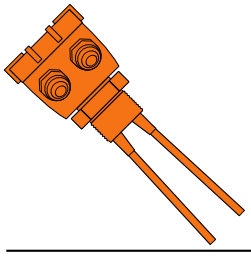
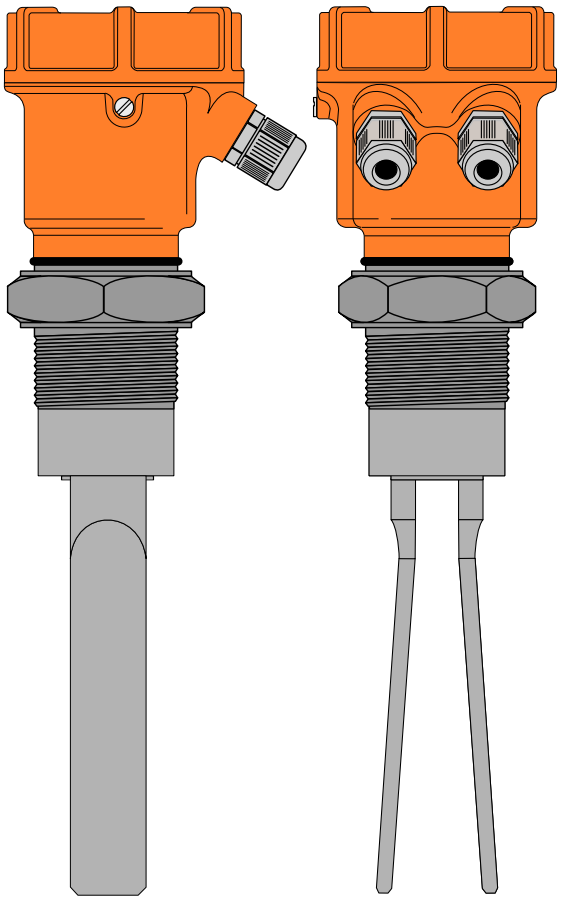


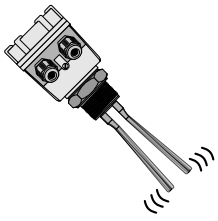
LSV:
Vibrating Fork
Level Limit Switch for Solids

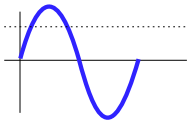
Trumen
sensing matters



Instruction Manual

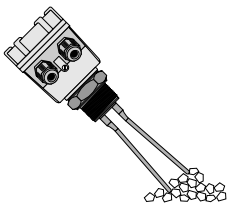
Operating Principle

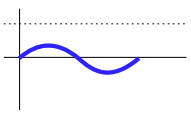




Electronics of LSV excites the piezo-electric-crystals inside tuning fork, which makes the fork tines vibrate at their natural resonance frequency in free air.

Amplitudes of vibration are above threshold when tines are free to vibrate.



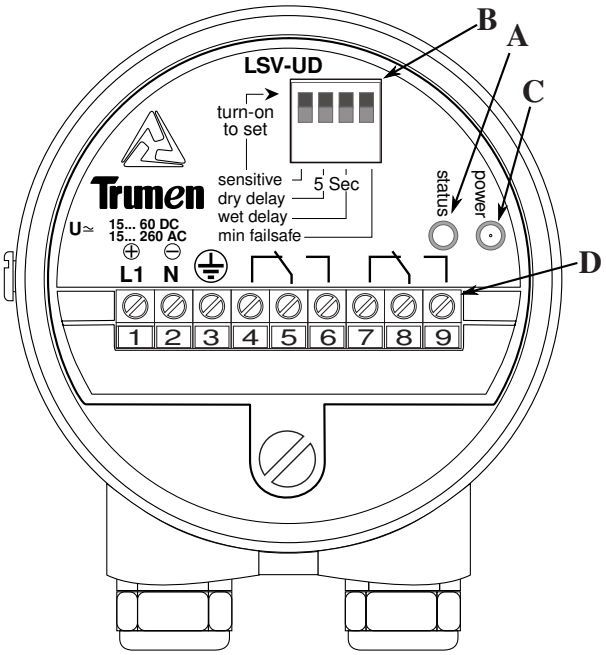


When material touches fork tines, vibration stops as resonance gets disturbed.

Amplitudes of vibration, as seen by electronics falls below the threshold-strength,
material presence is thus detected.

