# Multifunction Meter


## User Manual

www.selec.com

# PREFACE

Thank you for choosing the multifunction MFM386 series. This manual will provide you with the detailed steps and precautions regarding Installation, Wiring, Setting of functional parameters, Routine maintenance, Malfunction diagnosis and Solution etc.

To utilize the meter to its full potential and ensure the safety of both users and the product, please read this manual carefully before using the meter. Any incorrect operations may lead to fault, Malfunction or shortened lifetime, or even damage to the device or the people around it.

This manual is available on our website and is accessible through the QR code provided on the unit. We request that you keep it safe considering its importance in commissioning, inspecting, and maintaining the product. In the pursuit of constant improvement, kindly note that all information contained in these materials, including products and product specifications represent information on the product at the time of publication and are subject to change without notice.

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# INTRODUCTION

**The MFM386 Series** is a high end multifunction meter series that offers comprehensive 3 phase electrical metering and energy monitoring.

The meter is a panel-mounted 96 x 96 mm panel meter that measures important electrical parameters in 3P4W, 3P3W, and 1P2W L-L and 1P2W L-N networks with field-programmable CT / VT primary and secondary values.

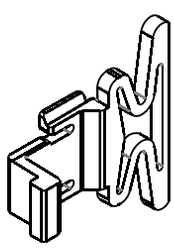
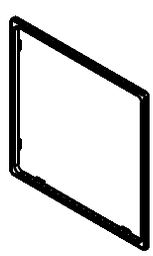
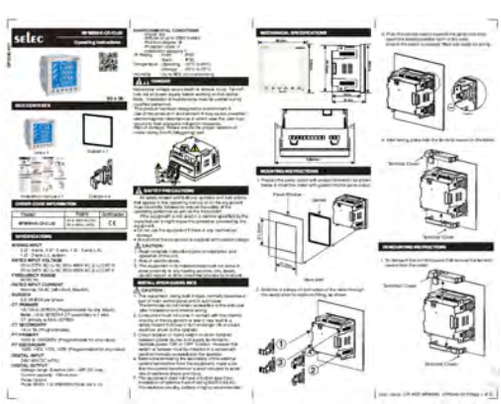
The meter is easy to install, easy to use, compact in size, and meets all safety and reliability standards. The meter is normally supplied readily pre-programmed for operation and can be directly installed in the usual manner. Meter read/write operations can be performed either manually or through communication protocols, including MODBUS RTU over RS485 and MODBUS TCP over Ethernet.

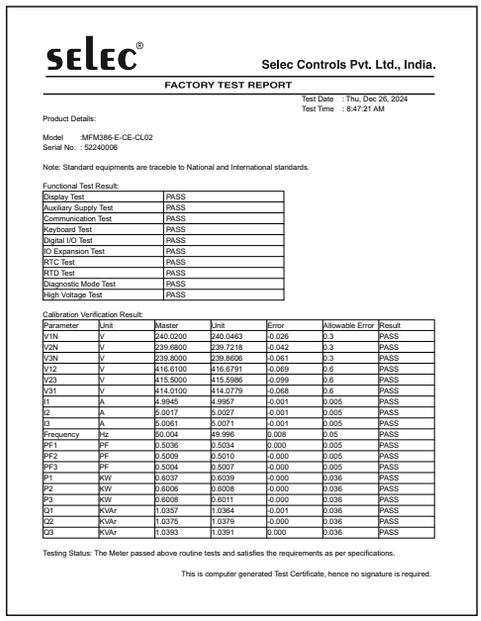
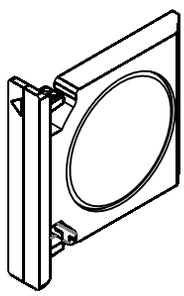
This user manual describes the basic functions and operational methods of the meter. Please read through this manual carefully before using the product.

## Contents of the package:

Unpack the box and check the contents before using the product. If any part or accessory is missing or if the product appears to be damaged, contact our sales representative.

**List of accessories**

| Sr no. | Description of accessories | Image | Qty |
|---|---|---|---|
| 1 | Panel mount clamp |  | 4 |
| 2 | Gasket |  | 1 |
| 3 | Instruction manual |  | 1 |

| | | | |
|---|---|---|---|
| 4 | Record test certificate |  | 1 |
| 5 | Battery cover & battery |  | 1 |

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**Selec Controls Pvt. Ltd., India.**

**FACTORY TEST REPORT**

Test Date : Thu, Dec 26, 2024
Test Time : 8:47:21 AM

Product Details:

Model :MFM386-E-CE-CL02
Serial No. : 52240006

Note: Standard equipments are traceble to National and International standards.

Functional Test Result:

| | |
|---|---|
| Display Test | PASS |
| Auxiliary Supply Test | PASS |
| Communication Test | PASS |
| Keyboard Test | PASS |
| Digital I/O Test | PASS |
| IO Expansion Test | PASS |
| RTC Test | PASS |
| RTD Test | PASS |
| Diagnostic Mode Test | PASS |
| High Voltage Test | PASS |

Calibration Verification Result:

| Parameter | Unit | Master | Unit | Error | Allowable Error | Result |
|---|---|---|---|---|---|---|
| V1N | V | 240.0200 | 240.0463 | -0.026 | 0.3 | PASS |
| V2N | V | 239.6800 | 239.7218 | -0.042 | 0.3 | PASS |
| V3N | V | 239.8000 | 239.8606 | -0.061 | 0.3 | PASS |
| V12 | V | 416.6100 | 416.6791 | -0.069 | 0.6 | PASS |
| V23 | V | 415.5000 | 415.5986 | -0.099 | 0.6 | PASS |
| V31 | V | 414.0100 | 414.0779 | -0.068 | 0.6 | PASS |
| I1 | A | 4.9945 | 4.9957 | -0.001 | 0.005 | PASS |
| I2 | A | 5.0017 | 5.0027 | -0.001 | 0.005 | PASS |
| I3 | A | 5.0061 | 5.0071 | -0.001 | 0.005 | PASS |
| Frequency | Hz | 50.004 | 49.996 | 0.008 | 0.05 | PASS |
| PF1 | PF | 0.5036 | 0.5034 | 0.000 | 0.005 | PASS |
| PF2 | PF | 0.5009 | 0.5010 | -0.000 | 0.005 | PASS |
| PF3 | PF | 0.5004 | 0.5007 | -0.000 | 0.005 | PASS |
| P1 | KW | 0.6037 | 0.6039 | -0.000 | 0.036 | PASS |
| P2 | KW | 0.6006 | 0.6008 | -0.000 | 0.036 | PASS |
| P3 | KW | 0.6008 | 0.6011 | -0.000 | 0.036 | PASS |
| Q1 | KVAr | 1.0357 | 1.0364 | -0.001 | 0.036 | PASS |
| Q2 | KVAr | 1.0375 | 1.0379 | -0.000 | 0.036 | PASS |
| Q3 | KVAr | 1.0393 | 1.0391 | 0.000 | 0.036 | PASS |

Testing Status: The Meter passed above routine tests and satisfies the requirements as per specifications.

This is computer generated Test Certificate, hence no signature is required.

# SAFETY RECOMMENDATION

Read this manual carefully and follow all safety precautions before mounting, installing, operating, and servicing the multifunction meter. Ignoring the safety protocols may cause harm, a loss of life, or damage to property.

### Warning

People working on the device should take part in professional electrical and safety training, receive the certification, and be familiar with all steps and requirements of installing, commissioning, operating and maintaining the device to avoid any hazards.

### Delivery installation

A pre-delivery inspection for each meter is implemented strictly by our QC department. The packaging is adequately strengthened with special packing materials to protect it from justifiable harm during handling and transportation. However, as an added precaution, we request that you kindly check the following points upon receipt of the device.

- Please check for any damage caused during transportation
- Please check if the enclosed documents are all inside the case, namely the instruction manual and record test certificate
- Please check if this is the model of the product for which you placed an order

### Safety guidelines

All safety related codifications, symbols and instructions that appear in this operating manual or on the meter must be strictly followed to ensure the safety of the operating personnel as well as the instrument. If the meter is not used in the manner specified by the manufacturer, it might impair the protection provided by the meter.

### Caution

- Do not use the meter if there is any mechanical damage
- Ensure that the equipment is supplied with the correct voltage
- Read the complete instructions prior to the installation and operation of the unit
- The equipment in its installed state must not come in close proximity to any heating sources, oils, steam, caustic vapours, or other unwanted process by products
- Power must be shut of completely before performing any kind of wiring on the auxiliary terminals
- Do not touch the internal components for your own and the product's safety
- Only qualified professional engineers are allowed to assemble, wire, commission or maintain
- Do not conduct the procedure of inspection or maintenance until the meter has been shut down for at least 3 minutes
- No permission is granted to change or modify the internal components or circuits

# INSTALLATION

## Installation environment

- The surroundings must be free from Dust, Caustic / Corrosive / Inflammable gases / Liquids
- There should not be any metal particulate in the surrounding air
- The ambient temperature should be -10 °C to +55 °C

## Installation guidelines

- This equipment, being built-in, normally becomes part of the main control panel
- The terminals do not remain accessible to the end user after installation and internal wiring
- Conductors must not come into contact with the internal circuitry of the meter or else it may lead to a safety hazard that may in turn endanger life or cause an electrical shock to the operator
- A circuit breaker or mains switch must be installed between the power source and supply terminals to facilitate power ON or OFF functions. however, this switch or breaker must be installed in a convenient position that is normally accessible to the operator
- Before disconnecting the secondary of the external current transformer from the equipment, make sure that the current transformer is short circuited to avoid the risk of electric shock and injury
- The equipment does not have a built-in-type fuse; installation of an external fuse of rating 300V 0.5A AC for electrical circuitry.

# FEATURES SUMMARY

## Features

- LCD display screen.
- True RMS measurement.
- Measurement of 3-phase energy.
- Maximum and minimum of peak, present, predective and last demand measurements
- Password protected programmable features.
- Pages auto scrolling and manual mode provision.
- Site programmable for CT / VT ratio.
- Site programmable for network selection.
- User selectable energy measurement on DO and INT LED.
- 33 built-in types of configurable alarms with user-selected priorities.
- User configurable multi-tariff and datalogging.
- External IO modules available: 2DI+4RO, 2DI+2DO+1AI+1AO.
- RS485 MODBUS and Ethernet communication.
- Enclosure protection for dust and water.
- Compliance with the international standard IEC 61557-12 & IEC61326-1.

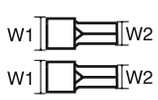
## Salient features

- Accuracy class for active energy (Wh) class 0.2S as per IEC62053-22.
- Accuracy class for reactive energy (VARh) class 1 as per IEC62053-24.
- On site firmware update downloading via the bootloader functionality through ethernet and RS485 communication.
- Endianness selection (MSRF/LSRF).
- Energy auto resolution for Kilo, Mega and Giga values
- Programmable minimum suppression current (2mA to 99mA).
- Power factor sign convention (IEC/IEEE standards).
- Four quadrant measurements of Power Factor & Power.
- Supports data logging up to 30 user-selectable parameters from a total of 105, with a retention period of 90 days at a 5-minute sampling interval.
- 3 Phase Import, Export, Import + Export, Import - Export (Active, Reactive, Apparent) Energies.
- Demand parameters with various methods (Peak, Present, Last, Predictive).
- Time-stamping for the occurrence of Peak demand, Min/Max parameter values (Voltage, Current, Power factor, Power, Frequency) and reset of energies and tariff parameters.
- Measurements of true, Displacement and Distortion power factor.
- Digital input (DI1) for dual energy measurement - Mains and DG.
- Configurable Digital Input(DI2) of 24/48V for external input and demand sync application.
- Configured system error code to define the errors.
- Configurable digital output (DO) for control, synchronization and pulsing application.
- Configurable pulse weight from 1 to 9999999 (pulse/k_h).
- Measurement of motor RPM.
- Real - Time clock (RTC) with 4 and 7 register format.
- RTD (temperature range: -150 to 850 °C).
- THD% , thd% and individual harmonics upto 40th harmonics for voltage & current.
- TDD for calculation of Total demand distortion.
- Crest Factor, K-Factor, CO2 emission.

- Self - Test mode
- 4 tariff with each having 4 time slots settings
- Voltage phase sequence detection
- Current polarity reversal detection and correction
- Load run hour - Based on accumulated energy - Import and Export (mains and DG both), ON hour, Active load timer.
- Number of auxiliary interruptions

# SPECIFICATIONS

| Technical specifications | | |
|---|---|---|
| Type of measurement | Networks | 3P4W, 3P3W, 1P2W L-N, 1P2W-LL |
| | | True RMS |
| Measurement accuracy | | Class 0.2S as per IEC62053-22 |
| Display | LCD | Negative (blue) LCD with backlight.<br>4 line 4 digit: 12.46 x 6.72mm<br>last line of 9 digit: 6.85 x 3.73mm<br>bar graph for % load for each phase |
| Auxiliary input | Aux voltage | 40V - 300V AC/DC |
| | Power consumption | <10VA |
| | Freq range | 50/60Hz |
| Measurement input | Input voltage | 20 to 277V AC (L-N); 35 to 480V AC (L-L) CAT III<br>20 to 347V AC (L-N); 35 to 600V AC (L-L) CAT II |
| | VT secondary | 100,110,115,120 V (programmable) |
| | VT primary | 100 V to 1000000 V (programmable) |
| | Frequency | 45 to 65Hz |
| | Measurement method | True RMS |
| | Burden | 0.5 VA |
| | Wire gauge | 18-14 AWG (UL) |
| | Input current | Nominal 5A AC (Min-2mA, Max-8.5A) |
| | CT primary | 1A / 5A to 32767A (programmable) |
| | CT secondary | 1A / 5A (programmable) |
| | Measurement method | True RMS |
| | Burden | 0.5VA |
| | Wire gauge | 18-14 AWG (UL) |
| Digital input | DC input | 24V/48V DC |
| Digital output | Digital output | Voltage range: External 48V DC max<br>Current capacity: 20mA max |
| | Pulse width | 1 to 9999999 (pulse per k_h) |
| | Pulse duration | For POP: 50ms<br>For LED: 25ms |
| | Output type | Open collector |
| Communication (RS485) | Type | RS485 MODBUS RTU |
| | Baud rate | 9600, 19200, 38400, 57600, 115200,<br>bps (programmable) |
| | Slave ID | 1 to 247 (programmable) |
| | Parity | Odd, Even, None |
| | Isolation | 2 kV AC isolation for 1 minute between communication and other circuits |
| Communication (ethernet) | Connector | 8 pin RJ45 |
| | Speed | 10/100 Mbps |
| | Protocol | TCP (Server, Client), MODBUS TCP |
| | Standards | IEEE802.3, IEEE802.3u |
| | Magnetic isolation protection | 1.5KV |
| | IP conguration | DHCP/Auto IP, Static IP |

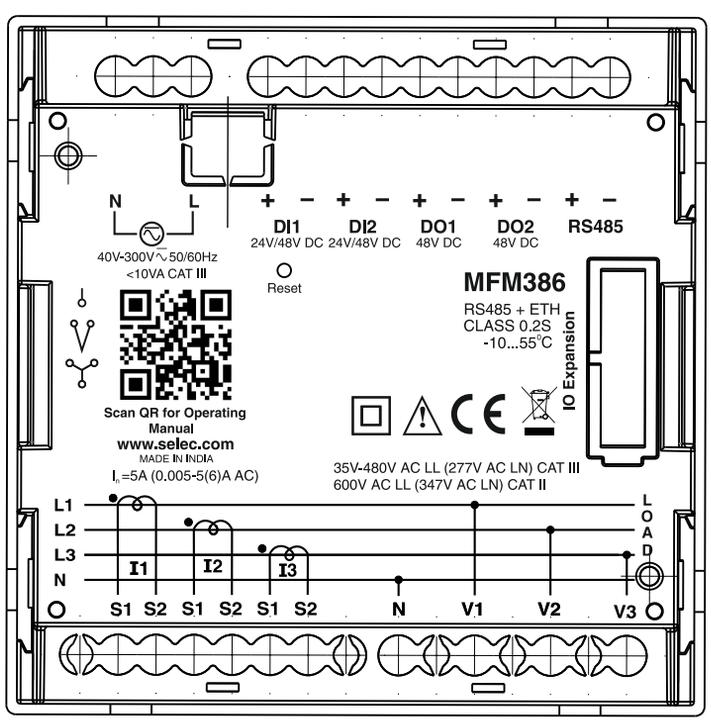
| Accuracy | | |
|---|---|---|
| Measurement type | Class of accuracy as per IEC 61557-12 ($I_N$ = 5A-nominal CT) | 0.2% |
| Active energy | Class 0.2S (class 0.2S as per IEC 62053-22 at $I_N$ = 5A nominal CT). | ±0.2% |
| Reactive energy | Class 1 (class 1 as per IEC 620253-24 at $I_N$ 5A nominal CT) | ±1% |
| Apparent energy | Class 0.5S (class 0.5S at $I_N$ = 5A nominal CT) | ±0.5% |
| Active power | Class 0.2 | ±0.2% |
| Reactive power | Class 1 | ±1% |
| Apparent power | Class 0.5 | ±0.5% |
| Current | Class 0.2 | ±0.2% |
| Voltage (L-L) | Class 0.2 | ±0.2% |
| Voltage (L-N) | Class 0.2 | ±0.2% |
| Frequency | Class 0.05 | ±0.05% |
| Power factor | Class 0.1 | ±0.005 count |
| THD and Individual harmonics till 15$^{th}$ harmonics | Class 2 | ±2% |
| **Electrical specification** | | |
| Insulation properties | Impulse voltage test | ±4kV as per IEC 61010-1 |
| | AC voltage test | ±2kV double insulation as per IEC 61010-1 |
| | Insulation resistance | 500V DC voltage as per IEC 61010-1 |
| Electrical requirements | Test of power consumption | As per IEC 61010-1 |
| | Voltage dips and Interrupts | As per IEC 61000-4-11 |
| | Short time over current protection | 20 times of IMAX for half a second as per IEC 61010-1 |
| Electromagnetic compatibility (EMC) | Electrical fast transient / burst immunity test | IEC 61000-4-4 |
| | Electrostatic discharge immunity test | IEC 61000-4-2 |
| | Radiated, radio-frequency, electromagneti field immunity test | IEC 6100-4-3 |
| | Immunity to conduct disturbances, induced by radio-frequency fields | IEC 61000-4-6 |
| | Surge immunity test | IEC 61000-4-5 |
| | Rated power frequency magnetic fields | 30A/m as per IEC 61000-4-8 for continuous duration<br>300A/m as per IEC 61000-4-8 for short duration |
| | Emission | Class A as per CISPR 11 |
| Environmental | Temperature | Operating: -10 ºC to 55 ºC<br>Storage: -25 ºC to 70 ºC |
| | Humidity | Up to 85% non-condensing |
| Lug dimension |  | W1 = 4.2mm<br>W2 = 1.8mm<br>W1 = 3.8mm<br>W2 = 1.6mm |

| | | |
|---|---|---|
| Recommended fuse specifications | 300V 0.5A AC | |
| Battery specifications | Coin type lithium battery (CR3032) | 3V/220mAh |
| **Mechanical specifications** | | |
| Mounting type | Panel mount | |
| Size | 96 x 96mm | |
| Front bezel | 96 x 96mm | |
| Panel cutout | 90.7 x 90.7mm | |
| Material | Poly carbonate - Lexan 923 | |
| Accessories | Panel mount clamp, Terminal cover | |
| Weight | 350 gm approx | |
| Protection rating | IP rating<br>Front: IP65<br>Back: IP30 | |
| Mechanical testing | Casing plastic mould protected to IP65 from front | |
| Certification | | CE, RoHS |

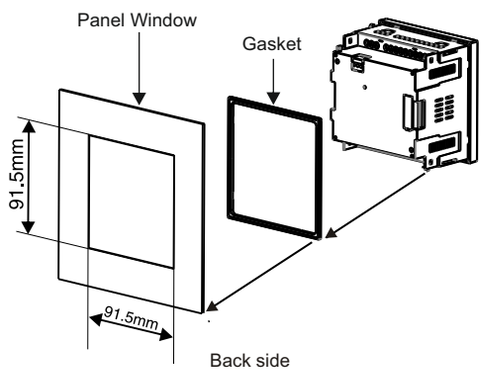
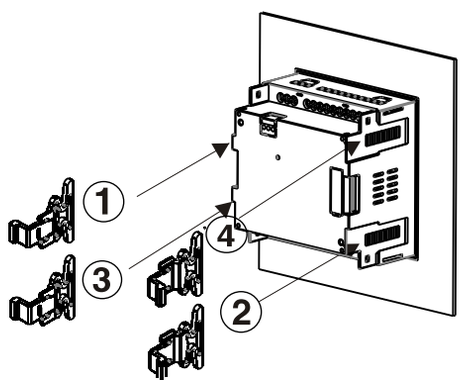
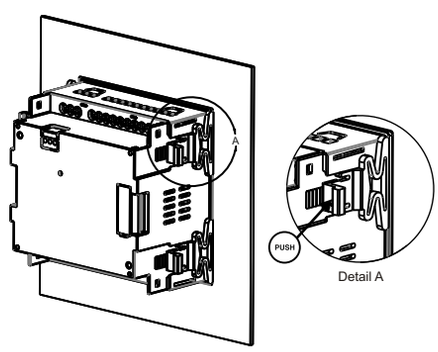
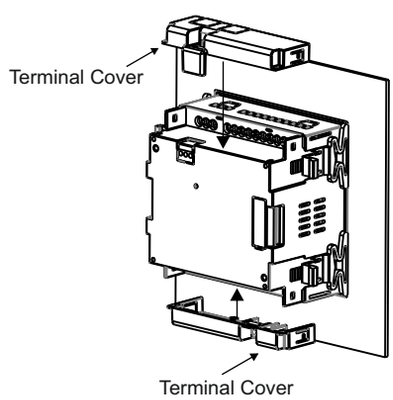
**NOTE:** Cable size (mm2): 0.75 to 2.5; Tightening torque (Nm): 0.4 to 0.6

## Front panel view

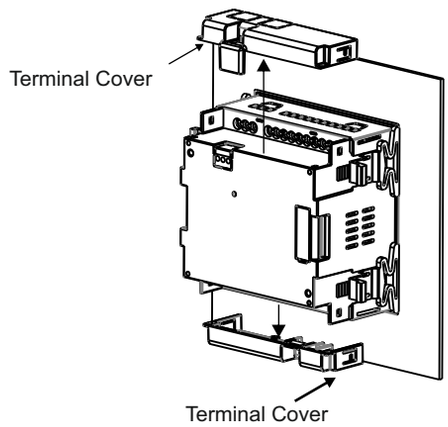
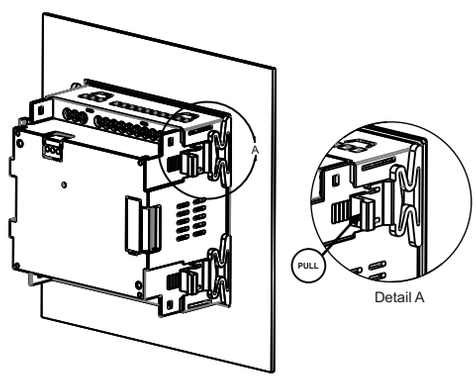
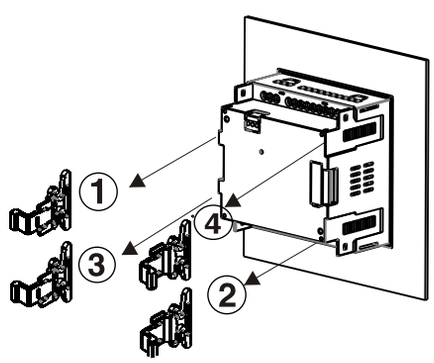
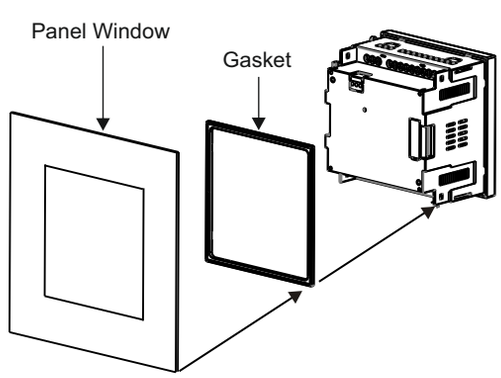

