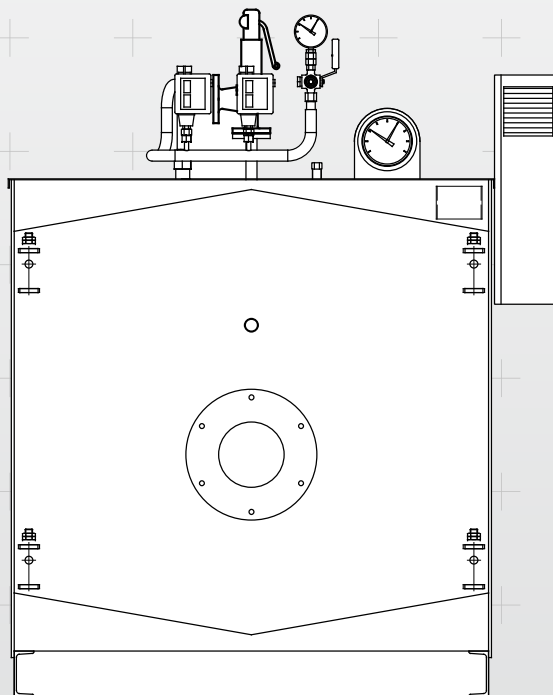




EN

Superheated water heat generator

# ASX



## INSTALLATION, USE AND MAINTENANCE MANUAL



ASX\_200\_3000\_en\_01 - 01/2023

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## 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 **ASX**, 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	
	5 bar	12 bar
ASX200	86290200	86390200
ASX300	86290300	86390300
ASX400	86290400	86390400
ASX500	86290500	86390500
ASX600	86290600	86390600
ASX800	86290800	86390800
ASX1000	86291000	86391000
ASX1200	86291200	86391200
ASX1500	86291500	86391500
ASX1750	86291750	86391750
ASX2000	86292000	86392000
ASX2500	86292500	86392500
ASX3000	86293000	86393000

## COMPLIANCE

Superheated water heat generators Series **ASX** 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 **ASX** 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.
- It is necessary to check that the operating water conductivity values are within those provided in the supplied technical manual.
- 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).
- **Check that the acid condensate that can form during the system start-up is drained outside of the plant room after a neutralisation process in compliance with the standards in force.**
- **Check that there is no danger of frost inside the heating plant room.**
- The boiler must be operated at reduced power (max 50%) until reaching the water operating temperature in order to avoid thermal shocks and thermal expansions between the various parts of the body.



## IMPORTANT

- Climb up and down the top of the boiler body to perform ordinary and extraordinary maintenance operations using PPE according to the Regulations in force in the Unit Installation Country.
- 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.
- 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.



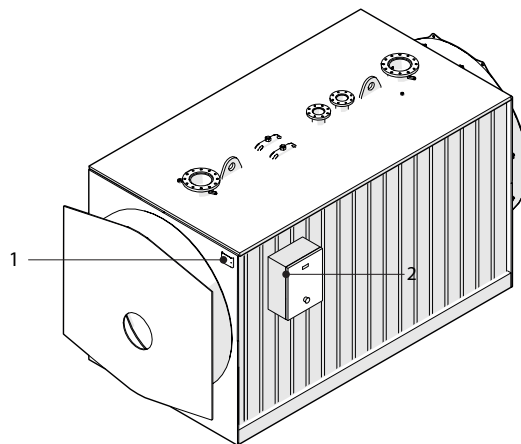
## DANGER

- **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 **ASX** 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.



### IMPORTANT

The installation must be performed in compliance with the local standards by **qualified personnel**, namely by personnel with specific technical skills in the field of the superheated water boiler system components. An incorrect installation may cause damage to persons or property for which the manufacturer will not 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

Monobloc reverse flame fire tube super-heated water boilers with fully wet-bottom furnace. Built with tested quality steel according to regulations in force and welded with automatic submerged arc methods. Suitable for liquid and gaseous fuels. Complete with regulation and safety accessories for automatic operation.

The single front door is thermally insulated with refractory materials and is mounted on adjustable hinges, easily opened without having to remove the burner; it is equipped with visor for flame control.

The smoke box is fixed with bolts to the back of the generator. It is equipped with smoke duct fitting, cleaning door and can be dismantled.

The body is thermally insulated with high density rock wool mat, protected with stainless steel panels.

They are equipped with lower water side inspection opening (flanged hatch)

They use a single control panel in which the entire electrical wiring converges.

The control panel includes all the equipment required for a correct management of the boiler with fail-safe devices and circuits, built with redundant technology in order to ensure maximum safety.

The appliance rests on a carbon steel profile base that ensures its stability.

Steam boilers **ASX** are certified both for liquid and gaseous fuels for steam production from 350 to 5000 kg/h at high pressure (12-15 bar).

## DESCRIPTION OF THE EQUIPMENT

The equipment described below is intended for the regulation and protection of super-heated water boilers pressurised from the outside.

The range of safety accessories must be completed according to the type of system where the boiler is to be installed.

Below are the European Standards adopted for the manufacture of the electrical and safety equipment:

- List of equipment for super-heated water boilers(EN 12953-6).
- Requirements for safety and limitation devices of super-heated water boilers(EN 12953-9).
- Requirements for application design of electrical equipment for boilers and furnaces(CEI EN 50156-1).

## OPERATING PRINCIPLE OF THE HEATING SYSTEM

There are essentially two types of systems:

### **CONTROL AND REGULATION WITHIN PERMISSIBLE LIMITS**

- Continuous temperature detection system, which is used to regulate and keep the operating temperature within the boiler's permissible limits, directly acting on the boiler's controls.

### **SAFETY AND PROTECTION AGAINST THE EXCEEDING OF PERMISSIBLE LIMITS**

- No. 1 - 2 safety valves built according to EN 4126-1 in compliance with PED Directive as safety accessory of IV risk category, calibrated at the PS value of the pressurised boiler body, used to drain the maximum water flow rate if the limit pressure is reached.
- No. 2 Safety pressure switches complying with PED Directive as safety accessory of IV risk category, used to switch off the burner with manual reset on the control panel if:
  - Maximum limit pressure is reached.
  - Minimum limit pressure is reached.
- No. 1 safety pressure switch complying with PED Directive as safety accessory of IV risk category, used to switch off the burner with manual reset on the control panel if the flow pipe water reaches the limit temperature.

## TECHNICAL DATA

### ASX 200 ÷ 800(5 BAR)

DESCRIPTION	u.m.	ASX					
		200	300	400	500	600	800
Nominal power	kW	233	349	465	581	698	930
Thermal capacity	kW	258	387	516	645	774	1032
Efficiency at 100% (N.C.V.)	%	90	90	90	90	90	90
Hydraulic pressure drop	mbar	30	29	52	33	48	35
Rated pressure	bar	5	5	5	5	5	5
Total capacity	l	735	750	865	1095	1245	1535
Total weight	kg	1400	1600	1850	2200	2200	2600
Electric supply	Volt ~	230	230	230	230	230	230
Frequency	Hz	50	50	50	50	50	50
Insulation class	IP	IP55	IP55	IP55	IP55	IP55	IP55
Electric power	W	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
Allowed fuels		Methane - LPG - Diesel - Naphtha					

### ASX 1000 ÷ 3000(5 BAR)

DESCRIPTION	u.m.	ASX						
		1000	1200	1500	1750	2000	2500	3000
Nominal power	kW	1163	1395	1744	2035	2326	2907	3488
Thermal capacity	kW	1292	1550	1937	2260	2584	3229	3876
Efficiency at 100% (N.C.V.)	%	90	90	90	90	90	90	90
Hydraulic pressure drop	mbar	54	38	59	80	105	52	60
Rated pressure	bar	5	5	5	5	5	5	5
Total capacity	l	1765	2265	2875	3155	3605	4570	5450
Total weight	kg	3000	3400	4000	5500	7500	8500	9000
Electric supply	Volt ~	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230
Frequency	Hz	50	50	50	50	50	50	50
Insulation class	IP	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Electric power	W	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
Allowed fuels		Methane - LPG - Diesel - Naphtha						

Water delivery  $\Delta T$  max 30°C.

Electric powers only for gas or diesel fuels.

