EN

TD 150 Steam Generator

Instructions for Installation, Use and Maintenance

Dear Customer,
thank you for choosing a Boldan TD 150 Steam Generator.

In your own interest, we would like to invite you to follow and observe the instructions contained in this manual, and to make sure that the scheduled maintenance is carried out by skilled operators to guarantee maximum efficiency and life to the equipment.

Please note that failure to observe the instructions contained in this manual will invalidate the warranty.

The steam generator specified below complies with Directive 2014/68/EU (PED) on pressure equipment.

CONTENTS

1. INTRODUCTION

The high level of performance achieved by our steam generators series TD 150, their automation, the safety devices protecting against the accidental lack of water, flame, power and the exceeding of the rated pressure, guarantee a safe operation without particular manual services.

In any case, to abide by the Norms in force in the installation site on the subject and to carry out the normal checks during operation, the running of the generator shall be entrusted with duly trained and competent staff.

This manual is designed to provide support to operators in performing their tasks.

A careful reading of the manual, especially when starting up the generator, guarantees a perfect execution of the preliminary operations that are the prerequisite for a long life of the equipment.

2. SIX MONTHLY INSPECTION OF GENERATOR'S INTERNAL SURFACES

USE OF THE GENERATOR IF CORROSION/SCALING IS PRESENT

An accurate inspection of the pressure body of the generator by the user is scheduled at least EVERY SIX MONTHS.

This visual inspection must involve both the water and the fume sides of the generator to the extent that these are visible and can be inspected.

The performance of periodical inspections must be recorded and records must be signed by the person in charge of generator's maintenance. These records shall be made available to Boldan Oy in case of servicing required on the equipment.

The presence of scaling, including light, INVALIDATES THE CONTRACTUAL WARRANTY ON THE PRESSURE BODY.

The presence of any corrosion on metal parts of the pressure body FURTHERMORE RELIEVES BOLDAN OY OF ALL RESPONSIBILITIES FOR DAMAGES CAUSED BY USING THE PRODUCT, because in these conditions the Essential Safety Requirements, on which the equipment was designed and manufactured for its safe operation, are no longer present.

It is absolutely forbidden to use the generator before Boldan Oy has checked the extent of the corrosion and assessed the actions to be implemented from time to time.

