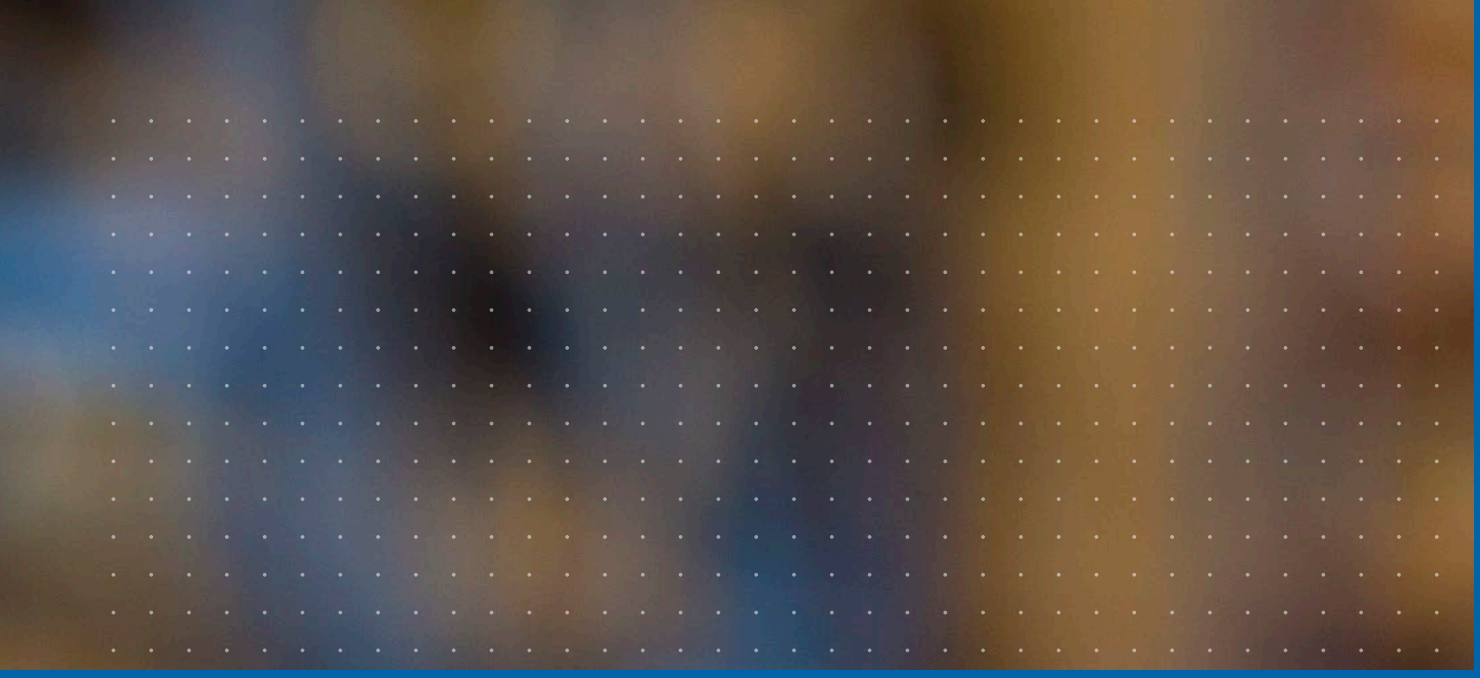
