



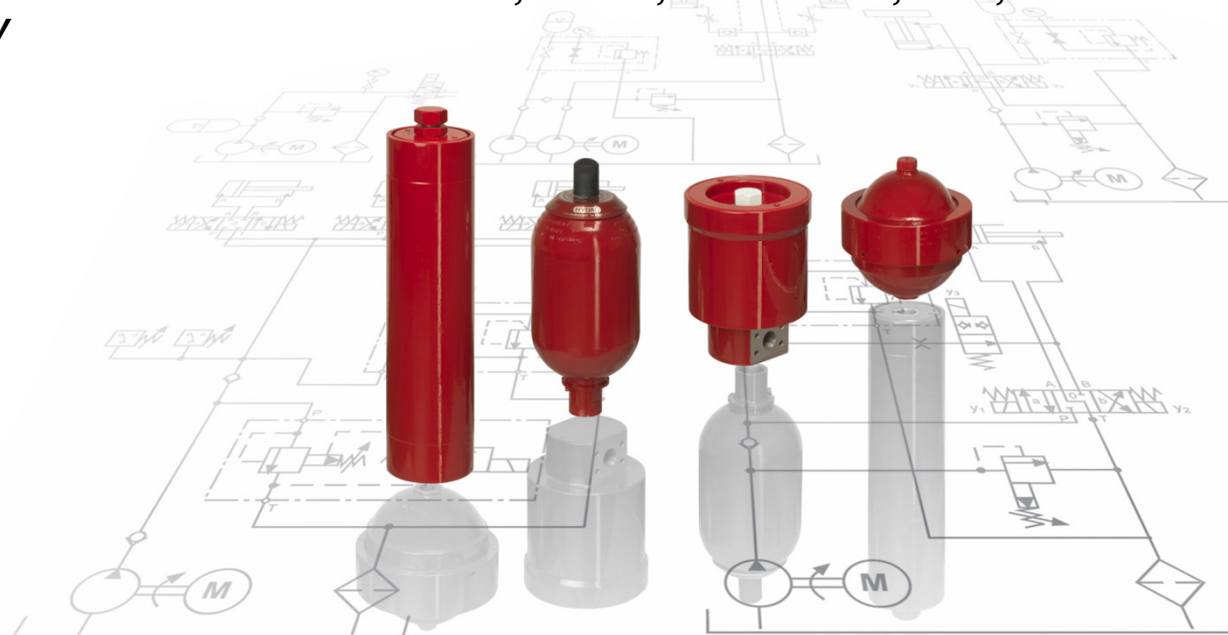
HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows

Peter Kloft and Daniel Rau

***The 11th International Fluid Power Conference, 11. IFK, March 19-21, 2018,
Aachen, Germany***





HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows *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

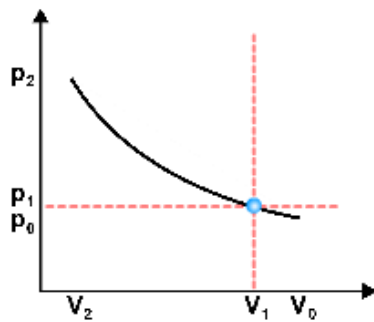


HYDAC INTERNATIONAL

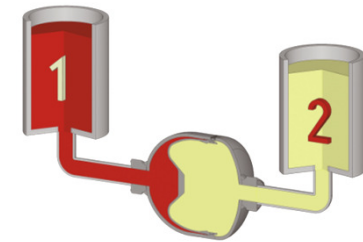
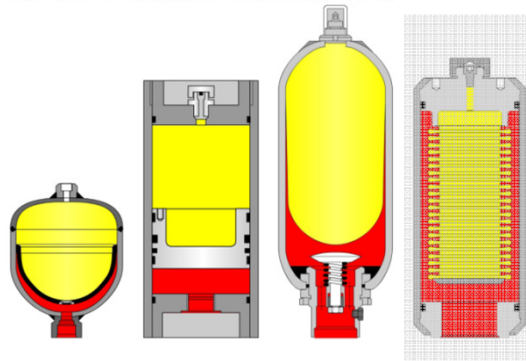
Speichertechnik / Accumulators

