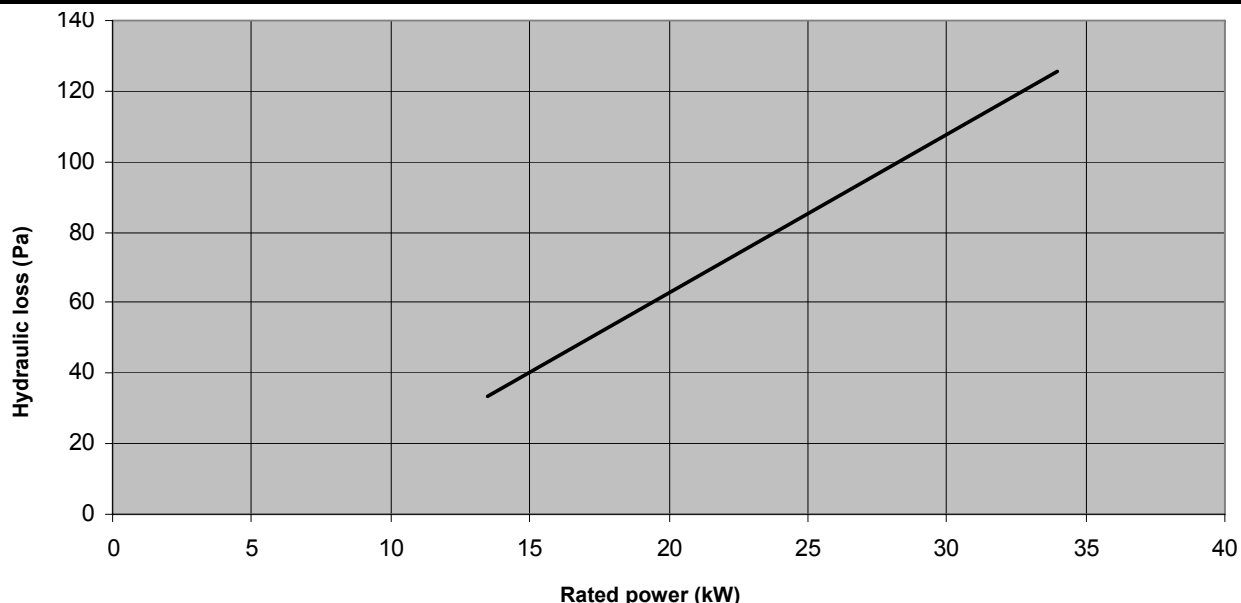


Fig. No. 1 Hydraulic loss of the boiler drum

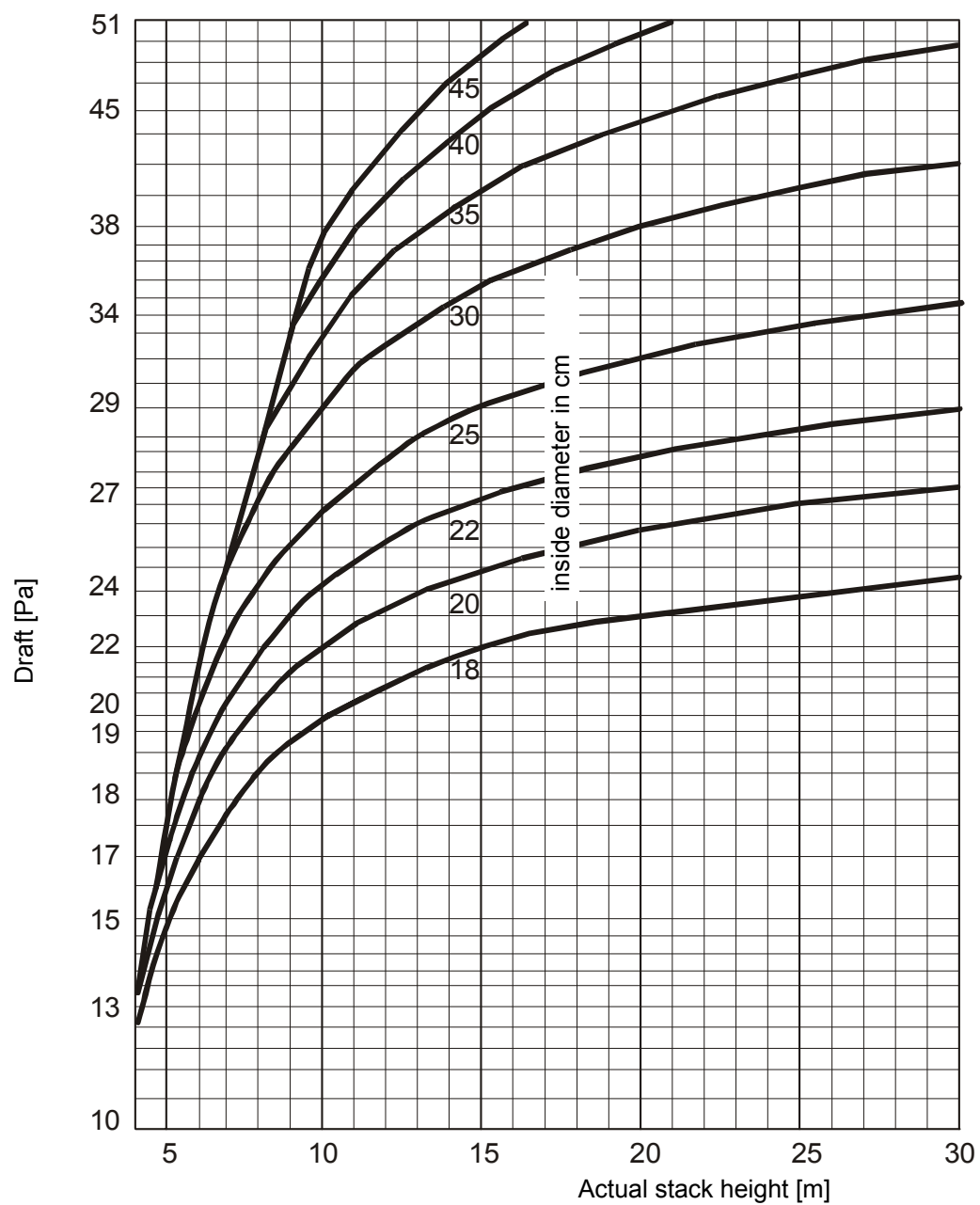
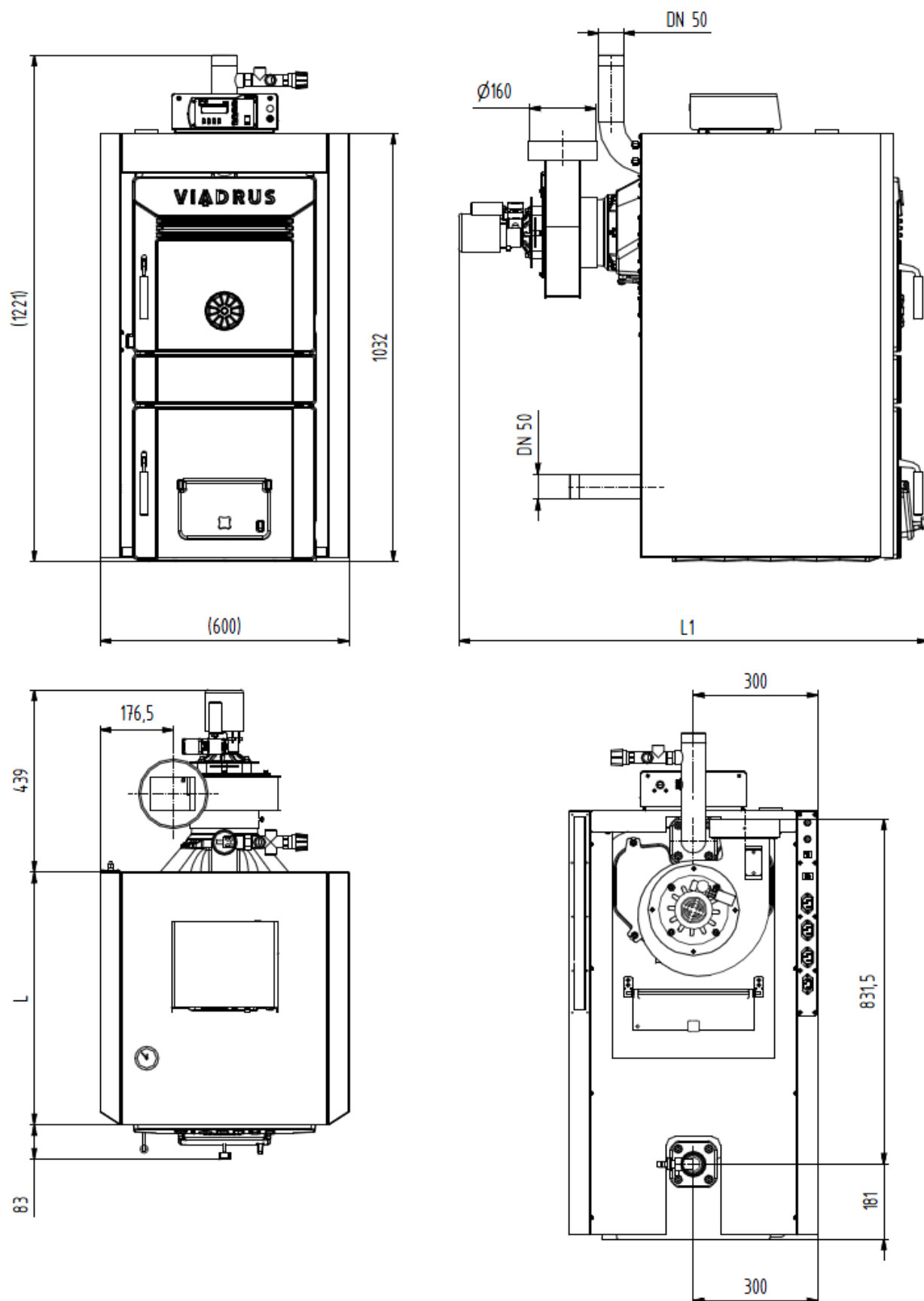


Fig. No. 2 Stack diameter setting

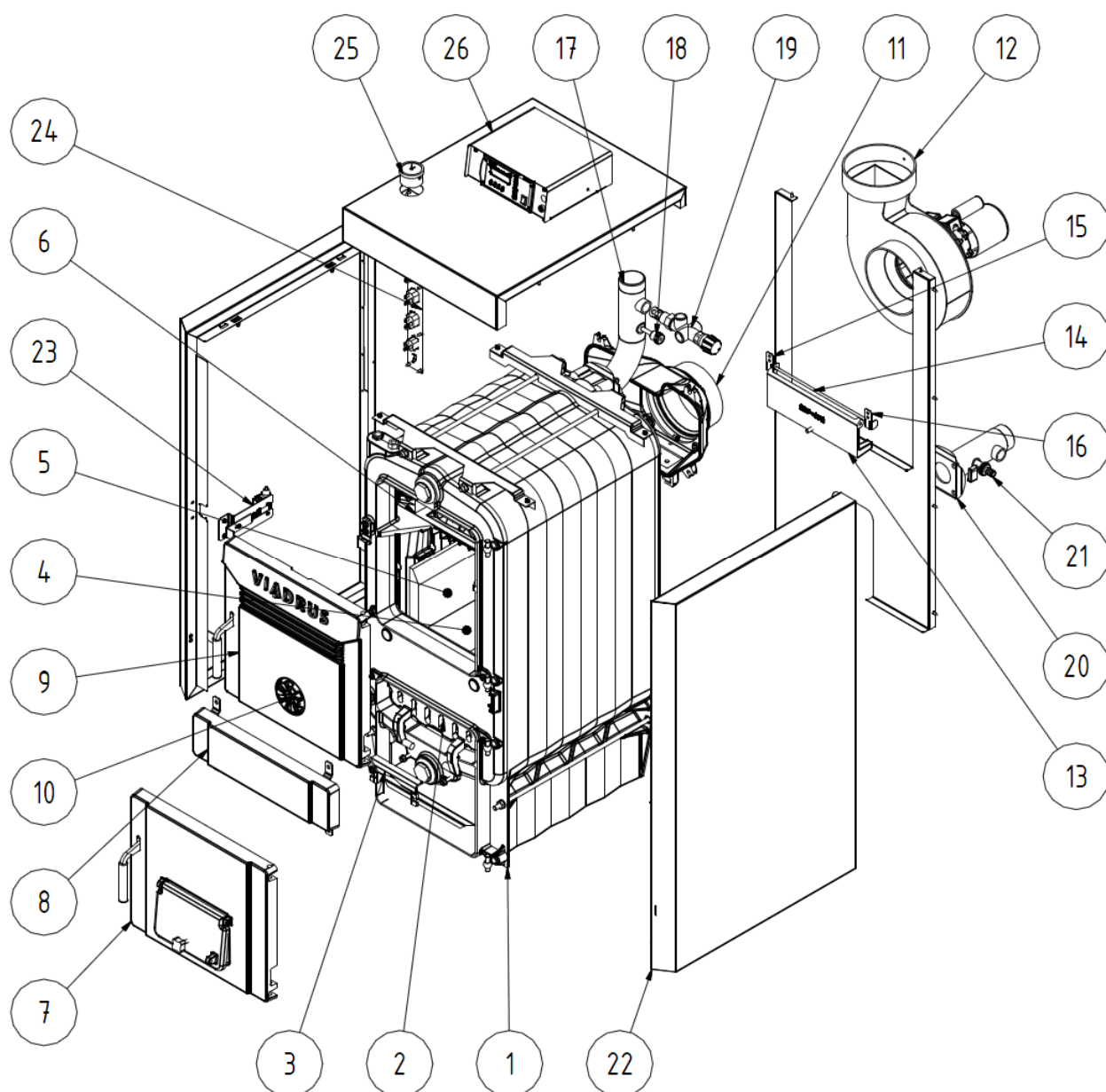


Number of sections	5	6	7	8	9	10
L	609	720	831	942	1053	1164
L1	1133	1244	1355	1466	1577	1688

