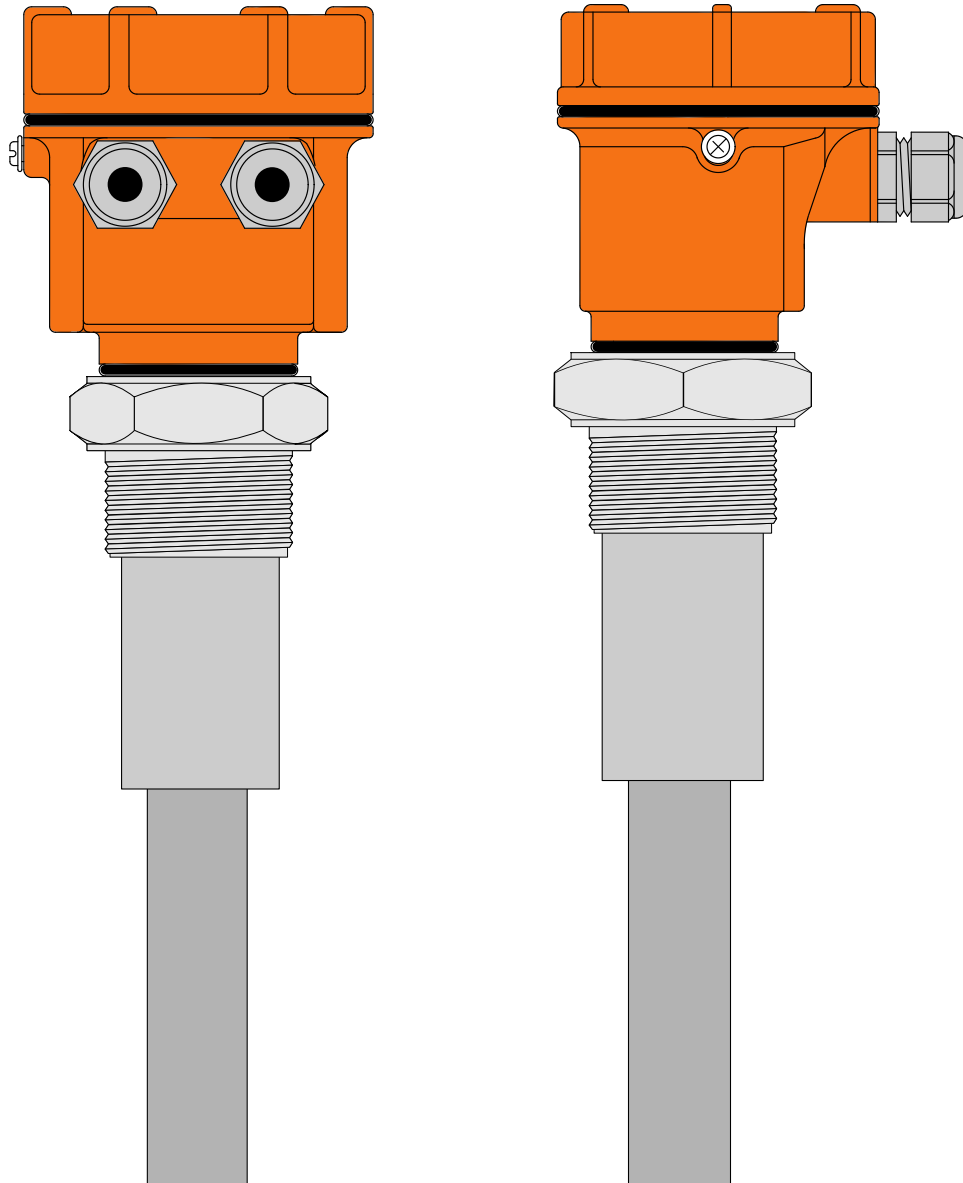


LMC:  
Capacitance Type Level  
Limit Switch for Liquids



# Instruction Manual



## Trumen Technologies Pvt. Ltd.

39 Mangal Nagar, Behind Sai Ram Plaza, Near Rajiv Gandhi  
Circle, AB Road, Indore, MP 452 001, India  
Phone: +91-731-497 2065

## Customer Support

Phone: +91-731-656 2425  
email: sales@trumen.in  
email: support@trumen.in  
web: www.trumen.in

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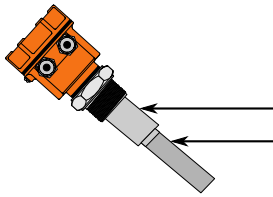
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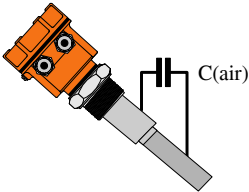
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# Operating Principle



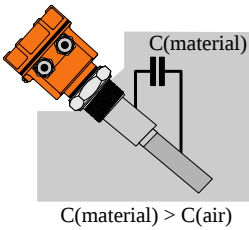
LMC Capacitance type limit switch is a static level sensor, Sensing parts of LMC capacitance level limit switch are:

Earth Extension (metallic process connection may be used as earth in-place of earth extension tubes)  
Sensing Rod (or Rope as per application)



The capacitance is formed by the sense rod and earth

When no material is present, the capacitance is analogically a multiple of probe dimension and dielectric constant of air  $\{\epsilon(\text{air})\approx 1\}$ .



When the material is present, the capacitance gets multiplied by dielectric constant of the material  $\{\epsilon(\text{material}) > 2\}$ .

This variation in capacitance, which is due to the dielectric property of material, is then translated into switching output by the LMC Capacitance level limit switch.

With two point independent type switches, two different values are mapped to two different outputs and thus only one level switch can provide two different level outputs.

# Technical Specification

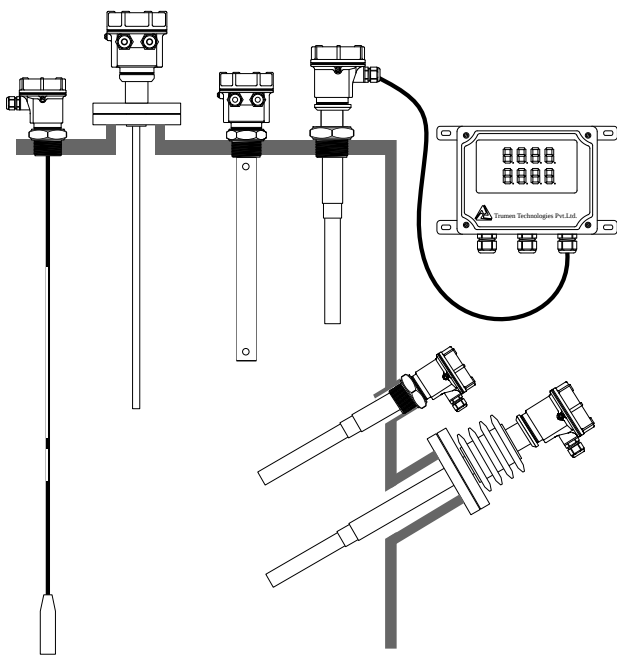
## Features

1. Fast Switching Response
2. High temperature endurable probes
3. Single sensor allows pump-control & multi-point switching
4. Easy calibration with or without material
5. Remote electronics with std 10 meters cable length
6. External indication LED available
7. Threaded & Flanged Mountings
8. Electronic Inserts support all requirements
9. Ingress protection : IP 68/65 (as per IS-13947)
10. 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
11. Compact size
12. Low power consumption

## Applications

1. Suitable for non-sticky liquids and solids
2. Suitable for side as well as top mounting
3. Minimum and maximum failsafe field selectable
4. Process temperature max 600°C (ceramic insulation)
6. Process pressure max. 20 bar
7. PTFE coated for corrosive and conductive liquids

## Typical Mountings



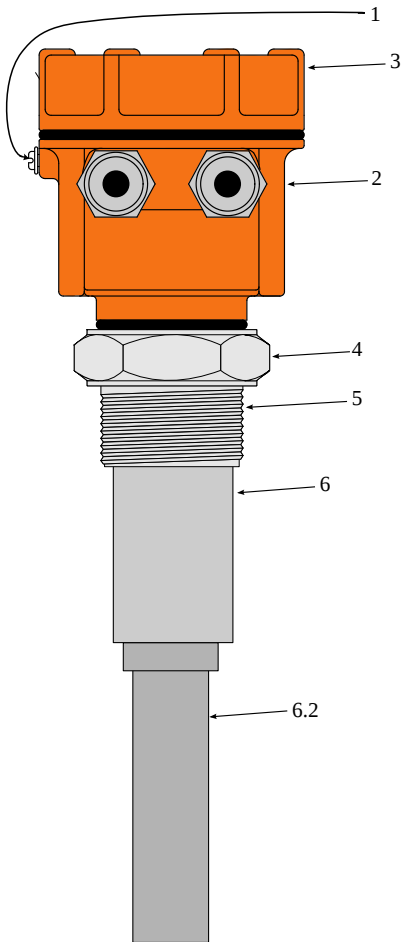
## Specifications

<b>EIUDD / ERUDD</b>	Integral / Remote Electronics DPDT Output Single/2 point (Pump) field settable
Supply & Output	Universal Supply DPDT Out 15 to 80 VDC
Relay Contact	15 to 260 VAC 50/60Hz 5 A each @ 24VDC or 220VAC
<b>EIUSI / ERUSI</b>	Integral / Remote Electronics 2 SPDT Relays for 2 Single point sensing
Supply & Output	Universal Supply DPDT Out 15 to 80 VDC
Relay Contact	15 to 260 VAC 50/60Hz 6 A each @ 24VDC or 230VAC
<b>EIUSP / ERUSP</b>	Integral / Remote Electronics 2 SPDT Relays for 2 Pump-control
Supply & Output	Universal Supply DPDT Out 15 to 80 VDC
Relay Contact	15 to 260 VAC 50/60Hz 6 A each @ 24VDC or 230VAC
<b>EIDPD / ERDPD</b>	Integral / Remote Electronics for PNP Output Single/2 point (Pump) field settable
Supply & Output	15 to 60 VDC, PNP
Output Limit	250mA max. Short Circuit Safe.
<b>EIDPI / ERDPI</b>	Integral / Remote Electronics with 2 PNP for 2 Single point sensing
Supply & Output	15 to 60 VDC, PNP
Output Limit	150mA max. Short Circuit Safe
<b>EIDPP / ERDPP</b>	Integral / Remote Electronics with 2 PNP for 2 Pump control
Supply & Output	15 to 60 VDC, PNP
Output Limit	150mA max. Short Circuit Safe.
<b>EIUSH / ERUSH</b>	Integral / Remote Electronics with 1 single point and 1 pump control
Supply & Output	15 to 80 VDC, PNP
Relay Contact	15 to 260 VAC 50/60Hz 6 A each @ 24VDC or 230VAC
<b>EINL</b>	NAMUR (L-H / H-L) as per IEC-60947-5-6
Supply & Output	8.2 VDC 1KΩ series resistance from NAMUR barrier 1 NAMUR Output ≤1.2mA & ≥2.2mA
<b>EINLI</b>	NAMUR (L-H / H-L) as per IEC-60947-5-6
Supply & Output	8.2 VDC 1KΩ series resistance from NAMUR barrier 2 x NAMUR Output (≤1.2mA & ≥2.2mA) each channel
<b>EIDLD</b>	Integral Electronics 4-20mA Loop Powered single/pump settable
Supply & Output	Two Wire DC 8 / 16 mA 15 to 60 VDC
Output Limit	8mA (-1mA max) / 16mA (+1mA max)
<b>ERR2R/ERR3R</b>	Remote Electronics Dual / Three SPDT Output, special cable
Supply & Output	80-270VAC, 50/60Hz
Relay Contact	5 A each @ 24VDC or 220VAC
<b>ERS2R/ERS3R</b>	Remote Electronics Dual / Three SPDT Output, normal shielded cable
Supply & Output	80-270VAC, 50/60Hz
Relay Contact	5 A each @ 24VDC or 220VAC
Sensor Cable (Special)	Enclosure for Remote Electronics is IP-65 and probe is IP-68
Sensor Cable (Shielded)	Remote electronics require special cable from probe to controller 10 meter standard length more available on demand Ordinary 2/3 core shielded cable as probe contains sensor unit
Min. Dielectric Constant	1.6 (non-hygroscopic)
Ambient Temp.	-20°C ... 60°C (-4°F ... 140°F)
Process Temp.	-20°C ... 100°C (-4°F ... 212°F)
Extended Process Temperature	-30°C ... 600°C (-22°F ... 1,112°F) (extensions & heat sinks required)
Process Pressure	absolute / max. 15 bar
Wetted Parts	SS-304, SS-316, SS-316L, PTFE, part ceramic
Process Connection	NPT / BSP 1", 1¼", 1½", 2" etc Flanged : ANSI/JIS/DIN/ASA/custom
Probe Insertion Length	Rigid Rod : 50mm to 3,000mm Flexible Rope : 100mm to 20,000mm

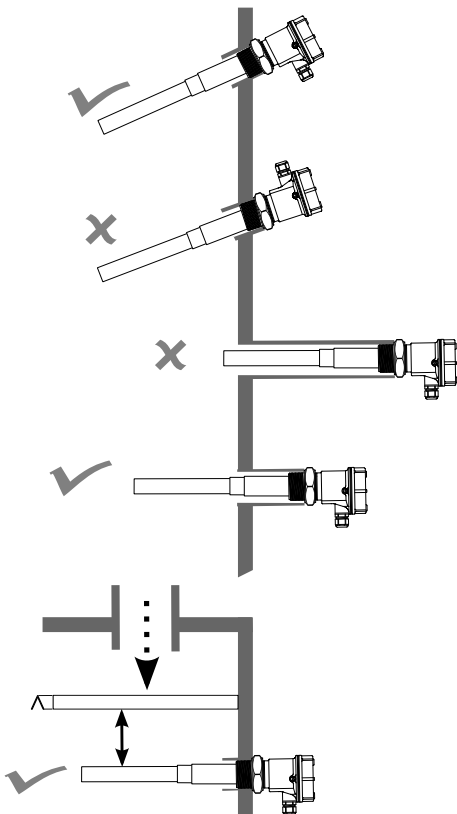
Specifications are subject to change without prior notice

# 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. Capacitance probe:-
  - 6.1 Should never be bent
  - 6.2 Should never be held from thin part
  - 6.3 Should never be cut or machined in any way
  - 6.4 Should never be extended by welding or machining

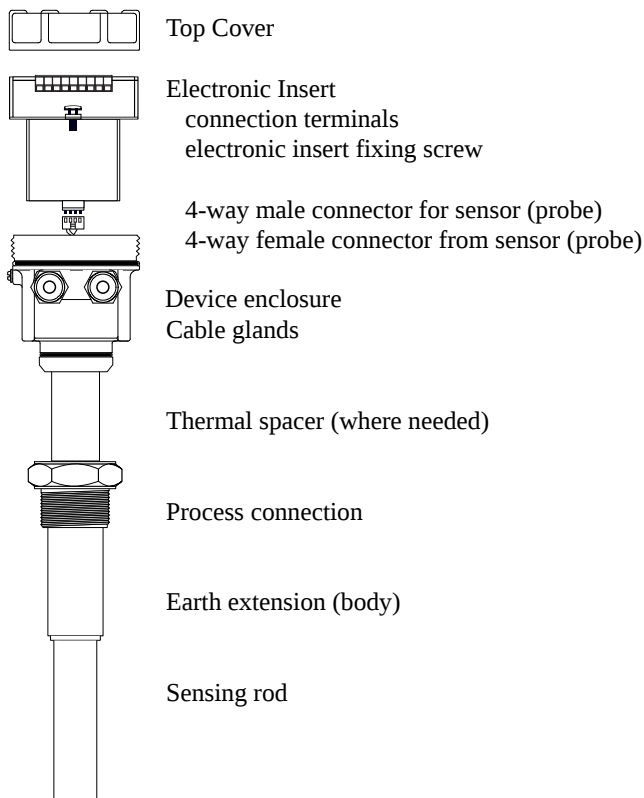


7. Cable entries must face downwards only
8. Nozzles should never be longer than the probe
9. If mounted directly under the material entry, always install a canopy of suitable strength at proper height from the probe
10. Never climb either by gripping or stepping over either the probe or its aluminum housing
11. 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.
After calibration no switching output when sense part of probe is touched	Sense and earth part of probe are shorted	Remove electronic insert and calibrate without probe, test calibration by touching and releasing rightmost pin of 4-pin male connector, with your finger	Capacitance probe is needed to be replaced, check for any visible damages on probe and inside LMC enclosure.
Abrupt switching (in case of LMC-UD)	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.
Device shows material present even when material is well below the probe	Sticky material or calibration was done at too sensitive setting	Recalibrate and choose higher hysteresis by turning off more LED's at calibration	Recalibrate at insensitive setting reduces effect of sticky material.
Device shows material absent even when probe is fully covered with material	Very low dielectric material not causing enough change of capacitance	Recalibrate at sensitive setting or consider ordering probe with longer and wider sense part	If recalibration doesn't seem to solve then probe with bigger sense surface has to be ordered.
Calibration and settings are all OK but device switches abruptly or chatters continuously	Power supply carrying extra noise and capacitance 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, capacitance enclosure earthing screw and capacitance probe 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 shows material present permanently	Material deposition sensor  Not enough thermal extension spacer used in material with high temperature	Clean up deposited materials on capacitance probe as a part of maintenance schedule  Order device of proper thermal grade for proper service life of device	Care is needed to be taken while ordering.  Scheduled cleaning of sense probe in sticky material application is recommended.

