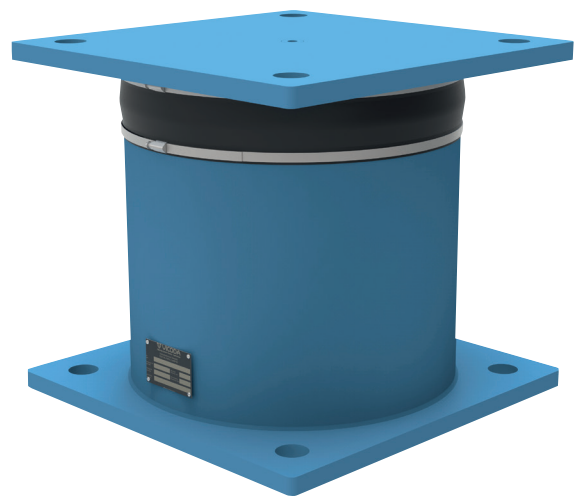


Product catalogue



# **VICODA<sup>®</sup>**

## **VISCOELASTIC DAMPERS**

## About our product

Viscoelastic dampers effectively reduce vibrations by converting kinetic energy into heat, thereby damping the movement of the system. Their design allows them to be used over a wide range of frequencies, however, the required type of viscoelastic damper depends on the planned application. The application range extends from process technology to the damping of individual machines or complete piping systems. Ambient temperatures from  $-30\text{ }^{\circ}\text{C}$  to  $+110\text{ }^{\circ}\text{C}$  as well as the most demanding environmental conditions (e.g. chemicals, dust- or salt-polluted atmospheres) do not present an obstacle. At high pipeline temperatures, the viscoelastic damper can be equipped with a special insulation.

The viscoelastic dampers and damping parameters are tested and monitored by our in-house test lab as well as independent test laboratories based on Safety Standard KTA 3205.3 issued by the German Nuclear Safety Standards Commission (KTA).

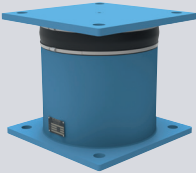
## Design

Viscoelastic dampers consist of a metal housing filled with a highly viscous medium. A piston connected to the upper connection plate can move freely in all directions within the medium. Either the upper or lower connection plate of the damper can be connected to the vibrating system, while the other plate is mounted on a fixed abutment. Dampers cannot bear static loads. The dampers are protected against corrosion as standard according to ISO 12944 C3 (M). Tailor-made solutions can be provided to meet special customer requirements.



## Product features

Viscoelastic dampers use three types of viscous media suited for different temperature ranges and environmental requirements.

PRODUCT FEATURES		
	Damper type	Description
	Viscoelastic damper – type VD	Bitumen-based media suited for large damping parameters (d = up to 554 kNs/m at 5 Hz) and operating temperatures from +20 °C to +80 °C in a working range of $\Delta T$ = up to 20 °C (depending on the application).
	Viscoelastic damper – type VM	Polybutene-based media suited for medium damping parameters (d = up to 438 kNs/m at 5 Hz) and operating temperatures from -10 °C to +40 °C.
	Viscoelastic damper – type VI	Silicone oil-based media suited for low damping parameters and operating temperatures from -30 °C to +110 °C.

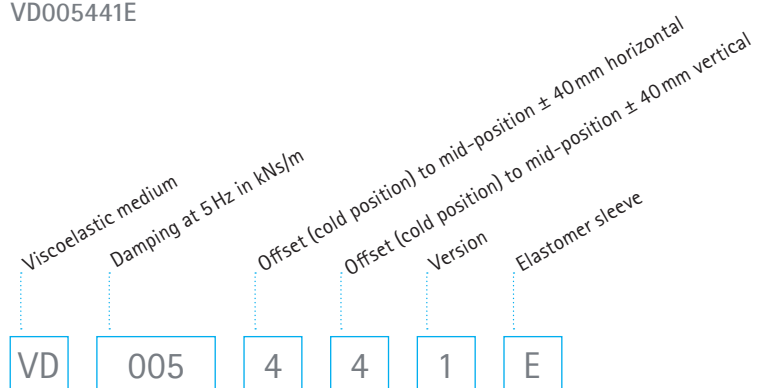
Nominal load is defined as the maximum allowable dynamic damping force at operating temperatures and represents the load that can be transmitted by the damper. It is specified in the dimension sheets for each damper size and is considered as the amount of the force vector. The damper design is normally not based on the nominal load but on the necessary damping parameter.

Where several viscoelastic dampers are used, the specified type-specific nominal loads are combined to give the total applicable.

