

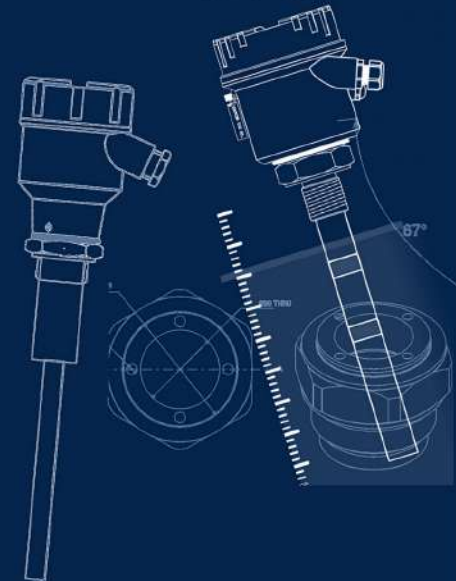
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## INSTRUCTION MANUAL

### COAT-ENDURE

Admittance Level Limit Switch

Version 3.0



## SAPCON INSTRUMENTS PVT. LTD.

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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	Specs Revisions
3.0	28 Mar 2019	BRND	Features Revisions

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- 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 on-board microcontroller, the extent of coating immunity can be set easily.

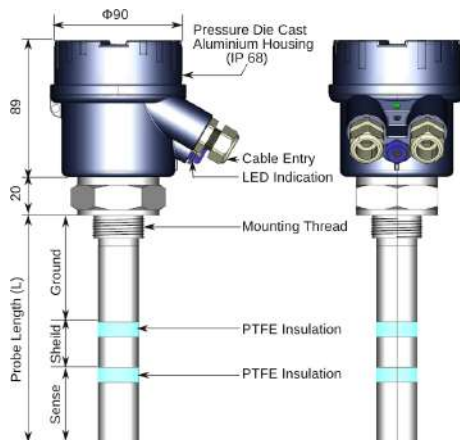


Figure 2: Description of Parts

## 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 at 24 V
Switching Indication	Bi-color LED: Red - Alarm Green - Normal
Fail-safe	Field Selectable <ul style="list-style-type: none"> <li>● Open - Fail-safe High (For High Level)</li> <li>● Close - Fail-safe Low (For Low Level)</li> </ul>
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	<ul style="list-style-type: none"> <li>● SCUTE: Pressure die-cast aluminium weatherproof (Rating IP-68)</li> <li>● FP2C: Cast aluminium, weatherproof &amp; flameproof, powder coated, suitable for Gas Groups IIA, IIB &amp; IIC as per IS-2148</li> </ul>
Electrical Connector	2 x 1/2" BSP/NPT , PG 13.5
Operating Temperature	0°C to 60°C (Electronics)
Process Temperature	Up to 250°C
Operating Pressure	Up to 10 bar
Mounting	<ul style="list-style-type: none"> <li>● Screwed: 1/2", 1", 1 1/2", 3/4" BSP / NPT</li> <li>● Flanged: As per user specification</li> </ul>
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 instrument should be installed in horizontal or vertical position only.

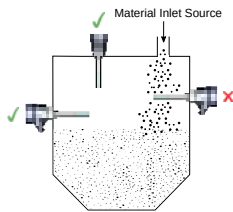


Figure 3: Proper Mounting Arrangement

2. 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.

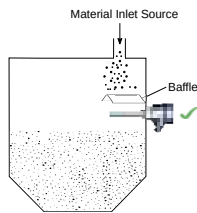


Figure 4: Coat-Endure with Baffle

3. To prevent the ingress of moisture and water seepage in side mounting position, the cable entries should always point downwards.

