

# Rosemount 2130 Extreme Temperature Vibrating Fork Liquid Level Switch

The Rosemount 2130 Vibrating Fork Level Switch, based on vibrating short fork technology, is designed for use in extreme temperatures of  $-94$  to  $500$  °F ( $-70$  to  $260$  °C) and suitable for virtually all liquid applications. Features include a complete range of process connections, wide choice of housings and wetted parts materials, four different switching functions, extended fork lengths, and hazardous area approvals. This makes the Rosemount 2130 an ideal choice for a wide variety of challenging applications in the chemical, power generation, and oil and gas industries.



## MEASUREMENT PRINCIPLE

The Rosemount 2130 is a liquid point level switch designed using the principle of a tuning fork. A piezo-electric crystal oscillates the forks at their natural frequency. Changes to this frequency are continuously monitored.

When the 2130 is used as a low alarm, the liquid in the vessel drains down past the fork causing a change of natural frequency that is detected by the electronics and switches the output state.

When the 2130 is used as a high alarm, the liquid rises in the vessel, making contact with the fork causing the output to switch.

## Short Fork Technology

The natural frequency ( $\sim 1400$ Hz) of the fork avoids interference from plant vibration that may cause false switching. This allows for minimum intrusion into the vessel or pipe through the use of a short fork.

Using Short Fork Technology, the Rosemount 2130 can be used in almost 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

### Mode Switch and Adjustable Time Delay

A mode switch allows the 2130 to be set to switch from wet-to-dry (typically for low level alarm) or from dry-to-wet (typically for high level alarm).

There is also a user-selectable time delay of 0.3, 1, 3, 10, or 30 seconds. Increasing the time delay in turbulent or splashing applications virtually eliminates the risk of false switching.

### Heartbeat LED

The 2130 has a 'heartbeat' LED that indicates status. The LED flashes when the 2130 output is 'off' and is constantly lit when 'on'. The LED constantly indicates that state of the 2130.

### Magnetic Test Point

A magnetic test-point is located on the side of the housing, allowing for a functional test of the 2130 and the system connected to it. Holding a magnet to the test-point causes the output to change states.

### Instrument Health Monitor and Continuous Self-Check

The 2130 continuously performs instrument health diagnostics to self-check the condition of the fork and sensor. These diagnostics can detect damage to the forks including corrosion, internal or external damage to the forks, and breakages to the internal wiring. Any of these conditions will trigger the 'heartbeat' LED to pulse intermittently, followed by safe handling of the electrical load.

### Electrical Hookup

The terminal blocks extend above the housing and give easy terminal access. The polarity insensitivity on Direct Load and Relay electronics, and short-circuit protection on Direct Load and PNP/PLC electronics make electrical hook-up safe and easy.

### Fork Design

The "fast drip" fork design draws liquid away from the fork tips, together with a short switching delay allows the 2130 to react quickly and with greater sensitivity to density variations.

# Rosemount 2130

## Rosemount 2130 Application Examples



- High integrity
- Manual test facility

### Overfill Protection

Spillage caused by overfilling can be hazardous to people and the environment, resulting in lost product and potentially high clean up costs.

- High temperature
- High pressure



### High and Low Level Alarm

Maximum and minimum level detection in tanks containing different types of liquids are ideal applications. The Rosemount 2130 is robust and operates continuously across the temperature range of  $-94$  to  $500$  °F ( $-70$  to  $260$  °C) and operating pressures of up to 1450 psig (100 barg), making it perfect for use as a high or low level alarm. It is common practice to have an independent high level alarm switch as a backup to an installed level device in case of primary failure.



- Time delay switching option
- Resistance to false switching

### Pump Control (Limit Detection)

Batch processing tanks often contain stirrers and agitators to ensure mixing and product 'fluidity'. The standard user selectable time delay, from 0.3 to 30 seconds, virtually eliminates the risk of false switching due from splashing.

- Small forks
- Low cost



### Pump Protection or Empty Pipe Detection

With the fork projecting only 2 inches (50 mm) (dependant on connection type), the 2130 can be installed in small diameter pipes. Short forks mean minimum intrusion on the wet side and allow for simple, low cost installation at any angle into pipes or vessels. By selecting the option of direct load switching electronics, the 2130 is ideal for reliable pump control and can be used to protect against pumps running dry.



- Extreme temperature range
- Thermal tube

### Extreme Temperature Applications

The 2130 is designed for extreme temperatures and is suitable for continuous operation within the temperature range of  $-94$  to  $500$  °F ( $-70$  to  $260$  °C).

