Product Data Sheet
00813-0100-4480, Rev AD
May 2022

Rosemount™ 1408H Level Transmitter

Non-Contacting Radar



- Optimized for food and beverage applications
- Hygienically certified to 3-A® and EHEDG, process wetted parts comply with FDA and EC 1935/2004
- Designed to withstand tank cleaning processes as well as external washdowns (IP69 and IP6K9K rated)
- 4-20 mA output and IO-Link deliver ease of integration to existing or new systems
- Cost-effective FMCW radar with 80 GHz technology

Introduction

Optimized for food and beverage applications

The Rosemount 1408H Level Transmitter provides accurate continuous level measurements in the food and beverage industry. The transmitter is hygienically certified to 3-A® and EHEDG, and the process wetted parts comply with FDA and EC 1935/2004. It is designed to withstand clean-in-place (CIP) and steam-in-place (SIP) processes as well as external washdowns (IP69 and IP6K9K rated).

Figure 1: Features and Benefits



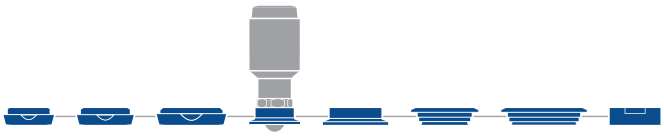
A. *Polished stainless steel housing*
B. *M12 connector for simple commissioning*
C. *Wide choice of hygienic adapters*
D. *CIP/SIP capable*

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Wide variety of connections

The G1 process connection is compatible with a full suite of hygienic process connection adapters. Furthermore, the compact design of the transmitter allows it to be installed in tight spaces and small vessels.

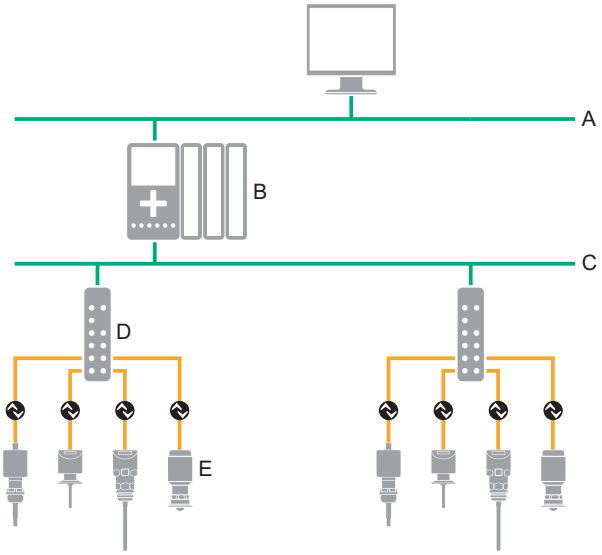


Easy integration with IO-Link

The Rosemount 1408H provides both conventional 4-20 mA and digital switch outputs, enabled by IO-Link connectivity. This supports easy integration into any automation system.

Each IO-Link system consists of an IO-Link master and one or more IO-Link devices (sensors and actuators). The connection between the master and the device is established via unshielded standard cables using standard connectors such as M12. Process data, events and parameters are transferred to the master via IO-Link. The IO-Link master then transfers the data to the controller (PLC) and its fieldbus or industrial ethernet network.

Figure 2: Example of an IO-Link System



A. Industrial ethernet
B. Programmable logic controller (PLC)
C. Industrial Fieldbus
D. IO-Link master
E. IO-Link devices

Non-contacting radar technology

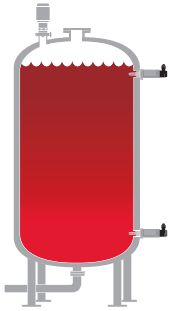
Non-contacting radar technology is ideal for a wide range of applications as it is maintenance-free, has a top-down installation that reduces the risk of leakages, and is unaffected by process conditions such as density, viscosity, temperature, pressure, and pH.

The Rosemount 1408H uses Frequency Modulated Continuous Wave (FMCW) technology and smart algorithms to maximize measurement accuracy and reliability, even in small tanks and challenging fast-filling vessels.

Application examples

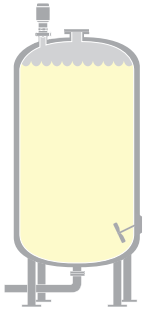
Storage tank

Gain insights into your tank and ensure production runs smoothly without interruption.



