

Centrometal

HEATING TECHNIQUE

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TECHNICAL INSTRUCTIONS

for assembling, use and maintenance
of solid fuel firing boiler and its
additional equipment



EKO-CKS 500

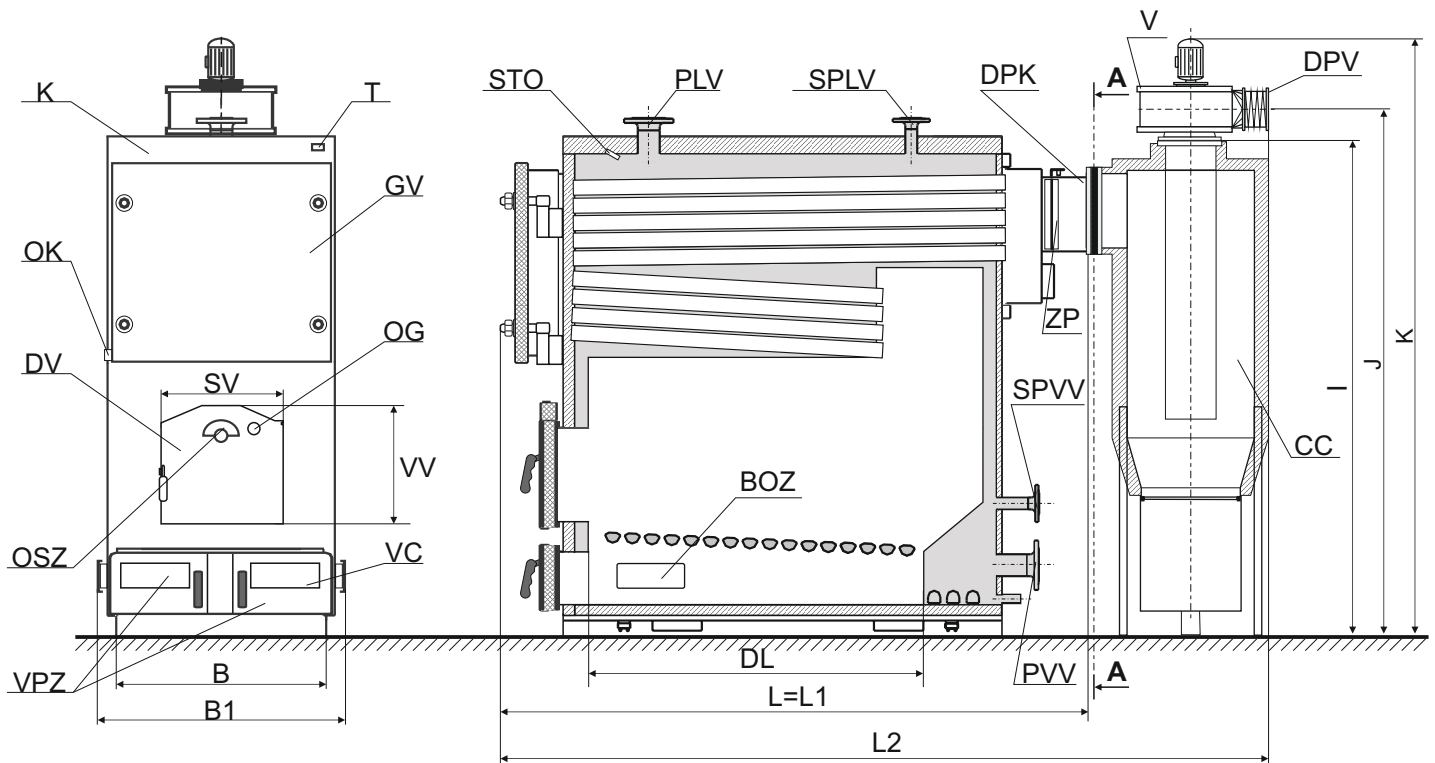
TECHNICAL DATA

TYPE		EKO-CKS 500	
Rated thermal output		kW	380-500
Dimensions of the boiler body	Depth (L)	mm	2665
	Width (B)	mm	1245
	Height (H)	mm	2540
Total boiler dimensions	Total depth (L1)	mm	2665
	Total width (B1)	mm	1391
	Total height (H1)	mm	2540
Boiler body mass		kg	2850
Total boiler mas (firing boiler body with insulation & regulation)		kg	2920
Boiler water content		l	1700
Max. operating pressure		bar	4
Boiler connections	Main / return flow	DN	100
	Safety line	DN	50
	Filling / drainage	G	5/4"
	Safety line dimensions	G	2"
	Safety pump suggestions	TIP	like Grundfos TYPE UPS-32-80
Flue gas connection (on boiler)		□ mm	430 x 170
Flue gas connection (on fan)		⊕ mm	202

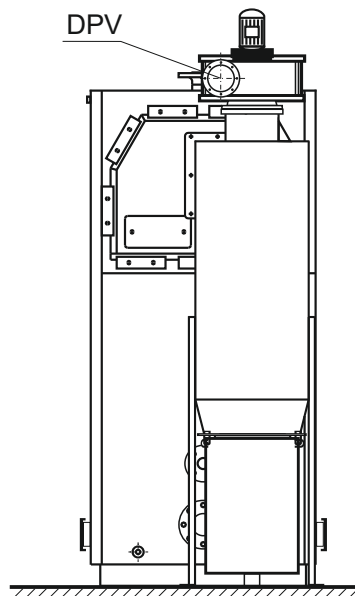
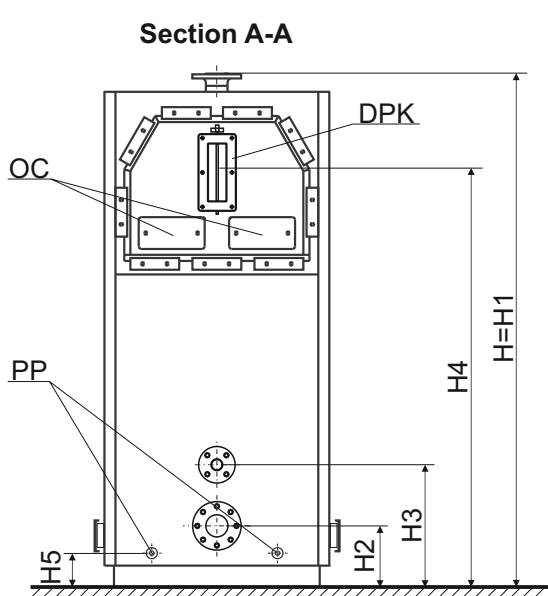
Dimensions

Type	EKO - CKS 500	
H2	mm	670
H3	mm	920
H4	mm	2080
H5	mm	600
DL	mm	1613
SV	mm	782
VV	mm	654

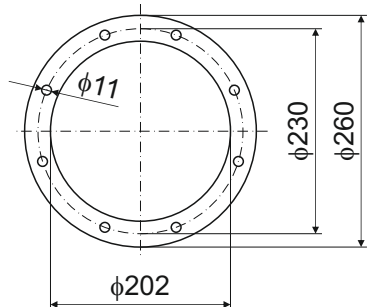
Type	EKO - CKS 500	
Total boiler lenght with cyclone L2	mm	3510
Total height of the cyclone with the fan K	mm	2560
Height of the flue gas exh. conn. of the fan J	mm	2505
Height of the cyclone I	mm	2355



