

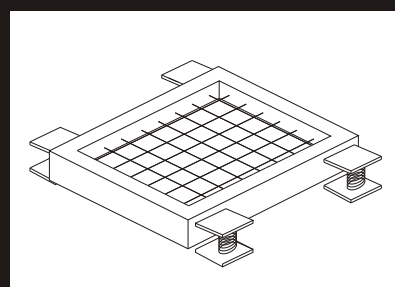
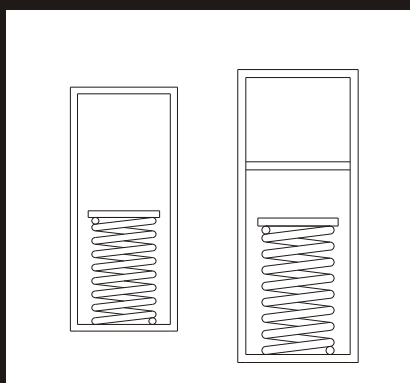
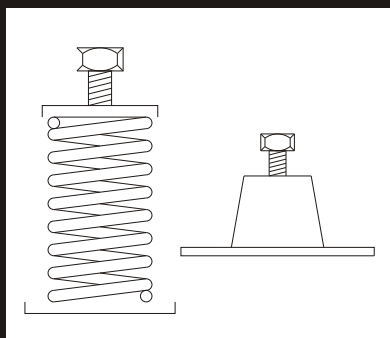
MINIKIN

Anti Vibration Booklet

2nd Edition

EMFLEX Vibration Isolators, Inertia Bases and Related Equipment for Pipework and Plant

With special reference to the
Building Services Industry



N. Minikin and Sons Limited
Spa House, Hookstone Park, Harrogate, North Yorkshire, HG2 7DB.
Tel: 01423 889845 Fax: 01423 880724
Email: minikin@dial.pipex.com



Certificate No. Q 5468

Contents

INTRODUCTION	1
INERTIA BASES	5
OPEN SPRING MOUNTS	6
CLOSED SPRING MOUNTS	7
RESTRAINED SPRING MOUNTS	8
HEAVY DUTY RESTRAINED SPRING MOUNTS	9
RUBBER TURRET MOUNTS	10
DAMPING & ISOLATING SHEETS	11
SPRING HANGERS	12
POSITIONED SPRING HANGERS	13
DUCTWORK RUBBER HANGERS	14

Appendix 1 - Water Filled Pipe / Insulation / Flange Weights

Appendix 2 - Water Filled Pipe Fitting & Steelwork Weights

CONDITIONS OF BUSINESS

Also available, but not featured in this booklet:-

FLEXIBLE CONNECTORS

Rubber Flexible Connectors
Braided Flexible Connectors
Stainless Steel Flexible Connectors
Flexible Duct Connectors

Please ask for our catalogue "EMFLEX Flexible Connectors, Expansion Joints and Related Equipment for Pipework Systems"

If you have any additional requirements for equipment related to noise and vibration control for pipework and plant then please ask, even if you do not see it listed here.

We reserve the right to alter or amend any information detailed. E&OE.

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This anti-vibration booklet presented by:

Introduction to Anti Vibration Mounts

Vibration from building services plant

The normal method to isolate the vibration from building services plant is to support on resilient supports or isolators e.g. helical steel springs; rubber blocks or pads. These resilient supports or isolators, otherwise known in the building services industry as anti vibration mounts (AVMs), must be selected and positioned carefully, as incorrect specification and use can equally worsen the vibration problem as isolate it.

The following introductory pages aim to provide a brief guide to the selection, positioning and calculation of loads for building services pipework and plant.

Anti vibration mount selection

(1) Estimating the Force or Load on each mounting point.

The weight distribution at each mounting point is dependent on the position of that point relative to the centre of gravity of the total mass. The equipment manufacturer will provide the equipment weight and the centre of gravity. The load on each mounting point can be calculated by taking moments about each mounting point. These calculations can be performed manually if there are 4 mounting points, each at the corner of a rectangular base. However, if there are more than 4 points, or the base is not rectangular, then the calculations are more complex and computer programs should be used; our technical department can assist with this.

Example:

A pump weighing 1200kg is to be mounted on anti vibration mounts as the diagram opposite. The centre of mass, as given by the manufacturer, is shown marked 'CM'.

Load on points 1 & 3 = $300\text{mm} \div 900\text{mm} \times 1200\text{kg} = 400\text{kg}$

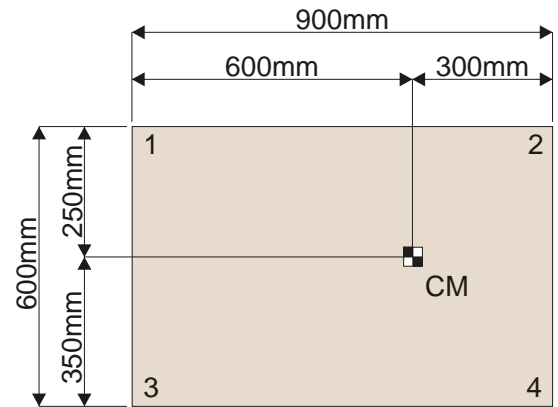
Load on points 2 & 4 = $600 \div 900 \times 1200 = 800\text{kg}$

Load on point 1 = $350 \div 600 \times (300 \div 900 \times 1200) = 233\text{kg}$

Load on point 2 = $350 \div 600 \times (600 \div 900 \times 1200) = 467\text{kg}$

Load on point 3 = $250 \div 600 \times (300 \div 900 \times 1200) = 167\text{kg}$

Load on point 4 = $250 \div 600 \times (600 \div 900 \times 1200) = 333\text{kg}$



(2) Selecting the type of anti vibration mount.

Once the load on each mounting point has been calculated, or if the information was given directly by the manufacturer, thought can be given to which type of mount is best suited to the type of equipment being supported, operating speed (speed of rotation), the supporting building structure, environmental conditions (e.g. wind loadings) and space availability. The table below is a brief guide to which type of AVM to use relative to the building structure.

Type of Equipment	Location in the Building									
	Supported Slab/Raft (Solid Floor)		Suspended Slab (Flexing Floor)							
	AVM Type	Deflection (mm)	6m Span		9m Span		12m Span		15m Span	
AVM Type			Deflection (mm)	AVM Type	Deflection (mm)	AVM Type	Deflection (mm)	AVM Type	Deflection (mm)	
Boilers	Pad	6	RS	25	RS	25	RS	50	RS	50
Compressors	Pad	6	RS	25	RS	25	RS	50	RS	50
Condensing Units	Rubber	6	RS	25	RS	25	RS	50	RS	75
Cooling Towers	Rubber	6	RS	50	RS	50	RS	75	RS	75
Air Handling Units	Rubber	6	S	25	S	50	S	50	S	50
Generating Sets	S	25	RS	25	RS	50	RS	50	RS	75
Pumps	>1000 rpm	Rubber	S	25	S	25	S	25	S	25
	<1000 rpm	S	S	25	S	50	S	75	S	75
Fans	>500 rpm	S	S	50	S	50	S	75	S	75
	<500rpm	S	S	50	S	75	S	75	S	100

Where S=Steel Spring, RS=Restrained Steel Spring, Pad=Rubber/cork Pad Material, Rubber=Rubber Turret Mount.

The mathematical model used for the selection of the anti vibration mounts is a simple spring/mass arrangement based on the supporting mass being very large compared with the equipment mass. In practice, if the equipment is placed on suspended supports of increasing span, then these act as further "springs" in the model which require a higher performance from the anti vibration mount. This usually means higher deflection in the case of a spring mount, although the amount of damping offered by the anti vibration mount may also need to be increased when faced with lightweight structures and "live" steel frameworks.

Rotating plant and equipment should have no out of balance forces and therefore need little isolation. Equipment manufacturers do endeavour to fully balance the rotating parts of their equipment, but this can never be fully achieved and the use of anti vibration mounts reduces further any transmission of vibration (and noise) to the building structure. The most versatile mount is that based on the helical steel compression spring. The linear performance characteristics are predictable and it is available in a very wide range of load ratings.

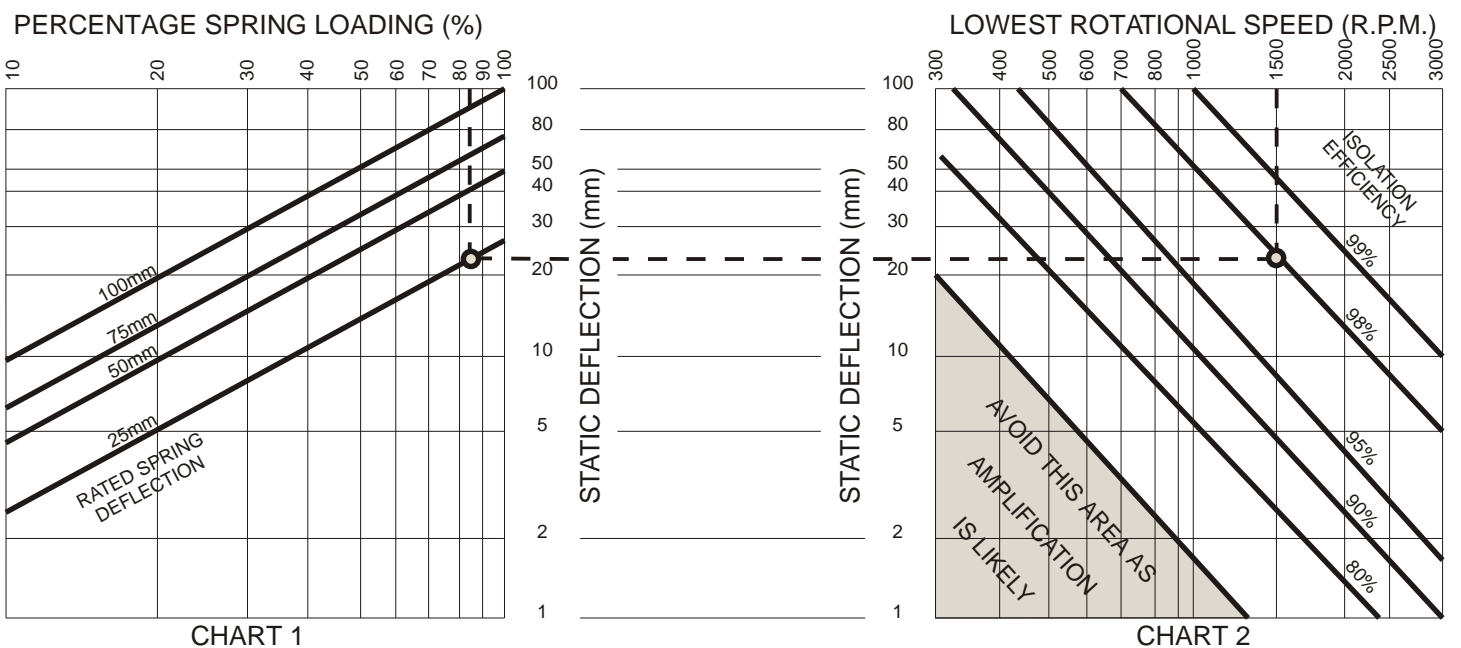
The often under used rubber turret compression mount can be used on a variety of equipment types. It is best suited to high speed equipment and where "live" steel supporting structures are present.

