

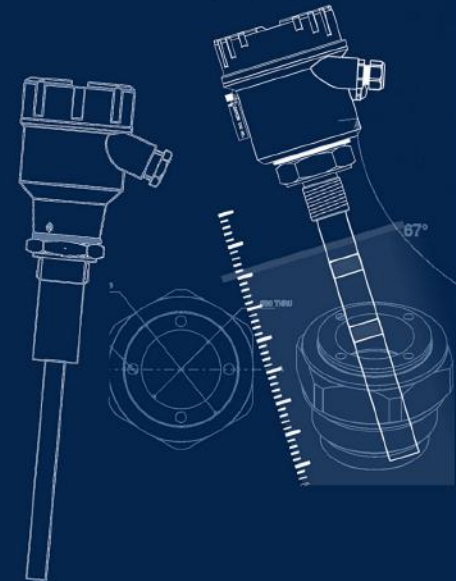


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## INSTRUCTION MANUAL

**SLM**  
Solid Level Switch

Version 2.0



## SAPCON INSTRUMENTS PVT. LTD.

30+ Years in Process Control Instrumentation

An ISO 22000 company

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## Revision History

Revision	Date	Author(s)	Description
1.0	27 Jan 2014	RND	First Version Editing
1.1	15 Jun 2014	MRK	Applications Revision
1.2	20 Aug 2015	RND	Features Revision
1.3	16 Dec 2015	RND	Specs Revision
1.4	21 Jul 2016	RND	Specs Revision
2.0	08 Jan 2017	BRND	Revised Format
2.1	17 Sep 2017	BRND	Branding 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

- 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 10 mm.
- 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 and 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.



Figure 1: SLM

## 2 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.

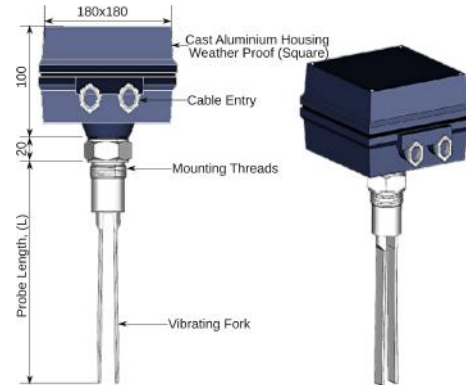


Figure 2: Part Diagram

## 3 Features

- Independent of material's electrical properties.
- High temperature durability (up to 200°C) are in millimeters.
- No moving parts, maintenance-free.
- Suitable for detection of underwater chips.
- Insensitive to mechanical vibrations and material build-up.
- Configured for high and low level fail-safe detection.

## 4 Technical Specifications

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

For Compact Version, please refer Table 1

PARAMETER	VALUE
Housing	Cast aluminium weather proof enamel painted / powder coated
Mounting	<ul style="list-style-type: none"> <li>• Screwed : 1 1/2, 2" BSP/ NPT</li> <li>• Flanged : (50 NB onwards, as per process requirement) Dairy / sanitary coupling, adjustment type gland for probe length adjustment</li> <li>• Material : M.S plated / S.S</li> </ul>
Cable Entry	2 * 1/2" / 5/8" / 3/4"-ET / BSP / NPT Brass / Plastic -NG 20-single / double compression
Mains Supply	110 /230 / 240 V AC 50 Hz, 24 VDC/AC,90 to 265 V AC universal supply
Output	One set / two sets of potential free c/o contacts rated 6Amps/230 V AC for non-inductive loads
Response Time	2 to 4 seconds
Indication	<ul style="list-style-type: none"> <li>• Red LED for Alarm</li> <li>• Green LED for Normal</li> </ul>
Time Delay	<ul style="list-style-type: none"> <li>• For Tines covered- 2 to 20 seconds</li> <li>• For Tines uncovered- 2 to 20 seconds</li> </ul>
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°C to 60°C
Power consumption	4 VA approx.
Resonant Frequency	85 Hz approx.
Max Grain size	10mm
Process Temp.	-20°C to 80°C (standard)/150°C/200°C (optional)
Overall dimension	Refer enclosed drawing
Weight	3.5 Kg approx for standard compact version
NB.	For flameproof compact version SLM 130 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.

