Type 500X

Electropneumatic Transducer (I/P, E/P)

Economical and reliable electrical conversion to pressure

The ControlAir Type 500X converts a current or voltage input signal to a linearly proportional pneumatic output pressure. This versatile instrument is designed for control applications that require a high degree of reliability and repeatability at an economical cost. Optional NEMA 4X (IP65) version allows for splashdown and outdoor installation. Typically, these units are used for applications that require the operation of valve actuators, pneumatic valve positioners, damper and louver actuators, final control elements, relays, air cylinders, web tensioners, clutches, and brakes. Industries that utilize the Type 500X include Petrochemical, HVAC, Energy Management, Textile, Paper, Paper Converting, Food and Drug

Features

- Low Cost
- Integral Volume Booster
- Compact Size
- Low Air Consumption
- Field Reversible
- Flexible Zero & Span Adjustments
- Standard Process Inputs
- Split Ranging

Type 500X

Low Cost. Compact. Reliable.

The Type 500X is available in two different versions. The lower range model is designed for standard process control applications which typically utilize a 3 to 15 psig output. The extended range unit provides up to 120 psig output for higher pressure industrial pneumatic and process control system requirements.

Principle of Operation

The Type 500X 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 towards the nozzle and creates back pressure which acts as a pilot pressure to an integral booster relay. Input signal increases (or decreases for reverse acting) cause proportional output pressure increases.

Zero and Span are calibrated by turning adjust screws on the front face of the unit. Adjustment of the zero screw repositions the nozzle relative to the flexure. The span adjustment is a potentiometer that controls the amount of current through the coil.

NEMA-4X (IP65) Enclosure

Optional Factory Mutual NEMA 4X enclosure rating allows for installation in splashdown or outdoor environments. Unit also meets the requirements of IEC standards IP65.

Mounting

The Type 500X may be mounted by pipe, panel, or bracket. Field adjustment of the zero may be required if position is changed. High external vibration may cause output fluctuations. Mounting in a vibration-free area is recommended.

Split Ranging

If split ranging is required the 4-20 mA input, 3-15 psig output version (ControlAir part number 500-AC) can be recalibrated to provide a 3-9 psig or 9-15 psig output.

Intrinsically Safe

The Type 500X has been tested and approved by Factory Mutual as Intrinsically Safe Class I, II, and III, Division 1, Groups C, D, E, F and G when used with an apparatus meeting the following entity requirements:

Vmax = 29.9 V C_I = 0 C_I is capitance
Imax = 65 mA L_I = 35 mH L_I is inductance

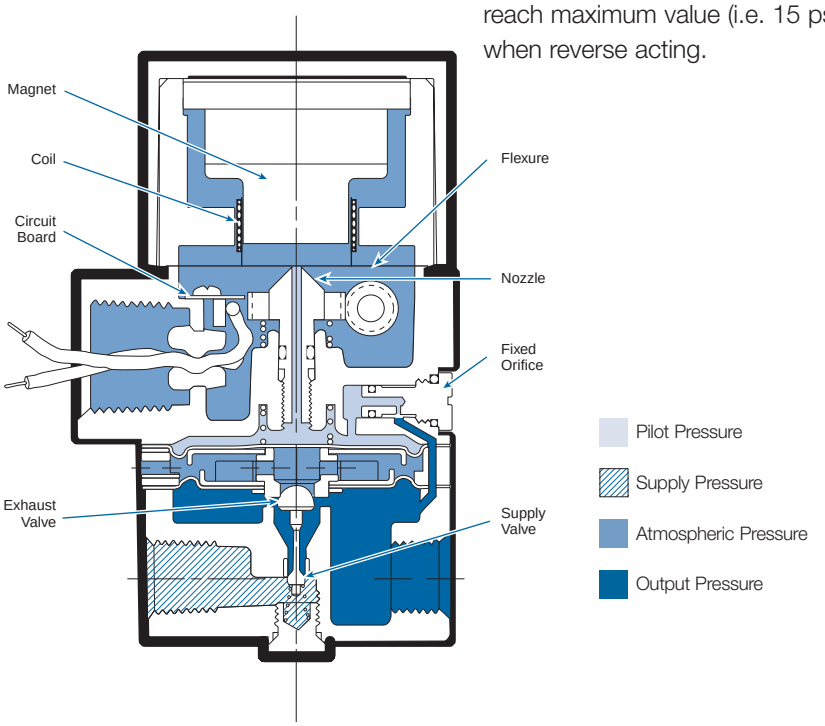
Installation should be in accordance with ControlAir interconnection drawing no. 431-990-013. This drawing is included in the Type 500X Installation, Operation and Maintenance Instruction. The Intrinsically Safe approval is a standard feature of the Type 500X and applies only to units with a 4-20 mA input signal that are installed with the following barriers:

