MEATROL®
ELECTRICAL

ME440

Handheld Data Logger

V1.0

ROGOWSKI TECHNOLOGY (SHANGHAI) CO., LTD

Catalogue

Connectivity advantages	
Model	ME440
Support Extra sensor	4pcs BNC terminal 333mV CT 4pcs BNC terminal 320mV current clamp 4pcs BNC terminal Rogowski coil
Storage	16GB Memory,USB DISK download (save intervals 1mins default)
Power	2*18650 lithium battery(wroking time: approx 10 hours) Or 5V DC power supply(included adaptor)

Feature

Specification	
Model	ME440
Product component type	Handheld;poly-phase;data logger;power analyzer
Poles description	3PH4W 3PH3W 1PH2W (L-N); 1PH2W(L-L);1PH3W(L-L-N)
Device application	Power analysis Data log
Input type	External Rogowski coil External CT(333mV only)
Display	3.5 inch TFT screen display
Sampling rate	8k samples per second
Harmonic	51th in the mean time
Mechanical characteristics	
Weight	850g (with Accessory 2kgs)
Dimension	L*W*D:21.5*13*6CM

Power Meter Characteristics

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

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

Real-Time Measuring

The following table lists the metering characteristics of the power meter for the 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 power meter saves the minimum and maximum values in its nonvolatile memory.

From the power meter 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 power meter provides time stamping for all minimum/maximum 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

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	
Current	Per phase and average
Active, reactive, apparent power	Per phase and Total

Demand Calculation Methods

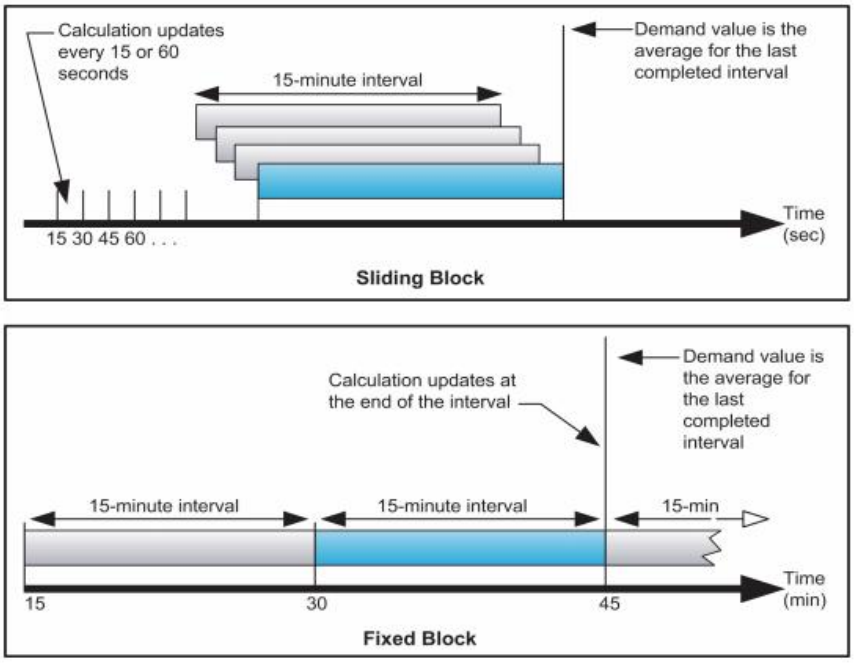
Power demand is the energy accumulated during a specified period divided by the length of the period. Current demand is calculated using arithmetical integration of the current RMS values during a time period, divided by the length of the period. How the power meter performs this calculation depends on the selected method. To be compatible with electric utility billing practices, the power meter provides block interval power/current demand calculations.

For block interval demand calculations, you select a block of time (interval) that the power meter uses for the demand calculation and the mode the meter uses to handle he interval. 2 different modes are possible:

• 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 2 ways to calculate demand power using the block method. For illustration purposes, the interval is set to 15 minutes.



Peak Demand

In nonvolatile 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.

You can view energy values from the display. The resolution of the energy value automatically changes from kWh to MWh to GWh (kVAh to MVARh to GWh).

The energy values automatically resets 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:

Characteristics	Description
Energy values	
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 Values

The power quality analysis values use the following abbreviations:

• Fundamental phase current rms: I1

• Fundamental phase voltage rms: V1

• RMS of up to three harmonics of phase current:

Ix, Iy, Iz, x, y, z = 2, 3,…, N

• RMS of up to three harmonics of phase voltage:

Vx, Vy, Vz, x, y, z = 2, 3,…, 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

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

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

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

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

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

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

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

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	16GB Memory	
	Store about 2.5K Bytes data each time	
	record 12 years （1min interval）	
Record data	"Current Harmonic"file	ITHD(%),IHD2(%),IHD3(%),,,,,IHD51(%) (Each phase)
	"Voltage Harmonic"file	UTHD(%),UHD2(%),UHD3(%),,,,,UHD51(%)(Each phase)
	"DataSheet" file	Voltage(V);UTHD(%);Current(A);ITHD(%); Frequency(Hz);Power Factor; Current Demand(A); Current Peak Demand(A)&Date; (Each phase and Average)
		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 Deamnd(W) Total Active Power Peak Deamnd(W)&Date Total Reactive Power Deamnd(Var) Total Reactive Power Peak Deamnd(Var)&Date Total Apparent Power Deamnd(Va) Total Apparent Power Peak Deamnd(Va)&Date

Other Characteristics

The following table lists other characteristics of the power meter:

Characteristics	Description
Reset	
Minimum and maximum values	—
Peak demand values	—
Current demand calculation method	1 to 60 minutes
Power demand calculation method	1 to 60 minutes

Environmental conditions	
Operating temperature	-25℃ to +55℃
Storage temperature	-40℃ to +85℃
Humidity rating	5 to 95% RH at 50℃(non-condensing)
Pullution 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
Contractual warranty	12months
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	

Specification

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)	
Rogwoski coil connect setting	600A	MRC-36
	3000A	NRC-150 or Y-FCT-510
	6000A	NRC-200 or Y-FCT-800
ST08 current clamp	5A	0.5% (100mA～5A) 1%(10mA～100mA)
	10A	0.5% (100mA～10A) 1%(10mA～100mA)
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 PANASONIC 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	UN	N-phase voltage input	Voltage input
6	UC	C-phase voltage input	
7	UB	B-phase voltage input	
8	UA	A-phase voltage input	
9	UE	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