Table 1: Compact Version

## 4.2 Remote version SLM 120 /220 /320 /620

### 4.2.1 Evaluation Unit

For Evaluation Unit, please refer Table 2

PARAMETER	VALUE
Housing	Cast aluminium weather proof, enamel painted / powder coated
Mounting	Back Panel / wall mounting
Cable Entry	3 * 1/2" / 5/8" / 3/4" ET / BSP /NPT Brass / Plastic-NG 20 single/double compression
Mains	110/230/240 V AC, 50Hz 24 V DC/AC, 90 to 265 V AC universal supply
Relay Output	One / Two sets of potential free c/o contacts rated at 6Amps, 230 V AC for non-inductive loads
Response Time	2 to 4 seconds
Indication	Red for alarm, 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 and minimum fail-safe
Ambient temp	-20°C to 60°C
Power consumption	4 VA (approx )

Table 2: Evaluation Unit

## 4.2.2 Fork

For Fork, please refer Table 3

PARAMETER	VALUE
Housing	Cast aluminium weather proof, enamel painted / powder coated <ul style="list-style-type: none"> <li>• Screwed : 1-1/2" / 2" BSP / NPT</li> <li>• Flanged : 50 NB onwards, as per process requirement</li> </ul>
Cable Gland	1 or 2 X 1/2" 5/8" / 3/4"-BSP / NPT Brass single/Double compression 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°C to 80°C (standard) /150°C/ 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

Table 3: Fork

## 4.3 Separate Version SLM 120S/220S/320S/620S

### 4.3.1 Fork with electronic insert VFI-100

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

PARAMETER	VALUE
Inter-connection cable	Unscreened 3 Core cable used (Not in Sapcon scope)
N.B	<ul style="list-style-type: none"> <li>• In flame proof model SLM 120F / 220 F/ 320 / 620 F , Evaluation unit and fork available in Flameproof, Enclosure suitable for gas group IIA, IIB as Per IS - 2148.</li> <li>• Probe available in Flame proof enclosure for installation in hazardous area.Evaluation unit is installed in safe area.</li> <li>• Suffix "H" indicates High temperature version in all categories.</li> </ul>

Table 4: Fork with Evaluation Unit



### 4.3.2 Evaluation Unit

All Specifications are same as in the remote version.

## 5 Installation & Handling Guidelines

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 200 mm above the tines especially for low level side mounting applications.

## 6 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 250 V AC operation.
- Earth terminal should be connected to external ground.

- In case of 24 V DC any polarity may be connected to terminals 1 and 2, terminal 3 is connected to external ground.

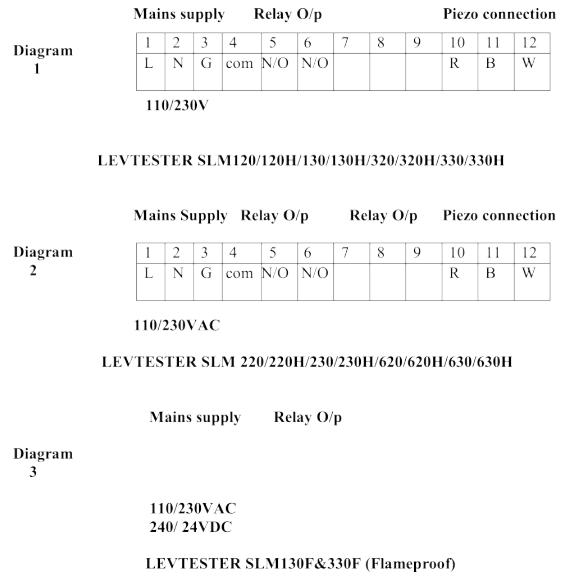


Figure 3: Connection Diagram

## 7 calibration

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

## 8 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 signaled 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.

### 8.1 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.

### 8.2 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.

## 9 Precautions

- Ensure that tines of the fork are not bent or their dimensions altered during installation.
- Weatherproofness of enclosure is guaranteed only, if the cover is in place and 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 10 mm.
- Do not lift the instrument by holding the tines.
- Do not deform the shape of the tines.

## 10 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.

## 11 Troubleshooting

For Troubleshooting, please refer Table 5

S.NO.	PROBLEM	POSSIBLE CAUSE	REMEDY
1	Instrument is non Functional	<ul style="list-style-type: none"> <li>• Loose connection</li> <li>• Mains failure</li> </ul>	<ul style="list-style-type: none"> <li>• Check connections.</li> <li>• Restore the supply.</li> </ul>
2	Fork not vibrating	<ul style="list-style-type: none"> <li>• Piezo connection discontinuous</li> <li>• Piezo elements faulty</li> </ul>	<ul style="list-style-type: none"> <li>• Check Piezo connection</li> <li>• Replace Piezo crystal assembly or check with another fork</li> </ul>
3	Relay does not change state, when material covers the fork tips	Faulty relay or faulty electronics	Check relay and associated circuit.
4	Green LED glows when material reaches high level point	Fail safe selection wrong	Select correct fail-safe option

Table 5: Troubleshooting

## 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:

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