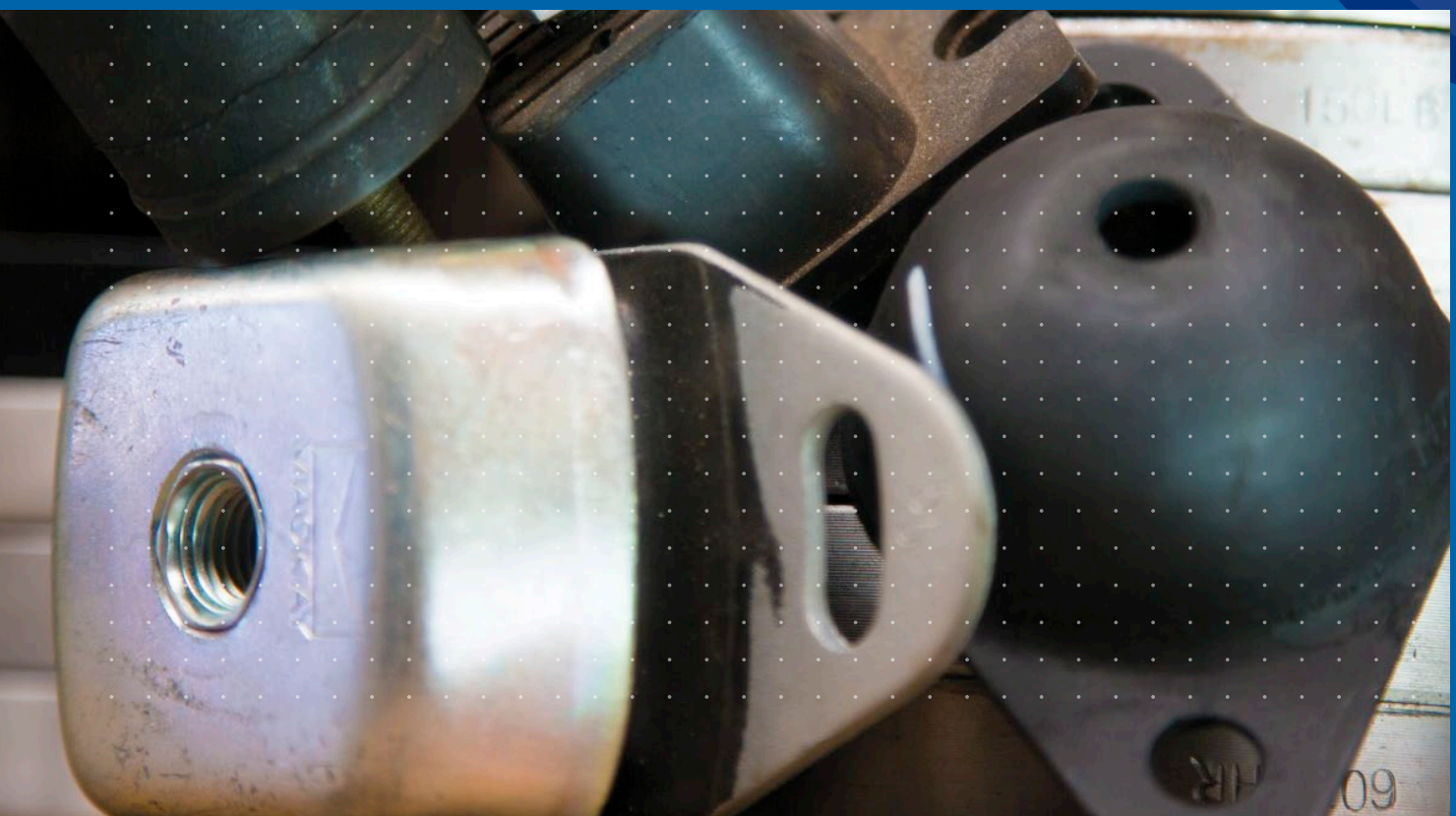