#### Design data

Minimum/maximum temperature **-10°C / 158,9 °C**

Minimum/maximum temperature **-10°C / 191,7 °C**



**ASX 200 ÷ 800(12 BAR)**

DESCRIPTION	u.m.	ASX					
		200	300	400	500	600	800
Nominal power	kW	233	349	465	581	698	930
Thermal capacity	kW	258	387	516	645	774	1032
Efficiency at 100% (N.C.V.)	%	90	90	90	90	90	90
Hydraulic pressure drop	mbar	30	29	52	33	48	35
Rated pressure	bar	12	12	12	12	12	12
Total capacity	l	735	750	865	1095	1245	1535
Total weight	kg	1400	1600	1850	2200	2200	2600
Electric supply	Volt ~	230	230	230	230	230	230
Frequency	Hz	50	50	50	50	50	50
Insulation class	IP	IP55	IP55	IP55	IP55	IP55	IP55
Electric power	W	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
Allowed fuels		Methane - LPG - Diesel - Naphtha					

**ASX 1000 ÷ 3000(12 BAR)**

DESCRIPTION	u.m.	ASX						
		1000	1200	1500	1750	2000	2500	3000
Nominal power	kW	1163	1395	1744	2035	2326	2907	3488
Thermal capacity	kW	1292	1550	1937	2260	2584	3229	3876
Efficiency at 100% (N.C.V.)	%	90	90	90	90	90	90	90
Hydraulic pressure drop	mbar	54	38	59	80	105	52	60
Rated pressure	bar	12	12	12	12	12	12	12
Total capacity	l	1765	2265	2875	3155	3605	4570	5450
Total weight	kg	3000	3400	4000	5500	7500	8500	9000
Electric supply	Volt ~	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230	1/N~ 230
Frequency	Hz	50	50	50	50	50	50	50
Insulation class	IP	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Electric power	W	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
Allowed fuels		Methane - LPG - Diesel - Naphtha						

Water delivery  $\Delta T$  max 30°C.

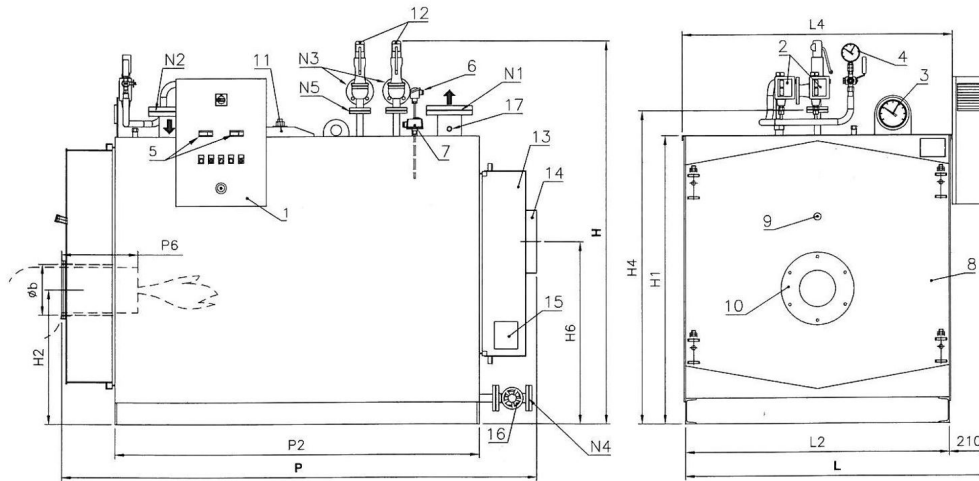
Electric powers only for gas or diesel fuels.

**Design data**

Minimum/maximum temperature **-10°C / 158,9 °C**

Minimum/maximum temperature **-10°C / 191,7 °C**

## DIMENSIONS AND CONNECTIONS



- |                               |                             |                          |
|-------------------------------|-----------------------------|--------------------------|
| 1 Electrical panel            | 10 Burner application plate | N1 Boiler flow line      |
| 2 Min/max pressure switches   | 11 Inspection hatch         | N2 Boiler return line    |
| 3 Thermometer                 | 12 Safety valves            | N3 Safety valve drain    |
| 4 Pressure gauge              | 13 Rear smoke chamber       | N4 Boiler drain          |
| 5 Thermoregulator and display | 14 Chimney fitting          | N5 Safety valve fittings |
| 6 Thermoregulator probe       | 15 Cleaning door            |                          |
| 7 Safety thermostat           | 16 Drain unit               |                          |
| 8 Front door                  | 17 Thermometer probe        |                          |
| 9 Flame control warning light |                             |                          |

### NOTE

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

### ASX 200 ÷ 800(5-12BAR)

Dimensions	u.m.	ASX					
		200	300	400	500	600	800
H	mm	1730	1815	1900	1980	2005	2090
H1	mm	1240	1270	1270	1450	1450	1580
H2	mm	555	615	615	700	700	740
H4	mm	1360	1390	1390	1570	1570	1750
H6	mm	720	850	850	945	945	1000
L	mm	1280	1350	1350	1520	1520	1650
L2	mm	1080	1150	1150	1320	1320	1450
L4	mm	1160	1230	1230	1400	1400	1530
P	mm	2000	2080	2280	2300	2540	2600
P2	mm	1510	1510	1760	1760	2010	2010
P6	mm	280-330	310-360	310-360	350-400	350-400	370-420
Øb	mm	180	225	225	280	280	280
Øc	mm	250	250	250	300	300	350
N1/N2	PN	16	16	16	16	16	16
N1	DN/in	65	80	80	100	100	125
N2	DN/in	65	80	80	100	100	125
N4	DN/in	32	32	32	32	32	32

**ASX 1000 ÷ 3000(5-12BAR)**

Dimensions	u.m.	ASX						
		1000	1200	1500	1750	2000	2500	3000
H	mm	2170	2260	2490	2430	2610	2730	2880
H1	mm	1580	1840	1870	1870	1980	2100	2190
H2	mm	740	765	850	850	900	950	975
H4	mm	1720	1820	2030	2030	2120	2260	2360
H6	mm	1000	1200	1200	1200	1380	1430	1500
L	mm	1650	1740	1920	1920	2000	2100	2180
L2	mm	1450	1540	1720	1720	1800	1900	1980
L4	mm	1530	1620	1800	1800	1880	1980	2060
P	mm	2960	3165	3370	3717	3719	4175	4477,5
P2	mm	2310	2502	2714	3012	3016	3514	3750
P6	mm	370-420	370-420	420-470	420-470	480-530	480-530	480-530
Øb	mm	280	320	360	360	360	360	400
Øc	mm	350	400	450	450	500	550	600
N1/N2	PN	16	16	16	16	16	16	16
N1	DN/in	125	150	150	150	150	200	200
N2	DN/in	125	150	150	150	150	200	200
N4	DN/in	32	32	32	32	40	65	40

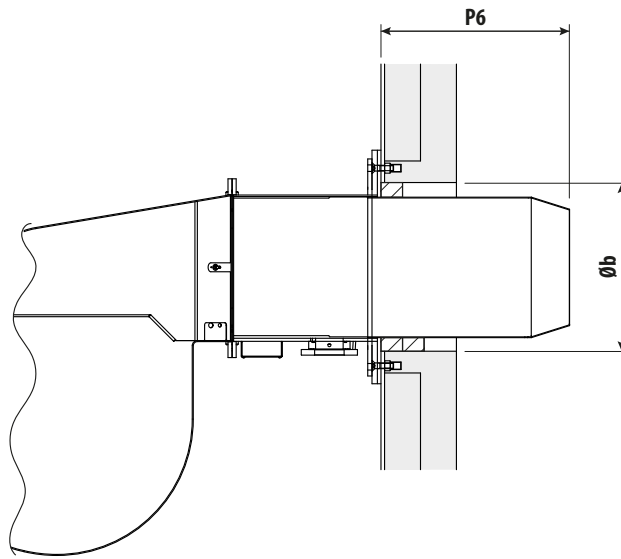
## BURNERS

The burners that can be installed on the **ASX** 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 boiler depends on the correct selection of the burner and its adjustment, find below some points to take into account:

- The burner to be combined with the boiler must be of two-stage or modulating type; so that excessive flow temperature variations can be avoided.
- The burner firing range must include the point of operation of the boiler (flow rate-back pressure in combustion chamber considering also any 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 length and shape of the flame must be suitable to the flame inversion combustion chambers. The burner manufacturers have this information as they are required by certification.



### IMPORTANT

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

Dimensions	u.m.	ASX					
		200	300	400	500	600	800
P6	mm	280-330	310-360	310-360	350-400	350-400	370-420
Øb	mm	180	225	225	280	280	280

Dimensions	u.m.	ASX						
		1000	1200	1500	1750	2000	2500	3000
H	mm	2170	2260	2490	2430	2610	2730	2880
P6	mm	370-420	370-420	420-470	420-470	480-530	480-530	480-530
Øb	mm	280	320	360	360	360	360	400

## 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 superheated water boilers **ASX** feature a series of components that can be divided into:

- Safety components (safety valves, safety pressure switch, safety thermostat).
- Indicator components (temperature indicator, pressure gauge, flame warning light).
- Adjustment components (Thermostat).

