SPM93 Three Phase Energy Meter

Installation & Operation Manual V 1.3

ZHUHAI PILOT TECHNOLOGY CO., LTD.

Danger and warning!

This device can be installed only by professionals.

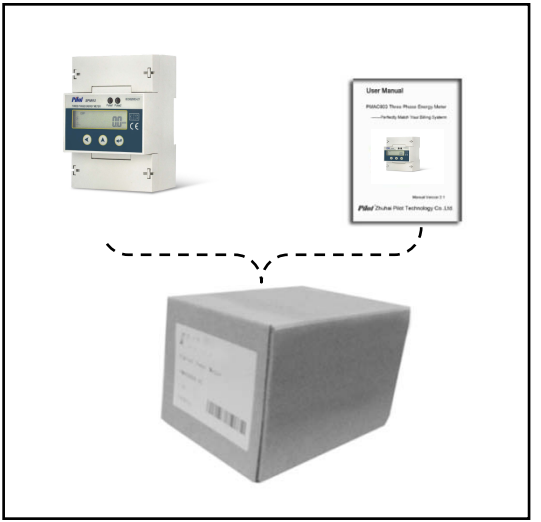
The manufacturer shall not be held responsible for any accident caused by the failure to comply with the instructions in this manual.

Risks of electric shocks, burning, or explosion

- This device can be installed and maintained only by qualified people.
- Before operating the device, isolate the voltage input and power supply and short-circuit the secondary windings of all current transformers.
- Use appropriate voltage tester to make sure the voltage has been cut-off.
- Put all mechanical parts, doors, or covers in their original positions before energizing the device.
- Always supply the device with the correct working voltage during its operation.

Failure to take these preventive measures could cause damage to equipment or injuries to people.

Packing list



Packing box included:

1. SPM93 Three Phase Energy Meter
2. User Manual

CONTENTS

1. Product Description

SPM93 DIN rail energy meter is a kind of new style three phase whole electronic type meter. The meter is completely conformed to the relative requirements of the International Standard IEC 62053-21:2003 (Class 1) and IEC 62053-22:2003 (Class 0.5s) . It is an integration of up-to-date micro-electronics technique, special large scale integrate circuit, advanced technique of digital sampling technique and SMT techniques etc.

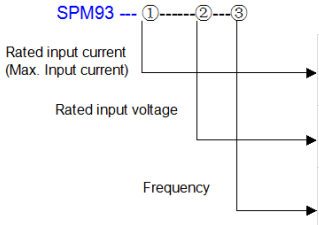
SPM93 three phase energy meter is used for measuring active energy power consumption in a rated frequency of 50Hz or 60Hz three phase alternating current circuit. LCD display total kWh (Imp. & Exp.), total kWh (Imp. & Exp.), Multi-tariff energy, voltage, current, power, power factor, frequency. It is characterized with good reliability, compact size, light weight, specious nice appearance and easy installation.

2. Features

- 35mm DIN installing, in accordance with Standard DIN EN50022
- High accuracy, active energy accuracy up to class 1 or Class 0.5s (depends on model selected)

- Measure and display U, I, P, PF, F, kWh, kvarh, Multi-tariff energy value
- 7+1 digits LCD display (9999999.9 kWh)
- 2 Passive pulse output, output signal is in accordance with Standard DIN43864
- LED indicates pulse (Settable for kWh or kvarh)
- Key-press for local parameter setting and clean energy, password protection
- RS485 communication port, Modbus protocol
- Record historical energy for last 31days, last 12 month and last 10 years
- Freeze data per 15 min daily
- Support Over-voltage timing, under-voltage timing, loaded timing function

3. Order Information



63 5	5(63)A direct (Class 1.0) 5(6)A via CT (Class 0.5s)
V1 V2	230/398V (Direct) (Suit for 220, 230, 240Vac ph-N) 120/208V (Direct) (Suit for 110, 120Vac ph-N)
50 60	50Hz 60Hz

Note:

1. SPM93 default rated voltage 220V, frequency 50Hz.

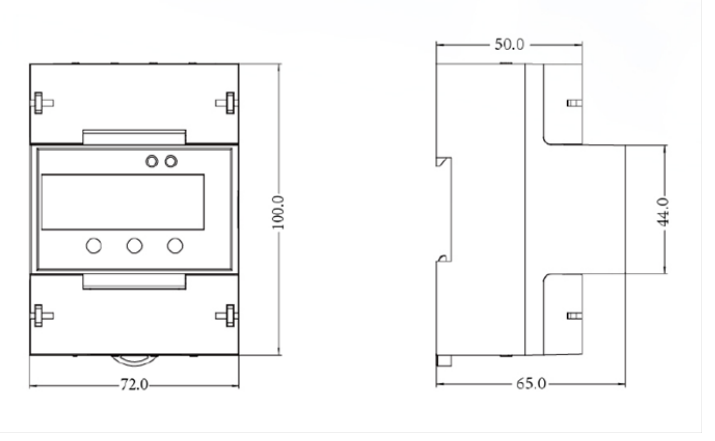
2. Accuracy for 63A direct connection is Class 1.0, accuracy for 5A via CT is 0.5s

Example 1: Model No. SPM93-63-V1-50, which indicates the device provides basic function, accuracy class 1, rated current is 5(63)A , provides optional TOU (Multi-tariff) function and rated voltage input is 220/380V, 50Hz.

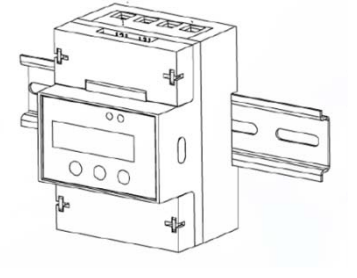
2: Model No. SPM93-5-V1-50, which indicates the device provides basic function, accuracy class 0.5s, rated current is 5(6)A , provides optional TOU (Multi-tariff) function and rated voltage input is 220/380V, 50Hz.

4. Figure and Installation Dimension

SPM93 dimension:



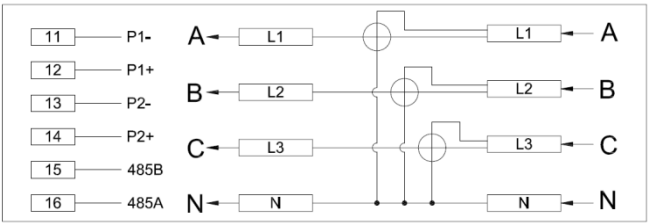
SPM93 installation:



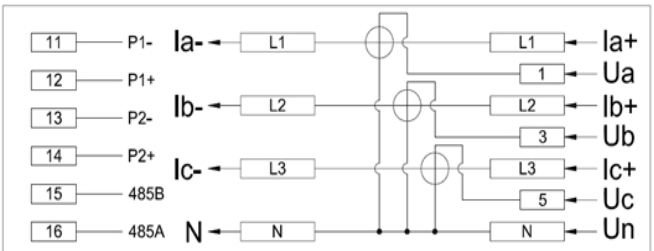
5. Wiring

There are two connection modes: direct connection and indirect connection through CT.

(1) For Model 5(63)A, SPM93 should be connected directly. Direct connection drawing, in 3-phase 4-wire system.



(2) For model 5(6)A, SPM93 should be connect though external CT. Indirect connection drawing through CT, in 3-phase 4-wire system (Suggest to connect all 3 phase).



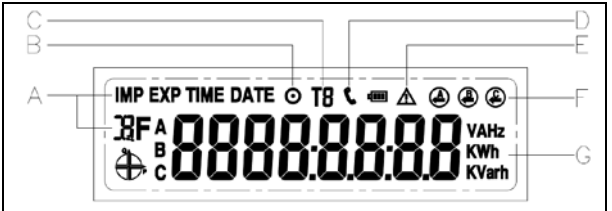
Note:

(1) For both 5(6)A and 5(63)A model, terminal 11, 12 and terminal 13, 14 can be set as pulse output port of kWh or kvarh. And pulse constant is settable.

(2) All Pulse output port are passive pulse output, power supply range 5~30Vdc.

