

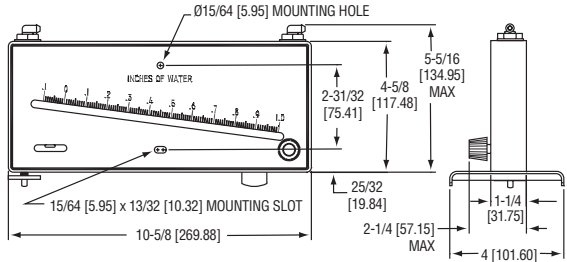


## Mark II - Model 40 Molded Plastic Manometers

### Installation and Operating Instructions



MARK II MODEL 40



**Dwyer Mark II - Model 40 Molded Plastic Manometers** are ideally suited for air velocity and air filter gage applications at minimal cost. These inclined manometers provide linear calibration and excellent resolution throughout their ranges. They are capable of pressure measurements above and below atmospheric, as well as differential pressure measurements.

### INSTALLATION

**Stationary Applications:** Mount the Mark II manometer on a convenient vertical surface. The installation should not be exposed to strong chlorine atmospheres or solvents such as benzene, acetone, carbon tetrachloride, etc. The instrument is suitable for total internal pressures of up to 15 psi (100 kPa) and ambient temperatures of 150°F (65°C). **DO NOT EXCEED THESE LIMITS.** At the mounting location selected, drill two  $9/64$ " diameter holes on a vertical

line spaced  $2-31/32$ " apart. Install the gage with the self-tapping screws provided, turning the screws down snug but not tight. Adjust the position of the gage until the bubble is centered in the spirit level. Tighten the mounting screws, checking to be sure the instrument remained level, and re-level as necessary.

### SPECIFICATIONS

**Accuracy:**  $\pm 3\%$  of full scale.

**Maximum Internal Working Pressure:**

15 psi (100 kPa).

**Maximum Working Temperature:** 150°F (65°C).

**Scale Length:** Approx.  $8-1/4$ " (21 cm).

**Weight:** 10 oz (283.49 g).

**Accessories:**  $3/4$  oz. gage oil, mounting screws,  $1/8$ " NPT tubing adapters, washers, nuts, red and green pointer flags, (2)  $4-1/2$  ft. lengths  $3/16$ " I. D. vinyl tubing.

**Portable Applications:** For portable use, a molded plastic swing-away foot and leveling screw are provided. Referring to the picture on the first page of this bulletin, secure the swing-away foot to the bottom of the gage, using the plastic screw in the tapped hole on the right-hand side. Install the plastic leveling screw in the tapped hole on the bottom left side of the manometer. In use, the swing-away foot is positioned perpendicular to the gage. With the manometer in operating position, the leveling screw is adjusted until the bubble is centered in the spirit level. For storage, the swing-away foot can be rotated to a position in line with the gage body.

### FILLING

Turn the zero adjust knob fully counterclockwise until it stops; then turn it clockwise approximately four full turns so as to center the adjustment to allow room for adjusting either side of zero. Unscrew the entire low pressure (right) shut-off connection fitting. A  $\frac{3}{4}$ " wrench is required. Also, remove the cork, disc, and "O" ring. Vent the left connector by turning the elbow 1 - 2 turns counterclockwise. Slowly fill gage with fluid provided until fluid rises in the indicating tube to the vicinity of zero on the scale. Nearly all the oil provided will be required to fill the gage. Replace the cork, disc, "O" ring and the low-pressure shut-off connection fitting.

### CAUTION

USE .826 SPECIFIC GRAVITY RED GAGE OIL FOR MODEL #'S 40-1, 40-1-AV, 40-250 Pa, 40-250 Pa-AV, and 40-25 mm. Use 1.910 SPECIFIC GRAVITY BLUE GAGE OIL FOR MODEL #'S 41-2, 41-2-AV, 41-600 PA, 41-60 mm.

### OPERATION

The Model 40 manometer is provided with convenient shut-off tubing connections to prevent loss of oil when transporting the gage. To use the gage, turn each barbed tubing connection counterclockwise 1-2 turns from the closed (fully clockwise) position. Rotate the zero adjustment for an exact zero reading and the gage is ready for use. In stationary installations, these steps need only be performed upon initial installation. In portable use, each time the gage is used the connections must be opened, the gage leveled and zeroed; prior to storage, the gage connections must be closed.