Equipment such as reciprocating compressors, diesel generators and condensing units have out of balance forces and require restraint from horizontal, and in some cases vertical movement. Where these types of equipment require isolation, a restrained steel spring mount should be used. This type of isolator should also be used for equipment subject to wind loadings, (eg when the equipment is installed on a roof), or where dramatic changes in the total equipment weight would alter the operational height of the mounts, (eg cooling towers).

Equipment that has little dynamic movement or has a large mass compared to it's volume can be supported on rubber pads / mats, or on composite pads such as those containing layers of cork and rubber.

(3) Selecting the size or load rating of the anti vibration mount

Having established the equipment load and type of mount, the next step is to determine the load rating of the mount. The selection will depend upon the load, the speed of rotation (usually the lowest) and the isolation efficiency required. The charts below enable prediction of the isolation efficiency based upon the speed of rotation and the percentage loading of the spring. When selecting rubber mounts, the charts will only give an approximate indication of the isolation efficiency because rubber has high inherent damping properties that reduce the maximum efficiency attainable.



For each of the load points in turn, look on the selected anti vibration mount data sheet and find the next highest load rating. Divide the actual load by the mount load rating to obtain the percentage loading. From CHART 1, select the Percentage from the X-axis and project a vertical line until it intersects the diagonal Deflection line. Read off the actual Static Deflection value and project horizontally across to CHART 2 until it intersects the Lowest Rotational Speed value. Then read off the Isolation Efficiency from the diagonal lines.

Example:

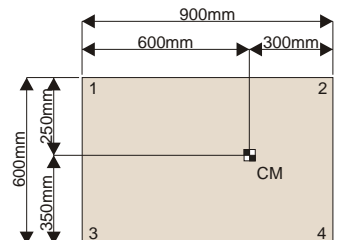
Continuing the previous example, we can now look in more detail at where the pump is in the building and what isolation efficiency can be expected. The pump is to be supported on a slab with a span of 6m and has an operating speed of 1500rpm.

The table on page 1 shows that the AVM type should be a steel spring with a static deflection of 25mm.

The load ratings available from the open spring mount data sheet are as follows:-
 Point 1 use 250kg load rating; point 2 use 500kg; point 3 use 200kg; point 4 use 400kg.

Then calculate the percentage loadings:-
 % load at point 1 = 233kg ÷ 250kg = 93% % load at point 2 = 467kg ÷ 500kg = 93%
 % load at point 3 = 167kg ÷ 200kg = 83% % load at point 4 = 333kg ÷ 400kg = 83%

The isolation efficiency for the lowest loaded spring taken from the charts above is 98%
 The actual static deflection of the spring at 83% loading is 0.83 x 25mm = 20.75mm



The above charts are derived from established formulae that relate the Equipment Vibration Frequency (f), the Natural Frequency of the system (fo), the actual Static Deflection of the steel spring (Xst), the Transmissibility (T) and the Efficiency (E) of the system, as follows:-

$$f = \frac{rpm}{60} \quad f_o = 15.8 \sqrt{\frac{1}{X_{st}}} \quad T = \frac{1}{\left(\frac{f}{f_o}\right)^2 - 1} \quad E = (1-T) \times 100\%$$

Example using the previous data:
 f = 1500 ÷ 60 = 25Hz
 fo = 15.8 x sqrt(1 ÷ 20.75mm) = 3.47Hz
 T = 1 ÷ [(25 ÷ 3.47) x (25 ÷ 3.47) - 1] = 0.0196
 E = (1 - 0.0196) x 100% = 98.04%

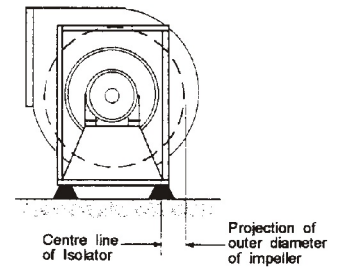
Positioning of Anti Vibration Mounts

(1) General notes

Anti vibration mounts or vibration isolators are generally designed to operate under the action of a force acting vertically. Helical steel springs and rubber springs must therefore be used in the vertical compressive mode only. Operation under any other mode will be detrimental to the operation and life expectancy of the isolator. However, special designs that incorporate additional snubbers and restraints are available, but are more complex. Isolators must always be positioned on a level surface and operated in the vertically straight position. The equipment supported must also be levelled and the majority of isolators provide this facility in their design.

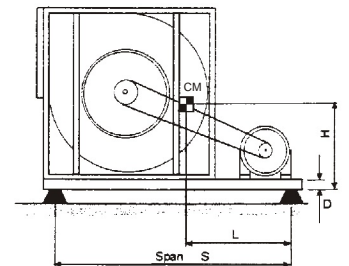
(2) Position of isolators relative to impellers

Out of balance forces should always be within the frame of reference of the isolators. It is common, on direct drive machines, particularly the small direct coupled industrial blower, to use the pedestal base holes as the location for the isolators. The nature of the configuration means invariably that the isolators are within the line of the outer diameter of the impeller. The effect of this during operation is that, as out of balance forces increase, there is an increased rocking mode of vibration on the isolators, for which they are not designed to attenuate. If this arrangement is being considered, then firstly select rubber turret mounts where ever possible; or secondly, if steel springs are used, select the restrained or closed spring mounts; using outrigger brackets to increase the horizontal distance between isolators.



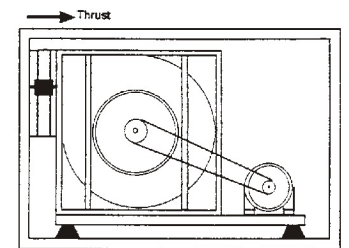
(3) Base frame considerations

Having noted previously that isolators should operate in the vertical mode, it is possible to perform complex calculations to determine the performance of the isolator when subjected to other modes of vibration. Simplicity can be aimed for and the use of empirical methods helps greatly. If the base frame is not very stiff in relation to the spring stiffness of the isolators, then a detrimental twisting of the frame will ensue during operation. This can be reduced by ensuring that the depth (D) of the frame is not less than 8% of the span (S) of the frame. A further rocking mode can be induced if the height of the centre of mass above the top of the isolators is greater than the horizontal distance to the isolators. Inertia bases are considered in their own section below.



(4) The effect of thrust

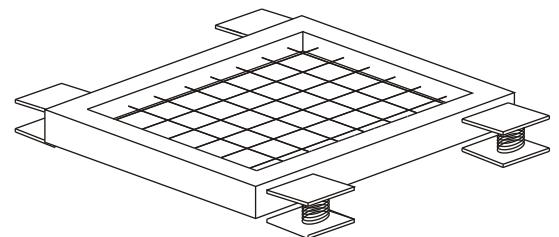
A fan with flexible duct connections, or a pump with flexible pipe connectors, at the inlets and outlets will produce a pressure thrust or reaction force. This thrust or force will be an addition to the loads already placed on the anti vibration mount or isolator and will be detrimental to the correct operation of the isolator. The approach to solving this effect is to introduce snubbing to the system. This could be in the form of thrust restraints; in the case of flexible connectors, tie bars are used with rubber bushings to restrain the thrust whilst providing isolation for vibration transmission. Snubbing may also be introduced at the isolator.



Inertia Base Considerations

Inertia bases are commonly used in building services plant areas to mount pumps etc and it is advised that this method is evaluated to overcome the problems associated with vibration. In short, inertia bases are used to:-

- * Give stability to a system
- * Lower the centre of gravity (mass) of a system
- * Reduce problems due to coupled modes
- * Minimise the effect of external forces
- * Ensure an even load distribution
- * Add rigidity to the equipment
- * Minimise the effect of errors in estimating the centre of gravity
- * Provide the equipment with suitable anti vibration mount fixing points
- * Reduce vibratory movement of the system due to equipment start-up and run-down, as the equipment passes through resonance.



Inertia bases are commonly used with helical spring mounts which are designed to reduce vibration in the vertical mode. This mode can be modelled as 'simple harmonic motion', but for this to be valid, all other modes of vibration, such as rocking and torsional modes must be minimised. To do this effectively, the following must be observed:-

- * The height of the centre of gravity above the top of the isolators for the combined base and equipment must be less than the horizontal distance to the isolators.
- * The isolators should be outside the boundary of the rotating mass.
- * All equipment must be rigidly coupled together as a common mass on a homogeneous platform.
- * The mass of the platform must be very high compared with the mass of the equipment.
ie The weight of the inertia base should be between 1.5 and 2.0 times that of the equipment being supported.

Remember that flexible pipe connectors must always be of 'tied' or 'restrained' type when using with pumps mounted on inertia bases or any vibration isolator.

Vibration from building services pipework

Although flexible pipe connectors are used to reduce the noise and vibration transmission between plant and pipework, there is always some small amount of transmission through the flexible element and through the heating or cooling water. Vibration is therefore usually present in the pipework installed in and near to plant areas. As the pipe is supported from the building structure, there will be a direct transmission through the support to the building fabric and subsequently to occupied building areas, unless the pipe support incorporates an anti vibration device such as a spring hanger.

Spring hanger selection

(1) Estimating the Force or Load on each support point.

As with plant equipment, the weight distribution at each hanger support point is dependent on the relative position of the centre of gravity for each unit length of pipe, pipe joint, pipe fitting (valve, strainer, etc). The actual load can be calculated by taking moments about each hanger point.

Example:

A water filled horizontal pipe is to be supported from the plantroom roof. It contains a valve and a strainer at the positions shown on the diagram, and is to be supported at the five points shown.

