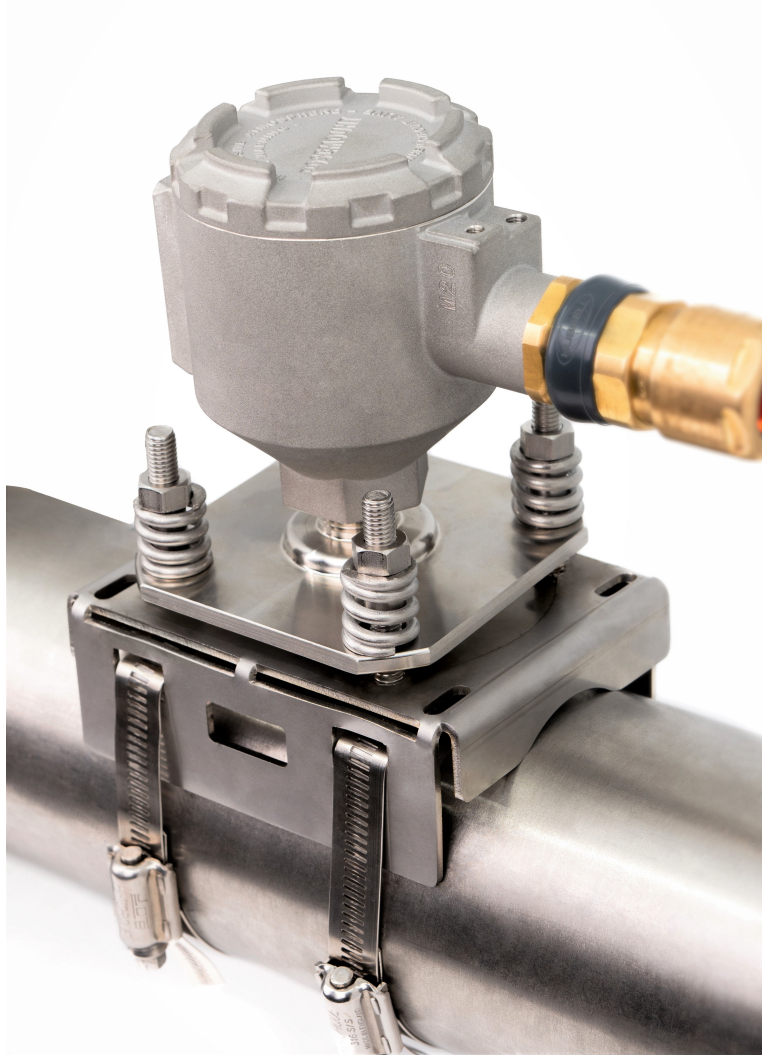


Rosemount™ SAM42 Acoustic Particle Monitor

Non-intrusive Sand Monitoring



Rosemount SAM42 is a sensitive and reliable acoustic particle monitor that enables you to optimize production without compromising the asset safety by minimizing the erosion risk within your pipework.

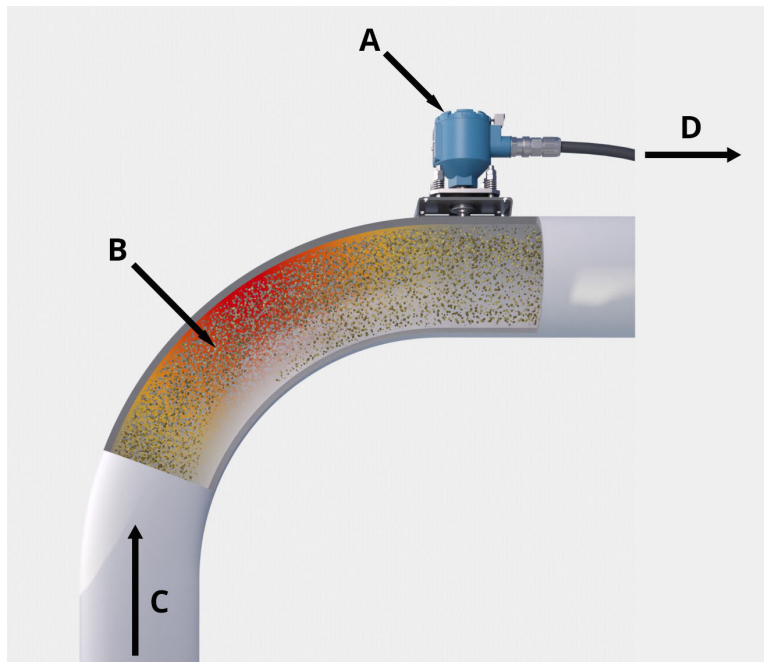
Rosemount SAM42 provides instant sand rates and an indication of solid particles production, with the ability to detect low concentration solids in challenging conditions, giving industry leading sand measurement repeatability and sensitivity. The key benefits are:

- Non-intrusive sensor with onboard data processing makes no software requirement
- Real-time sand rates even in low concentrations enable improved decision making
- Compact design explosion proof and intrinsically safe supports a simple deployment in-field with reduced maintenance costs
- High temperature option operates up to 554 °F (290 °C) at pipe surface

Working principle

The Rosemount SAM42 Acoustic Particle Monitor is a non-intrusive device that detects the sound generated by the solid particles as they hit the pipe wall on a bend. The sensor picks up the sound and converts it to a digital signal providing sand intensity (μV), sand rate (g/s), or accumulated sand mass (g) output.

Figure 1: SAM 42 Working principle



- A. SAM42 Acoustic Particle Monitor
- B. Solid particles impacting the pipe
- C. Direction of flow
- D. Output:
 - Sand intensity (μV)
 - Sand rate (g/s)
 - Accumulated sand (g)

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Product specifications

Applicable for both Ex I and Ex d Acoustic Particle Monitors.

Item	Description
Communication specifications	
Protocol	Modbus® RTU RS485
Transmit rate	1 second
Output	<ul style="list-style-type: none"> ▪ Sand intensity (μV) ▪ Sand rate (g/s) (requires flow velocity input) ▪ Accumulated sand (g) (requires flow velocity input)
Alarms	<ul style="list-style-type: none"> ▪ Sand rate alarm (onboard alarm) ▪ Mass accumulation alarm (onboard alarm) ▪ Sand intensity alarm (to be configured in DCS)
Performance specifications	
Repeatability	Better than 1% ⁽¹⁾ , meaning that the sensor signal will read the same values repeatedly with less than 1% deviation
Minimum detectable sand rate	0.01 g/s ⁽¹⁾
Uncertainty	$\pm 5\%$ ⁽¹⁾ (with sand injection calibration)
Minimum required flow velocity	3.28 ft/s (1 m/s) ⁽¹⁾
Detectable particle size	From 15 μm ⁽¹⁾ in gas, and 25 μm ⁽¹⁾ in liquid, depending on flow velocity
Pipe surface temperature	<ul style="list-style-type: none"> ▪ Standard temperature: $-40\text{ }^\circ\text{F}$ ($-40\text{ }^\circ\text{C}$) to $266\text{ }^\circ\text{F}$ ($130\text{ }^\circ\text{C}$) ▪ High temperature: $-40\text{ }^\circ\text{F}$ ($-40\text{ }^\circ\text{C}$) to $554\text{ }^\circ\text{F}$ ($290\text{ }^\circ\text{C}$)
Ambient temperature	$-40\text{ }^\circ\text{F}$ ($-40\text{ }^\circ\text{C}$) to $167\text{ }^\circ\text{F}$ ($75\text{ }^\circ\text{C}$) for T6 $-40\text{ }^\circ\text{F}$ ($-40\text{ }^\circ\text{C}$) to $176\text{ }^\circ\text{F}$ ($80\text{ }^\circ\text{C}$) for T2–T5
Storage temperature	$-4\text{ }^\circ\text{F}$ ($20\text{ }^\circ\text{C}$) to $104\text{ }^\circ\text{F}$ ($40\text{ }^\circ\text{C}$)
Environmental conditions	This equipment is suitable for outdoor use under the following conditions: <ul style="list-style-type: none"> ▪ Maximum altitude: 6561.7 ft. (2000 m) ▪ 0 to 100% relative humidity
Pipe diameter	2 in. (50 mm) to 48 in. (1200 mm)
Mounting position	Within 75 cm of a 90° bend
Flow patterns	Liquid, Gas, Multiphase, including Churn ⁽¹⁾
External power supply	24 VDC nominal voltage, 9 V–28 V rated voltage range or 100–240 VAC (a separate power supply unit is available upon request) I _{max} 20 mA (maximum input current)
Physical specifications	
IP rating	IP66, IP68, Enclosure Type 4X
Transmitter housing material	SS 316L
Spring material	Stainless steel
Base flange material	Flange: ASTM A479 UNS S31600/S31603 (316/316L)
Mounting socket and strap	SS 316