Accessories

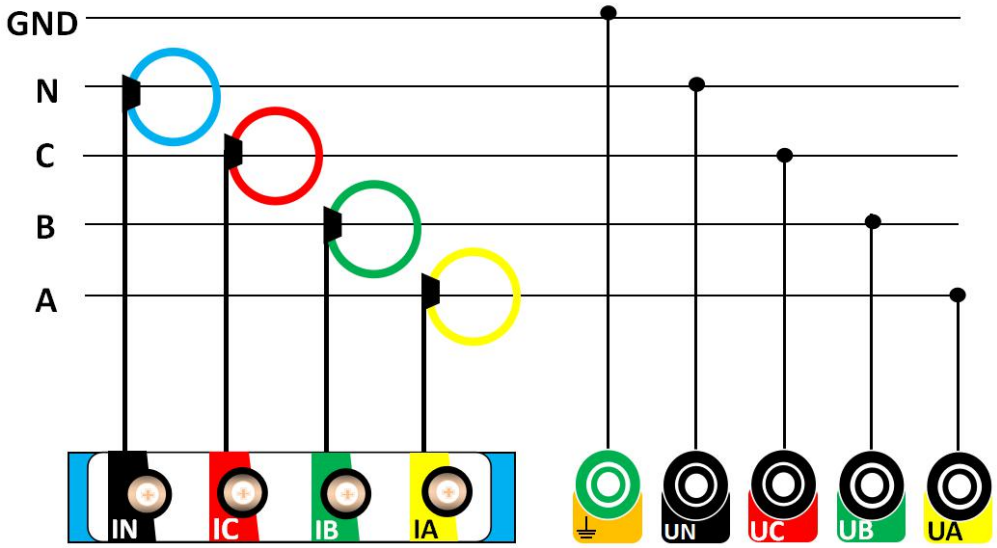
Accessories	
Voltage wires	5pcs voltage clamp wires with banana plug (2 meters,1.5mm²)
Adaptor	85-265 AC to 5V DC adaptor(default Europe plug)
Remark	**Rogowski coil not included**

Wiring

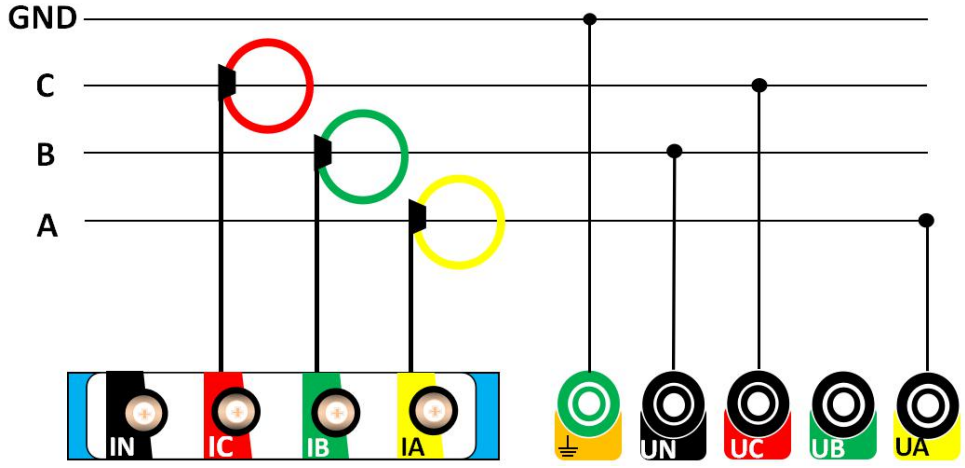
*：Rogowski coil secondary output voltage can not over 333mV rms.

