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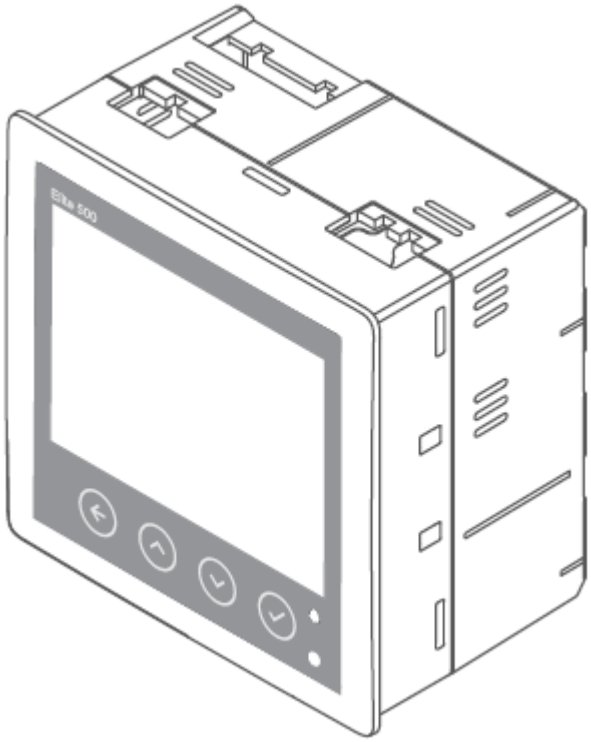
Elite 500

Multi-function panel meter

With advanced communication protocol



Technical reference manual

BGX701-313-R03

Table of Contents

1 Introduction

This manual is intended for understanding the various functions of Elite 500 series of microcontroller based multi-function panel meters and how to use their available features.

The manual covers the various application and features of Elite 500 series of meters, the configuration process both from the meter's Setup Mode (using touch keys) and using the ConfigView software, the various displays and their meanings, installation process and the list of supporting parameters corresponding to each Elite 500 variant.

1.1 Reference documents

For installation details, refer to the Elite 500 quick installation guide.

For configuring certain parameters in the meter with the help of configuration tool, the user may find the ConfigView user manual useful in addition to this manual. ConfigView is an application that can be used for configuring, data reading and maintaining Elite 500 multi-function panel meters.

1.2 Disclaimer

This user manual covers all variants of the Elite 500 multi-function panel meter. Depending on the product offering based on business proposal, some features or functionalities may or may not be available in the supplied version. It is therefore recommended to refer the features or functionalities according to the product proposal.

The display layouts and the screenshots are only for illustration purposes.

2 Precautions and safety practices

- This product must be installed and serviced only by trained personnel. We strongly recommend reading the 'Elite 500 Quick installation guide' thoroughly before installing the product.
- Use appropriate personal protective equipment (PPE) and follow safe electrical practices.
- Elite 500 meters should only be installed indoors by suitably trained persons. This meter is for indoor use only, to use in outdoor (UV exposed environment), a secondary transparent panel should be used.
- Failure to observe precautions can result in serious or even fatal injury and equipment damage.
- Do not exceed the specified voltage and current ratings.
- Check the auxiliary supply voltage and / or polarity before making connection.
- Prior to any work with the product, isolate the voltage inputs and auxiliary power supply; and short-circuit the secondary winding of all current transformers.
- Under no circumstances, the CT connections to the meter should be disconnected while current is flowing in the primary circuit of the external CT. The CT connector is provided with retaining screws to reduce the possibility of accidental disconnection.

  For Rogowski coil (Elite 500 variant):

  - The Rogowski coil supplied with this meter is designed to be used for LV (415 V) applications only. This coil must not be used on bare HV lines voltages as it can result in serious or even fatal injury.
  - Do not stress the Rogowski coil by applying any kind of mechanical force (i.e. twisting, puncturing, excessive pressure, tight bending etc.) which will dramatically degrade the device's accuracy.
- Make sure that there are no loose connections, stray wires or exposed conductors. Make sure that all connectors are correctly seated and firmly in place.
- Do not use solvents or abrasive materials to clean the unit, use only a slightly damp cloth and isolate the unit from the supply before cleaning it.
- An easily reachable switch and circuit breaker must be provided while installing Auxiliary supply. Make sure to mark it as 'Disconnecting device for the equipment'.
- The equipment does not incorporate internal fuse. External fuse of rating 300 V / 0.5 A must be incorporated for safety precautions under fault conditions.

- Impact rating is IK06 and rated impact energy level is 1 Joule.
- Care must be exercised during the installation of Elite 500 meter due to presence of mains voltages. Various points at the rear side operate at hazardous voltages.
- Modules are hot pluggable. However, it is recommended to disconnect the auxiliary power supply and mains supply before fixing or removing external plug-in modules from the rear of the meter.
- Disconnect the supply to the meter and de-energise all the circuits before installation.
- Shielded cable should be used for RS-485 connections. Connect the shield to signal ground (SG) at meter-end only.
- Ensure that the meter auxiliary supply source must always have an isolation from other voltage measurement input. Do not connect the voltage measurement input to the auxiliary supply terminal of the meter.

Observe local safety norms when disposing of the product at the end of their life to ensure that they do not enter the household waste stream.

Danger of Electrocution

Read the instructions carefully before installing and using the product.

The organization is committed to continuous improvement in our products and upgrading the feature set. While we will endeavour to integrate new features seamlessly, there could be instances when the enhancement is not backward compatible. Please check with the company representative for compatibility check before upgrading an existing product.

Damage Preventing Measures:

Before installation, carryout the following checks and note the maximum voltage and current across the input terminals (refer to the marking on the product):

- The voltage of the auxiliary power must be in the range of 48-300 V DC or 85-300 V AC. Ensure that phase-to-phase input power supply is not continuously connected otherwise the meter may get damaged.
- The frequency of the distribution system should be 50/60 Hz ± 5%;
- The measuring voltage range across the voltage-input terminals (V1, V2, V3 and VN) is 20-300 V (L-N) or 35-500 V (L-L).
- The measuring current range on the current-input terminals (I1, I2 and I3) is 10 mA to 6 A (nominal current In 1 A / 5A) for conventional CT variant. For Rogowski coil variant, the measuring current range on the current-input terminals (A1, A2 and A3) is from 5% to 100% of I_{prim}.
- The maximum current overload supported by the meter is 7.5 A for conventional CT variant.

Failure to comply with the above safety measures could cause serious injuries and equipment damage. If the meter is used in a manner not specified by the manufacturer, the protection provided by connections may be impaired. The manufacturer shall not be held responsible for failure to comply with the instructions in this manual.

3 Acronyms and measurement units

3.1 Acronyms

Acronym	Definition
Aux	Auxiliary power
O/P	Output
PF	Power Factor
RPM	Revolution per minute
THD	Total Harmonic Distortion
TEHD	Total Even Harmonic Distortion
TOHD	Total Odd Harmonic Distortion

3.2 Measurement units

Unit	Description
A	Ampere (unit of current)
Hz	Hertz (unit of frequency)
kVA	kilovolt ampere
W	Watt
kWh	kilowatt-hour
ms	millisecond
V	Volt

4 Overview

Elite 500 series are multi-function panel meters with graphical coloured TFT display. Elite 500 series are new generation multi-function meters which can be used in wide variety of segments for instantaneous parameter and power quality monitoring, for building automation and process industry. Elite 500 also supports a new type of current sensor input i.e. Rogowski coil input which can be directly connected to the meter for parameter measurement.

The table given below provides detailed explanation of order codification of the available product variants.

Conventional current input		Rogowski current input		Module	
Elite 500	E500	**Elite 500**	E500	**Elite 500**	E500
Current input		**Current input**		**Module**	M
Conventional	C	Rogowski	R	**Module type**	
Accuracy		**Accuracy**		Ethernet module	1
Class 0.2S	2	Class 0.5S	5	Input/Output module	2
Class 0.5S	5			Analogue output module	3
PQ parameters		**PQ parameters**		Select any one based on the module type	
Individual harmonics up to 15th order without PQ parameters	1	Individual harmonics up to 15th order without PQ parameters	1	**For Ethernet module**	
Individual harmonics up to 15th order, With PQ parameters*	2	Individual harmonics up to 15th order, With PQ parameters*	2	Modbus TCP/IP	01
Individual harmonics up to 31st order without PQ parameters	3	Individual harmonics up to 31st order without PQ parameters	3	Modbus TCP/IP gateway	02
Individual harmonics up to 31st order, With PQ parameters*	4	Individual harmonics up to 31st order, With PQ parameters*	4	BACnet IP	03
				Profinet	04
				IEC 61850	05
Fix digit	0	**Rogowski current input and diameter**		**For Input/Output module**	
Manufacturer-specific digit	1	3x(1000 A, 70 mm)	C	2 configurable pulse input/output, 1 pulse output, 1 alarm output	01
e.g. model number: E500C-2101		3x(1000 A, 140 mm)	D	3 Alarm outputs	02
		3x(4000 A, 140 mm)	E	**For Analogue output module**	
		3x(4000 A, 200 mm)	F	4 analogue outputs	01
		Manufacturer-specific digit	1	**Manufacturer-specific digit**	1
		e.g. model number: E500R-51C1		e.g. model number: E500M-1011	

*PQ Parameters – Sag, Swell, Interruption, TDD, K factor, Crest factor, TEHD, TOHD, positive, negative and zero sequence components.

Table 1: Elite 500 variants

Note: Refer to the purchase order for details of the product supplied based on the requirement.

Elite 500 series of meters have the following benefits:

- Suitable for diverse applications through wide-range voltage, current and auxiliary supply inputs.
- Minimal integration cost through multiple communication ports (one fixed RS-485 communication port and an optional Ethernet module (which is available based on the requirement)).
- Support of multiple industry standard protocols: Modbus TCP/IP, BACnet IP, Profinet and IEC 61850 for integration with SCADA and other automation systems.
- Field replaceable hot pluggable ethernet, pulse input/output, alarm output and analogue output modules.
- Easy to install for retrofit installation with Rogowski current sensor as input.
- Large, high-resolution graphical display for analytical and graphical view.
- Option to have Conventional CT or Rogowski coil.

These are panel mounted (96*96) meters capable of measuring and monitoring various electrical quantities as well as detecting fault conditions in LV/HV networks. These meters are an ideal replacement for analogue ammeter/voltmeter combinations and are suitable for sub-metering of distribution system in Industrial and Commercial applications. A single Elite 500 meter can replace several single-function panel meters thereby saving the time and cost of installation.

Elite 500 meters are configurable for LV 3P4W / HV 3P4W / 1CT 3PT / LV 3CT / HV 3P3W / 3CT 2PT / 2CT 2PT / 1P 2W and have accuracy class of 0.5s and 0.2s.

Note: Refer to the rating plate and display for the supplied product. The product will be supplied as per the requirement.

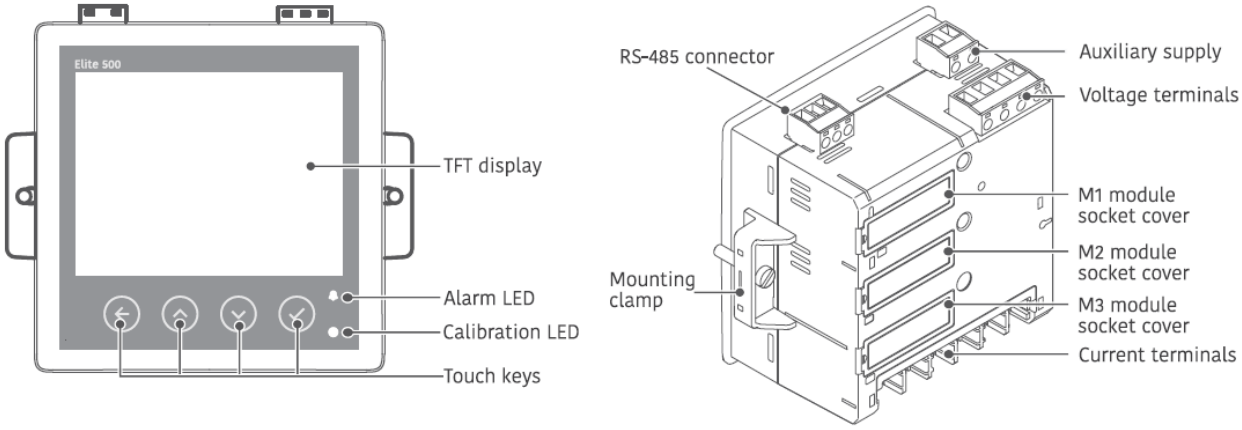


Figure 1: Elite 500 meter (conventional CT variant)

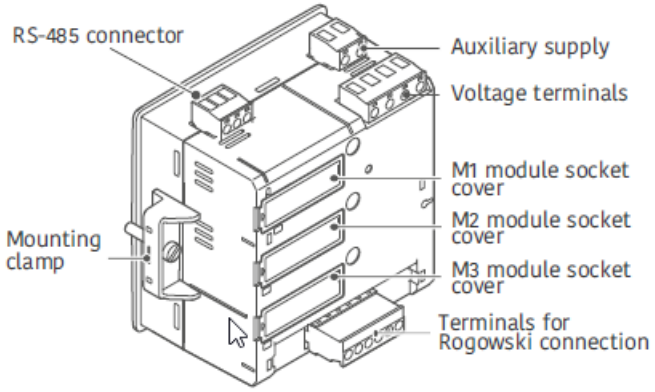


Figure 2: Elite 500 meter (Rogowski coil variant) rear view

These meters support external attachment of modules to enhance their existing functionality or add extra features to the meter. The modules are replaceable and configurable at installation site and gives Elite 500 variants the flexibility to meet a broad range of applications. These modules are optional and can be procured separately.

The meter's front panel has a TFT display. When powered, the meter is capable of displaying a group of related electrical parameter values together on a single page. For example, 3-phase voltage and average voltage can be displayed simultaneously on a single display page.

The touch keys provided on the front panel can be used to navigate through various displays, configure the meter or to perform specific actions at the meter-end such as MD reset.

Elite 500 series of meters are pre-configured at the factory-end. Certain configurations can be modified at the installation site with the help of ConfigView and/or the meter touch keys. Configurations done using ConfigView are saved in a configuration file with '.xml' extension that can be downloaded in the meter locally via the RS-485 connector port (with RS-485 to RS-232 converter) or Ethernet module (if attached to the meter). For this, it is important to know the Modbus ID and baud rate (for Modbus RTU) or IP address (for Ethernet module) configured in the meter so that a communication link can be established between the computer and the meter.

The meter has module socket covers at the rear as shown in the above figure. The modules can be attached by removing the module socket covers.

5 Features

On the rear panel, these meters have voltage terminals, current terminals, an auxiliary power supply socket and an RS-485 communication socket as shown in Figure 1. In addition, there are three separate sockets for fitting the external Modules.

1. **Voltage and current supply**

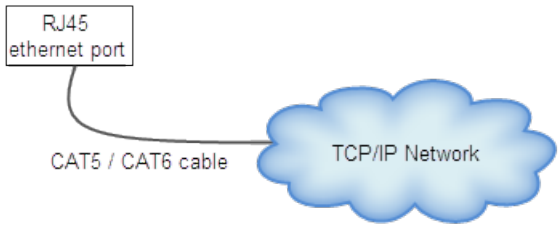
   6-pin Current input terminals

   4-pin Voltage input terminals

2. **Ethernet module socket**

   The female socket (which is the topmost socket (M1)) at the rear is provided for attaching Ethernet Module. This module is optional and can be used to enhance the meter functionality.

   Connection layout for Ethernet Module is shown below.



   Note: For ethernet module, latest available cables such as CAT 6A can be used.

3. **Input/ Output module socket**

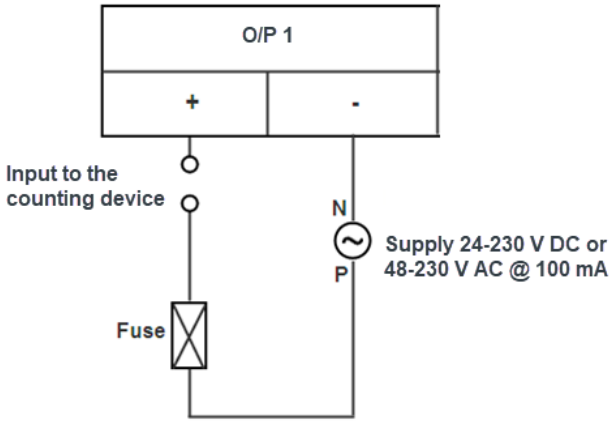
   The female socket (M2 module socket) at the rear is provided for attaching external I/O module. There are two I/O modules available each having different functions:

   - Pulse input/output and alarm output
   - Three alarm outputs

   Note: For pulse input/output and alarm output terminals, use cables of size 2.5 mm^2.

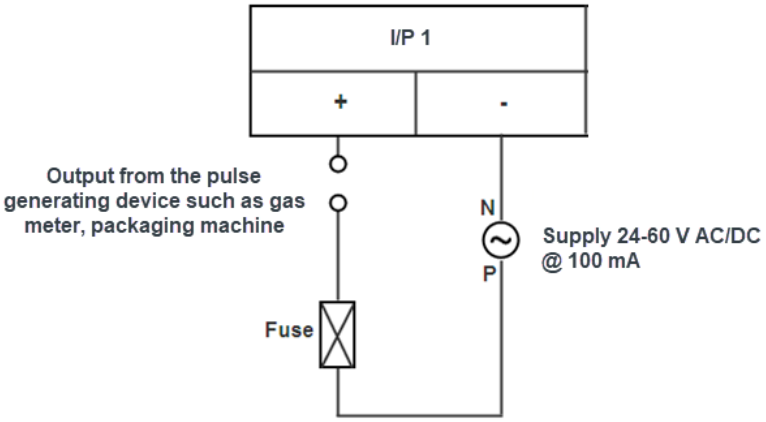
   These modules are optional and can be used to enhance the meter functionality.

Pin layout and connection details for digital pulse output is shown below.

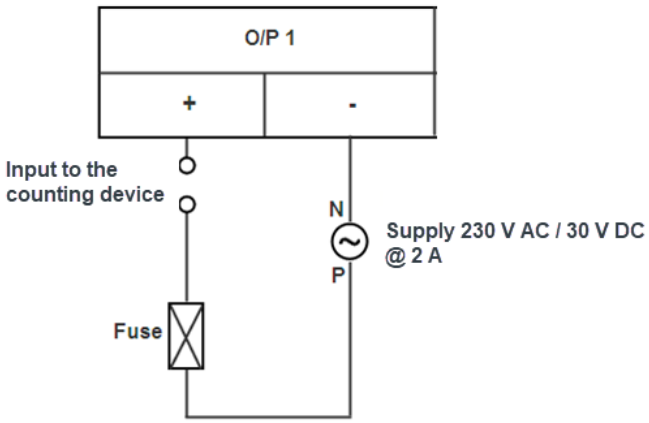


Note: The configurable pulse input/output can be configured as input or output and must be connected accordingly.

Pin layout and connection details for digital pulse input is shown below.



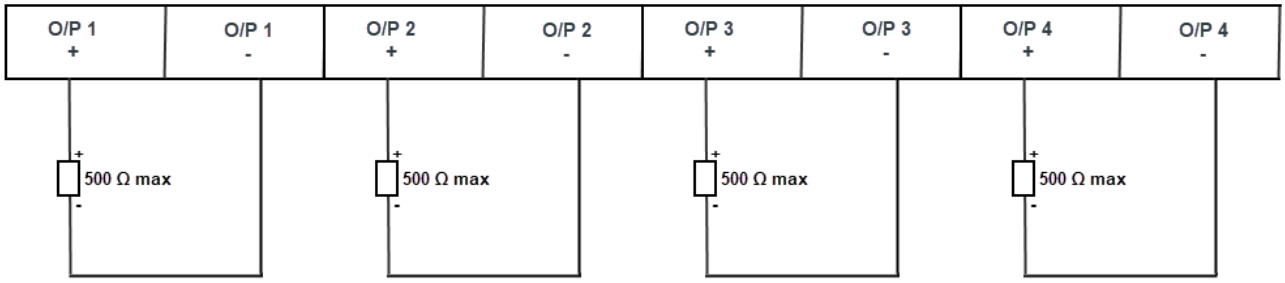
Pin layout and connection details for alarm/relay output is shown below.



4. **Analogue output module socket**

The female socket (M3 module socket) at the rear is provided for attaching four configurable 4-20 mA, 0-10 mA or 0-20 mA analogue outputs module. This module is optional and can be used to enhance the meter functionality.

Pin layout and connection details for four analogue outputs are shown below.



All the modules are hot pluggable. However, it is recommended to disconnect the auxiliary power supply before attaching or removing a module. A knurled head screw provided with each module holds it with the meter base.

5. **Module socket cover**

The module socket covers (M1, M2 and M3) made of polycarbonate plastic are used to seal module sockets when not in use. Before attaching a module, remove these covers with the help of a flat-head screw-driver. Please refer the instruction to remove the module socket cover as embossed on the cover.

6. **Auxiliary power supply socket**

This 2-pin auxiliary power supply socket is used for powering up the meter.

7. **Meter communication socket**

This is an RS-485 connector port used for communication with the meter over Modbus protocol. Its baud rate is set to 9600 bps as the default speed of communication, for data transfer and configuration download, and can be configured up to 38400 bps from the meter's Setup Mode (touch keys) or using ConfigView. The available options are 1200, 2400, 4800, 9600, 19200 and 38400.

8. **Mounting clamps**

Two mounting clamps are provided to hold the meter with the panel. These clamps are fitted on the sides using the screws.

9. **Calibration LED**

This red colour LED indicates the energy consumption for the configured energy. The pulse rate will be based on the meter commissioning.

10. **Alarm LED**

This amber colour LED indicates alarm for configured events. On occurrence of an alarm, this LED will glow until the event is acknowledged and restored.

Press ✓ to acknowledge the event. The event logs will be displayed.

Note: Press ← to ignore the alarm and go to the previous display.

5.1 Supported protocols

You can integrate the meter into various industry-standard networks. Measured meter data can be made available to other devices using Modbus RTU, Modbus TCP/IP, Modbus TCP/IP gateway, BACnet, Profinet and IEC 61850 protocols.

Note: For more information on protocol support, refer to the Elite 500 technical reference guides for Modbus, BACnet, Profinet and IEC 61850.

5.1.1 Modbus RTU

The meter is factory-configured with default serial communication settings that you may need to modify before connecting the meter to the RS-485 bus. The default settings are as follows:

Protocol = Modbus RTU

Modbus ID = 1

Baud rate = 9600

Parity = none

Stop bit = 1

5.1.2 Modbus TCP/IP

An Ethernet module can be connected to each meter for Modbus TCP/IP communication.

The meter's Ethernet feature extends the meter's functionality by allowing Ethernet access. The module receives Modbus TCP/IP data on TCP port 502 and forwards it to the meter. This functionality allows the use of monitoring software to access information from meter for data collection, trending, alarm/event management, analysis, and other functions.

You can establish two TCP/IP socket connections (Port 1- 502, Port 2- 503) for an IP for performing simultaneous reading using two different clients.

5.1.3 Modbus TCP/IP gateway

The meter's Ethernet gateway feature extends the meter's functionality by allowing access to serial devices connected to the meter's RS-485 serial communication port through ethernet interface. A Modbus master device (such as an energy management system) connected through Ethernet, can communicate with the serially connected meters through the meter having gateway module. The meter receives Modbus TCP/IP data on TCP port 502 and forwards it to the addressed slave device. This functionality allows the use of monitoring software to access information from slave devices for data collection, trending, alarm/event management, analysis, and other functions.

5.1.4 BACnet IP

BACnet IP protocol allows communication between the components of a building automation and control system (for example, HVAC, lighting control, security systems and related equipment).

The BACnet IP protocol defines a number of services that are used to communicate between devices and the objects that are acted upon by those services.

Elite 500 supports following:

- Device profile: B-ASC (BACnet Application Specific Controller)
- BACnet objects: Analogue IO, Binary IO
- Change of Value (COV) subscriptions: The meter supports up to 20 COV subscriptions. You can add COV subscriptions to Analogue input, Binary input and multi-state input objects using BACnet compatible software.
- Network: BACnet/IP

You can configure the BACnet module settings through ConfigView.

5.1.5 Profinet

Profinet (Process Field Net) is a newer and enhanced automation protocol which is widely used in process automation field for manufacturing and flow industry. It has advanced capabilities that can facilitate a flexible and faster field of communication within a network. It is suitable for high speed, time-critical, and high reliability communication systems. It is a kind of open style field network standard.

With optimized, high-speed, low-cost communication links, Profinet is especially used in automatic controlling systems and equipment level decentralized I/O communication. It can meet real-time response, stability and reliability of equipment level and distributed controlling systems. The Profinet module uses Profinet protocol.

Elite 500 supports following:

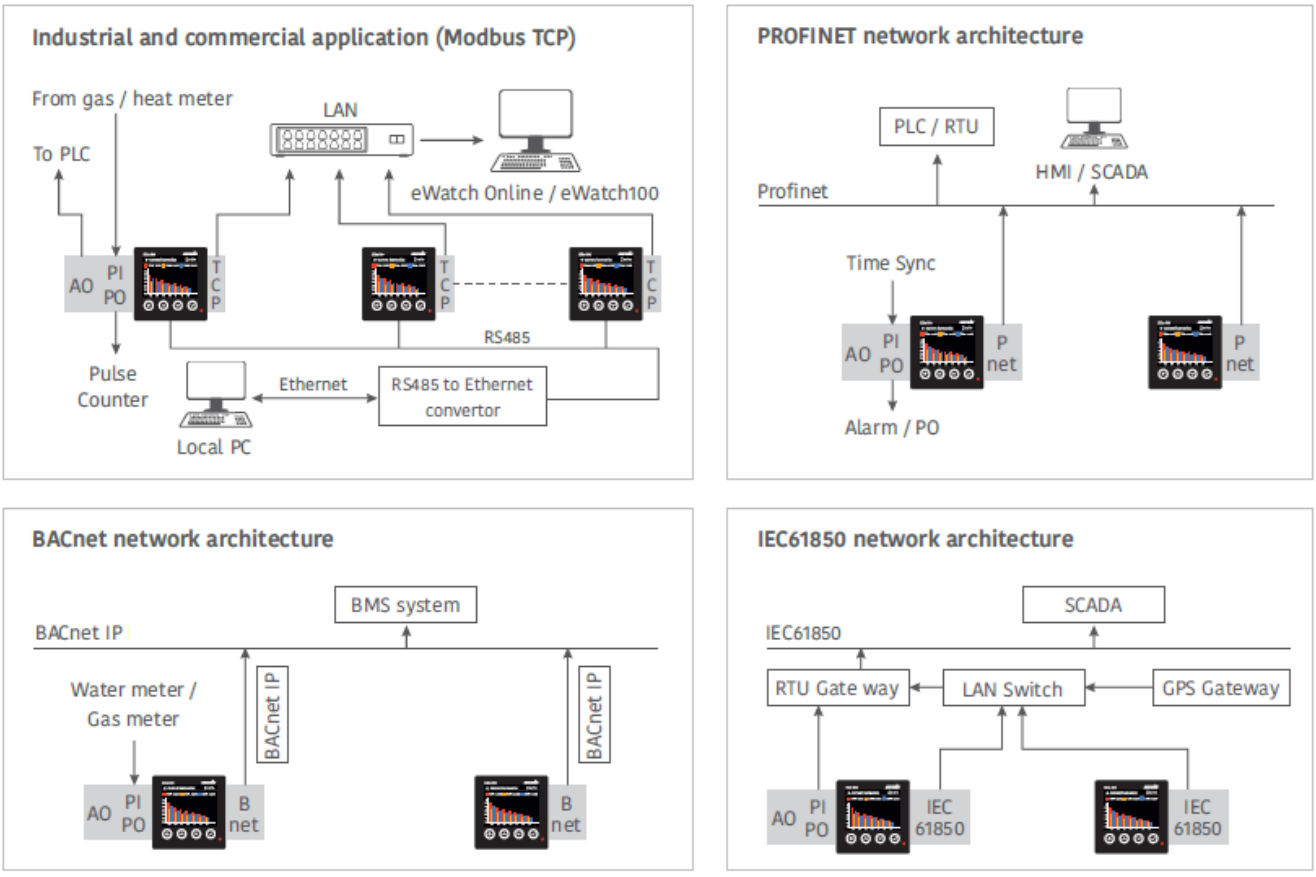
- Device type: IO-Devices
- Conformance Class B
- Real Time Class 1
- NetLoad Class I: Basic robustness against net load

5.1.6 IEC 61850

Elite 500 supports IEC 61850 (edition 1.0 and edition 2.0) which is an Ethernet-based protocol designed for electrical substation automation system. It is a standardised method of communications, developed to support integrated systems composed of multi-vendor, self-describing IEDs (intelligent electronic devices) that are networked together to perform monitoring, metering and real-time non-critical protection and control. You can configure the IEC 61850 module settings through ConfigView.

