



VT-PM604

3 Phase Power Monitor & Data Logger

Volterra Techniks LLP

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Product Details

Basic Details	
Model	VT-PM604
Extra Sensor Support	4 BNC terminals - 333mV CT and Rogowski Current Clamps
Storage	30GB Memory, USB drive download
Power	2x 18650 lithium batteries or 5V DC power supply(adaptor included)

Features	
Product description	3 phase power monitor and data logger
Supported Wiring Configurations	3PH4W; 3PH3W; 1PH2W (L-N); 1PH2W (L-L); 1PH3W (L-L-N)
Input type	External Rogowski coil External CT(333mV only) External Voltage Probes
Display	3.5" TFT screen display
Sampling rate	8k samples per second
Harmonic Monitoring	Till 51 st harmonic in real time
Mechanical characteristics	
Weight	850g
Dimensions	21.5 cm x 13 cm x 6 cm

Meter Characteristics

The VT-PM604 measures currents and voltages and reports real-time RMS values for all 3-phases and neutral. In addition, the power meter calculates power factor, active power, reactive power, and more.

The following sections list the metering characteristics of the power meter.

Real-Time Measurements

The following table lists the parameters of the power meter for real-time measurement:

Characteristics	Description
Current	Per phase, neutral, and average of 3 phases
Voltage	L-L, L-N, and average of 3 phases, N-PE
Frequency	45 - 65 Hz
Active power	Total and per phase (signed)
Reactive power	Total and per phase (signed)
Apparent power	Total and per phase (signed)
Power factor (True)	Total and per phase 0.000 to 1 (signed)
Angle	Voltage angle, Current angle
Current unbalance	Per phase, most unbalanced of 3 phases
Voltage unbalance	most unbalanced of 3 phases

Minimum/Maximum Values

When any one-second real-time reading reaches its highest or lowest value, the VT-PM604 saves the minimum and maximum values, along with a time stamp in its non-volatile memory. From the display, you can:

- View all min./max. values since the last reset and the reset date and time.
- Reset min./max. values.

All running min./max. values are arithmetic minimum and maximum values. For example, the minimum phase A-N voltage is the lowest value in the range from 0 to 999.9GV that has occurred since last reset of the min./max. values. The following table lists the minimum and maximum values stored in the power meter:

Characteristics	Description
Current	Per phase and average
Voltage	per phase and average
Active power	Per phase and total
Reactive power	Per phase and total
Apparent power	Per phase and total

Demand Readings

Power demand is the energy accumulated during a specified period divided by the length of the period. Current demand is calculated using arithmetical integration of the current RMS values during a time period, divided by the length of the period. The power meter provides the following demand readings:

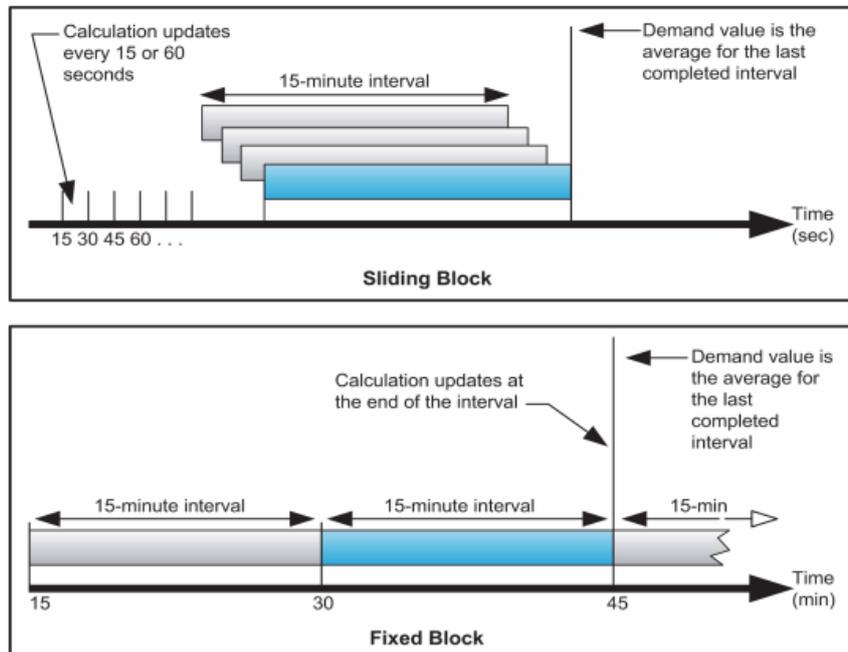
Characteristics	Description
Current	Per phase and average
Active, reactive, apparent power	Per phase and Total
Peak Demand Values	Description
Current	Per phase and average
Active, reactive, apparent power	Per phase and Total

Demand Calculation Methods

To be compatible with electric utility billing practices, the VT-PM604 provides block interval power/current demand calculations. For block interval demand calculations, following modes are available:

- Fixed block - Select an interval from 1 to 60 minutes (in 1 minute increments). The power meter calculates and updates the demand at the end of each interval.
- Sliding block - Select an interval from 1 to 60 minutes (in 1 minute increments). For demand intervals less than 15 minutes, the value is updated every 15 seconds. For demand intervals of 15 minutes and greater, the demand value is updated every 60 seconds. The power meter displays the demand value for the last completed interval.

The following figures illustrate the two ways to calculate demand power using the block method. For illustration purposes, the interval is set to 15 minutes.



Peak Demand

In non-volatile memory, the power meter maintains a maximum operating demand value called peak demand. The peak is the highest value (absolute value) for each of these readings since the last reset. You can reset peak demand values from the power meter display. You should reset peak demand after changes to basic power meter setup such as power system configuration.

Energy Readings

The power meter calculates and stores Per phase and total energy values for active, reactive, and apparent energy. The resolution of the energy value automatically changes from kWh to MWh to GWh (kVAh to MVARh to GWh). The energy values automatically reset to 0 when it reaches the limit of 999.9GWh, 999.9GVAh, or 999.9GVARh.