Section A-A



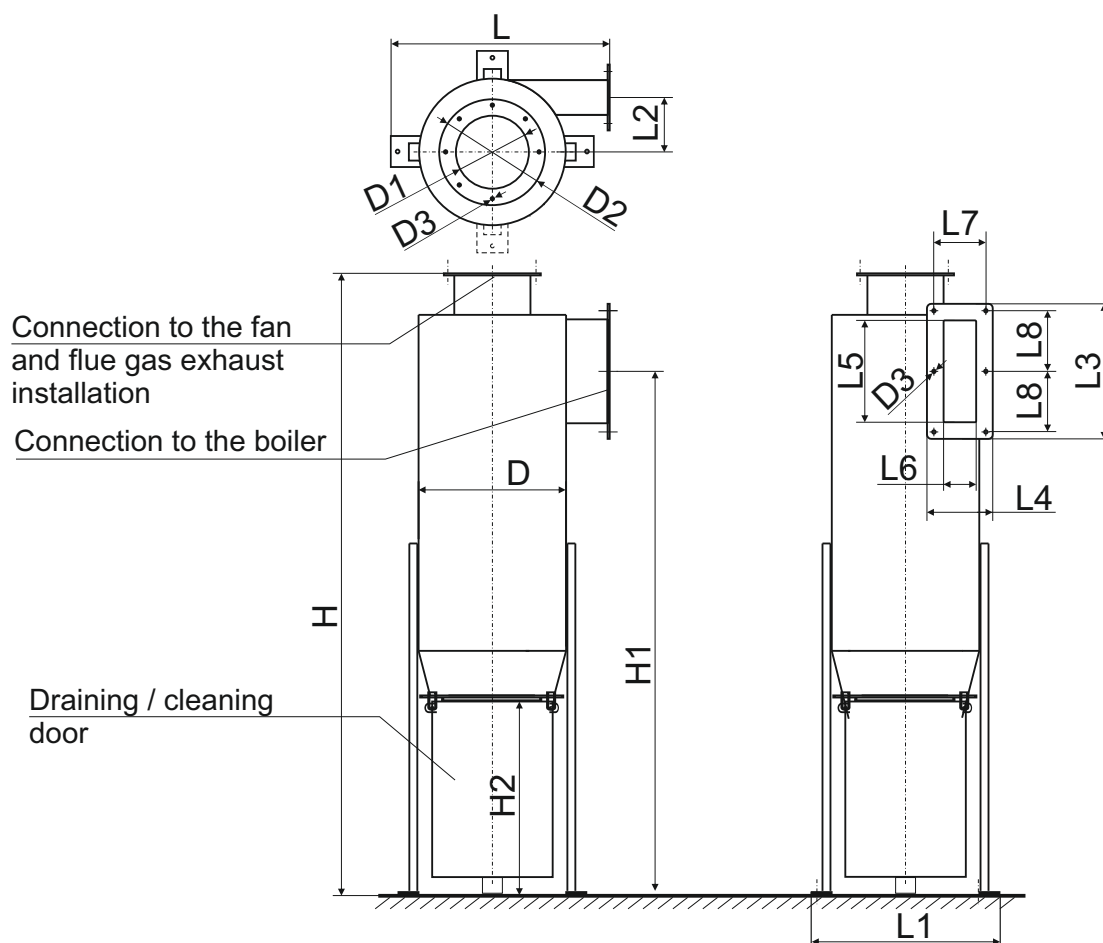
Flue gas connection
DPV-dimensions



Legend:

DPK	- Boiler flue gas exhaust (boiler to cyclone)	SPVV	- Safety outlet line
DPV	- Fan flue gas exhaust (fan to the chimney)	STO	- Temperature sensor probe
OC	- Opening for cleaning	T	- Thermometer
OSZ	- Secondary air door	OK	- Condensate exhaust connection
PLV	- Inlet	DV	- Lower boiler door
PP	- Filling/Draining	GV	- Upper boiler door
PVV	- Outlet	OG	- Visual control opening
SPLV	- Outlet	VPZ	- Primary air door/opening for cleaning
VC	- Door for cleaning	ZP	- Opening for under pressure regulator
V	- Fan	BOZ	- Side opening for the primary air
K	- Hot water boiler EKO-CKS 500	CC	- Cyclone

CYCLONE CC 500 - Technical data



Cyclone type		CC 500
Boiler type		EKO-CKS 500
Total height of the cyclone H	(mm)	2360
Boiler connection height H1	(mm)	2080
Height opening for draining H2	(mm)	730
Total depth of the cyclone L	(mm)	845
Total width of the cyclone L1	(mm)	790
Distance L2	(mm)	232
Connection height L3	(mm)	526
Connection width L4	(mm)	266
Height opening L5	(mm)	430
Width opening L6	(mm)	170
Distance L7	(mm)	226
Distance L8	(mm)	243
Cyclone diameter DO	(mm)	fi 650
Pening diameter D1	(mm)	fi 203
Outer connection diameter D2	(mm)	fi 260
Screw hole diameter D3	(mm)	fi 14
Cyclone mass	(kg)	158

1.0. DESCRIPTION OF THE BOILER

Boiler **EKO-CKS 500** is a special steel boiler for central heating systems. It has been constructed on the basis of a long term experience. The boiler is engineered for solid fuel firing. Its nominal thermal output is achieved through solid fuel ($H_d > 15000$ kJ/kg). The steel body of the boiler is welded according to modern technology, produced out of high quality material. Boiler's efficiency rate reaches over 75%. It is constructed for a maximum operating pressure of 4,0 bar. The entire surface inside the boiler which comes in touch with fire or with smoke is in contact with water and its tubing net has water cooling. Flue gases are streaming through three passages of exchanging surfaces: combustion chamber, first bundle of boiler flue exhaust and the second bundle of boiler flue exhaust tubes. After that they are coming out through the smoke chamber and through the chimney connection to the cyclone. In the cyclone the rigid particles are outshine from the flue gases, passages through the fan and went to the chimney. The firing procedure is manual through the spacious door. The temperature, i.e. fire intensity is regulated by a before fixed flue gas damper which is situated in the flue gas exhaust and the regulator which steers the fan installed on the cyclone. Additional regulation of the fire intensity can be also perform with the opening for the secondary air which is situated on the lower boiler door. The upper boiler door enables the access to the first and second bundle of the boiler flue exhaust tubes and their cleaning. There is also free access to all other doors and openings when the boiler has to be cleaned. The boiler is equipped with all necessary connections for the connection to the central heating system. The body of the boiler is delivered separately from the casing and the thermal insulation and separately cyclone and fan which enables easier transportation and assemblage without unnecessary risks of casing damage.

WARNING:

Connection of the boiler to the chimney and to the central heating system as well as the start-up has to be performed by the authorized person licensed on behalf of Centrometal d.o.o. company.

