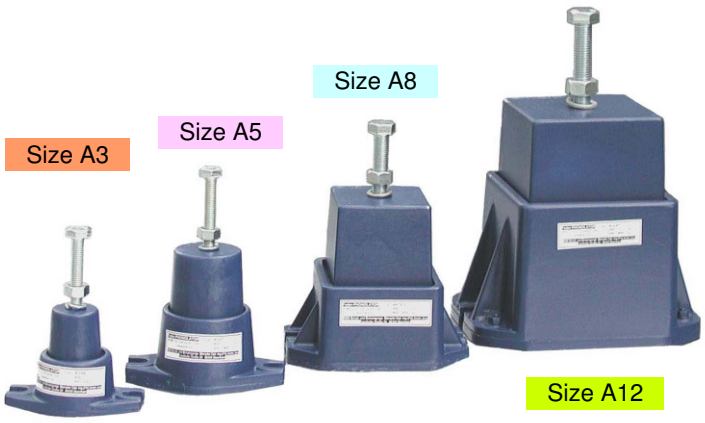
Spring PHONOLATORS series A

for the vibration-isolated set-up of machines

Selection table



Ill.1: Housing sizes of the series A spring PHONOLATORS

Spring PHONOLATOR type A5/85
Housing of light metal cast iron, with height adjustment device and body sound-damping coat, loadable from 100 to 165 kg, for speeds above 630 rpm.

Ill.2: Sectional drawing

Insulation factor in %			For machine speeds in rpm									
under load	at speed											
	lower	upper										
min	70 %	82 %	250 - 320		320 - 400		400 - 500		500 - 630		630 - 800	
max	82 %	90 %										
min	82 %	90 %	320 - 400 and more		400 - 500 and more		500 - 630 and more		630 - 800 and more		800 - 1000 and more	
max	90 %	94 %										
Load in kg	Load in N		Type	Hmm	Type	Hmm	Type	Hmm	Type	Hmm	Type	Hmm
10 -15	100 - 150		A 8/40	120/90	A 5/50	100/80	A 5/60	90/75	A 3/70	75/65	A 3/80	60/54
15 - 25	150 - 250		A 8/41	160/130	A 5/51	115/95	A 5/61	95/80	A 3/71	75/65	A 3/81	65/59
25 - 40	250 - 400		A 8/42	155/125	A 5/52	115/95	A 5/62	105/90	A 3/72	85/75	A 3/82	72/66
40 - 65	400 - 650		A 8/43	165/135	A 8/53	145/125	A 5/63	115/100	A 5/73	105/95	A 3/83	82/76
65 - 100	650 - 1.000		A 8/44	160/130	A 8/54	135/115	A 5/64	130/115	A 5/74	105/95	A 3/84	86/80
100 - 165	1.000 - 1.650		A12/45	200/170	A 8/55	155/135	A 5/65	130/115	A 5/75	115/105	A 5/85	92/86
165 - 250	1.650 - 2.500		A12/46	205/175	A 8/56	170/150	A 8/66	135/120	A 5/76	125/115	A 5/86	100/94
250 - 400	2.500 - 4.000		A12/47	225/195	A12/57	190/170	A 8/67	165/150	A 8/77	160/150	A 5/87	125/119
400 - 650	4.000 - 6.500		A12/48	255/225	A12/58	200/180	A12/68	210/195	A 8/78	150/140	A 8/88	145/139
650 - 1000	6.500 - 10.000		A12/49	270/240	A12/59	235/215	A12/69	200/185	A12/79	180/170	A 8/89	136/130
Natural frequency			1.67 to 2.00 Hz		2.00 to 2.50 Hz		2.50 to 3.17 Hz		3.17 to 4.08 Hz		4.08 to 5.27 Hz	

Table 1: Selection table according to speed and loading.
Operating heights and natural frequencies of series A spring PHONOLATORS

1. General information

The spring PHONOLATORS of the standard series A with housing of impact-resistant light metal cast iron, with height adjustment device and body sound-damping coat have been being manufactured since 1949 with consistent quality for the vibration-isolated set-up of machines and devices of all types. None of the dimensions and performance data have been changed since then. This has a positive effect on the procurement of spare parts and long-range planning.

2. Area of applicability

Our series A spring PHONOLATORS are preferably used for the vibration-isolated set-up of continuously operating machines and aggregates such as

-Fans,
-Blowers, compressors,
-Emergency power generators,
-Centrifuges, screening machines,
-Swing mills, conveying troughs,
-Coal mills, ball mills
-Pumps, granulators.

Spring PHONOLATORS prevent both the transfer of disturbing machine vibrations to the floor as well as the transfer of floor vibrations to vibration-sensitive machines and devices.

