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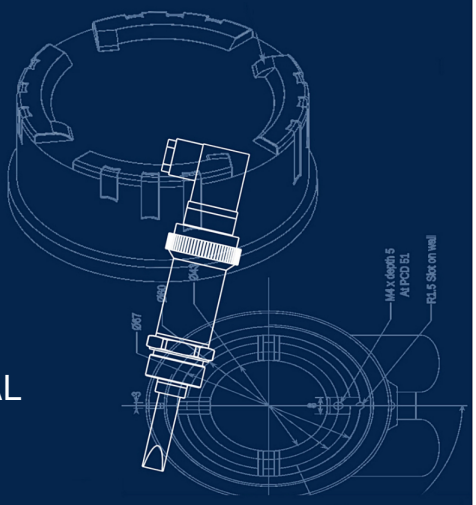
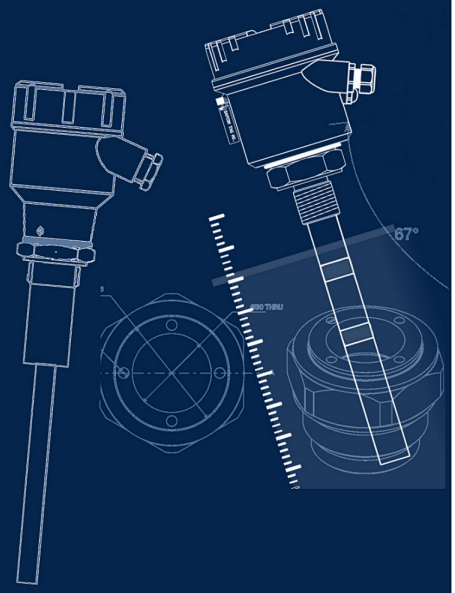


# INSTRUCTION MANUAL

## SLP-VIBROSONDE

Vibrating Rod

Version 3.0



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## Revision History

| Revision | Date | Author(s) | Description |
|---|---|---|---|
| 1.0 | 10 Mar 2014 | RND | First Version Editing |
| 1.1 | 15 Sep 2014 | MRK | Applications Revision |
| 1.2 | 25 May 2015 | RND | Features Revision |
| 1.3 | 20 Nov 2015 | RND | Specs Revision |
| 1.4 | 28 Jul 2016 | RND | Specs Revision |
| 2.0 | 08 Jan 2017 | BRND | Revised Format |
| 2.1 | 17 Sep 2017 | BRND | Branding Revisions |
| 2.2 | 12 Jan 2018 | RND | Specs Revision |
| 2.3 | 05 Jul 2018 | BRND | Branding Revisions |
| 2.4 | 27 Apr 2021 | RND | Order Code Chart Updation |
| 2.5 | 4 May 2021 | RND | Display Section Updation |
| 3.0 | 16 Aug 2021 | RND | Addition of AS-Interface |

[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.
- Make all electrical connections as instructed in the manual. DO NOT power on the device before verifying the connections.

# 1 Introduction

Vibrosonde is a vibrating rod level limit switch for free-flowing solids having a maximum granule size $\leq 12$ mm. It is suitable for level detection in silos, bins, hoppers, etc. where the process temperature ranges between $0°$C to $+150°$C. It has no moving parts and can replace rotating paddle level switch in most applications.

Figure 1: Vibrosonde Product Image

# 2 Operating Principle

A vibrating rod is kept in mechanical vibrations at its resonance frequency by piezo-electric crystals. When the service material covers the rod probe, vibrations are damped which is sense electronically and processed signal is used for switching.

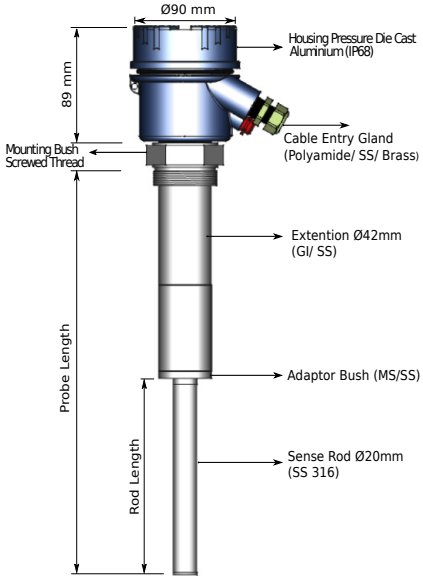



Figure 2: Description of Parts

# 3 Features

- Low Power Consumption: Less heat, Long life
- Self-diagnosis
- External LED indication available with WL option
- Independent of material's electrical properties
- No moving parts, no wear and tear, maintenance-free
- IP68 Protection, as per IS 13947

