



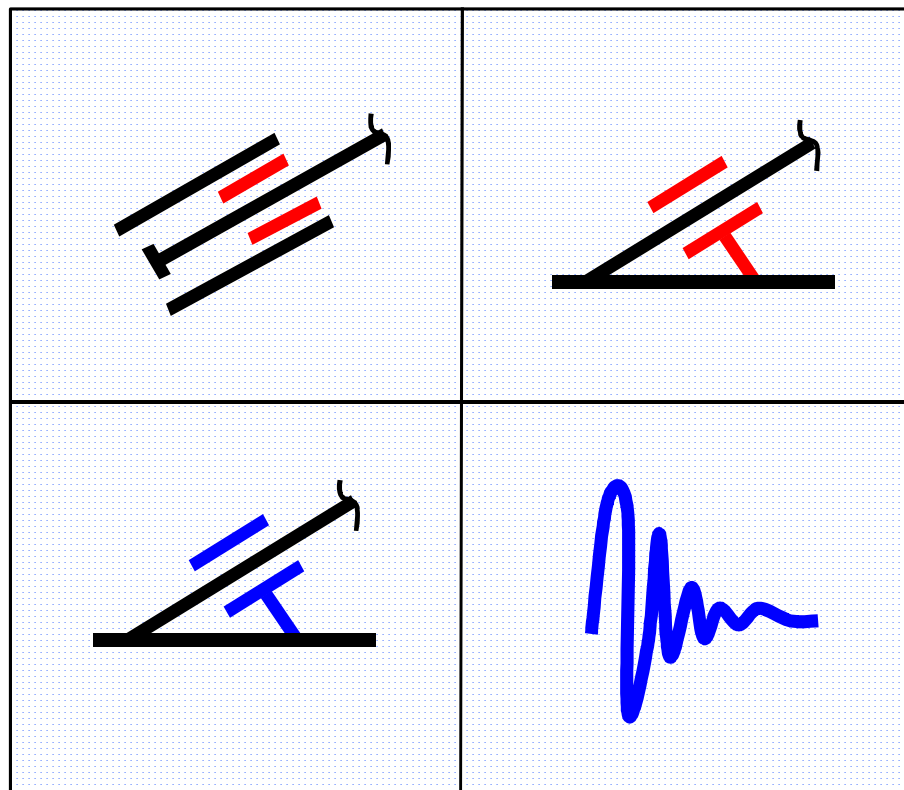
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## MAURER Systems for Damping of Cables and Suspensions



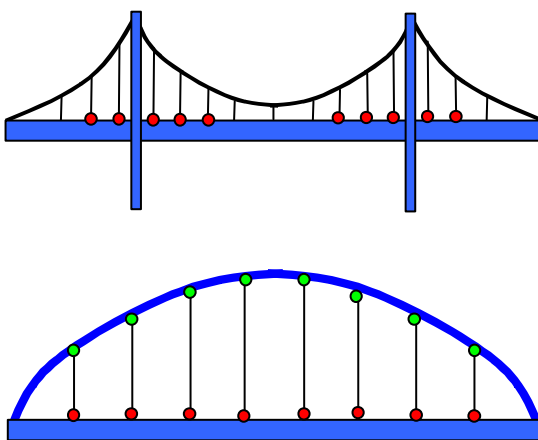
Many modern bridge structures are constructed in a very slender and tall manner to satisfy architectural and economical considerations of the owner as well.

Therefore often vibration problems of the deck occur. With suitable damping measures, means with especially tuned dampers, the deck vibrations can be damped such effectively, that no significant problems will occur. Therefore please also see the product information "MAURER Tuned Mass and Viscous Dampers".



*MAURER Systems for Damping of Cables and Suspensions*

For suspension bridges, cable stayed bridges and arch bridges with hangers in addition the cables and hangers can vibrate.



- = Location for MAURER dampers
- = possible additional location for MAURER dampers

These vibrations of the cables can bring along several problems:

- Phenomenon of resonance resulting in structural damages and possibly in a final structural collapse.
- Reduction of comfort for normal traffic use of the bridge.
- Fatigue problems of the cables, hangers or other components, whereby the structural service life and the maintenance interval will be significantly shortened respectively.

