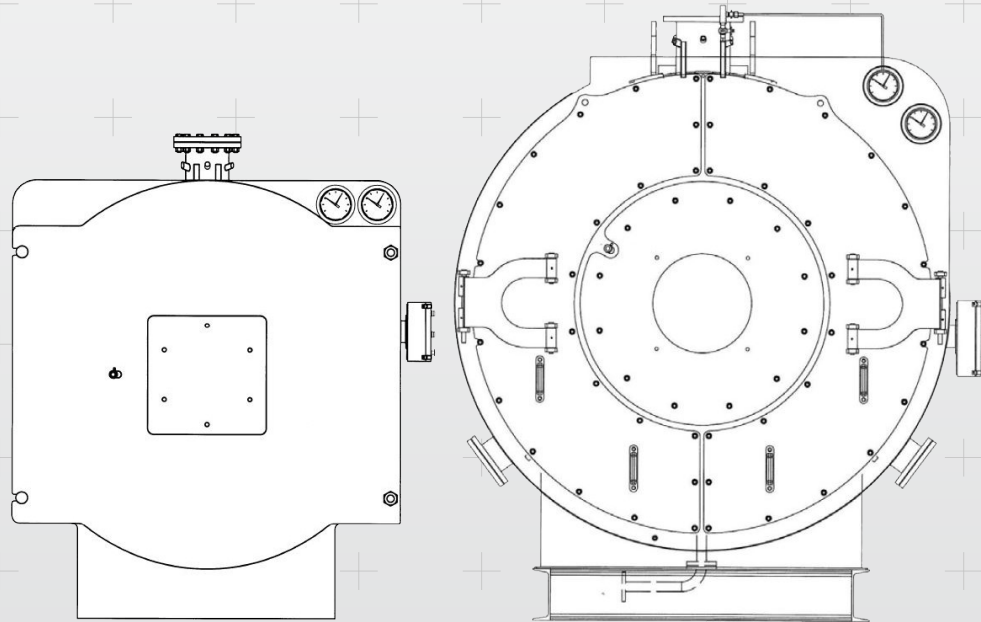


Superheated water heat generator

# ASGX EN



ASGX EN\_3000\_17000\_en\_01 03-2023 - 03/2023

# INDEX

## General information

- 3 Introduction
- 3 Range
- 3 Compliance
- 4 Warnings
- 5 Prohibitions
- 5 Hazards
- 6 Identification
- 7 Appliance description
- 8 Technical data
- 9 Dimensions and connections
  - 9 *ASGX EN 3000-7000*
  - 10 *ASGX EN 8000-17000*
- 11 Burners
- 12 Paperwork
- 12 Fire prevention
- 13 Components
  - 13 *Pressure*
  - 13 *Pressure gauge*
  - 16 *Safety valves*
  - 17 *Temperature*
  - 17 *Thermoregulation and message display*
  - 19 *Thermometer*
  - 19 *regulation thermostat*
  - 19 *Safety thermostat*

## Installation

- 20 Product receipt
- 21 Handling
- 21 Film removal
- 22 Installation room
  - 22 *Positioning*
  - 22 *Room ventilation*
- 23 System cleaning

- 23 Hydraulic connections
- 24 Starting hydraulic circuit
- 24 Flue exhaust
- 25 Front door opening
  - 25 *ASGX EN 3000 ÷ 7000*
  - 25 *ASGX EN 8000 ÷ 17000*
- 26 Turbulator assembly
- 27 Electrical connections
- 28 Burner assembly
  - 29 *Water characteristics*
  - 30 *Frequency of analysis*

## Use

- 31 Preliminary checks
- 31 Thermal expansion
- 32 Commissioning
- 33 Checks after commissioning
- 34 Stop periods

## Maintenance

- 35 Routine maintenance
- 36 Periodic verifications
- 37 Methods for checking the safety devices
  - 37 *Check of the safety pressure switch*
- 37 Extraordinary maintenance
- 38 Any anomalies and remedies
- 38 Protecting the environment
- 38 Decommissioning and disposal

## Residual Risk Management

## Useful information and declarations

- 43 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 **ASGX EN**, 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
	12 bar
ASGX EN3000	86803000
ASGX EN3500	86803500
ASGX EN4000	86804000
ASGX EN5000	86805000
ASGX EN6000	86806000
ASGX EN7000	86807000
ASGX EN8000	86808000
ASGX EN9000	86809000
ASGX EN10000	86810000
ASGX EN11000	86811000
ASGX EN12000	86812000
ASGX EN13000	86813000
ASGX EN14000	86814000
ASGX EN15000	86815000
ASGX EN16000	86816000
ASGX EN17000	86817000

## COMPLIANCE

Superheated water heat generators Series **ASGX EN** 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 **ASGX EN** 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

- 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.



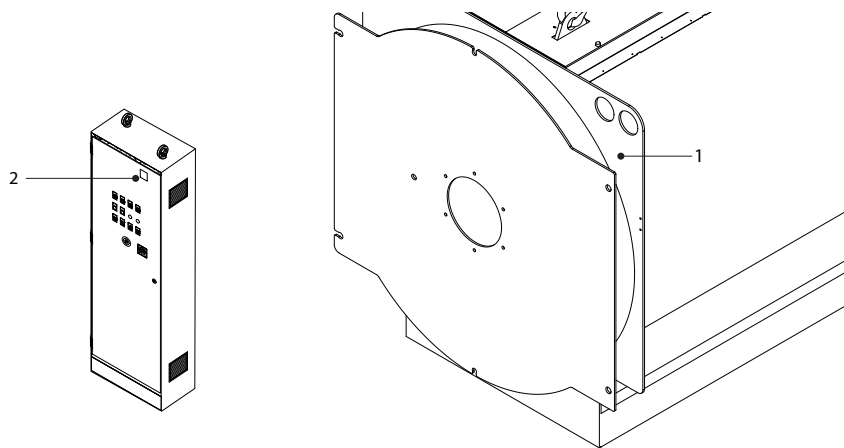
## DANGER

- **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 **ASGX EN** 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

The **ASGX EN** range provides super-heated water boilers with three flue gas passes and completely wet furnace back. Manufactured from steel, quality tested according to the prevailing standards and welded with automatic submerged arc welding processes.

Suitable for liquid and gaseous fuels.

Complete with regulation and safety accessories for automatic operation.

