

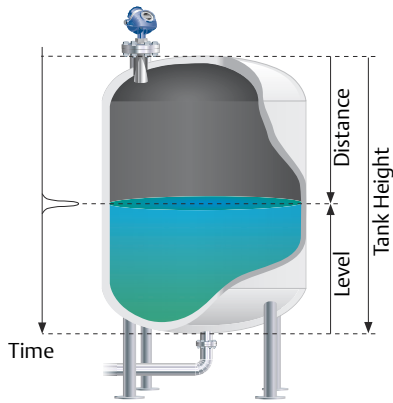
# Rosemount 5400 Series

## Superior Performance Two-Wire Non-Contacting Radar Level Transmitter

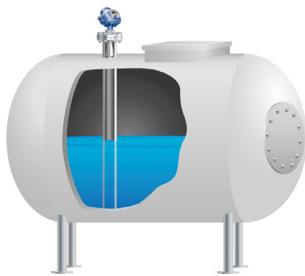


- Accurate and reliable, direct level measurement, virtually unaffected by process conditions
- Best performance and uptime provided by dual port technology, advanced surface tracking capability, and condensation- and dirt-resistant antennas
- Easy installation and commissioning through circular polarization and powerful, easy-to-use configuration tools
- High application flexibility, including solids, with a wide range of process connections, materials, antennas, and low and high frequency models
- Minimized maintenance with no contact and no moving parts; no re-calibration required
- Increased safety. Third party approved for overfill protection and safety integrated system suitability

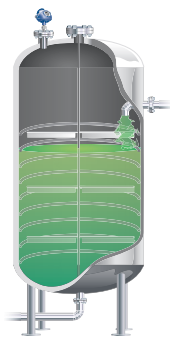
# Innovation that delivers clear business results



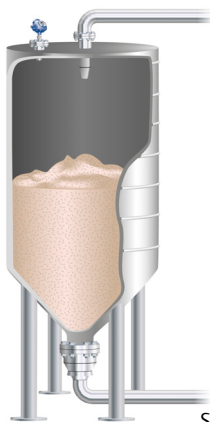
Storage and buffer tanks



Pipes, stilling wells, and underground tanks



Reactor and mixing tanks



Solids applications

## Measurement principle

The distance to the surface is measured by short radar pulses, which are transmitted from the antenna at the tank top. When a radar pulse reaches a media with a different dielectric constant, part of the energy is reflected back to the transmitter. The time difference between the transmitted and the reflected pulse is proportional to the distance to the product surface, from which the level, volume, and level rate are calculated.

Applications with, for example, turbulence, foam, long measuring ranges, disturbing objects, and low dielectric constants can reduce the energy reflecting back, and in worst case eliminate it completely with the result that no surface can be detected. The reflection intensity can however be improved by using a high performance radar with dual port technology, and thereby detect the surface in challenging applications.

## Radar technology benefits

- Highly accurate and reliable direct level measurement with no compensation needed for changing process conditions (such as density, conductivity, viscosity, pH, dielectric, temperature, and pressure)
- Top down installation minimizes risk for leakages and allows for installation with liquid in the tank
- No moving parts and no re-calibration needed result in minimized maintenance
- Non-contacting technology is ideal for dirty, coating, and corrosive applications

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### Special 5400 features

#### High application flexibility

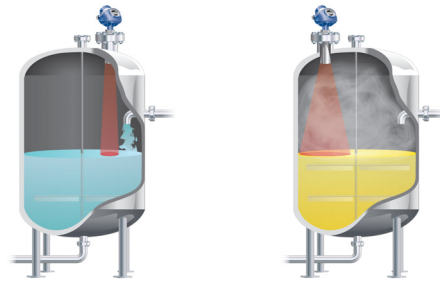
- Suitable for most liquid and slurry level applications and process conditions from challenging reactor tanks to storage and buffer tanks
- Suitable for solids applications. See page 33 for more information.
- Low and high frequency models
- A wide selection of materials, process connections, antenna styles, and accessories
- Dual port technology to increase the signal strength and provide measurement in challenging applications
- Can be isolated by full-port ball valves

#### Best performance and uptime

- Dual port technology ensures reliability, even with disturbing factors, longer measuring ranges, and lower dielectrics
- Advanced surface tracking provides the ability to handle weak echoes reliably by identifying the true echo and registering false echoes
- Condensation- and dirt- resistant antennas maximize uptime
- Uninterrupted process monitoring reduces downtime

#### Robust design reduces costs and increases safety

- Robust, shock-resistant, and vibration-proof design
- Detachable transmitter head allows the tank to remain sealed
- Dual Compartment housing separates cable connections and electronics for safer handling and improved moisture protection



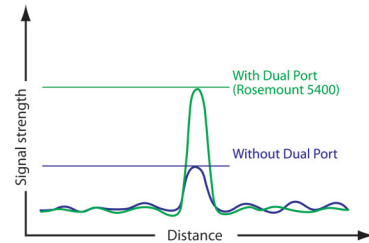
High frequency is preferred in most other applications due to greater mounting flexibility.

Low frequency is preferred when measuring in vapor and foam.

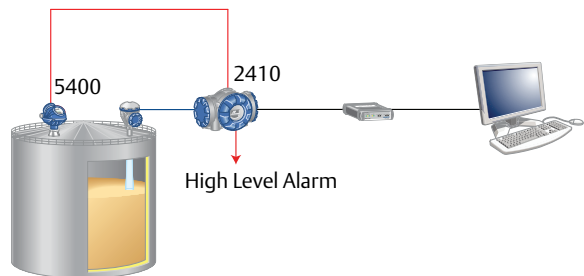
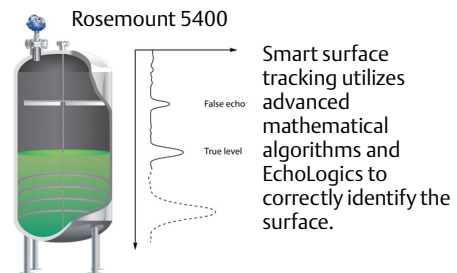


Cone Extended cone Process seal Rod antenna Bracket mount

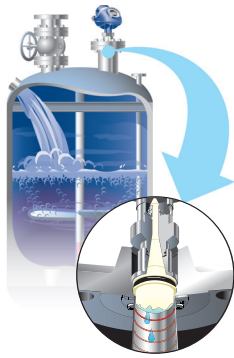
High application flexibility



The unique dual microwave ports for sending and receiving radar signals yield a 75% stronger signal than single port transmitters.



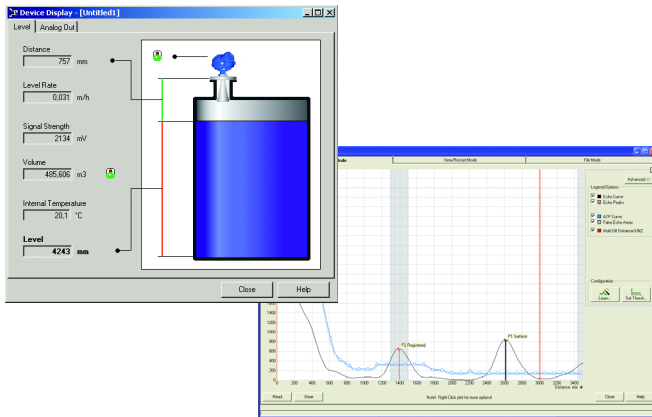
Independent alarm sensor in a continuous overflow prevention tank gauging system



Larger sealing surface towards the process connection, making the transmitter less sensitive to condensation and dirt. Circular polarization will automatically reduce the disturbance effect close to tank walls and obstacles.



Robust modular design



Rosemount Radar Master enables easy configuration and service with a wizard, an echo curve tool with the "Measure and Learn" function, offline/online configuration, an extensive online help, logging capabilities, and more.

### Easy installation and plant integration

- Circular polarization minimizes installation constraints
- MultiVariable™ device reduces the number of process penetrations
- Seamless system integration with HART®, FOUNDATION™ fieldbus, Modbus®, or IEC 62591 (WirelessHART®) with the Smart Wireless THUM™ adapter
- MultiVariable output includes the choice of level, distance, volume, and signal strength
- Pre-configured or easy configuration in Rosemount Radar Master with a five-step wizard, auto connect, and online help
- Supports DD compatible configuration tools such as AMST™ Device Manager, and Field Communicator
- Enhanced DD with step-by-step configuration and echo curve capability (HART)
- DTM with echo curve capability for use in FDT®/DTM™ compatible configuration tools such as PACTware™, Yokogawa® FieldMate/PRM

### Minimized maintenance reduces cost

- No contact with media and no mechanical moving parts
- No re-calibration or compensation needed
- Easy online troubleshooting with user friendly software, utilizing powerful echo curve and logging tools
- Predictive maintenance with advanced diagnostics and PlantWeb® alerts

# Rosemount 5402 High Frequency Radar Level Transmitter Ordering Information



5402 Radar Level Transmitter

Rosemount 5402 High Frequency Radar Level Transmitter is a reliable 2-wire radar level transmitter designed for outstanding performance in a wide range of applications and process conditions.

Characteristics include:

- The preferred choice for most applications especially where the nozzle size is 4 in. or less
- High frequency (26 GHz) meaning a concentrated radar beam resulting in smaller antenna diameters
- The narrow beam means suitable for mounting on valves, taller nozzles, smaller openings, and that it is easier to avoid unwanted reflections from mechanical obstacles such as agitators and heating coils
- Build-up resistant cone antenna
- Condensation resistant process seal antenna

Rosemount 5402 with 4 inch cone antenna available for solids applications. See [page 16](#) and [page 33](#) for more information.

## Additional information

Specifications: [page 16](#)

Certifications: [page 34](#)

Dimensional drawings: [page 39](#)

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [page 29](#) for more information on Material Selections.

**Table 1. 5402 High Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

Model	Product description	
5402	High frequency version (~26 GHz)	★
<b>Housing material</b>		
A	Polyurethane-covered Aluminum	★
S	Stainless Steel (SST), Grade CF8M (ASTM A743)	
<b>Signal output</b>		
H	4-20 mA with HART communication (HART Revision 5, see <a href="#">page 16</a> for details)	★
F	FOUNDATION fieldbus (see <a href="#">page 19</a> for details)	★
M	RS-485 with Modbus communication (see <a href="#">page 20</a> for details)	★
U	Rosemount 2410 tank hub connectivity (consult factory for details)	
<b>Conduit/cable threads</b>		
1	½ in. - 14 NPT	★
2	M20 x 1.5 adapter	★
E <sup>(1)</sup>	M12, 4-pin, male connector (eurofast <sup>®</sup> )	★
M <sup>(1)</sup>	A size Mini, 4-pin, male connector (minifast <sup>®</sup> )	★

**Table 1. 5402 High Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

4	2 pcs M20 x 1.5 adapters (consult factory for details)	
G <sup>(2)(3)</sup>	2 pcs metal cable glands (½-14 NPT), (consult factory for details)	
<b>Product certifications</b>		
NA	No product certificates	★
E1 <sup>(1)</sup>	ATEX Flameproof	★
I1	ATEX Intrinsic safety	★
IA <sup>(4)</sup>	ATEX FISCO Intrinsic safety	★
E5 <sup>(1)</sup>	FM Explosion-proof	★
I5	FM Intrinsic safety and non-incendive	★
IE <sup>(4)</sup>	FM FISCO Intrinsic safety	★
E6 <sup>(1)</sup>	CSA Explosion-proof	★
I6	CSA Intrinsic safety	★
IF <sup>(4)</sup>	CSA FISCO Intrinsic safety	★
E7 <sup>(1)</sup>	IECEX Flameproof	★
I7	IECEX Intrinsic safety	★
IG <sup>(4)</sup>	IECEX FISCO Intrinsic safety	★
E2	INMETRO Flameproof	
EM	Technical Regulations Customs Union (EAC) Flameproof (consult factory for details)	
I2	INMETRO Intrinsic safety	
IB	INMETRO FISCO Intrinsic safety	
E3 <sup>(1)</sup>	NEPSI Flameproof	
I3	NEPSI Intrinsic safety	
IC	NEPSI FISCO Intrinsic safety	
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety (consult factory for details)	
E4 <sup>(5)</sup>	TIIS Flameproof	
N1 <sup>(1)</sup>	ATEX Type n (consult factory for details)	
N7 <sup>(1)</sup>	IECEX Type n (consult factory for details)	
<b>Antenna - size and material (for process connection availability, reference to “Dimensional Drawings and Mechanical Properties” on page 39)</b>		
<b>Cone antennas</b>		
2S	2 in. DN 50, 316L SST (EN 1.4404)	★
3S	3 in. DN 80, 316L SST (EN 1.4404)	★
4S	4 in. DN 100, 316L SST (EN 1.4404)	★
2H	2 in. DN 50, Alloy C-276 (UNS N10276) with protective plate	

**Table 1. 5402 High Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

3H	3 in. DN 80, Alloy C-276 (UNS N10276) with protective plate	
4H	4 in. DN 100, Alloy C-276 (UNS N10276) with protective plate	
2M	2 in. DN 50, Alloy 400 (UNS N04400) with protective plate	
3M	3 in. DN 80, Alloy 400 (UNS N04400) with protective plate	
4M	4 in. DN 100, Alloy 400 (UNS N04400) with protective plate	
2N	2 in. DN 50, 316L SST (EN 1.4404), with protective plate. Complies with guidelines in NACE® MR0175/ISO 15156 and NACE MR0103.	
3N	3 in. DN 80, 316L SST (EN 1.4404), with protective plate. Complies with guidelines in NACE MR0175/ISO 15156 and NACE MR0103.	
4N	4 in. DN 100, 316L SST (EN 1.4404), with protective plate. Complies with guidelines in NACE MR0175/ISO 15156 and NACE MR0103.	
<b>Process seal antennas</b>		
2P	2 in. (DN50), PTFE (requires tank sealing code NA)	
3P	3 in. (DN80), PTFE (requires tank sealing code NA)	
4P	4 in. (DN100), PTFE (requires tank sealing code NA)	
<b>Other antennas</b>		
XX	Customer specific	
<b>Tank sealing, o-ring material</b>		
PV	Viton® Fluoroelastomer	★
PK	Kalrez® 6375 Perfluoroelastomer	★
PE	Ethylene Propylene (EPDM)	★
PB	Nitrile Butadiene (NBR)	★
NA <sup>(6)</sup>	None	★
<b>Process connection and material (for antenna availability, reference to “Dimensional Drawings and Mechanical Properties” on page 39)</b>		
<b>ASME/ANSI flanges (316/316L SST)<sup>(7)</sup></b>		
AA	2 inch, 150 lb	★
AB	2 inch, 300 lb	★
BA	3 inch, 150 lb	★
BB	3 inch, 300 lb	★
CA	4 inch, 150 lb	★
CB	4 inch, 300 lb	★
DA	6 inch, 150 lb	★
EA	8 inch, 150 lb	★
<b>EN (DIN) flanges (EN 1.4404 SST)<sup>(7)</sup></b>		
HB	DN 50 PN 40	★

