

Operating Instructions

Flooded Heat Exchangers



OUR PRODUCTS



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DECLARATION OF CONFORMITY TO ASME

ALL PRESSURE VESSELS MANUFACTURED BY PROVIDES US, INC. MEET ALL OF THE REQUIREMENTS OF ASME BOILER AND PRESSURE VESSEL CODE. THE DATA PLATE ON EACH VESSEL WILL BE MARKED WITH THE APPROPRIATE CODE MARKINGS AND REQUIRED INFORMATION. THE APPROPRIATE "U" FORM WILL ACCOMPANY THE VESSEL. IF THE INFORMATION IS NOT PROVIDED, PLEASE CONTACT PROVIDES US, INC. FOR ASSISTANCE.

PRELIMINARY REMARKS

Keep this manual in a place easily accessible to the assigned personnel and diligently follow what is written in this Operating Instruction manual.

Provides US, Inc. DECLINES ALL RESPONSIBILITIES in case of:

- non-observance of laws in force regarding safety and accident prevention
- inadequate utilization of the pressure equipment
- modifications to or tampering with the pressure equipment
- modifications to the pressure equipment issued by personnel not authorized by Provides US, Inc.
- non-observance of what is written in this Operating Instruction manual

INTRODUCTION

3.1 FLOODED EVAPORATOR

The main application of PROVIDES flooded heat exchangers (from here simply "Flooded EV") is into HVAC plants, in which through the thermal cycle of condensation and evaporation of the refrigerant, intended as the primary fluid, transfers heat to the secondary fluid (generally water) condensing or evaporating itself. Primary fluid gets in the shell of the flooded and is totally distributed around the tube bundle. The secondary fluid flows into the tubes of the tube bundle.

The standard construction materials of PROVIDES Flooded EV consist in: copper for tube bundle and carbon steel for header, tubesheets, shell, baffles, hydraulic and refrigerant connections and support brackets. On request other materials can be used.

3.2 CONDENSER

The main application of PROVIDES condensers is the condensation of the refrigerant that comes out from the compressor (and from evaporator) in order to make it liquid and ready to begin a new cycle. Through the thermal cycle of condensation the refrigerant (gas), intended as the primary fluid, transfers heat to the secondary fluid (generally water) and condenses.

Generally primary fluid gets in the condenser from the top of the shell and it is totally distributed around the tube bundle. The secondary fluid flows into the tubes of the tube bundle.

On request it is possible to produce totally or partially heat recovery units for sanitary use.

The standard construction materials of PROVIDES condensers consists in: copper for tube bundle; cast iron or carbon steel for the header; carbon steel for tubesheets, shell, baffles, hydraulic connections and support brackets.

Refrigerant connections are generally made of copper.

It is possible to supply carbon steel gas side connections.

On request other materials can be used.

3.3 Refrigerants

It is possible to use HCFC, HFO, HFC, NH₃ and propane and others, provided they are compatible with construction materials and certification. Heat exchanger performance depends on the type of refrigerant, so different refrigerants will yield different capacities under the same conditions.

3.4 Secondary fluids

Heat exchanger's performance depends on the type of secondary fluid as well.

It's necessary to check water quality in order to avoid scales or acid etching that may compromise the tube bundle integrity.

For flooded evaporator, if the evaporation temperature or water temperatures are less than 0°C an antifreeze solution must be used.

Most common solutions are ethylene or propylene glycol type.

Other types of solutions can be used, unless not compatible with construction materials of the heat exchangers. Be advised that glycol solution's viscosity changes as temperature changes, with a consequence of an increase of pressure drop as temperature decreases.

MATERIAL INSPECTION

Before undergoing any operation on the heat exchanger make sure that the delivered equipment is what you have ordered, verifying the correctness of the nameplate. The general nameplate is located onto the shell and it is possible to read the model of the heat exchanger, the serial number, the year of construction, the design and test temperatures and pressures, the volumes and the fluid types. The Notified Body code is also indicated on the nameplate (CE, ASME, etc.).

In particular, the spacing "TYPE" will be filled as shown below:

- for flooded evaporator: "EVAPORATOR"
- for condenser: "CONDENSER"

			
TUBE SIDE	TYPE	MODEL	SHELL SIDE
DESIGN PRESSURE			DESIGN PRESSURE
PSI bar			PSI bar
DESIGN TEMPERATURE	SERIAL N°	YEAR	DESIGN TEMPERATURE
FLUID	CRN		FLUID
VOLUME			VOLUME
MANUFACTURED BY PROVIDES US Inc.			

4.1 Documentation

The heat exchanger is always provided with the present Operating Instructions manual and with the Declaration of conformity.

HANDLING AND TRANSPORTATION

PROVIDES heat exchangers are internally charged with nitrogen so as to guarantee their perfect conservation, also in corrosive environments. In case of sea freight the heat exchangers are individually wrapped.

On request it is possible to supply heat exchangers in wooden cases in compliance with the enforced norms of the delivering country. The heat exchanger may be pre charged with nitrogen in both water and refrigerant side circuits; make sure to relieve pressure from all circuits before opening.



LIFTING AND TRANSPORTATION MUST ALWAYS BE DONE ONLY BY EXPERT PERSONNEL

Verify on the catalog the dimensions and weight supplied by manufacturer before handling, in order to choose a suitable system of lifting.

Steel chain or synthetic fiber slings, appropriate to the load to move, can be used.

Some heat exchanger models are supplied with appropriate points of anchorage in order to make the lift easier.

