

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Plate Heat Exchanger**with type designation(s)
NT/NX100X B-6/CD-6, B-10/CD10, B-16/CD-16, B-25

Issued to

Kelvion PHE GmbH
Sarstedt, Germany

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.7 Pressure equipment
Offshore Standard DNV-OS-D101, Marine and Machinery Systems and Equipment**Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Temperature range:** -40°C to +200°C**Design pressure:** See certificate**Operating media:** Sea water, fresh water, glycol, lubricating oils, thermal oils, fuel oils, refrigerantsIssued at **Hamburg** on **2017-03-22**This Certificate is valid until **2022-03-21**.DNV GL local station: **Magdeburg**for **DNV GL**Approval Engineer: **Arthur Ivombo**.....
Harald Pauli
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.



Product description

- Gasketed plate heat exchanger (PHE) with tie bolted frame plates of series type NT/NX100X intended for sea water, fresh water, glycol, fuel oils, lubricating oils, thermal oils, refrigerants.
- Thickness of base plate:
 - 30 mm Nominal pressure (P_n) = 6 bar
 - 40 mm Nominal pressure (P_n) = 10/16 bar
 - 50 mm Nominal pressure (P_n) = 25 bar
- Materials:
 - Base plate: S355J2+N acc. to EN 10025-2
 - Bolts: 8.8 DIN EN ISO 898-1, 42CrMo4 DIN EN 10269
 - Channel plate/HE-plate: Stainless steel or titanium depending on medium
 - Frame/beam/support S235JR acc. to EN 10025-2
 - Gaskets: Viton, NBR(SC), NBR(PC), NBR(LT) and EPDM depending on operating temperature and medium
- Gasket dimensions (short span x long span)
 - 396.0 x 1655 mm Series NT/NX100XSealing by rubber gaskets (elastomer). Gaskets material dependent on medium and operating temperature.

Different PHE types based on corrugation of channel plates: NT New Technology, NX: New Extra Narrow Gap. For further details of the plate heat exchangers (e.g. dimensions) see the documentation as specified below under "Type Approval documentation".

Application/Limitation

Applied Rules and Design Code:

- DNV GL SHIP Pt.4 Ch.7 "Pressure Equipment"
- AD-2000 Merkblatt.

DNV GL Pressure Equipment Classes according to DNV GL SHIP rules Pt.4 Ch.7 Sec.1 Table 2:

Medium	$P_n = 6$ bar	$P_n = 10$ bar	$P_n = 16$ bar	$P_n = 25$ bar
Sea water, fresh water, glycol	Class III	Class III	Class III	Class II
Fuel oils, lubricating oils	$T > 150^\circ\text{C}$: Class I $T \leq 150^\circ\text{C}$: Class II $T \leq 60^\circ\text{C}$: Class III	$T > 150^\circ\text{C}$: Class I $T \leq 150^\circ\text{C}$: Class II	$T > 150^\circ\text{C}$: Class I $T \leq 150^\circ\text{C}$: Class II	Class I
Thermal oils	Class II $T \leq 150^\circ\text{C}$: Class III	Class II	Class II	Class I
Refrigerants Group 1 (*)	Not allowed	Not allowed	Class II (***)	Class II (***)
Refrigerants Group 2 (**)	Not allowed	Not allowed	Class I (***)	Class I (***)

(*) To be within the limits of DNV GL rules ships Pt.4 Ch.6 Section 6 Table 1.

(**) To be within the limits of DNV GL rules ships Pt.4 Ch.6 Section 6 Table 2.

(***) To be within the limits of DNVGL rules ships Pt.4 Ch.6 Section 6 Table 3

Maximum allowable working pressure and temperature values shall not exceed limits listed in the manufacturer's technical data sheet entitled "NT/NX/NH/ND/NW/LWC100X – Technische Daten und Abmessungen", doc. no.: 100-120/150-1/DNV dated 2016-12-02.

Job Id: **262.1-000215-5**
Certificate No: **TAP00000VC**

Gasket materials depending on medium and operation temperature as specified by the manufacturer:

Gasket Material	Medium	Temperature Range
Viton	All specified media	-40°C to +200°C
NBR (Sulphur cured)	All specified media	-30°C to +85°C
NBR (Peroxide cured)	Sea water Fresh water, Glycol Lube oil	-30°C to +85°C -30°C to +140°C -30°C to +100°C
NBR (Low Temperature)	All specified media	-45°C to +110°C
EPDM	Sea water Fresh water, Glycol Not permitted for Hydrocarbons	-40°C to +85°C -40°C to +150°C

The certificate covers the strength of the pressurized parts. The choice of the material for heat exchanger plates and gaskets shall comply with the service conditions of the heat exchanger - i.e. maximum operating temperature and pressure as well as the kind of the operating medium.

Materials for base plates, tightening bolts and nuts are to meet Charpy V-notch energy values of minimum 27 J at 5°C below minimum design temperature, see DNV GL Rules SHIP Pt.2 Ch.2 Sec.3 Subsec.3 "Steel for low temperature service" and Pt.2 Ch.2 Sec.6 Subsec.9 "Bolts and Nuts".

Materials used shall have certificates according to DNV GL Rules SHIP Pt.4 Ch.7 Sec. 2 Table 1. Materials with VL or W certificates have to be supplied from a manufacturer approved by DNV GL for the type and grade of steel being supplied and for the relevant steelmaking and processing route.

Traditional stainless steels, e.g. SUS304, SUS316 and SUS316L, cannot be used as material of channel plates in seawater applications.

Each heat exchanger is to be

- Constructional tested and hydraulic pressure tested to minimum 1.5 times design pressure.
- Certified by DNV GL and delivered with a product certificate when required by the DNV GL rules or by the purchaser.

Type Approval documentation

Drawing No.	Drawing Title	Rev.	Date
1.100-120-DNV	Plattenwaermetauscher, NX100X CD Plate type heat exchanger	1	14.11.
1.100-150-1-DNV	Plattenwaermetauscher, NX100X-B Plate type heat exchanger	1	14.11.
1.100-150-2-DNV	Plattenwaermetauscher, NX100X B25 Plate type heat exchanger	1	14.11.
100-120/150-1/DNV	NT/NX/NH/ND/NW/LWC100X – Technische Daten und Abmessungen	1	02.12.2016
1.100-800	Anschlussvarianten NT100 - Connection	4	23.05.2016
	Diverse strength calculation sheets	0	24.11.2016

Marking of product

For traceability to this type approval the products are at least to be marked with:

- a. Name and domicile of the manufacturer
- b. Manufacturer's type designation and serial number
- c. Year of manufacture
- d. Design pressure
- e. Design temperature(s) in °C
- f. Hydraulic test pressure
- g. DNV GL's identifying mark

Periodical assessment

The objective of the periodical assessment is to verify that the conditions for the type approval (TA) have not been altered.

The main scope of the periodical assessment will normally include:

- verification of the TA applicant's production and quality system w.r.t. ensuring continued consistent production of the TA products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products
- review of TA documentation and that this is still used as basis for the production
- review of possible changes in the design, the materials and the performance of the product
- verification of the product marking

For retention of the TA certificate in its validity period the periodical assessments will be carried out bi-yearly.

Unscheduled assessments for retention of the certificate may be carried out when there is reason to believe that the type approval applicant has not adhered to the obligations stipulated in the Type Approval certificate.