

SFERE720C
Multifunction Power Meter
User Manual

JIANGSU SFERE ELECTRIC CO., LTD.

1. Product descriptions

1.1 Overview

SFERE720C is equipped with electrical variable measurement, energy metering and power quality analysis functions. SFERE720C also can be extended with I/O modules for monitoring and controlling equipment at field, realizing system integration with different smart electricity distribution system and energy management system, and sharing monitoring data and energy data.

1.2 Extended modules

SFERE720C has two extension interfaces for connecting modules and expanding functions. Please take attention to the following points when connecting modules to SFERE720C.

- a) Two modules for one interface at most, and four modules for SFERE720C at most;
- b) Only one communication module can be connected to SFERE720C. The communication modules are FM7, FM8, FM9, FM10, FM11, FM12, FM13, FM14, and FM15. Two interfaces should be connected with different communication modules except for FM8 , FM11 and FM15;
- c) The arrangement of modules can be set according to user's requirements in compliance with a) and b). For example, four FM2 modules, two FM2 modules + one FM3 module + one FM10 module; one FM2 module + one FM6 module + one FM11 module.

Module type	Description
FM1	2 AC digital input
FM2	4 digital inputs
FM3	2 relay outputs
FM4	2 analog inputs: mA
FM5	2 analog inputs: PT100
FM6	2 analog outputs: mA

FM7	RJ45 :Modbus/TCP
FM8	DB9, Profibus-DP
FM9	WIFI :Modbus/TCP
FM10	GPRS: Modbus/TCP, SMS
FM11	RS485, Modbus-RTU
FM12	M-Bus communication
FM13	BACnet/MSTP communication
FM14	BACnet/IP communication
FM15	RS232, Modbus-RTU




2. Measurement

The following list shows variables which can be measured by SFERE720C including relevant variables calculated from basic electrical parameters.

Measurement variable	Instant	Max	Min	Demand	Sum	Unit
V1/V2/V3	●	●	●	—	—	[V,kV]
U12/U23/U31	●	●	●	—	—	[V,kV]
I1/I2/I3/In	●	●	●	●	—	[A,kA]
F	●	●	●	—	—	[Hz]
P1/P2/P3	●	—	—	—	—	[kW,MW,GW]
P	●	●	●	●	—	[kW,MW,GW]
Q1/Q2/Q3	●	—	—	—	—	[kvar,Mvar,Gvar]
Q	●	●	●	●	—	[kvar,Mvar,Gvar]
S1/S2/S3	●	—	—	—	—	[kVA,MVA,GVA]
S	●	●	●	●	—	[kVA,MVA,GVA]
PF1/PF2/PF3	●	—	—	—	—	—
PF	●	●	●	—	—	—
EP+/EP-	—	—	—	—	●	[kWh,MWh]
EQ1/EQ2/EQ3/EQ4	—	—	—	—	●	[kvarh,Mvarh]
THDV1/THDV2/THDV3	●	—	—	—	—	[%]

THDI1/THDI2/THDI3	●	—	—	—	—	[%]
Harmonic RMS-U (1~63th)	●	—	—	—	—	[%]
Harmonic RMS-I (1~63th)	●	—	—	—	—	[%]
Unbalance-U	●	—	—	—	—	[%]
Unbalance-I	●	—	—	—	—	[%]

