

Model 2090P Absolute and Gage Pressure Transmitter

A TRADITION OF EXCELLENCE IN THE PULP AND PAPER INDUSTRY

- 1-inch flush mount compatible with a PMC[®] process connection, or 1½-inch threaded mounting connection
- Absolute or gage pressure ranges from 0–1.5 to 0–300 psi
- Communicates via the HART[®] protocol
- 20:1 turndown
- 0.20% reference accuracy, including linearity, hysteresis, and repeatability



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Model 2090P

INTRODUCTION

The Rosemount® Model 2090P is a microprocessor-base Smart pressure transmitter with process connections that positions the isolation diaphragm flush with vessel or pipe walls. This design eliminates clogging problems associated with highly viscous processes that tend to crystallize, polymerize, or precipitate, such as those in the pulp and paper industry.

The Model 2090P sensor system has a single filled system which utilized a solid-state, polysilicon pressure sensor and a 316L diaphragm. The benefits of this single filled sensor system are reliability, low oil fill for less temperature effect, and outstanding accuracy due to full sensor compensation.

FEATURES

The Model 2090P provides accurate, stable, and reliable pressure measurement in your most difficult applications. Its small compact design allows it to be directly connected to your process in either its 1½ inch threaded or 1 inch flush mount process connections. The Model 2090P is ideal for replacing existing transmitters with these connections or new installations with the optional weld spuds.

The Model 2090P advantages of the HART® protocol for fast configuration, commissioning, and diagnostics.

Rosemount Pressure Solutions

Model 3051S Series of Instrumentation

The next evolution in scalable pressure, flow and level measurement solutions with a limited lifetime warranty and 10-year stability. See product data sheet 00813-0100-4801.

Model 1151 Pressure Transmitter

Provides reliable measure of differential, gage, and absolute pressure or liquid level. Ranges from 0.5 inH₂O to 0-6000 psig. See product data sheet 00813-0100-4360.

Model 305 and 306 Integral Manifolds

Factory-assembled, calibrated and seal-tested manifolds reduce on-site installation costs. See product data sheet 00813-0100-4733.

Model 1195 Integral Orifice and ProPlate/Mass ProPlate Flowmeters

Convenient ready-to-install assembly designed for small-bore flow measurement of any clean gas, liquid, or vapor. See product data sheet 00813-0100-4686.

Annubar Flowmeter Series

A series of highly accurate and repeatable insertion-type flowmeters available in 2-in. to 72-in. (50.8 to 1829 mm) line sizes. See product data sheet 00813-0100-4809.

Model 405P Compact Orifice

A wafer style primary element with an integral three-valve manifold. See product data sheet 00813-0100-4810.

Specifications

Functional Specifications

Service

Liquid, gas, vapor, and high-viscosity applications

Ranges

Ranges	Min. Span	URL/Max. Span. Sensor Limit
1	1.5 psi (103 mbar)	30 psi (2,06 bar)
2	7.5 psi (517 mbar)	150 psi (10,34 bar)
3	40 psi (2,76 bar)	300 psi (20,68 bar)

Output

4–20 mA dc/Digital HART Protocol

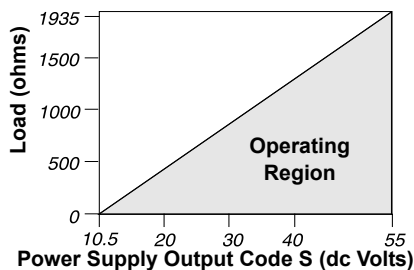
Rangedown

20:1

Load Limitations

Reverse polarity protection is standard. Maximum loop resistance is determined by the power supply voltage as described by the following equation:

$$\text{Max. Loop Resistance} = 43.5 \text{ (Power Supply Voltage} - 10.5)$$



(1) For hazardous location approvals, power supply must not exceed 36 V.

Zero Elevation and Suppression

Zero can be suppressed between atmosphere (2090PG), or 0 psia (2090PA) and upper range limit, provided the calibrated span is equal to or greater than the minimum span, and the upper range value does not exceed the upper range limit. No vacuum calibrations are allowed on the Model 2090P.

