VoltEdge

Three - phase Multifunction Power Meter
VE-PM5000 Series

User Guide V1.0

Safety Information

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation which,if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if notavoided, can result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this signal word.

Please Note

Electrical equipment should be installed, operated,serviced, and maintained only by qualified personnel. No responsibility is asumed by Nova for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recongnize and avoid the hazards involved.

1.Product Description

VE-PM5000 series products is a range of DIN 96 panel mounted multi-function power analysis instrument, the products can support in the 1P2W, 2P3W, 3P3W and 3P4W grid environment analysis of electric power parameter measurement, and at the same time providing multi-channel digital input/output interface, and SOE function.

The series products can support external voltage transformer (PT) and current transformer (CT) access, and with RS485 communication interface, supporting Modbus communication protocols. It can easily realize the function of remote data read, and adopt the design of large-screen LCD and touch-sensitive key, which can easily carry out the local view and set operation of various parameters.

The product has the function of password protection, which ensures the data security of the product.

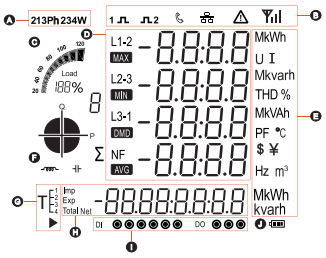
1.1. Characteristics

△ True RMS measurement
△ 2~63rd voltage/current IHD of all phase
△ Supported 1P2W, 2P3W, 3P3W and 3P4W network
△ Supported direct access of Rogowski coil.
△ Supported the current transformer reverse connection correction function.
△ Provide monthly electricity consumption statistics for the last 12 months
△ Provide daily electricity consumption statistics for the last 31 days.
△ Support multi - channel digital input and output interface.
△ Pulse output and Modbus communication

1.2. The Unit can measure and display

○ Voltage : L-N, L-L
○ Current : Per phase, nuetral (calculated), total
○ Voltage/Current THD% (Total harmonic distortion) of all phase
○ 2~63rd voltage/current IHD% (Individual harmonic distortion) of all phase
○ Frequency and phase sequency
○ Active power, reactive power, apparent power, power factor
○ Maximum / Minimum value of power, voltage and current.
○ Maximum demand of power and current.
○ Import / export / total active and reactive energy
○ Total active energy of each phase
○ Multi tariff active energy and four quadrant reactive energy
○ Voltage / Current unbalance factor (Modbus read only)
○ Voltage crest factor (Modbus read only)
○ Current K factor (Modbus read only)
○ Displacement power factor (Modbus read only)
○ Nature of load (Modbus read only)
○ The occur Time maximum / minimum value and maximum demand (Modbus read only)

1.3. LCD display area description



A: The power grid type icon represents the current measurement type of the power meter.
B: The status indicator icon for the power meter.
C: Bar graph for power indication.
D: Measured values.
E: An icon of a unit of measurement data.
F: Quadrant indicator icon indicating the quadrant of the current load.
G: Multi tariff icon indicating the tariff segment to which the current energy. ▶ represents the tariff number displayed as the running tariff segment.

For example: T1 ▶ The figure on the left represents that the tariff 2 (T2) segment is running, and the accumulated energy will be counted into the corresponding energy area of tariff 2 (T2).

H: Energy data display area of the power meter.
I: An icon of digital I/O status for the power meter.
J: The battery status icon of the power meter indicates the state of the battery.

