

# Rosemount 2110 Compact Vibrating Fork Liquid Level Switch

## 2110 FEATURES:

- *Function virtually unaffected by flow, turbulence, bubbles, foam, vibration, solids content, coating, properties of the liquid, and product variations*
- *No need for calibration and requires minimum installation procedures*
- *Polarity insensitive and short circuit protection*
- *Industry standard plug/socket connection*
- *No moving parts or crevices means virtually no maintenance*
- *Electronic, self-checking and condition monitoring - Heartbeat LED gives status and health information*
- *Magnetic test point makes functional test easy*
- *Compact design, small in size and weight*
- *“Fast Drip” Fork Design gives quicker response time especially with viscous liquids*
- *Hygienic connections*



DIBt CE

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## Superior Reliability in a Compact Package

The Rosemount 2110 is a liquid point level switch based on the vibrating short fork technology. It is a compact switch with a rugged stainless steel body and forks for use in a wide range of liquid applications. Economical 3/4-in. or 1-in. threaded mounting in pipes or tanks or hygienic mounting for food industry use. Direct load switching suits all supplies or PNP output for direct interface to PLCs. Overfill approval available. For use in safe area only.

### MEASUREMENT PRINCIPLE

The Rosemount 2110 is a liquid point level switch designed using the principle of a tuning fork. A piezo-electric crystal is used to oscillate the forks at their natural frequency. Changes to this frequency are continuously monitored. When the 2110 is used as a low alarm, the liquid in the vessel drains down past the fork, resulting in a change of natural frequency; this is detected by the electronics which switch the output state. When used as a high alarm, the liquid rises in the vessel, makes contact with the fork and again the output switches.

### Short Fork Technology

The natural frequency (~1300Hz) of the fork has been chosen to avoid interference from plant vibration which may cause false switching. This also allows for minimum intrusion into the vessel or pipe through the use of a short fork length. Using Short Fork Technology, the Rosemount 2110 is designed for use in virtually all liquid applications. Extensive research has maximized the operational effectiveness of the fork design making it suitable for almost all liquids, including coating liquids (avoid bridging of forks), aerated liquids, and slurries.

### SPECIAL FEATURES

#### Heartbeat LED

The Rosemount 2110 has a status indicating heartbeat LED which can be seen at all times through a window in the housing. The LED will flash (once per second) when the 2110 is 'off' and will be constantly lit when it is 'on'. The LED gives constant indication that the 2110 is functioning correctly (different flash rates indicate different faults) and gives a local indication of the process state.

#### Magnetic Test Point

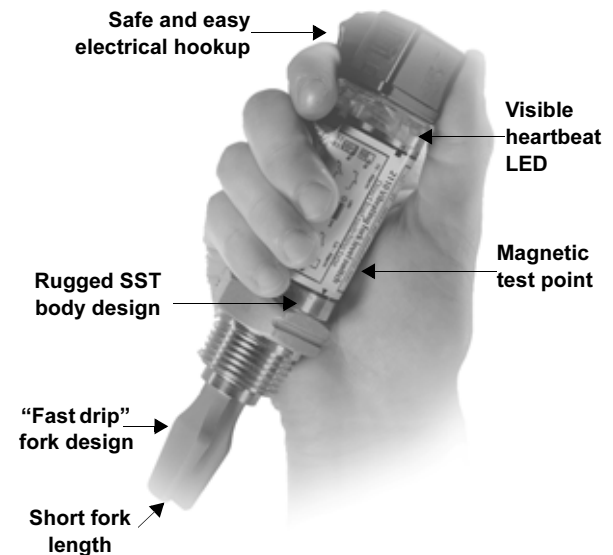
A magnetic test point is indicated on the side of the housing, allowing the user to perform a functional test of the 2110. By touching a magnet to the target the 2110 output will change state for as long as the magnet is present.

#### Electrical Hookup

The industry standard DIN 43650 plug/socket is used for fast connection. The polarity insensitivity and short circuit protection make electrical hookup safe and easy.

#### Fork Design

The "fast drip" fork design (the liquid is drawn away from the fork tips) makes detection quicker and more sensitive especially in high viscosity liquids.



