Exhaust catalogue

Version 2.3

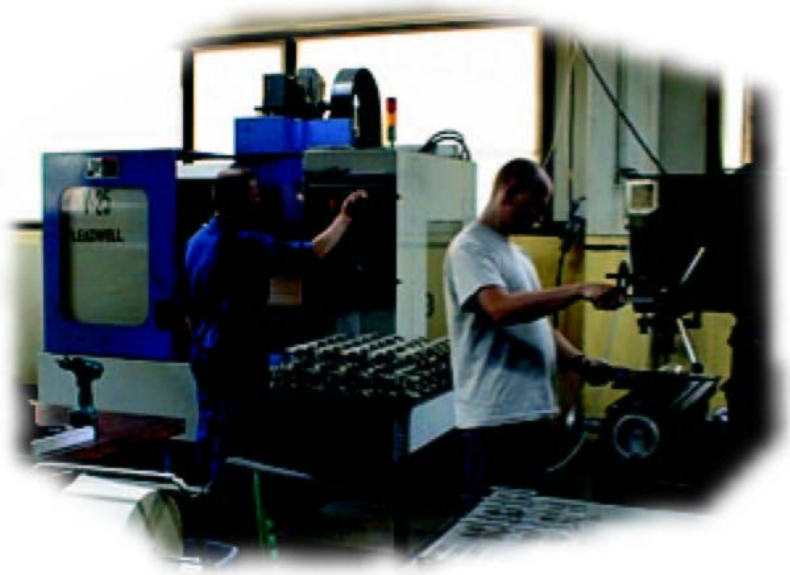
Vibratec Akustikprodukter

was established in 1988 under the name of Vibratec Isolation AB and has today companies in both Norway and Sweden. The head office is located at Blidö, an island in the northern part of Stockholm's archipelago. The Norwegian subsidiary, Akustikprodukter Norge AS (apn) is located in Horten, a small city south of Oslo. Both companies stock a variety of different anti-vibration and shock mounts, exhaust gas silencers, compensators (expansion joints) and different noise reducing materials.

Vibratec Akustikprodukter manufacturers several types of all-metal vibration and shock mounts. In Norway we produce cable mounts (wire rope isolators) as the only Scandinavian company. In Sweden we produce metal spring and cushion mounts for industrial and marine applications.

Combining the use of sophisticated computer programmes with years of experience in the fields of vibration and shock technology, we help our clients to find the optimal solution to their problem.

In cooperation with subcontractors, which are, world leading in this profession, there are few problems with sound, vibration or shock that we cannot handle. The products are produced and delivered with the highest demands of quality both to the military and civil market.



Noise is a serious environmental problem. We fight this problem. We also fight air pollution problems with advanced catalyst technology in cooperation with DCL International in Canada.

Our long experience and tradition as a subcontractor to Scandinavian shipyards and engine suppliers have now promoted to an export to several countries outside Europe. Our competence is wide in the field, from damping of exhaust noises via reduction of polluted gases to protection of sensitive equipment. Our ambition is to be the obvious choice for our clients in cases concerning sounds, vibrations, chocks and other closely related problems.

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Vibration isolation of exhaust pipes

Non-flexible suspension of exhaust pipes in ships is an obsolete method. Today, most shipowners require that the pipes are mounted flexibly to the structure, in that vibrations and structure born sound is not transmitted to the ship hull.

The benifits of a flexible pipe-suspension include:

- a general reduction of the noise level aboard,
- elimination of the deformation of the collectors which were caused by rigid rigid attachment,
- suppression of some expansion joints, because the elastic suspension enables a free expansion

Principles of flexible pipe suspensions

The basic idé is to carefully choose certain fixing points where the movement of the pipe must be limited. For this purpose, relatively stiff mounts must be used, for example isolators from the V5600-serie (fig. 1). Typical fixing points are: directly after the engine turbo-charger, at sharp bends and on silencers and other heavy equipment.

Fig. 1. VIBRACHOC-isolator , V5600-series.

In the remaining mounting points the pipe is to be stabilized, and at the same time allowing the pipe to expand freely. Depending on the surrounding structure and the orientation of the pipe (vertical or horizontal), one can stabilize the pipe using one of the following methods:

- pendelum mounting using isolators from the VT4524-XX series (*fig 2)*.
- slide-mounted isolators (V565X-series).
- pipe clamps with resilient cushions (*fig 3-4)*.

Fig. 2. Pendelum isolator, VT4524-series.

Fig. 3. Anti-vibration pipe clamp, VT PC-series.

Fig.4. All metal cushion VT1110 for installation in pipe clamp.

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Advantages with Vibratec's mounting system

The solutions offered by Vibratec have been implemented in thousands of ships since the mid 70:s.
A major reason for our success is the fact that all our products are so well adapted to their purpose. Because VIBRAMETAL-isolators are all metallic, they are insensitive to one of the main problems with exhaust suspensions - the heat. They have a life comparable to that of the suspended equipment and do not normally need to be replaced.

Our all metal elastic systems cope with the expansion movements whilst isolating the vibrations.

Vibratec offers total solutions for elastic exhaust suspensions, we will naturally provide complete technical proposals to all our customers.

Necessary input data

To present a complete technical proposal, the following data must be supplied to us by the ship yard:

- 2 sets of drawings showing the pipe routing and the sorrounding structure.
- Pipe material, diameter and thickness.
- Weight of additional heavy equipment: silencers, boilers and ventiles etc.

Technical data on included expansion bellows, if any.

Example-elastic suspension

For clearity, the following example is illustrated with a principal sketch on the following page.

The pipe is fixed above the engine turbo charger using two V5600-serie isolators and one machine mounting.
The machine mounting is there to insure that the pipe expansion is directed away from the engine, thus the turbo-charger will not be damaged by the reaction forces from the next expansion joint.

Since the pressure pulsations often reaches a maximum near the engine, it is advisable to make the first pipe section as long and heavy as possible to avoid a dynamic problem.

For this reason, the nextcoming expansion joint should be located as far away from the engine as possible.

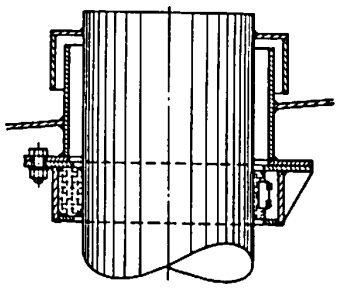
To reduce the loads on the mounts and therefore increase their isolation, we recommend that all expansion joints be as soft and flexible as possible.

All metal cushion VT1110 for installation in pipe clamp.

The clamb provides a very compact suspension and gurantees free thermal expansion.

In the present example, we have choosen to stabilise the pipe above the silencers with three single action pendelum isolators. These isolators comprises a soft steel spring with very low resonance frequency and excellent vibration isolation. Low frequency isolators are a recommended for mountning points located near passanger areas.

Finally, the pipe passes through a clamb at the top of the shimney, a sealing cap provides a rain proof passage above the clamb.



Clamp combined with a rain-proofing "cap".

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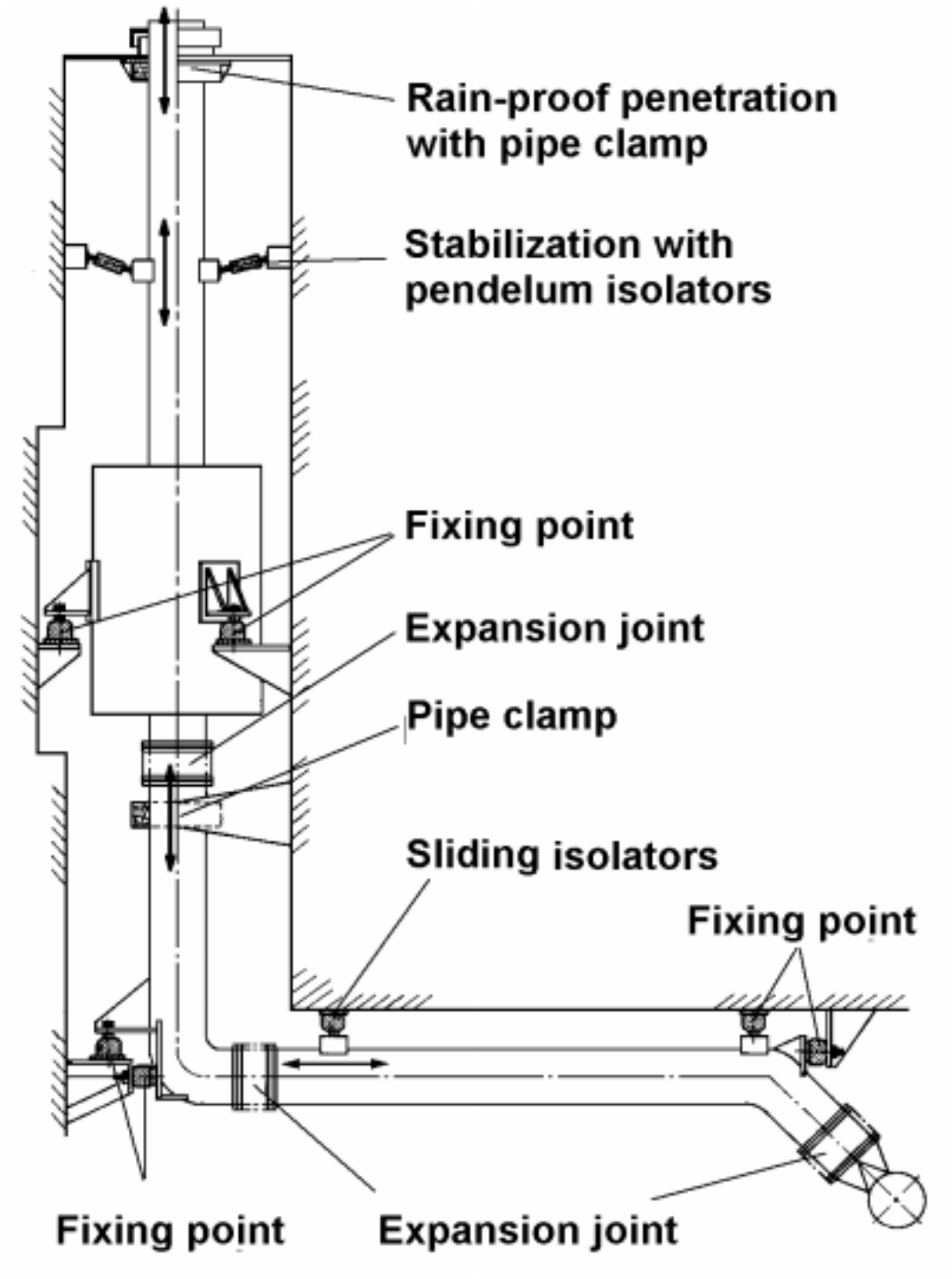
Example, elastic exhaust suspension



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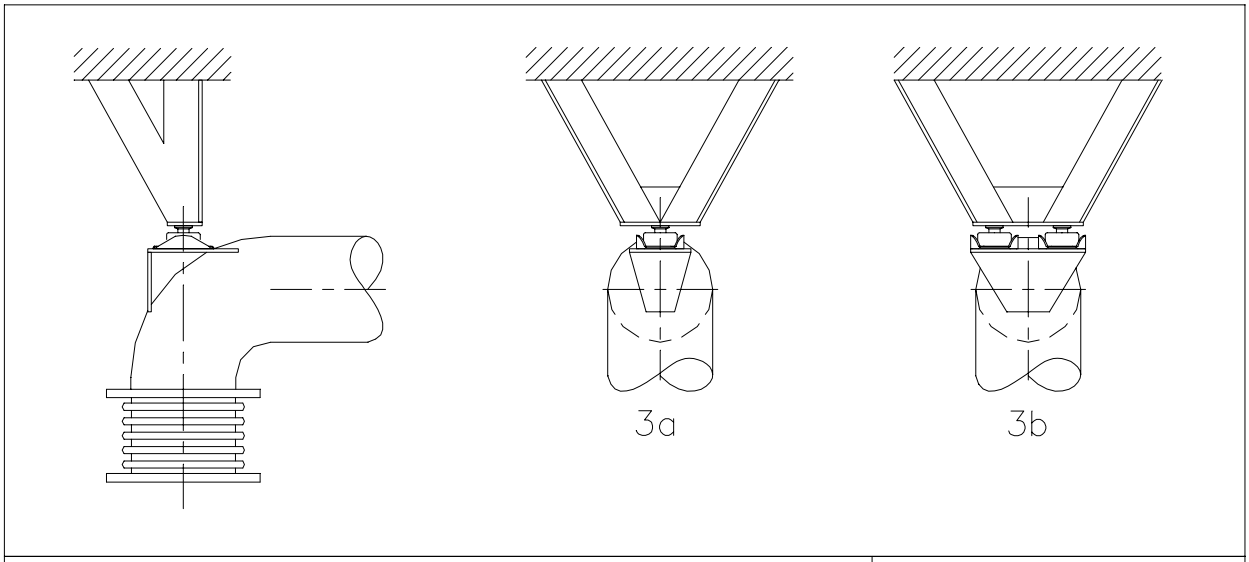
PL 3



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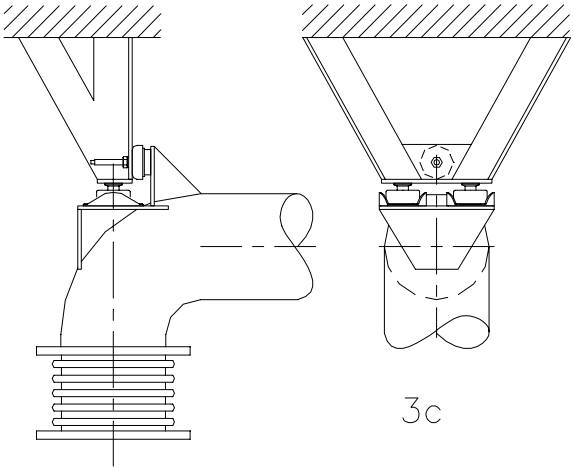

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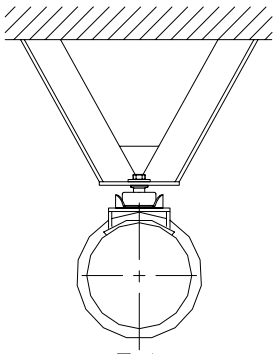

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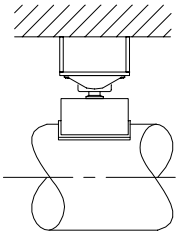

