minus k® TECHNOLOGY

Installation and Adjustment

SM-1 Isolator

Dimensions: 13” W x 13” D x 20.5” H (330mm W x 330mm D x 521mm H)	
Approximate payload weight range: 155 lb (70.3 kg)	
Model	Payload Range
700SM-1	110 - 750 lb (50 - 340 kg)
1200SM-1	675 - 1330 lb (315 - 603 kg)
1500SM-1	800 - 1550 lb (363 - 703 kg)
1900SM-1	1200 - 1950 lb (544 - 885 kg)
2400SM-1	1800 - 2500 lb (817 - 1134 kg)
2900SM-1	2400 - 3000 lb (1089 - 1361 kg)
3400SM-1	2800 - 3600 lb (1270 - 1633 kg)
4000SM-1	3400 - 4200 lb (1542 - 1905 kg)

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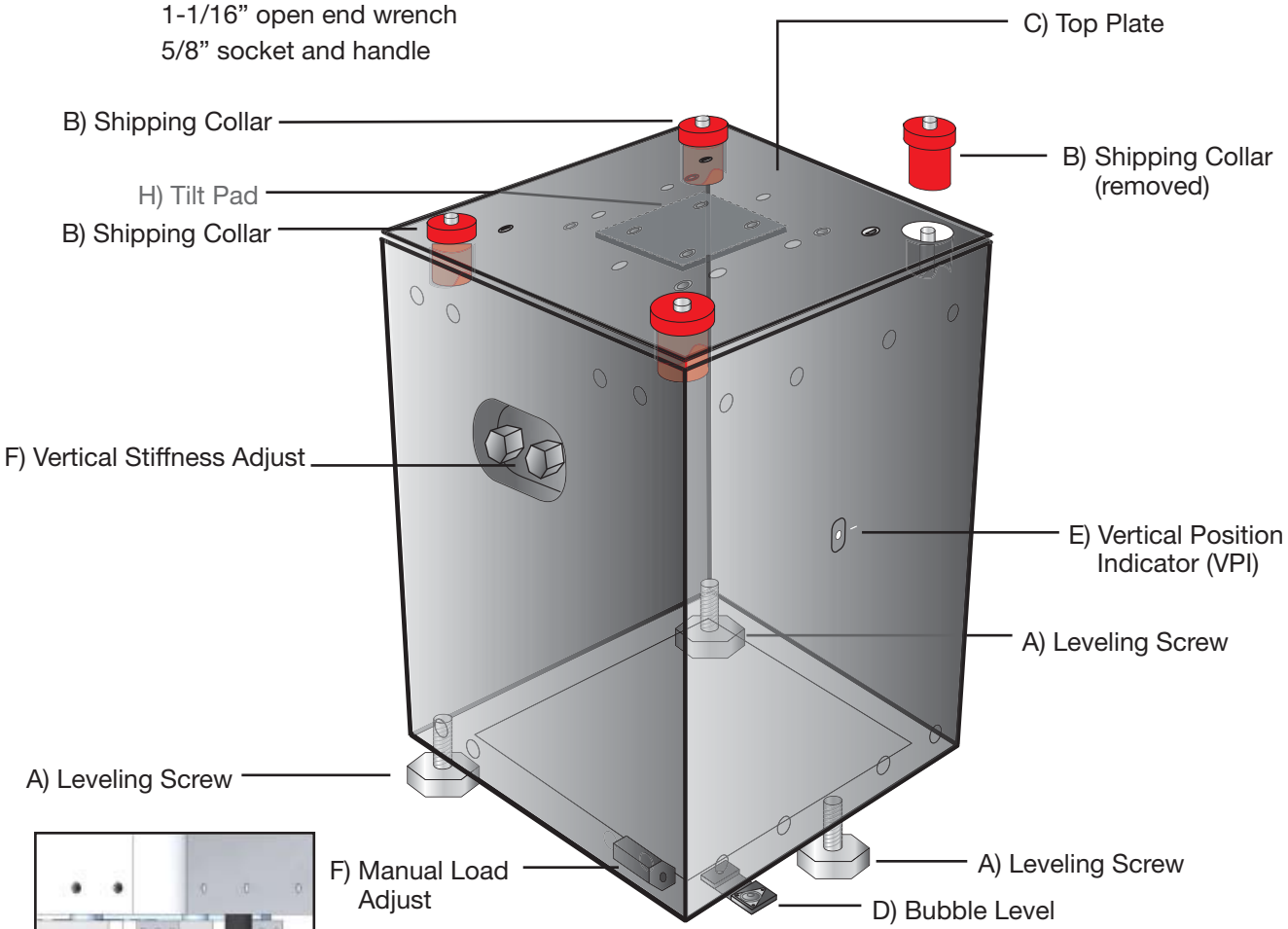
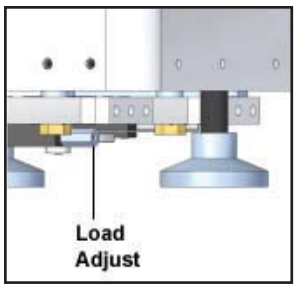
SM-1 Isolator
Single Isolator Configuration
Installation and Adjustment

