

## TECHNICAL MANUAL

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



Centrometal d.o.o. Glavna 12, 40306 Macinec, CROATIA  
sales department tel: +385 40 372 640  
central tel: +385 40 372 600, fax: +385 40 372 611

www.centrometal.hr  
e-mail: servis@centrometal.hr

TECHNICAL DATA

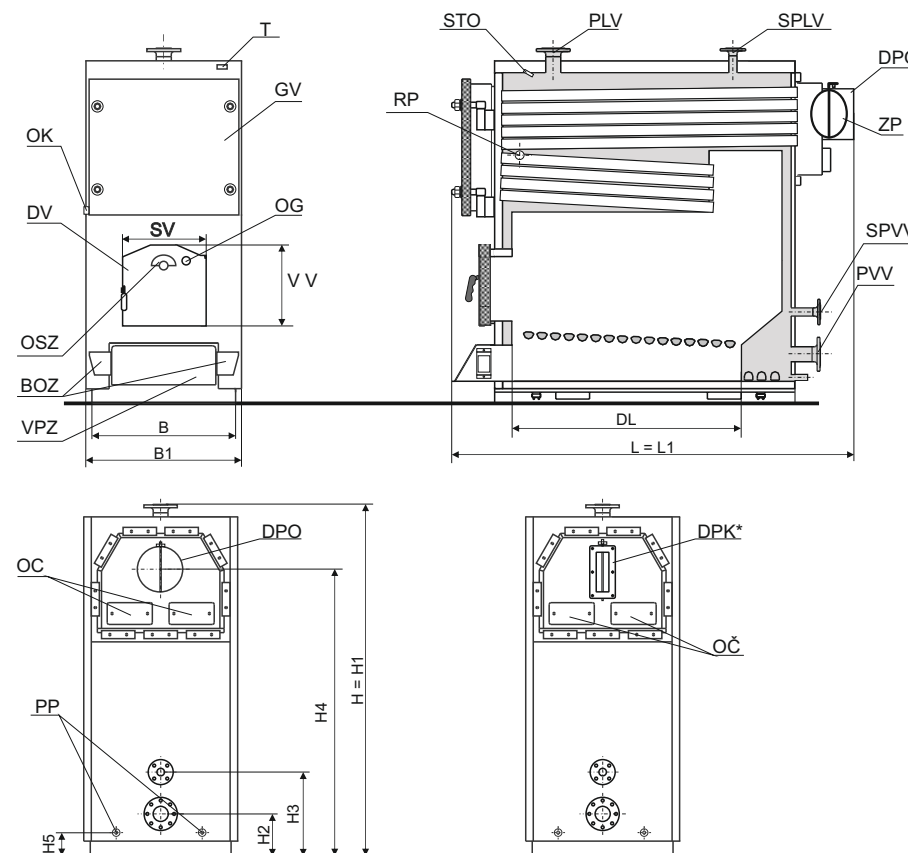
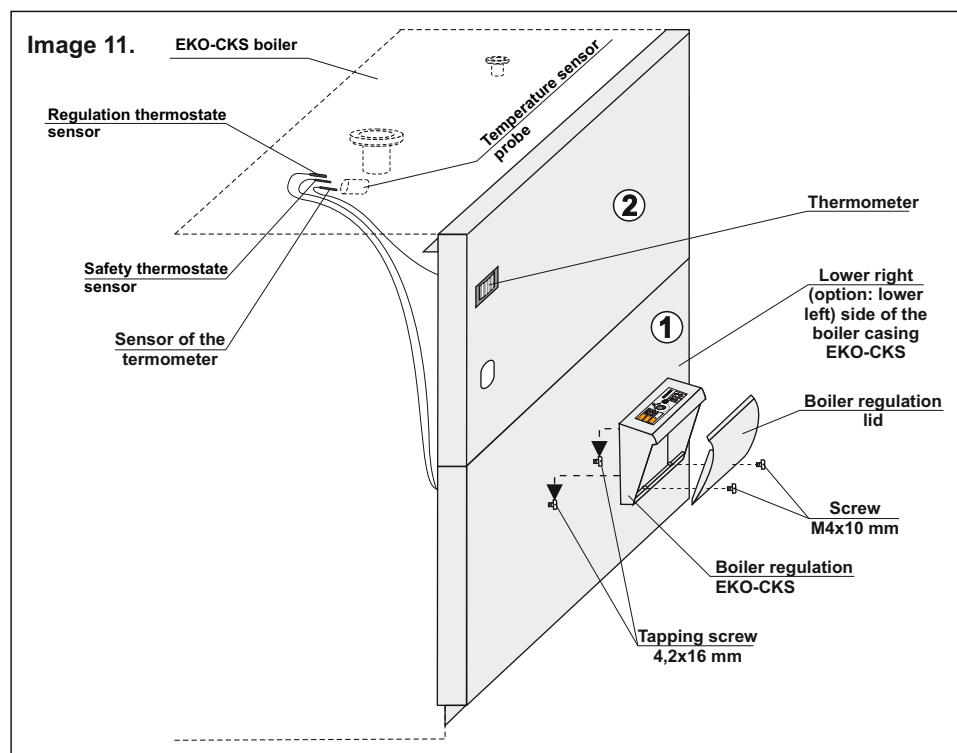
TYPE			EKO-CKS 150	EKO-CKS 200	EKO-CKS 250	EKO-CKS 300	EKO-CKS 380
Rated thermal output		kW	110 - 150	150 - 200	200-250	250-300	300-380
Dimensions of the boiler	Depth (L)	mm	1600	2000	2000	2350	2350
	Width (B)	mm	750	750	850	850	1000
	Height (H)	mm	1600	1600	2100	2100	2100
Total dimensions	Total depth (L1)	mm	1600	2000	2000	2350	2350
	Total width (B1)	mm	900	900	1000	1000	1150
	Total height (H1)	mm	1600	1600	2100	2100	2100
Total boiler body mass		kg	700	900	1300	1500	1750
Total boiler mass (firing boiler body with insulation and regulation)		kg	800	1050	1405	1625	1885
Boiler water content		l	380	520	790	963	1155
Max. operat. pressure		bar	4	4	4	4	4
Boiler connections	Inlet/Outlet	R/DN	2"	2"	80	80	80
	Safety line	R/DN	6/4"	6/4"	40	40	40
	Filling/Draining	G	1"	1"	1"	1"	1"
	Safety line dims.	G	6/4"	6/4"	6/4"	6/4"	6/4"
	Safety pump - suggestions	TIP	as Grundfos type UPS-32-60	as Grundfos type UPS-32-55	as Grundfos type UPS-32-55	as Grundfos type UPS-32-80	as Grundfos type UPS-32-80
Boiler flue exhaust outer diameter		○ mm	250	300	300	300	300
Boiler flue exhaust (cyclone)		▮ mm	250x90	250x90	300x100	350x100	350x100
Combustion chamber resistance	Pa		18	20	23	25	27
	mbar		0,18	0,20	0,23	0,25	0,27
Chimney underpressure	Pa		34	38	42	45	50
	mbar		0,34	0,38	0,42	0,45	0,50