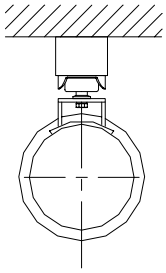

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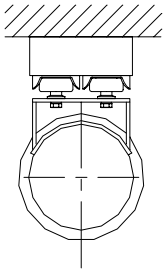

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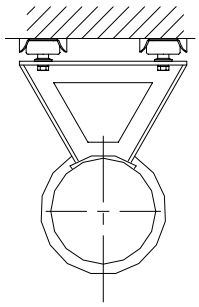

3h

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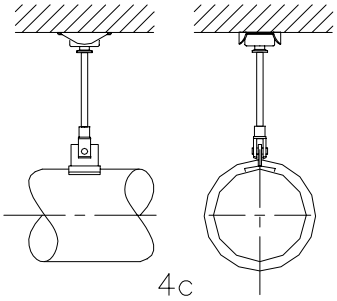
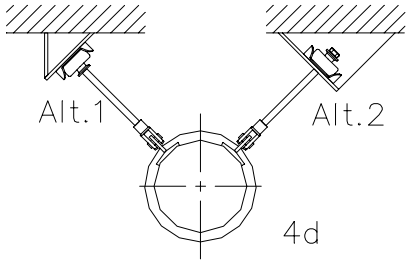
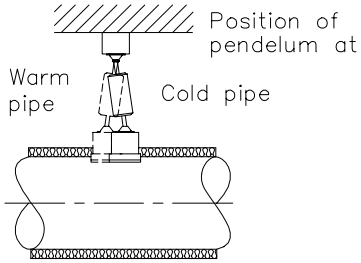
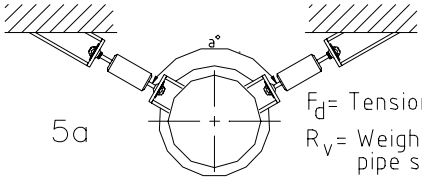
PL 4 - 5









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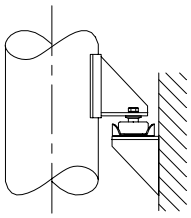

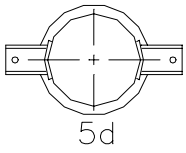

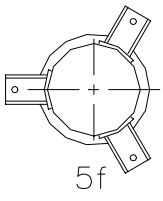

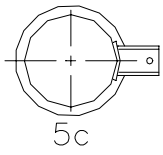

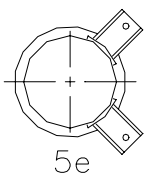

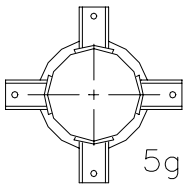

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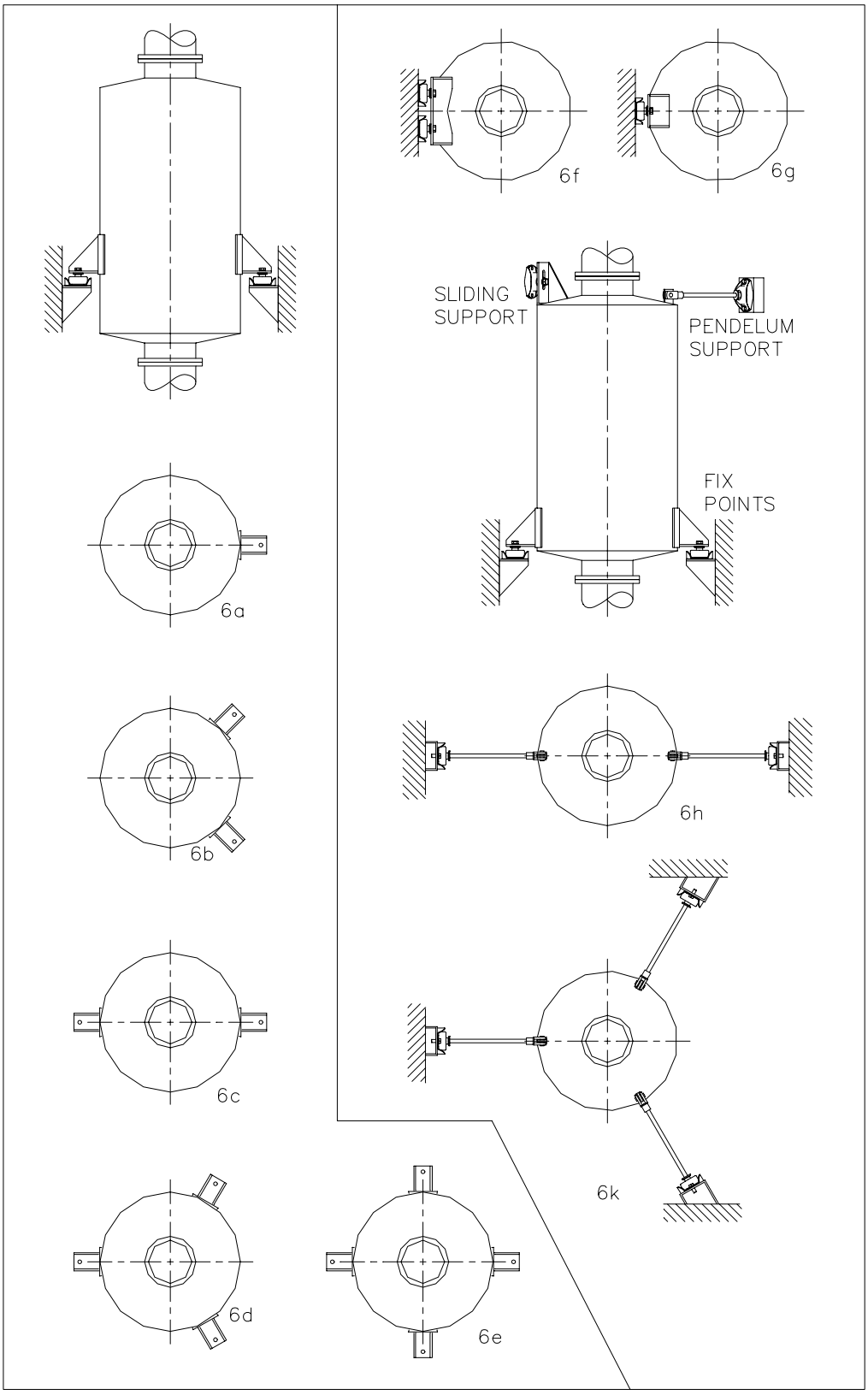
PL 6



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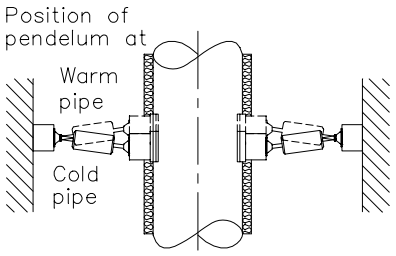

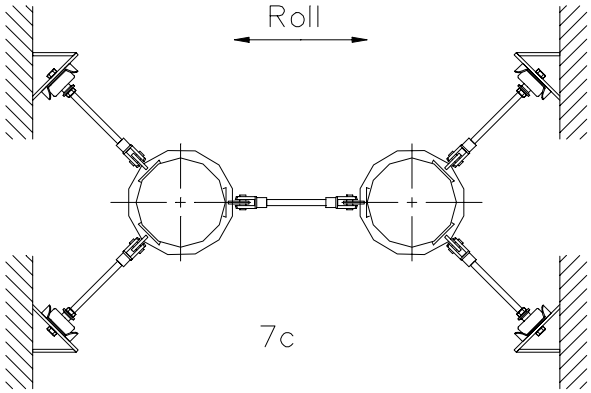

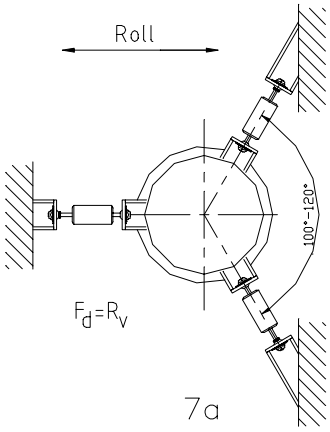

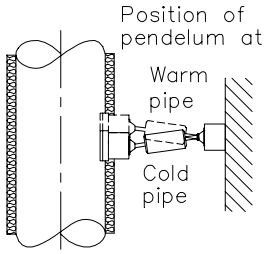

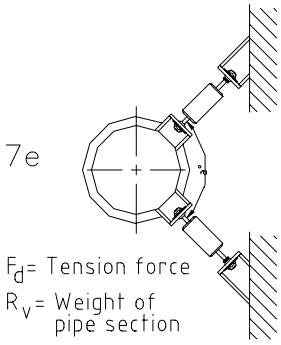

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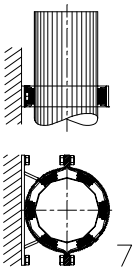

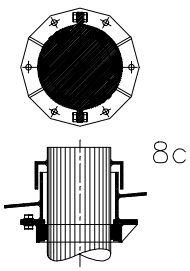

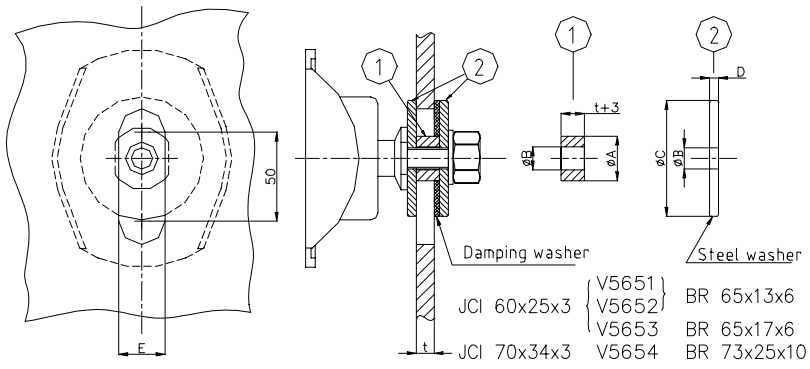

Type	A	B	C	D	E
V5651 V5652	25	13	65	6	26
V5653	25	17	65	6	26
V5654	34	25	73	10	36

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V43W - V46HW

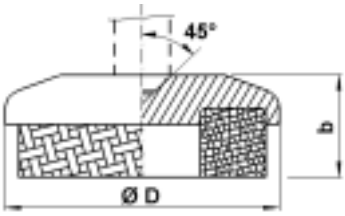

Fig. 1. V43W-V46W.

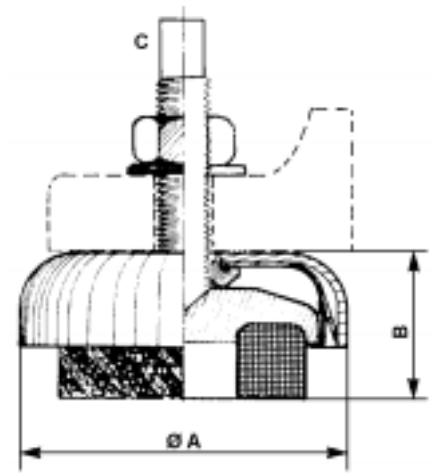

Fig. 2. V43HW-V46HW includes an upper housing, a levelling screw, locking nut and washer.

ALL METAL machine mounting

Description

All metal mounts, 18/8 stainless steel wire mesh resilient cushion fixed under the foot.
Locating foot in cast iron, paint protection.
Suffix "H" with house and levelling screw.

Characteristics

Mounting with a natural frequency of 15-20 Hz within a wide load range. Progressive spring-rate.
Designed to absorb high static and dynamic forces for machines without base fitting.
For compression loads only.
Maximum excitation amplitude: ± 0,3 mm.
Dynamic overloading: 5 g.
Magnification factor (Q): < 4.
Temperature range: -90°C to +300°C.

Ref.	Load range, daN (≈ kg)	
	Static	Dynamic
V43W, -HW	50-350	1200
V44W, -HW	300-1500	4500
V45W, -HW	1000-3000	9000
V46W, -HW	2000-7000	21000

Applications

Vibration isolation of very disturbing machine tools or where a high degree of isolation is required: All types of presses, guillotines, bending-and rolling machines. Suspension of rotating machines operating at over 2500 rpm.
Stabilisation of exhaust pipes.

Installation

Raise the machine.
Place the mount under the machine and fasten the bolt.
Lower the machine on to the mounts
Level the machine and lock the nuts.

Note

For less disturbing machine tools or where a very stable suspension is necessary, use machine mountings V43 - V46 or V43H - V46H.

Ref.	ØA	B	ØD	b	C	Weight (kg)	
		free		free		"W"	"HW"
V43W, -HW	95	45	80	31	M16 X 140	0,4	0,9
V44W, -HW	95	45	80	31	M16 X 140	0,5	1,1
V45W, -HW	155	56	128	36	M20 X 200	1,4	2,9
V46W, -HW	190	66	170	43	M27 X 200	3,3	6,5

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VT PC-100 -700

Complete PIPE CLAMP

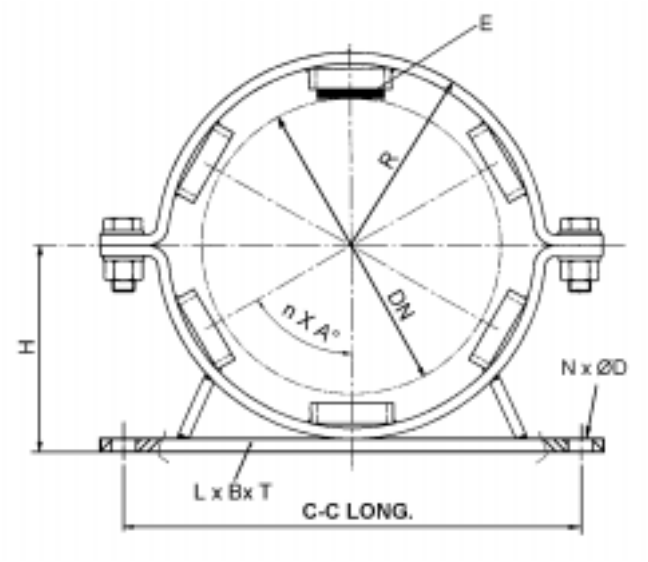
Description

All metal pipe clamp with resilient elements made of stainless steel 18/8. Ring and base plate made of construction steel.
Protection: primer.

Characteristics

A very rigid construction that allows quick mounting/dismounting of the pipes.