6. Display and Keys

6.1 LCD display instruction



A：Data type prompt

B：Running prompt

C：Multi-tariff prompt

D: Communication prompt, 1Hz frequency means communication normal

E：Device failure prompt

F：Phase sequence error prompt

G：Data unit prompt

The device also has is two LED light : PULSE1, PULSE2

6.2 Data Display

There has 4 categories for display menu:

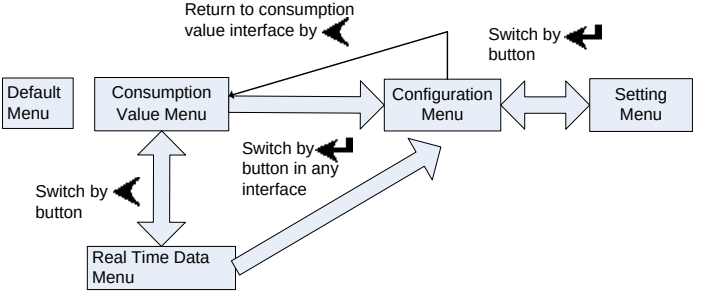
1. Consumption value menu (default interface)

2. Real-time value menu

3. Configuration menu

4. Setting menu

How to switch to each menu?

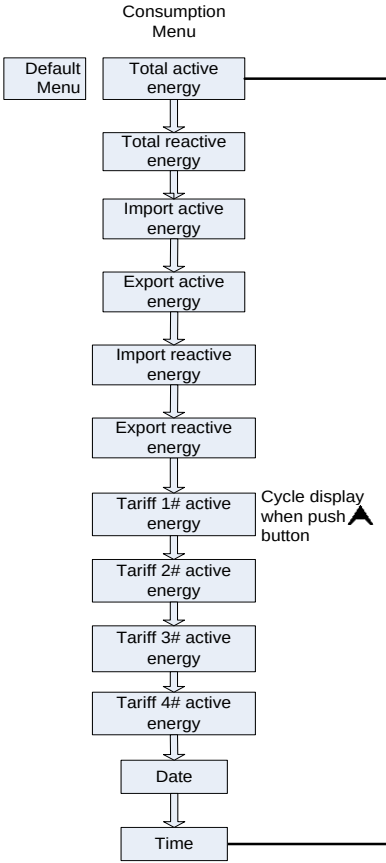


6.2.1 Keys

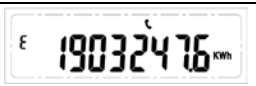
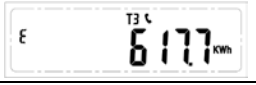
Menu definition / Key	Consumption value menu	Real-time value menu	Configuration menu	Setting menu
	Switch to Real-time value Menu	Switch to Consumption value menu	Switch to Consumption value menu	Move cursor /Exit to Configuration menu
	Turn page	Turn page	Turn page	Turn page/modify value
	Switch to configuration menu	Switch to configuration menu	Switch to setting menu (>3s)	Modify / Save

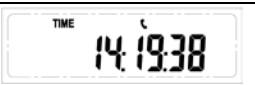
Note1: if the input wrong password, then user can't modify parameter, LCD will prompt password error. After 5s later, it will return to the interface inquiry.

6.2.2 Real-time consumption value interface

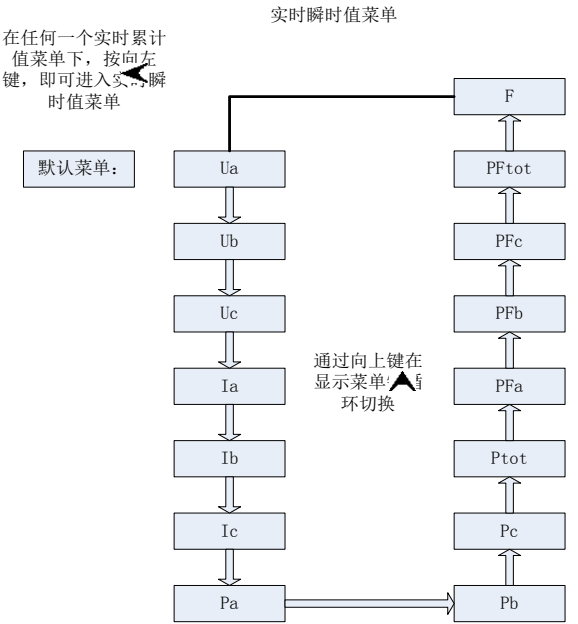


Push ▲ display as below:

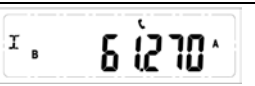
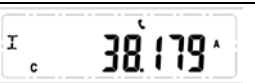
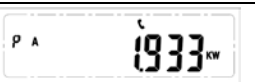
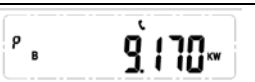
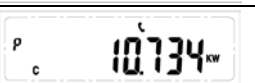
Item	LCD display	Remark
Total active energy		7+1 digit display Max. 9999999.9kWh
Total reactive energy		
Import active energy		
Export active energy		
Import reactive energy		
Export reactive energy		
T1=Tariff 1# active energy		
T2=Tariff 2# active energy		
T3=Tariff 3# active energy		
T4=Tariff 4# active energy		

Date		
Time		

6.2.3 Real-time value interface

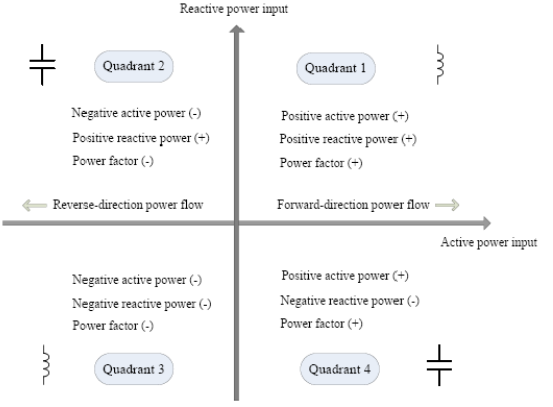


In any consumption value interface, Push ◀ to enter into real-time value menu.

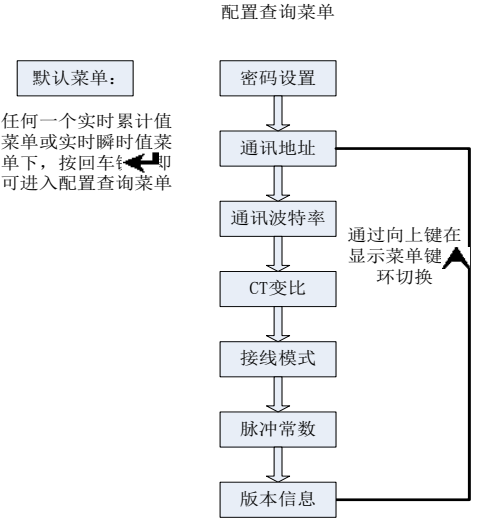
Item	LCD display	Remark
Phase A voltage		Voltage data display two decimal, Unit: V, Unsigned 16-digit integer
Phase B voltage		
Phase C voltage		
Phase A current		Current data display three decimal, Unit: A, Unsigned 32-digit integer
Phase B current		
Phase C current		
Phase A active power		Active power data display three decimal, Unit: kW, Signed 32-digit integer. When it is negative data, only display two decimal.
Phase B active power		
Phase C active power		
Total active power		

Phase A power factor		Power factor data display three decimal, Signed 16-digit integer.
Phase B power factor		
Phase C power factor		
Total power factor		
Frequency		Frequency data display three decimal, Unsigned 16-digit integer.

Note: Definition of data type for active power, reactive power and power factor as below:

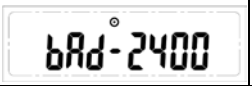


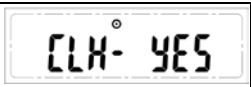
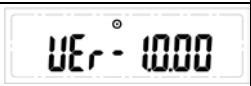
6.2.4 Configuration interface



