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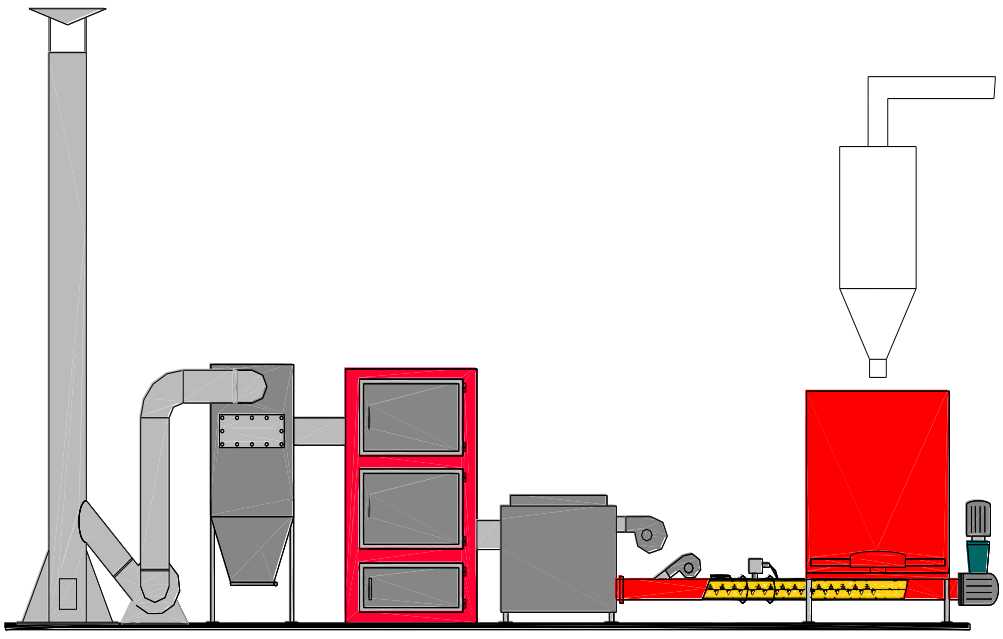
AUTOMATIC WOOD SAWDUST BURNING SYSTEM SASP 150 - 2000 kW



ASSEMBLY AND INSTRUCTION MANUAL

INTRODUCTION

NOTE: MAKE SURE TO READ TROUGH THIS INSTRUCTION MANUAL BEFORE STARTING THE SYSTEM AND TO FOLLOW THE INSTRUCTIONS

The aim of this manual is to get you to know with our system complitely.The manual consist of the assebly instructions manual for the system which has been delivered.

Please, follow the instructions and the system will always function to your satisfaction.

THE MANUAL IS TO BE KEPT FOR PERMANENT USE SO PUT IT AWAY IN A PLACE WITHIN REACH FOR FUTURE REFERENCE!

We are always at your disposal for futher information.

PP " TOPLING " - PRNJAVOR

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1. PRODUCT DESCRIPTION

1.1 GENERAL OPERATING INFORMATION

The Wood Sawdust Automatic Burning System(hereinafter referred to as the system) has been constructed to function as a solid-fuel operated system. The system is primarily intended for wood and timber plants producing large amounts of waste in the form of sawdust. The operating of this system enables efficient disposal of wood sawdust and other wood waste from a plant on one hand, and provides efficient heat energy supply for drying shed system, plants, offices, and dwelling units on the other hand.

The system is made in eight sizes considering their heat power within the range of 150 kW to 100 kW. The systems have the power of 150, 175, 200, 250, 350, 550, 750, and 1000 kW. The system has been made for water heating with the distributed water temperature of 90 °C max. It is intended for operational temperature regime of 90/70 °C with the operating pressure of 1,5 bars max.

The system construction meets the European Instructions No. 98/37/EC, 97/23/EC, 73/23/EC, 89/336/EC, and European Standards EN 292- 1, EN 292-2, EN 12953, EN 60204-1, and EN 50081-1. The system testing has been carried out according to EN 626-1, DIN 4702/EN 12953, JUS M.R4.020, JUS M.E2.203, and JUS M.E2.056.

The whole system has been made of high quality attested materials tested by appropriate institutions. Steel boiler lim seamless and welded tubes have been used. Most often the construction has been made on the basis of welded joints and binders. Butt welded joints and fillet welds have been used most often. Heat insulation and sheet armour have been fitted in. The system can be operated either automatically or manually. When the maximum pressure and temperature have been reached, the system switches off automatically and provides safe operation. The burning place and the camber part of the boiler have been constructed in such a way that consumption of any kind of fuel results in complete combustion, excellent heat exchange and the minimum losses through flue gases.

CAUTION: The user should be aware if high temperature in gasificator, at the boiler door, multicyclone, and chimney. At the places with temperature above 55°C there is the warning symbol according to EN 61310-1

1.2 OPERATOR

NOTE: Make sure to read through this system instruction manual and to follow the instructions on safety and operation.

The operator must have secondary school qualifications of technical orientation. The operator will be trained for system operating and meeting safety requirements by the manufacturer. If a buyer wants to change a system operator they are obliged to inform the manufacturer about this and arrange the training of a new operator. In case of not acting according to this obligation, the manufacturer does not accept any liability for possible damage caused by the lack of operator's training.

1.3 TEHNICAL DATA FOR SISTEM

Parameter	Unit	Value
SYSTEM		
Hot water boiler power	kW	150, 175, 200, 250, 350, 550, 750, 1000
Efficiency coefficient	%	75-82
Temperature of exhaust flue gases at boiler nominal power	°C	max. 190
Maximum system noise at the position of the control panel	dB	<78
HOT-WATER BOILER		
Boiler operating pressure	bar	1.5
Boiler test pressure	bar	3
Temperature at the boiler inlet	°C	70
Temperature at the boiler outlet	°C	90
Dimensions of the connection to the gasificator	mm	∅525/375
Dimensions of DN connection	-	65, 80,100
Dimensions of R1 connection	-	32,40, 50,65
Dimensions of R2 and R3 connections	mm	20
TANK WITH A FEEDER		
Volume	m^3	2
Electric motor (mixer)	kW	1,1
Electric motor (worm)	kW	1,5
Maximum sawdust feeding discharge	m^3/h	0,7
GASIFICATOR		
Type N 402 ventilator	kW	0,25
Type N 252 ventilator	kW	0,18
MULTICYCLONE		
Outlet connection of the multicyclone	mm	∅370
Type LM25 ventilator	kW	0,55
CHIMNEY		
Chimney diameter	mm	∅500
Chimney height	mm	10000

2. SYSTEM APPLIANCE

The system is intended for good sawdust automatic burning and the production of hot water up to 90 °C warm. The instruction manual including the description of the system operation must be delivered with the system. The user is not allowed to use the system for burning other materials except dry and wet (up to 60%) wood sawdust or 8 mm granulation maximum. Temperature increase has been prevented by the installation of a thermoregulator and additionally secured by a safety thermostat, and pressure increase has been prevented by a safety valve.

