

# Rosemount™ 228

## Toroidal Conductivity Sensor



### **A versatile conductivity sensor for solving diverse application challenges**

Rosemount 228 toroidal conductivity sensors reliably measure conductivity in highly conductive electrolyte solutions up to 2 S/cm (2,000,000  $\mu$ S/cm). These sensors work in dirty and corrosive applications where metal electrode sensors would otherwise fail. A robust sensor design makes the Rosemount 228 ideal for measuring concentrations of acid, base, and salt solutions.

## Overview



### High-performance and reliability:

- Meet challenging application requirements with a selection of chemical-resistant body options including PEEK and Tefzel®.
- High-vibration tolerance with reinforced internal metal frame design.
- High-temperature option for process temperatures up to 392 °F (200 °C) and suitable for use under high-pressure up to 295 psig (2135 kPa [abs]).



### Meet your process mounting needs:

- Suitable for insertion and submersion type applications.
- Versatile mounting options featuring either a 3/4-in. MNPT or 5/8-in. 11 UNC process connection.
- Eliminate the need to shut down the process when removing sensors from piping and tanks by using an optional retraction assembly kit.

## Ordering information



Rosemount 228 Toroidal Conductivity Sensors are molded of chemically resistant glass filled PEEK or Tefzel™ and are ideal for measuring concentrations of acid, base, and salt solutions. The sensors include an integral PT-100 Resistance Temperature Device (RTD) for temperature compensation and an integral cable length of 20 ft. (6.1 m). The Rosemount 228 can be used with a variety of insertion mounting adapters to meet your installation requirements (see [Accessories](#)).

### Note

For improved EMI/RFI shielding, choose cable option 56-61 (not for use with the Rosemount 1181T, 1054, and 2054). Allowed combinations for level 3 and 4 are: 54-61, 56-61, and 54-62.

**Table 1: Rosemount 228 Toroidal Conductivity Sensor Ordering Information**

Option	Description
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**Table 1: Rosemount 228 Toroidal Conductivity Sensor Ordering Information (continued)**

228	Conductivity sensor - toroidal insertion/submersion
<b>Materials of construction</b>	
02	PEEK, standard temperature to 248 °F (120 °C)
<b>Option</b>	<b>Description</b>
03	PEEK, high temperature to 391 °F (200 °C)
04	Tefzel®, standard temperature to 248 °F (120 °C) <sup>(1)</sup>
05	Unfilled Tefzel, standard temperature to 248 °F (120 °C) <sup>(2)</sup>
20	5/8-11 UNC (EPDM gasket standard), requires mounting adapter
21	3/4-in. MNPT threads <sup>(3)</sup>
<b>Cable Type</b>	
54	Unshielded cable <sup>(4)</sup>
56	Shielded cable for improved EMI/RFI protection <sup>(5)</sup>
<b>Cable length</b>	
61	Integral 20-ft. (6.1 m) cable (for use with -54 and -56 options)
62	18 in. (457 mm) <sup>(6)</sup>
35	Integral 35-ft. (10 m) cable (for use with -54 and -56 options)
04	Integral 50-ft. (15 m) cable (for use with -54 and -56 options)
06	Integral 100-ft. (30 m) cable (for use with -54 and -56 options)
09	Integral 10-ft. (3 m) cable (for use with -54 and -56 options)
<b>Calibration and conformance certificates - optional level</b>	
CC	Certificate of Calibration (no test data given)
LC	Loop Calibration Certificate (sensor and transmitter calibrated together, with test data)
EC	Electronic Calibration Certificate (Sensor calibrated against factory instrument, with test data)
<b>Material traceability certificates (optional level)</b>	
MC	Material Traceability Certification

(1) Not available with options -50-62 and -54-62.

(2) Not available with option -54-62.

(3) Not available with option -62.

(4) Recommended for use with transmitter models 1054 and 2054. May be used with transmitter models 1056, 1066-T, and 5081, but not recommended.