Dimensions

TYPE		EKO - CKS 150	EKO - CKS 200	EKO - CKS 250	EKO - CKS 300	EKO - CKS 380
B	mm	750	750	850	850	1000
B1	mm	900	900	1000	1000	1150
H1	mm	1600	1600	2100	2100	2100
H2	mm	290	290	290	290	290
H3	mm	500	500	500	500	500
H4	mm	1280	1280	1705	1705	1705
H5	mm	155	155	155	155	155
L	mm	1965	2000	2000	2350	2350
DL	mm	606	1006	1006	1356	1356
SV	mm	532	532	582	582	682
VV	mm	424	424	630	630	625

While assembling the boiler casing the regulation sensors have to be inserted in the probe situated on the upper front side of the boiler, the fan connection and supply cables have to be pulled through.

Screws 4,2x16 mm screw to half into already drilled holes in lower side of the casing (Image 9 and 10). Put regulation on screws and screw the screws completely. At the end put the regulation lid on regulation and screw 2 screws M4x10 mm on (Image 11.)



\*Rectangular boiler flue exhaust is recommended when the boiler is connected to the chimney through the fire fan and fan drive (cyclone).

**Legend:**

DPO - Boiler flue exhaust (direct connection to the chimney)	SPVV - Safety outlet line
*DPK - Boiler flue exhaust (connection through the cyclone and fan drive)	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
RP - Opening for draught regulator (with cyclone - watertight sealed)	VPZ - Primary air door/opening for cleaning
SPLV - Safety inlet line	ZP - Underpressure regulator lid
	BOZ - Side air opening

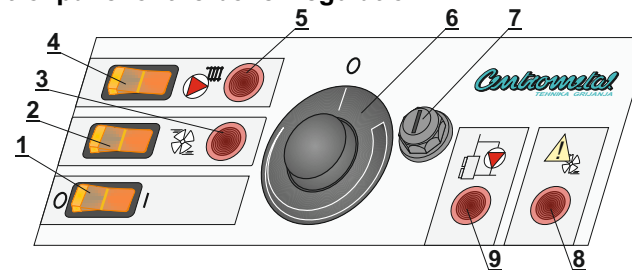
## 1.0. DESCRIPTION OF THE BOILER

**EKO-CKS** 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 and tested in compliance with EN-303-5 norm. 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. The firing procedure is manual through the spacious door. The temperature, i.e. fire intensity is regulated by the underperssure lid in boiler flue exhaust and properly sized fan. Additional firing regulation can be achieved through the secondary air door which is situated on the lower boiler's 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 which enables easier transportation and assemblage without unnecessary risks.

### 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.

Image 8. Control panel of the boiler regulation



## 14.2. 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 7. plan of the connection to the boiler regulation and to the electrical power net on page 22.

## 14.3. ASSEMBLING THE BOILER REGULATION

Before assemblage of the boiler cover, 3 holes should be made on the lower side of the cover: on the **right lateral** (or **left lateral** side), which depends upon the position of the boiler in the heating room - (see plan for the boiler casing EKO-CKS on the page 13). The 2 holes should have diameter of  $\text{R}3,5$  mm for screws and also one bigger hole ( $\text{R}22,3$  mm) should be made for sensors, supply and connection to the fan. The Image 9. shows places where the holes are to be made.

