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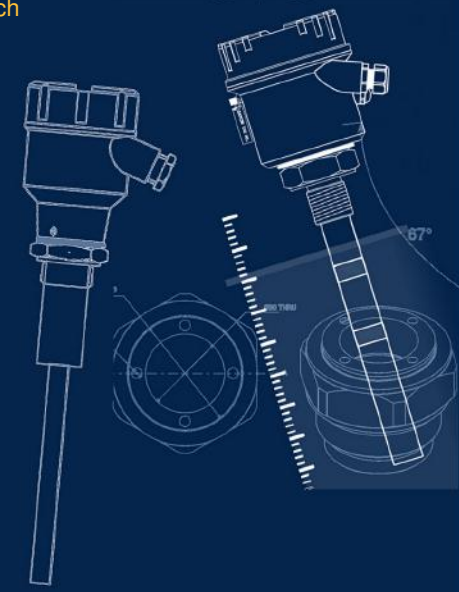


INSTRUCTION MANUAL

VITAL

Compact Vibrating Fork Level Switch

Version 2.3



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Revision History

Revision	Date	Author(s)	Description
1.0	13 Jan 2014	RND	First Version Editing
1.1	20 Jun 2014	MRK	Applications Revision
1.2	25 Jul 2015	RND	Features Revision
1.3	30 Dec 2015	RND	Specs Revision
1.4	19 Aug 2016	RND	Specs Revision
2.0	08 Jan 2017	BRND	Revised Format
2.1	17 Sep 2017	BRND	Branding Revisions
2.2	26 Feb 2018	BRND	Updated Housing Details
2.3	04 Jul 2018	BRND	Technical Specs Revision

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

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



Figure 1: Vital Product Image

2 Operating Principle

A specially shaped tuning fork is kept vibrating using piezo-electric elements. The oscillations of the fork dampen when it comes in contact with the application material. The loss of oscillation amplitude is detected and used for switching the output. The output contacts of the relay are in turn used for annunciation and / or control.

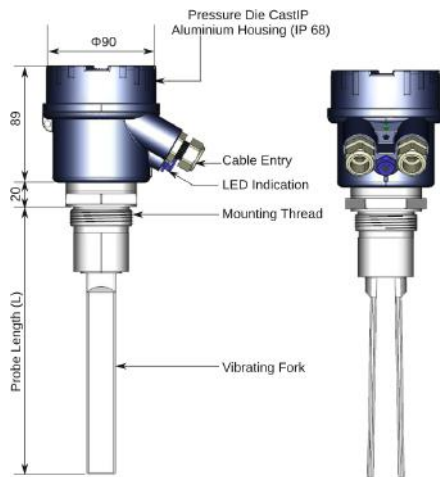


Figure 2: Description of Parts

3 Features

- Low Power Consumption: Less heat, Long life.
- Fast switching minimum of 0.5s available on request with FS option

- Self-diagnosis.
- External LED indication available with WL option
- Independent of material's electrical properties.
- Compact instrument, minimum tines length of 100 mm.
- No moving parts, no wear and tear, maintenance-free.
- IP68 Protection, as per IS 13947.
- Polished tines ideal for hygienic applications with FB option

4 Applications

- Fast Packaging machines for powders, granules
- PET / PVC chips with underwater detection
- Powders, sand & sugar
- Iron ore, sinters & pulverized coal
- Dry sand & Fly-ash
- Food grains
- Cement

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 DPDT Relay SPDT, PNP
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 on the electronics insert <ul style="list-style-type: none"> Green - Normal Red - Alarm External LED between the cable glands(with option WL) <ul style="list-style-type: none"> Blue - Normal Red - Alarm
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 Settings	1 - 25 seconds (For both, Covered and Uncovered Delays)
Operating Temperature	<ul style="list-style-type: none"> Ambient Temperature: 0°C to 65°C Process Temperature: 0°C to 100°C with option HT
Relay Rating	6 Amp at 230 VAC

Table 1: Electrical Specifications

6 Application Specifications

Please refer to Table 2 for Application Specifications.

PARAMETER	VALUE
Sensitivity	<ul style="list-style-type: none"> Dense Media/Build Up - 1 Lighther Media - 5
Density of media (min)	0.7 gm/cm ³
Grain Size	A maximum of 12mm
Response Time with 'NS' option	<ul style="list-style-type: none"> Cover Delay : 1-2 second Uncover Delay : 1-3 seconds
Response Time with 'FS' option	<ul style="list-style-type: none"> Cover Delay : 1 second Uncover Delay : 0.8 seconds

Table 2: Application Specifications

7 Mechanical Specifications

Please refer to Table 3 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	PG-13.5, 1/2" BSP DC Glands, 1/2" NPT DC Glands
Mounting	<ul style="list-style-type: none"> ● Screwed - 1"/1 1/2" BSP/NTP(M) ● Flanged - As per your specifications ● 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 fork should be installed in horizontal or vertical position. The following image displays different allowable installation positions. 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 fork as shown.