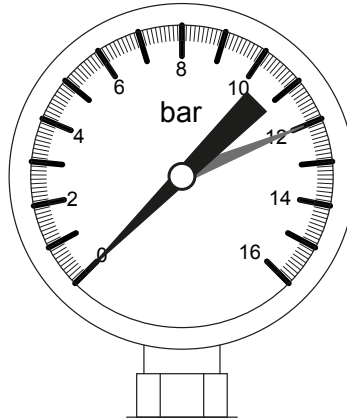
In the descriptions below, accessories are divided based on the values they control.

### 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 communicated with the inside of the generator whose pressures 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).



*Indicative figure for 12 bar boiler.*

#### THERMOMETER

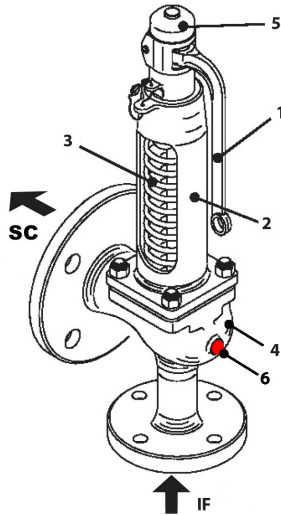
It is of the built-in inert gas (nitrogen) type, with a capillary for detecting the temperature.

- **Full scale:** 200 °C / 250 °C
- **Diameter:** 100mm/150mm

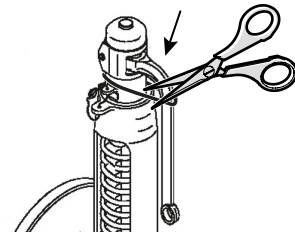
**SAFETY VALVES**

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
- 6 Drainage hole (if any)
- SC Drain
- IF Fluid inlet



**ATTENTION**

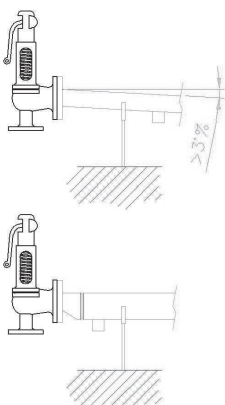
Drainage hole placed at the bottom of the valve body (6). Drainage hole with diameter 1/4" BSP-f until DN80. For higher DN sizes, the hole diameter is equal to 1/2" BSP-f. Remove the red plastic cap (if any) and provide for collecting draining suitably. (provided by the customer). For further information, refer to the supplier's manual.



**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**



**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 MIN-MAX PRESSURE SWITCHES



The pressure switch features a unipolar switch whose contact's position depends on the pressure found on the relevant connection and on the set value.

The max safety pressure switch is set at a pressure higher than the maximum one of the pressure transducer, but always lower than safety valve opening value.

The minimum pressure must be calibrated at a pressure higher than the water saturated steam pressure at the operating temperature in order to ensure that the boiler body only contains water in a liquid state.

The safety pressure switches are triggered in case of pressure transducer fault and stops the burner permanently.

The burner will be switched on again only after the water pressure value has decreased and the control panel has been manually reset.

### NOTE

*Calibration and sealing at the manufacturer's premises*

For further information, see the specific instructions supplied with the boiler.

## SAFETY THERMOSTAT

The safety thermostat stops the burner when the required temperature value is reached and sends an alarm signal.

The restart is performed only after the alarm cause has been removed and the system has been reset by using the reset button on the control panel.

### NOTE

*Calibration and sealing at the manufacturer's premises*

For further information, see the specific instructions supplied with the boiler.



## CONTROL PANEL

The boiler ASX is equipped with a control panel for the management and control of the equipment. The type of panel is chosen based on the boiler configuration. For more details refer to the layout and wiring diagram provided with the installed panel.

## CONTROL PANEL

The control panel has been made in compliance with EN 50156-1 standard. All the electrical system components have been made taking into account the reference technical standards. All the equipment and relevant circuits of the protection system have been made, wired and checked in compliance with CEI EN 50156-1 standard, thus ensuring the prevention of faults as required by the same standard.



### IMPORTANT

The certification will be forfeited if:

- 1 The panel is used differently from its intended use.
- 2 The panel is subjected to interventions that alter its functionality and operating logic.
- 3 The panel is powered with voltage, current and frequency values, and any other value, different from those required.
- 4 The panel supplies utilities having nameplate data different from those described in the multi-wire wiring diagram.
- 5 Modifications are applied to extend the panel, increase the number of utilities, etc.

## DESCRIPTION OF SAFETY LOGIC-RELATED COMPONENTS

The study and design of the safety measures for the electrical equipment have been carried out in compliance with the provisions of EN50156-1 and relevant mentioned standards; protection devices comply with the requirements of EN12953-9. The system has been designed to ensure the maximum safety and liability over time, then studied and checked in depth to provide the user with maximum ease of use and/or maintenance. Besides the use of "PED certified" safety devices, special attention has been paid when assessing possible electrical events/faults, inside and outside of the control panel, that could cause the boiler to be "unsafe", thus damaging it or, in extreme cases, causing an explosion, with consequent damage to property and persons within the perimeter.

### Wiring diagram

**See the diagram inside the control panel.**

## THERMOREGULATION AND MESSAGE DISPLAY

### Thermoregulator front



- 1 Instructions: 1 = 2nd stage of burner on (enabled to work) 2 = Burner on (enabled to work)
- 2 Display of flow temperature measured or indication of the variable during the thermoregulator parametrization phase (HSET - SP - AL2 - HAL2)
- 3 Display of the burner AL2 (ON-OFF variable) or of the sets of variables during the thermoregulator parametrization phase (HSET - SP - AL2 - HAL2)
- 4 Enter key, its pressure allows accessing variable parametrization and if you push it again it scrolls the sequence of variables (HSET - SP - AL2 - HAL2)
- 5 Up and down keys for the variables during the thermoregulator parametrization

#### Variable functions

HSET = Set Point hysteresis (working temperature hysteresis, burner 2nd stage control)

SP = Set Point (working temperature, burner 2nd stage control)

AL2 = Limit temperature set (burner ON-OFF control)

HAL2 = Limit Set hysteresis (limit temperature hysteresis, burner ON-OFF control)

NOTE:

in case of a panel with e-therm, refer to the relevant manual.

## Thermoregulator parametrization example

Push the enter key (4), field 2 to display the HSET variable and field 3 to display the variable parametrization (example: working temperature hysteresis 2°C); to modify the variable push the up and down keys (5).

Attention: HSET hysteresis affects both above and below the Set Point; this means that, for example, if the desired Set Point temperature is 110°C and hysteresis 2°C, the control at 2nd stage burner will be interrupted at 112°C and activated again at 108°C. When the enter key (4) is pushed again, the system goes to the SP variable (example: working temperature 110°C, burner 2nd stage control); to modify the variable push the up and down keys (5).

By doing it again, the system goes to the AL2 variable (example: limit temperature 120°C, burner ON-OFF), to modify the variable push the up and down keys (5).

At last the system goes to the HAL2 variable (example: limit temperature hysteresis 2°C), to modify the variable push the up and down keys (5).

Attention: HAL2 hysteresis only affects above the limit set; this means that, for example, if the desired temperature limit is 120°C and hysteresis 2°C, the burner ON-OFF control will be interrupted at 122°C and activated again at 120°C.

At the end of the parametrization wait a few seconds, the thermoregulator goes automatically to normal visualization.

## Message display front (Alarms)



- 1 Alarm output connected - Buzzer on electric panel enabled
- 2 Alarm indicator
- 3 Indication of several alarms - There is more than one alarm
- 4 Alarm/s indicator - Alarm indicator box, see the type below, if there are several alarms the display will display them alternately every 4 seconds
- 5 Alarm silencing key - Press to mute the buzzer, when a new alarm appears it will switch back on automatically
- 6 Key to reset the alarms in the memory - If signal 2 is not on and the display is flashing, alarm/s in the memory but not present, the button can be used to clear it/them.

## Alarm indications

A.01 = (Minimum or maximum) pressure alarm, check the system pressure, the settings of the loading system and of the expansion system

A.02 = High temperature alarm, check the flow water temperature and the parametrization of the control thermoregulator

A.03 = Safety circuit alarm, indicates a fault inside the control panel

A.04 = Burner shut off alarm, indicates an incorrect operation of the burner

# 2 Installation

## PRODUCT RECEIPT

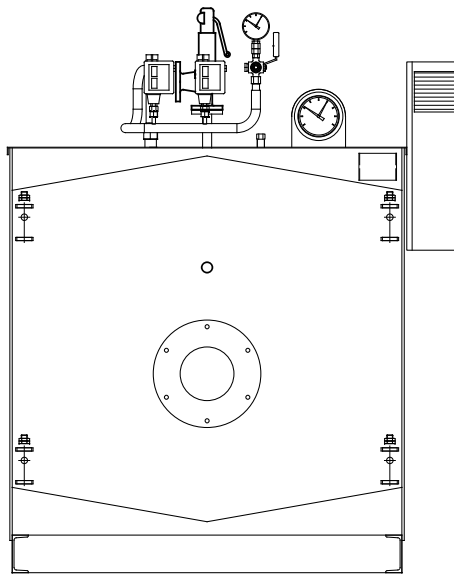
The **ASX** generators are supplied complete with accessories.