## Back panel view



## Mounting

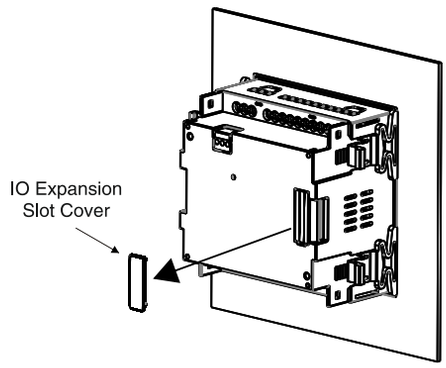
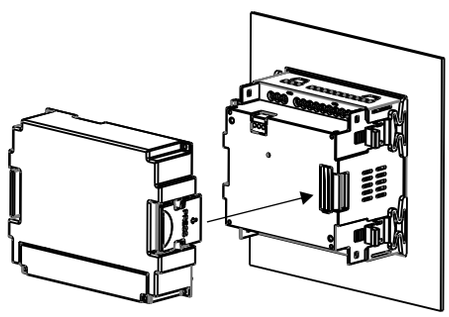
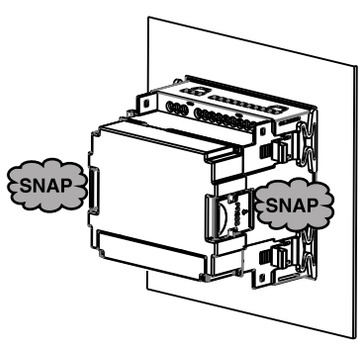
| STEP | INSTRUCTION | |
|---|---|---|
| 1 | Prepare the panel cutout with proper dimension as shown below & Insert the meter with gasket into the panel cutout |  |
| 2 | Slide the 4 clamps on both sides of the meter through the clamp slots for optimum fitting, as shown |  |
| 3 | Push the clamps evenly towards the panel until they reach the lowest possible tooth of the slots. Ensure the meter is properly fitted and ready for wiring |  |
| 4 | After wiring, place both the terminal covers on the meter |  |

## Demounting

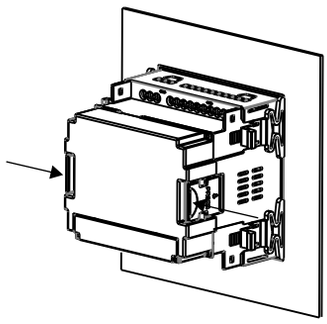
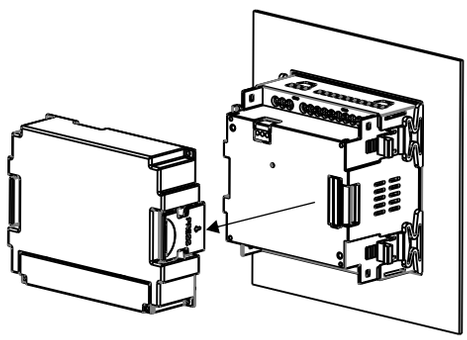
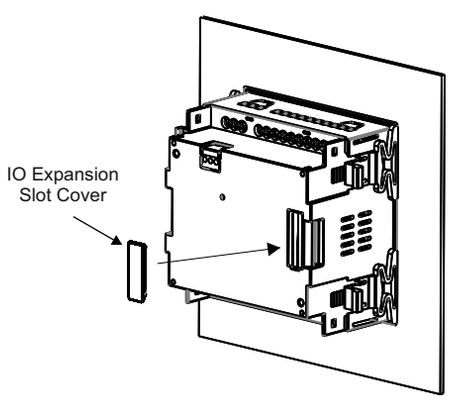
| STEP | INSTRUCTION | |
|---|---|---|
| 1 | To demount the unit from panel first remove the terminal covers from the meter |  |
| 2 | Pull the arm of the sliding clamp in outward direction (opposite to meter) and drag the sliding clamps away from the panel |  |
| 3 | Remove all the 4 clamps from meter |  |
| 4 | Push the meter from the back side of the panel window and remove it from the panel |  |

## IO Module mounting

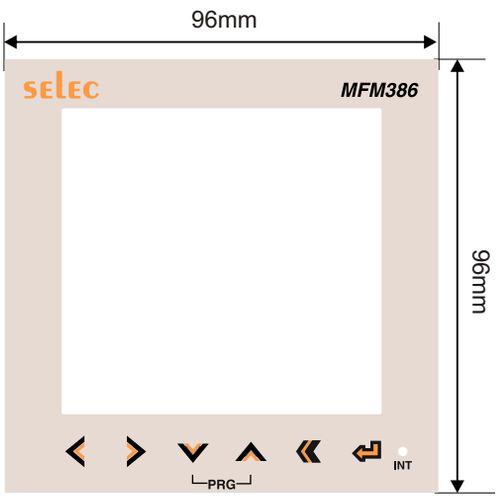
**Note:** To be installed in off condition only

| STEP | INSTRUCTION | |
|---|---|---|
| 1 | Remove the IO expansion slot cover from meter |  |
| 2 | Plug the IO module into meter as shown |  |
| 3 | The IO module is secured with the meter after snap sound is heard |  |

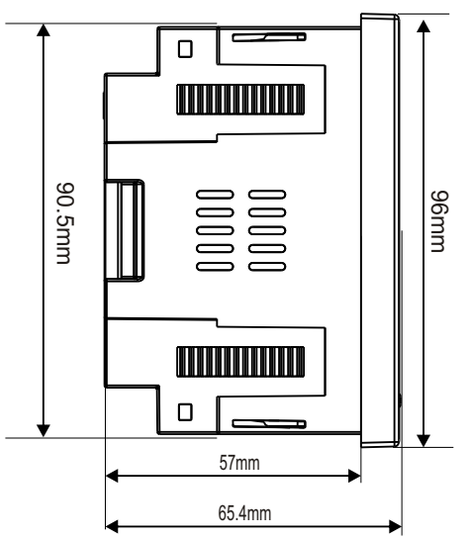
## IO MODULE DEMOUNTING

| STEP | INSTRUCTION | |
|---|---|---|
| 1 | Pinch the clamps at the specified location to detach the IO expansion module from the meter |  |
| 2 | Pull out the IO module |  |
| 3 | Put the IO expansion slot cover to the meter |  |

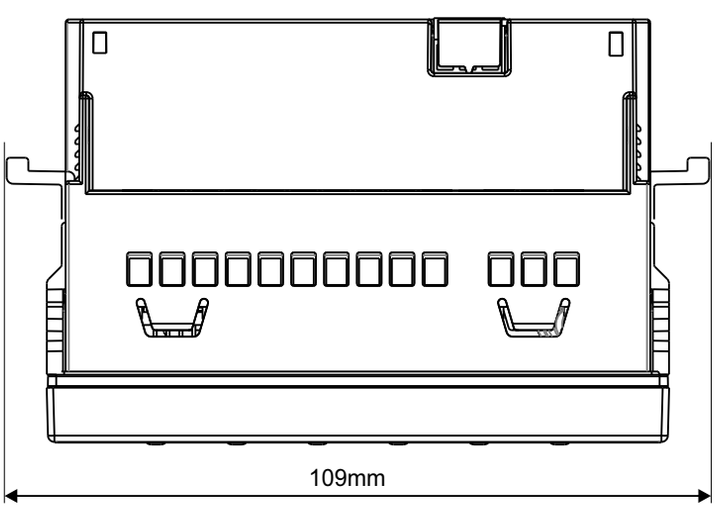
## Mechanical specification




**FRONT VIEW**

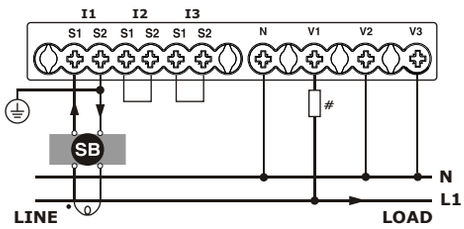
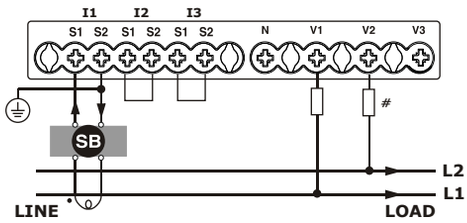
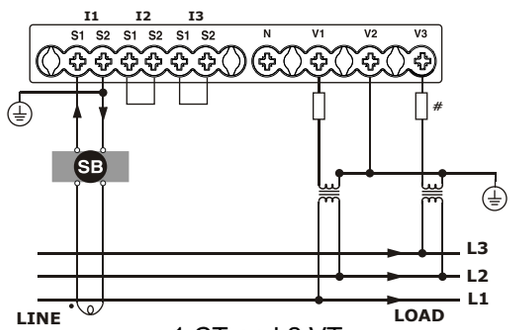
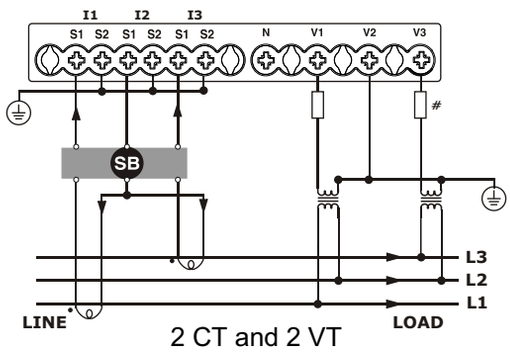
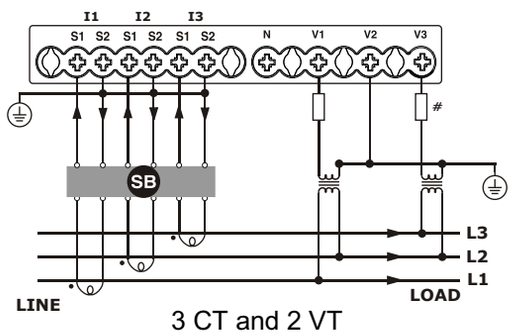
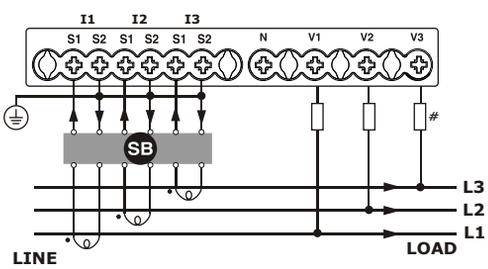
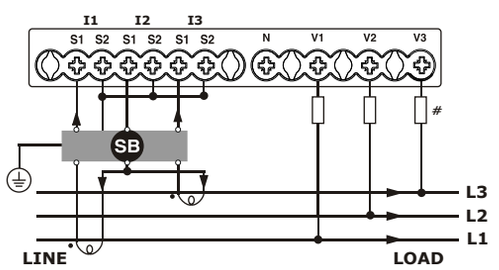



**SIDE VIEW**

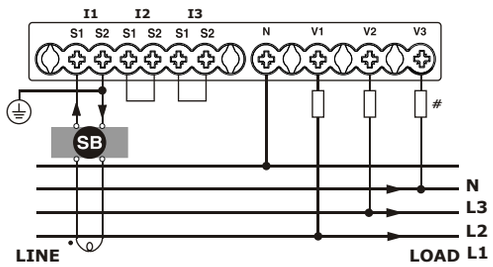



**TOP VIEW**

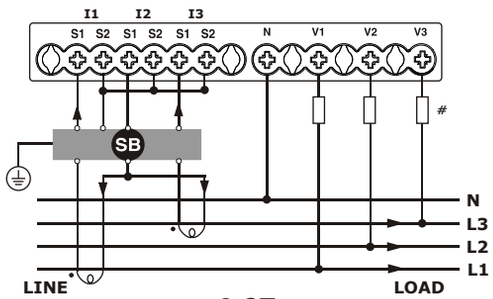
## Wiring diagram

| 1 PHASE 2 WIRE (L-N) | 1 PHASE 2 WIRE (L-L) |
|---|---|
|  |  |
| 1CT (L-N) | 1CT (L-L) |
| **3 PHASE 3 WIRE** | |
|  |  |
| 1 CT and 2 VT | 2 CT and 2 VT |
|  |  |
| 3 CT and 2 VT | 3 CT |
|  | |
| 2 CT | |

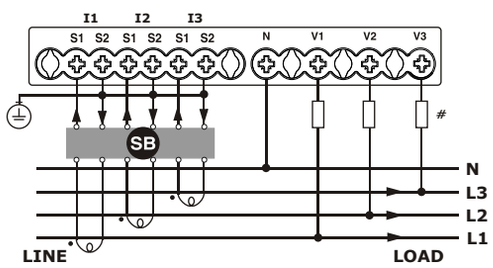
## 3 PHASE 4 WIRE



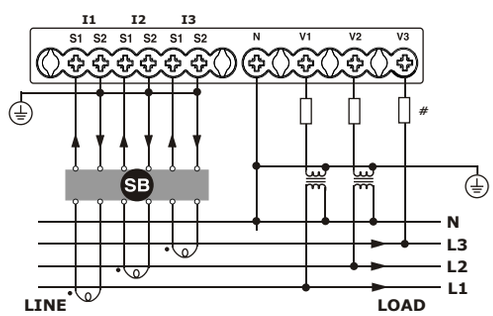

1 CT



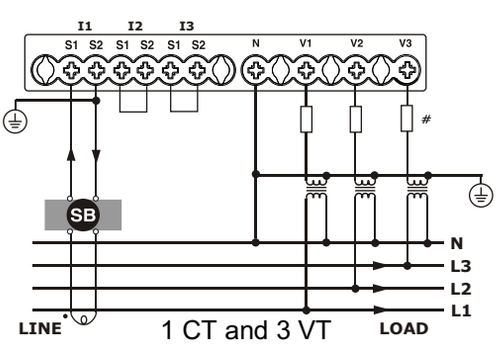

2 CT



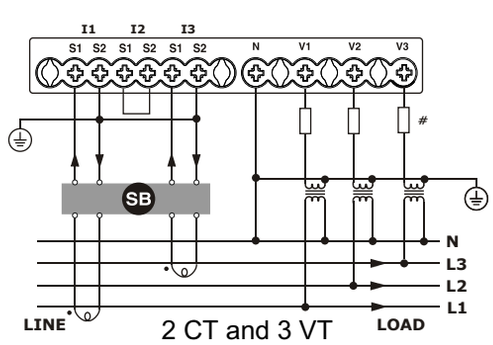

3 CT



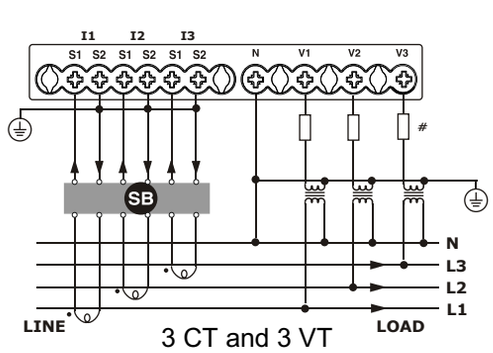

3 CT and 2 VT




1 CT and 3 VT



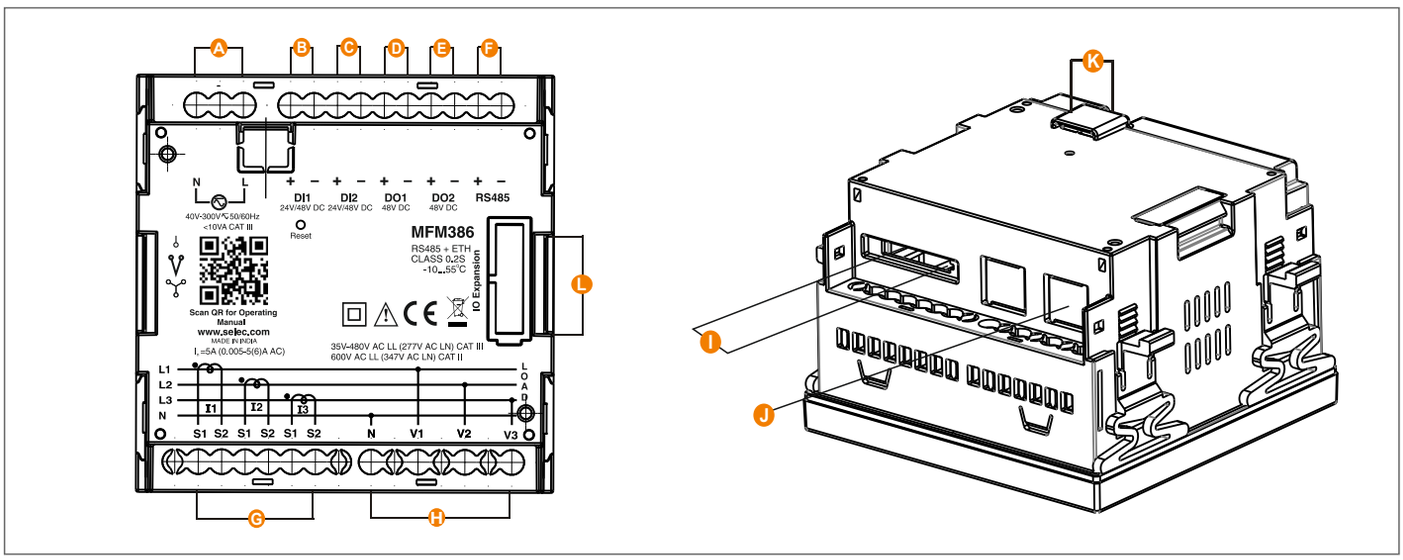

2 CT and 3 VT




3 CT and 3 VT

Note:
# All fuse types : 0.5A class CC UL type
0.5A fast acting 600V
SB : Shorting block

## Description of terminals



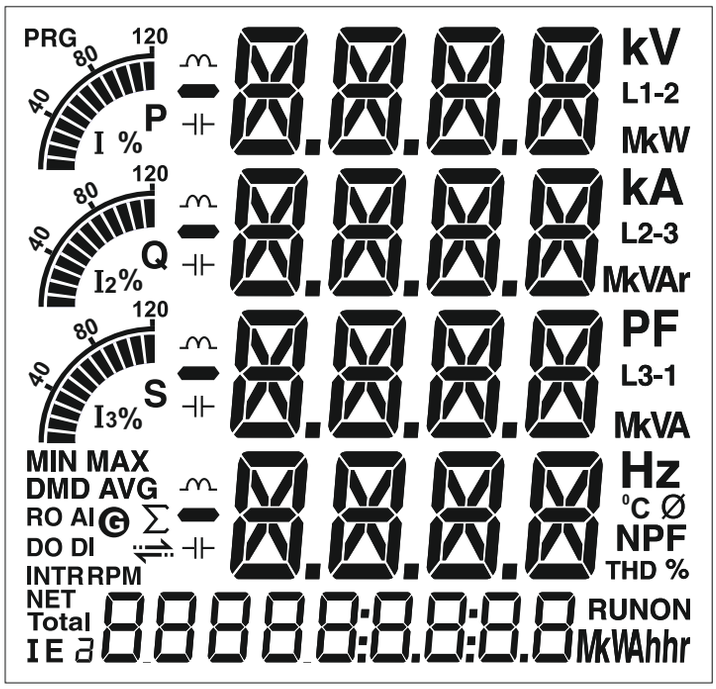

| Terminal | Description | |
|---|---|---|
| A | L (Line) | Auxiliary input |
| | N (Neutral) | |
| B | DI1+ | Digital input 1 |
| | DI1- | |
| C | DI2+ | Digital input 2 |
| | DI2- | |
| D | DO1+ | Digital output 1 |
| | DO1- | |
| E | DO2+ | Digital output 2 |
| | DO2- | |
| F | RS485+ | Communication connection |
| | RS485- | |
| G | S1(I1) | 3 phase current input |
| | S2(I1) | |
| | S1(I2) | |
| | S2(I2) | |
| | S1(I3) | |
| | S2(I3) | |
| H | N (Neutral for voltage input) | Three phase voltage input |
| | VR (Voltage R - Phase) | |
| | VY (Voltage Y - Phase) | |
| | VB (Voltage B - Phase) | |
| I | RTC BATTERY | RTC |
| J | ETHERNET | Ethernet |
| K | RTD1 | RTD |
| | RTD2 | |
| | RTD3 | |
| L | IO expansion | External IO expansion module |

**LCD description:**

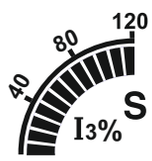
The front of the meter consists of LCD screen and six control keys. All the display segments are illustrated as below.

