



PREFORMED LINE PRODUCTS
The connection you can count on.

VORTX™ VIBRATION DAMPER



COMMUNICATIONS



ENERGY



SPECIAL INDUSTRIES



SOLAR

VORTX™



PLP Motion Control Products VORTX™ Vibration Damper

From the Recognized Leader in Conductor Protection

Much of PLP's business has developed from over 60 years of studying and analyzing the effects of wind induced conductor motion. It began in 1947 with PREFORMED™ Armor Rods, originally designed to protect power cables from abrasion and fatigue. PLP products are continually tested and evaluated, both in the laboratory and in the field to insure that customers have the finest product possible whether in support systems or motion control.

The worldwide group of PLP companies have tested, evaluated, and offered a number of motion control designs throughout our history. Most are unique in design and offer the best conductor protection for their specific purpose.



Contoured Clamp

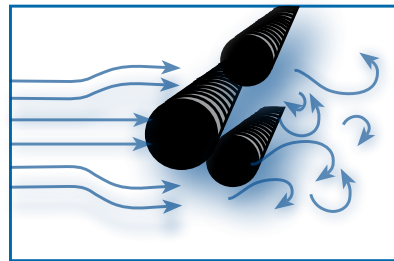
Aeolian Vibration – Its Affect on Conductor

Aeolian vibration is a high frequency, low amplitude motion caused by smooth laminar winds flowing across a cable. When conductors or cables are exposed to this wind type, a phenomenon known as “vortex” shedding occurs. Vortex, or “eddy” shedding as it is also known, creates an alternating pressure imbalance above and below the conductor, inducing it to oscillate up and down at right angles to the direction of air flow. These vibrations take the form of discrete standing waves that can cause support hardware breakdown, conductor fatigue, abrasion, and eventually conductor failure. Although potentially very destructive, these high frequency (>5Hz), low amplitude (<1 cable diameter) standing waves are almost invisible to the naked eye and require special instrumentation to detect their severity.

In terms of the frequencies observed, Aeolian vibration is directly related to the laminar wind velocity and is inversely related to the diameter of the cable. Thus, the higher the wind speed or the smaller diameter of wire, the higher the vibration frequency.



Technical Support - when you need it!

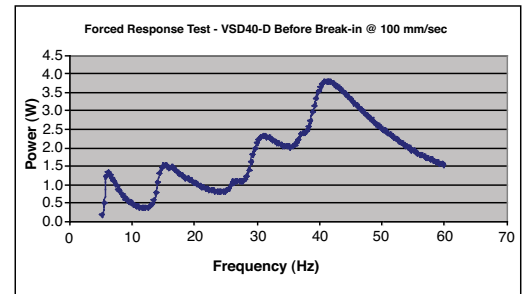


The VORTX Vibration Damper Reduces Aeolian Vibration

The VORTX Vibration Damper improves upon the established theory of the Stockbridge damper invented in the 1920's. Such dampers function by transferring the conductor's vibration

energy through the damper clamp to the messenger wire and weights. Inter-strand friction between wires in the messenger helps dissipate this energy as heat. In addition, these dampers work by opposing and interfering with the conductor vibration itself.

The original Stockbridge Dampers were considered “2-Response” designs in that they had equal weights and messenger lengths, creating 2 resonant frequencies. The VORTX Damper exceeds this 2-response performance with a multi-response design that more efficiently reduces vibration across the corresponding Aeolian frequency range. This is accomplished with unequal messenger lengths and weights which are matched to the specific conductor impedance and line operation conditions to achieve optimum performance.



Features

- Contoured Clamp – Aluminum alloy extrusion offers a “precision” fit to evenly capture the conductor and uniformly distribute pressure along the conductor surface.
- Clamp Profile – During installation, the damper clamp will hang from the conductor in accordance with IEC standards. Hands are free to tighten the bolt to the proper torque.
- Messenger Strand – Precision manufactured galvanized steel messenger strand efficiently absorbs vibration energy.
- Weight – Open galvanized ductile iron weights do not enclose the messenger, reducing the possibility of corrosion.
- Weight Attachment – PLP's novel weight attachment system exceeds the pull-off strength requirements of the IEC standards without changing the properties of the adjoining messenger. In contrast, heat from casting or welding attachment methods can alter the messenger strand and reduce performance.

