



Group
Member



STEELCO VS

MEDIUM CAPACITY STEAM STERILIZER

Service Manual

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1. INSTALLATION

1.1. Pre-installation requirements

1.1.1. Fluids specification

Below is a table resuming all suggested characteristics for all fluids introduced into the sterilizer, as per ISO17665 and EN285.

Fluid	Determinant	Value
Water (Steam boiler feeding) If applicable	Pressure	1,5 ÷ 3 bar (150 ÷ 300 kPa) ± 10%
	Flow Rate	20 l/min.
	Temperature	8 ÷ 15 °C (>21°C)
	Potable	yes
	Appearance	Colorless clean without sediment
	Hardness (of alkaline earth)	≤0,02 mmol/l
	Residue on evaporation	≤10 mg/l
	Conductivity (at 20°C)	≤5 µS/cm
	pH (20°C) value	5 ÷ 7
	Silicate (SiO ₂)	≤1 mg/l
	Iron	≤ 0,2 mg/l
	Cadmium	≤ 0,005 mg/l
	Lead	≤ 0,05 mg/l
	Rest of heavy metals except iron, cadmium, lead	≤ 0,1 mg/l
	Chloride (Cl')	≤ 0.5 mg/l
	Phosphate (P ₂ O ₅)	≤ 0,5 mg/l
Water (Vacuum pump feeding) if applicable	Pressure	1,5 ÷ 3 bar (150 ÷ 300 kPa) ± 10%
	Flow Rate	20 l/min.
	Hardness (of alkaline earth)	0,7 ÷ 2,0 mmol/l of CaCo/3
	Temperature	15°C (not exceeding 20°C)
Clean Steam ("V" & "E/V"/"I/V" ver.)	Pressure	3 bar (300 kPa) ± 10%
	Flow Rate	As per Installation drawing
	Absence of	Condensate, Drag, Additives
	Water content	< 5 %
	Filtration grade	7 µm
	Non-condensable gases	3,5% V/V
	Overheating	25°C
Indirect Steam ("I"/"E/V"/"E/I" ver.)	Pressure	6 ÷ 8 bar (600 ÷ 800 kPa) ± 10%
	Flow Rate	As per installation drawing
	Absence of	Condensate, Drag, Additives
Compressed Air (Pneumatic valve)	Pressure	6 ÷ 8 bar (600 ÷ 800 kPa)
	Flow Rate	5 l/min.
	Filtration grade	25 µm
	Oil droplets	greater than 2 µm
	Absence of	Water, impurity

1.1.2. General Connections



Consult your installation drawing for flow rate requirements.

1.1.3. Electrical Connections

DEDICATED DISCONNECTION DEVICE FOR MACHINE

As per IEC 61010-1, the equipment “[...] shall employ a switch or a circuit breaker as the means of disconnection.”

It must be suitably located and easily reached

It must be marked as the disconnecting device for the equipment.



We suggest to install a Ground Fault Circuit Interrupter (GFCI) and label it as “DEDICATED STERILIZER BREAKER”



Consult always your installation drawing to validate the pre-installation requirements.

1.1.4. Pre-installation checklist

Read and follow below hints for proper installation:



ATTENZIONE!

Always consult the installation drawings and wiring diagrams supplied with the machine to verify the characteristics required for the correct connection of the utilities.

		✓
Check for compliance with the Occupational Health and Safety Act and National Electric Code, as well as local electric and plumbing codes, for any special requirements that may pertain to the installation of this sterilizer.		
Examine the delivery crate for damages and notify them immediately, if any.		
Review drawing to familiarize with all connections (position and size) before installing the sterilizer.		
Location review (1.2. Positioning the machine on page 6)		
Clearance requirements	At least 50cm (19,68 in)	
Illumination Level	From 700 to 1100 Lux - or following local regulation.	
Flow rate	Check for correct requirements in your installation drawing.	
Utilities Service lines:		
Water connections (1.3. Water connections on page 7)	Back-flow preventer installation on water inlet pipe is highly recommended, as per CEI EN 61770	
	Supply line size and check valve installation (recommended)	
	Water pressure 3bar (43,52 psig), 5.3 GPM)	
	Pressure reducer installation (required for water supply pressure above 3 bar (43,52 psig)	
	Water Hardness (0.02 mmol/L, 70 PPM)	
Compressed air connections (1.5. Compressed Air line connections (IF APPLICABLE) on page 9)	Compressed air line size (if applicable)	
	Compressed air line pressure (6 bar, PSIG as per installation dwg)	
Electrical connections (1.6. Electrical connections on page 9)	Power supply proper cable characteristics of isolation, size and diameter, as per Installation drawing requirements.	
	Terminal box installation, as per 61010-1; It must be: - Equipped with circuit breakers; - Suitably located and easily reached; - Marked as the disconnecting device for the equipment.	
	Dedicated circuit, DO NOT share the service	
	All electrical system is in compliance with installation drawing	

Table 1 – Pre-installation checklist



WARNING!

Operator must wear proper Personal Protective Equipment (PPE) during loading and unloading phase, due to high temperatures of the equipment.



Uncrating and installation instructions are also furnished with the sterilizer. If any documents are missing, please contact Steelco Assistance giving Serial number and model of the equipment. All missing documentation will be sent promptly.



Clearance space (Min maintenance Area) shown on the Customer Layout (CL), is necessary to assure proper installation, operation and maintenance of the equipment.

1.2. Positioning the machine

- ▶ Carefully open the crate
- ▶ Do not roll the autoclave to avoid irreparable damages
- ▶ Remove caps and nylon cover
- ▶ Place the autoclave on the work surface and level and shim it properly (Figure 1).

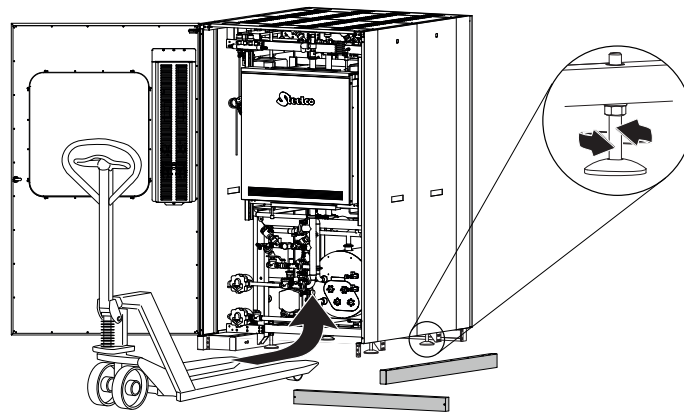


Figure 1 – Appliance positioning



WARNING!

The front door panel must be open when positioning the autoclave.



WARNING!

When lifted, the autoclave tends to lean towards the side of the chamber due to the position of the center of gravity of the machine. A proper counterweight should be considered before moving the machine.

Lift carefully the machine just as much as needed.

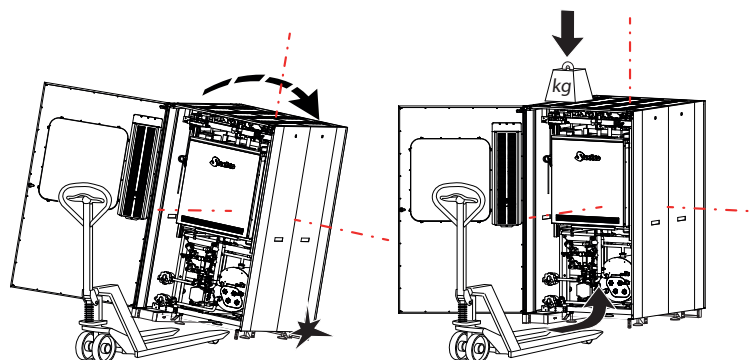


Figure 2 – Appliance movimentation

1.3. Water connections

- ▶ Connect to the water supply following the data information on installation drawing attached on the autoclave.
- ▶ Use the right fittings for connections with the machine.

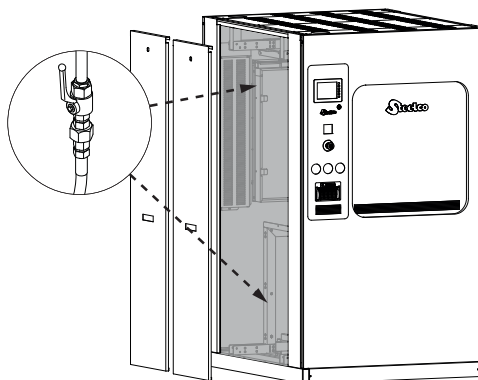


Figure 3 – Water inlet

1.4. Drain connection

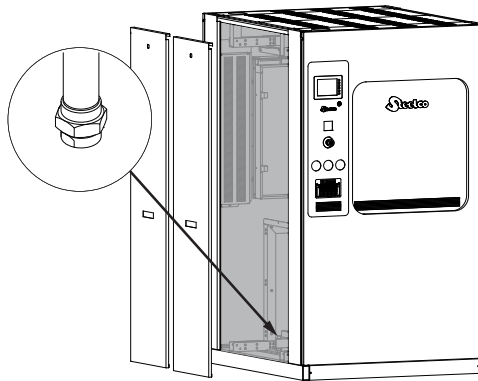


Figure 4 – Water outlet

- ▶ Connect the exhaust to the general drain system and ensure that runoff has the required characteristics (Figure 4).
- ▶ For the connection type and diameter refer to installation drawing attached to the autoclave (Attachment 2)



WARNING!