Trumen Technologies Pvt. Ltd.
86 Tilak-Path Rambag, Indore, MP, 452 007, India
Phone: +91-731-656 2425, 243 5106
email: sales@trumen.in web:www.trumen.in

Introduction



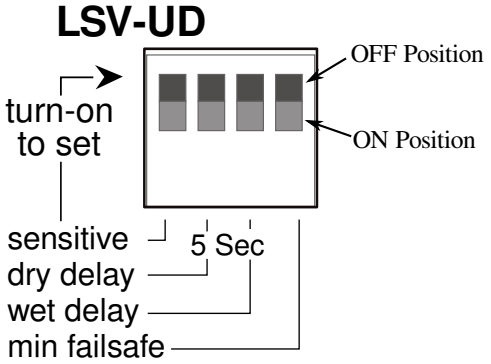
controls & indicators

A	Alarm Indicating LED
B	Configuration Switches
C	Power ON LED Indicator
D	Connecting Terminals

connection terminals

1	+ of DC or Live of AC Supply input
2	- of DC or Neutral of AC Supply input Supply: 15 to 80VDC or 15 to 260VAC 50/60Hz
3	Earth terminal for safety
4	Normally closed terminal of contact 1
5	Common terminal of contact 1
6	Normally open terminal of contact 1
7	Normally closed terminal of contact 2
8	Common terminal of contact 2
9	Normally open terminal of contact 2

configuration switches

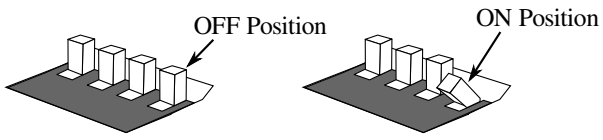


1 sensitivity control
sensitive setting for low density materials
(turn-on for fluffy/low density powders etc)
(keep turned-off for normal density materials)

2 "dry" (or uncovered) delay (5 second delay)
(turn-on when 5 second more time is needed for fork out of solid confirmation)

3 "wet" (or covered) delay (5 second delay)
(turn-on when 5 second more time is needed for fork touching the material, confirmation)

4 minimum failsafe select
Failsafe means alarm is same as power failure.
Failsafe=high (maximum) for overflow detection
Failsafe=low (minimum) for underflow detection

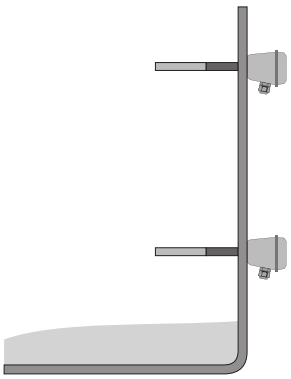
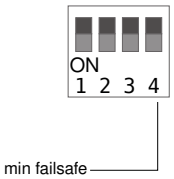
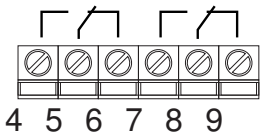
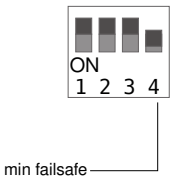
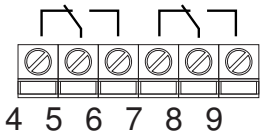
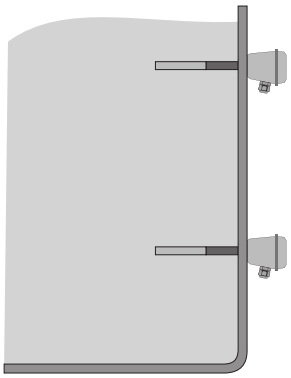
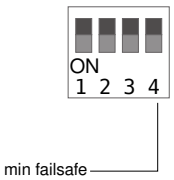
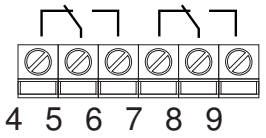
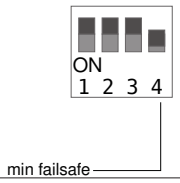
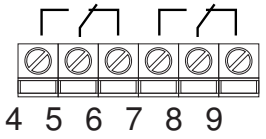