# Maintenance and Spares



Shown on the left are various parts of LMC level switch.

Separatable parts are

1. Electronic insert in short called 'electronics'
2. Probe + 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.

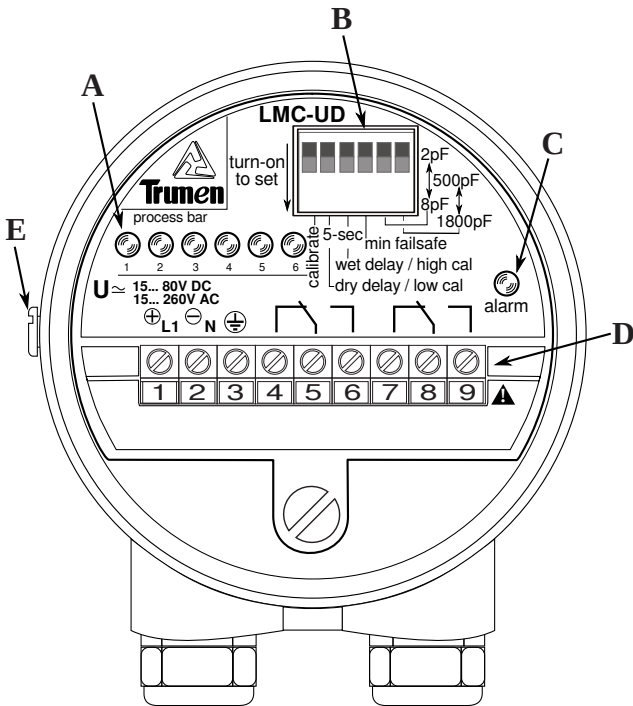
Match the mounting screw hole of electronics with that of enclosure and fix the screw.

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



# Annexure-1

## Introduction - LMC-UD (EIUDD / ERUDD)



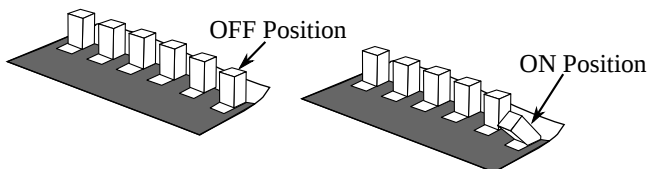
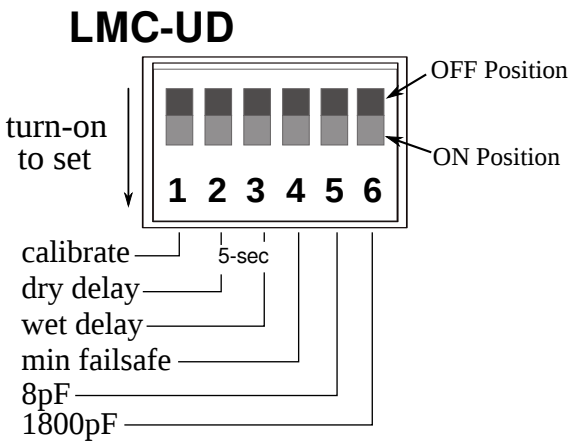
### controls & indicators

- A Process indicating LED bar
- B Configuration switches
- C Alarm indication
- 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 Supply 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



Example of Switch in On and Off Positions

- 6 "500 & 1800pF" switch: For less than 100mm probe length and / or low dielectric materials (switch #6 OFF) is used. For more than 100mm probe length and / or high dielectric materials or conductive liquids (switch #6 ON) is used.

- 1 "calibrate" switch: This switch allows calibration in two calibration modes:
  - 1.1 Single Point (switches 2 & 3 must be open)
  - 1.2 Pump Control (requires switches 2 & 3)
 Please refer next page for calibration process.
- 2 "dry" (or uncovered) delay switch: During normal operation, this switch is turned ON if 5 second uncovered delay is required. During 'pump-control' calibration this switch is turned ON to set low switching point.
- 3 "wet" (or covered) delay switch: During normal operation, this switch is turned ON if 5 second covered delay is required. During 'pump-control' calibration this switch is turned ON to set high switching point.
- 4 "minimum" failsafe select switch:
  - Failsafe means alarm is same as power failure.
  - OFF = High (maximum) for overflow detection (device will give alarm in covered condition)
  - ON = Low (minimum) for underflow detection (device will give alarm in uncovered condition)
- 5 "insensitivity" switch (2pF / 8pF): For low dielectric materials 2pF insensitivity (switch #5 OFF) is used, for high dielectric materials 8pF insensitivity (switch #5 ON) is used.

# Annexure-1

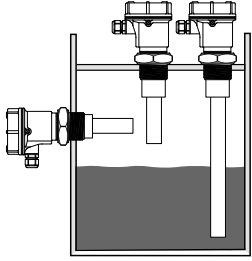
## Calibration - LMC-UD (EIUDD / ERUDD)

Before starting the calibration procedure, we need to decide the position of DIP Switch 5 & 6.

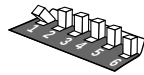
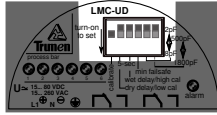
In case the service material is having low dielectric eg. cement, dry sand, PVC chips, PVC resin, oil, diesel, petrol, kerosin etc, keep the DIP Switch 5 in OFF condition (2pF position).

In case the service material is having high dielectric eg. iron ore, kitchen flour, water, shampoo, mud, materials having moisture content like, rice paddy, soap etc, keep the DIP Switch 5 in ON condition (8pF position). For oil and nonconductive material having any probe length keep the DIP Switch no.6 in OFF condition (500pF position). For conductive material having probe length between 1000 to 3500mm keep DIP Switch no.6 in ON condition (1800pF position).

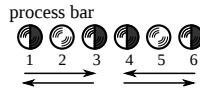
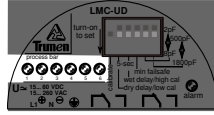
## Calibration (Single Point)



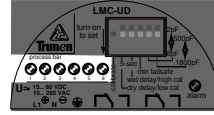
For top / side mounted probes, empty the material so the probe will not touch the material. For top/side mounted probes, fill the material up-to the switch point level.



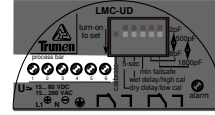
Turn "calibrate" switch ON  
Make sure that switch 2, 3 & 4 are OFF (as shown above)  
Switch no.5 & 6 (ON or OFF) as per service material and probe length requirement as described above.



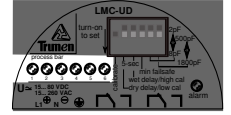
All LEDs of process bar will blink sequentially. This indicates that current level recognized as switching level.



6th LED will then start blinking. This means that the device is setting itself 1 pF insensitive to current material level for 2 pF sensitivity. It will be 4 pF for 8 pF sensitivity.



6th LED will then turn OFF. This means that the device is setting itself 2 pF insensitive to current material level for 2 pF sensitivity. It will be 8 pF for 8 pF sensitivity.

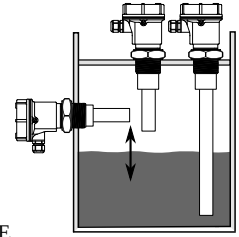


This sequence will repeat itself. When 5th, 6th LEDs are off, the device has set itself 4 pF insensitive to current material level for 2 pF sensitivity. It will be 16 pF insensitive for 8 pF sensitivity.

**!** process bar  
1 2 3 4 5 6  
1pF 2pF 2pF 2pF 2pF 2pF  
If switch no.5 is OFF total 11pF insensitivity can be achieved. For tip sensitive calibration 4pF is recommended. For in between probe length calibration 2pF is recommended

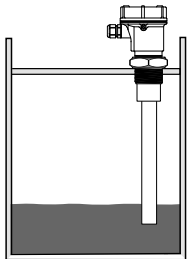
**!** process bar  
1 2 3 4 5 6  
4pF 8pF 8pF 8pF 8pF 8pF  
If switch no.5 is ON, total 44pF insensitivity can be achieved. For tip sensitive calibration 16pF insensitivity is recommended. For in between probe length calibration 8pF is recommended

process bar  
1 2 3 4 5 6  
5th & 6th LED Off  
When required insensitivity is reached (4pF is most common setting) Turn "calibrate" switch OFF.

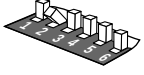
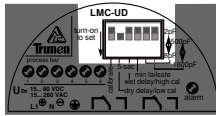


device is now ready for use as single point level switch.

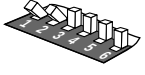
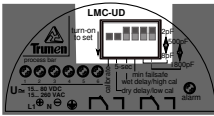
## Calibration (Two-Point or Pump Control)



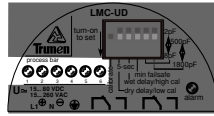
Empty the material down to the required low switch point level



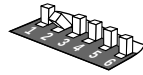
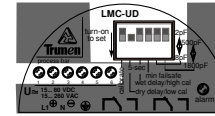
Turn dry delay switch (switch #2) ON  
Make sure that switch 1, 3 & 4 are OFF (as shown above)  
Switch no.5 & 6 (ON or OFF) as described above



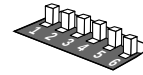
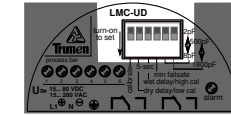
Turn calibrate (switch #1 ON)  
process bar  
1 2 3 4 5 6  
All LEDs of process bar will blink sequentially for 4 sec.



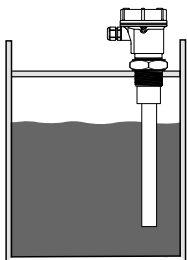
Then only LED 1 will blink. This shows that level is read as low level switch point of pump control calibration



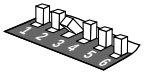
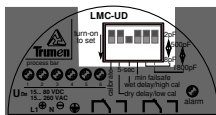
Turn calibrate switch OFF.



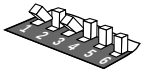
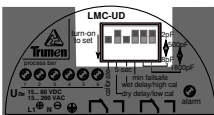
Turn dry delay switch OFF. This sequence of turning off the switches is important. Low level switch point of pump control has been calibrated.)



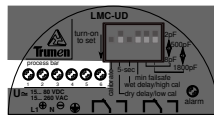
Fill the material up to the required high switch point level



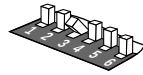
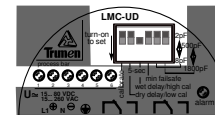
Turn wet delay switch (switch #3) ON  
Make sure that switch 1, 2 & 4 are OFF (as shown above)



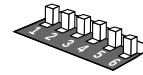
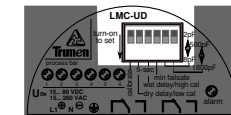
Turn calibrate switch (switch #1) ON  
Make sure that switch 2 is OFF (as shown above)



LED 6 blinking, other LEDs ON  
LEDs will turn on, then wait for 3-4 seconds here. only LED 6 will blink. This shows that level is read as high level by device.



Turn calibrate switch OFF.



Turn wet delay switch OFF. This sequence of turning off the switches is important. Two point pump control has been calibrated. Device is ready for use.

**!** When device is calibrated in two-point (or pump control) process bar LEDs will follow material level while in use.

process bar  
1 2 3 4 5 6  
Low Level

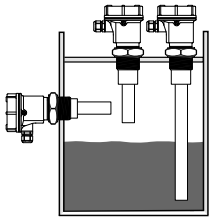
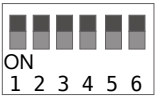

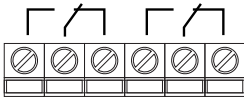
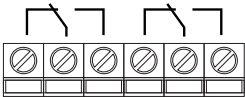
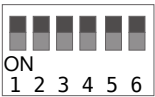

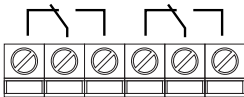
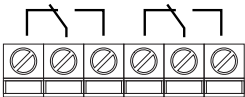
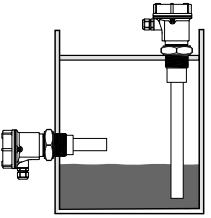
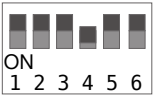

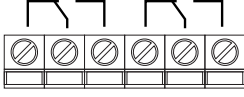
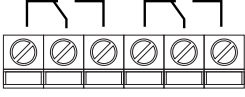
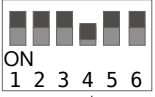

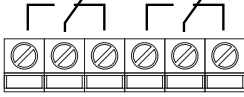
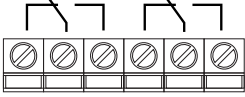
process bar  
1 2 3 4 5 6  
Mid Level

process bar  
1 2 3 4 5 6  
High Level

# Annexure-1

## Operation Matrix - LMC-UD (EIUDD / ERUDD)

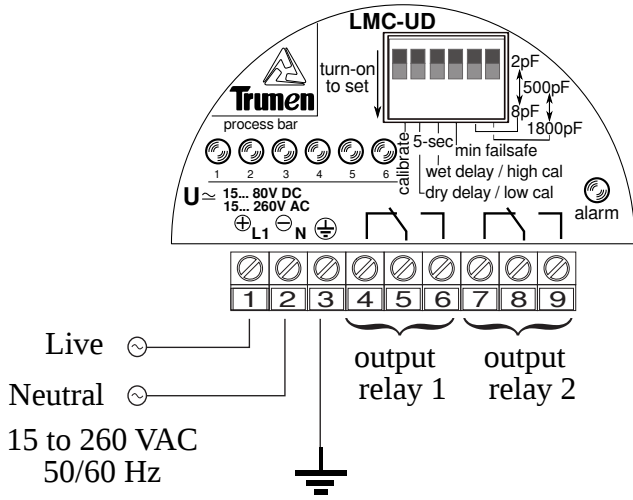
This model is suitable for single point level switching operation as well as pump control operation between high level and low level. Failsafe defines that the alarm and power failure / device failure conditions are same to the external system. Failsafe operation is best understood with the type of installation 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.	 min failsafe Switch no. 4 is off, failsafe high/maximum.	 Off Indicating normal or healthy status.	 4 5 6 7 8 9 Relay 'ON' normal or healthy contacts.	 4 5 6 7 8 9 Relay 'OFF' alarm contacts. (due to power failure)
	Material is above the high level or probe is covered with material.	 min failsafe Switch no. 4 is off, failsafe high/maximum.	 On Indicating alarm status.	 4 5 6 7 8 9 Relay 'OFF' alarm contacts.	 4 5 6 7 8 9 Relay 'OFF' alarm contacts. (as it is)
Low level / underflow detection 	No material at low level.	 min failsafe Switch no. 4 is on, failsafe low/minimum.	 On Indicating alarm status.	 4 5 6 7 8 9 Relay 'OFF' alarm contacts.	 4 5 6 7 8 9 Relay 'OFF' alarm contacts. (as it is)
	Material is above the low level or probe is covered with material.	 min failsafe Switch no. 4 is on, failsafe low/minimum.	 Off Indicating normal or healthy status.	 4 5 6 7 8 9 Relay 'ON' normal or healthy contacts.	 4 5 6 7 8 9 Relay 'OFF' alarm contacts. (due to power failure)

