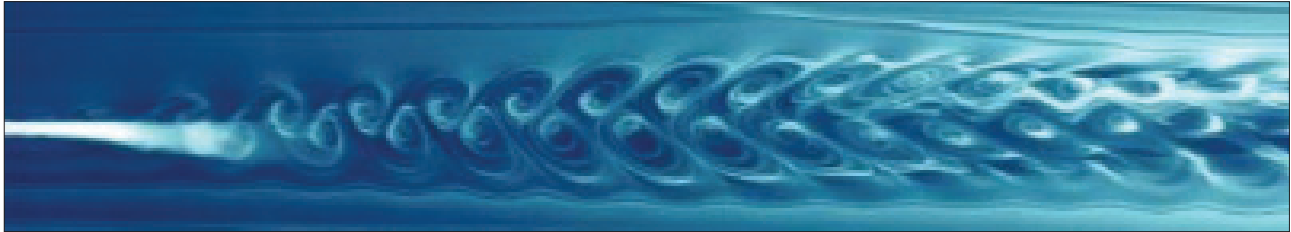
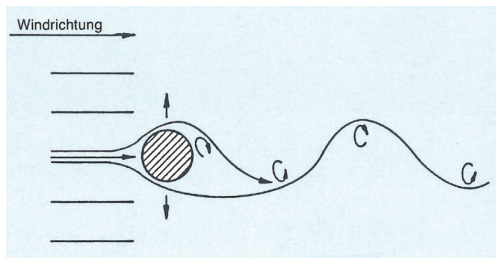


Vibration dampers

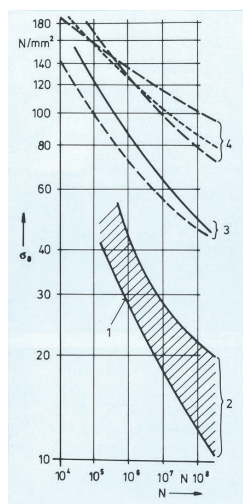
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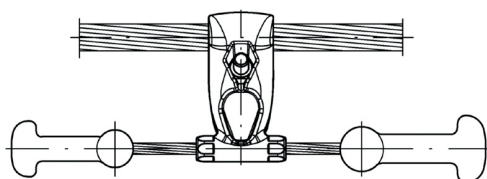
Vortex shedding at a laminar wind inflow



Wind induced vibrations vertical to the wind flow



Safe border line for an Al-alloy cable



Stockbridge damper with 4 resonances
with open weights

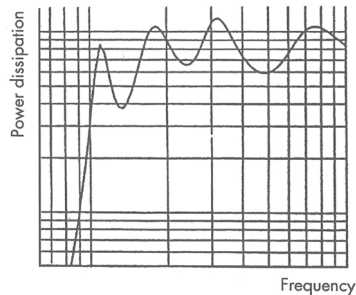
General

On tensioned overhead conductors, wind flow leads to high-frequency vibrations, with amplitudes in the magnitude of one conductor diameter. This is caused by vortex shedding, which excites the conductor into Aeolian vibrations at right angles to the wind direction.

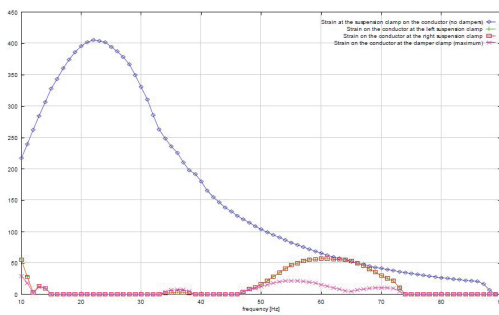
Aeolian vibration occurs at wind velocities of approximately 1-7m/s causing vibration frequencies of 5-100 Hz, dependent on conductor diameter and tension. These vibrations will lead to internal conductor fatigue stress at suspension and tension fittings, applying compression and bending loads at conductor support points. As higher tensile loads are applied vibration increases. Line routes along flat terrain or spanning valleys require higher levels of protection, particularly where prevailing wind directions are perpendicular to the line route. Fatigue stresses will damage the conductor, causing strand breakage and cable failure. Insulator string ball fittings and turnbuckles are particularly at risk due to their specific shapes. For the conductor, including tension and support fitting protection, suitable vibration dampers offer a level of protection that reduce stresses within the system to safe operating levels, protecting from long term fatigue failures during the operational life of the network.

Stockbridge dampers

Since construction of the first overhead lines, there have been problems with vibrations. Very soon, the Stockbridge Vibration Damper (named after its inventor) proved to be a most effective type of damper. These dampers are a combined energy absorbing resonance type, that damp all frequencies that occur as part of an energy balanced system. Mosdorfer dampers work particularly well, where the wind energy will be partly absorbed by the conductor, and the remaining majority absorbed by the damper.