Firstly, the weight of each individual section of pipe and equipment must be determined (Appendices 1 & 2) as follows:-

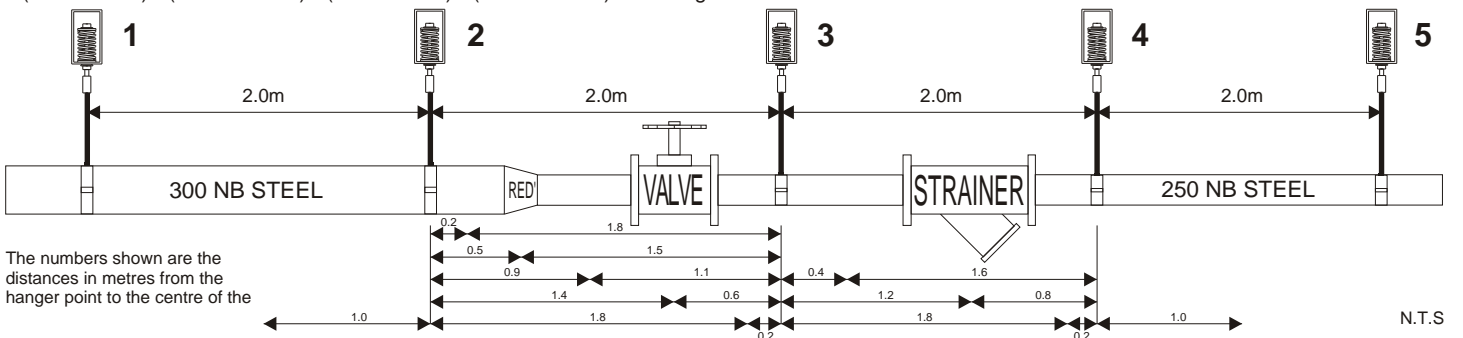
- Between hanger points we have:-
- Between points 1 & 2 we have 2.0m of 300 NB steel pipe (10mm wall) weighing 300kg
- Between points 2 & 3 we have 0.4m of 300 NB steel pipe (10mm wall) weighing 60kg
- Between points 2 & 3 we have a 300 to 250 reducer weighing 30kg
- Between points 2 & 3 we have 0.8m of 250 NB steel pipe (10mm wall) weighing 92kg
- Between points 2 & 3 we have a 250 NB gate valve weighing 234kg
- Between points 2 & 3 we have 0.4m of 250 NB steel pipe (10mm wall) weighing 46kg
- Between points 3 & 4 we have 0.8m of 250 NB steel pipe (10mm wall) weighing 92kg
- Between points 3 & 4 we have a 250 NB strainer weighing 300kg
- Between points 3 & 4 we have 0.4m of 250 NB steel pipe (10mm wall) weighing 46kg
- Between points 4 & 5 we have 2.0m of 250 NB steel pipe (10mm wall) weighing 230kg

Loads on points 1 and 5 can not be fully determined in this example as we do not know the extent of the pipework and fittings beyond these points. The moments about each hanger point are calculated as follows:-

Load on point 2
 $= (1.0m \div 2.0m \times 300kg) + (1.8m \div 2.0m \times 60kg) + (1.5m \div 2.0m \times 30kg) + (1.1m \div 2.0m \times 92kg) + (0.6m \div 2.0m \times 234kg) + (0.2m \div 2.0m \times 46kg) = 351.9kg$

Load on point 3
 $= (0.2 \div 2.0 \times 60) + (0.5 \div 2.0 \times 30) + (0.9 \div 2.0 \times 92) + (1.4 \div 2.0 \times 234) + (1.8 \div 2.0 \times 46) + (1.6 \div 2.0 \times 92) + (0.8 \div 2.0 \times 300) + (0.2 \div 2.0 \times 46) = 458.3kg$

Load on point 4
 $= (0.4 \div 2.0 \times 92) + (1.2 \div 2.0 \times 300) + (1.8 \div 2.0 \times 46) + (1.0 \div 2.0 \times 230) = 354.8kg$



(2) Selecting the type of spring hanger

As with plant equipment, the span of the supporting slab is relevant. For most applications a spring deflection of 25mm will be sufficient. The other consideration is whether the hanger should be a simple hanger or whether it should contain a loading plate for positioning the pipework during installation. The 'positioned' spring hanger saves much time and effort on site. Once the pipe is installed and levelled, the pipe load can be easily transferred to the spring isolating element.

(3) Selecting the load rating of the spring hanger

As with anti vibration mounts, the next highest load rating of spring is taken from the spring hanger data sheet. The efficiency is calculated in the same way as spring mounts.

Example:

The load ratings for the spring hangers in the example above available from the spring hanger data sheet are as follows:-
 Point 2 use 400kg load rating; point 3 use 500kg load rating; point 4 use 400kg load rating.
 The isolation efficiency is calculated in the same way as for spring mounts mentioned earlier.

(4) Determining the distance from the vibration source that pipes should be supported from spring hangers

This is dependent on pipe diameter and noise rating of building spaces adjacent to or within 5m of the plant. As a 'rule of thumb' use 100 pipe diameters for the 'standard' category of isolation where the adjacent space is >NR35 and 200 pipe diameters for the 'critical' category of isolation where the adjacent space is <NR35. It may be impractical to use these distances beyond the plant areas, such as with vertical mains; these applications will need discussion with our engineers.

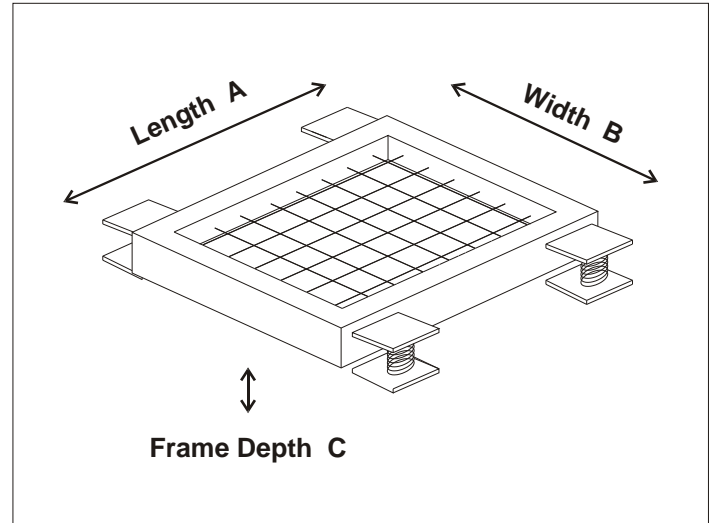
EMFLEX Inertia Base & Mount Packages

EMFLEX inertia base and mount packages are used beneath mechanical equipment to improve stability and to minimise the vibratory movement and noise transmission due to equipment start-up, operation and run-down.

They are designed and manufactured to meet with individual requirements and are suitable for mechanical equipment such as pumps, air handling units, chillers, booster sets, compressors, etc.

They are supplied to site ready for filling with concrete. We recommend that a concrete mix ratio of 4 parts gravel : 2 parts sand : 1 part cement is used to give a concrete density of 2,400 to 2,500 kg/m³.

We request that our engineers are contacted for assistance with this type of equipment.



Type IBMP

A package consisting of a pre-galvanised formed steel inertia frame, zinc plated steel reinforcing bars, zinc plated steel 'outrigger' mounting brackets and suitable anti vibration mounts to suit the mechanical equipment being isolated.

Heavy steel channel sections and steel angle section may be used where necessary.

The approximate concrete weight is calculated from:-
Weight (kg) = A x B x C x D

Where,

- A = Frame Length (m)
- B = Frame Width (m)
- C = Frame Depth (m)
- D = Concrete Density (2400kg/m³)

Approximate Concrete Weights in kg for Inertia Bases with DEPTH 'C' of 150mm						
WIDTH 'B'	LENGTH 'A'					
Remember to add mounting bracket outstand dimensions	500 mm	750 mm	1000 mm	1250 mm	1500 mm	1750 mm
	500 mm	90	135	180	225	270
750 mm		202	270	337	405	472
1000 mm			360	450	540	630
1250 mm				562	675	787
1500 mm					810	945
1750 mm						1102

Approximate Concrete Weights in kg for Inertia Bases with DEPTH 'C' of 200mm						
WIDTH 'B'	LENGTH 'A'					
Remember to add mounting bracket outstand dimensions	500 mm	750 mm	1000 mm	1250 mm	1500 mm	1750 mm
	500 mm	120	180	240	300	360
750 mm		270	360	450	540	630
1000 mm			480	600	720	840
1250 mm				750	900	1050
1500 mm					1080	1260
1750 mm						1470

Approximate Concrete Weights in kg for Inertia Bases with DEPTH 'C' of 250mm						
WIDTH 'B'	LENGTH 'A'					
Remember to add mounting bracket outstand dimensions	500 mm	750 mm	1000 mm	1250 mm	1500 mm	1750 mm
	500 mm	150	225	300	375	450
750 mm		337	450	562	675	787
1000 mm			600	750	900	1050
1250 mm				937	1125	1312
1500 mm					1350	1575
1750 mm						1837

Approximate Concrete Weights in kg for Inertia Bases with DEPTH 'C' of 300mm						
WIDTH 'B'	LENGTH 'A'					
Remember to add mounting bracket outstand dimensions	500 mm	750 mm	1000 mm	1250 mm	1500 mm	1750 mm
	500 mm	180	270	360	450	540
750 mm		404	540	674	810	944
1000 mm			720	900	1080	1260
1250 mm				1124	1350	1574
1500 mm					1620	1890
1750 mm						2204

The weight of the inertia base should be between 1.5 and 2.0 times that of the equipment being supported.

To reduce rocking modes, the height of the centre of gravity above the top of the isolators for the combined base and equipment must be less than the horizontal distance to the isolators.

Allow 150mm between equipment hold down bolts and the edge of the frame so as not to crack the concrete.

The guidance tables above show sizes of inertia bases that utilise 4 isolator mounting positions. Larger sizes are available and generally utilise more isolators.

EMFLEX Open Spring Mounts

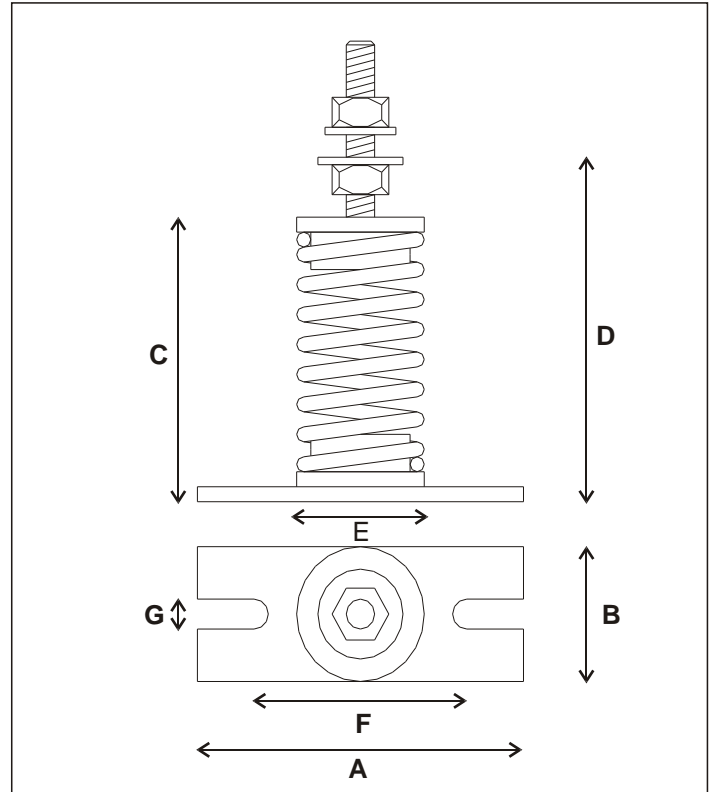
EMFLEX open spring mounts are used beneath mechanical equipment, either alone or in conjunction with inertia bases, to minimise the transmission of noise and vibration to the building structure.