**Table 1. 5402 High Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

IB	DN 80 PN 40	★
JA	DN 100 PN 16	★
JB	DN 100 PN 40	★
KA	DN 150 PN 16	★
LA	DN 200 PN 16	★
<b>JIS flanges (EN 1.4404 SST)<sup>(7)</sup></b>		
UA	50A 10K	★
VA	80A 10K	★
XA	100A 10K	★
YA	150A 10K	★
ZA	200A 10K	★
<b>Other flanges</b>		
BR <sup>(8)</sup>	Bracket mounting, 316L / EN 1.4404 SST	
XX	Customer specific	
<b>Options</b>		
M1	Integral digital display	★
GC	Transparent meter glass protection cover made of PTFE / FEP	★
T1	Transient protection terminal block (standard with FISCO options)	★
<b>Factory configuration</b>		
C1	Factory configuration (Configuration Data Sheet required with order, available at <a href="http://www.rosemount.com">www.rosemount.com</a> )	★
<b>Alarm limit configuration</b>		
C4	NAMUR alarm and saturation levels, high alarm	★
C8 <sup>(9)</sup>	Low alarm (standard Rosemount alarm and saturation levels)	★
<b>Overfill</b>		
U1 <sup>(10)</sup>	WHG Overfill approval	★
<b>Special certifications</b>		
Q4	Calibration Data Certificate	★
Q8 <sup>(11)</sup>	Material Traceability Certification per EN 10204 3.1	★
N2 <sup>(12)</sup>	Certificate of compliance with guidelines in NACE MR0175/ISO 15156 and NACE MR0103	
QG	GOST Primary Verification Certificate	
<b>Safety certifications</b>		
QS <sup>(10)</sup>	Prior use certificate of FMEDA data	
<b>Shipboard approvals<sup>(13)</sup></b>		
SBS	American Bureau of Shipping Type Approval (consult factory for details)	



**Table 1. 5402 High Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

SDN	Det Norske Veritas (DNV) Type Approval (consult factory for details)	
SLL	Lloyd's Register Type Approval (consult factory for details)	
SBV	Bureau Veritas Type Approval (consult factory for details)	
SRS	Russian Maritime Register of Shipping Type Approval (consult factory for details)	
SGL	Germanischer Lloyd Type Approval (consult factory for details)	
<b>Special procedures</b>		
P1 <sup>(8)</sup>	Hydrostatic testing	★
<b>Antenna extension</b>		
S3 <sup>(14)</sup>	Cone Antenna extension in 316 / 316L / EN 1.4404 SST. To be used if there are irregularities in the nozzle. Fits nozzles up to 20 in. (500 mm).	
<b>Diagnostics functionality (see page 22 for more information)</b>		
D01	FOUNDATION fieldbus Diagnostics Suite (includes Signal Quality Metrics diagnostics) (consult factory for details)	
DA1	HART Diagnostics Suite (includes Signal Quality Metrics diagnostics) (consult factory for details)	
<b>Solids applications (see page 33 for more information)</b>		
SM1	Solids Measurement mode	★
<b>Engineered solutions (see page 29)</b>		
Rxxxx	Engineered Solutions beyond standard model codes (consult factory for details)	
<b>Typical model number: 5402 A H 1 E5 4S PV CA - M1 C1</b>		

(1) Options E (eurofast) and M (minifast) are not available with explosion-proof, flameproof, or type n approvals.

(2) Min temperature -20 °C (-4 °F).

(3) Not available with explosion-proof, flameproof, or type n approvals.

(4) Requires FOUNDATION fieldbus signal output ( $U_i$  parameter listed in "Product Certifications" on page 34).

(5) G ½ in. SST cable gland is included in delivery.

(6) Requires Process Seal Antenna (2P-4P). O-rings are not wetted.

(7) See "Process connections" on page 44 for Face style.

(8) Bracket mounting (BR) is not available with hydrostatic testing (P1).

(9) The standard alarm setting is high.

(10) Only available with 4-20 mA HART signal output.

(11) Certificate includes all pressure retaining wetted parts.

(12) Requires Protective Plate Cone Antennas (2H-4H, 2M-4M, 2N-4N) or Process Seal Antennas (2P-4P).

(13) Only for stainless steel housing material (code S). Not available with Modbus signal output (code M). Contact an Emerson Process Management representative for additional information.

(14) Requires a SST Cone Antenna (2S-4S).

# Rosemount 5401 Low Frequency Radar Level Transmitter Ordering Information



5401 Radar Level Transmitter

Rosemount 5401 Low Frequency Radar Level Transmitter is a reliable 2-wire radar level transmitter designed for use in applications with some specific process conditions. Characteristics include:

- Low frequency (6 GHz) meaning a wider radar beam resulting in larger cone antenna diameters
- Ideal for applications with obstacles, turbulence, condensation, vapor, dust, contamination, and foam, or where there is a risk of deposits forming on the antenna
- Condensation resistant cone or rod antennas

## Additional information

Specifications: [page 16](#)

Certifications: [page 34](#)

Dimensional Drawings: [page 39](#)

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [page 29](#) for more information on Material Selections.

**Table 2. 5401 Low Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

Model	Product description	
5401	Low frequency version (~6 GHz)	★
<b>Housing material</b>		
A	Polyurethane-covered aluminum	★
S	Stainless Steel (SST), Grade CF8M (ASTM A743)	
<b>Signal output</b>		
H	4-20 mA with HART communication (HART Revision 5, see <a href="#">page 16</a> for details)	★
F	FOUNDATION fieldbus (see <a href="#">page 19</a> for details)	★
M	RS-485 with Modbus communication (see <a href="#">page 20</a> for details)	★
U	Rosemount 2410 tank hub connectivity (consult factory for details)	
<b>Conduit / cable threads</b>		
1	½ in. - 14 NPT	★
2	M20 x 1.5 adapter	★
E <sup>(1)</sup>	M12, 4-pin, male connector (eurofast)	★
M <sup>(1)</sup>	A size Mini, 4-pin, male connector (minifast)	★
<b>Product certifications</b>		
NA	No product certificates	★
E1 <sup>(1)</sup>	ATEX Flameproof	★
I1	ATEX Intrinsic safety	★

**Table 2. 5401 Low Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

IA <sup>(2)</sup>	ATEX FISCO Intrinsic safety	★
E5 <sup>(1)</sup>	FM Explosion-proof	★
I5	FM Intrinsic safety and non-incendive	★
IE <sup>(2)</sup>	FM FISCO Intrinsic safety	★
E6 <sup>(1)</sup>	CSA Explosion-proof	★
I6	CSA Intrinsic safety	★
IF <sup>(2)</sup>	CSA FISCO Intrinsic safety	★
E7 <sup>(1)</sup>	IECEX Flameproof	★
I7	IECEX Intrinsic safety	★
IG <sup>(2)</sup>	IECEX FISCO Intrinsic safety	★
E2	INMETRO Flameproof	
I2	INMETRO Intrinsic safety	
IB	INMETRO FISCO Intrinsic safety	
E3 <sup>(1)</sup>	NEPSI Flameproof	
EM	Technical Regulations Customs Union (EAC) Flameproof (consult factory for details)	
I3	NEPSI Intrinsic safety	
IC	NEPSI FISCO Intrinsic safety	
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety (consult factory for details)	
E4 <sup>(3)</sup>	TIIS Flameproof	
N1 <sup>(1)</sup>	ATEX Type n (consult factory for details)	
N7 <sup>(1)</sup>	IECEX Type n (consult factory for details)	
<b>Antenna - size and material (for process connection availability, reference to “Dimensional Drawings and Mechanical Properties” on page 39)</b>		
<b>Cone antennas</b>		
3S	3 in. DN 80, 316L SST (EN 1.4404)	★
4S	4 in. DN 100, 316L SST (EN 1.4404)	★
6S	6 in. DN 150, 316L SST (EN 1.4404)	★
8S	8 in. DN 200, 316L SST (EN 1.4404)	★
3H	3 in. DN 80, Alloy C-276 (UNS N10276) with protective plate, pipe installations only	
4H	4 in. DN 100, Alloy C-276 (UNS N10276) with protective plate	
6H	6 in. DN 150, Alloy C-276 (UNS N10276) with protective plate	
8H	8 in. DN 200, Alloy C-276 (UNS N10276) with protective plate	
3M	3 in. DN 80, Alloy 400 (UNS N04400) with protective plate, pipe installations only	
4M	4 in. DN 100, Alloy 400 (UNS N04400) with protective plate	

**Table 2. 5401 Low Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

6M	6 in. DN 150, Alloy 400 (UNS N04400) with protective plate	
8M	8 in. DN 200, Alloy 400 (UNS N04400) with protective plate	
3N	3 in. DN 80, 316L SST (EN 1.4404), with protective plate, pipe installations only. Complies with guidelines in NACE MR0175/ISO 15156 and NACE MR0103.	
4N	4 in. DN 100, 316L SST (EN 1.4404), with protective plate. Complies with guidelines in NACE MR0175/ISO 15156 and NACE MR0103.	
6N	6 in. DN 150, 316L SST (EN 1.4404), with protective plate. Complies with guidelines in NACE MR0175/ISO 15156 and NACE MR0103.	
8N	8 in. DN 200, 316L SST (EN 1.4404), with protective plate. Complies with guidelines in NACE MR0175/ISO 15156 and NACE MR0103.	
<b>Rod antennas</b>		
1R <sup>(4)(5)</sup>	Short version, all-PFA, with protective plate, max. nozzle height 4 in. (100 mm), free propagation only	
2R <sup>(4)(5)</sup>	Long version, all-PFA, with protective plate, max. nozzle height 10 in. (250 mm), free propagation only	
3R <sup>(4)</sup>	Short version, SST+PFA, max. nozzle height 4 in. (100 mm), free propagation only	
4R <sup>(4)</sup>	Long version, SST+PFA, max. nozzle height 10 in. (250 mm), free propagation only	
<b>Other antennas</b>		
XX	Customer specific	
<b>Tank sealing, o-ring material</b>		
PV	Viton Fluoroelastomer	★
PK	Kalrez 6375 Perfluoroelastomer	★
PE	Ethylene Propylene (EPDM)	★
PB	Nitrile Butadiene (NBR)	★
PD <sup>(4)</sup>	All-PFA Rod Antennas (O-rings are not wetted)	★
<b>Process connection and material (for antenna availability, refer to “Dimensional Drawings and Mechanical Properties” on page 39)</b>		
<b>ASME/ANSI flanges (316/316L SST)<sup>(6)</sup></b>		
AA	2 in. 150 lb	★
AB	2 in. 300 lb	★
BA	3 in. 150 lb	★
BB	3 in. 300 lb	★
CA	4 in. 150 lb	★
CB	4 in. 300 lb	★
DA	6 in. 150 lb	★
EA	8 in. 150 lb	★

**Table 2. 5401 Low Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

<b>EN (DIN) flanges (EN 1.4404 SST)<sup>(6)</sup></b>		
HB	DN 50 PN 40	★
IB	DN 80 PN 40	★
JA	DN 100 PN 16	★
JB	DN 100 PN 40	★
KA	DN 150 PN 16	★
LA	DN 200 PN 16	★
<b>JIS flanges (EN 1.4404 SST)<sup>(6)</sup></b>		
UA	50A 10K	★
VA	80A 10K	★
XA	100A 10K	★
YA	150A 10K	★
ZA	200A 10K	★
<b>Tri-Clamp™ connection (316/316L)</b>		
AT <sup>(7)</sup>	2 in. Tri-Clamp	
BT <sup>(7)</sup>	3 in. Tri-Clamp	
CT <sup>(7)</sup>	4 in. Tri-Clamp	
<b>Threaded (316L / EN 1.4404 SST)</b>		
RA <sup>(8)</sup>	1.5-in. NPT	
<b>Other</b>		
BR <sup>(8)</sup>	Bracket mounting, 316L / EN 1.4404 SST	
XX	Customer specific	
<b>Options</b>		
M1	Integral digital display	★
T1	Transient protection terminal block (standard with FISCO options)	★
GC	Transparent meter glass protection cover made of PTFE/FEP	
<b>Factory configuration</b>		
C1	Factory configuration (Configuration Data Sheet required with order, available at <a href="http://www.rosemount.com">www.rosemount.com</a> )	★
<b>Alarm limit configuration</b>		
C4	NAMUR alarm and saturation levels, high alarm	★
C8 <sup>(9)</sup>	Low alarm (standard Rosemount alarm and saturation levels)	★
<b>Overfill</b>		
U1 <sup>(10)</sup>	WHG Overfill approval	★

**Table 2. 5401 Low Frequency Radar Level Transmitter Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery.

The non-starred offerings are subject to additional delivery lead time.

<b>Special certifications</b>		
Q4	Calibration Data Certificate	★
Q8 <sup>(10)</sup>	Material Traceability Certification per EN 10204 3.1	★
N2 <sup>(11)</sup>	Certificate of compliance with guidelines in NACE MR0175/ISO 15156 and NACE MR0103	
QG	GOST Primary Verification Certificate	
<b>Safety certifications</b>		
QS <sup>(12)</sup>	Prior use certificate of FMEDA data	
<b>Shipboard approvals<sup>(13)</sup></b>		
SBS	American Bureau of Shipping Type Approval (consult factory for details)	
SDN	Det Norske Veritas (DNV) Type Approval (consult factory for details)	
SLL	Lloyd's Register Type Approval (consult factory for details)	
SBV	Bureau Veritas Type Approval (consult factory for details)	
SRS	Russian Maritime Register of Shipping Type Approval (consult factory for details)	
SGL	Germanischer Lloyd Type Approval (consult factory for details)	
<b>Special procedures</b>		
P1 <sup>(8)</sup>	Hydrostatic testing	★
<b>Antenna extension</b>		
S3 <sup>(14)</sup>	Extended Cone Antenna in 316 / 316L / EN 1.4404 SST. Maximum recommended nozzle height is 20 in. (500 mm).	
<b>Diagnostics functionality (see page 22 for more information)</b>		
D01	FOUNDATION fieldbus Diagnostics Suite (includes Signal Quality Metrics diagnostics) (consult factory for details)	
DA1	HART Diagnostics Suite (includes Signal Quality Metrics diagnostics) (consult factory for details)	
<b>Engineered solutions (see page 29)</b>		
Rxxxx	Engineered Solutions beyond standard model codes (consult factory for details)	
<b>Typical model number: 5401 A H 1 NA 4S PV CA - M1 C1</b>		

(1) Options E (eurofast) and M (minifast) are not available with explosion-proof, flameproof, or type n approvals.

