

# EM3

Poly Phase Electronic Meter is designed for measurement of electric energy in households and at commercial areas in 3 phase 4 wire networks. EM3 provides a comprehensive tariff structure suitable for the most complex domestic, commercial and industrial metering applications. Battery is compulsory for multi-tariff metering.



## SYED BHAIS

The Infinity Bandwidth Company



**POLYPHASE ELECTRONIC METER**

**TYPE PRISM EM3-205**

**MDI, MULTI – RATE TARIFF**

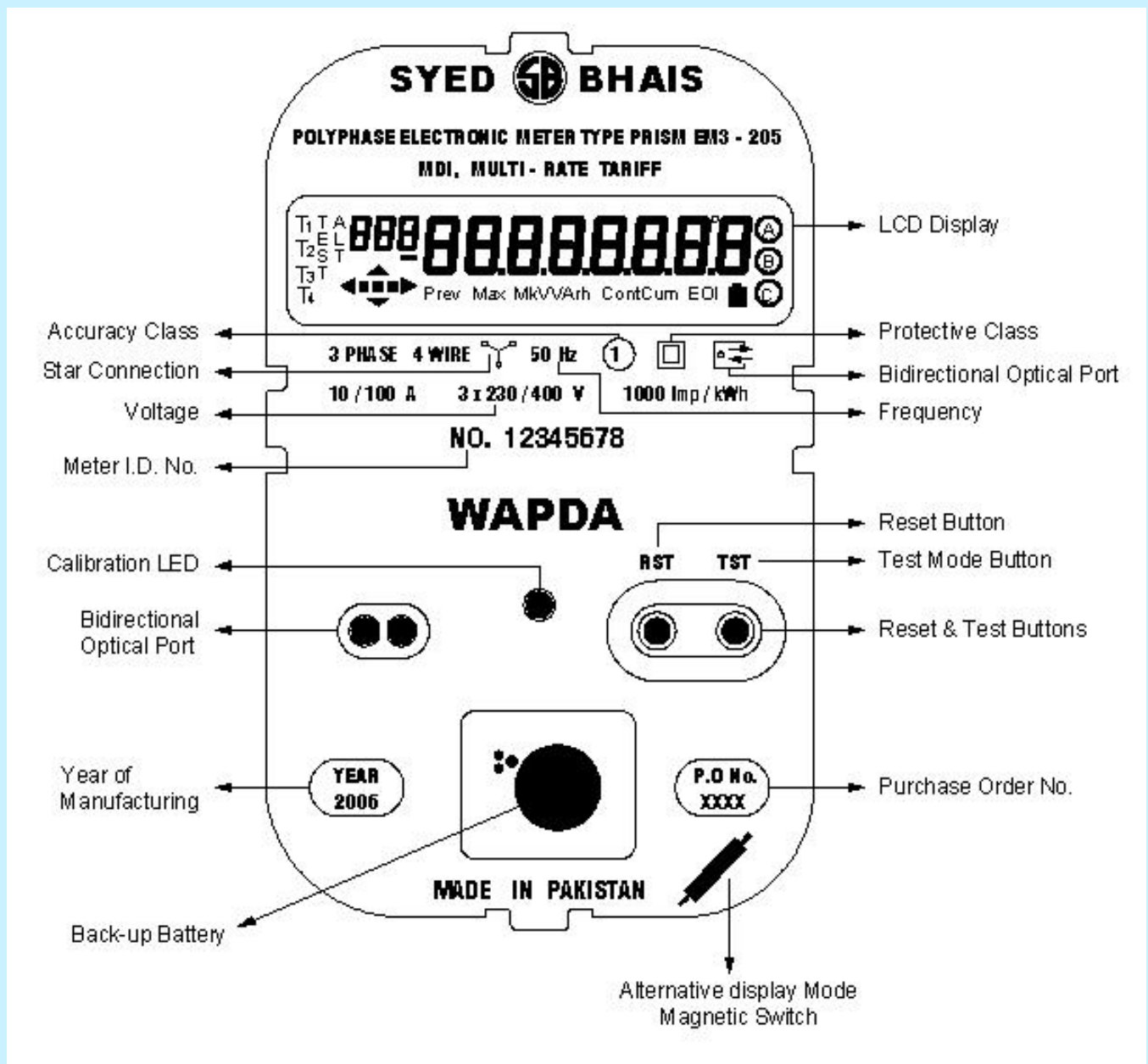
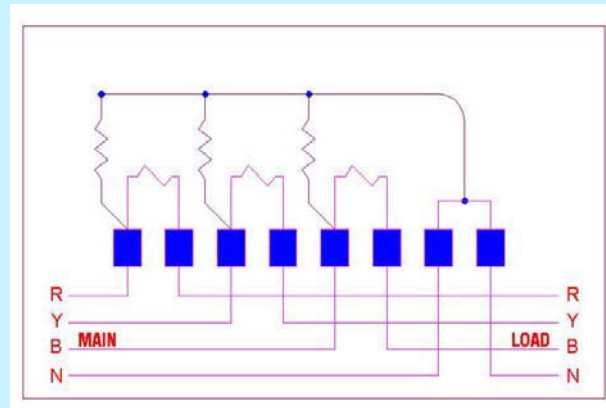
## Technical Specifications