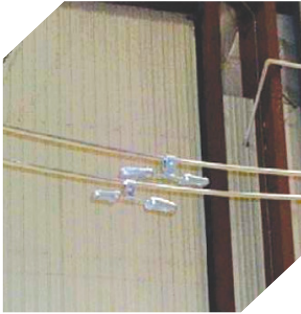
Features (continued)

Glue compounds are avoided as these can vary in performance with changing temperature.

- Breakaway Bolt Option – The VORTX Vibration Damper can also be ordered with a breakaway bolt. When tightened



PLP Laboratory



Electrical Corona Testing of VORTX Damper



Vibration Recorder

To correctly find the proper VORTX Damper for your application, follow the 3 basic steps below.

VORTX DAMPER Catalog Number Selection:

Product Code **VSD -** **40** **50** **B**

"VSD" – VORTX (Stockbridge) Damper.

- Select the Weight Code using the Conductor Type and Diameter
Weight Code (20, 25, 35, 40, 50)
 Ex: Damper weight for 795 kcmil 26/7 ACSR 'Drake' with 1.108" diameter: 40
- Select the Clamp Code from the Applied Diameter
Clamp Code (16, 20, 25, 32, 40, 50, 61)
 Ex: Clamp for 'Drake' over bare conductor: 32
 Ex: Clamp for 'Drake' over 0.310" diameter armor rods (1.108" + 2 x 0.310" = 1.728" applied diameter): 50
- With the Product, Weight, and Clamp Code, create the complete catalog number and confirm the damper properties. Include suffix "B" for optional design with break-away bolt.

to the recommended torque level, the top head of this bolt will shear off, ensuring that the clamp is neither over, nor under-tightened.

Damper Installation

VORTX Dampers may be installed on either energized (hot) or unenergized (cold) lines. Application instructions are supplied with each order which include the recommended installation procedure and bolt torque.

Technical Support & Product Recommendations

PLP is known worldwide for quality technical support. Our field representatives can help determine the cause and effects of wind-induced motion and help find a solution to this problem.

In cases where VORTX Vibration dampers are recommended, PLP can provide the proper size, quantity, and optimal placement locations to best reduce Aeolian vibration. For some damper installations (such as cables incorporating fiber optics), dampers should be installed over a set of protective factory formed rods. PLP Protector Rods are offered for this purpose and combine structural reinforcement with a relatively short length.

Technical Assessment

The VORTX Damper was developed and tested at PLP's Engineering Facility, recognized as one of the foremost cable vibration laboratories in the world.

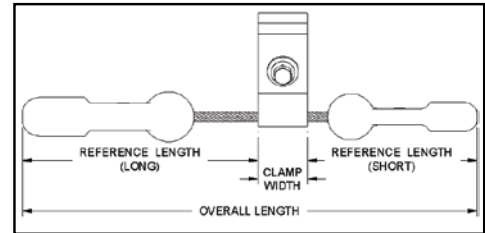
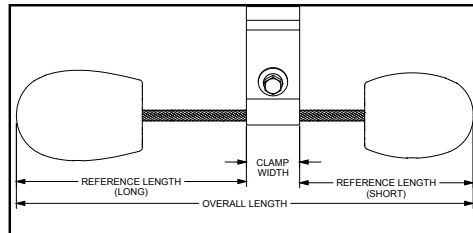
VORTX Dampers are tested in accordance with IEC 61897: Overhead Lines – Requirements and Tests for Stockbridge Type Aeolian Vibration Dampers. This demanding test series includes energy dissipation of the damper along with mechanical, electrical, and fatigue performance. All damper sizes meet or exceed requirements of the standard. Contact PLP for test reports that cover these results in detail. Testing and field studies continue as a service to our customers and our commitment to continuous technical improvement.

The VORTX Vibration Damper Placement Software

To make recommendations which maximize damping performance, PLP has developed a proprietary computer program known as the VORTX Vibration Damper Placement Software or VORTX VDP for short. This software is based upon data gathered from laboratory testing, field studies, CAD research, and PLP's 60+ year knowledge base on vibration.

