Rosemount Inc.
(an Emerson Process Management company)
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March 26, 2008

Subject: Request for Exemption Based on Adaptation to Scientific and Technical Progress Under Directive 2002/95/EC: Lead Oxide (PbO) in Seal Frit Used for Hermetic Seals on Sapphire Based Pressure Sensors

Dear Oko-Institute,

Rosemount Inc. ("Rosemount"), an Emerson Process Management company, respectfully submits the following request to support exemption #25 for lead oxide (PbO) containing glass. Rosemount currently used lead oxide containing glass seal frit to hermetically seal the reference chamber of sapphire based pressure sensors.

Examples for application of these units include the monitoring and controlling industrial processes that require accuracy and high reliability to protect personnel, environment and equipment. **The quantity of PbO in each sensor unit is less than 0.25 micrograms and the total amount in shipments to the EU in 2006 was less than 100 micrograms. Therefore we believe the environmental impact in question is minimal.**

Please also note that our supporting exemption request is similar to the granted request submitted by Babcock for use of lead oxide (PbO) in DC plasma displays ("Use of Mercury in Babcock's DC Plasma Displays and Use of Lead Oxide (PbO) in Babcock's DC Plasma Displays Frit Seal," Adaption to Scientific and Technical Progress Under Directive 2002/95/EC Final Report, 28 July 2006, Institute for Applied Ecology, set 4 no 23, pages 130 to 133). From the published information on the Babcock product stating challenges to finding alternative material(s), we believe their application with respect to the use of lead oxide is very similar in our technical material requirements. Even though the products in question are very different in form and function, the requirements driving the use of lead oxide in seal frit are virtually the same. A second granted application to Coherent for sealing laser tubes also has many similarities for the technical needs of lead oxide seal frit ("Adaption to Scientific and Technical Progress Under Directive 2002/95/EC" Final Report, 28 July 2006, Institute for Applied Ecology, "Lead Oxide in Seal Frit Used for Making Window Assemblies for Argon and Krypton Laser Tubes", set 4 no. 21, pages 127-128). Our experience aligns with the information presented for these applications. Therefore we support the Commission's granted exemptions for those products.

Introduction

Rosemount was founded in 1956 with a focus on the manufacture and development of aeronautical and aerospace instrumentation and expanded to encompass instrumentation for industrial process control applications in the late 1960s. Rosemount is headquartered in Chanhassen, MN, USA, and has numerous affiliated manufacturing and development facilities worldwide, six (6) of which are located in the EU. Rosemount affiliates have approximately 1500

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employees in the EU. The sapphire based pressure sensors enable a product introduced in 2003 to fulfill the defined needs of customers, many of whom are in the EU. Lead oxide (PbO) seal frit has been used on the sapphire based pressure sensors from the beginning. These sensors are unique in that they provide excellent performance over a very wide pressure range and continue to do so after extreme overpressure exposure that commonly occurs in applications. The applications involve hazardous materials and conditions requiring the best of reliability to protect people, environment and equipment. For the reasons set forth in this letter and attachments, Rosemount Inc has no viable alternative for the lead oxide (PbO) use in sapphire based pressure sensors.

Background on Use of Lead Oxide Seal Frit in Sapphire Based Pressure Sensors:

The sensor uses sapphire for construction to provide a stable structure enabling a high accuracy, highly reliable device. Sapphire can be characterized as a crystalline brittle material. There is a long history for the use of seal frit or glass frit to join fragile or brittle materials. Typically the application is for structural joints that are quite often used in vacuum applications requiring hermetic seals. To produce a seal, heat is used to fuse or melt the frit yielding a rigid joint when cooled. As this is a hermetic seal, there must be no build up of stresses that may result in a crack in the frit or base materials. Therefore the match of thermal expansion coefficient of the frit to the base material is very important and cannot be compromised. As such the seal frit can be formulated to match the thermal expansion of the joined parts yielding virtually stress free hermetic joints. The sapphire based pressure sensor only uses the seal frit to produce a hermetic seal on the via to the vacuum reference chamber in the sensor. As such, only a very small amount of the frit is used as compared to other applications. **The quantity of lead oxide in each sensor is 0.25 micrograms or less. Total lead oxide shipment to the EU in 2006 was less than 100 micrograms.** Since the sealed chamber must be at a vacuum, the frit must also be compatible with firing in a vacuum environment. The via to be sealed also has metal leads running through it. These metal conductors must survive and the frit must be chemically inactive with the metal at the firing temperature. All of these requirements are met by the lead oxide (PbO) bearing seal frit used in the sapphire based pressure sensor.