R.Stahl, Inc. barriers:	MTL, Inc. barriers:
9001/01-280-100-10	728
9002/13-280-110-00	787S+
	4045

The Type 500X is also Factory Mutual Approved as Nonincendive for Class I, Division 2, Groups A, B, C and D, and suitable for Class II and III, Division 2, Group F and G. Barriers are not required for nonincendive rating.

Field Reversible

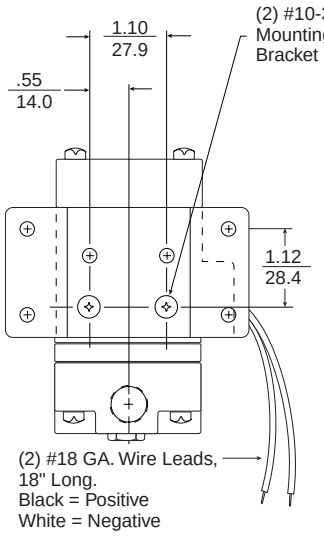
In the reverse acting mode the output is the opposite of the direct acting mode (i.e. 4-20 mA input creates a 15-3 psig output). To change from direct acting to reverse acting simply reverse the polarity of the signal leads and recalibrate. Input signal failure causes output pressure to reach maximum value (i.e. 15 psig) when reverse acting.