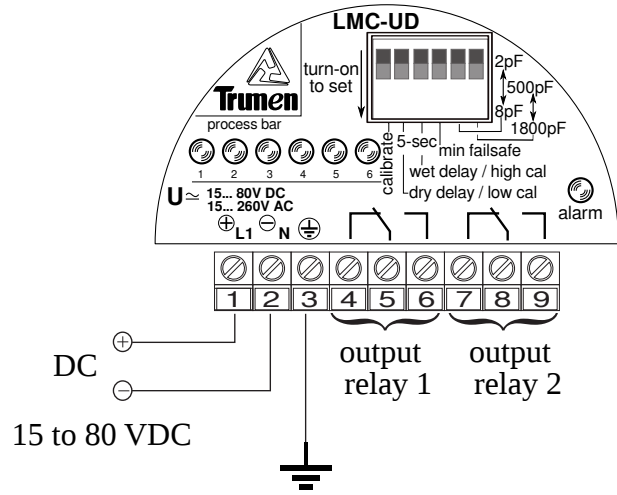
# Annexure-1

## Electrical Connections - LMC-UD (EIUDD / ERUDD)

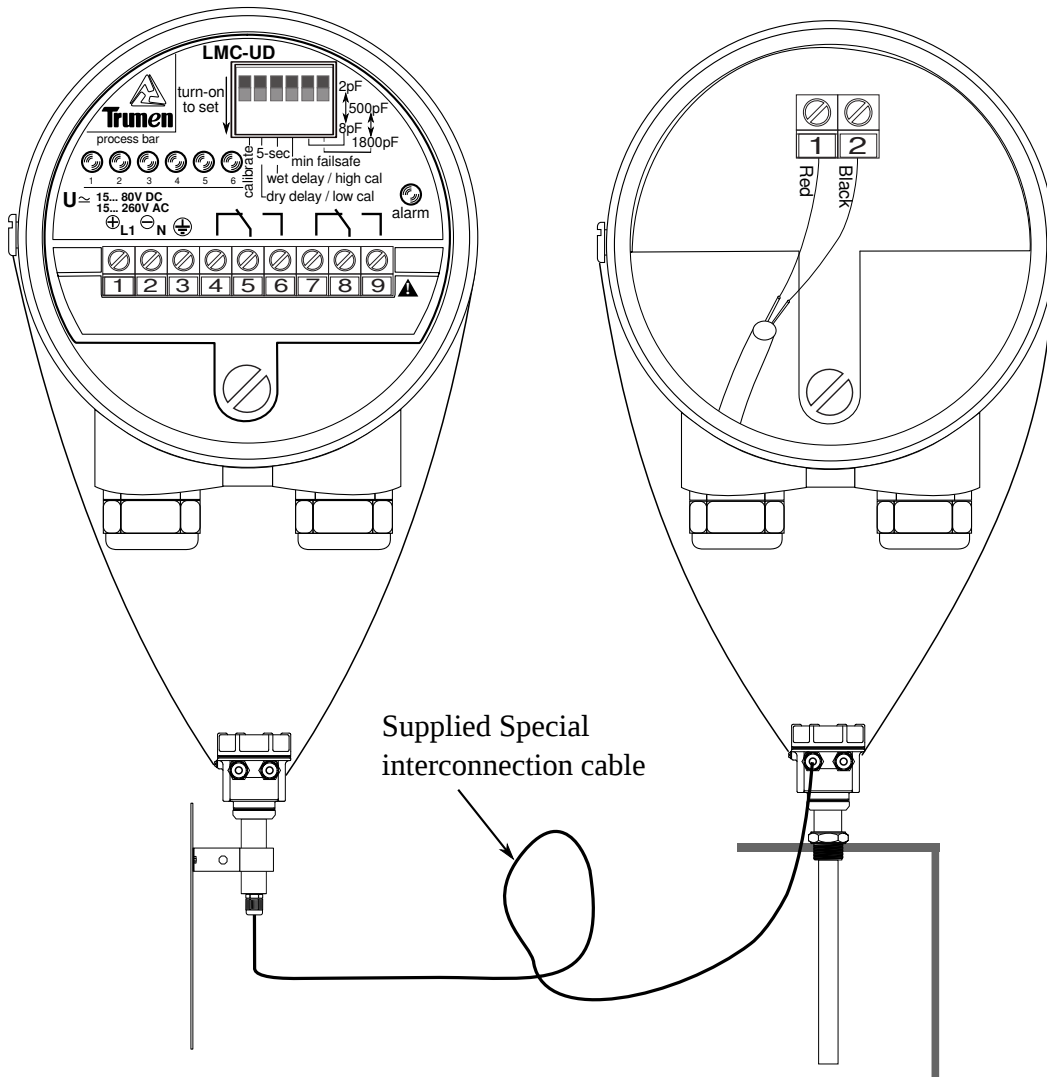
### electrical connections (AC)



### electrical connections (DC)



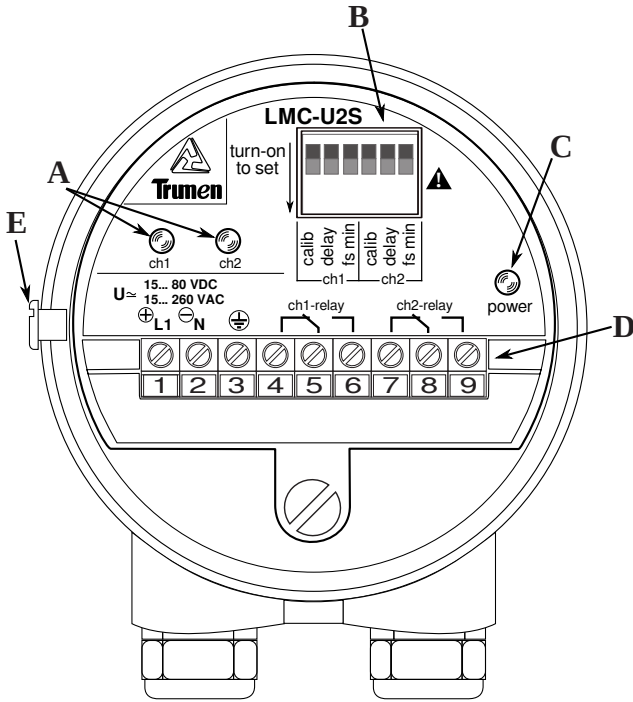
### Remote probe connections for LMC-UD (ERUDD)



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

# Annexure-2

## Introduction - LMC-U2S (EIUSI / ERUSI)



### controls & indicators

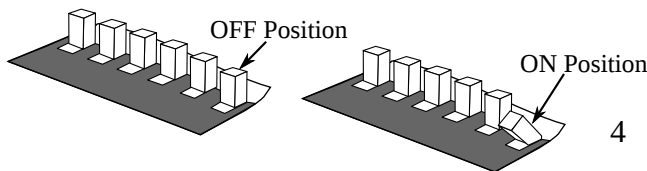
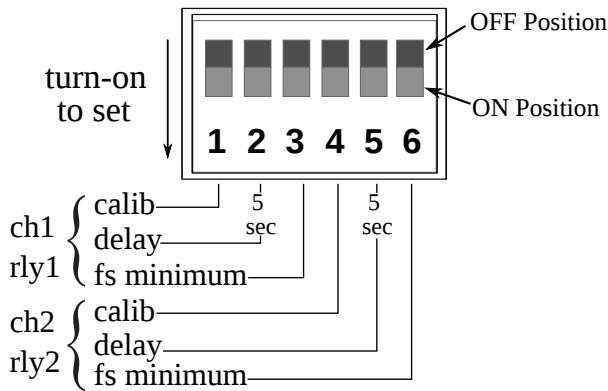
- A Output Indication LEDs
- B Configuration Switches
- C Power Indication LED
- D Connecting Terminals
- E External Earthing Terminal

### 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 Supply earth terminal for safety
  - 4 Normally connected terminal of relay 1
  - 5 Common terminal of relay 1
  - 6 Normally open terminal of relay 1
  - 7 Normally connected terminal of relay 2
  - 8 Common terminal of relay 2
  - 9 Normally open terminal of relay 2

### configuration switches

#### LMC-U2S



Example of Switch in On and Off Positions

(device will give alarm in covered condition)  
Switch ON: Low (minimum) for underflow detection  
(device will give alarm in uncovered condition)

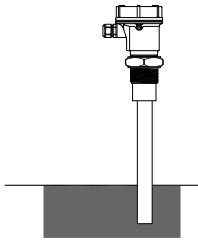
- 1 “calib-rly1” switch: This switch sets switching level for relay 1. Please refer next page for calibration process.
- 2 “5sec dly rly1” switch: This switch sets 5 second delay for relay 1 output if set in ON position, else delay is close to 1 sec for relay 1 in both (dry and wet positions) if this is turned OFF.
- 3 “fs minimum-rly1” switch: Failsafe means alarm is same as power failure.  
Switch OFF: High (maximum) for overflow detection (device will give alarm in covered condition)  
Switch ON: Low (minimum) for underflow detection (device will give alarm in uncovered condition)
- 4 “calib-rly2” switch: This switch sets switching level for relay 2. Please refer next page for calibration process.
- 5 “5sec dly rly2” switch: This switch sets 5 second delay for relay 2 output if set in ON position, else delay is close to 1 sec for relay 2 in both (dry and wet positions) if this is turned OFF.
6. “fs minimum-rly2” switch: Failsafe means alarm is same as power failure.  
Switch OFF: High (maximum) for overflow detection

# Annexure-2

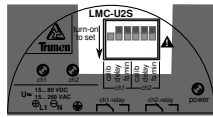
## Calibration - LMC-U2S (EIUSI / ERUSI)

This model is suitable for two point independent level switching operation. Relay 1 and relay 2 can be calibrated at any switch point level throughout the probe length. Failsafe select switch (maximum / minimum) is provided for both relay, so any relay can be used for high level or low level. 5 sec time delay for probe covered and uncovered is also provided for both relay.

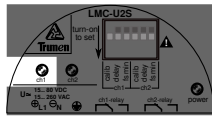
### Calibrate Relay 1 (CH1)



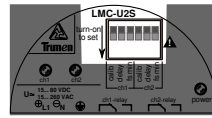
Fill the material up-to-the low switch point level (It is assumed that relay 1 is used for low level detection)



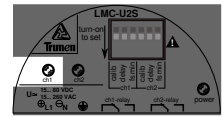
Turn "calib-ch1" switch #1 ON  
Make sure that switch 2 & 3 are OFF (as shown above)



alarm ch1 LED will start blinking rapidly for 5 sec then blink slowly. After 3 or 4 blinks (For oil take 1 sec only)

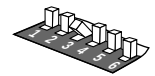


Turn "calib-ch1" switch #1 OFF  
The level is calibrated as switch point for ch1 relay 1



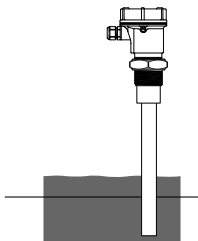
alarm ch1 LED will turn OFF  
This is because the existing level is not MORE than set level.

Turn fs minimum switch #3 ON

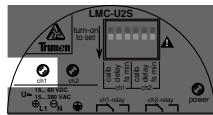


alarm ch1 LED will turn ON

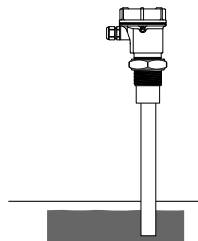
### Test Relay 1 (CH1)



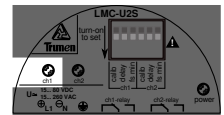
Fill the material slightly beyond the set point



alarm ch1 LED will turn OFF  
Because this is the healthy / normal level for low level detection. Indicating that level is MORE than the set level for relay1

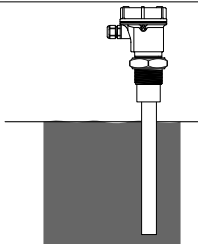


Lower the level slightly below the set point

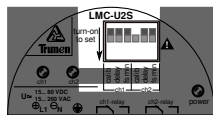


alarm ch1 LED will turn ON  
Because this is the alarm level for low level detection. Indicating that level is LESS than the set level for relay1

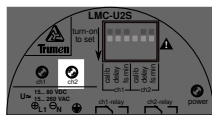
### Calibrate Relay 2 (CH2)



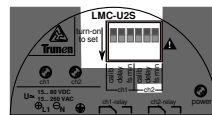
Fill the material up-to-the high switch point level (It is assumed that relay 2 is used for high level detection)



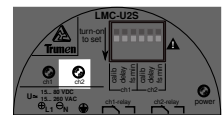
Turn "calib-ch2" switch #4 ON  
Make sure that switch 5 & 6 are OFF (as shown above)



alarm ch2 LED will start blinking rapidly for 5 sec then blink slowly. After 3 or 4 blinks (For oil take 1 sec only)

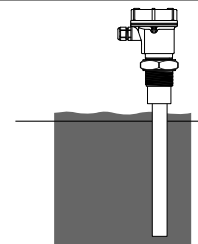


Turn "calib-ch2" switch #4 OFF  
The level is calibrated as high switch point for ch2 relay 2

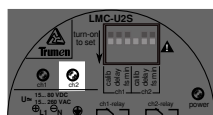


alarm ch2 LED will turn OFF  
This is because existing level is not MORE than set level. Kept fs minimum switch #6 as it is in OFF condition

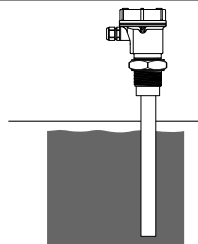
### Test Relay 2 (CH2)



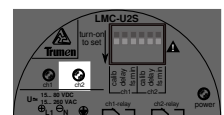
Fill the material slightly beyond the set point



alarm ch2 LED will turn ON  
Because this is the alarm level for high level detection. Indicating that level is MORE than the set level for relay 2



Lower the level slightly below the set point

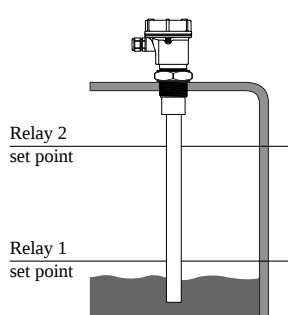
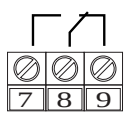
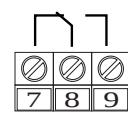
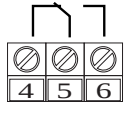
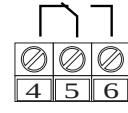
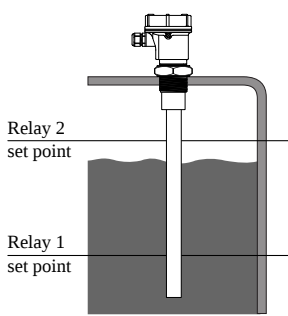
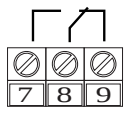
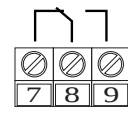
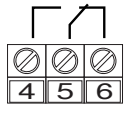
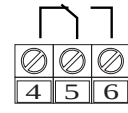
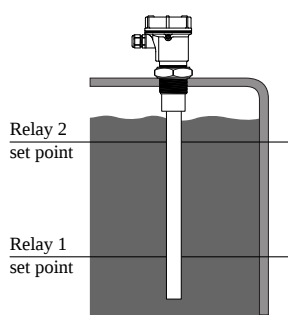
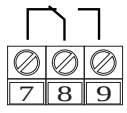
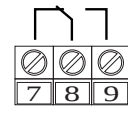
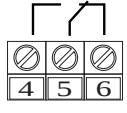
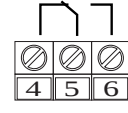


alarm ch2 LED will turn OFF  
Because this is the normal / healthy level for high level detection. Indicating that level is LESS than the set level for relay 2

# Annexure-2

## Operation Matrix - LMC-U2PI (EIUSI / ERUSI)

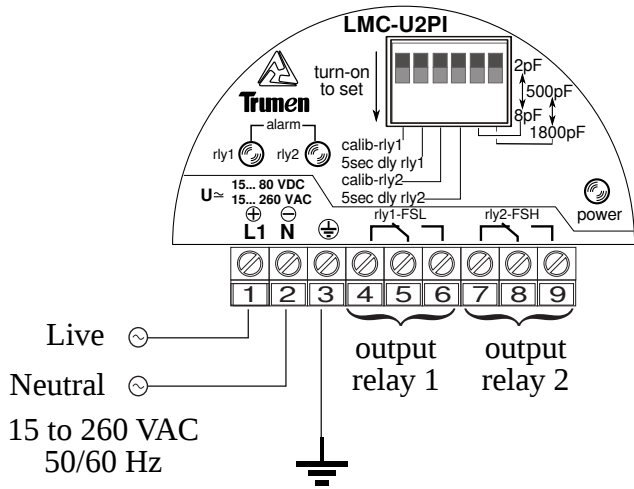
LMC-U2PI have 2 SPDT relays and can be made to switch at any level independent of each other. These two relays are internally set in fixed failsafe modes. Relay 1 is always in failsafe low and relay 2 is always in failsafe high. Contacts terminals of relays while in alarm remain same as during power failure. Status of LED, Relay terminals as per set level is shown in following table.

