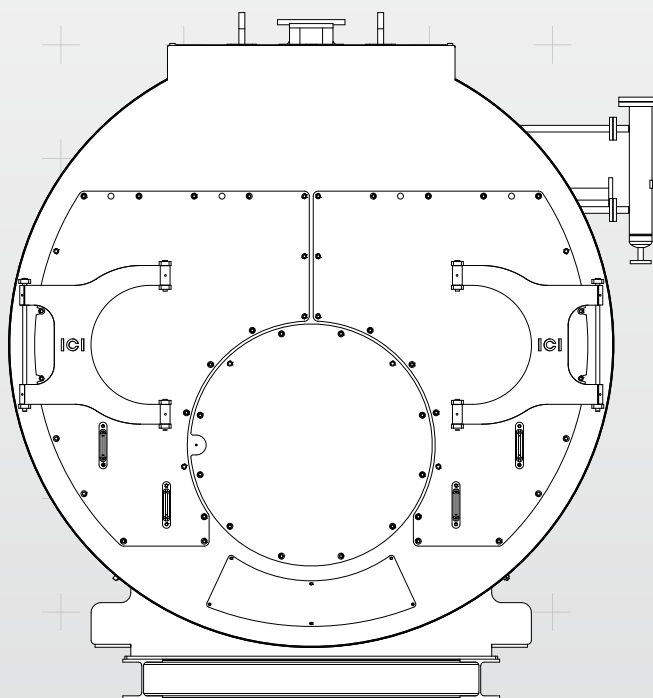




EN

Three-pass steam boiler

GX



INSTALLATION, USE AND MAINTENANCE MANUAL



GX_1000_15000_en_00 - 06/2019

INDEX

General information

- 3 Introduction
- 3 Range
- 3 Compliance
- 4 Warnings
- 5 Prohibitions
- 5 Hazards
- 6 Identification
- 7 Appliance description
- 7 Structure
- 8 Dimensions and connections
- 10 Technical data
- 11 Burners
- 12 Paperwork
- 12 Fire prevention
- 13 Components

Installation

- 18 Product receipt
- 19 Handling
- 19 Film removal
- 20 Installation room
- 21 System cleaning
- 21 Hydraulic connections
- 21 Starting hydraulic circuit
- 22 Flue exhaust
- 22 Front door opening
- 23 Burner assembly
- 23 Accessing the burner nosepiece
- 24 Electrical connections
- 25 Loading and supply of the generator/system

Use

- 28 Preliminary checks
- 28 Thermal expansion
- 29 Commissioning
- 30 Checks after commissioning
- 30 Mandatory periodic verifications
- 30 Stop periods

Maintenance

- 31 Periodic verifications
- 32 Methods for checking the safety devices
- 33 Routine maintenance
- 33 Extraordinary maintenance
- 34 Any anomalies and remedies
- 34 Protecting the environment
- 34 Decommissioning and disposal

Risk analysis

Useful information and declarations

- 39 QR code

Notes

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 General information

INTRODUCTION

Dear Customer,

Thank you for having chosen an appliance of the series **GX**, a high quality and efficiency product, reliable and safe.

We recommend entrusting its maintenance to **Professionally Qualified Personnel** who, when necessary, uses original spare parts. This manual contains important information and suggestions that must be observed for easier installation and best possible use of the appliance.



IMPORTANT

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



IMPORTANT

This manual refers to boilers with "standard accessories".

For boilers **that "do not require continuous monitoring"** by the operator refer to the specific technical manual.

RANGE

MODEL	CODE	MODEL	CODE	MODEL	CODE	MODEL	CODE	MODEL	CODE
GX 12 bar									
GX 1000	86161000	GX 2000	86162000	GX 4000	86164000	GX 8000	86168000	GX 13000	86169913
GX 1200	86161200	GX 2500	86162500	GX 5000	86165000	GX 9000	86169000	GX 15000	86169915
GX 1500	86161500	GX 3000	86163000	GX 6000	86166000	GX 10000	86169900		
GX 1750	86161750	GX 3500	86163500	GX 7000	86167000	GX 12000	86169912		
GX 12 bar EXP									
GX 1000	86161004	GX 2000	86162004	GX 4000	86164004	GX 8000	86168004	GX 13000	86169923
GX 1200	86161204	GX 2500	86162504	GX 5000	86165004	GX 9000	86169004	GX 15000	86169925
GX 1500	86161504	GX 3000	86163004	GX 6000	86166004	GX 10000	86169904		
GX 1750	86161754	GX 3500	86163504	GX 7000	86167004	GX 12000	86169922		
GX 15 bar									
GX 1000	86171000	GX 2000	86172000	GX 4000	86174000	GX 8000	86178000	GX 13000	86179913
GX 1200	86171200	GX 2500	86172500	GX 5000	86175000	GX 9000	86179000	GX 15000	86179915
GX 1500	86171500	GX 3000	86173000	GX 6000	86176000	GX 10000	86179900		
GX 1750	86171750	GX 3500	86173500	GX 7000	86177000	GX 12000	86179912		
GX EXP 15 bar									
GX 1000	86171004	GX 2000	86172004	GX 4000	86174004	GX 8000	86178004	GX 13000	86179923
GX 1200	86171204	GX 2500	86172504	GX 5000	86175004	GX 9000	86179004	GX 15000	86179925
GX 1500	86171504	GX 3000	86173004	GX 6000	86176004	GX 10000	86179904		
GX 1750	86171754	GX 3500	86173504	GX 7000	86177004	GX 12000	86179922		

COMPLIANCE

The steam generators Series **GX** comply with the following European Directives:

- Directive 2014/68/EU (PED)
- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU



NOTE

The serial number is indicated on the boiler nameplate.

WARNINGS



IMPORTANT

- The instructions manual is an integral and essential part of the product. If the body is sold or transferred to a new owner or if you relocate and leave the system, always make sure that the manual accompanies the boiler body, so that it can be consulted by the new owner and/or by the installer. In case of damage or loss, request a copy from Technical Assistance Service **ICI CALDAIE S.p.A.**. This body must be intended for the use it was expressly designed for. The manufacturer will be exempted from any liability, contractual and extra-contractual, for any injury/damage caused to people, animals, or property due to the failure to perform maintenance and/or scheduled periodic checks and improper uses.
- Upon receipt of the generator, make sure that the supply is intact and undamaged and promptly contact **ICI CALDAIE S.p.A.** if it does not correspond to the order
- The installation of **GX** generator must be performed by a Certified Company which, at the end of the operation, must provide the owner with the declaration of conformity certifying that the installation has been correctly carried out, namely in compliance with the Standards and the national and local Laws in force, and with the indications included in the instruction manuals supplied by **ICI CALDAIE S.p.A.**
- After long periods of inactivity of the device, the intervention of professionally qualified personnel is required to perform the operations described in the relevant paragraph in order to preserve the boiler.
- The periodic check and maintenance of the appliance is a legislative obligation. The User must have it performed by professionally qualified personnel.
- Make sure the safety valves properly open at the design pressure.
- Make sure the safety pressure switch intervenes properly which, by shutting down the burner, eliminates the cause of the pressure increase.
- Check the correct connection of the accessories to the boiler body (gasket seal check).
- Pay the due attention during handling and installation.
- Periodically check the condition of the same accessories (exclusion of fractures).
- Once installation is completed, check the intervention of the safety valve by carrying out a preventive hydraulic test (at the PT pressure indicated on the ID plate).
- Make sure the safety level switch is working properly, in accordance with the contents of the technical manual supplied with the boiler.
- It is necessary to check that the operating water conductivity values are within those provided in the supplied technical manual.
- Make sure the water loading pump is working properly as described in the technical manual provided with the boiler (pump wear, hydrostatic head in suction, water supply temperature, pump connection/disconnection from the level control probes).
- Analyse the water when necessary, ascertaining that the values are within the limits expressed in this technical manual and carry out the due chemical treatments. Check the intervention of the safety probes by lowering the level below the minimum required.
- Manually check that the level switch is working properly every 6 hours.
- Do not step on or damage the protective sheath of the cable with any other mean.
- It is not necessary to consider the boiler connections as support points for the weight of the pipes.
- It is good practice to provide expansion joints and appropriate supports for the pipes connecting the boiler to the system
- Check that the panel power supply complies with the wiring diagram supplied.
- Make sure the generator is properly earthed.
- Check the plant's electrical system.
- Before opening the manhole, check that the pressure in the boiler body is equal to the atmospheric pressure (0 relative bar).
- Before opening the door, check that the burner is off and disconnected.
- Switch off the burner and the pump before closing the shut-off valve.
- Avoid contact with the non-insulated parts of the equipment during its operation. When adjustments or checks are carried out during operation, it is necessary to protect oneself with suitable clothing (P.P.E. according to Italian Legislative Decree 81/08).



IMPORTANT

- Pay attention to sharp edges on the generator and its accessories.
- The boiler must be kept sheltered from adverse weather conditions, with regard to the minimum temperature (-10 °C) and from the rain.
- The user is responsible for considering the seismic degree of the user area in the design of the heating plant.
- After an earthquake, have technical personnel assess any damage by carrying out NDCs (non-destructive checks), if necessary.
- The manufacturer shall not be held liable in the event of accidents caused by incorrect decommissioning.
- The personnel in charge must be able to prove to have sufficient knowledge and experience relating to the safety and control / regulation accessories supplied with the generator and good familiarity with the instructions contained in the use and maintenance manual and be capable and physically suitable.
- During handling, always maintain a distance of at least 5 m from the projection of the appliance to the ground
- In case of violent impact during handling, visually check the integrity of the appliance, all over; run the hydraulic test again.
- **The generators are sized only for loads due to pressure, temperature and contained fluid.**

PROHIBITIONS



IT IS FORBIDDEN

- Operate electrical devices or appliances such as switches, household appliances, etc. if you smell fuel or unburnt materials. In this case:
 - ventilate the room by opening doors and windows
 - close the fuel shut-off device
- Perform any technical or cleaning intervention before disconnecting the appliance from the electrical power supply and wearing the Personal Protective Equipment (P.P.E. according to Italian Legislative Decree 81/08).
- Modifying safety or adjustment devices without the boiler manufacturer's authorisation and indications.
- Plug or dimensionally reduce the ventilation openings of the installation room. The ventilation openings are essential for proper combustion.
- Perform any welding/repairs. If necessary, contact the manufacturer/verifying party for operation (in Italy according to MD 329/04).
- Expose the generator to atmospheric agents.
- Leave flammable substances and containers in the room where the appliance is installed.
- Disperse the packaging material in the environment and leave it within the reach of children as it may be a potential source of danger. It must be disposed of in accordance with the legislation in force.

HAZARDS



DANGER

- Dangers due to **water leaks**. Disconnect the boiler from the electrical power supply, close the water supply and promptly contact the Technical Assistance Service Authorised **ICI CALDAIE S.p.A.** or professionally qualified personnel.
- **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.



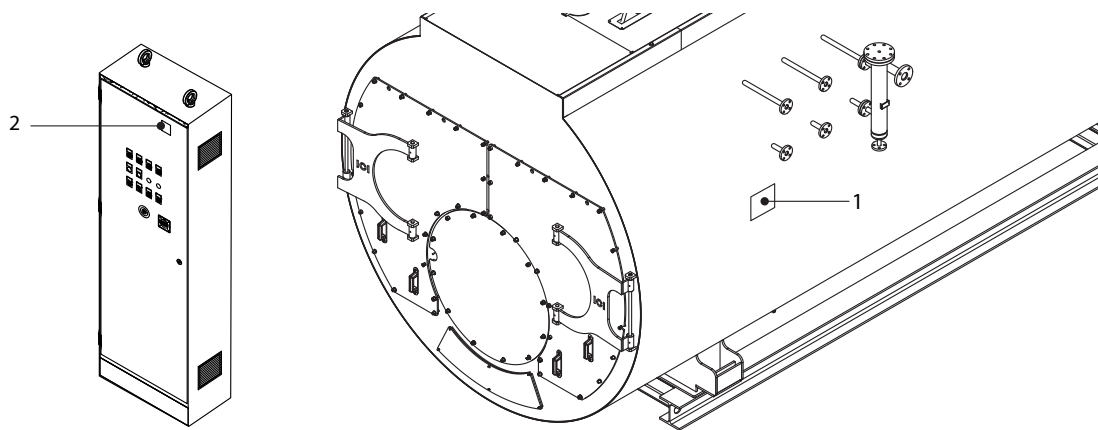
DANGER

- **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*
 - *upper tread walkway.*
- **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.