Overpressure Limits

- Range 1: 120 psig
- Range 2: 300 psig
- Range 3: 1,600 psig

Temperature Limits

Process: Codes A & C: –40 to 250 °F (–40 to 121 °C)

Codes D & G: –4 to 250 °F (–20 °C to 121 °C)

Ambient: All Codes: –4 to 185 °F (–20 to 85 °C)

Storage: All Codes: –50 to 185 °F (–46 to 85 °C)

Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio.

$$\text{Maximum Ambient Temperature in } ^\circ\text{F} = 185 - \frac{(\text{Process Temp} - 185)}{1.5}$$

$$\text{Maximum Ambient Temperature in } ^\circ\text{C} = 85 - \frac{(\text{Process Temp} - 85)}{1.5}$$

Humidity Limits

0–100% relative humidity

Volumetric Displacement

Less than 0.00042 cm³

Turn-on Time

2.0 seconds, no warm-up required

Failure Alarm

If self-diagnostics detect a sensor or microprocessor failure, the analog signal is driven either high or low to alert the user. High or low failure mode is user-selectable with a jumper on the transmitter. The values to which the transmitter drives its output in failure mode depend on whether it is factory-configured to *standard* or *NAMUR-compliant* operation. The values for each are as follows:

Standard Operation

Linear Output: $3.9 \leq I \leq 20.8$
 Fail High: $I \geq 21.75 \text{ mA}$
 Low: $I \leq 3.75 \text{ mA}$

NAMUR-Compliant Operation

Linear Output: $3.8 \leq I \leq 20.5$
 Fail High: $I \geq 22.5 \text{ mA}$
 Low: $I \leq 3.6 \text{ mA}$

Transmitter Security

Activating the transmitter security function prevents changes to the transmitter configuration, including local zero and span adjustments. Security is activated by an internal jumper.

Model 2090P

Performance Specifications

(Zero-based spans, reference conditions, and 316 SST isolating diaphragm.)

Reference Accuracy

±0.20% of calibrated span. Includes combined effects of linearity, hysteresis, and repeatability.

Ambient Temperature Effect per 100 °F (56 °C)

±(0.3% URL + 0.3% of span) from -40 to 185 °F (-40 to 85 °C)

Stability

±0.10% of upper range limit for 12 months

Time Response

Less than 200 ms time constant (63.2% response to a step change in pressure).

Vibration Effect

Less than ±0.1% of upper range limit when subjected to vibration of peak to peak constant displacement of 4 mm (5–15 Hz) and constant acceleration of 2 g (15–150 Hz) and 1 g (150–2000 Hz).

Power Supply Effect

Less than 0.01% of calibrated span per volt

Mounting Position Effect

Zero shift of up to 1.2 inH₂O (0.003 bar), which can be calibrated out. No span effect.

RFI Effect

Less than ±0.25% of upper range limit from 20–1000 MHz at 30 V/m with leads in conduit. Less than ±0.25% of upper range limit from 20–1000 MHz at 10 V/m with unshielded twisted pair (no conduit).

Physical Specifications

Electrical Connection

¹/₂–14 NPT, M20 × 1.5 (CM20), or PG 13.5 conduit entry

Process Wetted Parts

Isolating Diaphragm

316L stainless steel

Process Connector

316L stainless steel

Process Connection Size

1¹/₂–11.5 NPT or 1-in. Flush Mount

Process Connector Gasket (1¹/₂-in.)

TFE

Process Connection O-rings (1-in.)

Standard: Viton[®]. Optional: Buna-N or Ethylene propylene

Non-wetted Parts

Electronics Housing

Low-copper aluminum, NEMA 4X, IP65, IP67, CSA enclosure Type 4X

Paint

Polyurethane

Cover O-rings

Buna-N

Fill Fluid

Silicone oil

Weight

Approximately 2.96 lb (1.34 kg)

Hazardous Locations Certifications

Ordinary Location Certification

Factory Mutual (FM) Approval

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Hazardous Locations Certifications

Factory Mutual (FM) Approvals

- E5** Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II, Division 1, Groups E, F, G; Class III, Division 1, indoor and outdoor (NEMA 4X) hazardous locations; factory sealed.
- I5** Intrinsically safe for use in Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1 when connected in accordance with Rosemount drawing 02088-1018. Non-incendive for Class I, Division 2, Groups A, B, C, and D.
- K5** Combination of E5 and I5.