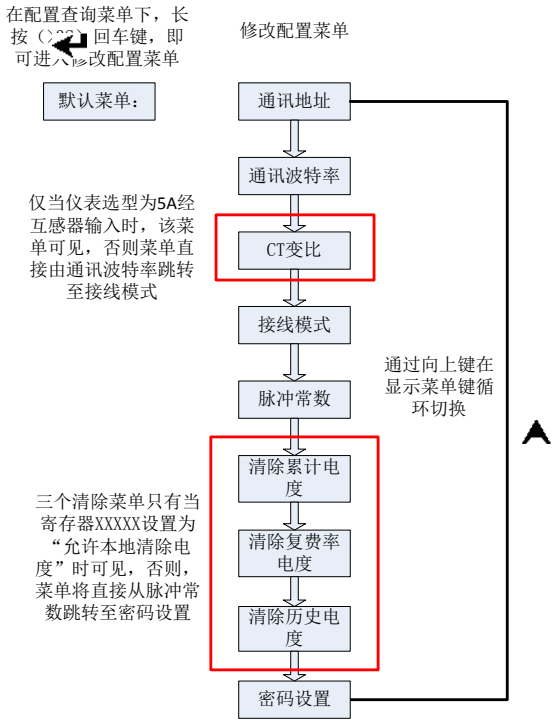
In any consumption / real time value interface, Push ↵ to enter into configuration menu

Item	LCD display	Remark
MODBUS address	Add- 100	MODBUS address, range: 1~247
MODBUS baud rate	bAd-9600	MODBUS baud rate, range: 9600, 4800, 2400, default 9600bps

	 	
CT ratio		CT ratio is the ratio of current primary and secondary. Range 1~1000, default 1. When select 5(6)A model, should connect with external CT.
Connection mode		Fixed to 3 phase 4 wire
Pulse constant		63A:Pulse output constant, default 400 5A:Pulse output constant, default 6400
Clean energy	 	Clean consumption energy (total energy, import / export energy)) When select “YES” and confirm, then the meter will clean the energy.
Clean historical energy		Clean historical energy, including daily energy, monthly, yearly energy. When select “YES” and

		confirm, then the meter will clean the energy.
Version information		Version number, can't change

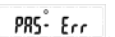
6.2.5 Setting interface



In configuration menu, press ↵ >3s to enter into setting menu

Password	 	4 digit password Supper password: 4567 Default: 0000 Only when input right password, can user modify parameter Otherwise it will prompt password error, then return to configuration interface after 5s later.

Note 1: Only in configuration interface, can user enter into password input interface after press ↵ >3s. Then LCD will display  , the farthest right "0" flashing, customer can press ∧ to modify flashing digit (circle display from 0~9) and press < to move cursor.

Note 2: If input wrong password, user can't modify parameter, display  , then return to configuration interface after 5s later.

Note 3: If input correct password, LCD display will skip to MODBUS address interface, the farthest right digit flashing, customer can press ∧ to modify flashing digit (circle display from 0~9) and press < to move cursor.

Note 4: In setting interface, press ↵ to enter setting status or save and exit setting status.

Note 5: Press < to exit to real-time consumption value interface, when in non-modify status.

7. Functions

7.1 Historical energy data

1. SPM93 records the historical energy data as below:
   1) Monthly total kWh (imp. & exp.), total kvarh (imp. & exp.), total kWh, total kvarh. (last 12 months)
   2) Yearly total kWh (imp. & exp.), total kvarh (imp. & exp.), total kWh, total kvarh. (last 10 years)

2. SPM93 support freeze daily energy data and provide 2 kinds of data:
   1) Freeze yesterday energy data from 22:00 to 24:00
   2) Freeze day energy data per 15min from 00:00, and refresh data daily.

Note: User can inquiry historical energy data via MODBUS register.

7.2 TOU (Multi-tariff Energy)

SPM93 statistics energy of different tariffs.

SPM93 supports 2 tariff lists. Users can set the 2 lists separately. Each tariff list can be set max. 8 periods in one day and 4 different tariff (F1, F2, F3, F4 means 4 kinds of tariff, and F1 for Sharp, F2 for Peak, F3 for Flat, F4 for Valley).

