SAPCON

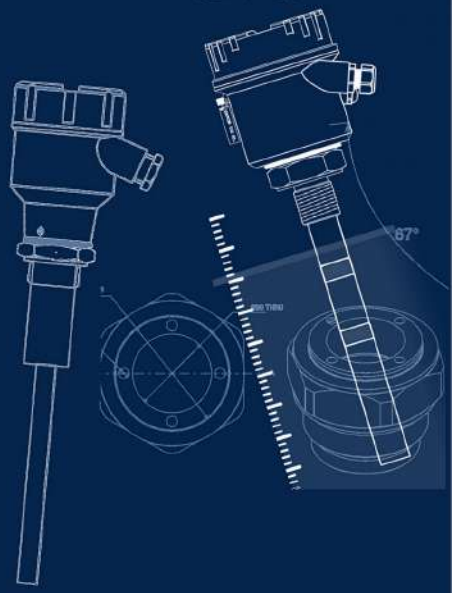
*Grown...to meet challenges*

# INSTRUCTION MANUAL

**COAT-ENDURE**

Admittance Level Limit Switch

Version 3.0



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# Revision History

| Revision | Date | Author(s) | Description |
|---|---|---|---|
| 1.0 | 27 Jan 2014 | RND | First Version Editing |
| 1.1 | 10 Aug 2014 | MRK | Applications Revision |
| 1.2 | 29 May 2015 | RND | Features Revision |
| 1.3 | 19 Nov 2015 | RND | Specs Revision |
| 1.4 | 25 Jul 2016 | RND | Specs Revision |
| 2.0 | 08 Jan 2017 | BRND | Revised Format |
| 2.1 | 17 Oct 2017 | BRND | Branding Revisions |
| 2.2 | 05 Feb 2018 | MRK | Marketing Revisions |
| 2.3 | 11 Oct 2018 | RND | Specs Revisions |
| 3.0 | 27 Dec 2019 | BRND | Features Revisions |

[1]

[1]



- The images shown in this manual may differ from the actual instrument / housing in terms of dimensions, color and design. Please refer to GA drawings for dimensional details.
- Values (of performance) described in this manual were obtained under ideal testing conditions. Hence, they may differ under industrial environment and settings.

**General Instructions**

- Instrument shouldn't block the material filling inlet.
- Secure the cover of housing tightly. Tighten the cable glands. For side mounting, the cable glands should point downwards.
- For side mounting, provide a baffle to prevent the material from falling on the probe.
- When handling forks, do not lift them using their tines. While using them with solids, ensure that material size is less than 10mm.
- Deforming the shape of the tines may interfere with the fork's operating frequency.
- Make all electrical connections as instructed in the manual. Don't power on the device before verifying the connections.

# 1 Introduction

Coat-Endure is a microcontroller based compact coat immune admittance level limit switch. It is a compact level switch which is suitable for sticky solids, pastes and slurries. The device is specially suited for compact silos and packaging machines where material has a tendency to stick on the probe.

Figure 1: Coat-Endure

# 2 Operating Principle

Coat-Endure is an improvement over traditional principle of admittance. The ring type probe has an alternating active and an inactive region, which collectively help the controller to calculate the extent of coating on the probe. In effect, the device is able to identify the differential coating between the sense and the shield by measuring their individual capacitances. As the coating immunity is controlled by the onboard microcontroller, the extent of coating immunity can be set easily.