(5) Recommended for use with transmitter models 1056, 1066-T, 56, and 5081.

(6) For use with option -54 only. Connects sensor used in valve insertion assembly to junction box. Requires interconnecting cable to connect junction box to transmitter. Use either cable 23294-00 (unshielded) or 23294-05 (shielded).

**Note**

The Rosemount 228 sensor is molded from chemically resistant glass-filled PEEK (polyetheretherketone) or glass-filled Tefzel and includes an integral Pt 100 resistance temperature device (RTD) and 20 ft. (6.1 m) of cable. For improved EMI/RFI shielding, choose cable option 56-61 (not for use with the Rosemount 1181T, 1054, and 2054). Allowed combinations for level 3 and 4 are: 54-61, 56-61, and 54-62.

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# Specifications

## Sensor specifications

**Cell constant (nominal):** 2.7/cm

**Wetted materials:** Body materials either glass-filled PEEK, glass-filled Tefzel, or unfilled Tefzel. Option -20 has EPDM gasket.

**Process connection:** -20: 5/8 in. 11 UNC, -21: 3/4 in. MNPT

**Standard cable length:** 20 ft. (6.1 m)

**Weight/shipping weight:** 2 lb./3 lb. (1.0 kg/1.5 kg)

**Table 2: Maximum Operating Temperature and Pressure**

Body material option	Maximum temperature	Maximum pressure	Maximum pressure (for CRN registration only)
-02	248 °F (120 °C)	295 psig (2135 kPa)	220 psig (1618 kPa [abs])
-03	392 °F (200 °C)	295 psig (2135 kPa)	220 psig (1618 kPa [abs])
-04	248 °F (120 °C)	200 psig (1480 kPa)	150 psig (1135 kPa [abs])
-05	248 °F (120 °C)	200 psig (1480 kPa)	150 psig (1135 kPa [abs])

## Insertion adapter specifications

**Table 3: Maximum Operating Temperature and Pressure**

Adapter part number	Sensor compatibility	Process connection	Wetted materials	Maximum temperature	Maximum pressure	Maximum pressure (for CRN registration only)	Weight/shipping weight
23242-02	For use with option -21	1½-in. MNPT	316 stainless steel, glass-filled PEEK, Viton	392 °F (200 °C)	295 psig (2134 kPa)	220 psig (1618 kPa)	3 lb./4 lb. (1,5 kg/2,0 kg)
23242-03	For use with option -20	1½-in. MNPT	316 stainless steel, glass-filled PEEK, Viton	392 °F (200 °C)	295 psig (2134 kPa)	220 psig (1618 kPa)	3 lb./4 lb. (1,5 kg/2,0 kg)
2001990	For use with option -21	2-in. MNPT	CPVC, Viton	100 °F (38 °C)	100 psig (791 kPa [abs])	N/A	1 lb./2 lb. (0,5 kg/1,0 kg)
				185 °F (85 °C)	45 psig (412 kPa [abs])		

## Retraction assembly specifications

**Sensor compatibility:** The retraction assemblies are used with 228 -[ ]-20-54-62 only.

**Wetted materials:** 316 stainless steel, ethylene, polypropylene (EP), unfilled Teflon®, carbon-filled Teflon

**Process connection:** 1½-in. MNPT

**Maximum temperature:** 392 °F (200 °C)

**Maximum pressure:** 295 psig (2135 kPa [abs])

**Table 4: Maximum Retraction/Insertion Conditions**

Description	Temperature	Pressure	Maximum insertion travel	Weight/shipping weight
23311-00 mechanical retraction assembly	392 °F (200 °C)	295 psig (2135 kPa [abs])	10.5 in. (267 mm)	12 lb./15 lb. (5,5 kg/7,0 kg)
23311-01, manual retraction assembly	130 °C (266 °F)	35 psig (343 kPa [abs])	12.0 in. (305 mm)	9 lb./12 lb. (4,5 kg/5,5 kg)