- Add wireless switches to existing or new plant
- Acts as a wireless repeater



### Wireless Applications

The advent of wireless communications allows process plant managers to save up to 90% on installation cost compared to wired technologies. More data can be collected at central locations than ever before. The 2130 can be used with a Rosemount 702 Wireless Transmitter to enable these benefits for your applications.



- Hygienic surface finish
- Extended fork

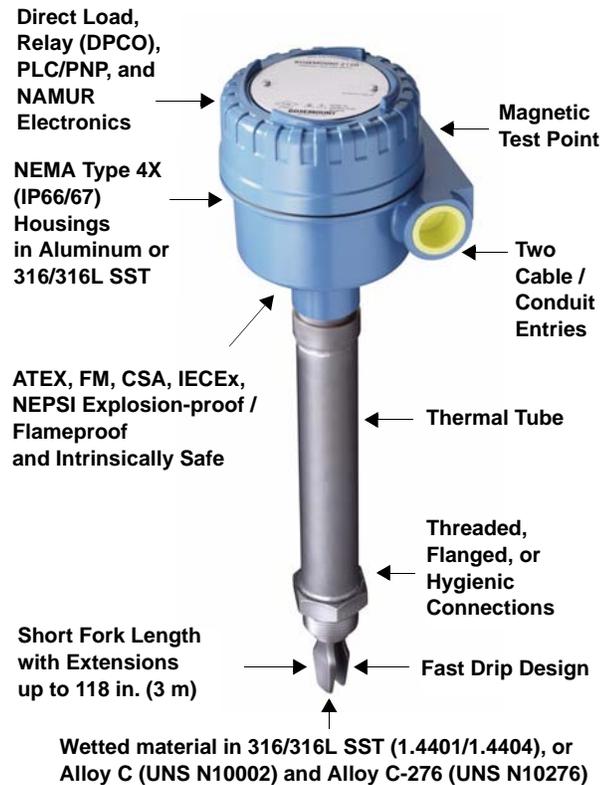
### Hygienic Applications

With the highly polished forks option providing a surface finish (Ra) better than  $0.4$   $\mu\text{m}$ , the 2130 meets the most stringent hygienic requirements used in food and beverage, and pharmaceutical applications. Manufactured in stainless steel, the 2130 is robust enough to easily withstand steam cleaning (CIP) routines.

## Selecting a Rosemount 2130 Vibrating Liquid Level Switch

The 2130 consists of a housing, thermal tube, process connection, and forks. The process connection and forks are the only wetted parts.

FIGURE 1. 2130 Features



### Switch Housing

The switch housing is available in aluminum or SST, with two cable/conduit entries (M20 or 3/4-in. NPT). It can be ordered with Explosion-proof / Flameproof or Intrinsically Safe approvals. See Product Data Sheet 00813-0100-4130 for approvals.

### Electronics

Standard two-core cable can be used with any power supply from 20 to 264V ac (50/60 Hz) or 20 to 60V dc to connect the Rosemount 2130 in series with a load to achieve direct load switching (page 4). The output acts as a simple SPST switch that changes state with liquid presence.

Alternatively, the switching function of the DPCO dual relay electronics output can be used (page 4). The 2130 has an electronics option that can be interfaced directly to a Programmable Logic Controller (PLC) using the PNP transistor output model (page 4). The 2130 is also available with a NAMUR switching output (page 4).

### NOTE:

See Product Data Sheet (00813-0100-4130) for available accessories and ordering information.

### Process Connection and Fork

#### Fork Length

Short fork, for minimum intrusion installation (minimum length is 2 in. [50 mm]). Fork extensions are available up to 118 in. (3 m).

#### Threaded Connection

Threads: R 3/4-in. and 1-in. (BSPT); G 3/4-in. and 1-in. (BSPP); 3/4-in. and 1-in. NPT

Material: 316/316L SST (1.4401/1.4404), or Alloy C and Alloy C-276

Accessories: A stainless steel adjustable clamp gland is available for use with the extended length 2130 (1-in. models only). This is a threaded 1 1/2-in. BSPP to connect to the vessel, and allows the 1-in. extended length 2130 to be raised or lowered, as desired, and then clamped into position.