Handle with care and avoid collisions which could compromise the integrity of the heat exchanger. Before handling, always be sure the paths inside the building are suitable to the dimensions of the pressure equipment.



ATTENTION: DO NOT MOVE THE HEAT EXCHANGER WHEN IT IS UNDER PRESSURE

STORAGE

The heat exchanger must be stored preferably indoors and prevented from atmospheric conditions.

In case of outdoor storage, sunlight and cooling during the night may cause the formation of moisture inside the heat exchanger and/or inside the plastic wrapping.

PROVIDES heat exchangers are, at any rate, purged with nitrogen and upon request, supplied with silica-gel bags. All openings are protected with plastic caps. If stored for more than 60 days, make sure all openings are plugged and that nitrogen is present in both circuits (water and refrigerant).

6.1 Rust prevention

PROVIDES heat exchangers' external surface is protected by a rustproof primer and by a final color coat. On request it is possible to supply adhesive insulation that covers the whole surface of the evaporator.

INSTALLATION



THE USE OF THE PRESSURE EQUIPMENT SHOULD BE RESTRICTED TO PROPERLY INSTRUCTED PERSONNEL

Verify the integrity of the pressure equipment after unpacking. Do not use in case of doubt and contact Provides US, Inc.

CAUTION: be sure to discharge any nitrogen pressure from both sides before removing plugs.

Installation must allow for the normal operations of maintenance and cleaning.

The place of installation must be supplied with fire extinguishing systems and safety accessories in order to prevent any overpressure risks.

In case of outdoor installation protect the pressure equipment from accidental impacts.

The heat exchanger must be installed in horizontal position or in any case must rest on supports provided: any slopes may cause changes in the performance of the heat exchanger.

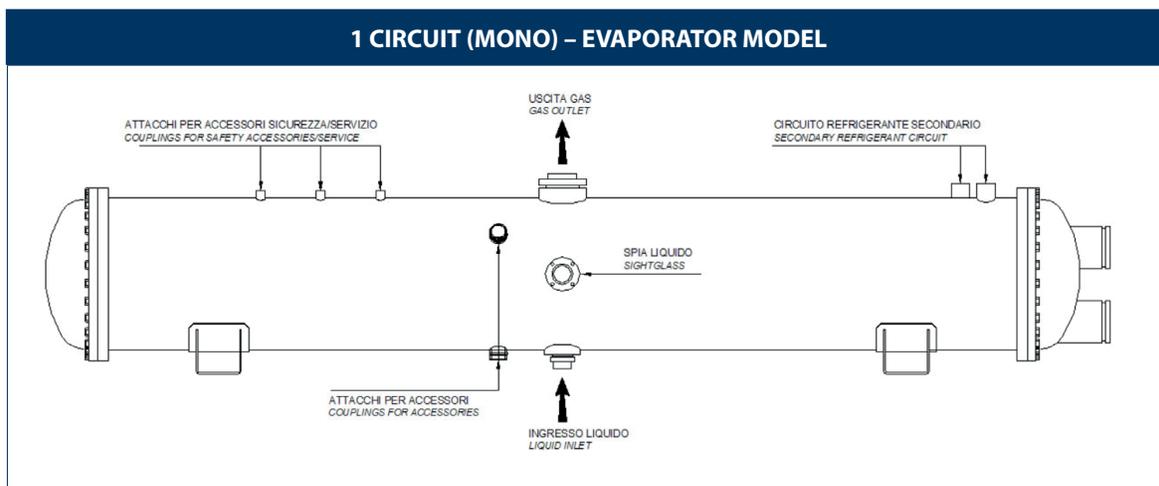
7.1 Flooded EV connections

The correct installation of refrigerant and water connections is described in the following figures.

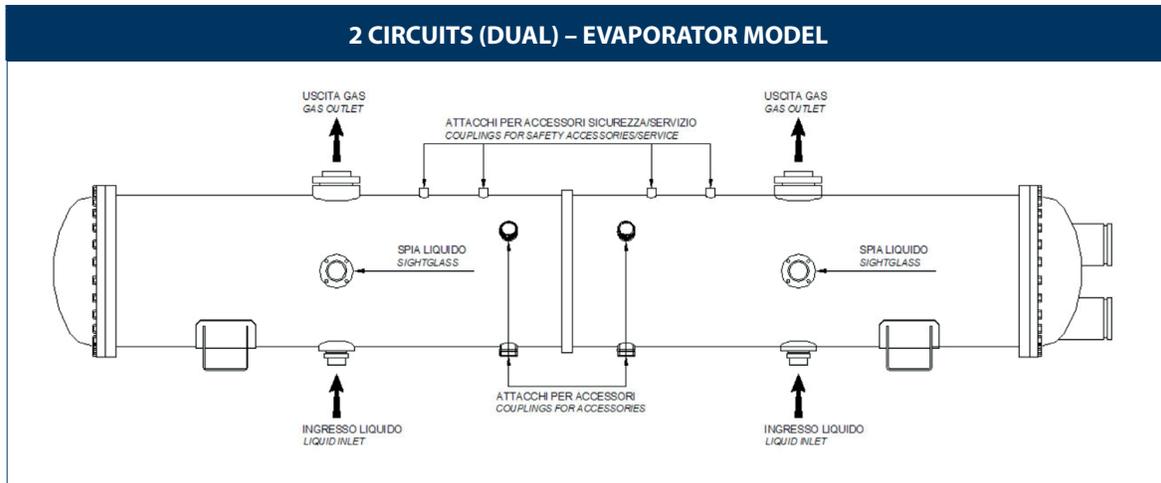
7.1.1 Refrigerant side

PROVIDES Flooded EV can have 1 to "n" refrigerant circuits.

