

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Heat Exchanger

with type designation(s)
HX200-HX300, HX510-HX520

Issued to

A.S.T.R.A. REFRIGERANTI S.r.l.
Galliate, NO, Italy

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.7 Pressure equipment
DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021

Application :

Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV.

Type	Temperature range:	Design pressure:	Operating media:
HX200-HX300	See page 2	See page 2	See page 2
HX510-HX520	See page 2	See page 2	See page 2

Issued at **Høvik** on **2022-10-17**

This Certificate is valid until **2027-10-16**.

for **DNV**

DNV local station: **Italy/Malta CMC**

Approval Engineer: **Thomas Wilhelm Juell**

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Sinisa Sedlan
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

Two types of shell and tube heat exchanger with fixed tubesheet, designed according to DNV-RU-SHIP Pt.4 Ch.7 and ASME VIII Div.1.

Materials:

Type:	HX200-HX300	HX510-HX520
Shell:	SA-240 316L	SA-312 TP316L
Nozzles:	SA-312 TP316L	SA-312 TP316L
Blind flange nozzle:	SA-105	SA-105
Blind flange end cover:	SA-516 Gr.70	SA-516 Gr.70
Tubesheets:	SA-965 F316L	SA-965 F316L
Heat exchanger tubes:	SA-213 TP316L	SA-213 TP316L
Flanges:	SA-182 F316L according to EN 1092-1	SA-182 F316L according to EN 1092-1

Application/Limitation

	Shell side	Tube side
Design pressure	9 bar(g)	24 bar(g)
Test pressure	13.5 bar(g)	36 bar(g)
Design temperature	-49°C /+149°C	-49°C /+149°C
Joint efficiency	1	1
DNV vessel class	III	I
Medium	Water glycol	He-N2
Corrosion allowance	0 mm	0 mm

Materials and material protection chosen for the specific system shall be suitable for the intended medium and environmental conditions. Surface in contact with the medium shall be protected from corrosion by considering adequate corrosion allowance, and/or by applying suitable coatings. Surface preparation and coating shall be approved by the Society.

Type Approval documentation

Production testing

Each pressure vessel shall be subjected to hydrostatic pressure test upon completion to at least 1.5 times the design pressure in the presence of a DNV Surveyor.

Certification

Materials for pressure retaining parts are to be delivered with material certificates according to DNV-RU-SHIP Pt.4 Ch.7 Sec.1 Table 5 for the shell side and Table 7 for the tube side, and shall meet the requirements of relevant parts of DNV-RU-SHIP Pt.2 Ch.2.

Approval of manufacture is required for NV and W material certificates.

Manufacturer of pressure vessels of class I & II shall be approved in accordance with DNV-CP-0261.

Each pressure vessel shall be certified by a DNV surveyor and to be delivered with a DNV product certificate.

Marking of product

Each heat exchanger shall be permanently and legibly marked on the pressure part or on a nameplate permanently attached to a principal pressure part to show its identity and origin.

The marking of the heat exchanger shall show at least the following particulars:

- manufacturer's name and address
- type designation and serial number
- year of manufacture
- maximum allowable working pressure
- hydrostatic test pressure
- design temperature range.

Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNV-CP-0338.