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

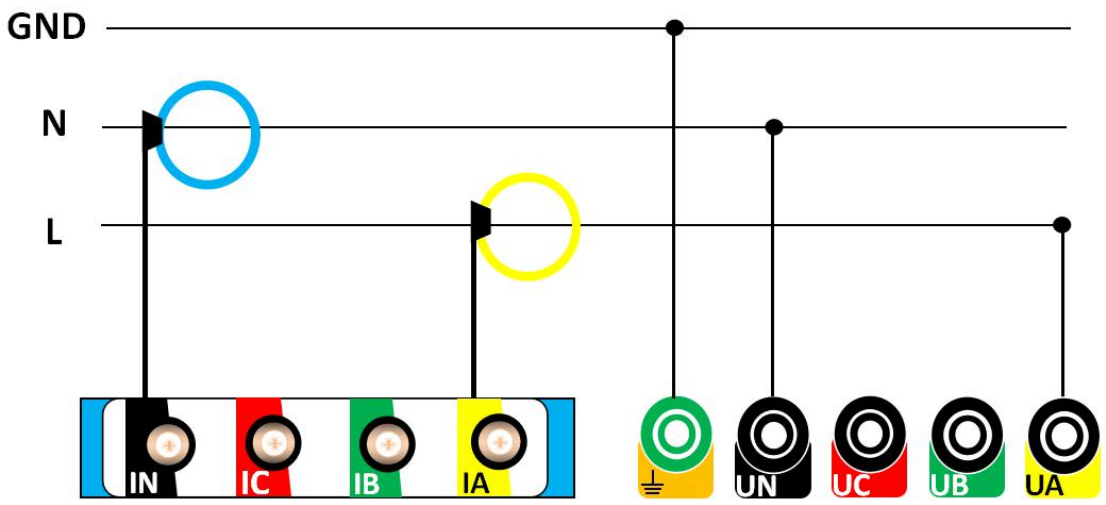
3PH4W



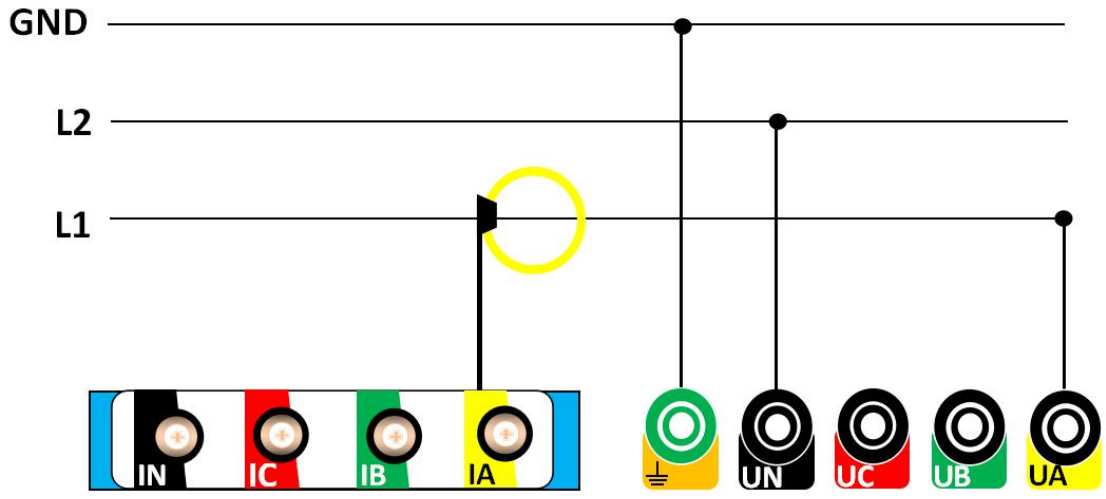
3PH3W



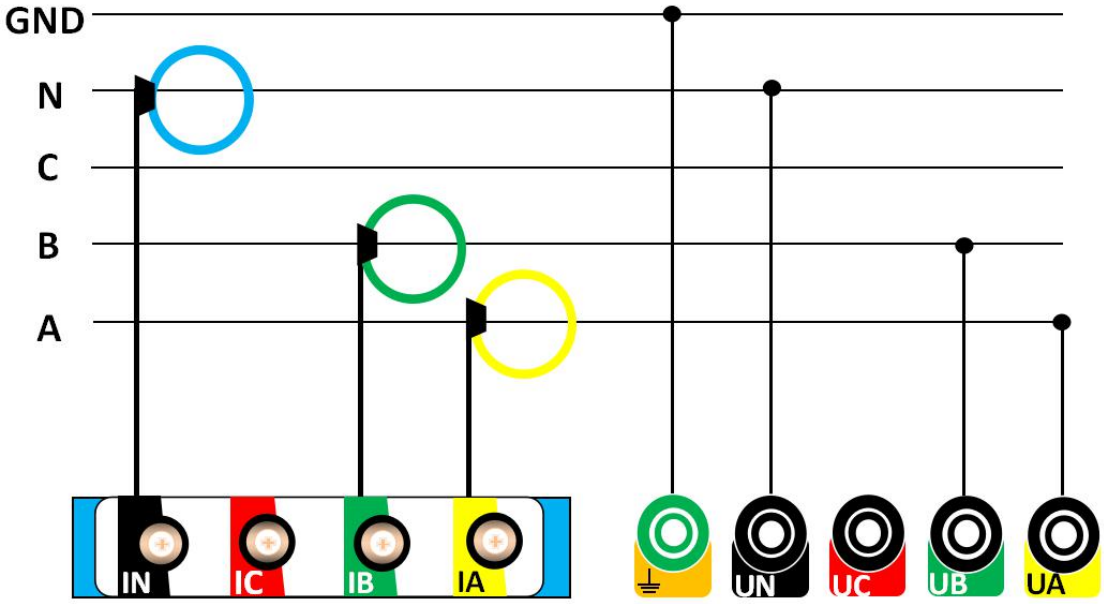
1PH2W L-N



1PH2W L-L



1PH3W L-L-N



Installation

Current Voltage Input

Battery

Power,USB DISK,RJ45 port

Meter operation

Introduction

The power 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.

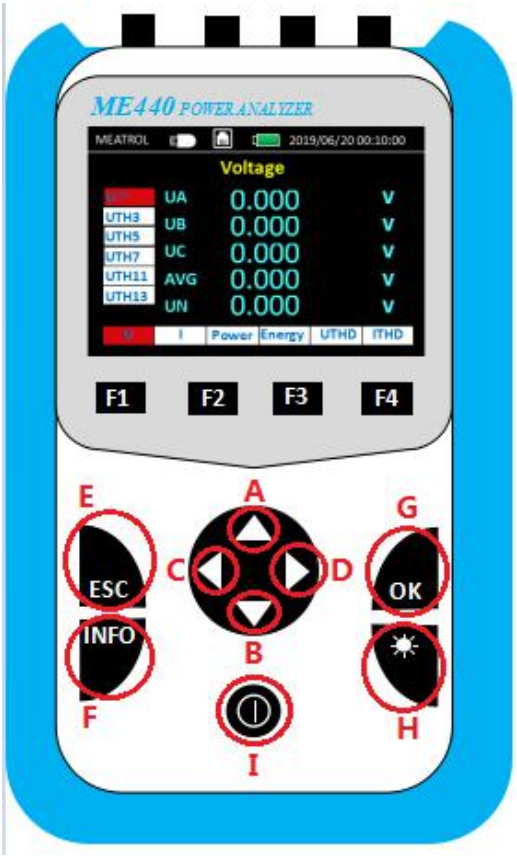
The Navigation menu allows you to display, configure, and reset parameters

Configuration mode

The default factory settings are listed in the following 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



Button：

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 to check series,FW version No.

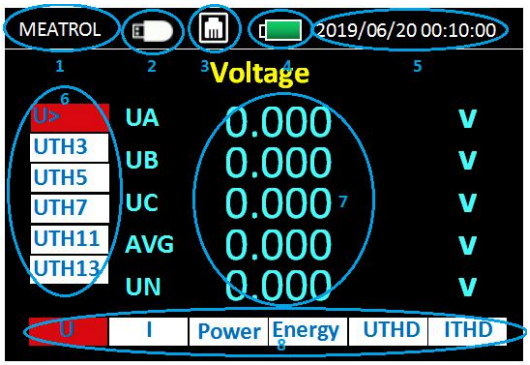
G: "Enter" Switch to secondary interface

H:"Light" backgound light switch, 5 level for choice

I:"Power" ON/OFF,long press 3s after a buzzing sound.