1.1. DELIVERY PACKAGE

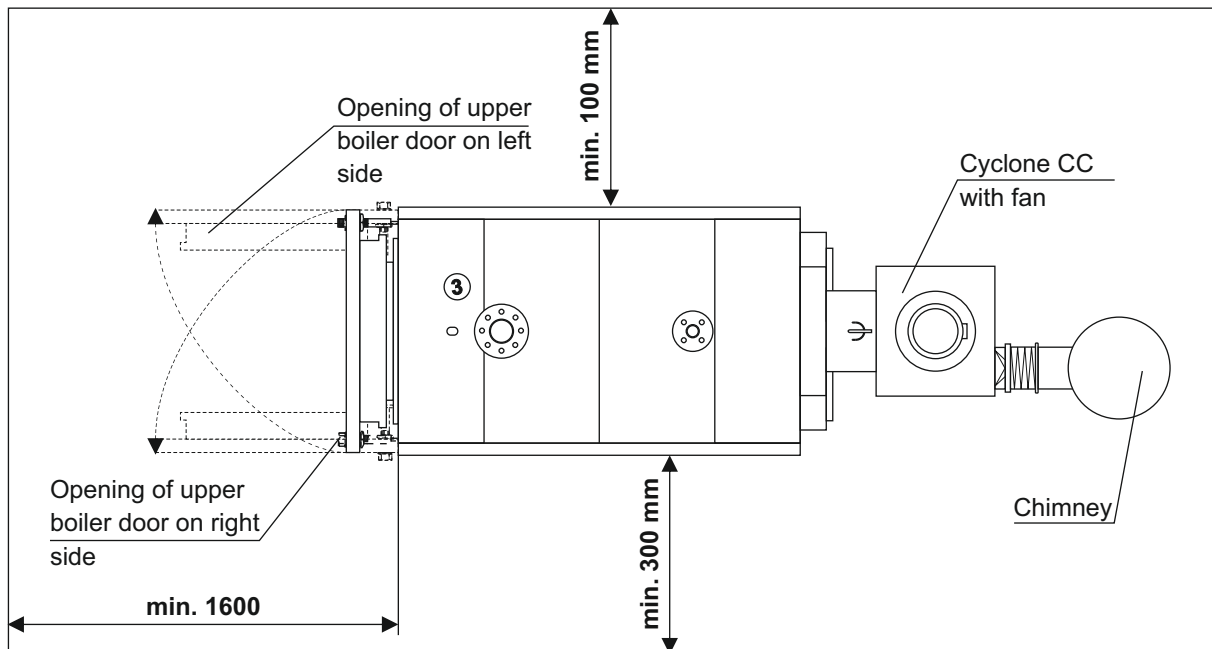
- Boiler's body with the door
- Casing with thermal insulation
- Thermometer, draught regulator, cleaning set (cleaning brush, poker, shovel)
- Cyclone is used to expell the dust particle
- Fan for the flue gases
- Boiler regulation CK/CKB

2.0. ASSEMBLAGE OF THE BOILER

The boiler and cyclone has to be put on the previously prepared concrete fundament which minimum height is 200-300 mm. The upper fundament surface has to be smooth and exactly horizontal.

The room has to be frost proof and adequately ventilated. The boiler and the cyclone has to be situated in order its connection to the chimney can be performed correctly (Image 1.) its cleaning and handling should be convenient, the boiler, cyclone and fan has to be situated to have all its parts easily accessible. The casing has to be assembled after the boiler has been connected to the cyclone, chimney and to the central heating system, according to the instructions attached with the casing (Image 5.). Before the mounting of the casing to the boiler it is necessary to attach the boiler regulation to the casing of the boiler (see point 9.3) Before any kind of connecting the boiler and cyclone to the installation the boiler and the cyclone has to be in level (has to be put exactly in the horizontal position)

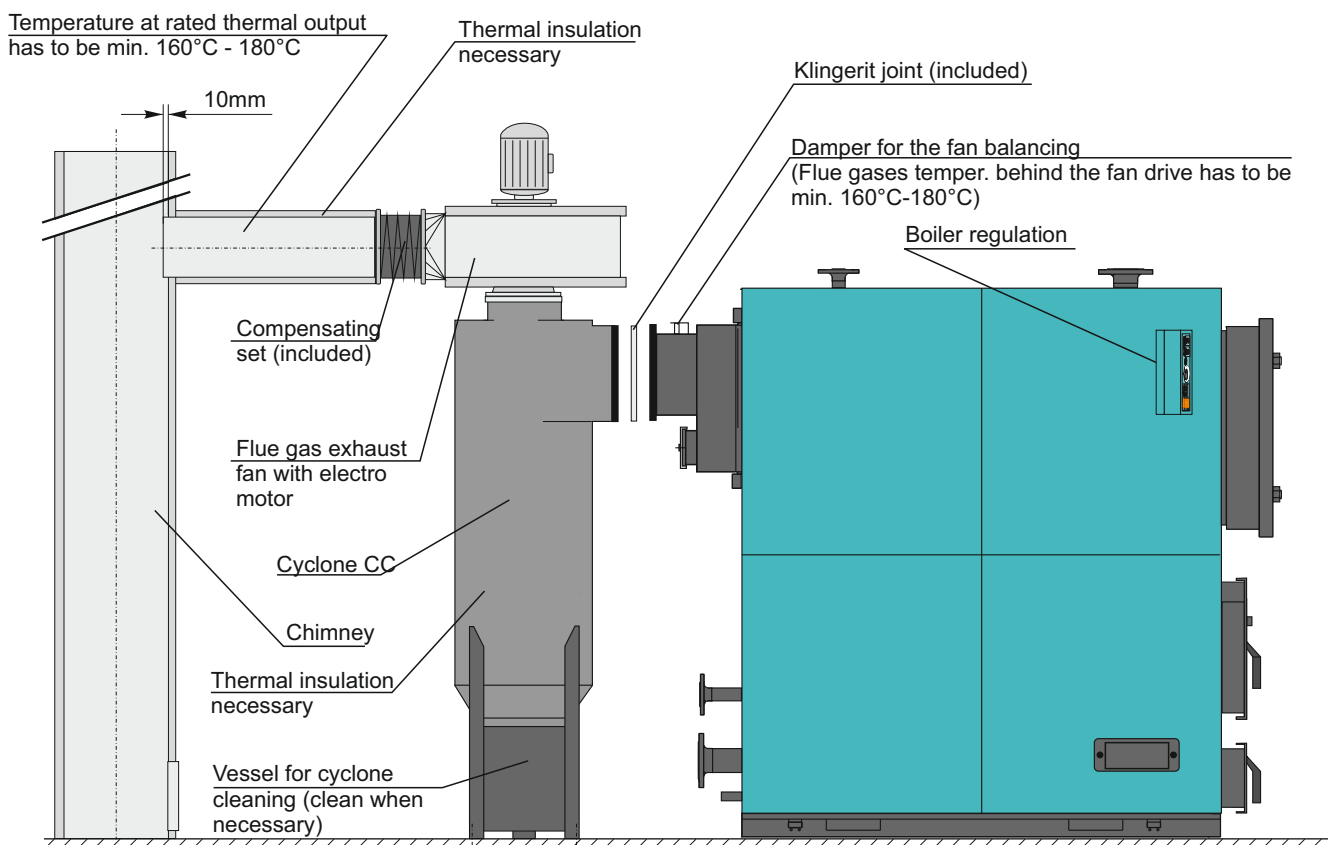
Figure 1. Minimal distances from the boiler room walls



3.0. CONNECTION TO THE CHIMNEY

Properly dimensioned and built chimney is the main condition for safe and economical functioning of the boiler. **The thermal insulation of the chimney has to be done properly**, it has to be absolutely gas-proof and smooth. On its lower part there has to be built in the opening for cleaning with the door. An brick - layed chimney has to have three layers with an insulation of 30 mm in the middle, if the chimney is built inside the house (i.e. inside the heated area), or an insulation of 50 mm if it is built outside the house (i.e. outside the heated area). The flue gas temperature has to be at least 30°C higher then the temperature of their condensation point. The choice and the construction of the chimney have to be performed by the authorized person.