I5 Connection Parameters

FM I5 Connection Parameters	Approved Groups
$V_{max} = 30 \text{ V dc}$	A-G
$I_{max} = 165 \text{ mA}$	A-G
$I_{max} = 225 \text{ mA}$	C-G
$P_{max} = 1 \text{ W}$	A-G
$C_i = 0.01 \mu\text{F}$	A-G
$L_i = 10 \mu\text{H}$	A-G
$L_i = 1.06 \text{ mH}$ (T1 option)	A-G
$I_{max} = 160 \text{ mA}$ (T1 option)	A, B

Canadian Standards Association (CSA) Approvals

- C6** Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II, Division 1, Groups E, F, G; Class III, indoor and outdoor hazardous locations, CSA enclosure Type 4X; factory sealed. Suitable for Class I, Division 2, Groups A, B, C, and D.

Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D. Temp. Code T3C. (Intrinsically safe when connected with approved barriers in accordance with Rosemount drawing 02088-1024.)

CSA I. S. Connection Parameters

CSA I. S. Connection Parameters	Approved Groups
$V_{max} = 30 \text{ V dc}/R_{min} = 330 \text{ Ohms}$	A, B, C, D
$V_{max} = 28 \text{ V dc}/R_{min} = 300 \text{ Ohms}$	A, B, C, D
$V_{max} = 25 \text{ V dc}/R_{min} = 200 \text{ Ohms}$	A, B, C, D
$V_{max} = 22 \text{ V dc}/R_{min} = 180 \text{ Ohms}$	A, B, C, D
$V_{max} = 30 \text{ V dc}/R_{min} = 150 \text{ Ohms}$	C, D

BASEEFA/CENELEC Intrinsic Safety ATEX Approval

- I1** Certificate No.: BAS01ATEX1166X
 ATEX Marking: II 1G
 EEx ia IIC T5 ($T_{amb} = -55 \text{ to } 40 \text{ }^\circ\text{C}$)
 EEx ia IIC T4 ($T_{amb} = -55 \text{ to } 70 \text{ }^\circ\text{C}$)

BASEEFA I1 Connection Parameters

BASEEFA I1 Connection Parameters
$U_i = 30 \text{ V dc}$
$I_i = 200 \text{ mA}$
$P_i = 0.9 \text{ W}$
$C_i = 0.012 \mu\text{F}$

SPECIAL CONDITIONS FOR SAFE USE

When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding a 500V rms test to case. This must be taken into account on any installation in which it is used, for example by assuring that the supply to the apparatus is galvanically isolated.

- N1** BASEEFA Type N Certification (Ex 97Y4277X)
 Ex N IIC T5 ($T_{amb} = -40 \text{ to } 70 \text{ }^\circ\text{C}$)

Special Conditions for Safe Use (x):

When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding a 500 V r.m.s. test to case. This must be taken into account on any installation in which it is used, for example, by assuring that the supply to the apparatus is galvanically isolated.