The VDP Software takes into consideration many input variables specific to the individual line, its construction, design, and local operating conditions. The software output includes the recommended damper model, quantity, and optimal placement location within the span.

After an initial testing/development phase and use by technical support, the VORTX VDP Software is now available for registration at no charge to PLP customers. Please contact your local representative or technical support for more information.



VORTX DAMPER DETAILS FOR CONDUCTOR AND SHIELD WIRE APPLICATIONS

| Product Code | Weight Code (wc) | ACSR, ACSS, & AL Conductor Range | OPGW Range | Steel & AL-Clad Shield Wire Range | 1. Select Weight Code from Conductor Type and Diameter | | 2. Select Clamp Code from Applied Diameter | | |
|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--|---|--|-------|------|
| | | | | | Clamp Code (cc) | Clamp Range (over bare cable or conductor and rods) | Clamp Width | | |
| | | | | | Inches | mm | Inches | mm | |
| VSD | 20 | 0.473 - 0.720 in. 12.0 - 18.3 mm | 0.492 - 0.720 in. 12.5 - 18.2 mm | 0.401 - 0.486 in. 10.2 - 12.3 mm | 16 | 0.483 - 0.612 | 12.3 - 15.5 | 1.630 | 41.4 |
| | | | | | 20 | 0.612 - 0.786 | 15.5 - 20.0 | 2.000 | 50.8 |
| | | | | | 25 | 0.786 - 0.983 | 20.0 - 25.0 | 2.000 | 50.8 |
| | | | | | 32 | 0.983 - 1.261 | 25.0 - 32.0 | 2.200 | 55.9 |
| | | | | | 40 | 1.261 - 1.579 | 32.0 - 40.1 | 2.380 | 60.5 |
| | | | | | 50 | 1.579 - 1.970 | 40.1 - 50.0 | 2.500 | 63.5 |
| | 25 | 0.721 - 0.857 in. 18.3 - 21.8 mm | 0.612 - 1.260 in. 15.5 - 32.0 mm | 0.487 - 0.650 in. 12.4 - 16.5 mm | 20 | 0.612 - 0.786 | 15.5 - 20.0 | 2.000 | 50.8 |
| | | | | | 32 | 0.983 - 1.261 | 25.0 - 32.0 | 2.200 | 55.9 |
| | | | | | 40 | 1.261 - 1.579 | 32.0 - 40.1 | 2.380 | 60.5 |
| | | | | | 25 | 0.786 - 0.983 | 20.0 - 25.0 | 2.000 | 50.8 |
| | | | | | 32 | 0.983 - 1.261 | 25.0 - 32.0 | 2.200 | 55.9 |
| | | | | | 40 | 1.261 - 1.579 | 32.0 - 40.1 | 2.380 | 60.5 |
| 35 | 0.858 - 0.983 in. 21.8 - 25 mm | 0.721 - 1.260 in. 18.3 - 32.0 mm | | 25 | 0.786 - 0.983 | 20.0 - 25.0 | 2.000 | 50.8 | |
| | | | 32 | 0.983 - 1.261 | 25.0 - 32.0 | 2.200 | 55.9 | | |
| | | | 40 | 1.261 - 1.579 | 32.0 - 40.1 | 2.380 | 60.5 | | |
| | | | 50 | 1.579 - 1.970 | 40.1 - 50.0 | 2.500 | 63.5 | | |
| 40 | 0.984 - 1.345 in. 25.0 - 34.2 mm | | | 32 | 0.983 - 1.261 | 25.0 - 32.0 | 2.200 | 55.9 | |
| | | | | 40 | 1.261 - 1.579 | 32.0 - 40.1 | 2.380 | 60.5 | |
| | | | | 50 | 1.579 - 1.970 | 40.1 - 50.0 | 2.500 | 63.5 | |
| | | | | 61 | 1.970 - 2.422 | 50.0 - 61.5 | 3.000 | 76.2 | |
| 50 | 1.346 - 1.762 in. 34.2 - 44.8 mm | | | 40 | 1.261 - 1.579 | 32.0 - 40.1 | 2.380 | 60.5 | |
| | | | | 50 | 1.579 - 1.970 | 40.1 - 50.0 | 2.500 | 63.5 | |
| | | | | 61 | 1.970 - 2.422 | 50.0 - 61.5 | 3.000 | 76.2 | |
| 55 | 1.602 - 1.929 in. 40.7 - 49 mm | | | | 1.500 - 1.700 | 38.1 - 43.2 | 2.610 | 66.3 | |
| | | | | | 1.700 - 1.950 | 43.2 - 49.5 | 2.750 | 69.9 | |

