

# User's Guide



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## IP610 SERIES I/P Converters



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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, patient-connected applications.



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

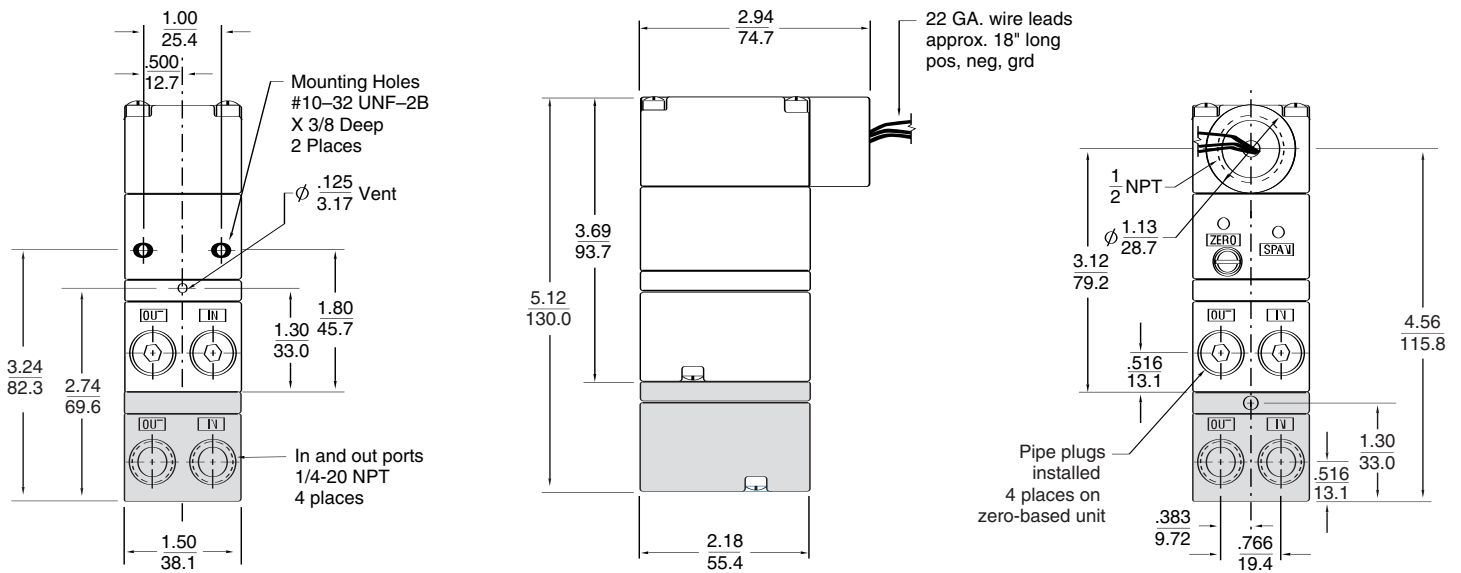
1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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# IP610 SERIES I/P Converters



**Shaded areas and associated dimensions apply to the zero based unit only.**

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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

### Functional Specifications

	STANDARD RANGE		ZERO-BASED RANGE	
<b>Inputs</b>	4-20 mA		4-20 mA	
<b>Outputs</b>	3-15 psig	0.20-1.00 BAR	0-30 psig	0.00-2.00 BAR
	3-27 psig	0.20-1.80 BAR	0-60 psig	0.00-4.00 BAR
	6-30 psig	0.40-2.00 BAR	0-120 psig	0.00-8.00 BAR
	2-60 psig	0.14-4.00 BAR		
	3-120 psig	0.20-8.00 BAR		
<b>Air Consumption</b>	1.8 scfh (0.05 m3/hr) at mid range typical		6.0 scfh at mid range typical	
<b>Supply Pressure</b>	100 psig (6.90 BAR) max. (3-15, 3-27, 6-30 psig) Note: Supply pressure must be a minimum of 5 psig (0.3 BAR)		100 psig (6.90 BAR) max. (0-30, 0-60 psig)	
	above maximum output 150 psig (10.00 BAR) max. (2-60, 3-120 psig)		150 psig (10.00 BAR) max. (0-120 psig)	
<b>Flow Capacity</b>	4.5 scfm (7.7 m3/hr) at 25 psig (1.70 BAR) supply (3-15, 3-27, 6-30 psig)		12.0 scfm (20.0 m3/hr) at 100 psig (6.90 BAR) supply (0-30, 0-60 psig)	
	12.0 scfm (20.0 m3/hr) at 100 psig (6.90 BAR) supply (3-15, 3-27, 6-30, 2-60 psig)		20.0 scfm (34.0 m3/hr) at 150 psig (10.00 BAR) supply (0-120 psig)	
	20.0 scfm (34.0 m3/hr) at 150 psig (10.00 BAR) supply (3-120 psig)			
<b>Temperature Limits</b>	-20° to +150° F (-30° to +65° C)		-20° to +150° F (-30° to +65° C)	
<b>Impedance</b>	4-20 mA	3-15 psig 180 Ohms	4-20 mA	0-30 psig 290 Ohms
		3-27 psig 240 Ohms		0-60 psig 300 Ohms
		6-30 psig 240 Ohms		0-120 psig 315 Ohms
		2-60 psig 245 Ohms		
		3-120 psig 280 Ohms		