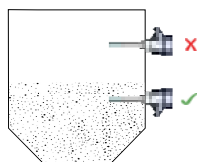


Figure 5: Cable Gland Arrangement

4. Secure the cover of housing tightly. Tighten the cable glands.

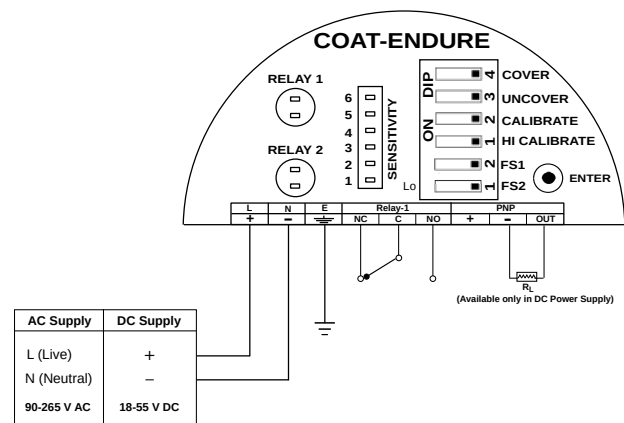
5. Make all electrical connections as instructed in the manual. Don't power on the device before verifying the connections.
6. Weatherproofness of enclosure is guaranteed only if the cover is in place glands adequately tightened. Damage due to accidental entry of water can be avoided if the instrument is installed in a rain shade.
7. 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.

## 9 Electrical Connections

Electrical connections for the instrument will change with the models. Please refer to figure 6 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)

Figure 6: Electrical Connections



## 10 Calibration

The DIP switches for calibration can be accessed by opening the top aluminium cover. Calibration process depends on the conductivity of the application material.

### 10.1 Calibration for Non-conductive Material

**Note:** Calibration in air is specific to the tank, if the tank changes, the instrument needs to be calibrated again.

This calibration is also known as **Air Calibration** and **Calibration without material**. It should be done without the application material (i.e only air, no material). Once calibrated in the empty tank, the device can be used with a wide range of materials. Calibrating the instrument outside the tank can cause malfunctions.

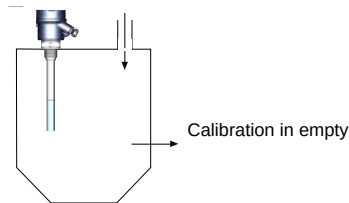


Figure 7: Calibration for Non-conductive Material

Follow the procedure given below to calibration the sensor:

- Install Coat-Endure in an empty tank.
- Unscrew the cover and ensure that all DIP switches are in the OPEN position as shown in Figure 8. Make sure that the status LED is not blinking for error.

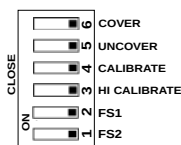


Figure 8: DIP Switch

- To start the calibration process, set the CALIBRATE switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 9.

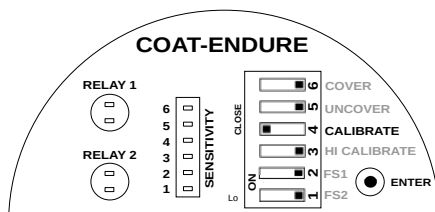


Figure 9: Calibration Switch Position

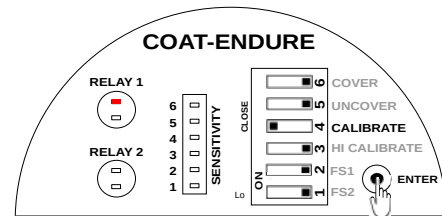


Figure 10: Setting Calibration

- Press and hold ENTER key. The STATUS LED for RELAY 1 will glow in RED color.
- Release the ENTER key and set the CALIBRATE switch back to OPEN position.

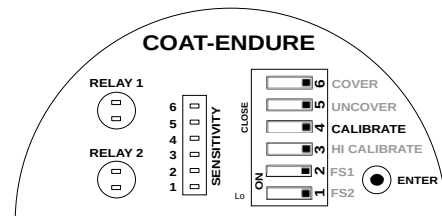


Figure 11: Saving Calibration

- Low calibration is done.

### 10.2 Calibration for Conductive Material

For applications using conductive materials (water, acid based pastes etc.), Coat-Endure needs to be calibrated with the application material. This will make the instrument specific to the application material i.e. if the application material is changed; calibration should be repeated.

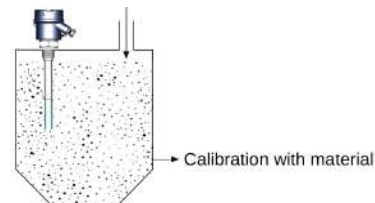


Figure 12: Calibration for Conductive Material

Follow the procedure given below to calibration the sensor:

- Fill the tank with the application material such that the Coat-Endure's probe is completely covered with the material.
- Unscrew the cover and make sure that all DIP switches are in the OPEN position as shown in Figure 8. Ensure that the STATUS LED is not blinking for error.
- To start with the calibration, set the HI CALIBRATE switch to CLOSE (Opposite of OPEN for DIP switch) position as shown in Figure13 and wait until Green LED becomes stable.

