

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Metallic Expansion Joints**with type designation(s)
UN1F.0080.06.025

Issued to

EagleBurgmann KE A/S
RINGKØBING, Denmark

is 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.****Temperature range:** -10°C to +80°C**Max. working press.:** Inner below: 1 bar / Outer bellow: 6 bar**Sizes:** 85 mm / 125 mm (Inside diameters)This Certificate is valid until **2021-01-08**.Issued at **Høvik** on **2016-01-09**for **DNV GL**DNV GL local station: **Fredericia**Approval Engineer: **Adel Samiei**

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

Double wall expansion component made of two single expansion bellows without internal sleeve –
Designed in accordance with EJMA 9th edition
Internal: three plies bellow intended for natural gas – External: single ply bellow intended for air
Bellow material: 1.4541 (321) according to EN 10028-7
Pipe & flange material: 1.4404 (316L) according to EN 10028-7
Dimensional data in accordance with approve drawings and calculation.

Application/Limitation

This type approval covers the design of the product with respect to internal pressure. External loading/pipe loads have not been considered.

The installation/location of expansion joints is to be approved in each case. Piping system drawings shall be sent to DNV GL whenever expansion joints are to be installed in a ship classed by the society. The piping system design drawing(s) shall specify the location of all anchors, guides, supports, fixed points and type and location of all expansion joints.

The pipeline in which an expansion bellow shall be fitted, shall be adequately adjusted, aligned and clamped. When found necessary, protection against mechanical damage of the expansion bellows may be required.

Each expansion joints has to be hydraulically tested to 1.5 times the design pressure in presence of DNV GL surveyor and delivered with a DNV GL product certificate.

Flow velocities in each bellow shall be limited as specified in EJMA 9th edition Table 4.10-1.

Material of bellow shall have material certificates in accordance with DNV GL rules for classification of ships Pt.5 Ch.7 Sec.1 Table 8. All materials delivered with VL or works certificate shall be made at works approved by DNV GL manufacturers (AOM).

All expansion bellows covered by this approval are approved for :
- 8000 life cycles (movements as indicated in the product description part)
- 1000000 cycles (caused by ship deformation).

Full penetration welds (including longitudinal weld of all plies) are to be subject to 100% X-ray inspection. Bellows weld to pipe are to be subject to 100% dye Penetrant testing

Type Approval documentation

Tests carried out

Burst pressure test, hydraulic test, cyclic test and fatigue life test

Marking of product

For traceability to this type approval, the final products are to be marked with:

- Manufacturer's name or trade mark
- Type designation
- Arrow to indicate direction of flow on one way flow bellows.

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform a survey – every second year and before the expiry date of this certificate to verify that the conditions for the type approval are complied with.