5.2 System architecture

Elite 500 offers in-built RS-485 port for Modbus RTU communication and add-on modules for Ethernet based communication protocols- Modbus TCP/IP, BACnet, Profinet and IEC 61850.



5.3 Using the display

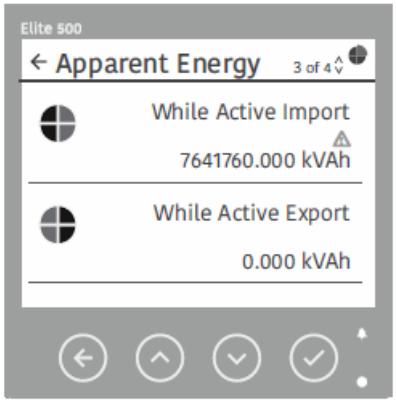
This section describes how the Elite 500 display can be used to read measurement values and also to control certain functions in the meter.

Elite 500 has 3.5 inch (320 x 240 pixels) graphical colour TFT display. The meter display is legible up to a distance of 2 m and viewing angle up to six o' clock excluding information being displayed in graphs, waveform and table.

Display parameters such as instantaneous parameters, energy TOU and demand; power quality parameters, alarms, configuration, billing parameters, vector diagram, bar chart and harmonics are arranged into groups for easier navigation.

Display parameters are grouped in to a number of sequences: Instantaneous, energy, demand, min-max, power quality, settings, favourite pages, event logs and miscellaneous.

The display resolution for values of instantaneous parameters is 0000.000 and energy parameters is 0000000.000. In case the value overflows, ⚠ appears on the display.



You can set the required scalar for power and energy values.

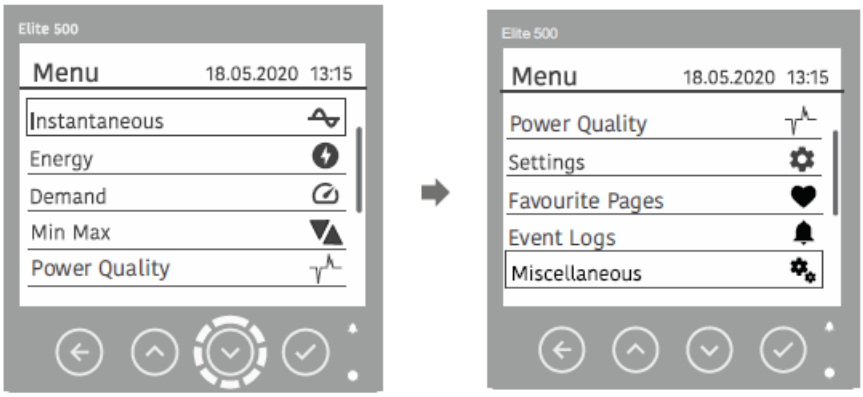
The display backlight always remains ON and its brightness is lowered after 5 minutes (in case of idle condition).

Elite 500 has four touch keys- ←, ↑, ↓ and ✓. The touch key functions are as follows:

Keys	In Setup Mode	
	Short press	
	To Navigate	To edit
←	Go back to the previous option	Exit the edit mode
↑	Scroll up through the menu list	Increment the value
↓	Scroll down through the menu list	Decrement the value
✓	Select/ enter the current option	·Confirm/ save the entered digit/ value ·To move to the next digit/ value

In Display Mode			
Keys	Short press	Keys	Short press
←	Go back to the previous menu	↓	Scroll down through the menu list
↑	Scroll up through the menu list	✓	·Select the current option ·Acknowledge the alarm

Note: Long press (2 seconds) ← to go to the main menu.



5.4 Configuring the meter using settings menu

The settings menu is used to set-up and enable features such as commissioning, power and energy scalar; footer energy on display, reset password, energy and demand; factory reset, demand/MD, SIP for primary and secondary loggers, RPM and Min-Max. They are also used to set-up communications and network settings.

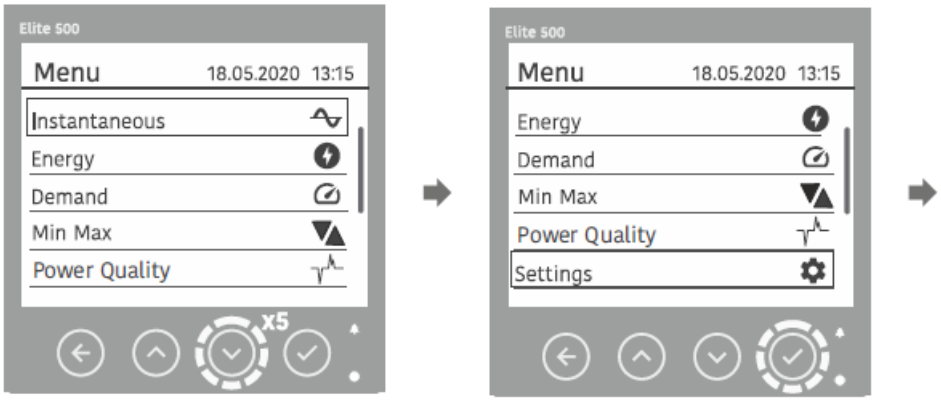
The settings menu is password protected which can be accessed only by users authorised to change the above configurations. The password can be configured using Settings menu on the meter display.

At the password prompt enter the 4-digit password (default password is '0000') using ⌃, ⌄ and ✓ keys. Use ⌃ and ⌄ keys to enter a value for the digit and press ✓ key to save the entered value and move the cursor to the right while entering a password. After entering the last digit of the password, use ✓ key to confirm.

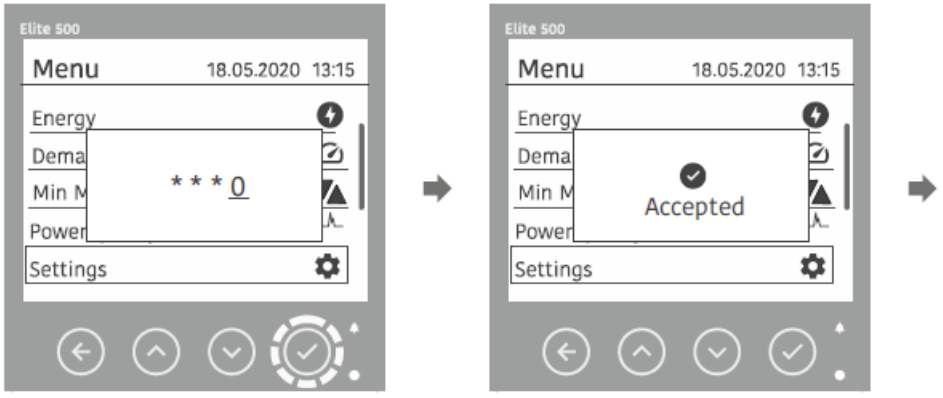
Using ✓ key you can navigate through the password entry screen.

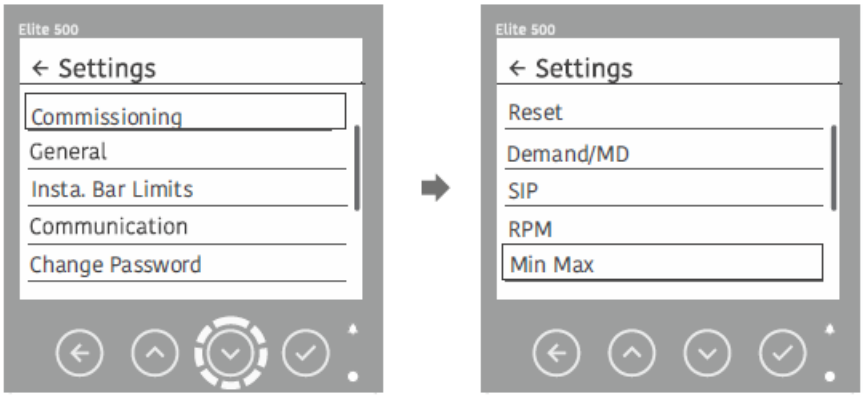
Correct password grants access to the settings menu. An incorrect password will display 'Denied' message.

Long press ← to go to the main menu. Use ⌄ key to move to the Settings option. Press ✓ key to select the Settings menu.



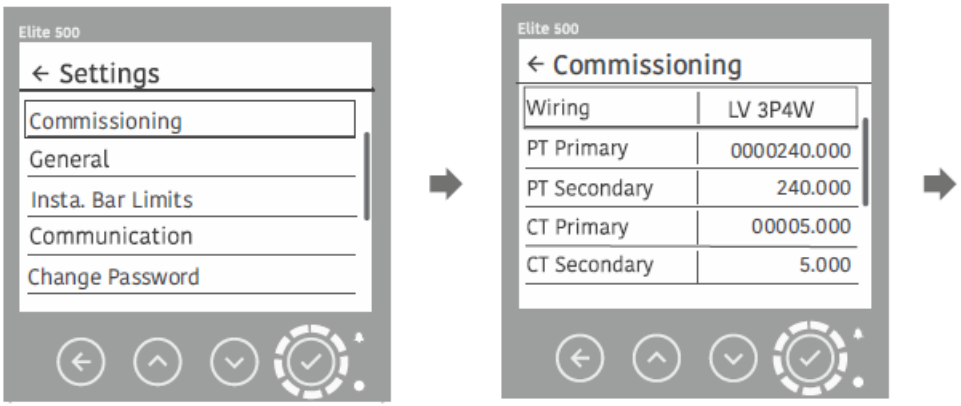
The meter prompts for the password. At the password prompt, enter the 4-digit password (default password is '0000') using ⌃, ⌄ and ✓ keys.

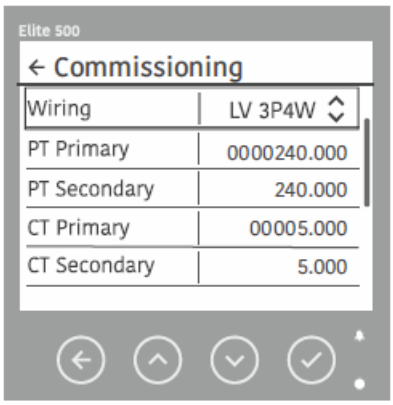




Use ^ and v keys to scroll through the Settings menu. The selected option will be highlighted. Press ✓ to configure the selected option.

1. **Commissioning:** This option is used to configure the wiring, CT-PT primary and secondary values. Use ^ and v keys to navigate through the commissioning menu. Press ✓ to configure the selected option.





- Wiring: This option is used to set the wiring configuration of the meter. Available options for Wiring are LV 3P4W, HV 3P4W, 1CT 3PT, LV 3CT, HV 3P3W, 3CT 2PT, 2CT 2PT and 1P 2W. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Commissioning menu.

  Note: 2CT 2PT connection type is not applicable for Rogowski coil variant.

- CT-PT primary and secondary values: These options are used to configure the CT-PT primary and secondary values.

  Note: It is recommended to configure CT-PT primary and secondary values in the meter.

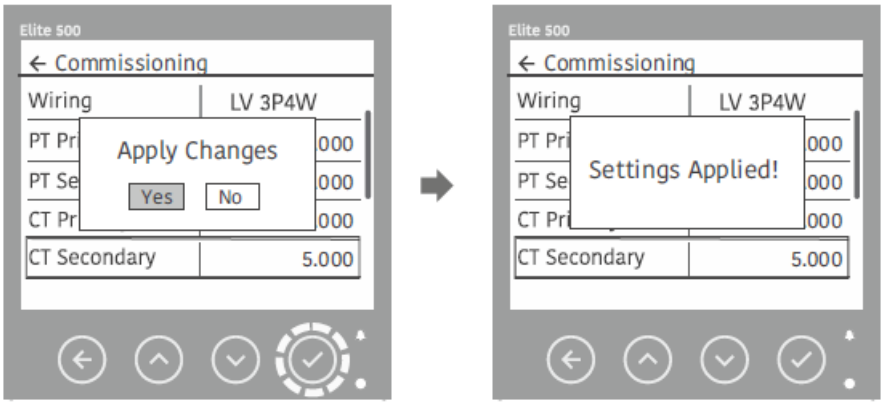
For Rogowski coil meter variant,

- CT secondary is not applicable. However, based on your load conditions, I Load should be configured for event detection and showing instantaneous bar on the meter display.
- CT primary is configured at manufacturer's end and should not be changed otherwise the declared accuracy will not be guaranteed.

Note: Use ^ and v keys to increment and decrement the value of a digit. Press ✓ to save the entered digit and move the cursor to the next digit.

Enter the desired value and then press ← to save the value and go back to the Commissioning menu.

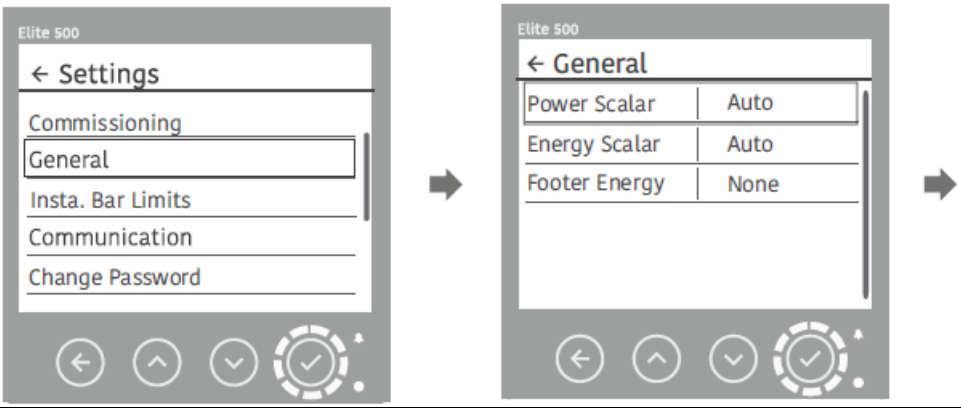
Press ← to confirm and apply the changes to commission the meter.

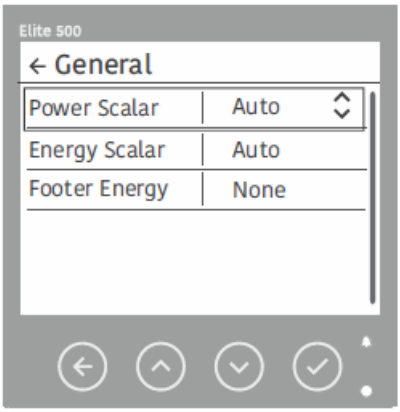


Use ^ or v key to select the 'Yes' option and press ✓ to apply the settings.

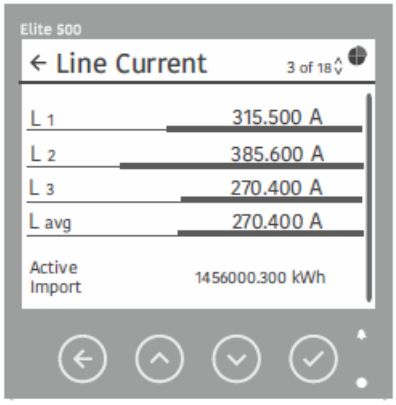
Note: The Commissioning menu options will be applicable based on the selected wiring.

2. **General settings:** This option is used to configure the power and energy scalar settings for meter display. It is also used to configure the footer energy on display. Use ^ and v keys to navigate through the General menu. Press ✓ to configure the selected option.





- Power scalar: This option is used to set the power scalar for the meter display. Available options are Auto, None, kilo, Mega and Giga. Use ↑ and ↓ keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the General menu.
- Energy scalar: This option is used to set the energy scalar for the meter display. Available options are Auto, None, Kilo, Mega and Giga. Use ↑ and ↓ keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the General menu.
- Footer energy: This option is used to set the footer energy on the meter display for instantaneous pages. An example for footer energy on display is shown below:



Available options are None, Active Import, Active Export, Active Net, Line 1 Active Import, Line 2 Active Import, Line 3 Active Import, Line 1 Active Export, Line 2 Active Export, Line 3 Active Export, Reactive Import, Reactive Export, Reactive Lag, Reactive Lead, Apparent while Active Import, Apparent while Active Export and Apparent Total Forwarded.

Note: The footer energy cannot be configured using ConfigView.

Use ↑ and ↓ keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the General menu.

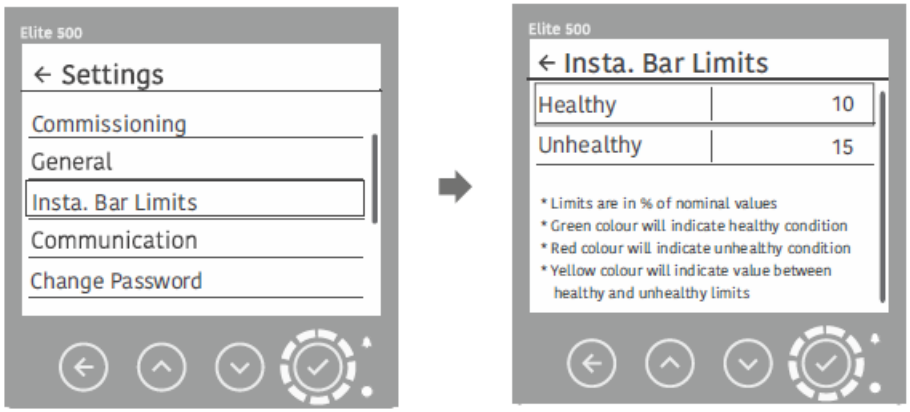
Press ← to apply the changes and configure scalar settings in the meter.

3. **Instantaneous bar limits:** This option is used to set the instantaneous bar limits for healthy and unhealthy conditions shown on the meter display for Instantaneous pages. The instantaneous bar limits can be configured only using meter touch keys.

Note:

- The healthy and unhealthy limits are in % of nominal value.
- Green coloured bar on the Instantaneous pages indicates healthy condition.
- Red coloured bar on the Instantaneous pages indicates unhealthy condition.
- Yellow coloured bar indicates the value lies between healthy and unhealthy limits.

Use ⌃ and ⌄ keys to navigate through the Insta. Bar Limits menu. Press ✓ to configure the selected option.



Note: Use ⌃ and ⌄ keys to increment and decrement the value of a digit. Press ✓ to save the entered digit and move the cursor to the next digit.

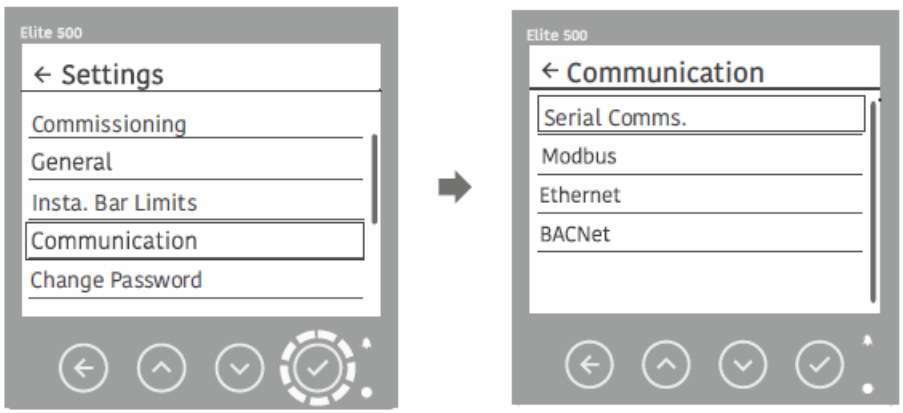
Enter the desired value and then press ← to save the value and go back to the Insta. Bar Limits menu.

Press ← to apply the changes and configure the instantaneous bar limits.

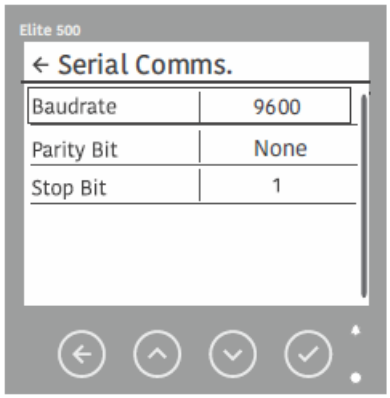
4. **Communication settings:** This option is used to set-up communications and network settings. It is used to configure the following:

   - Serial communication
   - Modbus
   - Ethernet configuration
   - BACnet configuration

   Note: For more information on protocol support, refer to the Elite 500 technical reference guides for Modbus, BACnet, Profinet and IEC 61850.



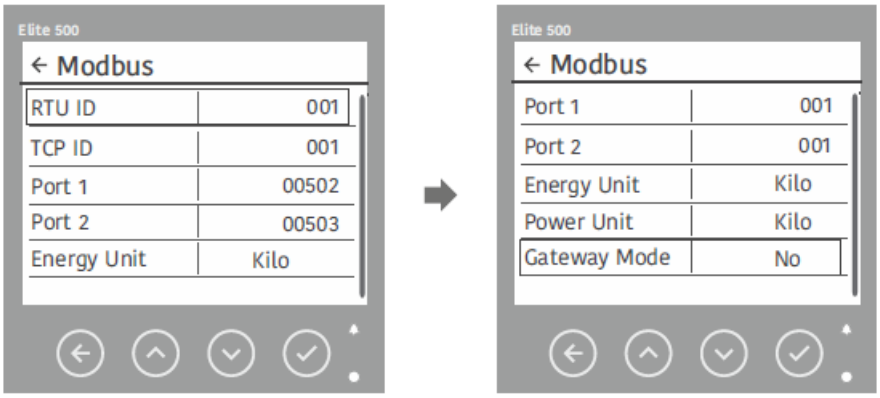
- **Serial communication:** This option is used to set the baudrate, parity and stop bit. Use ^ and v keys to navigate through the Serial Comms menu. Press ✓ to configure the selected option.



  - Baud rate: By default, the baudrate is set as 9600. Available options are 1200, 2400, 4800, 9600, 19200 and 38400. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Serial Comms menu.
  - Parity: By default, the parity is set as None. Available options are None, Odd and Even. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Serial Comms menu.
  - Stop bit: By default, the stop bit is set as 1. Available options are 1 and 2. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Serial Comms menu.

Press ← to apply the changes and configure serial communication settings in the meter.

- **Modbus communication:** This option is used to set the Modbus RTU ID, Modbus TCP ID, port 1, port 2, energy unit, power unit and Modbus master. Use ^ and v keys to navigate through the Modbus menu. Press ✓ to configure the selected option.

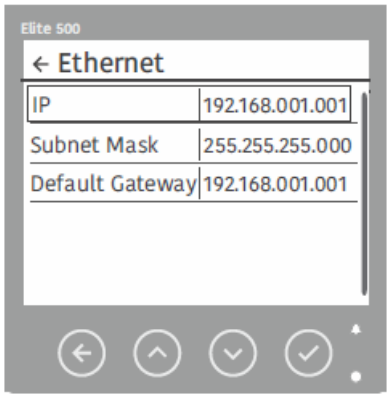


Note: Set the Gateway Mode as 'Yes' if the Modbus TCP/IP gateway module is attached to the Ethernet Module socket (M1) available at the rear of the meter.

Enter the desired value and then press ← to save the value and go back to the Modbus menu.

Press ← to apply the changes and configure the Modbus communication settings in the meter.

- **Ethernet configuration:** This option is used to set the IP address, Subnet Mask and Default Gateway. Use ^ and v keys to navigate through the Ethernet menu. Press ✓ to configure the selected option.

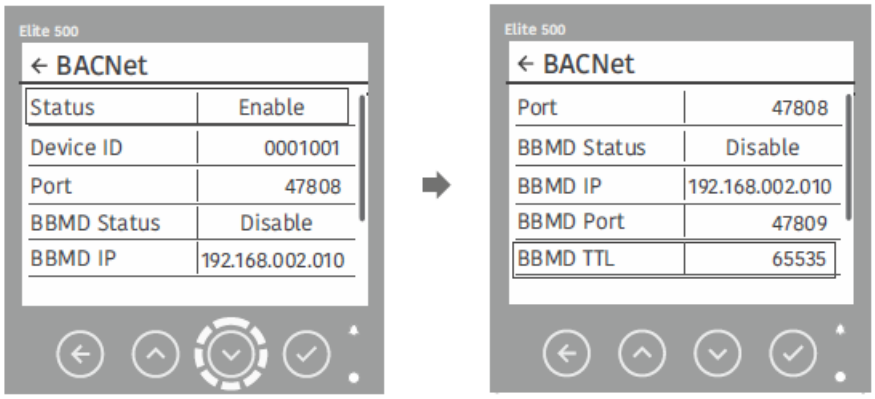


Note: Use ^ and v keys to increment and decrement the value of a digit. Press ✓ to save the entered digit and move the cursor to the next digit.

Enter the desired value and then press ← to save the value and go back to the Ethernet menu.

Press ← to apply the changes and configure the Ethernet communication settings in the meter.

- **BACNet configuration:** This option is used to configure the BACNet and BBMD settings. Use and keys to navigate through the BACNet menu. Press to configure the selected option.



Enter the desired value and then press to save the value and go back to the BACNet menu.

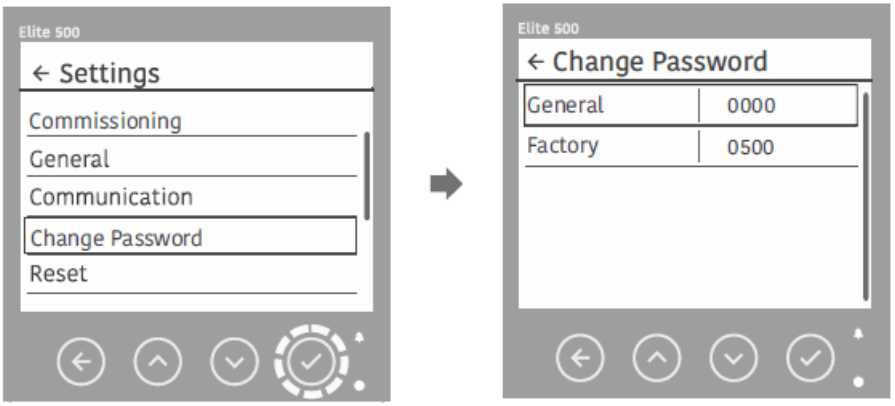
Press to apply the changes and configure the BACNet communication settings in the meter.

5. **Change password:** This option is password protected and is used to configure the general and factory passwords in the meter.

   The meter prompts for the password. At the password prompt, enter the 4-digit password (default password is '0500') using , and keys.

   Note: The general and factory passwords can also be configured using ConfigView.

   Use and keys to navigate through the Password menu. Press to configure the selected option.