2.Buttons and Displays

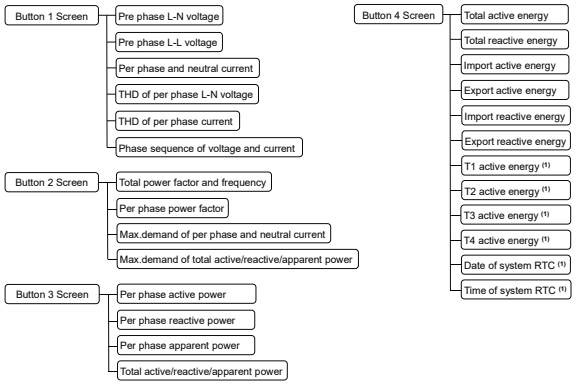
2.1. Button definition description

Button	Definition	Click	Press 3S
1 U/I Esc	Button 1: Escape key (Esc)	1. In the setting screen or auxiliary screen: exit or return to the previous screen. 2. In the main display screen: page turning for parameters such as voltage and current.	Under the main display screen: enter the auxiliary display screen.
2 PF/HZ ▲	Button 2: Up key(Up)	1. In the main display screen: check the power factor, maximum demand. 2. In the setting screen or auxiliary screen: scroll up to display the page or the increasing number.	Null
3 P ▼	Button 3: Down key (Dn)	1. In the main display screen: check the power information. 2. In the setting screen or auxiliary screen: scroll down to display the page or the decreasing number.	Null
4 E ↵	Button 4: Enter key (Et)	1. In the main display screen: check energy data and system time. 2. In the setting screen: right move the setting cursor.	1. In the main display screen: enter the setting mode. 2. In the auxiliary display screen: confirm the auxiliary information to be viewed and enter the specific display screen. 3. In the setting screen: enter the setting state or carry out confirmation operation.

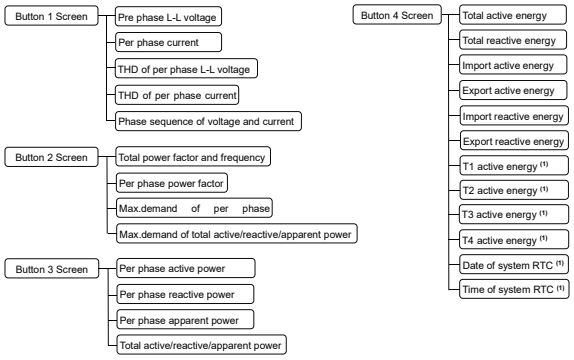
2.2. Main display screen

Under the main display screen, the power meter will assign different parameter display for each button according to the different system types currently set.

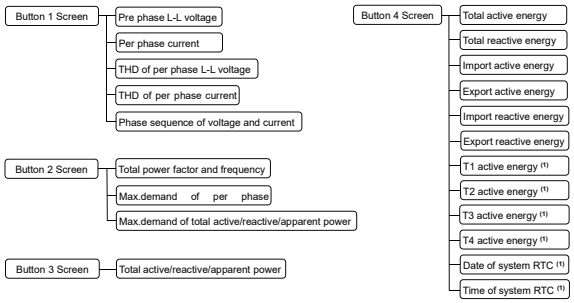
1). Three-phase four-wire (3P4W)



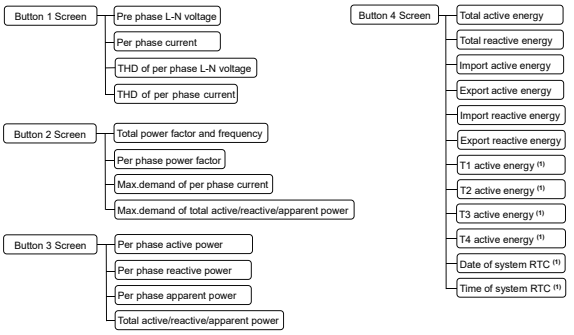
2). Three-phase three-wire 2CT (3P3W 2CT)



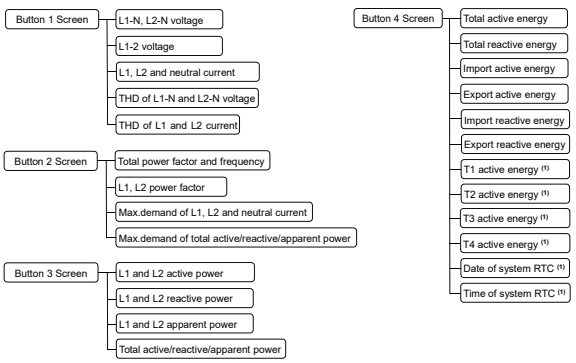
3). Three-phase three-wire 3CT (3P3W 3CT)



4). Single-phase two-wire (1P2W)



5). Two-phase three-wire (2P3W)