Mixing tanks

Ensure correct filling and storage levels in tanks with agitators.



Batch filling

Optimize the batch filling process.



CIP process

Reliable level measurement during and after cleaning, plus optimization of cleaning agent storage.



Ordering information

Online product configurator

Many products are configurable online using our Product Configurator. Select the **Configure** button or visit our website to start. With this tool's built-in logic and continuous validation, you can configure your products more quickly and accurately.

Specifications and options

See the Specifications and options section for more details on each configuration. Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See the Material selection section for more information.

Related information

Performance specifications
Functional specifications
Physical specifications
Material selection

Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in Figure 3.

Figure 3: Model Code Example

1408H	CA Q4 Q8
1	2

1. Required model components
2. Additional options (variety of features and functions that may be added to products)

Note
Additional options will not be included in the model string printed on the Rosemount 1408H transmitter. For product reorder, make sure to include any desired optional options in the model string.

Rosemount 1408H Level Transmitter



The Rosemount 1408H is a non-contacting radar transmitter for continuous level measurements primarily in the food and beverage industry.

CONFIGURE > VIEW PRODUCT >

Required model components

Model

Code	Description	Thread type
1408H	Level Transmitter	G1

Additional options

Process connection type

The hygienic process connection adapter comes with an EPDM O-ring. Other O-Rings are available as accessories.

Code	Description	Approval
CA	1½-in. Tri Clamp (ISO 2852 / DIN 32676)	3-A®, EHEDG, FDA, CRN
C2	2-in. Tri Clamp (ISO 2852 / DIN 32676)	3-A, EHEDG, FDA, CRN
DC	DN32 Dairy Coupling (DIN 11851)	FDA
DA	DN40 Dairy Coupling (DIN 11851)	FDA
D2	DN50 Dairy Coupling (DIN 11851)	FDA
VF	VARIVENT® Type F	3-A, EHEDG, FDA
VN	VARIVENT Type N	3-A, EHEDG, FDA
WD(1)	D50 weld-in adapter	3-A, EHEDG, FDA, CRN
BZ	Mounting bracket including lock nut	N/A

(1) *A welding mandrel is available as accessory.*

Related information

Type 1 Drawing

Special quality assurance

Special quality assurance	
Q4	Calibration data certificate

Material traceability certification

Not available with mounting bracket.

Code	Description
Q8	Material traceability certification per EN 10204 3.1 (2.1 for non-metallic)

Spare parts and accessories

Hygienic process connection adapters

Description[1]	Approval	Material certificate[2]	Part number
1½-in. Tri Clamp (ISO 2852 / DIN 32676)	3-A®, EHEDG, FDA, CRN	Yes	FB-1001Q8
		No	FB-1001
2-in. Tri Clamp (ISO 2852 / DIN 32676)	3-A, EHEDG, FDA, CRN	Yes	FB-1002Q8
		No	FB-1002
DN32 Dairy Coupling (DIN 11851)	FDA	Yes	FB-1020Q8
		No	FB-1020
DN40 Dairy Coupling (DIN 11851)	FDA	Yes	FB-1021Q8
		No	FB-1021
DN50 Dairy Coupling (DIN 11851)	FDA	Yes	FB-1022Q8
		No	FB-1022
VARIVENT® Type F	3-A, EHEDG, FDA	Yes	FB-1010Q8
		No	FB-1010
VARIVENT Type N	3-A, EHEDG, FDA	Yes	FB-1011Q8
		No	FB-1011
D50 Weld-in Adapter	3-A, EHEDG, FDA, CRN	Yes	FB-1041Q8
		No	FB-1041
G1 Welding Mandrel[3]	N/A	No	FB-6041

(1) *The adapter comes with an EPDM O-ring. Other O-Rings are available.*
(2) *Material Traceability Certification per EN 10204 3.1.*
(3) *Absorbs heat and prevents warping during welding of FB-1041.*

Hygienic adapter O-rings

Description	Approval	Pack quantity	Part number
FKM	3-A, FDA	1 pc	FB-3001
		5 pcs	FB-3002
EPDM	3-A, EHEDG, FDA	5 pcs	FB-3003

Process connection adapters and flanges

Description	Part number
2-in. flange for non-pressurized applications	01408-5000-0002
3-in. flange for non-pressurized applications	01408-5000-0003
4-in. flange for non-pressurized applications	01408-5000-0004
1½-in. NPT thread	01408-5000-0005
2-in. NPT thread	01408-5000-0006
D50 weld adapter	01408-5000-0007

