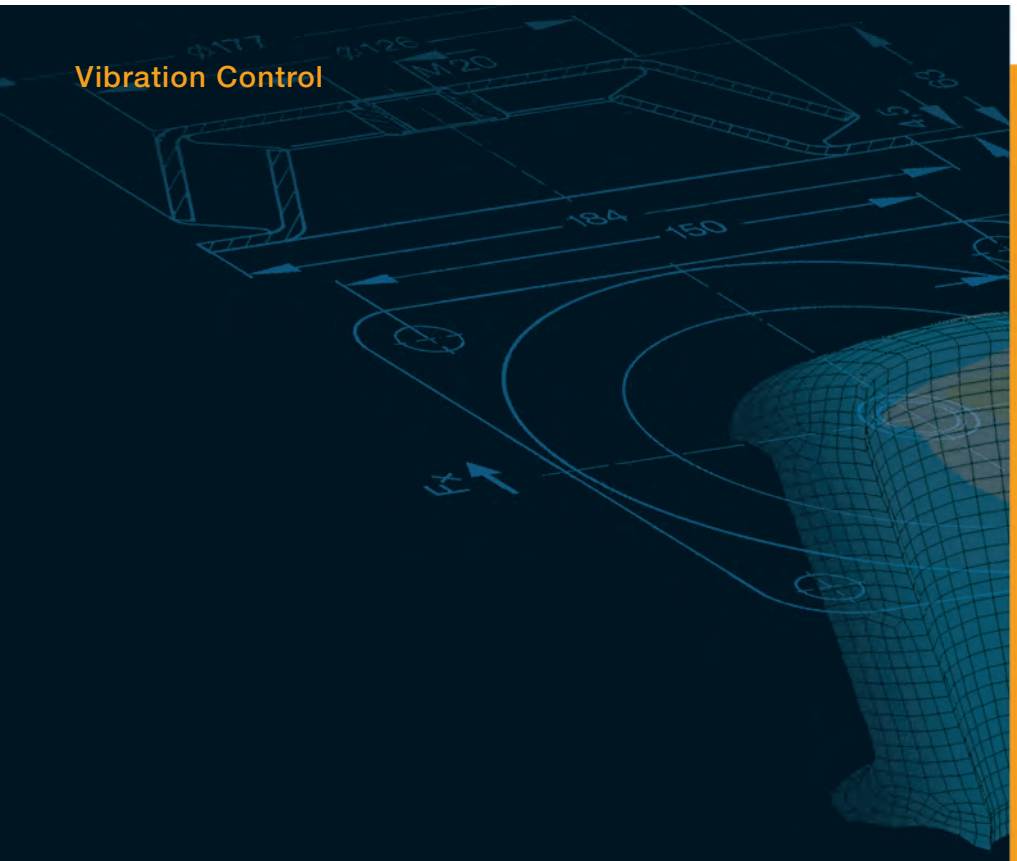
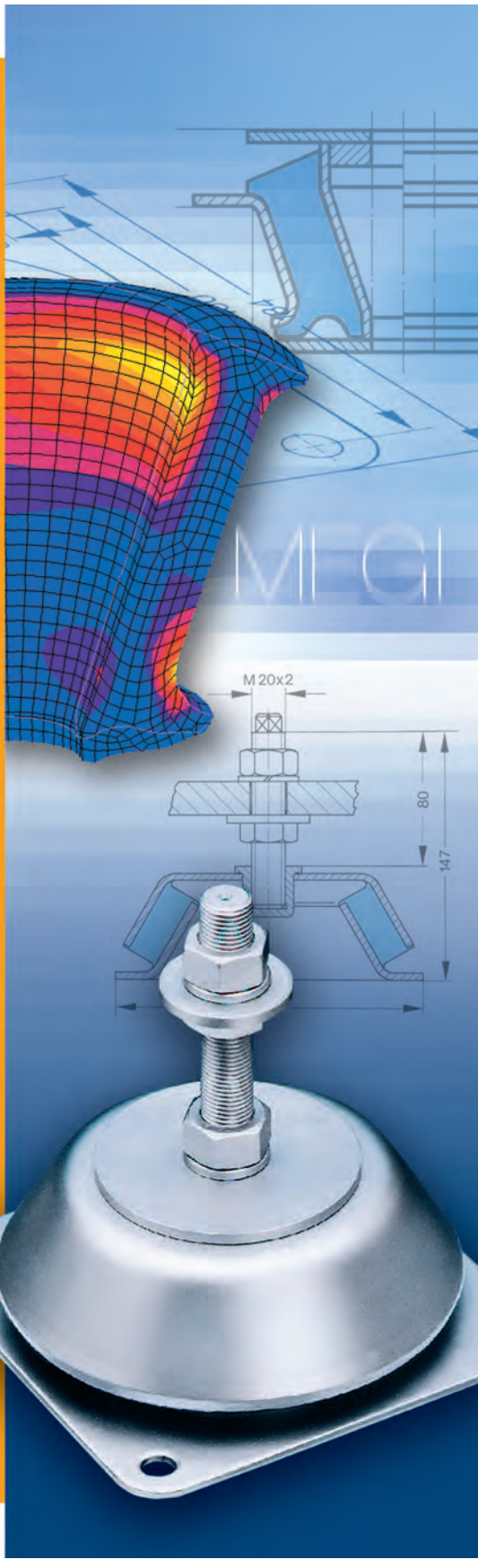
Vibration Control

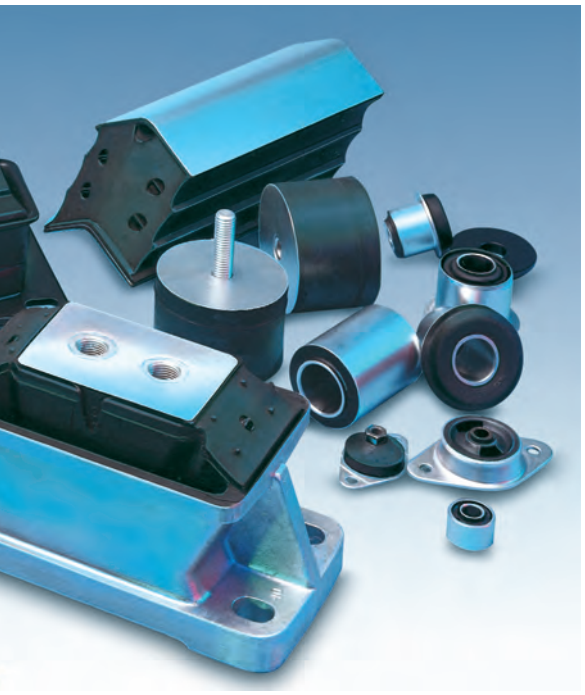




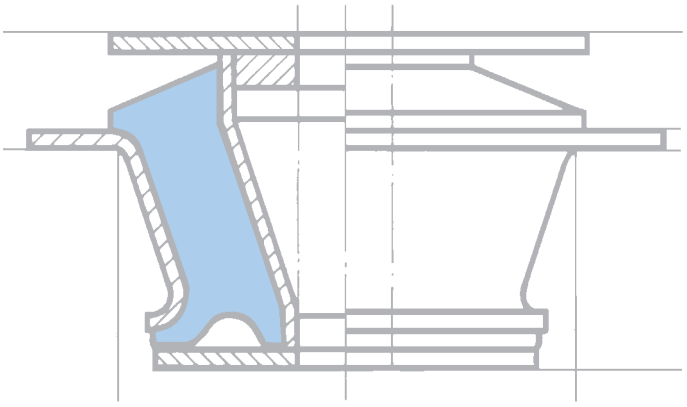
MEGI®

Product information and delivery programme

Continental CONTITECH



MEGI® = METALLGUMMI (METAL RUBBER)



MEGI® Spring Elements

MEGI spring elements are construction elements for use wherever vibration and noise from machines, equipment and systems are to be reduced effectively (passive suppression) as well for protection of the environment (active suppression), or forces have to be transferred without play or friction.

MEGI spring elements are distinguished by the permanent connection between the metal and elastomer as well the highly varying possibilities for application.

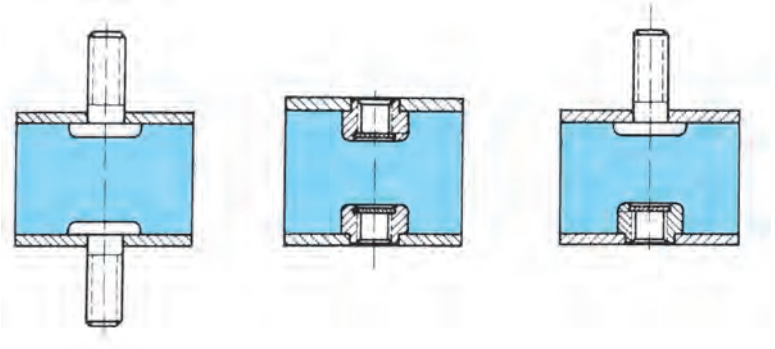
The comprehensive MEGI product line offers a spring element for merely every type of application required for vibration damping aspects.

When selecting MEGI spring elements, please observe the corresponding technical data and notes.

MEGI Standard Items: Properties, Application, Load Limits

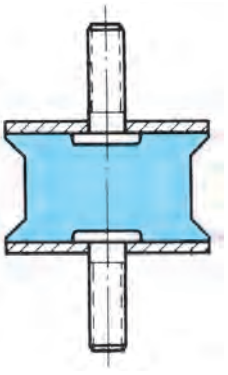
Product group: MEGI buffers

Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Simple, reasonably priced standard components ■ Simple to mount	Mounting light to medium-heavy equipment, electric motors and internal combustion engines, compressors, pumps, jolting and vibration machines	- Pressure - Thrust - Compound loads	$F_{Z\,max.}$ 30 kN	Strength class of threaded joint: 5. Other strength classes available on request. No tension load permissible on part. Protection against corrosion: Zinc coated and colourless passivated



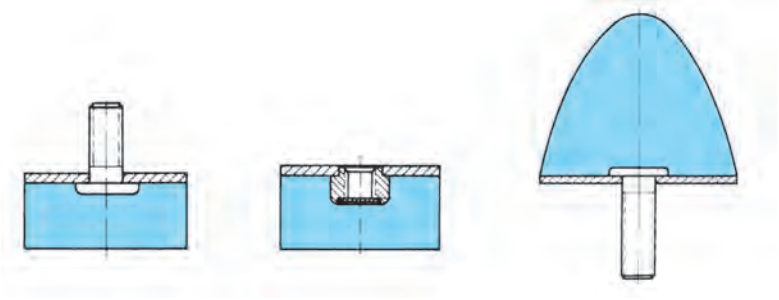
Product group: MEGI buffers with enlarged adhesive surface

Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Simple, reasonably priced standard components ■ Simple to mount ■ Less sensitive than conventional buffers to rarely occurring tension loads ■ Higher dynamic peak loads possible than with conventional version	Mounting equipment, electric motors and internal combustion engines, compressors, pumps, jolting and vibration machines	- Pressure - Thrust - Compound loads	$F_{Z\,max.}$ 5,2 kN (Higher dynamic peak loads possible)	Strength class of threaded joint: 5. Other strength classes available on request. No tension load permissible on part. Protection against corrosion: Zinc coated and colourless passivated



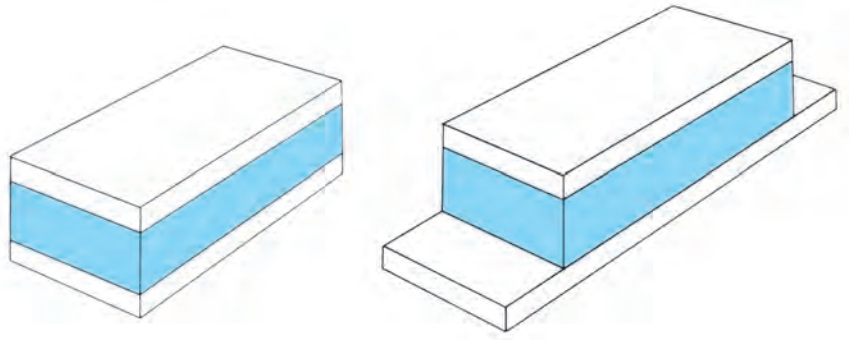
Product group: MEGI Stop Buffer

Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Simple, reasonably priced standard components ■ Simple to mount	Limitation of motion, end position damping, supporting thrust loads, mounting machines and equipment without fastening to foundation.	- Pressure - Limited pressure/ thrust (rubber abrasion due to friction)	$F_{Z\,max.}$ 50 kN (Fender buffer)	Strength class of threaded joint: 5. Other strength classes available on request. Protection against corrosion: Zinc coated and colourless passivated



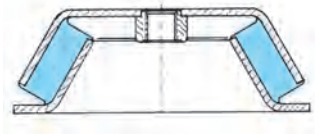
Product group: MEGI bars

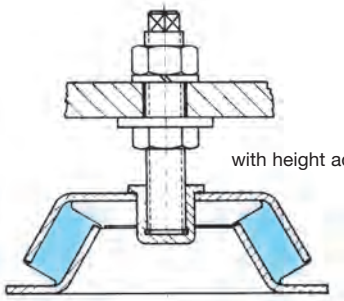
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ High specific pressure load bearing capacity ■ Can be prefabricated and adapted to mounting conditions on a custom-tailored basis ■ Delivery length up to 2000 mm	Mounting medium-heavy to heavy equipment, electric motors and internal combustion engines, heavy machines, machine tools, machines for passenger and cargo elevators, jolting and vibration machines	- Pressure - Thrust - Compound loads	$F_{Z\,max.}$ 800 kN	No tension load permissible on part.



Product group: MEGI Machine Mounts

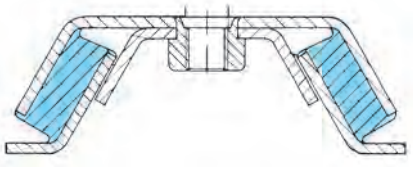
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Rigidity ratio vertical/horizontal nearly 1 ■ Extremely good horizontal guidance ■ Vertical and horizontal rigidities can be changed by mounting to Machine Mounts next to one another in series	Mounting eccentric presses, planing machines, printing presses and textile machines, electric motors and internal combustion engines, machine tools	- X, Y, Z - Compound loads	$F_{Z\,max.}$ up to 21 kN	Strength class of central threaded joint: 5. Other strength classes available on request. No tension load permissible on part. Protection against corrosion: Zinc coated and colourless passivated





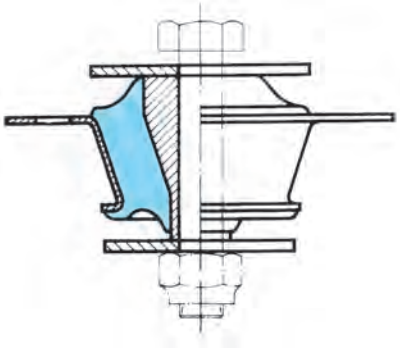
with height adjustment

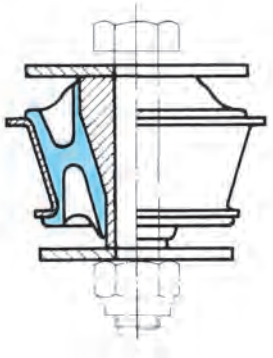
with tear-off safety device

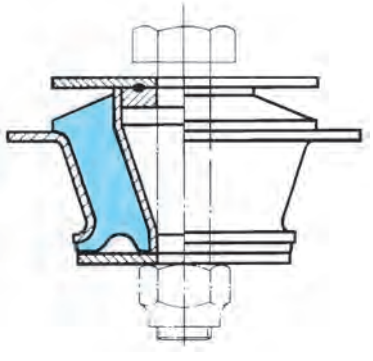


Product group: MEGI cones

Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Impact plates for progressive axial absorption and tear-off protection ■ Extremely good horizontal guidance ■ Optional varying horizontal rigidities	Mounting electric motors and internal combustion engines, body structures, compressors	- X, Y, Z - Compound loads	$F_{Z\,max.}$ up to 16 kN	Observe maximum pretension forces for central mounting bolt. Other strength classes available on request. No tension load permissible on part. Protection against corrosion: Zinc coated and colourless passivated

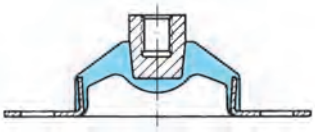




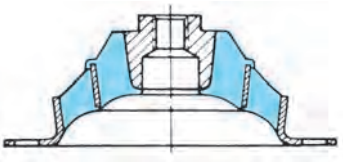


Product group: MEGI bearings

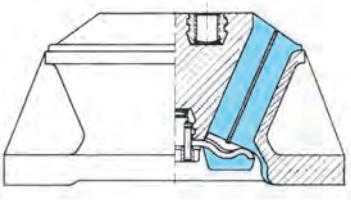
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Special vertical/horizontal rigidity ratios ■ Simple to mount with housing	Mounting electric motors and internal combustion engines, compressors.	- X, Y, Z - Compound loads	$F_{Z\,max.}$ up to 6 kN	Strength class of threaded joint: 5. Other strength classes available on request. No tension load permissible on part.



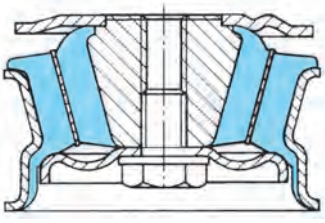
786 028



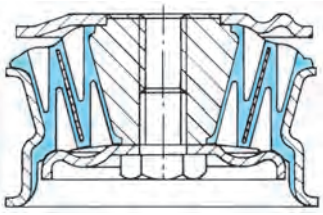
742 022



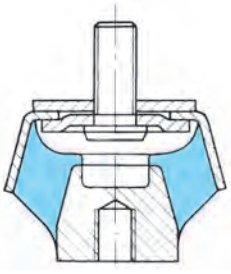
742 157



742 034 S6



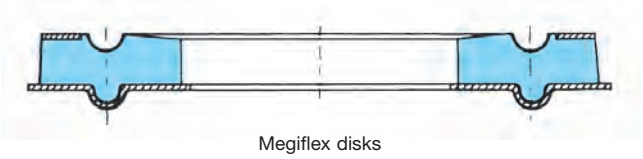
742 034 S7



786 012

Product group: MEGIFLEX disks

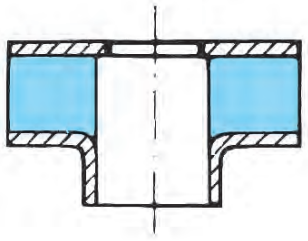
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ High specific pressure loading capacity ■ Spring characteristics can be adjusted by using a combination of several elements ■ Can be assembled as tension/pressure spring assembly	Mounting machines and equipment, electric motors and internal combustion engines. Used as, torque supports and for suspension of swing arms and ends of leaf springs in vehicle construction. Various systems can be combined to form thrust and tension assemblies.	- Pressure	$F_{Z\,max.}$ 82,4 kN (MEGIFLEX-disks)	It is necessary to secure higher spring assemblies against resilient buckling and lateral loads.



Megiflex disks

Product group: MEGI annular buffers

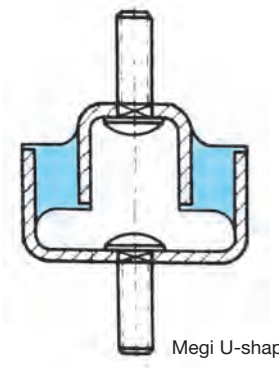
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Can be combined as tension/ pressure spring assembly ■ Simple to mount	Mounting light to medium-heavy machines and equipment, electric motors and internal combustion engines, cabs, pipelines and equipment cabinets.	- Pressure	$F_{Z\,max.}$ 6,1 kN (individual annular buffers)	Two spring elements can be pretensioned against one another to achieve double pressure spring rigidity for the spring assembly.



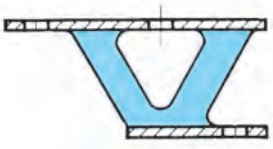
Megi annular buffers

Product group: MEGI-U-V-W shaped parts

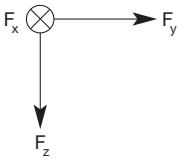
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Soft support ■ Various rigidities in three spatial directions (U elements)	Mounting sensitive equipment, apparatus, measuring instruments and equipment.	F_z for U element F_y and F_z for V and W elements	950 N	Strength class of threaded joint: 5. Other strength classes available on request. No tension load permissible on part.

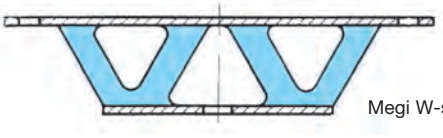


Megi U-shaped element



Megi V-shaped element

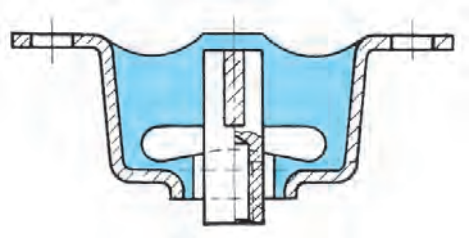




Megi W-shaped element

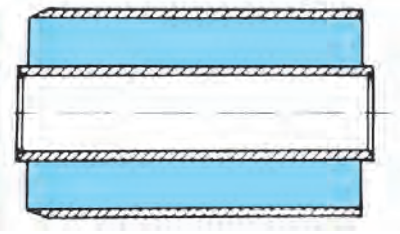
Product group: MEGI ceiling elements

Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Tear-off proof ■ Can take up tension loads	Mounting pipelines, illumination elements and ceiling suspensions.	Tension	$F_{Z\,max.}$ 280 N	Strength class of threaded joint: 5. Other strength classes available on request.



Product group: MEGI HL bushes

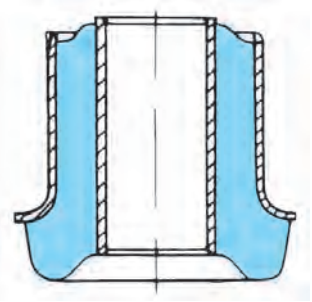
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Can be loaded in radial, axial, torsional and cardanic loads	Mounting electric motors and internal combustion engines, axles and pivot arms in vehicle construction as well as machines and equipment. Also use as resilient joints.	- Radial pressure - Axial pressure - Torsion - Cardanic - Compound loads	- Radial: 14,7 kN - Axial: 6,3 kN	The outer and inner tube must be clamped rigidly to transfer torsion loads.



Megi HL bushes

Product group: MEGI AS bushes

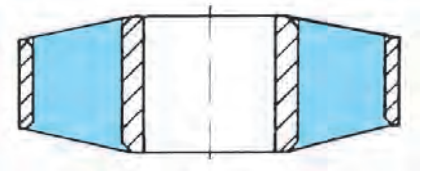
Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Properties same as MEGI HL bushes, however, stiffer axially	See MEGI HL bushes	- Radial pressure - Axial pressure - Torsion - Cardanic - Compound loads	- Radial: 3,4 kN - Maximum axial load depends on axial pretension	The outer and inner tube must be clamped rigidly to transfer torsion loads and axial forces



Megi AS bushes

Product group: MEGI rings

Particular characteristics	Typical applications	Possible types of loads/directions	Static load limits	Notes
■ Large torsional twist possible	Mounting axles and pivot arms in vehicle construction. Use as resilient joints.	- Radial pressure - Axial pressure - Torsion - Cardanic - Compound loads	- Radial: 2,2 kN - Axial: 1,55 kN - Torsional moment 28,4 Nm	When installing, it is necessary to pretension the outer bush radially



Megi rings

MEGI® Buffers

Applications

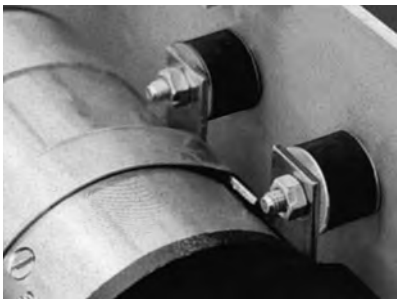
Megi buffers are simple, reasonably priced standard elements for flexible bearing arrangements. They are used successfully in general mechanical engineering, light engineering, printing press manufacture and pump manufacture, in the electrical industry and in many other fields. The various construction types (threaded bolt, weld nut) provide an appropriate means of mounting the elements in practically every case).

Description

Megi buffers can be subjected to either shearing or compressive loads, or to both when mounted at an angle to each other. While the high degree of stiffness is desirable for compressive stress, especially for high kinetic and impact loads, the high degree of flexibility to shear stress provides good vibration isolation. If the Megi buffers are subject only to shearing stress, pre-compression has a favourable effect on the service life. Megi buffers with an enlarged rubber-to-metal bonding surface are particularly suitable for high peak dynamic stress. These parts are zinc coated and colourless passivated.

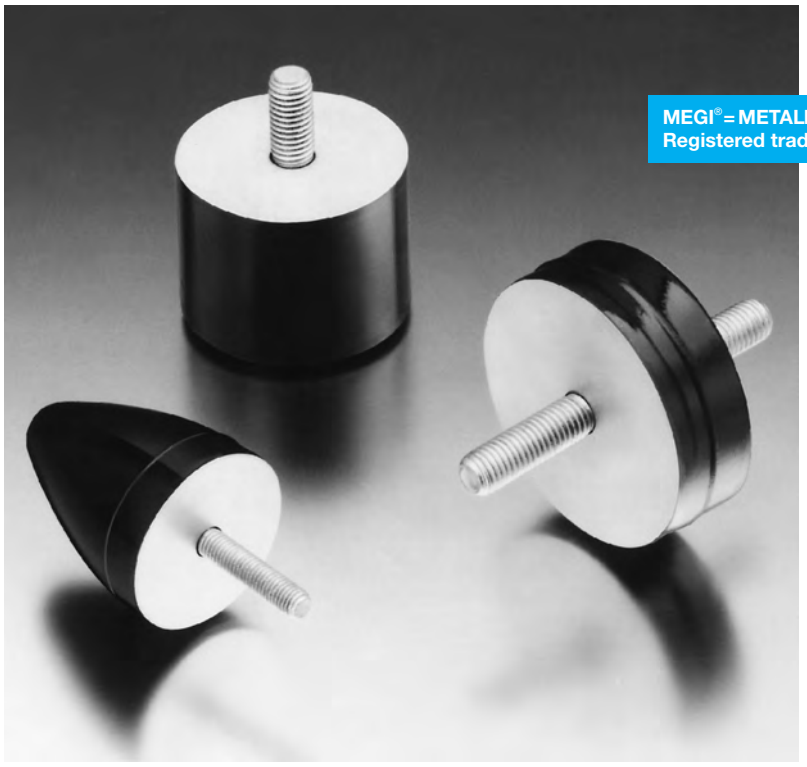
Technical Data

Megi buffers cover a load range up to 30 kN depending on the application and type of rubber used. The maximum tightening torque for the central threaded connection can be selected according to strength class 5.



Delivery

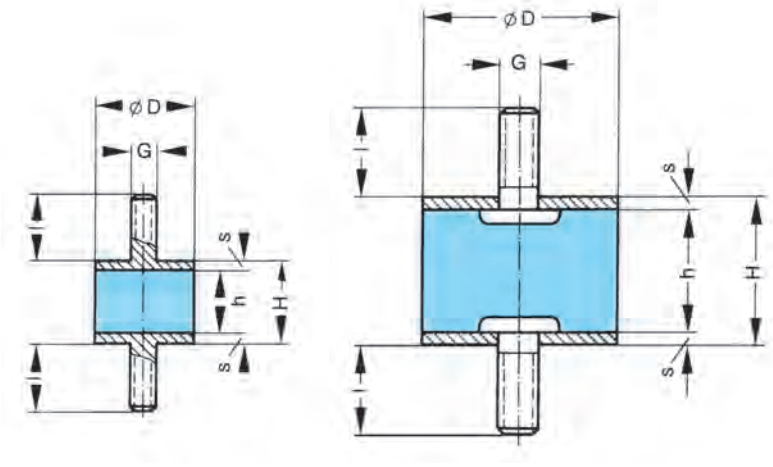
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.



MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

Supply Programme **MEGI® Buffer**

Megi buffers with threaded stud on both sides
Part No. 781…
Versions: hard, medium, soft



Dimensions in mm						Technical data												Part No.	Number in package
						Compression stress						Shear stress							
						Spring rate c_z in N/mm			Perm. load $F_{Perm.}$* in N			Spring rate $c_{x,y}$ in N/mm			Perm. load $F_{Perm.}$* in N				
D	H	h	s	G	l	hard	medium	soft	hard	medium	soft	hard	medium	soft	hard	medium	soft		
18	8,5	4,5	2	M 6	11	800	500	300	540	340	200	80	50	30	*120*	*70*	*40*	781 040 S1	100
18	8,5	4,5	2	M 6	16	800	500	300	540	340	200	80	50	30	*120*	*70*	*40*	781 040	100
20	15	11	2	M 6	16	290	180	110	480	300	180	50	30	20	190	110	70	781 050	100
25	20	14	3	M 6	16	350	220	130	740	460	270	60	40	20	300	190	110	781 060	60
30	15	10	2,5	M 8	21	940	590	340	1400	880	520	110	70	40	390	250	150	781 070	60
30	15	11	2	M10	18	680	420	250	1120	700	410	80	50	30	330	200	120	781 130	–
30	20	14	3	M 8	21	570	360	210	1190	750	440	90	60	30	440	280	160	781 071	60
30	30	24	3	M 8	20	260	160	90	920	580	340	50	30	20	430	270	160	781 072	60
40	30	24	3	M 8	21	510	320	190	1840	1150	680	90	60	30	780	490	240	781 080	20
40	40	34	3	M 8	21	320	200	120	1620	1020	600	60	40	20	770	480	280	781 081	20
50	20	14	3	M10	18,5	2430	1520	890	5100	3190	1880	240	150	90	1120	760	450	781 090 S1	12
50	24	18	3	M10	26,5	1490	930	550	4020	2510	1480	190	120	70	1230	770	450	781 090	12
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75	55	49	3	M12	39	640	400	235	4700	2940	1730	120	70	40	2090	1300	770	781 102	4
100	30	24	3	M16	44	6160	3850	2260	22170	13860	8150	510	320	190	4470	2780	1640	781 110 S2	4
100	40	34	3	M16	44	2980	1860	1090	15180	9480	5580	360	220	130	4410	2760	1620	781 110	–
100	60	54	3	M16	44	1360	850	500	11020	6890	4050	230	140	80	4440	2780	1630	781 111	4

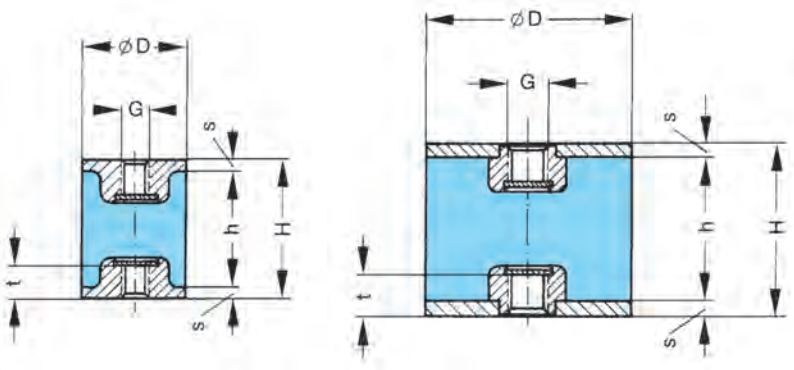
* $F_{Perm.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Supply Programme **MEGI® Buffer**

Megi buffers with female thread on both sides
Part No. 781…
Versions: hard, medium, soft



Dimensions in mm						Technical data												Part No.	Number in package
						Compression stress						Shear stress							
						Spring rate c_z in N/mm			Perm. load $F_{Perm.}$* in N			Spring rate $c_{x,y}$ in N/mm			Perm. load $F_{Perm.}$* in N				
D	H	h	s	G	t	hard	medium	soft	hard	medium	soft	hard	medium	soft	hard	medium	soft		
20	25	22	1,5	M 6	6,5	190	120	70	270	170	100	40	25	15	130	80	50	781 054	80
30	30	24	3	M 8	9,5	570	360	210	690	430	250	80	50	30	240	150	90	781 074	60
40	30	24	3	M 8	9,5	880	550	320	1060	660	390	140	80	50	370	230	130	781 084	40
40	40	34	3	M 8	9,5	370	230	140	990	620	360	80	50	30	530	330	190	781 085	40
50	30	24	3	M10	10,5	1680	1050	620	1520	950	560	220	140	80	480	300	180	781 094 S1	20
50	40	34	3	M10	10,5	660	410	240	1570	980	580	140	80	50	750	470	280	781 094	20
75	50	44	3	M12	12,5	980	610	360	3620	2010	1180	190	120	70	1540	960	560	781 104	12
100	60	54	3	M16	16,5	1360	850	500	4900	3060	1800	250	150	90	2100	1310	770	781 114	4
200	100	90	5	M20	17,5	3250	2030	1190	30200	18880	11100	460	290	170	10460	6540	3850	781 134	–

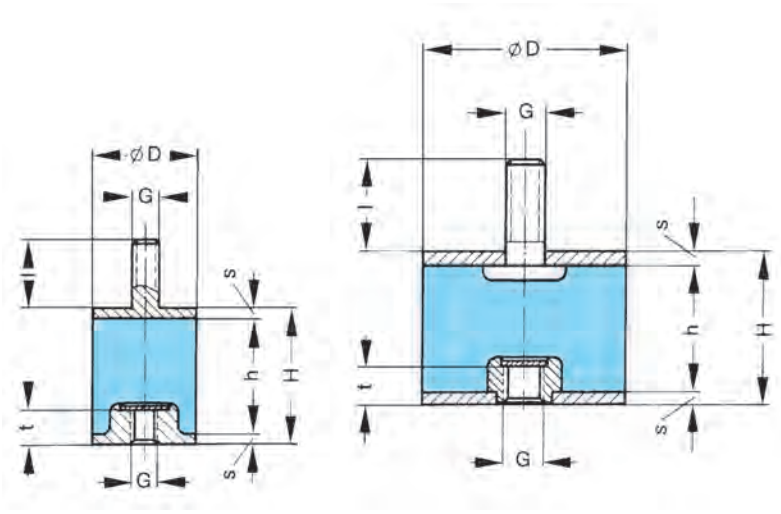
* $F_{Perm.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Supply Programme **MEGI® Buffer**

Megi buffers with female thread and threaded stud
Part No. 781…
Versions: hard, medium, soft



Dimensions in mm							Technical data												Part No.	Number in package
							Compression stress						Shear stress							
							Spring rate c_z in N/mm			Perm. load $F_{Perm.}$* in N			Spring rate $c_{x,y}$ in N/mm			Perm. load $F_{Perm.}$* in N				
D	H	h	s	G	l	t	hard	medium	soft	hard	medium	soft	hard	medium	soft	hard	medium	soft		
20	25	21,5	2/1,5	M 6	16	6,5	140	80	50	290	180	100	27	17	10	140	90	50	781 057	100
25	20	16,5	2/1,5	M 6	11	6,5	300	140	110	470	290	170	60	38	22	220	140	80	781 067	80
30	20	15,5	2,5/2	M 8	13	6,5	650	410	240	900	560	330	110	70	40	370	230	140	781 079	60
30	20	14,5	2,5/3	M 8	16	6,5	670	420	250	820	510	300	110	70	40	320	200	120	781 079 S1	60
30	30	24	3	M 8	16	9,5	340	210	120	740	460	270	65	40	25	340	210	120	781 077 S3	–
30	30	24	3	M 8	21	9,5	340	210	120	740	460	270	65	40	25	340	210	120	781 077	60
30	40	34	3	M 8	21	9,5	180	110	60	660	410	240	32	20	12	290	180	100	781 078	60
40	30	24	3	M 8	21	9,5	540	340	200	1200	740	440	100	60	35	510	320	190	781 087	40
40	40	34	3	M 8	21	9,5	390	190	110	1150	700	410	90	40	25	580	360	210	781 088	40
50	40	34	3	M10	18,5	10,5	550	350	210	2000	1240	730	110	65	35	900	560	330	781 097 S1	–
50	40	34	3	M10	26,5	10,5	550	350	210	2000	1240	730	110	65	35	900	560	330	781 097	20
75	50	44	3	M 12	39	12,5	930	600	310	4600	2850	1680	160	100	60	1850	1150	680	781 107	12
100	40	34	3	M 16	44	16,5	3100	1600	1000	6700	4200	2500	400	220	120	2250	1400	820	781 117	4

* $F_{Perm.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

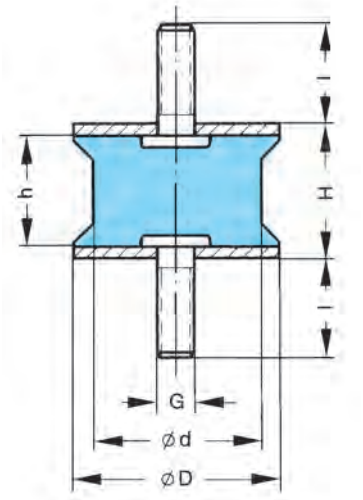
Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Supply Programme **MEGI® Buffer**

Megi buffers with enlarged rubber-to-metal bonding surface
Part No. 781…
Versions: hard, medium, soft

Megi buffers with a “waisted” rubber section in relation to the bonding surface have good durability even at peak dynamic loads. Since the very dangerous peak stresses can be avoided at the edges of the bonding surfaces, these buffers are less affected by tensile stress than the normal cylindrical type of metal rubber buffers.

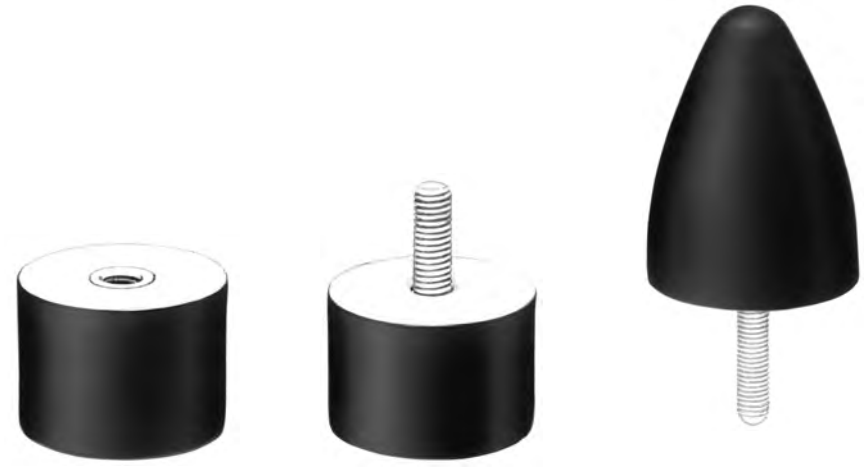


Dimensions in mm							Technical data												Part No.	Number in package
							Compression stress						Shear stress							
							Spring rate c_z in N/mm			Perm. load $F_{Perm.}$* in N			Spring rate $c_{x,y}$ in N/mm			Perm. load $F_{Perm.}$* in N				
D	d	H	h	s	G	l	hard	medium	soft	hard	medium	soft	hard	medium	soft	hard	medium	soft		
25,5	22	22	16	3	M 8	21	320	200	120	770	480	280	60	35	20	320	200	120	781 146	60
40	35	28	22	3	M 10	26,5	530	330	190	1740	1090	640	80	50	30	640	400	240	781 147	20
55	45	36	30	3	M 10	22	600	370	250	2700	1670	1120	110	65	40	1100	650	400	781 145	–
60	50	60	54	3	M 10	26,5	340	200	110	2590	1620	950	60	35	20	110	690	400	781 150 S1	8
80	70	70	64	3	M 14	37	540	340	200	5220	3260	1920	100	60	35	2240	1400	820	781 149	8

* $F_{Perm.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

Stock items: Available only in standard packages.

MEGI® Stop Buffers



Applications

Megi are used to limit the effects of impact, e.g. in machines mounted on flexible bearings and as shock absorbers to limit the spring deflection in vehicles.
Megi are also used where machines, such as office machines are not anchored to the foundation or on sensitive floors. The larger versions such as the Megi fender buffers, are used for heavy and very heavy shock stresses, where it is necessary to absorb extremely high impact energy.

Description

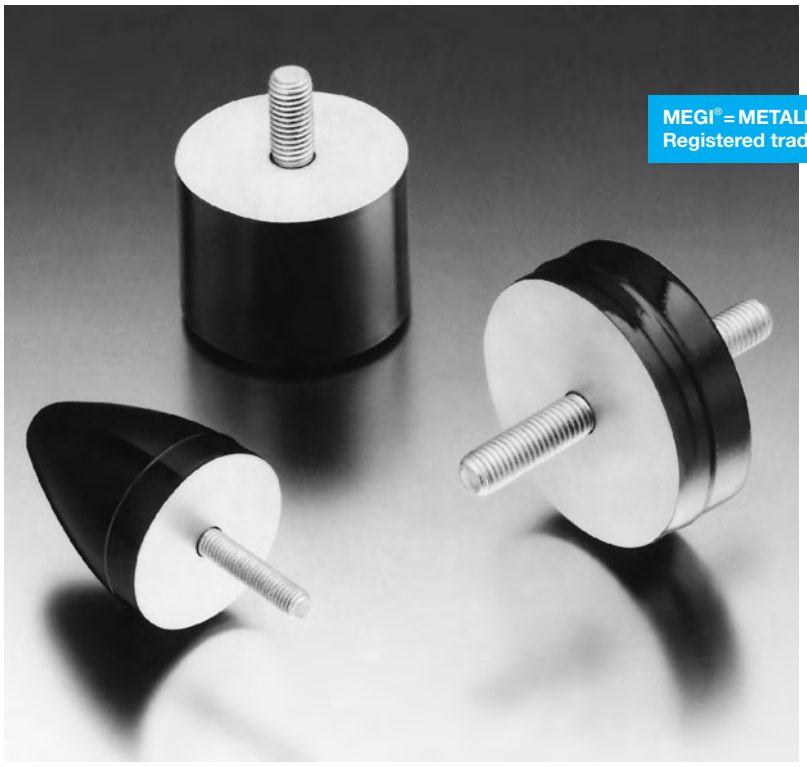
Megi are in principle only subjected to compressive loads. When fitting the Megi, it is necessary to ensure that the components cannot move horizontally to the direction of the compressive load. Otherwise, the abrasion will lead to increased wear:
The different versions, e.g. with threaded studs, female thread or flange mounts, ensures good mounting possibilities for nearly every type of application. These parts are zinc coated and colourless passivated.

Technical Data

Megi cover a load spectrum up to **50 kN** depending on the shape and size of the bumper. Details are given in the tables. The maximum tightening torque for the central threaded mount can be chosen in conformance with strength class 5.

Delivery

Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.



MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

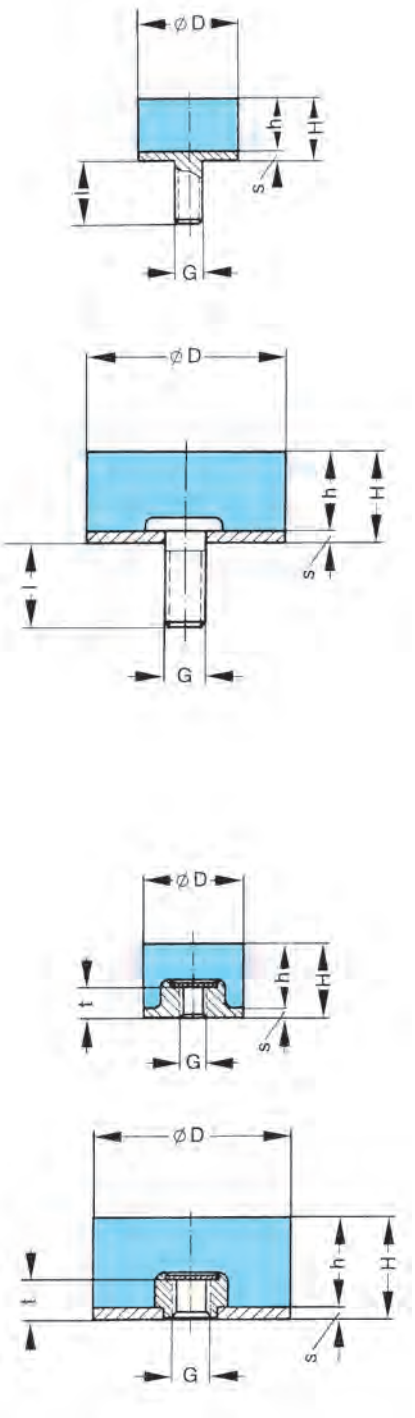
Supply Programme **MEGI® Stop Buffers**

Megi buffers with threaded stud
Part No. 781…

Dimensions in mm						Compression stress			
D	H	h	s	G	l	Spring rate c_z in N/mm medium	Perm. load $F_{Perm.}$* in N medium	Part No.	Number in package
18	7,5	5,5	2	M 6	16	350	240	781 043	100
20	13,5	11,5	2	M 6	16	150	260	781 053	100
25	17	14	3	M 6	16	180	380	781 063	100
30	17	14	3	M 8	21	360	760	781 073	60
40	27	24	3	M 8	21	270	970	781 083	50
50	21	18	3	M 10	26,5	650	1760	781 093	20
75	25	22	3	M 12	39	1400	4620	781 103	8
100	40	37	3	M 16	44	1400	7770	781 113	4

Megi stop bumper with female threads
Part No. 781…

Dimensions in mm						Compression stress			
D	H	h	s	G	t	Spring rate c_z in N/mm medium	Perm. load $F_{Perm.}$* in N medium	Part No.	Number in package
20	13,5	12	1,5	M 6	6,5	220	230	781 056	100
30	17	14	3	M 8	9,5	550	620	781 076	80
40	27	24	3	M 8	9,5	350	920	781 086	40
50	21	18	3	M 10	10,5	700	1100	781 096	20
75	25	22	3	M 12	12,5	1700	3200	781 106	20
100	40	37	3	M 16	16,5	1400	4950	781 116	12
200	100	95	5	M 20	17,5	1700	21000	781 136	–



Stock items. Can be supplied in standard packages in “medium” hardness, approx. 60° shore.
Other types produced to order.

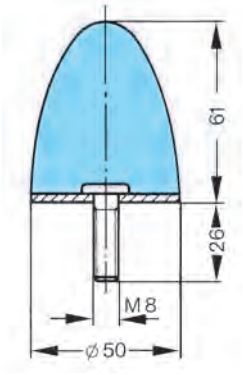
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

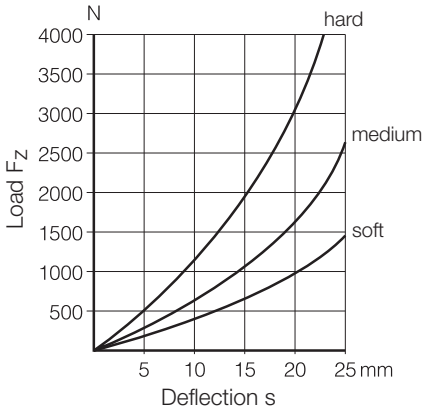
Supply Programme **MEGI® Stop Buffers**

Megi with parabolic cross-section

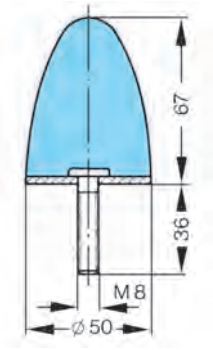
The special design of Megi with their parabolic cross-section allows them to yield readily to initial impact while maintaining highly progressive spring characteristics. They can be used as shock absorbers to limit the amplitude of vibration and spring deflection.

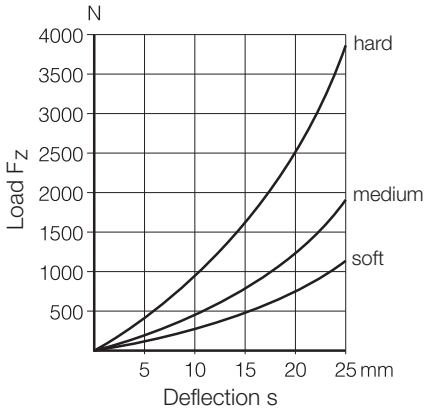
Part No. 741 279



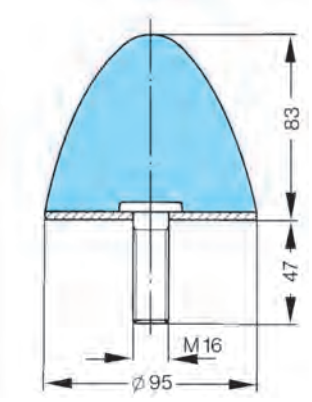


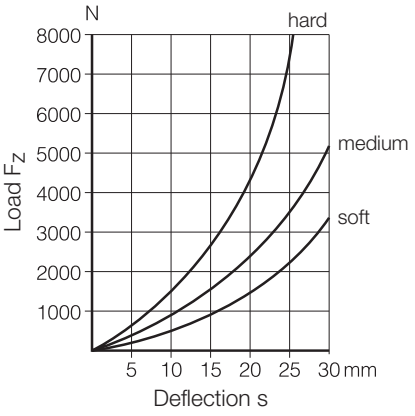
Part No. 741 280





Part No. 741 278

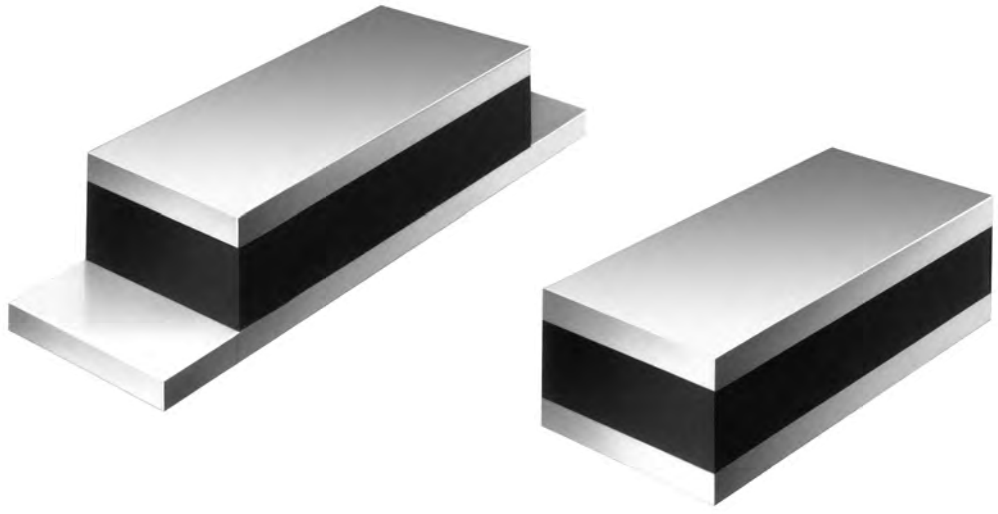




Stock items. Can be supplied in standard packages in “medium” hardness, approx. 60° shore. Only available in packages of 10.

Other types produced to order.

MEGI® Bars



Applications

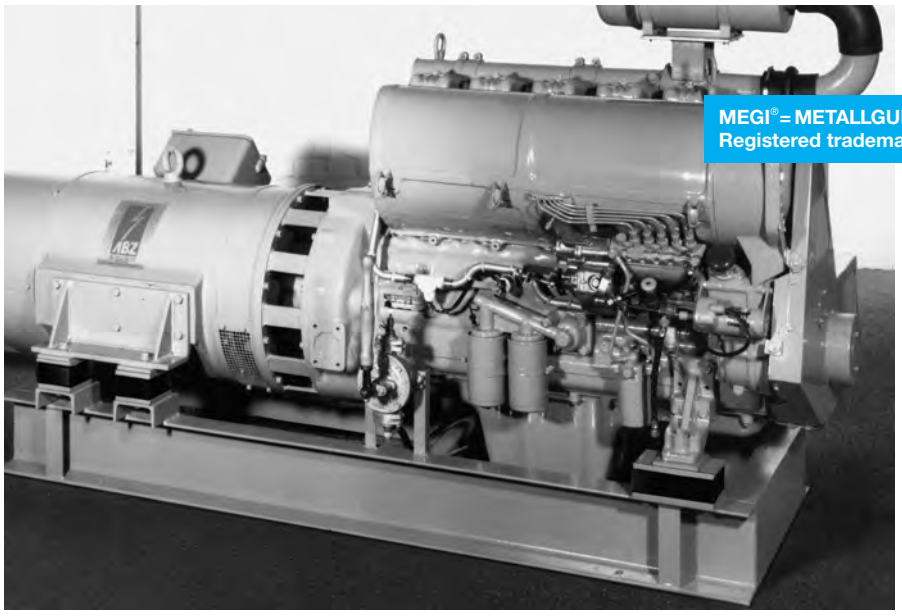
Megi bars are especially suitable for flexible bearing arrangements for heavy machines such as, for example, marine engines, large stationary engines, lathes, hoisting engines, jogging and vibrating machines. Megi bars can be used anywhere the available space and high loads do not allow installation of buffers.

Description

Megi bars are produced in lengths from 500 to 2000 mm and can be cut to any desired length. However, it is necessary to ensure that the minimum length does not exceed the sectional width. The thickness of the metal plate must be selected so that threaded holes can be tapped in them for fastening purposes. Megi bars with projecting base plate can only be supplied in the fixed lengths indicated in the table. Under static load, the rubber thickness “h” can be compressed by approx. 10 to 15%. 10% for h<40 mm, 15% for h>40 mm. Megi bars are installed primarily to absorb compressive stress or are set at an angle to each other to absorb compressive and shearing stress.

Technical Data

Megi bars cover a load spectrum up to 775 kN depending on the bar section and length. Further details are given in the tables.



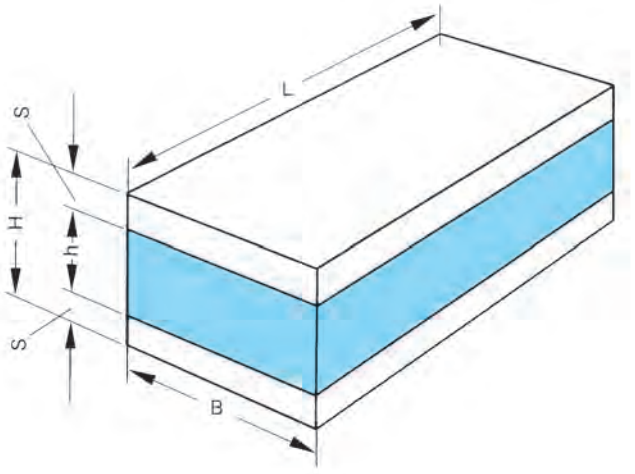
MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

Supply Programme **MEGI® Bars**

Megi Bars

For large orders, metal-rubber bars can be supplied with metal plates of a different thickness “s” and with a thinner rubber layer.
Metal rubber bars can also be supplied as impact plates, that is with a metal plate on one side only to meet special production orders.

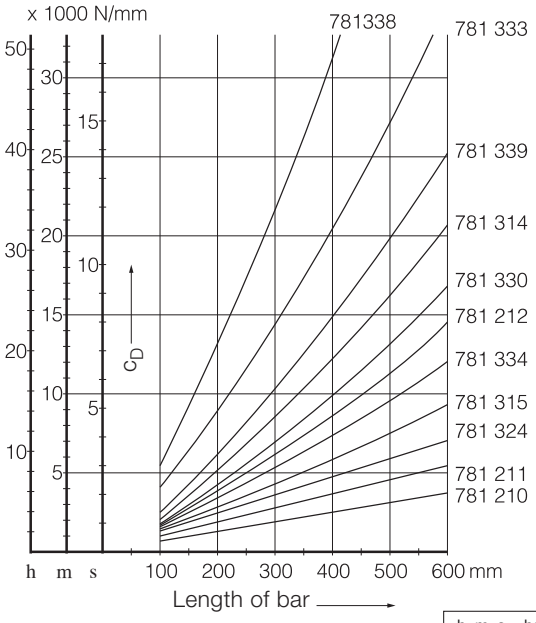
DIN 1017 applies for metal parts.
The appropriate thickness tolerances for Megi bars are given in DIN ISO 3302 - M3.



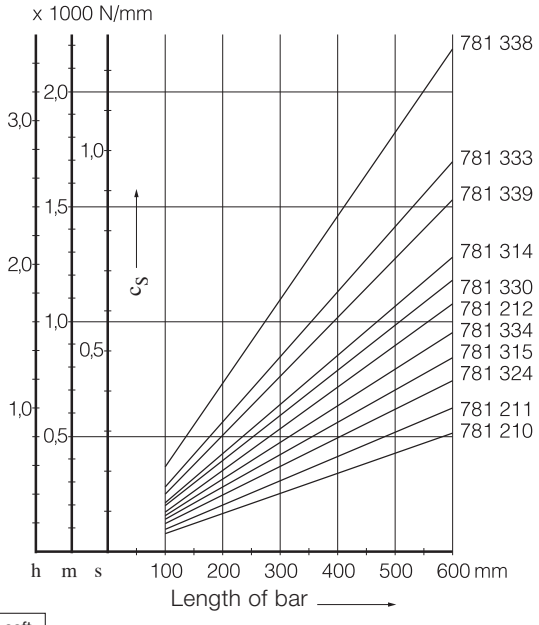
B	H	h	s	Available in lengths of	Part No.
20	30	20	5	500 mm	781 210
25	30	20	5	500 mm	781 211
40	35	19	8	500 mm	781 212
50	40	20	10	2000 mm	781 314
50	50	30	10	2000 mm	781 315

B	H	h	s	Available in lengths of	Part No.
60	60	40	10	2000 mm	781 324
70	50	30	10	2000 mm	781 330
100	60	30	15	2000 mm	781 333
100	80	50	15	2000 mm	781 334
150	65	35	15	2000 mm	781 338
150	80	50	15		781 339

Spring rate for compression stress c_D



Spring rate for compression stress c_S



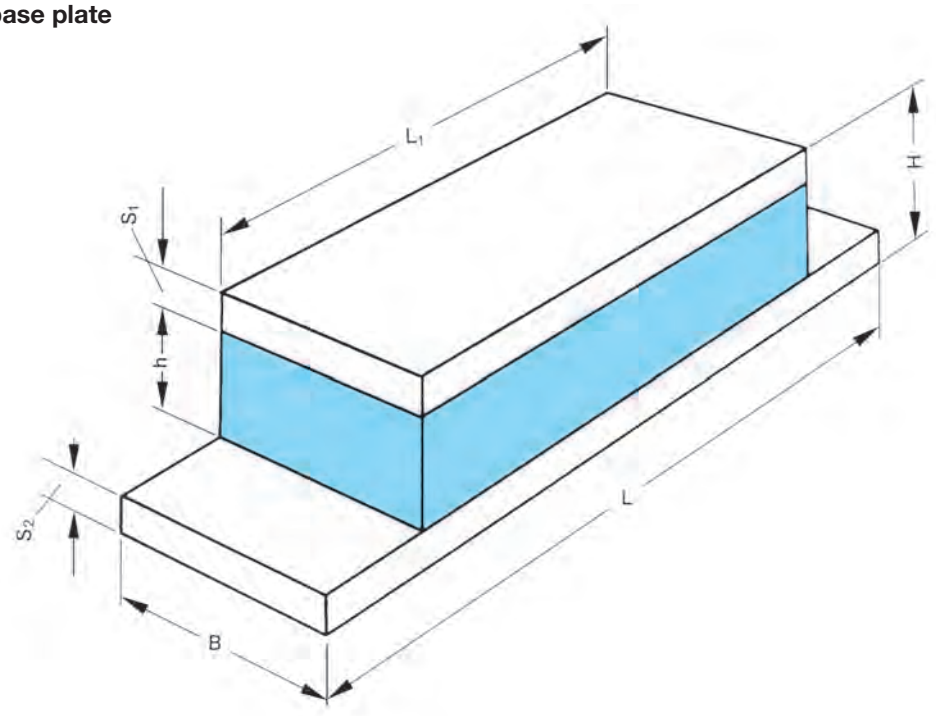
h, m, s = hard, medium, soft

Stock items. Can be supplied in standard packages in “medium” hardness, approx. 60° shore. Only available in packages of 10. No standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Supply Programme **MEGI® Bars**

Megi bars with extending base plate



Dimensions in mm							Technical data												Part No.
							Compression stress						Shear stress						
							Spring rate c_D in N/mm			Perm. load $F_{Perm.}$* in kN			Spring rate c_S in N/mm			Perm. load $F_{Perm.}$* in kN			
B	H	h	S_1	S_2	L	L_1	hard	medium	soft	hard	medium	soft	hard	medium	soft	hard	medium	soft	
50	40	20	12	8	200	150	6500	4000	2300	13	8	5	500	300	200	2,5	1,5	1	711 023
50	40	20	12	8	270	220	11400	7100	4000	24	15	9	750	500	300	3,5	2	1,5	711 025
100	60	30	15	15	480	360	29000	18200	10400	94	59	35	1700	1000	600	11,5	7	4	711 019

* $F_{Perm.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. If the Megi bars are subjected to shearing stress, it is essential to avoid tensile stress on the rubber during installation of the Megi bars. In order to obtain an adequate service life, the bars should be pretensioned.

Stock items. Delivered in “medium” hardness, approx. 60° shore.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

MEGI® Machine Mounts

Application

■ Megi Machine Mounts are proven universal elements for resilient support of machines of all types. Megi Machine Mounts are preferred wherever it is necessary to avoid great horizontal motions (e.g. machine tool instability). Their horizontal rigidity is greater than the vertical rigidity in all directions. When used properly, Megi Machine Mounts are excellent to prevent transfer of shocks and noises.

■ Megi Machine Mounts can also be supplied with a height adjustment allowing the equipment to be levelled.

■ Megi Machine Mounts with tear-off protection specially withstand 3 g in all directions. When such load occurs, it's necessary to replace the part. These tear-off proof Machine Mounts are the ideal spring elements for special applications where tension forces are expected (e.g. in vehicle and marine construction). These articles are zinc coated and Cr6-free passivated.

Description

Megi Machine Mounts are supplied with rectangular or oval flange. The versions with height adjustment allow the resiliently supported equipment to be levelled. Megi Machine Mounts are distinguished by their low overall height. These parts are zinc coated and colourless passivated.

Technical Data

The Megi Machine Mounts cover a load spectrum **up to 21 kN** depending on the size of the Machine Mounts and type of rubber used. Further information is given in the tables.

The maximum tightening torques for the central threaded mounts can be selected in conformance with strength class 5.

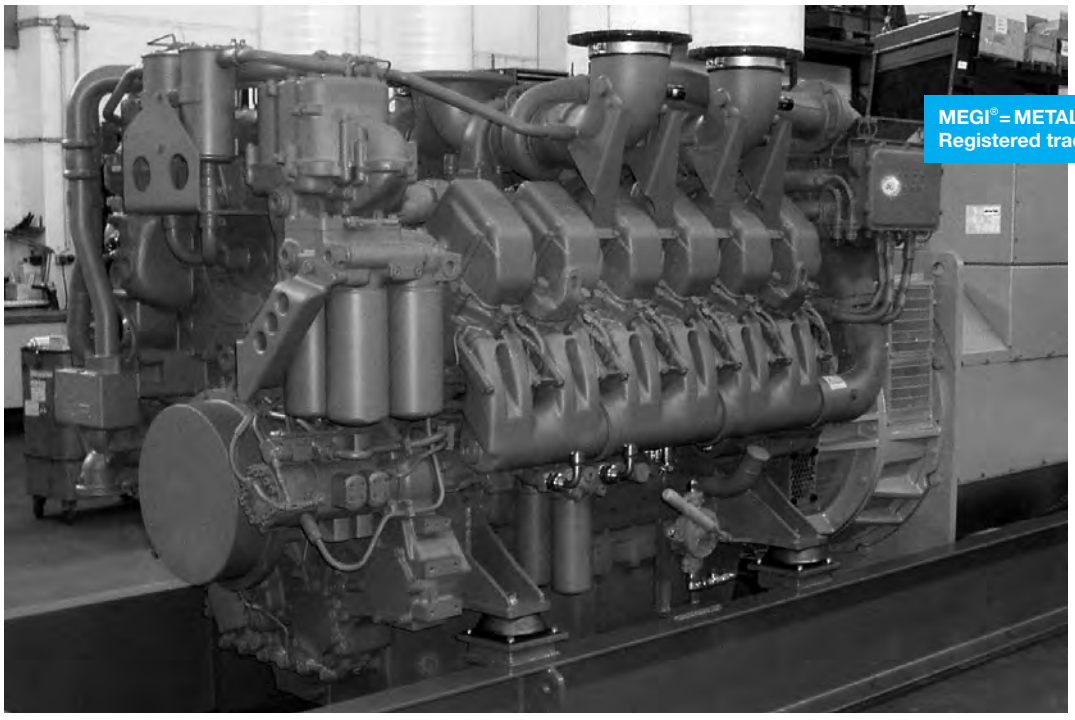
Use for resilient support of:

■ Engines of all types,
■ Diesel assemblies,
■ Machine tools,
■ Eccentric presses,
■ Textile machines,
■ Wood processing machines,
■ Printing presses,

■ Sieves,
■ Rolling mills,
■ Pumps,
■ Ventilation equipment, etc.
■ Washing machines.