ELECTRICAL SPECIFICATIONS		INSULATION	
Voltage – Three Phase	3X230/400V	Impulse Voltage Test	8kV, IEC 62053-21
Frequency	50Hz±10% (45Hz - 55Hz)	AC Voltage Test	4kV rms, 1 min.
Basic Current	I <sub>b</sub> = 10A	<b>CONSUMPTION</b>	
Maximum Current	I <sub>max</sub> = 100A	Voltage Circuits	< 2W, 10VA
Starting Current	I <sub>s</sub> ≤ 40 mA	Current Circuits	< 10VA (at Basic Current)
Accuracy	Class 1 according to IEC 62053-21	<b>COMMUNICATIONS</b>	
Meter Constant	1000 Pulses / kWh		• ANSI C12.18
Storage of Data	Non-volatile memory (EEPROM)		• Serial Interface RS-232
<b>IMMUNITY TO EXTERNAL DISTURBANCES</b>		<b>ENVIRONMENTAL CONDITIONS</b>	
Electrostatic Discharges	IEC 61000 – 4 – 2	Ambient Temperature	- 25 °C to + 60 °C (Normal Range)
Surge Immunity	IEC 61000 – 4 -5		- 25 °C to + 85 °C (limit Range)
Fast Transient Burst	IEC 61000 – 4 – 4		- 25 °C to + 85 °C (Storage Range)
Radio Interference	IEC 61000 – 4 – 3	Relative Humidity	Up to 95% Non-condensing
DC Magnetic Field	> 1,000 Aturns	<b>MECHANICAL DATA</b>	
AC Magnetic Field	> 400 Aturns	Dimensions (HxWxL)	(165mm x 232mm x 337mm)
		Weight	4.5 Kg.

