Product Data Sheet
00813-0100-4699, Rev FA
Catalog 2008 - 2009

Rosemount 2090P Absolute and Gage Pressure Transmitter

- *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*
- *20:1 turndown*
- *Communicates via the HART® protocol*
- *0.20% reference accuracy, including linearity, hysteresis, and repeatability*

Content

Accurate, stable, and reliable pressure measurements for the Pulp and Paper Industry

1-in. flush mount compatible with PMC process connection, or 1 1/2-in. threaded mounting connection

The 2090P has process connections that position the isolation diaphragm flush with vessel or pipe walls, eliminating clogging problems associated with highly viscous processes that tend to crystallize, polymerize, or precipitate, such as those in the pulp and paper industry.

Absolute or gauge pressure ranges from 0-1.5 to 0-300 psi and 20:1 turndown

Higher turndown allows for lower inventories by allowing you to measure pressures from 1.5 psi to 300 psi with only three transmitter ranges.

Communicates via the HART® protocol

The 2090P utilizes the advantages of HART communication, enabling quick and easy reranging, calibration and troubleshooting.

0.20% Reference Accuracy, including linearity, hysteresis, and repeatability

The single-filled sensor system of the 2090P leads to outstanding accuracy due to full sensor compensation.

Rosemount Pressure Solutions

Rosemount 3051S Series of Instrumentation
Scalable pressure, flow and level measurement solutions improve installation and maintenance practices.

Rosemount 3095 MultiVariable™ Mass Flow Transmitter
Accurately measures differential pressure, static pressure and process temperature to dynamically calculate fully compensated mass flow.

Rosemount 304, 305, and 306 Integral Manifolds
Factory-assembled, calibrated and seal-tested manifolds reduce on-site installation costs.

Rosemount 1199 Diaphragm Seals
Provides reliable, remote measurements of process pressure and protects the transmitter from hot, corrosive, or viscous fluids.

Annubar Flowmeter Series: Rosemount 3051SFA, 3095MFA, and 485
The state-of-the-art, fifth generation Rosemount 485 Annubar combined with the 3051S or 3095MV MultiVariable transmitter creates an accurate, repeatable and dependable insertion-type flowmeter.

Compact Orifice Flowmeter Series: Rosemount 3051SFC, 3095MFC, and 405
Compact Orifice Flowmeters can be installed between existing flanges, up to a Class 600 (PN100) rating. In tight fit applications, a conditioning orifice plate version is available, requiring only two diameters of straight run upstream.

Integral Orifice Flowmeter Series: Rosemount 3051SFP, 3095MFP, and 1195
These integral orifice flowmeters eliminate the inaccuracies that become more pronounced in small orifice line installations. The completely assembled, ready to install flowmeters reduce cost and simplify installation.

Orifice Plate Primary Element Systems: Rosemount 1495 and 1595 Orifice Plates, 1496 Flange Unions and 1497 Meter Sections
A comprehensive offering of orifice plates, flange unions and meter sections that is easy to specify and order. The 1595 Conditioning Orifice provides superior performance in tight fit applications.

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

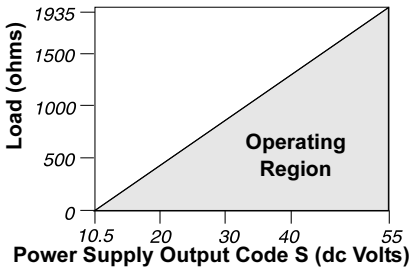
Rangedown

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:

Max. Loop Resistance = 43.5 (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 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.

