

Fisher® i2P-100 Electro-Pneumatic Transducer

The Fisher® i2P-100 electro-pneumatic transducer, shown in figure 1, uses a patented converter module that converts a milliampere input to a proportional pressure output. Both the current input and pressure output range are user-configurable in the field. The converter module uses small parts of minimum mass, which are balanced symmetrically around a pivot point at the center of the mass. This balanced arrangement results in a high performance instrument that reduces sensitivity to vibration.

An integral pneumatic relay provides the high capacity necessary to drive pneumatic control valve/actuator assemblies without additional boosters or positioners. The transducer also provides stable, accurate operation when its output is transmitted to small volume chambers, such as a pneumatic positioner or other pneumatic instrument. Reduced sensitivity to vibration, combined with high capacity and first order lag characteristics, make the i2P-100 transducer suitable for direct mounting on control valve/actuator combinations.

Features

- **Low Pneumatic Supply Consumption**—The transducer has low pneumatic supply consumption which lowers operating costs.
- **Approved for use with Natural Gas**—The i2P-100 is approved for use with natural gas as the pneumatic supply.
- **Single Sealed Device**—The i2P-100 has been tested in accordance with ANSI/ISA Standard 12.27.01 (Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids) as a single sealed device.
- **High Output Capability and Rangeability**—The integral output relay volume of the transducer is adequate to drive valve/actuator combinations without requiring a positioner or volume booster. Selectable user field-configurable dip switch setting for output range of 0.14 to 2.3 bar (2 to 33 psi).

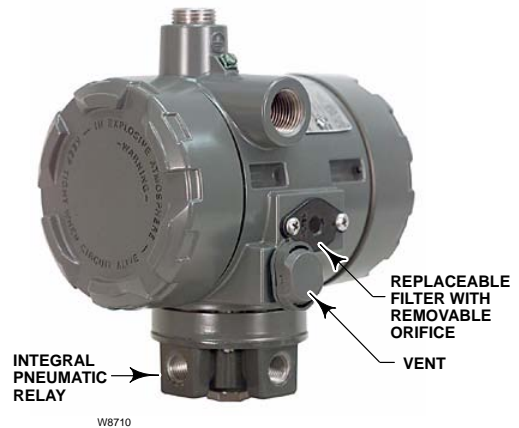


Figure 1. Fisher® i2P-100 Electro-Pneumatic Transducer

- **Split Range**—Selectable user field-configurable two-way split range, using either half of the standard input signal.
- **Corrosion Resistant**—Separate housing compartments isolate the electronics from the pneumatic process. The electronics module is encased in a rugged plastic shell which helps to prevent damage to the electronics. The printed wiring board and dip switches are conformal coated to help prevent corrosion. Converter module coils have corrosion resistant coating and all flexures are gold plated to provide protection from hostile environments.
- **Tolerant of Dirty Supply Medium**—Free-flow pilot stage design and large internal air passages provide excellent tolerance to dirty pneumatic supply, by reducing the effects of contaminant buildup and erosion. The removable primary orifice and replaceable 5 micron filter are easy to remove for service and maintenance (see figure 1).
- **Easy Maintenance**—Modular electronics and converter modules contained in separate housing compartments, isolating the electronics from the process, allow for easy replacement in the field for reduced maintenance time and costs.





Figure 2. Fisher® i2P-100 Electro-Pneumatic Transducer Mounted on a Rotary Actuator



Figure 4. Fisher® i2P-100 Electro-Pneumatic Transducer Mounted on a Sliding-Stem Actuator

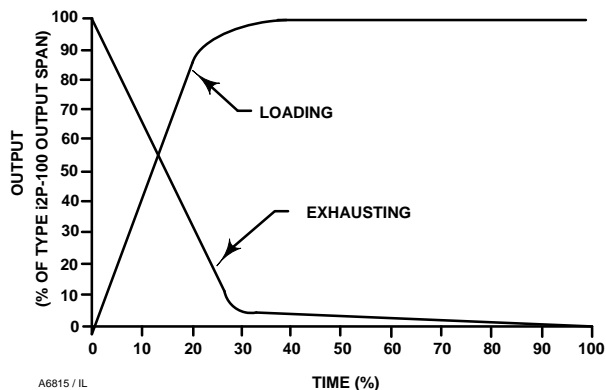


Figure 3. Output-Time Relationships

● **Vibration Resistance**—The transducer, used in a standard valve/actuator mounted application, exhibits an output shift of less than 1 percent of span when tested to ISA S75.13.

Valve Stroking Time

Figure 3 shows relative times for loading and exhausting an actuator. Stroking time depends upon the size of the actuator, travel, relay characteristics

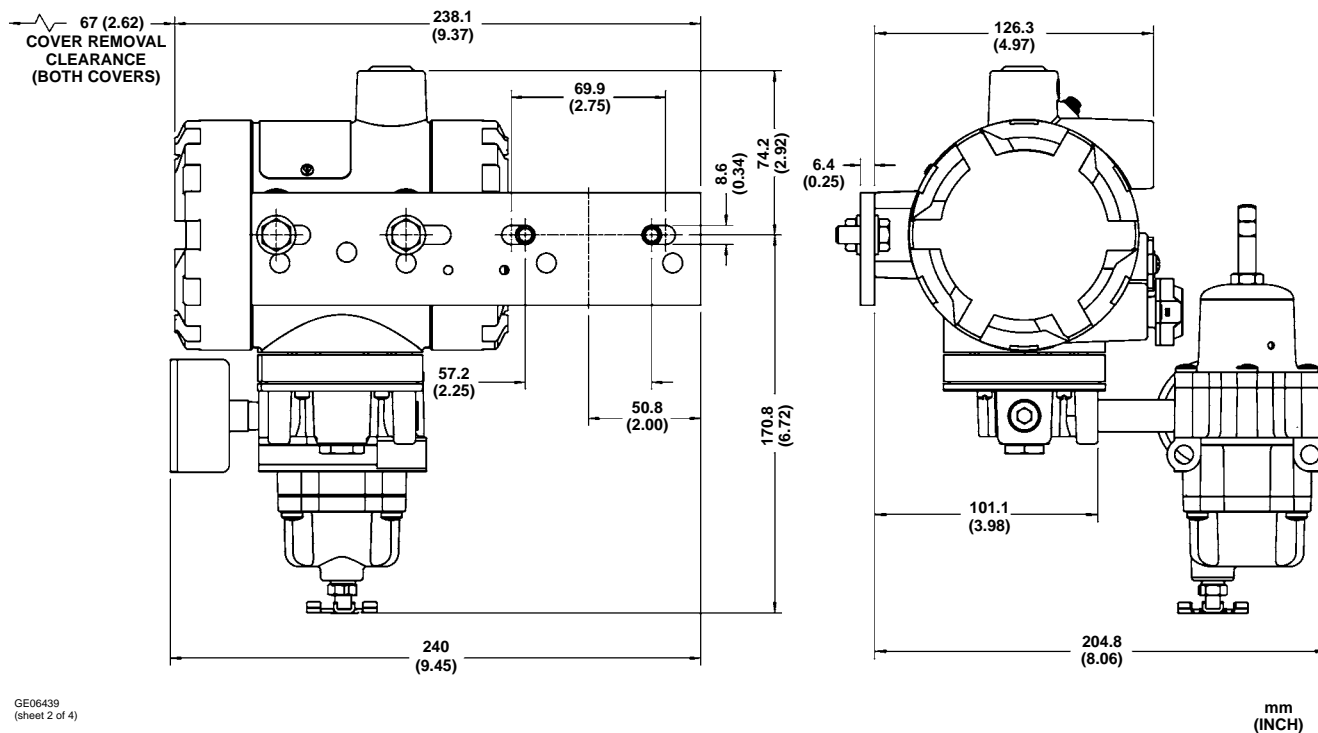
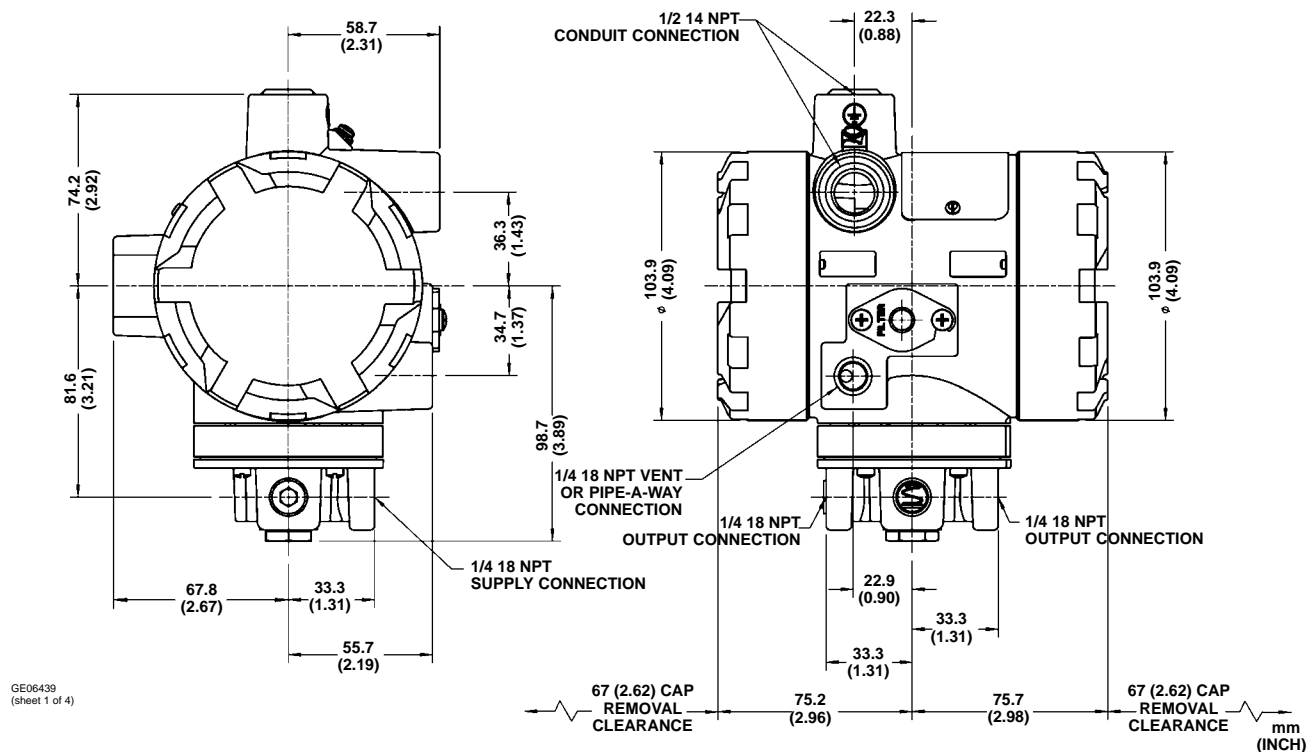
and the magnitude and rate of change of the input signal. If stroking time is critical, contact your Emerson Process Management sales office.