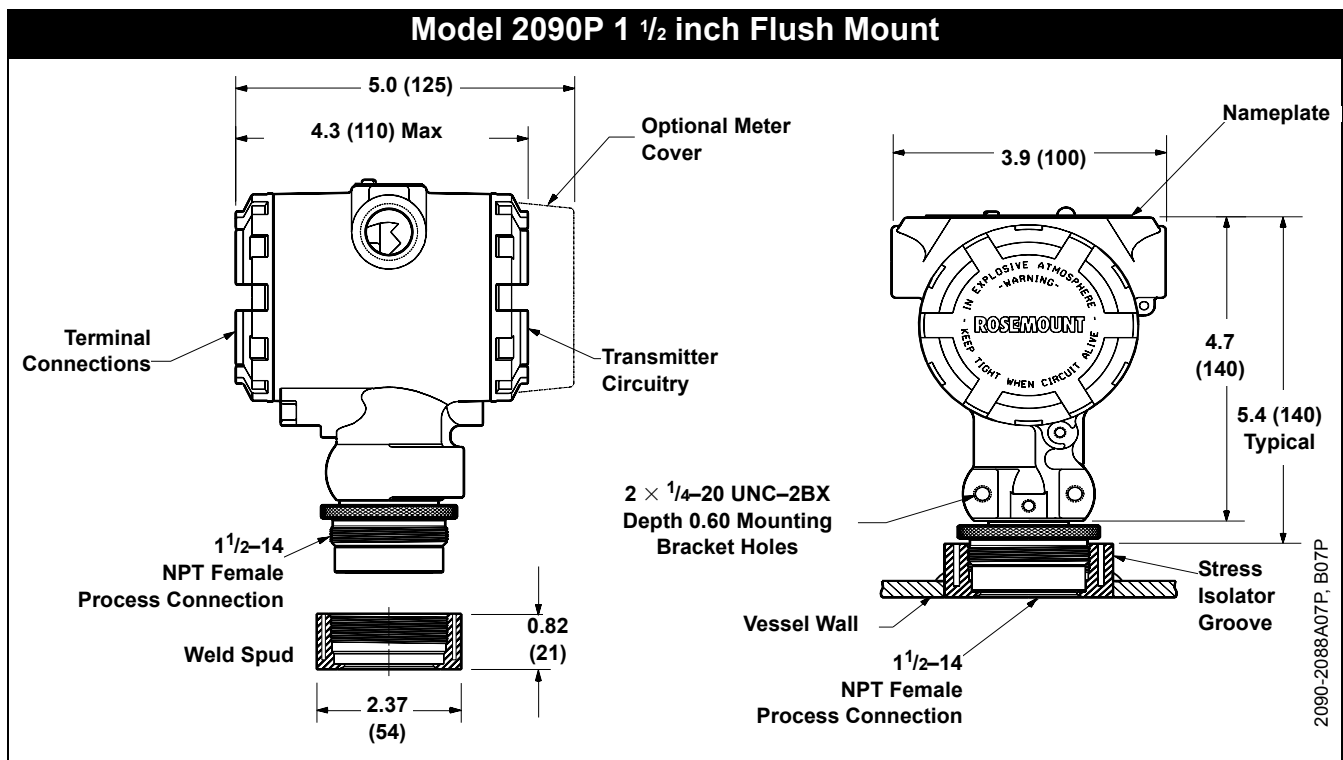