Existence of feasible substitutes in an industrial and/or commercial scale:

The requirements for this hermetic seal on sapphire based sensors left no practical alternative to the lead oxide based seal frit. Frits free of lead oxide require air or more specifically oxygen to be fired correctly. This is incompatible with the sapphire based sensor for multiple reasons. **First**, the seal is for a vacuum and would not be accomplished when firing in an atmosphere. **Second**, any oxygen present during firing temperatures will consume the metal conductors. The limit for the metal to survive in oxygen bearing atmospheres is 450 degrees C. The firing temperatures for the lead oxide seal frit is above this and all lead oxide free seal frits require even higher temperatures. **Third,** the frit material itself can attack the metal conductors that are

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fed through the seal via. The lead oxide free seal frits fire at a temperature where the metal is attacked. The lower firing temperature of the lead oxide seal frit leaves the materials inactive to the metal conductors. One more requirement for the seal frit is, it must have a thermal expansion match to sapphire. The thermal expansion match to sapphire can be met by lead oxide free seal frits, but they fail to meet the previously discussed requirements.

To date, no lead free seal frit has been found that meets the requirements of this application. It is fortunate that only a very small amount of the lead oxide seal frit is needed to complete the product. Even so, it is a directive of Rosemount to eliminate hazardous materials in products and manufacturing processes as much as possible. This is supported by a company requirement that any new material to be used in construction of product or in manufacturing processes must go through a review to be accepted. The markets will be continually monitored for new safer materials to displace the use of lead oxide seal frit in this application.

Restrictions applicable to such substitutes:

The requirements for any substitute material have been presented above. Beyond this, any replacement material must provide equivalent or better reliability to the function and life time of the sapphire based pressure sensor than it currently has. Customers of this product demand it as well as any person or surrounding area that would be affected by the use and failure of this product. Therefore, any replacement action will include a rigorous evaluation of reliability with the new material. Rosemount's experience does not reveal a viable replacement for the lead oxide seal frit to date.

Costs and benefits, advantages and disadvantages of such substitutes:

Rosemount does not have a viable alternative. There are no clear benefits or advantages to the environment of using alternative materials. There would potentially be significant disadvantages to an alternative with respect to a reduced reliability of the products and the potential consequences from a product failure.

Precise wording for the exemption:

"Lead oxide (PbO) seal frit used for Rosemount sapphire based pressure sensors."

Technical and scientific evidence:

Please refer to the attached Directive 2002/95/EC check list and the product data sheet for Rosemount model 4600 Pressure Transmitters which use the sapphire based pressure sensors.

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We appreciate this opportunity to participate in the stakeholder consultation. Please do not hesitate to contact Eric Petersen at Rosemount in the USA at 952 949-7608 if you require additional information or assistance in processing this request.

Sincerely,

Eric Petersen
Director Sensor Manufacturing
Rosemount Inc

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Attachment to Exemption Request for Rosemount's Sapphire Based Pressure Sensor

Check List: Directive 2002/95/EC

Technical and scientific evidence in support of request for exemption for lead oxide (PbO) seal frit used for making sapphire based pressure sensors

1a) Please describe the material/component of the electrical and electronic equipment that contains the hazardous substance.

Request exemption for use of seal frit containing lead oxide (PbO) used to make a hermetic seal for the reference vacuum chamber of sapphire based pressure sensors

1b) Please indicate the type and quantity of the hazardous substance used in the homogenous material. Please indicate the quantity of the substance in absolute numbers and in percentage by weight in homogeneous material.

Lead Oxide (PbO) seal frit is used in Rosemount sapphire based pressure sensors. The sapphire based pressure sensors have 0.1 micrograms or less of Lead Oxide (PbO) per unit on ranges 2 to 6 and less than 0.25 micrograms for range 1. The lead oxide is 50% by weight of the glass frit.

1c) Please indicate the functionality of the substance in the material of the equipment.

Lead Oxide (PbO) seal frit is used in sealing the reference chamber of the sapphire based pressure sensor. It's coefficient of thermal expansion is compatible for the temperature level needed to fire a seal and for the service temperature range of the finished product. It meets the requirements of firing in a vacuum and at a temperature level where the frit components do not damage the conductors used in the sensor. Lead oxide in frit sealing makes the hermetic seal of the pressure sensor reference chamber possible.

1d) Estimated annual quantities of the hazardous substance used in this particular application that would enter the EU market.

The total number of sapphire based pressure sensors sold into the EU in 2006 was 221. The total amount of Lead Oxide (PbO) entering the EU market for that year was less than 55.25 micrograms.

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2) Please explain why the elimination or substitution of the hazardous substance via design changes or materials and components is currently technically or scientifically impracticable.

Substitution or elimination of Lead Oxide (PbO) in sapphire based pressure sensors is currently technically not possible. Alternate sealing glass frits without PbO cannot be used for primarily three reasons. First, seal frits without PbO require air for the oxygen when fired. The oxygen destroys the metal conductors of the sensor at temperatures above 450 degrees C. Second, when sealed with oxygen present, the reference chamber would not be at the required vacuum. Third, seal frits without PbO require higher temperatures to fire. At required temperatures to fire (above 650 degrees C) the seal frit materials will destroy the metal conductors of the sensor. To date, a seal frit to make hermetic seals that can be fired in a vacuum and not destroy the metal conductors of the sensor has not been found.