**Function LCD symbols, LED description:**

**All display segments**




| Sr. No. | Display | Description |
|---|---|---|
| 1 | Four lines of 4 digit | The numeric real time metering data will be displayed here |
| 2 | Single line of 9 digit | Display energy data and real time clock (time) |
| 3 | kV, kA,PF, Hz, kW, kVAr, kVA, kWh, kVArh, kVAh, k, M | Symbols represents for units representation of parameter values<br>Voltage: V, kV<br>Current: A, kA<br>Active power: kW, MW<br>Reactive power: kVAr, MVAr<br>Apparent power: kVA, MVA<br>Frequency: Hz<br>Active energy: kWh, MWh, kMWh(1)<br>Reactive energy: kVArh, MVArh, kMVAh(1)<br>Apparent energy: kVAh, MVAh, kMVAh(1)<br>(1)**For Giga – k and M both symbols will be ON.** |
| 4 | $L_{1-2}$,$L_{2-3}$ ,$L_{3-1}$, $L_{AVG}$, $L_N$ | 1, 2, 3: Represents 3 phases<br>1-2, 2-3, 3-1: Represents 3 phase VLL<br>AVG: represents the average<br>N: Stands for neutral |
| 5 | THD%, MIN, MAX, DMD, RPM, Ⓖ | THD: Total harmonics distortion;<br>MAX: Maximum; MIN: Minimum;<br>DMD: Demand;<br>RPM: Revolution per minute<br>Ⓖ : Secondary source (DG) |

| | | |
|---|---|---|
| 6 | Ø | Angle symbol |
| 7 | $I_{1,2,3}$, $E_{1,2,3}$, Σ | $I_{123}$: Individual Import energy<br>$E_{123}$: Individual Export energy<br>Σ : Shows individual summation of powers |
| 8 | **Total** | It shows summation of all 3 import or export energy |
| 9 | **NET Total** | It is absolute summation of total import and total export energy |
| 10 | **AVG** | Used to show average of 3-phase measurable parameter |
| 11 | | Communication symbol for RS485 |
| 12 | | Load type symbol:<br>Inductive and Capacitive<br>Indicates negative Power & Power factor |
| 13 |  | Bar graph represents percentage load to the rated current for each phase |
| 14 | INTR | Auiliary interrupt |
| 15 | ON, RUN | ON hour and RUN hour indications |
| 16 | ºC | Temperature |
| 17 | PRG | Configuration mode |
| 18 | P , Q , S | Symbol represent active power, Reactive power and Apparent power respectively |

### Keyboard description

There are 6 dedicated keys to read the meter parameters. Simply press these keys to read the parameters illustrations of keyboard operations with different modes

### Key function to access measurement mode parameters

| Mode | Key press | Key description |
|---|---|---|
| Measurement mode |  | Phase measurement |
| |  | System measurement |
| |  | Demand measurement |
| |  | Min/Max measurement |
| |  | Real time clock |
| |  | Energy measurement |

### Key function to access different features of meter

| Mode | Key press | Key description |
|---|---|---|
| Measurement mode |  | Press and hold key for 3 seconds to check the phase voltage sequence detection |
| |  | Press and hold key for 3 seconds to check the CT polarity reversal detection |
| |  | Press and hold key for 3 seconds to enter or exit from the configuration mode |
| |  | Press and hold key for 3 seconds to enter or exit from active alarm list |
| |  | Press and hold key for 3 seconds to enter or exit from the self test mode |
| |  | Press and hold key for 3 seconds to toggle between automatic and manual (fixed) mode |

## Key function to access configuration mode parameters

| Mode | Key press | Key description |
|---|---|---|
| Configuration mode |  | To move cursor left by one digit each time and to enter in edit mode for parameter value selection |
| |  | To move cursor right by one digit each time and to enter in edit mode for parameter value selection |
| |  | To decrement the parameter value and also for page change |
| |  | To increment the parameter value |
| |  | To go back to previous levels |
| |  | To save the setting & To enter in the next level |

- This meter comes with different types of mode to see the meter features and their functionality. For ease of meter operation, the operating modes are classified as below
- Measurement mode
- Configuration mode
- Self-Test Mode
- Scrolling mode

**Measurement mode:**

Measurement mode is the default mode when you power up the meter. In measurement mode, the types of measurement have been classified into six specified parameters measurement as mentioned in the table below.

| Key press | Key description | Screens | Online page description (3P4W) |
|---|---|---|---|
|  | Phase measurements | 1st | Display $V_{LN}$ of 3 phase and Avg $V_{LN}$. |
| | | 2nd | Display $V_{LL}$ of 3 phase and Avg $V_{LL}$. |
| | | 3rd | Display phase current of 3 phase and Avg current. |
| | | 4th | Display power factor of 3 phase and Avg power factor. |
| | | 5th | Display phase angle 3 of phase. |
| | | 6th | Display all 3 phase active power and total active power of 3 phases |
| | | 7th | Display all 3 phase reactive power and total reactive power of 3 phases. |
| | | 8th | Display all 3 phase apparent power and total apparent power of 3 phases. |
| | | 9th | Display $V_{LN}$ THD% of 3 phase and Avg $V_{LN}$ THD%. |
| | | 10th | Display $V_{LL}$ THD% of 3 phase and Avg $V_{LL}$ THD%. |
| | | 11th | Display current THD% of 3 phase and Avg current THD%. |
|  | System measurements | 1st | Display Avg voltage, Current, Power factor and Frequency. |
| | | 2nd | Display 1st phase voltage, Current, Power factor and Frequency. |
| | | 3rd | Display 2nd phase voltage, Current, Power factor and Frequency. |
| | | 4th | Display 3rd phase voltage, Current power factor and Frequency |
| | | 5th | Display unbalanced current. |
| | | 6th | Display neutral current. |
| | | 7th | Display Total active, Reactive and Apparent power. |
|  | Demand measurements | 1st | Display peak MAX demand of Active, Reactive and Apparent power. |
| | | 2nd | Display peak MIN demand of Active and Reactive power. |
| | | 3rd | Display present MAX demand of Active, Reactive and Apparent power. |
| | | 4th | Display present MIN demand of Active and Reactive power. |
| | | 5th | Display last MAX demand of Active, Reactive and Apparent power. |
| | | 6th | Display last MIN demand of Active and Reactive power |
| | | 7th | Display predictive MAX demand of Active, Reactive and Apparent power. |
| | | 8th | Display predictive MIN demand of Active and Reactive power. |
| | | 9th | Display peak MAX demand of Avg current. |
| | | 10th | Display present MAX demand of Avg current. |
| | | 11th | Display last MAX demand of Avg current. |
| | | 12th | Display predective MAX demand of Avg current. |
|  | Min / Max measurements | 1st | Display MAX Avg of Voltage, Current and Frequency |
| | | 2nd | Display MAX Avg $V_{LL}$. |
| | | 3rd | Display MAX Total of Active, Reactive and Apparent Power. |
| | | 4th | Display MIN Avg of Voltage, Current and Frequency. |
| | | 5th | Display MIN Avg $V_{LL}$ |
| | | 6th | Display MIN Total of Active, Reactive and Apparent Power. |
|  | RTC/ RTD | 1st | Display Time and Date in RTC |
| | | 2nd | Display RTD Temperture |
| | | 3rd | Display status DI1 and DI2 |
| | | 4th | Display status DO1 and DO2 |

| | | | |
|---|---|---|---|
|  | Energy measurement | 1st | Display 1st Phase Import Active Energy |
| | | 2nd | Display 2nd Phase Import Active Energy. |
| | | 3rd | Display 3rd Phase Import Active Energy. |
| | | 4th | Display 1st Phase Export Active Energy |
| | | 5th | Display 2nd Phase Export Active Energy. |
| | | 6th | Display 3rd Phase Export Active Energy |
| | | 7th | Display Total Import Active Energy. |
| | | 8th | Display Total Export Active Energy |
| | | 9th | Display NET Total Active Energy |
| | | 10th | Display 1st Phase Import Reactive Energy. |
| | | 11th | Display 2nd Phase Import Reactive Energy. |
| | | 12th | Display 3rd Phase Import Reactive Energy. |
| | | 13th | Display 1st Phase Export Reactive Energy. |
| | | 14th | Display 2nd Phase Export Reactive Energy. |
| | | 15th | Display 3rd Phase Export Reactive Energy. |
| | | 16th | Display Total Import Reactive Energy. |
| | | 17th | Display Total Export Reactive Energy. |
| | | 18th | Display NET Total Reactive Energy |
| | | 19th | Display 1st Phase Import Apparent Energy. |
| | | 20th | Display 2nd Phase Import Apparent Energy. |
| | | 21st | Display 3rd Phase Import Apparent Energy |
| | | 22nd | Display 1st Phase Export Apparent Energy. |
| | | 23rd | Display 2nd Phase Export Apparent Energy. |
| | | 24th | Display 3rd phase Export Apparent Energy. |
| | | 25th | Display Total Import Apparent Energy. |
| | | 26th | Display Total Export Apparent Energy. |
| | | 27th | Display NET Total Apparent Energy. |
| | | 28th | Display RPM |

| Key Press | Key Description | Screens | Online page description (3P3W) |
|---|---|---|---|
|  | Phase measurements | 1st | Display $V_{LL}$ of 3 phase and Avg $V_{LL}$. |
| | | 2nd | Display phase current of 3 phase and Avg current. |
| | | 3rd | Display Avg Power Factor. |
| | | 4th | Display Avg Phase Angle. |
| | | 5th | Display $V_{LL}$ THD% of 3 phase and Avg $V_{LL}$ THD%. |
| | | 6th | Display current THD% of 3 phase and Avg current THD%. |
|  | System measurements | 1st | Display Avg LL VAF and Power Factor. |
| | | 2nd | Display Unbalanced current. |
| | | 3rd | Display Total Active, Reactive and Apparent Power |
|  | Demand measurements | 1st | Display Peak MAX Demand of Active, Reactive and Apparent Power. |
| | | 2nd | Display Peak MIN Demand of Active and Reactive Power. |
| | | 3rd | Display Present MAX Demand of Active, Reactive and Apparent Power. |
| | | 4th | Display Present MIN Demand of Active and Reactive Power. |
| | | 5th | Display Last MAX Demand of Active, Reactive and Apparent Power. |
| | | 6th | Display Last MIN Demand of Active and Reactive Power. |
| | | 7th | Display Predective MAX Demand of Active, Reactive and Apparent Power. |
| | | 8th | Display Predective MIN Demand of Active and Reactive Power. |
| | | 9th | Display Peak MAX Demand of Avg Current. |
| | | 10th | Display Present MAX Demand of Avg Current. |
| | | 11th | Display Last MAX Demand of Avg Current. |
| | | 12th | Display Predective MAX Demand of Avg Current. |
|  | Min / Max measurements | 1st | Display MAX Avg LL of VAF . |
| | | 2nd | Display MAX Total of Active, Reactive and Apparent Power. |
| | | 3rd | Display MIN Avg LL of VAF. |
| | | 4th | Display MIN Total of Active, Reactive and Apparent Power. |

| | | | |
|---|---|---|---|
|  | RTC/ RTD | 1st | Display Time and Date in RTC. |
| | | 2nd | Display RTD Temperature. |
| | | 3rd | Display DI1 and D12 |
| | | 4th | Display DO1 and DO2 |
|  | Energy measurement | 1st | Display Total Import Active Energy |
| | | 2nd | Display Total Export Active Energy. |
| | | 3rd | Display NET Total Active Energy. |
| | | 4th | Display Total Import Reactive Energy |
| | | 5th | Display Total Export Reactive Energy |
| | | 6th | Display NET Total Reactive Energy |
| | | 7th | Display Total Import Apparent Energy |
| | | 8th | Display Total Export Apparent Energy |
| | | 9th | Display NET Total Apparent Energy |
| | | 10th | Display RPM. |

| Key Press | Key Description | Screens | Online Page Description (1P2W) |
|---|---|---|---|
|  | Phase measurements | 1st | Display Phase wise Voltage. |
| | | 2nd | Display Phase wise Current. |
| | | 3rd | Display Phase wise Power Factor. |
| | | 4th | Display Phase wise Phase Angle. |
| | | 5th | Display Phase wise Voltage THD %. |
| | | 6th | Display Phase wise Current THD %. |
|  | System measurements | 1st | Display Phase wise Voltage, Current, Power Factor and Frequency. |
| | | 2nd | Display Active, Reactive and Apparent Power. |
|  | Demand measurements | 1st | Display Peak MAX Demand of Active, Reactive and Apparent Power. |
| | | 2nd | Display Peak MIN Demand of Active and Reactive Power. |
| | | 3rd | Display Present MAX Demand of Active, Reactive and Apparent Power. |
| | | 4th | Display Present MIN Demand of Active and Reactive Power. |
| | | 5th | Display Last MAX Demand of Active, Reactive and Apparent Power. |
| | | 6th | Display Last MIN Demand of Active and Reactive Power. |
| | | 7th | Display Predective MAX Demand of Active, Reactive and Apparent Power. |
| | | 8th | Display Predective MIN Demand of Active and Reactive Power. |
| | | 9th | Display Peak MAX Demand of Current. |
| | | 10th | Display Present MAX Demand of Current. |
| | | 11th | Display Last MAX Demand of Current. |
| | | 12th | Display Predective MAX Demand of Current. |
|  | Min / Max measurements | 1st | Display MAX VAF of phase |
| | | 2nd | Display MAX of Active, Reactive and Apparent Power. |
| | | 3rd | Display MIN VAF of phase. |
| | | 4th | Display MIN of Active, Reactive and Apparent Power. |
|  | RTC/ RTD | 1st | Display Time and Date in RTC. |
| | | 2nd | Display RTD Temperature |
| | | 3rd | Display DI1 and D12. |
| | | 4th | Display DO1 and DO2. |
|  | Energy measurement | 1st | Display Total Import Active Energy |
| | | 2nd | Display Total Export Active Energy. |
| | | 3rd | Display NET Total Active Energy. |
| | | 4th | Display Total Import Reactive Energy |
| | | 5th | Display Total Export Reactive Energy |
| | | 6th | Display NET Total Reactive Energy |
| | | 7th | Display Total Import Apparent Energy |
| | | 8th | Display Total Export Apparent Energy |
| | | 9th | Display NET Total Apparent Energy |
| | | 10th | Display RPM. |

| Key Press | Key Description | Screens | Online Page Description (1P2W-LL) |
|---|---|---|---|
|  | Phase measurements | 1st | Display Phase wise LL Voltage |
| | | 2nd | Display Phase Wise Current |
| | | 3rd | Display Phase Wise Avg Power Angle |
| | | 4th | Display Phase Wise Avg Power Angle. |
| | | 5th | Display Phase wise Voltage THD %. |
| | | 6th | Display Phase wise Current THD %. |
|  | System measurements | 1st | Display Avg Phase wise Voltage, Current, Power Factor and Frequency. |
| | | 2nd | Display Total Active, Reactive and Apparent Power. |
|  | Demand measurements | 1st | Display Peak MAX Demand of Active, Reactive and Apparent Power |
| | | 2nd | Display Peak MIN Demand of Active and Reactive Power. |
| | | 3rd | Display Present MAX Demand of Active, Reactive and Apparent Power. |
| | | 4th | Display Present MIN Demand of Active and Reactive Power. |
| | | 5th | Display Last MAX Demand of Active, Reactive and Apparent Power. |
| | | 6th | Display Last MIN Demand of Active and Reactive Power. |
| | | 7th | Display Predective MAX Demand of Active, Reactive and Apparent Power. |
| | | 8th | Display Predective MIN Demand of Active and Reactive Power. |
| | | 9th | Display Peak MAX Demand of Current. |
| | | 10th | Display Present MAX Demand of Current. |
| | | 11th | Display Last MAX Demand of Current. |
| | | 12th | Display Predective MAX Demand of Current. |
|  | Min / Max measurements | 1st | Display MAX Average LL of VAF. |
| | | 2nd | Display MAX total of Active, Reactive and Apparent Power. |
| | | 3rd | Display MIN Average LL of VAF. |
| | | 4th | Display MIN total of Active, Reactive and Apparent Power. |
|  | RTC/ RTD | 1st | Display Time and Date in RTC. |
| | | 2nd | Display RTD Temperature. |
| | | 3rd | Display D11 and D12. |
| | | 4th | Display DO1 and DO2. |
|  | Energy measurement | 1st | Display Total Import Active Energy |
| | | 2nd | Display Total Export Active Energy. |
| | | 3rd | Display NET Total Active Energy. |
| | | 4th | Display Total Import Reactive Energy |
| | | 5th | Display Total Export Reactive Energy |
| | | 6th | Display NET Total Reactive Energy |
| | | 7th | Display Total Import Apparent Energy |
| | | 8th | Display Total Export Apparent Energy |
| | | 9th | Display NET Total Apparent Energy |
| | | 10th | Display RPM. |

## Configuration mode:

The configuration mode allows the user to configure the functions. The functions are explained in the table below.

Note: The settings should be done by a professional, after going through this users manual and after having understood the application situation.

Time out for configuration mode is 1 minute. After time out, meter exits configuration mode and goes measurement mode.

- Basic Setup
- Power Demand
- Current Demand
- Energy
- Serial Communication
- RTC
- Alarm
- Internal IO
- Factory Default
- Reset Parameters.

## Configuration mode:

| Level 1 | Level 2 | Level 3 | Range or Selection | Default value | Remark |
|---|---|---|---|---|---|
| Change password | New password | | 0000 to 9998 | 1000 | |
| Basic | Network Selection | | 3P4W<br>3P3W<br>1P2W<br>2P2W | 3P4W | |
| | CT Terminal Selection | | CT1<br>CT2<br>CT3<br>CT12<br>CT23<br>CT31<br>CT123<br>NONE | NONE | **NOTE:** The CT terminal parameters are enabled based on the selected network and VT connect configuration |
| | CT Secondary | | 1 or 5 | 5 | |
| | CT Primary | | 1 or 5 to 32767 | 5 | |
| | VT Connection Selection | | NO VT<br>1 VT<br>2 VT<br>3 VT | NO VT | **NOTE:** The VT connect parameters are enabled based on selected network |
| | VT Secondary | | 100<br>110<br>115<br>120 | 100 | **NOTE:** VT primary will not be enabled if VT selection is NO VT |
| | VT Primary | | 100 to 1000000 | 100 | **NOTE:** VT secondary will not be enabled if VT connect is NO VT |
| | System Frequency Selection(Hz) | | 50/60 | 50 | |
| | Minimum Suppression Current(mA) | | 2 to 99 mA | 11 mA | |
| | LOAD I TIMER SET POINT | | 5 to 50000 mA | 11 mA | |
| | CT Sequence | | CT123<br>CT321<br>CT312<br>CT231<br>CT213<br>CT132 | CT123 | **NOTE:** The CT sequence is applicable for 3P3W and 3P4W configurations and CT123 CT terminal value. If you change the network or CT terminal value, then the CT sequence resets to the default value. |
| | CT POLARITY | | CT1<br>CT2<br>CT3<br>CT12<br>CT23<br>CT31<br>CT123<br>NONE | NONE | **NOTE:** The CT polarity parameters are enabled based on selected network and CT terminal value. If you change the network or CT terminal value, then the CT polarity correction resets to the default value. |
| | NUMBER OF POLE SELECT (EVEN NUMBER) | | 02 to 98 | 2 | |
| | PF CONVENTION SELECTION | | IEC<br>IEEE | IEC | |

| | | | | | |
|---|---|---|---|---|---|
| Power & Current | DMD method | | Sliding, Fixed, Fixed-Slding, Thermal | Sliding | |
| | DMD duration (min) | | 1 to 60 | 15 | |
| | DMD length (min) | | 1 to 60 | 1 | |
| | Demand sync type | | None, Command, Clock-sync, Input | None | |
| | Demand clock sync time | Clock sync hour | 0 to 23 | 0 | **NOTE:** Demand Clock Sync time option is only available if in Demand sync type Clock-Sync is selected |
| | | Clock sync minute | 0 to 59 | 0 | |
| | | Clock sync second | 0 to 59 | 0 | |
| | Digital output selection | | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selectio is only available if Demand Sync type is selected as input. |
| | Digital input selection | | NONE & DI2 | NONE | **NOTE:** The digital output selection is only available if Demand Sync type is selected as input. |
| Energy | POP 1 ENERGY | | NONE<br>IMPORT kWh<br>EXPORT kWh<br>TOTAL kWh<br>IMPORT kVARh<br>EXPORT kVARh<br>TOTAL kVARh<br>IMPORT kVAh<br>EXPORT kVAh<br>TOTAL kVAh | NONE | |
| | POP1 pulse width | | 1 to 9999999 | 1000 | |
| | POP 2 energy | | NONE<br>IMPORT kWh<br>EXPORT kWh<br>TOTAL kWh<br>IMPORT kVARh<br>EXPORT kVARh<br>TOTAL kVARh<br>IMPORT kVAh<br>EXPORT kVAh<br>TOTAL kVAh | NONE | |
| | POP2 pulse width | | 1 to 9999999 | 1000 | |
| | LED CTRL mode | | NONE/ ALARM /ENERGY | NONE | |
| | LED energy | | NONE<br>IMPORT kWh<br>EXPORT kWh<br>TOTAL kWh<br>IMPORT kVARh<br>EXPORT kVARh<br>TOTAL kVARh<br>IMPORT kVAh<br>EXPORT kVAh<br>TOTAL kVAh | NONE | **NOTE:** These parameters are only visible if selected LED mode as energy & LED Pulse width is configured. |
| | LED pulse width | | 1 to 9999999 | 1000 | |
| Serial Communication | Communication password | | 0 to 9999 | 1000 | **NOTE:** Password same as configuration password |
| | Change communication password | | NO, YES | NO | |
| | Communiation setting | | ON, OFF | ON | |
| | Slave ID selection | | 1 to 247 | 1 | |
| | Baudrate selection | | 9600/ 19200/ 38400/ 57600/ 115200 | 9600 | |

| | | | | | |
|---|---|---|---|---|---|
| COMMUNICATION | Parity selection | | NONE/ODD/EVEN | NONE | |
| | Stopbit selection | | 1 or 2 | 1 | |
| | Endianness | | MSRF/LSRF | MSRF | Note: This parameter will help you see values in LSRF (Mid-Little endian) or MSRF (Big endian) |
| HMI & CLOCK | Backlight off timer (secs) | | 0 to 7200 | 0 | |
| | SET RTC Date | SET RTC YEAR | 24 to 90 | 85 | |
| | | SET RTC MONTH | 1 to 12 | 12 | |
| | | SET RTC DAY | 1 to 31 | 1 | |
| | | SET RTC Week Day | SUNDAY<br>MONDAY<br>TUESDAY<br>WEDNESDAY<br>THRUSDAY<br>FRIDAY<br>SATURDAY | MONDAY | |
| | SET RTC Time | SET RTC HOUR | 0 to 23 | 0 | |
| | | SET RTC MIN | 0 to 59 | 0 | |
| | | SET RTC SEC | 0 to 59 | 0 | |
| Alarms | Current alarms | Alarm selection | Over Current Phase, Under Current Phase, Over Current Neutral | OVER CURRENT PHASE | |
| | | Enable | OFF, ON | OFF | |
| | | Pickup set point | 00.0000 to 10.0000 | 0.0000 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |
| | | Dropout setpoint | 00.0000 to 10.0000 | 0.0000 | |
| | | Dropout time delay (sec) | 0 to 999999 | 0 | |
| | | Priority | NONE, LOW, MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |
| | | Relay output selection | NONE<br>(EXTERNAL)RO1<br>(EXTERNAL)RO2<br>(EXTERNAL)RO3<br>(EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility. |
| | Voltage alarms | Alarm selection | Over Voltage L-L, Under Voltage L-L, Over Voltage L-N, Under Voltage L-N, Over Voltage Unbal, Over Voltage THD, Phase Loss | OVER VOLTAGE L-L | |
| | | Enable | YES/NO | NO | |
| | | Pickup set point | 000.00 to 600.00(V-LL),<br>000.00 to 347.00(V-LN),<br>0.00 to 100.00<br>(V-unbal, THD) | 000.00 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| Alarms | Voltage Alarms | Dropout setpoint | 000.00 to 600.00(V-LL), 000.00 to 347.00(V-LN), 0.00 to 100.00 (V-unbal, THD) | 000.000 | |
| | | Dropout time delay (sec) | 0 to 999999 | 0 | |
| | | Prioity | NONE, LOW, MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |
| | | Relay output selection | NONE (EXTERNAL)RO1 (EXTERNAL)RO2 (EXTERNAL)RO3 (EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility. |
| | Power Alarms | Alarm selection | OVER ACTIVE, OVER REACTIVE, OVER APPARANT | OVER ACTIVE | |
| | | Enable | OFF & ON | OFF | |
| | | Pickup set point | 00000.000 to 10410.000 | 00000.000 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |
| | | Dropout setpoint | 00000.000 to 10410.000 | 0 | |
| | | Dropout time delay (s) | 0 to 999999 | 0 | |
| | | Priority | NONE, LOW, MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |
| | | Relay output selection | NONE (EXTERNAL)RO1 (EXTERNAL)RO2 (EXTERNAL)RO3 (EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility. |
| | Demand Alarms | Alarms selection | OVER ACTIVE PRESENT, OVER ACTIVE LAST, OVER ACTIVE PREDICTIVE, OVER REACTIVE PRESENT, OVER REACTIVE LAST, OVER REACTIVE PREDICTIVE, OVER APPARANT PRESENT, OVER APPARANT LAST, OVER APPARANT PREDICTIVE | OVER ACTIVE PRESENT | |

