

Table Stands and Pneumatic Isolators

- *Modular design*
- *Excellent performance*
- *Upgradeable*
- *High load capacity*

The performance of a table is dependent on its conditions of use. Thermal gradients, air turbulence and ambient vibration, if not controlled, can easily overcome the benefits of superior table top design. The commonest disturbance is ground vibration transmitted through the table support structure.

To make the most of a high performance table, especially for the most critical and sensitive applications, it is necessary to employ a pneumatic isolation system. The new range of Pneumatic Isolators from TMC represents the latest advance in this technology and has proven to be superior in practical comparative tests as well as in objective transmissibility measurements.

Some instruments and assemblies are not particularly sensitive to low amplitude vibration, and provided ground vibration is not excessive, are able to operate quite well on a good table top and firm support stand. For these situations TMC has a range of sturdy levelling stands which will accommodate any of the LaserTop™ tables previously described.

TMC has adopted a modular approach to the design of its Pneumatic Isolator and Levelling Stands to afford maximum adaptability and user convenience. Three heights of Pneumatic Isolator are offered corresponding to the 3 different table thicknesses and chosen to give a table surface height of 914 mm (36 inches) above the floor. It is easy

to upgrade from a basic Table Levelling Stand to a full Pneumatic Isolator Stand. Table Casters and Large Base Units may be supplied with a stand or fitted later as required. For isolation of instruments or small Breadboards compact Workstation Isolators are also available.

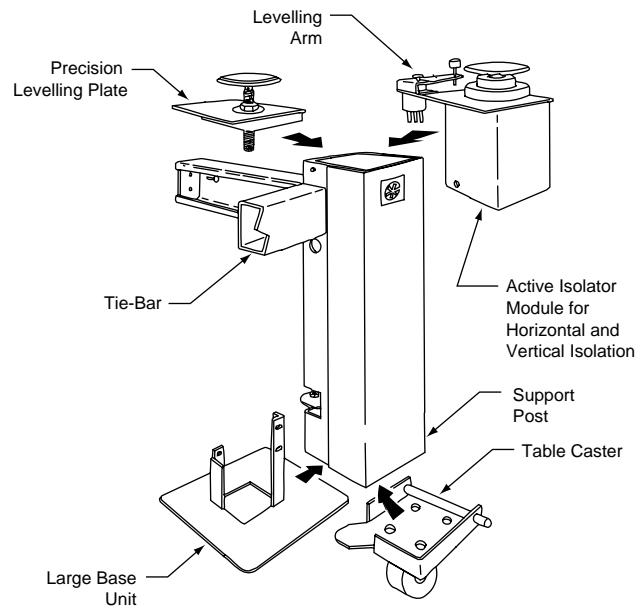


Table Stands and Pneumatic Isolators

| | Pneumatic Isolator Stand | Table Levelling Stand | Workstation Isolator | Breadboard Levelling Stand |
|--|---|----------------------------|---|--|
| Top Levelling Units | Pneumatic Isolator Modules | Precision Levelling Plates | Pneumatic Isolator Modules | Adjustment Screws with Load Pads |
| Vibration Isolation | Horizontal and Vertical | None | Horizontal and Vertical | None |
| Stand | 102 mm (4 inch) or 152 mm (6 inch) Section Steel Posts | | 102 mm (4 inch) Section Steel Frame with Knee-well | 51 mm (2 inch) Section Steel Posts |
| Additional Base Options | Table Casters Large Base Units (152 mm Posts Only) | | | |
| Stand Height | 610 mm (24 inch), 711 mm (28 inch) 813 mm (32 inch) | | 762 mm (30 inch) | 762 mm (30 inch) |
| Load Capacity *see note | 102 mm (4 inch) Posts: 640 kg (1400 lb) 152 mm (6 inch) Posts: 1820 kg (4000 lb) | | 640 kg (1400 lb) | |
| Table Size Supported: Minimum Maximum | 0.9 x 0.9 m (3 x 3 ft) 1.5 x 3.75 m (5 x 12 ft) | | Supplied with Stainless Steel Top 0.64 x 0.92 m (2 x 3 ft) 1.25 x 1.25 m (4 x 4 ft) | 0.75 x 1.0 m (2 x 3 ft) 1.0 x 1.75 m (3 x 6 ft) |

*Note: Load Capacity includes the weight of any supported optical table. Table weight must be deducted from the load capacity figure to determine the maximum equipment load allowed.

