



Seismic devices

mageba seismic protection devices – for reliable preservation of structures



Flendruz Bridge, Switzerland

RESTON®STU Shock Transmission Unit

prevention, protection, control



mageba



Characteristics & Dimensions

Principle

mageba RESTON®STU shock transmission units consist of a piston, a piston rod and a cylinder pipe. They are temporary (dynamic) connecting devices allowing free movements during service conditions while locking up during a shock loading from an earthquake or due to traffic/train braking. In such cases, they transmit the forces to the connected elements.

Shock transmission units – also known as lock-up devices – work on the principle that the rapid passage of a viscous fluid through a narrow gap, orifice or port generates high resistance, while slow passage at low velocity generates only minor resistance. Consequently, RESTON®STU devices lock-up during a quick motion, while delivering a very small reaction force caused by friction during slow displacements such as from thermal expansion or contraction.

Properties

RESTON®STU shock transmission units do not dissipate energy and consequently there

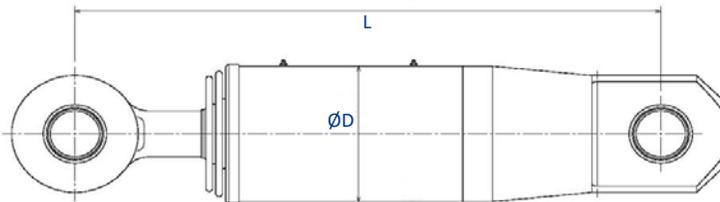
is no reduction of the load impacts. However, by locking up in certain extraordinary events, the RESTON®STU devices temporarily change the static system of a structure, e.g. from simply supported to continuously supported elements.

The main purpose is to control the load distribution and to share the forces with several structural elements. In addition, RESTON®STU devices avoid large movements of the structural elements such as bridge decks in case of sudden load impacts.

RESTON®STU devices are frequently applied in combination with seismic isolators such as mageba LASTO®LRB lead rubber bearings, LASTO®HDRB high damping rubber bearings or RESTON®PENDULUM isolators in order to control the forces and to minimize the movements of structures.

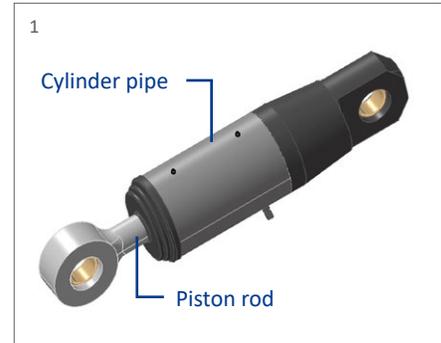
Main Dimensions

The table below summarizes the main dimensions of the standard type devices. Values for other sets of input parameters can be provided upon request.



Unit	Axial Force		Length L		Diameter D		Stroke	
	RM (kN)	RM (kips)	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)
STU 100 - 100	100	22.5	490	19.3	90	3.5	100	3.9
STU 150 - 100	150	33.7	620	24.4	115	4.5	100	3.9
STU 300 - 100	300	67.4	720	28.3	155	6.1	100	3.9
STU 500 - 100	500	112.4	800	31.5	180	7.1	100	3.9
STU 750 - 100	750	168.6	860	33.9	230	9.1	100	3.9
STU 1000 - 100	1,000	224.8	930	36.6	250	9.8	100	3.9
STU 1250 - 100	1,250	281.0	1,000	39.4	280	11.0	100	3.9
STU 1500 - 100	1,500	337.2	1,050	41.3	310	12.2	100	3.9
STU 2000 - 100	2,000	449.6	1,150	45.3	430	16.9	100	3.9
STU 2500 - 100	2,500	562.0	1,250	49.2	440	17.3	100	3.9
STU 3000 - 100	3,000	674.4	1,350	53.1	450	17.7	100	3.9
STU 3500 - 100	3,500	786.8	1,500	59.1	500	19.7	100	3.9
STU 4000 - 100	4,000	899.2	1,900	74.8	520	20.5	100	3.9
STU 4500 - 100	4,500	1,011.6	2,200	86.6	550	21.7	100	3.9
STU 5000 - 100	5,000	1,124.0	2,500	98.4	570	22.4	100	3.9

(Dimensions for differing input parameter can be provided upon request)



- 1 RESTON®STU shock transmission unit
- 2 RESTON®STU devices combined with high damping rubber bearings
- 3 Flendruz Railway bridge, Gstaad, Switzerland Retrofitted with RESTON®STU devices



Properties & Benefits

Mode of Operation

The behavior of RESTON®STU shock transmission units is completely different for the following two operational situations:

- At low velocities, free movement with no load transmission
- At high velocity, the full axial design force is transmitted while any movement is locked and restrained

Materials

The following materials are used by mageba for the production of RESTON®STU devices:

- Main outer steel parts such as cylinder tubes, cylinder pipes, etc. conforming to ASTM A709 Grade 36 and 50
- Piston rods are machined from type 17-4 PH stainless steel billet, through hardened, hand polished to a mirror-like 2 micro-inch surface finish
- Operating fluid is manufactured per U.S. Federal standards, environmentally safe, and cosmetically inert

Viscous Fluid

The viscous fluid used by mageba for seismic devices is protected against aging by special additives. The fluid itself protects the device from inner corrosion. In the case of temperature variations, viscosity remains nearly constant. This characteristic helps the mechanical system to be thermally compensated.

Sealing

The sealing represents the most critical element of the hydraulic system and requires highest quality standards. Consequently, mageba employs a high grade sealing that demonstrates a quasi-zero natural wear and an absolute physical chemic compatibility with the adopted viscous fluid.

Corrosion Protection

mageba proposes corrosion protection systems based on hot dip galvanizing ASTM A-123 / AASTHO M111, or any applicable painting systems approved by the responsible Department of Transportation (D.O.T.).

Corrosion protection systems according to other standards can be provided upon request.

Temperature Resistance

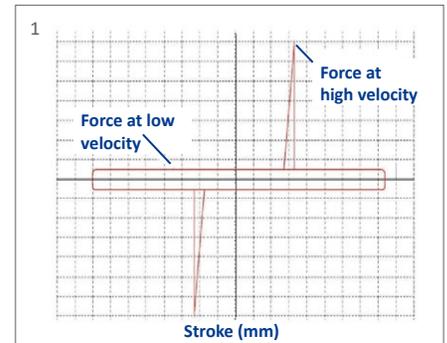
Typically, mageba seismic devices are designed for an operating temperature range of 14 °F to 122 °F (-10 °C to +50 °C). Upon request, devices with even greater resistance with a design temperature range of -31 °F to 176 °F (-35 °C to +80 °C) can be manufactured.

Service Life Time

The high quality of materials and components used for manufacturing the seismic devices ensures a service life of 50 years without requiring extensive maintenance. mageba recommends visual inspection of the devices during regular inspection of the main structure.

Benefits

- Significant increase of the safety of the structure and its users
- Longer lifespan of the devices due to finest quality standards for all components
- Devices tailored to the needs of the client
- Applicable for new structures as well as for retrofitting of existing ones



1 Performance diagram
2 Sealing system
3 Installed RESTON®STU



Seismic devices

Quality & Support

Quality

For five decades, mageba products have proven their worth in thousands of structures under the most demanding conditions. In addition to the product properties, the extensive experience of mageba's well-qualified manufacturing and installation staff also contributes to the high quality and durability of the products.

mageba has a process-orientated quality system. In addition, its quality is regularly inspected by independent testing institutes. mageba factories are AISC certified for Major Bridges (CPT, STD, SPE) and also maintain AWS certifications for D1.1 and D1.5.

Testing

If required by the client, full-scale factory production control testing can be carried out. mageba performs the tests in-house as well as with independent 3rd party test institutes. Commonly performed tests are based on AAHSTO Specifications or European Standard EN 15129:2009. Upon request, customized testing based on other codes can also be performed.

Installation

mageba offers supervision of installation for its products all over the world. The supervision is highly recommended to ensure proper installation of the devices and to provide the benefit of the full mageba guarantee.

Careful handling of the devices is essential during transportation and installation to avoid damages.

Inspection and Maintenance

Thanks to the use of high quality components, the application of advanced design methods and a systematic internal quality assurance system, mageba seismic protection devices can be regarded as maintenance free.

Nevertheless, mageba recommends an inspection to be carried out every 5 years to verify the internal pressure of the units.

Upon delivery of the units, mageba submits an installation as well as an inspection and maintenance manual, allowing a regular and appropriate inspection to be carried out by the operation and maintenance staff.

Customer Support

Our product specialists will be pleased to advise you in the selection of the optimal solution for your project, and to provide you with a quotation.

On our website, mageba-group.com, you can find further product information, including reference lists and tender documentation.

Reference Projects for mageba Seismic Devices



Tappan Zee Bridge (US)



Awaza Bridge (TM)



Flendruz (CH)



Langenargen (DE)



Agin Bridge (TR)



Vasco da Gama Bridge (PT)

mageba Seismic Devices



RESTON®SA & STU



RESTON®PSD



RESTON®PENDULUM



LASTO®LRB & HDRB

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