Below example for setting the tariff lists:

Tariff List	Num. of period	Period order	Starting time (to end time)	Tariff
Tariff List 1	8	1st period	00:00 (to 03:00)	F1
		2nd period	03:00 (to 06:00)	F2

		3rd period	06:00 (to 09:00)	F4
		4th period	09:00 (to 12:00)	F3
		5th period	12:00 (to 15:00)	F1
		6th period	15:00 (to 18:00)	F4
		7th period	18:00 (to 21:00)	F2
		8th period	21:00 (to 00:00)	F3
Tariff List 2	5	1st period	06:00 (to 10:00)	F1
		2nd period	10:00 (to 12:00)	F2
		3rd period	12:00 (to 14:00)	F1
		4th period	14:00 (to 20:00)	F3
		5th period	20:00 (to 06:00 of next day)	F4

There are 2 modes to calculate the multi-tariff energy: Date Mode and Holiday Mode.

Under Date Mode, it divides one year (365 days) into 2 periods

Under Holiday Mode, it divides the days by working day and holiday. There has 2 mode in Holiday Mode.

1. Working day is from Monday to Friday. Holiday is from Saturday to Sunday.
2. Working day is from Sunday to Thursday. Holiday is from Friday to Saturday.

Below example for setting the mode:

Mode	Time Zone 1	Time Zone 2

	(use the Tariff List 1)	(use the Tariff List 2)
Date Mode	From Apr.1 to Sep. 30	From Oct.1 to Mar.31 of next year
Holiday Mode 1	From Mon. to Fri.	From Sat. to Sun.
Holiday Mode 2	From Sun. to Thurs.	From Fri. to Sat.

Attention
1. Users can divide one day (24 hours) up to 8 periods, and set 4 tariff maximum.
2. Each period must >15 minutes, and the duration must be a multiple of 15.
3. The starting time of each period must be in ascending order
4. The multi-tariff only can be set from communication. It can't be set on panel.
5. If 2 different periods use the same tariff, the meter will combine the energy of 2 periods together.
6. The system default that: Time Zone 1 uses the Tariff List 1, and Time Zone 2 use the Tariff List 2. User can't change it.

7.3 Over-voltage timing, under-voltage timing, loaded timing function

1. Over-voltage timing and under-voltage timing function

SPM93 support over-voltage timing function and under-voltage timing function.

Over-voltage timing function: when one of the phase voltage value higher than the setting upper limit value, then the timer 1 will start-up

Under-voltage timing function: when one of the phase voltage value lower than the setting lower limit value, then the timer 1 will start-up

2. Loaded timing function.

SPM93 support loaded timing function.

Loaded timing function: when one of the phase current value higher than the setting upper limit value, then the timer 2 will start-up

Note:

1. Timer length is 32bit data, revolution is 0.1 hours;
2. When timer is fully 0.1 hours then count time, otherwise it will waiting;
3. Timer will save the counted time if power-off, unless the meter is execute clean command.
4. Over-voltage timing, under-voltage timing and loaded timing function can not be read via LCD display, customer can inquiry via MODBUS register.

8. Main Technical Parameter

Rated voltage	3×220Vph-N, direct 3×120Vph-N, direct (optional)
Rated (Max.) current	3×5(6) A/ CT 3×5(63) direct
Input frequency	50Hz or 60Hz
Power supply	self-supply 220V, (176V-275V) 120V, (96V-140V) If only connect 1 phase, RS485 port will not work.
Starting current	0.4%Ib
Power consumption	<10VA
Insulating property	Power frequency withstand voltage: AC 2 kV Impulse withstand voltage: 6 kV
Accuracy	Class 1 for 3×5(63) direct Class 0.5s for 3×5(6) A/ CT
Pulse output	1000imp
Communication	RS485 output, Modbus-RTU protocol Address: 1~247 Baudrate: 2400bps, 4800bps, 9600bps
Connection mode	3-phase 4-wire
Dimension	72×100×65mm

Installation mode	Standard 35mm DIN rail
Operating environment	Operating temperature: -10℃~+55℃ Storage temperature: -40℃~+70℃ Relative humidity: 5%~95%,non-condensing
Electrostatic discharge immunity test	IEC61000-4-2,Level 4
Radiated immunity test	IEC61000-4-3,Level 3
Electrical fast transient/ burst immunity test	IEC61000-4-4,Level 4
Surge immunity test (1,2/50μs~8/20μs)	IEC61000-4-5,Level 4
Conducted Emission test	EN55022, Class B
Radiated Emission test	EN55022, Class B

Notice:

- PILOT reserves the right to modify this manual without prior notice in view of continued improvement.
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