| | | | | | |
|---|---|---|---|---|---|
| | Demand Alarms | Enable | YES/NO | NO | |
| | | Pickup set point | 00000.000 to 10410.000 | 00000.000 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |
| | | Dropout setpoint | 00000.000 to 10410.000 | 00000.000 | |
| | | Dropout time delay (s) | 0 to 999999 | 0 | |
| | | Priority | NONE, LOW, MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |
| | | Relay output selection | NONE (EXTERNAL)RO1 (EXTERNAL)RO2 (EXTERNAL)RO3 (EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility. |
| | Frequency Alarms | Alarm selection | OVER FREQUENCY, UNDER FREQUENCY | OVER FREQUENCY | |
| | | Enable | OFF & ON | OFF | |
| | | Pickup set Point | 45.000 to 65.000 | 0 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |
| | | Dropout setpoint | 45.000 to 65.000 | 0 | |
| | | Dropout time delay (s) | 0 to 999999 | 0 | |
| | | Priority | NONE, LOW, MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |
| | | Relay output selection | NONE (EXTERNAL)RO1 (EXTERNAL)RO2 (EXTERNAL)RO3 (EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility. |
| | RTD* Alarms | Alarm selection | OVER RTD, UNDER RTD | OVER RTD | |
| | | Enable | OFF & ON | OFF | |
| | | Pickup (celsius) | -170.0 to 850.0 | 0 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |
| | | Dropout (celsius) | -170.0 to 850.0 | 0 | |
| | | Dropout time delay (s) | 0 to 999999 | 0 | |
| | | Priority | NONE, LOW, MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1, DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |

| | | | | | |
|---|---|---|---|---|---|
| | RTD Alarms | Relay output selection | NONE<br>(EXTERNAL)RO1<br>(EXTERNAL)RO2<br>(EXTERNAL)RO3<br>(EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility.. |
| | PF* Alarms | Alarm selection | TRUE PF,<br>DISPLACEMENT PF | - | |
| | | Enable | OFF & ON | OFF | |
| | | Pickup setpoint | -1.0000 to 1.0000 | 0 | |
| | | Pickup time delay (s) | 0 to 999999 | 0 | |
| | | Dropout setpoint | -1.0000 to 1.0000 | 0 | |
| | | Dropout time delay (s) | 0 to 999999 | 0 | |
| | | Priority | NONE, LOW,<br>MEDIUM, HIGH | NONE | |
| | | Digital output selection | NONE, DO1,<br>DO2 | NONE | **NOTE:** The digital output selection is available only if control mode is set to ALARM |
| | | Relay output selection | NONE<br>(EXTERNAL)RO1<br>(EXTERNAL)RO2<br>(EXTERNAL)RO3<br>(EXTERNAL)RO4 | NONE | **NOTE:** The Relay output selection will be available only if control mode is set to ALARM.<br><br>* It is only configurable through MODBUS or Selec Utility. |
| | | PICKUP PF TYPE | NONE<br>INDUCTIVE<br>CAPACITIVE | NONE | |
| | | DROPOUT PF TYPE | NONE<br>INDUCTIVE<br>CAPACITIVE | NONE | |
| Internal IO | | DI2 Control Mode | NONE, NORMAL,<br>DEMAND SYNC | NONE | |
| | | DI2 Debounce Time | 10 to 9999ms | 10 | |
| | | DO1 Control Mode | NONE, ENERGY PULSES,<br>EXTERNAL, DEMAND,<br>ALARM | NONE | |
| | | DO2 Control Mode | NONE, ENERGY PULSES,<br>EXTERNAL, DEMAND,<br>ALARM | NONE | |
| FACTORY DEFAULT | | | YES/NO | NO | |

| | | | | | |
|---|---|---|---|---|---|
| Reset Parameter | | Reset Password | 0 to 9999 | 0 | |
| | | Reset meter Parameter | Yes/No | No | |
| | | Reset Active Energy | None, Mains, DG, Both | None | |
| | | Reset Reactive Energy | None, Mains, DG, Both | None | |
| | | Reset Apparent Energy | None, Mains, DG, Both | None | |
| | | Reset Max Demand | None, Power Demand, Current Demand, Both | None | |
| | | Reset Run Hour | Yes/No | No | |
| | | Reset On Hour | Yes/No | No | |
| | | Reset Load Timer | Yes/No | No | |
| | | Reset Auxiliary Interupt | Yes/No | No | |
| | | Reset Min/Max | Yes/No | No | |
| | | Reset Alarm Counter | Yes/No | No | |
| | | Reset IO Counter | Yes/No | No | |
| | | Reset Tariff | Yes/No | No | |

*Note: Configurable only through Utility. Fixed tariff will not be reset in any of the case.

**Configuration mode password**

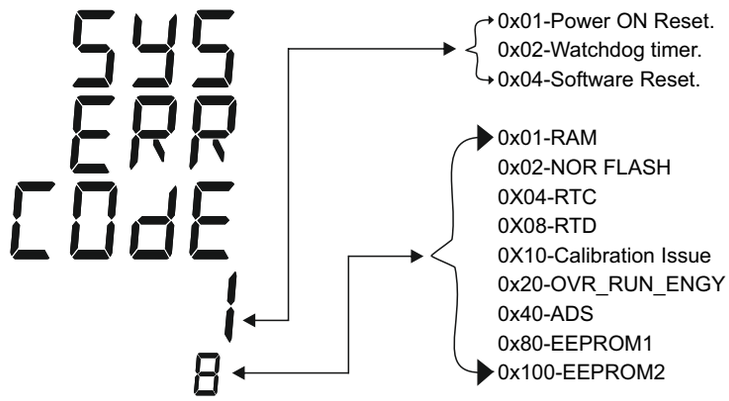
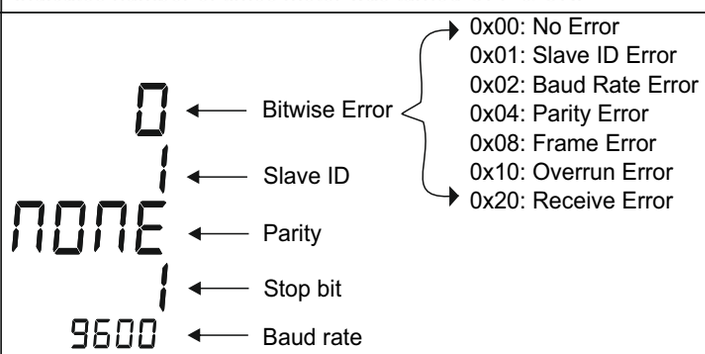
For setting the configuration mode parameters user will be prompted for the password. If correct password is entered, user will be able to access the all programming parameters.

| Description | Range | |
|---|---|---|
| Configuration mode | 0000-9997 | Default: 1000 |
| Communication | 0001-9998 | This password will be greater than the configuration password by 1 i.e. (1001) |

## Self-Test mode:

The meter offers in built self-test mode feature to identify the meter's measurement failure and communication failure error with meter's system information given in table below.

| Sr. No. | Function | Description |
|---|---|---|
| 1 | All segment and LED ON | On entering self-test mode, all LCD segments will be ON |
| 2 | Serial number | Displays the meter serial number, for example 50220001 |
| 3 | Hardware version | Displays the meter hardware version number |
| 4 | Software version | Displays the meter software version number |
| 5 | Boot loader version | Displays the meter boot loader version number |

| | | |
|---|---|---|
| 6 | System error code | Displays the system error codes of the meter and are mentioned in hex code.<br>  <br><br>Note: If more than one error occur, then the display will show summation of those errors. |
| 7 | ON hour | Indicates the period for which the power meter's auxiliary supply is ON, regardless of the voltage and current inputs. |
| 8 | Run hour | Indicates the period when the average current is present. |
| 9 | Import run hours - mains | Indicates the period the load has been delivered. This counter accumulates as long as the load is ON. |
| 10 | Export run hours - mains | Indicates the period the load has been received. This counter accumulates as long as the load is ON |
| 11 | Import run hours - DG | Indicates the period the load has been delivered. This counter accumulates as long as the generator load is ON. |
| 12 | Export run hours - DG | Indicates the period the load has been received. This counter accumulates as long as the generator load is ON. |
| 13 | Load run hr | The system allows the configuration of a threshold value for the current. When the measured current is equal to or exceeds this configured threshold, the associated time duration will in crese. |
| 14 | Auxilary interruption | Indicates number of times meter was turned OFF & ON. |
| 15 | Communication error |  <br> |
| 16 | External IO | Indicates type of IO card connected to the meter.<br>2400 represents 2DI-4RO card is connected |

**Scrolling mode:**

The user can set the display screen in auto scrolling mode or manual screen mode via the front panel keys. Long press ⏎ for 3 seconds to toggle between manual and automatic mode.

- Automatic mode: In automatic mode, Online pages scroll automatically at a rate of 5 seconds per page. In automatic mode, when any key is pressed, the unit temporarily switches to manual mode and the appropriate page is displayed. Also, if any key is not pressed for 5 seconds, unit resumes automatic mode. The RTC page will not be visible while scrolling but can be viewed if the key is pressed.
- Manual mode: In manual mode, selected online page will remains static.

## Display measured parameter

| Function | Description | Parameters |
|---|---|---|
| Real time measuring | VL-N phase voltage per phase and 3 phase average | V1, V2, V3, $VLN_{AVG}$ |
| | VL-L line voltage per phase and 3 phase average | V12, V23, V31, $VLL_{AVG}$ |
| | Current - per phase and 3 phase average | I1, I2, I3, $I_{AVG}$ |
| | Calculated neutral current | $I_N$ |
| | Unbalanced voltage * | V1, V2, V3, V12, V23, V31, $VLN_{AVG}$, $VLL_{AVG}$ $VLN_{WORST}$, $VLL_{WORST}$ |
| | Unbalanced current * | I1, I2, I3, $I_{AVG}$, $I_{WORST}$ |
| | Worst Current | $I_{WORST}$ |
| | Active power | kW1, kW2, kW3, $kW_{TOTAL}$ |
| | Reactive power | kVAR1, kVAR2, kVAR3, $kVAR_{TOTAL}$ |
| | Apparent power | kVA1, kVA2, kVA3, $kVA_{TOTAL}$ |
| | Phase angle | PA1, PA2, PA3 |
| | True power factor - per phase and 3 phase average | PF1, PF2, PF3, $PF_{AVG}$ |
| | Displacement power factor - per phase and 3 phase average * | PF1, PF2, PF3, $PF_{AVG}$ |
| | Distortion power factor - per phase and 3 phase average* | PF1, PF2, PF3, $PF_{AVG}$ |
| | Frequency | Hz |
| | THD VL-N % | V1, V2, V3, $VLN_{AVG}$ |
| | THD VL-L % | V12, V23, V31, $VLL_{AVG}$ |
| | THD current % | I1, I2, I3, $I_N$, $I_{AVG}$ |
| | thd VL-N% | V1, V2, V3, $VLN_{AVG}$ |
| | thd VL-L% | V12, V23, V31, $VLL_{AVG}$ |
| | thd current | I1, I2, I3, $I_{AVG}$ |
| Min and Max values with time stamping* | Average voltage L-N | $VLN_{MIN}$, $VLN_{MAX}$ , |
| | Average voltage L-L | $VLL_{MAX}$, $VLL_{MIN}$ |
| | Current | $I_{MIN}$, $I_{MAX}$ |
| | Neutral current * | $I_{NMAX}$, $I_{NMIN}$ |
| | PF* | $PF1_{MIN}$, $PF1_{MAX}$ $PF2_{MIN}$, $PF2_{MAX}$ $PF3_{MIN}$, $PF3_{MAX}$ |
| | Total power | $KW_{MIN}$, $KW_{MAX}$ $KVA_{MIN}$, $KVA_{MAX}$ $KVAR_{MIN}$, $KVAR_{MAX}$ |
| | Frequency | $Hz_{MIN}$, $Hz_{MAX}$ |
| Demand | Power demand: Max(KW,KVA,KVAR) | Last demand<br>Present demand<br>Predictive demand<br>Peak demand |
| | Power demand: Min(KW,KVAR) | |
| | Current demand (I1,I2,I3,$I_{AVG}$) | Last demand<br>Present demand<br>Predictive demand<br>Peak demand |

| | | |
|---|---|---|
| Energy (mains) | Active energy<br>Apparent energy<br>Reactive energy (4 quadrant based VARh *) | Accumulated energy<br>Import - per phase and total<br>Export - per phase and total<br>Total NET ( Import + Export)<br>Total NET ( Import - Export)* |
| | | Last cleared energy *<br>Import - per phase and total<br>Export - per phase and total<br>Total NET (Import + Export)<br>Total NET (Import - Export) |
| Energy (DG)$ | Active energy<br>Apparent energy<br>Reactive energy | Accumulated energy<br>Import - Per phase and total<br>Export - Per phase and total<br>Total NET (Import + Export)<br>Total NET (Import - Export)* |
| | | Last cleared energy *<br>Import - per phase and total<br>Export - per phase and total<br>Total NET (Import + Export)<br>Total NET (Import - Export) |
| RTC | Date and Time | DD:MM:YY<br>HH:MM:SS |
| RPM | Revolution per minute | RPM |
| ON HR | ON Hour | Hour |
| Run hours | Run hour: Import/Export - Mains | Import run Hours - Mains |
| | | Export run Hours - Mains |
| | Run hour: Import/Export - DG | Import run Hours - DG |
| | | Export run Hours - DG |
| Load Run Hour | Load Run Hour | Hour |
| AUX Interruption | Auxiliary interrupts | |

**$Note:** DG Energy are only displayed when DG is connect to DI 1.

**All features can be accessed via communication or from the meter front, however * indicating features that can only be accessed via communication.**

### Phase and system measurement:

The meter provides highly accurate 1-second measurements, Average values, Including true RMS, Per phase and total.

- Per phase and average voltage (line-to-line, line-to-neutral)
- Per phase and average current, and neutral current (neutral current is calculated)
- Per phase and total power (VA, W, Var)
- Per phase and average for true and displacement power factor
- System frequency
- Per phase and maximum of all three for voltage unbalance and current unbalance

### Harmonics overview:

Harmonics, integer multiples of the fundamental frequency, are a common power quality issue that can significantly impact the performance and reliability of electrical systems. They arise from non-linear loads, such as electronic devices, variable speed drives, and arc furnaces, which draw non-sinusoidal current. The presence of harmonics can lead to a variety of problems, including increased power losses, equipment overheating, voltage distortion, and interference with communication systems. To mitigate these issues, it's crucial to monitor and analyze harmonic levels in power systems. By understanding the sources and impacts of harmonics, engineers can implement appropriate mitigation strategies, such as harmonic filters, to ensure the overall quality and efficiency of the power system.

**Total harmonics distortion %:**

Meter can measure and analyze several power quality parameters which is useful for further analyzing the voltage and current signals measured by the meter. Total Harmonic Distortion: A ratio of the sum of powers in all harmonic components to power of the fundamental frequency. Meter also supports even and odd order THD, where even order harmonics are the 2nd, 4th, 6th, and so on and odd order harmonics are 3rd, 5th, 7th, etc. %THD of voltage and current per phase and average value data can be accessed via communication or from the meter front, however individual harmonics can only be accessed via communication.

**Total demand distortion:**

Total demand distortion (TDD) is a crucial metric in power systems that quantifies the impact of harmonic currents on the system's capacity. It's a more accurate measure of harmonic distortion than Total Harmonic Distortion (THD) because it considers the system's full load current.

**Harmonic content calculations:**

Harmonic content (HC) is equal to the RMS value of all the non-fundamental harmonic components in one phase of the power system. The meter uses the following equation to calculate HC:

$HC = \sqrt{(H_2)^2 + (H_3)^2 + (H_4)^2}$ ---

**THD% calculations:**

THD% is a quick measure of the total distortion present in a waveform and is the ratio of harmonic content (HC) to the fundamental harmonic (H1). By default, the meter uses the following equation to calculate THD%:

$THD = (HC/H_1) \times 100\%$

**thd% calculations:**

thd% is an alternate method for calculating total harmonic distortion that uses the RMS value for the total harmonic content rather than the fundamental content. The meter uses the following equation to calculate thd:

$thd = (HC/\sqrt{(H_1)^2 + (HC)^2}) \times 100\%$

**TDD calculations:**

TDD (total demand distortion) evaluates the harmonic currents between an end user and a power source.The harmonic values are based on a point of common coupling (PCC), which is a common point where each user receives power from the power source. The meter uses the following equation to calculate TDD:

$TDD = (\sqrt{(HC_{IA})^2 + (HC_{IB})^2 + (HC_{IC})^2}) / (I_{Load}) \times 100\%$

Where $I_{Load}$ is equal to the maximum demand load on the power system.

## Min/Max values:

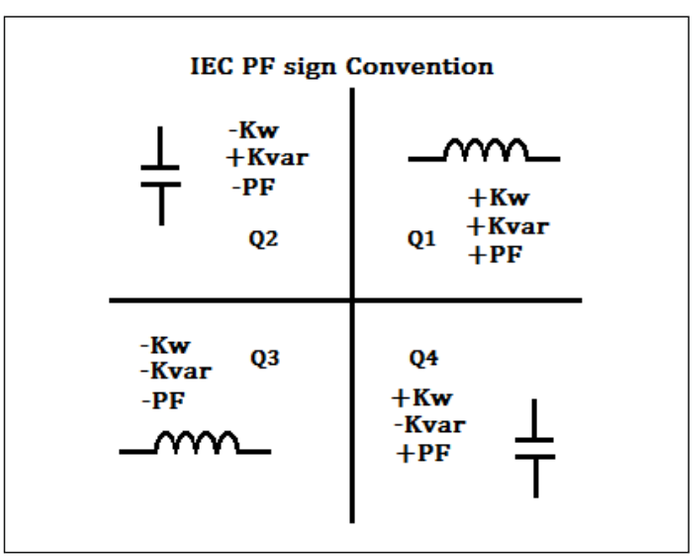
The meter logs maximum and minimum value for real time as well as the time when they occurred. All data is stored in non-volatile memory so that statistic information can be preserved even when the meter is loses power or gets shut off. All maximum and minimum data of $V_{LN}$, $V_{LL}$, Current, Total power and Frequency can be accessed via communication or from the meter front. However only power factor's Min/Max value can only be accessed via communication.

## Power factor & sign convention

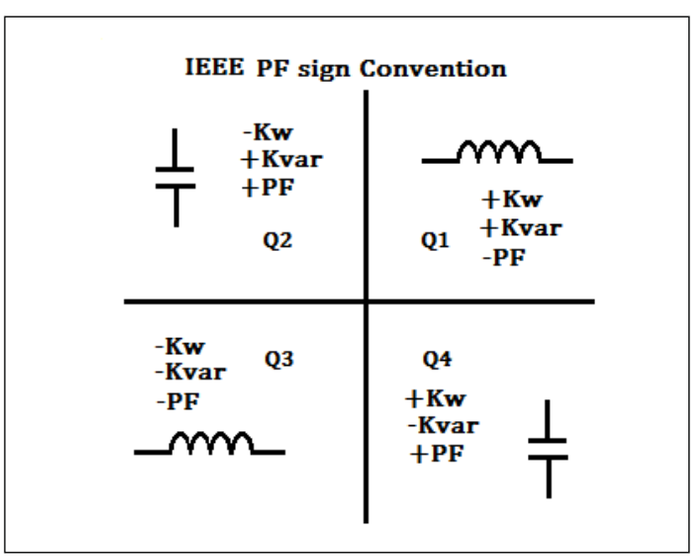
Power factor sign (PF sign) can be positive or negative, and is defined by the conventions used by the IEEE or IEC standards.

You can set the power factor sign (PF sign) convention that is used on the display to either IEC or IEEE.

**• PF sign convention: IEC**




**• PF sign convention: IEEE**



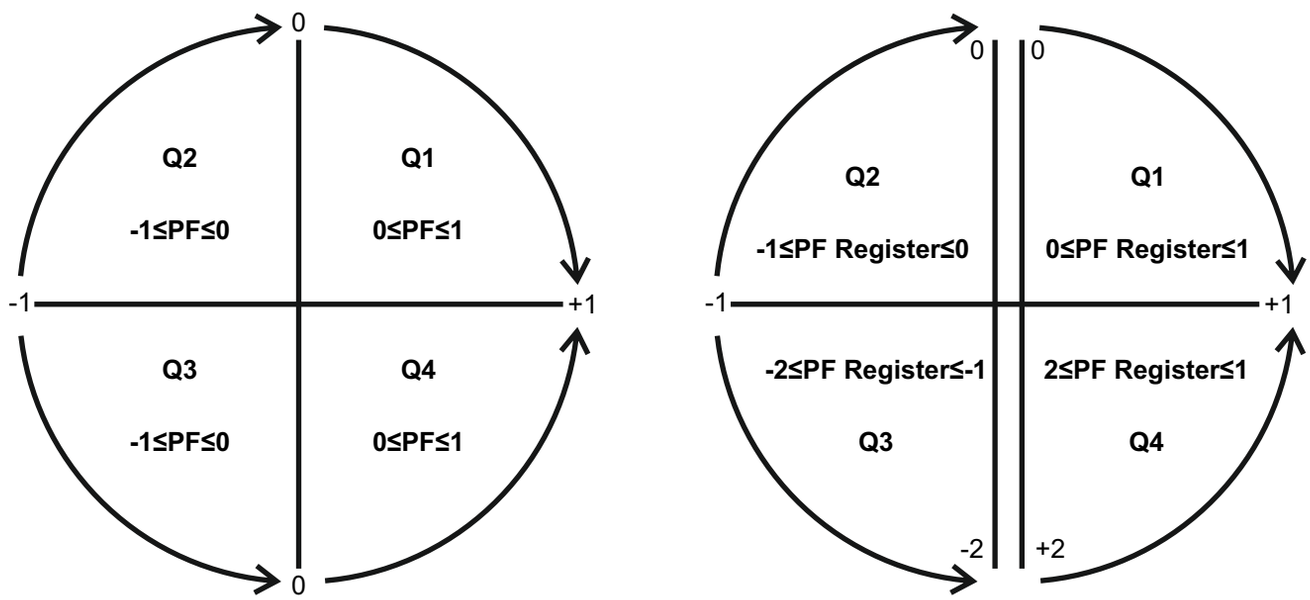
**True PF and displacement PF**:

- True power factor includes harmonic content. True PF is the ratio of the active power to the apparent power at the power outlet.
- Displacement power factor only considers the fundamental frequency. Displacement power factor can be defined as the cosine of the angle between the current and voltage.

### Power factor Min/Max convention

The meter uses a specific convention for determining the power factor minimum and maximum values.

- For **negative** PF readings, the **minimum PF value** is the measurement closest to -0 for PF readings between -0 to -1, the **maximum PF value** is the measurement closest to -1 for PF readings between -0 to -1.
- For **positive** PF readings, the **minimum PF value** is the measurement closest to +1 for PF readings between +1 to +0, the **maximum PF value** is the measurement closest to +0 for PF readings between +1 to +0.
  For communication, the power factor is displayed in the form of a PF register value as below.




The power factor value is calculated from the PF register value using the following formula:

| Quadrant | Power factor range | PF register range | PF formula |
|---|---|---|---|
| Quadrant 1 | 0 to +1 | 0 to +1 | PF Value = PF register value |
| Quadrant 2 | -1 to 0 | -2 to -1 | PF Value = (-2) - PF register value |
| Quadrant 3 | 0 to -1 | -1 to 0 | PF Value = PF register value |
| Quadrant 4 | +1 to 0 | +1 to +2 | PF Value = (+2) - PF register value |

| Type of power factor | Range of power factor | Minimum power factor | Maximum power factor |
|---|---|---|---|
| Negative power factor reading | PF readings between -0 to -1. | Closest to -0 | Closest to -1. |
| Positive power factor reading | PF readings between +1 to +0 | Closest to +1. | Closest to +0 |

## Demand measurement:

The meter can support demand measurements consisting of power and current demand readings as the cosine of the angle between the current and voltage.

The demand will be calculated using the demand calculation method configured in the meter.

There are four standard types of demand calculation methods, that meter supports: Fixed, Sliding, Fixed-Sliding, Thermal method.

