

USER MANUAL

DIN Rail Smart Energy Meter for Single and Three Phase Electrical Systems

SMART VEN680 CT-2T

Important Safety Information is contained in the Maintenance section. Familiarize yourself with this information before attempting installation or other procedures.



Symbols used in this document:



Risk of Danger: These instructions contain important safety information, Read them before starting installation or servicing of the equipment



Caution: Risk of Electric Shock

1 Introduction

This document provides operating, maintenance and installation instructions. The unit measures and displays the characteristics of single phase two wires (1p 2w), three phase three wires (3p 3w) and three phase four wires (3p 4w) supplies, including KWh, kVarh, KW, KVar, KVA, PF, Frequency, Voltage, Current, dmd. THD etc. Energy is measured in terms of kWh, kVarh. Maximum demand current can be measured over preset periods of up to 60minutes. The requisite current input(s) are obtained via current transformers (CT).

This meter 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.

This unit has 2 Source Powers and can show T1 energy and T2 energy. If you want to shift T1 to T2, as far as there is 230V load between terminal 7 and 8, the meter will count up to T2. When T1 is working, you can get Pulse 1 output 2 from pin 9 & 10. When T2 is working, you can get Pulse 2 output from pin 11 & 12. Both Pulse 1 output and Pulse 2 output Rate are configurable

1.1 Unit Characteristics

The Unit 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 1p2w, 3p3w, 3p4w
- . Demand Interval time
- . Reset for demand measurements
- . Pulse output duration

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

1.2 Current Transformer Primary Current

The unit can be configured to operate with CT ratio between primary current and secondary current. The secondary CT has two options: 1A/5A

1.3 RS485 Serial – Modbus RTU




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

Set-up screens are provided for setting up the RS485 port. Refers to section 4.8

1.4 Pulse output

This provides two pulse outputs that clock up measured T1 active energy and T2 active energy. The default constant for active energy is 3200imp/kWh. The pulse width for active energy can be set from the set-up menu





Start Up Screens

 <p>The screenshot shows a dark blue background with white text. At the top, there are icons for power (1, 2), MD, a telephone handset, and buttons for 'IMPORT' and 'EXPORT'. A signal strength indicator is on the right. The main display area shows three rows of data: 'L1-2 T -8.8:8.8 MkWh', 'L2-3 M -8.8:8.8 VI%THD', and 'N -8.8:8.8 MkVArh'. Below these are 'L3-1 -8.8:8.8 Hz' and 'MkVA'. At the bottom left are a battery and clock icon, and at the bottom right are 'PF C1 C2'.</p>	<p>The first screen lights up all display segments and can be used as a display check.</p>
 <p>The screenshot shows a dark blue background with white text. The text is arranged in three lines: 'Soft', '1000', and '2014'.</p>	<p>The second screen indicates the firmware installed in the unit and its build number.</p>
 <p>The screenshot shows a dark blue background with white text. The text is arranged in three lines: 'Inst', 'TEST', and 'PASS'.</p>	<p>The interface performs a self-test and indicates the result if the test passes.</p>

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



3. 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 display screens In Set-up Mode, this is the "Up" button</p>
	<p>Select the Power display 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>

3.1 Voltage and Current



Each successive pressing of the  button selects a new range:

	<p>Phase to neutral voltages</p>
	<p>Current on each phase</p>

	Phase to neutral voltage THD%
	Current THD% for each phase

3.2 Frequency and Power factor and Demand

Each successive pressing of the  button selects a new range:



	Frequency and Power Factor (total)
	Power Factor of each phase

	Maximum Power Demand
	Maximum Current Demand

3.3 Power



Each successive pressing of the  button select a new range:





	Instantaneous Active Power in kW
	Instantaneous Reactive Power in kVAr





	Instantaneous Volt-amps in KVA
	Total kW, kVArh, kVA

3.4 Energy Measurements


Each successive pressing of the  button selects a new range:

	Total active energy in kWh
	Imported active energy in kWh

 <p>EXPORT 0000 0000.0 kVArh</p>	<p>Exported active energy in kWh</p>
 <p>0000 kWh 135.0 T1</p>	<p>T1 active energy in kWh When T1 working, the symbol " T1 " will be flashing</p>
 <p>0000 kWh 117.0 T2</p>	<p>T2 active energy in kWh When T2 working, the symbol " T2 " will be flashing</p>
 <p>M 0000 0000.0 kVArh</p>	<p>Total reactive energy in kVArh</p>

	<p>Imported reactive energy in kVArh</p>
	<p>Exported reactive energy in kVArh</p>
	<p>T1 reactive energy in kVArh When T1 working, the symbol " T1 " will be flashing</p>
	<p>T1 reactive energy in kVArh When T1 working, the symbol " T1 " will be flashing</p>

4. Setting 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.

4.1 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.

