SafePoint® Self-Validating Rotary Paddle Bin Monitor

- The Leader in Self-Validating Point Level Monitors
- "Fail-Safe" PLUS
- Microcontroller-based Reliability
- Material Sense and Fault Outputs
- Choice of Process Connections & Accessories
- Hazardous Location Approvals Available
Imagine a bin level sensor that is more than just an indicator of the presence or absence of material. Picture technology that allows intelligent devices to indicate when something is wrong. Dream that a level sensor provides real-time information when the quality of the sensor function no longer allows it to operate as you expect. That is a “self-validating” bin level indicator. Now you can wake up, your dream has arrived. Costly overfilling and outages due to sensor failure can now be avoided!

The SafePoint® self-validating bin monitor is the state-of-the-art in rotary paddle technology. Going beyond traditional fail-safe sensor technology that only protects against power failure, the SafePoint® bin monitor is the most reliable, rotary paddle point level control sensor available.

The SafePoint® bin monitor provides the ultimate in performance wherever critical continuous operation must be ensured. Detection of both material presence and its own operational status is performed on a continuous basis.

The SafePoint® level sensor monitors its electrical and mechanical operating condition. This, in conjunction with separate outputs for material sense and unit status (fault conditions) make the SafePoint® a self-validating device.

PRINCIPLE OF OPERATION

While the SafePoint® bin monitor is an evolution in rotary paddle technology, it continues to use tried-and-true operating techniques. Unlike many other available units, the SafePoint® incorporates a feature that automatically shuts off its motor when the paddle is in a stalled condition. This extends the life of the unit and minimizes maintenance.

The operation of the SafePoint® rotary paddle bin monitor uses patented technology to detect material presence and operational status of the unit. The unit is installed through the wall of the vessel so that the paddle protrudes inside the vessel. A small electric motor drives the paddle, which rotates freely in the absence of material.

The rotation of the unit’s shaft is continuously monitored by detection of a magnetized rotating disk. When the paddle is impeded by material, the shaft rotation stops. The motor rotates within the housing and magnetized sections of the motor mounting plate are detected. Use of these patented magnetic sensing techniques eliminates problems that occur with fouling of the optical systems used by other brands.

The built-in microcontroller performs self-validating diagnostics and monitors both shaft and motor mounting plate rotation. This allows the SafePoint® to easily distinguish between material presence and any electrical and mechanical failure of the unit. When material presence is detected, the SENSE relay changes state and the drive motor is de-energized to extend motor life. This output is available to control a process function or alarm circuit. When the material level drops, a tension spring returns the drive motor to its original running condition and is reactivated.

A unit failure is detected by sensing a lack of shaft rotation while material presence has not been detected by rotation of the motor mounting plate. In a failure condition the independent FAULT relay will change state. Monitoring the state of both the SENSE and FAULT relays provides the most flexibility for control and monitoring that is beyond being just “fail-safe”.

The SafePoint® bin monitor is installed in an aggregate application.
The rugged and reliable design of the SafePoint® self-validating bin monitor makes it the best choice for critical level control applications. The unit is compatible with many granular, pelletized and powder bulk applications. It can be utilized for high level indication of materials over 10 lb/ft³ (160 kg/m³) and for low and intermediate level indication for materials over 5 lb/ft³ (80 kg/m³). The SafePoint bin level monitor can be installed almost anywhere dry bulk materials are stored including bins, hoppers, silos and tanks.

**Applications**

The rugged and reliable design of the SafePoint® self-validating bin monitor makes it the best choice for critical level control applications. The unit is compatible with many granular, pelletized and powder bulk applications. It can be utilized for high level indication of materials over 10 lb/ft³ (160 kg/m³) and for low and intermediate level indication for materials over 5 lb/ft³ (80 kg/m³). The SafePoint bin level monitor can be installed almost anywhere dry bulk materials are stored including bins, hoppers, silos and tanks.