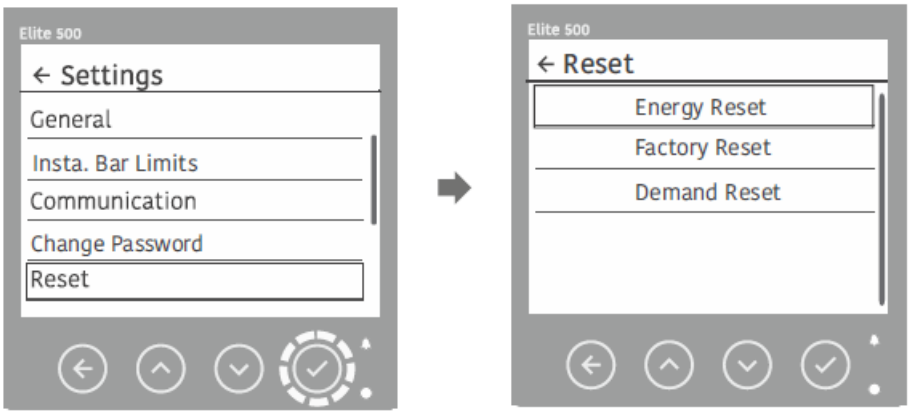


   Note: Use and keys to increment and decrement the value of a digit. Press to save the entered digit and move the cursor to the next digit.

   The password for the settings menu is a 4-digit integer ranging from 0000 to 9999. The default value is '0000'. Enter the desired value and then press to save the value and go back to the Change Password menu.

   Press to apply the changes and configure the general and factory passwords in the meter.

6. **Reset:** This option is used to reset energy and demand. It is also used to reset to factory settings.



Note: Performing energy reset, factory reset and demand reset will finish the current billing cycle and starts a new billing cycle.

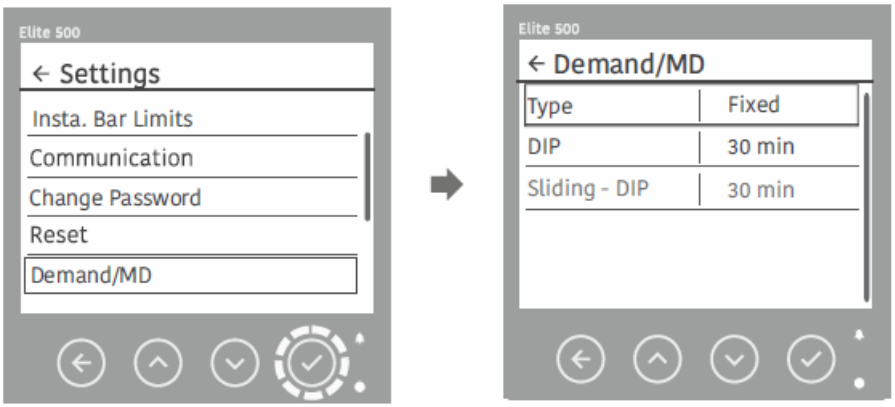
On performing factory reset, all the energy registers, rate registers and MD registers will be reset; and billing history, load profile data and midnight data will be cleared. The meter configuration will be reset to factory configuration with default commissioning values (LV 3P4W).

On performing factory reset, the meter will restart automatically. Once the meter is powered up and the display appears, manually power off-on the meter again and thereafter configure the desired Time zone and Time in the meter. This is required for proper setting of time in the meter.

7. **Demand/MD:** This option is used to configure the demand type, DIP and sliding-DIP.

Note: The Maximum Demand can also be configured using ConfigView.

Use ⌃ and ⌄ keys to navigate through the Demand/MD menu. Press ✓ to configure the selected option.

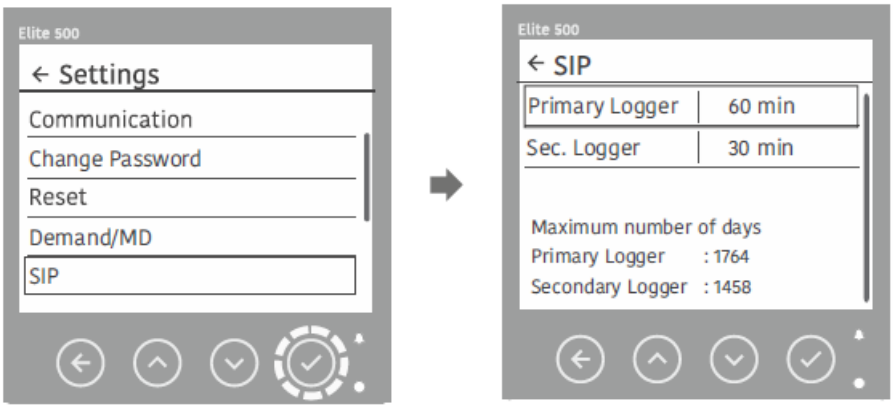


- Demand type: The meter supports fixed-window and sliding-window type demand computation. Use ⌃ and ⌄ keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Demand/MD menu.
- DIP: Energy demands are monitored periodically at each configured DIP (Demand Integration Period) to record the maximum demand value of each energy type. DIP can be set to 1, 2, 5, 10, 15 or 30 minutes. Use ⌃ and ⌄ keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Demand/MD menu.

- Sliding - DIP: The meter supports the sliding interval of 5 minutes for DIP interval of 15 minutes; and it supports the sliding interval of 5, 10 or 15 minutes for DIP interval of 30 minutes. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the Demand/MD menu.
  Note: Sliding - DIP setting is applicable for sliding-window type demand computation.

Press ← to apply the changes and configure Demand/MD settings in the meter.

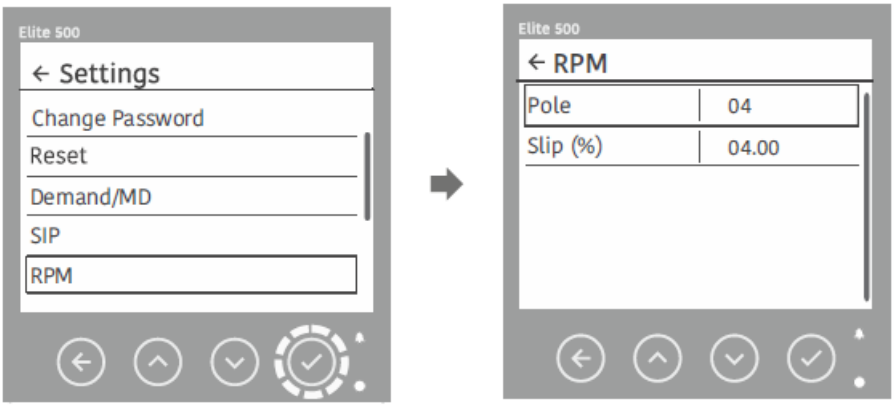
8. **SIP:** This option is used to configure the SIP for primary and secondary loggers.



- Primary logger: Primary logger can log load profile data with an integration period of 5, 15, 30 and 60 minutes. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the SIP menu.
- Secondary logger: Secondary logger can log load profile data with an integration period of 1, 2, 5, 10, 15 and 30 minutes. Use ^ and v keys to scroll through the available options. Select the desired option and then press ← to save the value and go back to the SIP menu.

Press ← to apply the changes and configure the SIP for primary and secondary loggers in the meter.

9. **RPM (Revolution per minute):** This option is used to configure pole and slip to calculate RPM of a motor. Pole is the number of poles of the motor installed. Slip is the slip of motor installed. The RPM settings can also be configured using ConfigView.



Use ^ and v keys to navigate through the RPM menu. Press ✓ to configure the selected option.

Enter the desired value and then press ← to save the value and go back to the RPM menu.

Press ← to apply the changes and configure the RPM settings in the meter.

10. **Min-Max:** This option is used to configure the reset frequency for min-max parameter values. The meter can be configured to reset the min-max values daily, weekly or at the time of billing.

Use ⌃ and ⌄ keys to navigate through the Min-Max menu. Press ✓ to configure the selected option.

Select the desired option and then press ← to save the value and go back to the Min-Max menu.

Note: Day setting is applicable for weekly reset.

Press ← to apply the changes and configure the Min-Max reset criterion in the meter.

5.5 Viewing display parameters

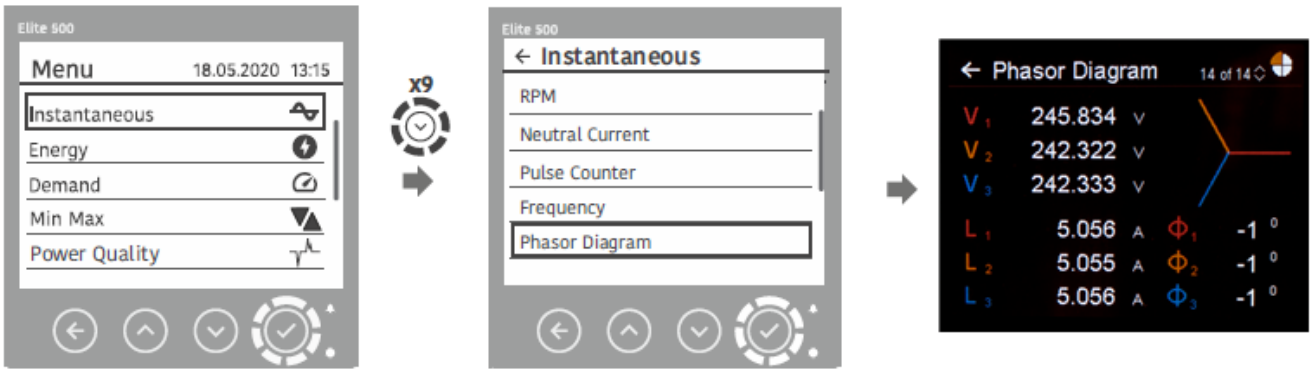
Display parameters are grouped in to a number of sequences: Instantaneous, energy, demand, min-max, power quality, settings, favourite pages, event logs and miscellaneous.

The illustrations shown below explains how to view phasor diagram, TOU energy, TOU MD, energy snapshot historical data, high resolution energy, harmonics, installation check, self-diagnostics, demand trend and last IP demand.

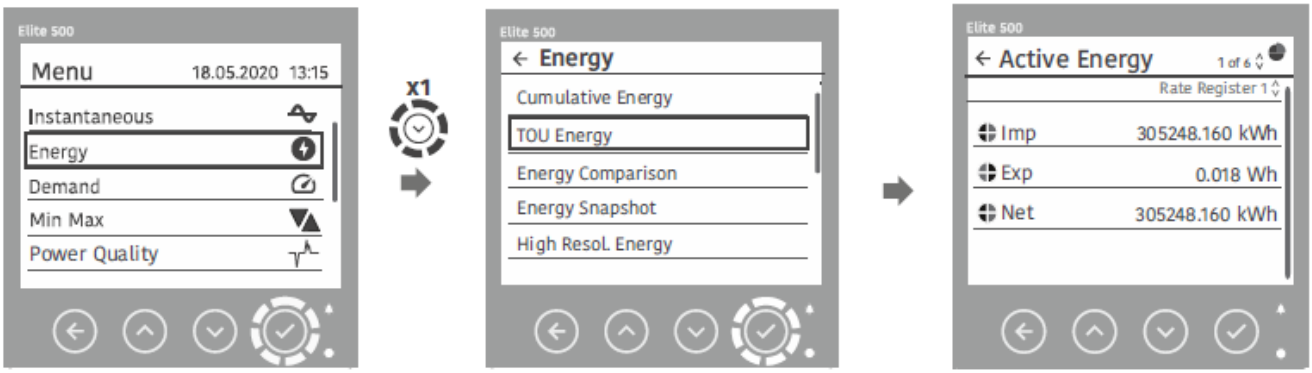
The final sequences and their corresponding displays depends on the meter configuration.

Phasor diagram

Long press ← to go to the main menu.

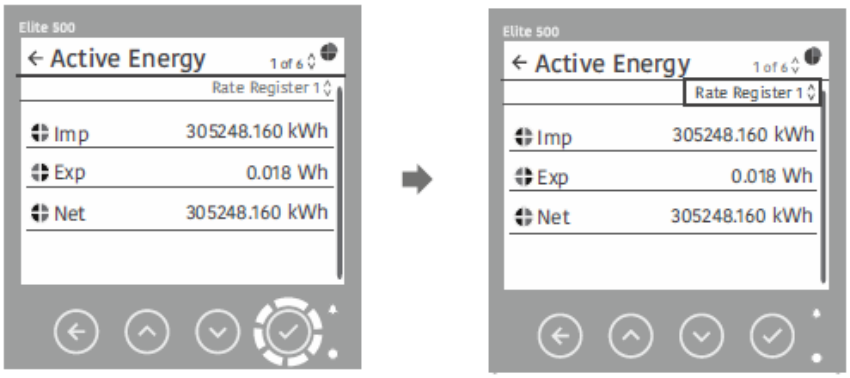


TOU energy



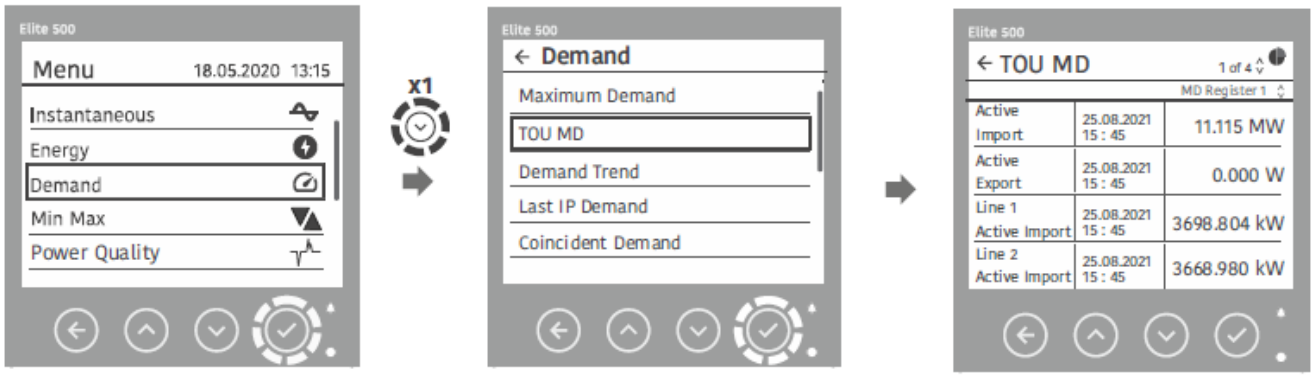
Use ^ and v keys to navigate through the TOU energy sequence.

You can view the TOU energy values for the desired rate register. Press ✓ to enable the rate register selection.



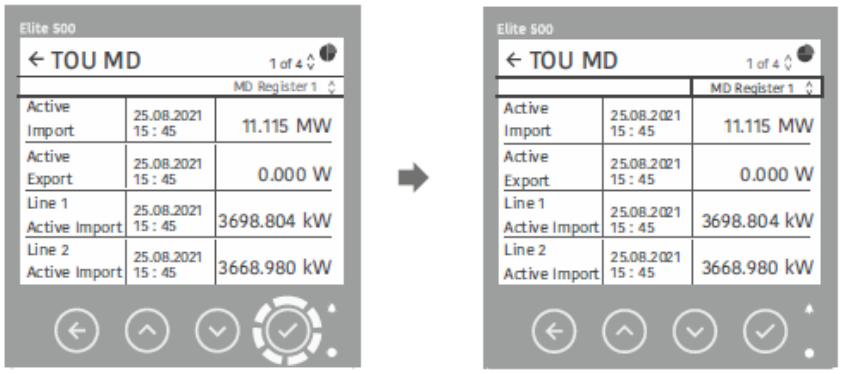
Use ^ and v keys to scroll through the available options. Select the desired option and then press ✓ to set the rate register and go back to the TOU Energy sequence.

TOU MD



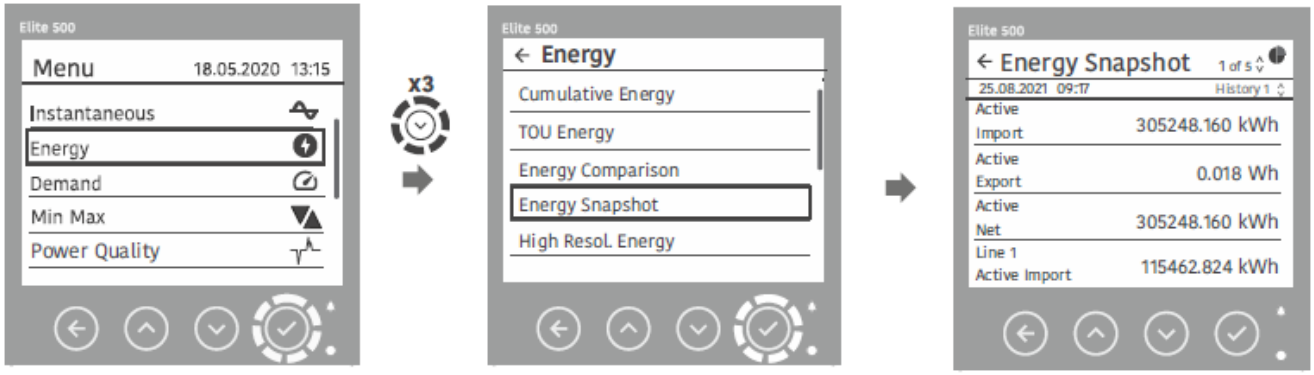
Use ^ and v keys to navigate through the TOU MD sequence.

You can view the TOU MD values for the desired MD register. Press ✓ to enable the MD register selection.



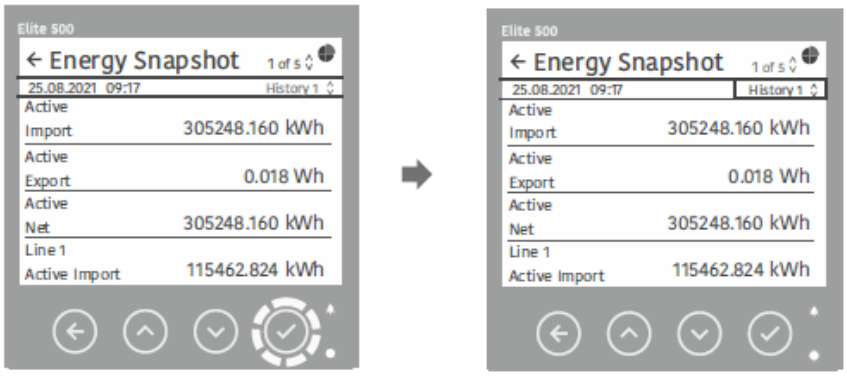
Use ^ and v keys to scroll through the available options. Select the desired option and then press ✓ to set the MD register and go back to the TOU MD sequence.

Energy snapshot historical data



Use ^ and v keys to navigate through the Energy snapshot sequence.

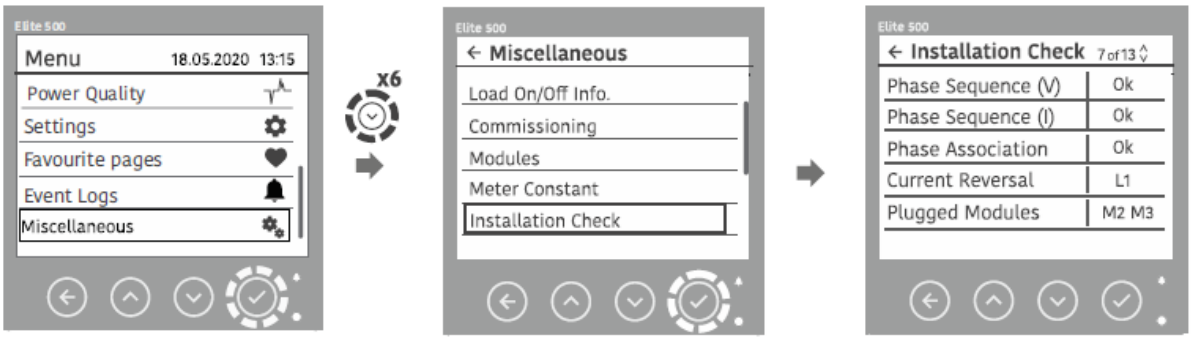
You can view the Energy snapshot values for the desired historical register. Press ✓ to enable the history selection. Elite 500 supports a maximum of 10 historical registers on the meter display.



Use ^ and v keys to scroll through the available options. Select the desired option and then press ✓ to save the value and go back to the Energy snapshot sequence.

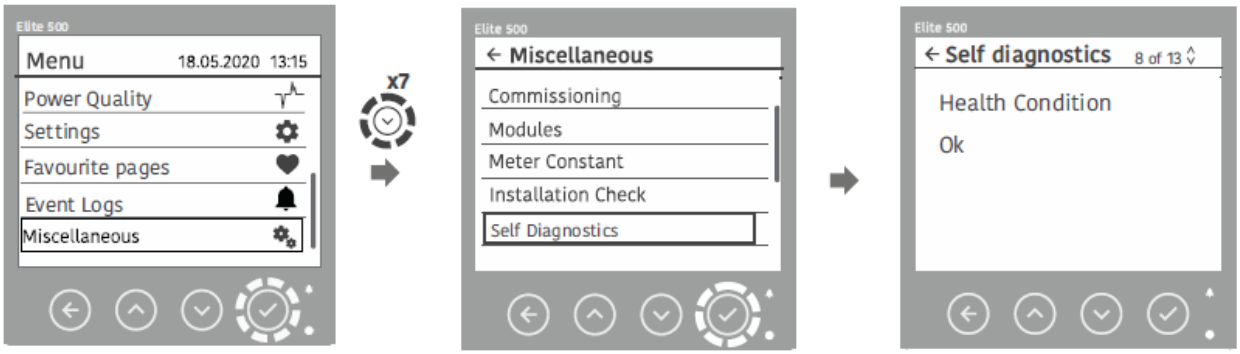
5.5.1 Installation check

The Installation check page helps you to verify the meter installation. It shows the status of phase sequence for voltage and current; phase association, current reversal and plugged modules, if the required voltage and current cables are connected to the meter terminals.



5.5.2 Self-diagnostics

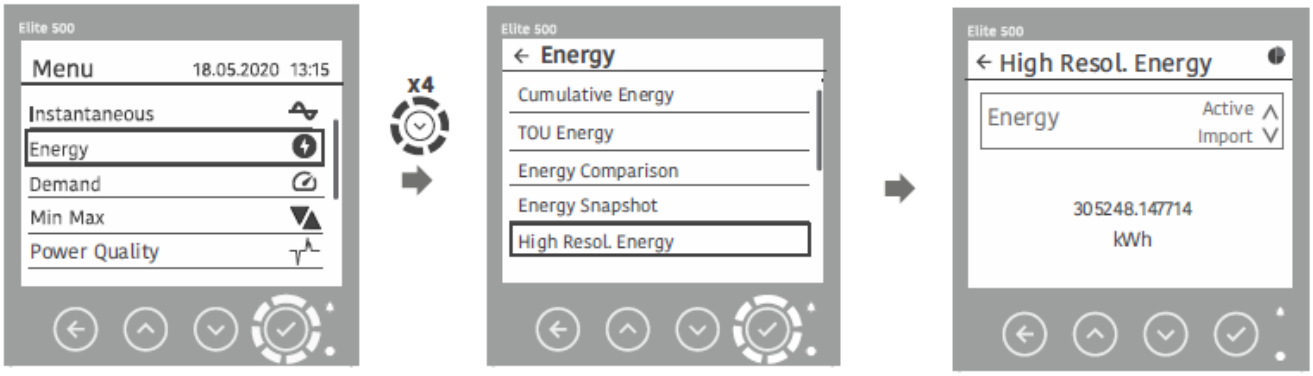
The self-diagnostics page shows the health condition of the meter.



Note: In case of error, contact concerned sales representative for further information.

5.5.3 High resolution energy

Elite 500 shows the high resolution energy values with the resolution of 0.000000.

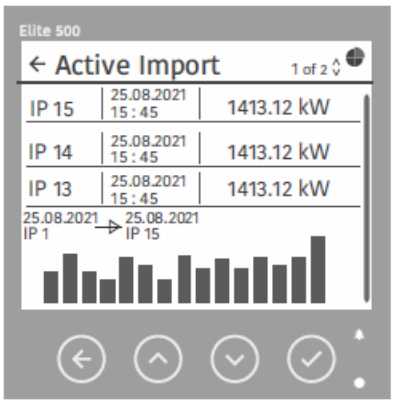


You can view the high resolution energy values for the desired energy type. Press ✓ to enable the energy type selection.

Use ^ and v keys to scroll through the available options. Select the desired option and then press ✓ to save the value and go back to the High Resol. Energy sequence.

5.5.4 Demand trend

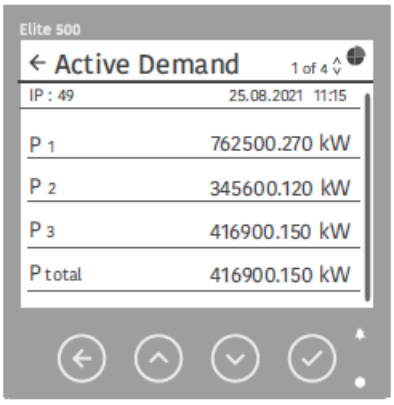
Elite 500 shows the demand trend for the last 15 SIP intervals and values for the last three SIP intervals. The meter shows the demand trend for Active import and Active export. This is based on the load survey SIP interval.



The demand trend is shown on the meter display (under Demand>Demand Trend menu).

5.5.5 Last IP demand

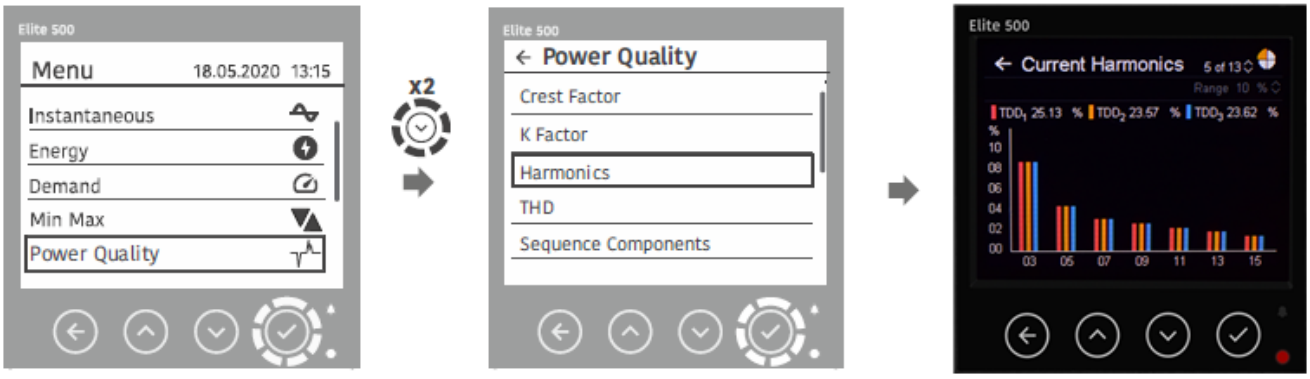
The Last IP demand menu shows the last IP demand for Active, Reactive, Apparent and Ampere demand. This shows the average value of the last DIP interval.



The Last IP Demand is shown on the meter display (under Demand>Last IP Demand menu) and can also be read using ConfigView.

5.5.6 Harmonics

Elite 500 shows the graphical display of voltage and current harmonics.



Note: The Power Quality menu options will be available based on the meter variant. The meter variant information can be viewed on the meter display under Miscellaneous>Product Information>Catcode. Refer to Table 1 for variant details.

Use ^ and v keys to navigate through the voltage and current harmonics displays.

You can view the harmonics graph for the desired Range %. Press ✓ to enable the Range (in %) selection.

Use ^ and v keys to scroll through the available options. Select the desired option and then press ✓ to save the value and go back to the Harmonics sequence.

5.6 Functional specifications

Elite 500 series of meters are pre-configured at the factory-end. Certain configurations can be modified using the ConfigView Suite and/or with the help of meter touch keys. Refer to section List of configurable features and parameters on page 65 for configurable features.

Note:

- On changing the configuration using ConfigView, meter display will reset to main menu.
- The screenshots are for illustration purpose only and may change as per the latest development in the BCS.