Delivery

Available from stock in standard packages.



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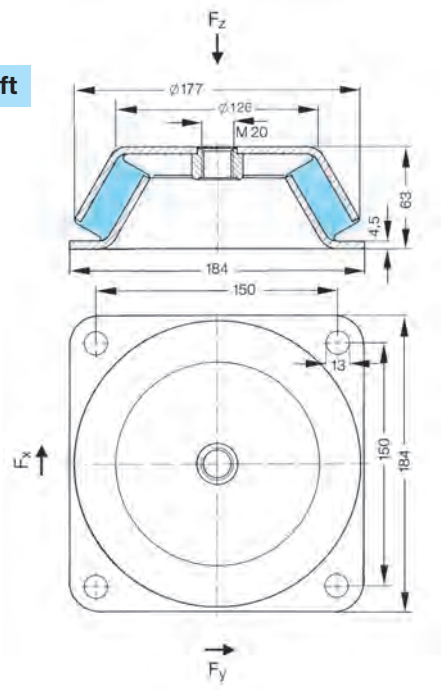
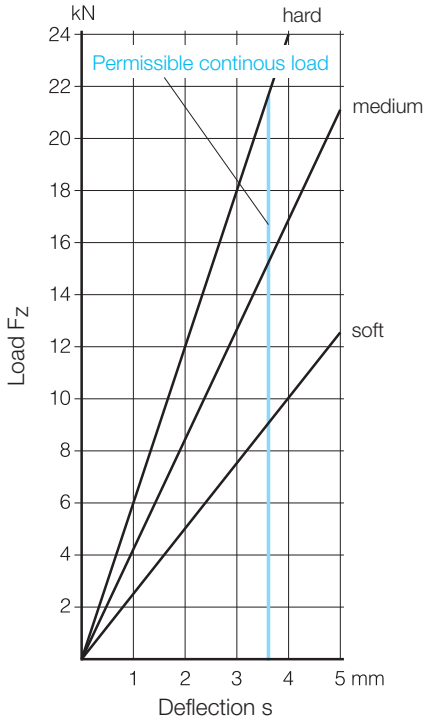
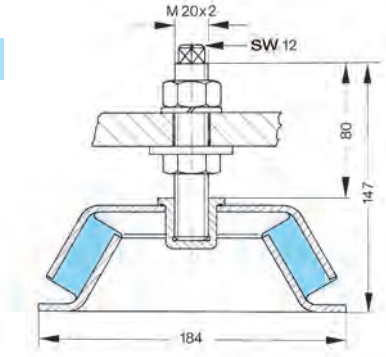
Supply Programme **MEGI® Machine Mounts**

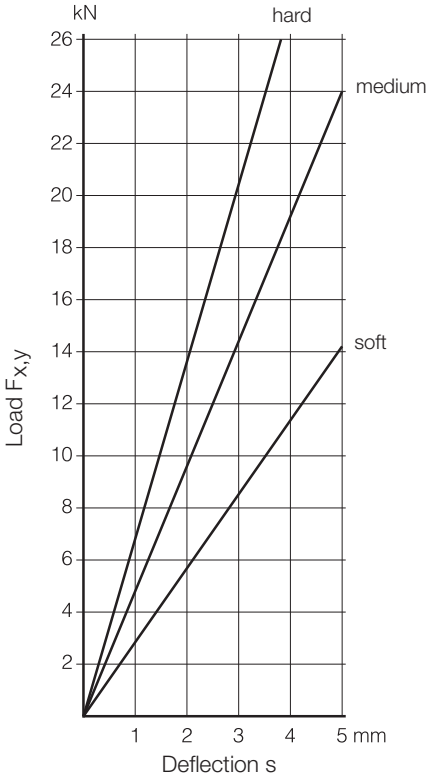
Megi Machine Mounts
Part No. 786 010
Versions:
hard, medium, soft



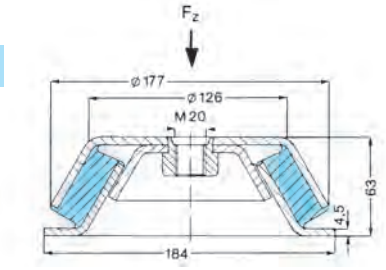


Megi Machine Mounts with height adjustment
Part No. 786 110
Versions:
hard, medium, soft





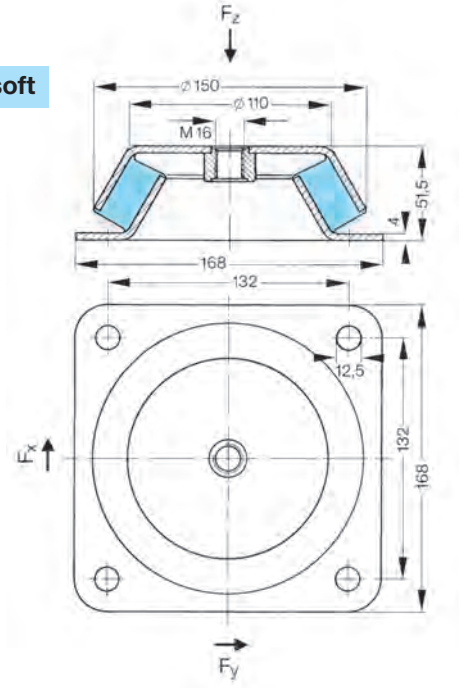
Megi Machine Mounts with tear-off protection
Part No. 786 210
Versions:
hard, medium, soft

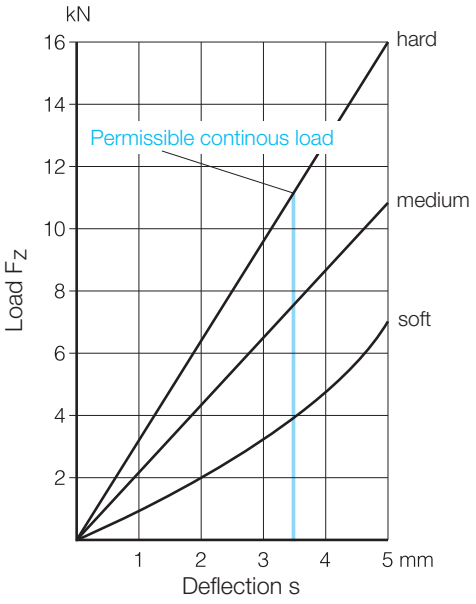


Stock items.
Available only in packages of 4 each.

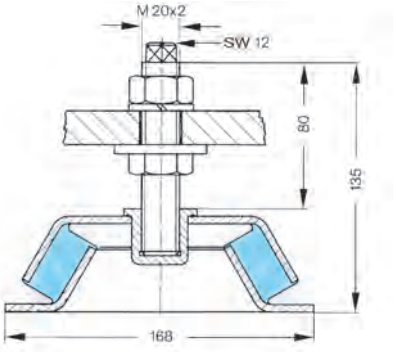
Supply Programme **MEGI® Machine Mounts**

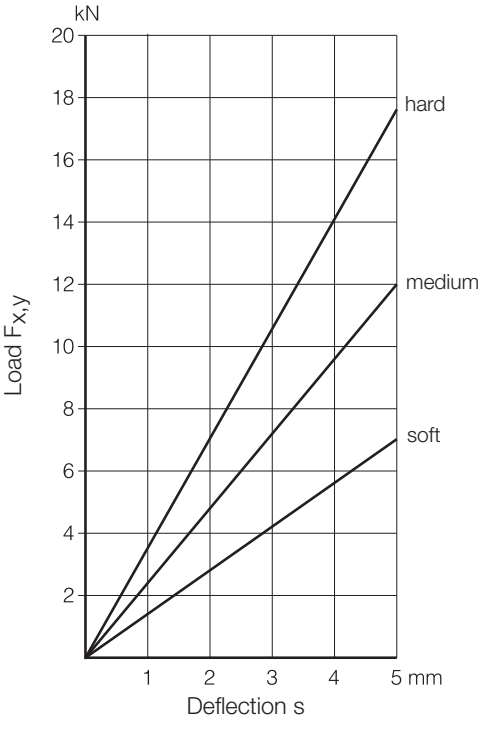
Megi Machine Mounts
Part No. 786 011
Versions:
hard, medium, soft



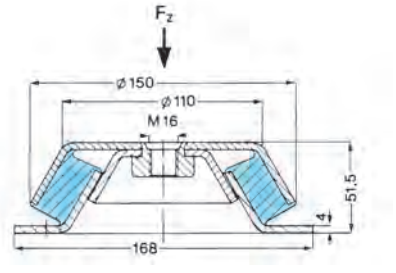


Megi Machine Mounts with height adjustment
Part No. 786 111
Versions:
hard, medium, soft





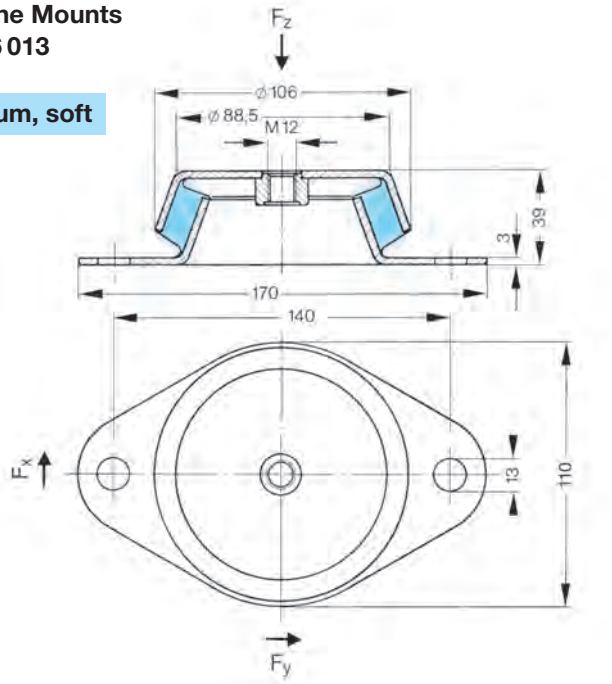
Megi Machine Mounts with tear-off protection
Part No. 786 211
Versions:
hard, medium, soft

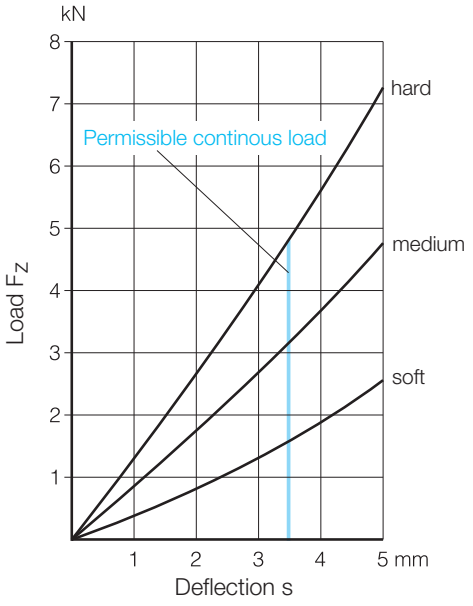


Stock items.
Available only in packages of 4 each.

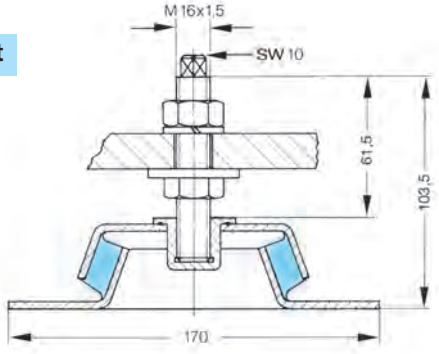
Supply Programme **MEGI® Machine Mounts**

Megi Machine Mounts
Part No. 786 013
Versions:
hard, medium, soft

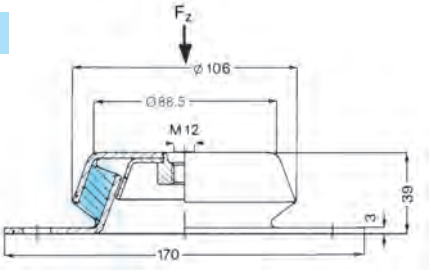


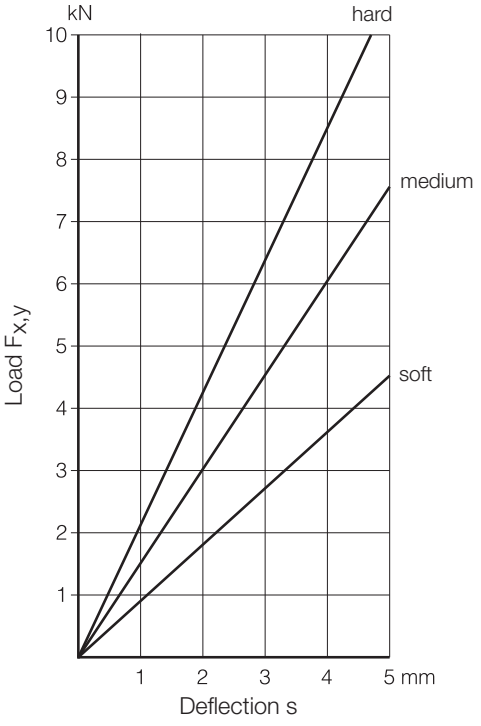


Megi Machine Mounts with height adjustment
Part No. 786 113
Versions:
hard, medium, soft



Megi Machine Mounts with tear-off protection
Part No. 786 213
Versions:
hard, medium, soft

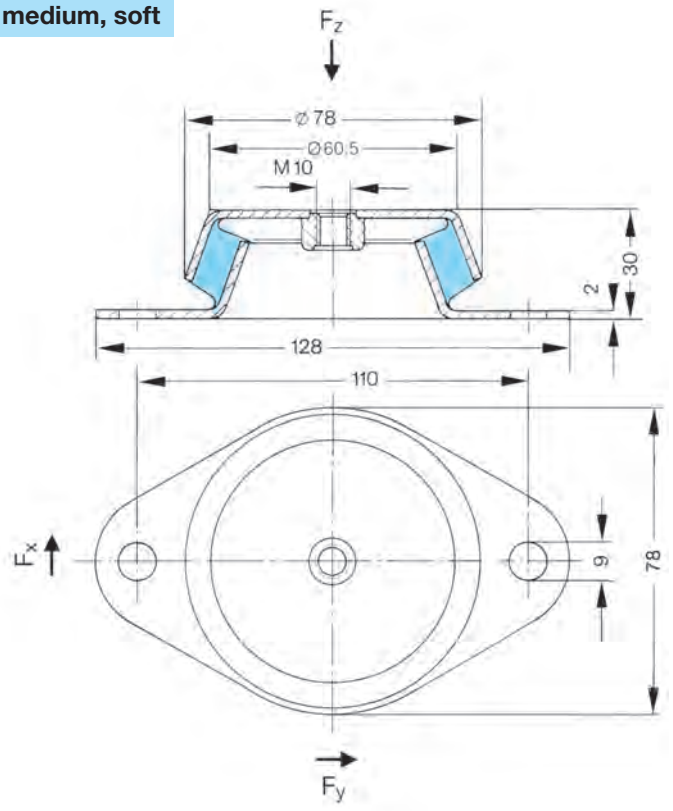


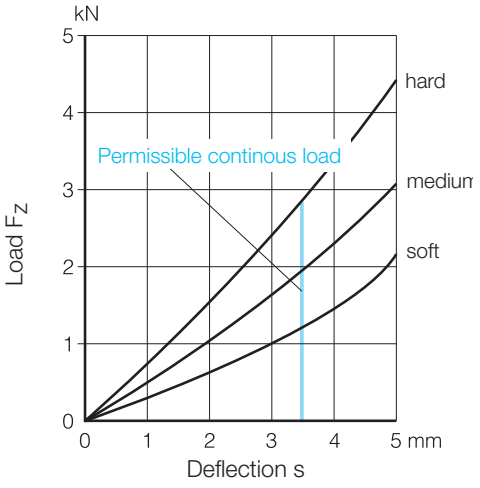


Stock items.
Available only in packages of 8 each.

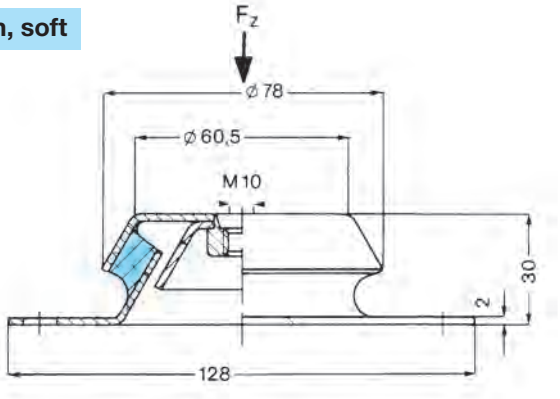
Supply Programme **MEGI® Machine Mounts**

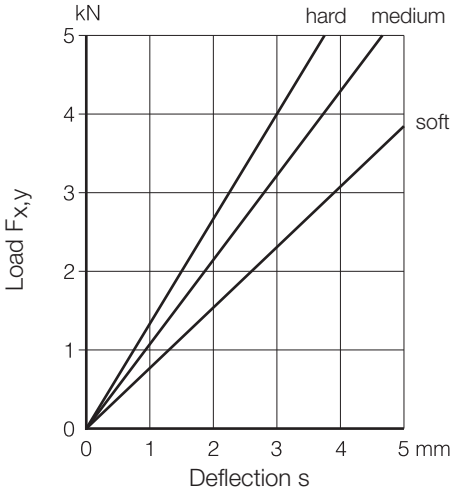
Megi Machine Mounts
Part No. 786 014
Versions:
hard, medium, soft





Megi Machine Mounts with tear-off protection
Part No. 786 214
Versions:
hard, medium, soft





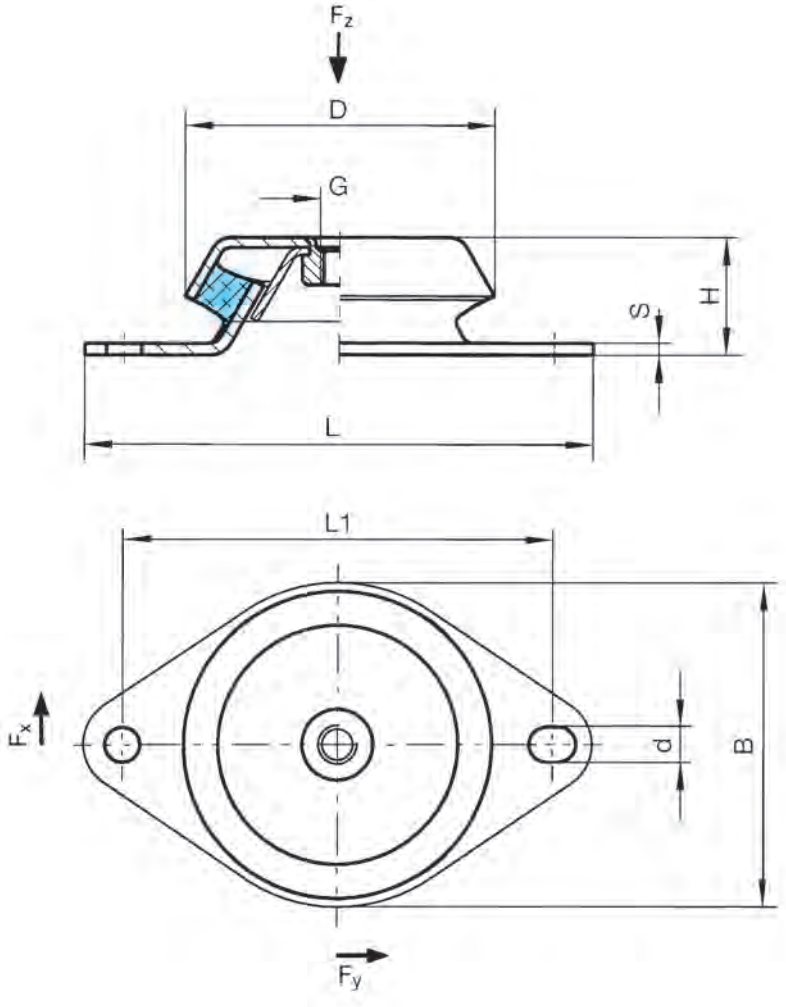
Stock items.
Available only in packages of 8 each.

Supply Programme **MEGI® Machine Mounts**

Megi Machine Mounts with tear-off protection

	Compressive load		Dimensions in mm								Max. tightening torque
Part No.	C_Z in N/mm ± 20%	max. load F_Z [N]	D	L1	L	H	d	s	G	B	$M_{anz.}$ [Nm]
786 230	315	950	79	110	130	30	9	3	M10	79	50
786 230 S1	680	1900	79	110	130	30	9	3	M10	79	50
786 231	235	1500	82	110	135	35,5	11	2,5	M10	89	50
786 232	475	1800	94	124	150	35	10	3,5	M10	100	50
786 232 S1	1000	2700	94	124	150	35	10	3,5	M10	100	50
786 233	570	2500	101	144	175	38	14	3,5	M16	105	210
786 233 S1	1215	4500	101	144	175	38	14	3,5	M16	105	210
786 234	860	4000	123	158	192	42	14	4	M16	130	210
786 234 S1	1285	6000	123	158	192	42	14	4	M16	130	210
786 236	1150	7500	144	182	216	48	14	4	M16	144	210
786 236 S1	2150	13000	144	182	216	48	14	4	M16	144	210

The ratio of the vertical to horizontal rigidity is near to 1.
(C_Z / $C_{X/Y} \approx 1$)



MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

MEGI®-Cones

Applications

Megi cones are ideal for oscillation damp, i.e. low vibration bearing arrangements for motors, body superstructures on chassis frames, compressor units on rail cars, etc. there are transfer recesses in the Megi cones used for piston engines so that the elasticity constant in the longitudinal direction differs from the value in the transverse direction.

Description

Megi cones consist of inner and outer metal cones. The outer cone has an oval or rectangular flange for mounting purposes. Stop plates are fitted in order to limit deformation under compression and tension. Where extremely high stress is present, these stop plates prevent separation of the cone components. Axial impact can be progressively absorbed by the upper stop plate, which, if compression force is excessive, rests on the upper rubber shoulder. If tensile forces are excessive, the inner cone can be deflected only until the bottom stop plate comes up against the lower collar of the outer cone. Megi cones are designed so that the springing effect is soft in the axial direction and very stiff in the radial direction. These parts are zinc coated and colourless passivated.

Technical Data

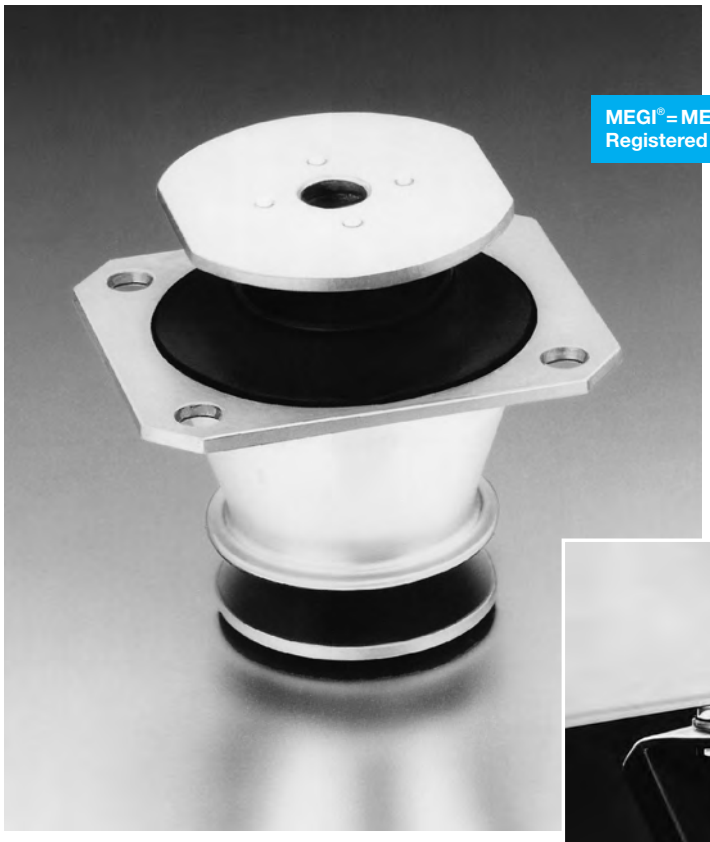
Megi cones cover a load spectrum **up to 17 kN** depending on the cone and type of rubber used. The spring values are given in the diagrams. The inner part of the cone may only be subjected to compression at the specified max. initial tension (inner parts with high strength available on request). The upper washer has to be supported by the screwed part. The type of threaded mount and tightening torques must be selected accordingly.

Example:

M8 bolt, strength class 8.8, coefficient of friction $\mu_R = 0.15$ result in an initial tension force for the threaded connection of approx. 16 kN and a tightening torque of approx. 25 Nm.

Delivery

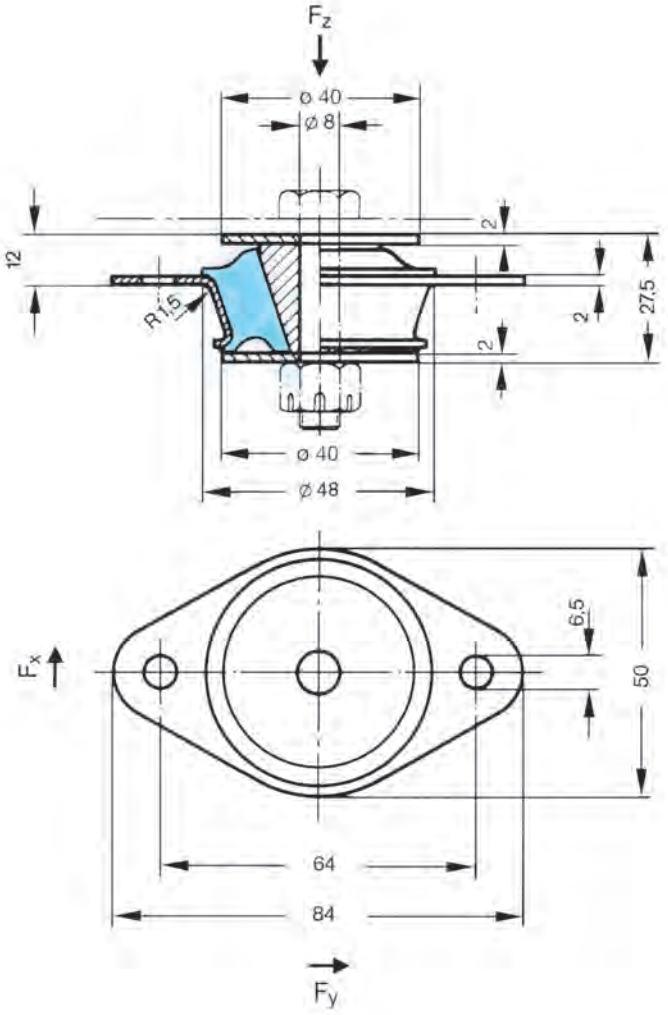
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.

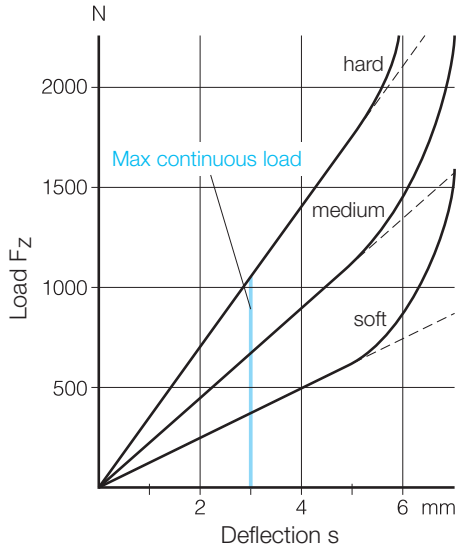


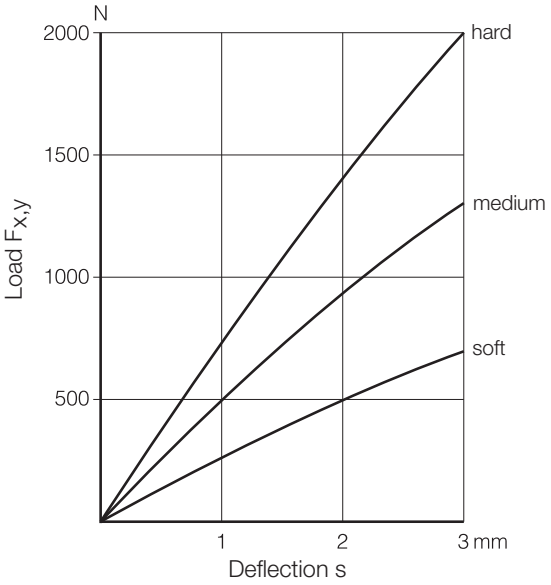
MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

Supply Programme **MEGI®-Cones**

Megi cone
Part No. 786 021
Versions:
hard, medium, soft







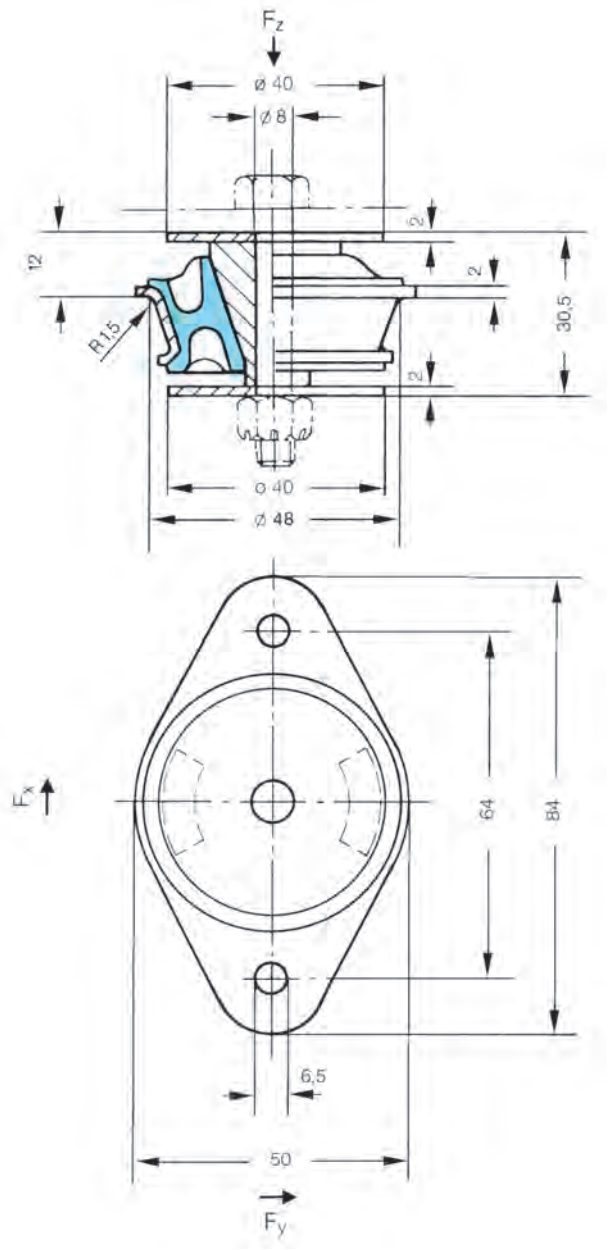
Stock items.
Available only in packages of 16 each.