Figure 2. Connection mode of the boiler EKO-CKS with the cyclone and fan to the chimney



Note:

- Cyclone and boiler connection with screw joint M12- 6 pieces
- Cyclone to be connected to the fundament by screws
- Connection of cyclone to the fan by screw joint M10 - 8 pieces
- Connection of the fan to the flue gas installation has to be performed using the compensating set to reduce vibrations
- Connections of the boiler to the cyclone and fan to the flue gas installation have to be gas-proof.- Flue gas installation has to be absolutely gas-proof.
- Flue gas installation and the cyclone have to have a thermal insulation

TYPE	INTERSECT HEIGHT *	CHIMNEY DIAMETER **
EKO-CKS 500	10 metara	minimalno fi 500 mm

NOTE:

Flue gas box (connection fan with chimney) must be straight and maximal length of 1 m (elbow must not be used)!

*** Intersect height**

- chimney height from intersect flue gas tube with chimney to top of the chimney

**** Promjer dimnjaka**

- interior chimney diameter.

The cyclone and connecting tubes has to have a thermal insulation made out of 30-50mm thick stone wool. In order to unable condensate fwlrom the chimney to the fan, the flue exhaust tube has to be situated 10mm deeper inside the chimney. If for any reason the boiler and the cyclone have to be connected to the chimney dimensioned for higher capacity boilers, the possibility of condensation inside the chimney shall be highly increased. The boiler's function shall not be affected, but the damper on the flue exhaust has to be positioned according to the chimney underpressure.

4.0. PRIMARY AIR SUPPLY OPENING

Every heating room has to have an fresh air opening dimensioned according to the boiler's capacity. The opening has to be protected by a net.

$$A=6,02 \times Q$$

A - opening surface in ²

Q - rated thermal output in kW

5.0. CONNECTION OF THE BOILER TO THE CENTRAL HEATING INSTALL.

5.1. CONNECTION OF THE BOILER TO THE OPEN EXPANSION VESSEL

The boiler **has to be connected to the open system** according to the scheme on the image 3. All connections from the boiler to the open expansion vessel and from the open expansion vessel to the boiler have obligatory to be covered by the thermal insulation of min. 40mm (stone wool or equivalent insulating material). If the expansion vessel is situated outside the heated area, it has to be insulated. The dimension of the open expansion vessel is determined by the quantity of water inside the installation, i.e. approximately 7% of the total water quantity inside the entire installation.

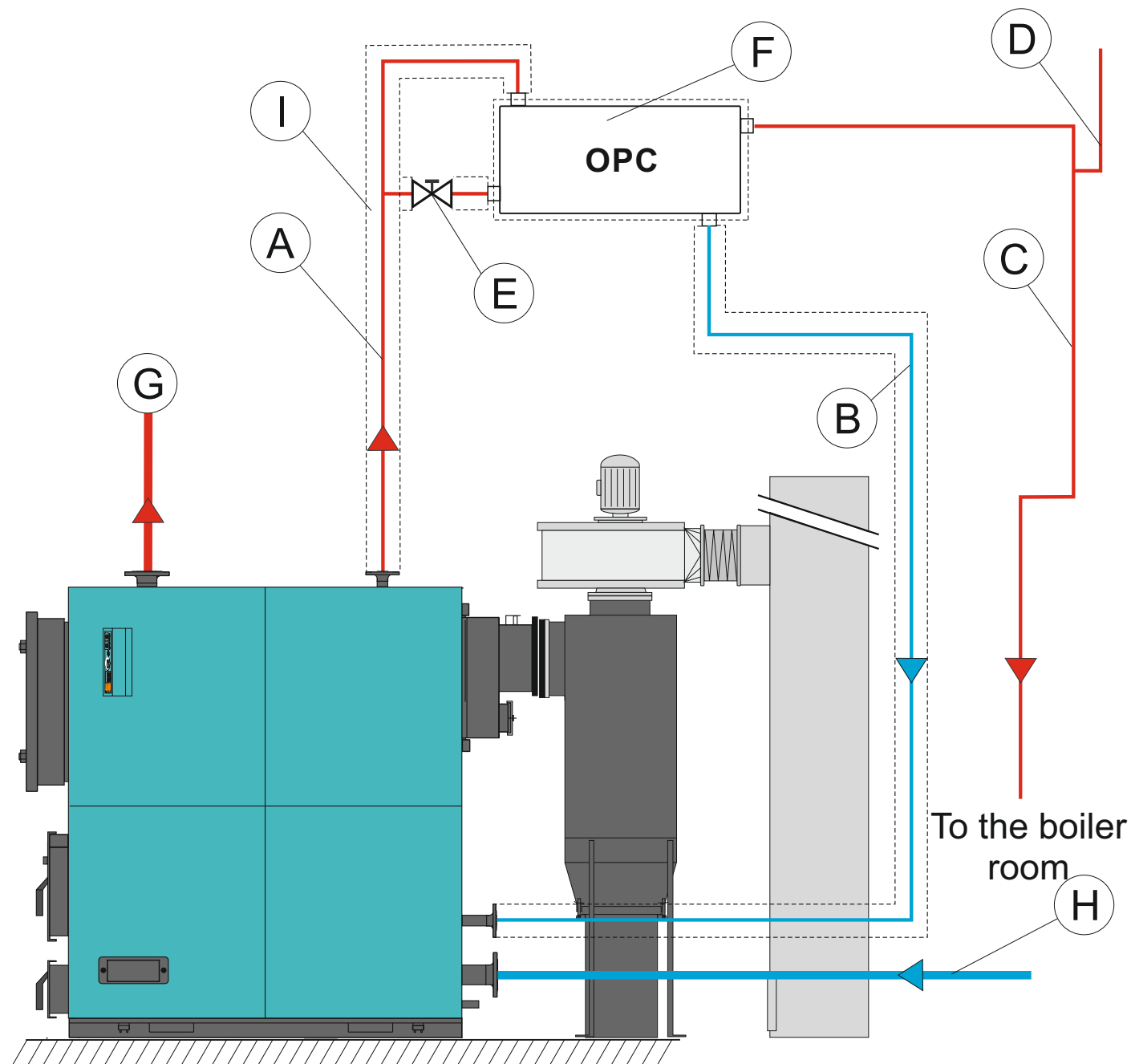
5.2. BOILER SAFETY PUMP

In order to minimize the condensation inside the boiler a safety line with an safety pump has to be build in (Image 4.). Activating and disactivating of the safety pump is steered by the pipe valve situated on the boiler's outlet, approx. 300 mm from the safety line connection point, towards the installation with an functioning field of 0°C to 65°C. Safety line suggestions according to the boilers capacity is shown by the table „TECHNICAL DATA“. **Safety line have to be cover by thermal insulation**, min. 40mm stone wool or equivalent insulating material.

5.3. CONNECTION OF THE BOILER TO THE CENTRAL HEATING SYSTEM

The central heating system to be connected to the boiler has to be performed according all professional and security standards. The regulation of the room temperature can be solved in few ways, but each of solutions has to be worked out in order the outlet water operating temperature does not reach the value below 60°C. **It is recommended to build in the 4-passes manual valve**. In order to minimize the water steam condensation of the flue gas, it is necessary the circulating pump of the heating circuit/s to be activated and dis activated by means of the pipe thermostat set up to min. 75°C. The system can also be regulated by means of any other appropriate system. The pipe thermostat has to be situated on the boiler's inlet right next to its connection to the boiler. The general connection plan is figured on the image 4.

