

FINE-TUNING YOUR APPLICATION

Every Type 2000 is factory-calibrated to user-specification. 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 Course-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 its normal output range, when supplied with its 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

(pending)

INTRINSIC SAFETY: Pending Factory Mutual, CSA, and Cenelec approval for Class I, Division 1 and 2, Groups A, B, C, D; Class II, Division 1 and 2, Groups E, F, and G; and Class III for hazardous locations.

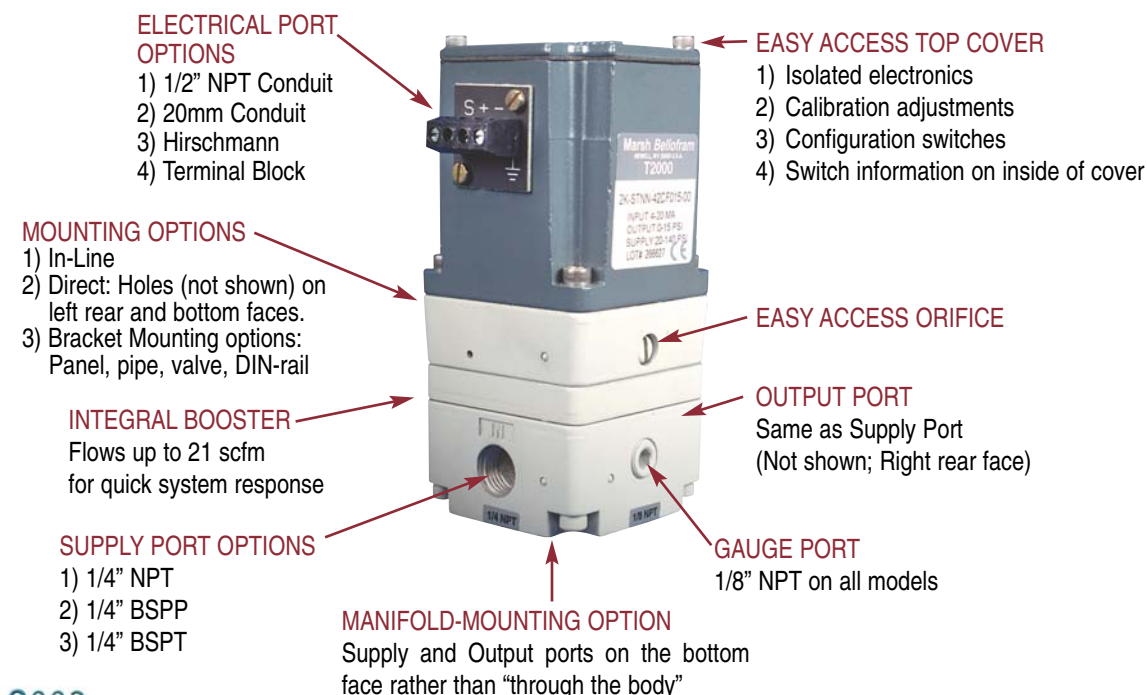
NEMA 4X: Pending Factory Mutual and CSA approval (water tight, dust tight, and corrosion-resistant).

IP66: Pending Cenelec approval.

(NEMA 4X & IP66 not available on Terminal Block Models.)