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

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

Humidity Limits

0–100% relative humidity

Volumetric Displacement

Less than 0.00042 cm^3

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: $I \geq 21.75$ mA
Low: $I \leq 3.75$ mA

NAMUR-Compliant Operation

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

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 inH_2O (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

$1^1/_2$ –11.5 NPT or 1-in. Flush Mount

Process Connector Gasket ($1^1/_2$-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)

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota, USA

Emerson Process Management GmbH & Co. — Wessling, Germany

Emerson Process Management Asia Pacific Private Limited — Singapore

Beijing Rosemount Far East Instrument Co., LTD — Beijing, China

European Union Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

European Pressure Equipment Directive (PED) (97/23/EC)

2088/2090 Pressure Transmitters
— Sound Engineering Practice

Electro Magnetic Compatibility (EMC) (89/336/EEC)

All 2088/2090 Smart Pressure Transmitter:
EN 61326-1:1997 with Amendments A1, A2, and A3

Ordinary Location Certification for Factory Mutual

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

North American 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.
For input parameters see control drawing 02088-1018.

Canadian Standards Association (CSA)

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.
For input parameters see control drawing 02088-1024.

European Certifications

I1 ATEX Intrinsically Safe
Certificate No.: BAS00ATEX1166X ⟨Ex⟩ II 1 G
EEx ia IIC T5 (T_{amb} = –55 to 40 °C)
EEx ia IIC T4 (T_{amb} = –55 to 70°C)
CE 1180

TABLE 1. Input Parameters

Loop/Power	Input Type
U_i = 30 V dc	Smart
I_i = 200 mA	Smart
P_i = 0.9 W	Smart
C_i = 0.012 μF	Smart

Special Conditions for Safe Use (x):
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 ATEX Type n
Certification No.: BAS00ATEX3167X ⟨Ex⟩ II 3 G
EEx nL IIC T5 (T_a = -40 °C to 70 °C)
U_i = 50 V dc max
CE

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.

ND ATEX Combustible Dust
Certificate No.: BAS01ATEX1427X ⟨Ex⟩ II 1 D
T105°C (T_{amb} = -20°C to 85°C)
IP66
CE 1180
Vmax = 36 V dc Max
I_i = 24 mA

Special Conditions for Safe Use (x):
1. The user must ensure that the maximum rated voltage and current (36 volts, 24 mA, D.C.) are not exceeded. All connections to other apparatus or associated apparatus shall have control over this voltage and current equivalent to a category “ib” circuit according to EN50020.
2. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
3. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
4. Cable entries and blanking plugs must be suitable for the ambient range of the apparatus and capable of withstanding a 7J impact test.
5. The 2088/2090 sensor module must be securely screwed in place to maintain the ingress protection of the enclosure.

ED ATEX Flame-Proof
Certification No.: KEMA97ATEX2378 ⟨Ex⟩ II 1/2 G
EEx d IIC T6 (T_a = -20 °C to 40°C)
EEx d IIC T4 (T_a = -20 °C to 80 °C)
CE 1180
Vmax = 36 (with Smart output option)
Vmax = 14 (with low power output option)