The standard layout of 1 circuit flooded consists in one gas outlet on the top of the shell, one liquid inlet on the bottom of the shell and a series of welded fittings for safety and service accessories.



The standard layout of “n” circuits flooded evaporator consists in “n” refrigerant chambers, each provided with a series of welded fittings for safety and service accessories.



The connections can be positioned according to client request and constructive feasibility. Refrigerant connections may be different, depending on the model of flooded and will be mounted with bolted flanges. Before installation always remove plastic caps and silica-gel bags from openings.

7.1.2 Water side

Water side connections are exclusively located onto the headers.

Water side connections are available on flooded vessel heads, and can have a variable number of steps. The type of connection on the water side can be considered from cast iron shells or from carbon steel headers. The water connections can be threaded, Victaulic (flexible connection) or flanged connection.

Spare kits of flexible joint type (Victaulic®) not assembled on the evaporator may be supplied on request.

Victaulic® kits (see appendix fig. 14.2)

Victaulic® kits consist of 2 coupling connections supplied with EPDM gaskets on the inside and 2 connection pipes.

- loosen the coupling connection and extract the gasket.
- fit the gasket between the screwed water connection of the flooded vessel and the pipe, only after you have verified the cleanliness of surfaces (it is useful to wet the gasket with water or lubricant, unless it is incompatible with the gasket material).
- tighten the coupling after you have verified the correct position of the gasket in order to avoid leakage or break-ups.

Flange Kits

Flange kits are provided with coupling flanges, gaskets, screws and nuts.

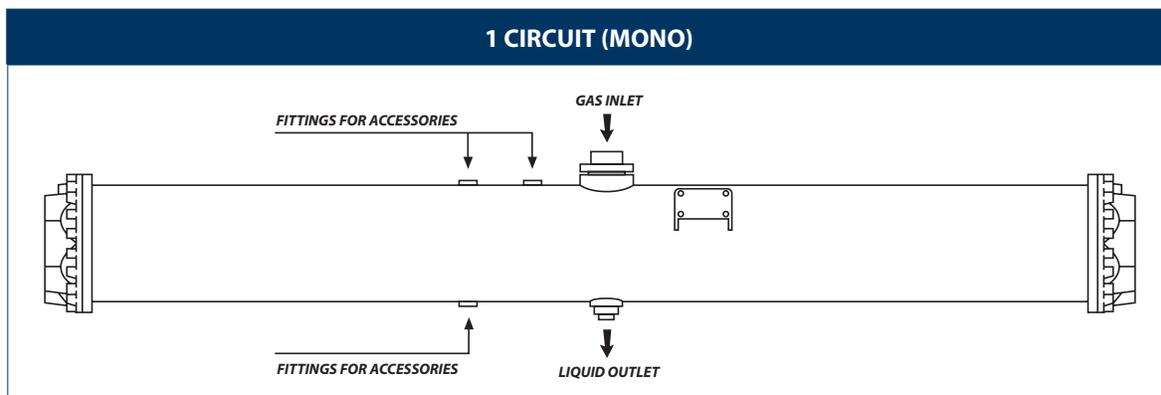
7.2 Condenser connections

The correct installation of refrigerant and water connections is described in the following figures.

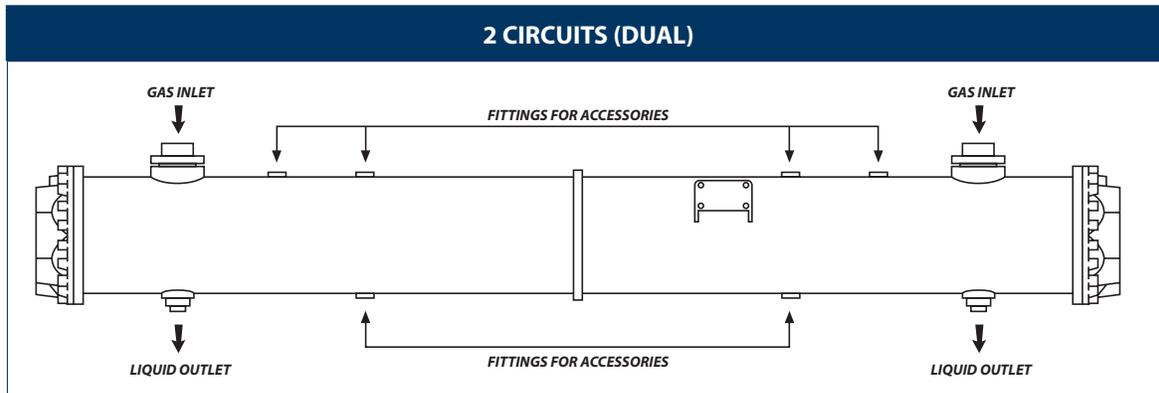
7.2.1 Refrigerant side

PROVIDES condensers can have 1 or “n” refrigerant circuits.

The standard layout of 1 circuit condensers consists in one gas inlet on the top of the shell, one liquid outlet on the bottom of the shell and a series of welded fittings to be used for safety accessories, pressure gauges and cocks.



The standard layout of “n” circuits condensers consists in “n” independent refrigerant side circuits, each equipped with refrigerant inlets and outlets and a series of welded connections.



Refrigerant connections may be placed in different positions (longitudinally) depending on the Client request and may be different depending on the model of condenser: - they will be mounted with bolted flanges.

