

MB **MARSH BELLOFRAM**[®]

Type-2000

Electro-Pneumatic
I/P & E/P
Transducers

Precision
Control
Devices



MB T-2000 I/P & E/P Transducers

www.bellofram-usa.com

MB **MARSH BELLOFRAM**
Distributed By **FLW** Inc,

(800) 576 - 6308
ISO 9001:2000
certified



DESCRIPTION

The Marsh Bellofram Type 2000 is a robust electronic instrument that regulates an incoming supply pressure down to a precise output pressure which is directly proportional to an electrical control signal. The secret to the Type 2000's precise, reliable performance under a variety of demanding environmental conditions is a patented piezo-ceramic actuator with many industry-wide firsts.

The Type 2000 has been designed to meet the electropneumatic needs of the world:

- Field-selectable inputs and direct/reverse/split ranging
- Multiple input/output/mounting configurations
- Precise, reliable performance under extreme conditions of temperature, vibration, orientation, supply pressure changes, supply voltage changes, RFI/EMI, humid / oil-laden media, and corrosive surroundings



PRINCIPLE OF OPERATION

The Type 2000 I/P and E/P transducers utilize closed-loop pressure feedback-control for precision pressure output and minimized effects of temperature, supply pressure changes, supply voltage changes, and mounting angle.

Supply pressure is reduced by the supply valve to provide an output pressure which is internally routed to a precision temperature compensated piezoresistive pressure sensor. Supply pressure is also routed to an externally removable orifice which provides a reduced pilot pressure to a chamber containing a servo diaphragm and nozzle. Pilot pressure is controlled by modulating the gap between the face of a nozzle and an adjacent piezo-ceramic actuator, which is part of a unique patented mechanism.

The piezo-ceramic actuator serves as a control link between electrical input and pressure output as follows:

- The input current (I/P) or voltage (E/P) signal is conditioned to provide a normalized control signal directly proportional to the desired pressure output.
- Simultaneously the output of the pressure sensor is amplified and conditioned to produce a feedback signal.
- The sum of the control signal and the feedback signal produce a command signal which is delivered as a DC voltage to the piezo-ceramic actuator.
- As voltage increases, the force applied by the actuator increases, so as to restrict nozzle bleed and thus increase pilot pressure.
- Increased pilot pressure applied to the servo diaphragm directly causes opening of the supply valve and an increase in the output pressure until the output feedback signal and control signal combine to produce the correct command signal.

APPLICATIONS

The Type 2000's precisely regulated pneumatic output can be used to operate:

- Valve actuators
- Louver and damper actuators
- Valve positioners
- Relays
- Clutches and brakes
- Controllers
- Air cylinders

INDUSTRY APPLICATIONS INCLUDE:

- Chemical & Petrochemical Industries
- Petroleum Production
- Pipeline Transmission
- Electric Utilities
- Water & Wastewater Systems
- Pulp & Paper
- Textiles
- Semiconductor Industry
- Food & Beverage
- Environmental Control Systems
- Construction Equipment
- Agricultural Equipment
- Machine Tool
- Material Handling
- Automotive Testing & Assembly
- Medical Equipment

FINE-TUNING YOUR APPLICATION

For optimal performance in your application, the calibration of the Type 2000 can be fine-tuned in the field. An easily-removable cover provides access to the isolated electronics. All potentiometers, connections, jumpers, and switches are clearly marked on the circuit board or on the handy chart located on the inside of the cover. The three elements of calibration (Gain, Zero, and Span) are described below. Consult the Type 2000 User's Manual for detailed calibration procedures, cautions, and instrumentation requirements.

GAIN (DAMPING) ADJUSTMENT

The output response of the Type 2000 can be optimized for varying downstream volumes by adjusting the system gain of the control circuit. Adjust the Gain Pot counterclockwise for increased gain; clockwise for increased oscillation damping. For maximum allowable gain in your application, the pot should be turned clockwise until oscillation just disappears.

ZERO & SPAN ADJUSTMENTS

The Type 2000 contains multi-turn Coarse-Zero, Fine-Zero, and Span adjustment potentiometers which are clockwise positive. Adjustment of either Zero Pot changes the unit's minimum output while the Span Pot changes the maximum output. The adjustments are interactive, so it may take iterations to reach the desired calibration.

