

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Quick Connecting Coupling for LNG / LPG**with type designation(s)
DCCoupling (Dry Cryo Couplings)

Issued to

Mann Teknik AB
MARIESTAD, Swedenis found to comply with
DNV GL rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers**Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Max. working temp.:** -196°C to +55°C
Max. working press.: PN25 (DN25 to DN100) PN16 (DN150)
Sizes: DN25, DN50, DN65, DN80, DN100 and DN150This Certificate is valid until **2017-12-31**.Issued at **Høvik** on **2016-08-09**DNV GL local station: **Gothenburg**Approval Engineer: **Adel Samiei**for **DNV GL**-----
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

The Dry Cryogenic Coupling (LNG coupling) consist of a "tank unit" which is a type of a non-return valve and a "hose unit" with a valve driven by an internal cam curve to open both valves at the same time. Tank unit and hose unit are made from 1.4404 (EN 10272). An initial push and turn action on the hose unit provides engagement with the tank unit, thus locking and sealing the two units together.

Application/Limitation

Components covered by this certificate may be used for transfer of LNG/LPG into tanks within limits of maximum working pressure and temperature range mentioned on the front page.

Based on fire test performed on DCC-2", component covered by this certificate (up to and including 4" – DN100) are to be considered fire safe.

The couplings shall always be installed according to the manufacturer's instructions.

The couplings shall always be assembled with tubing of correct temper and tolerances as recommended by the manufacturer.

The couplings shall not be installed in systems where vibration may occur.

Each coupling is before delivery to be hydraulic pressure tested to 1.5 times the maximum working pressure. Also, seat leakage test at a pressure equal to 1.1 times the maximum working pressure on each component shall be performed before each delivery.

Furthermore cryogenic testing consisting of functionality and leakage verification for a minimum of 10% of each type and size of couplings intended to be used at a working temperature below -55°C have to be carried out.

Type Approval documentation

Drawings of each size containing tank unit and hose unit

Calculation design method for DC coupling dated 2012-11-15 issue 2

Test report containing burst test, cryogenic test and tightness dated 2016-02-11 witnessed by DNV GL local surveyor Sweden (on size DN80)

Test report containing burst test, cryogenic test and tightness dated 2012-11-16 witnessed by DNV GL local surveyor Sweden (on sizes DN50 and DN150)

Fire test reports (SP) 3P06390-4,-5-6 dated 2014-09-11 & 2014-09-12 (DCC – 2")

Tests carried out

Tightness test, Functionality test, Burst test, Fire test (on DCC 2")

Marking of product

For traceability to this type approval each product is at least to be marked with:

- Manufacturer's name
- Type designation
- Maximum working pressure
- Size

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform periodical assessment every second year and before the expiry date of this certificate. The scope of the periodical assessment survey is to verify that the conditions stipulated for the type approval is complied with and that no alterations are made to the product design or choice of materials.

The main elements of the certificate retention survey are:

- Review of Type Approval documentation
- Review of possible changes in design, materials and performance
- Ensure traceability between manufacturer's product type marking and Type Approval Certificate.