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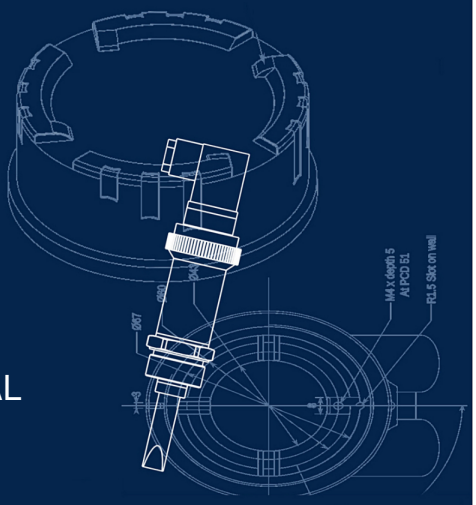
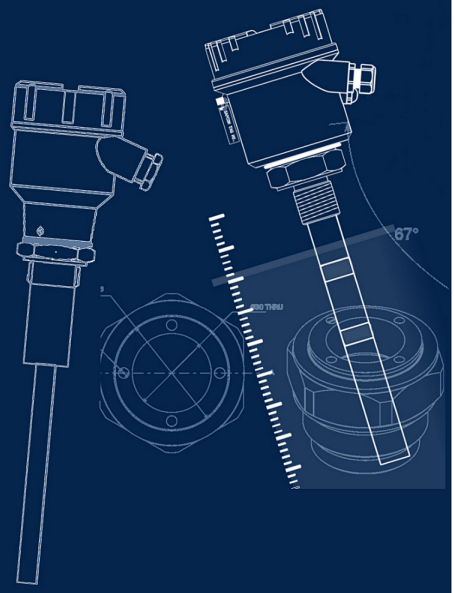


INSTRUCTION MANUAL

COAT-ENDURE

Admittance Level Limit Switch

Version 3.4



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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
3.1	3 Jun 2022	RND	Namur Section Added
3.2	16 Mar 2023	RND	Key settings Table Added
3.3	23 Jul 2024	RND	Order Code Chart Updated
3.4	13 Jul 2026	RND	Coat-Endure Split Section Added

[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, 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.

Coat Endure is available in split version as well. It consists of a Controller unit and a Sensor unit; both units are communicable through Power Line communication for long distance upto 50 meters. The sensor unit will be mounted either from top or side of the vessel.

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.

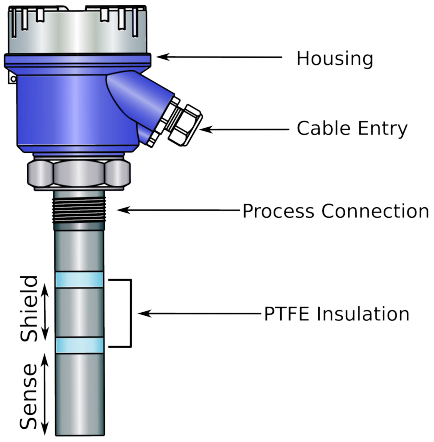


Figure 2: Description of Parts

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 System Diagram

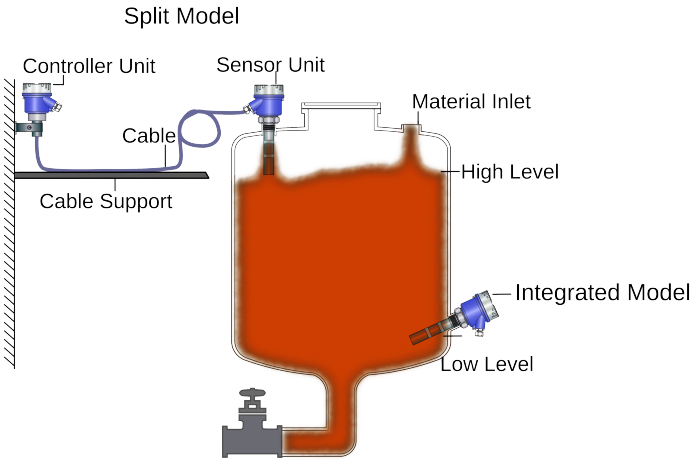


Figure 3: System Diagram

6 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 • Open - Fail-safe High (For High Level) • 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

7 Mechanical Specifications

Please refer to Table 2 for Mechanical Specifications.

PARAMETER	VALUE
Housing	• SCUTE: Pressure die-cast aluminium weatherproof (Rating IP-68) • FP2C: Cast aluminium, weatherproof & flameproof, powder coated, suitable for Gas Groups IIA, IIB & IIC as per IS-2148 • CLB: Weatherproof plastic housing with transparent cover for LED illumination, Rating IP68/IP66, Material : PBT-FR & PC
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	• Screwed: 1/2",1”,1½", 3/4” BSP / NPT • Flanged: As per user specification
Probe Length	• 100 mm • 150 mm to 2000 mm
Insulation	Part PTFE / Full PTFE

Table 2: Mechanical Specifications

8 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

9 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.

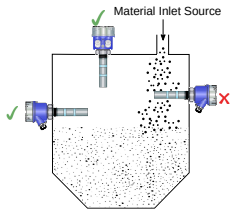


Figure 4: Proper Mounting Arrangement

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.

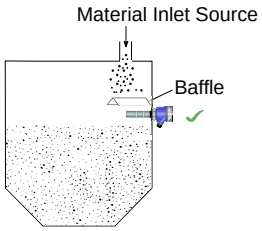


Figure 5: Coat-Endure with Baffle

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

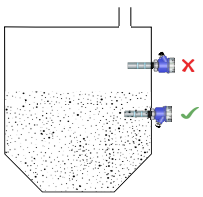


Figure 6: Cable Gland Arrangement

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.

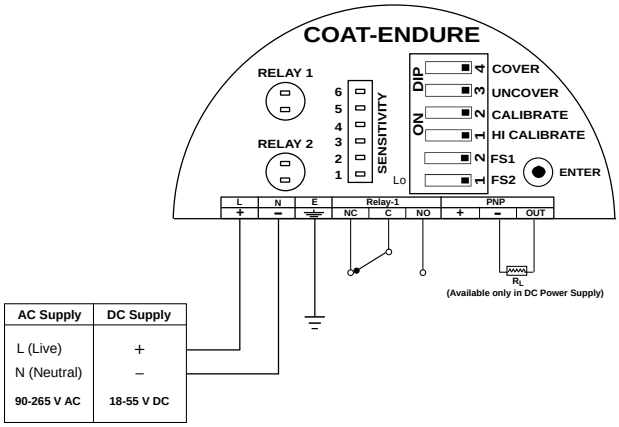
7. If the ambient temperature is high, the instrument should not be installed to receive direct sunlight. In case such a position of shade is not available, a heat shield should be fitted above the instrument especially if the operating temperature lies between 60°C and 80°C.

10 Electrical Connections

Electrical connections for the instrument will change with the models. Please refer to figure 7 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 8.
- **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 7: Electrical Connections

11 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.

11.1 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 use with a wide range of materials. Calibrating the instrument outside the tank can cause malfunctions. Instrument calibration from the outside of the tank can cause malfunctions.

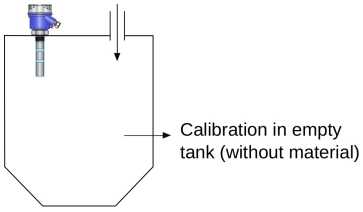


Figure 8: Calibration for Non-conductive Material

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 9. Make sure that the status LED is not blinking for error.