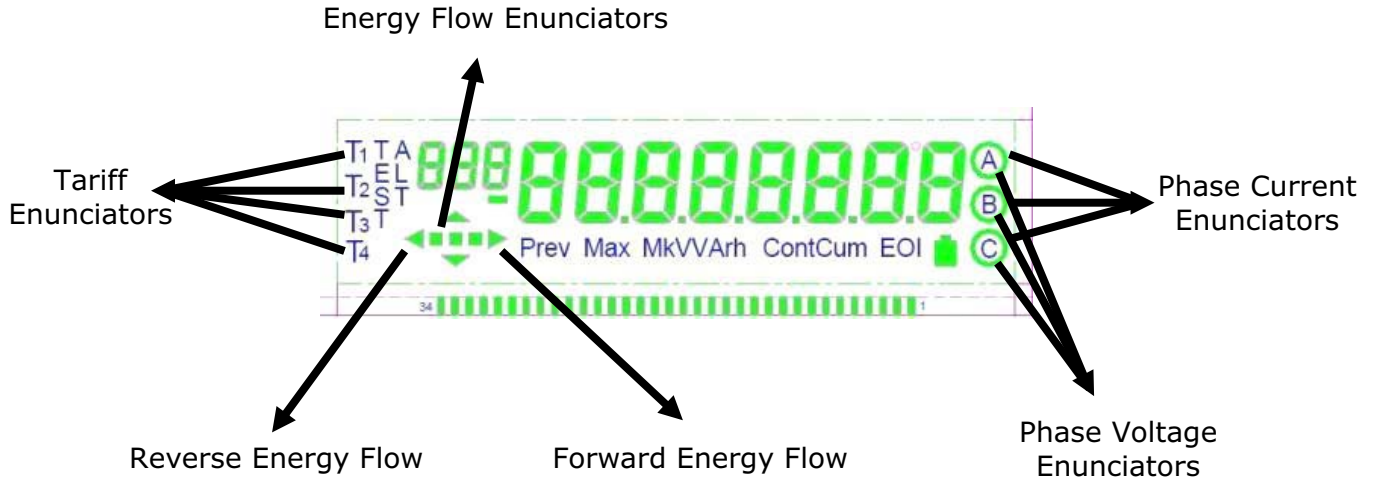
## FEATURES

- 3 Ø, 4 Wire, 3 \* 230/400 V, 10/100 Amp, 50 Hz
- Accuracy Class I
- Protective Class II
- Starting current less than 40mA
- MDI
- Facility to Reset MDI manually and automatically
- Demand integration period programmable
- Optocom / Bi-Directional Communication Port
- The meters are provided with 3 levels of security to secure its data and program.
- The meter can be programmed with DOS/Windows based software.
- Per Phase Voltage and Current Measurement
- Per Phase and Total Instantaneous kW Measurement
- Four Programmable Seasons
- Four Programmable Day Types
- Four Programmable Rates (Tariffs)
- 100 Programmable Dates for Events
- Large Digit Liquid Crystal Display (LCD)
- IEC 62053-21 Compliant
- Internal Real Time Clock and Calendar with Battery Back-up. Battery is field replaceable.
- More than 15 Years Product life
- Extensive Security Features.
- Registers Full Energy even if one or all phases are reversed.
- Register full energy even if only two wires are connected; phase and neutral or phase and phase only.
- 2 display modes are provided normal and alternate modes with indication.
- High Accuracy having No Tilt Error
- High Environmental Stability
- Option of addition of new features

**CONNECTION DIAGRAM**



**DISPLAY**



- LCD type with 8 digits for Energy consumption.
- Three small digits for Sequence number of quantity being displayed
- Display scrolling time is programmable (1 to 255s). (Default is 7 seconds).
- Display unit is programmable (W/kW). (Default is kWh & kW).
- Two programmable Display modes are available. Normal and Alternate Display Modes
- Phase voltage & current Indicators are permanently displayed in all Display modes.
- All Segment Check is provided upon power up to check functionality of all segments.
- Display Mode Indicator.
- Display Quantity Labels.
- Pulse Output for field testing of Meter is provided.
- TOU Tariff Rate indicators

**VOLTAGE AND CURRENT ENUNCIATORS**

- 3 Voltage AND 3 Current Enunciators are provided on right side of LCD.
  - A represents phase A voltage and circle across A represents current flowing through that phase (also called Red phase)
  - B represents phase B voltage and circle across B represents current flowing through that phase (also called Yellow phase)
  - C represents phase C voltage and circle across C represents current flowing through that phase (also called Blue phase)
- Voltage enunciators remain ON while voltage at corresponding terminal is greater than (Programmable 1-255 V) 180 volts. When voltage drops below this limit, corresponding enunciator starts blinking (1 Sec ON, 1 Sec OFF). This is the indication of Low voltage.

If voltage is below 130 (Programmable 1-255 V) volts, corresponding enunciator vanishes. This represents phase outage.

- Current enunciators remain ON while current through that phase is more than (Programmable 1-100 A) 10A. When Current drops below this limit, corresponding Enunciator starts blinking (1 Sec ON, 1 Sec OFF). If Current is below 0.5 A (Programmable 0.0-100 A), corresponding enunciator vanishes. This represents No load.