When designing viscoelastic dampers, care must be taken that the nominal load of the viscoelastic damper is not exceeded by shock loads.

## Description of type designation on example

VD005441E



Special types apply for nuclear power stations – please contact us for more information.

## Parameters and construction

Key parameters required to define a damping solution are as follows:

- operating temperatures [°C], i.e. the lowest and highest expected temperature of the vibrating system and the environment
- resonance frequencies [Hz] of the vibrating system
- amplitude [mm] of the vibrating system
- mass [kg] of the vibrating system between two fixed points
- cold/hot displacement

Not all details are required. LISEGA is pleased to provide support when selecting viscoelastic dampers.

Other services provided by LISEGA include vibration measurements or simulations to get to the root cause of vibrations.

## Simplified interpretation

A simplified interpretation based on the calculation below is usually deemed conservative. However, by measuring in-situ pipe vibrations, LISEGA Service or another service provider can optimize your choice of dampers.

The following values are required for providing a simplified interpretation:

- Vibration frequency (resonant frequency) [f]
- Mass of the vibrating system [m]
- Cold/hot movement [mm]
- Ambient temperature (min./max.) and temperature of the vibrating system

A damping of 40% is considered necessary to provide an initial selection.

The formula used is as follows:

$$\text{Damping parameter} = \frac{40\% \cdot m \cdot 2\pi \cdot f}{1000}$$

**Example:** Vertical vibration of a pipe with 10mm cold/hot displacement.

- Pipe temperature: approx. 75°C
- Ambient temperature: 10°C – 30°C
- Mass of the pipe including isolation, fluid between two static bearings: 1750 kg
- Frequency of the vibrating pipe: 5 Hz

$$\text{Damping parameter} = \frac{0,4 \cdot 1750 \cdot 2\pi \cdot 5}{1000} = 22 \text{ kNs/m (e.g. VM 030 331E)}$$

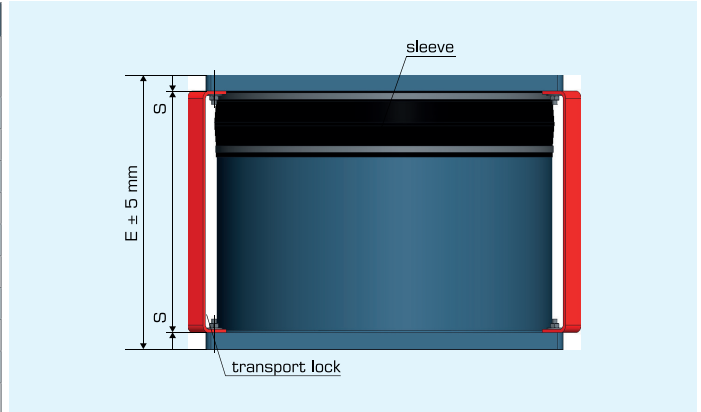
## Dynamic loads on the structure

When damping operational vibrations, forces acting on the structure amount to a fraction of the nominal load. Shock loads are transmitted up to the nominal load.

Please note that specified nominal loads represent minimum values that are guaranteed within the specified operating temperature range. The nominal load can increase many times over if the operating temperature is not reached. This is especially important for the dampers type VD.

### VD 441E: nominal load, dimensions, weight

Type	Nominal load [kN]	E [mm]	B [mm]	C [mm]	s [mm]	d [mm]	Weight ca. [kg]
VD005441E	0.3	240	175	125	8	14	9
VD015441E	2.5	240	195	145	8	14	11
VD025441E	5	240	210	160	8	14	14
VD045441E	10	240	260	200	10	18	23
VD085441E	20	280	315	245	12	22	42
VD140441E	30	320	375	290	15	26	70
VD160441E	40	335	400	310	18	26	90
VD185441E	60	350	435	330	20	33	103
VD225441E	80	390	490	365	25	39	165
VD340441E	100	405	510	395	30	39	203