3. Description

The housing of the spring PHONOLATOR protects the internal helical compression springs against weather effects and mechanical damages. The helical compression springs are dimensioned in such a way that they can fully absorb the static and dynamic loads. The set screw with lock nut and spring washer enables an arrangement in a level position on uneven floors or with one-sided gravitational centre. The side insulators have a damping effect on the run-through of resonance. They prevent unacceptably large vibration amplitudes, which could negatively affect the machine and connected piping. Even with sudden impacts (storm effect on outdoor installations, crane and forklift traffic) the movements are effectively restricted.
The body noise-damping coat prevents the transfer of vibrations in the audible range and in the range of the natural frequency of the helical compression springs.

Accessories:

Aluminum protective caps for protection against penetration of water and dust.
Rubber base plates for set-up without fasteners

.

4. Selection

The required type can be determined by means of the adjacent selection table, and precisely according to static loading (weight), the lowest machine speed, the desired insulation factor.

4.1 Selection according to operating speed

The green range with speeds from 250 rpm to 800 rpm with insulation factors from 70 - 90 % produces the column where you can search the required type.

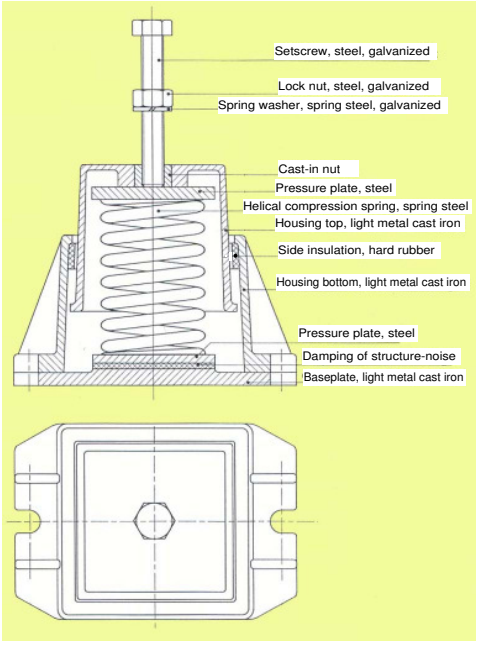
Example: Lowest operating speed of the machine 550 rpm, type A3/70 to A12/70 depending on load.

4.2 Selection according to load

With an accepted piece load of 350 kg at a speed of 550 rpm, type A8/77 should be selected.
For the computation of piece loading only the pure static weights should be applied.

4.3 Selection according to insulation factor

For higher insulation factors from 82 to 94 % the gray range should be selected, thus the type A A8/67 for a lowest operating speed of 550 rpm and for a piece loading of 350 kg.



Ill.3: Sectional drawing with components

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Spring PHONOLATORS series A

for the vibration-isolated set-up of machines

Insulation factors

APH2

Insulation factors for series A spring PHONOLATORS, Type **A8/40 to A12/49**, for speed 250-320-400 rpm

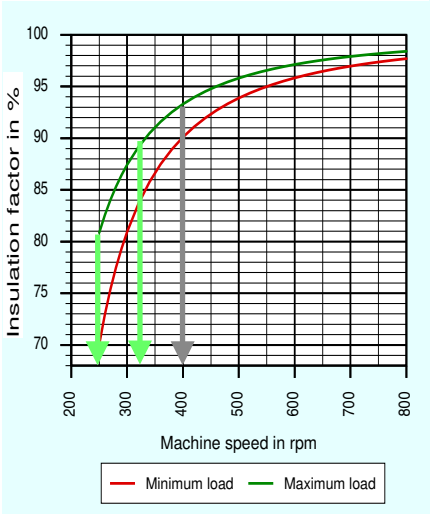

Diagram 1: Insulation factor series 40

Insulation factors for series A spring PHONOLATORS, Type **A5/50 to A12/59**, for speed 320-400-500 rpm

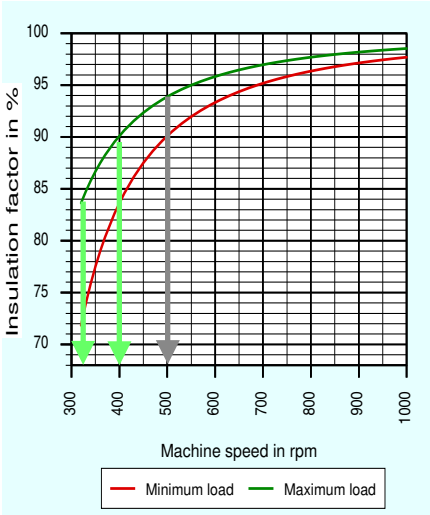

Diagram 2: Insulation factor series 50

Insulation factors for series A spring PHONOLATORS, Type **A5/60 to A12/69**, for speed 400-500-630 rpm