# 4 Applications

- Fast Packaging Machines for Powders & Granuales
- PET / PVC chips with underwater detection
- Powders, Sand & Sugar
- Iron ore, Sinters & Pulverized Coal
- Dry Sand & Fly-ash
- Food Grains
- Cement

# 5 Application Specifications

Please refer to Table 1 for Application Specifications.

| PARAMETER | VALUE |
|---|---|
| Sensitivity | • Dense Media/Build Up - 1<br>• Ligthter Media - 5 |
| Density of media (min) | 0.7 gm/$cm^3$ |
| Grain Size | A maximum of 12mm |
| Response Time with 'NS' option | • Cover Delay : 1-2 seconds<br>• Uncover Delay : 1-3 seconds |

Table 1: Application Specifications

# 6 Electrical Specifications

Please refer to Table 2 for Electrical Specifications.

| PARAMETER | VALUE |
|---|---|
| Input Power Supply | 18 - 55V DC and 90 - 265V AC at 50Hz on same terminal |
| Output | • Relay DPDT<br>• Relay SPDT, PNP |
| Power Consumption | • 1.5W (SPDT, PNP) at 24 V<br>• 2.2W (DPDT) at 24 V |
| Switching | Single-point level switching |
| Switching Indication | Bi-Color LED on the electronics insert<br>• Green - Normal<br>• Red - Alarm<br>External LED between the cable glands(with option WL)<br>• Blue - Normal<br>• Red - Alarm |
| Fail-safe | Field Selectable<br>• Open - Fail-safe High (For High Level)<br>• Close - Fail-safe Low (For Low Level) |
| Time Delay Settings | 1 - 25 seconds (For both, Covered and Uncovered Delays) |
| Operating Temperature | • Ambient Temperature: $0°C$ to $65°C$<br>• Process Temperature: $0°C$ to $100°C$ with option HT |
| Relay Rating | 6 Amp at 230 VAC |

Table 2: Electrical Specifications

# 7 Mechanical Specifications

Please refer to Table 3 for Mechanical Specifications.

| PARAMETER | VALUE |
|---|---|
| Housing | • SCUTE: Pressure die-cast aluminium weatherproof (Rating IP-68)<br>• FP2C: Cast aluminium, weatherproof & flameproof, powder coated, suitable for Gas Groups IIA, IIB & IIC as per IS-2148 |
| Electrical Connector | PG-13.5, 1/2" BSP DC Glands, 1/2” NPT DC Glands |
| Mounting | • Screwed - 1”/1 1/2” BSP/NTP(M)<br>• Flanged - As per your specifications<br>• Material - MS (Plated), SS |
| Sensing Fork | SS 316 |
| Extension Pipe | GI (Galvanized Iron) / SS-304 / SS -316 |

Table 3: Mechanical Specifications

# 8 Installation & Handling Guidelines

The Vibrosonde should be installed in horizontal or vertical position. The following image displays different allowable installation positions. While installing the instrument, please take care of the following points:

- The instrument shouldn't block the material filling inlet.
- Secure the cover of housing tightly. Tighten the cable glands.
- 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 vibrating rod as shown in Figure 3.

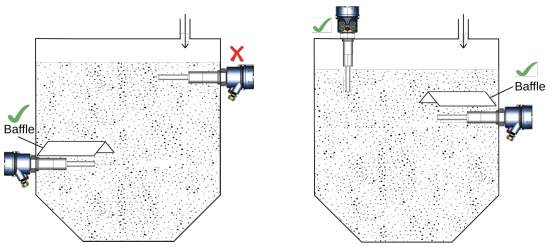



Figure 3: Correct Side Mounting

- When handling vibrating rod, do not lift them using their rod. Please see Figure 4.