Intended for heating or technological systems with operating temperature above 110°C.

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.

## TECHNICAL DATA

DESCRIPTION	u.m.	ASGX EN					
		3000	3500	4000	5000	6000	7000
Nominal power	kW	3000	3500	4000	5000	6000	7000
Thermal capacity	kW	3333	3888	4444	5555	6666	7777
100% efficiency (ref. NCV)	%	90	90	90	90	90	90
NG max flow rate G20	Stm <sup>3</sup> /h	352,65	411,47	470,28	587,92	705,43	822,94
NG max flow rate G30	kg/h	261,74	305,39	349,04	436,35	523,56	610,78
NG max flow rate G31	kg/h	258,9	302,08	345,26	431,62	517,89	604,16
Max flue gas flow rate	kg/h	5254,49	6130,9	7007,17	8760,01	10510,91	12261,81
100% efficiency (ref. NCV)	%	92	92	92	92	92	92
Pressure drop	mbar	15	18	15	20	13	15
Heat losses through the chimney	%	9,7	9,7	9,7	9,7	9,7	9,7
Heat losses through the casing	%	0,3	0,3	0,3	0,3	0,3	0,3
Heat losses with burner off	%	0,1	0,1	0,1	0,1	0,1	0,1
Flue gas temp. at boiler output and air at 20 deg. C	°C	240	240	240	240	240	240
CO <sub>2</sub>	%	10	10	10	10	10	10
Hydraulic pressure drop	mbar	55	75	98	154	91	123
Rated pressure	bar	12	12	12	12	12	12
Total capacity	l	4520	5300	6650	8600	9150	10200
Total weight	kg	7000	7800	9000	11000	13000	14500
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	1000	1000	1000	1000	1000	1000
Allowed fuels		Methane - LPG - Diesel - Naphtha					

DESCRIPTION	u.m.	ASGX EN									
		8000	9000	10000	11000	12000	13000	14000	15000	16000	17000
Nominal power	kW	8000	9000	10000	11000	12000	13000	14000	15000	16000	17000
Thermal capacity	kW	8791	9890	10989	12087	13157	14285	15384	16339	17486	18681
100% efficiency (ref. NCV)	%	91	91	91	91	91,2	91	91	91,8	91,5	91
NG max flow rate G20	Stm <sup>3</sup> /h	930,23	1046,51	1162,91	1279,19	1392,4	1511,75	1628,03	1729,05	1850,38	1976,87
NG max flow rate G30	kg/h	690,41	776,71	863,11	949,41	1033,42	1122,01	1208,31	1283,29	1373,33	1467,21
NG max flow rate G31	kg/h	682,93	768,29	853,75	939,11	1022,22	1109,85	1195,21	1269,38	1358,45	1451,31
Max flue gas flow rate	kg/h	13860,43	15593	17327,36	19059,93	20746,76	22525,08	24257,65	25762,85	27570,66	29455,36
100% efficiency (ref. NCV)	%	93	93	93	93	93,2	93	93	93,8	93,5	93
Pressure drop	mbar	17,5	22,5	15	19	22	26	23,5	19,5	22	23
Heat losses through the chimney	%	8,7	8,7	8,7	8,7	8,5	8,7	8,7	7,9	8,2	8,7
Heat losses through the casing	%	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Heat losses with burner off	%	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Flue gas temp. at boiler output and air at 20 deg. C	°C	212	212	212	212	208	212	212	195	201	212
CO <sub>2</sub>	%	10	10	10	10	10	10	10	10	10	10
Hydraulic pressure drop	mbar	161	98	66	79	94	111	128	86	98	111
Rated pressure	bar	12	12	12	12	12	12	12	12	12	12
Total capacity	l	14950	16200	20200	20200	21800	21800	23800	33000	33000	35100
Total weight	kg	15400	16300	24940	24940	25400	25400	28050	37500	37500	45000
Electric supply	Volt ~	230	230	230	230	230	230	230	230	230	230
Frequency	Hz	50	50	50	50	50	50	50	50	50	50
Insulation class	IP	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Electric power	W	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Allowed fuels		Methane - LPG - Diesel - Naphtha									

Water delivery  $\Delta T$  max 30°C

### Design data

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



# DIMENSIONS AND CONNECTIONS

## ASGX EN 3000-7000

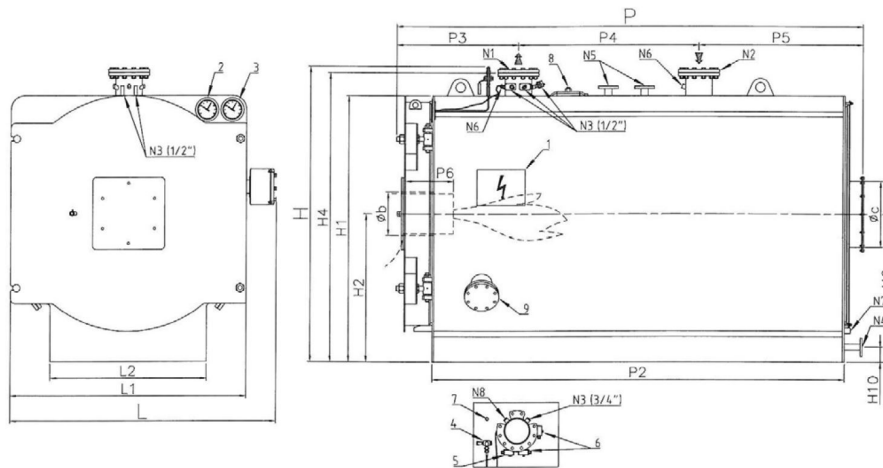


Fig. 1

- 1 Electrical panel
- 2 Pressure gauge
- 3 Thermometer
- 4 Pressure gauge valve
- 5 regulation thermostat
- 6 Safety thermostats
- 7 Safety pressure switch fitting (not supplied)
- 8 Upper inspection hatch
- 9 Lower inspection hatches