3) Please indicate if the negative environmental, health and/or consumer safety impacts caused by substitution are likely to outweigh the environmental, health and/or consumer safety benefits. If existing, please refer to relevant studies on negative impacts caused by substitution.

Currently substitution for Lead Oxide (PbO) in Rosemount Inc sapphire based pressure sensors is technically or scientifically impracticable and therefore environmental impacts of a substitute material are not known.

Rosemount sensors are often used in very hazardous and remote industrial locations that demand the highest reliability. Substitution of the lead oxide (PbO) seal frit that could diminish that reliability would have an impact on the safety of personnel and the environment. A single event of sensor failure could cause significant damage to the environment, equipment and harm personnel. When a potential substitute material is found, it must demonstrate equivalent or better reliability in the system.

4) Please indicate if feasible substitutes currently exist in an industrial and/or commercial scale. Please indicate the possibilities and/or the status for the development of substitutes and indicate if these substitutes will be available by 1 July 2006 or at a later stage.

No substitutes currently exist in an industrial and/or commercial scale for Lead Oxide (PbO) bearing seal frit used in the Rosemount Inc sapphire based pressure sensor.

5) Please indicate if any current restrictions apply to such substitutes. If yes, please quote the appropriate legislation/regulation.

Not applicable.

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6) Please indicate the costs and benefits and advantages and disadvantages of such substitutes. If existing, please refer to relevant studies on costs and benefits of such substitutes.

Not applicable.

7) Please provide any other relevant information that would support your application for an additional exemption.

Rosemount sensors are often used in very hazardous and remote industrial locations that demand the highest reliability. Any substitution for the lead oxide (PbO) seal frit could diminish that reliability and therby have an impact on the safety of personnel and the environment. A single event of sensor failure could cause significant damage to the environment, equipment, and harm personnel. When a potential substitute material is found, it must demonstrate equivalent or better reliability in the system.

Technically, there are no viable substitutes currently available to replace the lead oxide containing seal frit used in sapphire based pressure sensors. Rosemount will continue to look for a viable replacement lead-oxide-free seal frit for the reference chamber hermetic seal on these sensors.

Product Data Sheet
00813-0100-4022, Rev FA
Catalog 2008-2009

Rosemount 4600 Oil & Gas Panel Pressure Transmitter

TRANSMITTER FEATURES:

- *A compact, lightweight, all-welded stainless steel design*
- *40:1 rangeability for increased flexibility and reduced inventories*
- *3 year stability guarantee reduces maintenance costs*
- *Leading edge capacitance sensor with integral temperature measurement for improved total performance*
- *4-20 mA HART® Smart capabilities and 0.25% of calibrated span reference accuracy*

Contents

Legendary Rosemount Performance, Customized For Your Panel Applications

The Rosemount 4600 Oil & Gas Panel Transmitter is a compact, reliable transmitter designed to meet your panel-mount monitoring needs. The Rosemount 4600 continues the Rosemount tradition of delivering superior performance, industry leading reliability, and exceptional value.

A compact, lightweight, all-welded stainless steel design

You asked for it and we've delivered — the stability, performance and reliability of Rosemount are now available in a compact transmitter for your space and weight constrained panel applications. The entire transmitter weighs less than 1.5 pounds (0,6 kg) and the all-welded, hermetic enclosure maximizes reliability by minimizing environmental effects, such as salt spray and humidity, on the electronics and sensor.

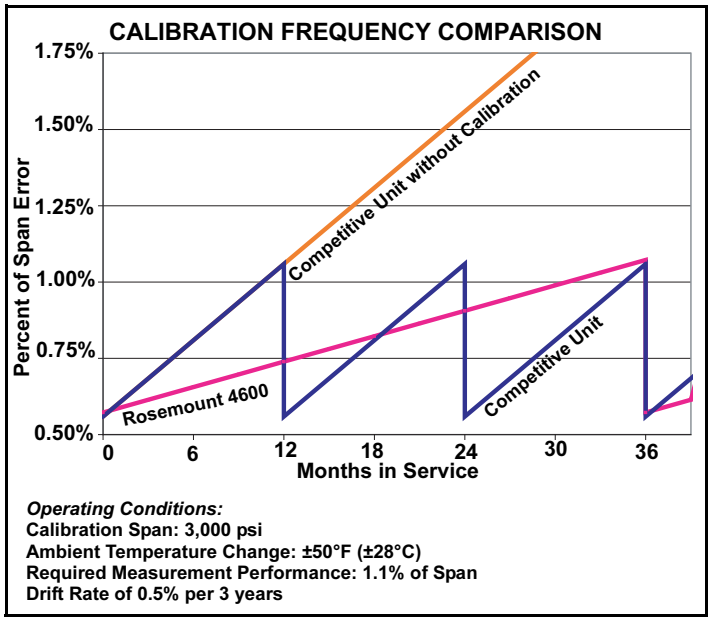
40:1 rangeability for increased flexibility and reduced inventories

Rosemount understands that Oil & Gas Well Pressures are sometimes unpredictable, and that's why we've incorporated 40:1 rangeability into the Rosemount 4600 Oil & Gas Panel Transmitter. Not only does 40:1 rangeability allow you incredible flexibility, it also lowers your transmitter inventories by allowing you to measure pressure ranges from 20 psi to 20,000 psi with only 4 transmitter ranges.

