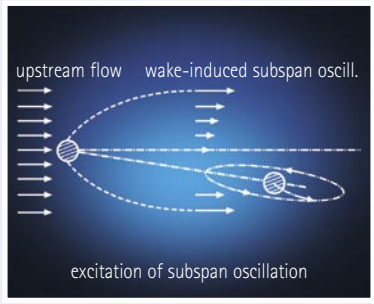
RIBE®

ELECTRICAL FITTINGS

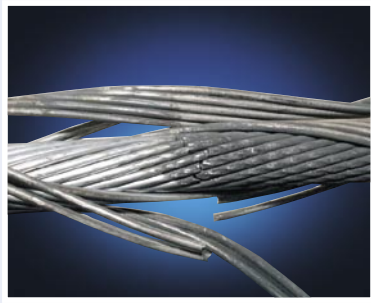
RIBE Spacer Dampers
Protect Your Investment

Wind-induced vibrations in overhead transmission lines can damage conductors

Bundled conductor systems are used in overhead transmission lines for high-voltage and extra-high-voltage grids for electrical reasons. A dreaded phenomenon in such systems is the occurrence of high-frequency, short-wave vibrations in the bundled conductors due to natural wind flow at wind speeds between 1 and 7 m/s. These vibrations are caused by the periodic shedding of vortices on the downstream side of the conductors (Kármán vortex street), which induces vibrations in the subconductors transverse to the direction of wind flow. The frequencies are in the range from 5 to 60 Hz with amplitudes up to 1 x conductor diameter.



These vibrations cause alternating bending strains in the conductors, which are superimposed on the static tensile and bending strains. This can result in conductor damage at the clamping points (suspension and tension clamps, spacer clamps) that ranges from fatigue breakages in single wires to breakage of the complete conductor. If the conductor vibrations cause the spacer clamps to loosen, the loose clamp shells wear through the conductor very quickly. The vibrations spread via the suspension and tension fittings to the mast and lead to problems such as shaking out of joints to breakage of mast struts.