IDENTIFICATION

Each generator **GX** is identified by the following nameplates:

- **Boiler body nameplate (1):** this plate carries the boiler body main data and is riveted on a special support.
- **Assembly nameplate (2):** this plate carries the data relating to the boiler complete with the accessories, which may vary from those of the boiler body only.



The appliance is also accompanied by **construction certificate** attesting the successful result of the hydraulic test.



IMPORTANT

The installation must be carried out in compliance with the local applicable regulations by **professionally qualified personnel**, ie personnel having specific technical skills in the steam production system component sector. An incorrect installation can harm people or damage property for which the manufacturer cannot be liable.

During **commissioning** check the effectiveness of all adjustment and control devices in the control panel.

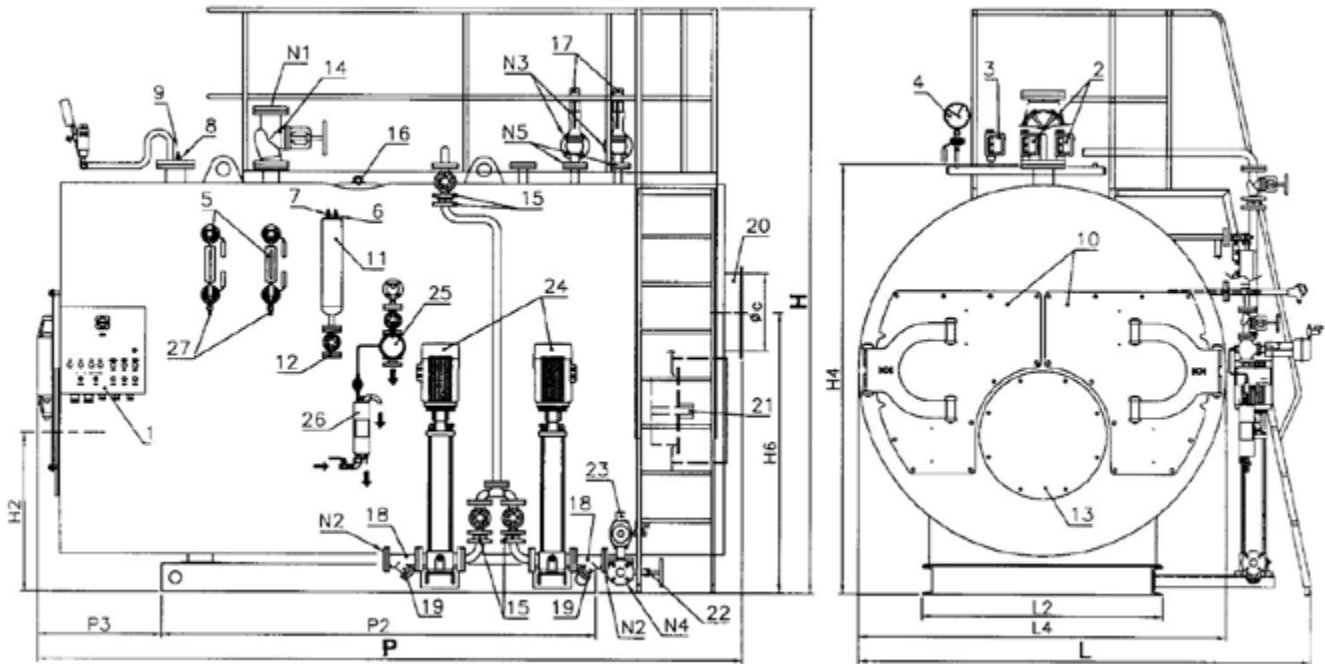
The **warranty** validity is subject to compliance with the instructions in this manual.

APPLIANCE DESCRIPTION

The **GX** range offers high-performance monobloc steam generators, designed to guarantee the highest levels of reliability and durability. All models feature a corrugated furnace dimensioned so as to obtain reduced thermal loads and allow for an optimal operation, even in heavy-duty working conditions. A complete range that can be used for a variety of applications, available also with superheater (GX S) and waste heat recovery sections (GX C).

The **GX** model is of the three-pass monobloc type with fully wet furnace bottom. It is built with tested quality steel according to regulations in force and is welded with automatic submerged arc methods. Suitable for liquid and gaseous fuels. Complete with regulation and safety accessories for automatic operation.

STRUCTURE



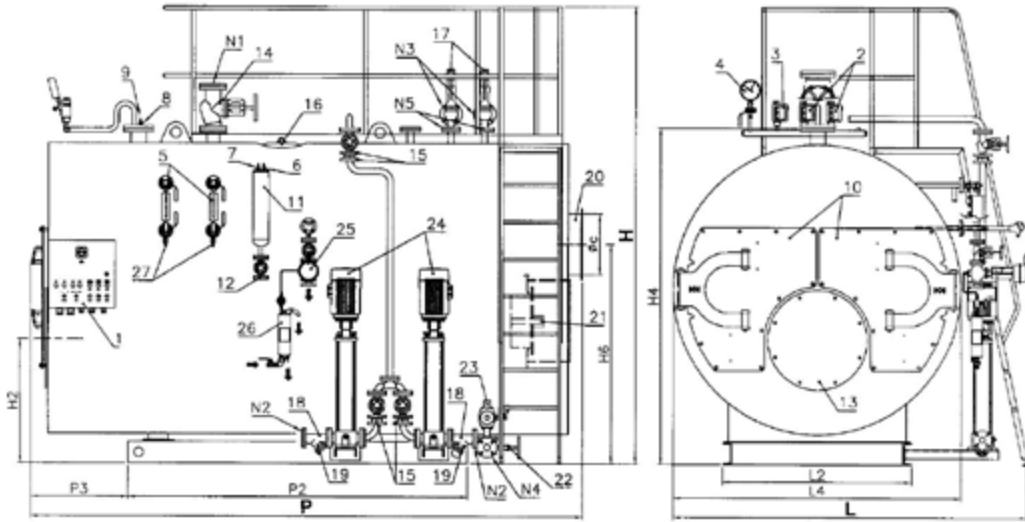
- | | | |
|--------------------------------|-----------------------------|-----------------------------------|
| 1 Electrical panel | 12 Cylinder drain | 24 Electric feed pump |
| 2 Regulation pressure switches | 13 Burner application plate | 25 Salinity check |
| 3 Pressure transducer | 14 Steam inlet | 26 Cooler |
| 4 Pressure gauge | 15 Check valves | 27 Level indicator discharge |
| 5 Level indicators | 16 Inspection hatch | |
| 6 Pump stop probes | 17 Safety valves | N1 Steam inlet |
| 7 Pump start probes | 18 Supply | N2 Supply |
| 8 1st safety level probe | 19 Pump suction filter | N3 Instruments fitting |
| 9 2nd safety level probe | 20 Chimney fitting | N4 Boiler drain |
| 10 Front doors | 21 Flame indicator | N5 Safety valve(s) fitting |
| 11 Probe holder cylinder | 22 Boiler drain | |
| | 23 Pneumatic drain valve | |

NOTE

Drawing, legend and data refer to standard models. For specific models refer to the supplied accessory manual.

The electric panel is supplied separately from the boiler and must be compulsorily fixed to the ground. Upon installation, it will have to be electrically connected to the boiler according to the instructions of the wiring diagram provided.

DIMENSIONS AND CONNECTIONS



Dimensions

Description	u.m.	GX									
		1000	1200	1500	1750	2000	2500	3000	3500	4000	5000
H	mm	3200	3200	3300	3350	3350	3500	3600	3600	3780	3954
H2	mm	865	865	915	915	915	990	1030	1020	1115	1150
H4	mm	2280	2280	2460	2460	2460	2620	2690	2720	2920	3020
H6	mm	1500	1500	1620	1620	1620	1745	1830	1750	1950	2020
L	mm	2450	2450	2550	2650	2650	2760	2900	2900	3000	3260
L2	mm	1200	1200	1400	1400	1400	1500	1500	1500	1600	1600
L4	mm	200	200	200	200	200	200	200	200	200	200
P	mm	4100	4100	4100	4100	4600	4900	5100	5600	5700	5700
P2	mm	2400	2400	2500	2500	3000	3200	3200	3500	3700	3500
Øc	mm	400	400	450	450	500	550	600	600	650	650

Attachments

Description	u.m.	GX									
		1000	1200	1500	1750	2000	2500	3000	3500	4000	5000
N1	DN/in	65	65	80	80	80	100	100	125	125	125
N2	DN/in	40	50	50	50	50	50	50	65	65	65
N1/N2	PN	16	16	16	16	16	16	16	16	16	16
N4	DN/in	40	40	40	40	40	40	40	40	40	40

Dimensions

Description	u.m.	GX							
		6000	7000	8000	9000	10000	12000	13000	15000
H	mm	4110	4250	4400	4550	4550	4650	4870	4870
H2	mm	1250	1300	1345	1320	1400	1400	1470	1477
H4	mm	3200	3350	3500	3600	3685	3770	3970	3892
H6	mm	2050	2070	2150	2200	2350	2240	2240	2500
L	mm	3390	3460	3620	3750	3750	4000	4500	4500
L2	mm	1700	1800	1900	2000	1900	2300	2300	2300
L4	mm	200	200	200	200	200	3350	3500	3500
P	mm	6300	6750	7250	7650	8050	8700	9030	9300
P2	mm	4000	4500	5000	5100	5500	6000	6200	6500
Øc	mm	700	700	800	900	900	1100	1100	1100

Attachments

Description	u.m.	GX							
		6000	7000	8000	9000	10000	12000	13000	15000
N1	DN/in	150	150	150	200	200	200	200	250
N2	DN/in	80	80	80	80	80	100	100	100
N1/N2	PN	16	16	16	16	16	16	16	16
N4	DN/in	40	40	40	40	40	40	40	40

TECHNICAL DATA

DESCRIPTION	u.m.	GX									
		1000	1200	1500	1750	2000	2500	3000	3500	4000	5000
Effective rated ⁽¹⁾	kW	1163	1395	1744	2035	2326	2907	3488	4070	4651	5814
Thermal capacity	kW	1292	1550	1937	2261	2584	3230	3875	4522	5167	6460
Efficiency at 100% (ref. P.C.I.) ⁽¹⁾	%	90,02	90	90,04	90	90,02	90	90,01	90	90,01	90
Flue gas outlet temperature (Air Rated Output 20°C)	°C (Gas)	243	244	243	244	243	227	243	244	243	244
	°C (Diesel fuel)	245	246	245	246	245	230	246	246	246	246
	°C (Naphtha)	245	245	244	245	245	229	245	245	245	245
Pressure drops on exhaust side	mbar	5,5	7	7	7	8,5	8	9	10,5	10	10,5
Rated pressure	bar	12/15	12/15	12/15	12/15	12/15	12/15	12/15	12/15	12/15	12/15
Total capacity	l	5940	5840	6960	6860	8435	9610	9865	11940	12670	13750
Capacity at level	l	4565	4565	5475	5475	6615	7640	7955	9725	10470	11200
Exchange surface	m ²	40	47	58	65	73	91	109	127	143	176
Steam production ⁽¹⁾	kg/h	1700	2050	2560	3000	3410	4260	5100	6000	6800	8520
Electric supply	Volt ~	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400
Frequency	Hz	50	50	50	50	50	50	50	50	50	50
Electric protection rating	IP	55	55	55	55	55	55	55	55	55	55
Electric power ⁽²⁾	W	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
Allowed fuels		Methane - LPG - Diesel - Naphtha									
Total weight	kg	6800	7550	8950	10050	10950	12050	13650	15050	16600	19200

DESCRIPTION	u.m.	GX							
		6000	7000	8000	9000	10000	12000	13000	15000
Effective rated ⁽¹⁾	kW	6977	8140	9302	10465	11628	13953	15116	17441
Thermal capacity	kW	7752	9044	10335	11627	12920	15503	16795	19401
Efficiency at 100% (ref. P.C.I.) ⁽¹⁾	%	90	90	90	90,01	90	90	90	89,9
Flue gas outlet temperature (Air Rated Output 20°C)	°C (Gas)	244	244	244	243	244	244	244	246
	°C (Diesel fuel)	246	246	246	246	246	246	246	248
	°C (Naphtha)	245	245	245	245	245	245	245	247
Pressure drops on exhaust side	mbar	12	12	14	14	15	19	20	25
Rated pressure	bar	12/15	12/15	12/15	12/15	12/15	12/15	12/15	12/15
Total capacity	l	16530	20030	24700	28140	32000	37500	39000	39000
Capacity at level	l	13545	15970	19450	22060	24680	29250	30000	30000
Exchange surface	m ²	210	239	250	306	357	413	442	408
Steam production ⁽¹⁾	kg/h	10240	12000	13600	15300	17000	20000	22170	25000
Electric supply	Volt ~	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400	3/N~ 400
Frequency	Hz	50	50	50	50	50	50	50	50
Electric protection rating	IP	55	55	55	55	55	55	55	55
Electric power ⁽²⁾	W	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
Allowed fuels		Methane - LPG - Diesel - Naphtha							
Total weight	kg	21700	24700	28800	30800	37600	39200	41300	47000