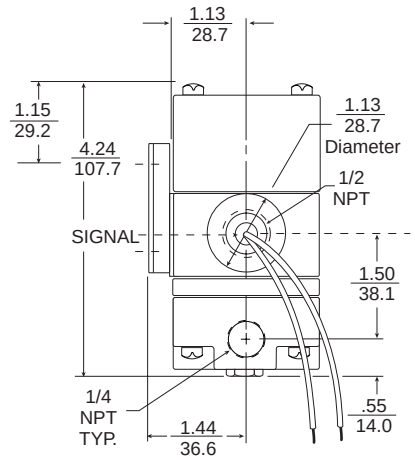


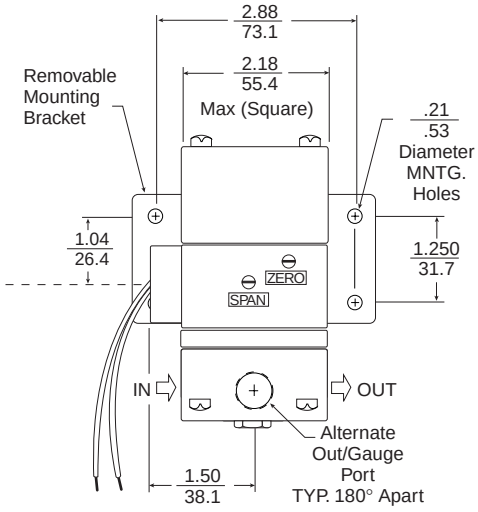
Specifications

	LOW OUTPUT RANGE (UP TO 30 PSIG)	HIGH OUTPUT RANGE (UP TO 120 PSIG)
Min./Max. Supply Pressure	Minimum - 3 psig (.21 BAR) Above maximum output Maximum - 100 psig (7 BAR)	Minimum - 5 psig (0.35 BAR) above maximum output Maximum - 150 psig (10.5 BAR)
Supply Pressure Sensitivity	<± 0.1% of span per psig (<± 0.15% of span per 0.1 BAR)	<± .04% of span per 1.0 psig (0.07 BAR)
Terminal Based Linearity	<± 0.75% of span	<± 1.5% of span typical, ± 2.0% max.
Repeatability	< 0.5% of span	< 0.5% of span
Hysteresis	< 1.0% of span	< 0.5% of span
Response Time	Dependent on pressure range - typically less than 0.25 sec for 3-15 psig units	
Flow Rate	4.5 scfm (7.6 m3/hr ANR) at 25 psig (1.7 BAR) supply 12.0 scfm (20.0 m3/hr ANR) at 100 psig (6.8 BAR) supply	20.0 scfm (34.0 m3/hr) at 150 psig (10.5 BAR) supply
Relief Capacity	2 scfm (3.4 m3/hr) at 5 psig (2.4 BAR) above 20 psig (1.3 BAR) setpoint	7 scfm (11.9 m3/hr) at 10 psig (0.7 BAR) above 20 psig (1.3 BAR) setpoint
Maximum Air Consumption	.05 scfm (.07 m3/hr) midrange typical	.07 scfm (.14 m3/hr) midrange typical
Media	Oil free, clean dry air filtered to 40 micron	
Temp. Range (Operating)	-20°F to +140°F (-30°C to 60°C)	
Port Sizes	1/4 NPT (Pneumatic) 1/2 NPT (Electric)	1/4 NPT (Pneumatic) 1/2 NPT (Electric)
Weight	2.1 lbs. (0.94 kg)	2.1 lbs. (0.94 kg)

Type 500X Dimensional Drawings







Type 500X Ordering Information

Type 500X I/P Transducers

Part Number	Input	Output Range psi	Output Range BAR	Impedance
500-AA	4-20 mA	3-9	0.2-0.6	90 Ohms
500-AB	4-20 mA	9-15	0.6-1.0	90 Ohms
500-AC	4-20 mA	3-15	0.2-1.0	180 Ohms
500-AD	4-20 mA	3-27	0.2-1.8	220 Ohms
500-AE	4-20 mA	6-30	0.4-2.0	220 Ohms
500-AF	4-20 mA	1-17	0.1-1.2	250 Ohms
500-BC	10-50 mA	3-15	0.2-1.0	70 Ohms
500-BD	10-50 mA	3-27	0.2-1.8	85 Ohms
500-BE	10-50 mA	6-30	0.4-2.0	85 Ohms
500-AG	4-20 mA	2-60*	0.14-4.1	225 Ohms
500-AH	4-20 mA	3-120*	0.2-8.2	260 Ohms
500-BF	0-60 mA	2-120*	0.15-8.2	220 Ohms

Type 500X E/P Transducers

Part Number	Input	Output Range psi	Output Range BAR	Impedance
500-CC	0-5 VDC	3-15	0.2-1.0	615 Ohms
500-CD	0-5 VDC	3-27	0.2-1.8	530 Ohms
500-CE	0-5 VDC	6-30	0.4-2.0	530 Ohms
500-DC	1-9 VDC	3-15	0.2-1.0	985 Ohms
500-DD	1-9 VDC	3-27	0.2-1.8	840 Ohms
500-DE	1-9 VDC	6-30	0.4-2.0	840 Ohms
500-CF	0-5 VDC	2-60*	0.14-4.1	500 Ohms
500-EH	0-10 VDC	3-120*	0.2-8.2	805 Ohms

*Output shown is as calibrated at the factory. Large span adjustment capability allows recalibration to achieve output ranges from 3-35 psig (0.2-2.4 BAR) with 2-60 psig unit to 3-145 psig (0.2-10 BAR) with 2-120 psig unit.

Options/Accessories: Add proper letter onto end of part number

D - Din Connector: DIN 43650 Connector provided mounted to unit. Orients in 4 directions.

W - NEMA 4X: Enclosures for splashdown/outdoor use.

U - 1/4" BSP: 1/4" BSP porting.

G - Pressure Gauge: 2" face, back mounted. Dual scale. 0-15 PSI, 0-30 PSI, 0-60 PSI, 0-160 PSI

Warranty

ControlAir, Inc. products are warranted to be free from defects in materials and workmanship for a period of eighteen months from the date of sale, provided said products are used according to ControlAir, Inc. recommended usages. ControlAir, Inc.'s liability is limited to the repair, purchase price refund, or replacement in kind, at ControlAir, Inc.'s sole option, of any products proved defective. ControlAir, Inc. reserves the right to discontinue manufacture of any products or change products materials, designs or specifications without notice. Note: ControlAir does not assume responsibility for the selection, use, or maintenance of any product. Responsibility for the proper selection, use, and maintenance of any ControlAir product remains solely with the purchaser and end user.