They are suitable for mechanical equipment such as fans, pumps, air handling units, booster sets, etc and offer an economic solution to many vibration problems encountered with rotating plant.

Available with a standard deflection of 25mm. The spring will compress proportionally to the actual load applied; ie full compression of 25mm will be achieved when a load is applied which is equal to the load rating. The fixing bolt allows the equipment to be levelled when the spring mounts have been installed.

Type MOS

An open spring mount consisting of a colour coded steel spring and rubber isolating end caps with internal tapped steel inserts. Fitted to a plated steel base beneath and supplied with plated levelling / fixing bolt. A ribbed rubber acoustic pad is bonded to the underside of the base plate.



TYPE	SPRING COLOUR	LOAD RATING	STATIC DEFL'N	FIXING BOLT	Dim A	Dim B	UNLOADED			LOADED			Dim E	Dim F	Dim G
							C1	D1 (min)	D1 (max)	C2	D2 (min)	D2 (max)			
		kg	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
MOS-A	YELLOW	25	25	M8	77	40	74	94	114	49	69	89	40	57	M8
	GREEN	50													
	BLUE	75													
	RED	100													
MOS-B	BLACK	50	25	M12	110	60	110	140	160	85	115	135	60	81	M12
	WHITE	100													
	GREEN	150													
	YELLOW	200													
	BROWN	250													
	BLUE	300													
	PURPLE	400													
	RED	500													
MOS-C	BLACK	400	25	M16	150	100	142	178	200	117	153	175	85	112	M16
	YELLOW	600													
	GREEN	800													
	BLUE	1000													
	RED	1200													

High deflection (50mm) units are available.
Add suffix 'H' to the model type code. (e.g. MOS-A-H).
Dimensions are available on request.

EMFLEX Closed Spring Mounts

EMFLEX closed spring mounts are used beneath mechanical equipment, either alone or in conjunction with inertia bases, to minimise the transmission of noise and vibration to the building structure.

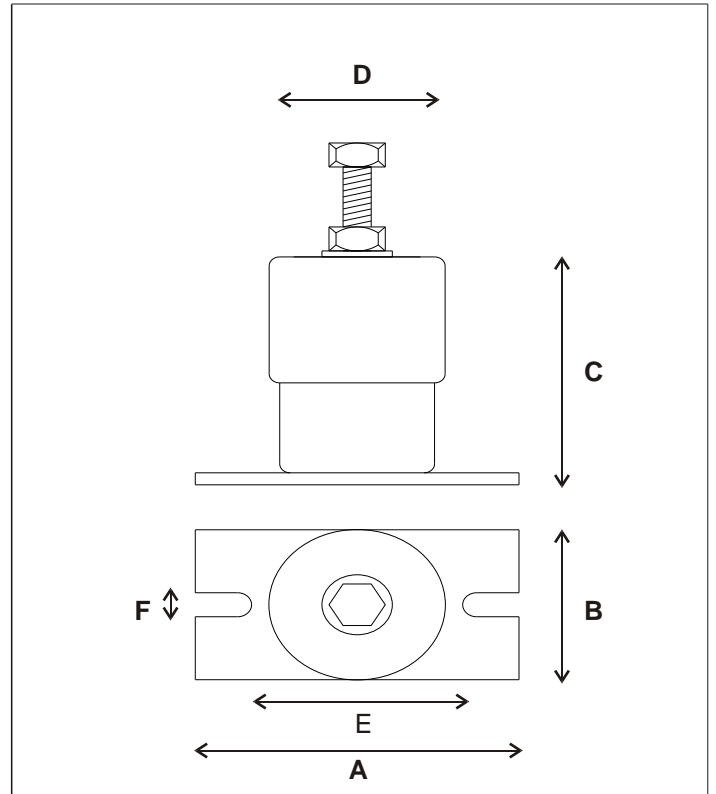
They are suitable for mechanical equipment such as fans, pumps, air handling units, booster sets, etc and offer an economic solution to many vibration problems encountered with rotating plant.

Available with a standard deflection of 25mm. The spring will compress proportionally to the actual load applied; ie full compression of 25mm will be achieved when a load is applied which is equal to the load rating. The fixing bolt allows the equipment to be levelled when the spring mounts have been installed.

These spring mounts have built-in snubbing which allows some control of vertical and horizontal movement. (Note:- Where large forces need to be controlled re movement, then EMFLEX restrained spring mounts must be used - please ask our engineers)

Type MCS

An enclosed spring mount consisting of a helical steel spring and plated steel cup enclosures with rubber O-ring to prevent metal to metal contact. Fitted to a plated steel base beneath and supplied with plated levelling / fixing bolt. A ribbed rubber acoustic pad is bonded to the underside of the base plate.



TYPE	COLOUR CODING	LOAD RATING	STATIC DEFL'N	FIXING BOLT	Base Plate Length	Base Plate Width	UNLOADED Height	LOADED Height	Housing Diameter	Hole Centres	Base Fixing
		kg	mm		mm	mm	mm	mm	mm	mm	mm
MCS-A	YELLOW	25	25	M8	77	40	70	70	50	67	M8
	GREEN	50									
	BLUE	75									
	RED	100									
MCS-B	BLACK	50	25	M10	150	100	76	76	90	120	M10
	WHITE	100									
	GREEN	150									
	YELLOW	200									
	BROWN	250									
	BLUE	300									
	PURPLE	400									
RED	500										
MCS-C	BLACK	400	25	M12	230	150	83	83	140	195	M12
	YELLOW	600									
	GREEN	800									
	BLUE	1000									
	RED	1200									

High deflection (50mm) units are available.
Add suffix 'H' to the model type code. (e.g. MCS-A-H).
Dimensions are available on request.

EMFLEX Restrained Open Spring Mounts

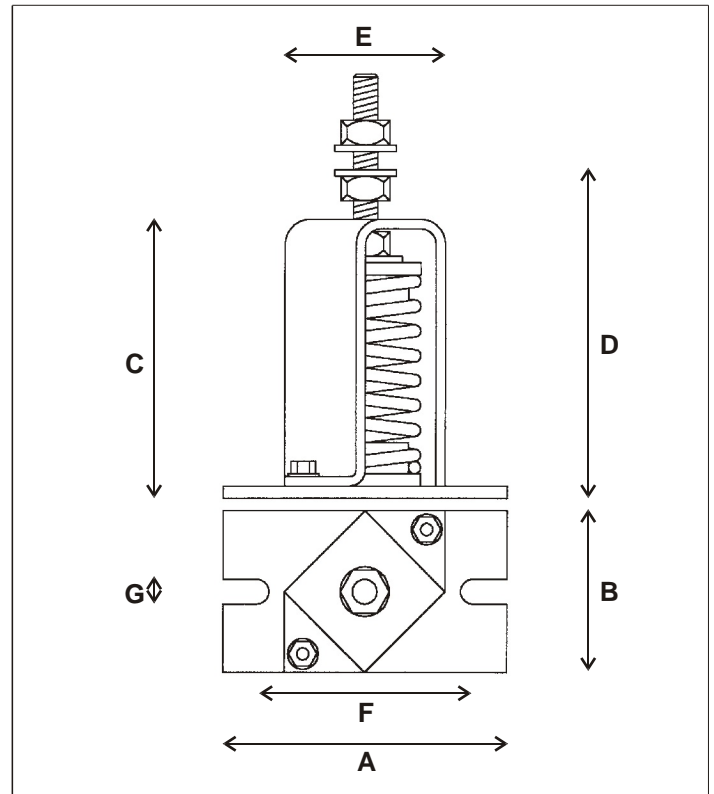
EMFLEX restrained open spring mounts are used beneath mechanical equipment, either alone or in conjunction with inertia bases, to minimise the transmission of noise and vibration to the building structure. They are designed to ensure that once the vertical load is applied, the horizontal and vertical forces are restrained without affecting the isolation efficiency.

They are suitable for mechanical equipment such as chillers, fans, pumps, air handling units, booster sets, etc and offer an economic solution to many vibration problems encountered with plant.

Available with a standard deflection of 25mm. The spring will compress proportionally to the actual load applied; ie full compression of 25mm will be achieved when a load is applied which is equal to the load rating. The fixing bolt allows the equipment to be levelled when the spring mounts have been installed.

Type MROS

An open spring mount consisting of a colour coded steel spring and rubber isolating end caps with internal tapped steel inserts. Fitted to a plated steel base beneath and complete with a restraint housing which is designed to provide maximum resistance to horizontal plane forces. Supplied with levelling / fixing bolt. A ribbed rubber acoustic pad is bonded to the underside of the base plate.



TYPE	SPRING COLOUR	LOAD RATING	STATIC DEFL'N	FIXING BOLT	Dim A	Dim B	Dim C	UNLOADED		LOADED		Dim E	Dim F	Dim G
								D1 (min)	D1 (max)	D2 (min)	D2 (max)			
		kg	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
MROS-B	BLACK	50	25	M12	150	100	135	175	200	175	175	95	120	M10
	WHITE	100												
	GREEN	150												
	YELLOW	200												
	BROWN	250												
	BLUE	300												
	PURPLE	400												
RED	500													
MROS-C	BLACK	400	25	M16	290	100	200	230	255	230	230	120	250	M12
	YELLOW	600												
	GREEN	800												
	BLUE	1000												
	RED	1200												

High deflection (50mm) units are available.
Add suffix 'H' to the model type code. (e.g. MROS-A-H).
Dimensions are available on request.