Edge welded metal bellows

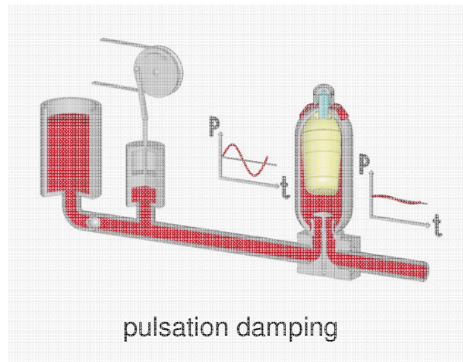
Types and Applications of Accumulators



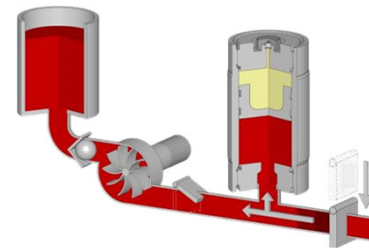
energy storage



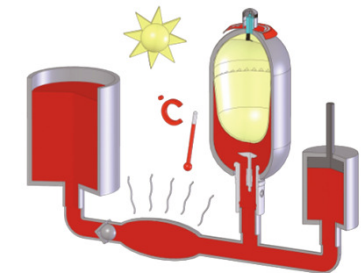
separation



pulsation damping



shock absorption



volume compensation

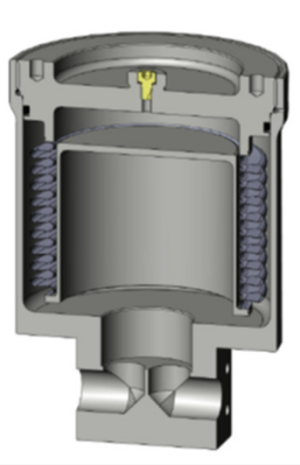


HYDAC INTERNATIONAL

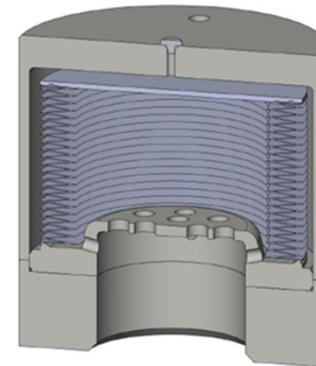
Speichertechnik / Accumulators

Edge welded metal bellows

Principle designs



Corrugated metal bellows



Edge welded metal bellows

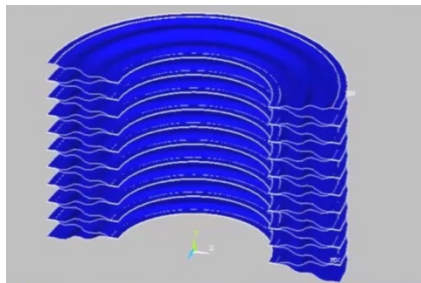


HYDAC INTERNATIONAL

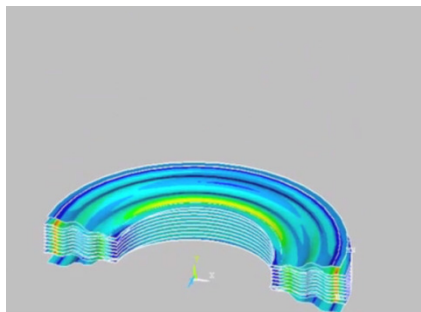
Speichertechnik / Accumulators

Edge welded metal bellows

Principle designs



Metal bellows in elongated position



Metal bellows in block position



Welded seam

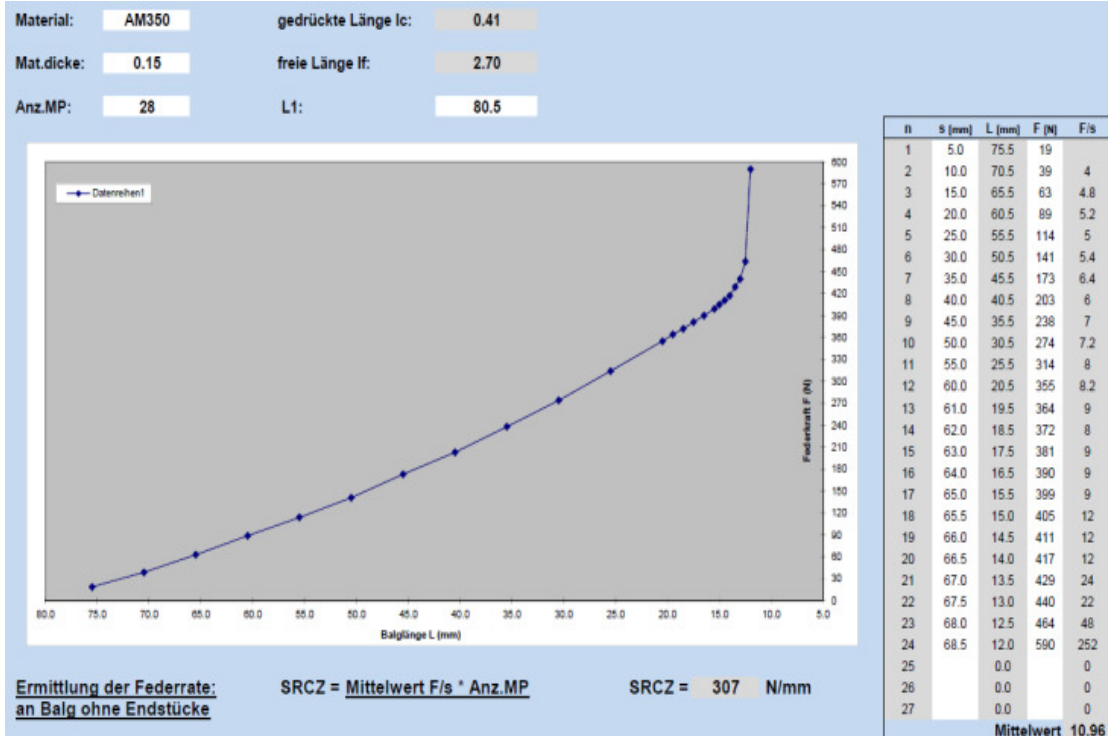
Single, round blanks welded in circumference direction inside and outside



HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows Spring rate

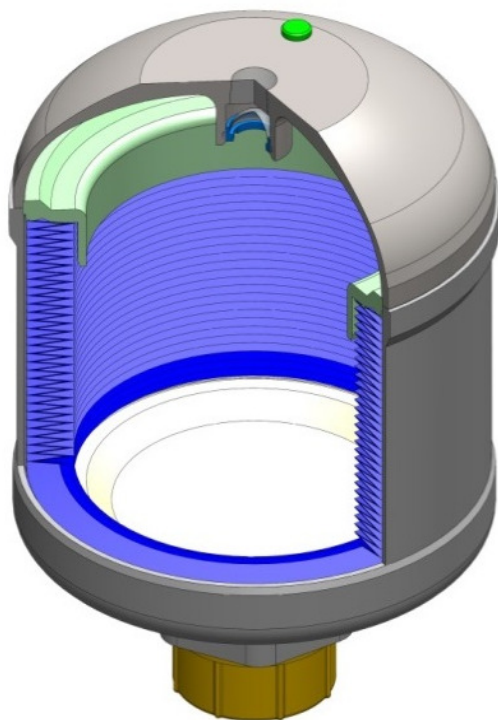




HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows
Accumulator for a suction line

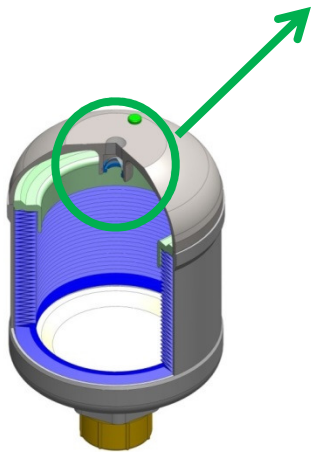




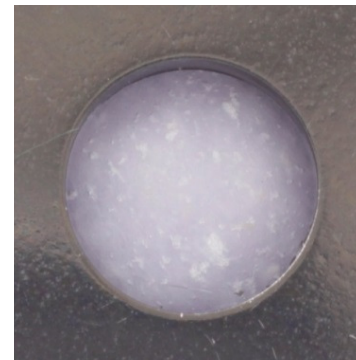
HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows *Indicator*



Not contaminated



Contaminated with HyJet™



Indicator with "Nil Red"