PLP Motion Control Products

VORTX™ Vibration Damper

| 3. Confirm Damper Catalog Number and Properties | | | | | | | | | | | |
|---|-----------|----------------|-----|------------------|-----|----------------|-----|-----------------------|-----|------------------------|-----|
| Damper Catalog Number | Bolt Size | Install Torque | | Assembled Weight | | Overall Length | | Reference Length Long | | Reference Length Short | |
| | | Ft-lb | N-m | lb | kg | Inches | mm | Inches | mm | Inches | mm |
| VSD-2016 | M10 x 50 | 30 | 41 | 3.6 | 1.6 | 14.6 | 370 | 6.9 | 175 | 6.0 | 153 |
| VSD-2020 | M10 x 50 | 30 | 41 | 3.9 | 1.8 | 14.9 | 379 | | | | |
| VSD-2025 | M10 x 50 | 30 | 41 | 4.0 | 1.8 | 14.9 | 379 | | | | |
| VSD-2032 | M12 x 70 | 40 | 54 | 4.4 | 2.0 | 15.1 | 384 | | | | |
| VSD-2040 | M12 x 70 | 40 | 54 | 4.6 | 2.1 | 15.3 | 389 | | | | |
| VSD-2050 | M12 x 70 | 40 | 54 | 4.9 | 2.2 | 15.4 | 392 | | | | |
| VSD-2520 | M10 x 50 | 30 | 41 | 4.9 | 2.2 | 12.7 | 322 | 6.4 | 161 | 4.3 | 110 |
| VSD-2525 | M10 x 50 | 30 | 41 | 5.0 | 2.3 | 12.7 | 322 | | | | |
| VSD-2532 | M12 x 70 | 40 | 54 | 5.4 | 2.5 | 12.9 | 327 | | | | |
| VSD-2540 | M12 x 70 | 40 | 54 | 5.7 | 2.6 | 13.1 | 332 | | | | |
| VSD-3525 | M10 x 50 | 30 | 41 | 7.3 | 3.3 | 14.7 | 374 | 7.0 | 179 | 5.7 | 145 |
| VSD-3532 | M12 x 70 | 40 | 54 | 7.7 | 3.5 | 14.9 | 379 | | | | |
| VSD-3540 | M12 x 70 | 40 | 54 | 7.9 | 3.6 | 15.1 | 384 | | | | |
| VSD-3550 | M12 x 70 | 40 | 54 | 8.2 | 3.7 | 15.2 | 387 | | | | |
| VSD-4032 | M12 x 70 | 40 | 54 | 10.8 | 4.9 | 20.3 | 515 | 10.5 | 267 | 7.6 | 192 |
| VSD-4040 | M12 x 70 | 40 | 54 | 11.1 | 5.0 | 20.5 | 519 | | | | |
| VSD-4050 | M12 x 70 | 40 | 54 | 11.4 | 5.2 | 20.6 | 522 | | | | |
| VSD-4061 | M12 x 70 | 40 | 54 | 12.1 | 5.5 | 21.1 | 535 | | | | |
| VSD-5040 | M12 x 75 | 40 | 54 | 11.5 | 5.2 | 23.9 | 606 | 12.1 | 307 | 9.4 | 239 |
| VSD-5050 | M12 x 75 | 40 | 54 | 11.8 | 5.3 | 24.0 | 609 | | | | |
| VSD-5061 | M12 x 75 | 40 | 54 | 12.5 | 5.7 | 24.5 | 622 | | | | |
| VSD-5543 | M12 x 75 | 45 | 61 | 18.4 | 8.3 | 21.6 | 548 | 11.3 | 285 | 7.75 | 197 |
| VSD-5549 | M12 x 50 | 50 | 68 | 18.5 | 8.4 | 21.8 | 553 | | 286 | | |



PREFORMED
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