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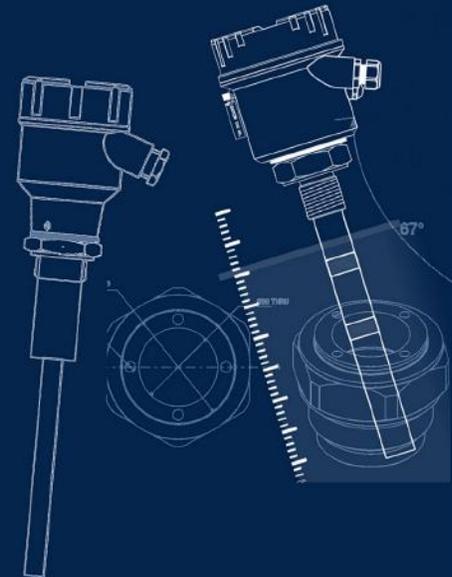


INSTRUCTION MANUAL

COAT-ENDURE

Admittance Level Limit Switch

Version 2.3



SAPCON INSTRUMENTS PVT. LTD.

30+ Years in Process Control Instrumentation

An ISO 22000 company

www.sapconinstruments.com

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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

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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.

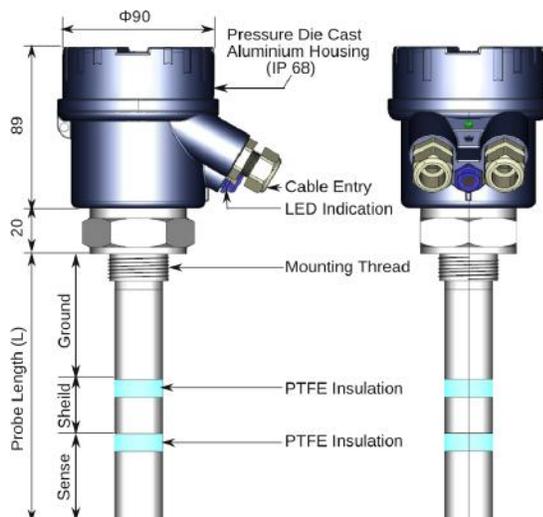


Figure 2: Description of Parts

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
Output	<ul style="list-style-type: none"> • Relay SPDT , PNP • Relay DPDT
Power Consumption	<ul style="list-style-type: none"> • 1.5W (SPDT, PNP) at 24 V • 2.2W (DPDT) at 24 V
Switching	Single-point level switching
Switching Indication	Bi-color LED: Red - Alarm Green - Normal
Fail-safe	Field Selectable <ul style="list-style-type: none"> • 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

6 Mechanical Specifications

Please refer to Table 2 for Mechanical Specifications.

PARAMETER	VALUE
Housing	<ul style="list-style-type: none"> • 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
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"> • Screwed: 1/2", 1", 1 1/2", 3/4" BSP / NPT • Flanged: As per user specification
Probe Length	65 mm and (85 mm to 1500 mm)
Insulation	Part PTFE / Full PTFE

Table 2: Mechanical Specifications

7 Application Specifications

Please refer to Table 3 for Application Specifications.

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

Table 3: Application Specifications

8 Installation Guidelines

8.1 Procedure for Installation

For quick and easy installation, follow the steps in the order mentioned below:

- 1. Testing Electrical Connections:** Before mounting the device on the tank, understand and test the connections outside the tank for at least one piece. For details on connections, refer to Figure 5 before connecting the device to outputs and power supply.
- 2. Mounting the Device:** Correct mounting of the instrument is critical to the operation of the instrument. Please refer to Tank Mounting Installation to mount the instrument in the tank/silo or hopper. Coat-Endure is designed to work properly in metal-body tanks only, e.g. MS, SS or Aluminium tanks. Performance in plastic tanks might not be satisfactory.
- 3. Electrical Connections:** Perform the electrical connections as mentioned earlier in Step 1.
- 4. Calibration and Settings:**
 - For non-conductive materials, Coat-Endure can be calibrated in an empty process tank without the application material.
 - If the application material is conductive, Coat-Endure has to be calibrated with the material.

