EN

LOW NOx PRESSURISED STEEL BOILERS

GREENOx .e

WITH THREE GAS PASSES

La figura riportata è puramente indicativa

GREENOx .BT COND

LOW RETURN TEMPERATURE WITH CONDENSER

INSTALLATION, USE AND MAINTENANCE MANUAL

CE

GREENOx_en_02 07_2024 - 07/2024

INDEX

SYMBOLS USED IN THE MANUAL

DANGER
To indicate actions that, if not performed correctly, can result in injury of generic origin or may generate malfunction or damage to the appliance; therefore require particular caution and adequate preparation.

IT IS FORBIDDEN
To indicate operations that SHOULD NOT be performed.

IMPORTANT
To indicate particularly useful information and important.

The illustrations and data presented are not binding. The company reserves the right to make without prior notice any changes it deems appropriate for continuous improvement and constant updating.

1 *INTRODUCTION*

Dear Customer,
Thank you for having chosen our **generator.**
In your interests, we invite you to follow and observe the instructions in this manual to ensure the highest level of efficiency and duration of the unit.

IMPORTANT
failure to observe the instructions in this manual will void the warranty conditions.

SAFETY WARNINGS

IMPORTANT

– **For safety and for proper operation, carefully read this TECHNICAL MANUAL before installing and starting the generator. The manual is an integral and essential part of the generator and must accompany it from installation until disposal. The generator must be used for the purpose for which it was strictly intended and any liability by the Manufacturer for damages to people, animals or property due to lack of maintenance or for improper use, is excluded.**

– **Safety of the thermal power plant:** For safety purposes, the qualified technical personnel in charge of running the system must consider the following requirements:
  - Follow the accident prevention and environmental safety regulations in force.
  - Ensure the generator installation in the thermal power plant complies with the standards in force.
  - Ensure that the electrical and hydraulic system complies with the standards in force.
  - Ensure that the boiler room complies with the standards in force and is sufficiently ventilated.
  - Ensure that the boiler fumes are conveyed outside the thermal power plant through a flue compliant with the standards in force.
  - Ensure that the acidic condensation that may develop during system start-up, is evacuated outside the thermal power plant after a neutralisation process in compliance with the standards in force.
  - Ensure that there is no danger due to frost inside the thermal power plant.

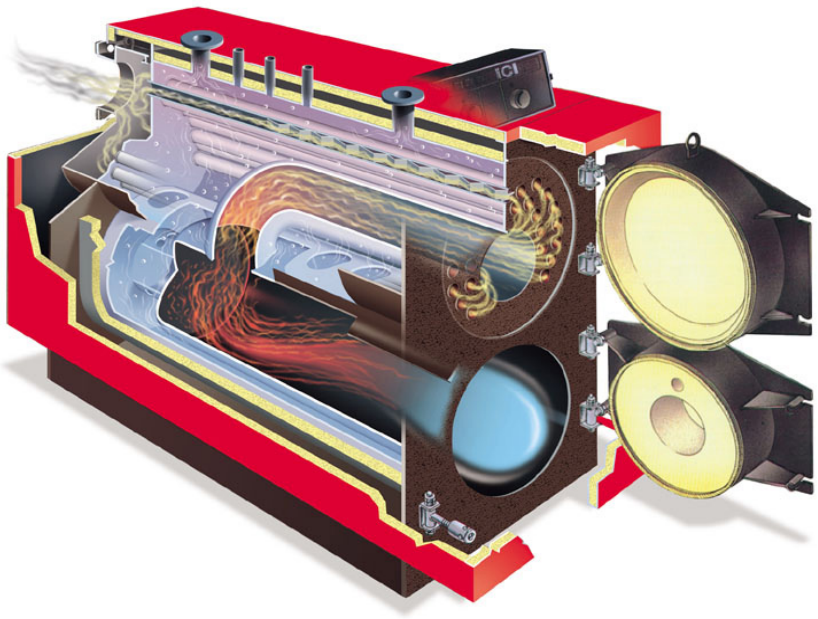
- **System check:** Before switching on the generator for the first time, a duly qualified technician must perform a check at the central heating plant and update the system log once the check is over.
- **Periodic verifications:** The generator must be periodically checked by a duly qualified technician (maintenance worker), who should update the system log once the check is over.
- **Danger of explosion:** Routine and extraordinary maintenance must be entrusted to **professionally qualified personnel** with the purpose of promptly detecting any damage to the generator's pressurised body and the safety and control accessories.
- **Danger deriving from the fuel:** Sensing the presence of fuel in the thermal power plant, it is appropriate to follow the precautions below to avoid the risk of explosions and fires:
  - Do not smoke or cause sparks.
  - Do not turn on lights or electrical devices in general (mobile phones).
  - Open doors and windows.
  - Close the fuel shut-off valve normally placed outside the thermal power plant.
  - Disconnect the electrical power supply by using the switch normally placed outside the thermal power plant.
- **Danger of burns:** During normal operation, the generator has hot parts that, upon accidental contact without suitable personal protection, can cause serious burns. Potentially hot parts include:
  - Accessories and valves connected to the generator.
  - Door and smoke chamber.
- **Danger from fumes:** An incorrect adjustment of the closing door or an insufficient draught in the flue can leave fumes inside the thermal power plant, causing fatal intoxication deriving from carbon monoxide which, by its nature, is colourless and odourless. Therefore, ensure the generator is properly installed and adjusted and the presence of ventilation openings in the thermal power plant are compliant with the regulations in force.
- **Repairs:** Any generator repair must be carried out or authorised by the manufacturer in order to avoid risks to people and property, as well as to prevent **voiding the Warranty Conditions being** . Generator maintenance must be entrusted to competent personnel.
- **Spare parts:** In order to ensure maximum safety and reliability, it is essential that all removable defective accessories and parts are replaced with **Original Spare Parts** supplied by the Manufacturer.

GENERAL FEATURES

This steel boiler range features 3 gas passes with no flame inversion.
This design minimises the formation of nitrous oxides (NOx) caused by the high temperatures and long flame stay times typical of traditional boiler furnaces.

Furthermore, the BT range boilers have been designed for low temperature operations (return at 35°C). For this reason, a double tube and a special smokebox refractory protection are essential to maintain the high temperature of parts in contact with combustion product, and without condensate production.

The boilers are classified as "high performance" boilers according to the regulations in force due to their extremely high efficiency deriving from optimisation of heat exchange and complete insulation of the exposed surfaces.



The above picture is only for reference.

GENERAL WARNINGS

Each generator is provided with a **manufacture plate** that can be found in the envelope with the boiler documents. The plate lists:
- Serial number or identification code;
- Rated thermal output in kcal/h and in kW;
- Furnace thermal output in kcal/h and in kW;
- Types of fuels that can be used;
- Max operating pressure.

A **manufacture certificate** is also provided which certifies the hydraulic test positive performance.
The installation must be performed in compliance with the regulations in force by **professionally qualified personnel**. The term "professionally qualified personnel" means persons with specific technical skills in the sector of heating system components. Incorrect installation may cause damage to persons, animals or objects for which the manufacturer cannot be held responsible.

At the first start up, all regulation and control devices positioned on the control panel should be checked for efficiency.
The **guarantee** shall be valid only upon compliance with the instruction given in this manual.
Our boilers have been built and tested in observance of EEC requirements and, as a consequence, CE-marked. EEC directives are as follows:

- **Directive on Gas** 2009/142/CE (Rif. EN 303)
- **Directive on Output** 92/42/EEC
- **Directive on Electromagnetic Compatibility** 2014/30/UE
- **Directive on Low Voltage** 2014/35/UE

IMPORTANT
This boiler has been designed to heat hot water at a temperature less than the boiling temperature at atmospheric pressure and must be connected to a heating plant and/or a domestic hot water plant within the limits of its performance and output.