The resilient elements are non-creeping, are unaffected by oils, grease or corrosive agents or extremes of temperature. If required, it is possible to have the cushions produced in higher quality stainless steel or in other special metals.



Applications

Resilient mounting for all kinds of pipes. Provides elastic stabilisation of vertical pipes whilst eliminating the tension forces caused by thermal expansion of the pipe. The dimensions of the clamp are shown in table bellow.

Note

The cushions can be ordered separately, see data sheets for VT 1110-1130, VT 1120-1140

DN	R	n x A	E	H	L x B x T	N x ØD	C-C Hole distance	
							LONG.	ACROSS
100 (Ø114,3)	77	6 x 60°	VT1130	95	254x70x10	2 x 18	220	-
125 (Ø139,7)	90	6 x 60°	VT1130	108	280x70x10	2 x 18	246	-
150 (Ø168,3)	104	8 x 45°	VT1130	122	308x70x10	2 x 18	274	-
175 (Ø193,7)	117	8 x 45°	VT1130	135	334x70x10	2 x 18	300	-
200 (Ø219,1)	135	6 x 60°	VT1110	153	370x90x10	2 x 18	336	-
250 (Ø273,0)	162	6 x 60°	VT1110	180	424x90x10	2 x 18	390	-
300 (Ø323,9)	187	8 x 45°	VT1110	209	488x100x12	2 x 22	450	-
350 (Ø355,6)	203	8 x 45°	VT1110	225	520x100x12	2 x 22	482	-
400 (Ø406,4)	228	8 x 45°	VT1110	325	486x150x10	4 x 23	406	110
450 (Ø457,0)	254	10 x 36°	VT1110	345	517x150x10	4 x 23	437	110
500 (Ø508)	279	10 x 36°	VT1110	366	548x150x10	4 x 23	468	110
600 (Ø610)	330	10 x 36°	VT1110	407	609x150x10	4 x 23	529	110
700 (Ø711)	380	12 x 30°	VT1110	447	670x150x10	4 x 23	590	110
800 (Ø813)	431	12 x 30°	VT1110	492	720x150x10	4 x 23	640	110
900 (Ø914)	482	16 x 22,5°	VT1110	551	810x150x10	4 x 23	730	110

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VT 1110, VT 1130

ALL METAL resilient cushion

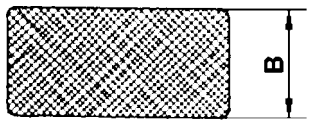
Description

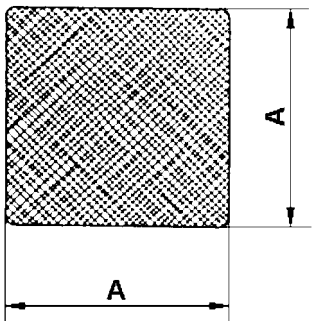
All metal resilient element produced of 18/8 steel mesh. The progressive spring rate yields an almost constant natural frequency over a wide load range. The element is non creeping, has excellent resistance to oils, solvents, water, chemical agents and to extremes of temperature.

Cushions are also available in AISI 316 stainless wire and other special metals.

Characteristics

Material: stainless steel 18/8.
Natural frequency: 12-15 Hz.
Maximum excitation amplitude: ± 0,3 mm.
Amplification factor: 3-4.
Dynamic overload: 5 g
Temperature range: -90 °C to +300 °C.





Ref.	A	B
VT 1110	50	25
VT 1130	30	20

Ref.	Load range in daN (≈kg)
VT 1110	25-300
VT 1130	5-50

Applications

A very useful construction element for suspension of smaller machine tools and for protection of delicate equipment.
Also used as a resilient element for anti vibration pipe clamps.

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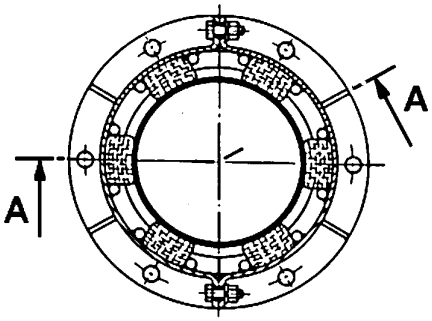
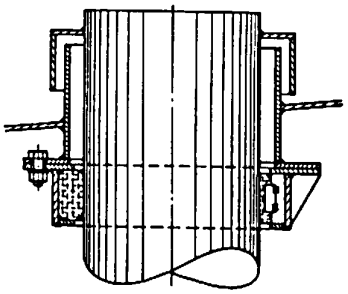
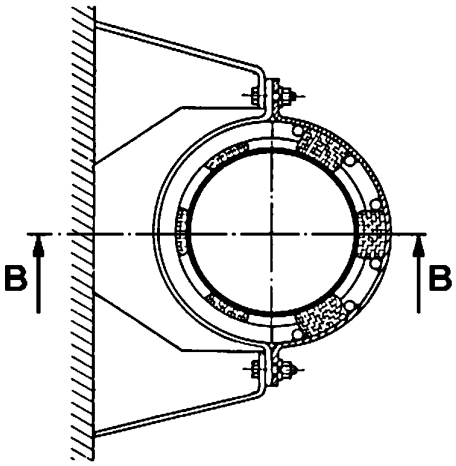
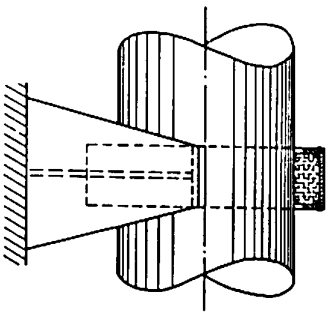
VT 1110, VT 1130





A - A





B - B

Installation in pipe clamp.

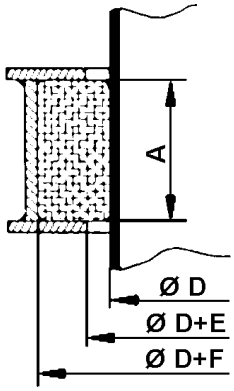
The elastic cushions are placed circumferentially around pipework providing a compact isolation system allowing both axial and radial expansion. For best isolation result, the clamp is to be made as rigid and heavy as possible.

We recommend the installation for the cushions as shown opposite (two half-rings in which the cushions are evenly spaced inside the rings).

Rain proof penetrations should be made with a sealing "hat" as shown in figure A.

The design of the clamp must allow compression of the cushions because of thermal expansion of the pipe; 10 mm for VT 1110 and 6 mm for VT 1130. The cushions should not be pre-compressed. The recommended dimensions of the clamp and the number of cushions are shown in the table below.

Ref.	A	E	F
VT 1110	50	20	50
VT 1130	30	12	40



Pipe diameter Ø D (mm)	Qty VT1110	Qty VT1130
50	-	4
100	-	6
150	-	8
200	6	-
300	8	-
450	10	-
650	12	-
850	14	-
1000	16	-
1150	18	-

Note

For complete pipe-clamps, refer to VT PC-XXX

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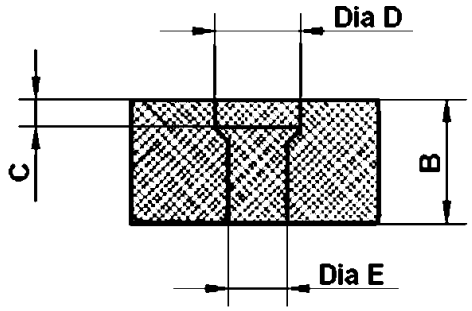
VT 1120, VT 1140

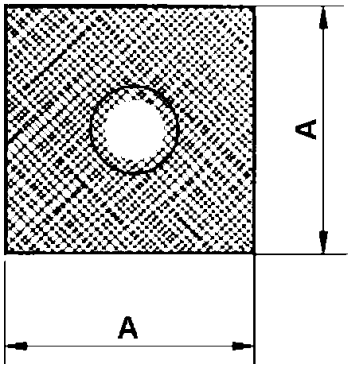
ALL METAL resilient cushion

Description

All metal resilient element produced of 18/8 steel mesh. The progressive spring rate yields an almost constant natural frequency over a wide load range. The element is non creeping, has excellent resistance to oils, solvents, water, chemical agents and to extremes of temperature.

Cushions are also available in AISI 316 stainless wire and other special metals.





Ref.	A	B	C	D	E
VT 1120	50	25	10	20	9
VT 1140	30	20	8	11	6

Characteristics

Material: stainless steel 18/8.
Natural frequency: 12-15 Hz.
Maximum excitation amplitude: ± 0,3 mm.
Amplification factor: 3-4.
Dynamic overload: 5 g
Temperature range: -90 °C to +300 °C.

Ref.	Load range in daN (≈kg)
VT 1120	30-300
VT 1140	5-50

Applications

A very useful construction element for suspension of smaller machine tools and for protection of delicate equipment.
Also used as a resilient element for anti vibration pipe clamps.

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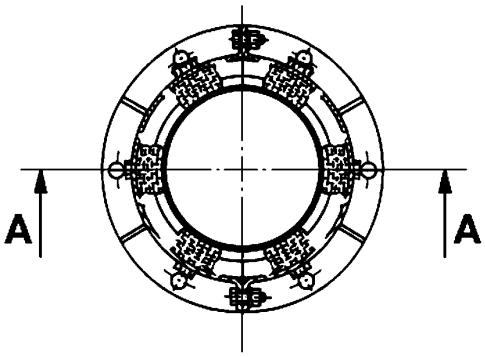
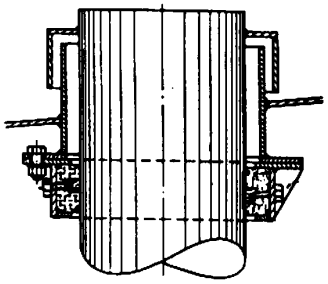
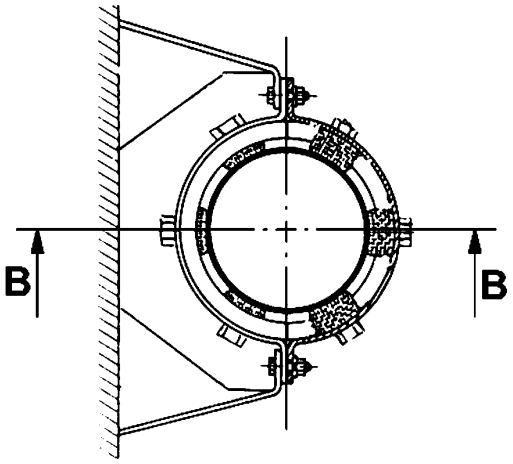
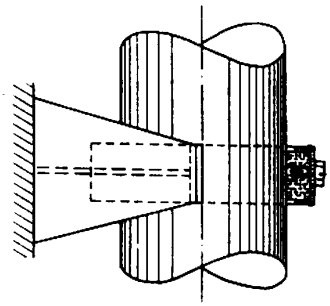
VT 1120, VT 1140





A - A





B - B

Installation in pipe clamp.

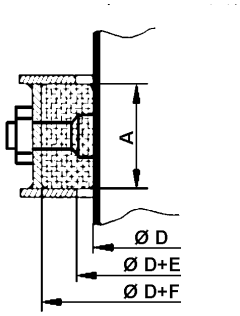
The elastic cushions are placed circumferentially around pipework providing a compact isolation system allowing both axial and radial expansion. For best isolation result, the clamp is to be made as rigid and heavy as possible.

We recommend the installation for the cushions as shown opposite (two half-rings in which the cushions are evenly spaced inside the rings).

Rain proof penetrations should be made with a sealing "hat" as shown in figure A.

The design of the clamp must allow compression of the cushions because of thermal expansion of the pipe; 10 mm for VT 1110 and 6 mm for VT 1130. The cushions should not be pre-compressed. The recommended dimensions of the clamp and the number of cushions are shown in the table below.

Ref.	A	E	F
VT 1120	50	20	50
VT 1140	30	16	40



Pipe diameter Ø D (mm)	Qty VT1120	Qty VT1140
70	-	4
130	-	6
170	-	8
210	-	10
370	8	-
530	10	-
690	12	-
850	14	-
1010	16	-
1170	18	-
1330	20	-

Note

For complete pipe-clamps, refer to VT PC-XXX.

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VT345P

Description

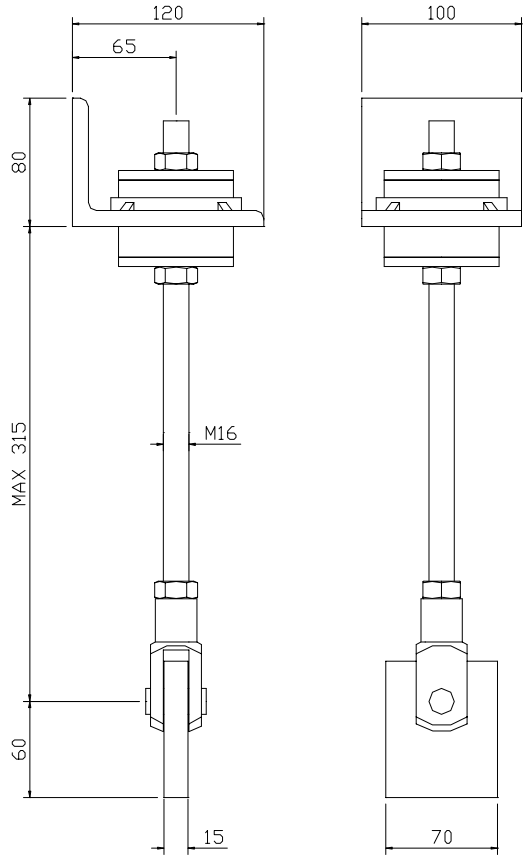
Double acting all metal pendulum mount. Resilient element, cushion in stainless steel wire.
Other parts in painted mild steel.

Characteristics

Mounts with very low natural frequency,
15-20 Hz.
Accepts both static and dynamic tension forces.
Maximum excitation: ± 0,3 mm.
Amplification factor: < 8.
Temperature range: -90°C to +300°C
Load range in daN (≈kg): 100 – 800

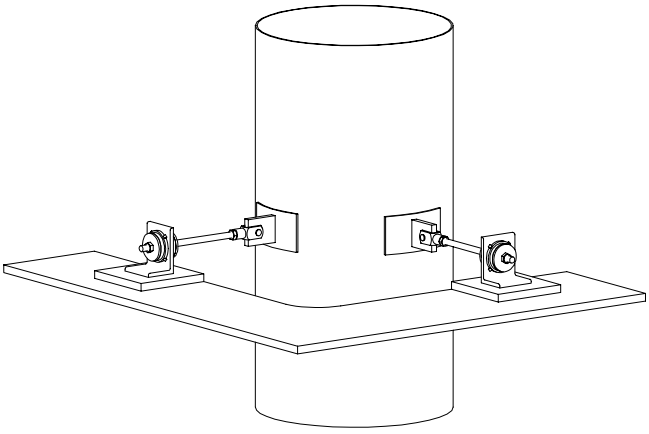
Application

Isolation of exhaust-, air- and steam-pipes.
Stabilisation of frames and equipment on vessels, vehicles etc.