WIDE RANGEABILITY

The Type 2000 can be field calibrated to pressure ranges other than the standard ones by combinations of recalibration, pressure range switching, and split high/low ranging. A unit should not be switched to a range outside its pressure sensor family (eg., a 0-15 psig can be switched to a 3-15 psig, but not to 0-30 psig). **(Caution: Do not exceed the range of the onboard pressure sensor.)** For example, the easiest way to recalibrate a 0-30 psig unit to 3-15 psig would be to change the switch setting to 3-27 psig, then switch to split range low.

FIELD-SELECTABLE FEATURES

Onboard switches allow the user to easily reconfigure the Type 2000 for any of several electrical inputs, direct/reverse acting, or output split-ranging high/low. Fine tuning of the unit's calibration may be necessary after a reconfiguration.

DIRECT/REVERSE ACTING

Direct Acting transducers regulate to their minimum output when supplied with minimum input; maximum out with maximum in. Reverse Acting transducers regulate to their maximum output at minimum input.

SPLIT RANGING HIGH & LOW

The Type 2000 can be configured to regulate either half (top or bottom) of it's normal output range, when supplied with it's normal full-ranging electrical input. For example, a 0-10V 0-30psi unit set to split range low will regulate 0-15psi @ 0-10V. It will regulate 15-30psi @ 0-10V if set to split range high.

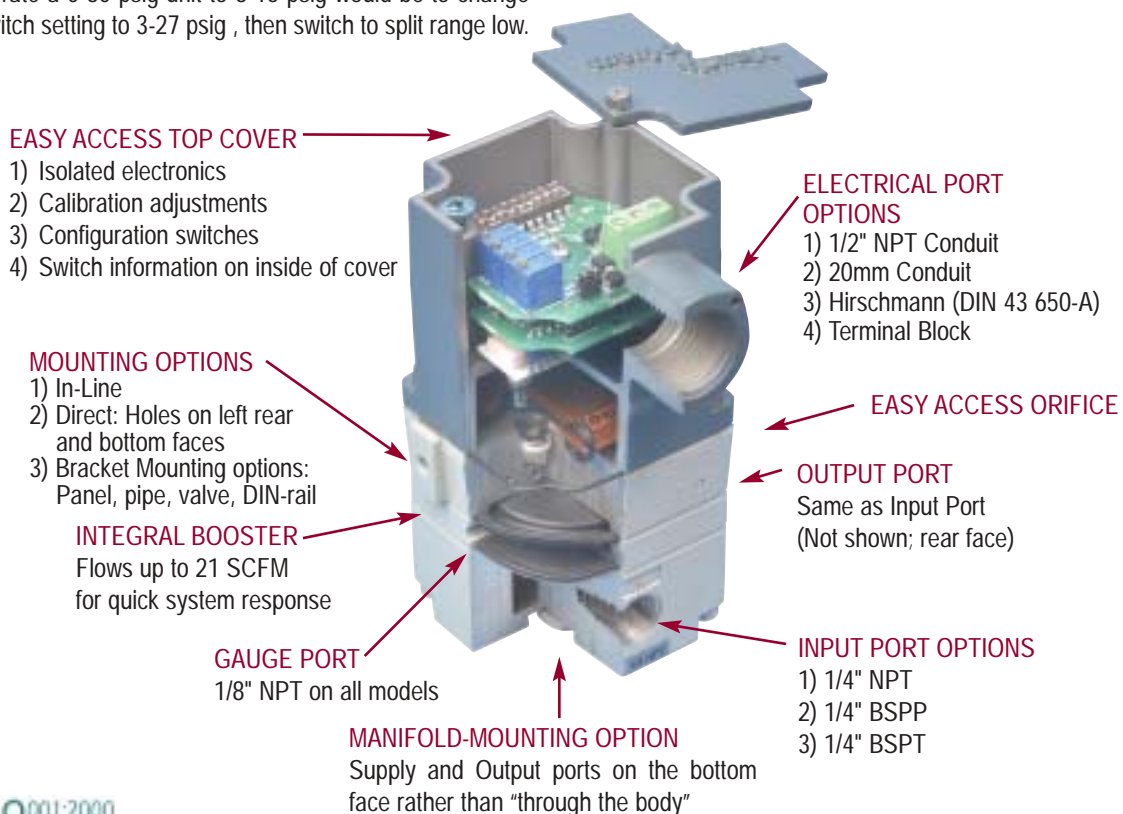
HAZARDOUS AREA & USAGE CLASSIFICATION

INTRINSIC SAFETY: (S Enclosure) Factory Mutual approvals: Class I, II, and III, Divisions 1 and 2, Groups A through G. ATEX Approvals: Ex II 1 G EEx ia IIC T4 (-20°C<Ta<+60°C)

NEMA 4X / IP66: (Conduit and Hirschmann Connectors only) Water tight, dust tight, and corrosion resistant.