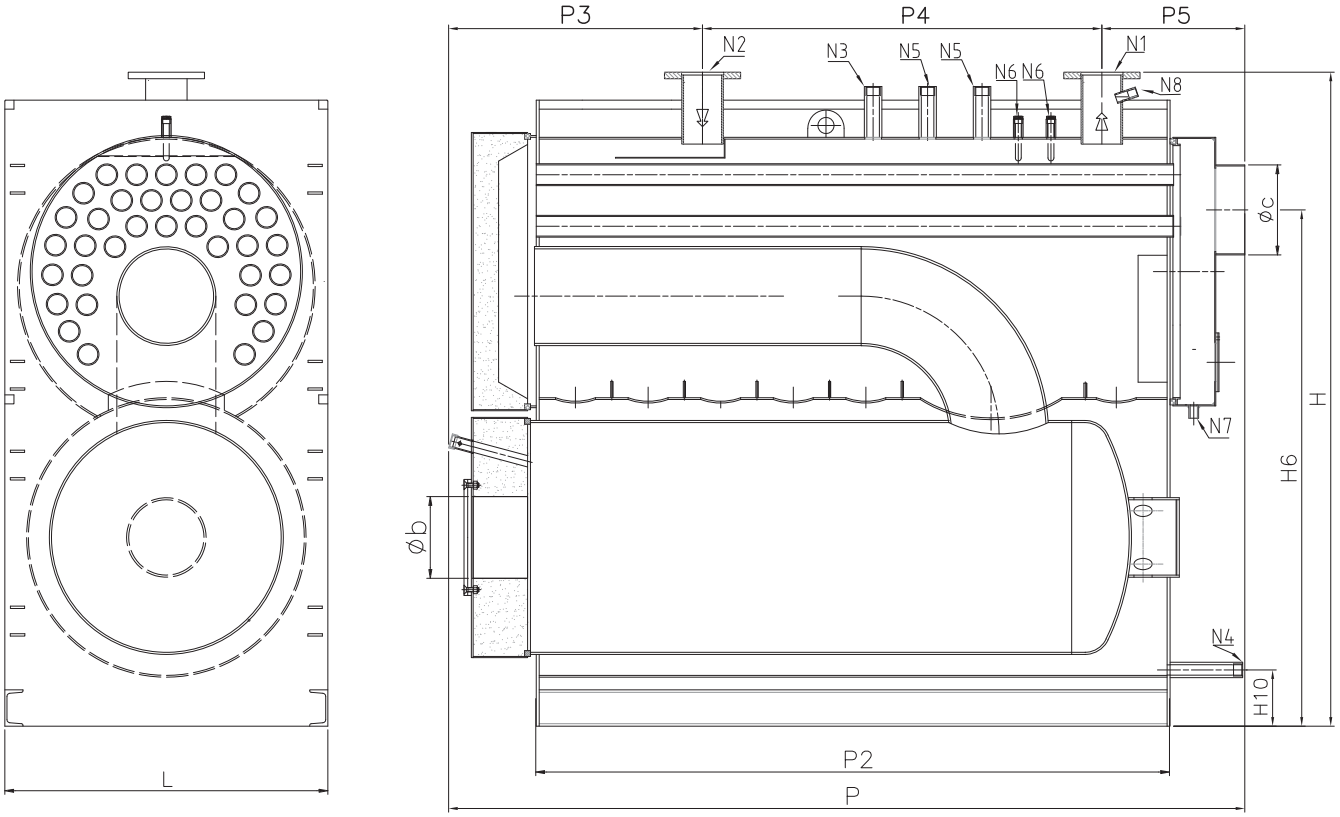
TECHNICAL SPECIFICATIONS

GREENOX.E 10 ÷ 70 BOILER

DESCRIPTION		u.m.	GREENOx.e			
			40 [1]	47 [1]	60 [1]	70 [1]
Heat output	Temp. media 70°C	kW	420	470	600	700
Heat input		kW	441	493	630	734
Efficiency 100% (N.C.V.)	Medium temp. 70°C	%	95,24	95,33	95,24	95,37
NG max flow rate G20		Stm^3/h	46,67	52,17	66,67	77,67
NG max flow rate G30		kg/h	34,64	38,72	49,48	57,65
NG max flow rate G31		kg/h	34,26	38,30	48,94	57,02
Max flow rate of flues		kg/h	695,38	777,33	993,38	1157,28
Max fluid flow		kg/h	36100	40400	51600	60200
Min. fluid flow		kg/h	14440	16160	20640	24080
Efficiency at 30% (N.C.V.)	Medium temp. 70°C	%	95,76	95,80	95,77	95,85
Pressure losses flue gas side		mbar	4,0	4,0	4,5	5,5
Heat losses through the chimney		%	4,26	4,17	4,26	4,13
Heat losses through		%	0,50			
Heat losses with burner off		%	0,10			
Flue gas temp. at boiler output and air at 20 deg. C	Gas	°C	127	125	127	124
	Gasoil	°C	127	125	127	124
	Heavy oil	°C	127	124	127	124
CO2	Gas	%	11,0			
	Gasoil	%	13,5			
	Heavy oil	%	14,0			
Press. losses fluid side	(ΔT=12K)	mbar	42	53	35	48
Design pressure		bar	5			
Capacity		l	505	738	863	
Total weight		kg	850	1110	1390	
Electric supply		Volt~	230			
Frequency		Hz	50			
Insulation class		IP	IP40			
Eletric power		W	20			
Fuel			Nat. gas - LPG - Gasoil - Heavy oil			

[1] *Door opening reversible*

N1 *Flow*
N2 *Return*
N3 *Fitting for instruments*
N4 *System filling/drainage*
N5 *Fitting for safety valves*
N6 *Bulb wells*
N7 *Boiler condensation drain*
N8 *Inspection well*



(1) One fitting only

DESCRIPTION	u.m.	GREENOX.e			
		40	47	60	70
H	mm	1210	1340	1422	
H1	mm	1475	1605	1725	
H2	mm	460	495	520	
H4	mm	1555	1685	1802	
H10	mm	155			
L	mm	745	820	890	
P	mm	1913	2191	2193	
P2	mm	1462	1744	1746	
P3	mm	651	697	699	
P4	mm	900	1075	1100	
P5	mm	362	419	393	
P6	mm	200 - 250			
Øb	mm	225			
Øc	mm	248			
N1	DN/in	80		100	
N2	DN/in	80		100	
N1/N2	PN	6			
N3	DN/in	1"1/4			
N4	DN/in	1"			
N5	DN/in	1" 1/4 [1]		1" 1/4	
N6	DN/in	1/2"			
N7	DN/in	1/2"			
N8	DN/in	1/2"			

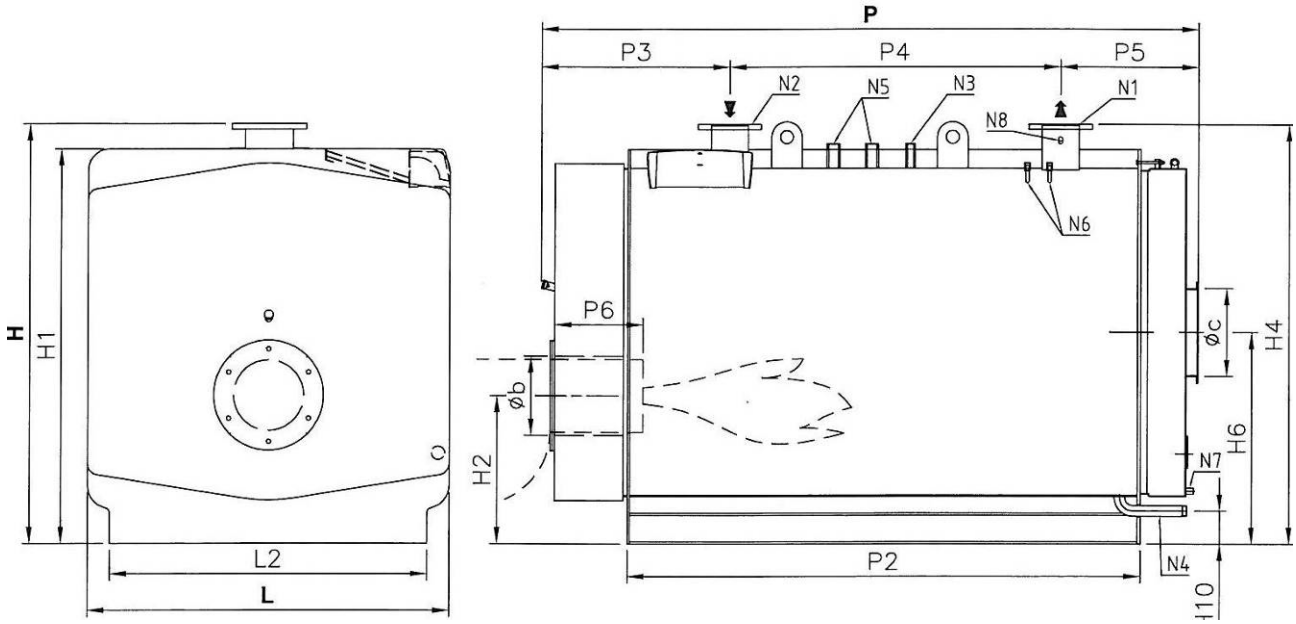
CALDAIA GREENOX.E 80 ÷ 300

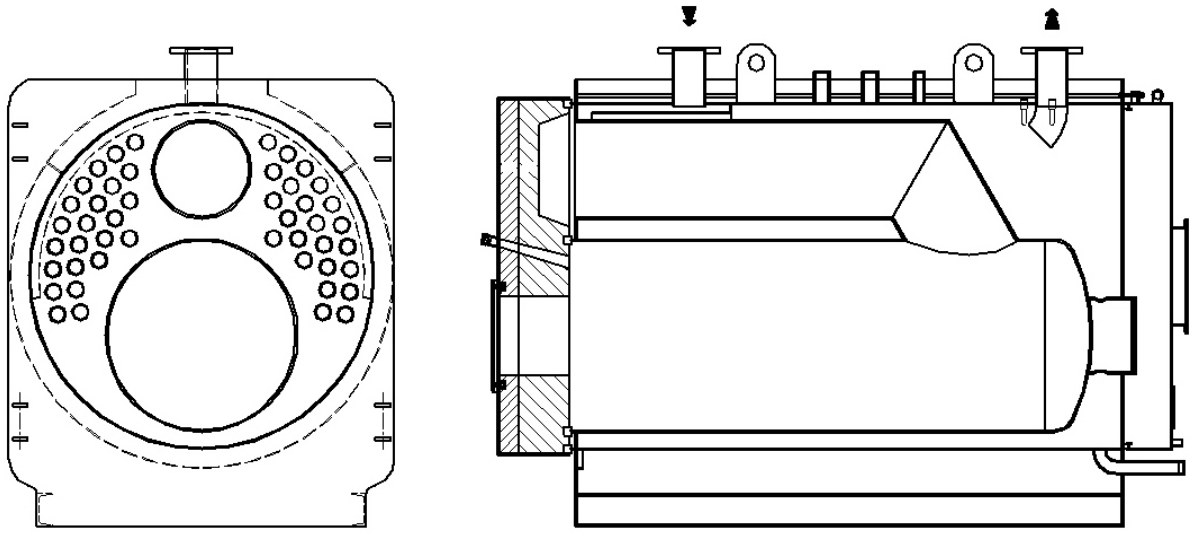
DESCRIPTION		u.m.	GREENOx.e							
			80 [1]	90 [1]	100	120	140	170	200	230
Heat output	Temp. media 70°C	kW	800	900	1000	1200	1400	1700	2000	2300
Heat input		kW	839	944	1050	1259	1469	1784	2099	2415
Efficiency 100% (N.C.V.)	Medium temp. 70°C	%	95,35	95,34	95,24	95,31	95,30	95,29	95,28	95,24
NG max flow rate G20		Stm^3/h	88,78	99,89	111,11	133,23	155,45	188,78	222,12	255,56
NG max flow rate G30		kg/h	65,89	74,14	82,47	98,88	115,37	140,11	164,85	189,67
NG max flow rate G31		kg/h	65,18	73,34	81,57	97,81	114,12	138,59	163,07	187,62
Max flow rate of flues		kg/h	1322,82	1488,36	1655,54	1985,13	2316,21	2812,82	3309,59	3807,84
Max fluid flow		kg/h	68800	77400	86000	103200	120400	146200	172000	197800
Min. fluid flow		kg/h	27520	30960	34400	41280	48160	58480	68800	79120
Efficiency at 30% (N.C.V.)	Medium temp. 70°C	%	95,88	95,92	95,76	95,83	95,84	95,79	95,79	95,77
Pressure losses flue gas side		mbar	4,5	5,5	5,0	6,5	8,0	6,0	6,5	6,5
Heat losses through the chimney		%	4,15	4,16	4,26	4,19	4,20	4,21	4,22	4,26
Heat losses through		%	0,50							
Heat losses with burner off		%	0,10							
Flue gas temp. at boiler output and air at 20 deg. C	Gas	°C	124		127	125		126		127
	Gasoil	°C	124		127	125		126		127
	Heavy oil	°C	124		127	125			126	127
CO2	Gas	%	11,0							
	Gasoil	%	13,5							
	Heavy oil	%	14,0							
Press. losses fluid side	(ΔT=12K)	mbar	63	80	40	58	38	56	78	103
Design pressure		bar	5							
Capacity		l	1200		1365		1270	2300	2800	
Total weight		kg	1970		2760		2995	4300	4850	
Electric supply		Volt~	230							
Frequency		Hz	50							
Insulation class		IP	IP40							
Eletric power		W	20							
Fuel			Nat. gas - LPG - Gasoil - Heavy oil							