**END OF INTERVAL INDICATION (EOI)**

At the end of each programmable interval of demand calculation **EOI** indicator will remain ON for five seconds. This indicates the completion of current demand interval and availability of new MDI calculation as previous interval kW (scroll item 5 in alternate display mode). It will also update Maximum kW if current interval demand exceeds the previous Max. kW. (Scroll item 3 in normal display mode).

**TARIFF INDICATORS**

On left side of LCD 4 letters are provided vertically as A, B, C, D. One of these indicators is ON if meter is programmed for TOU metering. Each indicator represents current tariff rate.

**DISK ANALOG**

Three blocks are provided on LCD to represent the energy flow through meter. These blocks represent the idea of disk rotation as in electromechanical meter. On each blinking of "Calibration LED" the block jumps from one position to next position. This may also be used for checking calibration of EM3 meter using Mark sensor. However for this purpose the Meter constant will be 500/3 per kWh.

## ENERGY FLOW DIRECTION

Forward and reverse arrows are provided along disk analog blocks. These show the direction of energy flowing through meter. Forward arrow represents positive energy flow and reverse arrow shows reverse energy flow through meter. However by default (for WAPDA) meter has been programmed for phase by phase unidirectional energy registration so that meter always records positive energy irrespective of direction of energy flow.

## ZERO SUPPRESSION

This is programmable feature for all scroll items. We can suppress leading zeroes or disable zero suppression. By default Zero suppression is ON.

## DISPLAY MODES

Two display modes are provided in meter for flexible operation.

### 1. NORMAL MODE

This is the default display mode of meter. Following items are displayed in this mode according to WAPDA approved program in the sequence mentioned here.

1. Current Date
2. Current Time
3. kWh
4. kWh Rate A (T1)
5. kWh Rate B (T2)
6. kWh Rate C (T3)
7. Instantaneous kW Total

### All segments on

When meter powers up all segments of LCD are displayed to check the LCD functionality.

### Battery indication

Low and off battery indication is added as last scroll item if battery is low or off.

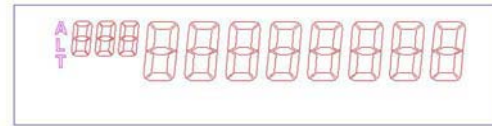
### 2. ALTERNATE MODE

Alternate mode of display is provided through a hidden magnetic switch at lower right corner of meter (marked on ID plate) for additional display information to avoid unaccepted long display scroll of item in normal mode. WAPDA approved program for alternate mode display items is as below.

1. Meter Serial Number
2. Battery Voltage
3. Voltage Phase A
4. Voltage Phase B
5. Voltage Phase C
6. Current Phase A
7. Current Phase B
8. Current Phase C
9. Previous Interval kW
10. Number of Demand Resets
11. kW Maximum

12. kW Maximum Rate A (T1)
13. kW Maximum Rate B (T2)
14. kW Maximum Rate C (T3)
15. kW Cumulative
16. kW Cumulative Rate A (T1)
17. kW Cumulative Rate B (T2)
18. kW Cumulative Rate C (T3)
19. Time Remaining in Demand Interval
20. Last Reset kWh Total
21. Last Reset kWh Rate A (T1)
22. Last Reset kWh Rate B (T2)
23. Last Reset kWh Rate C (T3)
24. Last Reset Maximum kW
25. Number of Power Outages
26. Instantaneous kW Phase A
27. Instantaneous kW Phase B
28. Instantaneous kW Phase C

Alternate mode is activated by placing a magnet near alternate switch symbol on ID plate. Once Alternate mode is accepted LCD shows the indication of this in form of all segments displayed for 5 seconds. For this period display mode is unchangeable. ALT symbol on right side indicates the display mode to be alternate mode.

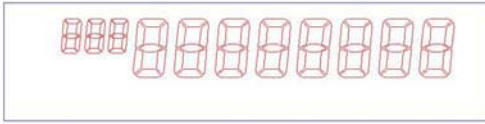


## MAXIMUM DEMAND RESET

There are two Maximum demand Reset (MDI Reset) mechanisms available.