Housing for Indicator

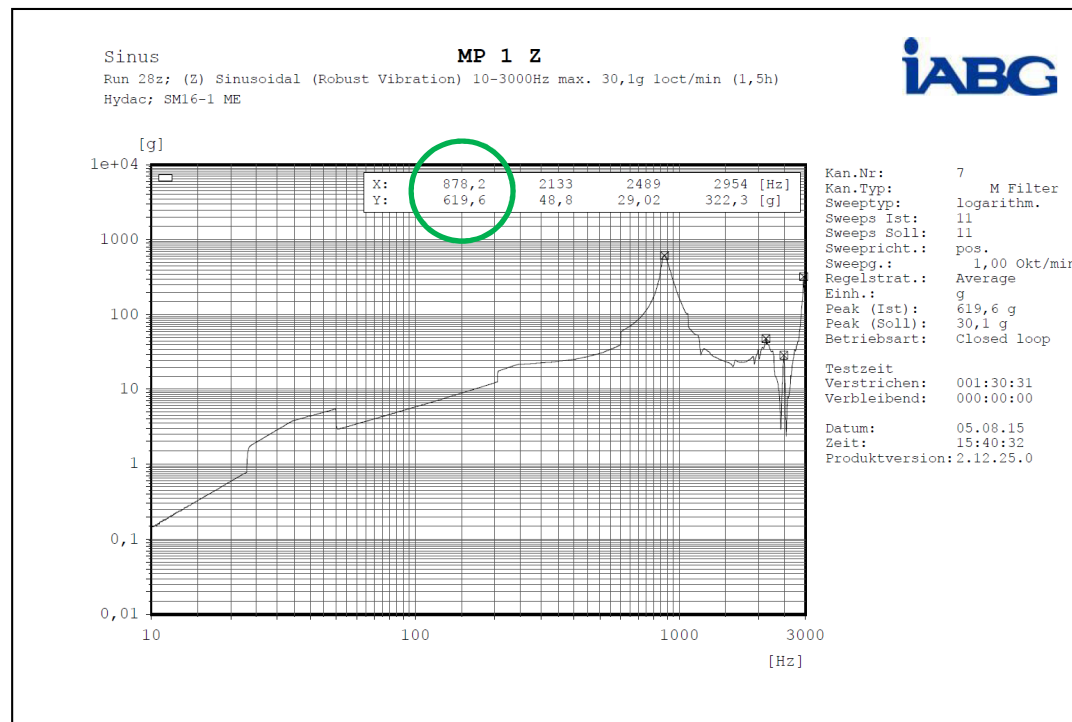




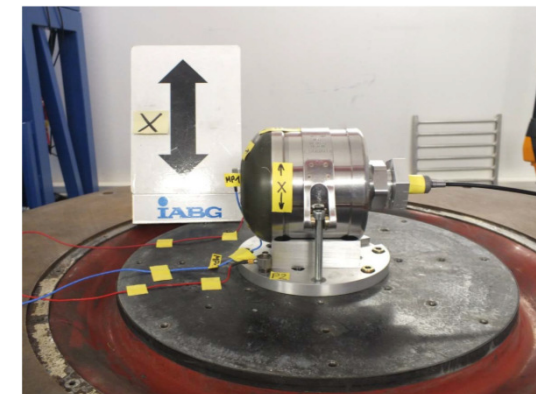
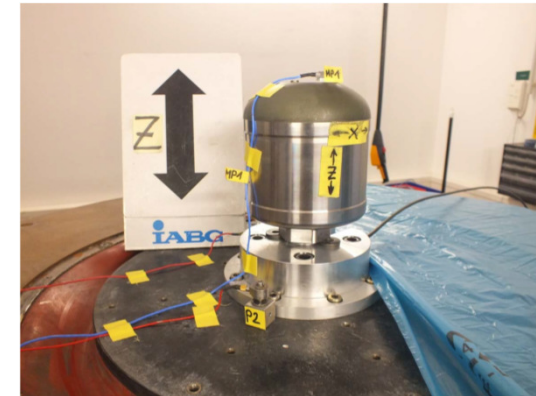
HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows Environmental tests - vibration



C:\VcpNT\Daten\m+p\Hydac\8_2015\ (Z) (1,5h) Sinusoidal (Robust Vibration) mit Strom Notch_001.rsn

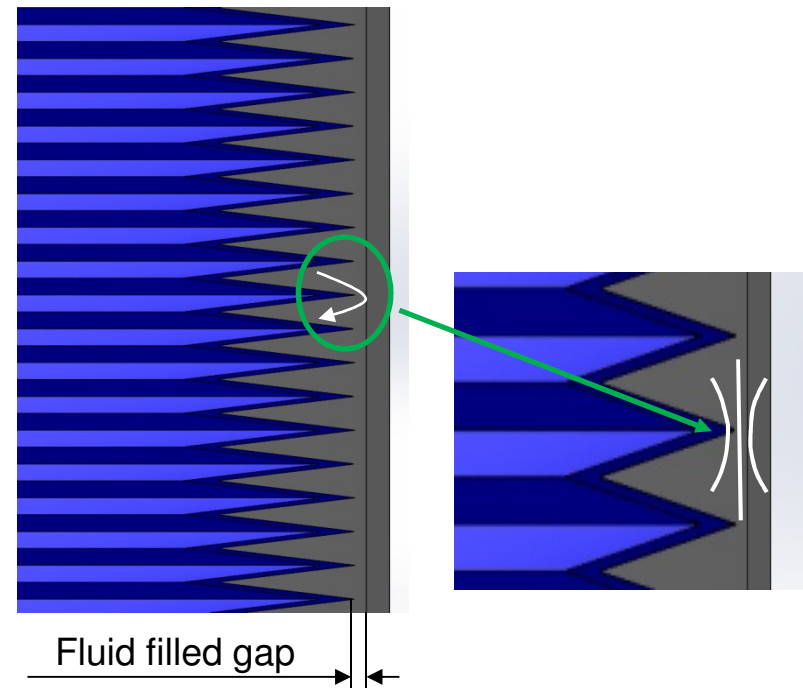
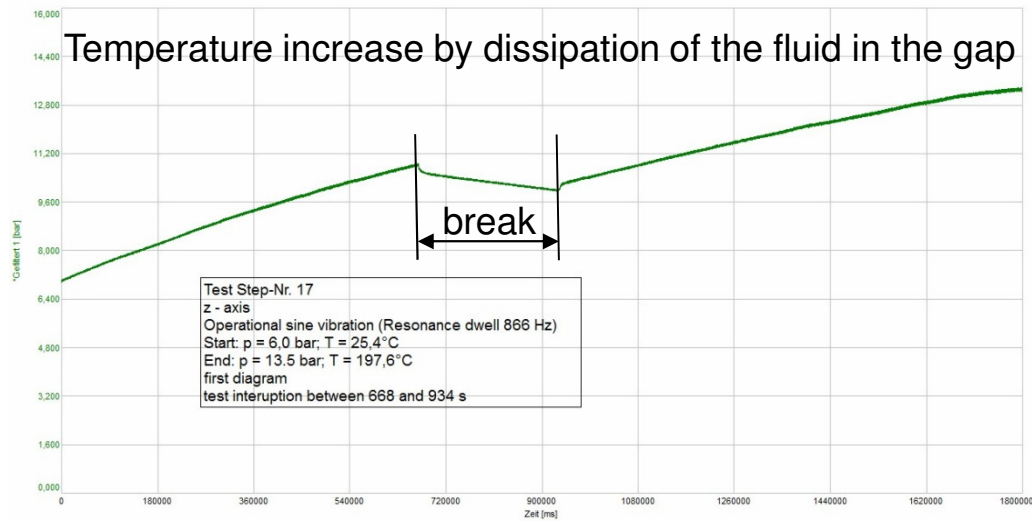




HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows *Environmental tests - vibration*

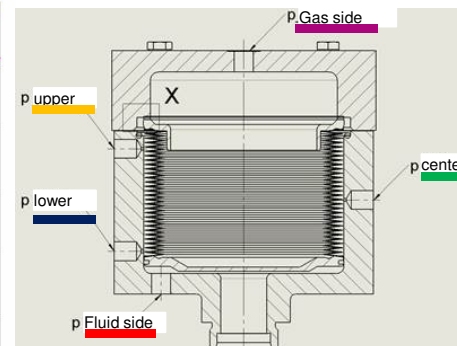
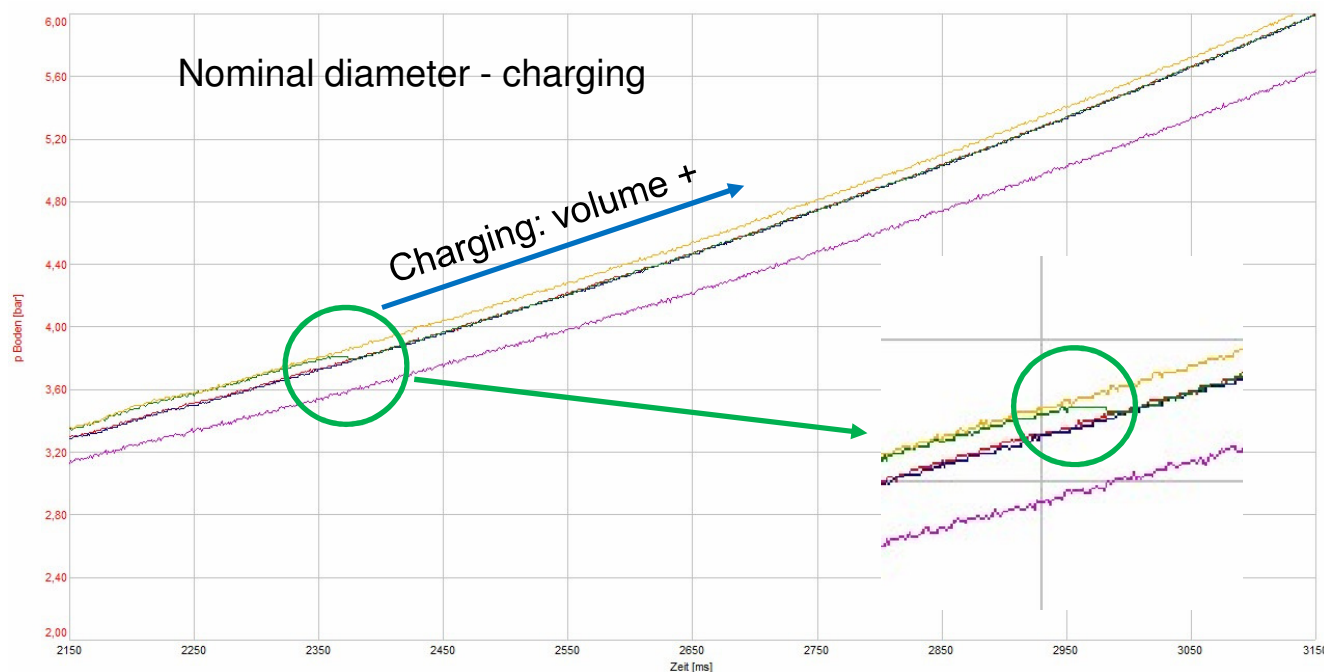




HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows Environmental tests - vibration