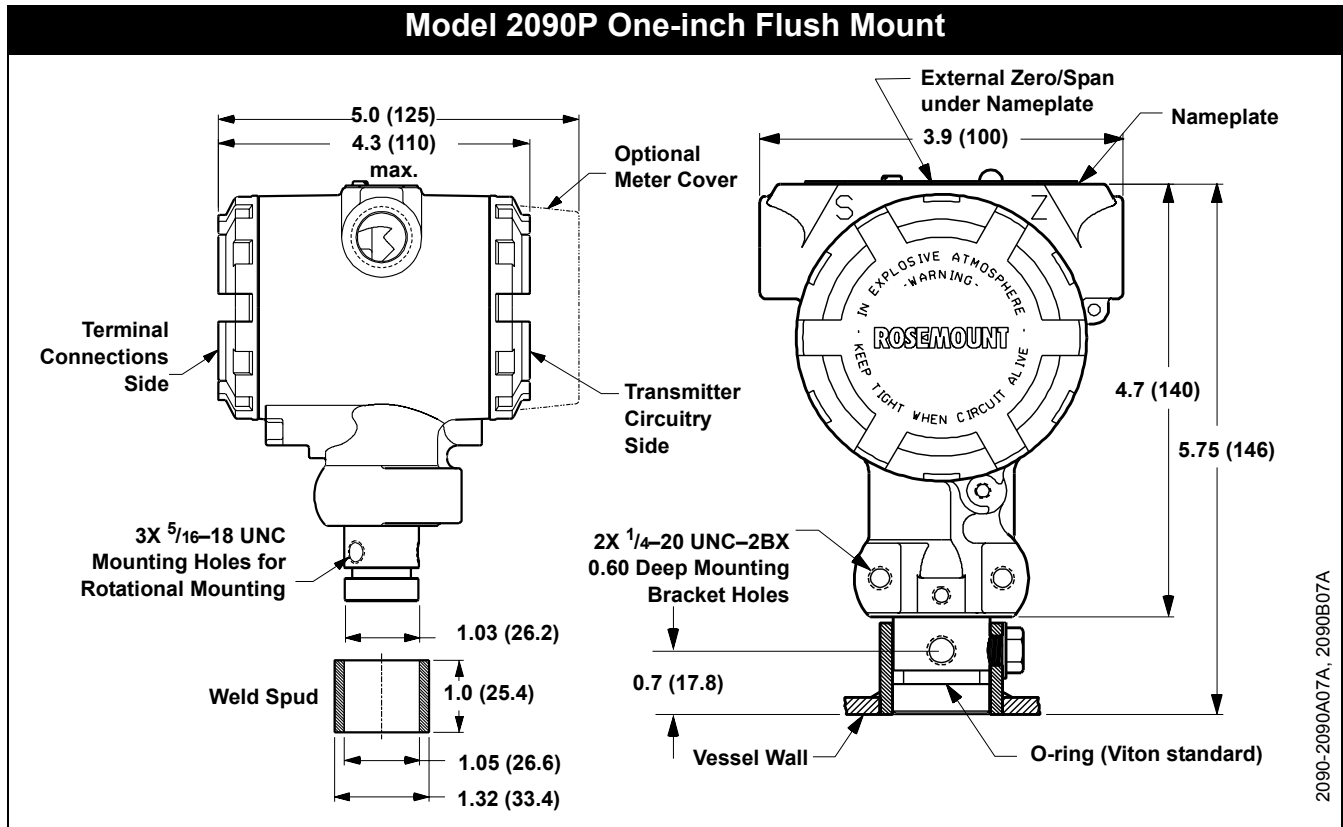
KEMA/CENELEC ATEX Flameproof

