

## INSTALLATION AND OPERATING INSTRUCTIONS

# Series DPM Differential Pressure Manometer

The Differential Pressure Manometer (DPM) is a rugged, digital instrument used to measure the pressure drop or pressure gain across hydronic system components. The DPM is available in either 0-15 psi or 0-100 psi measurement range models for precise adjustment of circuit balancing valves, and to monitor circulator performance. Both models measure gauge or differential pressure and can store up to 40 readings for later recall. The operator can select from a variety of Imperial and metric measurement units to suit the hydronic system design data. Valuable safety features include visible and audible instrument over-range warning alarms and backlit display for work in poorly illuminated areas. The lightweight, compact DPM design is easy to use in the tight, overhead spaces commonly encountered when balancing or troubleshooting hydronic systems.



TECHNICAL DATA	
Accuracy	±0.5% of full scale from 60°F - 78°F (15°C - 25°C); ±1% of full scale from 32°F - 60°F and 78°F - 104°F (0°C - 15°C and 25°C - 40°C)
Measurement Range	DPM-15    0 - 15 psi (0 - 1.0 bar) DPM-100    0 - 100 psi (0 - 6.9 bar)
Maximum Pressure	DPM-15    30 psi (2.0 bar) DPM-100    200 psi (13.0 bar)
Selectable Pressure Units	psi, in. H <sub>2</sub> O, in. Hg, mm Hg, kPa, bar and mbar
Storage Temperature	-4°F - 176°F (-20°C - 80°C)
Pressure Hysteresis	±0.1% of full scale
Power Source	9 V alkaline battery (included)
Battery Life	Up to 100 hours (less when LCD backlight is used)

### BATTERY INSTALLATION

The unit is shipped with a separate 9 Volt alkaline battery which must be installed before operation. Remove the two screws holding the bottom endcap in place and remove the endcap. Connect the battery to the enclosed battery clip observing correct polarity. Be careful not to trap wires between the battery, case or foam pads which retain the battery. This could make it difficult to install the battery or remove it later for replacement. Be sure the rubber gasket is properly seated in the gasket channel of the endcap and replace endcap. Note that the endcap will only fit one way because the holes are slightly off-center. Place the "Z" shaped wrist strap clip in one of the screw recesses and replace the screws. Do not overtighten the screws. Attach wrist strap to clip.

When battery replacement becomes necessary, use only a 9 Volt alkaline type such as a Duracell® MN1604, Eveready® 522 or equivalent. Zinc-carbon types, often labeled Heavy-duty are not recommended because of the increased potential for leakage. Alkaline batteries are also a better value because they last up to three times longer in this device.

### ON-OFF OPERATION

The on-off control is a toggle function. Press and release the ON/OFF key once to turn unit on; again to turn it off. If the manometer is left on with no activity for approximately 20 minutes, unit will turn itself off to conserve the battery.

### DISPLAY BACKLIGHT

The Model DPM includes a display backlight to allow use in the dark or in poor lighting conditions. Manometer must be switched off before this feature can be activated. Next, press and hold the ON/OFF key down. After about 1 second the backlight will come on and remain lighted for approximately 2 minutes after which it will turn itself off to conserve battery life.



## ZEROING PRESSURE READING

Potential inaccuracy due to temperature effects can be minimized by re-zeroing immediately before use. To zero the display, vent both ports to atmosphere so no pressure is applied to either port. Press the ZERO/STORE key and - - - will be momentarily displayed as zeroing occurs. Zeroing is not possible when the memory mode is in use. It must be done before selecting that function.

If the unit is accidentally zeroed with pressure applied to one of the ports, internal circuitry might detect an error and display ALARM 1 or ALARM 2 at the top of the readout area. Additionally, if the ports are then vented, the audible overpressure alarm may sound continuously. This will not normally cause harm if the maximum pressure has not been exceeded. To correct the fault, vent the pressure ports to atmosphere and press the ZERO/STORE key to zero the unit. The fault will then be corrected. If a zero is attempted with pressure applied to the meter that exceeds 4% of full scale, the zero attempt is aborted.

## PRESSURE CONNECTIONS

For a single positive pressure, connect tubing to port marked + and vent opposite port to atmosphere. To measure differential positive pressure, connect higher positive pressure to port marked + and lower positive pressure to port marked -. Manometer will indicate the difference between the two.

## SELECTING PRESSURE UNITS

Up to seven pressure units are available. The display will indicate the current selection. To change to different units, use the UNITS/LOC key. Each touch will cause an advance to the next choice. The selected units will remain in memory even when power is shut off. This way, your preference will always be displayed after the initial selection.

## DISPLAY HOLD

There may be situations where you want to temporarily retain a reading. The Model DPM includes a Display Hold feature which freezes the current reading and holds it in the display until cleared. To activate this operation, momentarily press the HOLD/MEMORY key when the pressure you want to save is displayed. A HOLD indicator will appear in the display to indicate that the reading shown is frozen. To return to normal operation, press the HOLD/MEMORY key again. The HOLD indicator will disappear and the current pressure will again be shown.