3. **TECHNICAL DESCRIPTION OF THE SYSTEM**

K E Y :
1. Hot-water boiler
2. Gasificator
3. Wood sawdust tank
4. Multicyclone with fire tubes and flue gases ventilator
5. Control panel
6. Chimney
7. Centrifugal ventilator 1
8. Centrifugal ventilator 2
9. Buncher
10. Reducer
11. Electric motor
12. Flue gases ventilator
13. Mixer
14. Worm feeder

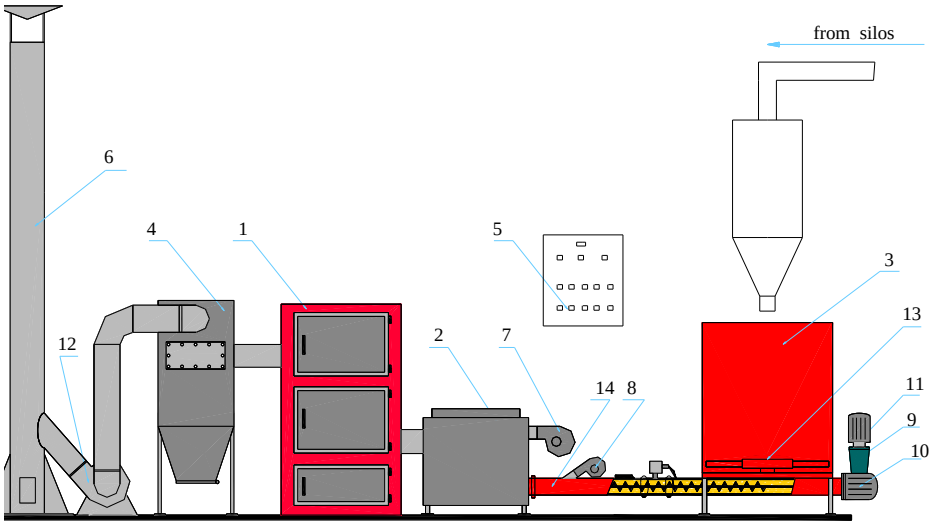


Fig.1. WOOD SAWDUST AUTOMATIC BURNING SYSTEM

The system consists of six main assemblies (Fig.1.):

- Hot-water boiler
- Gasificator
- Tank with a feeder
- Multicyclone with fire tubes and flue gases ventilator
- Control panel
- Steel chimney (if another one does not already exist)

The system works as follows: the fuel coming to the tank from the bin goes into the gasificator with the help of the worm feeder. Gasification process and partial sawdust burning goes on within the gasificator which leads to the generation of gas which is blown into the boiler burning place together with the unburned solid mass. Burning of the gas and the solid sawdust residues is carried out in the boiler burning place. The process in the gasificator is followed by evolving of a lot of heat enabling its self-supporting. The system operation is completely automatic and is performed on the basis of users' (for example a drying shed) demands for heating.

A panel for controlling, adjustment and system operation following is installed in the boiler house.

Hot-water boiler is made by welding of high-quality steel boiler lim and it has a connection to the gasificator for automatic sawdust burning or manual burning of lump waste. These two systems can be combined and they are not mutually exclusive. The boiler is completely immersed with water-cooled grating. It is distinctive because at one of its sides there is a connection to the gasificator.

Gasificator is a device which the sawdust gasification process goes on in in the way that already formed jet of hot gases comes into the boiler burning place. This way enables the complete combustion of sawdust coming directly from a saw mill plant. The gasificator is cylindrical in shape and in its bottom part there is a grating with a canal for fuel feeding. The gasificator itself is installed with a thick layer of thermoconcrete and has the connections for air inlet and the outlet of the burning process products towards the boiler. There is a centrifugal ventilator (Fig.1. No.7.) installed on the gasificator and it speeds up the process of burning and directing i.e. flow of the gases towards the boiler i.e. the chimney.

The tank with a feeder consists of a tank with a mixer and a worm feeder. Sawdust from the bim comes into the tank and it is further conveyed to the gasificator by worm conveyer. The mixer and the worm conveyer have electric motor and reducer drive.

The mixer is by a fixed joint connected with the worm feeder support, supporting the centrifugal ventilator 2 (Fig.1. No.8), temperature probe, reducer, buncher and the electric motor.

Multicyclone separates bigger particles from flue gases in order to reduce environment pollution and to prevent getting out of sparks which could start a fire.
This means that it has been included in the system for the increase of safety factor and for safer operation.

Fire tubes conduct flue gases through flue gases ventilator to the chimney.

The control panel automatically runs the burning process through the set upper and lower temperature of boiler water.

A view and description are given under item 4.7 and in figure 7.

The chimney must be properly chosen . Proper chimney dimensions are a prerequisite for boiler operation safety and heating economy. At the bottom part of the chimney there is a withdrawal door installed. Inner chimney dimensions have been chosen depending on the chimney height and hot-water boiler power.

The chimney lining between the boiler and the chimney should be as short as possible without any sharp joints. It is good to insulate thermally all chimney linings longer than 0,5 m. It is important to keep the fresh air flow into the boiler house steady.

Air flow section must be at least as large as the chimney blow-off section. A view of the chimney is given in Fig. 6.

Regular boiler operation requires minimum chimney draught which can be achieved by proper chimney section and height.
Boiler installation has been well designed by the designer and carried out competently in order to achieve maximum efficiency and avoid operating irregularities and side effects.

