

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Metallic Expansion Joints**

with type designation(s)

HSF, HUF, HUF - T, HGDP/HGDS

Issued to

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

is found to comply with

DNV GL 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 GL.**

Type:	Temperature range:	Max. working press.:	Sizes:
HSF	-169°C to +150°C	10 bar	DN32 to DN700
HUF	-169°C to +150°C	10 bar	DN32 to DN750
HUF - T	-169°C to +150°C	10 - 13.5 bar	DN32 to DN750
HGDP/HGDS	-169°C to +150°C	0.84 bar	N.D. 1428 mm/1465 mm

Issued at **Høvik** on **2018-12-21**This Certificate is valid until **2023-12-20**.for **DNV GL**DNV GL local station: **Seoul**Approval Engineer: **Adel Samiei**

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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

Four types of expansion bellows made of SA240 316L designed according to EJMA 10th edition. Middle pipes are made of SA312 TP316L.

All dimensional data and approved movements shall be in accordance with drawings listed in the "Type approval documentation" of this certificate.

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|--|--------------------------|
| 1) HSF: Single Bellow Untied | Dwg: 120440-1 & 120440-2 |
| 2) HUF: Universal Bellow Untied | Dwg: 120441-1 & 120441-2 |
| 3) HUF-T: Universal Bellow Tied | Dwg: 120442-1 & 120442-2 |
| 4) HGDP: Gas Dome Bellow Primary (universal) | Dwg: 120443 |
| 5) HGDS: Gas Dome Bellow Secondary (universal) | Dwg: 120444 |

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 systems.

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

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 in the presence of a DNV GL surveyor.

Certification:

Material of bellow shall have material certificates in accordance with DNVGL-RU-SHIP Pt.5 Ch.7 Sec.1 Table 8:

- Minimum design temperature < -55°C: VL certificate
- Minimum design temperature > -55°C: Works certificate

All materials delivered with VL or works certificate shall be made at works approved by DNV GL manufacturers

Bellows covered by this certificate shall be delivered with a DNV GL product certificate (see to DNVGL-RU-SHIP Pt.5 Ch.7 Sec.1 Table 7).

Type Approval documentation

Tests carried out

Burst pressure test, hydrostatic pressure test, Cyclic test, Cyclic fatigue 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

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.