⁽¹⁾ Water delivery: **80°C**

⁽²⁾ W.D.-See the wiring diagram supplied

Design data

Minimum/maximum temperature:(12 bar): **-10°C / 191,7 °C**

Minimum/maximum temperature:(15 bar): **-10°C / 200,4 °C**

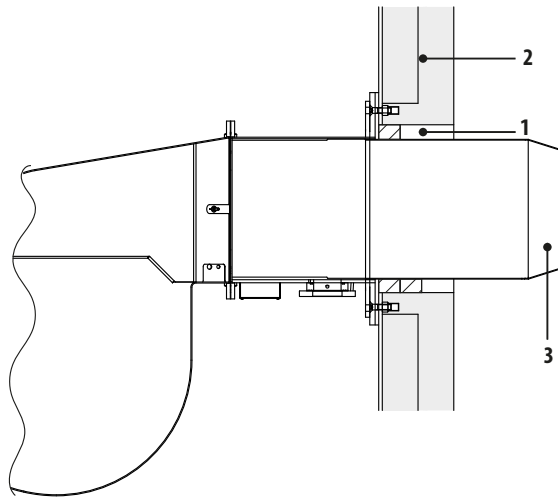
BURNERS

The burners that can be installed on the **GX** boilers must be CE marked according to European Directives:

- Gas Directive 2009/142/EC
- Electromagnetic Compatibility Directive 2014/30/EU
- Low Voltage Directive 2014/35/EU
- Machinery Directive 2006/42/EC (for liquid fuel burners)

Since the optimal operation of the steam generator depends on the correct choice of burner and its adjustment, below are some points to consider:

- The working range of the burner must include the operating point of the steam generator (flow rate-back pressure in combustion chamber considering also the possible resistance/draught of the smoke duct)
- the length of the combustion head must be adequate to the penetration into the combustion chamber provided by ICI and shown in the table
- The burner manufacturers have this information as they are required by certification



- (1) Gap
- (2) Door
- (3) Mouthpiece



IMPORTANT

The gap between the mouthpiece and door must be filled with flame-resistant thermoceramic material.

PAPERWORK

These generators, supplied in single-block, are CE marked according to the Directive 2014/68/EU "PED".

The documentation supplied with the generator is:

- declaration of conformity of the whole
- use and maintenance manual (always housed in the electrical panel)
- safety valve certificate, declaration of conformity, use and maintenance manual
- feed pump characteristic curve
- Machinery Directive 2006/42/EC (for liquid fuel burners)
- wiring diagram (always housed in the electrical panel).



USER OBLIGATIONS

Check which pressure equipment commissioning and use regulations are in force in the country of use.

FIRE PREVENTION

Refer to the Regulations in force in the Unit Installation Country.

COMPONENTS

The **GX** steam generators are equipped with a set of components that can be divided into:

- Safety components (safety valves, safety level switches, safety pressure switch).
- Indicator components (level indicator, pressure gauge, flame warning light).
- Adjustment components (level regulators, pressure switches, pressure transmitters).
- Supply components (centrifugal pump).
- Operating components (shut-off valves, drain valve).

In the following descriptions, the accessories are divided according to the physical quantity they control (pressure and level).

PRESSURE

PRESSURE GAUGE

The pressure gauge is of Bourdon type and it consists of a very flat arch-shaped elliptical metal tube and shows the design pressure on the graduated scale (marked in red). One of the ends is open and it communicates with the inside of the generator whose pressure is to be measured; the other end, closed and free to move, is connected to the index by a toothed sector lever system. The pressure gauge is mounted on a three-way valve that allows performing the following operations:

- Communication between generator and pressure gauge (normal operating position).
- Communication between pressure gauge and the outside (position needed to purge the siphon).
- Communication between generator, pressure gauge and sample pressure gauge (position needed for pressure gauge comparison).

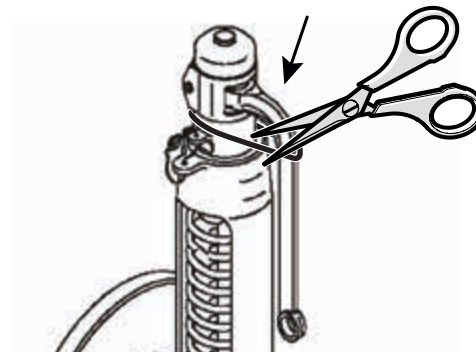
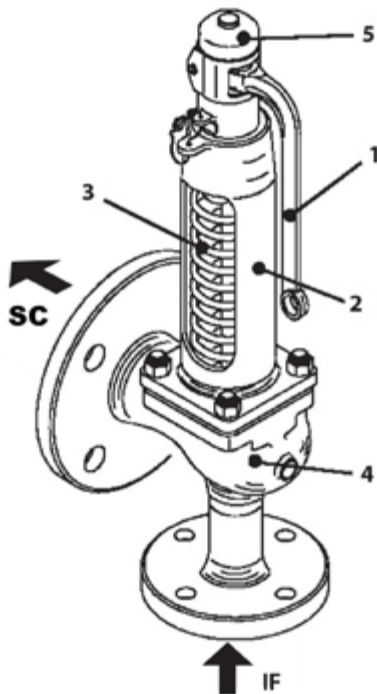
SAFETY VALVES

The safety valves are able to maintain the pressure in the generator to the design pressure (save temporary peaks of 10% max of the max PS of the whole) even if all other pressure control devices (pressure switches and transmitters) are out of use.

These valves are regulated by specific national and international standards, therefore they are sized, tested, installed and maintained in compliance with the applicable regulations and the contents of this manual.

The **use and maintenance manual** is supplied with the safety valves.

The main components of the safety valve are:



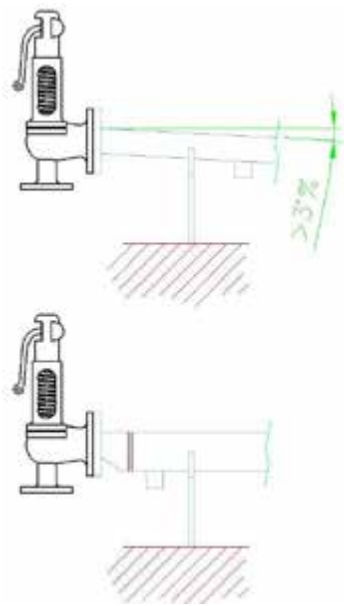
- 1 Lifting lever
- 2 Hat
- 3 Spring
- 4 Valve body
- 5 Cap
- SC Drain
- IF Fluid inlet



IMPORTANT

Before starting the generator, remove the steel wire that blocks the lever during transport. Make sure that the lifting lever is free to move.

In case of conveyed drain, bracket the conveying pipe to compensate the reaction force generated when the fluid is drained. Make one or more draining holes in the conveying pipe to drain any condensate. Drain must take place in the atmosphere, direct the valve so as not to harm people or damage property.



Interception valves must not be provided.

The exhaust pipe must be designed in such a way that any low temperatures do not create ice that obstructs the outlet.

N.B.: Bracket at no more than 1 m away

Typical suggested scheme



IMPORTANT

The operation of the safety valves is sensitive to pressure losses that occur in the drain conveying pipe during their opening. The pressure losses in the drain conveying pipe of the safety valves must be 0. The nominal diameter of the exhaust pipe must be greater than or equal to the size of the safety valve outlet connection. A diameter ≥ 1.5 DN (PSV) is suggested.

VALVE MAINTENANCE

The valve is a very delicate mechanism, so the system operator must check its efficiency. If necessary, contact a technician authorised by the manufacturer.

It is good practice for the safety valves installed to protect the plant:

- to be operated (once a week) with system pressurised, by activating the manual lifting lever of the shutter
- to have their calibration checked once a year, directly on the system or with bench test
- to be subjected to overhaul every two years
- to be replaced after ten years of operation



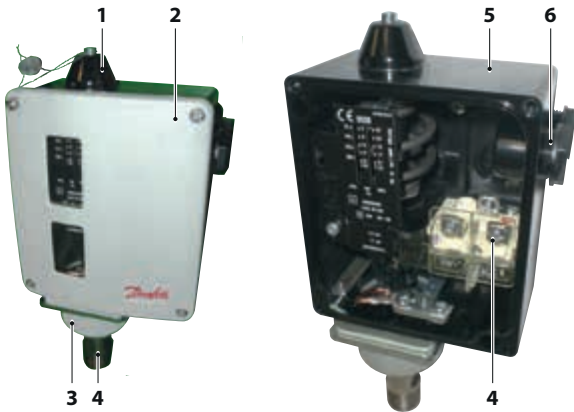
IMPORTANT

The safety valves are designed and built to operate without lubricant; simply keep them clean and efficient. Always refer to the specific manual.

SAFETY PRESSURE SWITCH

The pressure switch is equipped with a single-pole switch, of which the position of the contact depends on the pressure on the relevant connection and on the value set. It is calibrated at a higher pressure compared to the maximum one of the pressure transmitter, but always lower than the opening pressure of the safety valve.

The safety pressure switch intervenes in case of steam pressure regulator failure (adjustment pressure switch or pressure transmitter) and permanently stops the burner.



- 1 Sealed anti-tampering cap
- 2 Polyamide cover
- 3 Stainless steel bellows
- 4 Pressure connection G 1/2 A
- 5 Protection class IP 66
- 6 2 x PG 13.5 cable diameter 6 - 14 mm
- 7 SPDT interchangeable contact system

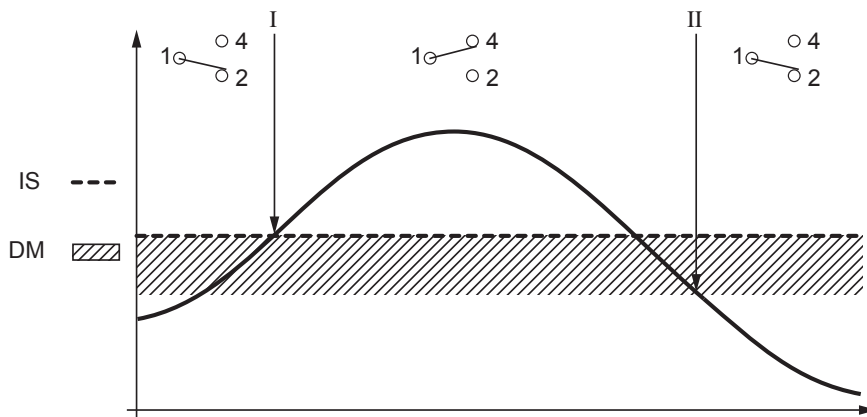


IMPORTANT

The safety pressure switch is calibrated and sealed during generator construction.

Operation

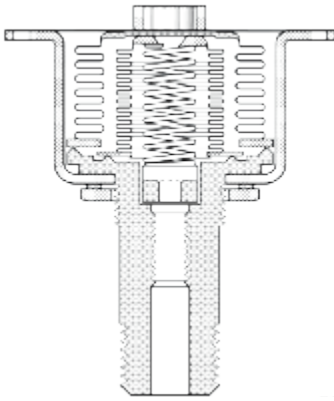
When the pressure exceeds the set value, contacts 1-4 close and contacts 1-2 open. Contacts go back to their initial position when the pressure drops below the set value, minus the differential value (fixed at 1.2 bar).



- I** Alarm triggered by the increase of the pressure above the set value.
- II** Alarm triggered by the decrease of the pressure below the set value, minus the differential value.
- IS** Scale setting.
- DM** Mechanical differential.

Intrinsic safety operation for increasing pressure

The figure shows a section of the intrinsic safety bellows for increasing pressure.



When pressure increases, the contact lever interrupts the connection between terminals 1 and 2. Should the internal bellows pierce, the pressure will be sent to the external bellows. The external bellows surface is three times higher than the one of the internal bellows. The connection between terminals 1 and 2 is interrupted. Should the external bellows pierce, atmospheric pressure will be present between the two bellows. The contact system interrupts the connection between terminals 1 and 2. Thanks to the double bellows structure, in case of breakage, fluid will not leak into the environment.