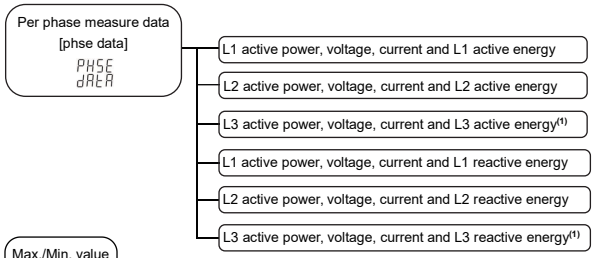


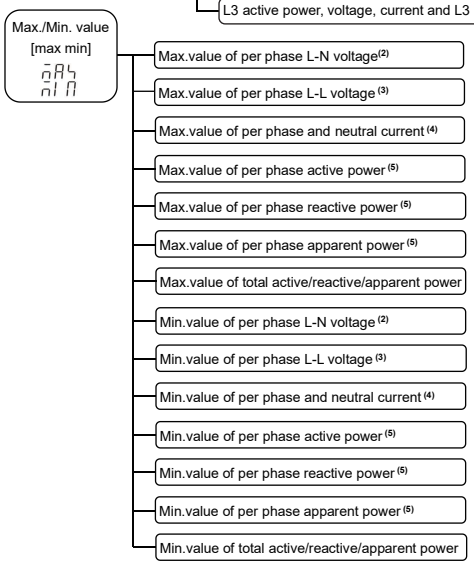
Note (1): This is only shown if the power meter is a multi tariff model, such as VE-PM5010and VE-PM5110.

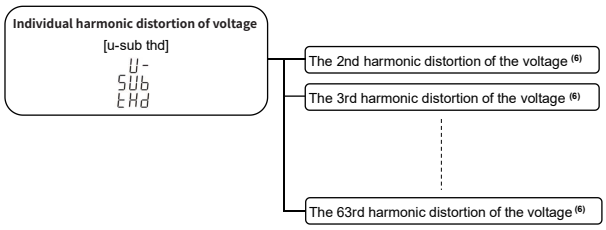
2.3. Auxiliary display screen

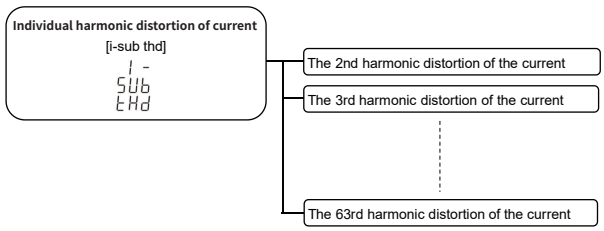
The display categories of the auxiliary display screen respectively include:

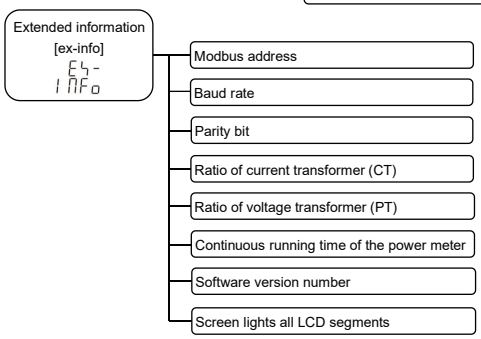
1). Per phase measurement data. (Not displayed under type 3P3W)
2). Maximum and minimum value data.
3). Individual harmonic distortion of voltage
4). Individual harmonic distortion of current
5). Extended information









