



TYPE APPROVAL CERTIFICATE

Certificate No:
TAP00000MC
Revision No:
1

This is to certify:

That the Metallic Expansion Joints

with type designation(s)
Omega ZH

Issued to
Rattay DK ApS
Esbjerg, Syddanmark, 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: -163 °C to 80 °C
Max. working press.: 10 bar
Sizes: 2.5", 5", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24", 28"

Issued at **Høvik** on **2022-06-27**

This Certificate is valid until **2026-06-30**.

DNV local station: **France CMC**

Approval Engineer: **Thomas Wilhelm Juell**

for **DNV**



Digitally Signed By: **Zeinab, Sharifi**

Location: **DNV Høvik, Norway**

Zeinab Sharifi
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

Design:

Omega ZH shaped (universal) double ply metallic expansion bellows with permanently fitted flanges, designed according to EJMA 9th edition.

Materials:

Part	Material
Bellows	316L/Inconel 625/Incoloy 825
Tie Rods	316L
Pipes	≤12" A312-TP316L Sch 10S
	≥14" A409-TP316L Sch 10S
Flanges	A182 F316L WN 150 lbs RF

Application/Limitation

Expansion bellows covered by this certificate are found to be in compliance with the given design standard and may be installed in LNG/LPG gas systems.

Design data for Omega ZH shaped convolutions in references drawings:

Drawing no	Sizes	Sleeve	Drawing no	Sizes	Sleeve
PC26955_GL_01	6", 8", 12", 20", 24"	YES	PC26955_CR_01	5"	NO
PC26955_GL_02	6", 8", 12"	YES	PC26955_CR_02	6"	NO
PC26955_GL_04	2.5"	NO	PC26955_CR_03	12"	YES
PC26955_GL_05	6", 14", 22", 24"	YES	PC26955_CR_04	12", 18", 24"	YES
PC26955_GL_06	6", 8", 12", 18"	YES	PC26955_CR_06	8", 10", 12", 16", 20"	YES
PC26955_GL_07	6", 8", 18"	YES	PC26955_CR_07	10"	YES
PC26955_GL_09	24", 28"	YES	PC26955_CR_08	10", 18"	YES
PC26955_GL_11	6", 10"	YES	PC26955_CP_01	16"	NO

Flow velocities in each bellow shall be limited as specified in EJMA 10th edition Table 4.10-1 when there is no sleeve installed.

All expansion bellows covered by this approval are approved for 8000 life cycles or 2000000 cycles (caused by ship deformation).

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 Rules Pt.2 Ch.4.

The installation shall be done according to type approval holder's procedures.

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 (AoM).

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

Type Approval documentation

Drawings: PC26955_GL_01, PC26955_GL_02, PC26955_GL_04, PC26955_GL_05, PC26955_GL_06, PC26955_GL_07, PC26955_GL_09, PC26955_GL_11, PC26955_CR_01, PC26955_CR_02, PC26955_CR_03, PC26955_CR_04, PC26955_CR_06, PC26955_CR_07, PC26955_CR_08, PC26955_CP_01
 NA_DNV Revision 0

Manufacturer's calculations No.:

- NC_24445_A_0, NC_24445_B_0, NC_24445_C_0, NC_24445_D_0, NC_20023_A_0 and NC_20023_B_0

apave fatigue life test reports No.:

- 20266222/a DN700, 20266222/b DN250, 20266222/c DN150, 20266222/d DN50

CETIM fatigue life test reports No:



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- 5/023496/523/4A and 5/031044/581/4A

Tests carried out

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

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
- 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.