**ROSEMOUNT 2110 APPLICATION EXAMPLES**



- Simple
- Cost effective
- High integrity
- Heartbeat LED

**Overflow Protection**

Spillage caused by overfilling can be hazardous to people and the environment, resulting in lost product and potentially high clean up costs. The 2110 is a limit level switch used to signal overflow at any time. The 2110 is available with DIBt/WHG overflow protection approval.



- Small Forks
- Low Cost
- Resistance to false switching

**Pump Protection**

Short forks mean minimum wet-side intrusion and allow for a simple low cost installation at any angle into your pipes or vessels. With the fork projecting only 2-in. (50 mm) (dependant on connection type), the 2110 can be installed in even small diameter pipes. By selecting the option of direct load switching electronics, the 2110 is ideal for reliable pump control and can be used to protect against pumps running dry.

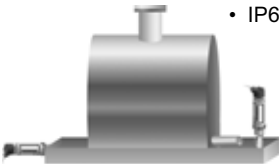


- Economical
- Reliable
- Minimal maintenance
- Manual test facility

**High and Low Level Alarm**

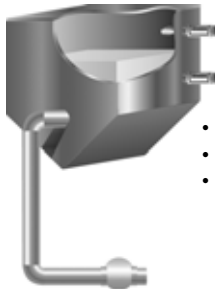
Maximum and minimum level detection in tanks containing many different types of liquids are ideal applications for the 2110. The robust 2110 operates continuously at temperatures up to 302°F (150°C) and operating pressures up to 1450 psig (100 barg) making it perfect for use as a high or low level alarm. It is common practice to fit an independent high level switch as a backup to any other level device installed in case of primary device failure.

- SST 304 Housing
- IP66/67



**Leak Detection**

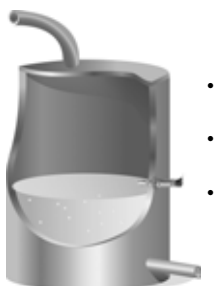
Flanges, gaskets, seals, corrosive liquids – they all have the potential to leak at the most inconvenient times. Many users site tanks and vessels above trays or in containments to prevent any liquids from escaping. A 2110 can quickly and accurately detect any leakage thereby eliminating cost.



- Lightweight
- 316 SST
- 3/4-in. threaded model

**Pump Control**

Many processes have batching and header tanks, and there is usually the need to control a pump to maintain levels between set points. These tanks are often manufactured from thin wall materials and cannot support the weight of heavy instrumentation.



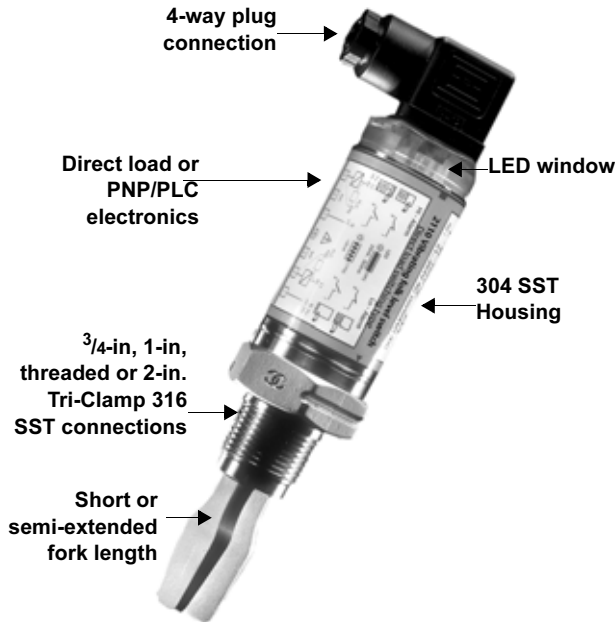
- Hygienic mounting boss kit
- Hygienic surface finish
- 2-in. Tri-clamp

**Hygienic Applications**

With the option of highly polished forks providing a surface finish (Ra) better than 0.8 µm, the 2110 meets the principle design criteria of the most stringent hygienic requirements used in food and beverage, and pharmaceutical applications. Manufactured in stainless steel the 2110 is robust enough to easily withstand steam cleaning (CIP) routines at temperatures up to 302°F (150°C).

