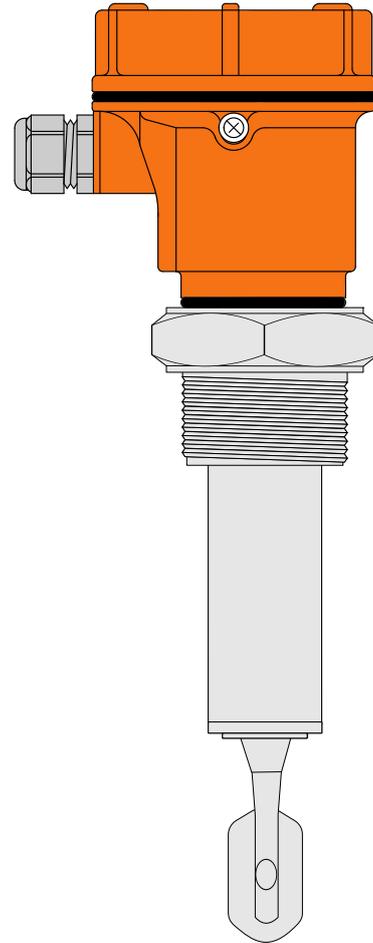
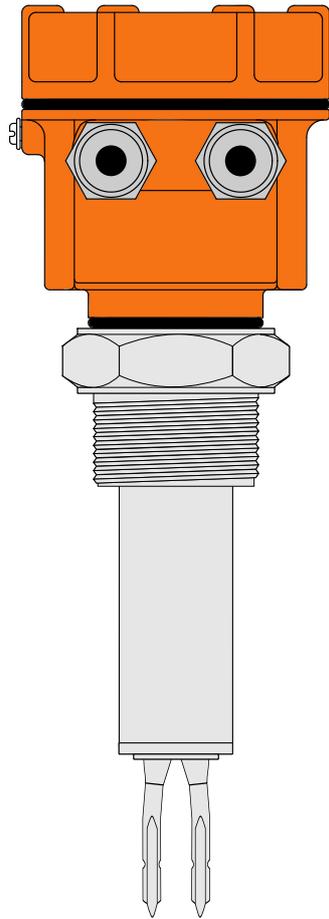


LFV Vibrating Fork Level Switch for Liquids



Instruction Manual



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List of content

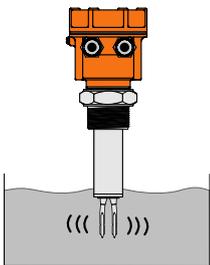
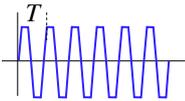
Page

Operating Principle	1
Technical Specification	2
Do's and Don'ts	3
Troubleshooting	4
Maintenance & Spares	4
Annexure-1	
Introduction - LFV-UD (Order code EIUD / ERUD)	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-UD (EIUD / ERUD)	Page2
Electrical Connections - LFV-UD (EIUD / ERUD)	Page3
Annexure-2	
Introduction - LFV-DP (Order code EIDP / ERDP)	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-DP (EIDP / ERDP)	Page2
Electrical Connections - LFV-DP (EIDP / ERDP)	Page3
Annexure-3	
Introduction - LFV-NL (Order code EINL)	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-NL (EINL)	Page2
Electrical Connections - LFV-NL (EINL)	Page3
Annexure-4	
Introduction - LFV-U(S+P) (Order code EIUSP / ERUSP)	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-U(S+P) (EIUSP / ERUSP)	Page2
Electrical Connections - LFV-U(S+P) (EIUSP / ERUSP)	Page3
Annexure-5	
Introduction - LFV-AR (Order code EIAR)	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-AR (EIAR)	Page2
Electrical Connections - LFV-AR (EIAR)	Page3
Annexure-6	
Introduction - LFV-DL (Order code EIDL)	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-DL (EIDL)	Page2
Electrical Connections - LFV-DL (EIDL)	Page3
Annexure-7	
Introduction - LFV-PFM	Page1
controls & indicators, connection terminals, configuration switches.....	Page1
Operation Matrix - LFV-PFM	Page2
Electrical Connections - LFV-PFM	Page3

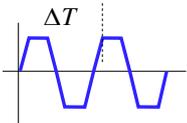
Operating Principle



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



When the fork tines are immersed in liquid, the frequency of fork vibration falls due to the density of liquid.



This change in frequency is detected by the electronic circuit.

Liquid presence is thus detected.

Technical Specification

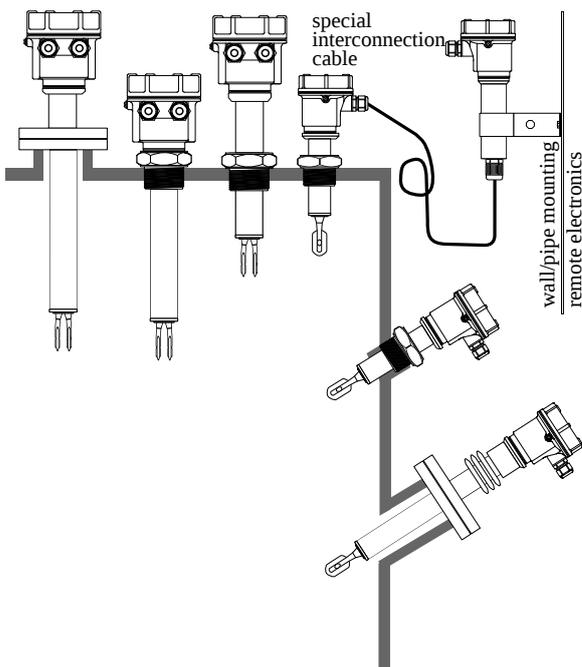
Features

1. Fast Switching Response 1 sec
2. ½" screw mountings available
3. High pressure 15 bar forks
4. High Temperature up-to 250°C available
5. Calibration-less operation
6. Remote electronics with std 10 meters cable length
7. External indication LED available
8. Threaded & Flanged Mountings
9. NAMUR (L-H / H-L) as per IEC-60947-5-6
10. Ingress protection : IP 68/65 (as per IS-13947)
11. Ex-proof (Ex d T6 IP-66 IIC)
 - Flameproof as per IS/IEC 60079-1:2007
 - Weatherproof (IP-66) as per IS/IEC 60529:2001
 - Suitable for Gas Group : IIC
 - Suitable for Zone 1 & 2 atmospheres
12. Compact size
13. Low power consumption

Applications

1. Free flowing liquids
2. Suitable for side as well as top mounting
3. Minimum and maximum failsafe field selectable
4. Process temperature max 200°C
6. Process pressure max.15 bar
7. Flow/no-flow detection in pipe-lines

Typical Mountings



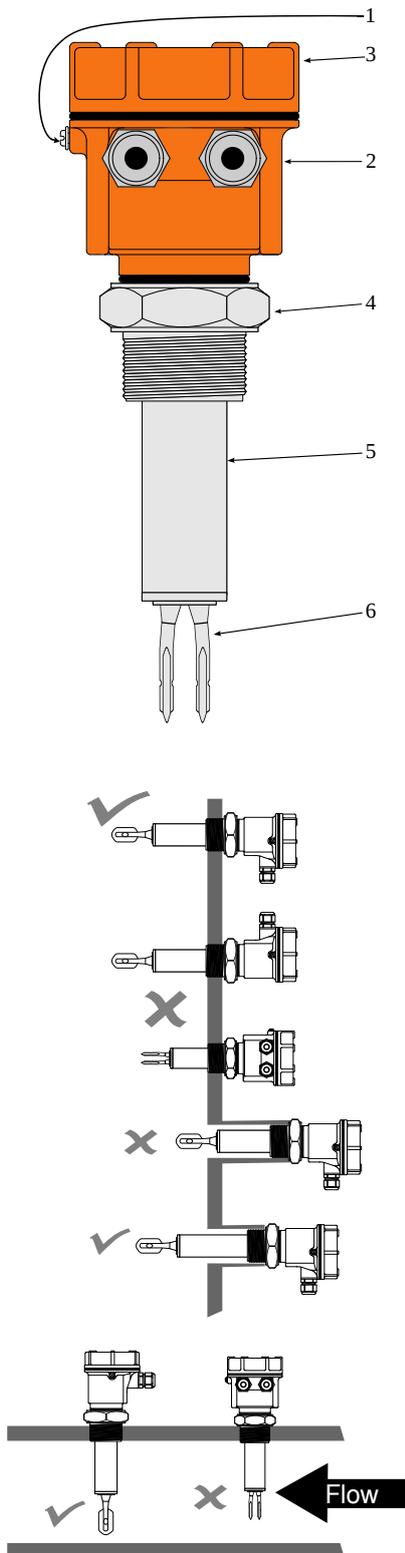
Specifications

EIUD / ERUD Supply & Output	Integral / Remote Electronics DPDT Output Universal Supply DPDT Out 15 to 80 VDC 15 to 260 VAC 50/60Hz 5 A each @ 24VDC or 220VAC
Relay Contact	
EIDP / ERDP Supply & Output Output Limit	Integral / Remote Electronics for PNP Output 12 to 60 VDC, PNP 250mA max. Short Circuit Safe
EINL/EINH Supply & Output	NAMUR (L-H / H-L) as per IEC-60947-5-6 8.2 VDC 1KΩ series resistance
EIUSP / ERUSP Supply & Output	Integral / Remote Electronics SPDT + PNP Output Universal Supply for SPDT Output 15 to 80 VDC 15 to 260 VAC 50/60Hz DC Supply for PNP Output 15 to 60 VDC
Relay Type and Rating	Potential Free SPDT Relay Output 5 A each @ 24VDC or 220VAC
PNP Output	250mA max. Short Circuit Safe
EIAR Supply & Output	Integral Electronics AC series relay Two Wire 18 to 260 VAC, Series Relay not less than 4mA to release external relay maximum 150mA to magnetize relay
Output Limit	Use relays/contactors will more than 4mA holding current
EIDL Supply & Output	Integral Electronics 4-20mA Loop Powered Two Wire DC 8 / 16mA & 4 / 20mA 15 to 60 VDC
Output Limit	8mA (±1mA max) / 16mA (±1mA max) 4mA (±1mA max) / 20mA (±1mA max)
EIPFM Supply & Output Output Limit	Integral Electronics PFM Sourced Powered From PFM Tester device < 30VDC PFM Output 50Hz / 150Hz 200μS, 10mA
Sensor Cable	Remote electronics require special cable from fork to controller 10 meter standard length (more available on demand)
Max. Viscosity	10,000 cStokes (= cPose/(g/cm ³)) (Higher viscosity available on request)
Ambient Temp.	-20°C ... 70°C (-4°F ... 158 °F)
Process Temp.	-20°C ... 80°C (-4°F ... 176 °F)
Extended Process Temperature	-30°C ... 200°C (-22°F ... 392 °F) (extensions & heat sinks required)
Process Pressure	absolute / max. 15 bar
Wetted Parts	SS 316 or SS 316L, PTFE, PFA, TEFZEL, HALAR
Process Connections	NPT / BSP / Hygienic ½", ¾", 1", 1¼", 1½", & Flanged ANSI/JIS/DIN/ASA/custom
Extensions Tube Material & Length	SS 304, SS 316, SS 316L 50mm to 3,000mm