## DISPLAY AVERAGING

The displayed reading is sampled and averaged to provide a stable reading in turbulent flow conditions. The default value of 2 should suffice for most applications. To change the sampling period, press and hold the HOLD/MEMORY key until DAMP is displayed. A value from 1 to 16 is displayed. To increase reading stability, press ZERO/STORE to obtain a higher value. To increase the displayed value refresh rate, press UNITS/LOC. To store the selected display averaging value, press HOLD/MEMORY. Use the lowest value that provides a stable reading. The default value of 2 is ideal for most applications.

## MEMORY FUNCTION

A memory function is included that allows you to store up to 40 pressure readings for later review and recording. This is helpful for finding the most disadvantaged valve in a circuit, and for comparing realive pressure readings, to use as the basis for proportional circuit balancing.

## STORING READINGS

Press and hold HOLD/MEMORY until STO1 is displayed. Press ZERO/STORE to store the displayed value in this memory location. To store another reading, press UNITS/LOC to advance to the next memory location, and press ZERO/STORE.

## VIEWING STORED READINGS

Press and hold HOLD/MEMORY until RD01 is displayed. To view another stored reading, press UNITS/LOC to advance to the next stored reading.

## CLEARING MEMORY

Press and hold HOLD/MEMORY until CLR is displayed. Press ZERO/STORE to clear all stored readings from memory.

## RETURNING TO DISPLAY MODE

Press HOLD/MEMORY. MEM is no longer displayed. All readings stored since the memory was last cleared are retained and can be viewed at anytime.



## OVERPRESSURE ALARM

OFL is displayed and alarm sounded to alert the operator that pressure has exceeded the operating range of the unit. Exceeding the range will not damage it or affect calibration as long as the maximum rated pressure is not exceeded. **Do not exceed the maximum rated pressure of the manometer. Doing so will cause permanent damage to the sensor, may rupture the housing and/or cause injury.** The maximum pressure is shown on the rear label and on page 1 of these instructions.

## LOW BATTERY INDICATOR

A weak battery can cause improper operation or inaccurate measurements. A low battery indicator is provided on the display to show when the battery needs replacement. Although the unit might appear to function and indicate properly, the accuracy of readings cannot be guaranteed when the LOW BAT indicator is illuminated. Replace the battery with a fresh one. Do not leave an exhausted battery in the unit due to potential leakage.

## CONNECTING THE DPM

### WARNING:

The DPM should only be used by qualified personnel, in accordance with all applicable codes, and following generally accepted safety practices.

Always exercise extreme caution when connecting any instrument to a pressurized system.

Prevent operator exposure to pressurized fluid leaks to avoid personal injury.

### Pressure Hose and Metering Probe Connections

Follow these instructions when using the optional pressure hoses and metering probes, supplied by Armstrong.

### CAUTION:

Do not use thread compound or sealing tape on the meter hoses or fittings.

1. Ensure the brass pressure hose adapters are screwed firmly into the DPM input ports.
2. Connect the red pressure hose to the DPM input port labeled "High Pressure".
3. Connect the blue pressure hose to the DPM input port labeled "Low Pressure".
4. Connect the metering probes to the free ends of the pressure hoses.

### PT Port Connections

1. Verify the pressure to be measured is within the specified measurement range of the meter.
2. Close the ¼ turn valve of each metering probe.
3. Loosen the protective cap of the PT Port one complete turn to test for a seal leak. If fluid leaks from under the cap, depressurize the system and replace the PT Port before proceeding.
4. Remove the protective cap completely.
5. Insert the full length of the metering probe into the PT Port and screw the retaining nut down firmly by hand. (Refer to "Pressure Connections" for single versus differential pressure requirements).
6. Open the ¼ turn valve on the metering probes slowly to pressurize the hoses. (If an over-pressure alarm is activated, immediately close both valves and disconnect the meter.)
7. Use the various meter functions as required to display and store readings.



## CONVERTING READINGS TO FLOW RATE

To convert DPM differential pressure readings to flow rate, use the data supplied by the system designer or the specific hydronic system component manufacturer. Performance curves and quick conversion tools are available for all Armstrong circuit balancing valves.

Alternatively, the following formula may be used:

$$f = C_v \sqrt{\frac{\Delta P}{\left(\frac{d}{62.4}\right)}}$$

where  $f$  = flow rate (GPM)  
 $C_v$  = valve flow coefficient (supplied by manufacturer)  
 $\Delta P$  = differential pressure (psi)  
 $d$  = density of the fluid ( $d/62.4 = 1$  for water at 60°F)

## REPLACEMENT PARTS

The following replacement parts are available from your local Armstrong supplier.

Polyester hard case for DPM-15/100	570095-900
DPM/pressure hose adapter	939002-105
Pressure hose kit (one red, one blue)	997095-500
Metering probe (to suit Armstrong PT ports)	570147-010
Armstrong CBV balancing wheel	570109-203
Armstrong ARMflo CBV slide rule	570109-204

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