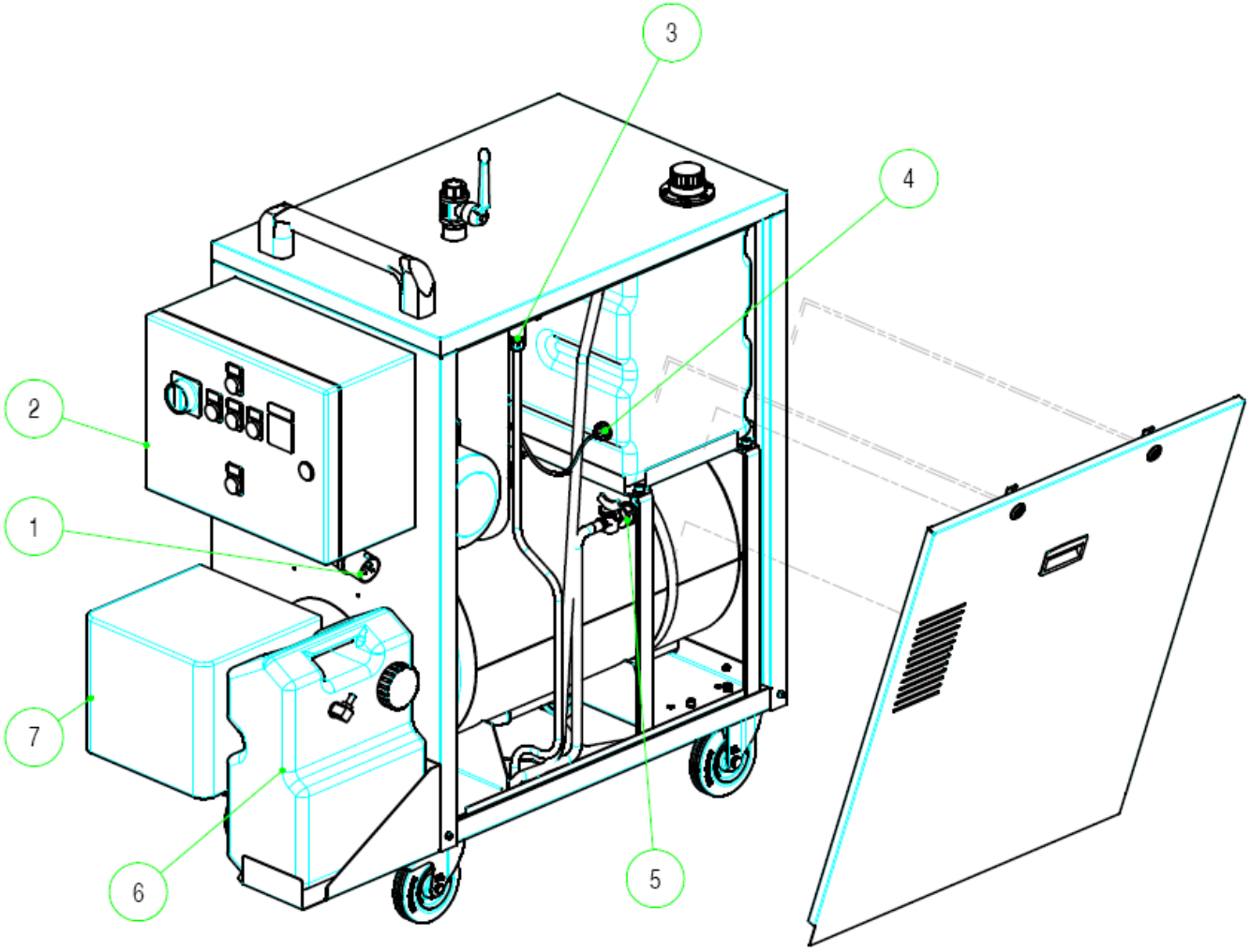
3. STRUCTURE OF THE MANUAL

The descriptions and illustrations contained herein are not binding and may not be a loyal representation of the layout, size and accessories of the generator the manual accompanies. It is solely aimed at illustrating and describing the operating principles and the safety standards to be applied.

The user and the operator in charge of running and maintaining the generator are obliged to know the contents of this manual.