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Pneumatic Isolators

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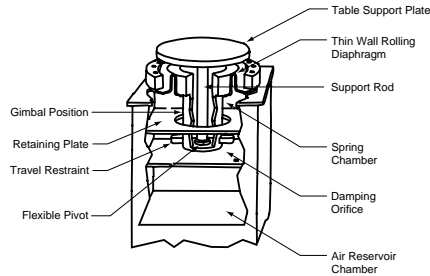
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Pneumatic Isolator Section



Pneumatic Isolators - Principles

A pneumatic isolation system acts as a low frequency air spring supporting an inertial mass. The object is to absorb any transient displacements of the floor and maintain the table top in precisely the same position in space. Such an air spring relies on the compressibility of a gas contained in a chamber, a flexible sealing element and a load bearing piston. This simple design concept forms the basis of most modern pneumatic isolation systems.

The most critical measure of an isolator's performance is its 'transmissibility' which determines how much ground vibration is transferred to a table top. Transmissibility may be defined as the ratio of the amplitude of transmitted vibration to that of the input vibration level. At very low frequencies an air spring behaves as a rigid body with a transmissibility of unity (or zero isolation). This increases to a peak transmissibility at the natural resonance frequency of the isolator. At peak resonance, an isolator amplifies any input vibration. Transmissibility declines rapidly with increasing frequency above the resonance point – at a rate inversely proportional to the square of the frequency. Thus the higher the input vibration frequency the better the isolation. Clearly, isolators should have

as low a resonant frequency as possible to benefit from this 'high frequency roll off' effect, and ideally, the resonant peak should be below 3 Hz. In practice there is usually very little ground or floor movement at or below 3 Hz which is capable of driving an isolator into resonance.

The ideal isolator has a very low spring rate (i.e. a very soft spring), but without adequate damping, this results in unacceptably large or prolonged oscillations even at low resonant frequencies. The conventional solution for pneumatic isolators is a double chamber system whereby one chamber (the 'spring') which supports the load bearing piston assembly is connected to another chamber (the 'reservoir') via a pinhole orifice. It is the movement of air which is forced back and forth between the two chambers under the pressure of vibrations transmitted from the floor that creates the damping effect. Optimization of such a design can result in excellent isolation from disturbances in the vertical plane.

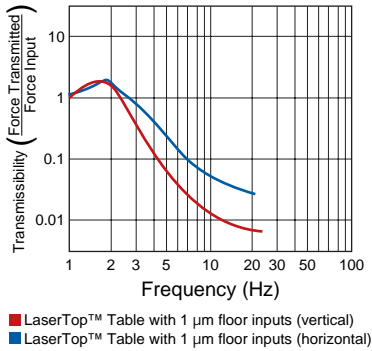
Horizontal vibration is always present and may be directly generated by out of balance machinery for example, but also arises as a by-product of vertical vibration. As vibration waves travel along a floor they will reach the legs of a table at different times so that one end of a table will tend to lift before the other. In this way the different phase relationships of vertical vibrations can produce a rocking motion with a horizontal displacement of the table top.

The conventional rolling diaphragm isolator has a natural centering force which usually results in a horizontal resonance frequency several times the best vertical resonance. In practical applications where there is a mix of

vertical and horizontal excitation forces, the stiffer horizontal mode will always be activated to some extent. As a result the table will show an apparent vertical resonance higher than specified. Most attempts to decouple a table top from horizontal vibration have taken the form of pendulum suspensions, horizontal bearing slip plates and more complex assemblies incorporating oil filled dashpots. These systems have met with varying degrees of success but still show significant resonance activity at the higher frequency mode of the diaphragm itself. Mechanical pendulum and bearing devices are often susceptible to misalignment and must be closely monitored to avoid a decline or sudden failure in isolator performance.

TMC Pneumatic Vibration Isolation Systems are described in detail on the following page.

