Edge welded metal bellows

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Overview

- Hydro-pneumatic accumulators – different designs and applications
- Metal bellows accumulators
- Design and production of edge welded metal bellows
- An indicator showing the integrity of the metal bellows
- Edge welded metal bellows accumulators in extreme environments
- Testing of edge welded metal bellows accumulators
- Industrial applications
Edge welded metal bellows

Types and Applications of Accumulators

energy storage

pulsation damping

shock absorption

volume compensation

separation
Edge welded metal bellows
Principle designs

Corrugated metal bellows
Edge welded metal bellows
Edge welded metal bellows
Principle designs

Metal bellows in elongated position

Metal bellows in block position

Welded seam

Single, round blanks welded in circumference direction inside and outside
Speichertechnik / Accumulators

**Edge welded metal bellows**

*Spring rate*

<table>
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<tr>
<th>Material</th>
<th>gedrückte Länge Lc</th>
<th>Mitt.dicke</th>
<th>freie Länge Lf</th>
<th>Anz.MP</th>
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![Diagram](image)

Ermittlung der Federrate: \( SRCZ = \frac{\text{Mittelwert} \times F_1}{\text{Anz.MP}} \)

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<th>( F_{\text{N}} )</th>
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\( SRCZ = \frac{307}{N/mm} \)

Mittelwert: 10.96
Edge welded metal bellows
Accumulator for a suction line
Edge welded metal bellows

Indicator

Not contaminated

Contaminated with HyJet™

Indicator with “Nil Red”

Housing for Indicator
Edge welded metal bellows

Environmental tests - vibration
**Edge welded metal bellows**

*Environmental tests - vibration*

Temperature increase by dissipation of the fluid in the gap

- Fluid filled gap
- Break
Edge welded metal bellows

Environmental tests - vibration

Nominal diameter - charging

Charging: volume +
Edge welded metal bellows

Environmental tests - vibration

Increased diameter - charging

Charging: volume +

- Gas side
- Upper position
- Center position
- Lower position
- Fluid side
ISO 2685 1998
Aircraft -- Environmental test procedure for airborne equipment -- Resistance to fire in designated fire zones
Edge welded metal bellows

*Environmental tests – fire tests*
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Environmental tests – fire tests

Flame from the side

Flame from the front

Glass after fire test
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Hydraulic tests – test setup

Test setup for pressure close to 0 bar absolute pressure
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Endurance test

- maximum pressure
- metal bellows on block position
- precharge pressure
Edge welded metal bellows
Industrial applications
Edge welded metal bellows

Industrial applications
Edge welded metal bellows

Industrial applications
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Industrial applications
Thank you very much for your attention!

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