OPERATING PRESSURE SWITCH (2 for EXP version; 1 for IT version)

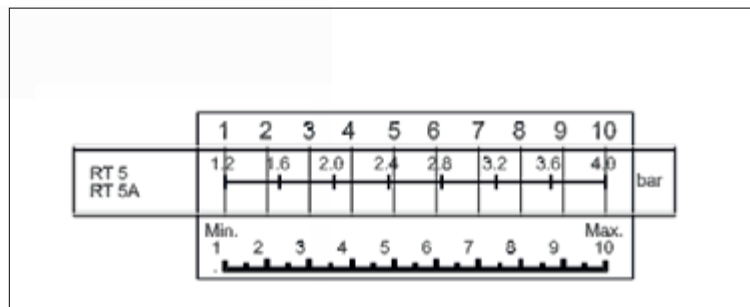
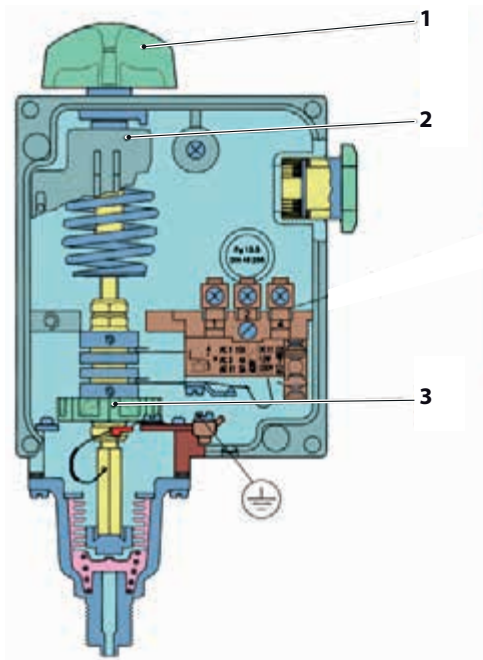
Device that controls the generator pressure and keeps it within the preset value.

Instructions for calibration

The electric switch has three screws (1-2-4 from left to right). Upon reaching the set pressure the contact 1-2 is switched into contact 1-4.

Pressure switch calibration

- For pressure switches with AUTOMATIC reset: Set the cut-in pressure on the RANGE scale and the differential on the DIFF scale, The restart pressure is the same as the cut-in pressure, less the preset differential value.
- for Automatic pressure switches with MANUAL reset or lock pressure switches at maximum pressure: Set the cut-in pressure on the RANGE scale, the block pressure switch can only be manually reset by pressing the reset button with a screwdriver when the pressure drops below or is equal to the cut-in pressure less the differential value.



Scale of the differential regulation disc

Example
 Pressure switch type: RT 5
 Scale index: 9 bar
 Drum index: 4 corresponding to 2.1 bar
 Burner start: 9 bar
 Burner stop: 11.1 bar

LEVEL

LEVEL INDICATOR

The level indicator consists of a pair of valves connected to a reflecting box containing a prismatic glass. This appliance is connected to the generator above and below the normal water level, while at the lower end it is equipped with a purge valve to evacuate the sludge and keep the glass clean.

With these valves you can periodically test the efficiency of the level control system by performing the following operations. Open the purge valve for a few seconds and close it again.

If the water disappears and then quickly returns to the starting point with large swings, it can be assumed that the level works well. Whereas, if the water slowly returns or stops at a different point from the previous, it means that one of the communications is obstructed; to ascertain which of the two and to try purging it, close the steam valve leaving the water valve open, then reopen the purge valve: water should come from here, taking with it any muddy deposits formed in the ducts.

When the water valve is closed, the steam valve opens and steam must come out from the purge.

By closing the purge valve and leaving the two steam and water side valves open, the water must return to the starting point. If this does not happen, clean the connecting ducts of the level indicator to the generator.

During commissioning, make sure that the vent and drain are closed. During operation the shut-off valves must be fully open.

To reduce the possible leaks, the indicators must be periodically insulated to check that the tightening torque of bolts is at least 30 Nm.

Do not proceed with maintenance without having firstly checked that:

- The generator pressure is equal to the atmospheric pressure.
- The indicator temperature is equal to the environment temperature.

Maintenance must be carried out when:

- The crystal loses part of its transparency, partially opaque, signs of internal roughness due to erosion or corrosion as it involves loss of geometry and reading becomes difficult.
- Minimal leaks from the gaskets or shut-off groups are also noticed.

AUTOMATIC LEVEL REGULATOR AND SAFETY LEVEL SWITCH

The detection and control principle of the level is based on the electrical conductivity of the water.

The following conditions must be met to ensure the proper operation of the level switch:

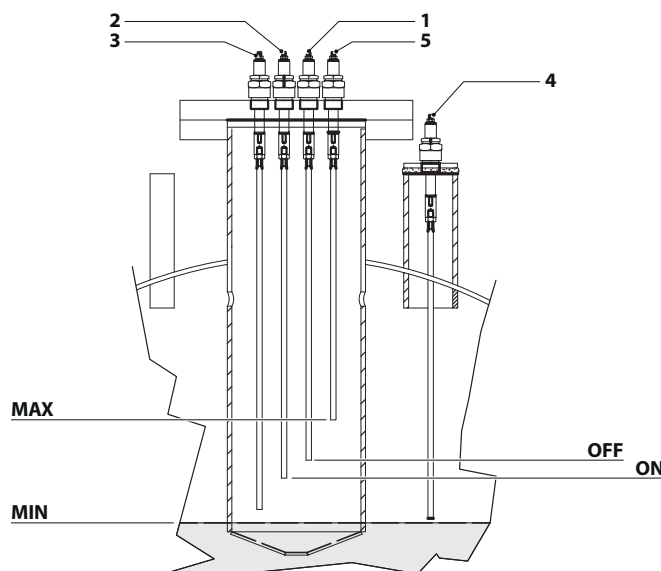
- Water conductivity: >250 $\mu\text{S}/\text{cm}$
- Generator temperature: <210°C
- Pressure: <20 bar

(See the "Operating water" paragraph).

The appliance consists of a part located in the control panel (electronic relays) and probes of different length immersed in the generator body.

The operation includes:

- **Automatic start and stop of the pump:** it is managed with two probes inserted in the generator, one longer (2) to start the pump and one shorter (1) to stop it, connected to a single adjustment relay in the control panel
- **Burner stop for low level:** it is managed with two probes (3 and 4) of the same length, inserted in the generator and connected to two separate adjustment relays in the control panel. They generate a burner stop if the water level drops below the minimum limit allowed.



Probes in the generator:

- 1 Pump stop
- 2 Pump start
- 3 1st minimum level safety (burner lock and alarm insertion)
- 4 2nd minimum level safety (burner lock and alarm insertion)
- 5 Maximum level

N.B.: In addition to the ringing of the alarm in the installation room, it is advisable to add an acoustic or visual signal in a regularly attended place.

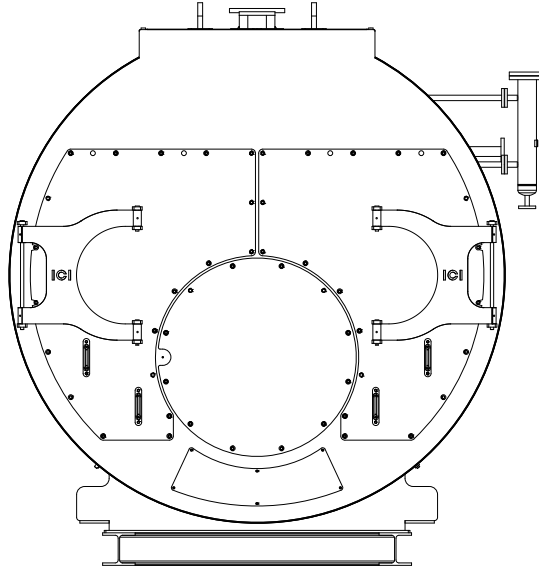
2 Installation

PRODUCT RECEIPT

The **GX** generators are supplied complete with accessories.

The control panel contains the following documentation:

- declaration of conformity
- use and maintenance manual
- safety valve certificate, with declaration of conformity and use and maintenance manual
- feed pump characteristic curve
- electrical diagram



IMPORTANT

The instruction manual is an integral part of the appliance and so **MUST** be carefully read before installing and commissioning the generator, carefully stored for future consultation and **MUST** always accompany the appliance.

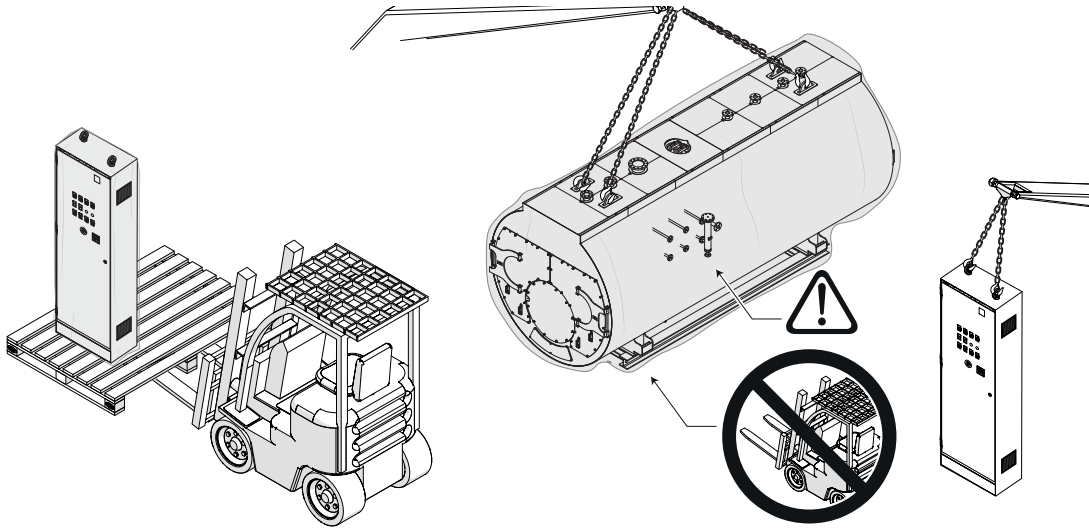
HANDLING



ATTENTION

Pay the utmost care during handling and use the Personal Protective Equipment requested by the prevailing regulations.

The **GX** steam generator must be handled using means adequate to the size and weight of the appliance, using the provided lifting eyebolts.

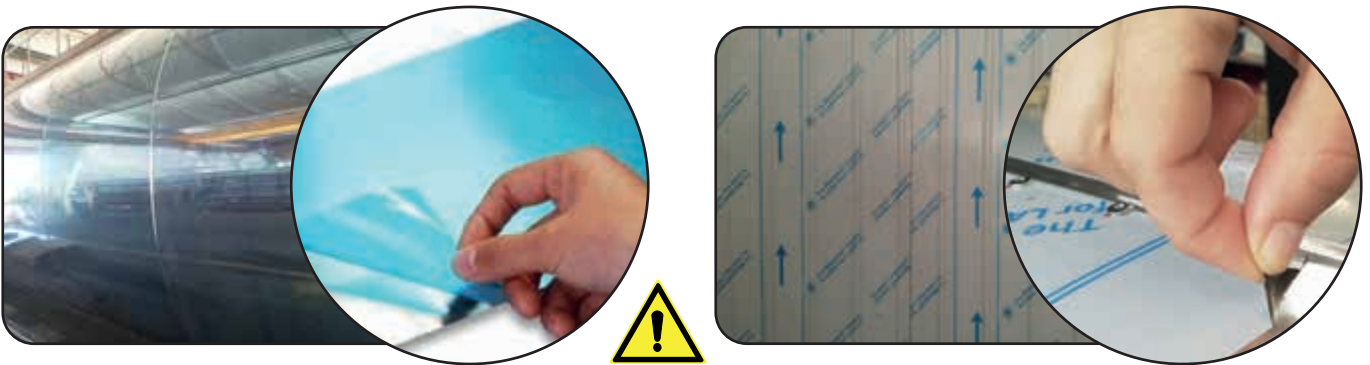


ATTENTION

– Do not expose the packed product to direct sunlight.

FILM REMOVAL

The boilers can feature the following types of protective films:



ATTENTION

Remove the **PROTECTIVE FILM**, if any:

- After handling and after having installed all components.
- **BEFORE STARTING THE BOILER**. The generated heat makes it impossible to remove the film.
- The film exposure to direct sunlight makes it impossible to remove it.