#### Flanged Connections

Flange: ASME B16.5 (1-in. or larger), or EN 1092-1 (DN25 or larger)

Material: 316/316L SST (1.4401/1.4404), or Alloy C and Alloy C-276

#### Hygienic Connections

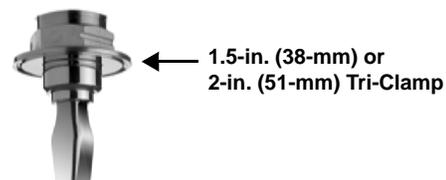
Fittings: 1 1/2-in. (38 mm) or 2-in. (51 mm) Tri-Clamp, or 1-in. BSPP (G) O-ring seal

Material: 316/316L SST (1.4401/1.4404)

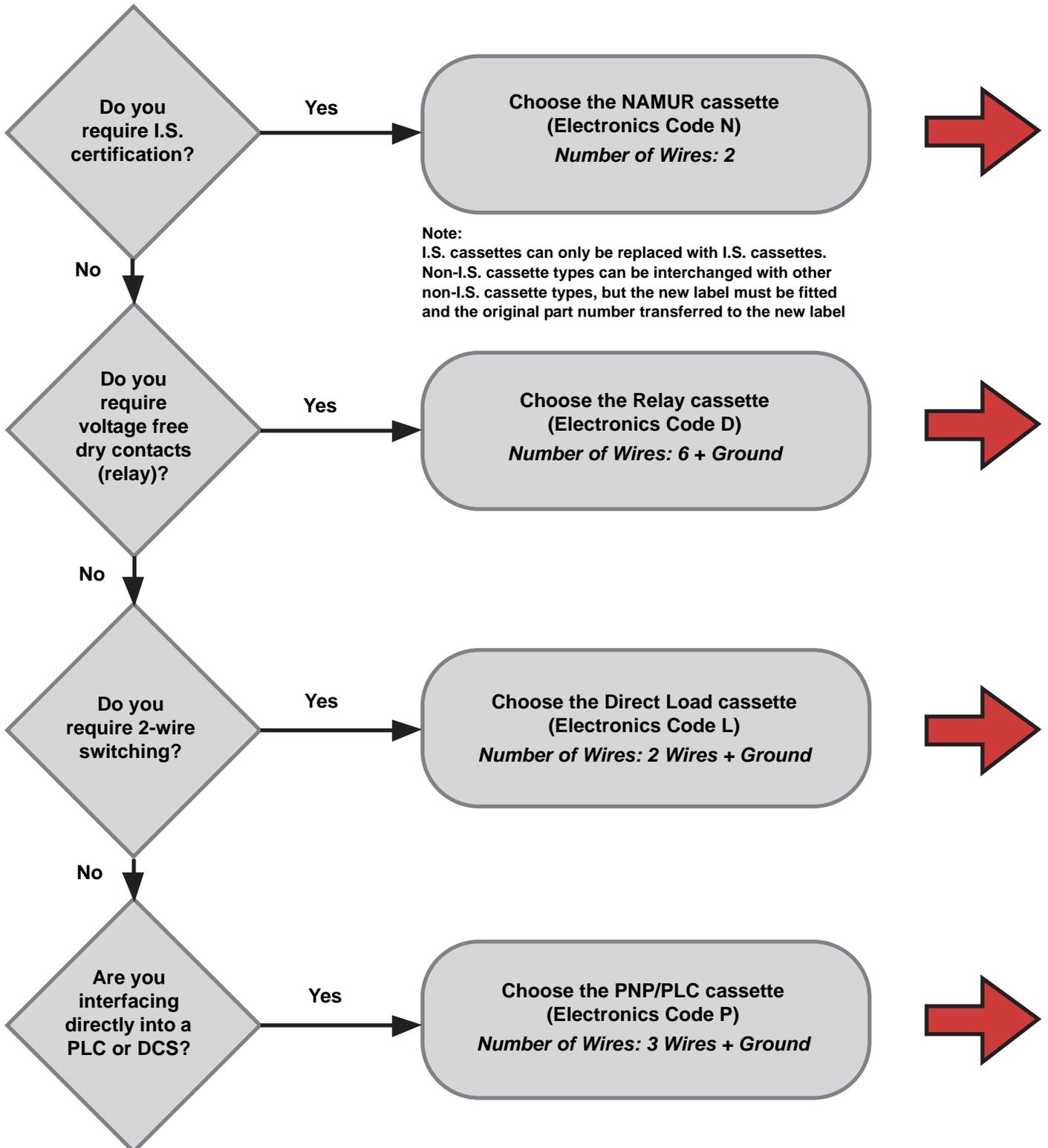
Options: Hand polished wetside to a finish better than 0.4 µm meets the most stringent hygienic requirements.