Leading edge capacitance sensor with integral temperature measurement for improved total performance

Integral temperature measurement means the Rosemount 4600 provides superior temperature compensation and therefore, a more precise pressure measurement over the entire operating temperature range.

3-year stability guarantee reduces maintenance costs



Most competitive devices can drift out of specification after just a few months and require recalibration, which consumes both your time and money. The Rosemount 4600 carries a 3-year "Set and Forget" stability guarantee to reduce the frequency of calibration and lower maintenance costs.

4-20 mA HART Smart capabilities and 0.25% of calibrated span reference accuracy

The HART protocol enables quick and easy reranging, calibration and troubleshooting for nearly effortless field adjustments. As always, reference accuracy is specified as a percent of *calibrated span*, not as a percent of full scale, so you're guaranteed 0.25% reference accuracy whether you're measuring 20,000 psi or 20 psi.

Specifications

PERFORMANCE SPECIFICATIONS

For zero-based spans, reference conditions, silicone oil fill, SST materials, 1/2 in.- 14 NPT process connections, digital trim values set to equal range points. Does not include any error due to the effects of sealed gauge.

Conformance to specification (±3 Sigma)

Technology leadership, advanced manufacturing techniques and statistical process control ensure specification conformance to at least ±3 sigma.

Reference Accuracy

Includes the effects of terminal based linearity, hysteresis, and repeatability.

Range 2: ±0.25% of calibrated span from 1:1 to 7.5:1 rangedown

Range 4: ±0.25% of calibrated span from 1:1 to 40:1 rangedown

Range 5: ±0.25% of calibrated span from 1:1 to 30:1 rangedown

Range 6: ±0.25% of calibrated span from 1:1 to 30:1 rangedown

Long Term Stability

0.5% of span for 3 years under normal operating conditions

Vibration Effect

Less than ±0.1% of URL when tested per the requirements of IEC 60770.84 pipeline (general and extreme vibration level) (10-60 Hz 0.21mm peak to peak displacement/60-2000 Hz 3g).

Electromagnetic Compatibility (EMC)

Meets all relevant requirements of EN 61326

Transient Protection (Option T1)

Meets IEEE C62.41, Category B

- 6 kV crest (0.5 μs - 100 kHz)
- 3 kA crest (8 × 20 microseconds)
- 6 kV crest (1.2 × 50 microseconds)

Meets IEEE C37.90.1, Surge Withstand Capability

- SWC 2.5 kV crest, 1.25 MHz wave form

General Specifications:

- Response Time: < 1 nanosecond
- Peak Surge Current: 5000 amps to housing
- Peak Transient Voltage: 100 V dc
- Loop Impedance: < 25 ohms
- Applicable Standards: IEC61000-4-4, IEC61000-4-5

NOTE:
Calibrations at 68 °F (20 °C) per ASME Z210.1 (ANSI)

Range and Sensor Limits

Rosemount 4600 Oil & Gas Panel Transmitter Range Limits								
	Range 2		Range 4 Span		Range 5		Range 6	
Units	min.	max.	min.	max.	min.	max.	min.	max.
psi	20	150	125	5,000	330	10,000	660	20,000
MPa	0.14	1.03	125	34.47	2.28	68.95	4.55	137.90
bar	1.38	10.34	125	344.74	22.75	689.48	45.51	1378,95
kg/cm^2	1.41	10.55	125	351.535	23.20	703.07	46.40	1406,14

FUNCTIONAL SPECIFICATIONS

Dynamic Performance

500 Milliseconds (response time + dead time)

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

±0.03% URL + 1.0% span from 1:1 to maximum rangedown

Service

Liquid, gas, and vapor applications

4–20 mA (output code A)

Zero and Span Adjustment

Zero and span values can be set anywhere within the range. Span must be greater than or equal to the minimum span.

Output

Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

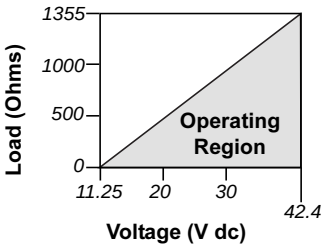
Power Supply

External power supply required. Standard transmitter (4–20 mA) operates on 11.25 to 42.4 V dc with no load.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

Max. Loop Resistance = 43.5 (Power Supply Voltage – 11.25)



Communication requires a minimum loop resistance of 250 ohms.