Example of Switch in On and Off Positions

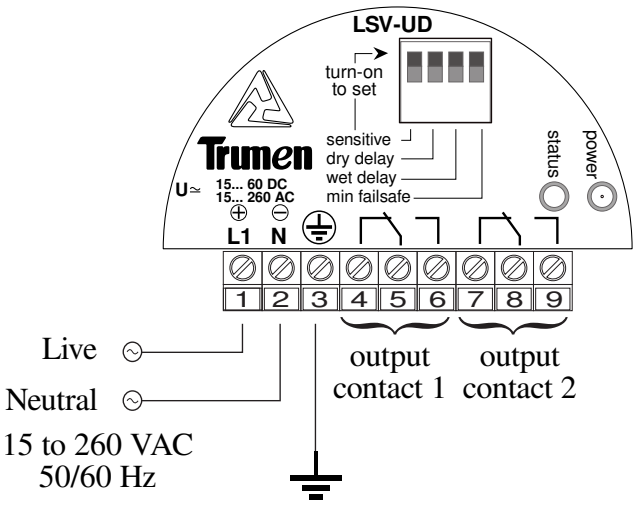
Failsafe Installation

failsafe selection

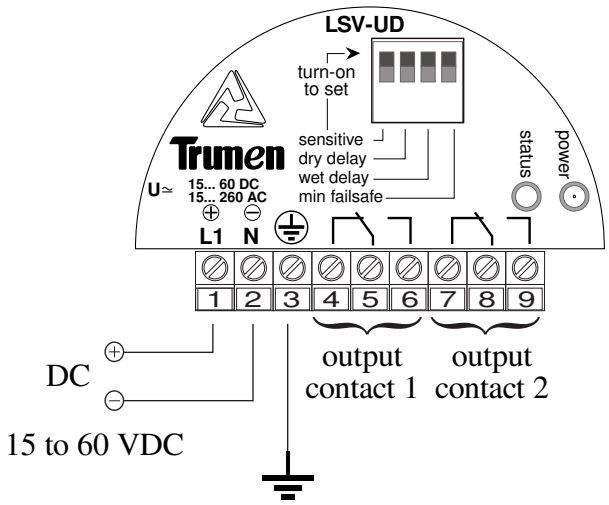
Failsafe defines that the alarm and power failure / device failure conditions are same to the external system. Failsafe operation is best understood with the type of installation.

Material & installation	failsafe setting	alarm LED	Alarm	DPDT relay contacts
		Off	Normal	
		On	Alarm	
		On	Alarm	
		Off	Normal	

electrical connections (AC)



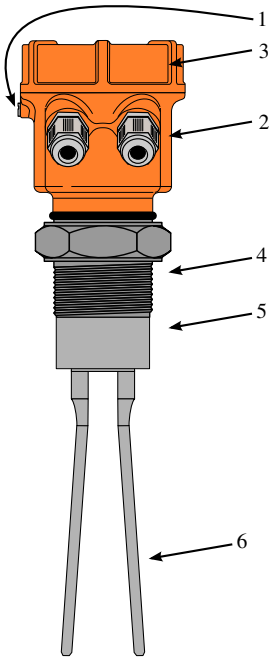
electrical connections (DC)



Proper connection to supply earth terminal (3) and the external earth terminal (screw) is must.

Do's & Dont's

installation precautions



1. Always connect the "Earth" to the external "Earthing" screw

2. Tighten the cable entries & glands properly

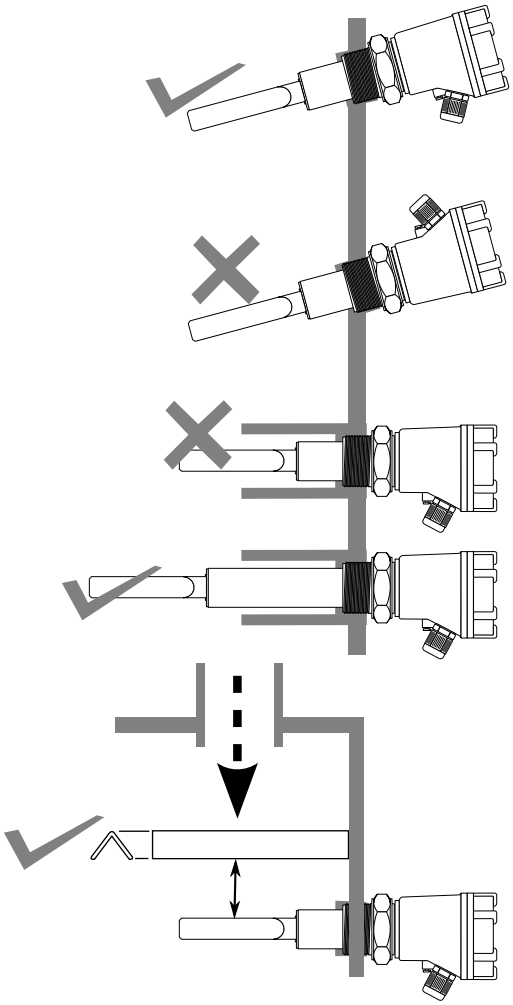
3. Secure the top aluminum cover at its place properly once the electrical connections and other settings are completed

4. Always tighten the process connection using proper wrench never try to tight by rotating the aluminum housing

5. Make sure process connection is same at that in hooper/tank

6. Vibrating fork tines should never be:-

6.1 Bent closer
6.2 Bent apart
6.3 Cut or machined in any way
6.4 Extended by welding or machining



7. Cable entries must face downwards only

8. Nozzles should never be longer than the fork extension.

8. If mounted directly under the material entry, always install a canopy of suitable strength at proper height from the fork

