

TYPE APPROVAL CERTIFICATE

This is to certify:

That the **Metallic Expansion Joints**

with type designation(s)
BMK-E/Y, BMK-E

Issued to

Hacı Ayvaz Endüstriyel Mamuller Sanayi ve Tic. A.S.
Istanbul, Turkey

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021

Application :

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

Type:	Temperature range:	Max. working press.:	Sizes:
BMK-E/Y	0°C/550°C (see page 3)	0.5 bar	DN200 to DN3000 (see page 2)
BMK-E	0°C/550°C (see page 3)	16 bar (See page 3 & 4)	DN25 to DN350 (see page 2)

Issued at **Høvik** on **2022-03-03**

This Certificate is valid until **2027-03-02**.

for **DNV**

DNV local station: **Istanbul**

Approval Engineer: **Thomas Wilhelm Juell**

.....
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

13 Single type (BMK-E) and 37 universal type (BMK-E/Y) metallic expansion bellows with collar and internal sleeve designed according to EJMA 10th edition:

Size	Type	Inside Diameter (mm)	Pitch (mm)	Height (mm)	Ply x thk. (mm)	Convolutions
DN25	Single	38.0	7.0	5.0	2 x 0.25	14
DN32	Single	42.4	7.2	5.9	2 x 0.30	14
DN40	Single	48.3	8.2	6.0	2 x 0.30	14
DN50	Single	60.3	9.6	7.55	2 x 0.40	16
DN65	Single	76.1	9.6	8.7	2 x 0.40	14
DN80	Single	88.9	13.6	10.75	2 x 0.40	10
DN100	Single	114.3	13.6	12.55	2 x 0.40	9
DN125	Single	139.7	14.6	12.2	2 x 0.40	9
DN150	Single	168.3	18.0	15.5	2 x 0.50	9
DN200	Single	219.1	18.0	16.5	2 x 0.50	9
DN250	Single	273.0	23.4	19.8	2 x 0.60	9
DN300	Single	323.9	25.4	23.35	2 x 0.60	7
DN350	Single	355.6	31.2	25.6	2 x 0.80	9
DN200	Universal	219.1	17.60	14.65	2 x 0.40	14 x 2
DN250	Universal	273	22.6	20.2	2 x 0.40	10 x 2
DN300	Universal	323.9	24.6	22.75	2 x 0.40	9 x 2
DN350	Universal	355.6	29.6	27.4	2 x 0.40	7 x 2
DN400	Universal	406.4	29.6	28.5	2 x 0.40	7 x 2
DN450	Universal	457	29.6	28.2	2 x 0.40	7 x 2
DN500	Universal	508	31.6	32.7	2 x 0.40	6 x 2
DN550	Universal	559	32.0	32.0	2 x 0.50	6 x 2
DN600	Universal	610	32.0	33.0	2 x 0.50	6 x 2
DN650	Universal	660	32.0	33.0	2 x 0.50	6 x 2
DN700	Universal	711	32.0	33.5	2 x 0.50	6 x 2
DN750	Universal	762	32.0	33.0	2 x 0.50	6 x 2
DN800	Universal	813	32.0	33.5	2 x 0.50	6 x 2
DN850	Universal	864	32.0	33.0	2 x 0.50	6 x 2
DN900	Universal	914	32.0	33.0	2 x 0.50	6 x 2
DN950	Universal	964	32.0	33.5	2 x 0.50	6 x 2
DN1000	Universal	1016	32.0	33.5	2 x 0.50	6 x 2
DN1100	Universal	1120	32.0	34.0	2 x 0.50	6 x 2
DN1200	Universal	1220	32.0	34.0	2 x 0.50	6 x 2
DN1300	Universal	1320	32.0	34.0	2 x 0.50	6 x 2
DN1400	Universal	1420	32.0	34.0	2 x 0.50	6 x 2
DN1500	Universal	1520	32.0	34.0	2 x 0.50	6 x 2
DN1600	Universal	1620	32.0	34.0	2 x 0.50	6 x 2
DN1700	Universal	1720	32.0	34.0	2 x 0.50	6 x 2
DN1800	Universal	1820	32.0	34.0	2 x 0.50	6 x 2
DN1900	Universal	1920	32.0	34.0	2 x 0.50	6 x 2
DN2000	Universal	2020	32.0	34.0	2 x 0.50	6 x 2
DN2100	Universal	2120	32.4	33.8	2 x 0.60	6 x 2
DN2200	Universal	2220	32.4	33.8	2 x 0.60	6 x 2
DN2300	Universal	2320	32.4	33.8	2 x 0.60	6 x 2
DN2400	Universal	2420	32.4	33.8	2 x 0.60	6 x 2
DN2500	Universal	2520	32.4	33.8	2 x 0.60	6 x 2
DN2600	Universal	2620	32.4	33.8	2 x 0.60	6 x 2
DN2700	Universal	2720	32.4	33.8	2 x 0.60	6 x 2
DN2800	Universal	2820	32.4	33.8	2 x 0.60	6 x 2
DN2900	Universal	2920	32.4	33.8	2 x 0.60	6 x 2
DN3000	Universal	3020	32.4	33.8	2 x 0.60	6 x 2