- Certificate No. KEMA97ATEX2378
 ATEX Marking: Ex II 1/2 G
ED EEx d IIC T6 ($T_a = -20^\circ\text{C to } 40 \text{ }^\circ\text{C}$)
 T4 ($T_{amb} = -20^\circ\text{C to } 80 \text{ }^\circ\text{C}$)

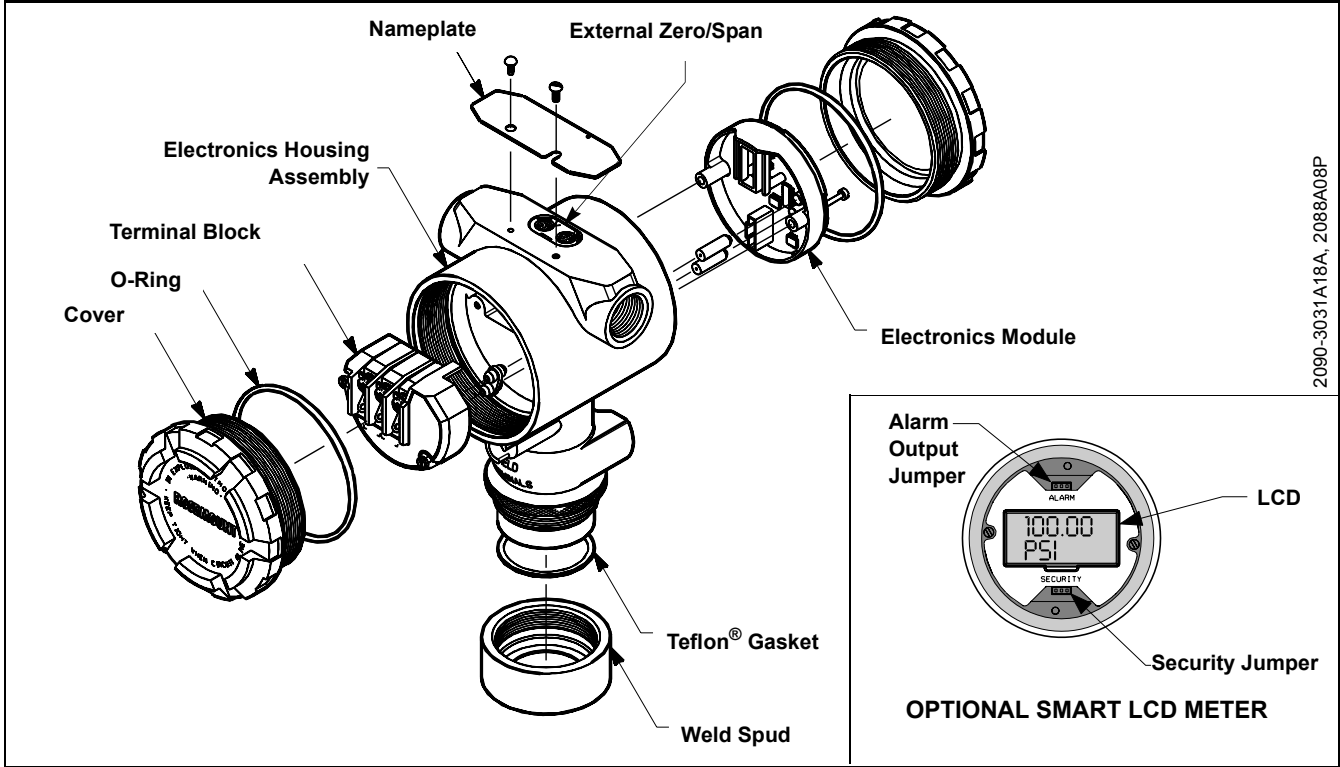
Combination of Approvals

- KB** Combination of K5 and C6
- KH** Combination of K5, ED, and I1

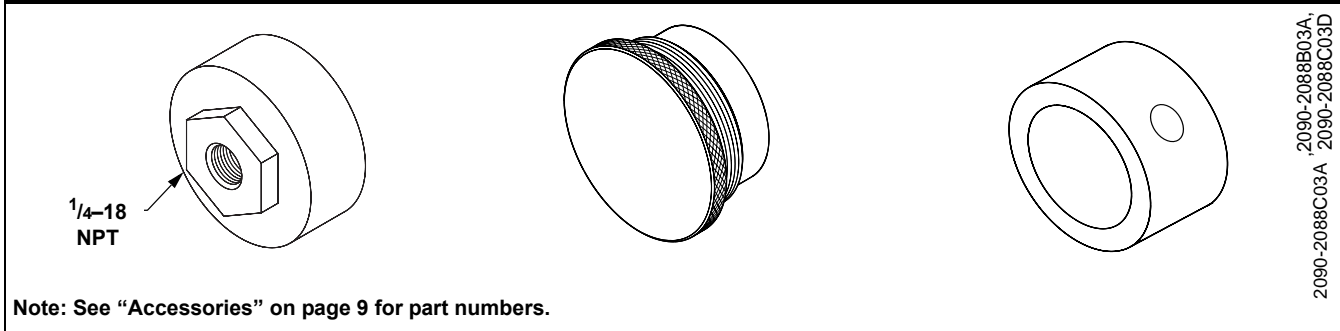
Dimensional Drawings



Model 2090P 1 1/2 inch Flush Mount Exploded View and Optional LCD Meter



316 SST Plug/Heat Sink for Process Connection Codes A and C **Weld Spud for Process Connection Codes D and G**



(1) See ordering information

Model 2090P

Ordering Information

Model	Product Description		
2090P	Flush Mount Pressure Transmitter		
Code	Transmitter Type		
A	Absolute		
G	Gage		
Code	Range	Min. Span	URL/Max. Span Sensor Limit
1	0–30 psi (0–2 bar)	1.5 psi (103 mbar)	30 psi (2.06 bar)
2	0–150 psi (0–10.3 bar)	7.5 psi (517 mbar)	150 psi (10.34 bar)
3	0–300 psi (0–20.7 bar)	40 psi (2.76 bar)	300 psi (20.68 bar)
Code	Output		
S	4–20 mA dc/Digital HART Protocol		
MATERIALS OF CONSTRUCTION			
Code	Process Connection	Isolating Diaphragm	Oil Fill
22	316L SST	316L SST	Silicone
Code	Process Connection		
A	1½-in. Threaded, No Weld Spud, 1½-in. <i>Teflon</i> ® Gasket		
C ⁽¹⁾	1½-in. Threaded, 316L SST Weld Spud with Stress Isolation and <i>Teflon</i> Gasket		
D ⁽¹⁾	1-in. Flush Mount (available with Gage Pressure, Range 2 only)		
G ⁽¹⁾	1-in. Flush Mount with weld-on nipple (available with Gage Pressure, Range 2 only)		
Code	Conduit Thread		
1	½–14 NPT		
2	M20 × 1.5 (CM20) Female		
3	PG 13.5		
Code	Options		
Hazardous Locations Approvals			
C6	Canadian Standards Association (CSA) Explosion-Proof, Intrinsic Safety, and Non-Incendive Approval		
E5	Factory Mutual (FM) Explosion-Proof Approval		
I5	Factory Mutual (FM) Non-Incendive and Intrinsic Safety Approval (Entity Concept)		
I1	BASEEFA Intrinsic Safety Certification		
N1	BASEEFA Type N Certification		
K5	E5 and I5 Combination		
ED	KEMA (CENELEC) Flame-Proof Approval		
KB	K5 and C6 Combination		
KH	K5, ED, and I1 Combination		
Accessory Options			
M5	LCD Meter, Scaled 0-100%		
M7	LCD Meter, Special Configuration		
B4	SST Mounting Bracket with SST Bolts		
