

TYPE 1500 I/P TRANSDUCER Product Instructions

PRINCIPLE OF OPERATION

The Type 1500 transducer is a force balance device in which a coil is suspended in the field of a magnet by a flexure. Current flowing through the coil generates axial movement of the coil and flexure. The flexure moves against the end of a nozzle, and creates a back pressure in the nozzle by restricting air flow. This back pressure acts as a pilot pressure to an integral booster relay. Consequently, as the input signal increases (or decreases, for reverse acting), output pressure increases proportionally.

Zero and span are calibrated by turning easily accessible adjusting screws on the front face of the unit (See figures 4 through 6). The zero adjustment causes the nozzle to move relative to the flexure. The span adjustment is a potentiometer that limits the flow of current through the coil. A thermistor circuit in series with the coil provides temperature compensation.

MOUNTING

- The T1500 can be mounted at any angle, but should be calibrated after mounting.
- For maximum output pressure stability, the Type 1500 should be mounted vertically in a vibration free location or such that the vibration is isolated to the X and Z axis as shown in Figure 1.

Pipe: Due to its light weight, the Type 1500 may be supported by the piping used for the supply and output.

Panel: (with access to rear of panel) Attach transducer to panel using two 10-32 screws and two threaded mounting holes on back of the unit.

Panel: (with no access to rear of panel) Attach bracket (see Fig 2) to transducer using two 10-32 screws on the back of the unit and mount bracket to panel using four 10-32 screws.

Pipe mount U-Bolt: Attach bracket (see Fig 2) to transducer using two 10-32 screws on the back of unit. Place U-bolt around pipe and through bracket. Place nuts on U-bolt and tighten (see Fig 3).

Manifold: Due to its compact size the T-1500 can easily be mounted in manifolds. For information regarding standard manifold assemblies offered by Bellofram, please contact the factory or your Local Bellofram Distributor.

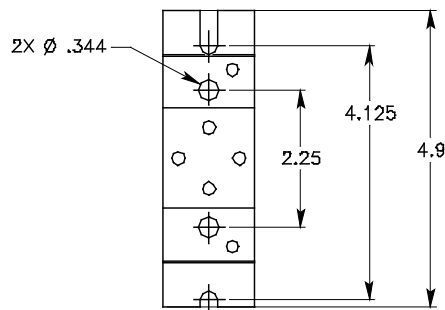


FIGURE 2

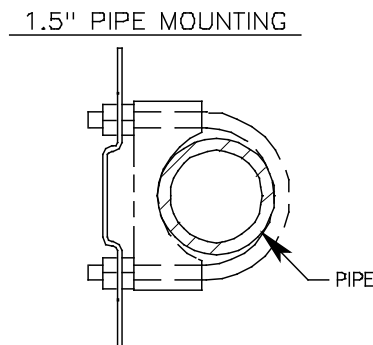


FIGURE 3

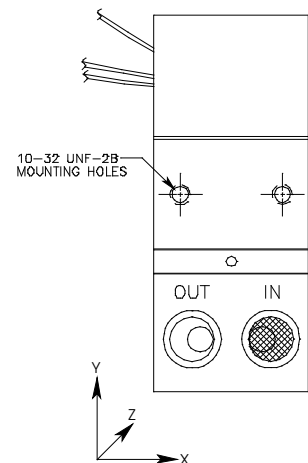


FIGURE 1

Warranties of Sale, disclaimer thereof and limitations of liability are covered exclusively by Bellofram's printed warranty statement for the T-1500 transducer. These instructions do not expand, reduce, modify or alter Bellofram's warranty statement and no warranty or remedy in favor of a customer or any other person arises out of these instructions.

AIR CONNECTIONS

- **WARNING:** High pressure air; Observe standard safety precautions.
- Supply pressure must be at least **3 PSI** greater than the minimum calibrated output pressure with a maximum supply pressure of **120 PSI**.
- The Transducer must be supplied with Instrument quality air. (See definition *)
 - a * A dew point less than 35 deg. F
 - b * No particles larger than three microns
 - c * Maximum oil content of 1 ppm

Supply: Connect supply to either of two 1/4 NPT ports marked "IN" on the base of the transducer. Avoid getting pipe sealant inside the piping or transducer. All unused ports must be plugged.

