Intrinsically Safe
When used With Approved Barriers

Series 2200 Current To Pressure Transducer
Specifications - Installation and Operating Instructions

Bulletin E-32
INTRODUCTION

The Dwyer Series 2200 Current to Pressure Transducer combines low cost, accuracy, and minimal air consumption with field proven technology. The design features a rugged, compact housing with FM approved Intrinsically Safe operation when used with a barrier. This transducer utilizes a virtually weightless membrane that is electro-magnetically positioned over the air flow consuming minimal air and electrical energy while providing an accurate, precise output pressure signal. This low-mass membrane yields an output that is virtually unaffected by shock, vibration or mounting position. By employing an internal feedback network, the I/P responds quickly to step input changes, and by balancing air supply and exhaust provides control stability, while delivering accuracies of ±0.15% or ±0.25%. The pneumatic control signal is enhanced by an integral volume booster. The unit features easy access to zero and span adjustments along with field selectable direct, reverse and split range operation.

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DANGER, WARNING, CAUTION and NOTE Statements:

DANGER
• Refers to conditions or hazards which could result in serious personal injury or death.

WARNING
• Refers to conditions or hazards which could result in personal injury.

CAUTION
• Refers to conditions or hazards which could result in equipment or property damage.

NOTE
• Alerts you to facts or special instructions.

ALL DANGER, WARNING, AND CAUTION NOTICES MUST BE COMPLIED WITH IN FULL

SPECIFICATIONS

Input ......................... 4-20mA
Output ..................... 6-30 or 3-15 psig (41-207 or 20-103 kPa)
Accuracy ............ ±0.15% of Span (3-15 psig, 41-207 kPa) & ±0.25% of Span (6-30 psig, 20-103 kPa)
Repeatability .......... ±0.05% of Span
Deadband ............... 0.02% of Span
Stability/Reproducibility: 0.5% of Span / 6 Months
Position Effect . . . Not Measurable
Vibration Effect . . <0.25% from 1-200Hz/1g
Frequency Response . . -3db at 5 Hz (per ISA-S26.4.3.1 Configuration A)
Loop Load .............. 3.8Vdc +5 ohms (195 ohm load at 20mA)
Operating Current . 3.7mA min. 200mA max. continuous at 120°F; Half cycle 70 amp 1/120 sec. at 68°F
Supply Pressure ....... 20 (±2) psig for 3-15 psi output, and 35 (±2) psig for 6-30 psi output.
Supply Pressure Effect . . Not measurable within the recommended supply pressure range
Output Capacity ....... 4.0 SCFM (Supply and Exhaust characteristics are balanced to within ±10%)
Air Consumption .... 0.04 SCFM Steady State Average (0.06 SCFM Maximum)
Operating Temperature . . -40° to 150°F (-40° to 66°C)
Temperature Effect . . ±0.02% / °F of Span (Range of 0°F to 150°F), or ±0.04% / °F of Span (Range of -40°F to 150°F)
RFI-EMI Effect ........ Per SAMA PMC 33.1 standard (b), (c) 20 to 1000MHz, Class 3 effect on zero & span less than 1%. Also tested and found to comply with BS EN50081-2: 1993 Generic Emissions, Residential, Commercial and Light Industrial and BS EN50082-2: 1995 Generic Immunity, Residential, Commercial and Light Industrial.
Operational Modes .... Direct, Reverse, and/or Split-Range (field-selectable, no additional parts needed)
Failure Mode ........ Transducer Always Fails In The Mechanically Direct Mode Regardless Of Mode Selection. Example: Unit with a 3-15 psi output will fail to 3 psi (or less) with the loss of Input Signal (mA).
Enclosure .......... Internally purged NEMA 4X. Cast Aluminum with powder coat epoxy
Electrical Safety .... Factory Mutual, CSA and Sira/CENELEC Approved Intrinsically Safe. See Sections 1.5, 1.6 & 1.7.
Weight .............. 2.5 lbs (1.13 kg)
1. INSTALLATION

1.1. PRE-INSTALLATION REQUIREMENTS

1.1.1 Environment: Suitable for installations in the following locations:
   1. 2200 Series I/P
      • Intrinsically Safe Operation in Hazardous Locations Outdoors, NEMA 4X.
   2. See Section 1.5.0 for Factory Mutual approvals, Section 1.6.0 for Canadian Standards Association approvals and 1.7.0 for Sira/Cenelec approvals

   • All Wiring must be made in accordance with all local and national codes appropriate to the area in which the instrument is installed. Intrinsically Safe Barriers must be Factory Mutual Research Corporation approved (See Section 1.5.0).

