



# Vibrating Fork Level Limit Switch SLM Series

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## **Introduction**

The SLM series instruments are specially designed for detecting maximum and minimum level in vessels filled with free flowing fine-grained or powdery material.

The instruments are used for detecting the level of service materials that are non-sticky and free-flowing, having grain size less than 10mm. Variation of electrical characteristics of the service material such as conductivity and dielectric constant do not affect its operation.

It can be used successfully for level detection of powders and granules of plastic, silica, sand, cement chalk & wood chips etc.

It can be used for level detection of powder and fine-grained food-stuffs as the wetted parts are made of stainless steel with polished finish. Non-stick PTFE / Hilar coatings are also available for special applications.

Special designs are available for detecting the level of granular material submerged in liquids of low viscosity viz. sand or gravel or polyester chips under water.

High temperature version suitable up to 200° C is provided with stand-off to keep the electronics relatively cool.

## **Operating principle**

The tines of the fork are kept in mechanical vibration at its resonant frequency by Piezo elements. When the tines are covered by the service material, they cause damping of the vibrations. This stoppage of vibrations is sensed by the electronic circuitry and the signal after processing is used to operate a relay. The potential free contacts of the relay are available for alarm annunciation / control. When the tines are free from material the fork starts vibrating again and the relay contacts revert to the previous state.

Forks of special design are available that can vibrate in liquids of low density. They are used for detection of level of submerged granular material.

## **Installation**

The LEVTESTER SLM series instruments can be installed in almost any position in the vessel provided the following care is taken:

- \* The sharp edge of the tines of the fork should be vertical, when installed from side of the vessel.
- \* Cable glands should point downward for side mounted position to avoid seepage of water into the housing. The tines of the fork are so positioned that when the glands point downwards the sharp-edge of the tines is always vertical.
- \* Ensure before installing the instrument that the threads match.
- \* While installing the instrument rotate the hexagonal mounting bush and not the housing.
- \* Select the mounting location such that the inflowing material does not fall directly on the tines of the fork.
- \* In slanting installation, the position of the tines is unimportant provided the material slides off the tines.
- \* When selecting the mounting location, avoid direct impingement of sun rays on the instrument. If required provide a sun shield.
- \* A deflection plate should be provided to avoid material hitting the tines after rebounding from the vessel walls.
- \* The tines of the fork should be shielded by providing windscreen to avoid disturbance due to material turbulence caused in pneumatic conveying.
- \* The threaded mounting connection should be kept as short as possible to avoid material deposition.
- \* A baffle should be provided at a distance of 200mm above the tines especially for low level side mounting applications.

### **Installation diagram**

## Connections

\* Open the cover by removing four screws.

\*Connect the wires as shown in the diagram.

\*Wires used for mains supply and relay output contacts should be of 1.5sq.mm core cross-section and the insulation suitable for 250VAC operation.

\* Earth terminal should be connected to external ground.

\*In case of 24Vdc any polarity may be connected to terminals 1&2, terminal 3 is connected to external ground.

**Diagram 1**

Mains supply			Relay O/p			Piezo connection					
1	2	3	4	5	6	7	8	9	10	11	12
L	N	G	com	N/O	N/O				R	B	W

**110/230V**

### LEVTESTER SLM120/120H/130/130H/320/320H/330/330H

**Diagram 2**

Mains Supply			Relay O/p		Relay O/p			Piezo connection			
1	2	3	4	5	6	7	8	9	10	11	12
L	N	G	com	N/O	N/O				R	B	W

**110/230VAC**

### LEVTESTER SLM 220/220H/230/230H/620/620H/630/630H

**Diagram 3**

Mains supply			Relay O/p		
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**110/230VAC  
240/ 24VDC**

**LEVTESTER SLM130F&330F (Flameproof)**

## Calibration

The instrument is Factory set to cover most of the commonly available service materials and needs no calibration at site.

## Fail-safe selection

A toggle switch is provided on the PCB for selection of fail-safe condition. Fail-safe High or fail-safe low can be selected via this switch. An instrument is said to be fail-safe when the alarm is signalled by the relay in its de-energized condition. An instrument failure or a supply failure will thus initiate an alarm. Fail-safe high condition is used in the case of High level detection whereas fail-safe low is used for low level detection.

**Fail-safe high:** In this condition, when the material level rises and covers the tines of the fork, the relay de-energizes, an alarm is initiated and **Red LED** glows. For achieving this mode shift the toggle switch **upwards** to the fail-safe High position.

**Fail-safe low:** In this condition, when the material level falls and uncovers the tines of the fork, the relay de-energizes, an alarm is generated and **Red LED** glows. For achieving this mode shift the toggle switch **downwards** to its fail-safe low level position.

## Precautions

- \* Ensure that tines of the fork are not bent or their dimensions altered during installation.
- \* Weatherproof-ness of enclosure is guaranteed only, if the cover is in place & cable glands adequately tightened.
- \* If the ambient temperature is high, there should be a heat shield between the container and the housing of the instrument.
- \* Earth must be connected to the ground terminal of the instrument.
- \* The tines should extend far enough into the vessel, so that they are free to vibrate despite build-up from the vessel wall.
- \* Ensure that material size is not greater than 10mm.
- \* Do not lift the instrument by holding the tines.
- \* Do not deform the shape of the tines.