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P/N 441-625-005 1/30/08

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CE

FM Approvals ISO-9001

Type 500X

Electropneumatic Transducer (I/P, E/P)
Installation, Operation and Maintenance Instructions

FM APPROVED

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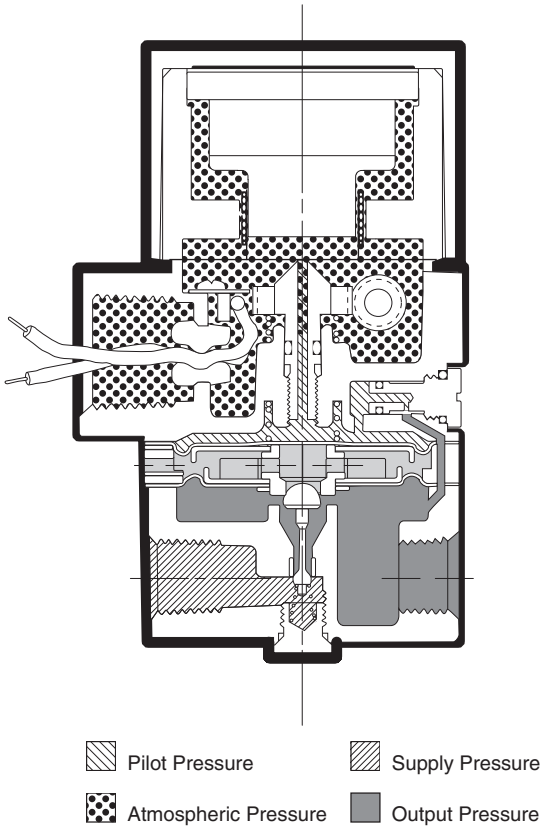

Ordering Information

Type 500X I/P Transducers

Part Number	Input	Output Range psi	Output Range kPa	Impedance
500-AA	4-20 mA	3-9	20-60	90 Ohms
500-AB	4-20 mA	9-15	60-100	90 Ohms
500-AC	4-20 mA	3-15	20-100	180 Ohms
500-AD	4-20 mA	3-27	20-185	220 Ohms
500-AE	4-20 mA	6-30	40-200	220 Ohms
500-AF	4-20 mA	1-17	7-117	250 Ohms
500-BC	10-50 mA	3-15	20-100	70 Ohms
500-BD	10-50 mA	3-27	20-185	85 Ohms
500-BE	10-50 mA	6-30	40-200	85 Ohms
500-AG	4-20 mA	2-60*	14-420	225 Ohms
500-AH	4-20 mA	3-120*	20-830	260 Ohms
500-BF	0-60 mA	2-120*	15-830	220 Ohms

Type 500X E/P Transducers

Part Number	Input	Output Range psi	Output Range kPa	Impedance
500-CC	0-5 VDC	3-15	20-100	615 Ohms
500-CD	0-5 VDC	3-27	20-185	530 Ohms
500-CE	0-5 VDC	6-30	40-200	530 Ohms
500-DC	1-9 VDC	3-15	20-100	985 Ohms
500-DD	1-9 VDC	3-27	20-185	840 Ohms
500-DE	1-9 VDC	6-30	40-200	840 Ohms
500-CF	0-5 VDC	2-60*	14-420	500 Ohms
500-EH	0-10 VDC	3-120*	20-830	805 Ohms

*Output shown is as calibrated at the factory. Large span adjustment capability allows recalibration to achieve output ranges from 3-35 psig (20-240 kPa) with 2-60 psig unit to 3-145 psig (20-1000 kPa) with 2-120 psig unit.