TMC provides data based on low amplitude vibration test levels (approximately 10 nm to 1 μ m displacement) which are consistent with realistic operating conditions. Other isolation systems claiming less than 1.5 Hz resonance have been routinely observed to shift to 3 Hz or more by TMC's method of measurement.



TMC Pneumatic Isolators exhibit high attenuation of both vertical and horizontal Vibration, even at the low amplitude levels typical of most laboratory floors.

TMC Pneumatic Vibration Isolation Systems - Performance

TMC has adopted a simple solution to the problem of multi-plane vibration isolation with its range of modular Pneumatic Isolators. A patented gimbal device is used which carries the load on a separate top plate and has a rigid rod which extends deep into the well of the main piston. The bottom of the rod has a precision ball end which bears on a hard flat seat. Any horizontal flexure in the isolator is translated into a very slight rocking motion of the ball. Horizontal movement is thus converted to an out of phase vertical diaphragm flexure; one side of the piston goes up, the other side goes down as in a gimbal motion. This displaces the bottom of the piston well horizontally and results in a gimbal like wobbling movement of the main piston in the diaphragm suspension. This is an inherently flexible coupling through the piston assembly and is fully effective even to sub-micron levels of input displacement.

TMC Isolators employ a flexible, thin wall, rolling diaphragm, air seal which closely follows the ideal characteristics of an air spring support. Transmission of low amplitude disturbances through the diaphragm is the lowest of all types of air mount, and the ideal viscous air

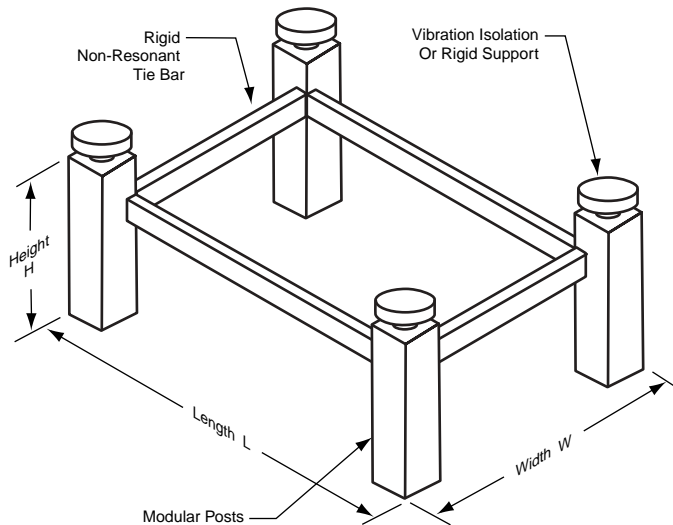
damping of piston movement is more closely achieved with TMC's material than with thicker wall rubber elements.

The height of a table at each support is adjustable over a 19 mm (¾ inch) range, but once set, is maintained to within 0.5 mm by servo air valves. These automatically adjust the air pressure in each leg to compensate for changes in weight and load distribution.

For safety, all Pneumatic Isolation systems incorporate a rugged internal travel restraint which limits piston movement to a maximum of 19 mm (¾ inch). This allows heavy equipment to be moved on a table without fear of inducing any instability.

The excellent damping characteristics of these isolators also give a very positive 'feel' to tables when making coarse adjustments and moving equipment around.

Every system is fully tested under load and subjected to high pressure leak checks to ensure long term reliability and superior isolation. TMC Pneumatic Isolators are linear, with high attenuation of a wide range of amplitude and frequency input in both vertical and horizontal planes.



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Pneumatic Isolators for LaserTop™ Tables



- *Modular design*
- *Casters and large base units available*
- *Tie bars provide additional safety in earthquake areas*
- *Available from stock*

These Pneumatic Isolators are designed for use with the LaserTop™ range of table tops. The suggested isolator is specified so as to give a table surface height of 914 mm (36 inches) above floor level. Each stand is constructed of four heavy duty steel vertical posts of either 100 mm (4 inch) or 150 mm (6 inch) square section (according to

load capacity). These posts are joined horizontally by damped tie bars to form a safe, sturdy framework. They are finished in a durable black texture epoxy paint. The support posts are fitted with pneumatic isolator units providing the highest level of vibration isolation performance. A compressed air line with pressure of about 5.5 bar (80 psi) is

required to operate the system. An air filter and all necessary air line tubing, connectors, valves and pressure gauges are supplied with the isolators. As an additional option Table Casters and Large Bases are also available for 150 mm (6 inch) posts. The casters allow the tables to be moved more easily, and the post bases allow use without tie bars.