Noted： After entering the Secondary interface, press "Left" and "Right" can't switch the bottom item, need to return to the main interface to switch

1. Date display Interface



① Company name

② USB DISK connecting

③ RJ45 connecting

④ Battery usage

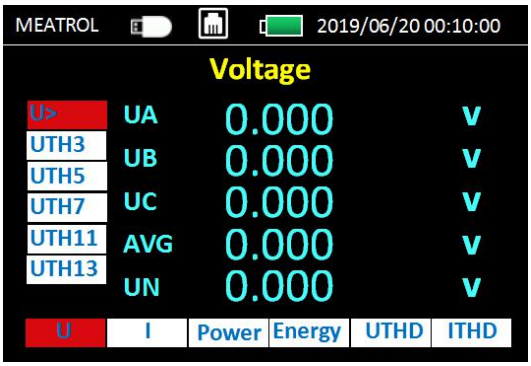
⑤ Date&Time

⑥ From Up to down,
Voltage,Voltage harmonic 3,5,7,11,13 times

⑦ Display Value

⑧ From left to right,
Voltage---Current---Power---Energy--
Voltage-harmonic---Current harmonic

2. Voltage display Interface



Left Area from top to bottom：

“U>” Voltage RMS value(Secondary interface)

“UTH3” X times Voltage harmonic RMS value

“UTH5” Y times Voltage harmonic RMS value

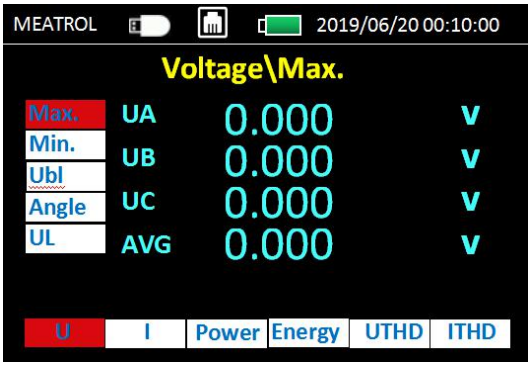
“UTH7” Z times Voltage harmonic RMS value

“UTH11” A times Voltage harmonic RMS value

“UTH13” B times Voltage harmonic RMS value

Voltage RMS value “U>” press “**Enter”** switch to Voltage Secondary interface

2.1 Voltage Secondary Interface



Left Area from top to bottom：

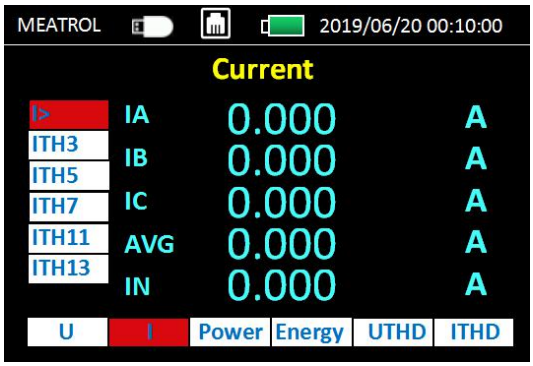
“Max.” Voltage Maximum value

“Min.” Voltage Minimum value

“Angle” Voltage Unbalance degree

“UL ” Line Voltage value

3. Current display interface



Left Area from top to bottom：

“I>” Current RMS value(Secondary interface)

“ITH3” X times Current harmonic RMS value

“ITH5” Y times Current harmonic RMS value

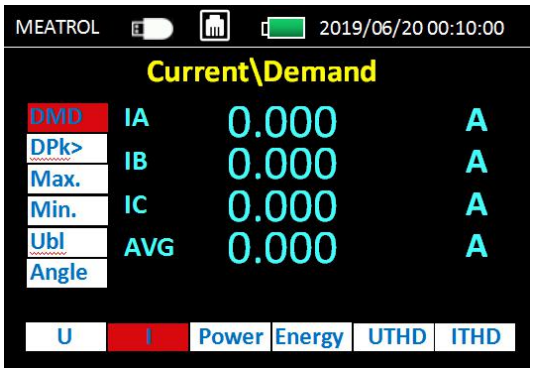
“ITH7” Z times Current harmonic RMS value

“ITH11” A times Current harmonic RMS value

“ITH13” B times Current harmonic RMS value

Current RMS value “U>” press “**OK”** switch to Current Secondary interface

3.1 Current Secondary interface



Left Area from top to bottom：

“EMD” Current demand

“DPK>”Current Maximum demand(Third interface)

“Max.” Current Maximum value

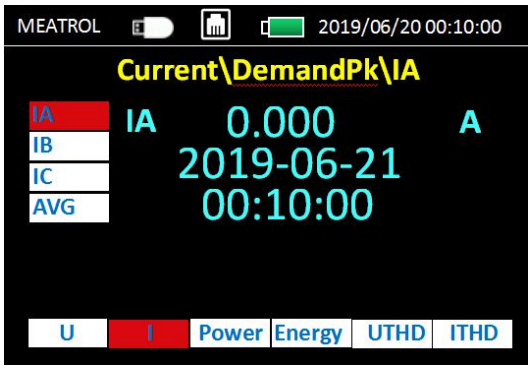
“Min.” Current Minimum value

“Ubl” Current unbalance degree

“Angle” Current angle

Current Maximum demand(Third interface)(DPK>) press **“OK”** to switch.

3.1.1 Current Maximum demand(Third interface)



Left Area from top to bottom：

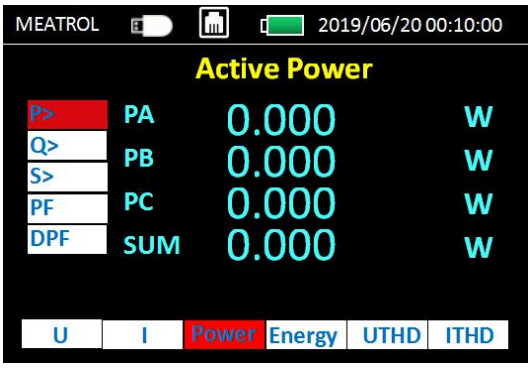
"IA" Phase A Current Maximum demand

"IB" Phase B Current Maximum demand

"IC" Phase C Current Maximum demand

"AVG" Total Average Current Maximum demand

4. Power display interface



Left Area from top to bottom：

Active Power(Secondary interface)

Reactive Power(Secondary interface)

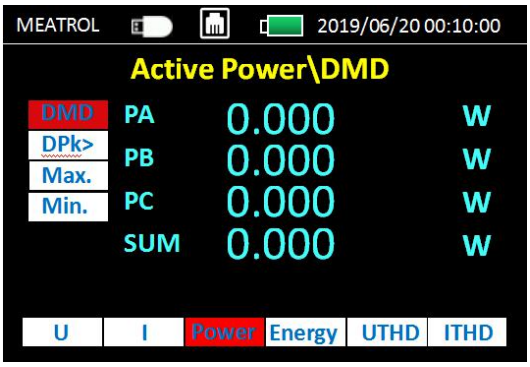
Apparent Power(Secondary interface)