Fig. No. 3 Connecting dimensions of LIGNATOR boiler

3. Description

3.1 Boiler construction



- | | |
|--|--|
| 1. Boiler body | 14. Axis of stifling for the rear section |
| 2. Tilting grate | 15. Console of stifling right |
| 3. Holder of the tilting grate | 16. Console of stifling left |
| 4. Fireclay bottom plate | 17. Threaded flange of heating water |
| 5. Fireclay top plate | 18. Unitary bulb for output water sensor G1/2" short |
| 6. Turbulator | 19. Two-way safety valve DBV 1-02 |
| 7. Ash door (secondary air) | 20. Threaded flange of heating and return water |
| 8. Central part | 21. Filling and drain valve |
| 9. Stoking door | 22. Shell |
| 10. Air rosette (primary air) | 23. Switch holder assembly |
| 11. Smoke extension | 24. Electric panel assembly with connectors |
| 12. Conch with fan | 25. Manometer |
| 13. Stifling for the rear section (tertiary air) | 26. Control box |

Fig. No. 4 Boiler assembly LIGNATOR

The main part of boiler is the cast-iron sectional boiler drum made of the grey cast-iron according to EN 1561, quality 150.

The pressure parts of boiler meet the demands on the strength according to:

EN 303-5 Heating boilers – Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW – Terminology, requirements, testing and marking

The boiler drum is assembled of sections by means of pressed-in boiler insertions with 56 mm diameter and secured by anchor bolts. The sections constitute the feeding shaft, the combustion chamber and the ash pan space, the water space and the convective part. The heating water inlet and outlet are situated in boiler rear part.

The rear part of boiler in its upper part has a smoke extension/adapter and the heating water flange. In the lower part there is the reverse water flange. To the front section there are mounted the stoking and ash-pan doors. Under the ash-pan door there is installed a tilting grate.

The whole boiler drum is insulated by the health harmless mineral insulation which reduces the losses caused by heat transmission into the environment. The steel shell is coloured by a good quality comaxit spray.

4. Positioning and installation

4.1 Regulations and guidelines

The solid fuel boiler can only be installed by a firm holding a valid licence to carry out its installation and maintenance. A project according to the valid regulations must be elaborated for installation. Before the boiler installation on an older heating system the installation firm must flush out(clean) the whole system. **The heating system must be filled with water meeting the ČSN 07 7401 requirements; especially its hardness must not exceed the required parameters**

Tab. no. 2

Recommended values		
Hardness	mmol/l	1
Ca ²⁺	mmol/l	0,3
The total Fe + Mn concentration	mg/l	(0,3)*

*) recommended value

WARNING!!! The use of anti-freeze mixture is not recommended by the manufacturer.

In case of two way safety vent reaction, when there is a possibility of boiler having been filled with the water, which does not meet the ČSN 077401 requirements it is necessary to change the water in the heating system so that it meets the ČSN 077401 requirements again.

a) to the heating system

ČSN 06 0310 Heating systems in buildings – Designing and installation
ČSN 06 0830 Heating systems in buildings – protecting device
ČSN 07 7401 Water and steam for thermal energy equipments with working pressure up to 8 MPa
EN 303-5 Heating boilers – Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW – Terminology, requirements, testing and marking

b) to the chimney

ČSN 73 4201 Chimneys and flue gas ducting – designing, implementation and connection of fuel consumers.

c) regarding the fire regulations

ČSN 06 1008 Fire safety of heat installations.
EN 13501-1 + A1 Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests.

d) to the system of HWS heating

ČSN 06 0320 Heating systems in buildings – Hot water preparation – Designing and planning
ČSN 06 0830 Heating systems in buildings – Safety devices.
ČSN 73 6660 House water plumbing

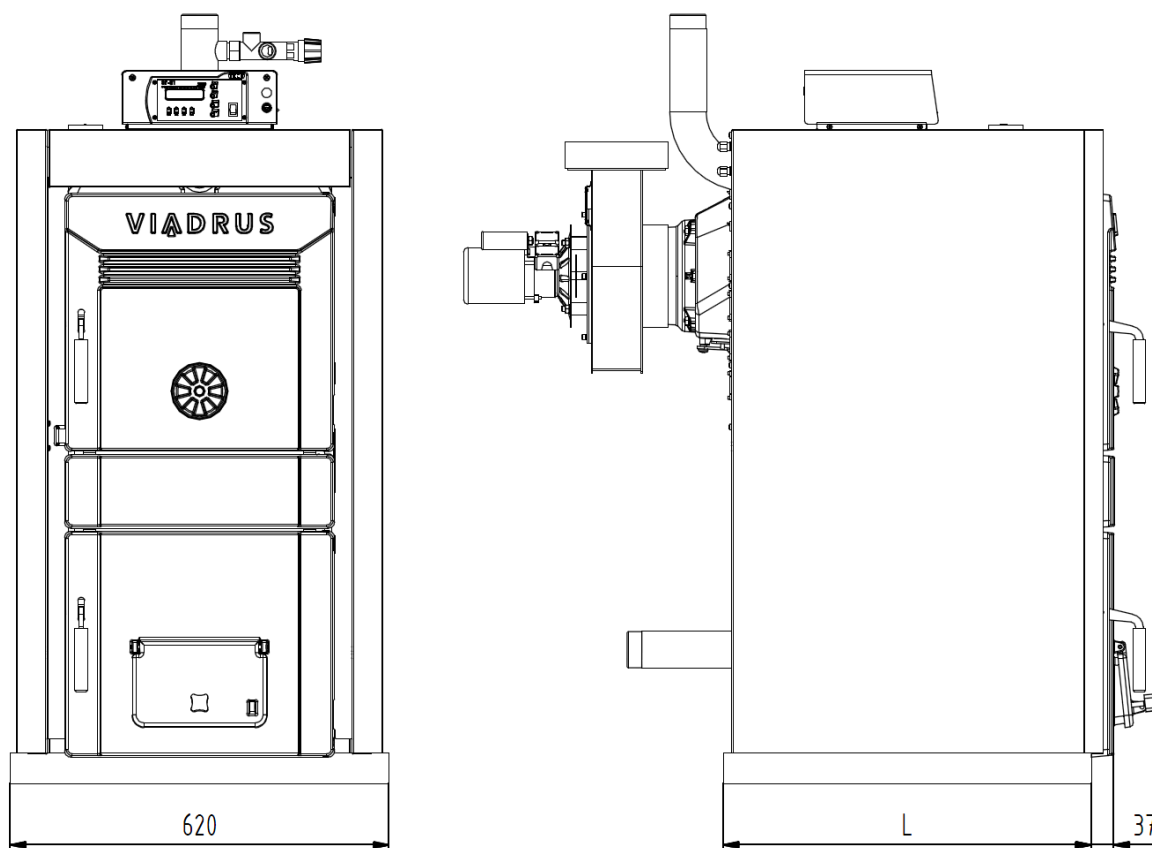
4.2 Positioning possibilities

LIGNATOR boiler is approved for installation in non-residential premises (like cellars, corridors etc.). The installation of flue way must provide sufficient draught and to prevent condensation and sooting through the entire length of the chimney.

The installation of the boiler must comply with all requirements of ČSN 06 1008

The boiler positioning with regard to the fire regulations:

1. Installation on a floor made of incombustible material (Fig. No. 5):
 - the boiler can be installed on a fireproof floor exceeding the boiler platform by 20 mm on the sides and only up to the boiler drum depth;
 - If the boiler is positioned in a cellar we recommend to install it on a retaining wall (substruction) minimum 50 mm high;
 - install the boiler in the middle of the retaining wall.
2. A safe distance from the combustible materials:
 - when installing and operating the boiler it is necessary to keep a safety distance of 200 mm from the materials of combustibility grade A1, A2, B and C (D);
 - for easily combustible materials of combustibility grade E (F), which quickly burn and burn themselves even after removal of ignition source (such as paper, cardboard, asphalt and tar paper, wood and wood-fiber boards, plastics, floor coverings) the safe distance has to be doubled, i.e. to 400 mm;
 - safe distance should be doubled as bulb where the grade of reaction to fire has not been proved.



number of sections	5	6	7	8	9	10
L mm]	603	713	823	933	1043	1153

Fig. No. 5 Substruction (retaining wall) dimensions

Tab. no. 3 Grade of reaction to fire

Grade of reaction to fire	Examples of building materials and products included in the reaction to fire (Extract from EN 13 501-1 + A1)
A1 – incombustible	Granite, sandstone, concrete, bricks, ceramic tiles, mortars, fireproof plasters, ...
A2 – combustible with difficulty	acumin, izumin, heraklit, lignos, boards and basalt felt, fibreglass boards,...
B – hardly combustible	Beech and oak wood, hobrex boards, plywood, werzalit, umakart, sirkolit,...
C (D) – medium combustible	Pinewood, larch, whitewood, chipboard and cork boards, rubber flooring,...
E (F) – easily combustible	Asphaltboard, fibreboards, cellulose materials, polyurethane, polystyrene, polyethylene, PVC,...

Boilers positioning with regard to the necessary handling space:

- Basic AA5/AB5 environment according to ČSN 33 2000-3.
- In front of the boiler there must be left a minimum handling area of 1000 mm.
- Keep minimum 400 mm distance between the rear part of the boiler and the wall.
- At least from one lateral face keep minimum 400 mm space for access to rear part of the boiler.

Fuel storage:

- It is out of question to store the fuel behind the boiler or next to the boiler within a distance smaller than 400 mm.
- It is out of question to store the fuel between two boilers in the boiler room.
- The manufacturer recommends to keep minimum 1000 mm distance between the boiler and the fuel or to store the fuel in a room different from that where the boiler is installed.

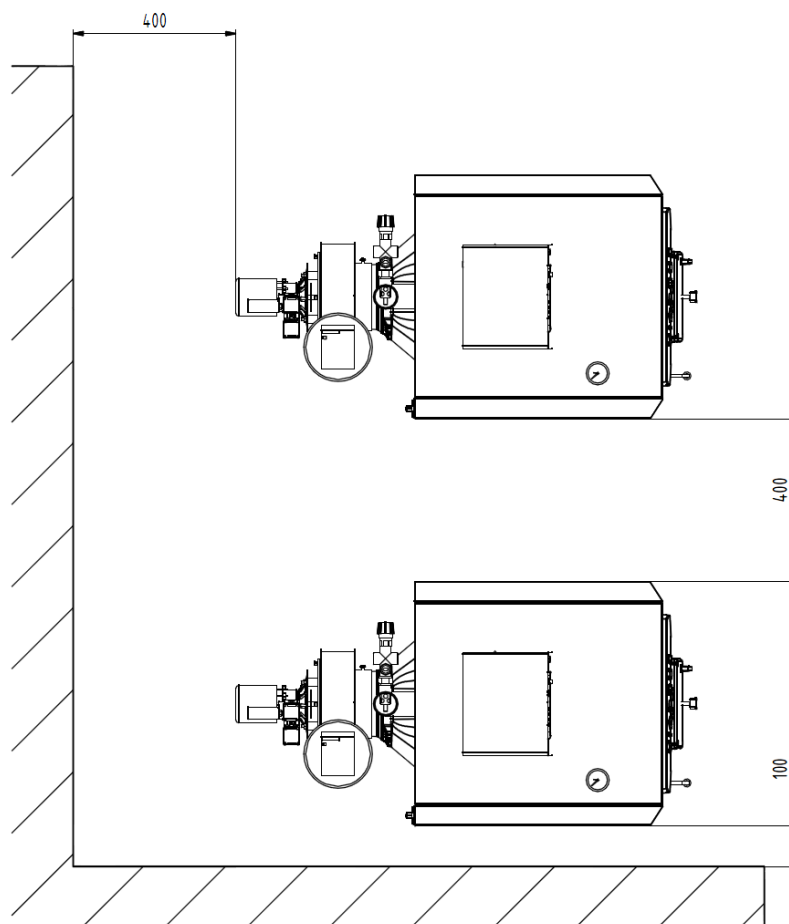


Fig. No. 6 Positioning of LIGNATOR boiler in boiler room

5. Delivery and assembly

5.1 Delivery and accessories

LIGNATOR is delivered according to the purchase order on the pallet on which the complete boiler drum is placed and on the side there is attached the wrapped boiler shell. The accessories are put inside the boiler drum, accessible only after opening the stoking door. The boiler is wrapped in a transport package and it must not be tilted over during the transport.