[1] *Door opening reversible*

DESCRIPTION		u.m.	GREENOX.e	
			260	300
Heat output	Temp. media 70°C	kW	2600	3000
Heat input		kW	2731	3150
Efficiency 100% (N.C.V.)	Medium temp. 70°C	%	92,20	95,24
NG max flow rate G20		Stm^3/h	288,99	333,33
NG max flow rate G30		kg/h	241,49	247,40
NG max flow rate G31		kg/h	212,16	244,72
Max flow rate of flues		kg/h	4305,95	4966,62
Max fluid flow		kg/h	223600	258000
Min. fluid flow		kg/h	89440	103200
Efficiency at 30% (N.C.V.)	Medium temp. 70°C	%	95,80	
Pressure losses flue gas side		mbar	8,0	10,0
Heat losses through the chimney		%	4,30	4,26
Heat losses through		%	0,50	
Heat losses with burner off		%	0,10	
Flue gas temp. at boiler output and air at 20 deg. C	Gas	°C	128	127
	Gasoil	°C	128	127
	Heavy oil	°C	127	
CO2	Gas	%	11,0	
	Gasoil	%	13,5	
	Heavy oil	%	14,0	
Press. losses fluid side	(ΔT=12K)	mbar	42	55
Design pressure		bar	5	
Capacity		l	3300	
Total weight		kg	5950	
Electric supply		Volt~	230	
Frequency		Hz	50	
Insulation class		IP	IP40	
Eletric power		W	20	
Fuel			Nat. gas - LPG - Gasoil - Heavy oil	

N1 *Flow*
N2 *Return*
N3 *Fitting for instruments*
N4 *System filling/drainage*
N5 *Fitting for safety valves*
N6 *Bulb wells*
N7 *Boiler condensation drain*
N8 *Inspection well*

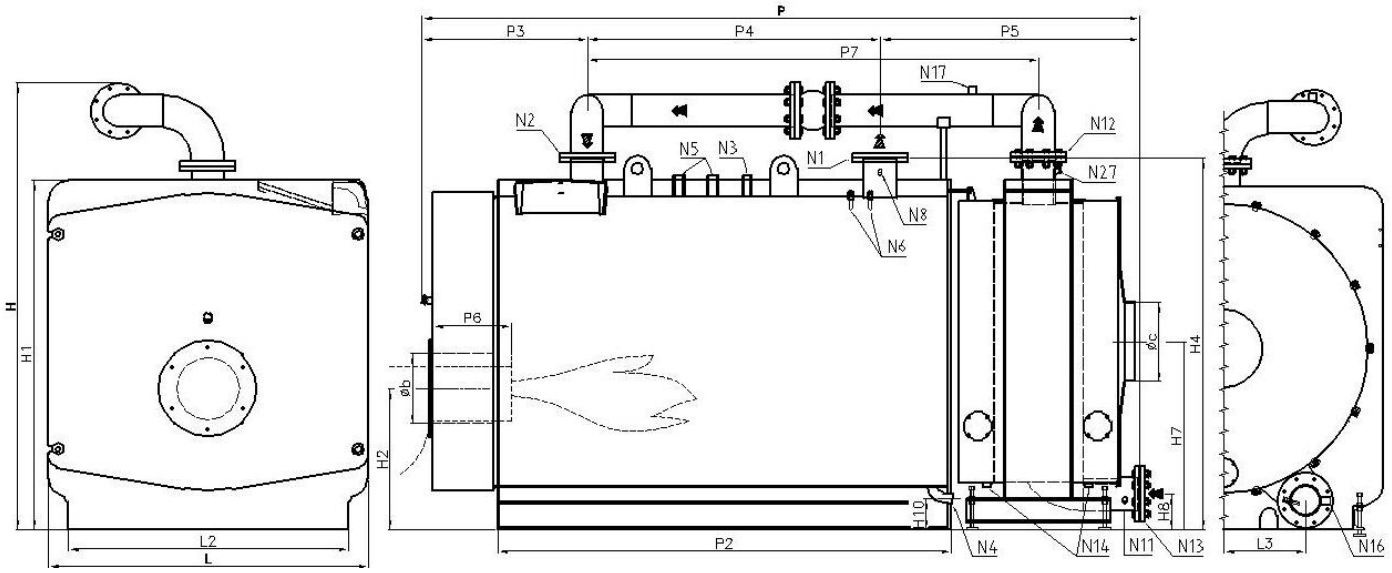




DESCRIPTION	u.m.	GREENOX.e									
		80	90	100	120	140	170	200	230	260	300
H	mm	1712		1764			2065				
H1	mm	1600		1650			1950				
H2	mm	682		671			800				
H6	mm	895		890			1040				
H10	mm	210		150							
L	mm	1380		1490			1800				
L2	mm	1180		1290			1600				
P	mm	2535		2589		2899	2966	3466		3935	
P2	mm	1970		1972		2282	2324	2824		3324	
P3	mm	748		800		850	875				
P4	mm	1300				1550	1500	2000		2500	
P5	mm	487		489		499	591			560	
P6	mm	300-350		360-410							
Øb	mm	280			320		360				
Øc	mm	350		400						500	
N1	DN/in	100		125		150				200	
N2	DN/in	100		125		150				200	
N1/N2	PN	16									
N3	DN/in	1"						1"1/2			
N4	DN/in	1"1/4									
N5	DN/in	1"1/2						2"			
N6	DN/in	1/2"									
N7	DN/in	1/2"									
N8	DN/in	1/2"									

GREENOX BT COND BOILER

N1 *Boiler flow*
N2 *Boiler return*
N3 *Fitting for instruments*
N4 *Boiler drain*
N5 *Fitting for safety valves*
N6 *Bulbs wells*
N8 *Inspection well*
N11 *Condenser return temperature control*
N12 *Condenser flow*
N13 *Condenser return*
N14 *Condenser condensation drain*
N16 *Condenser drain*
N17 *Air vent fitting*
N27 *Condenser flow temperature control*



DESCRIPTION		u.m.	GREENOX BT COND								
			100	120	140	160	180	200	230	260	300
Heat output	Medium temp. 70°C	kW	914	1097	1280	1463	1646	1829	2103	2377	2743
	Temp. flow/return 50/30 °C		1000	1200	1400	1600	1800	2000	2300	2600	3000
Heat input		kW	930	1116	1302	1488	1674	1860	2140	2419	2791
Efficiency 100% (N.C.V.)	Medium temp. 70°C	%	98,30								
	Temp. flow/return 50/30 °C		107,50								
NG max flow rate G20		Stm³/h	98,44	118,12	137,81	157,50	177,19	196,87	226,41	255,94	295,31
NG max flow rate G30		kg/h	73,06	87,67	102,28	116,89	131,51	146,12	168,04	189,95	219,18
NG max flow rate G31		kg/h	72,27	86,72	101,17	115,63	130,08	144,53	166,21	187,90	216,80
Max flow rate of flues		kg/h	1466,76	1759,99	2053,37	2346,75	2640,13	2933,36	3373,51	3813,51	4400,12
Max fluid flow		kg/h	86000	103200	120400	137600	154800	172000	197800	223600	258000
Min. fluid flow		kg/h	34400	41280	48160	55040	61920	68800	79120	89440	103200
Efficiency at 30% (N.C.V.)	Medium temp. 70°C	%	98,50								
Pressure losses flue gas side		mbar	3,5	5,0	5,4	7,0	5,0	6,0	7,5	7,0	9,0
Heat losses through the chimney		%	1,50								
Heat losses through		%	0,50								
Heat losses with burner off		%	0,10								
Flue gas. temp. at boiler output and air at 20 deg. C.	Gas for condensing Temp. flow/ return 50/30 °C	°C	50								
CO2	Gas for condensing Temp. flow/ return 50/30 °C	%	10,5								
Condense production		kg/h	233,3	279,9	326,6	373,3	419,9	466,6	536,6	606,6	699,9
Press. losses fulid side	(ΔT=12K)	mbar	32	47	64	83	105	130	172	69	93
Design pressure		bar	5								
Capacity		l	1800		2000		2957			3507	
Total weight		kg	3100		3850		6080			6750	
Electric supply		Volt~	230								
Frequency		Hz	50								
Insulation class		IP	IP40								
Electric power		W	20								
Fuel			Nat. gas - LPG								

DESCRIPTION	u.m.	GREENOX BT COND								
		100	120	140	160	180	200	230	260	300
H	mm	2089		2121		2448			2554	
H1	mm	1950								
H2	mm	800								
H4	mm	2064								
H7	mm	1040								
H8	mm	206								
H10	mm	155								
L	mm	1490				1800				
L2	mm	1600								
P	mm	3330		3797		4180			4680	
P2	mm	1474		1941		2824			3324	
P3	mm	850							880	
P4	mm	2000							2500	
P5	mm	480		947		1330			1300	
P6	mm	360-410								
Øb	mm	360								
Øc	mm	400								
N1	DN/in	150							200	
N2	DN/in	150							200	
N1/N2	PN	16								
N4	DN/in	1"1/4								
N8	DN/in	1/2"								
N11	DN/in	1/2"								
N12	DN/in/mm	150							200	
N13	DN/in	150							200	
N14	in	1"								
N16	in	1"								
N17	DN/in	1"								
N27	in	1/2"								

2 INSTALLATION

Before **connecting** the boiler, perform the following operations:
– Thoroughly clean all the **system pipes** in order to remove any foreign matter that could affect correct operation of the boiler;
– Check that the flue has an adequate draught, that there is no narrowing of passages and that it is free from debris; also check that other appliances do not discharge into the flue (unless designed to serve several utilities). See the regulations in force.