Overpressure Limits

Transmitters withstand the following pressure without damage:

Range 2: 1,500 psi (103,4 bar)
Range 4: 7,500 psi (517,1 bar)
Range 5: 15,000 psi (1034 bar)
Range 6: 24,000 psi (1655 bar)

Burst Pressure Limits

Range 2: 11,000 psi (758,4 bar)
Range 4: 11,000 psi (758,4 bar)
Range 5: 26,000 psi (1793 bar)
Range 6: 31,000 psi (2137 bar)

Temperature Limits

Ambient

–40 to 185 °F (–40 to 85 °C)

Storage

–50 to 230 °F (–46 to 110 °C)

Process Temperature Limits

–40 to 200 °F (–40 to 93°C)

Turn-On Time

Performance within specifications less than 2.5 seconds after power is applied to the transmitter

Damping

Analog output response to a step input change is user-selectable from 0.3 to 60 seconds for one time constant. This software damping is in addition to sensor module response time.

Failure Mode Alarm

HART 4-20mA (output code A)

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven offscale to alert the user. Rosemount standard and custom alarm levels are available.

High or low alarm signal is software-selectable.

Alarm Configuration

Rosemount

High Alarm: ≥ 21.75 mA
Low Alarm: ≤ 3.75 mA

Custom Level (1)

High Alarm: 20.2 - 23.0 mA
Low Alarm: 3.6 - 3.8 mA

(1) Low alarm must be 0.1 mA less than low saturation and high alarm must be 0.1 mA greater than high saturation.

PHYSICAL SPECIFICATIONS

Electrical Connections

1/2–14 NPT Male, 72in. flying leads (polyvinyl chloride insulated #18 AWG copper wire)

Conduit Seal

Integral conduit seal meets the requirements of NEC© 2002 section 501.5 (A), 501.5 (B) and 505.16 (B)(1). No additional conduit seal required.

Process Connections

- 1/2-14 NPT female (Available on Ranges 2 and 4 only)
- 1/4–18 NPT female (Not available on Range 6)
- Autoclave type F-250-C (Pressure relieved 9/16-18 gland thread: 1/4 OD high pressure tube 60° cone: available Range 5 and 6 transmitters only.

Process Sealing

Reliable dual process seal design meets the requirements NEC© 2002 section 501.5 (F)(3), 505.16 (E)(3) and API 14F/14FZ 6.8.2.2. No additional process sealing is required.

Process-Wetted Parts

Process Isolating Diaphragms
316L SST (1)
Hastelloy C-276® (1)

Non-Wetted Parts

Electronics Housing
316L SST
NEMA 4X
IP 68, IP 66

Sensor Module Fill Fluid

Silicone

Shipping Weights for Rosemount 4600

Range 2 and 4: 1.34 lb. (0,61 kg.)
Range 5 and 6: 2.03 lb. (0,92 kg.)

(1) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oilfield production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota, USA

Ordinary Locations Certifications

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).

European 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)

Model 4600 Pressure Transmitters-
Sound Engineering Practice

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

All Models: EN 50081-1: 1992; EN 50082-2:1995;
EN 61326-1:1997 + A1, A2, and A3 – Industrial

Process Sealing Certification

FM Approved Dual Process Seal

Certified to the requirements of ANSI / ISA 12.27.01

No additional sealing required.

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 and Class III, Division 1, Groups E, F, and G hazardous locations;
Temperature Code T5
(T_{amb} = -40°C to 85°C);
Explosion-Proof for Class 1, Zone 1 AEx d IIC
T5 (T_{amb} = -40°C to 85°C);
Enclosure Type 4X
Conduit seal not required

I5 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D;
Temperature Code T4 (T_{amb} = -50°C to 70°C);
Intrinsically Safe for use in Class I, Zone 0 AEx ia IIC
T4 (T_{amb} = -50°C to 70°C);
Non-incendive for Class I, Division 2, Groups A, B, C, and D;
When connected in accordance with
Rosemount drawing 04620-5007;
Enclosure Type 4X
For entity parameters see control drawing 04620-5007

Canadian Standards Association (CSA) Approvals

E6 Explosion-Proof for Class I, Division 1, Groups B, C, and D; dust-ignition proof for Class II and Class III, Division 1, Groups E, F, and G hazardous locations;
Temperature Code T5 (T_{amb} = -50°C to 40°C);
Explosion-Proof for Class 1, Zone 1 Ex d IIC
T5 (T_{amb} = -20°C to 40°C);
Suitable for Class I, Division 2, Groups A, B, C, and D, when installed per Rosemount drawing 04620-5005;
Enclosure Type 4X
Conduit seal not required