13 VIBRATION CONTROL



Isomounts

Isomounts are general-purpose vibration isolators suitable for mobile and static equipment installations.

Available in three different sizes Isomounts come with choice of rubber hardnesses and can be supplied with two types of specialist height adjusters.

Load Range

Isomount isolators are suitable for operation under all types of engines. They offer 3-way control of engine movement with excellent isolation efficiency. Maximum use of this 3-way control when the isomount isolators are used as engine supports can be obtained by arranging the isolator with their maximum flexibility (Y) at right angles to the engine crankshaft and maximum stiffness (X) in line with the crankshaft. Using the isolators in this manner also has the advantage in marine applications of providing isolation against propeller thrust. The Isomount range also features bump and rebound control, which prevents excessive movement under shock loads.

Nominal Stiffness Ratio

X = 2.5

Y = 0.75

Z = 1.0

Static Load

The static load figures shown in Figure 1 are offered as a reference to the maximum load acceptable for each rubber mix.

NOTE: When used in marine engine applications with thrust forces, the maximum load capacity is substantially reduced. See table above.

Height Adjusters

Two styles of height adjusters are available for each Isomount Isolator.

Type 1 Is supplied minus height adjuster.

Type 2 Is a general-purpose adjuster suitable for static applications.

Type 3 Is available for mobile applications, where thrust is an issue.

Height adjusters are recommended where precise alignment is required and care should be taken when height adjusters are used not to allow excessive bending forces to be imposed on the centre spindle.

In the past fitting of inappropriate height adjusters has resulted in premature failure of the isolator by damage to the centre spindle.

Both types of height adjusters are available separately for each size Isomount, under the part numbers shown in Figure 2.

FIGURE 1 - Static loads

TYPE 1	TYPE 2	TYPE 3	MAXIMUM LOAD	LOAD	MAXIMUM DEFLECTION (mm)	DURO
M20004	M20014	M20024	50	35	4	45
M20005	M20015	M20025	70	55	4	55
M20006	M20016	M20026	100	80	4	65
M22004	M22014	M22024	135	85	5	45
M22005	M22015	M22025	200	135	5	55
M22006	M22016	M22026	300	210	5	65
M22007	M22017	M22027	450	315	5	75
M24004	M24014	M24024	355	250	5	45
M24005	M24015	M24025	530	370	5	55
M24006	M24016	M24026	800	560	5	65
M24007	M24017	M24027	1000	700	5	75

FIGURE 2 - Height Adjusters

	HEIGHT ADJUSTER	
ISOMOUNT	GENERAL PURPOSE	H/THRUST
M2000	M2000A	M2000B
M2200	M2200A	M2200B
M2400	M2400A	M2400B

FIGURE 3 - Dimensions

CODE	TYPE	A	B	C	D	E		F	G	H	I	J	K	WEIGHT
						MAX	MIN							(kg)
M2000	1	38.5	120	60	M1	-	-	100	14	11	14	11	-	0.4
M2001	2	38.5	120	60	M1	32	22	100	14	11	14	11	3	0.5
M2002	3	38.5	120	60	M1	40	30	100	14	11	14	11	3	0.6
M2200	1	50.0	183	75	M1	-	-	140	13	20	30	13	-	0.9
M2201	2	50.0	18	75	M1	38	28	140	13	20	30	13	4	1.2
M2202	3	50.0	18	75	M1	41	31	140	13	20	30	13	4	1.4
M2400	1	68.0	228	112	M2	-	-	182	18	26	34	18	-	2.2
M2401	2	68.0	228	112	M2	44	34	182	18	26	34	18	4	2.8
M2402	3	68.0	228	112	M2	41	31	182	18	26	34	18	4	2.9

13.1 :: Isomounts

Installation Instructions

It is important that isolators of the correct size (weight carrying capacity) and rubber hardness are selected to suit the application. Details on load range and static deflections are shown in Figure 1.

Installation Without Height Adjuster

Ensure tightening torque values for the centre bolt fixing are followed as shown in Figure 4.

Check that after tightening of the centre bolt fixing that there is not excessive distortion, misalignment and rotation of the top cap relative to the base.

Where alignment of the equipment is required packing pieces or shims should be employed either below the mounting base plate or above the isolator top cap. Alignment should be rechecked after centre-fixing bolts have been tightened.

FIGURE 4 - Recommended Centre Bolt / Nut Tightening

CODE	TYPE	TORQUE NM
M2000	1	45 – 50
M2001	2	45 – 50
M2002	3	45 – 50
M2200	1	100 – 110
M2201	2	100 – 110
M2202	3	100 – 110
M2400	1	150 – 170
M2401	2	150 – 170
M2402	3	150 – 170

Installation With Height Adjuster

When accurate alignment of equipment is required one of two types of adjusters (Type '2' or '3') should be employed.

