

## Techtrol Vibrating Fork Switch for Liquid – VFSL



*Every Techtrol product should be installed properly, maintained regularly and used within its specified limits to ensure accurate & trouble free performance with extended working life.*



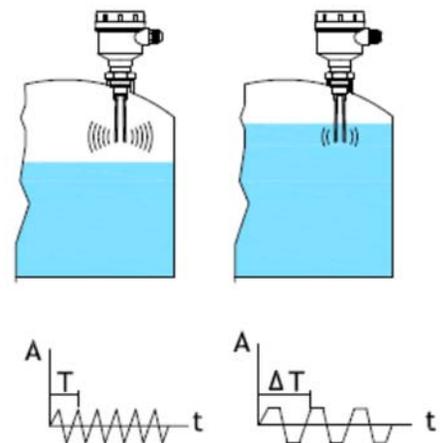
### 1. Introduction

VFSL is used for free flowing liquids to detect level in tank. The fork vibrates in air at its mechanical resonance frequency of approx. 350 to 390 Hz in air. If the bulk material covers the fork, its vibration damp and detected in electronics to actuate relay to changeover of the contacts. The vibration of the fork has self-cleaning properties. The light deposit on the container wall does not affect the operation of the VFSS.

Vibrating Fork Switch is available in two types as **integral** and **two-part system**. In integral system, electronics/ controller is housed in enclosure on probe top whereas in two-part system probe and controller are separate.

VFSL is suitable for temperature of **80°C** as **standard**, however for **high temperature** applications upto **150 °C**, it is provided with **temperature standoff**.

Fig 1



## 2. Pre-Installation Check

- Ensure that forks are not bent and electronics is not damaged in transit.
- Do not hold the switch by its fork. **Hold it by its enclosure.** (Fig 2)
- Handle the fork carefully. Do not bang the forks on ground or wall.
- Open the enclosure cover and connect appropriate power supply to respective terminals. Refer figure 8, 9, 10 as per switch type.
- Hold the fork switch in hand by its enclosure and switch on the supply. As the forks vibrate in air, find blue (normal) LED glows and red LED (alarm) is off.
- Now touch the forks with hand so that its vibration gets damped. **Do not hold it tightly.** Observe red LED (alarm) glows showing level /alarm detection and blue LED is off. Check changeover of relay contacts using continuity tester.
- It ensures that the switch is operating properly and ready for installation.

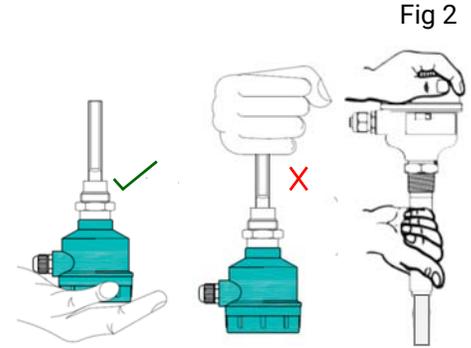


Fig 2

### WARNING:

- Ensure that switch is installed by qualified person.
- The fork blades should not be bent and altered for its mechanical dimensions. Deforming the shape of the fork blades may affect the fork's operating frequency and its functioning.

## 3. Installation

### 3.1 Precautions during Installation –

Please ensure that –

1. Mounting location is away from inlet of the material feed and heavy splashing on fork to prevent unwanted switching. Refer fig. 3.
2. No bridging occurs between the forks such as in dense paper slurries or bitumen. Switch is suitable for free flowing liquids.
3. Forks are free from heavy build-up due to drying & coating of liquid; periodic cleaning may be needed. Liquid viscosity should be less than 10000 cP
4. Switch is mounted with forks parallel to liquid flow. Liquid should flow freely through the gap

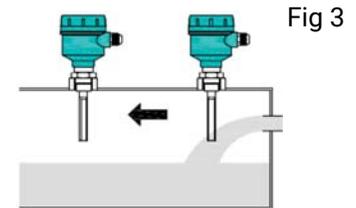


Fig 3

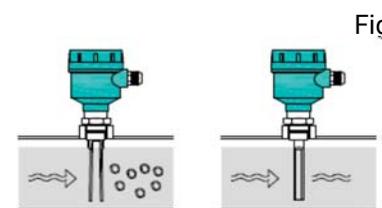


Fig 4

between fork blade. Refer fig 4.