**Ball valve specifications (sold separately)**

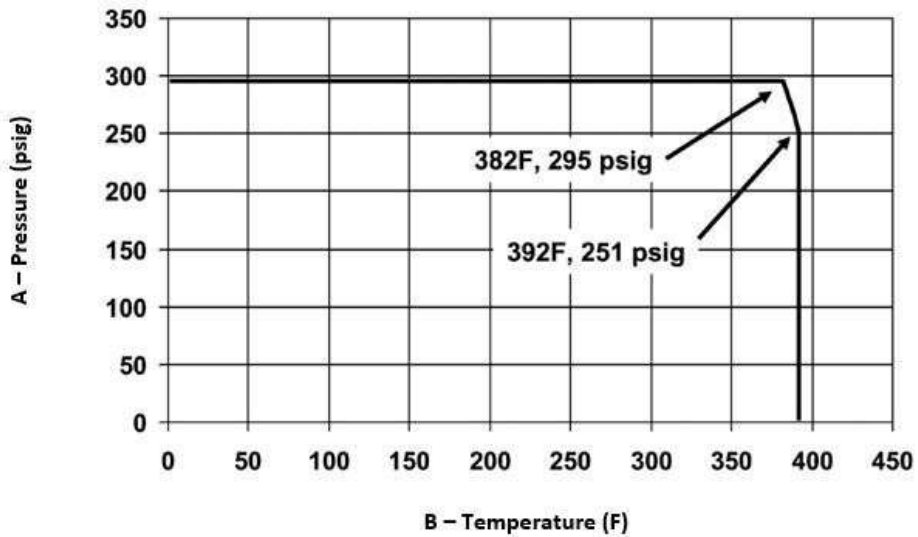
**Part number:** 9340065

**Wetted materials:** 316 stainless steel, Teflon TFE

**Process connection:** 1½-in. FNPT

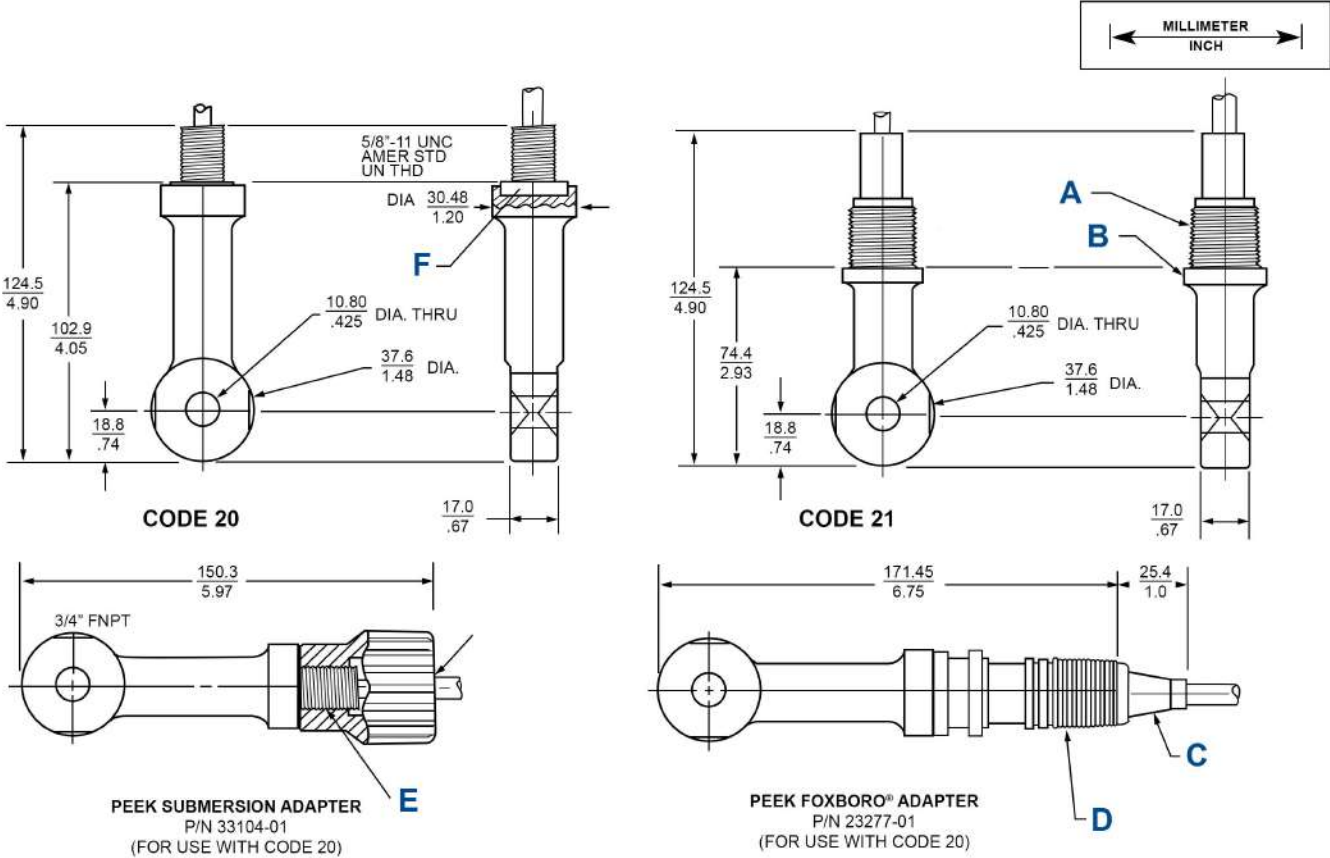
**Weight/shipping weight:** 4 lb./5 lb. (2,0 kg/2,5 kg)

**Figure 1: Pressure and temperature**



# Dimensional drawings

Figure 2: Rosemount 228 Dimensional Drawing



