

USER MANUAL

Multifunction Energy Analyser SMART VEN485



1 Safety instructions

The Smartcontroller multifunction panel meter SMART VEN485 is a state of the art intelligent panel meter, used not only in the electricity transmission and power distribution system but also in the power consumption measurement and analysis in high voltage intelligent power grid.

This document provides operating, maintenance and installation instructions for the Smartcontroller SMART VEN485. The unit measures and displays the characteristics of single phase two wires and three phase four wires supplies, including voltage, frequency, current, power and active and reactive energy, imported or exported. Energy is measured in terms of kWh, kVarh. Maximum demand current can be measured over preset periods of up to 60minutes. In order to measure energy, the unit requires voltage and current inputs in addition to the supply required to power the product. The requisite current input(s) are obtained via current transformers (CT).

The SMART VEN485 can be configured to work with a wide range of CTs, giving the unit a wide range of operation. Built-in interfaces provide pulse and RS485 Modbus RTU outputs. Configuration is password protected.

* LCD Display is available in both blue and green colour. Default setting is green display

Unit Characteristics

The SMART VEN485 can measure and display:

- Line voltage and THD% (total harmonic distortion) of all phases
- Line Frequency
- Currents, Current demands and current THD% of all phases
- Power, maximum power demand and power factor
- Active energy imported and exported
- Reactive energy imported and exported

The unit has password-protected set-up screens for:

- Changing password
- Supply system selection 1phase2wire, 3phase 4wires
- CT Ratio and secondary current
- PT Ratio and secondary voltage
- Demand Interval time
- Reset for demand measurements
- Pulse output duration

A pulse output indicates real-time energy measurement. An RS485 output allows remote monitoring from another display or a computer.

Current Transformer Current ratio

The unit can be configured to operate with CT ratio between primary and secondary current is 1 and 2000. Maximum CT primary current corresponds to a maximum input current to the unit of 1/5A.

RS485 Serial – Modbus RTU

This uses an RS485 serial port with Modbus RTU protocol to provide a means of remotely monitoring and controlling the SMART VEN485.

Set-up screens are provided for setting up the RS485 port.

Pulse output

This Unit provides 2 pulse outputs. One pulse output is configurable, which can be set from the SETUP menu to refer to active or reactive energy (total, import, export). While, another pulse output is fixed to total active energy, the constant is 3200imp/kWh.

Start-up Screens



The first screen lights all display segments and can be used as a display check



The second screen indicates the firmware installed in the unit and its build number.







Next the unit performs a self-test and indicates if the test passes.

After a short delay, the screen will display active energy measurements.

. Measurements

The buttons operate as follows:

	<p>Selects the Voltage and Current display screens In Set-up Mode, this is the “Left” or “Back” button.</p>
	<p>Select the Frequency and Power factor screens In Set-up Mode, this is the “Up” button</p>
	<p>Select the Power screens In Set-up Mode, this is the “Down” button</p>
	<p>Select the Energy display screens In Set-up mode, this is the “Enter” or “Right” button</p>

Voltage and Current



Each successive pressing of the button selects a new range:

	<p>Total kW Frequency Power factor (total)</p>
	<p>Power factor of each phase</p>
	<p>Max. Power demand</p>
	<p>Max. Current demand</p>

Power





Each successive pressing of the  button select a new range:

	Instantaneous active power (kW)
	Instantaneous reactive power (kVar)
	Instantaneous Volt-amps (KVA)
	Total kW, kVarh, kVA

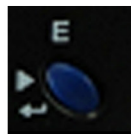
Energy Measurements

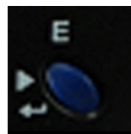


Each successive pressing of the  button selects a new range:

	Imported active energy in kWh
	Exported active energy in kWh
	Imported reactive energy in kVarh
	Exported reactive energy in kVarh
	Total active energy in kWh
	Total reactive energy in kVarh

Set-up



To enter set-up mode, pressing the  button for 3 seconds, until the password screen appears



Setting up is password-protected so you must enter the correct password (default '1000') before processing. If an incorrect password is entered, the display will show: PASS Err

To exit setting-up mode, press  repeatedly until the measurement screen is restored.

