

# DM4003 POTENTIOMETER POSITION INPUT FIELD RANGEABLE TRANSMITTER



The *DM4003* provides an isolated output voltage or current proportional to the wiper or slide position of a potentiometer.

It is a useful interface module for monitoring valve and actuator positions, or generating test signals.

A regulated voltage of +1 volts DC is provided to excite potentiometer values from 100 ohms to 100,000 ohms. Potentiometer values over this range may be interchanged without performing a calibration. Input terminals are provided to connect the potentiometer to a high quality differential preamplifier.

The output is fully isolated from input, line power, and ground. The unit is useful for eliminating ground loops and for isolating from common mode voltages. The *DM4003* utilizes a feedback voltage controlled oscillator to develop a digital signal with a duty cycle proportional to the input signal amplitude. This signal is coupled through an isolating pulse transformer to the output circuitry, where the duty cycle data is converted to a proportional output signal level.

The module includes filtering and conditioning to reduce susceptibility to transients and noisy environments.

Input and output ranges are fully user-settable. With handy gold plated jumper connections, the user selects and sets - full range input span, response time/filtering capacitor, suppressed and elevated full range input offset, voltage/current output, output range, and normal/reverse acting output.

Input span and zero adjustments provide full range adjustability. All adjustments, settings, and input and output connections are easily accessed from under a pull off/push on cover panel. A write-on label is supplied on the front panel for the user's convenience.

The DIN Rail package snaps onto the rail and is easily removed from the front side by using a screwdriver to release the spring loaded snap.

## OPTIONS

(User specified)

**AC Power** 24, 115 or 230 VAC

**DC Power** 12 or 24 VDC

**U** All circuit boards conformal coated for protection against moisture.

## INSTALLATION

*DM4003* mounts on standard DIN Rail. Install it by hooking the top of the module's latch onto the top of the rail, then use a downward rotating motion to snap the module onto the rail. To remove the module, insert a screwdriver into the slot on the spring loaded snap which is located on the lower backside of the unit. Apply a downward pressure on the release and rotate the module up and off of the rail.

1. Remove the front panel by spanning the top and bottom edges between the thumb and index finger. Use a rocking motion to pull the front panel away from the module.
2. Input, Output and Power connections are shown on the terminal block labels.

**CAUTION: BEFORE PROCEEDING, REMOVE ALL POWER TO THE WIRES AND MODULE TO AVOID THE DANGER OF SHOCK AND/OR DAMAGE TO THE UNIT.**

To access input and output terminals, the connecting wires are inserted into the top of the top terminal block, and into the bottom of the bottom terminal block. The terminal blocks unplug. Wiring can be completed before the product is installed. Recommended wire sizes are 22-14 AWG Cu, with a strip length of 0.25 inches.

3. Replace the front panel by inserting the pins into the slotted holes located on the bezel and pushing it into position.
4. The front panel label provides space for the user to make application notes.

## CALIBRATION

The *DM4003* is factory calibrated to the input and output noted on the side label.

The *DM4003* allows the user to calibrate the module to operate as required for a specific application.

Field adjustments can be made by using the following recommended procedure.

**CAUTION: BE SURE ALL RANGE SELECT JUMPERS ARE SET TO THEIR PROPER POSITIONS BEFORE APPLYING INPUT OR POWER.**

1. Remove the front panel and disconnect the power.
2. Using the label on the side of the module (Figure 1) as a guide, position the jumper blocks for the desired operation of the following functions:

**span (the potentiometer may be used over any 25, 50, 75, or 100% of its travel)**- Choose the lowest span selection which includes the maximum of the input span. Span is the difference between the highest input and the lowest input. With the SPAN adjustment, the module's amplification can be calibrated to give the full output range for the input span.

**% of offset cancel**- The ZERO adjustment provides  $\pm 50\%$  offset canceling. For larger offsets, select the % OFFSET CANCEL needed to zero the input signal. The ZERO adjustment will provide 50% variation above and below the selected offset cancel.