5.6.1 Energy definition

Elite 500 variants measures, records and displays metered energy values for each configured energy register. The meter maintains current and historical energy registers separately for each assigned energy type. By default, the following energy types are supported by the meter:

1. Active total - forwarded
2. Apparent total - forwarded
3. Reactive lag (Q1+Q3)
4. Reactive lead (Q2+Q4)
5. Active import total (Q1+Q4)
6. Active export total (Q2+Q3)
7. Net active total energy (Import – Export) or (Export – Import)
8. Reactive import (Q1+Q2)
9. Reactive export (Q3+Q4)
10. Apparent while active import
11. Apparent while active export
12. Active import total (Q1+Q4) - L1
13. Active import total (Q1+Q4) – L2
14. Active import total (Q1+Q4) – L3
15. Active export total (Q2+Q3) - L1
16. Active export total (Q2+Q3) – L2
17. Active export total (Q2+Q3) – L3

Table 2: Energy list

Configuration of energy definition using ConfigView

In ConfigView window, select the meter name and then in Configuration sub-folder click **Energy Definition**. The list of energy registers that the meter supports will appear as shown below:

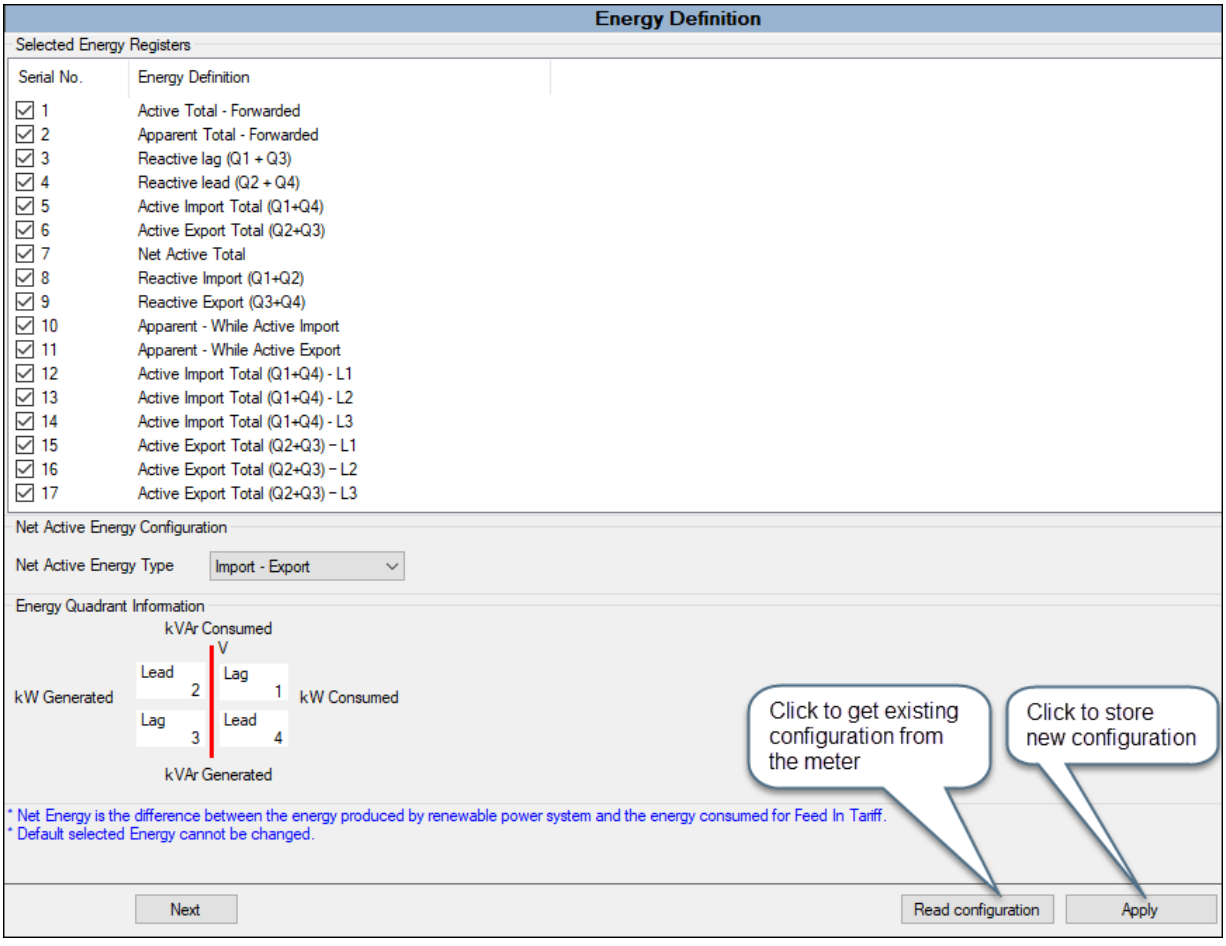


Figure 3: Energy definition

Note: You cannot change the default selected energies.

You can only configure the Net active energy as ‘Import - Export’ or ‘Export - Import’. By default, Net active energy type is configured as ‘Import - Export’.

Note: On changing the energy registers, the value of all Rate registers and MD registers will be reset and the billing history will be cleared.

5.6.2 Maximum demand

Elite 500 variants can maintain MD (Maximum Demand) registers for supported energy channels. Energy demands are monitored periodically at each configured DIP (Demand Integration Period) to record the maximum demand value of each energy type. DIP can be set to 1, 2, 5, 10, 15 or 30 minutes. It supports fixed-window and sliding-window type demand computation. The meter maintains current and historical registers separately for each MD energy type, changing the MD energy registers triggers the meter to store the current MD value in historical MD register. The meter supports the sliding interval of 5 minutes for DIP interval of 15 minutes; and it supports the sliding interval of 5, 10 or 15 minutes for DIP interval of 30 minutes.

The meter maintains two types of MD registers for each energy type:

- Cumulative MD registers – stores historical information which is the summation of all MD values recorded up to previous billing. The meter maintains separate cumulative MD registers for each MD energy type.
- Universal MD registers – stores the maximum of daily (0-24 hrs) demand values recorded at each DIP. The meter maintains separate universal MD registers for each MD energy type.

Configuration of MD energies using ConfigView

In ConfigView window, select the meter name and then in Configuration sub-folder click **Maximum Demand.** You can select the DIP as shown below:

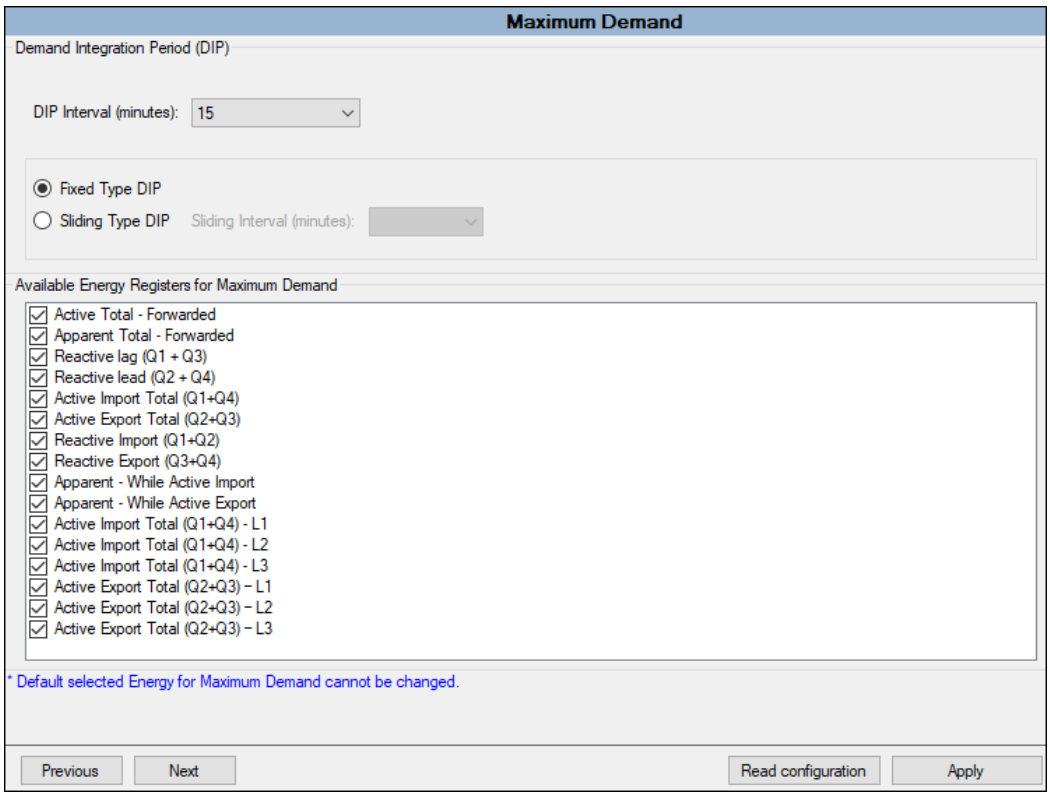


Figure 4: Maximum demand configuration

Note:

- Energies cannot be configured for MD.
- On changing the DIP or sliding interval, the current registers values are stored in the historical registers.

5.6.3 Energy snapshots

Elite 500 records daily cumulative energy values at a predefined time as configured in the meter. Each energy type configured for daily energy snapshot will have separate cumulative registers that will hold data only from the previous day. The meter can store the data for 90 days for 10 parameters.

With the help of ConfigView Suite, these energies can be selected from the configured energies. In addition, you can select the snapshot recording time since midnight (in steps of 30 minutes). This feature is not configurable from the display touch keys.

Configuration of energy snapshots using ConfigView

In ConfigView window, select the meter name and then in Configuration sub-folder click **Energy Snapshots**. You can select energy registers for snapshots from the list as shown below:

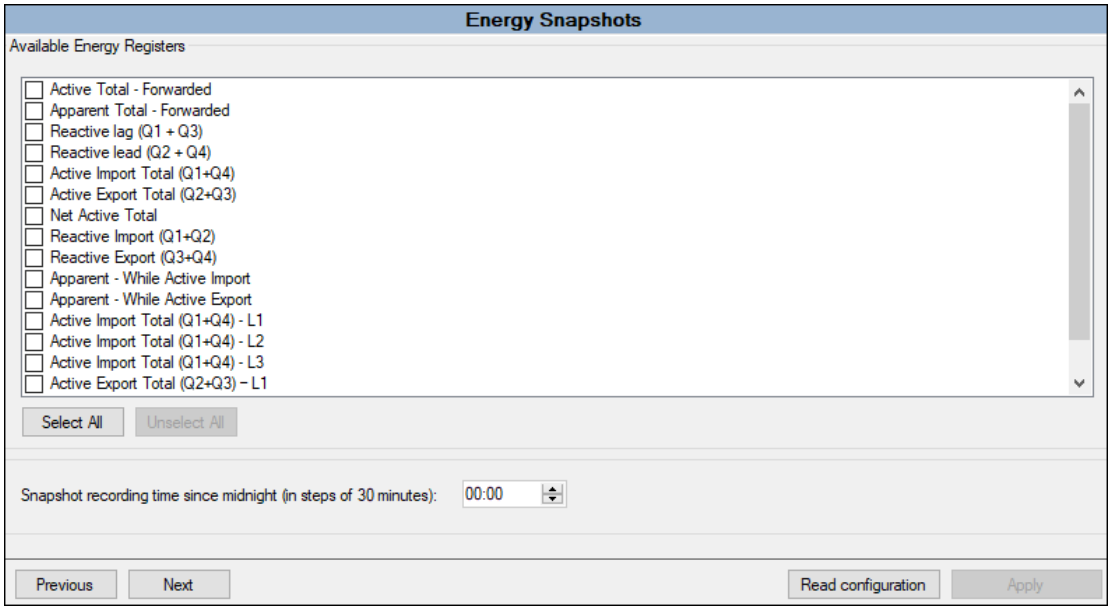


Figure 5: Energy snapshot configuration

Note: On changing the energy registers for daily energy snapshot, the daily energy snapshot data will be cleared.

5.6.4 Load profile

Elite 500 supports dual loggers. Load profile data comprises energies and instantaneous parameter values recorded by the meter at fixed intervals for predefined number of days. The number of days of load profile data that the meter can record depends on the SIP (Survey Integration Period) as well as the number of energies and instantaneous parameters configured in the meter for the selected logger type. It supports only fixed-window type load profile.

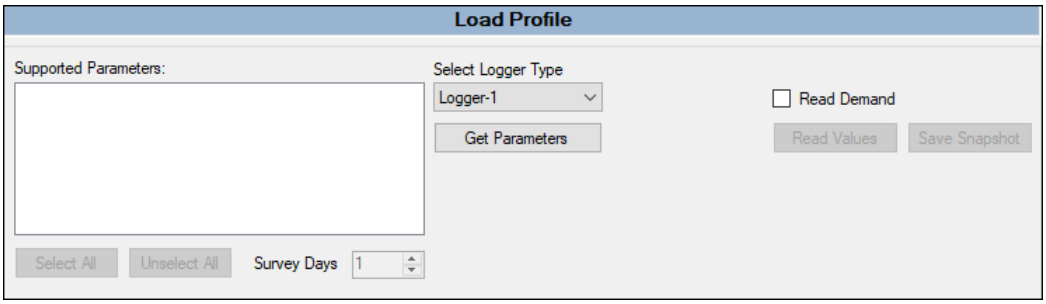
Using ConfigView, you can configure load profile data logging of energies, instantaneous parameters, pulse counters and SIP as per the requirement.

You can also select SIP for both primary and secondary loggers using the meter's Settings menu (using display touch keys).

Primary logger (Logger-1):

Primary logger (Logger-1) can log up to 17 energy and demand channels' values and up to two pulse counters with an integration period of 5, 15, 30 and 60 minutes. The meter can store approx. 12500 parameter days at 30 minutes SIP.

Note: The demand values can be read by selecting the Read demand checkbox (which is available in ConfigView under section Reading>Load profile).



Secondary logger (Logger-2):

Secondary logger (Logger-2) can log up to 24 instantaneous values with an integration period of 1, 2, 5, 10, 15 and 30 minutes. The meter can store approx. 40000 parameter days at 30 minutes SIP.

Load profile data stored for each instantaneous parameter is the average over a SIP.

Load profile data logging energies can be selected from the energies configured in the meter. In addition, the following instantaneous parameters can be selected for fixed load survey logging:

- Phase-wise and average voltage
- Phase-wise and average current
- Neutral current
- Phase-wise and average power factor
- Frequency
- Phase-wise voltage THD
- Phase-wise current THD
- Phase-to- phase voltage and Average phase-to-phase voltage

Note:

- In case of HV 3-phase 3-wire, phase 2 related instantaneous parameters, phase-wise and average voltage will not be applicable for load profile logging.
- In case of 1-phase 2-wire, phase 2 and phase 3 related instantaneous parameters will not be applicable for load profile logging.

Configuration of load survey parameters using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Load Profile**. You can select energy channels for load profile from the energy list populated as shown below:

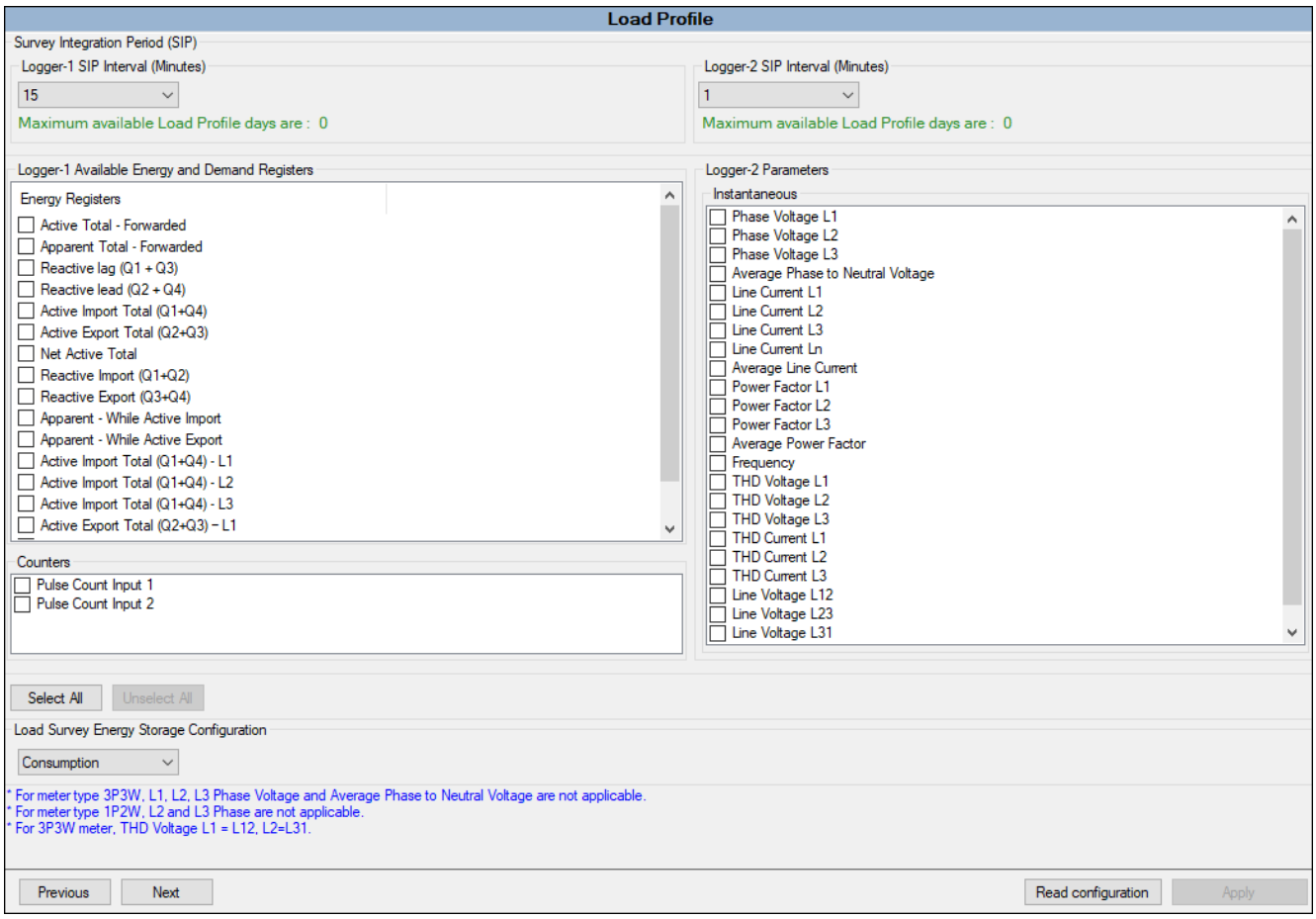


Figure 6: Load profile configuration

Note:

- Load survey energy storage can be configured as cumulative or consumption.
- On changing the SIP or number of parameters for the logger (Logger-1 or Logger-2), the Load profile data for that logger will be erased.

5.6.5 Metrological LED

Elite 500 variants have got one Metrological LED that can be set to flash at a rate proportion to the rate of consumption of the assigned energy. The energy can be assigned using ConfigView Suite. The number of flashes over a period corresponds to the amount of energy registered by the meter.

Configuration of Metrological LED using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Metrological LED**.

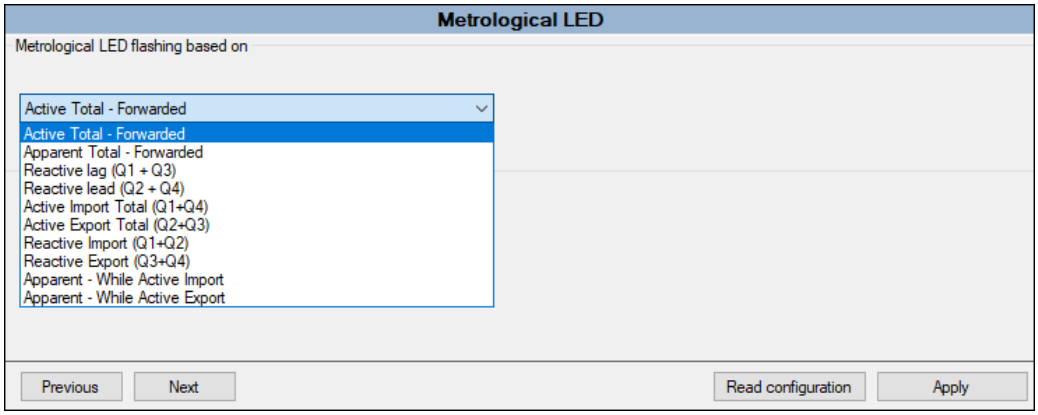


Figure 7: Metrological LED configuration

5.6.6 Billing dates

Elite 500 records snapshot of the measured energies on predefined billing dates. You can select a maximum of 12 billing dates. These dates are defined using ConfigView which can be uploaded into the meter either at the factory-end or at the installation site through configuration file but cannot be uploaded into the meter over Modbus protocol. Snapshot of all the configured energies will be taken on every billing cycle. Billing dates are not configurable from the meter's Settings menu (display touch keys).

Configuration of billing dates using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Billing Dates**.

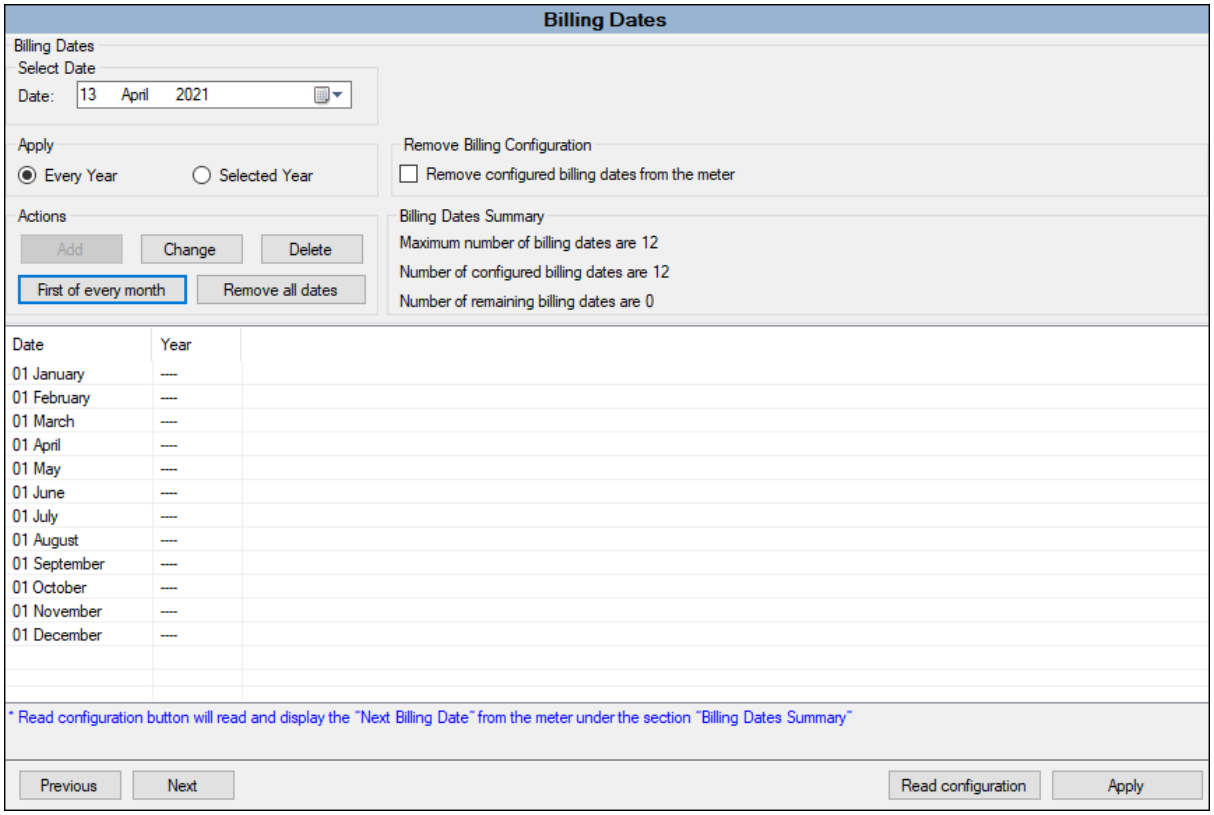


Figure 8: Billing dates configuration

5.6.7 Daylight Saving Time (DST) definition

Internal clock in Elite 500 meter variants are configured to display standard base time. These meters have DST feature that can be used to move the meter clock forward or backward by half-an hour or more to adjust the meter time where applicable. The date and time of change along with the offset time can be defined using ConfigView. You can set the DST start date and end date which can be sent to the meter over Modbus protocol. DSTs are not configurable from the meter's Settings menu (display touch keys) but are configurable from ConfigView.

Configuration of DST definitions using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **DST Definitions**.

By default, DST date configuration will be disabled.

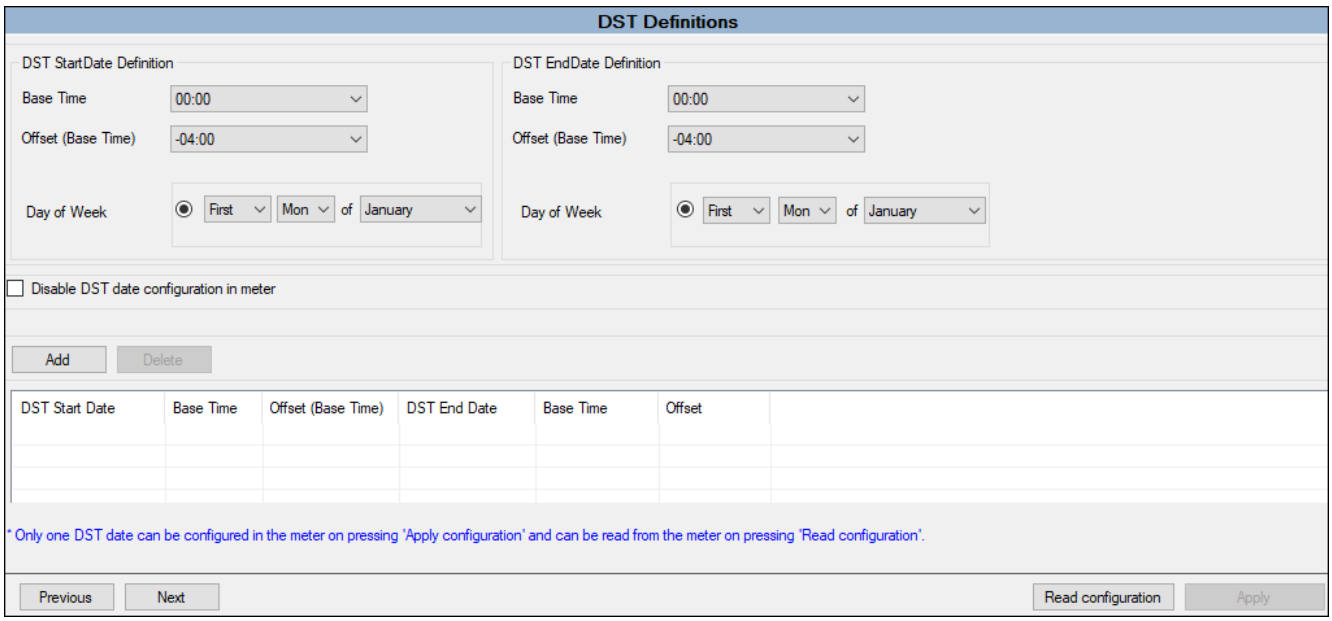


Figure 9: DST configuration

5.6.8 Favourite parameter configuration

This option is used for your selection of display parameters for favourite pages.

When the favourite sequence is full, you will need to delete the display parameter in this sequence to make space for the new one, so be sure before selecting parameters as maximum 15 parameters can be selected in favourite pages display sequence. A maximum of 5 display parameters can be added to each of the three favourite pages.

Configuration of Favourite pages on the meter display using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Favourite parameter configuration**.