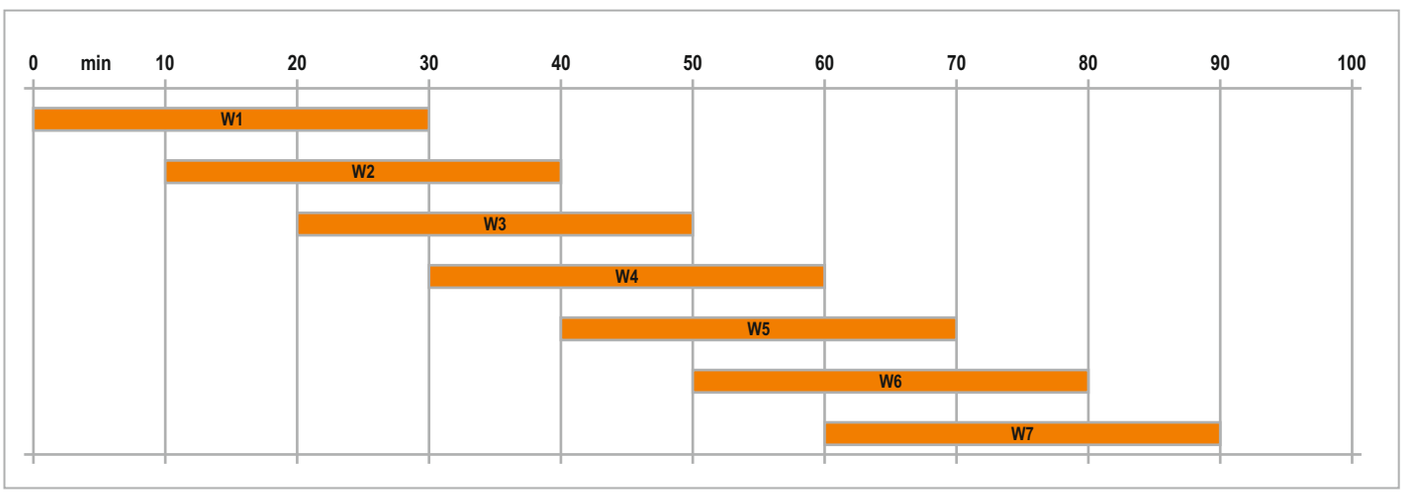
The meter provides last, present, predicted, and peak demand values and a time stamp when the peak demand occurred.

- **Power demand (Total W, VAR, VA)**
- **Current demand (Average Amps)**

All demands value data can be accessed and reset via communication or from the meter front.

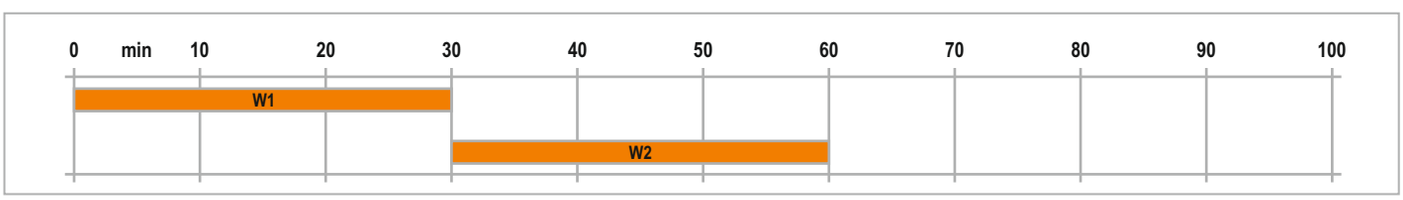
### 1. Sliding Demand:

Present and peak demand updates at the end of each sub-interval. Last demand lags one sub-interval. If demand duration selected is 3 and demand length selected is 2, then demand is updated at the end of 2 minutes. Here, interval is of 6 minutes and update time is 2 minutes.



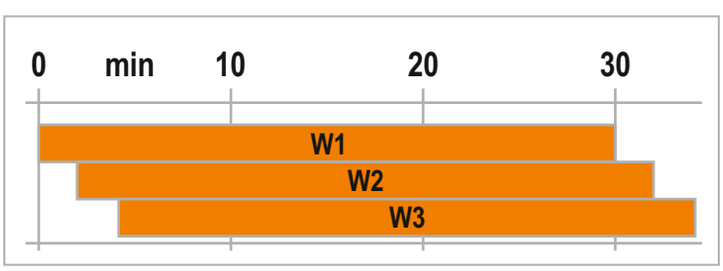

### 2. Fixed demand:

Present demand updates at the end of every 1 minute (fixed) and the peak and last demand values are updated at the end of interval.



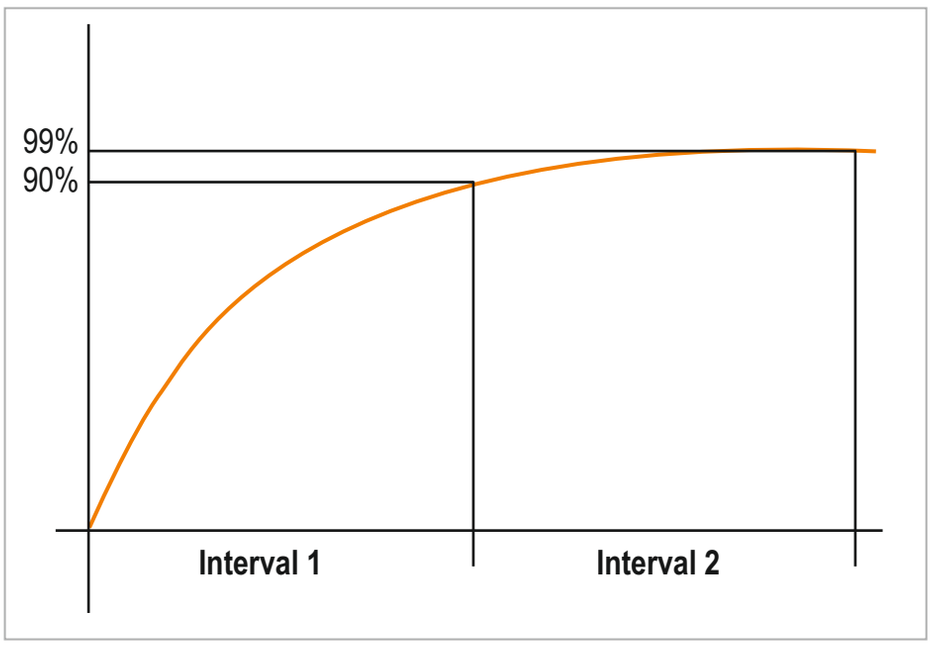

### 3. Fixed-sliding demand:

Present and peak demand updates every 15 seconds (if demand duration is between 1 and 15 minutes) or 60 seconds (if demand duration is between 16 and 60 minutes) and last demand is updated at the end of interval.



**4. Thermal demand:**

A thermal response is the one which is used to calculate thermal demand. By setting the DMD duration (1 to 60min) the thermal response curve can be derived.




## Energy - Mains / DG (Import / Export):

**Accumulated energy (mains and DG both)**

- Active, Apparent, Reactive energy
- Import - Per phase and Total
- Export - Per phase and Total
- Total NET (Import + Export)
- Total NET (Import – Export)

**Last cleared energy (mains and DG both)**

- Active, Apparent, Reactive energy
- Import - Per phase and Total
- Export - Per phase and Total
- Total NET (Import + Export)
- Total NET (Import – Export)

## Energy Roll-over:

When any energy value exceeds the maximum value 999999.999 GWh, GVArh, GVAh, then that particular energy rolls over and stores the count at modscan address and starts accumulating fresh from 0. To response in increase in energy, the energy rollover automatically on display from WATT to KWATT then to MWATT and GWATT.
Energy unit symbol will change to k/M/G depending on the value.

| Case | Displayed Energy | Displayed Energy Unit | Updated Displayed Energy | Updated Displayed Energy Unit |
|---|---|---|---|---|
| 1 | 999.999 | kWh | 0 | MWh |
| 2 | 999.999 | GWh | 0 | Wh |

Note : In Case 2 after energy roll-over,count gets updated at particular address. Displayed Energy & unit get updated as shown

**Energy pulsing detailed method:**

Within specific limits, the meter's energy pulsing LED and pulse outputs are capable of performing energy pulsing.

| Energy pulsing at | Maximum pulse frequency | Max. No of Pulses / Sec |
|---|---|---|
| LED OUTPUT | 40 Hz | 36 |
| PULSE OUTPUT | 20 Hz | 18 |

Configurable pulse width: 1 to 9999000 (per k_h)

**Note:** Pulse duration is fixed for LED output is 25ms and for POP output is 50ms

**Calculation to allow the energy pulsing at LED output**

LED Output will increment only if the total number of pulses is more than configured pulse width otherwise the LED pulsing count will be 0.

$$\text{Total No of pulses / Hr are calculated as} = \frac{\text{Max. No of Pulses / Sec}}{\text{Total power}}$$

$$= \frac{36 \times 3600}{3.6\ (kW_{Total})}$$

$$= 36000/Hr$$

| Configured pulse width | Condition | LED output |
|---|---|---|
| 10 | Total No of pulses > Pulse width | LED pulsing will start incrementing as per observed energy |
| 10000 | Total No of pulses > Pulse width | LED pulsing will start incrementing as per observed energy |
| 37000 | Total No of pulses < Pulse width | LED pulsing will not start incrementing. Remains OFF. |

The LED pulse count is dependent on the configured pulse width in relation to the incrementing energy as below table.

| Sr No. | Configured LED pulse Width | Energy in kWh | LED pulse count |
|---|---|---|---|
| 1 | 1 | 1.000 | 1 |
| 2 | 10 | 0.100 | 1 |
| 3 | 100 | 0.010 | 1 |
| 4 | 1000 | 0.001 | 1 |
| 5 | 10000 | 0.001 | 10 |
| 6 | 100000 | 0.001 | 100 |
| 7 | 1000000 | 0.001 | 1000 |
| 8 | 9999000 | 0.001 | 10000 |

**Calculation to allow the energy pulsing at POP output**

Pulse output will increment only if the total number of pulses is more than configured pulse width otherwise the POP count will be 0.

$$\text{Total No of pulses / Hr are calculated as} = \frac{\text{Max. No of Pulses / Sec X 3600}}{\text{Total power}}$$

$$= \frac{18 \times 3600}{3.6\ (kW_{Total})}$$

$$= 18000/Hr$$

| Configured pulse width | Condition | LED output |
|---|---|---|
| 10 | Total No of pulses > Pulse width | POP will start incrementing as per observed energy |
| 10000 | Total No of pulses > Pulse width | POP will start incrementing as per observed energy |
| 19000 | Total No of pulses < Pulse width | POP will not start incrementing. |

The POP count is dependent on the configured pulse width in relation to the incrementing energy as below table.

| Sr No. | Configured POP pulse width | Energy in kWh | POP count |
|---|---|---|---|
| 1 | 1 | 1.000 | 1 |
| 2 | 10 | 0.100 | 1 |
| 3 | 100 | 0.010 | 1 |
| 4 | 1000 | 0.001 | 1 |
| 5 | 10000 | 0.001 | 10 |
| 6 | 100000 | 0.001 | 100 |
| 7 | 1000000 | 0.001 | 1000 |
| 8 | 9999000 | 0.001 | 10000 |

## Terminology

**RPM:**

Meter provides the measurement of rotational speed of motor. usually displays value in terms of RPM.
The speed a synchronous motor will run can be determined by the electrical service using. No of poles are set table through communication or from the meter front.

**ON hour:**

ON hour shows how long the meter has been powered up. ON hour data an be accessed via communication or from the meter front under self-test mode.

**Import run hour-Mains:**

Import run hours-Mains show how much time a load has been running, based on accumulated energy – Import (delivered) of mains supply. run hour import mains data can be accessed via communication or from the meter front under self- test mode. It can be reset via communication or meter front.

**Export run hour-Mains:**

Export Run hours-Mains show how much time a load has been running, based on accumulated energy – Export (received) of mains supply. run hour export mains data can be accessed via communication or from the meter front under self-test mode. It can be reset via communication or meter front.

**Import run hour- DG:**

Import run hours-DG show how much time a load has been running, based on accumulated energy – Import(delivered) of DG supply. run hour import DG data can be accessed via communication or from the meter front under self-test mode. It can be reset via communication or meter front.

**Export run hour- DG:**

Export run hours-DG show how much time a load has been running, based on accumulated energy – Export (received) of DG supply. run hour export DG data can be accessed via communication or from the meter front under self-test mode. It can be reset via communication or meter front.

**Load Run Hour:**

Load Run hour shows how long a load has been running, based upon the load timer set point set in communication. (minimum current). active load timer data can be accessed via communication or from the meter front under self-test mode. It can be reset via communication or meter front.

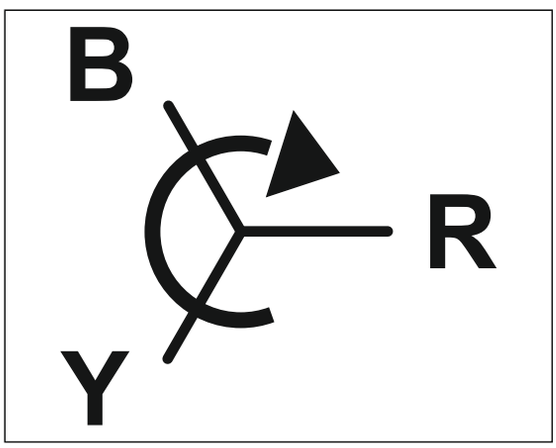
**Auxiliary interrupts:**

Auxiliary interrupts shows number of auxiliary supply interruptions. Auxiliary interrupts data can be accessed via communication or from the meter front under self-test mode. It can be reset via communication or meter front.

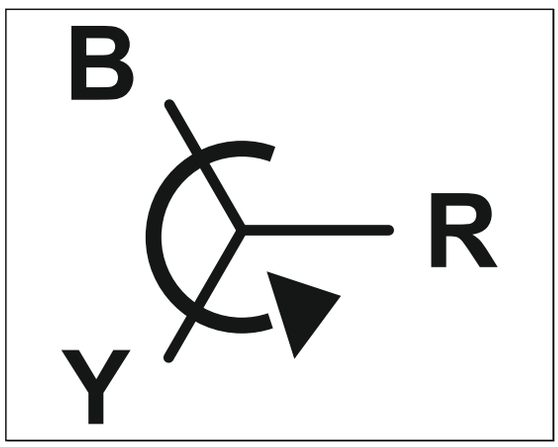
### Voltage sequence detection:

Meter performs the analysis of the input voltage signals. It detect the wrong phase sequence or failure of one of the input voltage and displays result upon pressing  key for 3 seconds.

1. OK phase sequence - **"Clockwise"**
2. Wrong phase sequence **- "Anticlockwise"**
3. Failure of one of the input voltage - **"Invalid"**




**CLOCKWISE**




**ANTI-CLOCKWISE**

### Current polarity (CT reversal detection and Correction)

The meter supports a setting that allows user to changes the current polarity in the meter via communication and from panel in configuration mode. This is beneficial is the CT's have been installed in the reverse direction polarity.

Configure the CT through the front panel according to the CT polarity shown on the current reversal detection page. with changing the current polarity to negative is basically changing the phase angle of the current by 180 degrees, making it possible to correct any installation errors. There is no need to change the physical wiring.

By default the current direction is configured to positive for CT1, CT2 and CT3 i.e., NONE.

Upon pressing the key  for 3 seconds, the current reversal detection page will appear with the CT number of the input current that is reversed in polarity.

1. 1st phase CT polarity has reverse connection - **"1"**
2. 1st and 2nd phase CT polarity has reverse connection. - **"12"**
3. 1st, 2nd, 3rd hase CT polarity has reverse connection. - **"123"**

**Note: CT polarity correction should be referred when input active power is positive.**
**CT correction changes can be done through meter configuration.**

### Real-time clock:

The meter supports with real-time clock. The RTC parameters are date and time shown in the form of DD:MM:YY and HH:MM:SS respectively. The RTC parameters data can be accessed via communication or from the meter front.

**Battery specifications**:

Cr2032
**Diameter**: 20mm
**Height**: 3.2mm
**Nominal capacity**: 220mAh
**Battery voltage**: 3V
**Operating voltage**: -30 °C to 70 °C

The meter is equipped with both Serial and Ethernet communication with MODBUS TCP and MODBUS RTU protocols.

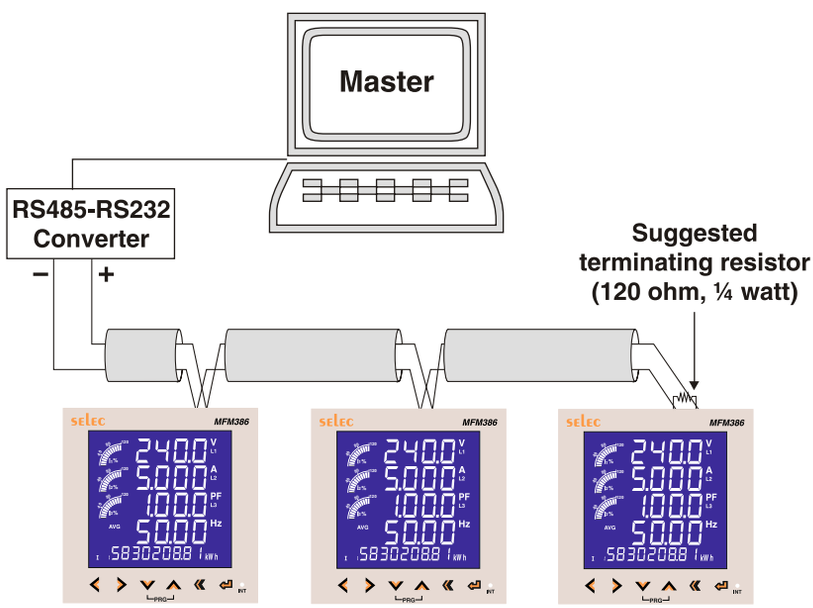
### Serial Communication(RS 485):

The meter has RS485 port for the purpose of Serial communication, the RS485 bus can support up to 32 devices connected to it.

In RS485 bus the devices are connected in point-to-point configuration. With (+) and (-) terminals of devices connected in series.

**Note:** Use a shielded twisted pair RS485 cable

The total distance for devices connected on an RS-485 bus should not exceed 500 m (1640 ft)




Contact sales for PC based monitoring
software to communicate with the meters.

**Wiring diagram**

Configuration of RS485 network need to be performed after wiring the RS485 port in order to communicate with the network.

Each device on the same Rs485 communications bus must have a unique slave id and all connected devices must be set to the same protocol, baud rate, and parity (data format).

### Serial interface:

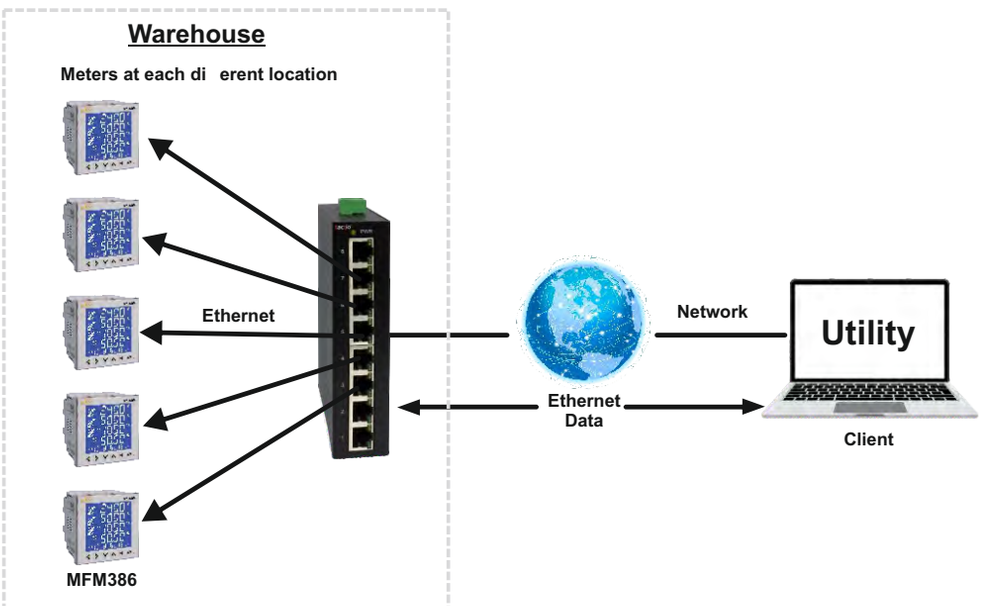
| | |
|---|---|
| Serial standard | RS485 |
| No. of ports | 1 |
| Protocol | Modbus RTU |
| Baudrate | 9600, 19200, 38400, 57600, 115200 bps |
| Data bits | 8 |
| Stop bits | 1, 2 |
| Parity | None, Odd, Even |
| RS485 data direction control | Auto |

**Note** - Serial communication configuration process on page xx

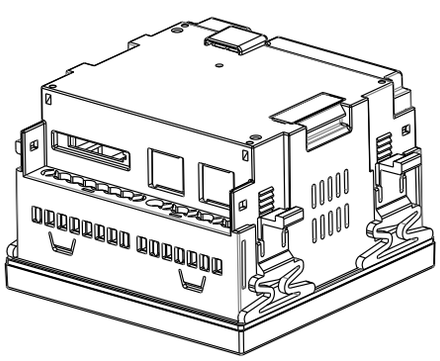
## • Ethernet:

### • Overview:-

A serial to ethernet converter is a small electronic device which can convert ethernet IP/TCP packets to either RS232, RS485 serial data signals and vice versa. Most commonly it is used for connecting a serial RS232, RS485 device such as a serial printer, Energy meter, Bar code scanner, Scale, GPS, Sensor or any other consumer or industrial device with a serial interface, to a computer over a standard LAN network. The advantage of this is obvious; you will be able to control, monitor and communicate with your serial device remotely from a central computer. No need to walk all the way down to the other end of the factory to check your serial device. A picture showing basic architectural overview is as shown below.




The meter has a ethernet communication port which uses MODBUS TCP protocol and MODBUS TCP over RTU to communicate at data speed up to 100Mbps. Cat 5 cable to be used for the connection of meter's ethernet port.
The ethernet connection between client and server should be positioned in a location that minimizes the overall length of ethernet cable routing, a router can be used if the transmission distance is less than 100m.



The ethernet port setup allows you to assign a unique IP address to the meter so you can to access the meter's data or configure the meter remotely through the ethernet port. All devices must have a unique IP address and be set to the same subnet mask and gateway, to communicate with meter through ethernet.