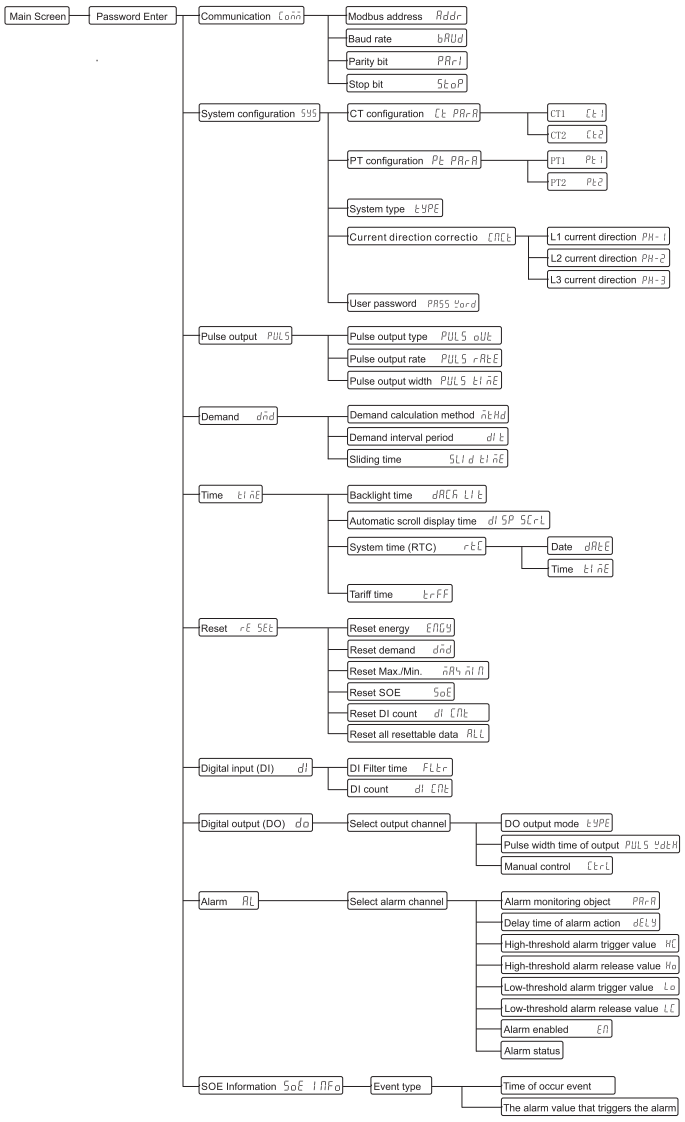


Note:
(1). It is not displayed in two-phase three-wire mode.
(2). It is not displayed in three-phase three-wire mode.
(3). It is not displayed in signle-phase three-wire mode.
(3). Neutral current is not displayed in three-phase three-wire mode
(5). It is not displayed in three-phase three-wire 3CT mode.
(6). In the three-phase three-wire mode, the L-L voltage harmonics are displayed, while in other modes, the L-N voltage harmonics are displayed.

How to enter the auxiliary display screen:

Step1: Under the main display screen, press 3S button 1 to enter the selection screen of auxiliary display.
Step2: Click button 2 or button 3 can be used to select the option of auxiliary information that needs to be viewed.
Step3: Press 3S button 4 to enter the specific data display screen of the selected auxiliary information option.
Step4: After entering the specific auxiliary information display screen, you can turn the page by click the button 2 or button 3, and clcik the button 1 to return to the previous menu.

3. Setting-up



How to enter the "Parameter setting Menu" screen:
Step 1: In the main display screen, press 3S button 4 to enter the user password input mode.
Step 2: Enter the correct user password and press 3S button 4 to confirm.

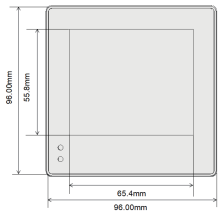
How to enter a password:
Step1: Click button 2 or 3 to increase or decrease the number of flashing bits.
Step2: Click button 4 to move the flashing position to the right.
Step3: After entering the correct password, press button 4 for confirmation. If the password is verified correctly, the power meter will enter the screen of "Parameter Setting menu".

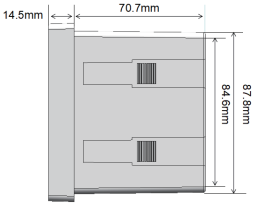
4. Specification

Electrical Characteristics		
Measurement accuracy	Voltage, Current	Class 0.2
	Active power	Class 0.5
	Reactive power	Class 2
	Apparent power	Class 0.5
	Active energy	Class 0.5S
	Reactive energy	Class 2
	Power factor	Class 0.5
	Frequency	Class 0.05
	Harmonic distortion	Class 2
Input-Voltage	Rate voltage(Un)	230 Vac (L-N) / 400 Vac (L-L)
	Measured range(Direct connection)	30 to 350 Vac (L-N), 30 to 660 Vac (L-L)
	PT primary	30 to 600000
	Impedance	1MΩ
	Frequency range	45 to 65 Hz
	Overload capacity	2*Un for 1 second
Input-Current	CT2 (Secondary)	1A or 5A Optional: 100mA, 100mV
	CT1 (Primary)	1 to 9999 A
	Measured range	0.003 to 6 A, basic current (Ib) is 5A
	Impedance	<0.01 ohm
	Overload capacity	120A for 0.5 second
	Burden	<0.06VA at 6A
Auxiliary power supply	Operating range	80 ~ 300 Vac / 100 ~ 420 Vdc
	Frequency	45 ~ 65 Hz
	Power consumption	< 4VA/0.5W