Note

The total length of the extension rod is 330 mm.
Of course a longer rod can be used, but there is a risk of breaking during compression loads.



Exampel of stabilisation of exhaust pipe in casing.

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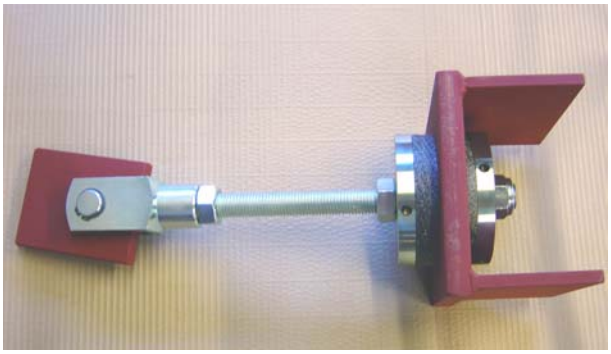
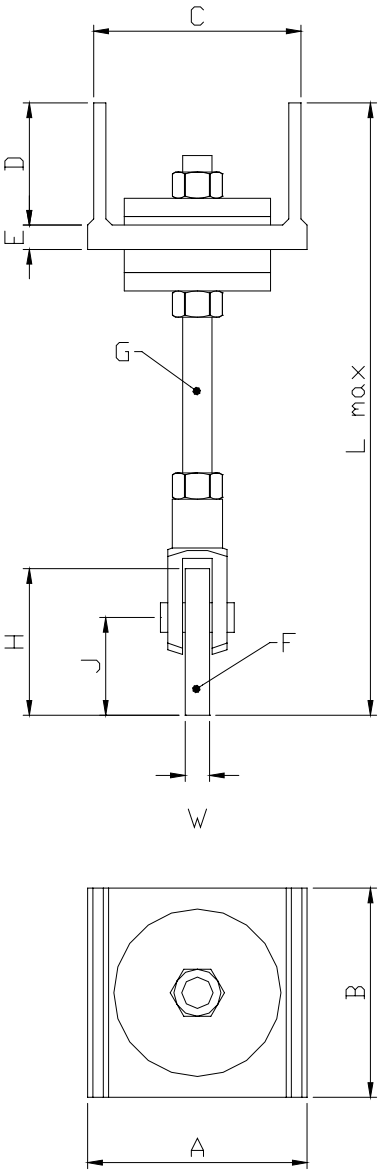
VT281P-VT283P





Description

Double acting all metal pendulum mount.
Resilient element, cushion in stainless steel wire.
Other parts in painted mild steel.

Characteristics

Mounts with low natural frequency, 15-20 Hz.
Accepts both static and dynamic tension forces.
Maximum excitation: ± 0,3 mm.
Amplification factor: < 4.
Temperature range: -90°C to +300°C

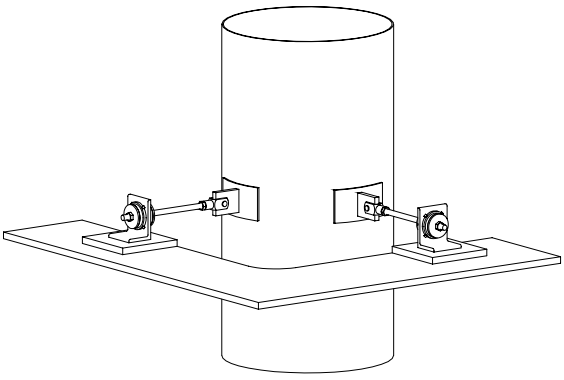
Ref.	Load range in daN (≈kg)
VT281P	1000 - 3000
VT283P	2000 - 7000

Application

Isolation of exhaust-, air- and steam-pipes.
Stabilisation of frames and equipment on vessels, vehicles etc.

Note

The total length of the extension rod is 330 mm for VT281P and 500 mm for VT283P.
Of course a longer rod can be used, but there is a risk of breaking during compression loads.



Exampel of stabilisation of exhaust pipe in casing.

Dimensions

Type	A	B	C	D	E	G	Lmax	F(LxWxH)	J
VT281P	180	180	170	100	20	M24x330	505	100x20x120	80
VT283P	210	200	200	100	25	M30x500	665	100x25x120	80

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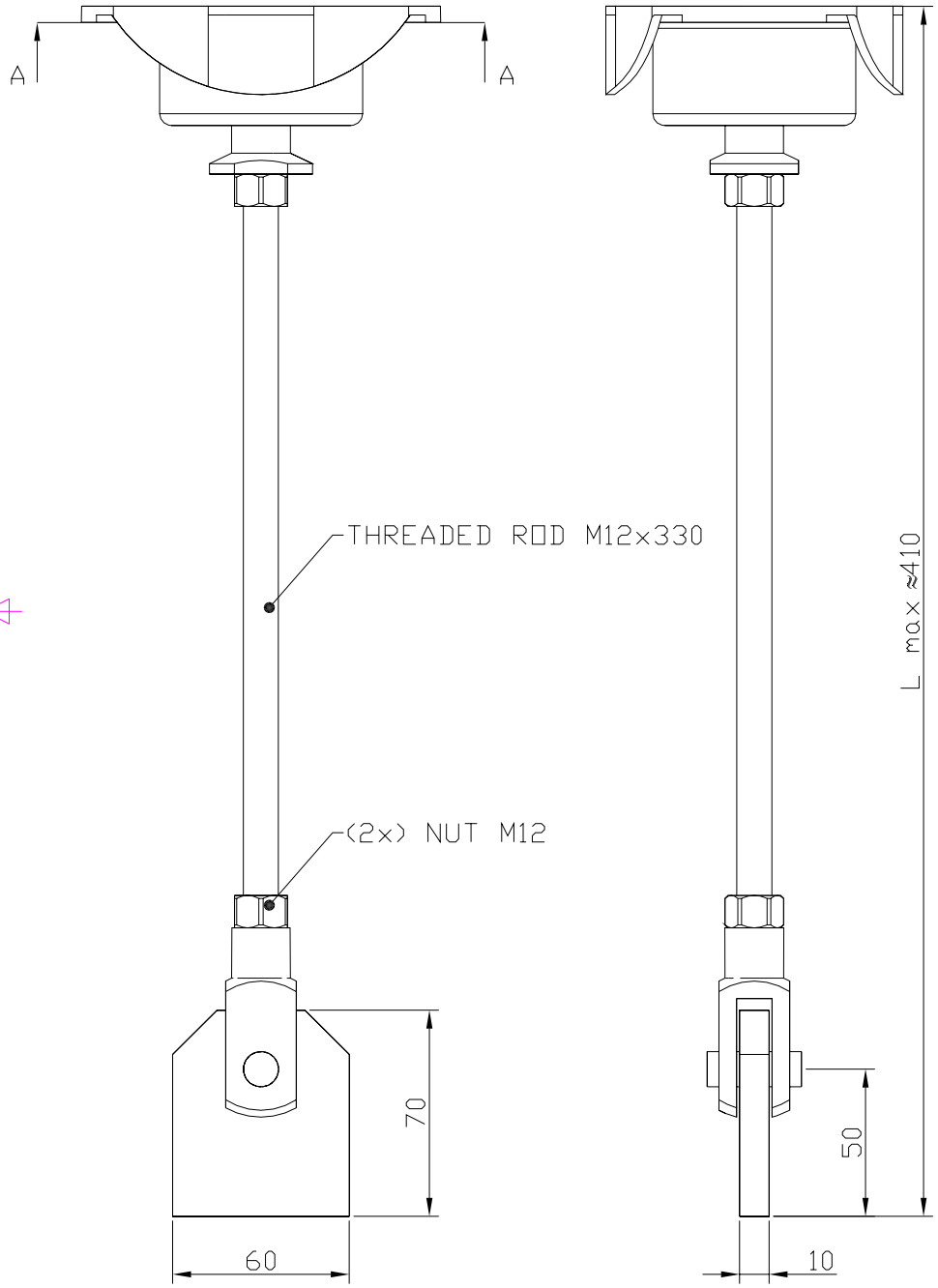
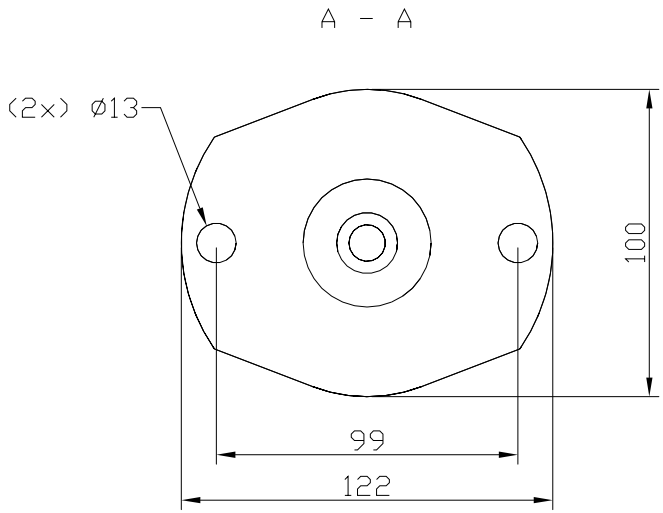
RevNo	Revision note	Date	Signature	Checked





Characteristics

Double acting all metal pendulum mount.
Resilient element, cushions in stainless steel wire.
Other parts in painted steel.

Mount with low natural frequency, 15 - 20 Hz.
Amplification factor: 3-4.
Temperature range: -90°C to +300°C.
Load range in daN: V5651P: 100-300
V5652P: 200-700

WORKMANSHIP AND TOLERANCES IN ACCORDANCE WITH VIBRATEC MANUFACTURING STANDARD, CLASS M.

2004-10-18	DJ	Not in scale
DATE	*SIGN*	*NOTE*

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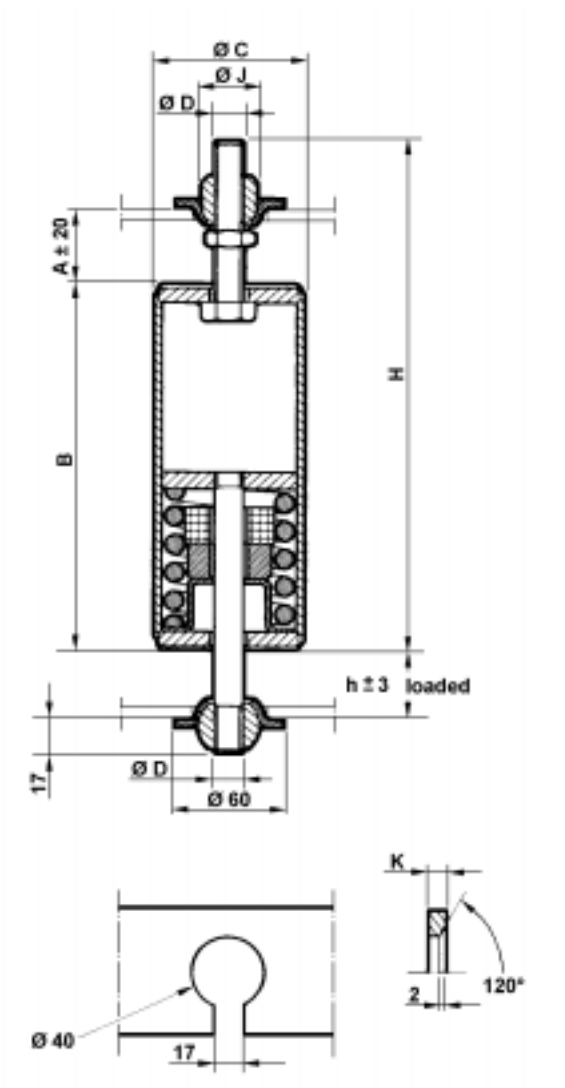
TITLE: DIMENSIONAL DRAWING
PENDULUM MOUNT V5651P/V5652P

SCALE:	*SIZE:* A4	*REVISION:*

DRAWING NO: 0410181DJ

V 303 - V 308



Ref.	A	B	C	D	H	J	K	h
303	40	135	63	M12	210	30	6	35
304	40	155	63	M12	230	30	6	35
305	45	175	82	M16	257	30	8	40
306	45	200	82	M16	282	30	8	40
308	45	220	82	M16	302	30	8	40

ALL METAL isolator

Description

All metal isolator of the single-action type, designed for loading in tension only.
Resilient elements: High tensile steel springs and 18/8 stainless steel cushions. Brass spherical nuts.
Housing and other parts in steel. Protection: paint.
Weights: V 303: 2 kg
V 304: 2.1 kg
V 305: 4.4 kg
V 306: 4.6 kg
V 308: 2.8 kg

Characteristics

A series of low-frequency isolators for tension loads.
Natural frequency: 3,5 to 5 Hz.
Amplification factor: < 9.
Temperature range: -90 °C to +300 °C.
Maximum load corresponding to a continuos acceleration of 3 g.

Ref.	Load range in daN (≈kg)	
	Static	Dynamic
V 303	4 -85	260
V 304	75-140	420
V 305	120-230	700
V 306	200-380	1200
V 308	270-500	1500

Applications

Isolation of exhaust systems, especially on ships.
Isolation of various pipes (pressurised air or fluids).
Protection of fragile equipment during transportation.

Installation

Attachment points to be made as shown in the cross-selection a-a. The mount may then be easily hooked onto the bracket without removing the nuts. The distance between the cups can be adjusted by turning the sleeve and locking the nut. The isolator must not be tensioned. Dimension "h" must be checked after thermal expansion of the pipe and the locknut locked afterwards. Dimension "h" must be within the ± 3 mm tolerances.