Specifications are subject to change without prior notice

Do's and Don'ts

Installation Precaution

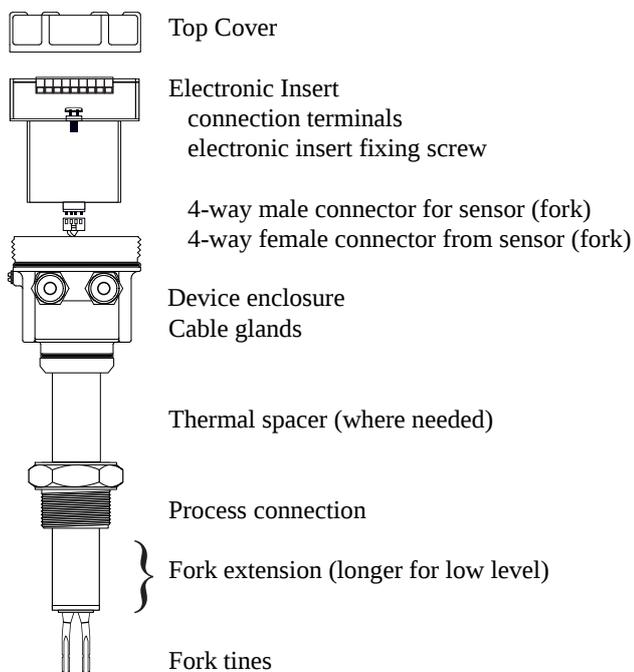


1. Always connect the "Earth" to the external "Earthing" screw
2. Tighten the cable entries & glands properly
3. Secure the top aluminium cover at its place properly once the electrical connections and other settings are completed
4. Always tighten the process connection using proper wrench never try to tight by rotating the aluminium housing
5. Make sure process connection is same as that in hopper/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
9. If mounted directly under the material entry, always install a canopy of suitable strength at proper height from the fork
10. In flow-no-flow sensing, align the fork tines in direction of flow as shown
11. Never climb either by gripping or stepping over either the fork tines or its aluminium housing
12. Observe 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 Proper voltage is available but 'power' LED is still OFF	Power is not available Power section of sensor electronic insert is failed	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.
Fork is not vibrating when fork tines are touched Fork vibrating but no switching output when fork tines are touched	Sensor electronic insert fork oscillator failed Sensor electronic insert evaluation section failure		Sensor electronic insert is needed to be replaced.
Abrupt switching	Material is agitated	Set time delay to 5 second in both dry and wet condition (turn switch 2, 3 ON)	Time delay solves switching issues in agitated materials.
Fork settings are all OK but fork fails to switch to 'no material' at random times	Power supply carrying extra noise and fork amplifier 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 sufficient 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 sense as a part 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 temperature stress, fork sensor is needed to be replaced.

Maintenance and Spares



Shown on the left are various parts of LfV level switch separatable parts are

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

For maintenance issues involving 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 rigid 4-way connectors to it.

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

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

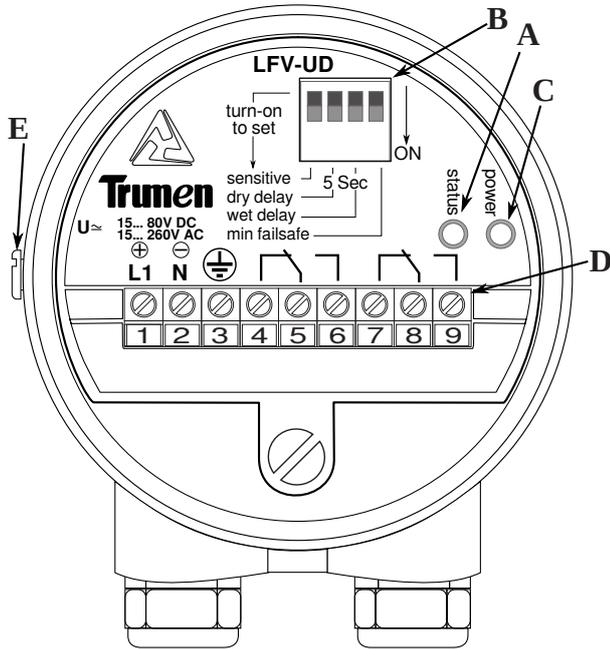
Set the electronics properly to its position.

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.

Annexure-1

Introduction - LFV-UD (EIUD / ERUD)



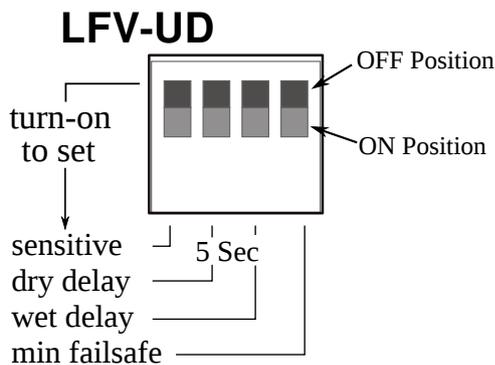
controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Power ON LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

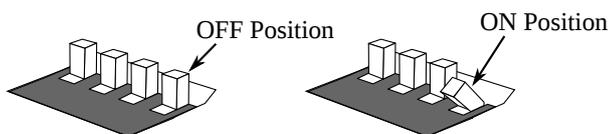
connection terminals

- 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 connected terminal of contact 1
- 5 Common terminal of contact 1
- 6 Normally open terminal of contact 1
- 7 Normally connected 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 fluids
(turn-on for low density fluids)
(keep turned-off for normal fluids)
- 2 “dry” (or uncovered) delay (5 second delay)
(turn-on when 5 second more time is needed for
fork out of fluid confirmation)
- 3 “wet” (or covered) delay (5 second delay)
(turn-on when 5 second more time is needed for
fork dipped in the fluid confirmation)
- 4 minimum failsafe select
Failsafe means alarm is same as power failure.
Turn on for underflow detection (min. failsafe)
Keep turned off for overflow detection
(max. failsafe)

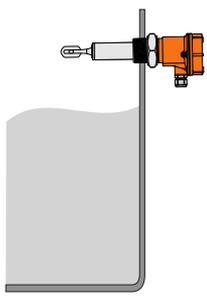
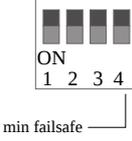
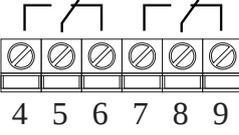
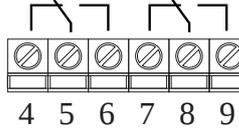
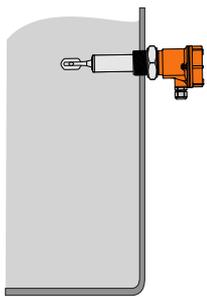
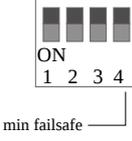
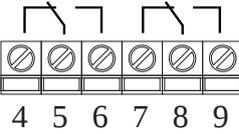
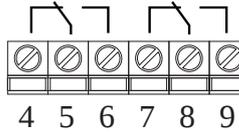
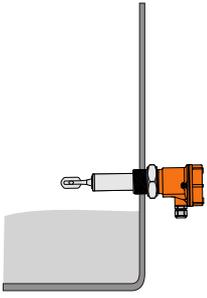
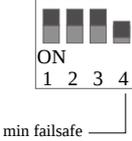
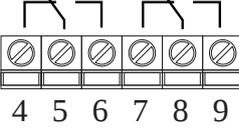
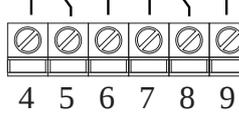
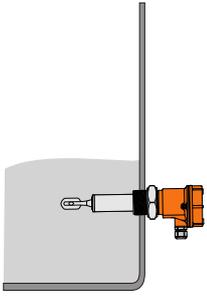
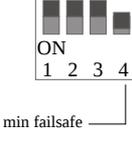
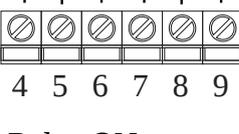
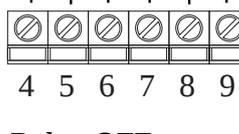


Example of Switch in On and Off Positions

Annexure-1

Operation Matrix - LfV-UD (EIUD / ERUD)

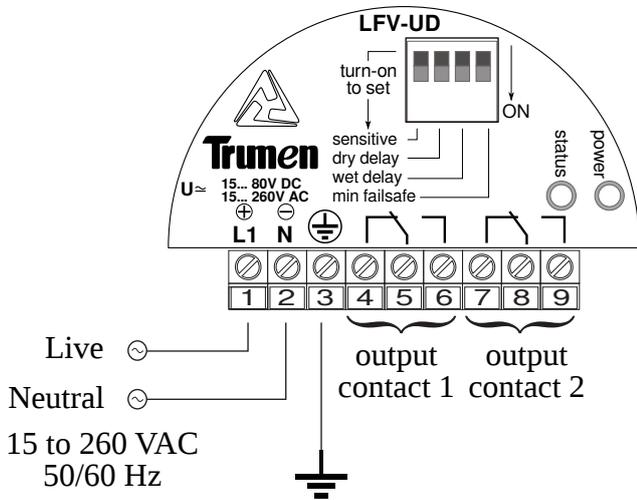
Failsafe defines that the alarm and power failure / device failure conditions are same to the external system. Failsafe operation is best understood with the type of installation and following matrix.

	Material & Installation	Material Status	Failsafe Setting	Status LED	DPDT Relay Contacts	
					Power ON	Power OFF
High level / overflow detection		No material at high level.	 <p>Switch no. 4 is off, failsafe high/maximum</p>	 Off Indicating normal or healthy status.	 <p>Relay ON normal or healthy contacts.</p>	 <p>Relay OFF alarm contacts. (due to power failure)</p>
		Material is above the high level or fork is covered with material.	 <p>Switch no. 4 is off, failsafe high/maximum</p>	 On Indicating alarm status.	 <p>Relay OFF alarm contacts.</p>	 <p>Relay OFF alarm contacts. (as it is)</p>
Low level / underflow detection		No material at low level.	 <p>Switch no. 4 is on, failsafe low/minimum</p>	 On Indicating alarm status.	 <p>Relay OFF alarm contacts.</p>	 <p>Relay OFF alarm contacts. (as it is)</p>
		Material is above the low level or fork is covered with material.	 <p>Switch no. 4 is on, failsafe low/minimum</p>	 Off Indicating normal or healthy status.	 <p>Relay ON normal or healthy contacts.</p>	 <p>Relay OFF alarm contacts. (due to power failure)</p>

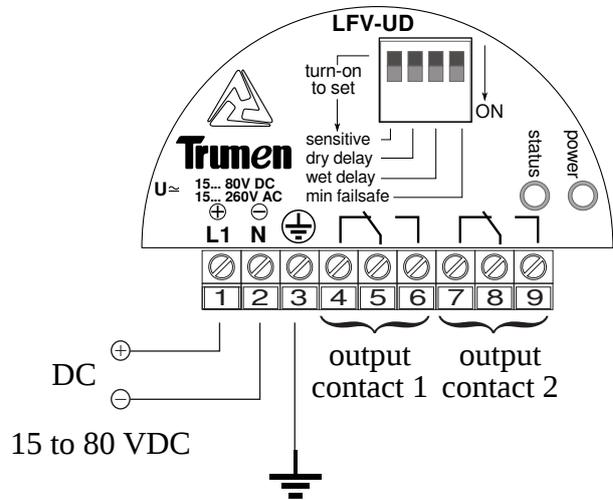
Annexure-1

Electrical Connections - LFV-UD (EIUD / ERUD)