Attendance, maintenance and cleaning of the system are very simple. The burning process is extremely successful , therefore dirtying of the exchange areas is minimal and precipitated ash is simple to shovel aside.

Cleaning set is delivered by the manufacturer with the system.

4. TRANSPORT AND ASSEMBLY

4.1 TRANSPORT

The goods are transported to the buyer by truck. Smaller system parts are packed in wooden boxes and bigger assemblies are placed on wooden pallets, foil covered and secured from rolling during the transport. Hot-water boiler is delivered partially assembled without the outer jacket. The complete final assembly is to be done at the spot at the buyer's. The allowable temperature during transport is between –25°C and +55°C. Loading and unloading of all the system parts should be done by a fork-lift truck except the hot-water boiler which should be loaded and unloaded by a crane using the hangers on the boiler.

4.2 SYSTEM ASSEMBLY

The presence of persons having assembled the boiler and other people in control of the boiler assembly is required at the first boiler starting. The company performing the boiler assembly is obliged to present the buyer all the rules on the operation and functioning of the complete system. The space which the system is assembled and operated in must meet the following requirements:

- temperature in the boiler house – from +5°C to +40°C
- humidity in the room – up to 90% at 20°C
- height above sea level – not higher than 1000 m
- light in the room – not less than 500 lux

Fig. 3. gives the complete assembly drawing of connecting the system.

Assembly can be carried out only by an appropriate manufacturer's personnel member or a trained person with an assembly license of an institution competent in this area.

Any kind of valve or other shutting accessories must not be assembled on the safety pipe from the boiler.

For a plant of this system type often only one room is provided for the boiler, gasificator, tank with a feeder, and other installations. If possible, the room should be:

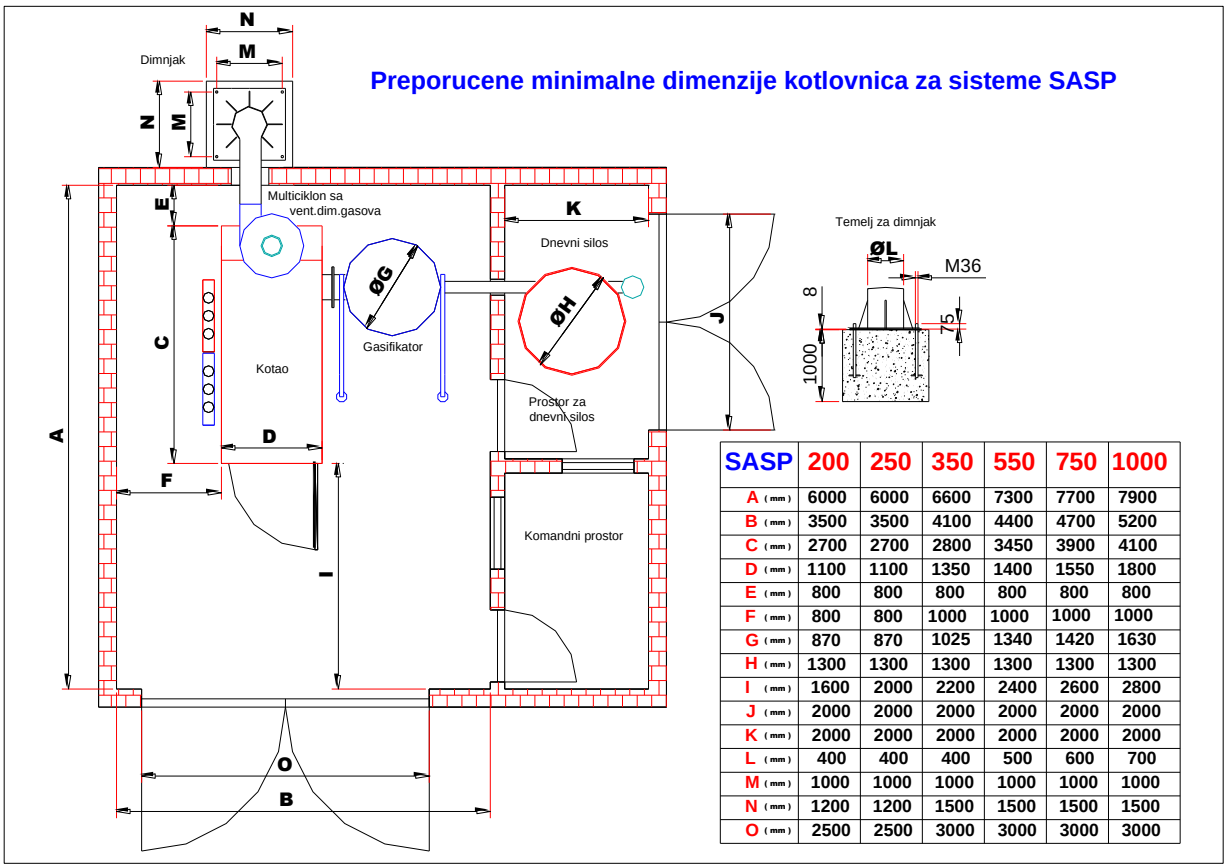
- as close to the place of sawdust collecting as possible
- as close to the biggest heat consumer as possible.

The system arrangement within the room should enable free access to the boiler for its assembly, operation and over-haul. The recommended minimal distances between the boiler and the wall are given in Fig. 2. and table 2.

Table 2

Dimension	TK150	TK175	TK200	TK250	TK350	TK550	TK750	TK1000
I (mm)	1300	1400	1600	2000	2200	2400	2600	2800
E(mm)	800	800	800	800	800	800	800	800
F(mm)	800	800	800	800	1000	1000	1000	1000

For different system sizes it is necessary to anticipate different sizes of boiler house rooms. Boiler house dimensions can be planned on the basis of Fig.2 and table 2.. Normal boiler house height should be planned on the boiler height and width which should be summed up. Minimal height could be boiler height + ½ boiler width.