(2) Requires FOUNDATION fieldbus signal output (Ui parameter listed in "Product Certifications" on page 34).

(3) G ½ in. SST cable gland is included in delivery.

(4) PFA is a fluoropolymer with properties similar to PTFE.

(5) All-PFA Rod Antennas (1R or 2R) require all-PFA tank seal (PD).

(6) See "Process connections" on page 44 for Face style.

(7) Only available with Rod Antenna (3R and 4R).

(8) Certain process connections are not available with hydrostatic testing (P1).

(9) The standard alarm setting is high.

(10) Certificate includes all pressure retaining wetted parts.

- (11) Requires Protective Plate Cone Antennas (3H-8H, 3M-8M, 3N-8N) or Rod Antennas (1R-4R).
- (12) Only available with 4-20 mA HART signal output.
- (13) Only for stainless steel housing material (code S). Not available with Modbus signal output (code M). Contact an Emerson Process Management representative for additional information.
- (14) Requires a SST Cone Antenna (4S-8S).


### Table 3. Accessories

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


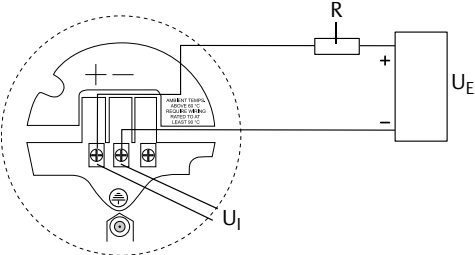
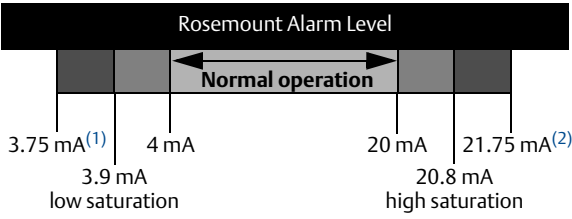
HART modem and cables		
03300-7004-0001	MACTek Viator HART modem and cables (RS232 connection)	★
03300-7004-0002	MACTek Viator HART modem and cables (USB connection)	★

# Specifications

## Functional specifications

General	
Field of liquids application	<p>Ideal for liquids and slurries in tanks, vessels, containers, reactor vessels, and underground tanks. Applications with sticky, viscous, corrosive, condensing, and crystallizing product.</p> <ul style="list-style-type: none"> <li>■ Model 5402, best choice for a broad range of applications and suitable for mounting in valves and bridles/stilling wells</li> <li>■ Model 5401, suitable for some extreme process conditions such as condensing vapors, product build-up, and heavy turbulence</li> </ul>
Field of solids application	<ul style="list-style-type: none"> <li>■ Model 5402 with 4 inch cone antenna for a broad range of solids applications.</li> </ul>
Measurement principle	Pulsed, free propagating radar. Low frequency (model 5401, 6 GHz) and high frequency (model 5402, 26 GHz). (see “ <a href="#">Measurement principle</a> ” on page 2 for details)
Microwave output power	< 1 mW
Internal power consumption	< 50 mW in normal operation
Humidity	0 - 100% relative humidity, non-condensing
Start-up time	< 40 s
4-20 mA HART (output option code H) - (see <a href="#">Table 1</a> on page 5 and <a href="#">Table 2</a> on page 10)	
Output	<p>Two-wire 4–20 mA, HART Revision 5. Digital process variable is superimposed on 4–20 mA signal, and available to any host that conforms to the HART protocol. The HART signal can be used in a multidrop mode.</p>
Signal wiring	Recommended output cabling is twisted shielded pairs, 18-12 AWG
HART Tri-Loop	 <p>By sending the digital HART signal to the optional HART Tri-Loop, it is possible to have up to three additional 4–20 mA analog signals. See the <a href="#">Rosemount 333 HART Tri-Loop Product Data Sheet</a> (document number 00813-0100-4754) for additional information</p>



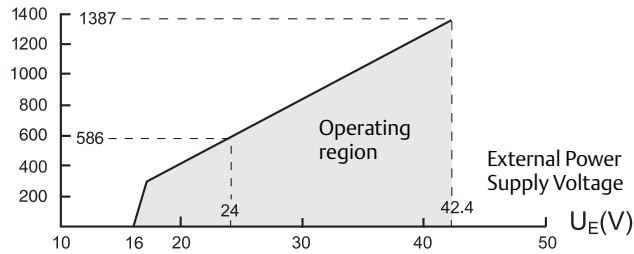
<p>Smart Wireless THUM Adapter</p>	 <p>The optional Smart Wireless THUM adapter can be mounted directly on the transmitter or by using a remote mounting kit. IEC 62591 (WirelessHART) enables access to multi-variable data and diagnostics, and adds wireless to almost any measurement point. See the <a href="#">Rosemount Smart Wireless THUM adapter Product Data Sheet</a> (document number 00813-0100-4075) and <a href="#">Smart Wireless THUM Adapter for Rosemount Process Level Transmitter Applications</a> (document number 00840-0100-4026).</p>
<p>External power supply</p>	<p>The input voltage <math>U_I</math> for HART is 16-42.4 Vdc (16-30 Vdc in IS applications, and 20-42.4 Vdc in Explosion-proof / flameproof applications).</p>  <p><math>R</math> = Load Resistance (<math>\Omega</math>)  <math>U_E</math> = External Power Supply Voltage (Vdc)  <math>U_I</math> = Input Voltage (Vdc)</p>
<p>IS Electrical parameters</p>	<p>See “<a href="#">Product Certifications</a>” on page 34.</p>
<p>Signal on alarm (configurable)</p>	<p>High = 21.75 mA (standard Rosemount setting)          Low = 3.75 mA (option code C8)          Namur NE43: High = 22.5 mA (option code C4)</p>
<p>Saturation levels</p>	<p>Standard: Low=3.9 mA, High=20.8 mA          Namur NE43: Low=3.8 mA, High=20.5 mA</p>  <p>(1) Transmitter failure, hardware or software alarm in Low position.          (2) Transmitter Failure, hardware or software alarm in High position.</p>

Load limitations

Maximum load resistance (R) is determined by the voltage level of the external power supply ( $U_E$ ), as described by:

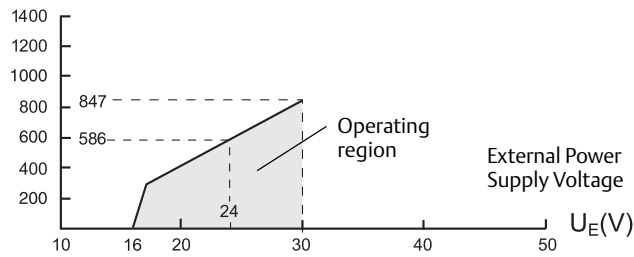
**Non-hazardous installations**

R( $\Omega$ ) Maximum Load Resistance



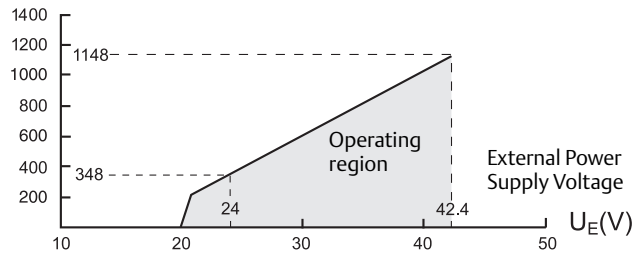
**Intrinsically safe installations**

R( $\Omega$ ) Maximum Load Resistance



**Explosion-proof/flameproof installations**

R( $\Omega$ ) Maximum Load Resistance

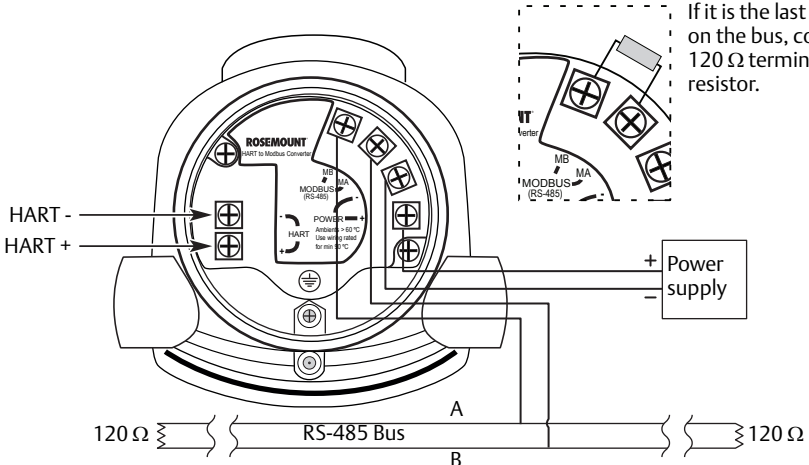


**Note**

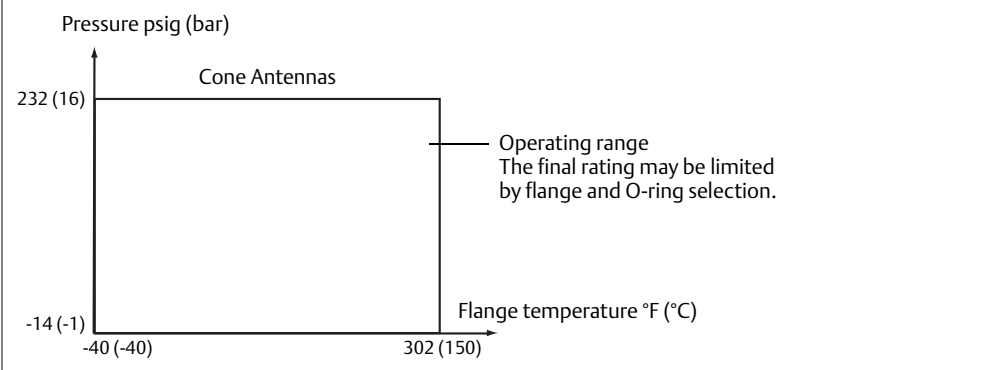
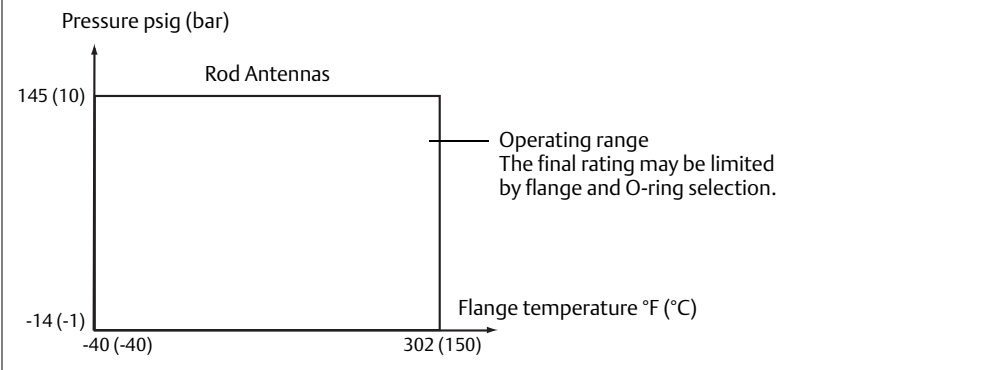
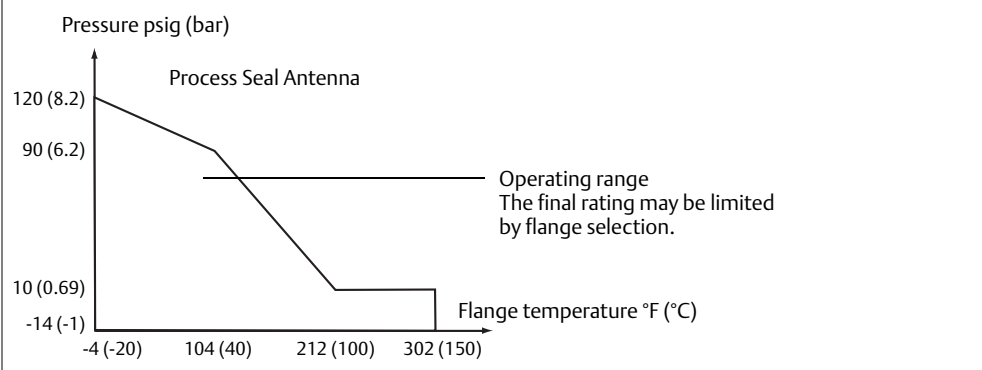
The diagram is only valid if the HART load resistance is at the + side and if the - side is grounded, otherwise the load resistance value is limited to 435  $\Omega$ .

