Multifunction Meter



User Manual

www.selec.com

PREFACE

Thank you for choosing the 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 Solutions etc.

To utilize the meter to its full potential and ensure the safety of users and the safe operation of 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 harm the individuals nearby.

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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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.

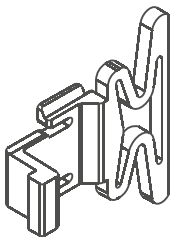
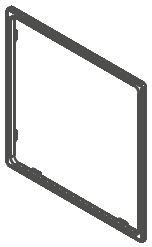
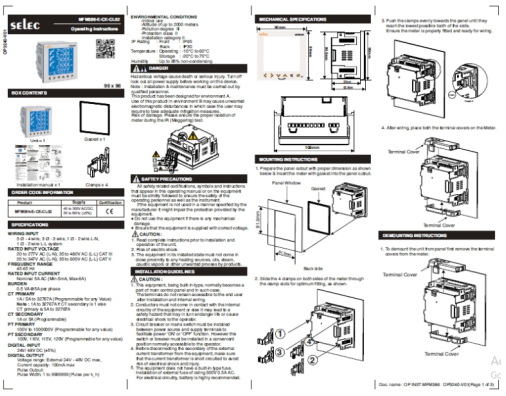
The meter is easy to install, easy to use, compact in size, and meets all safety and reliability standards.
The meter is normally supplied readily pre-programmed for operation and can be directly installed in the usual manner. Meter read/write operations can be performed either manually or through communication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

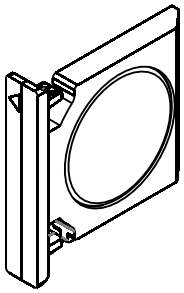
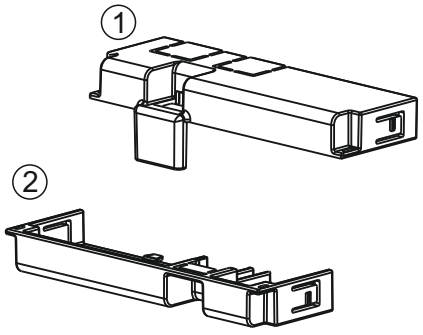
This user manual describes the basic functions and operational methods of the meter. Please read through this manual carefully before using the product.

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	selec® 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.	1
5	Battery cover and battery		1
6	Terminal cover		2

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 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

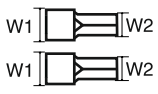
Features

- 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
- Inbuilt Resistance Temperature Detector (RTD)
- External IO modules available: 2DI+4RO
- 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, demand 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
- Total demand distortion
- Crest Factor K-Factor CO_2 emission
- Self - Test mode
- 4 tariff with each having 4 time slots settings
- Voltage phase sequence detection
- Current polarity detection and correction
- Import and Export run hour (Mains/DG), Load run hour, Active load timer
- Number of auxiliary interruptions

Technical specifications		
Type of measurement	Networks	3P4W, 3P3W, 1P2W L-N, 1P2W-LL
		True RMS
Display	LCD	Negative (blue) LCD with backlight 4 line 4 digit: 12.46 x 6.72mm last line of 9 digit: 6.85 x 3.73mm 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 20 to 347V AC (L-N); 35 to 600V AC (L-L) CAT II
	VT secondary	100,110,115,120V (programmable)
	VT primary	100 V to 1000000V (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
	Wire gauge	18-14 AWG (UL)
Digital input	DC input	24V/48V DC
Digital output	Digital output	Voltage range: External 48V DC max Current capacity: 20mA max
	Pulse width	1 to 9999999 (pulse per k_h)
	Pulse duration	For POP: 50ms For LED: 25ms
	Output type	Open collector
Communication (RS485)	Type	RS485 MODBUS RTU
	Baud rate	9600, 19200, 38400, 57600, 115200 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)	±0.2%
Reactive energy	Class 1 (class 1 as per IEC 62053-24 at I_N = 5A)	±1%
Apparent energy	Class 0.5S (class 0.5S at I_N = 5A)	±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 15th 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	IEC 61010-1
	Voltage dips and Interrupts	IEC 61000-4-11
	Short time over current protection	20 times of IMAX for half a second as per IEC62053-22 and IEC62053-24
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 61000-4-3
	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	IEC 61000-4-8 30A/m for continuous duration 300A/m for short duration
	Emission	Class A as per CISPR 11
Environmental	Temperature	Operating: -10 ºC to 55 ºC Storage: -25 ºC to 70 ºC
	Humidity	Up to 85% non-condensing
Lug dimension		W1 = 4.2mm W2 = 1.8mm W1 = 3.8mm 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	91.5 x 91.5mm	
Material	Poly carbonate - Lexan 923	
Accessories	Panel mount clamp, Terminal cover, battery and battery cover	
Weight	350 gm approx	
Protection rating	IP rating Front: IP65 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

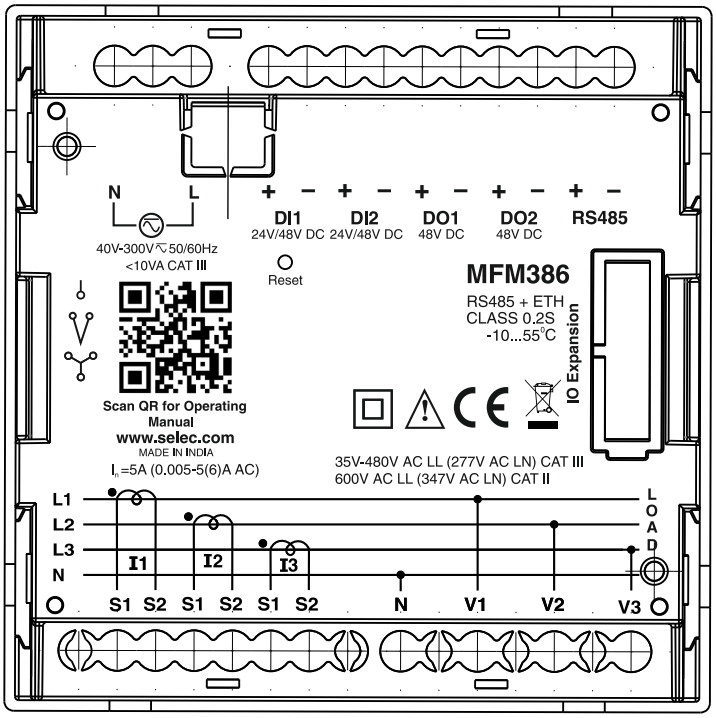
Ordering information

Product code	Supply voltage	Output		Input	Certification
		Digital output	Communication	Digital input	
MFM386-E-CE-CL02	40 to 300V AC/DC 50/60 Hz(±5%)	2	Ethernet + RS485	2	CE
MFM386-C-CE-CL02	40 to 300V AC/DC 50/60 Hz(±5%)	2	RS485	2	CE

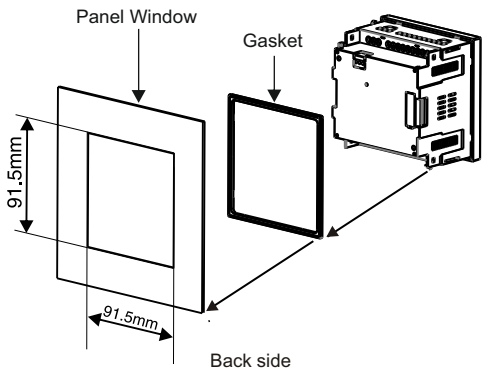
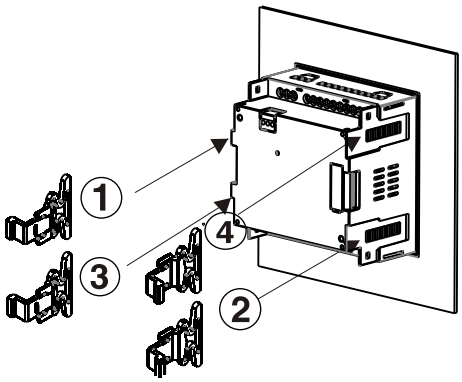
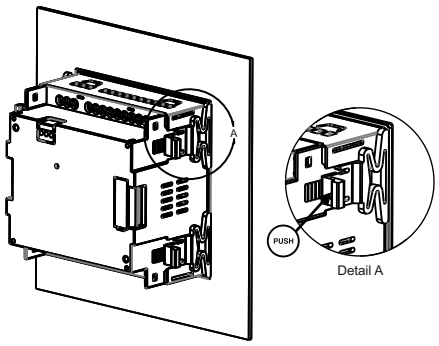
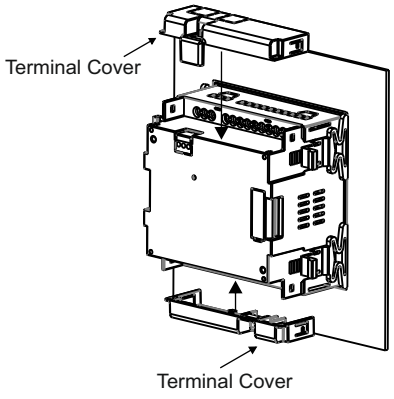
Front panel view



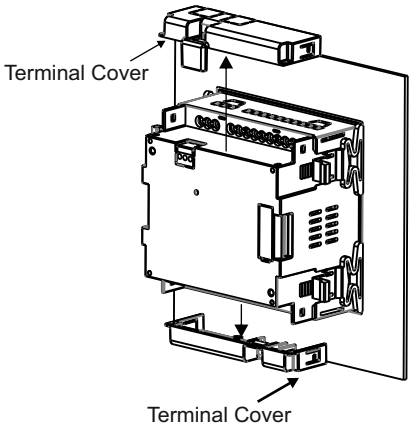
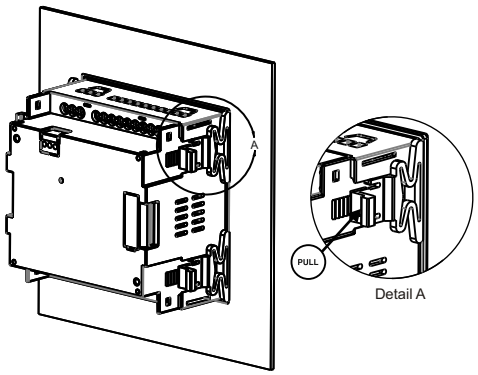
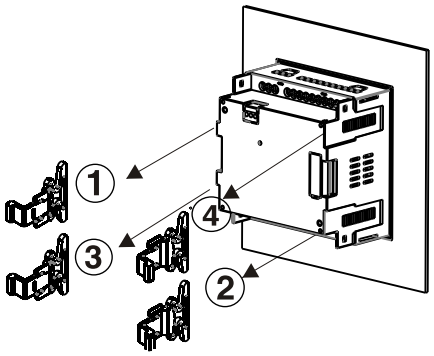
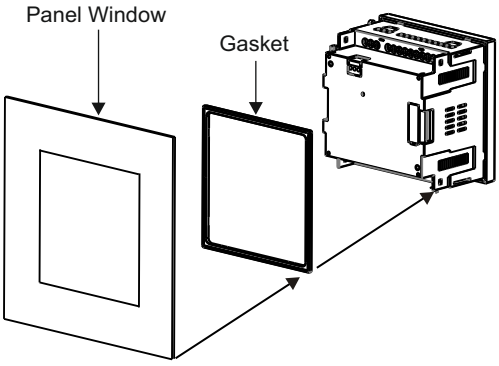
Back panel view



Meter mounting

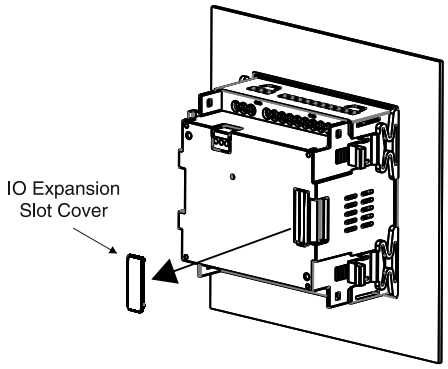
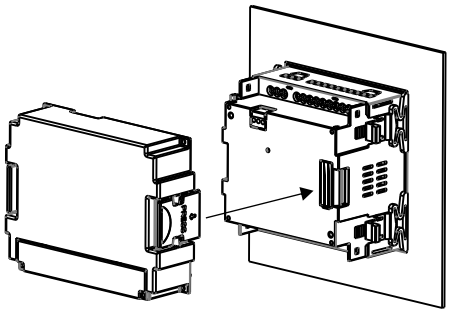
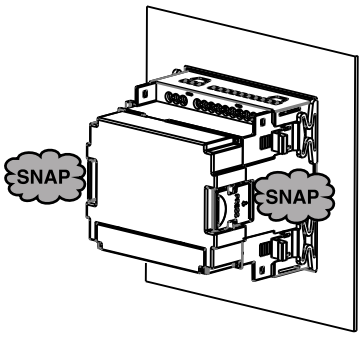
STEP	INSTRUCTION	
1	Prepare the panel cutout with proper dimension as shown below & Insert the meter with gasket into the panel cutout	
2	Slide the 4 clamps on both sides of the meter through the clamp slots for optimum fitting, as shown	
3	Push the clamps evenly towards the panel until they reach the 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	

Meter demounting

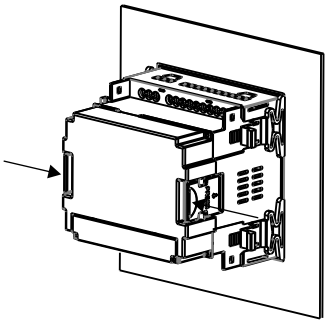
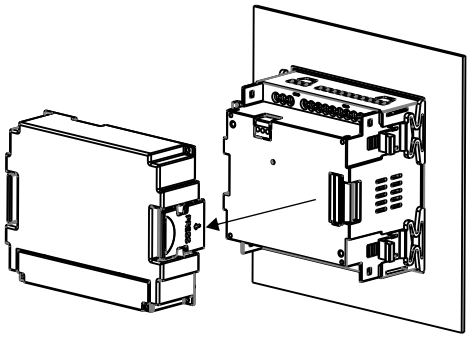
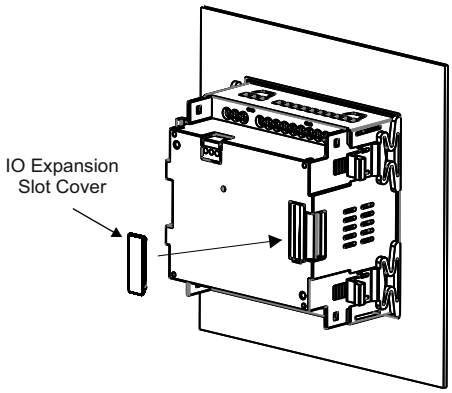
STEP	INSTRUCTION	
1	To demount the unit from panel first remove the terminal covers from the meter	
2	Pull the arm of the sliding clamp in outward direction (opposite to meter) and drag the sliding clamps away from the panel	
3	Remove all the 4 clamps from meter	
4	Push the meter from the back side of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