4.1.1 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, there 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.











4.1.2 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.

4.2 Change password

	<p>Use the  and  to choose the change password option</p>
	<p>Press the  to enter the change password routine. The new password screen will appear with the first digit flashing</p>
	<p>Use  and  to set the first digit and press  to confirm your selection. The next digit will flash.</p>
	<p>Repeat the procedure for the remaining three digits</p>





After setting the last digit, SET will show.

Press  to exit the number setting routine and return to the Set-up menu. SET will be removed


4.3 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



From the set-up menu, use  and  buttons to select the DIT option. The screen will show the currently selected integration time.





Press  to enter the selection routine. The current time interval will flash

	<p>Use M ▲ and P ▼ buttons to select the time required.</p>
	<p>Press E ▶ to confirm the selection. SET indicator will appear.</p>
<p>Press U/ESC ◀ to exit the DIT selection routine and return to the menu.</p>	

4.4 Supply System


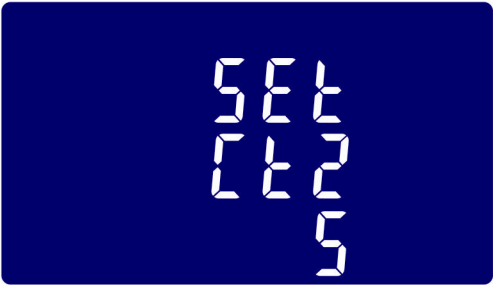
Use this section to set the type of power supply being monitored.

	<p>From the Set-up menu, use M ▲ and P ▼ buttons to select the System option. The screen will show the currently selected power supply.</p>
	<p>Press E ▶ to enter the selection routine. The current selection will flash</p>

	<p>Use M ▲ and P ▼ buttons to select the required system option: 1P2(W), 3P3(W), 3P4(W)</p>
	<p>Press E ▶ to confirm the selection. SET indicator will appear.</p>
<p>Press U/ ESC 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>	

4.5 CT

The CT option sets the secondary current (CT2 1A or 5A) of the current transformer (CT) that wires to the meter.

	<p>From the Set-up menu, use M ▲ and P ▼ buttons to select the CT option.</p>
	<p>Secondary CT setting</p> <p>Press E ▶ to enter the CT secondary current selection routine.: 5A/1A</p>

	<p>Set CT Ratio value</p> <p>Press to enter the CT Ratio setting screen. The range is from 0001 to 9999.</p>
<p>For example, if set the ratio to be 100, it means the primary current equals secondary current x 100</p>	


4.6 PT

The PT option sets the secondary voltage (PT2 100 to 500V) of the Voltage transformer (PT) that wires to the meter.

	<p>From the Set-up menu, use and buttons to select the PT option. The screen will show the voltage PT secondary voltage value. The default value is 400V</p>
	<p>Secondary PT setting</p> <p>Press to enter the PT secondary voltage selection routine. The range is from 100 to 500V</p>



Set PT ratios value

Press  to enter the PT ratio screen. The range is from 0001 to 9999

For example, if set the ratio to be 100, it means the primary voltage equals secondary voltage x 100

4.7 Pulse Output

This option allows you to configure the pulse output, both for Pulse 1 and Pulse 2. 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: Pulse 1 (kWh), Pulse 2 (kWh)










(It shows 1 impulse = 100kWh)

4.7.1 Pulse Rate Setting



From the Set-up menu, use  and  buttons to select the Pulse output option.









	<p>Press E  to enter the selection routine. The current setting will flash.</p> <p>Default (dft): 3200</p>
	<p>Use M  and P  buttons to choose Pulse Rate.</p> <p>Optional: 0.01/0.1/1/10/100kWh per pulse</p>
<p>On completion of the entry procedure, press E  to confirm the setting and press U/I  <small>ESC</small> to return to the main set up menu.</p>	

4.7.2 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)

	<p>From the Set-up menu, use  buttons to select the Pulse width option</p>
	<p>Press  to enter the selection routine. The current setting will flash.</p>
<p> and  buttons to choose pulse width. On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.</p>	

4.8 Communication

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

4.8.1 RS485 Address








(The range is from 001 to 247)






	<p>From the Set-up menu, use M ▲ and P ▼ buttons to select the Address ID</p>
	<p>Press E ↵ button to enter the selection routine. The current setting will be flashing.</p>
	<p>use M ▲ and P ▼ buttons to choose Modbus Address (001 to 247)</p>
<p>On completion of the entry procedure, press E ↵ button to confirm the setting and press U/I ESC button to return the main set-up menu</p>	

4.8.2 Baud Rate

	<p>From the Set-up menu, use M ▲ and P ▼ buttons to select the Baud Rate option.</p>
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	<p>Press  to enter the selection routine. The current setting will flash</p>
	<p>Baud rate 2.4k, 4.8k, 9.6k, 19.2k, 38.4k</p>
<p>On completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.</p>	