Set-up Menu Structure

Change password

nnnn 4-digit number default "1000"



Set the ratio of the CT

nnnn 4-digit number 0001~2000



set the ratio of PT

nnnn 4-digit number 0001~2000.













DIT(Demand Integration Time)

This is the period in minutes over which the current and power readings are integrated for maximum demand measurement. Options are: off, 5, 10, 15, 30 and 60minutes.

Set-up Entry Methods





Some menu items, such as password and CT, require a four-digit number entry while others, such as supply system, require selection from a number of menu options.

1 Menu Option Selection

1. Use the  and  buttons to select the required item from the menu shown in section 4.1. Selection does not roll over between bottom and top of list
2. Press  to confirm your selection
3. if an item flashes, then it can be adjusted by the  and  buttons. If not, they're maybe a further layer.
4. Having selected an option from the current layer, press  to confirm your selection. The SET indicator will appear.
5. Having completed a parameter setting, press  to return to a higher menu level.
The SET indicator will be removed and you will be able to use the  and  buttons for further menu selection
6. On completion of all setting-up, press  repeatedly until the measurement screen is restored

Number Entry Procedure

When Setting up the unit, some screens require the entering of a number. In particular, on entry to the setting up section, a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

1. the current digit to be set flashes and is set using the  and  buttons
2. Press  to confirm each digit setting. The SET indicator appears after the last digit has been set.
3. After setting the last digit, press  to exit the number setting routine. The SET indicator will be removed.

Change Password

1		<p>Use the  and  to choose the change password option</p>
2		<p>Press the  to enter the change password routine. The new password screen will appear with the first digit flashing</p>

3		<p>Use  and  to set the first digit and press  to confirm your selection. The next digit will flash</p>
4		<p>Repeat the procedure for the remaining three digits</p>
5		<p>After setting the last digit, SET will show.</p>
6		<p>Press  to exit the number setting routine and return to the Set-up menu. SET will be removed</p>

DIT(Demand Integration Time)

This sets the period in minutes over which the current and power readings are integrated for maximum demand measurement. The options are: off, 5, 10,15 30,60 minutes

1		<p>From the set-up menu, use  and  buttons to select the dIT option. The screen will show the currently selected integration time.</p>
2		<p>Press  to enter the selection routine. The current time interval will flash</p>
3		<p>Use  and  buttons to select the time required.</p>
4		<p>Press  to confirm the selection. SET indicator will appear.</p>
5	<p>Press  to exit the dIT selection routine and return to the menu.</p>	

Supply System

Use this section to set the type of power supply being monitored.

1		<p>From the Set-up menu, use  and  buttons to select the System option. The screen will show the currently selected power supply</p>
2		<p>Press  to enter the selection routine. The current selection will flash</p>
3		<p>Use  and  buttons to select the required system option: 3P4W 3P3W or 1P2W</p>
4		<p>Press  to confirm the selection. SET indicator will appear.</p>
5		<p>Press  to exit the system selection routine and return to the menu. SET will disappear and you will be returned to the main Set-up Menu</p>

CT

The CT option sets the current ratio (1~2000) and secondary current (CT2 1A or 5A) of the Current transformer (CT), which wires to the meter

1		<p>From the Set-up menu, use  and  buttons to select the CT option. The screen will show the current CT primary current value.</p>
2		<p>Secondary CT setting</p> <p>Press  to enter the CT secondary Current selection routine. 5A/1A</p>
3		<p>Set CT Ratio Value</p> <p>Press  to enter the CT Ratio The range is from 0001~2000.</p>
4	<p>For example: if set the ratio to be 100, that means the primary current is secondary current X100.</p>	

PT

The PT option sets the primary voltage (PTratio 100~500000V) and secondary voltage (PT2 100~500V) of the Voltage transformer (PT) that wires to the meter. The default value is 230V for both primary and secondary voltage.