SASP	200	250	350	550	750	1000
A (mm)	6000	6000	6600	7300	7700	7900
B (mm)	3500	3500	4100	4400	4700	5200
C (mm)	2700	2700	2800	3450	3900	4100
D (mm)	1100	1100	1350	1400	1550	1800
E (mm)	800	800	800	800	800	800
F (mm)	800	800	1000	1000	1000	1000
G (mm)	870	870	1025	1340	1420	1630
H (mm)	1300	1300	1300	1300	1300	1300
I (mm)	1600	2000	2200	2400	2600	2800
J (mm)	2000	2000	2000	2000	2000	2000
K (mm)	2000	2000	2000	2000	2000	2000
L (mm)	400	400	400	500	600	700
M (mm)	1000	1000	1000	1000	1000	1000
N (mm)	1200	1200	1500	1500	1500	1500
O (mm)	2500	2500	3000	3000	3000	3000

Fig.2. Recommended minimal distances in the boiler house

The following services have to be installed in the boiler house:

- water service for filling the boiler
- runoff service for emptying the boiler
- electric service should have enough power to feed all the consumers (pumps, engines, lights, etc.). The electric system must comply with the specified necessary installed elements in the electro-cupboard.

Note: Fuses must be chosen according to real consumption. The electric system must be installed according to current rules and regulations. Lightening must be strictly electric. It must be designed in the way that the boiler and the control panel are well controlled.

Preferably there should be a sort of ventilation in the boiler house nad if there is not any, draught should be created by opening the windows or in some other way. Boiler house must have at least one window opening right towards outside.

There must be a fire extinguisher in the boiler house i.e. there must be as many of them as specified by fire regulations.

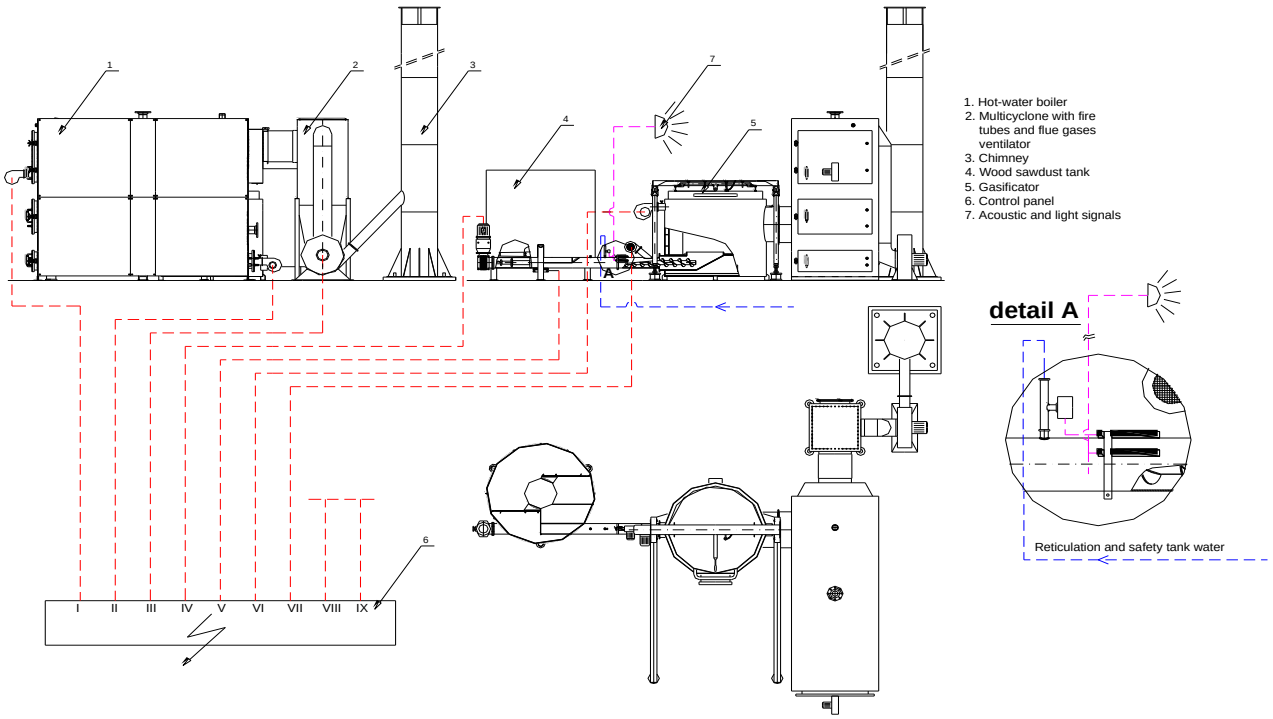


Fig. 3. Drawing of the sistem connections

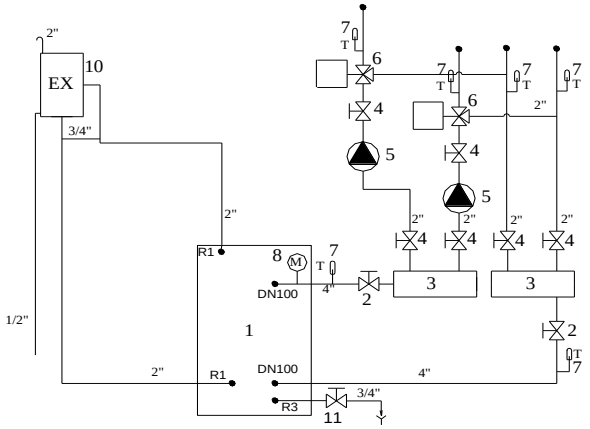
1 Note: Connections VIII and IX to the control cabinet run towards the pumps

- ----------signal line
- ----------automatic process running lines

4.2.1 Hot-water boiler installation

The boiler will be installed at a specified place and on a concrete leveled floor with the incline of +/- 3 mm max. It should be placed on an unstrained horizontal and hard ferro-concrete slab.

4.2.2 Hot-water boiler connection to heating service



1. Boiler TK 750 kW
2. Ball valve 4”
3. Collector
4. Ball valve 2”
5. Circulating pump
6. Electromotively driven three-way cock 2” (partitioning)
7. Thermometer
8. Manometer
9. Safety valve
10. Expansion tank 1000 l
11. Ball valve ¾”

Fig. 4. Hot-water boiler connection to heating service (for example of a driving shed)

The boiler should be connected to hot water service through starting and returning pipes. While connecting the boiler all the stresses possibly caused by pipelines should be prevented. The pipeline weight should be transferred to pipeline supports. All the connections and accessories should be installed in a way enabling free boiler cleaning. If possible, an air bleeder should be installed right over the boiler.