The MAURER vibration dampers reduce rather effectively the displacement amplitudes and accelerations of the cables or hangers as well. These dampers (see the red marks in above sketch) are fixed by bolting at the cable or hanger legs without influencing the structural aesthetics at all. In case the damping at the cable or hanger leg is not sufficient for special structural demands, additional dampers can be placed at the cable or hanger top end (green marks). Also in such with this damper arrangement the structural overall aesthetics are not disturbed.

For the effective and individual adaptation of the necessary damping, different types of dampers are available:

- **SDI-R:** Integrated elastomeric or friction damper
- **SDE-R:** External elastomeric or friction damper
- **SDE-V:** External viscous damper



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## MAURER Systems for Damping of Cables and Suspensions



### SDI-R: Integrated elastomeric or friction damper

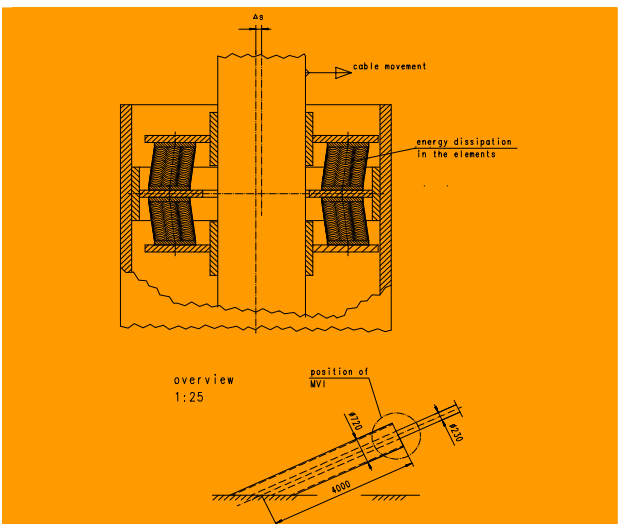
A rather aesthetic version for a cable or hanger damping system is the integration of the damper of type SDI-R in a tube at the cable or hanger bottom end. The damper is entirely installed into a cover tube. However it has to be checked if the displacement at the damping location is enough to get the damper activated and if the cover tube is suitable to accommodate the damper itself.

For this damper type high damping elastomers (20-30% damping), cured in special geometries and cut in special shapes are applied. Or alternatively friction liners, which are pre-stressed together with a defined force, can be integrated.

All dampers are individually adapted to the structural requirements (damping, space conditions, etc.) and are individually dimensioned.



Traunsteig in Wels/Austria with cable dampers of type SDI-R



SDI-R: Possible arrangement of the damping elements if elastomers are applied



SDI-R test at the University Munich



*MAURER Systems for Damping of Cables and Suspensions*



SDE-R: External elastomeric or friction damper

The SDE-R-Damper is externally mounted with clamps to the cable or hanger with a sufficient distance to the firm fixation of the cable or hanger leg. This solution is chosen, if a cover tube is not existing or the cover tube is not suitable for a integration of the damper type SDI-R.

Depending on the structure elastomeric, friction or viscous damping elements are applied. The SDE-R type is fitted with special elastomeric or friction damping elements.

All dampers are individually adapted to the structural requirements (damping, space conditions, etc.) and are individually dimensioned.



*Footbridge Forchheim/Germany with SDE-R cable dampers at the stay cables*



*SDE-R test with hysteretic loop*



*SDE-R installed in the bridge Forchheim*





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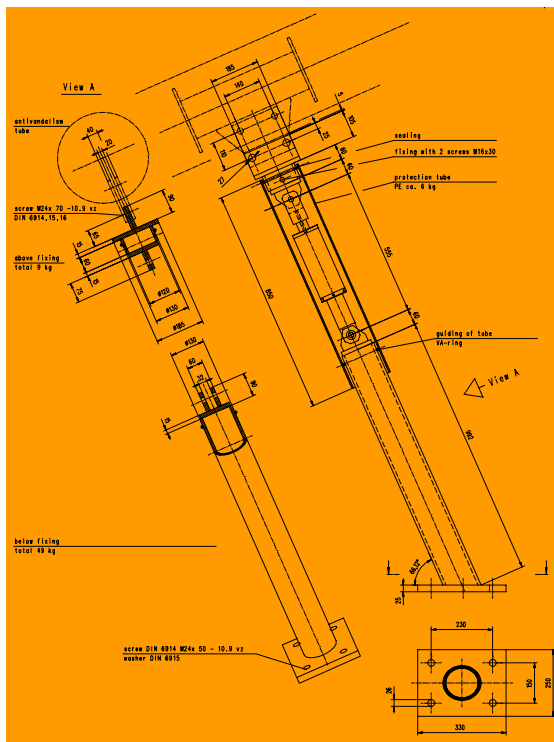
### SDE-V: External viscous damper

The external damper of the type SDE-V has got a highly efficient viscous damping element instead of the elastomeric or friction element of the SDE-R type. These viscous elements have got a higher efficiency than the elastomeric or friction elements and are applied mostly for very energetic cable or hanger vibrations, e.g. cables longer than 70 m.