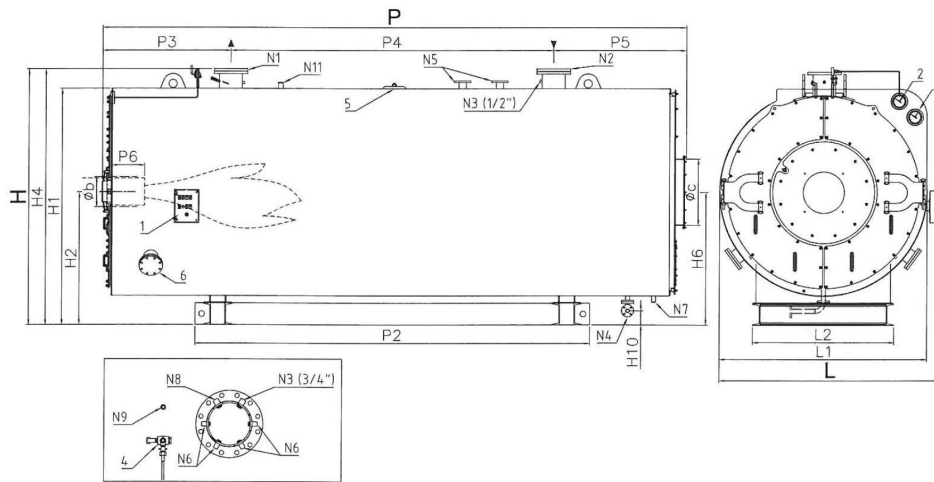
- N1 Boiler flow line
- N2 Boiler return line
- N3 Instruments fittings
- N4 System intake/drain fitting
- N5 Safety valve fittings
- N6 Bulb-holder pockets
- N7 Condensate drain
- N8 Control pocket

### NOTE

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

Dimensions	u.m.	ASGX EN					
		3000	3500	4000	5000	6000	7000
H	mm	2460	2460	2700	2700	2820	2820
H1	mm	2210	2210	2420	2420	2570	2570
H2	mm	1230	1230	1335	1335	1410	1410
H4	mm	2400	2400	2610	2615	2765	2765
H6	mm	1230	1230	1335	1335	1410	1410
H10	mm	125	125	125	125	125	125
L	mm	2200	2200	2410	2410	2560	2560
L1	mm	1960	1960	2170	2170	2320	2320
L2	mm	1300	1300	1400	1400	1600	1600
P	mm	3879	4379	4379	5373	5389	5889
P2	mm	3430	3930	3930	4930	4930	5430
P3	mm	1012	1012	1012	1006	1264	1264
P4	mm	1500	2000	2000	3000	2700	3200
P5	mm	1367	1367	1367	1367	1425	1425
P6	mm	300-400	300-400	300-400	300-400	300-400	300-400
Øb	mm	400	400	450	450	450	450
Øc	mm	550	550	600	600	700	700
N1	DN/in	200	200	200	200	250	250
N2	DN/in	200	200	200	200	250	250
N1/N2	PN	16	16	16	16	16	16
N4	DN/in	40	40	40	40	40	40
N7	DN/in	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4
N8	DN/in	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"

<sup>[1]</sup> Tb=Turbulators size and quantity.



- 1 Electrical panel
- 2 Pressure gauge
- 3 Thermometer
- 4 Pressure gauge valve
- 5 Upper inspection hatch
- 6 Lower inspection hatches
- N1 Boiler flow line
- N2 Boiler return line
- N3 Instruments fittings
- N4 System intake/drain fitting
- N5 Safety valve fittings
- N6 Safety and regulation thermostat fittings
- N7 Condensate drain
- N8 Control pocket
- N9 Safety pressure switch fitting (not supplied)
- N11 Minimum level probe fitting (not supplied)

**NOTE**

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

Dimensions	u.m.	ASGX EN									
		8000	9000	10000	11000	12000	13000	14000	15000	16000	17000
H	mm	3050	3050	3400	3400	3400	3400	3500	3960	3960	3960
H1	mm	2850	2850	3200	3200	3200	3200	3276	3700	3700	3700
H2	mm	1600	1600	1730	1730	1730	1730	1764	1975	1975	1975
H4	mm	3050	3050	3400	3400	3400	3400	3500	3960	3960	3960
H6	mm	1600	1600	2450	2450	2450	2450	2530	2840	2840	2840
H10	mm	171	171	105	105	105	105	128	200	200	200
L	mm	2700	2700	3140	3140	3140	3140	3265	3650	3650	3650
L1	mm	2490	2490	2940	2940	2940	2940	3065	3450	3450	3450
L2	mm	1700	1700	2000	2000	2000	2000	2000	2250	2250	2250
P	mm	7035	7535	7735	7735	8235	8235	8183	8820	8820	9320
P2	mm	4750	5250	5400	5400	5900	5900	5900	6500	6500	7000
P3	mm	1548	1548	1800	1800	1800	1800	1673	1706	1706	1706
P4	mm	3885	4255	4135	4135	4635	4635	4670	5144	5144	5644
P5	mm	1602	1732	1800	1800	1800	1800	1840	1970	1970	1970
P6	mm	600-700	600-700	650-800	650-800	650-800	650-800	650-800	600-700	600-700	600-700
Øb	mm	500	500	580	580	580	580	580	740	740	740
Øc	mm	800	800	900	900	900	900	1000	1100	1100	1100
N1	DN/in	250	300	350	350	350	350	350	400	400	400
N2	DN/in	250	300	350	350	350	350	350	400	400	400
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
N7	DN/in	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4	1"1/4
N8	DN/in	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
N11	DN/in	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

<sup>[1]</sup> Tb=Turbulators size and quantity.

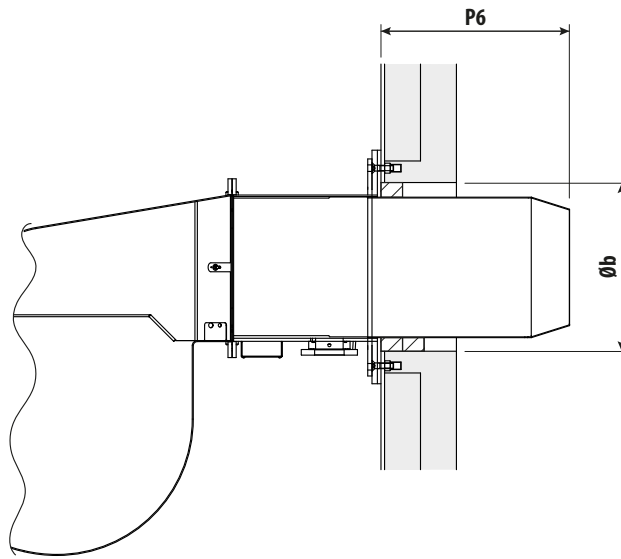
## BURNERS

The burners that can be installed on the **ASGX EN** 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.	ASGX EN					
		3000	3500	4000	5000	6000	7000
P6	mm	300-400	300-400	300-400	300-400	300-400	300-400
Øb	mm	400	400	450	450	450	450

Dimensions	u.m.	ASGX EN									
		8000	9000	10000	11000	12000	13000	14000	15000	16000	17000
P6	mm	600-700	600-700	650-800	650-800	650-800	650-800	650-800	600-700	600-700	600-700
Øb	mm	500	500	580	580	580	580	580	740	740	740

## 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 **ASGX EN** 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).