FOUNDATION fieldbus (output option code F) - (see Table 1 on page 5 and Table 2 on page 10)	
Output	<p>FOUNDATION fieldbus</p> <p>Host / DCS system (e.g. DeltaV) Maintenance</p> <p>H2 - High Speed Field Bus</p> <p>H1 - Low Speed Field Bus</p> <p>Field Communicator</p> <p>Rosemount 5301 Rosemount 5401 Rosemount 5601</p> <p>Rosemount 752 Field Signal Indicator</p> <p>Fieldbus modem</p> <p>PC with Rosemount Radar Master</p> <p>6200 ft (1900 m) max (depending upon cable characteristics)</p>
Signal wiring	Recommended output cabling is twisted shielded pairs, 18-12 AWG
External power supply	The input voltage $U_i$ for FOUNDATION fieldbus is 9-32 Vdc (9-30 Vdc in IS applications, 9-17.5 Vdc in FISCO applications, and 16-32 Vdc in Explosion-proof / flameproof applications)
Quiescent current draw	21 mA
FOUNDATION fieldbus blocks	Resource block, 3 transducer blocks, 6 Analog Input (AI) blocks, Proportional /Integral/Derivate (PID) block, Input Selector (ISEL) block, Signal Characterizer (SGCR) block, Arithmetic (ARTH) block, and Output Splitter (OS) block
FOUNDATION fieldbus class (Basic or Link Master)	Link Master (LAS)
FOUNDATION fieldbus block execution time	AI-block: 30 ms. PID-block: 40 ms. ARTH-, ISEL-, OSPL-block: 65 ms. CHAR-block: 75 ms
Conforming FOUNDATION fieldbus	ITK 4.6.1
FOUNDATION fieldbus PlantWeb Alert Support	Yes

Rosemount 2410 Tank Hub connectivity (output option code U) - (see Table 1 on page 5 and Table 2 on page 10)	
Output	<p>The 5400 Level Transmitter communicates with the 2410 Tank Hub via a daisy-chain connection. The 2410 Tank Hub supports autoconfiguration of the FOUNDATION fieldbus based Tankbus. The hub identifies and auto-addresses the different field devices in the network, manages communication, and supervises the status of all connected devices.</p> <p><b>Primary fieldbus:</b> Rosemount 2410 communicates with a host or a field communication unit via TRL2 Modbus, RS485 Modbus, Enraf or HART</p> <p><b>Secondary fieldbus:</b> TRL2 Modbus, Enraf, IEC 62591 (<i>WirelessHART</i>)</p>
Signal wiring	Recommended output cabling is twisted shielded pairs, 18-12 AWG (cable characteristics specified for FISCO according to IEC 60079-27).
Power supply	The 5400 level transmitter and other connected devices are powered by the 2410 Tank Hub
RS-485 with Modbus communication (output option code M) - (see Table 1 on page 5 and Table 2 on page 10)	
Output	<p>The RS-485 Modbus version communicates by Modbus RTU, Modbus ASCII, and Level Master Protocols.              8 data bits, 1 start bit, 1 or 2 stop bits, and software configured parity              Baud Rate: 1200, 2400, 4800, 9600 (default), and 19200 bits/s              Address range: 1 to 255 (default device address is 246)              HART communication is used for configuration via HART terminals, or tunneling via the RS-485.</p>

<p>External power supply</p>	<p>The input voltage <math>U_i</math> for Modbus is 8-30 Vdc (max. rating)                  Power Consumption:                  &lt; 0.5 W (with HART address=1)                  &lt; 1.2 W (incl. four HART slaves)</p>  <p>If it is the last transmitter on the bus, connect the 120 <math>\Omega</math> termination resistor.</p>
<p>Signal wiring</p>	<p>Two-wire half duplex RS-485 Modbus. Use shielded twisted pair wiring, preferably with an impedance of 120 <math>\Omega</math> (typically 24 AWG), in order to comply with EIA-485 standard and EMC regulations.</p>
<p>Ground (common mode) Voltage limit</p>	<p><math>\pm 7</math> V</p>
<p>Bus termination</p>	<p>Standard RS-485 bus termination per EIA-485.</p>
<p><b>Display and configuration</b></p>	
<p>Integral display (option code M1)</p>	<p>5-digit integral display. The process variables listed below can be presented. If more than one variable is chosen, carousel toggling of data is used. The display also shows diagnostics and error information.</p>
<p>Remote display</p>	<p>Data can be read remotely by using the Rosemount 751 Field Signal Indicator (see Product Data Sheet, document number 00813-0100-4378) for 4-20 mA / HART, or Rosemount 752 Remote Indicator for FOUNDATION fieldbus (see Product Data Sheet, document number 00813-0100-4377).</p>
<p>Configuration tools</p>	<p>Emerson Field Communicator (e.g. 375/475 Field Communicator), Rosemount Radar Master (RRM) software package (included with delivery of transmitter), Emerson AMS Device Manager or any other EDDL or enhanced-EDDL host, or DeltaV or any other DD (Device Description) compatible host systems. Certificates are available from all major host system vendors.</p> <hr/> <p><b>Note</b>                  DTM (compliant with version 1.2 of the FDT/DTM specification) supporting configuration in for instance Yokogawa Fieldmate/PRM, E+H™ FieldCare, and PACTware.</p> <hr/> <p><b>Note</b>                  To communicate using RRM or AMS Device Manager, a HART modem is required. The HART modem is available as an RS232 or USB version (see <a href="#">Table 3 on page 15</a>).</p> <hr/> <p><b>Note</b>                  The transmitter can be pre-configured by selecting option code C1 (see <a href="#">page 8</a>), and sending a complete Configuration Data Sheet (CDS). The CDS is available from <a href="http://www.rosemount.com">www.rosemount.com</a>.</p>

Output units	Level and distance: ft, in., m, cm, or mm Volume: ft <sup>3</sup> , in. <sup>3</sup> , US gals, Imp gals, barrels, yd <sup>3</sup> , m <sup>3</sup> , or liters Level rate: ft/s, m/s Temperature: °F, °C																							
Output variables	Level, distance, volume, level rate, signal strength, surface/noise margin, internal temperature, analog output current (not applicable for FOUNDATION fieldbus) and % of range (not applicable for FOUNDATION fieldbus)																							
Damping	0-60 s (2 s, default value)																							
<b>Diagnostics</b>																								
General	Invalid measurement alerts, configuration error alerts, advanced full/empty tank diagnostics, hardware/software failures, electronic temperature, online status report (advisory/warnings/errors), signal quality and signal strength monitoring																							
Diagnostics Suite (option code D01 or DA1)	Signal Quality Metrics - Diagnostics package that monitors the relations between surface, noise and threshold. The function can be used to detect abnormal conditions in the process such as antenna contamination or sudden loss of signal strength. Signal Quality Metrics parameters are available as Output Variables in Rosemount Radar Master, and can be sent to Distributed Control System (DCS) to trigger an alarm.																							
<b>Temperature and pressure limits</b>																								
Ambient temperature	Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.																							
	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">Ambient temperature</th> </tr> <tr> <th>IS/Ex ia</th> <th>XP/Ex d</th> <th>Non-hazardous</th> </tr> </thead> <tbody> <tr> <td>HART communication</td> <td>-58 °F to 158 °F (-50 °C to 70 °C)</td> <td>-40 °F to 158 °F (-40 °C to 70 °C)</td> <td>-40 °F to 176 °F (-40 °C to 80 °C)</td> </tr> <tr> <td>FOUNDATION fieldbus</td> <td>-58 °F to 140 °F (-50 °C to 60 °C)</td> <td>-40 °F to 140 °F (-40 °C to 60 °C)</td> <td>-40 °F to 176 °F (-40 °C to 80 °C)</td> </tr> <tr> <td>FISCO</td> <td>-58 °F to 140 °F (-50 °C to 60 °C)</td> <td>N/A</td> <td>-40 °F to 176 °F (-40 °C to 80 °C)</td> </tr> <tr> <td>Modbus communication</td> <td>N/A</td> <td>-40 °F to 158 °F (-40 °C to 70 °C)</td> <td>-40 °F to 176 °F (-40 °C to 80 °C)</td> </tr> </tbody> </table>		Ambient temperature			IS/Ex ia	XP/Ex d	Non-hazardous	HART communication	-58 °F to 158 °F (-50 °C to 70 °C)	-40 °F to 158 °F (-40 °C to 70 °C)	-40 °F to 176 °F (-40 °C to 80 °C)	FOUNDATION fieldbus	-58 °F to 140 °F (-50 °C to 60 °C)	-40 °F to 140 °F (-40 °C to 60 °C)	-40 °F to 176 °F (-40 °C to 80 °C)	FISCO	-58 °F to 140 °F (-50 °C to 60 °C)	N/A	-40 °F to 176 °F (-40 °C to 80 °C)	Modbus communication	N/A	-40 °F to 158 °F (-40 °C to 70 °C)	-40 °F to 176 °F (-40 °C to 80 °C)
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Modbus communication	N/A	-40 °F to 158 °F (-40 °C to 70 °C)	-40 °F to 176 °F (-40 °C to 80 °C)																					
LCD display readable in: -4 °F to 158 °F (-20 °C to 70 °C)																								
Storage temperature	-58 °F to 194 °F (-50 °C to 90 °C) LCD display: -40 °F to 185 °F (-40 °C to 85 °C)																							

<p>Process temperature and pressure</p>	<p>The final rating depends on the antenna, the tank seal, and O-rings (if applicable). See <a href="#">Table 4</a> on page 24.</p> <p><b>Rosemount 5402 and 5401 with SST Cone Antenna (Model Code: 2S-8S), Rosemount 5402 and 5401 with Protective Plate Cone Antenna (Model Code: 2H-8H, 2M-8M, and 2N-8N)</b></p>  <p><b>Rosemount 5401 with Rod Antenna (Model Code: 1R-4R)</b></p>  <p><b>Rosemount 5402 with Process Seal Antenna (Model Code: 2P-4P)</b></p> 	
	<p>ASME/ANSI Flange rating</p>	<p>316L SST flanges according to ASME B16.5 Table 2-2.3</p>
	<p>EN Flange rating</p>	<p>1.4404 according to EN 1092-1 material group 13E0</p>
	<p>JIS Flange rating</p>	<p>316L SST according to JIS B2220 material group 2.3</p>
	<p>Flange connection rating</p>	<p>See <a href="#">Table 5</a> for the conditions used for flange strength calculations.</p>

**Table 4. Temperature Restrictions due to O-ring Selection (Not Applicable for 1R-2R or 2P-4P Where no Process O-ring is Present)**

Tank seal with different O-ring materials <sup>(1)</sup>	Min. temperature °F (°C) in air	Max. temperature °F (°C) in air
Viton Fluoroelastomer	-4 (-20)	302 (150)
Ethylene Propylene (EPDM)	-40 (-40)	302 (150)
Kalrez 6375 Perfluoroelastomer	5 (-15)	302 (150)
Nitrile Butadiene (NBR)	-40 (-40)	230 (110)

(1) Always check the chemical compatibility of the O-ring material with your application.

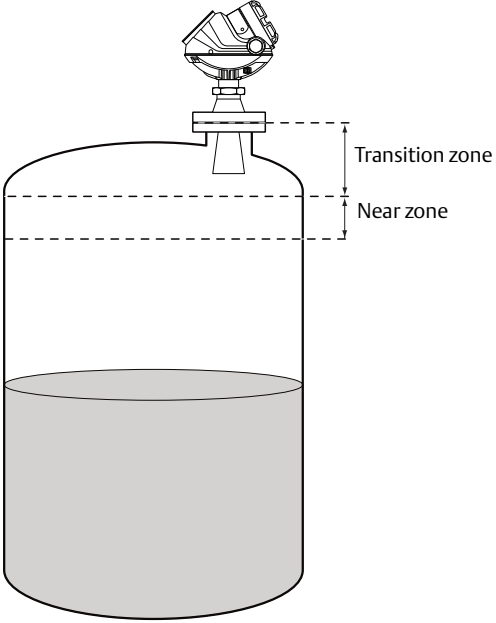
**Table 5. Conditions Used for Flange Strength Calculations**

	Bolting material	Gasket	Flange material
ASME / ANSI	SST SA193 B8M Class 2	Soft (1a) with min. thickness 1.6 mm	SA/A182 316L
EN, JIS	EN 1515-1/-2 group 13E0, A4-70	Soft (EN 1514-1) with min. thickness 1.6 mm	EN10222-5-1.4404



## Performance specifications

General	
Reference conditions	Ideal metal plate with no disturbing objects Temperature: + 68 °F (20 °C). Pressure: 14-15 psi (960-1060 mbar). Humidity: 25-75% RH.
Instrument accuracy at reference conditions	5402: ± 0.1 in. (± 3 mm) 5401: ± 0.4 in. (± 10 mm)
Repeatability	± 0.04 in. (± 1 mm) at 16.4 ft (5 m) distance
Resolution	0.04 in. (1 mm)
Ambient temperature effect	0.05%/10 K in temperature range -40 °F to 176 °F (-40 °C to 80 °C)
Update interval	1 second
Measuring range	
Measuring range and minimum Dielectric Constant	<p>Maximum measuring range from flange: 115 ft (35 m)</p> <p>The measuring range depends on:</p> <ul style="list-style-type: none"> <li>■ microwave frequency</li> <li>■ antenna size</li> <li>■ the dielectric constant (<math>\epsilon_r</math>) of the liquid (min. <math>\epsilon_r=1.4</math>)</li> <li>■ process conditions</li> </ul> <p>See <a href="#">Table 6</a> and <a href="#">Table 7</a> for measuring range and minimum dielectric constant. Due to the measuring range depending on the application and factors described below, the values are a guideline for clean liquids. For more information, ask your local Emerson Process Management representative.</p>
Beam angle and beam width	<p>For a comparison between the beam angle and beam width for the Rosemount 5401 (~6 GHz) and 5402 (~26 GHz) transmitters with antennas of the same size and type, see <a href="#">Table 8</a>, <a href="#">Table 9</a>, and <a href="#">Table 10</a>.</p> <p>The diagram illustrates the beam characteristics for two transmitter models. On the left, the 5401 (low frequency) transmitter is shown with a wider beam angle. On the right, the 5402 (high frequency) transmitter is shown with a narrower beam angle. A vertical scale on the left indicates distances of 16 ft (5 m), 33 ft (10 m), 49 ft (15 m), and 66 ft (20 m). Horizontal lines at each distance indicate the beam width for both models. The 5401 beam width is significantly larger than the 5402 beam width at all distances. The beam angle is also larger for the 5401 model. The diagram shows that as distance increases, the beam width for both models increases, but the 5401 model's beam width increases much more rapidly.</p>

<p>Transition zone</p>	<p>Transition zones are areas where measurements are not recommended. Near zones are areas where the accuracy is reduced.</p>  <p>The diagram shows a cylindrical tank with a liquid level. A transmitter is mounted on top. Two horizontal dashed lines indicate measurement zones: the upper line is labeled 'Transition zone' and the lower line is labeled 'Near zone'. The liquid level is below the near zone.</p>
<p>Transition zone</p>	<p>6 in. (150 mm) from lower end of the antenna</p>
<p>Near zone distance</p>	<p>1.3 ft (0.4 m) from lower end of the antenna</p>
<p>Near zone accuracy</p>	<p>5402: ± 0.6 in. (± 15 mm) 5401: ± 1.2 in. (± 30 mm)</p>
<p>Max level rate</p>	<p>1.6 in./s (40 mm/s) as default, adjustable to 7.1 in./s (180 mm/s)</p>
<p><b>Environment</b></p>	
<p>Vibration resistance<sup>(1)</sup></p>	<p>Aluminum housing: IEC 60770-1 Level 1. SST housing: IACS E10.</p>
<p>Electromagnetic compatibility<sup>(1)</sup></p>	<p>Emission and immunity: EMC directive 204/108/EC. EN 61326-1:2006<sup>(2)</sup>. NAMUR recommendations NE21<sup>(2)</sup>.</p>
<p>Transient / built-in lightning protection</p>	<p>IEC 61000-4-5:2001 T1 option: C62.41.2-2002 (IEEE), C37.90.1 (IEEE)</p>
<p>Pressure Equipment Directive (PED)</p>	<p>Complies with 97/23/EC article 3.3</p>
<p>Radio approvals<sup>(3)(4)</sup></p>	<p>FCC part 15C (1998)<sup>(5)</sup>, R&amp;TTE (EU directive 99/5/EC), and IC (RSS210-5)</p>

- (1) The device may also comply with other standards. Consult your local Emerson Process Management representative.
- (2) Additional deviations at strong electromagnetic fields (NAMUR NE21) at specific frequencies are less than ± 1.6 in. (40 mm).
- (3) Only a limited selection is presented. Contact your local Emerson Process Management representative for more information.
- (4) For Japan: "Install device on tanks or pipes made of metal".
- (5) For 5402: "This device is authorized for use in tank-mounted applications, including metal tanks as well as concrete, plastic, glass, and other non-conductive tanks." No specific restrictions are stated for the 5401.