Contents

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Fax: 603-889-1844
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sales@controlair.com

FM Approvals ISO-9001

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

Min./Max. Supply Pressure	Minimum - 3 psig (21 kPa) Above maximum output Maximum - 100 psig (700 kPA)
Supply Pressure Sensitivity	<± 0.1% of span per psig (<± 0.15% of span per 10 kPa)
Linearity	<± 0.75% of span
Repeatability	< 0.5% of span
Hysteresis	< 1.0% of span
Flow Rate	4.5 scfm (7.6 m3/hr ANR) at 25 psig (175 kPa) supply 12.0 scfm (20.0 m3/hr ANR) at 100 psig (700 kPa) supply
Maximum Air Consumption	.05 scfm (.07 m3/hr) midrange typical
Port Sizes	1/4 NPT (Pneumatic) 1/2 NPT (Electric)

1. DESCRIPTION and INSTALLATION

1.1 Description

1.1.1 The ControlAir Type 500X converts a current or voltage input signal to a linearly proportional pneumatic output pressure. This versatile instrument is designed for control applications that require a high degree of reliability and repeatability at an economical cost.

1.2 Principle of Operation

1.2.1 The Type 500X 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 towards the nozzle and creates back pressure which acts as a pilot pressure to an integral booster relay. Input signal increases (or decreases for reverse acting) cause proportional output pressure increases.

Zero and Span are calibrated by turning adjust screws on the front face of the unit. Adjustment of the zero screw repositions the nozzle relative to the flexure. The span adjustment is a potentiometer that controls the amount of current through the coil.

1.3 Mounting

1.3.1 Unit may be pipe, panel, or bracket mounted. Mounting may be at any angle, though may require field adjustment. High external vibration may cause output fluctuations. Mounting in a vibration-free area is recommended.

1.4 Pneumatic Connections

1.4.1 The 1/4 NPT supply and output ports are marked “IN” and “OUT” respectively on the base of the unit. Clean all pipe lines to remove contamination before installation. Apply pipe compound to male threads of the air line only. Avoid getting compound in the air lines.

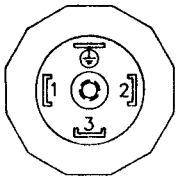
Clean dry instrument quality air must be used. To insure optimum performance supply pressure should be regulated. To provide stable inlet pressure and prevent contamination of the internal section of the transducer the use of an Instrument Air Filter Regulator is recommended.

The two unmarked ports on the base of the unit are gage ports but may be used as alternative output ports. Any unused ports must be plugged.

1.5 Electrical Connections

1.5.1 Electrical connections are made to the black and white leads extending out from the 1/2 NPT conduit fitting. When the positive side of the input signal is connected to the black lead, the output pressure will increase as the input signal increases. For reverse acting mode (increasing input signal decreases output pressure), connect positive side of the input signal to the white lead.

Figure 1 DIN 43650 Connector



TERMINAL	CONNECTION
1	POSITIVE (+)
2	NEGATIVE (−)
3	NOT USED
⏚	GROUND (⏚)

2. OPERATION

2.1 Calibration

2.1.1 Zero and Span should always be checked after mounting. If unit is calibrated in a vertical position and then mounted at an angle, readjustment of the zero is necessary. To calibrate use the following procedure:

1. Open protective covers to expose zero and span adjustment screws.
2. Connect the recommended air supply to the inlet of the transducer and an accurate pressure gage to the outlet.
3. Connect the electrical input and set the input signal to the minimum value of the range being used (e.g. 4 mA for a 4-20 mA unit).
4. Observe the output pressure. If necessary adjust zero screw until reaching minimum output pressure setting. Turn zero screw counter clockwise to increase pressure, clockwise to decrease pressure.

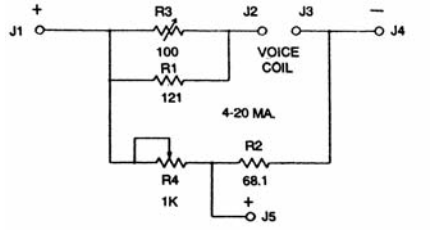
NOTE ***If unable to achieve output during calibration process, turn zero adjustment screw counter clockwise for up to 30 revolutions, until output pressure rises.***

5. Increase electrical input signal to its maximum value (e.g. 20 mA for a 4-20 mA unit).
6. Observe the output pressure. If necessary adjust the span screw until reaching maximum output pressure setting.