## Performance Specifications

	STANDARD RANGE	ZERO-BASED RANGE
Linearity (Independent)	<±0.5% of span	<±1.5% of span
Hysteresis, and Repeatability	<0.5% of span	<1.0% of span
Supply Pressure Sensitivity	<0.1% of span per 1.0 psig (0.07 BAR)	<0.02% of span per 1.0 psig (0.07 BAR)

## Physical Specifications

Port Sizes	Pneumatic	1/4" NPT
Media	Clean, dry, oil-free, instrument air, filtered to 40 micron	
Electrical Connections	Conduit 1/2" NPT, DIN 43650	
Mounting	Direct wall, panel, 1 1/2" pipe, DIN rail	
Materials	Housing	Chromate-treated aluminum with epoxy paint. NEMA 4X (IP65)
	Elastomers	Buna-N
	Trim	Stainless steel; brass; zinc-plated steel
Weight	Standard Unit: 1.3 lbs	Zero-based Unit: 1.7 lbs

# 1. INSTALLATION AND APPROVALS

## 1.1 Pre-installation Requirements

- 1.1.1 Environment: Suitable for installation in the following locations:
- Intrinsically safe operation in hazardous locations outdoors (NEMA 4X, CSA.ENC.4 & IP65)
  - See section 1.5, 1.6 and 1.7 for Factory Mutual (FM), Canadian Standards (CSA).

**DANGER** *All wiring must be made to all local and national codes appropriate to the area of installation.*

- 1.1.2 Electrical Input: 4-20 mA<sub>dc</sub> current source.
- 1.1.3 Air supply: Clean, dry, oil free instrument air filtered to 40 micron

**NOTE** *Clean all pipe lines to remove dirt and scale prior to installation. Failures attributable to instrument air supply contamination are not covered by the warranty.*

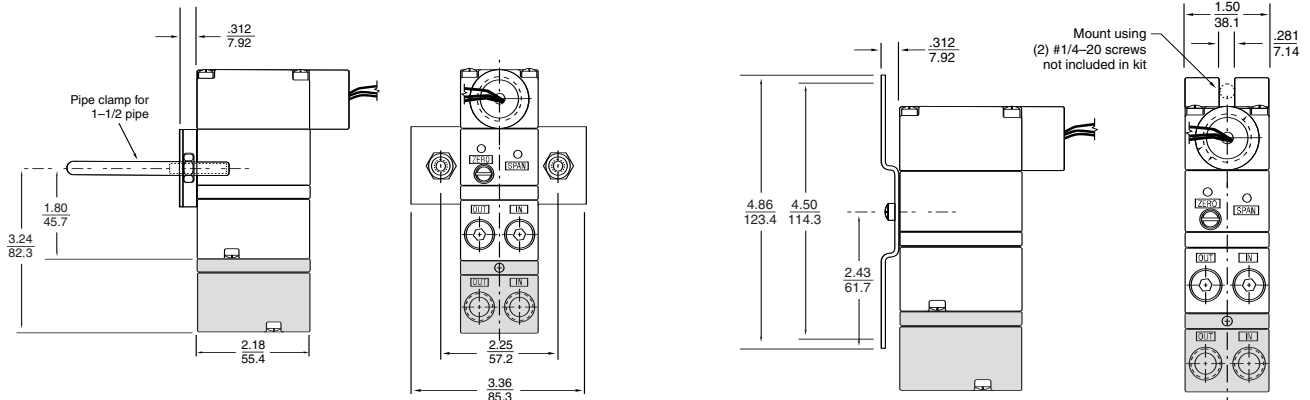
**CAUTION** *This instrument vents to atmosphere. The use of supply gas other than air can create a hazardous environment.*

## 1.2 Mounting

- 1.2.1 The IP610 has a standard mounting kit that enables 1½” pipe, panel or wall mounting of the unit.
- 1.2.2 To mount unit to a 1½” pipe, use two 10-32 holes on the back of the unit to attach bracket to transducer. Then place U-bolt around pipe and through bracket. Place nuts on U-bolt and tighten (see figure 1).
- 1.2.3 With access to the rear of a panel, attach transducer using two 10-32 screws and the two threaded mounting screws on the back of the unit. With no access to the back of the panel, attach the bracket to the transducer using the two 10-32 holes on the back of unit and mount bracket to panel using four 10-32 screws (see figure 2).
- 1.2.4 Due to it's light weight, the IP610 can also be mounted in line with support provided by the supply and output piping.