6. The forks of the switch protrude sufficiently into the vessel and are free to vibrate.
7. In side mounted, cable gland points downward to prevent water ingress. Refer fig 5.

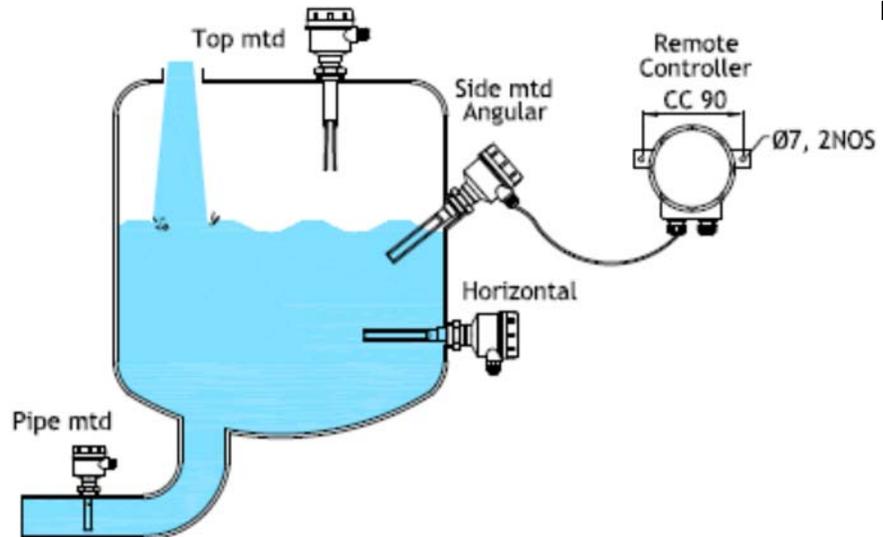
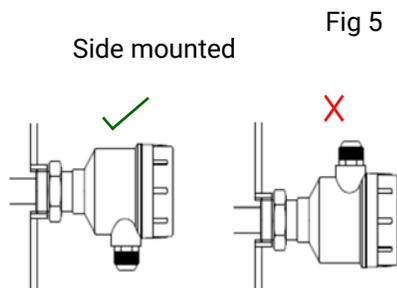


Fig 6

### 3.2 Mounting of Switch

The switch has screwed or flanged mounting connection.

- Top Mounting – The switch can be mounted on tank top. Insertion length of the switch should be such that forks are at height where the switching point is required.
- Side Mounting - It can be side mounted on the container wall at the desired level of the liquid to be controlled.

Provide suitable gasket between the flanges and appropriate thread sealant between threads before bolting / tightening to ensure sealing.

#### WARNING:

*Ensure that the switch is operated within its specified operating conditions.*

- For SS MOC, the maximum temperature is 80°C. It can withstand up to 150°C only with a temperature standoff. Maximum pressure is 10 kg/cm<sup>2</sup>.
- For PTFE-coated SS, the max. temperature is 120°C, and the max. pressure is 10 kg/cm<sup>2</sup>.

## 4. Termination and Wiring

- Ensure the power supply is turned off during wiring to prevent accidents and ensure safety.
- The switch with a relay output is compatible with a universal power supply. You can connect either an AC supply (20 to 265 VAC) or a DC supply (20 to 265 VDC) to the same terminals. Connect the power supply to the L, N and E terminals of the switch. Ensure correct polarity while connecting 24 VDC to the +ve and -ve terminals.

For switch with PNP output, connect 24 VDC supply to +ve and -ve terminals.

- In two-part system, remote controller is located in areas having ambient temperature < 60°C. Use 3 core, 1.5 mm<sup>2</sup> PVC cable to connect the probe and controller as shown in fig 5.
- For top mounting, route cable in downward direction as shown fig 7.
- In side mounted, ensure cable gland is pointed downward.
- Route the wiring away from high voltage cables, contactors and inductive loads.
- Ensure that the enclosure cover is properly closed with gasket for its weather proof ness and there is no gap between cable gland ID and cable OD to prevent ingress of moisture into the enclosure.
- Before switching on supply, ensure wiring is correct and completed as per termination & wiring diagram.