Energy consumption of a 4R damper



Vibration study: bending stresses with and without dampers



Field measurement with recorder at a HSU clamp

This method of system damping is only effective if the conductor and damper are harmonized. This requires that damper weights and messenger cable lengths are compatible with the conductor. This design harmonization makes it possible to offer dampers with 2 or 4 resonance frequencies, which do not overload the conductor at the clamp interface, or over stress the messenger cable.

Vibration studies

For an energy balanced system, it is therefore necessary to ensure that the dampers are “tuned” and compatible with the conductor system. A vibration study considers line route terrain, climatic conditions, conductor data (Conductor Data Sheet) line tension, configuration, span lengths, system voltage, and self-damping characteristics of the conductor if known. Data from existing lines, suspension and tension arrangements are also required when available. This data enables Mosdorfer to make vibration studies, choose the most suitable damper type, and recommend both quantities and positioning within the span to protect the system.

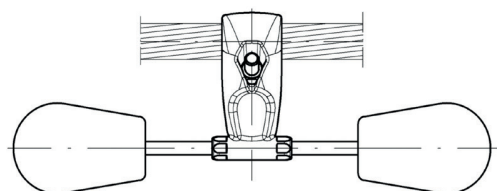
Field measurements on existing overhead lines

Existing vibration measurements from existing lines valuable data for making vibration studies. Mosdorfer-DAMP are active making field measurements, which assist with system life expectancy calculations. By using these measurements, (each taking approximately 3 months) combined with conductor self damping tests in Mosdorfer’s own laboratory, our recommendations can be optimised to offer economic solutions for system protection.

Types of dampers

Standard Stockbridge damper types have open weights cast onto the messenger cable. Conductor clamps are manufactured in aluminium, either forged or cast. Messenger wires are manufactured from high tensile hot dip galvanized steel or stainless steel wires, constructed to incorporate good energy dissipation and damping properties. Screws and nuts for cast clamps are hot dip galvanized. Forged clamps use stainless steel screws.

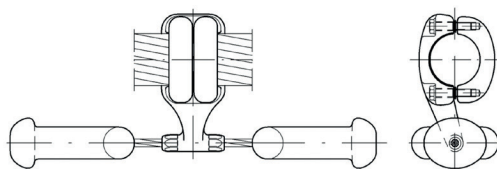
Different design features are possible, with the following variations available:



Stockbridge dampers with bell weights

Damper weights

Bell-shaped damper weights are available for all types. These have superior high voltage corona properties; particularly suitable for vertical twin bundles. The damper weights can also be fixed to the conductor by means of pressed tapered cones.

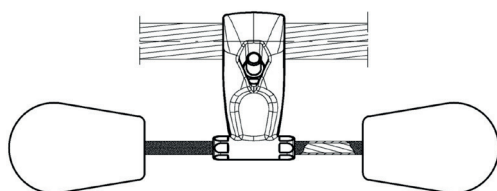


Damper with special clamps

Clamps

For copper conductor compatibility and applications, forged copper alloy clamps or bimetallic (copper-aluminium) conductor clamp groove sleeves are available.

For larger non-standard conductors, special clamps are also available.



Damper with a protected damper wire

Messenger damper wire

For highly corrosive atmospheres and regions, stainless steel material may be necessary. For additional corrosive protection of all messenger cable types, sealed elastomer sleeves are also available.

Dampers for fibre optic cables

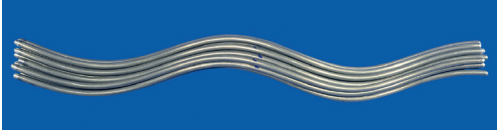
These dampers are generally lighter weight types with bigger clamps as they are mounted on heliformed rods. These are described in detail in Part [material for fibre optic lines](#) of the catalogue, including Spiral dampers.

Break away nuts

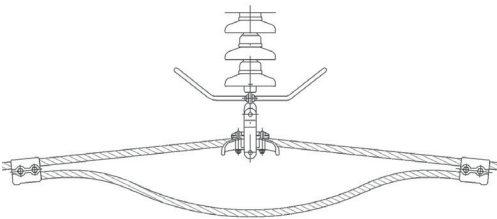
For correct tightening of the screws break away nuts can also be supplied.

Testing and inspection of the dampers

Vibration dampers, both dynamic performance and physical properties are developed, tested and checked in accordance with *EN 61897* - Overhead lines - Requirements and tests for Stockbridge type Aeolian vibration dampers. High Voltage Corona and partial discharge testing is made in accordance with *EN 61284* - Overhead lines - Requirements and tests for fittings. Ferrous component galvanization and tests are made in accordance with *ISO EN 1461* Hot dip galvanized coating on fabricated iron and steel articles - Specifications and test methods. Stainless steel components conform to - *ISO EN 3506* - Mechanical properties of corrosion-resistant stainless steel fasteners.