INSTALLATION ROOM

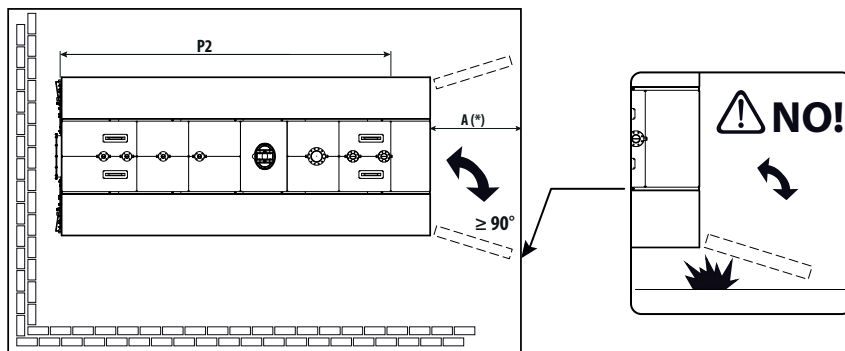
POSITIONING

The **GX** boiler installation room must be for exclusive use, meet the Technical Standards and Legislation in force and equipped with adequately sized ventilation openings.

It is recommended to position the boiler, if possible, lifted from the floor to minimise dust extraction by the burner fan.

For information only, below is some useful information:

- the room must have a main entrance for the passage of the boiler and two doors with panic push-bars for the passage of the personnel. It must also feature a suitable fire protection system
- the support base of the generator must be flat and able to withstand the weight of the appliance full of water, complete with accessories and pipes for the possible execution of the on-site hydraulic test
- it must be equipped with ventilation openings created as established by the relevant Technical Standards
- the room must be exclusively used by the personnel in charge of the activities on the generating system. **The access prohibition to unauthorised people must be duly signalled**
- consider the possible the need to replace components that fail over time
- special buffer zones, duly sized in order to allow the operators to carry out the operating, check and maintenance operations of all the installed components in full safety and in compliance with the **Legislation in force in the place of installation**, must be arranged around the boiler
- the boiler can be installed inside an outdoor prefabricated heating plant room, compatibly with the dimensions of the supplied boiler model, and in compliance with the Legislation in force in the place of installation. **COMPULSORY request upon order placing.**



(*) $A \geq P2$ (see "Size and fittings")



IMPORTANT

- A space is necessary at the front of the generator, at least equal to the length of the tube bundle to allow the extraction of the turbulators to clean the pipes and possibly replace the smoke pipes.
- All generator, safety valves discharges, etc., must be suitably conveyed to inspectionable collection points.



ATTENTION

- Consider the spaces necessary to access the adjustment and safety devices and to perform maintenance.
- If the burner is fed with gas of specific weight greater than that of the air, the electrical parts must be positioned at least 500 mm from the ground.

ROOM VENTILATION

The installation room must be equipped with a ventilation system according to the current legislation.

For the dimensions of the openings, always refer to the current legislation.

The ventilation openings are used to allow the inflow of combustion air and to eliminate any fuel gas pockets from the room.

Indicatively, if gases lighter than air (methane) are used, the ventilation openings must be placed at the highest point of the room; vice-versa, for fuel gas heavier than air (lpg), the ventilation openings must be placed flush with the floor.

SYSTEM CLEANING

All system pipes, especially those already installed, must be carefully cleaned and/or washed, to eliminate processing residues and any sludge. The gaskets interposed in the joints must not reduce the pipe section.

HYDRAULIC CONNECTIONS

Once positioned, the steam generator bodies must be connected to the system in the following points:

- **Water;** From the condensate collection tank (if present, otherwise from the purified water collection)
- **Steam;** From the main steam inlet valve to the uses (distribution manifold or others), from the safety valves outlet to outside the room, in a safe position.
- **Drains;** From the level indicator discharge, from the boiler discharge to the drain mains.
- **Fuels;** Connection to burner provided for methane gas, lpg, diesel and naphtha.
- **Compressed air;** The air pressure must be between 4 and 10 bar.



IMPORTANT

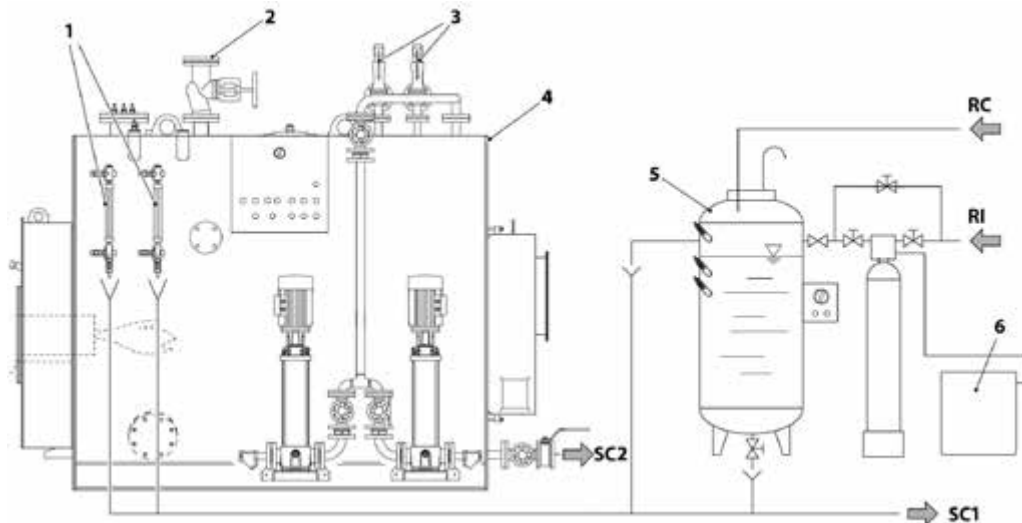
We recommend insulating the system pipes to avoid heat dispersion and greater fuel consumption. Make sure that the drains of the generator safety valves have been connected to a drain well in order to avoid that, in case of intervention, the rooms are flooded. Make sure that the water and heating system pipes are not used as earthing point of the electrical system. The air must be filtered with 25 µm mesh.



IMPORTANT

ICI CALDAIE S.p.A. is not liable for any harm to people, animals or property damage caused by errors in the choice of components or in the construction of the plant.

STARTING HYDRAULIC CIRCUIT



- 1 Visual level indicator
- 2 Steam inlet
- 3 Safety valve

- 4 Steam generator
- 5 Condensate tank
- 6 Feed water purifier

- RC Condensate return
- RI Water mains
- SC Drains

FLUE EXHAUST

The main chimney features, such as height, section, type of outlet in the atmosphere, control points, smoke mass, must be established by a company specialised in the sector that will operate according to the applicable Standards and Legislation. The connection between chimney and generator (smoke duct) must be made according to the specific plant requirements.



IMPORTANT

The diameter of the connection between chimney and generator (smoke duct) must not be less than that shown in the "DIMENSIONS AND CONNECTIONS" table (ØC value).

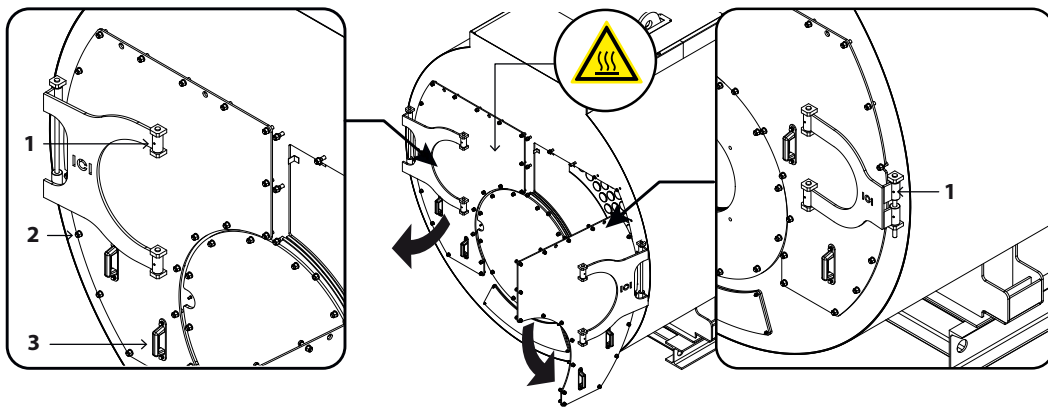
FRONT DOOR OPENING

- Loosen the retaining screws (1) located on the hinges of door arms.
- Remove the bolts retaining the doors (2)
- Open the doors using the handles (3)



IMPORTANT

Retaining screws (1) reduce vibrations. When closing the doors, tighten again the retaining screws (1).



NOTE

Check the correct adjustment of tie-rods and hinges, making sure that, during the closing phase, the seal is evenly pressed along the whole middle section of the circumference.

BURNER ASSEMBLY

Having chosen the burner to be used, refer to the Manual supplied with it for information about:

- the installation and fastening to the boiler
- the connection to the fuel supply
- the electrical connections
- the adjustments to be made
- maintenance
- the necessary checks.



IMPORTANT

The diameter of the front door plate hole has been specially dimensioned according to the features of the chosen burner.

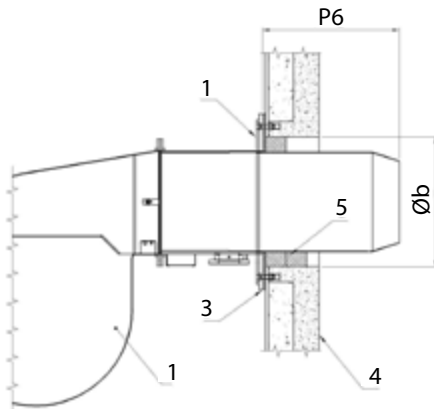
The space between gap and nosepiece is minimal.

THEMAL CERAMIC INSULATING MATERIAL (SUPPLIED AS STANDARD)

The strip of ceramic insulating material supplied as standard with the generator must be wrapped around the nosepiece for at least one full turn in order to protect the burner flange from the flame.

It is not necessary that the ceramic insulation material fills the gap up to the door insulation inner surface.

If the material supplied is not suitable for the burner used, use another material that can also resist to 1000°C and whose size is appropriate to fully close the gap.

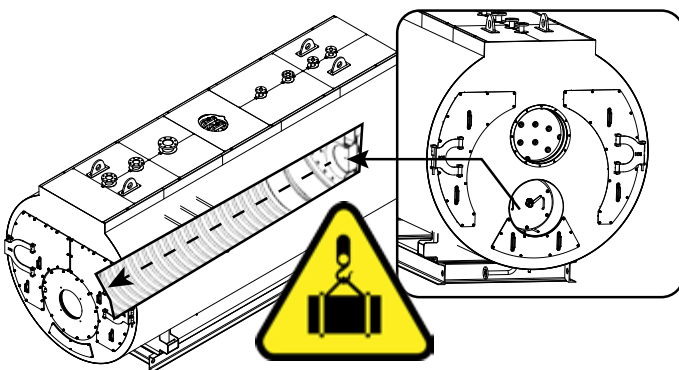


- 1 Burner
- 2 Flange
- 3 Gasket
- 4 Door
- 5 Thermoceramic material

ACCESSING THE BURNER NOSEPIECE

If the insulation of the burner nosepiece from the front gable side is difficult, proceed as follows.

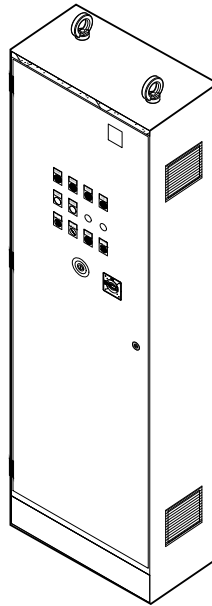
The nosepiece can be accessed by removing the boiler rear buffer, always in compliance with the **Safety Standards in force in the Country of Installation.**



Example of a lifting system

ELECTRICAL CONNECTIONS

The generators are equipped with electrical panel (IP 55 protection rating) complete with all connections to the various generator components, already made in the factory. The panel model is determined by the version of the ordered generator and the wiring diagram, specific and detailed, is present inside the panel. The installer connections must be made by professionally qualified personnel, in compliance with the applicable Technical Standards and the local and national Legislation.



IMPORTANT

Connect the generator to an efficient earthing system. **ICI CALDAIE S.p.A.** is not liable for any damage caused by the lack of earthing and failure to comply with the wiring diagram.



PROHIBITION

Do not use the water and heating system pipes for the **earthing connections**.

LOADING AND SUPPLY OF THE GENERATOR/SYSTEM

The steam generator is fed with a multistage centrifugal pump. The water must reach the pump intake with a certain head in order to avoid cavitation.

The minimum temperature of the sucked water must be greater than 60°C; this favours the elimination of oxygen which, in any case, must be completely eliminated with suitable chemicals. Also, a water temperature > 60°C reduces the risk of thermal shock in the boiler.