**Figure 1 - Pipe Mounting    Figure 2 - Panel Mounting**

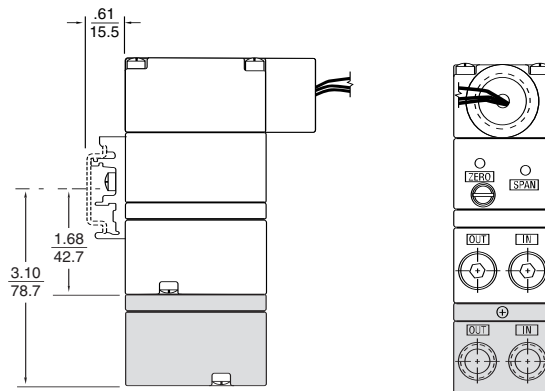
*Shaded areas and associated dimensions apply to the zero based unit only.*



- 1.2.5 The IP610 can be mounted to DIN-rail using the optional kit that is Omega part number IP610-DM. This will allow the transducer to mount to DIN 50045, 50035, 50022 rails (See figure 3).

**Figure 3 - DIN Rail mounting kit IP610-DM**

*Shaded areas and associated dimensions apply to the zero based unit only.*



## 1.3 Pneumatic Connections

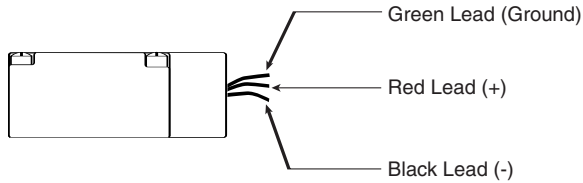
- 1.3.1 Clean all pipe lines to remove dirt and scale prior to installation.
- 1.3.2 Supply air must be filtered to 40 microns and free of moisture and lubricants.
- 1.3.3 Two (2) 1/4” NPT ports are provided for supply air connections. Either port may be used. The unused port must be plugged with the pipe plug included with the unit.
- 1.3.4 Two (2) 1/4” NPT 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.

**WARNING** The I/P transducer enclosure contains aluminum and is considered to constitute a potential risk of ignition by impact or friction and must be taken into account during installation.

## 1.4 Electrical Connections

- 1.4.1 The I/P versions of the IP610 are two wire devices (do not require a separate power source), plus a safety ground. The I/P unit requires a variable input current of 4-20 mA.
- 1.4.2 1/2" NPT conduit connection (A) is made using 18" pigtail wire coming from unit. For I/P (current to pressure) versions, electrical connections are made to the red (+) and black (-) leads. The green lead is furnished for case ground.

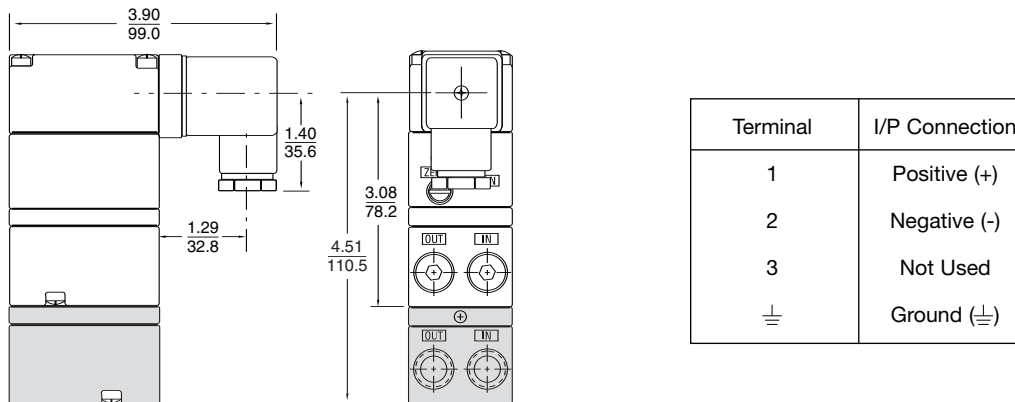
**Figure 4 - 1/2" Conduit Connection**



### I/P Conduit Connection

- 1.4.3 **DIN 43650 Connector (D)** electrical connections are made as shown in figure 5.