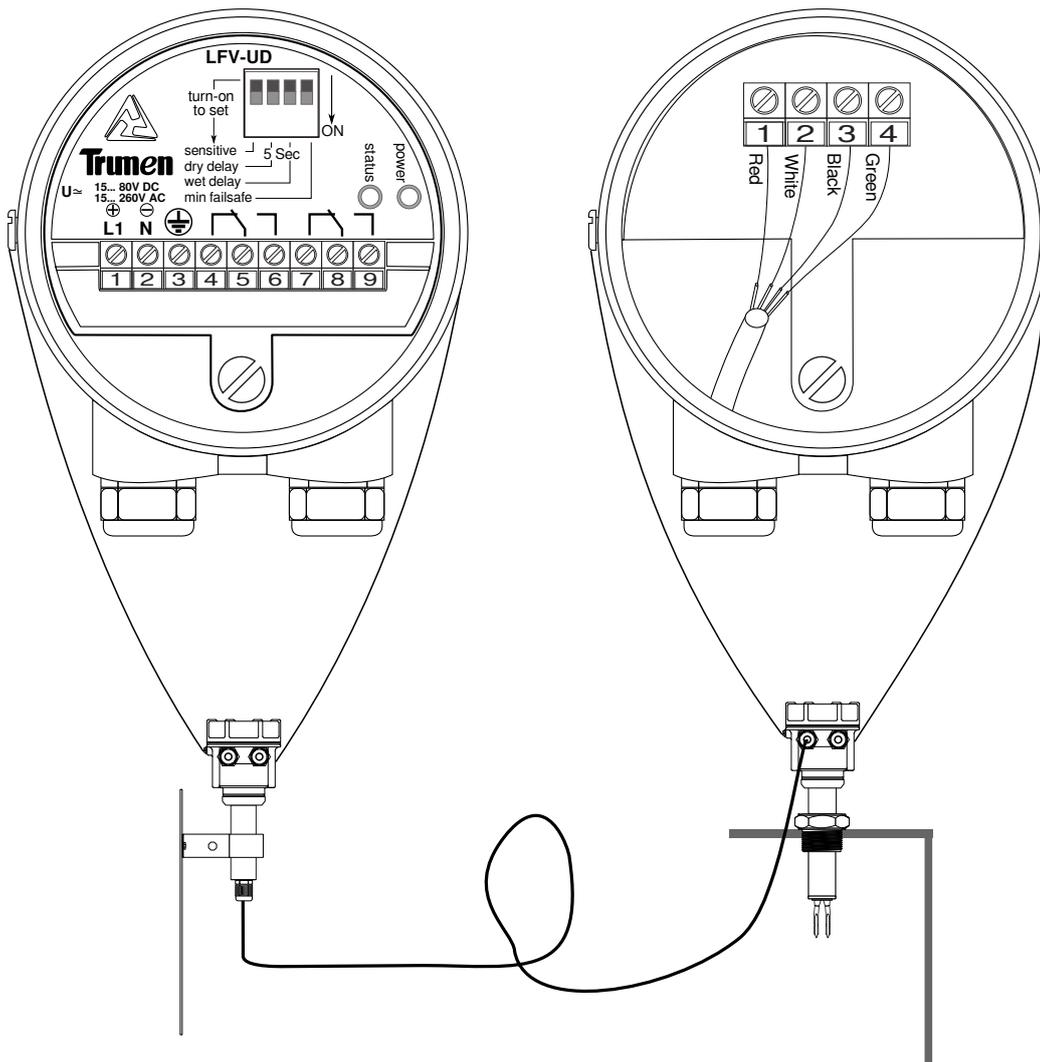
electrical connections (AC)



electrical connections (DC)



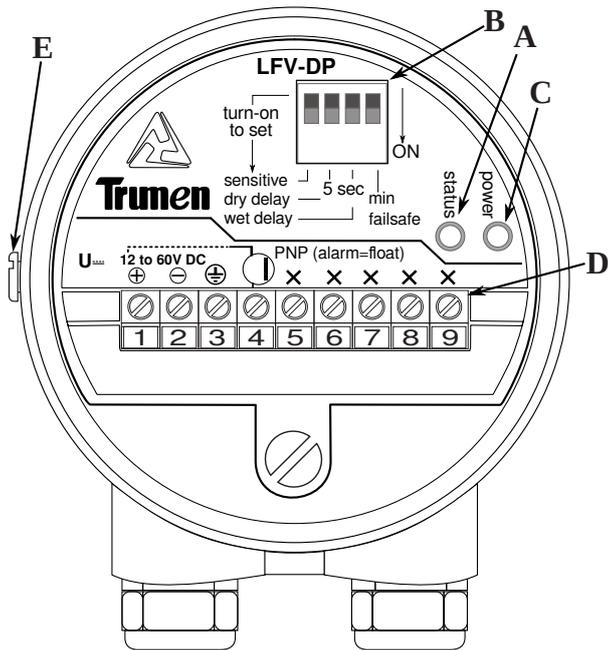
Remote probe connections for LFV-UD (ERUD)



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

Annexure-2

Introduction - LFV-DP (EIDP / ERDP)



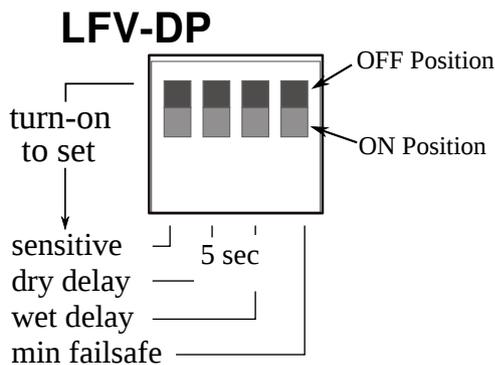
controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Power ON LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

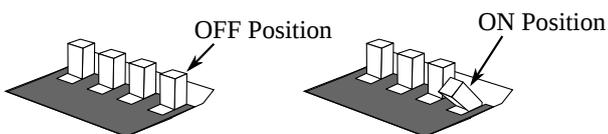
connection terminals

- 1 + of DC Supply input
 - 2 - of DC Supply input
- Supply:
12 to 60VDC
- 3 Earth terminal for safety
 - 4 PNP output is supplied with voltage
12 to 60VDC

configuration switches



- 1 sensitivity control
sensitive setting for low density fluids
(turn-on for low density fluids etc.)
(keep turned-off for normal density fluids)
- 2 “dry” (or uncovered) delay (5 second delay) setting
(turn-on when 5 second more time is needed for
fork out of fluid confirmation)
- 3 “wet” (or covered) delay (5 second delay) setting
(turn-on when 5 second more time is needed for
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- 4 minimum failsafe select
Failsafe means alarm is same as power failure.
Turn on for underflow detection (min. failsafe)
Keep turned off for overflow detection (max. failsafe)

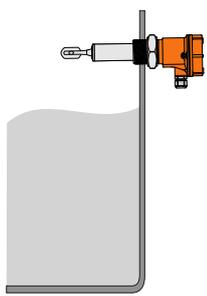
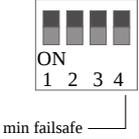
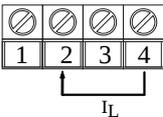
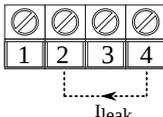
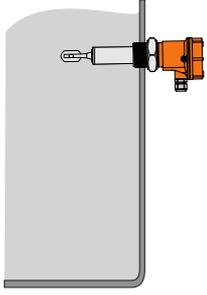
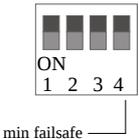
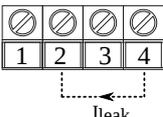
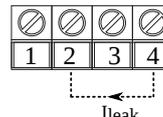
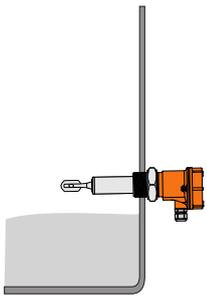
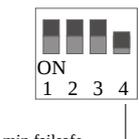
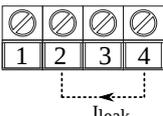
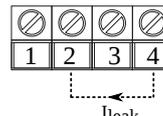
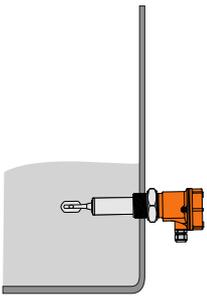
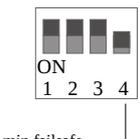
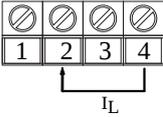
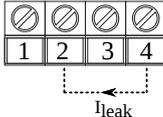


Example of Switch in On and Off Positions

Annexure-2

Operation Matrix - LFV-DP (EIDP / ERDP)

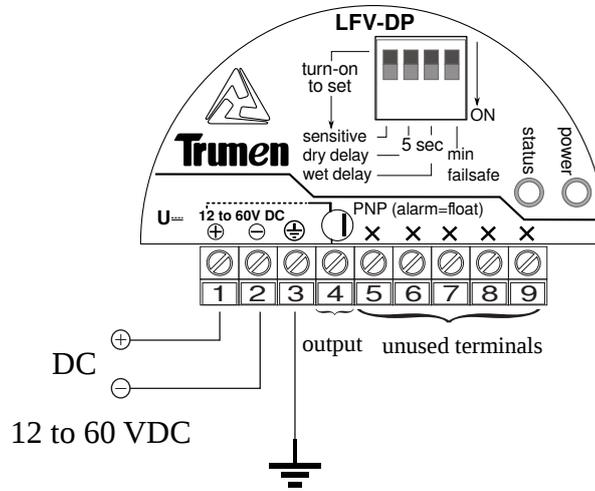
PNP output is supplied with voltage in No-Alarm condition. PNP output is de-energized in Alarm condition. Failsafe defines that the alarm and power failure / device failure conditions are same to the external system. Failsafe operation is best understood with the type of installation and following matrix.