Before installation always remove plastic caps and silica-gel bags from openings.

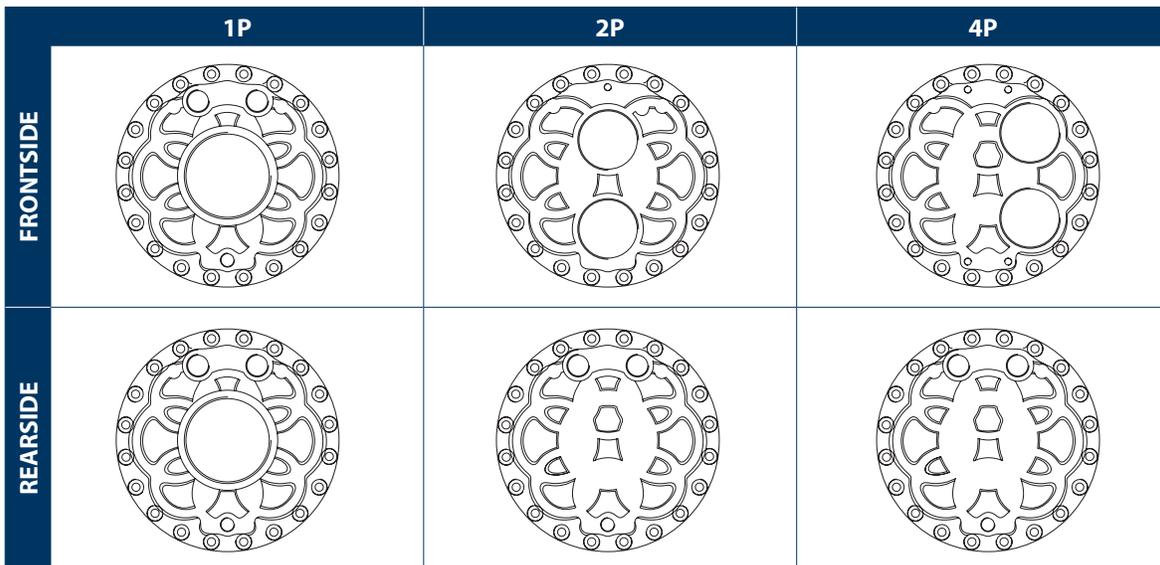
7.2.2 Water Side

Water side of condensers can vary from 1 up to 4 passes, on tube bundle condensers, while “n” circuits in the case of compact condensers. The headers can be in cast or iron or carbon steel.

On 1 Pass models the inlet connection is placed on one header and the outlet is on the opposite header. The water inlet is located on the opposite side compared to refrigerant inlet (that is on the same side as the refrigerant outlet).

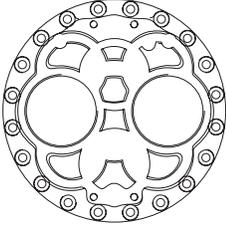
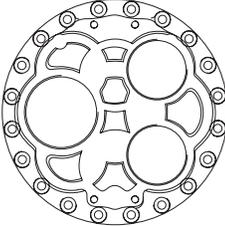
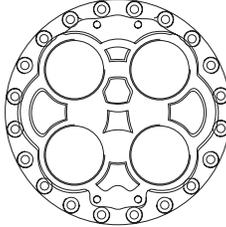
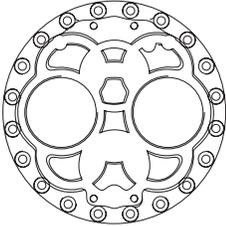
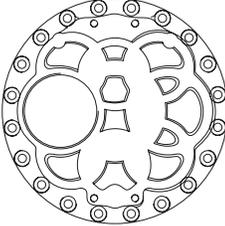
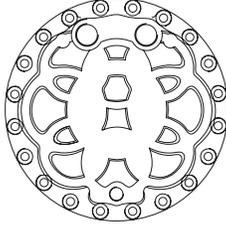
On 2 and 4 Passes models, inlet and outlet connections are both on the same header with the inlet placed in the lower side.

The following is the layout of the water connections.



On models with both condensing and heat recovery circuits, (1 Pass + 2 Passes) the inlet connection of the heat recovery circuit is on the same side of the inlet connection of the condensing circuit (the last one is placed in the lower side of the header), while the outlet connection of the heat recovery circuit is placed on the opposite header of the condenser.

On models with both condensing and heat recovery circuits, (2 Passes + 2 Passes), inlet connections of both circuits are on the same lower side; outlet connections are on the opposite header in the upper side.

	1P + 1P	1P + 2P	2P + 2P
FRONTSIDE			
REAR SIDE			

Standard water connections consist in threaded nozzles screwed in the headers and formed in order to fit Victaulic® joint.

Spare kit of flexible joint type (Victaulic®) not assembled on the condensers may be supplied on request.

On request it is possible to supply flanged type of connections.

Victaulic® kits (see appendix fig. 14.2)

Victaulic® kits consist of 2 coupling connections supplied with EPDM gaskets on the inside and 2 connection pipes.

For the installation of the kit follow the steps below:

- loosen the coupling connection and extract the gasket.
- fit the gasket between the screwed water connection of the condenser and the connection pipe, only after you have verified the cleanliness of surfaces (it is useful to wet the gasket with water or lubricant, unless it is incompatible with the gasket material); make sure the joint between the two pipes lies at the centre of the gasket.
- tighten the coupling after you have verified the correct position of the gasket in order to avoid leakage.