Do not pull the tines outwards

Do not press inside

## Maintenance

The electronics of SLM series requires no maintenance as there are no moving parts

When cleaning and checking the vessel remove the deposits from the tines of fork.

In case the material has a tendency to stick to the tines of the vibrating fork, it is advisable to clean the tines more often.

Make sure that the cable glands and cover are tightened properly and sealed. to prevent the ingress of moisture and dust into the instrument.

## Trouble Shooting

S.no.	Problem	Possible cause	Remedy
1	Instrument is non Functional	Loose connection Mains failure	Check connections. Restore the supply.
2	Fork not vibrating	Piezo connection discontinuous Piezo elements faulty	Check Piezo connection. Replace Piezo crystal assembly or check with another fork.
3	Relay does not change state, when material covers the fork tips	Faulty relay or faulty electronics	Check relay & associated circuit.
4	Green LED glows when material reaches high level point	Fail safe selection wrong	Select correct fail-safe option

## Technical Specifications

### For Compact version SLM 130F/ 330 F/ 230/630

Housing	: Cast aluminium weather proof enamel painted / powder coated
Mounting	: Screwed- 1-1/2, 2” BSP/ NPT Flanged – (50NB onwards, as per process requirement) Dairy / sanitary coupling, adjustment type gland for probe length adjustment Material – M.S plated / S.S
Cable Entry	: 2X ½” / 5/8” / 3/4”- ET / BSP / NPT Brass / Plastic – NG 20- single / double compression
Mains supply	: 110 /230 / 240 VAC 50 Hz, 24 VDC/AC, 90 to 265V AC universal supply
Out put	: One set / two sets of potential free c/o contacts Rated 6Amps/230VAC for non-inductive loads
Response Time	: 2 to 4 seconds
Indication	: Red LED for Alarm Green LED for Normal
Time delay	: A. For Tines covered - 2 to 20 seconds B. For Tines uncovered – 2 to20 seconds
Fail safe feature	: Field selectable for High /Low fail-safe mode
Sensing fork	: S.S 316
Extension pipe	: G.I / S.S
Ambient Temp	: -20 to 60 degree centigrade
Power consumption	: 4 VA approx.
Resonant Frequency	: 85 Hz approx.
Max grain size	: 10mm
Process Temp.	: -20 to 80(standard)/ 150 / 200°C (optional)
Overall dimension	: Refer enclosed drawing
Weight	: 3.5 Kg approx for standard compact version
NB.	For flameproof compact version SLM130 F / 330F the Enclosure is suitable for gas group IIA, IIB as per IS – 2148. (2) Suffix “H” in model stands for high temperature version.

## Technical specification

Remote version SLM 120 /220 /320 /620

### Evaluation unit

Housing	: Cast aluminium weather proof, enamel painted / powder coated
Mounting	: Back Panel / wall mounting
Cable Entry	: 3 X ½” / 5/8” / 3/4” ET / BSP / NPT Brass / Plastic-NG 20 single/double compression
Mains	: 110 / 230 / 240 VAC, 50Hz 24VDC / AC, 90 to 265V AC universal supply
Relay O/p	: One / Two sets of potential free c/o contacts rated at 6Amps, 230V AC for non inductive loads
Response Time	: 2 to 4 seconds
Indication	: A. Red for alarm : B. Green for normal
Switching delay	: For tines covered – 2 to 20 seconds : For tines uncovered –2 to 20 seconds
Fail-safe	: Field Selectable for maximum & minimum fail-safe
Ambient temp	: -20 to 60°C
Power consumption	: 4VA (approx )

### Fork

Housing	: Cast aluminium weather proof, enamel painted / powder coated
Cable Gland	: 1or 2 X ½” 5/8” / ¾”- BSP / NPT Brass single/Double compression Screwed – 1 ½” / 2” BSP / NPT Flanged – 50 NB onwards, as per process requirement Dairy / sanitary coupling, adjustable gland type for probe length adjustment
Material	: M.S (plated), Stainless steel
Sensing Fork	: S.S 316
Extension Pipe	: G.I / S.S
Resonant frequency.	: 85 Hz ( approx )



Max grain size	: 10 mm
Process Temp.	: -20 to 80 (standard) /150/ 200°C (optional)
Inter-connection cable	: Special individually screened two core cable supplied with the instrument
Over all dimensions	: Refer attached diagram
N.B	: Suffix “H” indicate High temp version

## **Technical specification**

**For separate version SLM 120 S / 220 S / 320 S/ 620S**

### **Evaluation unit**

All specifications are same as in the remote version.

### **Fork with electronic insert VFI -100**

All specifications are same as in remote version except, the following:

Interconnection cable : Unscreened 3 Core cable used (Not in **Sapcon** scope)

N.B

1. In flame proof model SLM 120F / 220 F/ 320 / 620 F Evaluation unit and fork available in Flame-proof Enclosure suitable for gas group **IIA, IIB as Per IS -2148.**
2. Probe available in Flame proof enclosure for installation in hazardous area. Evaluation unit is installed in safe area.
3. Suffix “**H**” indicates High temperature version in all categories.