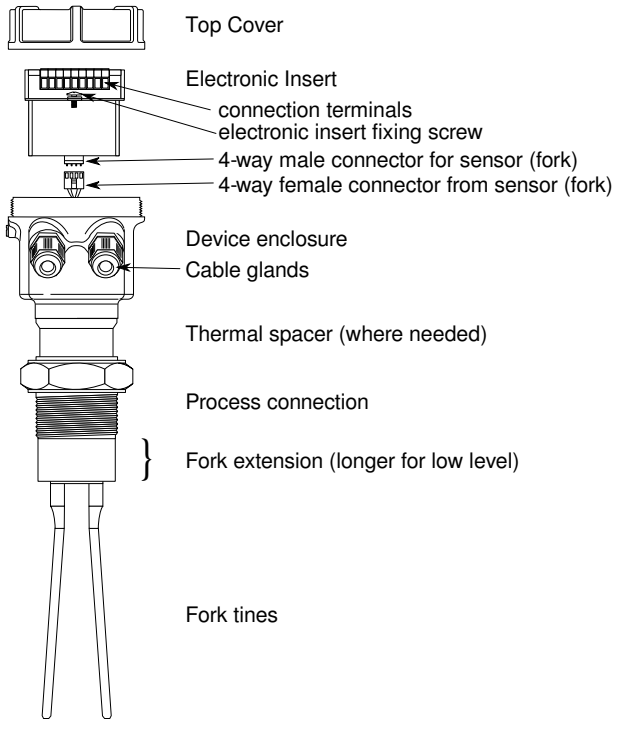
9. Never climb either by gripping or stepping over either the fork tines or its aluminum housing

10. Obeserve other safety precautions as required at the place of application

Troubleshooting

Indication	Probable cause	Work-around	Solution
No switching output or sensor is permanently in alarm	Power is not available	See if 'power' LED is ON If power LED is OFF check voltage on terminal 1 and 2	Sensor electronic insert is needed to be replaced.
Proper voltage is available but 'power' LED is still OFF	Power section of sensor electronic insert is failed		
Fork is not vibrating when fork tines are touched by hand.	Sensor electronic insert fork oscillator failed		Sensor electronic insert is needed to be replaced.
Fork vibrating but no switching output when fork tines are touched.	Sensor electronic insert evaluation section failure		
Abrupt switching	Material is agitated	Set time delay to 5 second in both dry and wet condition (turn switch 3, 4 ON)	Time delay solves abrupt switching issue in agitated materials
Device shows no material after some-time even when fork is inside the material	Material fluffy or fork rat-holes the material due to its own vibrations.	Set device in sensitive mode (turn switch 1 ON)	sensitive setting reduces vibrational strengh and makes switching point at lower amplitude
Fork settings are all OK but fork fails to switch to 'no material' at random times	Power supply carrying extra noise and fork amplifier is picking the noise	Make necessary arrangements to filter the noise in power-line before being fed to the device. Provide an exclusive earthing to terminal# 3, fork enclosure earthing screw and fork process connection (device mounting screw or flange)	device contains suffiicient filtering of power supply noise inside, but sometimes external earth is needed to make filters sink the extra power supply noise back to earth.
Device worked for few months/years but now fails to switch with respect to material while power conditions are all same.	Device senses fork frequency and amplitude to ascertain presence/ absence of material. Possible reasons are 1. Fork frequency shift due to fork wear/erosion by service material 2. Material deposition on fork leads 3. Over temperature of service material causing fork drive damage.	Select proper fork surface while ordering as per service material to mitigate fork erosion as well as deposition. Order device of proper thermal grade for proper service life of device. Clean up deposited materials on fork tines as a pert of maintenance schedule	Care is needed to be taken while ordering. Scheduled cleaning of fork tines in sticky material application is recommended . In case of fork tine wear or tempreture stress, fork sensor is needed to be replaced.

Maintenance and Spares



Shown on the right are various parts of LSV level switch.
separatable parts are

1. Electronic insert in short called 'electronics'
2. Fork + Enclosure + Cover + Galnds collectively called 'mechanical'

For maintenance issues ivolving replacement of 'electronics', just a single fixing screw is needed to be released.

Lift the electronics slowly by holding electronics with one hand and mechanical with other, as wires are connected using rigit 4-way connectors to it.

Disconnect 4-way connector by holding electonics with one hand and female connector by other hand, while the rest of the device is at rest.

Connect the new replaced sensor. 4-way connector is directional and only connects in proper direction.

Set the electronics properly to its position.

Match the mounting screw hole of electronics with that of enclosure and fix the screw.

For mechanical issues please send the entire device back to Trumen.