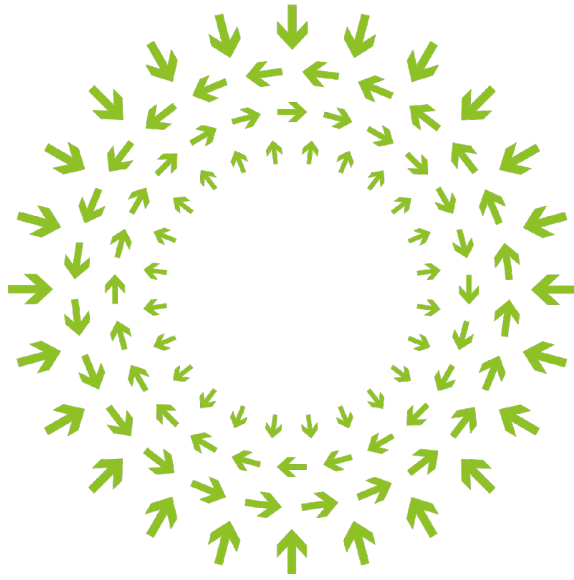




OPEN

Compute Project

Plate Heat Exchangers

Rev 0

Version 1.0

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1.2 Acknowledgements

The Contributors of this Specification would like to acknowledge the following companies for their feedback:

Alfa Laval
Wieland
Kelvion
Danfoss

2. Compliance with OCP Tenets

2.1. Openness

This specification enables the clarification of plate heat exchanger product architecture in terms of both construction and performance. It establishes a minimum baseline suitable for deployment in an OCP facility.

2.2. Efficiency

Efficiency is evaluated based on performance relative to design specifications and total cost of ownership (TCO). It is essential that selected units deliver the expected thermal output while operating efficiently to minimize operational expenditure (OPEX), downtime, and maintenance costs.

2.3. Impact

By introducing global standards, this specification supports the deployment of efficient systems that are compatible with OCP-ready infrastructure.

2.4. Scale

Plate heat exchangers are widely available from numerous suppliers. This specification provides a foundational standard for robust and reliable products that can be sourced globally.

2.5. Sustainability

This specification promotes the standardization of sustainably designed and manufactured plate heat exchangers. It outlines criteria to ensure sustainable system performance and optimized total cost of ownership.

Sustainable performance includes alignment with design specifications, appropriate material selection, and system robustness to ensure long-term suitability.

3. Change Log

Date	Version #	Author	Description
22 nd August 2025	1.0	Gemma Reeves	

4. Overview

The purpose of this specification is to define the standard to which plate heat exchange products must be designed and supplied for use in OCP-ready facilities and systems.

Plate heat exchangers are used to transfer thermal energy between two fluids without allowing them to mix. They are a critical component in managing heat within data center systems and are deployed in both white space and gray space environments.

In the white space, plate heat exchangers are integrated into various systems, including but not limited to cooling distribution units, immersion-cooled systems, direct-to-chip (DTC) systems, and both single-phase and two-phase cooling solutions.

In the gray space, they are commonly found in chillers, as interchangers between cooling towers, dry or adiabatic coolers, and free cooling sources such as river, sea, or borehole water. They also support the associated cooling infrastructure loops within data halls.

In systems designed for heat recovery, plate heat exchangers may serve as components in heat pumps or as separation interfaces between data center circuits and downstream recovery applications such as district heating, algae farming, greenhouses, and swimming pools

Please see below indicative images of copper brazed plate heat exchanger and gasketed plate (plate and frame) heat exchangers.



Copper Brazed Plate Heat Exchangers



Gasketed (Plate and Frame) Heat Exchangers

5. Environmental / Regulatory Requirements

5.1 Pressure vessel code requirements/options

- The complete assembly to be designed and manufactured in accordance with regulatory/pressure vessel code (PED /ASME/UL) requirements as appropriate and furnished with a certification for the stated design pressure for both circuits.
- Standards; PED2014/68/EU and ASME BPVC Section 8 Division 1 or other applicable local regulations specified by the client.
- All heat exchangers shall be tested in accordance with the specific pressure vessel code it has been produced for.