Gas side ———

Upper position ———

Center position ———

Lower position ———

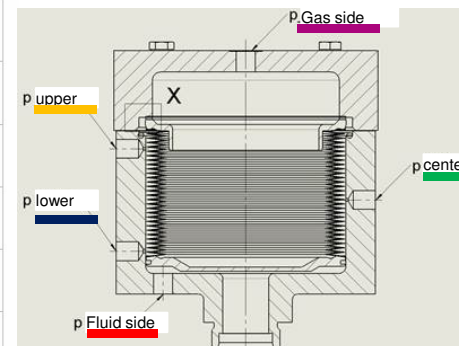
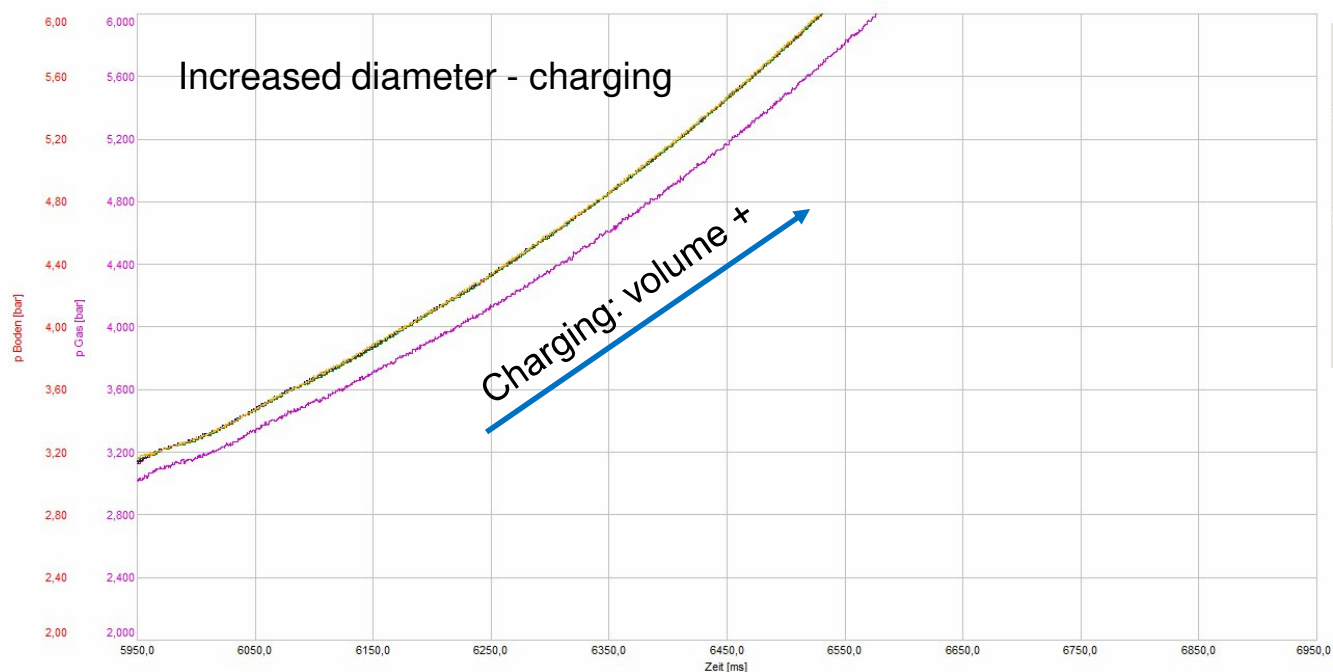
Fluid side ———



HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows Environmental tests - vibration