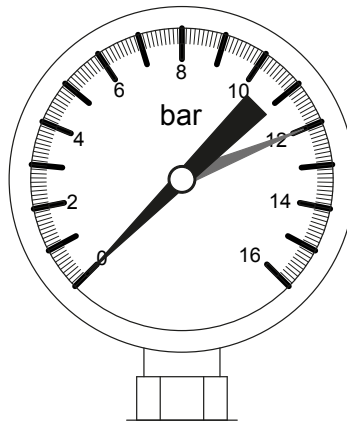
In the descriptions below, accessories are divided based on the values they control.

### 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.*

## OPERATING PRESSURE SWITCH

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.

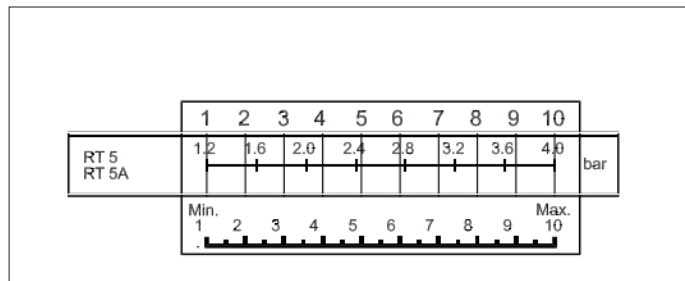
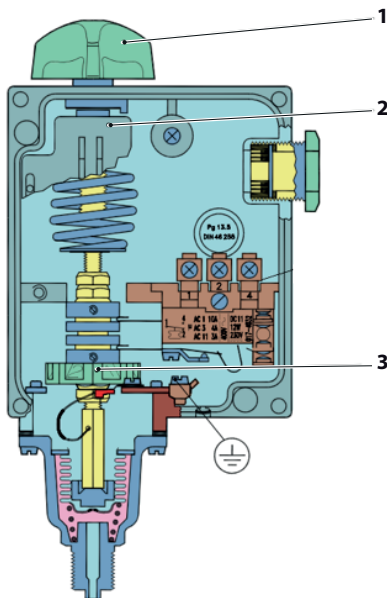
### Pressure switch calibration

- Rotate the knob (1) until setting the index of the scale (2) to the pressure value at which you wish the burner to restart.
- Remove the cover of the pressure switch and set the drum (3) to the value selected for the differential (burner stop) based on the "Scale of the differential regulation disc".

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



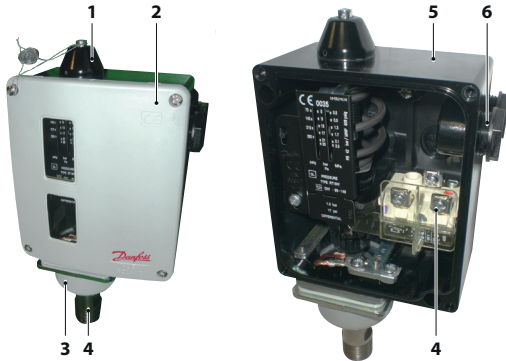
## SAFETY PRESSURE SWITCH

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

The safety pressure switch is triggered in case of regulation pressure switch fault and permanently stops the burner.

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

The calibration of this pressure switch is carried out with a procedure similar to that used for the regulation pressure switch, with the only requirement of setting the drum indicator to 1, practically with a zero differential.



- 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

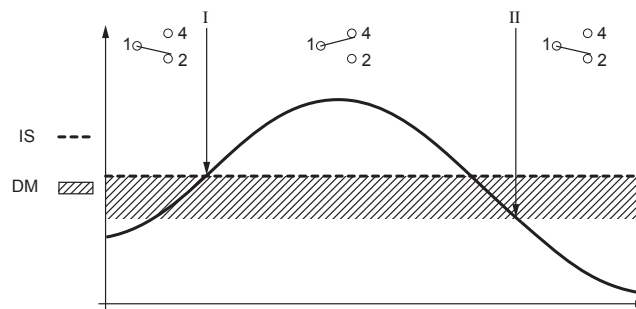


### IMPORTANT

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

### Operation

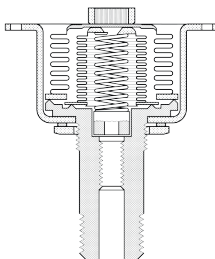
When the pressure exceeds the set value, contacts 1-4 close and contacts 1-2 open. Contacts go back to their initial position when the pressure drops below the set value, minus the differential value (fixed at 1.2 bar).



- 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.

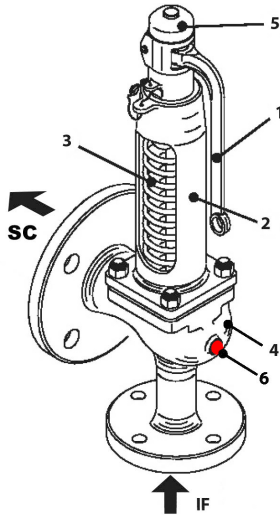
The external bellows surface is three times higher than the one of the internal bellows. The connection between terminals 1 and 2 is interrupted. Should the external bellows pierce, atmospheric pressure will be present between the two bellows.

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.