EXPLOSION PROOF: (E Enclosure; N Electrical Port; G Agency Approval) Certified to CSA standards. Class I, Division 1, Groups C and D, T3. Exia IIB Ci=0, Li=0, 24VDC, 25MA. Meets the requirements for CSA Class I Division 1, Group D gas use, including natural gas as the media flowing through the transducer.

CE: (Conduit Connector Only) EN 50081-1 Residential, commercial & light industry; EN-50082-2 Heavy Industrial.

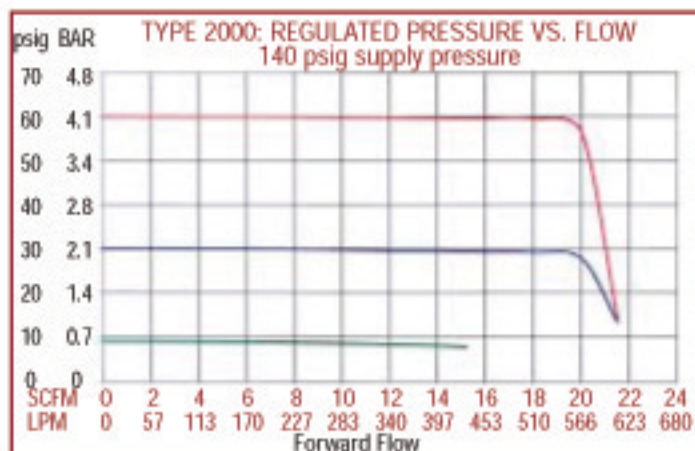


SPECIFICATIONS

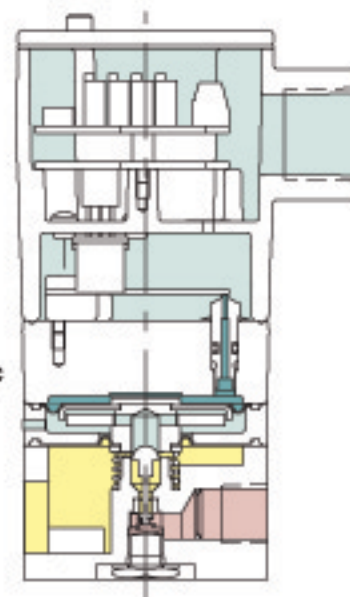
ACCURACY	0.1% of full-scale output typical (0.25% guaranteed); includes effects of hysteresis, dead band, and repeatability		
ELECTRICAL			
Inputs	Switch-Selectable 4-20mA, 0-5, 1-5, 1-9, 1-10, or 0-10VDC		
Connections	1/2" NPT or 20mm Conduit DIN Hirschmann (S model only) External Terminal Block (S model only)		
Power Supply	5-28VDC (with voltage inputs only)		
Direct/Reverse Acting	Switch-Selectable		
PNEUMATIC			
Outputs	0-2, 0-5, 0-15, 3-15, 1-17, 0-30, 6-30, 3-27, 0-60, 0-100, or 120 psig 0-0.1, 0-0.3, 0-1.0, 0.2-1.0, 0.07-1.2, 0-2.1, 0.4-2.1, 0.2-1.9, 0-4.1, 0-6.9, 0-8.3 BAR		
Ports (Input/Output)	1/4" (NPT, BSPT, or BSPP threads) Bottom-ported for Manifold Mounting		
Exhaust (Explosion proof only)	1/8"-27 NPT		
Ports (Gauge)	1/8" NPT		
Supply	From 5 psi (0.3 BAR) above output, up to 140 psi (9.7 BAR) maximum (20 psi [1.4 BAR] minimum)		
Split-Ranging	Switch-Selectable, Full-Range or Split-Range High or Split-Range Low		
Consumption	4 scfh maximum (1.9 LPM)		
Flow Capacity	RANGE	SENSOR	FLOW
	psig BAR	psig BAR	scfm LPM
	0-2 0-0.1	2 0.1	4 113
	0-5 0-0.3	5 0.3	11 312
	0-15 0-1.0	15 1.0	19 538
	3-15 0.2-1.0	15 1.0	19 538
	1-17 0.07-1.2	15 1.0	19 538
	0-30 0-2.1	30 2.1	21 595
	3-27 0.2-1.9	30 2.1	21 595
	6-30 0.4-2.1	30 2.1	21 595
	0-60 0-4.1	50 3.5	21 595
	0-100 0-6.9	100 6.9	21 595
	0-120 0-8.3	100 6.9	21 595
	(Typical Flow @ 140 psi (9.7 BAR) in and maximum out)		
Exhaust Capacity	3 SCFM (85 LPM) @ 5 psig (0.3 BAR) above setpoint (0-15 psig range unit set at mid range)		