The combustion chamber contains:

- turbulator unit to be inserted in the smoke pipes during installation
- thermoceramic material to be inserted in the gap between burner mouthpiece and door insulation

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.

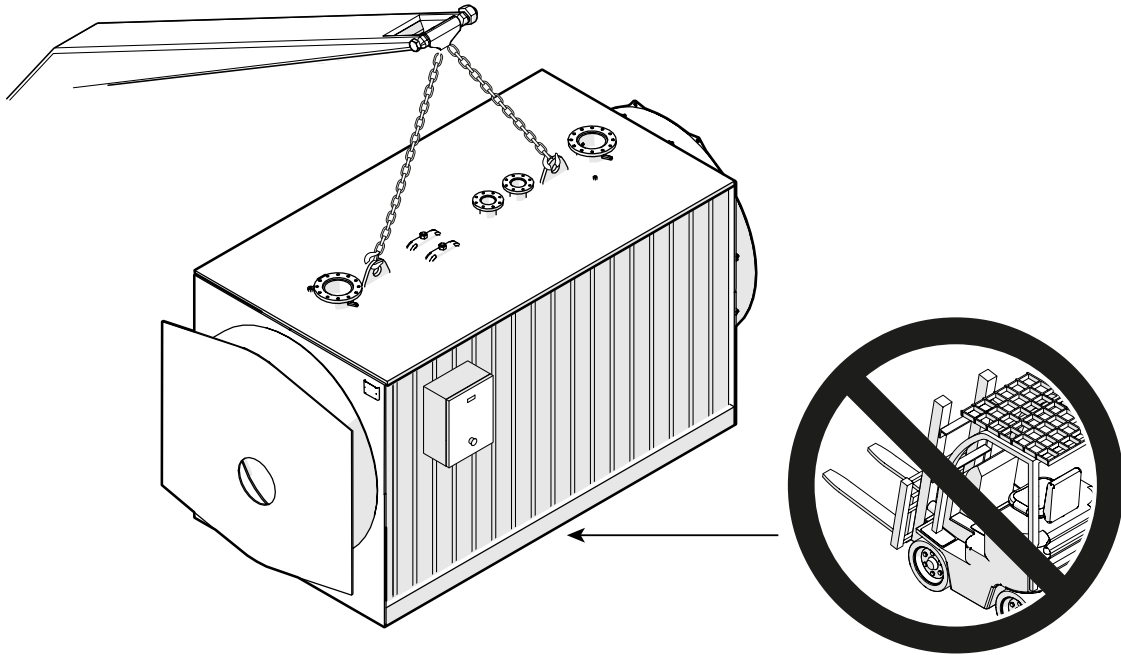
## HANDLING



### ATTENTION

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

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

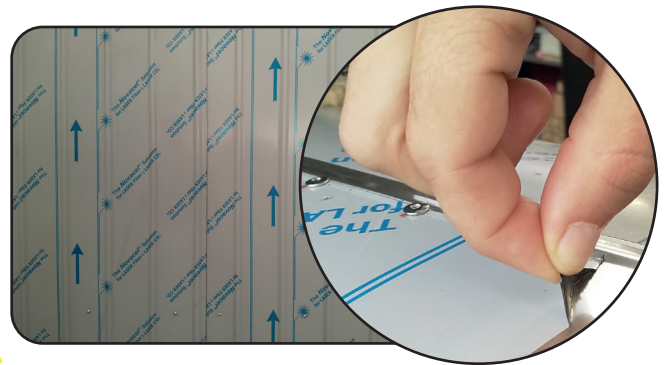
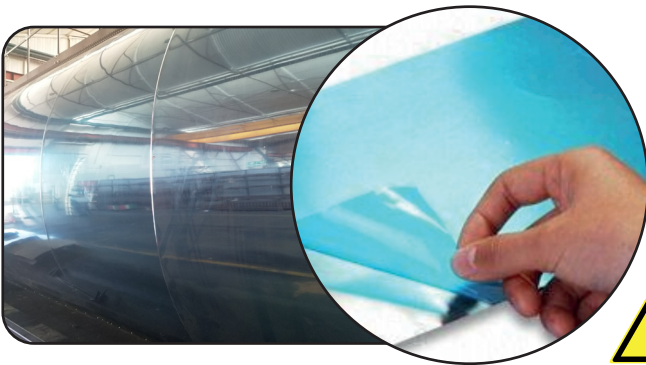


### ATTENTION

– 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

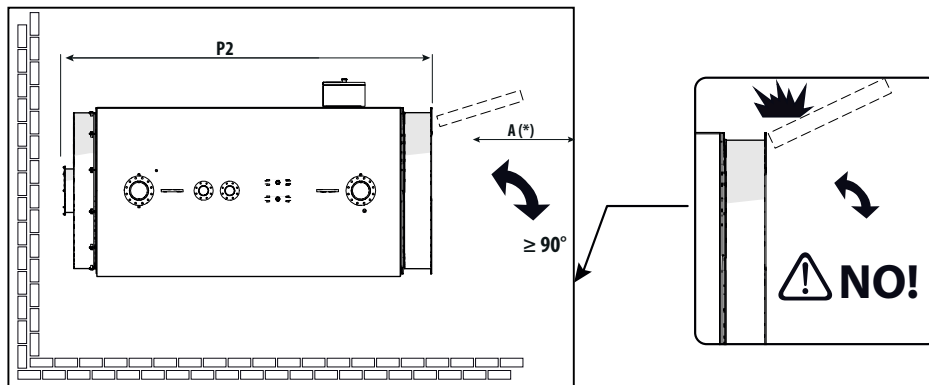
### POSITIONING

The **ASX** 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 superheated water boiler bodies must be connected to the system at the following points:

- **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 a 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.

## 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).

## 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**.



## FRONT DOOR OPENING

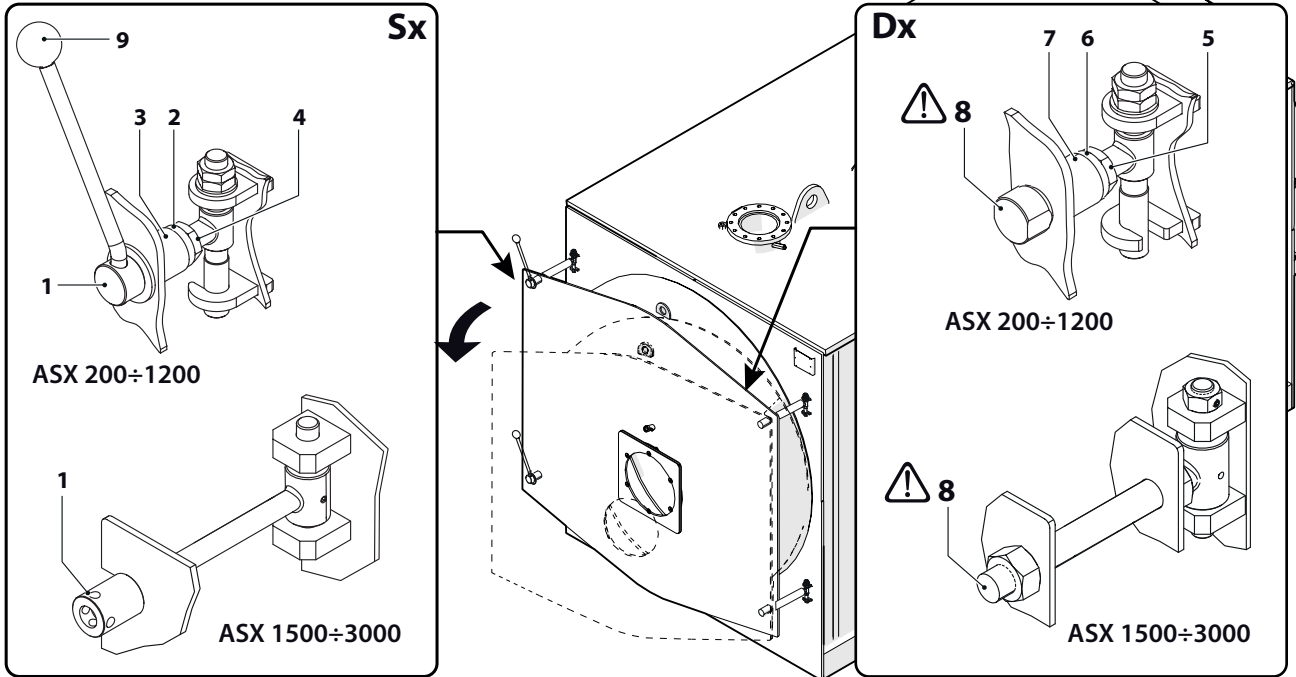
The door is adjusted in the factory with standard opening to the left (Sx) and hinges on the right (Dx).