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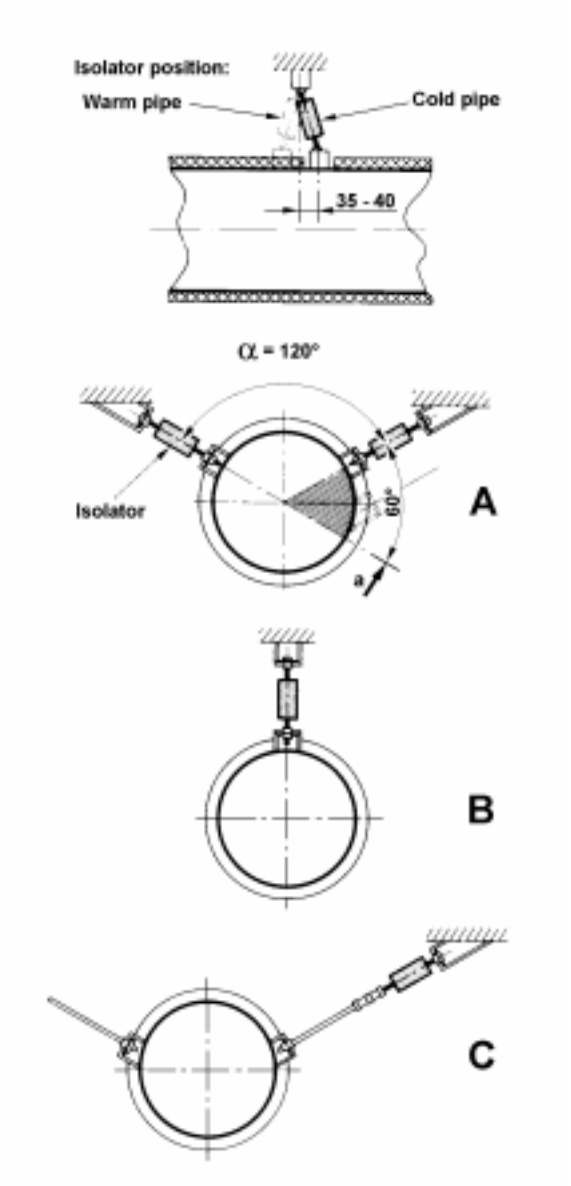
V 303 - V 308

α°=	120	100	90	60
Fd =	Rv	0,8Rv	0,7Rv	0,6Rv

Fd = Isolator load
Rv = Weight of section



Selection of the mount

The mount type is determined according to the weight of the suspended section.
When the mounts are installed at angle α°, use the table to estimate the load.

Choice of mounting

This series of isolators should be used for suspension of horizontal pipes, the recommended mountings are shown in figure A and B.
Use design "A" whenever side stabilisation of the pipe is required. The load on each isolator can be obtained from the table.

Expansion compensation

The ball-joints enable a radial movement of ± 40 mm. For extra precaution, the attachment brackets should be mounted at a 35-40 mm distance between one another (observe carefully the direction of thermal expansion).

Attachment

The attachment bracket requires an open slot to enable easy location of the mount.
For best result, the isolators should be located near the support mounting surface when the mounting points are not located near the manifold.

Note

For the stabilisation of vertical pipeworks, refer to data sheets for V 403 - V 406.
See also isolator VT 4524-XX.

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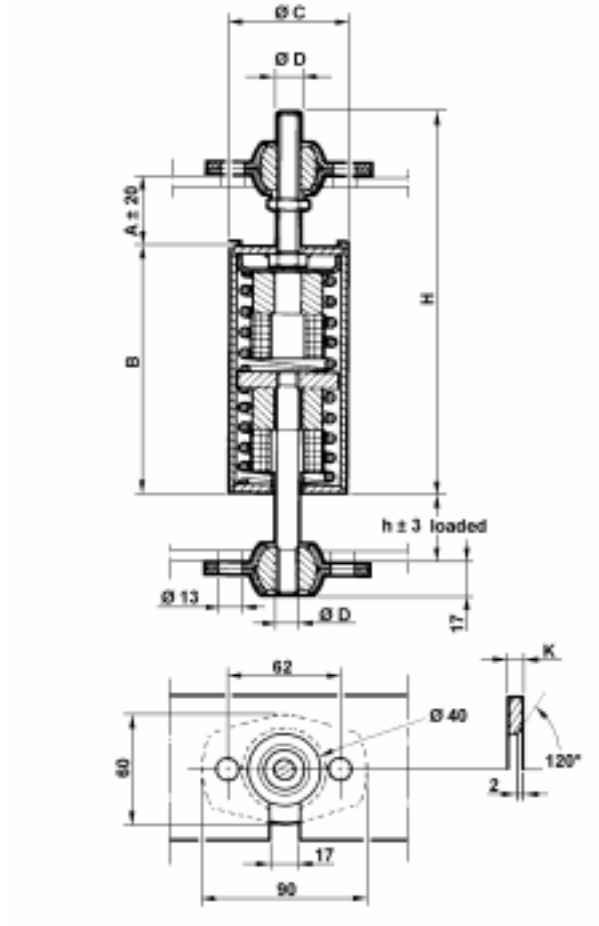
V 403 - V 406



Ref.	A	B	C	D	H	K	h
V 403	40	135	63	M12	210	6	40
V 404	40	155	63	M12	230	6	40
V 405	40	175	82	M16	257	8	45
V 406	40	200	82	M16	282	8	45

ALL METAL isolator

Description

All metal isolator of the double-action type, designed for loading in tension and compression. Resilient elements: High tensile steel springs and 18/8 stainless steel cushions. Brass spherical nuts. Housing and other parts in steel. Protection: paint.
Weights: V 403: 2,7 kg
V 404: 3,0 kg
V 405: 5,0 kg
V 406: 5,8 kg.

Characteristics

A series of low-frequency isolators operating in both tension and compression.
Natural frequency: 3,5 to 5 Hz.
Amplification factor: < 8.
Temperature range: -90 °C to +300 °C.
Maximum load corresponding to a continuos acceleration of 3 g.

Ref.	Load range in daN (≈kg)	
	Static	Dynamic
V 403	60-120	360
V 404	100-200	600
V 405	160-320	960
V 406	270-500	1500

Applications

Isolation of exhaust systems, especially on ships.
Isolation of various pipes (pressurised air or fluids).
Protection of fragile equipment during transportation.

Installation

Attachment points to be made as shown in the cross-selection a-a. The mount may then be easily hooked onto the bracket without removing the nuts. The distance between the cups can be adjusted by turning the sleeve and locking the nut. The isolator must not be tensioned. Dimension "h" must be checked after thermal expansion of the pipe and the locknut locked afterwards. Dimension "h" must be within the ± 3 mm tolerances.

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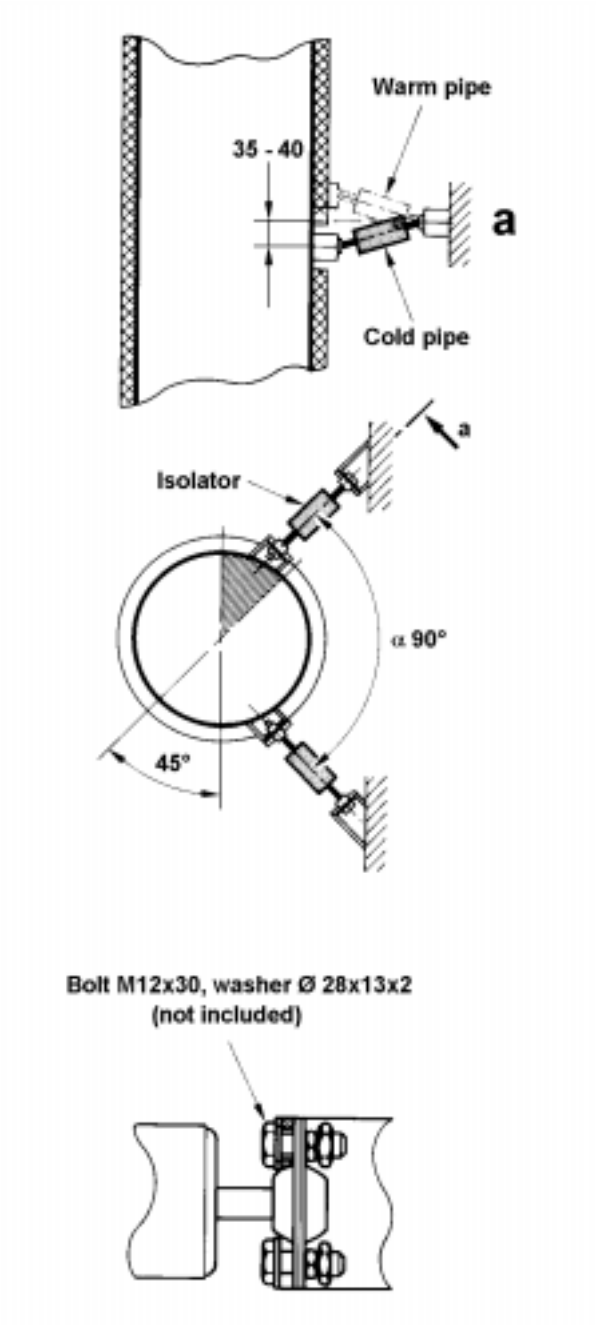
V 403 - V 406

α° =	100	90	60
Fd =	0,8Rv	0,7Rv	0,6Rv

Fd = Isolator load
Rv = Weight of section



Selection of the mount

The mount type is determined according to the weight of the suspended section.
When the mounts are installed at angle α°, use the table to estimate the load.

Choice of mounting

This series of isolators should be used for resilient stabilisation of vertical pipes. The mount is not intended to carry static loads.
The isolators should be located at an angle of 90° to one another (see figure) in order to distribute the stabilising force in all directions.

Expansion compensation

The ball-joints enable a radial movement of ± 40 mm. For extra precaution, the attachment brackets should be mounted at a 35-40 mm distance between one another (observe carefully the direction of thermal expansion).

Attachment

The attachment bracket requires an open slot to enable easy location of the mount.
For best result, the isolators should be located near the support mounting surface when the mounting points are not located near the manifold.

Note

For the suspension of horizontal pipeworks, refer to data sheets for VT 4524-XX (single action telescopic mounts).

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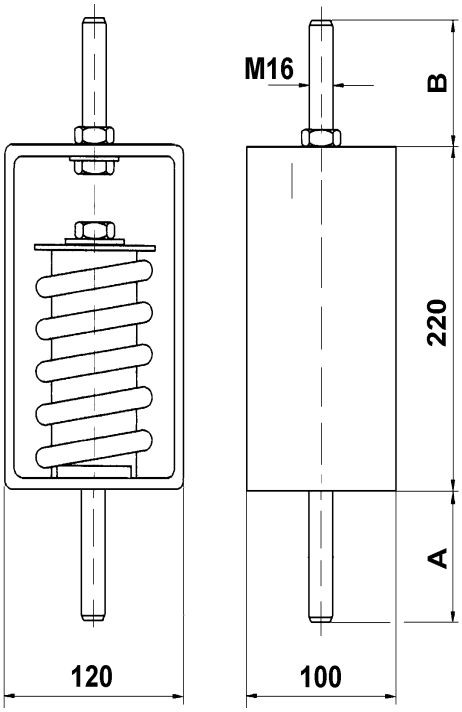
VT4524-0X



Description

Single working all metal telescopic mount. Spring made of high tensile steel.
Resilient element, cushion in stainless steel wire.
Scrolls in aluminium.
Other parts in mild steel

Characteristics

Mounts with very low natural frequency,
3-4 Hz, depending on pre-load.
Accepts both static and dynamic tension forces.
Maximum excitation: ± 1 mm.
Mechanical strength: 2 g.
Amplification factor: < 8.
Temperature range: -90°C to +300°C

Ref.	Load range in daN (≈kg)
VT4524-01	70 - 100
VT4524-02	95 - 130
VT4524-03	125 - 160
VT4524-04	160 - 230
VT4524-05	210 - 310
VT4524-06	300 - 420
VT4524-07	350 - 550

Application

Isolation of exhaust-, air- and steam-pipes.
Stabilisation of frames and equipment on vessels, vehicles etc.

Ref.	A	B	Weight (kg)
VT4524-01	100	120	4,2
VT4524-02	100	120	4,3
VT4524-03	100	120	4,4
VT4524-04	100	120	4,5
VT4524-05	100	120	4,6
VT4524-06	100	120	4,7
VT4524-07	100	120	4,8

Note

For larger loads, see isolator
VT4524-2X and VT4524-4X.

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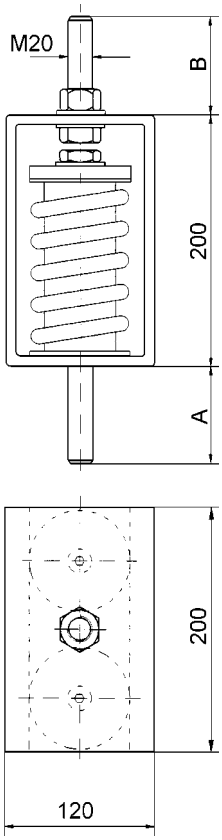
VT4524-2X



Description

Single working all metal telescopic mount. Spring made of high tensile steel.
Resilient element, cushion in stainless steel wire.
Scrolls in aluminium.
Other parts in mild steel.

Characteristics

Mounts with very low natural frequency,
3-4 Hz, depending on preload.
Accepts both static and dynamic tension forces.
Maximum excitation: ± 1 mm.
Mechanical strength: 2 g.
Amplification factor: < 8.
Temperature range: -90°C to +300°C

Ref.	Load range in daN (≈kg)
VT4524-25	420 - 620
VT4524-26	600 - 840
VT4524-27	700 - 1100

Application

Isolation of exhaust-, air- and steam-pipes.
Stabilisation of frames and equipment on vessels, vehicles etc.

Ref.	A	B	Weight(kg)
VT4524-25	100	120	10,5
VT4524-26	100	120	10,6
VT4524-27	100	120	10,7

Note

For smaller loads, see isolator
VT 4525-0X.

For larger loads, see isolator
VT 4525-4X

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VT4524-4X

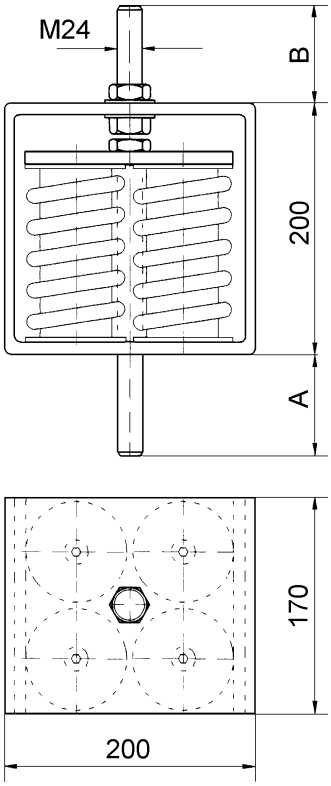
Description

Single working all metal telescopic mount. Spring made of high tensile steel.
Resilient element, cushion in stainless steel wire.
Scrolls in aluminium.
Other parts in mild steel.