**Note**

Measurements are expressed with millimeter on the top and inches on the bottom.

- A. 3/4-in. MNPT
- B. 1-in. wrench opening
- C. Strain relief boot
- D. Foxboro 3/4-in. truncated pipe thread
- E. Typical thread cutaway for code 20
- F. EPDM gasket

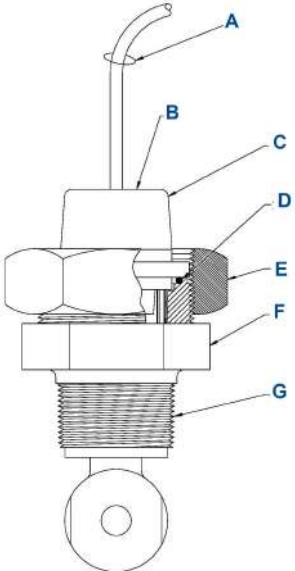
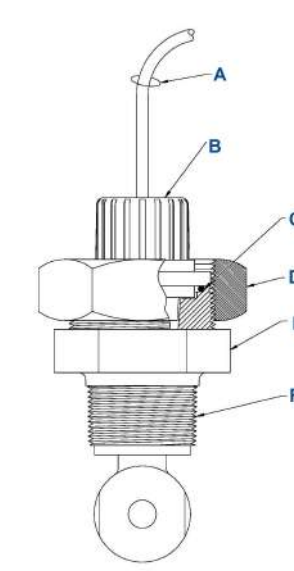
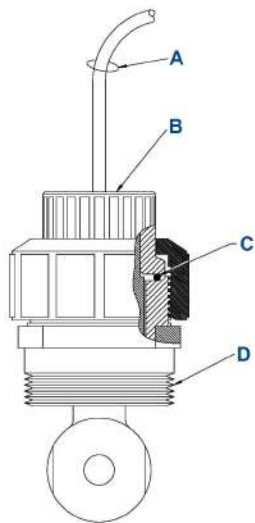
Figure 3: Insertion Adapter 23242-02	Figure 4: Insertion Adapter 23242-03
	