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

KB Combination of E5, I5, and C6

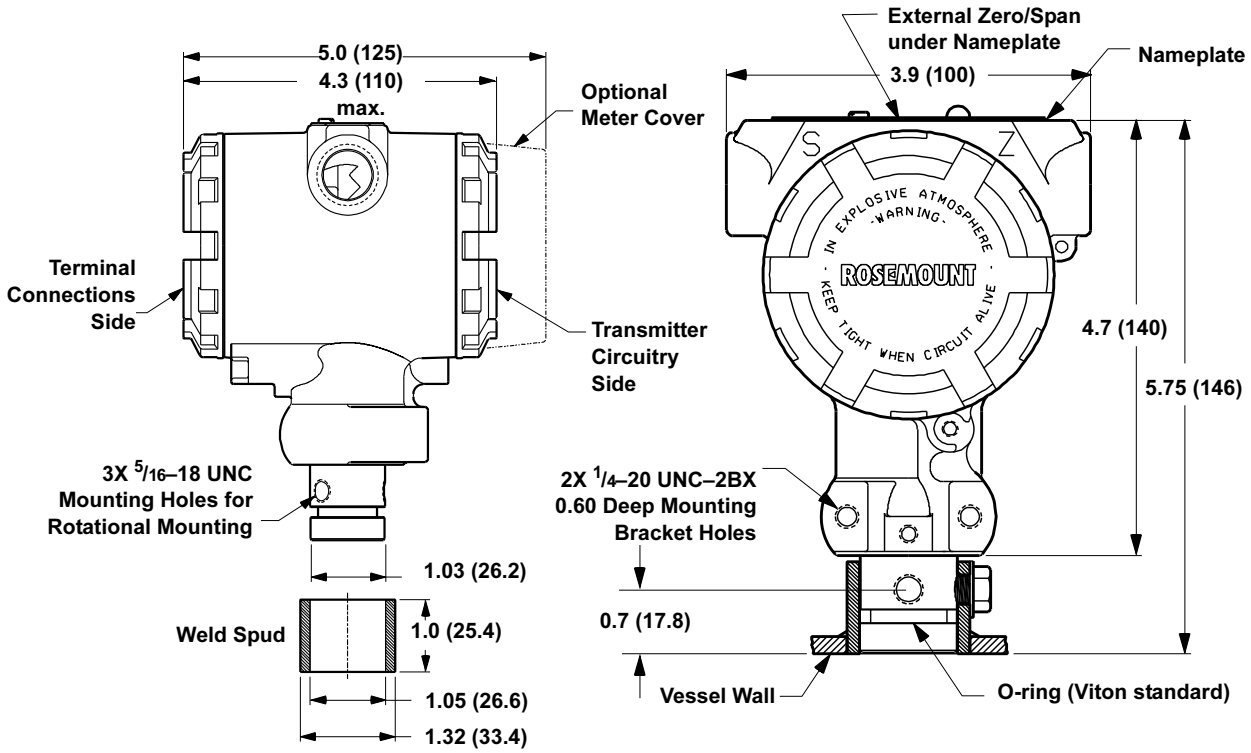
KH Combination of E5, I5, and I1

K5 Combination of E5 and I5

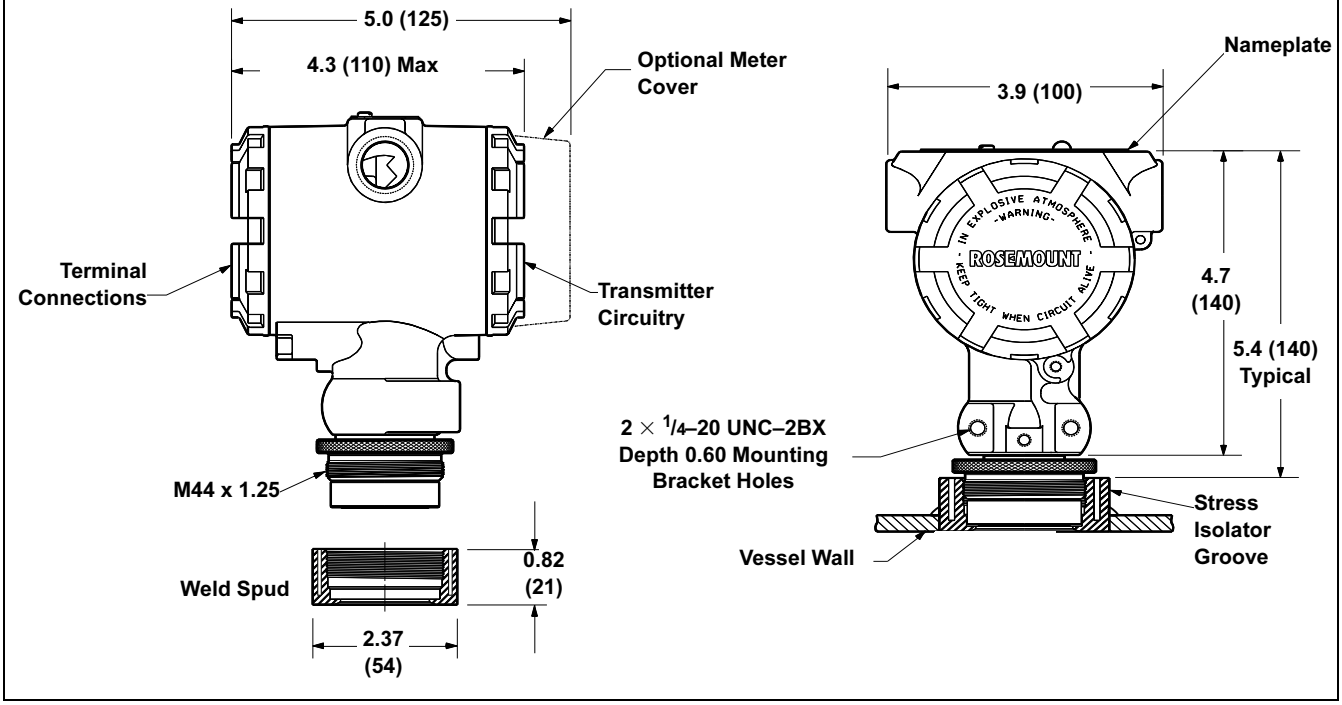
K6 Combination of C6, I1, and ED

Dimensional Drawings

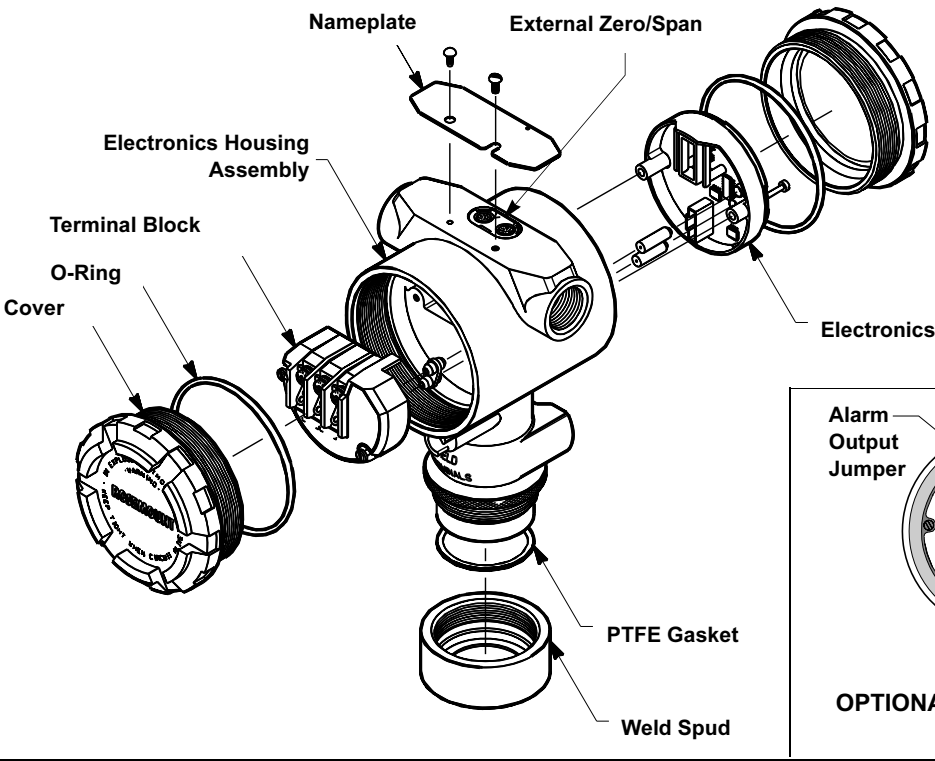
Rosemount 2090P One-inch Flush Mount

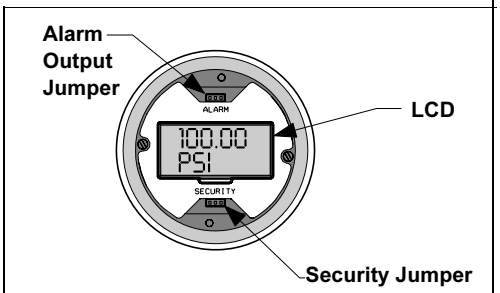


Rosemount 2090P 1 1/2 inch Flush Mount

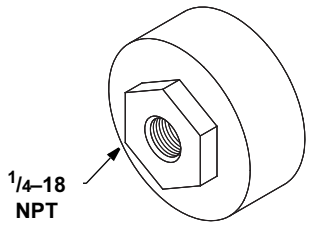
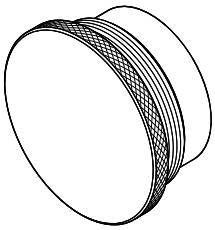
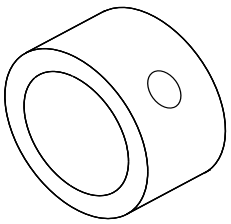


Rosemount 2090P 1 1/2 inch Flush Mount Exploded View and Optional LCD Display





OPTIONAL SMART LCD DISPLAY

Calibration Adapter(1)	316 SST Plug/Heat Sink for Process Connection Codes A and C	Weld Spud for Process Connection Codes D and G
		

Note: See "Accessories" on page 11 for part numbers.

(1) See ordering information

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		
Code	**Material of Construction**		
	Process Connection	**Isolating Diaphragm**	**Oil Fill**
22	316L SST	316L SST	Silicone
Code	**Process Connection**		