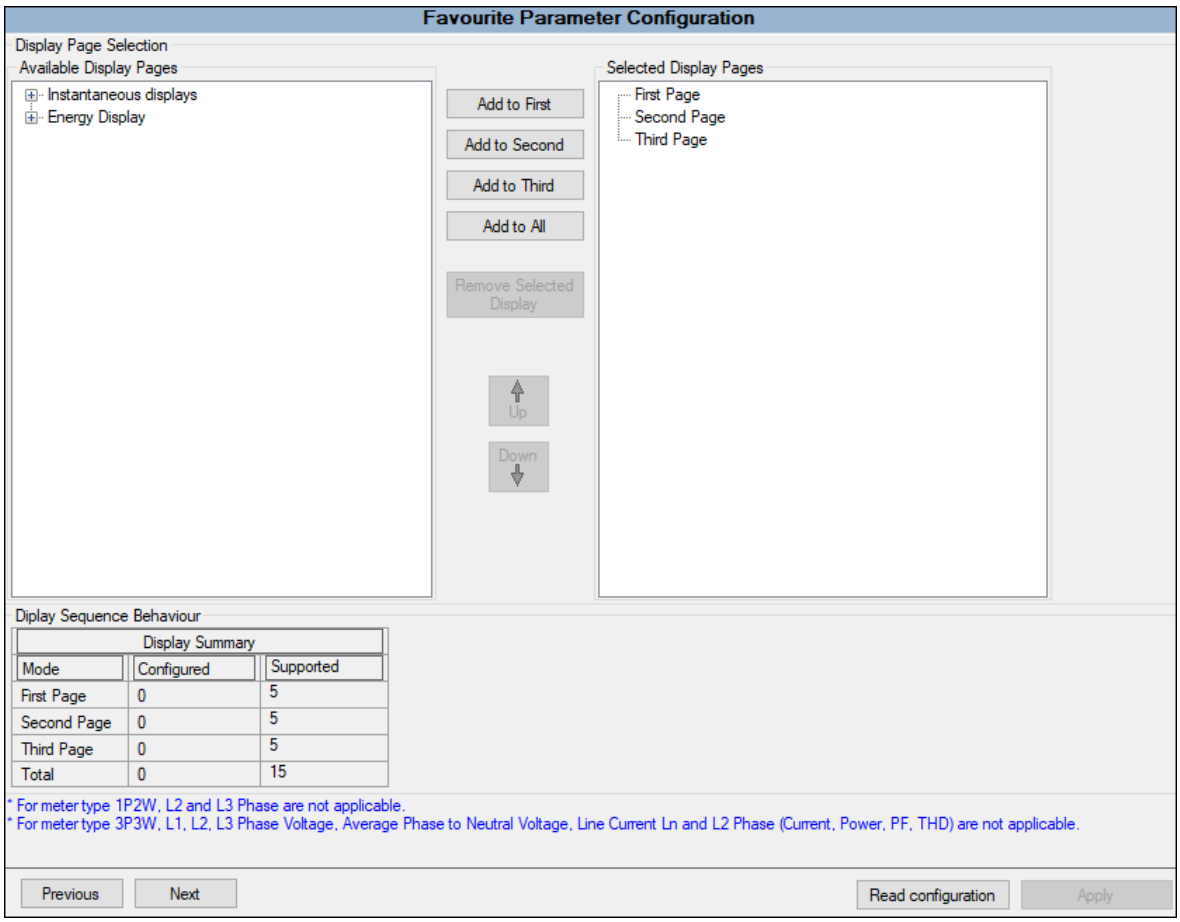


Figure 10: Favourite parameter configuration

5.6.9 Min-Max parameters

Elite 500 meter variants measure the following instantaneous parameters every second and record the maximum and minimum value for each.

- Phase-wise voltage
- Phase-wise current
- Phase-wise active power (kW)
- Phase-wise reactive power (kVAr)
- Phase-wise apparent power (kVA)
- Frequency
- Minimum power factor (Lead and Lag)
- Voltage THD
- Current THD

Note: Min-max power will be based on the absolute value.

All the above recorded values are configured to display on the meter. The meter resets these recorded values daily, weekly or at the time of billing; or may never reset as configured. You can configure the Min-Max reset criterion using Actions>Reset configuration in ConfigView or using the meter's Settings menu (using display touch keys).

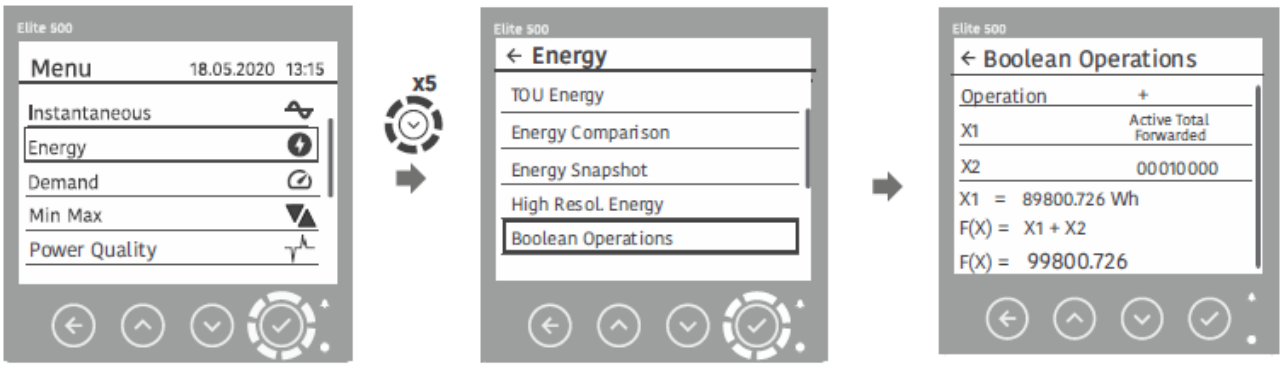
5.6.10 Ammeter functionality

Elite 500 works as an ammeter when no line voltage is applied. In this case, meter measures only current magnitude and value of other parameters such as instantaneous, load survey and ampere demand will be shown as zero.

5.6.11 Boolean operations

Elite 500 supports addition, subtraction, multiplication and division of energy values. The boolean operations are used in case of meter replacement, energy credit and for energy consumption per square feet calculation.

Note: A maximum energy offset of 99.999999 M can be added in a boolean operation.



5.7 Optional plug-in modules

Elite 500 supports field replaceable modules. All the modules are hot pluggable.

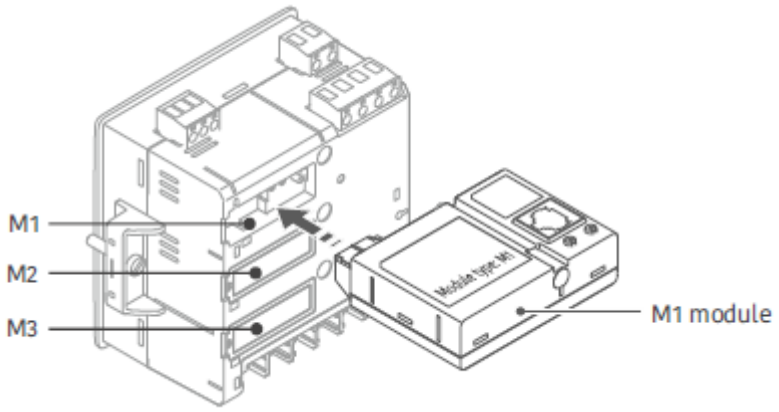


Figure 11: Fitting the module in the respective socket

5.7.1 Input/ Output (I/O) modules

Elite 500 meter variants have an Input/ Output (I/O) module socket (M2) at the rear to which you can attach any of the following I/O modules. The following I/O Modules are available for Elite 500 series of meters which are provided depending on the requirement:

- Pulse input/output or
- Three alarm outputs

Any authorised personnel can remove or replace these Modules at the installation site. After attaching the Module when the auxiliary power supply is switched on, the meter will automatically detect the attached Module. The meter is configured with default settings for both pulse input/output and three alarm output modules. The configuration will be applied depending on the module connected. The configuration can be modified using ConfigView.

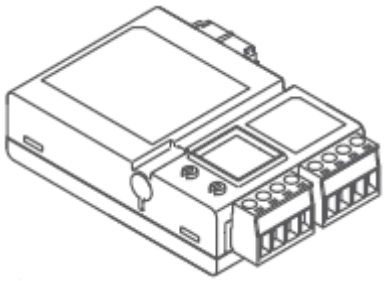


Figure 12: M2 (Pulse I/O or Alarm O/P module)

5.7.1.1 Pulse Input/ Output module

This module has two configurable pulse inputs/outputs, one fixed pulse output, and one alarm output.

Pulse duration can be configured from 20-300 ms in steps of 20 ms.

Configuration of pulse input/output module using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Input/ Output Modules**. Select the **Module card type** as PIPO Module.

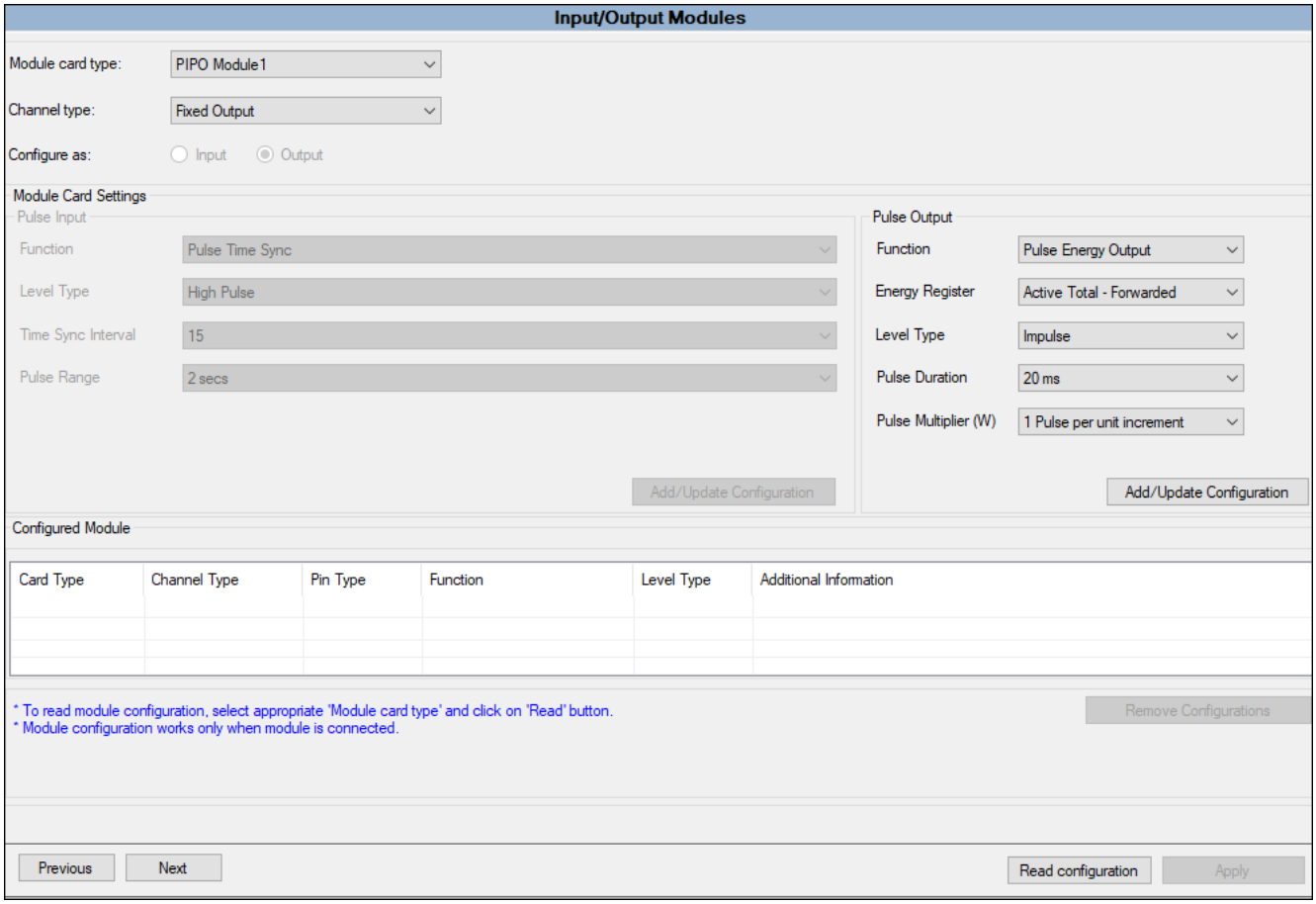


Figure 13: Pulse Input/Output module configuration

Click the **Read configuration** button to download the existing configuration from the meter.

Select the Module card type as ‘PIPO Module 1’ from the dropdown list.

Select the Channel Type as Fixed output, Configurable I/O 1, Configurable I/O 2, or Alarm output for input, output and alarm configuration.

Complete the screen as per your requirements.

Click **Add/Update configuration** to add or update the selected configuration.

To remove a configuration from the list, select the configuration and click **Remove configuration**.

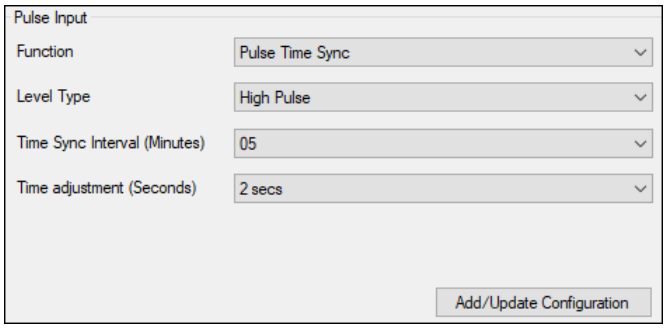
When you have completed input and output configuration, click **Apply** to update the configuration in the meter.

i. Configuring Pulse input

Pulse input function can be configured for pulse time sync, pulse counter or circuit breaker monitoring application.

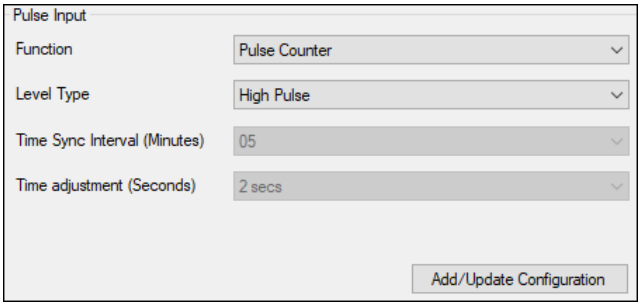
Pulse time sync: Elite 500 meter supports time sync through pulse input.

You can configure time synchronisation settings using ConfigView by selecting the Level type (High or low pulse), time sync interval (in minutes) to specify the frequency with which the meter synchronises and time adjustment (in seconds).



Pulse counter: Elite 500 meter supports the pulse counter function for pulse input.

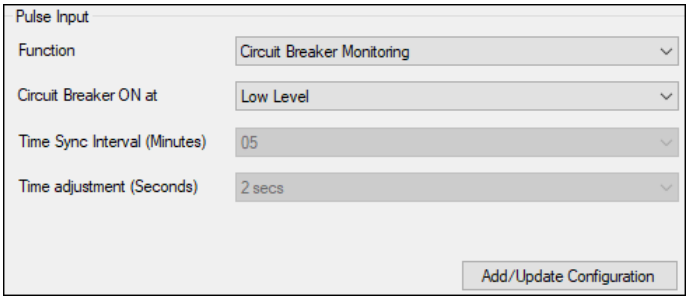
You can configure pulse counter settings using ConfigView by selecting the Level type as high pulse or low pulse.



Circuit breaker monitoring: Elite 500 meter supports circuit breaker monitoring through pulse input.

You can configure 'Circuit breaker On at' Low level or High level using ConfigView.

If 'Circuit breaker On at' is configured as Low level, then on High level pulse input, the circuit breaker status will be Off.

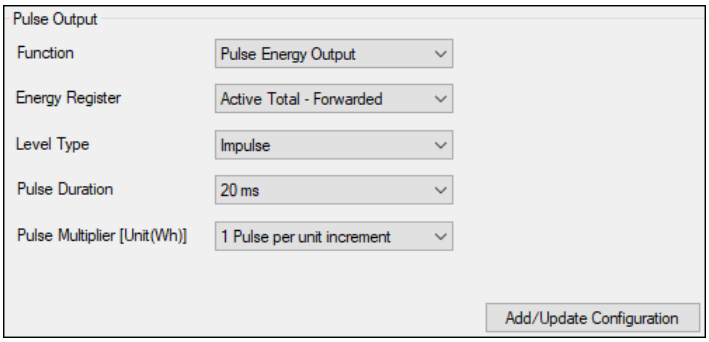


ii. Configuring Pulse output

Pulse output function can be configured for pulse energy output and event indication.

Pulse energy output: You can configure the pulse energy output settings using ConfigView by selecting the energy register from the drop-down list, level type, pulse duration (in millisecond) of the generated pulse and pulse multiplier.

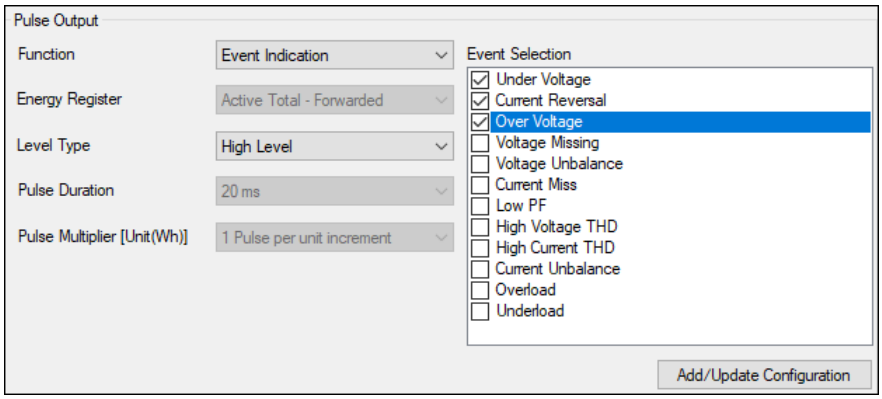
Pulse multiplier is the ratio of output pulses to energy register increments. List of values in the pulse multiplier drop-down list is populated based on the commissioning.



Event indication: Elite 500 meter supports event indication through pulse output/alarm output.

You can configure the event indication settings using ConfigView by selecting the events and level type.

Note: Events must be defined (refer to section Events configuration for configuring events) before configuring event indication through pulse output.



Note:

- Energy must be defined before configuring pulse outputs.
- When configurable pulse input/output is configured as an output, then pulse input should not be connected to it otherwise it will be damaged.
- When a module is replaced in a meter variant, you may reconfigure it using ConfigView.

5.7.1.2 Three alarm outputs

Configuration of alarm output module using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Input/ Output Modules**. Select the **Module card type** as 3 Alarm Module.

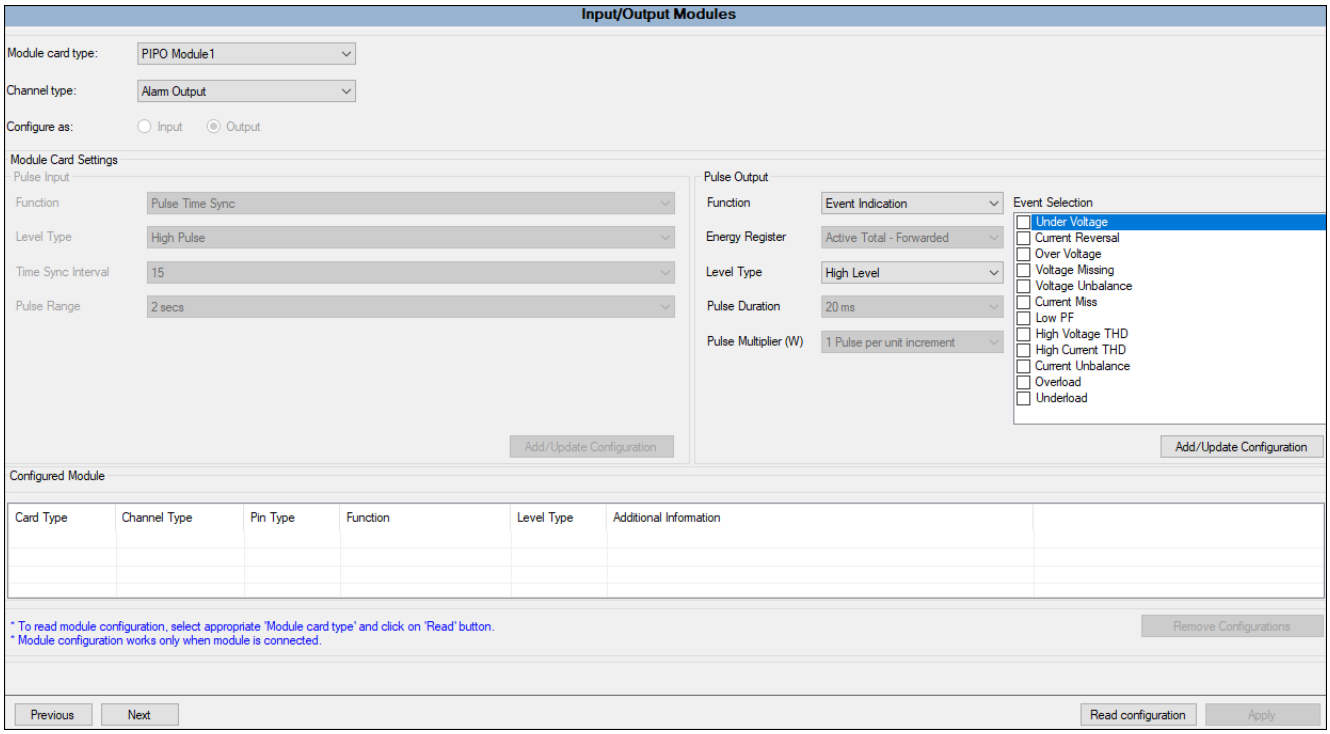


Figure 14: Three alarm outputs module configuration

Note:

- Energy must be defined before configuring pulse outputs.
- When a module is replaced in a meter variant, you may reconfigure it using ConfigView.

5.7.2 Analogue output module

Elite 500 meter have an Analogue output Module socket (M3) at the rear to which you can attach the analogue output module which is provided depending on the requirement.

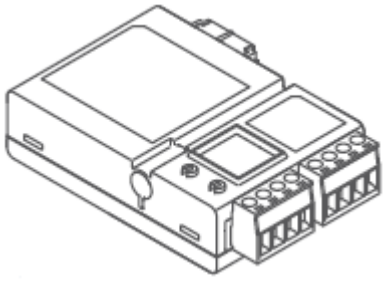


Figure 15: M3 (Analogue O/P module)

Four 4-20 mA, 0-10 mA or 0-20 mA Analogue Outputs

This module is used as transducer where voltage, current and other instantaneous electrical parameters will be converted to industry standard of 4-20 mA, 0-10 mA or 0-20 mA. All four analog outputs are self-powered and does not need any external power supply to provide 0-20 mA. Maximum loop resistance is 500 ohms.

Without a breakpoint, the transfer characteristic between input and output is purely linear. A breakpoint allows the curve to be adjusted for non-linear characteristics. For example, this can be done to apply a correction for a deficiency in a sensor, or to ‘roll off’ the sensitivity at the top end.

The outputs are configurable using the ConfigView configuration tool.

Configuration of four analogue outputs module using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **Analogue Output Configuration**.

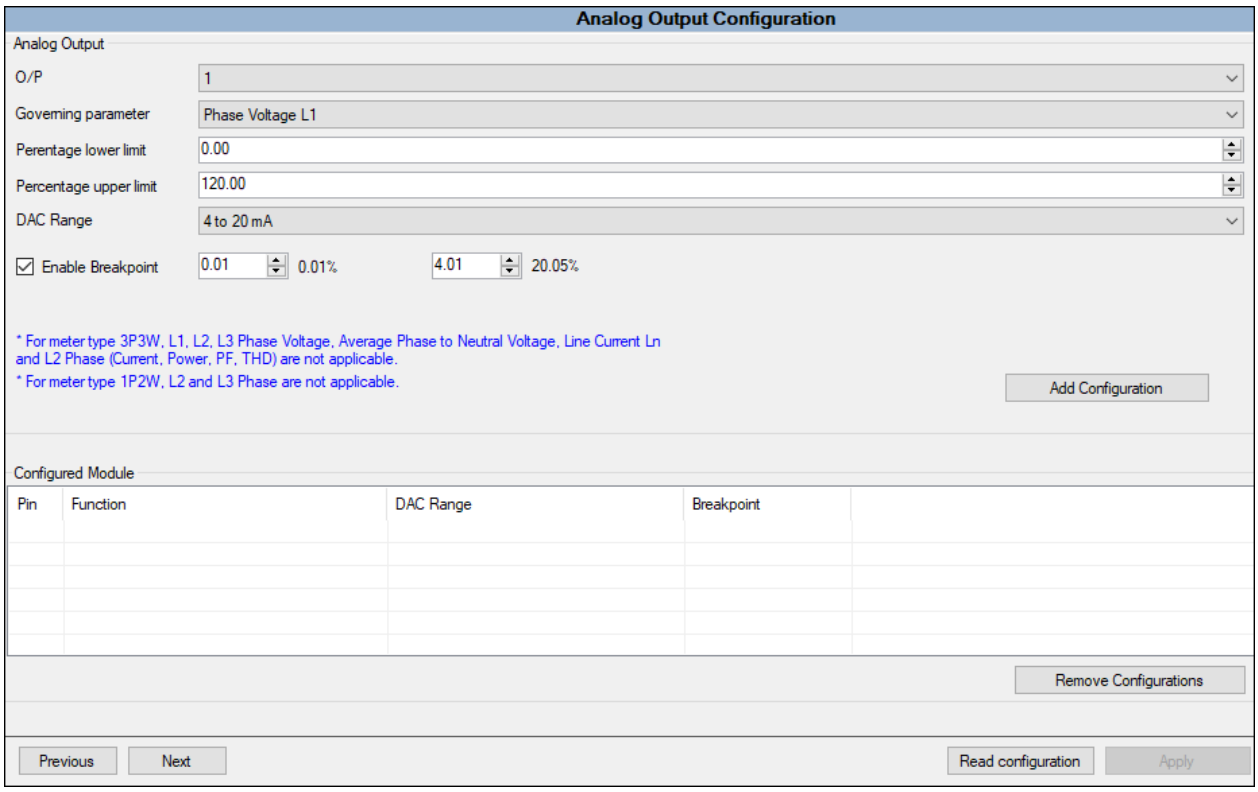


Figure 16: Analogue output module configuration

Note: When a module is replaced in a meter variant, configure it using ConfigView.

5.7.3 Ethernet module

Elite 500 meter variants have an Ethernet Module socket (M1) at the rear to which you can attach Ethernet Module. The following three Ethernet Module variants are available of which any one can be used at a time depending on the requirement:

- Modbus TCP/IP: This is used for TCP/IP communication with single meter. In this case, the Ethernet module is attached to each meter.
- Modbus TCP/IP Gateway: This is used to communicate with multiple meters. Multiple meters are connected in a RS485 network with any one meter having Modbus TCP/IP Gateway module attached to it. Meter with TCP/IP gateway module acts a bridge between the PC with Modbus client on ethernet and meters connected on RS-485 serial link to this meter. The meter converts the Modbus TCP query to Modbus RTU and sends it to the serially connected meters. It converts the RTU response received to Modbus TCP response and send it back to the client PC.
- BACnet

  Note: For BACnet, Modbus TCP/IP and Modbus TCP/IP Gateway communication modules,

LED	Description
Green LED - Steady On	Link is established
Yellow LED - Flashing	Activity is in progress

- Profinet

  For Profinet, the IP address can be configured using Profinet configuration tools. The IP address configured using Profinet configuration tool can be viewed on the meter display under Miscellaneous>Ethernet.

  Note: The IP address configured in IP configuration is not applicable for Profinet.

  Note: For 3P3W, V1 THD=V12 THD, V2 THD=V23 THD and V3 is not applicable.