### DOOR OPENING REVERSAL (TO THE RIGHT)



#### IMPORTANT

Door opening inversion is possible ONLY for models from ASX 200 to ASX 1000.



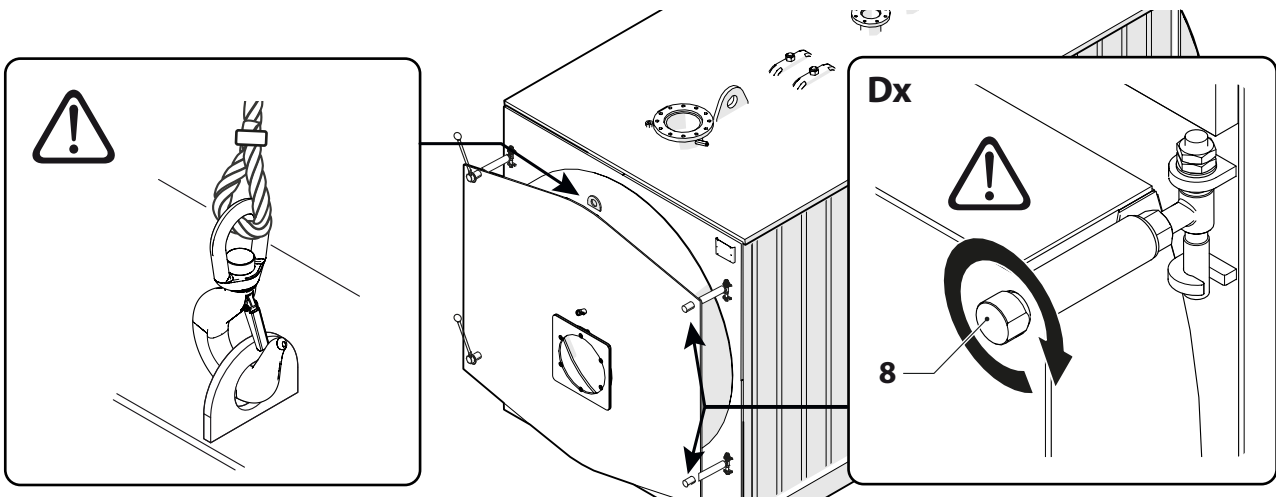
#### IMPORTANT

The door should be secured before performing the opening inversion and adjustment operations.



#### DANGER

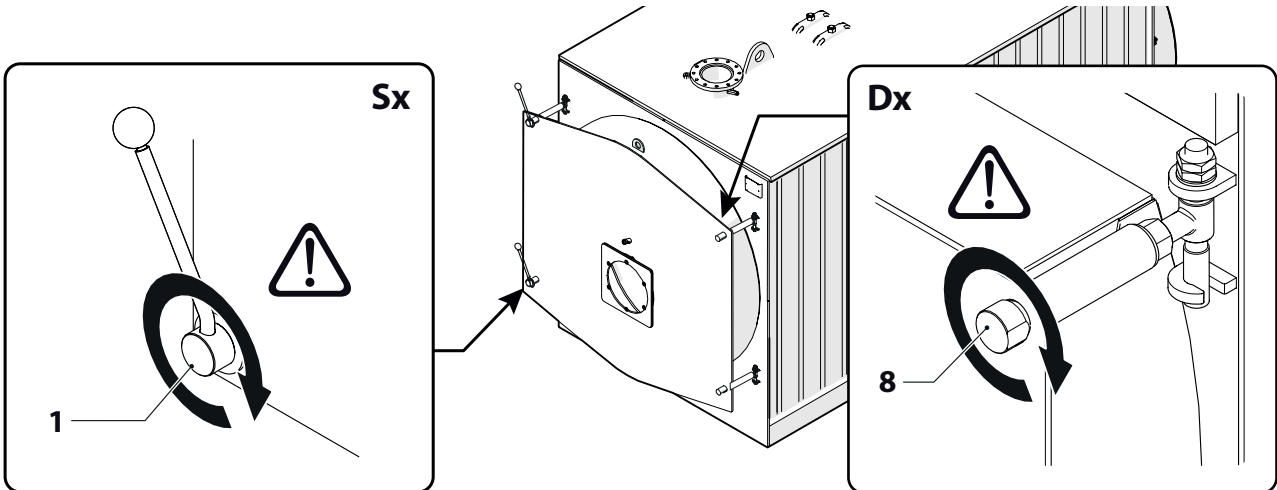
IT IS DANGEROUS TO UNSCREW the ring nuts (8) located on hinge side. This could cause the detachment of the door, with possible severe damages to persons and property.





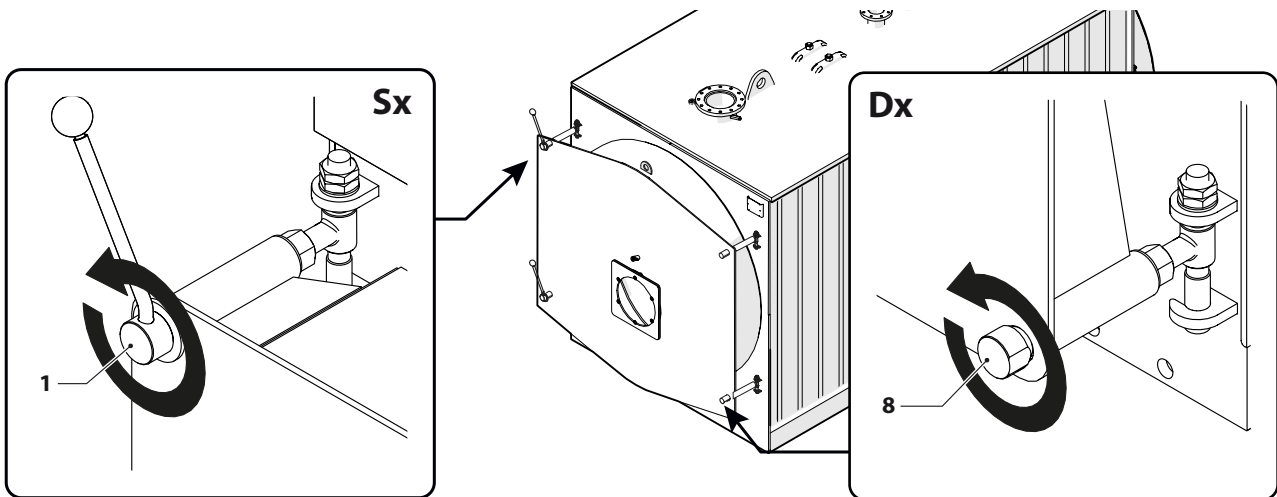
**DANGER**

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

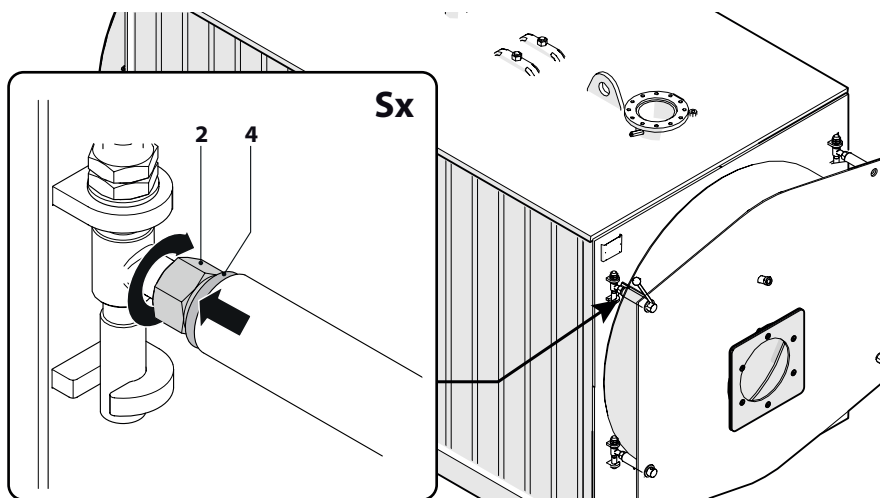


Proceed as follows to reverse the opening direction of the door:

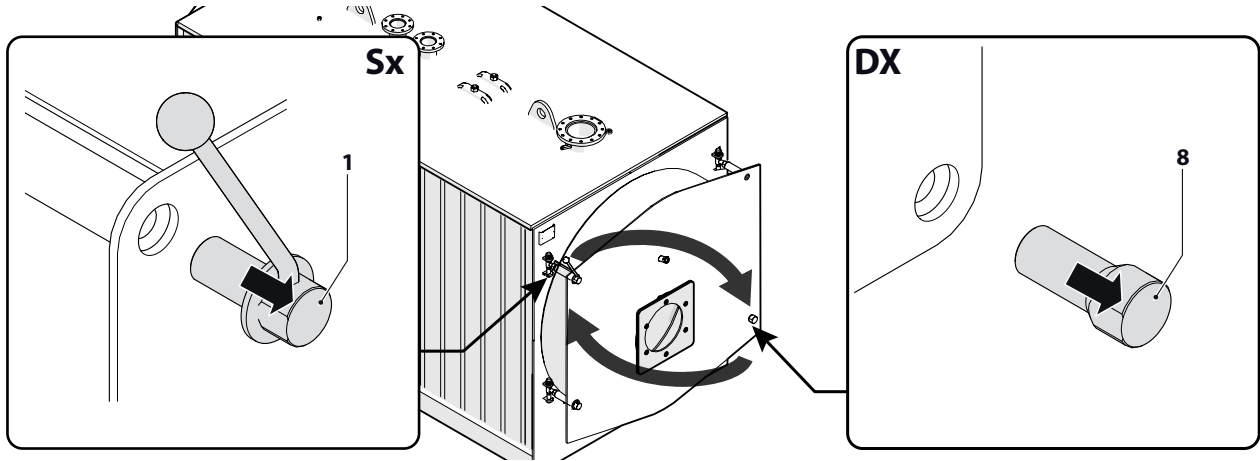
- loosen drilled ring nut (1) and socket ring nut (8)



- loosen locking nuts (2) present on tie-rod and release the conical washers (4)



- following a cross pattern, swap the socket ring nut of a hinge (8) with the opposite drilled one (1),
- fix the conical washer (4) to the door with nut (2)
- repeat the whole sequence for the other ring nuts



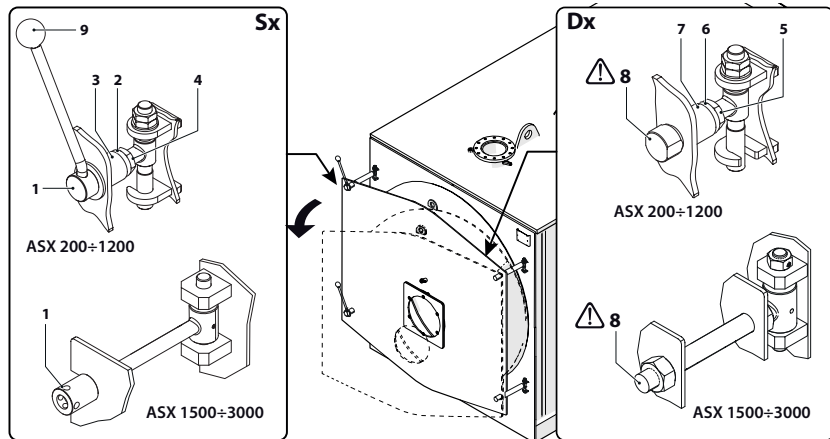
Check the correct adjustment of the tie-rods and hinges ensuring that, during closure, the seal gasket is evenly pressed in the centre on the whole circumference. If necessary, adjust the door as described in the following paragraph.

## FRONT DOOR ADJUSTMENT



### DANGER

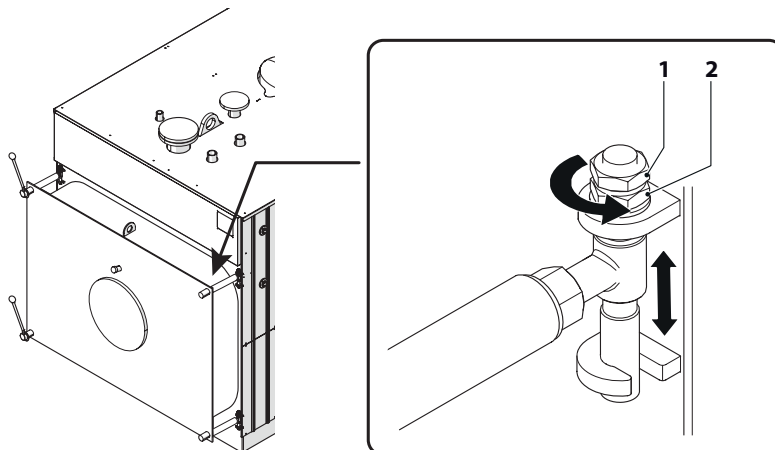
Incorrect door adjustment with consequent damage to people and property voids the warranty conditions.



## VERTICAL ADJUSTMENT

To make the adjustment:

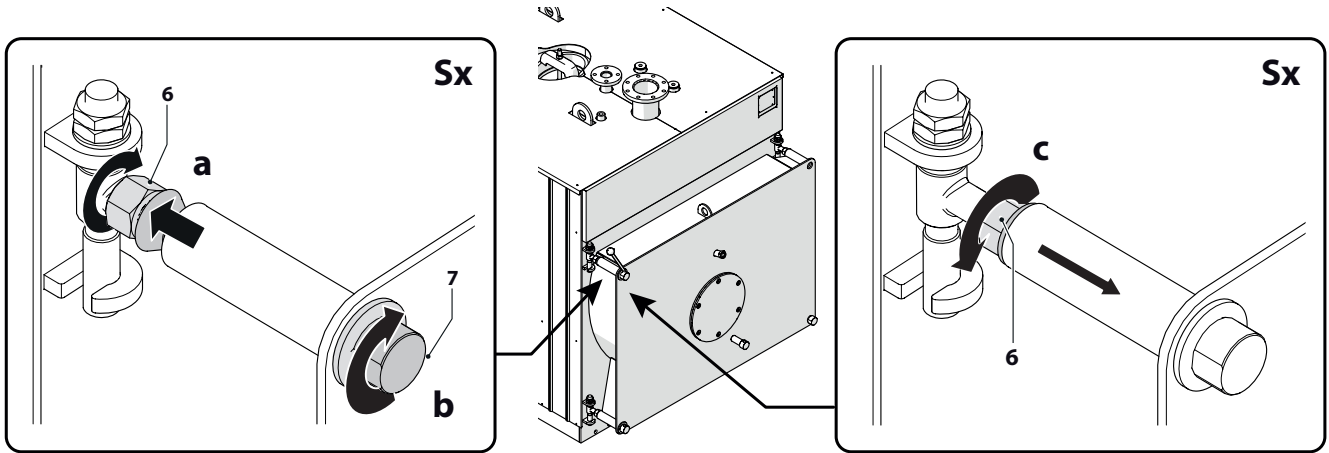
- with the door ajar, loosen the counter-nuts (1) of the hinge units
- act on the adjustment nuts (2) to lift or lower the door by centring the gasket on the stop plate, then block the counter-nuts (1)
- close the door and centre the tie-rod (4) on the mechanical tube (5), proceeding as in the previous point.



## HORIZONTAL ADJUSTMENT

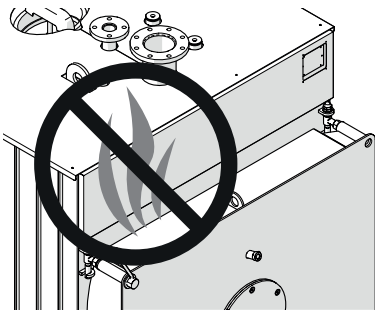
Close the door using the lever and check that there is equal distance on both sides, between the stop plate and the band. If this is not the case:

- with the door ajar, loosen the locking nuts (6) of the hinge units
- act on the ferrule (7) to adjust the distance depth-wise
- screw the nuts (6) and block the conical washers on the mechanical tubes.



### DANGER

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



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.



### DANGER

THERE MUST BE NO FLUE GAS LEAKS.