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.
- For side-mounting, provide a baffle to prevent the application material from falling on the fork. Please refer to Figure 3.

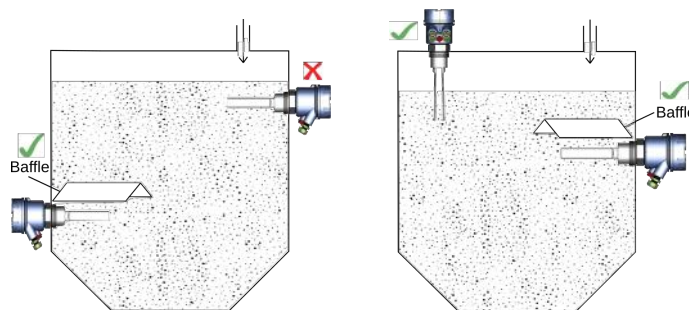


Figure 3: Correct Side Mounting

- When handling forks, do not lift them using their tines. Please see Figure 4.
- The tines should not be bent and neither should their dimensions be altered. Deforming the shape of the tines may interfere with the fork's operating frequency. Please see Figure 4.
- 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.

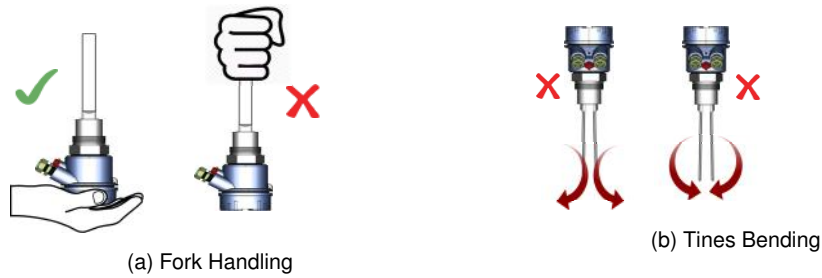


Figure 4: Instrument Handling

- 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.

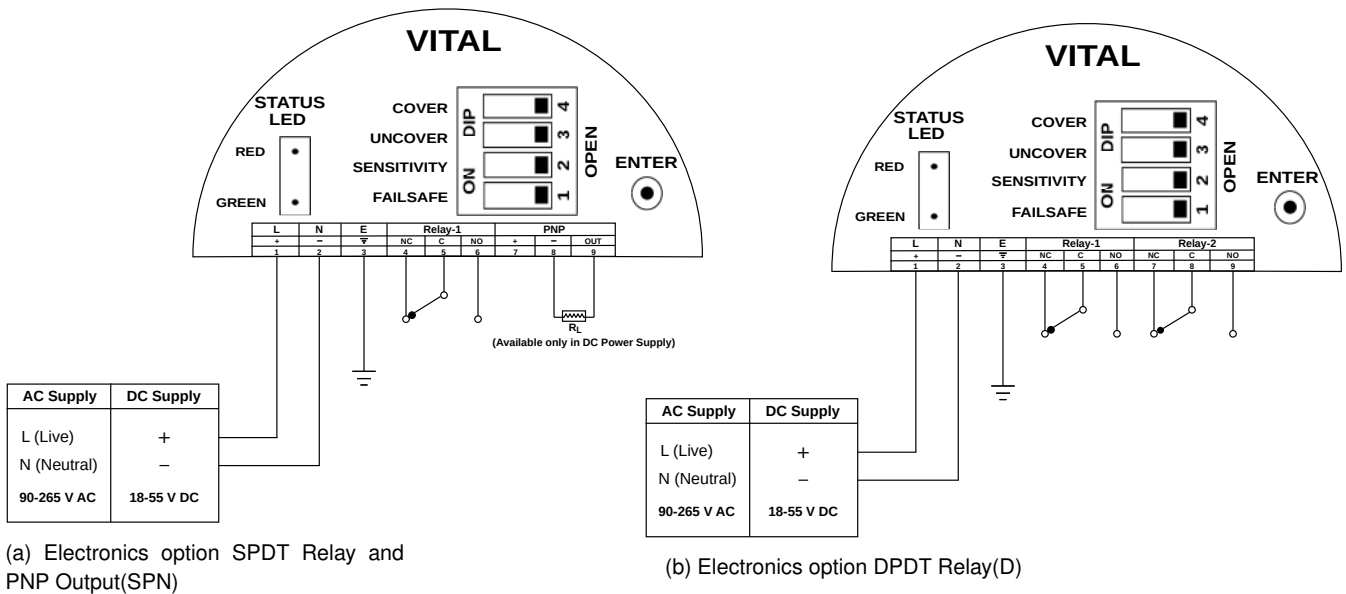


Figure 5: Electrical Connections

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:

You can 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.