IO module mounting

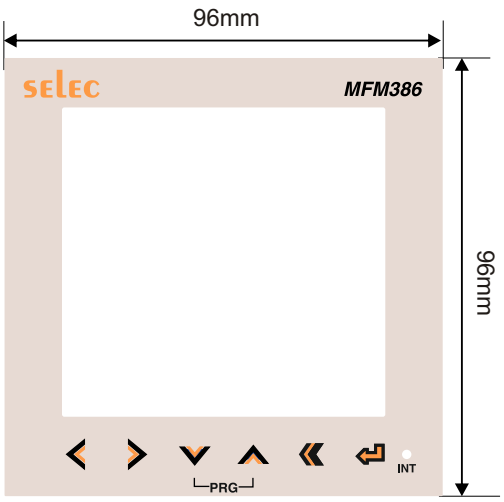
Note: To be installed in off condition only

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	

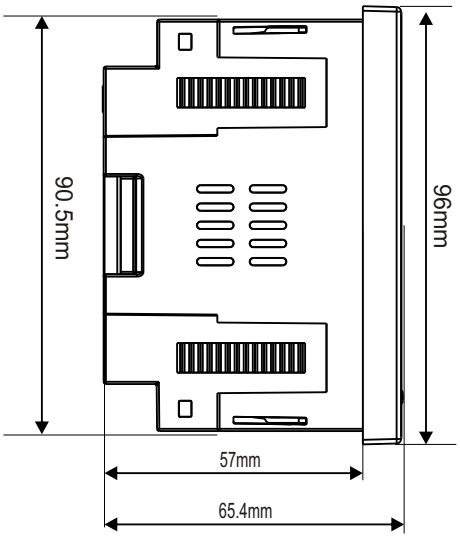
IO module demounting

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	

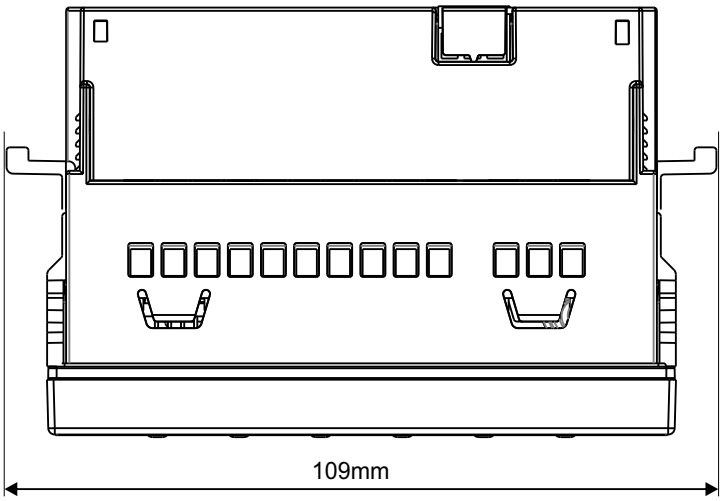
Mechanical dimensions



FRONT VIEW

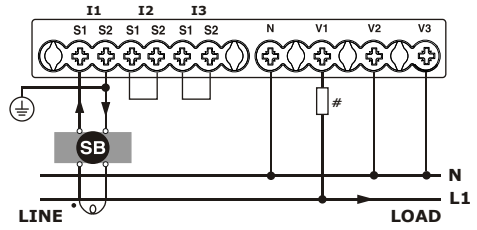
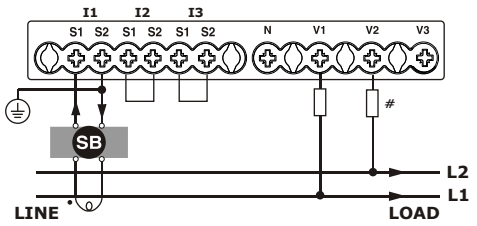


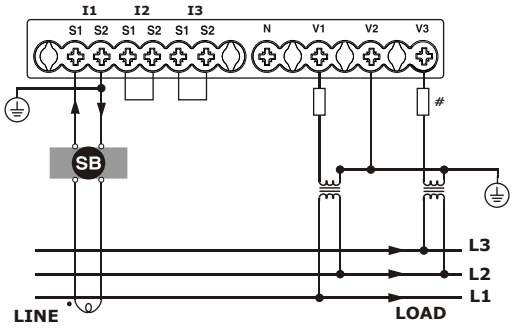
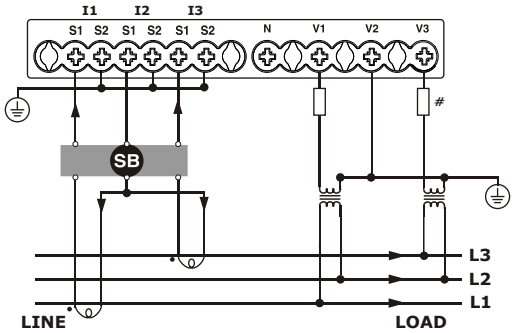
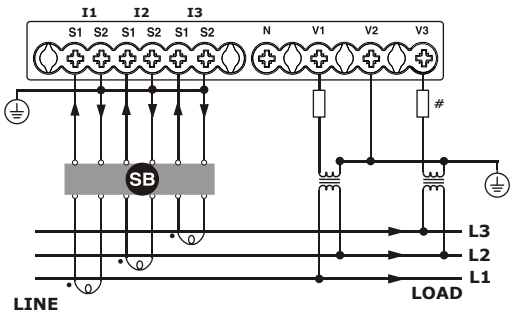
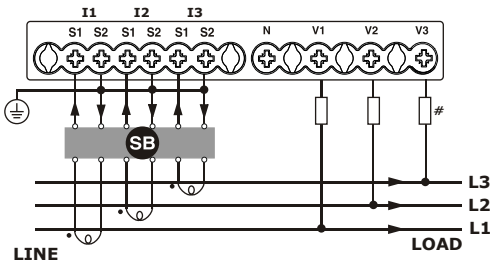
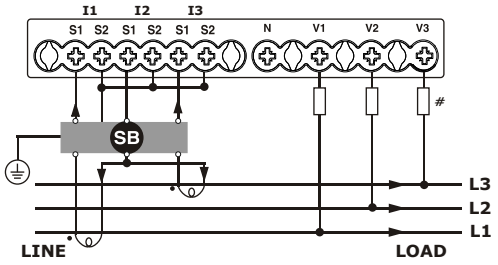
SIDE VIEW



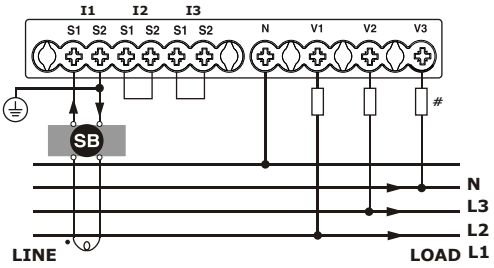
TOP VIEW

Wiring diagram

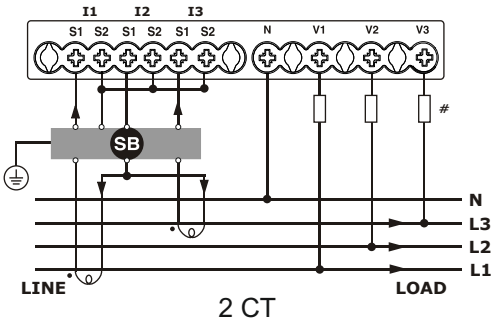
1 PHASE 2 WIRE (L-N)	1 PHASE 2 WIRE (L-L)
	
1CT (L-N)	1CT (L-L)

3 PHASE 3 WIRE	
	
1 CT and 2 VT	2 CT and 2 VT
	
3 CT and 2 VT	3 CT
	
2 CT	

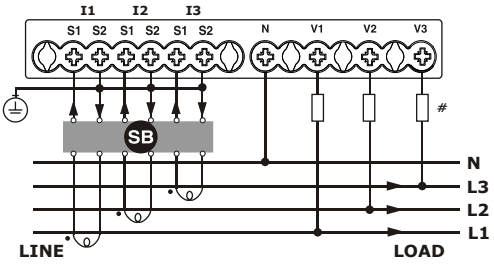
3 PHASE 4 WIRE



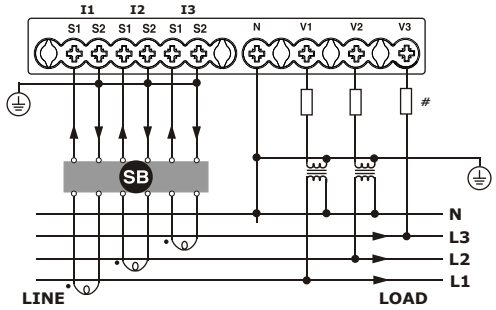
1 CT



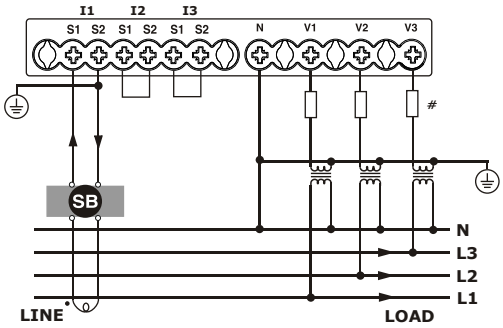
2 CT



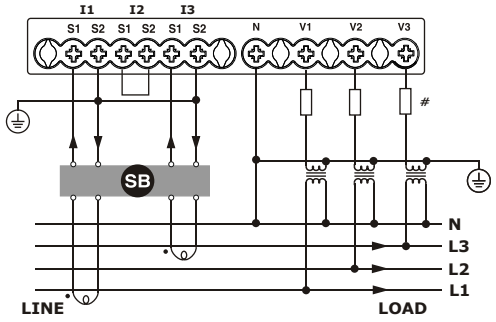
3 CT



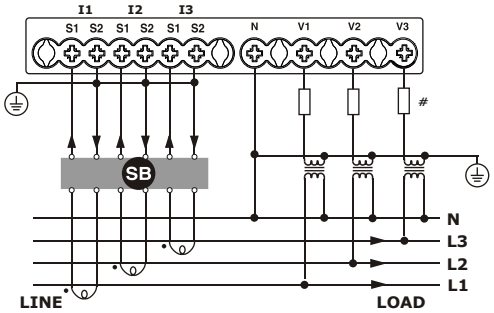
3 CT and 2 VT



1 CT and 3 VT



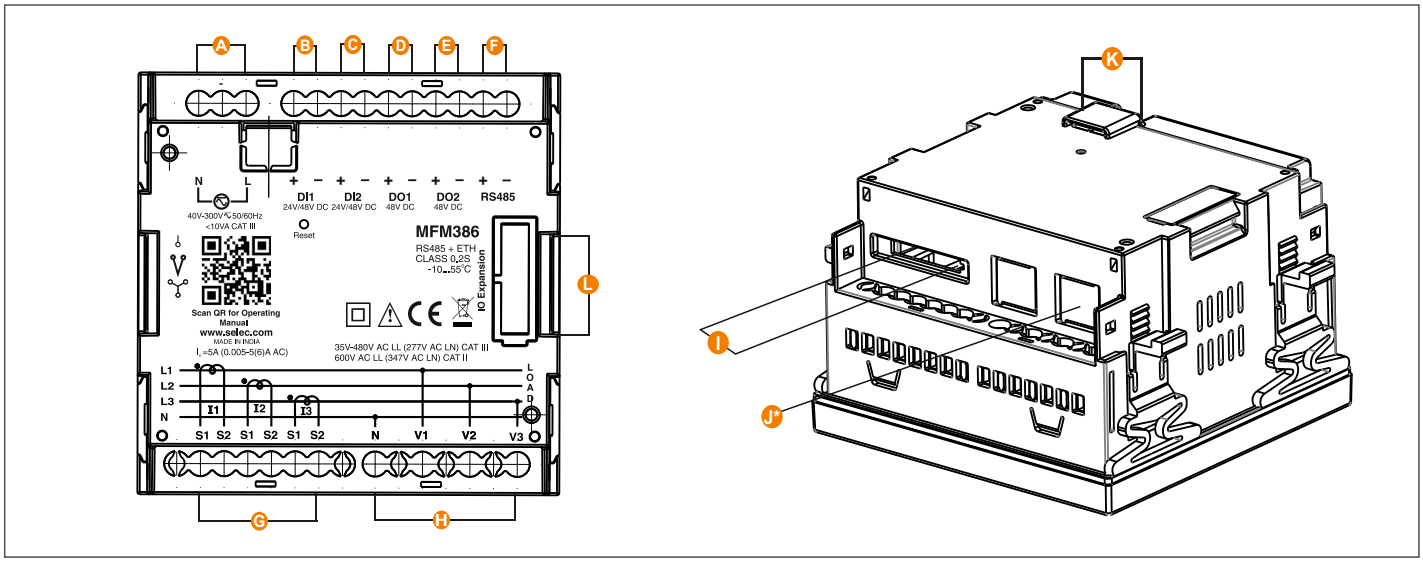
2 CT and 3 VT



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

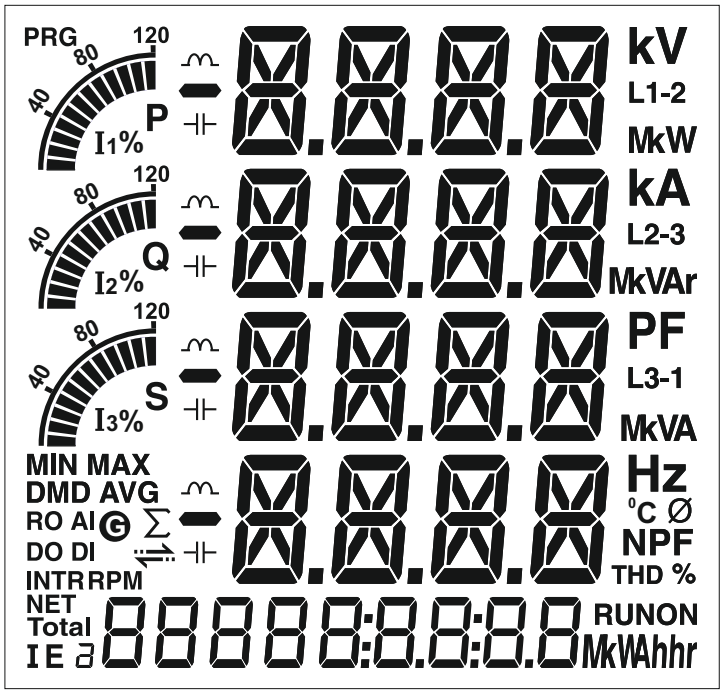


Terminal	Description	
A	L (Line)	Auxiliary input
	N (Neutral)	
B	DI1+	Digital input 1
	DI1-	
C	DI2+	Digital input 2
	DI2-	
D	DO1+	Digital output 1
	DO1-	
E	DO2+	Digital output 2
	DO2-	
F	RS485+	Communication connection
	RS485-	
G	S1(I1)	3 phase current input
	S2(I1)	
	S1(I2)	
	S2(I2)	
	S1(I3)	
	S2(I3)	
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