5.2 Quality standards for production.

- ISO9001

5.3 Environmental and Safety Standards

Compliance shall be demonstrated with the following standards in agreement with plate heat exchanger supplier:

- REACH / RoHS
- ISO 14001 (Environmental Management)
- ISO 45001 (Occupational Health and Safety)
- ISO 14025 (Environmental Labels and Declarations)
- ISO 14040/14044 (Life Cycle Assessment)
- ISO 14067 (Carbon Footprint of Products)
- ISO 50001 (Energy Management Systems)
- Environmental Product Declaration:
All heat exchangers shall be accompanied by an Environmental Product Declaration (EPD) in accordance with ISO 14021 in agreement with PHE supplier.

6. Plate heat exchangers

6.1 General

Applicable for all plate heat exchangers.

- Thermal lab testing is optional and may be conducted upon customer request or in accordance with AHRI qualification/certification.
- Minimum acceptable documentation requirements:
 - Declaration of conformity
 - Pressure test certificate
 - Instruction manual in the regional language
 - Supplier must be able to provide 2D and 3D drawings upon request
 - As a minimum, drawings must show the following critical dimensions: port-to-port center distance, overall unit height, and plate pack depth

- Heat exchangers shall incorporate channel plate designs under full design authority of the manufacturer. Plate production should be conducted under direct control to ensure alignment with established quality and performance standards. Where manufacturing is subcontracted, equivalent quality assurance processes must be demonstrably applied.
- Tau values should be selected based on the application. A suggested target value is 25 N/m² (Pa). Higher Tau values generate more turbulence and are recommended for fouling-prone duties (e.g., open cooling towers, seawater). Lower Tau values may be suitable for clean duties (e.g., DTC/CDU systems).
- All channel plates shall be pressed in one continuous pressing operation to ensure uniform thickness and eliminate weak spots. This process must maintain plate thickness within acceptable limits to enhance the plate pack's ability to withstand pressure shocks, vibrations, plate fatigue, high operating pressures, and high differential pressures.
- Records corresponding to serial numbers of the heat exchanger unit must be maintained by the supplier for a minimum retention period as per regulatory or contractual obligations.

6.2 Mandatory Product Label Information:

Each product shall include the following information on its label:

- a) **Supplier Information;** The legal name of the supplier or manufacturer.
- b) **Model;** The specific model identifier or number assigned to the product.
- c) **Make;** The brand or make under which the product is marketed.
- d) **Build/Final test Date;** The manufacturing year/pressure test year of the product in a clear and traceable format
- e) **Serial Number;** A unique identifier (serial number) for the specific product, allowing it to be tracked individually.
- f) **Place of Manufacturing;** Place of manufacture of the product should be marked on product documentation.
- g) **Minimum and Maximum Operating Temperature;** The minimum and maximum temperature (in °C or °F) at which the product can safely operate.
- h) **Design Pressure;** The maximum pressure (in bar, psi, or other appropriate units) that the product is designed to withstand during operation.
- i) **Volume;** The internal volume of the product, where applicable, stated in appropriate units (e.g., liters, cubic meters).
- j) **Connector identification:** The location of hot and cold streams needs to be identified with legible graphics.

6.2.1 Label Placement and Durability

- The label must be securely affixed to the product in a location that is clearly visible and accessible during normal use or inspection.
- The label must be durable and resistant to environmental factors such as heat, moisture, abrasion, and chemical exposure, ensuring legibility throughout the product's lifecycle.

6.2.2 Label Format

- All information must be presented in a clear, legible format using standardized fonts and symbols where applicable.

- Barcodes or QR codes may be included to facilitate digital traceability systems, provided they link to the required product information.