Figure 6: DIP Switch

2. To make the instrument sensitive, set the SENSITIVITY switch to CLOSE position as shown in figure 7. A small screw driver can be used for closing and opening of DIP Switch. (CLOSE is the opposite of OPEN for a DIP switch). The STATUS RED LED will glow.

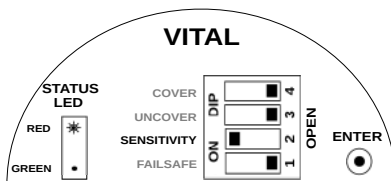


Figure 7: Sensitivity Switch Position

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

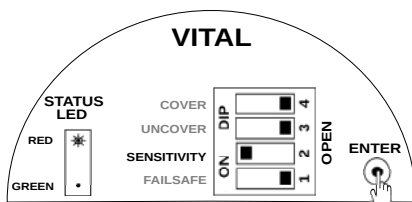


Figure 8: Setting Sensitivity Value

4. The value of sensitivity is now entered, but not saved. To save and test the sensitivity, set the SENSITIVITY switch back to OPEN position as shown in Figure 9. The STATUS LED will come back to its original position.

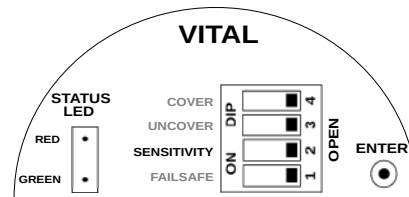


Figure 9: Saving Sensitivity Value

11 Cover Delay

When the application material covers the fork tines, 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.
2. To set the Cover Delay, set the COVER 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.

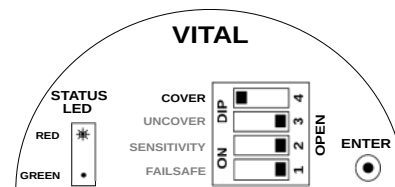


Figure 10: Cover Delay Switch Position

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.
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. The STATUS LED will come back to its original position.
5. To test, dip vital into the application material until the switching point is reached.

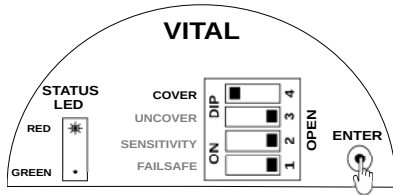


Figure 11: Setting Cover Delay

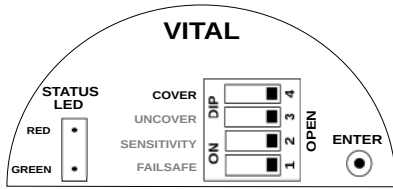


Figure 12: Saving Cover Delay

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 vital's fork tines, 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 13. (CLOSE is the opposite of OPEN for a DIP switch.) The STATUS RED LED will glow.

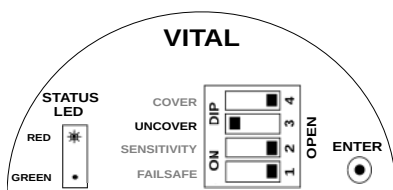


Figure 13: Uncover Delay Switch Position

3. Press ENTER and keep it pressed as shown in Figure 14. The STATUS RED LED will start blinking. Count the number of blinks. After setting the value release the ENTER key.

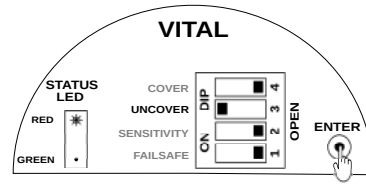


Figure 14: Setting Uncover Delay

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. The STATUS LED will come back to its original position.

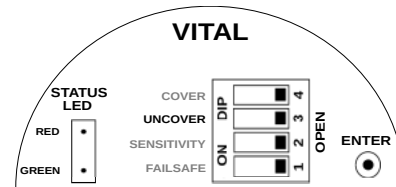


Figure 15: Saving Uncover Delay

5. To test, dip vital 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.

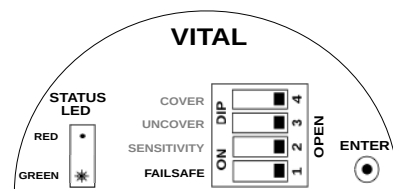


Figure 16: Failsafe High

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.