4. PART DESCRIPTION

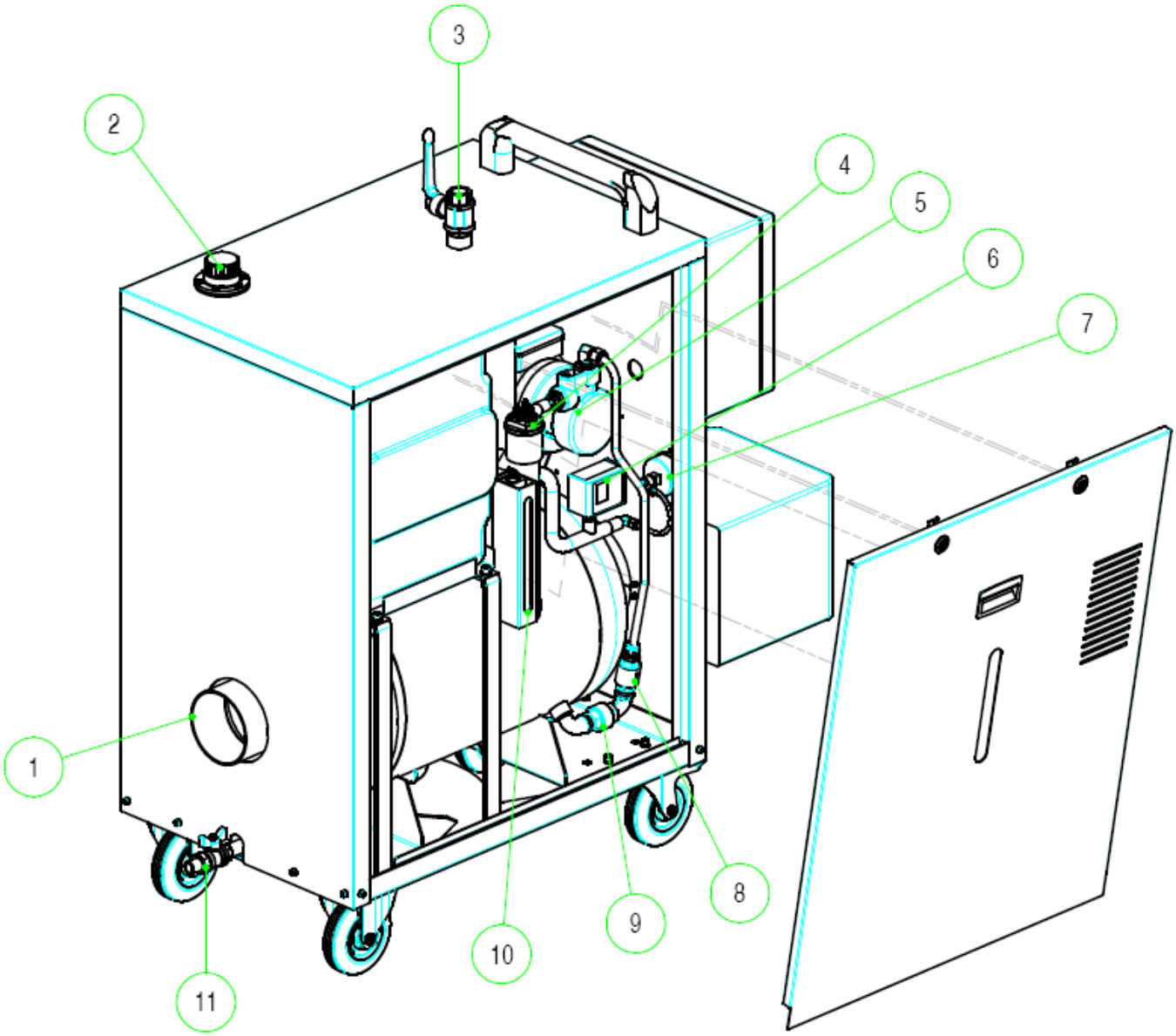
Fig. A



Legend of Fig. A

1. Power supply plug
2. Control panel
3. Safety valve
4. Level sensor
5. Tank discharge tap
6. Gas oil tank
7. Burner

Fig. B



Legend of Fig. B

1. Fume outlet
2. Tank water inlet
3. Steam valve
4. Level probes
5. Feed pump
6. Safety pressure switch
7. Pressure gauge
8. Check valve EU
9. Check valve MB
10. Visual level
11. Boiler discharge

4.1 TEMPERATURE REGULATOR

Deviation indicators

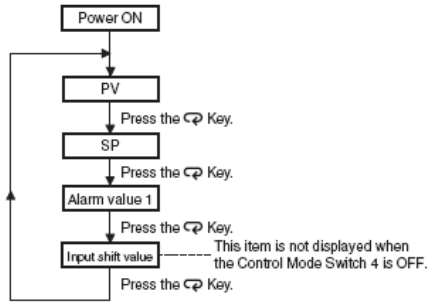
The △ indicator lights when the PV is greater than the SP and the ▽ indicator lights when the PV is less than the SP. The □ indicator (green) lights when the deviation is less than 1% FS (0.25% FS for multi-input models). These indicators flash during ST (self-tuning)/AT (auto-tuning).

Mode indicators

The SP indicator lights when the setting temperature is being displayed. The ALM indicator lights when the alarm value 1 is being displayed.

Mode Key

When the power is turned ON, normally the display will use the display items in the following order each time the Mode Key is pressed.



PV, SP, Alarm Value, Input Shift Display

The display switches each time the ↻ Key is pressed.

Output indicator

Lights when the control output is ON.

Alarm indicators

ALM1 (Alarm 1): Lights when the alarm 1 output is ON.
ALM2 (Alarm 2): For future use.

Up Key

Pressing the Up Key increases the SP/alarm value display. Keeping the Up Key pressed continues to increase the display value. When the internal protect switch is ON, press the Up Key while holding down the Lock Release Key.

Down Key

Pressing the Down Key decreases the SP/alarm value display. Keeping the Down Key pressed continues to decrease the display value. When the internal protect switch is ON, press the Down Key while holding down the Lock Release Key.

Lock Release Key

When the protect switch is ON, the set value can be changed by pressing the Up and Down Keys while holding down the Lock Release Key.

5. GENERATOR INSTALLATION

The generator is delivered completely pre-assembled as a single block that is ready to be installed on site.

The points to be connected are:

- Steam valve connection
- Tank water inlet
- Generator discharge
- Power supply to control panel
- Connection of fume outlet vent to the outside using a cylindrical flue.