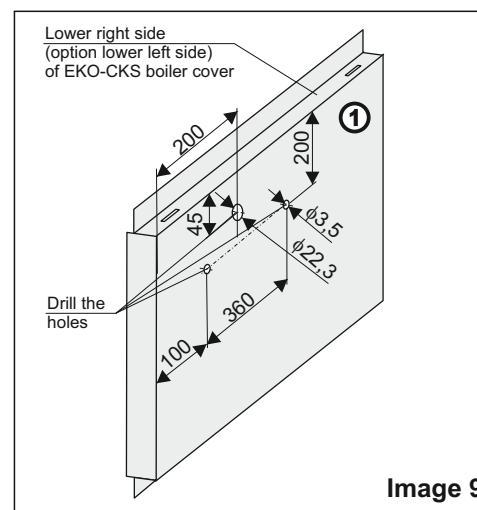


Image 9.

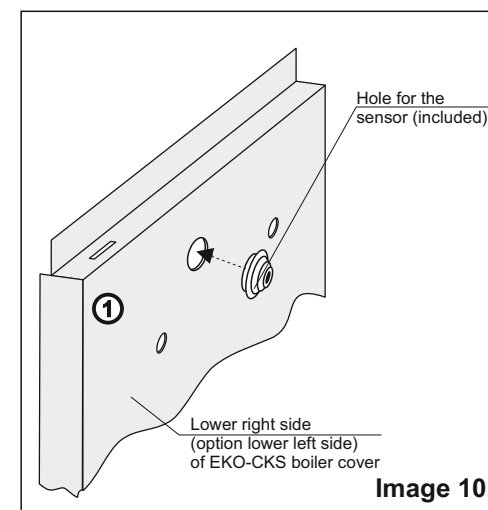


Image 10.

After the holes have been perforated, through the bigger hole the tap should be inserted (included in delivery package) and pulled through the sensors, supply and the wires for the connection with the fan (Image 10).

## 14.0. BOILER REGULATION

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

### 14.1. 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.

### 1.1. DELIVERY PACKAGE

- Boiler's body with the door
- Casing with thermal insulation
- Thermometer, draught regulator, cleaning set (cleaning brush, poker, shovel)

### 1.2. ADDITIONAL EQUIPMENT

- Cyclone CC for dust cleaning
- Fan for flue gases
- Boiler regulation
- CAS water accumulator

### 2.0. ASSEMBLAGE OF THE BOILER

It is recommended to put boiler 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 has to be situated in order its connection to the chimney can be performed correctly (Image 1. and 2.); its cleaning and handling should be convenient. If there is planned an cyclone and fan connection, the boiler has to be situated to have all its parts easily accessible (Image 2.). The casing has to be assembled after the boiler has been connected to the chimney and to the central heating system, according to the instructions attached (Image 6.). If the fan regulation is included, the boiler regulation has to be connected previously to the casing (page 23.). Before connecting to the instalation the boiler has to be put exactly in the horizontal position.

### 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 temprerature of their condensation point. The choice and the construction of the chimney has to be performed by the authorized person.

#### 3.1. DIRECT CONNECTION TO THE CHIMNEY

Inside dimensions of the chimney intersection depend of its height and of the capacity of the boiler (Image 3.). Prescribed maximal distance between boiler and the chimney is 700 mm, minimal distance 300 mm. Boiler flue exhaust angle has to be 30° to 45° (Image 1). In order to unable condensate to enter the boiler, the flue exhaust pipe has to be situated 10mm deaper inside the chimney. The **pipe connecting the boiler and the chimney has** to have a thermal insulation made out of 30-50mm thick stone wool. If for any reason the boiler has to be connected to the chimney dimensioned for higher capacity boilers, the possibility of condensation inside the chimney shall be highly inreased. The boiler's function shall not be affected, but the damper on the flue exhaust has to be positioned according to the chimney underpressure (see technical data regarding the chimney pressure for each type of the boiler).

#### 3.2. CONNECTION THROUGH THE CYCLONE AND FAN DRIVE

In case of the connection through the flue gas fan the height of the chimney can be reduced for 50% regarding the read value (see Image 3). The cyclone is directly connected to the boiler and the distance between the fan and the chimney shall be determined by enabling the smooth maintaining of the cyclone, flue gas fan, boiler and the chimney. **The cyclone and connecting tubes have to be coated by an 30-50mm stone wool termal insulation.**