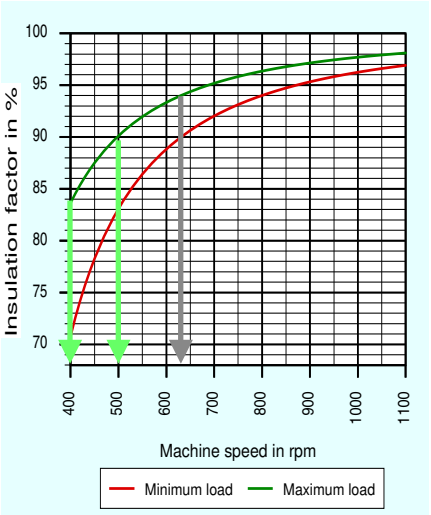

Diagram 3: Insulation factor series 60

Insulation factors for series A spring PHONOLATORS, Type **A3/70 to A12/79**, for speed 500-630-800 rpm

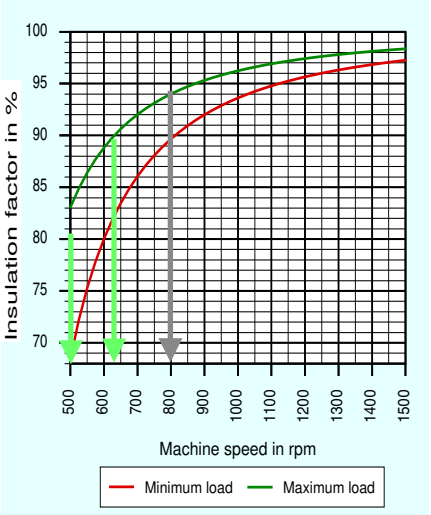

Diagram 4: Insulation factor series 70

Insulation factors for series A spring PHONOLATORS, Type **A3/80 to A8/89**, for speed 630-800-1000 rpm

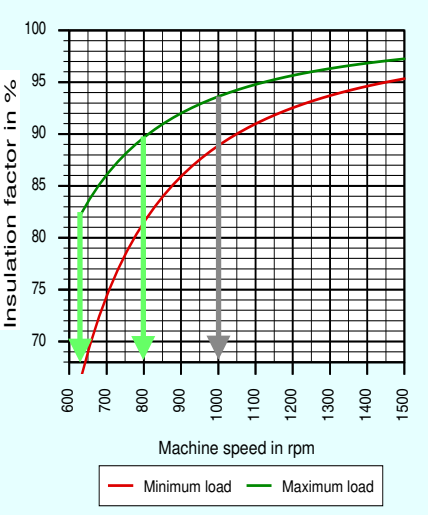

Diagram 5: Insulation factor series 80

5. Insulation factor

The insulation factors of the spring PHONOLATORS for machine speeds of 250 to 1500 rpm can be taken from diagrams 1 to 5. The normal speed range of the individual series 40, 50, 60, 70 and 80 lies between the two green arrows ↓ with insulation factors of 70 to 90 %, the speed range for higher insulation factors of 82 to 94% between the right green arrow and the grey arrow.
For special cases with insulation factors up to 98 %, the area on the right beside the grey arrow should be selected.

6. Selection example

A speed-regulated radial fan should be set-up with vibration isolation.

6.1 Technical data

-Weight including motor and base frame is approx. 1200 kg
-Operating speed 735 to 1470 rpm
-Basic frame dimensions 2200 x 1500 mm
-Gravitational centre: in both directions, not in the middle
-Piping: Elastically connected with compensators

6.2 Determination of the number of spring PHONOLATORS

7 spring PHONOLATORS are selected in order to prevent the clearance between the individual spring PHONOLATORS from becoming too great and to enable a gravitationally favourable distribution.

6.3 Computation of piece loading

With a total weight of 1200 kg the piece loading is calculated at 171 kg. Dynamic loads, e.g. unbalance powers, should be ignored in the load computation since they will be significantly reduced by the spring PHONOLATORS in accordance with the insulation factor.

6.4 Selection of the type of spring PHONOLATORS

According to table 1 (selection table), the types A12/46, A8/56, A8/ 66, A5/76 or A5/86 with an allowable piece loading of 165 kg to 250 kg should be considered.
The selection table recommends for a lowest operating speed of 735 rpm the type A5/86 with a speed range of 630 to 800 rpm (green range) and an insulation factor of 70 to 90 % depending on position of the load in the loading range of 165 to 250 kg and depending on the position of the speed in the speed range of 630-800 rpm. Type A5/86 is selected.