The following table lists the energy readings from the power meter:

Energy values	Description
Active energy	0 to 999.9GWh Auto reset to 0 in case of over limit

Reactive energy	0 to 999.9GVARh Auto reset to 0 in case of over limit
Apparent energy	0 to 999.9GVAh Auto reset to 0 in case of over limit

Power Quality Analysis

The power quality analysis values use the following abbreviations:

- Fundamental phase current rms: I_1
- Fundamental phase voltage rms: V_1
- RMS of up to three harmonics of phase current:
 $I_x, I_y, I_z, x, y, z = 2, 3, \dots, N$
- RMS of up to three harmonics of phase voltage:
 $V_x, V_y, V_z, x, y, z = 2, 3, \dots, N$
- Total harmonic distortion of the phase current

$$(THD)_I = \frac{\sqrt{I^2 - I_1^2}}{I_1}$$

- Total harmonic distortion of the phase voltage

$$(THD)_V = \frac{\sqrt{V^2 - V_1^2}}{V_1}$$

- Harmonic distortion of up to three harmonics on the phase current

$$HD_{I_x} = \frac{I_x}{I_1}, x = 2, 3, \dots, N$$

$$HD_{I_y} = \frac{I_y}{I_1}, y = 2, 3, \dots, N$$

$$HD_{I_z} = \frac{I_z}{I_1}, z = 2, 3, \dots, N$$

- Harmonic distortion of up to three harmonics on the phase voltage:

$$HD_{V_x} = \frac{V_x}{V_1}, x = 2, 3, \dots, N$$

$$HD_{V_y} = \frac{V_y}{V_1}, y = 2, 3, \dots, N$$

$$HD_{V_z} = \frac{V_z}{V_1}, z = 2, 3, \dots, N$$

THD provides a measure of the total distortion present in a waveform. THD is the ratio of harmonic content to the fundamental and provides a general indication of the quality of a waveform. THD is calculated for both voltage and current. The following table lists the power quality values of the power meter:

Characteristics	Description
THD	Total,2,3,4,5,,,,,51(51 times) Per phase current (percentage value) X,Y,Z,A,B(5 times each time) Per phase current(rms value) Total,2,3,4,5,,,,,51(51 times)Per phase voltage(percentage value) X,Y,Z,A,B(5 times each time)Per phase voltage(rms value)

Data Record

The power meter records data to SD card, the following table lists data record of the power meter.

Record		
Record interval	1s to 9999s (default 1min)	
Record format	csv	
Record capacity	30GB Memory	
	Store about 2.5K Bytes data each time	
	12 years (1min interval)	
Record data	"Current Harmonic"file	ITHD(%),IHD2(%),IHD3(%),,,,,,IHD51%(%) (Each phase)
	"Voltage Harmonic"file	VTHD(%),VHD2(%),VHD3(%),,,,,,VHD51%(%) (Each phase)
		Voltage(V);UTHD(%);Current(A);ITHD(%); Frequency(Hz);Power Factor; Current Demand(A); Current Peak Demand(A)&Date; (Each phase and Average)
	"DataSheet" file	Active Power(W) ;Reactive Power(Var);Apparent Power(Va) Active Energy(Wh);Reactive Energy(Varh);Apparent Energy(Vah) (Each phase and Summary) Total Active Power Demand(W) Total Active Power Peak Demand(W)&Date Total Reactive Power Demand(Var) Total Reactive Power Peak Demand(Var)&Date Total Apparent Power Demand(Va) Total Apparent Power Peak Demand(Va)&Date

Operational Characteristics

The following table lists other characteristics of the power meter:

Environmental conditions	
Operating temperature	-25°C to +55°C
Storage temperature	-40°C to +85°C
Humidity rating	5 to 95% RH at 50°C(non-condensing)
Pollution degree	2
Overvoltage category	III, for distribution systems up to 277/480VAC
Dielectric withstand	As per IEC61010-1, Doubled insulated front panel display
Altitude	3000m Max
IP degree of protection	IP20 conforming to IEC 60629
Colour	White
EMC	
Electrostatic discharge	Level IV(IEC61000-4-2)
Immunity to radiated fields	Level III (IEC61000-4-3)
Immunity to fast transients	Level IV (IEC61000-4-4)
Immunity to surge	Level IV (IEC61000-4-5)
Conducted immunity	Level III (IEC61000-4-6)
Immunity to power frequency magnetic fields	0.5mT (IEC61000-4-8)
Conducted and radiated emissions	Class B (EN55022)
Standard compliance	
EN 62052-11,EN61557-12,EN 62053-21,EN 62053-22,EN 62053-23,EN 50470-1,EN 50470-3, EN 61010-1,EN 61010-2,EN 61010-031	

Product Specifications

Measurement accuracy		
Rated current (3 level selectable)	600A(0.5% from 6A to 720A)	
	3000A(0.5% from 10A to 3600A)	
	6000A(0.5% from 20A to 7200A)	
Rogowski Current Probe Settings	600A	VT-RC600
	3000A	VT-RC3K
	6000A	VT-RC6K
Current Clamp Settings	10A [0.5% (100mA~10A), 1%(10mA~100mA)]	VT-CC10
CTs connect setting	Primary setting:	from 1A to 999999A
	Secondary setting:	from 0.001mV to 707mV
Voltage	0.2% from 5 to 600V	
Power factor	±0.005	
Active/Apparent Power	IEC62053-22 Class 0.5	
Reactive power	IEC62053-21 Class 2	
Frequency	0.01% from 45 to 65Hz	
Active energy	IEC62053-22 Class 0.5s	
Reactive energy	IEC62053-21 Class 2	
Input-current characteristics		
Primary current range	600A	0.5A to 720A
	3kA	0.5A to 3600A
	6kA	0.5A to 7200A
Measurement input range	1/2 ²⁵ mV-707mV	
Permissible overload	2V for 10s/hours	
Power Supply		
Power	2*2900mAh lithium battery	
	Working time: 10 hours	
	Charging time: 8 hours	
	5V DC power supply(included adaptor)	
Power Consumption		
Screen Maximum Brightness	2000mW	
Screen Minimum Brightness	1800mW	
Wire diameter for terminals		
Current input	BNC connector	
Voltage input	Banana plug	
DC power supply	DC 5.5*2.1 plug	

MODBUS-TCP

Communication	
Transmission mode	RJ45 port
Communication protocol	MODBUS TCP
Settings	
IP address	Configurable (default 192.168.1.5)
Port No.	502