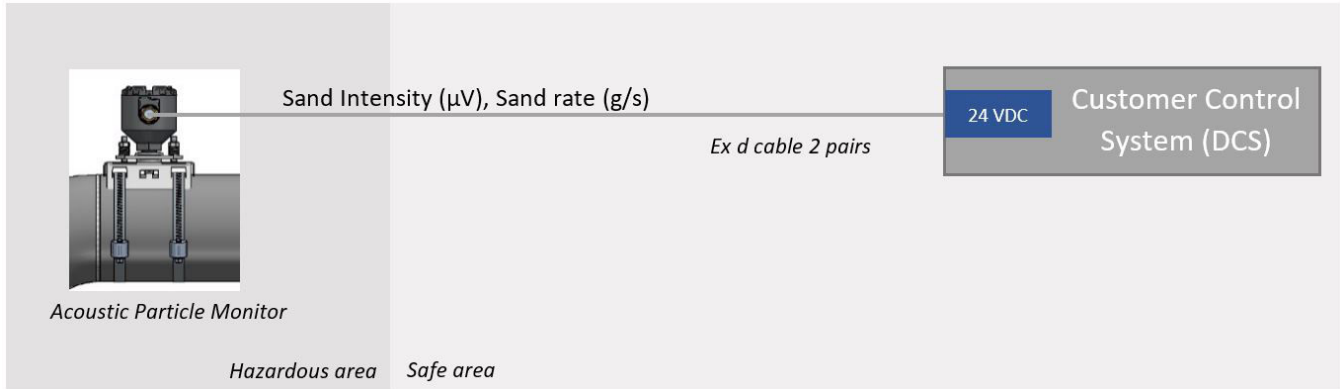
Item	Description
U-bolt for 2-in. pipe mounting	SS 316
Cable entry (detector housing)	M20
Size	3.08 in. (78 mm) OD x 5.42 in. (138 mm) for standard temperature 3.08 in. (78 mm) OD x 6.2 in. (158 mm) for high temperature
Weight	~ 6.6 lb. (3 kg)
Field cable recommended	Ex d: 20110626 BFOU(I) M 250 V 2 pair 18 AWG (0.75 mm ²) S3/S7/S103 GREY. OD 0.57 in. (14.5 mm) Ex ia: 20104969 BFOU(I) M 250 V 2 pair 18 AWG (0.75 mm ²) S3/S7/S103 BLUE. OD 0.57 in. (14.5 mm)
Cable gland	Ex d and Ex ia: Hawke 501/453/Universal, Class1 Div 2, Metric 20 available in brass, nickel-plated brass and stainless steel. For North America only: Hawke ICG/653/Universal, Class1 Div 1, Metric 20, available in stainless steel. Note Alternative cable glands may be used as long as they are suitably rated for the installation location.
Terminal connection block	Connection socket with four ports: two for communication 485, and two for power. Refer to the <i>Rosemount SAM42 Acoustic Particle Monitor Quick Start Guide</i> for details.
Software compatibility	
Software requirement	No software is required.
Process data feed	Processed data is sent from device directly to DCS. Utilizes dedicated Modbus map. Refer to the <i>Rosemount SAM42 Acoustic Particle Monitor Quick Start Guide</i> for details.
Compatibility with other software	Fieldwatch
Approvals	
	Hazardous locations: <ul style="list-style-type: none"> ▪ Ex d: Zone 1 ATEX, IECEx, and Class 1 Div 1 for USA and Canada ▪ Ex i: Zone 0 for ATEX, IECEx Ordinary locations: <ul style="list-style-type: none"> ▪ USA and Canada Refer to the <i>Rosemount SAM42 Acoustic Particle Monitor Quick Start Guide</i> for details.