NOTE ***For I/P (current) input models turn span screw counter clockwise to increase pressure, clockwise to decrease pressure. For E/P (voltage) input models turn span screw clockwise to increase pressure, counter clockwise to decrease pressure.***

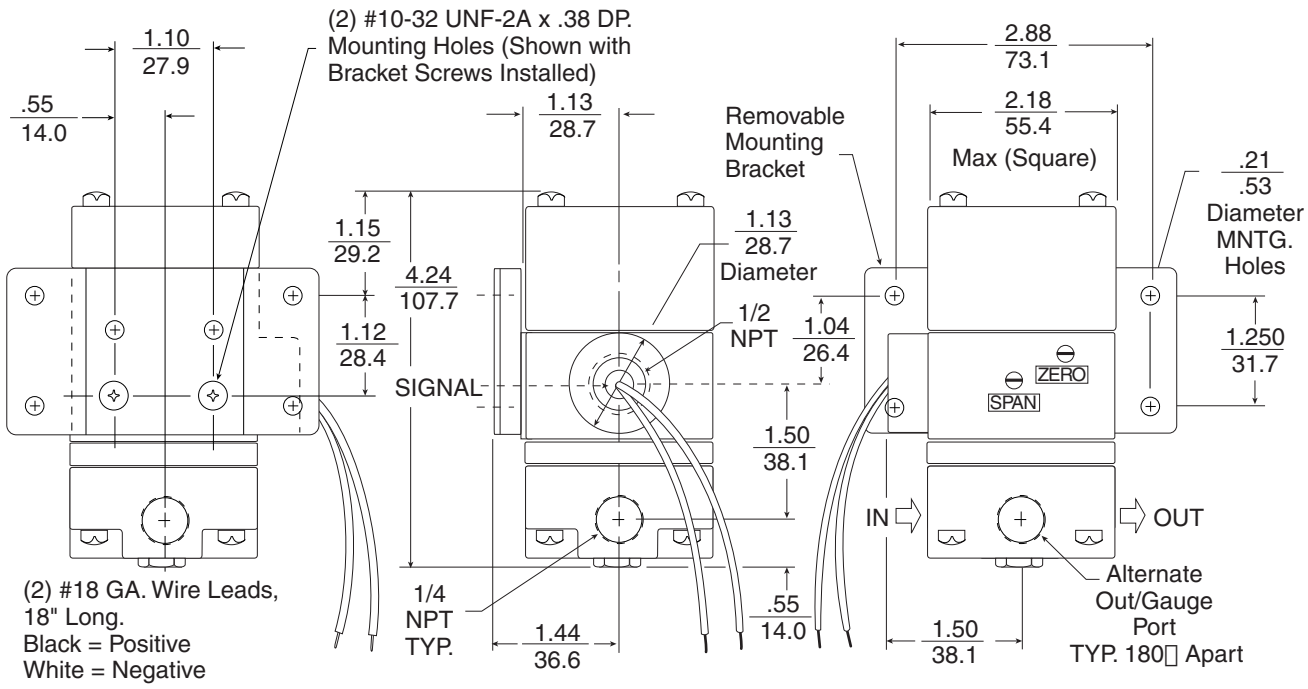
7. The Zero and Span adjustments are interactive. After adjusting the span it will be necessary to recheck the zero. Repeat steps 3-6 until both end points are at the required values.
8. **For reverse acting** performance interchange the black and white electrical signal leads and carry out the same procedure as described above. Adjust the zero screw with minimum input (4mA) to get maximum output then adjust span screw with maximum input (20mA) to get minimum output. Repeat as necessary.

Figure 2 Electrical Schematic



Notes:
1. For 4-20 mA and 10- mA use J1 as positive input.
2. For 10-50 mA change R4 to 100 Ohms.
3. For 1-9 VDC and 0-10 VDC remove R2, use J5 as positive input.

2.2 Dimensional Drawings (Dimensions are $\frac{\text{in.}}{\text{mm}}$)



2.3 Intrinsically Safe Operation

2.3.1 ControlAir, Inc. offers Factory Mutual Intrinsically Safe approval as a standard feature on all units with a 4-20 mA input signal.