Port definition

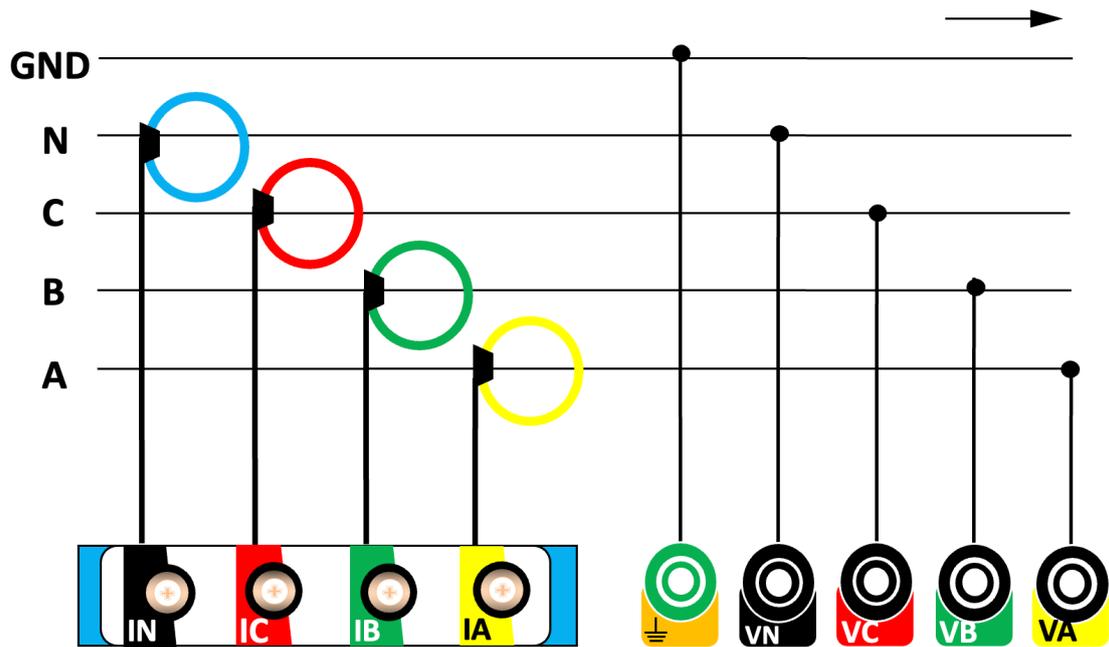
Port number	Port name	Port function	Remarks
1	IA	A-phase current input	Current input
2	IB	B-phase current input	
3	IC	C-phase current input	
4	IN	N-phase current input	
5	VN	N-phase voltage input	Voltage input
6	VC	C-phase voltage input	
7	VB	B-phase voltage input	
8	VA	A-phase voltage input	
9	VE	PE-N voltage input	
10	Power	POWER 5V DC	Power 5-9V DC
11	USB port	Download log data	Plug out(in) USB DISK
12	RJ45 port	Mobus-TCP communication	Communication

Wiring

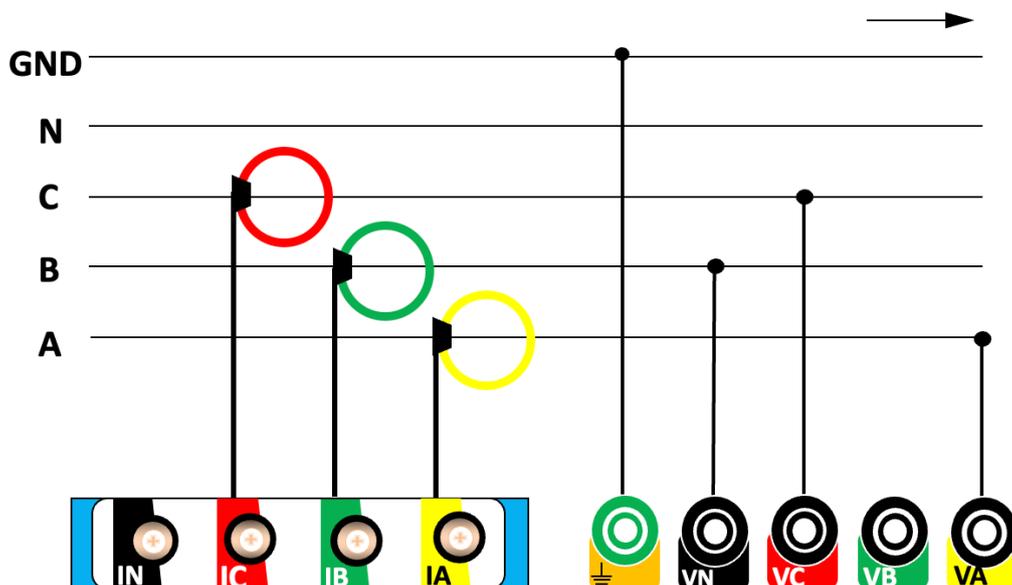
*: Rogowski coil secondary output voltage cannot be over 333mV rms.

^: CT must be voltage output, secondary output cannot over 333mV rms.