(1) Performance measured in reference test conditions.

Field block diagram

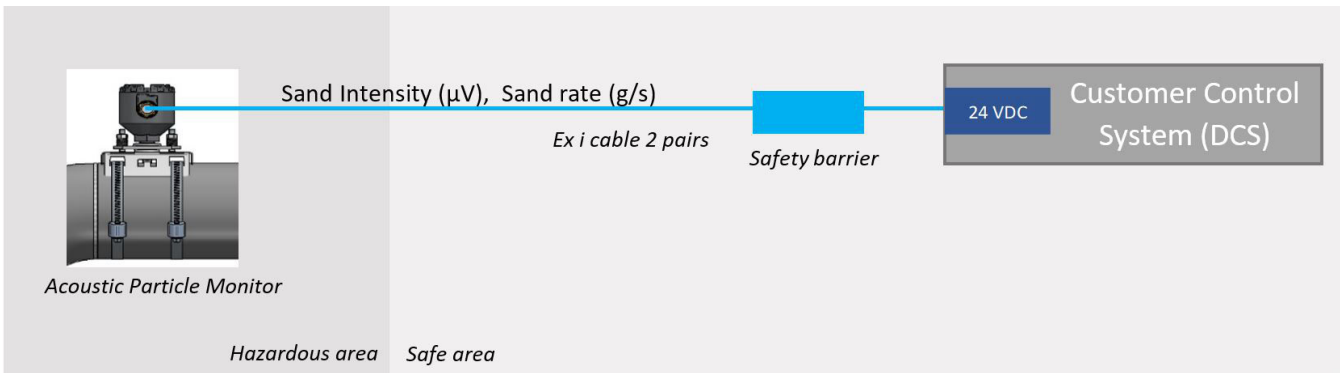
Explosion proof installation

The SAM42 Ex d variant requires no electronics wired in the field. Sand rate and sand intensity output are delivered from the detector to client DCS (Distributed Control System) via Ex d cable.



Intrinsically safe installation

The SAM42 Ex i variant requires a safety barrier to be mounted in safe area to ensure the integrity of the intrinsically safe circuit. Sand rate and sand intensity output are delivered from the detector to client DCS via Ex i cable.



Ordering information

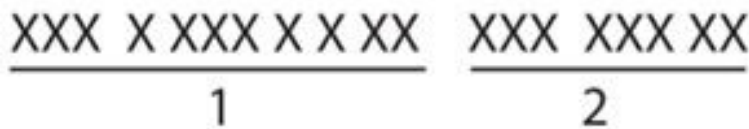
Specifications and options

The purchaser of the equipment must make the specification and selection of product materials, options, or components.

Model code

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 2.

Figure 2: Model code example



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

Optimizing lead time

The starred offerings (★) represent the most common options and should be selected for the fastest delivery times. The non-starred offerings are subject to additional delivery lead time.