THERMAL PLANT

ROOM BOILER

Current regulations must always be observed.

Premises in which boilers will be installed should be sufficiently ventilated and permit access for ordinary and extraordinary maintenance operations.

FLUE

IMPORTANT
The smokestack must be dimensioned as to applicable regulations.

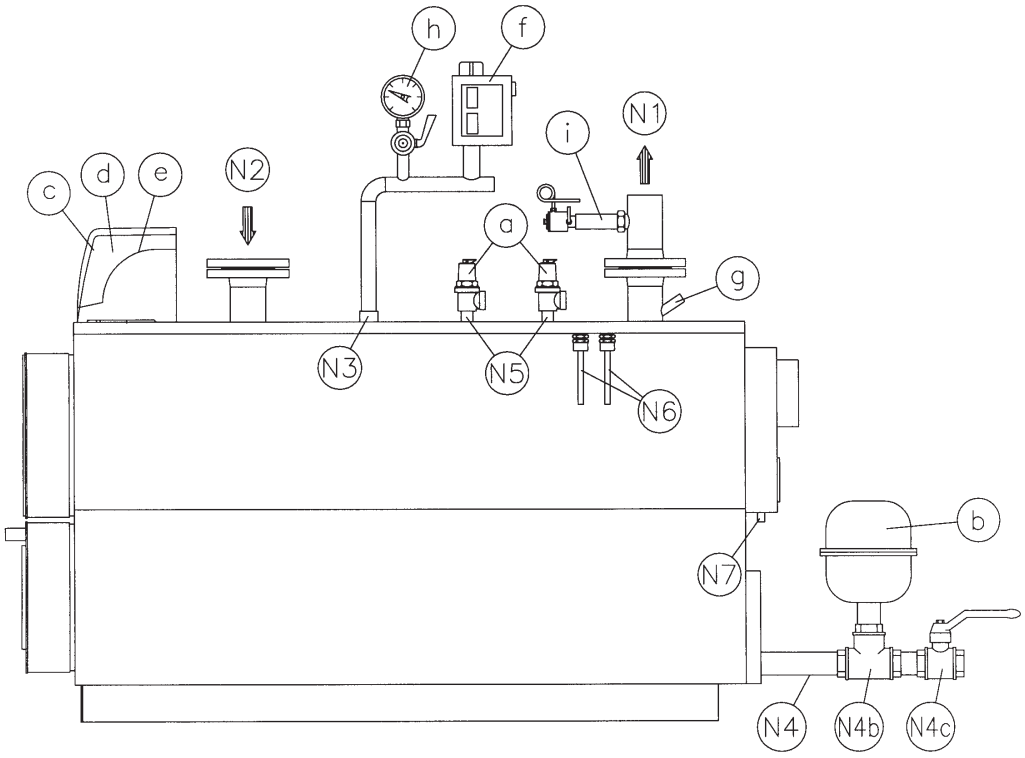
HYDRAULIC CONNECTION

SEALED Hot water heating system with expansion vessel

The generator must be provided with:

a1 *safety valve*
a2 *safety valves if output is (≥ 500.000 kcal/h)*
b *Expansion vessel*
c *Regulation thermostats*
d *1st safety thermostat*
e *2nd safety thermostat*
f *Cut-off pressure switch*
g *Well for control thermometer*
h *Pressure gauge with flange for control pressure gauge*
i *Heat discharge valve or fuel on-off valve*

N1 *Flow*
N2 *Return*
N3 *Instrument fitting*
N4 *Lower fitting:*
N4b *expansion vessel fitting*
N4c *Filling/drain*
N5 *Safety valve fitting (≥ 500.000 kcal/h: n. 2 valves)*
N6 *Bulb wells (thermometer, pump consent thermostat, regulation thermostat, safety thermostat)*
N7 *Condensation recollection fitting*



Ensure that the hydraulic pressure measured after the reduction valve on the supply pipe does not exceed the operating **pressure specified on the rating plate of the component** (boiler, heater etc.).

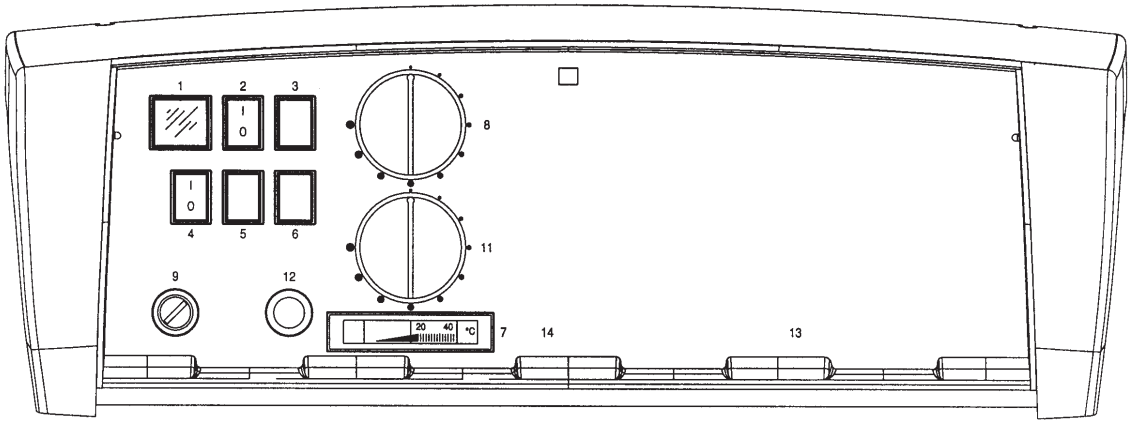
– As the water contained in the heating system increases in pressure during operation, ensure that its maximum value does not exceed the maximum hydraulic pressure specified on the component rating plate.
– Ensure that the safety valve outlets of the boiler and hot water tank, if any, have been connected to an exhaust funnel in order to prevent the valves from **flooding the room** if they open**.**
– Ensure that the pipes of the water and heating system **are not used as an earth connection** for the electrical system as this can seriously and very rapidly damage the pipes, boiler, heater and radiators.
– Once the heating system has been filled, you are advised to close the supply cock and keep it closed so that **any leaks from the system** will be identified by a drop in hydraulic pressure indicated on the system pressure gauge.

ELECTRICAL CONNECTION

Electrical systems of thermal plants designed only for heating purposes **must comply with numerous legal regulations which apply in general as well as specifically to each application or fuel type.**

OPTIONAL CONTROL PANEL

The control panel (optional) with the boilers is made of IP40 protection plastic material, and houses the regulation and safety instruments:



KEY

1	NET WARNING LIGHT
2	1st BURNER SWITCH
4	CIRCULATOR SWITCH
7	BOILER THERMOMETER
8	1st ADJUSTMENT THERMOMETER
9	1st SAFETY THERMOSTAT
11	2nd ADJUSTMENT THERMOSTAT

The upper part of the control panel can be rotated to gain access to the terminal board and uncoil the thermostat and thermometer capillaries. A copy of the wiring diagram is contained inside the control panel cover.
The **regulation thermostats** have an operating range from 60° to 100° and can be set by the user by means of the front knob.
Safety thermostats has a fixed setting of 110°C and can be manually reset in accordance by law.
Circulator consent thermostat located inside the panel can be adjusted from 0°C to 90°C using a tool and is factory-set at 50°C, while its differential deviation is 6°C. Thanks to this thermostat, the circulator is inactive when the temperature is below 50°C to avoid dangerous exhaust condensation.

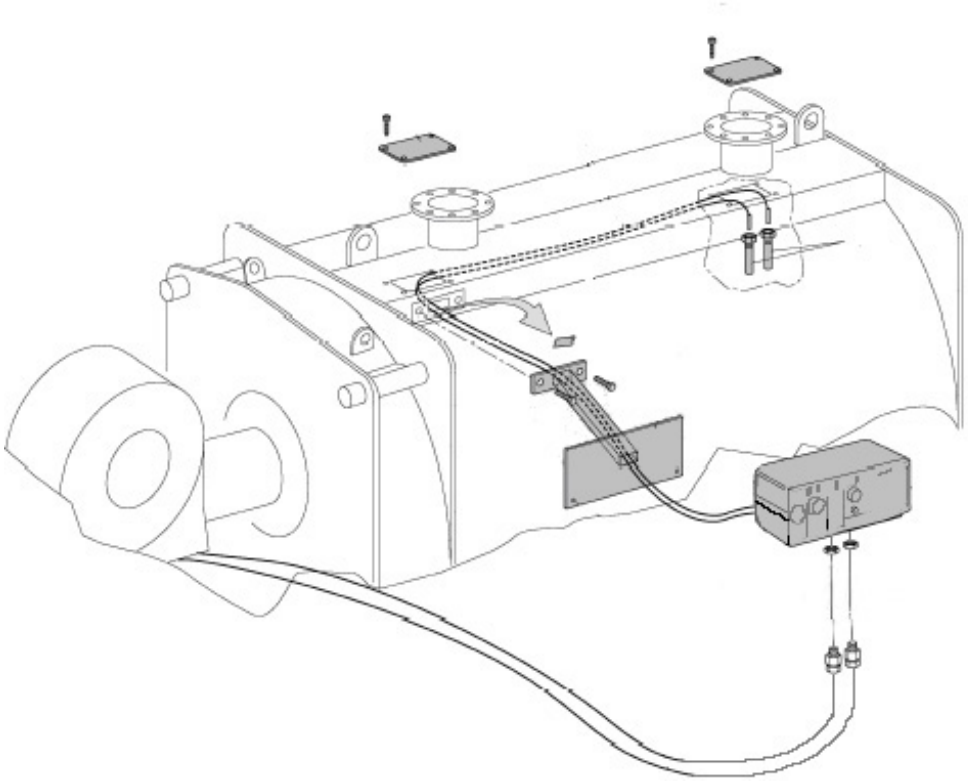
For correct installation, refer to the boiler casing assembly instructions.

