

**PTS601, PTS602, PTS603**  
**Active Isolating**  
**Optical Table Supports**

**User Guide**



Original Instructions

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# Chapter 1 Safety

## 1.1 Safety Information

For the continuing safety of the operators of this equipment, and the protection of the equipment itself, the operator should take note of the **Warnings, Cautions** and **Notes** throughout this handbook and, where visible, on the product itself.

The following safety symbols may be used throughout the handbook and on the equipment itself.

The following safety symbols may be used throughout the handbook and on the equipment itself.



### **Warning: Risk of Electrical Shock**

Given when there is a risk of injury from electrical shock.



### **Warning**

Given when there is a risk of injury to users.



### **Caution**

Given when there is a risk of damage to the product.

### **Note**

Clarification of an instruction or additional information.

## 1.2 General Warnings



### **Warning**

Do:

Ensure that the system is securely positioned prior to any work being undertaken.

If using the system with any electrical equipment, incorporate appropriate earthing and/or other safety circuitry as required by national standards to protect the operator.

When lifting or moving components, ensure that the proper posture is maintained. Do not lift loads in excess of nationally recognized safe working limits (25kg per operator in Europe). If in doubt use an appropriately designed lifting device.

Before lifting the table top, ensure it is unpopulated.

Exercise particular caution if moving the system on a sloping surface.

Ensure all fixings are secure prior to use.

Ensure that proper airflow is maintained to any electrical equipment installed on the system.

Do not:

Use the system outdoors. The system is designed for indoor use only.

Get into any position where you can be trapped between a wall, door frame or other immovable object and the system.

Go underneath the system when the unit is being moved.

Sit on the system.



### **Finger Trap Warning**

The normal, continuous operation of the equipment results in a gap between the bottom surface of the installed table and the main body cylinder of each leg. This gap will vary based on the instantaneous load and forces exerted on the table. In some instances this gap is large enough into which to insert fingers, and therefore presents a potential pinch hazard. Keep fingers clear of this gap.

## Chapter 2 Operation

### Note

The equipment contains no user servicable parts. Only personnel authorized by Thorlabs Ltd and trained in the maintenance of this equipment should remove its covers or attempt any repairs.

### 2.1 General Description

Active isolation floats the table on a cushion of air to keep the work surface both level and at a constant height. Thorlabs active isolators offer total isolation from vertical and horizontal disturbances, ensuring protection from ground and building noise. They provide sub-micron stability, making them particularly suitable for applications such as interferometry, holography, atomic force microscopy and nanopositioning.

A self-levelling feature is incorporated to allow for changing load conditions and the table height can be adjusted over a range of 18 mm (0.7 in.). Standard isolators are available in a choice of two heights, allowing any of the standard Thorlabs table tops to be mounted at a nominal working height of 910mm (36 in.) above the floor. Nonstandard heights are available on request.

### 2.2 Damping System

#### 2.2.1 Vertical Damping

Vertical damping is achieved by the use of a dual chamber damped pneumatic spring – see Fig. 2.1. The table is supported by the air pressure in these chambers. A piston, fixed to the bottom of the table, is sealed to the upper chamber with a rolling rubber diaphragm, allowing virtually friction-free motion between piston and chamber. Floor or tabletop motion forces air to flow from one chamber to the other through a laminar flow damper. This restriction of airflow damps oscillatory motion between the floor and table, dramatically reducing settling time. The volume ratio of the chambers has been optimized to maximize damping performance while preserving a low resonant frequency.