Required tools:

5/16” hex wrench
3/16” hex wrench
1-1/16” open end wrench
5/8” socket and handle





DO NOT REMOVE SHIPPING COLLARS UNTIL INSTRUCTIONS INDICATE. SHIPPING COLLARS MUST BE USED WHEN MOVING ISOLATOR.

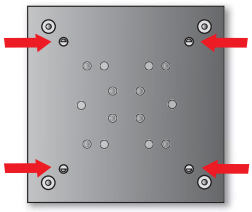


Illustration 1 (C)

Illustration 2 (A)

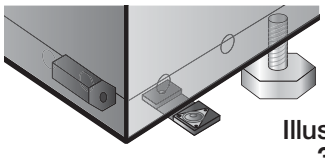


Illustration 3 (D)

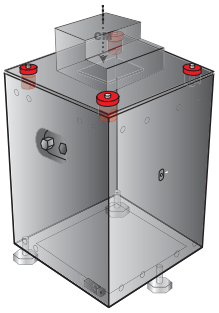
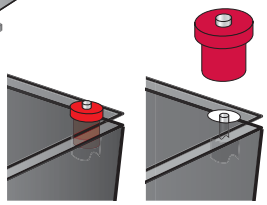
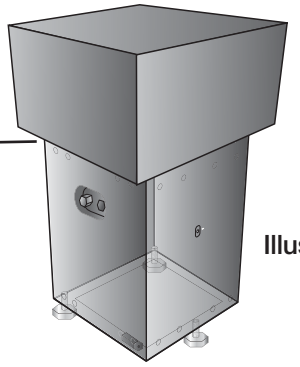


Illustration 4 (D)

Illustration 5 (B)





Gap should be equal on all sides

Illustration 6

Incorrect

Incorrect

(E)

Illustration 7

Correct Position

1. Make sure you have the correct model for your payload. Payload weight MUST be within the recommended range. When using a system of two or more SM-1 isolators for a single payload, after becoming familiar with this manual, please refer to the Minus K Multiple Isolator System Installation Manual.

2. The SM-1 isolator is shipped within a crate. Only with the shipping collars installed, the isolator can be lifted by the top plate (B). There are 4 holes in the top plate that can be used to hoist the isolator. These lifting holes are shown in illustration 1 (C) and have a ½-13 thread.

Caution: The isolator weighs approximately 155 lbs.

Turn all 3 leveling feet (see Illustration 2 (A)) to about the same height so the top plate is at the desired height. Adjust leveling feet to a length of 2 11/16" (from the base of the foot to the base edge of the isolator)

3. Install a bubble level (see Illustration 3 (D)) (included) on each isolator. The bubble levels have been attached to the bubble level mounts. Use a ¼-20 screw inserted in the bottom of the isolator (located at each of the four corners) so that the bubble level faces up and sticks out to the side or front of the isolator. Then adjust the leveling feet so that the isolator is level.

4. The SM-1 isolator has a high weight capacity. To spread the weight over a greater floor area a metal plate can be placed under the isolator. Position the isolator to allow easy access to the Vertical Stiffness Adjust screws, the Vertical Position Indicator (VPI) and the Load Adjust screw, confirming that the accessible VPI slot has the indicator pin.

5. Carefully position payload on top plate so its center-of-mass (CM) (see Illustration 4) is as close to center as possible.