Accessories: A mounting kit comprising vessel fitting, Nitrile seal and clamp ring is available for use with the 2-in. (51-mm) Tri-Clamp version of the 2130. A fitting boss with Fluorocarbon (FPM/FKM) O-ring is available for use with the O-ring seal version of the 2130.

FIGURE 2. Tri-Clamp Fitting



## Output Selection



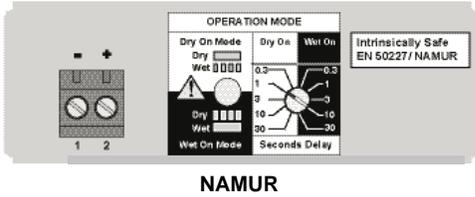
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00840-0100-4130, Rev AA

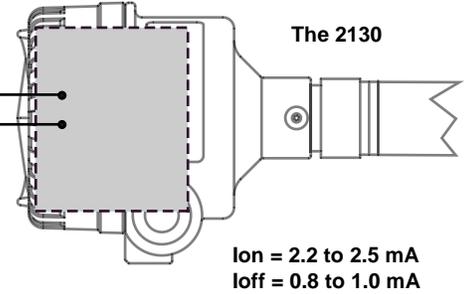
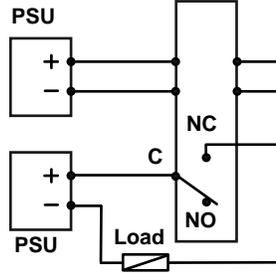
September 2010

# Rosemount 2130

Blue Cassette

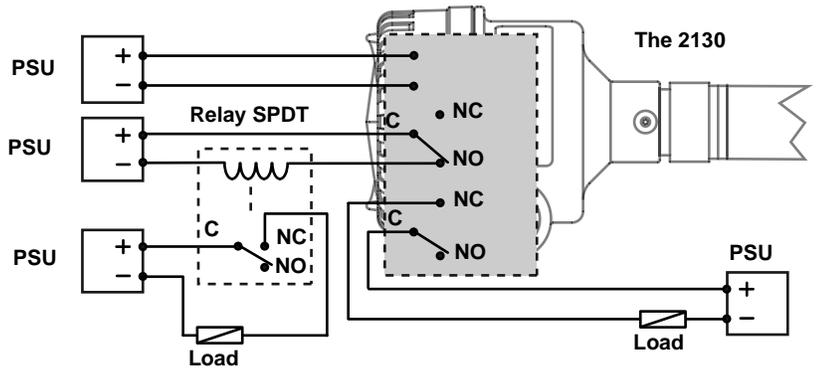
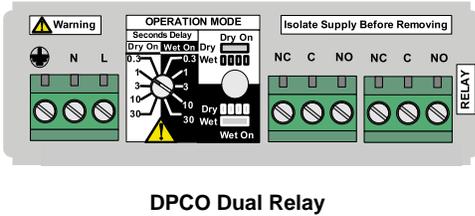


### Isolating Amplifier To NAMUR (IEC60947-5-6, EN50227)

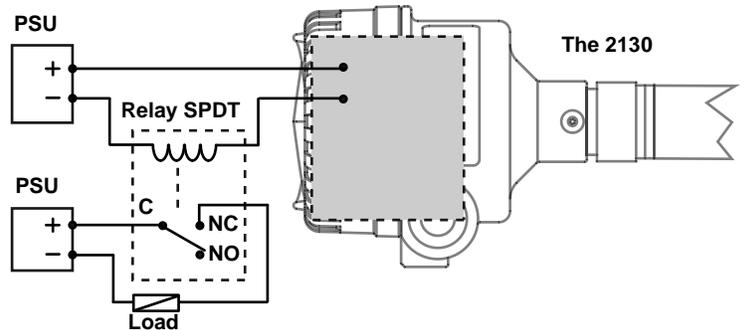
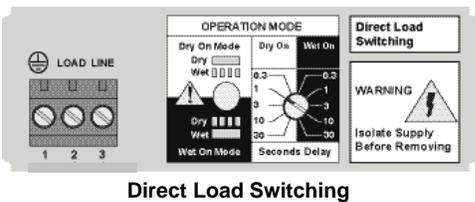