Time-delay and fail-safe selection should be done after this stage. Section Calibration and Settings covers settings in more detail.

- 5. Trial Run:** Perform a trail run of the application process with the application material. In case of errors or unsatisfactory output, refer to Section Error Indications.
- 6. Finishing the Installation:** Tighten the lid and the cable entries on the instrument so that no moisture seeps into the instrument.

8.2 Tank Mounting Installations

- Coat-Endure is designed to work in metal-body tanks only, e.g. M.S., S.S. or Aluminium tanks. Performance in plastic tanks might not be satisfactory.

- The Coat-Endure probe can be installed in the vessel in both horizontal (side mounting) and vertical (top mounting) positions. Please refer to Figures 3 and 4.
- To prevent the ingress of moisture and water seepage in side mounting position, the cable entries should always point downwards.
- Weatherproofness of enclosure is guaranteed only if the cover is in place and glands are 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. If 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.
- Grounding part (S.S. material) of the probe should be exposed atleast 20mm inside the hopper after threading/nozzle.

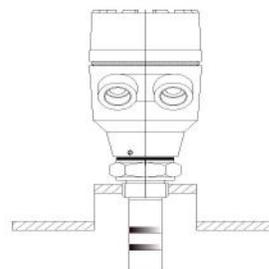


Figure 3: Dimensional Layout - Top Mounting

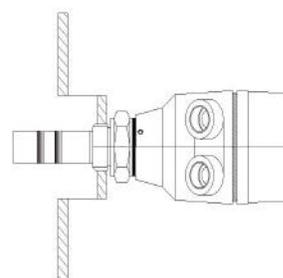


Figure 4: Dimensional Layout - Side Mounting

8.3 Electrical Connections

Electrical connections for the instrument will change with the models. Please refer to figure 5 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.

application material is changed; calibration should be repeated.

Note:

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

9.1 Calibration for Non-Conductive Materials

Coat-Endure needs to be calibrated inside the empty process tank (i.e only air, no material). Calibrating the instrument outside the tank can cause malfunctions. Once calibrated inside the empty tank, Coat-Endure can operate with a wide range of application materials without the need of changing its default sensitivity settings.

1. Make sure that all DIP switches are in the OPEN position.
2. To start with the calibration, set the CALIBRATE switch to CLOSE position (CLOSE is opposite of OPEN for DIP switch).
3. Make sure that the status LED is not blinking. A blinking LED here indicates Error.
4. Then press ENTER, the status LED will blink once in RED color.
5. Now set the CALIBRATE switch back to OPEN position.
6. Air calibration for Coat-Endure is now complete.

Now, test the calibration by filling in the material or draining it out from the tank. Repeat the filling and draining to confirm proper operation of the device.

Note:

For certain application materials, Coat-Endure might need an adjustment to its settings. Refer to Section Sensitivity Adjustment for more details.

9.2 Calibration for Conductive Materials

Fill the tank with the application material such that the probe is completely covered with the material.

1. Make sure that all DIP switches are in the OPEN position.
2. To start with the calibration, set the CALIBRATE and COVER switches to CLOSE position (CLOSE is opposite of OPEN for DIP switch).
3. Make sure that the status LED is not blinking, a blinking LED here indicates Error.
4. Then press ENTER, the status LED will blink once in RED color.
5. Now set the CALIBRATE and COVER switch back to OPEN position.