I6 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D;
Temperature Code T3C (T_{amb} = -50°C to 70°C);
Intrinsically Safe for use in Class I, Zone 0 Ex ia IIC
T4 (T_{amb} = -50°C to 70°C);
When connected in accordance with
Rosemount drawing 04620-5005;
Enclosure Type 4X
For entity parameters see control drawing 04620-5005

European Certifications

I1 **ATEX Intrinsic Safety**
Certificate No. Baseefa03ATEX0114X
ATEX Marking: ⟨Ex⟩ II 1 G
EEx ia IIC T4 (-40 ≤ Ta ≤ 70°C)
CE 1180
Input Parameters:
U_i = 30V
I_i = 200mA
P_i = 1.0W
C_i = 35nF
L_i = 390µH

SPECIAL CONDITIONS FOR SAFE USE (X):

The Apparatus with the Transient Protection (T1) option is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020 2002. This must be taken into account when installing the apparatus.

E1 **ATEX Flame-Proof**
Certificate No. KEMA02ATEX2231X
ATEX Marking: ⟨Ex⟩ II 1/2 G
EEx d IIC T6 (-40 ≤ Ta ≤ 80°C)
CE 1180

SPECIAL CONDITIONS FOR SAFE USE (X):

This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

The Model 4600 Pressure transmitter is provided with a permanently connected unterminated cable. The free end of the cable shall be connected using a suitable junction box, e.g. in type of explosion protection flameproof enclosure "d" or increased safety "e".

N1 **ATEX Type n**
Certificate No. Baseefa03ATEX0115X
ATEX Marking: ⟨Ex⟩ II 3 G
EEx nA II T5 (-40 ≤ Ta ≤ 70°C)
U_i = 42.4V MAXIMUM

SPECIAL CONDITIONS FOR SAFE USE (X):

The Apparatus with the Transient Protection (T1) option is not capable of withstanding the 500V insulation test required by Clause 9.1 of EN50021 1999. This must be taken into account when installing the apparatus.

ND **ATEX Dust Ignition-Proof**
Certificate No. KEMA02ATEX2231X
ATEX Marking: ⟨Ex⟩ II 1 D
Dust Rating: T85°C (-40 ≤ Ta ≤ 80°C)
IP66, IP68
CE 1180
V = 42.4 Volts MAX
A = 24mA

SPECIAL CONDITIONS FOR SAFE USE (X):

This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

The Model 4600 Pressure transmitter is provided with a permanently connected unterminated cable. The free end of the cable shall be connected using a suitable junction box, e.g. in type of explosion protection flameproof enclosure "d" or increased safety "e".

Combinations of Certifications

A 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.

K1 Combination of **E1**, **I1**, and **N1**
K5 Combination of **E5** and **I5**
K6 Combination of **E6** and **I6**
KA Combination of **E1**, **I1**, **E6,** and **I6**
KB Combination of **E5**, **I5**, **I6** and **E6**
KC Combination of **E5**, **E1**, **I5** and **I1**

Dimensional Drawings

FIGURE 1. Dimensional Drawings for the Rosemount 4600 Oil & Gas Panel Pressure Transmitter