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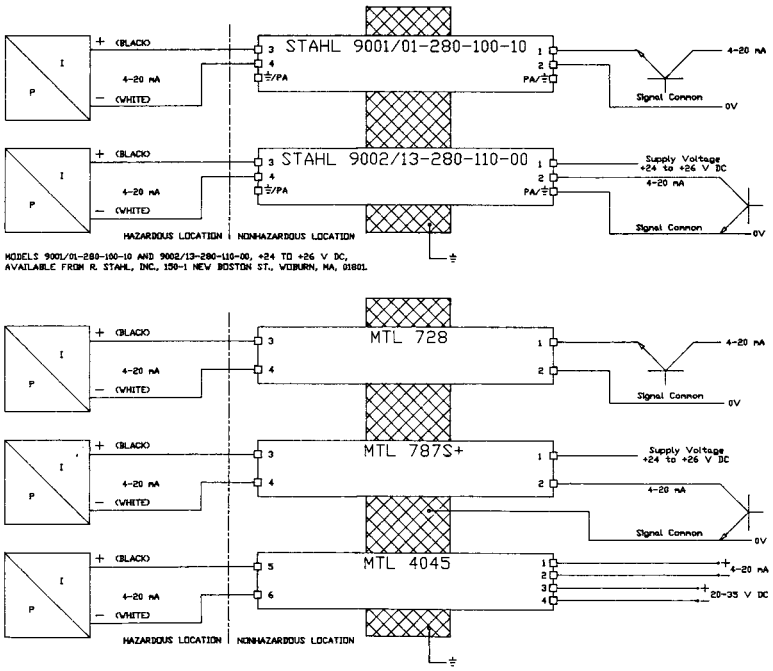


NOTES:

1. INSTALLATION TO BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, NFPA 70, ARTICLE 504, AND ANSI/ISA RP 12.6.
2. APPARATUS CONNECTED TO THE SYSTEM SHALL NOT USE OR GENERATE VOLTAGE GREATER THAN 250 V.
3. INSTALL INTRINSICALLY SAFE BARRIERS IN ACCORDANCE WITH BARRIER INSTRUCTIONS.
4. FACTORY MUTUAL APPROVED AS INTRINSICALLY SAFE FOR CLASS I, II, AND III, DIVISION 1, GROUPS C, D, E, F, AND G, WHEN INSTALLED AS SHOWN ON SHEET 1 AND 2. UNITS WITH 'D' OPTION ARE FACTORY MUTUAL APPROVED AS INTRINSICALLY SAFE FOR CLASS I DIVISION 1, GROUPS C, D WHEN INSTALLED AS SHOWN ON SHEET 1 AND 2.
5. FACTORY MUTUAL APPROVED AS NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A, B, C, AND D, AND SUITABLE FOR CLASS II, DIVISION 2, GROUP F, G AND CLASS III, DIVISION 1 AND 2. UNITS WITH 'D' OPTION ARE FACTORY MUTUAL APPROVED AS NONINCENDIVE FOR CLASS I DIVISION 2, GROUPS A,B,C,D WHEN INSTALLED AS SHOWN ON SHEET 1 AND 2. BARRIERS ARE NOT REQUIRED FOR NONINCENDIVE RATING. MAX V=29.9 VDC.
6. CAUTION: SUBSTITUTION OF COMPONENTS MAY VOID FACTORY MUTUAL APPROVAL.
7. AMBIENT TEMPERATURE RANGE: -30° C TO 60° C.
8. FACTORY MUTUAL APPROVED AS INTINSICALLY SAFE FOR CLASS I, II, AND III, DIVISION 1, GROUPS C, D, E, F, AND G WHEN USED WITH AN APPARATUS MEETING THE FOLLOWING ENTITY REQUIREMENTS:

   Vmax=29.9V Ci=0
   Imax=65mA Li=35mH

   Ci IS CAPACITANCE CONTRIBUTED BY THE TRANSDUCER.
   Li IS INDUCTANCE CONTRIBUTED BY THE TRANSDUCER.
9. FOR DIN CONNECTOR OPTION, ADD D TO THE MODEL NUMBER.
10. FOR NEMA 4X OPTION, ADD W TO THE MODEL NUMBER. ONLY THE STANDARD 1/2NPT CONDUIT IS SUITABLE FOR NEMA 4X INSTALLATIONS. UNITS WITH 'D' CONNECTION MUST BE MOUNTED IN A SUITABLE ENCLOSURE.
11. MODELS WITH NEMA 4X OPTION ARE FACTORY MUTUAL APPROVED FOR INDOOR/OUTDOOR USE PER THE REQUIREMENTS OF NEMA 4X AS DESCRIBED IN THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION STANDARD NO. 250 "ENCLOSURES FOR ELECTRICAL EQUIPMENT, 1000 VOLTS MAX."

Drawing No. 431-990-013

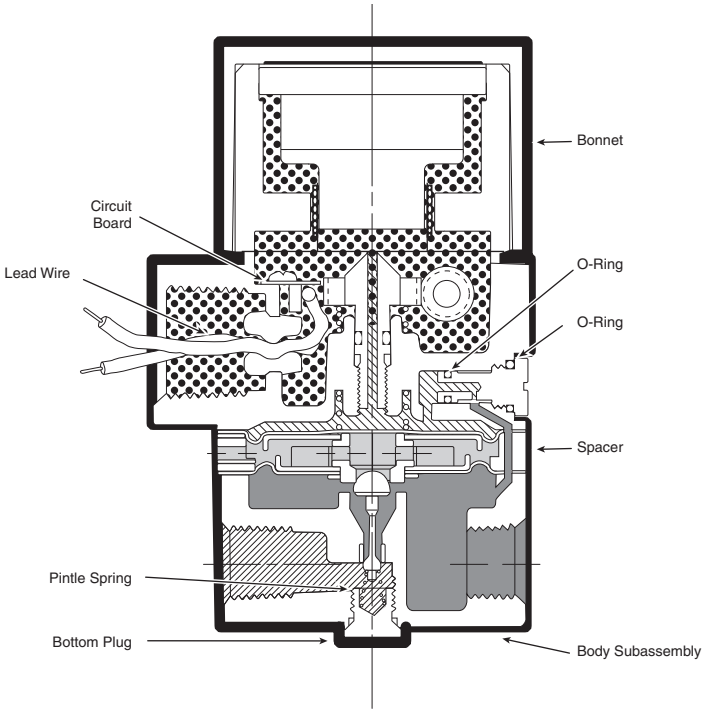
Models 728+, 787S+ and 4045, +24 to +26 VDC, Model 728-, -24 to -26 VDC, available from MTL Inc. 7541 Gary Road, Manassas, VA 221110, USA.

3. MAINTENANCE

Under normal circumstances, no maintenance should be required. If clean dry air is not used the orifice can become blocked. To clean, first turn off supply air, unscrew and remove orifice assembly (large silver screw head located above the out port). Then unplug orifice by using a wire that has a smaller diameter than 0.015 in. (0.38 mm). Use compressed air to blow out any loose particles inside the orifice assembly. Screw orifice assembly back into unit.

4. TROUBLESHOOTING

PROBLEM	*CHECK*
No output or low output	Zero adjustment Supply pressure too low Clogged orifice
Leakage	Connections
Low or improper span	Zero and Span adjustments Supply pressure too low Output leakage
Erratic operation	Electrical input signal Loose wires or connections Liquid in air supply



5.WARRANTY & DISCLAIMER

ControlAir, Inc. products are warranted to be free from defects in materials and workmanship for a period of eighteen months from the date of sale, provided said products are used according to ControlAir, Inc. recommended usages. ControlAir, Inc.'s liability is limited to the repair, purchase price refund, or replacement in kind, at ControlAir, Inc.'s sole option, of any products proved defective. ControlAir, Inc. reserves the right to discontinue manufacture of any products or change products materials, designs or specifications without notice.

WARNING ***These products are intended for use in industrial compressed-air systems only. Do not use these products where pressures and temperatures can exceed those listed under Specifications.***

Before using these products with fluids other than air, for non-industrial application, life-support systems, or other applications not within published specifications, consult ControlAir, Inc.