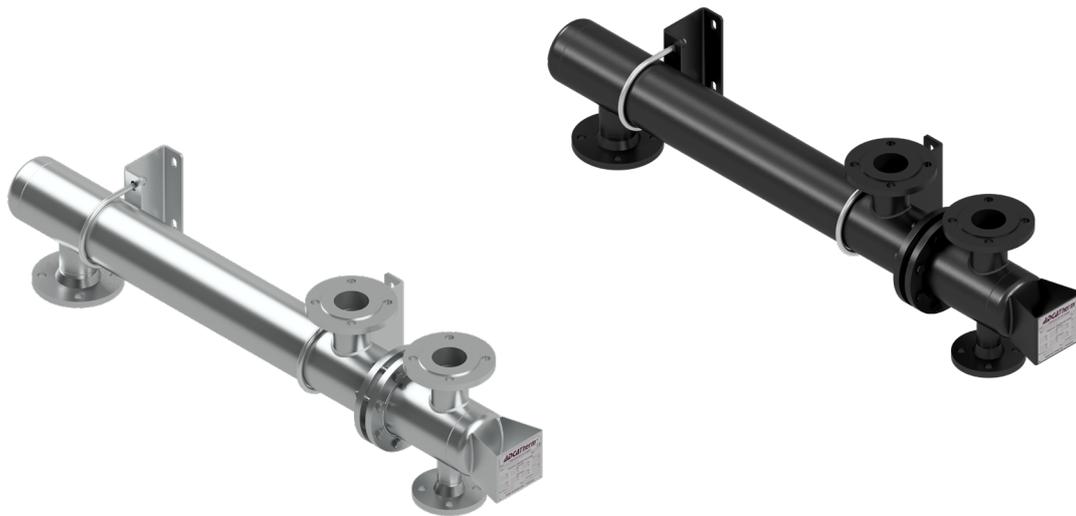


ST SHELL AND TUBE HEAT EXCHANGERS

INSTALLATION AND MAINTENANCE INSTRUCTIONS



STH / STV

GENERAL INFORMATION

- These instructions must be carefully read before performing any work involving VALSTEAM ADCA products. Failure to observe these instructions may result in hazardous situations.
- These instructions describe the entire life cycle of the product. Keep them in a location that is accessible to every user and make these instructions available to every new owner of the product.
- Current regional and plant safety regulations must be considered and followed during installation, operation, and maintenance work.
- The images shown in these instructions are for illustration purposes only.
- For problems that cannot be solved with the help of these instructions, please contact VALSTEAM ADCA or its representative.

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We reserve the right to change the design and material of this product without notice.

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1. SAFETY INFORMATION

1.1. Explanation of symbols



DANGER

Hazardous situations which, if not avoided by applying the correct preventive measures, will result in fatal or serious injury and/or considerable property damage.



WARNING

Hazardous situations which, if not avoided by applying the correct preventive measures, could result in fatal or serious injury and/or considerable property damage.



CAUTION

Hazardous situations which, if not avoided by applying the correct preventive measures, could result in moderately severe or minor injury.



NOTICE

Situations which, if not avoided, can result in property damage or product malfunction.



NOTE

Indicates additional informations, tips, and recommendations.

1.2. Intended use

Refer to the markings on the device, such as nameplate and laser markings, Information Sheet (IS), and these Installation and Maintenance Instructions (IMI) to check that the product was designed for the intended use and meets the specifications used for sizing and selection. This includes checking application, material suitability, process medium, pressure, and temperature as well as their respective limiting values.

VALSTEAM ADCA does not assume any responsibility for damage resulting from inappropriate use of the product, damage caused by external stresses, or any other external factors. Correct installation of the product is the full responsibility of the contractor.

Inappropriate use of the product is any use other than the one described in this chapter. Inappropriate use also includes:

- Use of spare parts that are not genuine;
- Performance of maintenance work not described in these instructions;
- Use outside the limits defined by the accessories connected to the product;
- Unauthorized modifications to the product.