4.8.3 Parity

	<p>From the Set-up menu, use  and  buttons to select the Parity option.</p>
	<p>Press  to enter the selection routine. The current setting will flash</p>



	<p>use M ▲ and P ▼ buttons to choose Parity (EVEN / ODD / NONE)</p>
<p>On completion of the entry procedure, press E ▶ to confirm the setting and press U/I ◀ to return to the main set up menu</p>	

4.8.4 Stop bits

	<p>From the Set-up menu, use M ▲ and P ▼ buttons to select the Stop Bit option.</p>
	<p>Press E ▶ to enter the selection routine. The current setting will flash</p>
	<p>use M ▲ and P ▼ buttons to choose Stop Bit (2 or 1)</p>
<p>On completion of the entry procedure, press E ▶ to confirm the setting and press U/I ◀ to return to the main set up menu</p>	

4.9 CLR

The meter provides a function to reset the maximum demand value of current and power.

	From the Set-up menu, Use M ▲ and P ▼ buttons to select the reset option.
	Press E ▶ to enter the selection routine. The dlt will flash.
Press E ▶ to confirm the setting and press U/I ESC to return to the main set up menu	

SPECIFICATIONS

Measured Parameters

The unit can monitor and display the following parameters of a single phase two wire (1p2w), three phase three wire (3p3w) or four phase four wire(3p4w) 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 THD% for each phase

Power factor and Frequency and Max. Demand

Frequency in Hz
 Instantaneous power:
 Power 0 to 3600 MW
 Reactive Power 0 to 3600 MVA
 Volt-amps 0 to 3600 MVA

Energy Measurements

↳ Imported/Exported active energy 0 to 99999999.9 kWh
 ↳ Imported/Exported reactive energy 0 to 99999999.9 kVAh
 ↳ Total active energy 0 to 99999999.9 kWh
 ↳ Total reactive energy 0 to 99999999.9 kVAh

Measured Inputs

Voltage inputs through 4-way fixed connector with 2.5mm² stranded wire capacity. single phase two wire(1p2w), three phase three wire(3p3w) or four phase four wire(3p4w) 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

Interfaces for External Monitoring

Three interfaces are provided:

- ☒ An RS485 communication channel that can be programmed for Modbus RTU protocol
- ☒ An relay output indicating real-time measured energy.(configurable)
- ☒ An pulse output 3200imp/kWh (not configurable)

The Modbus configuration (Baud rate etc.) and the pulse relay output assignments (kW/kVArh, import/export etc.) are configured through the Set-up screens.

Pulse Output

The pulse output can be set to generate pulses to represent kWh.

Rate can be set to generate 1 pulse per:

0.01 = 10 Wh/VArh

0.1 = 100 Wh/VArh

1 = 1 kWh/kVArh

10 = 10 kWh/kVArh

100 = 100 kWh/kVArh

Pulse width 200/100/60 ms.

Relay Rating 240V ac 50mA

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

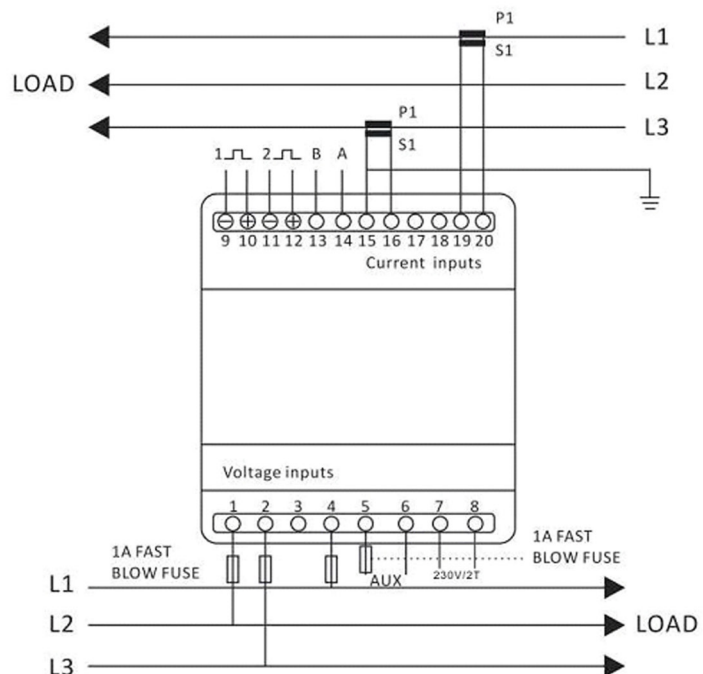
Parity none/odd/even

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.

Three Phase Three Wires



Three Phase Four Wires