Material Position Relative to Calibrated Relay Set Points	Switching Operation	Alarm LED Status	Relay Contacts	
			Power ON	Power OFF
 <p>Relay 2 set point</p> <p>Relay 1 set point</p>	Relay 2 in normal or healthy as level is less than set level (Relay 2 is Failsafe High)	Alarm LED Relay 2 ● OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in alarm as level is less than set level (Relay 1 is Failsafe Low)	Alarm LED Relay 1 ☀ ON Indicating alarm status	 Relay 1 OFF alarm contacts	 Relay 1 OFF alarm contacts (as it is)
 <p>Relay 2 set point</p> <p>Relay 1 set point</p>	Relay 2 in normal or healthy as level is less than set level (Relay 2 is Failsafe High)	Alarm LED Relay 2 ● OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in normal or healthy as level is more than set level (Relay 1 is Failsafe Low)	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
 <p>Relay 2 set point</p> <p>Relay 1 set point</p>	Relay 2 in alarm as level is more than set level (Relay 2 is Failsafe High)	Alarm LED Relay 2 ☀ ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)
	Relay 1 in normal or healthy as level is more than set level (Relay 1 is Failsafe Low)	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)

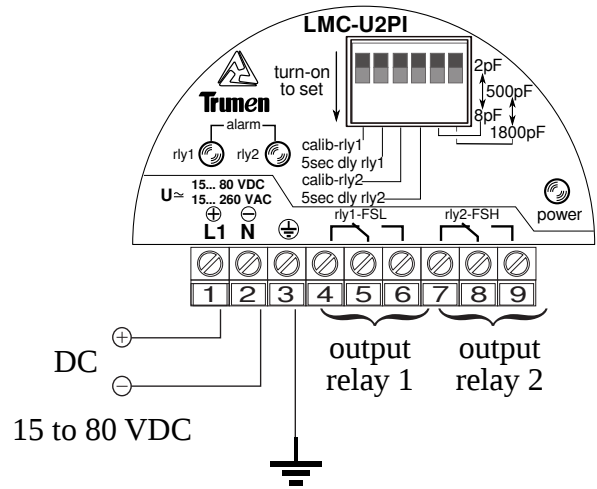
# Annexure-2

## Electrical Connections - LMC-U2PI (EIUSI / ERUSI)

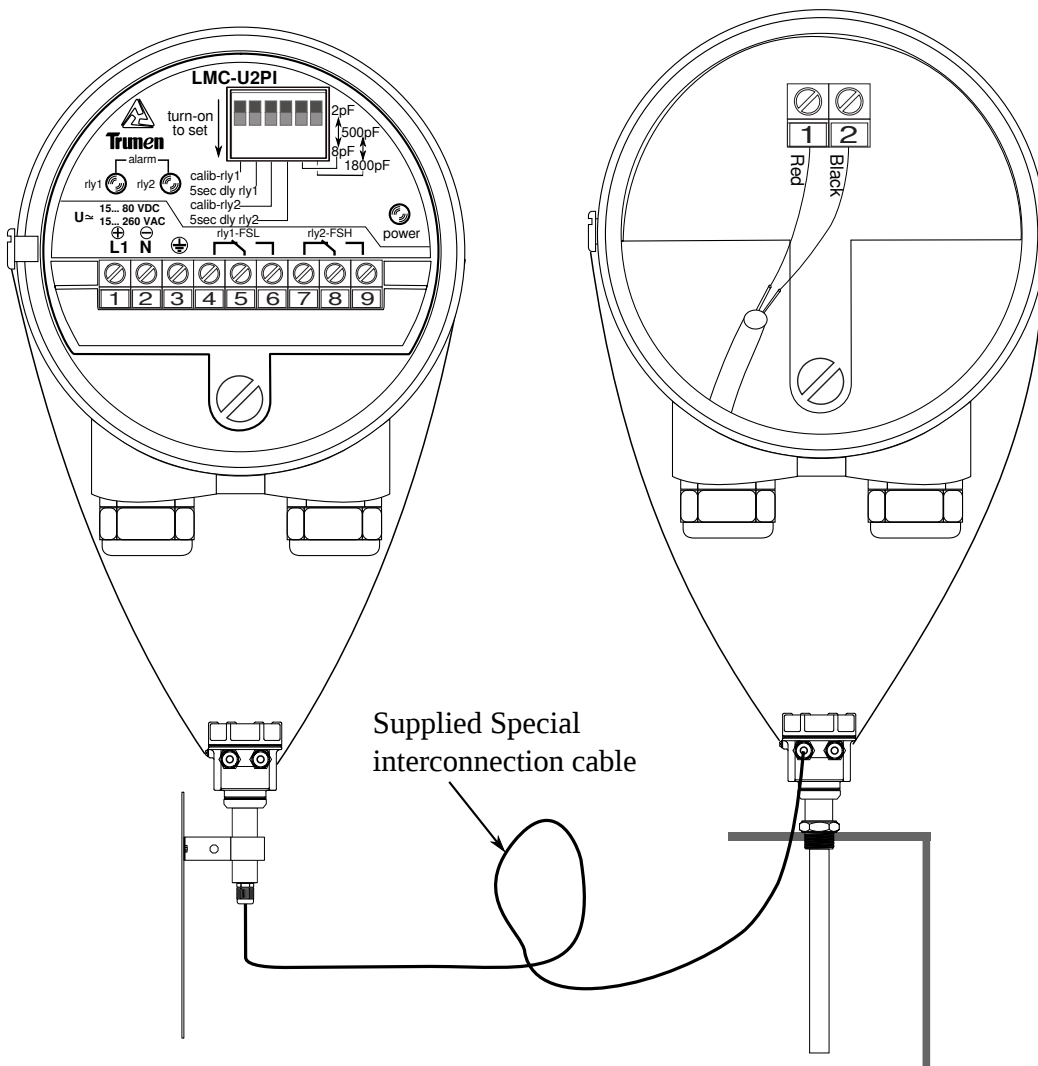
### electrical connections (AC)



### electrical connections (DC)



### Remote probe connections for LMC-U2PI (ERUSI)

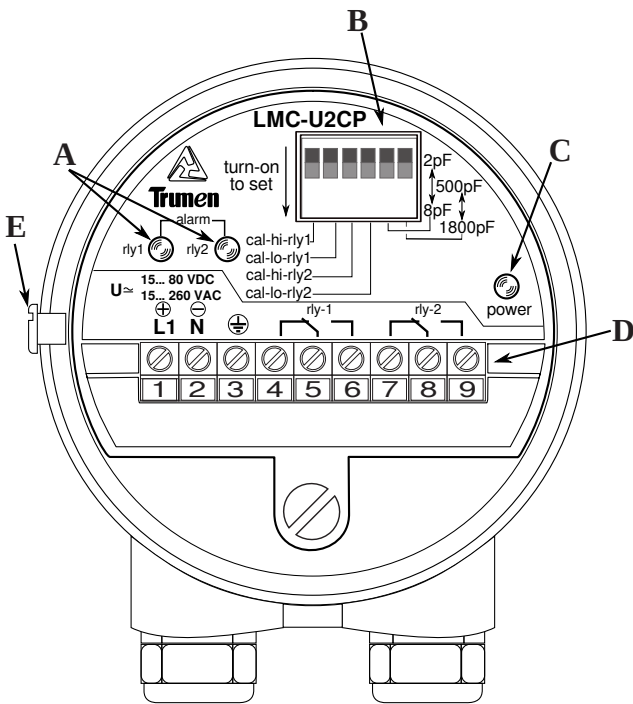


**Proper connection to supply earth terminal (3) and the external earth terminal (screw) is must.**



# Annexure-3

## Introduction - LMC-U2CP (EIUSP / ERUSP)



### controls & indicators

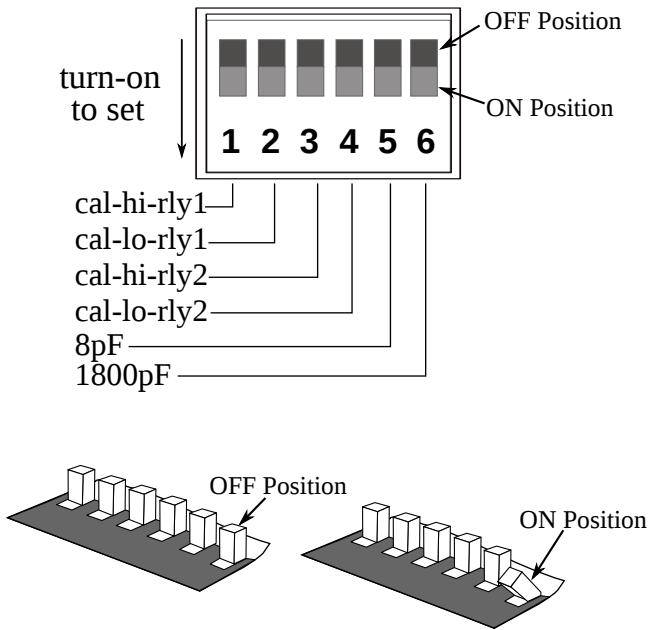
- A Process Indicating LEDs
- B Configuration Switches
- C Power Indication
- D Connecting Terminals
- E External Earthing Terminal

### 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 relay1
  - 5 Common terminal of relay1
  - 6 Normally open terminal of relay1
  - 7 Normally connected terminal of relay2
  - 8 Common terminal of relay2
  - 9 Normally open terminal of relay2

### configuration switches

#### LMC-U2CP



- 1 "cal-hi-rly1" switch: This switch is used to calibrate high level switch point of pump control differential switching for rly1
- 2 "cal-lo-rly1" switch: This switch is used to calibrate low level switch point of pump control differential switching for rly1
- 3 "cal-hi-rly2" switch: This Switch is used to calibrate high level switch point of pump control differential switching for rly2
- 4 "cal-lo-rly2" switch: This switch is used to calibrate low level switch point of pump control differential switching for rly2
- 5 "range1 & range2 switch  
For small probes and / or low dielectric materials range1 (switch # 5 OFF) is used  
For long probes and / or high dielectric materials range2 (switch # 5 ON) is used

Example of Switch in On and Off Positions

# Annexure-3

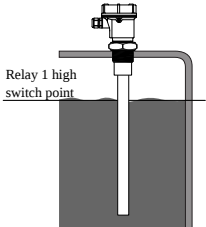
## Calibration - LMC-U2CP (EIUSP / ERUSP) - Relay-1

Before starting the calibration procedure, we need to decide the range / position of DIP Switch 5.

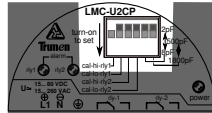
In case the service material is having low dielectric eg. cement, dry sand, PVC chips, PVC resin, oil, diesel, petrol, kerosin etc, keep the DIP Switch 5 in OFF condition (2pF position).

In case the service material is having high dielectric eg. iron ore, kitchen flour, water, shampoo, mud, materials having moisture content like, rice paddy, soap etc, keep the DIP Switch 5 in ON condition (8pF position). For oil and nonconductive material having any probe length keep the DIP Switch no.6 at 500pF position (OFF). For conductive material having probe length between 1000 to 3500mm keep DIP Switch no.6 at 1800pF position (ON).

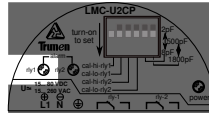
### Calibrate Relay 1 (Two Point pump control high level switch point) Failsafe Minimum



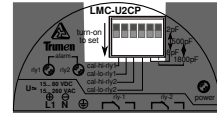
Fill the material up to the high level switch point of pump control rly-1.



Turn "cal-hi-rly1" switch ON  
Make sure that switch 2, 3 & 4 are OFF (as shown above).  
Switch no.5 & 6 (ON or OFF) as per service material requirement as described above.



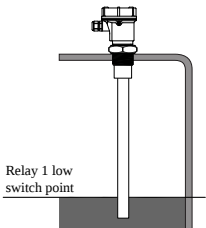
alarm rly1 LED will start blinking. Wait till three or four blinks.



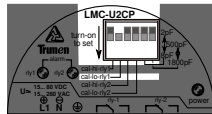
Turn "cal-hi-rly1" switch OFF

The level is calibrated as high level switch point of pump control rly-1.

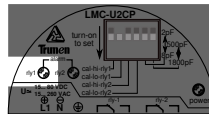
### Calibrate Relay 1 (Two Point pump control low level switch point) Failsafe Minimum



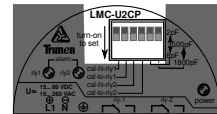
Fill the material down to the required low level switch point of pump control rly-1.



Turn "cal-lo-rly1" switch ON  
Make sure that switch 1, 3 & 4 are OFF (as shown above).  
Switch no.5 & 6 (ON or OFF) as per service material requirement as described above.



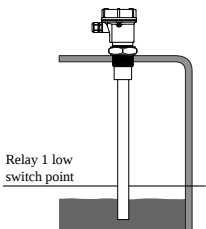
alarm rly1 LED will start blinking. Wait till three or four blinks.



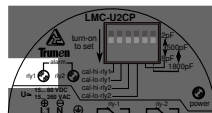
Turn "cal-lo-rly1" switch OFF

The level is calibrated as low level switch point of pump control rly-1.

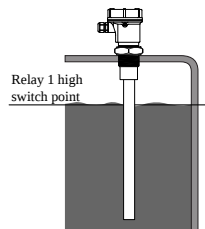
### Test Relay 1



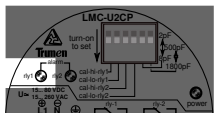
Lower the level slightly (below the low level switch point of pump control rly-1).



alarm rly1 LED will turn ON because this is the alarm level for rly-1.  
Relay-1 is in minimum (low) failsafe by default.



Fill the material up to the rly-1 high switch point.  
Alarm rly-1 LED will remain ON until material not reached at high level switch point.



As soon as material reached at high level switch point.  
Alarm rly-1 LED will turn OFF because this is the normal or healthy level for pump control rly-1 (minimum failsafe).

# Annexure-3

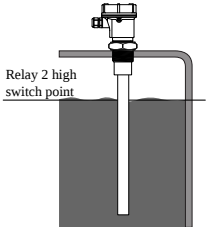
## Calibration - LMC-U2CP (EIUSP / ERUSP) - Relay-2

Before starting the calibration procedure, we need to decide the range / position of DIP Switch 5.

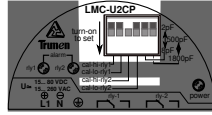
In case the service material is having low dielectric eg. cement, dry sand, PVC chips, PVC resin, oil, diesel, petrol, kerosin etc, keep the DIP Switch 5 in OFF condition (2pF position).

In case the service material is having high dielectric eg, iron ore, kitchen flour, water, shampoo, mud, materials having moisture content like, rice paddy, soap etc, keep the DIP Switch 5 in ON condition (8pF position). For oil and nonconductive material having any probe length keep the DIP Switch no.6 at 500pF position (OFF). For conductive material having probe length between 1000 to 3500mm keep DIP Switch no.6 at 1800pF position (ON).

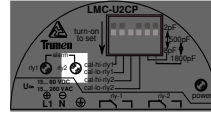
### Calibrate Relay 2 (Two Point pump control high level switch point) Failsafe Maximum



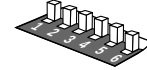
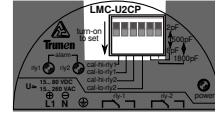
Fill the material up to the high level switch point of pump control rly-2.



Turn "cal-hi-rly2" switch ON  
Make sure that switch 1, 2 & 4 are OFF (as shown above).  
Switch no.5 & 6 (ON or OFF) as per service material requirement as described above.



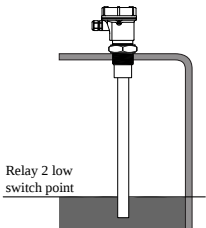
alarm rly2 LED will start blinking. Wait till three or four blinks.



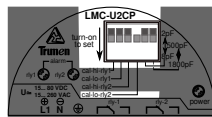
Turn "cal-hi-rly2" switch OFF

The level is calibrated as high level switch point of pump control rly-2.

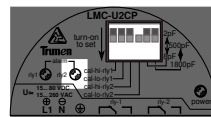
### Calibrate Relay 2 (Two Point pump control low level switch point) Failsafe Maximum



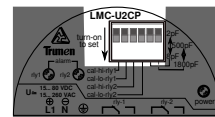
Fill the material down to the required low level switch point of pump control rly-2.



Turn "cal-lo-rly2" switch ON  
Make sure that switch 1, 2 & 3 are OFF (as shown above).  
Switch no.5 & 6 (ON or OFF) as per service material requirement as described above.



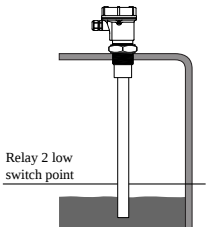
alarm rly2 LED will start blinking. Wait till three or four blinks.



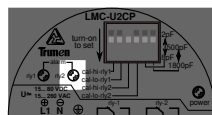
Turn "cal-lo-rly2" switch OFF

The level is calibrated as low level switch point of pump control rly-2.

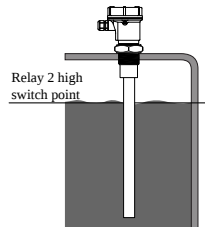
### Test Relay 2



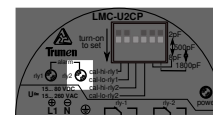
Lower the level slightly (below the low level switch point of pump control rly-2).



alarm rly2 LED will turn OFF because this is the normal or healthy level for rly-2.  
Relay-2 is in maximum (high) failsafe by default.



Fill the material up to the rly-2 high switch point.  
Alarm rly-2 LED will remain OFF until material not reached at high level switch point.