EMFLEX Heavy Duty Restrained Spring Mounts

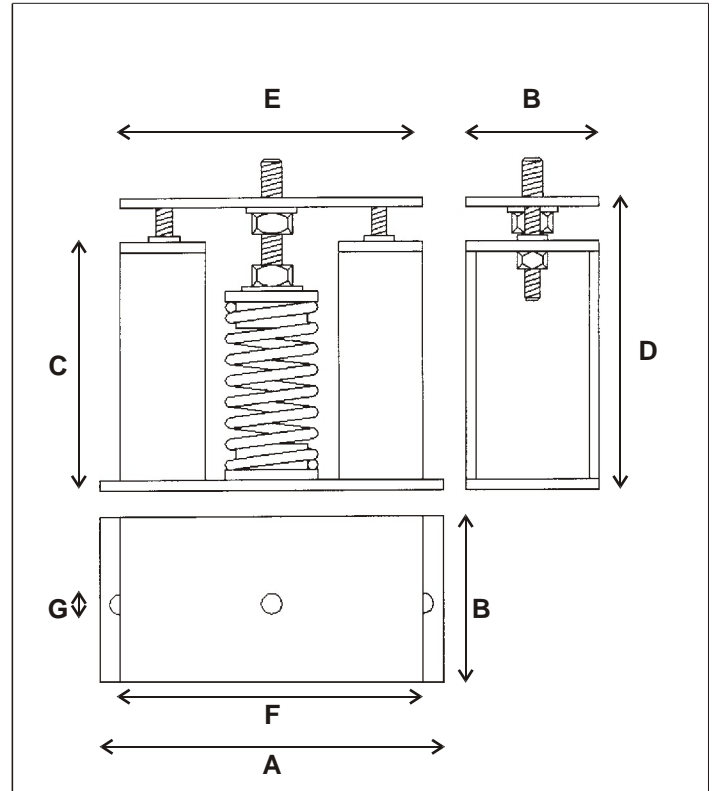
EMFLEX heavy duty restrained spring mounts are used beneath mechanical equipment, either alone or in conjunction with inertia bases, to minimise the transmission of noise and vibration to the building structure. They are designed to ensure that once the vertical load is applied, the horizontal and vertical forces are restrained without affecting the isolation efficiency.

They are suitable for mechanical equipment such as chillers, cooling towers, fans, pumps, air handling units, booster sets, etc and offer an economic solution to many vibration problems encountered with plant.

Available with a standard deflection of 25mm. The spring will compress proportionally to the actual load applied; i.e. full compression of 25mm will be achieved when a load is applied which is equal to the load rating. The fixing bolt allows the equipment to be levelled when the spring mounts have been installed.

Type MROS-HD

An open spring mount consisting of a colour coded steel spring and rubber isolating end caps with internal tapped steel inserts. Fitted to a plated steel base beneath and complete with two heavy steel channel restraint housings and heavy top plate to provide maximum resistance to forces. A ribbed rubber acoustic pad is bonded to the underside of the base plate.



TYPE	SPRING COLOUR	LOAD RATING kg	STATIC DEFL'N mm	FIXING BOLT	Base Plate Length mm	Base Plate Width mm	Channel Height mm	Working Height mm	Top Plate Length mm	Hole Centres mm	Base Fixing mm
MROS-HD-B	BLACK	50	25	M12	200	75	154	172	166	150	M12
	WHITE	100									
	GREEN	150									
	YELLOW	200									
	BROWN	250									
	BLUE	300									
	PURPLE	400									
RED	500										
MROS-HD-C	BLACK	400	25	M16	250	100	197	215	215	200	M12
	YELLOW	600									
	GREEN	800									
	BLUE	1000									
	RED	1200									
MROS-HD-D	PURPLE	1500	25	M24	375	150	225	250	315	225	M16
	YELLOW	2000									
	RED	3000									

High deflection (50mm) units are available.
Add suffix 'H' to the model type code. (e.g. MROS-HD-A-H).
Dimensions are available on request.

EMFLEX Rubber Turret Mounts

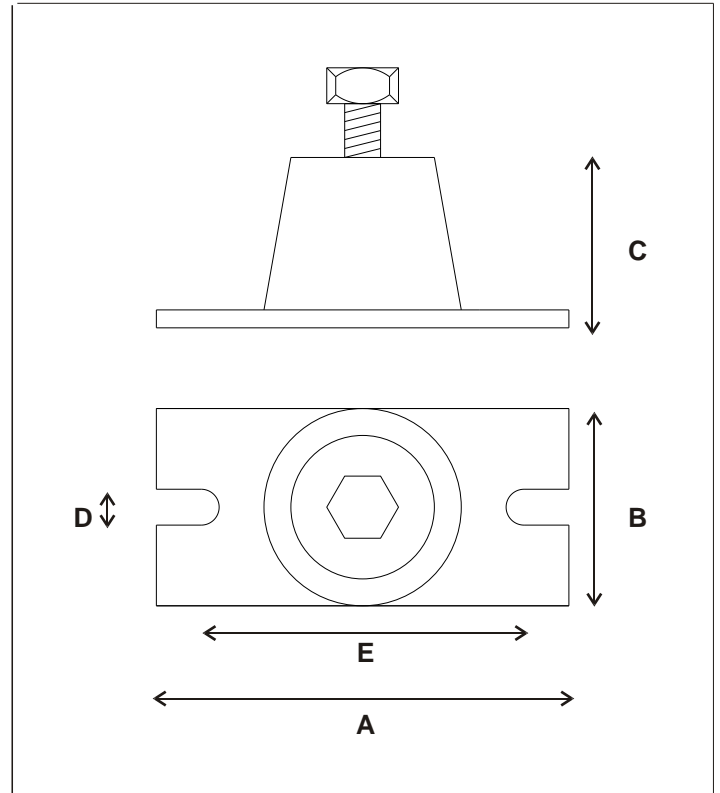
EMFLEX rubber turret mounts are used beneath mechanical equipment, either alone or in conjunction with inertia bases, to minimise the transmission of noise and vibration to the building structure. They are also used for snubbing of rocking modes with plant and as isolators for floating floors etc.

They are available for load ratings up to a maximum of 1200kg per mount. The rubber element will compress proportionally to the actual load applied; ie full compression will be achieved when a load is applied which is equal to the load rating.

The fixing bolt allows ease of fixing to inertia bases, plant frames and other equipment items.

Type MNR

A moulded rubber turret mount consisting of a colour coded rubber element with threaded steel inserts in the top and bottom. Fitted to a plated steel base beneath and supplied with a plated levelling / fixing bolt. A ribbed rubber acoustic pad is bonded to the underside of the base plate.



TYPE	COLOUR CODE	LOAD RATING	STATIC DEFL'N	FIXING BOLT	Dim A LENGTH	Dim B WIDTH	Dim C HEIGHT	Dim D HOLE DIA	Dim E CENTRES
		kg	mm		mm	mm	mm	mm	mm
MNR-A	RED	25	4	M8	75	40	26	7	57
	YELLOW	60							
	BLUE	85							
MNR-B	RED	100	8	M10	110	60	39	13	71
	YELLOW	200							
	BLUE	300							
MNR-C	RED	300	10	M12	150	90	63	13	108
	YELLOW	450							
	BLUE	600							
MNR-D	RED	800	10	M16	150	100	63	13	120
	YELLOW	1000							
	BLUE	1200							

EMFLEX Damping & Isolating Sheets

EMFLEX damping and isolating sheets are used primarily for damping purposes but at higher forcing frequencies they have inherent isolation properties. They can be used as a damping sheet beneath mechanical equipment, either alone or in conjunction with cast concrete inertia block sandwich, to reduce the transmission of noise and vibration to the building structure.

They can be applied as a damping sheet beneath mechanical equipment such as pumps, air handling units, boilers, booster sets, etc. When used for isolation please ask our engineers about the suitability of the application.

Individual pads or strips can be cut to size if required.

Type NRP

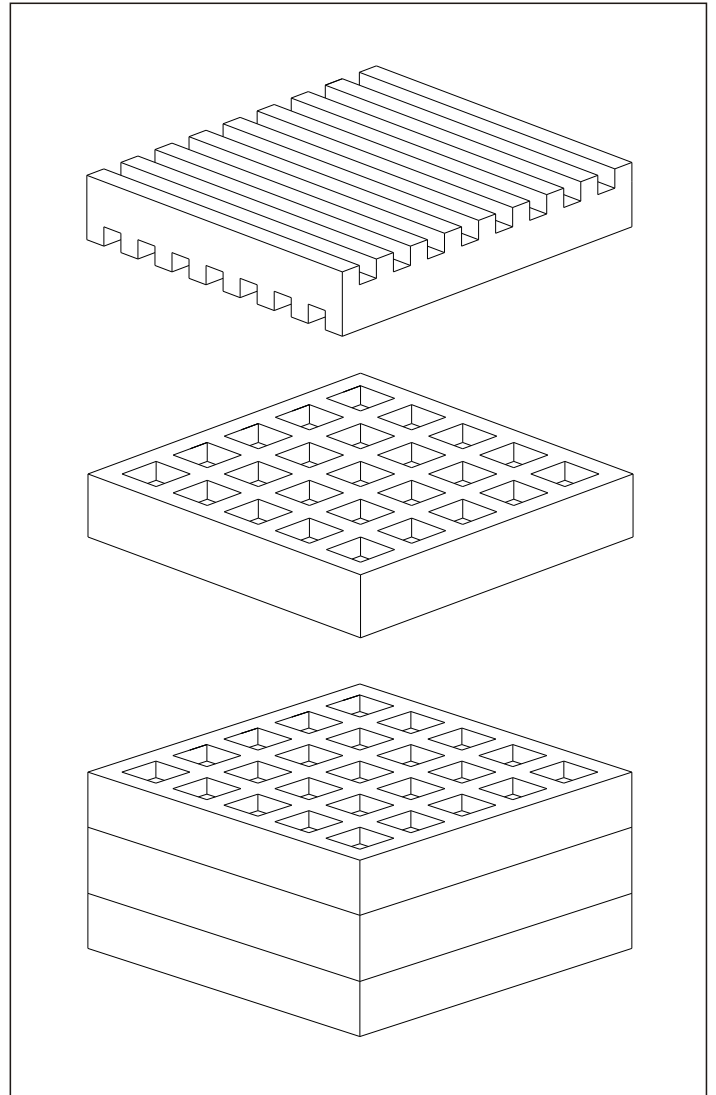
A ribbed rubber damping sheet consisting of bi-directional profiled top and bottom surfaces. These sheets can be bonded together with intermediate steel shim plates to form composites giving higher deflections and different damping properties.

Type NWP

A rubber damping sheet similar to NRP but consisting of profiled grids (or 'waffles') on the top and bottom surfaces. These sheets can be bonded together with intermediate steel shim plates to form composites giving higher deflections and different damping properties.

Type NCN

A cork sheet laminated between two rubber damping sheets with profiled grids (or 'waffles') on the top and bottom surfaces. Good for acoustical problems.