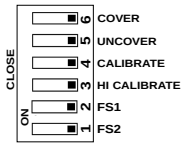


Figure 9: DIP Switch

- To start the calibration process, set the CALIBRATE switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 10.

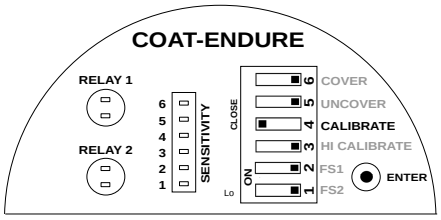


Figure 10: Calibration Switch Position

- Press and hold ENTER key. The STATUS LED for RELAY 1 will glow in RED color.

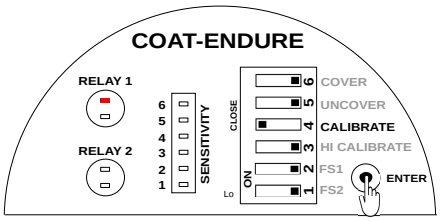


Figure 11: Setting Calibration

- Release the ENTER key and set the CALIBRATE switch back to OPEN position.

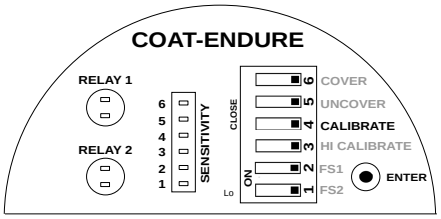


Figure 12: Saving Calibration

- Low calibration is done.

11.2 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.

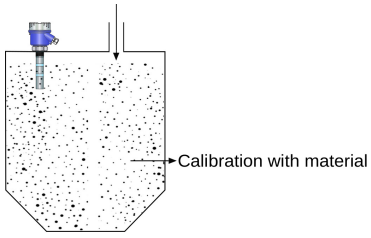


Figure 13: Calibration for Conductive Material

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 9. 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 Figure 14 and wait until Green LED becomes stable.

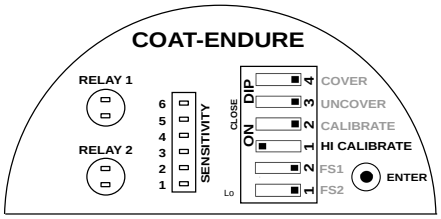


Figure 14: High Calibration Switch Position

- Press and hold ENTER key, the STATUS LED for RELAY 1 will glow in RED color as shown in Figure 15.

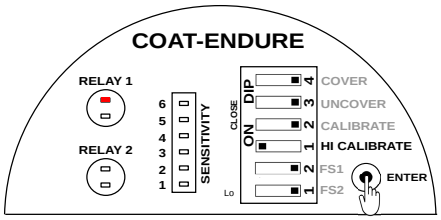


Figure 15: Setting Calibration

- Release the ENTER key and set the HI CALIBRATE switch back to OPEN position as shown in Figure 16.

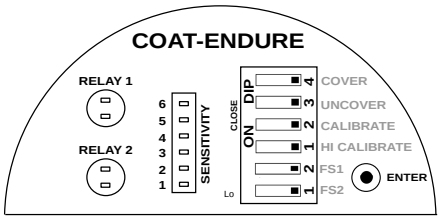


Figure 16: Saving Calibration

- High Calibration is complete.

12 Covered Delay

Note: Set the value of Covered 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 Covered Delay. For a different value of covered delay, the number of blinks can be adjusted as per requirement. Follow the procedure given below for setting covered delay:

1. Ensure that all DIP switches are in OPEN position as shown in Figure 17. Make sure that STATUS LED is not blinking for error.

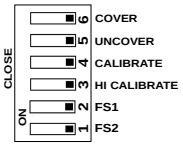


Figure 17: DIP Switch

2. Set the COVER switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 18.

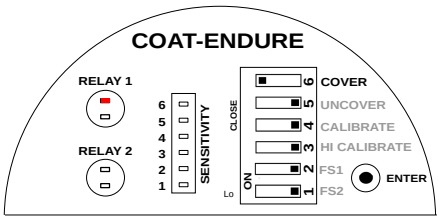


Figure 18: Cover Switch Position

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

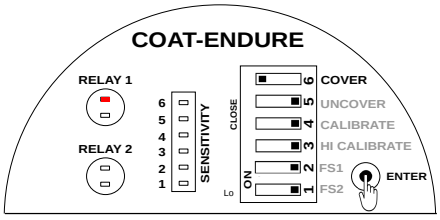


Figure 19: Setting Cover Delay

4. Covered delay is entered, but not saved. To save and test the covered delay, set the COVER switch back to OPEN position as shown in Figure 20.

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

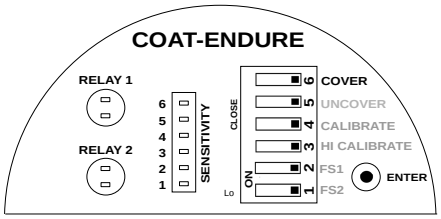


Figure 20: Saving Cover Delay

6. The STATUS LED will start blinking RED if the switch point is reached. It will blink for the number of seconds for which the covered delay is set. 1 blink is equal to 1 second during switching.

13 Uncovered Delay

Note: Set the value of Uncovered 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 Uncovered Delay. For a different value of uncovered delay, the number of blinks can be adjusted as per requirement. Follow the below procedure for setting uncovered delay:

1. Ensure that all DIP switches are in OPEN position as shown in Figure 17. 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 21.

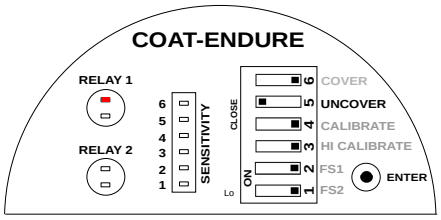


Figure 21: Uncover Switch Position

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

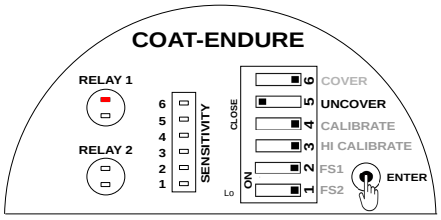


Figure 22: Setting Uncover Delay

4. Uncovered Delay is entered, but not saved. To save and test the uncovered delay, set the UNCOVER switch back to OPEN position as shown in Figure 23.

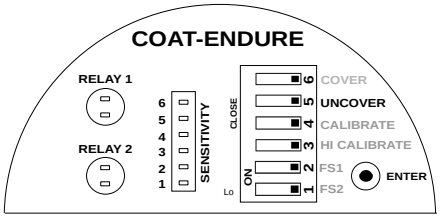


Figure 23: Saving Uncover Delay

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 Uncovered Delay is set.

14 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.

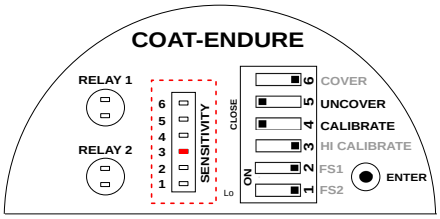


Figure 24: Sensitivity Bar Display

2. The Sensitivity Bar Display will indicate the current sensitivity value. As can be seen in the Figure 24, 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 sensitvity to 4, count up to four blinks and release the ENTER key.