5.1 STEAM VALVE CONNECTION

Using a seamless steel pipe having the appropriate diameter, connect the generator steam valve to the steam distribution pipe.
All steam distribution pipes shall be duly insulated to prevent a strong steam condensation and to limit the loss of heat.

5.2 TANK WATER INLET

In addition to being clean, clear and duly treated to prevent scale deposits that may damage the generator, the feed water is conveyed by the purifier to the feed tank inside the generator, which is already equipped with all automatisms.

5.3 GENERATOR DISCHARGE

The generator discharge unit pipe must be connected to another pipe having the same diameter and convey it to a drip pan from where the drain water will be discharged into the sewage system.
The pipe connecting the discharge unit to the drip pan must be anchored to prevent vibrations and coupled in such a way not to cause back flows during draining operations.
It is also advisable to make sure that the drip pan is sealed and equipped with a bleeder line to the outside so that the pressure that develops during the automatic discharge can be relieved.

To discharge the generator completely, open the manual valve on the back of the generator.

ATTENTION: The generator's discharge pipe is subject to a pressure corresponding to that of the generator itself. Therefore, the discharge pipe must be manufactured with great care in order not to cause hazards for people during automatic discharge operations.

5.4 POWER SUPPLY TO CONTROL PANEL

The single-phase line (phase + neutral + earth) must be connected to the generator's electric panel by means of an extension equipped with an industrial male-female coupling.
The electric connection is subject to the norms envisaged by Law 46/90.

5.5 CHIMNEY

Connect the flue to the generator's fume outlet making sure that the pipe diameter is the same.
Technically, the chimney insulation is not required because the temperatures of the fumes exhausted by the generator do not cause condensation. *Possible insulations may be required for specific environmental conditions or other provisions.*

6. START UP OF THE GENERATOR

The operations described below are the ones that must be performed for the start-up of the generator. They must be performed under the supervision of qualified staff to guarantee compliance with the safety requirements of the steam generator unit.

To prevent corrosion of the generator's internal surface, passivation (boiling) is recommended. This operation consists in maintaining the generator temperature constant for a specific period of time. The generator is filled with water containing appropriate passivating additives. This operation favours the formation of a magnetite film on the water side of the generator.
It is advisable to entrust the performance of this operation to Companies that are qualified and experienced in water treatments for generators.
Since the operation must be performed with the equipment running, it is clearly necessary to follow the start up operations specified below before carrying out passivation.

When the steam pressure reaches the desired value, gradually open the main steam valve so that the steam piping warms up slowly. When the generator is at the operating pressure, make sure that bolts and gaskets are tight. Possible leakages of water from the generator are determined by condensation phenomena which normally occur during start-up, and end with normal operation.

Before commissioning or after more or less lengthy stops, make sure that:

- feed pump works normally
- safety pressure switch is set on the requested value
- safety valve is calibrated on the set values
- steam valve is closed

Every time the generator is switched on with cold water in the boiler, when pressure reaches approximately 2 bars, it is advisable to stop the burner and partially open the discharge valve for several seconds; then re-start the burner until it reaches maximum pressure.

After start-up and for the next five days, check the seal of all the gaskets and tighten all nuts evenly. Failure to carry out these checks causes an early wear of gaskets and seals, which are not covered by warranty.

To start-up the generator, carry out the following operations:

6.1 INSPECTION

Before starting up, make sure that all the couplings are tightened evenly, that any blind disks for the hydraulic test have been removed, that the electric and hydraulic connections have been executed properly.

6.2 FILLING OF GENERATOR

- *Close the following valves:*
  - generator discharge

- *Open the following valves:*
  - main steam intake (to be closed when water has reached the normal level)

Never fill a boiler, which is still hot, with cold water.

6.3 ELECTRIC PANEL

On the front operator panel of the electric panel, put the main switch on “1”, then follow the steps described in point 4.1

6.4 BURNER

Carefully read the instructions given on the burner manual to adjust combustion; in any case, contact the manufacturer’s customer assistance service.

6.5 PRESSURE SWITCHES

The pressure switch stops the burner in case of excess pressure.
The correct pressure for the three pressure switches is the following:

- Safety pressure switch 11 bars

7. COMMISSIONING

After having carefully followed the above steps, fill the water feed tank through the intake placed in the upper part of the generator; when the red light “TANK LOW LEVEL” goes out, the minimum level has been reached; add approximately another 30 litres, then press the blinking green button “START – STOP CYCLE”.