A	$1\frac{1}{2}$–in. Threaded, No Weld Spud, $1\frac{1}{2}$–in. PTFE Gasket		
C	$1\frac{1}{2}$–in. Threaded, 316L SST Weld Spud with Stress Isolation and PTFE Gasket		
D	1–in. Flush Mount (available with Gage Pressure, Range 2 only)		
G	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**		
Digital Display			
M5	LCD display, scaled 0-100%		
M7	LCD display, special configuration		
Mounting Brackets			
B4	SST mounting bracket with SST Bolts		
Product Certifications			
I1	ATEX Intrinsic Safety		
N1	ATEX Type n		
ND	ATEX Dust		
ED	ATEX Flameproof		
C6	CSA Explosion-Proof, Intrinsically Safe, and Non-incendive		
K6	CSA Explosion-Proof, Dust Ignition-proof, Intrinsically Safe, Division 2		
E5	FM Explosion-Proof, Dust Ignition-proof		
I5	FM Intrinsically safe, Division2		
K5	FM Explosion-Proof, Dust Ignition-proof, Intrinsically Safe, Division 2		
KB	FM and CSA Explosion-Proof, Dust Ignition-proof, Intrinsically Safe, Division 2		
KH	FM Approvals and ATEX Explosion-Proof and Intrinsically Safe		
NK	IECEx Dust		
K7	I7, N7, E7 & NK Combination		

Model	Product Description
K1	I1, N1, ED & ND Combination
Terminal Blocks	
T1	Transient Protection
Special Certifications	
Q4	Calibration Certificate
Q8	Material Traceability per EN 10204 3.1.B
Special Configuration (Software)	
C4	NAMUR alarm and saturation levels, high alarm
CN	NAMUR alarm and saturation levels, low alarm
Wetted O-ring Material	
W2	Buna-N (available with Process Codes D and G only)
W3	Ethylene Propylene (available with Process Codes D and G only)
Special Procedures	
P2	Cleaning for Special Service
P8	0.1% Accuracy to 10:1 Turndown
Typical Model Number: 2090PG 2 S 22 A 1	

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 Display: 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 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-in. 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-in. Flush Mount Weld Spud (2) (See the drawing of the Weld Spud)	02088-0285-0001
1 1/2-in. Threaded Weld Spud Kit Includes PTFE O-ring.	02088-0295-0003

(1) Process Connection Codes A and C only.

(2) Process Connection Codes D and G only.

Standard Terms and Conditions of Sale can be found at www.rosemount.com\terms_of_sale

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