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

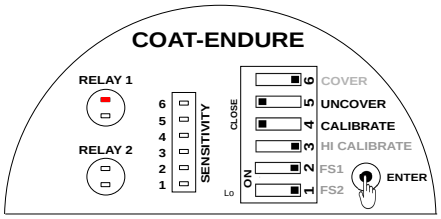


Figure 25: Setting Sensitivity

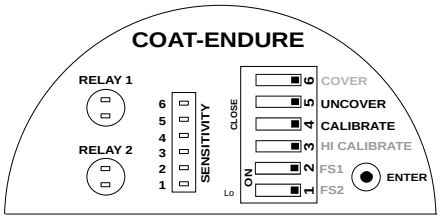


Figure 26: Setting Sensitivity

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	15-30
3	5-15
4	3-5
5	$>$ 1.0 & $<$ 3

Table 4: Sensitivity

15 Failsafe

In a condition of device failure, known errors and input power failure,the outputs of the device resemble the ALARM condition. This 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.

Prevent Dry run - Low Level Switch:

Note: LO in top cover indicates failsafe low.

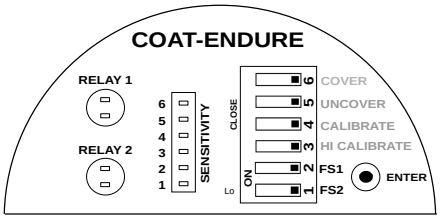


Figure 27: Failsafe High

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.

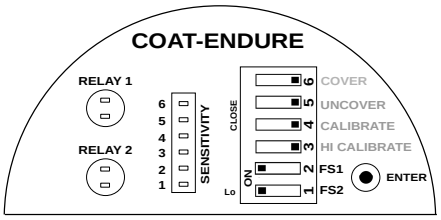


Figure 28: Failsafe Low

16 Display Indications

As seen in Fig.29, Coat-Endure has STATUS LEDs and a 6-point LED bar display.

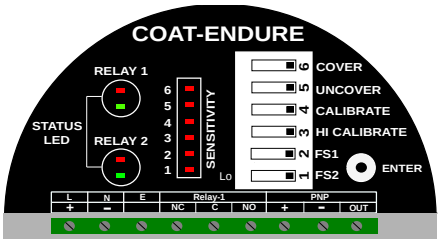


Figure 29: LED Indication on Top Cover

16.1 STATUS LED

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

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

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

16.2 LED Bar Display

A numeric LED Bar displays helps to visualize swithching point and senstivity 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 30.

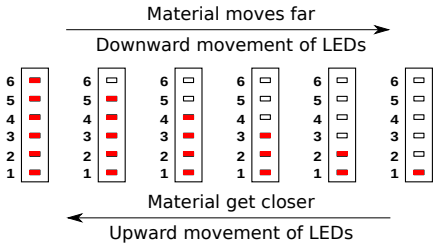


Figure 30: Demonstration of LED Bar Display

17 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.

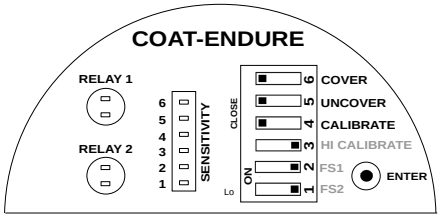


Figure 31: Switch Position

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

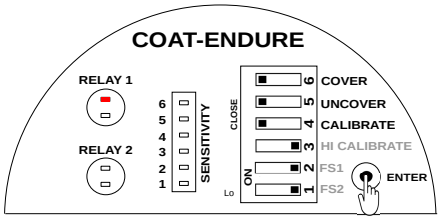


Figure 32: Setting Default Value

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

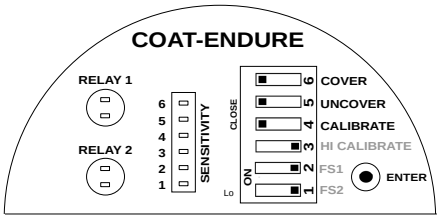


Figure 33: Saving Default Value

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

18 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.

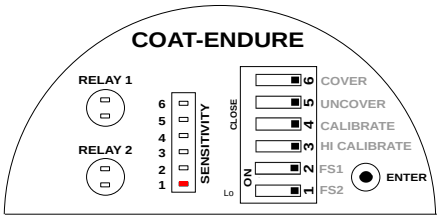


Figure 34: Single Point Switching without Material

19 For AS-Interface Module

19.1 AS-Interface Topology

AS-Interface by design is a loop-powered digital bus. The 2-wire unshielded lines carry power as well as data on them. The single cabling system connects I/O devices with automation systems as shown in Figure 45. ASi-3 is based

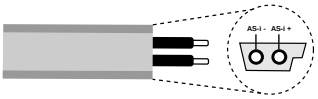


Figure 35: AS-Interface

on a master-slave system where single master can transfer input and output data with up to 62 slaves.

19.2 Electrical Specifications

Please refer to Table 5 for Electrical Specifications.

PARAMETER	VALUE
Input Power Supply	24-30V DC
Electrical Connector	PG-13.5, 1/2" BSP DC Glands, 1/2" NPT DC Glands
Current Consumption	60mA @24V DC
Fail-safe Settings	User selectable (Field selectable through toggle switch) • Open: Fail-safe High • Close: Fail-safe Low

Table 5: Electrical Specifications

19.3 AS-i Configuration

Please refer to Table 6 for AS-Interface Configuration.

PARAMETER	VALUE
AS-i Version	3
Max. Slaves	62 Slave
Max. Cable Length	100m
Communication Method	Master/Slave with cyclic polling
Communication Speed	167 kbits/sec
Max. Data Size	8 bits

Table 6: AS-i Configuration

19.4 Electrical Connections

Please refer to the Figure 36 for electrical connections of AS-Interface Module.

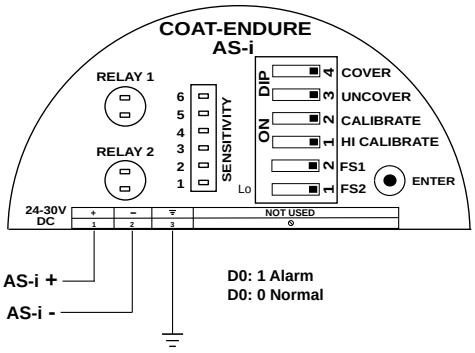


Figure 36: Electrical Connection

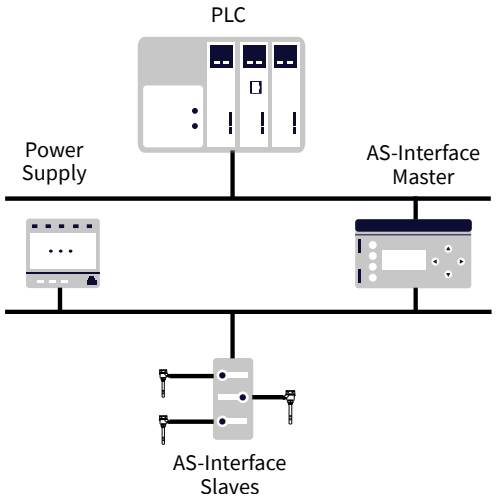


Figure 37: Connection of Coat-Endure via AS-Interface

19.5 Setting Up AS-Interface

Note: ASi-4 and ASi-5 are later versions of the AS-i protocol. However, ASi-3 version is the most prevalent. ASi-4 & ASi-5 are backwards compatible with ASi-3.