## SELECT ROSEMOUNT 2110 SWITCH

The Rosemount 2110 Level Switch consists of switch housing, tank connection and fork. The tank connection and the forks are the only wetted parts.



### Switch Housing

The housing is built in rugged stainless steel with a polyamide LED window. It has a 4 way plug connection, DIN43650, with 4 position orientation and cable gland supplied.

### Electronics

Standard two core cable with any power supply from 21 to 264 V ac (50/60 Hz)/dc is used to connect the 2110 in series with the load and achieve direct load switching. The output acts as a simple SPST switch that changes with liquid presence. Alternatively use the 24V dc solid state PNP output for direct interface to PLCs.

## Tank Connection and Fork

Wetted material is 316 SST and forks are available in short or semi-extended lengths. For fork length see "Dimensional Drawing" on page 8.

### Threaded Connection

**Threads:** 3/4-in. NPT or BSPT (R),  
1-in. BSPT (R) or BSPP (G)

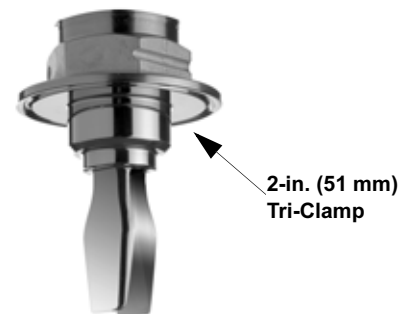
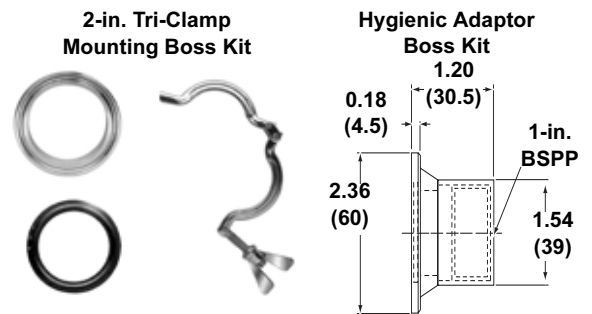
**Material:** 316L SST

### Hygienic Connection

**Fittings:** 2-in. (51 mm) Tri-Clamp,  
1-in. BSPP (G) O-ring seal

**Material:** 316L SST

**Accessories:** Where hygiene is important, Emerson Process Management offers a companion mounting boss which is for use with the 1-in. BSPP, or the industry standard 2-in. (51mm) Tri-Clamp connection. The Tri-clamp comes with a hand polished wetside and surface finish (Ra) better than 0.8µm to meet the principle design criteria of the most stringent hygienic requirements. See "Spares & Accessories" on page 9 for mounting kits.