Materials:

Part	Standard
Bellows, collar ¹⁾ ,	EN 10095
internal sleeve	EN 10028-7

Material grade
All
1.4301, 1.4306, 1.4307, 1.4311, 1.4315, 1.4371,
1.4401, 1.4404, 1.4406, 1.4420, 1.4429, 1.4432,
1.4434, 1.4434, 1.4435, 1.4436, 1.4438, 1.4439,

Flanges²⁾

EN 10095
EN 10028-2
EN 10028-7

EN 10025-2
ASME SA-240

ASME SA-516

¹⁾ with 30 mm length and 1 mm thickness

²⁾ EN1092-1, ASME B16.5/B16.47, DIN86044-1 or JIS B2220

1.4529, 1.4539, 1.4541, 1.4550, 1.4563, 1.4571,
1.4580, 1.4618, 1.4910, 1.4941, 1.4948, 1.4950,
1.4951, 1.4958, 1.4959, 1.4961, 1.4547, 1.4335,
1.4361, 1.4537, 1.4318, 1.4372, 1.4466, 1.4646,
1.4410
All
All
1.4301, 1.4306, 1.4307, 1.4311, 1.4315, 1.4371,
1.4401, 1.4404, 1.4406, 1.4420, 1.4429, 1.4432,
1.4434, 1.4434, 1.4435, 1.4436, 1.4438, 1.4439,
1.4529, 1.4539, 1.4541, 1.4550, 1.4563, 1.4571,
1.4580, 1.4618, 1.4910, 1.4941, 1.4948, 1.4950,
1.4951, 1.4958, 1.4959, 1.4961, 1.4547, 1.4335,
1.4361, 1.4537, 1.4318, 1.4372, 1.4466, 1.4646,
1.4410
1.0038
304, 304H, 316, 316H, 317, 304L, 316L, 321,
321H, 347,
347H, 348, 348H, 309H, 310, 310H, S31254,
S32750,
S32760, 309S, 310S
60, 70

Application/Limitation

Expansion bellows covered by this certificate are found to be in compliance with the given design standard and may be installed in exhaust gas systems and scrubber water line.

Size	Type	Movement			Lifetime	Design Pressure
		Axial	Lateral	Angular		
DN25	Single	+6 /-14 mm	0	0	1000 cycles	16 bar ¹⁾
DN32	Single	+6 /-14 mm	0	0	1000 cycles	16 bar ¹⁾
DN40	Single	+6 /-17 mm	0	0	1000 cycles	16 bar ¹⁾
DN50	Single	+7 /-21 mm	0	0	1000 cycles	16 bar ¹⁾
DN65	Single	+7 /-21 mm	0	0	1000 cycles	16 bar ¹⁾
DN80	Single	+10 /-26 mm	0	0	1000 cycles	16 bar ¹⁾
DN100	Single	+10 /-28 mm	0	0	1000 cycles	16 bar ¹⁾
DN125	Single	+10 /-28 mm	0	0	1000 cycles	16 bar ¹⁾
DN150	Single	+10 /-38 mm	0	0	1000 cycles	16 bar ¹⁾
DN200	Single	+10 /-40 mm	0	0	1000 cycles	16 bar ¹⁾
DN250	Single	+10 /-50 mm	0	0	1000 cycles	16 bar ¹⁾
DN300	Single	+10 /-50 mm	0	0	1000 cycles	16 bar ¹⁾
DN350	Single	+15 /-60 mm	0	0	1000 cycles	16 bar ¹⁾
DN200	Universal	+50 /-130 mm	95	0	1000 cycles	0.5 bar
DN250	Universal	+50 /-190 mm	95	0	1000 cycles	0.5 bar
DN300	Universal	+100 /-190 mm	90	0	1000 cycles	0.5 bar
DN350	Universal	+100 /-190 mm	80	0	1000 cycles	0.5 bar
DN400	Universal	+100 /-190 mm	75	0	1000 cycles	0.5 bar
DN450	Universal	+100 /-190 mm	70	0	1000 cycles	0.5 bar
DN500	Universal	+100 /-175 mm	60	0	1000 cycles	0.5 bar
DN550	Universal	+100 /-175 mm	50	0	1000 cycles	0.5 bar
DN600	Universal	+100 /-175 mm	48	0	1000 cycles	0.5 bar
DN650	Universal	+100 /-175 mm	45	0	1000 cycles	0.5 bar
DN700	Universal	+100 /-175 mm	42	0	1000 cycles	0.5 bar
DN750	Universal	+100 /-175 mm	38	0	1000 cycles	0.5 bar
DN800	Universal	+100 /-175 mm	35	0	1000 cycles	0.5 bar