**Figure 5 - DIN 43650 Connections**



*Shaded areas and associated dimensions apply to the zero based unit only.*

# 1.5 Factory Mutual Research Corporation (FM) and Canadian Standards association (CSA)



### Intrinsically Safe

Class I, II, III, Div. 1,  
Groups C, D, E, F & G  
Models IP610-\*

Class I, Div. 1, Groups C & D  
Models IP610-\*

### Suitable for:

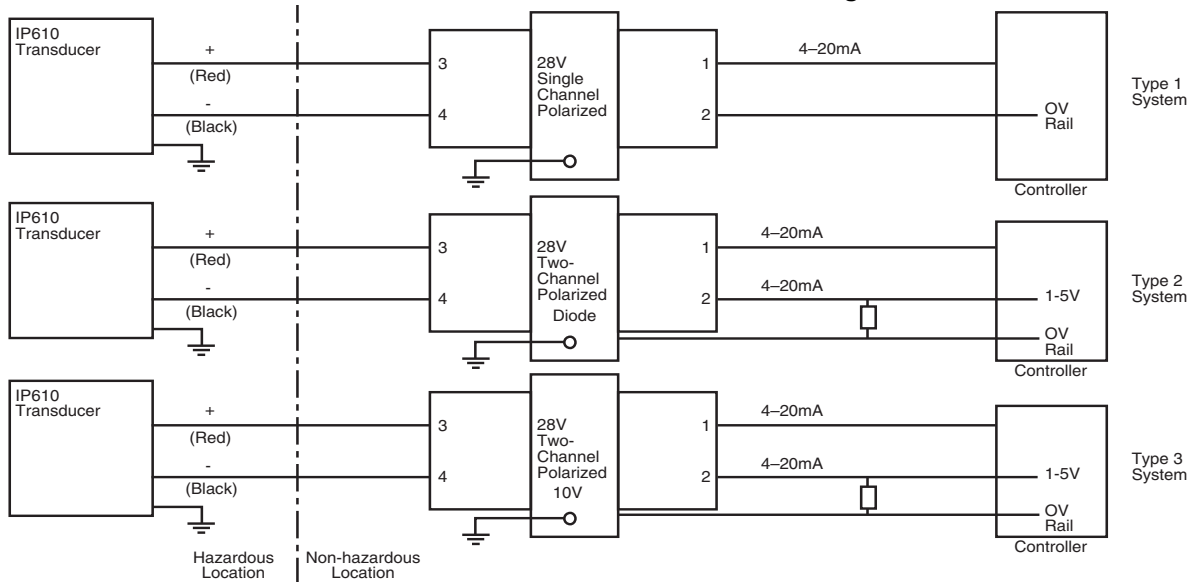
Class I, Div. 2, Groups A, B, C & D  
Models IP610-  
IP610-\*

### Suitable for:

Class II & III, Div. 2, Groups F & G  
Models IP610-\*

\*= Output pressure option does not affect rating

## Factory Mutual and Canadian Standards Association I.S. Installation Drawing



### Notes:

- Control equipment connected to the Associated Apparatus must not use or generate more than 250 Vrms or Vdc.
- The IS Barriers or Equipment (Associated Apparatus) must be FM Approved and CSA Certified and the configuration of Associated Apparatus must be FM Approved and CSA Certified under the Entity Concept. The Associated Apparatus may be installed within the Hazardous (Classified) location for which it is certified. The Associated Apparatus and hazardous location loop apparatus manufacturer's control drawings must be followed when installing this equipment. An AEx [ib] Associated Apparatus is suitable only for connection to Class I, Zone 1, Hazardous (Classified) Locations and is not suitable for Class I, Zone 0, or Class I, Division 1 Hazardous (Classified) Locations.
- Installation should be in accordance with ANSI/ISA RP12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and Article 500 of the National Electrical Code (ANSI/NFPA 70) and Section 18 of the Canadian Electrical Code.
- The standard conduit is suitable for Type 4X installations. All others must be mounted in a suitable enclosure.
- The standard conduit is suitable for Class I, II and III, Division 2, Groups A, B, C, D, E, F & G hazardous (classified) locations. Dust-tight conduit seal must be used when installed in Class II and Class III environments.  
The connection option "D" is suitable for Class I, Division 2, Groups A, B, C and D hazardous (classified) locations.  
Transducers to be installed in accordance with National Electrical Code (ANSI/NFPA 70) Division 2 hazardous (classified) location wiring techniques and the Canadian Electrical Code.
- The Intrinsic Safety Entity concept allows the interconnection of two FM Approved or CSA Certified intrinsically safe devices with entity parameters not specifically examined in combination as a system when:

$U_i$  or  $V_{max} > U_o$  or  $V_o$   
 $I_i$  or  $I_{max} > I_o$  or  $I_{sc}$  or  $I_t$   
 $C_a$  or  $C_o > C_i + C_{cable}$   
 $L_a$  or  $L_o > L_i + L_{cable}$   
 $P_i > P_o$

### Entity Parameters for Models IP610-\*

$U_i$  ( $V_{max}$ ) = 30 V  
 $I_i$  ( $I_{max}$ ) = 125 mA  
 $C_i$  = 0 uF  
 $L_i$  = 0 mH  
 $P_i$  = 0.7 watts

- No revision to this drawing is permitted without prior FM Approval/CSA Certification.

## 1.6 EC Declaration of Conformity



We, Omega Engineering Inc.  
One Omega Drive  
Stamford, CT 06907

Declare that the IP610 Transducer family to which this declaration applies, comply with these standards:

EN 50082-1:1998  
EN 55011:1999  
EN 61010-1:1993 including AMD2:1995

Following the provisions of EMC directive 89/336/EEC

## 2. OPERATION

### 2.1 Calibration

2.1.1 All units are shipped from the factory calibrated, direct acting.

**NOTE** *Factory calibration is susceptible to shift due to handling during transit. Omega recommends that all units be recalibrated prior to use.*

2.1.2 Though the units are shipped fully calibrated it is suggested that the user check the calibration to ensure that settings and operation match the application requirements.

**NOTE** *The unit must be calibrated in the plane it is mounted in.*

### 2.2 Direct Acting Calibration

2.2.1 In direct acting operation the unit is calibrated so that minimum input signal corresponds to minimum output pressure and increasing input signal results in increasing output pressure.

2.2.2 Apply the minimum input signal of the range being used (e.g. 4 mA for a 4-20 mA unit).

2.2.3 Observe the output pressure. If necessary, adjust the zero screw until reaching minimum output pressure setting. Turn zero screw clockwise to increase and counter clockwise to decrease.

**NOTE** *If unable to achieve output during the calibration process, follow the steps outlined in 3.1.4 to clean the orifice. Then turn the zero adjustment screw clockwise slowly and carefully until output pressure begins to respond.*

**CAUTION** *Turning the zero screw too fast or too far can cause permanent damage.*

2.2.4 Apply the maximum input signal of the range being used (e.g. 20 mA for a 4-20 mA unit).

2.2.5 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 clockwise to increase pressure, counter clockwise to decrease pressure.*

2.2.6 After setting the span it will be necessary to recheck the zero. Repeat steps 1-4 until both end points are at required values.

### 2.3 Reverse Acting Calibration

2.3.1 For reverse acting calibration, consult dealer.

## 3. MAINTENANCE AND REPAIRS

**NOTE** Under normal circumstances, no maintenance should be required.

### 3.1 Instrument Air Filtration

- 3.1.1 Failures due to instrument supply air contamination are not covered by warranty.
- 3.1.2 Use of oil and/or water saturated instrument air can cause erratic operation.
- 3.1.3 Poor quality instrument air can result in unit failure. It is recommended that a filter regulator be placed upstream of each unit where oil and/or water laden instrument air is suspected.
- 3.1.4 If clean, dry air is not used the orifice can become blocked. To clean, first turn off supply air, then remove the screw located on the side of the unit above the “out” port. Unplug the orifice using a wire that has a smaller diameter than 0.012” (0.30mm). Replace screw tightly into unit.

## 4. TROUBLESHOOTING

PROBLEM	LOOK FOR	SOLUTION
No or low output	Zero adjustment Supply pressure too low	Reset zero (2.2.3) Increase supply pressure (see specs)
Unstable/low output	Electrical connection Clogged orifice	Check connection/signal (1.1.2) Clean orifice (3.1.4)
Erratic operation	Liquid/contamination in air supply	Clean air supply (1.1.3)
Works in reverse	Pressure goes down when signal is increased	Reverse input wires (1.4.2)
Output equals supply pressure	Improper pneumatic connections	Insure that supply is connected to “IN” port and output is connected to “OUT” port (1.3.3, 1.3.4)

**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 Omega Engineering Inc.

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