If the product is to be used for an application or with a fluid other than the one it was designed for, contact VALSTEAM ADCA.

1.3. Qualification of personnel

Handling, installation, operation, and maintenance work must be carried out by fully trained and qualified personnel, capable of judging the work which they are assigned to perform and recognizing potentially hazardous situations. They should be trained to properly use this product according to these Installation and Maintenance Instructions.

Where a formal “Permits to Work” system is implemented in the plant it must be complied with.

1.4. Personal protective equipment

Personal protective equipment should always be worn during work in order to protect against hazards posed by e.g. the process medium, dangerous temperatures, noise, falling or projected objects, and working at height. This equipment includes a helmet, safety glasses, safety harness, protective clothes, safety shoes, hearing protection, etc.

NOTE

Always assess whether you or others in your vicinity require any protective equipment. When in doubt, check with the plant’s health & safety responsible personnel for details on required protective equipment.

1.5. The system

The complete system should be assessed as well as every action (e.g. closing of shut-off valves, disconnection of the power supply) to ensure this will not bring additional risk to personnel or property.

Dangerous actions that can result in a hazardous situation include isolation of protective devices such as safety valves, vents, vacuum relief valves, disconnection of electric safety devices, sensors, and alarms.

1.6. ATEX

If the product is in the scope of the ATEX 2014/34/EU directive and as such bears the Ex marking, consult its specific Additional Instructions for use in Potentially Explosive Areas (IMI Ex). In such cases, handling, installation, operation, and maintenance work must only be performed by personnel qualified and authorized to work in potentially explosive areas.

1.7. General safety notes



DANGER

RISK OF BURSTING OR IMPLOSION IN PRESSURE EQUIPMENT

Valves, ancillaries, and pipelines are pressure equipment. Working outside their operating limits, improper opening, malfunction, or system operation failure may result in component bursting or implosion.

- Observe the maximum and minimum operating limits of the product and check if they are within those of the system in which it is being installed. If not, ensure a safety device is included in the system to prevent operation outside those limits. Check the product Information Sheet (IS).
- In case the malfunction of any equipment installed on the system or a system operation failure may result in a dangerous overpressure, overtemperature, or vacuum condition, ensure a safety device is included in the system to prevent such situation.
- Before starting any work on the product, depressurize it and cool or heat it to ambient temperature. This also applies to the line in which it is fitted.
- Drain the process medium from the product and all the relevant plant sections.



WARNING

RISK OF BURNS

Depending on the operating conditions, products, and pipelines may get very hot or cold and cause burn injuries.

- Do not touch the product while it is hot or cold, allowing it firstly to cool down or heat up.
- Wear protective clothing and safety gloves during working operations.
- Thermally insulate tubes and products as a preventive measure.



WARNING

RISK OF INJURY CAUSED BY FLUID ATTACK ON PRODUCT MATERIALS

The product must only be used with mediums that do not attack the materials of the product (body, gaskets, seals). Otherwise, leaks may occur, and hot and/or hazardous fluid can escape.

- Do not use the product with mediums other than the ones it was designed for. Check section 1.2 – Intended Use.
- Prevent medium contamination.

RISK OF INJURY CAUSED BY UNDER TIGHTENED PRODUCT OR ITS COMPONENTS

Excessively low tightening torques may cause medium to escape and/or components to be projected at high speed, which may result in a hazardous situation depending on the medium, chemical properties, and/or its operating conditions.

- Do not loosen any screws while the equipment is pressurized.
- Observe the specified tightening torques on these Installation and Maintenance Instructions. If the relevant torque value is not mentioned, contact VALSTEAM ADCA.

RISK OF HEARING LOSS

Depending on the operating conditions, the product may generate loud noises.

- Wear hearing protection when in the vicinity of the product.

RISK OF INJURY AS A RESULT OF ILLEGIBLE INFORMATION

Important information written in the product nameplate, markings, and warning signs may wear over time or become illegible due to e.g. dirt accumulation, resulting in hazardous situations and personal injury or property damage.

