DNV·GL

Certificate No:
TAM00000H6

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Positive Displacement Pumps - Reciprocating

with type designation(s)
MRP

Issued to
Cryostar S.A.S.
HESINGUE, France

is found to comply with
DNV GL rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

Installation within high pressure LNG and gas fuel systems for two-stroke engines.
Max. working press.: 600 bar
Operating media: Liquefied gases, in particular LNG, LIN
Temperature range: -196°C to + 45°C

Issued at **Hamburg** on **2017-10-20**
This Certificate is valid until **2022-10-19**.
DNV GL local station: **Paris CMC / VMC**

Approval Engineer: **Guido Friederich**

for **DNV GL**

Olaf Drews
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.

© DNV GL 2014. DNV GL and the Horizon Graphic are trademarks of DNV GL AS.

Product description

Electric motor driven high pressure cryogenic reciprocating pump consisting of the drive section (hot end) and the direct connected reciprocating cryogenic pump (cold end). Depending on the required amount of cryogenic fuel supply one, two or three pumps are combined. The drive section consists of the electric motor directly connected to a power transmission gearbox which covers an integrated camshaft converting the rotatory drive motion into the stroke actuation for the reciprocating pump. Design features of the high pressure pump are the vacuum jacketed pump cylinders for reduced heat transfer and the integrated balanced low and high pressure chambers for the cryogenic fuel (LNG) suction and discharge.
This type approval includes the cryogenic pump section (cold end) only. The additional documentation of the drive section has been reviewed and filed for information.

Pump type	Design pressure (bar)	Test pressure (bar)	Design temperature (°C)
MRP 40/55 OL3	600	900	-196° to +45°
MRP 40/55 OL2	600	900	-196° to +45°

Application/Limitation

Installation as a cryogenic (LNG) fuel supply pump in gas fuel systems of two-stroke engines. The pumps are arranged on a single rigid pump skid piped with a pulsation damper.
Operating media: Liquefied gas, LNG, liquid nitrogen (LIN)

Remark:
Electric motors for pump drive including other electrical equipment necessary for pump operation shall be provided with respective DNV GL (type) approvals for installation on board of DNV GL classed ships.
If the pump is used on board of a vessel with a cargo temperature below -165°C, the requirements for design temperatures below -165°C shall be specially agreed with the flag state administration.

Type Approval documentation

Tests carried out

- Pressure test
- MRP pump performance / capacity test. Test medium: liquid nitrogen (LIN)
- Number of test specimes: Two pumps, type MRP 40/55 OL2
  The following operating data have been recorded during pump performance test:

Volume flow rate	[m3/hr]
Pump power input	[kW]
Speed of rotation	[min -1]
Suction pressure	(p1) [bar]
Discharge pressure	(p2) [bar]
Inlet and outlet temperature	(°C) / Test fluid liquid nitrogen

Marking of product

For traceability to this type approval the MRP pumps are to be marked with:

- Manufacturers name or trade mark
- Pump type designation
- Size
- Design pressure and temperature

Periodical assessment

A condition for retention of the Type Approval Certificate in its validity period is that periodical assessments are successfully carried out.

The objective of the periodical assessment is to verify that the conditions for the type approval 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 type approved products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the TA documentation and that this is still used as a basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking

END OF CERTIFICATE