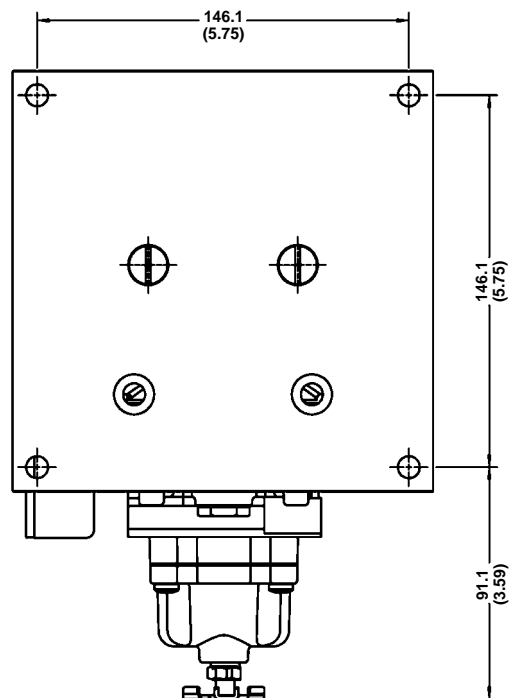
Installation

Refer to figure 5 for location of standard mounting holes in the housing. See figures 2 and 4 for typical mounting configurations. Standard mounting hardware is provided for mounting on the actuator, a pipestand, or surface mount. Field wiring connections are made to the terminal block accessible under the housing cap, via the 1/2 NPT conduit connection. Dimensions are shown in figures 5, 6, 7, and 8.

Ordering Information

To determine what ordering information is required, refer to the Specifications table. Carefully review the description of each specification. Specify the desired choice whenever there is a selection available. Also, specify options that are applicable to the application.





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(sheet 3 of 4)

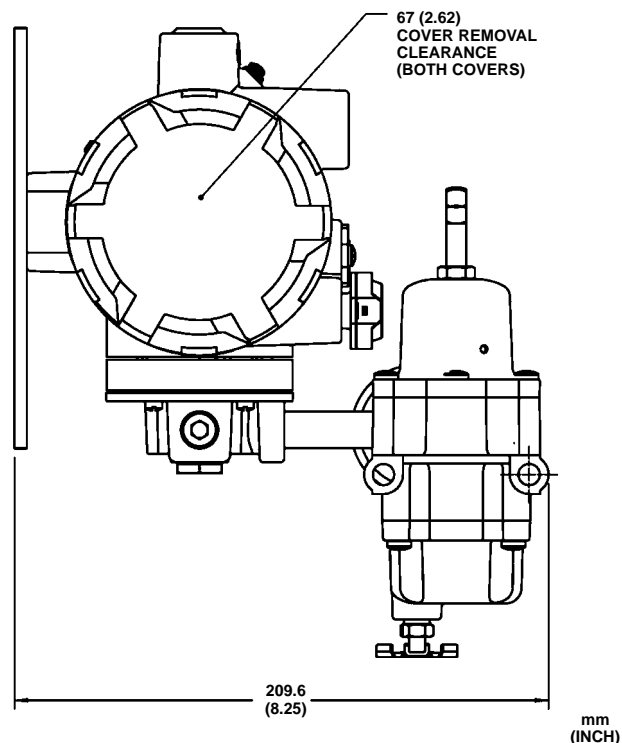
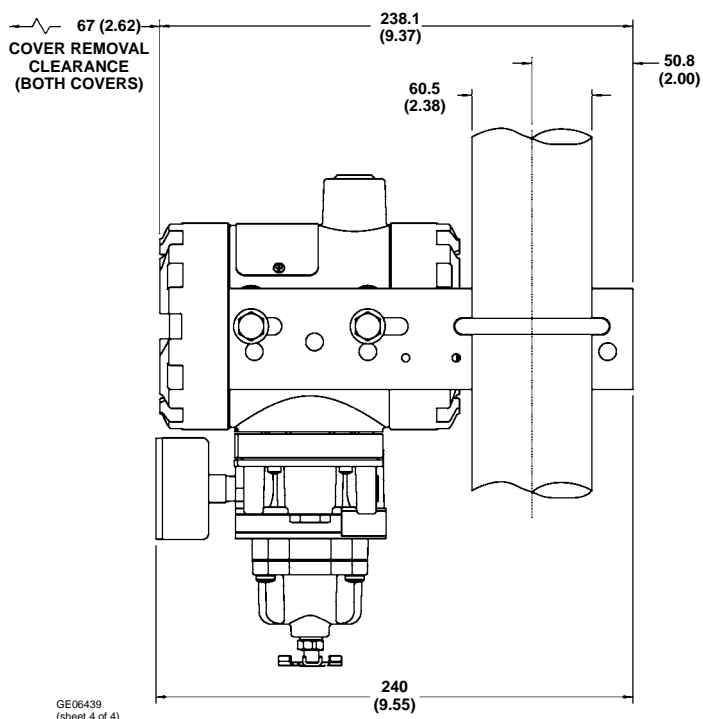


Figure 7. Dimensions with Optional Fisher® 67 Filter-Regulator (Surface/Wall Mounted)



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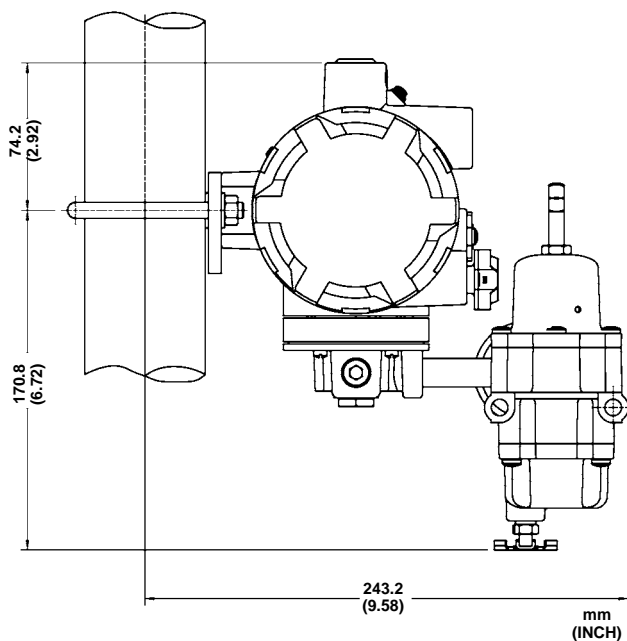


Figure 8. Dimensions with Optional Fisher® 67 Filter-Regulator (Pipestand Mounted)

Specifications

Input Signal

Available as standard with 4-20 mA.
User configurable by dip switch for split ranging, see table below.

Output Signal

Available as standard 0.2 to 1.0 bar (3 to 15 psig), 0.4 to 2.0 bar (6 to 30 psig), or 0.14 to 2.3 bar (2 to 33 psig). User configurable by dip switch selection and zero and span potentiometer adjustment, see table below.

INPUT SIGNAL	OUTPUT PRESSURE	
	BAR	PSIG
4 to 20 mA DC	0.2 to 1.0	3 to 15
	0.4 to 2.0	6 to 30
	0.14 to 2.3	2 to 33
4 to 12 mA DC	0.2 to 1.0	3 to 15
12 to 20 mA DC	0.2 to 1.0	3 to 15

Equivalent Circuit

The i2P-100 equivalent circuit is a series circuit consisting of a constant voltage drop (battery) of approximately 4 VDC and a total resistance of 40 ohms. Input is shunted by two 6.8 V zener diodes (see figure 9).

Supply Pressure⁽¹⁾

Recommended: 0.34 bar (5 psi) higher than upper range limit of output signal

Maximum: 3.4 bar (50 psig)

Medium: Air or Natural Gas⁽²⁾

Average Steady State Flow Rate

See table 2

Maximum Output Air Capacity⁽³⁾

8.04 normal m³/hr (300 scfh) at 1.4 bar (20 psig) supply pressure

Performance⁽⁴⁾

Reference Accuracy: $\pm 1.0\%$ of full scale output span; includes combined effects of hysteresis, linearity, and deadband

Independent Linearity: $\pm 0.75\%$ of full scale output span

Hysteresis: 0.4% of full scale output span

Frequency Response: Gain is attenuated 3 dB at 6 Hz with transducer output signal piped to a typical instrument input

Temperature Effect: $\pm 0.14\%$ per degrees Celsius ($\pm 0.075\%$ per degrees Fahrenheit) of span

Supply Pressure Effect: 0.2% of full scale output span per psi supply pressure change)

Vibration Effect: Less than 1% of full scale output span when tested to ISA S75.13

Electromagnetic Compatibility

Meets EN 61326-1 (First Edition)

Immunity—Industrial locations per Table 2 of EN 61326-1 Standard. Performance is shown in table 1 below.

Emissions—Class A

ISM equipment rating: Group 1, Class A

Operating Ambient Temperature Limits⁽¹⁾

-40 to 85°C (-40 to +185°F)

Electrical Seal

Single sealed device per ANSI/ISA 12.27.01

Electrical Classification

Hazardous Area:



Intrinsic Safety, Explosion proof, Type n, Dust-Ignition proof



Intrinsic Safety, Explosion proof, Type n, Non-incendive, Dust-Ignition proof

ATEX Intrinsic Safety, Type n and Flameproof

IECEx Intrinsic Safety, Type n and Flameproof

Refer to tables 3, 4, 5, and 6 for specific approval information.