### VD 441E: vertical damping parameters [kNs/m]

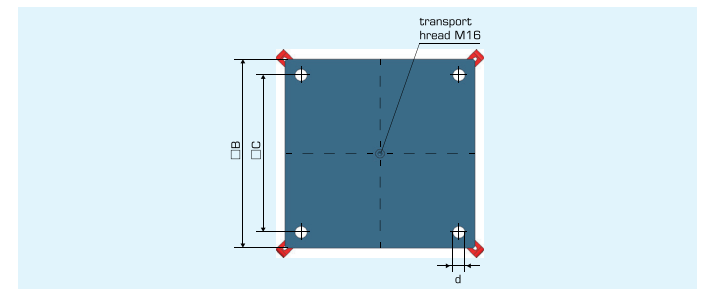
Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VD005441E	0.3	6.2	4.7	4.0	3.6	3.3	3.0	2.9
VD015441E	2.5	15.7	12.0	10.2	9.1	8.3	7.7	7.3
VD025441E	5	27.8	21.1	18.0	16.0	14.7	13.7	12.9
VD045441E	10	47.3	36.0	30.7	27.4	25.0	23.3	21.9
VD085441E	20	89.3	67.9	57.9	51.6	47.3	44.0	41.4
VD140441E	30	143.9	109.4	93.2	83.2	76.2	70.9	66.7
VD160441E	40	162.7	123.7	105.4	94.1	86.1	80.1	75.4
VD185441E	60	189.4	144.0	122.7	109.5	100.3	93.3	87.8
VD225441E	80	229.9	174.8	148.9	132.9	121.7	113.2	106.5
VD340441E	100	340.2	258.7	220.4	196.7	180.1	167.6	157.7

### VD 441E: horizontal damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VD005441E	0.3	5.9	4.5	3.6	3.0	2.5	2.2	2.1
VD015441E	2.5	14.0	10.8	8.6	7.0	6.0	5.4	5.1
VD025441E	5	23.7	18.3	14.6	12.0	10.2	9.1	8.6
VD045441E	10	37.4	28.8	22.9	18.9	16.1	14.4	13.6
VD085441E	20	94.0	72.5	57.8	47.5	40.6	36.3	34.2
VD140441E	30	148.7	114.5	91.3	75.1	64.2	57.4	54.1
VD160441E	40	229.9	177.1	141.2	116.2	99.2	88.7	83.6
VD185441E	60	293.0	225.8	180.0	148.1	126.5	113.1	106.6
VD225441E	80	367.3	283.0	225.6	185.6	158.5	141.8	133.7
VD340441E	100	554.1	427.0	340.4	280.0	239.2	214.0	201.7

### VM 331E: nominal load, dimensions, weight

Type	Nominal load [kN]	E [mm]	B [mm]	C [mm]	s [mm]	d [mm]	Weight ca. [kg]
VM010331E	5	270	220	150	10	18	17
VM020331E	10	270	260	190	10	18	26
VM030331E	15	290	310	230	20	24	50
VM055331E	25	290	390	300	20	28	87
VM100331E	40	300	500	390	25	42	157
VM175331E	50	380	540	430	30	42	243



### VM 331E: vertical damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VM010331E	5	10.2	7.7	6.6	5.9	5.4	5.0	4.7
VM020331E	10	19.5	14.9	12.7	11.4	10.4	9.7	9.1
VM030331E	15	29.7	22.7	19.4	17.3	15.8	14.8	13.9
VM055331E	25	54.9	41.9	35.8	32.0	29.3	27.3	25.7
VM100331E	40	103.1	78.7	67.2	60.0	55.0	51.2	48.3
VM175331E	50	174.8	133.4	113.8	101.8	93.3	86.9	81.8

### VM 331E: horizontal damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VM010331E	5	11.6	8.7	7.3	6.5	5.9	5.5	5.2
VM020331E	10	24.0	18.1	15.3	13.6	12.4	11.5	10.8
VM030331E	15	41.0	30.8	26.1	23.2	21.1	19.6	18.4
VM055331E	25	100.0	75.3	63.7	56.6	51.7	47.9	45.0
VM100331E	40	217.3	163.5	138.5	123.1	112.3	104.2	97.8
VM175331E	50	436.3	329.9	279.4	248.3	226.6	210.2	197.4

VM 551E: nominal load, dimensions, weight

Type	Nominal load [kN]	E [mm]	B [mm]	C [mm]	s [mm]	d [mm]	Weight ca. [kg]
VM010551E	5	390	235	180	10	18	28
VM020551E	10	390	300	230	10	24	42
VM030551E	15	410	360	270	20	28	85
VM055551E	25	410	430	340	20	28	125
VM100551E	40	490	540	420	25	42	216
VM175551E	50	500	650	540	30	42	393

VM 551E: vertical damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VM010551E	5	10.2	7.7	6.6	5.9	5.4	5.0	4.7
VM020551E	10	19.5	14.9	12.7	11.4	10.4	9.7	9.1
VM030551E	15	29.7	22.7	19.4	17.3	15.8	14.8	13.9
VM055551E	25	54.9	41.9	35.8	32.0	29.3	27.3	25.7
VM100551E	40	103.1	78.7	67.2	60.0	55.0	51.2	48.3
VM175551E	50	174.8	133.4	113.8	101.8	93.3	86.9	81.8