Standard boiler delivery

- Boiler on a palette with appropriate number of sections
 - flange of heating and return water DN 50 2 pcs
 - sealing ϕ 90 x 60 x 3 2 pcs
 - washer 10,5 8 pcs
 - nut M10 8 pcs
 - filling and drain valve Js 1/2" 1 pc
 - conch with fan 1 pc
 - screw M6 x 10 1 pc
 - sealing ϕ 60 x 48 x 2 1 pc
 - plug Js 6/4" blind 1 pc
- Unitary bulb for output water sensor G1/2" short 1 pc
- Fireclay bottom plate 2 pcs / 4 pcs – for 10 sect. boiler
- Fireclay top plate 2 pcs / 4 pcs – for 10 sect. boiler
- Fireclay insert 1 pc
- Turbulator 4 pcs
- Shell including insulation and the ashtray of appropriate size
 - lowered console 2 pcs
 - washer 10,5 4 pcs
 - nut M10 4 pcs
 - screw ST 4,8 x 13 10 pcs
 - serrated washer 4,3 2 pcs
 - spring clip 4 pcs
 - screw M5 x12 8 pcs
 - serrated washer 5,3 4 pcs
 - connecting stud 4 pcs
 - manometer 1 pc
 - spring of capillary 2 pcs
 - screw ST 4,2 x 13 10 pcs
 - screw M6 x 10 2 pcs
 - serrated washer 6,4 2 pcs
- Control cabinet with electric equipment 1 pc
- Electric panel with connectors 1 pc
- Switch holder assembly 1 pc
 - screw M4 x 10 2 pcs
 - spring washer 4 2 pcs
 - washer 4,3 4 pcs
- Screw of stifling 2 pcs
- Cleaning and operating tools
 - brush 1 pc
 - tip of the spike 1 pc
 - shovel for tang 1 pc
 - handle for brush 1 pc
 - hook for cinder 1 pc
 - hooklet 1 pc
 - handling key 1 pc
 - dowel 8 mm 2 pcs
 - threaded rivet straight 5 x 60 2 pcs
- Business Technical Documentation
- Manufacturing plate

Necessary accessories: (is not included in delivery):

- The two way safety vent DBV 1 - 02 incl. siseal 10 g.
- Safety valve 1 pc
- Filter 3/4" – for delivery with the two way safety vent DBV 1 - 02

The necessary accessories is not included in the boiler standard price.

5.2 Assembly procedure

5.2.1 Installation of smoke extension (only for the size of 8 – 10 sections)

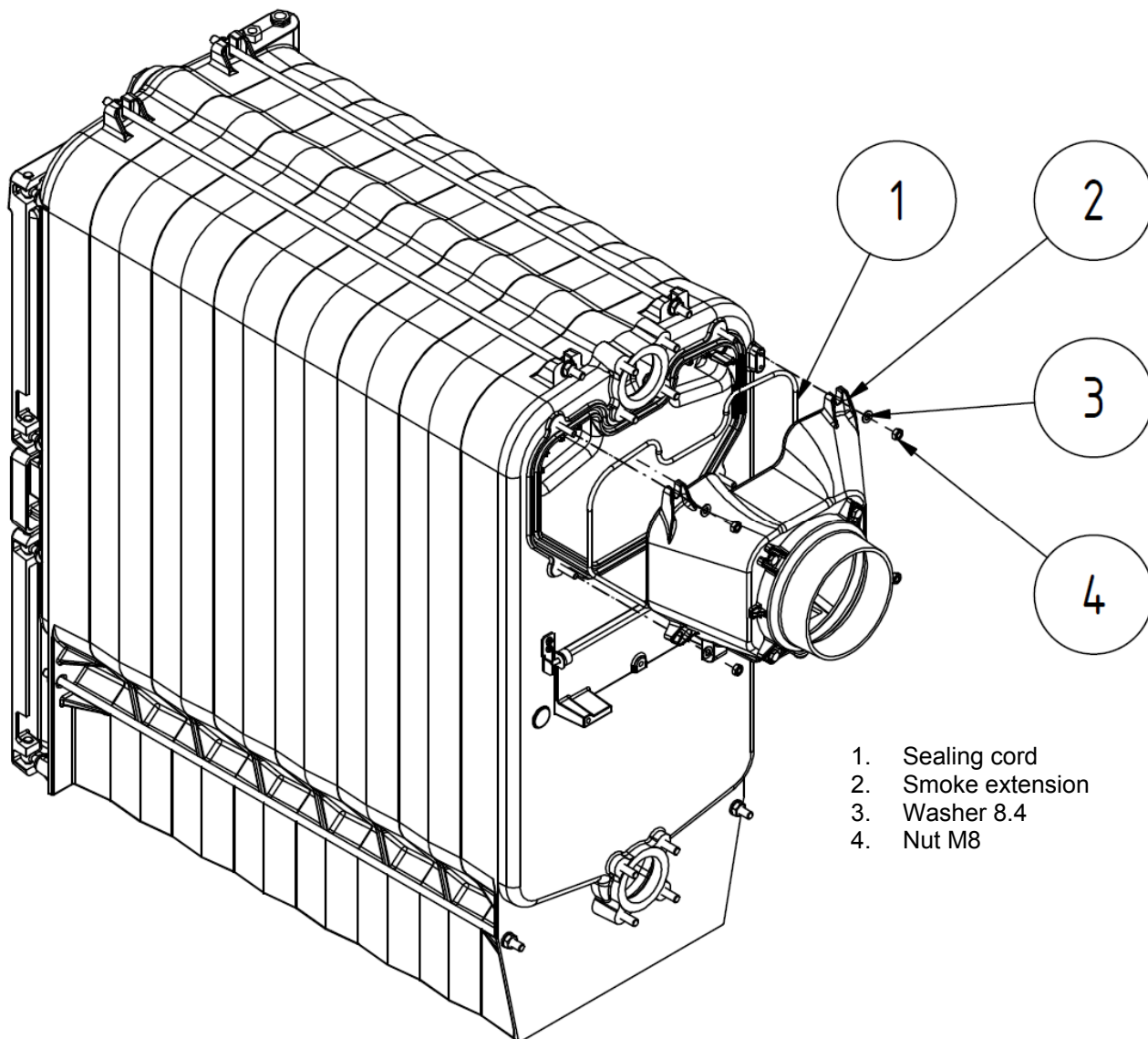


Fig. No. 7 Installation of smoke extension

1. Insert the sealing cord (1) into the groove in the rear section.
2. Screw the smoke extension (2) by means of washers 8,4 (3) and nuts M8 (4). Be careful when tightening due to the fragility of the material of the smoke extension.

5.2.2 Boiler drum installation

1. Set the boiler drum on the retaining wall (substruction)
2. Insert sealing (1) between the flange of heating water (2) and boiler, then mount to the boiler by means of 4 pcs nuts M10 (4) and washers 10.5 (3). (According to the instructions of boiler room). Connect the heating water outlet with the heating system.
3. Insert sealing (5) between the flange of return water (6) and boiler, then mount to the boiler by means of 4 pcs nuts M10 (8) and washers 10.5 (7). Connect the lower output of return water with heating system.

4. According to Fig. No. 24 connect the two-way safety valve DBV 1 - 02 (10) with the flange of return and heating water (6) and with the cooling water input and excess heat output.
5. Install the drain valve (9) into the flange of return water (6).
6. Set the conch with fan (12) on the smoke extension and secure with one screw M6 x 10 (13).
7. Set the smoke tube on the conch with fan (12) and insert into the chimney hole. Diameter of smoke tube is 160 mm.
8. The threaded hole JS 6/4 "in front section blind with stopper JS 6/4". Put sealing under the stopper ϕ 60 x 48 x 2.

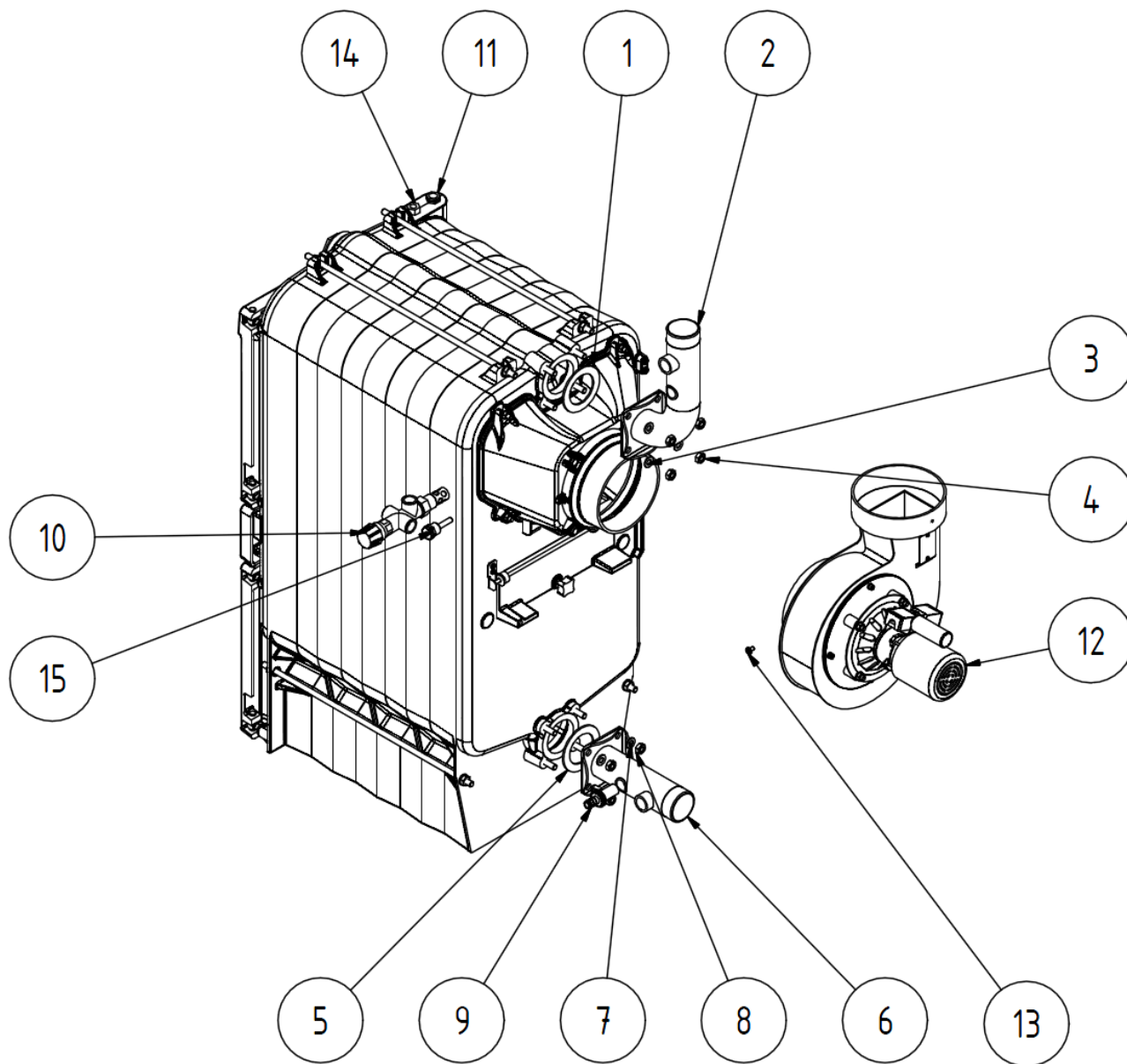
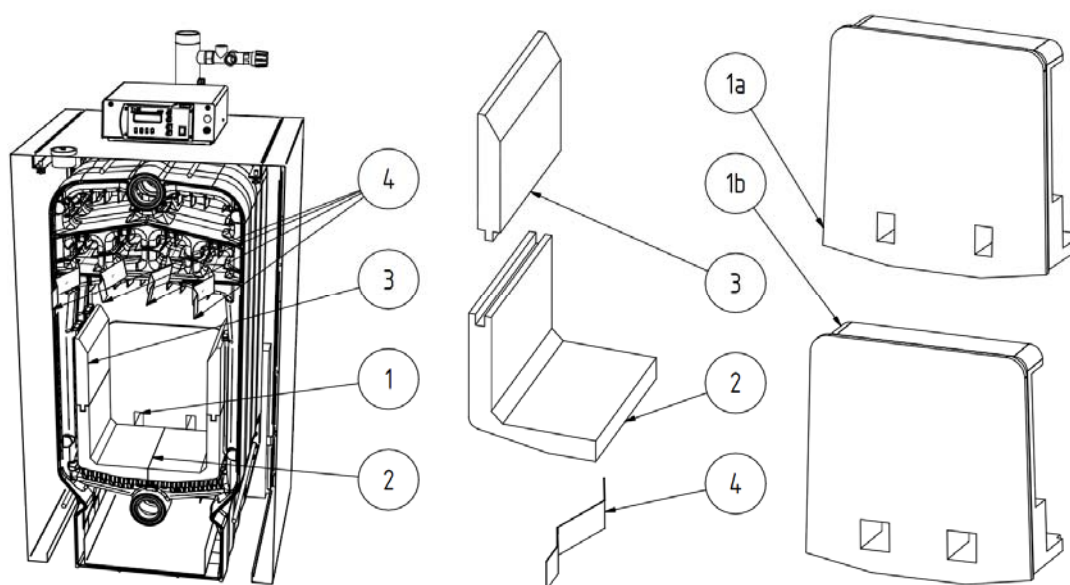