Designation	Character	Formula	Value	Dimension
Weight	G	-	1.200	kg
Number of spring PHONOLATORS	n	-	7	-
Load per spring PHONOLATOR	m	m = G/n	171,43	kg
spring PHONOLATOR type	-	-	A5/86	-
Spring rate	c	from table 3	163,5	N/mm
Spring rate	c_m	c_m = c x 1000	163.500	N/m
Natural frequency	ω	ω = root(c_m/m)	30,9	s^{-1}
Natural frequency	f	f = ω/(2 x π)	4,92	Hz
Machine speed	n_M	-	735	Upm
Excitation frequency	f_e	$f_e = n_M/60$	12,25	Hz
Adjustment ratio	η	$\eta = f_e/f$	2,49	-
Insulation factor	I	$I = (\eta^2-2)/(\eta^2-1) \times 100$	80,81	%

Table 2: Formulas for the computation of the insulation factor

6.5 Effective insulation factor

The loading of 171 kg lies in the lower boundary of the loading range of 165 to 250 kg.
The following insulation factors for the applicable curve "Minimum load" should be taken from diagram 5 (Insulation factors for spring.PHONOLATORS of types A3/80 to A8/89):
79 % for the lowest operating speed of 735 rpm. 95 % for the highest operating speed of 1470 rpm.
An exact computation of the insulation factors is possible with the aid of the formulas in table 2 and produces the following values: 80.81% for the lowest operating speed of 735 rpm.
95.81 % for the highest operating speed of 1470 rpm.

6.6 Alternatives

For a particularly vibration-sensitive environment the selection of the required type can also be made in accordance with the grey range of table 1 and produces type A5/76 for a speed range of 630-800 rpm. The associated insulation factors are then in accordance with diagram 4:
88 % for the lowest operating speed of 735 rpm.
97 % for the highest operating speed of 1470 rpm
.

7. Distribution to the gravitational centre

The spring PHONOLATORS should be arranged under the base frame so that the sums of the clearances right and left of the gravitational centre are each the same size in both room directions, as depicted in illustration 8 on page 4.

8. Pipes

The pipes of the elastically spring loaded machines should be elastically connected by compensators and the electrical cable should be flexibly connected in such a way that the vibration system on the spring elements is not hindered and the body noise transfer through the pipes to the environment is sufficiently reduced.

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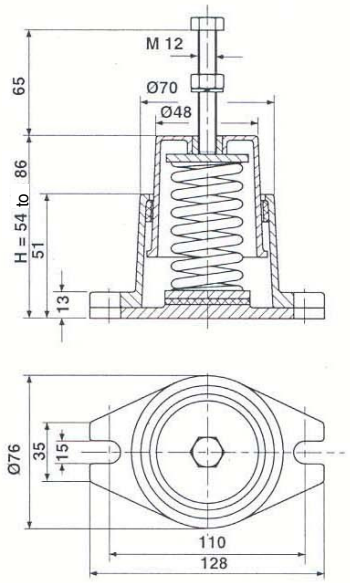
Spring PHONOLATORS series A

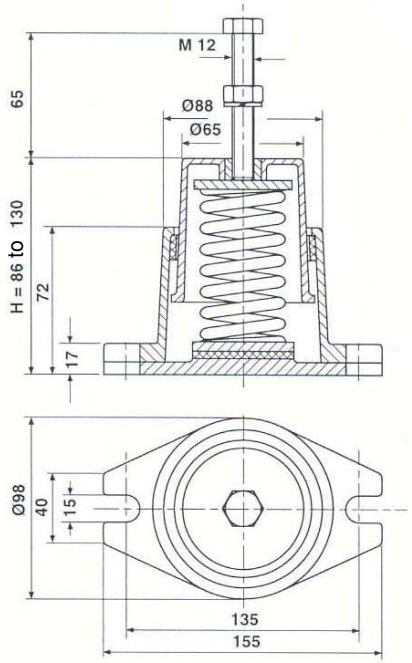
for the vibration-isolated set-up of machines

Installation dimensions

Type
A3/70
A3/71
A3/72
A3/80
A3/81
A3/82
A3/83
A3/84



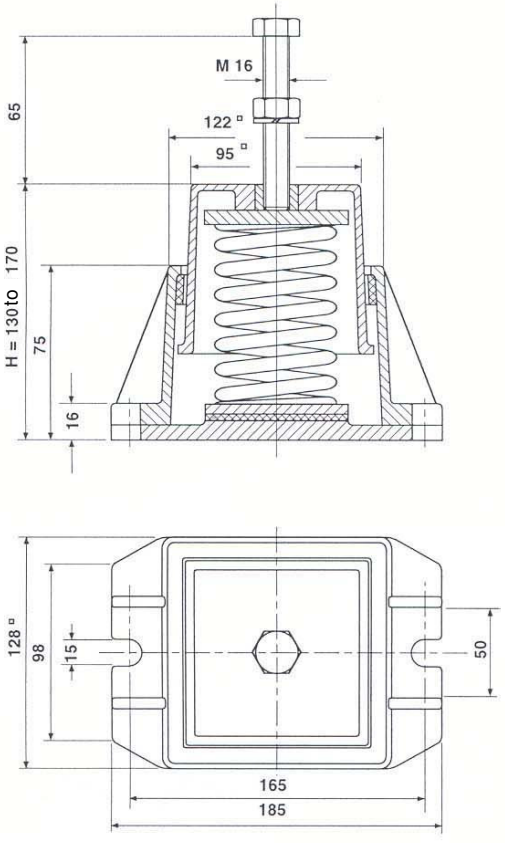
Ill.4: Spring PHONOLATORS series A, housing size A3