1		<p>From the Set-up menu, use  and  buttons to select the PT option. The screen will show the voltage PT primary voltage value.</p>
2		<p>Secondary PT setting The setting method is same as Primary voltage Setting PT1 Max. PT2 value is 500V</p>
3		<p>Set PT Ratio Value  Press  to enter the PT Ratio The range is from 0001~2000. For example: if set the ratio to be 100, that means the primary current is secondary current X100.</p>
4		<p>Press  to exit the system selection routine and return to the menu. SET will disappear and you will be returned to the main Set-up Menu</p>

Pulse output

This option allows you to configure the pulse output. The output can be set to provide a pulse for a defined amount of energy active or reactive.

Use this section to set up the relay pulse output—
Units: kWh, kVarh

1		<p>From the Set-up menu, use  and  buttons to select the Pulse output option.</p>
2		<p>Press  to enter the selection routine. The unit symbol will flash</p>
3		<p>Use  and  buttons to choose kWh or kVarh.</p>
4	<p>On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.</p>	

Pulse rate

Use this to set the energy represented by each pulse. Rate can be set to 1 pulse per 0.001Wh/0.01kWh/0.1kWh/1kWh/10kWh/100kWh.



(It shows 1 impulse = 1Wh/kVarh)

1		<p>From the Set-up menu, use  and  buttons to select the Pulse Rate option.</p>
2		<p>Press  to enter the selection routine. The current setting will flash</p>
3	<p>Use  and  buttons to choose pulse rate.</p>	<p>0.001/0.01/0.1/1/10/100kWh/kVarh per pulse</p>
4		<p>On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.</p>

Pulse Duration

The energy monitored can be active or reactive and the pulse width can be selected as 200, 100 or 60ms.



(It shows pulse width of 200ms)

1		<p>From the Set-up menu, use  and  buttons to select the Pulse width option.</p>
2		<p>Press  to enter the selection routine. The current setting will flash.</p>
3	<p>Use  and  buttons to choose pulse width (200/100/60ms)</p>	
4	<p>On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.</p>	

Communication

There is a RS485 port can be used for communication using Modbus RTU protocol. For Modbus RTU, parameters are selected from Front panel.

4.9.1 RS485 Address

Baud Rate

1		From the Set-up menu, use  and  buttons to select the Baud Rate option.
2		Press  to enter the selection routine. The Baud Rate setting will flash
3		Use  and  buttons to choose Baud rate 2.4k, 4.8k, 9.6k, 19.2k, 38.4k
4	On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.	

Parity

1		<p>From the Set-up menu, use  and  buttons to select the Parity option.</p>
2		<p>Press  to enter the selection routine. The current setting will flash.</p>
3		<p>Use  and  buttons to choose Parity (EVEN / ODD / NONE)</p>
4	<p>On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.</p>	

Stop bits








1		From the Set-up menu, use  and  buttons to select the Stop Bit option.
2		Press  to enter the selection routine. The current setting will flash.
3		Use  and  buttons to choose Stop Bit (2 or 1)
4	On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.	

CLR

CLR kWh

1		<p>From the Set-up menu, use  and  buttons to select the reset option.</p>
2		<p>Press  to enter the selection routine. The yes will flash.</p>
3	<p>Press  to confirm the setting and press  to return to the main set up menu.</p>	

CLR KVarh

1		From the Set-up menu, use  and  buttons to select the reset option.
2		Press  to enter the selection routine. The yes will flash.
3	Press  to confirm the setting and press  to return to the main set up menu.	

CLR Max Demand

1		From the Set-up menu, use  and  buttons to select the reset option.
2		Press  to enter the selection routine. The yes will flash.
3	Press  to confirm the setting and press  to return to the main set up menu.	




reverse connected current inputs correction setting.