Fig. No. 8 Boiler drum installation

5.2.3 Placement of fireclay plates and turbulators

For boiler size 5 – 9 sections

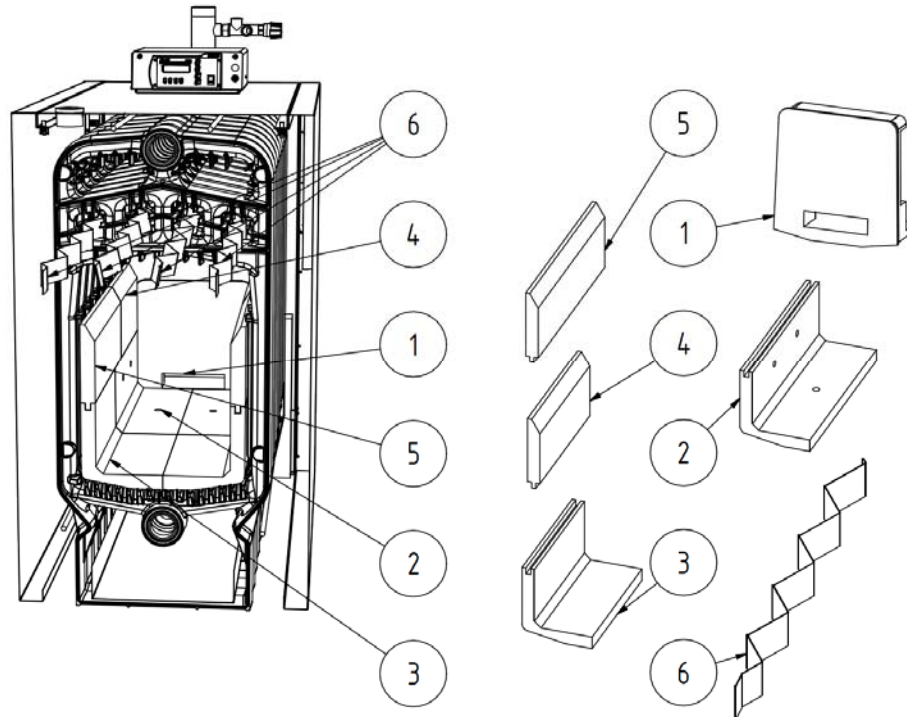


- | | |
|--------------------|--------------------------|
| 1. fireclay insert | 2. bottom fireclay plate |
| 1a. 5 sect. | 3. top fireclay plate |
| 1b. 6 - 9 sect. | 4. turbulators |

Fig. No. 9 Placement of fireclay plates and turbulators

1. Insert the fireclay liner (1) into the hole in the bottom rear part of the combustion chamber, so that it does not protrude
2. Insert the bottom fireclay plates (2) through the stoking door and then put the upper fireclay plates (3) onto them into the lock.
3. Insert the turbulators made of metal sheets (4) into the openings between the ribs of the boiler section above the flue gas chamber.

For boiler size 10 sections



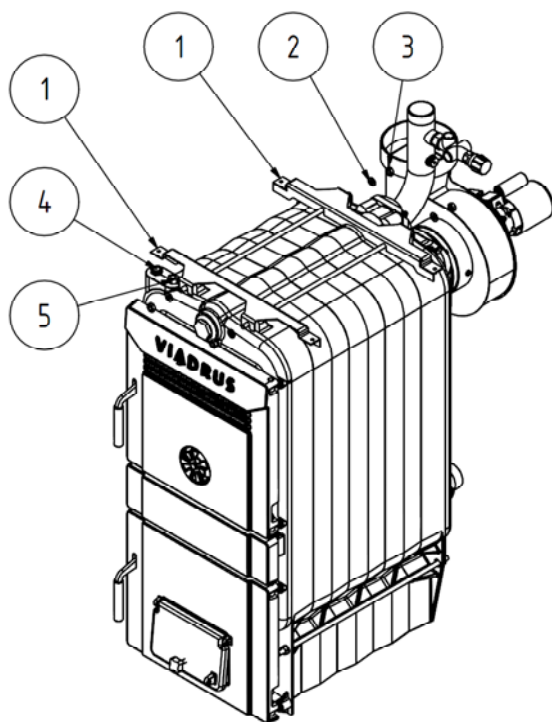
- | | |
|------------------------------------|-----------------------------|
| 1. fireclay insert 10 sect. | 4. top fireclay plate short |
| 2. bottom fireclay plate with hole | 5. top fireclay plate long |
| 3. bottom fireclay plate | 6. turbulators |

Fig. No. 10 Placement of fireclay plates and turbulators

1. Insert the fireclay liner (1) into the hole in the bottom rear part of the combustion chamber, so that it does not protrude
2. Insert the bottom fireclay plates with holes (2) through the stoking door and then put the bottom fireclay plates (3) and then onto them into the lock put the upper short fireclay plates (4) and upper long fireclay plates (5).
3. Insert the turbulators made of metal sheets (4) into the openings between the ribs of the boiler section above the flue gas chamber.

5.2.4 Boiler shells and wiring system assembly

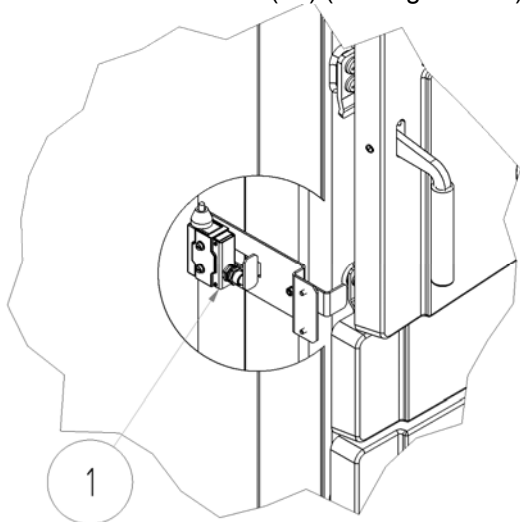
1. Remove the casings, control box, power panel with connectors and connecting accessories from the packaging.
2. Put two lowered consoles(1) on the threads of upper anchor bolts and screw them by means of four nuts M10 (3) and four washers 10,5 (2) - (see Fig. No. 11).
3. Mount 2 pieces of spring clamps (2) on both side parts of the shell (1 and 9).
4. Remove the insulation from the side part of the shell (1 or 9 - as needed) and break off a hole for the electrical panel with connectors in the rear part.
5. Pull the assembly of holder of the limit switch through the broken hole in the side part of the shell together with a bundle of cables for the control box. Screw the el. panel with connectors by means of 10 screws ST 4.8 x 13 and 2 pieces of serrated washers 4.3.
6. If the el. panel with connectors is in the left side part of the shell (1), screw to this part of the shell the assembly of holder of the limit switch (see detail B of Fig. No. 17 and Fig. No. 12) using 2 screws M4 x 10 and secure with two pieces of nuts M4 and washers 4, 3. Put back the insulation. **Electrical cables must not directly touch the boiler drum.** The bundle of cables for the control box must come to the upper part of left side part of the shell.
 - 6.1 Open the stoking door and put the assembled left side part of the shell (1) on the bottom anchor bolts and join the upper part with lowered consoles by using two screws M5 x12 (10) and 2 washers 5.3 (11) (see Fig. No. 17).
 - 6.2 Put the right-side part of the shell (9) on the bottom anchor bolts and join the upper part with lowered consoles by using two screws M5 x12 (10) and 2 washers 5.3 (11) (see Fig. No. 17).



1. Lowered console (2 pcs)
2. Washer 10,5 (4 pcs)
3. Nut M10 (4 pcs)
4. Thermometer bulb
5. Manometer bulb

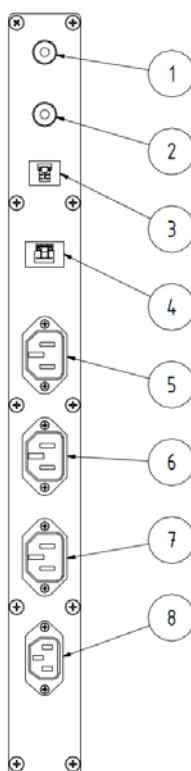
Fig. No. 11 Mounting of boiler shell consoles

7. If the el. panel with connectors is in the right-side part of the shell (9) put back the insulation. **Electrical cables must not directly touch the boiler drum.** The bundle of cables for the control box must come to the upper part of left side part of the shell.
 - 7.1 Put the right-side part of the shell (9) on the bottom anchor bolts and join the upper part with lowered consoles by using two screws M5 x12 (10) and 2 washers 5.3 (11) (see Fig. No. 17).
 - 7.2 Remove the insulation from the left part of the shell and bolt assembly of holder of the limit switch (Fig. No. 12 and 17) by using 2 screws M4 x 10 and secure with two pieces of nuts M4 and washers 4.3. The cable of the limit switch must come to the upper part of left side part of the shell.
 - 7.3 Open the stoking door and put the assembled left side part of the shell (1) on the bottom anchor bolts and join the upper part with lowered consoles by using two screws M5 x12 (10) and 2 washers 5.3 (11) (see Fig. No. 17).



1. Limit switch

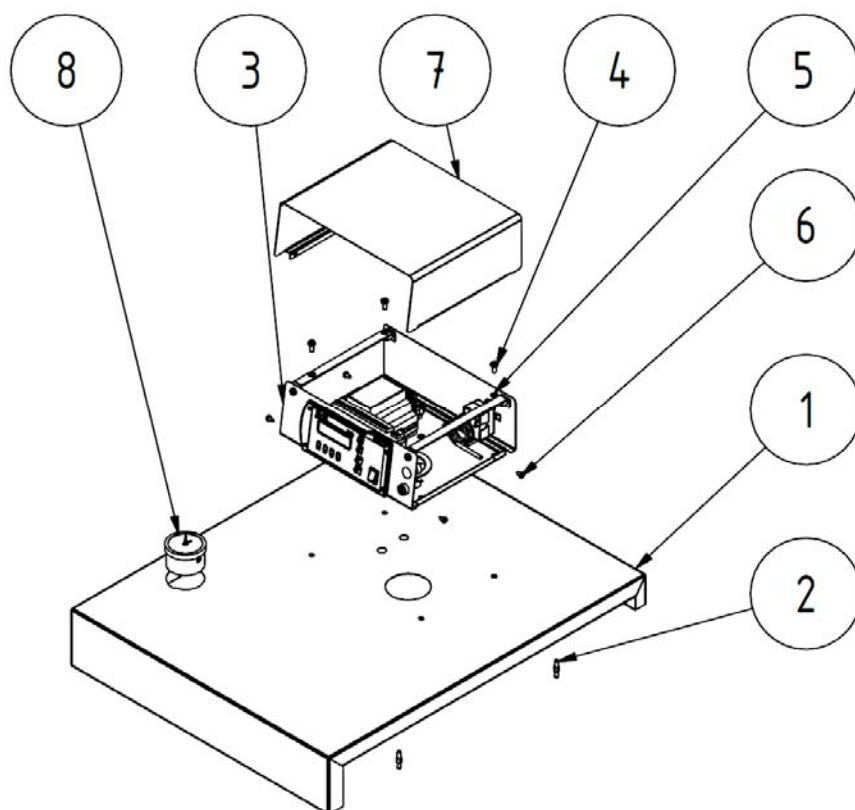
Fig. No. 12 Limit switch



1. ÚT sensor (central heating)
2. Flue gas temperature sensor
3. TV sensor (hot water)
4. Exhaust fan speed sensor MV1 (ČO)
5. Exhaust fan (MV1)
6. Pump TV (Q3)
7. Pump ÚT (Q1)
8. Network 230 V/50 Hz

Fig. No. 13 Electric panel assembly with connectors

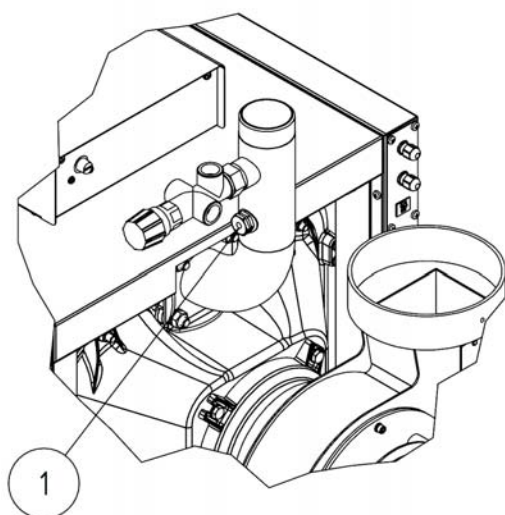
8. Screw the protective conductor connected from the el. panel with connectors on the lug (riser) of the rear section by using a screw M6 x 10 and lock washer 6.3.
9. Remove the insulation from the upper part of the shell (1) and lay it on the boiler drum. **Electrical cables must not directly touch the boiler drum.** Mount 4 connecting plugs (pin) (2) on the upper part of the shell (1) (Fig. No. 14).