AS-Interface can set up easily using a PLC with AS-Interface bus input. Follow these steps for setting up the AS-Interface bus with Caot-Endure:

- **Set Unique Bus ID:** Default set address(extended) is 1a (HEX) can be change using ASi programming unit by selecting default address zero. Each device should have a unique bus identification. For setting the ID, there needs to be single device connected to the AS-Interface, other slaves need to be disconnected from the bus.
- **Check Configuration:** Use the magnet to observe the changes in D0 bit for the assigned address.When magnet placed at the target area of the instrument, current status of switching-LED and D0 bit will change and when the magnet is released; the status of the switching-LED and D0 bit will changed to the previous (original) state. The output change can observed via a PLC or a SCADA system connected to the PLC.

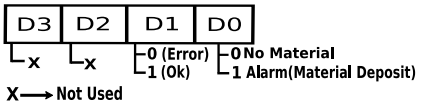


Figure 38: Output of AS-Interface

19.6 Installation

Proceed to Section Installation Guidelines for installing the product in an application tank and then refer to given

Figure 36 for connecting Coat-Endure AS-i.

20 Coat-Endure Split

20.1 Introduction

Coat-Endure Split is coat immune admittance level switch. It consist of a controller unit and a sensor unit. Both units are communicable through powerline communication for long distance upto 50 meters. The sensor unit will be mounted either from top or side of the vessel.

Figure 39: Coat-Endure Split

20.2 Electrical Connection

Refer to diagram.

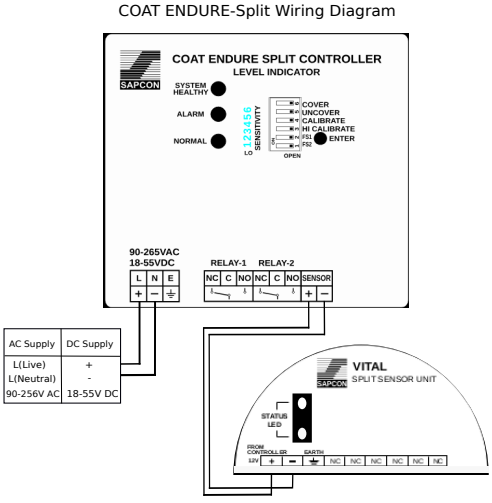


Figure 40: Type 1:Electrical Connection of Coat-Endure Split

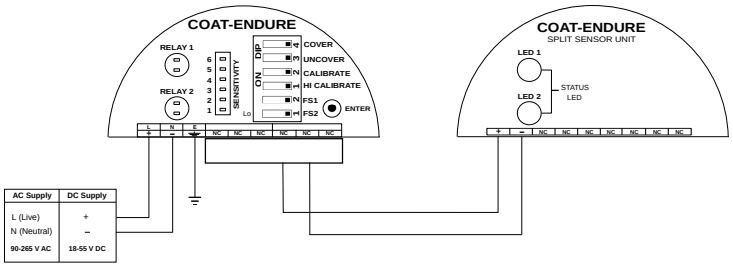


Figure 41: Type 2: Electrical Connections of Coat-Endure Split

20.3 Calibration

Please refer to pg.11 - Calibration settings

20.4 Cover Delay

Please refer to pg.12 - Cover Delay settings

20.5 Uncover delay

Please refer to pg.13 - Uncover Delay settings

20.6 Sensitivity Settings

Please refer to pg.13 - Sensitivity settings

20.7 Failsafe

Please refer to pg.14 - Failsafe settings

21 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 7 for a list of errors and their indication.

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 7: Error Indication

22 For Namur Module

22.1 Electrical Specifications

Please refer to Table 8 for Electrical Specifications.

PARAMETER	VALUE
Input Power Supply	NMR: Namur type current output at 8.2V (I ON $\geq$ 2.1 mA, I OFF $\leq$ 1.2 mA) Namur compliance can be attained with a Namur certified isolator.
Ambient Temperature	$-20°$C to $60°$C (Electronics)
Switching Indication	Red - Alarm & Green - Normal
Fail-safe	Field Selectable: Open - Fail-safe High (For High Level) Close - Fail-safe Low (For Low Level)

Table 8: Electrical Specifications

22.2 Mechanical Specifications

Please refer to Table 9 for Mechanical Specifications.

PARAMETER	VALUE
Housing	• SCUTE: Pressure Die Cast Aluminium, weatherproof, powder-coated, IP68 • FP2C: Cast aluminium, weatherproof & flameproof, powder coated, suitable for Gas Groups IIA, IIB & IIC as per IS-2148 (Rating IP-66) • CLB: Weatherproof plastic housing with transparent cover for LED illumination, Rating IP68/IP66, Material : PBT-FR & PC
Cable Gland	2 x 1/2” BSP/NPT , PG 13.5
Mounting	• Screwed: 1/2",1”,1 1/2", 3/4” BSP / NPT • Flanged: As per user specification
Probe Length	100 mm and (100 mm to 2000 mm)
Insulation	Part PTFE / Full PTFE

Table 9: Mechanical Specifications

23 Namur Isolation Barrier Specs

The ’NMR’ electronics of the Coat-Endure requires the following specifications to be functional:

Parameter	Value
Functional Operating Voltage	8.5 ± 0.2 V DC
Internal Source Resistance	1KΩ
Absolute Maximum Voltage	UI & UO = 13 V
Current Consumption	II & IO = 16 mA
Power Consumption	PI & PO = 65 mW
Input Capacitance	0 uF
Input Inductance	LI = 22 uH
Certification	Ex ia IIC T6 Ga (-20℃ $\leq$ Tamb $\leq$ 60℃)

Table 10: Namur Isolation Barrier Specifications

24 Installation Guidelines

The Coat-Endure can be installed in the vessel in almost any position. While installing, please take care of the following points:

- Ensure that atleast 10 mm for the "Grounding" electrode on the Coat-Endure probe should be completely inside the application tank. i.e. No part of sense or shield electrode should be inside the nozzle.

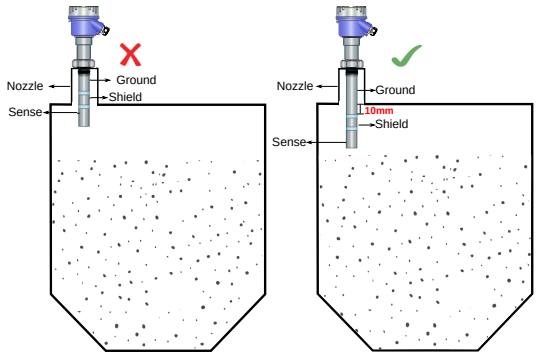


Figure 42: Grounding Length in an Application Tank

- Before Installing the device, ensure that the calibration process has been already carried out in safe area (Zone 2) then install the instrument in hazardous area as shown in Figure 43.