Ensure that excessive bending forces are not imposed on the centre spindle.

When using height adjusters, ensure that the recommended washer is placed hard against the top cap and the height adjusting spindle is fully located into the isolator.

If height adjusters are insufficient to achieve desired height adjustment shims or packing pieces should be employed under the mounting base.

The isolators with the height adjusters in the mean position (dimension Figure 3) should be fitted to the equipment, which should then be lowered onto the support. Vertical and horizontal alignment should now be effected using the height adjuster and slotted holes in the mounting base. After tightening centre fixings to the values shown in fig 4 recheck alignment. If necessary coupling and shaft alignment should be undertaken in accordance with the coupling manufactures recommendations. Where possible coupling alignment procedures should be carried out after the power unit has settled on the mountings (preferably 2 days after installation). Should this action not be possible the power unit should be raised approximately 1mm after completion of the alignment procedure.

Specifications

The MULTICUSHION system is a new approach to isolator selection. The large range of sizes and durometers combined with interchangeable metric and imperial studs allows selection of the most appropriate cushion isolator for the application

First choose the best cushion for the application and then choose the desired stud combination.

MULTICUSHION isolators are made from high-grade natural rubber and all metal surfaces are passivated to automotive OEM standards. The interchangeable studs are easily inserted with a screwdriver whilst the microBOND™ fastener adhesive system' provides secure thread locking.

NOTE: Multicushions are not recommended for use under permanent tension loading.

Multicushions

CODE	THREAD A (mm)	THREAD B (mm)	DIMENSION C (mm)	DIMENSION D (mm)	DIMENSION E (mm)	DIMENSION F (mm)	DIMENSION G (mm)
M4M4	M4 x 0.7	M4 x 0.7	4.0	0.8	0.9	19.0	15.0
104105	M4 x 0.7	M5 x 0.8	4.0	0.8	0.9	20.5	15.0
M4W316	M4 x 0.7	3⁄16" WHIT x 24tpi	4.0	0.8	0.9	20.5	15.0
M6M6	M6 x 1.0	M6 x 1.0	6.0	1.3	1.4	21.0	15.0
M6M8	M6 x 1.0	M8 x 1.25	6.0	1.3	1.4	28.0	20.0
M6W316	M6 x 1.0	3⁄16" WHIT x 24tpi	6.0	1.3	1.4	22.5	15.0
M6W14	M6 x 1.0	1⁄4" WHIT x 20tpi	6.0	1.3	1.4	22.5	15.0
M8M8	M8 x 1.25	M8 x1.25	8.0	1.3	1.4	28.0	20.0
M81VI10	M8 x 1.25	M10 x 1.5	8.0	1.3	2.0	35.0	25.0
M8W516	M8 x 1.25	5⁄16" WHIT x 18tpi	8.0	1.3	1.4	31.0	20.0
M10M10	M10 x 1.5	M10 x 1.5	10.0	1.6	2.0	37.0	25.0
M10M12	M10 x 1.5	M12 x 1.75	10.0	1.6	2.0	49.0	35.0
M10W38	M10 x 1.5	3⁄8" WHIT x 16tpi	10.0	1.6	2.0	39.0	25.0
M16M16	M16 x 2.0	M16 x 2.0	16.0	1.6	2.0	56.0	40.0

microBOND™ Thread Security

THREAD	PREVAILING ON-TORQUE (MAX) Nm	BREAKAWAY OFF-TORQUE (MIN) Nm	PREVAILING OFF-TORQUE (MIN) Nm
M4	--	--	--
M6	1.8	1.5	0.8
M8	2.8	4.0	2.0
M10	5.5	11.0	4.0
M16	14.0	33.0	16.0