TYPE	COLOUR	LOAD RATING	DEFLECTION	Dim A LENGTH	Dim B WIDTH	Dim C THICKNESS
		kg/cm ²	mm	mm	mm	mm
NRP	BLACK	8.0	2.5	1000	300	10
NWP	BLACK	8.0	1.5	900	450	8
		6.0				
		4.0				
		2.5				
NCN	BLACK	2.5	2.5	450	450	27
				300	300	
				150	150	
				100	100	
				75	75	
				50	50	

EMFLEX Spring Hangers

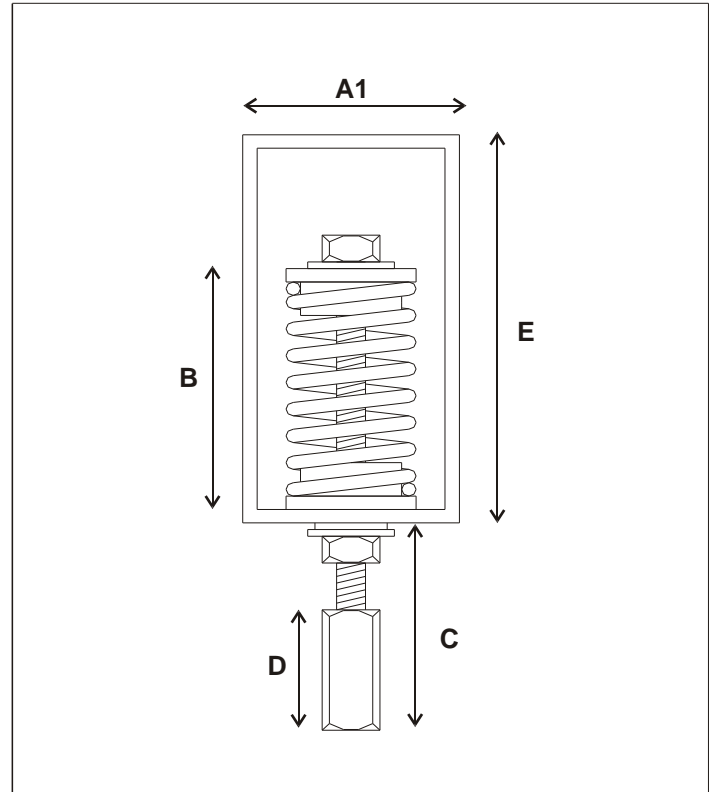
EMFLEX spring hangers are used to support pipework from above, to minimise the transmission of noise and vibration to the building structure.

They may be suspended from drop rods above or bolted directly to the soffit or slab.

Available with a standard deflection of 25mm. The spring will compress proportionally to the actual load applied; ie full compression of 25mm will be achieved when a load is applied which is equal to the load rating.

Type HS

An open spring hanger consisting of a colour coded steel spring and rubber isolating end caps. Fitted in a plated steel hanger box. Complete with fixing stud and connector for fixing lower drop rod.



TYPE	SPRING COLOUR	LOAD RATING	STATIC DEFL'N	FIXING STUD	Dim A1 WIDTH	Dim A2 DEPTH	UNLOADED		LOADED		Dim D CONNECTOR	Dim E
							Dim B1	Dim C1	Dim B2	Dim C2		
		kg	mm		mm	mm	mm	mm	mm	mm	mm	mm
HS-A	YELLOW	25	25	M8	50	60	72	70	47	95	24	100
	GREEN	50										
	BLUE	75										
	RED	100										
HS-B	BLACK	50	25	M12	100	80	105	90	80	115	36	150
	WHITE	100										
	GREEN	150										
	YELLOW	200										
	BROWN	250										
	BLUE	300										
	PURPLE	400										
	RED	500										
HS-C	BLACK	400	25	M16	100	100	150	125	125	150	48	200
	YELLOW	600										
	GREEN	800										
	BLUE	1000										
	RED	1200		M20								
HS-D	WHITE	1500	25	M20	150	125	145	105	120	130	60	250
	YELLOW	2000		M24	200	150	165	130	140	155	75	300
	RED	3000		M30	200	150	200	145	175	170	75	350

High deflection (50mm) units are available.
Add suffix 'H' to the model type code. (e.g. HS-A-H).
Dimensions are available on request.

Note: the fixing stud size is based on safe working loads stated in BS3974.

EMFLEX Positioned Spring Hangers

EMFLEX positioned spring hangers are used to support pipework from above, to minimise the transmission of noise and vibration to the building structure.

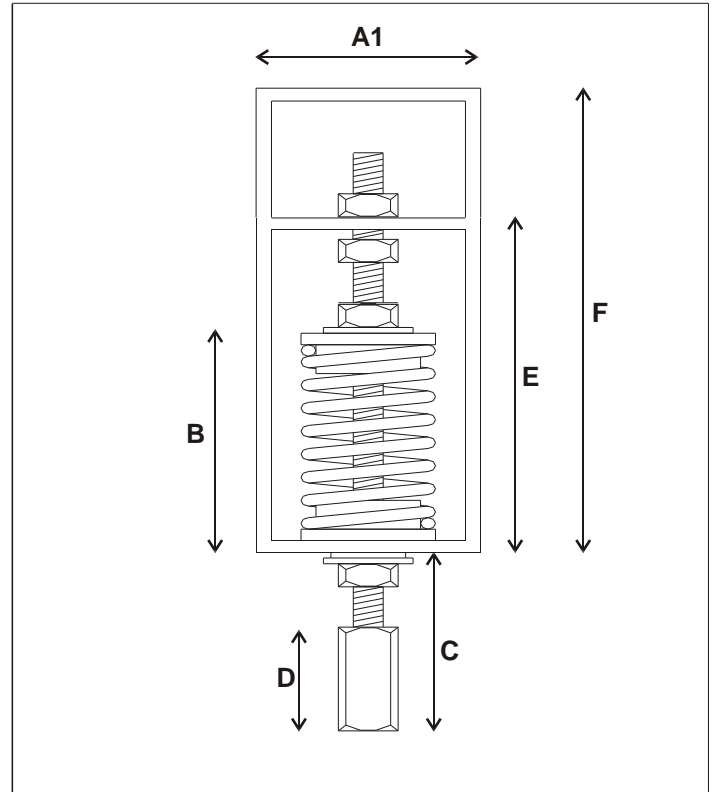
They are specifically designed with a positioning plate for initial supporting and levelling of the pipework during installation. When the pipe is fully installed and filled, the load is transferred to the isolating spring by adjustment of the nuts on the fixing stud.

They may be suspended from drop rods above or bolted directly to the soffit or slab.

Available with a standard deflection of 25mm. The spring will compress proportionally to the actual load applied; ie full compression of 25mm will be achieved when a load is applied which is equal to the load rating.

Type HPS

An open positioned spring hanger consisting of a colour coded steel spring and rubber isolating end caps. Fitted in a plated steel hanger box with integral positioning plate. Complete with fixing stud and connector for fixing lower drop rod.



TYPE	SPRING COLOUR	LOAD RATING	STATIC DEFL'N	FIXING STUD	Dim A1 WIDTH	Dim A2 DEPTH	UNLOADED		LOADED		Dim D	Dim E	Dim F
							Dim B1	Dim C1	Dim B2	Dim C2			
		kg	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm
HPS-A	YELLOW	25	25	M8	100	60	72	70	47	70	24	110	150
	GREEN	50											
	BLUE	75											
	RED	100											
HPS-B	BLACK	50	25	M12	100	80	105	90	80	90	36	150	200
	WHITE	100											
	GREEN	150											
	YELLOW	200											
	BROWN	250											
	BLUE	300											
	PURPLE	400											
	RED	500											
HPS-C	BLACK	400	25	M16	100	100	150	125	125	125	48	200	300
	YELLOW	600											
	GREEN	800											
	BLUE	1000											
	RED	1200											
HPS-D	WHITE	1500	25	M20	150	125	145	105	120	130	60	215	350
	YELLOW	2000		M24	200	150	165	130	140	155	75	260	400
	RED	3000		M30	200	150	200	145	175	170	75	300	450

High deflection (50mm) units are available.
Add suffix 'H' to the model type code. (e.g. HPS-A-H).
Dimensions are available on request.

Note: the fixing stud size is based on safe working loads stated in BS3974.

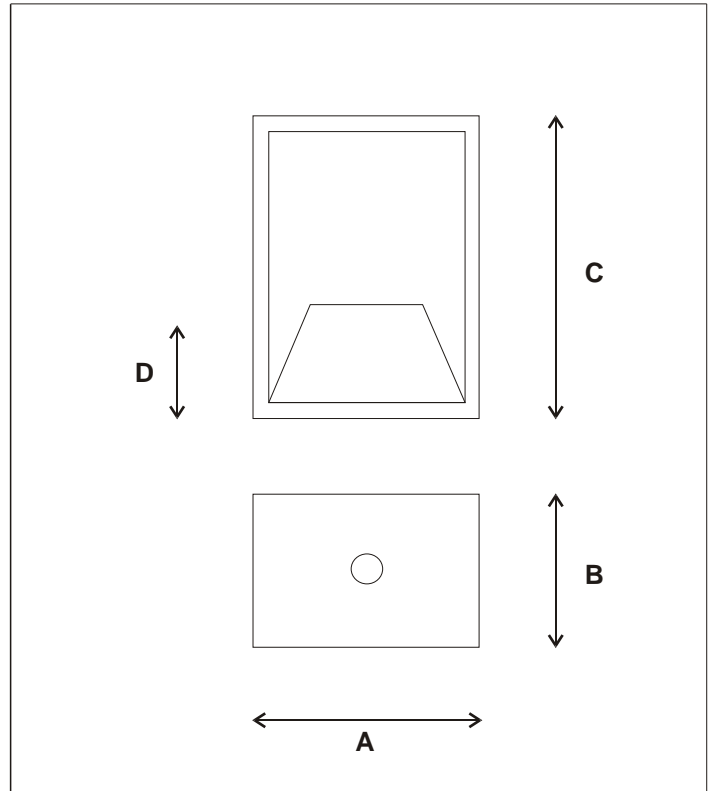
EMFLEX Ductwork Rubber Hangers

EMFLEX ductwork rubber hangers are an economic solution for isolating building services ductwork from the structure.

They are available for load ratings up to a maximum of 200kg per hanger. The rubber turret element will compress proportionally to the actual load applied; ie full compression will be achieved when a load is applied which is equal to the load rating.

Type HR

A moulded rubber turret hanger consisting of a colour coded rubber element fitted in an aluminium hollow section housing. Fixing holes allow for installation in standard stud.