Required model components

Model

Code	Description	
SAM42	Acoustic Particle Monitor	★

Performance class

Code	Description	
B	Standard performance	★

Functional properties

Code	Description	
ST	Standard temperature version: -40 °F (-40 °C) to 266 °F (130 °C)	★
HT	High temperature version: -40 °F (-40 °C) to 554 °F (290 °C)	

Main material (sensor housing)

Code	Description	
A	Stainless Steel 316L	★

Detector approvals

Code	Description	
I1	ATEX Intrinsic Safety	★
I7	IECEX Intrinsic Safety	★
E1	ATEX Flameproof	★
E7	IECEX Flameproof	★
E5	USA Explosion proof	★
E6	Canada Explosion proof	★

Communication interface/ supply voltage required

Code	Description	
A1	Modbus® RTU / 24 VDC	For 100–240 VAC, 50/60 Hz, power supply is offered separately. ★

Additional options

Barrier

Code	Description	
B0	No barrier (for Ex d) Client Provided barrier (for Ex ia)	★
B1 ⁽¹⁾	Zener barrier (IS)	
B2 ⁽¹⁾	Galvanic isolator barrier (Non ISE)	

⁽¹⁾ Not available with Detector Approvals, options E1, E5, E6, and E7.

Pipe size

Code	Description	
P1	Mounting fixture for 2-in. (50 mm) pipe size	
P2	Mounting fixtures from 2 ½-in. (65 mm) to 48-in. (1200 mm) pipe size	★

Field cable gland/ field cable size range

Code	Description	
	Field cable ⁽¹⁾ gland and size range	
G0	No gland (client provided)	★
M2	Brass, M20, Hawke 501/453/Universal Cable size range: OD: 0.49 - 0.81 in. (12.5–20.5 mm) ⁽²⁾ , ID: 0.33 - 0.56 in. (8.4–14.3 mm) Class 1 Div. 2	★

Code	Description	
	Field cable⁽¹⁾ gland and size range	
M3	Nickel-plated brass, M20, Hawke 501/453/Universal Cable size range: OD: 0.49 - 0.81 in. (12.5–20.5 mm) ⁽²⁾ , ID: 0.33 - 0.56 in. (8.4–14.3 mm) Class 1 Div. 2	★
M4	SS316, M20, Hawke 501/453/Universal Cable size range: OD: 0.49 - 0.81 in. (12.5–20.5 mm) ⁽²⁾ , ID: 0.33 - 0.56 in. (8.4–14.3 mm) Class 1 Div. 2	
M5	SS316, M20, Hawke ICG/653/Universal Cable size range: OD: 0.49 - 0.81 in. (12.5–20.5 mm) ⁽²⁾ , ID: Max. 0.55 in. (14 mm) Class 1 Div. 1	

- (1) *The field cable is not part of the model code for the transmitter, and the option must be communicated to the sales representative to include it in the quotation.*
- (2) *For cable sizes above 0.81 in. (20.5 mm) OD, a suitable cable gland must be used. Refer to [Field cable and glands specifications](#).*

Tag plates

Code	Description	
T0	No tag — Customer information not required.	★
T1	Instrument tagging — Customer information required (max. 30 characters), Dim 60 x 15 mm, SS	★

Product specific options

Code	Description	
C0	No coating	★
C6	Standard coating for SS (Sensor housing)	

Spare parts and accessories

Part number	Description
ROXA20101159	Strap kit
ROXA20101171	U-bolt for 2-in. (50 mm) pipe x 2.95 in. (75 mm) THD M5 - KIT
ROXA20102233	Mounting socket ST - KIT
ROXA20102234	Mounting socket HT - KIT
ROXA20101162	Fixing mounting socket kit
ROXA20102952	Cover O-ring kit, BUNA-N, 146, 5 pcs.
ROXA20102320	Cable BFOU(I) M 250 V 2 pair 18 AWG (0.75 mm ²) S3/S7/S103 gray, Ex d
ROXA20102321	Cable BFOU(I) M 250 V 2 pair 18 AWG (0.75 mm ²) S3/S7/S103 blue, Ex ia
ROXA20077447	Exd gland kit M20, Brass, Hawke 501/453/Univ, for cable size 0.49 - 0.81 in. (12.5–20.5 mm) OD / 0.33 - 0.56 in. (8.4–14.3 mm) ID, Class 1 Div. 2
ROXA20077448	Exd gland kit M20, Nickel-plated brass, Hawke 501/453/Univ, for cable size 0.49 - 0.81 in. (12.5–20.5 mm) OD / 0.33 - 0.56 in. (8.4–14.3 mm) ID, Class 1 Div. 2
ROXA20083511	Exd gland kit M20, SS316, Hawke 501/453/Univ, for cable size 0.49 - 0.81 in. (12.5–20.5 mm) OD / 0.33 - 0.56 in. (8.4–14.3 mm) ID, Class 1 Div. 2