The feed pump will start filling the generator until the maximum level is reached; when the light “BOILER LOW LEVEL” goes out, the burner starts and it will continue operating until the temperature set on the temperature regulator on the operator panel of the electric panel is reached. For adjusting the Set Point temperature, follow the instructions given in point 4.1.

8. ACCESSORIES

8.1 PRESSURE GAUGE

The pressure gauge is the key instrument for running the generator, therefore it must be checked periodically. Make sure it works uninterruptedly. In case of doubt, check against a sample pressure gauge.

8.2 LEVEL INDICATOR

When pressure starts increasing, the level rises as a consequence of the water volume increase. Make sure that water is not dragged with steam.
As a precaution, make sure that water does not exceed the visual level; if necessary, use the generator discharge with slow and intermittent movements.

8.3 SAFETY PRESSURE SWITCH

The safety pressure switch activates immediately if a pressure close to the operating pressure of safety valves is reached. As for safety probes, the pressure switch must be released manually to reset it.

Even a minimum power drop to the panel is sufficient to activate the safety control relays; in this case, safeties must be released even if they have not tripped because of danger.

Check of the safety pressure switch: operating the burner pressure switches, bring the pressure to the calibration value of the safety pressure switches and check if they trip (the burner goes out).
After checking, reduce the pressure by at least one bar to release the pressure switches and restore the calibration of the burner pressure switches.

8.4 SAFETY PROBES

For safety purposes, you can check that safeties trip by causing a drop in the boiler level, even if the safety level trip switches present in Boldan generators and made up of level probe and electronic regulator are an active safety and hence, in case of failure or damage, they can automatically trigger an alarm and stop of the safety circuit preventing the burner from running.

If water is missing inside the generator or the feed tank, the following conditions will occur:

- burner will stop;
- alarm will be displayed on front operator panel.

The fact that the two safety probes do not activate contemporarily is not a defect. Activation may take place within a few seconds, depending on the actual probe length, which may vary with a tolerance of 5-6 mm. Their activation is visible through the switching on of the alarm light.

Reset of generator operation:

- close the discharge on the boiler bottom if it had been opened;
- start the feed pump by pressing start – stop cycle;
- let the water level in the boiler rise by a few centimetres;
- emergency probes will release automatically.

9. HYDRAULIC TEST

During the manufacturing of the boiler body, a hydrostatic test is performed on Boldan Oy's premises in compliance with the requirements of directive 2014/68/EU and the relevant technical dossier. The successful outcome of the hydraulic test leads to applying the CE marking on the equipment/unit.

10. PERIODICAL CHECKS AND MAINTENANCE

The generator must be run by a competent operator who will have to carry out the checks listed below to guarantee a regular performance of the equipment:

10.1 DAILY CHECKS

- Clean and check efficiency of visual level and level regulator.
- Check the overall cleanliness and alkalinity of feed water.
- Clean the boiler several times a day to eliminate possible sludge and to prevent increases of alkalinity in the generator.
- Cleaning of visual levels and probe containers will end when the water you can see through the inspection glass in colourless.

10.2 WEEKLY CHECKS

- Check efficiency of the safety pressure switch at its calibration temperature by temporarily increasing the steam temperature regulator to 250°C.
- Check the total residual hardness of feed water (not exceeding 0.5°).

10.3 MONTHLY CHECKS

- Empty the generator and the internal feed tank completely.

10.4 ANNUAL CHECKS AND MAINTENANCE

- Disassemble the probes of the level regulator, eliminate possible scale deposits on probes.
- Disassemble front and rear lid.
- Close covers making sure that gaskets are in good condition and correctly positioned.
- If scaling is present, check purifier performance and carry out a chemical cleaning, if necessary.

10.5 LEVEL UNIT

- Periodic checks and the elimination of possible leakages prevent useless waste of steam.

10.6 BURNER

The basic control and maintenance operations are listed in the relevant instruction manual; for fine tuning and periodic servicing, it is advisable to refer to the Area Dealer.

10.7 FEED PUMP

- Inspect the status of check valves and stuffing box (or mechanical seals) and replace when necessary.