Non-Hazardous Area Hazardous Area

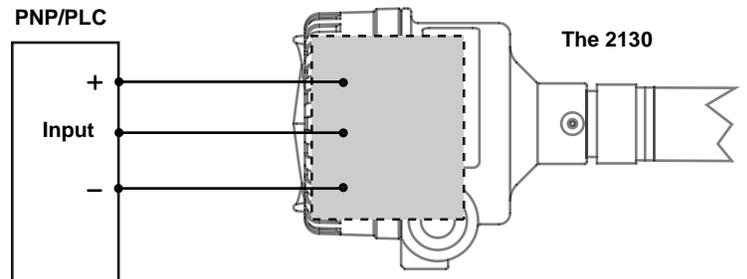
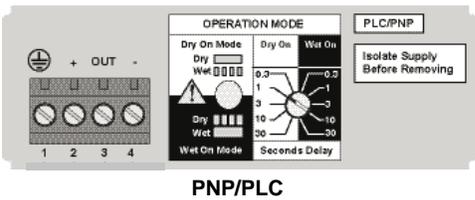
Green Cassette



Red Cassette



Yellow Cassette

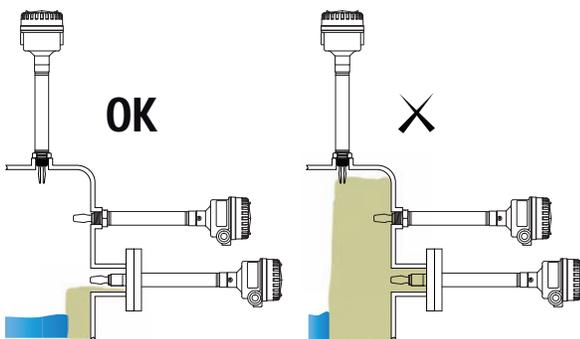


## Application and Installation Best Practices

### Application Considerations:

- Ensure the process is operating within the instrument temperature and pressure ranges
- Ensure the liquid viscosity is within the recommended viscosity range
- Check that the liquid density is higher than 37.5 lb/ft<sup>3</sup> (600 kg/m<sup>3</sup>), or above 31.2 lb/ft<sup>3</sup> (500 kg/m<sup>3</sup>) when ordered with the Low Density Range option
- Check the risk of build-up on the forks. 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  
As a guideline, 0.2 in. (5 mm) is the maximum solid particle diameter in the liquid  
When dealing with particles larger than 0.2 in. (5 mm), consult the factory
- Problems may occur if the product coats and dries, causing caking
- In almost all cases, the 2130 is insensitive (does not see) foams  
In rare cases, some very dense foams may be seen as liquid. An example of this is ice-cream and orange juice manufacturing

FIGURE 3. Avoid Build-up On A Tank Wall



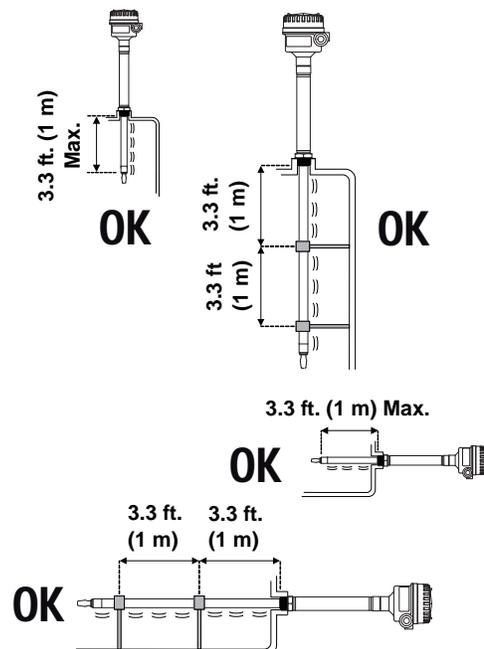
**NOTE:**

See Product Data Sheet 00813-0100-4130 for ordering information, specifications, approvals, and dimension drawings.

### Recommended Installation:

- Always install in the “on” state:
  - For a high level, use the “Dry on” setting
  - For a low level, use the “Wet on” setting
- Ensure the system is tested by using the local magnetic test-point during commissioning
- Ensure there is sufficient room for mounting and for electrical connections
- Avoid installing the 2130 near to liquid entering the tank at the fill point
- Avoid heavy splashing on the forks  
Increasing the time delay reduces accidental switching caused by splashing
- Ensure the forks do not come into contact with the tank wall, any internal fittings, or obstructions
- Ensure there is sufficient distance between build-up on the tank wall and the fork (Figure 3)
- Extra consideration is needed if the plant vibration is close to the 1400 Hz operating frequency of the 2130
- Supporting the fork avoids long fork length vibration (Figure 4)

FIGURE 4. Supports For Long Fork Lengths





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