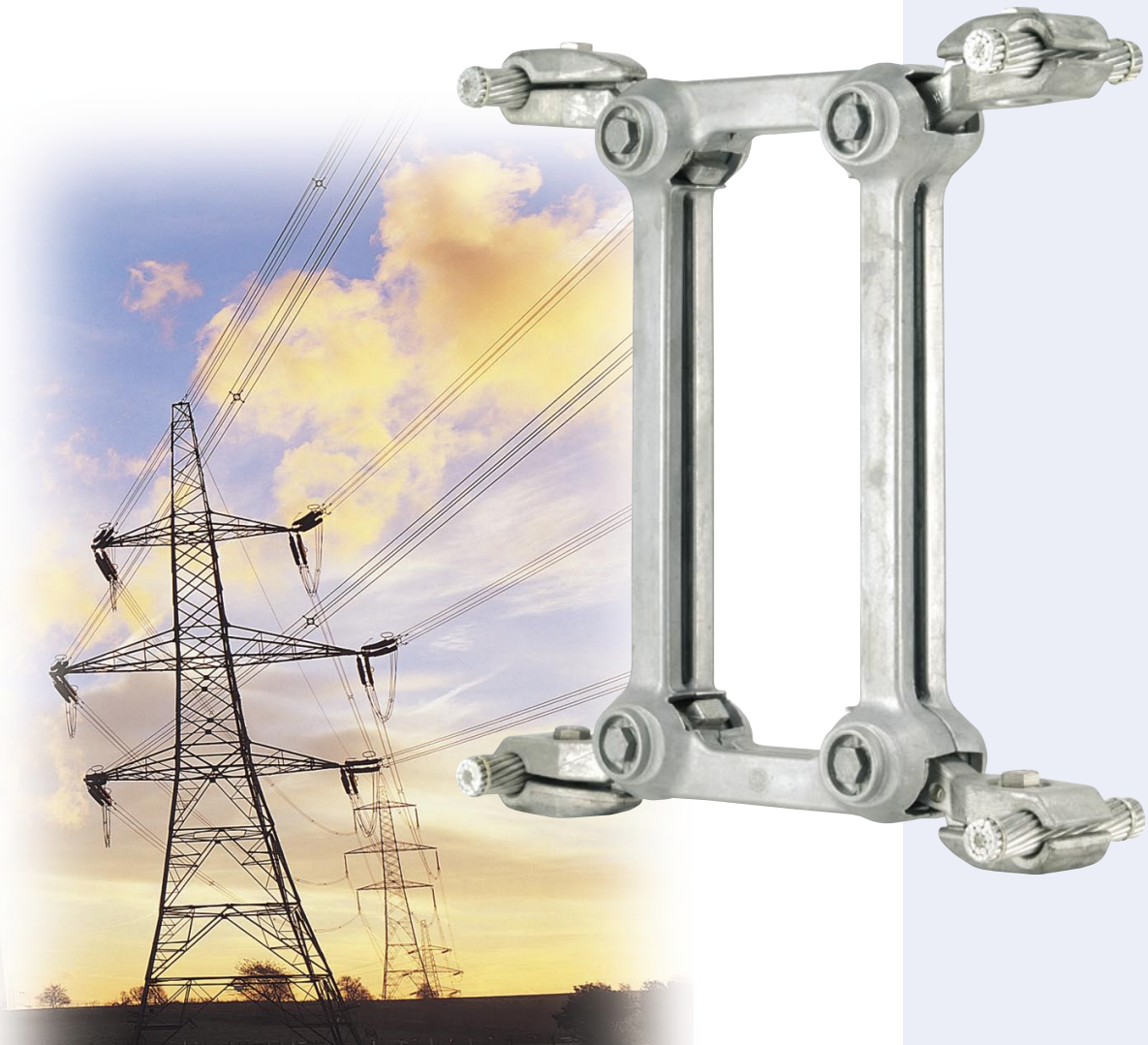


Another vibration phenomenon is the occurrence of low-frequency subspan oscillations, which can have amplitudes large enough to cause subconductors to hit each other. Subspan oscillations occur in horizontally adjacent subconductors at high wind speeds (greater than 6 m/s) when the downstream subconductor is affected by the wake of the upstream subconductor.

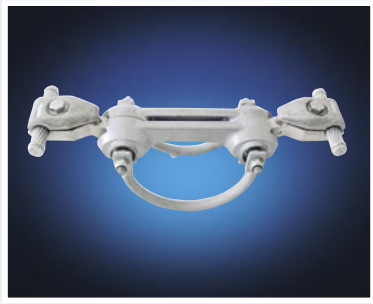
RIBE spacer dampers protect your investment

The use of vibration dampers alone is no longer sufficient for damping the short-wave conductor vibrations in bundled conductors. RIBE spacer dampers offer an intelligent solution to this problem: The presence of the spacers (spacing arms, frame) means that the vibrations are reflected at the spacer installation points in the subspans and do not reach the vibration damper. Although rigid spacers impair the vibration build-up in the span, they do not generally reduce the vibration level. It is therefore necessary to use the spacers themselves as vibration dampers. In principle, effective protection must be provided for conductors if an increased tendency to conductor vibrations exists.

Short-wave conductor vibrations and subspan oscillations can be limited and controlled by damping measures using RIBE spacer dampers.



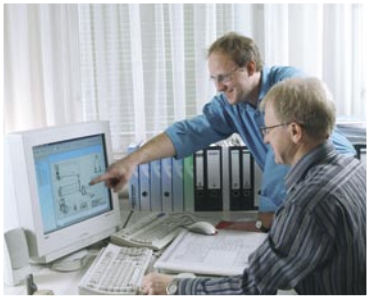
RIBE now has 25 years of operational experience in the field of spacer dampers, which has enabled it to achieve an outstanding position in this field. On the basis of this experience, RIBE currently concentrates mainly on damping elements of silicone rubber. Silicone rubber has three outstanding material properties that make it suitable for use in this field:

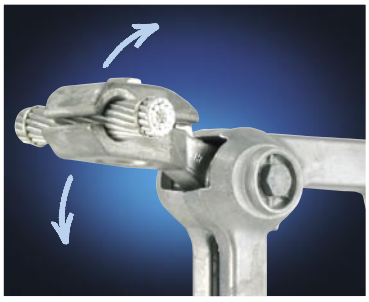


- optimum working properties at high and low temperatures
- very good ozone resistance
- long-term UV resistance

RIBE has the application engineering know-how

RIBE not only supplies sophisticated products, but also offers its customers application engineering support. RIBE Engineering prepares damping concepts based on project data such as conductors, length of spans and installation data (conductor tension forces), defines the necessary quantities and installation locations and provides calculations to verify the optimum effectiveness of the concepts.