- Keep nameplates, markings, and warning signs in a legible state, replacing them when illegible, missing, or damaged.



CAUTION

RISK OF INJURY DUE TO RESIDUAL PROCESS MEDIUM

Direct contact with a dangerous process medium may lead to personal injury, e.g. smoke inhalation and chemical burns.

- Drain the process medium from the product and all the relevant plant sections.
- Wear protective clothing, safety gloves, mask, and eye protection.



CAUTION

RISK OF INJURY DUE TO IMPROPER HANDLING

Manual handling (e.g. lifting, carrying, pushing, pulling) of large and/or heavy products may result in personal injury.

- Assess the risk associated with the handling task.
- Use adequate handling methods and appropriate auxiliary handling equipment.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO EXCESSIVELY HIGH TIGHTENING TORQUES

High tightening torques may lead to premature wearing of product components.

- Observe the specified tightening torques on these Installation and Maintenance Instructions. If the relevant torque value is not mentioned, contact VALSTEAM ADCA.

2. PRODUCT INFORMATION

The ADCATherm ST series are compact shell and tube steam-to-water heat exchangers designed for thermal energy transfer between steam and water, or other fluids compatible with the materials of construction.

Compared to conventional smooth tube shell and tube heat exchangers, the ADCATherm ST models are shorter and lighter, due to the use of extruded low fin tubes which increase the external heat transfer surface and significantly enhance thermal performance.

2.1. Principle of operation

In ADCATherm STH (horizontal design) and STV (vertical design) heat exchangers, steam flows inside the low finned tubes, while the process water (or other compatible fluid) flows on the shell side, outside the tubes.

As the steam passes through the tube bundle, it transfers its thermal energy through the tube walls to the process fluid, thereby heating it. During this heat transfer process, the steam condenses into hot condensate, which must be properly drained using a suitable condensate removal system.

The finned tube geometry increases the effective heat transfer surface area, resulting in improved thermal efficiency when compared to conventional smooth tube designs.

The integrated floating head allows free thermal expansion and contraction of the tube bundle, preventing structural damage and extending the service life of the equipment.

The heat exchangers are suitable for use with steam, water, hot condensate and other

fluids compatible with the construction materials. Sizing and selection are based on steam pressure and temperature, inlet and outlet secondary fluid temperatures, flow rate, or required heat duty.

2.2. Certification

This product has been specifically designed for use with liquids and gases which are in Group 2 of the European PED – 2014/68/EU Pressure Equipment Directive and it complies with its requirements.

CE MARKING – GROUP 2 (PED – EUROPEAN DIRECTIVE)		
PN16	CATEGORY TUBE SIDE	CATEGORY SHELL SIDE
STH/STV 4.075 to 4.150	1 (CE marked)	1 (CE marked)
STH/STV 5.075 to 5.150	1 (CE marked)	1 or 2 (CE marked)
STH/STV 6.075 to 6.150	1 (CE marked)	2 (CE marked)
STH/STV 8.075 to 8.150	2 (CE marked)	2 (CE marked)
STH/STV 10.075 to 10.150	2 (CE marked)	2 or 3 (CE marked)
STH/STV 12.075 to 12.150	2 (CE marked)	3 (CE marked)

NOTE

If the product falls within the category SEP it must not be CE marked, unless other directives are applicable.

This product is not in the scope of the ATEX 2014/34/EU directive as it does not have its potential ignition source. Personnel responsible for the plant installation must assess the risks caused by static electricity and take the necessary precautionary measures to prevent static charge. These measures include e.g. connection of the product to the equipotential bonding system.