**APPLICATION AND INSTALLATION BEST PRACTICES**

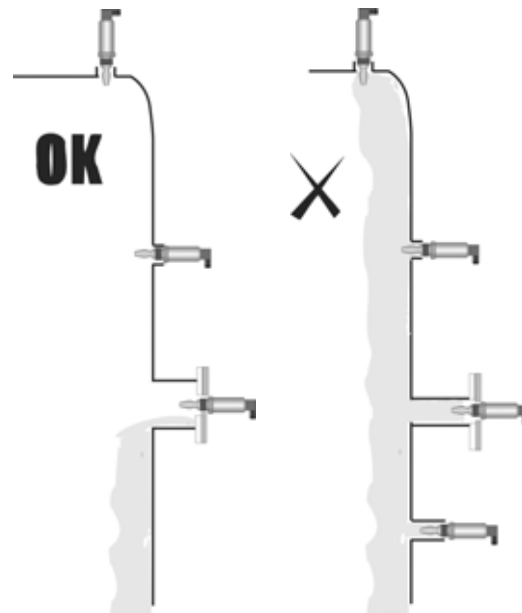
**Application Considerations:**

- Ensure liquid is inside the temperature and pressure ranges (see specifications).
- Check that the liquid is inside recommended viscosity range 0.2 to 10,000 cP.
  - Examples of products that are too viscous are chocolate syrup, ketchup, peanut butter and bitumen.
  - The switch will still detect products above 10,000 cP, however, the drain times become prohibitively long or cleaning may become necessary to resume dry functioning.
- Check that the liquid density is above 37.5 lb/ft<sup>3</sup> (600 kg/m<sup>3</sup>).
  - Examples of products with densities too low are propane and propylene.
- Check for risk of build-up on the forks.
  - Avoid situations where drying and coating products may create excessive build-up.
  - Ensure there is no risk of bridging the forks.
  - Examples of products that can create bridging of forks are dense paper slurries and bitumen.
- Check the solids content in the liquid.
  - Problems may occur if product coats and dries causing caking.
  - As a guideline maximum solid particle diameter in the liquid is 0.2-in. (5 mm).
  - Extra consideration is needed when dealing with particles bigger than 0.2-in. (5 mm), consult factory.
- Foam
  - In almost all cases the 2110 is insensitive to foams (does not see the foam).
  - However in rare occasions some very dense foams may be seen as liquid, known example of this is found in ice-cream and orange juice manufacturing.

**Recommended Installation:**

- Always install in the normally “on” state.
  - For high level is Dry on.
  - For low level is Wet on.
- Always ensure the system is tested by using the local magnetic test point during commissioning.
- Ensure sufficient room for mounting and electrical connection (See page 8 for switch dimensions).
- Avoid installing the 2110 where it will be exposed to liquid entering the tank at the fill point.
- Avoid heavy splashing on the forks.
- Ensure that the forks do not come into contact with the tank wall or any internal fittings or obstructions.
- Ensure there is sufficient distance between build-up on the tank wall and the fork.

FIGURE 1. Example of OK and not OK build-up on tank wall.



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## Specifications

### PHYSICAL

#### Product

Rosemount 2110 Compact Liquid Level Switch

#### Measuring principle

Vibrating Fork

#### Applications

Most liquids including coating liquids, aerated liquids, and slurries

### Mechanical

#### Process Material

316L Stainless Steel (1.4404)

For Tri-Clamp connection hand polished to better than 0.8  $\mu\text{m}$ .  
Gasket material for 1 in. BSPP (G1) is Non-asbestos BS7531  
Grade X carbon fiber with rubber binder.

#### Housing Materials

Body: 304 SST with polyester label  
LED window: Flame retardant Polyamide (Pa12) UL94 V2  
Plug: Polyamide glass reinforced  
Plug seals: Nitrile butadiene rubber

#### Mounting

- 3/4-in. BSPT (R) or NPT
- 1-in. BSPT (R) or BSPP (G) thread, or
- Hygienic 2-in. (51 mm) Tri-clamp fitting

#### Dimensional Drawings

See "Dimensional Drawing" on page 8

#### Ingress of Protection Rating

IP66/67 to EN60529

### PERFORMANCE

#### Hysteresis (water)

$\pm 0.039$ -in. ( $\pm 1$ mm) nom.

#### Switching Point (water)

0.5-in. (13mm) from tip (vertical) / from edge (horizontal) of fork  
(this will vary with different liquid densities)

### FUNCTIONAL

#### Maximum Operating Pressure

Final rating depends on tank connection

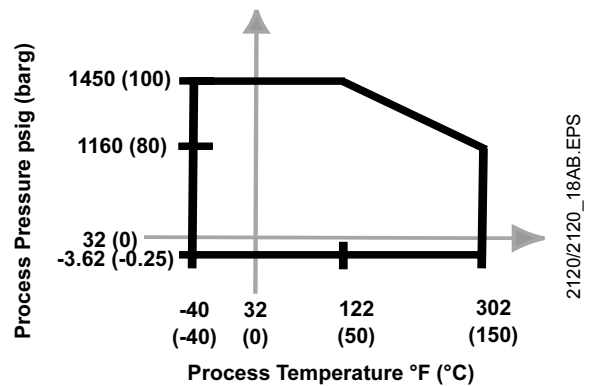
#### Threaded Connection

See Figure 2.