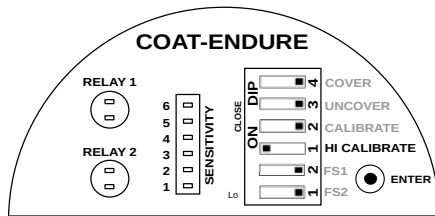


Figure 13: High Calibration Switch Position

- Press and hold ENTER key, the STATUS LED for RELAY 1 will glow in RED color as shown in Figure 14.

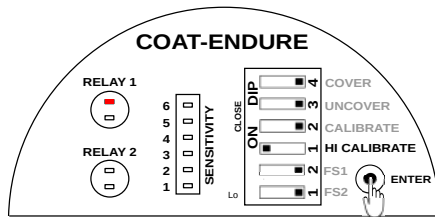


Figure 14: Setting Calibration

- Release the ENTER key and set the HI CALIBRATE switch back to OPEN position as shown in Figure 15.

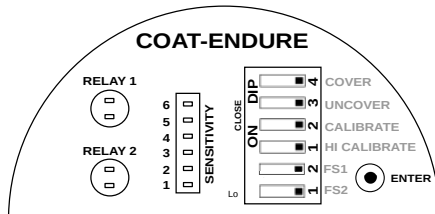


Figure 15: Saving Calibration

- High Calibration is complete.

## 11 Cover Delay

**Note:** Set the value of Cover Delay between 1-25 secs.

When the application material covers the probe, the changeover of the output can be delayed by a pre-determined time. This time is called Cover Delay. For a different value of cover delay, the number of blinks can be adjusted as per requirement. Follow the procedure given below for setting cover delay:

- Ensure that all DIP switches are in OPEN position as shown in Figure 16. Make sure that STATUS LED is not blinking for error.
- Set the COVER switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 17.
- Press ENTER. The STATUS LED for RELAY 1 starts blinking. Blink the STATUS LED according to value of cover delay.

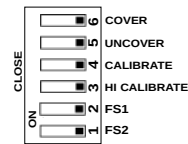


Figure 16: DIP Switch

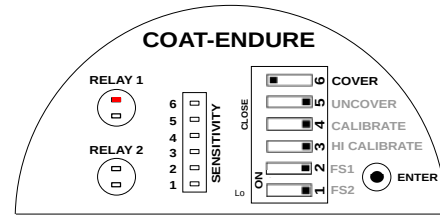


Figure 17: Cover Switch Position

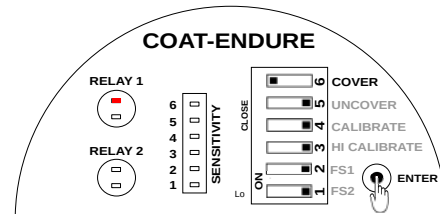


Figure 18: Setting Cover Delay

- Cover 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 19.

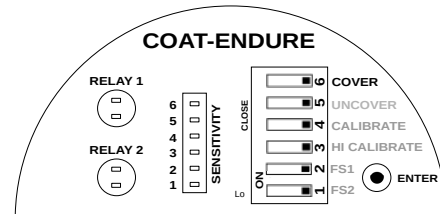


Figure 19: Saving Cover Delay

- 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.

## 12 Uncover Delay

**Note:** Set the value of Uncover Delay between 1-25 secs.

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. Follow the below procedure for setting uncover delay:

1. Ensure that all DIP switches are in OPEN position as shown in Figure 16. Make sure that STATUS LED is not blinking for error.
2. Set the UNCOVER switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 20.

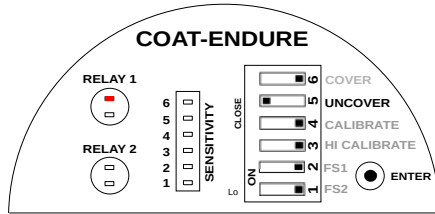


Figure 20: Uncover Switch Position

3. Press ENTER. The STATUS LED for RELAY 1 starts blinking. Blink the STATUS LED according to value of uncover delay.

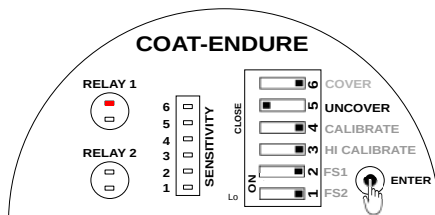


Figure 21: Setting Uncover Delay

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 22.