2.3. Product identification

The following items are indicated on the product nameplate or directly on its body:

- Manufacturer
- Product model (e.g. STH/S)
- Pressure rating (e.g. PN 16)
- Nominal size (e.g. DN 40)
- Min. operating temperature (e.g. $T_{min} = 50\text{ °C}$)
- Max. operating temperature (e.g. $T_{max} = 250\text{ °C}$)
- Flow direction (indicated by inlet/outlet designations)
- Volume (e.g. 18,2)

- Test pressure (in some cases)
- Pressure / temperature rating for both shell and tubes
- Serial number and year of manufacturing (e.g. Reg.:17483/19)
- CE Marking (when applicable – see section 2.2 – Certification)
- EX Marking (when applicable e.g. EX h IIB T6...T3 Gb – see section 2.2 – Certification)

2.4. Technical data

For technical data including dimensions, materials, limiting conditions and versions refer to the product's respective Information Sheet (IS).

3. TRANSPORT, STORAGE, AND PACKAGING



WARNING

RISK DUE TO FALLING LOADS

Loads may tip or fall over resulting in damage to property, serious injury, or death.

- Use suitable equipment when moving or lifting suspended loads.
- Make sure no one is standing below the suspended load.



CAUTION

RISK OF INJURY DUE TO IMPROPER HANDLING

Manual handling (e.g. lifting, carrying, pushing, pulling) of large and/or heavy products may result in personal injury such as back injury.

- Assess the risk associated with the handling task.
- Use adequate handling methods and appropriate auxiliary handling equipment.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO IMPROPER STORAGE

- Do not remove any packaging or protective covers until immediately before installation at the site.
- Store the product in a solid base in a dry, cool, and dust-free environment.
- Until its installation, protect it from the weather, dirt, corrosive atmospheres, and other harmful influences.

! NOTICE

RISK OF PRODUCT DAMAGE DUE TO LONG-TERM STORAGE

Some product components may deteriorate with time (e.g. valve packings, seals).

- Do not store the product for more than 12 months.
- If, for any reason, the product must be stored for longer periods, contact VALSTEAM ADCA.

Products are individually wrapped in plastic film, thermo shrinkable plastic, and/or stored in a cardboard box as they leave VALSTEAM ADCA. Avoid removing packaging and any protective cover until immediately before installing the product at the site.

i NOTE

If the transport packaging has any shipping damage, contact VALSTEAM ADCA or its representative.

Before storing and transporting the product, protect it from impacts and mechanical damage, paying special care to sealing surfaces and other fragile parts.

i NOTE

If the corrosion protection (paint and other surface coatings) of the product is damaged during transport or other handling procedures repair it immediately.

4. INSTALLATION

Before performing any installation work, refer to section 1 – Safety information.

! WARNING

RISK OF INJURY DUE TO INSUFFICIENT SUPPORT DURING INSTALLATION

Insufficient support of the product during installation may cause it to fall and cause personal injury.

- Ensure the product is safely held in place during installation.
- Wear protective safety shoes.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO STRESS

The product is not intended to withstand external stresses that may be induced by the system to which it is being connected.

- Make sure that the connected pipe does not subject the body to any stress (forces or torques) during installation and operation.
- Do not use the product as an elevation point.

4.1. Preparation for installation

Before installation, make sure the following conditions are met:

- The installation area has easy access and the product is to be installed in a position where operation and maintenance work can be performed safely.
- The product will be installed with proper support and free of any stresses that can be induced by the system due to e.g. pipe expansions. The necessary precautions are recommended during system design.
- The pipeline where the product will be installed is designed in such a way that it takes into account the weight of the product. The pipeline may require support on both sides next to the product, particularly if its size and weight are considerable and especially if vibrations are to be expected in the system.
- The product is not damaged.
- Make sure all the necessary materials and tools are readily available during installation work.
- Referring to this Installation and Maintenance Instructions (IMI), Information Sheet (IS), and nameplate, check that the product is suitable for the intended installation: temperature, medium, pressure, etc. – see section 1.2 – Intended use.
- Check that there are no foreign bodies inside the pipelines and ancillaries, flushing may be necessary. These should be thoroughly cleaned.
- Check any mounted pressure gauges and make sure they function properly.



NOTE

Assembly Drawings (AD) with assembly details and parts lists are available on request.