Flange kit

Flange kits are provided with coupling flanges, gaskets, screws and nuts.

7.3 Protect from vibrations

We recommend to avoid the transmission of vibrations that may cause damage to the flooded vessel through anti-vibrating systems.

7.4 Insulation

On request it is possible to supply an external adhesive insulation for the flooded vessel. Normal maintenance and inspection operations are permitted.

7.5 Heating protection

Permanent joints of connection, obtained by welding or brazing must be made with adequate heat protection systems; excessive exposure could damage the heat exchanger.

7.6 Static electricity

Adequate precautions must be taken in order to avoid the accumulation of static electricity (according to current local legislation).

All metallic parts of the equipment should be grounded.

7.7 Warnings

- Do not expose the heat exchanger to localized loadings due to supports (different from the mounting lugs), stiffening and connection pipes.
- Do not expose the heat exchanger to dynamic and/or localized loads; dynamic overpressures and water head could damage it.
- Do not expose the heat exchanger to bending stress.
- Always install a filter directly before the water inlet connection of the heat exchanger. In order to guarantee an acceptable water limit, we suggest the use of an N25 mesh filter (french numerical), mesh diameter 0.87 mm.
- Prevent freezing inside the heat exchanger using suitable safety systems (e.g. flow switch, pressure switch, heating resistance, etc.).
- Do not install any kind of internal variable by-pass (e.g. flow deflectors, filters, etc.) inside the pressure equipment.
- Always maintain a higher pressure in the outlet water side in order to avoid the entrance of air in water circuit.
- Always install devices for the regulation of water flow rate in the outlet of the heat exchanger.
- Always remove all air from the water circuits before operation.
- Every time the evaporator is emptied of water or glycol solution (inspection, storage, commissioning and maintenance), it must be dried, purged and filled with nitrogen at 1 bar and closed - otherwise corrosion may occur.
- Install a safety thermostat before the heat exchanger water side for a max temperature not greater than the heat exchanger label indicates.
- Each circuit must be equipped with adequate safety accessories to be considered as a separate chamber with its attached category.

SET-UP

Test all connections for leakage.

Completely purge the air from the heat exchanger during the water filling through the proper purge connections placed on the headers.

The presence of air inside may cause damages to the heat exchanger during the operation.

Before use, analyse the water and/or the antifreeze fluids and verify their compatibility with the materials of the flooded vessel, in order to avoid damage and malfunction due to corrosion or formation of deposits.

Always verify the presence and the correct operation of safety accessories and fire extinguishing systems.

Make reference to current local legislation that regulates the requirements at the start-up and periodical checks of plants and pressure equipments. Please contact your Notified Body in order to draft a report with positive result for the start-up.

START-UP AND UTILIZATION

In the case of SILICONE FREE units, PROVIDES declares that to the best of it's knowledge and based on previous findings and information available from it's suppliers at the time of the request, that the heat exchanger does not intentionally contain silicone, although there might be traces due to impurities in the raw materials.



**THE USE OF PRESSURE EQUIPMENT IS FORBIDDEN BY UNAUTHORIZED/
UNINSTRUCTED PERSONNEL**

For a correct use:



**DO NOT EXCEED THE MAXIMUM ALLOWABLE PRESSURE AND TEMPERATURE
INDICATED ON THE NAMEPLATE**



DO NOT EXCEED THE MAXIMUM FLOW RATE

- Do not expose the heat exchanger to any kind of excessive vibration;
- Avoid foreign particles entering in to the pressure equipment;
- Avoid the cavitation of the pump and the presence of gas in the hydraulic circuit;
- Do not expose the heat exchanger to pressure and temperature fluctuations;
- Do not expose the pressure equipment to constant or variable loads;
- Use only water and/or brine solutions compatible with the materials of the heat exchanger;
- Avoid the outlet of water from the flooded vessel at the room pressure.
- Maintain the water velocity within recommended limits. Excessive water velocity could cause erosion and damage to the heat exchanger.

MAINTENANCE AND CONTROLS BY THE USER



DO NOT REMOVE REFRIGERANT FROM PRIMARY CIRCUIT WITHOUT HAVING A FLOW IN THE SECONDARY CIRCUIT - IF THIS IS NOT POSSIBLE MAKE SURE THAT THE SECONDARY CIRCUIT IS COMPLETELY EMPTY TO AVOID FREEZING.



DO NOT OPEN THE HEAT EXCHANGER UNDER PRESSURE

Use, when necessary, inhibited brine antifreeze solutions and verify them periodically, avoiding their contact with air. Always verify the toxicity/danger of antifreeze solutions before handling. Water-glycol mixture with the passing of time decays and gives rise to acid products that can start corrosion processes. The degradation of products in the water-glycol mixture may allow biological proliferation also and thus bacteria formation can give rise to corrosion. For these reason glycol has to be used with suitable corrosion inhibitors. These have a life span of 1-2 years so it is important to periodically verify the percentage in the water-glycol mixture. Attention: glycol and inhibitors may be insufficient due to “top ups” of water in the circuit, then it is important to integrat the right glycol and inhibitors percentage. The parameters to be checked regularly are the antifreeze concentration and the pH of water-glycol mixture.

10.1 Water quality

Water quality, as regards chemical composition (salinity, pH), is very important for the performance and the life of the heat exchanger.

Excessive of hardness of water may cause the formation of a layer of deposits on the internal surface of the tubes that may reduce the performances and the life of the internal parts of the heat exchanger.