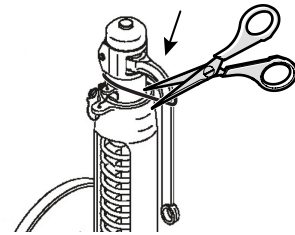
**SAFETY VALVES**

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**

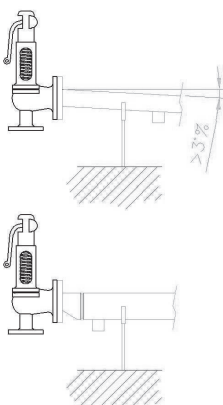
Drainage hole placed at the bottom of the valve body (6). Drainage hole with diameter 1/4" BSP-f until DN80. For higher DN sizes, the hole diameter is equal to 1/2" BSP-f. Remove the red plastic cap (if any) and provide for collecting draining suitably. (provided by the customer). For further information,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

## TEMPERATURE

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

## Thermoregulation AND MESSAGE DISPLAY (VALID ONLY FOR STANDARD ACCESSORIES)

### 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)

## 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

### **THERMOMETER**

It is of the inert gas recessed type, 0/120°C range, boiler with 100 mm diameter and 4000 mm long temperature detection capillary tube.

### **REGULATION THERMOSTAT**

The regulation thermostat stops the burner when the required temperature is reached and restarts it automatically at a pre-set value. It also features a contact to activate the second flame of a two-stage burner.

### **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.

# 2 Installation

## PRODUCT RECEIPT

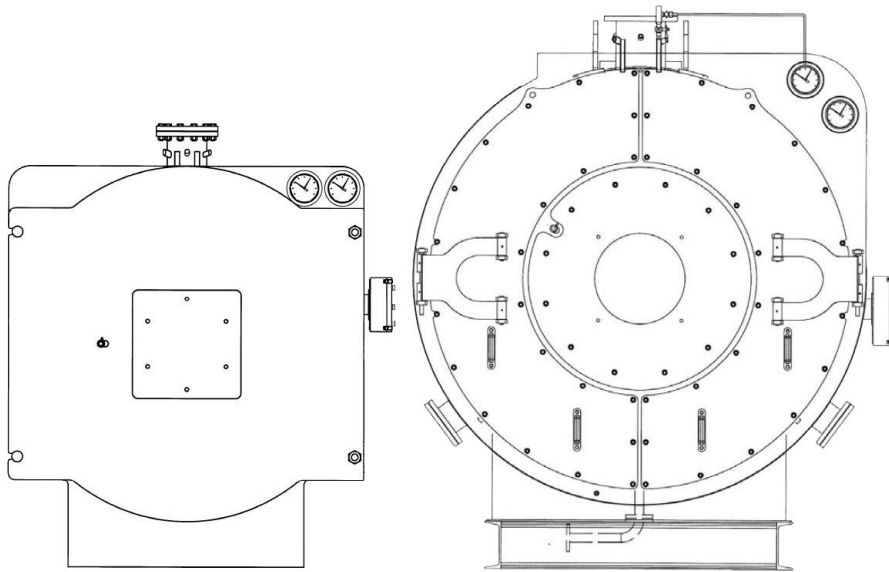
The **ASGX EN** generators are supplied complete with accessories.

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
- 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.