Mounting bracket

Description	Part number
Mounting bracket including antenna extension and lock nut	01408-5000-0001

Cables and connectors

Description	Length	Part number
Hygienic wireable terminal connector - M12 female (angled) to screw terminals	N/A	FB-4000
Hygienic cable - M12 female (angled) to flying lead (4 x 22AWG)	6.6 ft. (2 m)	FB-4002
	16.4 ft. (5 m)	FB-4005
	32.8 ft. (10 m)	FB-4010
	65.6 ft. (20 m)	FB-4020
	164 ft. (50 m)(1)	FB-4050
Hygienic patch cable - M12 female (angled) to M12 male	1.97 ft. (0.6 m)	FB-4106
	3.3 ft. (1 m)	FB-4101
	6.6 ft. (2 m)	FB-4102
	16.4 ft. (5 m)	FB-4105
	32.8 ft. (10 m)	FB-4110

(1) *For IO-Link, the maximum cable length is 65.6 ft. (20 m) between device and master.*

IO-Link Masters

Description	IO-Link ports	Part number
Rosemount IO-Link Master Hub with PROFINET® interface	4	FB-5104
	8	FB-5108
Rosemount IO-Link Master Hub with EtherNet/IP™ interface	4	FB-5204
	8	FB-5208
Rosemount IO-Link USB Communicator	1	FB-5301

Configuration software

Description	Part number
Rosemount IO-Link Assistant	FB-5401

Performance specifications

General

Reference conditions

- Measurement target: Stationary metal plate, no disturbing objects
- Temperature: 59 to 77 °F (15 to 25 °C)
- Ambient pressure: 14 to 15 psi (960 to1060 mbar)
- Relative humidity: 25-75%
- Damping: Default value, 2 s

Instrument accuracy (under reference conditions)

±0.08 in. (±2 mm)(1)

Repeatability

±0.04 in. (±1 mm)

Ambient temperature effect

±0.04 in. (±1 mm)/10 K

Sensor update rate

Minimum 1 update per second (typically 5 updates per second)

Maximum level rate

200 mm/s

Measuring range

Maximum measuring range

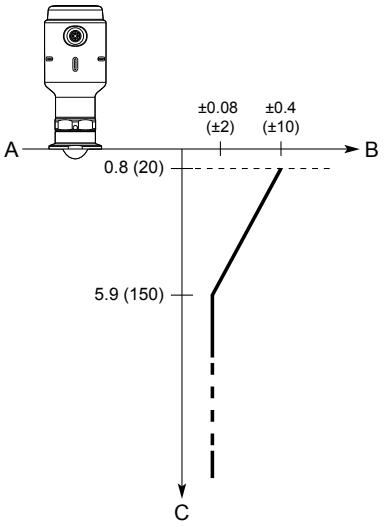
33 ft. (10 m)(2)

(1) Refers to inaccuracy according to IEC 60770-1 when excluding installation dependent offset. See the IEC 60770-1 standard for a definition of radar specific performance parameters and if applicable corresponding test procedures.
(2) Measurement is possible up to 49 ft. (15 m) if there is good reflection of the product surface (dielectric constant >10, i.e. water based media). Note though that a combination of adverse process conditions, such as heavy turbulence, foam, and condensation, together with products with poor reflection may affect the measuring range.

Accuracy over measuring range

Figure 4 illustrates the accuracy over measuring range at reference conditions.

Figure 4: Accuracy Over Measuring Range



A. Device Reference Point
B. Accuracy in inches (millimeters)
C. Distance in inches (millimeters)

Environment

Vibration resistance

2 g at 10-1000 Hz according to IEC 61298-3, level “field with general application”

Electromagnetic compatibility (EMC)

- EMC Directive (2014/30/EU): EN 61326-1
- NAMUR recommendations NE21 (only 4-20 mA output)

Pressure Equipment Directive (PED)

Complies with 2014/68/EU article 4.3

Radio approvals

- Radio Equipment Directive (2014/53/EU) and Radio Equipment Regulations (S.I. 2017/1206):
  - ETSI EN 302 372
  - EN 62311
- Part 15 of the FCC Rules
- Industry Canada RSS 211

Related information

Product certifications

Functional specifications

General

Field of application

Continuous level measurements in the hygienic industry.

