

Ladies and Gentlemen!

Thank you for purchasing the boiler COMFORT CLASSIC-RS, which with the operation in accordance with our recommendations will be used reliably for many years.

In order to properly and economically use the boiler please carefully and accurately read this manual. Also, please comply with the information and comments that your boiler will operate without failure.

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1 GENERAL INFORMATION

Boilers type **COMFORT CLASSIC-RS** are water, low temperature boilers, adapted to the combustion of biofuel in the form of sawdust and shredded wood residues. Boilers cooperate with low-temperature heating systems in open system. They can be a source of heat for industrial and ontically – communal buildings.

The present technical – operational documentation concerns of central heating boilers **COMFORT CLASSIC-RS** with thermal power:

**300kW; 500kW; 600 kW; 980kW; 1250kW;
1500kW; 1800 kW; 2000kW;**

All data contained in this instruction manual are based on the latest manufacturer's information. However, „UNIWEX – AJ 1” reserves the right to make changes to the described version, without further user's notice.

1.1 SYMBOLS USED



The most essential requirements because of the proper functioning of the device



Information necessary for safe operation

with construction, operation, installation, proper service and maintenance, transport and storage central heatings assemblies type **COMFORT CLASSIC-RS**. Before proceeding to operate boilers carefully read these manuals, and strictly follow the recommendations contained therein.



Failure to comply with manuals release the manufacturer from any warranty obligations.

2 TRANSPORT, STORAGE, CONSTRUCTION

The boiler should be transported in an upright position, in a manner that protects it from mechanical damage, which may cause breakage of welds, brickwork ceramic hearth or damage to the boiler thermal insulation. For boilers with large overall dimensions, in order to facilitate transport they can be disassembled into two parts. For carrying the eyebolts are used, located in the upper part of the boiler. In a separate set is transported also the fuel tank with feeding sawdust and cyclone (if any). Before lifting, make sure that the weight is distributed evenly across every lines. The device should be stored in roofed place, protected against corrosion.

The purpose of this technical – operational documentation is to familiarize the user and installers

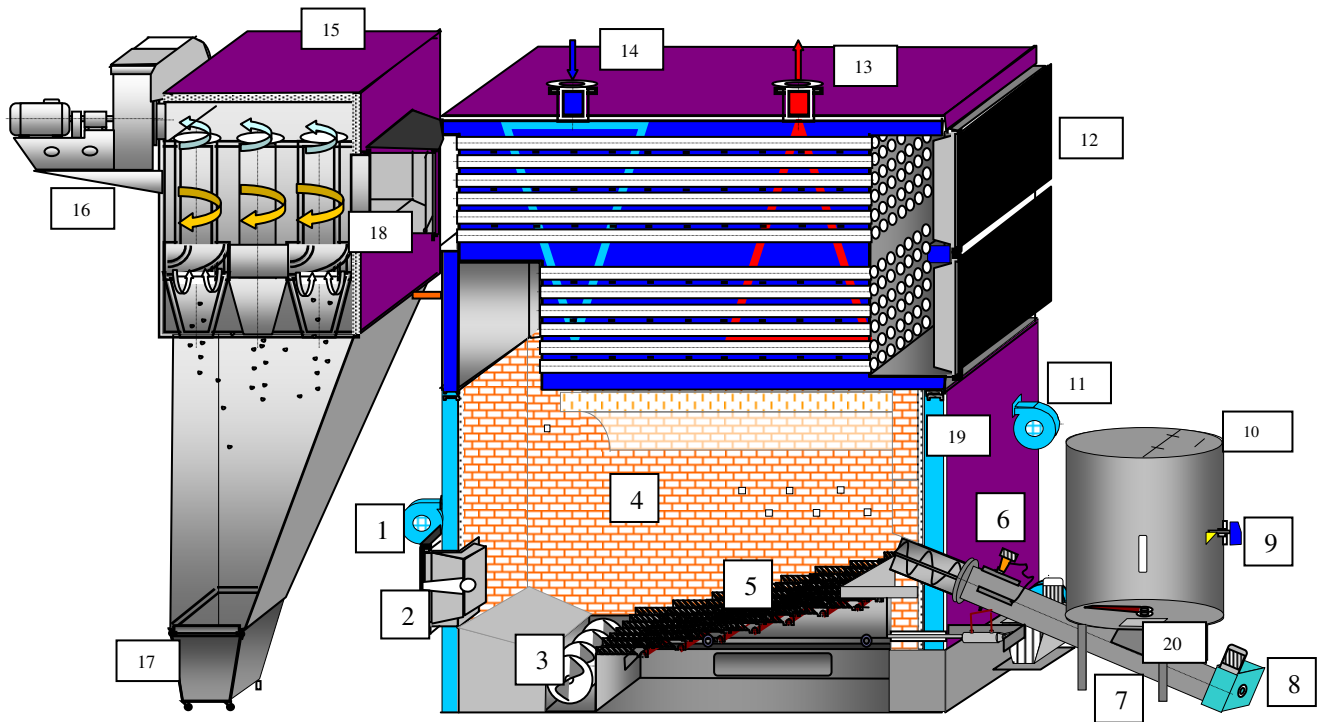


Fig. 1 Elements of the boiler

1. Blowing fan
2. Ceramic furnace door
3. Automatic ash removal
4. Ceramic chamber
5. Moving grate
6. Fire valve
7. Screw feeder
8. The feeder drive
9. Detector of sawdust level
10. The buffer tank
11. Blowing fan
12. Boiler exchanger
13. Water supply stubs
14. Return water stubs
15. Multicyclone
16. The exhaust fan
17. Dust collector of multicyclone
18. Smoke conduit
19. Boiler insulation
20. The drive unit of the tank scraper