### 4.0. PRIMARY AIR SUPPLY OPENING

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

**A=6,02 · Q**      A - opening surface in cm<sub>2</sub>      Q - rated thermal output in kW

## TECHNICAL MANUAL

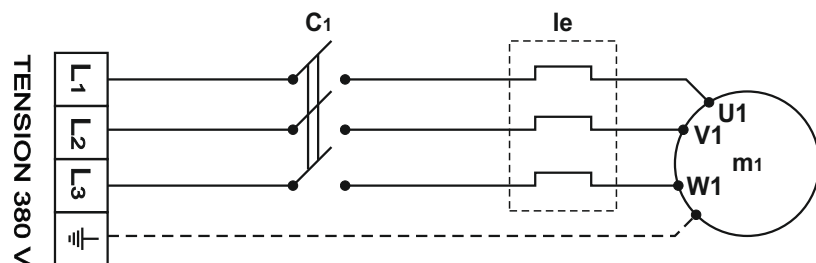
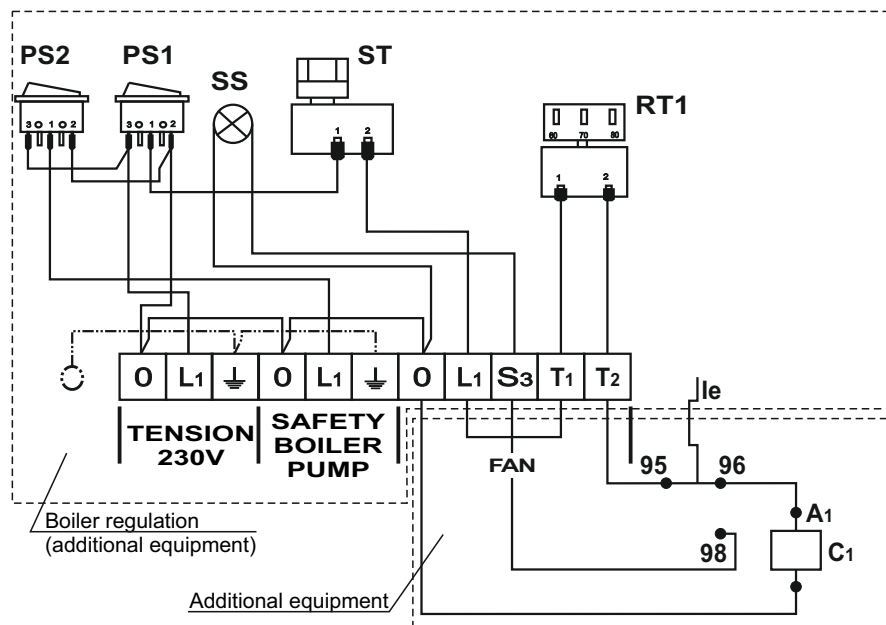
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## BOILER REGULATION

## CONNECTION OF THE FAN TO THE REGULATION AND TO THE ELECTRICAL POWER NET

Image 7. Plan of regulation and fan connections to the electrical power net.



PS1 - Switch (burner)  
 PS2 - Switch (pump)  
 SS - Signal light  
 ST - Security thermostat  
 RT1 - Working thermostat 1. stage

C1 - Contactor ABB, A16-30-10  
 le - bimetal protection, 4-6 A  
 m1 - fan motor

Image 1. Connection of the EKO-CKS to the chimney

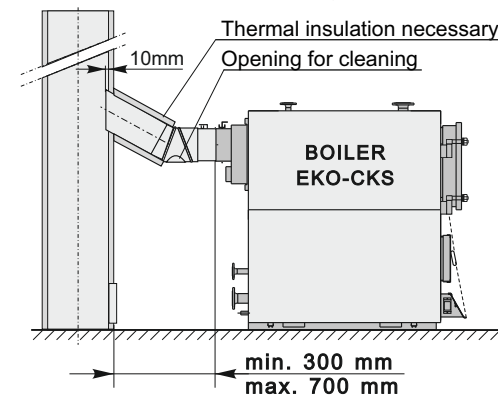
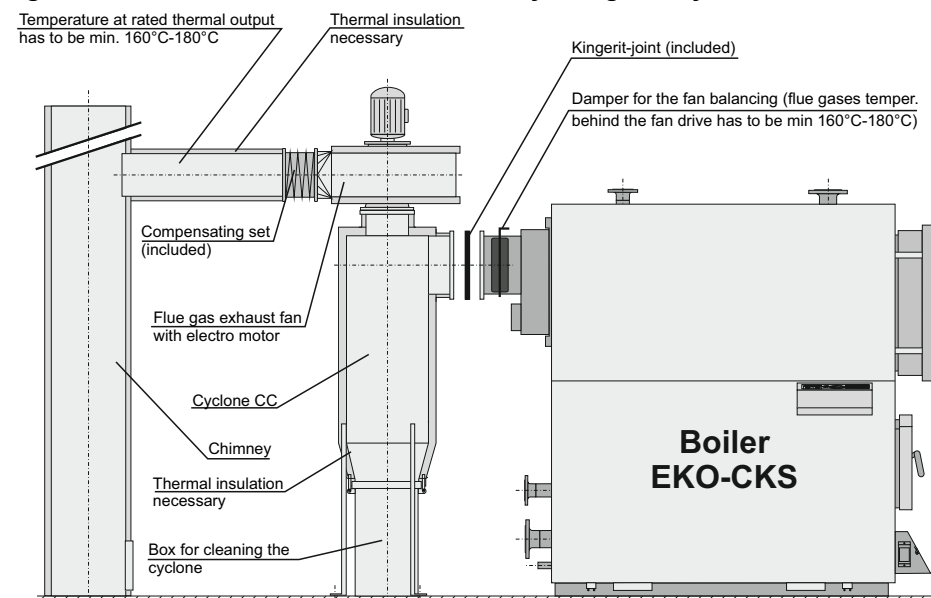


Image 2. Connection of the EKO-CKS to the chimney through the cyclone CC and the fan drive