<ul style="list-style-type: none"> <li>A. Cable</li> <li>B. 1-in. FNPT</li> <li>C. Adapter 3/4-in. FNPT thread</li> <li>D. 2-135 FKM O-ring</li> <li>E. Nut, hex union 2 inch</li> <li>F. Neck, union fitting</li> <li>G. 1 1/2-in. MNPT</li> </ul>	<ul style="list-style-type: none"> <li>A. Cable</li> <li>B. 3/4-in. FNPT</li> <li>C. 2-135 FKM O-ring</li> <li>D. Nut, hex union 2-in.</li> <li>E. Neck, union fitting</li> <li>F. 1 1/2-in. MNPT</li> </ul>

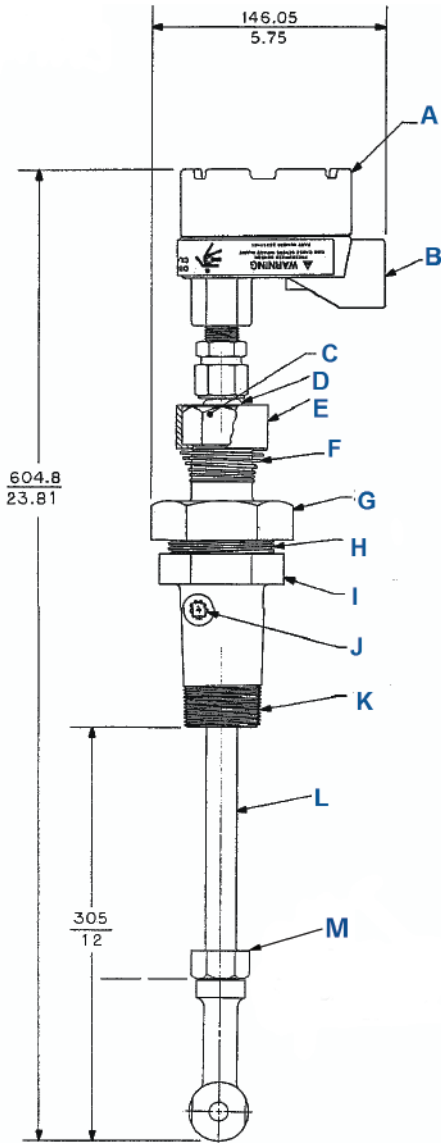
Figure 5: Insertion Adapter 2001990



A. Cable

- B. 3/4-in. FNPT
- C. 2-135 Viton O-ring
- D. 2-in. MNPT

**Figure 6: Manual Retraction Assembly PN 2311-01 Dimensional Drawing**



- A. Junction box with screw cap
- B. 3/4-in. FNPT
- C. Collet nut
- D. Collet
- E. Nut guard
- F. Nut guard spring
- G. 3-in. hex union nut
- H. 2.531-in. 8 ACME thread