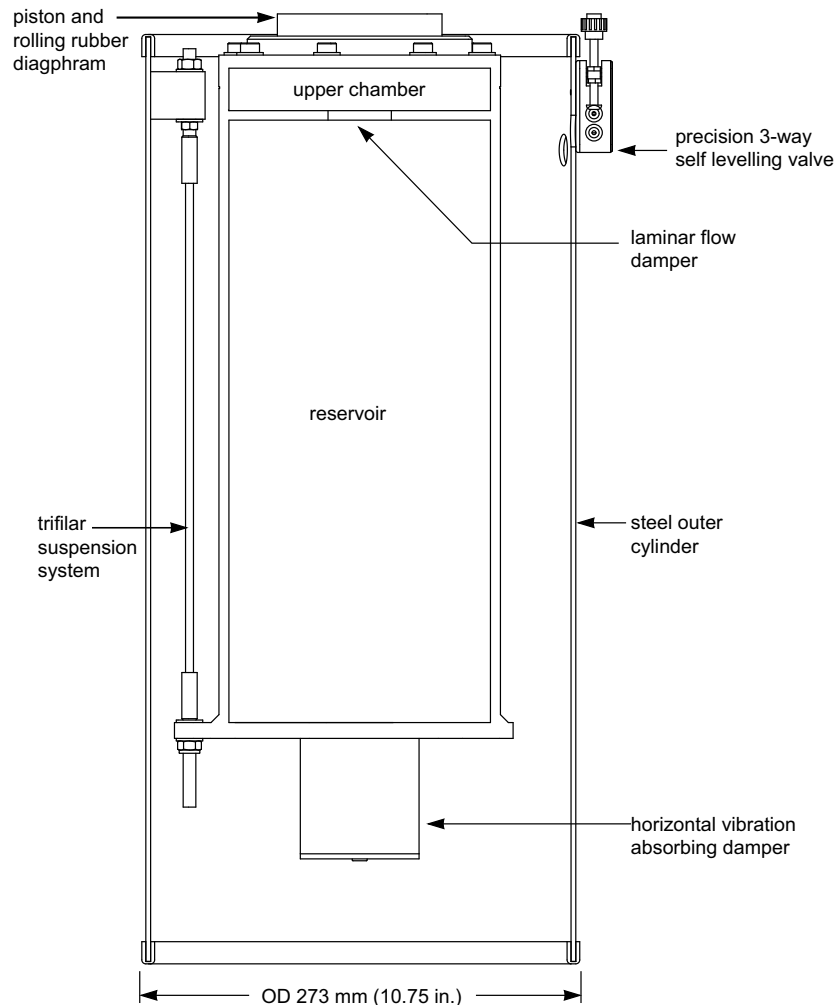


Fig. 2.1 Active isolator section

### 2.2.2 Horizontal Damping

Horizontal damping is accomplished by supporting the pneumatic vertical isolator on a trifilar suspension system – see Fig. 2.1. This innovative pendulum design uses gravity to provide the restoring force after horizontal disturbances. Horizontal oscillations at the system's resonant frequency are damped by linking the base of the vertical isolator to the outer cylinder with an oil-free vibration-absorbing damper.

## 2.3 Self Levelling System

Isolators A, B and C are each fitted with a self levelling valve and lever arm switch; isolator D is driven from isolator A providing a kinematic set up. The lever is in contact with the underside of the table top and if the table top is forced down on a particular isolator, due to added weight or disturbance, the lever is depressed. This opens a precision threeway valve which admits air into the isolator. If the load above the isolator is reduced the table top rises and so, in turn, does the lever. This closes the valve, releasing air pressure from the system. Therefore the table top remains level and at a constant height without manual intervention.

Additionally, this system allows the table height to be adjusted over a range of 18 mm (0.7 in.) and can be used to compensate for an uneven floor.

The isolators require a constant supply of air, either from an airline or compressor – see *handbook HA 0103 Air Compressor* for further details. When the air supply is removed, the table top rests securely on top of the legs with the isolation system disabled.

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## Chapter 3 Installation

### 3.1 General

#### Note

The equipment contains no user servicable parts. Only personnel authorized by Thorlabs Ltd and trained in the maintenance of this equipment should remove its covers or attempt any repairs.

The following sections contain information for the installation of four isolators with a single optical table. For information specific to joined systems please also see Chapter 4.



#### Warning

Each leg weighs between 25 kg and 34 kg (55 lb to 74.8 lb) depending on model.

Use the lifting handles provided when positioning the equipment.

#### 3.1.1 Parts List

The following items are supplied as standard:

- 4 active isolators (marked A, B, C, and D)
- 4 location bosses
- 4 M6 x 25mm cap head screws
- 4 1/4-20 UNC x 1.0" cap head screws
- 1 coil 6mm (outside diameter) nylon tubing
- 2 push-in T-connectors
- 2 lifting handles
- 8 plastic plugs
- 1 Air Line/Compressor Adapter 1/4" Unithread x 6mm OD

#### 3.1.2 Preparation

Ensure that the floor of the installation site is flat and horizontal to within 13 mm, (i.e. +/- 6.5 mm). Spreader plates should be used on floors which are grossly uneven.

### 3.2 Installation

#### 3.2.1 Positioning the Isolators

- 1) Fit the lifting handles into the tapped holes on each side of the outer cylinder of the isolator – see Fig. 3.1.