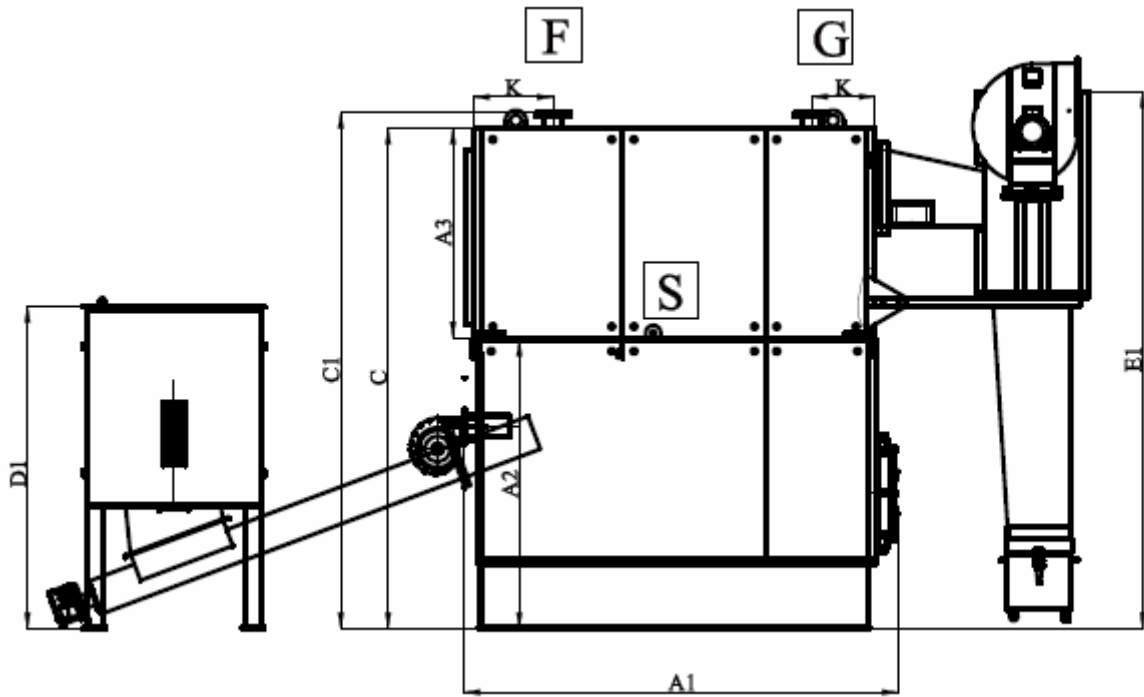


Fig. 2 Side view

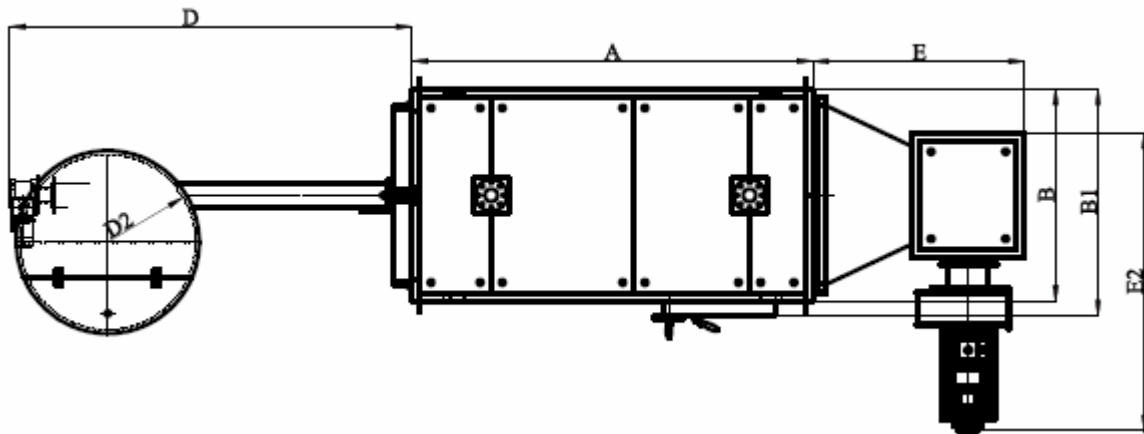


Fig. 3 View from the top

POWER (kW)	A	A1	A2	A3	B	B1	C	C1	D	D1	D2	E	E1	E2	F	G	K	S
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
300	2250	2400	1670	1220	1320	1470	2660	2760	2500	1800	1100	900	1255	1880	100	100	500	20
350	2250	2400	1890	1220	1320	1470	2780	2880	2500	1800	1100	900	1255	1880	100	100	500	20
500	2530	2630	1890	1320	1340	1490	3225	3325	2500	2000	1100	1300	1775	1880	100	100	500	20
600	2530	2680	1890	1425	1340	1490	3335	3435	2500	2000	1100	1300	1775	1880	125	125	500	20
780	3250	3400	2010	1425	1340	1490	3625	3725	2700	2000	1100	1750	2345	2445	125	125	500	20
980	3530	3680	2075	1320	1520	1670	3510	3610	2700	2000	1100	1750	2345	2445	150	150	500	20
1250	3530	3700	2300	1650	1520	1670	3845	3945	2700	2200	1100	2050	2645	2740	150	150	500	20
1500	3550	3700	2400	1650	1720	1870	3960	4060	3000	2500	1100	2050	2760	2740	200	200	500	20
1800	4200	4350	2550	1650	1720	1870	4115	4215	3000	2500	1100	2050	2760	2740	200	200	500	20
2000	4200	4350	2650	1650	1720	1870	4355	4455	3000	2500	1100	2300	3255	3000	250	250	500	20

2.1 DEVICES FORMING THE BOILER

COMFORT CLASSIC-RS is built of following assemblies:

1. The boiler body, which consists of
 - Block of furnace (moving grate)
 - Block of the heat exchanger.
2. Blow air / exhaust fans.
3. Fuel tank.
4. Screw feeder with drive unit.
5. Automatics control.
6. Hydraulic power unit of grate

The elements that are supplied together with the boiler:

- manometer to 0,6 MPa	1 pc.
- thermometer to 150°C	1 pc.
- release valves ¾ ”	2 pcs.
- stubs gasket connections	4 pcs.
- counter flanges	4 pcs.
- fire thermostatic valve with sensor	1 pc.

NOTE: The boiler can be equipped with optional accessories previously agreed with the manufacturer.

2.1.1 BOILER BODY

Block of hearth – in this part of the boiler takes place combustion of sawdust and wood chips. Housing comprises of double jacket, inside which there are ducts, feeding air to the combustion chamber and cooling the outer jacket. The combustion chamber is lined with refractory ceramic insert, constituting the thermal accumulator, what allows the combustion of fuel with higher humidity. In the lower part of the chamber is located movable grate, on which with screw conveyor fuel is supplied. Fuel in the form of sawdust or crushed pieces of wood is fed into the combustion chamber where is uniformly distributed, at the same time gaining the temperature from preheated brickwork chamber. The primary air fed from the bottom of the grate box raises particles at the same time providing oxygen required for proper combustion process. Sawdust light up in large quantities and the process of fuel combustion lasts. Burning particles are pushed by the further layers of the fuel supplied, so they are under the action of air, which provides oxygen for essential combustion. Additional secondary air at the rear of the combustion chamber afterburning remnants of fuel.

Block of heat exchanger – in the exchanger occurs the heat transfer of flue gas to the working medium. Flue gas from the previous block go here for two strings of pipes fire tube where dissipates heat to water, and then are discharged through a smoke conduit to the chimney.