4.2. Installation procedure

1. Remove plastic film and other packaging, as well as the protective covers that are placed on flanges or connection ends. Make sure the heat exchanger is free from foreign matter.
2. An ADCA pipeline strainer or filter should be installed before the inlet on both tube side and shell side, preventing solid particles from the process medium from damaging the product. Installing shut-off valves upstream and downstream of the heat exchanger is recommended to ensure the plant can still operate while the equipment is isolated for maintenance.
3. Determine the correct installation position and direction of the fluid flow. The heat-exchanger has an arrow or inlet/outlet designation, be sure that it is installed in the appropriate direction. For units supplied for use with steam, make sure the condensate connection is pointed to the ground. A properly sized float and thermostatic (FLT) steam trap is recommended to automatically discharge the condensate.
4. Take care with jointing materials and sealing compounds to ensure that none may be permitted to block or enter the heat exchanger causing malfunction. In case of flanged connections use appropriate flange gaskets.

5. START-UP

Before performing the start-up procedure, refer to section 1 – Safety Information.

The start-up procedure must be followed every time the product is put back into service.

5.1. Preparation for start-up

Before starting up, make sure the following conditions are met:

- All works on the system have been completed.
- All the necessary safety devices have been installed.
- When required, warning notices are used to alert others that the system is starting up.
- The product is correctly installed – see section 4 – Installation.
- Referring to these Installation and Maintenance Instructions (IMI), Information Sheet (IS), and nameplate, check that the product is suitable for the intended installation: temperature, medium, pressure, etc. – see section 1.2 – Intended use.
- A safety check was performed by qualified personnel. Checking for leaks, structural damage and integrity of system components.

! NOTICE

RISK OF PRODUCT DAMAGE DUE TO CONTAMINATION

The plant operator is responsible for cleaning the pipelines in the plant as well as keeping the product well-maintained. At start-up, the presence of small particles in the medium (dirt, scale, weld splatters, etc.) may damage the product or cause malfunction.

- Flush pipelines before start-up.
- Clean protection varnishes from pipes and flanges, leftover paint, graphite, grease, etc.
- Use a pipeline strainer or a filter.

5.2. Start-up procedure

1. Open shut-off valves slowly, until normal operating conditions are achieved. This will prevent sudden surges of pressure that can damage the heat exchanger.
2. Depending on the medium this will also avoid thermal shocks by bringing the heat exchanger slowly up to temperature.
3. Check for any leaks.
4. Check the heat exchanger to ensure it is operating correctly.

i NOTE

24 hours after system start-up, it is recommended to check the pipe connection for leaks and retighten when necessary. Clean strainers/filters to avoid blocking.

6. OPERATION

Before operating the product refer to section 1 – Safety Information.

Immediately after completing the start-up procedure, the product is ready for operation.

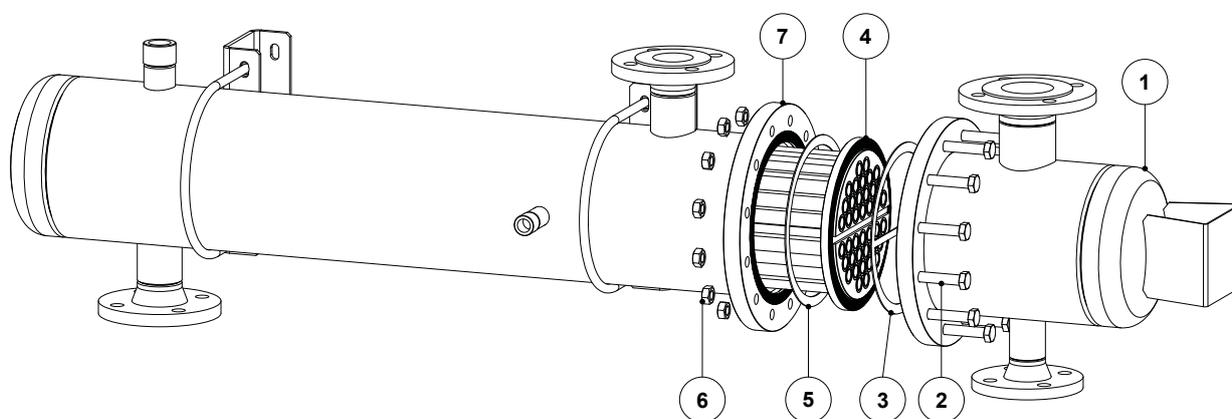
7. SHUTDOWN

Before performing the shutdown procedure, refer to section 1 – Safety information.