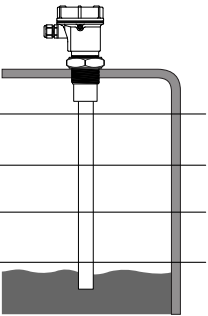

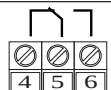
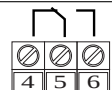

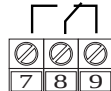
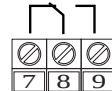
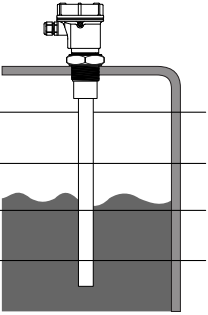

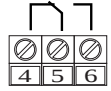
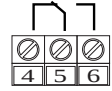


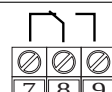
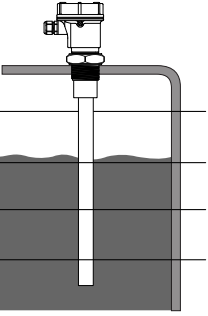


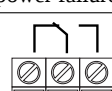

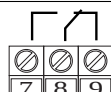
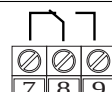
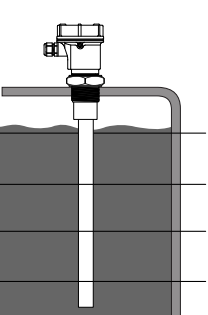

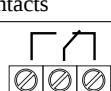
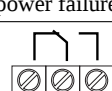

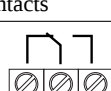
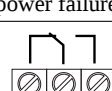
As soon as material reached at high level switch point.  
Alarm rly-2 LED will turn ON because this is the alarm level for pump control rly-2 (maximum failsafe).

# Annexure-3

## Operation Matrix - LMC-U2CP (EIUSP / ERUSP)

LMC-U2CP have 2 SPDT relays and each relay can be set for 2 point differential switching (pump control) between any two levels in the tank. These two relays are independent of each other and operate as per calibration of particular relay.

These two relays are internally set in fixed failsafe modes. Relay 1 is always in failsafe low (minimum) and relay 2 is always in failsafe high (maximum). Contacts of relays while in alarm remain same as during power failure. Status of LED and Relay contacts as per set level is shown in following table.

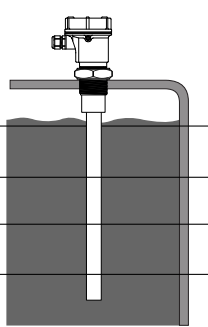
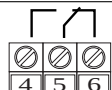


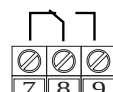
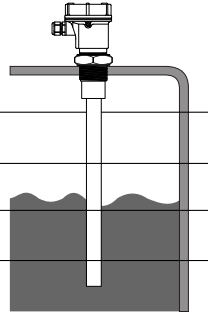

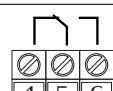
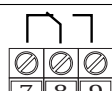
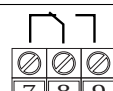
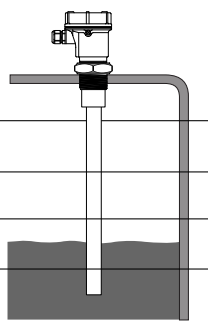



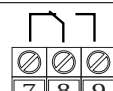
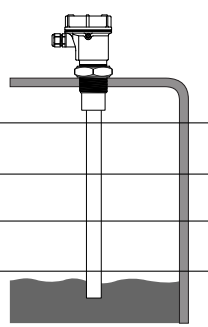
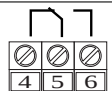
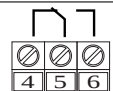
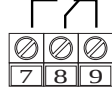
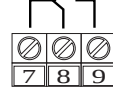
Alarm LED and Relay Status during material filling in the tank				
Material Position Relative to Calibrated Relay Set Points	Switching Operation	Alarm LED Status	Relay Contacts	
			Power ON	Power OFF
	Relay 1 in alarm condition as level is less than set low level # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1  ON Indicating alarm status	 Relay 1 OFF alarm contacts	 Relay 1 OFF alarm contacts (as it is)
	Relay 2 in normal or healthy condition as level is less than set high level # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2  OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in alarm condition as level is above set low level but not reached at set high level point	Alarm LED Relay 1  ON Indicating alarm status	 Relay 1 OFF alarm contacts	 Relay 1 OFF alarm contacts (as it is)
	Relay 2 in normal or healthy condition as level is above set low level but not reached at set high level point	Alarm LED Relay 2  OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in normal or healthy condition as level is above set high level # Relay 1 is failsafe low	Alarm LED Relay 1  OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in normal or healthy condition as level is above set low level but not reached at set high level point	Alarm LED Relay 2  OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in normal or healthy condition as level is above set high level	Alarm LED Relay 1  OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in alarm condition as level is above set high level # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2  ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)

# Annexure-3

## Operation Matrix - LMC-U2CP (EIUSP / ERUSP)

LMC-U2CP have 2 SPDT relays and each relay can be set for 2 point differential switching (pump control) between any two levels in the tank. These two relays are independent of each other and operate as per calibration of particular relay.

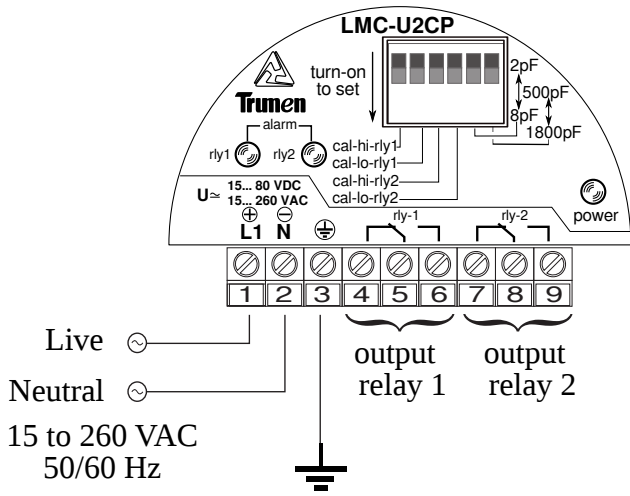
These two relays are internally set in fixed failsafe modes. Relay 1 is always in failsafe low (minimum) and relay 2 is always in failsafe high (maximum). Contacts of relays while in alarm remain same as during power failure. Status of LED and Relay contacts as per set level is shown in following table.

Alarm LED and Relay Status during material draining from the tank				
Material Position Relative to Calibrated Relay Set Points	Switching Operation	Alarm LED Status	Relay Contacts	
			Power ON	Power OFF
 <p>Relay 2 high switch point Relay 1 high switch point Relay 2 low switch point Relay 1 low switch point</p>	Relay 1 in normal or healthy condition as level is above set high level. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in alarm condition as level is above set high level. # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2 ☀ ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)
 <p>Relay 2 high switch point Relay 1 high switch point Relay 2 low switch point Relay 1 low switch point</p>	Relay 1 in normal or healthy condition as level is less than set high level but not reached at set low level switch point	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in alarm condition as level is less than set high level but not reached at set low level switch point	Alarm LED Relay 2 ☀ ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)
 <p>Relay 2 high switch point Relay 1 high switch point Relay 2 low switch point Relay 1 low switch point</p>	Relay 1 in normal or healthy condition as level is less than set high level but not reached at set low level switch point	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in normal or healthy condition as level is less than set low level. # Relay 2 is failsafe high (high level alarm)	Alarm LED Relay 2 ● OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
 <p>Relay 2 high switch point Relay 1 high switch point Relay 2 low switch point Relay 1 low switch point</p>	Relay 1 in alarm condition as level is less than set low level. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1 ☀ ON Indicating alarm status	 Relay 1 OFF alarm contacts	 Relay 1 OFF alarm contacts (as it is)
	Relay 2 in normal or healthy condition as level is less than set high level. # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2 ● OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)

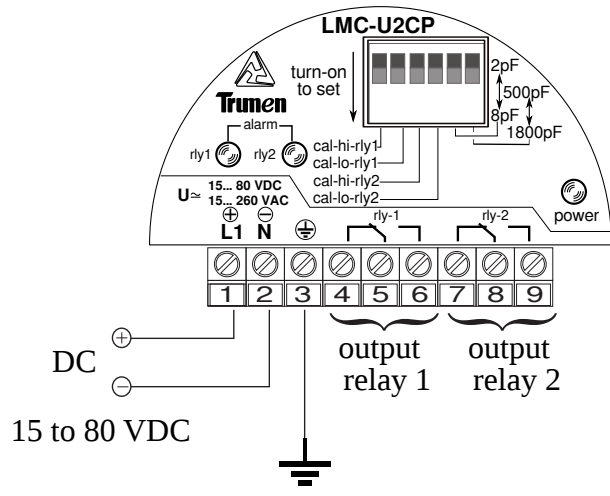
# Annexure-3

## Electrical Connections - LMC-U2CP (EIUSP / ERUSP)

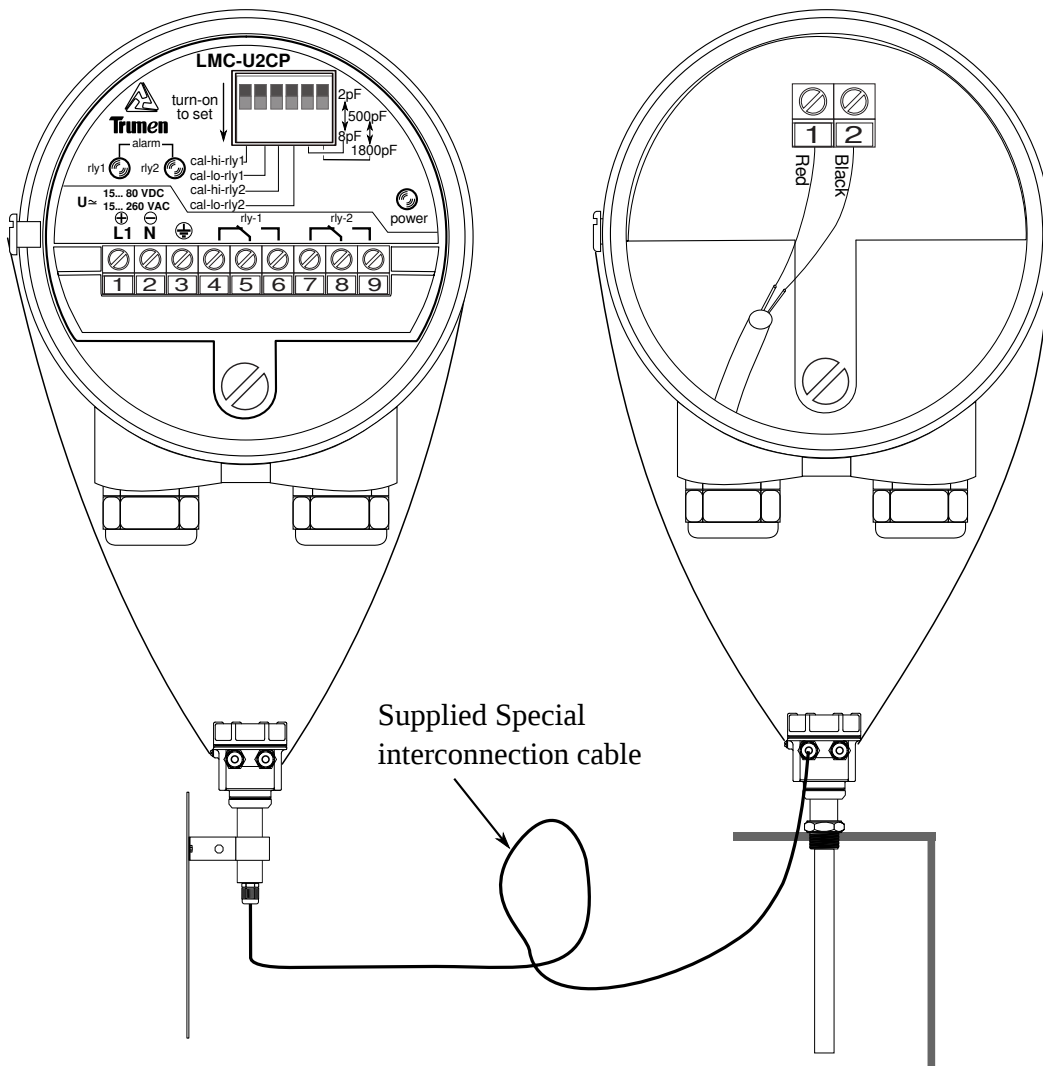
### electrical connections (AC)



### electrical connections (DC)



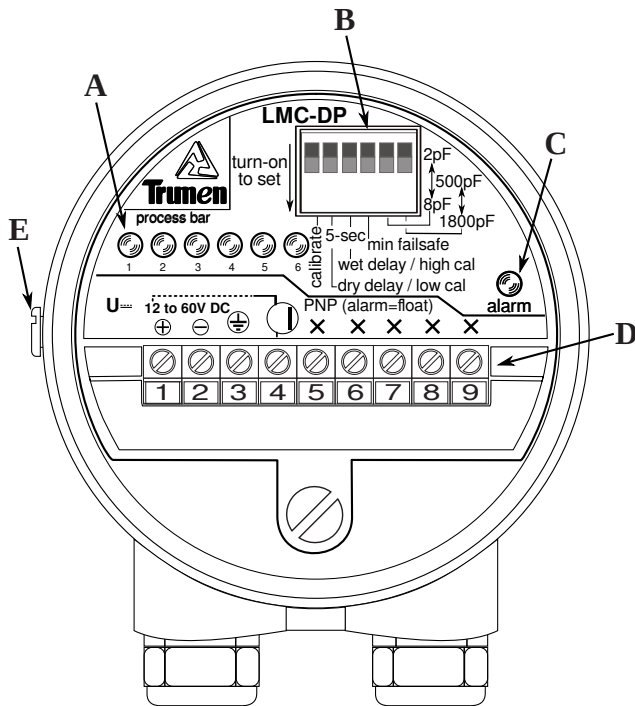
### Remote probe connections for LMC-U2CP (ERUSP)



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

# Annexure-4

## Introduction - LMC-DP (EIDPD / ERDPD)



### controls & indicators

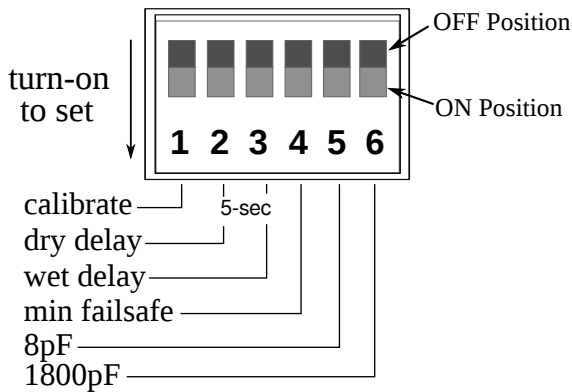
- A Processing Indicating LED bar
- B Configuration Switches
- C Alarm Indication
- D Connecting Terminals
- E External Earthing Terminal

### connection terminals

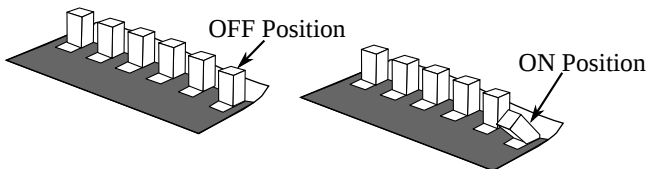
- 1 + of DC Supply input
- 2 - of DC Supply input
- Supply: 12 to 60VDC
- 3 Supply Earth terminal for safety
- 4 PNP output is supplied with voltage 12 to 60VDC

### configuration switches

#### LMC-DP



- 1 "calibrate" switch: This switch allows calibration in two calibration modes:
  - 1.1 Single Point (switches 2 & 3 must be open)
  - 1.2 Pump Control (requires switches 2 & 3)
 Please refer next page for calibration process.
- 2 "dry" (or uncovered) delay switch: During normal operation, this switch is turned ON if 5 second uncovered delay is required. During 'pump-control' calibration this switch is turned ON to set low switching point.
- 3 "wet" (or covered) delay switch: During normal operation, this switch is turned ON if 5 second covered delay is required. During 'pump-control' calibration this switch is turned ON to set high switching point.
- 4 "minimum" failsafe select  
Failsafe means alarm is same as power failure. Keep turned Off for Overflow detection (max. failsafe) (device will give alarm in covered condition) Keep turn On for Underflow detection (min. failsafe) (device will give alarm in uncovered condition)
- 5 "range1 & range2" switch: For small probes and/or low dielectric materials range 1 (switch #5 OFF) is used, for long probes and/or high dielectric materials range 2 (switch #5 ON) is used.



Example of Switch in On and Off Positions

# Annexure-4

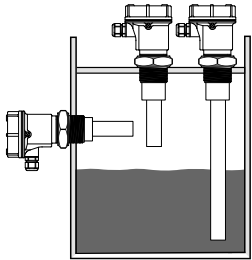
## Calibration - LMC-DP (EIDPD / ERDPD)

Before starting the calibration procedure, we need to decide the range / position of DIP Switch 5.