Please refer always to your Installation Drawing for connections.

1.5. Compressed Air line connections (IF APPLICABLE)

- ▶ Connect the autoclave to the compressed air line and be sure the pressure is fixed at 6 bar, verifying the absence of liquid in the supply (Figure 5).
- ▶ For the connection type and diameter refer to installation drawing attached to the autoclave (Attachment 2).

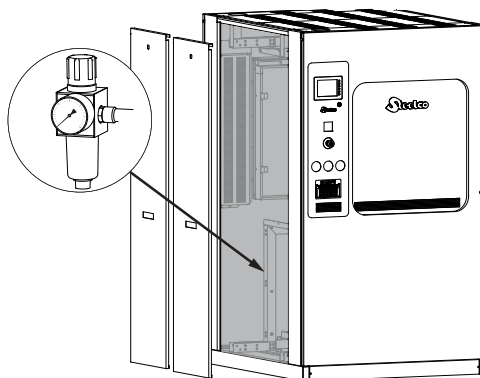


Figure 5 – Pneumatic connection

1.6. Electrical connections

- ▶ The power supply cable is not supplied with the autoclave, the installer must provide it, respecting the characteristics of isolation, size and diameter.
- ▶ Make sure the line voltage is in agreement with the installation drawing and electrical drawing attached to the autoclave.
- ▶ The presence of a GFCI (Ground fault circuit interrupter) that meets the absorption indicated in the electric diagram is required (if required).
- ▶ The equipotential point is identified and is placed on the bottom of the frame of the autoclave.
- ▶ Equipment must be properly hook up to Grounding connection.
- ▶ Connect the power supply cable (Figure 6).

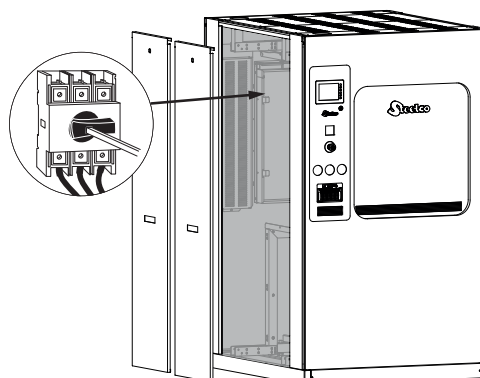


Figure 6 – Electrical connection

- ▶ Check the correct phase sequence by short manual activation of one of the motors (water pump or vacuum pump).



Please label properly dedicated circuit breaker.

1.7. Printer connection

- ▶ Open the front door panel;
- ▶ Plug the mini-USB connector to the printer on the back side of the front door panel (Figure 7);

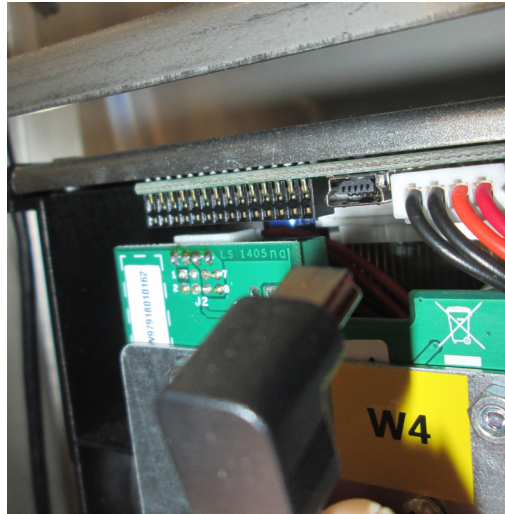


Figure 7 – Printer plug

- ▶ Close the front door panel.

1.8. Steam line connection (For Direct Line Steam, V)

Connect the steam line using a clamp.



Figure 8 – Steam line connection

1.9. Anti-seismic anchoring (OPTIONAL)

- ▶ Anchor the machine, using bolts, both to the floor and to the lower frame, internal side.

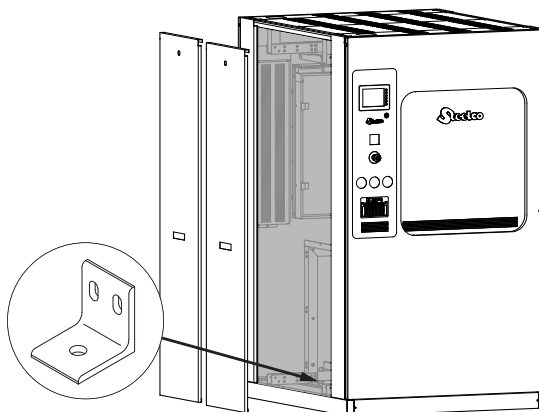


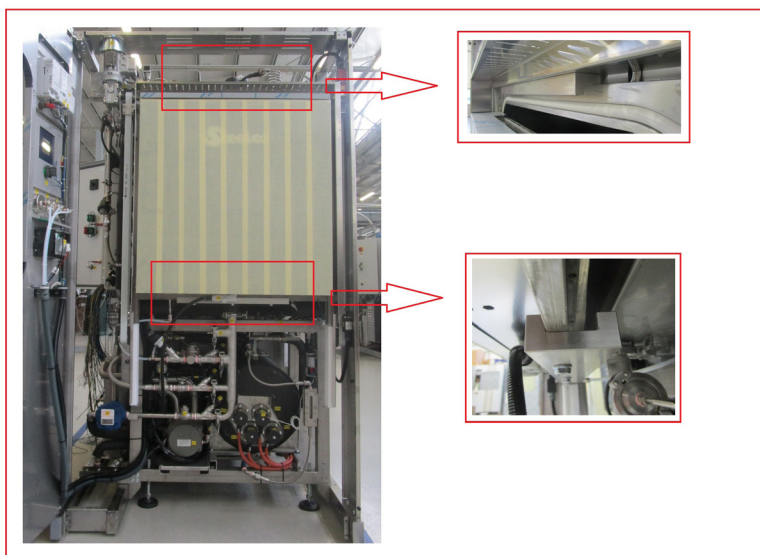
Figure 9 – Anti-seismic anchoring



WARNING!

DO NOT REMOVE THE DOOR STOPPERS:

These plates keep the door closed and blocked when door gasket is pressurized.



DO NOT REMOVE THEM

If removed, the gaskets come out from their location and it could cause steam escape.

1.10. Sterilizer Final check

- Door opens and closes smoothly
- Chamber strainer is in place
- Racks and shelves and/or loading carts operates correctly (If applicable)
- Load paper in the printer
- Labels are properly applied
- Unit switches ON properly

Once all the installation requirements are met, it is possible to proceed with the machine start-up. This activity must be performed only by qualified technicians that have been authorized by Steelco S.p.A.

In case of water, compressed air and/or steam leaks, shut down the machine immediately and contact Steelco authorized technical assistance.



WARNING!

The access door to the technical compartment must remain locked while the autoclave is in use. Access to the technical compartment by the operator is prohibited: the keys to the compartment door must be kept and used **ONLY** by suitably trained maintenance technicians.

1.11. Installation Checklist

After installing this unit according to the instructions provided, complete the following checklist to assure that your installation is complete and correct.

Or, if you desire, contact Steelco Service Representative for a technician to be scheduled to test your installation and demonstrate proper equipment operation.

		REVISED		INITIALS	DATE
		Yes	No		
	Clearance as specified on the equipment drawing must be available.				
1.2. Positioning the machine on page 7	Autoclave properly leveled and shim				
1.3. Water connections on page 8	Water connections hooked Water pressure supplied must be within specifications as shown on the Installation Drawing. If pressure is too high, a regulator must be installed. If water pressure is too low, equipment performance will be affected.				
	- Check for leaks				
1.4. Drain connections on page 9	Drainage connected It must be sloped properly, and sized to handle the maximum waste flow from the sterilizer				
	- Check for leaks				

1.5. Pneumatic connections (IF APPLICABLE) on page 9	Compressed air line connected (If applicable)				
	- Check for leaks				
1.6. Electrical connections on page 10	Electrical system connected and powered Electric service should be on a separate circuit, and not tied into circuits containing large reactive loads. (If applicable) Verify proper rotation of the vacuum pump by observing pump rotor shaft.				
	Steam generator operation:				
	- Check for leaks				
	- Gasket pressure				
Final checks:					
8.1.2. Printer paper roll replacement on page 61 (User Manual)	Paper loaded in printer				
Door(s) open and closes smoothly					
Loading rack works properly (If any)					
Cycle operation					
Unit powers up correctly					
Run Vacuum Leak Test and verify that it is performed successfully					
Verify operation of a typical cycle					