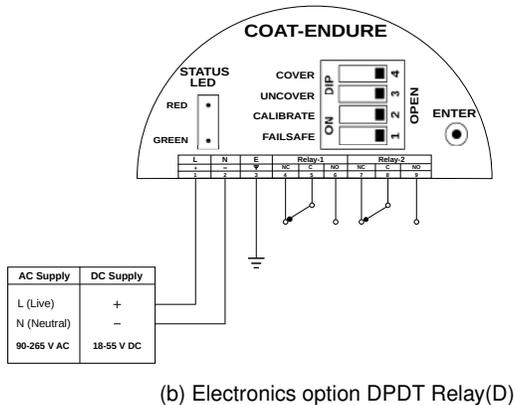
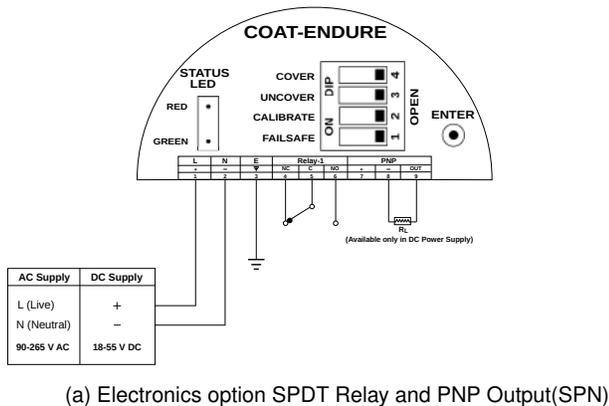


Figure 5: Electrical Connections

9 Calibration and Settings

The DIP switches for calibration and settings can be accessed by opening the top aluminium cover. Procedure for calibration Coat-Endure depends on the conductivity of the application material:

- **Calibration for Non-Conductive Materials**

Calibration should be done without the application material. Once calibrated in the empty tank, the device can be used with a wide range of non-conductive materials.

- **Calibration for Conductive Materials**

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

6. Calibration for Coat-Endure is now complete.

Now, test the calibration by filling in the material or draining it out from the tank. Repeat the filling and draining to confirm proper operation of the device.

Note:

For certain conductive application materials, Coat-Endure might need an adjustment to its settings. Refer to Section Sensitivity Adjustment for more details.

9.3 Factory Reset

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

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

9.4 Cover Delay

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.

Note:

You can set the value of COVER DELAY between 1-25 secs.

Follow the below procedure for setting Cover Delay

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



Figure 6: DIP Switch

2. To set the Cover Delay, set the COVER switch to CLOSE position as shown in Figure 7. (CLOSE is the opposite of OPEN for a DIP switch.) The STATUS RED LED will glow.
3. Press ENTER and keep it pressed as shown in Figure 8. The STATUS RED LED will start blinking. Count the number of blinks. After setting the value release the ENTER key.

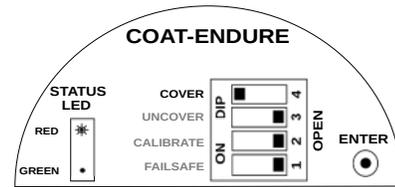


Figure 7: Cover Delay Switch Position

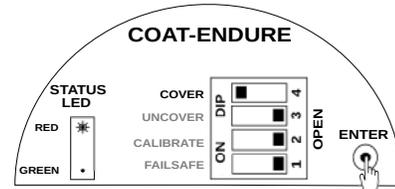


Figure 8: Setting Cover Delay

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

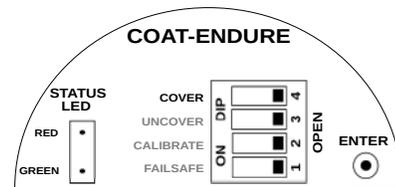


Figure 9: Saving Cover Delay

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

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

9.5 Uncover Delay

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

Note:

You can set the value of UNCOVER DELAY between 1-25 secs.

Follow the below procedure for setting Uncover Delay

1. Ensure that all DIP switches are in OPEN position as shown in Figure 6. Make sure that STATUS LED is not blinking for Error.
2. To set the Uncover Delay, set the UNCOVER switch to CLOSE position as shown in Figure 10.