7.1. Shutdown procedure

1. Switch off the system and secure it so it cannot be turned on by unauthorized personnel.
2. Fully close upstream shut-off valves, to stop the medium from flowing through the product.
3. Make sure the pipeline and the heat exchanger are not under pressure and are at a safe temperature.
4. Allow medium to cool down and completely drain it from the pipeline and the heat exchanger.
5. Fully close any downstream shut-off valves.
6. If the heat exchanger is to be removed from the pipeline – see section 3 - Transport, storage, and packaging.

8. PARTS LIST



POS. No.	DESIGNATION	SPARE PARTS
1	Head	
2	Bolt	
3	Gasket	X
4	Tube bundle	
5	Gasket	X
6	Nut	
7	Shell	

9. MAINTENANCE

Before performing a maintenance procedure, refer to section 1 – Safety information.

ADCATherm STH and STV heat exchangers do not require any specific type of maintenance. It is recommended to examine the unit at regular intervals. Cleaning/flushing may be necessary.

The estimated lifetime under satisfactory working conditions is 3 years. After this period, a wall thickness examination should be performed using appropriate inspection equipment. Different factors, such as medium quality and properties, contact with corrosive fluids and external atmospheres with corrosion-promoting conditions (e.g. sea water, chemical vapours) will reduce this period.

Cleaning of the equipment can be performed with a solution of water with 5% of Na_2CO_3 .

9.1. Replacing the body gaskets

1. Unscrew the nuts (6) and bolts (2).
2. Remove the head (1) of the heat exchanger, followed by gasket (5), the tube bundle (4), and gasket (3).
3. Clean all sealing surfaces thoroughly, ensuring no graphite residue remains.
4. Clean the inside of the heat exchanger using a solution of water with 5% Na_2CO_3 .
5. Position a new gasket (3) correctly in its seat and insert the tube bundle (4) carefully into the heat exchanger body.
6. Place gasket (5) in position on top of the tube bundle.
7. Reinstall the head (1), ensuring proper alignment with the body.
8. Insert bolts (2) and hand tighten the nuts (6) evenly in a criss cross pattern to ensure uniform compression.
9. Tighten the nuts (6) with the recommended torque – see section 9.2 – Tightening torques.

9.2. Tightening torques

MODEL	NUT (6)	
	No. OF BOLTS X THREAD SIZE	TORQUE (Nm)
STH/STV 4.075 to 4.150	8 x M12	55 - 60
STH/STV 5.075 to 5.150	8 x M12	55 - 60
STH/STV 6.075 to 6.150	10 x M12	55 - 60
STH/STV 8.075 to 8.150	12 x M14	60 - 65
STH/STV 10.075 to 10.150	16 x M14	70 - 75
STH/STV 12.075 to 12.150	16 x M20	160 - 165

10. TROUBLESHOOTING

Before applying any corrective measure, refer to section 1 – Safety information.

If the malfunction cannot be solved with the help of the following table, contact VALSTEAM ADCA or its representative.