Output: Connect output to either of two 1/4 NPT ports marked "OUT" on the base of the transducer. The second out port may be used for a pressure gauge. All unused ports must be plugged.

PRODUCT CERTIFICATIONS

FACTORY MUTUAL

INTRINSICALLY SAFE: The Type 1500 transducers are rated intrinsically safe by FM for the following HAZARDOUS LOCATIONS:

CLASS I, DIVISION 1, GROUPS A,B,C,D

Proper FM approved intrinsically safe wiring requires external FACTORY MUTUAL RESEARCH CORPORATION ENTITY APPROVED SINGLE CHANNEL BARRIERS. Barriers to be selected based upon MAXIMUM ENTITY PARAMETERS of Type 1500 transducers: Proper installation must be in accordance with Bellofram Drawing 010597.

INTRINSICALLY SAFE ENTITY PARAMETERS:

$V_{max} = 30 V$, $I_{max} = 100 mA$, $C_i = 0 \mu F$, $L_i = 0 mH$.

V_{oc} and I_{sc} of a barrier shall not exceed V_{max} and I_{max} of the transducer.

$(L_i + L_{wiring})$ and $(C_i + C_{wiring})$ shall not exceed L_a and C_a of a barrier.

NONINCENDIVE: CLASS I, DIVISION 2, GROUP A, B, C, D.

NOTE: A barrier is not necessary when the Type 1500 transducer is placed in a nonincendive location.

NOTICE: The following ratings apply only to the NPT and Hirschmann Connector Models. They do **not** apply to the Terminal Block Models.

NEMA 4X DUST- PROOF: DUST- PROOF FOR CLASS II, DIV 1, GROUP E, F, G.

SUITABLE FOR CLASS III LOCATIONS. **WARNING-** These ratings are valid **ONLY WHEN** the cover and gasket are fully installed, and the electrical connections conform to the Required standards.

ATEX

INTRINSICALLY SAFE: The Type 1500 model transducers are rated intrinsically safe by CENELEC for:

EEx ia IIB T4 ($T_{amb} = 65^{\circ}C$)

The following parameters are specified :

$U_i = 30 V$; $P_i = 1 W$; $C_i = 0$; $L_i = 20mH$; $R_{eq} = 180 ohms$

Proper installation must be in accordance with Bellofram Drawing 010-597-001.

CANADIAN STANDARDS ASSOCIATION

INTRINSICALLY SAFE: The Type 1500 transducers are rated intrinsically safe by CSA for the following HAZARDOUS LOCATIONS:

CLASS I, GROUPS A, B, C, D; CLASS II, GROUPS E, F, G; CLASS III: TYPE 4X.

NOTICE: The **TYPE 4X** rating applies only to the NPT and Hirschmann Connector Models. It does **not** apply to the Terminal Block Models.

Proper CSA approved intrinsically safe wiring requires external ENTITY APPROVED SINGLE CHANNEL BARRIERS. Barriers to be selected based upon MAXIMUM ENTITY PARAMETERS of Type 1500 transducers: Proper installation must be in accordance with Bellofram Interconnection Diagram Drawing Number 010-632.

INTRINSICALLY SAFE ENTITY PARAMETERS:

$V_{max} = 30 \text{ V}$, $I_{max} = 100 \text{ mA}$, $C_i = 0 \text{ } \mu\text{F}$, $L_i = 0 \text{ mH}$.
 V_{oc} and I_{sc} of a barrier shall not exceed V_{max} and I_{max} of the transducer.
 $(L_i + L_{wiring})$ and $(C_i + C_{wiring})$ shall not exceed L_a and C_a of a barrier.
T4; Maximum ambient 70°C

PRECAUTIONS TO BE OBSERVED DURING INSTALLATION



The Bellofram T-1500 Transducers were tested at the EMC Test Centre, Dunfermline, Fife, KY11 5LB to the Electromagnetic Compatibility Directive effective January 1, 1996. The relevant EMC specifications tested were the following: EN 50081-1 (1992) and EN 50082-1 (1992). A Technical Construction File, Serial #107 was written and Certificate of Conformity issued by a Competent Body.

EN 50081-1 (1992): Test results confirmed that no precautions need to be observed during installation regarding electromagnetic emissions from the T-1500 Transducers.

