

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Compensator, Bellow of Rubber Material**

with type designation(s)

AS-1; AS-2; AS-3; AS-4, A-1; A-2; A-3; A-4, RS-0; RS-1; RS-2, R-1; R-2

Issued to

**Stenflex Rudolf Stender GmbH
Norderstedt, Germany**

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems**DNV GL class programme DNVGL-CP-0183 – Type approval – Flexible hoses****Application :****Product(s) approved by this certificate are accepted for installation on all vessels classed by DNV GL.**

Type:	Temperature range:	Max. working press.:	Sizes:
AS-1; AS-2; AS-3; AS-4	up to +100°C	10bar, ANSI 150lbs	DN25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400
A-1; A-2; A-3; A-4	up to +90°C	10bar, ANSI 150lbs	DN25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400
RS-0; RS-1; RS-2	up to +100°C	10bar, ANSI 150lbs	DN25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300
R-1; R-2	up to +90°C	10bar, ANSI 150lbs	DN25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300

This Certificate is valid until **2021-06-05**.Issued at **Hamburg** on **2016-06-06**DNV GL local station: **Hamburg**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.

Product description

Spherical shaped rubber compensators equipped with loose flanges of carbon steel 1.0038 material.
The connection between flanges and the rubber is wire reinforced, and forms a raised face of rubber on the flange.

Type		Reinforcement	Liner	Marking ring	Cover	Flanges	
AS, RS	Fire resistant	Steel Wire	NBR	Red	CR	Special design with profil machining to bear the bellow	Materials 1.0038, 1.4541, 1.4571
			EPDM	Orange	EPDM		
A, R	Non – fire resistant	Nylon cord	NBR	Red	CR		
			EPDM	Orange	EPDM		

Design

Type designation	Description
A-1 AS-1	Standard design for axial, lateral and angular movement
A-2 AS-2	DN ≤ 150: Tie rods carried on rubber sockets. DN ≥ 175 : Tie rods carried on spherical washers
A-3 AS-3	Suitable for angular systems to take up large pipe expansion
A-4 AS-4	As type A-2, special restraints to prevent compression
R-1 RS-1	Standard design for axial, lateral and angular movements. Length 130 mm.
R-2 RS-2	Unit with tie bars for lateral movements. See A-2 above. Length 130 mm.
RS-0	Rubber bellows only. Length 130 mm

Application

The compensators are type approved for application in the following piping systems.
For selection and installation of the compensators the manufacturer's instructions are to be observed

Type AS, RS (steel wire reinforcement, fire resistant)	Type A, R (textile reinforcement, non-fire resistant)
- Ballast systems - Fuel oil , lubricating oil, hydraulic oil systems (not EPDM) - Bilge systems - Sea water systems - Permanently water filled fire extinguishing systems - Compressed air systems - Other piping systems where fire resistance is not required.	- Fresh cooling water systems - Sanitary piping systems - Other auxiliary systems where fire resistance capability is not required.

Limitation

The compensators shall be installed at visible and accessible positions.

The compensators shall be limited to a quantity necessary to provide relative movement between fixed and flexibly mounted items of machinery/equipment or systems.

Non-metallic compensators are not approved for the following application:

- In permanently pressurized starting air lines of diesel engines
- In cargo lines of tankers
- At the ship's side

Type Approval documentation

DNV P-13825/GL 33 576-84HH

Reference documents:

- Manufacturer's catalogue "Flexible Pipe Connections"-E15/0.75.
- Data sheets: A-1/1-D15, A-1/2-D15, A-2/A-4/1-D15, A-2/A-4/2-D15, A-3/1-D15, A-3/2-D15, AS-1/1-D15, AS-1/2-D15, AS-2/AS-4/1-D15, AS-2/AS-4/2-D15, AS-3/1-D15, AS-3/2-D15, RS-1/1-D15, RS-1/2-D15, RS-2/1-D15, RS-2/2-D15, R-1/1-D15, R-1/2-D15, R-2/1-D15 and R-2/-2-D15
- Test results: Burst test (witnessed by Lloyds) type A and AS.
- DNV's Retention Survey Report ESN-06-3975 dated 2006-08-05
- GL Audit report dated 22.08.2006
- Test protocols for flame-resistance test dated 2004-02-25
- Fire resistance test reports WTD 71 dated 2007-07-10
- Fire resistance test report IBB 424-15.07.2008, witnessed by DNV.
- Test report for hydrostatic- and bursting test of RS (witnessed by DNV) dated 2004-02-04
- Endurance test reports No. IBB 430, 432, 426,424,428
- Retention survey report dated 2011-05-16
- Assessment report dated 2016-05-18

Tests carried out

Burst- and endurance test.

Fire resistance tests performed on AS and RS type compensators according to ISO15540/41.

Marking of product

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

- Manufacturer's trade mark.
- Type designation
- Size
- Max. working pressure

Periodical assessment

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

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 the type approval documentation and that this is still the basis for the production
- review of design changes , pre- material and performance of the product
- verification of the product marking