

Multi-function Power Meter User Manual

**Applied to:
Sfere720B**

JIANGSU SFERE ELECTRIC CO., LTD.

1. Product description

1.1 Compliance with standards

International standards

IEC62053-22:2003 Electricity metering equipment (a.c.)-Particular requirements-Part 22: Static meters for active energy (classes 0,2S and 0,5S).

IEC62053-23:2003 Electricity metering equipment (a.c.)-Particular requirements-Part 23: Static meters for reactive energy (classes 2 and 3).

IEC61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.

IEC 61000-2-11 Electromagnetic compatibility (EMC)- Part 2-11

IEC60068-2-30 Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12h+12h cycle)

1.2 General

SFERE720B multi-function power meters can measure voltage, current, frequency, power, power factor, energy, harmonics and demand, record SOE events, and realize off-limit alarm. They also have the functions such as communication, digital input, relay output and energy pulse output. As an advanced smart digital front-end acquisition components for grid, they are widely applied in many kinds of control systems, energy management systems, substation automation systems, power distribution automation systems, smart distributors and switch cabinets. This series of products provide many wiring methods and convenient operation methods which can meet different requirements at field.

1.3 Model selection

		SFERE720B
Appearance and accuracy	Display mode	LCD
	Installation mode	Panel mounting
	Active energy accuracy	0.5S
	Reactive energy accuracy	2S
Real-time measurement	U/I/P/Q/S/PF/F	■
	Demand	■
	Neutral current	■
Energy metering	Bi-directional energy	■
	Four-quadrant reactive energy	■
	Spare energy	■
	Tariff energy	■
Power quality	Voltage/current THD	■
	Sub-harmonic content	2 nd - 51 st
	Sequence component and phase position of voltage and current	■
	Voltage and current unbalance	■
	Crest factor, current K factor	■
Data record	Meter/load running time	■
	Demand/max./min. Value record	■
	Off-limit record	■
	SOE event record	■
Input and output	Energy pulse output	■
	RS485 communication interface	■
	Digital input	■
	Relay output	■

Note: ■ Yes;
 — No

2. Technical parameters

2.1 Technical specification

Working environment	
Working temperature	-10°C to 55°C
Storage temperature	-25°C to 70°C
Relative humidity	≤95% RH, no condensation
Working altitude	≤2500m
Protection degree	Front case IP64, rear case IP20.
Insulation	Between signal, power supply, output terminal to case resistance >100MΩ
Working power supply	
Rated range	AC/DC (20~300) V
Power consumption	≤5VA
Withstand voltage	≥2kV
Voltage input	
Rated range	230V/400V (continuous: 1.2Un)
Resolution	0.1 V
Impedance	1.6 MΩ/per phase
Power consumption	≤0.1 VA /per phase
Over voltage	Instantaneous: 2 times/10s
Frequency	45-65 Hz
Current input	
Range	5A/1A, (continuous: 1.2In)
Resolution	1 mA
Impedance	≤20mΩ/per phase
Power consumption	≤0.2 VA/per phase
Over current	Instantaneous: 10 times/5s

Relay output	
Capacity	5A/250 VAC; 5A/30 VDC
Isolation voltage	Between contact and coil: 2000 VAC / min
Action time	10 ms max
Release time	5 ms max
Mechanical service life	10 ⁶ times
Energy pulse output	
Pulse width	80ms±20%
Max. terminal voltage	35V
Max. terminal current	10mA
Pulse frequency	≤10Hz
Digital input	
Sensitivity	ON:140~270V AC, OFF: <110 V AC
Isolation voltage	5000 VAC (1 min)
Scanning time	1 ms
Wave filtering time	30 ms
Communication interface	
Physical interface	RS-485
Communication speed	Up to 115.2 kbps
Communication protocol	Modbus-RTU
Isolation voltage	2000 VAC (1 min)
Real-time clock	
Error	≤0.5s/day
Electromagnetic compatibility	
<p>Electrostatic discharge immunity: IEC 61000-4-2-III</p> <p>Radiated, radio-frequency, electromagnetic field immunity: IEC 61000-4-3-III</p> <p>Electrical fast transient/burst immunity: IEC 61000-4-4-IV</p> <p>Surge immunity: IEC 61000-4-5-IV</p> <p>Immunity to conducted disturbances, induced by radio-frequency fields: IEC 61000-4-6-III</p>	