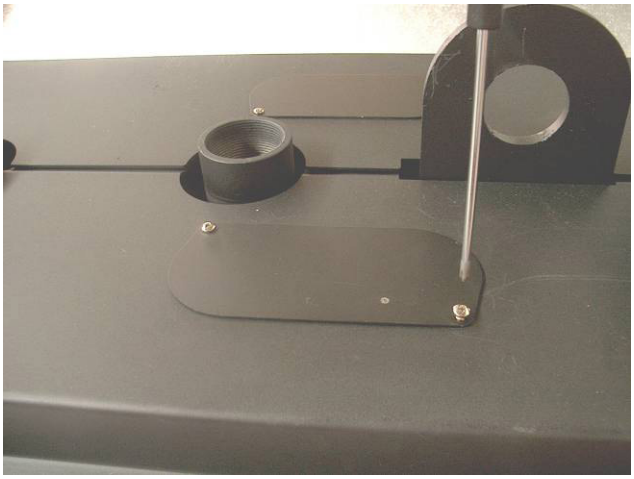
WIRING DIAGRAM
Refer to the diagram supplied with the specific switchboard.

INSTALLATION OF GREENOX.E 80 ÷ 300 BOILER CONTROL PANEL

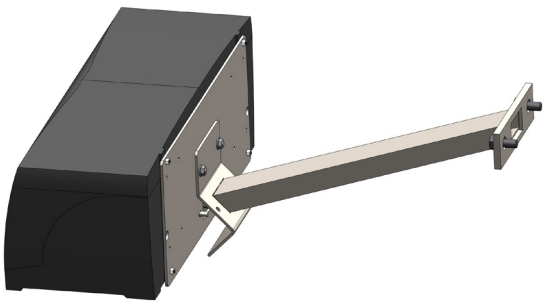
IMPORTANT
The control panel picture is purely indicative as it may vary according to the type of panel installed.

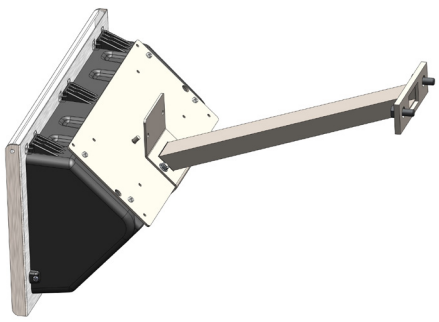
1 *Choose the side on which to install the control panel (RH or LH), remove the covers (1) and push in the pre-cut opening (2).*
2 *Pick up the kit of the arm complete with bracket (3).*
3 *Open the control panel (4) and cut the preset window on the rear side.*
4 *Pass the bulbs (5) of thermostats and thermometer through the window and screw them in the square pipe of the bracket and slide them in the protective tube through top openings until they reach the wells (6). Lock them using the special locking springs.*
5 *Connect the cables of burner (7) to the control panel using a protective sheath and lock them with the cable glands (8).*
6 *Secure the control panel to the bracket (3) using the kit supplied.*
7 *Use the two screws (9) and fasten the arm-control panel group to the top section of the boiler.*
8 *Assemble the covers (1).*





The bracket provided, which is equipped with a 2-hole shaped plate, enables the user to mount the panels with two inclinations, and hence to choose the position he/she prefers (see figures).





DOOR

DOOR OPENING

The door is adjusted in the factory with **standard opening to the left (s)** and with **hinges on the right (d)**.

DANGER
it is dangerous to unscrew the ring nuts (8d) on the side of the hinges to avoid causing the door to detach, with possible serious damage to people and property.

DOOR OPENING REVERSAL (to the right)
Only for models listed in the Technical Data table

Proceed as follows to reverse the opening direction of the door:

Door with ferrules perforated on both sides

1. **Screw the left perforated ferrules** (8s) so that the door seal gasket is pressed in the same way as the right part. Bring the conical washers (10s) of the left tie-rods close to the mechanical tubes (9s) of the door and tighten the nuts (7s) using a suitable wrench.
2. On the right opening side, loosen the nuts (7d) and free the conical washers (10d) from the mechanical tubes (9d) of the door.

Door with wrench ferrules, hinge side

IMPORTANT
In models equipped with wrench-adjustable ferrules (8d), these must always be mounted on the hinges to prevent the door from being accidentally opened through the lever (12).

In this case, proceed as follows:

3. Proceed as indicated in point 1.
4. Cross-change the wrench ferrule of a hinge (8d) with the opposite perforated ferrule (8s), after loosening the locking nuts on the tie rods and freeing the conical washers.
5. On the left hinge side, fasten the conical washer (9s) onto the door using the nut (10s).
6. Proceed with the other two ferrules following the procedure described in points 4 and 5.

IMPORTANT
When cross-changing ferrules, always make sure that the other two ferrules are fastened, so that they hold the door.

7. Check the correct adjustment of the tie-rods and hinges ensuring that, during closure, the seal gasket is **evenly pressed in the centre on the whole circumference** (see figure).

If necessary, adjust as described in the next par.

DOOR ADJUSTMENT (OPENING ON THE RIGHT)

Vertical adjustment

1. With the door ajar, loosen the counter-nuts (5s) of the hinge units.
2. Act on the adjustment nuts (4s) to lift or lower the door by centring the gasket on the stop plate (see figure), then block the counter-nuts (5s).
3. Close the door and centre the tie-rod (1d) on the mechanical tube (9d), proceeding as in point 2.

Horizontal adjustment

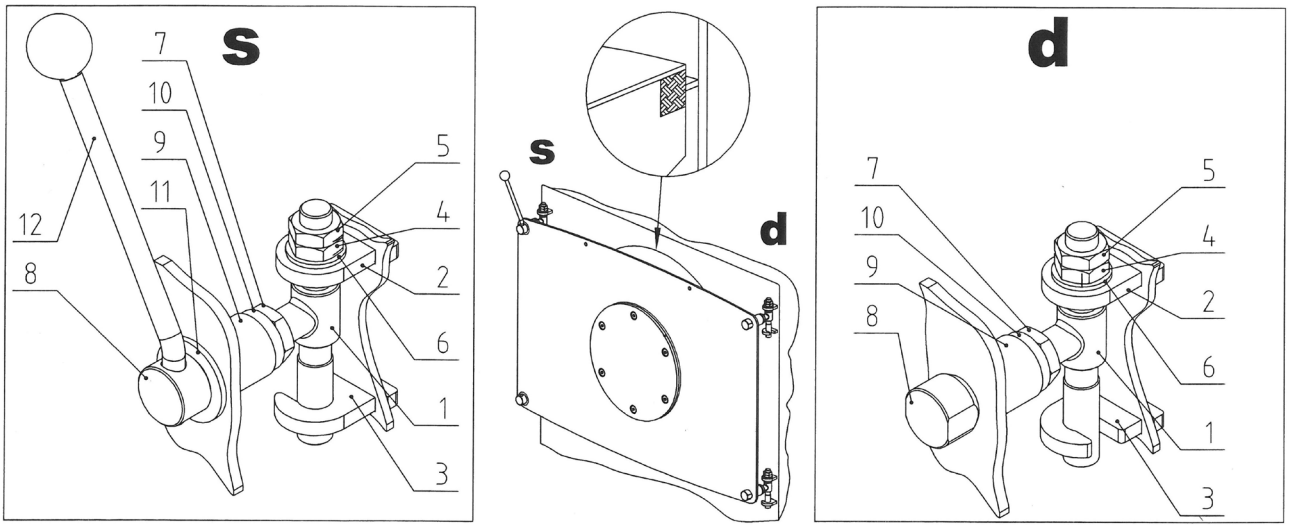
Close the door using the lever and check that there is equal distance on both sides, between the stop plate and the band. Otherwise, proceed as follows:

1. With the door ajar, loosen the locking nuts (7s) of the hinge units.
2. Act on the ferrule (8s) to adjust the distance depth-wise.
3. Screw the nuts (7s) and block the conical washers on the mechanical tubes.

Check the proper adjustment in depth ensuring that the door, manually pushed up to the stop plate, naturally returns remaining ajar. This is to ensure the hinge side fume seal.

For any problems related to the reversal and adjustment of the door, we recommend contacting our local Authorised Technical Assistance Centre.

DANGER
Incorrect door adjustment with consequent damage to people and property voids the warranty conditions.



OPENING UNIT HINGE UNIT

KEY

1 *Tierod with pin*
2 *Upper bracket*
3 *Lower bracket*
4 *Vertical adjustment nut*
5 *Locking counter nut*
6 *Vertical tie-rod plain washer*
7 *Horizontal locking nut*
8 *Perforated ferrule for opening (s)*
9 *Wrench ferrule for hinge (d)*
10 *Door mechanical tube*
11 *Conical centring washer*
12 *Opening lever washer*
13 *Opening lever*

BURNER CONNECTION

Before installation you are advised to thoroughly clean the inside of all the fuel supply system pipes in order to remove any foreign matter that could affect correct operation of the boiler. See technical specification tables and check the max pressure value inside the furnace. The value found on the table may also increase by 20% if heavy oil is used instead of gas or light oil; furthermore the following checks should also be carried out:

a) Check the internal and external seal of the fuel supply system;
b) Regulate the fuel flow according to the power required by the boiler;
c) Check that the boiler is fired by the correct type of fuel;
d) Check that the fuel supply pressure is within the values specified on the burner rating plate;
e) Check that the fuel supply system is sized for the maximum flow rate necessary for the boiler and that it is provided with all control and safety devices provided for by the regulations referred to above;

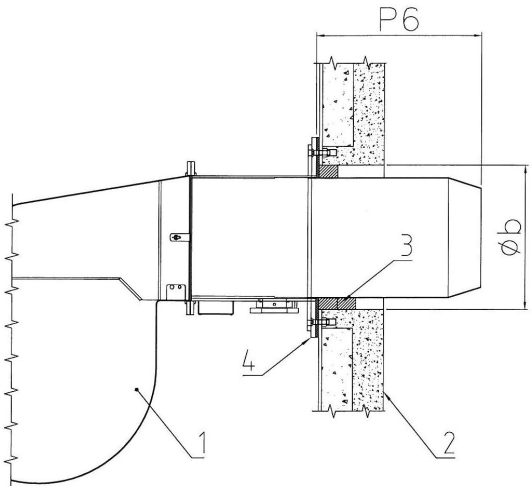
In particular, when using gas:

f) Check that the supply pipe and the gas ramp comply with the regulations in force;
g) Check that all the gas connections are sealed;
h) Check that the boiler room vents are of sufficient size to ensure the air flow dictated by the regulations referred to above and that they are in any case sufficient to obtain perfect combustion.
i) Check that the gas pipes are not used as earth connections for electrical appliances.