Figure 3. General connection plan of the EKO-CKS boiler with the open expansion vessel (open system)

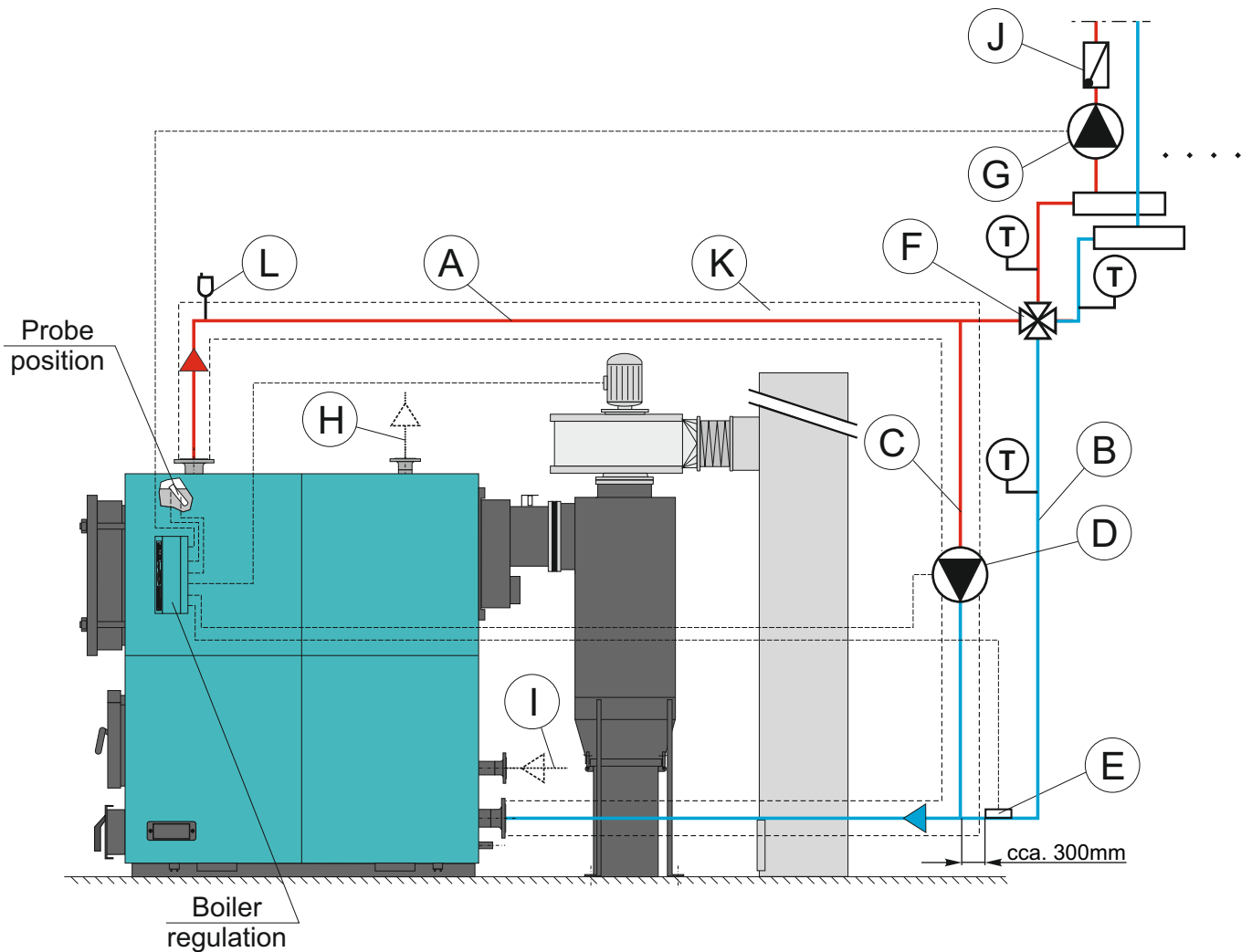


LEGEND:

- A - Safety inlet NO 40
- B - Safety outlet NO 32
- C - Overflow line NO 40
(has to lead to the boiler room)

- D - Air vent
- E - Throttle valve
- F - Open expansion vessel OPC
- G - Main flow
- H - Return flow
- I - Thermal insulation

Figure 4. General connection plan of the EKO-CKS boiler to the heating system



LEGEND:

- | | |
|--|--|
| A - Main flow | G - Circulation pump – according to the system |
| B - Return flow | H - Safety main flow (to open expansion v.) |
| C - Safety line | I - Safety return flow (from open expansion v.) |
| D - Safety pump | J - Stop valve |
| E - Pipe thermostat
(operat. temp. 0-60°C) | K - Thermal insulation of the safety boiler circuit |
| F - 4-way manual mixing valve | L - Thermal insulation of the safety boiler circuit |
| | T - Thermometer |

NOTE: Closing valves are not displayed on this plan.

6.0. FILLING THE SYSTEM

The boiler and the entire central heating system have to be filled with water according to the HRN M.E2011 norm – table 4.

The system has to be air vented in order the water can circulate normally.

7.0. CASING ASSEMBLAGE

Assamblage of the thermal insulation and plastificied metal sheet coating can be started after the all works with connection to the chimney and to the central heating installation. Before assembling the boiler casing, the regulation has to be fixed. The order of assembling is described on image 5 and with picture 7 and 9 and in the scheme which is attached to the casing packed in the cardboard box.

8.0. CONNECTION OF THE CONDENSATE OUTPUT

During the first heating process, usually by means of solid fuel firing, when the temperature in the boiler is below 65°C, a certain quantity of condensate produced by water steam appears on the cold walls of the boiler. In order to let this condensate get out of the boiler, in the left lower corner of the upper boiler's door (see image 3) there is an output. It is connected by an ½“ outer thread to which a flexible plastic/gum pipe can be connected which is draining the condensate into the plastic pot, or simply out of the boiler.

9.0. ASSEMBLING THE BOILER REGULATION

Before assemblage of the boiler cover is necessary on the right upper front side of the cover drill two holes (fi 3,2 mm) for screws and one bigger hole (fi 23 mm) for sensors of regulation. Positions for holes are shown on figure 5.

Figure 5.