- IEC 61850

  For IEC 61850, the IP address can be configured using IP configuration or DHCP (Dynamic Host Configuration Protocol). To set dynamic IP for IEC 61850, configure the IP address, subnet mask and default gateway as zero in IP configuration.

  Note: For Profinet and IEC 61850 communication modules,

LED	Description
Yellow LED - Steady On	Link is established
Green LED - Flashing	Activity is in progress

Note: User need to restart the meter if BACnet/Modbus TCP/IP module is replaced by Profinet/IEC 61850 module or vice versa.

IP configuration

This module is field replaceable. A replaced or newly connected module should be configured using ConfigView Suite or from the meter's Settings menu (using touch keys). With the help of ConfigView Suite, IP Address, Subnet Mask and Default Gateway can be configured in the meter (refer to ConfigView help for details). The IP setting is configured for Modbus TCP/IP / Modbus TCP/IP gateway / BACnet / IEC 61850 module attached to the meter.

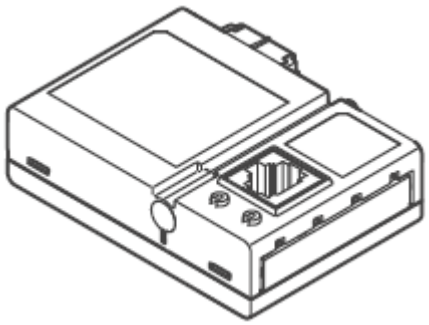


Figure 17: M1 (Ethernet module)

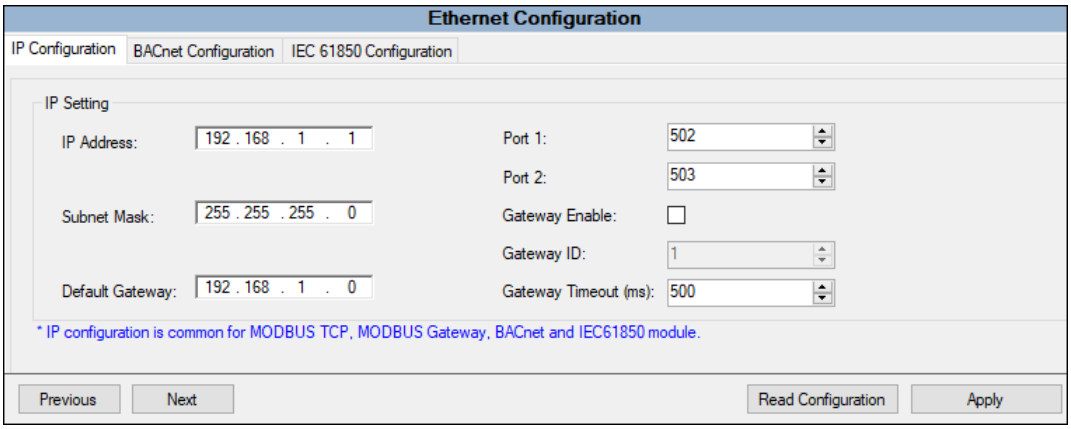


Figure 18: IP configuration

BACnet configuration

BACnet/IP protocol allows communication between the components of a building automation and control system (for example, HVAC, lighting control, security systems and related equipment).

The BACnet/IP protocol defines a number of services that are used to communicate between devices and the objects that are acted upon by those services.

You can configure the BACnet module through ConfigView.

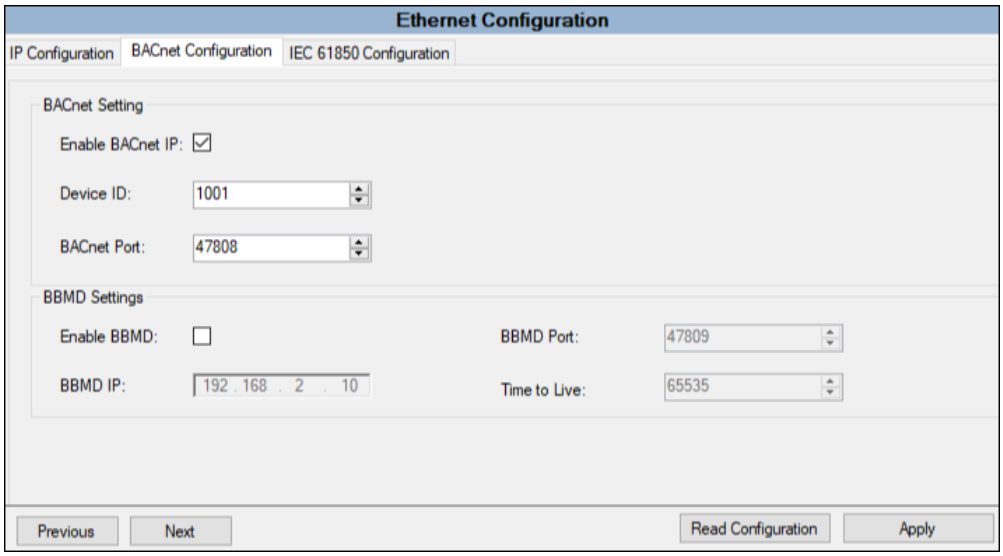


Figure 19: BACnet configuration

BACnet settings:

Select ‘Enable BACnet IP’ to enable BACnet/IP communications with the meter. Enter the Device ID which must be unique on the network. Enter the port the meter uses for BACnet/IP communications. The default is the standard BACnet/IP port (47808).

BBMD settings:

Select ‘Enable BBMD’ to enable registration of the meter as a foreign device. Enter the IP address of the BACnet/IP Broadcast Management Device (BBMD) you are using on your network. Enter the BBMD port that is used for communication with the BBMD. By default, the BBMD port is set as 47809. Enter the length of time (in seconds) the BBMD keeps an entry for this device in its foreign device table.

IEC 61850 configuration

IEC 61850 is an Ethernet-based protocol designed for electrical substations. It is a standardised method of communications, developed to support integrated systems composed of multi-vendor, self-describing IEDs (intelligent electronic devices) that are networked together to perform monitoring, metering and real-time non-critical protection and control.

Elite 500 can be integrated into an IEC 61850 system as an IED (or server), supporting a minimum of two IEC 61850 client connections and a FTP connection (used for transferring configuration files).

You can change the IEC 61850 configuration using CID file. The CID file can be generated through ConfigView, using ICD file provided by the manufacturer.

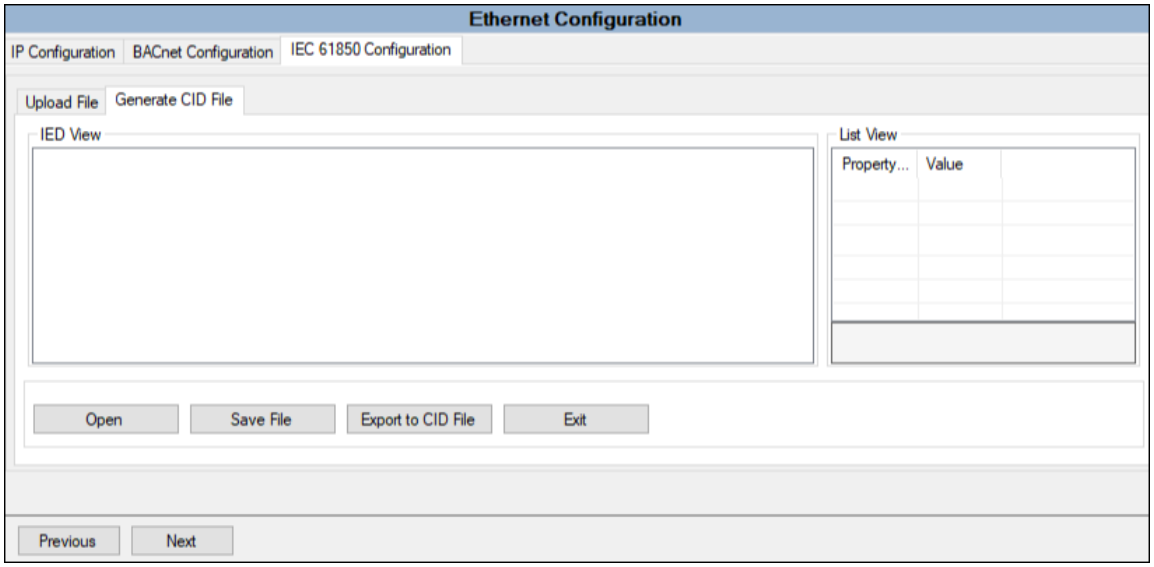


Figure 20: Generating CID file

You can upload the configuration files for IEC 61850 communication through ConfigView.

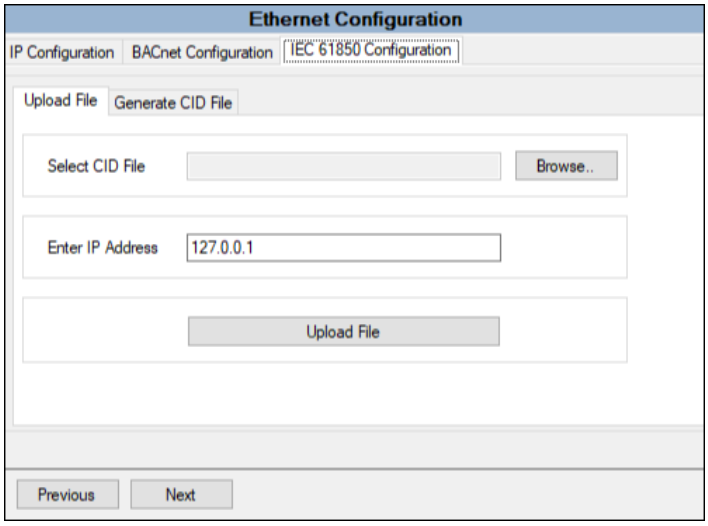


Figure 21: Uploading CID file for IEC 61850 configuration

5.8 TOU configuration

Configuration of TOU using ConfigView

In ConfigView window, select the meter name and then in the **Configuration** sub-folder click **TOU configuration**.

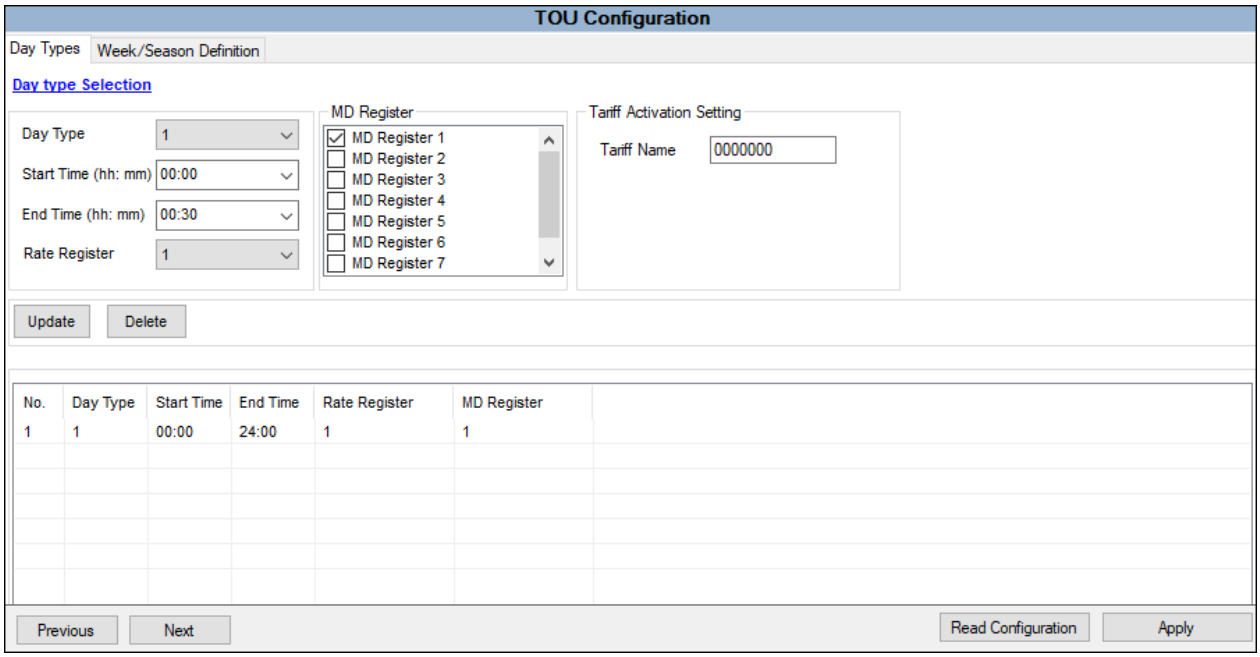


Figure 22: TOU configuration

The meter supports a maximum of 8 time-of-use (TOU) zones in a day, 8 rate registers (for both energy and MD), 8 seasons and 8 day types.

5.9 Coincident demand

Elite 500 meter can be configured to coincident demand for the parameters based on the peak demand of the configured energy registers.

Coincident demand configuration using ConfigView

In ConfigView window, select the meter name and then in Configuration sub-folder click **Coincident demand configuration.** You can select MD energy registers from the energy list for peak demand and trigger demand as shown below:

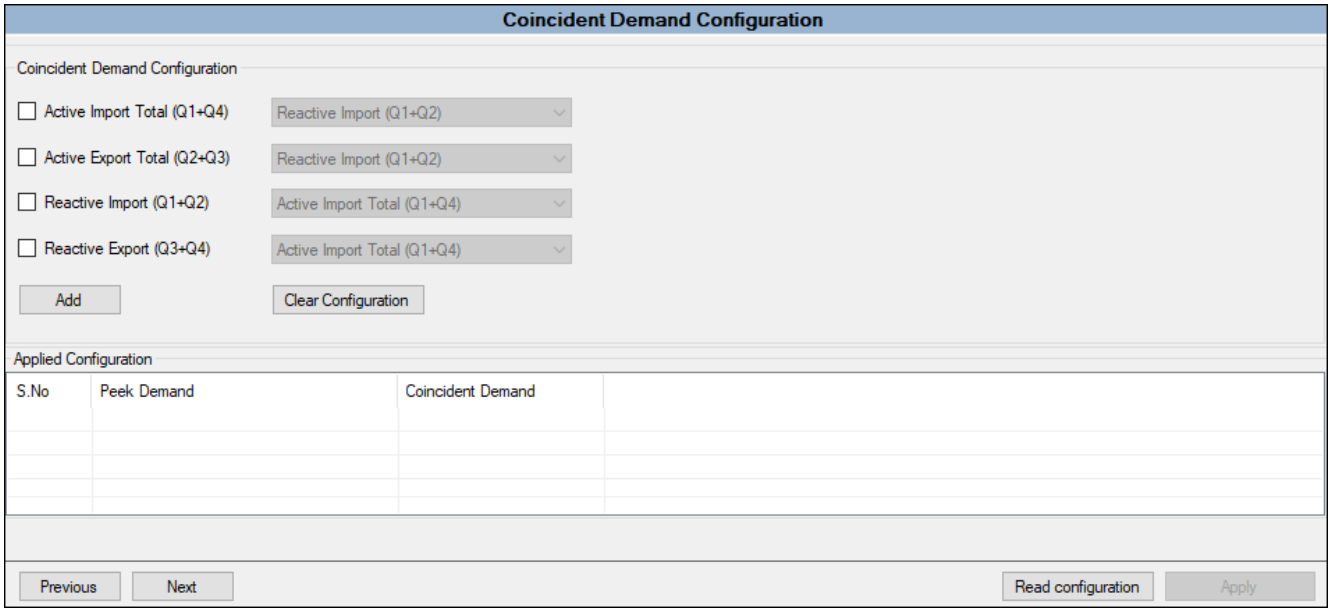


Figure 23: Coincident demand configuration

The integration period will be same as the demand integration period of MD.

5.10 Energy comparison configuration

Elite 500 meter can be configured to show the daily, weekly and monthly comparison for the configured energy registers on the meter display.

Configuration of energy comparison using ConfigView

In ConfigView window, select the meter name and then in Configuration sub-folder click **Energy comparison configuration.** You can select the energy registers from the energy list for daily, weekly and monthly comparison as shown below:

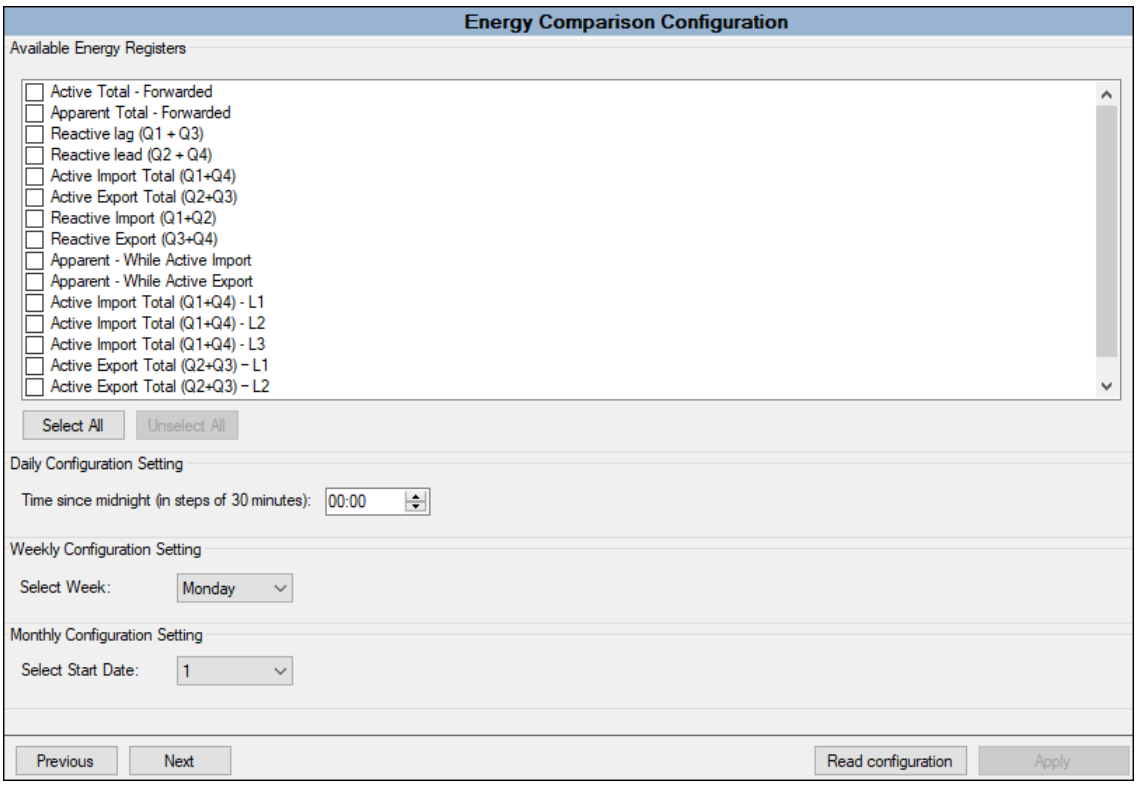


Figure 24: Energy comparison configuration

Note: The Energy comparison configuration performed using ConfigView is applicable only for the meter display. In ConfigView, comparison of all the energies can be read by clicking Reading>Energy comparison reading.

5.11 SNTP configuration

Elite 500 meter supports time sync through SNTP (Ethernet communication) protocol. Time sync through SNTP is considered most suitable method in revenue as well as power quality application.

You can enable network time synchronisation and configure SNTP time synchronisation settings using ConfigView by specifying the SNTP Server IP Address and selecting the Time Sync Interval (in hours) to specify the frequency with which the meter synchronises over SNTP.

Note:

- Reference time for SNTP configuration is 1 January 2000, 00:00 hours.
- Time sync through SNTP will be preferred in case time sync through pulse input is also configured.
- Time sync through SNTP is supported over Modbus TCP/IP, Modbus TCP/IP gateway, BACnet and IEC 61850.

Configuration of SNTP configuration using ConfigView

In ConfigView window, select the meter name and then in Configuration sub-folder click **SNTP configuration.** You can configure the SNTP server as shown below:

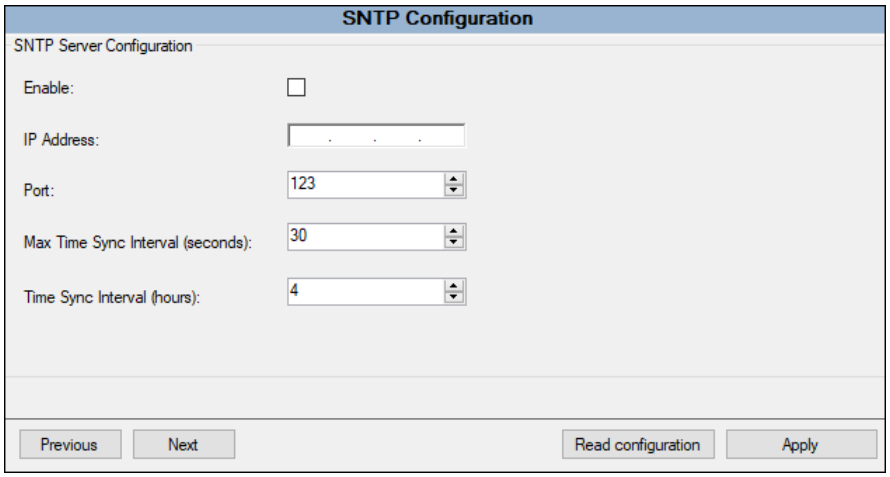


Figure 25: SNTP configuration

5.12 Modbus programmable addresses

Elite 500 meter supports Modbus configurable reading for the configured Modbus programmable addresses. A maximum of 50 parameters can be configured for Modbus configurable reading. Modbus configurable reading can be performed using ConfigView.

Configuration of Modbus programmable addresses using ConfigView

In ConfigView window, select the meter name and then in Actions sub-folder click **Modbus programmable addresses**. The list of registers that the meter supports will appear as shown below:

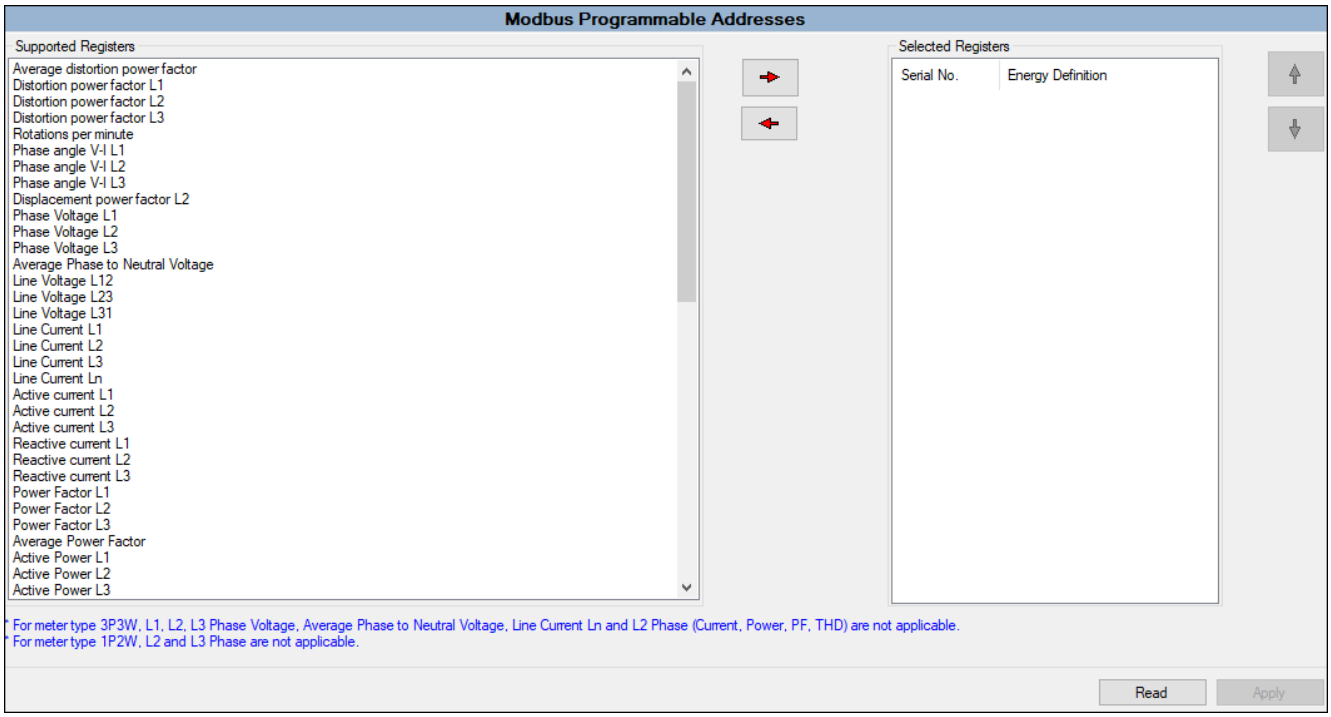


Figure 26: Modbus programmable addresses

5.13 Power quality parameters

The meter records the following power quality parameters:

Crest factor

Crest factor is the ratio of peak to RMS voltage values.

For a pure sinusoidal waveform, crest factor is equal to 1.414. The meter uses the following equation to calculate crest factor:

$C = V_{peak} / V_{RMS}$

Where,

C = Crest factor

V_{peak} = Voltage peak

V_{RMS} = Voltage RMS

K factor

K-factor relates the heating effect of a distorted current in a transformer to a sinusoidal current with the same RMS magnitude — it describes a transformer's ability to serve non-linear loads without exceeding rated temperature rise limits.

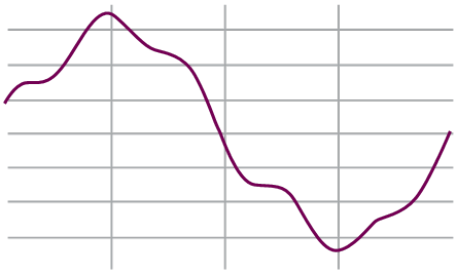
The K-factor is equal to the sum of the squares of the harmonic currents multiplied by the squares of the harmonic order. The meter uses the following equation to calculate K-factor:

$$K = \frac{\sum_{n=1}^{h} (Ih^2 \times h^2)}{\sum_{n=1}^{h} Ih^2}$$

Where K is the K-factor, h is the harmonic order and Ih is the true RMS current of harmonic order h.

Voltage harmonics

Harmonics are integral multiples of the fundamental frequency of the sine wave.



Total harmonic distortion

Total harmonic distortion (THD) is a measure of the total per-phase voltage, current and power harmonic distortion present in the power system.

THD provides a general indication of the quality of a waveform. THD% is calculated for each phase of both voltage, current and power.

Sequence components

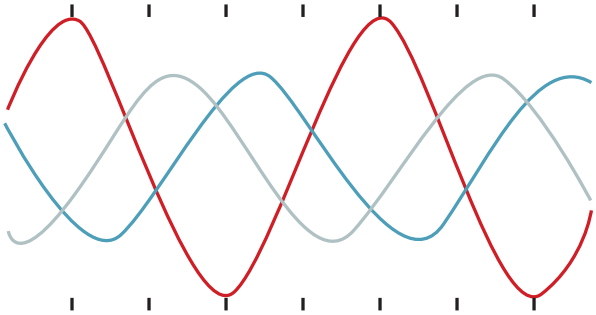
Positive Sequence (U1): A balanced three-phase system with the same phase sequence as the original sequence.

Negative sequence (U2): A balanced three-phase system with the opposite phase sequence as the original sequence.

Zero Sequence (U0): Three phasors that are equal in magnitude and phase.

Voltage unbalance

Condition in a poly-phase system in which the RMS values of the line voltages (fundamental component) and/or the phase angles between consecutive line voltages are not equal. Voltage unbalance is the deviation of each phase from the average voltage of all three phases.



u2=U2/U1

u0=U0/U1

u2 is the ratio of negative to positive sequence.

u0 is the ratio of zero to positive sequence.