2. MAINTENANCE CHECKLIST

Action	Item	Activity Description	Frequency of activities: Months/number of cycles			
			6 1000	12 2000	18 3000	24 4000
1		Verify the general conditions.				
2	C51	Drain the generator.				
3	F80	Replace Air filter.				
4		Check the electrical connections and possibly tighten the contacts.				
5		Clean the chamber and verify the drain filter.				
6		Replace door gaskets.				
7	7.1 F70	Check, clean or evenly change the fill water filter.				
	7.2 F70A					
8		Replace TC chamber gasket.				
9	9.1 PS52	Replace the pressure switch.				
	9.2 PS41					
	9.3 PS80					
10		Check the tightness of the door closing system				
11	Fo41	Check for obstructions in the steam inlet line				
12	12.1 PSV31	Replace the safety valves.				
	12.2 PSV41					
	12.3 PSV51					
13	13.1 LE51	Check, clean and if necessary replace the generator level probe.				
	13.2 LE52					
	13.3	Check the state of cleaning and if necessary clean the limestone deposits from the generator.				
	13.4	Replace probes level TC gasket.				
	13.5 Z51	Verify the integrity of the electrical resistances gaskets.				
	13.6 5KM51	Every two years replacement of the contactor resistance.				
	13.7 2SL51	Levels relays functional check.				
	13.8 2SL52					
	13.9 PI51	Verify Operation and eventual substitution of generator's gauge.				
14	2GD1	Check the supply voltage 230-500Vac 24Vdc.				
15	15.1 TS70	Check and verify ECO temperatures setting.				
	15.2 TS70A					
16		Check the hydraulic connections and possibly repair the leaks.				
17		Perform functional cycles.				
18	18.1 PSV31	Check no leaks on the safety valves.				
	18.2 PSV41					
	18.3 PSV51					
19	19.1 12SH1	Check the functionality of the emergency button.				
	19.2 12SH2					

Action	Item	Activity Description	Frequency of activities: Months/number of cycles			
			6 1000	12 2000	18 3000	24 4000
20	20.1	ZS01	Check the functioning of the microswitches and Doors Safety tile.			
	20.2	ZS03				
	20.3	ZS05				
21		Check for bolts tightening of the door stoppers				
21	21.1	PI41	Verify Operation and eventual substitution of gauges.			
	21.2	PI43				
22		Check the relationship between temperature and pressure.				
23		10PR1 Check the printer.				
24	24.1	TE22	Verification and possible calibration of the chamber temperature probes.			
	24.2	TE27				

Table 2 – Maintenance checklist

3. SERVICE

3.1. Recurring maintenance task and scheduling

Below the maintenance task and scheduling.

Perform maintenance based on the number of cycles or bi-annual basis, which value is reached before.

Action	Item	Activity Description	Frequency of activities: Months/number of cycles			
			6 1000	12 2000	18 3000	24 4000
1		Verify the general conditions	•	•	•	•
2	C51	Drain the generator.	•	•	•	•
3		Replace Air filter.		•		•
4		Check the electrical connections and possibly tighten the contacts.	•	•	•	•
5		Clean the chamber and verify the drain filter.	•	•	•	•
6		Replace door gaskets.	•	•	•	•
7	7.1 F70	Check, clean or evenly change the fill water filter.	•	•	•	•
	7.2 F70A		•	•	•	•
8		Replace TC chamber gasket.		•		•
9	Fo 40	Check for obstructions in the steam inlet line		•		•
10	10.1 PS53	Replace the pressure switch.		•		•
	10.2 PS41			•		•
	10.3 PS80			•		•
11		Check the door's closing system	•	•	•	•
12		Check the interlocking door's tightening	•	•	•	•
13	13.1 PSV31	Replace the safety valves.				•
	13.2 PSV41					•
	13.3 PSV51					•

Action		Item	Activity Description	Frequency of activities: Months/number of cycles			
				6 1000	12 2000	18 3000	24 4000
14	14.1	LE51	Check, clean and if necessary replace the generator level probe.	•	•	•	•
	14.2	LE52		•	•	•	•
	14.3		Check the state of cleaning and if necessary clean the limestone deposits from the generator.	•	•	•	•
	14.4		Replace probes level TC gasket.		•		•
	14.5	Z51	Verify the integrity of the electrical resistances gaskets.	•	•	•	•
	14.6	5KM51	Every two years replacement of the contactor resistance.	•	•	•	•
	14.7	2SL51	Levels relays functional check.	•	•	•	•
	14.8	2SL52		•	•	•	•
	14.9	PI51	Verify Operation and eventual substitution of generator's gauge.	•	•	•	•
15		2GD1	Check the supply voltage 230-500Vac 24Vdc.	•	•	•	•
16			Check the hydraulic connections and possibly repair the leaks.	•	•	•	•
17			Perform functional cycles.	•	•	•	•
18	18.1	PSV31	Check no leaks on the safety valves.	•	•	•	•
	18.2	PSV41		•	•	•	•
	18.3	PSV51		•	•	•	•
19	19.1	12SH1	Check the functionality of the emergency button.	•	•	•	•
	19.2	12SH2		•	•	•	•
20	20.1	ZS01	Check the functioning of the microswitches and Doors Safety tile.	•	•	•	•
	20.2	ZS03		•	•	•	•
	20.3	ZS05		•	•	•	•
21	21.1	PI41	Verify Operation and eventual substitution of gauges.	•	•	•	•
	21.2	PI43		•	•	•	•
22			Check the relationship between temperature and pressure.	•	•	•	•
23		10PR1	Check the printer.	•	•	•	•
24	24.1	TE22	Verification and possible calibration of the chamber temperature probes.		•		•
	24.2	TE27			•		•

Table 3 – Maintenance tasks and scheduling

Only Qualified personnel, in safety conditions, must carry out all the following operations.



WARNING - PERSONAL INJURY AND/OR EQUIPMENT DAMAGE HAZARD

Repairs and adjustments to this equipment must be made only by fully qualified service personnel. Maintenance performed by inexperienced, unqualified persons or installation of unauthorized parts could cause personal injury, invalidate the warranty or result in costly equipment damage.



WARNING - SHOCK AND BURN HAZARD

Disconnect all utilities to sterilizer before servicing. Do not service the sterilizer unless all utilities have been properly locked out. Always follow all locally mandated Lockout-Tagout and electrical safety-related work practice standards.



WARNING - BURN HAZARD

Allow sterilizer and accessories to cool to room temperature before performing any cleaning or maintenance procedures.



WARNING

Any time the front door panel is opened for checks or maintenances (i.e. check on heating elements), insert the safety blocks to prevent any movement of the chamber sliding door. Remove the blocks just before closing the door.



Never permit unqualified personnel to operate and/or Service the Sterilizer.



Contact your nearest Steelco Authorized Center to schedule your next maintenance. Maintenance state is tracked and read only in UTILITY MENU, MAINTENANCE STATE. The sterilizer alerts the operator when maintenance is needed.

3.2. Installation of door's belt

The purpose of this procedure is to define the necessary material and the type of operations to be performed.

1. The first thing to do is to secure the door, using the blocks that were used for shipping.

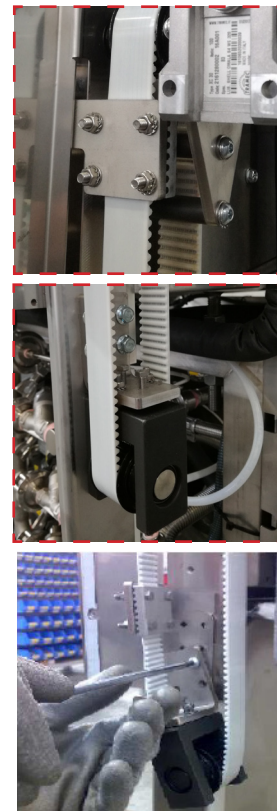


Figure 10 – Left side



Figure 11 – Right side

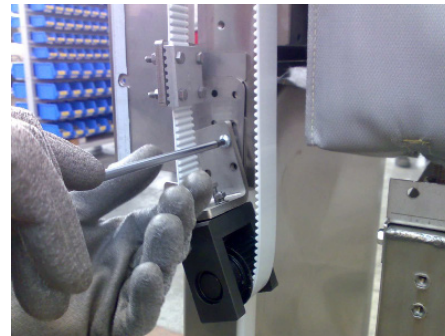
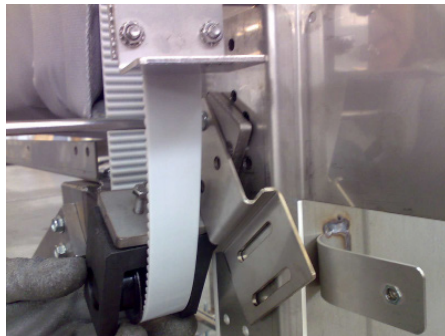
2. Unlock the tensioning blocks of the belt high and low. This operation must be carried out by both sides.



3. Insert the toothed belts, on the correct side.



4. Mounting pulley on limit switch (ZS01 or ZS05) side. Aim with a single screw TBEI M6X20.



5. Before definitively fixing the assembly , verify that the supports of the right belt and left belt are parallel.
6. Once verified that the supports of the doors are sliding parallel , proceed to final tightening of the assembly pulley , supports and crankcase.

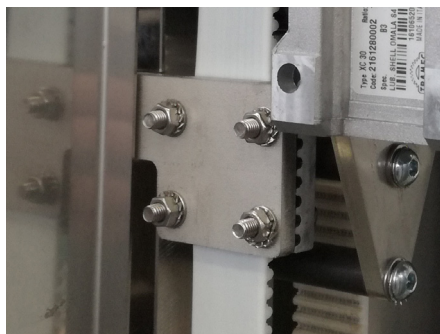


7. Secure the door on the support on the toothed belt by inserting the appropriate right and left spacer . Proceed to final tightening of four bolts TEM8X30 (two for each spacer).