Minimum dielectric constant

2

Measurement principle

Frequency Modulated Continuous Wave (FMCW)

Frequency range

77 to 81 GHz

Maximum output power

3 dBm (2 mW)

Internal power consumption

< 2 W (normal operation at 24 Vdc, no outputs)

< 3.6 W (normal operation at 24 Vdc, digital and analog outputs active)

Humidity

0 - 100% relative humidity, non-condensing

Turn-on time

< 15 s(3)

Outputs

The transmitter provides two configurable outputs:

Output 1	Digital output / IO-Link mode
Output 2	Digital output or active 4-20 mA analog output

Digital output

Switching signal for high and low level limits (using the same pin)

(3) Time from when power is applied to the transmitter until performance is within specifications.

Output type

PNP/NPN configurable

Switching function

Normally open

Permanent current rating

< 50 mA

Maximum voltage drop

2.5 V

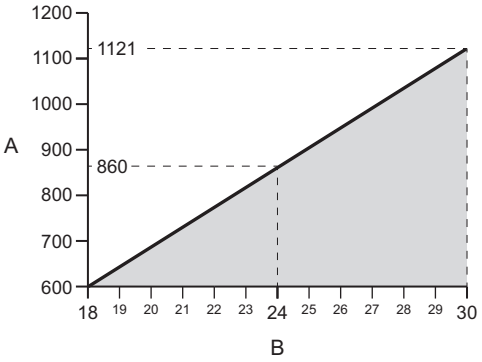
4-20 mA analog output

Load limitations

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

Maximum Loop Resistance = 43.5 × (External Power Supply Voltage - 18) + 600 Ω

Figure 5: Load Limits



A. Loop Resistance (Ω)
B. External Power Supply Voltage (Vdc)

Analog signal on alarm

The transmitter automatically and continuously performs self-diagnostic routines. If a failure or a measurement error is detected, the analog signal will be driven offscale to alert the user. High or low failure mode is user-configurable.

Table 1: Signal on Alarm

Level	Custom levels	NAMUR NE43 (default)
Low	3.5 to 4.0 mA	3.5 mA (NAMUR ≤ 3.6 mA)
High	20.0 to 22.5 mA	21.5 mA (NAMUR ≥ 21.0 mA)

Analog saturation levels

The transmitter will continue to set a current that corresponds to the measurement until reaching the associated saturation limit (and then freeze).

Table 2: Saturation Levels

Level	Custom levels	NAMUR NE43 (default)
Low	3.5 to 4.0 mA	3.8 mA
High	20.0 to 22.5 mA	20.5 mA

IO-Link specifications

IO-Link revision

1.1

Transfer type

COM2 (38.4 kBaud)

SIO mode

Yes

IO-Link master port

Class A

Minimum cycle time

6 ms

Configuration

IO-Link configuration tools

Examples:

- Rosemount IO-Link Assistant (available as accessory)
- FDT® frame applications, e.g. PACT*ware*

Damping

User selectable (default is 2 s, minimum is 0 s)

Output units

- Level: in., m
- Temperature: °F, °C
- Signal strength: mV

Output variables

Variable	4-20 mA	DO1 and DO2	Digital, service tools using IODD	IO-Link PDIn (to the PLC)
Level	✓	✓	✓	✓
Distance (ullage)	N/A	N/A	✓	N/A
Electronics temperature	N/A	N/A	✓	N/A
Signal strength	N/A	N/A	✓	N/A

Process pressure

-15 to 116 psig (-1 to 8 bar)

Atmospheric pressure at temperatures below -4 °F (-20 °C)

Note
The flanges must be used only in non-pressurized applications.

Temperature limits

Process temperature

With adapter

-4 to 302 °F (-20 to 150 °C)

Without adapter

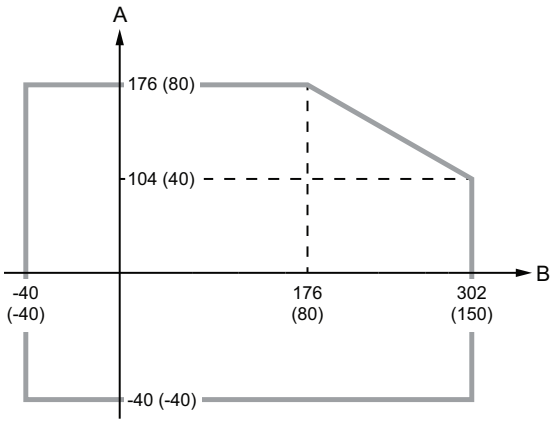
-40 to 302 °F (-40 to 150 °C)

Ambient temperature

-40 to 176 °F (-40 to 80 °C)

The ambient temperature limits may be further restricted by the process temperature as described by Figure 6.