EN 50082-1 (1992): The following precautions should be taken during installation to maintain the advertised accuracy specifications for the T-1500 Transducers. The input wiring to the transducer should be isolated from other high voltage transient wiring. The momentary switching on and off of nearby relays, motors, or other high Capacitive or inductive loads can have a minor effect on the terminal based linearity specification (0.75% of standard range models) for the T-1500. Any change in output pressure is minimal and momentarily, and is considered to be within the performance capabilities of the T-1500. Use of a ferrite bead collar on the input wires entering the transducer is recommended should installation next to high electromagnetic interference be necessary.

ELECTRICAL CONNECTIONS:

Both the I / P and E / P versions are two wire devices, plus a safety ground. The E / P requires a DC voltage input signal; example: 1 to 9 VDC. The I / P models require an input current of 4 to 20 mA.

Forward Acting

Electrical Connection	" + " Supply Signal Wire	" - " Supply Signal Wire	Safety Ground
1/2" NPT (see figure 4)	Red Wire	Black Wire	Green Wire
DIN 43 650-A (see figure 5)	Terminal " 1 "	Terminal " 2 "	Ground Terminal
Terminal Block (see figure 6)	Terminal " + "	Terminal " - "	Ground Terminal

Reverse Acting

Electrical Connection	" + " Supply Signal Wire	" - " Supply Signal Wire	Safety Ground
1/2" NPT	Black Wire	Red Wire	Green Wire
DIN 43 650-A	Terminal " 2 "	Terminal " 1 "	Ground Terminal
Terminal Block	Terminal " - "	Terminal " + "	Ground Terminal

CALIBRATION:

Note: Input percentage refers to the amount of voltage or current required to obtain the calibrated high and low output pressure calibration settings. eg; 0% =4 mA , and 100% = 20 mA., or 0% = 1 VDC, and 100% = 9VDC.

Forward Acting NOTE: See forward acting wiring connections.

1. Apply the 0% input current or voltage signal to unit and adjust the "Zero" adjusting screw until the output is the correct low output pressure (psi.) Turn screw clockwise to increase output. If there is no change in output, keep turning adjustment screw clockwise until output begins to rise. It is imperative that the output pressure be closely monitored as turning the zero screw excessively could damage the flexure.
2. Apply the 100% input current or voltage signal to unit and adjust the "Span" adjusting screw until output is the correct high output pressure (psi.) Turn adjusting screw clockwise to increase output.
3. Repeat steps 1 & 2 until unit is calibrated.

Reverse Acting NOTE: See reverse acting wiring connections.

1. Apply the 0% input current or voltage signal to unit and adjust "Zero" adjusting screw until output is the correct high output pressure (psi.) Turn clockwise to increase.
2. Apply the 100% input current or voltage signal to unit and adjust "Span" adjustment until output is the correct low output pressure (psi.) Turn counterclockwise to increase.
3. Repeat steps 1 & 2 until unit is calibrated.

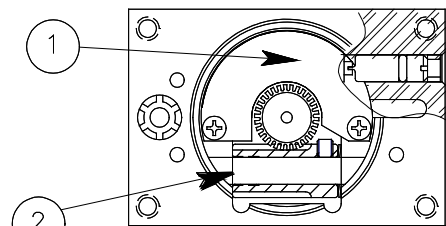
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TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Sluggish Performance or Reduced Range.	1) Plugged or blocked orifice.	1) Remove orifice screw and clean orifice with wire or pin <0.014 in. diameter (see figure 8).
	2) Supply pressure too high or too low.	2) Check supply pressure per "Air Connections" on page 2.
Transducer remains at start up no matter the input signal.	1) Zero set too low.	1) Turn zero adjustment clockwise until output pressure increases then follow calibration procedure.
	2) Electrical connection has opened or wrong type of signal applied.	2) Check electrical connections to insure that the proper signal is present.
	3) Clogged Orifice.	3) Remove orifice screw and clean orifice with wire or pin <0.014 in diameter (See figure 8).
Transducer works in reverse. (Pressure goes down when input signal goes up.)	Wires connected in reverse	Insure wiring is connected per Electrical Connection section.
Transducer cannot attain the maximum pressure.	1) Supply pressure too high or too low	1) Insure supply pressure is regulated per "Air Connections on page 2.
	2) Orifice blocked	2) Remove orifice screw and clean orifice with wire or pin <0.014 in diameter (See figure 8).
Output Pressure same as supply Pressure with no signal effect.	Pneumatic connections reversed or supply and output both connected to "IN" ports.	Insure supply is connected to port marked "IN" and output is connected to port marked "OUT".