Part number	Description
ROXA20103878	Exd gland kit M20, SS316, Hawke ICG/653/Univ, for cable size 0.49 - 0.81 in. (12.5–20.5 mm) OD / 0.55 in. (14 mm) max. ID, Class 1 Div. 1
ROX000085499	Safety barrier MTL7787+
ROX000085514	Isol. barrier MTL5541, repeater power supply
ROXA20104159	Loctite SI 5920, 80 mL

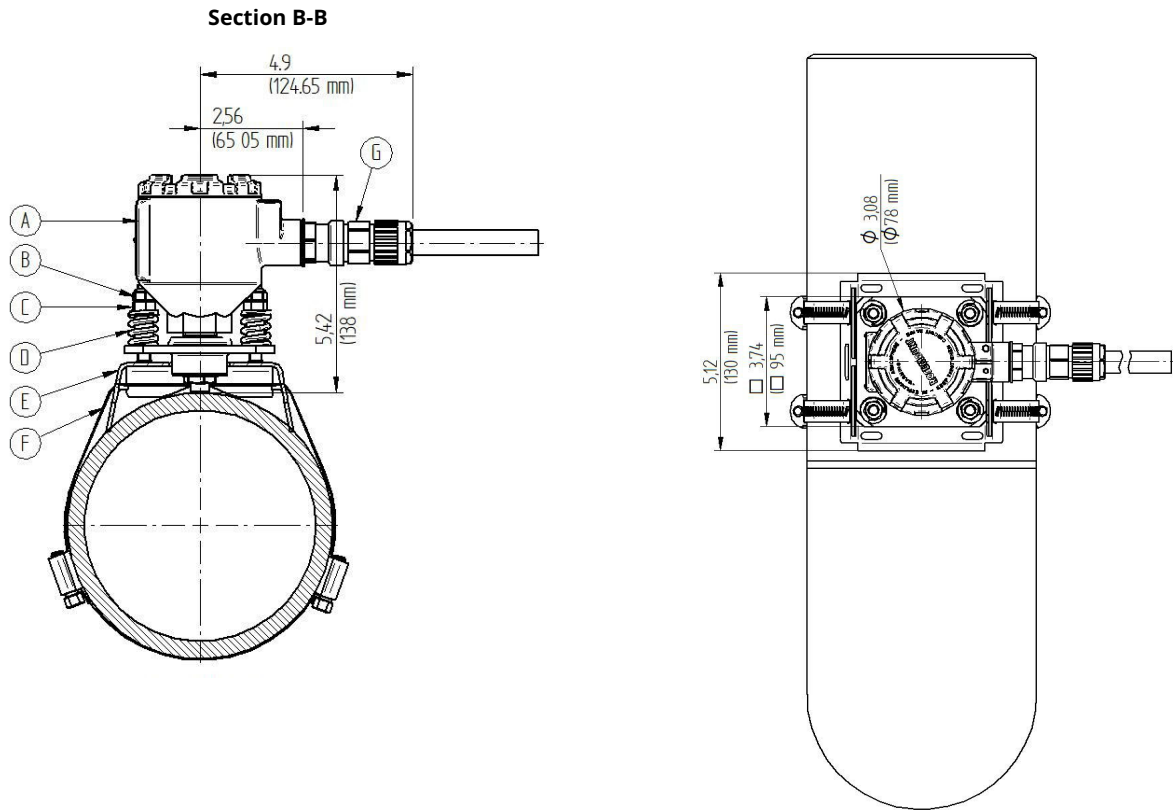
Product certifications

For Rosemount SAM42 product certifications, see the *Rosemount SAM42 Acoustic Particle Detector Quick Start Guide*.