1.1.2 Temperature: Ambient temperature must match specifications

1.1.3 Mounting/Attitude: No Restrictions

1.1.4 Electrical Input: 4-20mAdc current source. It is suggested that shielded wire be used to make electrical connections and shielding be attached to ground screw and earth ground. (See Figure 1, Page 4).

1.1.5 Air Supply: Clean, dry and oil free instrument air within acceptable pressure range for calibrated output.

1.1.6 A 43 micron external air filter is recommended.

   • The air line should be purged of all debris, oil and water.
   • Failures attributable to instrument air supply contamination are not covered by the warranty.
   • If supply pressure is not within acceptable range, a pressure regulator should be installed (consult factory).

1.1.7 Transducer Always Fails In The Mechanically Direct Mode Regardless Of Mode Selection.

   1. Example: Unit with a 3-15 psi output will fail to 3 psi (or less) with the loss of the Input Signal (mA).
1.2. MOUNTING

1.2.1 The 2200 Series housing has been designed for mounting to a standard valve yoke (2.25" bolt spacing) or a 2 1/2" (6.4cm) pipe.

1.2.2 **Valve Mounting:** Two (2) Bolts (5/16" x 2") and two (2) Lock Washers (5/16" nominal) are required. Order part number A-621 for this option.

1.2.3 **Pipe Mount:** A Pipe Mount Adapter Accessory is available. Order part number A-620 for this option.

1.2.4 See Dimensional Drawings on Front Cover and illustrations on Back Cover.

1.3. PNEUMATIC CONNECTIONS

1.3.1 One (1) 1/4" FNPT port is provided for supply air connections. A filter screen is also supplied with each unit to be placed in the supply port before the connection is made.

1.3.2 Two (2) 1/4" FNPT ports are provided for pneumatic output connections. Either port may be used and one may be used for the mounting of an output gauge. If no gauge is installed, the unused port must be plugged with the pipe plug included with the unit.

1.3.3 See Dimensional Drawings on Front and Back Cover.

* Before connecting pneumatics, blow out lines thoroughly.
* Soap test all joints and fittings for leaks.

1.4. ELECTRICAL CONNECTIONS

1.4.1 The 2200 Series I/P’s are supplied with two (2) 1/2" FNPT electrical conduit connections. The unused connection requires the insertion of a 1/2" FNPT pipe plug.

1.4.2 A two (2) position “Screw-Cage Clamp” terminal block is supplied for 22-12 AWG wire. Wire should be stripped approximately 1/4" before insertion. The Terminals are labeled “+” and “-“ on Label.

1.4.3 See Dimensional Drawings on Cover and Figure 1 for references.

* Observe polarity. Reverse polarity will not damage the unit, but unit will not operate.
* Conduit should be connected to prevent condensation from collecting in the instrument.
2. OPERATION

A block diagram outlining the operation of the 2200 Series is shown in Figure 3. A conditioned 4-20mA input signal provides an electric current to the coil.

This creates a magnetic field which magnetizes the valve. The magnetization is proportional to the input current signal and positions the membrane/button relative to the valve seat. The pneumatic output (back pressure) is thereby modulated relative to the input current. Further conditioning of the pneumatic output is achieved with a volume booster.

Final conditioning of the boosted pneumatic output signal is achieved by actually measuring the output with a pressure sensor. This signal is then compared with the input current to achieve the exact pneumatic output relative to the 4-20mA current input.

2.1. PROGRAMMING DIRECT, REVERSE OR SPLIT RANGE

2.1.1 Programming is selectable via internal jumpers located on the circuit board. To access, remove the Cover. The label located on the Module shows the location and position of these jumpers. See Figure 4.

CAUTION
• Disconnect power to unit before removing cover.

2.1.2 To Select desired operating mode, plug in jumpers according to Table 1 on Page 7.

NOTE
• It is recommended that mode selection be accomplished prior to final inspection.

CAUTION
• When switched from direct to reverse or into split range, the span will remain within ±1%

CAUTION
• TRANSUDER FAILS IN DIRECT MODE REGARDLESS OF OPERATING MODE SELECTED
Direct, Reverse and Split Range Inputs & Outputs

The Output of a 2200 Series is factory set for the desired output.

Table 1 (below) describes the jumper settings necessary for Split Range Inputs and Direct or Reverse Outputs.