7. Gasketed Plate Heat Exchangers

7.1 General

- **For plate heat exchangers that include gaskets**, the test pressure must be clearly specified. This represents the maximum pressure applied during testing to verify the integrity of the unit. The specified value (in bar, psi, or other appropriate units) must comply with relevant standards and the product's design specifications.
- **Pressure testing requirements** for gasketed plate heat exchangers:
 - For units with connections up to and including DN100 mm (4"): 10 minutes at test pressure
 - For units with connections larger than DN100 mm (4"): 10 minutes at test pressure plus 20 minutes at working pressure
 - Both sides shall be subjected to an unbalanced pressure test
- **Service support**: The manufacturer shall confirm the availability of a service engineer to attend to faults at the project site.
- **Spare parts**: The supplier shall confirm the ability to provide all essential spare parts for the proposed plate heat exchanger. Spare parts must be available for a minimum of 10 years from the date of supply.
- **Technical datasheet**: The datasheet shall include the surface area, plate thickness, thermal conductivity of fluids, and total number of plates.
- **Tightening measure**: The tightening dimension of the channel plate pack must be clearly specified and included in the technical submittal. This ensures proper installation and sealing performance. The dimension shall be determined based on plate pressing depth, number of channel plates, and channel-plate thickness, and should include any specific instructions or tolerances.
- **Frame design**: The plate heat exchanger frame shall allow for the removal and replacement of individual channel plates without requiring the removal of adjacent channel plates.

7.2 Design Standards

- The plate heat exchangers shall be AHRI-certified in accordance with the AHRI Liquid to Liquid Heat Exchangers Certification Program. The PHE specifications as selected for Water/ Water/Prop Gly/Eth Gly and sea water applications., shall be verified and registered by AHRI before purchase" <http://www.ahrinet.org>
- Maximum allowable connection velocity (velocity of flow/process media inside the nozzle connection); 6.5m/s

7.3 Frame Specification

To ensure reliable operation/serviceability/onsite safety.

- **The frame plates shall be equipped** with flange stud bolts or threaded pipes assembled around the connections.
- **External threaded pipe connections shall not be welded** onto the frame plates.

- **The frame, pressure plates, tightening bolts/nuts, and pipe connections** shall be marked with a charge number for full traceability.
- **Plate and frame units shall be designed** to allow removal of individual plates or cassettes without requiring the removal of adjacent plates.
- **The frame assembly shall be fully bolted**; welded frame assemblies are not permitted. This allows for field assembly if required.
- **The unit frame and pressure plates shall be of sufficient thickness** to meet design pressure and applicable code requirements and shall not include welded reinforcements or stiffeners.
- **Carbon steel components**, including the frame and pressure plate, shall be coated with a two-part aliphatic acrylic polyurethane or two-part epoxy paint.
- **Tightening bolts shall not require special tools** and shall be arranged to permit plate pack tightening from the fixed plate side only.

Specific requirements for units with DN150 mm (6”) connections and above:

- Main tightening bolts shall be fitted with bearing boxes to facilitate smooth and efficient opening and closing of the heat exchanger
- The Pressure plate shall be supported by rollers sliding along the carrying bar to enable easy and controlled movement during opening and closing operations.
- Tightening bolts shall be designed with fixed bolt heads to ensure secure and stable operation during tightening and loosening.
- The heat exchanger unit shall be provided with integrated lifting lugs or an equivalent design that allows for the safe attachment of lifting equipment, enabling the entire unit to be lifted as a single assembly.

7.4 Channel plate Specification

To ensure no contamination of facilities and white space

- **Plate material in contact with fluids** on both the hot and cold sides shall be Alloy 316/316L, Alloy 304/304L, or Titanium. The material selection shall be based on the specific process fluids used within the heat exchanger. Refer to Appendix A for-material suitability graphs based on chloride levels.
- **Self-aligning plates shall be provided** to ensure accurate positioning within the frame assembly, prevent lateral movement, and maintain proper gasket contact.
- **All plates shall be marked** with a charge number for full traceability.
- **Fluid inlet and outlet connections** shall be positioned in parallel on the frame plate, not diagonally, to facilitate ease of installation.