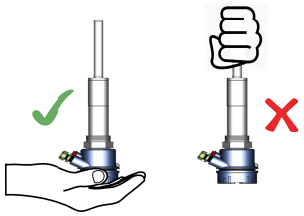
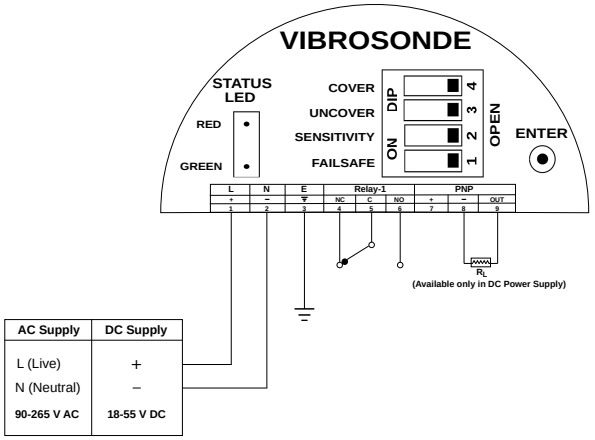


Figure 4: Instrument Handling

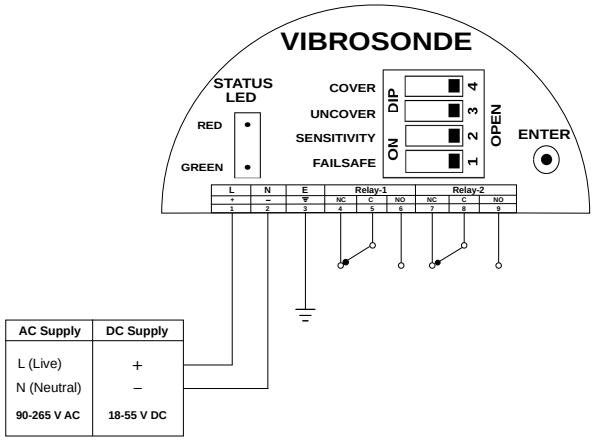
- Make all electrical connections as instructed in the manual. Don't power on the device before verifying the connections.
- To prevent the ingress of moisture and water seepage in side mounting position, the cable entries should always point downwards.
- Weatherproofness of enclosure is guaranteed only if the cover is in place 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 lies between $60°$C and $80°$C.
- While screwing the instrument, the hexagonal mounting bush should be turned and not the housing.

# 9 Electrical Connections

Please refer to Figure 5 for electrical connections.




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




(b) Electronics option DPDT Relay(D)

Figure 5: Electrical Connections

# 10 Sensitivity Settings

The sensitivity settings can be set as per the requirement using a DIP switch. The value of sensitivity is directly proportional to the number of blinks. 1 blink is the equivalent to the sensitivity value of 1. Thus, an increase in the number of blinks will make the instrument more sensitive.

**Note:** Set the value of Sensitivity between 1-5.

**Follow the below procedure for setting sensitivity**

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. Set the SENSITIVITY switch to CLOSE(Opposite of OPEN in a DIP switch) position as shown in Figure 7.

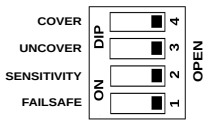



Figure 6: DIP Switch

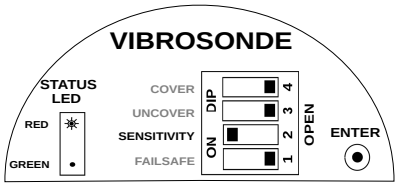



Figure 7: Sensitivity Switch Position

3. Press ENTER. The STATUS LED starts blinking. Blink the STATUS LED according to value of sensitivity as shown in Figure 8.
   - 5 blinks indicate highest sensitivity which is required for low density materials.
   - 1 blink refers to lowest value of sensitivity which is required for normal solids.

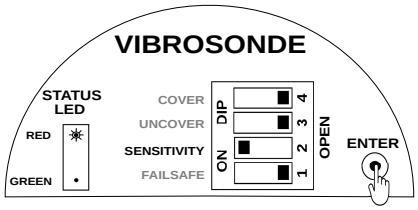



Figure 8: Setting Sensitivity Value

4. Sensitivity value is entered, but not saved.
   To save and test the sensitivity, set the SENSITIVITY switch back to OPEN position as shown in Figure 9.

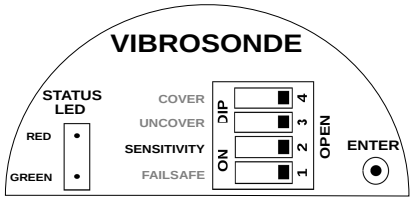



Figure 9: Saving Sensitivity Value

## 11 Cover Delay

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

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

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

1. Ensure that all DIP switches are in OPEN position as shown in Figure 6. Make sure that STATUS LED is not blinking for Error.
2. Set the COVER switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 10.