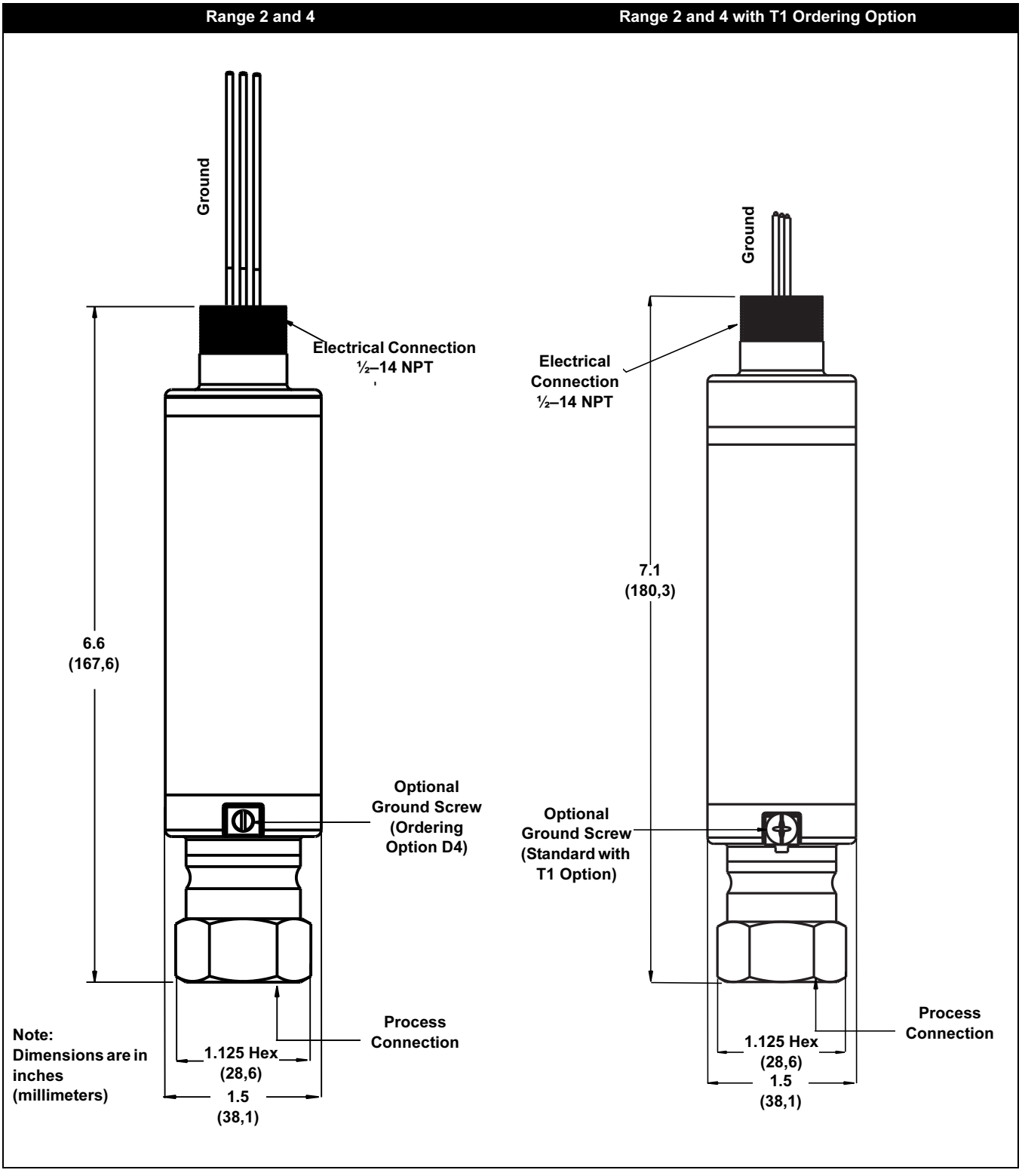
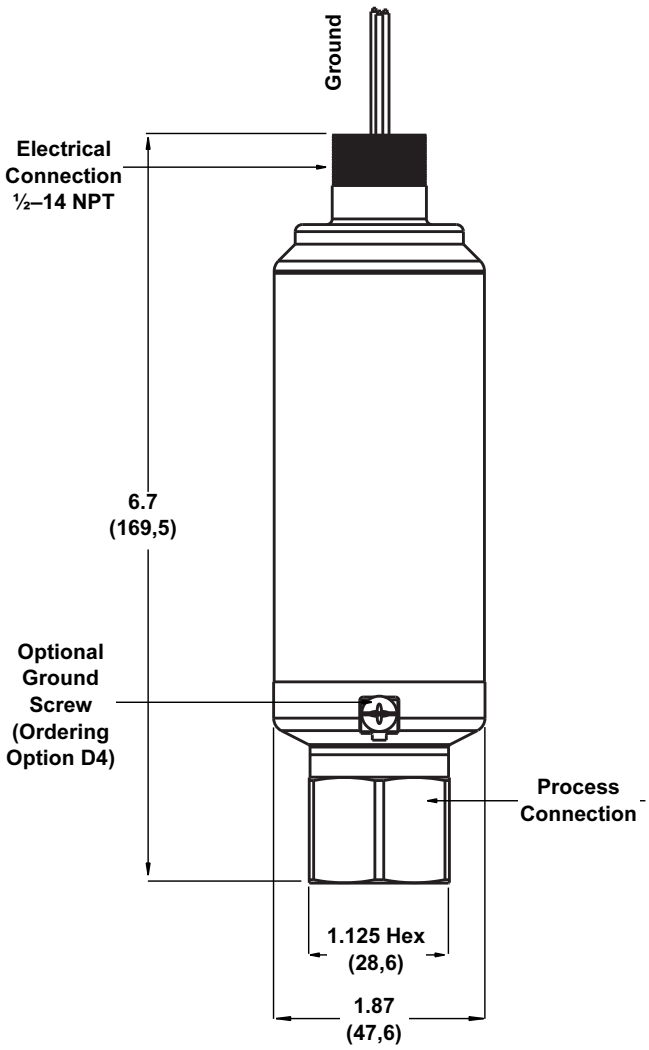
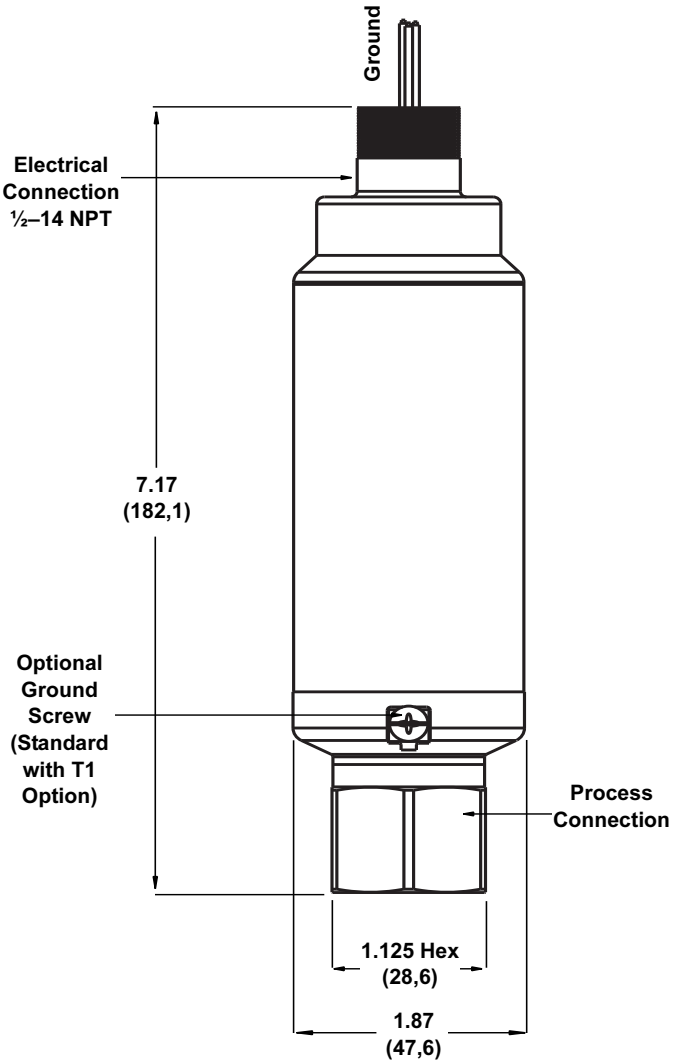