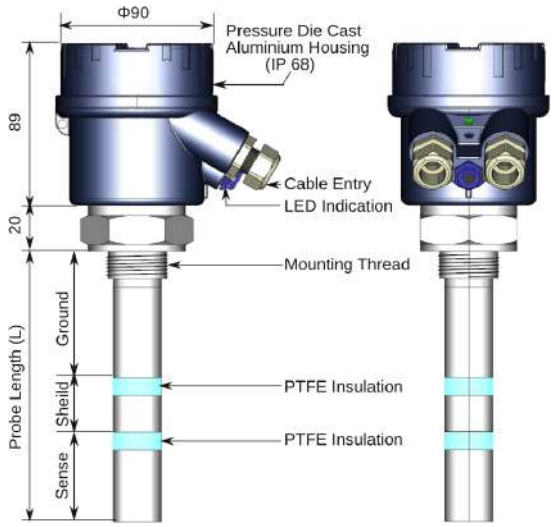



Figure 2: Description of Parts

# 3 Features

- Universal power supply of 18 - 55 V DC and 90 - 265 V AC on the same terminal.
- Compact and customizable probe size.
- Passive shielding compensation with adjustable coating immunity.
- Output options: Relay, PNP and Analog.
- High temperature probe suitable for applications up to 250°C.
- Self-diagnosis for probe and electronics.
- Popular with a wide range of materials: low-to-high dielectric conductive materials.

# 4 Applications

- Food & Beverages
- Foundry
- Material Handling
- Poultry
- Packaging Industry
- Chemicals
- Pharmaceuticals
- Dairy

# 5 Electrical Specifications

Please refer to Table 1 for Electrical Specifications.

| PARAMETER | VALUE |
|---|---|
| Input Power Supply | 18 - 55V DC and 90 - 265V AC at 50Hz on same terminal |
| Available Output Options | Relay SPDT , PNP - Single Point Switching |
| Power Consumption | • 1.5W (SPDT, PNP) at 24 V<br>• 2.2W (DPDT) at 24 V |
| Switching Indication | Bi-color LED:<br>Red - Alarm<br>Green - Normal |
| Fail-safe | Field Selectable<br>• Open - Fail-safe High (For High Level)<br>• Close - Fail-safe Low (For Low Level) |
| Time Delay Setting | 1 - 25 seconds (For both, Covered and Uncovered Delays) |
| Relay Rating | 6 Amps at 230V AC |

Table 1: Electrical Specifications

# 6 Mechanical Specifications

Please refer to Table 2 for Mechanical Specifications.

| PARAMETER | VALUE |
|---|---|
| Housing | • SCUTE: Pressure die-cast aluminium weatherproof (Rating IP-68)<br>• FP2C: Cast aluminium, weatherproof & flameproof, powder coated, suitable for Gas Groups IIA, IIB & IIC as per IS-2148 |
| Electrical Connector | 2 x 1/2” BSP/NPT , PG 13.5 |
| Operating Temperature | $0^{\circ}$C to $60^{\circ}$C (Electronics) |
| Process Temperature | Up to $250^{\circ}$C |
| Operating Pressure | Up to 10 bar |
| Mounting | • Screwed: 1/2",1”,1 1/2", 3/4” BSP / NPT<br>• Flanged: As per user specification |
| Probe Length | 65 mm and (85 mm to 1500 mm) |
| Insulation | Part PTFE / Full PTFE |

Table 2: Mechanical Specifications

# 7 Application Specifications

Please refer to Table 3 for Application Specifications.

| PARAMETER | VALUE |
|---|---|
| Response Time | 1 second |
| Sensitivity | Refer Table No. 4 |

Table 3: Application Specifications

# 8 Installation Guidelines

While installing the instrument, please take care of the following points:

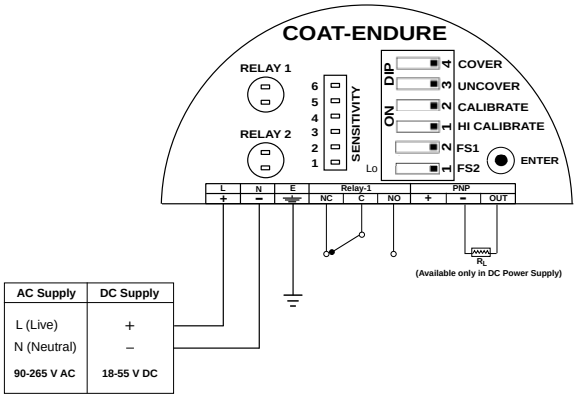
1. The product should be installed in horizontal or vertical position only. Observe that when installed directly under the material inlet source, a canopy called baffle of appropriate strength and size should be welded right above the instrument as shown.
2. To prevent the ingress of moisture and water seepage in side mounting position, the cable entries should always point downwards.
3. Secure the cover of housing tightly. Tighten the cable glands.
4. Make all electrical connections as instructed in the manual. Don't power on the device before verifying the connections.
5. Weatherproofness of enclosure is guaranteed only if the cover is in place glands adequately tightened. Damage due to accidental entry of water can be avoided if the instrument is installed in a rain shade.
6. If the ambient temperature is high, the instrument should not be installed to receive direct sunlight. In case such a position of shade is not available, a heat shield should be fitted above the instrument especially if the operating temperature lies between 60°C and 80°C.

## 8.1 Electrical Connections

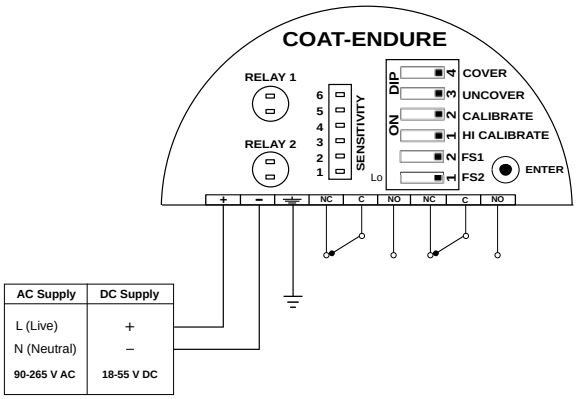
Electrical connections for the instrument will change with the models. Please refer to figure 3 and the precautions mentioned below before connecting the device.

**Precautions for connecting Coat-Endure :**

- **Power Supply Rating**
  Make sure the power supplied to the instrument is within the specified range mentioned in Table 1.
- **Connect Earth**
  When supplying AC power, please make sure that the grounding screw on the housing and the earth terminal are all connected to the plant's earth.
- **Power Supply Fluctuations & Noise**
  External noise or fluctuating power supplies could affect performance and shorten the life of the instrument. Use external line suppressors and fuse wires to contain the risk of damage to the circuit.




(a) Electronics option SPDT Relay and PNP Output(SPN)




(b) Electronics option DPDT Relay(D)

Figure 3: Electrical Connections

# 9 Calibration

The DIP switches for calibration and settings can be accessed by opening the top aluminium cover. Calibrating the instrument outside the tank can cause malfunctions.

## 9.1 Calibration without material

**Note:**
Only applicable when there is a non-conductive build-up on the probe.

Calibration should be done without the application material. Once calibrated in the empty tank, the device can be used with a wide range of materials. Coat-Endure needs to be calibrated inside the empty process tank (i.e only air, no material). Calibrating the instrument outside the tank can cause malfunctions.

- Make sure that all DIP switches are in the OPEN position.

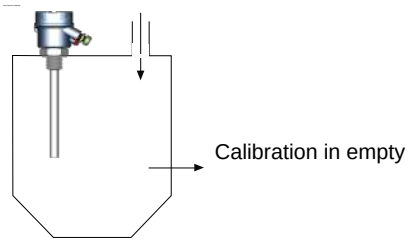



Figure 4: Calibration without Material

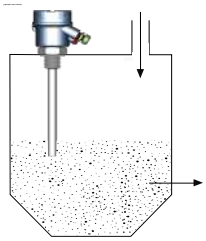


Figure 5: Calibration with Material

- Make sure that the status LED is not blinking. A blinking LED here indicates Error.
- To start with the calibration, set the CALIBRATE switch to CLOSE position (CLOSE is opposite of OPEN for DIP switch).
- Then press ENTER, the status LED of Relay 1 will blink once in RED color.
- Now set the CALIBRATE switch back to OPEN position.
- Calibration is now completed.