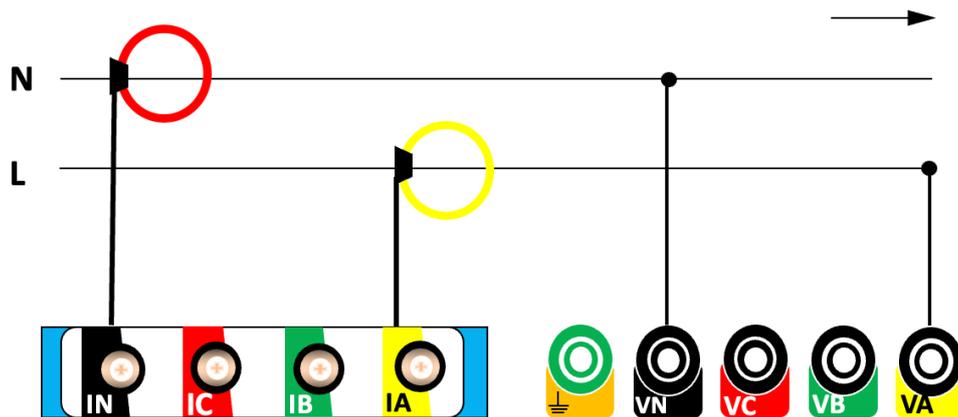
3PH4W



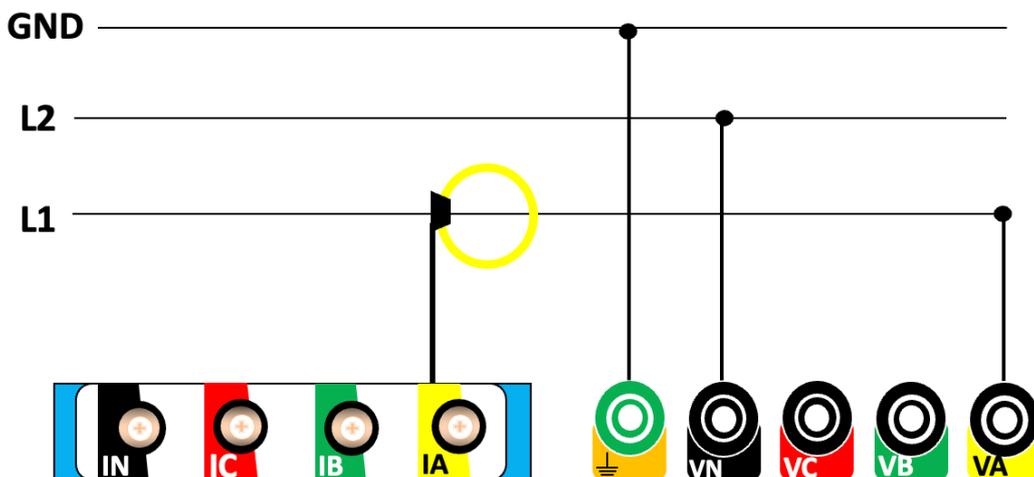
3PH3W



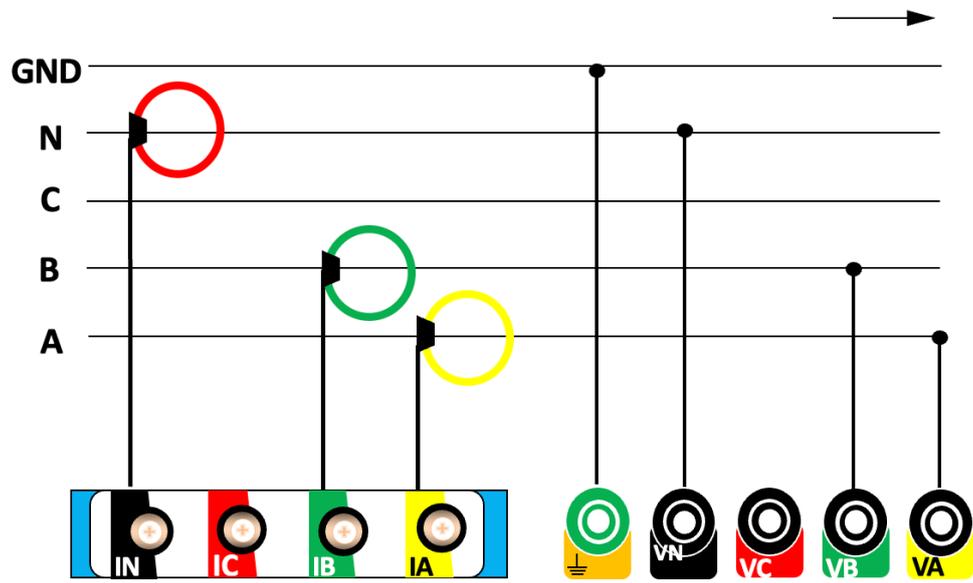
1PH2W L-N



1PH2W L-L



1PH3W L-L-N



Meter operation

Introduction

The meter features a panel with TFT LCD, a graphic display, and contextual menu buttons for accessing the information required to operate the power meter and modify parameter settings. The Navigation menu allows you to display, configure, and reset parameters

The default factory settings are listed in the below table:

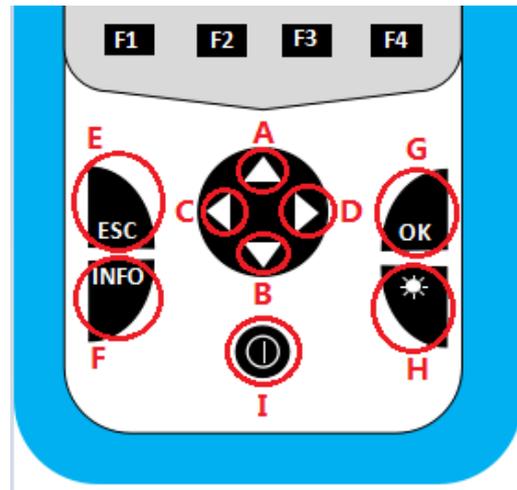
Function	Factory settings
Wire	3PH4W 50Hz
Current	Rcoil 600A 50mV/kA@50H
Voltage	DIRECT
Record	Switch:Disable Period:60s
LAN	DHCP: Disable IP: 192.168.1.5 Netmask: 255.255.255.0 Gateway: 192.168.1.1
Harmonic	H1=3 H2=5 H3=7 H4=9 H5=11
Password(Low)	1000
Date/Time	-
Demand	Method: sliding block; Interval: 15 minutes
Reset	-
Fn	F1:Wire F2:Current F3:Record F4:Fn

Interface

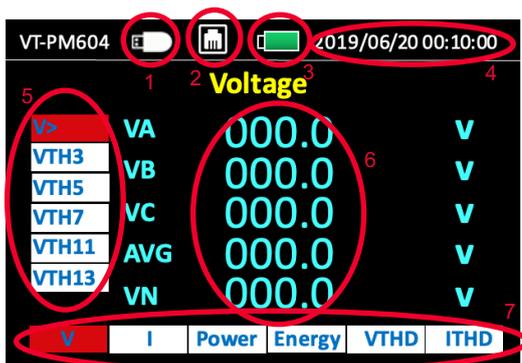
Buttons:

- A: "Up" - Switch cursor to up
- B: "Down" - Switch cursor to down
- C: "Left" - Switch cursor to left
- D: "Right" - Switch cursor to Right
- E: "ESC" - Return to previous menu or enter Menu
- F: "INFO" - Enter information menu to check product details
- G: "Enter" - Switch to secondary interface
- H: "Light" - Background light switch, 5 levels
- I: "Power" - ON/OFF, long press 3s after a buzzing sound.