7.5 Gasket Specification

Requirements to ensure reliable operation/serviceability.

- **Each channel plate shall be fitted with one - piece moulded gaskets.**
- **Gaskets shall include relieving grooves** to prevent intermixing of fluids and to direct any leakage to the outside of the unit.
- **Gaskets shall be affixed to the plates** using approved methods that ensure secure, durable, and maintenance-friendly installation. Acceptable fixation methods include, for example, clip-on, snap-fit, or other approved glue-less mechanical retention systems.

Where required by installation or operating conditions, adhesive-bonded (glued) gaskets may also be acceptable.

- **Gasket material shall be Nitrile, EPDM, or FKM**, selected based on compatibility with the process medium, operating pressure, and temperature.
- **All gaskets shall be securely locked into the groove.**
- **Gaskets shall have a suitable cross-sectional design** to ensure reliable sealing performance.
- **All gaskets shall be marked with a material identification code** visible from the outside of the assembled plate heat exchanger.

8. Copper Brazed and Alternative Bonded Material Plate Heat Exchangers

8.1 Pressure Testing Requirements

For both single-phase and two-phase applications shall be pressure tested according to the specified pressure vessel code it has been produced for.

- PED/CE: Test Pressure = $1.43 \times PS$ (service pressure)
- UL: Test Pressure = Design Pressure
- **Single-phase heat exchangers** shall be pressure tested with air or helium.
- **Two-phase heat exchangers** shall be leak tested with helium in accordance with EN 1779:1999. (Reference standards: EN378-2, ASHRAE 147)

8.2 Materials of Construction

8.2.1 Copper Brazed heat exchangers.

- Channel Plate Material; 316L
- Brazing material: Pure copper (minimum 99.9%)
 - UNS C10100 or C10200 or
 - ASTM B170: OFHC copper or
 - EN: CW008A

8.2.2 Nickel Brazed heat exchangers

- Channel plate material; Stainless Steel 316/316L
- Brazing Material; Nickel-based brazing alloys. These alloys may include elements such as chromium, boron, or silicon

8.2.3 100% Stainless Steel heat exchangers

- Channel plate material; Stainless Steel 316/316L
- Units must be 100% stainless steel, bonded without the use of copper or nickel.

8.3 Design Base;

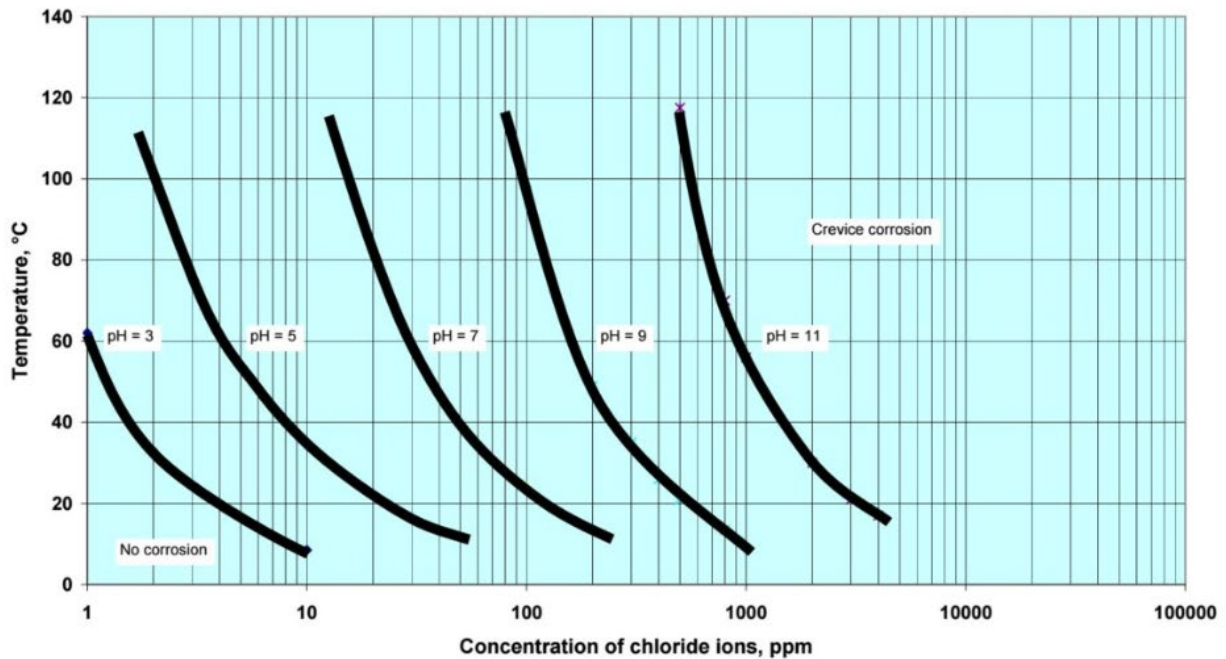
Maximum acceptable connection velocity (velocity of flow media inside the nozzle connection): 5.5 m/s