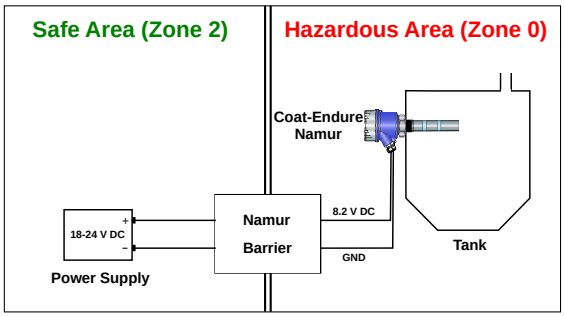


Figure 43: Calibration at safe zone

- For remote calibration, install the instrument in an application tank and then perform the calibration process in hazardous area (Zone 0).
- The instrument shouldn't block the material filling inlet.
- Secure the cover of housing tightly. Tighten the cable glands.
- For side-mounting, provide a baffle to prevent the material from falling on the probe. Please refer to Figure 44.

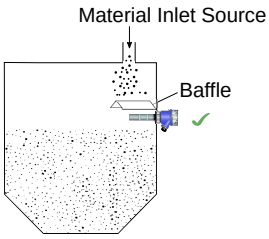


Figure 44: Coat-Endure with Baffle

- To prevent the ingress of moisture and water seepage in side mounting position, the cable entries should always point downwards as shown in Figure 45.

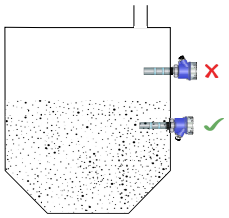


Figure 45: Cable Gland Arrangement

- Make all electrical connections as instructed in the manual. Don't power on the device before verifying connections.
- 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.
- 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 is 60℃.
- While screwing the Coat-Endure, the hexagonal mounting bush should be turned and not the housing.

24.1 Electrical Connections

Please refer to the Figure 46 for electrical connections while connecting the Elixir Namur in an application tank.

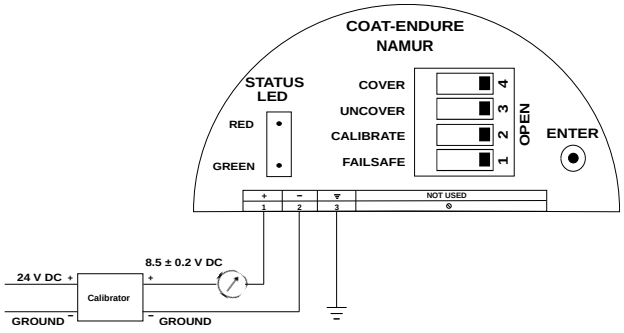


Figure 46: Electrical Connection during installation

24.2 Calibration

Note: Calibrator device must be used to power the instrument only when the level instrument is in a Safe Zone (Zone 2).

Calibration for the level sensor has to be carried out at the installation site. Calibration cannot be skipped and is essential for level sensor's operation. Calibration of Coat-Endure can be performed with the help of two different methods which are as follows:

- Normal Calibration
- Remote Calibration

24.3 Normal Calibration

Note: Perform the Normal Calibration of the level instrument only in a Safe Zone (Zone 2).

24.3.1 Calibration for Non-conductive Material

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).
It is recommended to first calibrate the Coat-Endure in a more convenient setup in Safe Zone(Zone 2) before installing it in the application tank.
To carry out calibration process, please follow the steps mentioned below:

- Prepare a Metallic Test Tank as shown in the following Figure 47. The distance from test tank side walls should be of the same order as with distance with the actual tank.

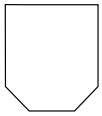


Figure 47: Metallic Test Tank

- Refer to given Figure 46 for Electrical Connections to power up and connect the device.
- Dip the Coat-Endure into test tank as shown in Figure 48.

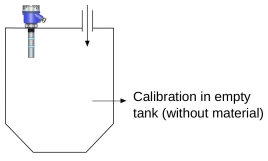


Figure 48: Calibration without Material

- Unscrew the cover and ensure that all DIP switches are in the OPEN position as shown in Figure 49. Make sure that the status LED is not blinking for error.

Figure 49: 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 50.

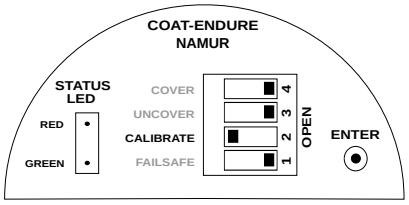


Figure 50: Calibration Switch Position

- Press and hold ENTER key. The STATUS LED will glow in RED color.

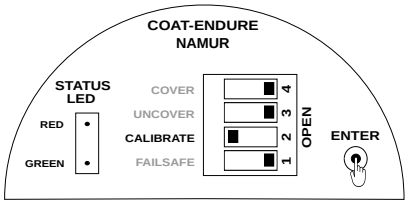


Figure 51: Setting Calibration

- Release the ENTER key and set the CALIBRATE switch back to OPEN position.

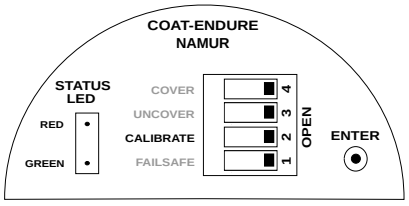


Figure 52: Saving Calibration

- Air calibration is done.
- Proceed to Section Installation Guidelines for installing the product in an application tank.

24.3.2 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.
It is recommended to first calibrate the Coat-Endure in a more convenient setup in Safe Zone(Zone 2) before

installing it in the application tank.
To carry out calibration process, please follow the steps mentioned below:

- Prepare a Metallic Test Tank as shown in the following Figure 47.
- Refer to given Figure 46 for Electrical Connections to power up and connect the device.
- Dip the Coat-Endure in test tank & fill the tank with the application material such that the Coat-Endure's probe is completely covered with the material.

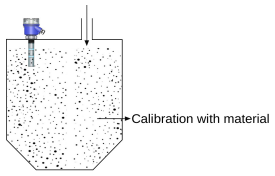


Figure 53: Calibration for Conductive Material

- Unscrew the cover and make sure that all DIP switches are in the OPEN position as shown in Figure 49. Ensure that the STATUS LED is not blinking for error.
- To start with the calibration, set the CALIBRATE & COVER switch to CLOSE (Opposite of OPEN for DIP switch) position as shown in Figure54.

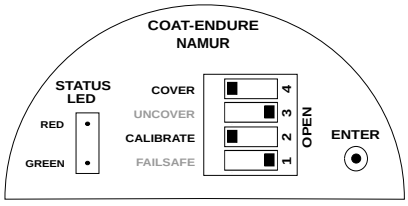


Figure 54: High Calibration Switch Position

- Press and hold ENTER key, the STATUS LED will glow in RED color as shown in Figure 55.

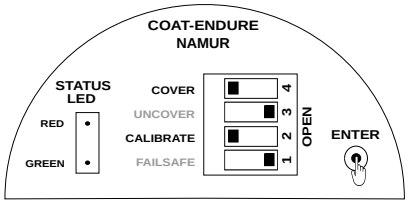


Figure 55: Setting Calibration

- Release the ENTER key and wait for 25 - 30 seconds.
- Set the CALIBRATE and COVER switch back to OPEN position as shown in Figure 56.
- High Calibration is complete.
- Proceed to Section Installation Guidelines for installing the product in an application tank.