Noted: After entering the Secondary Interface, pressing "Left" and "Right" will not toggle Primary Interface

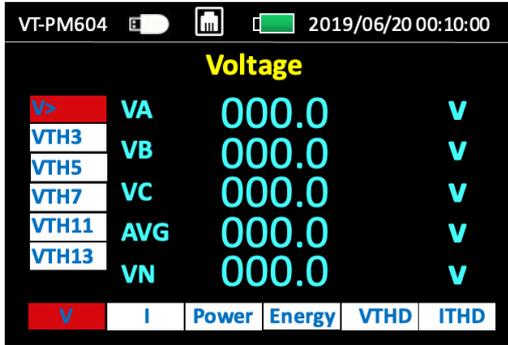


1. Date display Interface



- ① USB DISK connecting
- ② RJ45 connecting
- ③ Battery usage
- ④ Date & Time
- ⑤ From Up to down, Secondary Interface
Voltage, Voltage harmonic 3,5,7,11,13 times
- ⑥ Display Value
- ⑦ From left to right, Primary Interface
Voltage---Current---Power---Energy-- Voltage-harmonic---Current harmonic

2. Voltage display Interface



Selection	Parameter	Value	Unit
V>	VA	000.0	V
VTH3	VB	000.0	V
VTH5	VC	000.0	V
VTH7	AVG	000.0	V
VTH11	VN	000.0	V
VTH13			

"V>" - Voltage RMS value(Press "Enter" to switch to Secondary interface)

"VTH3" - X times Voltage harmonic RMS value

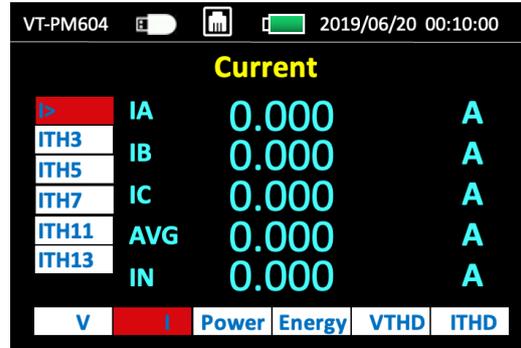
"VTH5" - Y times Voltage harmonic RMS value

"VTH7" - Z times Voltage harmonic RMS value

"VTH11" - A times Voltage harmonic RMS value

"VTH13" - B times Voltage harmonic RMS value

3. Current display interface



Selection	Parameter	Value	Unit
I>	IA	0.000	A
ITH3	IB	0.000	A
ITH5	IC	0.000	A
ITH7	AVG	0.000	A
ITH11	IN	0.000	A
ITH13			

"I>" - Current RMS value(Press "Enter" to switch to Secondary interface)

"ITH3" - X times Current harmonic RMS value

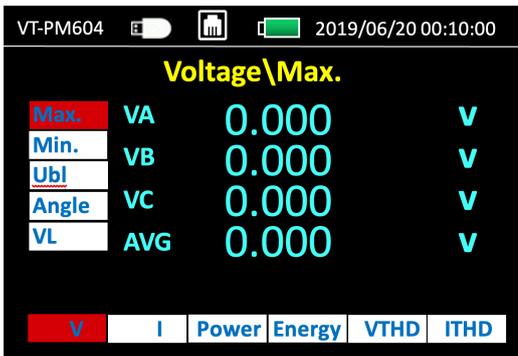
"ITH5" - Y times Current harmonic RMS value

"ITH7" - Z times Current harmonic RMS value

"ITH11" - A times Current harmonic RMS value

"ITH13" - B times Current harmonic RMS value

2.1 Voltage Secondary Interface



Selection	Parameter	Value	Unit
Max.	VA	0.000	V
Min.	VB	0.000	V
Ubl	VC	0.000	V
Angle	AVG	0.000	V
VL			

"Max." - Voltage Maximum value

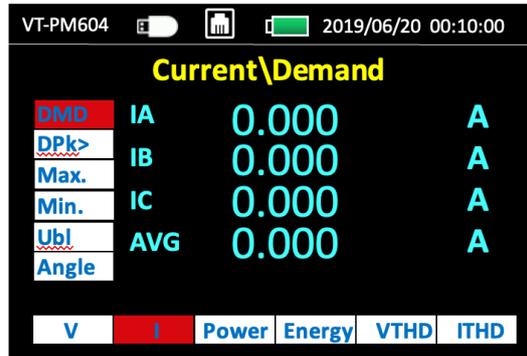
"Min." - Voltage Minimum value

"Ubl" - Voltage unbalance

"Angle" - Voltage Unbalance degree

"VL" - Line Voltage value

3.1 Current Secondary interface



Selection	Parameter	Value	Unit
DMD	IA	0.000	A
DPK>	IB	0.000	A
Max.	IC	0.000	A
Min.	AVG	0.000	A
Ubl			
Angle			

"EMD" - Current demand

"DPK>" - Current Maximum demand(Press "Enter" to switch to Third Interface)

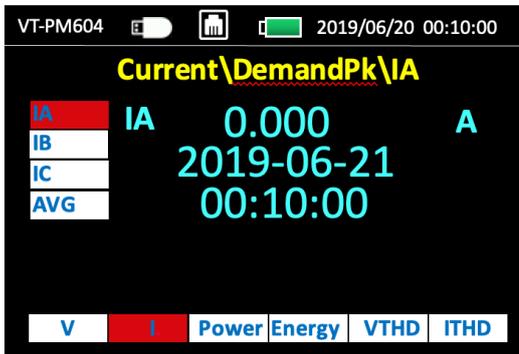
"Max." - Current Maximum value

"Min." - Current Minimum value

"Ubl" - Current unbalance degree

"Angle" - Current angle

3.1.1 Current Maximum demand (Third interface)



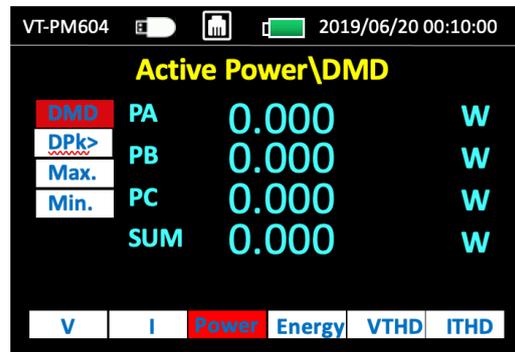
"IA" - Phase A Current Maximum demand

"IB" - Phase B Current Maximum demand

"IC" - Phase C Current Maximum demand

"AVG" - Total Average Current Maximum demand

4.1 Active Power (Secondary interface)



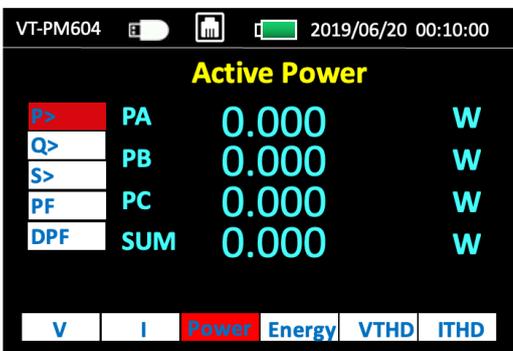
"DMD" - Active Power Demand

"Dpk>" - Active Power Maximum Demand(Press "Enter" to switch to Third interface)