The feed tank must be positioned at a height that depends on the temperature of the water in the degasser/feed tank, on the conformation of the degasser/pump-feed tank connection pipe and on the features of the pump itself (refer to the pump manual).



ATTENTION

- The oxygen dissolved in the water corrodes the boiler. Refer to the maximum allowed values indicated in the relevant section of the technical manual.
- Follow the table below to avoid pump cavitation problems.

DEGASSER TYPE	Water supply temperature (°C)	Head on the intake (metres)
Atmospheric degasser	60	1
	70	2
	80	3
	90	4,5
0.5 bar pressurised thermo-physical degasser	105	6
Pressurised thermophysical deaerator (3 bar)	120 ^[1]	7

^[1] Maximum pump suction temperature is 120°C.

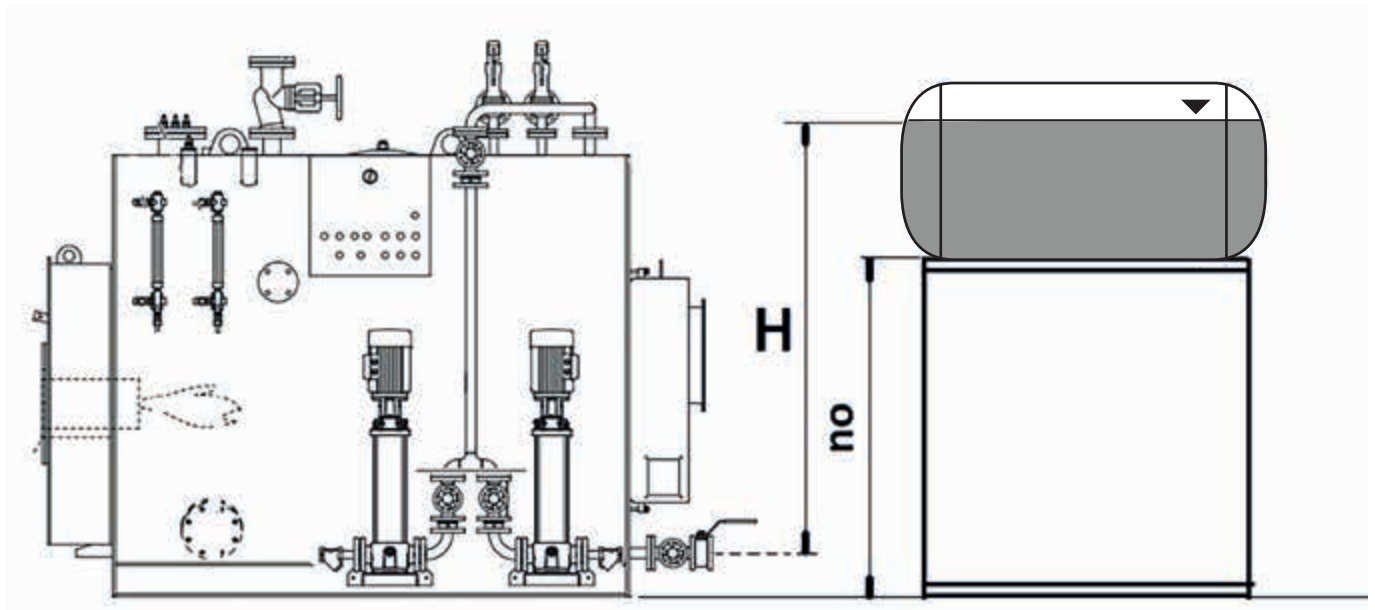


IMPORTANT

- Avoid using feed water at a temperature below 60°C because rich of dissolved oxygen, thus such to cause corrosion.

HYDROSTATIC HEAD DIAGRAM

Below is an example of hydrostatic head diagram.



WATER CHARACTERISTICS

The values in the following tables are extracted from tables 5.1 and 5.2 in EN 12953-10 (requirements concerning the quality of water supply and the water in the generator).

Even for generators that are not covered by the aforementioned provision it is however necessary to adopt at least the indicated limits and however, to refer to the specialised companies that manage selecting the type of treatment to be carried out on the basis of a thorough analysis of the water available.

5.1 Water supply - Threshold values (in input)

CHARACTERISTICS	u.m.	Steam generator water with pressure up to 20 bar
Appearance		Clear, limpid, without foam or suspended solids
Direct conductivity at 25°C	µS/cm	See table values "Operating water - threshold values"
pH at 25°C (°)	---	> 9,2 ^[b]
Total hardness (Ca+Mg)	mmol/l	< 0,01 ^[c]
Iron (Fe)	mg/l	< 0,3
Copper (Cu)	mg/l	< 0,05
Silica (SiO ₂)	mg/l	See the "Maximum acceptable silica content in the generator water up to 20 bar pressures" table
Oxygen (O ₂)	mg/l	< 0,05 ^[d]
Oily substances	mg/l	< 1
Concentration of organic substances	-	See note ^[e]

^[a] With copper alloys in the system the pH value must be kept within 8.7 and 9.2.

^[b] With a softened water pH value > 7.0, the pH of the generator water should be provided according to table 5.2.

^[c] At operating pressure <1 bar, a maximum total hardness of 0.05 mmol/l must be acceptable.

^[d] Instead of respecting this value with intermittent operation or operation without deaerator, in case of agents forming the film and/or excess of oxygen, the additive must be used.

^[e] Organic substances are generally a mixture of various different compounds. The composition of such mixtures and the behaviour of their individual components under the steam generator operating conditions, are difficult to predict. Organic substances can be decomposed to form carbonic acid or other acid decomposition products that increase acid conductivity and cause corrosion and deposits. They can also lead to the formation of foam and/or production of steam with suspended water, that must be kept as low as possible.

Maximum acceptable silica content in the generator water up to 20 bar pressures

Alkalinity	Silica
0,5 mmol/l	80 mg/l
5 mmol/l	105 mg/l
10 mmol/l	135 mg/l
15 mmol/l	160 mg/l

NOTE

These values are valid assuming the presence of a thermal deaerator. In the absence of the deaerator, it is appropriate, however, to raise the temperature of the water contained in the tank to at least 80°C to reduce the content of dissolved gas (O₂ and CO₂). It is, in any case, appropriate to use chemical conditioning to de-oxygenate the water supply completely and to minimise the corrosive CO₂ effects.

5.2 Operating water - threshold values

CHARACTERISTICS	u.m.	Steam generator water with pressure up to 20 bar	
		Direct conductivity of the supply water > 30 µS/cm	Direct conductivity of the supply water ≤30 µS/cm
Appearance		Clear, limpid, without foam or suspended solids	
Direct conductivity at 25°C	µS/cm	< 6000 ^[a]	< 1500
pH at 25°C	---	10,5 - 12	10 - 11 ^[b] ^[c]
Composite alkalinity	mmol/l	1 - 15 ^[a]	0,1 - 1 ^[c]
Silica (SiO ₂)	mg/l	See the previous table "Maximum acceptable silica content in the boiler generator water up to 20 bar pressures"	
Phosphates (PO ₄) ^[e]	mg/l	10 - 30	6 - 15
Organic substances	-	See note ^[d]	

^[a] With a superheater consider as maximum value 50% of the value indicated as maximum.

^[b] Basic pH adjustment by injecting NaPO₄, further injection of NaOH only if the pH value is < 10.

^[c] If the acid conductivity of the generator feed water is < 0.2 µS/cm, and its concentration of Na + K is <0.01 mg/l, the injection of phosphate is not required. It can be applied under AVT conditions (treatment with volatile chemicals, feed water pH ≥ 9.2 and generator water pH ≥ 8), in this case the conductivity of the generator water is < 5 µS/cm.

^[d] If treatment with coordinated phosphate is used, considering all other values, higher concentrations of PO₄ are acceptable.

^[e] Organic substances are generally a mixture of various different compounds. The composition of such mixtures and the behaviour of their individual components under the generator operating conditions, are difficult to predict. Organic substances can be decomposed to form carbonic acid or other acid decomposition products that increase acid conductivity and cause corrosion and deposits. They can also lead to the formation of foam and/or production of steam with suspended water, that must be kept as low as possible.

FREQUENCY OF ANALYSIS

The frequency of the analysis must be carried out according to the table in the periodic verifications paragraph. However, it is advisable to check the pH value, the total hardness and the alkalinity of the feed and operating water. It is good practice, especially under variable operating conditions, to monthly submit a significant sample of the feed and operating waters for complete analysis. It is also good practice to visually check the condensate returns for any highly polluting oily substances (reduction of evaporation on the surface of generator water due to a layer of oil).

3 Use

PRELIMINARY CHECKS



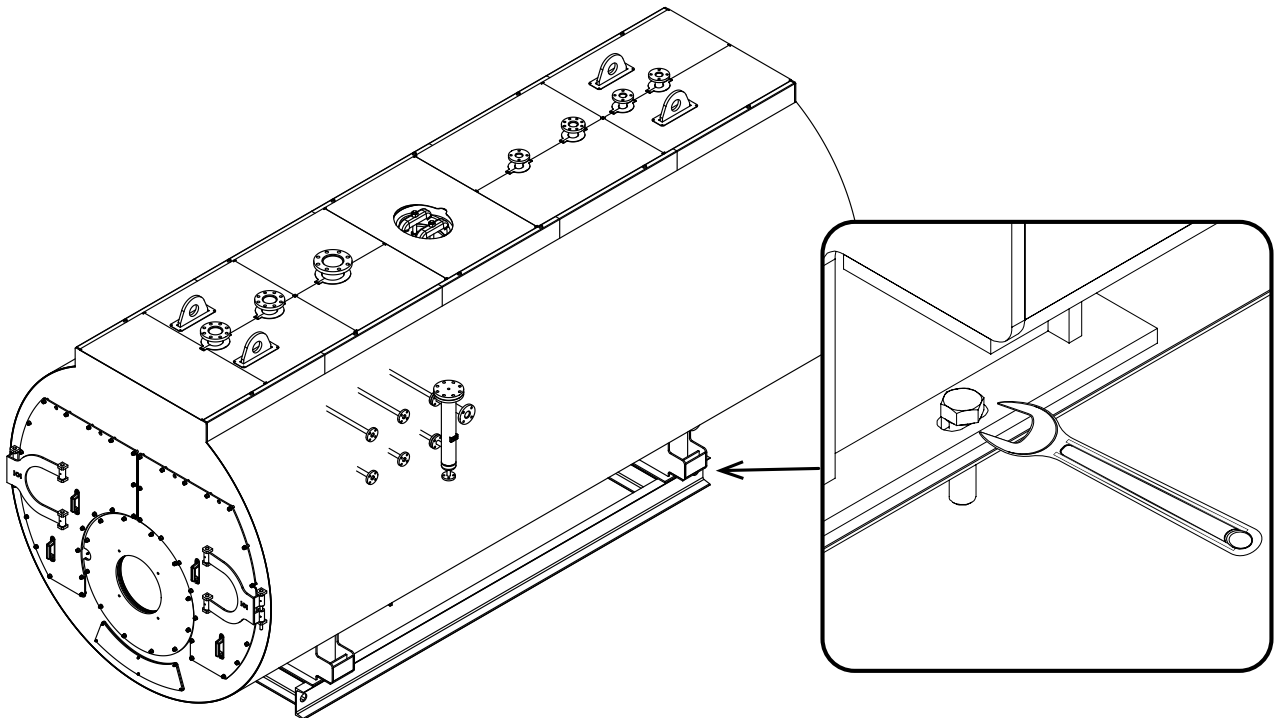
IMPORTANT

- Before starting the steam generator, it is advisable to perform "**Alkaline boiling**" with subsequent passivation, to remove any processing residues. Considering the high risk deriving from incorrect chemical treatments, the operations must be carried out by **professionally qualified personnel**.
- Before start-up, open the door and insert the turbulators completely inside the front ends of the smoke pipes, taking care to push them inside by at least 100 mm.

- Check that all connections are fully tightened
- Check that the feed water pipe is clean, repeatedly washing it before final filling
- Close the drain valve, steam inlet and level indicator discharge
- Open the level and supply shut-off valves (upstream and downstream of the water pump)
- Check that the door closes properly
- Verify the presence and condition of all control and safety accessories supplied with the generator.

THERMAL EXPANSION

- Loosen the rear saddle retaining bolts after having positioned the generator and always before start-up, in order to allow for thermal expansions during operation.