**Ethernet interface:**

| | |
|---|---|
| Connector | 8 pin RJ45 |
| No. of ports | 1 |
| Speed | 10/100 Mbps |
| Transmission distance | Max upto 100 m |
| Protocol | MODBUS TCP over RTU, Modbus TCP |
| Standards | IEEE802.3, IEEE802.3u |
| Magnetic isolation protection | 1.5KV |
| IP configuration | DHCP, Static IP |
| Signal | Tx+, Tx-, Rx+, Rx- |

**Ethernet port:**

| PIN | Signal |
|---|---|
| 1 | TXP |
| 2 | TXM |
| 3 | RXP |
| 4 | - |
| 5 | - |
| 6 | RXM |
| 7 | - |
| 8 | - |

**LED indication & Reset key**

| Indicator | Function | Description |
|---|---|---|
| ACT | Power on | Converter has power |
| Link | Network link | ON when network is connected |
| Reset switch | Factory reset | Reset switch for factory reset of ethernet |

**Device default settings:**

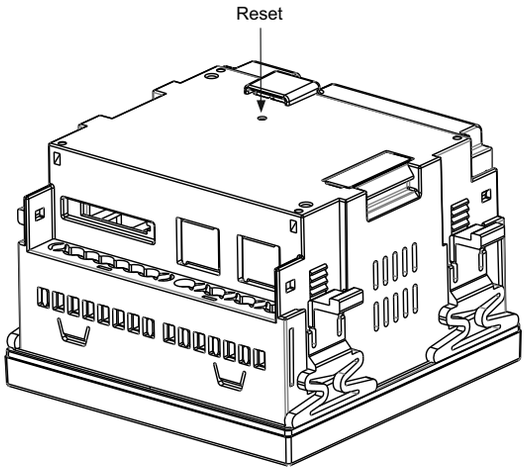
Network setting: Dynamic IP, TCP protocol

Serial setting: 115200,8,N,1

Mode setting: Transparent mode, TCP server, MODBUS TCP

**Device factory reset settings:**

In order to factory reset the meter ethernet to default setting press and hold the reset buttton on the back of the meter for more than 5 seconds




Before communicating with ethernet, make sure you obtain your meter's IP address information from your network administrator or IT department.

**Configuration requirements can include:**

Windows utility: Used for Ip finding, network configuration, serial configuration configuration OS support for utility: 32 bit/64-bit Windows XP/Vista/7/8/8.1/10, windows server 2003/2008/2008 R2/2012 R2

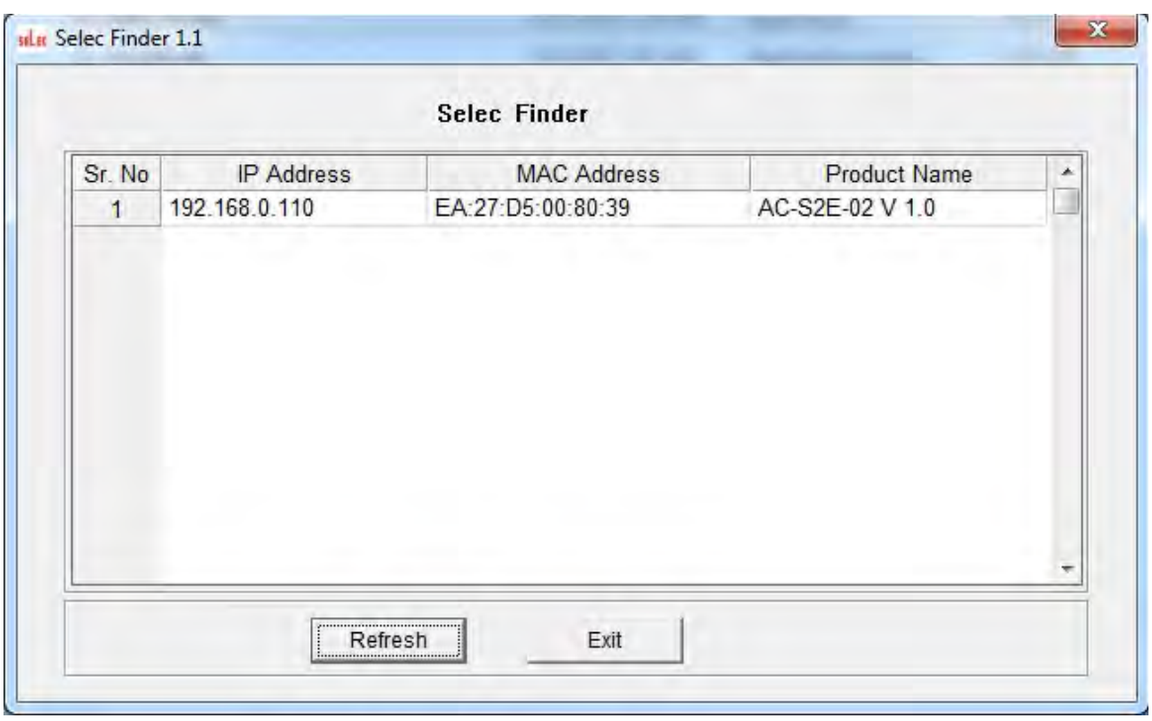
**Configuring the device:**

The device configuration is managed by a windows utility called Selec finder. The details regarding how to use the utility are as given below.

**Selec finder utility overview:**

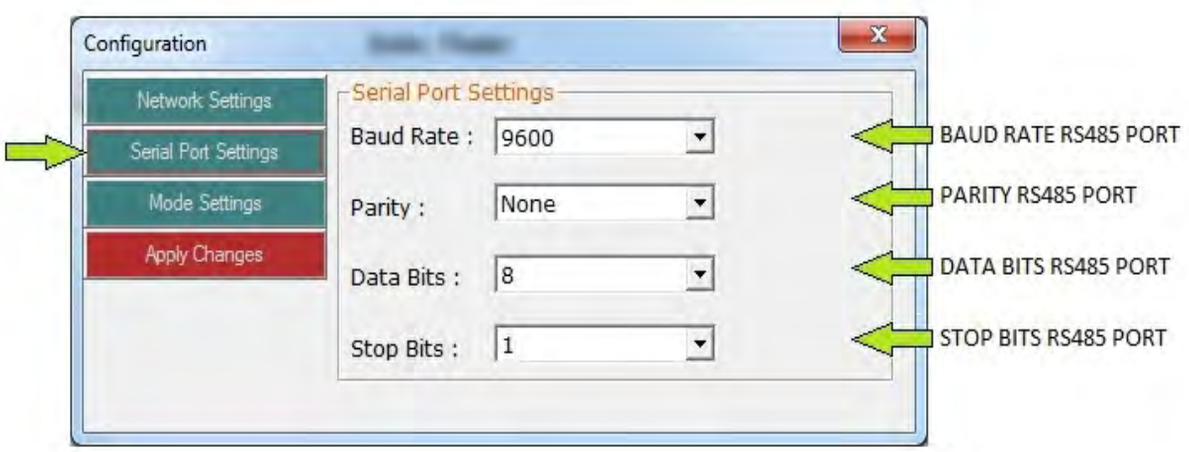
The Selec finder utility is used to find out and configure selec ethernet devices on the network. The utility will list all the Selec devices on the ethernet network and the information will contain IP address, MAC Address and Device description string. This utility can be further used to configure various Network settings, Serial settings and Mode settings of the S2E device.

• **Step 1:** Run the Selec finder utility and it should look some thing like this when the screen pops up

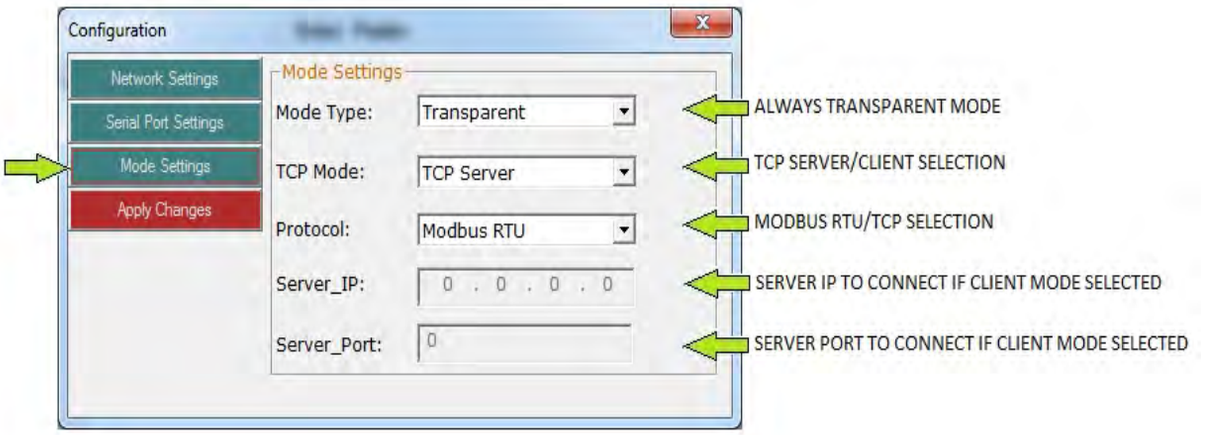


As shown above the screen display the Selec devices in the network using IP ADDRESS, MAC ADDRESS and PRODUCT NAME. The device to be configured should be seen in this list. If not then you can refreshing the screen by pressing the refresh button.

• **Step 2 :** Double click on the IP ADDRESS of the device you want to configure. The screen pops up showing existing configuration settings in various settings tabs which are Network, Serial and Mode. The screen displayed is as shown below. You can go to any tab just to view the existing settings. Just click on the tab and existing settings will be displayed. All 3 images showing existing settings are shown below. This is just a example and actual value in different settings tab will vary as per existing config in the device.

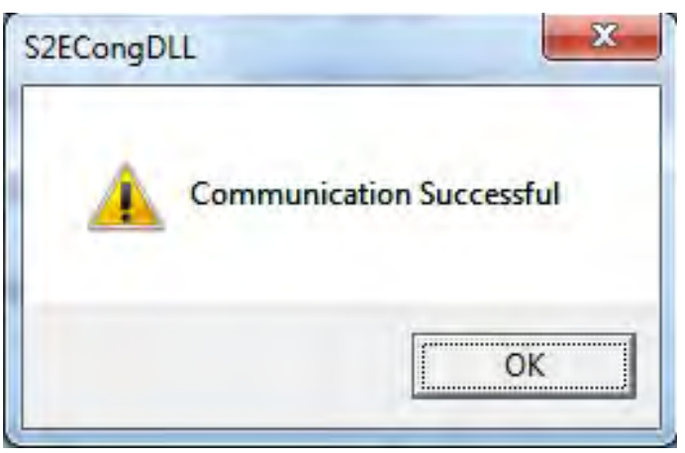

**Note :** If you are using the MFM386 device, select a baud rate of 115200.




**Note :-**

- If you are using the Modscan utility, select **MODBUS TCP** as the protocol in the "Select Finder" option.
- If you are using the RMMS utility with Modbus RTU over TCP/IP, choose **MODBUS RTU** as the protocol in the "Select Finder" option
- If you are using **MODBUS TCP** in the RMMS utility, Select MODBUS TCP as the protocol in the "Selec Finder" option

• **Step 3:** Make any relevant changes in the config. and then click on **Apply changes** button which should display the following screen on successful communication. Click ok and close the window.

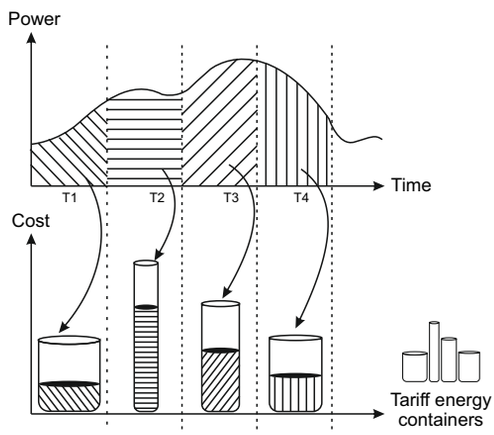



In case of error click ok on error message window and Restart the procedure from Step 1.

**• Multi - Tariff:**

The meter supports multiple tariffs for the measurement and monitoring of energy used for the purpose of costing and billing.

Meter allows you to use 4 different tariff containers to store the accumulated energy data. 4 tariff with each having 4 time slots settings. You can configure different tariff condition using tariff setup.




In the provided example, the energy consumed corresponds to the area beneath the power curve. Usually, utility companies establish tariff schedules such that energy costs are elevated during periods of high demand or consumption. The configuration of these "tariff energy containers" dictates the rate at which they fill, directly impacting rising energy expenses. Tariff T1 offers the lowest price per kWh, while tariff T2 imposes the highest cost.

There are different tariff modes you can use to determine what tariff is applied and when: Command mode, Time of day mode, and Input mode.

• Based on the conditions different tariff modes can be used:

**• Command mode overview:**

In this mode you can send a MODBUS command to the device for the activation of certain tarff. This tarifff mesured energy until different tariff MODBUS command is sent

**• Time of use mode overview:**

In this mode to store energy or input metered data, based on the time of year (Day, Month), the type of day (every day, weekend, weekday or a specific day of the week), or time of use a tariff schedule can be created

**Date & Time format table:**

| Parameter | Values | Description |
|---|---|---|
| Year | 24-90 | The calendar year |
| Month | 1 to 12 | The calendar month, where<br>1 = January, 2 = February, 3 = March,<br>4 = April, 5 = May, 6 = June, 7 = July,<br>8 = August, 9 = September,<br>10 = October, 11 = November,<br>12 = December. |
| Day | 1 to 31 | The calendar day of the month. |
| Weekday | Monday to Sunday | The calendar day of a week. |
| Hour | 0 - 23 | Real time clock hour in 24 hr format |
| Minute | 0 - 59 | Real time clock minutes |
| Seconds | 0 - 59 | Real time clock seconds |

**Valid tariffs:**

A valid must follow tariffs conditions:

- Tariffs cannot overlap, each tariff must have unique time period
- Time of use tariffs do not adjust for daylight savings time
- February 29th in a leap year can be a time of use tariff, but it is not recommended to have February 29th as a start or end date, as that tariff would be invalid for non-leap years
- Except for leap years, tariff dates are not year-specific; if you wanted to create a tariff that starts on the first monday in June, you need to enter the date for that year, then manually update the tariff information for the subsequent years

**Methods for creating a tariff:**

The device validates as you enter tariff information, it allows you to change the entered information or disables the tariff in the information is invalid:

- Start time can only be earlier than end time for tariffs that are applied every day. You can create a daily tariff that starts at 06:00 and ends at 11:00, but these times are only valid for the everyday tariff and invalid for the other tariff types
- Start day must be earlier than end day if the days are in the same month. You cannot create a tariff that starts June 15 and ends June 12
- The tariff setting starts from selecting the DAY TYPE from every day, weekend, weekday or a specific day of the week and can specify the time of use. For example, a four tariff configuration could have every day in the year divided into six-hour tariff periods or could have two tariffs for weekends and two tariffs for weekdays

**Tariff configurations examples:**

| | | Tari | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Timeslot 1 | Type | Everyday | Weekdays | Weekdays | Weekdays |
| | Start date | 01/01/23 | 01/05/23 | 01/01/23 | 01/09/23 |
| | End date | 23:30:00 | 05:00:00 | 07:00:00 | 19:30:00 |
| | Start time | 31/12/23 | 30/09/23 | 30/04/23 | 31/12/23 |
| | End time | 00:29:59 | 10:00:00 | 10:00:00 | 20:15:00 |
| Timeslot 2 | Type | Everyday | Weekdays | Weekdays | Weekdays |
| | Start date | 01/01/23 | 01/05/23 | 01/01/23 | 01/09/23 |
| | End date | 01:00:00 | 11:00:00 | 13:00:00 | 20:30:00 |
| | Start time | 31/12/23 | 30/09/23 | 30/04/23 | 31/12/23 |
| | End time | 02:29:59 | 13:00:00 | 14:00:00 | 21:15:00 |
| Timeslot 3 | Type | Everyday | Weekdays | Weekdays | Weekdays |
| | Start date | 01/01/23 | 01/05/23 | 01/01/23 | 01/09/23 |
| | End date | 03:00:00 | 15:30:00 | 15:30:00 | 21:30:00 |
| | Start time | 31/12/23 | 30/09/23 | 30/04/23 | 31/12/22 |
| | End time | 03:49:59 | 17:00:00 | 16:00:00 | 22:15:00 |
| Timeslot 4 | Type | Everyday | Weekdays | Weekdays | Weekdays |
| | Start date | 01/01/23 | 01/05/23 | 01/01/23 | 01/09/23 |
| | End date | 04:15:00 | 20:00:00 | 16:15:00 | 22:30:00 |
| | Start time | 31/12/23 | 30/09/23 | 30/04/23 | 31/12/23 |
| | End time | 04:59:59 | 23:29:59 | 17:30:00 | 21:15:00 |

As seen in the above table the

**Tariff 1** stores the energy of whole year 2022 of each day from 12:00:00 AM to 11:59:59 PM

**Tariff 2** stores energy of Midnight to 9:00 AM also from 5:00 to Midnight for months February to June of weekdays only

**Tariff 4** will store completer energy of month April, May, June, October, November, December as the day types and timeslot alliigns for these months. Rest Every day, weekdays, weekend energyies will be stored in tariff 4 according to time limit applied

**Configuring time of day mode tariffs:**

A valid must follow tariffs conditions:

- Tariffs cannot overlap; each tariff must have a unique time period
- Time of use tariffs do not adjust for daylight savings time
- February 29th in a leap year can be a time of use tariff, but it is not recommended to have February 29th as a start or end date, as that tariff would be invalid for non-leap years
- Except for leap years, tariff dates are not year-specific; if you wanted to create a tariff that starts on the first Monday in June, you need to enter the date for that year, then manually update the tariff information for the subsequent years

**• Input mode overview:**

In Input type tariff there are 3 different modes which takes No. Of Digital input as 2, 3 or 4
The input mode the energy is stored in the specified tariff based on the respective configured DI in the meter
If a digital input is used for tariff, it cannot be used for an exclusive association (such as Demand sync or Input metering), but digital inputs can be shared with a non-exclusive association (such as alarms)
The DI are used as binary counters to identify tariff, where ON = 1 and OFF = 0, and digital input 2 as most significant bit(MSB) and digital input 1 as least significant bit(LSB)

**Tariff configurations with different input modes:**

Using 2 digital inputs

| DI1 Status | DI2 Status | Stored in |
|---|---|---|
| 0 | 1 | Tariff 1 |
| 1 | 0 | Tariff 2 |

Using 3 digital inputs

| DI1 Status | DI2 Status | Stored in |
|---|---|---|
| 0 | 1 | Tariff 1 |
| 1 | 0 | Tariff 2 |
| 1 | 1 | Tariff 3 |

Using 4 digital inputs

| DI1 Status | DI2 Status | Stored in |
|---|---|---|
| 0 | 0 | Tariff 1 |
| 0 | 1 | Tariff 2 |
| 1 | 0 | Tariff 3 |
| 1 | 1 | Tariff 4 |

- **Fixed Tariff :-**
- The fixed tariff feature in meter enables users to accurately measure and monitor energy consumption for billing purposes. It initiates this process by recording energy usage starting from the user specified date onwards
- Configure fixed Tariff-Billing parameters

| Parameter | Holding register | Range | Description |
|---|---|---|---|
| Hour | 40348 | 0-23 | Set the hour fortariff calculation |
| Minutes | 40349 | 0-59 | Set the minutes for tariff calculation |
| Seconds | 40350 | 0-59 | Set the seconds for tariff calculation |
| Day | 40351 | 1-31 | Set the day of the month for tariff calculation |
| Month | 40352 | 1-12 | Set the month for tariff calculation |

**Note :-** All five parameters must be set simultaneously. If any parameter is left unconfigured, all parameters will default to zero

- **Retrieve energy data**

After configuration, stored energy data can be read from the input registers as follows:

| Time period | Stored energy registers | Beginning of period registers | Description |
|---|---|---|---|
| Current day | 30726-30746 | 30750-30770 | Access daily energy consumption and generation data for the current year |
| Previous day | 30774-30794 | 30798-30818 | Access yesterday's energy consumption and generation data for the current year |
| Current month | 30822-30842 | 30846-30866 | Access daily energy consumption and generation data for the current year |
| Previous months (1-12) | 30870-31418 | 30894-31442 | Access yesterday's energy consumption and generation data for the current year |
| Current year | 31446-31466 | 31470-31490 | Access daily energy consumption and generation data for the current year |
| Previous year | 31494-31514 | 31518-31538 | Access yesterday's energy consumption and generation data for the current year |

- **Energy categories**

The energy data covers the following parameters:

| Category | Description |
|---|---|
| Total import KWH | Total import active energy |
| Total export KWH | Total export active energy |
| Total import KVAH | Total import apparent energy |
| Total export KVAH | Total export apparent energy |
| Total import KVARH | Total import reactive energy |
| Total export KVARH | Total export reactive energy |

### • Alarms overview:

Meters are equipped with a robust alarm system designed to alert users when abnormal conditions are detected. These conditions could include errors, unexpected events, or measurements that deviate from standard operating ranges.

The alarms are flexible and can be configured based on specific set points to monitor critical parameters, events, or potential issues in your electrical system. Depending on the nature of the detected event, the meter supports high, medium, and low-priority alarms, ensuring that users can address concerns promptly and appropriately.

- **Key features include:**

Customizable alerts: Users can modify alarm settings, such as priorities, to align with specific operational needs.

- **Alarm creation:**

The meter's advanced features allow users to define custom alarms tailored to unique system requirements.

- **Event logging:**

All alarm events are logged in the meter for easy tracking and analysis. Meters offer a powerful and user-friendly alarm management system, enabling users to maintain optimal system performance and reliability.

### • Available Alarms:

Meters supports a number of different alarm types.

| Type | Number |
|---|---|
| Unary | 4 |
| Digital | 1 |
| Standard | 28 |

- **Unary alarms:**

Unary alarms are specific alerts designed to monitor and signal individual events are conditions. They insure efficient detection of issues like power-up, reset, diagnostics, and phase reversal.

**Available unary alarms:**

The power meter has four unary alarms

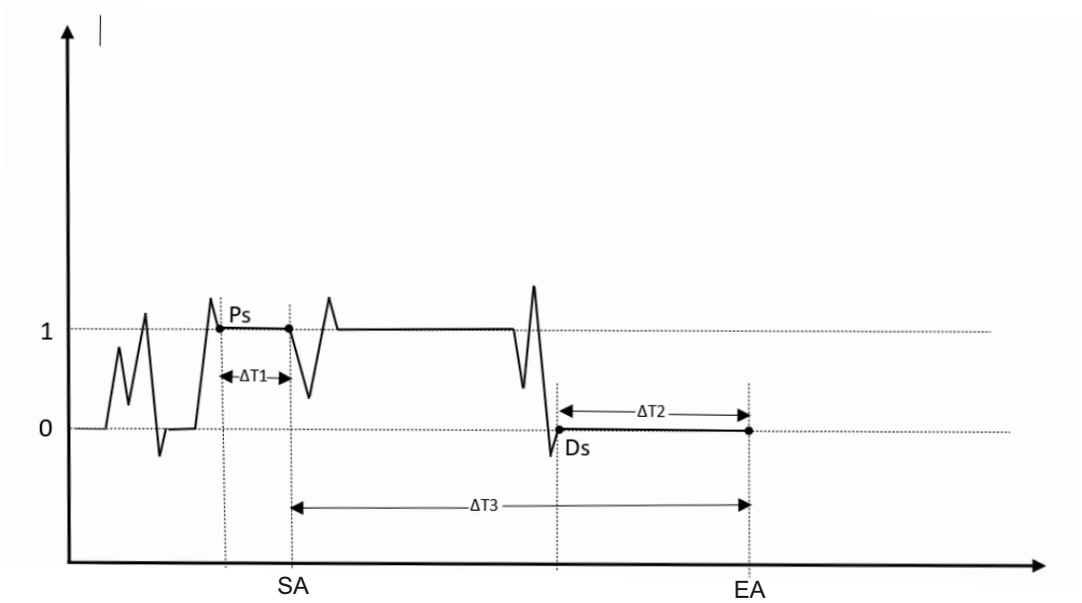
| Alarm label | Description |
|---|---|
| Meter powerup | Meter powers on after losing control power. |
| Meter reset | Meter resets for any reason. |
| Meter diagnostic | Alert about issues or irregularities identified during self-diagnostic checks. |
| Phase reversal | Detects incorrect phase sequencing in three-phase power system. |

**Digital alarms**

The meter has one digital alarms for alarming on status input status. The digital alarms are active when the associated enable input is ON. The pickup and dropout time delays are configured in seconds.