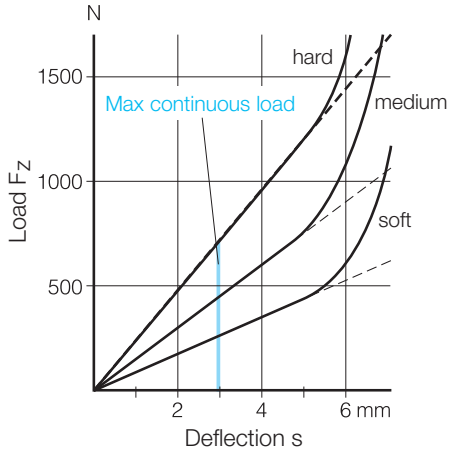
Max. tension force of central threaded mount on inner section of cone
F_V = 20 kN.

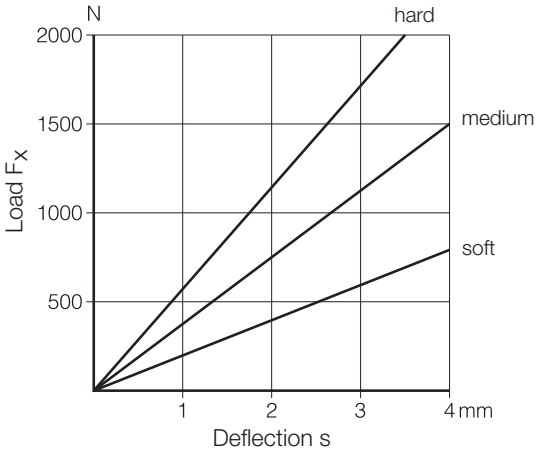
Supply Programme **MEGI®-Cones**

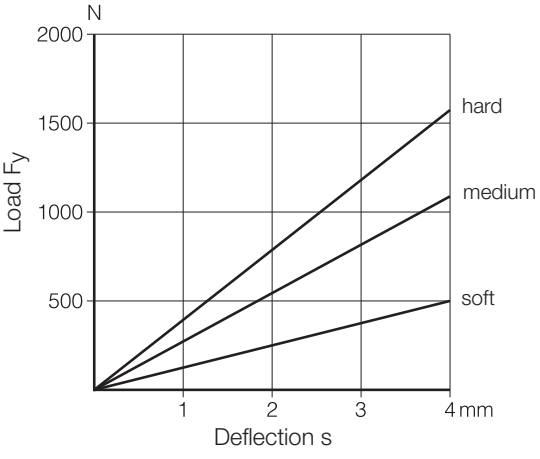
Megi cone
Part No. 786 021 S1
Versions:
hard, medium, soft

Special version for use as piston engine bearings. These cones have transverse radial recesses so that they are much softer in the transverse direction than in the longitudinal direction.







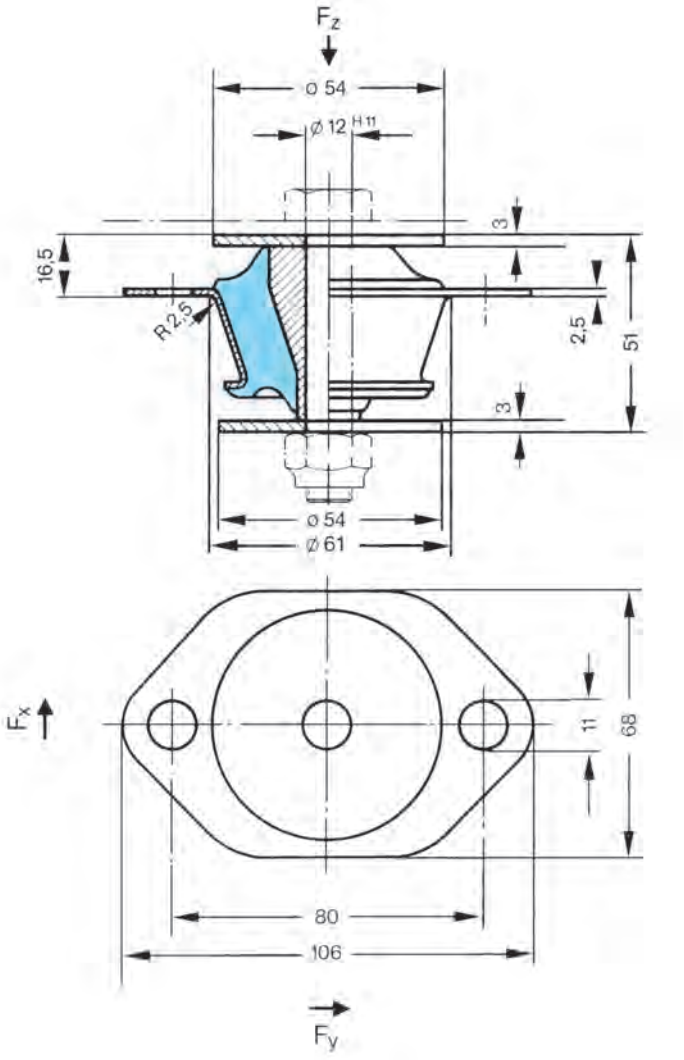


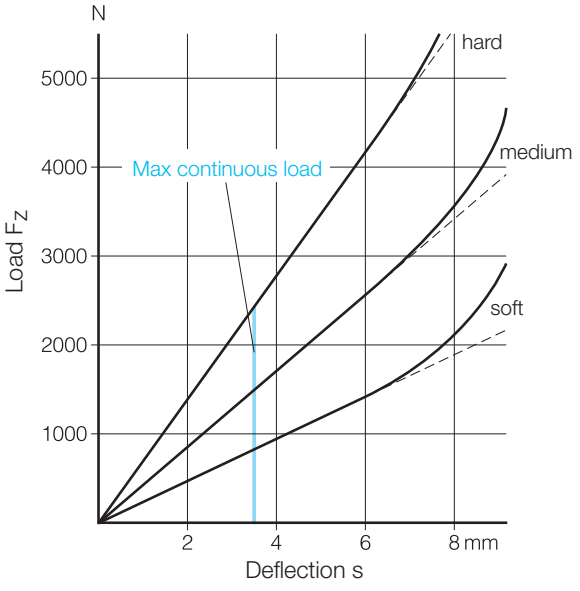
This item is listed in the catalogue and can be produced on request. Supply quantity on request.
Stock item. Available only in packages of 16 each.

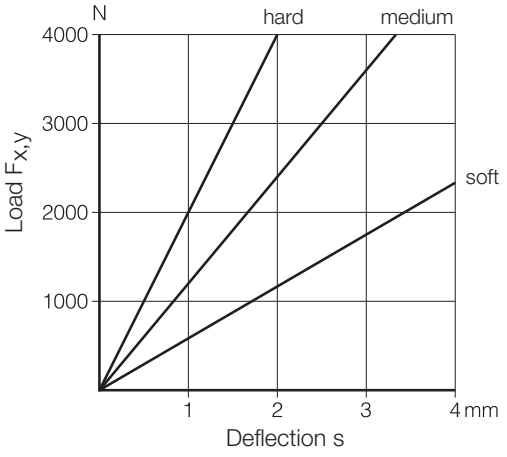
Max. tension force of central threaded mount on inner section of cone
F_V = 20 kN.

Supply Programme **MEGI®-Cones**

Megi cone
Part No. 786 025
Versions:
hard, medium, soft







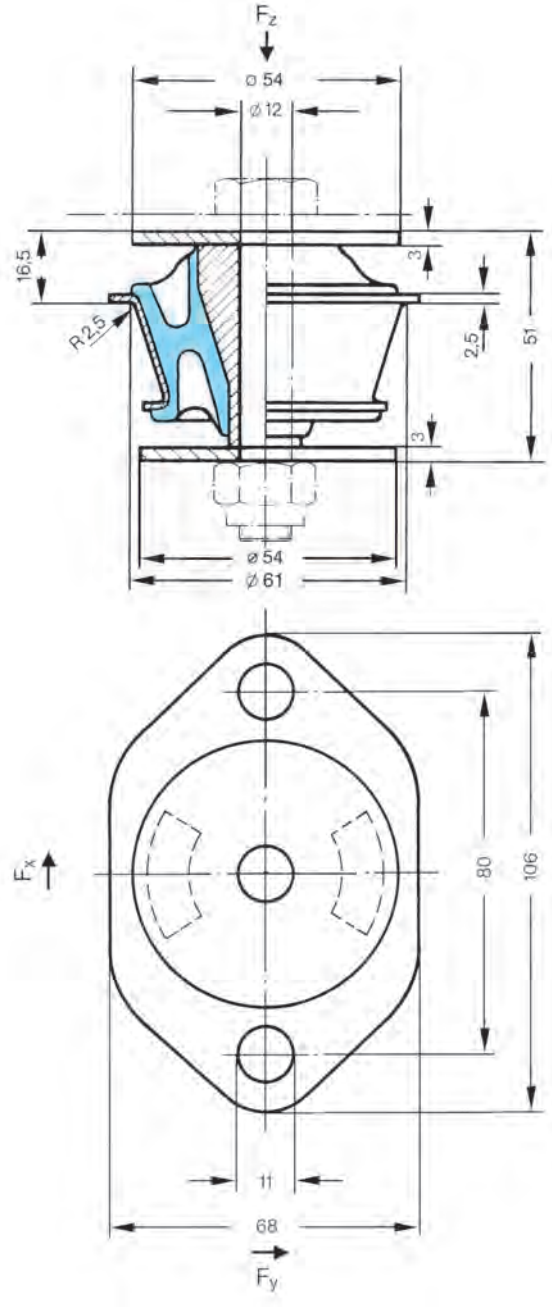
Stock item. Available only in packages of 8 each.

Max. tension force of central threaded mount on inner section of cone F_V = 40 kN.

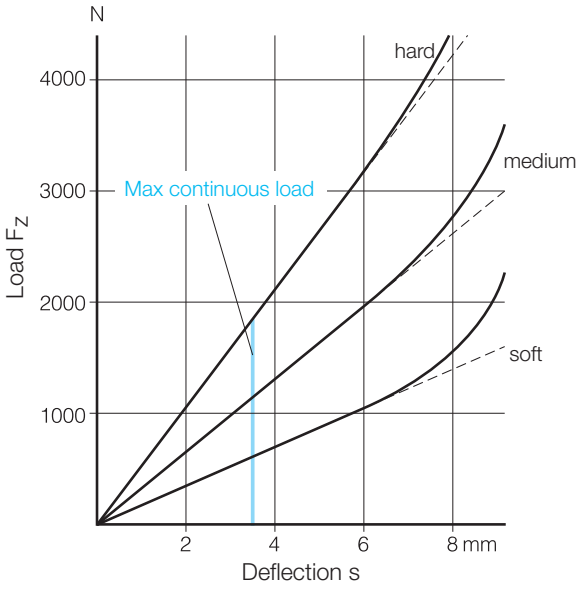
Supply Programme **MEGI®-Cones**

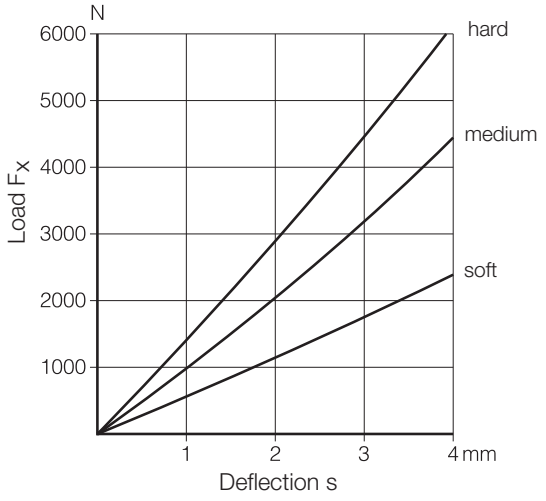
Megi cone
Part No. 786 025 S1
Versions:
hard, medium, soft

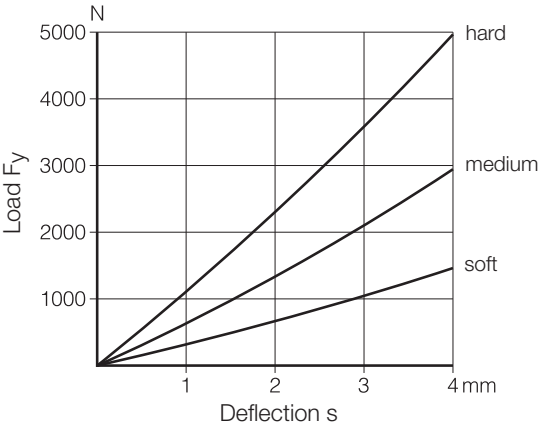
Special version for use as piston engine bearings. These cones have transverse radial recesses so that they are much softer in the transverse direction than in the longitudinal direction.



This item is listed in the catalogue and can be produced on request. Supply quantity on request.



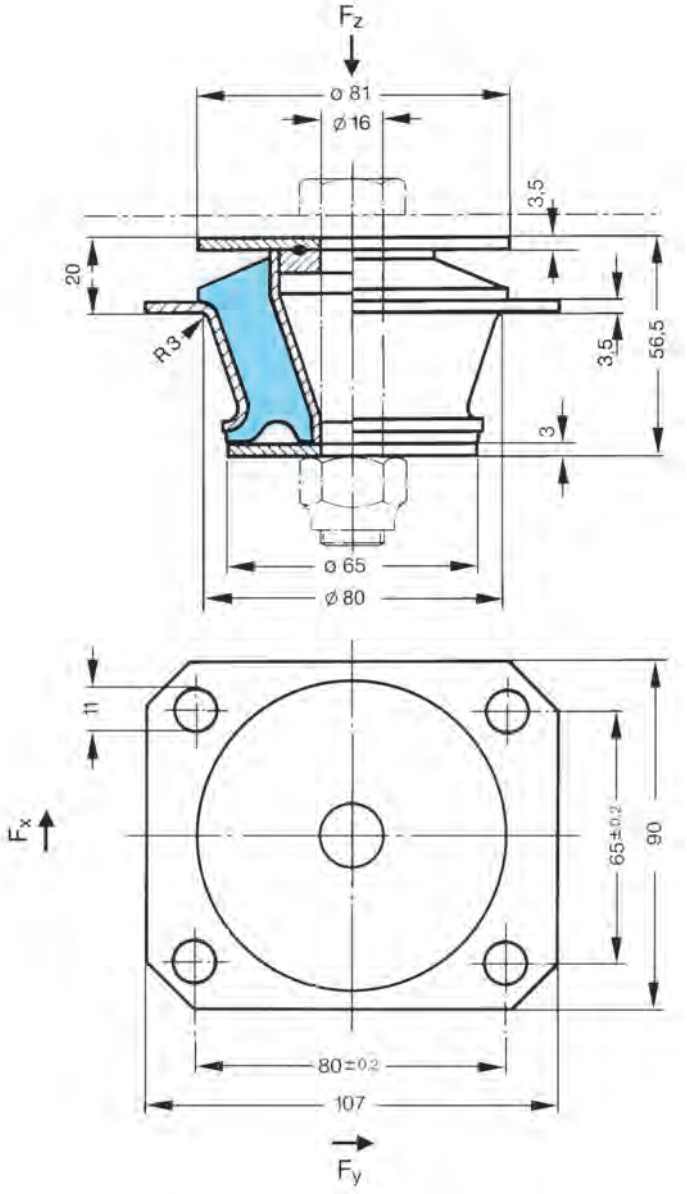


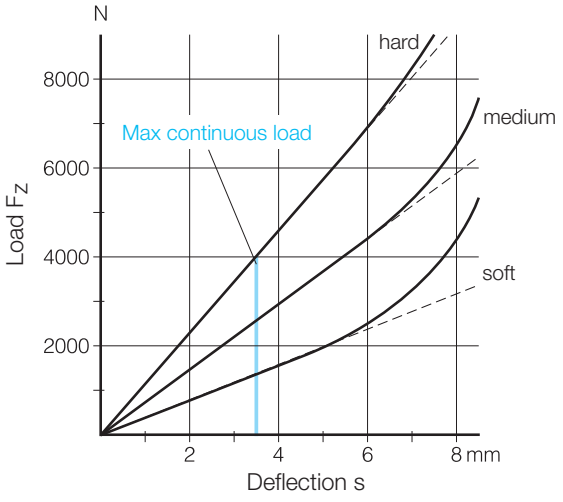


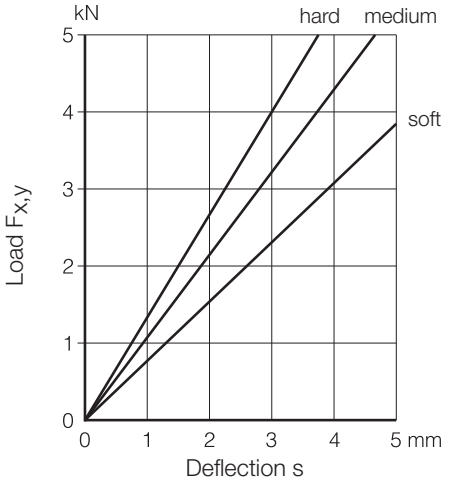
Max. tension force of central threaded mount on inner section of cone
F_V = 40 kN.

Supply Programme **MEGI®-Cones**

Megi cone
Part No. 786 026 S1
Versions:
hard, medium, soft







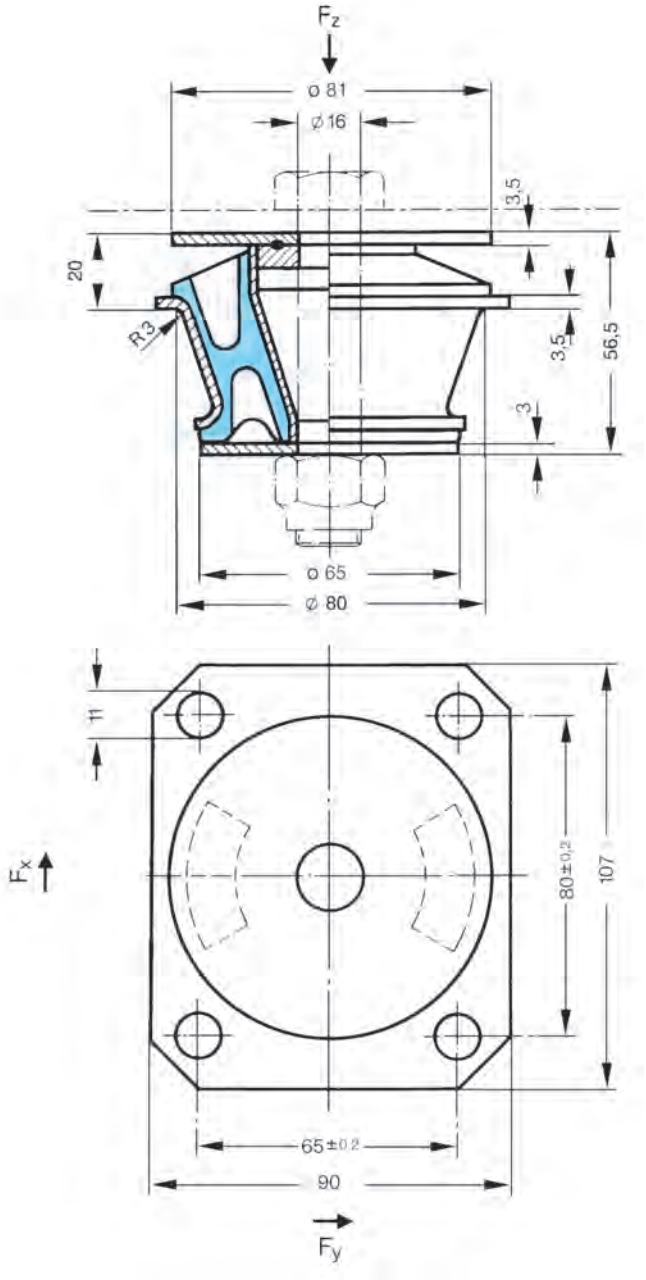
Stock item. Available only in packages of 4 each.

Max. tension force of central threaded mount on inner section of cone
F_V = 50 kN.

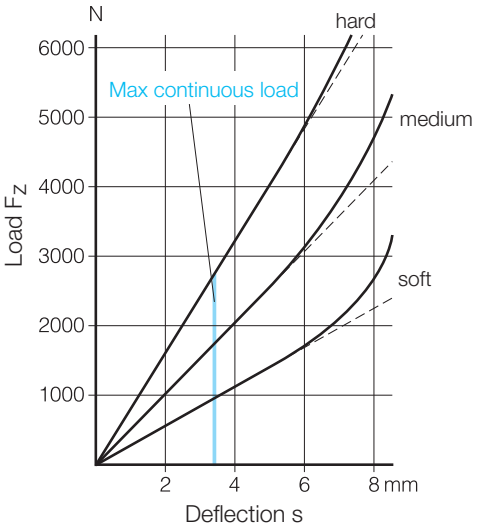
Supply Programme **MEGI®-Cones**

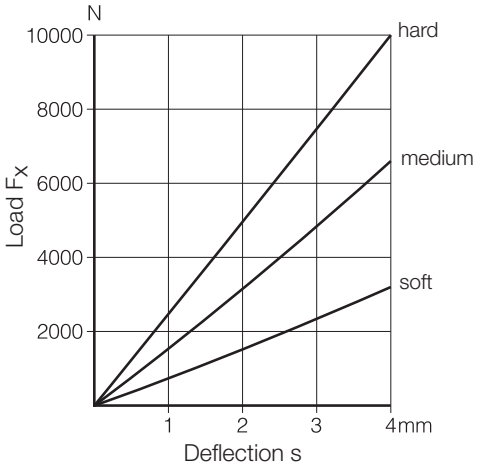
Megi cone
Part No. 786 026 S3
Versions:
hard, medium, soft

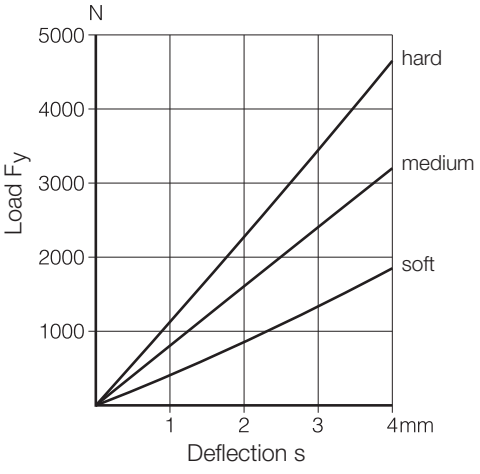
Special version for use as piston engine bearings. These cones have transverse radial recesses so that they are much softer in the transverse direction than in the longitudinal direction.



This item is listed in the catalogue and can be produced on request. Supply quantity on request.



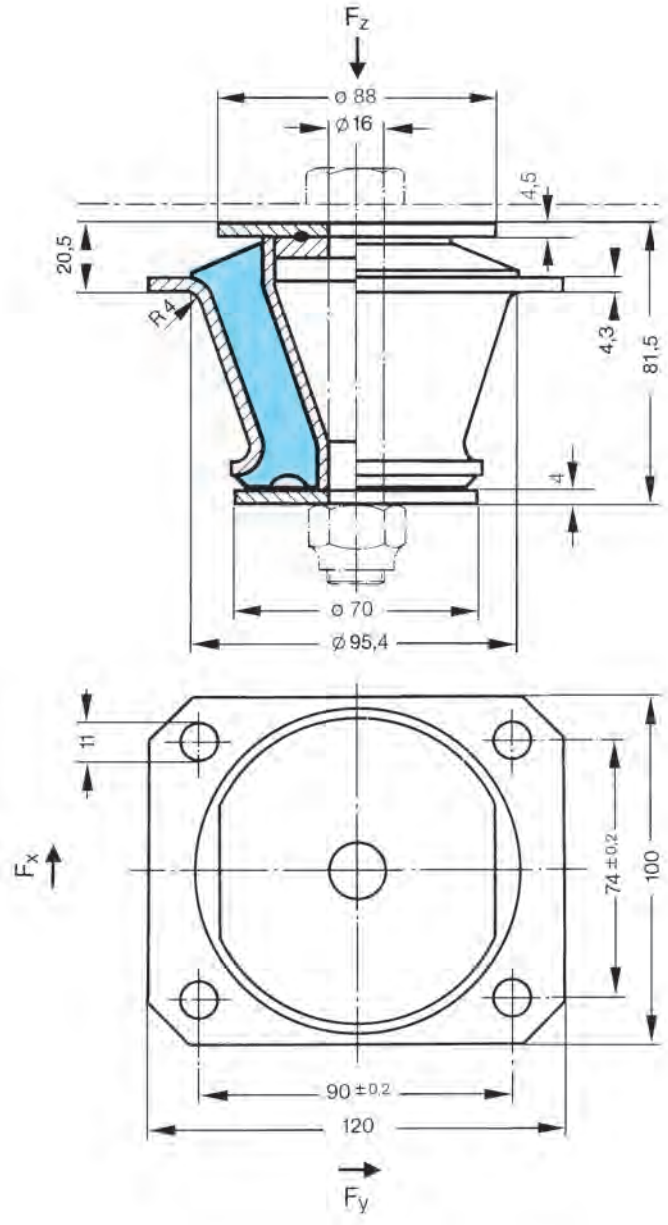


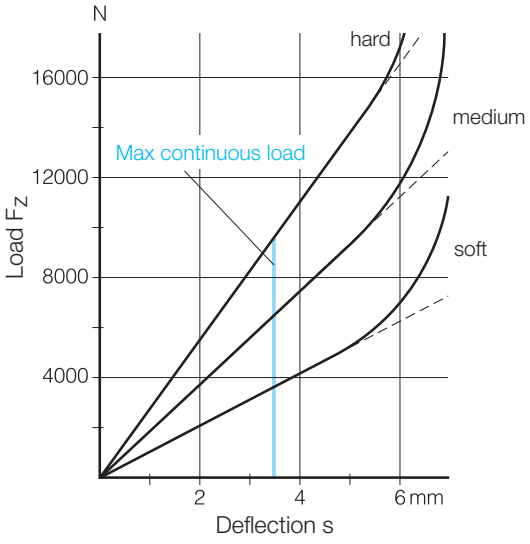


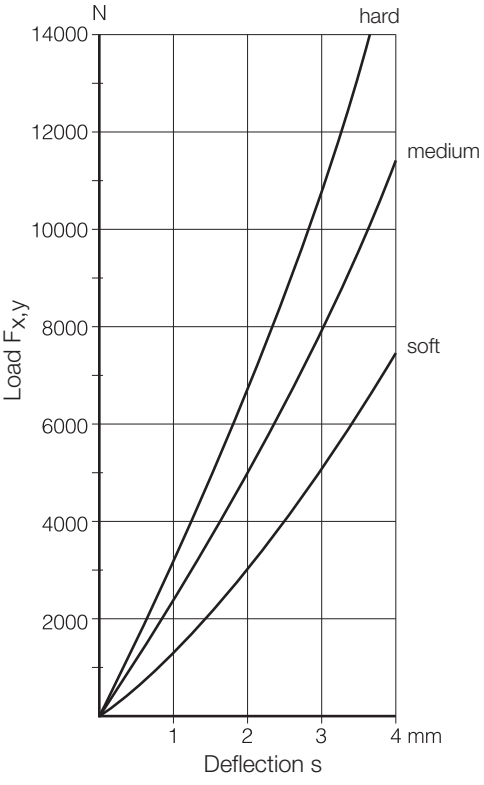
Max. tension force of central threaded mount on inner section of cone
F_V = 50 kN.

Supply Programme **MEGI®-Cones**

Megi cone
Part No. 786 027 S5
Versions:
hard, medium, soft





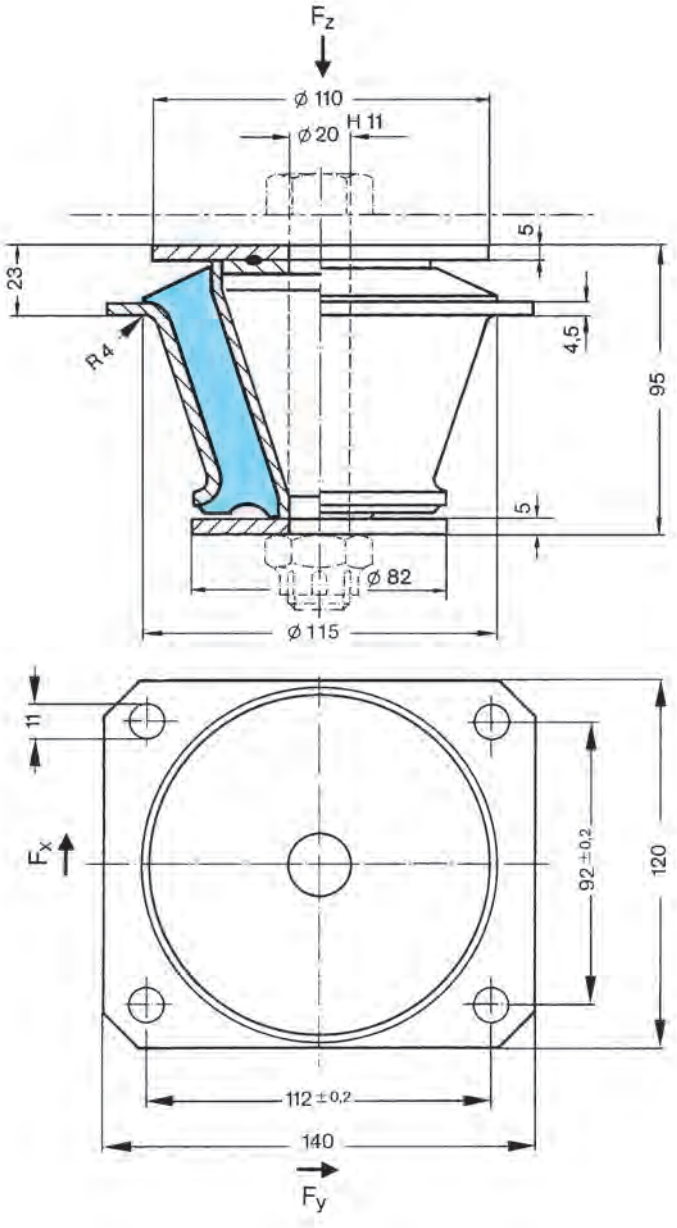


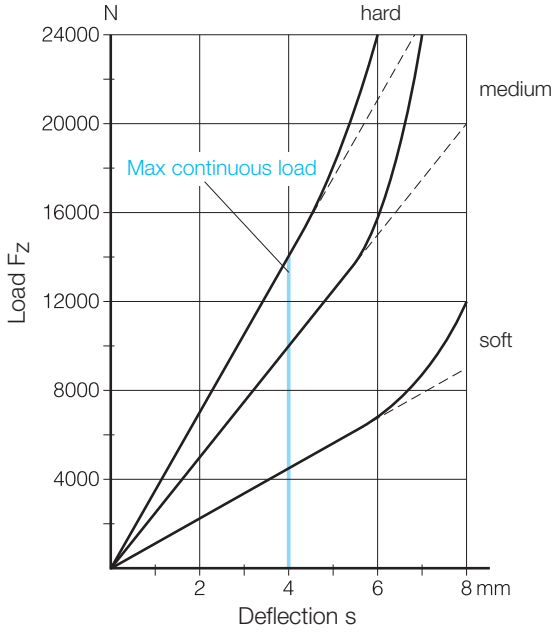
Stock item. Available only in packages of 4 each.

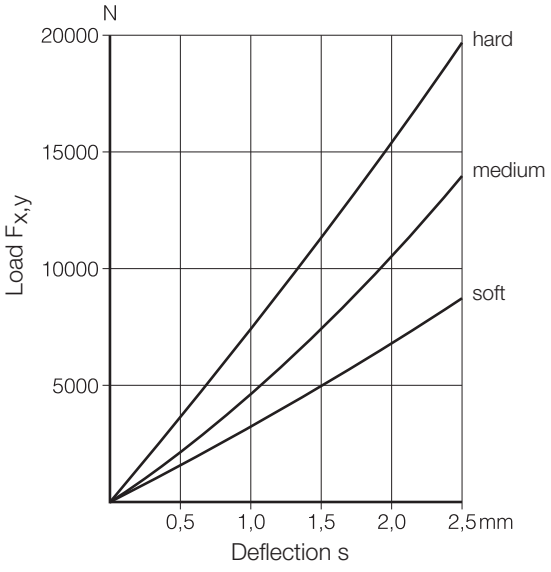
Max. tension force of central threaded mount on inner section of cone F_V = 80 kN.

Supply Programme **MEGI®-Cones**

Megi cone
Part No. 786 030
Versions:
hard, medium, soft







Stock item. Available only in packages of 4 each.

