

## TNM96E - Z / Energy measuring instrument



TNM96E-Z measures important electrical parameters in 3phase 4wire, 3phase 3wire, 1phase 2wire and 1phase 3wire network. It displays many parameters at a glance. It measures electrical parameters like active / reactive / apparent energy, power and all basic parameter. The instrument has one optional built in relay output which can be configured as pulse output for energy

### Energy as per IEC 62053-21

- Available in Accuracy Class 1
- Active Energy accuracy Class 1 as per 62053-21
- Independent import and export energy counter. Active energy (kWh), reactive energy (kVArh), apparent energy (kVAh) measurement.

### THD Measurement

The instrument measures per phase and system THD up to 31st harmonics for voltage and current.

### True RMS Measurement

The instrument measures distorted waveform up to 31st harmonic.

### On site programmable PT/CT ratios

It is possible to program primary, secondary of external potential transformer (PT) and primary, secondary of external current transformer (CT) via front panel keys and MODBUS.

### Limit (Alarm) or Pulse Output (Optional)

- Available in potential free output
- Configurable as pulse output which can be used to drive an external counter for energy measurement.
- Configurable as limit (alarm) switch.

### MODBUS (RS485) Output: (Optional)

- RS485 output enables the instrument to transmit all the measured parameters over standard MODBUS protocol
- The instrument can be configured locally via front panel keys as well as MODBUS communication.

### Storage of parameters possible

The instrument stores minimum and maximum values of system voltage, system current. Also run hour, ON hour and number of AUX interrupts are stored.

### Energy Count Storage

In case of power failure, the instrument memorizes the last energy count. The instrument updates the energy counter in the non-volatile memory.

### Impulse LED

Impulse LED on the front of the instrument is useful for checking the accuracy of energy measured by the instrument.

### Display

- 3 Line, 4 digit bright red LED display and indication LEDs
- Display can be configured for automatic scrolling of parameters or manual scrolling through 4 keys as per requirement and application of user.

### Demand

- The instrument integrates demand value for active power (kW), apparent power (kVA) and current (A).
- The demand integration time can be configured from 1 min to 60min