Approved for use with natural gas⁽²⁾

Electrical Housing:

CSA Type 4X Encl., NEMA 4X, IP66 when remote vented, otherwise

CSA Type 3 Encl., NEMA 3, IP64

Construction Materials

Housing: ■ Low-Copper aluminum with polyurethane paint

O-rings: Nitrile

Diaphragms: Nitrile

-continued-

Specifications (continued)

Adjustments⁽⁵⁾

Zero and Span: Trim potentiometers (20 turn) for zero and span adjustments are located under the housing cap.

Switch: Allows input signal split range and user-configurable 0.14 to 2.3 bar (2 to 33 psig) output.

Connections

Supply and Output Pressure: 1/4 NPT internal connection

Vent: 1/4 NPT internal

Electrical: ■ Standard 1/2 NPT

Wire Size: 18 to 22 AWG

Mounting Position

■ Actuator ■ pipestand or ■ surface

Approximate Weight

2.5 kg (5.5 lbs)

Options

■ Output pressure gauge ■ M20 or PG13 conduit adapter

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 – Process Instrument Terminology

1. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.

2. This product is approved for use with natural gas. Natural gas should contain no more than 20 ppm of H₂S.

3. Normal m³/hour--Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh--Standard cubic feet per hour (60°F and 14.7 psig).

4. Performance values are obtained using a transducer with a 4 to 20 mA DC input signal and a 0.2 to 1.0 bar (3 to 15 psig) output signal at an ambient temperature of 24°C (75°F).

5. For other ranges, zero and span adjustments needed.

Table 1. EMC Summary Results—Immunity

PORT	PHENOMENON	BASIC STANDARD	TEST LEVEL	PERFORMANCE CRITERIA ⁽¹⁾
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	8kV Air / 4kV Contact	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	Test waived	N/A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	+/- 0.5kV 5/50 nS	A
	Surge	IEC 61000-4-5	1kV Differential / 2kV Common	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Specification limit = ±1% of span
1. A=No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

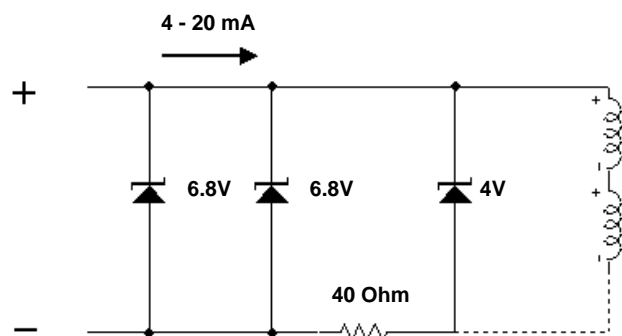


Figure 9. Equivalent Circuit

Table 2. Average Steady State Flow Rate

SUPPLY PRESSURE		OUTPUT PRESSURE		STEADY STATE FLOW RATE ⁽¹⁾	
PSI	BAR	PSI	BAR	Scfh	m3/hr
20	1.4	3-15	0.2-1.0		
		3	0.2	2.7	0.08
		9	0.62	4.22	0.12
		15	1.0	5.76	0.16
35	2.4	6-30	0.4-2.0		
		6	0.4	3.41	0.10
		18	1.2	6.58	0.19
		30	2.0	9.84	0.28
38	2.6	2-33	0.14-2.3		
		2	0.14	2.38	0.07
		17.5	1.21	6.43	0.18
		33	2.3	10.7	0.30

1. Normal m³/hour--Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh--Standard cubic feet per hour (60°F and 14.7 psig).

Product Bulletin

62.1:i2P-100
February 2009

i2P-100 Transducer

Table 3. Hazardous Area Classifications—CSA (Canada)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
CSA	(Intrinsic Safety) Zone Ex ia IIC T3/T4/T5 per drawing GE07471 Class/Division Class I, II, III Division 1 GP A,B,C,D,E,F,G per drawing GE07471	$V_{max} = 30 \text{ VDC}$ $I_{max} = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 5 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	CSA Type 4X Encl.*
	(Explosion Proof) Zone Ex d IIC T5/T6 Class/Division Class I, Division 1 GP, A,B,C,D T5	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	CSA Type 4X Encl.*
	(Type n) Zone Ex nC IIC T5/T6	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	CSA Type 4X Encl.*
	Class I, Division 2, GP A,B,C,D T5 Class II, Division 1 GP E,F,G T5 Class II, Division 2, GP F,G T5 Class III	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$)	CSA Type 4X Encl.*

*When remotely vented.

Table 4. Hazardous Area Classifications—FM (United States)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
FM	(Intrinsic Safety) Zone Class I Zone 0 AEx ia IIC T3/T4/T5 per drawing GE07470 Class/Division Class I, II, III Division 1 GP A,B,C,D,E,F,G per drawing GE07470	$V_{max} = 30 \text{ VDC}$ $I_{max} = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	NEMA 4X*
	(Explosion Proof) Zone Class I Zone 1 AEx d IIC T5/T6 Class/Division Class I, Division 1, GP A,B,C,D T5/T6	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	NEMA 4X*
	(Type n) Zone Class I Zone 2 AEx nC IIC T5/T6	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	NEMA 4X*
	Class I, Division 2, GP A,B,C,D T5/T6 Class II, Division 1 GP E,F,G T5/T6 Class II, Division 2, GP F,G T5/T6 Class III	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	NEMA 4X*

*When remotely vented.

Table 5. Hazardous Area Classifications—ATEX

CERTIFICATE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
ATEX	Ⓔ II 1 GD Gas Ex ia IIC T3/T4/T5—Intrinsic Safety Dust T95°C ($T_{amb} \leq 85^{\circ}\text{C}$)	$U_i = 30 \text{ VDC}$ $I_i = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	IP66*
	Ⓔ II 2 GD Gas Ex d IIC T5/T6—Flameproof Dust T95°C ($T_{amb} \leq 85^{\circ}\text{C}$)	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*
	Ⓔ II 3 GD Gas Ex nC II T5/T6—Type n Dust T95°C ($T_{amb} \leq 85^{\circ}\text{C}$)	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*

*When remotely vented.

Table 6. Hazardous Area Classifications—IECEX

CERTIFICATE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
IECEX	Gas Ex ia IIC T3/T4/T5—Intrinsic Safety	$U_i = 30 \text{ VDC}$ $I_i = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 0 \text{ uF}$ $L_i = 0 \text{ uH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	IP66*
	Gas Ex d IIC T5/T6—Flameproof	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*
	Gas Ex nC IIC T5/T6—Type n	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*

*When remotely vented.

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TEMPERATURE CONTROLLERS

DIRECT ACTION BASE ASSEMBLIES

ACTION:

Direct semi-throttle; Pilot Output Pressure (Yellow) increases with temperature rise.

APPLICATION:

Low temperature shut down, direct action temperature controller requiring semi-throttling direct action.

For piped vent in Direct or Indirect mode.

WORKING PRESSURE (sensing element):

psig	kg/cm ²
500	35.15 max. without Separable Socket
4000	281.23 max. with Separable Socket
7000	492.15 max. with Special Separable Socket

Separable Socket is an extra price item and must be ordered separately, if desired. To order Separable Sockets refer to Table of Contents

TEMPERATURE RANGE:

- 30°F minimum To 400°F maximum
- 34°C minimum to 204°C maximum

SUPPLY PRESSURE:

- 5 to 30 psig
- .35 to 2.11 kg/cm²

OPERATION:

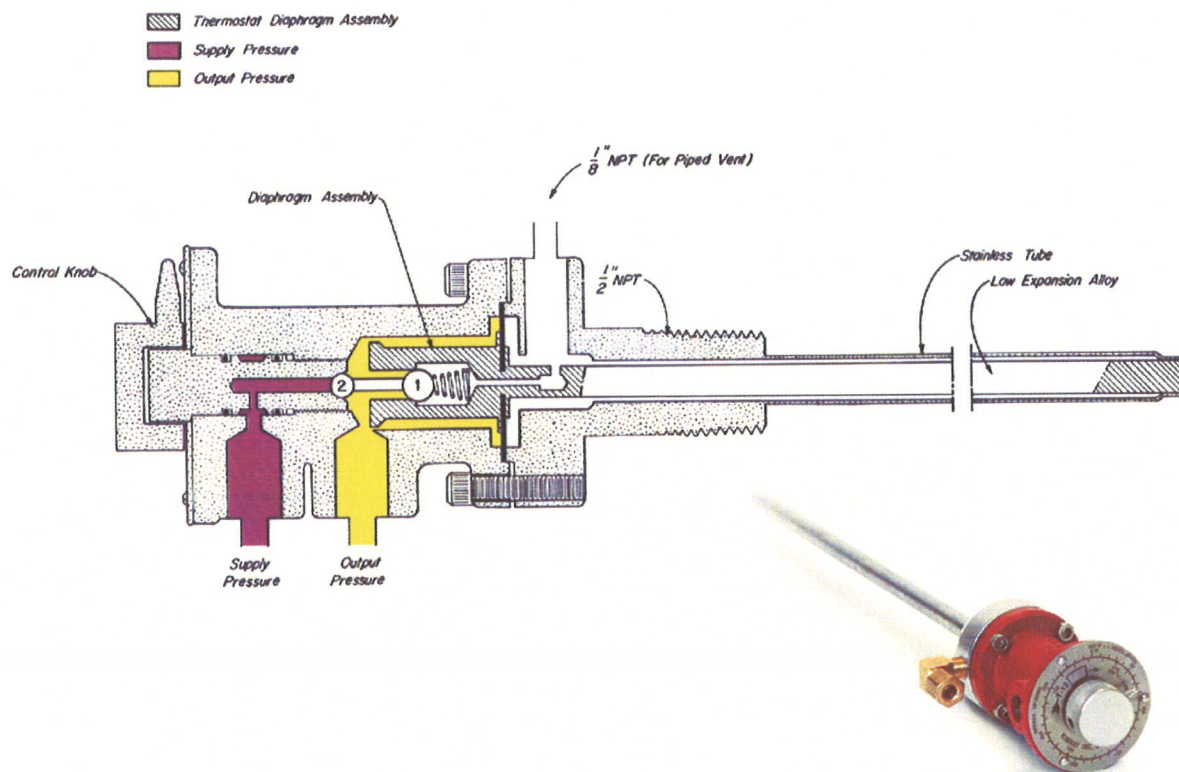
This Thermostat Base Assembly consists of a STAINLESS TUBE for monitoring the changing temperature, which is connected by a Low Expansion Alloy Rod to a DIAPHRAGM ASSEMBLY. The differential pressure across the Diaphragm combined with the changes in the length of the STAINLESS TUBE semi-throttle a PILOT PLUG valve. The PILOT PLUG consists of two stainless balls rigidly connected together. The seat at BALL 1 is the pressure vent (Yellow to Atmosphere). The seat at BALL 2 is the Supply Pressure inlet (Violet to Yellow).