Pneumatic Isolators for LaserTop™ Tables

| Catalog Number | Isolator Type | Height (mm) | Height (inches) | Post Size Square Section (mm) | Load Capacity (kg) | Table Size Supported (m) | Table Size Supported (ft) | Price US |
|----------------|---------------|-------------|-----------------|-------------------------------|--------------------|--------------------------|---------------------------|------------|
| 54-2316 | C | 813 | 32 | 102 | 640 | 0.9 x 0.9 | 3 x 3 | \$2,657.00 |
| 54-2324 | D | 813 | 32 | 102 | 640 | 0.9 x 1.2 | 3 x 4 | \$2,657.00 |
| 54-2308 | B | 813 | 32 | 102 | 640 | 0.9 x 1.5 | 3 x 5 | \$2,657.00 |
| 54-2399 | K | 711 | 28 | 152 | 1820 | 1.2 x 1.8 | 4 x 6 | \$3,502.00 |
| 54-2407 | L | 711 | 28 | 152 | 1820 | 1.2 x 2.4 | 4 x 8 | \$3,502.00 |
| 54-2415 | M | 711 | 28 | 152 | 1820 | 1.2 x 3.0 | 4 x 10 | \$3,502.00 |
| 54-2829 | O | 711 | 28 | 152 | 1820 | 1.5 x 2.4 | 5 x 8 | \$3,502.00 |
| 54-2837 | P | 711 | 28 | 152 | 1820 | 1.5 x 3.0 | 5 x 10 | \$3,502.00 |
| 54-2340 | F | 610 | 24 | 152 | 1820 | 1.2 x 2.4 | 4 x 8 | \$3,502.00 |
| 54-2357 | G | 610 | 24 | 152 | 1820 | 1.2 x 3.0 | 4 x 10 | \$3,502.00 |
| 54-2373 | I | 610 | 24 | 152 | 1820 | 1.5 x 3.0 | 5 x 10 | \$3,502.00 |
| 54-2381 | J | 610 | 24 | 152 | 1820 | 1.5 x 3.6 | 5 x 12 | \$3,502.00 |

Typical Performance Values

Isolator Natural Frequency - Vertical: 0.8 Hz

Horizontal: 1.0 Hz

Isolator Efficiency: @5 Hz @10 Hz

Vertical 80-97% 90-99%

Horizontal 60-90% 70-95%

Transmissibility of <0.01 (quiet lab conditions)

Pneumatic Isolator Accessories

| Catalog Number | Description | Price US |
|----------------|---|----------|
| 54-0831 | Large Base Units for 152 mm Posts (Quantity of 4) | \$210.00 |
| 54-0849 | Table Casters for 102 mm Table Posts | \$551.00 |
| 54-0856 | Table Casters for 152 mm Table Posts | \$567.00 |
| 54-2498 | Replacement Diaphragm for 102 mm Isolator Posts | \$137.00 |
| 54-2464 | Replacement Diaphragm for 152 mm Isolator Posts | \$137.00 |
| 54-2449 | Valve Repair Kit | \$159.00 |

Table Leveling Stands

- *Modular upgradable*
- *Wide range of sizes*
- *Tie bars provide additional safety in earthquake areas*



Table Stands are not vibration isolated and are suitable only for use in stable, vibration-free environments, or for applications which are insensitive to ambient vibration. Two different types of stand are available; Table Leveling Stands for supporting full sized tables, and Breadboard Leveling Stands for light weight tops such as breadboards. Table Leveling Stands are made with the same modular framework as the Pneumatic Isolator Stands, and can therefore be upgraded at a later date for operation as isolators if required. Details of Table Leveling Stands are given on this page and are available in three different heights with a choice of two load capacities. They are constructed of heavy duty steel posts joined horizontally by damped tie-bars to form a structurally rigid frame. All four corner posts are fitted with precision leveling plates which are adjustable over a range of 51 mm (2 inch) and may be set to ± 1 mm. These leveling plates are interchangeable with Pneumatic Isolator Modules of the same load capacity.