MALFUNCTION	POSSIBLE CAUSE	CORRECTIVE MEASURE
Insufficient heating / low outlet water temperature.	Low steam supply pressure.	<ul style="list-style-type: none"> Check steam pressure and adjust to design conditions.
	Heat exchanger stall (shell pressure lower than condensate return line).	<ul style="list-style-type: none"> Install vacuum breaker. Install an ADCAMat pump-trap or suitable condensate removal system.
	Steam trap malfunction, blocked, or undersized.	<ul style="list-style-type: none"> Inspect steam trap and condensate system. Repair, clean, or replace trap. Ensure correct sizing for maximum load.
	Tube bundle fouled or dirty.	<ul style="list-style-type: none"> Clean tube bundle and shell-side surfaces.
	Air or non-condensable gases trapped.	<ul style="list-style-type: none"> Vent system properly. Install an ADCA automatic air vent if required.
Fluctuating temperatures.	Steam trap is incorrectly sized.	<ul style="list-style-type: none"> Replace trap with correct capacity. Contact VALSTEAM ADCA or its representative.
	Excessive backpressure in condensate return.	<ul style="list-style-type: none"> Adjust return line design or install condensate pump.
Reduced heat transfer efficiency.	Scaling or deposits on tube surfaces.	<ul style="list-style-type: none"> Perform mechanical or chemical cleaning.
	Incorrect process flow rate.	<ul style="list-style-type: none"> Verify and adjust flow rate to specified values.
	Poor steam quality (wet steam).	<ul style="list-style-type: none"> Install humidity separator or improve steam quality. Contact VALSTEAM ADCA or its representative.
Excessive pressure drop.	Blocked tubes or shell side.	<ul style="list-style-type: none"> Inspect exchanger and remove obstructions.
	Strainers clogged.	<ul style="list-style-type: none"> Clean or replace strainers.
	Valves partially closed.	<ul style="list-style-type: none"> Fully open inlet and outlet valves.
Leakage between shell side and tube side.	Damaged tubes.	<ul style="list-style-type: none"> Inspect tube bundle and plug or replace damaged tubes.
	Defective gaskets or seals.	<ul style="list-style-type: none"> Replace gaskets or sealing elements.
Water hammer / loud noises.	Condensate backup in shell.	<ul style="list-style-type: none"> Check trap operation and drainage. Ensure trap is installed at lowest point. Avoid excessive horizontal distance to trap (<200 mm).
	Steam flow too high or flashing.	<ul style="list-style-type: none"> Reduce steam pressure or flow rate.
	Air pockets in system.	<ul style="list-style-type: none"> Vent system properly. Install air eliminator if required.
Condensate accumulation inside exchanger.	Steam trap faulty or undersized.	<ul style="list-style-type: none"> Check steam trap operation. Replace with suitable capacity. Contact VALSTEAM ADCA or its representative.
	Insufficient drainage.	<ul style="list-style-type: none"> Ensure the heat exchanger has been installed with the condensate outlet below the steam inlet. Install condensate pump if exchanger below return line. Check for backpressure.
Corrosion or reduced service life.	Condensate stagnation / waterlogging.	<ul style="list-style-type: none"> Ensure continuous condensate drainage. Apply proper water treatment.
	Rapid thermal cycling.	<ul style="list-style-type: none"> Avoid sudden heating/cooling. Check control valve operation.

11. DISPOSAL

Once the product has reached the end of its working life, it should be sent for disposal in accordance with the prevailing national and local regulations.

Before disposal make sure that the product is clean and free from fluid residues.

During its disposal, pay special attention to rubbers, resins, and polymer components (PVC, PTFE, PP, PVDF, FKM, NBR, etc.).

Do not dispose of components and hazardous substances together with household waste.

12. RETURNING PRODUCTS

Information regarding hazards and precautionary measures to be considered due to contaminating fluids and residues or mechanical damage that may represent a health, safety, or environmental risk must be provided in writing when returning products to VALSTEAM ADCA.



WARNING

RISK DUE TO THE PRESENCE OF HAZARDOUS RESIDUES ON RETURNED PRODUCTS

Contaminated fluids and residues may represent an environmental risk, or risk to VALSTEAM ADCA personnel.

- Information regarding any hazards or precautionary measures to be considered must be provided in writing when returning products to VALSTEAM ADCA.
- Health and Safety information sheets relating to any substances identified as hazardous or potentially hazardous must be provided outside the packaging.
- Use Hazmat labels on the packaging.

IMPORTANT NOTE

Total or partial disregard of these Installation and Maintenance Instructions involves loss of any right to warranty.

The extent and warranty period are specified in the “General sales conditions”.