"Max." - Active Power Maximum Value

"Min." - Active Power Minimum Value

4. Power display interface



"P" - Active Power (Press "Enter" to switch to Secondary interface)

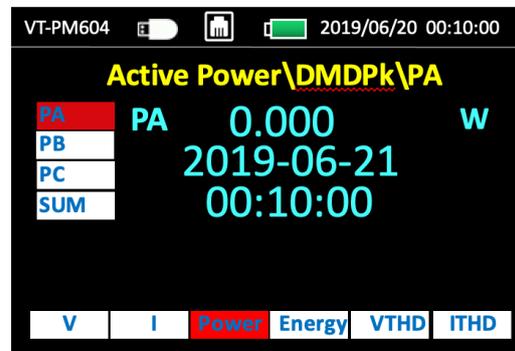
"Q" - Reactive Power (Press "Enter" to switch to Secondary interface)

"S" - Apparent Power (Press "Enter" to switch to Secondary interface)

"PF" - Power Factor

"DPF" - Fundamental Power Factor

4.1.1 Active Power Maximum Demand(Third interface)



"PA" - Phase A Active Power Maximum Demand

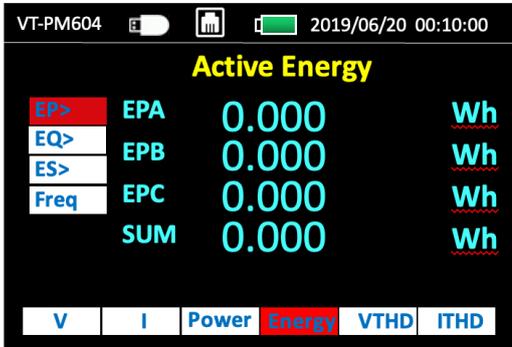
"PB" - Phase B Active Power Maximum Demand

"PC" - Phase C Active Power Maximum Demand

"SUM" - Total phase Active Power Maximum Demand

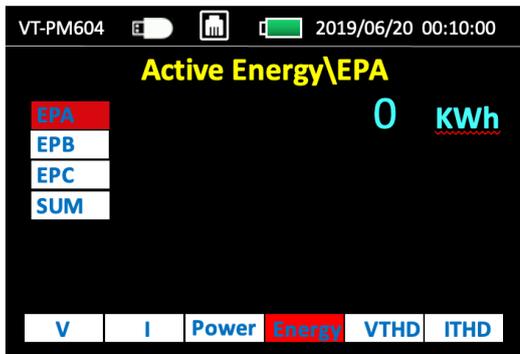
Note: Reactive Power(Q>) and Apparent Power (S>) Third Interface is similar to above shown

5. Energy display interface



- "EP>" - Active Energy(Press "Enter" to switch to Third interface)
- "EQ>" - Reactive Energy (Press "Enter" to switch to Third interface)
- "ES>" - Apparent Energy(Press "Enter" to switch to Third interface)
- "Freq" - Frequency

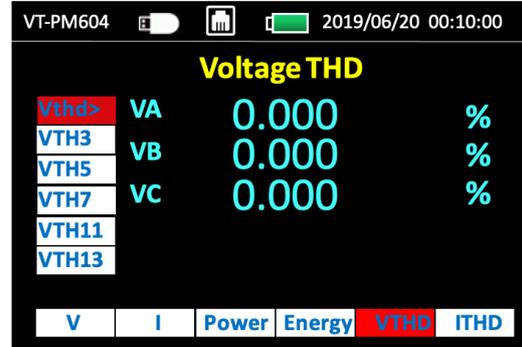
5.1 Active Energy in kWh (Third interface)



- "EPA" - Phase A Active Energy in kWh (total 9bits)
- "EPB" - Phase B Active Energy in kWh (total 9bits)
- "EPC" - Phase C Active Energy in kWh (total 9bits)
- "SUM" - Total phase Active Energy in kWh (total 9bits)

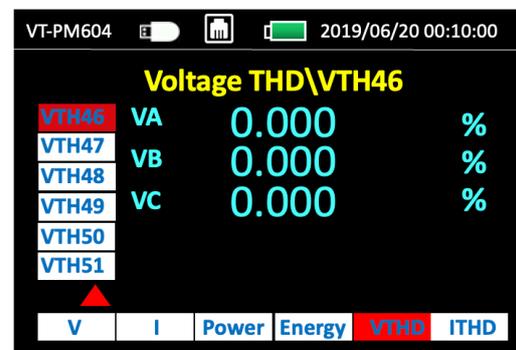
Note: Reactive Energy(EQ>) and Apparent Energy (ES>) Third Interface is similar to above shown

6. Voltage harmonic display interface



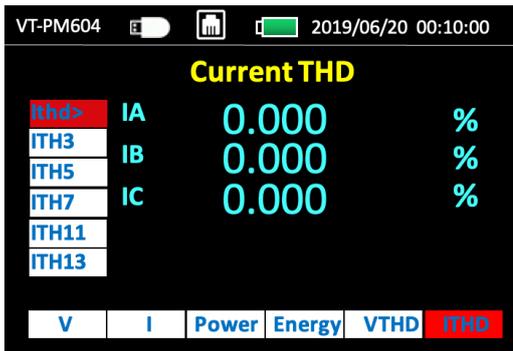
- "Vthd>" - Total Voltage harmonic percent (Press "Enter" to switch to Third interface)
- "VTH3" - X Voltage harmonic percent (Selectable from settings)
- "VTH5" - Y Voltage harmonic percent (Selectable from settings)
- "VTH7" - Z Voltage harmonic percent (Selectable from settings)
- "VTH11" - A Voltage harmonic percent (Selectable from settings)
- "VTH13" - B Voltage harmonic percent (Selectable from settings)

6.1 2 to 51 Total Voltage harmonic percent (Third interface)



- "VTH2" - 2 times Voltage harmonic percent
- "VTH3" - 3 times Voltage harmonic percent
- "VTH4" - 4 times Voltage harmonic percent
-"VTH51" - 51 times Voltage harmonic percent