CAUTION: If payload covers shipping collar holes, the collars must be removed before placing payload. Take extra care when placing payload without shipping collars installed. Do not replace screws as they may interfere with payload.

6. Remove the four (4) red shipping collars (see illustration 5 (B)). STORE SHIPPING COLLARS IN A SAFE PLACE AS THEY MUST BE USED WHENEVER MOVING ISOLATOR.

Do not lift the isolator by the top plate when the shipping collars have been removed or tilt the top plate excessively as this can damage the isolator.

7. Check the level of the top plate. The gap between the top plate and the isolator cover should be approximately equal on all sides (see illustration 6).

8. Reposition the payload, as necessary, to level the top plate. It is recommended that you re-install the red shipping collars if you need to re-position the payload (see Step 5). However, it is not necessary if you take extra care repositioning the payload. Do not use the leveling screws to level the top plate.

NOTE: Cables, hoses, etc. connected to the payload can affect the horizontal and vertical position. If possible make the following adjustment without attaching the cables.

Floating Isolator Vertically

The isolator comes from the factory adjusted to support the nominal weight, i.e., 700 lb for the 700SM-1, 1200 lb for the 1200SM-1, etc. Internal stops limit vertical motion. The isolator must be "floated" between the stops.

9. Check Vertical Position Indicator (E). The pin should be approximately centered on the horizon line (see illustration 7). Turn Load Adjust screw (F) only clockwise when pin is below the line, and only counterclockwise when it is above the line. If the payload weight varies from nominal weight by a few pounds/ kilograms it may take many turns (approximately 16 turns per payload pound/35.2 per kilogram).

NOTE: To avoid damage never force the Load-Adjust screw. If pin cannot be easily centered on line, turn Negative Stiffness Adjust screws slightly counter-clockwise and readjust vertical position. Turn both screws the same amount. Repeat as necessary. This is a very sensitive adjustment and is not usually necessary. Turn the screws only a few degrees each time.

Floating Isolator Horizontally

10. Internal stops limit the horizontal motion. The Isolator must be “floated” horizontally between the stops by adjusting the leveling screws. To check if the isolator horizontal position is centered, reference the overhang of top plate to the cover around all sides. Or push the top plate from center to the left until it stops, then from center to the right until it stops. Compare the difference. Then repeat for the front and back directions.

1/2 Hz = 3 cycles in 6 secs.

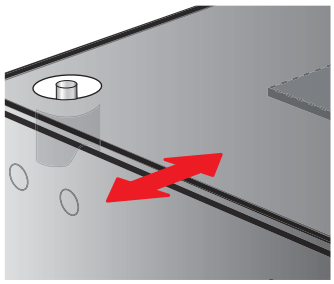


Illustration 8

HORIZONTAL NATURAL FREQUENCY

11. The horizontal natural frequency can only be changed by varying the payload weight. 1/2 Hz is achieved when payload is near nominal weight (ie. 700 lb. for the 700SM-1). Increasing the weight lowers the frequency. Decreasing the weight raises the frequency. Ballast weights can be used for fine adjustments to frequency (keep in mind when adding ballast it will effect the vertical position). Check the horizontal frequency by pushing horizontally near the center-of-mass of the payload to create small horizontal oscillations, then count cycles (one back and forth movement). For example, 3 cycles in 6 seconds is 1/2 Hz. Depending on the damping, the isolator may only cycle 10-15 times (see illustration 8) depending on the attached hoses and cables.

1/2 Hz = 3 cycles in 6 secs.

Illustration 9

(F) Vertical Stiffness Adjust

VERTICAL NATURAL FREQUENCY

12. Check the vertical frequency by pushing down vertically on top plate to create small vertical oscillations, then count cycles (one up and down movement). 1/2 Hz is equal to one cycle in 2 seconds.

The vertical natural frequency can be changed using the Vertical Stiffness Adjustment screws (F), although this adjustment is seldom necessary (see illustration 9). This adjustment requires a 5/8 inch socket wrench. Turning the screws clockwise reduces the natural frequency, counterclockwise increases the frequency. This is a sensitive adjustment. Turn both screws the same amount (only a few degrees at a time), then check the vertical position and frequency. Adjust further, if necessary.

Note: Run any cables to the instrument with plenty of slack. Do not tie cables together as this will make them stiffer. Stiff and taut cables can stop the isolator from providing vibration isolation.