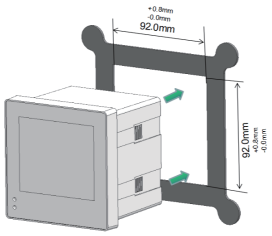
Digital input (DI)	Number	4
	Type	Support dry contact input (built-in power supply: 20 ~ 24VDC)
	Input Resistance	10kΩ
	Maximum frequency	250Hz
	Response time	2 milliseconds
	Isolation	2.5 kVrms
Digital output (DO)	Number/Type	2 - electromagnetic relay
	Output frequency	10Hz maximum
	Switching current	250 Vac at 3.0 Amps, 100k cycles
	Isolation	2.5 kVrms
Pulse output	Interface type	Open collector optocoupler
	Pulse constant	Per pulse equal 0.001/0.01/0.1/1/10/ 100/1000 kWh/kvarh (Configurable)
	Pulse width	60/100/200 milliseconds (Configurable), default is 100milliseconds
	Pulse output type	Import/export/total active energy, Import/export/total reactive energy (Configurable)
	Class	Class A, according IEC 62053-31
	Input voltage	5 ~ 27 Vdc
Pulse indicator light on the panel		Pulse constant is 5000imp/kWh, Represents the total active energy of the secondary side
Mechanical Characteristics		
IP Degree of Protection (IEC 60529)		Designed to IP51 front display, IP30 meter body
Dimensions (W X H X D)		96 x 96 x 70 mm (depth of meter from housing mounting flange) 96 x 96 x 14 mm (protrusion of meter from housing mounting flange)
Weight		PAC5000: 350g. PAC5010: 360g. PAC5100: 390g. PAC5110: 400g.
Mounting Position		Vertical
Panel thickness		1 ~ 5 mm
Material of meter case		UL 94 V-0
Environmental Characteristics		
Operating Temperature		-25 to +70°C
Storage Temperature		-40 to +80°C
Humidity		< 90%, non-condensing
Pollution Degree		2
Altitude		Up to 2000m
Vibration		10 Hz to 150Hz, IEC 60068-2-6
Electromagnetic Characteristics		
Electrostatic Discharge		Level 4, according IEC 61000-4-2
Immunity to Radiated Fields		Level 4, according IEC 61000-4-3
Immunity to Electrical Fast Transients		Level 4, according IEC 61000-4-4
Immunity to Surges		Level 4, according IEC 61000-4-5
Immunity to Conducted Disturbances		Level 4, according IEC 61000-4-6
Immunity to Magnetic Fields		IEC 61000-4-8
Immunity to Voltage Dips		IEC 61000-4-11
Radiated Emissions		Class B, according EN55011
Conducted Emissions		Class B, according EN55011
Harmonics		IEC 61000-3-2
Safety		
Measurement Category		CAT III, according IEC 61010-1
Current Input		Require external Current Transformenr for Insulation
Overvoltage Category		CAT III, according IEC 61010-1
Insulation		AC Voltage Test: 4kV for 1 minute
		Impulse Voltage Test: 6kV - 1.2/50μS waveform
Protective Class		II, according IEC61010-1
Communications		
Interfaces standard and protocols		2-wire RS485, Modbus RTU Optional: MBus
Buad rate		1200 to 38400 bps, default is 9600 bps
Parity bit		None, Even, Odd, default is None
Stop bit		1 or 2, default is 1
Response time		<100ms
Transmission mode		half-duplex
Transmission distance		Up to 1000m
Max. Bus loading		64 pcs
Firmware Update		Support communication port to update firmware

