

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Heat Exchanger**with type designation(s)
P10, P13, P20 and P28

Issued to

Kelvion Machine Cooling B.V.
Almere, Flevoland, Netherlandsis found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.7 Pressure equipment**Application :****Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.****Temperature range:** -10°C - 120 °C (See page 2)**Design pressure:** See page 2**Operating media:** See page 2Issued at **Høvik** on **2019-03-12**This Certificate is valid until **2021-06-29**.DNV GL local station: **Rotterdam**for **DNV GL**Approval Engineer: **Iselinn Vindstad**

Marianne Spæren Marveng
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

Heat exchangers of the following types: P10 ,P13, P20, and P28.

Materials:

P28		P10, 13, P20		
Component	Material grade	Material standard	Material grade	Material standard
Shell	P235GH	EN 10217-2	P235GH	EN 10217-2
Endpiece	P355NH P355NH	EN 10028-3 EN 10216-3	EN-GJS-400-15/15U P355NH P355NH	EN 1563 EN 10028-3 EN 10216-3
Waterbox	EN-GJS-400-15/15U G-CuSn5Zn5Pb5-C G-CuSn10Zn	EN1563 EN 1982 DIN EN 1982	EN-GJS-400-15/15U* G-CuSn5Zn5Pb5-C CuZn40Pb2 P265GH*	EN1563 EN 1982 EN12165 EN10028-2
Tubesheet	CuZn38AlFeNiPbSn (R390) CuZn35Ni3Mn2AlPb (R440) P265GH X2CrNiMo17-12-2	EN 1653 EN 12165 EN 10028-2 EN 10028-7	CuZn35Ni3Mn2AlPb (R440) P265GH X2CrNiMo17-12-2 CuZn38AlFeNiPbSn (R390)**	EN 12165 EN 10028-2 EN 10028-7 EN 1653
Tubes	CuZn20Al2As (R340) CuNi10Fe1Mn (R290) CuNi30Mn1Fe (R370) X2CrNiMo17-12-2 P235GH	EN 12451 EN 12451 EN 12451 EN 10217-7 EN 10216-2	CuZn20Al2As (R340) CuNi10Fe1Mn (R290) CuNi30Mn1Fe (R370) X2CrNiMo17-12-2 P235GH	EN 12451 EN 12451 EN 12451 EN 10217-7 EN 10216-2

* Not to be used in P10

** Only for P13 and P20

Application/Limitation

The heat exchangers are type approved with the following combinations of pressure and operating media on shell side/tube side:

Shell side				
Model	P10	P13	P20	P28
Design pressure	25 bar	25 bar	25 bar	16 bar
Test pressure	37.5 bar	37.5 bar	37.5 bar	24 bar
Design temperature	-10°C to 120°C	-10°C to 120°C	-10°C to 120°C	-10°C to 120°C
Medium	Lube oil, fresh water, MDO or MGO	Lube oil, fresh water, refrigerants, MDO or MGO	Lube oil, fresh water, refrigerants, MDO or MGO	Lube oil, fresh water, MDO or MGO
Tube side				
Model	P10	P13	P20	P28
Design pressure	10 bar	Option 1: 10 bar Option 2: 25 bar	Option 1: 10 bar Option 2: 25 bar	10 bar
Test pressure	15 bar	Option 1: 15 bar Option 2: 37.5 bar	Option 1: 15 bar Option 2: 37.5 bar	15 bar
Design temperature	-10°C to 120°C	Option 1: -10°C to 120°C Option 2: -10°C to 100°C	Option 1: -10°C to 120°C Option 2: -10°C to 100°C	-10°C to 120°C
Medium	Sea water or fresh water	Option 1: Sea water or fresh water Option 2: Refrigerants	Option 1: Sea water or fresh water Option 2: Refrigerants	Sea water or fresh water

Refrigerants: R22, R134a, R404A, R717, R407C, R507

Corrosion allowance carbon steel: 1 mm
Corrosion allowance all other materials: 0 mm

Pressure vessel class: I/II/III (depending on design parameters, reference is made to DNVGL-RU-SHIP Pt. 4 Ch. 7 Sec. 1 Table 2)

Materials chosen for the specific system shall be suitable for the intended medium and environmental conditions.

Copper materials are not to be applied if ammonia (R717) is an operating medium.

Type Approval documentation

Production Testing

Each heat exchanger shall be tested upon completion to at least 1.5 times the design pressure in the presence of a DNV GL Surveyor.

Certification

Materials for pressure retaining parts are to be delivered with material certificates according to DNVGL-RU-SHIP Pt. 4 Ch. 7 Sec. 1 Tables 5, 6 or 7, and shall meet the requirements of relevant parts of DNVGL-RU-SHIP Pt. 2 Ch. 2.

Approval of manufacturer is required for VL and W material certificates.

Manufacturer of pressure vessels of class I and II shall be approved manufacturer.

Each heat exchanger shall be certified by a DNV GL surveyor and to be delivered with a DNV GL product certificate when it is required by DNV GL Rules or by purchaser.

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.

Periodical assessment

For retention of the Type Approval, a DNV GL 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 DNVGL-CP-0338.