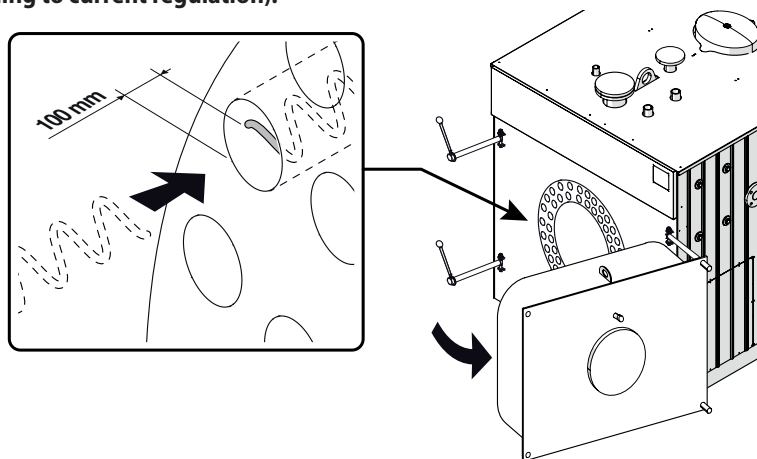
## TURBULATOR ASSEMBLY

To assemble the turbulators supplied with the boiler, open the door and insert the turbulators completely into the smoke pipes, until they penetrate by at least 100 mm.



### DANGER

The turbulators have very pointed and sharp ends. Therefore, wear suitable protective gloves during insertion (equipment according to current regulation).



Data relevant to the size, diameter and length ( $\varnothing \times P$ ) and to the quantities (no.) of the turbulators (Tb) for the various models are listed in the table present in the paragraph "Burners".

## BURNER ASSEMBLY

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

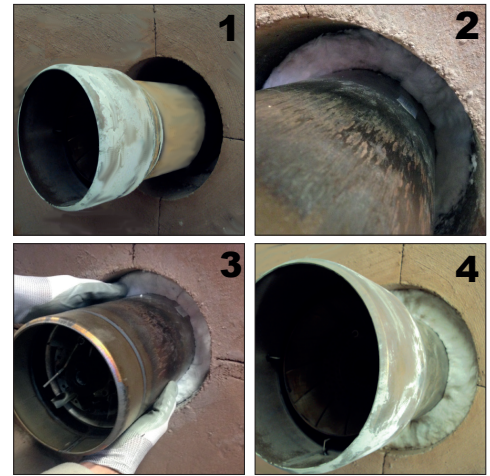
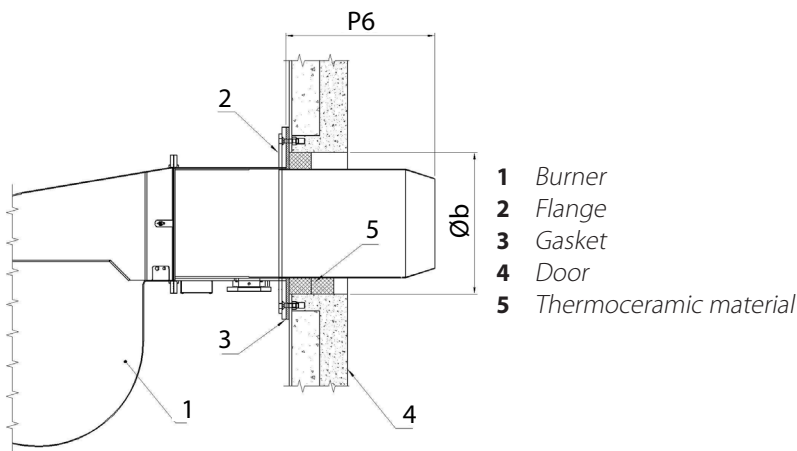
- the installation and fastening to the boiler
- the connection to the fuel supply
- the electrical connections
- the adjustments to be made
- maintenance
- the necessary checks.



### IMPORTANT

The strip of ceramic insulation supplied with the generator must be wrapped all around the mouthpiece at least once to protect the burner flange from the irradiation of the flame. It is not necessary for the ceramic insulation to fill the gap up to the internal surface of the door insulation. If the supplied material is not suitable for the used burner, use other material having characteristics suitable to withstand 1000°C and dimensions suitable to completely close the gap.

Installation sequence of the ceramic thermal insulation.



## 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**.

## 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	Integrating water for hot water boilers (total operating range)
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 <sup>[b]</sup>	> 7
Total hardness (Ca+Mg)	mmol/l	< 0,01 <sup>[c]</sup>	< 0,05
Iron (Fe)	mg/l	< 0,3	< 0,2
Copper (Cu)	mg/l	< 0,05	< 0.1
Silica (SiO <sub>2</sub> )	mg/l	See the "Maximum acceptable silica content in the generator water up to 20 bar pressures" table	
Oxygen (O <sub>2</sub> )	mg/l	< 0,05 <sup>[d]</sup>	-
Oily substances	mg/l	< 1	< 1
Concentration of organic substances	-	See note <sup>[e]</sup>	

<sup>[a]</sup> With copper alloys in the system the pH value must be kept within 8.7 and 9.2.

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

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

<sup>[d]</sup> 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.

<sup>[e]</sup> 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 (O<sub>2</sub> and CO<sub>2</sub>). It is, in any case, appropriate to use chemical conditioning to de-oxygenate the water supply completely and to minimise the corrosive CO<sub>2</sub> effects.

## 5.2 Operating water - threshold values

CHARACTERISTICS	u.m.	Steam generator water with pressure up to 20 bar		Boiler water for hot water boilers (total operating range)
		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 <sup>[a]</sup>	< 1500	< 1500
pH at 25°C	---	10,5 - 12	10 - 11 <sup>[b]</sup> <sup>[c]</sup>	9 ÷ 11,5 <sup>[d]</sup>
Composite alkalinity	mmol/l	1 - 15 <sup>[a]</sup>	0,1 - 1 <sup>[c]</sup>	< 5
Silica (SiO <sub>2</sub> )	mg/l	See the previous table "Maximum acceptable silica content in the boiler generator water up to 20 bar pressures"		
Phosphates (PO <sub>4</sub> ) <sup>[e]</sup>	mg/l	10 - 30	6 - 15	-
Organic substances	-	See note <sup>[e]</sup>		

<sup>[a]</sup> With a superheater consider as maximum value 50% of the value indicated as maximum.

<sup>[b]</sup> Basic pH adjustment by injecting NaPO<sub>4</sub>, further injection of NaOH only if the pH value is < 10.

<sup>[c]</sup> 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.

<sup>[d]</sup> If there are non-iron materials in the system, i.e. aluminum, these may require a lower pH value and a direct conductivity, however, the priority is to protect the boiler.

<sup>[e]</sup> If treatment with coordinated phosphate is used, considering all other values, higher concentrations of PO<sub>4</sub> are acceptable.

<sup>[f]</sup> 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 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 fittings are fully tightened.
- Check that all the safety and regulation accessories are correctly installed.
- Safety devices (safety valves, safety pressure switch, safety thermostat) can be supplied already calibrated and sealed during the manufacturing stage or otherwise they must be calibrated and sealed by the manufacturer and/or designated Certification Body at the customer's premises.
- Regulation devices must be calibrated by the user based on the needs.
- Make sure that the water delivery pipes are clean, by repeatedly flushing and draining them in the sewer before the final filling.
- Check the quality of the system water according to the indications in paragraph "CHARACTERISTICS OF WATER" of this manual.
- Check the sealing and correct operation of all fitted components and accessories (pipes, valves, regulators, etc.).
- Close the drain valves.
- Open the flow and return shut-off valves.
- Make sure that the water supply system pressure is correct.
- Check the fuel system pressure and open the shut-off valves.
- Make sure that the front door and the smokebox are correctly closed, checking for any leaks and, if necessary, progressively tightening the fixing tie-rods.



## COMMISSIONING

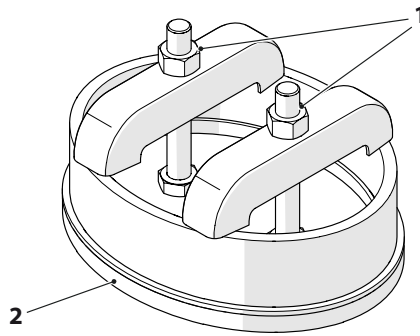
Start up the boiler as follows:

- 1) Power the boiler control panel on the general switch.
- 2) Make sure that the pressurization system has efficiently set the system to the minimum pressure.
- 3) The boiler must be operated at reduced power (max 50%) until reaching the water operating temperature in order to avoid thermal shocks and thermal expansions between the various parts of the body. During the start-up phase, it is recommended to limit the flow rate of the water passing through the boiler in order to reduce the condensation phenomenon and the consequent acid corrosion of the parts in contact with flue gases. The critical dew point temperature is approximately 57°C with methane gas and approximately 47°C with liquid fuels.



### 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 water seeping through and deteriorating gasket (2) rapidly.
- Check the intervention of all safety and adjustment accessories described in the relevant chapter.



## CHECKS AFTER COMMISSIONING

The system must be operated properly in order, on the one hand, to ensure an optimal combustion with reduced emissions into the atmosphere of carbon oxide, unburnt hydrocarbons and soot and, on the other, to prevent material damage and injuries to persons.