Note: If you experience an unusual problem that is not described in this section, or if troubleshooting procedures will not restore the unit to normal operation, please consult a factory applications engineer at (304)387-1200.

NUMBER	DESCRIPTION
1	CIRCUIT BOARD
2	WORM GEAR
3	MAGNET ASSEMBLY
4	NOZZLE ASSEMBLY
5	BONNET GASKET
6	SERVO DIAPHRAGM
7	CONTROL DIAPHRAGM
8	PINTLE
9	SUPPLY SEAT
10	COIL/FLEXURE ASSEMBLY



SHOWN WITHOUT COIL/
FLEXURE ASS'Y

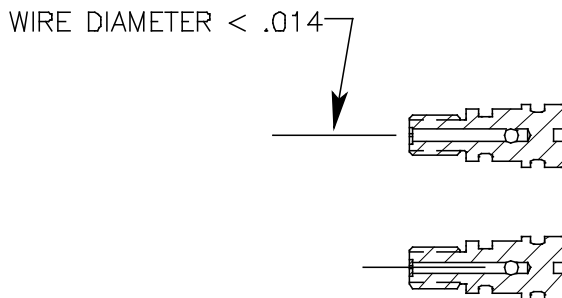


FIGURE 8

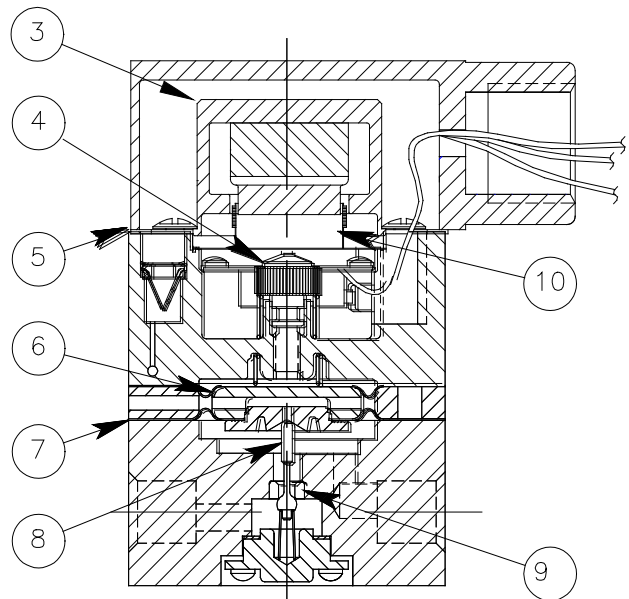


FIGURE 7

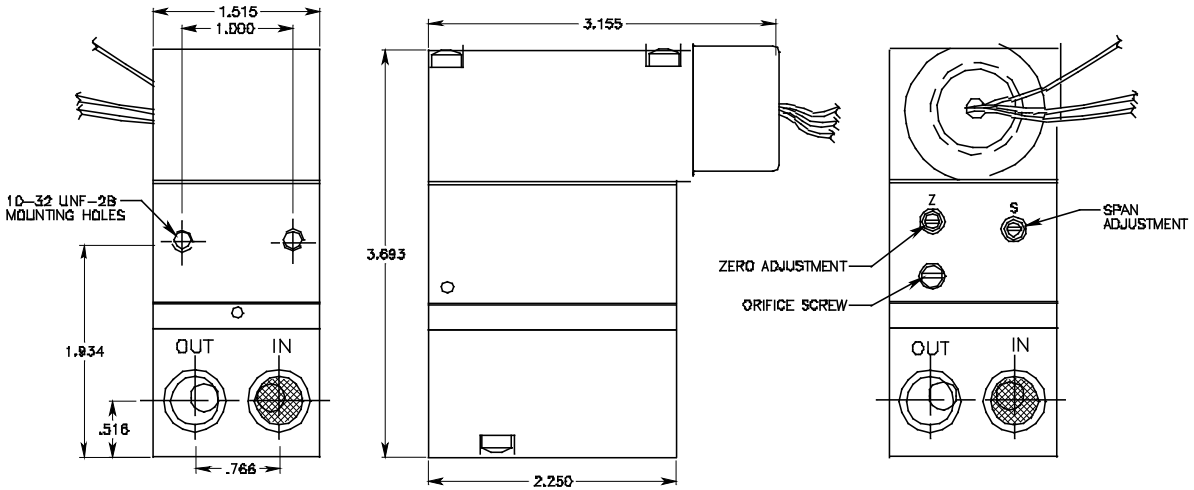


FIGURE 4 - 1/2" NPT

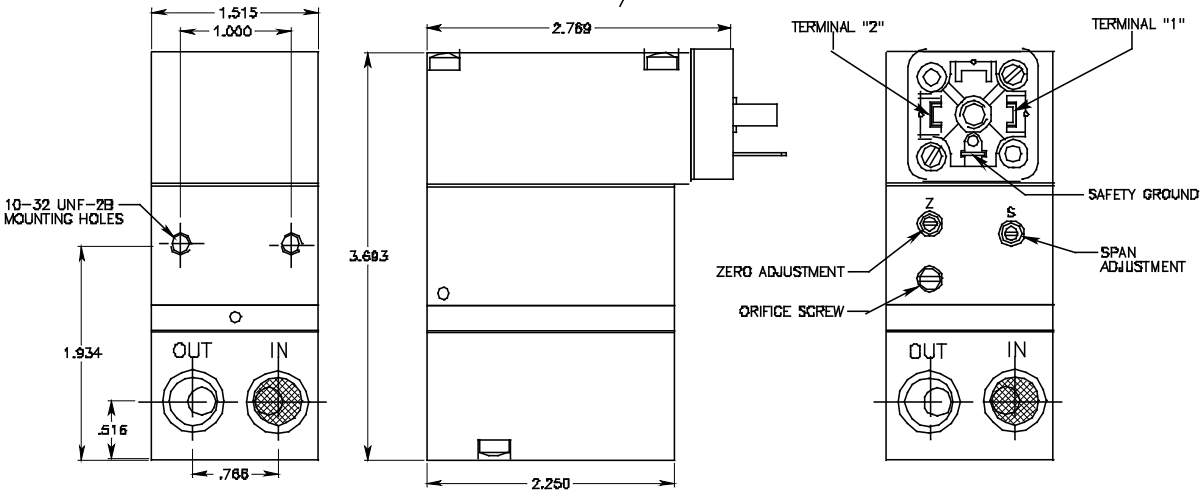


FIGURE 5 - DIN 43 650-A

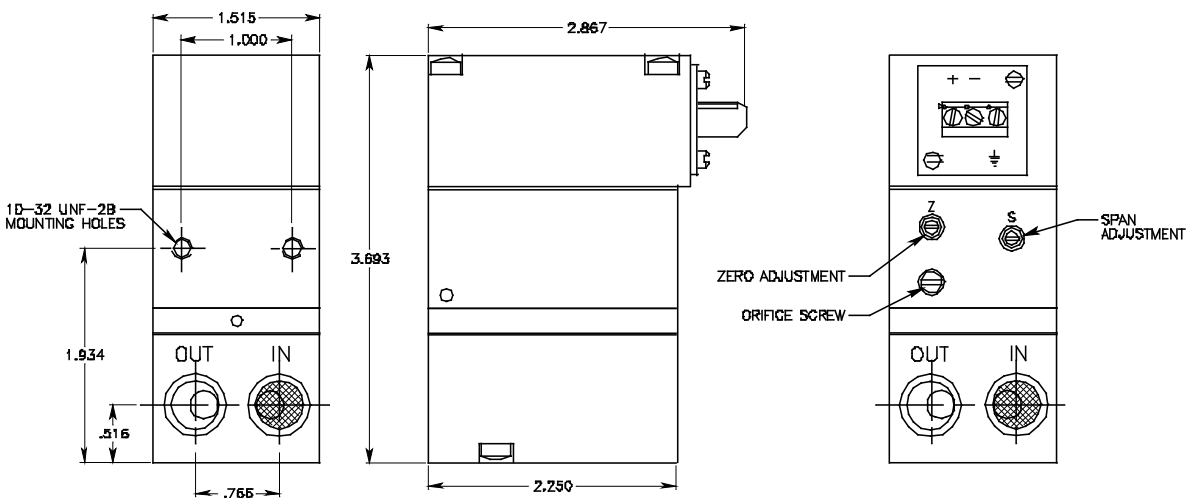


FIGURE 6 - TERMINAL BLOCK