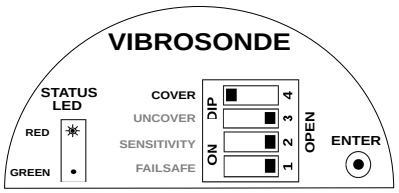



Figure 10: Cover Delay Switch Position

3. Press ENTER. The STATUS LED starts blinking. Blink the STATUS LED according to value of cover delay as shown in Figure 11.

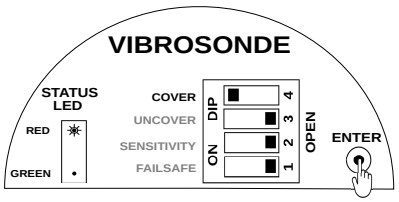



Figure 11: Setting Cover Delay

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 12.

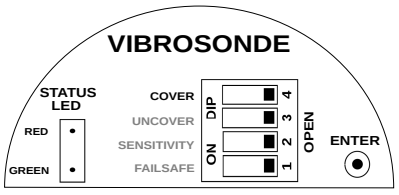



Figure 12: Saving Cover Delay

5. To test, dip Vibrosonde into the application material until the switching point is reached.
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 cover delay is set. 1 blink is equal to 1 second during switching. A maximum of 25 seconds can be set.

## 12 Uncover Delay

When the application material uncovers vibrating rod, the changeover of the output can be delayed by a predetermined time. This time is called UNCOVER Delay. For a different value of Uncover Delay, the number of blinks can be adjusted as per requirement.

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

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

1. Ensure that all DIP switches are in OPEN position as shown in Figure 6. Make sure that STATUS LED is not blinking for Error.
2. Set the UNCOVER switch to CLOSE (Opposite of OPEN in a DIP switch) position as shown in Figure 13.

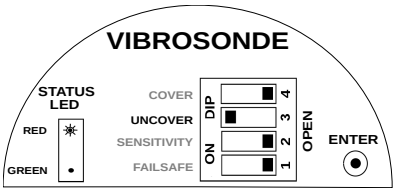



Figure 13: Uncover Delay Switch Position

3. Press ENTER. The STATUS LED starts blinking. Blink the STATUS LED according to value of uncover delay as shown in Figure 14.

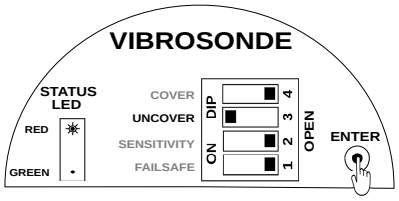



Figure 14: Setting Uncover Delay

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 15.

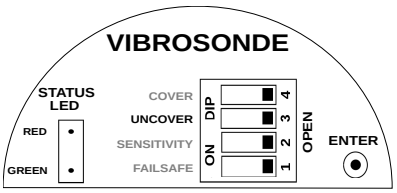



Figure 15: Saving Uncover Delay

5. To test, dip Vibrosonde 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 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.

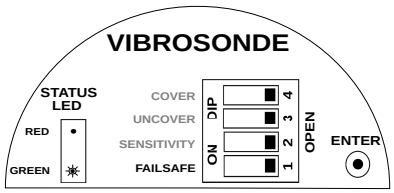



Figure 16: Failsafe High

**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.

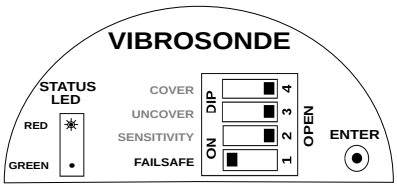



Figure 17: Failsafe Low

# 14 Display Indications

As seen in Fig.18, Vibrosonde has STATUS LEDs to show output indication.

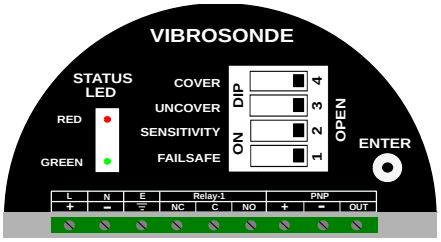



Figure 18: LED Indication on Top Cover

## 14.1 STATUS LED

A separate STATUS LED section indicate switching status for normal and alarm conditions.