STABILITY

Supply Voltage Effect	None
Supply Pressure Effect	None
Vibration Effect	<1%FS (+/-1G; 5-1000Hz)
Temperature Effect	0.02%FS/°F (-40° to 180°F [-40° to 82°C])
Mounting Position Effect	None
RF/EMI	CE-compliant
Storage Temperature	-40° to 200°F (-40° to 93°C)



TYPE 2000
EXPLOSION PROOF



MOUNTING OPTIONS

Mounting Method	Intrinsically-Safe (S) Model	Explosion-Proof (E) Model
In-Line	Yes	Yes
Direct Mounting	Side or Bottom Holes	Side or Bottom Holes
Panel Bracket	Supplied	Accessory
Valve Bracket	Accessory	Supplied
Pipe Bracket	Accessory	Accessory
DIN-Rail Bracket	Accessory	Accessory
Manifold Plate	Accessory	Accessory

MOUNTING: The Type 2000 can be mounted in-line, or directly to a panel via mounting holes located in the side and bottom of the unit. In addition, the S model includes a panel-mounting bracket; while the E model includes a valve-mounting bracket. Kits are available for mounting of either model to panel, valve, pipe, or DIN-Rail. A custom plate is available for mounting of the bottom-ported version to a manifold. (See Accessories)

www.bellofram-usa.com

ORDERING INFORMATION

Series **2** Model **K** - Electrical Input Pneumatic Output Specials **0 0**

ACCESSORIES P/N

Enclosure
 S = Intrinsically Safe
 E = Explosion Proof

Electrical Port ¹
 N = 1/2" NPT Conduit
 M = 20mm Conduit
 H = Hirschmann
 T = Terminal Block ²

Pneumatic Ports
 N = NPT
 T = BSPT
 P = BSPP
 M = Manifold Mount ³

Agency Approval
 F = FM/CSA
 C = ATEX
 G = Certified to CSA Standards ⁴
 N = None

42 = 4-20 mA
 05 = 0-5 V
 15 = 1-5 V
 19 = 1-9 V
 11 = 1-10 V
 01 = 0-10 V

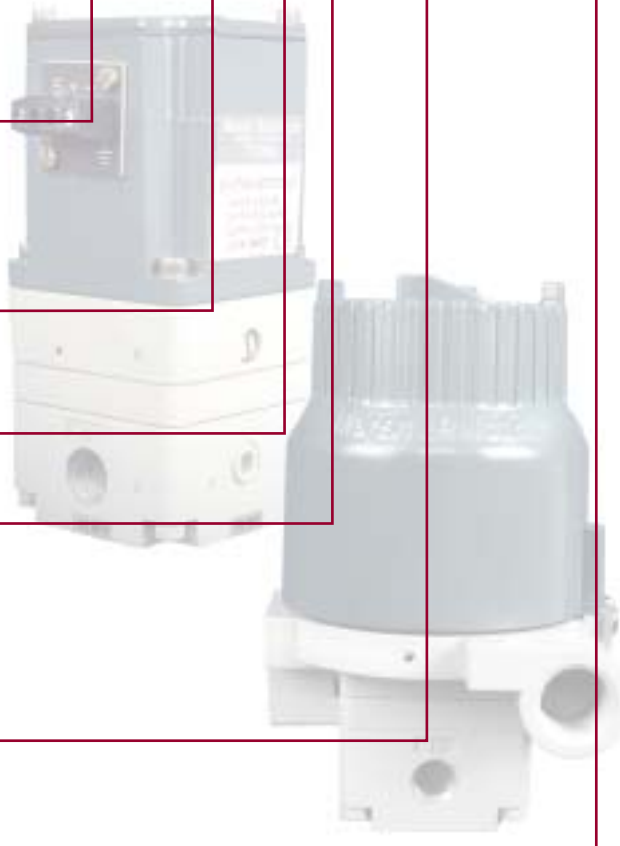
D = Direct Acting
 R = Reverse Acting

F = Full Range
 H = Split Range High
 L = Split Range Low

002 = 0-2 psig 0-0.1 BAR
 005 = 0-5 psig 0-0.3 BAR
 015 = 0-15 psig 0-1.0 BAR
 315 = 3-15 psig 0.2-1.0 BAR
 117 = 1-17 psig 0.07-1.2 BAR
 030 = 0-30 psig 0-2.1 BAR
 630 = 6-30 psig 0.4-2.1 BAR
 327 = 3-27 psig 0.2-1.9 BAR
 060 = 0-60 psig 0-4.1 BAR
 100 = 0-100 psig 0-6.9 BAR
 120 = 0-120 psig 0-8.3 BAR