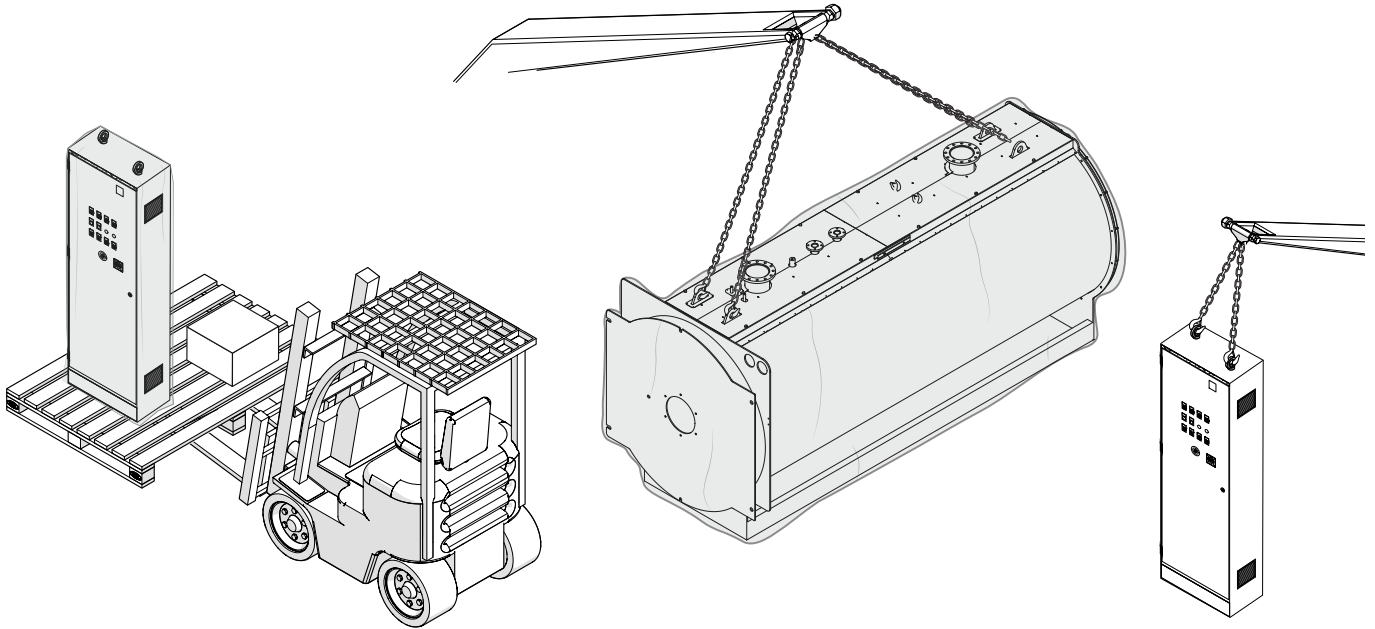
## HANDLING



### ATTENTION

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

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

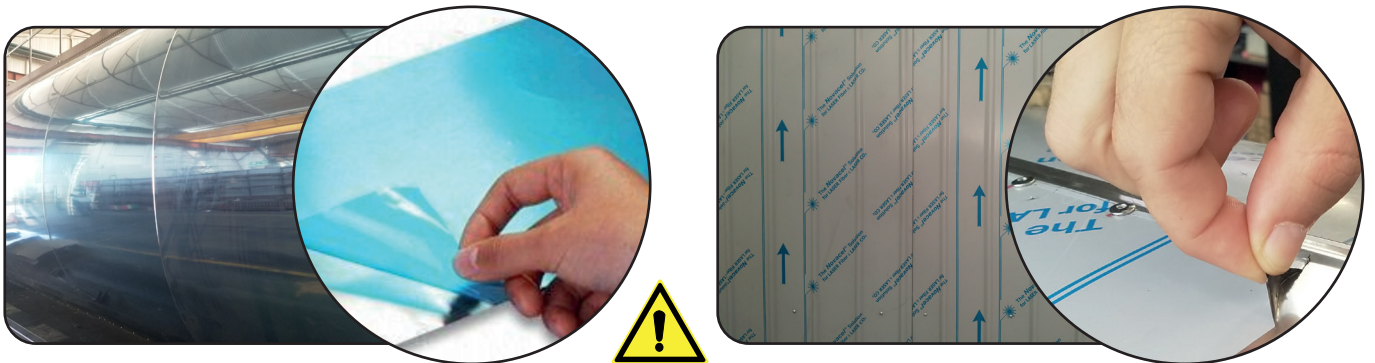


### ATTENTION

– 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

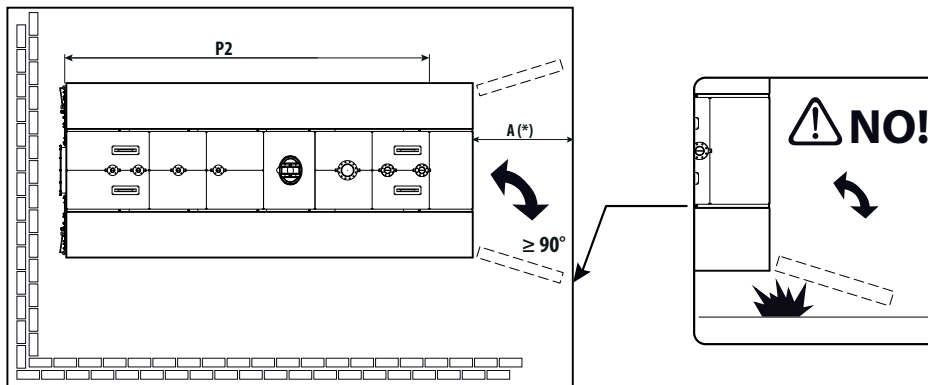
### POSITIONING

The **ASGX EN** 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.

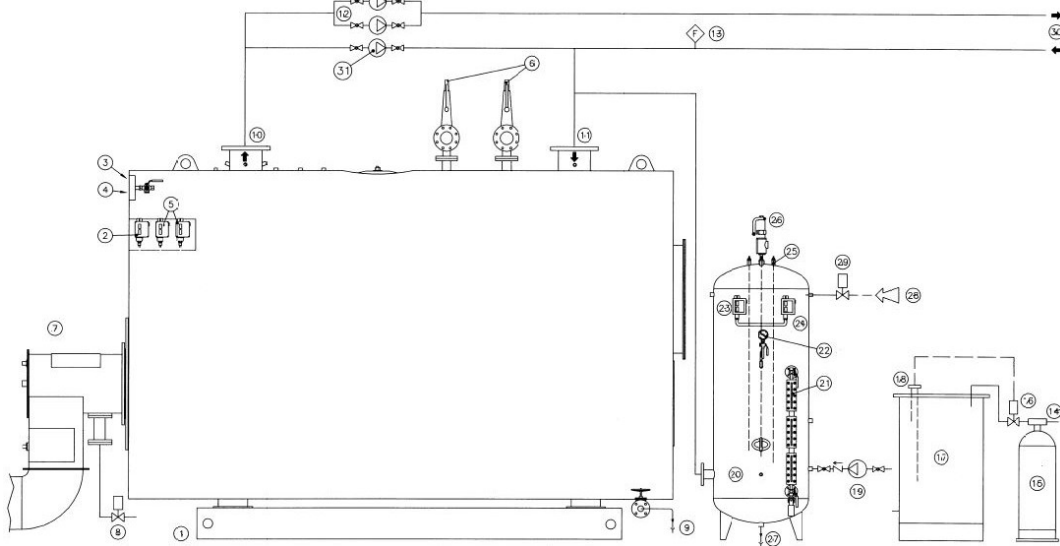
**The air must be filtered with a 25 µm mesh.**



### 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.

## STARTING HYDRAULIC CIRCUIT



- |                                |                               |                                  |
|--------------------------------|-------------------------------|----------------------------------|
| 1 Generator                    | 12 System pumps               | 23 Air supply pressure switch    |
| 2 Pressure transducer          | 13 Flow switch                | 24 Pressure transducer           |
| 3 Thermometer                  | 14 Water mains                | 25 Level regulation probes       |
| 4 Pressure gauge               | 15 Water softener             | 26 Expansion vessel safety valve |
| 5 Thermostat                   | 16 Water load solenoid valve  | 27 Expansion vessel drain        |
| 6 Safety valves                | 17 Water supply tank          | 28 Air supply                    |
| 7 Burner                       | 18 Water tank level regulator | 29 Air supply solenoid valve     |
| 8 Fuel shut-off solenoid valve | 19 System refilling pump      | 30 Use                           |
| 9 Boiler drain                 | 20 Closed expansion vessel    | 31 Recirculation pump            |
| 10 Delivery                    | 21 Level indicator            |                                  |
| 11 Return                      | 22 Pressure gauge             |                                  |