Current unbalance

Condition in a poly-phase system in which the RMS values of the line currents (fundamental component) and/or the phase angles between consecutive line currents are not equal. Current unbalance is the deviation of each phase from the average current of all three phases.

u2=U2/U1

u0=U0/U1

5.14 Events

Elite 500 continuously monitor voltage, current and phase angle for each phase. When the meter is powered, meter name will appear as the first display, which is then followed by the display Menu. Any events detected during the meter's normal operation will appear instantly on the meter display.

The meter can detect the following types of events:

- Phase-wise voltage missing
- Phase-wise current reversal
- Under or over voltage
- Low PF
- Over or under load
- Voltage unbalance
- Current unbalance
- Configured module card unplugged
- Power on/off

- Phase-wise current miss
- Phase-wise high voltage THD
- Phase-wise high current THD
- Voltage sag
- Voltage swell

Additionally, the transactional events will be logged in the transaction log.

The various fault conditions are described below as they appear on the meter display in the event of such faults. The following events can be configured using ConfigView:

Event	Description
Under voltage	Under voltage is detected if any of the connected voltages is less than 75% of the nominal value ($V_{nominal}$). Voltage missing and feeder fail should not be present.
Current reversal	Current reversal is detected if CT is connected with incorrect polarity (current direction) in any of the three phases. This test is not performed if the current is below 10% of the I_{basic}. Current reversal will be logged if polarity of any phase is changed.
Over voltage	Over voltage is detected if any of the connected voltages exceeds or equal to 115% (configurable) of the nominal value ($V_{nominal}$) for greater than the configured persistence time. By default, the occurrence limit is 115% and restoration limit is 110%.
Voltage missing	Voltage missing is detected if phase voltage is below the threshold percentage of nominal voltage where the respective line current is above the threshold percentage of I_{basic}. By default, the occurrence limit is 5% and restoration limit is 40%.
Voltage unbalance	Voltage unbalance is detected if (Voltage Max - Voltage Min) > 10% (configurable) of V_{max}. The event will be restored if (Voltage Max - Voltage Min) > 75% (configurable).
Current miss	Current miss is detected if line current is below 1% (configurable) of I_{basic}. The event will be restored if line current for all the phases are equal to or greater than 10% (configurable) of I_{basic}.
Low PF	Low PF is detected if the average power factor is less than 0.5 (configurable) and average line current is greater than or equal to 10% (not configurable) of I_{basic}.
High voltage THD	High voltage THD is detected if VTHD is greater than or equal to 10% of Vnom * Inom (configurable). By default, the occurrence limit is 10% and restoration limit is 7%.
High current THD	High current THD is detected if ITHD is greater than or equal to 10% (configurable). By default, the occurrence limit is 10% and restoration limit is 7%.
Current unbalance	Current unbalance is detected if (Line current Max - Line current Min) >= 30% (configurable) of I_{basic}.
Overload	Overload is detected if power (kVA) consumption exceeds the configured power (kVA) rating. Current reversal, current miss, voltage missing and feeder fail should not be present.
Underload	Underload is detected if power (kVA) consumption is less than the configured power (kVA) rating (110% of Vnom*Inom). Current reversal, current miss, voltage missing, and feeder fail should not be present.

The following events cannot be configured:

Event	Description
Voltage sag	Voltage sag is logged when low voltage is detected if any of the connected voltages is less than 90% of the nominal value ($V_{nominal}$) for greater than 1 second. This is not configurable.
Voltage swell	Voltage swell is logged when over voltage is detected if any of the connected voltages exceeds 110% of the nominal value ($V_{nominal}$) for greater than 1 second. This is not configurable.
Configured module card unplugged	An event is logged when a configured module card is unplugged.
Feeder fail	Feeder fail is detected if any of the connected voltages is less than 20% of $V_{nominal}$. The event will be restored if all the connected voltages are equal to or greater than 50% of $V_{nominal}$.

5.14.1 Events configuration

The events can be configured using ConfigView.

In ConfigView window, select the meter name and then in Configuration sub-folder click **Events Configuration**.

You can configure the threshold limits and delays for the respective event as applicable.

The occurrence and restoration limits are expressed as percentages of configured nominal voltage.

Events are logged if the condition for the detection of an event persists for a specified duration, known as the delay. Events can have a different delay for occurrence and restoration as applicable. The delay for an occurrence as well as for restoration is configurable for respective event as applicable.

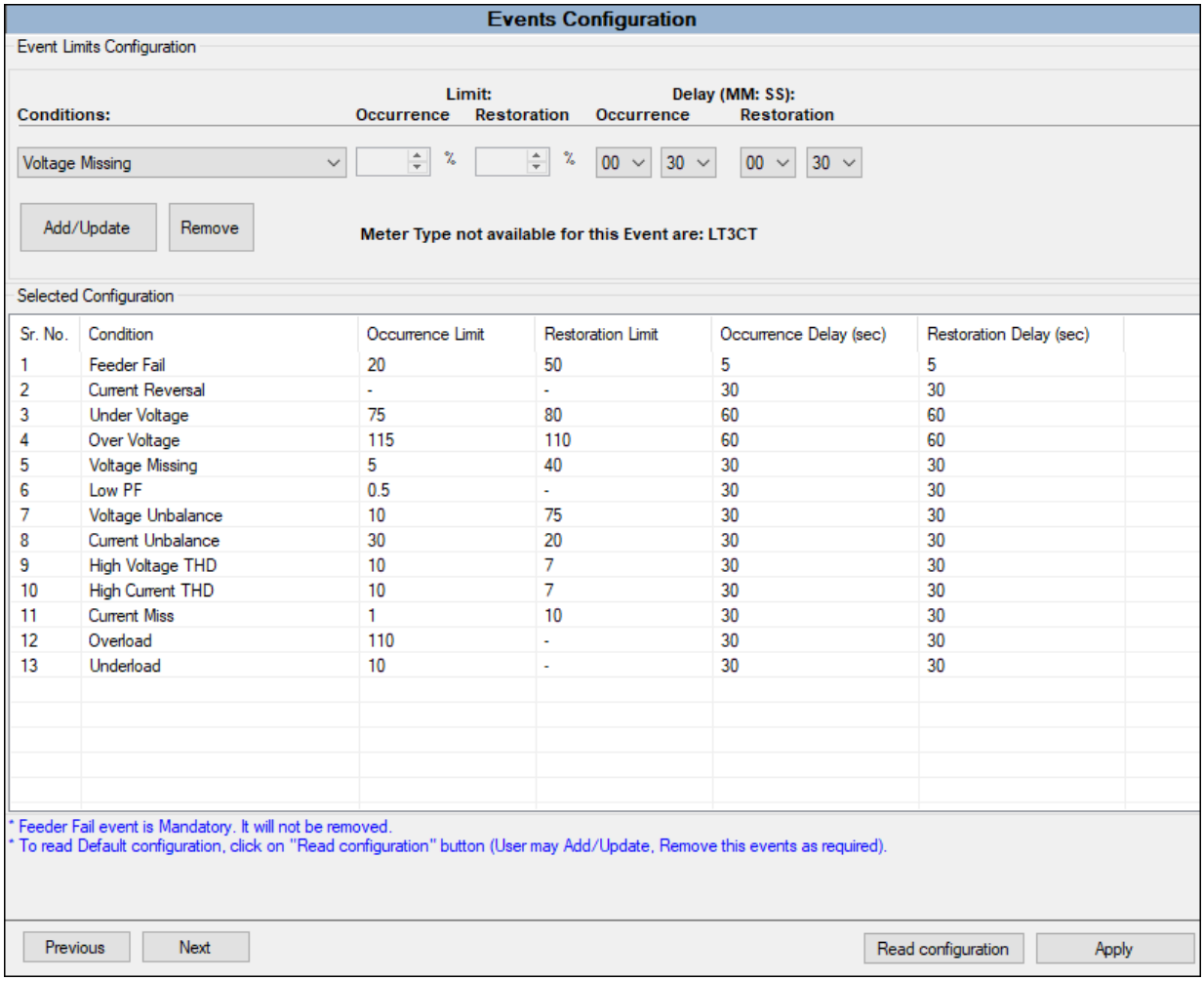


Figure 27: Events configuration

Note: Under voltage event will not be logged, if Feeder fail event has occurred and has not restored.

The following table shows the events supported for the connection types.

Events	Connection type							
	LT4	**HT4**	**3PT1CT**	**LT3CT**	**HT3**	**2PT3CT**	**2PT2CT**	**1P2W**
Under voltage	Y	Y	Y	-	Y	Y	Y	Y
Current reversal	Y	Y	-	-	Y	Y	Y	Y
Over voltage	Y	Y	Y	-	Y	Y	Y	Y
Voltage missing	Y	Y	Y	-	Y	Y	Y	Y
Voltage unbalance	Y	Y	Y	-	Y	Y	Y	-
Current miss	Y	Y	Y	-	Y	Y	Y	Y
Low PF	Y	Y	Y	Y	Y	Y	Y	Y
High voltage THD	Y	Y	Y	-	Y	Y	Y	Y
High current THD	Y	Y	Y	Y	Y	Y	Y	Y
Current unbalance	Y	Y	-	-	Y	Y	Y	-
Overload	Y	Y	Y	Y	Y	Y	Y	Y
Underload	Y	Y	Y	Y	Y	Y	Y	Y

5.14.2 Event indication

Events can be configured to indicate in one or more of the following ways:

- Alarm LED on meter front
- Pop-up on meter display
- Changed digital output level

The alarm LED stops flashing and the digital output returns to inactive low after the alarm state passes.

Note: Multiple events can be selected for a digital output.

5.14.3 Display of events

The events status can be viewed on the meter’s display under Event Logs sequence. A maximum of 15 events can be shown on the meter display. A more detailed description of the meter's events can be viewed in ConfigView under Reading>System conditions option. Via ConfigView, the event log can also be printed out or saved to a file.

Sr.No	Compartment name	Events	Maximum number of events per compartment
1	Voltage related events	Missing voltage phase wise	30
2		Over voltage	
3		Under voltage	
4		Voltage unbalance	
5		Phase wise voltage THD	
6	Current related events	Current reversal	30
7		Current miss	
8		Current circuit open phase wise	
9		Current terminal shorting	
10		Current unbalance	
11		Overload	

12		Underload	
13		Phase wise current THD	
14	Power failure related events	Power fail occurred and restored	30
15		Measurement interruption (Feeder start)	
16		Measurement interruption (Feeder stop)	
17	Transaction related events	3IO 1Alarm module unplugged	30
18		3 Alarm outputs module unplugged	
19		4 analogue outputs module unplugged	
20		Modbus TCP/IP module unplugged	
21		Modbus TCP/IP gateway module unplugged	
22		BACnet IP module unplugged	
23		Time set (through Modbus)	
24		Configuration download	
25		DST Change	
26		MD reset (using meter display touch keys)	
27		MD reset (through communication)	
28		Energy reset	
29		Factory reset	
30		CT/PT change (through Modbus)	
31		CT/PT change (using meter display touch keys)	
32		Upgrade success	
33		Password change (through Modbus)	
34		Password change (using meter display touch keys)	
35		SNTP rejected	
36		Upgrade fail	
37	Other events	Billing cycle	30
38		Circuit breaker (I/O 1) On	
39		Circuit breaker (I/O 1) Off	
40		Circuit breaker (I/O 2) On	
41		Circuit breaker (I/O 2) Off	
42	Diagnostic events	RTC RAM fail	30
43		Data flash fail	
44		EEPROM fail	
45		FRAM fail	
46		Flash fail	
47	PQ related events	Voltage sag	30

48		Voltage swell	
49	All events (except Diagnostic and PQ related events)	All events (except Diagnostic and PQ related events)	30

5.15 TDD configuration

Total current demand distortion (TDD) is a measure of the THD but takes into account the circuit rating. As circuit rating vs. load current rises, TDD drops.

TDD = THD * (fundamental load current / THD circuit rating)

$$TDD = \left(\frac{\sqrt{I_2^2 + I_3^2 + I_4^2 + I_5^2 + \ldots}}{I_L} \right) \times 100$$

Where,

I_n – Individual harmonics of order n

I_L – Max demand load current (in A) can be configured using ConfigView.

In ConfigView window, select the meter name and then in Configuration sub-folder click **TDD Configuration.** You can specify the Max Demand Load Current (in A) as shown below:

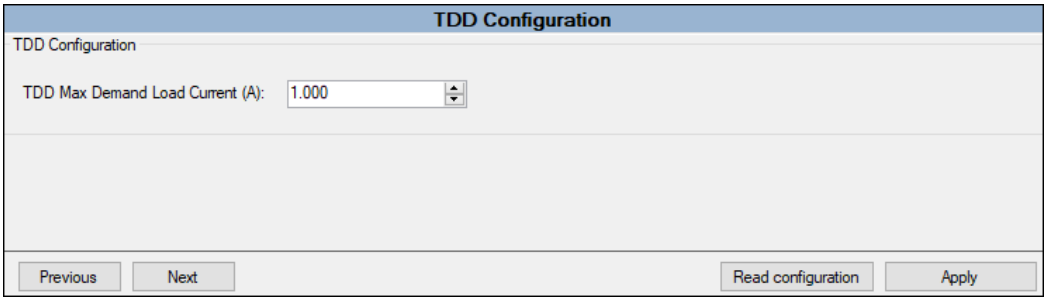


Figure 28: TDD configuration

5.16 Billing cycle

The Elite 500 provides following ways to perform a billing action. Performing a billing action finish current billing cycle and starts a new billing cycle.

- According to billing dates specified in tariff file. A billing action from a billing date is done at the start of the day on the nominated date file
- At the time of tariff activation i.e. whenever a new tariff is activated. Downloading of new tariff having change in Net active energy type (Import-Export) or (Export-Import), CT/VT ratio (scaling), meter type, and TOU.
- Authenticated command for MD reset, energy reset or factory reset from ConfigView or meter touch keys.

5.16.1 History of energy, rate and MD register

Following values are stored in the meter memory each time a billing cycle completes i.e. a billing action is performed.

1. Value of all main energy registers at the time of a billing action. This is maintained in a rollover fashion which may have a maximum of six histories .i.e. all last six historical values will be available to you.
2. Value of all rate registers. This is maintained in a rollover fashion which may have a maximum of six histories .i.e. all last six historical values will be available to you.
3. Value for all MD registers along with date and time of MD occurrence. This is also maintained in a rollover fashion which may have a maximum of six histories .i.e. all last six historical values will be available to you.
4. A special register is also provided for energy type selected for maximum demand which stores cumulative Maximum Demand for all MD register whenever a billing action takes place. Each time billing action takes place, the cumulative register shall increase by the value of their source register.

The purpose of this register is to limit the scope of tampering with Maximum Demand by performing a billing action repeatedly.

5. Value of all Billing PF at the time of a billing action. This is maintained in a rollover fashion which may have a maximum of six histories .i.e. all last six historical values will be available to you.
6. Each energy type configured for daily energy snapshot will have separate cumulative registers that will hold data only from the previous day. The meter can store the data for 90 days for 10 parameters.

6 Communication

Elite 500 meter variants can be interrogated over Modbus protocol for collecting energy and instantaneous electrical parameter values via ConfigView. In addition, certain configurations can be updated in the meter using ConfigView. For this purpose an RS-485 port is provided on the rear panel of these meters which can be used to communicate with the computer COM port and ConfigView via any RS-232 to RS-485 converter. Up to 32 meters can be connected in a RS-485 network. The default communication speed is 9600 bps which can be changed to 38400 bps for faster communication. Each Elite 500 meter must be configured with a unique Modbus ID which is used by the software for communication and identification. The communication port can be used for performing the following tasks:

a. Reading and updating meter Configuration
b. Reading meter information
c. Reading basic electrical parameters
d. Reading current and historical energy values
e. Changing CT-VT ratio in the meter, Modbus communication settings
f. Adjusting meter time
g. Resetting MD (Maximum Demand)

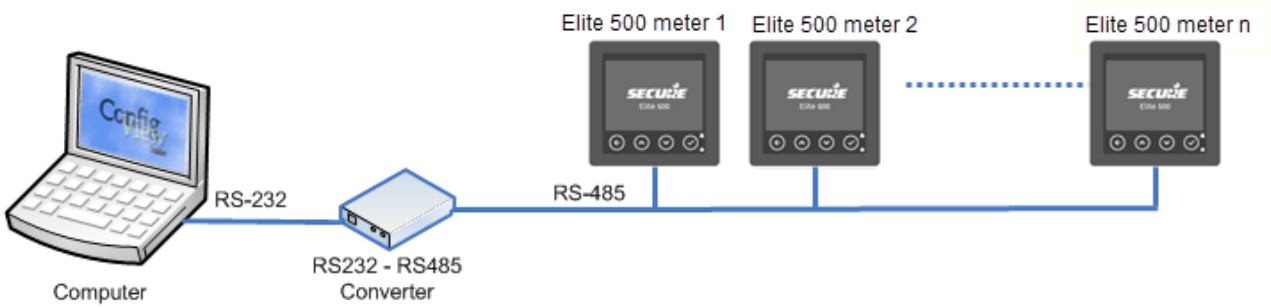


Figure 29: Meter Communication via RS232-RS485 Converter

To setup the communication link from ConfigView, use the ‘Communication Settings’ button as shown below:

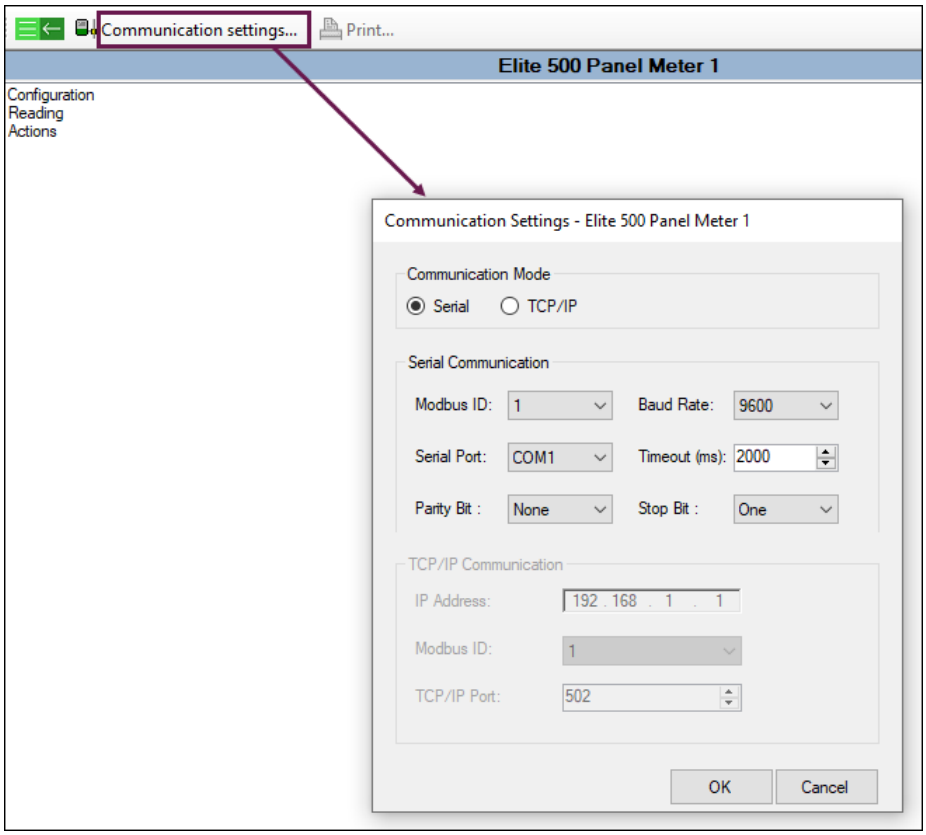


Figure 30: Meter Connection Setting Window in ConfigView

For establishing connection with the meter using ConfigView, it is important to know the Modbus ID and baud rate of the meter you are connecting to. The meter Modbus ID is also configurable using ConfigView.

ConfigView for Configuring Meter Modbus ID

In ConfigView window, select the meter name and then in the **Actions** sub-folder click **Modbus Communication**.

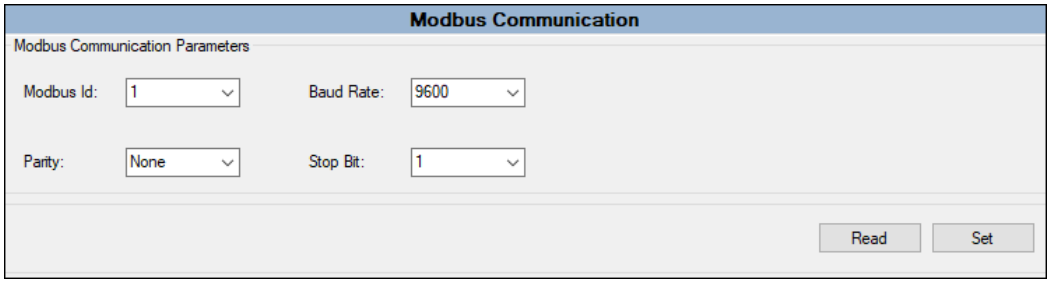


Figure 31: Modbus Communication Configuration with ConfigView

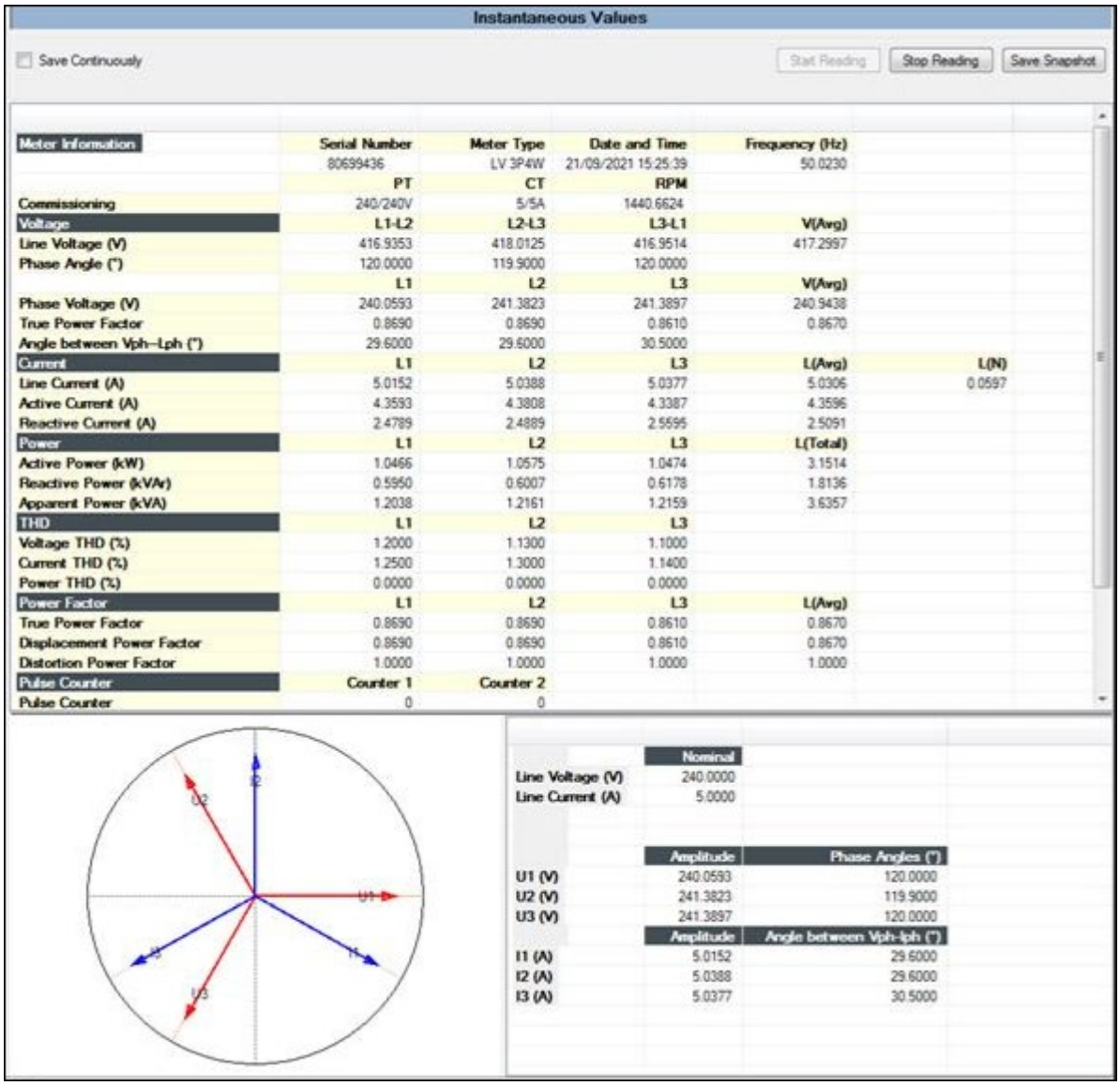
After establishing link with the meter, the following information and parameter values can be read from the meter:

- Meter type
- Program name
- Meter Sr. No.
- Meter time and date
- Phase-to-phase, phase-to-neutral and average voltages
- Phase-wise and neutral line currents
- Phase-wise active currents
- Phase-wise reactive currents
- Phase-wise and average power factors
- Phase-wise and total active powers
- Phase-wise and total reactive powers
- Phase-wise and total apparent powers
- Frequency
- Phase Angles (Phase-to-Phase)
- Cumulative MD (CMD)
- All supported energy values

- All supported historical energy values
- Historical values (billing) generation dates
- MD values with date and time stamp for all supported energies
- MD historical values with date and time stamp for all supported energies
- Cumulative power on-off time
- Power on-off count on meter display
- Cumulative load on-off time
- Daily energy snapshot for all selected energies
- Load profile
- Last 30 events for each compartment (Refer to section Display of events for details)
- Maximum and Minimum parameter values
- Metrological LED pulse rate
- Power quality parameters such as crest factor, K factor, harmonics, total harmonic distortion, sequence components, voltage unbalance and current unbalance
- Time-of-use (TOU) energy
- Coincident demand
- Billing power factor
- Miscellaneous information such as product information, power on/off information, load on/off information, commissioning, modules, meter constant, installation check, self-diagnostics and RGB test

Instantaneous values

The meter measures instantaneous values. Instantaneous values are constantly changing values such as current, voltage, power and harmonics. The instantaneous values are updated every second. The below figure shows the instantaneous values that can be read on the meter. Readings can be viewed with ConfigView or on the display. Most instantaneous values can be logged; for more information, see section Load profile on page 34.



True PF:

TPF (True Power Factor) is the ratio of the active power to the apparent power at the power outlet. TPF shows what portion of apparent power is converted by the load to active power. TPF can be viewed as the sum of useful power and losses.

Displacement PF:

The displacement power factor is the power factor due to the phase shift between voltage and current at the fundamental line frequency. For sinusoidal (non-distorted) currents, the displacement power factor is the same as the apparent power factor.

Distortion PF:

Distortion power factor is a measure of how much the harmonic distortion of a load current decreases the average power transferred to the load.