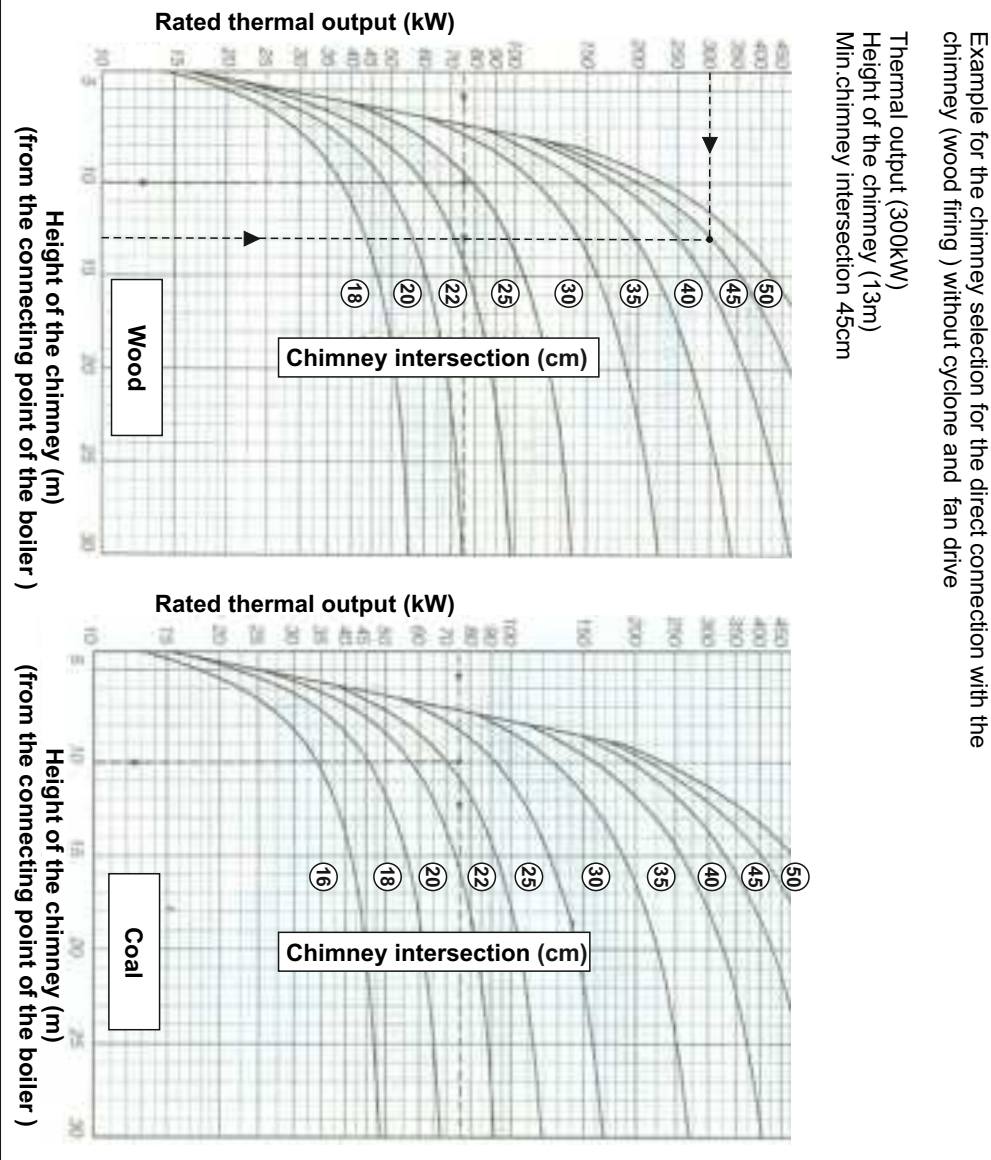


**Note:**

- Cyclone and boiler connection with screw joint M8 - 6 pieces
- Cyclone to be connected to the fundament by screws
- Connection of cyclone to the fan drive by screw joint M8 - 8 pieces done in the factory before delivery
- Connection of the fan drive to the chimney has to be performed using the compensating set to reduce vibrations
- Connections of the boiler to the cyclone and fan drive to the chimney 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



Image 3. Dimensioning the chimney for EKO-CKS boilers (Tdpl=250°C) - boiler connection directly to the chimney (without cyclone and fan drive).



13.7. 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 paid 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.



**13.3. CONNECTION OF THE FAN 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 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 7., page 22.

**13.4. STARTING THE FAN**

First to be checked if the fan 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 short 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 noises 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 exhaust of the boiler and should be put in the position which enables the flue exhaust gases temperature to reach minimum 160°C - 180°C at nominal thermal output.

**13.5. 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.

**13.6. 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 steerings (tightness, wear and tear). In case the spare parts are needed, they have to be cleaned previously.

**5.0. CONNECTION OF THE BOILER TO THE CENTRAL HEATING INSTALLATION****5.1. CONNECTION OF THE BOILER TO THE OPEN EXPANSION VESSEL**

The boiler has to be connected to the open system according to the Image 4. 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.

