Product Data Sheet
00813-0100-4698, Rev CA
Catalog 2006 - 2007

Rosemount 2090F Sanitary Pressure Transmitter with HART® Protocol

A TRADITION OF EXCELLENCE IN PERFORMANCE

- *Conforms to 3-A® Sanitary Standards*
- *Features CIP/SIP service with an upper temperature limit of 284 ° F (140 ° C)*
- *USDA accepted design*
- *Ranges in absolute or gage pressure from 0-1.5 to 0-300 psi*
- *Mounts with either 11/2- or 2-in. Tri-Clamp® connection*

Content

The Rosemount 2090F Sanitary Pressure Transmitter provides accurate, stable, and reliable pressure measurement

The 2090F is a microprocessor-based Smart pressure transmitter that conforms to 3-A Sanitary Standards. It is designed for CIP cleaning and materials of construction Generally Recognized As Safe (GRAS) by the FDA.

The 2090F sensor has a single filled system which utilized a solid-state, polysilicon pressure sensor, Neobee® M-20 fill fluid and a 316L diaphragm. The sanitary fill fluid, Neobee M-20, is approved as an indirect food additive according to the FDA Code of Federal Regulations Title 21. 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. The sanitary design also provides a product contact surface that is easy to clean and able to withstand thermal shocks.

The 2090F also provides HART protocol ability for fast configuration, commissioning, and diagnostics.

FEATURES

The 2090F provides accurate, stable, and reliable pressure measurement which makes it an ideal choice for food and pharmaceutical applications, including the following: Fermentation vessel pressure, CIP source center discharge pressure, spray dry, homogenizer or separator stuffing pressure, HTST pasteurization, and back pressure control. Its small compact design allows direct connections to the process.

Designed for sanitary applications, it easily connects through standard sanitary fittings without requiring special mounting hardware. The 2090F is available with both 1 1/2 in. and two-in. Tri-Clamp process connections.

Rosemount Pressure Solutions

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

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

Rosemount 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

Range	Minimum 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)

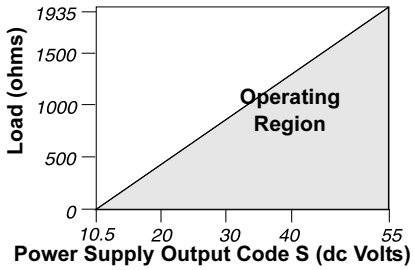
Output

4–20 mA dc/Digital HART Protocol

Load Limitations

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.

Power Supply

External power supply required. Transmitter operates on 10.5–36 V dc with no load. Reverse polarity protection is standard.

Zero Elevation and Suppression

Zero can be suppressed between atmosphere (2090FG), or 0 psia (2090FA) and upper range limit, if 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 2090F.

Overpressure Limits

Range 1:120 psig max
All other ranges: Twice the upper range limit

Temperature Limits

Process

–4 to 284 °F (–20 to 140 °C)

Ambient

–4 to 185 °F (–20 to 85 °C)

Storage

–22 to 185 °F (–30 to 85 °C)

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

Max. Ambient temperature in °F =

$$\frac{\textbf{185 – (Process Temp – 185)}}{\textbf{1.5}}$$

Max. Ambient temperature in °C =

$$\frac{\textbf{85 – (Process Temp – 85)}}{\textbf{1.5}}$$

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 by 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 (0,3 kPa), 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, PG 13.5, or M20 × 1.5 (CM20) conduit entry.