Table 1- Jumper Selection for Direct, Reverse & Split Range

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>INPUT</th>
<th>SUPPLY</th>
<th>DIRECT</th>
<th>REVERSE</th>
<th>RANGE 1:1</th>
<th>RANGE 1:2</th>
<th>ADJUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-15 PSIG</td>
<td>4-20 mA</td>
<td>20 PSIG</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
</tr>
<tr>
<td>3-15 PSIG</td>
<td>4-12 mA</td>
<td>20 PSIG</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
</tr>
<tr>
<td>3-15 PSIG</td>
<td>12-20 mA</td>
<td>20 PSIG</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
</tr>
<tr>
<td>15-3 PSIG</td>
<td>4-20 mA</td>
<td>20 PSIG</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-3 PSIG</td>
<td>4-12 mA</td>
<td>20 PSIG</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-3 PSIG</td>
<td>12-20 mA</td>
<td>20 PSIG</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-30 PSIG</td>
<td>4-20 mA</td>
<td>35 PSIG</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-6 PSIG</td>
<td>4-20 mA</td>
<td>35 PSIG</td>
<td>•</td>
<td>•</td>
<td>• ZERO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: UNITS WITH OUTPUT RANGES OF 6-30 PSIG

• Units with output ranges of 6-30 psig must be programmed for 1:2 mode to achieve output range.
• Split ranging is not possible on these units, but Reverse mode can be utilized.
• Units factory calibrated for 6-30 psig may have a pneumatic zero too high to recalibrate to 3-15 psig. You can attempt to recalibrate by changing mode selection from 1:2 to 1:1. If this does not work, the unit must be sent back to the factory for recalibration.
2.1.3 PREVENTION OF VALVE OPERATION OVERLAP

There is adequate adjustment of span and zero to put a dead spot in the output to prevent valve operation overlap in split range. Table 2 shows the values. (If valve overlap is desired, there is also adequate adjustment of span and zero to provide a margin of overlap).

<table>
<thead>
<tr>
<th>Mode</th>
<th>Input(mA)</th>
<th>Output(psig)</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct, 1:2</td>
<td>4-11</td>
<td>3-15</td>
<td>Zero &amp; Span</td>
</tr>
<tr>
<td></td>
<td>13-20</td>
<td>3-15</td>
<td>Zero &amp; Span</td>
</tr>
<tr>
<td>Reverse, 1:2</td>
<td>4-11</td>
<td>15-3</td>
<td>Zero &amp; Span</td>
</tr>
<tr>
<td></td>
<td>13-20</td>
<td>15-3</td>
<td>Zero &amp; Span</td>
</tr>
</tbody>
</table>

Table 2 - Valve Operation Overlap

3. USING THE TEST JACK

The TEST JACK is an optional feature on the 2200 Series I/P. Order part number A-624.

- Do not remove the cover in hazardous areas when the instrument is powered
- Inserting the test jack without connecting a calibrator or ammeter will interrupt the loop power (signal)

3.1. CALIBRATION / OPERATION WITH THE TEST JACK

3.1.1 Remove the Cover
3.1.2 Connect the RED wire of the Jack Plug to the positive (+) lead of the current calibrator
3.1.3 Connect the BLACK and GREEN wires of the Jack Plug to the Negative (-) lead of the current calibrator
3.1.4 Insert the Jack Plug into the TEST JACK
3.1.5 The current calibrator is now the input signal source.
3.1.6 Removing the Jack Plug will reconnect the unit to the original current source.

3.2. MONITORING WITH THE TEST JACK

3.2.1 Remove the Cover.
3.2.2 Connect the RED wire of the Jack Plug to the Negative (-) lead of the ammeter.
3.2.3 Connect the BLACK wire of the Jack Plug to the Positive (+) lead of the ammeter.
3.2.4 Insert the Jack Plug into the TEST JACK.
3.2.5 Use the ammeter to monitor the input current loop signal.

4. MAINTENANCE AND REPAIR

The 2200 Series I/P has been designed using Dwyer’s solid Module without moving parts on which routine maintenance can be performed. However, regular routine maintenance is very important and should be performed on both the supply air filtration and the pneumatic and electrical connections as well.

4.1 EXTERNAL FILTRATION

4.1.1 Failures due to instrument supply air contamination are not covered by original equipment warranty.
4.1.2 Applying heavily oil and/or water laden instrument air will cause premature loading of the unit’s final filter and decay the supply air pressure thus causing the loss of unit output.
4.1.3 Poor quality instrument air can result in unit failure. It is recommended that a coalescent, oil efficient, 43 micron filter be placed upstream of each unit where oil and/or water laden instrument air is suspected.
4.1.4 It is good practice on any instrument air system to provide filtration off the compressor for the removal of oil and water. We recommend our Part Number F221 or F451 Air Filters. Appropriate filtration is required for proper operation with minimal maintenance.

4.2 SUPPLY PRESSURE REGULATION

4.2.1 Maintain supply air at pressures required by output range; 20 (±2) psig for the 3-15 psig range and 35 (±2) psig for the 6-30 psig range. See Table 1, Page 6.