1. Upper part of the shell
2. Connecting stud
3. Control box
4. Screw M5 x 12
5. Serrated washer 5,3
6. Screw 4,2 x 9,5
7. Upper part of the control box
8. Manometer

Fig. No. 14 Upper part of boiler shell

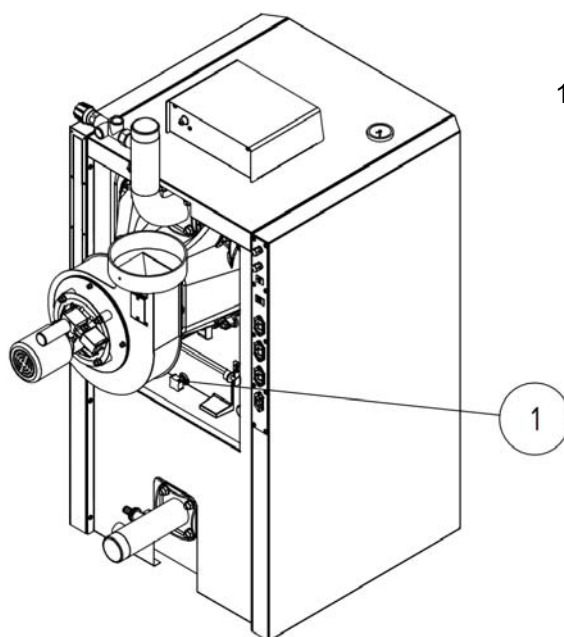
10. According to the Fig. No. 14 by using 4 screws M5 x 12 (4) and serrated washers 5.3 screw the control box (3) to the upper part of the shell (1).
11. Insert the manometer (8 – Fig. No. 14) and its capillary into the hole in the upper part of shell and screw into the reverse valve for manometer (15).
12. Insert the capillary of the safety thermostat into the boiler sump (16) - see. Fig. No. 17 and secure with the spring of the capillary.
13. Pull the bundle of cables with connectors for control box through the hole in the upper part of the shell and make electric connection of the control box according to the el. scheme (see Chap. 5.2.6).
14. Insert and screw the upper part of the control box (7 – Fig. No. 14) by using 4 screws ST 4.2 x 9.5 (6 – Fig. No. 14).
15. Mount the upper part of the shell (12 – Fig. No. 17) on the boiler. **Electrical cables must not directly touch the boiler drum.**
16. Mount the insulation on the rear part of the shell (13 – Fig. No. 17) and screw it to the upper and side parts of the shell by using screws ST 4.2 x 13 (14 – Fig. No. 17).
17. Insert the sensor of heating (central heating) into the bulb for sensor of the central heating and secure it with a spring of capillary - see. Fig. No. 15.



1. Unitary bulb for output water sensor G1/2" short

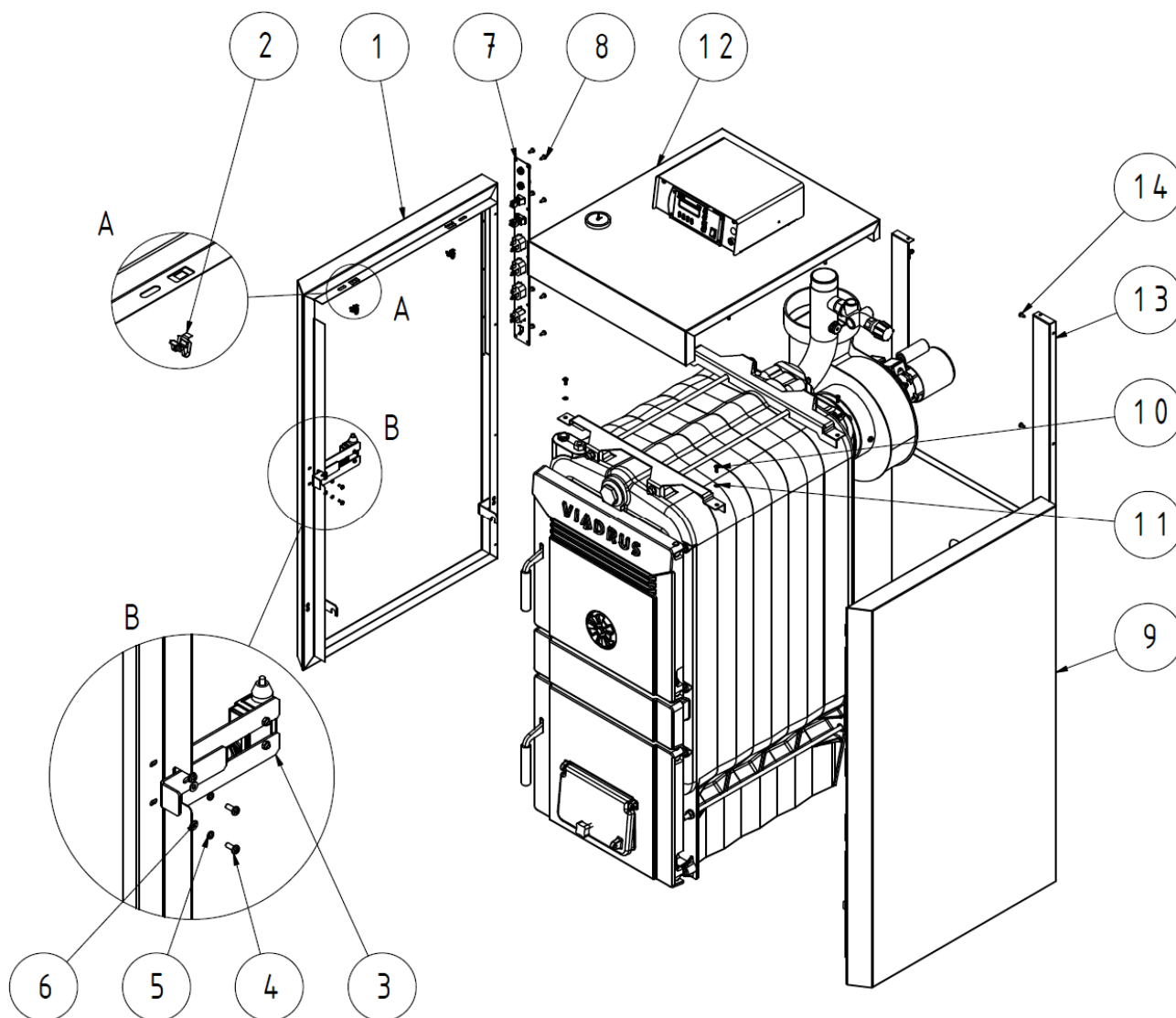
Fig. No. 15 Placement of bulb of ÚT sensor

18. Install the sensor of flue gas temperature sensor on the flue way in the distance $3 \times D$ (diameter) of the flue way from the fan shell and secure with a screw.
19. Finish the el. connection of the exhaust fan, pumps and sensors TV (hot water) according to the el. scheme (see Chap. 5.2.6).



1. Screw of stifling

Fig. No. 16 Screw of stifling



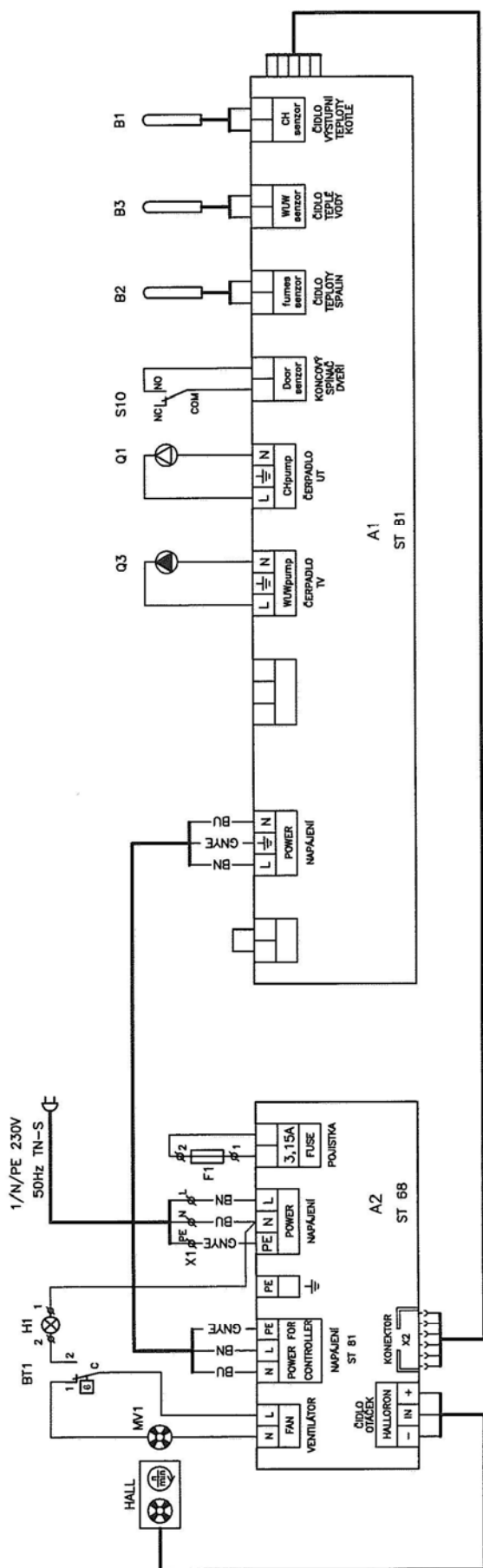
- | | |
|--|---------------------------------|
| 1. Left side part of the shell | 8. Screw ST 4,8 x 13 (10 pcs) |
| 2. Spring clamp (4 pcs) | 9. Right side part of the shell |
| 3. Switch holder assembly | 10. Screw M5 x 12 (4 pcs) |
| 4. Screw M4 x 10 (2 pcs) | 11. Washer 5,3 (4 pcs) |
| 5. Washer 4 (2 pcs) | 12. Upper part of the shell |
| 6. Washer 4,3 (2 pcs) | 13. Rear part of the shell |
| 7. Electric panel assembly with connectors | 14. Screw ST 4,2 x 13 (10 pcs) |

Fig. No. 17 Boiler shell

5.2.5 Assembly tools for brush

Use the leather gloves and common assembly tools for mounting or dismounting of the brush and the spike point (if they are included in the delivery).