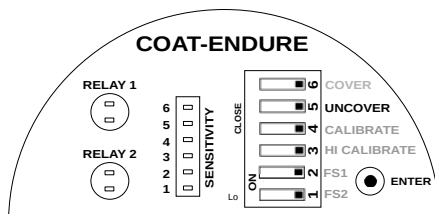


Figure 22: Saving Uncover Delay

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.

## 13 Sensitivity

**Note:** Set the sensitivity value between 1-5.

Sensitivity of the level sensor may have to be adjusted depending on the dielectric constant of the application media. Coat-Endure has a LED bar display which helps in visualizing the desired sensitivity level. The device ships with a default sensitivity level of 3.

**Traverse the following steps to set the sensitivity of Coat-Endure:**

1. Set the UNCOVER and CALIBRATE switch to CLOSE position.

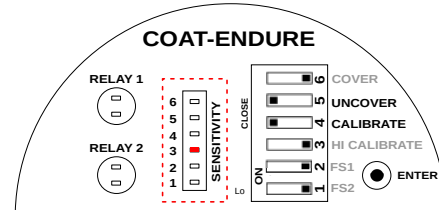


Figure 23: Sensitivity Bar Display

2. The Sensitivity Bar Display will indicate the current sensitivity value. As can be seen in the Figure 23, the value been shown here is 3.
3. To modify the set value, Press ENTER and HOLD the key, RED Status LED for RELAY 1 will start blinking. Count the number of times the LED blinks and release the ENTER key after the required value. e.g. For setting the sensitivity to 4, count up to four blinks and release the ENTER key.

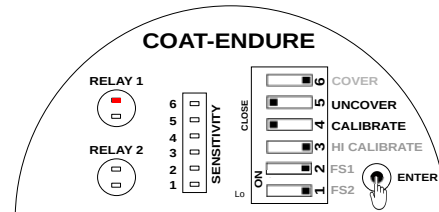


Figure 24: Setting Sensitivity

4. To save the sensitivity value, set the UNCOVER and CALIBRATE switches back to OPEN position.

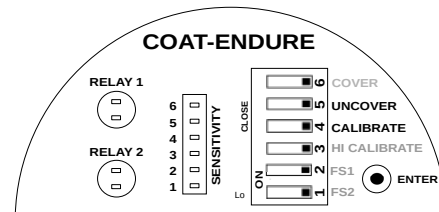


Figure 25: Setting Sensitivity

5. Check operation of Coat-Endure by filling in and draining out the material.
6. If the instrument does not switch when covered with the material, try again with a higher value of sensitivity.

7. If the instrument does not switch back to the uncovered state, try with a lower sensitivity value.

Select the sensitivity value with the help of Table 4.

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

Table 4: Sensitivity

## 14 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.

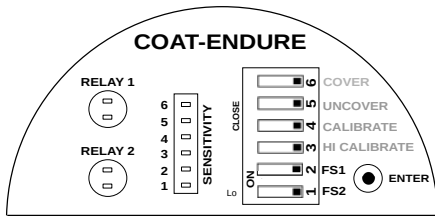


Figure 26: Failsafe High

**Prevent Dry run - Low Level Switch:**

**Note:** LO in top cover indicates failsafe low.

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.

## 15 Display Indications

As seen in Fig.28, Coat-Endure has STATUS LEDs and a 6-point LED bar display.

### 15.1 STATUS LED

Two separate STATUS LED sections indicate switching status for RELAY 1 and RELAY 2.

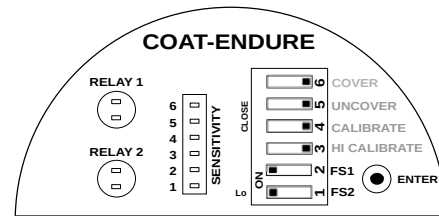


Figure 27: Failsafe Low

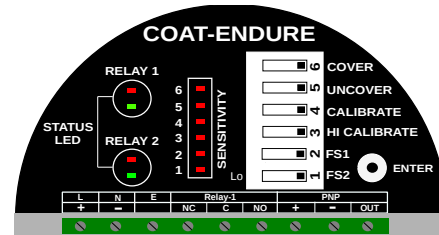


Figure 28: LED Indication on Top Cover

- **RED** LED: Alarm Condition
- **GREEN** LED: Normal Condition

Continuous blinking of Red or Green LED could indicate an error, refer to Error Indication

### 15.2 LED Bar Display

A numeric LED Bar displays helps to visualize switching point and sensitivity values.