### Compliance to International Safety standards

Compliance to International Safety standard IEC 61010-1- 2018

### EMC Compatibility

Compliance to International standard IEC 61326

# UNIVERSAL MEASURING INSTRUMENTS

## Technical Specifications

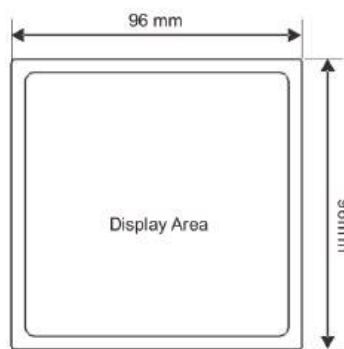
|                                  |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input voltage                    | Nominal input voltage (AC RMS)<br>programmable on site.<br>System PT primary values<br><br>Max continuous input voltage<br>Overload Indication<br>Nominal input voltage burden<br>Overload Withstand                                  | 100VLL to 500VLL<br>(57.5VLN to 288.67VLN)).<br>100VLL to 1200VLL programmable on site.<br>(1000MVA maximum power per phase) / (1200kVLL when CT primary ≤ 1002A)<br>120% of nominal value<br>"-ol." >121% of Nominal value<br>< 0.3VA approx. per phase (at nominal 240V)<br>2 x rated value for 1 second, repeated 10 times at 10 second intervals |
| Input current                    | Nominal input current Ranges<br>System CT primary values<br><br>Max continuous input current<br>Overload Indication<br>Nominal input current burden<br>Overload Withstand                                                             | 1A / 5A onsite programmable<br>From 1A up to 9999 A<br>(1000 MVA maximum power per phase) / (9999A when PT primary ≤ 120kVLL)<br>120% of rated value<br>"-ol." >121% of Nominal value<br>< 0.3VA approx. per phase<br>20 x rated value for 1 second, repeated 5 times at 5 minute intervals                                                          |
| Auxiliary supply                 | Higher Auxiliary supply range<br>Lower Auxiliary supply range<br>Aux Supply frequency<br>Auxiliary Supply burden                                                                                                                      | 60-300V AC/DC (230V AC/DC nominal)<br>20-60V AC/DC (24V AC / 48V DC nominal)<br>45 to 65 Hz range<br>< 6VA approx.                                                                                                                                                                                                                                   |
| Operating measuring ranges       | Current (energy measurement)<br>Starting current<br>Voltage<br>Power Factor<br>Frequency                                                                                                                                              | 1 to 120% of nominal value<br>As per Standard IEC 62053-21 (Class 1)<br>19VLL to 600VLL (11VLN to 346VLN)<br>0.5 Lag ... 1 ... 0.5 Lead<br>40Hz to 70Hz                                                                                                                                                                                              |
| Reference conditions of accuracy | Reference temperature<br>Influence of temperature<br>Input Waveform<br>Input frequency<br>Auxiliary supply frequency<br>Voltage Range<br>Current Range<br>Total Harmonic distortion<br>Voltage range for THD<br>Current range for THD | 23°C +/- 2°C<br>0.015%/°C for Voltage & 0.025%/°C for Current<br>Sinusoidal (distortion factor 0.005)<br>50/60 Hz ± 2%<br>50/60 Hz ± 1%<br>20 ... 120% of nominal value<br>10 ... 120% of nominal value<br>40% (up to 31st Harmonics)<br>50% ... 100% of nominal value<br>20% ... 100% of nominal value                                              |
| Accuracy (energy)                | Active Energy<br>Apparent Energy<br>Reactive Energy                                                                                                                                                                                   | Class 1 as per IEC 62053 - 21<br>Class 1<br>Class 2 as per IEC 62053 - 23                                                                                                                                                                                                                                                                            |
| Accuracy                         | Voltage<br>Current<br>Frequency<br>Active Power<br>Re-Active Power<br>Apparent Power<br>Power Factor/ angle<br>THD (Voltage / Current)                                                                                                | ± 0.5% of Nominal value<br>± 0.5% of Nominal value<br>± 0.1% of mid frequency<br>± 1% of Nominal value<br>± 1% of Nominal value<br>± 1% of Nominal value<br>±3°<br>±3%                                                                                                                                                                               |
| Display update rate              | Response time to step input                                                                                                                                                                                                           | 1 sec approx.                                                                                                                                                                                                                                                                                                                                        |
| Applicable standards             | EMC<br>Safety<br>IP for water and dust                                                                                                                                                                                                | IEC 61326 - 1 :Table 2<br>IEC 61010-1-2018 use<br>IEC 60529                                                                                                                                                                                                                                                                                          |
| Isolation                        | Pollution degree<br>Installation category<br>High voltage test<br><br>MODBUS Vs Relay                                                                                                                                                 | 2<br>III<br>Input + AUX Vs Surface 4kV RMS, 50Hz, 1min<br>Input + AUX Vs Remaining Circuit 3.3kV RMS, 50Hz, 1min<br>2kV RMS, 50Hz, 1min                                                                                                                                                                                                              |

# UNIVERSAL MEASURING INSTRUMENTS

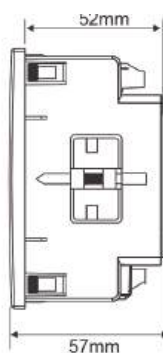
## Technical Specifications

|               |                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                       |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental | Operating temperature<br>Storage temperature<br>Relative humidity<br>Warm up time<br>Shock (As per IEC60068-2-27)<br>Vibration<br>Number of Sweep cycles<br>Enclosure<br>Altitude | -20 to +70 °C<br>-25 to +75 °C (Tested as per IEC 60688)<br>0... 95% RH (non condensing)<br>Minimum 3 minute<br>Half sine wave, Peak acceleration 30gn (300 m/s <sup>2</sup> ), duration 18ms.<br>10 ... 150 ...10 Hz, 0.15mm amplitude<br>10 per axis<br>IP20 (Terminal side) and IP54 (Front side)<br>2000          |
| Installation  | Mechanical Housing<br>Mounting Position<br>Connection Element<br>Connection Terminal<br>Weight                                                                                    | Lexan 940 (polycarbonate), Flammability Class V-0 acc. to UL 94, self extinguishing, non dripping, free of halogen<br>Panel Mounted (96X96)<br>Conventional screw type terminal with indirect wire terminals (Screw Torque: 0.5N.m)<br>4mm <sup>2</sup> solid or 2.5mm <sup>2</sup> stranded cable<br>250 gr. approx. |
| Interfaces    | Interfaces<br>Relay (Optional)<br>MODBUS (Optional)                                                                                                                               | Impulse Led For Energy testing<br>250 VAC, 5A A / 30VDC, 5A DC<br>RS485, max.1200m.<br>Baud rate: 2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 57.6k bps (Response time < 200ms)                                                                                                                                                   |