13.2 :: Multicushion Isolators

Cushion Details									
	DIMENSIONS				COMPRESSION		SHEAR		
CODE	DIAM A (mm)	HEIGHT B (mm)	DURO	(FEMALE) THREAD)	MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX LOAD (kg)	MAX DEFLECTION (mm)	WEIGHT (kg)
M10131540	13	15	40	M4	13.0	2.5	2.5	3.0	0.01
M10131555	13	15	55	M4	25.0	2.5	4.5	3.0	0.01
M10131570	13	15	70	M4	34.0	2.5	6.0	3.0	0.01
M10162040	16	20	40	M6	20.5	3.0	4.5	4.0	0.01
M10162055	16	20	55	M6	42.5	3.0	9.0	4.0	0.01
M10162070	16	20	70	M6	53.5	3.0	12.0	4.0	0.01
M10202540	20	25	40	M6	30.5	6.0	5.0	6.0	0.02
M10202555	20	25	55	M6	65.0	6.0	11.0	6.0	0.02
M10202570	20	25	70	M6	89.5	6.0	15.0	6.0	0.02
M10252040	25	20	40	M6	36.0	2.5	7.0	3.0	0.02
M10252055	25	20	55	M6	54.0	2.5	12.0	3.0	0.02
M10252070	25	20	70	M6	66.00	2.5	15.0	3.0	0.02
M10253040	25	30	40	M6	55.0	8.0	10.5	8.0	0.03
M10253055	25	30	55	M6	98.0	8.0	19.0	8.0	0.03
M10253070	25	30	70	M6	120.0	8.0	26.5	8.0	0.03
M10302040	30	20	40	M6	42.0	2.5	8	3.0	0.03
M10302055	30	20	55	M6	62.0	2.5	13	3.0	0.03
M10302070	30	20	70	M6	82.0	2.5	16	3.0	0.03
M10303040	30	30	40	M8	44.0	4.0	10.0	5.0	0.05
M10303055	30	30	55	M8	77.0	4.0	18.0	5.0	0.05
M10303070	30	30	70	M8	108.0	4.0	33.0	5.0	0.05
M10304040	30	40	40	M8	49.5	8.0	9.0	10.0	0.06
M10304055	30	40	55	M8	86.0	8.0	17.5	10.0	0.06
M10304070	30	40	70	M8	131.0	8.0	35.0	10.0	0.06
M10403040	40	30	40	M8	40.5	4.0	17.5	5.0	0.08
M10403055	40	30	55	M8	114.0	4.0	28.5	5.0	0.08
M10403070	40	30	70	M8	195.0	4.0	49.5	5.0	0.08
M10404040	40	40	40	M8	78.0	8.0	20.0	10.0	0.09
M10404055	40	40	55	M8	148.0	8.0	34.0	10.0	0.09
M10404070	40	40	70	M8	233.0	8.0	53.5	10.0	0.09
M10503540	50	35	40	M10	139.50	6.0	21.5	6.0	0.14
M10503555	50	35	55	M10	264.0	6.0	40.5	6.0	0.14
M10503570	50	35	70	M10	363.0	6.0	59.0	6.0	0.14
M10754540	50	45	40	M 10	111.5	8.0	25.0	10.0	0.16
M10754555	50	45	55	M10	195.0	8.0	44.5	10.0	0.16
M10754570	50	45	70	M10	244.0	8.0	62.0	10.0	0.16
M10755040	75	50	40	M 10	390.0	12.0	76.0	13.0	0.04
M10755055	75	50	55	M10	733.0	12.0	140.0	13.0	0.04
M10755070	75	50	70	M10	986.0	12.0	208.0	13.0	0.04
M101006040	100	60	40	M16	510.0	10.0	100.0	10.0	0.8
M101006055	100	60	55	M16	955.0	10.0	180.0	10.0	0.8
M101006070	100	60	70	M16	1500.0	10.0	306.0	10.0	0.8
M101507540	100	75	40	M16	1500.0	18.0	277.0	20.0	2.2
M101507555	100	75	55	M16	3200.0	18.0	525.0	20.0	2.2
M101507570	100	75	70	M16	4500.0	18.0	760.0	20.0	2.2

Stainless Steel Multicushions

Stainless steel Multicushion isolators are manufactured in the most popular sizes from high-grade natural rubber and stainless steel (Type 304) metal components.