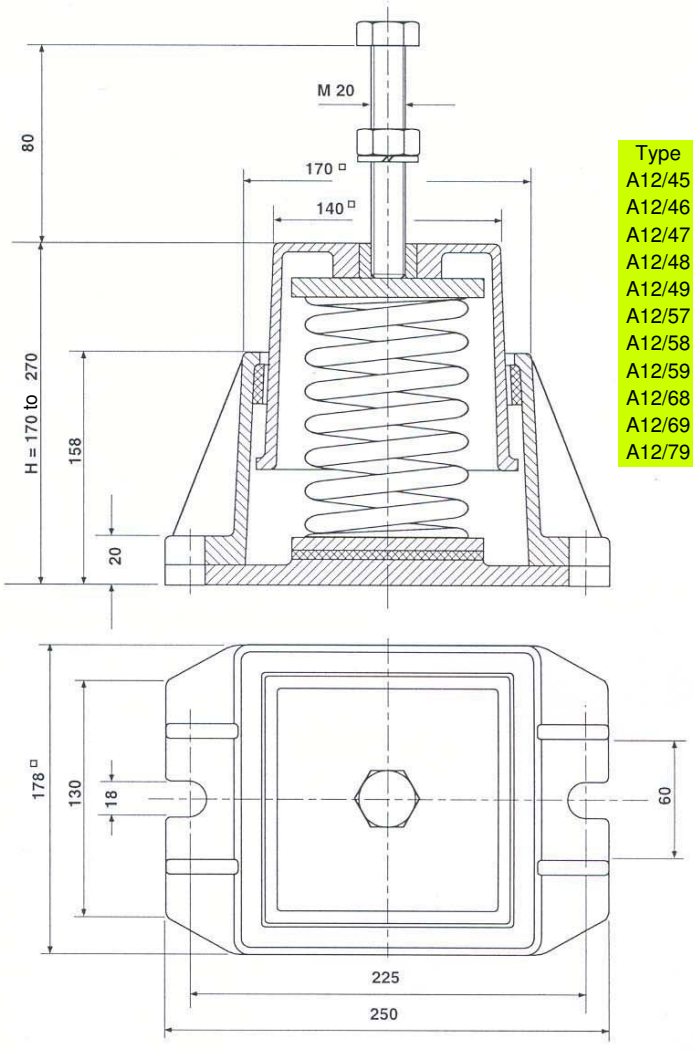
Type
A5/50
A5/51
A5/52
A5/60
A5/61
A5/62
A5/63
A5/64
A5/65
A5/66
A5/73
A5/74
A5/75
A5/76
A5/85
A5/86
A5/87

Ill.5: Spring PHONOLATORS series A, housing size A5

Type
A8/40
A8/41
A8/42
A8/43
A8/44
A8/53
A8/54
A8/55
A8/56
A8/66
A8/67
A8/77
A8/78
A8/88
A8/89



Ill.6: Spring PHONOLATORS series A, housing size A8



Type
A12/45
A12/46
A12/47
A12/48
A12/49
A12/57
A12/58
A12/59
A12/68
A12/69
A12/79

Ill.7: Spring PHONOLATORS series A, housing size A12

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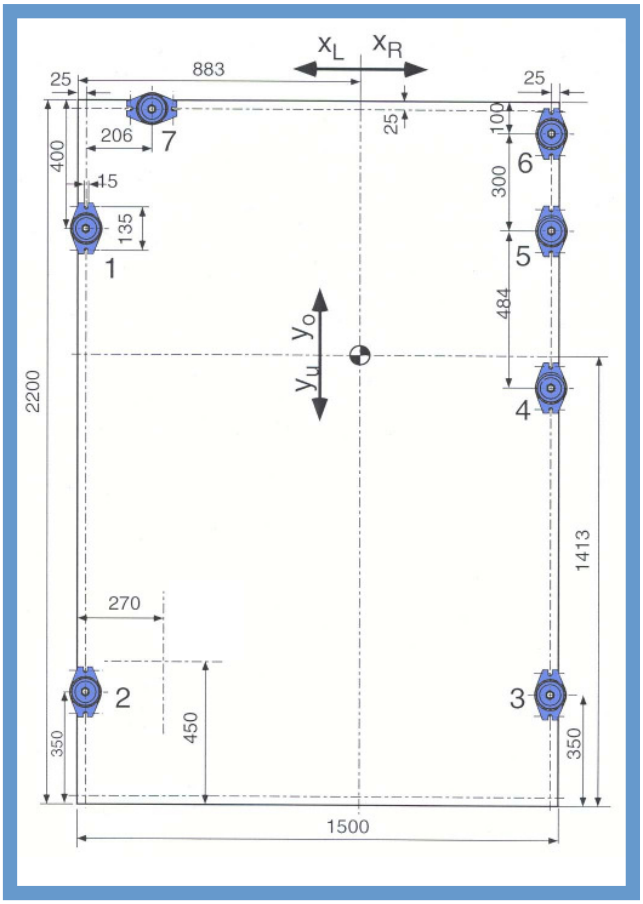