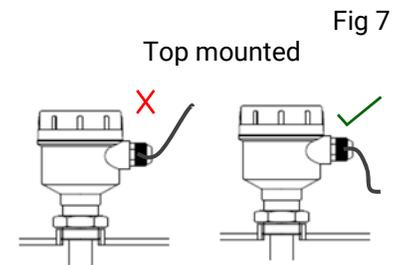
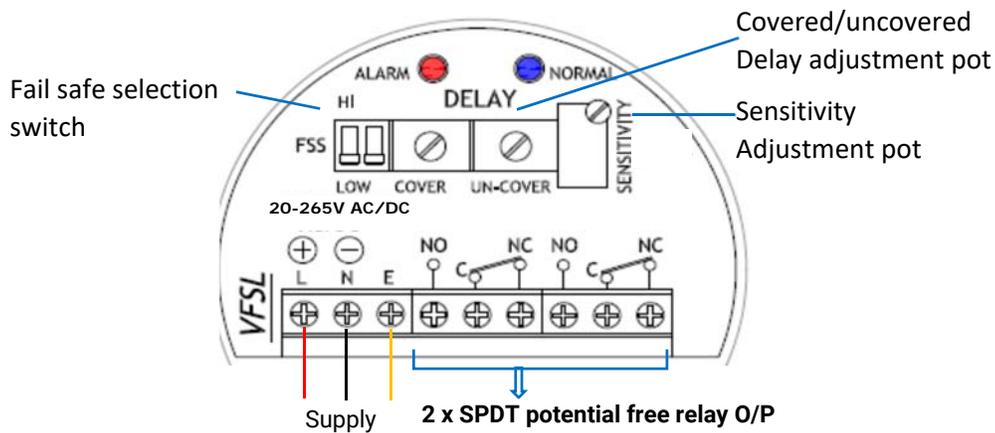


Fig 7

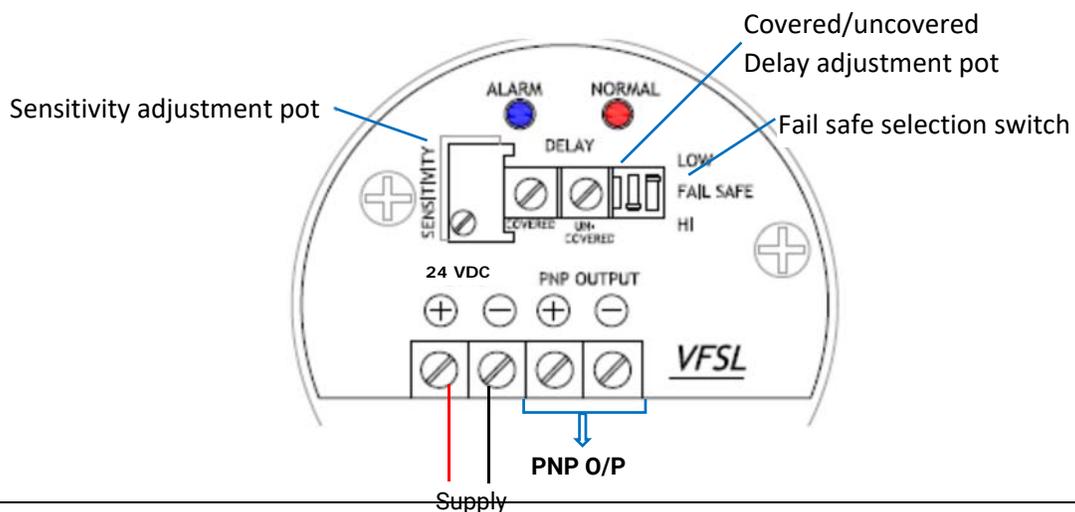
**a) Integral system with Relay Output**