Below are some of the main factors that influence the water quality:

Salinity: an increase of salinity causes an increase of electric conductivity and therefore a higher risk of galvanic corrosion. Be advised that, if you use sea water, salinity's values change depending on the sea.

pH: pH is normal on values around alkalinity (6.8 – 8.4). For a correct work such values have to be maintained.

Dissolved oxygen: an increase of the dissolved oxygen content in water may cause an increase of corrosion.

Bio-fouling: it includes microbiological fouling. Bio-fouling can create anaerobic conditions and make the attack of sulphate-reducing bacteria possible as well as aeration conditions with the consequence of localized corrosion.

Suspended solids: may form deposits which decrease performances and may cause corrosion and/or erosion.

For marine heat exchangers, it is necessary to equip the plant with special anodes which must be checked or replaced regularly.

To determinate the water quality, refer to the following table.

The above mentioned list indicates only some parameters that principally determine the quality of water. The elements briefly described can be present together and lead to more serious effects.

For all these reasons we recommend to:

- Always install a filter in the water inlet circuit, in order to reduce the entry of solid particles;
- Drain totally the vessel before doing any maintenance operations;
- Do not clean the flooded with non-suitable mechanical systems, e.g. drills or too high pressure jets;
- Do not clean with too aggressive chemical detergents and verify their compatibility with the materials of construction before handling.



FOR HEAT EXCHANGERS WITH ANODES AND ANTI-CORROSION TREATMENT: IF AT THE FIRST INSPECTION THERE IS AN EXCESSIVE CONSUMPTION OF THE ANODES, IT MEANS THAT THE ENVIRONMENT IS HIGHLY AGGRESSIVE SO IT IS NECESSARY TO FORMULATE A "MAINTENANCE TIMETABLE" ACCORDING TO THE AGGRESSIVENESS OF THE WATER (IT IS NOT POSSIBLE TO SUPPLY A "STANDARD" MAINTENANCE SCHEDULE SINCE THE ANODE CONSUMPTION IS SUBJECT TO MANY FACTORS).



FILL COMPLETELY WITH WATER OR DRAIN TOTALLY THE VESSEL IN CASE OF LONG NON-WORKING PERIODS.

ACCEPTABLE WATER QUALITY LIMITS

pH (25°C)	6.8 – 8.4
Electrical conductivity ($\mu\text{S}/\text{cm}$) (25°C)	< 800
Chloride ion (mg Cl ⁻ /l)	< 150
Chlorine molecular (mg Cl ₂ /l)	< 5
Sulphate ion (mg SO ₄ ⁻² /l)	< 100
Sodium nitrate (mg NaNO ₃ /l)	< 100
Alkalinity (mg CaCO ₃ /l)	< 100
Total Hardness (mg CaCO ₃ /l)	< 200
Iron (mg Fe/l)	< 1.0
Copper (mg Cu/l)	< 1.0
Sulphide ion (S ⁻² /l)	none
Ammonium ion (mg NH ₄ ⁺ /l)	< 1.0
Silica (mg SiO ₂ /l)	50
Maximum particle size to pass (filtration limit) through heat exchanger (mm)	0.87
Total dissolved solids (mg/l)	< 1500
Max Ethylene, Propylene glycol	50%

RECOMMENDATION FOR THE SUSTAINABILITY OF COPPER AND CuNi TUBES WITHIN WATER CONTENT SUBSTANCES			
	CONCENTRATION [-] o [mg/l]	COPPER	CuNi
pH-Value	< 6	0	+
	6 - 8	+	+
	> 8	+	+
Chloride (Cl-)	< 10	+	+
	10 - 100	+	+
	100 - 1000	+	+
	> 1000	0	+
Sulphate	< 50	+	+
	50 - 200	0	+
	> 200	-	+
Nitrates	< 100	+	+
Free & aggressive Carbonic Acid	< 5	+	+
	5 - 20	0	+
	> 20	-	0
Oxygen	< 1	+	+
	1 - 8	+	+
	> 8	0	+
Ammonium	< 2	+	+
	2 - 20	0	0
	> 20	-	-
Ferric und Manganese	> 1	0	+
Sulfides		-	-
Free Chlorine	< 5	+	+
deposable Substances		0	0

10.2 Header assembly and gasket replacement

Proceed as follow in order to disassemble the header:

- Remove pipeline;
- Always be sure to totally drain the water before removing the header;
- Remove insulation from the front side of the heat exchanger (if present);
- Replace A and B screws with 2 centering pins (fig. 10.2.1);
- Remove all the other screws;
- Remove the header C;
- Remove the anti-extrusion ring D (if present) and the rubber gasket E;
- Remove the flanged ring F (if present);
- Remove the anti-extrusion ring L (if present) and the rubber gasket G;(last two points only applicable for copper tubes maintenance).

If it is a heat exchanger with anti corrosive treatment, check that there is no wear, chipping or cracks, ect on the treatment itself.

- Proceed as follow in order to assembly the header:
- Handle with care and avoid collisions that may damage the header;
- Always be sure you have a new spare rubber gasket and o-ring;
- Carefully clean gasket seatings with a solvent in order to remove any adhesive scraps;
- Apply a thin and even coat of adhesive (Bostik) on the seating of the rubber gasket;
- Place the anti-extrusion ring D and the new rubber gasket E in their seatings;
- Place the header C using the centering pins;
- Insert the screws without tighten;
- Replace the 2 centering pins with the A and B screws;
- Tighten the screws following the tightening sequence as shown in fig.10.2.2 and with the appropriate torque shown in the table beside.