Detector dimensions and main components

SAM42 Standard Temperature version

Figure 3: Dimensions for SAM42 Standard Temperature version (side and top view)



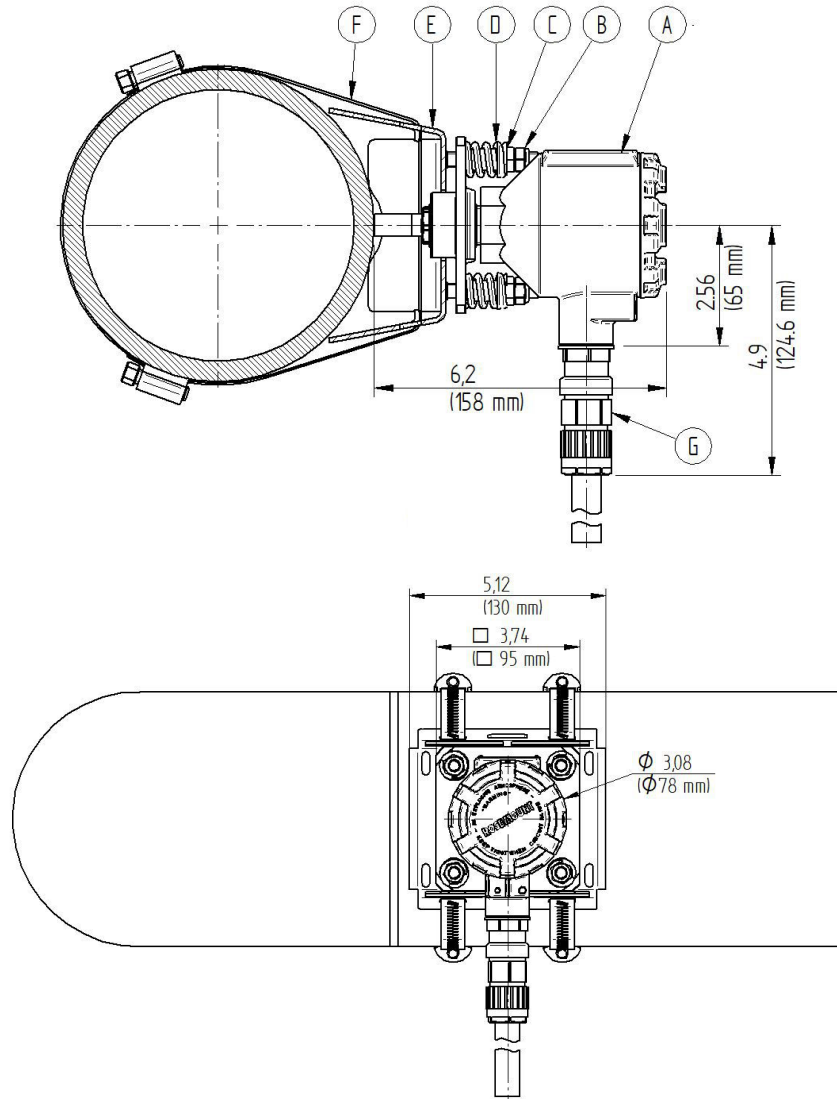
- A. SAM42 Detector housing
- B. Fixing nuts
- C. Fixing nuts
- D. Tensioning spring
- E. Mounting socket
- F. Mounting strap with tightening worm
- G. Cable gland for field cable

Dimensions are in inches (mm).

SAM42 High Temperature version

Figure 4: Dimensions for SAM42 High Temperature version (side and top view)

Section B-B



- A. SAM42 Detector housing
- B. Fixing nuts
- C. Fixing nuts
- D. Tensioning spring
- E. Mounting socket
- F. Mounting strap with tightening worm
- G. Cable gland for field cable

Dimensions are in inches (mm).

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

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