#### Hygienic Connection

435 psig (30 barg)

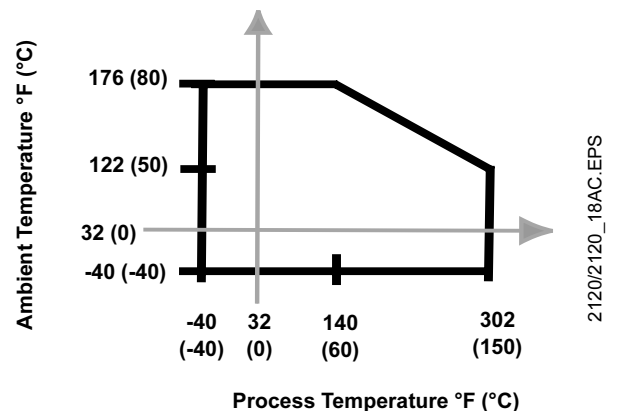
FIGURE 2. Process Pressure



#### Temperature

See Figure 3.

FIGURE 3. Temperature



# Product Data Sheet

00813-0100-4029, Rev BA  
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# Rosemount 2110

### Liquid Density

Minimum 37.5 lb/ft<sup>3</sup> (600 kg/m<sup>3</sup>)

### Liquid Viscosity Range

0.2 to 10,000 cP (centiPoise)

### Solids Content and Coating

Maximum recommended diameter of solid particles in the liquid is 0.2-in. (5 mm).

For coating product, avoid bridging of forks.

### Switching Delay

1 sec dry to wet/wet to dry

### CIP (Clean In Place) Cleaning

Withstands steam cleaning routines up to 302°F (150°C)

## Electrical

### Switching Mode

User selectable (Dry =on or Wet =on) by selecting plug wiring

### Cable Connection

Via 4-way plug provided - DIN43650. Max. conductor size - 15AWG. Orientation 4-position (90/180/270/360 deg).

### Conductor Size

Maximum 0.06 inch<sup>2</sup> (1.5 mm<sup>2</sup>)

### Cable Gland

PG9 provided - cable diameter 0.24 to 0.31-in. (6 to 8 mm)

### Protection

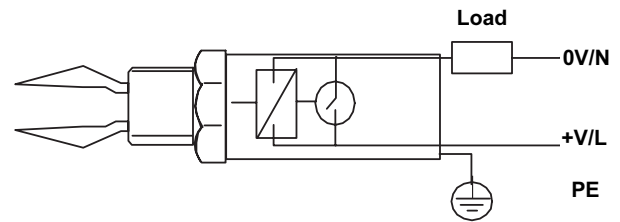
Polarity insensitive. Over-current, short circuit and load-missing protection. Surge protection to IEC61326.

### Grounding

The 2110 should always be grounded either through the terminals or using the external ground connection provided.

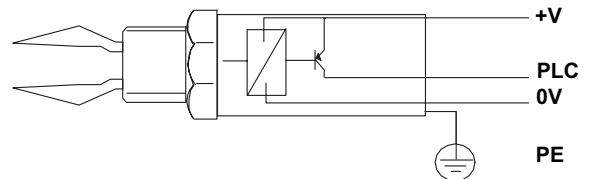
#### Direct load switching (Code 0)

|                         |                                |
|-------------------------|--------------------------------|
| Operating Voltage       | 21 to 264V ac (50-60Hz)/dc     |
| Maximum switched load   | 500mA                          |
| Maximum peak load       | 5A for 40 ms max.              |
| Minimum switched load   | 20mA continuous                |
| Voltage drop            | 6.5V @ 24V dc / 5.0V @ 240V ac |
| Current draw (load off) | <3.0mA continuous              |



#### PNP switching (Code 1)

|                           |                   |
|---------------------------|-------------------|
| Operating Voltage         | 18-60V dc         |
| Maximum switched load     | 500mA             |
| Maximum peak load         | 5A for 40 ms max. |
| Voltage drop              | <3V               |
| Supply Current            | 3mA nominal       |
| Output current (load off) | <0.5mA            |



## Product Certifications

### L.V. Directive

EN61010-1 Pollution degree 2, Category II (264V max),  
Pollution degree 2, Category III (150V max)