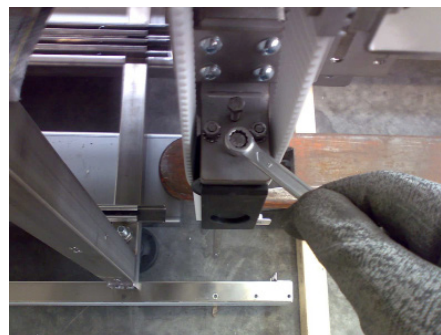
WARNING!

Use a torque of 4,5 Nm to tighten the nuts shown in the following picture.



3.2.1. Regulation of the toothed belt tension

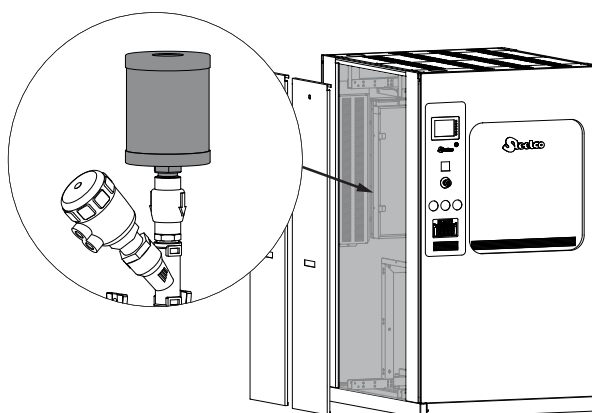
1. Loosen the two nuts with a wrench n°7.
2. Tighten the screw using the wrench n°7 until the two sides of the belt are stretched .
3. Tighten the nuts loosened in the previous.



3.3. Air filter

The air filter is located on the side of the pneumatic connections.

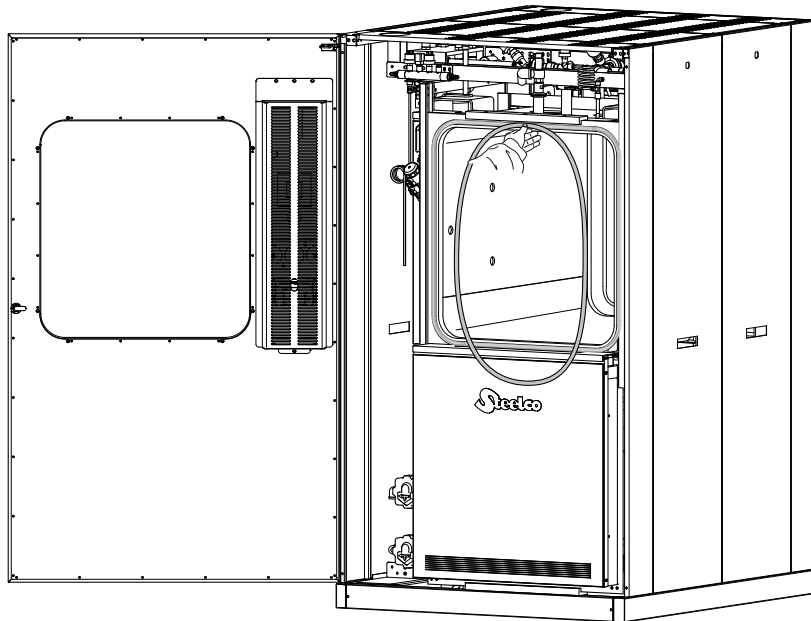
1. Remove the side panels to reach the air filter.



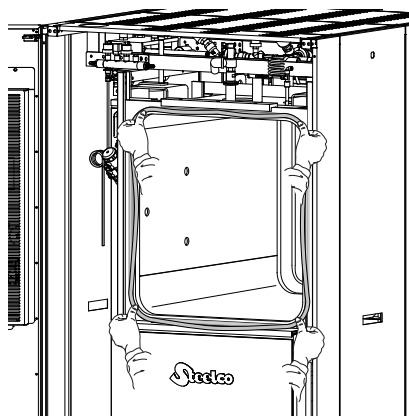
2. Unscrew the filter anticlockwise to remove it.

3.4. Door gasket replacement

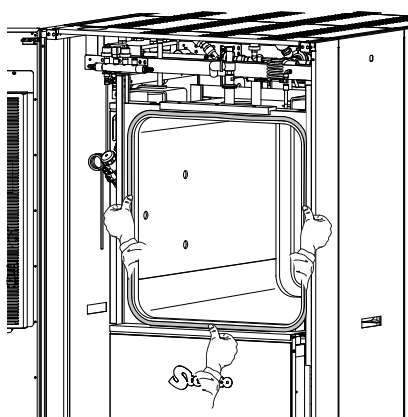
1. Open the door of the autoclave and remove the old gasket. If using any tool, pay attention not to scratch or damage the seat of the gasket.
2. Apply an all-purpose cleaner on a soft cloth, then clean the seat of the gasket. Any residual should be removed.
3. Ensure that the new gasket is perfectly cleaned or eventually clean it with a damp cloth.
4. Apply a thin coat of talc powder on the surfaces of the gasket.
5. Place the gasket starting from the center on the upper side of the seat. Push a short segment into the seat.



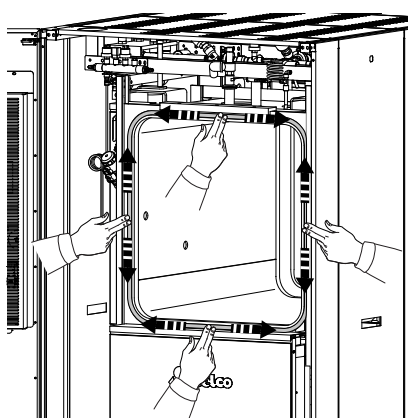
6. Push the gasket into the seat only on the upper corners then on the lower corners. Do not insert the gasket in between the corners. Do not pull the gasket when pushing it into the seat.



7. Push the gasket into the seat on the center of the left side, right side and lower side.

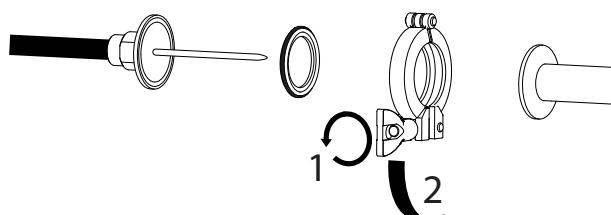


8. Push the gasket along the whole perimeter to ensure the correct positioning.



3.5. TC chamber gaskets

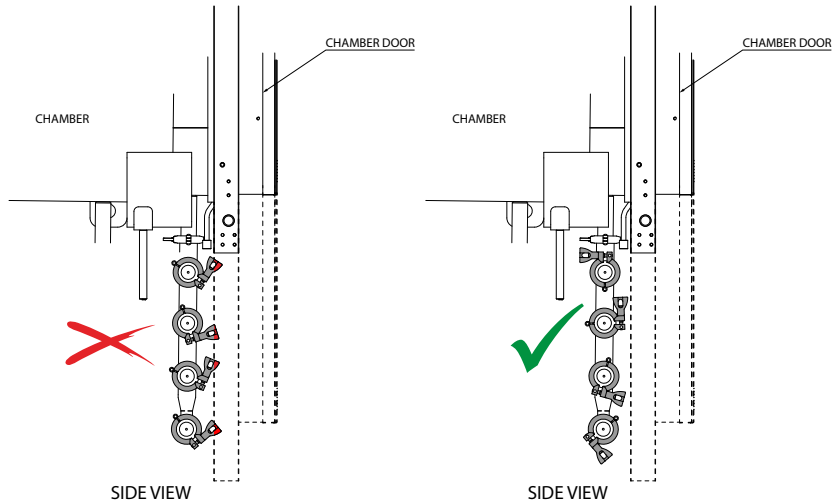
1. Loosen the wing nut and open the clamp.
2. Check the gasket and replace it if necessary.





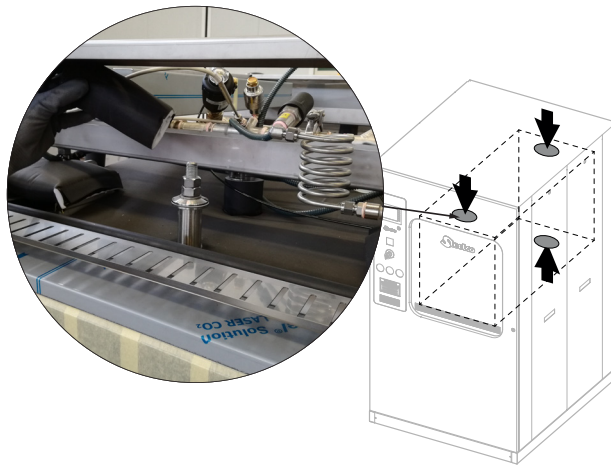
WARNING!

When reassembling the clamp on the front side of the autoclave, ensure the correct position of the wing nuts in order to avoid any interference with the door of the chamber.



WARNING!