**Table 6. Rosemount 5402, Maximum Recommended Measuring Range, ft (m)**

High frequency antennas	Dielectric constant <sup>(1)</sup>								
	A	B	C	A	B	C	A	B	C
2-in. Cone / Process Seal	33 (10)	49 (15)	66 (20)	82 (25)	115 (35)	115 (35)	9.8 (2)	20 (6)	33 (10)
3-in. Cone / Process Seal	49 (15)	66 (20)	98 (30)	82 (25)	115 (35)	115 (35)	13 (4)	30 (9)	39 (12)
4-in. Cone / Process Seal	66 (20)	82 (25)	115 (35)	82 (25)	115 (35)	115 (35)	23 (7)	39 (12)	49 (15)

- (1) A. Oil, gasoline or other hydrocarbons, and petrochemicals ( $\epsilon_r=1.9-4.0$ )  
In pipes or with ideal surface conditions, for some liquefied gases ( $\epsilon_r=1.4-4.0$ )
- B. Alcohols, concentrated acids, organic solvents, oil/water mixtures, and acetone ( $\epsilon_r=4.0-10.0$ )
- C. Conductive liquids, e.g. water based solutions, dilute acids, and alkalis ( $\epsilon_r>10.0$ )

**Table 7. Rosemount 5401, Maximum Recommended Measuring Range, ft (m)**

Low frequency antennas	Dielectric constant <sup>(1)</sup>								
	A	B	C	A	B	C	A	B	C
3-in. Cone <sup>(2)</sup>	N/A	N/A	N/A	82 (25)	115 (35)	115 (35)	N/A	N/A	N/A
4-in. Cone/Rod <sup>(3)</sup>	23 (7)	39 (12)	49 (15)	82 (25)	115 (35)	115 (35)	13 (4)	26 (8)	39 (12)
6-in. Cone	43 (13)	66 (20)	82 (25)	82 (25)	115 (35)	115 (35)	20 (6)	33 (10)	46 (14)
8-in. Cone	66 (20)	82 (25)	115 (35)	82 (25)	115 (35)	115 (35)	26 (8)	39 (12)	52 (16)

- (1) A. Oil, gasoline or other hydrocarbons, and petrochemicals ( $\epsilon_r=1.9-4.0$ )  
In pipes or with ideal surface conditions, for some liquefied gases ( $\epsilon_r=1.4-4.0$ )
- B. Alcohols, concentrated acids, organic solvents, oil/water mixtures, and acetone ( $\epsilon_r=4.0-10.0$ )
- C. Conductive liquids, e.g. water based solutions, dilute acids, and alkalis ( $\epsilon_r>10.0$ )
- (2) Pipe installations only. NA=not applicable.
- (3) Pipe installations are not allowed with Rod Antennas.

**Table 8. Beam Angle for the Rosemount 5400 Series**

Antenna size	Beam angle 5402	Beam angle 5401
2-in. Cone / Process Seal <sup>(1)</sup>	19°	–
3-in. Cone / Process Seal <sup>(1)</sup>	14°	(pipe only)
4-in. Cone / Process Seal <sup>(1)</sup> , Rod <sup>(2)</sup>	9°	37°
6-in. Cone	–	23°
8-in. Cone	–	17°

(1) Only with Rosemount 5402.

(2) Only with Rosemount 5401.

**Table 9. Beam Width at Different Distances from Flange for 5402**

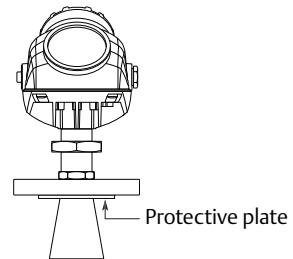
Distance	Antenna		
	2-in. Cone/Process seal	3-in. Cone/Process seal	4-in. Cone/Process seal
	Beam width		
16 ft (5 m)	4.9 ft (1.5 m)	3.3 ft (1.0 m)	3.3 ft (1.0 m)
33 ft (10 m)	9.8 ft (3.0 m)	6.6 ft (2.0 m)	4.9 ft (1.5 m)
49 ft (15 m)	14.8 ft (4.5 m)	9.8 ft (3.0 m)	8.2 ft (2.5 m)
66 ft (20 m)	19.7 ft (6.0 m)	13.1 ft (4.0 m)	9.8 ft (3.0 m)

**Table 10. Beam Width at Different Distances from Flange for 5401**

Distance	Antenna		
	4-in. Cone/Rod	6-in. Cone	8-in. Cone
	Beam width		
16 ft (5 m)	11.5 ft (3.5 m)	6.6 ft (2.0 m)	4.9 ft (1.5 m)
33 ft (10 m)	23.0 ft (7.0 m)	13.1 ft (4.0 m)	9.8 ft (3.0 m)
49 ft (15 m)	32.8 ft (10 m)	19.7 ft (6.0 m)	14.8 ft (4.5 m)
66 ft (20 m)	42.7 ft (13 m)	26.2 ft (8.0 m)	19.7 ft (6.0 m)

## Physical specifications

Material selection	
Material Selection	Emerson provides a variety of Rosemount product 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 Process Management 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.
Housing and enclosure	
Product	Rosemount 5400 Series, Non-Contacting Radar
Type	Dual compartment (terminal compartment and the electronics are completely separated). Two entries for conduit or cable connections. The transmitter housing can be rotated in any direction
Electrical connection	½ - 14 NPT for cable glands or conduit entries. Optional: M20 x 1.5 conduit / cable adapter, M12 4-pin male eurofast connector or A size Mini 4-pin male minifast connector. Recommended output cabling is twisted shielded pairs, 18-12 AWG.
Housing material	Polyurethane-covered Aluminum, or Stainless Steel Grade CF8M (ASTM A743)
Ingress protection	Type 4X, IP66, IP67
Factory sealed	Yes
Weight	Transmitter Head (TH): aluminum 4.4 lb (2 kg), stainless steel 10.8 lb (4.9 kg)
Engineered solutions	
Rxxxx	When standard model codes are not sufficient to fulfill requirements, please consult the factory to explore possible Engineered Solutions. This is typically, but not exclusively, related to the choice of wetted materials or the design of a process connection. These Engineered Solutions are part of the expanded offerings and may be subject to additional delivery lead time. For ordering, factory will supply a special R-labeled numeric option code that should be added at the end of the standard model string. See example model string below.  Example Model String: 5402-A-H-1-E5-45-PV-CA-M1C1- <b>R1234</b>
Tank connection and antennas	
Tank connection	<p>The tank connection consists of a tank seal, a flange, Tri-Clamp, or NPT thread.</p> <p>Certain models of tank connections have a tank connection design with a protective plate of the same material as the antenna. This is to prevent the 316L / EN1.4404 stainless steel flange from being exposed to the tank atmosphere.</p> <p>See <a href="#">“Dimensional Drawings and Mechanical Properties” on page 39.</a></p>
Flange dimensions	Follows ASME B16.5, JIS B2220, and EN 1092-1 standards. For more information, see <a href="#">“Standard flanges” on page 44.</a>



<p>Antennas</p>	<p>Cone, Process Seal, and Rod Antenna. Cone antennas can be ordered in different materials. Extended cone antennas are available in SST 316L.</p> <p><b>5402 Cone Antenna</b></p> <ul style="list-style-type: none"> <li>■ Suitable for stilling-well/bridle installation</li> <li>■ Can be recessed in smooth nozzles</li> <li>■ Cone extensions are available</li> <li>■ Suitable for solids applications (only 4 inch cone antenna)</li> </ul> <p><b>5402 Process Seal Antenna</b></p> <ul style="list-style-type: none"> <li>■ Ideal for small tanks and corrosive applications</li> <li>■ Suitable for applications with heavy condensation/build-up</li> </ul> <p><b>5401 Cone Antenna</b></p> <ul style="list-style-type: none"> <li>■ Suitable for applications with heavy condensation/build-up</li> <li>■ Cone extensions are available</li> </ul> <p><b>5401 Rod Antenna</b></p> <ul style="list-style-type: none"> <li>■ Suitable for small process connections and corrosive environments</li> <li>■ Two versions: all PFA and PFA+SST</li> </ul>
<p>Antenna dimensions</p>	<p><b>Cone Antenna:</b> See “Rosemount 5402 and 5401 with SST Cone Antenna (Model Code: 2S-8S)” on page 39 and “Rosemount 5402 and 5401 with Protective Plate Cone Antenna (Model Code: 2H-8H, 2M-8M, and 2N-8N)” on page 40.</p> <p><b>Rod Antenna:</b> See “Rosemount 5401 with Rod Antenna (Model Code: 1R-4R)” on page 41.</p> <p><b>Process Seal Antenna:</b> See “Rosemount 5402 with Process Seal Antenna (Model Code: 2P-4P)” on page 42.</p>
<p>Material exposed to tank atmosphere</p>	<p><b>Cone Antenna</b></p> <ul style="list-style-type: none"> <li>■ 316 / 316 L SST (EN 1.4404) or Alloy 400 (UNS NO4400) or Alloy C-276 (UNS N10276). Alloy 400 and Alloy C-276 antennas have a protective plate design</li> <li>■ PTFE fluoropolymer</li> <li>■ O-ring material</li> </ul> <p><b>Rod Antenna, two versions</b></p> <ul style="list-style-type: none"> <li>■ All-PFA<sup>(1)</sup> fluoropolymer</li> <li>■ PFA<sup>(1)</sup> fluoropolymer, 316 / 316 L SST (EN 1.4404) and O-ring material</li> </ul> <p><b>Process Seal Antenna</b></p> <ul style="list-style-type: none"> <li>■ PTFE fluoropolymer</li> </ul>
<p>Weight</p>	<p><b>Antennas</b></p> <p>Cone Antenna (Model Code: 2S-8S, 2H-8H, 2M-8M, 2N-8N): 2.2 lb (1.0 kg)</p> <p>Process Seal Antenna (Model Code: 2P-4P): 4.4 lb (2.0 kg)</p> <p>Rod Antenna (Model Code: 1R-4R): 2.2 lb (1.0 kg)</p> <p><b>Process connections<sup>(2)</sup></b></p> <p>ANSI Flange, 2 in. 150 lb SST (AA): 6.6 lb (3.0 kg)</p> <p>EN (DIN) Flange, DN50 PN40 SST (HB): 8.8 lb (4.0 kg)</p> <p>JIS Flange 50A 10K SST (UA): 6.6 lb (3.0 kg)</p> <p>Bracket mounting (BR): 4.4 lb (2.0 kg)</p> <p>Thread adapter (RA): 1.1 lb (0.5 kg)</p>
<p>Minimum clearance</p>	<p>No clearance distance needed.</p>

(1) PFA is a fluoropolymer with properties similar to PTFE.

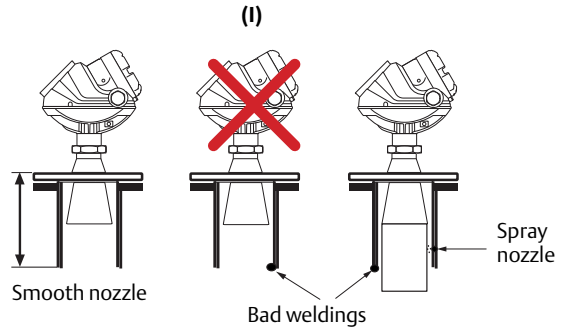
(2) Approximate weights for other 5400 Series process connection sizes than those in this table can be estimated: First of all, find out the weight of the SST blind flange (slip-on for Process Seal Antennas) that corresponds to the type and size shown in this table. Find out the weight for the SST blind flange that corresponds to the specific Rosemount 5400 Series flange size which is not represented in this table. The Rosemount 5400 Series flange weight can be estimated by adding the relative weight difference of these SST blind flanges.

**Installation and mounting considerations**

Special considerations may have to be taken due to the nozzle, depending on the selection of transmitter model and antenna.

**5402 with Cone Antenna**

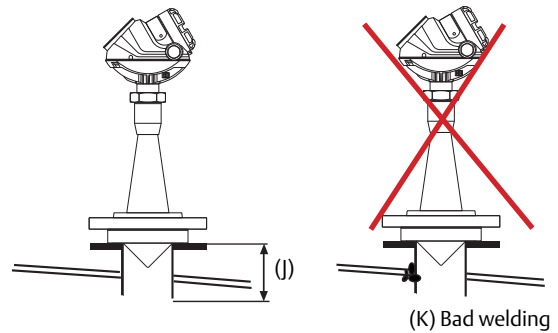
The antenna can be recessed in smooth nozzles up to 6 ft (2 m). If the inside of the nozzle contains disturbing objects, use the extended cone (I).



**5402 with Process Seal Antenna**

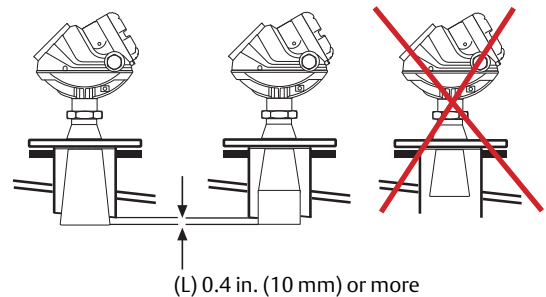
The antenna can be used on nozzles up to 6 ft (2 m), (J). Disturbing objects inside the nozzle (K) may impact the measurement, and should be avoided.

The flange on the tank should have a flat or raised face. Other tank flanges may be possible, please consult your local Emerson representative for advice.



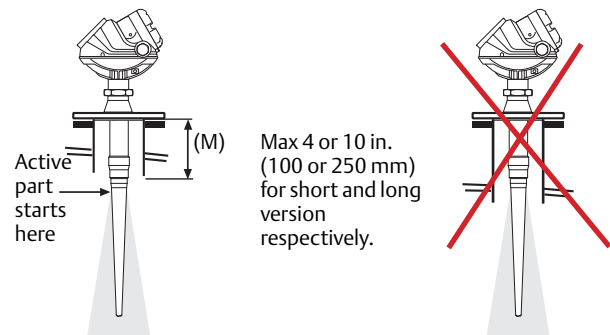
**5401 with Cone Antenna**

The antenna should extend 0.4 inches (10 mm), or more, below the nozzle (L). Use the extended cone solution.