## 9.2 Calibration with material

**Note:**
Only applicable when there is a conductive build-up on the probe.

Coat-Endure needs to be calibrated with the application material. Fill the tank with the application material such that the probe is completely covered with the material.

- Make sure that all DIP switches are in the OPEN position.
- Make sure that the status LED is not blinking. A blinking LED here indicates Error.
- To start with the calibration, set the HI CALIBRATE switch to CLOSE position (CLOSE is opposite of OPEN for DIP switch) and wait until Green LED becomes stable.
- Then press ENTER, the status LED of Relay 1 will blink once in RED color.
- Now set the HI CALIBRATE switch back to OPEN position.
- Calibration is now completed.

## 9.3 Factory Reset

To reset time delays and sensitivity values to default values, follow the following steps:

1. Set the CALIBRATE, COVER and UNCOVER switches to CLOSE position
2. PRESS and HOLD the ENTER key until the status LED blinks.
3. Switch the CALIBRATE, COVER and UNCOVER switches back to OPEN position.
4. This will set the time delay to 0 and the sensitivity level to 3.

# 10 Cover Delay

When the application material covers the probe, the changeover of the output can be delayed by a predetermined time. This time is called Cover Delay. For a different value of Cover Delay, the number of blinks can be adjusted as per requirement.

**Note:**
Set the value of COVER DELAY between 1-25 secs.

**Follow the below procedure for setting Cover Delay**

1. Ensure that all DIP switches are in OPEN position as shown in Figure 6. Make sure that STATUS LED is not blinking for Error.

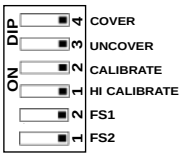



Figure 6: DIP Switch

2. To set the Cover Delay, set the COVER switch to CLOSE position as shown in Figure 7.
(CLOSE is the opposite of OPEN for a DIP switch.)
The STATUS RED LED will glow.

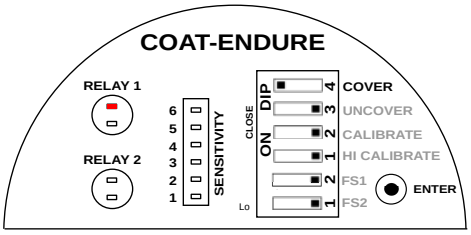



Figure 7: Cover Delay Switch Position

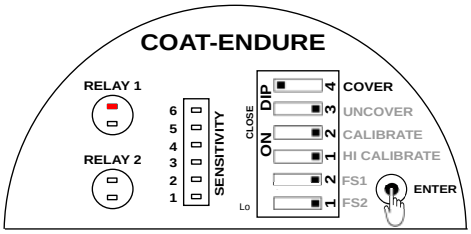



Figure 8: Setting Cover Delay

3. Press ENTER and keep it pressed as shown in Figure 8. The STATUS RED LED of Relay 1 will start blinking. Count the number of blinks. After setting the value release the ENTER key.

4. Delay is entered, but not saved. To save and test the Cover Delay, set the COVER switch back to OPEN position as shown in Figure 9. The STATUS LED of Relay 1 will come back to its original position.

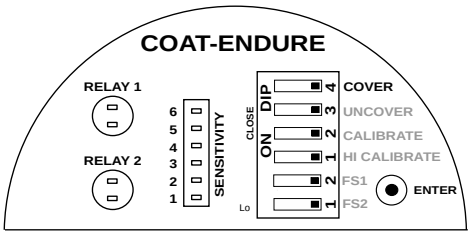



Figure 9: Saving Cover Delay

5. To test, dip coat-endure into the application material until the switching point is reached.

The STATUS LED will start blinking RED if the switch point is reached. It will blink for the number of seconds for which the cover delay is set. 1 blink is equal to 1 second during switching. A maximum of 25 seconds can be set.

## 11 Uncover Delay

When the application material uncovers coat-endure's probe, the changeover of the output can be delayed by a pre-determined time. This time is called UNCOVER Delay. For a different value of Uncover Delay, the number of blinks can be adjusted as per requirement.