Figure 6: Ambient Temperature vs. Process Temperature



A. Ambient temperature °F (°C)
B. Process temperature °F (°C)

Storage temperature

-40 °F to 194 °F (-40 °C to 90 °C)

Physical specifications

Material selection

Emerson provides a variety of Rosemount products with various product options and configurations, including materials of construction that can be expected to perform well in a wide range of applications. The Rosemount product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options, and components for the particular application. Emerson is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration, or materials of construction selected.

Transmissible Spongiform Encephalopathy (TSE) declaration

This declaration is applicable to the Rosemount 1408H when fitted with the hygienic adapter and O-ring.

Emerson certifies no process wetted components used in this product contain substances of animal origin. Materials used in the production or processing of wetted components for this product meet the requirements stated in EMA/410/01 Rev. 3 and ISO 22442-1:2015. Wetted components in this product are considered free of TSE.

Related information

Product certifications

Food and Drug Administration (FDA) declaration

When fitted with the hygienic adapter and O-ring, the process wetted components used in this product conform to FDA 21CFR110, Subpart C: Food and Drug Administration - Current Good Manufacturing Practice In Manufacturing, Packing, Or Holding Human Food.

Related information

Product certifications

Housing and enclosure

Process connection

ISO 228/1-G1 thread with a wide choice of hygienic adapters

Materials

Polished stainless steel 316L (EN 1.4404)

Transmitter weight

1.1 lb (0.5 kg)[4]

Ingress protection

- IP66/68[5]/69 (IEC 60529)
- IP6K9K (ISO 20563:2013)
- NEMA® 4X

The stated ingress protection only applies when plugged in using a suitable M12 connector that has the appropriate ingress protection.

Hygienic adapters

Materials

316L (EN 1.4435)

Mounting bracket

Materials

- Bracket and device holder: Stainless steel 316L
- Lock nut: Stainless steel A4

Surface finishes

Process wetted parts

- R_a < 30 µ-in. (0.76 µ-m) for polymeric parts
- R_a < 16 µ-in (0.4 µ-m) for metallic parts

Non-wetted parts

- R_a < 30 µ-in. (0.76 µ-m) for stainless steel housing

Material exposed to tank atmosphere

With adapter

- PTFE sealing: PTFE fluoropolymer
- Adapter: 316L (EN 1.4435)
- Hygienic O-ring: EPDM or FKM

(4) Adapter not included.
(5) IP68 at 9.8 ft. (3 m) for more than 30 minutes.

Without adapter

- PTFE sealing: PTFE fluoropolymer
- O-ring: FVMQ
- G1 thread: 316L (EN 1.4404)
- Profile ring: FKM

Electrical connection

Power supply

The transmitter operates on 18-30 Vdc at the transmitter terminals.

Connector type

M12 (A-coded)

Protection class

III

Wiring diagram

Figure 7: Connection

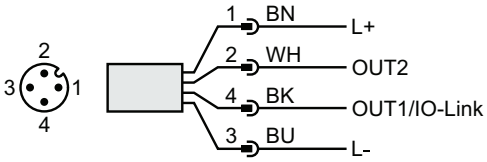


Table 3: Pin Assignment

Pin	Wire color(1)		Signal	
1	BN	Brown	L+	24 V
2	WH	White	OUT2	Digital output or active 4-20 mA analog output
3	BU	Blue	L-	0 V
4	BK	Black	OUT1/IO-Link	Digital output or IO-Link mode

(1) *According to IEC 60947-5-2.*

Installation considerations

Before installing the transmitter, follow recommendations for mounting position, sufficient free space, nozzle requirements, etc.

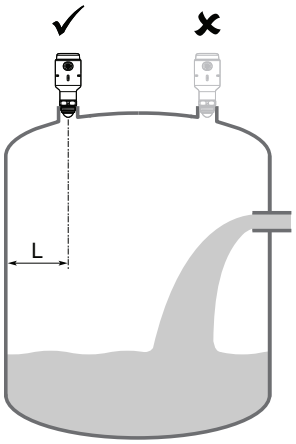
Mounting position

When finding an appropriate location on the tank for the transmitter, the conditions of the tank must be carefully considered.