If the boiler is not going to be used for some time, close the fuel supply cock or cocks.

IMPORTANT
check that the gap between the burner draught tube and the mounting plate are properly filled with thermoinsulating material.

The thermoinsulating strip provided with the boiler must be wrapped around the mouthpiece for at least an entire circumference of the flame radiation to protect the flange of the burner. Not that the ceramic insulation is necessary to fill the gap until the insulation inside surface of the door.



The above picture is only for reference.

KEY:
1 *Burner*
2 *Manhole*
3 *Thermoinsulating material*
4 *Flange*

All details on the draught tube lenght (**P6**), the diameter of the burner hole (**Øb**) and the pressurization are included in the par. Technical Specifications.

IMPORTANT
when using oil or bio-gas for operation, the door must have cement insulation and special tie rods. Any alterations and/or lack of communication during the selling phase shall nullify the warranty conditions.

GREENOX BT COND:

IMPORTANT
The boiler is designed for use with NATURAL GAS and LPG. The use of other fuels will void the boiler warranty.

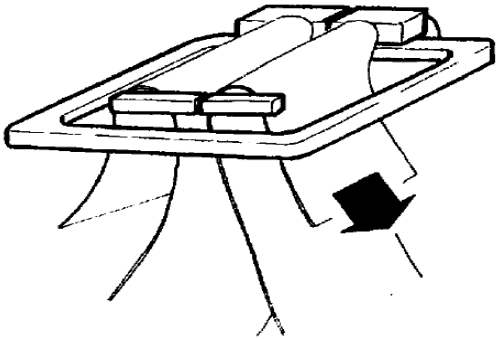
3 ASSEMBLY

IMPORTANT
Valid up to GREENOX.e 70

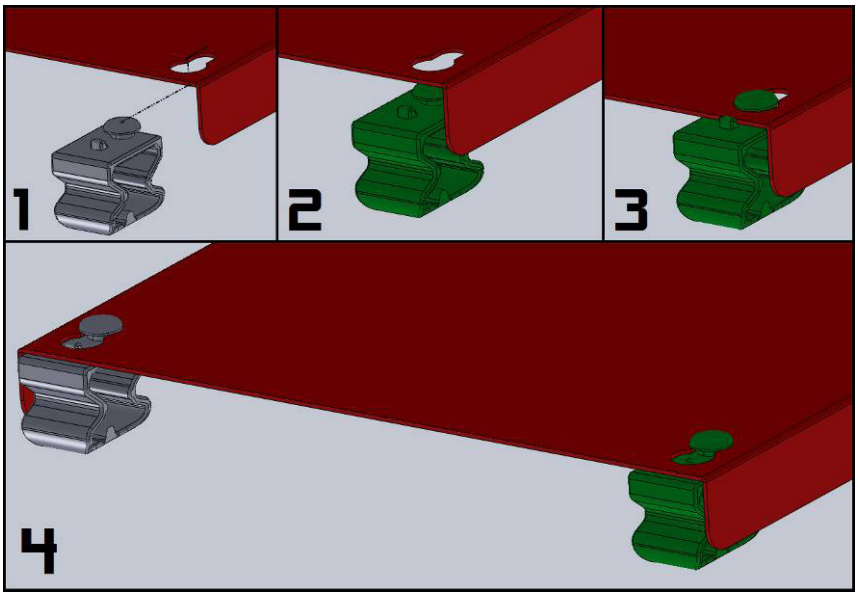
BOILER CASINGS AND CONTROL PANEL

1) Wrap the fibreglass around the boiler body and use the supplied strap to secure it (see fig.).

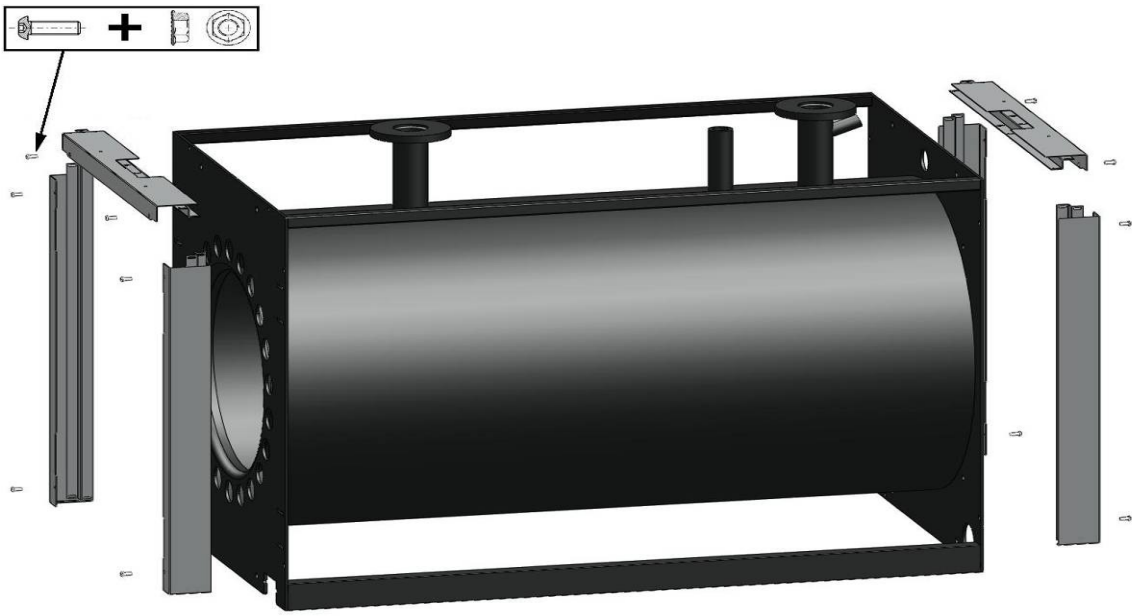
DIAGRAM OF PLASTIC STRAP LOCKING
TO SECURE THE FIBREGLASS
TO THE BOILER SHELL



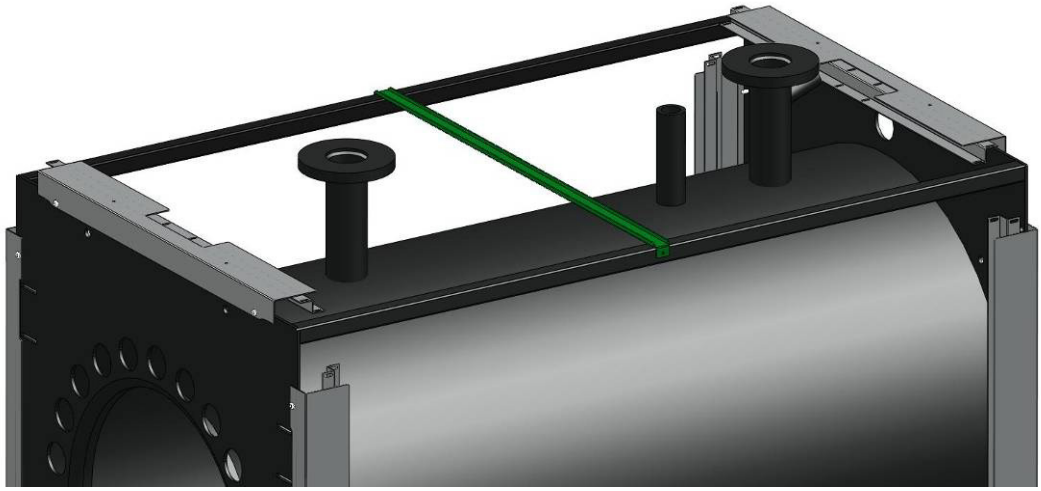
2) Prepare the staves by inserting the four stoppers, as shown in the figure.



3) Fasten the uprights and the beams to the plates by means of appropriate screws and nuts.

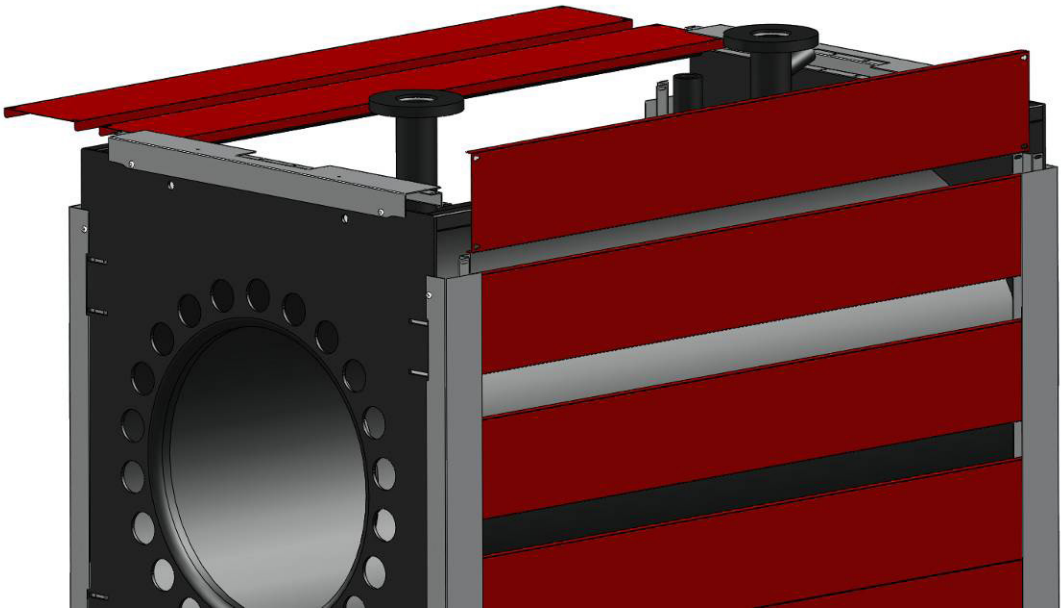


NOTE: the beam shown in the figure, if supplied in the package, must be placed between the two tube panels in order to support the staves.