2.1.2 AIR BLOWING/EXHAUST FANS

Blowing fans supply air necessary to maintain the combustion proces before the hearth. Their work is regulated by the automatic control. They provide primary air – taking direct part in the combustion process, and the secondary air – enabling afterburning of fuel. The exhaust fan located behind the multicyclone increases

speed od exhaust gas velocity departing into the chimney after cleaning in the multicyclone.

2.1.3 FUEL TANK

The tank has a cylindrical form. At the bottom mechanism in the form of sawdust reel control is mounted, which is driven by a worm gear unit with electric motor. The scooping arm is beared on stub mounted at the bottom of the tank . Sawdust from the tank enters the screw conveyor.



Each tank while working should be tightly closed in order to prevent the flow of gases from the hearth to the environment and fire reversing.

2.1.4 SCREW FEEDER

Feeder supplies fuel from the boiler –side tank. Its work is automatically or manually controlled. The drive provides motor with reduction gear.

2.1.5 AUTOMATICS CONTROL

The microprocessor controller with sensors continuously adjusts fuel consumption and the power of fans to maintain the programmed parameters of the working medium. The control program of the combustion process depends on many variables, above all the moisture of waste and heat demand. Correct positioning of the program takes place after gaining experience in the initial period of operation.

A detailed description of the operation automatics is located in instruction manual supplied with manuals.

2.1.6 MOBILE GRATE

Inside the hearth the mobile grate motor is located, so called stepped. It is powered by hydraulic actuators. The principle of operation of the grate is based on the performance of reciprocating motion of relevant sections. Moving grate causes the fuel, embers and ash movement into the ash gutter selector. During the distribution of the fuel takes place its gradual drying, gasification and combustion.

2.1.7 GENERAL DESCRIPTION OF OPERATION OF COMFORT CLASSIC-RS

Fuel contained in the tank by the action reel control scatters through a hole in the bottom of the tank on the feeding screw transporting the fuel to the furnace. There, the distribution of fuel by moving grate takes place and at the same time the process of combustion lasts. To make the process work correctly, to the chamber air is fed by blowing fans. Then the hot

combustion gases get into the heat exchanger block where dissipates heat and fly away through the smoke conduit to the chimney. The water flowing into the boiler is heated by flowing through a water jacket in the heat exchanger, and then through the supply collector is discharged into the heating system.

2.1.8 TECHNICAL CHARACTERISTICS

Table 1. Technical characteristics of boilers COMFOERT CLASSIC -RS

Parameters		300	500	600	780	980	1250	1500	1800	2000
nominal power	kW	300	500	600	780	980	1250	1500	1800	2000
approximate cubature of heating	m ³	6300	10000	13400	16800	21000	27300	31500	36000	40000
maximum allowable pressure	bar	1,5								
max temperature of water	°C	95								
boiler efficiency	%	83								
supply voltage	V	400								
power of electrical equipment	kW	6,2	7,2	7,2	9,9	9,9	12,5	12,5	16	21
average fuel consumption	kg/h	76	127	153	199	250	319	383	460	510
volume of the standard tank	m ³	1	1	1	1	1	1	1	1	1
working time on a standard tank	h	3,3	2	1,6	1,3	1	0,8	0,6	0,5	0,5
water pressure drop (10K)	mbar	330	385	451	535	605	710	761	770	790
water pressure drop (20 K)	mbar	189	226	252	335	386	449	491	510	550
min. pump activation temperature	°C	50								
water capacity	L	1500	2400	2500	3300	3900	4400	4900	5500	6100
flue gas temperature	°C	180-220								
chimney pressure drop	Pa	±20								
diameter and height of the chimney	mm/m	350/8	400/8	400/8	500/8	500/8	500/10	600/10	600/10	650/10
required string for chimney	Pa	55	60	60	60	65	65	70	90	90
flue gas flow	m ³ /h	533	888	1065	1385	1740	2220	2663	3196	3551
mass of boiler (tolerance ±5%)	kg	4200	5800	6600	9000	10500	12100	14200	20125	22750

2.1.9 FUELS

To boilers CLASSIC COMFORT-RS can be used the following types of fuel:

- sawdust, bark, wood chips a grain size up to 25mm max, without mineral impurities and moisture content of about 50% and 100% of dust.

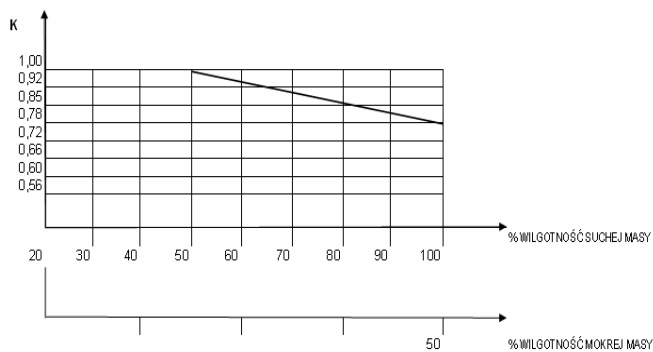


Fig. 4 Graph of declassification of boiler power


3 COMMISSIONING

The boiler is commissioned by quality control of Manufacturer.

4 ASSEMBLY

4.1 SEQUENCE OF ASSEMBLY

Boiler COMFORT CLASSIC-RS is executed as a divided in such a way, that one part is the heat exchanger block, a second block of furnace. Separately, it is also supplied boiler-side tank with a screw conveyor. The division facilitates the transport and setting the boiler to the desired location.

 **Before connecting the two main units transport elements should be removed, and then leveled units against each other.**

The connections must be tight, to prevent the entry of exhaust gases into the boiler room. To this end, all the connections must be sealed with mounting silicone. The heat exchanger block is mounted on the furnace block sealing the connection with string of aluminum-silicon sealant.

All additional elements which are not connected to the boiler, and belong to its equipment (fans, termometers, sensors etc.), are supplied in separate containers, together with the elements necessary for their installation (bolts, gaskets, etc.)

In order to assemble the boiler:

1. Place the combined boiler blocks on leveled area. Between the connecting flanges place the heat-resistant sealant delivered by the manufacturer.
2. To furnace attach the fuel tank with the screw feeder system (fig.5). Screw feeder should be welded to the flange the included in the kit (that will be connected to the inlet opening flange with bolts). Connection is to be made after exact setting of the tank and feeder against the boiler.