Example for round wire rods



Example for Bretelle clamps

Armour rods

Helical wire fittings are made of formed round wire rods, with the ends shaped depending on the material and diameter. The formed diameters of the wires are smaller than the diameter of cable to be applied. This creates uniform radial pre compression of the spiral without permanent distortion of the wires or sub-sets. This applies the initial low stress grip of the cable, which increases as a resultant of higher tension forces that convert to high frictional grip. Uniform radial loads and grip increase over a longer application and contact length that provide low relative and uniform radial stress. The reinforcement of the cross section causes lower conductor stresses. Identification and labelling of products are in accordance with IEC 61284 (Rules of behaviour with respect to possible hazards when dealing with electric equipment and equipment employing similar techniques) will either be printed on individual rod sets or stated on a label connected to the set. The lay direction of the helical rods is normally same as that of the outermost layer of the conductor, typically right hand lay. The material used is the same as that of the conductor.

Bretelle clamps

These clamps are specially intended for the installation of conductor loops. These loops primarily have a damping function but they will also help to prevent conductor rupture. The clamping grooves are designed to achieve a high slipping load. The conductor channel of the Bretelle conductor is grooved whereas the channel for the conductor is serrated in order to make it possible to protect the conductor without affecting the clamp function.

Two types are available:

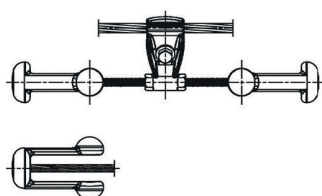
Bretelle clamps - open type:

with a continuous channel for the conductor (multiple loops).

Bretelle clamps - Closed type:

the closed end guarantees optimal corona protection. An internal recess serves to take up the binding clamp. The installation distance will be calculated upon request.

Stockbridge damper with casted clamp for aluminium based conductors



material: aluminium, **casted**, steel, hot dip galvanized; cast iron, hot dip galvanized

L.-Nr.	cond. Ø (mm)	screws	version	kg
9301.01/G/1	7,0 - 14,0	M10	1	1,70
9301.0010	7,0 - 14,0	M10	2	1,50
9303.01/G/1	7,0 - 14,0	M10	2	2,10
9301.03/G/1	14,0 - 16,5	M10	1	1,81
9303.03/G/1	14,0 - 16,5	M10	2	2,20
9303.04/G/1	14,0 - 19,0	M12	2	2,23
9301.04/G/1	16,6 - 19,0	M10	1	1,80
9301.020/G/1	19,0 - 29,0	M14	1	2,10
9304.021/G/1	19,0 - 29,0	M14	1	4,20
9306.03/G/1	19,0 - 29,0	M14	1	6,00
9303.006/G/1	19,0 - 29,0	M14	2	2,55
9305.06/G/1	19,0 - 29,0	M14	2	5,30
9304.10/G/1	28,5 - 41,0	M14	1	4,26
9306.07/G/1	28,5 - 41,0	M14	1	6,10
9303.10/G/1	28,5 - 41,0	M14	2	2,60
9305.07/G/1	28,5 - 41,0	M14	2	5,17

Version 1 covers two resonant frequencies

version 2 covers four resonant frequencies.

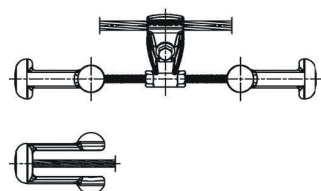
The weights are casted onto the messenger wire.

Models with compression sleeve are available upon request.

Models with stainless steel messenger wire are available upon request.

Other types are available upon request.

Stockbridge damper with forged clamp for aluminium based conductors



material: aluminium, **forged**; steel, hot dip galvanized; cast iron, hot dip galvanized