TYPE	COLOUR CODE	LOAD RATING	STATIC DEFL'N	FIXING STUD	Dim A LENGTH	Dim B WIDTH	Dim C HEIGHT	Dim D TURRET HEIGHT
		kg	mm		mm	mm	mm	mm
HR-A	RED	25	4	M8	50	40	75	26
	YELLOW	60						
	BLUE	85						
HR-B	RED	100	8	M10	100	60	100	40
	YELLOW	200						

Appendix 1

Water Filled Pipe / Insulation / Flange Weights

Nominal Pipe Size	Mass of Insulation (density 200kg/m ³)			Approximate Mass of Pipe and Water at the Pipe Wall Thickness shown												
				Steel												Copper
	25mm Thick	50mm Thick	75mm Thick	BS1387 Heavy	BS1387 Medium	3.2 mm	4.0 mm	5.0 mm	6.3 mm	8.0 mm	10.0 mm	12.5 mm	16.0 mm	20.0 mm	25.0 mm	Table 'X'
mm	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m	kg/m
15	0.7	2.3	4.6	1.6	1.4	1.6	1.8	2.1	2.4							0.4
20	0.8	2.4	4.8	2.2	2.0	2.2	2.5	2.9	3.4							0.8
25	0.9	2.6	5.1	3.5	3.0	3.0	3.4	4.0	4.6	5.3						1.2
32	1.1	2.9	5.6	4.8	4.2	4.2	4.7	5.5	6.4	7.4						2.0
40	1.2	3.1	5.8	5.7	5.0	4.9	5.6	6.5	7.5	8.8	10					2.6
50	1.3	3.5	6.4	8.2	7.3	6.8	7.7	8.8	10.2	11.9	14	16				3.9
65	1.6	4.0	7.1	11.4	10.2	9.6	11	12	14	16	19	22	25	29		5.4
80	1.8	4.4	7.8	15	14			15	17	20	23	27	31	36		7.3
100	2.2	5.2	8.9	23	21			22	25	28	33	38	44	51	58	13.1
125	2.6	6.0	10.2	31	30			30	33	38	43	50	58	67	77	18.8
150	3.0	6.8	11.4	40	38			40	44	50	56	64	75	86	99	27.7
200	3.8	8.4	13.7							74	83	93	108	123	142	
250	4.6	10.1	16.1							104	115	129	147	167	192	
300	5.4	11.6	18.6								150	166	188	213	243	
350	6.2	13.2	21.0								174	192	216	244	277	
400	7.0	14.8	23.3								215	236	264	296	335	
450	7.8	16.3	25.7								260	283	316	352	397	
500	8.6	17.9	28.0								310	336	372	413	463	
600	10.1	21.0	32.8								421	452	496	546	606	

Nominal Pipe Size	Approximate Mass of Pipe Flange for the Type and PN Rating shown														
	For Steel Pipe										For Copper Pipe				
	Steel Bored Flange (code 101)					Steel Blank Flange (code 105)					Bi-metal flange		Gun-metal Blank		
	PN6	PN10	PN16	PN25	PN40	PN6	PN10	PN16	PN25	PN40	PN6	PN16	PN6	PN16	
mm	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg		
15	0.4	REFER TO PN16 RATING	0.7	REFER TO PN40 RATING	0.7	0.5	REFER TO PN16 RATING	0.8	REFER TO PN40 RATING	0.8	0.4	0.7	0.5	0.9	
20	0.6		1.0		1.0	0.7		1.1		1.1	0.6	1.0	0.8	1.2	
25	0.8		1.2		1.2	0.9		1.3		1.3	0.8	1.2	1.0	1.5	
32	1.2		2.0		2.0	1.4		2.2		2.2	1.2	2.0	1.6	2.5	
40	1.4		2.2		2.2	1.7		2.5		2.5	1.4	2.2	1.9	2.8	
50	1.6		2.9		2.9	1.9		3.4		3.4	1.6	2.9	2.2	3.8	
65	2.0		3.5		3.5	2.5		4.2		4.2	2.0	3.5	2.9	4.8	
80	3.1		4.0		4.0	4.0		5.0		5.0	3.1	4.0	4.5	5.6	
100	3.4		4.8		4.8	6.7		4.9		6.6	8.9	3.4	4.8	5.5	7.4
125	4.7		5.8		5.8	9.2		7.1		8.5	12.7	4.7	5.8	8.1	9.6
150	5.1	7.8	7.8	11.4	8.7	12.1	16.8	5.1	7.8	9.8	13.6				
200	7.3	9.9	10.8	16.0	20.5	14.0	17.2	18.7	25.7	31.4					
250	9.6	12.9	15.8	22.7	32.9	20.9	25.2	29.5	39.2	52.8					
300	12.9	14.7	20.8	30.3	47.2	28.8	31.9	42.0	55.5	79.0					
350	17.9	21.9	30.7	46.7	69.5	38.7	44.3	58.7	80.3	112.7					
400	21.3	29.8	39.5	61.5	99.3	50.7	63.4	79.3	109.7	162.2					
450	26.2	36.8	51.1	73.1	104.8	65.9	84.5	106.8	139.3	192.2					
500	28.5	43.8	70.8	93.7	137.1	77.4	105.9	145.9	185.2	254.7					
600	37.8	59.7	105.2	141.2	215.1	113.2	158.6	227.7	301.3	412.9					

Appendix 2

Approx' Water Filled Pipe Fitting & Steelwork

Nominal Pipe Size	Approximate Mass of Iron/Steel Pipe Fitting and Water to suit Flanged/Welded Steel Pipes													
	Rated for 16 bar							Wall thickness = 5mm for 150dia & below; 10mm for 200dia & above						
	Gate Valve	Swing Check	Wafer Check	Globe Valve	Butter-fly	Double Reg'	Strainer	45 deg Bend	90 deg Bend (Short Rad)	Return Bend	Twin Elbow	Equal Tee	Reducer (to size below)	
mm	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
50	22	12	2	25	6	11	14	0.5	1.0	2.1	1.5	1.0	0.5	
65	26	17	3	30	7	21	24	0.9	1.8	3.6	2.7	1.5	0.9	
80	36	21	4	38	11	26	32	1.5	2.9	5.8	4.4	2.4	1.5	
100	52	29	7	58	12	41	48	2.4	4.9	9.8	7.3	4.4	2	
125	73	47	9	77	15	60	78	4.2	8.3	17	12	7.5	4	
150	94	60	12	105	16	78	104	6.5	13	26	19	12	6	
200	148	126	19		28	150	182	20	39		59	33	12	
250	234	186	25		39	270	300	33	66		100	57	21	
300	319	278	37		45	320	460	52	104		156	90	30	
350					100			76	152		228	121	57	
400					138			107	213		320	172	75	
450					175			144	288		432			
500					230			189	379		568			
600					340			306	611		917			

Nominal Pipe Size	Approximate Mass of Iron/Steel Pipe Fitting and Water to suit Flanged/Welded/BSP Steel Pipes - PN16 Rated													
	Tied Rubber Flex Flanged	Braided S/S Flex Flanged	Bellows S/S Flex Flanged	Axial Exp Joint Flanged	Artic' Exp Joint +/-25mm movement	Angular Exp Joint Flanged	Gimbal Exp Joint Flanged	Centrifugal Air Sep'	Micro-bubble Air Sep'	Micro-bubble Air/Dirt Sep'	Dirt Sep'			
mm	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg			
15		1.5												
20		2.3							1.9					
25	4.8	2.9						2.7	2.6					
32	4.8	4.6						2.7	3.4					
40	5.3	5.4						3.2	3.5					
50	5.4	7.4	11.7	6.4	15.1	8.0	13.4	4.6	21.5	25				
65	7.4	9.7	13.6	7.7	20.5	9.1	16.7	30.7	22.5	26				
80	8.0	11.9	17.1	8.9	25.7	10.2	18.9	32.9	54.5	63	125			
100	11.6	16.3	19.3	11.0	38	12.6	29	116.4	57.5	66	170			
125	14.4	21.3		18.4	52	19.5	36	120	106	135	255			
150	17.6	32.5		22.3	74	24.2	48	138	110	139	410			
200	32			38	115	35	74		178		545			
250	47			52	142	40	123		370		800			
300					220	109	159		400		1025			
350									870		1320			
400									920					

Approximate Mass of Steel Support Sections in kg per metre length												
Channel Section (RSC) to BS4 Part 1				Equal Angle Section (RSA) to BS4 Part 1				Square Hollow Section to BS4848 Part 2				
76 x 38	6.7		178 x 76	20.84	25 x 25 x 4	1.47	60 x 60 x 6	5.42	40 x 40 x 5	5.4	90 x 90 x 8	20.4
102 x 51	10.42		178 x 89	26.81	30 x 30 x 5	2.18	70 x 70 x 6	6.38	50 x 50 x 5	6.97	100 x 100 x 8	22.9
127 x 64	14.9		203 x 76	23.82	40 x 40 x 5	2.97	80 x 80 x 8	9.63	60 x 60 x 5	8.54	120 x 120 x 10	34.2
152 x 76	17.88		203 x 89	29.78	45 x 45 x 5	3.38	90 x 90 x 8	10.9	70 x 70 x 5	10.1	140 x 140 x 10	40.4
152 x 89	23.84		229 x 76	26.06	50 x 50 x 5	3.77	100 x 100 x 8	12.2	80 x 80 x 8	17.8	150 x 150 x 10	43.6

N.MINIKIN AND SONS LIMITED

CONDITIONS OF BUSINESS

1.00

The following conditions ("the Conditions") apply to and are deemed to be incorporated in all contracts for the sale of Goods by N. Minikin & Sons Limited ("the Company") to the buyer and the provision of advice or other services ("Services") by Salesmen or Engineers employed by the Company either during telephone negotiations or site or office visits and the Buyer acknowledges that these Conditions exclusively define the relationship and agreement between the Company and Buyer and that they supersede all other agreements and conditions between the parties. No variation in these Conditions, expressed or implied, shall be accepted by the Company unless expressly agreed in writing and signed by a director of the Company and signed on behalf of the Buyer

2.00

To the extent that these Conditions limit or exclude the liability of the Company to the Buyer or any person claiming through or under the buyer such limitation or exclusion of liability is imposed to avoid the need for the Company to increase the level of its insurance against the risks so limited or excluded, and thereby to minimise the cost to the Buyer of the Goods or Services supplied. If the Buyer nevertheless wishes the Company to be responsible for risks, or liability which is otherwise limited or excluded by these Conditions, then the Company will, at its option, quote an alternative price for the supply of the Goods or Services to reflect the additional cost of obtaining the appropriate additional insurance or other appropriate cover

3.00

All orders for the Goods made by the Buyer, orally or by telephone, shall be confirmed to the Company by the Buyer, in writing (including telex or fax) within 48 hours of being received by the Company whereupon a binding contract for the purchase by the Buyer of the Goods comprised in the order upon these Conditions shall be concluded. Any order made by the Buyer is subject to acceptance by the Company and a Contract will only be formed when the Company has accepted the Buyer's offer to buy

4.00

CANCELLATION AND RETURNS

4.01

No cancellation by the Buyer is permitted except where previously agreed in writing by a Director of the Company

