

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Metallic Expansion Joints

with type designation(s)

DSMBS-1, DSMBS-2, DSMBS-3, DSMBU-1, DSMBU-2, DSMBU-3, DSMBU-4

Issued to

SUNG MOON CO., LTD. (Gimhae Factory)
Gimhae-si, Korea, Republic of

is found to comply with

DNV rules for classification – Ships Pt.6 Ch.2 Sec.5 Gas fuelled ship installations – Gas fuelled LNG

Application :

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

Type:	Temperature range:	Max. working press.:	Sizes:
DSMBS-1	0°C/+100°C	See page 2	DN32(inner)/DN65(outer)
DSMBS-2	0°C/+100°C	See page 2	DN32(inner)/DN65(outer)
DSMBS-3	0°C/+100°C	See page 2	DN50(inner)/DN80(outer)
DSMBU-1	0°C/+60°C	16 bar	DN40(inner)/DN80(outer)
DSMBU-2	0°C/+60°C	16 bar	DN50(inner)/DN80(outer)
DSMBU-3	0°C/+60°C	15 bar	DN80(inner)/DN100(outer)
DSMBU-4	0°C/+60°C	15 bar	DN80(inner)/DN100(outer)

Issued at **Høvik** on **2022-10-28**

This Certificate is valid until **2027-10-27**.

for **DNV**

DNV local station: **Gimhae Station**

Approval Engineer: **Thomas Wilhelm Juell**

Sinisa Sedlan
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

Seven types of double walled metallic expansion bellows with collar and flange, designed according to EJMA 10th edition:

Type	DSMBS		
	Inner /Outer		
Bellow type	Single		
Designation	DSMBS-1	DSMBS-2	DSMBS-3
Size	DN32/DN65	DN32/DN65	DN50/DN80
Design Pressure (bar)	10 bar/5 bar	10 bar/5 bar	10 bar/5 bar
Number of plies	2/2	2/2	2/2
Thickness of each ply	0.4/0.4	0.4/0.4	0.4/0.4
Number of convolutions	11/10	7/7	9/9
Conv. Height (mm)	8/12	8/12	8/12
Conv. Pitch (mm)	10/10	10/10	10/10
Axial Movement (mm)	±2	±1	±2
Lateral Movement (mm)	2	0.6	2
Angular movement	0	0	0
Life cycle	7000	7000	7000
Maximum flow velocity (m/s)	1.83/1.83	1.83/1.83	1.83/2.44

Type	DSMBU			
	Inner /Outer			
Bellow type	Universal			
Designation	DSMBU-1	DSMBU-2	DSMBU-3	DSMBU-4
Size	DN40/DN80	DN50/DN80	DN80/DN100	DN80/DN100
Design Pressure (bar)	16 bar	16 bar	15 bar	15 bar
Number of plies	2/2	3/3	2/2	2/2
Thickness of each ply	0.4/0.5	0.3/0.5	0.5/0.5	0.5/0.5
Number of convolutions	5+5/5+5	8+8/7+7	5+5/5+5	7+7/7+7
Conv. Height (mm)	7/9	6.5/12	8/10	8/10
Conv. Pitch (mm)	9/10	10/12	10/10	10/10
Axial Movement (mm)	±1.5	±3	±0.07	±2
Lateral Movement (mm)	1.5	3.5	0.8	1.3
Angular movement	0	0	0	0
Life cycle	1,000,000	1,000,000	1,000,000	1,000,000
Maximum flow velocity (m/s)	1.83/2.44	1.83/2.44	2.44/3.05	2.44/3.05

Material:

Bellow: SUS316L
Flange: SUS316L
Collar: SUS304, SUS316L
Pipe: SUS316L, SUS316L TP

Application/Limitation

Expansion bellows covered by this certificate are found to be in compliance with the given design standard and may be installed in Natural gas systems (inner bellow) and air applications (outer bellow).

For application in gas piping systems on combustion engines in addition to the thermal expansion life cycle calculation the endurance against high frequency cycle is to be documented by EJMA lifetime calculation confirming fatigue life > 10⁷ cycles. See DNV-RU-SHIP Pt.4 Ch.3 Sec.1 [10.2.8.6].

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.

Ship deformation loads has not been considered.

Welding shall fulfil requirements in DNV-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 surveyor.

Type Approval documentation

Tests carried out

Burst test – Hydraulic Test - cyclic loading test (thermal movement)

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

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.