Max. tension force of central threaded mount on inner section of cone
F_V = 80 kN.

MEGI® Bearings

Applications

Megi bearings are used in a wide variety of applications because they are available in several different types, e.g. pedestal bearings, flanged bearings, round or box-type bearings. Some of the bearings are supplied with recesses in the rubber cross-section in order to obtain different degrees of longitudinal and transverse rigidity. In addition, some bearings are fitted with a device preventing overloading or tear-off of the rubber metal bond, so that the possibility of damage from overloading is eliminated. Bearing 742 157 is produced using cast aluminium to reduce the weight.

Description

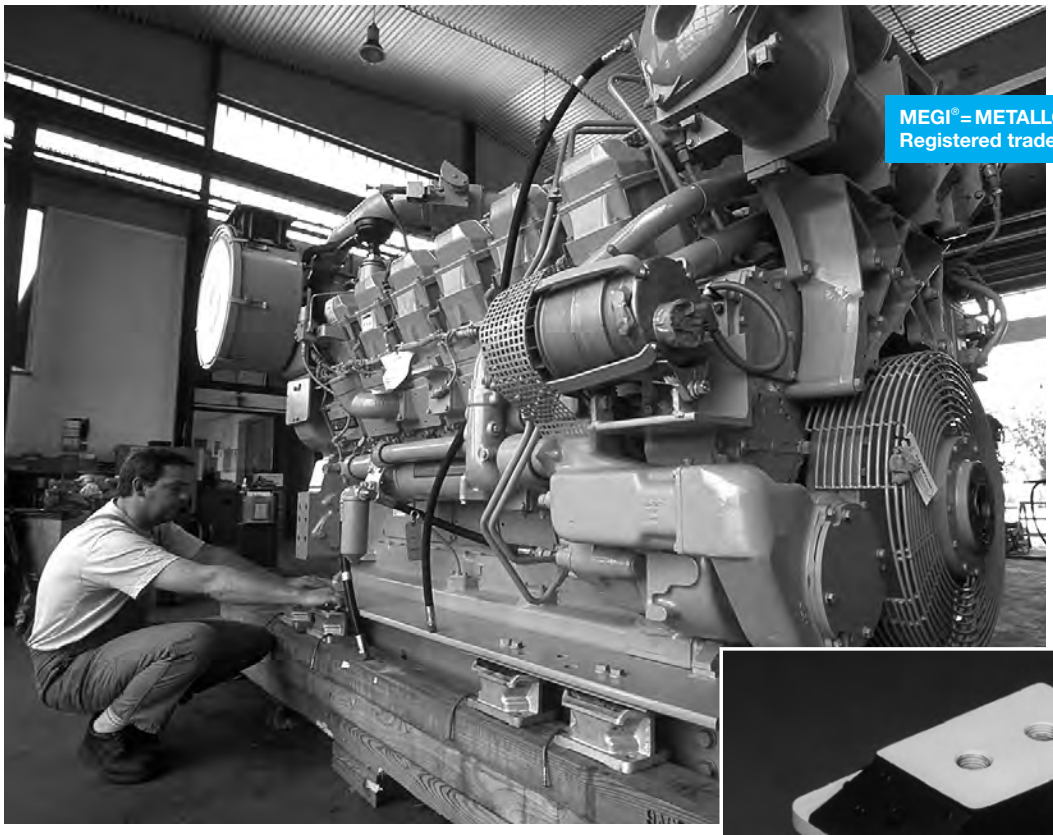
Megi bearings are simply and easy to install. The components, usually designed as pedestal bearings, are bolted directly to a frame or to the foundation. The slotted holes in the flange compensate for any deviations in the position of the drilled bolt holes.

Technical data

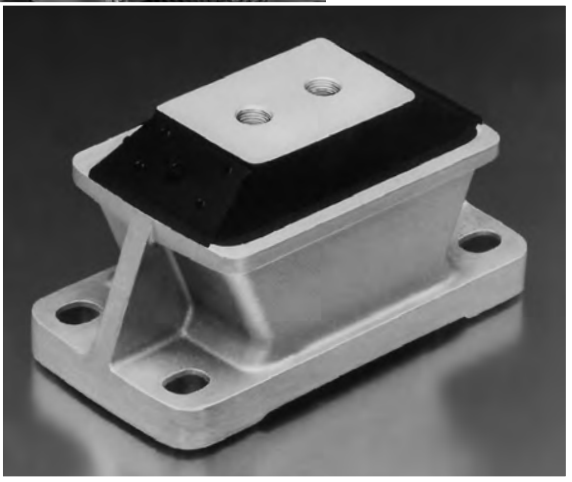
Megi bearings cover a load spectrum **up to 6 kN** depending on the bearing used and type of rubber. Further details are given in the tables.

Delivery

Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.



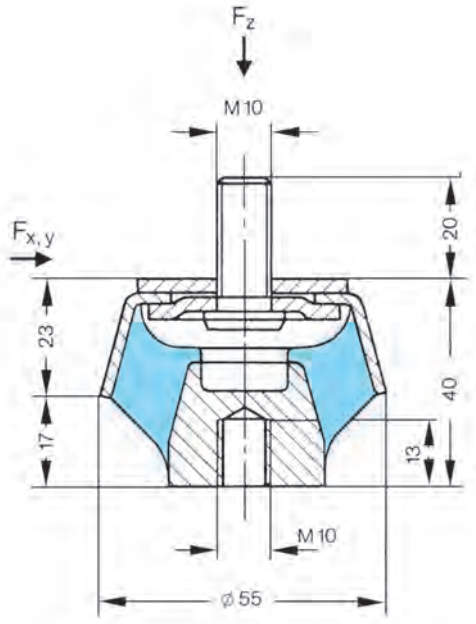
MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

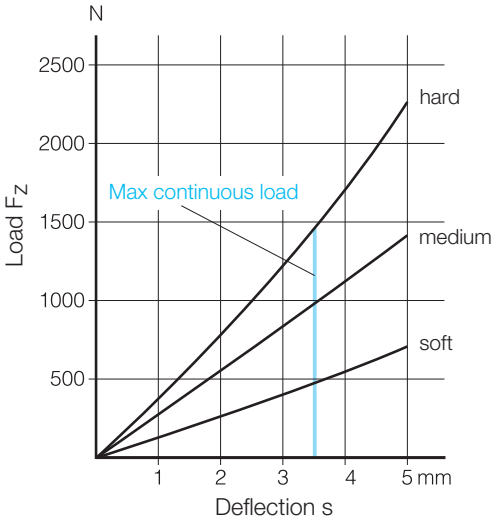


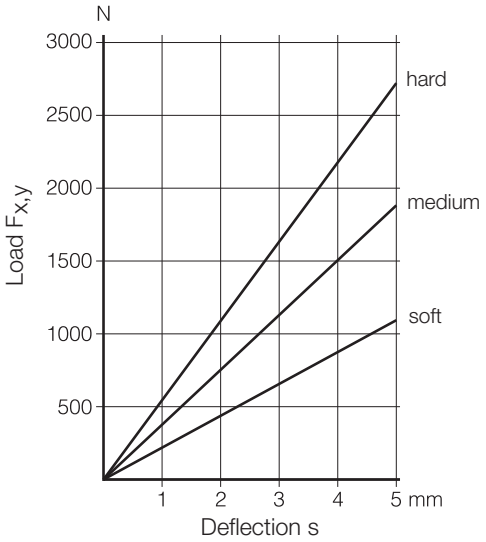
Supply Programme **MEGI® Bearings**

Megi bearing
Part No. 786 012
Versions:
hard, medium, soft

This bearing was developed for light loads. It is soft in the axial direction and has sufficient stiffness in the radial direction. The single-hole mount and the resulting installation possibilities make this bearing particularly suitable for sheet metal structures. These articles are zinc coated and Cr6-free passivated.





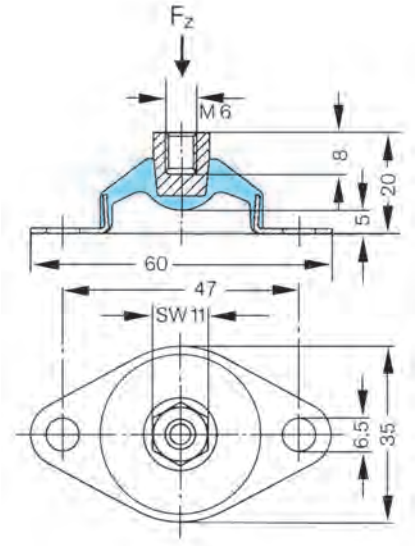


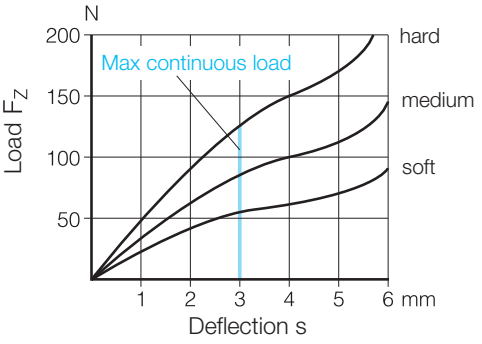
Stock item. Available only in packages of 12 each.

Supply Programme **MEGI® Bearings**

Megi bearing
Part No. 786 028
Versions:
hard, medium, soft

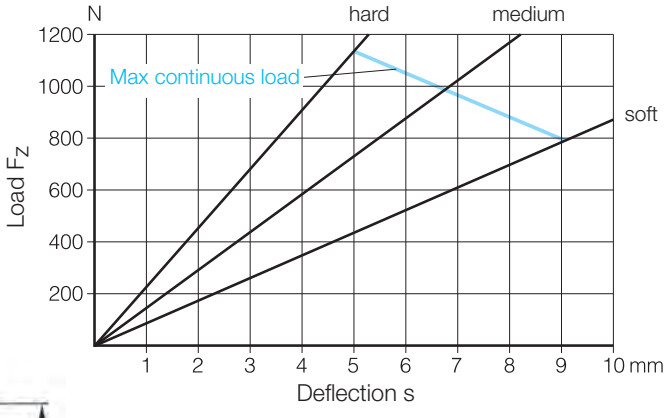
This rubber metal bearing can be used advantageously for flexible mounting of instruments, laboratory scales, etc. This bearing offers soft vertical suspension with sufficient rigidity in the horizontal direction.

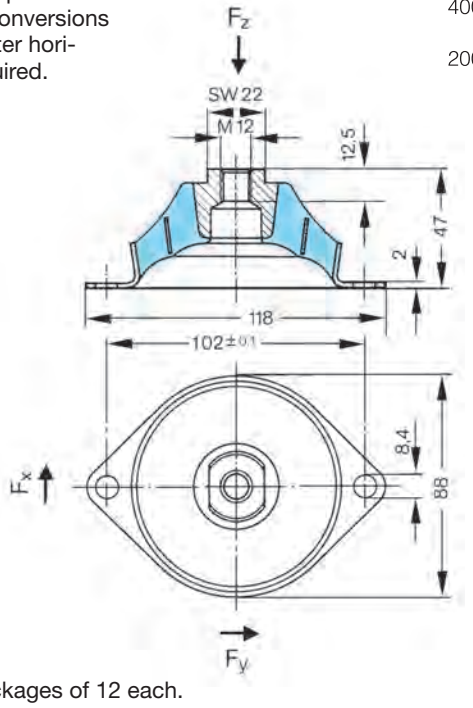


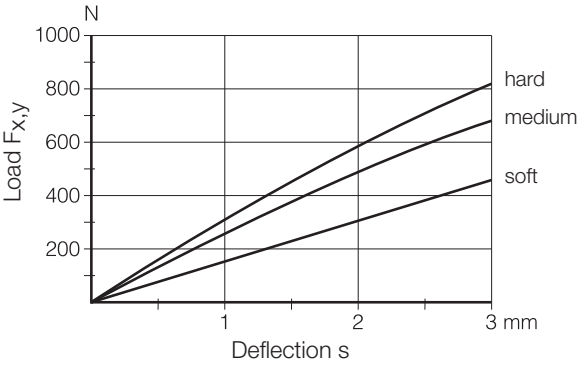


Megi bearing
Part No. 742 022
Versions:
hard, medium, soft

This rubber metal bearing is suitable for mounting equipment, fans, compressor units, etc. particularly in applications where soft vertical conversions combined with greater horizontal rigidity is required.







Stock item.

Available only in packages of 12 each.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Supply Programme **MEGI® Bearings**

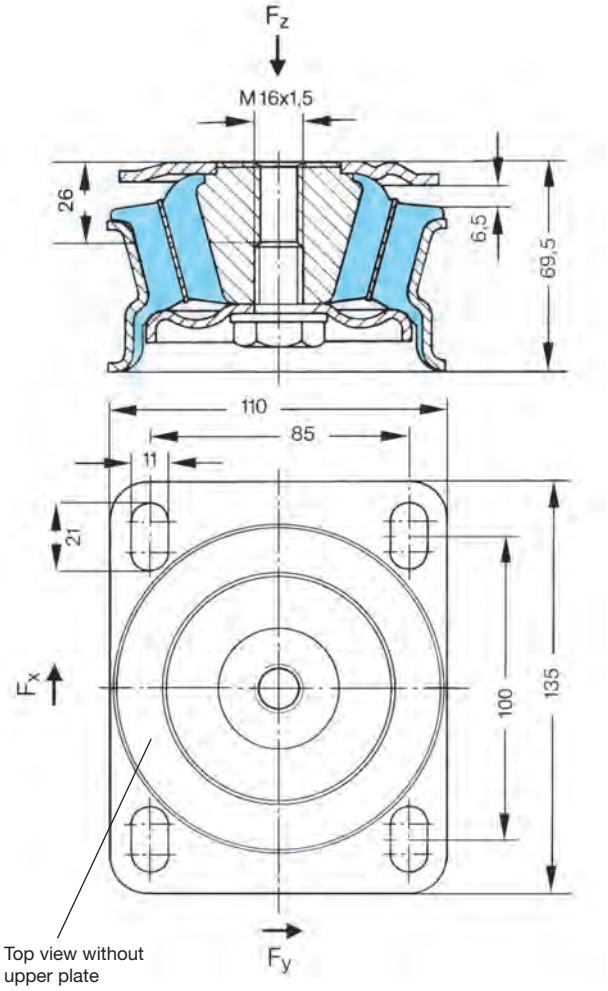
Megi bearing
Part No. 742 034 S6

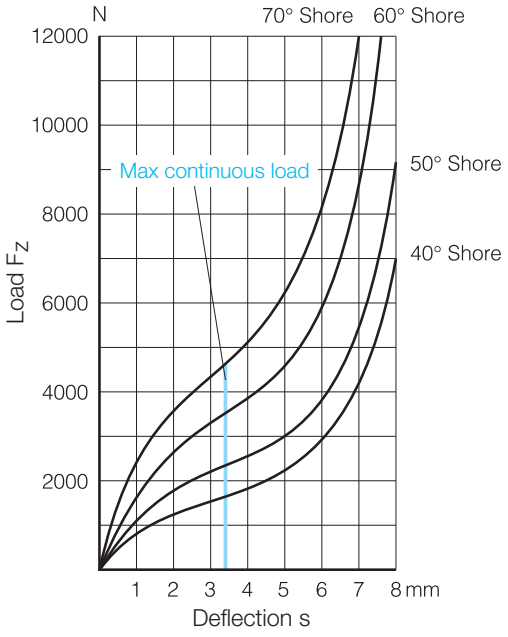
This round element is designed as a pedestal bearing and is suitable as a flexible mount for motors and stationary assemblies. The vertical deflection in the compression as well as tension direction is limited by the stop plates at the top and bottom making it impossible to overload this bearing.

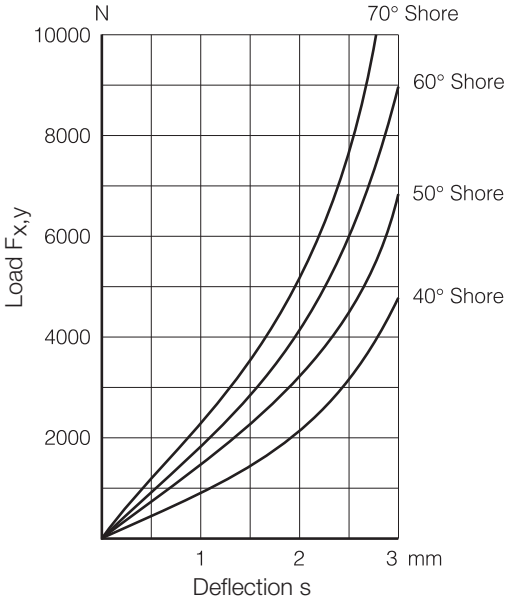
Rated shore hardness (spring curve has priority):

40° Shore A
50° Shore A
60° Shore A — Order No. 742 034 S 6
70° Shore A — Order No. 742 034 S 9

Spring rates in operating range in N/mm ±20 %				
Shore A	40°±5	50°±5	60°±5	70°±5
c_z	325	430	610	785
$c_{x,y}$	835	1325	1715	2160







Stock item. Available only in packages of 4 each.

Supply Programme **MEGI® Bearings**

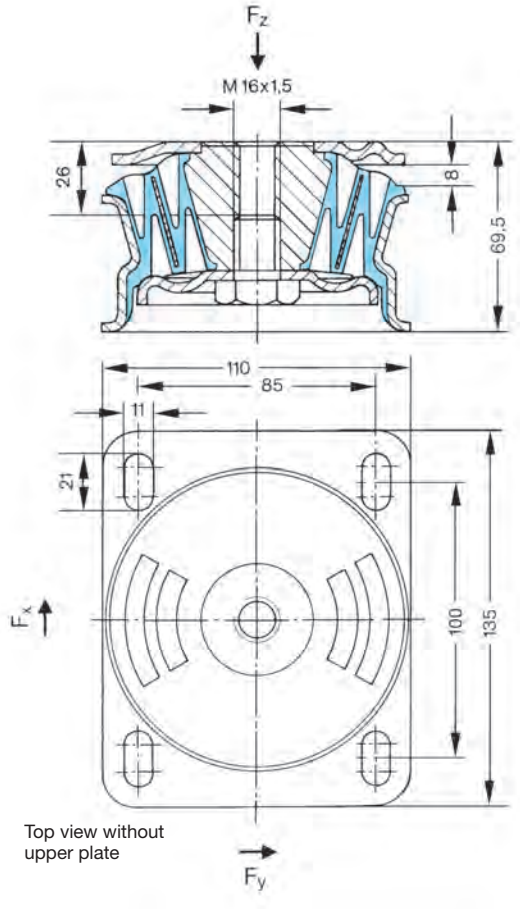
Megi bearing
Part No. 742 034 S7

This round element is designed as a pedestal bearing and is suitable as a flexible mount for motors and stationary assemblies. The vertical deflection in the compression as well as tension direction is limited by the stop plates at the top and bottom making it impossible to overload this bearing.

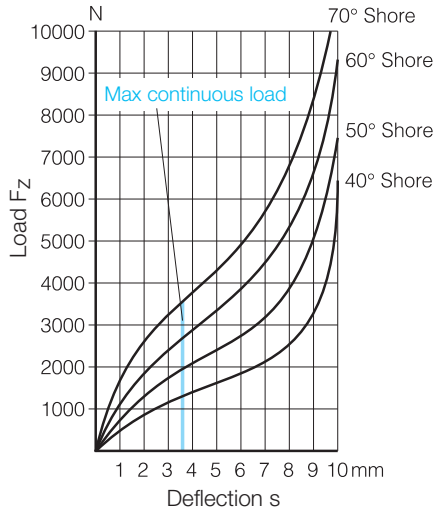
Rated shore hardness (spring curve has priority):

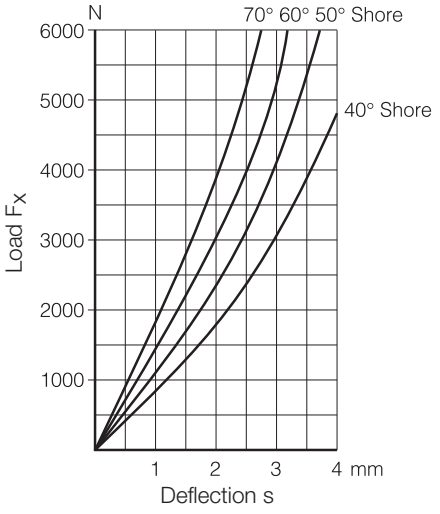
40° Shore A
50° Shore A
60° Shore A
70° Shore A

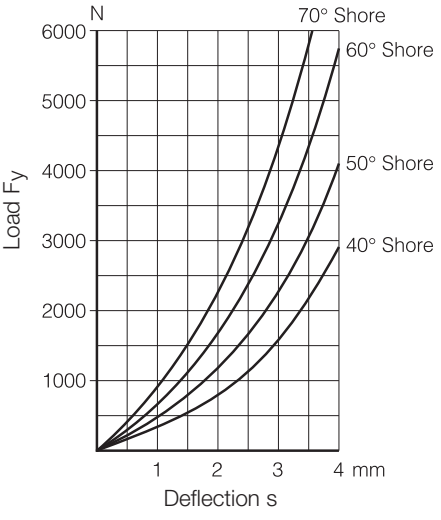
Spring rates in operating range in N/mm ±20 %				
Shore A	40°±5	50°±5	60°±5	70°±5
c_z	235	325	440	570
c_x	785	1130	1520	1960
c_y	345	540	740	980



Top view without upper plate







Stock item. Available only in packages of 4 each.

The recesses in the rubber provide different degree of longitudinal and transverse rigidity.

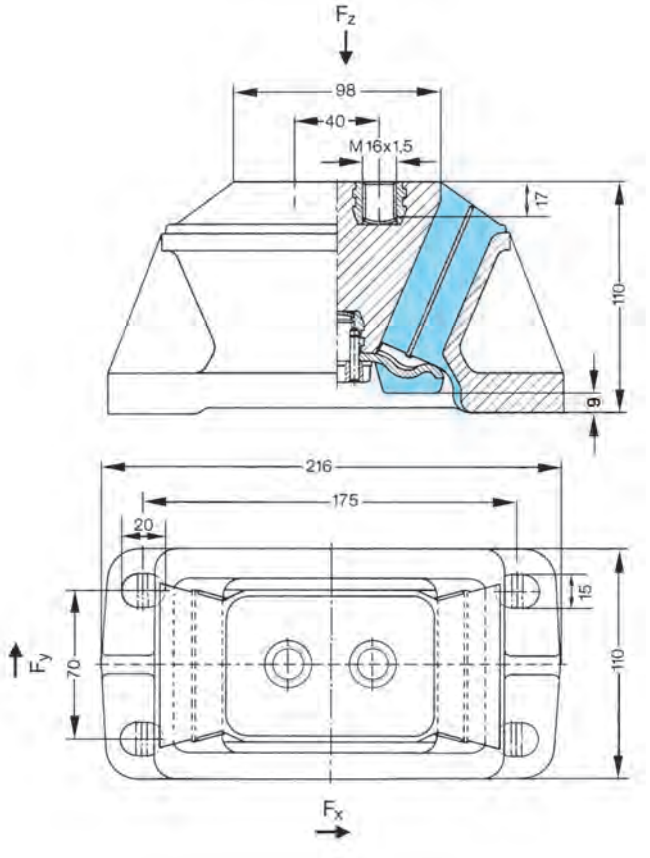
Supply Programme **MEGI® Bearings**

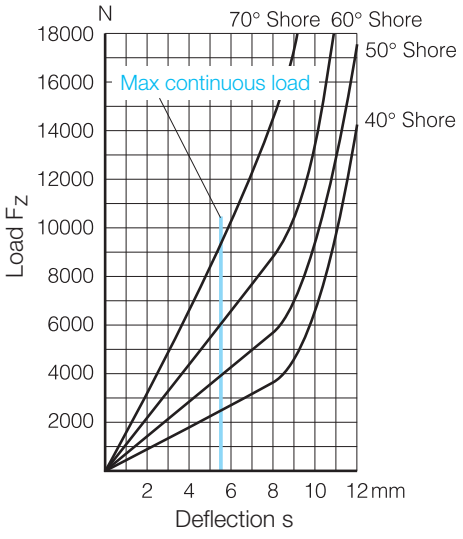
Megi bearing
Part No. 742 157

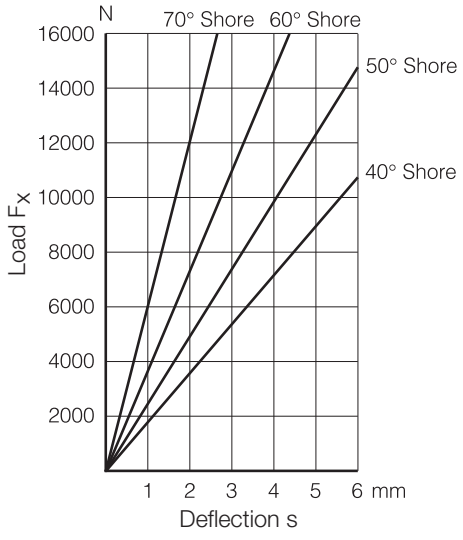
This large Megi box-shaped bearing can be used as a flexible mount for extremely heavy engines in vehicles and stationary assemblies. Cast aluminium was used for the core and flange parts to reduce the weight.

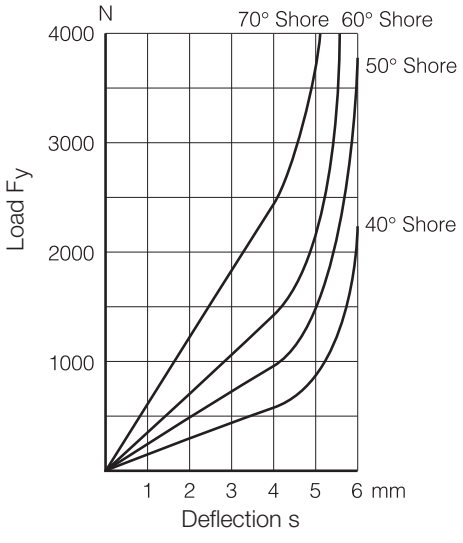
Rated shore hardness (spring curve has priority):
40° Shore A
50° Shore A
60° Shore A
70° Shore A

Spring rates in operating range in N/mm ±20 %				
Shore A	40°±5	50°±5	60°±5	70°±5
c_z	450	680	1020	1570
c_x	1765	2450	3680	5690
c_y	170	235	345	590









Stock item.

This item is listed in the catalogue and can be produced on request. Supply quantity on request.

MEGI® Ring Elements

Applications

Megiflex-disk and Megi annular buffers are simple standard elements in terms of the part geometry which are used as flexible mounts in light and heavy machine construction as well as automotive applications.

Megiflex-disk, which can be combined to form spring assemblies, are frequently used as buffer elements on rail vehicles. They can also be assembled to form tension/thrust elements. Various spring constants and therefore deflection values can be achieved by assembling a number of these disks in series.

Megi annular buffers are spring elements which are usually used as pairs at each bearing points. They are particularly effective when used as auxiliary mounts to interrupt structure-borne sound vibrations.

Annular buffers with tear-off protection can be used for many applications from resiliently suspended driver's seat to flexibly mounted truck cabs, from pipe mounts to control cabinets; minor transfer forces are absorbed.

Description

Megiflex-disk are prestressed when fitted and absorb both tensile and compressive forces. In spring assemblies made up of a large number of individual elements, it is necessary to insert supports to prevent buckling and a guide is required for the entire spring column. The number of spring elements assembled in series must be calculated to ensure that the load does not exceed the initial tension range. Transfer forces cannot be absorbed, or only to a small extent. Mounting plates must be provided by the customer.

Megi annular buffers are installed in pairs and decompressed. They provide a relatively hard flexible mount for tension and compression. The primary function of the element is to interrupt transmission of structure-borne noise.

Technical Data

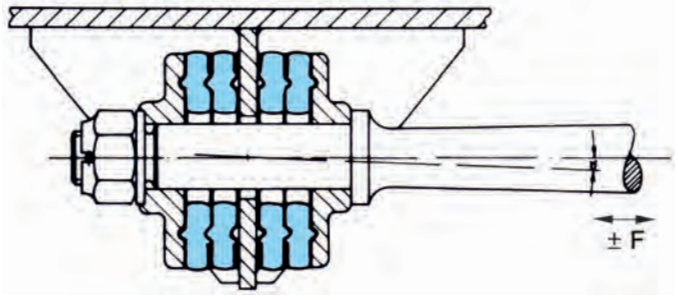
Megiflex-disk absorb impact loads **up to approx. 500 kN** depending on the application and type of rubber used. Megi annular buffers cover a load range up to approx. 3750 N.

Delivery

Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.

MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

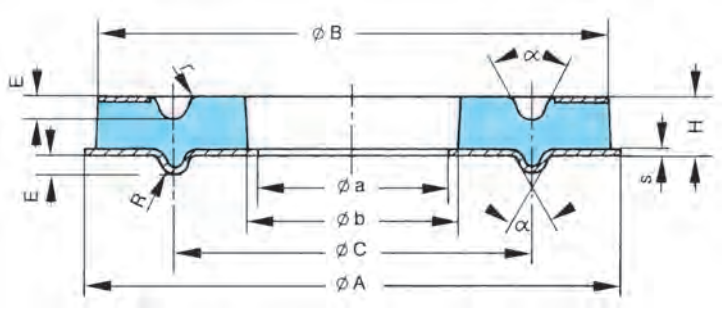
Assembly



Supply Programme **MEGI® Ring Elements**

Megiflex disks
Version:
medium

Megiflex disk are prestressed when fitted and absorb both tensile and compressive forces. In spring assemblies made up of a large number of individual elements, it is necessary to insert supports to prevent buckling and a guide is required for the entire spring column. The number of spring elements assembled in series must be calculated to ensure that the load does not exceed the initial tension range. Transfer forces cannot be absorbed, or only to a small extent. Mounting plates must be provided by the customer.



Dimensions											Technical data medium			Part No.	Number in package
A Ø	a Ø	B Ø	b Ø	C Ø	H	s	E	α°	R	r	Max. continuous static load N	Max. continuous static load s (mm)	infrequent peak load* N		
65	26	62	30	46	11	1	2,5	60	2	0,5	6850	1,8	17650	741 473	20
95	45	90	50	70	10,5	1,5	2,5	60	2,5	1	7850	1,4	20600	741 481	10
100	35	90	40	64	27,5	1,5	3,5	60	3	1	9800	6,4	58850	741 444	10
110	30	102	38	76	20,8	1,75	3,5	60	3	1	13750	3,7	62800	741 401	6
110	30	102	38	76	25,8	1,75	3,5	60	3	1	12750	5,1	73600	741 409	–
110	40	102	44	76	15,8	1,75	3,5	60	3	1	14200	2,4	49050	741 493	6
130	55	123	60	90	16	2	5	60	4	2	17150	2,1	57900	741 488	6
153	55	145	60	102	30	2	5	60	4	2	29450	6,2	107900	741 472	4
155	75	150	80	115	12	2	5	60	4	2	23550	1,2	73600	741 485	–
160	90	155	95	125	12	2	5	60	4	2	22550	1,3	66700	741 486	–
164	60	156	64	110	16	2	4	60	4	2	30400	1,8	88300	741 424	–
164	60	156	64	110	23	2	4	60	4	2	33350	3,6	122650	741 432	4
210	55	200	60	154	20	2	6	60	6	1,2	45150	2	153050	741 482	–
210	95	200	100	154	20	2	6	60	6	1,2	45150	2,6	173650	741 436	4
220	66	200	100	154	62	2	6	60	6	1,2	32400	13	103000	741 407	–
240	70	230	76	154	25	2	6	60	5	2	60800	2,9	217800	741 434	4
265	78	250	90	166	27,8	2,75	7	60	6	2	82400	3,2	276650	741 427	–

* $F_{zul.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. The permissible loadings given represent only approximate maximum values of static loading for guidance.