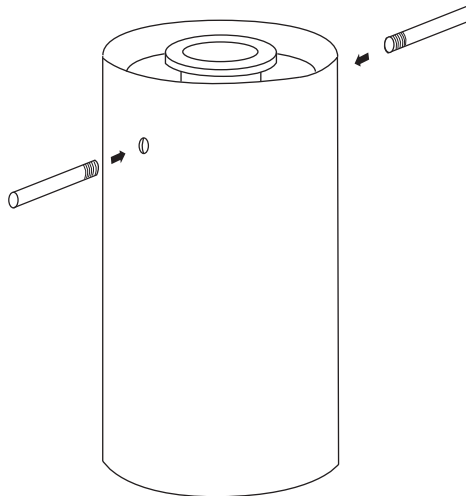
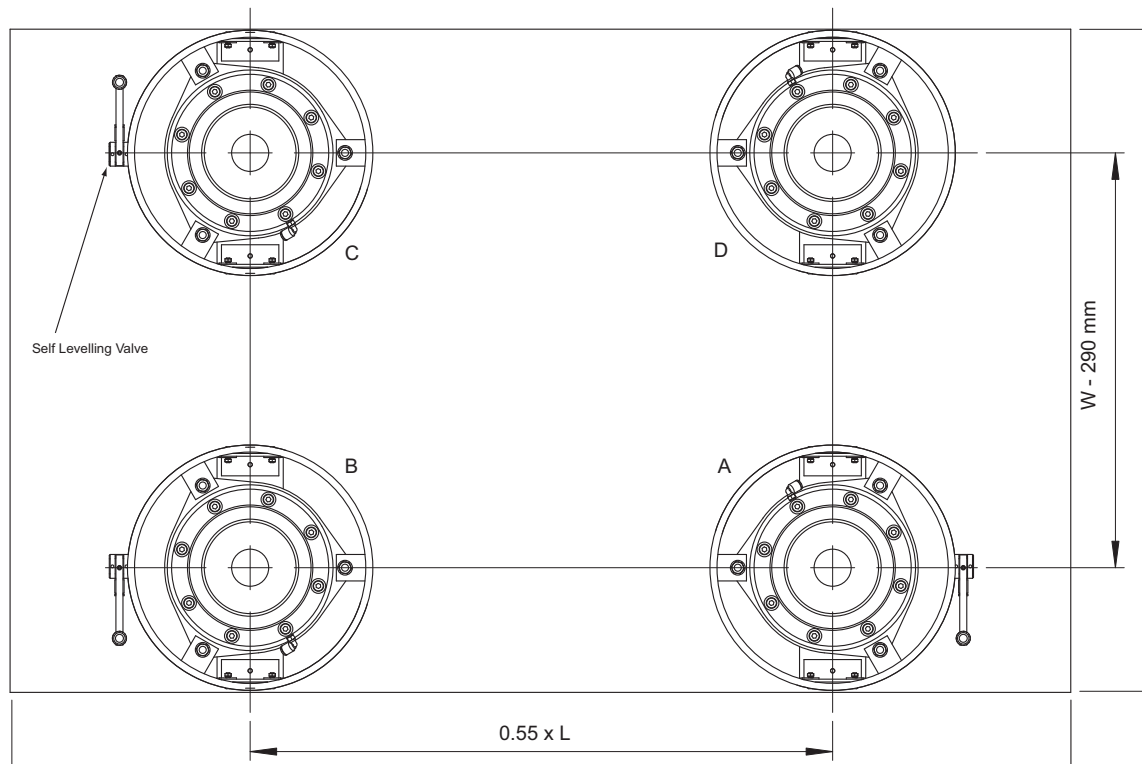


Fig. 3.1 Fitting the lifting handles

**Note**

During item 2, two people, one on each side, should be employed in positioning the isolators.

- 2) Position the isolators A, B, C, and D in approximately the correct position for the table – see Fig. 3.2 for dimensions.



**Fig. 3.2 Positioning the isolators**

- 3) Note the position of the self-levelling valves on A, B, and C and the inner cylinder of isolator D, and orientate the isolators as shown in Fig. 3.2.
- 4) Remove the lifting handles.
- 5) Fit the plastic plugs into the exposed lifting handle attachment holes (two per isolator).

### 3.2.2 Pneumatic Connections

- Using the 6mm outside diameter nylon tubing and T-pieces supplied, connect the air supply to isolators A, B and C as shown in Fig. 3.3. The air supply should be connected to the lower connector on each self levelling valve.



**Warning**

The air supply may come from an air line, a compressed gas bottle, or a small compressor dedicated to this installation. In all cases the supply to the isolators must be delivered through a pressure regulator.

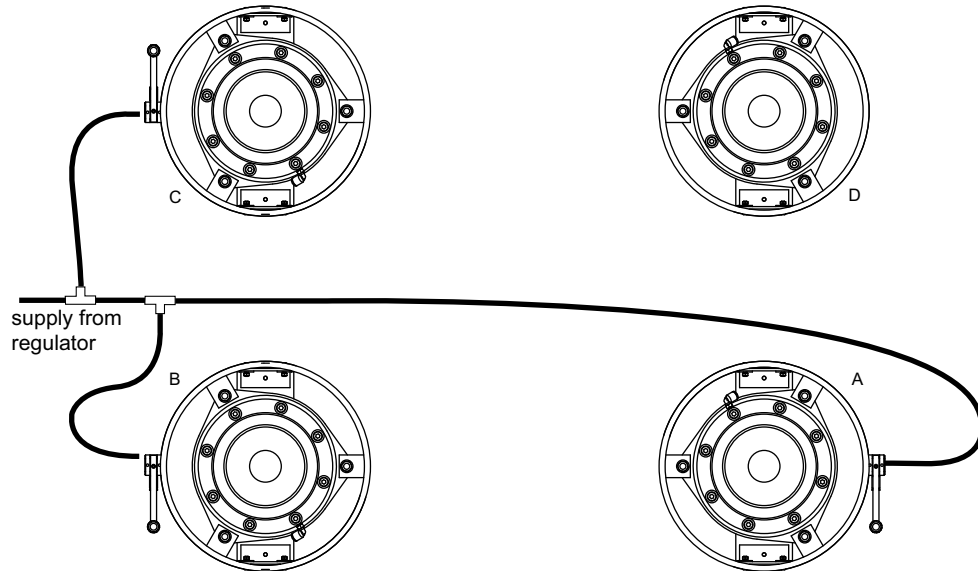


Fig. 3.3 Pneumatic connections



**Caution**

When cutting the tubing to the required length, ensure that all cuts are made at 90° to allow the tube to fit flush against the end stop – see Fig. 3.4.