Isolator Module Upgrade Kit

Table Leveling Stands may be upgraded to full Pneumatic Isolator Stands by removing the precision leveling plates and fitting the appropriate Isolator Module Kit. Each kit comprises four isolator modules, air filter, and all necessary air

valves, tubing, connectors and pressure gauges to make the full conversion.

Additional Options:

Stands may be supplied with Table Casters or Large Base Units.

Table Leveling Stands

| Catalog Number | Height | | Load Capacity | | Post Size (square section) | | Table Size Supported | | Price US |
|----------------|--------|--------|---------------|------|----------------------------|--------|----------------------|--------|------------|
| | (mm) | (inch) | (kg) | (lb) | (mm) | (inch) | (m) | (ft) | |
| 54-0898 | 813 | 32 | 640 | 1400 | 102 | 4 | 0.6 x 1.2 | 2 x 4 | \$1,074.00 |
| 54-0930 | 813 | 32 | 640 | 1400 | 102 | 4 | .9 x 1.2 | 3 x 4 | \$1,074.00 |
| 54-0948 | 813 | 32 | 640 | 1400 | 102 | 4 | .9 x 1.5 | 3 x 5 | \$1,074.00 |
| 54-1094 | 711 | 28 | 1820 | 4000 | 152 | 6 | 1.2 x 1.8 | 4 x 6 | \$1,393.00 |
| 54-1102 | 711 | 28 | 1820 | 4000 | 152 | 6 | 1.2 x 2.4 | 4 x 8 | \$1,393.00 |
| 54-1110 | 711 | 28 | 1820 | 4000 | 152 | 6 | 1.2 x 3.0 | 4 x 10 | \$1,393.00 |
| 54-1128 | 711 | 28 | 1820 | 4000 | 152 | 6 | 1.2 x 3.6 | 4 x 12 | \$1,393.00 |
| 54-1136 | 711 | 28 | 1820 | 4000 | 152 | 6 | 1.5 x 2.4 | 5 x 8 | \$1,393.00 |
| 54-1144 | 711 | 28 | 1820 | 4000 | 152 | 6 | 1.5 x 3.0 | 5 x 10 | \$1,393.00 |
| 54-1169 | 610 | 24 | 1820 | 4000 | 152 | 6 | 1.2 x 1.8 | 4 x 6 | \$1,393.00 |
| 54-1177 | 610 | 24 | 1820 | 4000 | 152 | 6 | 1.2 x 2.4 | 4 x 8 | \$1,393.00 |
| 54-1185 | 610 | 24 | 1820 | 4000 | 152 | 6 | 1.2 x 3.0 | 4 x 10 | \$1,393.00 |
| 54-1193 | 610 | 24 | 1820 | 4000 | 152 | 6 | 1.2 x 3.6 | 4 x 12 | \$1,393.00 |
| 54-1219 | 610 | 24 | 1820 | 4000 | 152 | 6 | 1.5 x 3.0 | 5 x 10 | \$1,393.00 |
| 54-1227 | 610 | 24 | 1820 | 4000 | 152 | 6 | 1.5 x 3.6 | 5 x 12 | \$1,393.00 |

Note: Table top weight must be deducted from the load capacity to determine the maximum equipment load allowed.

Leveling Stand Accessories

| Catalog Number | Description | Price US |
|----------------|--|------------|
| 54-0864 | Active Isolator Module Kit, 102 mm Posts | \$1,820.00 |
| 54-0872 | Active Isolator Module Kit, 152 mm Posts | \$1,890.00 |
| 54-0831 | Large Base Units for 152 mm Posts | \$210.00 |
| 54-0849 | Table Casters for 102 mm Posts | \$551.00 |
| 54-0856 | Table Casters for 152 mm Posts | \$567.00 |

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