	Material & Installation	Material Status	Failsafe Setting	Status LED	PNP Output	
					Power ON	Power OFF
High level / overflow detection		No material at high level.	 Switch no. 4 is off, failsafe high/maximum	 Off Indicating normal or healthy status.	 $I_L(\max) = 250\text{mA}$ Normal or healthy output.	 $I_{\text{leak}} \leq 0.1\text{mA}$ Alarm output (due to power failure)
		Material is above the high level or fork is covered with material.	 Switch no. 4 is off, failsafe high/maximum	 On Indicating alarm status.	 $I_{\text{leak}} \leq 0.1\text{mA}$ Alarm output.	 $I_{\text{leak}} \leq 0.1\text{mA}$ Alarm output. (as it is)
Low level / underflow detection		No material at low level.	 Switch no. 4 is on, failsafe low/minimum	 On Indicating alarm status.	 $I_{\text{leak}} \leq 0.1\text{mA}$ Alarm output.	 $I_{\text{leak}} \leq 0.1\text{mA}$ Alarm output. (as it is)
		Material is above the low level or fork is covered with material.	 Switch no. 4 is on, failsafe low/minimum	 Off Indicating normal or healthy status.	 $I_L(\max) = 250\text{mA}$ Normal or healthy output.	 $I_{\text{leak}} \leq 0.1\text{mA}$ Alarm output (due to power failure)

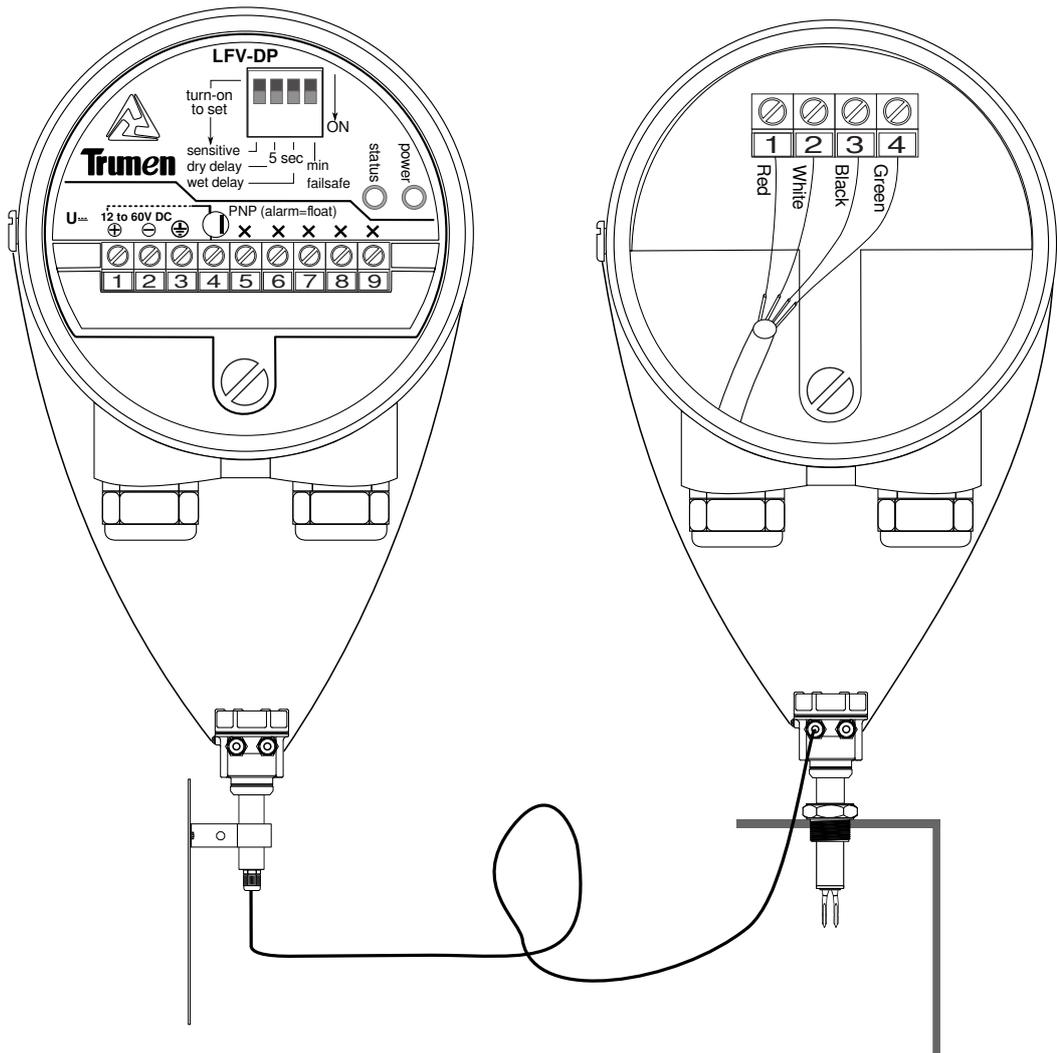
Annexure-2

Electrical Connections - LFV-DP (EIDP / ERDP)

electrical connections (DC)



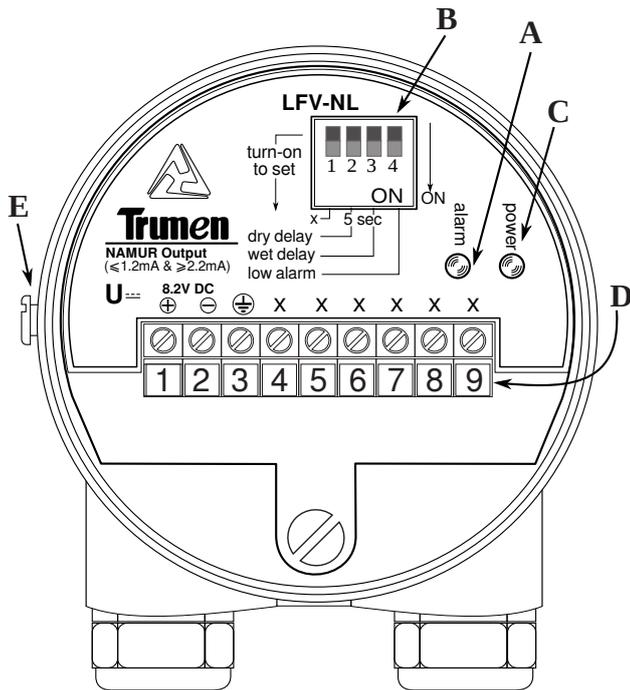
Remote probe connections for LFV-DP (ERDP)



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

Annexure-3

Introduction - LFV-NL (EINL)



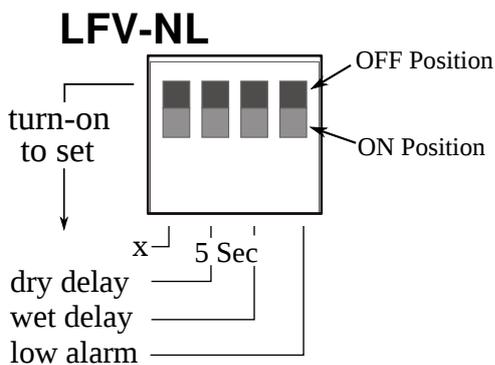
controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Power ON LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

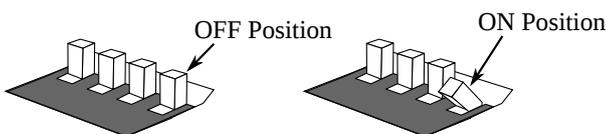
connection terminals

- 1 + of 8.2VDC NAMUR Supply
- 2 - of 8.2VDC NAMUR Supply
This supply must be taken from certified NAMUR Barrier or Amplifier
This input is not tolerant above 16VDC
Supplying more than 16V may damage the device.
- 3 Earth terminal for safety
- 4,5,6,7,8,9 Not used

configuration switches



- 1 Not used
- 2 “dry” (or uncovered) delay (5 second delay)
(turn-on when 5 second more time is needed for fork out of fluid confirmation)
- 3 “wet” (or covered) delay (5 second delay)
(turn-on when 5 second more time is needed for fork dipped in the fluid confirmation)
- 4 High / Low alarm switch
Switch OFF=(high alarm) for overflow detection
Switch ON=(low alarm) for underflow detection

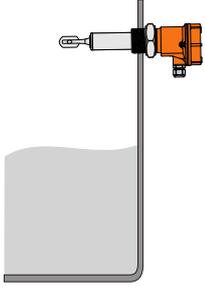
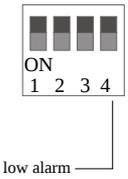
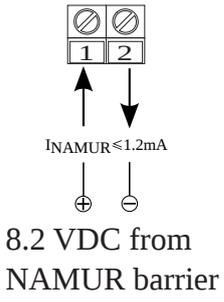
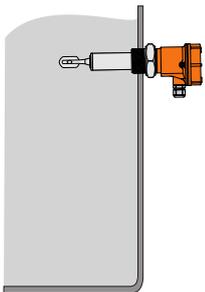
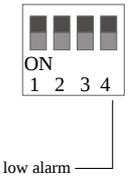
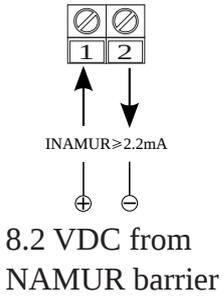
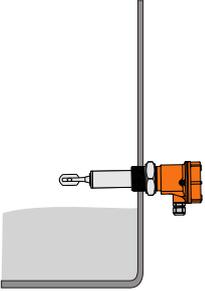
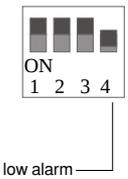
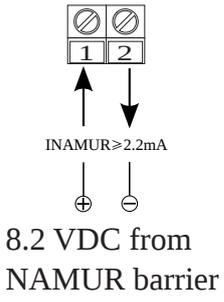
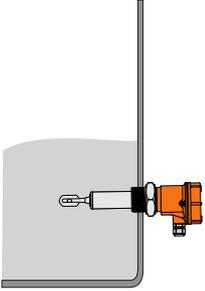
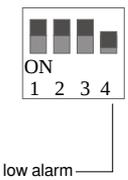
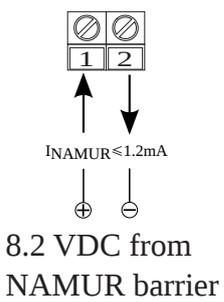


Example of Switch in On and Off Positions

Annexure-3

Operation Matrix - LFV-NL (EINL)

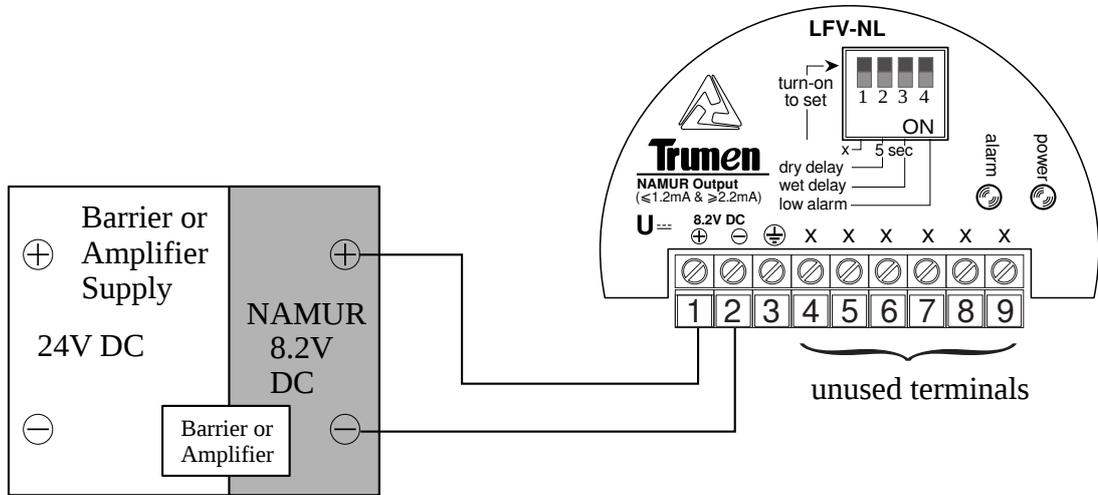
This device is meant to be operated through a NAMUR barrier or amplifier. Device can endure 16 VDC but is meant to be operated solely at 8.2 V NAMUR supply. High / Low alarm switch can be select as per requirement i.e. high alarm or low alarm. System operation is best understood with the type of installation and following matrix.