4.02

The Buyer will in the event of cancellation by the Buyer not previously agreed as aforesaid indemnify the company fully against all expenses incurred up to the time of such cancellation together with by way of liquidated damages a sum of 50% of the contract price such sum being intended to represent a genuine pre-estimate by the Company and the Buyer of the loss (apart from the said expenses) suffered by the Company by reason of such cancellation and which shall be paid by the Buyer to the Company forthwith on cancellation

4.03

Goods supplied cannot be returned for credit without the previous approval in writing of the Company. A minimum handling charge of 30% will be made on the value of the Goods returned together with all carriage charges shall be paid by the Buyer. Specially manufactured items cannot be returned after delivery and orders for such items cannot be cancelled

5.00

DELIVERY

5.01

The Buyer shall accept delivery by the Company or its agents on the date, or within the time period stipulated by the Company. However, any time or period for delivery stipulated by the Company shall be deemed an estimate only and the Company shall not be liable in any way for the costs and consequences of any delay except where the parties agree otherwise in writing

5.02

The Company may make and the Buyer shall accept deliveries of the Goods comprised in any order by instalments

5.03

Delivery will be made by or on behalf of the Company to anywhere within the United Kingdom specified by the Buyer. Delivery to the Buyer's carrier or agent shall be deemed to be delivery to the buyer for the purpose of these Conditions of Business

6.00

TERMS OF PAYMENT

6.01

Unless otherwise expressly agreed in writing in accordance with Condition 1 payment for the Goods or Services will be made within 30 days after the end of the month in which the Goods or Services in question are delivered or rendered to the Buyer (except for any of the Goods in respect of which a claim has been made by the Buyer in accordance with Condition 12.00 hereof) No discount or allowance shall be made (unless otherwise agreed). Interest on any overdue account may be charged on a day to day basis, with monthly rests, at a rate of 4% above the base lending rate of National Westminster Bank Plc from time to time, whether before or after judgement

6.02

Value Added Tax at the rate from time to time ruling shall be added to the price and shall form part of the purchase price of the Goods or Services for the purpose of these Conditions

7.00

If the Buyer fails to make payment in accordance with Condition 6.00 the Company reserves the right to discontinue, defer or suspend the supply to the buyer of any other of the Goods or Services contracted to be supplied and the Company shall be entitled to claim against the Buyer for any loss or damage whatsoever sustained by it in consequence thereof

8.00

If the Buyer shall be unable or unwilling for any reason to take delivery of the Goods or Services on the specified date or within the specified period, delivery shall for the purposes of calculating time for payment in accordance with Condition 6.00 be deemed to have taken place 14 days after the said date or period. The Company reserves the right to charge the Buyer for the cost of storage, labour, insurance and transport if the Buyer shall be unable or unwilling to take delivery of the Goods or Services as aforesaid

9.00

PRICE

9.01

The Goods or Services will be sold to the Buyer at the prices agreed at time of order placed by the Buyer. The Company reserves the right to increase prices specified in the price list issued by the Company without notice to take account of any change in cost of wages, materials, insurance, transport, duty, tax, surcharge or levy of any kind

9.02

Any price quoted by the Company or contained in any order or contract shall be valid only for 28 days from the date of such quotation, order or contract

9.03

Carriage by the Company's normal transport in Great Britain is paid on orders over 750 value. Delivery of export orders will be F.O.B. the relevant United Kingdom port. Special packing or special delivery requirements will be charged extra

9.04

The Company shall not be liable for any loss whatsoever or howsoever arising caused by its non-delivery or by the failure to make Goods available ready for collection on the due date

10.00

PROPERTY OF THE GOODS

10.01

Notwithstanding risk in the Goods passes to the Buyer as soon as the Goods become ascertained Goods and subject as provided below, the Goods shall remain the sole and absolute property of the Company and title to and legal and equitable ownership of the Goods shall not pass to the Buyer until payment is received by the Company for all monies due from the buyer to the Company in respect of all Goods supplied by the Company to the Buyer and the buyer acknowledges that until such payment is made in full it is in possession of the Goods solely as a fiduciary for the Company

10.02

If Goods the property of the Company are admixed with Goods being the property of the Buyer or are processed or incorporated therein the product thereof will become or deemed to be the sole and exclusive property of the Company

10.03

If Goods the property of the Company are admixed with Goods the property of any person other than the Buyer or are processed or incorporated therein the product thereof shall become or deemed to be owned in common with that other person in proportion to the respective invoice values of the Goods comprised in such product

10.04

The Buyer is licensed by the Company to use or to agree to sell the Goods provided that the entire proceeds of sale of such Goods (or if such Goods have been converted into some other product or mixed with other Goods being the property of some person other than the Buyer a fair proportion of the proceeds of sale) are held in trust for the Company are not mixed with other monies or paid into an overdrawn bank account and shall at all times be identifiable as the Company's money

10.05

Until title to the Goods passes to the buyer the Goods shall be kept separate and distinct from all other property of the Buyer and of third parties and in good condition and stored in such a way as to be clearly identifiable as belonging to the Company and the buyer will not cause or permit or suffer any labels, badges, serial numbers, packaging or other means of identification of the Goods to be removed or obscured

10.06

Without prejudice to any other right or remedies available to it the Company may for the purpose of recovering its Goods and at any time before payment to it of all monies due from the Buyer enter upon any premises where such goods are stored or where they are reasonably thought to be stored and may re possess the same

10.07

If the Buyer being an individual commits any act of bankruptcy or enters into or takes steps to enter into an individual voluntary arrangement under the Insolvency Act 1986 or being a company enters into liquidation (whether compulsory or voluntary) or has a receiver appointed over the whole or any part of its assets or is the subject of an administration order or any person becomes entitled to exercise the powers conferred on an administrative receiver and any payment due from the Buyer to the Company is overdue in whole or in part or the Buyer is unable to meet its obligations as and when they fall due then the Company may (without prejudice to any of its other rights) recover or re-sell the Goods or any of them and may enter upon the Buyer's premises by its servants or agents, for that purpose

11.00

11.01 Where the Goods are ordered by reference to any sample the Company shall use its best endeavours to ensure that the bulk corresponds with the sample

11.02

The Company warrants that the Goods supplied or Services given to the Buyer will be suitable for the primary purpose for which the Goods and Services given is/are made and normally used. Subject thereto no warranty is given or to be implied as to the suitability of the Goods or Services given for any particular purpose or for use under any specific conditions unless such purpose or conditions have been previously agreed in writing by the Company

11.03

In connection with the supply of the Goods the Company warrants to the Buyer in the terms implied by Section 12 of the Sale of Goods Act 1979 as to title, quiet possession and freedom from encumbrances of the Goods but except as aforesaid and without prejudice to the generality of paragraphs 12.01 and 12.02 of these Conditions, the Company gives no warranty whether expressed or implied, by law or otherwise as regards the Goods supplied by it provided that in the event of the Company's negligence nothing herein shall limit or exclude the Company's liability for personal injury or death

11.04

Subject to the operation of any other specific provisions of these Conditions the Buyer's remedies against the Company in respect of any liability of the Company, whether in contract or in tort, shall not exceed the sum of 50,000 or the invoice value of the Goods directly giving rise to the claim or loss (whichever is less) for the Buyer's direct financial loss and any indirect or consequential loss (including loss of profit) suffered by the Buyer or for any claim made against the Buyer by a third party

12.00

Subject to the provisions of paragraph 11.00:-

12.01

All claims for loss caused by damage in transit, in storage or on delivery by the Company must be notified in writing by the Buyer to the Company within three days after receipt of the Goods and must within seven days thereafter be supported by a detailed written claim by the Buyer to the Company

12.02

All claims for non delivery, shortages, variances in design, or incorrect specification must be notified to the Company by the Buyer verbally or by telephone, telex, or fax no later than three days after the date of delivery in the case of claims for variances in design or incorrect specification and no later than 48 hours after the date for delivery in the case of claims for non delivery and shortages and in all such cases confirmed in writing no later than seven days after the date of delivery and it is expressly provided that no claims for shortages, variances in design or incorrect specification shall be accepted in whole or in part if the Goods in question have been installed or cut or worked-upon by the Buyer or its employees or agents

12.03

The risk of accidental loss whilst the Goods are being returned will be borne by the Buyer

12.04

Time shall be of the essence in respect of any notification to be given by the Buyer to the Company in accordance with this paragraph 12

13.00

Any failure on the part of the Company to exercise, or any delay by the Company in exercising, any right or remedy available to it, whether contained in these Conditions or otherwise, shall not operate as a waiver of such right nor shall any single or partial exercise by the Company of such right or remedy preclude the exercise, successively or concurrently of any right or remedy. Subject to the provisions of Condition 1, no waiver by the Company, whether as a part of the course of dealings between the Company and the Buyer, or otherwise of any time limit specified in these Conditions shall be effective

14.00

The Company shall not be liable or deemed to be in default for any delay or failure to perform its obligations under these Conditions if such delay or failure results directly or indirectly from any cause beyond the reasonable control of the Company, including, but not limited to, acts or restraints of government or governmental agencies, force majeure, act of God, war, riot, civil or criminal disturbance, insurrection, accidents, fire, explosion, earthquake, flood, the elements, strikes, labour disputes, shortages of suitable material, labour or transport

15.00

The Company shall be entitled forthwith to terminate any contract incorporating these Conditions and payment thereunder shall immediately become due if the Buyer shall make any default in or commit a breach of these Conditions or of any of its obligations to the Company or if any distress or execution shall be threatened or levied on the Buyer's property or assets, or if the Buyer shall make or offer to make any arrangement or composition with creditors or seek to obtain pursuant to statute or otherwise any moratorium with creditors or shall pass any resolution or shall suffer a petition to be presented for the winding-up of the Buyer (other than for the purpose of a solvent amalgamation or reconstruction notified to the Company) or if a receiver or manager of the Buyer's undertaking, property or assets or any part thereof shall be appointed without prejudice or any claim or right the Company might otherwise make or exercise

16.01

All contracts incorporating these Conditions shall be interpreted in accordance with the laws of England and shall be enforceable in the English Courts

16.02

Any contract incorporating these Conditions may not be assigned by the Buyer without the prior written consent of the Company

16.03

The obligations of the Company may be performed in whole or in part by its authorised distributors sub-contractors or agents at the discretion of the Company

16.04

In making these Conditions the Company does so for itself and for and on behalf of every employee servant sub-contractor or agent of the Company and the Buyer hereby confirms that any exemption from liability granted to the Company by these Conditions shall also extend to any such employee servant sub-contractor or agent of the Company

16.05

Any notice sent under a contract incorporating these Conditions shall be sent to the registered office of the Company or the Buyer (as the case may be) and shall be deemed duly given by letter 48 hours after being posted by pre-paid registered post or if delivered by hand at the time of delivery or if given by telex or fax when the sender shall receive the answerback of the recipient sent

ALSO AVAILABLE TO THE ENGINEER

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