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

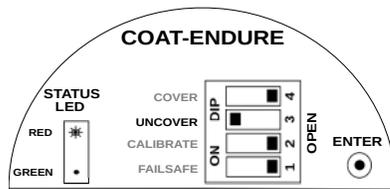


Figure 10: Uncover Delay Switch Position

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

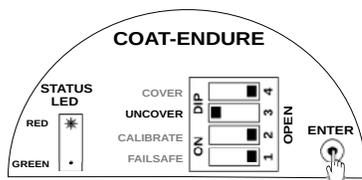


Figure 11: Setting Uncover Delay

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

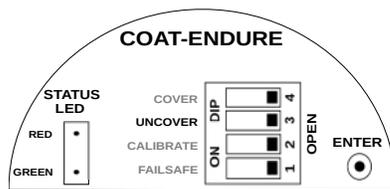


Figure 12: Saving Uncover Delay

5. To test, dip coat-endure into the application material until the switching point is achieved.
6. The STATUS LED will start blinking GREEN if the switch point is achieved. It will blink for the number of seconds for which the Uncover Delay is set.

9.6 Sensitivity Adjustment

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 4 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 of Coat-Endure -

1. Select a sensitivity value for the instrument as per table 4.

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

Table 4: Switching Sensitivity

2. Set the CALIBRATE switch to CLOSE position.
3. Also switch the UNCOVER switch to CLOSE position.
4. PRESS and HOLD the ENTER key, the status LED will start blinking.
5. The first blink leaves the sensitivity value unchanged.
6. Start counting from the next blink up to the selected sensitivity value.
7. Set the CALIBRATE and UNCOVER switches back to OPEN position.
8. Check operation of Coat-Endure by filling in and draining out the material.
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.

9.7 Failsafe Settings

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 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.

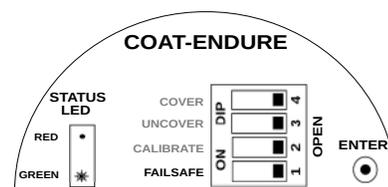


Figure 13: Failsafe High

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

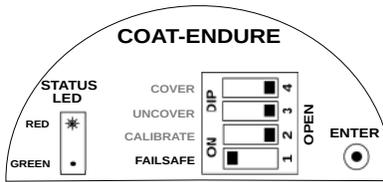


Figure 14: Failsafe Low

10 Error Indication

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

Nature of error:

1. Incomplete calibration
2. Low capacitance

To avoid errors:

1. Always complete the calibration by putting the CALIBRATE switch back to OPEN position. This can be done within 2 minutes of releasing ENTER for the last time for calibration purpose.
2. Always complete the delay settings by putting the DELAY switches back to OPEN position. This can be done within 2 minutes of releasing the ENTER for DELAY setting purpose.
3. Make sure that only 1 switch is at the CLOSE position amongst the CALIBRATE, COVER and UNCOVER switches. Fail-safe switch can be OPEN or CLOSE and is not a source of error.

Resetting Error:

1. Bring the CALIBRATE, COVER and UNCOVER switches to OPEN position.
2. Press the ENTER key.
3. LED alternate color blinking will STOP.

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

11 Maintenance

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

12 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
- sales@sapcon.in
- +91-731-4757575

13 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

Mounting	
	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
Sense	
👍	S20S4 : 20mm Length, SS 304 (Only for Probe Length ≤ 150mm)
	S20S6 : 20mm Length, SS 316 (Only for Probe Length ≤ 150mm)
👍	S40S4 : 40mm Length, SS 304 (Only for Probe Length ≥ 151mm)
	S40S6 : 40mm Length, SS 316 (Only for Probe Length ≥ 151mm)
Shield (Depends on "Sense")	
👍	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")
Grounding Length (Depends on Probe Length ≥ 85mm or 0.85H)	
👍	GS4 : SS 304
	GS6 : SS 316
Operating Temperature	
	10T : Upto 100°C
	25T : Upto 250°C
Standoff Material (Only with "25T")	
	STGI : GI (Galvanized Iron)
👍	STS4 : SS 304
	STS6 : SS 316
Probe Length	
	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
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👍 Shows First Priority Entity