1		<p>From the Set-up menu, use  and  buttons to select page "SET sys cont."</p>
2		<p>Press to  enter Phase A, the default is frd (forward)</p>
		<p>use  and  buttons to Phase B or C setting pages</p>
4	<p>Press  to confirm the setting and press  to return to the main set up menu.</p>	

how to operate if phase A is reversely connected

1		Go to phase A setting page
2		Press  to enter the selection routine. The Frd will flash. Use  button to change Frd to REV
3	On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.	

setting auto scroll display interval

1		Use the  and  to choose the change Round of the significant time option
2		Press the  to enter the change password routine. The new Round of the significant time screen will appear with the first digit flashing

3		<p>Use  and  to set the first digit and press  to confirm your selection. The next digit will flash.</p>
4		<p>Repeat the procedure for the remaining three digits</p>
5		<p>After setting the last digit, SET will show</p>
6		<p>Press  to exit the number setting routine and return to the Set-up menu. SET will be removed</p>
7	<p>After setting, you still need to active the auto scroll display function by keep pressing the button ESC. If you want exit from auto scroll display mode, you can press the ESC button to get out.</p>	

SPECIFICATIONS

Measured Parameters

The unit can monitor and display the following parameters of a single phase, 3-phase 3-wire or 3-phase 4-wire supply.

Voltage and Current

Phase to neutral voltages 100 to 289V A.C. (not for 3p3w supplies)

Voltages between phases 173 to 500V A.C. (3p supplies only)

Percentage total voltage harmonic distortion (THD%) for each phase to N (not for 3p3w supplies)

Percentage voltage THD% between phases (three phase supplies only)

Current on each phase – 1 to 9999A range, set by external current transformer(s) (CTs)

Current THD% for each phase

Power Factor, Frequency and Max. Demand

Frequency in Hz

Instantaneous power:

Power 0 to 999MW

Reactive Power 0 to 999MVA_r

Volt-amps 0 to 999 MVA

Maximum demanded power since last Demand reset Power factor

Maximum neutral demand current, since the last Demand reset (three phase supplies only)

Energy Measurements

Imported active energy 0 to 9999999.9 kWh

Exported active energy 0 to 9999999.9 kWh

Imported reactive energy 0 to 9999999.9 kVA_rh

Exported reactive energy 0 to 9999999.9 kVA_rh

Total active energy 0 to 9999999.9 kWh

Total reactive energy 0 to 9999999.9 kVA_rh

Measured Inputs

Voltage inputs through 4-way fixed connector with 2•5mm² stranded wire capacity. 3-Phase 3- and 4-wire and Single-phase 2-wire unbalanced. Line frequency measured from L1 voltage or L3 voltage.

Three current inputs (six physical terminals) with 2•5mm² stranded wire capacity for connection of external CTs. Nominal rated input current 5A or 1A A.C. Rms.

Accuracy

Voltage	0•5% of range maximum
Current	0•5% of nominal
Frequency	0•2% of mid-frequency
Power Factor	1% of unity (0.01)
Active power (W)	±1% of range maximum
Reactive power (VAr)	±2% of range maximum
Apparent power (VA)	±1% of range maximum
Active energy (Wh)	Class 1 IEC 62053-21
Reactive energy (VARh)	±2% of range maximum
Temperature co-efficient	Voltage and current = 0.013%/°C typical
Active energy	= 0•018%/°C, typical
Response time to step input	1s, typical, to >99% of final reading, at 50 Hz.

RS485 Output for Modbus RTU

For Modbus RTU, the following RS485 communication parameters can be configured from the Set-up menu:

Baud rate 2400,4800,9600,19200,38400

Parity none/odd/even

Stop bits 1 or 2

RS485 network address nnn – 3-digit number, 1 to 247

Modbus™ Word order Hi/Lo byte order is set automatically to normal or reverse. It cannot be configured from the set-up menu

Reference Conditions of Influence Quantities

Influence Quantities are variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions.

Ambient temperature 23°C ±1°C

Input waveform 50 or 60Hz ±2%

Input waveform Sinusoidal (distortion factor < 0•005)

Auxiliary supply voltage Nominal ±1%

Auxiliary supply frequency Nominal ±1%

Auxiliary supply waveform (if AC) Sinusoidal (distortion factor < 0•05)