Available in two rubber hardnesses the cushions are supplied without fixing studs. Mackay recommends fixing with appropriate stainless steel hexagonal socket set screws used with an appropriate locking compound.

NOTE: Multicushions are not recommended for use under permanent tension loading

Stainless Steel Multicushion Details

	DIMENSIONS				COMPRESSION		SHEAR		
CODE	DIAM A (mm)	HEIGHT B (mm)	DURO	(FEMALE) THREAD)	MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX LOAD (kg)	MAX DEFLECTION (mm)	WEIGHT (kg)
M11202540	20	25	40	M6	30.5	6.0	5.0	6.0	0.02
M1120255	20	25	55	M6	65.0	6.0	11.0	6.0	0.02
M11125204	25	20	40	M6	36.0	2.5	7.0	3.0	0.02
M11252055	25	20	55	M6	54.0	2.5	12.0	3.0	0.02
M11253040	25	30	40	M6	55.0	8.0	10.5	8.0	0.03
M11253055	25	30	55	M6	98.0	8.0	19.0	8.0	0.03
M11302040	30	20	40	M6	42.0	2.5	8	3.0	0.03
M11302055	30	20	55	M6	62.0	2.5	13	3.0	0.03
M11303040	30	30	40	M8	44.0	4.0	10.0	5.0	0.05
M11303055	30	30	55	M8	77.0	4.0	18.0	5.0	0.05
M11304040	30	40	40	MS	49.5	8.0	9.0	10.0	0.06
M11304055	30	40	55	M8	86.0	8.0	17.5	10.0	0.06
M11403040	40	30	40	M8	40.5	4.0	17.5	5.0	0.09
M11403055	40	30	55	M8	114.0	4.0	28.5	5.0	0.09
M11404040	40	40	40	M8	78.0	8.0	20.0	10.0	0.10
M11404055	40	40	55	M8	148.0	8.0	34.0	10.0	0.10
M11503540	50	35	40	M10	139.5	6.0	21.5	6.0	0.14
M11503555	50	35	55	M10	264.0	6.0	40.5	6.0	0.14
M11504540	50	45	40	M10	111.5	8.0	25.0	10.0	0.16
M11504555	50	45	55	M10	195.0	8.0	44.5	10.0	0.16

13.3 :: Conflex Isolators

Conflex isolators are designed to meet almost all machinery installations within the load range. Available in four rubber hardnesses they are the versatile answer to your mobile or static vibration problems.

Conflex Isolators

CODE	A	B	C	D	E	F	G	WEIGHT (kg)	TIGHTENING TORQUES (NM)
M1111##	80	60	29	50	31	8.5	M8	0.05	10
M1112##	100	76	32	60	46	8.5	M10	0.15	15
M1112##NM12	100	76	32	60	46	8.5	M12	0.15	15

Nominal Characteristics

CODE	MAX LOAD (kg)	DEFLECTION MAX LOAD (mm)	SHEAR (kg)	DEF (mm)	DURO	COLOUR CODE	WEIGHT (kg)
M111135	30	4.5	6	5	35	Green	0.05
M111145	40	5	10	5	45	Red	0.05
M111155	50	5.5	15	5	55	Yellow	0.05
M111165	75	5	20	5	65	White	0.05
M111235	90	6	20	6	35	Green	0.15
M111235 NM12-RED	90	6	20	6	35	Red	0.15
M111245	110	6	25	6	45	Red	0.15
M111255	160	6	40	6	55	Yellow	0.15
M1112551 VM12-GRN	160	6	40	6	55	Green	0.15
M111265	250	6	65	6	65	White	0.15

Stainless Steel Conflex Safety Interlocked Isolator

Similar dimensions to M1112 ## Isolators with the inclusion of Internal safety interlocks for failsafe protection. Manufactured in high-grade oil resisting rubber compound and type 304 stainless steel for marine and corrosive applications.