Ill. 8: Distribution of Spring PHONOLATORS under a ventilator base frame

Spring PHONO-LATOR No	Clearance from base frame		Clearance from gravitational centre in mm			
	x_i	x_i	x_L	x_R	y_o	y_u
1	25	1800	858	-	387	-
2	25	350	858	-	-	1063
3	1475	350	-	592	-	1063
4	1475	1316	-	592	-	97
5	1475	1800	-	592	387	-
6	1475	2100	-	592	687	-
7	231	2175	652	-	762	-
Summe			2368	2368	2223	2223

Table 3: Computation of the clearances of the spring PHONOLATORS under a ventilator base frame.

9. Distribution of the spring PHONOLATORS to the gravitational centre

In order to achieve an even loading of the spring PHONOLATORS, these should be arranged symmetrical to the gravitational centre under the affected machine.

If this is not possible for an extremely one-sided gravitational centre, then the distribution should be made in such a way that the sum of the clearances of the spring PHONOLATOR on the left of the respective centre line equals the sum on the right.

The adjacent example shows the correct distribution of spring PHONOLATORS for one-sided gravitational centre: The sum of the clearances on the left (xL1, xL2 + xL7) is equal to the sum of the clearances on the right (xR3, xR4, xR5 + xR6).

The same applies for the sums of yo and yu.

When planning the distribution, one should best proceed as follows:

In a scaled sketch, one first fills each of the 4 corners with a spring PHONOLATOR.

The remaining spring PHONOLATORS are distributed according to visual judgement at the resulting clearances are entered in a table. Now the sums are computed in both room directions and the single spring PHONOLATORS are shifted until the sums are equal. In the process it can sometimes become necessary to insert additional spring PHONOLATORS if single clearances are too great (clearance between two spring PHONOLATORS greater than 2 m) or to reduce the number if it is too congested.

The adjacent table 3 shows an example of the computation of the clearances of the spring PHONOLATORS

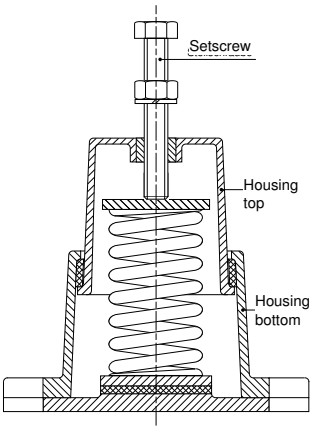
.

Ill.9: Vibration-isolated set-up of a power unit,
Weight approx. 7,100 kg, size approx. 4.6 m x 1.7 m x 2.5 m high, speed 1,500 rpm
set up on 8 units of spring PHONOLATORS of type A8/89, insulation factor 97 %

Ill.10: Vibration-isolated set-up of a fan,
Weight approx. 12,000 kg, speed 1,500 rpm
set up on 14 units of spring PHONOLATORS of type A8/89

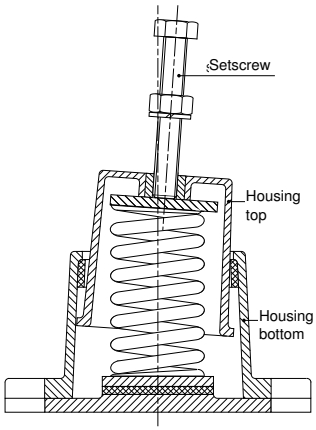
Spring PHONOLATORS series A

for the vibration-isolated set-up of machines
Installation instructions and weights



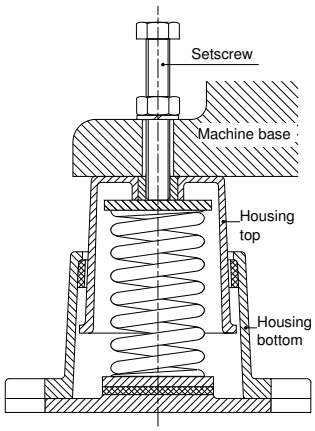
Wrong!

The set screw is turned too tight.
The housing top rests against the housing bottom.
Vibrations are still transmitted.



Wrong!

The housing top sits wedged in the housing bottom.
The housing top rests against the housing bottom.
Vibrations are still transmitted.



Correct!

The set screw is only lightly tightened (maximum 3 mm).
The housing top can move freely in the housing bottom.
The operating height lies between H_{min} and H_{max} of the table.