## 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

### ASGX EN 3000 ÷ 7000

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



ASGX EN 3000 ÷ 7000

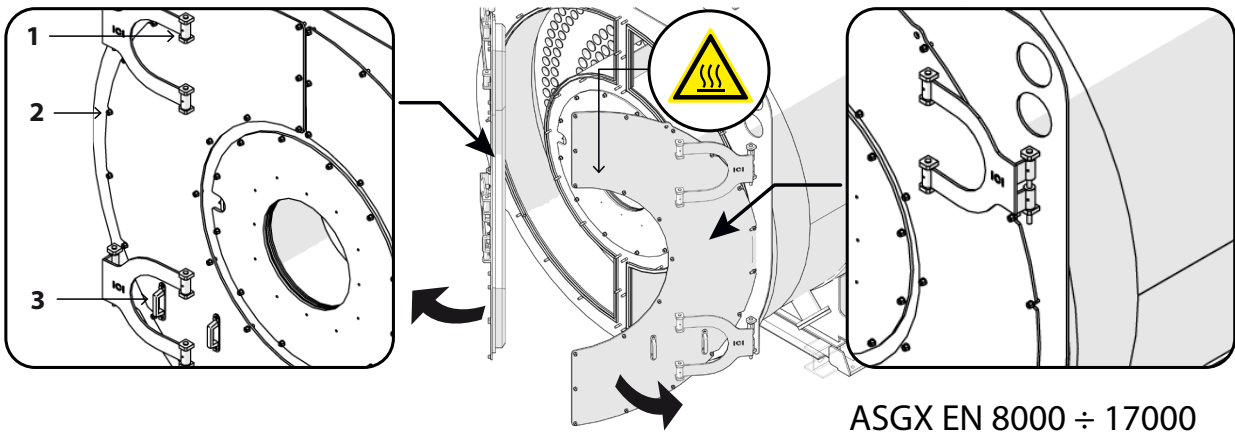
### ASGX EN 8000 ÷ 17000

- 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

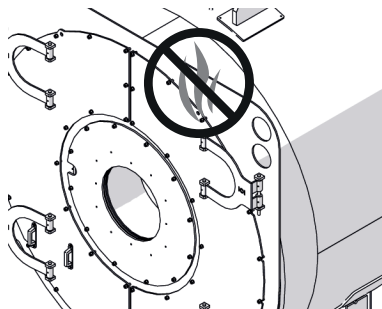
Retaining screws (1) reduce vibrations. When closing the doors, tighten again the retaining screws (1).



ASGX EN 8000 ÷ 17000

#### 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.



#### DANGER

THERE MUST BE NO FLUE GAS LEAKS.

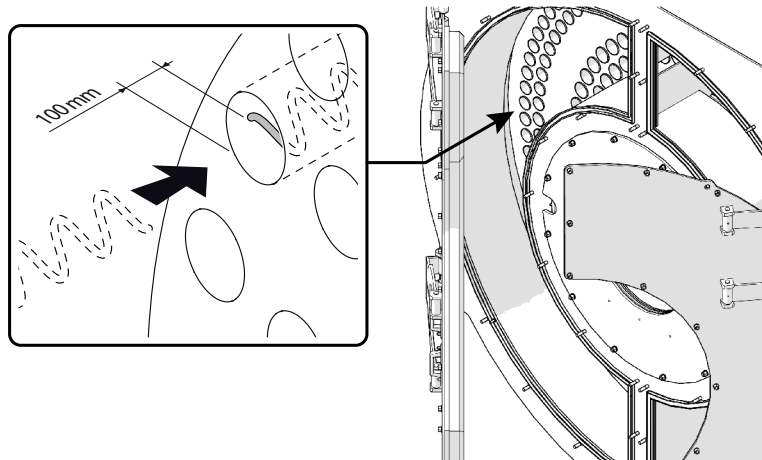
## TURBULATOR ASSEMBLY

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.



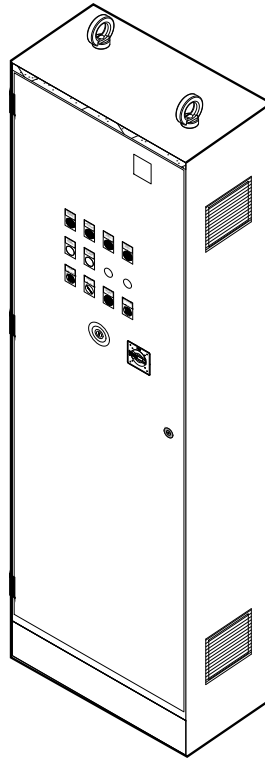
### DANGER

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



## 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**.

## BURNER ASSEMBLY

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

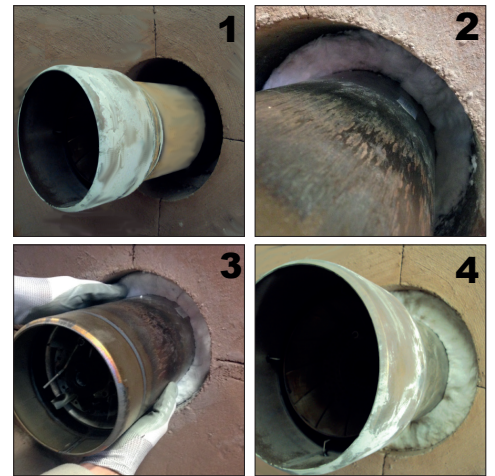
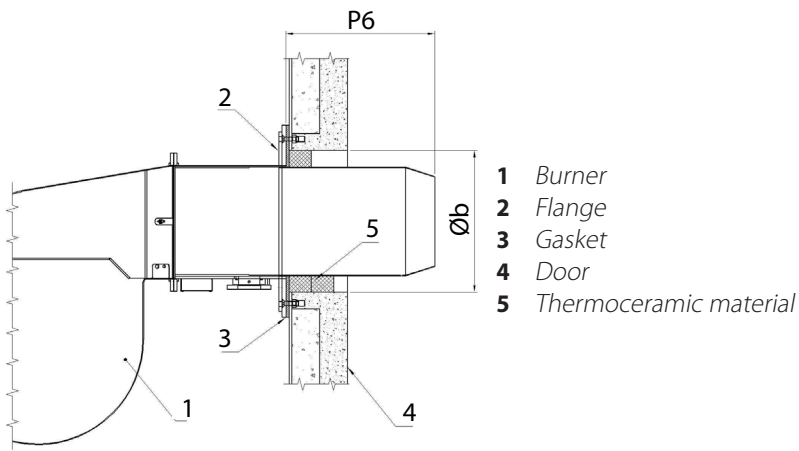
- the installation and fastening to the boiler
- the connection to the fuel supply
- the electrical connections
- the adjustments to be made
- maintenance
- the necessary checks.