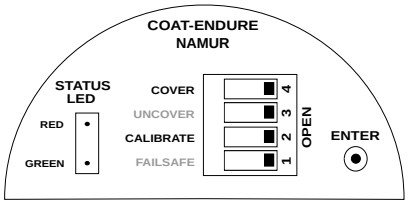


Figure 56: Saving Calibration

24.4 Remote Calibration

Note: Remote calibration is performed when test tank is not available in Safe Zone (Zone 2) and calibration needs to be performed in Hazardous Zone (Zone 0).

24.4.1 Calibration for Non-conductive Material

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).

Note: Power OFF the level instrument before starting the calibration process.

To carry out calibration process, please follow the steps mentioned below:

- Ensure that all DIP switches are in the OPEN position.

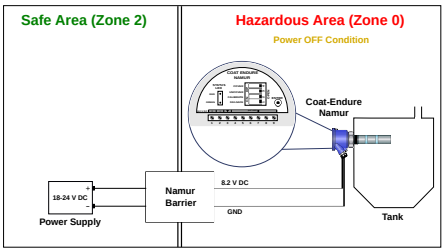


Figure 57: Remote Air Calibration Setup

- Set the CALIBRATE switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 50.
- Close the cover of housing properly before powering on the instrument.
- Power ON the instrument and wait for a minimum of 60 seconds.

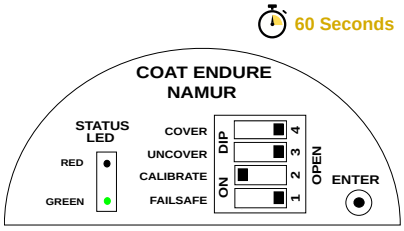


Figure 58: Power ON Condition

- Power OFF the instrument.
- Open the housing cover and set the CALIBRATE switch back to OPEN position as shown in Figure 52.
- Close the cover of housing properly.
- Power ON the instrument.
- Low calibration is completed.

24.4.2 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.

Note: Power OFF the level instrument before starting the calibration process.

To carry out calibration process, please follow the steps mentioned below:

- Ensure that all DIP switches are in the OPEN position.

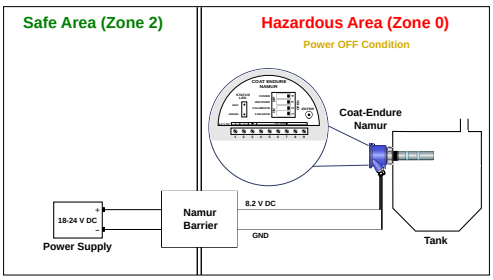


Figure 59: Remote High Calibration Setup

- Set the CALIBRATE and COVER switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 54.
- Close the cover of housing properly before powering on the instrument.
- Power ON the instrument and wait for a minimum of 60 seconds.

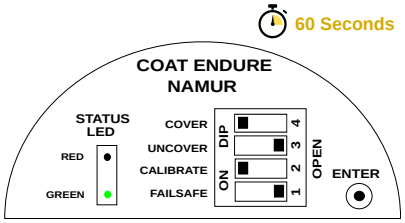


Figure 60: High Calibration Power ON Condition

- Power OFF the instrument.
- Open the housing cover and set the CALIBRATE and COVER switch back to OPEN position as shown in Figure 56.
- Close the cover of housing properly.
- Power ON the instrument.
- High calibration is completed.

25 Output Current Configuration

Note: Perform the operation of Output Current Configuration of the level instrument only in a Safe Zone (Zone 2).

Namur isolation barriers as specified in the Table 11 tend to have variation in their "Functional Operating Voltage". Change to the "Functional Operating Voltage" may cause a change in power consumption for Coat-Endure Namur level sensor. The output current can be configured is required as per the procedure mentioned below:

If the output current of alarm condition exceeds or goes below the specified limit only then use Low Current Configuration or High Current Configuration as per the current value.

STATUS	OUTPUT CURRENT
Normal Condition	≤1.2mA
Alarm Condition	≥2.1mA and <3mA

Table 11: Operating Conditions of Output Current

25.1 Low Current Configuration

If the output current of alarm condition is exceed over **3mA** then the instrument does not operate properly which results instrument will not be able to switch. To resolve this condition, the value of output current should be adjusted by setting Low Current Configuration. To set this mode please follow the procedure given below:

- Set the COVER and UNCOVER switch to CLOSE position.

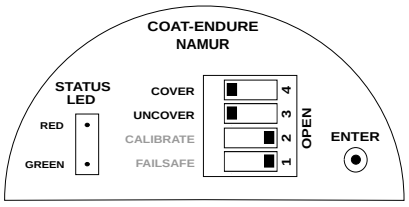


Figure 61: Switch Position Low Current Configuration

- Press and Hold the ENTER key, RED Status LED will start blinking.
- Blink the RED LED 2 times and release the ENTER key.

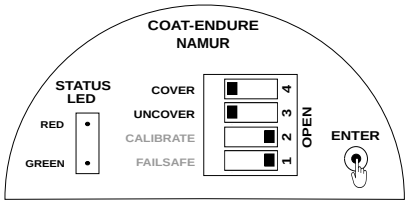


Figure 62: Setting of Low Current Configuration

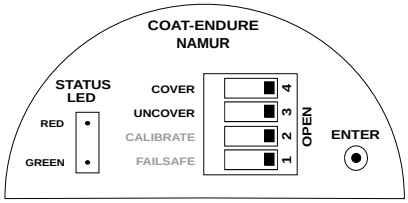


Figure 63: Saving of Low Current Configuration

- Low Current Configuration mode is set.

25.2 High Current Configuration

If the output current of alarm condition goes below **2.1mA** then the instrument does not operate properly which results instrument will not be able to switch. To resolve this condition, the value of output current should be adjusted by setting High Current Configuration. **Indication of this mode is shown by constantly glowing GREEN LED of STATUS LED.** To set this mode please follow the procedure given below:

- Set the COVER and UNCOVER switch to CLOSE position as per Figure 61.
- Press and Hold the ENTER key, RED Status LED will start blinking as per Figure 62.
- Blink the RED LED only once and release the ENTER key as per Figure 63.
- High Current Configuration mode is set.

26 Sensitivity

Note: Set the sensitivity value between 1-5.

The instrument has 5-point sensitivity level to suit a wide range of application materials. Sensitivity value should be decided with respect to the dielectric constant and coating thickness of the application material. Refer to table 12 for selecting a suitable value. By default, the sensitivity is set to 3 to suit a wide range of materials. Traverse the following steps to set the sensitivity:

Note: Set the Sensitivity of the level instrument only in a Safe Zone (Zone 2).

1. Power OFF the instrument and unscrew the electronics insert from the enclosure using screw driver.

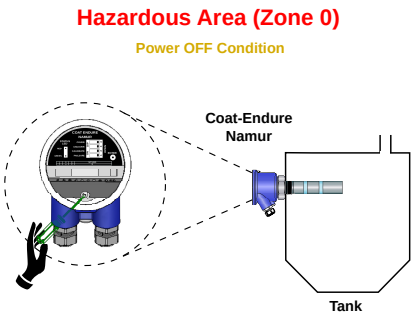


Figure 64: Sensitivity Setting

2. Kept the electronics in Safe Zone(Zone 2) and then set the Sensitivity.
3. Refer to given Figure 46 for Electrical Connections to power up and connect the device.
4. Select a sensitivity value for the product as per table 12.