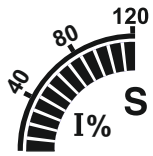
Note: *Only applicable for MFM386-E-CE-CL02

LCD description:

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



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 Voltage: V, kV Current: A, kA Active power: kW, MW Reactive power: kVAr, MVAr Apparent power: kVA, MVA Frequency: Hz Active energy: kWh, MWh, kMWh(1) Reactive energy: kVArh, MVArh, kMVAh(1) Apparent energy: kVAh, MVAh, kMVAh(1) (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 1-2, 2-3, 3-1: Represents 3 phase VLL AVG: represents the average N: Stands for neutral
5	THD%, MIN, MAX, DMD, RPM, G	THD: Total harmonics distortion; MAX: Maximum; MIN: Minimum; DMD: Demand; RPM: Revolution per minute; G : Secondary source (DG)

6	Ø	Angle symbol
7	$I_{1,2,3}$, $E_{1,2,3}$, Σ	I_{123}: Individual Import energy E_{123}: Individual Export energy 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 inductive :Indicates negative power & power factor :Load type capacitive
13		Bar graph represents percentage load to the rated current for each phase
14	INTR	Auxiliary 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

Key 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, RTD, I/O status
		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 predictive 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 DI2
		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 DI2
		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 DI1 and DI2
		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 setup	Network selection		3P4W 3P3W 1P2W 2P2W	3P4W	
	CT Terminal selection		CT1 CT2 CT3 CT12 CT23 CT31 CT123 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 1 VT 2 VT 3 VT	No VT	**Note:** The VT connect parameters are enabled based on selected network
	VT Secondary		100 110 115 120	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		2 to 50000 mA	11 mA	
	CT Sequence		CT123 CT321 CT312 CT231 CT213 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 CT2 CT3 CT12 CT23 CT31 CT123 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 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:** Digital output selection is only available if DO control mode is selected as Demand
	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 Import kWh Export kWh Total kWh Import kVArh Export kVArh Total kVArh Import kVAh Export kVAh Total kVAh	None	
	POP1 Pulse Width		1 to 9999999	1000	
	POP 2 Energy		None Import kWh Export kWh Total kWh Import kVArh Export kVArh Total kVArh Import kVAh Export kVAh Total kVAh	NONE	
	POP2 Pulse width		1 to 9999999	1000	
	LED Control mode		None/ Alarm /Energy	None	
	LED Energy		None Import kWh Export kWh Total kWh Import kVArh Export kVArh Total kVArh Import kVAh Export kVAh Total kVAh	None	**Note:** These parameters are only visible if selected LED mode as energy
	LED Pulse width		1 to 9999999	1000	
Serial communication	Communication password		0 to 9999	1000	
	Change communication password		No, Yes	No	
	Communication 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	00	
		Set RTC Month	1 to 12	1	
		Set RTC Day	1 to 31	1	
		Set RTC Week Day	Sunday Monday Tuesday Wednesday Thursday Friday 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	00.0000	
		Pickup time delay (s)	0 to 999999	0	
		Dropout Setpoint	00.0000 to 10.0000	00.0000	
		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 (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. * It is only configurable through MODBUS or 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), 000.00 to 347.00(V-LN), 0.00 to 100.00 (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)	000.00	
		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 * It is only configurable through MODBUS or 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	0000.000	
		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 * It is only configurable through MODBUS or 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	

Alarms	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 set point	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. * It is only configurable through MODBUS or Utility
	Frequency alarms	Alarm selection	Over frequency, Under frequency	Over frequency	
		Enable	Off & On	Off	
		Pickup set point	45.000 to 65.000	00.000	
		Pickup time delay (s)	0 to 999999	0	
		Dropout set point	45.000 to 65.000	00.000	
		Dropout time selay (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 * It is only configurable through MODBUS or Utility
	RTD* alarms	Alarm selection	Over RTD, Under RTD	-	
		Enable	Off & On	Off	
		Pickup (celsius)	-150.0 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

Alarms	RTD alarms	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 * It is only configurable through MODBUS or Utility
	PF* alarms	Alarm selection	True PF, Displacement PF	-	
		Enable	Off & On	Off	
		Pickup set point	-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, 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 * It is only configurable through MODBUS or Utility
		Pickup PF type	None Inductive Capacitive	None	
		Dropout PF type	None inductive capacitive	None	
Internal IO		DI2 Control mode	None, Normal, Demand sync	None	
		DI2 Debounce time	10 to 9999ms	10	
		DO1 Control mode	None, Energy, External, Demand, Alarm	None	
		DO2 Control mode	None, Energy, External, Demand, Alarm	None	
Factory default			Yes/No	No	

Reset parameter		Reset password	1 to 9999	1001	
		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 SELMET utility or MODBUS.

Fixed tariff will not be reset in any of the case.

Configuration mode password

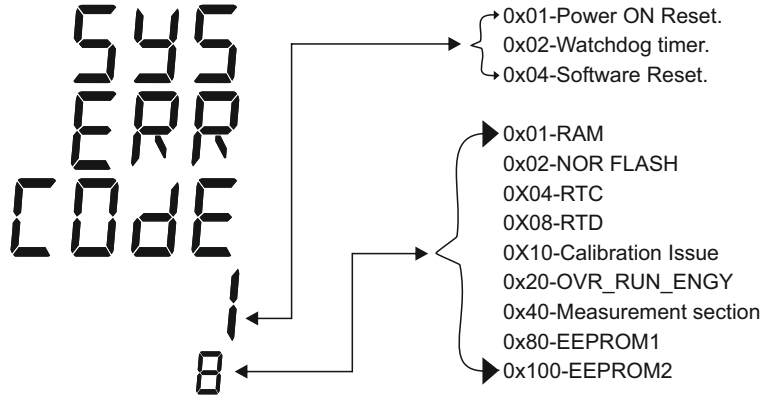
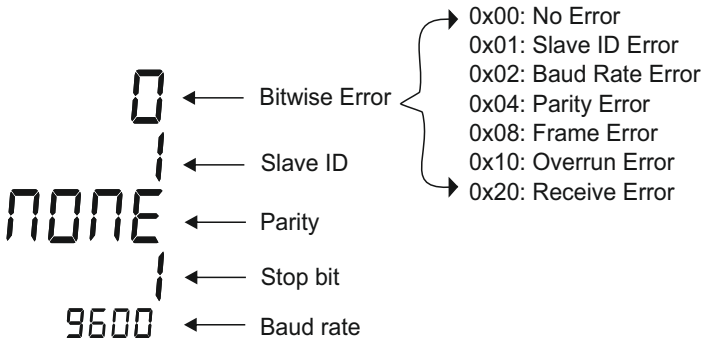
For setting the configuration mode parameters user will be prompted for the password. If correct password is entered, user will be able to access the all programming parameters.

Description	Range	
Configuration mode	0000-9998	Default: 1000
Communication	0000-9999	Default: 1000
Reset	0001-9999	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	Product name	Display the meter name
3	Serial number	Displays the meter serial number, for example 50220001
4	Hardware version	Displays the meter hardware version number
5	Software version	Displays the meter software version number
6	Boot loader version	Displays the meter boot loader version number

7	System error code	Displays the system error codes of the meter and are mentioned in hex code.  **Note:** If more than one error occur, then the display will show summation of those errors.
8	ON hour	Indicates the period for which the power meter's auxiliary supply is ON, regardless of the voltage and current inputs
9	Run hour	Indicates the period when the current is present
10	Import run hours - mains	Indicates the period the load has been delivered. This counter accumulates as long as the mains load is ON
11	Export run hours - mains	Indicates the period the load has been received. This counter accumulates as long as the mains load is ON
12	Import run hours - DG	Indicates the period the load has been delivered. This counter accumulates as long as the generator load is ON
13	Export run hours - DG	Indicates the period the load has been received. This counter accumulates as long as the generator load is ON
14	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 increse
15	Auxilary interruption	Indicates number of times meter was turned OFF & ON
16	Communication error	
17	External IO	Indicates type of IO card connected to the meter. 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	V_{L-N} phase voltage per phase and 3 phase average		V_1, V_2, V_3, V_{LNAVG}
	V_{L-L} line voltage per phase and 3 phase average		V_{12},V_{23},$V_{31,}$ $V_{LL\,AVG}$
	Current per phase and 3 phase average		I_1, I_2, I_3, I_{AVG}
	Calculated neutral current		I_N
	Unbalanced voltage*		V_1, V_2, V_3, V_{12}, V_{23}, V_{31}, V_{LNAVG}, $V_{LLAVG,}$ $V_{LNWORST}$, $V_{LLWORST}$
	Unbalanced current*		I_1, I_2, I_3, I_{AVG}, I_{WORST}
	Worst current		I_{WORST}
	Active power		kW_1, kW_2, kW_3, kW_{TOTAL}
	Reactive power		$kVAr_1$, $kVAr_2$, $kVAr_3$, $kVAr_{TOTAL}$
	Apparent power		kVA_1, kVA_2, kVA_3, kVA_{TOTAL}
	Phase angle		Φ_1, Φ_2, Φ_3
	True power factor-per phase and 3 phase average		PF_1, PF_2, PF_3, PF_{AVG}
	Displacement power factor - per phase and 3 phase average*		PF_1, PF_2, PF_3, PF_{AVG}
	Distortion power factor - per phase and 3 phase average*		PF_1, PF_2, PF_3, PF_{AVG}
	Frequency		Hz
	THD VL-N %		V_1, V_2, V_3, V_{LNAVG}
	THD VL-L %		V_{12}, V_{23}, V_{31}, V_{LLAVG}
	THD current %		I_1, I_2, I_3, I_N, I_{AVG}
	thd VL-N%		V_1, V_2, V_3, V_{LNAVG}
	thd VL-L%		V_{12}, V_{23}, V_{31}, V_{LLAVG}
	thd current		I_1, I_2, I_3, I_{AVG}
Min and Max values with time stamping*	Average line-neutral voltage		$V_{LNMIN,}$ V_{LNMAX}
	Average line-line voltage		V_{LLMAX}, V_{LLMIN}
	Current		I_{MIN}, I_{MAX}
	Neutral current*		I_{NMAX}, I_{NMIN}
	PF*		PF_{1MIN}, PF_{1MAX} PF_{2MIN}, PF_{2MAX} PF_{3MIN}, PF_{3MAX}
	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 Present demand Predictive demand Peak demand
		Min (kW, kVAr)	
	Current demand (I_1,I_2,I_3,I_{AVG})		Last demand Present demand Predictive demand Peak demand

Energy (mains)	Active energy Apparent energy Reactive energy (4 quadrant based VARh*)	Accumulated energy Import - per phase and total Export - per phase and total Total net (Import + Export) Total net (Import - Export)*
		Last cleared energy* Import - per phase and total Export - per phase and total Total net (Import + Export) Total net (Import - Export)
Energy (DG)[$]	Active energy Apparent energy Reactive energy	Accumulated energy Import - Per phase and total Export - Per phase and total Total net (Import + Export) Total net (Import - Export)*
		Last cleared energy* Import - per phase and total Export - per phase and total Total net (Import + Export) Total net (Import - Export)
RTC	Date and Time	DD:MM:YY 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 phase for voltage unbalance and current unbalance

Harmonics overview

Harmonic measurement shows how voltage and current in each phase differ from the main (fundamental) frequency. The meter measures the magnitude and phase angle of both the fundamental and higher-order harmonics. It helps identify the presence of non-linear loads that may affect system performance. Harmonics can cause extra current in the neutral line and lead to overheating or damage in equipment like motors. The meter calculates harmonics for line-to-line or line-to-neutral voltages depending on the system setup. Monitoring harmonics ensures that power quality meets required standards. Unwanted harmonics can be reduced using power conditioners or harmonic filters, improving system reliability and protecting connected devices.

Note: Viewing harmonics:-Phase wise THD% for voltage LL, LN & Current can be observed on the meter.
-Individual harmonics upto 40 can be seen on MODBUS address.

MODBUS Addresses for Harmonics:

Parameters	THD	thd	Individual harmonic address
Voltage V1N	31560	31590	32180 – 32256
Voltage V2N	31562	31592	32306 - 32382
Voltage V3N	31564	31594	32432 – 32508
Average Voltage L-N	31568	31598	-
Voltage V12	31570	31600	32558 – 32634
Voltage V23	31572	31602	32684 – 32760
Voltage V31	31574	31604	32810 – 32886
Average Voltage L-L	31576	31606	-
Current I1	31578	31608	32936 – 33012
Current I2	31580	31610	33062 – 33138
Current I3	31582	31612	33188 – 33264
Neutral Current	31584	31614	-
Average Current	31588	31618	-

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. 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.

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:

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

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.

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 two following equations to calculate TDD:

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

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

Note: User can read value at MODBUS address: 31620

2. $TDD = (\sqrt{(HC_{IA} \times I_A)^2 + (HC_{IB} \times I_B)^2 + (HC_{IC} \times I_C)^2}) / (I_{P-P}) \times 100\%$

Where I_{P-P} is equal to peak current for TDD.

Note: User needs to write value of I_{P-P} at MODBUS address: 40117

User can read value at MODBUS address: 31712

Crest factor

The crest factor is an important parameter in assessing the quality of an input signal. A higher crest factor typically indicates greater signal distortion, reflecting a larger difference between peak and average signal levels.

$$\text{Crest factor} = \frac{\text{Peak value}}{\text{RMS value}}$$

Note: Crest factor is calculated for voltage L-N, voltage L-L & current.

Example: For sinusoidal wave
Peak value = 8.2A
RMS = 5.8A
Crest factor = 1.41A

K factor

The K-factor quantifies the impact of harmonic currents on transformer heating. It is used to evaluate a transformer's ability to handle non-linear loads without excessive temperature rise.

K factor = $\sum(Ih)^2(h)^2$

where Ih = RMS current at harmonics h

h = Harmonic order i.e. 3^{rd}, 5^{th},....

K factor rating

It is used to define the transformers abiling to define the additional heating generated by harmonic current . It is ratio between the additional losses due to harmonics & the eddy loses at 60Hz

CO_2 emission

The carbon dioxide (Co_2) emissions associated with the operation of this equipment are directly related to its energy consumption.