Characteristics

Mounts with very low natural frequency,
3-4 Hz, depending on preload.
Accepts both static and dynamic tension forces.
Maximum excitation: ± 1 mm.
Mechanical strength: 2 g.
Amplification factor: < 8.
Temperature range: -90°C to +300°C

Ref.	Load range in daN (≈kg)
VT4524-45	840- 1240
VT4524-46	1200 - 1680
VT4524-47	1400 - 2200



Application

Isolation of exhaust-, air- and steam-pipes.
Stabilisation of frames and equipment on vessels, vehicles etc.

Ref.	A	B	Weight (kg)
VT4524-45	100	120	19,4
VT4524-46	100	120	19,9
VT4524-47	100	120	20,2

Note

For smaller loads, see isolator
VT 4525-2X and VT 4525-0X.

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Mounting instructions VT4524-XX

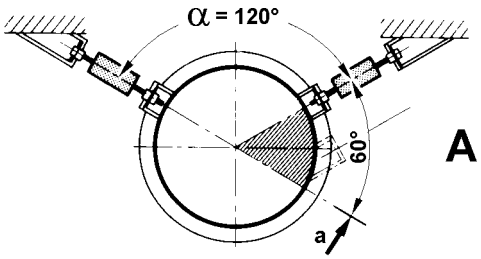
The VT4524-XX series is especially designed for suspension of horizontal pipes and for stabilisation of vertical pipes.

Horizontal pipes

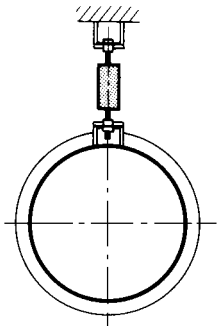
The recommended way to suspend horizontal pipes is shown in figure A and B. The weight of the suspended section determines the type of isolator to be used.
When mounting at an angle, use table 1 to estimate the load on each isolator.
Dimension "H1" must be checked after thermal expansion of the pipe. If H1 is outside the given interval, the isolator is loaded outside its design limits.

Table 1				
α° =	120	100	90	60
Fd =	Rv	0,8Rv	0,7Rv	0,6Rv

Fd = tension load
Rv = weight of the suspended section



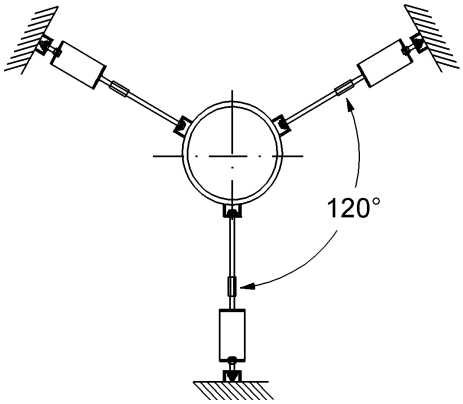
A

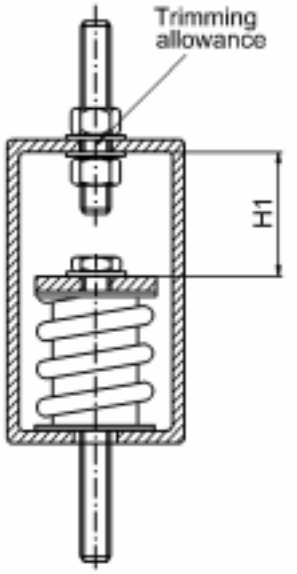


B

Vertical pipes

For stabilisation of vertical pipes, the mounting shown in C should be used (or according to sketch 7 in our catalogue A.01).
In order to prevent any downgrading of the system, the isolators should always be located near structure.
The VT4524-XX isolators are of the single acting type and must therefore be pre-tensioned.
Control and pre-tensioning is to be done when the pipe has reached it's working temperature, the distance H1 is then adjusted according to the table below.





Ref.	H1
VT4524-0X	90 ± 5
VT4524-2X	77 ± 5
VT4524-4X	70 ± 5

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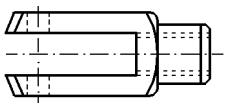
Mounting instructions VT4524-XX

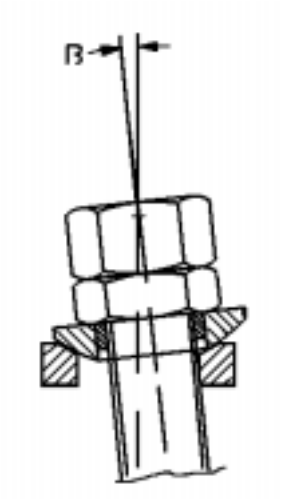
Expansion compensation

The mounts enable the pipeworks to move axially by ±35 mm or more.
Joints can be ordered in two different models: chapes or spherical brackets, see separate data-sheet and figure below.
If spherical brackets are used, the isolators will permit movements in all (lateral) directions.

I**mportant**: All screw nuts must be locked with a safety nut.



Chapes



Spherical brackets

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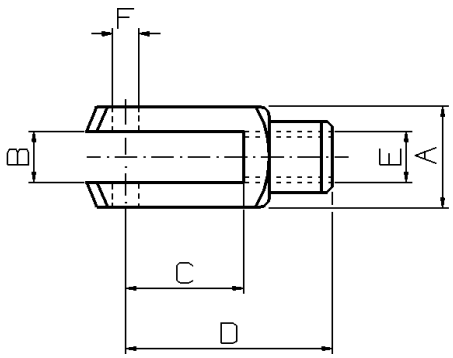
Attachment systems

Chapes

Protection: Zinc plated

With lockable pins

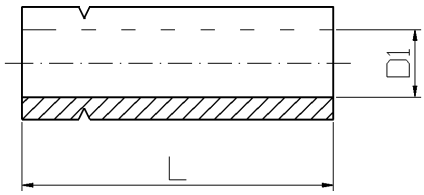


Type	Isolator	Size	A	B	C	D	E	F
VT-GL12	V5651 V5652	M12 x 24	20	12	24	48	M12	Ø12
VT-GL16	V5653 VT4524-0X	M16 x 32	26	16	32	64	M16	Ø16
VT-GL20	VT4524-2X	M20 x 40	34	20	40	80	M20	Ø20

Jointing sleeve

Protection: Zinc plated

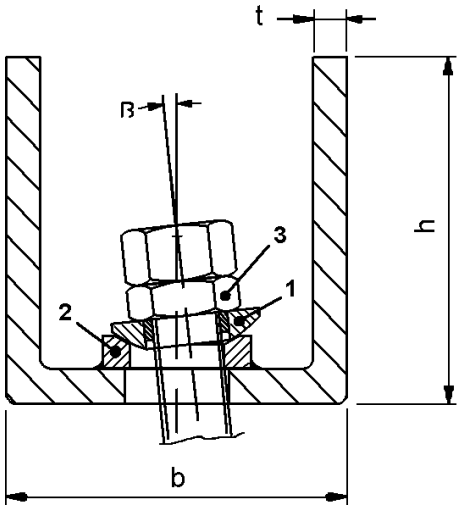
Type	Isolator	D1	L
VT-SM12	V5651 V5652	M12	50
VT-SM16	V5653 VT4524-0X	M16	50
VT-SM20	VT4524-2X	M20	50
VT-SM24	VT4524-4X	M24	50



Spherical bracket joint

The steel structure is welded to pipe and structure. Complete with sperical brackets and turned nut.
Protection: Primer

Typ	Isolator	b	h	t	ß max
VT-FB12	V5651 V5652	100	98	10	8°
VT-FB16	V5653 VT4524-0X	100	98	10	7°
VT-FB20	VT4524-2X	100	98	10	6°
VT-FB24	VT4524-4X	100	98	10	6°



In fig,: 1. spherical bracket, 2. taper washer, 3. turned nut

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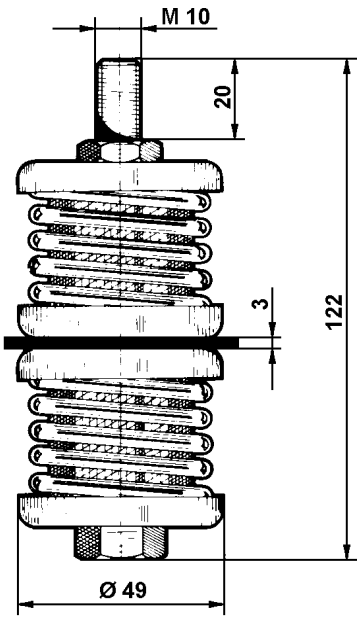
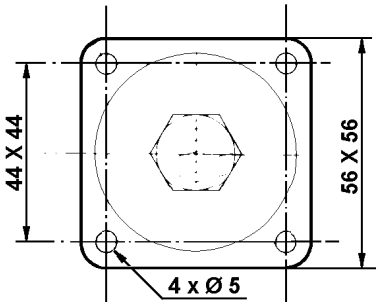
VT4570





ALL METAL isolator

Description

All metal mounts . High tensile steel springs. Resilient cushions in 18/8 stainless steel wire.
Other parts in steel.

Surface protection: anodic treatment.
Weight: 0,55 kg.

Characteristics

A series of low frequency isolators with a natural frequency of 7-10 Hz within a wide load range.
May be loaded in tension or compression.

Maximum excitation amplitude: ± 1 mm.
Mechanical overload factor: 3 g.

Magnification factor (Q): < 5.
Temperature range: -90°C to +300°C.

Ref.	Load range in daN (≈kg)
VT4570-1	10-15
VT4570-2	15-25
VT4570-3	25-50

Application

Stabilisation and protection of fragile equipment.
Suspension of light exhaust systems on vehicles and vessels.

Note

For higher loads, refer to models:

V 403 = 60 - 120 daN
V 404 = 100 - 200 daN
V 405 = 160 - 320 daN
V 406 = 270 - 500 daN

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V5651 - V5653

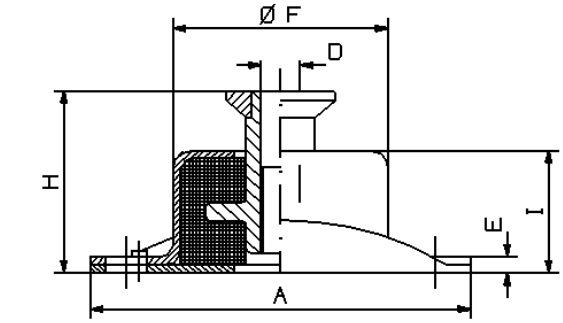
ALL METAL isolator

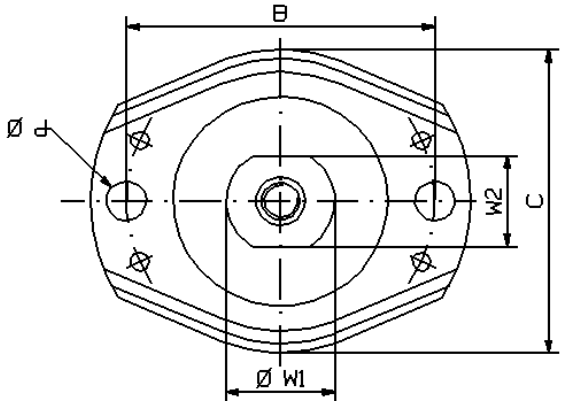
Description

Resilient elements made of 18/8 stainless steel wire, stud in aluminium, casing and flange in steel.
Protection: paint.
Weights: V5651: 0,8 kg
V5652: 0,8 kg
V5653: 1,7 kg.

Characteristics

A series of isolators with equifrequency character; 15-20 Hz for the recommended load range.
May work under compression or tension.
Maximum excitation amplitude: ± 0,3 mm.
Amplification factor: < 6.
Temperature range: -90 °C to +300 °C.
Maximum load corresponding to a continuous acceleration of 2 g.





Ref.	Load range in daN (≈kg)
V5651	100 - 300
V5652	200 - 700
V5653	500- 1500

Applications

Suspension of machine tools in general, especially crushing machines, grinding mills.
Elastic suspension of exhaust pipes, motors, pumps etc. on ships and vehicles.
Rotating machines operating above 30 Hz.

Note

For larger loads, refer to isolators V5654, V318.

Ref.	A	B	C	D	E	F	H	I	W1	W2	d
V5651 V5652	122	99	100	M 12	5.5	69	60	40.5	35	30	13
V5653	173	141	135	M 16	7	96	65	45	50	42	17

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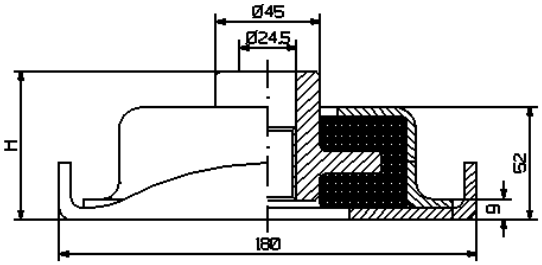
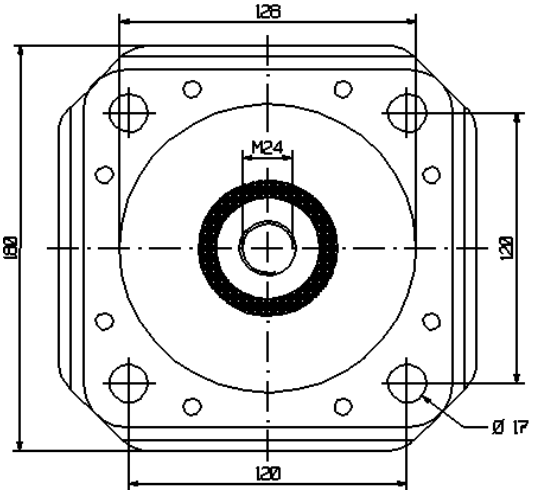
V5654

ALL METAL isolator

Description

Resilient elements made of 18/8 stainless steel wire, stud in aluminium, casing and flange in steel.
Protection: paint.
Weight: 4,0 kg.





Characteristics

Isolator with equifrequency character; 15-20 Hz for the recommended load range.
May work under compression or tension.
Load range: 1500 - 3000 kg
Maximum excitation amplitude: ± 0,3 mm.
Amplification factor: < 6.
Temperature range: -90 °C to +300 °C.
Maximum load corresponding to a continuous acceleration of 2 g.

Applications

Suspension of machine tools in general, especially crushing machines, grinding mills.
Elastic suspension of exhaust pipes, motors, pumps etc. on ships and vehicles.
For rotating machines operating above 30 Hz.