Fig 8



**b) Integral system with PNP Output**

Fig 9



### c) Two- part system with Relay Output

Fig 10

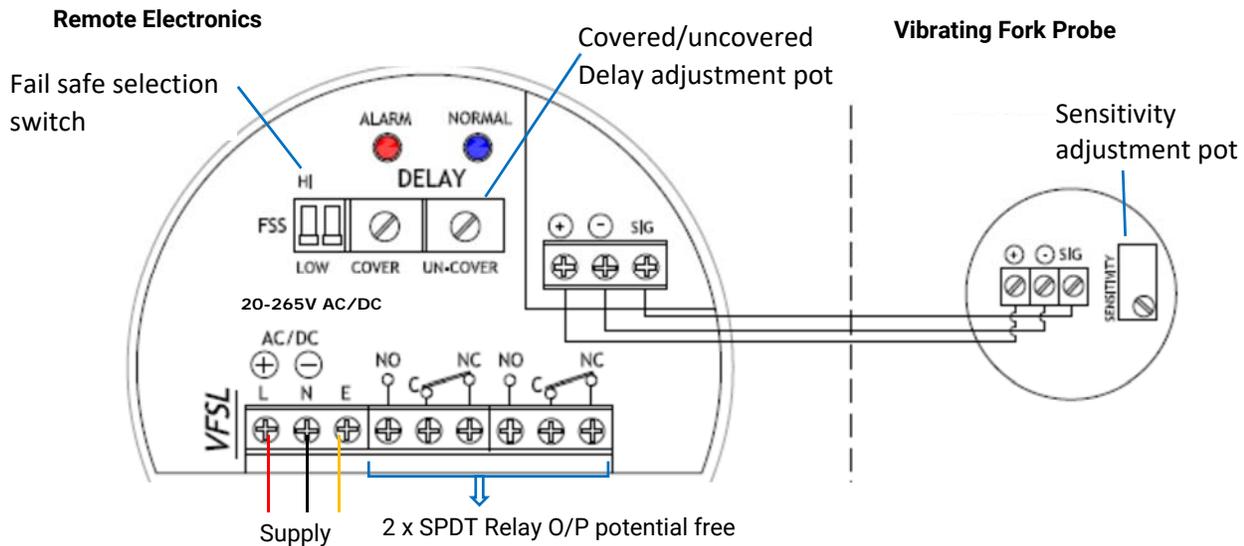
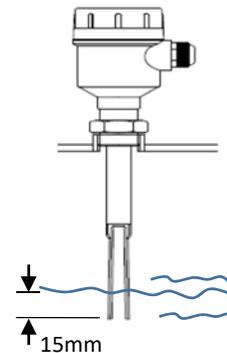


Fig 11



## 5. Sensing Point

Switches are set in factory to sense liquid (water) level at 15 mm approx. from fork end. In case of high viscous liquids switching point will be at lower position than normal switching level of water.

## 6. Sensitivity Adjustment

Default sensitivity of the switch is set to sense water level. You can increase or decrease the sensitivity of switch using sensitivity pot.

Rotate the sensitivity pot in clockwise (➡) direction to decrease the sensitivity for viscous liquid applications. For low viscous liquids, increase the sensitivity by rotating the pot in anticlockwise (↩) direction.

In two-part system, sensitivity trim pot is provided on vibrating fork probe.

## 7. Adjustment of Covered & Uncovered Delay Time

Relay contacts change over, when fork gets covered or uncovered.

Actuation of relay can be delayed using trim pot. Refer figure 8, 9 & 10, find two trim pots, one for covered delay and another for uncovered delay.

You can set delay time from 2 to 25 sec for relay actuation for the fork covered. That is when forks get covered with material, relay will actuate after set delay time.

Similarly, delay time for relay de-actuation while uncovered condition is set using trim pot.

Rotate trim pot in clock wise direction to increase the delay time.

## 8. Selecting Fail Safe Mode

Fail safe condition can be selected high or low using DIP switch as shown in figure 6.

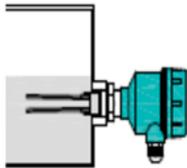
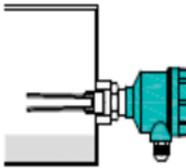
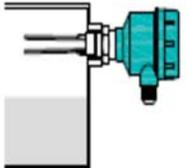
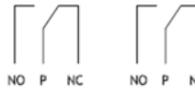
Keep 1<sup>st</sup> DIP switch at 'HI' for fail safe high selection and at 'LOW' for fail safe low selection.

Refer table below to understand relay output condition at fail safe high and fail safe low condition.

**Relay Output-** Switches are factory-set to FSH and shipped

**At FSH:** Relays are de-energized, when forks are covered by the material and red LED glows.

**At FSL:** Relays are de-energized, when forks are un-covered by the material and blue LED glows.

	FSL – Fail Safe Low		FSH – Fail Safe High		Power OFF Condition
Level					
Relay Contacts					
Indication	● ●	○ ●	○ ●	● ●	
Status	Normal Condition	Alarm/Fail Condition	Normal Condition	Alarm/Fail Condition	

Blue LED glows when fork is in air, Red LED glows when fork is covered by the material.

## 9. Sensing Solid Material Under Liquid

The switch is used for free flowing liquids to highly viscous liquids. It is also used to detect solids under liquids, typical applications for this include detecting rice under water, detecting salt under water in salt saturators, detecting plastic chips under water.