CO_2 Emissions (kg) = Energy Consumption (kWh) × Emission Factor (kg CO_2/kWh)

Note: CO_2 emission factor value is 0.223

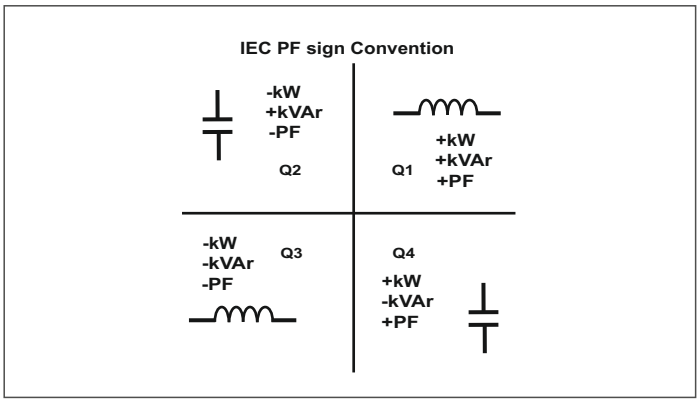
Min/Max values

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 unbalance voltage and current, neutral current & power factor's Min/Max value can only be accessed via communication.

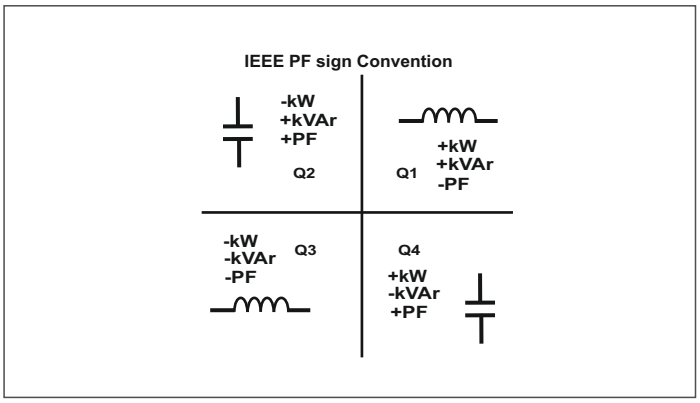
Power factor & sign convention

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

- True power factor is the ratio of real power to apparent considering all frequencies including harmonics. It is more comprehensive measure of overall system performance, as it accounts for the impact of harmonics on power delivery.

Displacement PF

- Displacement power factor only considers the fundamental frequency of voltage and current, ignoring the harmonic distortion. Displacement power factor can be defined as the cosine of the angle between the current and voltage.

Distortion factor

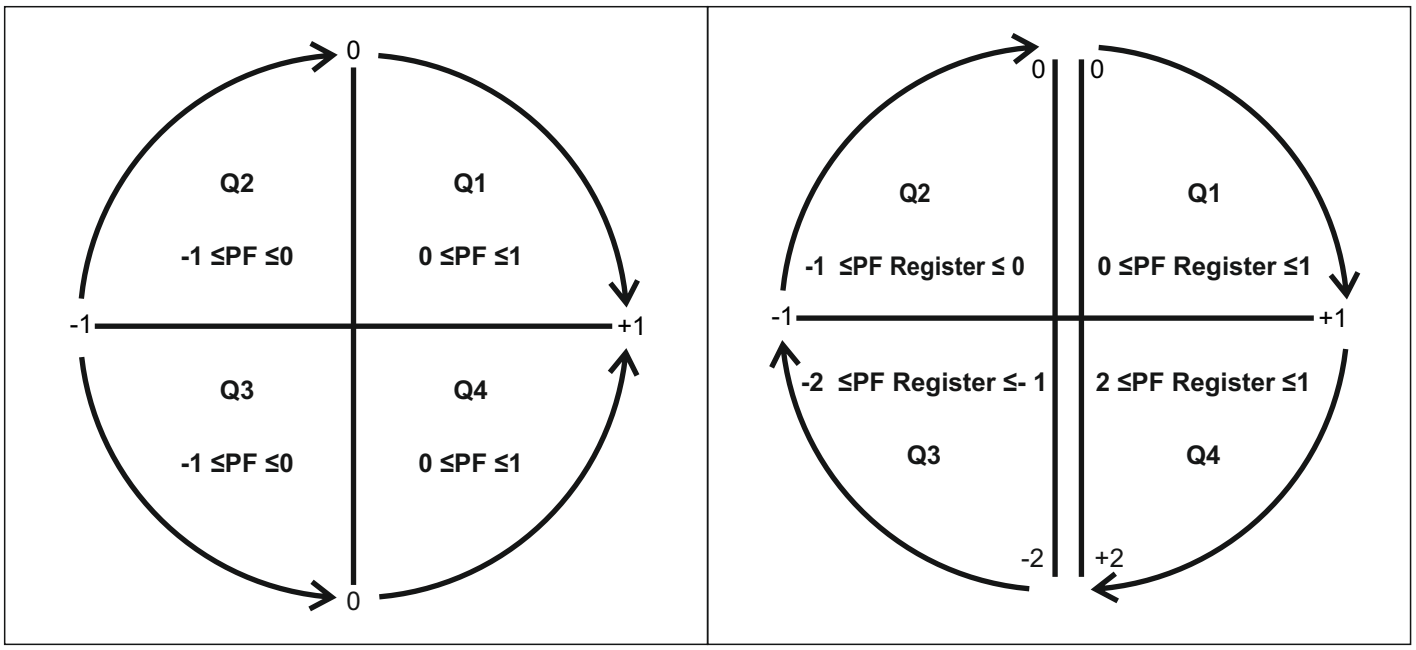
- DF is related to Total Harmonic Distortion (THD), which measures the harmonic content compared to the fundamental frequency.

  $DF = \sqrt{1/(1 + THD^2)}$.

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	-1 to 0	PF Value = PF register value
Quadrant 3	0 to -1	-2 to -1	PF Value = (-2) - 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.

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.

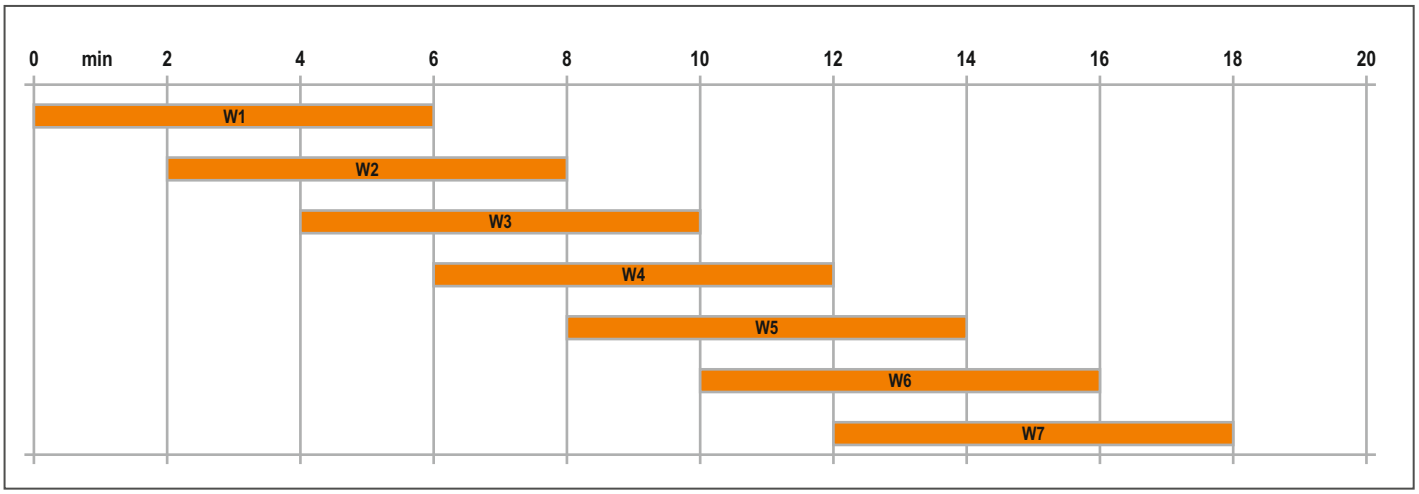
The meter provides last, present, predicted, and peak demand values and a time stamp when the peak demand occurred.

- **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:

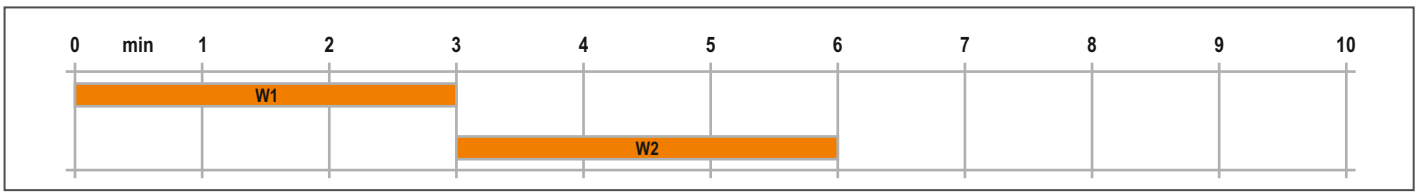
Present and peak demand updates at the end of each sub-interval. Last demand lags one sub-interval. If demand duration selected is 3 and demand length selected is 2, then demand is updated at the end of 2 minutes. Here interval is of 6 minutes and update time is 2 minutes.



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.

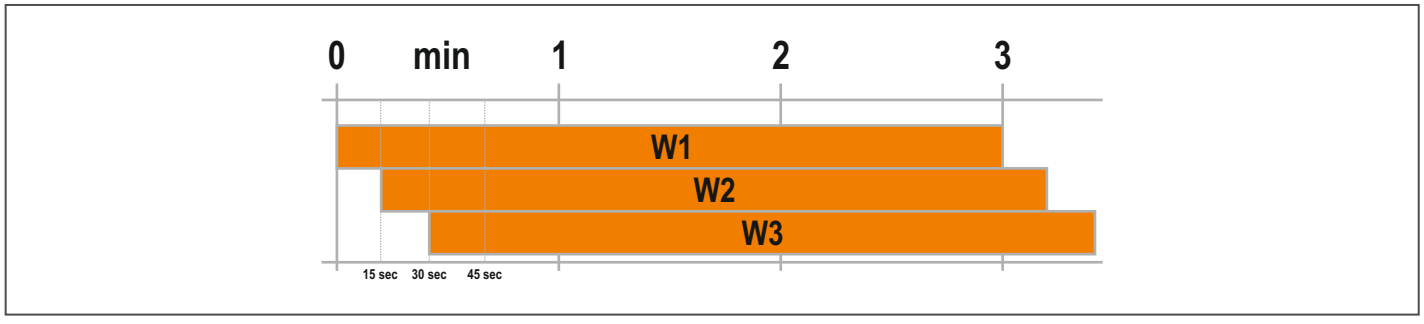
For example: If Duration selected is 3 minutes, present demand updates at end of 1 minute, while peak and last demand updates at end of 3 minutes.



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.

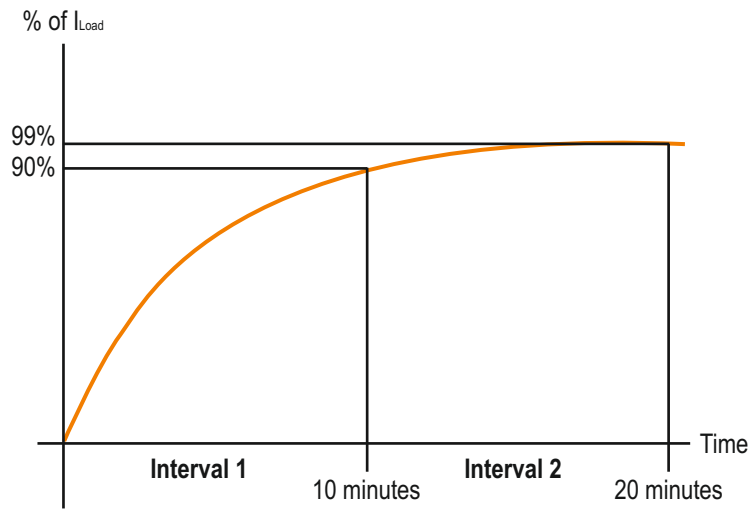
For example: If Duration selected is 3 minutes, present and peak demand updates at every 15 seconds, while last demand lags one sub-interval.



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.

For example: the interval is set to 10 minutes. The interval is a window of time that moves across the timeline.



Energy Roll-over

When any energy value exceeds the maximum value 99999999.9 GWh, GVArh, GVAh, then that particular energy rolls over and stores the count at MODBUS address and starts accumulating fresh from 0. To response in increase in energy, the energy rollover automatically on display from Wh to kWh then to MWh and kMWh (GWh) Energy unit symbol will change to k/M/kM depending on the value.

Case	Displayed energy	Displayed energy unit	Energy incremented value	Updated displayed energy	Updated displayed energy unit
1	999999.999	kWh	Increment by 0.001kWh	1000000.00	kWh
	9999999.99	kWh	Increment by 0.01kWh	10000000.0	kWh
	99999999.9	kWh	Increment by 0.1kWh	100000.000	MWh
2	999999.999	MWh	Increment by 0.001MWh	1000000.00	MWh
	9999999.99	MWh	Increment by 0.01MWh	10000000.0	Mwh
	99999999.9	MWh	Increment by 0.1MWh	100000.000	kMWh
3	999999.999	kMWh	Increment by 0.001kMWh	1000000.00	kMWh
	9999999.99	kMWh	Increment by 0.01kMWh	10000000.0	kMWh
	99999999.9	kMWh	Increment by 0.1kMWh	000000.001	kWh

Note: In Case 3, after increment of 0.1 kMWh in 99999999.9 the Rollover happens and 1 gets stored in Rollover counter.

Energy pulsing calculation

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

Energy pulsing at	Max. No of Pulses / Sec
LED output	36
Pulse output	18

Configurable pulse width: 1 to 9999999 (per k_h)

Note: 1. Pulse duration is fixed for LED output is 25ms and for POP output is 50ms
2. The meter's energy pulsing LED and pulse outputs are capable of energy pulsing within specific limits.
3. POP/LED count is depend upon applied input, CT*PT ratio & pulse width.

Calculation to allow the energy pulsing at POP output

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

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

Example for POP output(Energy selected is kWh):

Parameter	Value	Parameter	Value
Input voltage	240	Phase angle	60
Input current	5	CT Primary	100
PT Primary	100	CT Secondary	5
PT Secondary	100	CT Ratio	20
PT Ratio	1	PT x CT Ratio	20

$$\text{Total Power} = \frac{3 \times 240 \times 5 \times \cos(60°) \times 20}{1000} = 36\text{kW}$$

Maximum number of pulses that can be configured so that the POP will be incremented
= (18*3600) / Total Power (in kW)
= 1800
where,
Maximum number pulses per second =18
Hour to second conversion = 3600

POP selection = Import kWh
Pulse width setting in configuration = 100 (means 100 pulses per kWh)
As POP pulse width is less than maximum number of pulses, LED pulsing will start incrementing as per observed energy.