Consider the following guidelines when mounting the transmitter:

- For optimal performance, the transmitter should be installed in locations with a clear and unobstructed view of the product surface.
- The transmitter should be mounted with as few internal structures as possible within the signal beam.
- Do not mount close to or above the inlet stream.
- Do not mount the transmitter on a manway cover.
- Do not position the transmitter directly over a side manway door.
- Multiple Rosemount 1408H transmitters can be used in the same tank without interfering with each other.

Figure 8: Recommended Mounting Position



Free space requirements

If the transmitter is mounted close to a wall or other tank obstruction such as heating coils and ladders, noise might appear in the measurement signal. See Table 4 for recommended clearance.

Figure 9: Free Space Requirements

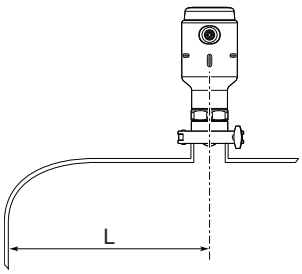


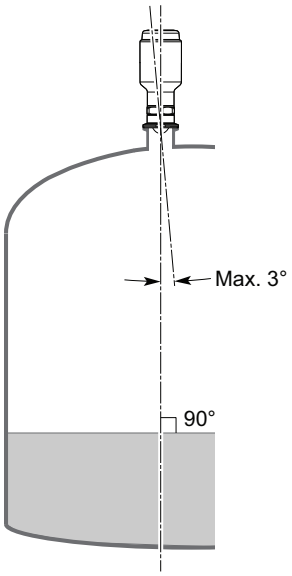
Table 4: Distance to Tank Wall (L)

Minimum	Recommended
8 in. (200 mm)	½ of tank radius

Inclination

The transmitter should be mounted vertically to ensure a good echo from the product surface. See Figure 10 for recommended maximum inclination.

Figure 10: Inclination



Non-metallic tanks

Nearby objects outside the tank may cause disturbing radar echoes. Wherever possible, the transmitter should be positioned so that objects close to the tank are kept outside the signal beam.

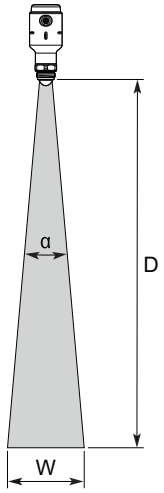
Related information

Product certifications

Beam angle and beam width

The transmitter should be mounted with as few internal structures as possible within the signal beam.

Figure 11: Beam Angle and Beam Width



Beam angle (α)

10°

Beam width

See Table 5 for beam width at different distances.

Table 5: Beam Width

Distance (D)	Beam width (W)
6.6 ft. (2 m)	1.2 ft. (0.4 m)
13.1 ft. (4 m)	2.3 ft. (0.7 m)
19.7 ft. (6 m)	3.5 ft. (1.1 m)
26.2 ft. (8 m)	4.6 ft. (1.4 m)
32.8 ft. (10 m)	5.8 ft. (1.8 m)

Nozzle requirements

To allow the microwaves to propagate undisturbed, the nozzle dimensions should be kept within the specified limits as given in Table 6. The inside of the nozzle must be smooth (i.e. avoid bad welding, rust, or deposit).

Figure 12: Mounting in Nozzles

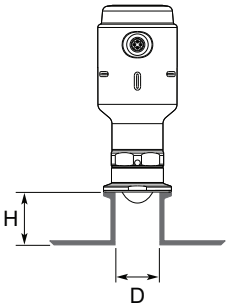


Table 6: Nozzle Requirements

Nozzle diameter (D)	Maximum nozzle height (H)
1 in. (25 mm)	3.9 in. (100 mm)
1.5 in. (40 mm)	5.9 in. (150 mm)
2 in. (50 mm)	7.9 in. (200 mm)
3 in. (80 mm)	11.8 in. (300 mm)
4 in. (100 mm)	15.8 in. (400 mm)
6 in. (150 mm)	23.6 in. (600 mm)

For 3-A® and EHEDG applications, the allowed nozzle height is further restricted to ensure cleanability.