DIELECTRIC CONSTANT	COATING THICKNESS	SENSITIVITY VALUE
High	High	$1-3$
Low	High	$3-5$ (default)
High	Low	$1-2$
Low	Low	5

Table 12: Switching Sensitivity

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

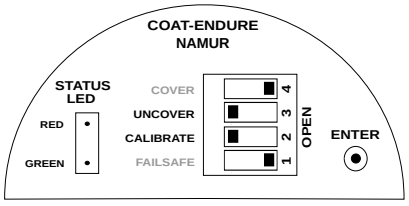


Figure 65: Sensitivity Switch Position

6. To modify the set value, Press ENTER and HOLD the key, RED Status LED 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 sensitvity to 4, count up to four blinks and release the ENTER key.
7. To save the sensitivity value, set the CALIBRATE and UNCOVER switches back to OPEN position.
8. Check operation of Coat-Endure by filling in and draining out the material.

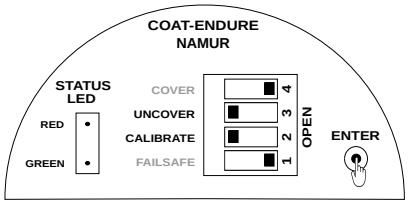


Figure 66: Setting Sensitivity Position

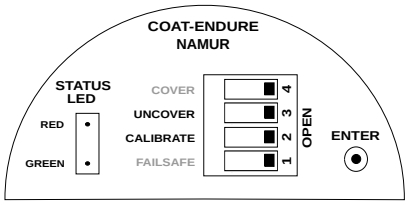


Figure 67: Saving Sensitivity

9. If the instrument does not switch when covered fully with the material, try again with a higher value of sensitivity.

10. If the instrument switches when covered fully with the material, but does not switch back to normal state when uncovered, try again with a lower sensitivity value.

27 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.

Note: Perform the Failsafe operation in Power OFF condition in hazardous area (Zone 0).

Prevent Overflow - High Level Switch: Failsafe High (default) is set by moving the FAILSAFE switch to OPEN position.

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

2. When in contact with the material, LED turns RED.

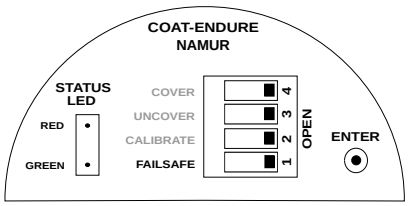


Figure 68: Failsafe High

Prevent Dry run - Low Level Switch: Failsafe Low is set by moving the FAILSAFE switch to CLOSE position.

1. When in contact with the material, LED turns GREEN.

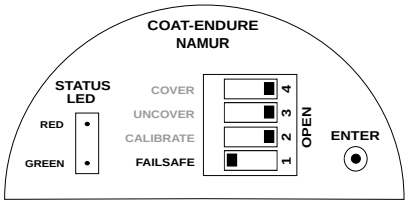


Figure 69: Failsafe Low

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

28 Factory Reset

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

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

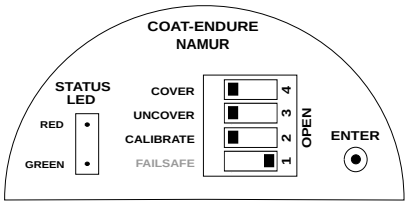


Figure 70: Switch Position

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

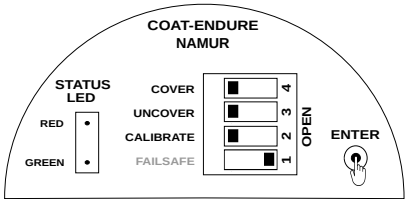


Figure 71: Setting Default Value

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

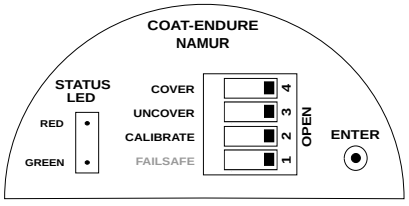


Figure 72: Saving Default Value

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

29 Certification

CERTIFICATION	ITEM SELECTION
IS/IEC 60529: 2001 (IP68)	SCUTE
IS/IEC 60529: 2001 (IP66)	FP2C
IS/IEC 60079-1:2014 (Ex 'd')	FP2C
Ex ia IIC T6 Ga	NMR-DC6

Table 13: Certifications

30 Maintenance

The electronics of Coat-Endure needs no maintenance. When cleaning and checking the vessel, free the Coat-Endure from deposits. If the material has tendency to form a hard sticky deposit, 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 .

31 Key settings for various functions and their operations

Functions	KEYS	OPERATIONS
Air Calibration	Key 4	Set the (key4) CALIBRATE switch to CLOSE (Opposite of OPEN in a DIP switch). Press ENTER key. The STATUS LED for RELAY 1 will glow in RED color.Release the ENTER key and set the (key4) CALIBRATE switch back to OPEN position.
High Calibration	Key 3	Set the (key3) HI CALIBRATE switch to CLOSE (Opposite of OPEN for DIP switch) position and wait until Green LED becomes stable.Press and hold ENTER key, the STATUS LED for RELAY 1 will glow in RED color.Release the ENTER key and set the (Key3) HI CALIBRATE switch back to OPEN position.
Cover Delay	Key 6	In Cover Delay the numerical value can be set between 1-25 Sec. Set the (key6) COVER switch to CLOSE (Opposite of OPEN in a DIP switch) position.
Uncover Delay	Key 5	In UnCover Delay the numerical value can be set between 1-25 Sec. Set the (key5) UNCOVER switch to CLOSE (Opposite of OPEN in a DIP switch) Position.
Sensitivity	Key 4 and 5	Sensitivity can be set from 1 to 5. Set the (key5) uncover and (key4) calibrate switch to close position.To save the sensitivity value, set the UNCOVER and CALIBRATE switches back to OPEN position
Failsafe High	Key 2	Failsafe high is set by moving the (key2) fs1 switch for Relay 1 to open position.
Failsafe Low	key 1	Failsafe low is set by moving the (key1) fs2 switch for Relay 2 to open position.
Factory Reset	Key 4 , 6 , 5	Set the CALIBRATE, COVER and UNCOVER switches to CLOSE position.Press the ENTER key until the STATUS LED blinks. Again Set the CALIBRATE, COVER and UNCOVER switches to OPEN position and set the time delay to 0 and the sensitivity level to 3

32 Customer Support

Thankyou 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
- sales@sapcon.in
- +91-731-4757575