Assume the set temperature of the Thermostat is above that of the system. The Inlet at BALL 2 is closed and the vent at BALL 1 is open. Output Pressure (Yellow) is vented away so that no signal is being sent to the Pilot or Motor Valve.

As the temperature rises in the system, the STAINLESS TUBE increases in length to move the Thermostat Diaphragm Assembly in a direction to first close the seat at BALL 1 (Yellow to Atmosphere) and open the seat at BALL 2 (Violet to Yellow). Output Pressure (Yellow) increases and acts on the DIAPHRAGM accounts for the semi-throttle action of the Thermostat. Output Pressure (Yellow) increases to cause the desired Pilot or Motor Valve action.

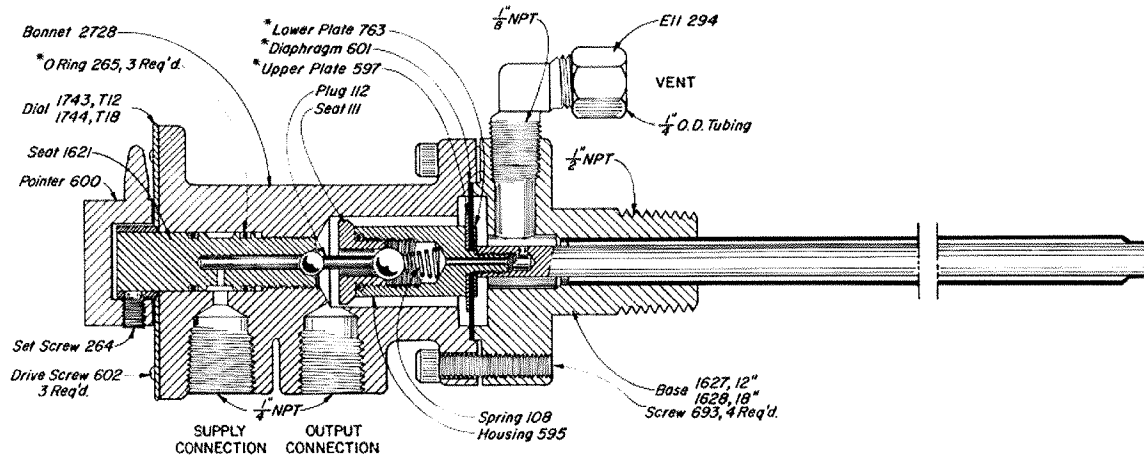
As the temperature decreases, the action is reversed to decrease or vent Output Pressure (Yellow).

By reversing the Vent and Supply lines, the Thermostat can be made to act in an indirect throttle mode, Pilot Output Pressure decreases with temperature rise. In this mode the "DA" Thermostat acts identical to the standard T 12 Thermostat with the exception of being able to pipe the vent line away from the thermostat.

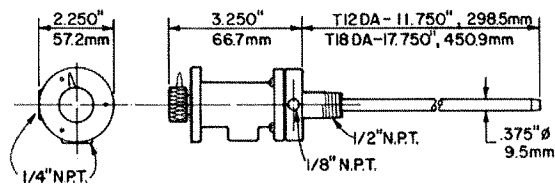


TEMPERATURE CONTROLLERS

DIRECT ACTION BASE ASSEMBLIES CAST IRON



DIMENSIONS



THERMOSTATS AVAILABLE:

CAT. NO.	BASE ASSEMBLY	MAX. TEMP. °F	MAX. TEMP. °C	REPAIR KIT
HAP	T 12 DA	400	204	RLK
HAR	T 18 DA	400	204	RLK

NOTES:

*These are recommended spare parts and are stocked as repair kits.

Separable Sockets are available at extra cost, refer to Table of Contents for ordering.



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Website: www.ktekcorp.com

Model MS10

Electric Level Switch

Installation and Operational Manual



The Direction in Level Detection →



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TABLE OF CONTENTS

1.0 INTRODUCTION	3
Description	
Operation	
Installation	
2.0 SPECIFICATIONS	6
3.0 ORDERING INFORMATION	7
4.0 MAINTENANCE.	8
Handling and Storage Requirements	
5.0 APPENDIX	8
Replacement of Switch (SPDT) on the MS10	
6.0 WARRANTY	12



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1.0 INTRODUCTION

Description:

The MS10 is a magnetically isolated single pole double throw point level switch. When the MS10 is inserted into a process vessel or external chamber it can sense high or low levels within the vessel. The unique magnetic isolation action eliminates the need for such things as seals, diaphragms, springs, or torque tubes because there is no physical contact with the process. The MS10 typically requires no preventive maintenance since it is totally sealed. The switch is not protected against radiation, electro-magnetic devices, permanent magnets or excessive mechanical vibration.

Operation:

The MS10 will provide either a normally open or normally closed dry contact, which may be used to activate external devices such as alarms or solenoids. The capacity of the switch allows for control of a wide range of devices. Maximum voltage and current ratings are listed in the specification section of this manual. Variations in process fluid specific gravity (0.4 minimum clean fluid SG) have minimal effect because of the small size of the integral float. The float tracks the liquid level and provides for an electrical contact output (SPDT). These contacts are suitable for use with alarms and/or to activate a pump motor starter relay.

Installation:

The MS10 is mounted to the process vessel via the integral 1-1/2" MNPT fitting. Suitable reducers and/or adapters may be used provided they do not interfere with the full stroke of the float. The MS10 should be tightened such that the electrical connection is at its uppermost position.

The following procedures outline the steps necessary to install the switch.

WARNING! MAKE SURE CIRCUIT IS DE-ENERGIZED WHILE INSTALLING THE SWITCH.

1. Inspect the switch for any signs of damage incurred during shipment. Mount the switch in a process connection at the point in which you want the switch to trip. Use of a suitable lubricant/sealing compound is recommended. During final tightening, align the MS10 electrical connection to the topmost position as shown (Figure 1). A 2" wrench is needed for tightening. The electrical contacts may be installed either before or after installing the switch housing (Figure 2). Be sure to push the retainer assembly firmly into the switch housing during installation. The retainer assembly may be removed to facilitate removal of the switch assembly, if necessary.

Note: The MS10 will also function when the electrical connection is aligned to the lowest position (bottom), however the electrical contacts will function opposite of the diagram (Figure 3).

2. Connect the field wires to the wiring harness of the MS10 according to the application. Reference Figure 3 for proper operation of contacts. Be sure to adequately insulate all electrical connections.
3. The liquid level inside the vessel should be cycled above and below the switch and operation of the contacts should be verified.
4. The float of the switch shall always be mounted in a straight horizontal position, arrow pointing up, so that the float of the switch is allowed to move freely up and down with the process. Obstruction of the float will cause inaccurate and erroneous readings to be relayed by the switch that could cause a hazardous condition to develop.
5. Competent personnel should only perform installation and maintenance procedures on process control equipment and these switches.



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6. Placement of switches should be only where the effects of a hazardous atmosphere will not effect the material integrity of the apparatus. It is a requirement the installation personnel to assure the hazardous atmosphere or the surrounding atmosphere will not compromise the long-term integrity (strength, conductivity, corrosion) of the switch material.

7. Warranty/Repair/Replacement:

For warranty, repair, or replacement of transmitter call the K-TEK service department at 225-673-6100. The service department is located in Prairieville, Louisiana 70769, USA.

8. The material construction of these units offers no particular protection against radiation, electro-magnetic or mechanical hazards. The construction of units is not designed to protect against other hazardous not defined in above sentence.

9. Strong magnetic fields should not be placed around the switch (reed switch is magnetically coupled) in order to prevent inaccurate and erroneous readings, which could cause a hazardous condition to develop.

10. Avoid aggressive substances that could drip, spill, pour, or fall on the switch and cause premature failure of the material or wiring resulting in inaccurate and erroneous readings which could lead to a hazardous condition.

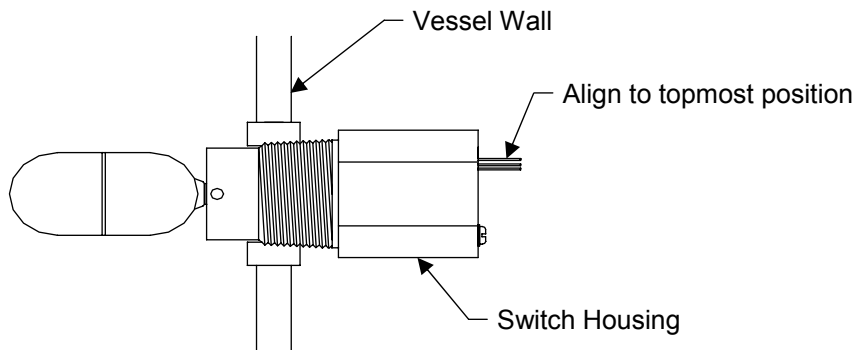


Figure 1 – MS10 Alignment



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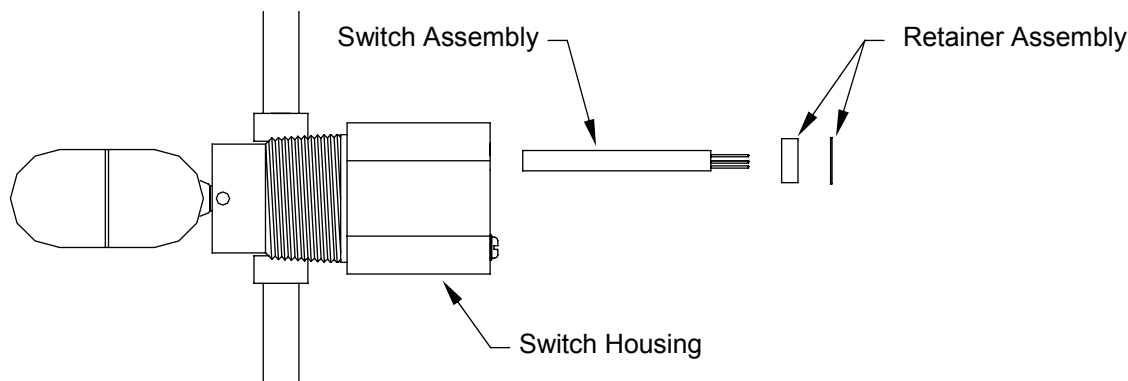