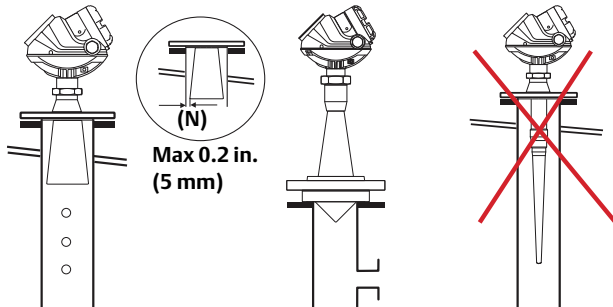
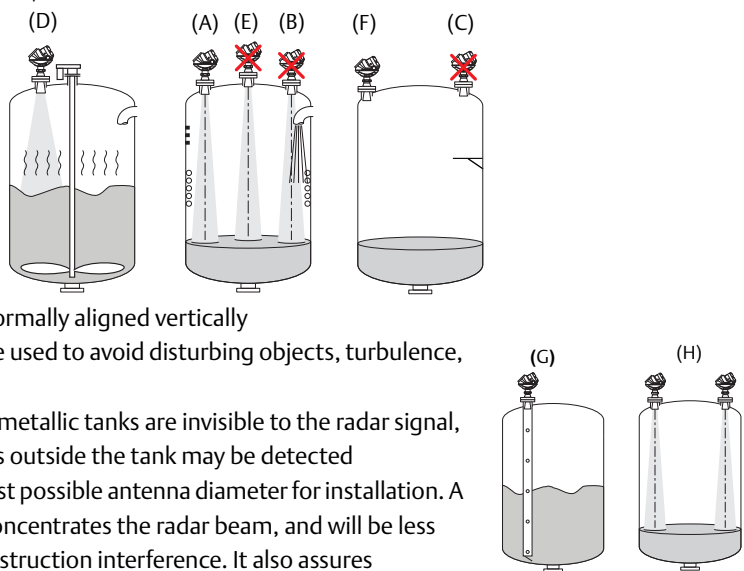


**5401 with Rod Antenna**

The active part of the rod antenna should be placed under the nozzle (M).



Tank installations

<p>Pipe / chamber installations</p>	<p>If used correctly, pipe or chamber measurement can be advantageous in many applications:</p> <ul style="list-style-type: none"> <li>■ The Rosemount 5402 is the preferred choice for pipe measurements</li> <li>■ Use a cone antenna</li> <li>■ The inside of the chamber shall be of a constant diameter</li> <li>■ The gap between the cone antenna and the still-pipe is limited to 0.2 in. (5 mm). If required, order an oversized antenna and cut on location (N).</li> </ul> 
<p>Ball-valve installations</p>	<p>The Rosemount 5400 Series transmitter can be isolated from the process by using a valve:</p> <ul style="list-style-type: none"> <li>■ The 5402 is the preferred choice for pipe measurement</li> <li>■ Use the largest possible antenna</li> <li>■ Use a full-port ball valve</li> <li>■ Ensure there is no edge between the ball valve and the nozzle / pipe, the inside should be smooth</li> <li>■ Valves can be combined with pipes</li> </ul>
<p>Mechanical mounting considerations</p>	<ul style="list-style-type: none"> <li>■ Filling inlets creating turbulence (B), and stationary metallic objects with horizontal surfaces (C) should be kept at a distance, outside the signal beam – see tables on page 28 for beam width information</li> <li>■ Agitators with large horizontal blades may reduce the performance of the transmitter, so install the transmitter in a location where this effect is minimized. Vertical or slanted blades are often invisible to radar, but create turbulence (D)</li> <li>■ Do not install the transmitter in the center of the tank (E)</li> <li>■ Because of circular polarization, there is no clearance distance requirement from the tank wall if it is flat and free from obstructions such as heating coils and ladders (F). Usually, the optimal location is 1/3 of the radius from the tank wall</li> </ul>  <ul style="list-style-type: none"> <li>■ The antenna is normally aligned vertically</li> <li>■ A still-pipe can be used to avoid disturbing objects, turbulence, and foam (G)</li> <li>■ The walls in non-metallic tanks are invisible to the radar signal, so nearby objects outside the tank may be detected</li> <li>■ Choose the largest possible antenna diameter for installation. A larger antenna concentrates the radar beam, and will be less susceptible to obstruction interference. It also assures maximum antenna gain</li> <li>■ Multiple Rosemount 5400 transmitters can be used in the same tank without interfering with each other (H)</li> </ul>



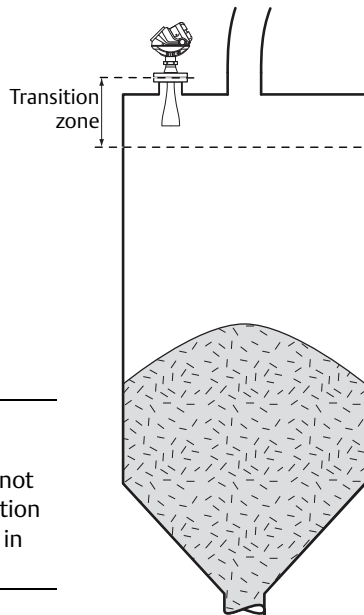
### Solids applications

Rosemount 5402 Non Contacting Radar level transmitter provides industry leading measurement capabilities and reliability on solids.

Characteristics include:

- 4 inch cone antenna (4S, 4H, 4M or 4N)
- Measurement accuracy: Application dependent
- Measurement independent of dust (may need air purging<sup>(1)</sup>)

**Figure 1. Transition Zone**



**Note**

Transition zones are areas where measurements are not recommended. The transition zone for Rosemount 5402 in solids mode is 3 ft (1 m).

**Table 11. Measuring Range and Dielectric Constant<sup>(2)</sup>**

Minimum dielectric constant	Maximum measuring range	Transition zone
1.5	33 ft (10 m)	3 ft (1 m)
2.0	66 ft (20 m)	

(1) An air purge connection can prevent clogging of the antenna in extremely dusty applications, consult factory if unclear.  
 (2) Measuring range may be reduced by steep inclining surfaces and a combination of dust and condensation. For low dielectric constants and/or long ranges consider the Rosemount 5303 guided wave radar or the Rosemount 5708 3D solids scanner.

# Product Certifications

## Note

A safety isolator such as a zener barrier is always needed for intrinsic safety.

## EU conformity

The most recent revision of the EC declaration of conformity can be found at [www.rosemount.com](http://www.rosemount.com).

## Safety Instrumented Systems (SIS)<sup>(1)</sup>

The Rosemount 5400 Series has been evaluated by a third party, the SP (Technical Research Institute of Sweden), against hardware requirements according to IEC 61508. With a FMEDA (Failure Modes, Effects and Diagnostics Analysis) report with a Safe Failure Fraction (SFF) above 80%, 5400 is suitable in SIS according to the Prior Use methodology. For more information, go to:

<http://www.rosemount.com/safety>. To order the certificate of FMEDA data use option code QS.

## Hazardous locations certifications

### North-American certifications

#### Factory Mutual (FM) Approvals

Project ID: 3020497

**E5** Explosion-proof for Class I, Div. 1, Groups B, C, and D;  
Dust ignition proof for Class II/III, Div. 1, Groups E, F, and G;  
With intrinsically safe connections to Class I, II, III, Div. 1, Groups B, C, D, E, F, and G.  
Temp. Code T4  
Ambient temperature limits: -50 °C to +70 °C<sup>(2)</sup>.  
Seal not required.  
Approval valid for HART, FOUNDATION fieldbus, and Modbus options.

**I5, IE** Intrinsically safe for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, and G,  
Class I, Zone 0, AEx ia IIC T4 when installed per control drawing: 9150079-905.

Non-incendive Class I, II, Div. 2, Groups A, B, C, D, F, and G suitable for Class II, III.

4-20 mA / HART model:  $U_i=30$  Vdc,  $I_i=130$  mA,  $P_i=1.0$  W,  $C_i=7.26$  nF,  $L_i=0$  H.

FOUNDATION fieldbus model:  $U_i=30$  Vdc,  $I_i=300$  mA,  $P_i=1.3$  W,  $C_i=0$  nF,  $L_i=0$  H.  
FISCO model:  $U_i=17.5$  Vdc,  $I_i=380$  mA,  $P_i=5.32$  W,  $L_i=C_i=0$ .

Temp. Code T4

Ambient temperature limits: -50 °C to +70 °C<sup>(2)</sup>.

Approval valid for HART, FOUNDATION fieldbus, and FISCO options.

#### Canadian Standards Association (CSA) Approvals

When bearing the "Dual Seal" marking, this product meets the Dual Seal Requirements of ANSI/ISA 12.27.01-2003.

Cert. No.: 1514653

**E6** Explosion-proof with internal intrinsically safe circuits [Exia] Class I, Div. 1, Groups B, C, and D;

Temp Code T4.

Class II, Div. 1 and 2, Groups E, F, and G;

Class III, Div. 1

Ambient temperature limits -50 °C to +70 °C<sup>(2)</sup>

Approval valid for HART, FOUNDATION fieldbus, and Modbus options.

**I6, IF** Intrinsically safe Exia:

Class I, Div. 1, Groups A, B, C, and D.

Temp Code T4.

4-20 mA / HART model:  $U_i=30$  Vdc,  $I_i=130$  mA,  $P_i=1.0$  W,  $C_i=7.26$  nF,  $L_i=0$  H.

FOUNDATION™ fieldbus model:  $U_i=30$  Vdc,  $I_i=300$  mA,  $P_i=1.3$  W,  $C_i=0$  nF,  $L_i=0$  H.

FISCO model:  $U_i=17.5$  Vdc,  $I_i=380$  mA,  $P_i=5.32$  W,  $L_i=C_i=0$ .

Installation drawing: 9150079-906

Ambient temperature limits -50 °C to +70 °C<sup>(2)</sup>.

Approval valid for HART, FOUNDATION fieldbus, and FISCO options.

(1) Not available for solids applications.

(2) +60 °C with FOUNDATION fieldbus or FISCO option.

## European certifications


### ATEX Approvals

#### Nemko 04ATEX1073X


##### Specific Conditions for Safe Use (X):

1. The intrinsically safe circuits do not withstand the 500V AC test as specified in EN 60079-11 clause 6.4.13.
2. "Potential ignition hazards by impact or friction need to be considered according to EN 60079-0:2012 clause 8.3 (for EPL Ga and EPL Gb) and clause 8.4 (for EPL Da and EPL Db), when the transmitter enclosure and antennas exposed to the exterior atmosphere of the tank, is made with light metals containing aluminum or titanium, The end user shall determine the suitability with regard to avoid hazards from impact and friction."
3. The antennas for type 5400, are non-conducting and the area of the non-conducting part exceeds the maximum permissible areas for Group IIC and according to EN 60079-0:2012 clause 7.4: 20 cm<sup>2</sup> for EPL Gb and 4 cm<sup>2</sup> for EPL Ga. Therefore, when the antenna is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.
4. The Ex ia version of model 5400 may be supplied by an Ex ib certified safety barrier. The whole circuit shall then be regarded type Ex ib.  
The preferred type Ex ia or Ex ib shall be indicated on the marking label as specified in the instructions for the transmitter. The antenna part, located in the process vessel, is classified EPL Ga and electrically separated from the Ex ia or ib circuit.
5. ½" NPT threads need to be sealed for dust and water ingress protection, IP 66, IP 67 or 'Ex t', EPL Da or Db is required.

#### E1 Flameproof:

-  II 1/2 G Ex d ia IIC T4 Ga/Gb (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>).  
 II 1D Ex ta IIIC T79°C<sup>(2)</sup> Da (-40 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
 U<sub>m</sub>=250 V  
 Approval valid for HART, FOUNDATION fieldbus, and Modbus options.

#### I1, IA Intrinsically safe:

-  II 1 G Ex ia IIC T4 Ga or II 1/2 G Ex ib IIC T4 Ga/Gb  
 (-40 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
 II 1 D Ex ta IIIC T79°C<sup>(2)</sup> Da (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
 4-20 mA / HART model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=130 mA, P<sub>i</sub>=1.0 W,  
 C<sub>i</sub>=7.26 nF, L<sub>i</sub>=0 H.

FOUNDATION fieldbus model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=300 mA,  
 P<sub>i</sub>=1.5 W, C<sub>i</sub>=4.95 nF, L<sub>i</sub>=0 H.



FISCO model: U<sub>i</sub>=17.5 Vdc, I<sub>i</sub>=380 mA, P<sub>i</sub>=5.32 W,  
 C<sub>i</sub>=4.95 nF, L<sub>i</sub><1 μH.

Installation drawing: 9150079-907.

Approval valid for HART, FOUNDATION fieldbus, and FISCO options.

#### Nemko 10ATEX1072

##### N1 Type n:

-  II 3G Ex nA IIC T4 Gc (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
 II 3G Ex nL IIC T4 Gc (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)

HART 4-20 mA<sup>(3)</sup>

Maximum input voltage U<sub>i</sub>: 42.4 V

Maximum input current I<sub>i</sub>: 23 mA

Maximum input power P<sub>i</sub>: 1.0 W

Maximum internal capacitance C<sub>i</sub>: 7.25 nF

Maximum internal inductance L<sub>i</sub>: 0 H

FOUNDATION fieldbus<sup>(3)</sup>

Maximum input voltage U<sub>i</sub>: 32 V

Maximum input current I<sub>i</sub>: 21 mA

Maximum input power P<sub>i</sub>: 0.7 W

Maximum internal capacitance C<sub>i</sub>: 4.95 nF

Maximum internal inductance L<sub>i</sub>: 0 H

Approval valid for HART and FOUNDATION fieldbus options.

Installation drawing: 9240031-958

(1) +60 °C with FOUNDATION fieldbus or FISCO option.

(2) +69 °C with FOUNDATION fieldbus or FISCO option.

(3) Valid for Ex nL.