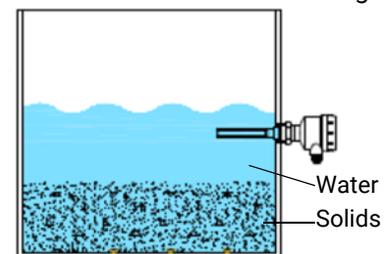


Fig 12

Application – detection of solid under water

## 10. Maintenance

- Before starting maintenance work, ensure that the power supply is disconnected.
- In case of hazardous area, do not open the enclosure cover before disconnecting the power supply.
- If the material has built up tendency over a period of time, fork blades should be cleaned as and when required.
- After completion of maintenance work, ensure that the probe /electronics enclosure cover is in its place and closed with gasket for its weather proof ness.
- Ensure that there is no gap between cable gland ID and cable OD to prevent moisture and ingress of water inside the enclosure.

## 11. Troubleshooting

SL	Problem	Cause	Solution
1.	Switch not working	1. Loose connection or disconnected power supply connection 2. Incorrect power supply  3. Wrong probe connections in case of two-part system	1. Check and tighten connection  2. Check and connect correct power supply. Ensure correct polarity for 24 VDC supply  3. Check and make correct connection of fork probe and controller.
2.	Incorrect Switching	Check fail safe setting	Keep DIP 1 <sup>st</sup> switch at high or low position as required.
3.	Alarm LED continuous on	Check whether the material has been clogged  Forks does not protrude inside the vessel and free to vibrate	Check and ensure material particle size is less than 10 mm. Clear the clogged material.  Ensure the forks protrude inside the vessel and vibrates freely

## 12. Specifications

	System	Integral System (I) (Probe with Integral Controller)	Two-Part System (T) (Probe with Remote Controller)
<b>PROBE</b>	Enclosure	Cast Al. IP66 Cast Al. Exd Gr. IIB / IIC T6, IP66	Cast Al. IP66 Cast Al. Exd Gr. IIB / IIC T6, IP66 Cast Al. ATEX Exd Gr. IIC T6, IP66
	Cable Gland	M20 x 1.5 Cable Gland, PVC (WP) , ½" NPT DC Cable Gland, Brass (Ex d)	
	Vibrating Fork MOC	a. SS316 as standard b. SS316, or PTFE coated SS316 available optionally	
	Insertion Length	130 mm (standard), maximum upto 3000 mm with extension	
	Extension MOC	a. SS304 or SS316 (as standard) b. SS316L or PTFE coated SS316 (option on request)	
	Process Conn MOC	a. SS304, SS316 (as standard) b. SS316L, PTFE coated SS316 Flange only (option on request)	
	Process Connection	1" BSP or NPT (M) or 1-1/2" NB Flange 150# (standard insertion length) 1-1/2" BSP or NPT (M) or 1-1/2" NB Flange 150# (extended insertion length) 50 mm Triclover Ferrule (optional)	
	Measuring Frequency	350 to 390 Hz	
	Max Liquid Viscosity	10,000 CP	
	Temperature	-10 to 80 °C, 150°C (SS, with temp. standoff), 120 °C (PTFE ctd. SS)	
	Max. Pressure	Vacuum to 10 kg/cm <sup>2</sup> (High pressure option on demand)	
<b>CONTROLLER</b>	Enclosure (Remote)	NA	Cast Al. IP66
	Cable Gland (Remote)	NA	M20 x 1.5 Cable Gland, PVC
	Supply	20 to 260 VAC/DC 24 VDC ±10% (for PNP O/P) (Reverse protection for DC supply)	
	Output	1. Relay x 2 SPDT, potential free contacts, 5A, 250 VAC (resistive load) 2. Transistor PNP, non- isolated, load 180 mA maximum	
	Indication LED	Blue – Normal, Red – Alarm	
	Adjustable Switching Delay	Covered - 5 to 20 sec, Uncovered – 5 to 20 sec	
	Sensitivity Adjustment	For viscous liquids through trim pot	
	Fail Safe Operation	High or low selectable through DIP switch	
	Power Consumption	<100 mA	
	Amb. Temperature	-10 to 60°C	
	Humidity	95% Rh Non- condensing	
Interconnecting Cable	NA	3 core x 1.5 mm <sup>2</sup> PVC insulation (Buyer's Scope)	

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