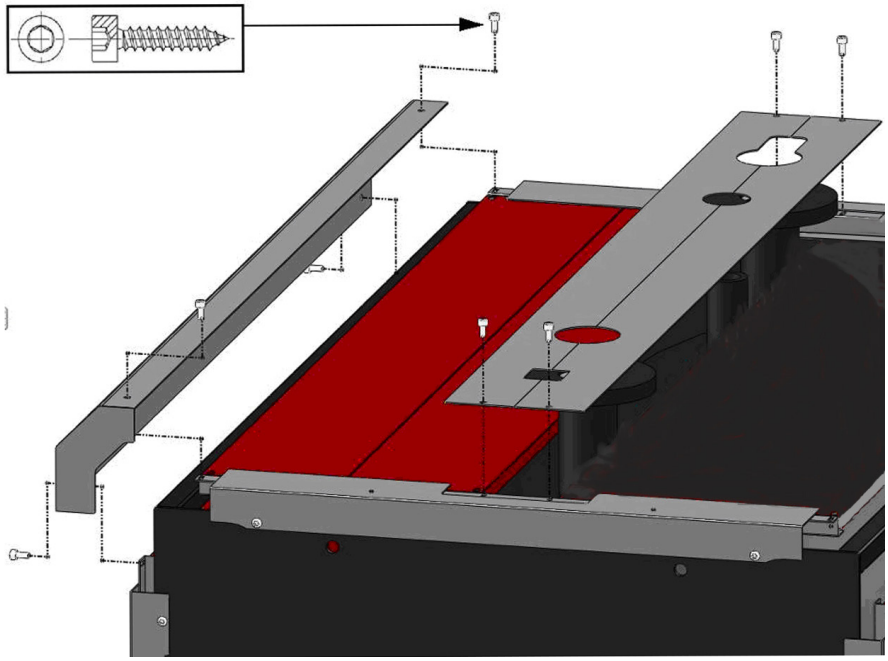


4) Insert the staves, with the previously installed stoppers, between the uprights and the beams, as shown in the figure.

PLEASE NOTE: do not cover the upper corner on the manhole side; this is required for the subsequent installation of the control panel and its bulbs.



5) After inserting the lags and fastening the relevant central masks (1), install the closing profiles (2) using the self-tapping screws, on the side opposite the manholes.



CONTROL PANEL INSTALLATION

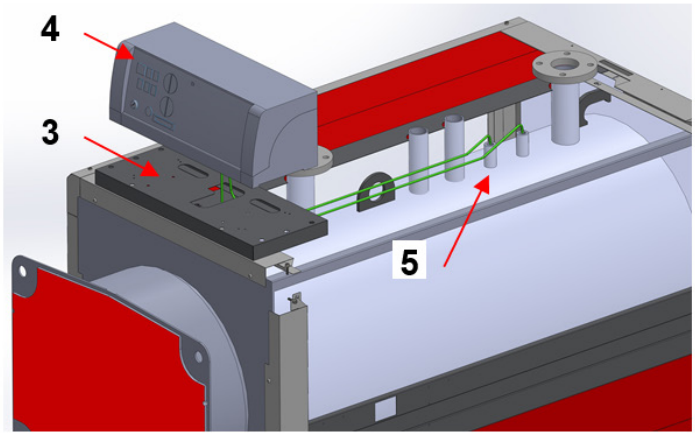
NOTE*:* the control panel picture is purely indicative as it may vary according to the type of panel installed.

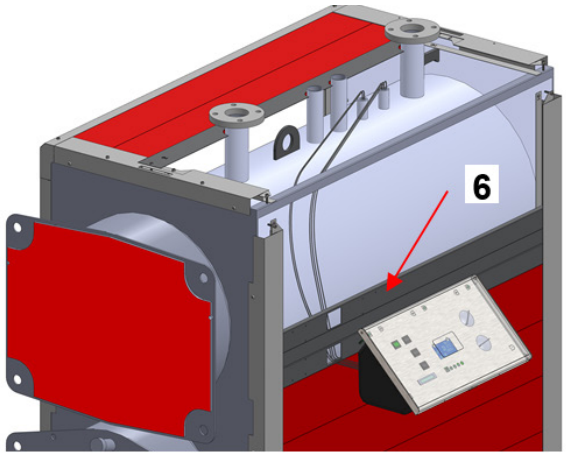
TOP INSTALLATION

6) Install the control panel support (3) included in the kit on the front beam of the boiler.
7) Place the control panel (4) onto the support (3) and insert the boiler adjustment thermostats capillary tubes, the safety thermostat capillary tubes, the circulator consent thermostat capillary tubes and the boiler thermometer capillary tubes through the relevant openings, until the bulb-holding manholes (5) on the shell have been reached.
8) Fasten the control panel onto the support using the screws provided.

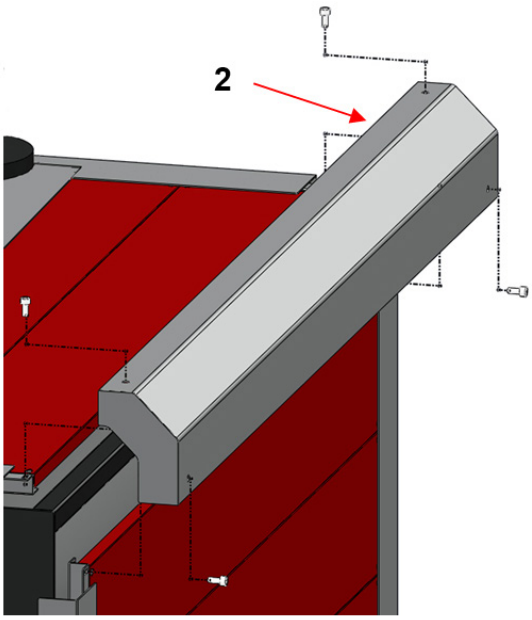
SIDE INSTALLATION

6) The control panel can be mounted either on the right or left after mounting the panel support stave (6)
7) Place the control panel in the vicinity of the stave (6) and pass the capillaries through the relevant openings, until the bulb-holding manholes (5) on the shell have been reached.
8) Fasten the control panel onto the stave using the screws provided.





9) Finish inserting the lags and installing the closing profiles (2) using the self-tapping screws on the manhole side.



4 START UP

IMPORTANT
Before start up, open the door and insert wholly turbolators into the front end sections of the smoke tubes, ensuring that they have been pushed inside for at least 100 mm.

PRELIMINARY CHECKS

Before starting the boiler, check that:

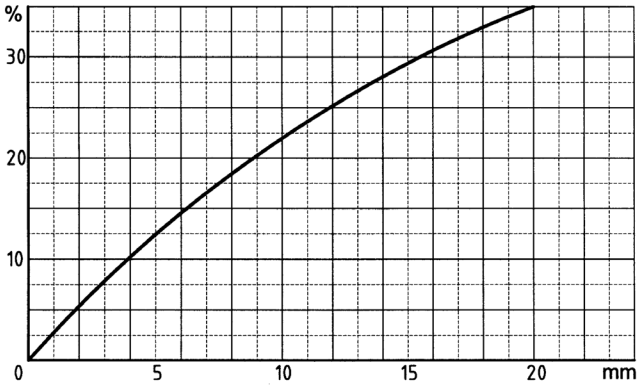
- The **rating plate** specifications and power supply network (electricity, water, gas or fuel oil) specifications correspond;
- The burner **power range** is compatible with the power of the boiler;
- There is a copy of the burner instructions in the boiler room;
- The **flue gas exhaust pipe** is correctly fitted;
- The **air inlet supply** is the correct size and free from any obstacle;
- The **manhole**, the **smokebox** and the **burner plate** are closed in order to provide a complete flue gas seal;
- The system is **full of water** and that any **air pockets** have been eliminated;
- The **anti-freeze** protections are operative;
- The water **circulation pumps** are operating correctly.
- The expansion vessel and the safety valve(s) have been connected correctly (with no interception) and are properly operating.
- Check the electrical parts and thermostat operation.

WATER TREATMENT

The most common phenomena that occur in heating systems are:

- **Scaling**

  Scale reduces heat transfer between the combustion gases and the water, causing an abnormal increase in the temperature of the metal and therefore reducing the life of the boiler.
  Scale is found mostly at the points where the wall temperature is highest and the best remedy, at construction level, is to eliminate areas that overheat.
  Scale creates an insulating layer which reduces the thermal transfer of the generator, affecting system efficiency. This means that the heat produced by burning the fuel is not fully exploited and is lost to the flue



Scale diagram

Key
% % fuel not used
mm mm scale

- Corrosion on the water side

Corrosion of the metal surfaces of the boiler on the water side is due to the passage of dissolved iron through its ions (Fe+). In this process the presence of dissolved gases and in particular of oxygen and carbon dioxide is very important. Corrosion often occurs with softened or demineralised water which has a more aggressive effect on iron (acid water with Ph <7): in these cases, although the system is protected from scaling, it is not protected against corrosion and the water must be treated with corrosion inhibitors.

FILLING THE SYSTEM

The water must enter the system as slowly as possible and in a quantity proportional to the air bleeding capacity of the components involved. Filling times vary depending on the capacity and characteristics of the system but should never be less than 2 or 3 hours.
In the case of a sealed system with an **expansion vessel**, water is let in until the pressure gauge indicator reaches the static pressure value pre-set in the vessel.
Heat the water to maximum temperature. During this operation the air contained in the water is released through the automatic air separators or through manual bleed valves. Once the air has been entirely released, reset the pressure to the pre-established value and close the manual and/or automatic filling valve.