**Note:**
Set the value of UNCOVER DELAY between 1-25 secs.

**Follow the below procedure for setting Uncover Delay**

1. Ensure that all DIP switches are in OPEN position as shown in Figure 6. Make sure that STATUS LED is not blinking for Error.

2. To set the Uncover Delay, set the UNCOVER switch to CLOSE position as shown in Figure 10.

(CLOSE is the opposite of OPEN for a DIP switch.) The STATUS RED LED will glow.

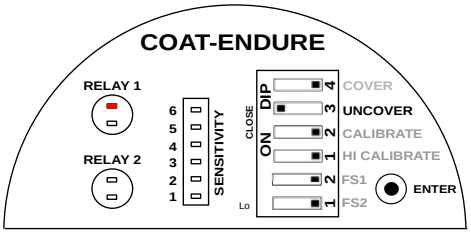



Figure 10: Uncover Delay Switch Position

3. Press ENTER and keep it pressed as shown in Figure 11. The STATUS RED LED of Relay 1 will start blinking. Count the number of blinks. After setting the value release the ENTER key.

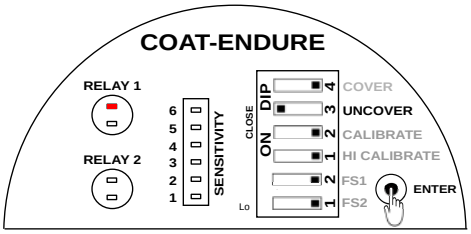



Figure 11: Setting Uncover Delay

4. Uncover Delay is entered, but not saved. To save and test the Uncover Delay, set the UNCOVER switch back to OPEN position as shown in figure 12. The STATUS LED of Relay 1 will come back to its original position.

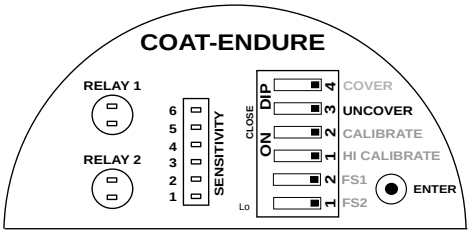



Figure 12: Saving Uncover Delay

5. To test, dip coat-endure into the application material until the switching point is achieved.

6. The STATUS LED will start blinking GREEN if the switch point is achieved. It will blink for the number of seconds for which the Uncover Delay is set.

## 12 Sensitivity

The instrument has 5-point sensitivity level to suit a wide range of application materials. By default, the sensitivity is set to 3 to suit a wide range of materials. Traverse the following steps to set the sensitivity of coat-endure.

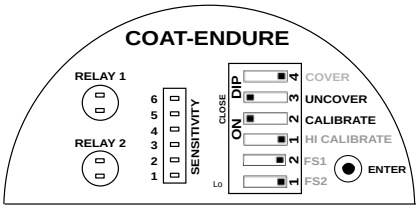



Figure 13: Switch Position

1. Set the UNCOVER and CALIBRATE switch to CLOSE position.
2. Press ENTER key for number of times according to the sensitivity value.

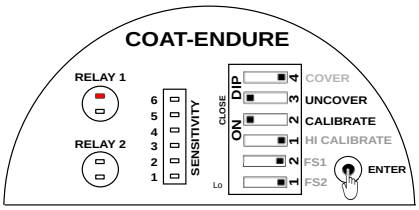



Figure 14: Setting Sensitivity

3. Set the UNCOVER and CALIBRATE switches back to OPEN position.

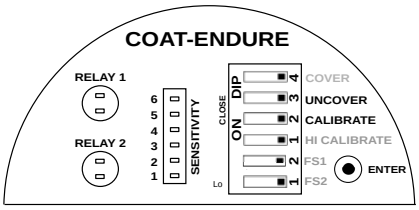



Figure 15: Setting Sensitivity

4. Check operation of coat-endure by filling in and draining out the material.
5. If the instrument does not switch when covered with the material, try again with a higher value of sensitivity.
6. If the instrument does not switch back to normal state when uncovered, try with a lower sensitivity value.