**Pressure Connection:** Two  $4\frac{1}{2}$ " lengths of plastic tubing are included with the gage along with two adapters for connection of the tubing to  $\frac{1}{8}$ " NPT fittings or sheet metal ducts. The tubing from the high pressure pickup should be connected to the high pressure (left) barbed connection at the top of the gage. The tubing from the low pressure pickup should be connected to the low pressure (right) barbed fitting. Stick-on red and green arrows are provided to indicate the appropriate range of readings for the particular application. The  $\frac{1}{8}$ " NPT tubing adapters can be used as static pressure sensors in sheet metal ducts by drilling a  $\frac{7}{16}$ " diameter hole in the duct and mounting the adapter in the hole, placing one of the washers on each side of the duct wall and securing the  $\frac{1}{8}$ " NPT nut.

### TYPICAL APPLICATIONS

**Draft Gage:** Run iron pipe,  $\frac{1}{8}$ " or larger in size, from the source of the draft to a point within  $4\frac{1}{2}$ ' of the manometer. Provide a means for periodic clean-out to remove any soot accumulation. Using one of the lengths of tubing provided, make the connection from the pipe to the low pressure (right) fitting on the gage.

**Static Pressure Indicator:** Using the 1/8" NPT tubing adapters provided, make a static pressure connection to the duct at the desired location. Using either the tubing provided or a longer length if necessary, connect the pressure sensor to either the high (left) or low (right) pressure connection of the gage, depending on whether the static pressure is positive or negative compared to atmosphere. Where air velocities in the duct are 1000 ft. per minute or higher, static pressure error may be induced unless a static pressure tip is used.

**Air Filter Gage:** Mount the gage within 4 1/2' of the filter bank and install a 1/8" NPT tubing adapter in the duct on each side of the filter element. Run the tube from the fitting on the discharge side of the filter to the low pressure (right) gage connection and the tube from the upstream side of the filter to the high pressure (left) connection. Remove the paper backing from the green and red arrows and install the arrows on the face of the manometer adjacent to the indicating tube to indicate clean and dirty filter readings.

**Air Velocity Indicator:** A pitot tube is required for air velocity readings and care must be taken in installations to insure accuracy. Select a location for the pitot tube with smooth straight sections of duct at least 8 1/2 diameters upstream and 1 1/2 or more diameters downstream. Install the pitot tube so it is centered in the duct with the tip directed into the air stream. The right angle pitot tube connection is connected to the low pressure (right) gage connection. The straight pitot tube connection is connected to the high pressure (left) gage connection. Velocity reading now indicated on the gage is the center or maximum air velocity in the duct. For average velocity across the full area of the duct, multiply by a factor of .9. The veloc-

ity indicated is for dry air at 70°F (21.1°C), 29.9" barometric pressure, and a resulting density of .075 pounds per cubic foot. For variations from these standard conditions, corrections may be based upon the following formula:

$$\text{Air Velocity (FPM)} = 1096.5 \sqrt{\frac{P_v}{D}}$$

Where  $P_v$  = velocity pressure in in./H<sub>2</sub>O

$D$  = air density in lbs. per ft<sup>3</sup>

$$D = 1.325 \times \frac{P_b}{T}$$

Where  $P_b$  = barometric pressure in inches of mercury

$T$  = absolute temperature (indicated °F + 460)

To determine the volume of air flow in the duct in cubic feet per minute, multiply air velocity in FPM times the cross-sectional area of the duct in square feet.

## OPERATING RANGES

| <b>Model</b>      | <b>Range</b>               | <b>Minor Grads</b>  | <b>Indicating Fluid</b>     |
|-------------------|----------------------------|---------------------|-----------------------------|
| <b>40-1</b>       | .10-0-1.00" w.c.           | .01" w.c.           | .826 sp. gr.<br>(red oil)   |
| <b>40-1-AV*</b>   | 0-1.10" w.c.<br>0-4200 fpm | .01" w.c.<br>varies | .826 sp. gr.<br>(red oil)   |
| <b>41-2</b>       | .20-0-2.400" w.c.          | .02" w.c.           | 1.910 sp. gr.<br>(blue oil) |
| <b>41-2-AV*</b>   | 0-2.50" w.c.<br>0-6300 fpm | .02" w.c.<br>varies | 1.910 sp. gr.<br>(blue oil) |
| <b>40-250 Pa</b>  | 10-250 Pa                  | 2 Pa                | .826 sp. gr.<br>(red oil)   |
| <b>40-250-AV*</b> | 0-260 Pa<br>0-21 mps       | 2 Pa<br>varies      | .826 sp. gr.<br>(red oil)   |
| <b>41-600 Pa</b>  | 20-0-600 Pa                | 5 Pa                | 1.910 sp. gr.<br>(blue oil) |
| <b>40-25 mm</b>   | 0-26 mm w.c.               | 2 mm w.c.           | .826 sp. gr.<br>(red oil)   |
| <b>41-60 mm</b>   | 0-60 mm w.c.               | 5 mm w.c.           | 1.910 sp. gr.<br>(blue oil) |

\* Pitot tube required at additional cost. See Bulletin H-100.