Process Wetted Parts

Isolating Diaphragm
316L stainless steel

Process Connector
316L stainless steel

Non-wetted Parts

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

Paint
Polyurethane

Cover O-rings
Buna-N

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 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997

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)
T4 (T_a = -20 °C to 80 °C)
CE 1180
Vmax = 36 (with Smart output option)
Vmax = 14 (with low power output option)

Japanese Certifications

E4 JIS Flame-Proof
Ex d IIC T6 (T_{amb} = 85 °C)

Certificate	Description
C15870	2090F with SST wetted parts (with meter)
C15878	2090F with SST wetted parts (no meter)

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

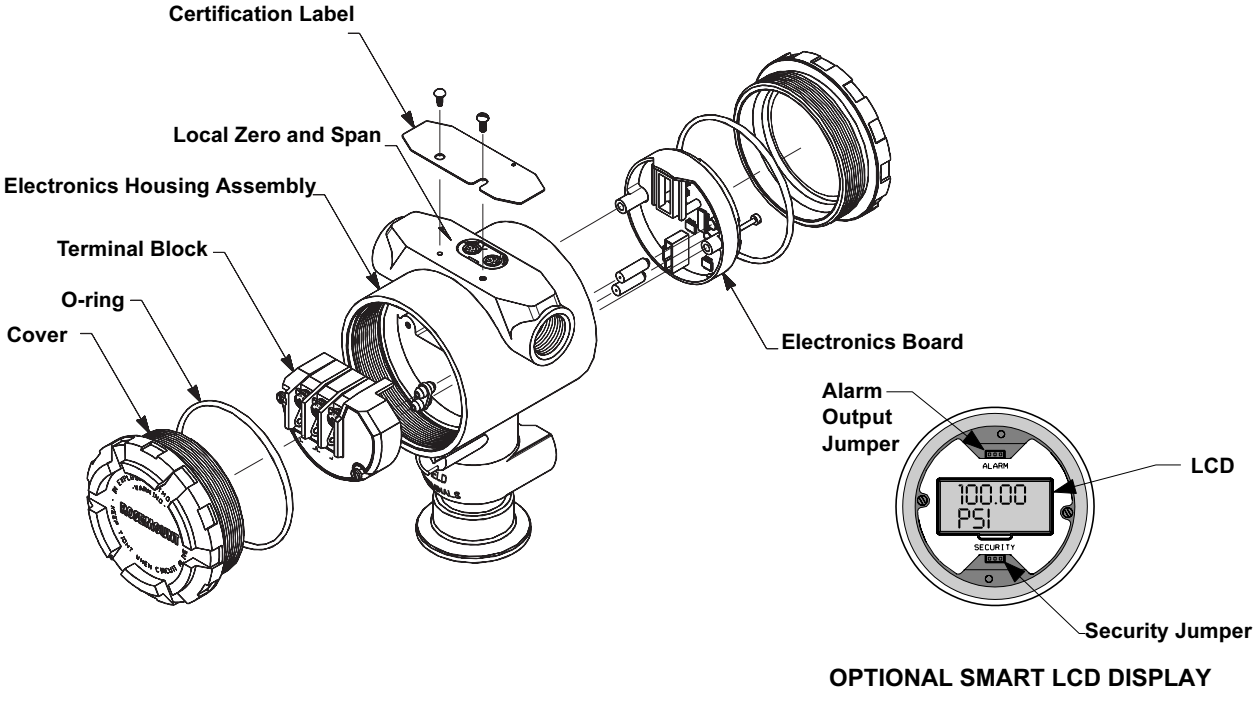
KH Combination of E5, I5 and I1

K5 Combination of E5 and I5

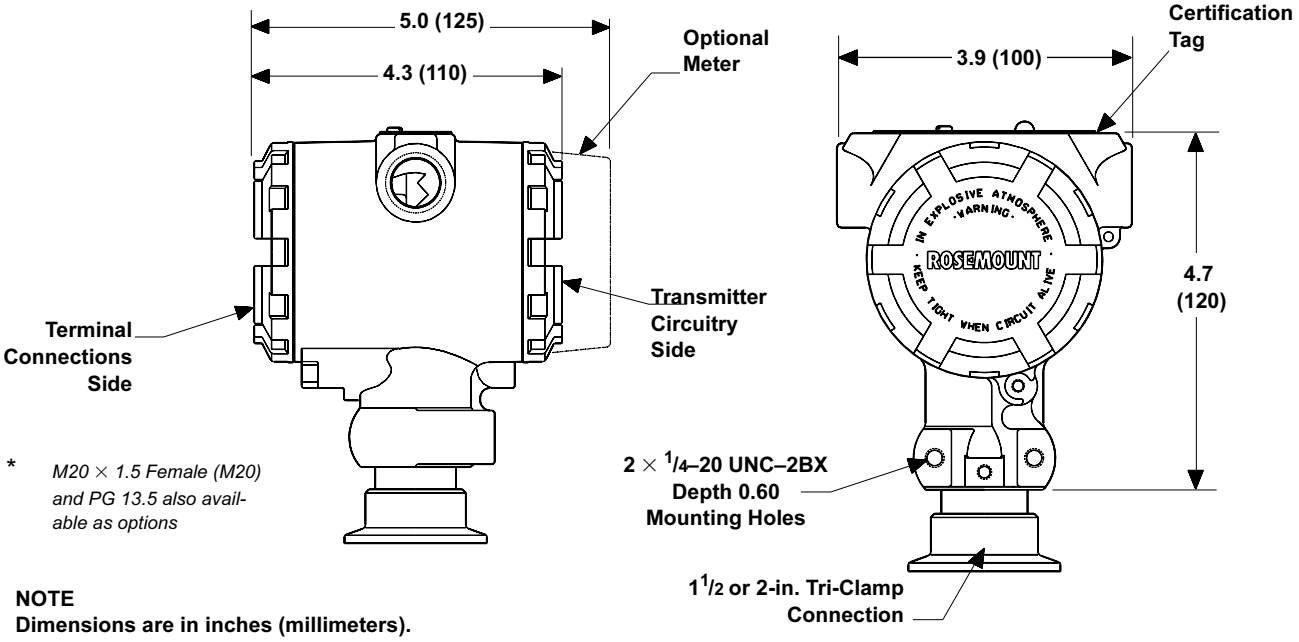
K6 Combination of C6, I1, and ED

Dimensional Drawings

Rosemount 2090F Transmitter Exploded View



Rosemount 2090F



NOTE
Dimensions are in inches (millimeters).

Ordering Information

Model	Product Description		
2090F	Sanitary Pressure Transmitter		
Code	**Transmitter Type**		
A	Absolute		
G	Gage		
Code	**Range**	**Minimum 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**
2D	316L SST	316L SST	*Neobee*
Code	**Process Connection**		
E	$1^1/_2$–in. *Tri-Clamp* Connection		
F	2–in. *Tri-Clamp* Connection		