DN850	Universal	+100 /-175 mm	32	0	1000 cycles	0.5 bar
DN900	Universal	+100 /-175 mm	30	0	1000 cycles	0.5 bar
DN950	Universal	+100 /-175 mm	30	0	1000 cycles	0.5 bar
DN1000	Universal	+100 /-175 mm	28	0	1000 cycles	0.5 bar
DN1100	Universal	+100 /-175 mm	26	0	1000 cycles	0.5 bar
DN1200	Universal	+100 /-175 mm	24	0	1000 cycles	0.5 bar
DN1300	Universal	+100 /-175 mm	22	0	1000 cycles	0.5 bar
DN1400	Universal	+100 /-175 mm	20	0	1000 cycles	0.5 bar
DN1500	Universal	+100 /-175 mm	18	0	1000 cycles	0.5 bar
DN1600	Universal	+100 /-175 mm	17	0	1000 cycles	0.5 bar
DN1700	Universal	+100 /-175 mm	16	0	1000 cycles	0.5 bar
DN1800	Universal	+100 /-175 mm	15	0	1000 cycles	0.5 bar
DN1900	Universal	+100 /-175 mm	14	0	1000 cycles	0.5 bar
DN2000	Universal	+100 /-175 mm	14	0	1000 cycles	0.5 bar
DN2100	Universal	+50 /-175 mm	10	0	1000 cycles	0.5 bar
DN2200	Universal	+50 /-175 mm	10	0	1000 cycles	0.5 bar
DN2300	Universal	+50 /-175 mm	9	0	1000 cycles	0.5 bar
DN2400	Universal	+50 /-175 mm	9	0	1000 cycles	0.5 bar
DN2500	Universal	+50 /-175 mm	8	0	1000 cycles	0.5 bar
DN2600	Universal	+50 /-175 mm	8	0	1000 cycles	0.5 bar
DN2700	Universal	+50 /-175 mm	8	0	1000 cycles	0.5 bar
DN2800	Universal	+50 /-175 mm	7	0	1000 cycles	0.5 bar
DN2900	Universal	+50 /-175 mm	7	0	1000 cycles	0.5 bar
DN3000	Universal	+50 /-175 mm	7	0	1000 cycles	0.5 bar
1) Design pressure reduction as per chart in drawing E0803-03						

Maximum design temperature is limited for materials as per below table:

Standard	Designation/ grade	Maximum design Temperature
EN 10095	All	+550°C
EN 10028-7	1.4301, 1.4306, 1.4307, 1.4311, 1.4315, 1.4371, 1.4401, 1.4404, 1.4406, 1.4420, 1.4429, 1.4432, 1.4434, 1.4434, 1.4435, 1.4436, 1.4438, 1.4439, 1.4529, 1.4539, 1.4541, 1.4550, 1.4563, 1.4571, 1.4580, 1.4618, 1.4910, 1.4941, 1.4948, 1.4950, 1.4951, 1.4958, 1.4959, 1.4961	+550°C
	1.4547(*)	+500°C
	1.4335, 1.4361, 1.4537	+400°C
	1.4318, 1.4372, 1.4466, 1.4646	+350°C
	1.4410 (*)	+250°C

(*) Only these materials are allowed to be used in seawater lines of scrubber systems.

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

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.

Type Approval documentation

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 test report with reference to this type approval certificate (see to DNV-RU-SHIP Pt.4 Ch.6 Sec.1 Table 3).
- Welding shall fulfill requirements in DNV-RU-SHIP Pt.2 Ch.4.
- Material of bellow shall have material certificates in accordance with DNV-RU-SHIP Pt.4 Ch.6 Sec.2 Table 3. Approval of manufacturer is required for VL or W material certificates.

Marking of product

For traceability to this type approval, the compensators 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.