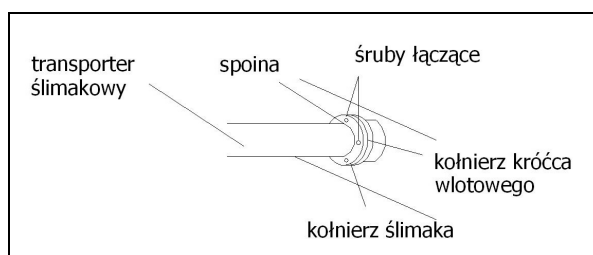


Fig.5 Connection of screw feeder with furnace block

Transporter ślimakowy – screw feeder

Spoina – weld

Śruby łączące –connecting bolts

Kołnierz króćca wlotowego - collar of intake nozzle
 Kołnierz ślimaka –flange of screw

3. To other end of the feeder connect the gear unit with motor (fig 6):
 - deprotect spigot with keyed connection wrapped with tape,
 - unscrew the screw securing the puck,
 - push the gear unit (with attached motor) on the spigot, remembering that that key has to be placed in the groove of the sleeve gear
 - screw gear unit to the flange of screw using the supplied screws, screws through the flange are screwed directly into gear unit, where the threaded holes are located,
 - Secure the end of the spigot imposing protection puck and tightening the screw,
 - connect the motor to the control box.

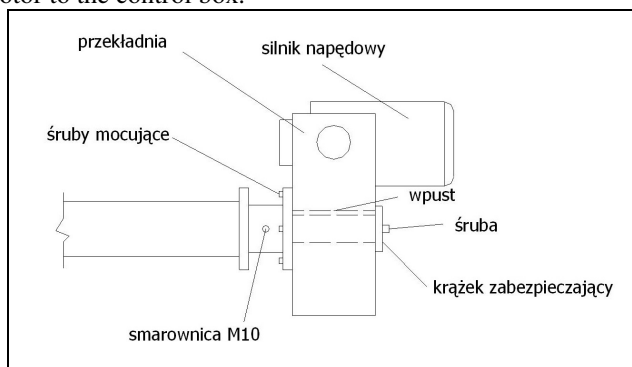



Fig.6 Installation of the system driving feeder

 **Worm gear is sent to the recipient after an eight-reaching out and pouring with protecting oil against corrosion by the manufacturer. Before starting the equipment the user necessarily should check the oil level in the gearbox and fill to the level of overflow cap. Continue reaching out for another approximately 100 hours.**

4. Connect the gear unit with the driver motor to the bottom of the fuel tank (fig.7). To install this element follow the same steps as in the preceding paragraph.

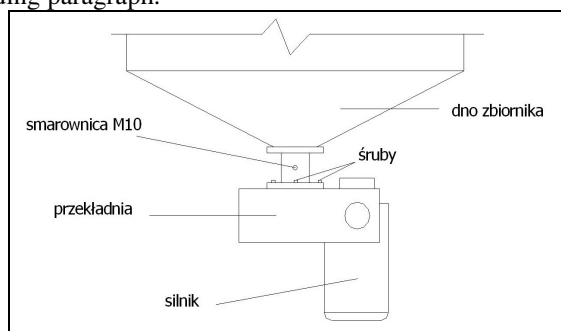


Fig. 7 Installation of the system driving tank stirrer

Smarownica M10 – lubricator M10

Dno zbiornika – tank bottom

Śruby – bolts

Przekładnia – gear unit

Silnik - motor

5. Connect the smoke conduit with the chimney (canal connecting the smoke conduit with the chimney should have a height of not less than 1% and the right amount of washout holet to remove ash and soot; before connecting the boiler to the chimney check its dimensions, which should correspond to the parameters set out in Table 1,
6. If to the smoke conduit is to be connected multicyclone, connect the smoke conduit to the cyclone with the enclosed screws (M10 or M12); setting the cyclone against boiler is possible using the adjustable legs (fig.8) Depending on the cyclone mode it may be attached directly to the boiler.

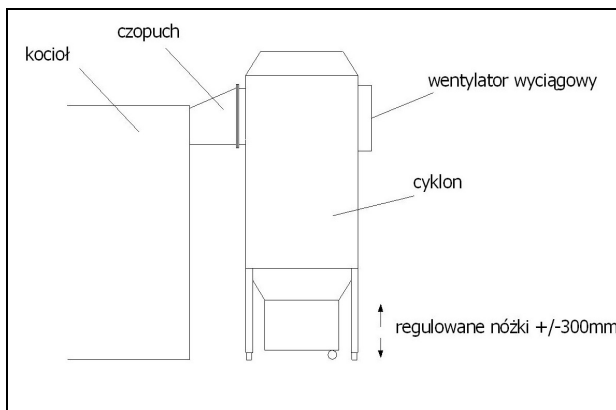


Fig. 8 Boiler with installed multicyclone
 Kocioł – boiler
 Czopuch – smoke conduit
 Wentylator wyciągowy – exhaust fan
 Cyklon – cyclone
 Regulowane nóżki – adjustable legs

7. Seal the connections made (using a heat-resistant silicone or mastic)
8. Connect the fans (fig.9):
 - fans should be screwed with the screws (included in package) to the corresponding holes provided with flanges; in the case of different types of fan each has a specific shape of the connecting duct matching into the hole in the boiler, therefore particular fan is suitable for one of its proper input; in the case of the same input it means that the fans are also the same and where they are connected is not important,
 - power cable should be connected to the control box.

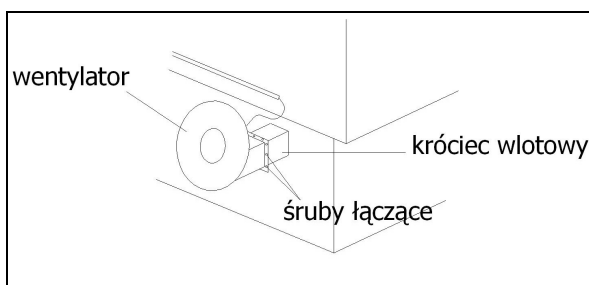


Fig. 9 Connecting the fans
 Wentylator – fan
 Króciec wlotowy – inlet nozzle
 Śruby łączące – connecting bolts

8. Installation of drain valves

- The valves must be screwed into with the supplied connector at the position shown in Fig. 3
9. Installation of pressure gauge (fig 11):
 - to connect a pressure gauge it should be screwed into the supplied connector 2/3" then screwed into the hole in the body of the boiler, (it does not matter in which hole gauge will be placed)

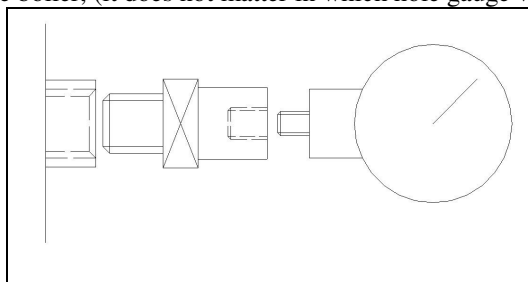


Fig. 11 9. Installation of pressure gauge

10. Installation of thermometer

- thermometer is to be screwed directly into the hole in the body of the boiler, located next to the gauge,

11. Installation of the sensor and fire valve AVTA (fig.12)

- detailed manual valve assembly is placed in a box with the valve.
- after the assembly of the valve and sensors tighten the valve using connectors 1/2" into the hole in the screw,
- screw the sensor into the pocket at the side of the screw,
- connect to the valve water supply – hole 1/2".