5.2.6 Electric wiring diagrams



LEGEND:

A2	CONTROLLER TECH ST 68
HALL	SPEED SENSOR MV1
MV1	EXHAUST FAN
BT1	SAFETY THERMOSTAT
H1	SIGNALLING BT1
X1	TERMINAL BOARD OF SUPPLY
X2	CONNECTOR ST 81 TO ST 68
F1	FUSE 3,15 A
A1	CONTROLLER TECH ST 81
Q3	TV (HOT WATER) PUMP
Q1	UT (CENTRAL HEATING) PUMP
S10	LIMIT SWITCH OF STOKING DOOR
B2	FLUE GASES TEMPERATURE SENSOR
B3	HOT WATER TEMPERATURE SENSOR
B1	BOILER OUTPUT TEMPERATURE SENSOR

Wire colour:

GNYE	greenish yellow
GN	green
YE	yellow
RD	red
BK	black
BN	brown
BU	blue

Fig. No. 18 Circuit wiring diagram

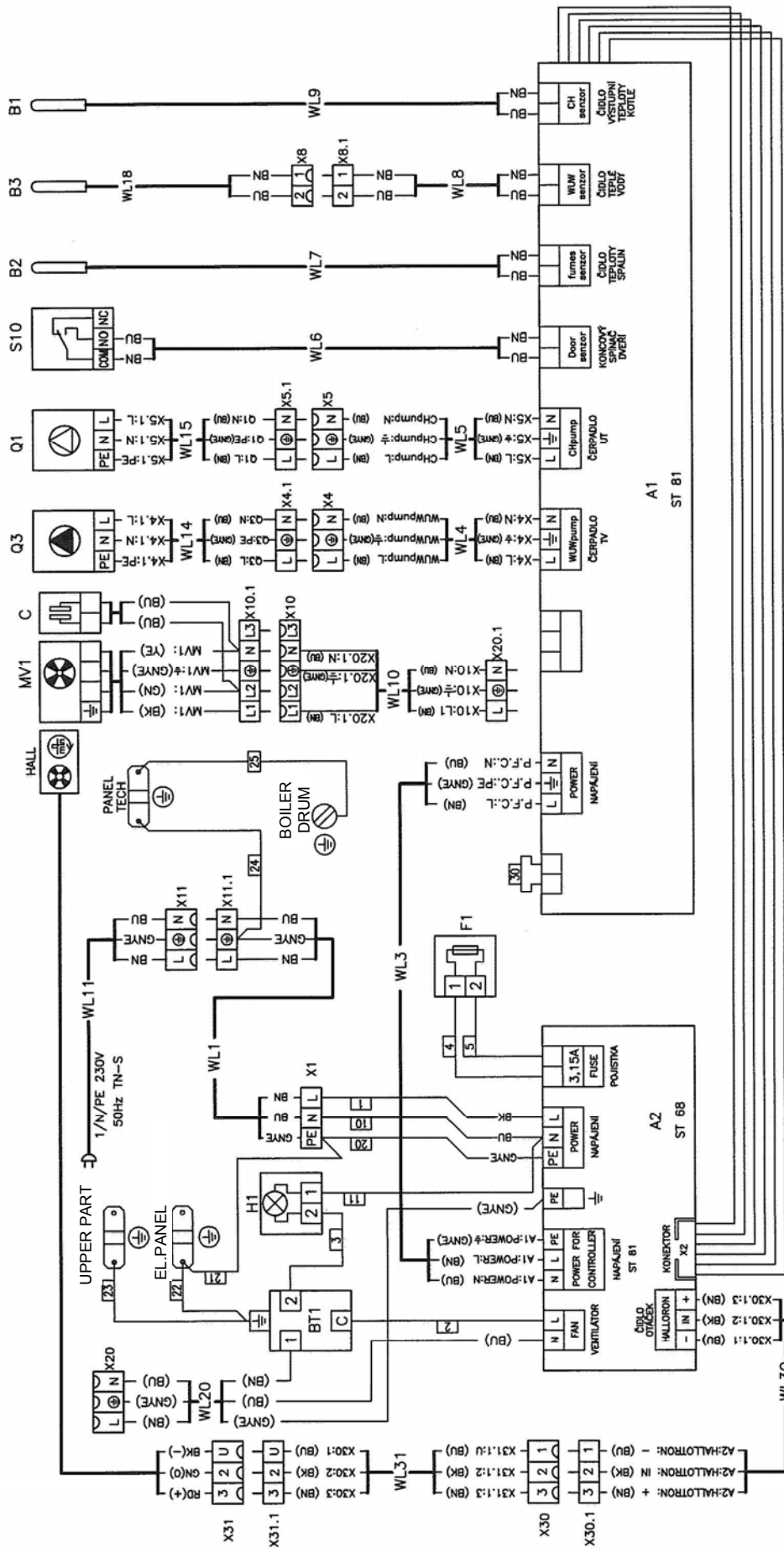


Fig. No. 19 Electric wiring diagram

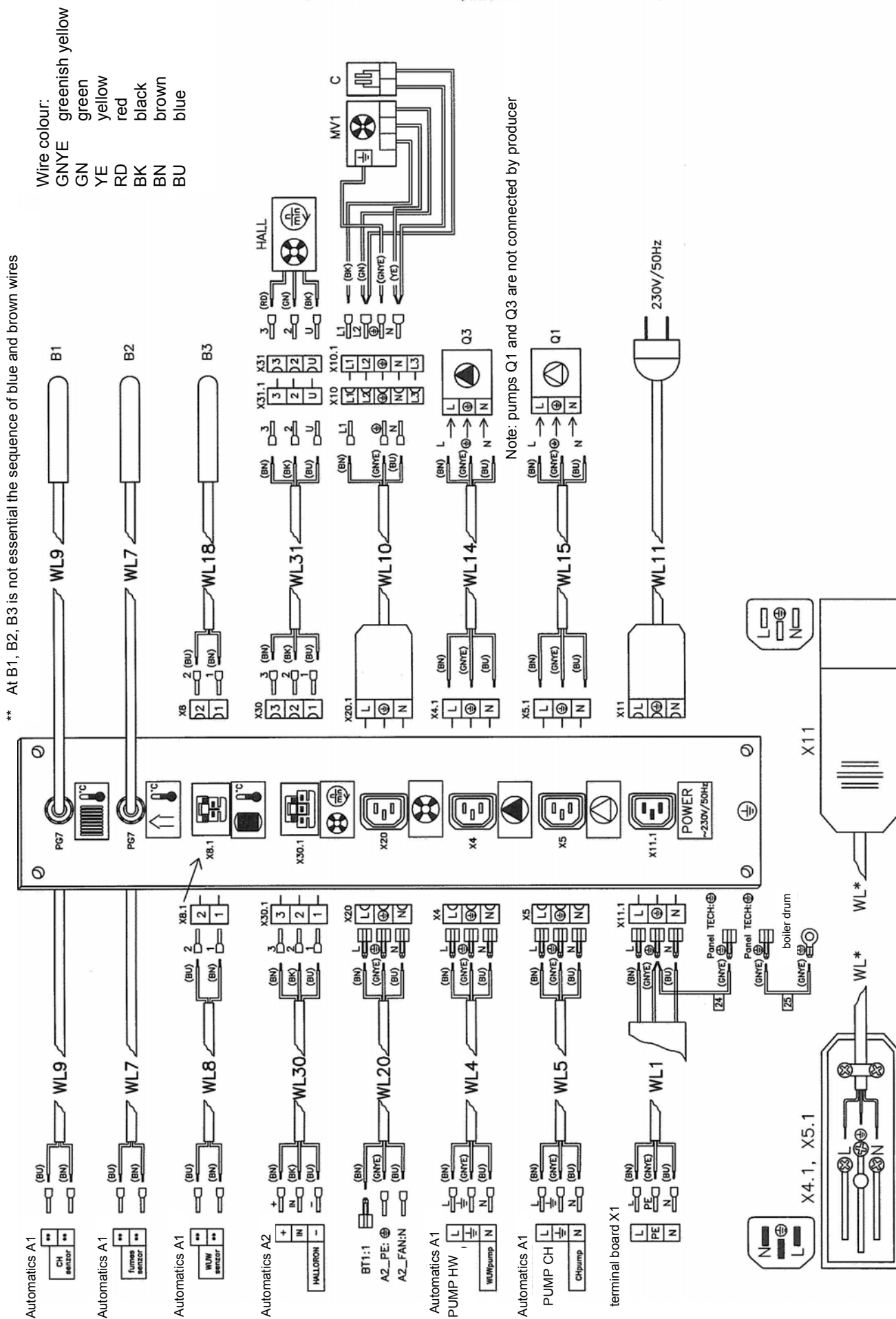


Fig. No. 20 Wiring of panel TECH

5.2.7 Filling the heating system with water:

The water hardness must correspond to ČSN 07 7401 and it is inevitable to treat the water according to Chap. no. 4.1 in case the water hardness is unsatisfactory.

The heating systems with an open expansion tank allow the direct contact between the heating water and the atmosphere. During the heating season the water expanding in the tank absorbs the oxygen, which increases its corrosive effects and at the same time the water evaporates heavily. Only the water treated to the values according to ČSN 07 7401 can be used for refilling.

The heating system must be thoroughly flushed out in order to wash out all impurities.

During the heating season it is necessary to keep a constant volume of heating water in heating system and be particular about bleeding the heating system to avoid the air suction into the system. Water from the boilers and heating system must never be discharged or taken for usage except in cases of emergency like the repairs etc. Water discharge and filling with new water increases the danger of corrosion and scale development. **In case we have to refill the heating system with water we only do this operation when the boiler is cold** in order to prevent its sections from getting broken.

After boiler and heating system refilling operation the all joints must be tested for tightness.

When using the two way safety vent DBV 1 - 02 the cooling water is added gradually to the to the reverse water.

The assembly and stoking test completion must be recorded in the "Guarantee certificate".

5.2.8 Boiler hydraulic diagram

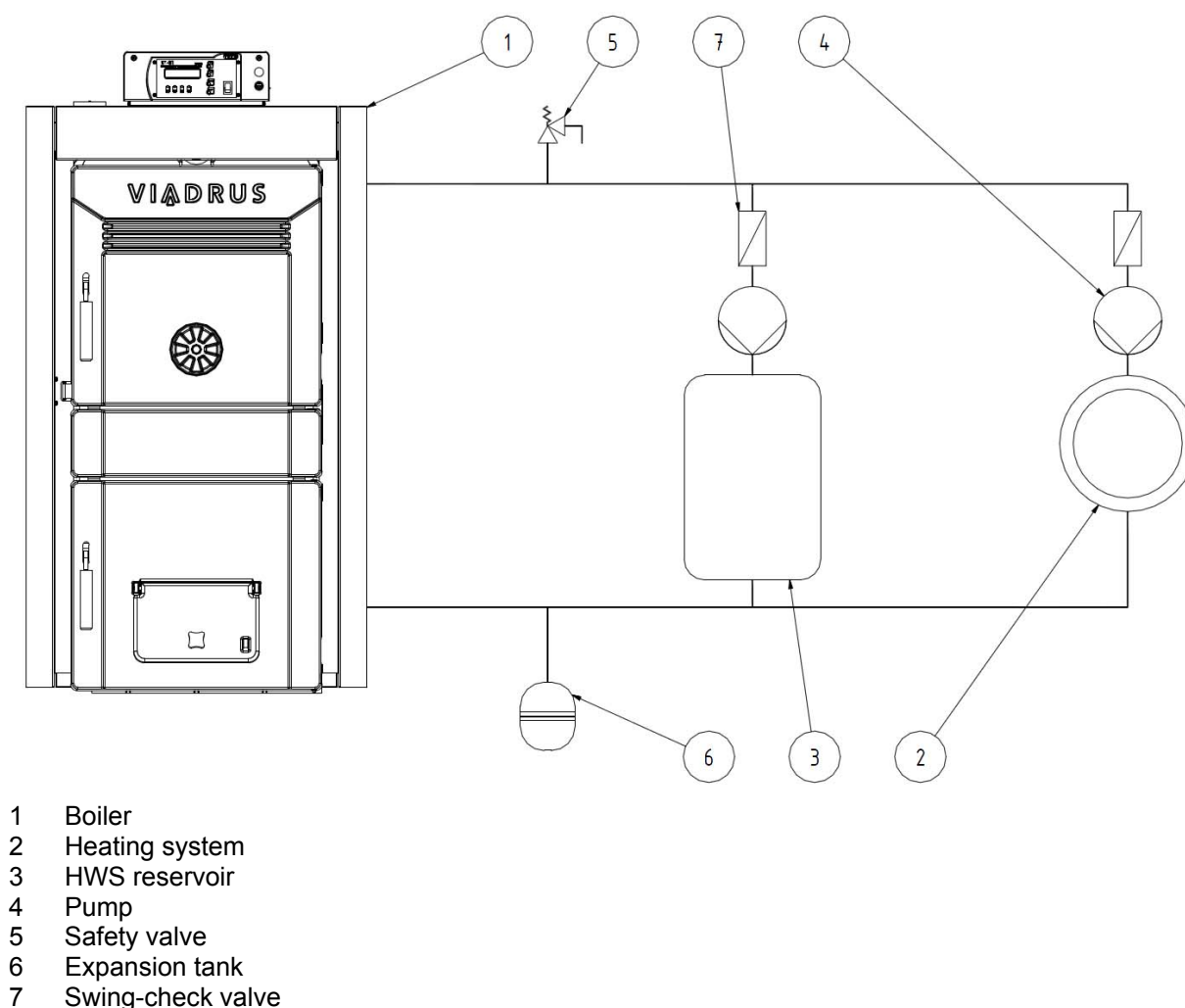


Fig. No. 21 LIGNATOR boiler with HWS reservoir – hydraulic diagram

6. Commissioning

The boiler can only be commissioned by professional assembly firms authorized to do this activity.

6.1 Verification activities before commissioning

Before the boiler is put into operation it is necessary to check:

1. Filling the heating system with water (manometer check) and the system tightness.
2. Connection to the chimney– **this connection can only be done with the agreement of a chimney-sweepers' firm (chimney revision).**
3. The two way safety vent DBV 1 - 02 functionality.