## IECEX Approval

### IECEX NEM 06.0001X

#### Specific Conditions for Safe Use (X):

1. The intrinsically safe circuits do not withstand the 500V AC test as specified in IEC 60079-11 clause 6.4.13.
2. "Potential ignition hazards by impact or friction need to be considered according to IEC 60079-0:2011 clause 8.3 (for EPL Ga and EPL Gb) and clause 8.4 (for EPL Da and EPL Db), when the transmitter enclosure and antennas exposed to the exterior atmosphere of the tank, is made with light metals containing aluminum or titanium, The end user shall determine the suitability with regard to avoid hazards from impact and friction."
3. The antennas for type 5400, are non-conducting and the area of the non-conducting part exceeds the maximum permissible areas for Group IIC and according to IEC 60079-0 .2011 clause 7.4: 20 cm<sup>2</sup> for EPL Gb and 4 cm<sup>2</sup> for EPL Ga. Therefore, when the antenna is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.
4. The Ex ia version of model 5400 may be supplied by an Ex ib certified safety barrier. The whole circuit shall then be regarded type Ex ib.  
The preferred type Ex ia or Ex ib shall be indicated on the marking label as specified in the instructions for the transmitter. The antenna part, located in the process vessel, is classified EPL Ga and electrically separated from the Ex ia or ib circuit.
5. ½" NPT threads need to be sealed for dust and water ingress protection, IP 66, IP 67 or 'Ex t', EPL Da or Db is required.

#### E7 Flameproof:

Ex d ia IIC T4 Ga/Gb (-40 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
Ex ta IIIC T79°C<sup>(2)</sup> Da (-40 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)

U<sub>m</sub>=250 V

Approval valid for HART, FOUNDATION fieldbus, and Modbus options.

#### I7, IG Intrinsically safe:

Ex ia IIC T4 Ga or Ex ib IIC T4 Ga/Gb (-50 °C ≤ Ta ≤ +70 °C).

Ex ta IIIC T79°C<sup>(2)</sup> Da (-50 °C ≤ Ta ≤ +70 °C).

4-20 mA / HART model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=130 mA, P<sub>i</sub>=1.0 W,  
C<sub>i</sub>=7.26 nF, L<sub>i</sub>=0 H.

FOUNDATION fieldbus model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=300 mA,  
P<sub>i</sub>=1.5 W, C<sub>i</sub>=4.95 nF, L<sub>i</sub>=0 H.

FISCO model: U<sub>i</sub>=17.5 Vdc, I<sub>i</sub>=380 mA, P<sub>i</sub>=5.32 W,  
C<sub>i</sub>=4.95 nF, L<sub>i</sub><1 μH.

Installation drawing: 9150079-907.

Approval valid for HART, FOUNDATION fieldbus, and FISCO options.

### IECEX NEM 10.0005

#### N7 Type n:

Ex nA IIC T4 Gc (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)

Ex nL IIC T4 Gc (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)

HART<sup>®</sup> 4-20 mA<sup>(3)</sup>

Maximum input voltage U<sub>i</sub>: 42.4 V

Maximum input current I<sub>i</sub>: 23 mA

Maximum input power P<sub>i</sub>: 1.0 W

Maximum internal capacitance C<sub>i</sub>: 7.25 nF

Maximum internal inductance L<sub>i</sub>: 0 H

FOUNDATION fieldbus<sup>(3)</sup>

Maximum input voltage U<sub>i</sub>: 32 V

Maximum input current I<sub>i</sub>: 21 mA

Maximum input power P<sub>i</sub>: 0.7 W

Maximum internal capacitance C<sub>i</sub>: 4.95 nF

Maximum internal inductance L<sub>i</sub>: 0 H

Approval valid for HART and FOUNDATION fieldbus options  
installation drawing 9240031-958

## EAC certifications

### Technical Regulations Customs Union (EAC)

**EM, IM:** Contact an Emerson Process Management representative for additional information.

(1) +60 °C with FOUNDATION fieldbus or FISCO option.

(2) +69 °C with FOUNDATION fieldbus or FISCO option.

(3) Valid for Ex nL.

## Brazilian certifications

### NCC/INMETRO Approvals

#### Special Condition for Safe Use (X):

1. Refer to Certificate NCC 14.2256X

#### Standards

ABNT NBR IEC 60079-0:2013, ABNT NBR IEC 60079-1:2009, ABNT NBR IEC 60079-11:2009; ABNT NBR IEC 60079-26:2008, ABNT NBR IEC 60079-27:2010, ABNT NBR IEC 60079-31:2011

#### E2 Flameproof:

Ex ia/db ia IIC T4 Ga/Gb (-40 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
Ex ta IIIC T79 °C<sup>(2)</sup>  
IP66/67

#### I2, IB Intrinsically safe:

Ex ia IIC T4 Ga/Gb (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
Ex ta IIIC T79 °C<sup>(2)</sup> (-50 °C ≤ Ta ≤ +70 °C<sup>(1)</sup>)  
IP66/67  
4-20mA / HART model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=130 mA, P<sub>i</sub>=1.0 W,  
C<sub>i</sub>=7.26 nF, L<sub>i</sub>=0 H.  
FOUNDATION™ fieldbus model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=300 mA,  
P<sub>i</sub>=1.5 W, C<sub>i</sub>=4.95 nF, L<sub>i</sub>=0 H.  
FISCO model: U<sub>i</sub>=17.5 Vdc, I<sub>i</sub>=380 mA, P<sub>i</sub>=5.32 W,  
C<sub>i</sub>=4.95 nF, L<sub>i</sub><1 μH.

## Chinese certifications

### National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation (NEPSI) Approvals

#### Special Condition for Safe Use (X):

1. Refer to Certificate GYJ111229X

#### E3 Flameproof:

Ex d ia IIC T4 (-40 °C < Ta < +70 °C<sup>(1)</sup>)  
U<sub>m</sub>=250 V

#### I3 Intrinsically safe:

Ex ia IIC T4 (-50 °C < Ta < +70 °C<sup>(1)</sup>)  
DIP A20 Ta 79°C<sup>(2)</sup> (-50 °C < Ta < +70 °C<sup>(1)</sup>)  
4-20 mA / HART model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=130 mA, P<sub>i</sub>=1.0 W,  
C<sub>i</sub>=7.26 nF, L<sub>i</sub>=0 H.  
FOUNDATION fieldbus model: U<sub>i</sub>=30 Vdc, I<sub>i</sub>=300 mA, P<sub>i</sub>=1.5 W,  
C<sub>i</sub>=4.95 nF, L<sub>i</sub>=0 H.  
FISCO model: U<sub>i</sub>=17.5 Vdc, I<sub>i</sub>=380 mA, P<sub>i</sub>=5.32 W,  
C<sub>i</sub>=4.95 nF, L<sub>i</sub><1 μH.

## Japanese certifications

### Technology Institution of Industrial Safety (TIIS) Approval

#### Special Condition for Safe Use (X):

1. Refer to certificate TC20109-TC20111 (4-20 mA HART) and TC20244-TC20246 FOUNDATION fieldbus)

#### E4<sup>(3)</sup> Flameproof:

4-20 mA HART model:  
Transmitter: Ex d [ia] IIC T4x  
-20 ~ +60 °C  
DC 20 - 42.4 V  
U<sub>m</sub> = 250 V  
U<sub>o</sub> = 22.2 V  
I<sub>o</sub> = 177 mA  
P<sub>o</sub> = 0.985 W  
Antennas: Ex ia IIC T4X

FOUNDATION fieldbus model:  
Transmitter: Ex d [ia] IIC T4x  
-20 ~ +60 °C  
DC 16 - 32 V  
U<sub>m</sub> = 250 V  
U<sub>o</sub> = 22.2 V  
I<sub>o</sub> = 177.5 mA  
P<sub>o</sub> = 0.985 W  
Antennas: Ex ia IIC T4X  
Installation drawing: 05400-00375.  
Approval valid for HART and FOUNDATION fieldbus options.

(1) +60 °C with FOUNDATION fieldbus or FISCO option.

(2) +69 °C with FOUNDATION fieldbus or FISCO option.

(3) Not available for solids applications.

## Other certifications

### Overfill protection

Cert No: Z-65.16-475

**U1<sup>(1)</sup>** TÜV-tested and approved by DIBt for overfill protection according to the German WHG regulations. Approval valid for HART option.

### Suitability for intended use

Compliant with NAMUR NE 95, version 07.07.2006 “Basic Principles of Homologation”

### Type Approval Certifications (Marine/shipboard approvals)

**SBS<sup>(1)</sup>** American Bureau of Shipping (ABS) Product Type Approval

Certificate Number: 10-LD530607-PDA

Intended Service: For monitoring, process-control and hi/lo-alarming in continuous or batch like operation for the marine applications on Oil, Product, Chemical and Gas tankers as well as on Offshore mobile units.

ABS Rules: 2010 Steel Vessels Rules 1-1-4/7.7, 4-8-4/27.5 and 4-9-7, 5C-1-7/21.15.1; 5C-8-13/2; 5C-9-13/1

Approval valid for HART and FOUNDATION fieldbus options.

**SDN<sup>(1)</sup>** Det Norske Veritas (DNV) Type Approval Certificate

Certificate Number: A-11731

Intended Service: The Rosemount 5400 is found to comply with Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards.

Location classes	
Temperature	D
Humidity	B
Vibration	A
EMC	B
Enclosure	C

Approval valid for HART and FOUNDATION fieldbus options.

**SLL<sup>(1)</sup>** Lloyd's Register Type Approval Certificate

Certificate Number: 09/00034

Application: For use in environmental categories ENV1, ENV2, ENV3 and ENV5 as defined in Lloyd's Register Test Specification No. 1: 2002.

Approval valid for HART and FOUNDATION fieldbus options.

**SBV<sup>(1)</sup>** Bureau Veritas Type Approval Certificate

Certificate Number: 22379/A0 BV

Requirements: BUREAU VERITAS Rules for the Classification of Steel Ships

Application: Approval valid for ships intended to be granted with the following additional class notations: AUT-UMS, AUT-CCS, AUT-PORT and AUT-IMS.

Approval valid for HART and FOUNDATION fieldbus options.

**SRS<sup>(1)</sup>** Russian Maritime Register of Shipping Type Approval Certificate

Certificate Number: 08.00159.120

Application and limitations: Rosemount 5400 Series Twin-Lead Radar Level Transmitter (models: 5401, 5402) are intended for using on sea-going ships, floating constructions and fixed offshore platforms.

Approval valid for HART and FOUNDATION fieldbus options.

**SGL<sup>(1)</sup>** Germanischer Lloyd Type Approval Certificate

Certificate Number: 86 883 - 10 HH

Approval valid for HART and FOUNDATION fieldbus options.

## Canadian Registration Number (CRN)

Cert No: 0F06878.2

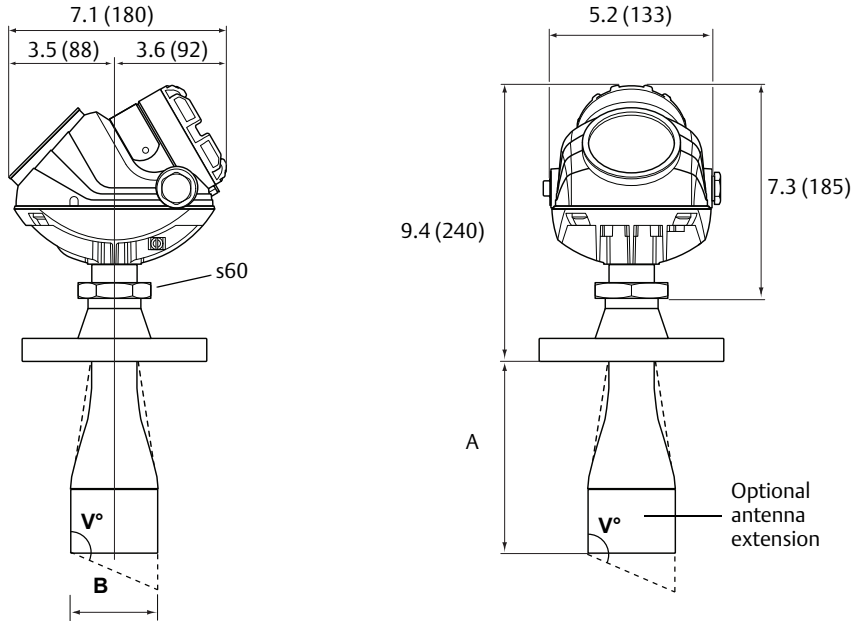
The product design has been accepted and registered for use in Canada.

For more information on product certificates, refer to the Rosemount 5400 Series Reference Manual (document number 00809-0100-4026).

(1) Not available for solids applications.

# Dimensional Drawings and Mechanical Properties

## Rosemount 5402 and 5401 with SST Cone Antenna (Model Code: 2S-8S)



All dimensions are in inches (mm).

**Process connection availability**

● Available as standard

○ Available as special, consult factory

– Not available

Process connection	Antenna code	
	2S	3S, 4S, 6S, 8S
2 in./DN 50/50A	●	○
3 in./DN 80/80A	●	●
4 in./DN 100/100A	●	●
6 in./DN 150/150A	●	●
8 in./DN 200/200A	●	●
Threaded connection	-	-
Bracket mounting	●	●

### 5402 Standard SST Cone

Cone size (inches)	A	B	Antenna code
2	6.5 (165)	2.0 (50)	2S
3	5.9 (150)	2.6 (67)	3S
4	8.8 (225)	3.6 (92)	4S

### 5402 and 5401 Extended SST Cone<sup>(1)</sup>

Max. nozzle height	A	Option code
20 (500)	20.4 (518)	S3

(1) The extended cone antennas are available in 5-inch step increments from 10 to 50 inches. Consult your local Emerson Process Management representative for more information. Expect long lead times for other sizes than the 20 in. (500 mm) version.

### 5401 Standard SST Cone

Cone size (inches)	A	B	Antenna code
3	3.3 (84)	2.6 (67)	3S
4	5.9 (150)	3.6 (92)	4S
6	7.3 (185)	5.5 (140)	6S
8	10.6 (270)	7.4 (188)	8S

### 5402 Extended SST Cone

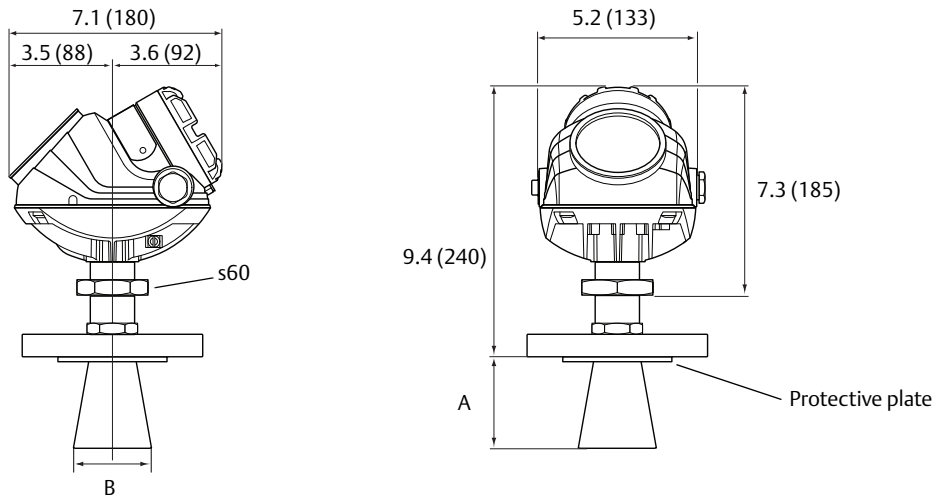
Cone size (inches)	V°
2	90°
3	90°
4	90°

### 5401 Extended SST Cone

Cone size (inches)	V°
3	90°
4	135°
6	135°
8	90°

## Rosemount 5402 and 5401 with Protective Plate Cone Antenna (Model Code: 2H-8H, 2M-8M, and 2N-8N)

All dimensions are in inches (mm).