**filter capacitor** (use the 1.0  $\mu F$  for most applications, or use the filter capacitor selection chart to obtain the desired filter and response time characteristics)

**output range** - Select the voltage or current range to obtain the desired output.

**output mode** - Select either voltage or current, this selection must be made in conjunction with the output range selection. There are two jumper positions for this selection, both must be selected.

**normal or reverse acting output** - Select normal for the output to increase as the input increases, select reverse for the output to decrease with increasing input.

3. Connect the mating device or equivalent resistive elements to the input; and meters to the input and output terminals. Apply power to the module.
4. Set the input resistance to represent the zero level, the lowest value of the input span.
5. Observe the output meter. Use the ZERO adjustment to raise or lower the output to the desired zero level.
6. Set the input resistance to represent the upper limit of the SPAN, the highest value of the input span.
7. Observe the output monitor. Use the SPAN adjustment to raise or lower the output to the desired maximum level.
8. Repeat steps 4 to 7 to fine tune the output. Usually 3 repetitions will give the desired results.
9. Remove power, disconnect test equipment and install the module for operation. Replace the front panel.

### Example for Span and Offset Selection:

1000 ohm Pot to be used over 750 ohm to 950 ohm range

**Actual Span:** 950 ohm  
-750 ohm = 200 ohm  
(200 ohm/1000 ohm) x 100% = 20%  
Select Span Jumper for 25%

**Actual Offset:** (750 ohm/1000 ohm) x 100% = 75%  
Select Offset Jumper for 75%

## SPECIFICATIONS

### INPUT

Span Select (User settable)  
25%, 50%, 75% & 100% of potentiometer

Span adjustment  
+5%, -55% of selected span

Zero adjustment  
±55% of selected span

Offsets (User settable)  
Suppress or elevated at 0%, 12.5%,  
25%, 50% & 75% of the potentiometer  
value

### OUTPUT

Modes (User settable)  
Voltage/current  
Normal/reverse acting

Range (User settable)  
0/.25, 0/1, 0/5, 0/10, -5/5, & -10/10 VDC  
0/1, 0/4, 0/20, & 4/20 mAdc

Accuracy  
±0.1% of span

Step Response Time  
see FILTER CAPACITOR SELECTION CHART

Ripple (peak-to-peak)  
<0.1%

Input to Output Linearity  
±0.01% of span

### COMMON MODE REJECTION

120 dB DC to 60 Hz

### ISOLATION, OUTPUT/INPUT

>500 megohms

### BREAKDOWN, OUTPUT TO INPUT

>1000 volts RMS sinewave

### BREAKDOWN, POWER CIRCUITRY

>1500 volts RMS sinewave

### OPERATING TEMPERATURE

14° to 140°F (-10° to 60°C)

### TEMPERATURE STABILITY

±(0.01% of span)/°C

### POWER Wattage 2.5 W max

AC (standard)

115 VAC ±10%, 50/60 Hz

230 VAC ±10%, 50/60 Hz

24 VAC ±10%, 50/60 Hz

DC (optional)

12 VDC nominal (10 to 15 VDC)

24 VDC nominal (21 to 28 VDC)

FILTER CAPACITOR SELECTION CHART		
CAPACITOR	RESPONSE TIME TO 99% FREQUENCY	LOW PASS CUT-OFF
μF	m s	Hz
0.001	20	50
0.01	20	50
0.1	50	16
1	500	1.6