5 OPERATION

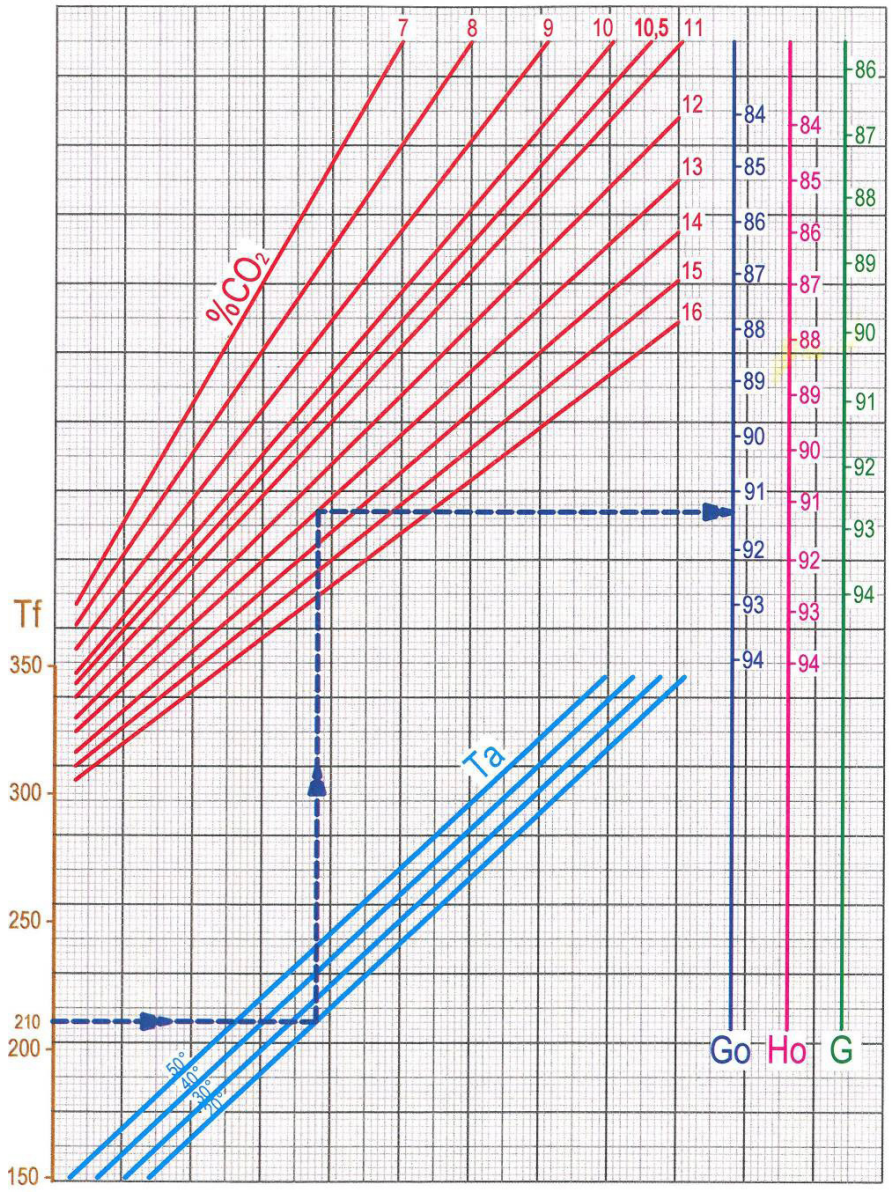
OPERATING CHECKS

The heating system must be correctly operated to ensure perfect combustion as far as possible with reduced emissions of carbon monoxide, unburnt hydrocarbons and soot into the atmosphere, and to avoid hazards and damage to people and goods. Guide to combustion values:

FUELS	$\%CO_2$	Flue gases temperature	% CO
Gas	10	190°C	0 – 20 ppm
Gas oil	13	195°C	10 – 80 ppm
Heavy oil	13.5	200°C	50 – 150 ppm

A diagram is provided in which the system efficiency is obtained according to the flue gas temperature, the ambient temperature and the percentage of carbon dioxide (CO_2). Dispersions through the boiler casings are not considered.

EXAMPLE
Flue gas temperature: 210 °C
Ambient temperature: 20 °C
%CO2 : 13 %
Fuel used: GAS OIL
Efficiency: 91.4 %
% EFFICIENCY CHART (significant losses only)



Key:
Tf Flue gas temperature – **Ta** Ambient temperature °C – **Go** Gas oil – **Ho** Heavy oil – **G** Gas

Pressurisation values should be included in the range given in the table of technical specifications.

IMPORTANT
The delta T between flow and return must not exceed 30°C, in order to avoid thermal shocks in the boiler. The boiler return temperature must be higher than 50°C on natural gas or LPG firing and higher than 40°C on oil firing, in order to protect the boiler from corrosion due to acid flue gas condensation; the guarantee therefore does not cover damages due to condensation.
If the system return temperature does not fulfill the above requirements, it is necessary to increase the return temperature by using a mixing valve and/or a recirculation pump.

GREENOX BT COND:

IMPORTANT
The temperature gradient between flow and return, with burner running at rated output of the boiler, must range from 10°C to 25°C. This protects the generator both from excessive flow, which can cause vibrations and noise, and from hot water stagnation which causes limestone build-up and creates internal thermal shocks.

It is recommended that the burner switch is always switched on in order to maintain water temperature approximately equal to the value the thermostat is set to.

If the flue gas seal is poor in the front part of the boiler (manhole and burner plate) or the back part (smokebox), the closing tie rods of the individual parts must be adjusted; if this is not sufficient, the seals must be replaced.

IMPORTANT
Do not open the manhole and do not remove the smokebox while the burner is working. Always wait a few minutes after the burner has been switched off until the insulating parts are cooler.

6 MAINTENANCE

IMPORTANT
Carry out thorough cleaning and periodic maintenance to ensure a correct and safe operation of the system. A perfectly clean tube bundle increases the thermal exchange between fumes and water contributing to energy saving and reducing air pollution.

PREPARATION FOR INSPECTION AND MAINTENANCE

Before carrying out any kind of maintenance, in order to avoid risks, the operator must be equipped with all the personal protection provided by the standards in force.

Before performing any cleaning and maintenance operation, it is first necessary to disconnect the device from both the fuel and the mains supply.

Maintenance must be entrusted only to **technically qualified personnel** and can be either mechanical or electrical.

The preparation and status of the generator may be different, depending on the operations to be performed:

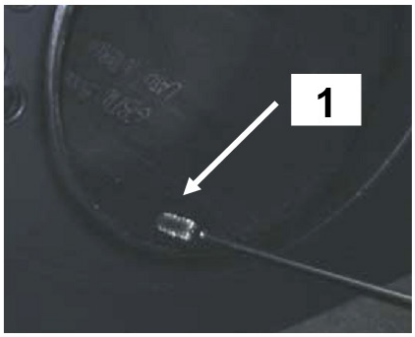
- **With the boiler running,** to check the integrity of the generator when hot (fume trace seal, water side gasket seal, flue draught, operation of adjustment and safety accessories),
- **With switch-off and complete cooling** of the generator, when having to open the front door with inspection inside the furnace and fume chamber.
- **With cooling, complete empting and safe shut-off of the generator** towards the system of use, in the case of water side internal visit.

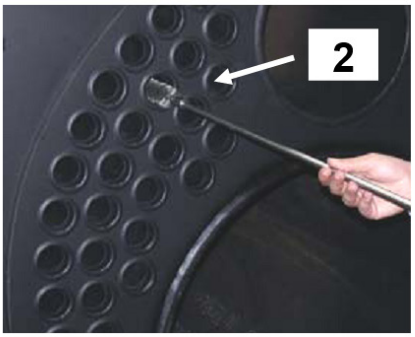
Particular precautions must be taken to avoid the risk of electric shock since the system on the generator has accessories powered at 230V and/or at 400V.

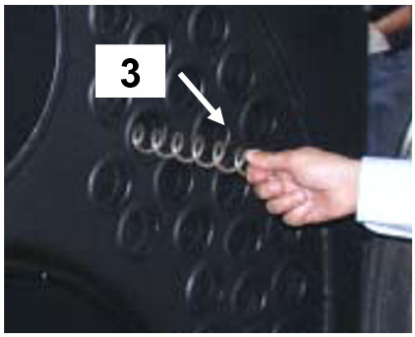
Before intervening on the generator, ensure that the connection to the electrical system has been made according to current standards, also ensuring proper earthing connection to the system.

ORDINARY

- Carry out burner maintenance (as to the specific instructions) and have the calibration checked by duly qualified personnel.
- Check the tightness of flange bolts and the state of the gaskets;
- Analyse the system water and make sure it is treated in such a way that scaling does not occur, as scales would not only reduce the boiler performance, but also cause potentially fatal damage to the boiler in the long run.
- Make sure that refractory cladding and fume seal gaskets are intact; if they are not, replace them;
- Check the integrity of the flame warning light.
- Periodically clean the furnace (1) and the tube bundle (2) using a brush.
- Check the integrity and cleanliness of the turbulators (3), if any; in general gaseous fuels should not produce any carbon deposit while with the use of liquid fuels, it is necessary to clean frequently to avoid substantial fouling.
- To clean more thoroughly, the smoke chamber is to be removed; in this way, carbon residues can be eliminated from the back.







- Check the integrity of the electrical system on the generator.
- Check the integrity of the electrical panel, both outside (IP protection) and inside (check of all components inside the electrical panel).
- Periodically check the efficiency of adjusting and system safety tools.

7 ENVIRONMENTAL PROTECTION AND DISPOSAL

Protection and respect for the environment is a fundamental principle for **ICI CALDAIE S.p.A.**.
The quality of products, lower costs and protection of the environment are of equal importance for the company. **ICI CALDAIE S.p.A.**, also through ISO 14001 certification, strictly adheres to European laws and standards for the protection and preservation of the environment.
In order to reduce its impact on the environment, the company uses the best technology and materials in its production processes and always considers their economic impact.
Thermal insulators are special waste and must therefore be disposed of in compliance with the applicable legislation.

8 INFORMATION FOR THE DISPOSAL OF ELECTRICAL AND ELECTRONIC EQUIPMENT

This product contains electrical and electronic equipment which cannot be disposed of through the normal means of municipal waste collection. There are separate collection centres for these products. Electrical and electronic equipment must be treated separately and in compliance with the laws in force in the respective Country.

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Rag. Soc. n. 6677
C.C.I.A.A. VR n. 69600

DECLARATION OF CONFORMITY WITH THE EUROPEAN COMMUNITY REGULATIONS

I undersigned Emanuela Lucchini, Managing Director of ICI CALDAIE S.p.A., headquarted in via G. Pascoli 38 – 37059 Campagnola di Zevio (VR) Italy

DECLARE THAT STEEL BOILERS

GREENOx.e
GREENOx BT COND

comply with the CE certificate and in accordance with the boards regulations:

- Gas Directive GAR 2016/426
- Efficiency Directive 92/42/CEE
- EMC Directive 2014/30/UE
- Low Voltage Directive 2014/35/UE

S. Maria di Zevio, li 04/08/2015

ICI CALDAIE S.p.A.
Direttore Generale
Emanuela Lucchini

9 NOTES

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