Spring PHONOLATOR type A5/ 85 housing of light metal cast iron, with height adjustment device and body noise-damping coat, can be loaded from 100 to 165 kg, for speed above 630 rpm

Type	Height in mm			Spring rate	Weight
	H_L	H_{min}	H_{max}	N/mm	kg
A 8/40	138	90	120	1,6	2,8
A 8/41	166	130	160	2,7	4,0
A 8/42	161	125	155	4,4	3,8
A 8/43	173	135	165	7,1	3,2
A 8/44	170	130	160	10,9	3,2
A12/45	227	170	200	18,0	8,6
A12/46	227	175	205	27,3	8,9
A12/47	239	195	225	43,6	10,3
A12/48	275	225	255	70,9	11,8
A12/49	280	240	270	109,0	13,4
A 5/50	108	80	100	2,5	1,0
A 5/51	124	95	115	4,1	1,3
A 5/52	125	95	115	6,5	1,3
A 8/53	156	125	145	10,6	3,7
A 8/54	144	115	135	16,4	3,2
A 8/55	162	135	155	27,0	3,8
A 8/56	175	150	170	40,9	3,7
A12/57	204	170	190	65,4	9,3
A12/58	218	180	200	106,3	10,4
A12/59	245	215	235	163,5	11,8
A 5/60	97	75	90	3,7	1,1
A 5/61	103	80	95	6,1	1,1
A 5/62	112	90	105	9,8	1,1
A 5/63	124	100	115	15,9	1,3
A 5/64	136	115	130	24,5	1,4
A 5/65	133	115	130	40,5	1,6
A 8/66	140	120	135	61,3	3,5
A 8/67	170	150	165	98,1	4,0
A12/68	220	195	210	159,4	10,3
A12/69	212	185	200	245,3	11,4

Table 4: Delivery heights, operating heights, spring rates and weights of of series A spring PHONOLATORS

Type	Height in mm			Spring rate	Weight
	H_L	H_{min}	H_{max}	N/mm	kg
A 3/70	79	65	75	5,9	0,6
A 3/71	81	65	75	9,8	0,6
A 3/72	91	75	85	15,7	0,7
A 5/73	111	95	105	25,5	1,2
A 5/74	108	95	105	39,2	1,2
A 5/75	120	105	115	64,7	1,5
A 5/76	132	115	125	98,1	1,7
A 8/77	168	150	160	157,0	4,2
A 8/78	156	140	150	255,1	4,5
A12/79	190	170	180	392,4	10,2
A 3/80	68	54	60	9,8	0,6
A 3/81	75	59	65	16,4	0,6
A 3/82	79	66	72	26,2	0,6
A 3/83	91	76	82	42,5	0,7
A 3/84	96	80	86	65,4	0,7
A 5/85	96	86	92	107,9	1,3
A 5/86	105	94	100	163,5	1,4
A 5/87	130	119	125	261,6	1,7
A 8/88	152	139	145	425,1	4,0
A 8/89	144	130	136	654,0	4,5

Height in mm:
H_L = pre-stressed delivery height
H_{min} = lowest operating height (at the highest load)
H_{max} = highest operating height (at the lowest height)

After completed assembly the operating heights of the spring PHONOLATORS must lie between H_{min} and H_{max} of the table.
Acceptable deviations:
± 2 mm at operating heights up to 150 mm.
± 4 mm at operating heights above 150 mm

9. Installation

9.1 The spring PHONOLATORS should be supported on the positions provided for.
9.2 The operating heights must be checked. They must lie between H_{min} and H_{max} of the table. In the case of larger deviations (more than ± 2 mm with heights up to 150 mm or more than ± 4 mm with heights above 150 mm), proceed according to paragraph 10.
9.3 The setscrews must be tightened by hand.
9.4 The installation should be regulated in the balance position with the aid of the setscrews (tighten the setscrews by 3 mm max.).
9.5 The operating heights must be checked again.
9.6 Use the locking nuts to engage the setscrews.

10. Frequent errors and their remedies

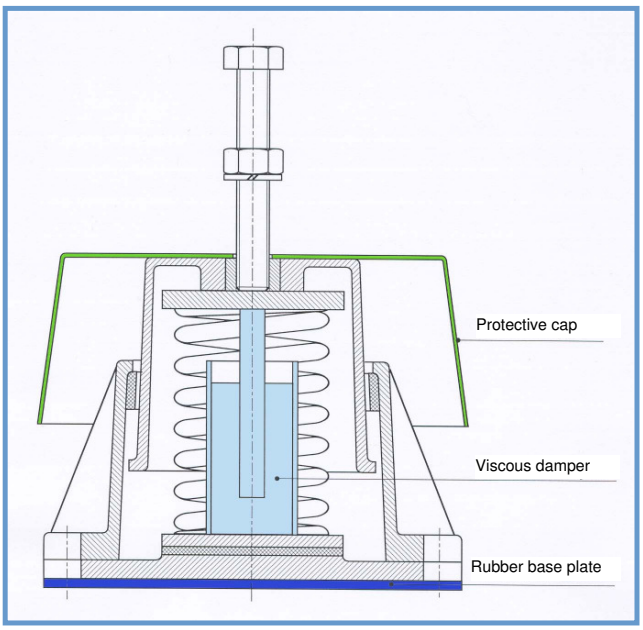
10.1 The operating height of all or most of the spring PHONOLATORS is above the value H_{max}:
The spring PHONOLATORS are underloaded. Spring PHONOLATORS with lower load capacity should be used.
10.2 The operating height of all or most of the spring PHONOLATORS is below the value H_{min}:
The spring PHONOLATORS are overloaded. Spring PHONOLATORS with higher load capacity should be used.
10.3 The operating heights are too low at one side and too high at the opposite side:
The spring PHONOLATORS are not correctly arranged to the gravitational centre. Remedy: Slide excessively high spring PHONOLATORS to the gravitational center, slide excessively low spring PHONOLATORS away from the centre of gravity.
10.4 The spring PHONOLATORS show irregular deviations from the operating height:
The floor or the machine support surface is uneven. The floor unevenness should be smoothed over or the excessively high spring PHONOLATORS should be underlaid, whereby they are more strongy pressed together.
If you have problems with the assembly or the desired success with the spring suspension is not achieved, give us a call. Our specialised engineers will help you with words and deeds.