Power Factor

Fundamental Power Factor

(Secondary interface) press **OK** to switch

4.1 Active Power(Secondary interface)



Left Area from top to bottom：

"DMD" Active Power Demand

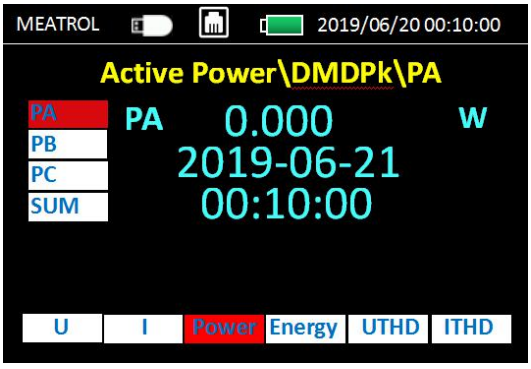
"Dpk>" Active Power Maximum Demand(Third interface)

"Max." Active Power Maximum Value

"Min." Active Power Minimum Value

"Dpk>" Active Power Maximum Demand(Third interface) press **Enter** to switch

4.1.1 Active Power Maximum Demand(Third interface)



Left Area from top to bottom：

"PA" Phase A Active Power Maximum Demand

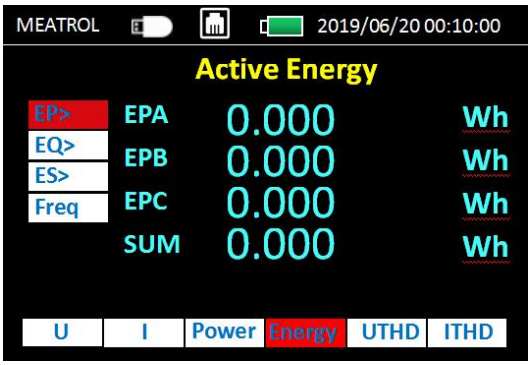
"PB" Phase B Active Power Maximum Demand

"PC" Phase C Active Power Maximum Demand

"SUM" Total phase Active Power Maximum Demand

Noted:Reactive Power(Q>) and Apparent Power (S>) Interface is similar to above

5. Energy display interface



Left Area from top to bottom：

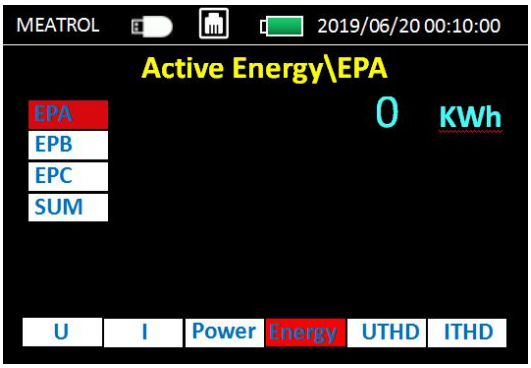
“EP>” Active Energy(Third interface)

“EQ>” Reactive Energy (Third interface)

“ES>” Apparent Energy(Third interface)

“Freq” Frequency

5.1 Active Energy in kWh (Third interface)



Left Area from top to bottom：

“EPA” Phase A Active Energy in kWh (total 9bits)

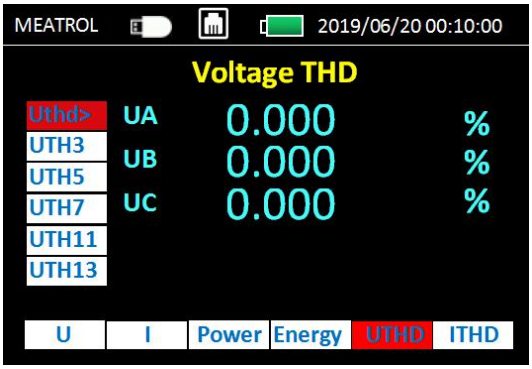
“EPB” Phase B Active Energy in kWh (total 9bits)

“EPC” Phase C Active Energy in kWh (total 9bits)

“SUM” Total phase Active Energy in kWh (total 9bits)

Noted:Reactive Energy(EQ>) and Apparent Energy (ES>) Interface is similar to above

6. Voltage harmonic display interface



Left Area from top to bottom：

“Uthd>’” Total Voltage harmonic percent (Third interface)

“THD3” X times Voltage harmonic percent

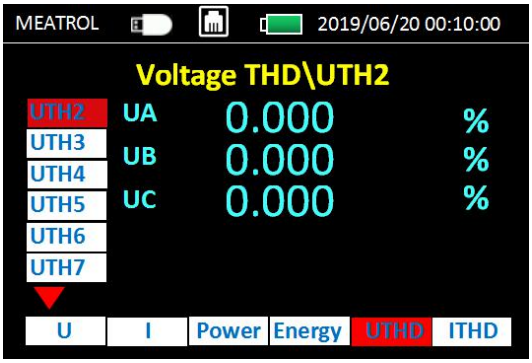
“THD5” Y times Voltage harmonic percent

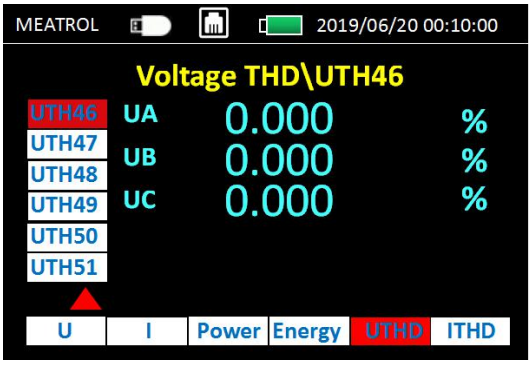
“THD7” Z times Voltage harmonic percent

“THD11” A times Voltage harmonic percent

“THD13” B times Voltage harmonic percent

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





“UTH2” 2 times Voltage harmonic percent

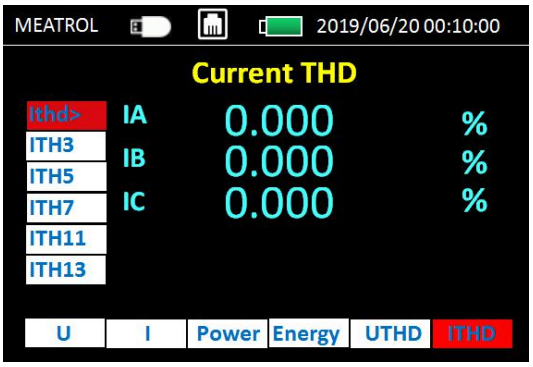
“UTH3” 3 times Voltage harmonic percent

“UTH3” 3 times Voltage harmonic percent

.....