Power frequency magnetic field immunity: IEC 61000-4-8-III

Voltage dips, short interruptions and voltage variations immunity: IEC 61000-4-11-III

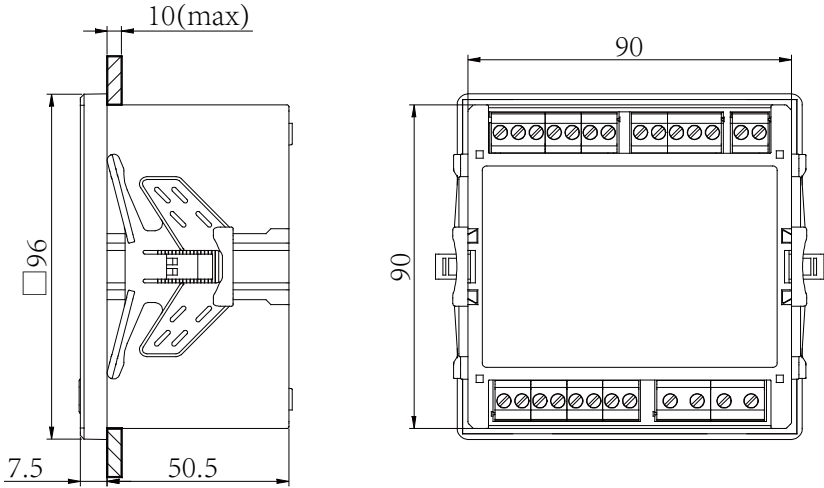
2.2 Function parameters

Functions	Sign	Accuracy	Range	Display range
Voltage	U	0.5	10--380 V	0--999.9 kV
Current	I	0.5	0--5 A	0--99.99 kA
Active power	P	0.5	0--5.7 kW	0--9999 MW
Reactive power	Q	0.5	0--5.7 kvar	0--9999 Mvar
Apparent power	S	0.5	0--5.7 kVA	0--9999 MVA
Power factor	PF	0.5	0--1.00	0--1.000
Frequency	F	$\pm 0.01\text{Hz}$	45--65 Hz	45.00Hz-65.00 Hz
Active energy	EP	0.5s	--	0--99999999 MWh
Reactive energy	EQ	2	--	0--99999999 Mvarh
Voltage THD	THDu	Class A	51	0--99.99 %
Current THD	THDi	Class A	51	0--99.9 %
Voltage sub-harmonic content	HRUh	Class A	51	0--99.99 %
Current sub-harmonic content	HRIh	Class A	51	0--99.99 %
Voltage unbalance	Uunb	Class B	--	--
Current unbalance	Iunb	Class B	--	--
Voltage sequence component	U1, U2, U0	0.5	--	--
Voltage phase position	$\theta_{U L1}, \theta_{U L2},$ $\theta_{U L3}$	$\pm 0.1^\circ$		
Current sequence component	I1, I2, I0	0.5	--	--
Current phase position	$\theta_{I L1}, \theta_{I L2}, \theta_{I L3}$	$\pm 0.1^\circ$		