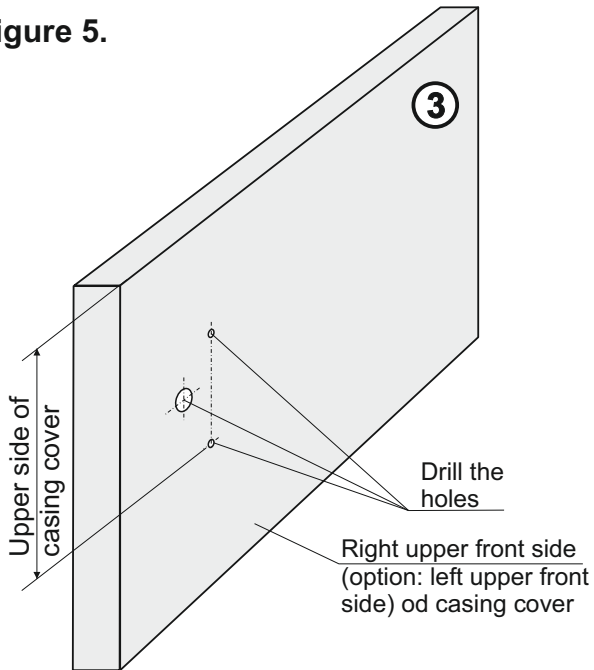
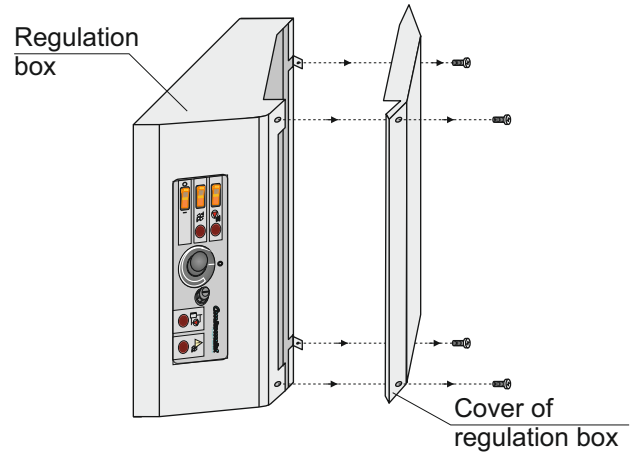
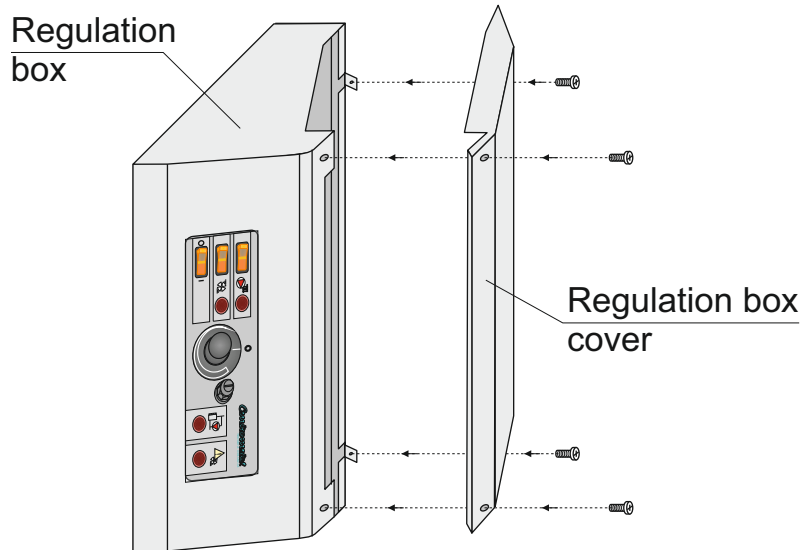


Figure 6.

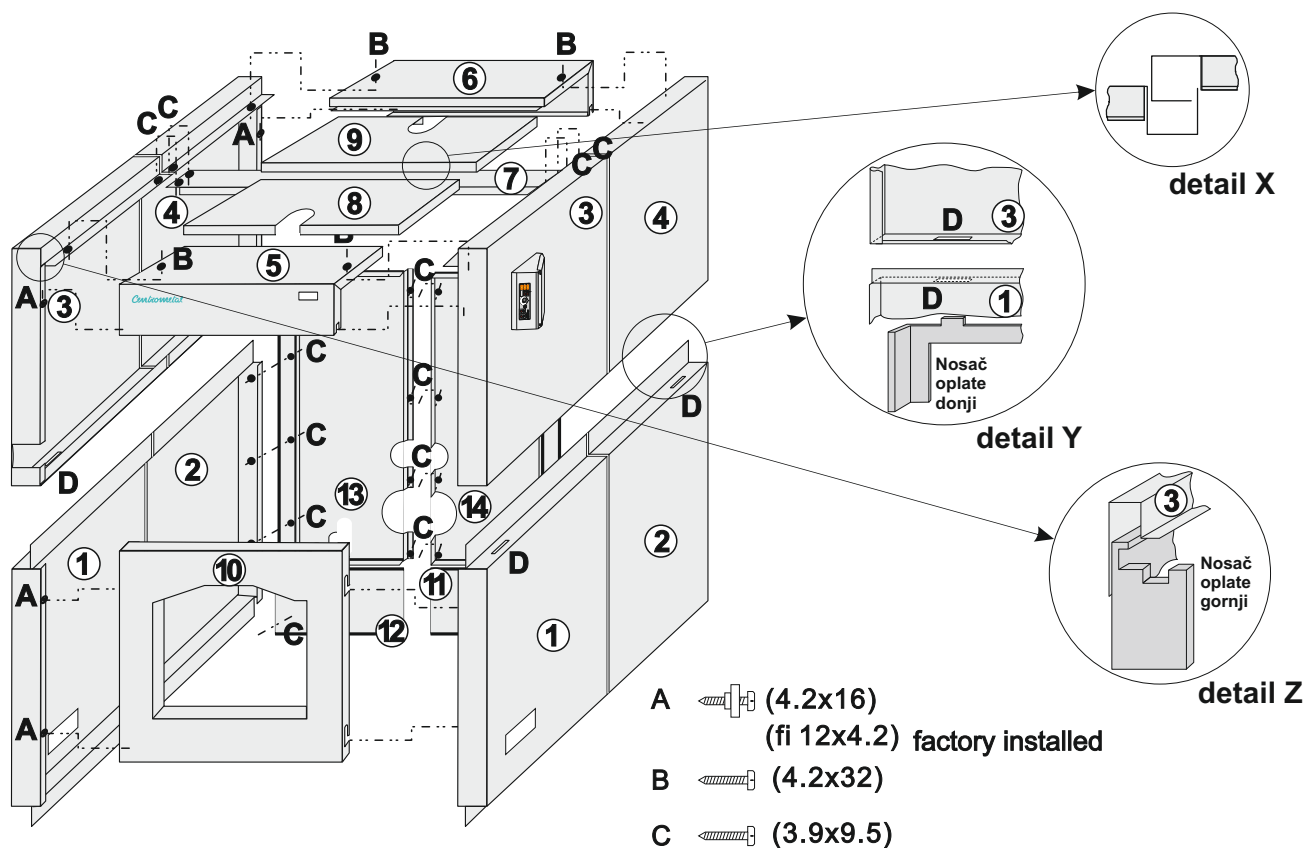


After drilling holes is necessary to put out regulation box cover (Figure 6.).

Figure 8.



Slika 10. Assembling order for the casing of EKO-CKS 500 boiler



Insert the lower lateral part of the insulation (1) and (2) into the slit D in order it fits into the lower boiler casing porter (see detail Y), in the same time put the lower part of the casing into the lower slit.

Fix the upper lateral part of the insulation (3) and (4) on to the upper porter of the boiler (see detail Z), while the lower part of the upper lateral insulation plate is fixed on the porter of the boiler according to the detail Y.

The sensor of the thermometer, operating and safety thermostat has to be inserted into the probe on the upper side of the boiler and the upper front cover (5) has to be hanged over the hooks A and fixed by screws B for the sides (3) on the casing. The same has to be done with the upper back cover (6).

The stone wool has to be placed on the upper side of the boiler, then with the screw C fix the U-profile (7), after that put the cover (8) on to the plate (3) and U-profile (7), then cover (9) put into the slid of the cover (8) – detail X and recline on to U – profile (7).

The back side plates (11) and (12), and back upper plates (7) and (8) has to be fixed on the boiler and fixed together by help of the screw C, successively to the lateral plates of the boiler (2) and (4).