CAUTION: DURING PUMP ASSEMBLY MAKE SURE TO CONSIDER PUMP DIRECTION.

4.2.3. Connection to water service

The boiler is connected to water service by flanges. Boiler filling is not performed if the boiler temperature is below 5°C.

4.2.4 Pressure test – hydraulic

In order to check the boiler tightness a three bar pressure test is carried out during the very manufacturing process and then again before the assembly. A visual boiler check and a check of the manometer good working order are carried out at the spot in order to enable start of filling the whole installation. Open the boiler door to check its functioning.

If there is no pressure loss during the checks the assembly can carry on.

4.2.5 Covering assembly

For easier boiler delivery into the boiler house, the assembly of insulation covering and metal covering will be performed only when the boiler is placed at the installing spot.

After the tightness test of the boiler, assembly can go on by lining the boiler with mineral wool and metal hot rolled sheet. Covering assembly order is given in Fig. 5. Covering assembly is simple and fast. Covering assembly order is different for each boiler type because of different boiler

dimensions. Because of this each boiler delivery is followed by a chart of covering jointing necessary for the very boiler type.

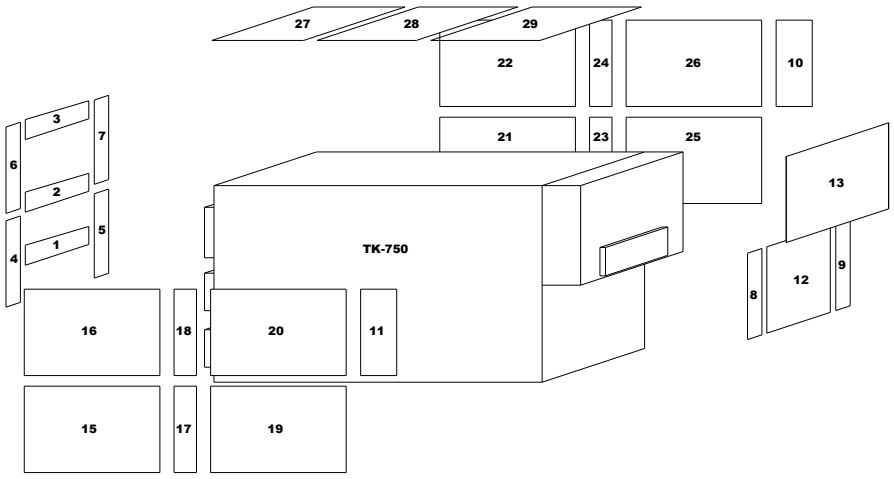


Fig. 5. Chart of covering jointing for TK-750

4.3 Gasificator connection

After having finished the boiler assembly gasificator connection by flange joint and bolted joint takes place. A heat resistant spacer will be assembled between the flanges. ∅12 mm bolts will be torqued up to 8,3 kpm. The gasificator must be assembled in a way avoiding stress at the flange joint. It is necessary to check the stability of the lid supports, and after their adjustment , check the lid's functioning ability.

4.4 Connection of the tank with a feeder

After having finished the gasificator assembly, the assembly of the tank with a feeder takes place by flange joint and bolted joint. A heat resistant spacer will be assembled between the flanges. ∅12 mm bolts will be torqued up to 8,3 kpm. The tank with a feeder should also be assembled without stress at the flange joint at the same time not forgetting to put a worm into the gasificator. Protective grate will be assembled on the tank and it cannot be removed without special tools.

CAUTION: IT IS NOT ALLOWED TO USE THE TANK WITHOUT THE PROTECTIVE GRATE.

4.5 Multicyclone connection

The multicyclone will be connected to the boiler by chimney linings and then to the chimney. The linings should be insulated by mineral wool for fire protection.

The joints between the multicyclone and the boiler, the multicyclone and the chimney lining towards the ventilator will be made of clamping rings with heat resistant spacers.

4.6 Chimney mounting

Before chimney mounting it is necessary to make a foundation with the help of ∅36 mm anchor bolts according to Fig. 6:

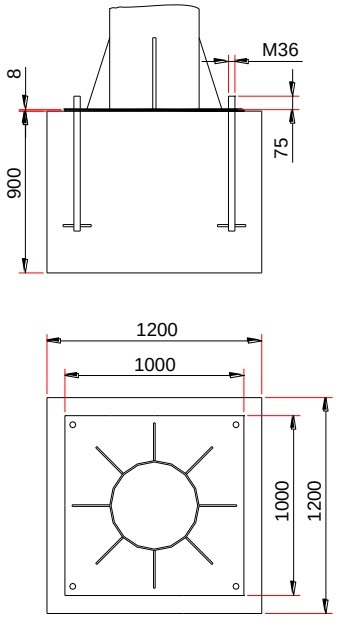


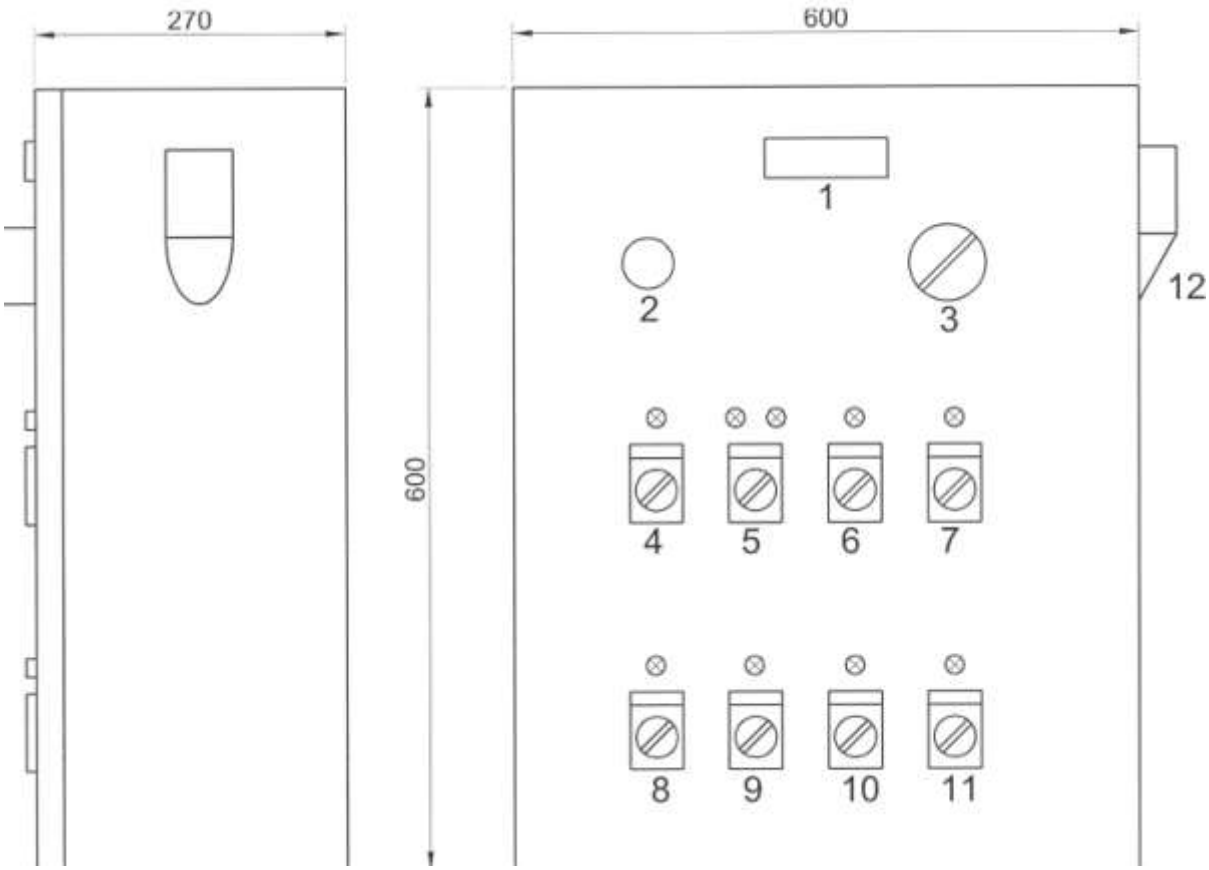
Fig. 6: Chimney foundation

CAUTION: DURING THE MOUNTING TAKE SECURITY MEASURES i.e. SECURE THE SPACE FROM THE PRESENCE OF PEOPLE ERECTING THE CHIMNEY. MAKE SURE TO ACHIEVE THE VERTICAL OF UP TO 90+/-1° AND A FIXED JOINT WITH THE FOUNDATION.

The chimney will be assembled on the foundation with the help of an anchor-plate and tightened with nuts. The necessary driving moment is 236 kpm. First the chimney is lined with mineral wool and then cased in by sheet. This will be done at the spot, in the field.

4.7 Control panel assembly

The control panel will be assembled on the boiler body or aboiler house wall depending on the number of boilers being assembled.. The control panel should always be under control and only persons trained for the system operating should have access to it. The operator has the key to the panel and the proper plant manager – director has a spare one. Fig. 7 gives a view of the control panel with the description of the switches.



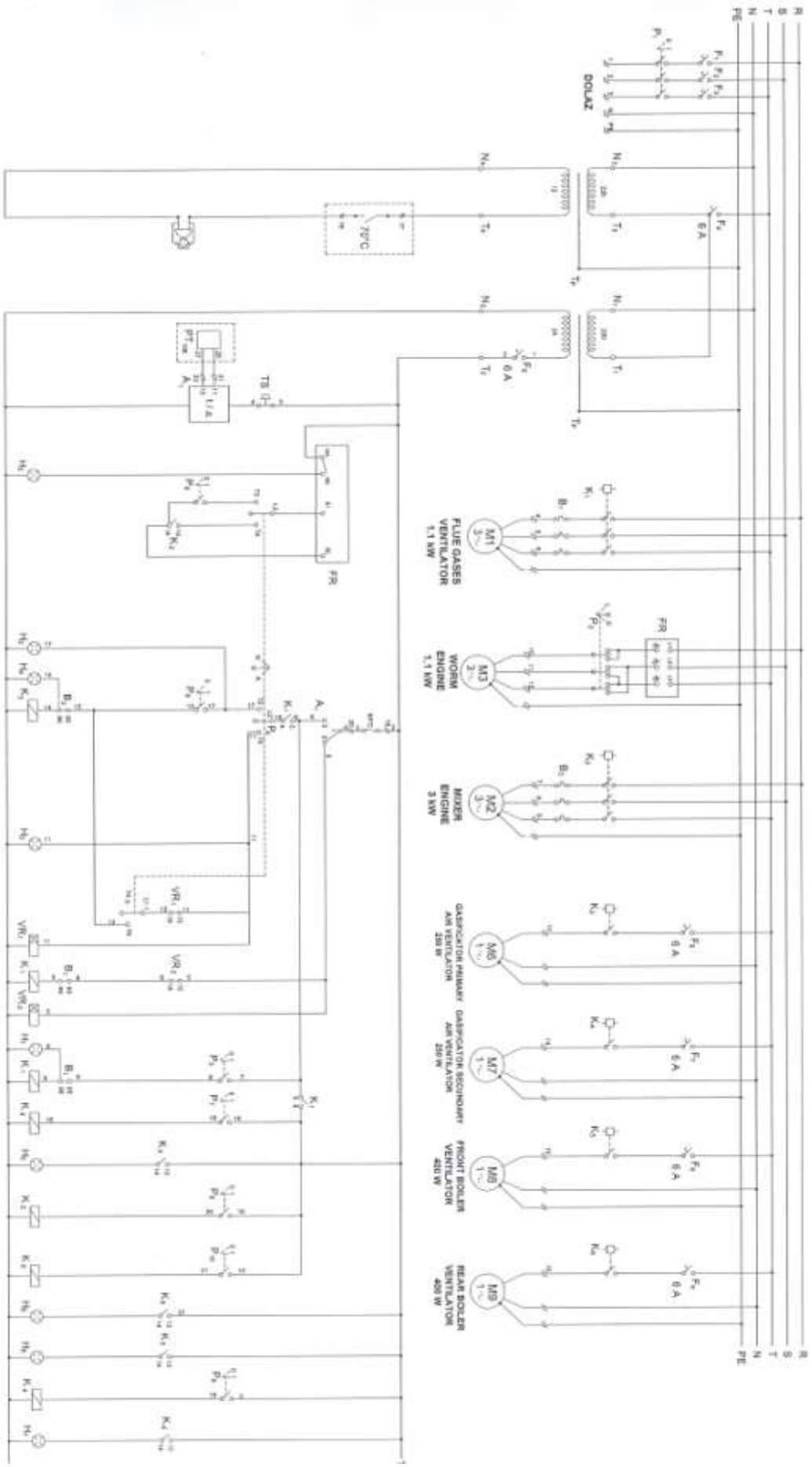
1. – THERMOREGULATOR
2. – TOTAL STOP
3. – MAIN SWITCH
4. – FLUE GASES VENTILATOR
5. – MANUAL / AUTOMATIC SWITCH
6. - MIXER ENGINE
7. - WORM ENGINE
8. – GASIFICATOR PRIMARY AIR VENTILATOR
9. – GASIFICATOR SECUNDARY AIR VENTILATOR
10. – FRONT BOILER VENTILATOR
11. – REAR BOILER VENTILATOR
12. – FIRE ALARM