### 1. MANUAL MDI RESET MECHANISM

Manual MDI Reset mechanism is provided on the meter through a sealable Reset lever. If reset button is pressed once it will be disabled for 5 seconds in order to avoid multiple resets due to human error or mechanical vibrations. When reset is done LCD shows the indication of reset occurrence in form of all segments displayed for 5 seconds as shown in figure below. These all segments also show that for this period reset button is disabled. Upon reset, Rest counter is incremented by 1 which is shown as scroll item 5 in Normal Display Mode. Upon reset the maximum kW is reset to 0 which is scroll item 4 in Normal Display mode. The reading of maximum kW (just before reset) is added to cumulative kW which is displayed item 6 in Normal Display mode. The rate wise registers of Max. kW of Rate A and B (Scroll items 10&11 in Normal Display mode) & respective cumulative kW registers of rate A & B ( Scroll items 6&7 in Alternate Display mode) are also updated in similar manner. Reset counter is capable of storing no of counts from **1 to 65,535** after which it will rollover to 0.



## 2. AUTOMATIC MAXIMUM DEMAND RESET

Automatic Maximum Demand Reset is programmable on a specified date of each month. This feature is implemented even in case of Power Outage but battery should be installed in meter. For WAPDA Automatic Maximum Demand Reset is programmed on 1<sup>st</sup> of each month so meter gets reset automatically on 1<sup>st</sup> of each month at 12.00AM (00.00 hrs).

## SECURITY FEATURES

- Each Meter has a unique serial No. in its memory which can be displayed/reported. This serial No. is same as printed on ID plate of meter.
- The No. of times programmed and the identification of the last programmer along-with Date & Time stamp is reported/displayed.
- A programmable meter User No. of 13 digits is provided.
- User Name and Address can be programmed into meter.
- Three levels of access/security codes are provided
- Meter keeps on recording/operating as long as voltage exists on any two terminals of the meter with or without neutral.
- Magnetic Alternate Mode button provided to avoid user access to meter board
- Sealable Reset and Test Mode buttons.
- The meter is protected against external Strong Electromagnet/Radar Magnet, Mobile phones interference and complies with all relevant IEC/ANSI standards for functional performance and loss of data.

## EVENT LOGS

100 total events are recorded in the meter at any one time before Roll Over. These include

- Log of Power Outages & Restoration.
- Phase failure/Disconnection of wires.
- Reset Demand (Both Automatic and Manual)
- Low Battery
- Off Battery
- Maximum Demand (total and of each TOU rate)
- Meter programmed

The logged events can be downloaded from meter by reading meter through OPTOCOM port. These events are arranged date-wise in generated report.

## BATTERY

- 3.6 Volt Replaceable Lithium-Ion Battery with standard connector is used to maintain real time clock in meter
- Battery has a casing for protection from UV (Ultraviolet) Radiations, the casing is fixed in a Battery enclosure
- Battery maintains time, calendar and Multi-Rate Program for a period of more than two years in case no power is applied to meter.
- Battery has Storage Life of about 20 years
- In normal operation of meter battery should last for a period of about 10 years. After this interval battery becomes low. This is indicated by “LOW BATT” indication in normal scroll of meter. The battery should be changed as soon as this indication is displayed. The meter keeps correct date and time even in Low battery condition. However, if battery is not replaced over a long period then battery voltage drops to very low levels. This is indicated by “OFF BATT” in normal display scroll. Under this condition meter may not be able to maintain correct date and time and as a result meter will disable TOU functionality. However, meter continues to register correctly in Total kWh and kW registers. If battery is replaced after **OFF BATT** indication, then meter date and time should be reprogrammed.

## OPTOCOM

- Meter employs Bi-Directional communication port as per ANSI C12.18 protocol.
- The meter can be programmed with DOS based Software through Optocom Port
- Meter Software is highly secure, it provides access as per user requirement
- Three levels of access are available:
  1. Administrator
  2. Writer
  3. Reader
- MDI, TOU and Display entries can be programmed through software
- Optocom Reader can be connected to Serial Port as well as USB Port

## EEPROM

Electrically erasable memory is provided to save billing data without use of battery backup. The data also includes last 12 months of billing data, event logs, current billing data and other parameters programmed through meter software.