Material & Installation	Switching Operation	Failsafe Setting	Status LED	Alarm/ Normal	NAMUR-LH Edge Output	
High level / overflow detection		When switch no. 4 is off (high alarm). output status shows normal when there is no material at high switch point or fork is out of the fluid.		 Off	Normal	
		When switch no. 4 is off (high alarm). output status shows alarm if fork is dipped in fluid at high switch point.		 On	Alarm	
Low level / underflow detection		When switch no. 4 is on (low alarm). output status shows alarm when there is no material at low switch point or fork is out of the fluid.		 On	Alarm	
		When switch no. 4 is on (low alarm). output status shows normal if fork is dipped in fluid at low switch point.		 Off	Normal	

Annexure-3

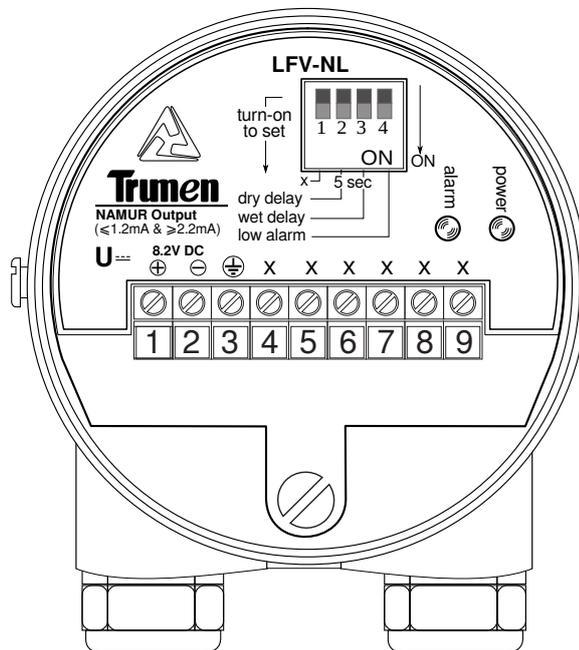
Electrical Connections - LFV-NL (EINL)

electrical connections (DC)



LFV-NL will damage if DC voltage is more than 16VDC.

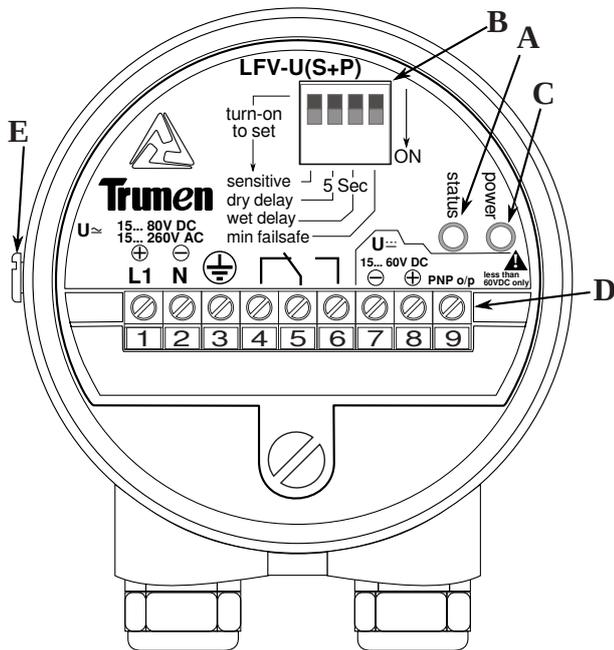
Use only certified NAMUR Barrier or Amplifier



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

Annexure-4

Introduction - LFV-U(S+P) (EIUSP / ERUSP)



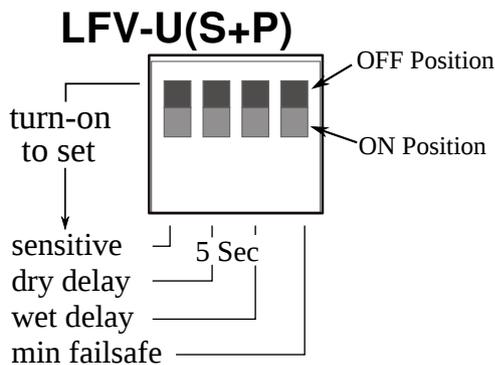
controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Power ON LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

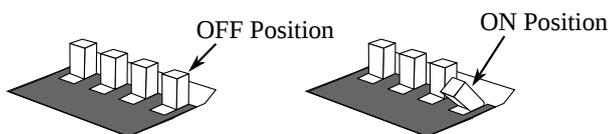
connection terminals

- 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 connected terminal of SPDT contact
- 5 Common terminal of SPDT contact
- 6 Normally open terminal of SPDT contact
- 7 (-) of DC for PNP output
- 8 (+) of DC for PNP output
- 9 DC PNP output with respect to -ve of DC
▲ Supply should be within 15 to 60VDC for PNP output

configuration switches



- 1 sensitivity control
sensitive setting for low density fluids
(turn-on for low density fluids)
(keep turned-off for normal fluids)
- 2 “dry” (or uncovered) delay (5 second delay)
(turn-on when 5 second more time is needed for fork out of fluid confirmation)
- 3 “wet” (or covered) delay (5 second delay)
(turn-on when 5 second more time is needed for fork dipped in the fluid confirmation)
- 4 minimum failsafe select
Failsafe means alarm is same as power failure.
Turn on for underflow detection (min. failsafe)
Keep turned off for overflow detection (max. failsafe)

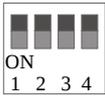
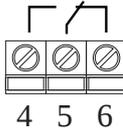
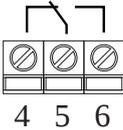
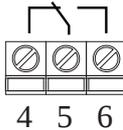
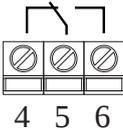
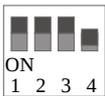
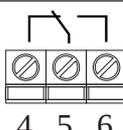
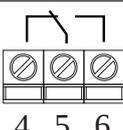
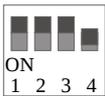
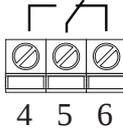
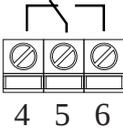


Example of Switch in On and Off Positions

Annexure-4

Operation Matrix - LFV-U(S+P) (EIUSP / ERUSP)

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 and following matrix.

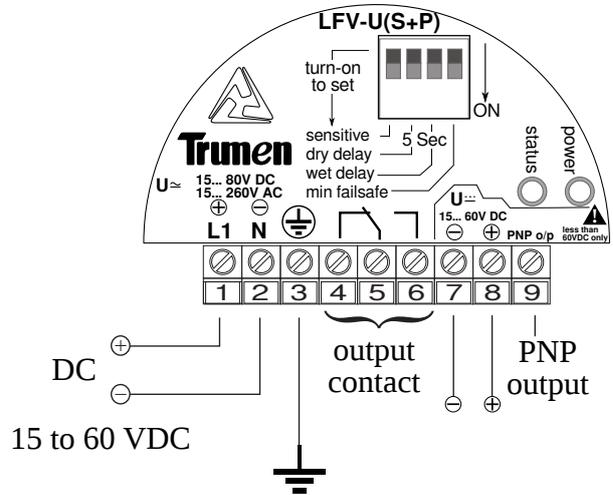
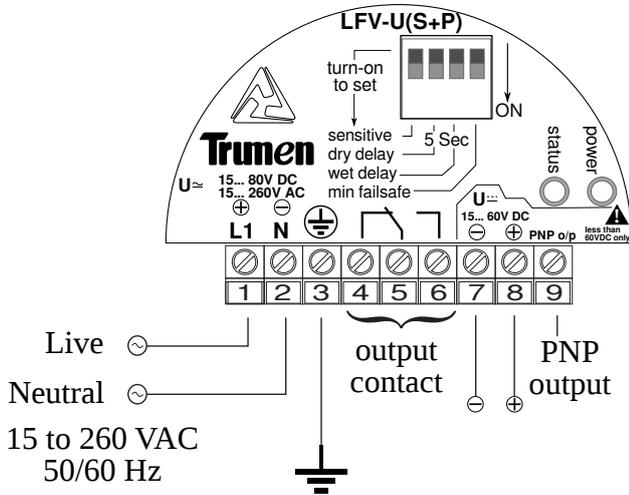
Material & Installation	Material Status	Failsafe Setting	Status LED	Relay Contacts & PNP Output	
				Power ON	Power OFF
High level / overflow detection	No material at high level.	 <p>Switch no. 4 is off, failsafe high/maximum</p>	 Off Indicating normal or healthy status.	 <p>Relay ON normal or healthy contacts.</p> <p>$I_L(\max) = 250\text{mA}$</p>	 <p>Relay OFF alarm contacts. (due to power failure)</p> <p>$I_{\text{leak}} \leq 0.1\text{mA}$</p>
	Material is above the high level or fork is covered with material.	 <p>Switch no. 4 is off, failsafe high/maximum</p>	 On Indicating alarm status.	 <p>Relay OFF alarm contacts.</p> <p>$I_{\text{leak}} \leq 0.1\text{mA}$</p>	 <p>Relay OFF alarm contacts. (as it is)</p> <p>$I_{\text{leak}} \leq 0.1\text{mA}$</p>
Low level / underflow detection	No material at low level.	 <p>Switch no. 4 is on, failsafe low/minimum</p>	 On Indicating alarm status.	 <p>Relay OFF alarm contacts.</p> <p>$I_{\text{leak}} \leq 0.1\text{mA}$</p>	 <p>Relay OFF alarm contacts. (as it is)</p> <p>$I_{\text{leak}} \leq 0.1\text{mA}$</p>
	Material is above the low level or fork is covered with material.	 <p>Switch no. 4 is on, failsafe low/minimum</p>	 Off Indicating normal or healthy status.	 <p>Relay ON normal or healthy contacts.</p> <p>$I_L(\max) = 250\text{mA}$</p>	 <p>Relay OFF alarm contacts. (due to power failure)</p> <p>$I_{\text{leak}} \leq 0.1\text{mA}$</p>