Figure 2 – Installation of MS10 Electrical Contacts

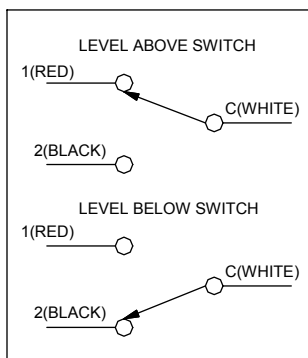


Figure 3 – Operation of Electrical Contacts

Note:

A.) Field wiring connected to the MS10 switch must comply with applicable sections of the National Electrical Code. Do not install/use in environments that would allow the metal of the switch to react with the contents (liquid or vapor) which could cause corrosion and metal fatigue.



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2.0 SPECIFICATIONS

Switch Type:	Magnetically actuated, hermetically sealed, bi-stable switch. Single pole double throw (Form C).
Switch Action:	Break before make
Contact Material:	Rhodium alloy
Max. Dead Band:	Approx. ± 0.50 " of float travel
Contact Ratings:	AC Rating: 250 VAC, 1Amp, 250 VA resistive
(Non IS Ratings)	DC Rating: 250 VAC, 1Amp, 250 W resistive
	If higher contact ratings are required see: IR10/10 Amp Interposing Relay (IR10-0202-1) PP10/10 Amp Pump-Pak Controller (PP10-0202-1)
Process Temperature:	-100 to 450oF / -73 to 232oC Contact factory regarding use in colder applications
Contact Temperature:	-40 to 302°F / -40 to 150°C
Max. Pressure:	1500 psig / 103 bar (Standard) 5000 psig / 345 bar with HP1 option
Customer Connection:	1-1/2" MNPT Process, 1/2" FNPT conduit and AWG 20 wiring harness (18inch). MS10 housing is 2" Hex for tightening into process connection
Insertion Length:	3-5/8" (Standard)" Otional 5" or 6-1/2" Insertion Length Consult Factory for Special Applications
Specific Gravity:	0.4 Minimum (Clean Fluid)
Approvals:	
Factory Mutual Approved	XP CL I, Div 1, GP ABCD CL I, Zn 1 AEx d IIC IS CL I, Div 1, GP ABCD CL I, Zn 0 AEx ia IIC T6 DIP CL II, III, Div 1, GP EFG
CSA Approved	XP CL I, Div 1, GP ABCD CL I, Zn 1 Ex d IIC IS CL I, Div 1, GP ABCD CL I, Zn 0 Ex ia IIC T6 DIP CL II, III, Div 1, GP EFG
ATEX Approved:	II 1G EEx ia IIC T6 (-40C<Tamb<80C)



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3.0 ORDERING INFORMATION:

MS10/a/b/c/d/e/f/g		
/a	Mounting Orientation	
	/H	Horizontal (Standard)
/b	Process Connection	
	/15	1-1/2" MNPT (Standard)
	/20	2" MNPT
	/WPxx	Welded Flange
	/T2	2" NPT 3000# Modified Tee
		Includes 1-1/2" X 2" Reducer Bushing
	/S2	2" Socket Weld 3000# Modified Tee
/c	Flange or Mounting Adapter Material	
	/S6	316/L Stainless Steel
	/S4	304/L Stainless Steel
	/CST	Carbon Steel
/d	Nametag with Customer Specified Options	
	/NT	316 Stainless Steel Nametag with Customer Specified Options
/e	Insertion Length	
	/EXT1	4 in. / 101 mm Insertion Length (Standard)
	/EXT2	5 in. / 127 mm Insertion Length
	/EXT3	6-1/2 in. / 165 mm Insertion Length
	/EXTn	Custom Insertion Length
/f	Other Options	
	/HP	5000# psig / 345 bar
		1. Available with /EXT1 only
		2. Flanged Process Connection Required
		3. Contact Factory Regarding Materials of Construction
/g	Approvals	
	/FM	Factory Mutual Flameproof and Intrinsically Safe (Standard)
	/CSX	CSA Flameproof
	/CSI	CSA Intrinsically Safe
	/CEI	ATEX Intrinsically Safe (Not for Flameproof Installations)



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4.0 MAINTENANCE

The MS10 does not require any routine maintenance in normal day to day operation.

WARNING! If there is a need to take the switch out of service or disconnect it for any reason, then make sure the circuit is de-energized, or insure that the area is known to be non-hazardous!

Handling & Storage Requirements:

There are no special handling and storage requirements associated with this device.

5.0 APPENDIX

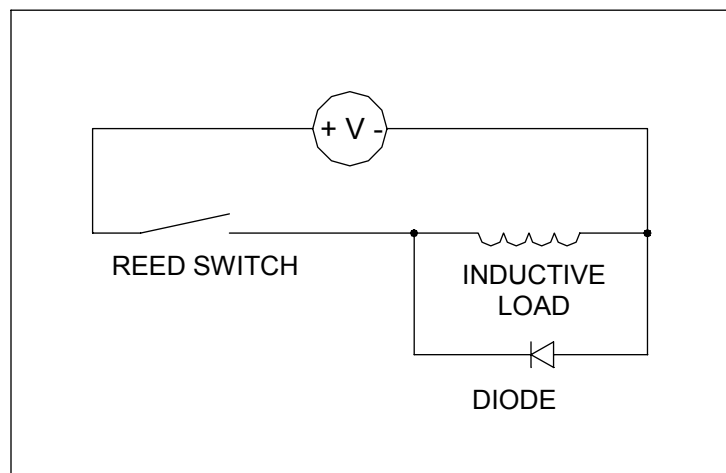
Explosion Proof Installation:

(Non-Intrinsically Safe Installation for ATEX IS Installations see page 7)

Many of K-TEK's switch products (MS10, MS30, MS50) are based on magnetically operated reed switches. Since reed switches have the inherent characteristic of very closely spaced switch contacts, it is extremely important to protect these contacts from high voltage transients caused by inductive loads. When an inductive load is de-energized, the collapsing magnetic field induces a high voltage of opposite polarity into itself and thus the switch. Two basic methods exist to clamp this voltage and thus protect the switch contacts.

D.C. Applications

For D.C. applications, a diode is placed in parallel with the inductive load (note the polarity of the diode and power supply). A 1N4001 general purpose diode is normally sufficient to clamp the induced voltage of the inductive load to a safe level.



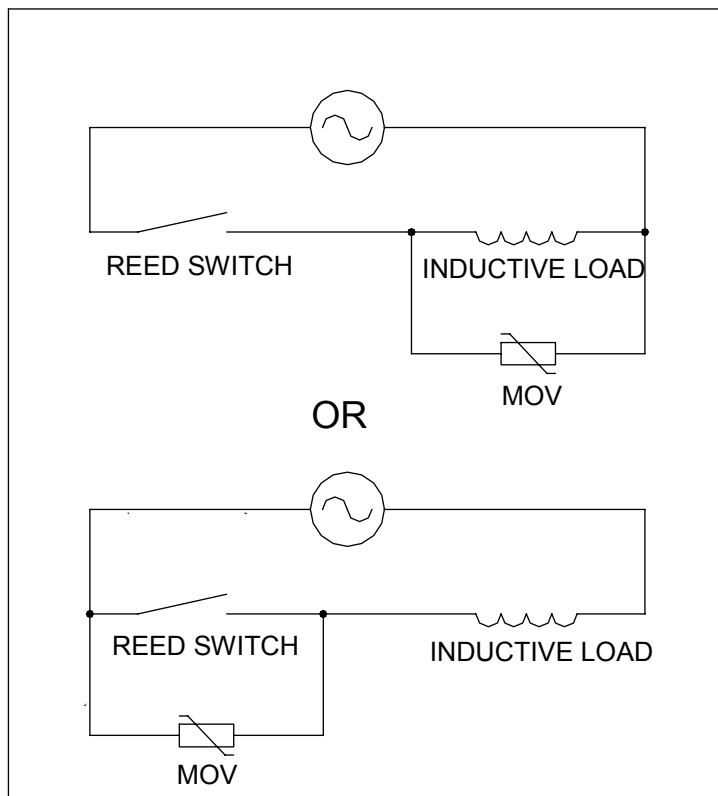
D.C. Contact Protection



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A.C. Applications

For A.C. applications, a Metal Oxide Varistor (MOV transient surge suppressor) is placed either in parallel with the switch or the inductive load. The MOV changes from a high impedance to a very low impedance when the voltage across the MOV exceeds its rated voltage (the MOV rating must correspond with the power supply voltage). For 120 VAC control systems a typical MOV would be the GE (General Electric Co.) part number V130LA10A. In either case shown, the result is the limiting of the switch voltage to approximately 130 volts.



A.C. Contact Protection

Explosion Proof Applications

The switch has been rated for explosion proof applications by Factory Mutual (FM) and the Canadian Standards Association (CSA) only. For typical/specific explosion proof installation see NEC 500 or NEC 505, or IEC directives. The MS10 is not approved for flameproof (European) application at this time.