Note

For larger loads, refer to isolator V318.

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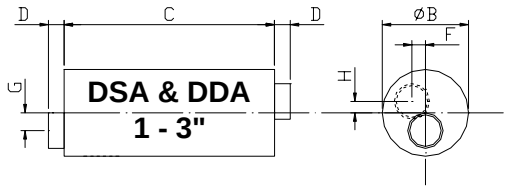
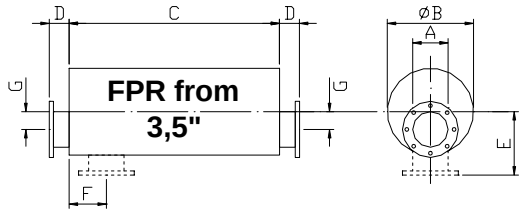
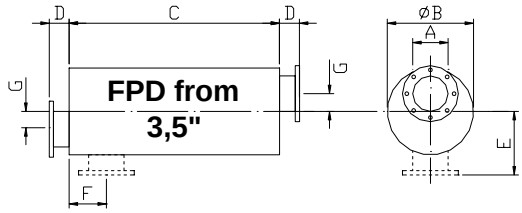
DSA / FPR
DDA / FPD







Silencer

Description

Recommended for silencing the exhausts of small and medium sized diesel and petrol engines.
The DSA/FPR have twin chambers and provides 25 dB(A) attenuation, and the DDA/FPD have triple chambers and provides 30dB(A) attenuation.

Connections: 1,5" to 3", B:S:P: nipple connetion
3,5" to 7", flanges acc.to DIN2573 (PN6)
8" and larger, flanges acc.to DIN86044

Finish; heat resistant paint.

Options

Material; mild Steel, Cor-Ten, stainless Steel Grades 304L, 316L & 409.

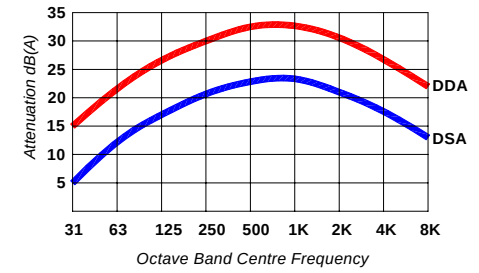
Alternative configurations, mating flange assemblies, lifting lugs, support feet horizontal & vertical.

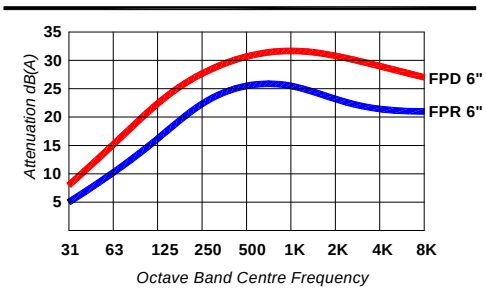
Dimensions

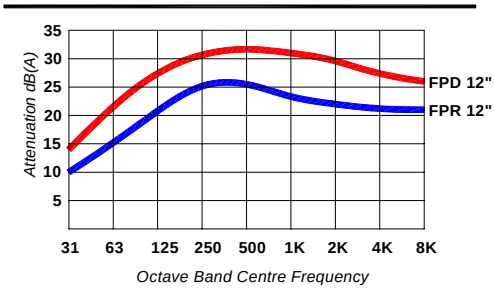
Connections		A	B	C		D	E	F	G	H	Weight	
				DSA	DDA						DSA	DDA
	B.S.P. Nipple onnections	DN (inch)	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg
		25 (1,0")	89	255	380	16	-	13	15	7	1	2
		38 (1.5")	115	380	560	30	-	21	24	12	3	4
		50 (2.0")	152	510	765	35	-	27	30	14	5	8
		65 (2.5")	178	610	889	38	-	33	38	19	7	12
		75 (3.0")	206	735	1015	48	-	40	46	22	12	15
				FPR	FPD						FPR	FPD
	DIN2573 (PN6)	90 (3.5")	260	800	1000	75	205	70	45	-	23	30
		100 (4.0")	280	900	1200	75	215	75	51	-	26	33
		125 (5.0")	360	900	1200	75	255	90	64	-	43	55
		150 (6.0")	410	1000	1400	75	280	100	77	-	48	67
		175 (7.0")	460	1100	1600	75	305	115	90	-	91	110
	DIN86044	200 (8.0")	510	1300	1800	75	330	125	102	-	105	125
		225 (9,0")	560	1500	2000	75	355	150	112	-	155	180
		250 (10.0")	610	1700	2200	75	380	165	128	-	200	232
		300 (12.0")	710	2300	2800	100	460	190	153	-	355	380
		350 (14,0")	760	2500	3000	100	500	215	178	-	390	422

All dimensions in mm unless otherwise stated

Typical Attenuation Curve







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ADS25 & FP-serie

Silencer

Description

Absorptive silencers with a design as provides very low restriction to exhaust gases, thus back pressure is negligible. Silencers of this type may also be used as secondary units on systems using reactive primary silencers.

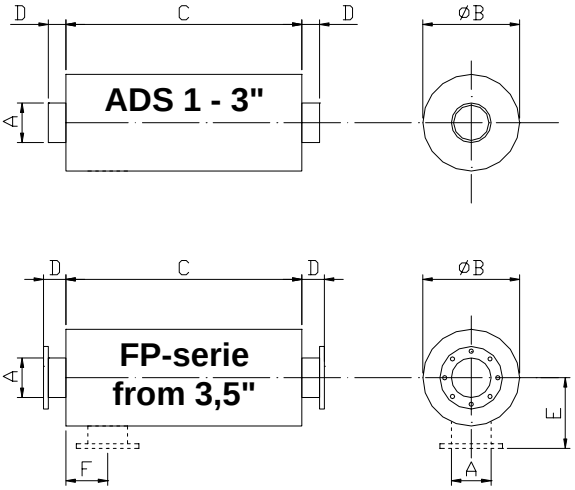
Connections: 1,5" to 3", B:S:P: nipple connetion
3,5" to 7", flanges acc.to DIN2573 (PN6)
8" and larger, flanges acc.to DIN86044

Finish; heat resistant paint.

Options

Material; mild Steel, Cor-Ten, stainless Steel Grades 304L, 316L & 409.

Alternative configurations, mating flange assemblies, lifting lugs, support feet horizontal & vertical.

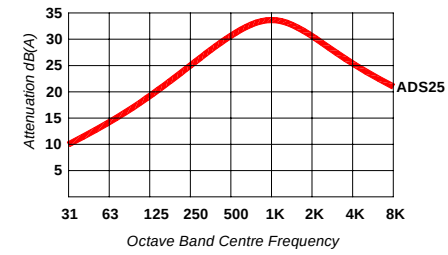


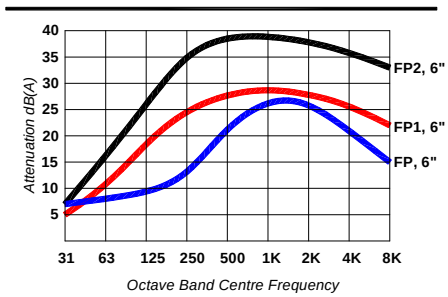
Dimensions

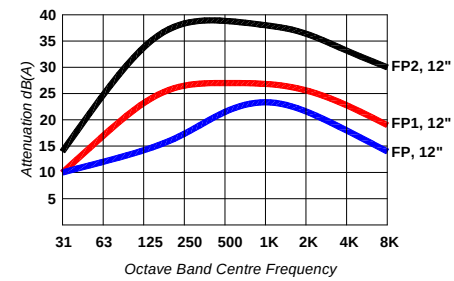
Connections		A	B		C			D	E		F	Weight		
B.S.P. Nipple connections		DN (inch)	mm		mm			mm	mm		mm	kg		
		25 (1,0")	89		380			20	-		-	2		
		38 (1.5")	115		610			30	-		-	4		
		50 (2.0")	115		765			35	-		-	6		
		65 (2.5")	133		765			45	-		-	7		
		75 (3.0")	152		765			50	-		-	9		
DIN2573 (PN6)			FP	FP1/2	FP	FP1	FP2	D	FP	FP1/2		FP	FP1	FP2
		90 (3.5")	178	310	850	950	1350	75	164	230	150	15	60	80
		100 (4")	230	360	850	1100	1600	75	190	255	160	20	85	125
		125 (5")	310	410	850	1200	1800	75	230	280	180	30	120	160
		150 (6")	360	460	1150	1400	1900	75	255	305	190	46	160	220
		175 (7")	360	460	1150	1500	2300	75	255	305	200	47	170	250
DIN86044		200 (8")	410	610	1450	1650	2500	75	280	355	220	64	190	280
		225 (9")	410	610	1450	1800	2600	75	280	355	235	68	220	320
		250 (10")	460	660	1750	2000	2700	75	305	430	250	130	290	400
		300 (12")	560	760	2200	2200	3200	100	380	480	280	200	400	500
		350 (14")	560	760	2200	2400	3300	100	380	480	320	218	490	680
		400 (16")	660	920	2600	2700	3700	100	430	550	340	280	630	850
		450 (18")	660	920	2900	3000	4200	100	430	550	370	310	780	1000
		500 (20")	760	1070	2900	3300	4500	100	480	640	400	330	900	1200
		550 (22")	760	1270	3200	3600	4800	100	480	735	430	375	1100	1400
		600 (24")	810	1370	3500	3700	5000	100	505	835	460	430	1300	1800

All dimensions in mm unless otherwise stated

Typical Attenuation Curve







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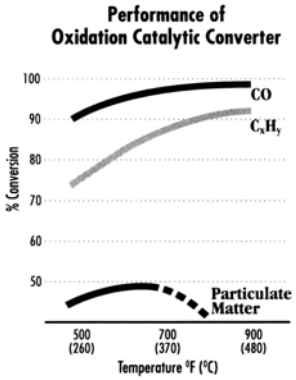
MINE-X® DC2 - DC18

OXIDATION PURIFIERS

the Solution for a cleaner working environment

MINE-X® oxidation purifiers eliminate dangerous carbon monoxide (CO), hydrocarbons (HC), odor and particulates from diesel fueled engines. By using the most advanced catalyst formulations, MINE-X oxidation purifiers are able to eliminate dangerous engine emissions even at low exhaust temperatures.



It is important that the engine exhaust reaches a temperature of at least 200°C. MINE-X purifiers will operate under a variety of load and speed conditions but will not compensate for a poorly tuned engine. Engine malfunctions such as defective injectors or high lubricating oil consumption can result in loss of purifier efficiency. A new engine should run for some hours before installation of purifier.

Conversion Efficiency, Quality and Service

- ► **Reduce CO by up to 95%**
- ► **Reduce HC by up to 90%**
- ► **Reduce particulates by up to 45%**
- ► **Lowest back-pressure in the market**
- ► **Stainless steel construction**
- ► **Standard or custom designs**
- ► **Easy to install**
- ► **Honeycomb is brazed, not pinned**
- ► **Virtually maintenance free**
- ► **Rapid delivery**
- ► **Cost effective**

Each MINE-X® oxidation purifier contains a patented stainless steel honeycomb, which is brazed to its stainless steel shell through a proprietary vacuum brazing process. This unique brazing process eliminates the possibility of the honeycomb loosening, cracking or telescoping inside the purifier.

MINE-X® oxidation purifiers install directly in the exhaust gas stream between the exhaust manifold and silencer and are available in two designs. The first features two quick release clamps, which enable removal of the purifier center body for easy inspection or replacement. The second design is all-welded and has a fixed purifier center body. The oxidation purifiers are ideal for large diesel applications, where space in the exhaust system is unrestricted.

DCL International Inc.

DCL is world leader in emmission control technologies. Besides oxidation catalysts, the MINE-X product line comprises three-way catalysts, soot filters and mufflers.

For people who work underground, carbon monoxide, hydrocarbons and particulate matter pose serious health risks. MINE-X purifiers clean dangerous exhausts, keeping employees safe and productive.

Vibratec Akustikprodukter designs and supplies complete exhaust systems to diesel-engined service locomotives and trolleys, ordered by the Norwegian State Railways (Jernbaneverket). The photo to the right shows a diesel-engined trolley with a Deutz V-engine supplied with two separate exhaust systems, each comprising expansion joint, MINE-X Oxidation Purifier, exhaust silencer, piping, as well as vibration isolators, just ready for emission measuring control.