Annexure-4

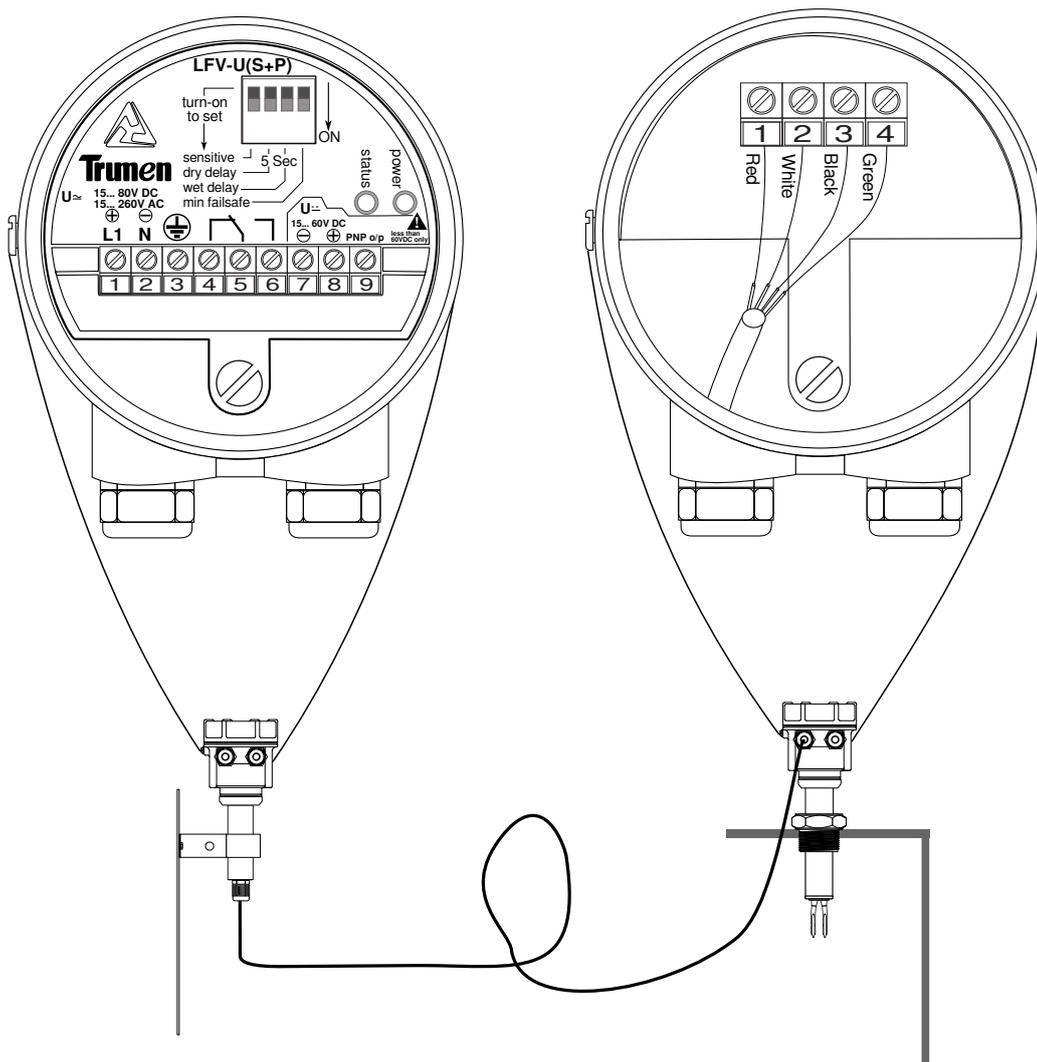
Electrical Connections - LFV-U(S+P) (EIUSP / ERUSP)

electrical connections (AC)

electrical connections (DC)



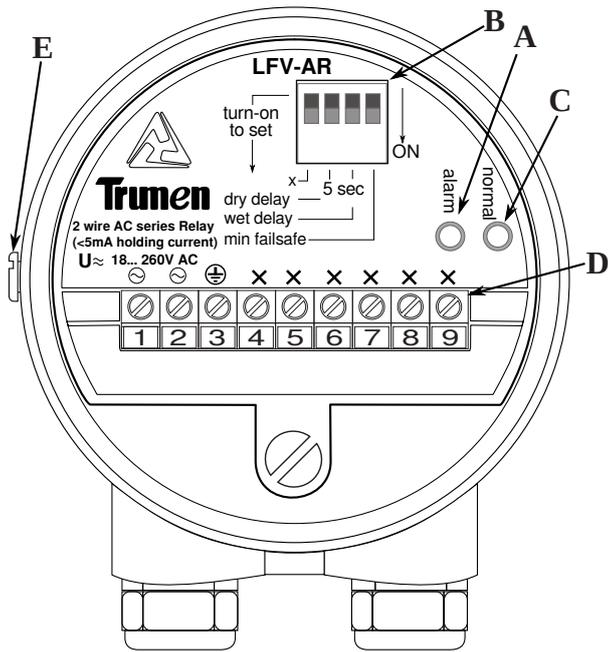
Remote probe connections for LFV-U(S+P) (ERUSP)



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

Annexure-5

Introduction - LFV-AR (EIAR)



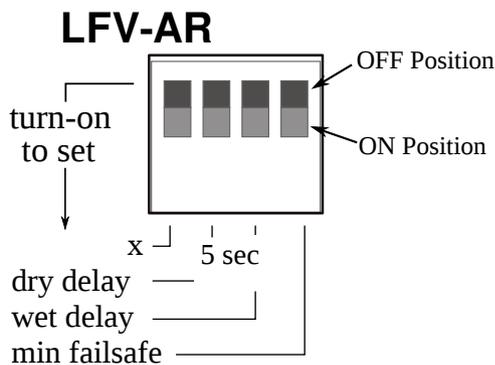
controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Normal LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

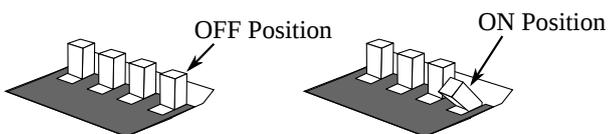
connection terminals

- 1 Live of AC Supply through fuse
- 2 Neutral of AC Supply input through specified series relay
18 to 260VAC 50/60 Hz series
- 3 Earth terminal for safety
- 4,5,6,7,8,9 Not used

configuration switches



- 1 Not used
- 2 “dry” (or uncovered) delay (5 second delay) setting (turn-on when 5 second more time is needed for fork out of fluid confirmation)
- 3 “wet” (or covered) delay (5 second delay) setting (turn-on when 5 second more time is needed for fork dipped in the fluid confirmation)
- 4 minimum failsafe select
Failsafe means alarm is same as power failure.
Turn on for underflow detection (min. failsafe)
Keep turned off for overflow detection (max. failsafe)

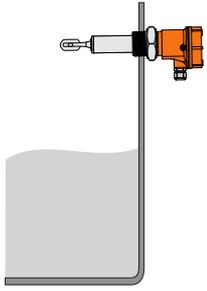
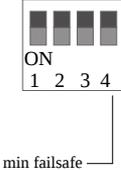
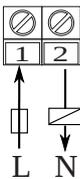
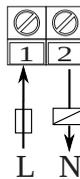
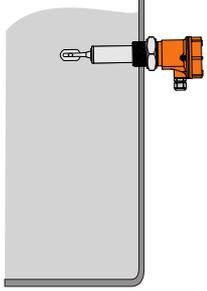
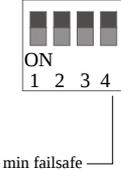
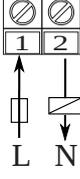
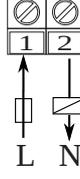
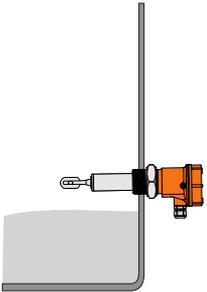
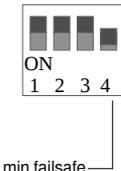
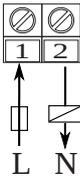
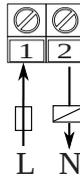
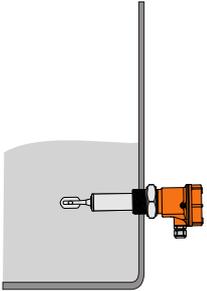
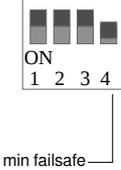
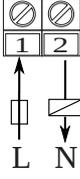
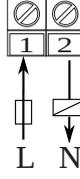


Example of Switch in On and Off Positions

Annexure-5

Operation Matrix - LFV-AR (EIAR)

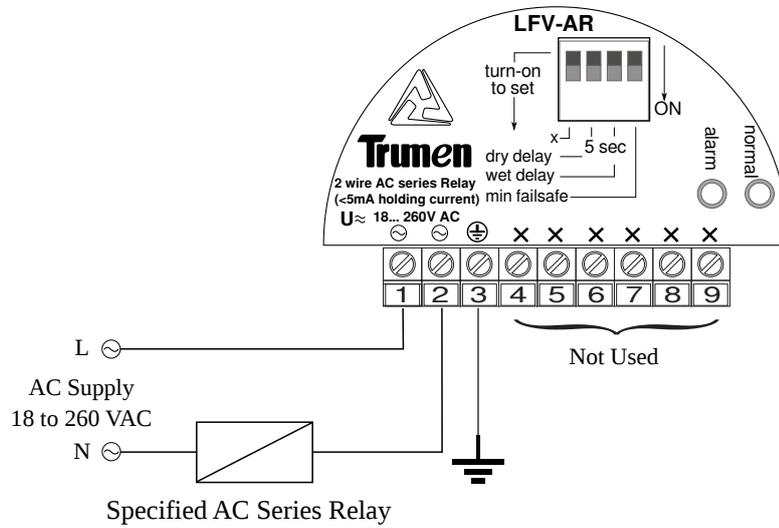
Series relay will be energized in normal or healthy condition. Series relay will be de-energized in alarm condition. Failsafe defines that the alarm and power failure / device failure conditions are same to the external system. Failsafe operation is best understood with the type of installation and following matrix.

Material & Installation	Switching Operation	Failsafe Setting	Status LED	Alarm/ Normal	Series Relay Status	
					Power ON	Power OFF
High level / overflow detection	 <p>When switch no. 4 is off (failsafe high / maximum). output status shows normal when there is no material at high switch point or fork is out of the fluid.</p>		<p>Red ○ Off</p> <p>Green ☀ On</p>	Normal or healthy	 <p>Series relay on</p>	 <p>Series relay off (due to power failure)</p>
	 <p>When switch no. 4 is off (failsafe high / maximum). output status shows alarm if fork is dipped in fluid at high switch point.</p>		<p>Red ☀ On</p> <p>Green ○ Off</p>	Alarm	 <p>Series relay off</p>	 <p>Series relay off as it is)</p>
Low level / underflow detection	 <p>When switch no. 4 is on (failsafe low / minimum). output status shows alarm when there is no material at low switch point or fork is out of the fluid.</p>		<p>Red ☀ On</p> <p>Green ○ Off</p>	Alarm	 <p>Series relay off</p>	 <p>Series relay off as it is)</p>
	 <p>When switch no. 4 is on (failsafe low / minimum). output status shows normal if fork is dipped in fluid at low switch point.</p>		<p>Red ○ Off</p> <p>Green ☀ On</p>	Normal or healthy	 <p>Series relay on</p>	 <p>Series relay off (due to power failure)</p>

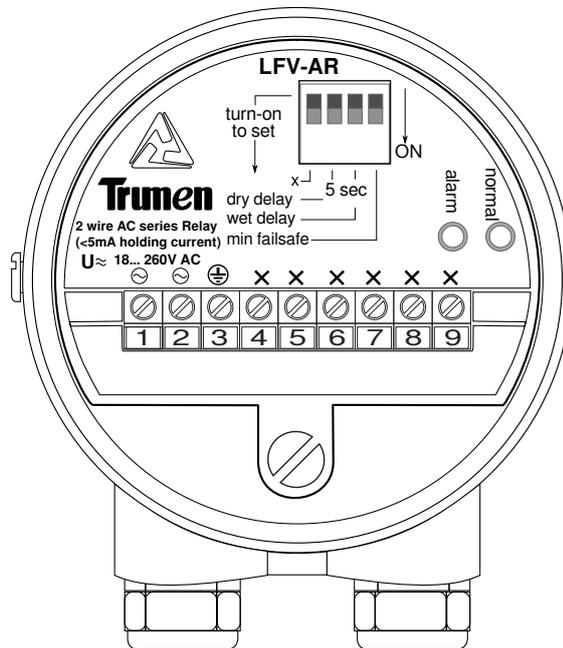
Annexure-5

Electrical Connections - LFV-AR (EIAR)

electrical connections (AC)



Use AC relay / contactor having maximum 150mA to magnetize and holding current should not be less than 4mA.
Voltage rating of AC relay should be as per input supply voltage.