“UTH51” 51 times Voltage harmonic percent

7.Current harmonic display interface



Left Area from top to bottom：

“Ithd>” Total Current harmonic percent (Third interface)

“ITH3” X times Current harmonic percent

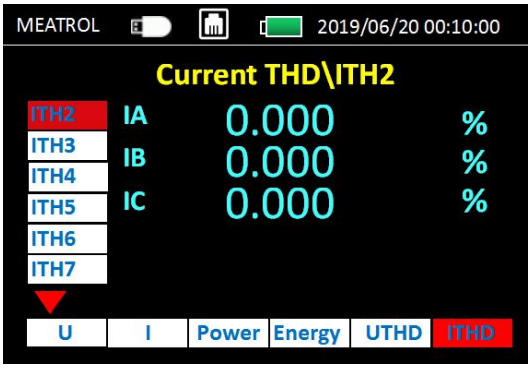
“ITH5” Y times Current harmonic percent

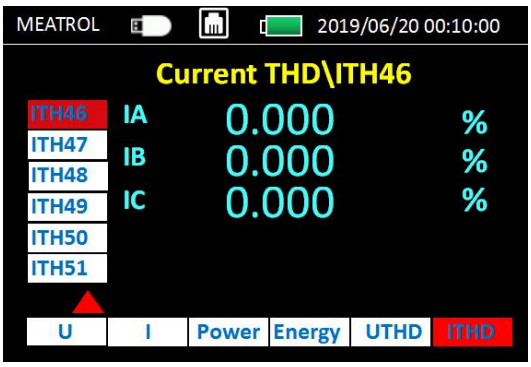
“ITH7” Z times Current harmonic percent

“ITH11” A times Current harmonic percent

“ITH13” B times Current harmonic percent

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





“ITH2” 2 times Current harmonic percent

“ITH3” 3 times Current harmonic percent

“ITH3” 3 times 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 choice “**Data**” “**Set**”

9. Setting interface

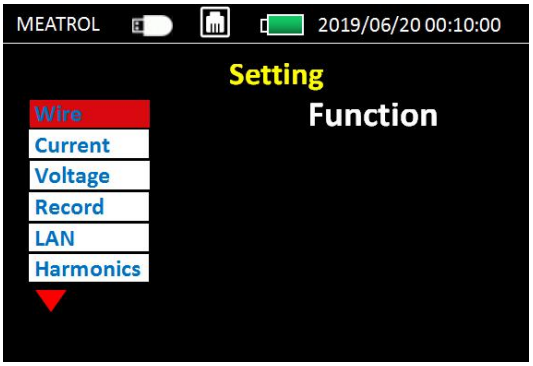
Enter “**Set**” on Menu interface.

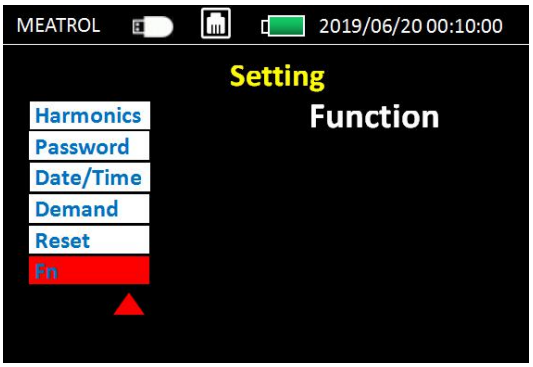
Enter Password(Low) :1000 (default)

Press **“Up/Down”** to change number.

Press **“Left/Right”** to change display number position.

9.1 System Setting Operation





Left Area from top to bottom：

“Wire” Wiring setting

“Current” Configuration Current sensor&Rated current

“Voltage” Configuration voltage sensor ratio

“Record” Storage and download setting

“LAN” MDOBUS TCP setting

“Harmonic” Harmonic times setting

“Password” Password change setting

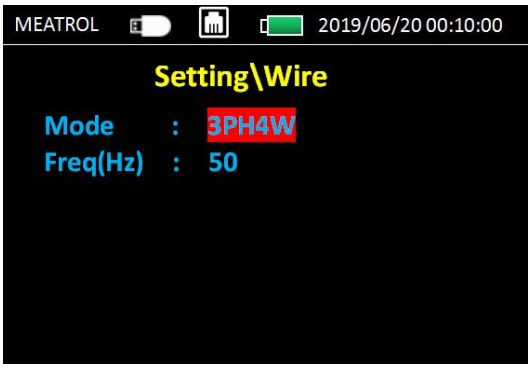
“Date/Time” Date/Time change setting

“Demand” Demand setting

“Reset” Reset Energy/Min/Max value

“Fn” F1 F2 F3 F4 KeyRocket setting

9.1.1 Wire setting



Press **“OK”** ,change to next line.

Press Up/Down,modify value on current line.

“Mode” Choice wiring type

“3PH4W” three phase 4 wire

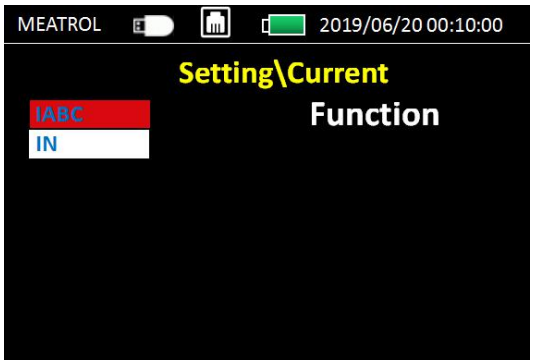
“3PH3W” three phase 3 wire

”1PH2W_LL” single phase 2 wire L_L type

”1PH2W_LN” single phase 2 wire L_N type

”1PH3W_LLN” single phase 3 wire L_L_N type

9.1.2 Current Setting

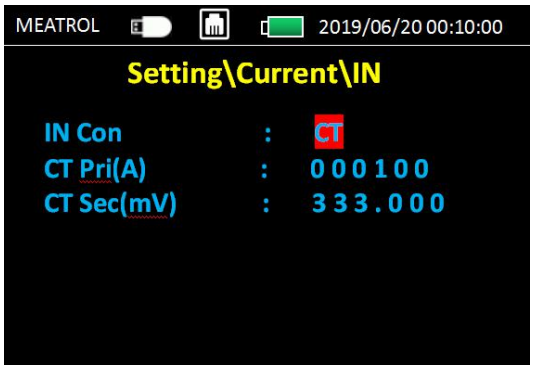


Press **“OK”** ,enter to secondary interface.