Intrinsically Safe Applications

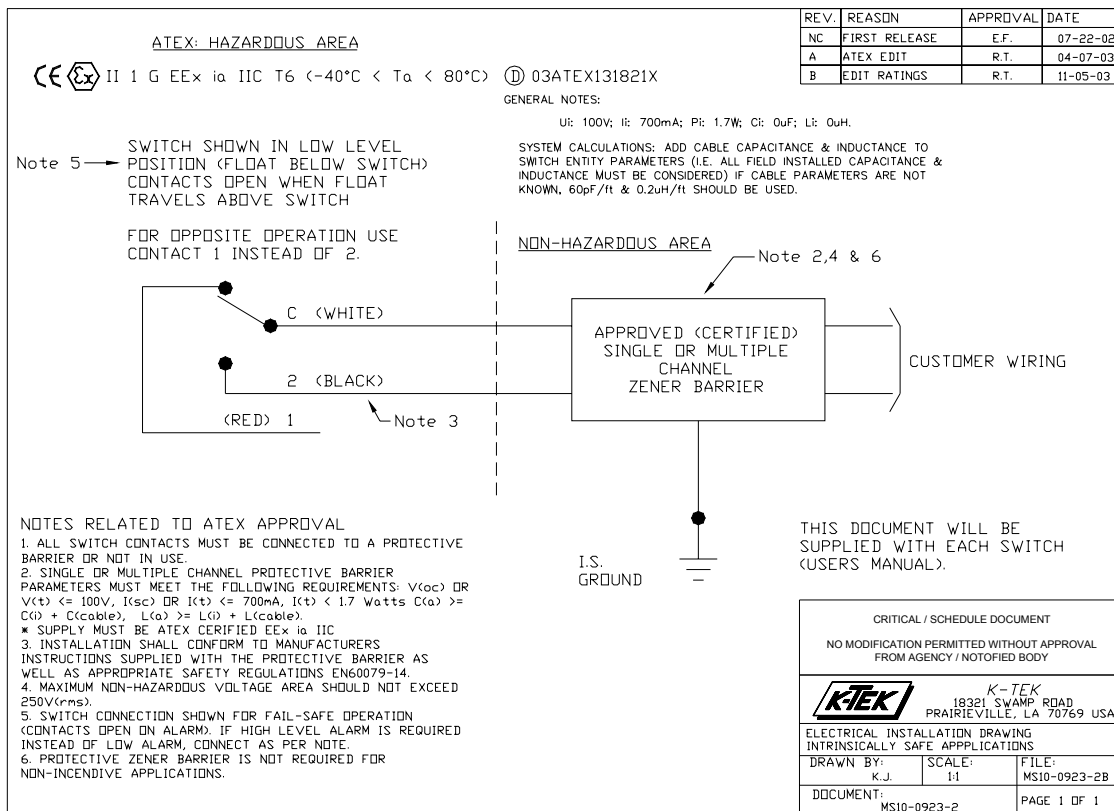
This switch is ATEX approved in IS installations (EEx ia) Zone 0 in Europe by DEMKO, in the U.S. by FM and in Canada by CSA. This switch can be used in areas/processes that do not have explosive environments. For a typically IS installation application please see the example below.

If only two wires are used, then the 3rd wire must be electrically and physically insulated from the circuit.

For use with three (3) wires, that is, use of the Normally Closed (NC) and Normally Opened (NO) contacts, a second IS barrier is required.



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This IS installation hook-up is good for:

Europe under ATEX approval
 U.S. under FM approval
 Canada under CSA approval

ATEX Note:

"High Pressure" (/H) option switch uses a titanium float.

Caution: Foreign objects (metals made of other material) sticking the titanium float could cause a spark. Use caution to prevent such conditions for arising.



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Replacement of switch (SPDT) on the MS10:

* The MS10 switch must be replaced with K-Tek's part number MS10-4 reed switch because the switch is pot-
ted for dimensions to fit inside of the SS tubing.

Disconnect the power that runs through/to the switch (Assure that removing the power will not effect your proc-
ess or process control)

Lock-out and Tag-out the power so that power can not be applied to the switch until after the switch has been
completely repaired/replaced

It is not necessary to remove the MS10 from the process to replace the reed switch

Remove retaining ring with small screwdriver

Remove the rubber grommet

Pull out the magnetic reed switch by the wires

Put in the replacement reed switch

Replace grommet & retaining ring

Disconnect the wires (2 or 3 wires) on old switch, noting the connections and colors, and re-connect the wires to
the new switch according to hook-up of the old wiring.

Ensure that the applied wattage & current do not exceed the power & current rating of the switch

Remove the Lock-out / Tag-out device from the applied power

Before applying power assure that this will not effect your process or process control

Apply power and check the switch to assure that it is functioning properly

Note: For the switch to operate (make and break contact) in the process, the fluid/process must be lower and
raised above the level of the float.



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6.0 WARRANTY

5 YEAR WARRANTY FOR:

KM26 Magnetic Liquid Level Gauges, Buoyancy Level Switches (LS20, MS50, MS10 & MS8), Magnetic Level Switches (MS30, MS21, MS40, MS41, PS35 & PS45), EC External Chambers and ST95 Seal Pots.

3 YEAR WARRANTY FOR:

KCAP300 & KCAP 400 capacitance switches.

2 YEAR WARRANTY FOR:

AT100 and AT200 series transmitters; VF20 and VF30 vibrating fork switches; RLT100 and RLT200 reed switch level transmitters; TX, TS, TQ, IX and IM thermal dispersion switches; MT2000 radar level transmitters; KP paddle switches; A02, A75 & A77 RF capacitance level switches and A38 RF capacitance level transmitters.

1 YEAR WARRANTY FOR:

KM50 gauging device; AT500 and AT600 series transmitters; LaserM and SureShot series laser transmitters; LPM 100 and 200 series digital indicators; DPM100 digital indicators; APM100 analog indicators; KVIEW series digital indicators and controllers; SF50 and SF60 vibrating fork switches, KB Electro-Mechanical Continuous Measuring Devices, KSONIK ultrasonic level switches, transmitters & transducers.

SPECIAL WARRANTY CONSIDERATIONS:

K-TEK will honor OEM warranties for items not manufactured by K-TEK (i.e. Palm Pilots).

K-TEK will repair or replace, at K-TEK's election, defective items which are returned to K-TEK by the original purchaser within the period specified above from the **shipment date** of the item and which is found, upon examination by K-TEK, to its satisfaction, to contain defects in materials or workmanship which arose only under normal use and service and which were not the result of either alterations, misuse, abuse, improper or inadequate adjustments, applications or servicing of the product. **K-TEK's warranty does not include onsite repair or services.** Field service rates can be supplied on request.

If a product is believed to be defective, the original purchaser shall notify K-TEK and request a Returned Material Authorization before returning the material to K-TEK, with transportation **prepaid** by the purchaser. (Request door to door delivery via New Orleans International Airport located in Louisiana, USA.) The product, with repaired or replaced parts, shall be returned to the purchaser at any point in the world with transportation prepaid by K-TEK for best-way transportation only. K-TEK is not responsible for expedited shipping charges. If the product is shipped to K-TEK freight collect, then it will be returned to the customer freight collect.

If inspection by K-TEK does not disclose any defects in material or workmanship, K-TEK's normal charges for repair and shipment shall apply (minimum 100.00 USD).

The materials of construction for all K-TEK products are clearly specified and it is the responsibility of the purchaser to determine the compatibility of the materials for the application.

THE FOREGOING WARRANTY IS K-TEK'S SOLE WARRANTY AND ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED AND NEGATED TO THE MAXIMUM EXTENT PERMITTED BY LAW. NO PERSON OR REPRESENTATIVE IS AUTHORIZED TO EXTEND ANY OTHER WARRANTY OR CREATE FOR K-TEK ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF K-TEK'S PRODUCTS. THE REMEDIES SET FORTH IN THIS WARRANTY ARE EXCLUSIVE OF ALL OTHER REMEDIES AGAINST K-TEK. K-TEK SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, OR SPECIAL DAMAGES OF ANY KIND. K-TEK'S SOLE OBLIGATION SHALL BE TO REPAIR OR REPLACE PARTS (FOUND TO BE DEFECTIVE IN MATERIALS OR WORKMANSHIP) WHICH ARE RETURNED BY THE PURCHASER TO K-TEK.

POL-CSV-81, REV 08, EFF 05/2004

Vibration Transmitters

ST5484E Velocity 4-20 mA



ATEX



SEISMIC PRODUCTS

Features

- Loop terminals w/Independent Polarity (IPT®)¹. Prevents incorrect wiring
- Different mounting studs available
- Available with flying leads, terminal block or MIL style connector
- Most stable detection circuit
- Temperature shock protected
- Widest frequency range
- High & low pass filters options
- Built-in base & housing strain protection
- Dynamic signal option

Applications

- Blowers
- Centrifuges
- Compressors
- Engines
- Fans
- Generators
- Motors
- Pumps
- Turbines
- Turbochargers

Loop-powered Transmitter

Model ST5484E is the ideal solution for sensing vibration on most plant equipment. This precision case mounted vibration sensor and signal conditioner in a single package is built to provide years of reliable service. A simple two-wire loop signal proportional to velocity is generated for transfer to a programmable logic controller (PLC), distributed control system (DCS) or other 4-20 mA input devices. Simply mount the transmitter on the machine case, connect the 2-wire loop and read and/or record the vibration. Model ST5484E is made with our patented IPT®¹ technology which eliminates wiring polarity errors.

Notes:

1. IPT® (Independent Polarity Terminal) is a registered trademark of Metrix Instrument Co.

Specifications

Vibration Range: 4 to 20 mA output proportional to velocity. Refer to "How to Select A" for ranges. Nonstandard ranges available.

Accuracy: 2% (Repeatability)

Dynamic Signal: Acceleration, 100 mV/g. The dynamic signal has the same frequency range as in "How to Select E/F". 12dB / oct high pass and 12 dB / oct low pass response.

Frequency Response:

Standard: 2 - 1500 Hz, available up to 2000 Hz. Refer to "How to Select E/F". 12 dB / oct high pass and low pass filters are used.