6.2 Boiler commissioning

1. Fire a boiler.
2. Bring the boiler to the necessary operating temperature. The recommended output water temperature (ÚT) is 80 °C.
3. Check the functionality of protecting device against overheating (the two way safety vent DBV 1 - 02)
4. Operate the boiler in operating condition according to relevant standards.
5. Check again the boiler tightness.
6. Acquaint the user with operation.
7. Make a record in the Guarantee certificate.

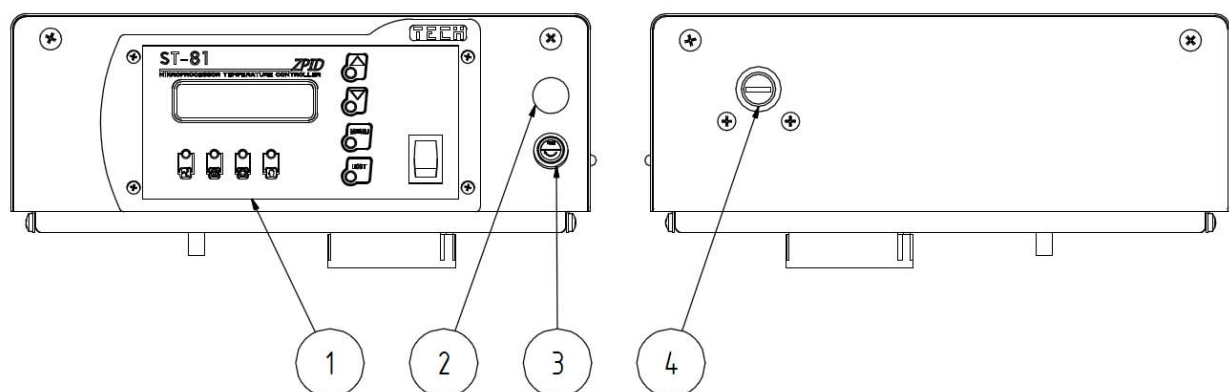
6.3 Regulation and safety elements

Manometer – serves for determination of water pressure in boiler.

Safety thermostat (nonreversible) - serves as a protection against overheating of the boiler. It is set at 95 °C. In case of a fault it is necessary to deactivate the safety thermostat manually after cooling down the boiler. (We unscrew the black cover of safety thermostat and by using a suitable tool we press the button). Activation of the safety thermostat is switched off by the exhaust fan and is signalled by an orange light on the panel of control box.

Controller ST 81 - processes data from sensors of output water temperature, from sensors of hot water temperature and the temperature of flue gases. Thus according to the data the modulated exhaust fan, UT (central heating) pumps and TV (hot water) pumps are controlled.

Limit switch of stoking door - turns on exhaust fan at max power when you open the stoking door (opening the limit switch) and thus prevents the escape of flue gases into the space of boiler. After closing the stoking



- | | |
|--|----------------------|
| 1. Controller ST 81 | 3. Fuse |
| 2. Signalling of the safety thermostat | 4. Safety thermostat |

Fig. No. 22 Control box

6.4 Equipment for surplus heat removal

The two way safety vent DBV 1 - 02 serves for surplus heat removal in case the water temperature in boiler exceeds 95 °C.

In case the system is equipped with a two way safety vent and the boiler becomes overheated (the output temperature exceeds 95 °C) the two way safety vent creates a cold water circuit which is kept until the temperature drops below the limit temperature. At this moment there are simultaneously closed the discharge cooling equipment and the cold water inlet of refilling the system.

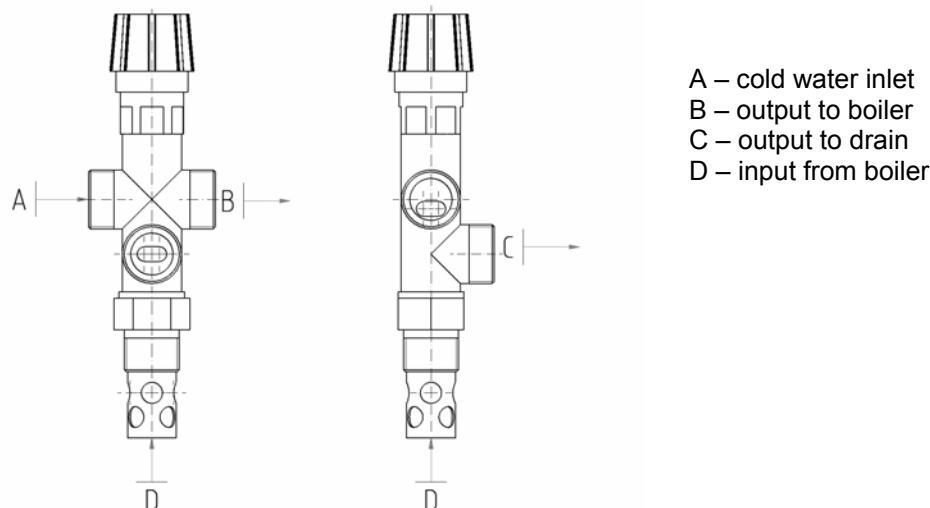


Fig. No. 23 The two way safety vent DVB 1 – 02

The two way safety vent DBV 1 – 02 technical data (from the firm Regulus)

Opening temperature (limit):	100 °C (+0° - 5 °C)
Maximum temperature:	120 °C
Maximum stress on boiler side	400 kPa
Maximum stress on water side	600 kPa
Nominal flow at Δp 100 kPa:	1,9 m ³ /h

Usage

The two way safety vent DBV 1 – 02 is used as a protection of heating boilers against overheating. In the valve body there is the bleed and supply valve controlled by thermostatic element. When the limit temperature is reached, the bleed and supply valve is simultaneously opened meaning that the cold water is running in and the hot water is running out. When the temperature drops below limit, the bleed and supply valve is simultaneously closed.

Caution! It is not a compensation for safety valve.

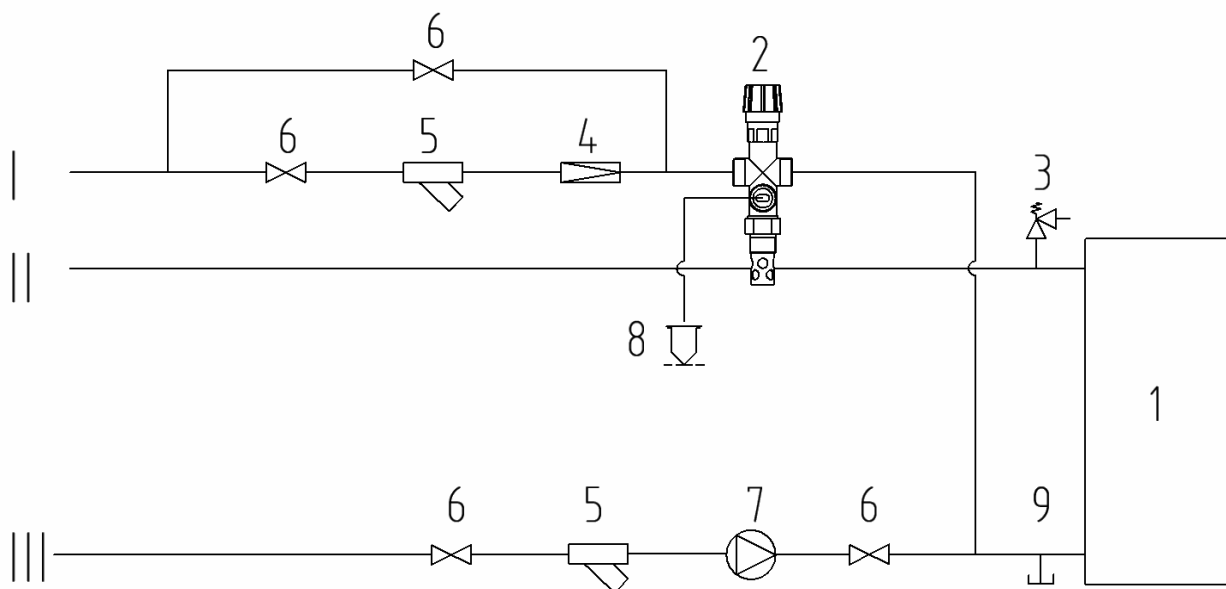
In case of two way safety vent reaction, when there is a possibility of boiler having been filled with the water, which does not meet the ČSN 077401 requirements it is necessary to change the water in the heating system so that it meets the ČSN 077401 requirements again.

Installation

Installation can be only carried out by a qualified person. For the correct operation of the thermostatic, two ways safety vent it is necessary to comply with the conditions for its installation and keep the flow directions marking on its body. The safety vent is always mounted in the output pipe of boiler or directly on the upper part of boiler, where the hot water leaves boiler and is transported into heating system. When installing the vent it is necessary to check, if the 3/4" socket usage, which can be both in pipeline and on boiler, ensures complete immersion of the thermostatic vent element after the vent installation. After the vent has been installed in socket, connect the down pipe, in which the hot water from boiler will flow to drain, to „C“ (see. fig. No. 23). The cooling water inlet, which will cool the boiler after setting the vent in operation, is connected (see fig. No. 24) to „A“ (see fig. No. 23). The filter for mechanical impurities must be installed in the cooling water inlet. It is necessary to connect the pipeline to „B“ (see. fig. No. 23) and the pipeline is to be led into reverse flow pipe of heating system near the boiler (see fig. No. 24).

Regular maintenance

Once a year it is necessary to turn the safety vent's head to remove possible impurities formed in the vent. Clean the cooling water inlet filter.



- | | |
|------------------------------------|---------------------------|
| 1 – Boiler | 7 – Pump |
| 2 – Two way safety vent DBV 1 – 02 | 8 – Surplus heat removal |
| 3 – Safety valve | 9 – Bleed valve |
| 4 – Transforming valve | I – Cooling water inlet |
| 5 – Filter | II – Heating water outlet |
| 6 – Ball-shaped cock | III – Return water inlet |

Fig. No. 24 The recommended scheme of the two way safety vents DBV 1 – 02 connection

6.5 Superfluous heat removal equipment- storage reservoirs

In case that the required volume exceeds 300 l we recommend to install a storage reservoir. Because the minimum output of this boiler is higher than 30% of the rated power we recommend to remove the heat into the storage reservoirs.

The calculation of the minimum volume of stack heat exchanger

$$V_{sp} = 15T_b \times Q_N (1 - 0,3 \times (Q_H/Q_{min}))$$

where

V_{sp} the volume of storage reservoir in l
 Q_N rated thermal output in kW
 T_b burning time in h

Q_H thermal load of buildings in kW
 Q_{min} minimum thermal output in kW

The dimensions of storage reservoirs at the boilers for central heating that are operated with individual prescribed fuels must be set according to the fuel which needs the biggest storage reservoir. This storage reservoir isn't necessary if the calculated volume is smaller than 300 l.

7. Boiler operation by user

User guide for controller ST 81 is delivered separately.

WOOD

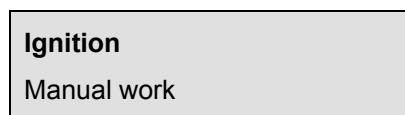
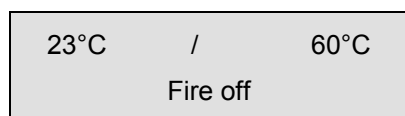
The wood maximum moisture of 20% must be observed in order to achieve the rated boiler output.
The fuel must be stored under cover.

Recommended sizes of wooden blocks

number of sections	5	6	7	8	9	10
Blocks diameter [mm]	Ø 40 až 100					
Blocks length [mm]	250	360	470	580	680	780

Firing a boiler

1. Check on the manometer the volume of water in the heating system.
2. Open the stop valve between the boiler and the heating system.
3. Clear the ceramics on the grid, the ash pan, smoke flues and the boiler walls.
4. Insert kindling and wood on the clean ceramics through the stoking door along the whole depth of the boiler.
5. Set the gaps of silencer and roses - see Table No.4
6. We start up the controller ST 81 by pressing the button I on the power switch.



We confirm by pressing the key . At this moment the fan starts working.

7. Fire the kindling through the open ash pan door.
8. Shut the ash pan door.
9. On the flaring wood load a thinner layer of basic fuel.
10. After its good burning add next fuel to fill the combustion chamber and balance the fuel in equal layers across the depth of the boiler.
11. If the outlet water temperature exceeds 40 ° C, 30 min. (Factory setting) the ignition of the boiler has been successful and the operation has been switched to automatic mode of the the boiler. Otherwise, repeat the process.