### Digital Alarms:

To prevent false triggers from erratic signals, you can set up pickup and dropout time delays for the digital alarm.




| | |
|---|---|
| PS | Pickup setpoint (1 = ON) |
| DS | Dropout setpoint (0 = OFF) |
| ΔT1 | Pickup time delay (in seconds) |
| SA | Start of alarm condition |
| ΔT2 | Dropout time delay (in seconds) |
| EA | End of alarm condition |
| ΔT3 | Alarm duration (in seconds) |

**NOTE:** To prevent filling the alarm log with nuisance alarm trips, the digital alarm is automatically disabled if the digital input changes state more than 4 times in one second or more than 10 times in ten seconds. In this case, you must re-enable the alarm using the display or utility

### Standard alarms:

The Meter has 28 Standard over / under alarms

Majority of standard alarms are three-phase, but reported as single phase alarms

Alarms can be used for controlling Relay and Digital output

Standard Alarms are configured by following values

- Enable-disable (default) or enable
- Pickup setpoint (magnitude)
- Pickup time delay (in seconds)
- Dropout setpoint (magnitude)
- Dropout time delay (in seconds)
- Priority (High / Medium / Low / None)
- DO
- RO

**Note:**

- RO Can be configured only through Utility if External RO is connected and in Control Mode of RO ALARM is selected
- Current, Voltage, Power, Demand and Frequency related alarms are configurable through meter front rest are configured using utility

**• Example of over and under setpoint (standard) alarm operation**

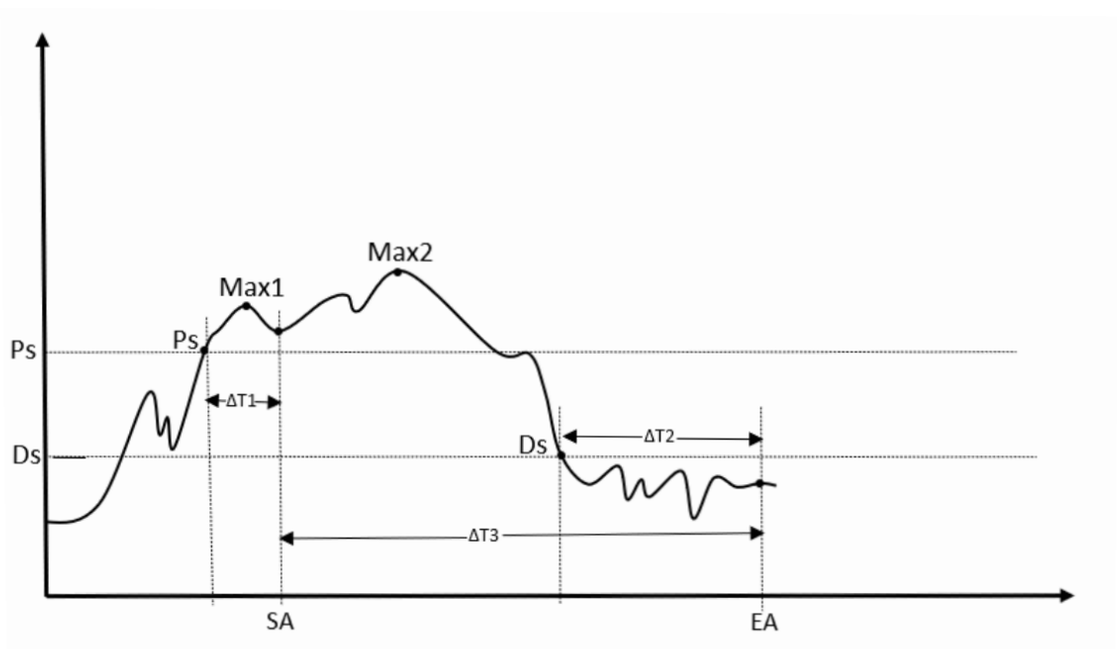
The meter supports over and under setpoint conditions on standard alarms. A setpoint condition occurs when the magnitude of the signal being monitored crosses the limit specified by the pickup setpoint setting and stays within that limit for a minimum time period specified by the pickup time delay setting.

The setpoint condition ends when the magnitude of the signal being monitored crosses the limit specified by dropout setpoint setting and stays within that limit for a minimum time period specified by dropout time delay setting

**Over setpoint**

When the value rises above the pickup setpoint setting and remains there long enough to satisfy the pickup time delay period (ΔT1), the alarm condition is set to ON. When the value falls below the dropout setpoint setting and remains therec long enough to satisfy the dropout time delay period (ΔT2), the alarm condition is set to OFF

The meter records the date and time when the alarm event starts (SA) and when it ends (EA). The meter also performs any task assigned to the event, such as operating a digital output. The meter also records maximum values (Max1, Max2) before, during or after the alarm period




| | |
|---|---|
| PS | Pickup setpoint (1 = ON) |
| DS | Dropout setpoint (0 = OFF) |
| ΔT1 | Pickup time delay (in seconds) |
| SA | Start of alarm condition |
| ΔT2 | Dropout time delay (in seconds) |
| EA | End of alarm condition |
| ΔT3 | Alarm duration (in seconds) |
| MAX1 | Maximum value recorded during pickup period |
| MAX2 | Maximum value recorded during alarm period |

**Under setpoint**

When the value falls below the pickup setpoint setting and remains there long enough to satisfy the pickup time delay period (ΔT1), the alarm condition is set to ON. When the value rises above the dropout setpoint setting and remains there long enough to satisfy the dropout time delay period (ΔT2), the alarm condition is set to OFF.

The meter records the date and time when the alarm event starts (SA) and when it ends (EA). The meter also performs any task assigned to the event, such as operating a digital output. The meter also records minimum values (Min1, Min2) before, during or after the alarm period.

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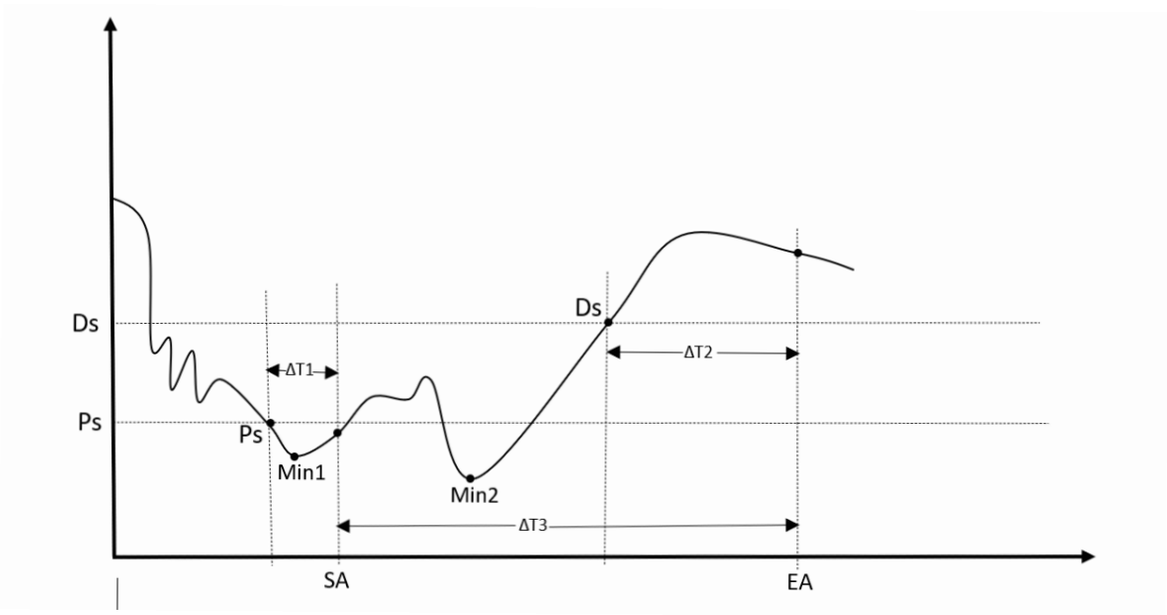



| | |
|---|---|
| PS | Pickup setpoint (1 = ON) |
| DS | Dropout setpoint (0 = OFF) |
| ΔT1 | Pickup time delay (in seconds) |
| SA | Start of alarm condition |
| ΔT2 | Dropout time delay (in seconds) |
| EA | End of alarm condition |
| ΔT3 | Alarm duration (in seconds) |
| MIN1 | Maximum value recorded during pickup period |
| MIN2 | Maximum value recorded during alarm period |

## Available standard alarms:

**Table of list of standard Over / Under alarms**

| Alarm number | Alarm name |
|---|---|
| 1 | Over Current, Phase |
| 2 | Under Current, Phase |
| 3 | Over Current, Neutral |
| 4 | Over Voltage, L-L |
| 5 | Under Voltage, L-L |
| 6 | Over Voltage, L-N |
| 7 | Under Voltage L-N |
| 8 | Over Voltage Unbal |
| 9 | Over Voltage THD |
| 10 | Phase Loss |
| 11 | Over kW |
| 12 | Over kVAR |
| 13 | Over kVA |
| 14 | Over kW Dmd, Pres |
| 15 | Over kW Dmd, Last |
| 16 | Over kW Dmd, Pred |
| 17 | Over kVAR Dmd, Pres |
| 18 | Over kVAR Dmd, Last |
| 19 | Over kVAR Dmd, Pred |
| 20 | Over kVA Dmd, Pres |
| 21 | Over kVA Dmd, Last |
| 22 | Over kVA Dmd, Pred |
| 23 | Over Frequency |
| 24 | Under Frequency |
| 25 | Lead-Lag PF, True |
| 26 | Lead-Lag PF, Disp |
| 27 | Over RTD |
| 28 | Under RTD |

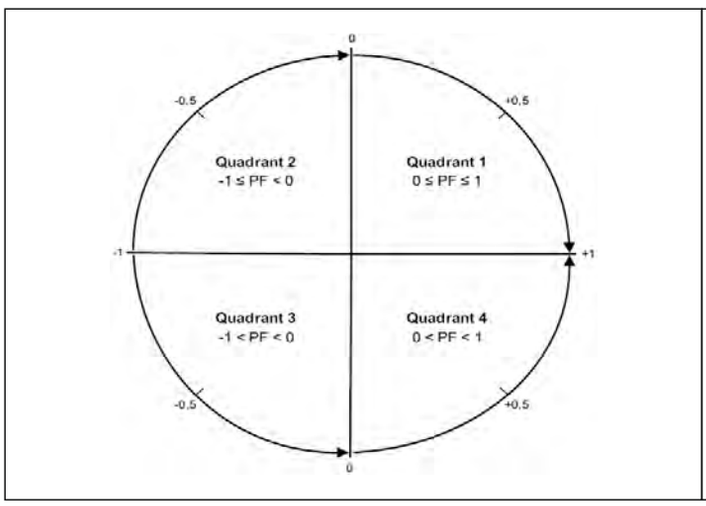
• **Power factor alarm:**

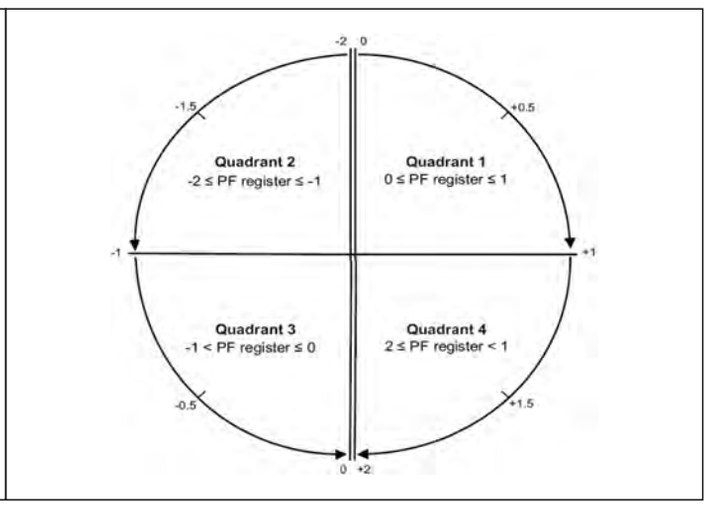
An alarm can be configured for either Leading Power Factor or Lagging Power Factor, allowing for the monitoring of the circuit's power factor when it exceeds or falls short of the threshold you have established. The Leading PF and Lagging PF alarms use the power factor quadrants

**Four quadrant power factor information: Floating point registers**

The meter also provides PF information (including sign and quadrant) in single floating point registers for each of the PF values (for example, per-phase and total values for true and displacement PF, and associated minimums and maximums). The meter performs a simple algorithm to the PF value then stores it in the appropriate PF register.

The meter and software interpret these PF registers for reporting or data entry fields according to the following diagram:



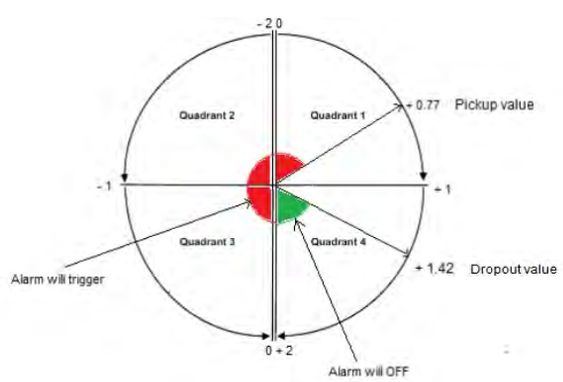




**The PF value is calculated from the PF register value using the following formulas:**

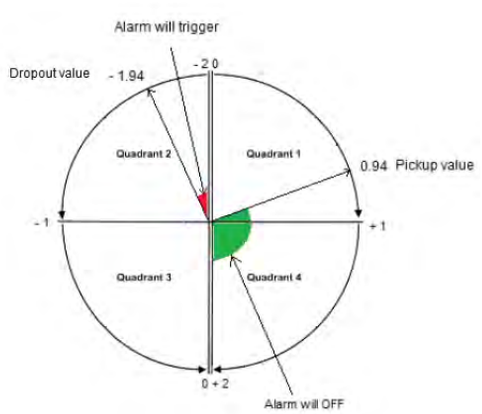
| Quadrant | PF range | PF register range | PF formula |
|---|---|---|---|
| Quadrant 1 | 0 to +1 | 0 to +1 | PF value = PF register value |
| Quadrant 2 | -1 to 0 | -2 to -1 | PF value = (-2) - (PF register value) |
| Quadrant 3 | 0 to -1 | -1 to 0 | PF value = PF register value |
| Quadrant 4 | +1 to 0 | +1 to +2 | PF value = (+2) - (PF register value) |

**For the configration of PF Alarm there are four cases outline below**

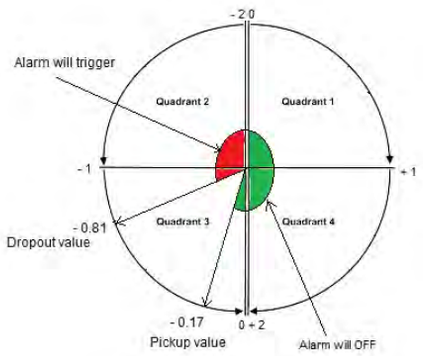
Case 1: Positive Pickup and Dropout Points



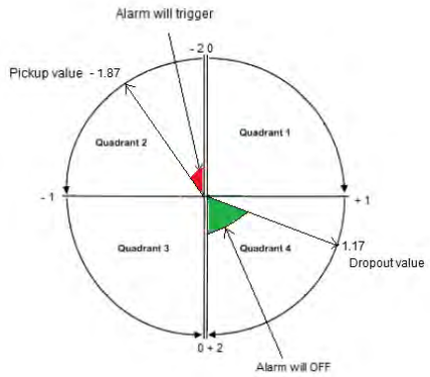

Case 2: Positive Pickup and Negative Dropout Points



Case 3: Negative Pickup and Negative Dropout Points




Case 4: Negative Pickup and Positive Dropout Points




**Alarm trigger condition:**

- **Lagging power factor:** The alarm will trigger when the power factor (PF) value is less than both the pickup and dropout values. This indicates a significantly lagging power factor
- PF value < Pickup value AND PF value < Dropout value

**Alarm deactivation condition:**

- **Leading or Improved lagging power factor**: The alarm will deactivate when the power factor value is greater than both the pickup and dropout values. This indicates a leading or improved lagging power factor.
- PF value > Pickup value AND PF value > Dropout value

This means that both conditions must be true for the alarm to be off. If either condition is not met, the alarm will remain active

**Note:**

- **Red area:** This area signifies the region where the alarm will trigger. If the measured value falls within this red zone, the alarm system will activate.
- **Green area:** This area represents the region where the alarm will be off. If the measured value is within this green zone, the alarm system will remain inactive.

**Phase loss alarm**

The phase loss alarm functions as an under setpoint alarm, designed to monitor the voltages within a three-phase system. It activates when one or two phases drop below the designated pickup setpoint and persist at that level for a duration sufficient to meet the pickup time delay requirement. Conversely, when all phases exceed the dropout setpoint and maintain that status long enough to fulfill the dropout time delay, the alarm condition is reset to OFF.

**Alarm priorities:**

Each alarm has a configurable priority level. Which are used distinguish between events that require immediate action and those that do not require action

| Alarm priority | Alarm display notification and recording method | | | | |
|---|---|---|---|---|---|
| | Alarm LED | Alarm display | Active Alarm with ACK | UNACK Alarm | Alarm history |
| High | Blinks while the alarm is active | Blinks while the alarm is active. “Alarm” remains displayed until Alarm is not off | All active alarm is display on active alarm page with ACK the alarm | UNACK alarm is display on UNACK ALARM page | Recorded in alarm history |
| Medium | Blinks while the alarm is active | Blinks while the alarm is active. “Alarm” remains displayed until Alarm is not off | All active alarm is display on active alarm page | UNACK alarm is display on UNACK ALARM page | Recorded in alarm history |

| Alarm priority | Alarm display notification and recording method | | | | |
|---|---|---|---|---|---|
| | Alarm LED | Alarm display | Active Alarm with ACK | UNACK Alarm | Alarm history |
| Low | Blinks while the alarm is active | None | All active alarm is display on active alarm page | None | Recorded in alarm history |
| None | No activity | None | All active alarm is display on active alarm page | None | None |

**Note:**

- The alarm LED notification only occurs if the alarm LED is configured for alarming
- If multiple alarms with different priorities are active at the same time, the display shows the alarms in the order they occurred

**To acknowledge a high-priority alarm, follow these steps:**

1. Long press (5 seconds) the 4th key on the display to open the Active Alarms page
2. Press the 1st key (ACK key) to acknowledge the alarm

**If a dropout condition occurs before you can acknowledge the alarms:**

1. Press the 4th key (no long press required) to open the Unacknowledged Alarms page
2. Press the 1st key (ACK button) to acknowledge each specific unacknowledged alarm listed on the page

## Alarm setup overview

User can use the meter display or utility to configure unary, digital or standard alarms

### Unary alarm setup parameters

| Parameters | Option or range | Description |
|---|---|---|
| ENABLE | 0 – No (OFF)<br>1 – Yes (ON) | This enables or disables the alarm |
| PRIORITY | 0 – NONE<br>1 – LOW<br>2 – MEDIUM<br>3 – HIGH | This sets the alarm priority and notification options |
| DIGITAL OUTPUT SELECTION | 0-NONE<br>1-(INTERNAL) DO1<br>2-(INTERNAL) DO2 | Select the outputs you want to control when the alarm is triggered |
| RELAY OUTPUT SELECTION | 0-NONE<br>1-(EXTERNAL)RO1<br>2-(EXTERNAL)RO2<br>3-(EXTERNAL)RO3<br>4-(EXTERNAL)RO4 | |

**Note:** relay output selection is enable when connect external RO card and select RO CONTROL MODE as alarm

### Digital alarm setup parameters

### Configure the digital alarm setup parameters as required

| Parameters | Option or range | Description |
|---|---|---|
| ENABLE | 0 – No (OFF)<br>1 – Yes (ON) | This enables or disables the alarm |
| PICKUP_DELAY | 0 to 999999 | This specifies the number of seconds the digital input must be in the alarm pickup state before the alarm is tripped |

| Parameters | Option or range | Description |
|---|---|---|
| DROPOUT_DELAY | 0 to 999999 | This specifies the number of seconds the digital input must be out of the alarm pickup state before the alarm turns off |
| PRIORITY | 0 – NONE<br>1 – LOW<br>2 – MEDIUM<br>3 – HIGH | This sets the alarm priority and notification options |
| DIGITAL OUTPUT SELECTION | 0-NONE<br>1-(INTERNAL)DO1<br>2-(INTERNAL)DO2 | Select the outputs you want to control when the alarm is triggered |
| RELAY OUTPUT SELECTION | 0-NONE<br>1-(EXTERNAL)RO1<br>2-(EXTERNAL)RO2<br>3-(EXTERNAL)RO3<br>4-(EXTERNAL)RO4 | |

### Standard alarm setup parameters

### Configure the standard alarm setup parameters as required

| Parameters | Option or range | Description |
|---|---|---|
| ENABLE | 0 – No (OFF)<br>1 – Yes (ON) | This enables or disables the alarm |
| PICKUP | Varies depending on the standard alarm you are setting up | This is the value (magnitude) you define as the setpoint limit for triggering the alarm. For “over” conditions, this means the value has gone above the Pickup. For “under” conditions, this means the value has gone below the Pickup |
| PICKUP_DELAY | 0 to 999999 | This specifies the number of seconds the signal must stay above the pickup setpoint (for “over” conditions), or below the pickup setpoint (for “under” conditions) before the alarm is tripped |
| DROPOUT | Varies depending on the standard alarm you are setting up | This is the value (magnitude) you define as the limit for dropping out of the alarm condition. For “over” conditions, this means the value has gone below the Dropout. For “under” conditions, this means the value has gone above the Dropout |
| DROPOUT_DELAY | 0 to 999999 | This specifies the number of seconds the signal must stay below the dropout setpoint (for “over” conditions), or above the dropout setpoint (for “under” conditions) before the alarm condition is ended |
| PRIORITY | 0 – NONE<br>1 – LOW<br>2 – MEDIUM<br>3 – HIGH | This sets the alarm priority and notification options |
| DIGITAL OUTPUT SELECTION | 0-NONE<br>1-(INTERNAL) DO1<br>2-(INTERNAL) DO2 | Select the outputs you want to control when the alarm is triggered. |
| RELAY OUTPUT SELECTION | 0-NONE<br>1-(EXTERNAL)RO1<br>2-(EXTERNAL)RO2<br>3-(EXTERNAL)RO3<br>4-(EXTERNAL)RO4 | |

| Parameters | Option or range | Description |
|---|---|---|
| PICKUP PF TYPE | 0 – NONE<br>1 – INDUCTIVE<br>2 – CAPACITIVE | *Applies to PF (power factor) alarms only. Use this to set the PF value and quadrant to set the pickup setpoint for an over PF condition (PF Leading) or under PF condition (PF Lagging) |
| DROPOUT PF TYPE | 0 – NONE<br>1 – INDUCTIVE<br>2 – CAPACITIVE | *Applies to PF (power factor) alarms only. Use this to set the PF value and quadrant to set the dropout setpoint for an over PF condition (PF Leading) or under PF condition (PF Lagging) |

**LED alarm indicator**

When the LED CTRL MODE is set to "alarm," the LED blinks to signal an active alarm condition

**Alarm history:**

Meter stores the alarm history each time an alarm occurs

Each alarm is equiped with status, timer and counter function and the alarm history is stored in utility through Ethernet / RS485

The alarm list holds upto 40 enteries at a time. The history also works as a circular buffer,the list replaces old entries as the new entries arrive over 40 enters in the alarm event queue.