**Use of LED Bar Display:** The bar display can be used for two purpose:

- Sensitivity: Refer to section Sensitivity for more details.
- Display Mode: The display mode shows the material distance from the instrument's probe. The movement of LEDs in upward direction depicts the movement of application media towards Coat-Endure's Probe and vice-versa, as shown in Figure 29.

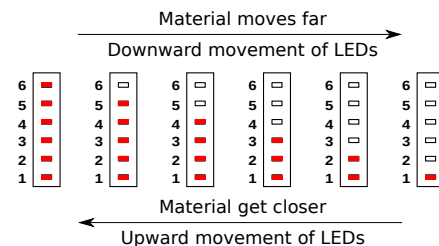


Figure 29: Demonstration of LED Bar Display

## 16 Factory Reset

Follow the steps given below to reset the time delays and sensitivity value to default values. Factory Rest does not reset any calibration values:

1. Set the CALIBRATE, COVER and UNCOVER switches to CLOSE position.

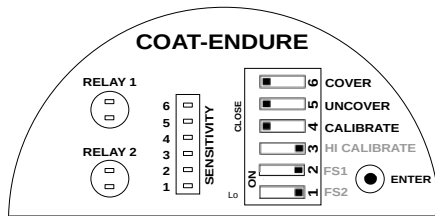


Figure 30: Switch Position

- Press and hold the ENTER key until the STATUS LED blinks.

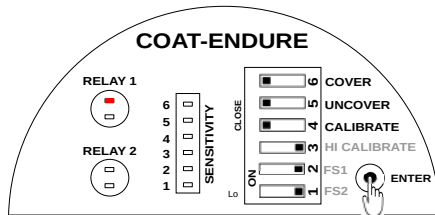


Figure 31: Setting Default Value

- Set the CALIBRATE, COVER and UNCOVER switches back to OPEN position.

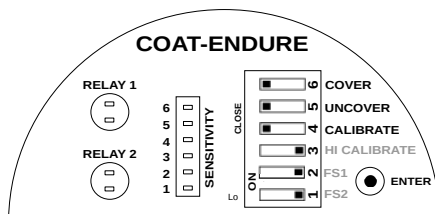


Figure 32: Saving Default Value

- This will set the time delay to 0 and the sensitivity level to 3.

## 17 Output Options

Depending on the selection mode for output, the two relay outputs can also operate independantly for two different switch points. Refer to Order Code

- All keys should be in the OPEN position.
- To see the output mode, press and hold ENTER key.
- If the only the first LED lights up, Coat-Endure is operating in the single point switching mode.

## 18 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

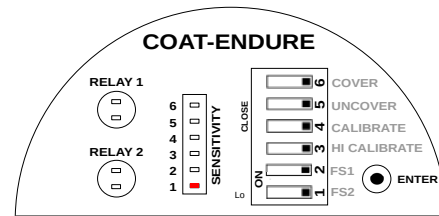


Figure 33: Single Point Switching without Material

indicate an error. Refer to Table 5 for a list of errors and their indication.

## 19 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:

- [www.sapconinstruments.com](http://www.sapconinstruments.com)
- [sales@sapcon.in](mailto:sales@sapcon.in)
- +91-731-4757575

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

## 20 Product Selection Order Code

### Product

**CE : Coat Endure - Compact Admittance Level Limit Switch (Use in Sticky Solids, Pastes and Slurries)**

#### Type

I : Integral (sensor in same unit)

#### Indication (Optional)

WL : External LED Indication infrared output

#### Housing

SCUTE : Pressure Die Cast Aluminium weather proof (Rating IP68) SCUTE

FP2C : Cast Aluminium weather & flame proof powder coated paint suitable for gas group IIC

#### Probe Housing Cable Entry

👍 PCPG13 : PG 13.5, Polyamide

👍 PCB5D : 1/2" BSP, DC Gland, Brass

PCN5D : 1/2" NPT, DC Gland, Brass

#### Output

👍 D : 2NO, 2NC DPDT Relay Output (rated at 6 A, 230 V AC for non-inductive load)