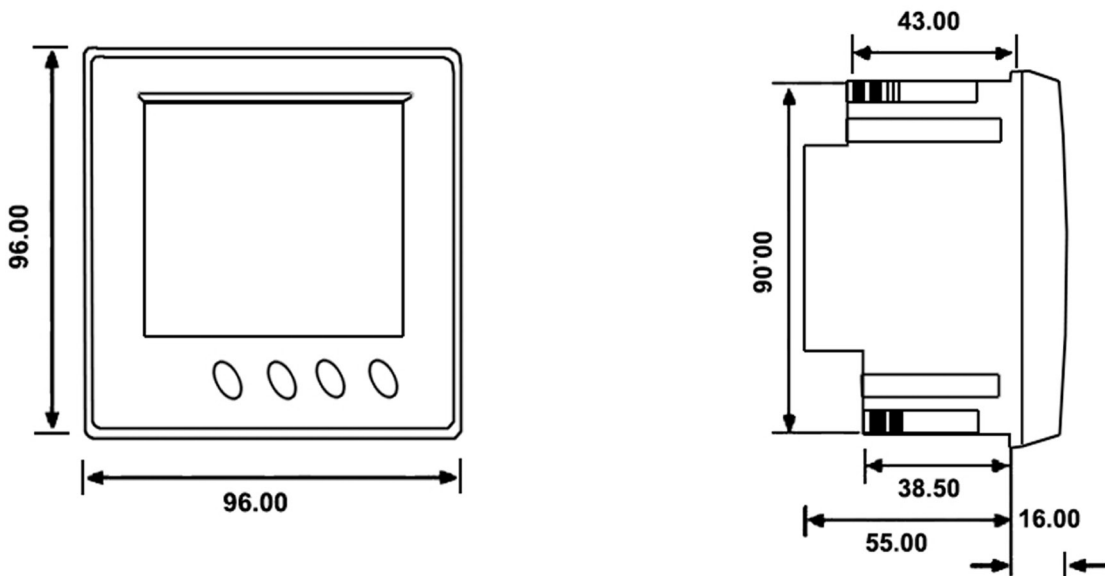
Magnetic field of external origin Terrestrial flux

Environment

Operating temperature	-25°C to +55°C*
Storage temperature	-40°C to +70°C*
Relative humidity	0 to 90%, non-condensing
Altitude	Up to 2000m
Warm up time	1 minute
Vibration	10Hz to 50Hz, IEC 60068-2-6, 2g
Shock	30g in 3 planes

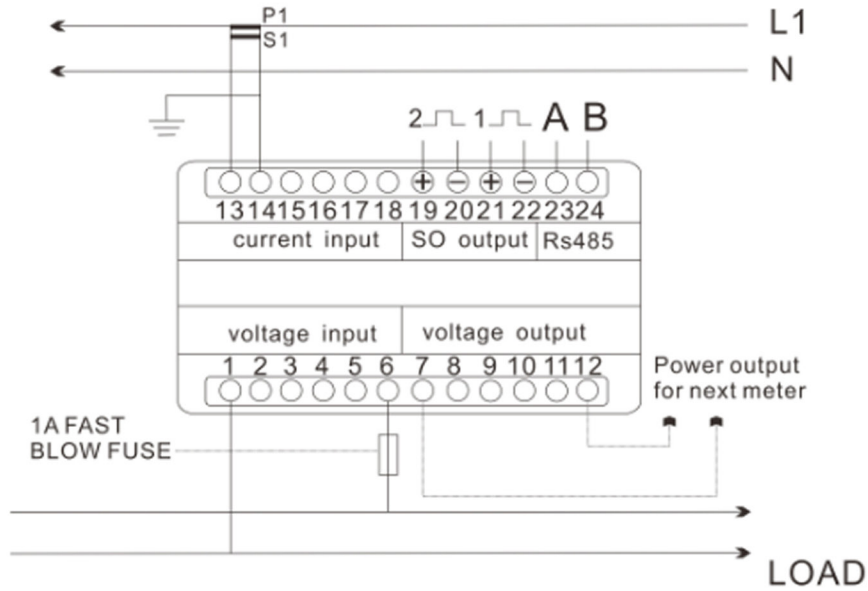
*Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.