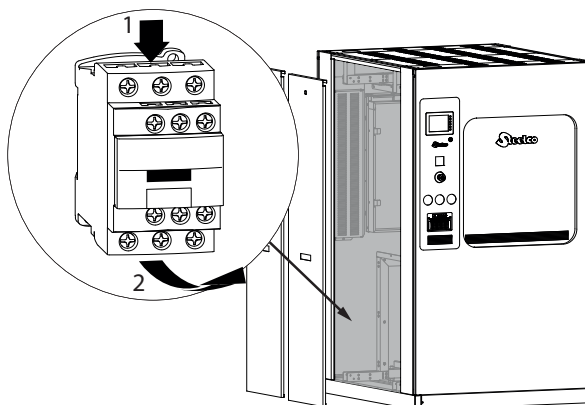
When replacing all the TC chamber gaskets according to the yearly maintenance checklist, do not forget to replace also the TC gasket on top (front and back side) and lower back side of the chamber.



3.6. Resistance contactor replacement (models with electric generator)

The resistance contactors are located on the side of the electrical connections inside the box underneath the electric control box.

1. Remove the side panels and the box cover to reach the resistance contactors.
2. Disconnect the wires and remove the resistance contactor.



3. Install the new resistance contactor and connect the wires according to the wiring diagram.

3.7. Steam generator inspection and replacement of the heating element gasket

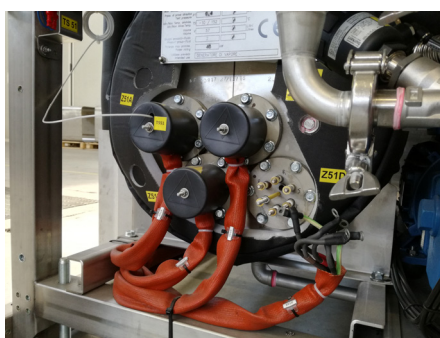


WARNING!

Drain the steam generator before proceeding with any operation.

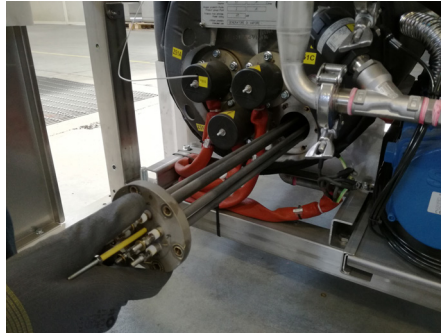
The steam generator is located underneath the chamber.

1. Open the front door panel.
2. Remove the connector cover and disconnect the wires on the heating element.

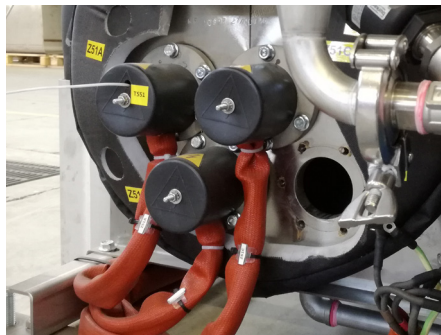


3. Unscrew the six bolts of the heating element flange.

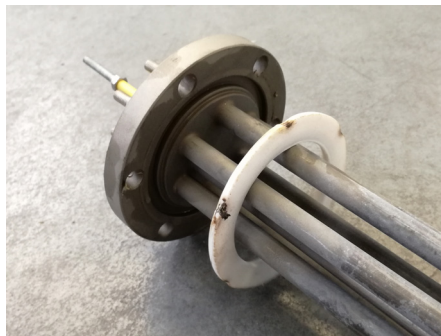
4. Pull out carefully the heating element from the steam generator.



5. Check the cleanliness inside the generator. If necessary clean the limestone deposits from the generator.



6. Check the condition of the gasket and replace it if necessary.



7. Reassemble the heating element and connect the wires according to the wiring diagram.

3.8. Generator level probe



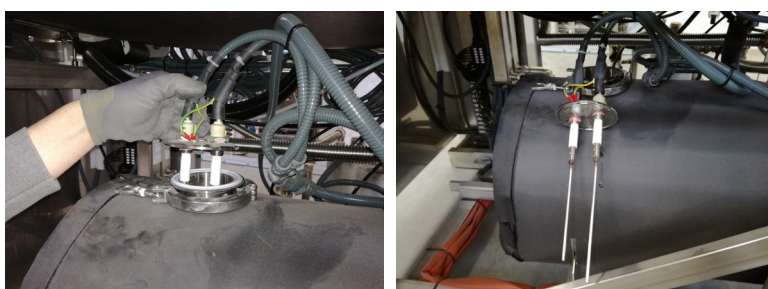
WARNING!

Drain the steam generator before proceeding with any operation.

3.8.1. Visual check

The generator level probe is located on the top of the steam generator and it is reachable from the side of the autoclave.

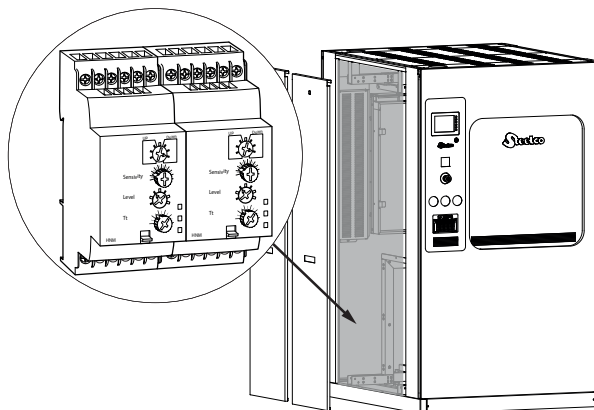
1. Remove the side panels to reach the generator level probe.
2. Loosen the wing nut and open the clamp.
3. Check the level probe and the gasket. If necessary replace the level probe and/or the gasket.



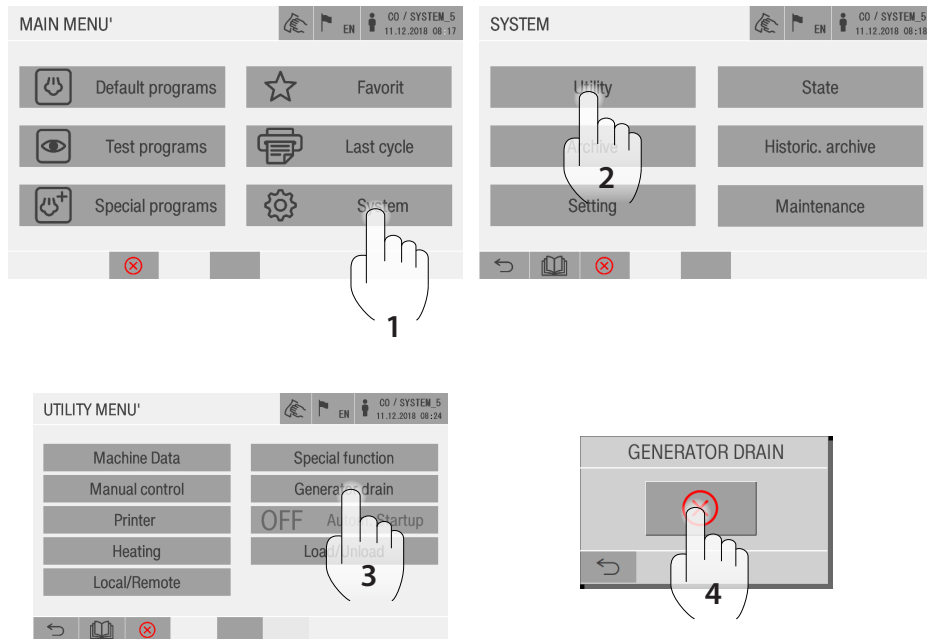
3.8.2. Functional check

The level monitoring relays are located in the technical compartment, inside the power connection box, under the electric control box.

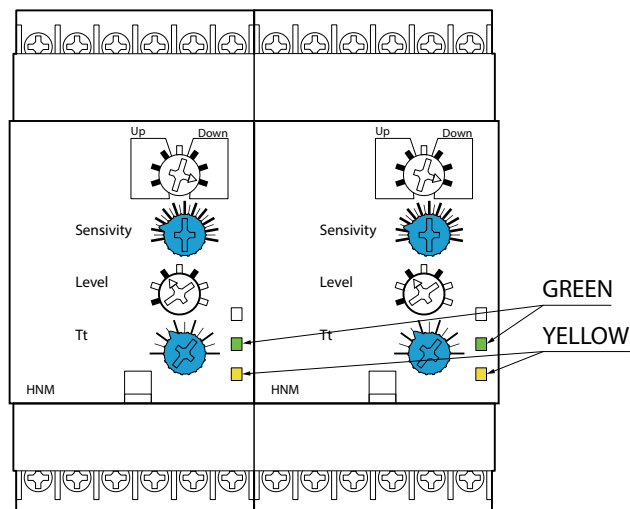
1. Remove the side panels and the box cover to reach the level monitoring relays.



2. Disable the discharge valve of the steam generator.



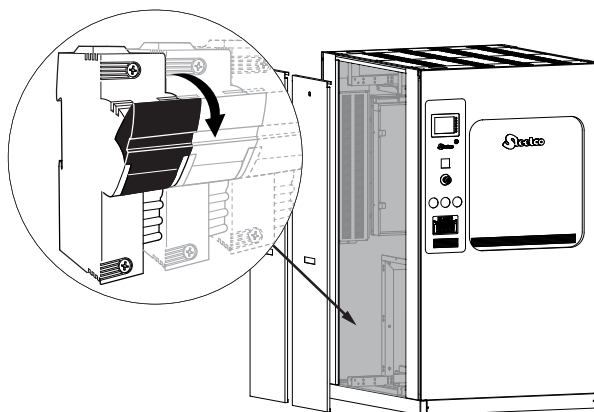
3. Check that both the level monitoring relays have the green led active. Check that in short time the yellow led is activated on one level monitoring relays, then in a few seconds the yellow led is activated also on the other level monitoring relay.