Conflex Isolators

CODE	A	B	C	D	E	F	G
M1113SN30	100	76	32	60	46	8.5	M8
M1113SN40	100	76	32	60	46	8.5	M8
M1113SN50	100	76	32	60	46	8.5	M8
M1113SN60	100	76	32	60	46	8.5	M8
M1113SN70	100	76	32	60	46	8.5	M8

CODE	MAX LOAD (kg)	MAX DEFLECTION (mm)	
M1113SN30	70	2.5	
M1113SN40	130	2.5	
M1113SN50	210	2.5	
M1113SN60	270	2.5	
M1113SN70	330	2.5	

13.4 :: Flange Isolators

These special isolators were developed to meet almost every type of machinery installation within the loading range, with telescopic metal inserts providing considerable stability in all directions. The two light duty isolators, M110 and M114 are equipped with upper metal inserts, tapped to receive standard bolts or set screws. The isolators can be fastened to the floor or other base, with bolts through the two lugs of the lower metal stamping. When using the heavy-duty isolators M139 and M140, loads can be suspended as well as supported.

Interlocking flanges incorporated in M139 and M140 isolators ensure suspension even if the rubber is completely destroyed by fire, etc.

Flange Isolators

CODE	STAINLESS STEEL	A	B	C	D	E	F	G (inches)	H	WEIGHT (kg)
M110	--	60.3	76	41	48	3	22	7/16 - 20unf	8.7	0.1
M114 *	--	76.1	92	57	60	3	29	1/2 - 20unf	8.7	0.2
M140 *	--	110.0	141	--	83	3	41	17/32	13.5	0.4
M139	--	127.0	157	--	102	3	48	13/16	14.2	0.6
M14060SS	304	110.0	141	--	83	3	41	17/32	13.5	0.4
M1390SS	316	127.0	157	--	102	3	48	13/16	14.2	0.6

* Part Numbers M114 and M140 are available with a shield (Part Number M189) to protect the isolators from mechanical and chemical attack. Order if required.

Duro Colour Code

DURO	COLOUR
40	Red
50	Yellow
60	White
70	Marked 70

To assist the isolation system designer we have provided the approximate deflections of Mackay isolators at various static loadings. It therefore becomes a simple matter to obtain the isolation efficiency by referring to the Mackay graph on "disturbing frequencies/deflections (Shown in our current Flexible Isolator Catalogue). If you require any further technical data on Mackay isolators, please contact the Mackay Technical Department.

Load / Deflection

	COMPRESSION		SHEAR	
CODE	LOAD (kg)	DEF (mm)	LOAD (kg)	DEF (mm)
M11040	25	2.3	20	2.2
	30	2.8	25	2.7
	35	3.2	30	3.3
	40	3.7	35	3.8
M11050	40	2.5	35	2.5
	45	2.8	40	2.8
	50	3.2	45	3.2
	55	3.5	50	3.5
M11060	31	1.0	21	1.0
	60	2.0	54	2.0
	85			
M11440	40	2.4	25	2.3
	45	2.7	30	2.8
	50	3.0	35	3.2
	55	3.3	40	3.7
	60	3.6		
M11450	60	2.4	40	2.4
	65	2.6	45	2.7
	70	2.8	50	3.0
	75	3.0	55	3.3
	80	3.2	60	3.6
	85	3.4		
M11460	90	2.4	60	2.6
	95	2.6	65	2.8
	100	2.7	70	3.0
	105	2.8	75	3.2
	110	3.0	80	3.4
	115	3.1		
	120	3.2		
	125	3.4		
	130	3.5		
M13940	400	3.4	150	3.0
	425	3.6	175	3.5
	450	3.8	200	4.0
	475	4.0	225	4.5
	500	4.2	250	5.0
	525	4.4		
	550	4.6		
M13950	550	3.5	250	3.1
	575	3.6	275	3.4
	600	3.8	300	3.7
	625	3.9	325	4.0
	650	4.1	350	4.3
	675	4.2	375	4.6
	700	4.4	400	4.9
	725	4.5		