**Features**

- Self-validating operation monitors electrical and mechanical status for critical applications—beyond “fail-safe”
- Use of magnetic sensing technology ensures reliable operation even in dusty environments
- Twist on/off cover for convenient and easy access—No bolts to lose or hold
- 1-1/4” NPT or 1-1/2” BSPT process connections
- Two conduit connections provide easy wiring access
- Microcontroller-based electronics ensures consistent and reliable operation
- Independent SPDT relays for “sense” and “fault” outputs

**Typical Applications Include, but are Not Limited To:**

<table>
<thead>
<tr>
<th>Feeds</th>
<th>Silica Sand</th>
<th>Pellets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>Rubber</td>
<td>Metals</td>
</tr>
<tr>
<td>Re­grind</td>
<td>Coal</td>
<td>Peanuts</td>
</tr>
<tr>
<td>Found­ry Sand</td>
<td>Resin</td>
<td>Limestone</td>
</tr>
<tr>
<td>Grain</td>
<td>Cement</td>
<td>Sawdust</td>
</tr>
</tbody>
</table>

**Applications**

The rugged and reliable design of the SafePoint® self-validating bin monitor makes it the best choice for critical level control applications. The unit is compatible with many granular, pelletized and powder bulk applications. It can be utilized for high level indication of materials over 10 lb/ft³ (160 kg/m³) and for low and intermediate level indication for materials over 5 lb/ft³ (80 kg/m³). The SafePoint bin level monitor can be installed almost anywhere dry bulk materials are stored including bins, hoppers, silos and tanks.

**Features**

- Self-validating operation monitors electrical and mechanical status for critical applications—beyond “fail-safe”
- Use of magnetic sensing technology ensures reliable operation even in dusty environments
- Twist on/off cover for convenient and easy access—No bolts to lose or hold
- 1-1/4” NPT or 1-1/2” BSPT process connections
- Two conduit connections provide easy wiring access
- Microcontroller-based electronics ensures consistent and reliable operation
- Independent SPDT relays for “sense” and “fault” outputs

**Available Configurations**

**Motor Voltages**

The SafePoint® fail-safe rotary paddle bin monitor is available in configurations to serve 115VAC, 230VAC and 24VAC/DC power requirements.

**Approvals/Labeling**

The SafePoint bin monitors are available approved to CSA, ATEX/IECEx requirements. Approvals for either general purpose, dust-ignition-proof and/or explosion-proof hazardous area locations can be provided. All units carry the CE mark. Refer to “Specifications” for details.

**High Temperature Unit**

The SafePoint high temperature model incorporates the standard features of the SafePoint bin monitor, but can be used in applications where bin temperatures reach as high as 750°F (399°C). The hi-temp models incorporate a specially designed mounting plate, pipe extension with air purge connection (recommended for all high temperature applications; must be used for > 500°F/260°C), shaft extension, couplings and bushings. The high-temp assembly is available in either a carbon steel or stainless steel version.
Monitor offers a variety of interchangeable paddle assemblies to meet the needs of a wide variety of applications. Different material densities, particle sizes and flow characteristics require specific paddles to provide optimum performance. See Monitor's Paddle Selection Guide for more detailed application recommendations.

1.) **Standard Stainless Steel Three Vane Paddle:** The most popular of all paddles. For use with average weight materials. P/N 1-4146

2.) **Large Stainless Steel Three Vane Paddle:** Provides accurate level control for lightweight materials. P/N 1-4141

3.) **Insertable* Stainless Steel, Scimitar Single Vane Paddle:** Provides low and high level control for light to average weight materials. P/N 1-4193

4.) **Insertable*, Stainless Steel Single Vane Paddle:** Provides low level control for average weight materials and low to high level control for heavy materials under 1-1/2 inch (40 mm) in diameter. P/N 1-4145

5.) **Stainless Steel, Two Vane Paddle:** Provides low and high level control for heavy materials under 1-1/2 inch (40 mm) in diameter. P/N 1-4135

6.) **Stainless Steel Four Vane Paddle:** For use with average to heavy weight materials in low and high level control installations. P/N 1-4156