COMMISSIONING

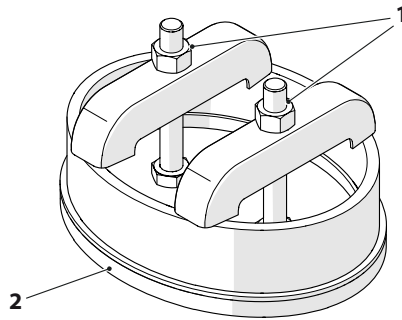
To start the steam generator:

- place the main switch at "**ON**" and electrically power the control panel
- electrically power the pump, briefly activating the selector, and check that:
 - the rotor rotates freely
 - the rotation direction should be correct (indicated in the rear side of the motor)
- place the pump selector at "**AUT**" and check that there is no consent to start the burner before the water has reached the minimum level
- check that the pump stops when the water reaches the maximum level visible in the glass indicator
- press, for at least 10 seconds, the reset button of the water safety level to activate the delayed type conductivity relay
- open the generator drain and check on the level indicator at which point the probe intervenes to start the pump
- position the pump selector at "**0**" leaving the generator drain open and check the level of intervention of the safety probes with reference to the minimum level plate
- close the generator drain and position the pump selector at "**AUT**"
- electrically power the burner, pressurise the generator and adjust the pressure value.



ATTENTION

- On the boilers equipped with manhole, during the first start-up, it is essential to progressively tighten the two nuts (1) of the hatch while pressure increases. Otherwise, the installation area may become dangerous for the operators in charge, due to steam seeping through and deteriorating gasket (2) rapidly.
- Check the intervention of all safety and adjustment accessories described in the relevant chapter.



CHECKS AFTER COMMISSIONING

With cold start, check that:

- the generator is filled with water up to the minimum level
- the volume increase due to heating (thermal expansion of the water) does not excessively increase the level making draining necessary at regular intervals to bring the level back to half scale of the glass indicator
- once the set pressure is reached, the steam outlet valve must be gradually opened in order to heat the delivery pipe, eliminating any condensation in the ducts
- the manhole gasket seals.

MANDATORY PERIODIC VERIFICATIONS

WATER MONITORING

The operator of the system in the installation room must frequently check the glass indicator so as that the water level in the generator remains above the minimum value indicated in the glass level. A possible drop below the minimum value must cause the intervention of the two safety level switches.

PRESSURE MONITORING

The operator of the system in the installation room must frequently verify that the pressure of the generator steam remains below the maximum value indicated on the generator assembly plate; a possible abnormal increase of the pressure must cause, at first, the intervention of the safety pressure switch, then the opening of the safety valves.

STOP PERIODS

The most serious corrossions for the generator often occur during the stop periods.

The operations to be carried out to store the generator correctly essentially depend on the duration of the downtime. When the generator needs to be stopped **for long periods, dry storage** can be done. When the stops are **for short periods** or when the generator is used as a spare and must start running in a short amount of time, a **wet storage** can be made.

In both cases, the operations described below tend to eliminate any possible cause of corrosion.

When possible, wet storage reduces the time required to reach the operating conditions.

Dry storage

It is necessary to empty and dry the generator carefully, subsequently pouring a hygroscopic substance inside the cylindrical body (e.g. quick lime, silica gel, etc.).

Wet storage

Drain the water out and clean the entire generator. Fill the unit up to the normal operating level, and after a brief period of evaporation it is essential to vent all the dissolved gases into the atmosphere. Then, completely fill the generator, using enough DEHA (diethyl hydroxyl amine) to develop a residual concentration of more than 100 ppm, to prevent the attacks of oxygen dissolved in the water. Also add trisodium phosphate, so that the overall alkalinity is greater than 400 ppm.

Then, close all the connections.

Make sure there are no leaks from the connections or joints and draw samples of water at regular intervals, to check that the alkalinity value has not been altered.

4 Maintenance

Periodic maintenance is an obligation required by the safety Legislation and duration of the appliance, and it must only be entrusted to professionally qualified personnel.

The frequency of the operations is shown in the specific paragraph.



IMPORTANT

Before performing any maintenance or cleaning:

- disconnect the electrical power supply by placing the main switch of the system, of the control panel and of the burner, if any, at "OFF"
- close the fuel supply
- use all Personal Protective Equipment required by current Standards and Legislation
- wait for the generator and the system to cool down.

- Periodically purge (level indicators, probe support, if any, generator) to avoid the build-up of sludge
- check the efficiency of the control and adjustment instruments by carefully examining the electrical parts, the connections and the mechanical parts (pressure switches); **it is recommended to replace the probe ceramic spark plugs annually**
- carry out burner maintenance (according to the relative instructions)
- check the torque of the flange bolts and the state of the gaskets
- check the state of the internal coating of the doors
- clean the tube bundle and turbulators
- carry out proper pump maintenance (bearings, mechanical seal)
- check the wear of the drain valves, replace them if necessary.

PERIODIC VERIFICATIONS

The frequency of verifications is shown in the table. **It MUST be strictly observed.**

Observation and tests	6 hours	1 day	1 week	1 month	3 months	6 months	12 months
Safety valves		O				T(9)	
Level indicators		T(4)					
"TDS-BWD" Unloading devices (if present)		T(5)					
Shut-off valves		O				T(10)	
Water load control devices		O					
Low level protection devices (if present)	T(1)	O				T(15)	
High level protection devices (if present)				T(3)			
Temperature and pressure indicators		O					
High pressure protection devices		O	T(2)				T(15)
Protection devices, quality of water in generator (if present)		O		T(7)			
Protection devices, quality of supply water (if present)		O				T(11)	
Safety systems		O				T(12)	
Pressurised parts, piping, flanges, joints				O			
Temperature, pressure control devices		O				T(13)	
Load system, pumps/valves		O			T(8)		
Analysis of the water quality		T(6)					
Burner control (combustion)		O					T(14)

- O Observe the proper operation of the generator in all its parts.
 There must be no leakage from the safety valves.
 There must be no leakage from the shut-off valves, piping, flanges, joints, pressurised parts in general.
 Visually check, through the glass indicators, the correct water level. Check pump(s), modulating valve (if installed).
 Verify the correct display and adjustment of temperatures/pressures.
 Check for alarms from the protection devices.
 Verify the proper operation of the burner.

- T(1) Physical verification of the intervention of low level safety devices..
- T(2) Physical verification of the intervention of high pressure safety devices..
- T(3) Physical verification of the intervention of high level safety devices..
- T(4) Purge the level indicators.
- T(5) Manually verify, using the selectors on the panel front, the opening of the valves.
- T(6) Analysis of the water quality by taking a sample from the generator, check if it meets the specifications of EN12953-10 (see paragraph "Water characteristics").
- T(7) Analysis of the water quality by taking a sample from the generator and check it meets the indications of the TDS automatic control device.
- T(8) Carefully check the load system, correspondence of level in the glass indicators with the parameters described in this manual.
- T(9) Verification of safety valves by applying a sample pressure gauge to the generator, as reference of the exact intervention pressure. Verifications must be performed by qualified personnel.
- T(10) Check correct seal, grease, lubricate where necessary.
- T(11) Analysis of the water quality by taking a sample from the supply/treatment system, check if it meets the specifications of EN12953-10 (see paragraph "Water characteristics").
- T(12) Check the proper operation of all safety, electric and electronic circuits. Verifications must be performed by qualified personnel.
- T(13) Check the correct indications of the instrumentation with sample thermometers/pressure gauges. Verifications must be performed by qualified personnel.
- T(14) Check the burner, combustion control, safety devices. Verifications must be performed by qualified personnel.
- T(15) Bench check of the safety devices. Verifications must be performed by qualified personnel.



ATTENTION

The electronic level relays inside the electrical panel must be replaced after 8 years of operation as they have reached the end of their life-span.

METHODS FOR CHECKING THE SAFETY DEVICES

CHECKING OF THE MINIMUM LEVEL SAFETY LEVEL SWITCHES

Stand in front of the electrical panel, leave the steam outlet valve with removal regulator open, turn off the pump by putting the selector to "0", wait for the natural lowering of the generator water level. To speed up the operation act on the mud discharge valve.



IMPORTANT

The two safety devices must intervene when the water level reaches the "minimum" indicated on the side of the glass indicators. Otherwise, check the entire level switch consisting of:

- electronic level regulator; check it is intact and, if not, proceed with replacement
 - connection cable between electrical panel and probe; possible interruption and/or short circuit
 - level probe; check for possible breakage of the ceramic part and consequent loss of electrical insulation
 - level dipstick; possible scaling that prevents water-probe current pass or possible detachment of the dipstick.
- If the check is positive, place the pump command to "AUT".

CHECK THE MAXIMUM LEVEL SWITCH (IF ANY)

Position the pump selector located on the electrical panel in the MAN position and wait for the water level in the generator to rise. Check that the pump stops when the maximum point visible in the glass indicator has been reached.

CHECK OF THE SAFETY PRESSURE SWITCH

The safety pressure switch calibration must be at least 0.5 bar below the calibration of the safety valves. To check the correct intervention of the safety pressure switch, it is necessary to increase the calibration of the adjustment pressure switch(es) and ensure the switch-off of the burner and activation of the block on the boiler electrical panel by visually following the indication given by the pressure gauge.

ROUTINE MAINTENANCE

- Depending on the degree of pollution of the premises, clean the ventilation and/or the air conditioner (if present) filters and grilles frequently.
- Every 2-3 months check for dust deposits inside the panel, vacuum and/or blow to eliminate any deposits.
- Every six months check the clamping of the connections to the inner components, paying particular attention to the power circuits.
- Every six months check the clamping of the connections to the field control/safety devices, including any junction boxes.
- Annually check that the electrical panel, the generator and the control unit equipotential is properly connected to earth.
- Every six months check the condition of the safety devices (probes and pressure switches).
- Every six months check that the burner and pump(s) command circuits respect the original conditions (see the paragraph "").



IMPORTANT

In order to preserve the proper operation of the generator over time, we recommend requesting a half-yearly/yearly inspection by the Technical Assistance Service, for a general check of all parts.

EXTRAORDINARY MAINTENANCE

The generator must be stopped periodically for a thorough inspection and maintenance: the time interval between downtime is established through experience, by operating conditions, by the quality of the feed water, and by the type of fuel used.

Before accessing the boiler body for inspection or cleaning, carefully ensure that there is no possibility of water or steam getting into the generator through the ducts that it is connected to. Every valve must be shut and, if required, isolated by removing a section of connecting pipe to the system or by placing a blind flange in between.

The pressurised parts must be carefully examined internally to look for any build-up, corrosion and other potential sources of danger pertaining to the feed water.

It is necessary to remove the deposits through mechanical or chemical action and use suitable tools to ensure that the actual thickness of the internal parts is not affected by corrosion. Any pockmark or other type of corrosion must be scraped and cleaned with an iron brush until the metal is exposed. Leaks between all fume pipes and tube sheets must be examined carefully: any welding must comply with legal requirements, not forgetting that the steam generator is a pressure appliance with an explosion hazard, subject to control by the relative Body.

During the inspection, check all safety accessories (safety valve, safety level switches and safety pressure switches).

LEVEL SWITCH REPLACEMENT

To replace the safety level switch or part of it, strictly observe the following instructions:

- check that the ceramic part of the new level probe is intact
- check the rod length
- check the coaxiality of the rod with the level probe axis
- check the integrity of the electrical system, in particular check that the insulation resistance of the electrical cable that connects the probe to the panel is above 2 MΩ
- check the integrity of the probe with particular regard to the isolation between the central electrode and the external part, that must be \geq at 10 MΩ
- check the operation of the level switch, consisting of the assembly of the two ceramic probes and relative conductivity relays.



IMPORTANT

- The electronic level relays inside the electrical panel HAVE AN AVERAGE CALCULATED DURATION (MTTFd, "Mean Time To Failure") of 8 YEARS. It is an average time before a dangerous failure occurs. Therefore, they must be replaced after this operating period. We recommend replacing the probes once a year. To be evaluated, during cleaning/maintenance, the other mechanical, electromechanical and electronic parts.