Tab. no. 4 Setting of fan and stifling

Number of sections	5	6	7	8	9	10
Min. fan output (%) *	10	10	10	10	10	10
Max. fan output (%) *	50	70	100	100	100	100
top rosette (primary air)	1 mm	1 mm	1 mm	2 mm	2 mm	2 mm
bottom stifling (secondary air)	3 mm	5 mm	5 mm	5 – 10 mm	5 – 10 mm	5 – 10 mm
rear stifling (tertiary air)	1 – 2 mm	1 – 2 mm	2 – 3 mm	2 – 3 mm	2 – 3 mm	4 – 8 mm
turbulators	ano	ano	ano	ano	-	-

* See adjustment procedure in User guide for controller ST1981 Chap. 5.2 and 5.3

Operation

1. If according to the table 4 we have adjusted the fan delivery and the silencer and roses with regard to the number of boiler sections we don't need to set anything during heating. The fan is modulatory and regulates the boiler output evenly according to the temperature set on the controller.

2. According to the heat consumption and burning intensity it is necessary to replenish the boiler with fuel during the operation. Stoking must be done in the way that makes sure that layer of fuel is uniformly high throughout the whole depth of the boiler.
3. The ash door must be permanently closed during the boiler operation.
4. If necessary, empty the ashtray (to be used gloves).
5. In case of shut-off valves it is necessary to install the safety valve between the boiler and shut-off valve.
6. We recommend cleaning the filter after the heating test and then before the heating season.

8. Maintenance

ATTENTION! Carry out the cleaning operations only before making fire when the combustion chamber is cold!

1. Before each new making fire it is necessary to remove the ashes from a ceramic grill. Cleaning is performed in direction away from the combustion nozzle toward the door. Ashes should be put into non-combustible containers with lids. During the work is necessary to use protective equipment and observe the personal safety.
2. 1x per month clean with a brush the inside walls of the combustion chamber, flue ways and smoke adapter.
3. After the heating season besides cleaning the boiler clean also the room behind the nozzle and remove soot and tar. Eject fireclay plates (see Chap. 5.2.3). Carefully eject the fireclay lining toward the door (using the supplied hook) and then clean the room.
4. If the tar deposits are on the walls of the combustion chamber, remove them with a scraper.
5. After the heating season clean the impeller of the fan.
6. After the heating season all door pins have to be serviced.

9. IMPORTANT WARNING

1. The boiler only can be used for the purpose that it is destined for.
2. The boiler only can be operated by adult persons who are familiar with this operation manual. In is inadmissible to leave the children at the boiler unattended by adults. The interferences with boiler that could endanger the health of operators or the roommates are impermissible.
3. The boiler is not destined for the use by persons (incl. children) whose physical, sensual or mental disability or lack of experience and knowledge prevent them from a safe use of the appliance unless they are supervised or if they were not instructed on the use of appliance by a person responsible for their safety.
4. Children should be supervised in order to ensure that they do not play with the appliance.
5. If there occurs a danger of inflammable vapours and gases development and penetration into the boiler room or at works accompanied by temporary development of the fire or explosion danger (gluing of floor covering, painting with combustible painting colours), the boiler must be duly closed down before the works start.
6. It is FORBIDDEN to use flammable liquids for LIGNATOR boiler ignition.
7. During the operation it is FORBIDDEN to overheat the boiler.
8. On the boiler and within the distance shorter than the safe distance from it there must not be put any objects made of flammable materials.
9. When clearing ashes at LIGNATOR boiler there must not be put any flammable materials within minimally 1500 mm distance from the boiler.
10. When operating the boiler at the temperature lower than 60 °C the boiler drum can get bedewed which means the low-temperature corrosion and reduction of boiler drum lifetime. Therefore we recommend to operate the boiler at the temperature of 60 °C and higher.
11. After the heating season termination it is necessary to clear thoroughly the boiler, smoke-flues and the smoke extension/ adaptor. Lubricate the pivots, the smoke throttle mechanism and other movable parts at the boiler with the graphite grease. Keep the boiler room clean and dry.
12. If the boiler is not in use (e.g. in summer season) you must disconnect it from power network, because of possible damage by atmospheric overvoltage (lightning)! Possible corrosion marks on the boiler drum don't mean a defect and they do not affect the boiler function.
13. There is necessary to install a safety valve in max. over-pressure of 400 kPa on the system, its dimension must come up to the boiler nominal capacity. In case of your further questions please do not hesitate to contact our contractual assembling firms and service organization.
14. In case of two way safety vent reaction, when there is a possibility of boiler having been filled with the water, which does not meet the ČSN 077401 requirements it is necessary to change the water in the heating system so that it meets the ČSN 077401 requirements again.

15. Installation of flue way must ensure sufficient draught and prevent condensation and sooting through the entire length of the chimney.
16. During assembly, installation and operation of the appliance it is necessary to comply with standards that apply in the relevant country of destination.

If you fail to meet these conditions you cannot requisite the guarantee repairs.

10. Instructions for product disposal after its lifetime extinction

ŽDB GROUP a.s., is a contracting partner of the firm EKO-KOM a. s. with the client number EK-F00060715. The packages comply with EN 13427.

We recommend to dispose the packages in the way as follows:

- plastic foil, cardboard cover, use a salvage point
- metal strapping tape, use a salvage point
- wooden base, is designated for a single and no longer can be used as a product. Its disposal is subject to Act 477/2001 Coll. and 185/2001 Coll. as amended.

Because the product is constructed of common metal materials, we recommend to dispose individual parts as follows:

- the heat exchanger (grey cast-iron), use a salvage
- distribution pipes, shell, use salvage point
- other metal parts, use a salvage point
- ROTAFLEX insulating material, through a firm engaged in waste collection and disposal

In case that the product has lost its manufacture qualities it can be taken advantage of the back collection service (if this is introduced); if the originator has declared that this is the waste and it will be handled according to the legislative provisions valid in the particular country.

11. Guarantee and reliability for defects

ŽDB GROUP a.s., VIADRUS division provides the guarantee:

- 24 months for boilers, this after the product was put into operation but maximum 30 months after the date it was dispatched from the manufacturing factory
- 5 years for a boiler drum, this after the date it was dispatched from the manufacturing factory

In case of possible complaint regarding the shell the customer is obliged to submit the packing label of the boiler shell. This is placed on the cardboard in which the shell has been dispatched.

The user is obliged to entrust a professional assembly firm with the commissioning and a contractual professional service accredited by ŽDB GROUP a.s., VIADRUS division, the manufacturer with the removal of faults. Otherwise the guarantee for boiler proper function does not apply. „LIGNATOR boiler quality and completeness certificate“ after its infilling serves as the „Guarantee certificate“.

A regular boiler maintenance must be done by its user.

Every notice of a fault must be conveyed immediately after its detection, always via a telephonic agreement and in writing.

If the above instructions are not observed the guarantees provided by the manufacturer will not be recognized.

The manufacturer reserves the right to make changes within the product innovations that needn't be included in this manual.

The guarantee does not apply to:

- the faults caused by a wrong assembly or wrong product operation and the faults caused by a wrong maintenance, see chapter 8.
- product damage arisen during the transport or other mechanical damage
- the faults caused by unsuitable storage
- Faults and damage caused by failure to observe water quality in heating system see chap. no. 4.1 and 5.2.7 or by using the anti-freeze mixture
- the faults caused by the failure to observe the instructions stated in this manual

Information for customer

Packaging edentification	Assessment reference
PE Plastic sacks, folie, corrugated board, iron and plastic fix line	

Identification od principál materials used. Paper, Polyethylene, iron, wood

Part 1: Summary of assessment

Standard/Report	Assessment requirement	Claim	Note
1.1 Prevention by source reduction		YES	
1.2 Heavy metals and	ensure below maximum permitted levels for components (CR 13695-1:2000)	YES	
1.3 Other noxious/hazardous substances	ensure in compliance with (CR 13695-2:2002, EN 13428:2000)	YES	
2 Reuse	ensure reusability in all terms of the standard for the functional packaging unit (EN 13429:2000)	NO	
3.1 Recovery by material recycling	ensure recyclability in all term sof the standard for the functional packaging unit (EN 13430:2000)	YES	
3.2 Recovery in the form of energy	ensure that calorific gain is achievable for the functional packaging unit (EN 13431:2000)	YES	Iron - NO
3.3 Recovery by composting	ensure compost ability in all terms of the standard for the functional packaging unit (EN 13432:2000)	NO	

NOTE Conformity with EN 13427 requires affirmative responses to sections 1.1; 1.2; 1.3 and to at least one of 3.1; 3.2; 3.3. In addition, where a claim of reuse is made section 2 should also record affirmative responses.
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Part 2: Statement of conformity

In the light of the assessment results recorded in part I above, this packaging is claimed to comply with the requirements of EN 13427:2000.
--

Guarantee certificate and Quality and completeness certificate for LIGNATOR boiler

Boiler serial number Boiler output

User (Surname, name)

Address (street, city, postcode)

Tel/Fax

Boiler complies with requirements

EN 303-5 Heating boilers – Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW – Terminology, requirements, testing and marking

ŽDB GROUP a.s., VIADRUS division provides the guarantee:

- for the boiler during 24 months after it was put into operation, but at the most 30 months after the boiler was dispatched from the production plant
- for the boiler drum during 5 years after it was dispatched from the production plant

Conditions of the warranty:

- **Installation of boiler must be carried out according to "Manual for boiler operation and installation" by a professional installation company**
- **Commissioning must be carried out according to "Manual for boiler operation and installation" contractual service organization accredited by the manufacturer**
- **Faults must be removed by a contractual service organization accredited by the manufacturer**

Completeness of the boiler delivery is guaranteed by the vendor

Warranty is void if not filled out

User confirms that:

- the boiler adjusted by the professional installation company did not show any fault during the heating test
- he received the "Manual for boiler operation and installation " with the duly completed guarantee certificate and certificate of quality
- he was acquainted with the operation and maintenance of boiler

.....
Manufacture date

.....
Manufacturer's stamp

.....
Controlled by (signature)

.....
Date of installation

.....
Installation company
(stamp, signature)

.....
User's signature

.....
Date of putting into operation

.....
Contractual service organization
(stamp, signature)

.....
User's signature

Annex to the guarantee certificate for customer- the user

[illegible]

Guarantee certificate and Quality and completeness certificate for LIGNATOR boiler

Boiler serial number Boiler output

User (Surname, name)

Address (street, city, postcode)

Tel/Fax

Boiler complies with requirements

EN 303-5 Heating boilers – Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW – Terminology, requirements, testing and marking

ŽDB GROUP a.s., VIADRUS division provides the guarantee:

- for the boiler during 24 months after it was put into operation, but at the most 30 months after the boiler was dispatched from the production plant
- for the boiler drum during 5 years after it was dispatched from the production plant

Conditions of the warranty:

- Installation of boiler must be carried out according to "Manual for boiler operation and installation" by a professional installation company
- Commissioning must be carried out according to "Manual for boiler operation and installation" contractual service organization accredited by the manufacturer
- Faults must be removed by a contractual service organization accredited by the manufacturer

Completeness of the boiler delivery is guaranteed by the vendor

Warranty is void if not filled out

User confirms that:

- the boiler adjusted by the professional installation company did not show any fault during the heating test
- he received the "Manual for boiler operation and installation " with the duly completed guarantee certificate and certificate of quality
- he was acquainted with the operation and maintenance of boiler

..... Manufacture date Manufacturer's stamp Controlled by (signature)
---------------------------	-------------------------------	------------------------------------

..... Date of installation Installation company (stamp, signature) User's signature
-------------------------------	---	---------------------------

..... Date of putting into operation Contractual service organization (stamp, signature) User's signature
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Guarantee certificate and Quality and completeness certificate for LIGNATOR boiler

Boiler serial number Boiler output

User (Surname, name)

Address (street, city, postcode)

Tel/Fax

Boiler complies with requirements

EN 303-5 Heating boilers – Part 5: Heating boilers for solid fuels, hand and automatically stocked, nominal heat output of up to 300 kW – Terminology, requirements, testing and marking

ŽDB GROUP a.s., VIADRUS division provides the guarantee:

- for the boiler during 24 months after it was put into operation, but at the most 30 months after the boiler was dispatched from the production plant
- for the boiler drum during 5 years after it was dispatched from the production plant

Conditions of the warranty:

- Installation of boiler must be carried out according to "Manual for boiler operation and installation" by a professional installation company
- Commissioning must be carried out according to "Manual for boiler operation and installation" contractual service organization accredited by the manufacturer
- Faults must be removed by a contractual service organization accredited by the manufacturer

Completeness of the boiler delivery is guaranteed by the vendor

Warranty is void if not filled out

User confirms that:

- the boiler adjusted by the professional installation company did not show any fault during the heating test
- he received the "Manual for boiler operation and installation " with the duly completed guarantee certificate and certificate of quality
- he was acquainted with the operation and maintenance of boiler

..... Manufacture date Manufacturer's stamp Controlled by (signature)
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..... Date of installation Installation company (stamp, signature) User's signature
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..... Date of putting into operation Contractual service organization (stamp, signature) User's signature
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VIADRUS

ŽDB GROUP a.s. / závod VIADRUS

Bezručova 300 / 735 93 Bohumín / CZ

Tel.: +420 596 083 050 / Fax: +420 596 082 822

www.viadrus.cz / info@viadrus.cz