*I. 2 $\frac{5}{8}$ -in. hex retraction chamber*

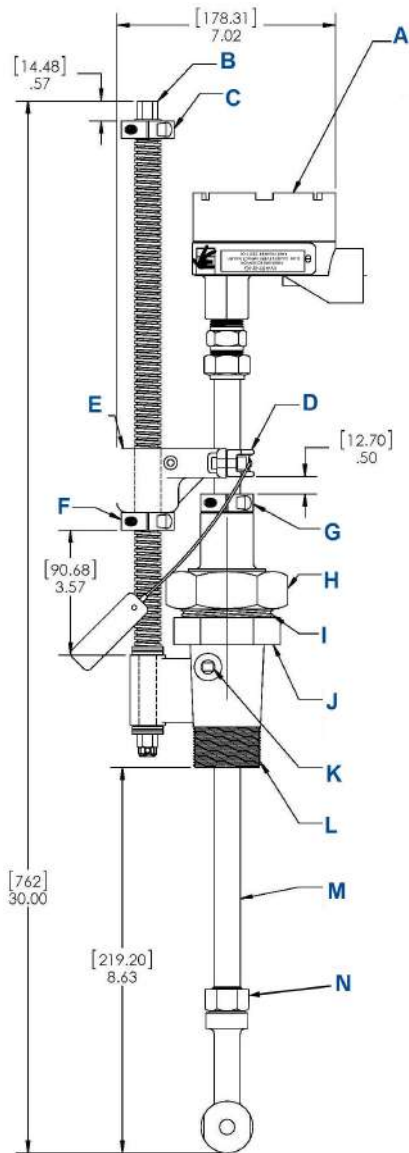
*J.  $\frac{1}{8}$ -in. MNPT plug*

*K. 1 $\frac{1}{2}$ -in. MNPT*

*L. 316 stainless steel  $\frac{3}{4}$ -in. O.D. tube*

*M. Manual retraction assembly*

**Figure 7: Mechanical Retraction Assembly PN 23311-00 Dimensional Drawing**



- A. Junction box with screw cap
- B. Lead screw
- C. Travel stop collar "B"
- D. Cap
- E. Nut housing
- F. Travel stop collar "A"
- G. Retraction stop collar
- H. 3-in. hex union nut
- I. 2.531-in. 8 ACME thread type
- J. 2 5/8-in. hex retraction chamber
- K. 1/8-in. MNPT plug type
- L. 1 1/2-in. MNPT
- M. Ø 3/4-in. tube 316 stainless steel
- N. Mechanical retraction assembly

## Accessories

**Table 5: Accessory list**

Part number	Description
23550-00	Remote junction box without preamplifier
33081-00	Adapter insert, PEEK, 1 x 3/4-in. for 23242-02
23294-00	Unshielded interconnecting cable for Rosemount 1054A, 1054B, and 2054C. Can also be used with Rosemount 1056, 56, 5081, and 1066-T, but not recommended. Prepped, specify length, per ft.
23294-05	Shielded interconnecting cable with additional shield wire for -03 option. For use with Rosemount 1056, 1066-T, 56, and 5081T. Prepped, specify length, per ft.
23311-00	Mechanical valve insertion assembly (Code 20)
23311-01	Manual valve insertion assembly (Code 20)
2001990	Sub assembly, adapter 2-in. bushing
9550179	O-ring, 2-135, EPR
23242-02	Mounting adapter, 1 1/2-in. insertion, 1-in. x 3/4-in.
23242-03	Mounting adapter, 1 1/2-in. insertion (code 20), 1-in. conduit connection
23277-01	Mounting adapter, Foxboro, PEEK Code 20, 5/8-11 UNC
33075-00	Viton® gasket for option 20
33075-03	Kalrez® gasket for option 20
9200276	Extension cable, unprepped (specify length) per foot
9340065	Ball valve, full port 1 1/2-in. Female National Pipe Thread (FNPT) (to 392 °F [120 °C])

**Table 6: Spare Parts**

Part number	Description
33080-01	Adapter insert, PEEK (Code 20) for 23242-03
33121-01	Sensor tube, 316 stainless steel, valve insertion
33131-00	Collette, brass (for PN 2311-00 only)
33168-00	Cap (for PN 23311-00 only)
33180-00	Bushing, PTFE® (for PN 23311-01 only)
33181-00	Bushing, PTFE (for PN 23311-00 only)
33182-00	Guard, PTFE
9555004	Cup seal, PTFE
9560279	Retaining ring for Rosemount 228 insertion assembly

For more information: [Emerson.com](https://www.emerson.com)

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