L.-Nr.	cond. Ø (mm)	screws	version	kg
9301.020/EA1	11,0 - 14,5	M10	1	1,50
9303.020/EA1	11,0 - 14,5	M10	2	2,10
9301.030/EA1	14,5 - 17,0	M10	1	1,59
9303.030/EA1	14,5 - 17,0	M10	2	2,05
9301.040/EA1	17,0 - 19,5	M10	1	1,57
9301.050/EA1	19,5 - 22,0	M12	1	1,65
9304.050/EA1	19,5 - 22,0	M12	1	3,95
9303.050/EA1	19,5 - 22,0	M12	2	2,05
9301.060/EA1	22,0 - 24,5	M12	1	1,79
9304.060/EA1	22,0 - 24,5	M12	1	3,80
9303.060/EA1	22,0 - 24,5	M12	2	2,07
9301.070/EA1	24,5 - 28,0	M12	1	1,91
9304.070/EA1	24,5 - 28,0	M12	1	4,00
9303.070/EA1	24,5 - 28,0	M12	2	2,33
9304.080/EA1	28,0 - 31,0	M12	1	4,00
9303.080/EA1	28,0 - 31,0	M12	2	2,20
9304.090/EA1	31,0 - 33,0	M12	1	4,00
9306.090/EA1	31,0 - 33,0	M12	1	5,90
9303.090/EA1	31,0 - 33,0	M12	2	2,40
9304.100/EA1	33,0 - 35,0	M12	1	4,10
9303.100/EA1	33,0 - 35,0	M12	2	2,60
9304.110/EA1	35,0 - 38,0	M12	1	4,32
9306.110/EA1	35,0 - 38,0	M12	1	6,20
9308.110/EA1	35,0 - 38,0	M12	1	8,10
9304.120/EA1	38,0 - 42,0	M12	1	4,10
9306.120/EA1	38,0 - 42,0	M12	1	6,32
9304.130/EA1	42,0 - 46,0	M12	1	4,10
9306.130/EA1	42,0 - 46,0	M12	1	6,00

Version 1 covers two resonant frequencies

version 2 covers four resonant frequencies.

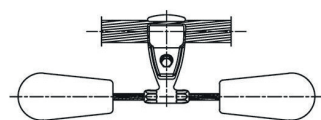
The weights are casted onto the messenger wire.

Models with compression sleeve are available upon request.

Models with stainless steel messenger wire are available upon request.

Other types are available upon request.

Stockbridge damper with bell weights, with forged clamp



material: aluminium, **forged**; steel, hot dip galvanized; cast iron, hot dip galvanized

L.-Nr.	cond. Ø (mm)	screws (mm)	kg
9303.9010	9,0 - 11,0	M10	2,99
9301.9020	11,0 - 14,5	M10	1,40
9303.9020	11,0 - 14,5	M10	2,99
9301.9030	14,5 - 17,0	M10	1,80
9303.9030	14,5 - 17,0	M10	3,06
9303.9050	19,5 - 22,0	M12	3,00
9304.9050	19,5 - 22,0	M12	4,91
9303.9060	22,0 - 24,5	M12	3,00
9304.9060	22,0 - 24,5	M12	4,89
9303.9070	24,5 - 28,0	M12	3,32
9304.9070	24,5 - 28,0	M12	5,30
9306.9070	24,5 - 28,0	M12	5,57
9303.9080	28,0 - 31,0	M12	3,28
9304.9080	28,0 - 31,0	M12	5,10
9306.9080	28,0 - 31,0	M12	5,76
9303.9090	31,0 - 33,0	M12	3,27
9306.9090	31,0 - 33,0	M12	5,69
9308.9090	31,0 - 33,0	M12	9,00
9304.9100	33,0 - 35,0	M12	5,11
9304.9110	35,0 - 38,0	M12	5,31
9306.9110	35,0 - 38,0	M12	6,01
9308.9110	35,0 - 38,0	M12	9,00
9308.9130	42,0 - 46,0	M12	9,20
4998.160	56,9	M14	0,00

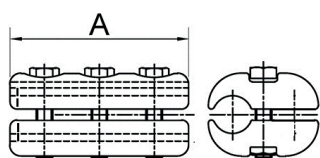
The weights are casted onto the messenger wire.

Models with compression sleeve are available upon request.

Models with stainless steel messenger wire are available upon request.

Other types are available upon request.

Bretelle clamp for damping wire, closed type



material: aluminium, **forged** steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	screws (mm)	kg
9350.0002	17,5 - 20,5	100	2	0,60
9350.03/1	20,5 - 23,5	100	2	0,90
9350.04	23,5 - 26,5	100	2	0,80
9350.0018	26,5 - 27,7	135	3	1,40
9350.0007	29,5 - 32,5	100	2	0,90
9350.0014	34,0 - 36,6	150	3	2,20
9350.0010	38,3 - 41,1	150	3	2,10
9350.0016/DC	38,3	160	3	2,50

Bretelle clamps with stainless bolts on request.

Bretelle clamp for damping wire, open type



material: aluminium, **forged** steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	screws (mm)	kg
9350.0011	17,5 - 21,0	125	3	1,00
9350.0021	23,52	125	3	1,00
9350.0012	26,5 - 27,7	135	3	1,40
9350.0015	34,0 - 36,6	150	3	2,30
9350.0013	38,3 - 41,1	150	3	2,10
9350.0017/DC	38,3	160	3	2,50

Bretelle clamps with stainless bolts on request.