The push-in connectors on the T-pieces and bulkhead fittings accept the nylon tube in two steps – see Fig. 3.4.

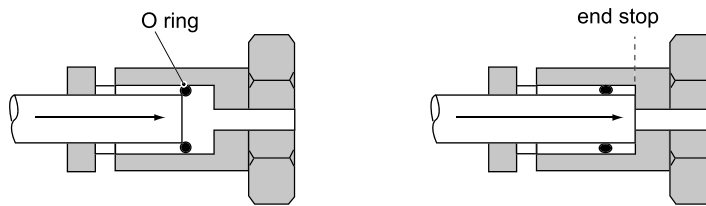


Fig. 3.4 T piece connections

- Using the 6mm outside diameter nylon tubing, connect the T-piece on Leg A to the connector on Leg D as shown below.

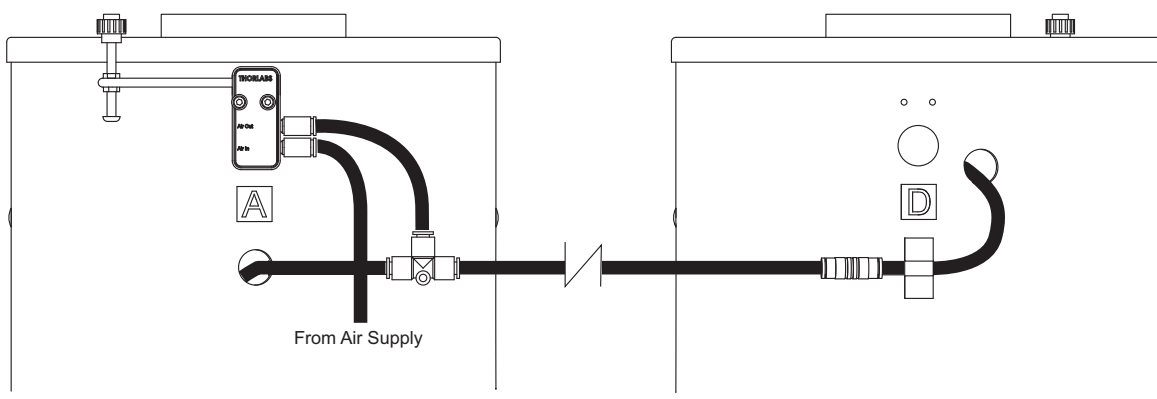


Fig. 3.5 Slave Leg D connections



### 3.2.3 Mounting the Table on the Isolators

#### Note

Item (1) is applicable only to systems fitted with a mobility kit.

- 1) Ensure the isolators, tie bars and castors are correctly assembled and that the castors are clear of the ground.
- 2) Raise the table on a fork-lift truck, ensuring that the fork distance is set such that the forks can pass between the isolators when the table is lowered into position – See Fig. 3.6.

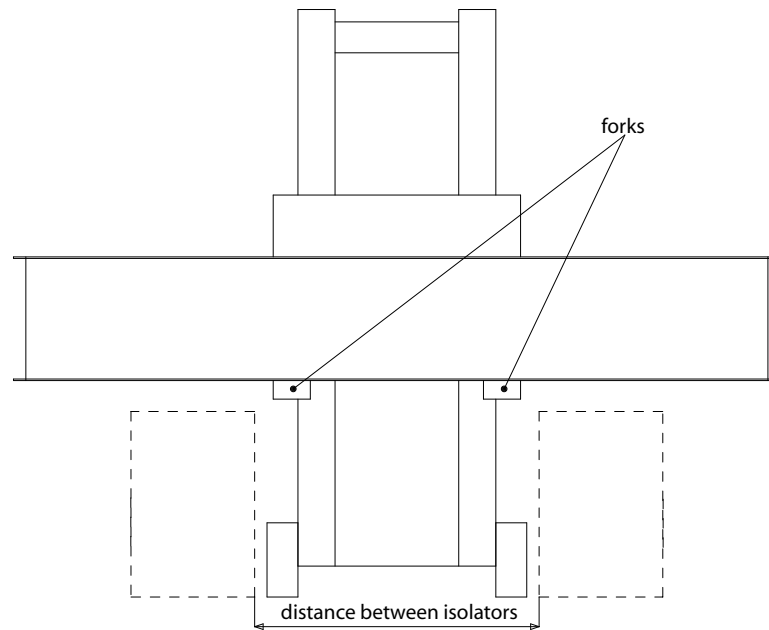


Fig. 3.6 Distance between forks

- 3) Using the M6 (1/4-20 UNC) bolts supplied, attach the 4 location bosses to the underside of the table – see Fig. 3.7.