SSD **S**chall- und **S**chwingungs- **D**ämpfer GmbH Sandhofer Str. 20 68305 Mannheim Tel. 0621 / 7 48 22 55 Fax 0621 / 7 48 22 66 E-Mail: ssd.jung@t-online.de

Spring PHONOLATORS series A

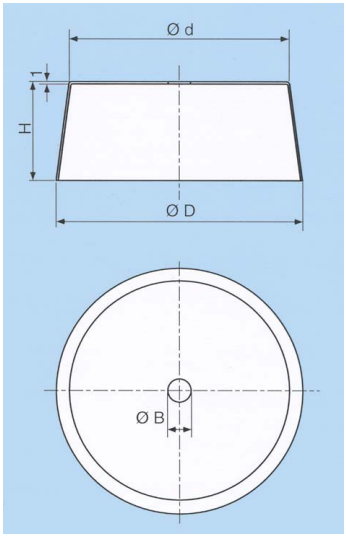
for the vibration-isolated set-up of machines

Accessories, service



III.11: Accessories

III.12: Protective cap



III.13: Protective cap, dimensional drawing

10. Accessories
Can be delivered as accessories:

10.1 Rubber base plates
for set-up without fasteners,
4 mm thick, fabric-patterned on both sides
in 4 sizes for A3, A5, A8 and A12, adapted to the
spring PHONOLATOR-base and glued on underneath.

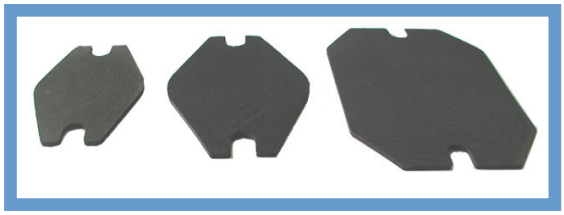
10.2 Viscous damper
for the fast decay of impact-type excited natural
vibrations of the elastically spring loaded system and
for the reduction of vibrations with resonance passage,
on bitumen basis, temperature range 10 °C to 30 °C,
installed in the spring PHONOLATOR.

10.3 Protective caps
for protection against penetration of water and dust,
formed from 1 mm thick aluminum sheet.

10.4 Special adhesive Brand G
for the attachment of spring PHONOLATORS on the
floor, preferably in connection with rubber base plates
as contact intermediary.

Spring PHONO-LATOR Type	Dimensions in mm			
	d	D	B	H
A3	70	75	14	25
	70	77	14	35
A5	90	98	14	40
	90	100	14	50
	90	104	14	65
A8	170	180	18	50
	170	186	18	75
	170	190	18	90
A12	235	246	22	60
	235	255	22	90
	235	260	22	125

Table 4: Dimension table for protective caps



III.14: Rubber base plates

11. Service
As part of our offer submission, you receive from us at no cost:
-Selection of spring PHONOLATORS suited to your needs..
-Consultation in the selection of the necessary insulation factors according to the type of machine and the vibration sensitivity of the environment.
-Suggestions for the the design of possibly necessary base frames.
-Dimensioning of possibly necessary concrete foundations, which serve as a calming base as are spring loaded together with the machine.
-Preparation of drawings with the distribution of the spring PHONOLATORS taking into account the gravitational centre and the stability of the installation.
-Computational evidence of the insulation factor.
-Construction and assembly manuals.

For this we require technical data according to the questionnaire after section 12.

12. Questionnaire
for the vibration-isolated set-up of machines.

1. Machine model.
2. Brand and type.
3. Weight.
5. Speed and stroke rate range.
6. Base dimensions.
7. Center of gravity.
8. Weight and path of the moving masses.
9. Existing machine or new planning.
10. Data about the erection site (ceilings, floors, distance to neighbours, neighbouring, vibration-sensitive machines).

The more detailed your data, the better our consultation !
A picture says more than a thousand words:
Send us your drawings or sketches.

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