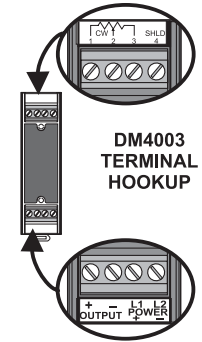
DM4003 POTENTIOMETER ISOLATED TRANSMITTER	
<p><b>INPUT CONFIGURATION</b></p> <p>SPAN %    100   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    75   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              50   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    25   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>FILTER μF    .001   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    .01   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              .1   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    1.0   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>OFFSET %    300   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    200   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>CANCEL SPAN 100   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    50   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>                  0   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/> ZERO</p> <p><input type="checkbox"/> SPAN</p>	<p><b>OUTPUT CONFIGURATION</b></p> <p>                  mA    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    V    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>                  .010   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    .5   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>                  .1   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    10   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>                  .15   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    15   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>RANGE    420   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    15   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              .020   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    .05   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              .04   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    .01   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              0/1   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    0.25   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>MODE    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    mA    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              V    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    μV    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>              <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    NORMAL</p> <p>              <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>    REVERSE ACTING</p>
<p><b>FACTORY SETUP</b></p> <p>MODEL _____</p> <p>INPUT _____</p> <p>OUTPUT _____</p> <p>POWER _____ V</p> <p>                  VA    _____ HZ</p> <p>CODE _____</p>	<p><b>FIELD SETUP</b></p> <p>INPUT _____</p> <p>OUTPUT _____</p> <p>POWER _____ V</p> <p>                  _____ HZ</p>

FIGURE 1

**CAUTION:** THE DIN/RAIL SHOULD BE EARTH GROUNDED (GREEN WIRE) TO ENSURE SAFEST OPERATION AND TO PROVIDE OPTIMUM PERFORMANCE.

## MOUNTING

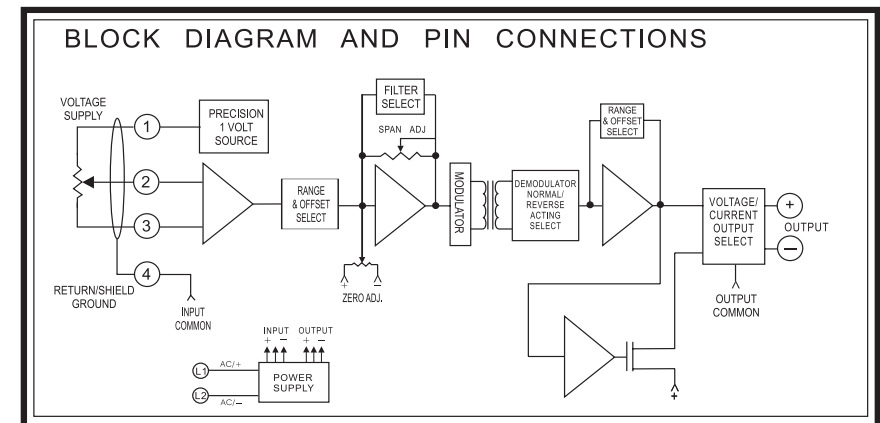
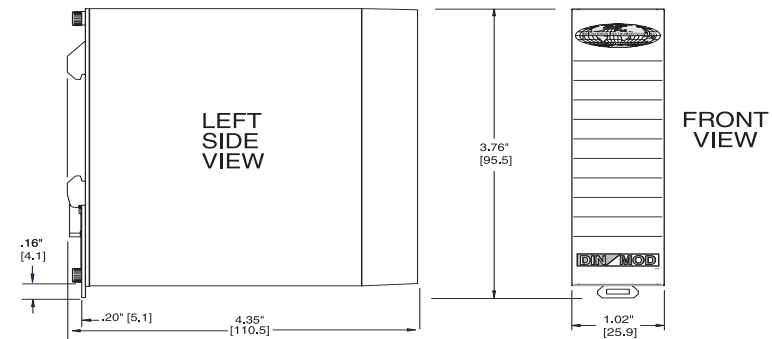
The DIN Rail package is installed by snapping it onto the rail and it is removed from the front side by using a screwdriver to release the spring loaded snap (located on the lower backside of the unit).



## WARRANTY

The **DIN/MOD** Series of products carry a limited permanent warranty. In the event of a failure due to defective material or workmanship, the unit will be repaired or replaced at no charge. Relays are not covered by the warranty.

## CASE DIMENSIONS INCHES [mm]



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