4.2.2 Although the 2200 Series I/P should not be damaged by excessive supply pressure up to the maximum, elevated zero levels may result. The maximum supply pressure is 10 psig above the maximum calibrated range.

4.3 FACTORY REPAIRS

4.3.1 In the unlikely event the 2200 Series I/P should fail, the unit can be returned to the factory for warranty repair if the warranty period has not expired.

4.3.2 Repairs for the 2200 Series in or out of warranty are done on a repair/exchange basis.

4.3.3 All units returned for repair are to be shipped freight prepaid, to:

**Dwyer Instruments Incorporated**
Junction of IN 212 and U.S. 12
Michigan City, Indiana 46360
Attention: Repair Department

5. TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>LOOK FOR</th>
<th>SOLUTION</th>
<th>SEE SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Pressure is 0 PSI</td>
<td>-Instrument Supply Not Applied</td>
<td>Check Air Supply</td>
<td>1.1.5</td>
</tr>
<tr>
<td></td>
<td>-Module Failure</td>
<td>Replace Unit</td>
<td></td>
</tr>
<tr>
<td>Output Remains Between 1-2 PSI With Increase Of Input</td>
<td>-Input Leads Are Reversed</td>
<td>Reverse Input Leads</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>-Faulty Internal Connections</td>
<td>Check Internal Connections</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>-Circuit Board Failure</td>
<td>Replace Unit</td>
<td></td>
</tr>
<tr>
<td>Unit Will Not Zero</td>
<td>-Oil Contamination in Module</td>
<td>Replace Unit</td>
<td></td>
</tr>
<tr>
<td>Output pressure below 3 PSI</td>
<td>-Module Failure</td>
<td>Replace Filter, Part No. F221 or F451</td>
<td></td>
</tr>
<tr>
<td>Output Signal Fails Below Calibrated Zero Level, 1-2.5 PSI</td>
<td>-Input Current Loop Is Open</td>
<td>Check Input Loop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Loss Of Loop Power</td>
<td>Check Input Loop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Open Input Loop Due To</td>
<td>Check Input Loop For Overcurrent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-No Power</td>
<td>Disconnect/Reseat Connectors</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>-Module Coil Is Open</td>
<td>Replace Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Circuit Board Failure</td>
<td>Replace Unit</td>
<td></td>
</tr>
<tr>
<td>Output Signal Fails To 0 Psig</td>
<td>-Instrument Air Has Failed</td>
<td>Check Supply Air</td>
<td>1.1.5</td>
</tr>
<tr>
<td></td>
<td>-External Filter Is Obstructed</td>
<td>Replace Filter</td>
<td>1.1.6</td>
</tr>
<tr>
<td>Unit Will Not Go To Full Scale With Full Scale Input</td>
<td>-External Filter Is Obstructed</td>
<td>Replace Filter</td>
<td>1.1.6</td>
</tr>
<tr>
<td></td>
<td>-Module Is Contaminated</td>
<td>Replace Unit</td>
<td>1.1.6</td>
</tr>
<tr>
<td></td>
<td>-Circuit Board Failure</td>
<td>Replace Unit</td>
<td>1.1.6</td>
</tr>
<tr>
<td></td>
<td>-Leak In Tubing</td>
<td>Check Tubing</td>
<td>1.3</td>
</tr>
<tr>
<td>Will Not Split Range</td>
<td>-Circuit Board Failure</td>
<td>Replace Unit</td>
<td>1.1.6</td>
</tr>
<tr>
<td></td>
<td>-Bad Connection</td>
<td>Check Connections &amp; Jumpers</td>
<td>2.1</td>
</tr>
<tr>
<td>Operates in 1:1 Only</td>
<td>-Circuit Board Failure</td>
<td>Replace Unit</td>
<td>1.1.6</td>
</tr>
<tr>
<td></td>
<td>-Bad Connection</td>
<td>Check Connections &amp; Jumpers</td>
<td>2.1</td>
</tr>
<tr>
<td>Output Goes To Full Scale With No Input</td>
<td>-Module Is Contaminated</td>
<td>Replace Unit</td>
<td>1.1.6</td>
</tr>
</tbody>
</table>
2200 Series I/P with Pipe Mount, Order Part Number A-620

Optional 2 ½" Pipe Mount

1/4" NPTF Output Connections (Both Sides)

1/2" Conduit (Both Sides)

Vent Cover

2200 Series I/P Valve Mounted, Order Part Number A-621

Valve Yoke With 2.25" Bolt Spacing

Optional Valve Mount Kit: Two Bolts (5/16" x 2") & Two (5/16" Lock Washers)

1/4" NPTF Output Connections (Both Sides)