FIG.7. CONTROL PANEL

4.8 Connection to electric service

Connection of the control panel and other electric units of the system is given in Fig. 3. The control panel must always be closed in order to avoid covering with dust and appearance of circulating current. Fig. 8 shows the connection of the panel to electric service. All the joints must be well tightened. Bolts should be torqued at 1,5 Nm.

CAUTION: BEFORE STARTING THE SYSTEM CHECK THE DIRECTION OF MOTION OF EACH THREE-PHASE ELECTRIC MOTOR.


DOLAZ
FLUE GASES VENTILATOR 1.1 kW
WORM ENGINE 1.1 kW
MIXER ENGINE 3 kW
FRONT BOILER VENTILATOR 400 W
REAR BOILER VENTILATOR 400 W

5. SYSTEM OPERATION

5.1 PREPARATION FOR OPERATION

Before starting all the services must be checked, meaning the performance of the following checks:

- check the pressure in water pipes
- check all the joints
- check if all the flaps in the flues are open
- if the chimney door is closed
- if the boiler door is closed
- chimney block flap must be wide open.

Having performed all the checks fuel (sawdust) can be put into the system and thus the boiler is finally ready for starting

5.2 SYSTEM STARTING – AUTOMATIC REGIME

NOTE CONCERNING THE HOT-WATER BOILER
It is not allowed to use wood waste except sawdust in the feeding tank.

CAUTION: BEFORE STARTING THE SYSTEM MUST BE FILLED WITH WATER AND PROPERLY AIR BLED AND CONSUMERS' PUMPS SWITCHED ON!

The boiler should be started manually in the gasificator lighting a proper amount of dry wood waste and closing the lid.

CAUTION: Inflammable materials (like petrol, oil etc.) must not be used for lighting.

Then the main switch (Fig. 7 No. 3) is turned on starting the control panel. Flue gases ventilator (Fig. 7 No. 4) is switched . Gasificator primary and secondary air ventilators (Fig. 7 Nos. 8 and 9) are also switched on right away. If necessary, the gasificator will be replenished manually for several times having in mind to switch off all the ventilators previously switched on before opening the lid. After replenishing the gasificator close the lid and switch the ventilators on again. The lighting takes about 3 to 4 hours until the heating of the gasificator visually controlled through the boiler door opening.

While controlling the gasificator heat, follow the flame colour, which should be yellow-red with good burning.

Then turn on the switch (Fig 7 Nos. 5 - automatic position) starting the preparation of sawdust burning process. Start adding combustion air into the gasificator thus speeding up the process and causing a rise of gasificator temperature. This start is under automatic operating regime. The gasificator should heat enough to make the process self-supporting. The process regulation is controlled by moving the gasificator flap and the gasificator secondary ventilator flap back and forth. The burning process optimality is estimated by the flame colour as mentioned before. In order to achieve a continuous burning process, regulation can take even a few hours, and the process should be controlled every three hours.

CAUTION: IT IS NOT ALLOWED TO OPEN THE GASIFICATOR LID WHILE THE SYSTEM IS IN OPERATION.

The thermoregulator regulates the controlling of mixer engines, worm, flue gases ventilators, gasificator primary air ventilators and boiler ventilators. The regulation is carried out through set

temperature. The temperature will be set by pushing the button F of the thermoregulator and then setting the desired temperature of boiler water or with the help of the keys on the right side of the thermostat..

The next step is direction regulation of the mixer engine and worm engine carried out with the help of the direction switch (left – right) in control panel.. The desired direction is achieved by setting the switch at the position 1 or 2.

Pump switches (Fig 7 Nos. 12 and 13) are independent and they are switched on at a start according to circumstances and depending on the number of pumps.

Each turning on of a switch is followed by the lightening of the green light, indicating that the function is in order. If the green light turns off, the given function is out of order because of some kind of error or break down.

The thermoregulator is connected with the safety thermostat in the boiler which in a case of boiler temperature exceeding 90°C will stop (automatically disconnect) power supply to the control panel, thus stopping the whole system. This means that the safety thermostat has switched off – it is "off". In this case sawdust feeding, feeder operation, and gasificator ventilator operation stop resulting in gradual boiler heat drop. This way the given objective has been achieved i.e. the regulation of automatic operation has been accomplished.

Thermoregulation will be restarted by correcting (resetting) the safety thermostat.

It is necessary to establish the cause of overheating right away and to eliminate it (either the set temperature or the thermoregulator is to high or a pump has stopped). After the resetting the process should go on without any additional switching on.