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

Continuous blinking of Red or Green LED could indicate an error, refer to Troubleshooting & Indications

# 15 Troubleshooting & Indications

## 15.1 Output Indications

**Green LED Glows When:**

- Vibrating Rod is Uncovered and Failsafe is High
- Vibrating Rod is Covered and Failsafe is Low

**Red LED Glows When:**

- Vibrating Rod is Covered and Failsafe is High
- Vibrating Rod is Uncovered and Failsafe is Low

## 15.2 Troubleshooting

- Heavy build-up of application material can dampen the rod oscillations. In this case, the vibrating rod requires to be cleaned. To avoid build up change sensitivity value to 1.
- If the vibrating rod is not sensing application media, consider changing the sensitivity.
- If instrument is not powering on (No LED is glowing). Check input supply voltage. It should be in the range mentioned in Electrical Specifications
- **Connectivity between Vibating Rod and Electronics is broken**
  - In failsafe 'High' mode, instrument will switch to ALARM
  - In failsafe 'Low' mode, instrument will switch to NORMAL

# 16 Maintenance

The electronics of Vibrosonde instrument needs no maintenance. When cleaning and checking the vessel, free the vibrating rod 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.

# 17 For AS-Interface Module

## 17.1 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 19. ASi-3 is based on a master-slave system where single master can transfer input and output data with up to 62 slaves.

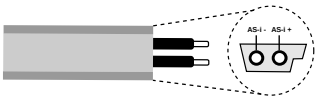



Figure 19: AS-Interface

## 17.2 Electrical Specifications

Please refer to Table 4 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)<br>• Open: Fail-safe High<br>• Close: Fail-safe Low |

Table 4: Electrical Specifications

## 17.3 AS-i Configuration

Please refer to Table 5 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 5: AS-i Configuration

## 17.4 Electrical Connections

Please refer to the Figure 20 for electrical connections of AS-Interface Module.

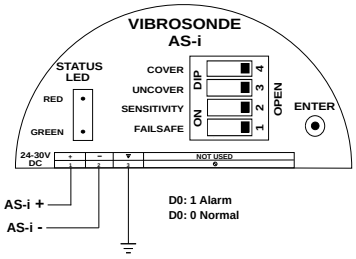



Figure 20: Electrical Connection

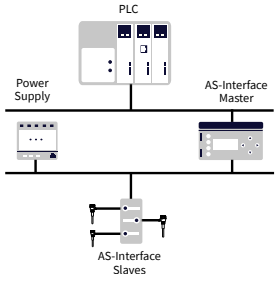



Figure 21: Connection of Vibrosonde via AS-Interface

## 17.5 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 Vibrosonde:

- **Set Unique Bus ID:** Assign and set a unique bus identification for the slave device. This can be done by using an AS-I master device. 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 failsafe switch to toggle the output and observe the change in the D0 bit for the assigned address. The output change can observed via a PLC or a SCADA system connected to the PLC.

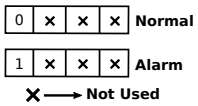



Figure 22: Output of AS-Interface

## 17.6 Installation

Proceed to Section Installation Guidelines for installing the product in an application tank and then refer to given Figure 20 for connecting Vibrosonde AS-i.