7.) **Stainless Steel Triangular Arc Single Vane Paddle:** Provides low and high level control for light to average weight materials. P/N 1-4144

8.) **Ex-Flex Three-Ply 20 inch (508 mm) Belt Vane Paddle:** Provides low and high level control for heavy materials over 2 inch (50 mm) in diameter. Top mount only. P/N 1-4137

---

**FLEXIBLE COUPLING**

The flexible coupling works to absorb heavy loads, side loads and loads caused by product surges, thus protecting the internal workings and extending the life of the paddle unit. A flexible coupling should be used with heavy materials and in top mount installations where a solid shaft extension is used. Monitor offers the following coupling option:

Spring-Flex: P/N 1-3335

---

*Insertable paddles eliminate the need for a mounting plate. 1-4193 is insertable through either a half or full 1-1/4" or 1-1/2" coupling, that is welded to the bin wall. 1-4145 is insertable through a half 1-1/4" or 1-1/2" coupling.
MOUNTING PLATES
Mounting plates allow the paddle units to be mounted from the outside of a vessel to curved or flat surfaces. All mounting plates featured below mount via six bolts.


3.) K-Flange Aluminum Mounting Plate: For flat surfaces or thin walled vessels where extra strength is required. Ideal for semi-corrosive environments, including outdoors. P/N 1-3316.

SHAFT EXTENSIONS
Many top mount installations require that the paddle extends into the vessel to a predetermined level. Solid shaft extensions are available in a variety of lengths up to 144 inches (3.6 m) to meet these demands. A flexible cable extension is also available. This 6.5 foot (2.0 m) flexible extension can be easily shortened in the field by the user. The use of the flexible cable extension for lengths greater than 3 feet (0.9m) requires the use of a guard to ensure proper activation of the rotary paddle bin monitor.

SHAFT GUARDS
Shaft guards are recommended for use with solid shaft extensions to limit the movement caused by side loading that would otherwise damage the working components of the paddle unit. Shaft guards should be the same length as the extension and should always be used when the extension meets or exceeds 18 inches (460 mm) in length.

**WIRING DIAGRAM**

Dimensions are shown in inches with millimeter equivalent in brackets.
**MECHANICALS**

Dimensions are shown in inches with millimeter equivalent in brackets.

![Diagram of a typical side mount unit](image)

**ORDERING INFORMATION**

1 = Ordinary locations, CSA / CE
2 = Hazardous locations, CSA / CE (North America)
3 = Hazardous locations, ATEX / IECEx

**OPERATING VOLTAGE**
1 = 115V AC
2 = 230V AC
3 = 24V AC/DC

**PROCESS CONNECTION**
1 = 1-1/4" NPT
2 = 1-1/2" BSPT

**TEMP STYLE**
1 = Hi-temp, CS
2 = Hi-temp, SS
Blank, none

**APPROVALS**
1 = Ordinary locations, CSA / CE
2 = Hazardous locations, CSA / CE (North America)
3 = Hazardous locations, ATEX / IECEx

**Note:**
1. 1-1/2" BSPT process connection is not available with high temperature style selection. A mounting plate is furnished for the process connection on all high temperature units.
2. External lights are not available with hazardous location approvals.