Please refer to Table 4 before selecting sensitivity value.

## 13 Failsafe

In a condition of device failure, known errors and input power failure the outputs of the device resemble the ALARM condition. This is meant to prevent overflow or dry run conditions in case of failures.

**Prevent Overflow - High Level Switch**: Failsafe High (default) is set by moving the FS 1 and FS 2 switch for relay 1 and 2 to OPEN position.

1. When not in contact with the material, LED turns GREEN.
2. When in contact with the material, LED turns RED.

| SENSITIVITY | DIELECTRIC CONSTANT |
|---|---|
| 1 | $>$ 30 |
| 2 | 20-30 |
| 3 | 5-20 |
| 4 | 2-5 |
| 5 | $>$ 1.5 & $<$ 2 |

Table 4: Sensitivity

**Prevent Dry run - Low Level Switch**: Failsafe Low is set by moving the FS 1 and FS 2 switch for relay 1 and 2 switch to CLOSE position.

1. When in contact with the material, LED turns GREEN.
2. When not in contact with the material, LED turns RED.

## 14 Factory Reset

To reset time delays and sensitivity values to default values, follow the following steps:

1. Set the CALIBRATE, COVER and UNCOVER switches to CLOSE position
2. PRESS and HOLD the ENTER key until the status LED of Relay 1 blinks.
3. Switch the LOW CALIB, COVER and UNCOVER switches back to OPEN position.
4. This will set the time delay to 0 and the sensitivity level to 3.

## 15 Output Options

Identify the output mode on which the instrument is being operate. To see the output mode press ENTER.

- If 1St LED is ON in display bar then the instrument is operated at Single Point Switching without material.

Figure 16: Single Point Switching without Material

- If 2nd LED is ON in display bar then the instrument is operated at Single Point Switching with material.

Figure 17: Single Point Switching with Material

## 16 Maintenance

The electronics of this instrument needs no maintenance. When cleaning and checking the vessel, free the probe from deposits. If the material has a tendency to form a hard sticky deposit, then the instrument must be checked more often. Make sure that the cable ducts and the lid are tightly sealed so that no moisture seeps into the instrument.

## 17 Error Indication

On error, the status LED starts blinking RED and GREEN alternately at a faster rate. Normal LED blinks are always at the rate of 1 blink per second, in either RED or GREEN color. In some cases, a GREEN or a RED blinking could indicate an error. Refer to Table 5 for a list of errors and their indication.

| LED ERROR INDICATION | DESCRIPTION | TROUBLESHOOTING |
|---|---|---|
| RED-GREEN Blinking | Calibration Error | Recalibrate the instrument, make sure that the probe is calibrated in an empty metal-body tank. |
| RED Blinking | Probe Short-Circuit | Moisture deposition in the probe connector. Clean the connector and use the instrument. |
| GREEN Blinking | Probe Open | Remove the electronic insert from the housing and check the cable connections of the probe. |
| 3 Times GREEN Blinking and 1 Red Blink | Illegal Key Combination | Switch all DIP switches to open position. Use only legal combination of keys. |
| 3 Times RED Blinking and 1 GREEN Blink | Circuit Error | Contact the Customer Support department at Sapcon. |

Table 5: Error Indication

## 18 Customer Support

Thank you for going through the instructions given in this manual. To further ease the process of installation and use, we have developed special demo videos which are hosted on YouTube.

Sapcon's YouTube channel, SAPCON INSTRUMENTS, lists all these videos: https://goo.gl/dnxfcz

Should you require further information regarding installation, use or working of the instrument, please don't hesitate to contact us. Kindly provide the following information at the time of contacting:

- Instrument Model and Serial Number
- Purchase Order Number and Date of Purchase
- Description of the query
- Your contact details

In an attempt to serve you better, we are open seven days a week (9:30am to 7:30pm). We are available at:

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