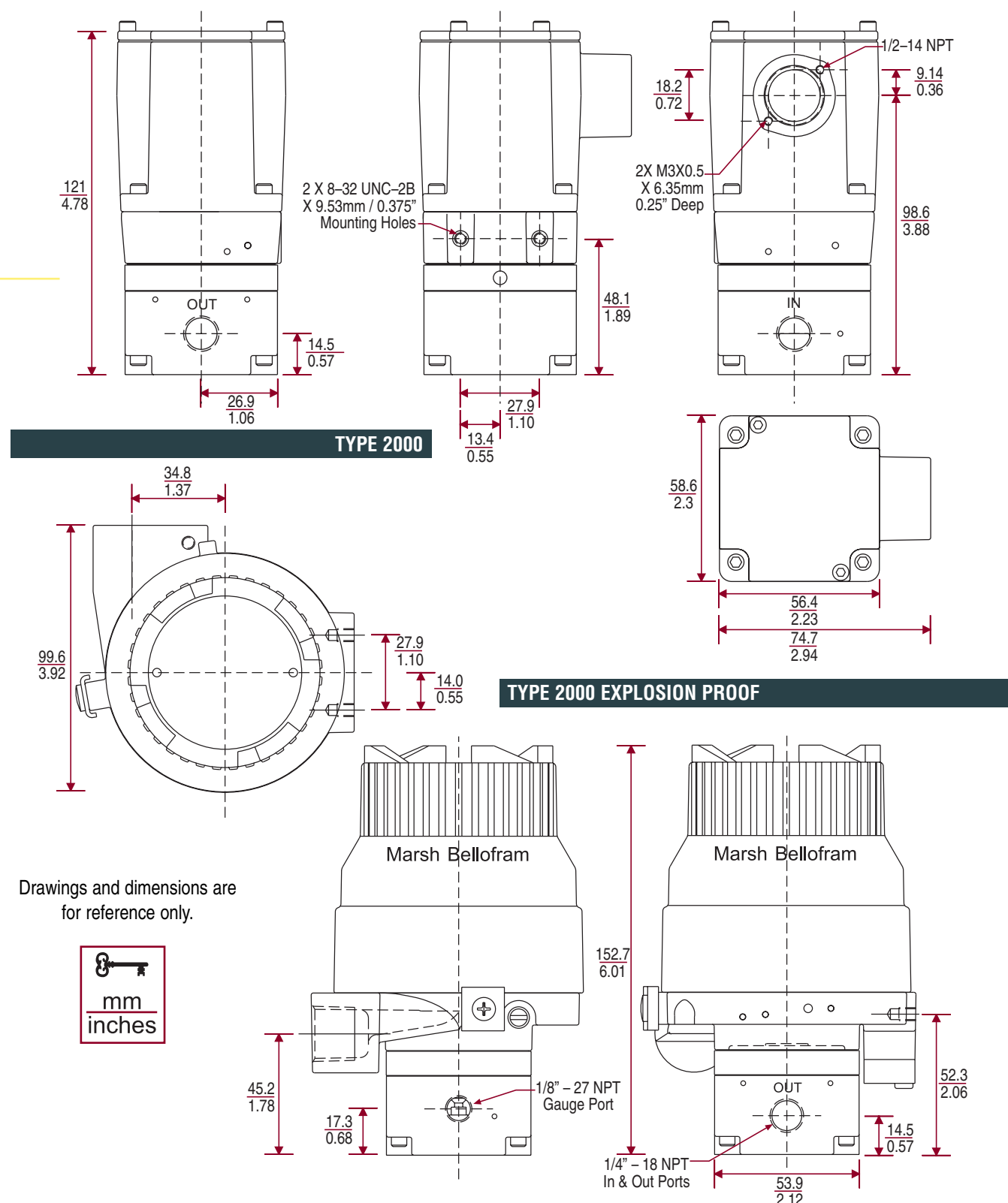
EXPLOSION PROOF (E MODEL ONLY): Pending Factory Mutual, CSA, and Cenelec approval for: Class I, Division 1 and 2, Groups A, B, C, and D; Class II, Divisions 1 and 2, Groups E, F, and G; and Class III.

CE (CONDUIT CONNECTOR ONLY): EN 50081-1 Residential, commercial & light industry; EN-50082-2 Heavy Industrial



T-2000 I/P & E/P TRANSDUCERS

T-2000 DIMENSIONAL DRAWINGS



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.

MB MARSH BELLOFRAM

Type-2000

Electro-Pneumatic
I/P & E/P
Transducer



Precision
Control
Devices

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ISO 9002
certified

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LT 1025 5m 9/2001

MB MARSH BELLOFRAM
The standard in Components, Instrumentation & Controls

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



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 (pending) 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.