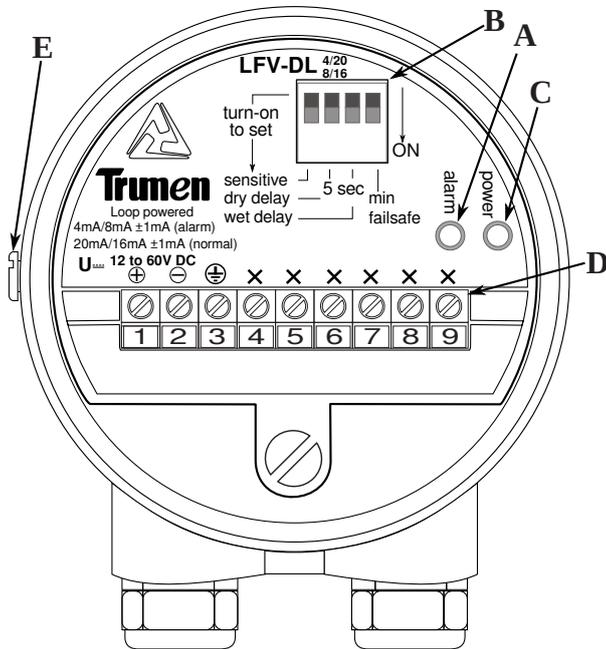


Proper connection to supply earth terminal (3) and the external earth terminal (screw) is must.

Annexure-6

Introduction - LFV-DL (EIDL)

4/20 - 8/16 mA Output



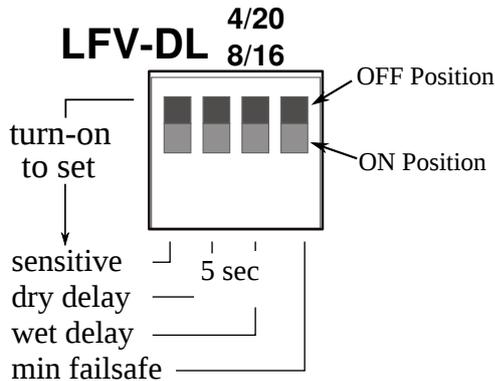
controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Power ON LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

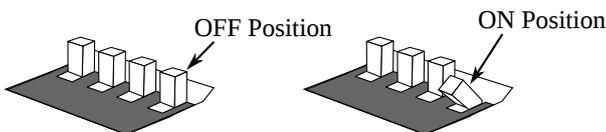
connection terminals

- 1 (+) of DC Supply input
- 2 (-) of DC Supply input
DC Supply: 12 to 60VDC
- 3 Earth terminal for safety
- 4,5,6,7,8,9 Not used

configuration switches



- 1 sensitivity control
sensitive setting for low density fluids
(turn-on for low density fluids etc.)
(keep turned-off for normal density fluids)
- 2 “dry” (or uncovered) delay (5 second delay) setting
(turn-on when 5 second more time is needed for
fork out of fluid confirmation)
- 3 “wet” (or covered) delay (5 second delay) setting
(turn-on when 5 second more time is needed for
fork dipped in the fluid, confirmation)
- 4 minimum failsafe select
Failsafe means alarm is same as power failure.
Turn on for underflow detection (min. failsafe)
Keep turned off for overflow detection (max. failsafe)

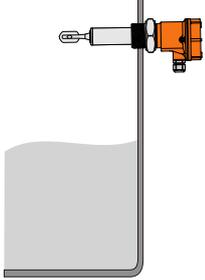
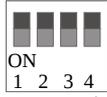
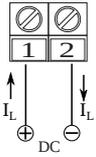
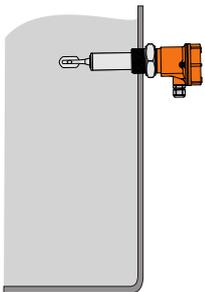
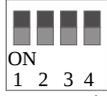
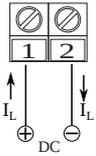
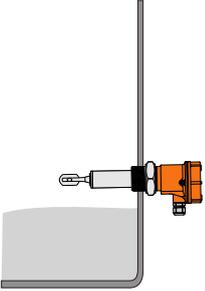
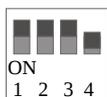
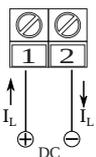
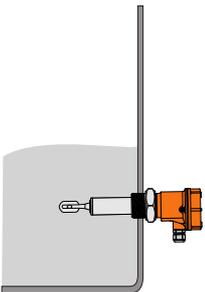
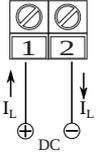


Example of Switch in On and Off Positions

Annexure-6

Operation Matrix - LFV-DL (EIDL)

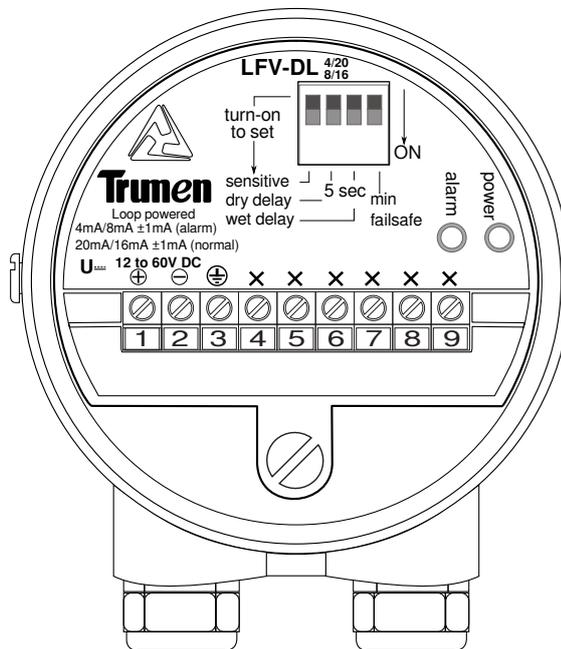
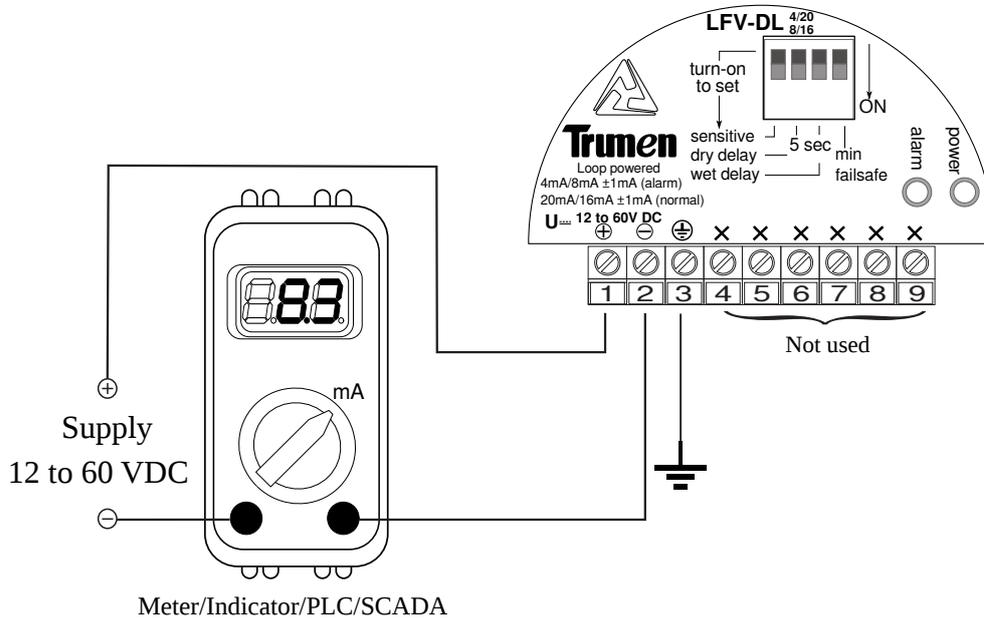
Miliampere output 16/20 is supplied in normal or healthy condition. Miliampere output 8/4 is supplied in alarm condition. Failsafe defines that the alarm and power failure / device failure conditions are same to the external system. Failsafe operation is best understood with the type of installation and following matrix.

Material & Installation	Switching Operation	Failsafe Setting	Status LED	Miliampere Output Status	
High level / overflow detection		When switch no. 4 is off (failsafe high / maximum). output status shows normal when there is no material at high switch point or fork is out of the fluid.	 min failsafe	○ Off Normal	 $I_L = 20\text{mA} / 16\text{mA}$
		When switch no. 4 is on (failsafe high / maximum). output status shows alarm if fork is dipped in fluid at high switch point.	 min failsafe	 On Alarm	 $I_L = 4\text{mA} / 8\text{mA}$
Low level / underflow detection		When switch no. 4 is on (failsafe low / minimum). output status shows alarm when there is no material at low switch point or fork is out of the fluid.	 min failsafe	 On Alarm	 $I_L = 4\text{mA} / 8\text{mA}$
		When switch no. 4 is off (failsafe low / minimum). output status shows normal if fork is dipped in fluid at low switch point.	 min failsafe	○ Off Normal	 $I_L = 20\text{mA} / 16\text{mA}$

Annexure-6

Electrical Connections - LFBV-DL (EIDL)