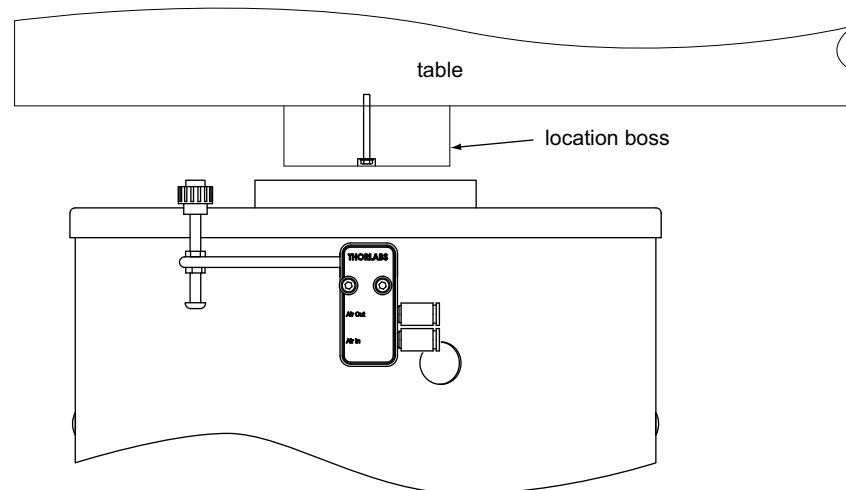



Fig. 3.7 Attaching the plastic feet

- 4) Manoeuvre the fork-lift truck until the table is over the isolators. Carefully lower the table, ensuring that the feet are correctly located inside the pistons – Fig. 3.7.
- 5) When the table is supported on the outer cylinders of the isolators, remove the fork-lift truck.

### 3.3 Set-up


- 1) Connect the isolators to the air supply.
- 2) Ensure the pressure regulator is set to minimum then switch on the supply.

**Caution**  During sub-item 3), the pressure must be increased gradually. If the pressure is increased suddenly, the isolators may be over-inflated and the rubber diaphragms may rupture.

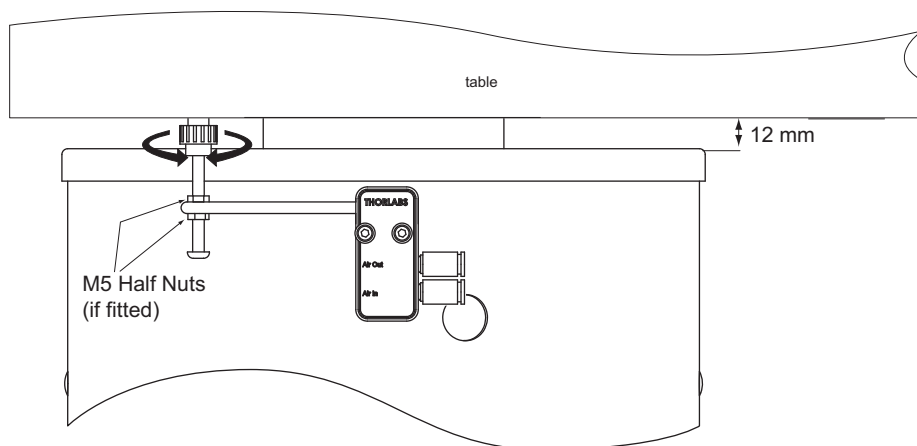
- 3) Gradually increase the pressure from zero to the required pressure. As a guide, recommended pressures for typical loads are as follows:
  - 500 kg - 16 psi (110 kPa)
  - 1000 kg - 32 psi (220 kPa)
  - 1500 kg - 48 psi (331 kPa)
  - 2000 kg - 64 psi (441 kPa)
  - 2500 kg - 80 psi (551 kPa)

**Note.** The figures above are for guidance only, and assume the load to be evenly spread and centered. If the load is not spread evenly, or is positioned off the table center line, then the pressures in each isolator may need to be adjusted accordingly.

- 4) Allow sufficient time for the isolators to fill and reach pressure. With heavy loads, the isolators will take longer to reach optimum pressure.

**Finger Trap Warning**  The normal, continuous operation of the equipment results in a gap between the bottom surface of the installed table and the main body cylinder of each leg. This gap will vary based on the instantaneous load and forces exerted on the table. In some instances this gap is large enough into which to insert fingers, and therefore presents a potential pinch hazard. Keep fingers clear of this gap.

- 5) Adjust the thumbscrew on isolator A to raise the table. Note that there is always a delay between adjusting the screw, and the isolator reaching its new position. This is due to the time taken for air to flow through the system.
- 6) Repeat item (4) for isolators B and C.
- 7) Repeat items (4) and (5) until all four isolators have a gap of 12 mm between the outer cylinder and the underside of the table – see Fig. 3.8.



**Fig. 3.8 Levelling the system**

- 8) Adjust the thumbscrews to lower the table to the nominal working height. If the floor is uneven, the gap between the table and each isolator may not be the same. If this is the case, identify the isolator with the largest gap. Set this gap to 12mm and then adjust the remaining isolators such that the table is level. Use a levelling device as necessary.
- 9) When the system is level, if the valve adjusters are fitted with lock nuts, tighten the nuts either side of the lever arm adjustment knob to lock the system. Valve adjusters without nuts have self locking adjuster stems.
- 10) Test the vertical isolation system by disturbing the table up or down. This should cause the valve to operate to correct the displacement. If the correction is very slow, or the table 'hunts' about its mean position, then the supply pressure is too low and should be increased (typically to about 10 psi above the minimum necessary to float the table).

