



Certificate No:
TAP00002KX

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Metallic Expansion Joints

with type designation(s)
TAC

Issued to

Liaoning Tian An Containers Co., Ltd.
Donggang City, Liaoning, China

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 all vessels classed by DNV.

Temperature range: -55°C up to +550°C
Max. working press.: 0.6MPa
Sizes: DN65 up to DN1200

Issued at **Hamburg** on **2023-02-21**

This Certificate is valid until **2028-02-20**.

DNV local station: **Dalian NB & CMC**

Approval Engineer: **Hagen Markus**

for **DNV**

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Sven Klinger
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

Metallic expansion joint consisting of corrugated bellows made of SUS321 with flanges made of Q235B, ready for installation.

Designed according to EJMA 2016 and GB/T12777-2019.

Types TAC (GB/T12777 - 2019) – Exhaust gas lines

Design pressure 0.6MPa, Temperature range up to 550°C

Type TAC(DN)-(PN)-(Length)	Ply	Convolution	
	Thickness*n	Pitch/Height	Quantity
TAC65-0.6-150	0.4*2	10/11.5	8
TAC80-0.6-150		12/12	
TAC100-0.6-220	0.4*3	15/13.5	8
TAC125-0.6-220	0.5*3	16/17.5	8
TAC150-0.6-250		20/18	
TAC200-0.6-280		22/19	
TAC250-0.6-280	0.6*3	22/23.5	8
TAC300-0.6-360	0.5*4	44/29	6
TAC350-0.6-380		32/23	8
TAC400-0.6-400	0.6*4	32/27	8
TAC450-0.6-400		32/28	
TAC500-0.6-410		32/28.5	
TAC600-0.6-440	0.8*4	60/48	5
TAC700-0.6-460		55/47	
TAC800-0.6-470		55/45.5	
TAC900-0.6-480	0.8*5	55/49	5
TAC1000-0.6-520		60/49	
TAC1100-0.6-540		50/48	6
TAC1200-0.6-550			

Range of Application/Limitation

Type	Flange design	Type ¹	Design pressure (MPa)	Service Temp.	Media	Pipe Class	Assembly Drawing
TAC	Welded flange	E	0.6	≤ 550°C	Exhaust gas lines	III	TAC-(DN)-(PN)-(Length)

Notes

¹ Reference DNV Pt.4 Ch.6, Sec. 9 – Table 7 Type of flange connection

Limitation

For installation in exhaust gas lines of combustion engines upstream (before) turbocharger, the bellows design calculation shall include prove acc. to EMA 9th Ed., Sec. 4.9- Vibration for each individual application.

Selection of materials

The material SUS 321 are considered not corrosion resistance to sea water and sea water atmosphere and therefore considered not suitable for application in unprotected installation areas subject to sea water spray or green sea, e.g., open deck or in wet exhaust gas respectively exhaust gas scrubber systems and similar application with high corrosive media.

This is also applicable to combination of carbon steel flanges with stainless steel bellows material.

In addition to the above it shall be noted that the selection of the materials shall always consider the applicable service condition with respect to type of media, flow velocity, media temperature and installation area of the piping system. In particular, the resistance to corrosion, erosion, oxidation and other deterioration during projected service life are to be taken into account.

Reference is made to DNV Rules Pt.4, Ch.6 – Section 2 – Materials.

Expansion bellows design

This type approval is based on bellows design calculations acc. to EJMA 10th edition, 2016.

Material class 1. Minimum life cycle $N_c \gg 5.000$ with $f_c=1$ and $N_c=5.000$ with correction factor 50%, $f_c 0.53$.

Reference EJMA 10th Edition, Sec. 4 – Figure 4.20.

The lifetime of expansion bellows depends on the service conditions, such as working pressure, axial and lateral stroke and bending angle. Accordingly, for each application the bellows design shall be based on the applicable service condition and lifetime. This is to be documented in the bellows design drawing for each delivery.

Installation

The bellows must only be fitted in places where they are always accessible. Possible exceptions to be considered in each case.

The pipeline, in which an expansion joint is to be fitted, is to be adequately adjusted, aligned and clamped.

The expansion joint is only to compensate for thermal movements and relative movement in ship and machinery, not to compensate for misalignment during installation of the pipework.

Production

Welding

Welding procedures WPS

WPS	WPQR	Process	Material	Joint type
HGY-02	DLO5T00018-1	TIG	SUS304	Butt weld – 0.8mm
HGY-15	Tech 07	TIG	SUS321/Q235B	Filled weld – 3mm
HPD-14	DLO5T00018-2	TIG	SUS304	Butt weld – 1.0mm

Production testing

Each batch of metallic expansion joints are subject to 100% non-destruction PT penetration testing of welded joints acc. to GB/T1277-2019.

In addition tightness test and pressure test with test pressure 15bar.

Appropriate works certificate to be issued and enclosed to each delivery.

Type Approval documentation

Type test scope

- Visual inspection, Dimension check
- NDT penetration test (PT) of but welds and fillet welds
- Tightness test (10minutes @1MPa) and Hydrostatic pressure test (10minutes @2.2MPa)
- Stiffness performance test
- Stability performance test(10minutes @2.2MPa)
- Pressure tests with two times PN
- Endurance test 10.001 cycles at maximum axial movement on sizes TAC100, 600 and 1200
- Burst test with 4.4 MPa (7.3times PN)

Marking of product

For traceability to this type approval certificate, the final product is marked with a name plate with following data:

	膨胀节 Expansion Joint 辽宁天安容器有限公司 Liaoning Tian An Containers Co., Ltd.	膨胀节型式 (型号) Expansion Joints Specification 出厂编号 Factory number	设计温度 Design temperature 工作压力 Working pressure	设计疲劳寿命 Design Fatigue Life 外形尺寸 Facade dimension	总重量 Total weight 出厂日期 Date of delivery	
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Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment.
Refer to the Class Programme DNV-CP-0338, Sec.4.

To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

End of certificate