T1	Transient Protection Terminal Block		
Other Options			
Q4	Calibration Data Sheet		
C4	Analog Output Levels Compliant with NAMUR Recommendation NE43, 18-January-1994		
P2	Cleaning for Special Service		
P8	0.1% Accuracy to 10:1 Turndown		
Q8	Material Traceability per EN 10204 3.1.B		
W2	Buna-N O-ring Process Connection (available with Process Codes D and G only)		
W3	Ethylene Propylene O-ring Process Connection (available with Process Codes D and G only)		
Typical Model Number: 2090PG 2 S 22 A 1			

(1) Flameproof hazardous location approvals not available.

Product Data Sheet

00813-0100-4699, Rev DA
January 2003

Model 2090P

Standard Configuration

Unless otherwise specified, transmitter is shipped as follows:

- Engineering units: psi
- 4 mA: 0 psi
- 20 mA: Upper Range Limit
- Alarm Output High
- LCD Meter: 0–100%

Custom Configuration

Calibration

Transmitters are factory calibrated to customer's specified range. If calibration is not specified, transmitters are calibrated at maximum range. Calibration is at ambient temperature and pressure.

Tagging

The transmitter will be tagged, at no charge, in accordance with customer requirements. All tags are stainless steel. The standard tag is wired to the transmitter. Tag character height is $\frac{1}{8}$ in. (0.318 cm). A permanently attached tag is available upon request.

Accessories

Item Description	Part Number
Calibration Adapter ⁽¹⁾ Use to connect a calibration device to a transmitter. (See the dimensional drawing of the Calibration Adapter)	02088-0197-0001
316 SST Plug/Heat Sink ⁽¹⁾ Use during installation to prevent welding damage. (See the drawing of the 316 SST Plug/Heat Sink).	02088-0196-0001
1" Flush Mount Calibration Adapter ⁽²⁾ Use to connect a calibration device to the 1" Flush Mount. (See the drawing of the Calibration Adapter)	02088-0198-0002
1" Flush Mount Weld Spud ⁽²⁾ (See the drawing of the Weld Spud)	02088-0285-0001
1$\frac{1}{2}$-in. Threaded Weld Spud Kit Includes Teflon O-ring.	02088-0295-0003

(1) Process Connection Codes A and C only.

(2) Process Connection Codes D and G only.

Product Data Sheet

00813-0100-4699, Rev DA
January 2003

Model 2090P

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