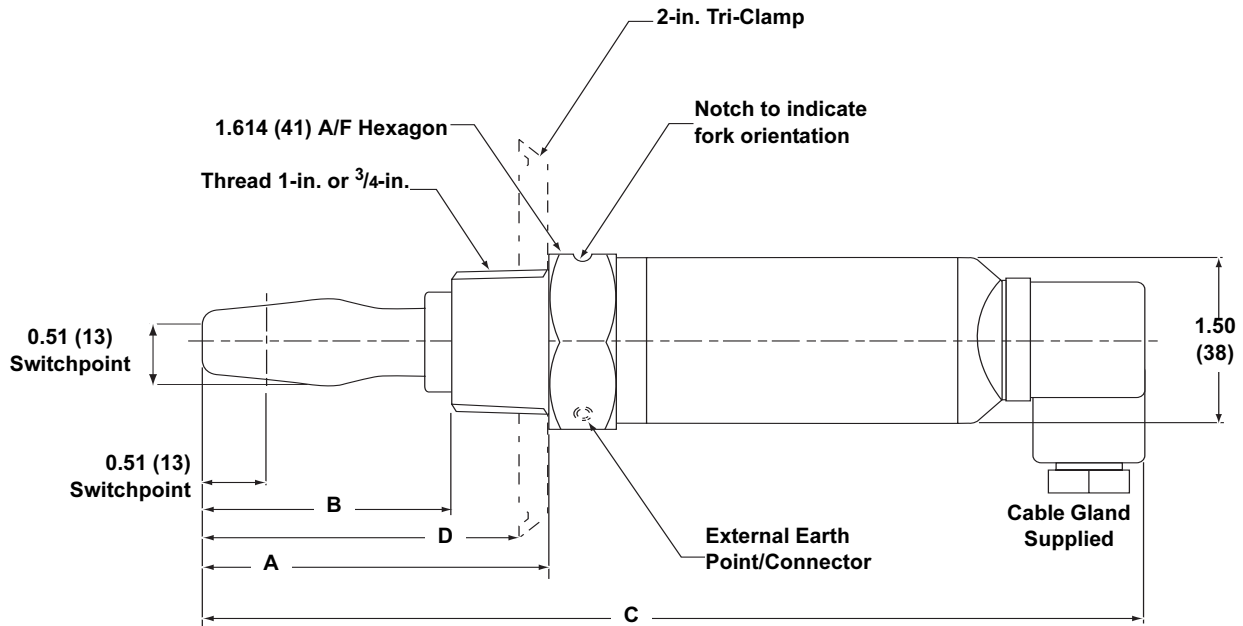
### Electro Magnetic Compatibility (EMC) Directive

EN61326

### Overfill Protection

Option available for DIBt/WHG

## Dimensional Drawing



2110-06AA.EPS

TABLE 1. Dimensions are in inches (millimeters)

| Connections                               | A          | B         | C          | D         |
|-------------------------------------------|------------|-----------|------------|-----------|
| <sup>3</sup> / <sub>4</sub> -in. BSPT (R) | 2.72 (69)  | 1.97 (50) | 7.40 (188) | N/A       |
| <sup>3</sup> / <sub>4</sub> -in. NPT      | 2.72 (69)  | 1.97 (50) | 7.40 (188) | N/A       |
| 1-in. BSPT (R)                            | 2.72 (69)  | 1.97 (50) | 7.40 (188) | N/A       |
| 1-in. BSPP (G)                            | 3.07 (78)  | 2.36 (60) | 7.91 (201) | N/A       |
| 2-in. (51 mm) Tri-Clamp                   | 2.72 (69)  | 1.97 (50) | 7.40 (188) | 2.52 (64) |
| 1-in. Semi-extended                       | 4.57 (116) | 3.86 (98) | 9.41 (239) | N/A       |



