



Certificate No:
TAP00002EJ

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Metallic Expansion Joints

with type designation(s)
NHUF600-44-01, NHUF150T-55-01

Issued to

UnisonHKR Co., Ltd.
Cheonan-si, Chungcheongnam-do, Korea, Republic of

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.

Type:	Temperature range:	Max. working press.:	Sizes:
NHUF600-44-01	-196°C to +200°C	10 bar	DN 600
NHUF150T-55-01	-196°C to +200°C	25 bar	DN 150

Issued at **Høvik** on **2023-05-04**

This Certificate is valid until **2028-05-03**.

for **DNV**

DNV local station: **Seoul**

Approval Engineer: **Renata Rossi**

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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

Universal type metallic expansion bellows designed according to EJMA 10th edition

Type	Size	Pitch	Height	Thickness	Ply	Convolutions	Overall length
NHUF600-44-01	DN 600	40 mm	40 mm	0.8 mm	3	4+4	1000 mm
NHUF150T-55-01	DN 150	20 mm	18 mm	0.8 mm	2	5+5	630 mm

Material specifications:

Bellows : A240-316L / INCOLOY 825 (UNS number N08825)
 Flanges : A182-F316L
 Sleeves : A240-316L
 End pipes : A312-TP316L / A409-TP316L

Flanges are according to ASME B16.5, as follow:

NHUF600-44-01 : Class 150
 NHUF150T-55-01: Class 300

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 application with below allowable movements.

Type	Axial	Lateral	Angular
NHUF600-44-01	0 mm	0 mm	3 mm
NHUF150T-55-01	0 mm	30 mm	0 mm

Yield stress of actual bellows material, S_{ym} , shall be delivered with a minimum value of 200 MPa.

Each expansion bellow is approved for 8000 life cycles. Allowable movements (axial, lateral and angular) shall be in accordance with the documents listed in this certificate.

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.

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

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 product certificate issued by the society.
- Welding shall fulfill requirements in DNV-RU-SHIP Pt.2 Ch.4.
- Material of bellows shall have material certificates in accordance with DNV-RU-SHIP Pt.5 Ch.7 Sec.1 Table 8. Approval of manufacturer is required for material certificates (MC) or material declarations (MD).

Type Approval documentation

Tests carried out

Burst test, pressure test at minimum design temperature, cyclic test (thermal movements) and cyclic fatigue test (ship deformation).

Marking of product

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

- Manufacturer's trademark
- 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.