DNV·GL

Certificate No:
TAP00000NY

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Metallic Expansion Joints

with type designation(s)
Single (may be subject to combined movement), Single lateral, Single angular, Dual (may be subject to combined movement)

Issued to
Belman A/S
ESBJERG, Denmark

is found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition July 2015

Application :

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

Type:	Temperature range:	Max. working press.:	Sizes:
Single (may be subject to combined movement)	-55°C to 400°C	2,5/6/10/16/25/40 bar	DN25 to DN2200
Single lateral	-55°C to 400°C	6/10/16/25/40/63 bar	DN50 to DN500
Single angular	-55°C to 400°C	2,5/6/10/16/25/40/63 bar	DN50 to DN2200
Dual (may be subject to combined movement)	-55°C to 400°C	2,5/6/10/16/25/40/63 bar	DN50 to DN2200

This Certificate is valid until **2021-12-31**.

Issued at **Høvik** on **2017-03-07**
DNV GL local station: **Fredericia** 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.

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

Job Id:
Certificate No: **TAP00000NY**

Product description

Four types of expansion bellows designed accoding to EJMA 9th edition with various end connections – with or without internal sleeve and collar (all dimensional data according to approved dimensional tables):

Type	designation	Total bellows	Pressure (bar)	sizes
Single bellow (may be subject to combined movement)	4716-10012	838	2,5	DN50 to DN2200
			6	DN50 to DN1200
			10	DN25 to DN700
			16	DN25 to DN500
			25	DN50 to DN400
			40	DN50 to DN300
Single lateral	4716-10013	417	6	DN50 to DN500
			10	DN50 to DN500
			16	DN50 to DN450
			25	DN50 to DN350
			40	DN50 to DN250
			63	DN50 to DN200
Single angular	4716-10014	978	2,5	DN400 to DN2200
			6	DN50 to DN2200
			10	DN50 to DN1400
			16	DN50 to DN1000
			25	DN50 to DN700
			40	DN50 to DN500
			63	DN50 to DN400
Dual bellow (may be subject to combined movement)	4716-10015	1066	2,5	DN50 to DN2200
			6	DN50 to DN2000
			10	DN50 to DN1400
			16	DN50 to DN1000
			25	DN50 to DN700
			40	DN50 to DN500
			63	DN50 to DN400

Material:

- Bellow, sleeve and collar: Stainless Steel 1.4401 (316); 1.4404 (316L);1.4541 (321); 1.4550 (347); 1.4571 (316Ti); 1.4462 (duplex 2205); 1.4547 (SMO 254); 1.4410 (SAF 2507); 1.4501 (super duplex); 2.4856 (Inconel 625); 1.4539 (904L); 2.4605 (Alloy 59) and 2.4858 (Incoloy 825)
- Pipe material: EN10216-[2/3/5]; EN10217-[2/3/7]; EN10028-[2/3/7]; ASTM A240/A516/A106/A312
- Flanges according to EN1092-1;ASME B16.5/B16.47; JIS B2220

Minimum thickness of internal sleeve: in accordance with EJMA 9th edition Table 4.10.3

Application/Limitation

The approval is valid for ship, machinery & cargo piping systems onboard DNV classed ships and mobile offshore units. Expansion bellows covered by this certificate shall not be used in LNG/LPG applications.

Axial, lateral and angular movements of expansion bellows covered by this certificate are to be in accoradance with approved dimensional tables. If bellows are subject to combined movements, the total equivalent axial movement "eMax" are to be in accordance with approved documents.

All expansion bellows covered by this certificate are approved for 1000 load cycles.

Maximum velocity for bellows without sleeves shall be in accordance with EJMA 9th adition table 4.10-1.

Each expansion bellow shall be subjected to minimum hydrostatic test pressure equal to 1.5 times internal design pressure. Bellows installed in piping classes I, II and III, shall be delivered with a product

certificate issued by society (ref. to DNV GL ship Rules Pt.4 Ch.6 Sec.1 Table 4). In this case hydrostatic test shall be witnessed by a DNV GL surveyor.

Bellows installed in non-class piping systems may be delivered with manufacturer's certificate; in this case production test is not to be witnessed by DNV GL surveyor.

Welding shall fulfill requirements in DNV GL Rules Pt.2 Ch.4.

Minimum thickness of pipe (in dual bellows) shall fulfil requirements in DNV GL Ship Rules Pt.4 Ch.6 Sec.9 Table 3 & Table 4.

Material of bellow shall have material certificates in accordance with DNV GL rules for classification of ships 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 (AOM).

Bellows made of 1.4462 (duplex 2205), 1.4547 (SMO 254), 1.4410 (SAF 2507), 1.4501 (super duplex), 2.4856 (Inconel 625), 1.4539 (904L), 2.4605 (Alloy 59) and 2.4858 (Incoloy 825) may be used in seawater systems. Other materials shall not be used in systems conveying seawater.

Maximum working pressure at elevated temperature shall be reduced according to manufacturer's correction factors as below:

Temperature °C	20	100	150	200	250	300	350	400
1.4401 & 1.4404	1,00	0,71	0,65	0,59	0,56	0,50	0,48	0,46
1.4541, 1.4550, 1.4571, 1.4539, 1.4547 2.4605, 2.4858 & 2.4856	1,00	0,83	0,78	0,74	0,71	0,67	0,64	0,62
1.4462, 1.4410 & 1.4501	1,00	0,83	0,78	0,74	0,71	Not Applicable		

Using below materials will limit the maximum design temperature to less than 400°C:

Material designation	Standard	Maximum design temperature
P620QH, P690QH	EN 10216-3	300°C
SA 240	ASME	325°C
SA 516	ASME	375°C
SA 106	ASME	350°C

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 fulfils below coniditons:

1- The installation/location of expansion joints is to be approved in each case. Piping system drawings shall be approved by 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.
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. The pipeline which expansion bellows are to be fitted shall not be subject to ship deformation loads.

Type Approval documentation

Marking of product

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

- Manufacturer's name
- Design pressure & temperature
- Type designation & size
- Arrow pointing to the direction of flow

Job Id:
Certificate No: **TAP00000NY**

Periodical assessment

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