Combustion guide values:

FUEL	%CO <sub>2</sub>	Flue gas temperature	% CO
Gas	10	190°C	0 – 20 ppm
Diesel fuel	13	195°C	10 – 80 ppm
Nafta	13,5	200°C	50 – 150 ppm

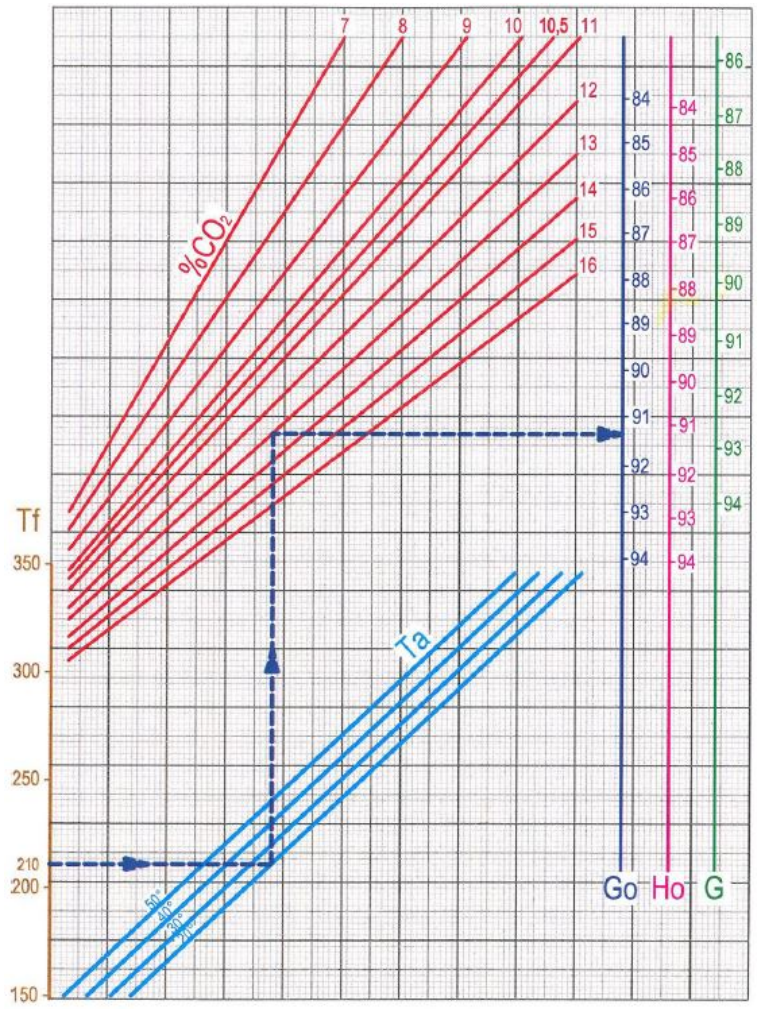
A diagram determines the boiler efficiency according to the flue gas and air temperature and the carbon dioxide percentage (%CO<sub>2</sub>), but without considering the losses through the boiler casing.

Example:

Flue gas temperature 210°C  
 Ambient temperature 20°C  
 %CO<sub>2</sub> 13%  
 Fuel Diesel fuel  
 Efficiency 91.4%

Example:

Flue gas temperature 210°C  
 Ambient temperature 20°C  
 %CO<sub>2</sub> 13%  
 Fuel Diesel fuel  
 Efficiency 91.4%



Tf Flue gas temperature in chimney °C

Ta Ambient temperature °C

Go Diesel fuel

Ho Nafta

G Gas

The pressurisation must fall within the values indicated in the table of the technical data.



#### IMPORTANT

The temperature difference between flow and return must not exceed 30°C in order to avoid thermal shocks to the boiler.

The return temperature from the system must be higher than 50°C with operation with methane gas or LPG and 40°C with operation with fuel oil or naphtha to protect the boiler against corrosion due to the acid condensate of flue gases.

Therefore, the warranty does not cover damage caused by the condensate.

It is useful to mitigate the return temperature by installing a mixing valve and/or a recirculation pump.

The burner switch must always be kept on.

In this way the temperature of the water in the boiler will be kept approximately at the value set with the thermostat.

In case of poor smoke sealing in the front part (door and burner plate) or rear part (smokebox) of the boiler, it is necessary to adjust the closing tie-rods of the single parts.

If this is not enough, replace the relevant gaskets.



#### ATTENTION

Do not open the door and do not remove the smokebox while the burner is in operation and, in any case, wait for a few minutes after it is turned off to allow the cooling down of the insulating parts.

## STOP PERIODS

The most serious corrosions 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.).

Also drain the condensate collection tank and all pipes.

### 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.

## 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 6 months, check the status of safety devices "(probes "and "pressure switches)

Carry out the maintenance of the burner (based on the relevant manufacturer's instructions).

Check bolt tightening at the flanges and all seals/gaskets for wear.

Check the status of the internal coating of doors and fibreglass braided ropes.

Check the integrity of the flame indicator light.

Periodically clean furnace and tube bundle using a brush.

Check that turbulators, if any, are clean and not damaged.

Generally, gaseous fuels do not produce any carbon deposit, while the use of liquid fuels requires frequent cleaning to prevent significant scale build-ups.

Check the wear of drain valves which tend to deteriorate more rapidly due to the sludge abrasive action.

Check the integrity of the electrical system on board the boiler.

Check the integrity of the control panel both externally (IP protection) and internally (check all the components inside the control panel).



## 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.

## PERIODIC VERIFICATIONS

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

Observation and tests	1 day	1 week	1 month	3 months	6 months	12 months
Safety valves	O	O			T(1)	
Shut-off valves	O	O			T(4)	
Protection devices, High Pressure	O	T(2)		T(5)		T(12)
Protection devices, High Temperature	O	O		T(5)		T(12)
Pressurised parts (pipes, inspection hatches, flanges, gaskets)		O	O			
Temperature, pressure control devices	O	O			T(7)	
Loading system, pumps/valves (if any)	O	O		T(8)		
Analysis of the water quality	T(6)	T(9)				
Burner control (combustion)	O	O				T(10)
Safety systems	O	O			T(11)	

- 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) *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(3) *Manually check, through the switches present on panel front side, that valves (if any) are open*
- T(4) *Check correct seal, grease, lubricate where necessary*
- T(5) *Physically check the triggering of safety devices*
- T(6) *Analyse water quality by taking a sample from the feed system; check whether it complies with EN12953-10 specifications*
- T(7) *Check the correct indications of the instrumentation with sample thermometers/pressure gauges  
Verifications must be performed by qualified personnel*
- T(9) *Analyse the boiler water*
- T(10) *Check the burner, combustion control, safety devices  
Verifications must be performed by qualified personnel.*
- T(11) *Check the proper operation of all safety, electric and electronic circuits. Verifications must be performed by qualified personnel.*
- T(12) *Bench check of the safety devices.  
Verifications must be performed by qualified personnel.*
- T(13) *Check and new calibration of the analysis system.  
Verifications must be performed by qualified personnel.*

## **METHODS FOR CHECKING THE SAFETY DEVICES**

### ***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.

### **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, thoroughly check that no water or steam can reach the boiler through the connecting ducts. Each valve will have to be locked and, if necessary, isolated by removing a section of the connection 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. The space between every fire tube and tube plates must be checked for leaks: any welding operation must always be performed in compliance with law requirements, remembering that the boiler is a pressure equipment posing a danger of bursting and subject to inspection by the designated Body.

During inspection, check all safety accessories.

## 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
Safety pressure switch triggering	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
Burner always on	Incorrect connection to the electrical panel	See the wiring diagram
	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
	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 *Residual Risk Management*

## **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.(EN 12953-10)
- 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.(EN 12953-10)

## **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 ZEVIO (VR) - ITALIA -											
Tipo - Type - Typ - Modelos											
Codice - Code - Code - Codice				Data - Date		N° Fabbrica					
<b>GENERATORE DI VAPORE - STEAM BOILER GENERATEUR DE VAPEUR - GENERADOR DE VAPOR</b>											
PORTATA TERMICA - HEAT INPUT DEBIT THERM. - POTENC. TERM.						POTENZA UTILE - HEAT OUTPUT DEBIT THERM. UTILE - POTENCIA UTIL					
MIN						MIN					
MED/MIN						MED/MIN					
MAX						MAX					
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		
SOLIO - 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 CARATTERISTICI VEDI DICHIARAZ.CONFORMITA')											
S.N. Body 1:									1370		
S.N. Body 2:											
TARGA DATI CORPO GENERATORE: VEDI FLANGIATURA INFERIORE BARILOTTO 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.icicaldaie.com - info@icicaldaie.com

# **7** *Notes*

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