00 = None

- Panel Mounting Kit 010-135-000
- Valve Mounting Kit 010-134-000
- 2" Pipe Mounting Kit 010-143-000
(Valve Mounting Kit is required)
- DIN Rail Adapter 010-115-000
- Manifold Adapter Kit 971-158-000
- Filter Kit, 60 microns 010-139-000
- Filter Kit, Coalescing,
0.1 microns 010-140-000
- Filter Element Kit 010-141-000
(for coalescing filter, package of 10)
- Pressure Gauge Kit 010-138-000
15 psig (1 BAR)
- Pressure Gauge Kit 010-138-001
30 psig (2.1 BAR)
- Pressure Gauge Kit 010-138-002
60 psig (4.1 BAR)
- Pressure Gauge Kit 010-138-003
160 psig (11 BAR)



NOTES:

Availability Matrix	Enclosure		
	S	E	
Electrical Port	N	yes	yes
	M	yes	yes
	H	yes	no
	T	yes	no

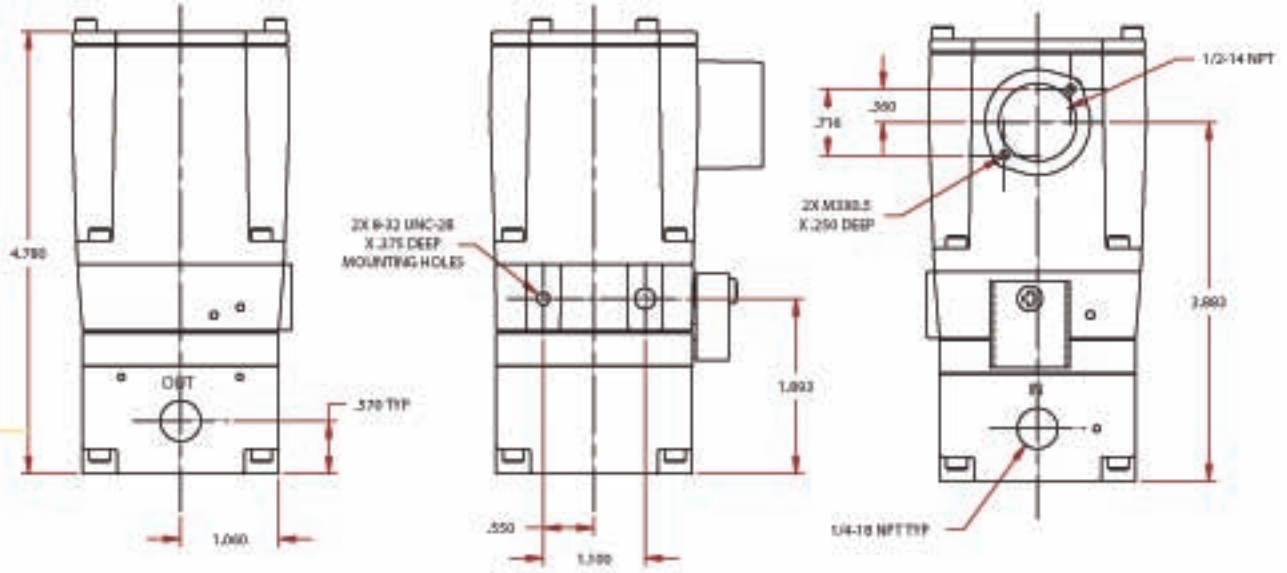
²NEMA 4X / IP66 not available
³Bottom O-Ring Ports
⁴Including Natural Gas Use (E Enclosure; N Electrical Port)