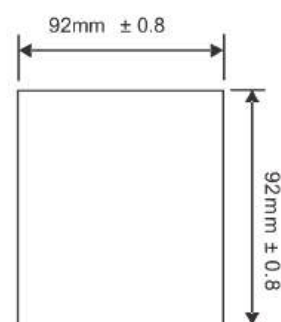
## Dimensions



Front View



Side View



Panel Cutout

### Wiring Guidelines

|                                                 |            |
|-------------------------------------------------|------------|
| Solid with Pin type lugs (sq. mm)               | 1 to 2.5   |
| Stranded with pin types lugs (sq. mm)           | 1 to 2.5   |
| Torque value (Nm)                               |            |
| 1. Aux and Voltage terminals                    | 0.5 to 0.6 |
| 2. Current Terminals                            | 0.4 to 0.5 |
| 3. RS485 and Relay terminals                    | 0.3 to 0.4 |
| Length available for lug entry in terminal (mm) | 9.5        |

# UNIVERSAL MEASURING INSTRUMENTS

| No. | Parameter                          | 3 Phase 4 Wire | 3 Phase 3 Wire | 1 Phase 2 Wire | 1 Phase 3 Wire |
|-----|------------------------------------|----------------|----------------|----------------|----------------|
| 1.  | System Voltage                     | ●              | ●              | ●              | ●              |
| 2.  | System Current                     | ●              | ●              | ●              | ●              |
| 3.  | Voltage L1                         | ●              | -              | -              | ●              |
| 4.  | Voltage L2                         | ●              | -              | -              | ●              |
| 5.  | Voltage L3                         | ●              | -              | -              | -              |
| 6.  | Voltage L1 - L2                    | ●              | ●              | -              | ●              |
| 7.  | Voltage L2 - L3                    | ●              | ●              | -              | -              |
| 8.  | Voltage L3 - L1                    | ●              | ●              | -              | -              |
| 9.  | Current L1                         | ●              | ●              | -              | ●              |
| 10. | Current L2                         | ●              | ●              | -              | ●              |
| 11. | Current L3                         | ●              | ●              | -              | -              |
| 12. | Frequency                          | ●              | ●              | ●              | ●              |
| 13. | System Active Power (kW)           | ●              | ●              | ●              | ●              |
| 14. | Active Power L1                    | ●              | -              | -              | ●              |
| 15. | Active Power L2                    | ●              | -              | -              | ●              |
| 16. | Active Power L3                    | ●              | -              | -              | -              |
| 17. | System Re-active Power (kVar)      | ●              | ●              | ●              | ●              |
| 18. | Re-active Power L1                 | ●              | -              | -              | ●              |
| 19. | Re-active Power L2                 | ●              | -              | -              | ●              |
| 20. | Re-active Power L3                 | ●              | -              | -              | -              |
| 21. | System Apparent Power (kVA)        | ●              | ●              | ●              | ●              |
| 22. | Apparent Power L1                  | ●              | -              | -              | ●              |
| 23. | Apparent Power L2                  | ●              | -              | -              | ●              |
| 24. | Apparent Power L3                  | ●              | -              | -              | -              |
| 25. | System Phase Angle                 | ●              | ●              | ●              | ●              |
| 26. | System Power Factor                | ●              | ●              | ●              | ●              |
| 27. | Power Factor L1                    | ●              | -              | -              | ●              |
| 28. | Power Factor L2                    | ●              | -              | -              | ●              |
| 29. | Power Factor L3                    | ●              | -              | -              | -              |
| 30. | Phase Angle L1                     | ●              | -              | -              | ●              |
| 31. | Phase Angle L2                     | ●              | -              | -              | ●              |
| 32. | Phase Angle L3                     | ●              | -              | -              | -              |
| 33. | Active energy Import (kWh)         | ●              | ●              | ●              | ●              |
| 34. | Active energy Export (kWh)         | ●              | ●              | ●              | ●              |
| 35. | Inductive Reactive energy (kVarh)  | ●              | ●              | ●              | ●              |
| 36. | Capacitive Reactive energy (kVarh) | ●              | ●              | ●              | ●              |
| 37. | Apparent energy (kVAh)             | ●              | ●              | ●              | ●              |
| 38. | RPM                                | ●              | ●              | ●              | ●              |
| 39. | Max and min - System voltage       | ●              | ●              | ●              | ●              |
| 40. | Max and min - System current       | ●              | ●              | ●              | ●              |
| 41. | Hour Run                           | ●              | ●              | ●              | ●              |
| 42. | ON Hour                            | ●              | ●              | ●              | ●              |
| 43. | Number of interruptions            | ●              | ●              | ●              | ●              |
| 44. | Current Demand                     | ●              | ●              | ●              | ●              |
| 45. | kVA Demand                         | ●              | ●              | ●              | ●              |
| 46. | kW Demand Import                   | ●              | ●              | ●              | ●              |
| 47. | kW Demand Export                   | ●              | ●              | ●              | ●              |
| 48. | Max Current Demand                 | ●              | ●              | ●              | ●              |
| 49. | Max kVA Demand                     | ●              | ●              | ●              | ●              |
| 50. | Max kW Demand Import               | ●              | ●              | ●              | ●              |
| 51. | Max kW Demand Export               | ●              | ●              | ●              | ●              |
| 52. | Neutral current                    | ●              | -              | -              | ●              |
| 53. | Max neutral current                | ●              | -              | -              | ●              |