12. Install the temperature and flue gas sensors

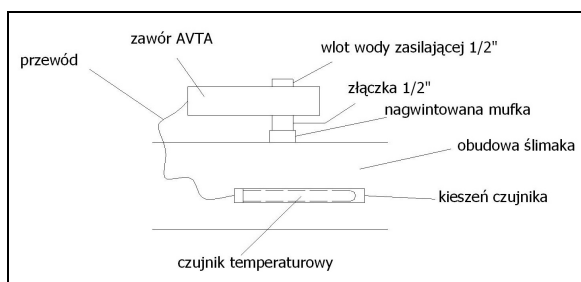


Fig .12 Connecting the fire protection valve AVTA

Przewód – wire

Zawór AVTA – valve AVTA

Wlot wody zasilającej - Inlet of water supply

Złączka – connector

Nagwintowana mufka - threaded muff

Obudowa ślimaka – screw casing

Kieszon czujnika – sensor pocket

Czujnik temperaturowy – temperature sensor

- Installation of box with automatic control box
- The control box is placed on its own basis. The box is supplied ready for connection to the boiler;
- after setting the box connect the conductors of sensors and power supply of drive motors of fan and screw
- connect the box to power supply

13. The preceding steps, check all connections for leaks and improve painting.



Connection of the two parts of the boiler with one another and with the heating system should be done as separable.

Selection of the chimney cross section when flue gas is discharged from several boilers:

$$F = 25,73 \cdot \frac{Q}{\sqrt{H}} [cm^2]$$

F – chimney cross section cm²

Q – power sum of thermal boilers in kW
meters

H – chimney height in

- optimal height of the chimney reduced to sea level should be according to the table 1,
- for towns located above sea level should be to the size indicated in Table 1 add 0.2 m for every 100 m above sea level

4.4 ASSEMBLY OF ELECTRICAL INSTALLATION

Controller and electrical equipment of combustion set are designed for use in networks with a voltage 220 and 380/220 V, 50 Hz in the control system protective earth to the system used at the user.



All electrical connections must be performed by a qualified electrician.

To the boiler switchgear must be lead power cord YDY 5x16. Voltage supply 400V 3~
Power cord protection should be made with a fuse with a current shutdown 63A.

Protection and power cord provides the user.

After the connection is made and before starting the engine check the operation of remaining regulating and control devices and check if direction of conveyor motor rotation is correct.

5. STARTING THE BOILER



Service (start-up and operation) of boiler can lead only employee trained in the operation of boilers in accordance with the OHS regulations in force in the boiler room.

5.1 QUALITY OF SUPPLY WATER

The quality of boiler feed water and central heating system has a serious impact on the reliability and working hours of boilers. There are two reasons for of boilers wear

- corrosion,
- accumulation of deposits (boiler scale)

The destruction of the walls due to perforation due to corrosion is relatively rare. More frequent is pollution od cables and instrumentation in many cases causing total blockage of conductors and blocking of valves. Especially dangerous for boilers is the deposition of sludge on the surface of the heat exchange. The formation of boiler scale forming an insulating layer hindering the proper removal of heat by the heating medium, can cause too strong overheating of the walls often involving major failure of boiler. The deposition of scale also reduces the patency flow. The most appropriate water to supply the boiler is a rainwater.



Under no circumstances should the installation and the boiler be filled with water of unknown hardness.

Permitted is to supply water with a hardness of max **6° n (2,142 mval)**, Water also must have a pH of alkaline namely hydrogen index pH greater than 7 and should be free of salts and gases.



Tap water before using it to supply installation should be soften. It is prohibited to fill the boiler with water directly from the aqueduct – this could damage the boiler.

The correct installation central heating water loss is insignificant and rarely needs to be completed.

5.2 DRYING BRICKWORK



In case of first boiler start-uo it should be first carry out the drying process of refractory lining. Drying refractory lining is a very important process that affects the longevity of the ceramic.

The furnace is constructed of refractory concrete and high alumina brick. In the process of the construction of the furnace these components carry a large amount of water. Drying involves evaporation of water from the material, wherein the process must be slow and conducted in accordance with the present "graph drying refractory lining" fig. 11, because otherwise there will be ceramic cracking and chipping.

Keeping the parameters selected in the chart requires constant monitoring of the temperature in the furnace. In practice, it looks something like this, that in the first day of operation we burn only wood in pieces in the furnace imposed onto a grate by the service door. During that burning we do not close the maintenance door of the furnace, only turn a blind them. Blast fans at this time does not work – we burn like in a traditional boiler for solid fuel. The next day, we can run the fuel supply by means of automatics, wherein the temperature of the water in the boiler we set in the range to 40 °C and we can not exceed it. It was only in the following days of boiler operation we can gradually increase the temperature to the temperature limit 95°C, wherein the maximum temperature can be used after 6 days.

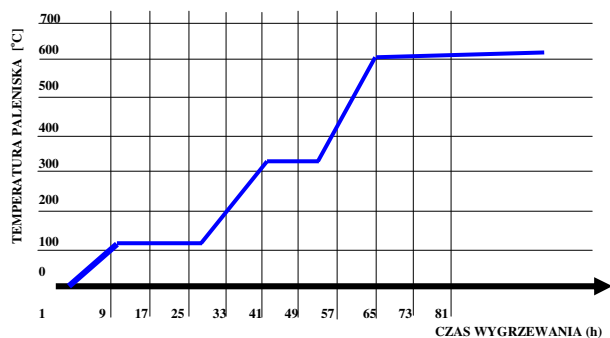




Fig. 13 Graph dry refractory lining

5.3 STEPS TO BE CARRIED OUT DURING THE START -UP:

1. Verify if in the installation central heating and the boiler there is enough water i.e. if in the expansion vessel, located at the highest point of the heating, there is water – wherein sufficient is if the level is 100 mm above the bottom of the vessel. This can be checked by signaling pipe.
2. Check if all cleaning flaps in the boiler are installed and closed, especially clean-flop in the rear part of boiler. Check all connections for leaks.
3. Check the oil level in the drive gearbox, following the description in item 7.2.4.
4. Press the grease into the bearing agitator in the tank in accordance with item 7.2.4.
5. Switch on power supply on desktop control.
6. Check the direction of rotation of the fan motor (must be consistent with an arrow drawn on the fan housing).
7. If the direction of motor rotation is correct and stirrer at the bottom of the tank moves to the right direction – the tank can be filled with fuel. The first charge should be made mandatory with fuel dry with humidity under 30%. It is necessary to burn and heat the chamber to temperature required for the reaction of pyrolysis of wood waste. The tank cover tightly with cover.