Axis Orientation: Any

Supply Voltage (Vs): 11 to 30 VDC, Non-polarity sensitive, IPT®

Isolation: 500Vrms, circuit to case

Electrical Connection Options:

- Flying leads w/18 AWG wire 457 mm (24 in.) long.
- MIL style 2-pin connector.
- Terminal block (accepts up to 16 AWG wire)

Maximum Load Resistance (R_L):

R_L = 50 x (V_{supply}-11) ohms

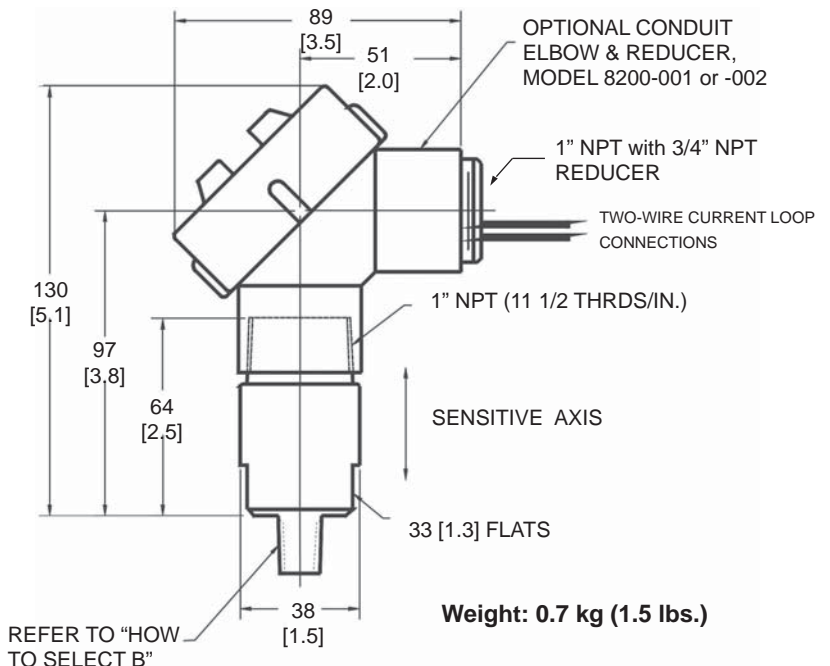
Service Temp. Rating: -40° to 100°C (-40°F to 212°F)

Enclosure Materials: 303 SS

Enclosure Environmental Rating: NEMA 4X, IP 65, IP 67 for 2 pin style connector

Approvals: Refer to "How to Select C".

Weight & Dimensions



Weight: 0.7 kg (1.5 lbs.)

REFER TO "HOW TO SELECT B"

METRIX

Vibration - Condition Monitoring
and Protection

www.metrix1.com • sales@metrix1.com
Sales & Service Tel: 1-281-940-1802 • Fax: 1-281-940-1799 • 03/07



ST5484E-XXX-X14-XX
With 2-pin MIL style connector.



ST5484E-XXX-X32-XX
With two slot terminal block.



ST5484E-XXX-X33-XX
Dynamic signal terminals provide buffered 100 mV/g connection for analysis.



ST5484E-XXX-X20-XX
With 2-24" flying leads.

ST5484E-XXX-X21-XX
With 4-24" flying leads.

How To Select

ST5484E - - -

A Full Scale Range

1	2	1	= 1 ips (25 mm/s), pk
1	2	2	= 0.5 ips (12.7 mm/s), pk
1	2	3	= 2.0 ips (50 mm/s), pk
1	2	4	= 5.0 ips (125 mm/s), pk
1	2	6	= 0.8 ips (20.3 mm/s), pk
1	3	2	= 3.0 ips (75 mm/s), pk
1	5	1	= 1 ips (25 mm/s), rms
1	5	2	= 0.5 ips (12.7 mm/s), rms
1	5	3	= 2.0 ips (50 mm/s), rms

Note: For true RMS velocity calibration, add 30 to dash number. Ex: -121 becomes -151.

B Mounting Stud

0	= Integral 1/4" NPT
1	= Integral 1/2" NPT
2	= 3/8 - 24 UNF X 1/2"
4	= M8 X 1-12
5	= M10 X 1.25-12
6	= 1/4 - 20 UNC

C Hazard Rating

1	= Non-hazardous & CSA/NRTL/C (for all connections) = Class I, Div 2, Grps A, B, C & D
2	= CSA/NRTL/C for Class I, Div 1, Grps B-D & Class II, Div 1, Grps E-G (available with flying leads ONLY)
3	= ATEX, EEx ia IIC T4 Intrinsically Safe (available with terminal block or 2-pin MS connector)
4	= CSA, Intrinsically Safe, Class I, Div 1, Grps A, B, C & D

D Connection

0	= 4-20 mA: Flying leads (C = 1 or 2)
1	= 4-20 mA and dynamic signal: Flying leads (C = 1 or 2)
2	= 4-20 mA: 2-pin terminal block (C = 1 or 3)
3	= 4-20 mA and dynamic signal: 4-pin terminal block (C = 1 or 3)
4	= 4-20 mA: 2-pin MIL style connector (C = 1 or 3)

E High Pass Filter

0	= No Filter (2 Hz), Standard
1	= 5 Hz
2	= 10 Hz
3	= 20 Hz
4	= 50 Hz
5	= 100 Hz
6	= 200 Hz

F Low Pass Filter

0	= No Filter (1500 Hz), Standard
1	= 500 Hz
2	= 1000 Hz
3	= 2000 Hz

Optional Stud Adapters

STUD	BUSHING
8253-002	1/4" NPT to 1/2" NPT
8841-084	3/8 - 24 UNF to 1/2 - 20 UNF
8841-099	M8 to M10 x 1.25

[Additional Accessories - Page 2.31](#)

Pressure Transmitter Explosion proof Model E-10, standard version Model E-11, flush diaphragm

WIKA Data Sheet PE 81.27



Applications

- Wellhead monitoring
- Refining / Petrochemical
- Offshore platforms / pipelines
- Gas measurement

Special Features

- FM-approved Explosion proof for Class I Division 1 hazardous locations
- ATEX-approved Flameproof for II 2G Ex d II C
- Available with 4 ... 20 mA, 2-wire or 1 ... 5 V, 3-wire output signals
- Engineered to meet harsh demands
- Retrofits many existing applications



Fig. left Pressure transmitter E-10 / ATEX

Fig. center Pressure transmitter E-10 / FM, CSA

Fig. right Pressure transmitter E-11 (open wires) / FM, CSA

Description

The Types E-10 and E-11 explosion proof / flameproof pressure transmitters are specifically designed to meet the durability and performance requirements of industrial applications.

These pressure transmitters feature an industry standard 4 ... 20 mA, 2-wire signal output (optional signal output 1 ... 5 V), NEMA 4X (IP 67) ingress protection, and are extremely resistant to vibration, moisture intrusion and pressure spikes. They are applicable for acid gas applications and therefore they provide extra resistance against sulfide stress cracking when exposed to gases containing sulphur.

The transmitters are engineered to meet Class I Division 1 Explosion proof protection according to FM, CSA or II 2G Ex d II C according to ATEX for installation in hazardous environments.

Each transmitter undergoes extensive quality control testing and calibration to achieve an accuracy of $\leq 0.5\%$. In addition, each pressure transmitter is temperature compensated to assure accuracy and long term stability when exposed to severe ambient temperature variations.

Specifications

Model E-10 / E-11

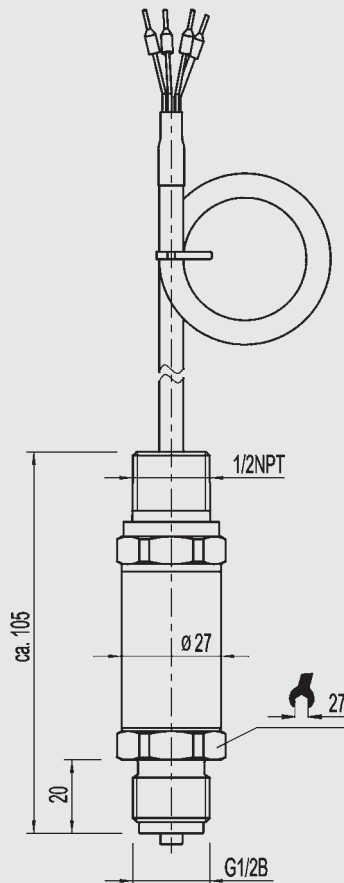
Pressure ranges	bar	0.1 ¹⁾	0.16 ¹⁾	0.25 ¹⁾	0.4	0.6	1	1.6	2.5	4	6	10
Over pressure safety	bar	1	1.5	2	2	4	5	10	10	17	35	35
Burst pressure	bar	2	2	2.4	2.4	4.8	6	12	12	20.5	42	42
Pressure ranges	bar	16	25	40	60	100	160	250	400	600	1000 ²⁾	
Over pressure safety	bar	80	50	80	120	200	320	500	800	1200	1500	
Burst pressure	bar	96	96	400	550	800	1000	1200	1700 ³⁾	2400 ³⁾	3000	
{Vacuum, gauge pressure, compound range, absolute pressure are available}												
¹⁾ Only with FM, CSA approval available												
²⁾ Only Model E-10.												
³⁾ For model E-11: the value specified in the table applies only when sealing is realised with the sealing ring underneath the hex. Otherwise max. 1500 bar applies.												
Materials												
■ Wetted parts		(other materials see WIKA diaphragm seal program)										
➤ Model E-10		Stainless steel (> 25 bar stainless steel and Elgiloy®)										
➤ Model E-11		Stainless steel {Hastelloy} O-ring: NBR {FPM/FKM}										
■ Case		Stainless steel										
Internal transmission fluid		Synthetic oil (Not for E-10 with pressure ranges > 25 bar)										
Power supply U _B	U _B in DC V	10 < U _B ≤ 30 for 4 ... 20 mA, 2-wire 6 < U _B < 30 for 1 ... 5 V, 3-wire										
Signal output and maximum load R _A	R _A in Ohm	4 ... 20 mA, 2-wire R _A ≤ (U _B - 10 V) / 0.02 A 1 ... 5 V, 3-wire R _A > 10,000										
Response time (10 ... 90 %)	ms	≤ 1 (≤ 10 ms at medium temperatures below -30 °C for pressure ranges up to 25 bar or with flush diaphragm)										
Dielectric strength	DC V	500										
Accuracy	% of span	≤ 0.25 (BFSL)										
	% of span	≤ 0.5 ⁴⁾										
		⁴⁾ Including non-linearity, hysteresis, non-repeatability, zero point and full scale error (corresponds to error of measurement per IEC 61298-2). Adjusted in vertical mounting position with lower pressure connection.										
Non-linearity	% of span	≤ 0.2 (BFSL) according to IEC 61298-2										
1-year stability	% of span	≤ 0.2 (at reference conditions)										
Permissible temperature of												
■ Medium ⁵⁾		-30 ... +100 °C {-40 ... +105 °C}						-22 ... +212 °F {-40 ... +221 °F}				
■ Ambience ⁵⁾		-30 ... +100 °C {-40 ... +105 °C}						-22 ...+212 °F {-40 ... +221 °F}				
■ Storage ⁵⁾		-30 ... +105 °C {-40 ... +105 °C}						-22 ... +221 °F {-40 ... +221 °F}				
		⁵⁾ Also complies with EN 50178, Tab. 7, Operation (C) 4K4H, Storage (D) 1K4, Transport (E) 2K3										
Compensated temp. range		0 ... +80 °C						+32 ... +176 °F				
Temperature coefficients within compensated temp range												
■ Mean TC of zero	% of span	≤ 0.2 / 10 K (< 0.4 for pressure ranges < 250 mbar)										
■ Mean TC of range	% of span	≤ 0.2 / 10 K										
⊕ - protection	ATEX	Category ⁶⁾ 2G										
Ignition protection type		Ex d II C T4, Ex d II C T5, Ex d II C T6										
		⁶⁾ Read the operating instructions and safety relevant data in the EC-type examination certificate in any case (KEMA 05 ATEX 2240 X).										
Approval authority		■ Factory mutual (FM / CSA) Explosion proof for: Class 1, Division 1, Groups A, B, C and D ■ Dust ignitionproof for: Class 1, Division 2, Groups E, F and G FM Standards according to class number 3600, 3615 and 3810										
CE - conformity		89/336/EEC (EMC directive) interference emission (class B) and immunity see EN 61 326, 97/23/EC Pressure equipment directive 97/9/EG (ATEX directive) EN 60079-0:2004, EN 60079-1:2004										
HF-immunity	V/m	10										
Burst	KV	4										
Shock resistance	g	1000 according to IEC 60068-2-27 (mechanical shock)										
Vibration resistance	g	20 according to IEC 60068-2-6 (vibration under resonance)										
Wiring protection		Protected against reverse polarity and short circuiting on the instrument side										
Mass	kg	Approx. 0.2 (0.4 lbs)										