Example energy = 10kWh
Expected POP = POP pulse width * Energy
= 100*10
= 1000

Calculation to allow the energy pulsing at LED output

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

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

Example for LED output(Energy selected is kWh):

Parameter	Value	Parameter	Value
Input Voltage	240	Phase Angle	60
Input Current	5	CT Primary	100
PT Primary	100	CT Secondary	5
PT Secondary	100	CT Ratio	20
PT Ratio	1	PT x CT Ratio	20

Power Factor = cos (60°)

Total Power = $\frac{3 \times 240 \times 5 \times \cos(60°) \times 20}{1000}$ = 36kW

Maximum number of pulses that can be configured so that the LED will be incremented
= (36*3600) / Total Power (in kW)
= 3600
where,
Maximum number pulses per second = 36
Hour to second conversion = 3600

LED selection = Import kWh
LED width setting in configuration = 3600 (means 3600 pulses per kWh)
As LED pulse width is less than maximum number of pulses, LED pulsing will start incrementing as per observed energy.

Example energy = 20 kWh
Expected LED = LED Pulse width*Energy
= 3600*20
= 72000

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

Table 1

Sr No.	Configured POP/LED pulse width	Energy in k_h	POP/LED count per(k_h)
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

Terminologies

RPM:

Meter provides the measurement of rotational speed of motor usually displays value in terms of RPM.
Speed, a synchronous motor will run can be determined by the electrical service through communication or from the meter front. multifunction meters can be used to measure and display RPM along with other electrical parameters, making them versatile instruments for monitoring various aspects of electrical systems

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 - total 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 - total 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 - total 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 - total 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. The load run hour only increments if the load current is greater then the minimum suppression 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.

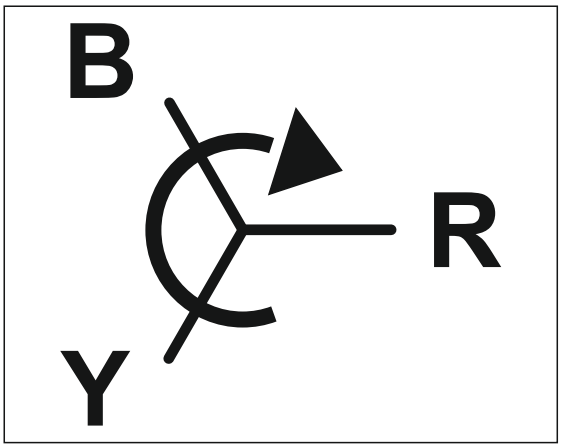
Auxiliary interrupts:

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.

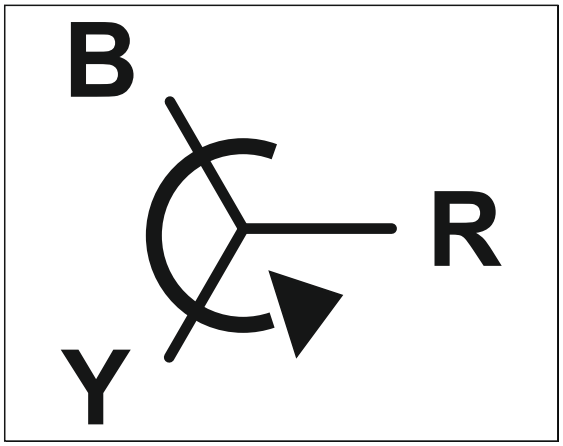
Voltage sequence detection

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. It 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

The meter is equipped with both serial and ethernet communication with MODBUS TCP and MODBUS RTU protocols.

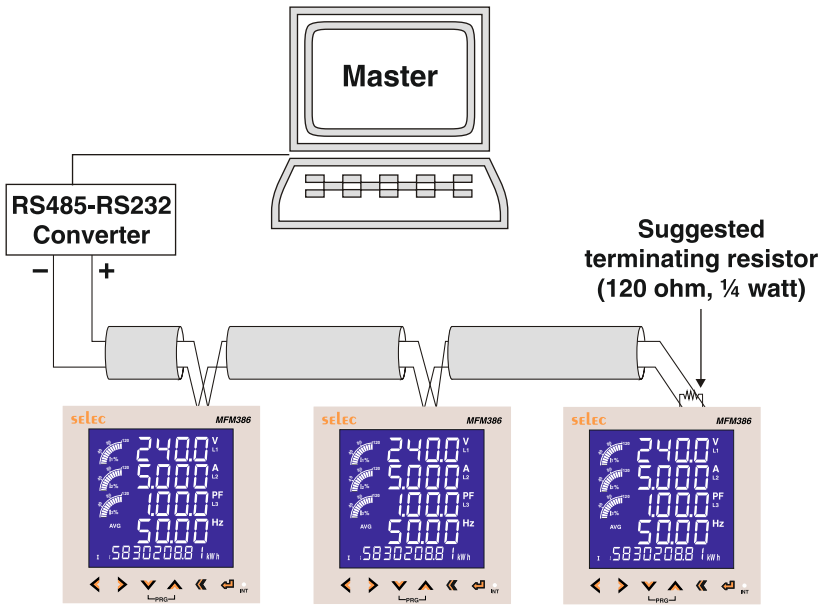
Serial communication (RS485)

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 RS485 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 31

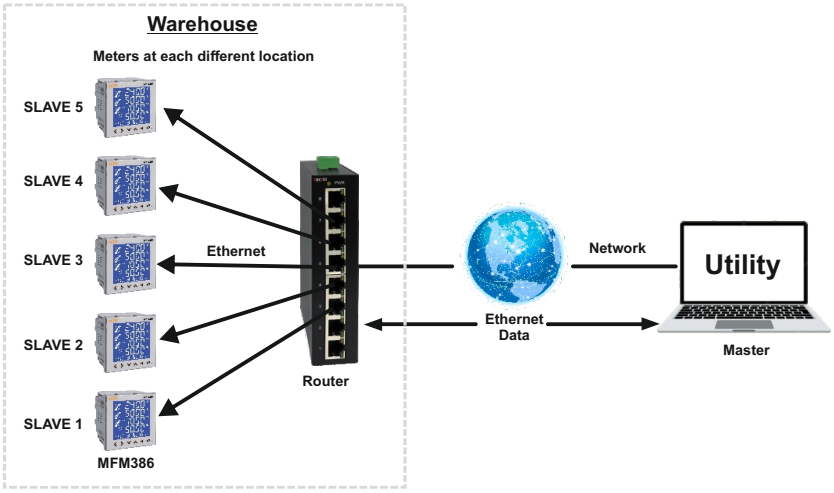
Ethernet

Meter has a ethernet communication port which uses MODBUS TCP protocol and MODBUS RTU over TCP to communicate at data speed up to 100Mbps.

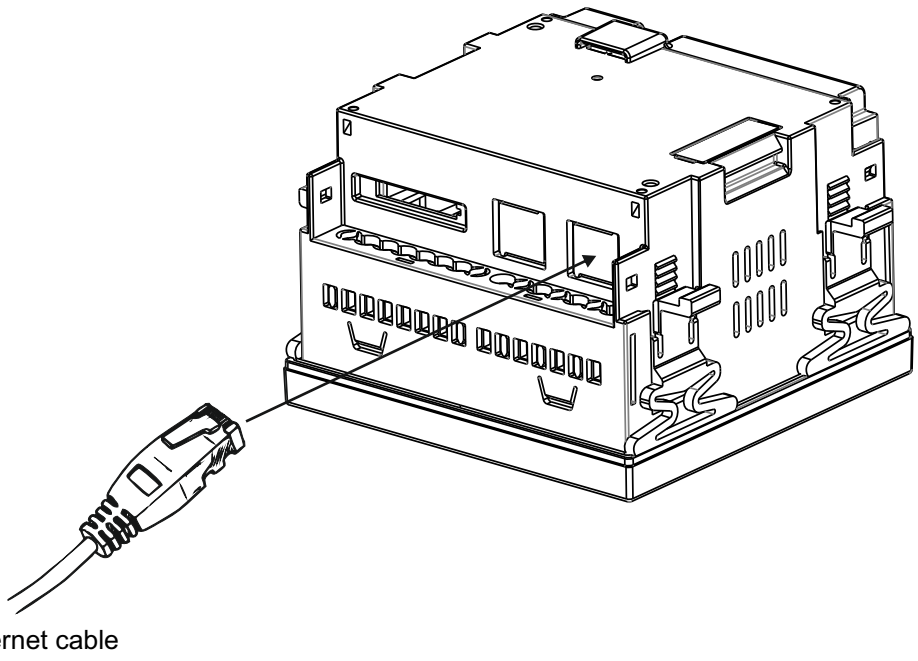
CAT 5 cable to be used for the connection of meter's ethernet port.

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.

***Note:** It is advisable to use Switch/Router if the cable length is greater 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 RTU over TCP, 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	-

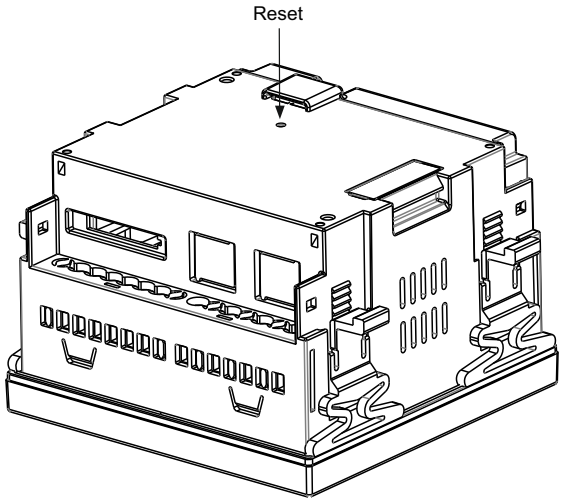
LED indication & Reset key:

Indicator	Function	Description
Green LED	Power on	Converter has power
Orange LED	Network link	ON when network is connected
Reset switch	Factory reset	Reset switch for factory reset of ethernet

Device settings

Network setting: User-configurable
Serial setting: 115200,8,N,1
Mode setting: Mode Type: Transparent
TCP Mode: TCP Server
Protocol: User-configurable
-MODBUS TCP (Master Utility should support MODBUS TCP Protocol.)
-MODBUS RTU (Master Utility should support MODBUS RTU over TCP Protocol.)

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 6 seconds



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

***Note:** You can also use our Selec Finder software.

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

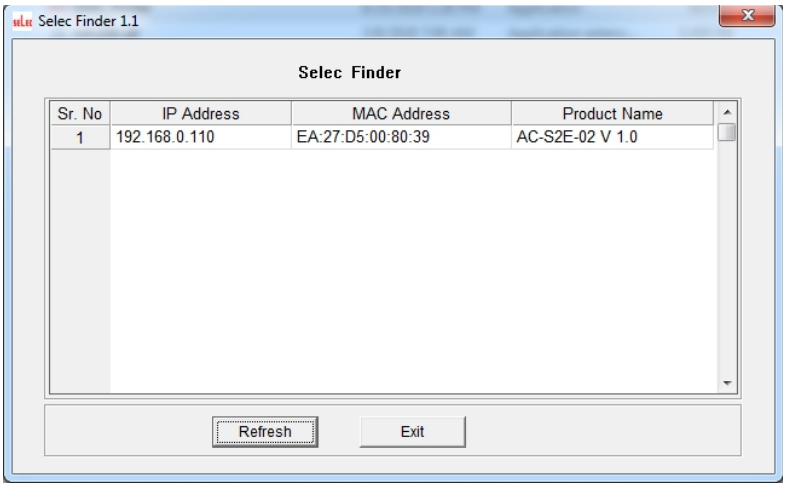
Configuring the device:

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

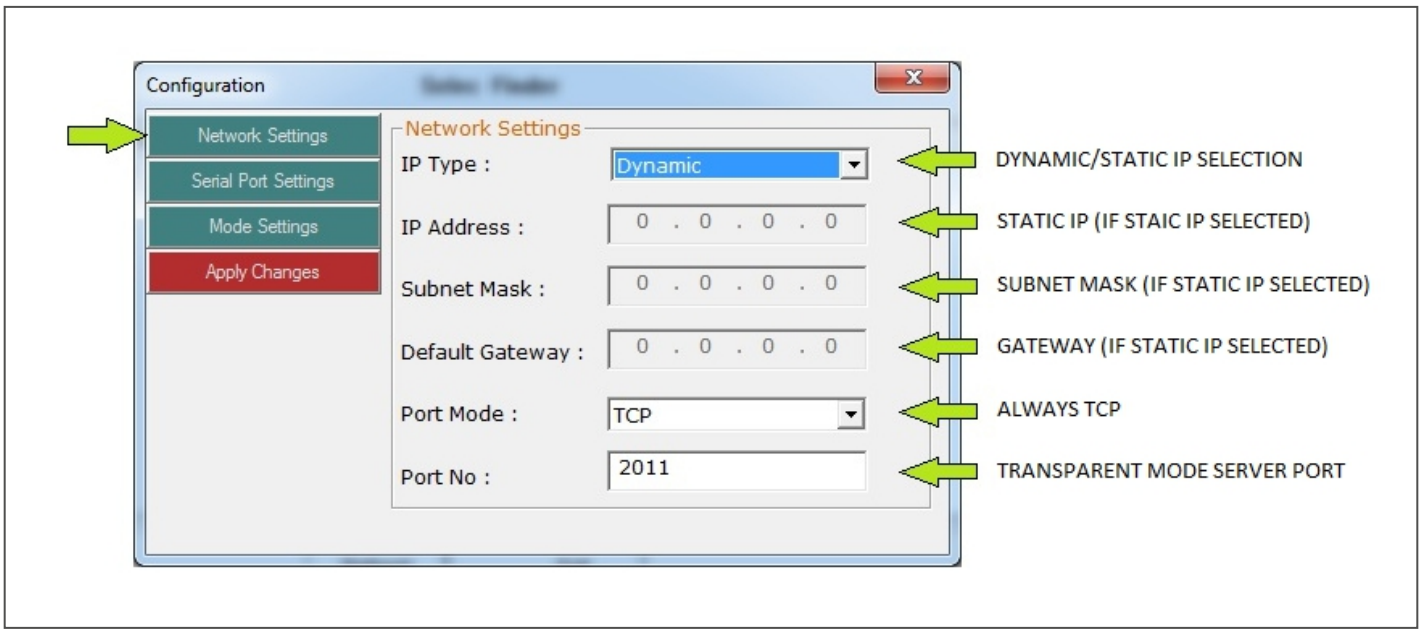
The Selec Finder utility is used to find out and configure selec ethernet devices on the network. The utility will list all the Selec devices on the ethernet network and the information will contain IP address, MAC Address and Device description string. This utility can be further used to configure various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

