



Seismic devices

Infrastructure | Buildings | Industrial structures

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 case 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

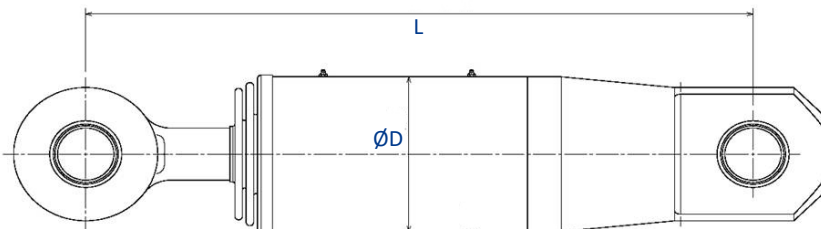
there is no reduction of the load impacts. However, by locking up in certain extraordinary events, the RESTON®STU devices temporarily change the static system of a structure, e.g. from simply supported to continuously supported elements.

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.

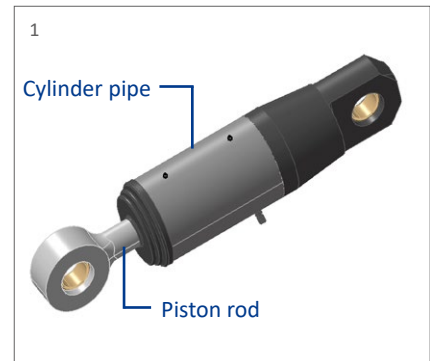
Main dimensions

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 RM (kN)	Length L (mm)	Diameter D (mm)	Stroke (mm)
STU 100 - 100	100	490	90	100
STU 150 - 100	150	620	115	100
STU 300 - 100	300	720	155	100
STU 500 - 100	500	800	180	100
STU 750 - 100	750	860	230	100
STU 1000 - 100	1'000	930	250	100
STU 1250 - 100	1'250	1'000	280	100
STU 1500 - 100	1'500	1'050	310	100
STU 2000 - 100	2'000	1'150	430	100
STU 2500 - 100	2'500	1'250	440	100
STU 3000 - 100	3'000	1'350	450	100
STU 3500 - 100	3'500	1'500	500	100
STU 4000 - 100	4'000	1'900	520	100
STU 4500 - 100	4'500	2'200	550	100
STU 5000 - 100	5'000	2'500	570	100

(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 behaviour 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. of S355 steel according to EN 10025 or equivalent
- Piston rods of 42CrMo4 steel according to EN 10083 or equivalent
- Hydraulic valves of cast steel according to EN 10025 or equivalent

Higher steel grades can be processed if required by the project specifications or by the local codes.

Viscous fluid

The viscous fluid used by mageba for the seismic devices is protected against aging by special additives. The fluid itself protects the device from inner corrosion. With respect to temperature variations, the viscosity shows a nearly constant characteristic. This characteristic facilitates 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 standard corrosion protection systems according to EN ISO 12944, with corrosivity category depending on location, environmental conditions and the required degree of protection.

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

Temperature resistance

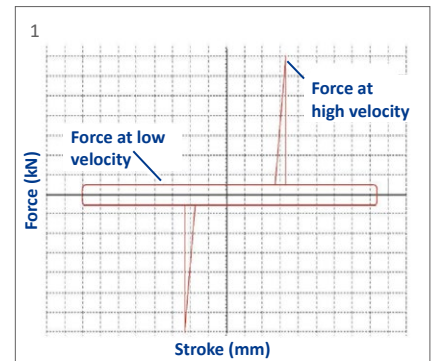
Typically, mageba seismic devices are designed for an operating temperature range of $-10\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$. Upon request, devices with even greater resistance with a design temperature range of $-35\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$ can be manufactured.

Service life time

The high quality of materials and components used for manufacturing the seismic devices ensure a service life of 50 years without the requirement for 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
- Higher life time 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



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 that is certified in accordance with ISO 9001:2008. mageba's factories are certified for welding in accordance with ISO 3834-2 and to the current steel construction standard EN 1090.

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 European Standard EN 15129:2009 or AASHTO "Guide Specifications for Seismic Isolation Design". 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 take 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 protection devices



Awaza Bridge (TM)



Flendruz (CH)



Langenargen (DE)



Ramstore Bridge (KZ)



Agin Bridge (TR)



Vasco da Gama Bridge (PT)

mageba seismic protection devices



RESTON®SA & STU



RESTON®PSD



RESTON®PENDULUM



LASTO®LRB & HDRB

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