

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Metallic Expansion Joints

with type designation(s)
LFZ

Issued to

**Witzenmann GmbH Metallschlauch-Fabrik
Pforzheim, Germany**

is found to comply with

**DNV GL rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems**

Application :

The metallic expansion joints of type LFZ are type approved for installation in liquefied gas cargo systems.

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

Temperature range: -50 °C up to +50 °C
Max. working press.: 5 bar
Sizes: DN 200 and DN 250

This Certificate is valid until **2021-09-22**.

Issued at **Hamburg** on **2016-09-23**

DNV GL local station: **Augsburg**

Approval Engineer: **Hagen Markus**

for **DNV GL**

Olaf Drews
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.

Job Id: **262.1-023006-1**
Certificate No: **TAP00000K1**

Product description

Lateral double-ply universal metallic expansion joint of type LFZ 06.0200 and 06.0250 with tie rods, center pipe, welded neck flanges and internal sleeves.
Bellow design according to EJMA 9th Edition.

Materials

Bellow and flange

DIN EN Code	US Grade	Chemical composition
1.4404	316L	X2CrNiMo17-12-2

Material certificates

Pre - materials for bellows, pipes and flanges shall be delivered with works certificate, MC issued by DNV GL approved manufacturers (AoM).

Refer to:

- DNVGL Rule Pt.4, Ch.6, Sec.2 – Table 3 Material certificates
- DNVGL Rule Pt.5, Ch.7, Sec.1 – Table 8 Certification of material quality and testing
- DNVGL Rule Pt.2, Ch.1, Sec.2 (Approval of manufacturers (AoM))
- DNVGL Rule Pt.1, Ch.3, Sec.5 (Compliance document types for products)

Welding

Full penetration welds (including longitudinal weld of all plies) are to be subject to 100% X-ray inspection.
Bellows weld to pipe are to be subject to 100% dye penetrate testing.

Refer to:

- DNVGL Rule Pt.5, Ch.7, Sec.6, 5 Welding of metallic materials and non-destructive testing

Range of Application

Types	LFZ 06.0200.070.1	LFZ 06.0250.110.1	LFZ 06.0250.230.1
Diameter	DN 200	DN 250	DN 250
Number of Convolutions	5	7	7
Height of Convolutions	21 mm	20.5 mm	20.5 mm
Corrugation length	16 mm	17.5 mm	17.5 mm
Working Pressure	5 bar	5 bar	5 bar
Working temperature	-50 ≤ T ≤ 50° C	-50 ≤ T ≤ 50° C	-50 ≤ T ≤ 50° C
Axial Movement (x-direction)	0 mm	0 mm	0 mm
Lateral Movement (y-direction or vertical)	±10 mm	±10 mm	±10 mm
Lateral Movement (z-direction or horizontal)	-38 mm / +16 mm	±38 mm	±75 mm
Angular Movement	0°	0°	0°
Cyclic fatigue (Cycles Ship Deformation)	2 x 10 ⁶	2 x 10 ⁶	2 x 10 ⁶
Cyclic Fatigue (Cycles Thermal Movement)	8000	8000	8000

Remarks

The installation / location of expansion joints is to be approved in each case under consideration of pipe loads.

Piping system drawings shall be sent to DNV GL whenever expansion joints are to be installed on a ship classed by the society. The piping system design drawing(s) shall specify the location of all fixed points, guides, supports and type and location of all expansion joints.

Pipe line alignment

The pipeline is to be adequately adjusted, aligned and clamped according to Witzenmann installation instructions.

Limitation

The bellows must only be fitted in places where they are always accessible. Exceptions to be considered in each case. For other applications than stated, approval has to be obtained in each case.

Approved Production Places

Witzenmann GmbH
Östliche Karl-Friedrich-Str. 134
75175 Pforzheim, GERMANY

Welding shop approval certificate WWA0000039, Rev.1

Production testing

Each batch of metallic expansion joints are to be hydraulically pressure tested up to 1,5-times the design pressure in the presence of a DNV GL surveyor. Appropriate product certificate (PC) is to be issued.

Type Approval documentation

Drawing number 1285181 rev.c dated 09-08-2007	Type approved
Drawing number 1286372 rev.a dated 19-06-2007	Type approved
Drawing number 1285186 rev.a dated 29-06-2007	Type approved
Drawing number 1286148 rev.c dated 13-09-2007	Type approved
Drawing number 1286651 rev.0 dated 15-06-2007	Type approved
Drawing number 1285361 rev.b dated 09-08-2007	Type approved
Drawing number 1286317 rev.0 dated 06-06-2007	Type approved
Drawing number 1285187 rev.a dated 28-06-2007	Type approved
Drawing number 1286141 rev.b dated 13-09-2007	Type approved
Drawing number 1286650 rev.0 dated 15-06-2007	Type approved
Drawing number 1285184 rev.b dated 09-08-2007	Type approved
Drawing number 1286317 rev.0 dated 06-06-2007	Type approved
Drawing number 1285187 rev.a dated 28-06-2007	Type approved
Drawing number 1286141 rev.b dated 13-09-2007	Type approved
Drawing number 1286650 rev.0 dated 15-06-2007	Type approved
Calculation document for drawing 1285185 dated 05-02-2015	For information
Calculation document for drawing 1285184 dated 05-02-2015	For information
Calculation document for drawing 1285361 dated 05-02-2015	For information
Burst test report document number: 07-02684-010-ER (dated 23-11-2007 stamped by DNV local station Essen)	For information
Pressure test with internal movement document number: 2007-0242 (dated 22-10-2007 stamped by DNV local station Essen)	For information
Cyclic test report document number: 2007-0242a (dated 19-11-2007 stamped by DNV local station Essen)	For information
Cyclic fatigue test document number: 2007-0242b (dated 30-10-2007 stamped by DNV local station Essen)	For information

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Tests carried out

Burst test, Pressure test, Cyclic test (Thermal movement), Cyclic fatigue test.

Marking of product

For traceability to this type approval, the final products are to be marked with:

- Manufacturer's name or trade mark
- Type designation
- Working pressure and temperature
- Direction of flow

Periodical assessment

For retention of the type approval certificate periodical assessments shall be carried out at production places.

The objective of the periodical assessment is to verify that the design and production conditions for the type approval have not been altered.

Main scope of the assessment:

- verification of the production and quality control system
- review of quality control documentation of recent deliveries
- review of drawings in production to verify any design changes which may have an impact on data specified in the type approval certificate, performance and range of application
- verification of the product marking