7 Technical specifications

Electrical	
Wiring configurations	3 phase 3 wire / 3 phase 4 wire
Connection type	LV 3P4W / HV 3P4W / 1CT 3PT / LV 3CT / HV 3P3W / 3CT 2PT / 2CT 2PT / 1P 2W Note: 2CT 2PT connection type is not applicable for Rogowski coil variant.
Measurement voltage range	20 V to 300 V (L-N) max , 35 V to 500 V (L-L) max
Nominal voltage range (U_n)	57.5 to 240 V (L-N), 100 to 415 V (L-L)
Over voltage	150% U_n continuous
Measurement current range	10 mA to 6 A
Nominal current range (I_n)	1 A or 5 A
Starting current	1 mA
Over load	150% I_n continuous
Short time over current	20 times of Imax for 1 second
Frequency range	45 to 65 Hz
Auxiliary supply range	48-300 V DC / 85-300 V AC (50/60 Hz)
Burden	Aux supply (for meter): < 3 W, < 6.5 VA at 240 V AC Aux supply (for meter with modules): < 6.5 W, < 16 VA at 240 V AC Current circuit: < 0.2 VA/phase @ 1A and @ 5A Voltage circuit: < 0.2 VA/phase
Sampling rate	156 samples/cycle/channel
Accuracy	
Energy	Active: Class 0.2S, 0.5S Reactive: Class 0.5S
Voltage	±0.2% FSD,(Up to 2000 kV) – Balanced – Total power 14 GW can be configured based on CT/PT ratings
Current	±0.2% FSD (Up to 25000 A) - Balanced
Frequency	±0.05 Hz over 50/60 Hz ±5%
Powers (Active, Reactive and Apparent)	±0.2% FSD for cumulative and ±0.5% FSD for individual power
Power factor	±0.005 (0.5 lag to 0.5 lead)
Maximum withstand voltage	2 times of nominal voltage value for 1 second repeated 10 times at 10 second interval
Maximum withstand current	1.2 times of I_b continuously
	10 times I_{max} for 1 second
	20 times I_{max} for 0.5 second
	1.5 times of I_b (up to 7.5 A) (only measurement)
Compliance	
Standards (Safety, EMI-EMC, Metrology)	IEC 62052-11, IEC 62053-31, IEC 62059-31-1, IEC 62053-22, IEC 62053-24, IS14697, IEC 61326-1, IEC 61557-12, IEC 61010-1, IEC 61010-2-30, IEC 61850-6, 7-1, 7-2, 7-3, 7-4, 8-1 (as per edition 1 and 2), IEC 61869-10

Environmental	
Protection degree (Ingress protection)	Front fascia: IP 54, Terminal: IP 20
Pollution degree	2
Insulation	Double insulation
Impulse withstand	6.4 kV
Operating temperature	-10°C to + 60°C
Storage temperature	-25°C to + 70°C
Temperature coefficient	0.02% / °C (For conventional CT variant) 0.1% / °C (For Rogowski coil variant)
Altitude	≤ 2000 m
Installation category	CAT III
Humidity	95% non-condensing
Impact energy level	1 Joule (IK06)
Mechanical	
Dimension (L x W x D)	96.0 mm (L) x 96.0 mm (W) x 57.6 mm (D) (without module) 96.0 mm (L) x 96.0 mm (W) x 111.5 mm (D) (with module) Tolerance ± 0.25 mm
Weight	365 g (meter), 50 g (M1 module), 74 g (M2/M3 module)
Terminals	Combicon connector (except current terminals in Conventional variant) Connector: Ring type for current terminal, combicon for voltage, Aux and Modbus RTU (For conventional CT variant) All are combicon connectors (For Rogowski coil variant)
Conductor size	2.5 mm^2
Torque (tightening screw)	0.8 Nm (for current terminals), 0.5 Nm (for module and other terminals)
Material	PC-FR
Features	
Power supply	Range: 48-300 V DC or 85-300 V AC Burden: < 6.5 W, < 16 VA at 240 V AC (with all modules)
Display	TFT for graphical and analytics (3.5 inch) Size: 53 x 70 mm (H x W), 320 x 240 pixels Pixel size: 0.22 mm^2
Two LEDs	LED for metrology LED for alarms/events
Battery	Battery for RTC backup
Input/ Output (I/O) modules- PIPO module/3 Alarm outputs module	• Pulse output: 24-230 V DC or 48-230 V AC @100 mA • Pulse input: 24-60 V AC/DC, 100 mA • Alarm output: 230 V AC / 30 V DC @ 2A • Relay type: SPST, NO

Analogue output module	• Analogue output (self-powered): 0-20 mA, 0-10 mA or 4-20 mA • Max loop resistance: 500 ohm
Communication	
RS-485 port	Modbus RTU, Half duplex, floating point, response time: 100 ms Baud rate: 1200 to 38400 bps (default 9600 bps) Parity bit: none, even, odd Stop bit: 1, 2 Modbus ID: 1 to 247
Ethernet port (RJ-45)	Ethernet over RJ-45, 10/100 Mbit/s Protocol – Modbus TCP/IP / Modbus TCP/IP gateway / BACnet IP / Profinet / IEC 61850
Time synchronization	Through SNTP protocol
For Rogowski coil (Elite 500 variant)	
Rogowski coil type	1000 A with 70 / 140 mm diameter or 4000 A with 140 / 200 mm diameter
Rogowski coil input/output ratio	1000 A / 100 mV or 4000 A / 100 mV
Rogowski coil cable length	3 m
Iprim	1000 A / 4000 A
Iprim range	5% to 100% of Iprim
Starting current	1 A for Iprim 1000 A 4 A for Iprim 4000 A
Accuracy	
Energy	Active - Class 0.5S considering the ideal installation, (35-500 V or better) Reactive - Class 0.5S
Weight	280 g (meter), 50 g (M1 module), 74 g (M2/M3 module)

8 List of configurable features and parameters

Elite 500 meters offer the flexibility to change certain configuration in the meter at client's end to suit their requirement. Although the meter comes with all pre-set default parameter values, it may be necessary to change certain configurable parameters to match the installation type and meet customer's requirements. Configuration of various features or parameters supported in Elite 500 meters can be modified using the following three methods:

- With meter touch keys from the Settings menu
- Modbus commands
- Using the ConfigView Suite

The following table gives a list of configurable features and parameters along with the possible options that can be used to change a configuration:

Configurable features and parameters	Factory configuration	Meter touch keys	ConfigView	Configuration file (ConfigView)
MD Reset	No	Yes	Yes	No
3-phase 3-wire or 3-phase 4-wire selection	No	Yes	Yes	No
CT-VT Commissioning	No	Yes	Yes	No
Energy configuration (Net Active energy only)	No	No	Yes	Yes
Maximum Demand register	No	No	No	No
Demand Integration Period	No	Yes	Yes	Yes
Sliding or Blocked window selection for demand logging	No	Yes	Yes	Yes
Input/output module configuration	No	No	Yes	Yes
Analogue output configuration	No	No	Yes	Yes
Ethernet module configuration	No	Yes	Yes	No
Load profile configuration	No	No	Yes	Yes
Billing dates selection	No	No	Yes	Yes
Metrological LED energy configuration	No	No	Yes	Yes
Energy snapshot	No	No	Yes	Yes
Daylight Saving Time(DST)	No	No	Yes (only one DST dates)	Yes
Favourite parameter	No	No	Yes	Yes
Coincident demand	No	No	Yes	Yes
SNTP	No	No	Yes	Yes
Event configuration	No	No	Yes	Yes
TOU	Yes	No	Yes	Yes
Energy comparison	No	No	Yes	Yes
TDD configuration	No	No	Yes	No
Modbus programmable addresses	No	No	Yes	No
Scalar setting	No	Yes	Yes	No
RPM setting	No	Yes	Yes	No
Load current configuration(For Rogowski Coil)	No	Yes	Yes	No
Modbus communication settings	No	Yes	Yes	No

9 Meter dimensions

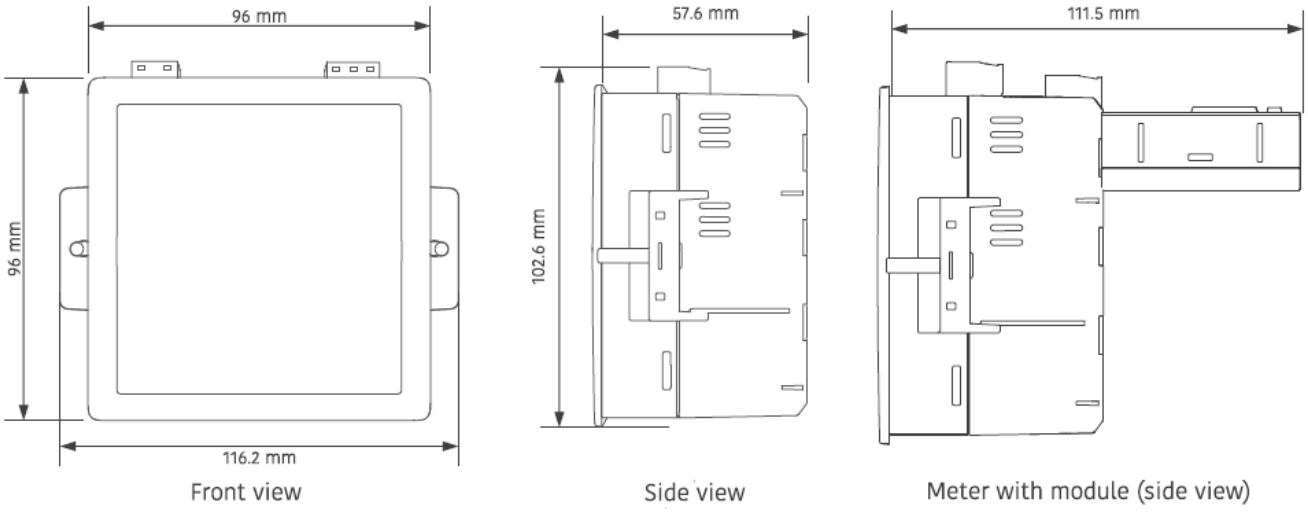


Figure 32: Meter dimensions

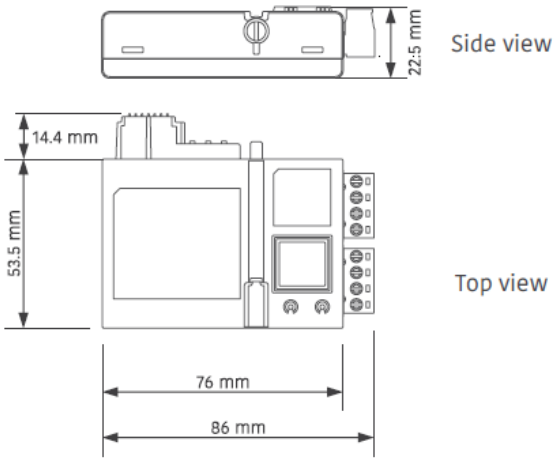


Figure 33: Module dimensions

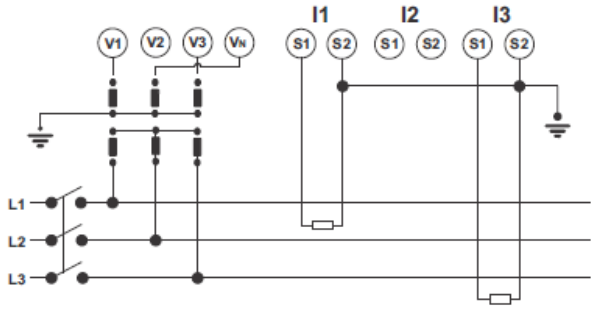
10 Installation and commissioning

The meter should be installed by trained personnel. In addition to the safety precautions recommended in this manual, local best practice and regulatory stipulations should be always followed during the installation and commissioning process.

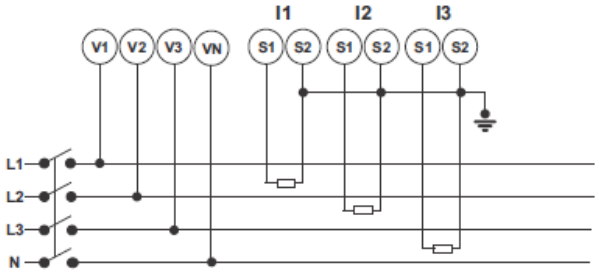
10.1 Connection diagram

Note:

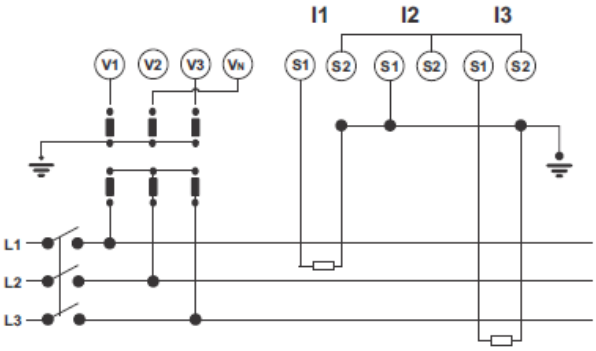
- One side of the CT secondary wiring should be earthed. The diagram shows ‘S2’ side earthed, but it is permissible to ground the ‘S1’ side instead, according to local practice.
- For current terminals, ring, U and pin lugs can be used for Conventional CT variant.
- Elite 500 supports Conventional CT or Rogowski coil depending on the requirement. Refer to the purchase order for details of the product supplied based on the requirement.



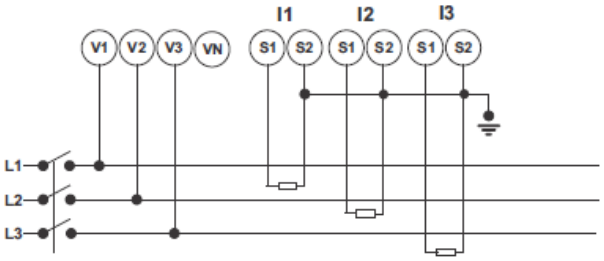
HV 3P3W



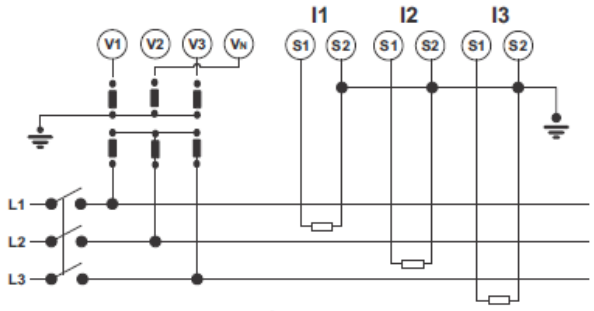
LV 3P4W



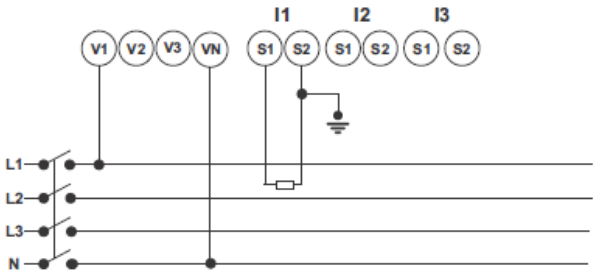
2CT 2PT



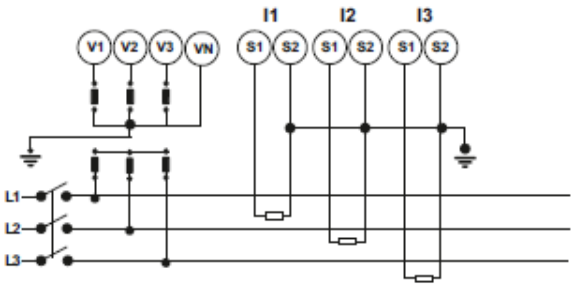
LV 3CT



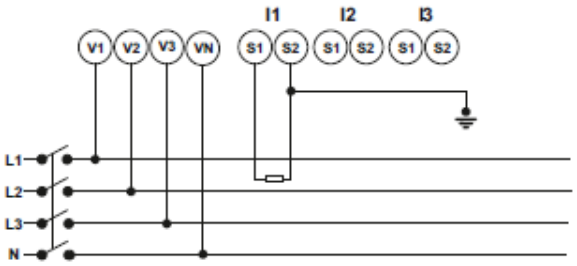
3CT 2PT



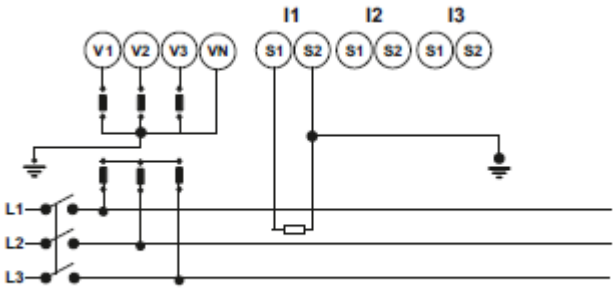
1P 2W



HV 3P4W



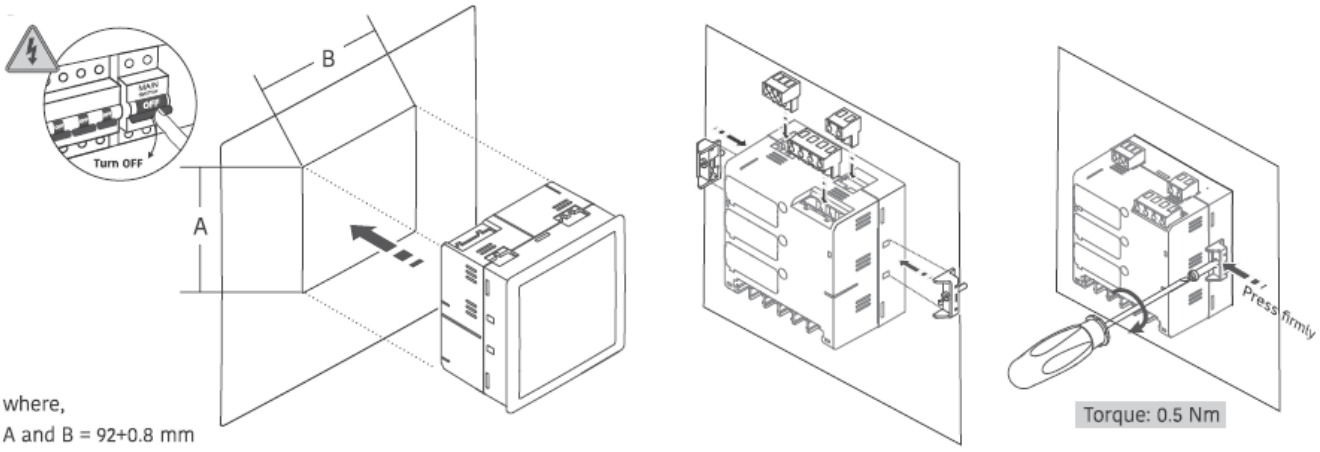
3P4W 1CT 3PT LV



3P4W 1CT 3PT HV

10.2 Mounting the meter on the panel

Elite 500 can be mounted on the panel with thickness between 1 to 4 mm.



10.3 Attaching the external module

External module can be easily fitted in the module socket present at the rear of the meter. Simply plug-in a module in the socket and turn the knurled screw provided with the module to hold it with the meter.

Note:

- Modules are hot pluggable. However, it is recommended to disconnect power before module plugin.
- Align the module with the socket and press to attach the module.
- Do not apply excessive force while plugging the module.

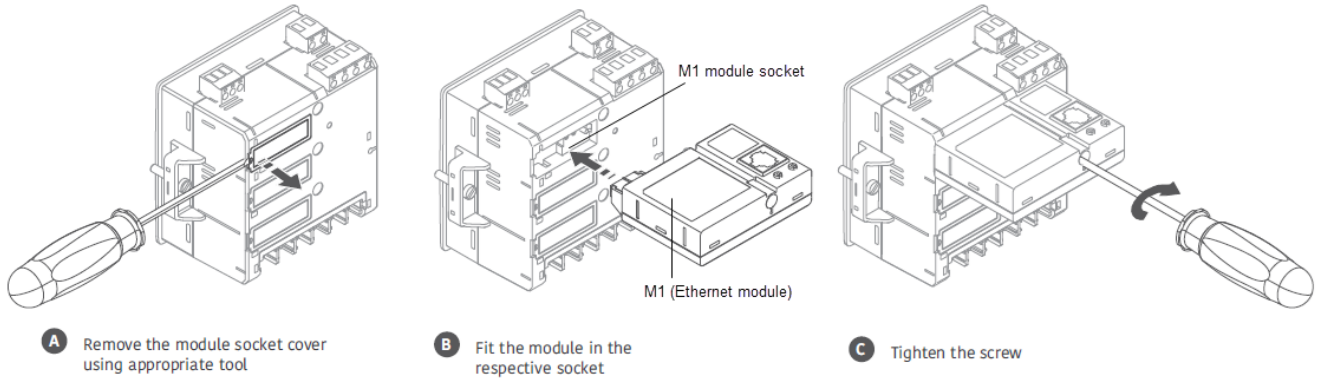
Attaching I/O module or Ethernet module

Remove the module socket cover using the flat-head screw driver. Fit the module in the respective socket by tightening the screw.

M1 module socket- for Ethernet module

M2 module socket- for Pulse input/output or Relay output (three alarm outputs) module

M3 module socket- for Analogue output module



After attaching the module when the power supply is switched on, the meter will detect the attached modules. The Installation check display (under Miscellaneous menu) shows the type of modules connected to the meter.

The attached module should be configured which can be done using ConfigView. Refer to the ConfigView help for details.

10.4 Removing the module

Important: It is recommended to disconnect the auxiliary power supply before removing a module.

Once the auxiliary power supply is disconnected, remove the screw from the attached module and simply pull the module out of the socket.

11 Frequently Asked Questions (FAQs)

Q **Meter does not power up after supplying power to the measurement circuit.**

Answer: Auxiliary supply is mandatory to power up the meter. Please refer the decal pasted on the meter for auxiliary supply type and range.

The voltage of the auxiliary power must be in the range of 48-300 V DC or 85-300 V AC. Ensure that phase-to-phase input power supply is not continuously connected otherwise the meter may get damaged.

Q **Meter is not showing correct values of instantaneous parameters?**

Answer: The following things should be verified:-

- Verify that the correct CT/VT commissioning values are selected in set up mode of the meter.
- Verify that the connection is done as directed on the decal pasted on the top of the meter.

Q **Meter is not communicating with the PC using serial communication?**

Answer: The following things should be verified:-

- Verify the communication settings (i.e. Baud rate and Modbus ID) in the setup mode of meter.
- Verify the connection between PC and the meter is done using standard RS485 communication cable and RS232/485 converter (i.e. all wires are connected properly +, - and SG).
- Proper communication settings at the software end.

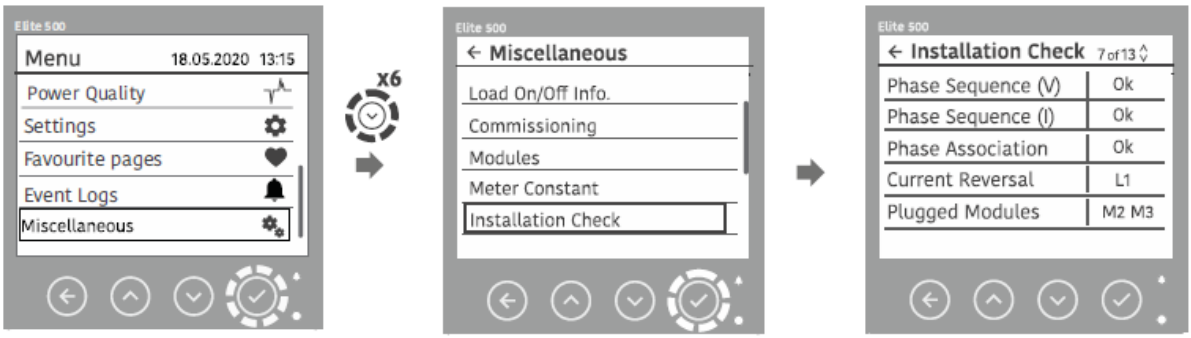
Q **Why the instantaneous/power quality parameter values are not shown on Modbus/ConfigView?**

Answer: The parameters may not be supported for that particular connection type/variant.

Q **How to verify the types of modules connected to the meter?**

Answer: The Installation check display shows the type of modules connected to the meter.

For example, the following display indicates ‘Pulse I/O or Alarm output’ and ‘Analogue output’ modules are connected.



Note:For IEC 61850 and Profinet modules, the Plugged Modules status will be updated after one minute of plugging the module.

Q **Can serial communication and TCP/IP communication through Ethernet Gateway be established simultaneously?**

Answer: While communicating Modbus RTU through Ethernet Gateway module, serial communication cannot be established.

Q **Where the IP setting for Ethernet module is stored?**

Answer: The IP setting for Ethernet module is stored in the meter.

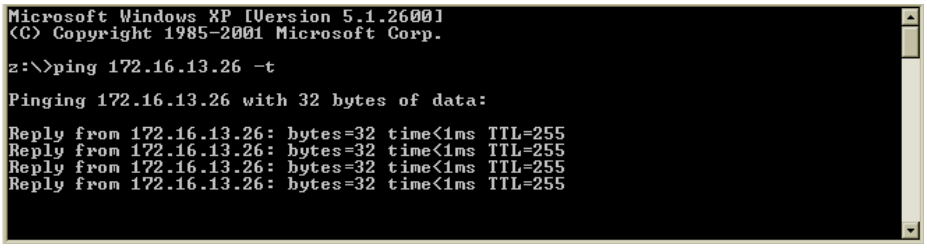
Q **What is the time to establish TCP/IP communication after meter power off-on?**

Answer: It will take up to 30 seconds to establish TCP/IP communication after power off-on. The same applies to similar actions such as after IP re-configure, module re-insert and LAN re-connect.

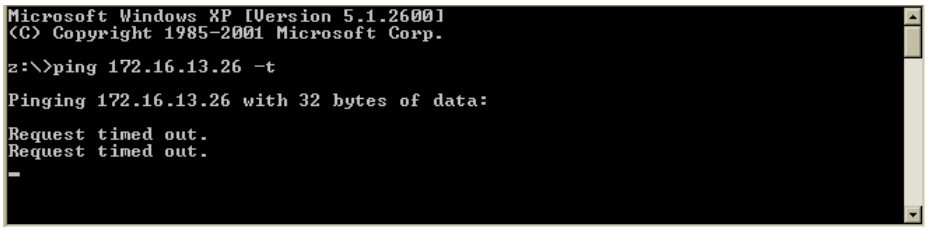
Q **Unable to communicate with the meter using TCP/IP communication.**

Answer: To resolve this problem, try one of the following methods in sequential order.

1. Check IP address status using ping command in command prompt.



Successful TCP/IP Communication



TCP/IP Communication Failure

2. Re-connect the LAN cable and try to communicate.
3. Ensure the following:
   - ✓ *IP address configured in the meter should be static and must be unique in the LAN network.*
   - ✓ *Proper opening and closing mechanism for TCP/IP socket connection is maintained at application software end as only two TCP/IP socket connections can be established for two different clients.*
   - ✓ *TCP/IP socket connection timeout has not occurred*

Q **How many TCP/IP socket connections can be established?**

Answer: You can establish two TCP/IP socket connections for an IP for two different clients.

Q **Unable to get response for a query even after opening a TCP/IP socket.**

Answer: After opening TCP/IP socket if no query is sent until 10 seconds, the TCP/IP socket will automatically get closed and user needs to re-open it.

Q **Unable to connect to a new TCP/IP socket.**

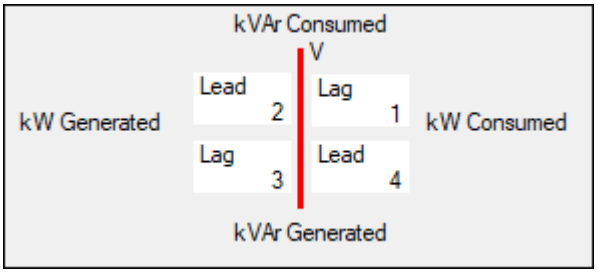
Answer: Ensure proper opening and closing mechanism for TCP/IP socket connection is maintained at application software end. For example, an energy management system application opens and closes a TCP/IP socket connection but the socket is not closed. This may create problem while establishing the TCP/IP socket connection if both the sockets are opened.

Q **Reporting has stopped.**

Answer: If reporting feature is running in IEC 61850, and either backward time is set manually or backward time sync is performed through SNTP, then report generation may stop. Reconfigure or restart reporting.

Appendix I: Energy quadrant information

Energy Quadrant as per relevant IS/IEC standard.



Notes:

Secure Meters (Sweden) AB

Box 1006 (Repslagaregatan 43)

SE 611 32 Nyköping

Sweden

t: +46 155 775 00

f: +46 155 775 97

Secure Meters (UK) Ltd

Secure House, Lulworth Close

Chandler's Ford, Eastleigh SO53 3TL

United Kingdom

p: +44 1962 840048

f: +44 1962 841046

www.securemeters.com

BGX701-313

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a Secure brand