If it is a heat exchanger with anticorrosive treatment, be sure to handle with care to prevent the treatment from chipping or being damaged. In such a case, the treatment must be re-applied to the damaged part.

FIG. 10.2.1

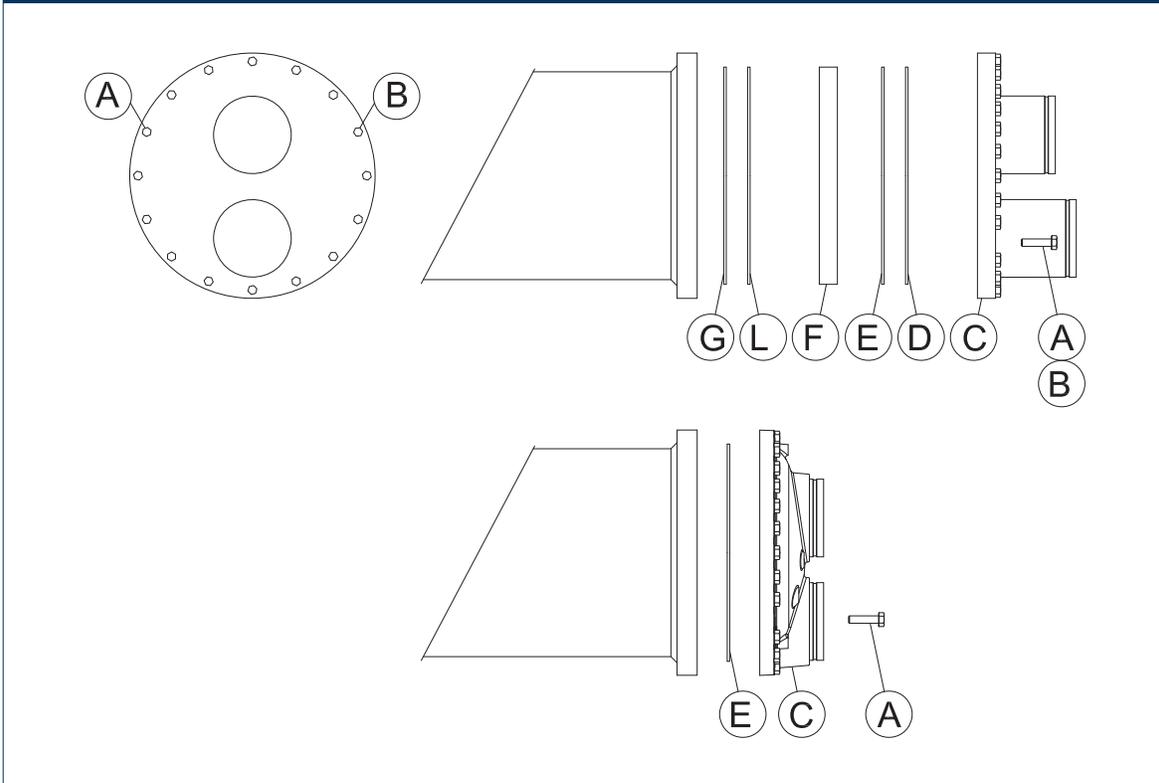
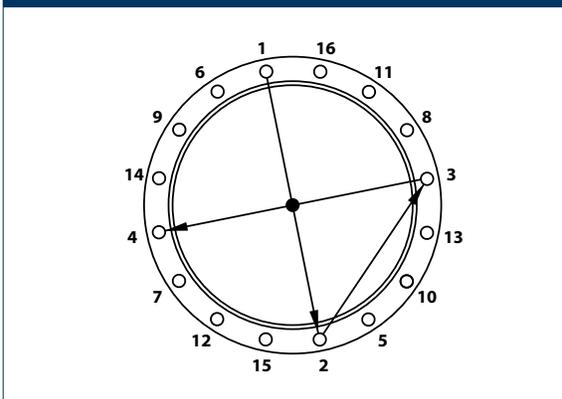


FIG. 10.2.2



TORQUE FOR BOLTS

TORQUE FOR BOLTS	
M8	20 □m □14. □ft. lbf.
M10	35 Nm / 25.8 ft. lbf.
M12	80 Nm □59 ft. lbf.
M14	140 □m □103.3 ft. lbf.
M16	180 □m □132.8 ft. lbf.
M20	200 □m □147.5 ft. lbf.

10.3 Summary of periodical checks

The following is a list of recommended maintenance and inspections and their frequency.

FLOODED	FREQUENCY	
	PERIODICAL	IF NECESSARY
Check the effective working conditions in compliance with Producer indications and/or start-up declaration)	Every 3 years	
Check the functioning of safety accessories	Every 3 years	
Check the functioning of measurement instruments	Every 3 years	
External viewing inspection for corrosion, erosion, contamination and damage	Every 3 years	
Check the tightening of screws	Every 3 years	
Inspection of thickness (where applicable) (see tabs. for minimum thicknesses)	Every 10 years	
Pneumatic test pressure (1.1 x PS) with clean air or inert gas (min. 2h)	Every 10 years	
Condensing temperature measurement		X
Subcooling measurement		X
Water inlet/outlet temperature measurement		X
Water pH measurement		X
Inspection of pump		X
Cleaning		X



THE RESPONSIBILITY FOR THE FREQUENCY OF CHECKS IS THE RESPONSIBILITY OF THE USER. THE FREQUENCY MAY VARY DEPENDING ON THE TYPE OF PLANT AND THE REGULATIONS ON THE CONTROLS OF THE PRESSURE VESSELS IN FORCE IN THE COUNTRY OF USE.