 **Before filling the fuel tank, make sure that on bottom of the tank there are no unnecessary items, which would hit the rotating agitator on the tank bottom. This can lead to the blockage and defect in the drive.**

8. Check the condition of the boiler (no leaks), fill with water and bleed the heating system. Set the desired temperature on the display of controller.

 **To the light the fire in the furnace do not use flammable materials: gasoline, kerosene, derivatives or other similar materials - their application may cause burns or explosion!**


NOTE: When starting a the newly installed boiler, when the smoke pipes are cold and damp, phenomenon may occur of smoking boiler by hoppers and before the grate doors, as well as the phenomenon of "sweating boiler" namely dark liquid dripping from the boiler, which often creates a spot under the boiler. This phenomenon is not malfunction signal of the boiler and after day or two disappear.

6 OPERATION OF COMFORT CLASSIC-RS

6.1 FURNACE OPERATION


After passing the initial phase can be started daily operation of the boiler, which is based on:

- Setting a desired operating parameter in the form of boiler water temperature,
- Checking the correct operation of all external assemblies working with the boiler,
- Ensuring the continuity of the fuel supply to the combustion chamber,
- Ash removal and deslagging of furnace grate,
- Overseeing the work of the boiler by means of the control – measurement devices.

 During the day can be changed the parameters of boiler operation i.e. may be different during the day and during the night, but it requires manually change of these parameters.

It is forbidden to frequent opening fire door during operation. The opening can cause burns, as well as contributing to rapid wear of refractory lining. Ceramics in the furnace during operation of boiler has a very high temperature. When the doors are open occurs the rapid cooling (thermal shock) what is the cause of cracking and spallation of refractory lining.

If we find lack of water in the boiler or installation and the boiler is filled with red-hot fuel:

 **It is forbidden (under pain of losing the warranty):**

filling the system with cold water – boiler may explode,

- **potting not extinguish furnace with water– risk of rupture of the boiler and production of poisonous carbon monoxide,**

In this case, follow the instructions for emergency stop (item 6.5) Installations fill with water when the failure is removed and boiler cooled.

In addition, during the operation of the boiler, apply the general requirements for the operation of heating equipment and general health and safety regulations and in particular those required for working in boiler rooms.

6.2 ADDING FUEL IN TANK:

Fuel loading can be done:

- manually (the least amount of heat collection)
- mechanically,

Manual loading of fuel in the boiler –side tank is inefficient way (not recommended); due to the large height of container.

This type of loading can be used when the device is in a recessed basement. It can be then used different levels and applied so-called. gravity chute. Mechanical loading may be accomplished through the use of any kind of conveyor; best suited for this purpose are screw conveyors. Fuel is transported from the warehouse conveyor directly into the tank.

It is recommended that the fuel is sifted through a sieve with a mesh aperture of 3 cm. After each filling the boiler-side tank should be closed.

6.3 CLOSING BURNING IN THE BOILER

To extinguish the hearth should be:

- interrupt the fuel supply,
- after burning the fuel open hoppers door, ash door, smoke conduit dampers set in the open position, to quickly cool down the boiler,
- remove slag and ash, clean the combustion chamber wall, furnace, smoke tubes and smoke conduit, shut isolation valves.


6.4 EMERGENCY STOP:

When it is find a boiler malfunction, should be:

- interrupt power supply,
- disable automatic control of hearth
- open hoppers door, ash door, smoke conduit damper, in order to quickly extinguish the heat in the boiler and furnace-cooling ceramics bearing in mind to avoid cause of thermal shock,
- remove the fuel, slag and ash from the boiler,

7. OVERVIEWS AND REPAIR, MAINTENANCE

To ensure reliable device operation control, it should be on a regular basis check the operating status and if necessary make running repairs. Operating of COMFORT CLASSIC-RS requires periodic inspections according to the plan set out in Table 2 below:


 **All maintenance and repairs should be carried out on the boiler off from work, and in the case of cleaning and maintenance of electrical equipment during power off.**

7.1. CLEANING AND ONGOING MAINTENANCE:


- Due to the fact that all chipped wood waste contain a small amount of silica, and also can be other mineral impurities in the form of sand, gravel, concrete or stone (when stored on the ground or concreted tray) during the operation occurs the phenomenon of "Slagging" gasification chamber, in particular, grates and innere walls of refractory lining. This phenomenon is detrimental and can significantly reduce the thermal efficiency of the combustion process. Efforts should be made to avoid the use of clean waste incineration (free of any mineral impurities).

A visible sign of the firebox slag is increasingly impaired and the associated temperature drop in the boiler and the black smoke from the chimney outlet (with normal burning from chimney is out slightly noticeable white cloud).

Because of above described reason, the furnace chamber must be subjected to cleaning – removing slug and all carbon deposits. Cleaning frequency depends on the purity of the fuel. Fuel more contaminated forces frequent cleaning and vice versa. The frequency of cleaning must determine the user depending on the type of fuel used.

 **Cleaning the furnace chamber should be carried out in such a way as not to damage the refractory lining. In the case of damage to the refractory lining must be repaired with fireproof materials (standard fire resistance 1370⁰C) (173sP)**

When burning of clean waste (free of mineral impurities) combustion chamber will always be clean, and a small amount of ash (about 1% of the mass of waste burned) spill over into the ash box. The ash is removed through ash door.

 After cleaning the ash pan door should be tightly closed.

- Cleaning the grate and boiler furnace from remains of burned fuel must be made each time before burning the boiler. If burning is held without interruption with only hopefully resulting fire at night, then hearth and grate cleaning should be done before the intensification of the fire. Once a day or more often (depending on the fuel burned) it is advisable to clean the ash pan, because in the combustion process congregate there unburned portion of the fuel and pollution, and ash.

Before starting the boiler it should also be checked if:

- set to process data on the controller are implemented,
- electrical installation shows no damage (sparks, shorts, etc.)
- sensors are functioning properly set the water temperature in the boiler,
- limit switch operates correctly, is maintained full integrity in all the connections,
- there is enough water in the central heating installation

7.1 PERIODIC REVIEWS AND REPAIR

Table 2 Inspection and preventive maintenance

In	Type of review	Time for carrying out	Indicative scope of work
1	Current overview*	Every 720 hours of boiler operation	Checking the fire protection sensor (item 7.2.1); exchanger cleaning (item 7.2.2), control state of refractory lining (cracking, crumbling), checking the condition of gear, fans, screw, reel in the tank, checking the sensor mounting
2	Periodic review **	Every 4800 hours of boiler operation	The scope of work from current overview and cleaning of the fan (item 7.2.3) screw, possibly complement defects in refractory lining, supplementing gearbox oil, lubrication of bearings, control of grate
3	Remont średni**	Every 15,200 hours of boiler operation	The scope of work of the points 1 and 2, and: control of state of combustion tubes, possible exchange of grate, possibly replacing the protective flap of Dutch oven, maintenance of the boiler after the heating season
4	Major overhaul **	Every 35,000 hours of boiler operation	Work on the complete replacement of the furnace refractory lining, replacement of covers and sealing of ducts, regeneration or replacement of screw, replacement of drive train bearings, possible exchange of gear wheels of gear unit

* If during the review is observed failure or damage of any assembly, in urgent mode execution of necessary repair or replacement the defective part / assembly.