Table 7: Nozzle Height in 3-A and EHEDG Applications

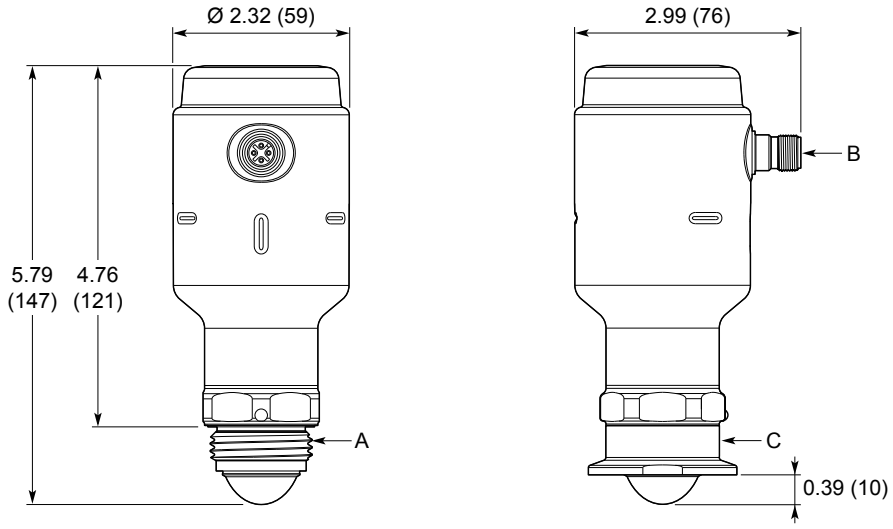
Standard	Maximum nozzle height (H)
3-A	Must not exceed 2 x Nozzle diameter (D) nor 5 in. (127 mm)
EHEDG	Must not exceed Nozzle diameter (D) − 0.95 in. (24 mm)

Product certifications

See the Rosemount 1408H Product Certifications document for detailed information on the existing approvals and certifications.

Dimensional drawings

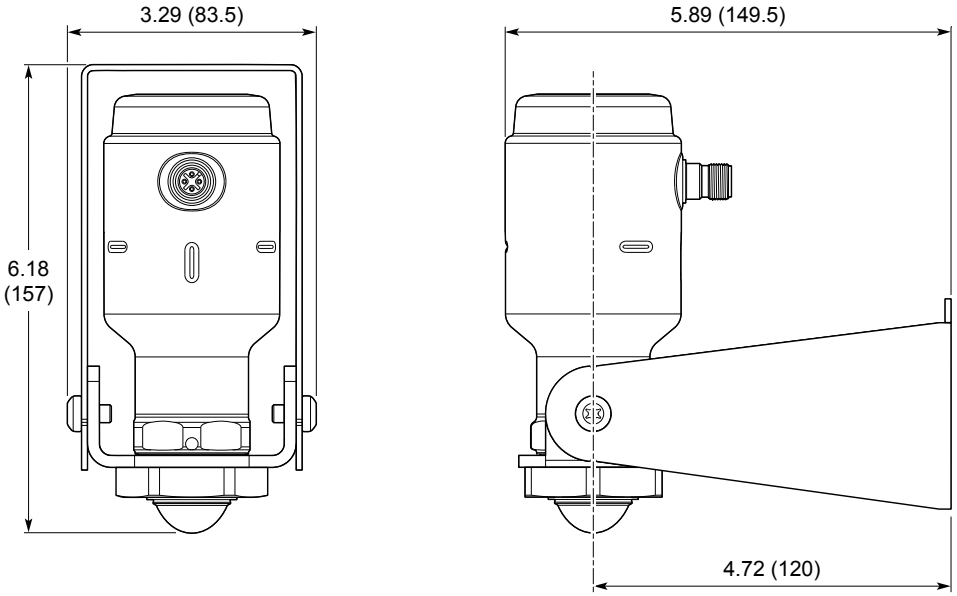
Figure 13: Rosemount 1408H



A. ISO 228/1-G1 thread
B. M12 connector (A-coded)
C. Hygienic process connection adapter

Dimensions are in inches (millimeters).

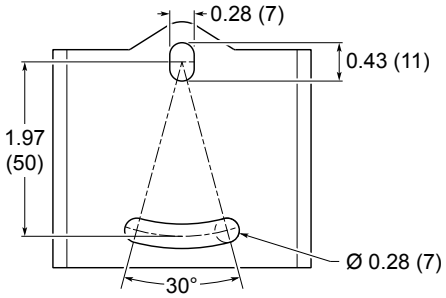
Figure 14: Mounting Bracket



Dimensions are in inches (millimeters).

Bracket hole pattern

Figure 15: Hole Pattern



Dimensions are in inches (millimeters).

Related information

Type 1 Drawing

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