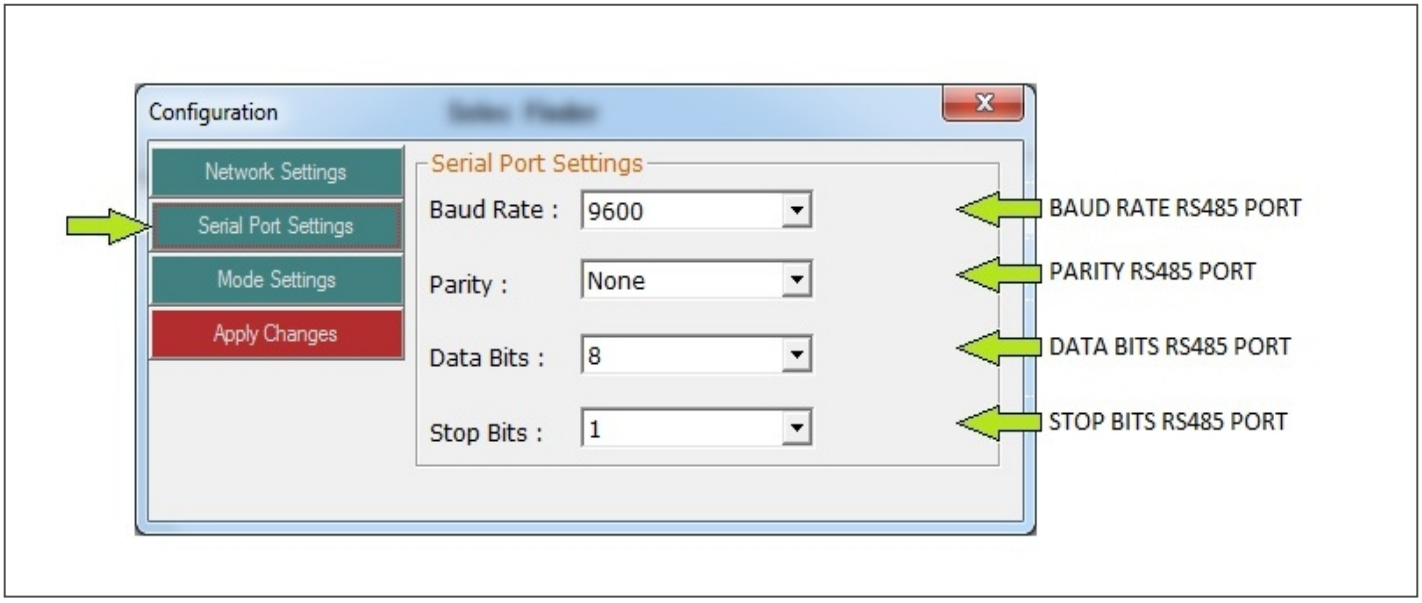
- **Step 1:** Open the Selec Finder utility, similar dialog box will appear.



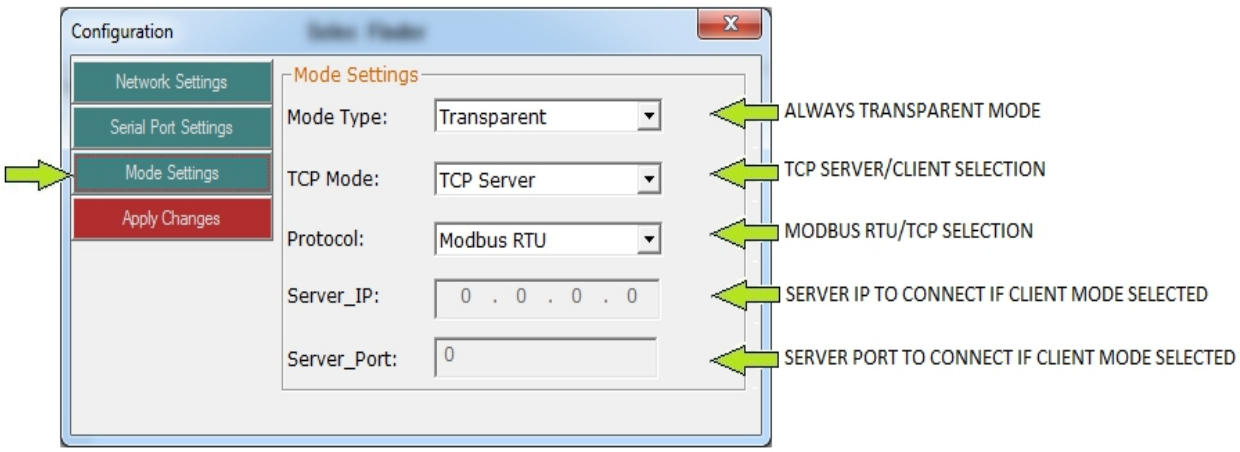
As shown above the screen display the Selec devices in the network using IP ADDRESS, MAC ADDRESS and PRODUCT NAME. The device to be configured should be seen in this list. If not then you can refreshing the screen by pressing the refresh button.

• **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:** MFM386 only supports 115200 baud rate.



• **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.

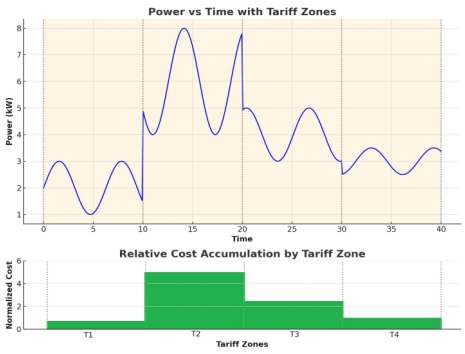


In case of error click ok on error message window and restart the procedure from step 1.

Multi - Tariff

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

The meter supports the configuration of up to four distinct tariff containers, each capable of storing accumulated energy data independently. Each tariff can be assigned up to four configurable time slots, allowing for flexible time-of-use billing and energy monitoring.



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 use mode
- Input mode
- Fixed 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 tariff. The selected tariff stores energy until different tariff MODBUS command is sent. The user can view stored energy values from MODBUS address provided or through SELMET utility.

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
*Note: These all configuration is based on year dependency.

Date & Time format table:

Parameter	Values	Description
Year	24-90	The calendar year
Month	1 to 12	The calendar month, where 1 = January, 2 = February, 3 = March, 4 = April, 5 = May, 6 = June, 7 = July, 8 = August, 9 = September, 10 = October, 11 = November, 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

Conditions for Tariff configuration:

Tariffs cannot overlap, each tariff must have unique time period

Time Of Use (TOU) 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

Explanation for creating a tariff:

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

Start time can only be earlier than end time for tariffs that are applied every day. You cannot create a tariff that starts at 16:00 and ends at 8:00.

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.

Tariff configurations example(Year dependency):

To calculate energy usage for the period from 1st April to 30th June, it is important to consider that electricity rates vary depending on the time of day. This pricing model is known as Time of Use (TOU) Tariff.
Under this model, different time blocks are assigned specific tariff rates. For example:
Tariff 1 is charged at rate R1; Tariff 2 is charged at rate R2
Tariff 3 is charged at rate R3; Tariff 4 is charged at rate R4
These rates are applied based on the time intervals defined in the tariff configuration. A sample tariff configuration table may be structured as follows:

		Tariff			
		1	2	3	4
Timeslot 1	Type	Everyday	Everyday	Everyday	Everyday
	Start date	01/04/2024	01/04/2024	01/04/2024	01/04/2024
	End date	30/06/2024	30/06/2024	30/06/2024	30/06/2024
	Start time	00:00:00	06:01:00	09:01:00	21:01:00
	End time	06:00:00	09:00:00	18:00:00	23:59:59
Timeslot 2	Type		Everyday		
	Start date		01/04/2024		
	End date		30/06/2024		
	Start time		18:01:00		
	End time		21:00:00		
Timeslot 3	Type				
	Start date				
	End date				
	Start time				
	End time				
Timeslot 4	Type				
	Start date				
	End date				
	Start time				
	End time				

As seen in the above table the

Tariff 1 stores the everyday energy of period starting from 1st April to 30th June, from 00:00:00 to 06:00:00.

Tariff 2 stores the everyday energy of period starting from 1st April to 30th June, from 06:01:00 to 09:00:00 as well as 18:01:00 to 21:00:00.

Tariff 3 stores the everyday energy of period starting from 1st April to 30th June, from 09:01:00 to 18:00:00.

Tariff 4 stores the everyday energy of period starting from 1st April to 30th June, from 21:01:00 to 23:59:59.

Concept of year dependency/ independency:

Below table shows energy consumption(k_h) for explained time period in different Tariff.

Time period	Tariff 1	Tariff 2	Tariff 3	Tariff 4
01/04/2024 to 30/06/2024	100	150	200	250
01/04/2025 to 30/06/2025	150	200	150	200

if energy consumption data recorded on 30th June 2025, below data will be observed:

If year independency:

Parameter	Tariff 1	Tariff 2	Tariff 3	Tariff 4
Energy consumption	250	350	350	450

If year dependency:

Parameter	Tariff 1	Tariff 2	Tariff 3	Tariff 4
Energy consumption	100	150	200	250

Note:

The tariff will store energy consumption data only for the specified period, i.e., 1st April to 30th June 2024, if configured as year-dependent. However, if the tariff is set as year-independent, it will continue to record energy consumption automatically for the same period in successive years.

If year-wise energy consumption data is needed, it is recommended to configure the tariff as year-dependent.

If the total cumulative energy consumption over multiple years is needed for a specific period, configuring the tariff as year-independent is preferable.

Input mode overview

In Input type tariff there are 3 different modes which takes no. of digital input as 2, 3 or 4. In input mode, the energy is stored in the specified tariff based on the respective configured DI of the meter.

***Note:**

- For Input mode tariff only 2 external DI can be used.
- For Tariff selection- Both external DI must be configured to Taiff mode.
- The DI are used as binary counters to identify tariff, where ON = 1 and OFF = 0.

Tariff configurations with different input modes:

When mode selected is 2:

DI1 Status	DI2 Status	Stored in
0	0	No Tariff
0	1	Tariff 1
1	0	Tariff 2

When mode selected is 3:

DI1 Status	DI2 Status	Stored in
0	0	No Tariff
0	1	Tariff 1
1	0	Tariff 2
1	1	Tariff 3

When mode selected is 4: When mode selected is 4:

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

Note: When mode selected is 4 at that time, 1 tariff will always record/store the energy.

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 for tariff 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.

Example: Fixed Tariff Configuration and Energy Recording

- **Initial Configuration:**

To enable the Fixed Tariff feature, configure the input registers with the following values:

- Hour: 07
- Minutes: 10
- Seconds: 00
- Day: 10
- Month: 4 (April)

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

Energy consumption scenario

Assume an energy usage increase of 100 kWh occurs over 4 days, ending on 14th April.

Energy data retrieval - 14th April

At this point, Energy is recorded in the following categories:

Time period	Energy value	Description
Current day	25 kWh	Energy accumulated from 00:00 to 23:59 on 14th April
Previous day	25 kWh	Energy accumulated from 00:00 to 23:59 on 13th April
Beginning of previous day	50 kWh	Energy accumulated from 00:00 on 10th April to 23:59 on 12th April
Beginning of current day	75 kWh	Energy accumulated from 00:00 on 10th April to 23:59 on 13th April

Note: For monthly and yearly records, energy accumulation is calculated up to the configured time (07:10:00) on the first day of the next month or next year, following the same logic used for daily totals.

- **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 current day and beginning of current day energy consumption
Previous day	30774-30794	30798-30818	Access previous day and beginning of previous day energy consumption
Current month	30822-30842	30846-30866	Access current month and beginning of current month energy consumption
Previous months (1-12)	30870-31418	30894-31442	Access previous months and beginning of previous months energy consumption
Current year	31446-31466	31470-31490	Access current year and beginning of current year energy consumption
Previous year	31494-31514	31518-31538	Access previous year and beginning of previous year energy consumption

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

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 (Internal)	1*
Standard	28

***Note:** If DI02-RO04 IO card is connected then the total digital alarms will be three.

Unary alarms

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

Available unary alarms:

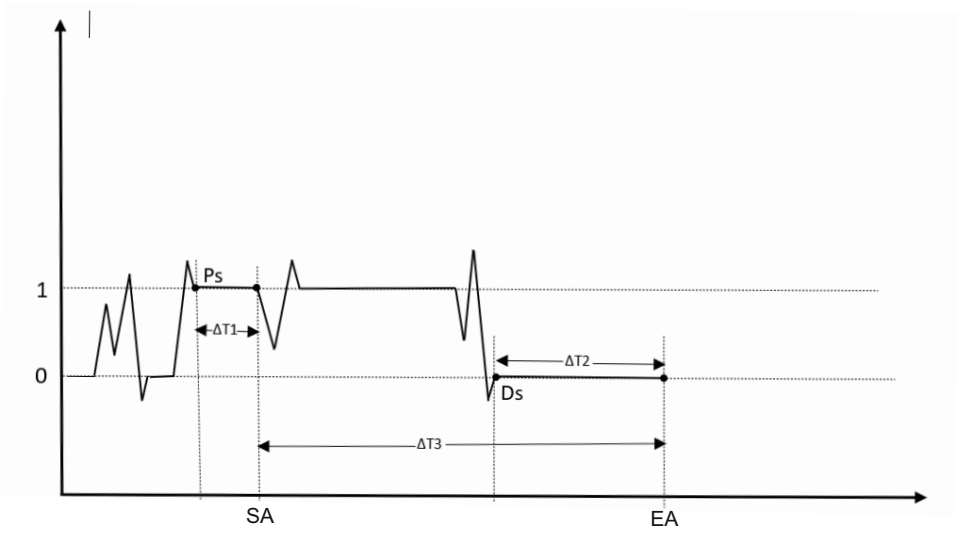
The power meter has four unary alarms:

Alarm label	Description
Meter powerup	Meter powers on after losing control power
Meter reset	Meter resets for any reason
Meter self test mode	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 digital input status. The digital alarms are active when the associated enable input is ON. The pickup and dropout time delays are configured in seconds.

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)

External digital alarm:
It is same as internal digital alarm, but it can only be configured if external IO Card (DI02-RO04) is connected.