8.4 Spares;

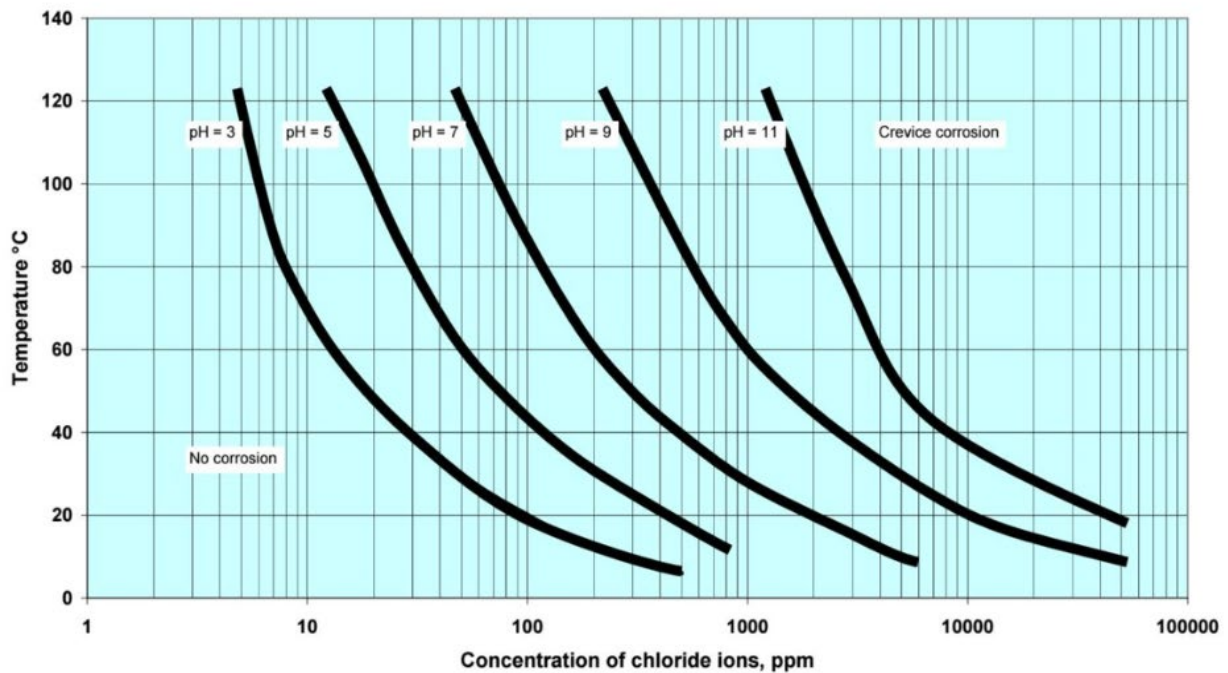
The manufacturer shall make direct replacement products—or functionally equivalent replacement products—available for a minimum of 10 years from the date of supply.