3.9. Heating resistance fuses check and replacement

The fuses are located in the technical compartment, inside the power connection box, under the electric control box.

1. Remove the side panels and the box cover to reach the fuse holders.
2. Open the fuse holder to release the fuse.

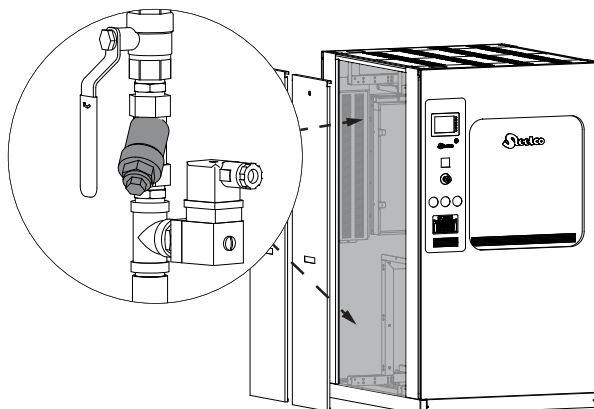


3. Check the fuses. If necessary replace the fuse with a new one.

3.10. Fill water filter

The fill water filter is located in the technical compartment.

1. Remove the side panels to reach the fill water filter.



2. Close the water inlet valve.
3. Unscrew the filter cap using a wrench.
4. Check the fill water filter, clean or replace it if necessary.

3.11. How to check for leakages on safety valves

1. Open the front door panel.
2. Check the water collector beside the steam generator.



3. Any presence of water inside the water collector means that there is a leakage on a safety valve.

4. TROUBLESHOOTING

4.12. Alarm

The following table provides a brief description of the meaning of each alarm and suggested actions.

Alarm message	Description of the trouble and its possible cause	Suggested solution
--	Moving the key-selector on "I" the machine does not switch on Possible causes: 1) the machine has no voltage; 2) the main switch upside the machine is switched off ; 3) the main switch of the electric panel is switched off; 4) the machine safety devices intervened; 5) transformer or power feeder damage	Check: 1) for live voltage; 2) for the main switch upside the machine; 3) that the main switch of the electric panel is switched on; 4) for the intervention of the safety devices; 5) for the efficiency of the transformer and/or the power feeder
00 PLC CONTROL OUT OF ORDER !!	Control PLC malfunction	Switch off and switch on again the machine. If the problem persists, contact Steelco customer service
01 FRONT DOOR SAFETY ???	The anti-crushing plate on the indicated side is pushed	Reset the alarm, and repeat the operation of closing and opening the door
02 BACK DOOR SAFETY ???		
03 FRONT DOOR SWITCH INCONGR.	The door sensors are inconsistent: door shows that it is open and closed at the same time.	Switch off and switch on again the machine and check the integrity of the limit switch. If the problem persists, contact Steelco customer service
04 BACK DOOR SWITCH INCONGR.		
05 PLC CONTROL PROBLEMS (XOB10)	Problems in the autoclave management program	Switch off and switch on again the machine. If the problem persists, contact Steelco customer service
06 PLC CONTROL PROBLEMS (XOB12)		
07 PLC CONTROL PROBLEMS (TEST)	PLC functionality test failure	
08 HAKKO TERMINAL NOT OK	The HMI does not answer	Check the Ethernet cable from Hakko to PLC If the problem persists, contact Steelco customer service

Alarm message	Description of the trouble and its possible cause	Suggested solution
09 PLC CONTROL JACKET PROBE ?	The probe does not read or gives no data to the PLC. Possible causes: - Damaged probe; - Converter breakdown; - Analogical card breakdown	Switch off and switch on again the machine. If the problem persists verify the probe, the converter and the analogical card. To replace one of these components and to set again the measuring system contact Steelco customer service
10 PLC CONTROL FIXED PROBE ?		
11 PLC CONTROL MOBILE PROBE ?		
12 PLC CONTROL PRESS. TRANSD. ?	The transducer does not read or gives no data to the PLC. Possible causes: - Damaged transducer; - Analogical card breakdown	Switch off and switch on again the machine. If the problem persists verify the probe, the converter and the analogical card. To replace one of these components and to set again the measuring system contact Steelco customer service
13 PROBE AIR DETECT ?	The probe does not read or gives no data to the PLC. Possible causes: - Damaged probe; - Converter breakdown; - Analogical card breakdown	
14 INCORRECT PHASE SEQUENCE !!	Phase error in the 3-phase voltage supply	Check that the power supply cables are connected as specified in the wiring diagram. If the problem persists, contact Steelco customer service
16 READING FIXED TEMP. RECORD. ?	Incorrect data reading from the probe to the PLC	Replace the probe or its analog inputs card to the PLC. If the problem persists, contact Steelco customer service
18 READING RECORDING PRESSURE ?	Incorrect data read from pressure switch to the PLC The door does not open even though the command is sent	Replace pressure switch or its analog inputs card to the PLC. If the problem persists, contact Steelco customer service
19 CONTROL FRONT DOOR ?		Check the settings of the cycle and the sliding guides. If the problem persists, contact Steelco customer service
20 CONTROL BACK DOOR ?		
21 GENERATOR OVER PRESSURE	Steam generator pressure too high. Possible causes: - Pressure switch failure; - Heating contactors jammed	Check the safety pressure switch and contactors (if faulty replace). If the problem persists, contact Steelco customer service
22 WATER PUMP SWITCH FAIL	Thermal protection of the water pump motor active	Check water line for blockage, reset the thermal protection. If the problem persists, contact Steelco customer service

Alarm message	Description of the trouble and its possible cause	Suggested solution
25 PLC RECORDING FIXED PROBE ?	The probe does not read or gives no data to the PLC. Possible causes: - Damaged probe; - Converter breakdown; - Analog card breakdown	Switch off the machine and switch on again. If the problem persists verify the probe, the converter and the analog card. To replace one of these components and to reset the measuring system contact Steelco customer service
27 PLC RECORDING PRESS. TRANSD.?	The transducer does not read or gives no data to the PLC. Possible causes: - Damaged transducer; - Analog card breakdown	Switch off the machine and switch on again. If the problem persists verify the transducer, the converter and the analog card. To replace one of these components and to reset the measuring system contact Steelco customer service
28 CONTRADICTION PROBE ON STER.	The two probes of the systems (registration, control) provide conflicting readings or one of the two does not provide data to the PLC Possible causes: - Damaged probe; - Converter breakdown; - Analog card breakdown	
29 PRESSURE TRASDUCTOR FAIL !		
31 MASTER/SLAVE CONTROL FAIL ?	Absence of communication between Master and Slave HMI	Check Ethernet cable connecting Master and Slave, and that the HMIs and PLC are in RUN mode
32 SLAVE/MASTER CONTROL FAIL ?	Absence of communication between Slave and Master HMI	
33 NO LINE STEAM !!	Steam pneumatic valve failure or absence of steam in-line	Check the presence of steam in line, and pneumatic valve. If the problem persists, contact Steelco customer service
34 NO LINE WATER !!	There is no water in the feed line. Possible causes: 1) there is no water in the circuit upstream of the machine; 2) the water pressure is not sufficient; 3) the water flow is not sufficient; 4) the pressure switch does not work correctly	Verify: 1) the presence of water in the feed circuit upstream of the machine; 2) that the water feed valve to the machine are open; 3) that the no return valve is not locked; 4) that the pressure and the water flow are according to the manufacturer's specifications; 5) the water in-line pressure switch is functioning and, if necessary, replace it

Alarm message	Description of the trouble and its possible cause	Suggested solution
35 COMPRESSED AIR FAILURE!	Signals there is no compressed air in the feed line. Possible causes: 1) there is no compressed air in the circuit delivered to the sterilizer; 2) the compressed air pressure is not sufficient; 3) the compressed air capacity is not sufficient; 4) the pressure switch does not work correctly	Verify: 1) the compressed air supply circuit delivers air to the sterilizer; 2) that the pressure and the compressed air capacity are according to manufacturer's specifications; 3) the compressed air in-line pressure switch is functioning and, if necessary, replace it.
36 THERMAL CUT-OUT !!	A motor safety thermal device cut out on the door motor is active	Open the electric panel and reset the thermal overload protection device. If the problem persists, contact Steelco customer service
37 EMERGENCY STOP!	The emergency stop button has been pushed	Reset to the normal state by unlocking the emergency button
38 FEED-WATER PROBLEMS !!	Water cannot be admitted to the machine. Possible causes: 1) the pump safety devices have intervened; 2) the water pump does not work; 3) the level monitoring relay does not work; 4) the tube or the strainer which takes water to the pump is obstructed; 5) the tube which comes out of the pump is obstructed; 6) the level control device does not work; 7) the level control probes are encrusted and cannot detect the presence of the water	Verify: 1) the fuses or the thermal device of the water pump are not blown or tripped; 2) the water pump output is sufficient; 3) no obstruction of the tube or the strainer which takes water to the pump 4) no obstruction of the tube which comes out of the pump; 5) the level control device is in working order; 6) the level control probes are clean and properly connected 7) clean or replace the level control probe
39 PROBLEMS WITH GASKET SEAL!!	The gasket is not pressurized / depressurized. Possible causes: 1) the door gasket is worn or damaged; 2) the gasket inlet pipe is obstructed; 3) the gasket steam inlet valve does not work; 4) there are some leaks in the gasket drain circuit	Verify: 1) the state of the gasket; 2) no obstruction in the gasket inlet pipe; 3) the function of the gasket steam valve; 4) the seal of the gasket drain circuit