Dimensions

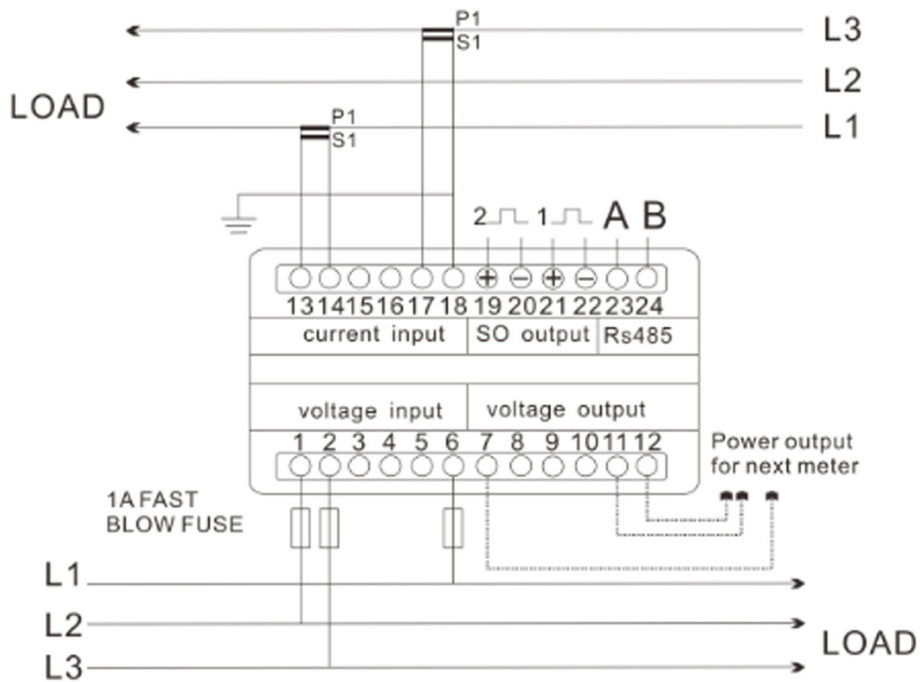


WIRING DIAGRAM

Single phase two wire



Three phase three wires



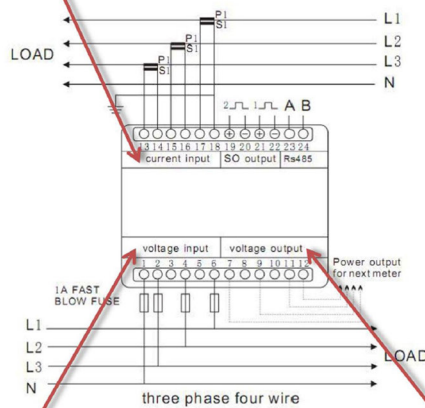
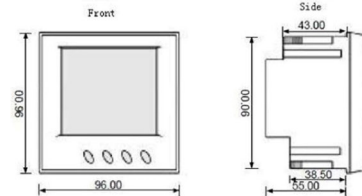
Three phase four wires

Plug in metering solution :

Dimensions:



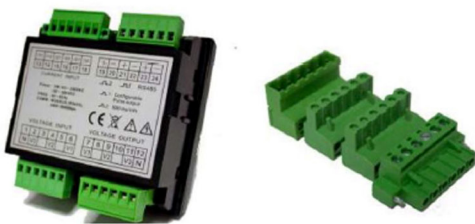
1. Current Transformer Input



2. Fuse Voltage input



3. Voltage Output to power the next meters (up to 16)



Terminal Kit Option :

Optional Terminal kit for customers who want to pre-manufacture their own wiring looms. Also the terminal kit can be used for any standard single phase or split core Current Transformer with a 1A or 5A Secondary. No requirement for additional convertors or hardware

Parameters:

- Phase to Phase Voltage
- Phase to Neutral Voltage
- Frequency
- Voltage Total Harmonic Distortion (THD)
- Current
- Neutral Current (Calculated Modbus only)
- Current Max Demand (Modbus Only)
- Current Total Harmonic Distortion (THD)
- kW
- KVAr
- kW Max Demand
- Power Factor
- Import kWh
- Export kWh
- Import kVArh
- Export kVArh

Current Transformers



A range of Smartcontroller three phase current transformers that have been designed to make installation safe and easy. Each model has pluggable terminals molded into the case, which replaces the traditional screw terminals and saves a considerable amount of time and labor on installation. To avoid an open circuit situation both ends of the CT to meter loom have connectors, which are lockable via two screws. They come in three different models ranging from 60A to 630A.