33 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 : With LED
  - **Housing**
    - SCUTE : Pressure Die Cast Aluminium, weatherproof, powder-coated, IP68
    - FP2C : Cast Aluminium, weather & flameproof, IEC 60079-1 Ex 'd', powder- coated suitable for gas group IIC, IP66/68
    - CLB : Weatherproof plastic housing with transparent cover for LED illumination, Rating IP68/IP66, Material : PBT-FR & PC
  - **Probe Housing Cable Entry**
    - PCPG13 : Threaded, PG 13.5 cable gland, Polyamide
    - PCB5D : Threaded, G ½" (BSP), DC gland, Brass (Ni plated)
    - PCN5D : Threaded, ½" NPT, DC gland, Brass (Ni plated)
  - **Output**
    - D : DPDT Relay (rated at 6A, 230V AC for non inductive load)
    - SPN : One SPDT Relay (rated at 6A, 230V AC for non inductive load) and one PNP output (only for 18 To 35V DC supply voltage)
  - **Power Supply (Depend on "Housing")**
    - U : Universal (18 to 55V DC and 90 to 265V AC, 50Hz) on the same terminals
  - **Insulation Type**
    - P : Partly Insulated, PTFE
    - F : Fully Insulated, PTFE
  - **Mounting**
    - MB10S4 : Threaded, G 1" (BSP), SS 304
    - MB10S6 : Threaded, G 1" (BSP), SS 316
    - MN10S6 : Threaded, NPT 1", SS 316
    - MB15S4 : Threaded, G 1½" (BSP), SS 304
    - MB15S6 : Threaded, G 1½" (BSP), SS 316
    - MN15S6 : Threaded, NPT 1½", SS 316
    - F15S4 : 10 mm thick Flange conforming to 1½" ANSI/ASME B16.5 Flange, SS 304
    - F15S6 : 10 mm thick Flange conforming to 1½" ANSI/ASME B16.5 Flange, SS 316
    - FA15S4 : 1½" ANSI/ASME B16.5 150 Lbs Flange, SS 304
    - FA15S6 : 1½" ANSI/ASME B16.5 150 Lbs Flange, SS 316
    - F20S4 : 10 mm thick Flange conforming to 2" ANSI/ASME B16.5 Flange, SS 304
    - F20S6 : 10 mm thick Flange conforming to 2" ANSI/ASME B16.5 Flange, SS 316
    - FA20S4 : 2" ANSI/ASME B16.5 150 Lbs Flange, SS 304
    - FA20S6 : 2" ANSI/ASME B16.5 150 Lbs Flange, SS 316
    - F25S4 : 10 mm thick Flange conforming to 2½" ANSI/ASME B16.5 Flange, SS 304
    - F25S6 : 10 mm thick Flange conforming to 2½" ANSI/ASME B16.5 Flange, SS 316
    - FA25S4 : 2½" ANSI/ASME B16.5 150 Lbs Flange, SS 304
    - FA25S6 : 2½" ANSI/ASME B16.5 150 Lbs Flange, SS 316
    - F30S4 : 10 mm thick Flange conforming to 3" ANSI/ASME B16.5 Flange, SS 304
    - F30S6 : 10 mm thick Flange conforming to 3" ANSI/ASME B16.5 Flange, SS 316

Mounting

- FA30S4 : 3” ANSI/ASME B16.5 150 Lbs Flange, SS 304
- FA30S6 : 3” ANSI/ASME B16.5 150 Lbs Flange, SS 316
- TC15S4 : 1½” Tri-Clamp ISO 2852/DIN 32676(DN40), SS 304
- TC15S6 : 1½” Tri-Clamp ISO2852/DIN32676(DN40), SS 316
- TC20S4 : 2” Tri-Clamp ISO2852/DIN32676(DN50), SS 304
- TC20S6 : 2” Tri-Clamp ISO2852/DIN32676(DN50), SS 316

WETTED PARTS

- SE4 : SS 304
- SE6 : SS 316

Operating Temperature

- 10T : Upto 100°C
- 25T : Upto 250°C

Probe Length

- 1H : 100mm
- 1H20H : 100mm to 2000mm (For Tri-Clamp)
- 1.5H20H : 151mm to 2000mm

Example - CE-I-SCUTE-PCPG13-D-U-P-MB10S6-SE6-25T-1H

34 AS-Interface 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 : With LED
  - **Housing**
    - SCUTE : Pressure Die Cast Aluminium, weatherproof, powder-coated, IP68
    - FP2C : Cast Aluminium, weather & flameproof, IEC 60079-1 Ex 'd', powder- coated suitable for gas group IIC, IP66/68
    - CLB : Weatherproof plastic housing with transparent cover for LED illumination, Rating IP68/IP66, Material : PBT-FR & PC
  - **Probe Housing Cable Entry**
    - PCPG13 : Threaded, PG 13.5 cable gland, Polyamide
    - PCB5D : Threaded, G ½" (BSP), DC gland, Brass (Ni plated)
    - PCN5D : Threaded, ½" NPT, DC gland, Brass (Ni plated)
  - **Output**
    - ASI : ASi-3, Actuator Sensor Interface, 4-bit bus
  - Power Supply
    - DC8 : 24 To 30V DC
  - **Insulation Type**
    - P : Partly Insulated, PTFE
    - F : Fully Insulated, PTFE
  - **Mounting**
    - MB10S4 : Threaded, G 1" (BSP), SS 304
    - MB10S6 : Threaded, G 1" (BSP), SS 316
    - MN10S6 : Threaded, NPT 1", SS 316
    - MB15S4 : Threaded, G 1½" (BSP), SS 304
    - MB15S6 : Threaded, G 1½" (BSP), SS 316
    - MN15S6 : Threaded, NPT 1½", SS 316
    - F15S4 : 10 mm thick Flange conforming to 1½" ANSI/ASME B16.5 Flange, SS 304
    - F15S6 : 10 mm thick Flange conforming to 1½" ANSI/ASME B16.5 Flange, SS 316
    - FA15S4 : 1½" ANSI/ASME B16.5 150 Lbs Flange, SS 304
    - FA15S6 : 1½" ANSI/ASME B16.5 150 Lbs Flange, SS 316
    - F20S4 : 10 mm thick Flange conforming to 2" ANSI/ASME B16.5 Flange, SS 304
    - F20S6 : 10 mm thick Flange conforming to 2" ANSI/ASME B16.5 Flange, SS 316
    - FA20S4 : 2" ANSI/ASME B16.5 150 Lbs Flange, SS 304
    - FA20S6 : 2" ANSI/ASME B16.5 150 Lbs Flange, SS 316
    - F25S4 : 10 mm thick Flange conforming to 2½" ANSI/ASME B16.5 Flange, SS 304
    - F25S6 : 10 mm thick Flange conforming to 2½" ANSI/ASME B16.5 Flange, SS 316
    - FA25S4 : 2½" ANSI/ASME B16.5 150 Lbs Flange, SS 304
    - FA25S6 : 2½" ANSI/ASME B16.5 150 Lbs Flange, SS 316
    - F30S4 : 10 mm thick Flange conforming to 3" ANSI/ASME B16.5 Flange, SS 304
    - F30S6 : 10 mm thick Flange conforming to 3" ANSI/ASME B16.5 Flange, SS 316
    - FA30S4 : 3" ANSI/ASME B16.5 150 Lbs Flange, SS 304

- **Mounting**
  - FA30S6 : 3” ANSI/ASME B16.5 150 Lbs Flange, SS 316
  - TC15S4 : 1½” Tri-Clamp ISO 2852/DIN 32676(DN40), SS 304
  - TC15S6 : 1½” Tri-Clamp ISO2852/DIN32676(DN40), SS 316
  - TC20S4 : 2” Tri-Clamp ISO2852/DIN32676(DN50), SS 304
  - TC20S6 : 2” Tri-Clamp ISO2852/DIN32676(DN50), SS 316
- **WETTED PARTS**
  - SE4 : SS 304
  - SE6 : SS 316
- **Operating Temperature**
  - 10T : Upto 100°C
  - 25T : Upto 250°C
- **Probe Length**
  - 1H : 100mm
  - 1H20H : 100mm to 2000mm (For Tri-Clamp)
  - 1.5H20H : 151mm to 2000mm

Example - CE-I-SCUTE-PCPG13-ASI-P-MB10S6-SE6-25T-1H