# 18 Customer Support

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

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

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

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

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

- www.sapconinstruments.com
- sales@sapcon.in
- +91-731-4757575

# 19 Production Selection Order Code

- **Product**
  - **VS: Vibrosonde - Vibrating Rod Level Limit Switch (Use in Powders, Sand, Sugar, Pulverized Coal, Food Grains, Cement, Granular Material)**
  - **Type**
    - I : Integral (sensor in same unit)
  - **Housing**
    - SCUTE : Pressure Die Cast Aluminium weather proof (Rating IP-68) SCUTE
    - FP2C : Cast Aluminium weather & flame proof powder coated suitable for gas group IIC
  - **Indication (Optional)**
    - WL : External LED Indication (Only with “SCUTE”)
  - **Probe Housing Cable Entry**
    - PCPG13 : PG 13.5, Polyamide
    - PCB5D : 1/2” BSP, DC Gland, Brass
    - PCN5D : 1/2” NPT, DC Gland, Brass
  - **Output**
    - 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 30V DC)
    - D : 2NO, 2NC DPDT Relay Output (rated at 6 A, 230 V AC for non-inductive load)
  - **Power Supply**
    - U : Universal (18 to 55V DC) and (90 to 265V at 50Hz AC)
  - **Switching**
    - NS : Normal Time Delay (Adjustable from 2 to 20 seconds for probe covered or uncovered)
  - **Mounting**
    - 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
    - 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
    - FA30S4 : 3” ANSI Flange, SS 304
    - 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
    - F20B15S4 : 2” ASA Slip-ON Flange with 1-1/2” BSP Thread, 10mm thickness, SS 304
    - F20B15S6 : 2” ASA Slip-ON Flange with 1-1/2” BSP Thread, 10mm thickness, SS 316
    - F25B15S4 : 2-1/2” ASA Slip-ON Flange with 1-1/2” BSP Thread, SS 304
    - F25B15S6 : 2-1/2” ASA Slip-ON Flange with 1-1/2” BSP Thread, SS 316
    - **Vibrating Rod**
      - VS162 : Active Rod Length 162mm, Material SS 316
    - **Finish**
      - FB : Fully Buffed

- **Extension Material (Depends on “Probe Length”, Only with “3H30H”)**
  - ES4 : SS 304
  - ES6 : SS 316
- **Standoff Material (Depends on “Operating Temperature”, Only with “20T”)**
  - STS4 : SS 304
  - STS6 : SS 316
- **Operating Temperature**
  - 10T : Up to 100°C
  - 20T : Up to 200°C
- **Probe Length**
  - 2.55H : 255 mm
  - 3H30H : 300 to 3000 mm

Example - VS-I-SCUTE-PCPG13-D-U-NS-MB15S4-VS162-FB-10T-2.55H

# 20 AS-Interface Order Code

- **Product**
  - **VS: Vibrosonde - Vibrating Rod Level Limit Switch (Use in Powders, Sand, Sugar, Pulverized Coal, Food Grains, Cement, Granular Material)**
  - **Type**
    - I : Integral (sensor in same unit)
  - **Housing**
    - SCUTE : Pressure Die Cast Aluminium weather proof (Rating IP-68) SCUTE
    - FP2C : Cast Aluminium weather & flame proof powder coated suitable for gas group IIC
  - **Indication (Optional)**
    - WL : External LED Indication (Only with “SCUTE”)
  - **Probe Housing Cable Entry**
    - PCPG13 : PG 13.5, Polyamide
    - PCB5D : 1/2” BSP, DC Gland, Brass
    - PCN5D : 1/2” NPT, DC Gland, Brass
  - **Output**
    - ASi-3 : ASi-3, Actuator Sensor Interface, 4-bit bus
  - **Power Supply**
    - U : Universal (18 to 55V DC) and (90 to 265V at 50Hz AC)
  - **Switching**
    - NS : Normal Time Delay (Adjustable from 2 to 20 seconds for probe covered or uncovered)
  - **Mounting**
    - 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
    - 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
    - FA30S4 : 3” ANSI Flange, SS 304
    - 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
    - F20B15S4 : 2” ASA Slip-ON Flange with 1-1/2” BSP Thread, 10mm thickness, SS 304
    - F20B15S6 : 2” ASA Slip-ON Flange with 1-1/2” BSP Thread, 10mm thickness, SS 316
    - F25B15S4 : 2-1/2” ASA Slip-ON Flange with 1-1/2” BSP Thread, SS 304
    - F25B15S6 : 2-1/2” ASA Slip-ON Flange with 1-1/2” BSP Thread, SS 316
    - **Vibrating Rod**
      - VS162 : Active Rod Length 162mm, Material SS 316
    - **Finish**
      - FB : Fully Buffed
    - **Extension Material (Depends on “Probe Length”, Only with “3H30H”)**
      - ES4 : SS 304
      - ES6 : SS 316
    - **Standoff Material (Depends on “Operating Temperature”, Only with “20T”)**
      - STS4 : SS 304
      - STS6 : SS 316

- **Operating Temperature**
  - 10T : Up to 100°C
  - 20T : Up to 200°C
- **Probe Length**
  - 2.55H : 255 mm
  - 3H30H : 300 to 3000 mm

Example - VS-I-SCUTE-PCPG13-ASi-3-NS-MB15S4-VS162-FB-10T-2.55H