**ACCESSORIES**

<table>
<thead>
<tr>
<th>Flexible Coupling</th>
<th>Mounting Plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3335 Spring flex</td>
<td>1-0100 Mounting plate with 1-1/2&quot; BSPP half coupling, CS</td>
</tr>
<tr>
<td>Paddles</td>
<td>1-0101 Mounting plate with 1-1/4&quot; NPSM full coupling, CS</td>
</tr>
<tr>
<td>Cable Extension</td>
<td>1-0102 Mounting plate with 1-1/4&quot; NPSM full coupling, SS</td>
</tr>
<tr>
<td>1-1175-2-78: Flexible extension, 304 SS, 78 inches (2 m) length</td>
<td>1-0112 Mounting plate with 1-1/4&quot; NPSM full coupling, SS</td>
</tr>
<tr>
<td>Solid Shaft Extensions:</td>
<td></td>
</tr>
<tr>
<td>1-1175-1-# 1/4&quot; Pipe, SCH-40, Galvanized</td>
<td>1-0113 Mounting plate with 1-1/4&quot; NPSM full coupling, SS</td>
</tr>
<tr>
<td>1-1175-2-# 1/4&quot; Pipe, SCH-40, Stainless Steel</td>
<td>1-0115 Mounting plate with 1-1/2&quot; BSPP full coupling, CS</td>
</tr>
<tr>
<td>Shaft Guards:</td>
<td></td>
</tr>
<tr>
<td>1-1174-1-# 1-1/4&quot; Pipe, SCH-40, Galvanized</td>
<td>1-3316 Mounting plate, heavy duty alum, with 1-1/4&quot; NPT</td>
</tr>
<tr>
<td>1-1174-2-# 1-1/4&quot; Pipe, SCH-40, Stainless Steel</td>
<td></td>
</tr>
</tbody>
</table>

*# = Extension and guard lengths (not to exceed 144 inches (3.6 m) in length)
**SPECIFICATIONS**

**Power Requirements:**
- 115 VAC (+/- 15%); 9 VA; 50/60 Hz
- 230 VAC (+/- 15%); 9 VA; 50/60 Hz
- 24 VAC/DC (+/- 15%); 11 VA

**Altitude:**
6562 ft (2000 m) max

**Relative Humidity:**
Suitable for outdoors

**Installation Category:**
II

**Pollution Degree:**
4 (Reduced to 2 via enclosure)

**Ambient Operating Temp:**
-40°F (-40˚C) to +150°F (65˚C)

**Conduit Connection:**
Two(2) 3/4" NPT; M20 cable glands (Ordinary Location units with 1-1/2" BSPT process connection only; Not provided on Haz Loc units)

**Outputs:**
- Material Sense: One SPDT; 5A @ 250 VAC, 30 VDC max
- Unit Status (Fault): One SPDT; 5A @ 250 VAC, 30 VDC max

**Maximum Pressure:**
30 PSI (2 bar)

**Sensitivity:**
5 lb./ft^2 (80 kg/m^2) minimum material density (when using large 3-vane paddle)

**Indicators:**
Red and green high intensity LEDs indicate material sense and unit status conditions (Ordinary Location unit only)

**Housing:**
Die cast alum, NEMA 4 / ENCLOSURE TYPE 4, IP66

**Housing Finish:**
Powder coating

**Mounting Connection:**
1-1/4" NPT or R 1-1/2 (BSPT 1-1/2)

**Weight:**
Approx. 8-1/2 lb. (3.9 kg)

**Materials of construction/accessories:**
- Flexible Couplings: 304 stainless steel
- Mounting Plates: Carbon steel or 304 stainless steel
- All Paddles except Ex-Flex: 304 SS
- Ex-Flex Belt: 304 SS coupling, rubber/fabric blend belt
- Flexible Cable Extension: 304 SS 1/4" diameter

**Listings/Approvals:**
- CSA US/C: Ordinary Locations; Class I, Div. 1&2, Groups C, D; Class II, Div. 1&2, Groups E, F, G
- ATEX: II 1/2 D Ex c T85°C
- IECEx: DIPA21 IP6X T85°C
- CE Mark

*Influenced by mounting, material thermal conductivity and ambient temp.

U.S. Patent 6,696,965 B2

---

**WARRANTY**

Monitor Technologies LLC warrants each SafePoint® rotary paddle bin indicator it manufactures to be free from defects in material and workmanship under normal use and service within two (2) years from the date of purchase. The purchaser must give notice of any defect to Monitor within the warranty period, return the product intact and prepay transportation charges. The obligation of Monitor Technologies LLC under this warranty is limited to repair or replacement at its factory. This warranty shall not apply to any product which is repaired or altered outside of the Monitor Technologies LLC factory, or which has been subject to misuse, negligence, accident, incorrect wiring by others or improper installation. Monitor Technologies LLC reserves the right to change the design and/or specifications without prior notice.