Stock item. Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

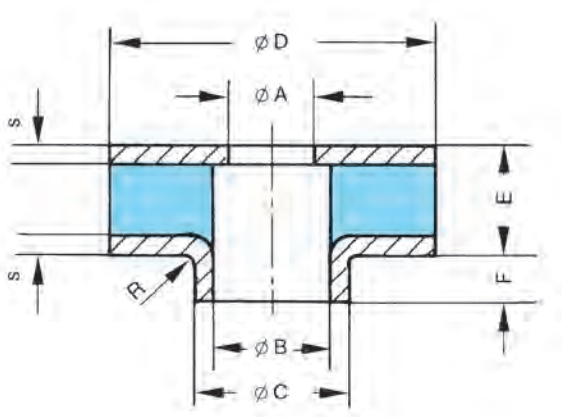
Supply Programme **MEGI® Ring Elements**

Megi Annular Buffers

Megi annular buffers are ring-shaped rubber metal parts with a collar on one of the two metal plates for centring. Megi annular buffers can be subjected to compression and shearing stress.

Megi annular buffers are used as flexible mounts where tensile forces are expected. They are used in pairs decompressed against one another.

Rubber hardnesses:
hard approx. 70 Shore A
medium approx. 60 Shore A
soft approx. 45 Shore A

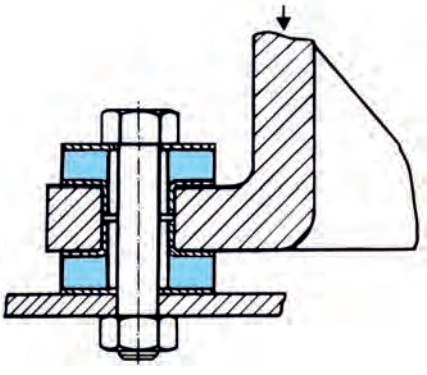


Dimensions in mm									Technical data										Part No.	Number in package
									Compression stress						Shear stress					
									Spring rate c_z in N/mm			Perm. load $F_{Perm.}$* in N			Spring rate $c_{x,y}$ in N/mm			Perm. load $F_{Perm.}$* in N				
D	A	B**	C	E	F	G	s	R	hard	medium	soft	hard	medium	soft	hard	medium	soft	hard	medium	soft		
36	6,2	6,2	15	10	6	–	1	1	2000	1350	800	2600	1600	950	170	110	65	500	300	180	741 029	–
36	8,5	12	18	10	4	–	1	1	1550	1000	620	1900	1200	700	150	100	60	400	250	150	741 027	50
36	16,6	16,6	20	8	3	–	1	1	1900	1250	770	1800	1100	650	175	115	70	300	200	120	741 092	50
50	16,5	20	23	13	9,5	–	1,5	2,5	2200	1500	900	3700	2300	1350	225	150	90	800	500	300	741 020	50
60	20,5	24	27	13	10,5	–	1,5	2,5	3000	2000	1050	6100	3800	2200	325	220	130	1100	700	410	741 026	25

* $F_{Perm.}$ is the **permissible continuous static load** upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

** Inner diameter (dimension B) on Part 741 027/-029/-92 is rubber-coated

Assembly



Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

MEGI® U-V-W-Shaped Elements · MEGI® Ceiling Elements

Applications

Megi-U bearings are suitable for reducing shock or isolation vibration in apparatus and equipment. The impact and excitation forces must remain small and the permissible maximum static load should be exceeded only slightly.

Megi-V-W parts have a variety of uses in mounting sensitive instruments, meters and indicating devices requiring protection against shock.

The Megi ceiling element is used purely for suspension purposes and is especially suitable for flexible suspension of light fittings, apparatus and pipe work from ceilings. A tear-off protection feature is built in.

Description

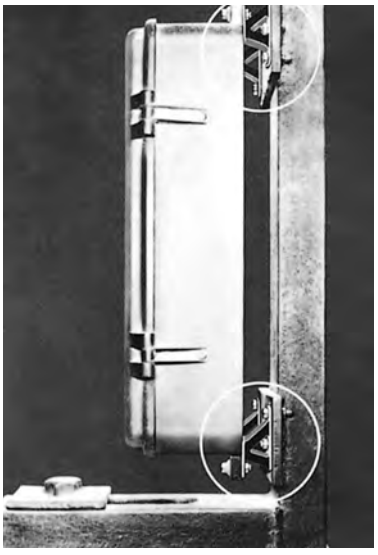
U-V-W elements should be installed in such a manner that the load is either at right angles or parallel to the metal plates. These elements should never be subjected to tensile stress. The design of the **Megi ceiling element** enables it to absorb flexibly even impact or acceleration forces acting on the suspended parts. The cross-ties, which is vulcanised in, holds the suspended parts securely, even when they are subjected to extremely heavy shocks.

Technical Data

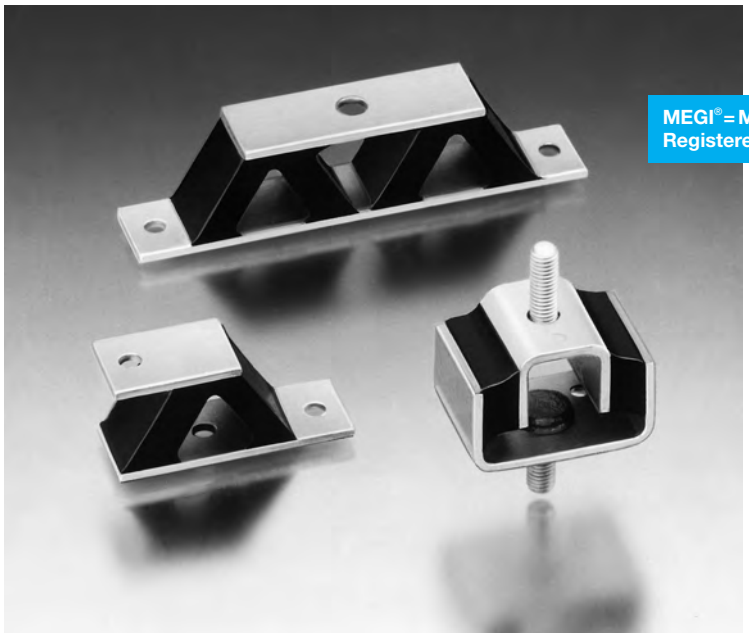
The following maximum loads can be supported by the previously described U-V-W elements and ceiling element:
Shore hardness: hard, medium, soft

Delivery

Available as stock item in standard packages



Part	Compression	Shear	Tension
Megi-U element up to		350-1400 [N]	
Megi-V element up to	100-300 [N]	40-150 [N]	
Megi-W element up to	200-600 [N]	70-240 [N]	
Ceiling element up to			300-750 [N]

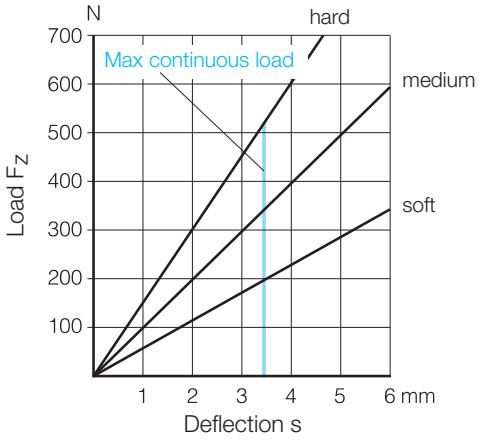


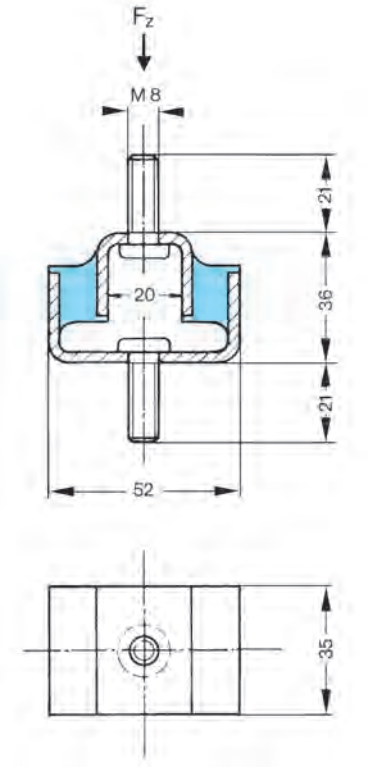
MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

Supply Programme **MEGI® U-V-W-Shaped Elements**

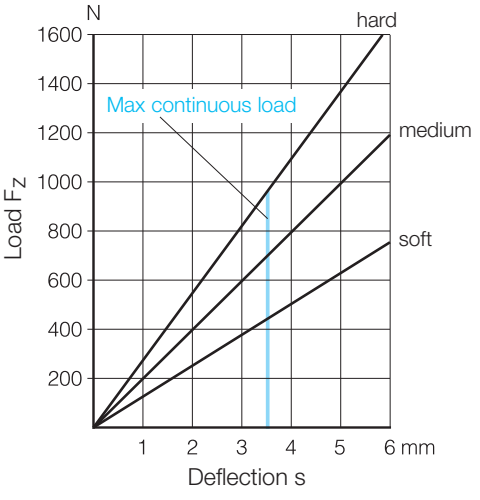
Megi-U bearing
Part No. 782 000
Versions:
hard, medium, soft

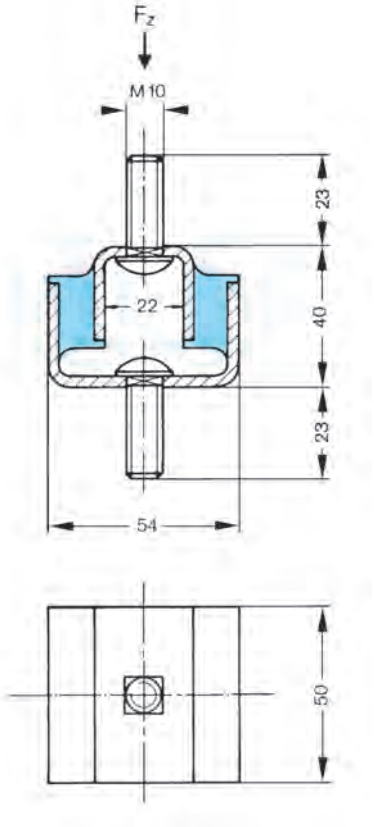
The Megi-U bearing is suitable as a mount for reducing shock or isolating vibration in apparatus and equipment. The impact and excitation forces must remain low.





Megi-U bearing
Part No. 782 001
Versions:
hard, medium, soft





Stock items: Available only in standard packages.
782 000 = 12 parts. 782 001 = 8 parts

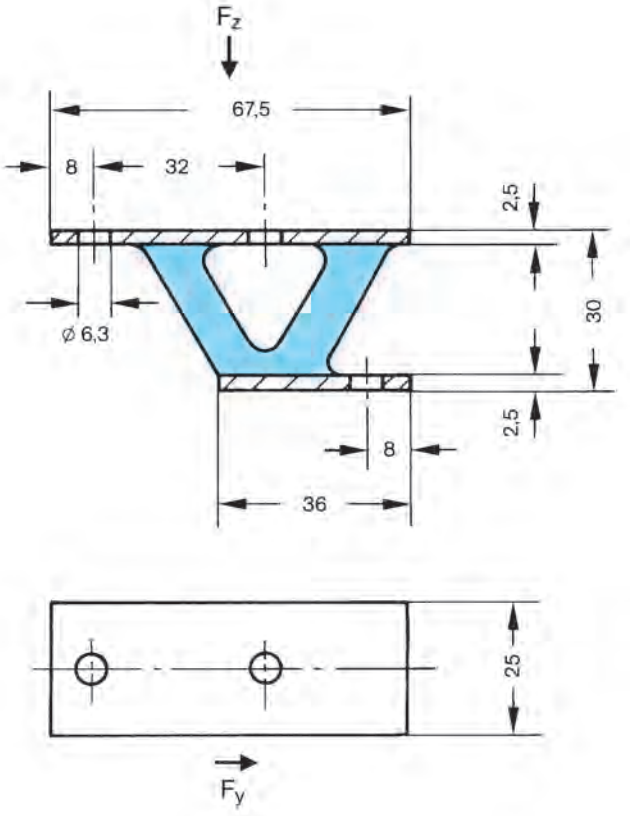
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

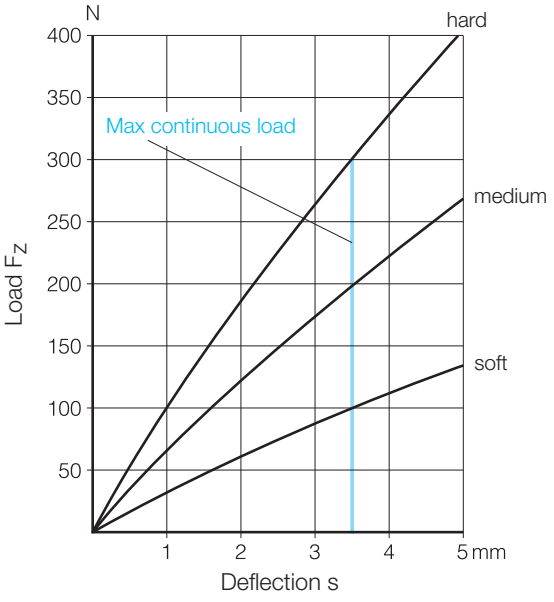
Supply Programme **MEGI® U-V-W-Shaped Elements**

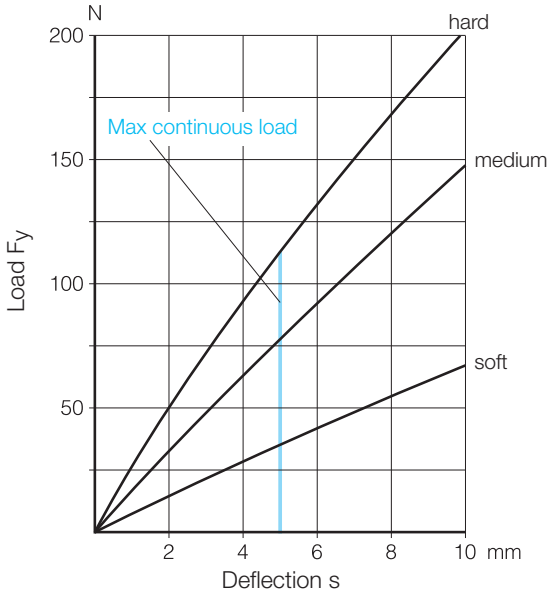
Megi-V bearing
Part No. 786 002
Versions:
hard, medium, soft

Megi-V bearings have a variety of applications as mounts for sensitive instruments, etc., which require protection against shock. They can be loaded in the compression direction (at right angles to the metal plate) as well as in the shear direction (parallel to metal plates).

Maximum permissible loads:
Under continuous static load, the spring deflection should generally not be greater than 3.5 mm in the compression direction and not more than 5 mm in the shearing direction. The loads corresponding to these deflections are given in the spring curves.







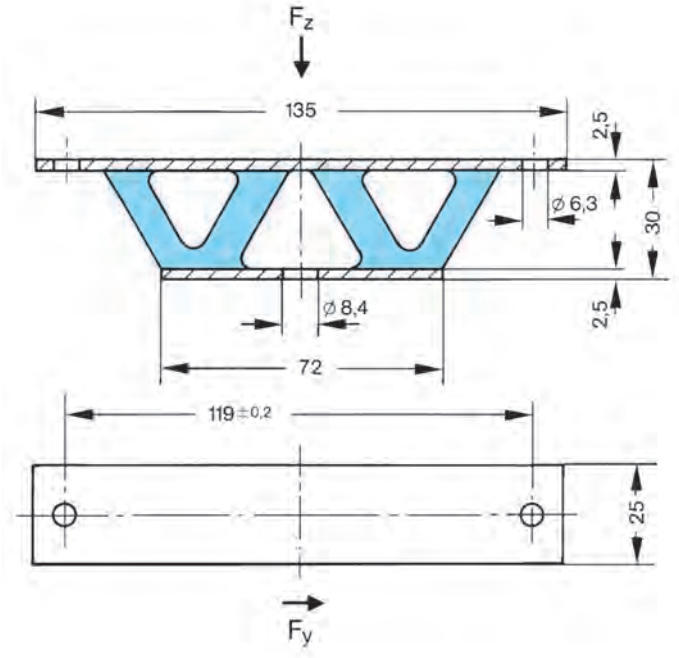
Stock items: Available only in packages of 20 each.

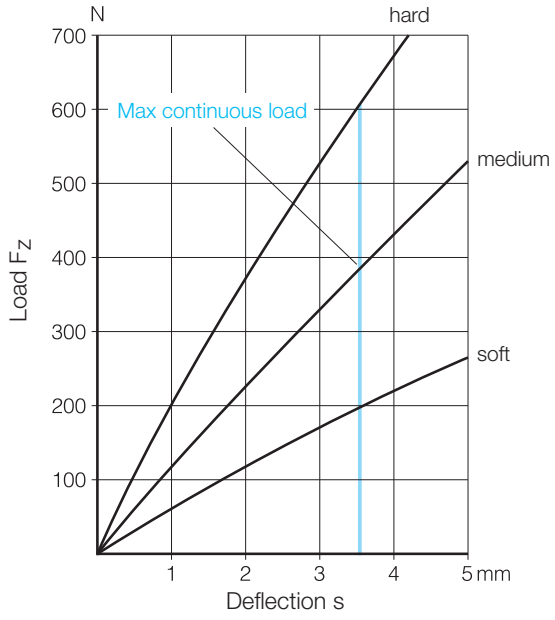
Supply Programme **MEGI® U-V-W-Shaped Elements**

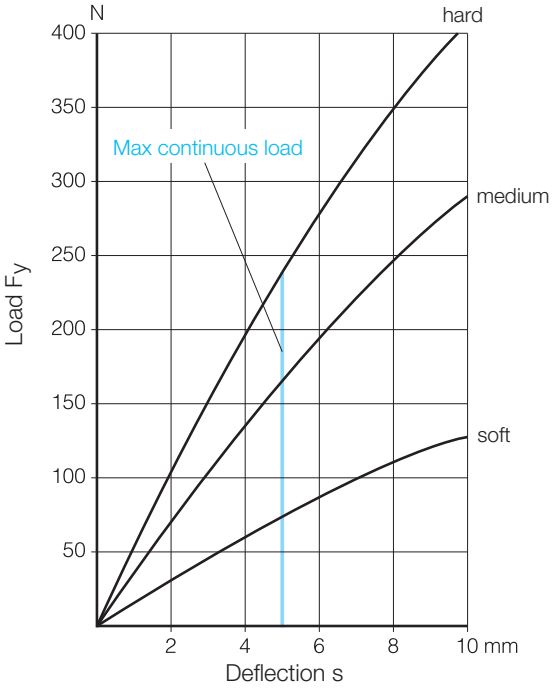
Megi-W bearing
Part No. 786 001
Versions:
hard, medium, soft

Megi-W bearings have a variety of applications as mounts for sensitive instruments, etc., which require protection against shock. They can be loaded in the compression direction (at right angles to the metal plate) as well as in the shear direction (parallel to metal plates).

Maximum permissible loads:
Under continuous static load, the spring deflection should generally not be greater than 3.5 mm in the compression direction and not more than 5 mm in the shearing direction. The loads corresponding to these deflections are given in the spring curves.





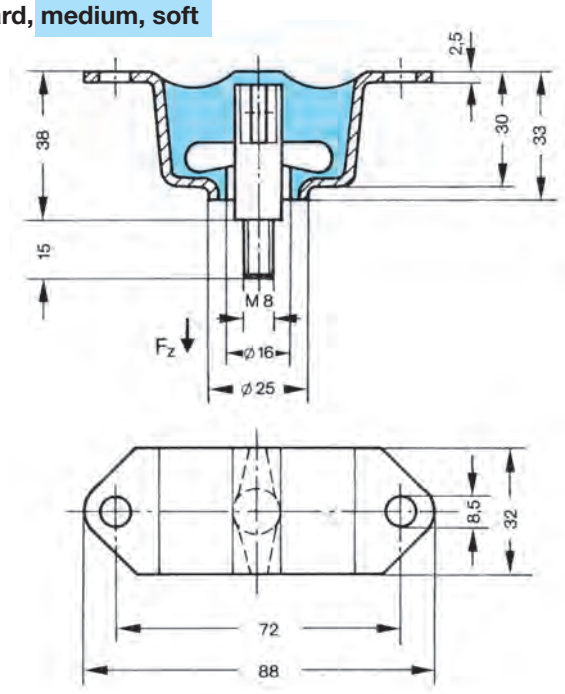


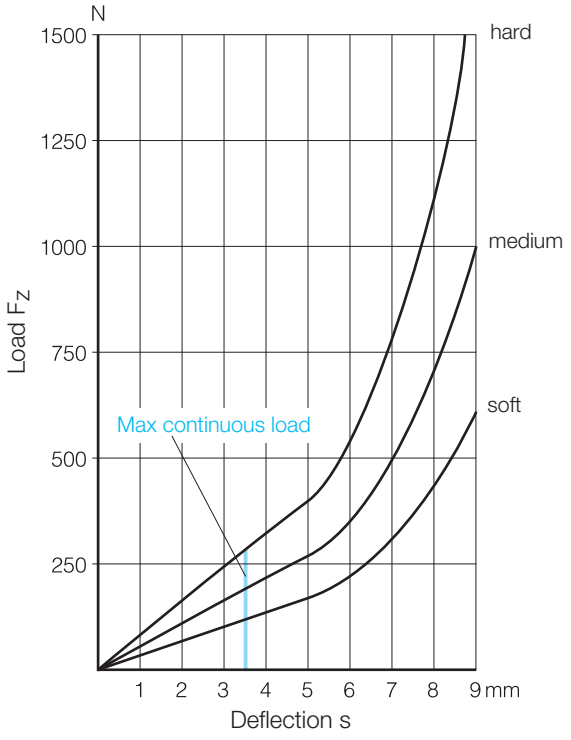
Stock items: Available only in packages of 12 each.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

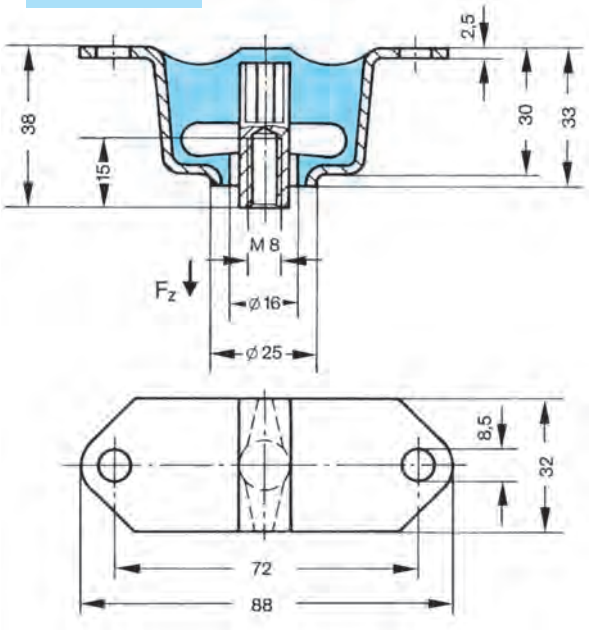
Supply Programme **MEGI® Ceiling Element**

Megi ceiling element
Part No. 782 002
Versions:
hard, medium, soft





Megi ceiling element
Part No. 782 002 S1
Versions:
hard, medium, soft



Stock items: Available only in packages of 10 each.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

MEGI® Bushes · MEGI® Rings

Applications

Megi bushes are used as flexible joints in motor vehicles and all branches of mechanical engineering. Megi bushes can withstand high radial stress because they are pre-stressed using a special process. The axially stiff AS bushes are excellent for use with high thrust loads.

Megi bushes can be subjected in continuous operation to angular distortion of +15° whereby a return moment proportional to the angle of twist is developed. As flexible joints, Megi bushes are completely maintenance-free. They operate noiselessly, are sound insulating and have a long service life.

Description

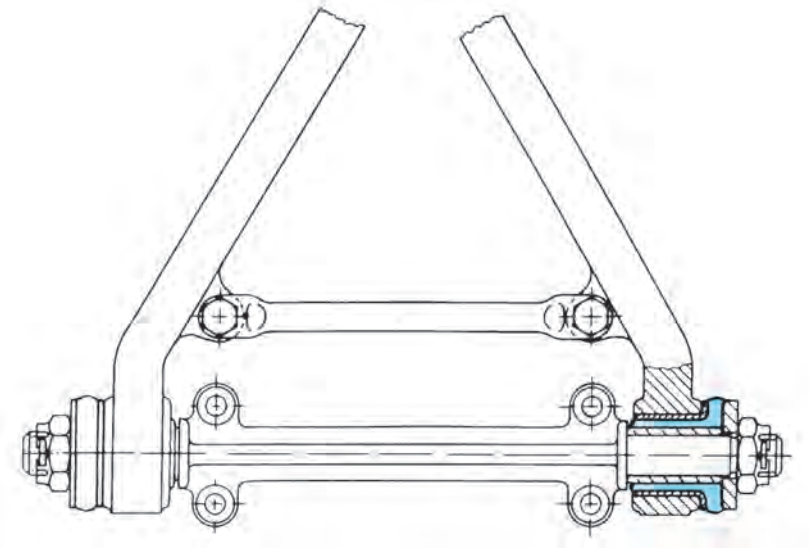
Generally, the outer tube of Megi bushes is held in place by a pressed fit or by the use of clamp bearings. The inner tube can be held, for example, by pressure against the end phase. In this case, the bolt passing through the H9 hole in the bush pressed the checked collar (e.g. plates) against the end phase of the inner tube.

Technical Data

Megi bushes cover a range of radial loads up to 15 kN depending on the bush used: Further details are given in the tables.

Delivery

Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.



MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.

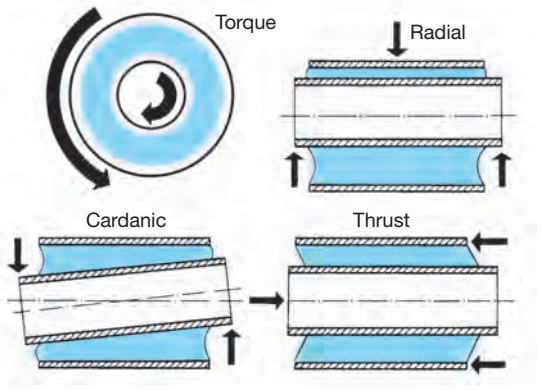
Supply Programme **MEGI® Bushes**

Megi HL bushes

Megi HL bushes can be subjected to radial, axial and torsional loads without the rubber being displaced in relation to the metal parts. A small cardanic angular displacement of the axis of the inner tube in relation to that of the outer tube or vice versa, is possible. The bearings are, however, relatively resistant to such angular displacement, whereby the resistance depends on the thickness, hardness and length of the rubber section.

The maximum continuous and peak radial, thrust and torsional loads are given in the table. They apply for highly resilient, particularly durable types of rubbers with a Shore A hardness of approx. 50°.

Types of deformation of Megi HL bushes:



Dimensions				Technical data									Part No.	Number in package
				Radial load		Axial load		Torsion						
Outer diameter	Inner diameter	Length of inner tube	Length of outer tube	Max. stat. radial load	Radial spring constant	Max. stat. axial load	axial spring constant	Max. stat. torsional angle	Max. stat. torque	Torsional spring constant	Max. peak torsional angle	Max. peak torque		
D mm	d mm	l mm	L mm	F_r N	C_r N/mm	F_a N	C_a N/mm	φ degree	M_d Nm	C_φ Nm/degree	φ max degree	Md_{max} Nm		
$24^{+0,08}$	10^{H9}	$17^{\pm0,1}$	$14^{+0,5}$	200	491	160	103	15	1,3	0,09	30	2,6	735 009 S2	20
$26^{+0,08}$	12^{H9}	$24^{\pm0,2}$	$17,5^{+0,2}$	690	1962	680	226	13	4,4	0,338	26	9,0	735 035	30
$26^{+0,08}$	12^{H9}	$36^{\pm0,2}$	$32^{+0,2}$	1370	3924	840	422	13	8,0	0,61	26	15,0	735 091	50
$30^{\pm0,08}$	13^{H9}	$40^{-0,4}$	$40^{-0,4}$	1670	3335	–	392	15	9,0	0,6	30	18,0	735 059	–
$30^{\pm0,08}$	$14^{\pm0,15}$	$76^{\pm0,1}$	$67^{\pm0,1}$	3920	8829	2310	765	15	19,0	1,24	30	37,0	735 067	–
$34^{\pm0,15}$	18^{H11}	$36^{+0,2}$	$32^{\pm0,5}$	1570	3237	830	417	14	12,0	0,9	28	25,0	735 043	20
$40^{\pm0,2}$	$26^{\pm0,2}$	$45^{\pm0,2}$	$40^{-0,2}$	4910	14715	2550	1020	7	28,0	3,9	14	55,0	735 081	20
$45^{+0,08}$	20^{H9}	$62,5^{\pm0,2}$	$55^{-0,2}$	3430	3924	1860	540	15	22,0	1,5	30	44,0	735 022 S1	20
$45^{+0,08}$	20^{H9}	$62,5^{\pm0,2}$	$59,5^{-0,2}$	3920	4905	1910	608	15	30,0	2,0	30	60,0	735 022	20
$48^{-0,1}$	$27,8^{H9}$	$67^{\pm0,2}$	$60^{\pm0,2}$	8830	14715	3340	961	11	60,0	5,3	22	120,0	735 074	–
$48^{-0,1}$	$27,8^{H9}$	$73^{\pm0,2}$	$60^{\pm0,2}$	8830	14715	6300	961	11	60,0	5,3	22	120,0	735 075	–
$50^{\pm0,2}$	25^{H9}	$67,5^{\pm0,2}$	$65,5^{-0,2}$	6380	6082	760	755	15	60,0	3,9	30	120,0	735 040	20
$55^{+0,08}$	25^{H9}	$93,5^{\pm0,2}$	$89,5^{-0,2}$	9810	8829	1650	824	15	70,0	4,6	30	140,0	735 023	10
$55^{+0,08}$	30^{H11}	$94^{\pm0,2}$	$89,5^{-0,2}$	13730	16677	2600	1177	13	100,0	7,6	26	200,0	735 078	20
$70^{+0,7}_{+0,5}$	$50^{+0,1}$	$60^{\pm0,2}$	$60^{\pm0,2}$	11770	19620	–	1511	6,5	140,0	21,1	13	270,0	735 039	10
$75^{-0,5}$	$40^{+0,2}$	$70^{\pm0,5}$	$57^{-0,5}$	5890	4611	4510	697	14	130,0	9,1	28	260,0	735 038	10
$80^{\pm0,35}$	50^{H11}	$100^{\pm0,2}$	$95^{-0,2}$	14720	14715	3430	1373	11	260,0	23,2	22	510,0	735 083	10
$85^{+0,5}$	36^{H9}	$102^{\pm0,5}$	$85^{\pm0,1}$	6870	2943	4910	598	15	120,0	7,8	30	240,0	735 077	–

Stock items: Available only in standard packages.