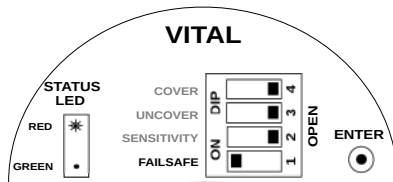


Figure 17: Failsafe Low

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

14 Troubleshooting & Indications

14.1 Output Indications

Green LED Glows When:

- Fork is Uncovered and Failsafe is High
- Fork is Covered and Failsafe is Low

Red LED Glows When:

- Fork is Covered and Failsafe is High
- Fork is Uncovered and Failsafe is Low

14.2 Troubleshooting

- The instrument is working but there may be solid particles in the application material that may be clogging the fork tines. Make sure particle size is 12 mm.
- Heavy build-up of application material can dampen the fork oscillations. In this case, the fork requires to be cleaned. To avoid build up change sensitivity value to 1.
- If the vibrating fork 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 Vibrating fork and Electronics is broken**
 - In failsafe 'High' mode, instrument will switch to ALARM
 - In failsafe 'Low' mode, instrument will switch to NORMAL

15 Maintenance

The electronics of Vital instrument needs no maintenance. When cleaning and checking the vessel, free the tuning fork 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.

16 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

17 Product Selection Order Code

Product

VITAL : Compact Vibrating Fork Type Level Limit Switch for free flowing solids, granules and powders

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

👍 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

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

Switching (Depends on "Vibrating Fork")

FS : Time Delay (Adjustable from 0.5 to 20 seconds for probe covered or uncovered) (Only with "VF105S", "VF130")

👍 NS : Normal Time Delay (Adjustable from 2 to 20 seconds for probe covered or uncovered)

Mounting

MB15MS : Screwed Thread, BSP 1-1/2", MS Plated

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

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

MN15MS : Screwed Thread, NPT 1-1/2", MS Plated

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

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

FA20MS : 2" ANSI Flange, MS Plated

FA20S4 : 2" ANSI Flange, SS 304

FA20S6 : 2" ANSI Flange, SS 316

FA25MS : 2-1/2" ANSI Flange, MS Plated

FA25S4 : 2-1/2" ANSI Flange, SS 304

FA25S6 : 2-1/2" ANSI Flange, SS 316

F20MS : 2" ASA Flange, 10mm thickness, MS Plated

F20S4 : 2" ASA Flange, 10mm thickness, SS 304

F20S6 : 2" ASA Flange, 10mm thickness, SS 316

F25MS : 2-1/2" ASA Flange, 10mm thickness, MS Plated

F25S4 : 2-1/2" ASA Flange, 10mm thickness, SS 304

F25S6 : 2-1/2" ASA Flange, 10mm thickness, SS 316

F20B15MS : 2" ASA Slip-ON Flange with 1-1/2" BSP Thread, 10mm thickness, MS Plated

Mounting
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
F25B15MS : 2-1/2" ASA Slip-ON Flange with 1-1/2" BSP Thread, 10mm thickness, MS Plated
F25B15S4 : 2-1/2" ASA Slip-ON Flange with 1-1/2" BSP Thread, 10mm thickness, SS 304
F25B15S6 : 2-1/2" ASA Slip-ON Flange with 1-1/2" BSP Thread, 10mm thickness, SS 316
Vibrating Fork (Depends on "Probe Length")
VF105S : Total Length 105mm, Tines 100mm, Material SS 316 (Only with "1.3H")
VF130 : Total Length 130mm, Tines 100mm, Material SS 316 (Only with "1.45H", "2H30H")
VF130S : Total Length 130mm, Tines 125mm, Material SS 316 (Only with "1.55H")
 VF185 : Total Length 185mm, Tines 155mm, Material SS 316 (Only with "2H", "2H30H" & "2.5H30H")
Finish
 HB : Standard
FB : Fully Buffered
Extension Material (Depends on "Probe Length", Only with ("2H30H", "2.5H30H"))
EGL : GI (Galvanized Iron)
 ES4 : SS 304
ES6 : SS 316
Standoff Material (Depends on "Operating Temperature", Only with "20T")
STGI : GI (Galvanized Iron)
 STS4 : SS 304
STS6 : SS 316
Operating Temperature
10T : Upto 100°C
20T : Upto 200°C
Probe Length (Depends on "Vibrating Fork")
1.3H : 130 mm (Only with "VF105S")
1.45H : 145 mm (Only with "VF130")
1.55H : 155 mm (Only with "VF130S")
2H30H : 200 to 3000 mm (Only with "VF130", "VF185") (Only with "Flange Mounting")
2H : 200 mm (Only with "VF185")
2.5H30H : 250 to 3000 mm (Only with "VF185") (Only with "Screwed Mounting")

Example -

VITAL-I-SCUTE-PCPG13-D-U-NS-MB15S4-VF185-HB-10T-2H

 Shows First Priority Entity