Before assembling the front plate the lower door has to be opened and the front plate (10) has to be pulled over the door. After that the front plate has to be hanged over the hooks (A) on the left and on the right side of the plate (1).

10.0. BOILER REGULATION

In order to obtain a regular and safe operation of the EKO-CKS 500 boiler connected with the Cyclone CC and the exhaust fan there is a need to install the EKO-CK/CKB boiler regulation. The regulation steers the start ups and stops of the fan, according to the set boiler temperature.

10.1. DESCRIPTION OF THE BOILER REGULATION

1. MAIN SWITCH

Switch with the signal light for starting and stopping the control unit.

2. FAN

Switch with the signal light for starting and stopping the fan (light if the switch is on).

3. CONTROL LIGHT OF THE FAN

If switch is on (position 2), light is on when the fan is working.

4. CIRCULATION PUMP

Switch with the signal light for starting and stopping the circulation pump (light if the switch is on).

5. CONTROL LIGHT OF THE CIRCULATION PUMP

If switch is on (position 4), light is on when pump is working.

6. REGULATION THERMOSTATE OF THE BOILER

Interval of the boiler operating temperature regulation (30-90°C), is performed by turning the button (position 6).

7. SAFETY THERMOSTAT

Switches off the fan if the boiler temperature exceeds 110°C-9°C; which protects the system from break down.

In order to restart the fan, following has to be done:

- wait until the boiler temperature falls below 70°C.
- open the safety thermostat lid (position 7):
- press the red button

If the system switches off successively, let the authorized person check the system.

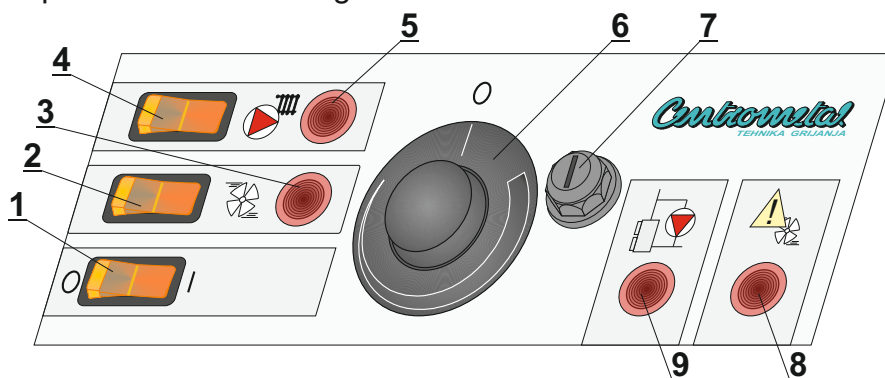
8. CONTROL LIGHT OF THE FAN

The light shall be switched on if the fan's operation is disturbed.

9. CONTROL LIGHT OF THE SAFETY PUMP

Light is on if safety pump of the boiler is working.

Slika 11. Control panel of the boiler regulation



10.2. CONNECTION THE BOILER REGULATION WITH THE FAN TO THE EL. POWER NET

The boiler regulation should be connected to the fan according to the image 12. – scheme of the connection the fan to the boiler regulation EKO-CK/CKB and to the electrical power net.

11.0. CYCLONE CC

The Cyclone produced by Centrometal d.o.o. is used to filter hard particle from the flue gases.

11.1. CONNECTING THE CYCLONE

The cyclone has to be connected to the flue gas exhaust behind the boiler. A general connection scheme is shown on the image 2. Between the boiler and the cyclone, there also has to be built in the klingerit-joint which is included in our standard delivery. Connect the absorbing part of the cyclone to the upper connection point (flange), if it has not already been connected by the manufacturer. Between the cyclone and the fan there a klingerit-joint has to be inserted (if it has not already been built in by the manufacturer). The cyclone and the entire flue gas **installation have to be coated by thermal insulation** made out of 40mm thick stone wool or equivalent material.

11.2. CONNECTING THE CYCLONE

The cyclone has neither movable nor parts subjected to wear and tear. On its lowest point there is an opening for cleaning. When necessary (depending on the quantity of the exhaust gases particles) it has to be opened and cleaned.

12.0. FAN

The fan takes out exhaust gases out of the boiler and pushes them to the chimney.

12.1. INSTALLING THE FAN

The fan is not allowed to be touched neither on the inlet or outlet opening nor on the fan axle or on the electrical motor. There has to be enough space provided for the assemblage, for the technician and his tools. The installation according to the image 1 to the cyclone outlet. After assembling the fan drive has to be leveled.

12.2. FAN CONNECTIONS

The connection to the pressure tubing system only with their connections is not allowed. It is also not allowed to transfer additional burden to the fan through the tubing system. Pressure tube connection of the fan has to be connected to the pressure tubing system by means of elastic joints – compensators, which do not transfer vibrations. The tube connections and tubes itself have to be airproof closed.

12.3. CONNECTION TO THE ELECTRICAL POWER NET

This connection has to be performed only by an authorized person. Technical data concerning the motor are attached in the technical manual and are also written on the motor body. The rotation sense of the fan drive is indicated on its casing and has to be considered. The cable has to be protected from mechanical or other kind of damages, set in the proper way, in order to avoid any damages. Connection plan to the electrical power net is shown on image 12.

12.4. STARTING THE FAN

First to be checked if the fan drive is properly fasten to the cyclone. Revolve the fan manually and find out if it is rotating without touching any obstacle. The rotor is not allowed to touch its housing! During its first start up it is necessary to start the fan when the draught regulator is closed or otherwise closed air flow, in order to enable the motor to reach the speed easier. During the first start up it is necessary to control the fan rotation sense (sense of the arrow). It has also to be checked if during the start up some kind of strange noise are appearing. Check the vibrations and find out if they are exceeding the normal range. The damper for the balancing of the fan which is situated on the flue gas exhaust of the boiler and should be put in the position which enables the flue gases temperature to reach minimum 160°C-180°C at nominal thermal output.

12.5. TEMPERATURE OF THE FAN BEARINGS

While the motor is running it is necessary to control the temperature of the motor and its bearings. The motor housing temperature should not exceed 70°C (constant operation). If the bearings are getting warmer the fan has to be stopped and the reason for the exceed temperature has to be found out and solve it.