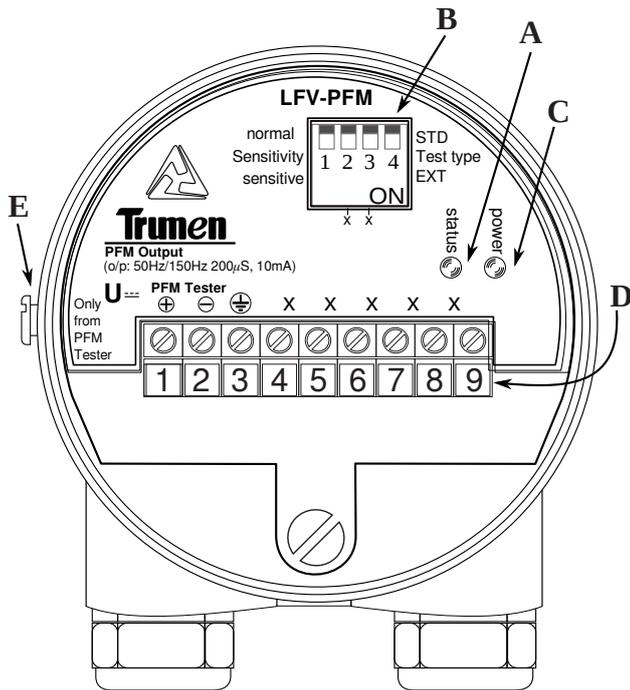
electrical connections (DC)



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

Annexure-7

Introduction - LFV-PFM



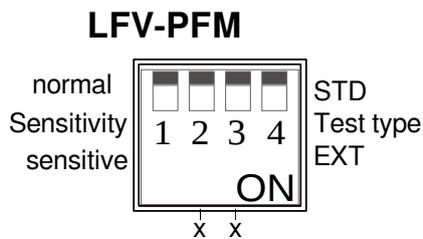
controls & indicators

- A Status Indicating LED
- B Configuration Switches
- C Power ON LED Indicator
- D Connecting Terminals
- E External Earthing Terminal

connection terminals

- 1 + of PFM Tester Sourced Supply
- 2 - of PFM Tester Sourced Supply
This supply must be taken from LFV PFM Tester Devices Only.
This input is not tolerant above 30VDC
Supplying more than 30V may damage the device.
- 3 Earth terminal for safety
- 4,5,6,7,8,9 Not used

configuration switches



- 1 Normal/Light Material sensitivity selector.
Turn ON this switch if density of material is smaller than 7gm/cc.
- 2 Not Used
- 3 Not Used
- 4 Power ON Test Mode selection switch

STD: Standard Test

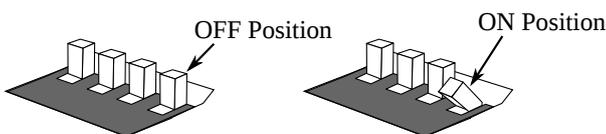
Performs Covered-Uncovered-Covered simulation for first 12 seconds of power ON.

Ignores Power-ON Test when fork is inside the material in accordance with overfill-safety

EXT: Extended Test

Performs Covered-Uncovered-Fault-Covered simulation for first 22 seconds of power ON.

Ignores Power-ON Test when fork is inside the the material in accordance with overfill-safety

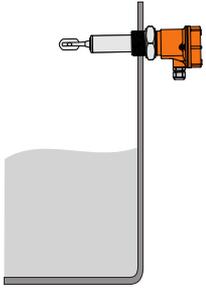
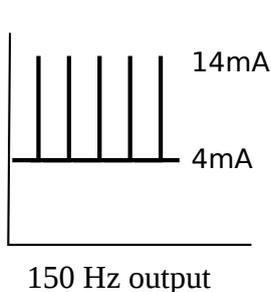
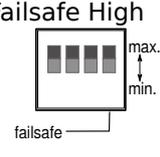
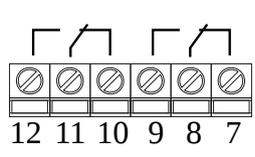
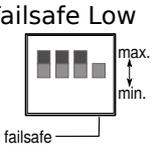
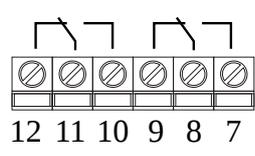
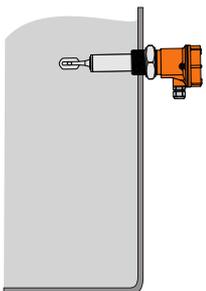
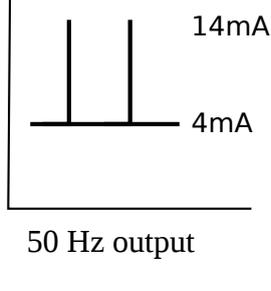
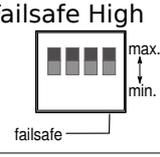
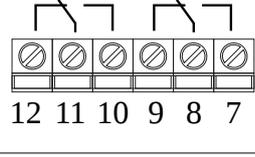
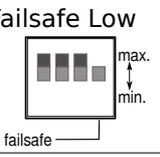
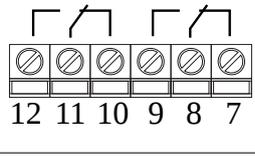
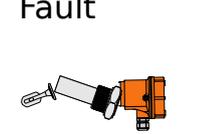
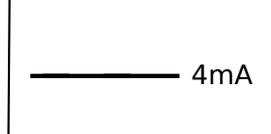
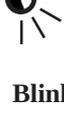
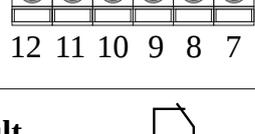
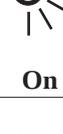
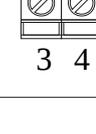


Example of Switch in On and Off Positions

Annexure-7

Operation Matrix - LFV-PFM

This device is meant to be operated through a LFV PFM Tester. Device can endure 30 VDC, but is meant to be operated solely via LFV PFM Tester. Since, level to electrical output is defined by a remote unit, called PFM tester, ability to remotely test the system integrity is built into the LFV-PFM sensor itself.

Material & Installation	LFV-PFM Output	LFV-PFM Status LED	LFV PFM Tester		
			Failsafe Setting	Alarm LED	Relay Contacts (DPDT)
			Failsafe High 	 Off	
			Failsafe Low 	 On	
			Failsafe High 	 On	
			Failsafe Low 	 Off	
			Alarm LED  On		
			Fault LED  On	Fault Relay SPST 	

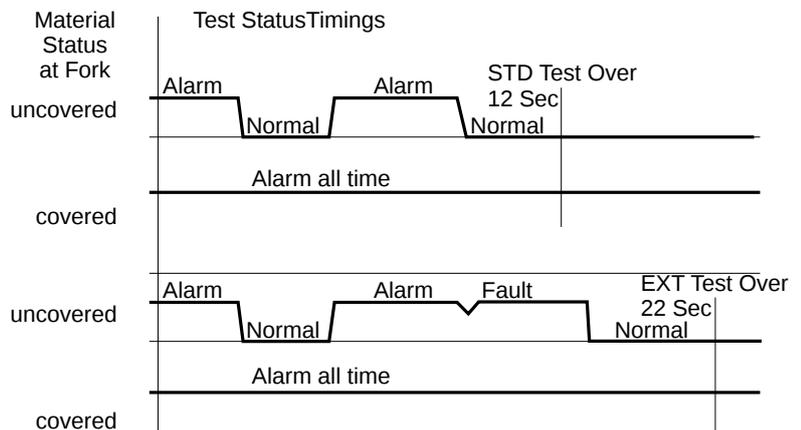
Power ON Self Test & Test Simulation:

LFV PFM Electronics Modules in sensors performs power-on-self test every time the power is turned ON. Two type of POST (Power On Self Test) can be selected at sensor, STD : Standard Test and EXT: Extended Test.

STD: Standard Test Simulation is maximum 12 seconds long.
EXT : Extended Test Simulation is maximum 22 seconds long.

Both test are not available when fork is covered with liquid, in accordance with overflow safety, as such may cause inadvertent overspill at the tank.

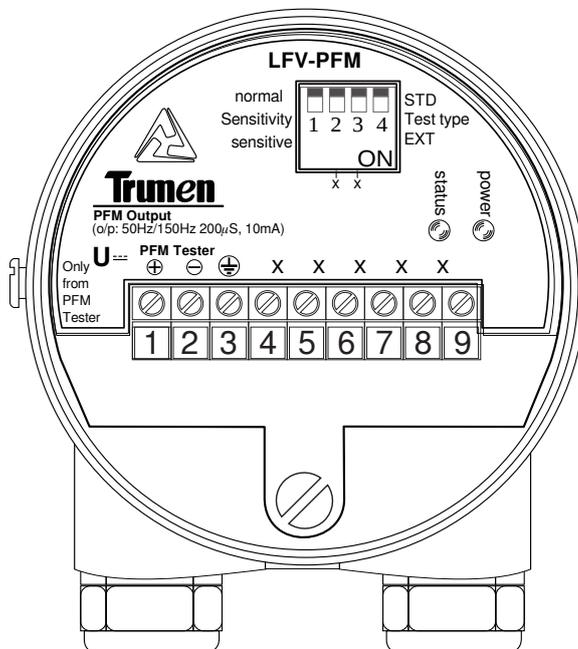
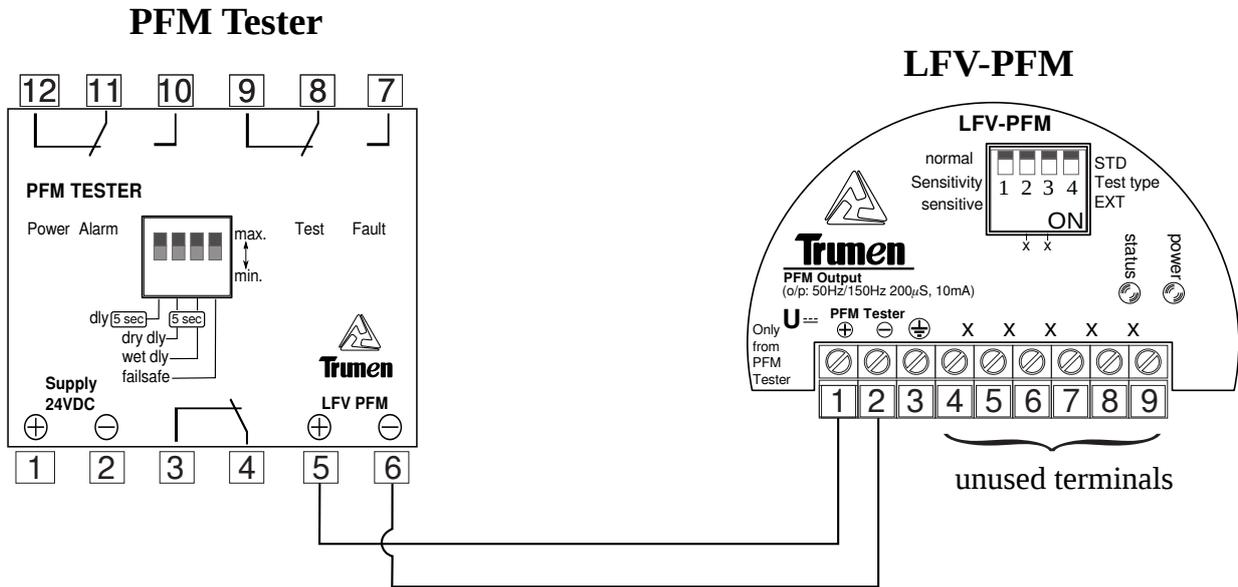
PFM Tester can initiate a test anytime when "Test" button is pushed apart from regular power ON.



Annexure-7

Electrical Connections - LFV-PFM

electrical connections (DC)



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