Appendix A - Water Quality Graphs ; Chloride and pH

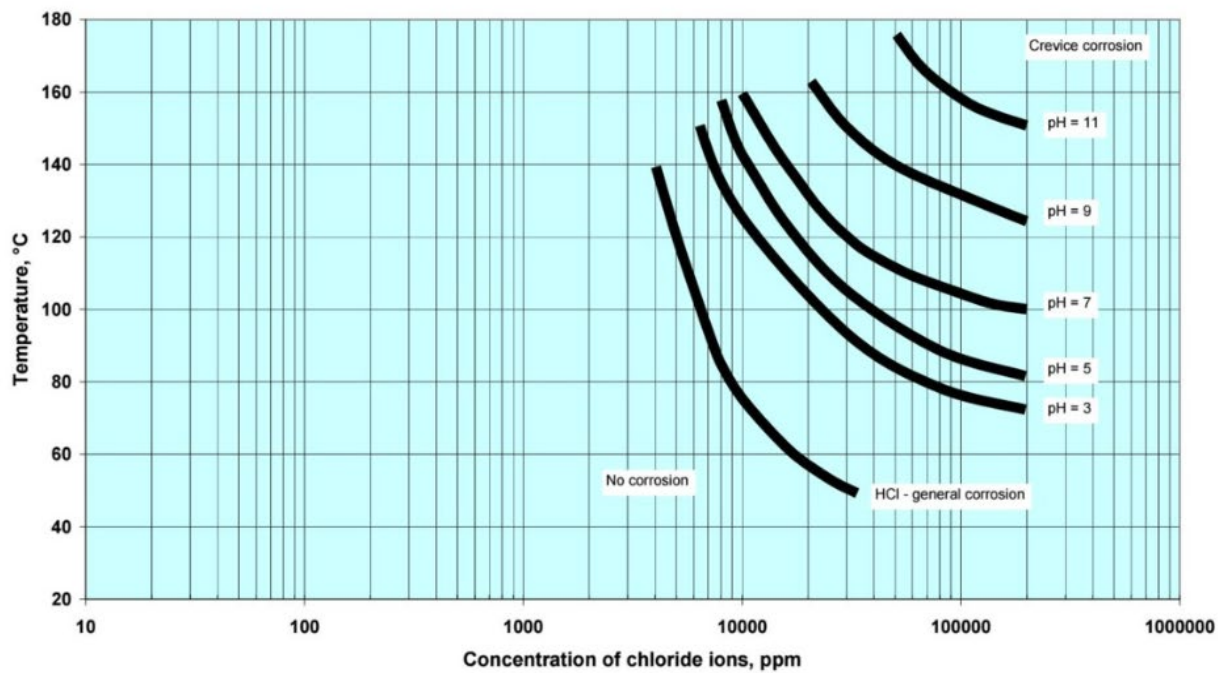
Performance limits (Crevice corrosion) of Alloy 304 in water containing chlorides



Performance limits (Crevice corrosion) of Alloy 316 in water containing chlorides



Performance limits (Crevice corrosion) of Titanium grade 1 (Ti1) in water containing chlorides



*All information is non-binding. The values and illustrations are provided for information only and do not create any legal obligation

Appendix B - Checklist for IC approval of this Specification

Complete all the checklist items in the table with links to the section where it is described in this spec or an external document .

Item	Status	Link to detailed explanation
Has this contribution been presented to an OCP Project group during a project call or engineering workshop?	Yes	If “No”, please state the reason.
Approval by Project Leads	Yes	If “No”, please state the reason.
Is this contribution entered into the OCP Contribution Portal?	Yes	If “No”, please state the reason.
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