- Using non-purified water could cause damage to the feed pump. This phenomenon causes the wear of the mechanical seal and the early wear of internal parts of the pump. Furthermore, the pump could easily deprime and stop feeding the boiler causing a low level stop.

The staff in charge of the steam generator's maintenance must carry out checks and maintenance operations even more frequently if the work load is higher than the average or if this need arises.

11. GENERATOR REPAIRS

By repairs, we mean:

- repairs or changes to the pressure body
- repair or replacement of safety accessories
- replacement of pressure accessories

11.1 REPAIRS OR CHANGES TO THE PRESSURE BODY

In the event these servicing operations are not carried out by Boldan Oy directly, any change or repair regarding the generator's pressure body must be authorised in writing by Boldan Oy upon submitting a report by the user or company in charge of repairs.

This report shall contain the description of the action to be taken, the methods adopted, materials used and qualifications of the operator.

Every service is, in any case, subject to the compliance with the national standards in force and relevant inspections.

11.2 REPAIR OR REPLACEMENT OF SAFETY ACCESSORIES

The **repair** of safety accessories, as defined by Directive PED (Directive 2014/68/EU) and described in the CE Declaration of Conformity accompanying the steam generator, if supplied by Boldan Oy together with the pressure body with which they form a *single unit*, must be **performed exclusively by the accessories' manufacturer.**

The **replacement** of safety accessories, as defined by Directive PED (Directive 2014/68/EU) and described in the CE Declaration of Conformity accompanying the steam generator, if supplied by Boldan Oy together with the pressure body with which they form a *single unit*, must be **performed directly by the Boldan Oy company**.

When new safety accessories are supplied, an additional Declaration must be issued to be attached to the original CE Declaration of Conformity containing the identification data of the accessories supplied.
The use of safety accessories not supplied by Boldan Oy, even if bearing a CE certificate and/or mark in compliance with Directive PED (Directive 2014/68/EU), nullifies the CE Declaration of Conformity of the *single unit* issued by Boldan Oy, as well as Bodan Oy's resulting responsibilities, which will be exclusively borne by the user.

11.3 REPAIR OR REPLACEMENT OF PRESSURE ACCESSORIES

The **repair** of pressure accessories, as defined by Directive PED (Directive 2014/68/EU) and described in the CE Declaration of Conformity accompanying the steam generator, if supplied by Boldan Oy together with the pressure body with which they form a *single unit*, must be **performed exclusively by the accessories' manufacturer**.

The replacement of pressure accessories, as defined by Directive PED (Directive 2014/68/EU) and described in the CE Declaration of Conformity accompanying the steam generator, if supplied by Boldan Oy together with the pressure body with which they form a *single unit*, must be **performed directly by the Boldan Oy company**.

12. BOILER STORAGE WHEN NOT IN USE

To store the boiler when not in use for lengthy periods of time, it is recommended to:

- Disconnect the electric panel from the generator by means of the main switch;
- Empty the water contained in the generator and dry it;
  Put hygroscopic material in the generator to absorb humidity;
- Empty the water contained in the accessories (pump, valves, pressure switches) to prevent breakages caused by freezing in winter months.
- Clean the fume side of the generator to prevent corrosion caused by sulphur, in case of liquid fuels.

The generator needs to be emptied also in case of short stops when the water temperature may have decreased and reached the room temperature. In these conditions, corrosion on the water side of the generator is more likely.

Emptying operations must be performed in safe conditions making sure that water is not under pressure and the fuel temperature is not dangerous.

Two procedures to store the generator when not in use are given below.

12.1 STORAGE OF GENERATOR NOT CONTAINING WATER

For this type of storage, the generator must be emptied completely, possibly when hot. This ensures that it dries in a short period of time. For this type of storage, all the water needs to be completely drained.
When water is absent, the generator may undergo surface oxidisation, but dangerous corrosion pittings are prevented.

- **Generator at the operating pressure and water at the set levels**

This storage allows the generator to be available immediately in case of need. The procedure keeps the generator at a pressure of 1-2 bars by switching on the burner from time to time and without producing steam. In this case, it is advisable to keep the steam and drain valves completely closed so that the suggested pressure range can be maintained as long as possible. The pressure present in the steam area prevents the entrance of external air and resulting corrosion attacks.