7. Current harmonic display interface



"Ithd>" - Total Current harmonic percent (Press "Enter" to switch to Third interface)

"ITH3" - X Current harmonic percent (Selectable from settings)

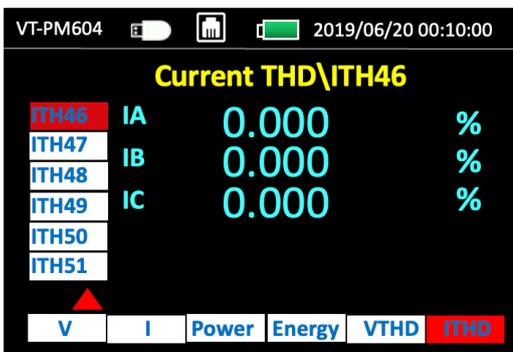
"ITH5" - Y Current harmonic percent (Selectable from settings)

"ITH7" - Z Current harmonic percent (Selectable from settings)

"ITH11" - A Current harmonic percent (Selectable from settings)

"ITH13" - B Current harmonic percent (Selectable from settings)

7.1 2 to 51 Total Current harmonic percent (Third interface)



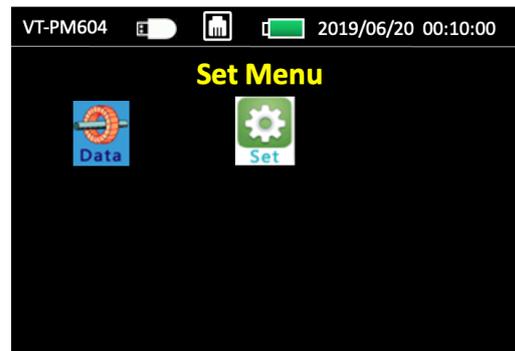
"ITH2" - 2 Current harmonic percent

"ITH3" - 3 Current harmonic percent

"ITH3" - 4 Current harmonic percent

....."ITH51" - 51 times Current harmonic percent

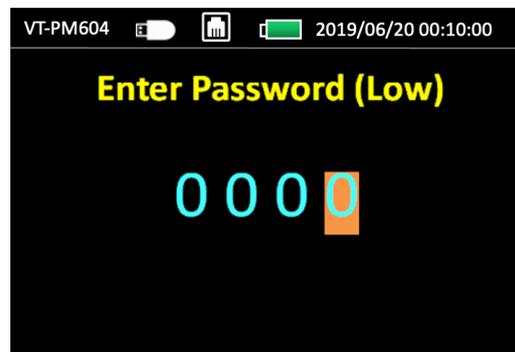
8. Menu Interface



Press "ESC" to switch on Data Menu

Press "Left/Right" and "OK" to choose "Data" or "Set"

9. Setting interface



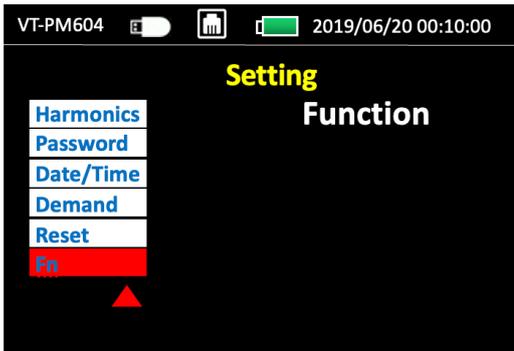
Enter "Set" on Menu interface.

Enter Password :1000 (default)

Press "Up/Down" to change number.

Press "Left/Right" to change display number position.

9.1 System Setting Operation



"Wire" - Wiring setting

"Current" - Configuration for current probes

"Voltage" - Configuration voltage sensor ratio

"Record" - Storage and download setting

"LAN" - MODBUS TCP setting

"Harmonic" - Harmonic setting for X, Y, Z, A, B

"Password" - Password setting

"Date/Time" - Date/Time configuration

"Demand" - Demand setting

"Reset" - Reset Min/Max values

"Fn" - F1, F2, F3, F4 Key setting

9.1.1 Wire setting



Press "Enter" to change to next line.

Press Up/Down to modify value on current line.

"Mode" Options:

"3PH4W" - 3 Phase 4 Wire

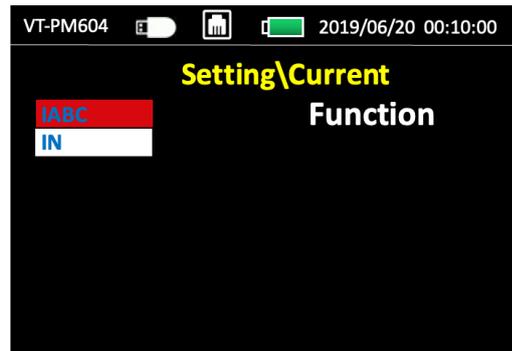
"3PH3W" - 3 Phase 3 Wire

"1PH2W_LL" - Single Phase 2 Wire L_L type

"1PH2W_LN" - Single Phase 2 Wire L_N type

"1PH3W_LL" - Single Phase 3 Wire L_L_N type

9.1.2 Current Setting



Press "Enter", to enter the secondary interface.

"IABC" – Setting for Phase A,B,C current probes

"IN" – Setting for Phase N current probes

9.1.2.1 Current secondary interface setting.



Press "Enter" to move to next line.

Press Up/Down to modify value on current line.

Press Left/Right to move cursor in numerical fields.

"IABC Con"/"IN Con" Options:

"Rcoil" - Rogowski coil connected directly(No integrator connect)

FSA: Rated Current selection (600A/3kA/6kA)

Coil: Each Rated current corresponding only one ratio of Rogowski coil, can't be changed.

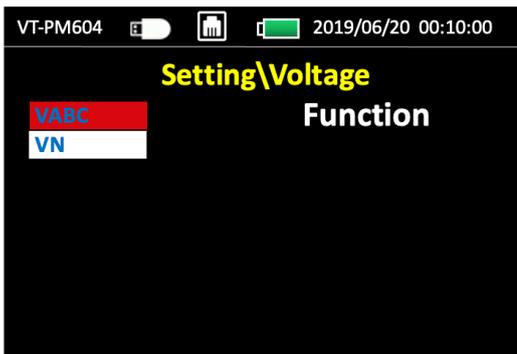
"CT" - 333mV output current probe connected

“CT Pri(A)”: CT Primary Rated Current A Value

“CT Sec(mV)”:CT Secondary Rated output mV value

Note: When navigating out of “IABC” and “IN” setting interfaces, a “Save Changes” notification will pop-up. Press “Enter” to save the settings or “ESC” to revert to the previous configuration.