## Ordering Information

| Model                              | Product Description                                                                        |
|------------------------------------|--------------------------------------------------------------------------------------------|
| 2110                               | Compact Vibrating Fork Liquid Level Switch                                                 |
| Code                               | Electronic Type                                                                            |
| 0                                  | Direct load switching with plug connection (2 wire) 21 to 264 V ac 50/60Hz, 21 to 264 V dc |
| 1                                  | PNP/PLC low voltage switching with plug connection 18 to 60 V dc                           |
| Code                               | Process Connection Size / Type                                                             |
| 0A                                 | <sup>3</sup> / <sub>4</sub> -in. BSPT (R) thread                                           |
| 1A                                 | 1-in. BSPT (R) thread                                                                      |
| 0D                                 | <sup>3</sup> / <sub>4</sub> -in. NPT thread                                                |
| 2R                                 | 2-in. (51mm) Tri-clamp                                                                     |
| 1B                                 | 1-in. BSPP (G) thread                                                                      |
| 1L                                 | 1-in. BSPP (G) Semi-extended 4.6-in. (116 mm)                                              |
| Code                               | Product Certificates                                                                       |
| NA                                 | No Hazardous Locations Certifications (safe area use only)                                 |
| Code                               | Overfill                                                                                   |
| U1                                 | DIBt/WHG Overfill protection                                                               |
| Code                               | Options                                                                                    |
| Code                               | Calibration Data Certificate                                                               |
| Q4                                 | Certificate of functional test                                                             |
| Code                               | Tag Plates                                                                                 |
| ST                                 | Tag plate SST engraved plate (maximum 16 digits)                                           |
| WT                                 | Tag plate laminated paper (maximum 40 digits)                                              |
| <b>Typical Model: 2110 0 2R NA</b> |                                                                                            |

## SPARES & ACCESSORIES

| Part Number     | Spares & Accessories                                                                                                                         |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 02100-1000-0001 | Seal for 1-in. BSPP (G1A). Material: Non-asbestos BS7531 grade X carbon fiber with rubber binder                                             |
| 02100-1010-0001 | Hygienic adaptor boss for use with 1-in. BSPP model. Material: 316 SST fitting. Fluorocarbon (FPM/FKM) O-ring                                |
| 02100-1020-0001 | Hygienic mounting kit for use with 2-in. (51 mm) Tri-clamp model including vessel fitting, clamp ring, seal. Material: 316 SST, NBR Nitrile. |
| 02100-1030-0001 | Telescopic test magnet                                                                                                                       |

# Rosemount 2110

**Product Data Sheet**  
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## Notes

**Notes**

## Rosemount Level Solutions

Emerson provides a complete range of Rosemount products for level measurement applications.

### Pressure – Level or Interface Measurement

Emerson has a complete line of Rosemount pressure transmitters and remote seals for measuring level or interfaces in liquid applications. Optimize performance with direct mount, Tuned Seal systems:

- Rosemount 3051S\_L, 3051L, and 1151LT Liquid Level Transmitters
- Rosemount 1199 Remote Diaphragm Seals with direct mount or capillary connections

### Guided Wave Radar – Level and Interface Measurement

The reliable Rosemount 3300 Series consists of:

- Rosemount 3301 for level measurements of liquids and solids
- Rosemount 3302 for level and interface measurement of liquids

Both can be equipped with a wide range of probes for different applications.

### Non-contacting Radar – Level Measurement

The Rosemount non-contacting radar family consists of:

- Rosemount 5400 Series Transmitters – The two loop-powered models utilize different transmitter frequencies, and both can be equipped with a wide range of antennas for liquid level measurement in most applications and process conditions
- Rosemount 5600 Series Transmitters – These radar level transmitters have ultra-high sensitivity and are the perfect choice for measuring level of liquids and solids, even for the most challenging applications

### Vibrating Fork Switches – Point Level Detection

The Rosemount 2100 Series is developed for reliable point level measurement of liquids and consists of:

- Rosemount 2110 Compact Vibrating Fork Liquid Level Switch
- Rosemount 2120 Universal Vibrating Fork Liquid Level Switch

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### Emerson Process Management

#### Rosemount Inc.

8200 Market Boulevard  
Chanhassen, MN 55317 USA  
T (U.S.) 1-800-999-9307  
T (International) (952) 906-8888  
F (952) 949-7001

#### Rosemount Temperature GmbH

Frankenstrasse 21  
63791 Karlstein  
Germany  
T 49 (6188) 992 0  
F 49 (6188) 992 112

#### Emerson Process Management Asia Pacific Private Limited

1 Pandan Crescent  
Singapore 128461  
T (65) 6777 8211  
F (65) 6777 0947  
Enquiries@AP.emersonprocess.com

[www.rosemount.com](http://www.rosemount.com)