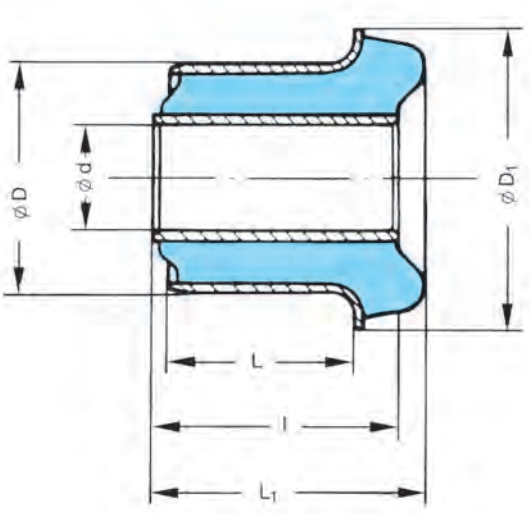
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Supply Programme **MEGI® Bushes**

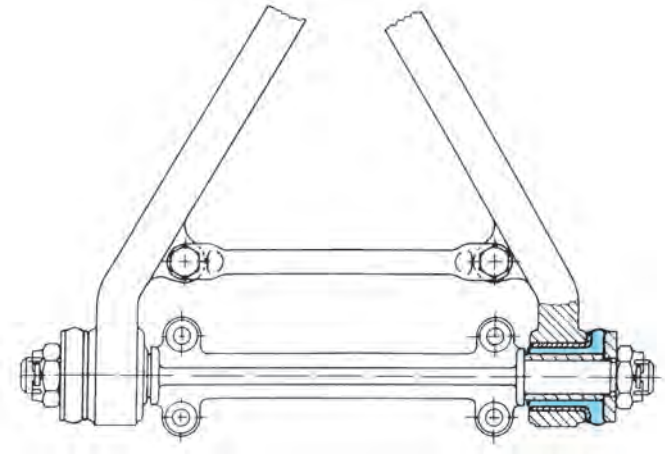
Megi AS bushes

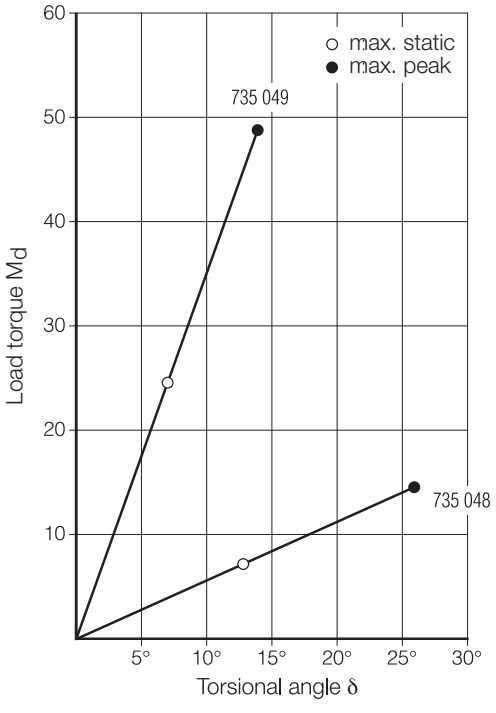
Megi AS bushes are produced using the same production methods as Megi HL bushes and therefore have the same superior quality of long life and load capacity. In addition, because of the special design of the outer metal collar, they are able to absorb higher thrust forces without over-stressing the rubber. Because of this property, they are especially suitable for use where high axial forces occur in joints, e.g. in triangular steering linkages (see illustration). No generally valid statements can be made regarding the spring constants for axial loads, because these depend on assembly conditions, especially the magnitude of the initial axial tension.

The maximum continuous and peak loads are given in the table. They apply for highly resilient, particularly durable types of rubbers with a Shore A hardness of approx. 50°.



Dimensions						Technical data							Part No.	Number in package
						Radial load		Axial load						
Outer diameter	Inner diameter	Flange diameter	Length of inner tube	Length of flanged outer tube	Total length of bush	Max. stat. radial load	Radial spring constant	Max. stat. torsional angle	Max. stat. torque	Torsional spring constant	Max. peak torsional angle	Max. peak torque		
D mm	d mm	D_1 mm	l mm	L mm	L_1 mm	F_r N	C_r N/mm	φ degree	M_d Nm	C_φ Nm/degree	φ max degree	Md_{max} Nm		
$30^{+0,2}$	$14^{+0,1}$	41	$34^{\pm0,25}$	$20^{+0,2}$	36	690	1373	13	7,5	0,6	26	15,0	735 048	–
$40^{+0,1}$	$24^{+0,1}$	58	$42^{\pm0,1}$	$30^{-0,5}$	45,5	3430	9810	7	24,0	3,4	14	48,0	735 049	20





Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

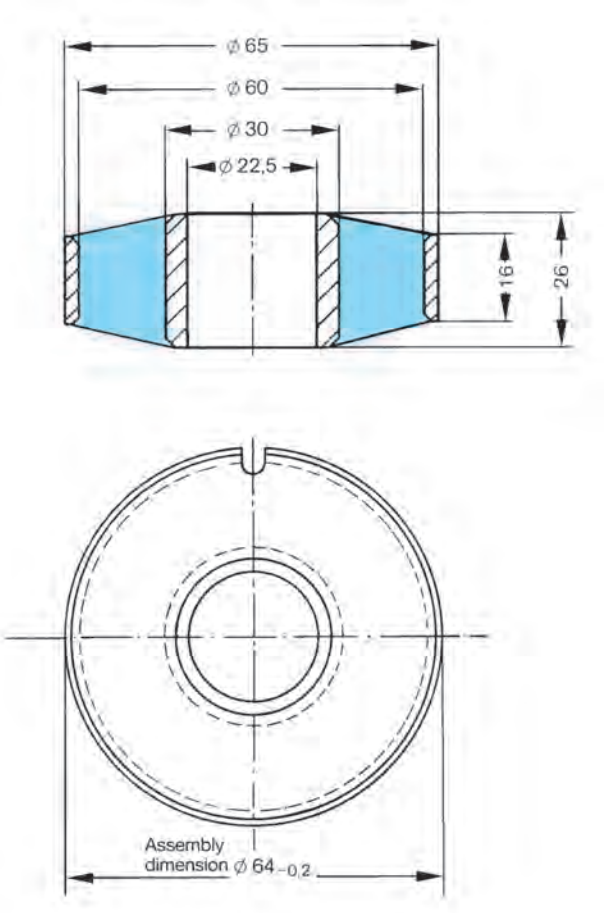
Supply Programme **MEGI® Rings**

Megi ring
Part No. 785 000

Megi rings can be subjected to radial, thrust and torsional loads. When installed, the outside diameter must be precompressed by 1 mm.

Rubber hardnesses:

hard	approx. 70 Shore A
medium	approx. 60 Shore A
soft	approx. 45 Shore A



Technical data			hard	medium	soft
Permissible stat. radial load	F_r zul.	[N]	2200	1250	600
Radial spring rate	c_r	[N/mm]	980	545	260
Permissible stat. axial load	F_a zul.	[N]	1550	900	500
Axial spring rate	c_a	[N/mm]	260	150	80
Permissible stat. torque	Mzul.	[Nm]	28,4	20,6	13,7
Torsional spring rate	c_φ	[Nm/Grad]	1,7	1,22	0,82
Perm. peak torque	M_{max}	[Nm]	57	41	28

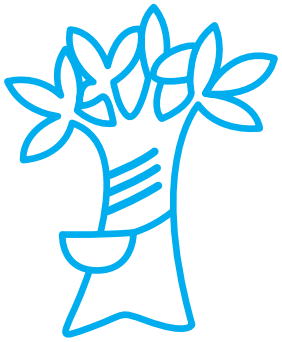
Stock items: Available only in packages of 10 each.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

MEGI®

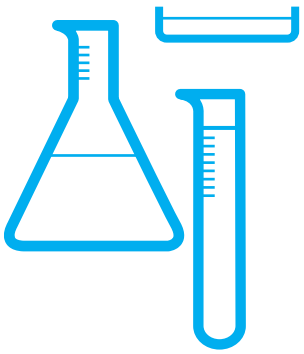
Materials Information
Principles of Calculation

Materials Information



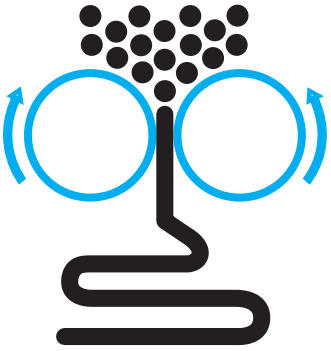
Natural rubber

Natural rubber is the base material for vulcanized products of the highest elasticity and tear resistance. In addition to high notch impact strength, these products have good abrasion resistance and low plastic flow characteristics. Natural rubber has the highest dynamic mechanical load-bearing capacity of all elastomers. Resistance to ozone is only moderate, but can be improved with suitable additives. Natural rubber is not resistant to non-polar liquids such as mineral oils, lubricants, motor fuels and aliphatic, aromatic and chlorinated hydrocarbons.



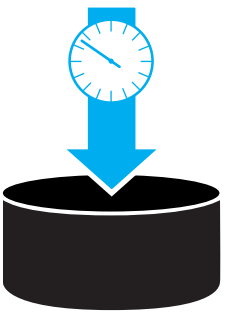
Synthetic rubber

The base material for the manufacture of synthetic rubber is oil or natural gas. In earlier times the manufacture of synthetic rubber as a substitute for natural rubber was encouraged, but increasingly it acquired its own fields of application, for which those properties in which natural rubber is deficient, such as resistance to heat, weathering and oil, were deliberately improved. Thus today there is a whole series of types of synthetic rubber, whose properties have made possible the wide range of applications which have given rubber technology its importance throughout the field of engineering.



Mixture

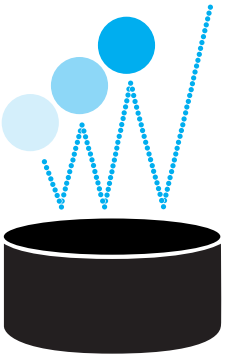
Rubber is not a uniform chemical substance, but a mixture of very different materials. Several hundred substances are available for the formulation of a mixture, making it possible to produce different mechanical properties and resistance to various types of degradation. As a macromolecular material caoutchouc is the elastic component in rubber. It determines the level of the mechanical properties such as elongation at break, rebound resilience, strength and tear resistance. It is only after chemicals and additives have been mixed in, followed by vulcanization, that a usable material is produced.



Hardness

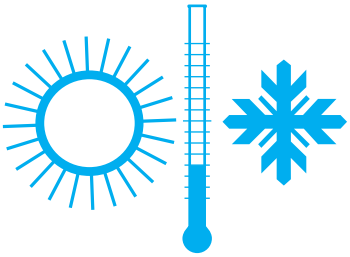
This is understood to mean the relative resistance of the surface to a given pressure applied by an indenter of given dimensions. The hardness number represents either the depth of indentation or suitable units derived therefrom, such as Shore hardness (DIN 53505). MEGI-Elements can generally be supplied from stock in three hardness steps (soft, medium, hard). These steps lie tendential in the range of the hardnesses 45, 60, 70 Shore A (Variations are in particular cases possible). Relevant for the execution of the article is the spring characteristics.

Materials Information



Elasticity

Different degrees of elasticity are found in different unvulcanized rubbers. The elasticity is given in terms of percentage rebound resilience (DIN 53512). High elasticity is equivalent to low damping effect. The natural rubber which is used for MEGI is remarkable for its specially high elasticity compared with synthetic rubbers.

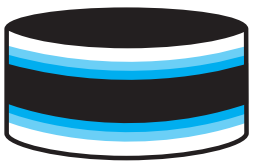


Temperature stability

Vulcanizates made from natural rubber are permanently resistant to temperatures within the limits -40° to +80°C and can withstand temperatures of -60° to +130°C for a short period. These limits can be varied by suitable modifications to the composition of the mixture. It must, however, be borne in mind that changes do not first appear above these limits; they start at lower temperatures but then they take place much more slowly.

Resistance to ozone

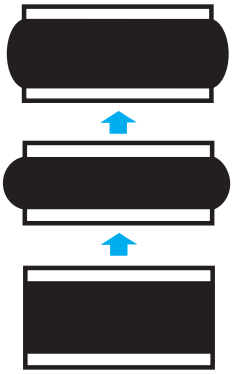
An important property, and one which is the basis for weather resistance, is resistance to ozone (DIN 53 509). Ozone is a modified form of oxygen and occurs in the atmosphere in varying concentrations. When rubber is stretched, attack by ozone produces cracks across the direction of stress. A precondition of the formation of ozone cracks is that the rubber must have been stressed or elongated beyond a certain limit. This limit is generally known as the critical elongation. The speed and extend of this degradation are dependent on the causative conditions and to a large extend on the mixture concerned.



Bonding

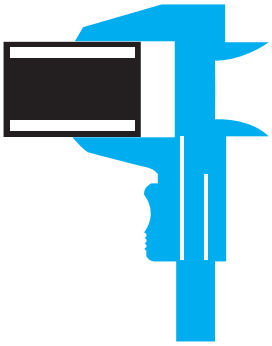
In order to bond elastomers to metals, bonding agents are used, usually employing the two-layer system. The two-layer system provides good bond strength and effective protection against under-film rusting. The bonding agents are applied to the clean, grease-free surfaces (mechanical or chemical pretreatment) by brushing on, dipping or spraying and a strong bond between the rubber mixture and the metal is produced by the vulcanization process. The bond strength obtained in this way is normally higher than the resistance to fracture of the elastomer. The absolute tear resistance values depend on the strength of the rubber mixture and the geometry of the article. The finished parts can be electrocoated subsequently without adversely affecting the bond.

Materials Information



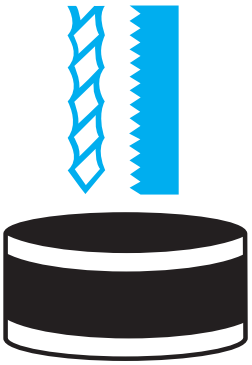
Compression set

It is not possible to avoid permanent deformation of rubber components under load. Under a static load the individual molecular chains slide over each other. This is referred to as “flow” or “creep” (DIN 53444). In the case of dynamic stress the term used is "set”. This compression set is proportional to the logarithm of the time and depends on temperature. It is expressed as a percentage of the static deflection. A compression set of 25 % is usual. As far as compression set is concerned, the performance of MEGI components made with natural rubber is much better than that of comparable components made with synthetic rubber.



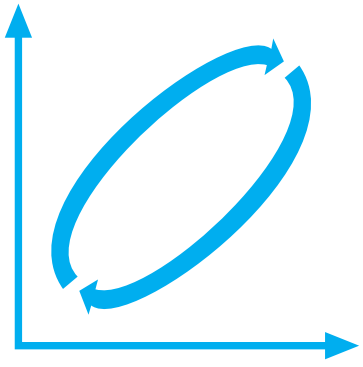
Tolerances

No workpiece can be made exactly to size. The dimensional tolerances are given in the relevant DIN standards. ISO 3302-M3 defines the dimensional tolerances for rubber, DIN ISO 2768 mK for steel. The same applies to the properties of the materials used in the manufacture of rubber components. The hardness can fluctuate by ± 5 points on the Shore scale, and for the spring rate there is a corresponding tolerance zone of ±20 %. Where technical requirements are especially high, the tolerance zone for the spring rate can be reduced to ±10 % by a corresponding expenditure of resources.



Machining

After vulcanization, rubber parts can be ground, cut and parted off, punched or drilled. It is important to ensure that as little heat as possible is conducted to the adhesion zones during these operations. The cutting operations require high cutting speeds (>1.2 m/s) and good lubrication with soap water.



Damping

Damping is the energy lost per oscillation. In vibration engineering the measure of damping is expressed as the mechanical loss angle δ. Damping is not a constant value. It is dependent upon the quality of the rubber, the temperature, the speed of deformation, the shape and the type of stress. For vibration isolation purposes mixtures producing weak damping are mostly used, because they give a better isolation effect when vibration is supercritical.

Materials Information

General material designation

ASTM Abbreviation	Polymer	Registered trade names
NR* IR	Natural rubber Isoprene rubber	Natsyn
SBR*	Styrene-butadiene rubber	Buna Hülsl, Polysar S
BR	Butadiene rubber	Buna CB
IIR	Butyl rubber	Polysar Butyl
EPDM	Ethylene propylene terpolymer	Keltan, BUNA AP
NBR*	Acrylonitrile butadiene	Perbunan, Chemigum N
NBR	Acrylonitrile butadiene (food)	Perbunan, Chemigum N hell
ECO	Epichlorohydrin copolymer	Herclor
CR	Chloroprene rubber	Baypren, Neoprene
CSM	Chlorosulphonated polyethylene	Hypalon
AU	Polyurethane rubber	Urepan
T	Polysulphide rubber	Thiokol
Q	Silicone rubber	Silopren
FKM	Fluoro rubber	Viton A, Fluorel
ACM	Polyacrylate rubber	Hycar
PUR	Polyurethane	Vulkollan
PTFE	Polytetrafluorethylene	Teflon, Hostaflon

* usual qualities for metal-rubber bonds

Summary table

Properties	NR	IR	SBR	BR	IIR	EPDM	NBR	ECO	CR	CSM	AU	T	Q	FKM	ACM	PUR	PTFE
Ult. tensile strength, not reinforced	1	2	5	6	4	5	5	5	3	5	2	6	6	5	6	1	1
Ult. tensile strength, reinforced	1	2	2	4	3	3	2	3	2	3	1	5	4	3	3	-	1
Elongation at break	1	1	2	3	2	3	2	3	2	3	2	4	4	3	3	2	3
Rebound resilience	2	2	3	1	6	3	3	2	3	4	3	4	3	5	5	2	-
Abrasion resistance	2	2	2	1	3	3	2	3	2	3	1	5	5	4	4	1	3
Initial tear resistance	2	2	3	5	3	3	3	3	2	4	3	4	6	3	4	1	2
Elec. volume resistivity	1	1	2	2	2	2	4	5	3	4	3	3	1	4	4	2	1
Temperature range hot air °C	+90	+90	+100	+100	+140	+150	+130	+145	+120	+130	+120	+140	+200	+220	+160	+80	+260
Temperature range cold °C	-50	-40	-40	-60	-40	-40	-40	-40	-30	-40	-20	-30	-80	-25	-20	-35	-190
Ageing resistance	3	3	3	3	2	1	3	2	2	2	2	3	1	1	2	1	1
Resistance to ozone	4	4	4	3	2	1	3	2	2	2	2	2	1	1	2	1	1
Resistance to petrol	6	6	4	5	6	5	1	1	2	2	1	1	5	1	1	2	1
Resistance to oil and grease	6	6	5	6	6	4	1	1	2	2	1	1	1	1	1	2	1
Resistance to acids	3	3	3	3	2	1	4	5	2	2	5	4	5	1	5	6	1
Resistance to alkalis	3	3	3	3	2	2	3	5	2	2	5	3	5	1	5	6	1
Hot water	3	3	2	3	1	2	3	4	3	3	5	3	5	2	5	6	1

1 = excellent 2 = very good 3 = good 4 = moderate 5 = slight 6 = poor

Materials Information

1. General Material Characteristics

Density	DIN 53 479	DIN 53 550
Hardness	DIN 53 505	
Ultimate tensile strenght and elongation at break	DIN 53 504	DIN 53 455
Shock elasticity (Rebound resilience)	DIN 53 512	
Damping - Dynatron	DIN 53 513	
Compression set	DIN 53 517	
Tension set	DIN 53 518	

2. Stress-Strain Characteristics

2.1 Destructive tests

Ultimate tensile strenght and elongation at break	DIN 53 504	DIN 53 455
- Strip specimen	DIN 53 507	
- Angle specimen	DIN 53 515	
- Tear resistance (needle test)	DIN 53 506	

2.2 Moduli

Tension and compression elastic modulus		
- Static	DIN 53 457	
- Dynamic	DIN 53 513	
Modulus in flexure (static)	DIN 53 457	
Shear modulus (Torsion oscillation test)	DIN 53 520	DIN 53 445
Stiffness in torsion (relative shear modulus)		
- Clash-Berg	DIN 53 447	
- Gehmann	ASTM D 1053	

2.3 Indentation hardness (material hardness)

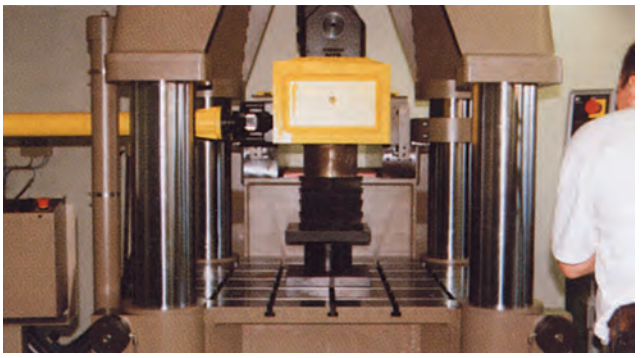
- Shore hardness	DIN 53 505
- Ball indentation hardness (IRHD)	DIN 53 519
- Indentation hardness (hardness number)	DIN 53 576
- Ball indentation hardness (Pusey & Jones)	ASTM D 531-56

3. Permeation Characteristics

Water vapour permeability	DIN 53 122	
Water tightness	DIN 53 886	
Gas permeability	DIN 53 536	DIN 53 380

4. Resistance to Solids

Coefficient of friction (Tannert apparatus)		
Adhesive strenght	DIN 53 530	DIN 53 531



3-Axle test stand for static and dynamic measurements

Computer supported documentation for release of the raw material

5. Continuous Stress

Creep	DIN 53 444	
Restoring force (relaxation)	DIN 53 441	
Compression set	DIN 53 517	DIN 53 572
Tension set	DIN 53 518	
Continuous wear (Destruction through heat build-up)		
- Martens ball fatigue		
- St. Joe flexometer	ASTM D 623-62	
Fatigue (Destruction through crack initiation and growth)		
- Tensile fatigue	ASTM D 430	
- Flex cracking (De Mattia)	DIN 53 522	
- DIN abrasion test	DIN 53 516	
- Frank-Hauser	DIN 53 528	
- Taber apparatus	DIN 53 754	
- Egner apparatus	DIN 51 963	
- Abrasion tester (Schopper)	DIN 53 863	

Materials Information

6. Properties under extreme temperatures
(Limits of usability)

Low temperature properties		
- Low temperature standards (dyn. brittle point)		
- Brittle point (glass transition temperature)		
High temperature properties		
- Resistance to glow heat	DIN 53 459	
- Nonflammability	DIN 53 438	DIN 53 382
	ASTM D 1692	ASTM D 635
	DIN 22 103	

7. Thermal Characteristics

Heat conductivity	DIN 52 612	
Coefficient of thermal expansion	DIN 53 328	

8. Electrical Characteristics

Volume resistivity	DIN 53 482	DIN 53 596
Surface resistance	DIN 53 482	DIN 53 596
	DIN 53 486	
Creep resistance	DIN 53 480	
Dielectric strenght	DIN 53 481	
Relative permittivity	DIN 53 483	
Dielectric loss factor	DIN 53 483	

9. Resistance to Chemicals (Swelling)

Changes in physical properties	DIN 53 521	DIN 53 476

10. Resistance to Gases and Vapours

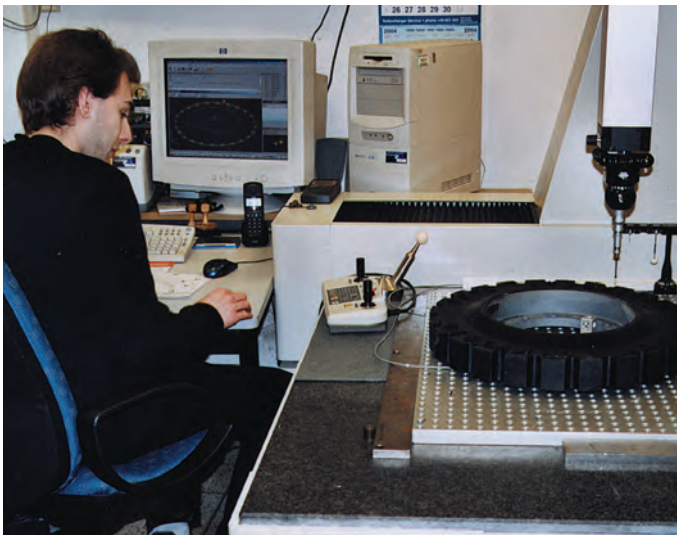
Resistance to ozone	DIN 53 509	
Resistance to oxygen		
- Geer aging	DIN 53 508	
- Bierer aging	DIN 53 508	
- Compressed-air bomb	DIN 53 508	
Air-steam resistance (Resistance to hydrolysis)		
- Air-steam chamber	DIN 53 508	
- Dessicator	DIN 53 473	
- Steam sterilizer		
- Environmental chamber		

11. Light Fastness

Sunlight	DIN 53 388	
Artificial light	DIN 53 388	DIN 53 389

12. Resistance to Organisms

Microbes	DIN 53 930	DIN 53 931



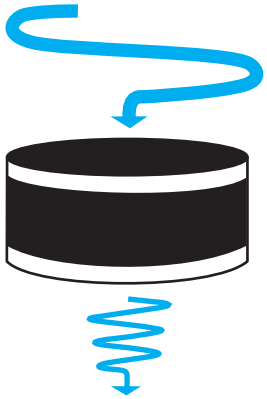
Testing metal part in receiving department

Rigidity test on MEGI component

Mode of Operation

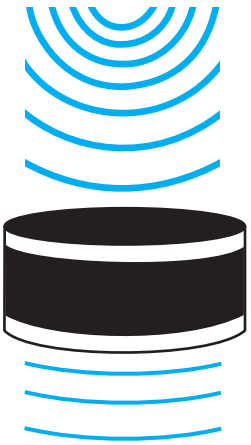
Vibration Isolation

Through the interplay of inertia and restoring force, the total mass of a machine and the spring rate of the Megi elastic rubber springs determine the natural frequency of the machine on its bearing; i.e. a single impact on the machine produces vibration of decreasing amplitude at the natural frequency. In the case of forced vibrations caused, for example, by eccentric weights on rotating masses, or by periodic stroke movements, the machine on its bearing always vibrates at this exciting frequency. Vibration isolation can only be achieved if the design is such that the natural frequency is less than the exciting frequency by a factor of $\sqrt{2}$. This is achieved by a suitable selection of Megi spring elements of the appropriate spring rate.



Sound Insulation

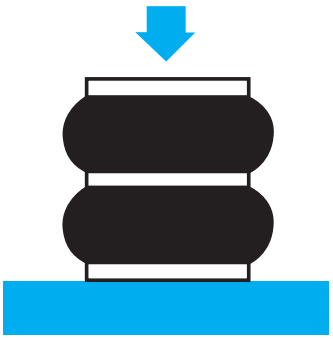
Sound waves are mechanical vibrations which are transmitted from one body to another through rigid connections (structure-borne sound). Rubber is a very good medium for insulating structure-borne sound. For that reason Megi elements are excellent sound insulators.



Impact and Shock Insulation

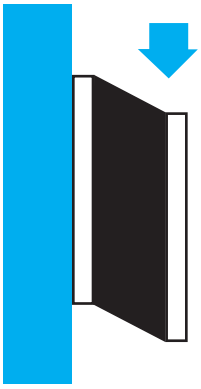
Impact and shock subject the bearing elements momentarily to the application of high kinetic energy. This energy is converted to work in the spring elements: the highest permissible values of the applied force can be two to three times as great as the permissible static load. The energy absorption of a spring element is given by the area under the load-deflection curve, which can be obtained by measuring with a planimeter.

Types of Stress



Compression

When a rigidly-sprung seating is required and heavy loading occurs, Megi elements for compression loads are used. The strength of the springs is not determined by the compressive stress, but by the shear stress which occurs by the prevention of lateral expansion in the individual layers. The stress is highest at the outer adhering edges. In order to obtain reduced spring deflection with the same load, multi-layer springs are used with intermediate plates bonded by vulcanization. Up to about 15 % compression the spring rate is linear but thereafter it becomes steeply progressive.

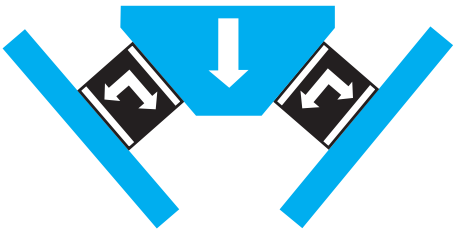


Shear

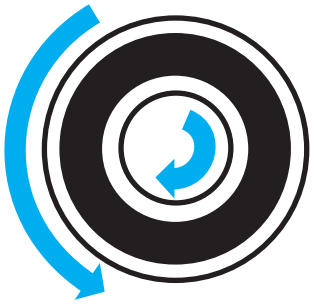
When large spring deflection is required for loads of medium weight, Megi elements for shearing stress are used. Where only shearing stress occurs, the load-deflection diagram is linear. If the rubber elements between the metal parts are high in relation to their cross-section, additional undesirable bending stress can occur, which gives a degressive load-deflection curve and adversely affects the service life.

Compression-Shear

Megi elements for compressive and shearing stress are used for heavy to medium loads where large spring deflection is required. This can be achieved by pairs of elements set at an angle to each other or by wedge- and cone-type bearings. The compression-shear stress distribution is completely uniform in the rubber, especially in wedge-type bearings, so that harmful bending stress can be avoided.



Types of Stress



Torsion-Shear

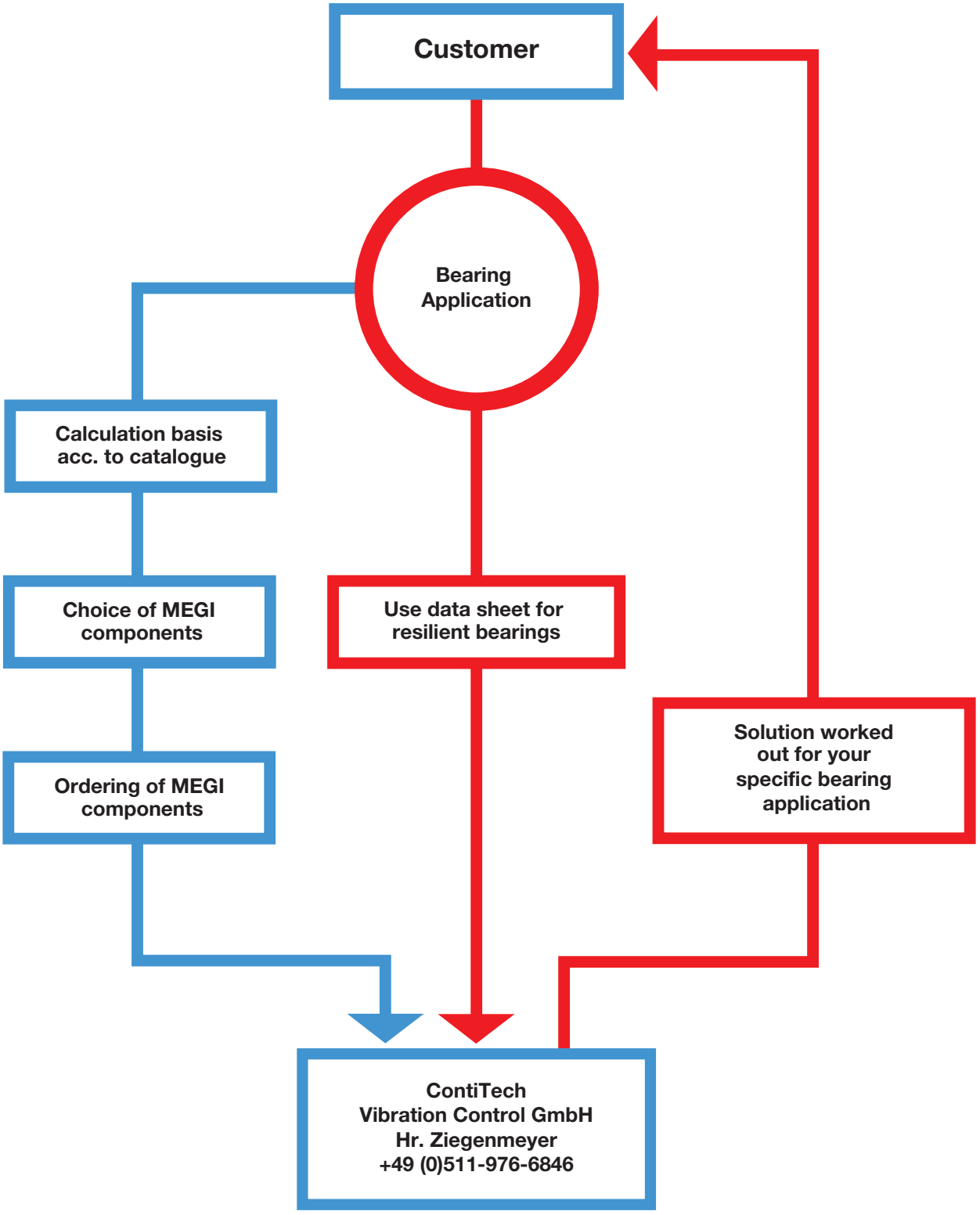
Megi bushes are used as torsion springs in industrial applications for the elastic absorption of torque. If the outer tube turns in relation to the inner tube, shearing stress occurs in the rubber. The thicker the rubber cushion between the inner and outer tubes, the less is the torsional stiffness of the bush.

Tension

If a solid piece of rubber with metal plates vulcanized on to the ends is subjected to tension, waisting of the central section occurs because the volume remains constant. Harmful stressing occurs, particularly at the edges of the metal parts, and if the stressing is dynamic, it will reduce the life of the component considerably. This can be alleviated by using rubber elements with a constricted central part and an enlarged area where the bond occurs. Nevertheless, tensile stress should be avoided as far as possible.

Possibilities for Problem Solving

Choice of appropriate MEGI®-Spring elements
for your bearing applications



Basis of Calculation

Formula symbols
The formula symbols used are those specified in DIN 1304. Any terms not listed in that standard are represented by the letters normally used by ContiTech. The units are those employed in the International System of Units (SI).