“**IABC**” setting Phase A,B,C Current sensor

“**IN**” setting Phase N Current sensor

9.1.2.1 Current secondary interface setting.



Press **“OK”** ,change to next line.

Press **Up/Down**,modify value on current line.

Press **Left/Right**,change display number position.

”**IABC Con**” **and** ”**IN Con**” : “Rcoil” and “CT” selection

Choice”**Rcoil**”**,**Rogowski coil connect 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 change.

600A 50mV/kA@50Hz

3kA 85mV/kA@50Hz

6kA 50mV/kA@50Hz

Choice"**CT**",333mV Current Transformer connect

"**CT Pri(A)**": CT Primary Rated Current A Value

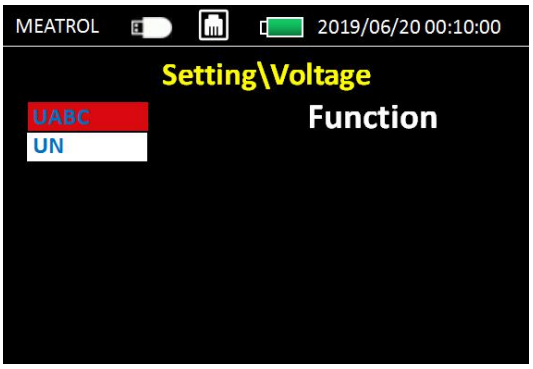
"**CT Sec(mV)**":CT Secondary Rated output mV value

Noted: If Choice "**Rcoil**" **in** "**IABC Con**" **and** "**IN Con**" **setting,Then this interface will show Rogowski coil rated current selection.**

If Choice "CTCon",this setting is setting CT primary and secondary

Noted: Out of "IABC" and "IN" setting interface,will have "Save Changes" notifications,must press "OK" to Save modify.If press "ESC",the modify can't be save.

9.1.3 Voltage Setting

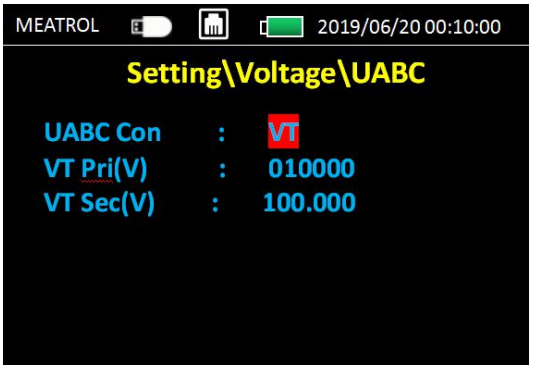


Press **"OK"** ,enter to secondary interface.

"**UABC**" setting Phase A,B,C Voltage sensor

"**UN**" setting Phase N Voltage sensor

9.1.3.1 Voltage secondary interface setting.



Press **OK** ,change to next line.

Press **Up/Down**,modify value on current line.

Left/Right,change display number position.

"**UABC Con**" **and** "**UN Con**" : "DIRECT" and "VT" selection

Choice"**DIRECT**",Voltage directly connect

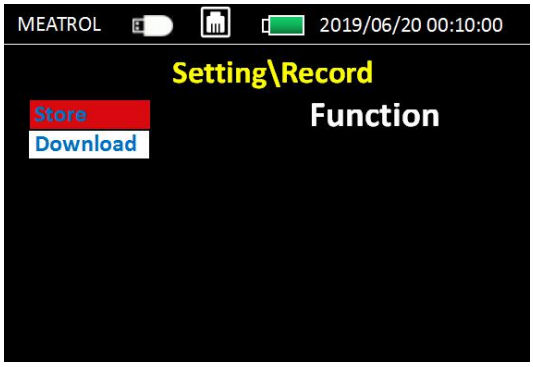
Choice"**VT**",Voltage transformer connect

VT Pri(V)：Voltage sensor Secondary output value

VT Sev(V)：Voltage sensor Primary input value

If Choice "DIRECT",the VT ratio setting will not display in this interface.

9.1.4 Record setting

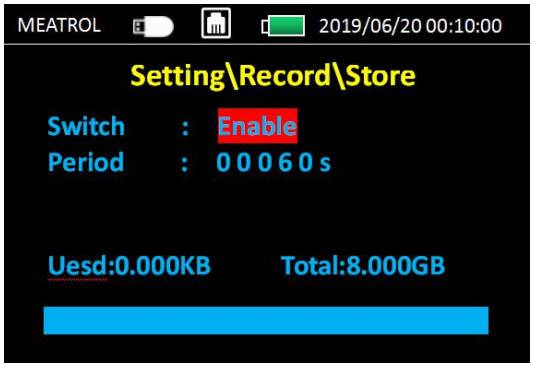


Press **"OK"** ,enter to secondary interface.

"**Store**" switch record function

"**Download**" setting Phase N Voltage sensor

9.1.4.1 Store secondary interface setting of Record



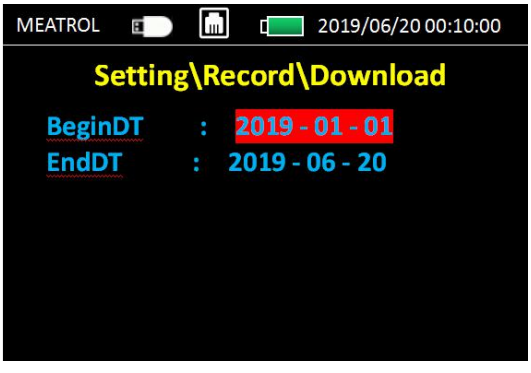
"Switch" choice Enable or Disable record function

"Enable" start record function

"Disable" stop record function.