SPN : SPDT Relay Output 1NO, 1NC (Relay rated at 6 A, 230 V AC for non-inductive load) and PNP Output (only for supply voltage 18V to 35V DC)

#### Power Supply (Depend on "Housing")

U : Universal (18 to 55V DC) and (90 to 265V at 50Hz AC) on same terminals

#### Insulation Type

P : Part PTFE

F : Full PTFE

#### Mounting

MB5S4 : Screwed Thread, BSP 1/2", SS 304

MB5S6 : Screwed Thread, BSP 1/2", SS 316

MN5S4 : Screwed Thread, NPT 1/2", SS 304

MN5S6 : Screwed Thread, NPT 1/2", SS 316

MB75S4 : Screwed Thread, BSP 3/4", SS 304

MB75S6 : Screwed Thread, BSP 3/4", SS 316

MN75S4 : Screwed Thread, NPT 3/4", SS 304

MN75S6 : Screwed Thread, NPT 3/4", SS 316

MB10S4 : Screwed Thread, BSP 1", SS 304

MB10S6 : Screwed Thread, BSP 1", SS 316

MN10S4 : Screwed Thread, NPT 1", SS 304

MN10S6 : Screwed Thread, NPT 1", SS 316

👍 MB15S4 : Screwed Thread, BSP 1-1/2", SS 304

MB15S6 : Screwed Thread, BSP 1-1/2", SS 316

MN15S4 : Screwed Thread, NPT 1-1/2", SS 304

MN15S6 : Screwed Thread, NPT 1-1/2", SS 316

F10S4 : 1" ASA Flange, 10mm thickness, SS 304

F10S6 : 1" ASA Flange, 10mm thickness, SS 316

F15S4 : 1-1/2" ASA Flange, 10mm thickness, SS 304

F15S6 : 1-1/2" ASA Flange, 10mm thickness, SS 316

<b>Mounting</b>	
	F20S4 : 2" ASA Flange, 10mm thickness, SS 304
	F20S6 : 2" ASA Flange, 10mm thickness, SS 316
	F25S4 : 2-1/2" ASA Flange, 10mm thickness, SS 304
	F25S6 : 2-1/2" ASA Flange, 10mm thickness, SS 316
	FA10S4 : 1" ANSI Flange, SS 304
	FA10S6 : 1" ANSI Flange, SS 316
	FA15S4 : 1-1/2" ANSI Flange, SS 304
	FA15S6 : 1-1/2" ANSI Flange, SS 316
	FA20S4 : 2" ANSI Flange, SS 304
	FA20S6 : 2" ANSI Flange, SS 316
	FA25S4 : 2-1/2" ANSI Flange, SS 304
	FA25S6 : 2-1/2" ANSI Flange, SS 316
<b>Sense</b>	
👍	S20S4 : 20mm Length, SS 304 (Only for Probe Length $\leq$ 150mm)
	S20S6 : 20mm Length, SS 316 (Only for Probe Length $\leq$ 150mm)
👍	S40S4 : 40mm Length, SS 304 (Only for Probe Length $\geq$ 151mm)
	S40S6 : 40mm Length, SS 316 (Only for Probe Length $\geq$ 151mm)
<b>Shield (Depends on "Sense")</b>	
👍	SH11S4 : 11mm Length, SS 304 (Only with "S20S4")
	SH11S6 : 11mm Length, SS 316 (Only with "S20S6")
👍	SH20S4 : 20mm Length, SS 304 (Only with "S40S4")
	SH20S6 : 20mm Length, SS 316 (Only with "S40S6")
<b>Grounding Length (Depends on Probe Length <math>\geq</math> 85mm or 0.85H)</b>	
👍	GS4 : SS 304
	GS6 : SS 316
<b>Operating Temperature</b>	
	10T : Upto 100°C
	25T : Upto 250°C
<b>Standoff Material (Only with "25T")</b>	
	STGI : GI (Galvanized Iron)
👍	STS4 : SS 304
	STS6 : SS 316
<b>Probe Length</b>	
	0.65H : 65mm
	0.85H1.5H : 85mm to 150mm
	1.5H15H : 151mm to 1500mm

Example - **CE-I-SCUTE-PCPG13-D-U-P-MB10S4-S20S4-SH11S4-10T-0.65H**

👍 Shows First Priority Entity