** When repairing the inside of the boiler and the associated disconnecting its parts should be then check the tightness of the boiler as well as the installation. When replacing items such as side walls or repairing cracks and leaks it is necessary to perform a pressure test 0,21 MPa.

Schedule of maintenance should be chosen so that the interim falls after the end of the heating season, that is, during the summer, possibly in planned periods when the boiler is out of service. When in this case, the period between the start-up to a planned interim review is shorter than the required, repairs to be carried out anyway. In the case of continuous operation of the boiler it should be scheduled periodic boiler shutdown from service in order to carry out medium and major overhauls.

All maintenance and repair work and records boiler operation the user is obliged to record in a special book service, supplied by the boiler manufacturer.

To facilitate the calculation of working time, repair time can be counted as working time and when at that time will fall the current or medium overview should be ignored, indicating the cause in the service manual.

NOTE: Each time a detailed, the necessary work to be performed is determined by the user based on the proven wear of parts or assemblies. Ranges and times listed in the table are approximate, as are strongly dependent on the type of fuel burned and cultural life of the product.



In case of absence of such a service book or absence of entries the manufacturer is EXEMPT FROM THE WARRANTY.

7.2.1 METHOD OF VERIFICATION OF PERFORMANCE OF FIRE PREVENTION SENSOR:

Performance check of valve sensor with fire protection. This includes the following:

- disconnection of the water supply valve
- removing the valve from the fire protection system
- setting knob to number 1
- dipping the tip (sensor) of thermostat in hot water (previously boiled)
- checking the patency of valve by blowing air

The valve should be considered efficient if the air moves freely through the valve.

It is recommended to also check the valve when set to other numbers.

If, at any of the settings, there is no valve patency (lack of air flow), valve is eligible for replacement.

7.2.2 OPERATIONS PERFORMED DURING THE CLEANING OF SMOKE TUBES:

- open flap sweeping closing compartment smoke of the heat exchanger, clean the Dutch oven and furnace chamber, clean fire tube pipes and interconnecting pathways through the wick, wherein the period of time between cleanings depends on many factors (type and moisture content of fuel burned, chimney draft) and is subject to change. Cleaning the heat exchanger

is important because it affects the efficiency of the boiler – contaminated fire tubes poorly give warm to water and greater is the chimney loss

- clean the smoke conduit,
- check that the exhaust damper in smoke conduit rotates freely without jamming,
- empty the ash pan underneath the furnace and fire tubes,

Boiler cleaning should be performed after complete burning of fuel, termination of heat and boiler cooling.

7.2.3 CLEANING THE FAN :

Due to the fact that the boiler is supplied with fuel, in the form of fine wood waste, there are conditions for wood dust settling on different parts of the device. The most exposed to wood dust settling is impeller blower. Contaminated rotor runs unevenly (trembles and makes noise) which can lead to its damage. It also reduces its efficiency by which deteriorates the combustion process in Dutch oven due to the insufficiency of air, which is essential in this process.

Therefore, during the current review should be:

- disconnect the fan from the power supply,
- remove the fan cover,
- clean the blades and intake ducts,
- clean the impeller housing.
- install the cover.

7.2.4 LUBRICATION OF SYSTEM

There are the lubrication points in the device and an assembly demanding a permanent oil bath:

- in the connector reducer - stirrer reel:

inject grease through grease nipple (fig. 10)

- in the connector regulator - screw conveyor:
inject grease through grease nipple (fig. 11)
 - oil bath at work require the gear wheels of worm gears
 - type of oil - gear unit plate contains data on flooded oil in the gearbox,
 - exchange rate - at 1000 hours or once a year,
 - oil level - to overflow plug,
 - with synthetic oil in the transmission is not necessary to replace it – gear unit has not oil drain plugs.

7.3 MAINTENANCE

Maintenance should be performed always after the finite of heating season or in case of long break in operation. The boiler should be carefully cleaned and it should be made potential repairs. After cleaning, the boiler should be completed with painting the exterior surface.

Water from the boiler for the summer period should not be drained. However, if in the winter boiler room for any reason is closed and there is a fear of freezing water in the system, **water should be drained.**

Before restarting the the boiler into operation after a long period of disable it is advisable to review the equipment and check for correct operation acting as during start-up, as described in item 5.3

8 OCCURRING DISORDERS OF BOILER OPERATION

Table 3. Causes of faults and remedies

Item No.	Fault	Expected cause	How to remove it
I. FUEL TANK			
1.	The suspension of the fuel	<ul style="list-style-type: none"> - not rotating movable stirrer - breakage or damage bent conditioner - (freezes for the walls during the winter) 	<ul style="list-style-type: none"> - because of damage to the drive, check the drive - weld new conditioner or repair damaged (upper wall conditioner should be installed away from the tank wall max.10mm). - to the wetfuel add portion of the fuel dry and mix thoroughly, do not beat in the tray
II. SCREW FEEDER			
1.	Do not rotate	<ul style="list-style-type: none"> - there is no power supply to the motor - damaged gear unit - faulty connector of screw to the drive shaft reducer - burned engine - damaged electrical wires - overloaded motor 	<ul style="list-style-type: none"> - determine the cause: blown fuse, defective thermistor, faulty driver - replace or repair the defective part - gearbox repair (replace damaged gear wheel) - remove the gearbox from the engine and repair the connector (secure the screw from falling from the reducer shaft) - repair or replace motor - damaged wires replace with new ones - remove the overload cause and test the thermals
2.	Not given fuel	<ul style="list-style-type: none"> - lack of fuel in the tank - damaged coils (pen) of screw - broken or damaged screw terminal - clogget throat outlet 	<ul style="list-style-type: none"> - refuel - remove the screw-fix turns of screw - remove the screw-fix damaged terminal - extinguish and let cool the Dutch oven chamber, clean the throat and check the flow fuel through channel
III. REDUCER			