Common Abbreviations

Abbrev.	Meaning
D	compression
S	shear
V	torsion
Kard	cardanic
e	self
err	exciter
stat	static
dyn	dynamic
st	impact, shock
ges	total
zul	permissible
x	lenghtwise
y	crosswise
z	vertical

Symbol	Unit	Meaning
F	N, kN	force
m	kg	mass
a	m/s^2	acceleration
g	9,81 m/s^2	accel. due to gravity
G	N, kN	weight
f	Hz = 1/s	frequency
n	1/min	rotational speed
c	N/m, N/mm	spring rate
c_v	Nm/degree	torsional spring rate
η	1	frequency ratio
i	%	degree of insulation
s	mm, m	spring deflection
ϕ	degree	torsion angle
γ	degree	shear angle
δ	degree	loss angle
M	Nm, Nmm	moment
W	J = Nm = Ws	absorption of work
E	J = Nm = Ws	energy
P	W	performance
p	Ns = Kgm^2/s	pulse
ε	%	compression set
A	mm^2, cm^2	area
v	m/s	velocity
α	degree	angle of incidence
D	1	attenuation constant
D	dB	structure-borne sound insulation value

Determination of direction of load on MEGI® spring elements
In most cases a bearing arrangement is necessary with different spring rates for the various directions of the applied load. In order to set out clearly the directions of the applied forces and deformations, these are indicated as the x, y and z directions as in Fig. 6.
Accordingly the spring rates for the various directions are designated as c_x, c_y und c_z.

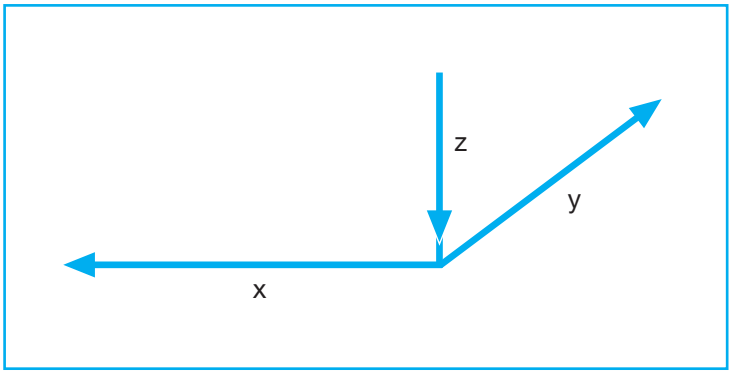


Fig. 6

Basis of Calculation

Determination of the spring rate from a load-deformation diagram

If a force F or a moment M acts on a Megi spring element, the element is deformed by a spring deflection s or by a torsion angle ϕ. A distinction is made between progressive, linear and degressive load-deformation curves. It is only when the curve is linear that the spring rate c, or, in the case of torsion c_v, is constant over the complete range of spring deflection. In the other two cases the spring rate c is dependent upon the degree of deformation. The method of determining the spring rate in each case is shown in the summary (Fig. 7).
The distance S_{subA} or ϕ_{subA} is obtained by projecting the tangent at point A for the given load F_A or torque M_A on to the x-axis. The spring rate at point A obstained by dividing the load at point A by the distance so obtained.

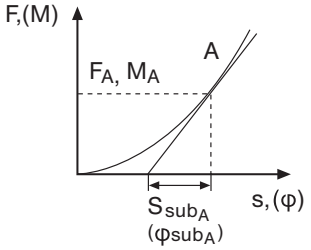
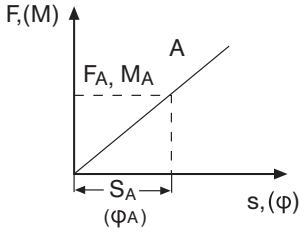
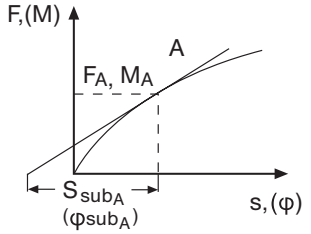
Spring rate	Spring rate at working point A	Load-deformation diagram
$c = \frac{dF}{ds}$ $c_v = \frac{dM}{d\varphi}$	$c_A = \frac{F_A}{s_{subA}}$ $c_\varphi = \frac{M_A}{\varphi_{subA}}$	progressive 
$c = \frac{F}{s}$ $c_v = \frac{M}{\varphi}$	$c_A = \frac{F_A}{S_A}$ $c_\varphi = \frac{M_A}{\varphi_A}$	linear 
$c = \frac{dF}{ds}$ $c_v = \frac{dM}{d\varphi}$	$c_A = \frac{F_A}{S_{subA}}$ $c_\varphi = \frac{M_A}{\varphi_{subA}}$	degressive 

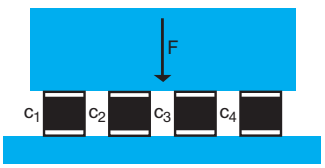
Fig. 7

Possible arrangements of MEGI® elements

Parallel arrangement:

Deflection: $s = \frac{F}{c_{ges}} = \frac{F}{c_1 + c_2 + c_3 + c_4}$

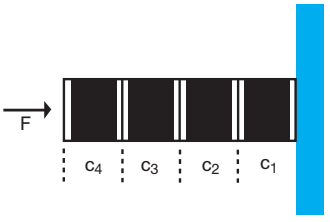
Spring rate: $c_{ges} = c_1 + c_2 + c_3 + c_4$



Serial arrangement:

Deflection: $s = \frac{F}{c_{ges}} = \frac{F}{c_1} + \frac{F}{c_2} + \frac{F}{c_3} + \frac{F}{c_4}$

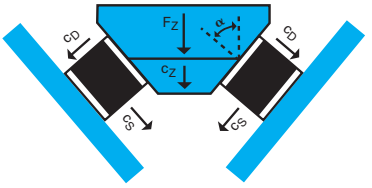
Spring rate: $\frac{1}{c_{ges}} = \frac{1}{c_1} + \frac{1}{c_2} + \frac{1}{c_3} + \frac{1}{c_4}$



Set at an angle:

Deflection: $s = \frac{F_Z}{c_Z}$

Spring rate:
$c_Z = 2 \cdot (c_D \cos^2\alpha + c_S \sin^2\alpha)$



If four or six springs are used, the factor 2 in the formula is changed to 4 or 6.

Basis of Calculation

Directions for calculations for uniform stressing of MEGI® elements

An elastic bearing arrangement should be assembled in such a way that spring deflection is equal at all bearing points. In a torsionally stiff system this requirement is met when the sum of the products of resilience value and respective distance from the centre of gravity is the same on both sides of the centre of gravity.

Calculation of distribution of the MEGI® elements
x, y [mm] G, F_A, F_B, F_C, F_D [N]

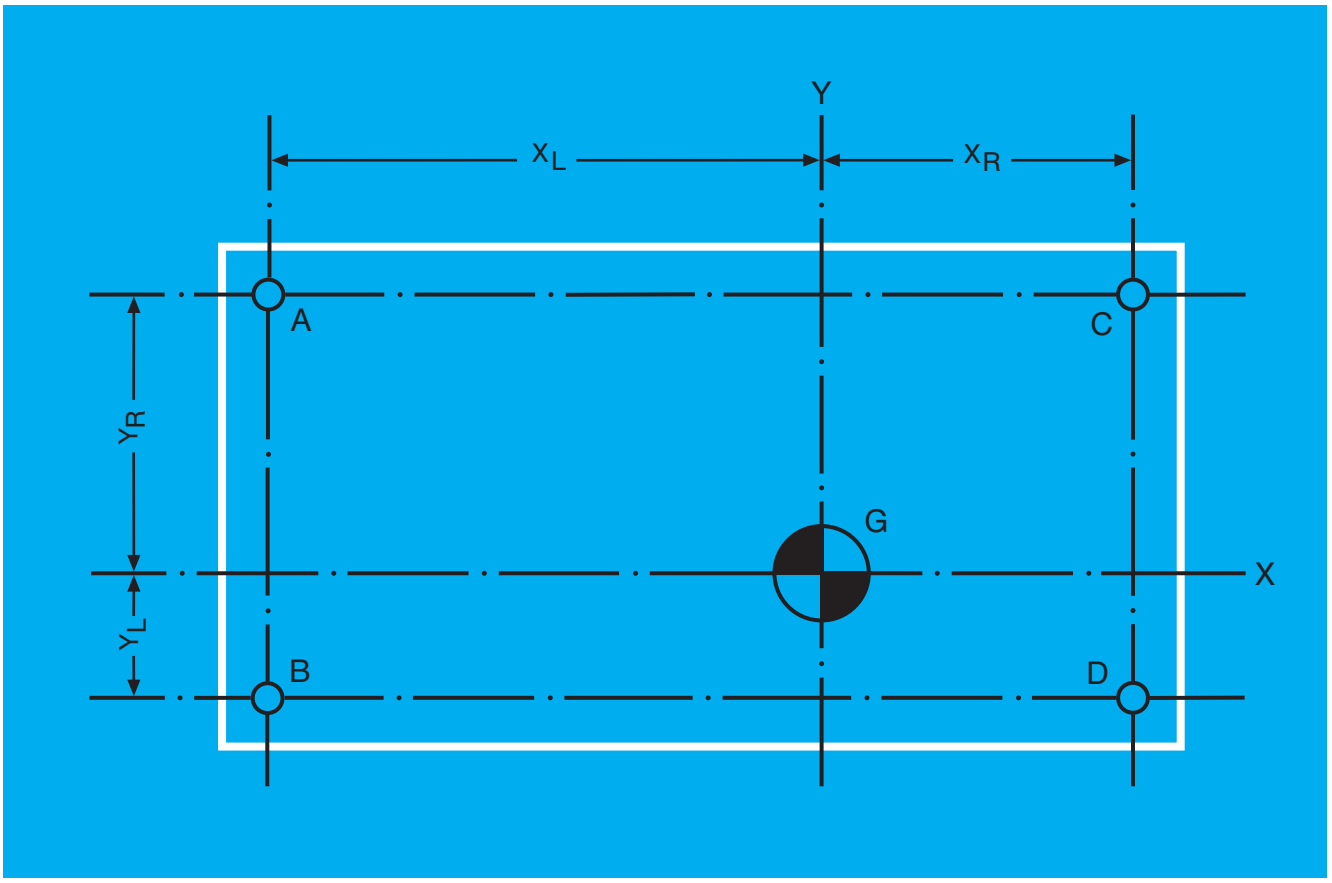


Fig. 8

Supporting forces F_A, F_B, F_C, F_D

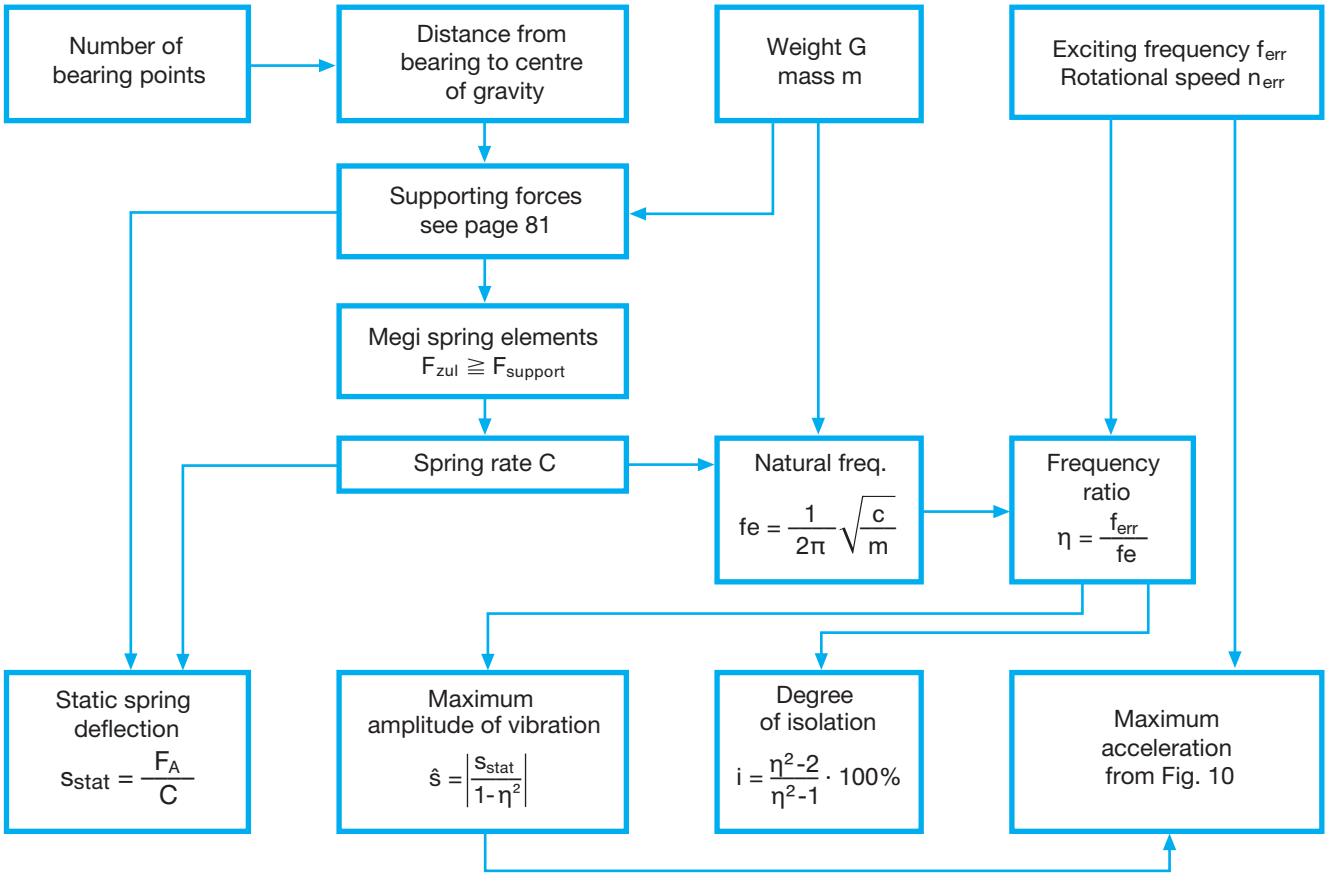
Calculation of the point loads at specified mounting points with non-symmetrical position of centre of gravity.

$$F_A = \frac{G \cdot x_R}{x_R + x_L} \cdot \frac{y_L}{y_R + y_L} \qquad F_B = \frac{G \cdot x_R}{x_R + x_L} \cdot \frac{y_R}{y_R + y_L}$$

$$F_C = \frac{G \cdot x_L}{x_R + x_L} \cdot \frac{y_L}{y_R + y_L} \qquad F_D = \frac{G \cdot x_L}{x_R + x_L} \cdot \frac{y_R}{y_R + y_L}$$

Basis of Calculation

Isolation of vibration from periodic excitation



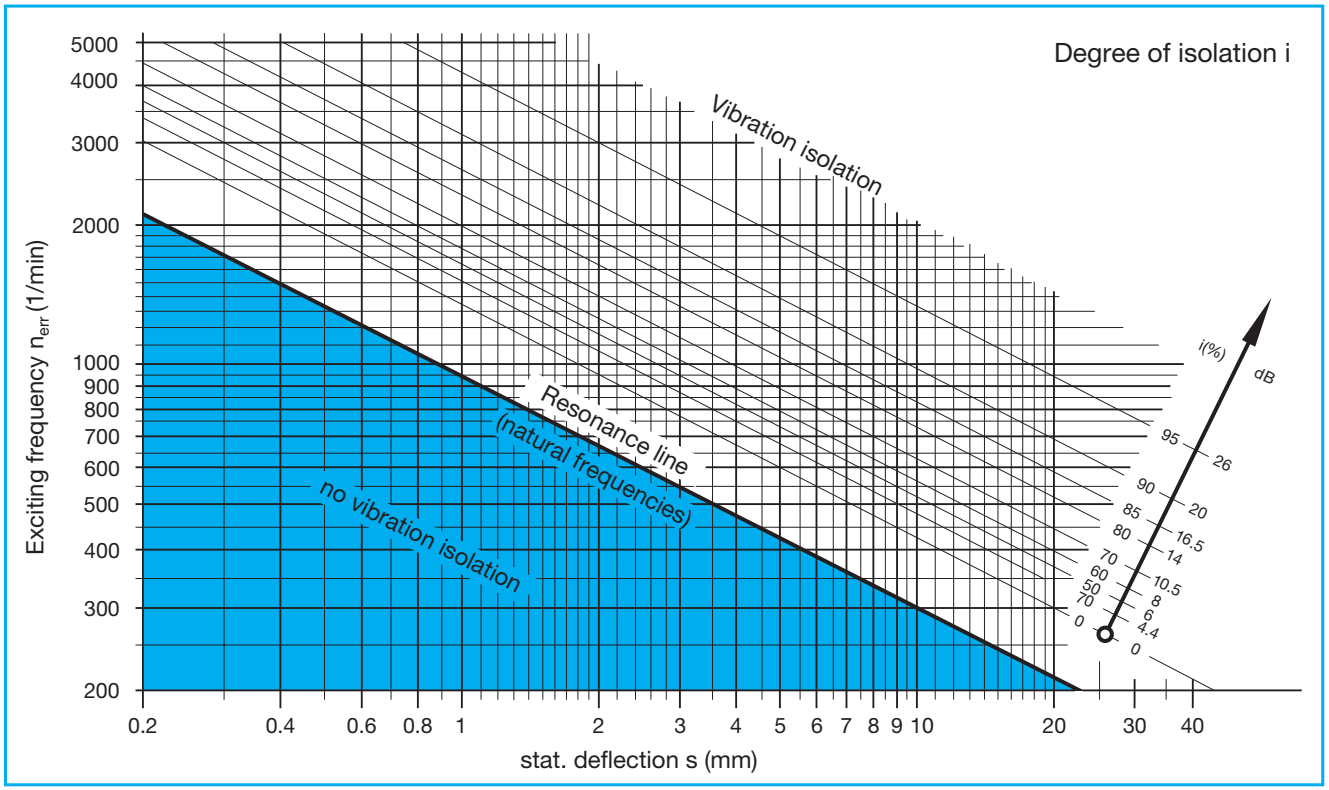


Fig. 9

Basis of Calculation

Shock and impact isolation

Reaction to a rectangular impact of an univariant elastic bearing with linear characteristic.

Input data:

Acceleration due to gravity g >= 9.81 m/s²
Mass m (kg); acceleration a_e [m/s²];
Impact duration t_{st} [s] or class of shock according to Federal Ministry of Building, e.g. RK 0.63/6.3

Kinetic energy of excitation:

$$E_{kin} = \frac{1}{2} mv^2 \text{ [Nm]}$$

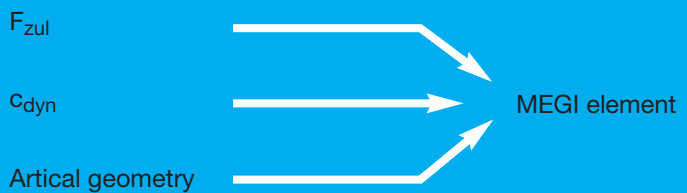
Energy absorbed by MEGI element:

$$E_A \approx \frac{4 \cdot F^2_{zul}}{c_{dyn}} \text{ [Nm] or measure area under spring characteristic}$$

Strength check:

$$E_{kin} \leqq E_A \text{ or } \cdot F_{zul} \geqq \sqrt{\frac{c_{dyn} \cdot E_{kin}}{4}} \text{ [N]}$$

Selection of the MEGI®-element



Dynamic spring rate:

$$c_{dyn} \approx 1{,}2 \cdot c \text{ [N/m]}$$

Static deflection:

$$s_{stat} = \frac{m \cdot g}{c} \text{ [m]}$$

Natural frequency:

$$f_e = \frac{1}{2\pi} \cdot \sqrt{\frac{g}{s_{stat}}} \text{ [Hz]}$$

Net acceleration:

$$a_r = \frac{a_e \cdot t_{st}}{\sqrt{\frac{s_{stat}}{g}}} \text{ [m/s²]}$$

Vibration amplitude:

$$\hat{s} = \frac{a_r}{(2\pi f_e)^2} \text{ [m]}$$

Static deflection at given net acceleration:

$$s_{stat} = g \cdot \left(\frac{a_e}{a_r} \cdot t_{st}\right)^2 \text{ [m]}$$

Basis of Calculation

Fig 10
Relationship between amplitude, frequency and acceleration

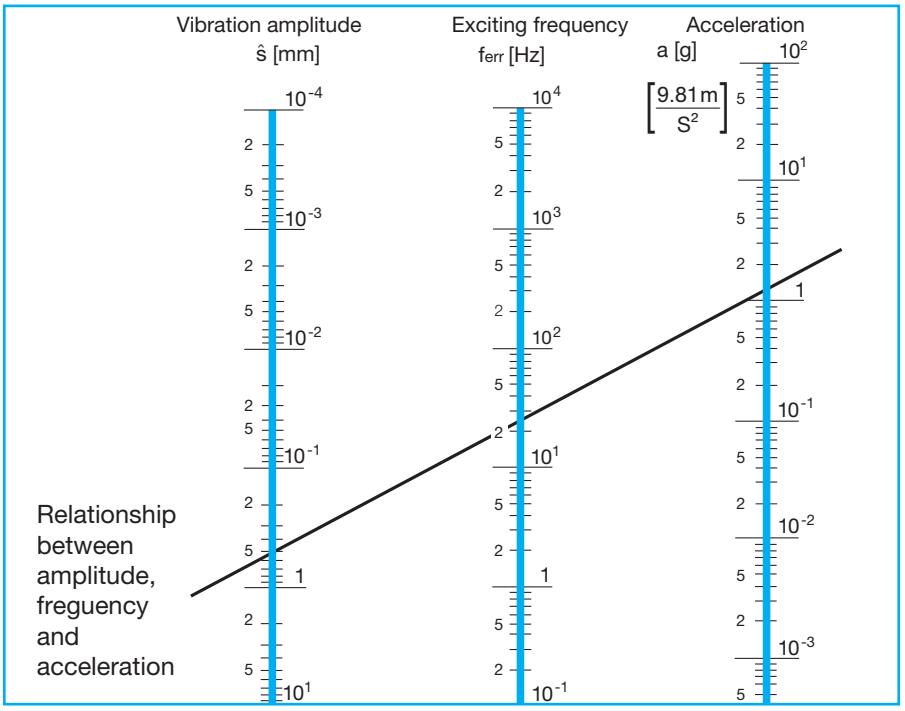


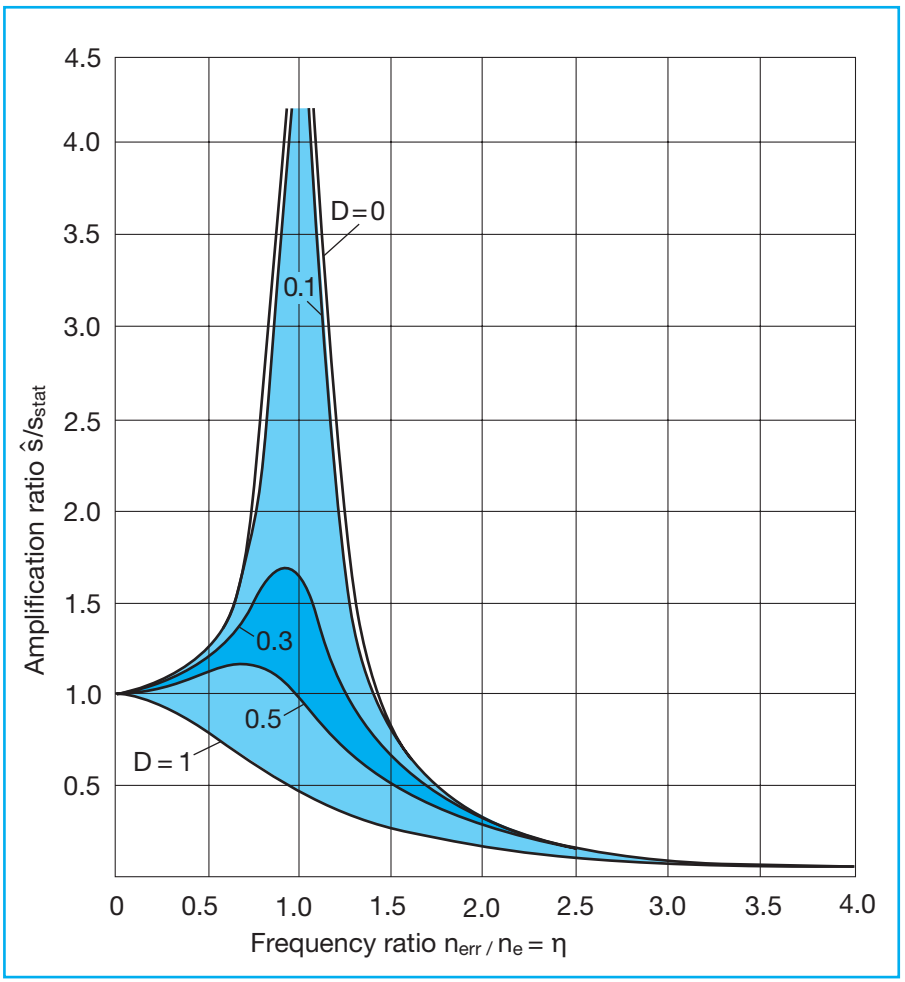
Fig 11
Relationship between amplification ratio for vibration amplitude $\hat{s}/s_{stat}$ and frequency ratio n_{err}/n_e at various values of damping D.

$\hat{s}$ greatest vibration amplitude
s_{stat} static deflection
n_{err} rotational speed of exciter
n_e natural frequency

$$\frac{\hat{s}}{s_{stat}} = \frac{1}{\sqrt{(1-\eta^2)^2 + 4\,D^2\eta^2}}$$

If D = 0:

$$\frac{\hat{s}}{s_{stat}} = \left|\frac{1}{1-\eta^2}\right|$$



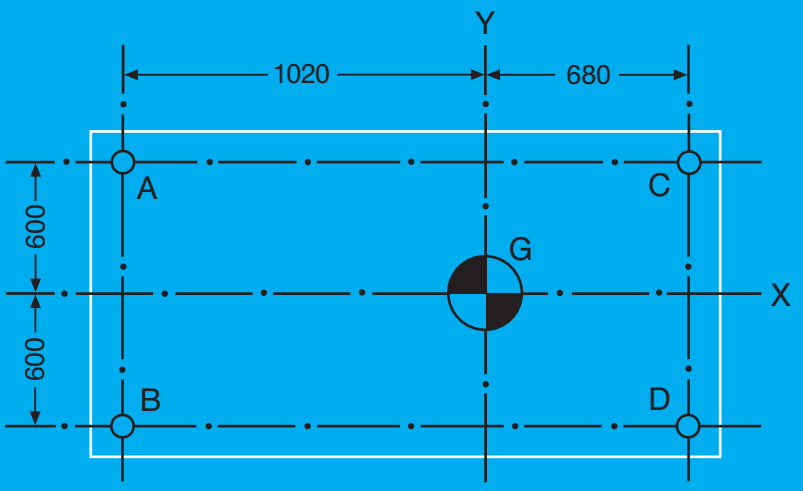
Example of Calculation

A machine unit with a total weight of 30 kN and with an exciter system, a part rotating at n_{err} = 1450 r.p.m., is to be erected so that the vibration is isolated. 4 bearing points are provided. The position of the centre of gravity is non-symmetrical.

Outline sketch:

Given:
Weight G = 30 kN,
Exciter speed n_{err} = 1450 r.p.m.,
No. of bearing points: 4
Distance of bearing points
from centre of gravity: Sketch

Required:
Supporting forces, Megi spring elements, spring rate, static deflection, natural frequency, frequency ratio, degree of isolation, damping value for structure-borne sound, maximum vibration amplitude, maximum acceleration of the machine.



Solution

1. Supporting forces: F_A, F_B, F_C, F_D

The supporting forces are determined in accordance with the directions for calculations for uniform stressing of Megi elements (page 15).

$$F_A = F_B = \frac{30\ \text{kN} \cdot 680}{680 + 1020} \cdot \frac{600}{600 + 600} = 6\ \text{kN}$$

$$F_C = F_D = \frac{30\ \text{kN} \cdot 1020}{680 + 1020} \cdot \frac{600}{600 + 600} = 9\ \text{kN}$$

2. MEGI spring elements

The Megi machine base support 786011 is selected from the load-deformation diagrams or from the tables. The “hard” quality, which has a deflection of 3 mm at a loading of 9 kN, is selected for the right-hand bearings and the medium quality, with a deflection of 3 mm at a loading of 6 kN, is selected for the left-hand bearings.

3. Spring rate: c

For the Megi machine base support 786011 the spring rate is

$$\text{medium } c = \frac{F_A}{s_{stat}} \cdot \frac{6000\ \text{N}}{0.003\ \text{m}} = 2 \cdot 10^6\ \text{N/m} = c_{A,B} \text{ and}$$

$$\text{hard } c = \frac{F_C}{s_{stat}} \cdot \frac{9000\ \text{N}}{0.003\ \text{m}} = 3 \cdot 10^6\ \text{N/m} = c_{C,D}$$

Example of Calculation

4. Static deflection: s_{stat}

The spring elements are arranged in parallel.
The total spring rate is therefore

$c_{total} = 2\ c_{A,B} + 2\ c_{C,D} = 2 \cdot 2 \cdot 10^6\ N/m + 2 \cdot 3 \cdot 10^6 = 10 \cdot 10^6\ N/m.$

Accordingly the total static deflection is

$$s_{stat} = \frac{G}{c_{ges}} = \frac{30000\ N}{10 \cdot 10^6\ N/m} = 0.003\ m$$

---

5. Natural frequency: f_e

The natural frequency of the machine on flexible bearings is calculated from the formula

$$f_e = \frac{1}{2\pi} \sqrt{\frac{c_{total}}{m}}\ [Hz] \text{ where mass } m = \frac{G}{g}\ [kg]$$

The natural frequency is therefore

$$f_e = \frac{1}{2\pi} \sqrt{\frac{9.81 \cdot 10 \cdot 10^6}{30000}} = 9.1\ Hz$$

---

6. Frequency ratio: η

$$\eta = \frac{f_{err}}{f_e}\text{, where } f_{err} = \frac{n_{err}}{60}\ Hz$$

In this example the frequency ratio is

$$\eta = \frac{1450}{60 \cdot 9.1} = 2.66$$

7.Degree of isolation: i

Given the exciter speed n_{err} and the static deflection s_{stat}, the degree of isolation can be read from Fig. 9, or it can be calculated from the formula

$$i = \frac{\eta^2 - 2}{\eta^2 - 1} \cdot 100\,\% = \frac{2.66^2 - 2}{2.66^1 - 1} \cdot 100\,\% = 83.54\,\%$$

It can be seen from the above that only 16.5 % of the vibrational forces generated by the machine are transmitted to the base.

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8. Structure-borne sound insulation value: D

As with the degree of isolation, the insulation value for structure-borne sound can be read directly from Fig. 9 or it can be calculated from the formula

$$D = 20 \cdot lg \frac{1}{1 - i} = 20 \cdot lg \frac{1}{1 - 0.8354} = 15.67\ dB$$

In this formula the degree of isolation i is not entered as a percentage.

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9. Maximum vibration amplitude: $\hat{s}$

The maximum vibration amplitude can be taken from Fig. 11 or can be calculated from the formula

$$\hat{s} = \frac{s_{stat}}{1 - \eta^2} = \frac{0.003}{1 - 2.66^2} = 0.00049\ m$$

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9. Maximum acceleration: a_{max}

The maximum acceleration can be taken from Fig. 10 or can be calculated from the formula

$$a_{max} = \hat{s} \cdot (2\pi \cdot f_{err})^2 = 0.00049 \cdot (2\pi \cdot \frac{1450}{60})^2 = 11.3\ m/s^2$$

i.e. the maximum acceleration of the machine is 1.15 g.

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Vibration Control

Market segment
Vibration Control Industry

Your local contact:

Autorizovaný distributor pro ČR a SR

TYMA CZ, s.r.o.
Na Pískách 731
CZ- 400 04 Trmice
Phone +420 475 655 010
Fax +420 475 655 018
Email info@tyma.cz
www.tyma.cz

www.contitech.de/contactlocator

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