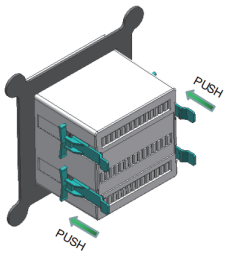
5. Installation dimensions





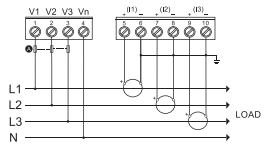
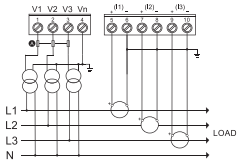
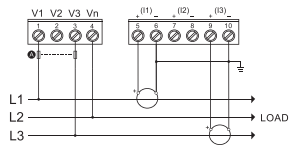
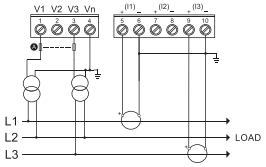
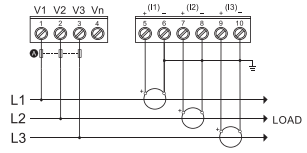
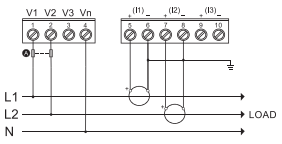
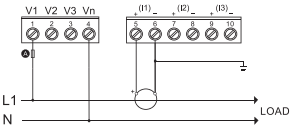
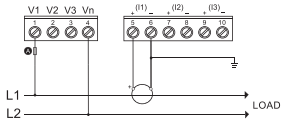
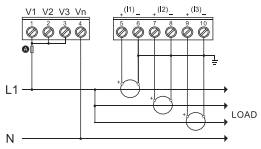
6. Mounting



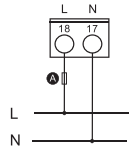
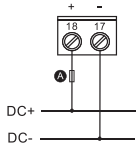


7. Wiring Diagrams

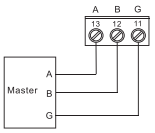
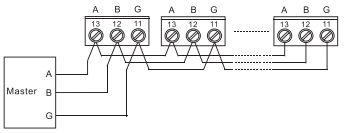
Measurement input wiring

3P4W (3CT)	3P4W (3PT+3CT)
	
3P3W (2CT)	3P3W (2PT+2CT)
	
3P3W (3CT)	2P3W (L+L+N, 2CT)
	
1P2W (L+N, 1CT)	1P2W (L+L, 1CT)
	
1P2W (L+N, 3CT)	
	

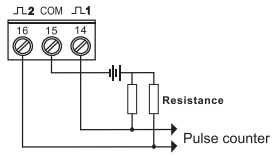
Auxiliary power wiring

AC Power	DC Power
	

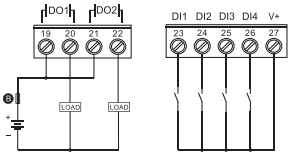
Communication terminal wiring

Single meter wiring	Multiple meters wiring
	

Pulse output terminal wiring



Digital inout and ouput terminal wiring



Ⓐ : 500 mA fast fuse.

Ⓑ : Fast fuse.
In use, the user needs to select the fast fuse according to the load specification parameters.

Terminal specification parameters

Voltage measurement input terminal	Wire size: 0.82 ~ 3.31 mm2 (18 ~ 12 AWG) Torque: 0.5 ~ 0.6 N.m
Current measurement input terminal	Wire size: 1.318 ~ 3.31 mm2 (16 ~ 12 AWG) Torque: 0.5 ~ 0.6 N.m
Auxiliary power terminal	Wire size: 0.82 ~ 3.31 mm2 (18 ~ 12 AWG) Torque: 0.5 ~ 0.6 N.m
Communication terminal	Wire size: 0.82 ~ 3.31 mm2 (18 ~ 12 AWG) Torque: 0.5 ~ 0.6 N.m
Pulse output terminal	Wire size: 0.82 ~ 3.31 mm2 (18 ~ 12 AWG) Torque: 0.5 ~ 0.6 N.m
Digital inout and ouput terminal	Wire size: 0.82 ~ 3.31 mm2 (18 ~ 12 AWG) Torque: 0.5 ~ 0.6 N.m

8.Model Overview

VE-PM5000 series products includes 4 models:

	RS485 Modbus	4DI & 2DO	Mulit-tariff & RTC	Power Quality
VE-PM5000	■			
VE-PM5010	■		■	■
VE-PM5100	■	■		■
VE-PM5110	■	■	■	■