

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Metallic Expansion Joints**with type designation(s)
Exhaust gas bellows

Issued to

Rubber Design B.V.
Heerjansdam, Netherlandsis found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems**Application :****Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.****Temperature range:** 20°C to 550°C**Max. working press.:** 1 barg**Sizes:** DN50 to DN2000Issued at **Høvik** on **2019-01-11**This Certificate is valid until **2024-01-10**.DNV GL local station: **Manchester**for **DNV GL**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

Metallic expansion bellows (Single & Multi Ply) designed according to EJMA 10th Edition:

- Single Bellow: DN50 to DN2000
- Universal Bellow: DN100 to DN1000

Dimensional data: according to document "50NB to 2000NB bellow Range Revision 5".

With or without internal sleeve (minimum thickness of sleeves in accordance with EJMA 10th Edition – Table 4.10-3)

Material of bellow:

- SA240 – 316 (1.4401), 316L (1.4404), 316Ti (1.4571), 321 (1.4541)
- 1.4547 (SMO 254), 1.4462 (Duplex) & 1.4501 (Super Duplex)
- 1.4876 & 2.4858 (Incoloy 800 & 825) / 2.4816 & 2.4856 (Inconel 600 & 625)

Flange: PN6/10 – JIS 5k/10K – DIN86044 (Other standard flanges complying with pressure-temperature range according to other international standard may be used) - may be delivered with pipe-end.

Application/Limitation

Expansion bellows covered by this certificate are found to be in compliance with the given design standard and may be installed in exhaust gas systems. (Fatigue life for each bellow is in-line with the independent and combination movements shown in document "50NB to 2000NB bellow Range Revision 5".

When vibrations are present in the piping system, care shall be taken that the natural frequency of the expansion bellows does not coincide with the system frequency. (According to clause 4.9 of EJMA 10th edition) Also, the maximum velocity of gas in expansion bellows without sleeves shall be limited according to EJMA 10th edition table 4.10-1.

Whenever the piping system is subject to approval by the society, the below limitations shall be considered:

- Bellows covered by this certificate shall be delivered with a reference to this type approval certificate (see to DNVGL-RU-SHIP Pt.4 Ch.6 Sec.1 Table 4).
- Welding shall fulfill requirements in DNVGL-RU-SHIP Pt.2 Ch.4.
- Material of bellow shall have material certificates in accordance with DNVGL-RU-SHIP Pt.4 Ch.6 Sec.2 Table 3. All materials delivered with VL or works certificate shall be made at works approved by DNV GL manufacturers
- The installation shall be done according to type approval holder's procedures.

Production test:

Each expansion bellow shall be subjected to minimum hydrostatic test pressure equal to 1.5 times internal design pressure.

Type Approval documentation

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
- Maximum working 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.