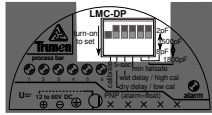
In case the sensing probe is having shorter length (less than 500 mm) and / or the service material is having low dielectric eg. PVC chips, PVC resin, oil, diesel, petrol, kerosin etc, keep the DIP Switch 5 in OFF condition (Range-1 position)

In case the sensing probe is having longer length (greater than 500 mm) and / or the service material is having high dielectric eg. cement, sand, iron ore, kitchen flour, water, shampoo, mud, materials having moisture content like, rice paddy, soap etc, keep the DIP Switch 5 in ON condition (Range-2 position).

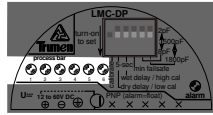
### Calibration (Single Point)



Fill the material up-to the switch point level, for full insulated probe or empty the material so the probe will not touch the material for part insulated probe

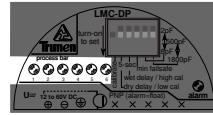


Turn "calibrate" switch ON. Make sure that switch 2, 3 & 4 are OFF (as shown above). Switch no.5 & 6 (ON or OFF) as per service material requirement as described above.



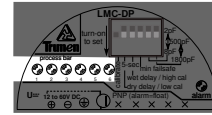
process bar  
1 2 3 4 5 6

All LEDs of process bar will turn ON. This indicates that current level recognized as switching level.



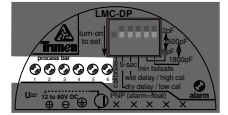
process bar  
1 2 3 4 5 6

6th LED will then start blinking. This means that the device is setting itself 1/2 pF insensitive to current material level.



process bar  
1 2 3 4 5 6

6th LED will then turn Off. This means that the device is setting itself 1 pF insensitive to current material level.



process bar  
1 2 3 4 5 6

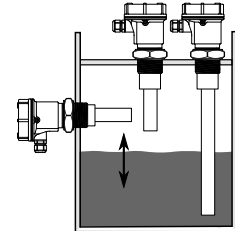
This sequence will repeat itself. When 4th,5th,6th LEDs are off, the device has set itself 3 pF insensitive to current material level.

**!** process bar  
1 2 3 4 5 6  
4pF 2pF 2pF 1pF 1pF 1pF  
Total 11pF insensitivity can be set for single point switching

**!** process bar  
1 2 3 4 5 6  
4pF 2pF 2pF 1pF 1pF 1pF  
For conductive materials setting of atleast 7pF is recommended

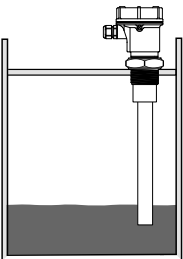
process bar  
1 2 3 4 5 6  
4th, 5th & 6th LED Off

When required insensitivity is reached (3pF is most common setting) Turn "calibrate" switch OFF.

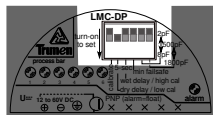


device is now ready for use as single point level switch.

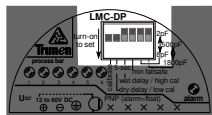
### Calibration (Two-Point or Pump Control)



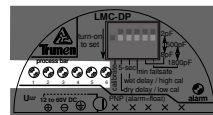
Empty the material down to the required low switch point level



Turn dry delay switch ON. Make sure that switch 1 & 3 are OFF (as shown above)

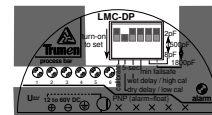


Turn calibrate switch ON. Make sure that switch 3 is OFF (as shown above)



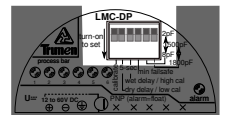
process bar  
1 2 3 4 5 6

All LEDs will turn On only LED 6 will blink wait for 3 seconds here. Then

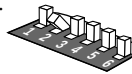


process bar  
1 2 3 4 5 6

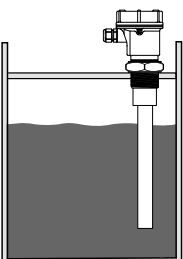
Only LED 1 will ON other LEDs OFF. This shows that level is read as low level by device.



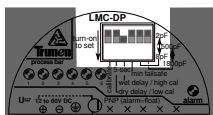
Turn dry delay switch OFF. This sequence of turning off the switches is important. Low level for two-point (pump control) has been calibrated.)



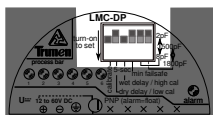
Turn calibrate switch OFF.



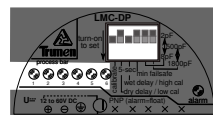
Fill the material up to the required high switch point level



Turn wet delay switch ON. Make sure that switch 1 & 2 are OFF (as shown above)

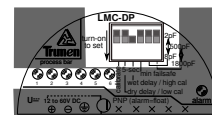


Turn calibrate switch ON. Make sure that switch 2 is OFF (as shown above)



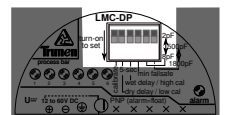
process bar  
1 2 3 4 5 6

All LEDs will turn Off, only LED 1 will turn On. wait for 3 seconds. Then

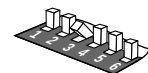


process bar  
1 2 3 4 5 6

LEDs will turn on, only LED 6 will blink. This shows that level is read as high level by device.



Turn wet delay switch OFF. This sequence of turning off the switches is important. High level for two-point (pump control) has been calibrated.) Device is ready for use.



Turn calibrate switch OFF.

**!** When device is calibrated in two-point (or pump control) process bar LEDs will follow material level while in use.

process bar  
1 2 3 4 5 6  
Low Level

process bar  
1 2 3 4 5 6  
Mid Level

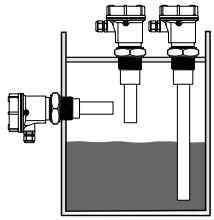
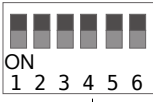

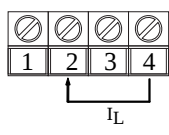
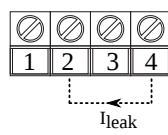
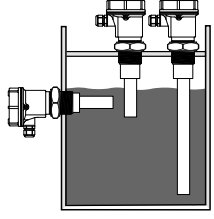
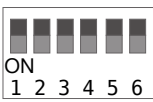

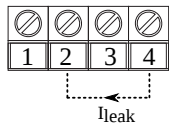
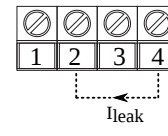
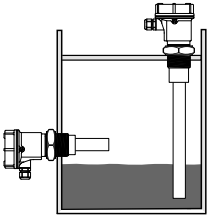


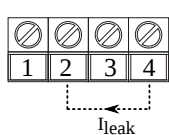
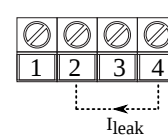
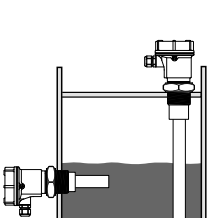
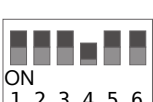

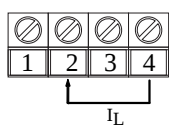
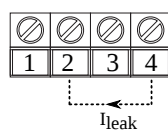
process bar  
1 2 3 4 5 6  
High Level



# Annexure-4

## Operation Matrix - LMC-DP (EIDPD / ERDPD)

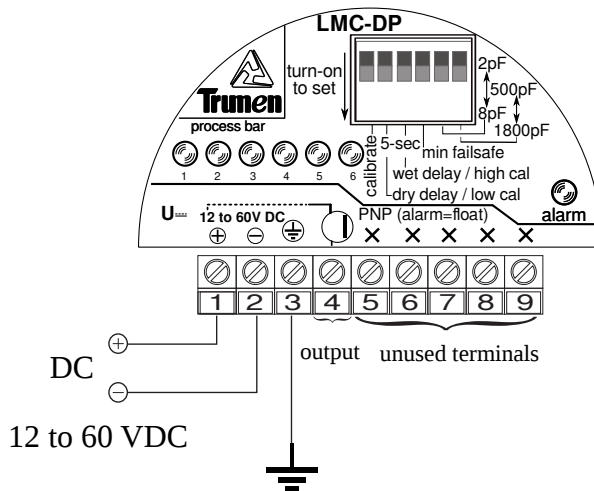
This model is suitable for single point level switching operation as well as pump control operation between high level and low level. PNP output is supplied with voltage in normal or healthy condition. PNP output is de-energized in Alarm condition. Failsafe defines that the alarm and power failure / 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.	 <p>min failsafe</p> <p>Switch no. 4 is off, failsafe high/maximum.</p>	 Off Indicating normal or healthy status.	 <p><math>I_L(\max) = 250\text{mA}</math></p> <p>Normal or healthy output.</p>	 <p><math>I_{\text{leak}} \leq 0.1\text{mA}</math></p> <p>Alarm output (due to power failure)</p>
		Material is above the high level or fork is covered with material.	 <p>min failsafe</p> <p>Switch no. 4 is off, failsafe high/maximum.</p>	 On Indicating alarm status.	 <p><math>I_{\text{leak}} \leq 0.1\text{mA}</math></p> <p>Alarm output.</p>	 <p><math>I_{\text{leak}} \leq 0.1\text{mA}</math></p> <p>Alarm output. (as it is)</p>
Low level / underflow detection		No material at low level.	 <p>min failsafe</p> <p>Switch no. 4 is on, failsafe low/minimum.</p>	 On Indicating alarm status.	 <p><math>I_{\text{leak}} \leq 0.1\text{mA}</math></p> <p>Alarm output.</p>	 <p><math>I_{\text{leak}} \leq 0.1\text{mA}</math></p> <p>Alarm output. (as it is)</p>
		Material is above the low level or fork is covered with material.	 <p>min failsafe</p> <p>Switch no. 4 is on, failsafe low/minimum.</p>	 Off Indicating normal or healthy status.	 <p><math>I_L(\max) = 250\text{mA}</math></p> <p>Normal or healthy output.</p>	 <p><math>I_{\text{leak}} \leq 0.1\text{mA}</math></p> <p>Alarm output (due to power failure)</p>

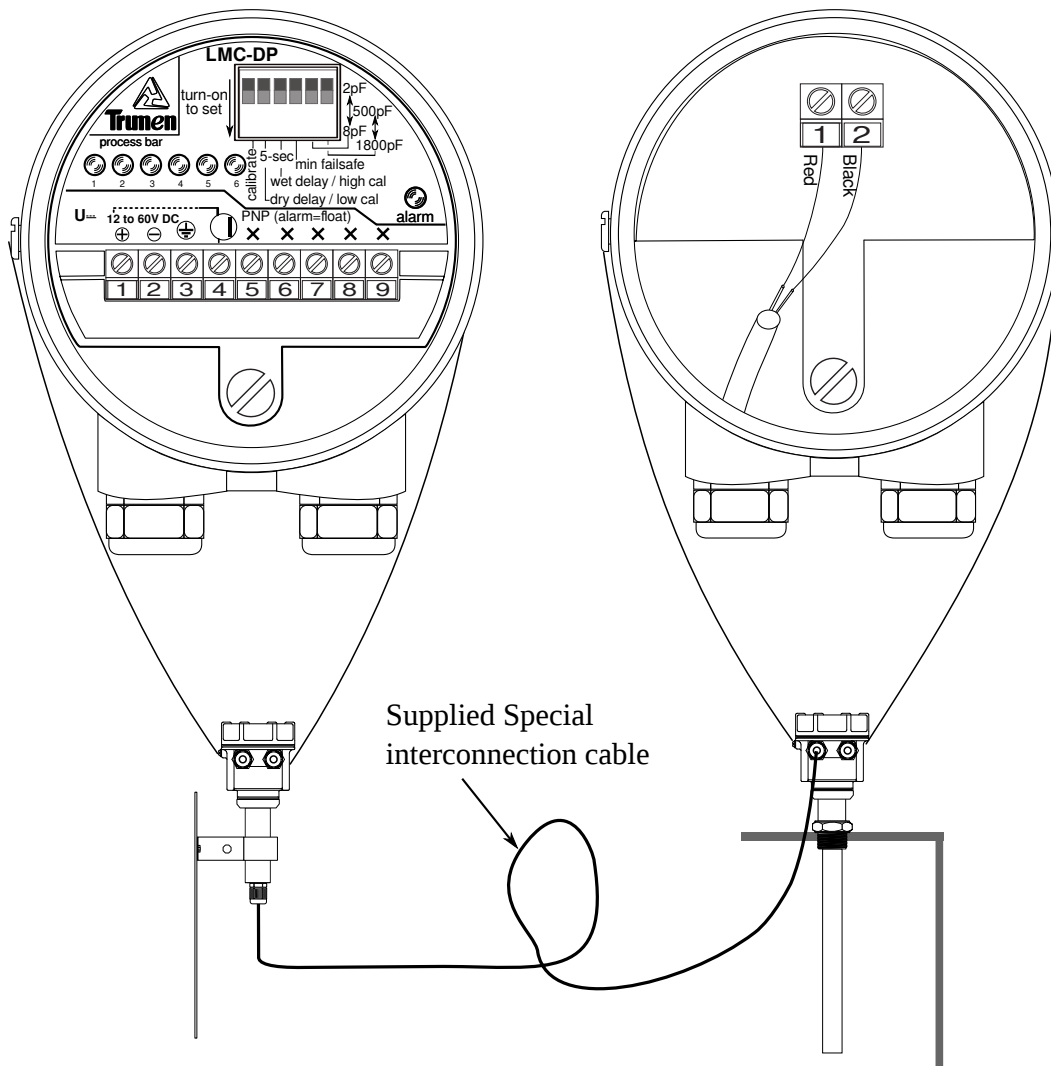
# Annexure-4

## Electrical Connections - LMC-DP (EIDPD / ERDPD)

### electrical connections (DC)



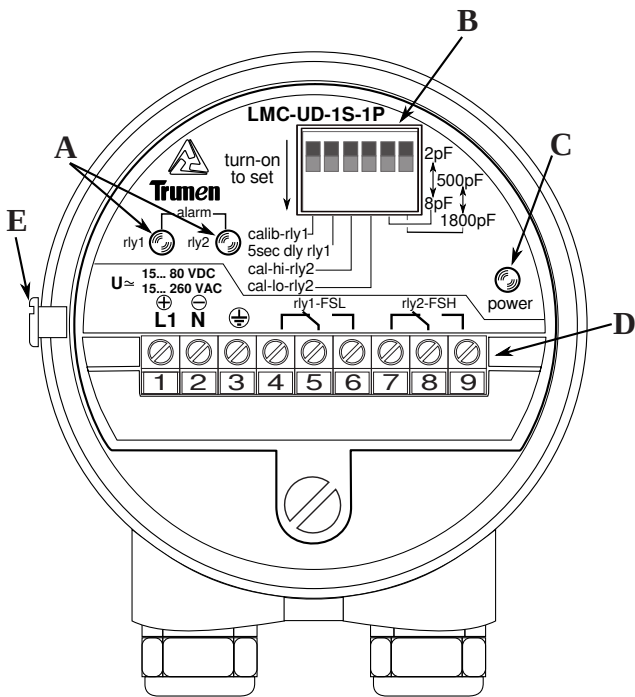
### Remote probe connections for LMC-DP (ERDPD)



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

# Annexure-7

## Introduction - LMC-UD-1S-1P (EIUSH / ERUSH)



### controls & indicators

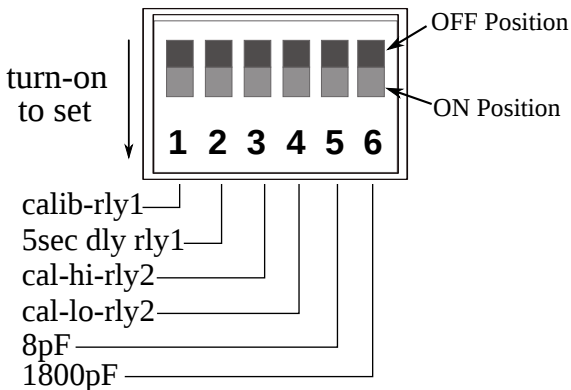
- A Process Indicating LEDs
- B Configuration Switches
- C Power Indication
- D Connecting Terminals
- E External Earthing Terminal

### connection terminals

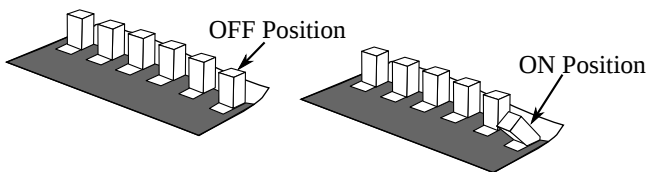
- 1 + of DC or Live of AC Supply input
  - 2 - of DC or Neutral of AC Supply input
- Supply:  
15 to 80VDC or 15 to 260VAC 50/60Hz
- 3 Earth terminal for safety
  - 4 Normally connected terminal of relay1
  - 5 Common terminal of relay1
  - 6 Normally open terminal of relay1
  - 7 Normally connected terminal of relay2
  - 8 Common terminal of relay2
  - 9 Normally open terminal of relay2

### configuration switches

#### LMC-UD-1S-1P



- 1 "cal-rly1" switch: This switch is used to single point switching level for rly1 (Failsafe low / minimum Factory set).
- 2 "5 sec dly rly1" switch: This switch sets 5 sec delay relay1 output in both (dry & wet positions) if it is turned ON. Else delay is close to 1 sec in both (dry & wet positions) if it is turned OFF.
- 3 "cal-hi-rly2" switch: This Switch is used to calibrate high level switch point of pump control differential switching for rly2 (Failsafe high / maximum Factory set).
- 4 "cal-lo-rly2" switch: This switch is used to calibrate low level switch point of pump control differential switching for rly2 (Failsafe high / maximum Factory set).
- 5 "range1 & range2 switch  
For small probes and / or low dielectric materials range1 (switch # 5 OFF) is used.  
For long probes and / or high dielectric materials range2 (switch # 5 ON) is used.