Alarm message	Description of the trouble and its possible cause	Suggested solution
40 FRONT DOOR NOT CLOSED !!	The door is not closed or the door closed signal does not reach the control PLC. Possible causes: 1) the door has not been closed by the operator; 2) the door closing stop device is damaged and can not detect the door reaching its closed position; 3) the signal of the limit switch is not detected by the PLC input card; 4) the door is out of its guide; 5) the door is blocked from closing completely.	1) check the door has been closed; 2) Verify: - The function of the door stop limit switch; - The function of the PLC input device; - The door movement.
41 BACK DOOR NOT CLOSED !!		
42 PRESSURE CONTROL TRASD. FAIL	Failure of connection between the transducer and the PLC. Defective transducer or analog input card	Check and replace the pressure transducer or the analog input card
43 VACUUM PUMP FAIL !	PLC does not receive feedback from the vacuum pump: 1) The pump is not working; 2) The pump is working but there is a problem between the aux contact and the PLC	Contact Steelco customer service
44 VACUUM PUMP SWITCH FAIL	The thermal protection of the pump's motor cut out	Contact Steelco customer service
45 WATER LEVEL MISMATCH !!	Inconsistency between the maximum and minimum levels of water	Contact Steelco customer service
46 FAIL DOOR IN CYCLE ??	Pressure loss in the door gaskets during the cycle	Contact Steelco customer service
47 GENERATOR DISCHARGE FAIL !	Discharge pneumatic valve jammed	Contact Steelco customer service

Alarm message	Description of the trouble and its possible cause	Suggested solution
48 JACKET HEATING TIME??	The machine can not heat the jacket in the time allowed. Possible causes: 1) the steam line is closed; 2) wrong data setting; 3) problem in the circuit taking steam to the jacket; 4) the water in the generator is not sufficient to generate the quantity of steam that is necessary for heating; 5) there is too much water in the generator: it fills the jacket causing a fall in temperature; 6) problem in the heating device; 7) the jacket steam traps are obstructed and do not drain the air or the condensate present in the jacket/generator; the system surveying temperature is not calibrated	Contact Steelco customer service
49 TIMEOUT WATER COOLING PUMP !	Timeout when refilling the vacuum pump water	Contact Steelco customer service
50 CHAMBER VACUUM TIME ??	The machine cannot achieve the vacuum in the chamber in the allowed time. Possible causes: 1) wrong data setting; 2) problem in the chamber vacuum circuit; 3) the transducer and the analog card are not working correctly; 4) the vacuum pump liquid ring does not have enough/has too much water supplied; 5) leak in the gasket or in the hydraulic circuit	Contact Steelco customer service
51 CHAMBER PRESSURE TIME ??	The machine cannot reach the right pressure value in the chamber in the allowed time. Possible causes: 1) wrong data setting 2) the transducer and the analog card are not working correctly; 3) problem in the circuit taking steam in the chamber 4) the condensate drain system is not functional	Contact Steelco customer service

Alarm message	Description of the trouble and its possible cause	Suggested solution
52 OUT OF STERILIZING TIME ?	The sterilization phase lasted longer than the MAX time set. Possible causes: 1) during the phase there was a temporary power failure; 2) a problem in the heating element causes a fall in temperature and stops the counting of the sterilization time; 3) the MAX time set was shorter than the sterilization time	Contact Steelco customer service
53 OPENING CONDITION TIME ??	TIME-OUT returning to atmospheric pressure. Possible causes: 1) Chamber pressure transducer not working; 2) Air filter clogged or 3) Pneumatic valve air intake jammed	Contact Steelco customer service
55 STERILIZATION TEMPERAT. LOW ?	During the sterilization phase the temperature fell below the minimum value set. Possible causes: 1) the steam line has been closed; 2) during the sterilization phase condensate covered the drain probe (failed or blocked steam trap or plumbing); 3) the measuring system is not calibrated; 4) problem with the heating element; 5) leak in the chamber drain circuit	Contact Steelco customer service
56 STERILIZATION TEMPERAT. HIGH ?	During the sterilization phase the temperature went over the maximum value set. Possible causes: 1) the measuring system is not calibrated; 2) leak in the door gasket to the chamber	Contact Steelco customer service
57 VACUUM TEST FAIL !!	During the vacuum test the machine cannot keep the leak under the allowed limit. Possible causes: 1) Measuring system issue; 2) Leakage in the hydraulic circuit or connections to the chamber, seals, valves, etc..	Contact Steelco customer service

Alarm message	Description of the trouble and its possible cause	Suggested solution
58 ATMOSPHERE CONDITION TIME	TIME-OUT returning to atmospheric pressure. Possible causes: 1) Chamber pressure transducer not working; 2) Air filter clogged or 3) Pneumatic valve air intake jammed	Contact Steelco customer service
60 AIR DETECTOR TEST FAIL	The test detected a loss greater than the set one.	Contact Steelco customer service
61 GENERATOR SUPPLY FAIL	The heating of the generator was ON too long compared to the value of TIME-OUT set	Contact Steelco customer service
62 COOLING NOT POSSIBLE	Phase not executable	Check the settings of the cycle. Contact Steelco customer service
63 ENERGY LACK DURING CYCLE !!	Power supply was interrupted while the machine was in cycle	Push the start button
69 GENERATOR LEVEL ALARM !!	Generator water level has dropped below the critical level	Contact Steelco customer service
70 GENERATOR TRASD. FAIL !!	The transducer does not read or gives no data to the PLC. Possible causes: - Damaged transducer; - Analog card failure	Switch off the machine and switch on again. If the problem persists verify the function of the probe, the converter and the analog card. To replace one of these components and to reset the measuring system contact Steelco customer service.
71 PROBE DEGASSING FAIL !!	The probe does not read or gives no data to the PLC. Possible causes: - Damaged probe; - Converter breakdown; - Analog card breakdown	
79 TIMEOUT HEATING 4D SENSOR !	The temperature of the device is not reached in foreseen time	Contact Steelco customer service

4.12.1. Alarms: how to simulate them

Alarm message	
00 PLC CONTROL OUT OF ORDER !!	- Set PLC switch on STOP position - Disconnect W50 cable
01 FRONT DOOR SAFETY ???	Press the micro of the anti-crushing device (ZS03) of the front door, while the latter is closing
02 BACK DOOR SAFETY ???	Press the micro of the anti-crushing device (ZS07) of the rear door, while the latter is closing
03 FRONT DOOR SWITCH INCONGR.	With the front door closed, press the door opening limit switch (ZS02)
04 BACK DOOR SWITCH INCONGR.	With the rear door closed, press the door opening limit switch (ZS06)
05 PLC CONTROL PROBLEMS (XOB10)	N/A
06 PLC CONTROL PROBLEMS (XOB12)	N/A
07 PLC CONTROL PROBLEMS (TEST)	N/A
08 HAKKO TERMINAL NOT OK	Disconnect the W50 cable
09 PLC CONTROL JACKET PROBE ?	Disconnect jacket temperature probe (wire 35.10)
10 PLC CONTROL FIXED PROBE ?	Disconnect chamber control probe (wire 35.6)
11 PLC CONTROL MOBILE PROBE ?	Disconnect product probe
12 PLC CONTROL PRESS. TRANSD. ?	Disconnect chamber pressure transducer (wire 35.1)
13 PROBE AIR DETECT ?	Disconnect air detector probe (wire 35.12)
14 INCORRECT PHASE SEQUENCE !!	Disconnect the phase control relay 3RP1
16 READING FIXED TEMP. RECORD. ?	Disconnect the chamber temperature reference 37UN27
18 READING RECORDING PRESSURE ?	Disconnect the chamber pressure reference 37UN16
19 CONTROL FRONT DOOR ?	Press the anti-crushing device of the front door while it is closing
20 CONTROL BACK DOOR ?	Press the anti-crushing device of the rear door while it is closing
21 GENERATOR OVER PRESSURE	N/A
22 WATER PUMP SWITCH FAIL	- Disconnect power supply to SSR 5KS91 - Switch OFF the circuit breaker 5QM91
25 PLC RECORDING FIXED PROBE ?	- Disconnect the W20 cable - Disconnect the temperature chamber reference 37UN27
27 PLC RECORDING PRESS. TRANSD.?	- Disconnect the W20 cable - Disconnect the temperature pressure reference 37UN16
28 CONTRADICTION PROBE ON STER.	Change calibration value of one probe
29 PRESSURE TRASDUCTOR FAIL !	N/A