### 3.4 Maximising System Stability

#### 3.4.1 System Stability Zone

The location and height of a load placed on a table top can dramatically affect the stability and function of the table system. To ensure optimum effectiveness of the isolators, it is important to avoid any instability due to the system centre of mass being misplaced.

In order to avoid dynamic instability and oscillation due to excessive rocking, the center of mass, including that of the table, should be within the pyramid defined by connecting the center point of each isolator with an apex point, whose vertical height is equal to  $1/2$  the shortest distance between isolators— see Fig. 3.9.

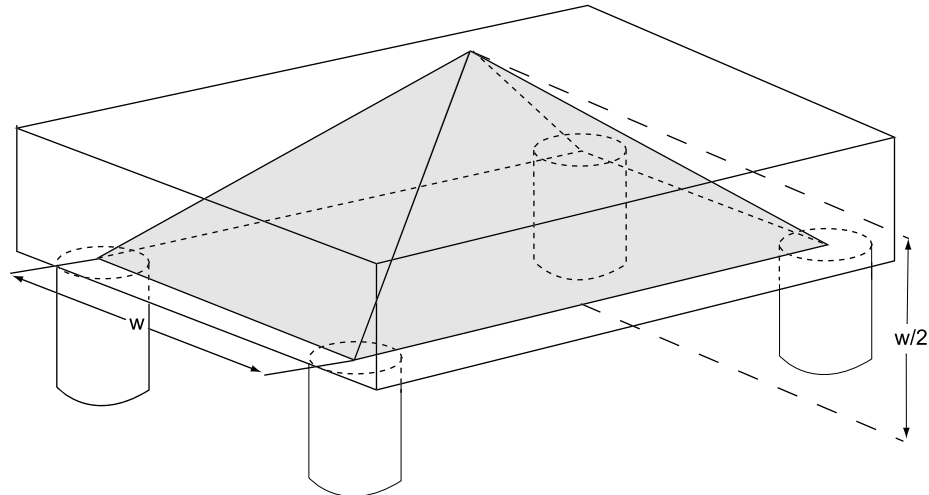


Fig. 3.9 System stability zone

Since the table top tends to be the heaviest component, to ensure the system is within the stability zone the system center of mass should be near the center of the table or below the table top surface. It may be necessary to lower the center of mass by relocating equipment on the table or by using accessory shelves situated below the table surface.

#### 3.4.2 Positioning Offset Loads

If it is necessary to mount a load with uneven weight distribution, the heaviest part of the load should be placed at the end of the table supported by isolators B and C, midway between the two isolators – see Fig. 3.10.

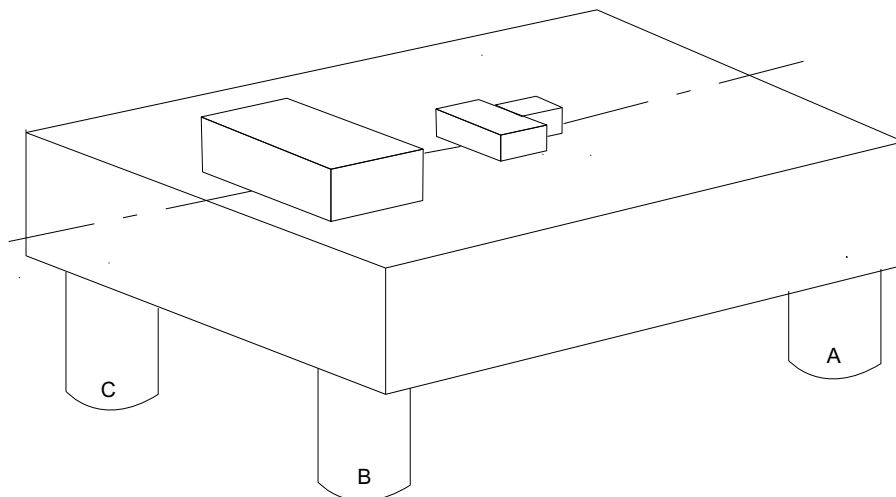


Fig. 3.10 Uneven weight distribution

## Chapter 4 Joined Systems

The location and pneumatic connections for a joined system will depend on the configuration of the system. Some typical examples are shown below. Please contact your local tech support office for more details.

### 4.1 Smaller Systems

Although single tables require four isolators, smaller joined systems may require only six rather than eight isolators. The number of isolators required will depend upon the joiner configuration and the size of the tables. Contact tech support for detmore details of a specific system attangement.