The viscous damping elements are designed in various versions, depending on the individual project.



*Eilandbrug at Kampen/Netherlands with dampers of type SDE-V*



*SDE-V: Externally arranged cable damper at the cable bottom with viscous damping element*



*SDE-V in the test rig of the University Munich*





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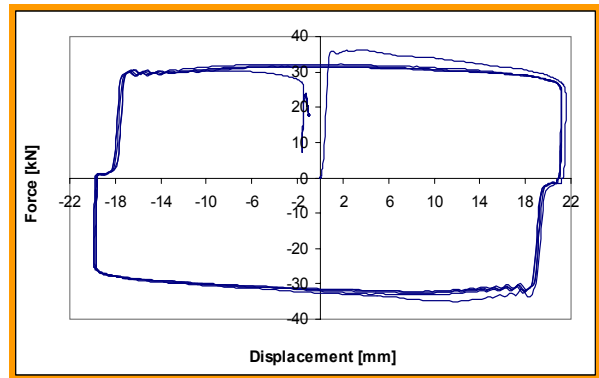


Test of the cable and hanger dampers

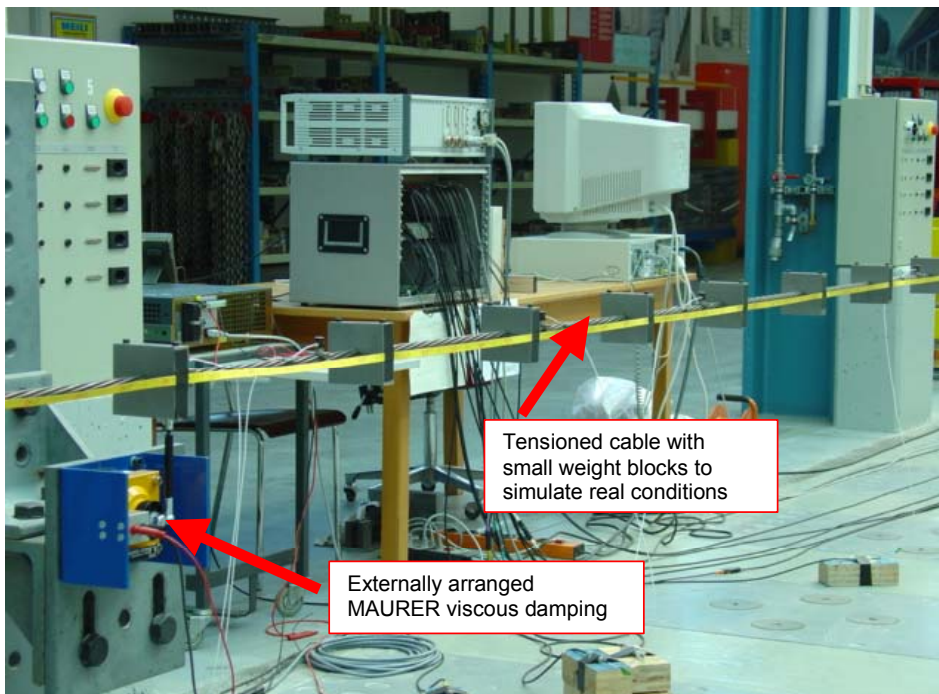
The tests of the various damper types are continuously carried out with regard to the required quality control for project orders and to push the product development.

The tests on individual projects confirm the device's requirements, like displacement, damping function and efficiency respectively.

For all cable and hanger dampers a permanent product development is safeguarded in the company headquarters in Munich, at the University in Munich and at the EMPA (Material Testing Institute) in Dübendorf/Switzerland. The EMPA has got a special cable vibration test rig for the testing of prototype cable dampers.



*Hysteretic loops resulting from damper tests with highly effective viscous damping elements*



*Test rig for cable vibrations at the EMPA in Dübendorf/Switzerland with MAURER damping element*