CT125 (25mm centers)

CT155 (35mm centers)

CT145 (45mm centers)

Due to the SMART VEN485 multifunction power meter having isolated inputs, there is no requirement for earthing or internal grounding the Current Transformers. The secondary output of these transformers is 1A, which enables higher accuracy and conforms to all the relevant metering and CT European Standard.

Model	Ratio	Burden VA Calass0.5	Order Code	Aperture Dimensions	Centers
CT125	60/1A	1.5VA	CT325-SC 60A	15.5×30mm	25mm
CT125	100/1A	1.5VA	CT325-SC 100A	15.5×30mm	25mm
CT125	125/5A	1.5VA	CT325-SC 125A	15.5×30mm	25mm
CT125	150/1A	1.5VA	CT325-SC 150A	15.5×30mm	25mm

CT125	200/1A	1.5VA	CT325-SC 200A	15.5×30mm	25mm
CT135	60/1A	1.5VA	CT-335-SC 60A	21×25mm	35mm
<i>CT135</i>	<i>100/1A</i>	<i>1.5VA</i>	<i>CT-335-SC 100A</i>	<i>21×25mm</i>	<i>35mm</i>
CT135	125/1A	1.5VA	CT-335-SC 125A	21×25mm	35mm
CT135	150/1A	1.5VA	CT-335-SC 150A	21×25mm	35mm
CT135	200/1A	1.5VA	CT-335-SC 200A	21×25mm	35mm
CT135	250/1A	1.5VA	CT-335-SC 250A	21×25mm	35mm
CT145	250/1A	2.5VA	CT345-SC 250A	31×31mm	45mm
CT145	300/1A	2.5VA	CT345-SC 300A	31×31mm	45mm
CT145	400/1A	2.5VA	CT345-SC 400A	31×31mm	45mm
CT145	500/1A	2.5VA	CT345-SC 500A	31×31mm	45mm
CT145	600/1A	2.5VA	CT345-SC 600A	31×31mm	45mm
CT145	630/1A	2.5VA	CT345-SC 630A	31×31mm	45mm

Wiring Looms

A range of wiring looms complete with durable and safe connector terminals. Pre-manufacture ready for ease of installation. They come in various sizes and can be supplied as a kit based on your requirements. There are three types of looms, Current Transformer to meter cable, Voltage supply cable and voltage to voltage which allows you to daisy chain up to 20 meters from one supply. All cables have been manufactured and tested to withstand most type of installation. They are flexible and provide a fast user-friendly solution over traditional wiring methods.

Model	Function	Length	Order Code
Volt-1	Fuses to voltage loom	0.3m	Volt-1-0.3m
Volt-1	Fuses to voltage loom	0.5m	Volt-1-0.5m
Volt-1	Fuses to voltage loom	1m	Volt-1-1m
Volt-1	Fuses to voltage loom	1.5m	Volt-1-1.5m
Volt-1	Fuses to voltage loom	2m	Volt-1-2m
Volt-1	Fuses to voltage loom	2.5m	Volt-1-2.5m
Volt-1	Fuses to voltage loom	3m	Volt-1-3m
CT	CT to meter loom	0.3m	CT-0.3m
CT	CT to meter loom	0.5m	CT-0.5m
CT	CT to meter loom	1m	CT-1m
CT	CT to meter loom	1.5m	CT-1.5m
CT	CT to meter loom	2m	CT-2m
CT	CT to meter loom	2.5m	CT-2.5m
CT	CT to meter loom	3m	CT-3m
Volt-2	Voltage to voltage loom	0.3m	Volt-2-0.3m
Volt-2	Voltage to voltage loom	0.5m	Volt-2-0.5m
Volt-2	Voltage to voltage loom	1m	Volt-2-1m
Volt-2	Voltage to voltage loom	1.5m	Volt-2-1.5m
Volt-2	Voltage to voltage loom	2m	Volt-2-2m