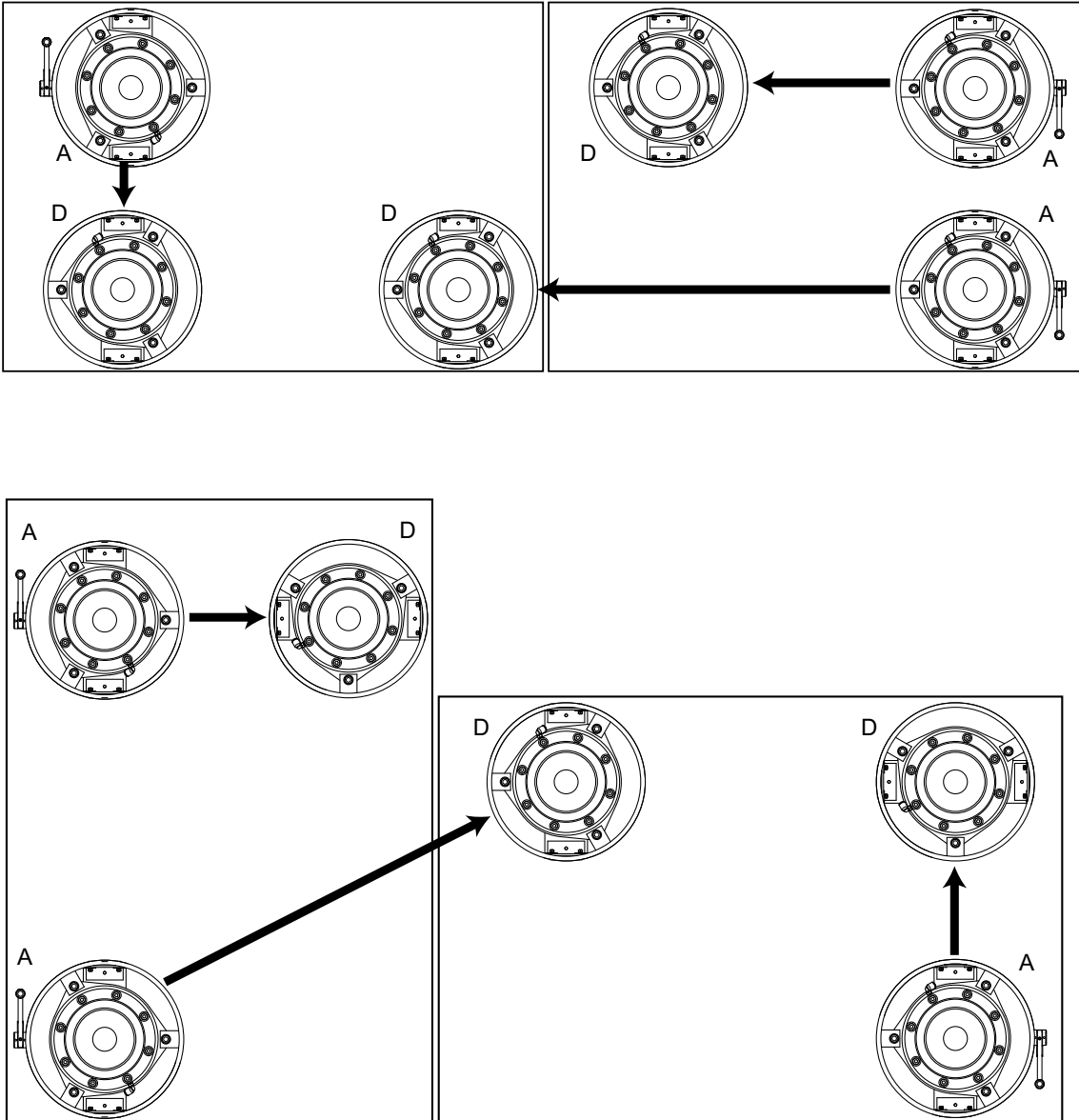


Fig. 4.1 Isolator positions and pneumatic connections - small systems

## 4.2 Larger Systems

Depending on the configuration of the joiner, larger systems may require eight or more isolators as shown below.