Extreme value	Max/Min	0.5	--	--
Demand	--	0.5	--	--

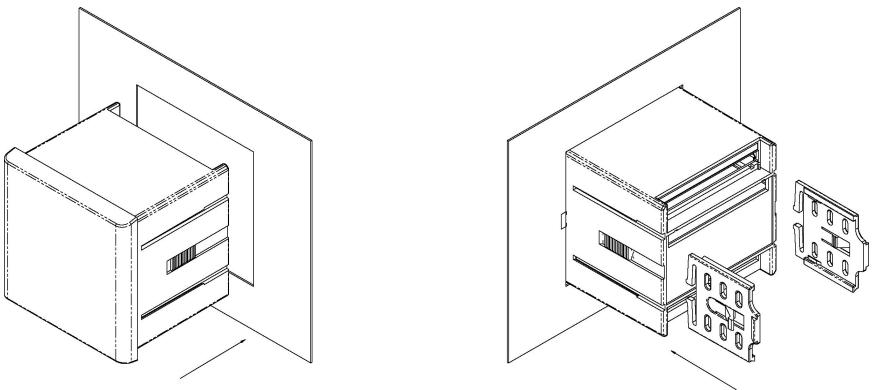
3. Installation and wiring

3.1 Meter dimensions



Picture 3-1 Meter dimensions

3.2 Installation method



Picture 3-2 Front view

Picture 3-3 Back view

- 1) Open a 91×91 (mm) hole on fixed switch gear;
- 2) Take the fixing claps off the meter;
- 3) Insert the meter to the cut-out;
- 4) Place the fixing claps, insert, fasten and fix the meter firmly on the panel.

4. Communication

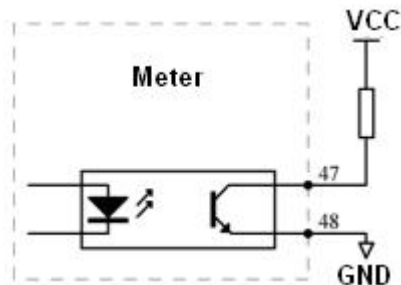
This meter is defaulted to be equipped with one RS485 communication interface with Modbus-RTU protocol. User can add one communication interface via connecting extended module to the meter.

As for detailed information, please refer to the communication manual.

5. Extended function

5.1 Energy pulse output

The meter provides one energy pulse output which can be selected as active or reactive energy pulse via setting so as to realize verification and remote transmission of energy data. With energy pulse of open circuit optocoupler, the energy accumulation metering can be realized by collecting energy pulse from the meter from the remote computer terminal, PLC and DI switch collection module. The output mode of the meter adopts energy accuracy inspection mode (National Meteorological Regulation: The Comparative Method for Pulse Error of the Standard Meter).



Picture 5-3 Energy pulse output

A. Electrical features: $V_{CC} \leq 35V$, $I_z \leq 10mA$;

B. Pulse constant : 5000 imp/kWh (380V/5A range), 20000 imp/kWh (380V/1A, 100V/5A range), 80000 imp/kWh (100V/1A range). The meaning is when the meter accumulates 1kWh, the number of output pulse is 5000. It must be emphasized that 1kWh is secondary side energy data. If the meter is connected with PT or CT, relevant pulse data 5000 corresponds to primary side energy data $1kWh \times \text{voltage ratio PT} \times \text{current ratio CT}$.

C. Application example : the pulse counting device is used for PLC terminal. Supposing during the period with the length of t , the number of collected pulse is N ; the input of meter is 10kV/100V, 400A/5A, thus the accumulated energy of meter during this period is $N/5000 \times 100 \times 80$ degrees of energy.

5.2 Digital input

Meter supports two digital inputs. Input signal is AC220V.

There are three working modes for digital inputs:

a. Status monitoring: meter receives the status of terminal contact point and shows it on front panel. The changing of status will be shown immediately.

b. Spare energy: terminal status is synchronous signal. Spare energy metering starts when the signal is received, meanwhile, basic energy metering stops.

5.3 Relay output

This device provides two relay outputs.

The relay output has two different work modes: alarm mode and remote control mode. Work mode, alarm item and alarm range of each relay output can be set in programming operation.

Remark: the format of alarm range data is secondary grid integer data. Specific format refers to the following table. (“H” indicate high alarm, while “L” indicates low alarm)

5.4 Max./Min. value demand

Meter can record max./min. value of voltage, current, power and harmonics, and save these data of present month, last month and the month before last month. Please refer to communication list for detailed recording parameters.

Meter can measure the demand of three-phase current, total active power, total reactive power and total apparent power. Demand measurement modes can be set through communication.

5.5 Event recording

This device supports event recording function. Reading the information of record and setting relevant parameters only can be realized through communication. Please refer to communication list for detailed instruction.

SOE recording include 32 pieces of events which contain activation time of digital input and relay output. The resolution is 1ms.

Off-limit alarm recording includes 10 pieces each of voltage, current and active power which are judged every 1 second. When any phase voltage and phase current or total active power is higher or lower than a threshold value, the relevant event will be recorded. Alarm value can be changed.