1.	Excessive heats up	<ul style="list-style-type: none"> - drive overload - little oil in the reducer - defective bearings - damaged gear wheel - improper oil - waste oil 	<ul style="list-style-type: none"> - release screw of the lock (clean channel and throat) - add oil to the level to overflow cap - determine which bearing is damaged - replace with new - replace damaged wheel (old worked out in replace in pairs) - pour competent oil - pour out used oil, rince gearbox, rinse and fill with fresh oil
2.	Unusually noisy operation	<ul style="list-style-type: none"> - bearing damage - damaged gear wheel - low level or lack of oil 	<ul style="list-style-type: none"> - replace with new one - replace with new one - supplement or pour new oil
IV	HEARTH		
1.	Fast accumulation of carbon deposits on the walls of the chamber and on the grate, throttling smoke conduit duct	<ul style="list-style-type: none"> - improperly conducted combustion process - excessively contaminated fuel - different type of fuel 	<ul style="list-style-type: none"> - by adjusting elements in the controller bring the combustion process to the most optimal - use clean fuel pollution-free, - do not burn coal, coke, plastics, etc. - mandatory remove carbon deposits, clean combustion chamber (not to damage the refractory lining)
2.	Rapid wear of the refractory lining	<ul style="list-style-type: none"> - not retained pre-burn-in chamber furnaces - mechanically damaged the lining - other than wood waste fuel burned 	<ul style="list-style-type: none"> - regenerate the lining or make a new with fire-resistant brick, stacking of cement mortar fire resistant with the addition of a filler "Boss"
V	WHOLE BOILER		
1.	Perceptible odor of smoke	<ul style="list-style-type: none"> - leaky connection on the flanges - not pressed against the side door or damaged gasket - damaged lining - untightly covered fuel tank - improper chimney draft - leaky flues and smoke conduit 	<ul style="list-style-type: none"> - seal repaired with new gaskets (press firmly with screws). The entrance to the boiler sealed with fire resistant mortar set the door and tighten the locks. If necessary, replace the seal of fire-resistant materials. - repair or make new with materials as in item .IV.2. - close tank with the terminals. If necessary, change gasket of cover - clean the chimney or smoke conduits,

			increase the the chimney or use artificial outflow, sealed smoke conduit and boiler flue gas ducts
2.	In combustion chamber is invalid process of waste burning	<ul style="list-style-type: none"> - too low temperature inside the chamber - too high humidity of fuel(over 50%) - too little air is supplied to the chamber - humidification with extinguishing water consumption due to valve leak-sensor 	<ul style="list-style-type: none"> - improperly run ignition process. The ignition process should be conducted, that brickwork of chamber-heat accumulator of Dutch oven has reached a bright color. It is possible to get it within 2-4 hours, burning fuel with a moisture content below 30% constantly adjusting appropriate times: break and feed - screw can feed not enough fuel - appropriately adjust the time of feed - lower fuel moisture by the admixture of dry fuel to the wet fuel - too small fan-replace with a larger - check the tightness of the valve. Replace a leaky valve.
3.	The boiler does not reach the desired temperature	<ul style="list-style-type: none"> - abnormal process in the furnace chamber - preset temperature of the sensor at the outlet of the boiler is too low - too much draft in the chimney - excess of secondary air - faulty driver-poorly leads the combustion process (gets out of whack constantly working on maintaining) 	<ul style="list-style-type: none"> - steps as in the item V.2. - adjust the setpoint temperature sensor to higher temperature - reduce the draft by means of the movable flap located in the boiler flue - lock a little flaps regulating flow of secondary air into the combustion chamber of the boiler - adjust the controller by an authorized service technician or replace controlle
4.	Emits a pair in the boiler (water boils)	<ul style="list-style-type: none"> - the adjustable temperature sensor is not working - sensor max. temperature is not working 	<ul style="list-style-type: none"> - check whether the sensor is well erected - verify the connection to the controller, possibly improve, if damaged, replace the sensor - verify that the controller is correctly responding to the sensor through the bridging
5.	No strict implementation of the given program	<ul style="list-style-type: none"> - interruption in electricity - damage oif the controller 	<ul style="list-style-type: none"> readjust the programs: - essential and supporting on the control panel - repair or replace the controller
6.	Attempt to roll back the fire from the combustion chamber into the container of sawdust	<ul style="list-style-type: none"> - no fuel feed (feeder does not work) - lack of fuel in the tank or fuel in it is suspended 	<ul style="list-style-type: none"> - determine the cause and rectify the fault item II - loosen suspended fuel or fill the tank with new fuel
7.	Rolling back the fire from the hearth into	<ul style="list-style-type: none"> - faulty feeder - no current in the network for 	<ul style="list-style-type: none"> - determine the cause and rectify the fault item II

	the container sawdust	<ul style="list-style-type: none"> - a long time - faulty sensor with fire protection valve 	<ul style="list-style-type: none"> - if the fire protection sensor is not running empty the fuel tank and add water to put out the fire in the housing transporter - replace the sensor with a valve fire protection.
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9 OHS INDICATIONS

Operation of the boiler unit is safe if the boiler is installed and maintained in accordance with the relevant standards and this technical and operational documentation. In particular, please observe the following rules:

- In flame in the boiler after checking if in the heating system and the boiler there is enough water and valves on the boiler outlet and inlet are open,
- Ensure protection fire safety, ie. setting that the boiler should be cleaned up, do not store near the boiler combustible materials,
- Connection to the chimney should be done very carefully, and the joints sealed with the clay refractory or graphite cord,
- At low temperatures, if cooling of the system occurred for any reason, and is suspected of freezing installation behind the boiler, before lighting the boiler it must be absolutely sure that the water cycle is stored in the system, otherwise firing up the boiler must be immediately stopped,
- The temperature and pressure of water in the boiler must not exceed the limit values, it is prohibited to work over these parameters,
- Installation of the equipment, commissioning and operation can be carried out by the buyer after carefully reading themselves with this manuals.

Buyer may be (on request) trained with a surcharge by the manufacturer's service.

- Modifications to the electrical and control installations are unacceptable. At the time of opening and closing of furnace door caution must be exercised.

The entire unit should be subjected to mandatory inspection to the effectiveness of zero and have the appropriate certificate to that effect. Approximate measurements of zero shall be in accordance with the provisions of the law of fire protection.

- All connections must be tight –exhale of carbon monoxide or smoke is unacceptable.
- The room in which is mounted COMFORT CLASSIC-RS must be dry and well-lit and ventilated with natural draft. Around the device should be stacked wooden boxes or insulated rubber mats.
- The use of mechanical ventilation in the boiler room with a chimney of the natural (gravity) is not permitted.
- The device can operate only with efficient automatic fire extinguishing apparatus. Boiler must comply with standards PN/B-02411. Heating. Boiler rooms built on solid fuel. Requirements.
- In place of installation COMFORT CLASSIC-RS should be put manual OHS and fire protection safety developed by the user with an indication of the risks that may occur in the circumstances on the job.
- The boiler can operate employee trained in the use of central heating boilers and familiar with the OHS regulations applicable in the boiler room.