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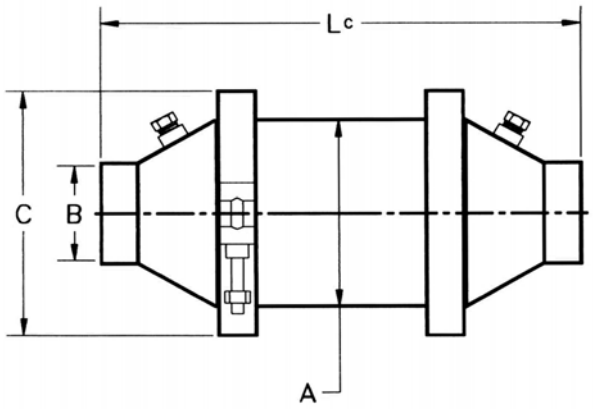
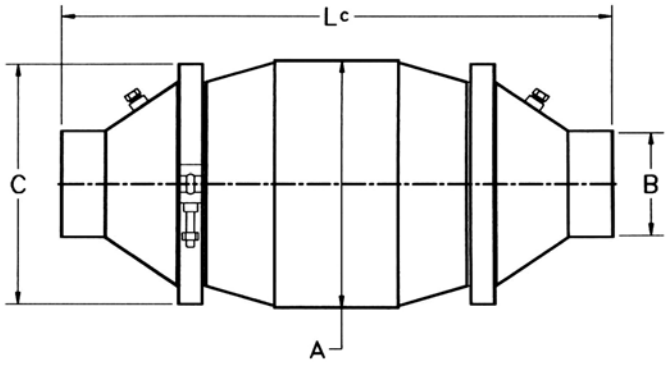
MINE-X® DC2 - DC18

MINE-X® OXIDATION PURIFIER DIMENSIONS

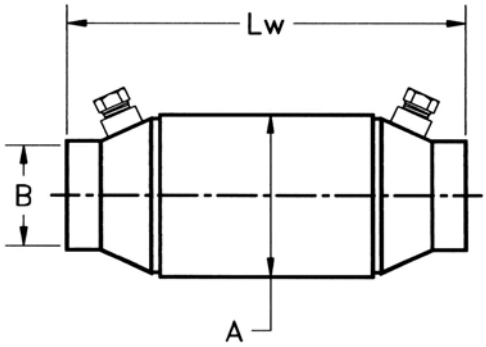
Model	DC2	DC3	DC4	DC5	DC6	DC7	DC8	DC10	DC12	DC14	DC16	DC18
Max Engine Power - HP (kW)	9 (7)	16 (12)	32 (24)	53 (40)	84 (63)	123 (92)	168 (125)	248 (185)	363 (271)	456 (340)	733 (547)	1114 (831)
Max Exhaust Gas Flow - m^3/h	90	160	330	540	856	1250	1700	2500	3700	4700	7500	11400
Approx. Weight - DP - Kg	0.2	0.4	0.8	1.2	1.8	2.6	3.1					
Approx. Weight - DQ - Kg			1.6	2.2	3.0	3.8	4.7	6.3	7.7	8.7	12.8	n/a
A - diameter - mm	42	62	79	102	127	152	178	216	257	292	368	n/a
L_W - length - mm	165	152	184	234	244	264	305					
L_C - length - mm			203	244	254	276	314	445	445	478	546	n/a
C - clamp diameter - mm			107	133	159	184	210	210	210	210	210	n/a
B - exhaust pipe outside diameter	CUSTOMER SPECIFIED											



MINE-X® Clamped Design
DC5 to DC8



MINE-X® Clamped Design
DC10 to DC18



MINE-X® Welded Design

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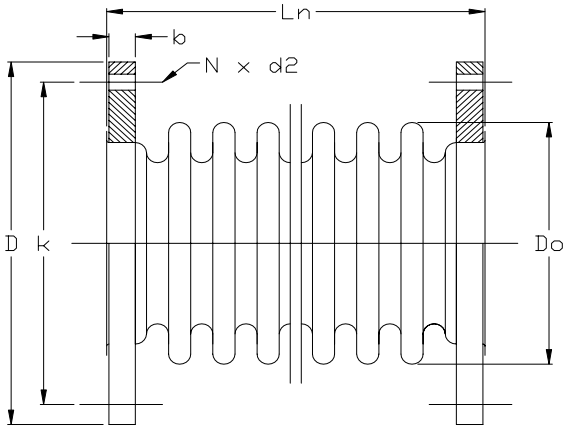
VTAS

Expansion joints

Bellow: AISI 321 (1.4541) steel (2 layer).
Flanges: RSt.37.2. DN40 - DN175:
acc. to DIN 2573 (PN6)
DN200 - DN1200: acc. to DIN 86044
Other standards or material at request.



Temperature > 600ºC
Design pressure > 1,0 BarG
Produced acc. to EJMA-standard
Turnable flanges or stub ends
Other specifications at request

Technical specification at 350ºC:

Type	Max. movment (+/-)		Max. reaction force		Spring rate	
	Axial (mm)	Lateral (mm)	Axial (daN)	Lateral (daN)	Axial (N/mm)	Lateral (N/mm)
VTAS-0040	21	20	137	22	65	11
VTAS-0050	23	17	122	20	53	12
VTAS-0065	29	16	165	34	57	21
VTAS-0080	30	15	171	38	57	25
VTAS-0100	36	12	209	90	58	75
VTAS-0125	33	11	162	77	49	70
VTAS-0150	39	11	207	119	53	108
VTAS-0175	43	10	249	164	58	164
VTAS-0200	43	9	482	353	112	392
VTAS-0250	53	10	541	456	102	456
VTAS-0300	53	8	541	518	102	648
VTAS-0350	53	7	689	713	130	1018
VTAS-0400	61	8	641	654	105	818
VTAS-0450	61	7	714	804	117	1148
VTAS-0500	64	7	768	984	120	1405
VTAS-0550	75	9	825	1076	110	1195
VTAS-0600	68	7	721	1077	106	1539
VTAS-0700	82	8	1427	1970	174	2462
VTAS-0800	82	7	1320	2157	161	3081
VTAS-0900	96	8	1469	2267	153	2834
VTAS-1000	96	8	1603	3066	167	3833
VTAS-1100	96	7	1747	3547	182	5067
VTAS-1200	110	8	1892	3682	172	4603

Type	Ln	Flanges acc to DIN 2573 (PN6)						Weight
		D	b	k	N	d2	Do	
	(mm)	(mm)	(mm)	(mm)	(ant.)	(mm)	(mm)	(kg)
VTAS-0040	165	130	16	100	4	14	60	3,5
VTAS-0050	170	140	16	110	4	14	71	4
VTAS-0065	170	160	16	130	4	14	88	4,5
VTAS-0080	180	190	18	150	4	18	101	7
VTAS-0100	140	210	18	170	4	18	129	8
VTAS-0125	165	240	20	200	8	18	156	10,5
VTAS-0150	165	265	20	225	8	18	187	12,5
VTAS-0175	165	295	20	255	8	18	212	13,5
		Flanges acc. to DIN 86044						
VTAS-0200	150	320	16	280	8	18	240	12
VTAS-0250	165	375	16	335	12	18	296	15
VTAS-0300	165	440	16	395	12	22	349	17,5
VTAS-0350	165	490	16	445	12	22	379	24,5
VTAS-0400	200	540	16	495	16	22	432	27,5
VTAS-0450	200	595	16	550	16	22	483	32
VTAS-0500	190	645	16	600	20	22	534	34
VTAS-0550	225	703	20	650	20	22	585	48,5
VTAS-0600	215	754	20	700	20	22	640	52,5
VTAS-0700	250	858	20	800	24	22	741	67,5
VTAS-0800	250	958	20	900	24	22	785	79
VTAS-0900	280	1060	20	1010	28	22	949	88
VTAS-1000	280	1162	20	1110	32	22	1051	97,5
VTAS-1100	280	1266	20	1210	32	22	1155	107
VTAS-1200	310	1366	20	1310	36	22	1255	116

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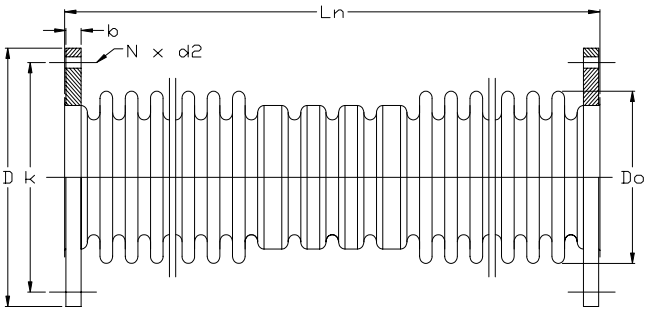
VTAD

Expansion joints

Bellow: AISI 321 (1.4541) steel (2 layer).
Flanges: RSt.37.2. DN40 - DN175:
acc. to DIN 2573 (PN6)
DN200 - DN1200: acc. to DIN 86044
Other standards or material at request.



Temperature > 600ºC
Design pressure > 1,0 BarG
Produced acc. to EJMA-standard
Turnable flanges or stub ends
Other specifications at request

Technical specification at 350ºC:

Type	Max. movment (+/-)		Max. reaction force		Spring rate	
	Axial (mm)	Lateral (mm)	Axial (daN)	Lateral (daN)	Axial (N/mm)	Lateral (N/mm)
VTAD-0040	30	50	171	20	57	4
VTAD-0050	32	50	195	30	61	6
VTAD-0065	50	50	250	40	50	8
VTAD-0080	38	50	205	30	54	6
VTAD-0100	32	41	211	70	66	17
VTAD-0125	34	39	201	74	59	19
VTAD-0150	39	36	207	90	53	25
VTAD-0175	43	34	249	136	58	40
VTAD-0200	43	31	482	257	112	83
VTAD-0250	58	26	534	330	92	127
VTAD-0300	58	30	522	603	90	201
VTAD-0350	47	36	555	400	118	111
VTAD-0400	45	32	630	528	140	165
VTAD-0450	60	36	702	727	117	202
VTAD-0500	64	34	768	830	120	244
VTAD-0550	64	30	819	1005	128	335
VTAD-0600	82	43	1287	1264	157	294
VTAD-0700	81	36	1409	1598	174	444
VTAD-0800	79	31	1525	1975	193	637
VTAD-0900	79	29	1414	2163	179	746
VTAD-1000	79	26	1541	2623	195	1009
VTAD-1100	106	28	1696	3466	160	1238
VTAD-1200	106	26	1823	4116	172	1583

Type	Ln	Flanges acc to DIN 2573 (PN6))						Weight
		D	b	k	N	d2	Do	
	(mm)	(mm)	(mm)	(mm)	(ant.)	(mm)	(mm)	(kg)
VTAD-0040	275	130	16	100	4	14	60	3,5
VTAD-0050	275	140	16	110	4	14	70	4
VTAD-0065	275	160	16	130	4	14	88	4,5
VTAD-0080	340	190	18	150	4	18	101	7
VTAD-0100	280	210	18	170	4	18	128	8
VTAD-0125	300	240	20	200	8	18	156	11
VTAD-0150	300	265	20	225	8	18	187	12,5
VTAD-0175	300	295	20	255	8	18	212	13,5
		Flanges acc. to DIN 86044						
VTAD-0200	300	320	16	280	8	18	240	13
VTAD-0250	300	375	16	335	12	18	296	17,5
VTAD-0300	300	440	16	395	12	22	347	21
VTAD-0350	400	490	16	445	12	22	379	28
VTAD-0400	400	540	16	495	16	22	432	31
VTAD-0450	400	595	16	550	16	22	483	36
VTAD-0500	400	645	16	600	20	22	534	39
VTAD-0550	400	703	20	650	20	22	585	53
VTAD-0600	500	754	20	700	20	22	640	61
VTAD-0700	500	858	20	800	24	22	742	70,5
VTAD-0800	500	958	20	900	24	22	843	80
VTAD-0900	500	1060	20	1010	28	22	949	90
VTAD-1000	500	1162	20	1110	32	22	1051	99,5
VTAD-1100	500	1266	20	1210	32	22	1155	113
VTAD-1200	500	1366	20	1310	36	22	1255	122

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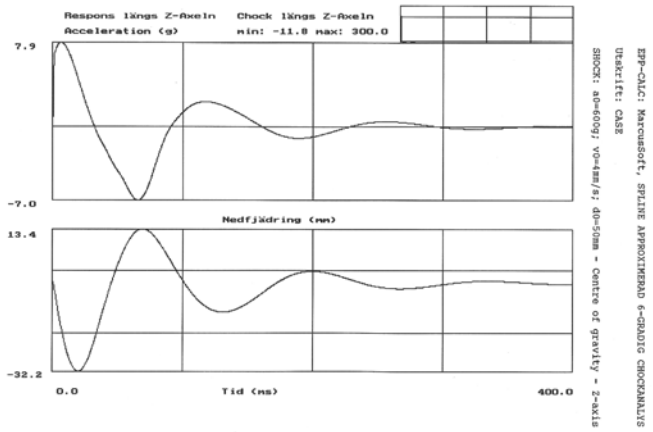
Engineering

SHOCK AND VIBRATION CALCULATION AND ANALYSIS

Some resilient suspensions may be rather complicated to calculate. Akustikprodukter Norge (APN) offers a complete shock and vibration engineering service. Many years of experience in the field, combined with use of modern tools, enable us making the optimized selection of resilient mounts for your applications and ensure that the suspension meets the required standards or demands. Utilizing our sophisticated vibration and shock calculation program, elements like 6 degrees of freedom, inertia of moments, centre of gravity of the suspended unit, dynamic stiffness of the selected mounts, earth gravitation, inherent damping, etc., are taken into account. The results of our calculations and analyses are supported by an explanatory summary report.



Residual shock determined by our calculation programme.

The upper graph indicates the residual shock measured at the centre of gravity of a suspended unit. Basis for the analysis is a double sine shock pulse (300g/-11.8g) with the durations of 1.4 and 36 ms., respectively. The values are calculated on the basis of a shock spectrum nomogram.

The lower graph indicates the dynamic travel, generated by the shock pulse, as well as the duration of the oscillation. The short duration is typical for a suspension using resilient mounts with essential inherent damping, like cable mounts.

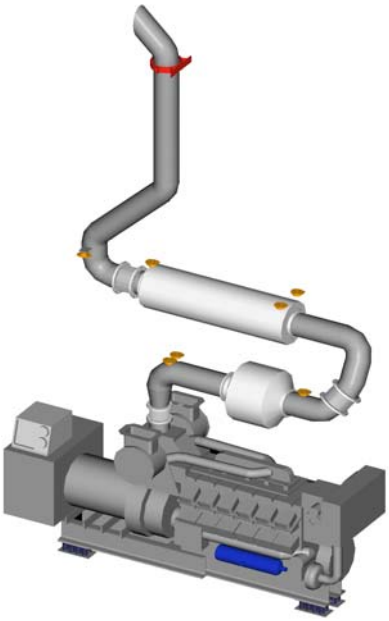
Shock insulation of sensitive mobile electronics.

Cable mounts, located in each of the four corners, are fixed between the inner cabinet containing sensitive components, and the outer protecting cabinet. The load mode is thus 45º compression/roll at the bottom and 45º tension/roll at the top of the inner cabinet. To select shock mounts for applications like this may require our engineering assistance.

3D DESIGN AND ANALYSIS

In order to optimize development projects it is highly important to avoid deviations and to communicate with all involved parties.

A sound technical design and low costs demand focus, visualization of ideas and early verification of said ideas. This can be achieved by using modern development tools for 3D CAD and FEM-based analysis. To avoid late discovery of a weak or inconsistent design we can supply your projects with 3D design and analysis of resonant frequencies and shock, as well as mechanical and thermal stress.



With modern 3D tools one can develop the basic geometry early and communicate the design via visualized data and models for analyses and better understanding. At the same time, the parametric data of the computer models provide freedom to change basic dimensions late in the project and still reach critical milestones.

The modern tools available make the communication between the parties effective. You may, f. inst., transfer your basic drawing of a complete exhaust system in 2D or 3D format by e-mail, whereupon we return it to you with adviced components - Silencer(s), Compensators, contingent Catalytic Converter, Resilient Mounts, etc. - implemented to the drawing and located in accordance with our proposal.

Founded in 1995, Akustikprodukter Norge AS (APN) joined in 1999 the **Vibratec Akustikprodukter** group, one of the leading suppliers of noise and vibration insulating products in Scandinavia. We are sole manufacturer of cable mounts in the region and offer extensive engineering assistance related to shock and vibration, as well as mechanical and thermal stress.

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