### 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.



## 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



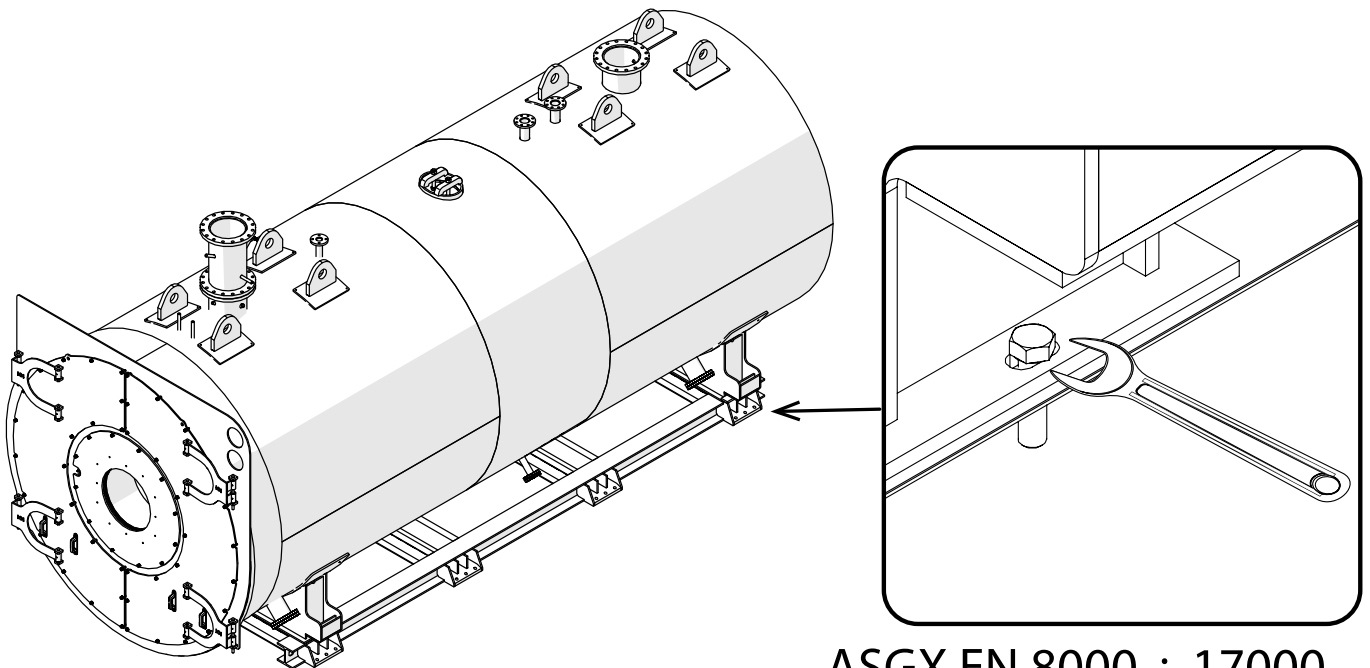
### IMPORTANT

- 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.

## 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.



ASGX EN 8000 ÷ 17000

## COMMISSIONING

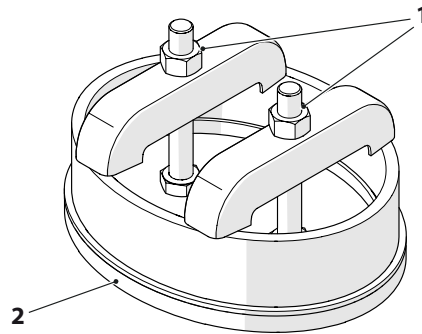
Start up the boiler as follows:

- 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:

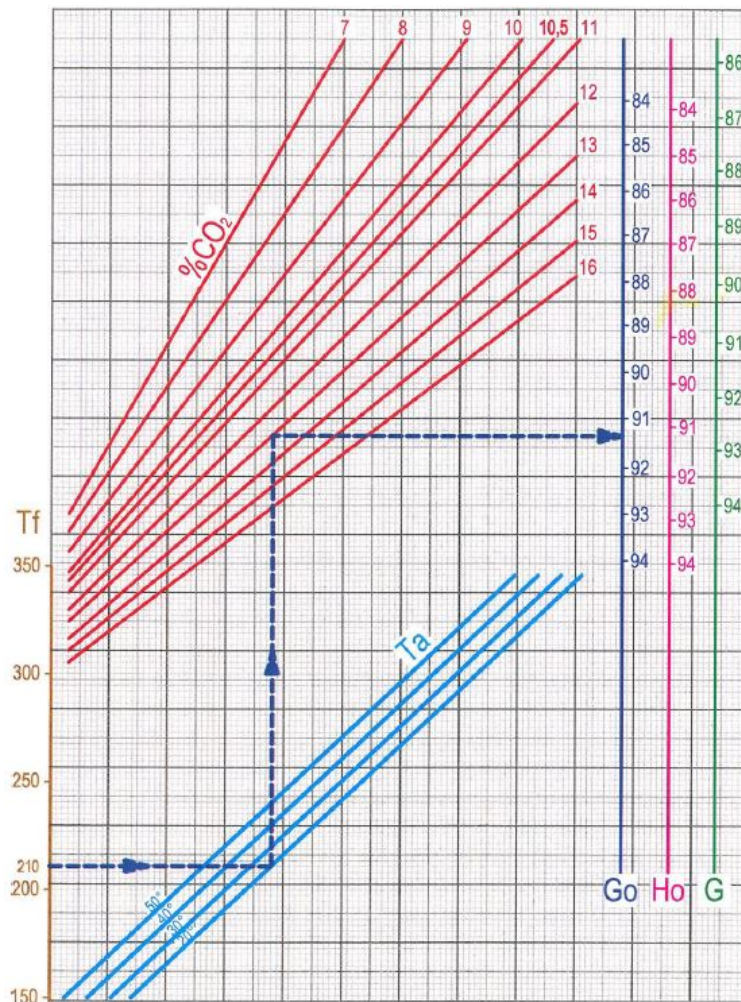
Flue gas temperature 210°C

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

- *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					
<b>ICI CALDAIE S.p.A.</b> Via G.Pascoli, 38 - 37059 ZEVIO (VR) - ITALIA -					
<i>Tipo - Type - Typ - Modelos</i>					
<i>Codice - Code - Code - Codice</i>		<i>Data - Date</i>	<i>N° Fabbrica</i>		
<b>GENERATORE DI VAPORE - STEAM BOILER GENERATEUR DE VAPEUR - GENERADOR DE VAPOR</b>					
<b>PORTATA TERMICA - HEAT INPUT DEBIT THERM. - POTENC. TERM.</b>		<b>POTENZA UTILE - HEAT OUTPUT DEBIT THERM. UTILE - POTENCIA UTIL</b>			
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
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:					
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.icaldaie.com - info@icaldaie.com





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