Gas side —

Upper position —

Center position —

Lower position —

Fluid side —



HYDAC INTERNATIONAL

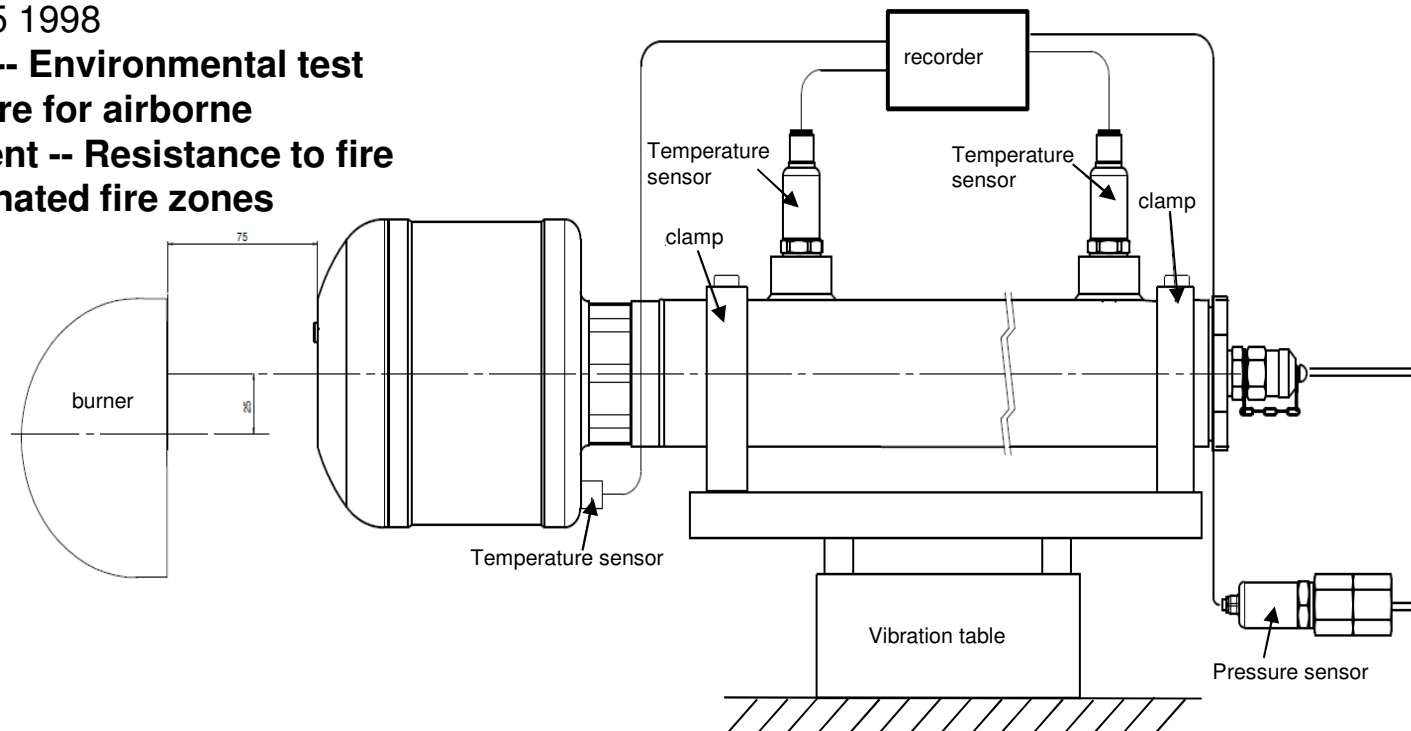
Speichertechnik / Accumulators

Edge welded metal bellows

Environmental tests – fire test setup

ISO 2685 1998

**Aircraft -- Environmental test
procedure for airborne
equipment -- Resistance to fire
in designated fire zones**





HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows *Environmental tests – fire tests*



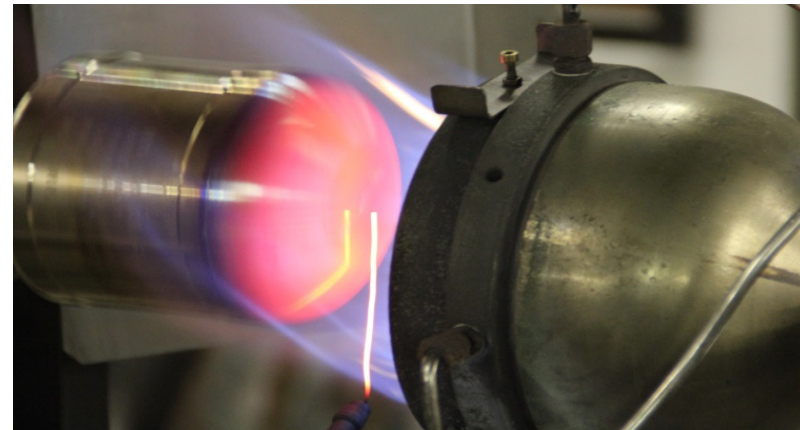
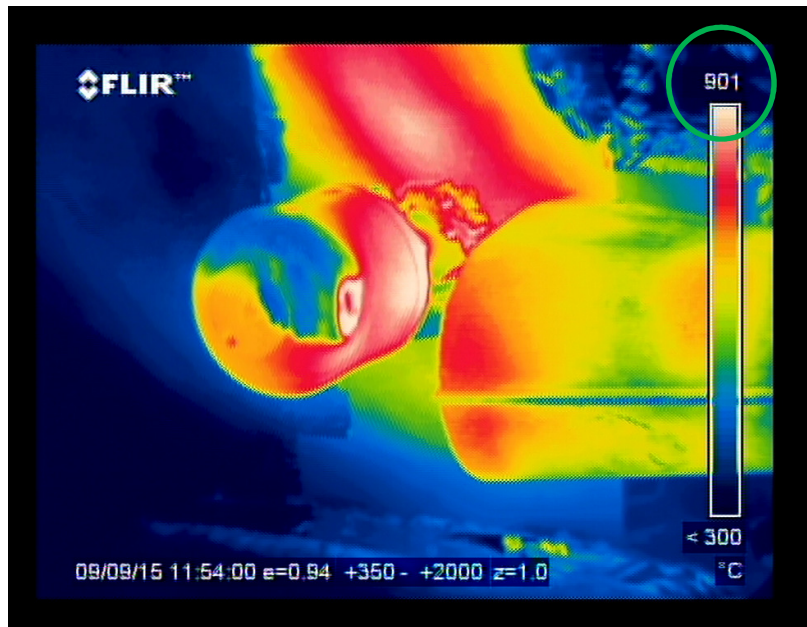


HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows *Environmental tests – fire tests*

