



TYPE APPROVAL CERTIFICATE

Certificate No:
TAP00000XN
Revision No:
2

This is to certify:

That the Metallic Expansion Joints

with type designation(s)
AX, AN, LA and UN

Issued to

Belman A/S
Esbjerg N, Denmark

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

Application :

Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV.

Temperature range: -165°C to +125°C (see page 2)
Max. working press.: 5 bar - 20 bar (see page 2)
Sizes: DN50, 80, 100, 200, 250, 350, 400

Issued at **Høvik** on **2022-11-14**

for **DNV**

This Certificate is valid until **2026-12-31**.
DNV local unit: **Fredericia Fleet In Service**

Approval Engineer: **Thomas Wilhelm Juell**

Sinisa Sedlan
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

Metallic expansion joint with single bellow, (AX1, AN1, LA1 and UN) or universal (AX2, AN2, LA2 and UN2) according to EJMA 10th edition. (AX: Axial Bellows – AN: Angular Bellows – LA: Lateral bellows – UN: Subject to combined movements). Dimensional data and allowable movements shall be in accordance with the type approved drawings mentioned below.

Materials of Bellows / End: 1.4301 / AISI 304, 1.4306 / AISI 304L, 1.4401 / AISI 316, 1.4404 / AISI 316L, 1.4541 / AISI 321, 1.4550 / AISI 347

Application/Limitation

For use on open deck on LNG/LPG cargo systems on LNG/LPG carriers:

| Nominal size (DN) | DN50 | DN100 | DN200 | DN250 | DN350 | DN400 | DN80 | |
|------------------------|----------------|-------|-------|-------|-------|-------|---------------|--|
| Design pressure (bar) | 10 | 10 | 10 | 5 | 10 | 10 | 20 | |
| Temperature range (°C) | -165 to +125°C | | | | | | -55 to +120°C | |

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

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 shall fulfil below conditions:

- 1- The installation/location of expansion joints is to be approved in each case. Piping system drawings shall be sent to DNV 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.
- 2- 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.
- 3- Ship deformation loads shall not be considered in the piping arrangement.

Materials and material protection chosen for the specific system shall be suitable for the intended medium and environmental conditions. Bellows of austenitic stainless steel shall not be used in direct contact with seawater.

Welding shall fulfill requirements in DNV-RU-SHIP Pt.2 Ch.4.

Production testing

Each expansion bellow shall be subjected to hydrostatic pressure test upon completion to at least 1.5 times the design pressure.

Certification

Material of bellows shall have material certificates in accordance with DNV-RU-SHIP Pt.5 Ch.7 Sec.1 Table 8. All materials delivered with NV or works certificate shall be made at works approved by the Society.

Expansion Bellows covered by this certificate shall be delivered with a product certificate issued by the society.

Type Approval documentation

| Doc. no. | Rev. | Description |
|------------------|------|--|
| 3205-053-010-0 | - | Drawing - UN2FU, dated 2012-07-16 |
| 3205-053-020-1 | - | Drawing - AX2SU, dated 2012-07-16 |
| 3205-053-030-0 | - | Drawing - LA2SU, dated 2012-07-16 |
| 3205-053-040-0 | - | Drawing - AN1SU, dated 2012-07-16 |
| 3205-053-050-0 | - | Drawing - AN1HU, dated 2012-07-16 |
| 3205-053-060-0 | - | Drawing - AX1SU, dated 2012-07-16 |
| 4120-11004-040-2 | 2 | Drawing - AX1FU, dated 2021-01-21 |
| - | - | Prototype test report witnessed by DNV GL, dated 2012-08-01 |
| - | - | Prototype test report witnessed by DNV, dated 2021-04-20 & 2021 -04-30 |

*Calculation sheet for each bellows size.

Tests carried out

Burst pressure test, hydraulic test, cyclic test, hydrostatic pressure testing at minimum design temperature.

Marking of product

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

- Manufacturer's trade mark
- Type designation (as stated in the submitted drawings)
- Size



Job Id: **262.1-024621-3**
Certificate No: **TAP00000XN**
Revision No: **2**

- Maximum working pressure
- Temperature range
- The flow direction, if applicable

Periodical assessment

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