Example of Switch in On and Off Positions

# Annexure-7

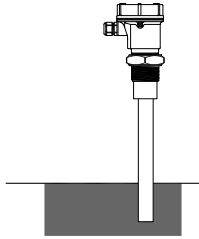
## Calibration - LMC-UD-1S-1P (EIUSH / ERUSH)

Before starting the calibration procedure, we need to decide the range / position of DIP Switch.5.

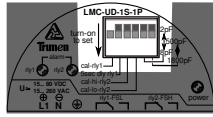
In case the sensing probe is having shorter length (less than 500 mm) and / or the service material is having low dielectric eg. PVC chips, PVC resin, oil, diesel, petrol, kerosin etc, keep the DIP Switch 5 in OFF condition (Range-1 position)

In case the sensing probe is having longer length (greater than 500 mm) and / or the service material is having high dielectric eg, cement, sand, iron ore, kitchen flour, water, shampoo, mud, materials having moisture content like, rice paddy, soap etc, keep the DIP Switch 5 in ON condition (Range-2 position).

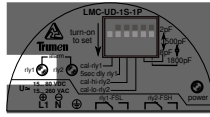
### Calibrate Relay 1 (single point level switch point) Failsafe Minimum



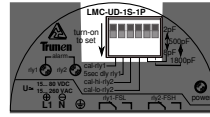
Fill the material up-to the switch point level



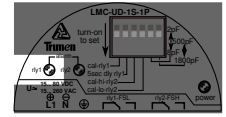
Turn "cal-ry1" switch ON  
Make sure that switch 2, 3 & 6 are OFF (as shown above)  
Switch no.5 & 6 (ON or OFF) as per service material requirement as described above



alarm rly1 LED will start blinking. Wait till three or four blinks.

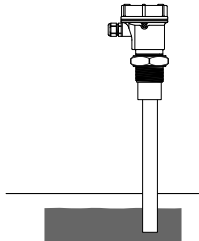


Turn "cal-ry1" switch OFF  
The level is calibrated as switch point for this relay

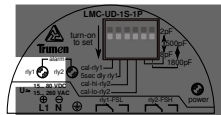


alarm rly1 LED will turn OFF  
This is because existing level is NOT LESS than set level

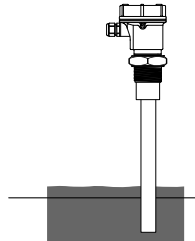
### Test Relay 1



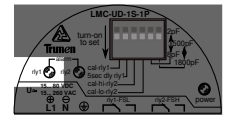
Lower the level slightly



alarm rly1 LED will turn ON because this is the alarm level for low level detection. Indicating that level is less than the set level for relay1

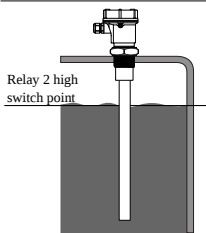


Fill the level slightly beyond the set point

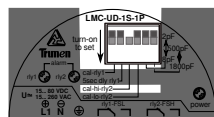


alarm rly1 LED will turn OFF because this is the normal or healthy level for low level detection. Indicating that level is more than the set level for relay1

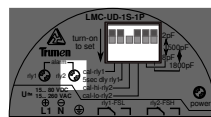
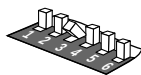
### Calibrate Relay 2 (Two Point pump control high level switch point) Failsafe Maximum



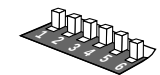
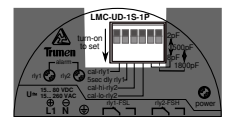
Relay 2 high switch point  
Fill the material up to the high level switch point of pump control rly-2.



Turn "cal-hi-ry2" switch ON  
Make sure that switch 1, 2 & 4 are OFF (as shown above).  
Switch no.5 & 6 (ON or OFF) as per service material requirement as described above

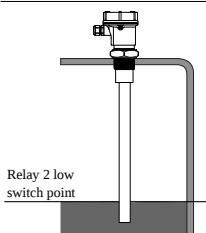


alarm rly2 LED will start blinking. Wait till three or four blinks.

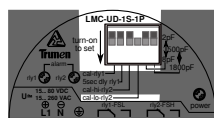


Turn "cal-hi-ry2" switch OFF  
The level is calibrated as high level switch point of pump control rly-2.

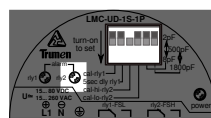
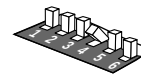
### Calibrate Relay 2 (Two Point pump control low level switch point) Failsafe Maximum



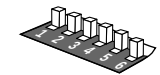
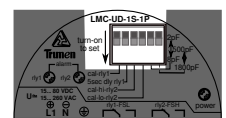
Relay 2 low switch point  
Fill the material down to the required low level switch point of pump control rly-2.



Turn "cal-lo-ry2" switch ON  
Make sure that switch 1, 2 & 3 are OFF (as shown above).  
Switch no.5 & 6 (ON or OFF)



alarm rly2 LED will start blinking. Wait till three or four blinks.

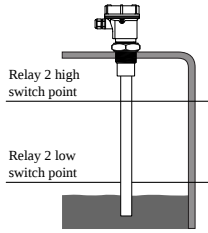


Turn "cal-lo-ry2" switch OFF  
The level is calibrated as low level switch point of pump control rly-2.

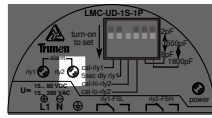
# Annexure-7

## Calibration - LMC-UD-1S-1P (EIUSH / ERUSH)

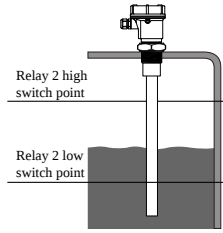
### Test Relay 2



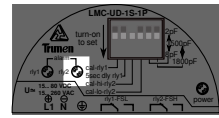
Lower the level slightly (below the low level switch point of pump control rly-2).



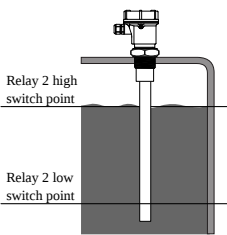
alarm rly2 LED will turn OFF because this is the normal or healthy level for rly-2. Relay-2 is in maximum (high) failsafe by default. (high level alarm)



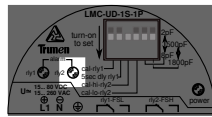
Fill some material in to the tank so that the level is above the low switch point of rly-2.



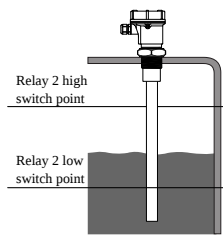
alarm rly2 LED will remain OFF because material is above low switch point but not reached up to high switch point.



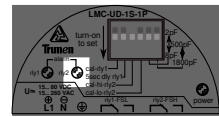
Fill the material up to the rly-2 high switch point. Alarm rly-2 LED will remain OFF until material not reached at high level switch point.



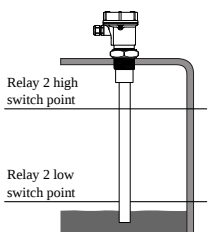
As soon as material reached at high level switch point. Alarm rly-2 LED will turn ON because this is the alarm level for pump control rly-2 (maximum failsafe). (high level alarm)



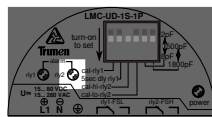
Drain some material from the tank so that the level is below the high switch point of rly2.



alarm rly2 LED will remain ON because material is lower than high switch point but not reached at low switch point.



Drain some more material from the tank so that level is below the low switch point. Alarm rly-2 LED will remain ON until material not reached at low level switch point.



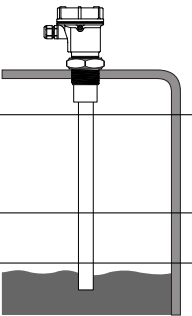


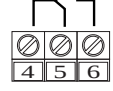



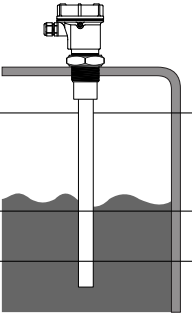

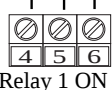




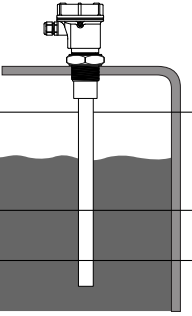





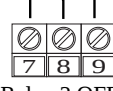
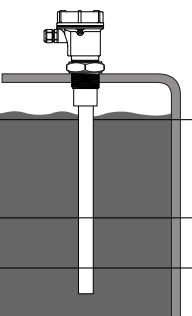






As soon as the material reached below low level switch point. Alarm rly2 LED will turn OFF because this is the normal or healthy level for rly-2. Relay-2 is in maximum (high) failsafe by default. (high level alarm)

# Annexure-7

## Operation Matrix - LMC-UD-1S-1P (EIUSH / ERUSH)

LMC-UD-1S-1P have 2 SPDT relays, Relay 1 can be set for single point level switching at any level throughout the tank. Relay 2 can be set for two point differential switching (pump control) between any two levels in the tank. These two relays are independent of each other and operate as per calibration of particular relay.

These two relays are internally set in fixed failsafe modes. Relay 1 is always in failsafe low (minimum) and relay 2 is always in failsafe high (maximum). Contacts of relays while in alarm remain same as during power failure. Status of LED and Relay contacts as per set level is shown in following table.

Alarm LED and Relay Status during material filling in the tank				
Material Position Relative to Calibrated Relay Set Points	Switching Operation	Alarm LED Status	Relay Contacts	
			Power ON	Power OFF
	Relay 1 in alarm condition as level is less than set single level switch point. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1  ON Indicating alarm status	 Relay 1 OFF alarm contacts	 Relay 1 OFF alarm contacts (as it is)
	Relay 2 in normal or healthy condition as level is less than set high level. # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2  OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in normal or healthy level is above set single level switch point. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1  OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in normal or healthy as level is not reached at set high level point.	Alarm LED Relay 2  OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in normal or healthy condition as level is above set single level switch point. # Relay 1 is failsafe low	Alarm LED Relay 1  OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in normal or healthy as level is above set low level but not reached at set high level point.	Alarm LED Relay 2  OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
	Relay 1 in normal or healthy condition as level is above set single level switch point. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1  OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in alarm condition as level is above set high level. # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2  ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)

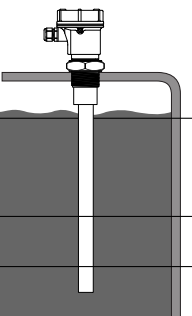
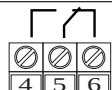

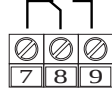
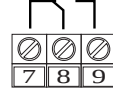
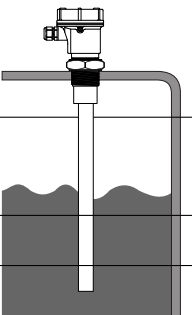

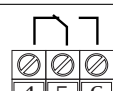
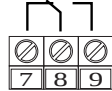
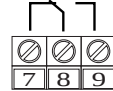
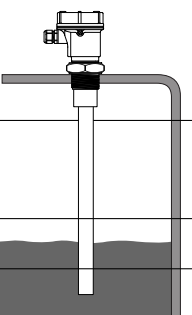


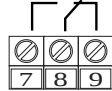
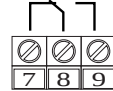
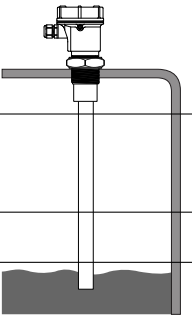
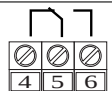
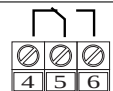

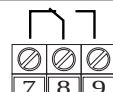
# Annexure-7

## Operation Matrix - LMC-UD-1S-1P (EIUSH / ERUSH)

LMC-UD-1S-1P have 2 SPDT relays, Relay 1 can be set for single point level switching at any level throughout the tank. Relay 2 can be set for two point differential switching (pump control) between any two levels in the tank. These two relays are independent of each other and operate as per calibration of particular relay.

These two relays are internally set in fixed failsafe modes. Relay 1 is always in failsafe low (minimum) and relay 2 is always in failsafe high (maximum). Contacts of relays while in alarm remain same as during power failure. Status of LED and Relay contacts as per set level is shown in following table.

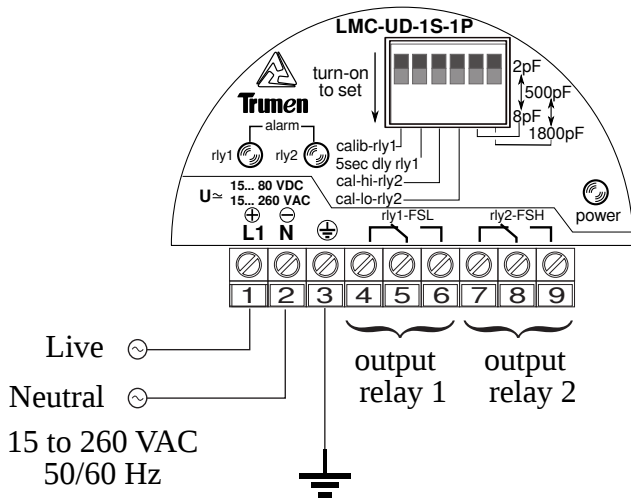
**Alarm LED and Relay Status during material draining from the tank**

Material Position Relative to Calibrated Relay Set Points	Switching Operation	Alarm LED Status	Relay Contacts	
			Power ON	Power OFF
 <p>Relay 2 high switch point</p> <p>Relay 2 low switch point</p> <p>Relay 1 single switch point</p>	Relay 1 in normal or healthy condition as level is above set single level switch point. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in alarm condition as level is above set high level. # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2 ☀ ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)
 <p>Relay 2 high switch point</p> <p>Relay 2 low switch point</p> <p>Relay 1 single switch point</p>	Relay 1 in normal or healthy as level is above set single level switch point.	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in alarm condition as level is less than set high level but not reached at set low level switch point.	Alarm LED Relay 2 ☀ ON Indicating alarm status	 Relay 2 OFF alarm contacts	 Relay 2 OFF alarm contacts (as it is)
 <p>Relay 2 high switch point</p> <p>Relay 2 low switch point</p> <p>Relay 1 single switch point</p>	Relay 1 in normal or healthy condition as level is above set single level switch point.	Alarm LED Relay 1 ● OFF Indicating normal or healthy status	 Relay 1 ON normal or healthy contacts	 Relay 1 OFF alarm contacts (due to power failure)
	Relay 2 in normal or healthy as level is less than set low level. # Relay 2 is failsafe high (high level alarm)	Alarm LED Relay 2 ● OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)
 <p>Relay 2 high switch point</p> <p>Relay 2 low switch point</p> <p>Relay 1 single switch point</p>	Relay 1 in alarm condition as level is less than set single level switch point. # Relay 1 is failsafe low (Low level alarm)	Alarm LED Relay 1 ☀ ON Indicating alarm status	 Relay 1 OFF alarm contacts	 Relay 1 OFF alarm contacts (as it is)
	Relay 2 in normal or healthy condition as level is less than set high level. # Relay 2 is failsafe high (High level alarm)	Alarm LED Relay 2 ● OFF Indicating normal or healthy status	 Relay 2 ON normal or healthy contacts	 Relay 2 OFF alarm contacts (due to power failure)