5.3 MANUAL BOILER FIRING

If necessary in case of running out of sawdust or for some other reason the system can operate feeding the boiler with bigger lumps of wood waste or coal without stopping the heating process. The way of switching over to this regime is the following: Turn off the manual/automatic switch; then switch off the mixer engine, worm engine and the switches of the gasificator primary and secondary air ventilators. Open the middle boiler door and put wood waste or coal into the boiler burning place. While doing this it is not allowed to switch off the multicyclone ventilator. Close the boiler door! Switch on the previously switched off ventilators and worm engine, and then switch on the boiler ventilators – rear and front (Fig. 7 Nos. 10 and 11). Control the wood or coal burning process in the boiler through the small control door opening until getting yellow and red flame. When having achieved this flame, switch off the worm engine and gasificator primary and secondary ventilators. Further burning process will be kept stable with the help of the front and rear boiler ventilators as long as having reached the conditions for further automatic operation. Until then from time to time it is necessary to replenish the fuel - wood or coal in the boiler. In case of sawdust delivery in a short time, try to start the automatic operating regime switching on the mixer engine, worm engine, gasificator primary and secondary air ventilators, at the same time controlling the burning flame through the boiler door opening. In case of trying to start automatic operation after a cease and not reaching continuous flame, boiler lighting process has to be repeated (as in item 5.2).

5.4 OPERATION CEASE

The very procedure has already been partially described in items 5.2 and 5.3. The cease is reached by switching off all the switches except the main switch, pump and flue gases ventilator. After 30 minutes switch off the main switch and after other 30 minutes check if there is flame in the boiler. Within the following two hours control the manometer pressure and the temperature at the boiler outlet.

The order of switching on and off is not changed in summer.
The system can be under voltage during occasional ceases.
It is not allowed to open the gasificator during an operation cease for at least 48 hours.

6. MAINTENANCE

6.1 CLEANING

The places for system cleaning are:
- under the boiler grate
- camber bunched pipes in the boiler
- at the place of the multicyclone bottom lid
- glasificator grate

If necessary, cleaning under the boiler grate will be done by opening the bottom boiler door, depending on the amount of accumulated ash which should be checked daily.

When cleaning the boiler camber bunch, the system must be switched off using the main switches. Cleaning of accumulated soot in the boiler camber bunched pipes will be done by pulling wire brush through and removing the soot. Accumulated soot should be checked once a week and, if necessary, cleaned.

Cleaning of accumulated soot on the multicyclone lid will be done from time to time i.e. every 15 days if the system is in operation.

Use each switching off of the system within a period not longer than 15 days and clean the gasificator. Make sure to clean the gasificator when cooled.

The boiler protection is achieved by installing a mixer valve or a thermostat for the regulation of the minimal temperature which is connected to the circulating pump.

If the regular cleaning has not been done, the residue soot decreases heat power of the boiler, which causes heating reduction and energy loss.

6.2 CONTROLS

<u>During the operation process, the following should be controlled daily:</u>
- temperature control probes on the worm feeder pipe must be checked for their position
- if there is any oil leaking from the reducer
- if there is any water bleeding from installations

<u>When the system is not in operation, the following should be controlled:</u>
- thickness of the gasificator fire clay lining state
- the state of worm conveyer and sawdust mixer
- tightness at the places of fitting in heat-resistant spacers
- check the permeability of the primary air exhaust pipes in the gasificator.

<u>The joint of the chimney and the foundation and chimney's verticality should be controlled every three months.</u>

6.3. TROUBLESHOOTING

No.	SIGN OF TROUBLE	POSSIBLE TROUBLE	REMEDY
1	The green flue gases ventilator light on the control panel is not on (just in the case of the boiler water tempertature being below the temperature set at the thermoregulator)	The bimetal i.e. thermal protection has ejected due to irregular bimetal set, all three phases not connected to the engine or engine overload.	Set the bimetal properly, check the engine feeding (fuses) and remove the cause of engine overload.
2	The green mixer engine or worm engine light on the control panel is not on (just in the case of the boiler water tempertature being below the temperature set at the thermoregulator)	The bimetal i.e. thermal protection has ejected due to irregular bimetal set, all three phases not connected to the engine or engine overload.	Set the bimetal properly, check the engine feeding (fuses) and remove the cause of engine overload.(for example jamming of a piece of wood waste in the worm feeder or mixer)
3	The green pump light on the control panel is not on	The bimetal i.e. thermal protection has ejected due to irregular bimetal set, all three phases not connected to the engine or engine overload.	Set the bimetal properly, check the engine feeding (fuses) and remove the cause of engine overload.
4	Cease of the work of the complete system followed by the turning off of the automatic-manual indicating light on the control panel (just in the case of the boiler water temperature being below the temperature set at the thermoregulator)	Incorrectly set thermoregulator safety thermostat has ejected or the flue gases ventilator switch being out of order	Set the thermoregulator properly, reset the safety thermostat, change the flue gases ventilator switch
5	Wood sawdust feeding in the gasificator has stopped	Feeding cease due to the lack of sawdust in the tank or failure of the feeding and mixing driving units	Fill the tank with wood sawdust, check the working order of the driving units, mixer blades, worm feeder spiral

7. SECURITY MEASURES DURING OPERATION

- when starting the system for the first time do not force (overload) the installations
- if water hammers can be heard reduce the forcing
- gasificator regulation should be adjusted to the instruction manual
- the control panel must be controlled all the time and when a red pilot light on the panel turns on, analyze and eliminate the cause of the given turning on
- if any operating irregularities (blows, smoke, buzz, vibrations) have been noticed, switch off the system immediately
- make sure to use leather gloves when moving the gasificator lid, opening the boiler door
- if gas can be smelled, any kind of action causing a spark, meaning cigarette lighting, switching on of an electric installation, etc is absolutely forbidden.

In such a case, immediately stop fuel supply and the boiler house must be ventilated. After each stop the company maintaining the installations should be informed and its experts should find the cause of the stop. The cause should be eliminated and the experts should restart the system.

8. GUARANTEE AND SERVICE

The warranty period for the system is 12 months.
The guarantee is valid only if the buyer follows the conditions from the assembly and instruction manual.
A written guarantee is enclosed with the assembly and instruction manual and it includes guarantee conditions and the address of the qualified service.

9. ANNEXES

9.1 Written guarantee
9.2 Declaration