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 (pending) 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
- Agency Approvals (pending)



APPLICATIONS

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

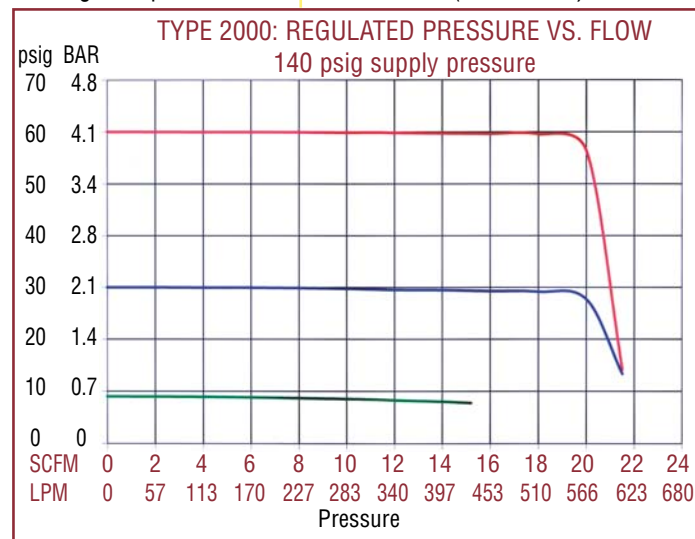
- Valve actuators
- Louver and damper actuators
- Valve positioners
- Relays
- Clutches and brakes
- Controllers
- Air cylinders

INDUSTRY APPLICATIONS INCLUDE:

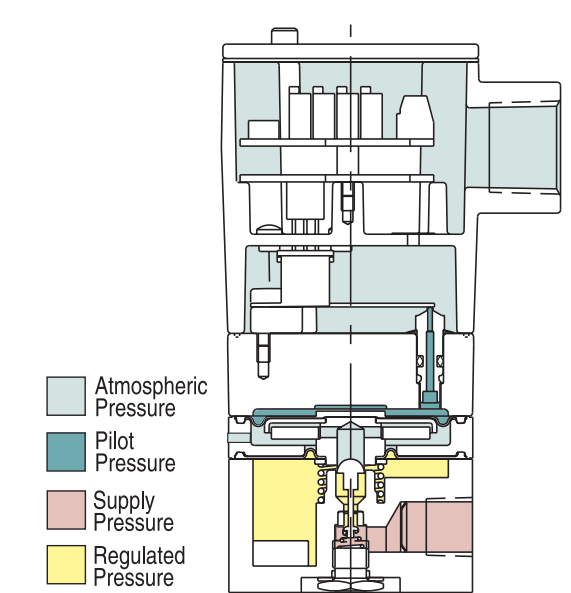
- Chemical & Petrochemical Industries
- Petroleum production
- Pipeline Transmission
- Electric Utilities
- Water & Wastewater Systems
- Pulp & Paper
- Textiles
- Semiconductor Industry
- Food & Beverage
- Environmental Control Systems
- Construction Equipment
- Heavy Truck
- Agricultural Equipment
-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

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 0-10V				
Ports	1/4" NPT or 20mm Conduit DIN Hirschmann (S model only) External Terminal Block (S model only)				
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 (Supply/Output)	1/4" (NPT, BSPT, or BSPP threading) Bottom-ported for Manifold Mounting				
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	None				
Supply Voltage Effect	None				
Supply Pressure Effect	None				
Vibration Effect	<1%FS (+/-1G; 5-1000Hz)				
Mounting Position Effect	None				
RFI/EMI	CE-compliant				
Temperature Effect	0.02%FS/°F (-40° to 180°F [-40° to 82°C])				
Storage Temperature	-40° to 200°F (-40 to 93°C)				



TYPE 2000 EXPLOSION PROOF



- Atmospheric Pressure
- Pilot Pressure
- Supply Pressure
- Regulated Pressure

ORDERING INFORMATION

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

ENCLOSURE
S = Intrinsically Safe
E = Explosion Proof¹

ELECTRICAL PORT
N = 1/2" NPT Conduit
M = 20mm Conduit
H = Hirschmann¹
T = Terminal Block²

PNEUMATIC PORTS³
N = NPT⁴
T = BSPT⁴
P = BSPP⁴
M = Manifold Mount⁵

AGENCY APPROVAL
F = FM/CSA
C = CENELEC
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

ACCESSORIES
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 Adaptor(2) 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:
¹Availability Matrix
²NEMA 4X / IP66 not available
³Gauge Ports = 1/8"NPT on all models
⁴Threads as specified (Supply&Output=1/4")
⁵Bottom O-Ring Ports

WIRING CONNECTIONS AND SWITCH POSITIONS

Switch #	1: psig		2	3	4	5	6: psig		7	8	9
	BAR	BAR					BAR	BAR			
ON	0-5 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	0-5 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