SAFETY



ALWAYS INSTALL SAFETY ACCESSORIES IN CONFORMITY WITH THE ESSENTIAL REQUIREMENTS OF THE NATIONAL STANDARD OF THE COUNTRY WHERE THE EQUIPMENT IS INSTALLED; AN EXTERNAL FIRE MAY PRODUCE AN EXCESS OF HEAT WHICH MAY CAUSE THE PRESSURE EQUIPMENT TO EXCEED ITS LIMITS



DO NOT EXPOSE THE PRESSURE EQUIPMENT TO ANY IMPACT THAT MAY CAUSE DAMAGE DURING OPERATION



DO NOT WELD ANYTHING ON THE BODY OF THE PRESSURE EQUIPMENT



DO NOT USE THE PRESSURE EQUIPMENT FOR OPERATION DIFFERENT FROM WHAT IS PRESCRIBED



IN CASE OF LEAKAGE, IMMEDIATELY STOP THE OPERATION OF THE EQUIPMENT

DISPOSAL



This pressure equipment contains recyclable materials (carbon steel, copper, plastics, etc.).

At the end of its useful lifetime get information about the laws in force in your country regarding recycling.

PROVIDES pressure equipment is supplied with recyclable packaging.

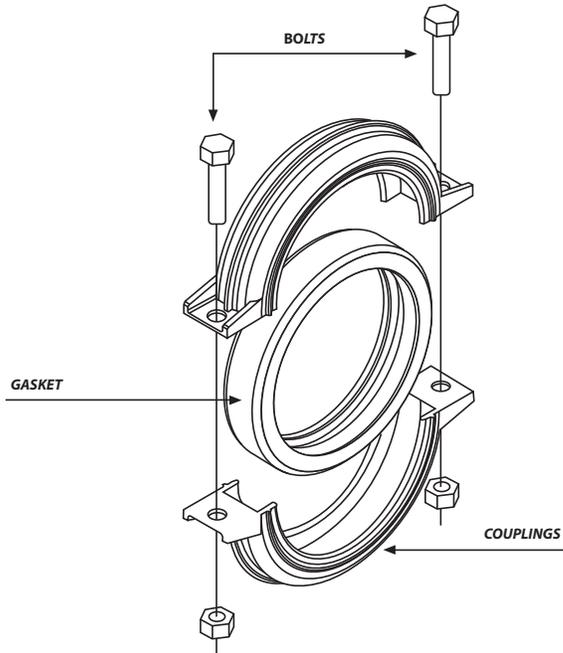
WARRANTY

- A.** Provides US, Inc. warrants that the Products shall be free from defects in materials and manufacture for a period not more than 18 months from the date of delivery or for a period not more than 12 months from the date of start-up, whichever comes first.
- B.** Provides US, Inc. therefore warrants the correct design and operation and the declared duties of each pressure equipment supplied.
- C.** Any eventual anomalies in materials and/or defects in manufacture found during the period of warranty, will engage Provides US, Inc. to repair or, to its judgment, to replace and to test, in the shortest possible time, those parts that are not suitable for the use for which they are designed.
- D.** In case of partial repairs or complete replacement, the original Product may be returned to Provides US, Inc. who won't be bound to pay compensation for any damages, unless prior agreement in writing by both parties.
- E.** Unless otherwise expressly agreed in writing by the parties, Client shall bear every expense of labor and/or any freight of materials related to the operations of repairing or replacing of the defective Products.
- F.** Provides US, Inc. also warrants that the Products are manufactured in compliance with the United States Laws and Regulations in force on the date of the relevant confirmation order by PROVIDES.
- G.** This warranty shall not apply if the defects of the products are caused by:
- natural wear and tear;
 - installation of the products not in compliance with the technical specifications provided by Provides US, Inc.
 - unsuited use or application;
 - thermal overexposure, even when occasional;
 - electrical or mechanical over-stress;
 - operations of repairing or modifications not authorized or agreed in advance by Provides US, Inc.;
 - failure of respecting the functional and environmental parameters suggested by Provides US, Inc. for the correct use of the products;
 - any other cause due to the Client's negligence.

- H.** This warranty shall also not apply in case of:
- non-compliance of the Products with Laws and/or regulations in force in the place where the products are installed and/or assembled by the Client and/or in the place of their final use, if the Client has not expressly required the conformity of the Products to said laws and Regulations and not duly informed Provides US, Inc. of their content before the date of transmission of the latter's confirmation order;
- I.** In case of non-compliance of the products with United States Laws and/or regulations entered in force after the date of transmission of the confirmation order by Provides US, Inc. the replacement or any possible adjustment under warranty conditions will not be applied. Provides US, Inc. is, at any rate, not responsible for the use of the products which do not conform to United States Laws and/or Regulations entered in force after the date of transmission of their confirmation order by Provides US, Inc.
- J.** The Client shall not sell or market Products not in compliance with the Laws and Regulations mentioned under letter H and I above. In the case of the contrary, the Client shall exclude any liability for Provides US, Inc. for any damage or loss suffered by the latter, due to any third party's and/or authority's claim raised as a consequence of the manufacture by Provides US, Inc. of products not in compliance with the above mentioned Laws and Regulations.
- K.** Without prejudice to the application of local legislation on product liability and liability for gross negligence or wilful misconduct, Provides US, Inc. shall never be liable for direct, indirect or occasional damages which in any manner derive from defective products.

APPENDIX

Fig. 14.2 VICTAULIC® CONNECTION





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