"Period" setting record interval time.(from 1s to 99999s,default 60s)

9.1.4.2 Download secondary interface setting of Record



"BeginDT" Beginning date setting

"EndDT" Ending date setting

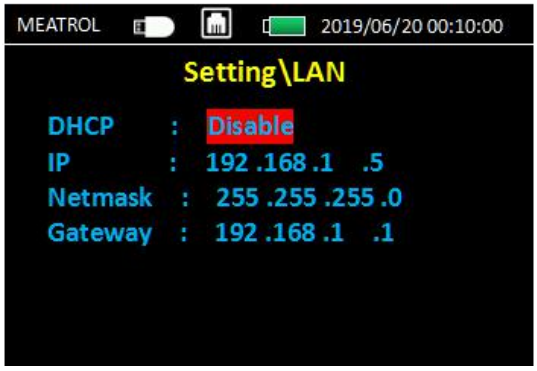
After setting time,press "OK" to download record data to USB-DISK

'White' means SD card has been inserted.

'Green' means data is being downloaded.

(When download complete, the icon disappears.)

9.1.5 LAN setting

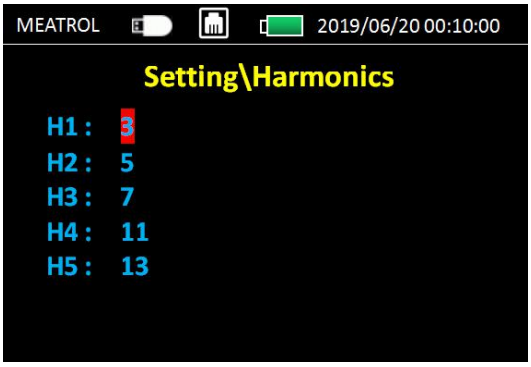


Configuration LAN for MODBUS-TCP

"Enable"The router automatically gives an IP address.

"Disable"You can set IP address

9.1.6 Harmonic times setting



Could measure 5 different times harmonic value A or V.

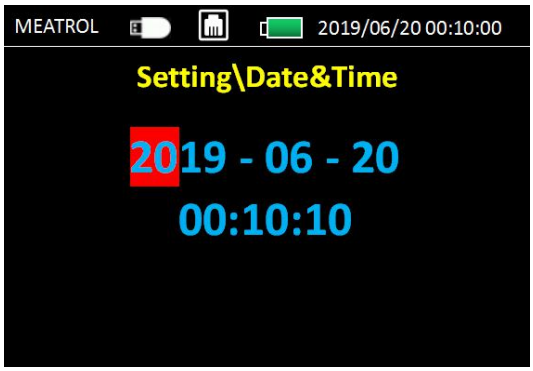
Setting times range: 2 to 51 times.

9.1.7 Password setting

Password default is 1000

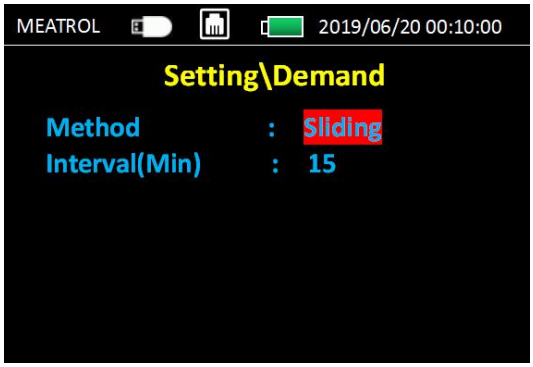
Enter again "set" interface,should enter new password after modify.

9.1.8 Date/Time Setting



Setting the Date&Time for ME440 system

9.1.9 Demand setting



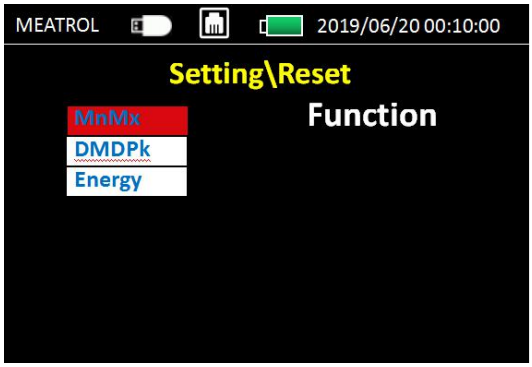
"Method" choice demand type:

Sliding: Time sliding mode

Fixed: Time fixed mode

Interval (Min): from 1 to 60 minute

9.1.10 Reset setting

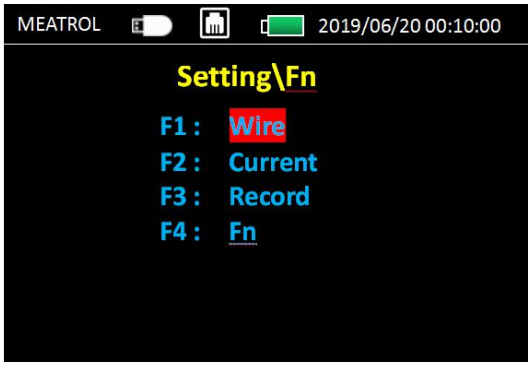


MnMx: Reset Minimum/Maximum value

DMDPk: Reset Maximum Demand value

Energy: Reset Energy

9.1.11 Fn setting

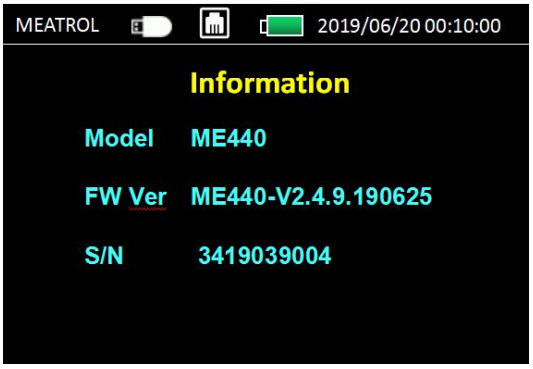


Fn is shortcut key for F1 F2 F3 F4.

After setting,when press F1 could enter any of interface of ”

setting” in “data Menu”

10. Information interface



Info interface is used for display the information

Model：meter Model No.

FW Ver：Meter Firmware version Number

SN: Series Number

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