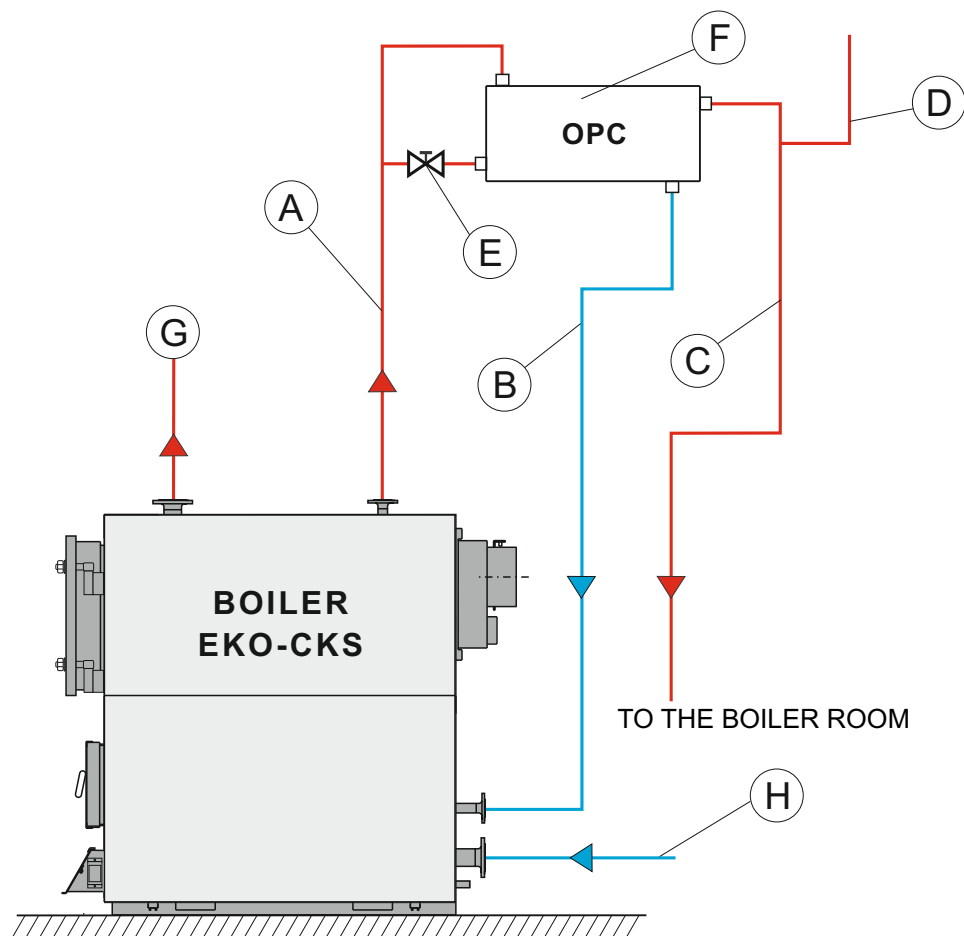
**5.2. BOILER SAFETY PUMP**

In order to minimize the condensation inside the boiler a safety line with an safety pump has to be build in (Image 5.). 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 has to be covered by thermal insulation, min. 40 mm 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 disactivated by means of the pipe thermostate 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 5.

Image 4. General connection plan of the EKO-CKS boiler to the open system



LEGEND:

- |                                  |                               |
|----------------------------------|-------------------------------|
| A - Safety inlet NO 40           | D - Air vent                  |
| B - Safety outlet NO 32          | E - Throttle valve            |
| C - Overflow line NO 40          | F - Open expansion vessel OPC |
| (has to lead to the boiler room) | G - Inlet (heating)           |
|                                  | H - Outlet (heating)          |

## 12.0. CYCLONE CC

The cyclone CC produced by Centrometal is used to filter flue gases.

### 12.1. CONNECTING THE CYCLONE CC

The cyclone CC has to be connected to the chimney behind the boiler. A general connection plan is shown on the Image 2, page 7. If the flue exhaust of the boiler and the opening of the cyclone do not have identical diameter, there has to be constructed a connecting part, which has to be hermetically fixed between cyclone and the boiler. 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 exhaust **installation has to be coated by thermal insulation** made out of 40mm thick stone wool or equivalent material.

### 12.2. ASSEMBLING THE CYCLONE

The cyclone CC 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.