Load / Deflection

	COMPRESSION		SHEAR	
CODE	LOAD (kg)	DEF (mm)	LOAD (kg)	DEF (mm)
M13960	725	3.6	400	3.4
	750	3.7	425	3.6
	775	3.8	450	3.8
	800	3.9	475	4.0
	825	4.1	500	4.0
	850	4.2	525	4.4
	875	4.3	550	4.6
	900	4.4		
M13970	1100	3.5	550	3.1
	1125	3.6	575	3.3
	1150	3.7	600	3.5
	1175	3.8	625	3.7
	1200	3.9	650	4.0
	1225	4.0	675	4.2
	1250	4.1	700	4.4
	1275	4.2	725	4.5
M14040	200	3.3	100	3.3
	210	3.5	110	3.7
	220	3.7	120	4.0
	230	3.9	130	4.3
	240	4.0	140	4.7
	250	4.2		
	260	4.3		
	270	4.5		
	280	4.7		
M14050	280	3.6	120	3.2
	290	3.1	130	3.5
	300	3.8	140	3.7
	310	3.9	150	4.0
	320	4.1	160	4.3
	330	4.2	170	4.5
	340	4.3	180	4.8
	350	4.4		
M14060	350	3.3	160	3.6
	375	3.5	170	3.8
	400	3.8	180	4.0
	425	4.0	190	4.2
	450	4.2	200	4.4
	476	4.5		
	500	4.7		
M14080	650	3.4	200	3.3
	675	3.5	210	3.5
	700	3.7	220	3.7
	725	3.8	230	3.8
	750	3.9	240	4.0
	775	4.1	250	4.2
	800	4.2	260	4.3
	825	4.3	270	4.5
	850	4.5	280	4.7
	880	4.6		

13.5 :: Machinery Mounting Pad

Machinery Mounting Pad			
CODE	SIZE (mm)	THICKNESS (mm)	WEIGHT (kg)
M164	475 x 475	7	1.7

13.6 :: Flexi Straps

Rubber Straps & Fasteners				
CODE	LENGTH (mm)	STRETCH LENGTH (mm)	WITH HOOKS (mm)	WEIGHT (kg)
FHS9K	230	285	+ 100	0.08
FHS15K	380	475	+ 100	0.10
FHS24K	610	765	+ 100	0.14
FHS31 K	785	980	+ 100	0.16

Single-Sphere Connectors - Table E

CODE	NOMINAL DIAMETER (inches)	NOMINAL DIAMETER (mm)	100 PSI	150 PSI	200 PSI	225 PSI
890 32	1 – ¼	32	o	o	●	●
890 40	1 – ½	40	o	o	●	●
890 50	2	50	o	o	●	●
890 65	2 – ½	65	o	o	●	●
890 80	3	80	o	o	●	●
890 100	4	100	o	o	●	●
890 125	5	125	o	o	●	●
890 150	6	150	o	o	●	●
890 200	8	200	o	o	●	●
890 250	10	250	o	o	●	●
890 300	12	300	o	●	●	●
890 350	14	350	●	●		
890 400	16	400	●			
890 450	18	450	●			
890 500	20	500	●			

● Use control rods

Single-Sphere Connectors - ANS Flanged

CODE	NOMINAL DIAMETER (inches)	NOMINAL DIAMETER (mm)	100 PSI	150 PSI	200 PSI	225 PSI
890 A32	1 – ¼	32	o	o	●	●
890 A40	1 – ½	40	o	o	●	●
890 A50	2	50	o	o	●	●
890 A65	2 – ½	65	o	o	●	●
890 A80	3	80	o	o	●	●
890 A100	4	100	o	o	●	●
890 A125	5	125	o	o	●	●
890 A150	6	150	o	o	●	●
890 A200	8	200	o	o	●	●
890 A250	10	250	o	o	●	●
890 A300	12	300	o	●	●	●
890 A350	14	350	●	●		
890 A400	16	400	●			
890 A450	18	450	●			
890 A500	20	500	●			

● Use control rods

Notes