12.6. MAINTAINING THE FAN

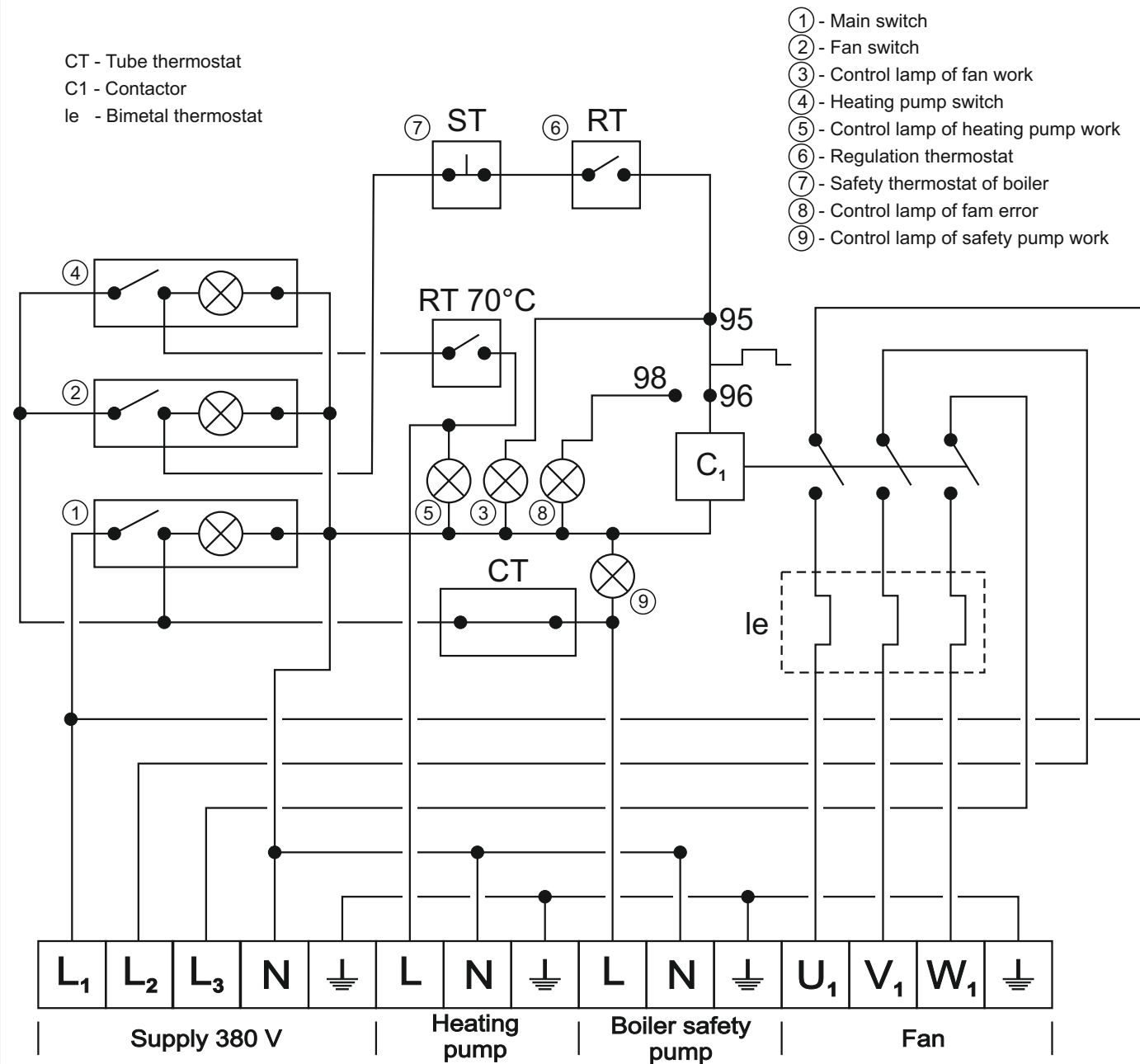
After each 6000 working hours, i.e. once in the year it is necessary to: check the general condition of the fan; check all elements and screw joints; check all welding points, especially those on the rotor; check the wear and tear of the motor housing and of the rotor; check the condition of the compensator and belonging steering (tightness, wear and tear). In case the spare parts are needed, they have to be cleaned previously.

12.7. THE ROTOR AND THE FAN'S HOUSING

Both parts are subjected to the wear and tear. The main reason is dust, i.e. the acid mixed with the medium inside the tubes, steam and gases. The wear and tear grade depends on the kind and quantity of the substance. During the rotation the rotor could slip out of its center, which causes the damage of bearings, of the axle and of the rotor itself. Because of the material wear and tear the solidity of the rotor can be minimized, which leads to its break down as well as to a heavy damage of the fan. The rotor and the housing have to be checked once in the month. During the operation process of the fan, there has to be pay special attention to its smooth moving, i.e. the vibration level has to be checked. The cleaning of the rotor depends of the dust quantity. Depending on general conditions (wear and tear of the rotor, higher dust stickiness) the controls have to be repeated in shorter periods.

CONNECTION OF THE FAN TO THE EKO-CK/CKB REGULATION AND TO THE ELECTRICAL POWER NET

Slika 12. Scheme of EKO-CK/CKB regulation and fan connections to the electrical power net.



13.0. START UP OF THE BOILER

The start up has to be done by the person authorized on behalf of Centrometal d.o.o.

It is necessary the check if previous assemblage has been performed exactly according to the requirements and description of this manual.

Additional following has to be check:

- the boiler and the central heating system have to be filled with water and air vented.
- the security elements are functioning and if they are correctly connected.
- the flue gas tube is well connected, insulated, and sealed.
- flue gas damper is properly set according to the chimney under pressure
- Are the cyclone and fan properly set to the boiler and the cyclone is well insulated.
- all objects, which eventually could have been left inside the boiler are removed (from the combustion chamber, exhaust tubes, etc.). Some objects could have been put inside during the assemblage for any reason and could negatively influence the functioning.
- the upper and lower door of the boiler and door of the primary air is well set (seal properly).
- the primary air/cleaning door properly fits
- the air lid on the door for primary air can freely move – when boiler do not work must be closed.
- the secondary air lid on the lower boiler door is closed
- the heating room has proper air circulation opening.
- the tube thermostat of the boiler's security pump is set to 65°C (the pump is functioning from 0°C to 65°C)
- the tube thermostat of the heating circuit pump is set up to 75°C (the pump is functioning above 75°C)

The start up procedure includes also:

- starting of at least one heating process during which the functioning of the lid in the flue gas exhaust and the fan regulation thermostat has to be set, so that the temperature inside the boiler during a normal firing process does not exceed 90°C and does not decrease below 75°C.
- check the outlet water temperature during functioning, because this temperature should not be under 60°C. If it happens the system should be accordingly set up.
- secondary air flow opening is set (can also be closed)
- training the person in charge of the boiler room, training protocol signed by the trained person.

14.0. FIRING THE BOILER

The boiler is constructed to be manual fired by means of solid fuel. Nominal thermal output is obtained through solid fuel and its lower calorific value $H_d > 15000 \text{ kJ/Kg}$.

After the initial firing the fuel has to be supplied in the way the boiler reaches the temperature of 70°C as soon as possible in order to minimize the intensity of the initial condensation.

The functioning of the lid in the flue gas exhaust has to be set in the way the temperature inside the boiler during the normal combustion does not exceed 90°C and does not fall below 75°C .

It is also necessary to take care of the outlet water temperature during the operation, because it should not fall under 60°C .

Additional regulation of the combustion quality can also be reached by setting the secondary air opening.

Between two firing, it is recommended to pass over the glow with the poker in order to obtain a balanced fresh air supply. It is also necessary to take care of all other previously mentioned points of this technical manual.

The fuel has to be dry as usually recommended for this kind of firing, for example, two years long air dried wood, i.e. **the wood has to contain less than 30% humidity.**

15.0. CLEANING AND MAINTAINING

The space under the grate and the combustion chamber has to be cleaned every day. The space under the grate can be cleaned through the primary air/cleaning door, which previously has to be removed without separating the chain of the draught regulator. Clean of the flue exhaust tubes of the second and third passage when necessary or once a week through the upper boiler door with the brush which has to be pushed through the whole length of the tube. On the back side of the boiler there is another opening for cleaning (see page 3.) through which is possible to remove the material which has been collected during firing as well as during the cleaning process. The hole can be approached by removing M8 screws and cover.

If there is a possibility of freezing, the boiler has to be fired constantly. Draining the water out of the system is absolutely not the right solution, because this would cause corrosion of the entire central heating system as well of the boiler's interior.

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