9.1.3 Voltage Setting

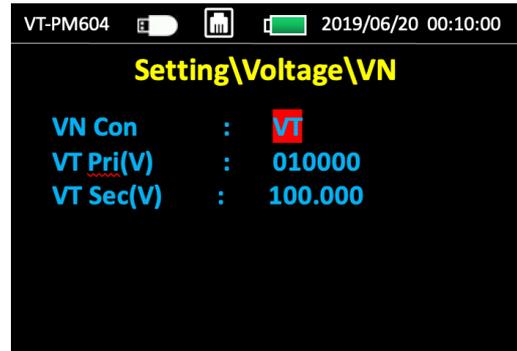


Press “Enter”, to enter the secondary interface.

“UABC” - Settings for Phase A, B, C voltage probes

“UN” - Settings for Phase N voltage

9.1.3.1 Voltage secondary interface setting



Press “Enter” to move to next line.

Press Up/Down to modify value on current line.

Press Left/Right to move cursor in numerical fields.

“UABC Con”/“UN Con” Options:

“DIRECT” - Voltage directly connected

“VT” - Voltage transformer connected

VT Pri(V): Voltage sensor primary input value

VT Sec(V): Voltage sensor secondary output value

9.1.4 Record setting



Press “Enter” to enter the secondary interface.

“Store” - Switch the record function ON/OFF

“Download” - Download data

9.1.4.1 Store secondary interface setting of Record



“Recording” Options:

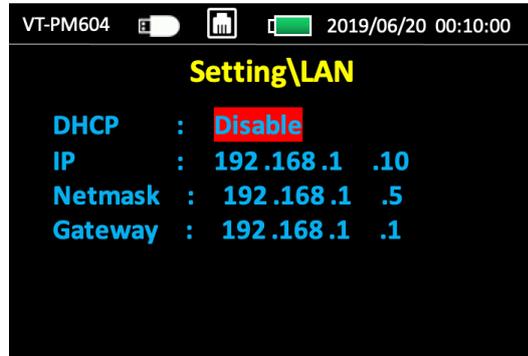
“Start” - Start record function

“Stop” - Stop record function.

“Period” - Record interval time (from 1s to 99999s, default 60s)

To clear the internal storage, long press F1 to enter the formatted internal storage operation and press 'OK'

9.1.5 LAN setting



“DHCP” Options:

“Enable” - The router automatically gives an IP address

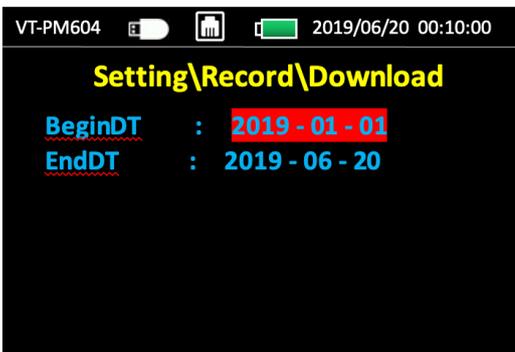
“Disable” - You can set the IP address

Press “Enter” to move to next line.

Press Up/Down to modify value on current line.

Press Left/Right to move cursor in numerical fields.

9.1.4.2 Download secondary interface setting of Record



“BeginDT” - Set beginning date for download

“EndDT” - Set ending date for download

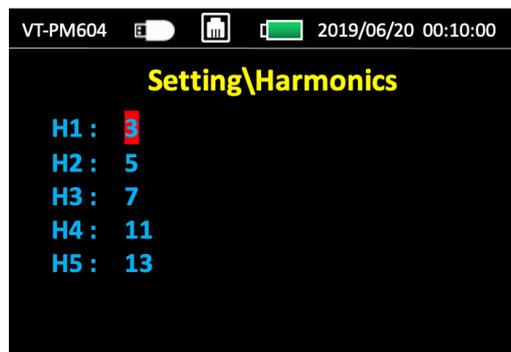
After setting dates, press “Enter” to download data to the inserted USB drive

 ‘White’ means USB drive has been inserted.

 ‘Green’ means data is being downloaded.

(When the download has been completed, the icon will disappear)

9.1.6 Harmonic times setting



Selection of the harmonics seen on screens 6 and 7

Range for each field: 2 to 51

9.1.7 Password setting



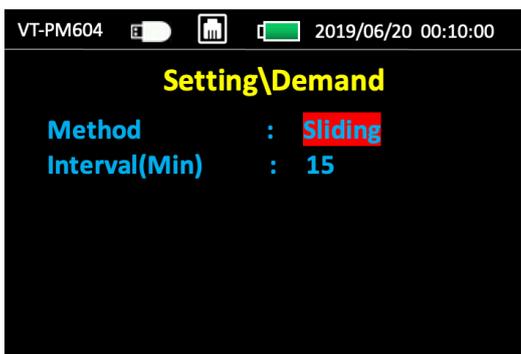
Enter new password, then press "Enter" to save.

9.1.8 Date/Time Setting



Modify date and time, then press "Enter" to save.

9.1.9 Demand setting



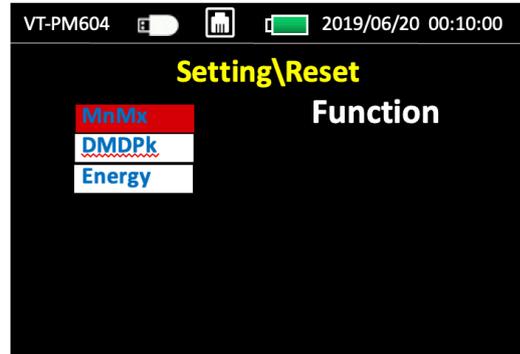
"Method" Options:

"Sliding": Time sliding mode

"Fixed": Time fixed mode

Interval(Min): 1 - 60 minutes

9.1.10 Reset setting



MnMx: Reset Minimum/Maximum value

DMDPk: Reset Maximum Demand value

Energy: Reset Energy values

9.1.11 Fn setting



Shortcut keys - F1, F2, F3, F4

10. Information interface



Info interface for product information

Model: Meter Model No.

FW Ver: Meter Firmware Version Number

SN: Series Number



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