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:**

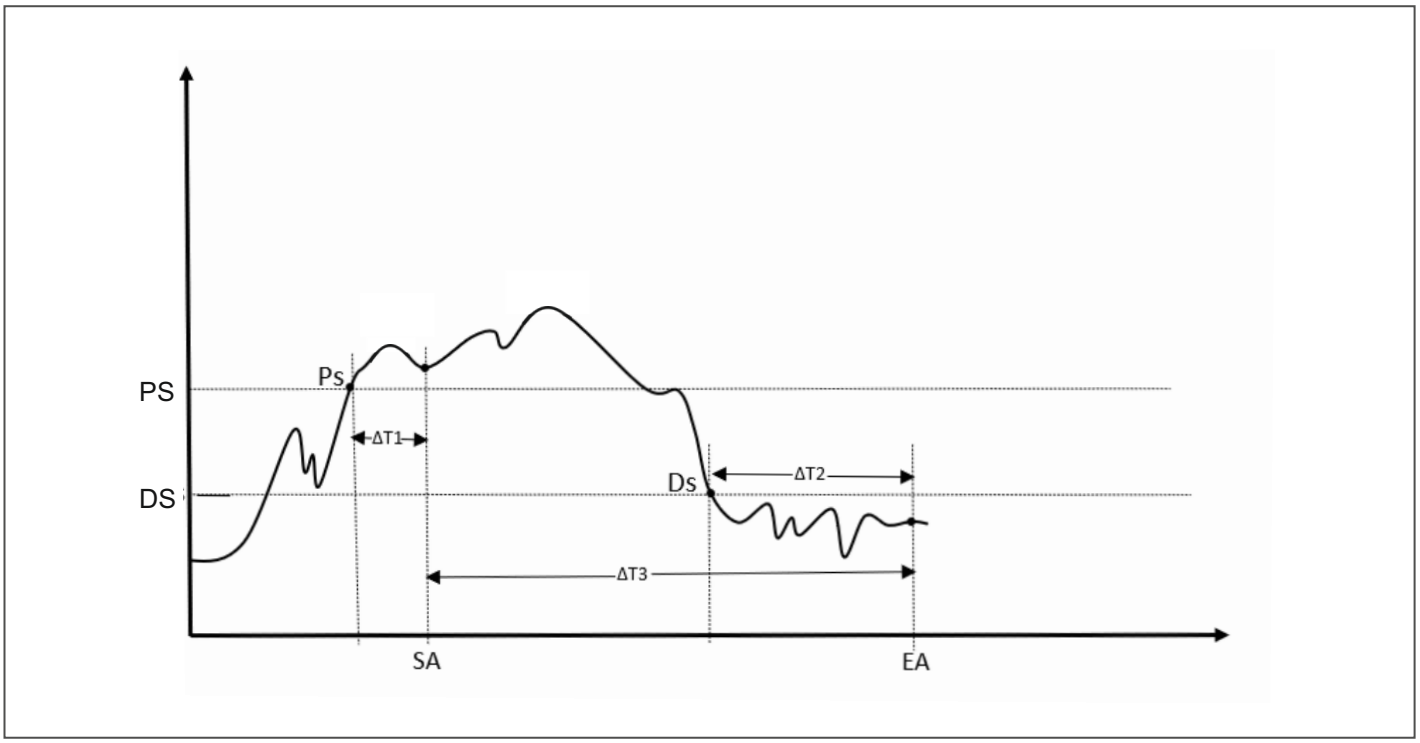
- RO can be configured only through SELMET Utility or communication if External RO is connected and in control mode of RO ALARM is selected
- Current, Voltage, Power, Demand and Frequency related alarms are configurable through meter front panel and configured using SELMET utility or communication

Example of over and under setpoint (standard) alarm operation

The meter is equipped with both over and under setpoint conditions for standard alarms. A setpoint condition is triggered when the monitored signal exceeds or falls below the threshold defined by the pickup setpoint. This condition remains active as long as the signal stays beyond the specified limit for a minimum duration, as determined by the pickup time delay setting.The setpoint condition is considered resolved when the monitored signal crosses back within the defined limit, as specified by the dropout setpoint. For the condition to end, the signal must remain within this limit for at least the duration specified by the 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 there for long enough time 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 records the value at which the alarm is triggered, and these values can be viewed in the alarm history.

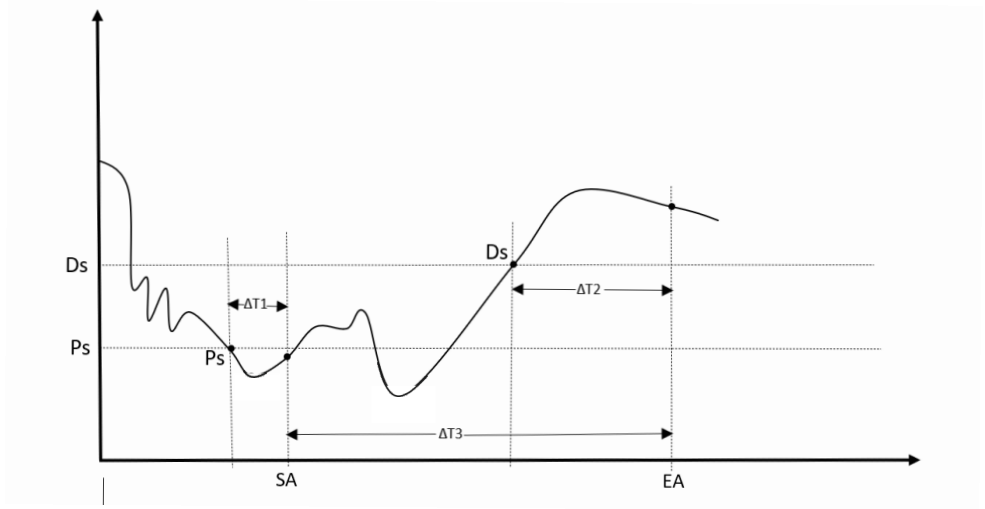


PS	Pickup setpoint (1 = ON)
DS	Dropout setpoint (0 = OFF)
ΔT1	Pickup time delay (in seconds)
SA	Start of alarm condition
ΔT2	Dropout time delay (in seconds)
EA	End of alarm condition
ΔT3	Alarm duration (in seconds)

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 records the value at which the alarm is triggered, and these values can be viewed in the alarm history.



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)

Consideration of CT & PT ratio for Standard alarms

Configuration of Under Voltage(L-N) Standard alarms

Enable	YES
Pick up value	150 V
Pickup delay	3 sec
Drop out value	200 V
Drop out delay	2 sec
Priority	High
DO	None
RO	None

***Note:** While configuring Alarms through SELMET Utility or communication, do not consider CT & PT ratio.

Case 1

Voltage provided	170V
PT Ratio	5
Meter reading without PT Ratio	170V
Meter reading with PT Ratio	850V
Note: The alarm will be not be triggered as the voltage is greater than configured pick-up value.	

Case 2

Voltage provided	100V
PT Ratio	5
Meter reading without PT Ratio	100V
Meter reading with PT Ratio	500V
Note: The alarm will be triggered if the voltage remains below the pickup threshold for a duration equal to or greater than the configured pick-up delay time	

Case 3

Voltage provided	205V
PT Ratio	5
Meter reading without PT Ratio	205V
Meter reading with PT Ratio	1025V
Note: As alarm was triggered in Case2, the alarm will be turned off if the voltage remains above the drop-out threshold for a duration equal to or greater than the configured drop-out delay time.	

Note: The alarm will be stopped if the voltage remains above the drop-out threshold for a duration equal to or greater than the configured drop-out delay time.

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

Alarm number	Alarm name
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

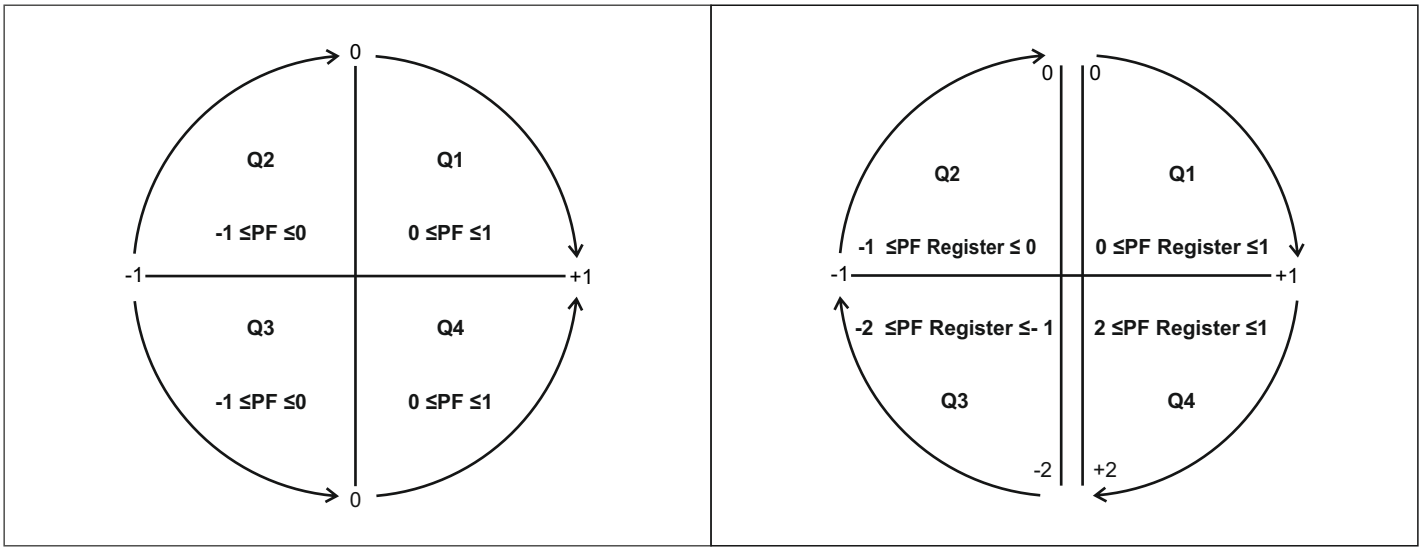
Power factor alarm

An alarm can be configured for either true PF or displacement PF allowing for the monitoring of the circuit's power factor when it exceeds or falls short of the threshold you have established. The true PF or displacement PF 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:

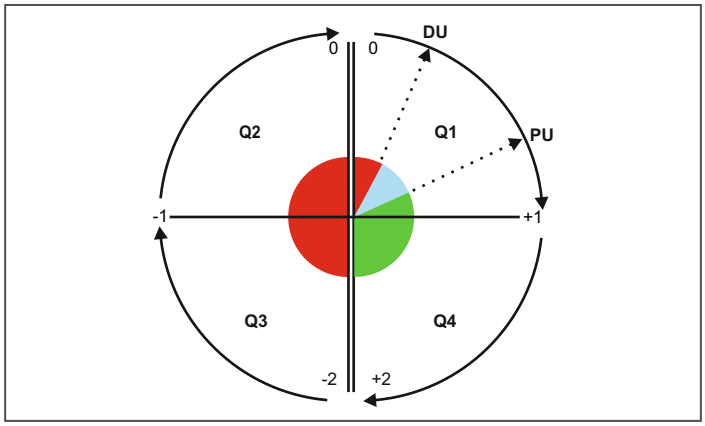


The PF value is calculated from the PF register value using the following formulas:

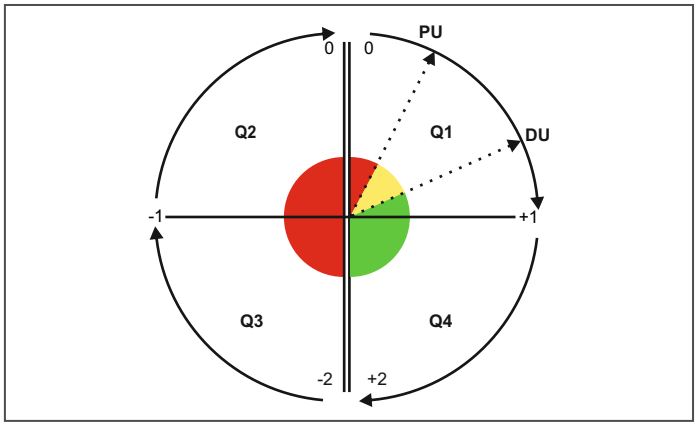
Quadrant	Power factor range	PF register range	PF formula
Quadrant 1	0 to +1	0 to +1	PF Value = PF register value
Quadrant 2	-1 to 0	-1 to 0	PF Value = PF register value
Quadrant 3	0 to -1	-2 to -1	PF Value = (-2) - PF register value
Quadrant 4	+1 to 0	+1 to +2	PF Value = (+2) - PF register value

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

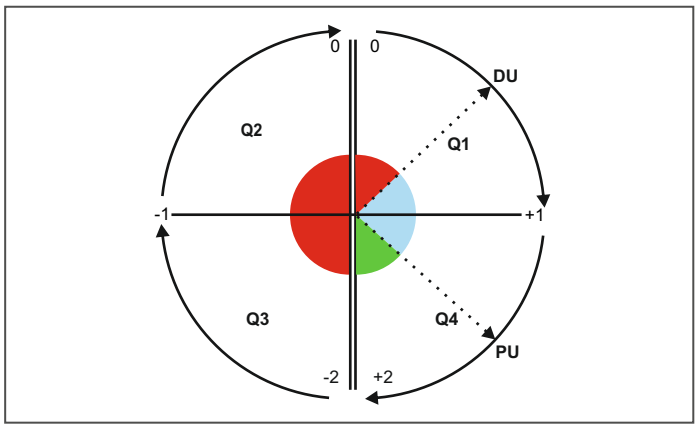
Case 1: When drop out value (DU) and pickup value (PU) are in same quadrant & pickup value is greater than dropout value



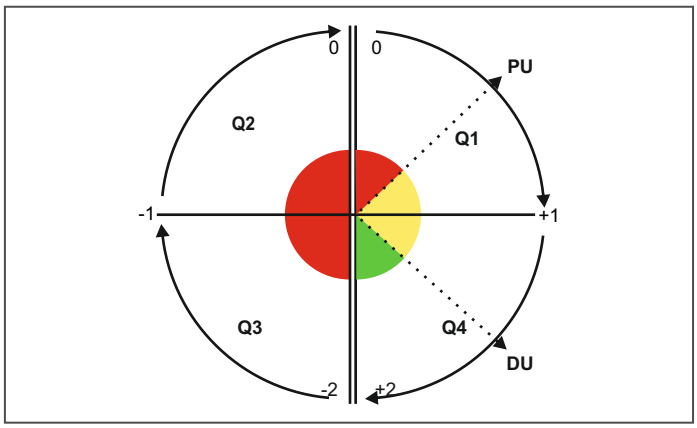
Case 2: When drop out value (DU) and pickup value (PU) are in same quadrant & dropout value is greater than pickup value



Case 3: When drop out value (DU) and pickup value (PU) are in different quadrant & pickup value is greater than dropout value



Case 4: When drop out value (DU) and pickup value (PU) are in different quadrant & dropout value is greater than pickup value



Alarm trigger condition:

- **Power factor alarm:** The alarm will trigger when the power factor (PF) value is less than both the pickup and dropout values. as shown in the above cases
- PF value < Pickup value & PF value < Dropout value

Alarm deactivation condition:

- **Power factor alarm**: 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 & 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 active
- **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
- **Yellow area:** In this area, alarm will trigger only when it has trigger previously and will remain triggered unless it's measured value is greater than Dropout value for duration greater than dropout delay.
- **Blue area:** In this area, alarm will trigger only when it has trigger previously and will remain triggered unless it's measured value is greater than Pickup value for duration greater than pickup delay.