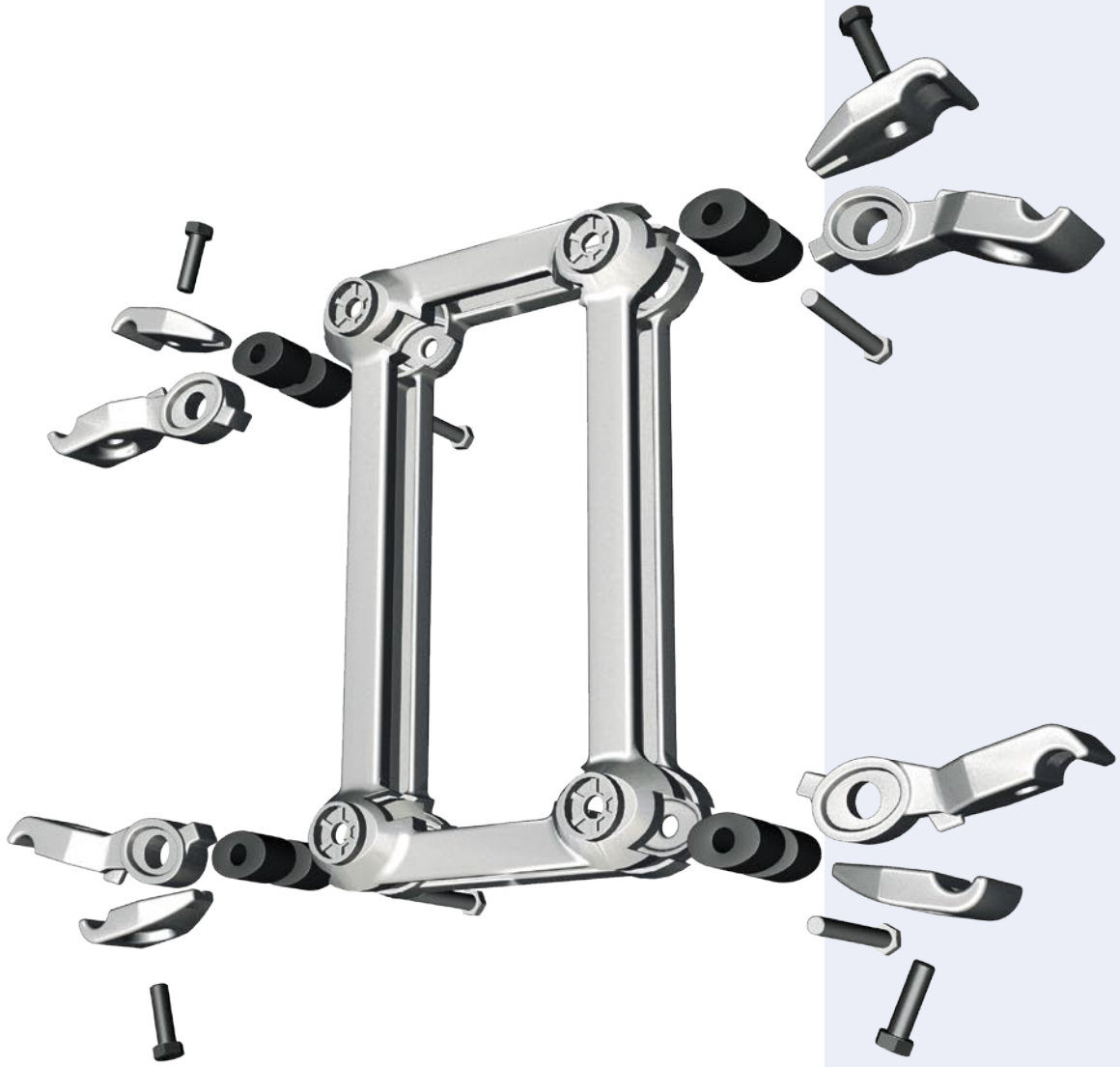


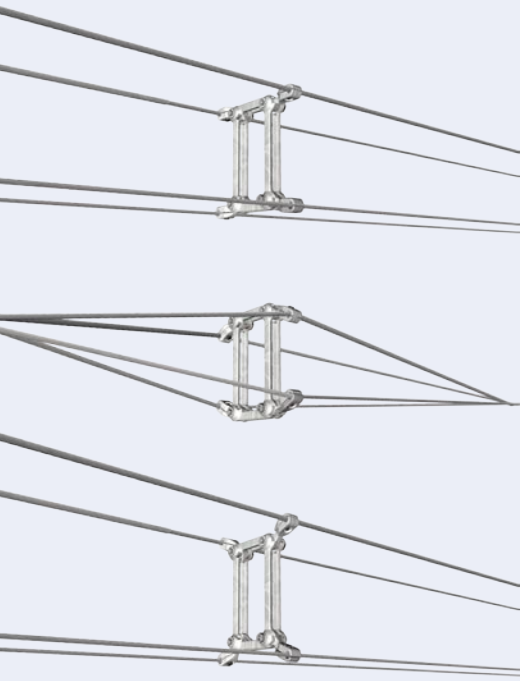


Damping wind-induced vibrations through energy absorption in the elastic mountings of the arms

The spacers must maintain the subconductors in the bundle at the specified distance and in the specified arrangement (2-conductor, 3-conductor or 4-conductor bundle) under normal operating conditions (with wind and ice load). The intelligent design of the RIBE spacer dampers supports the absorption and transfer of aeolian conductor vibrations in the span of the spacers, without damage to the conductor. The spacers damp conductor vibrations by absorbing the energy in the elastic components (silicone rubber damping elements) of the clamping arm mountings.

RIBE spacer dampers prevent the subconductors hitting each other or twisting and entangling in the bundle. Accurate calculations by RIBE Engineering to ensure the exact determination of the number of spacers and the distances between them are a decisive requirement at this point.





Short-circuit load

If a short-circuit occurs, the effects of the electromagnetic forces between the subconductors carrying the short-circuit current cause contraction of the conductor bundle between the spacers. This subjects the spacers to an extreme pressure load and then to an extreme tension load when the short-circuit current is removed.

The pressure and tension forces caused by a short-circuit must be absorbed by the spacers without permanent deformation or damage to the conductors.