VM 551E: horizontal damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VM010551E	5	11.6	8.7	7.3	6.5	5.9	5.5	5.2
VM020551E	10	24.0	18.1	15.3	13.6	12.4	11.5	10.8
VM030551E	15	41.0	30.8	26.1	23.2	21.1	19.6	18.4
VM055551E	25	100.0	75.3	63.7	56.6	51.7	47.9	45.0
VM100551E	40	217.3	163.5	138.5	123.1	112.3	104.2	97.8
VM175551E	50	438.3	329.9	279.4	248.3	226.6	210.2	197.4

VM 771E: nominal load, dimensions, weight

Type	Nominal load [kN]	E [mm]	B [mm]	C [mm]	s [mm]	d [mm]	Weight ca. [kg]
VM010771E	5	440	300	220	10	24	43
VM020771E	10	444	355	270	12	28	62
VM030771E	15	460	430	340	20	28	127
VM055771E	25	460	540	430	20	28	186
VM100771E	40	480	710	580	30	42	395
VM175771E	50	590	790	650	30	42	555

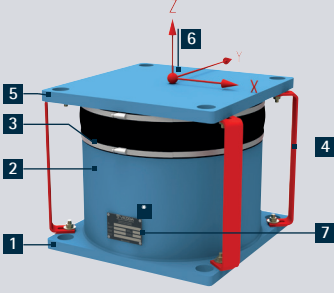
VM 771E: vertical damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VM010771E	5	10.2	7.7	6.6	5.9	5.4	5.0	4.7
VM020771E	10	19.5	14.9	12.7	11.4	10.4	9.7	9.1
VM030771E	15	29.7	22.7	19.4	17.3	15.8	14.8	13.9
VM055771E	25	54.9	41.9	35.8	32.0	29.3	27.3	25.7
VM100771E	40	103.1	78.7	67.2	60.0	55.0	51.2	48.3
VM175771E	50	174.8	133.4	113.8	101.8	93.3	86.9	81.8

VM 771E: horizontal damping parameters [kNs/m]

Type	Nominal load [kN]	5 [Hz]	10 [Hz]	15 [Hz]	20 [Hz]	25 [Hz]	30 [Hz]	35 [Hz]
VM010771E	5	11.6	8.7	7.3	6.5	5.9	5.5	5.2
VM020771E	10	24.0	18.1	15.3	13.6	12.4	11.5	10.8
VM030771E	15	41.0	30.8	26.1	23.2	21.1	19.6	18.4
VM055771E	25	100.0	75.3	63.7	56.6	51.7	47.9	45.0
VM100771E	40	217.3	163.5	138.5	123.1	112.3	104.2	97.8
VM175771E	50	436.3	329.9	279.4	248.3	226.6	210.2	197.4

## STEP-BY-STEP INSTALLATION OF DAMPER TYPES VD, VM AND VI (QUICK START GUIDE)

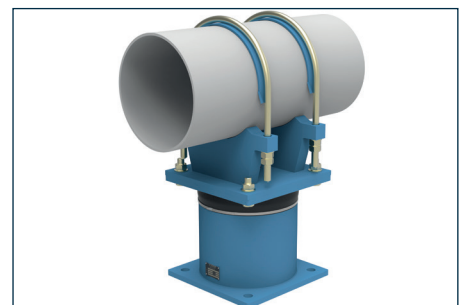
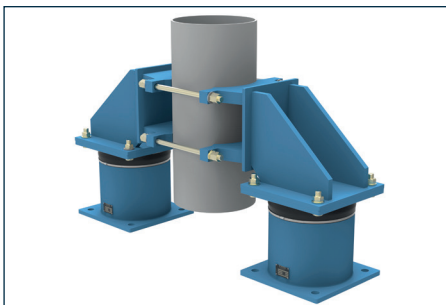
	Procedures	Description
 <p>1 lower connection plate 2 housing 3 sleeve 4 transport lock 5 upper connection plate 6 connection thread M16 for hoist 7 type plate</p>	I. Delivery condition	Viscoelastic dampers can be delivered preset to 'cold position' (offset position). This is guaranteed by transport locks securing the offset between the upper and lower part of the damper. Unless specified, the dampers are delivered using the locking position (offset position $x = 0; y = 0; z = 0$ ).
	II. Installation	The upper and lower connection plates are bolted to the piping system and steel construction. All transportation locks must be removed after installation.
	III. Startup	During startup, the relative position of the upper and lower connection plates change to the pre-calculated hot load position. The damper should then operate approximately in mid-position.

## Inspection and maintenance

Viscoelastic dampers are maintenance-free!

Visual control should be an integral part of regular plant inspection and maintenance and is recommended once a year.

## Mounting examples





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