### 5402 Cone Antenna with protective plate

Cone size (inches)	A	B	Antenna code
2	5.9 (150)	2.0 (50)	2H, 2M, 2N
3	6.9 (175)	2.6 (67)	3H, 3M, 3N
4	9.8 (250)	3.6 (92)	4H, 4M, 4N

### 5401 Cone Antenna with protective plate

Cone size (inches)	A	B	Antenna code
3	3.3 (84)	2.6 (67)	3H, 3M, 3N
4	5.9 (150)	3.6 (92)	4H, 4M, 4N
6	7.3 (185)	5.5 (140)	6H, 6M, 6N
8	10.6 (270)	7.4 (188)	8H, 8M, 8N

### Process connection availability

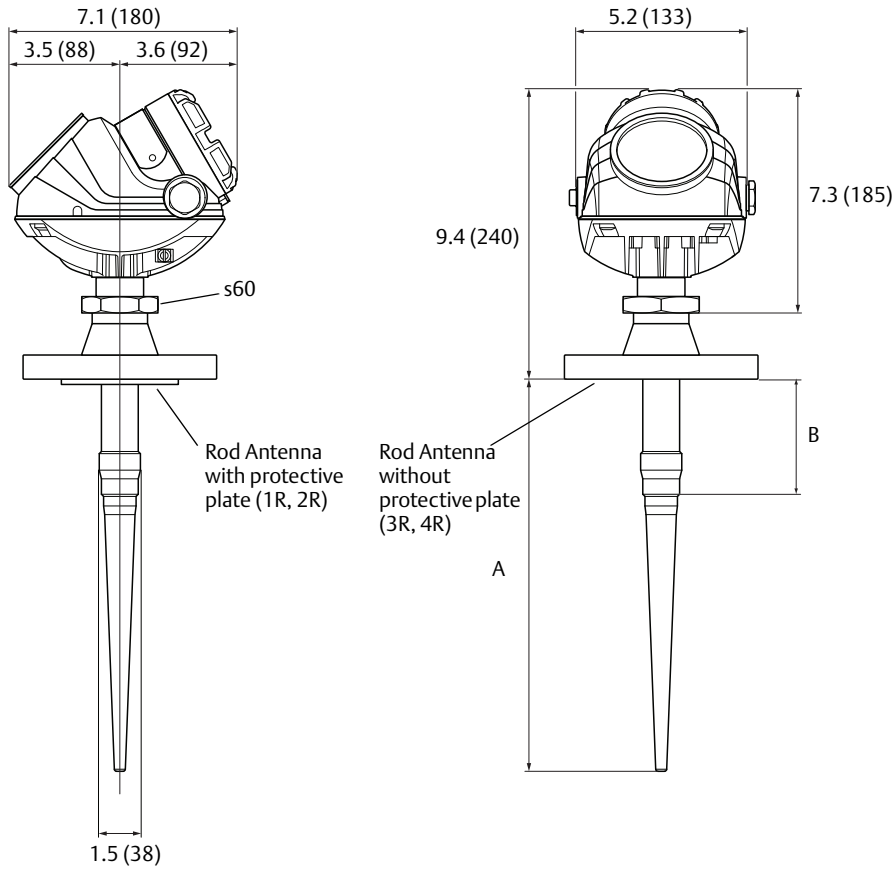
- Available as standard
- Available as special, consult factory
- Not available

Process connection	Antenna code				
	2H, 2M, 2N	3H, 3M, 3N	4H, 4M, 4N	6H, 6M, 6N	8H, 8M, 8N
2 in./DN 50/50A	●	○	○	○	○
3 in./DN 80/80A	○	●	○	○	○
4 in./DN 100/100A	○	○	●	○	○
6 in./DN 150/150A	○	○	○	●	○
8 in./DN 200/200A	○	○	○	○	●
Threaded connection	-	-	-	-	-
Bracket mounting	-	-	-	-	-



## Rosemount 5401 with Rod Antenna (Model Code: 1R-4R)

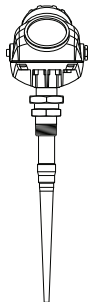
All dimensions are in inches (mm).



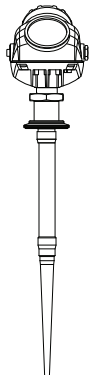
Rod	A	B <sup>(1)</sup>	Antenna code
Short	14.4 (365)	4 (100)	1R, 3R
Long	20.3 (515)	10 (250)	2R, 4R

(1) The active part of the antenna must protrude into the tank. B is the maximum nozzle height.

Threaded connection (RA) is available for Rod Antennas without protective plate (3R, 4R)



Tri-Clamp connections (AT, BT, CT) are available for Rod Antennas without protective plate (3R, 4R)



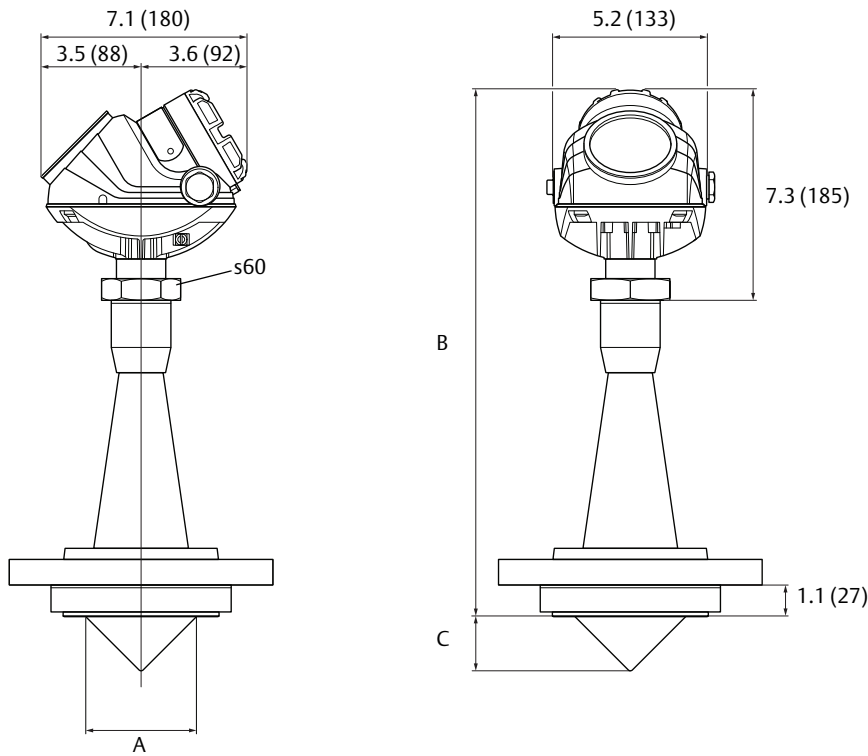
### Process connection availability

- Available as standard
- Available as special, consult factory
- Not available

Process connection	Antenna code	
	1R, 2R	3R, 4R
2 in./DN 50/50A	●	●
3 in./DN 80/80A	●	●
4 in./DN 100/100A	●	●
6 in./DN 150/150A	○	●
8 in./DN 200/200A	○	●
2 in. Tri-Clamp	○	●
3 in. Tri-Clamp	○	●
4 in. Tri-Clamp	○	●
Threaded connection	-	●
Bracket mounting	-	●

## Rosemount 5402 with Process Seal Antenna (Model Code: 2P-4P)

All dimensions are in inches (mm).



Process Seal size (inches)	A	B	C	Antenna code
2	1.8 (46)	14.2 (360)	0.9 (22)	2P
3	2.8 (72)	17.3 (440)	1.4 (35)	3P
4	3.8 (97)	18.9 (480)	1.9 (48)	4P

### Process connection availability

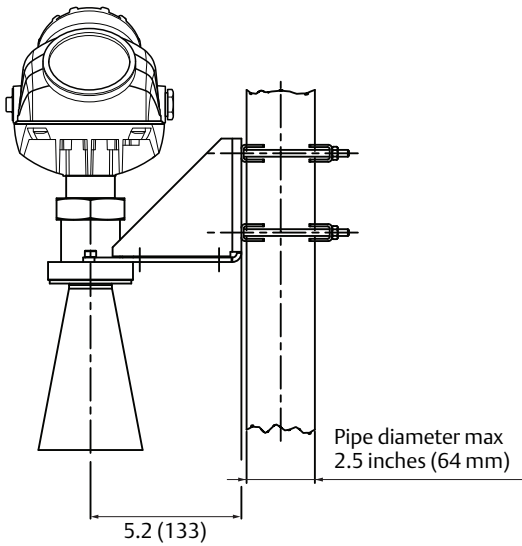
- Available as standard
- Available as special, consult factory
- Not available

Process connection	Antenna code		
	2P	3P	4P
2 in./DN 50/50A	●	-	-
3 in./DN 80/80A	-	●	-
4 in./DN 100/100A	-	-	●
6 in./DN 150/150A	-	-	-
8 in./DN 200/200A	-	-	-
Threaded connection	-	-	-
Bracket mounting	-	-	-

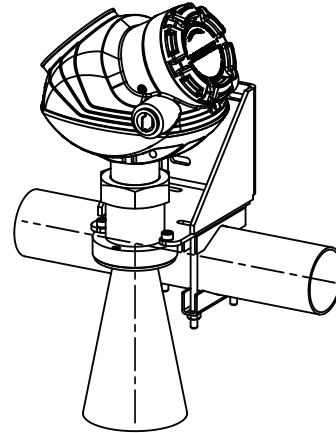
### Bracket mounting (Model Code: BR)

Bracket mounting is available for the Rosemount 5401 and 5402 with SST Cone Antenna (2S-8S) and Rosemount 5401 with Rod Antenna (3R-4R).

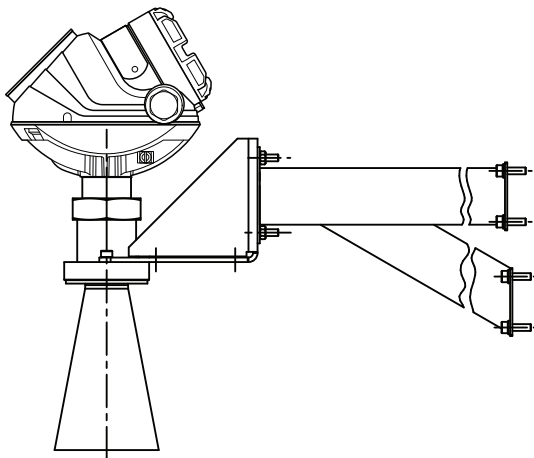
All dimensions are in inches (mm).



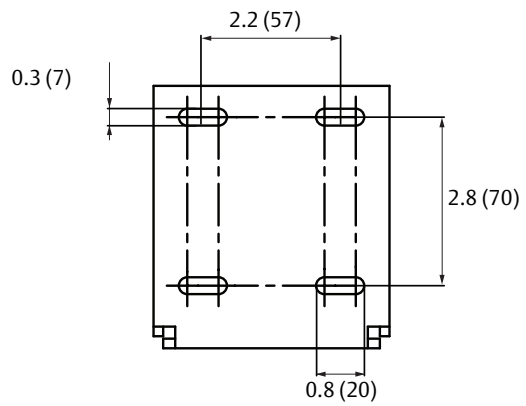
Pipe mounting (vertical pipe)



Pipe mounting (horizontal pipe)



Wall mounting

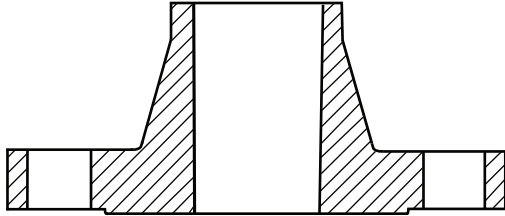


Hole pattern wall mounting

## Process connections

### Standard flanges

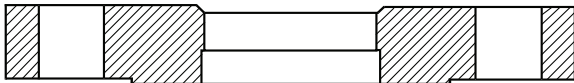
Figure 2. Cone and Rod Antennas (Model Code: 2S-8S and 1R-4R)



Designation	Mating standard	Face style <sup>(1)</sup>	Face surface finish	Material
ANSI	ASME B16.5	0.06 in. raised face	$R_a = 125-250 \mu\text{in}$	316 / 316L
EN (DIN)	EN 1092-1	2 mm raised face (Type B1)	$R_a = 3.2-12.5 \mu\text{m}$	EN 1.4404
JIS	JIS B2220	2 mm raised face	$R_a = 3.2-6.3 \mu\text{m}$	EN 1.4404

(1) Face gasket surface is serrated per mating standard.

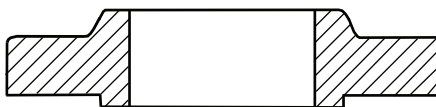
Figure 3. Cone Antennas with Protective Plate (Model Code: 2H-8H, 2M-8M, and 2N-8N)



Designation	Mating standard	Face style <sup>(1)</sup>	Face surface finish	Material
ANSI	ASME B16.5	0.06 in. raised face	$R_a = 125-250 \mu\text{in}$	316 / 316L
EN (DIN)	EN 1092-1	Flat face (Type A)	$R_a = 3.2-12.5 \mu\text{m}$	EN 1.4404
JIS	JIS B2220	2 mm raised face	$R_a = 3.2-6.3 \mu\text{m}$	EN 1.4404

(1) Face gasket surface is serrated per mating standard.

Figure 4. Process Seal Antennas



Designation	Standard	Style	Material
ANSI	ASME B16.5	Slip-on	316 / 316L
EN (DIN)	EN 1092-1	Slip-on (Type 01)	EN 1.4404
JIS	JIS B2220	Slip-on plate (SOP)	EN 1.4404



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