- **The faulty components must be replaced with ICI CALDAIE S.p.A. original components.**

ANY ANOMALIES AND REMEDIES

ANOMALY	CAUSE	REMEDY
Safety valve(s) opening	Exceeding of the max pressure regulated on the valve that must be equal to the appliance design pressure	Adjustment of block pressure switches and/or limit too high
	Safety valve calibration loss	Check and subsequent calibration of the valve using a sample pressure gauge
Small leak from the safety valve(s) (leakage)	Dirt around the shutter seat	Cleaning of seat by sometimes acting on the manual opening lever
	Scratched shutter seat	Valve disassembly and polishing of the internal seat with very fine abrasive paste
Pump block	Disconnected pump thermal relay	Check motor absorption
	Blocked pump shaft	Check thermal calibration
Block pressure switch intervention	Calibrated limit pressure switch too high	Limit pressure switch calibration
	Faulty limit pressure switch	Limit pressure switch replacement
	Clogged pressure switch coil	Coil cleaning or replacement
	Block pressure switch failure	Pressure switch replacement
Level 1 or 2 safety intervention	Interrupted water level detection	Encrusted stainless steel rod
		Interrupted connection cable
	Faulty safety level relay	Temporary replacement of electronic safety relay with one of the two relays in the panel
		If the problem is solved, permanently replace the faulty relay.
Lack of water filling	See "Loading" Problems	
Incorrect electrical panel probe power supply electrical cable wiring	Wiring diagram check	
Insufficient water loading	Pump block	See "Pump block" Problems
	Dirty pump intake filter	Filter cleaning
	Level adjustment anomaly	Temporary replacement of electronic adjustment relay with one of the two relays in the panel.
		If the problem is solved, permanently replace the faulty relay.
	Level adjustment probes short-circuit	Disassemble the adjustment probes to visually check the ceramic insulation
	Pump cavitation	Head (=height difference between the collection vessel level and the pump) insufficient in relation to the water temperature
		Pump intake filter cleaning
Reduce resistance of the duct between collection vessel and pump by increasing the passage section		
Pump rotation direction	Invert one of the phases (three-phase pump)	
Burner always on	Incorrect connection to the electrical panel	See the wiring diagram
	Faulty level safety relays	See "Level 1 or 2 safety intervention"
	Block and/or adjustment pressure switches not active	Pressure switches calibration check
Check of pressure switch connections to the electrical panel		
Burner always off	Burner problems	See specific Burner manual
	Burner fuses interrupted	Fuses replacement
	No consent to burner from adjustment pressure switch	Adjustment pressure switch replacement
	No consent to burner from level safety relays	See "Level 1 or 2 safety intervention"
Incorrect connection to the electrical panel	See the wiring diagram	

PROTECTING THE ENVIRONMENT

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.

System for 24 or 72 h operation without continuous supervision.

DECOMMISSIONING AND DISPOSAL

Decommissioned appliances contain materials that can be recycled since they do not contain asbestos or non-reusable hazardous materials.

5 *Risk analysis*

EXCESSIVE STEAM PRESSURE

- Make sure the safety valves properly open at the design pressure.
- It is necessary to check the correct activation of the shut-off pressure switch that eliminates the cause of pressure increase by stopping the burner.
- The matching between the boiler maximum flow thermal and the actual burned maximum power must be checked.

ACCESSORY BREAKAGE

- Check the correct connection of the accessories to the boiler body (gasket seal check).
- Take special care during handling and installation.
- Periodically check the condition of the same accessories (exclusion of fractures).
- Once installation is completed, check safety valve correct activation through the special lever and/or the pressure increase above the calibration value.

OVERHEATING DUE TO LOW WATER LEVEL

- The correct operation of the safety level switch must be checked in accordance with the indications set forth in the technical manual.
- It is necessary to check that the operating water conductivity values are within those provided in the supplied technical manual.
- Make sure the water loading pump is working properly as described in the technical manual provided with the boiler (pump wear, hydrostatic head in suction, water supply temperature, pump connection/disconnection from the level control probes).

OVERHEATING DUE TO THERMAL INERTIA

- Position of water minimum level 100 mm above the highest point of the heated surface.
- Calculation ensuring that the evaporation caused by refractory material thermal inertia does not uncover the highest point of the heated surface.

OVERHEATING DUE TO SCALE BUILD-UPS

- Analyse water at the required frequency intervals, making sure that the values are within the limits specified in the technical manual and performing the suitable treatments.

WATER CONDUCTIVITY

- Water delivery has to be checked and kept within the limit values declared in the instruction manual and prescribed by EN 12953-10, according to a suitable treatment with filtering, softening and conditioning processes of the mains water (specified on the user's manual and under the user's responsibility).
- Carry out operational tests of the safety devices at the times and with methods specified in the manuals.

CAUSTIC EMBRITTLEMENT

- Carry out water analysis at the necessary time intervals (refer to user's manual).
- Perform water treatments in order to bring the characteristic values back within the limits specified in the use and maintenance manual.
- Blowdown by working on the drain valves present on boiler bottom.

CORROSION

- Carry out water analysis at the necessary time intervals (refer to user's manual).
- Perform water treatments in order to bring the characteristic values back within the limits specified in the use and maintenance manual.
- Keep water at a temperature above 60 °C to facilitate deoxygenation.

PRESENCE OF SLUDGE

- Carry out water analysis at the necessary time intervals (refer to user's manual).
- Perform water treatments in order to bring the characteristic values back within the limits specified in the use and maintenance manual.
- Blowdown by working on the drain valves present on boiler bottom.

EXTERNAL LOADS

- Boiler fittings shall not be considered as pipe supporting points (refer to the user's manual).
- It is good practice to allow for expansion joints and suitable supports for the pipes connecting the boiler to the system (refer to the user's manual).
- Generators are sized only for the loads resulting from pressure, temperature and type of contained fluid (refer to the user's manual).

POWER SUPPLY

- A mains voltage control device has been inserted inside the electric system (voltage asymmetry-phase presence-phase sequence).
- Make sure that the panel power supply complies with the indications given in the attached wiring diagram.

ELECTRIC PANEL ACCIDENTAL OPENING

- Door lock connected to main switch.
- Voltage adhesive label.
- Inner parts can be accessed using a special key available only to professionally qualified staff.

STRAY CURRENTS

- Make sure that no stray currents are present on the generator
- Make sure the generator is properly earthed.
- Check the plant's electrical system.

DOOR ACCIDENTAL OPENING

- Before opening the door, check that the burner is off and disconnected.

PUMP SHUT-OFF VALVE CLOSING

- Switch off the burner and the pump before closing the shut-off valve.
- Water minimum level has to be continuously monitored through the level indicator.

WATER SUCTION FILTER

- Pump suction filter must be cleaned at regular intervals.
- Water minimum level has to be continuously monitored through the level indicator.

HOT SURFACES

- Avoid contact with generator uninsulated parts during operation. Should adjustment or check activities be carried out during operation, the operators must wear suitable protective equipment (gloves, shoes and thermal coverall).
- Protection with suitable clothing (PPE in compliance with the prevailing laws).
- Insulation with glass wool or refractory materials in general of the parts that can come into contact with hot surfaces during standard use and maintenance conditions.
- Use of warning signs to be affixed on hot surfaces.

SHOCKS AND ACCIDENTAL FALLS

- Anti-slip embossed upper walk-on platform.
- Climb on or off the roof to carry out ordinary and extraordinary maintenance operations using a suitable ladder and anti-slip shoes.
- Pay attention to sharp edges on the generator and its accessories.

MINIMUM TEMPERATURE

- Make sure that the temperature the boiler can be subjected to complies to the design minimum permitted temperature.

ATMOSPHERIC CONDITIONS

- Protect the generator against adverse climatic conditions.

INSTALLATION

- Make sure that hydraulic connections are duly joined together.
- Check the correct connection of electric parts.
- Perform a correct chimney fastening.
- Check generator correct operation.

FAILING TO CARRY OUT MAINTENANCE

- Carry out a periodical preventive maintenance and any component repair or replacement operations according to the indications set forth in the Technical Manual and, anyway, for the cases not provided for in the manual, consult the manufacturer of the generator.

SYSTEM DOWNTIME

- The appliance must be stored according to the indications given in the Technical Manual (Wet storage and Dry storage).
- The generator must be protected against adverse climatic conditions (minimum temperature -10 °C) and rain effects.

ACCESSORY REPLACEMENT

- The replaced accessories must have the same characteristics of the original ones. To carry out calibration, refer to the technical manual and, in any case, it is recommended to contact the manufacturer.

PRESSURISED BODY REPAIR

- To carry out repair operations, contact the manufacturer and/or the body responsible for the check of operating steam generator (technical and bureaucratic details), and use suitable means and materials.

TAMPERING

- The accessories must not be tampered with (safety valve, pressure switches, electric panel or level probes). The generator must be operated by qualified personnel. In case of accident due to tampering, the manufacturer accepts no liability.

DECOMMISSIONING

- Periodical check by the operator, as stated in the Technical Manual, and appliance decommissioning, if necessary.
- Any derating and/or change of use are subject to the prior authorisation of the responsible body.
- The manufacturer shall not be held liable in the event of accidents caused by incorrect decommissioning.

HANDLING

- During handling, always stay at a distance of at least 5 metres from boiler projection to the ground.
- Visually inspect generator to make sure that all its parts and accessories are intact; perform the hydraulic test once again.
- Handle the generator in compliance with the indications set forth in the manual.

FIRE

- The plant room must be arranged in compliance with the fire protection regulations in force in the country of installation.
- Check that body and accessories are intact and not damaged after the fire.

UNIT POOR MANAGEMENT

- The operator must meet the requirements provided by the prevailing standards in the country of installation.
- The user is anyway obliged to make sure that the generator operator meets all the requirements specified in the previous point.

SAFETY SYSTEM CHECKS

- The personnel (refer to the user's manual) must strictly comply with all the indications/prescriptions defined in the relevant instruction manual and declared by the manufacturer, as well as with the preset time intervals.
- Carry out operational tests of the safety devices at the times and with methods specified in the manuals.
- Generator control system triggers a visual and acoustic alarm at the intervals specified in the instructions for use.

6 Useful information and declarations

QR CODE

How to register your appliance



The appliance must be registered once the product has been installed, either before or after start-up.

Follow these steps:

- Obtain a smartphone (iPhone, Samsung Galaxy, Htc, Blackberry etc.) or a tablet
- after downloading and installing a "QR Reader" application (any free application is usually more than enough), open it and point the camera on the QR code located on the plate of your appliance (circled in the image)
- you will be sent back to a web page on which to register the data of your appliance and system by completing the indicated spaces.

VP05											
ICI CALDAIE S.p.A. Via G.Pascoli, 38 - 37059 ZEVIÒ (VR) - ITALIA -											
Tipo - Type - Typ - Modelos											
Codice - Code - Code - Codice				Data - Date		N° Fabbrica					
GENERATORE DI VAPORE - STEAM BOILER GENERATEUR DE VAPEUR - GENERADOR DE VAPOR											
PORTATA TERMICA - HEAT INPUT DEBIT THERM. - POTENC. TERM.						POTENZA UTILE - HEAT OUTPUT DEBIT THERM. UTILE - POTENCIA UTIL					
MIN		KW		Kcal/h		MIN		KW		Kcal/h	
MED/MIN		KW		Kcal/h		MED/MIN		KW		Kcal/h	
MAX		KW		Kcal/h		MAX		KW		Kcal/h	
TS min.= °C				Riferimento disegno:							
PS BAR				corpo:							
TS max esercizio °C				insieme:							
COMBUST. LIQUIDO - LIQUID FUEL						GAS CATEG. TIPO - TYPE - TYP			V. CATEG. BRUC. GAS BRUCIATORE		
SOLIDO - LIGHT OIL HEAVY OIL											
BRUCIAT. - BURNER - BRULEUR - QUEMADOR											
ALIM.ELETT.-VOLTAGE-ALIM.ELECT.-TENSION D'ALIMENT.						V. 1/N- 230					
CLASSE PROT.-PROTECT.CLAS- CLASE DE PROC.-PROTEC.						IP55					
DESTINAZIONE - DESTINATION - DEST.						CE					
(DATI CARATTERSTICI VEDI DICHIARAZ.CONFORMITA)											
S.N. Body 1:											
S.N. Body 2:											
TARGA DATI CORPO GENERATORE: VEDI FLANGIATURA INFERIORE BARILEOTTO LA TARGA DATI LIVELLOSTATO E' SITUATA ALL'INTERNO DEL QUADRO ELETTRICO.											

Once registered, authenticate your e-mail address by clicking on the link that will be sent by e-mail to the provided inbox. An additional e-mail will then be received with the credentials to access all services specifically developed by **ICI CALDAIE S.p.A.** for those who will register their boiler through the QR Code. Registration entitles you, even in future months and years, to take advantage of promotions and specific services for registered appliances (e.g.: discounts on spare parts, spare parts kits on sale, free routine maintenance for certain types of products, etc.).

For information, contact the ICI headquarter or the local representative offices.
www.icaldaie.com - info@icaldaie.com



ICI CALDAIE SpA

37059 Fraz. Campagnola di Zevio (Verona) Italy

Via G. Pascoli 38 Phone: +39 0458738511 Fax: +39 0458731148

info@icaldaie.com www.icaldaie.com