## 13.0. FAN

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

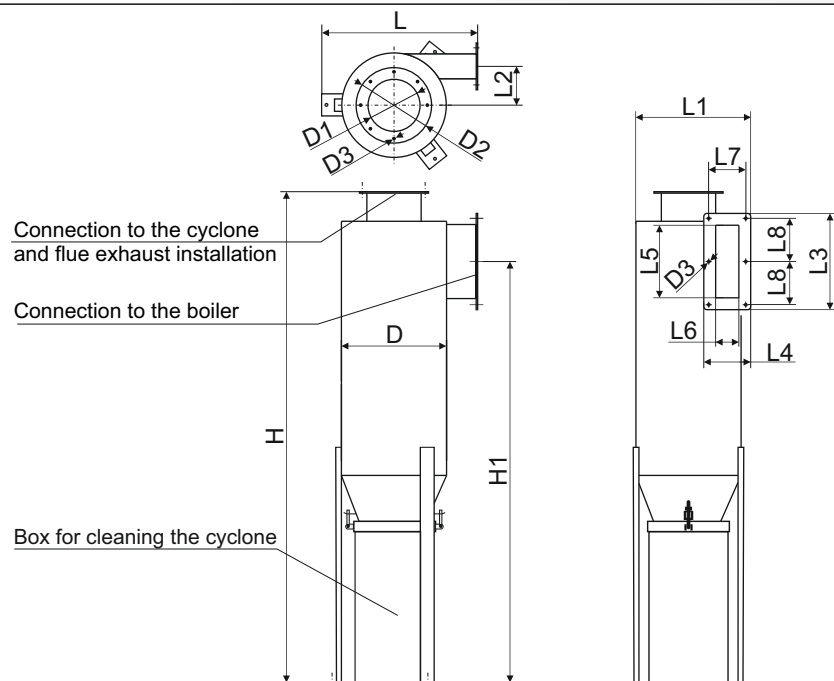
### 13.1. INSTALLING THE FAN

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 the Image 2 to the cyclone outlet. After assembling the fan has to be leveled.

### 13.2. FAN CONNECTIONS

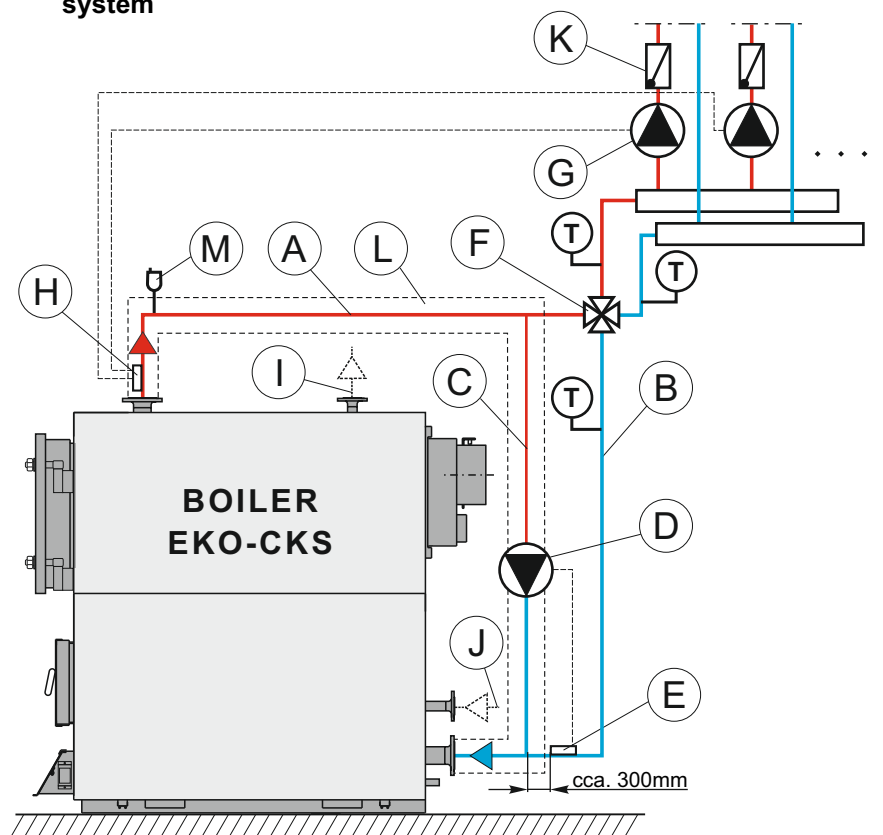
The connection to the pressure tubing system only with their connections **is not allowed**. It is also not allowed to transfer additional burden to the fan through the tubing system. Pressure tube connection of the fan has to be connected to the pressure tubing system by means of elastic joints compensators,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

### Cyclone CC - technical data



CYCLONE TYPE FOR THE BOILER	CC 150-200 EKO-CKS 150/200	CC 250 EKO-CKS 250	CC 300-380 EKO-CKS 300/380
Total height of the cyclone H (mm)	1476	1988	1940
Boiler connection height H1 (mm)	1284	1705	1705
Total depth of the cyclone L (mm)	566	612	718
Total width of the cyclone L1 (mm)	458	498	607
Distance L2 (mm)	142	157	208
Connection height L3 (mm)	340	390	440
Connection width L4 (mm)	190	190	190
Height opening L5 (mm)	250	294	344
Width opening L6 (mm)	90	94	94
Distance L7 (mm)	140	150	150
Distance L8 (mm)	150	175	200
Cyclone diameter D (mm)	fi 380	fi 426	fi 526
Opening diameter D1 (mm)	fi 174	fi 214	fi 203
Outer connection diameter D2 (mm)	fi 253	fi 310	fi 260
Screw hole diameter D3 (mm)	fi 11,5	fi 10	fi 11
Cyclone mass (kg)	61	88	114

Image 5. General connection plan of the EKO-CKS boiler to the heating system



### LEGEND:

- A - Inlet
- B - Outlet
- C - Safety line
- D - Safety pump
- E - Pipe thermostat (operat. temp. 0-60°C)
- F - 4-way manual mixing valve
- G - Circulation pump accord.to the system
- H - Pipe thermostat (operat.temp over 75°C)
- I - Safety inlet
- J - Safety outlet
- K - Stop valve
- L - Thermal insulation of the safety boiler circuit
- M - Automatic air vent pot
- 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 EN norm.