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" text on display	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	None	Recorded in 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) 1 - Yes (On)	This enables or disables the alarm
Priority	0 - None 1 - Low 2 - Medium 3 - High	This sets the alarm priority and Notification options
Digital output selection	0 - None 1 - (Internal) DO1 2 - (Internal) DO2	Select the outputs you want to control when the alarm is triggered
Relay output selection	0 - None 1 - (External) RO1 2 - (External) RO2 3 - (External) RO3 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) 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 ON, before the alarm is triggered.
Dropout_Delay	0 to 999999	This specifies the number of seconds the digital input must be OFF, before the alarm is turned OFF
Priority	0 - None 1 - Low 2 - Medium 3 - High	This sets the alarm priority and notification options
Digital Output Selection	0 - None 1 - (Internal) DO1 2 - (Internal) DO2	Select the outputs you want to control when the alarm is triggered
Relay Output Selection	0 - None 1 - (External) RO1 2 - (External) RO2 3 - (External) RO3 4 - (External) RO4	

Standard alarm setup parameters

Configure the standard alarm setup parameters as required

Parameters	Option or Range	Description
Enable	0 – No (Off) 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 triggered
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

Parameters	Option or range	Description
Priority	0 - None 1 - Low 2 - Medium 3 - High	This sets the alarm priority and notification options
Digital output selection	0 - None 1 - (Internal) DO1 2 - (Internal) DO2	Select the outputs you want to control when the alarm is triggered
Relay output selection	0 - None 1 - (External) RO1 2 - (External) RO2 3 - (External) RO3 4 - (External) RO4	
Pickup PF type	0 - None 1 - Inductive 2 - Capacitive	*Applies to PF (power factor) alarms only. Use this to set the PF value and quadrant to set the pickup setpoint for true / displacement PF alarms
Dropout PF type	0 - None 1 - Inductive 2 - Capacitive	*Applies to PF (power factor) alarms only. Use this to set the PF value and quadrant to set the dropout setpoint for true / displacement PF alarms

Note: LED alarm indicator is available only 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 through SELMET utility or communication.

The alarm list holds upto 40 entries 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

Note: Refer to the MODBUS address from 43000 to 43638 for alarm history data.

- 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 SELMET utility.
- Meter provides 90 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 SELMET 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 90 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	90
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 V1	44051
2	Voltage V2	44052
3	Voltage V3	44053
4	Average voltage LN	44055
5	Voltage V12	44056
6	Voltage V23	44057
7	Voltage V31	44058
8	Average voltage LL	44059
9	Current I1	44060
10	Current I2	44061
11	Current I3	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

Sr no.	Parameters selection	MODBUS addresses
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 PF1	44078
27	True power factor PF2	44079
28	True power factor PF3	44080
29	True power factor avg	44081
30	Frequency	44082
31	Total import active energy kWh (Mains)	44083
32	Total export active energy kWh (Mains)	44084
33	Total net active energy kWh (Mains)	44085
34	Total absolute active energy kWh (Mains)	44086
35	Total import apparent energy kVAh (Mains)	44087
36	Total export apparent energy kVAh (Mains)	44088
37	Total net apparent energy kVAh (Mains)	44089
38	Total absolute apparent energy kVAh (Mains)	44090
39	Total import reactive energy kVArh (Mains)	44091
40	Total export reactive energy kVArh (Mains)	44092
41	Total net reactive energy kVArh (Mains)	44093
42	Total absolute reactive energy kVArh (Mains)	44094
43	Total import active energy kWh (DG)	44095
44	Total export active energy kWh (DG)	44096
45	Total net active energy kWh (DG)	44097
46	Total absolute active energy kWh (DG)	44098
47	Total import apparent energy kVAh (DG)	44099
48	Total export apparent energy kVAh (DG)	44100
49	Total net apparent energy kVAh (DG)	44101
50	Total absolute apparent energy kVAh (DG)	44102
51	Total import reactive energy kVArh (DG)	44103
52	Total export reactive energy kVArh (DG)	44104
53	Total net reactive energy kVArh (DG)	44105
54	Total absolute reactive energy kVArh (DG)	44106
55	Peak Max DMD kW	44107
56	Peak max DMD kVA	44108
57	Peak Max DMD kVAr	44109
58	Peak min DMD kW	44110
59	Peak min DMD kVAr	44111
60	Present max DMD kW	44112
61	Present max DMD kVA	44113
62	Present max DMD kVAr	44114

Sr no.	Parameters selection	MODBUS addresses
63	Present min DMD kW	44115
64	Present min DMD kVAr	44116
65	Predictive max DMD kW	44117
66	Predictive max DMD kVA	44118
67	Predictive max DMD kVAr	44119
68	Predictive min DMD kW	44120
69	Predictive min DMD kVAr	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
79	Predictive current DMD PH2	44131
80	Predictive current DMD PH3	44132
81	Predictive current DMD AVG	44133
82	Peak current DMD PH1	44134
83	Peak current DMD PH2	44135
84	Peak current DMD PH3	44136
85	Peak current DMD AVG	44137
86	DI1	44138
87	DI2	44139
88	DO1	44140
89	DO2	44141
90	External DI1 count	44142
91	External DI2 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

Procedure for Data Logging

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

1. Get record data:
2. Record number: To be read from holding register 44302.
3. Overwrite counter: To be read from holding register 44303.
4. Timestamp: To be read from holding register 44180.
5. Error status: To be read from the holding register 44307.

Values	Error
128	No error
1	CRC error
2	Read error
4	Write error
8	Erase error

***Note:** Data logging occurs in FIFO basis. After the time period elapsed, data stored earlier will be erased first.

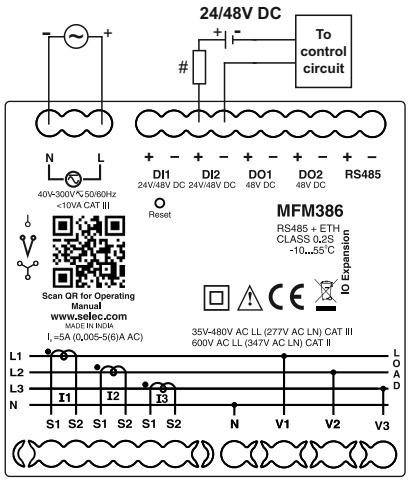
- The meter is equipped with digital inputs, digital outputs and relay outputs.
- The meter has 2 digital inputs and 2 digital output, after wiring the I/O ports they can be configured using communication.

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

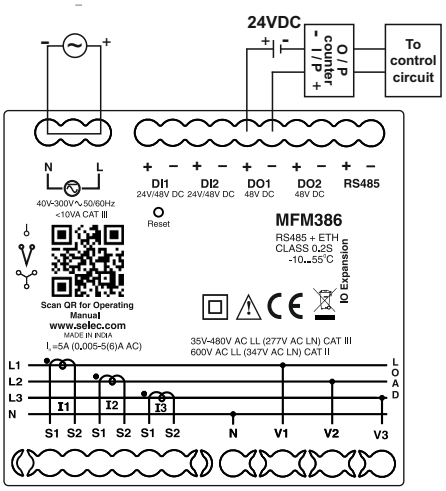
Digital input connection



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 setting for internal IO (2DI & 2DO):

Parameters	Option or Range	Description
DI Control mode	0 – None 1 – Normal 2 – Demand	This field displays how the digital input functions. • **None:** The digital input is not associated with another meter function. Meter does not count or record incoming pulses." • **Normal:** The digital input is not associated with another meter function. Meter counts and records the number of incoming pulses normally. • **Demand:** The digital input is associated with one of the input demand functions. Meter uses the incoming pulse to synchronize its demand period with the external source.
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.
DO Control mode	0 – None 1 – Energy Pulses 2 – External 3 – Demand 4 – Alarm	This field displays how the digital output functions. • **None:** The digital output is not associated with any system. • **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). • **External:** The digital output is controlled remotely either through software or by a PLC using commands sent through communications. • **Demand:** The digital output is associated with one of the demand systems. Meter sends a pulse to the digital output port at the end of every demand interval. • **Alarm:** The digital output is associated with the alarm system. Meter sends a pulse to the digital output port when the alarm is triggered.
DO Behaviour mode	0 – Normal 1 – Timed 2 – Coil hold	• **Normal:** 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. • **Timed:** The digital output remains ON for the period defined by the on time setup register. • **Note:** This mode applies when DO Control mode is set to Demand & Alarm. • **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. **Note:** This mode applies when DO Control Mode is set to demand.
DO Internal command*	0 – Low 1 – High	• **Low:** A low signal on the input de-asserts the digital output as low. • **High:** A high signal, On the other hand, asserts the digital output as high. • **Note:** DO internal command option is selectable when DO control mode type is external.

***Note:** This mode applies when control mode is set to external.
For Internal DI & DO meter shows status (ON/OFF), count (number of times specific DI or DO was turned ON) and timer (time period for which DI or DO was ON).
Below table shows address of each:

Parameter	DI1	DI2	DO1	DO2
Status	34000	34001	34002	34003
Count	34004	34006	34008	34010
Timer	34012	34014	34016	34018

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 communication or SELMET utility.

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.

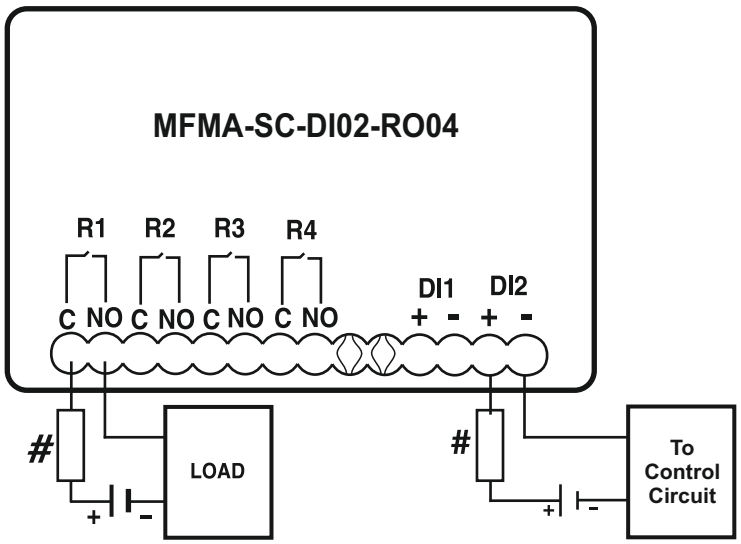
The DI requires external voltage to detect ON/OFF state, if the external voltage appearing on the DI is within the operating range(24 - 48V DC) the meter detects ON state.

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

Relay Rated : 5A@250VAC / 30VDC

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 setting for external IO (2DI & 4RO):

Parameters	Option or Range	Description
DI control mode	0 – None 1 – Normal 3 – Tariff	• This field displays how the digital input functions. • **None:** The digital input is not associated with another meter function. The meter does not count or record incoming pulses." • **Normal:** The digital input is not associated with another meter function. The meter counts and records the number of incoming pulses normally. • **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 1 – Alarm 2 – External	This field displays how the relay output functions. • **None:** The relay output is not associated with any system. • **Alarm:** The relay output is associated with the alarm system. Meter relay output will be set to high, when the alarm is triggered. • **External:** the relay output is controlled remotely either through software or by a PLC using commands sent through communications
RO behaviour mode	0 – Normal 1 – Timed 2 – Coil hold	• **Normal:** 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. • **Timed:** The relay output remains ON for the period defined by the ON time setup register. • **Coil hold:** 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
RO command	0 – Low 1 – High	• **Low:** Low signal deactivate a relay, turning off a device. • **High:** High signal activate a relay, turning on a device. • **Note:** RO command option is selectable when RO control mode type is external.

***Note:**
For External DI & RO meter shows status(ON/OFF) ,count(number of times specific DI or RO was turned ON) and timer (time period for which DI or RO was ON).
Below table shows address of each:

Parameter	External DI	External RO
Status	34020-34027	34028-34031
Count	34032-34046	34048-34052
Timer	34056-34070	34072-34078

LED can be enabled by configuring the meter's LED control mode as either alarm or energy.

- When configured for energy pulsing, the LED emits pulses to allow verification of the meter's energy measurement accuracy.
- When configured for alarms, the LED blinks while the alarm is active.

Configuring the Alarm / Energy pulsing LED

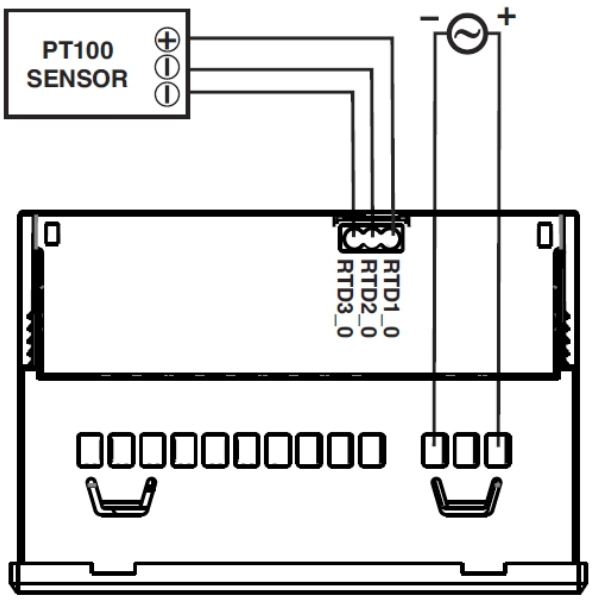
Parameters	Option or range	Description
LED CTRL mode	0 - None 1 - Energy 2 - Alarm	LED is disabled • Energy sets the LED for energy pulsing • Alarm sets the LED for alarm notification
LED energy	0 - None 1 - Import - kWh 2 - Export kWh 3 - Total kWh 4 - Import kVArh 5 - Export kVArh 6 - Total kVArh 7 - Import kVAh 8 - Export kVAh 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

- The meter is equipped with a RTD module internally 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 SELMET Utility 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
- Accuracy: ±0.5% of full scale
- Input isolation from unit main module: NO
- Under range value: <-150 °C
- Over range value: >850 °C

RTD connections



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: Only one meter can be upgraded at a time from same PC.
Separate downloader is a utility 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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