Flame from the side



Flame from the front

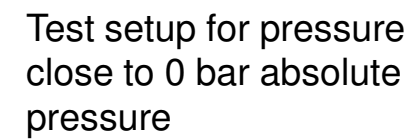


Glass after fire test



Edge welded metal bellows

Hydraulic tests – test setup

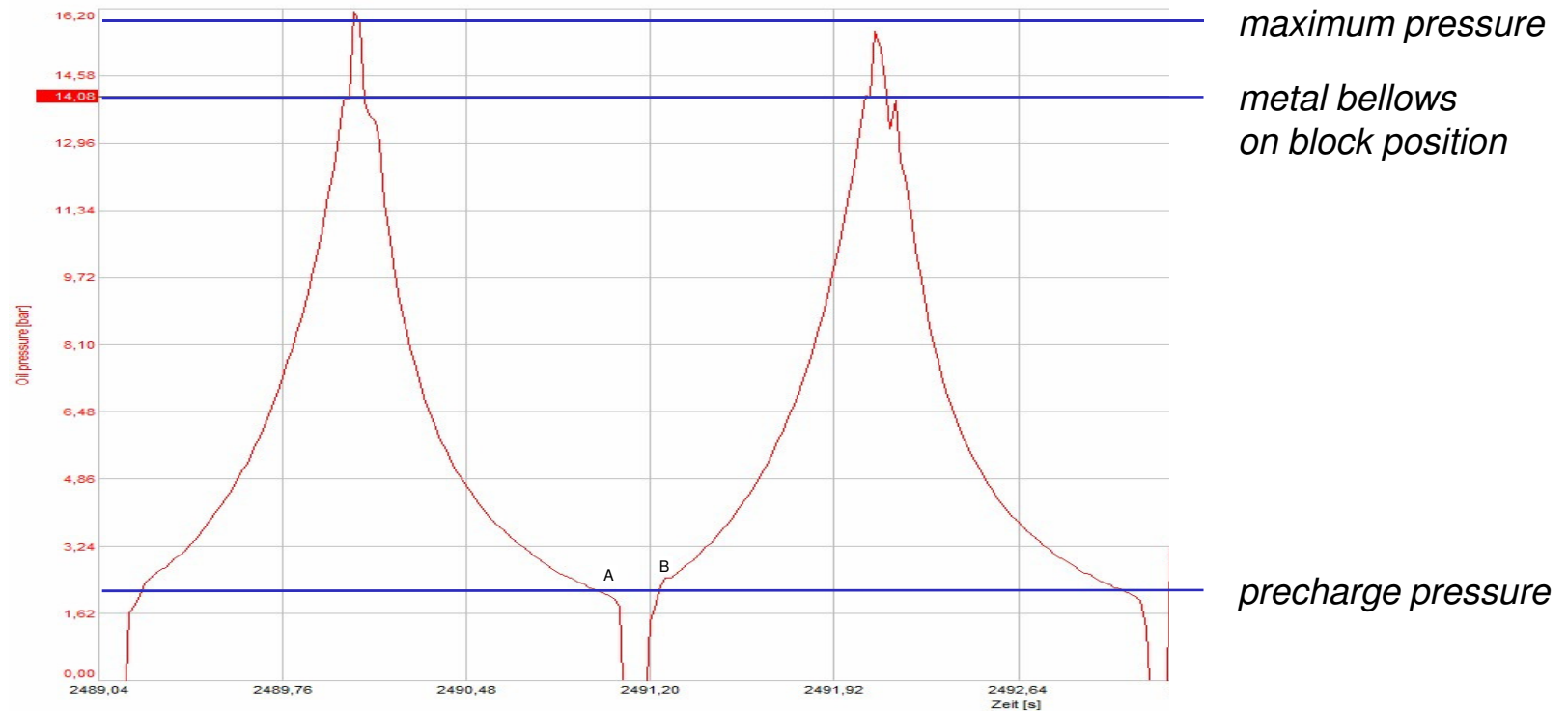




HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows Endurance test





HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows

Industrial applications





HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows

Industrial applications



© HYDAC International GmbH behält sich alle Schutzrechte vor. Alle Rechte zur Nutzung und Weitergabe liegen ausschließlich bei HYDAC International GmbH / © All rights reserved HYDAC International GmbH. No unauthorized copy or distribution allowed



HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows

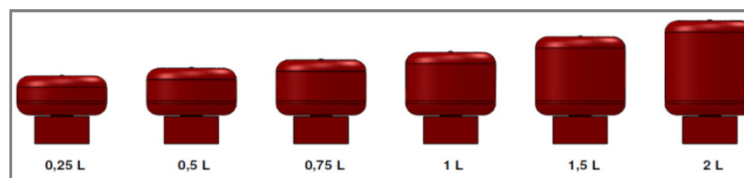
Industrial applications





Edge welded metal bellows

Industrial applications





HYDAC INTERNATIONAL

Speichertechnik / Accumulators

Edge welded metal bellows

Peter Kloft and Daniel Rau

*The 11th International Fluid Power Conference, 11. IFK, March 19-21, 2018,
Aachen, Germany*

**Thank you very
much for your
attention!**

Peter Kloft
HYDAC Technology GmbH
Head of Research & Development
+49 6897 5091657
peter.kloft@hydac.com