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

## 7.0. CASING ASSEMBLAGE

Assamblage of the thermal insulation and plastified metal sheet coating can be started after the boiler has been connected to the chimney and to the central heating installation. If the boiler regulation is planed for the fan, before assembling the boiler casing, the regulation has to be fixed. The order of assembling is described on Image 6. and the plan which is attached to the package.

## 8.0. CONNECTION OF THE CONDENSATE OUTPUT

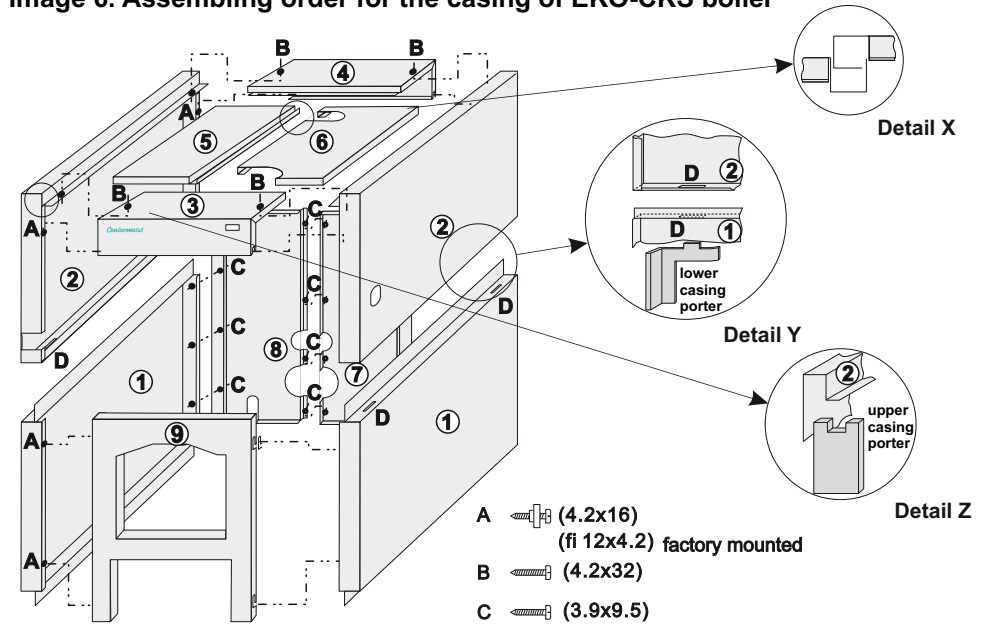
During the first heating process, usually by means of solid fuel firing, when the temperature in the boiler is below 65°C, a certain quantity of condensate produced by water steam appears on the cold walls of the boiler. In order to let this condensate get out of the boiler, in the left lower corner of the upper boiler's door (see page 3) there is an output. It is connected by an 1/2" inside 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.

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for assembling, use and maintenance  
of the additional equipment



**CYCLONE CC  
AND THE FAN**



Insert the lower lateral part of the insulation (1) 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 (2) onto 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 has to be inserted into the probe on the upper side of the boiler and the upper front cover (3) has to be hanged over the hooks A and fixed by screws B on the casing (2). The same has to be done with the upper back cover (4).

The stone wool has to be placed on the upper side of the boiler. After that the cover (5) has to be placed on the plate (2) as well as the cover (6) being fixed into the slit (5) (detail X).

The back side plate (7) and then (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 (1).

Before assembling the front insulation plate (9) take off the side air opening, then open the lower door and pull through the front insulation plate over them. After this step we adjust front insulation plate on the pin A on the left and right plate (1), and put back the side air opening.

**9.0. 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.

**Additionally following has to be checked:**

- the boiler and the central heating system have to be filled with water and airvented.
- the security elements are functioning and if they are correctly connected.
- the flue connection tube is well connected, insulated, and sealed.
- flue gas lid is properly set according to the chimney underpressure.
- 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 is well set (seal properly).
- the primary air/cleaning door properly fits.
- the draught regulator is put in the proper position and if it is properly connected with the chain to the primary air/cleaning door (in case of cyclone - opening of draught regulator must be watertight sealed).
- the secondary air regulator on the lower boiler door is closed.
- the side air opening can freely open/close, when the boiler does not work, side air opening must be closed.
- the heating room has proper air circulation.
- the tube thermostate of the boiler's security pump is set to 65°C (the pump is functioning from 0°C to 65°C).
- the tube thermostate 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 draught regulator (in case of cyclone - underpressure regulator lid and fan regulation) 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 is set (can also be closed)
- training the person in charge of the boiler room, training protocol signed by the trained person.

**10.0. FIRING THE BOILER**

The boiler is constructed to be manually fired by means of solid fuel. Nominal thermal output is obtained through solid fuel and its lower calorific value  $H_d > 15000$  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 draught regulator (in case of cyclone - underpressure regulator lid and fan regulation) 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.

**11.0. 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 covers. 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' interior.