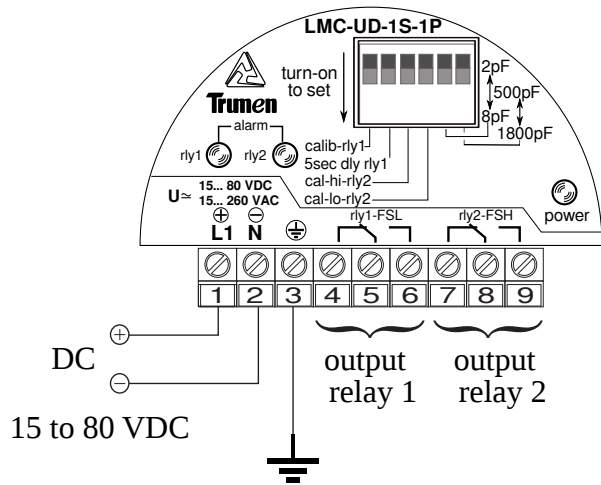
# Annexure-7

## Electrical Connections - LMC-UD-1S-1P (EIUSH / ERUSH)

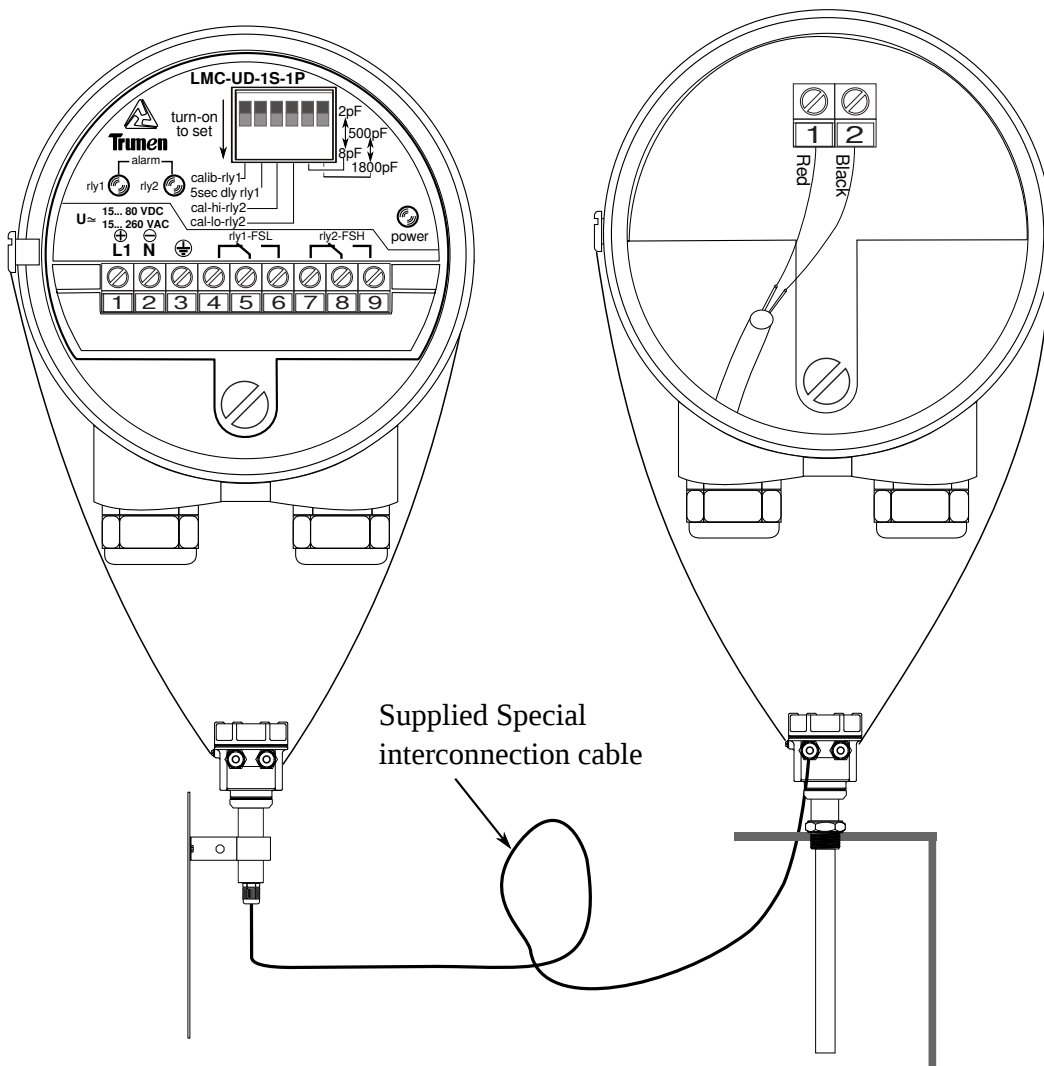
electrical connections (AC)



electrical connections (DC)



Remote probe connections for LMC-UD-1S-1P (ERUSH)

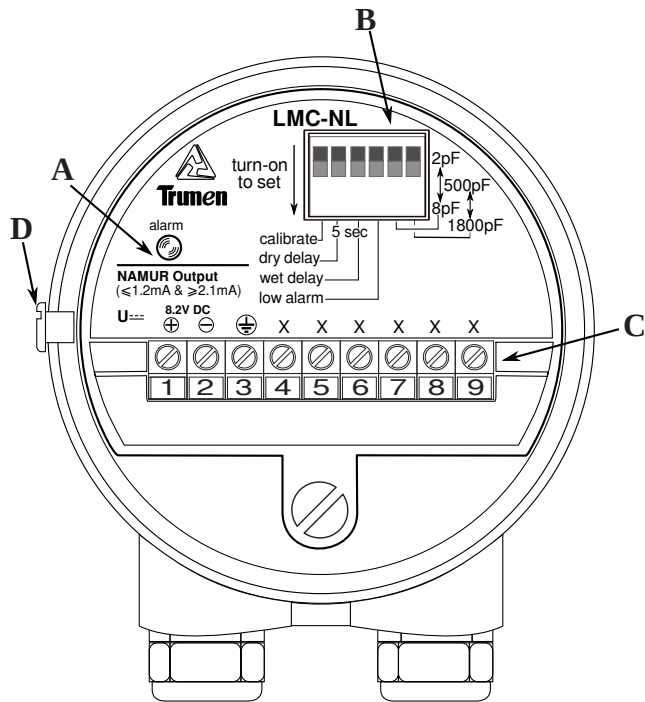


**Proper connection to supply earth terminal (3) and the external earth terminal (screw) is must.**



# Annexure-8

## Introduction - LMC-NL (EINL)



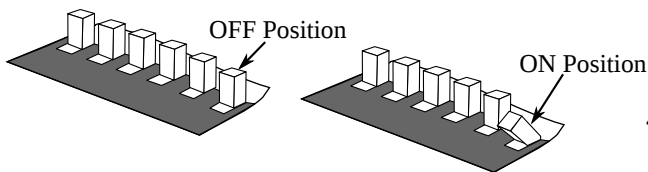
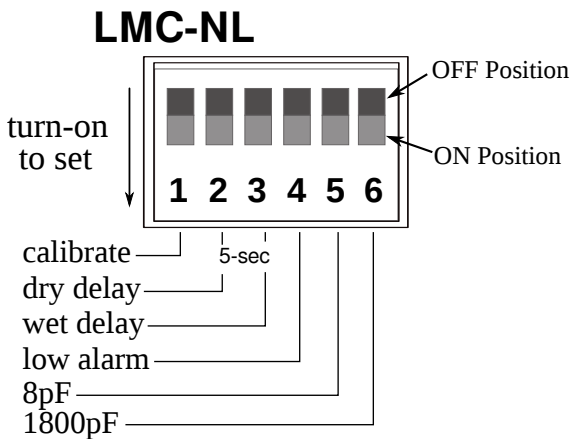
### controls & indicators

- A Alarm Indicating LED
- B Configuration Switches
- C Connecting Terminals
- D 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



Example of Switch in On and Off Positions

For NAMUR alarm is when alarm LED is ON and current output is 2.1mA.

- 1 "calibrate" switch: This switch allows calibration in two calibration modes:
  - 1.1 Single Point (switches 2 & 3 must be open)
  - 1.2 Pump Control (requires switches 2 & 3)
 Please refer next page for calibration process.
- 2 "dry" (or uncovered) delay switch: During normal operation, this switch is turned ON if 5 second uncover delay is required. During 'pump-control' calibration this switch is turned ON to set low switching point.
- 3 "wet" (or covered) delay switch: During normal operation, this switch is turned ON if 5 second cover delay is required. During 'pump-control' calibration this switch is turned ON to set high switching point.
- 4 high / low alarm switch  
Switch OFF = High level alarm for overflow detection.  
Switch ON = low level alarm for underflow detection.
- 5 "range1 & range2 switch  
For small probes and / or low dielectric materials range1 (switch # 5 OFF) is used.  
For long probes and / or high dielectric materials range2 (switch # 5 ON) is used.

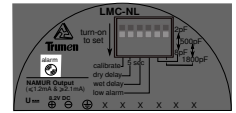
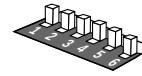
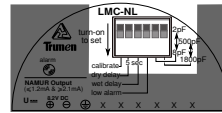
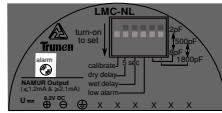
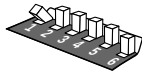
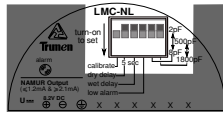
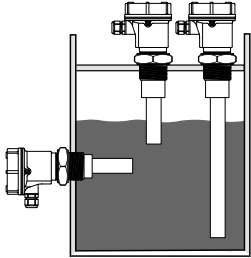
# Annexure-8

## Calibration - LMC-NL (EINL)

Before starting the calibration procedure, we need to decide the range / position of DIP Switch 5.

In case the service material is having low dielectric eg. cement, dry sand, PVC chips, PVC resin, oil, diesel, petrol, kerosin etc, keep the DIP Switch 5 in OFF condition (2pF position).

In case the service material is having high dielectric eg. iron ore, kitchen flour, water, shampoo, mud, materials having moisture content like, rice paddy, soap etc, keep the DIP Switch 5 in ON condition (8pF position). For oil and nonconductive material having any probe length keep the DIP Switch no.6 at 500pF position (OFF). For conductive material having probe length between 1000 to 3500mm keep DIP Switch no.6 at 1800pF position (ON).



Fill the material up-to the switch point level

Turn "calibrate" switch ON

Make sure that switch 2, 3 & 4 are OFF (as shown above)

Switch no.5 & 6 (ON or OFF) as per service material requirement as described above

alarm LED will start blinking. Wait till three or four blinks.

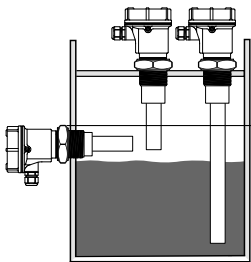
Turn "calibrate" switch OFF

The level is calibrated as switch point for NAMUR output

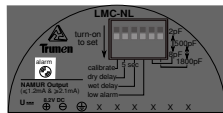
alarm LED will turn ON

This is because existing level is equal to set switch point level

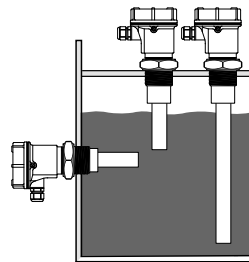
## Test Output



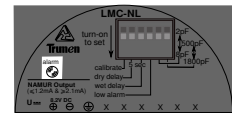
Lower the level slightly



alarm LED will turn OFF Indicating that level is less than the set level for NAMUR output



Fill the level slightly beyond the set point



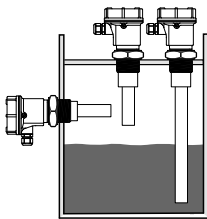
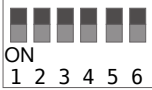
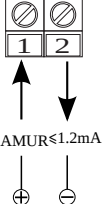
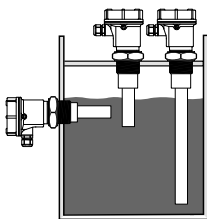
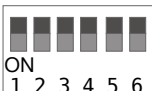

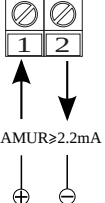
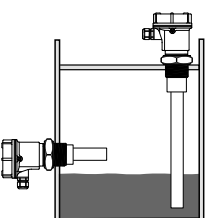
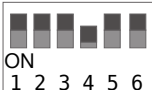

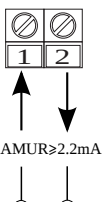
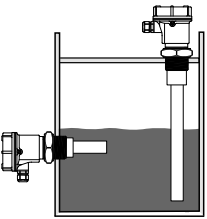
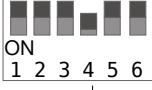
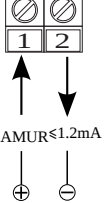
alarm LED will turn ON

This is because level is more than or equal to the set level for NAMUR output

# Annexure-8

## Operation Matrix - LMC-NL (EINL)

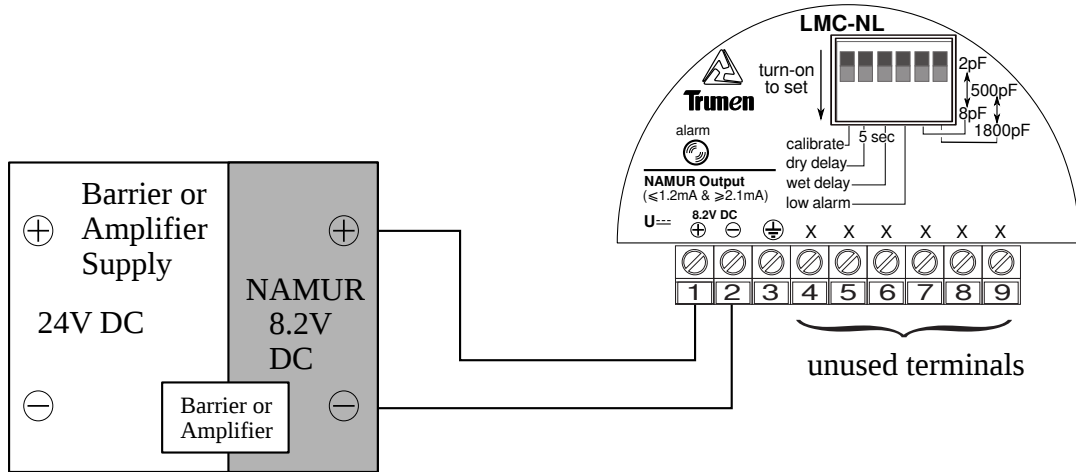
This device is meant to be operated through a NAMUR barrier or amplifier. Device can endure 16 VDC but is meant to be operated solely at 8.2 V NAMUR supply. High / Low alarm switch can be select as per requirement i.e. high alarm or low alarm. System operation is best understood with the type of installation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

Material & Installation	Material Status	Failsafe Setting	Status LED	Alarm/Normal	NAMUR-LH Edge Output	
High level / overflow detection (Highalarm)		No material at high level or set high level.	 low alarm Switch no. 4 is off, high alarm.	○ Off Indicating normal or healthy status.	Normal	 $I_{NAMUR} \leq 1.2mA$ 8.2 VDC from NAMUR barrier
		Material is above the high level or probe is covered with material above set high level.	 low alarm Switch no. 4 is off, high alarm.	 On Indicating alarm status.	Alarm	 $I_{NAMUR} \geq 2.2mA$ 8.2 VDC from NAMUR barrier
Low level / underflow detection (Lowalarm)		No material at low level or set low level.	 low alarm Switch no. 4 is on, low alarm.	 On Indicating alarm status.	Alarm	 $I_{NAMUR} \geq 2.2mA$ 8.2 VDC from NAMUR barrier
		Material is above the low level or probe is covered with material above set low level.	 low alarm Switch no. 4 is on, low alarm.	○ Off Indicating normal or healthy status.	Normal	 $I_{NAMUR} \leq 1.2mA$ 8.2 VDC from NAMUR barrier

# Annexure-8

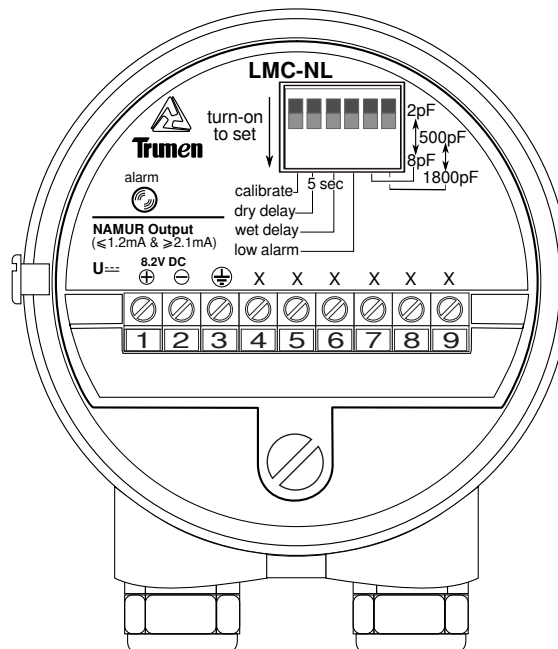
## Electrical Connections - LMC-NL (EINL)

### electrical connections (DC)



LMC-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.**