Alarm message	
31 MASTER/SLAVE CONTROL FAIL ?	N/A
32 SLAVE/MASTER CONTROL FAIL ?	N/A
33 NO LINE STEAM !!	Disconnect the steam line pressure switch PS52
34 NO LINE WATER !!	Disconnect the water line pressure switch PS70 o PS70A (if installed)
35 COMPRESSED AIR FAILURE!	Disconnect the air pressure switch PS60
36 THERMAL CUT-OUT !!	- Disconnect power supply to SSR 5KS01 or 5KS05 (if installed) - Switch OFF the circuit breaker 5QM01 or 5QM05 (if installed)
37 EMERGENCY STOP!	Press emergency push button
38 FEED-WATER PROBLEMS !!	Change the maximum water load time of the generator
39 PROBLEMS WITH GASKET SEAL!!	N/A
40 FRONT DOOR NOT CLOSED !!	Disconnect the front door safety switch ZS01
41 BACK DOOR NOT CLOSED !!	Disconnect the rear door safety switch ZS05
42 PRESSURE CONTROL TRASD. FAIL	Disconnect the chamber pressure transducer PT11
43 VACUUM PUMP FAIL !	Disconnect vacuum pump feedback to PLC
44 VACUUM PUMP SWITCH FAIL	- Disconnect power supply to SSR 5KS71 - Switch OFF the circuit breaker 5QM071
45 WATER LEVEL MISMATCH !!	Ensure that the generator is filled with water to the maximum level and disconnect the minimum level sensor
46 FAIL DOOR IN CYCLE ??	Disconnect the door gasket pressure switch PS04 or PS08 (if installed)
47 GENERATOR DISCHARGE FAIL !	Disconnect the steam generator drain pneumatic valve PV90 and activate steam generator auto drain
48 JACKET HEATING TIME??	Reduce the maximum heating time
49 TIMEOUT WATER COOLING PUMP !	N/A
50 CHAMBER VACUUM TIME ??	Reduce the maximum vacuum time
51 CHAMBER PRESSURE TIME ??	Reduce the maximum pressurizing time
52 OUT OF STERILIZING TIME ?	Reduce the maximum sterilization time
53 OPENING CONDITION TIME ??	N/A
55 STERILIZATION TEMPERAT. LOW ?	Change the value of low sterilization temperature
56 STERILIZATION TEMPERAT. HIGH ?	Change the value of high sterilization temperature
57 VACUUM TEST FAIL !!	N/A
58 ATMOSPHERE CONDITION TIME	Disconnect the pressure switch PS41 or PS80
60 AIR DETECTOR TEST FAIL	N/A
61 GENERATOR SUPPLY FAIL	<u>Internal generator with Electric heating</u> : open heating element fuse <u>Internal generator with Indirect steam heating</u> : disconnect the industrial steam line pneumatic valve PV52
62 COOLING NOT POSSIBLE	N/A
63 ENERGY LACK DURING CYCLE !!	N/A

Alarm message	
69 GENERATOR LEVEL ALARM !!	N/A
70 GENERATOR TRASD. FAIL !!	N/A
71 PROBE DEGASSING FAIL !!	N/A
79 TIMEOUT HEATING 4D SENSOR !	N/A

4.13. Warning

The following table provides a brief description of the meaning of each warning.

Warning message	Description
03 LOAD/UNLOAD SYSTEM ALARM	Warning or alarm from the Steelco conveyor Problem from Miele conveyor
04 WATCH-DOG LOAD/UNLOAD PLC ?	Communication problem between sterilizer and Steelco conveyor
05 LOAD/UNLOAD COMM.PLC FAIL ?	Steelco Conveyor PLC Problem
06 POWER SUPPLY FROM UPS	Power supply failure and UPS trip
07 AIR DETECTOR DISABLED	Air Detector is disabled
08 PRINTER DISABLED	Printer is disabled
09 RECORDING SYSTEM PROGR.FAIL	Problem with the chamber pressure and/or temperature reading from the recording system
10 SD-CARD NOT OK	HMI can't read SD card
11 PLC BATTERY NOT OK	PLC battery must be replaced or inserted
12 DRAIN GENERATOR STARTED UP	Sterilizer is performing the automatic generator discharge
13 CALL FOR MAINTENANCE	Scheduled maintenance is required
14 TERMINAL BATTERY NOT OK	HMI battery must be replaced or inserted
15 CHECKUP COMMUNICATION FAULT	Communication error with HMI CheckUp
16 4D:RS232 COMMUNICATION FAULT	Communication error with 4D Sensor
17 4D:INTERNAL SENSOR FAULT	4D Sensor hardware problem
18 4D:INSUFFICIENT STEAM CONC.	Steam concentration during sterilization phase is lower than expected
19 4D:CONDITIONING FAILED	Problem with the first vacuum pulse during the cycle. Consequently, the 4D sensor cannot set the "0 setpoint".
20 4D:CALIBRATION FAILED	4D Sensor, after 3 attempts, fails to calibrate
21 4D:SELF-CHECK FAILED	Steam concentration in Selfcheck program is too high than expected
22 4D:INSUFFICIENT STERILIZ.TIME	The set sterilization time is too short

4.13.1. Warnings: how to simulate them

Warning message	
03 LOAD/UNLOAD SYSTEM ALARM	Disconnect the communication cable between the sterilizer and the conveyor
04 WATCH-DOG LOAD/UNLOAD PLC ?	Disconnect the communication cable between the sterilizer and the conveyor
05 LOAD/UNLOAD COMM.PLC FAIL ?	N/A
06 POWER SUPPLY FROM UPS	With the UPS unit installed and configured turn off the main power switch
07 AIR DETECTOR DISABLED	N/A
08 PRINTER DISABLED	N/A
09 RECORDING SYSTEM PROGR. FAIL	Disconnect the communication cable W20 or W2 from Hakko HMI
10 SD-CARD NOT OK	Remove the SD-Card from HMI
11 PLC BATTERY NOT OK	Remove the battery from PLC
12 DRAIN GENERATOR STARTED UP	N/A
13 CALL FOR MAINTENANCE	N/A
14 TERMINAL BATTERY NOT OK	Remove the battery from HMI
15 CHECKUP COMMUNICATION FAULT	Disconnect the communication cable between the sterilizer and the CheckUp HMI
16 4D:RS232 COMMUNICATION FAULT	Disconnect the communication cable between the sterilizer and the 4D sensor
17 4D:INTERNAL SENSOR FAULT	N/A
18 4D:INSUFFICIENT STEAM CONC.	N/A
19 4D:CONDITIONING FAILED	N/A
20 4D:CALIBRATION FAILED	N/A
21 4D:SELF-CHECK FAILED	N/A
22 4D:INSUFFICIENT STERILIZ. TIME	N/A

5. RECOMMENDED SPARE PARTS LIST

CODE	DESCRIPTION	SUGGESTED ACTIVITY	Suggested order quantities per each autoclave	
			1 year	2 years
088500500	Thermal paper	Replace when needed	50	100
I04099	Air filter	Replace every 12 months or 2000 cycles	1	2
I04838	Door gasket	Replace every 6 months or 1000 cycles	4	8
I07405	Silicon gasket for 3/4" TC	Replace every 12 months	10	20
I07488	Silicon gasket for 3" TC	Replace every 12 months	1	2
I04013	Pressure switch Steam line	Replace once per year	1	2
I18035	Pressure switch Chamber	Replace once per year	1	2
I04019	Pressure switch Generator max	Replace once per year	1	2
I01918	Safety valve 3,7 BAR	Replace once per two years	-	1
I01917	Safety valve 2,7 BAR	Replace once per two years	-	2
I04129	Heater contactor	Replace once per two years	-	4
I17499	Pressure transducer 0/4 Bar 4-20 mA	Replace when needed	-	1
I19607	Vacuum pump	For VS10/12 to be replaced when needed	-	1
I04058	Vacuum pump	For VS6/8 to be replaced when needed	-	1
I04059	Vacuum pump	For VS4 to be replaced when needed	-	1
I04152	Water load pump	Replace when needed	-	1
H0067700A	Water level probe	Replace when needed	-	1
I02000	Pneumatic valve 1/2"	Replace when needed	-	1
I02001	Pneumatic valve 3/4"	Replace when needed	-	1
I17710	Jacket PT 1000 probe Te23	Replace when needed	-	1
I17711	Chamber PT 1000 probe Te22-27	Replace when needed	-	1
I01915	Generator water level switch	Replace when needed	-	1
I04073	DAT 3010 MOD. I/O	Replace when needed	-	1
I04103	Heating elements	8 KW VS 4 steam generator to be replaced when needed	1	2
I04104	Heating elements	12 KW VS 6 and VS 8 steam generator to be replaced when needed	1	2
H9012200A	Heating elements gasket	for all heating elements size	1	2
I177736	Printer PLUS4	Replace when needed	-	1
I18036	Pressure switch Door gasket	Replace when needed	-	1
I18039	Pressure switch Air	Replace when needed	-	1
I18038	Pressure switch Water line	Replace once per year	-	1

6. ATTACHMENTS

6.1. P&ID Drawing

6.2. Installation Drawing

6.3. Electrical drawing

6.4. Additional Drawing (if applicable)

SALES AND ASSISTANCE REFERENCES

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Doc. ID. STEELCOVS_4-12_G1.5_SM
Rev. 1.5.2 - July 2022
Lang: EN

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