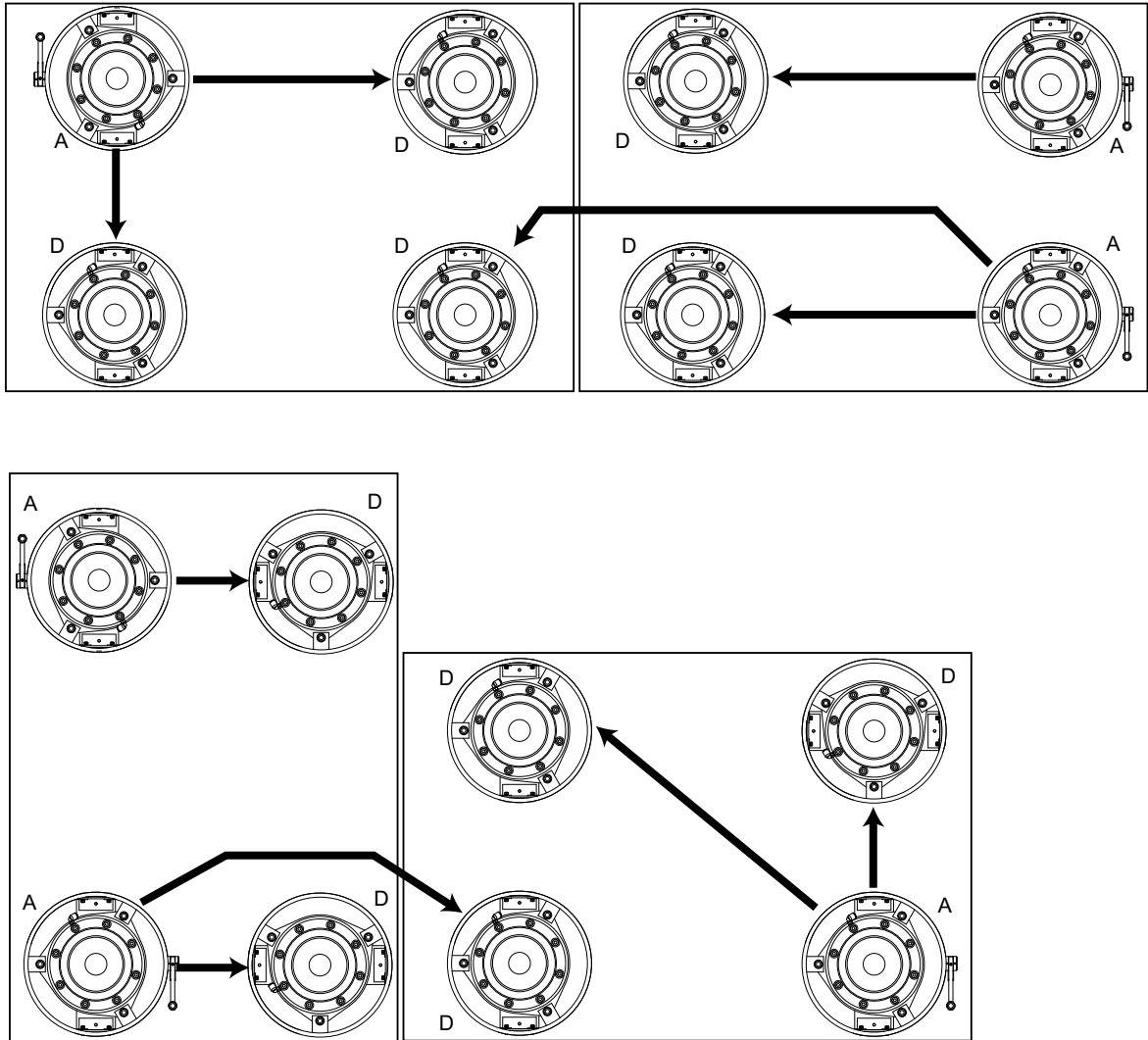


Fig. 4.2 Isolator positions and pneumatic connections - larger systems




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## Chapter 5 Packing List

Manual HA0205T		Handles 116212 QTY 2		Tee Piece CE0099 QTY 2		M6 Screws DB0061 Qty 4	
Fitting CE0225		Bungs BF0052 QTY 8		UNC Screws DB0257 Qty 4			
Boss 116112 Qty 4		Tube CE0095 15m					

Signed..... Countersigned..... Date.....

## Chapter 6 CE Certificates

		<h1>THORLABS</h1>	
		<a href="http://www.thorlabs.com">www.thorlabs.com</a>	
<h2>EU Declaration of Conformity</h2> <p><i>in accordance with EN ISO 17050-1:2010</i></p>			
We:	Thorlabs Ltd.		
Of:	204 Lancaster Way Business Park, Ely, CB6 3NX, UK		
in accordance with the following Directive(s):			
2006/42/EC	Machinery Directive (MD)		
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)		
hereby declare that:			
Model:	<b>PTS60X</b>		
Equipment:	<b>Active Legs (Optical Table Active Vibration Isolation Supports)</b>		
is/are in conformity with the applicable requirements of the following documents:			
EN ISO 12100	Safety of Machinery. General Principles for Design. Risk Assessment and Risk Reduction		2010
Authorised to compile the technical file:	Thorlabs GmbH Münchner Weg1, 85232 Bergkirchen, Deutschland		
EN 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances		2018
and which, issued under the sole responsibility of Thorlabs, is/are in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:			
contains no substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive			
I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.			
Signed:		On:	23 March 2023
Name:	Keith Dhese		
Position:	General Manager	EDC - PTS60X -2023-03-23	

## Appendix G Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at [www.thorlabs.com/contact](http://www.thorlabs.com/contact) for our most up-to-date contact information.



### USA, Canada, and South America

Thorlabs, Inc.  
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[techsupport@thorlabs.com](mailto:techsupport@thorlabs.com)

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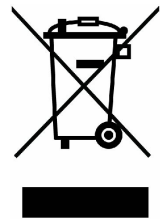
### Brazil

Thorlabs Vendas de Fotônicos Ltda.  
[brasil@thorlabs.com](mailto:brasil@thorlabs.com)

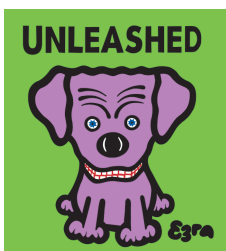
### China

Thorlabs China  
[chinasales@thorlabs.com](mailto:chinasales@thorlabs.com)

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out "wheelie bin" logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not disassembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. "End of life" units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.







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