The alarm log shows the alarm history on modbus in following format:

- ALARM NAME
- EVENT TYPE
- DAY
- MONTH
- YEAR
- HOURS
- MINUTES
- SECONDS
- PHASE NO
- PHASE VALUE 0
- PHASE VALUE 1
- PHASE VALUE 2

**• Data logs**

Total 105 parameters are avaliable for datalogging, of which up to 30 parameters can be data-logged at a time.

Data logging time can be configured from 1 to 1440 minutes(24hrs) using Selec Utility

Meter provides 105 days of retention of the data-logs for 5 minute interval.

The data logging functionality of the meter offers users flexibility and efficiency in monitoring various parameters.

With a total of 105 parameters available for logging, users can tailor their monitoring needs by configuring up to 30 parameters at a time. Using Selec Utility, users can easily adjust the logging time, spanning from a minimum of 1 minute to a maximum of 1440 minutes (equivalent to 24 hours). This granular control ensures that users can capture data at intervals that best suit their monitoring requirements, whether they need frequent updates or more long-term trend analysis. The meter ensures robust data retention, storing logs for up to 105 days at a 5-minute interval. This extensive retention period allows users to access historical data for extended periods, facilitating comprehensive analysis and troubleshooting.

**Table of data retention time and time interval**

| Time interval (time scan) (minutes) | Data retention period (days) |
|---|---|
| 1 | 21 |
| 5 | 105 |
| 10 | 213 |
| 30 | 640 |
| 60 | 1280 |
| 1440 | 30720 |

Memory allocations for data logs:

- Max. Records stored: 30720
- Max. register values recorded: 30
- Storage: 8 MB
- Parameter selection:  All 105 parameters

**Table of list of all 105 parameters**

| Sr no. | Parameters selection | Modbus addresses |
|---|---|---|
| 1 | Voltage V1N | 44051 |
| 2 | Voltage V2N | 44052 |
| 3 | Voltage V3N | 44053 |
| 4 | Average voltage LN | 44055 |
| 5 | Voltage V12N | 44056 |
| 6 | Voltage V23N | 44057 |
| 7 | Voltage V31N | 44058 |
| 8 | Average voltage LL | 44059 |
| 9 | Current L1 | 44060 |
| 10 | Current L2 | 44061 |
| 11 | Current L3 | 44062 |
| 12 | Current N | 44063 |
| 13 | Average current | 44065 |
| 14 | Active power KW1 | 44066 |
| 15 | Active power KW2 | 44067 |
| 16 | Active power KW3 | 44068 |
| 17 | Total active KW | 44069 |
| 18 | Apparent power KVA1 | 44070 |
| 19 | Apparent power KVA2 | 44071 |
| 20 | Apparent power KVA3 | 44072 |
| 21 | Total apparent KVA | 44073 |
| 22 | Reactive power KVAR1 | 44074 |
| 23 | Reactive power KVAR2 | 44075 |
| 24 | Reactive power KVAR3 | 44076 |
| 25 | Total reactive KVAR | 44077 |
| 26 | True power factor PH1 | 44078 |
| 27 | True power factor PH2 | 44079 |
| 28 | True power factor PH3 | 44080 |
| 29 | True power factor total | 44081 |
| 30 | Frequency | 44082 |
| 31 | Mains energy active total IMP | 44083 |
| 32 | Mains energy active total EXP | 44084 |
| 33 | Mains energy active total NET | 44085 |
| 34 | Mains energy active total ABS | 44086 |
| 35 | Mains energy apparent total IMP | 44087 |
| 36 | Mains energy apparent total EXP | 44088 |
| 37 | Mains energy apparent total NET | 44089 |
| 38 | Mains energy apparent total ABS | 44090 |
| 39 | Mains energy reactive total IMP | 44091 |

| Sr no. | Parameters selection | Modbus addresses |
|---|---|---|
| 40 | Mains energy reactive total EXP | 44092 |
| 41 | Mains energy reactive total NET | 44093 |
| 42 | Mains energy reactive total ABS | 44094 |
| 43 | DG energy active total IMP | 44095 |
| 44 | DG energy active total EXP | 44096 |
| 45 | DG energy active total NET | 44097 |
| 46 | DG energy active total ABS | 44098 |
| 47 | DG energy apparent total IMP | 44099 |
| 48 | DG energy apparent total EXP | 44100 |
| 49 | DG energy apparent total NET | 44101 |
| 50 | DG energy apparent total ABS | 44102 |
| 51 | DG energy reactive total IMP | 44103 |
| 52 | DG energy reactive total EXP | 44104 |
| 53 | DG energy reactive total NET | 44105 |
| 54 | DG energy reactive total ABS | 44106 |
| 55 | Max DMD KW total | 44107 |
| 56 | Max DMD KVA total | 44108 |
| 57 | Max DMD KVAR total | 44109 |
| 58 | Min DMD KW total | 44110 |
| 59 | Min DMD KVAR total | 44111 |
| 60 | Present Max DMD KW total | 44112 |
| 61 | Present Max DMD KVA total | 44113 |
| 62 | Present Max DMD KVAR total | 44114 |
| 63 | Present Min DMD KW total | 44115 |
| 64 | Present Min DMD KVAR total | 44116 |
| 65 | Predictive Max DMD KW total | 44117 |
| 66 | Predictive Max DMD KVA total | 44118 |
| 67 | Predictive Max DMD KVAR total | 44119 |
| 68 | Predictive Min DMD KW total | 44120 |
| 69 | Predictive Min DMD KVAR total | 44121 |
| 70 | Last current DMD PH1 | 44122 |
| 71 | Last current DMD PH2 | 44123 |
| 72 | Last current DMD PH3 | 44124 |
| 73 | Last current DMD AVG | 44125 |
| 74 | Present current DMD PH1 | 44126 |
| 75 | Present current DMD PH2 | 44127 |
| 76 | Present current DMD PH3 | 44128 |
| 77 | Present current DMD AVG | 44129 |
| 78 | Predictive current DMD PH1 | 44130 |

| Sr no. | Parameters selection | Modbus addresses |
|---|---|---|
| 79 | Predictive current DMD PH2 | 44131 |
| 80 | Predictive current DMD PH3 | 44132 |
| 81 | Predictive current DMD AVG | 44133 |
| 82 | Max current DMD PH1 | 44134 |
| 83 | Max current DMD PH2 | 44135 |
| 84 | Max current DMD PH3 | 44136 |
| 85 | Max current DMD AVG | 44137 |
| 86 | DI 1 | 44138 |
| 87 | DI 2 | 44139 |
| 88 | DO 1 | 44140 |
| 89 | DO 2 | 44141 |
| 90 | External DI 1 count | 44142 |
| 91 | External DI 2 count | 44143 |
| 92 | Quadrant 1 KWH | 44144 |
| 93 | Quadrant 2 KWH | 44145 |
| 94 | Quadrant 3 KWH | 44146 |
| 95 | Quadrant 4 KWH | 44147 |
| 96 | Quadrant 1 KVAH | 44148 |
| 97 | Quadrant 2 KVAH | 44149 |
| 98 | Quadrant 3 KVAH | 44150 |
| 99 | Quadrant 4 KVAH | 44151 |
| 100 | Quadrant 1 KVARH | 44152 |
| 101 | Quadrant 2 KVARH | 44153 |
| 102 | Quadrant 3 KVARH | 44154 |
| 103 | Quadrant 4 KVARH | 44155 |
| 104 | Average THD voltage LN | 44156 |
| 105 | Average THD current | 44157 |

**Data logging process**

1. Parameter selection for logging

• Available parameters: 105 (addresses 44051 to 44157 in holding registers)

• Maximum selectable parameters: 30

• Steps:

1. Choose any 30 parameters from the holding register range 44051 to 44157
2. Configure these parameters for logging

**2. Time interval configuration**

• Interval range:

  • Minimum: 1 minute

  • Maximum: 1440 minutes (24 hours)

• Steps:

Write the desired logging time interval (in minutes) to holding register 44306

**3. Start / Stop data logging**

• To start logging:

  • Write 1 to holding register 44305

• To stop logging:

  • Write 0 to holding register 44305

**4. Retrieve logged data**

• Total records: 30,720

• Steps to retrieve:

  1. Pass the desired record number to holding register 44179
  2. Read data from holding registers 44182 to 44301 for the selected parameters
  3. Each parameter occupies 8 bytes

**5. Additional information**

  • Get record data:

  • Record number: read from holding register 44302

  • Overwrite counter: read from holding register 44303

  • Timestamp: read from holding register 44180

• Error status:

• Read from: holding register 44307

  • Values:

  • 128: No error

  • 1: CRC error

  • 2: Read error

  • 4: Write error

  • 8: Erase error

**Inputs / Outputs**

**Available I/O ports**

The meter is equipped with digital inputs, digital outputs and relay outputs.

• The meter has 2 digital inputs and 2 digital output, after wiring the I/O ports they can be configured using communication

**Digital inputs:**

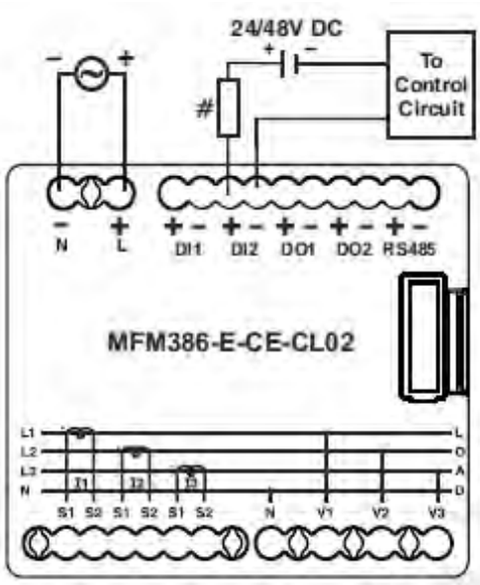
• The meter is equiped with 2 digital input ports (DI1, DI2). The digital inputs can be configured based on the application required.

• The DI requires external voltage to detect on/off state, if the external voltage appearing on the DI is within the operating range

• (24-48V DC) the meter detects ON state.

*__Note__: Di1 is fixed for DG

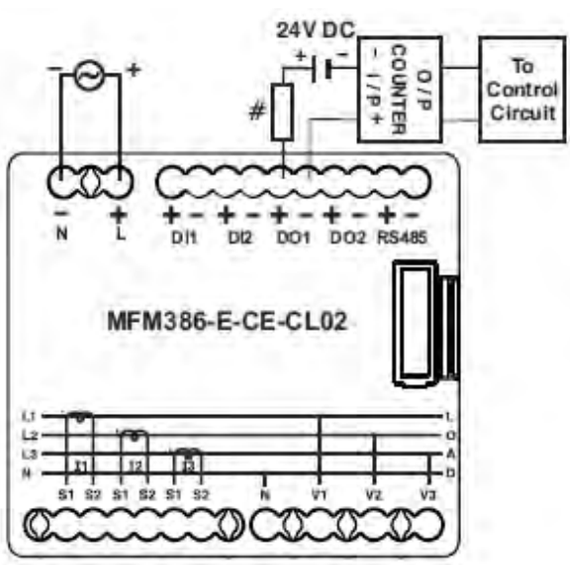
**Digital input connection**




**Digital outputs:**

• The meter is equiped with 2 digital output ports, which are configurable based on the application. Example energy Pulsing, Demand synchronization, Switching application etc

**Digital output connection**



**Configure the INTERNAL (2 DI: 2 DO) IO setup parameters as required**

| Parameters | Option or range | Description |
|---|---|---|
| DI CONTROL MODE | 0 – NONE<br>1 – NORMAL<br>2 – DEMAND | This field displays how the status input functions.<br>**None:** "None: The digital input is not associated with another meter function. The meter does not count or record incoming pulses."<br>**Normal:** the digital input is not associated with another meter function. The meter counts and records the number of incoming pulses normally.<br>**Demand:** the status input is associated with one of the input demand functions. The meter uses the incoming pulse to synchronize its demand period with the external source. |
| DI DEBOUNCE TIME (ms) | 1 to 9999 | Debounce is the time delay that compensates for mechanical contact bounce. Use this field to set how long (in milliseconds) the external signal must remain in a certain state to be considered a valid state change. |
| DO CONTROL MODE | 0 – NONE<br>1 – ENERGY PULSES<br>2 – EXTERNAL<br>3 – DEMAND<br>4 – ALARM | This field displays how the digital output functions.<br>• **None:** The digital output is not associated with any system.<br>• **Energy pulses**: The digital output is associated with energy pulsing. When this mode is selected, you can select the energy parameter and set pulse rate (p/k_h).<br>• **External:** The digital output is controlled remotely either through software or by a PLC using commands sent through communications.<br>• **Demand:** the digital output is associated with one of the demand systems. The meter sends a pulse to the digital output port at the end of every demand interval.<br>• **Alarm:** The digital output is associated with the alarm system. The meter sends a pulse to the digital output port when the alarm is triggered. |
| DO BEHAVIOUR MODE | 0 – NORMAL<br>1 – TIMED<br>2 – COIL HOLD | • **Normal:** This mode applies when control mode is set to External or Alarm. In the event of trigger for external mode, the digital output remains in the ON state until an OFF command is sent by the computer or PLC. In the event of trigger for alarm mode, the digital output remains in the ON state until the drop out point is crossed.<br>• **Timed:** The digital output remains ON for the period defined by the On time setup register.<br>• **Coil hold:** This mode applies when control mode is set to External or Alarm. For a unary alarm that is associated with a digital output, you must set behaviour mode to coil hold. The output turns on when the “energize” command is received and turns off when the “coil hold release” command is received. In the event of a control power loss, the output remembers and returns to the state it was in when control power was lost. |
| DO ON TIME (secs) | 1 to 9999 | This setting defines the pulse width (ON time) in seconds |
| DO INTERNAL COMMAND | 0 – LOW<br>1 – HIGH | **Low:** a low signal on the input de-asserts the digital output, leading to device deactivation.<br>**High:** A high signal, on the other hand, asserts the digital output, resulting in device activation.<br>**Note:** DO internal command option is selectable when DO control mode type is external. |

The meter consist of an I/O expansion module for the purpose of increasing Digital inputs, and Relay output. The available external I/O can be configured for 2DI+4RO.
The extended I/O is configured using meter front panel or communication

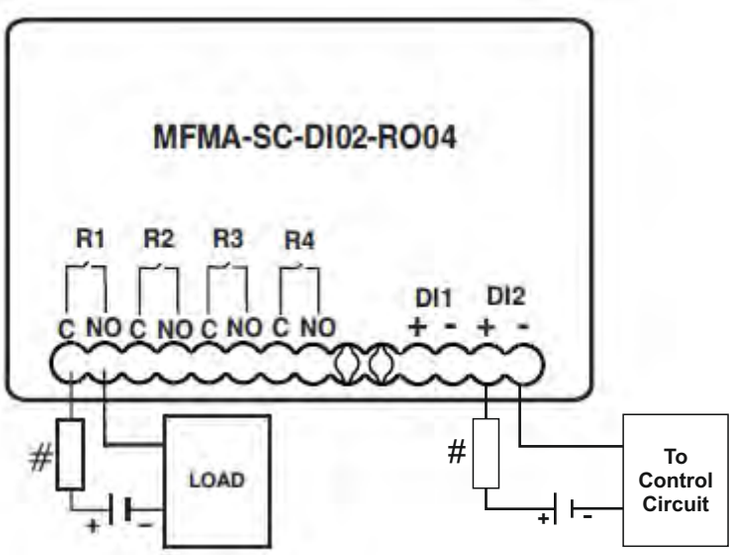
- **Digital inputs(DI):**

The meter external I/O can be set to digital input ports(DI). Those digital Inputs can be configured based on the application required

The DI requires external voltage to detect ON/OFF state, if the external voltage appearing on the DI is within the operating range(24 - 48V DC) the meter detects ON state

- **Relay output (RO):**
- The meter external IO can be set to form a mechanical relay output. Those relay outputs can be configured to used switching applications, for example, to provide ON/OFF control signals for switching capacitor banks, generators, and other external devices and equipment

**DI & RO connection**




**NOTE:** Unexpected change of state of the relay outputs may result when the supply power to the meter is interrupted or after a meter firmware upgrade.

**Configure the EXTERNAL(DI,DO,RO) IO setup parameters as required**

| Parameters | Option or range | Description |
|---|---|---|
| DI CONTROL MODE | 0 – NONE<br>1 – NORMAL<br>3 – TARIFF | This field displays how the digital input functions.<br>**None:** The input is not associated with another meter function. The meter does not count or record incoming pulses."<br>**Normal:** the digital input is not associated with another meter function. The meter counts and records the number of incoming pulses normally.<br>**Tariff:** The digital input is associated with one of the Tariff. The meter counts and records the number of incoming pulses and related consumption data associated with the pulses |
| DI DEBOUNCE TIME (ms) | 10 to 9999 | Debounce is the time delay that compensates for mechanical contact bounce. Use this field to set how long (in milliseconds) the external signal must remain in a certain state to be considered a valid state change |
| RO CONTROL MODE | 0 – NONE<br>1 – ALARM<br>2 – EXTERNAL | This field displays how the relay output functions.<br>• **None:** The relay output is not associated with any system.<br>• **Alarm:** the relay output is associated with the alarm system. The meter sends a pulse to the relay output port when the alarm is triggered.<br>• **External:** the relay output is controlled remotely either through software or by a PLC using commands sent through communications |
| RO BEHAVIOUR MODE | 0 – NORMAL<br>1 – TIMED<br>2 – COIL HOLD | • **Normal:** This mode applies when control mode is set to External or Alarm. In the event of trigger for external mode, the relay output remains in the closed state until an open command is sent by the computer or PLC. In the event of trigger for Alarm mode, the relay output remains in the closed state until the drop out point is crossed.<br>• **Timed:** The relay output remains ON for the period defined by the On time setup register<br>• **Coil hold:** This mode applies when control mode is set to External or Alarm. For a unary alarm that is associated with a relay output, you must set Behavior mode to coil Hold. The output turns on when the “energize” command is received and turns off when the “coil hold release” command is received. In the event of a control power loss, the output remembers and returns to the state it was in when control power was lost |
| RO ON TIME (secs) | 1 to 9999 | This setting defines the pulse width (ON time) in seconds |
| 0 – LOW<br>1 – HIGH 0 – LOW<br>1 – HIGH | 0 – LOW<br>1 – HIGH | **Low:** Low signal deactivate a relay, turning off a device.<br>**High:** High signal activate a relay, turning on a device.<br>**Note:** RO command option is selectable when RO control mode type is external |

Energy pulsing can be enabled by configuring the meter's Alarm / Energy LED or digital output(s).

- An Alarm / Energy pulsing LED is integrated into the meter. When configured for energy pulsing, the LED emits pulses to enable evaluation of the meter's energy measurement accuracy
- To determine the meter's energy measurement accuracy, a pulse counter receives and counts the pulses sent from the configured digital output(s) port

**Configuring the Alarm / Energy pulsing LED**

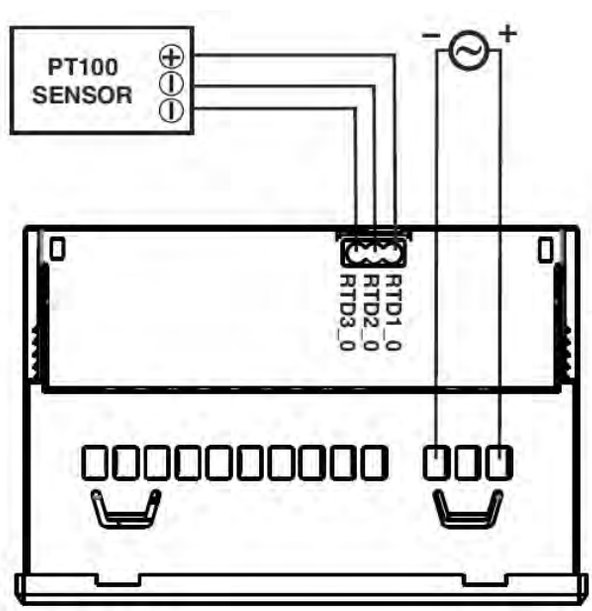
| Parameters | Option or range | Description |
|---|---|---|
| LED CTRL MODE | 0 - NONE<br>1 - ENERGY<br>2 - ALARM | LED is disabled<br>• Energy sets the LED for energy pulsing<br>• Alarm sets the LED for alarm notification |
| LED ENERGY | 0 - NONE<br>1 - IMPORT-KWH<br>2 - EXPORT KWH<br>3 - TOTAL KWH<br>4 - IMPORT KVARH<br>5 - EXPORT KVARH<br>6 - TOTAL KVARH<br>7 - IMPORT KVAH<br>8 - EXPORT KVAH<br>9 - TOTAL KVAH | Select which accumulated energy channel to monitor and use for energy pulsing. This setting is ignored when the LED mode is set to alarm |
| LED PULSE WEIGHT | 1 to 9999999 | When configured for energy pulsing, this setting defines how many pulses are sent to the LED for every 1kWh, 1kVARh or 1kVAh accumulated energy. This setting is ignored when the LED mode is set to alarm |

**• RTD**

The meter is equipped with a RTD module for the purpose of measurement of surrounding temperature. The meter seamlessly accepts standard RTD inputs and accurately linearizes them into temperature readings, ensuring precise monitoring of various temperature ranges. Its full 4-digit display provides ample space to showcase a broad spectrum of temperature inputs with clarity and accuracy. Users can view between Fahrenheit and Celsius on Untility and MODBUS for their preferred unit of measurement.

**RTD sensor:**

- **SENSOR TYPE:** PT100
- **TYPE OF INPUT:** DIFFERENTIAL
- **RESOLUTION:** 0.1 °C
- **DIGITAL RESOLUTION:** 12-bit
- **ANALOG INPUT ERROR AT 25 °C:** ±0.25% of full scale,
- **NON-LINEARITY:** ±0.25% OF full scale
- **CONVERSION TIME:** <100mS
- **CHANNEL ISOLATION:** NO
- **INPUT ISOLATION FROM UNIT MAIN MODULE:** YES
- **UNDER RANGE VALUE:** >-150 °C
- **OVER RANGE VALUE:** <850 °C
- **PROTECTION AGAINST POLARITY INVERSION:** YES




**RTD connections:**

# FIRMWARE UPGRADE

The meter supports on-site firmware upgrades for adding new functionality to the meter sing separate downloader software.

Procedure for firmware upgradation.

1. Go to www.selec.com to download the separate downloader-software for MFM386.
2. Download the newly uploaded firmware file (extension is XYZ.bin) from www.selec.com
3. Connect the meter to PC through RS485 communication.
4. Open separate downloader.
5. Check the communication setting of meter has properly select in downloader utility.
6. Select the COM port of PC
7. Browse the firmware saved location path from your PC.
8. Select bin file and then click - open
9. Press ◄ + ⏎ key of meter then powered UP the meter and then release the key.
10. Meter will enter in boot loader mode, on display it will shows "BOOT"
11. Click on download to download the upgraded firmware into; meter.
12. Downloading will start and meter will show the current downloading progress (in percent complete upto 100%) on display panel;
13. When the firmware upgrade is complete, seperate downloader will shows "download of bin file is successful".
14. After downloading the firmware, the meter will restart automatically.
15. Check the upgraded firmware version number under self test mode

**Note:** One meter can be upgrade at a one time from same PC.
Separate downloader is a program by the software company SELEC
Entry of boot loader mode can be accessed via communication or from the meter front.

Specifications are subject to change, since development is a continuous process.

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