{ } Items in curved brackets are optional extras for additional price.

Dimensions in mm

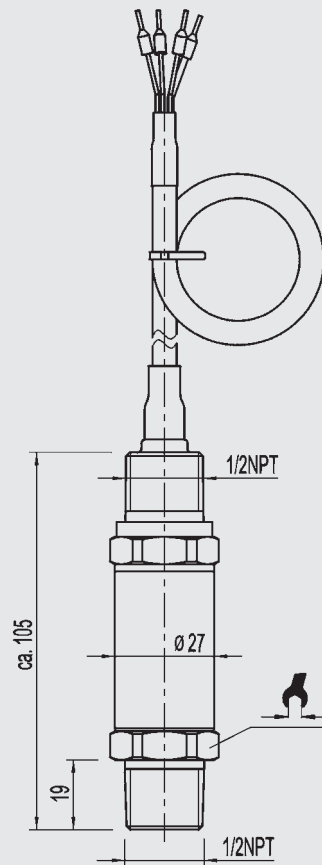
Ingress Protection IP per IEC 60 529

1/2 NPT Conduit with 2 m (6 ft)
flying leads
IP 67 (NEMA 4X)
ATEX
Order code: DX



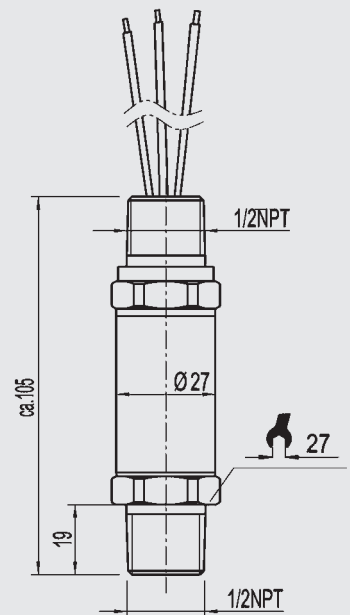
Pressure connection:
G 1/2, EN 837, Order code: GD

1/2 male conduit with 2 m (6 ft)
flying leads
IP 67 (NEMA 4X)
FM, CSA
Order code: 2X



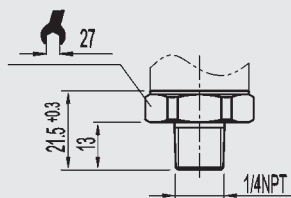
Pressure connection: 1/2 NPT per „Nominal size for US standard tapered pipe thread NPT“ Order code: ND

1/2 male conduit with 2 m (6 ft)
open wires
IP 67 (NEMA 4X)
FM, CSA
Order code: 3X

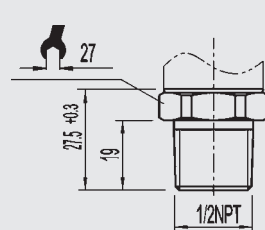


Pressure connections E-10

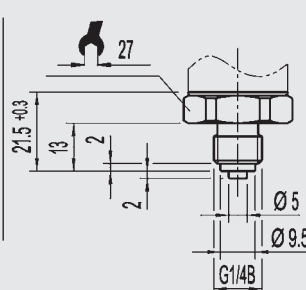
1/4 NPT per „Nominal size for
US standard tapered pipe thread
NPT“
Order code: NB



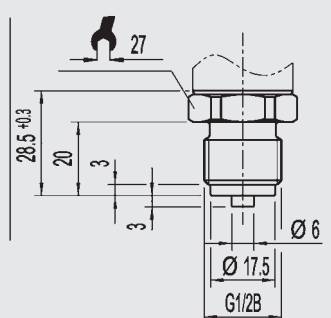
1/2 NPT
per „Nominal size for US
standard tapered pipe thread
NPT“
Order code: ND



G 1/4
EN 837
Order code: GB



G 1/2
EN 837
Order code: GD



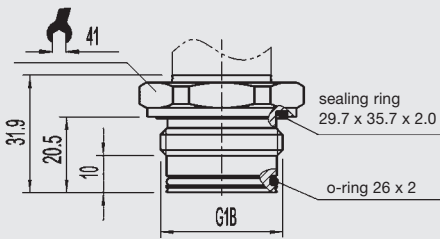
Other connections on request

For installation and safety instructions see the operating instructions for this product.

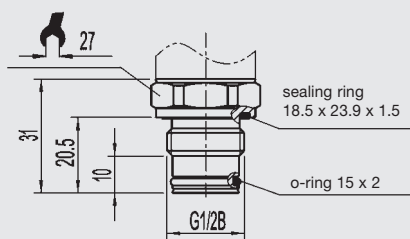
For tapped holes and welding sockets please see Technical Information IN 00.14 for download at
www.wika.de -Service

Pressure connections E-11, flush diaphragm

G 1 B with o-ring
(0 ... 0.1 to 0 ... 1.6 bar)
Order code: 85

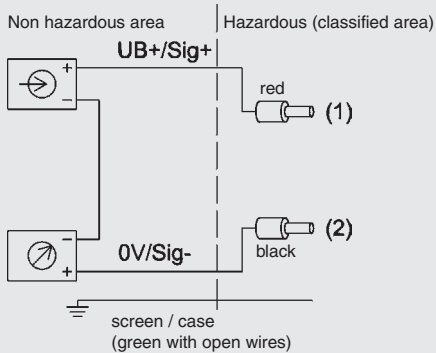


G 1/2 B with o-ring
(0 ... 2.5 to 0 ... 600 bar)
Order code: 86

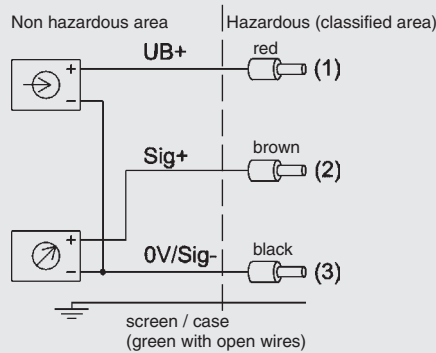


Wiring details

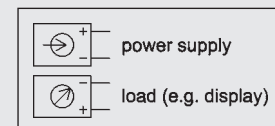
Flying leads / open wires 2-wire



Flying leads / open wires 3-wire

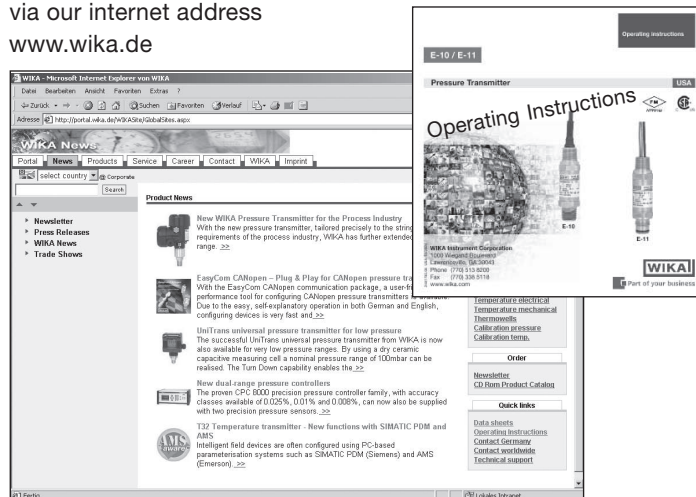


Legend:



Further information

You can obtain further information (data sheets, instructions, etc.) via our internet address www.wika.de



Other pressure transmitters for hazardous areas



Fig. left model N-10 Non-incendive (FM, CSA)
Fig. center model N-10 Non-incendive (ATEX)
Fig. right model IS-21-S Intrinsic safe

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing. Modifications may take place and materials specified may be replaced by others without prior notice.



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