FIGURE 2. Dimensional Drawings for the Rosemount 4600 Oil & Gas Panel Pressure Transmitter

Range 5 and 6



Range 5 and 6 with T1 Ordering Option



Note:
Dimensions are in inches (millimeters)

Ordering Information

Model	Transmitter Type
4600	Oil and Gas Panel Pressure Transmitter
Code	**Measurement Type**
G	Sealed Gauge
A	Absolute
Code	**Pressure Range**
2	0-20 to 0-150 psi
4	0-125 to 0-5000 psi
5	0-330 to 0-10,000 psi
6	0-660 to 0-20,000 psi (available only with H11)
Code	**Isolating Diaphragm/ Process Connection Materials**
2	316L SST (1)
3	Hastelloy C-276 (1)
Code	**Process Connection Style**
E09	1/4-18 NPT Female (not available with Pressure Range 6)
E11	1/2-14 NPT Female (not available with Pressure Range 5 or 6)
H11	Coned and Threaded, compatible with autoclave type F-250-C (available on Pressure Ranges 5 and 6 only)
Code	**Output**
A	4-20 mA with Digital Signal Based on HART protocol
Code	**Electrical Connection**
5A	1/2-14 NPT Male with 72 in. Flying Lead
Code	**Options**
Software Configuration	
C1	Custom Software Configuration (CDS required with order)
Alarm Limits	
C6	Custom Alarm and Saturation Signal Levels, High Alarm
C7	Custom Alarm and Saturation Signal Levels, Low Alarm
Hardware Adjustments	
D1	Zero and Span Adjustments
External Ground Screw Assembly	
D4	External Ground Screw Assembly
Product Certifications	
E1	ATEX Flameproof
I1	ATEX Intrinsic Safety
K1	ATEX Flameproof, Intrinsic Safety, Type n (combination of E1, I1, and N1)
N1	ATEX Type n
ND	ATEX Dust Ignition-Proof
E5	FM Approval Explosionproof
I5	FM Approval Intrinsic Safety, Non-incendive
K5	FM Approval Explosionproof, Intrinsic Safety, Non-incendive (combination of E5 and I5)
E6	CSA Explosionproof, Division 2
I6	CSA Intrinsic Safety
K6	CSA Explosionproof, Intrinsic Safety, Division 2 (combination of E6 and I6)
KA	ATEX/ CSA Flameproof and Intrinsic Safety (combination of E1, I1, E6, and I6)
KB	FM Approval and CSA Explosionproof and Intrinsic Safety (combination of E5, E6, I5, and I6)
KC	FM Approval and ATEX Explosionproof and Intrinsic Safety (combination of E5, E1, I5, and I1)

	Options (Continued)
Special Certifications	
Q4	Calibration data certificate consistent with ISO 10474 2.1 or EN 10204 2.1
Q8	Material traceability certification per EN 10204 3.1.B
Transient Protection	
T1	Transient protection
Typical Model Number: 4600 G 4 2 E11 A 5A D1 E5	

(1) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oilfield production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

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

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