Please note that for billing purpose one month is considered as interval between two successive Demand Resets (MDI) and not the normal standard month of 30 or 31 days.

**BILLING DATA OF LAST 12 RESETS**

At any time meter has billing data available of most recent last 12 Resets performed in its operation. This data is snap-shot of following quantities before Reset (Automatic or Manual).

1. Reset time
2. Reset date
3. Reset day
4. Total kWh
5. Total kWh rate A (T1)
6. Total kWh rate B (T2)
7. Total kWh rate C (T3)
8. Total kWh rate D (T4)
9. Maximum kW
10. Maximum kW rate A (T1)
11. Maximum kW rate B (T2)
12. Maximum kW rate C (T3)
13. Maximum kW rate D (T4)

**WORKING LIMIT**

Meter can work accurately up to 120 volts on any phase. When voltage is lower than this range on all phases then all metering functionality will be disabled at that stage and no calculation or measurement can be done. The meter goes in low power mode considering it as power outage. However a TOU programmed meter will keep its date and time while taking power from Back up battery.

**ERRORS**

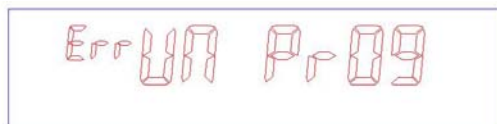
After power-up Meter performs all peripherals check to ensure proper operation. Any error is immediately displayed on LCD. Following errors can occur in meter. Possible remedy for each error is also suggested along with each error display.

**RAM ERROR**



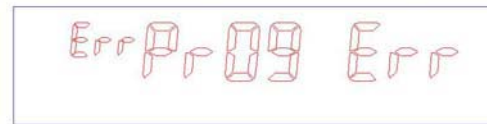
Remedy  
Replace the meter

**UN PROGRAM METER ERROR**



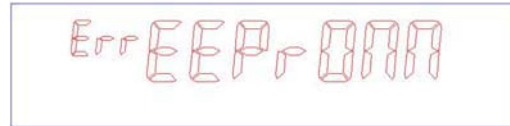
Remedy  
Program the meter

**PROGRAM ERROR**



Remedy  
Re-program the meter

**EEPROM ERROR**



Remedy  
Replace the meter

**CHECKSUM ERROR**



Remedy  
Replace the meter

**DSP ERROR**



Remedy  
Replace the meter

**INSTRUCTIONS FOR FRP BOX INSTALLATION**

1. Fix the Rag Bolts supplied with the FRP Box in vertically upward position as per figure 1.
2. At least 45mm length of Rag Bolts must remain outside the mounting surface Figure 2.
3. After proper fixing of Bolts, place the FRP Box on these Rag Bolts in vertical upward position and tightly secure it with washers / nuts figure 3.
4. Prepare your incoming / outgoing cables as given in Figure 4 and 4a.
5. Before connecting the meter cables please confirm what size of the cables you are using. After the cable size has been confirmed, insert the corresponding cable strip in the cable entry housing as shown in Figure 5. Please note that cable size (i.e. 10mm<sup>2</sup> & 25mm<sup>2</sup>) have been engraved on the corresponding cable entry strip (and 70mm<sup>2</sup> have been engraved on the housing cable entry strip).
6. Unfasten the terminal screws in Terminal Block up to 7-8 complete threads. Care should be taken not to loosen these screws excessively which may cause problem Figure 5.

# A New Family of Static Poly Phase Meters for Industrial and Commercial Applications

7. Insert the cables in the respective holes. Make sure inserted inside the terminals. Fix the screws tightly and ensure the grip by pulling down on the cables Figure 5.
8. Unfasten the locking screw present on the Terminal Sealing Strip Figure 6. Push Terminal Sealing Strip

that the stranded portion of the cables is fully in the Box. This operation may require tapping on the strip with the help of a plastic hammer. After you have fully inserted the sealing strip in the Box, the installation is complete.