13. BOILER AND FEED WATER

The feed water must be clear and free from suspended particles or impurities. The purification system must remove substances that may cause scale deposits, aggressive gas and it must neutralise acids.
Therefore, refer to Boldan Oy to carry out the necessary tests and for advice on the best water feed method.
The steam generator must be fed with purified and/or de-ionised/de-mineralised water; in any case, the feed and boiler water characteristics must comply with the provisions specified, in particular the limits given below must not be exceeded:

Feed water

Maximum hardness	0.5 °F
pH	7.5 – 9.5

Boiler water

1. Maximum hardness:	0.5 °F
2. Total maximum salinity:	3500 ppm
3. Maximum alkalinity as Ca; CO^3:	1000 ppm
4. Maximum silica:	150 ppm
5. Maximum conductivity:	7000 µS/cm

As stated previously, drains are used to keep alkalinity in the boiler within the acceptable range; to decrease alkalinity, increase discharges and vice versa.

Preliminary remark: in steam generators fed with condensate added with de-mineralised water or ultrapure rectified water (final mixed bed) or only with pure or ultrapure water, the use of fixed alkali-based products, in particular those containing **caustic soda and potash,** is **forbidden** for chemical conditioning. The use of volatile alkali-based products, if appropriately metered, and coordinated phosphates is admitted.

The control of the water treatment equipment and the mixing of feed water with additives is fundamental for maintaining the good working order of the boiler. Refer exclusively to companies specialised in water treatment. In any case, contact the Boldan Oy company; corrosion of the water side of generators is always caused by a low quality of water and not by the quality of the sheet metal used (the latter is subject to strict controls by the Authorities).

14. OPERATING FAILURES

FAILURE	POSSIBLE CAUSE	RECOMMENDED SOLUTION
The water feed pump does not start	Overload relay	Reset it
	The control unit does not send signal	Check electric circuit
		Check probe terminals and clean probes
		Replace control unit
The water feed pump does not stop	The contacts of probe cables are oxidised	Replace cable terminals on level probes
	The probe cables are interrupted	Check connection
	The level does not read the presence of water	If possible, check the mechanic seals of the feed pump; replace pump if necessary
	The check valves leak and steam bleeds on feed pump	Replace them
	The control unit does not send signal	Replace control unit
	The level does not remain constant	Make sure that the discharge valves are closed
	Water passes through the automatic discharge valve	Close the manual valve
The emergency level alarm signal will not reset	Water level below the minimum	Top it up
	Probe terminal is oxidised or not tight	Clean it
		Tighten it
		Replace it
	Probe scaled	Clean it
	Relay blocking probes broken	Check and replace it if necessary
The burner does not start	Feed water level low	Top it up
	Safety pressure switch tripped (displayed by visual alarm)	Reset the alarm
	Level probe scaled	Clean it
The burner does not ignite	No fuel arrives from the nozzle	Check piping
	The photocell does not send the signal to the cycle	Clean the photocell
		Check contacts
		Replace it, if necessary

15. DAILY START

- Turn the general switch on position “1”
- Press the button START – STOP CYCLE and follow the instructions given in point 7
- Slowly open the steam valve

16. DAILY STOP

- Turn the general switch on position “0”
- Close the steam valve

17. DURING OPERATION

- The button “START – STOP CYCLE” must always be illuminated with a green light both when in operation and when waiting.

Even a minimum power drop to the panel is sufficient to activate the safety control relays; in this case, safeties must be released even if they have not tripped because of danger and the button “START-STOP CYCLE” must be pressed.

18. DECOMMISSIONING THE MACHINE

If, for any reason, the generator needs to be decommissioned, there are some key rules to follow to ensure safety and protect the environment:

- make sure that the generator is not under pressure and that it does not contain any fluids;
- make sure that the power supply line to the electric panel is disconnected;
- make sure that the steam intake pipes, feed and discharge water are disconnected and that the risks of pressure and/or fluid back flows from the lines are eliminated.

The interruption of use and decommissioning of the generator shall be notified to the Competent Authority following the methods specified by the Law.

19. DISPOSAL

To guarantee environmental protection, the generator must be disposed of in compliance with the Norms in force in the country of installation.

Also make sure that:

- plastic or non-metal parts must be disposed of separately;
- Residues of liquid fuel, in particular gas oil or fuel oil, must be disposed of separately in compliance with the safety instruction paper that the fuel supplier must give to the user.