RIBE quality – for a long life

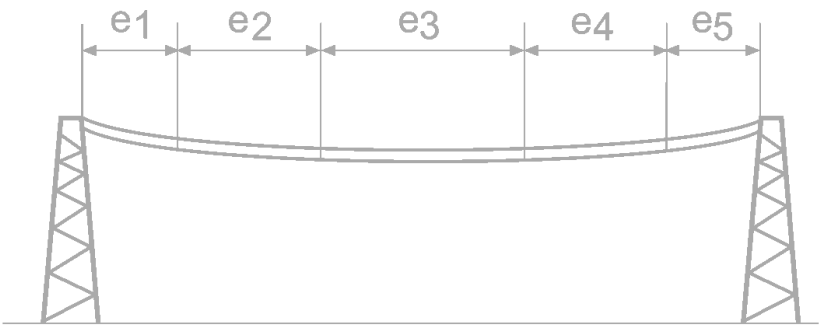
RIBE spacer dampers can withstand these extreme requirements without problems. All RIBE solutions and products are distinguished by their excellent quality and long life – the result of perfect cooperation between development, production and sales and sound market knowledge. An efficient stock management system also ensures constant availability for delivery.

RIBE Engineering – from development to practical application

Since RIBE was founded over 100 years ago, it has always been part of our corporate philosophy to not only develop and optimize electrical plant fittings in our own test laboratories and facilities, but also to use our expertise to solve application problems. A fully equipped indoor vibration test bed with three test spans (2 x 40 m, 1 x 30 m) is available for our competent engineering team to perform vibration tests to all international standards and customer specifications.

Other laboratory facilities with state-of-the-art systems for measuring mechanical and electrical parameters enable us to react flexibly to the customer's specific test requirements.

RIBE Engineering can also solve the customer's application problems using its own calculation programs or programs created in close cooperation with noted universities such as the Technical University of Darmstadt or the Technical University of Dresden.



placement scheme for spacer dampers

RIBE®

MADE TO fit

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