WIRING CONNECTIONS AND SWITCH POSITIONS

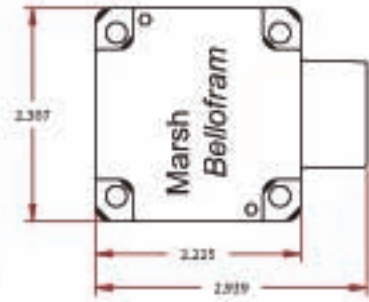
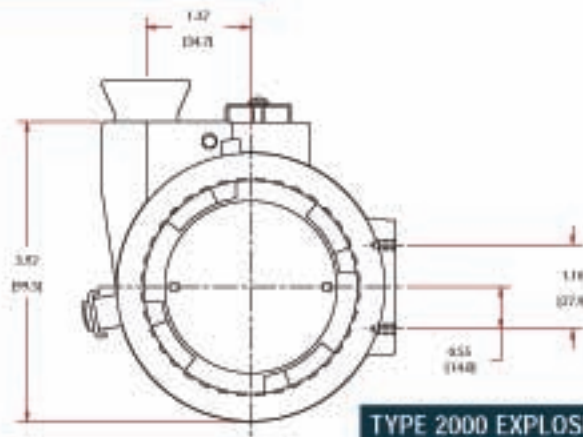
Terminal Block	I/P Transducer	E/P Transducer
S	N/C	+ Signal
+	+ Signal	+Power Supply
-	- Signal	Common

Switch #	1: psig	BAR	2	3	4	5	6: psig	BAR	7	8	9
ON	0-2 0-15 3-15 1-17 0-30 3-27 6-30 0-100	0-0.3 0-1.0 0.2-1.0 0.07-1.2 0-2.1 0.2-1.9 0.4-2.1 0-6.9	1-5 VDC 0-5 VDC	Split Low	Voltage Input (E/P)	Full Split Low	0-2 0-15 1-17 0-30 0-60 0-100 0-120	0-0.3 0-1.0 0.07-1.2 0-2.1 0-4.1 0-6.9 0-8.3	Reverse Acting	Full	I/P
OFF	0-60 0-120	0-4.1 0-8.3	1-9 VDC 1-10 VDC 4-20 mA	Full Split High	Current Input (I/P)	Split High	3-15 3-27 6-30	0.2-1.0 0.2-1.9 0.4-2.1	Direct Acting	Split Low Split High	E/P

TYPE 2000 SPECIFICATIONS

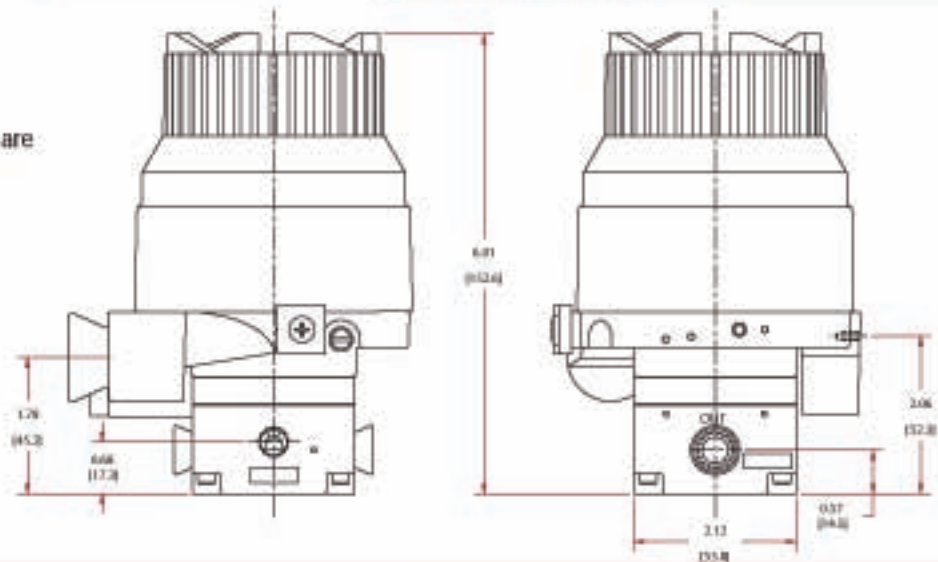


TYPE 2000



TYPE 2000 EXPLOSION PROOF

Drawings and dimensions are for reference only.



IMPORTANT NOTICE

Our recommendations, if any, for the use of this product are based on tests believed to be reliable. The greatest care is exercised in the selection of our raw materials and in our manufacturing operations. However, since the use of this product is beyond the control of the manufacturer, no guarantee or warranty, express or implied is made as to such use or effects incidental to such use, handling or possession or the results to be obtained, whether in accordance with the directions or claimed so to be. The manufacturer expressly disclaims responsibility therefor. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or us.