Code	**Conduit Thread**		
1	$^1/_2$–14 NPT		
2	M20 × 1.5 (CM 20)		
3	PG 13.5		
Code	**Options**		
Hazardous Locations Approvals			
I1	ATEX Intrinsically Safe		
N1	ATEX Type n		
ED	ATEX Flame-Proof		
ND	ATEX Combustible Dust		
C6	CSA Explosion-Proof, Intrinsically Safe, non-incendive		
K6	CSA and ATEX Explosion-Proof, Intrinsically Safe (combination of C6, I1, and ED)		
E5	FM Approvals Explosion-Proof		
I5	FM Approvals Intrinsically Safe, non-incendive		
K5	FM Approvals Explosion-Proof, Intrinsically Safe, non-incendive (combination of E5 and I5)		
KB	FM Approvals and CSA explosion-proof, Intrinsically Safe, non-incendive (combination of E5, I5, and C6)		
KH	FM Approvals and ATEX Explosion-Proof and Intrinsically Safe (combination of E5, I5, and I1)		
Accessories Options			
B4	SST Mounting Bracket with SST Bolts		
M5	LCD Display, scaled 0–100%		
M7	LCD Display, special configuration		
Other Options			
T1	Transient Protection		
Q4	Calibration Certificate		
C4	NAMUR alarm and saturation levels, high alarm		
CN	NAMUR alarm and saturation levels, low alarm		
P2	Cleaning for Special Service		
P8	0.1% Accuracy to 10:1 Turndown		
Typical Model Number:	**2090FG 2 S 2D E 1**		

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 inch (0.318 cm). A permanently attached tag is available upon request.

Cover Photo: 2090-0014AB

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