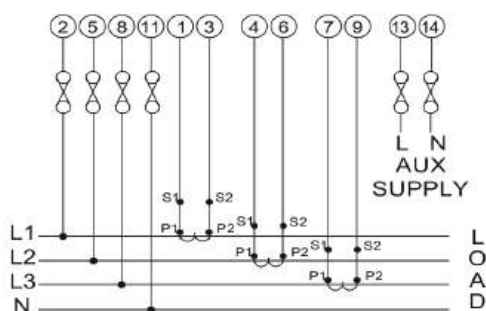
# UNIVERSAL MEASURING INSTRUMENTS

| No. | Parameter                               | 3 Phase 4 Wire | 3 Phase 3 Wire | 1 Phase 2 Wire | 1 Phase 3 Wire |
|-----|-----------------------------------------|----------------|----------------|----------------|----------------|
| 54. | % THD Voltage L1                        | ●              | ●              | -              | ●              |
| 55. | % THD Voltage L2                        | ●              | -              | -              | ●              |
| 56. | % THD Voltage L3                        | ●              | ●              | -              | -              |
| 57. | % THD Current L1                        | ●              | ●              | -              | ●              |
| 58. | % THD Current L2                        | ●              | -              | -              | ●              |
| 59. | % THD Current L3                        | ●              | ●              | -              | -              |
| 60. | System voltage THD                      | ●              | ●              | ●              | ●              |
| 61. | System current THD                      | ●              | ●              | ●              | ●              |
| 62. | Min and Max Import Active Power*        | ●              | ●              | ●              | ●              |
| 63. | Min and Max Export Active Power*        | ●              | ●              | ●              | ●              |
| 64. | Min and Max Inductive Re-active Power*  | ●              | ●              | ●              | ●              |
| 65. | Min and Max Capacitive Re-active Power* | ●              | ●              | ●              | ●              |
| 66. | Min and Max Apparent Power*             | ●              | ●              | ●              | ●              |
| 67. | Min and Max Line voltage*               | ●              | ●              | ●              | ●              |
| 68. | Min and Max Line current *              | ●              | ●              | ●              | ●              |

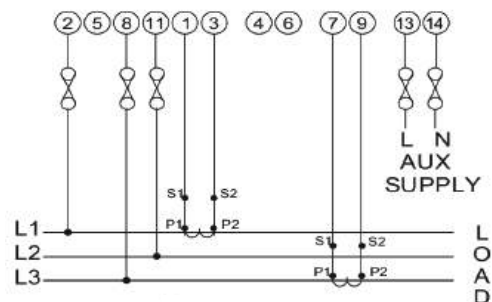
\*Note - Line and System parameters Min Max values are shown on Modbus only.

## Electrical connection:

### a) 3 Phase 4 wire

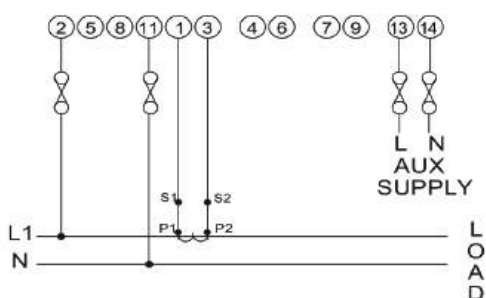


### b) 3 Phase 3 wire

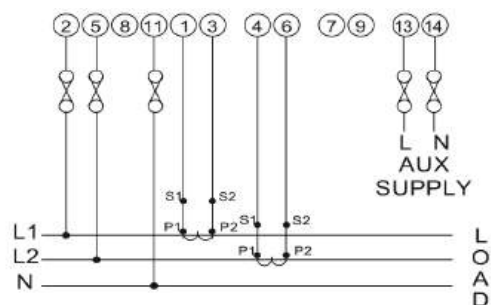


Note: L2 phase needs to be connected in terminal 11 instead of terminal 5 only for 3 Phase 3 Wire connections.

### c) 1 Phase 2 wire - Single phase load



### d) 1 Phase 3 wire - Split phase load



It is recommended that the wires used for connections to the instrument should have lugs crimped at the end. That is, the connections should be made with Lugged wires for secure connections.

## Order example:

- TNM96E-Z None or RS485 + 1 relay output and 60-300V AC/DC or 20-60V AC/DC