2.1 Instantaneous measurement

<table border="1"> <tr> <td style="text-align: center;">◀</td> <td style="text-align: center;">L-N Voltage</td> <td style="text-align: center;">▶</td> <td style="text-align: center;">1.1</td> </tr> <tr> <td style="text-align: center;">V1</td> <td style="text-align: center;">220.1</td> <td style="text-align: center;">V</td> <td></td> </tr> <tr> <td style="text-align: center;">V2</td> <td style="text-align: center;">220.1</td> <td style="text-align: center;">V</td> <td></td> </tr> <tr> <td style="text-align: center;">V3</td> <td style="text-align: center;">220.1</td> <td style="text-align: center;">V</td> <td></td> </tr> <tr> <td style="text-align: center;">Vavg</td> <td style="text-align: center;">220.1</td> <td style="text-align: center;">V</td> <td></td> </tr> <tr> <td style="text-align: center;">◀</td> <td style="text-align: center;">▶</td> <td style="text-align: center;">◀</td> <td style="text-align: center;">▶</td> </tr> </table>	◀	L-N Voltage	▶	1.1	V1	220.1	V		V2	220.1	V		V3	220.1	V		Vavg	220.1	V		◀	▶	◀	▶	<p>Left picture shows three-phase instantaneous voltage, average voltage. Press  or  to check other pages, press  to return to main menu.</p>
◀	L-N Voltage	▶	1.1																						
V1	220.1	V																							
V2	220.1	V																							
V3	220.1	V																							
Vavg	220.1	V																							
◀	▶	◀	▶																						

2.2 Energy metering and tariff meter reading

This meter has excellent energy metering functions as follows:

- Total bi-directional active and reactive energy metering
- Phase separated bi-directional active and reactive energy metering
- Fundamental energy metering;
- Four-quadrant reactive energy metering;
- Apparent energy metering;
- Spare energy metering;
- Tariff energy metering

The meter shows primary value. Primary value is equal to the secondary value multiplied by voltage or current transformer ratio. Secondary value is the reference to all of the energy. The smallest resolution ratio of secondary value is 1Wh or 1varh. The smallest resolution ratio of energy shown on meter is 0.001kWh or 0.001kvarh.

The storage range of energy is secondary energy 4294967295 Wh, and the

display range of energy is primary energy 9999999999 kWh (99.9 billion). The data will not exceed the range if the meter is in its mean time between failures. User can clear the energy data after entering correct password.

2.5.1 Tariff energy

①Rate number

Rate number is used to indicate the present tariff of working meter. T 1 indicates Tip rate; T2 indicates Peak rate; T3 indicates Flat rate; T4 means valley rate.

②Time period

One day can be divided into 12 time periods at most in the meter. The time period must be continuous, which means end time of the first time period is start time of the second time period.

③Rate schedule

Different rate schedules can be preset in the meter. They can perform different tariff in the specified time period. Up to 4 rates can be preset. During programming, rate schedule number is used to indicate what tariff that the meter performs. 1 indicates the first rate schedule.

④Holiday

Holiday includes regular holidays(22 days) and irregular holidays(60 days), a total of 82 days. Regular holidays means the same annual holiday that nation has stipulated, such as January 1st, May 1st,etc. It can be set according to the requirement. Irregular holiday means annual holidays stipulated by different nations, such as Spring Festive(February, 9th,2005). It can be set according to the requirement. The tariff for holiday can be any one in the four tariffs.

⑤Weekly tariff

Each of the four rates is available for seven days in a week.

⑥Monthly tariff

Each of the four rates is available for each month.

⑦Priority order of tariff

There are two modes to perform tariffs: holiday tariff and monthly tariff. In

holiday tariff mode, the holiday tariff will be performed if the day is holiday, otherwise the weekly tariff will be performed. In monthly tariff mode, it will be performed according to the rate schedule that is set monthly.

2.3 Energy quality

SFERE720C can monitor and analyze power quality of grid and measure the following variables:

Three phase voltage and current sequence component and unbalance

Electrical variables in three phase system can be divided into positive sequence component, negative sequence component and zero sequence component according to symmetrical component method. If electric system is in normal operation mode, the ratio between negative sequence component RMS value and positive sequence component RMS value is defined as three phase unbalance of an electrical variable.

2.4 Demand record

SFERE720C has six independent demand recording channels to measure and record max. demand, present demand and previous demand of three phase current, total active power, total reactive power and total apparent power.

2.5 Event record

Event record includes the total times and latest occurrence time of power on record, parameter modification record, over current record and so on.

2.6 Extended module

SFERE720C has two extension interfaces for connecting modules and expanding functions.

2.10.1 Digital input and relay output of SFERE720C

SFERE720C has two digital inputs and two relay outputs.

2.7 Max./Min. value

Max./min. value page shows the max./min. values of voltage, current, power, power factor and frequency.

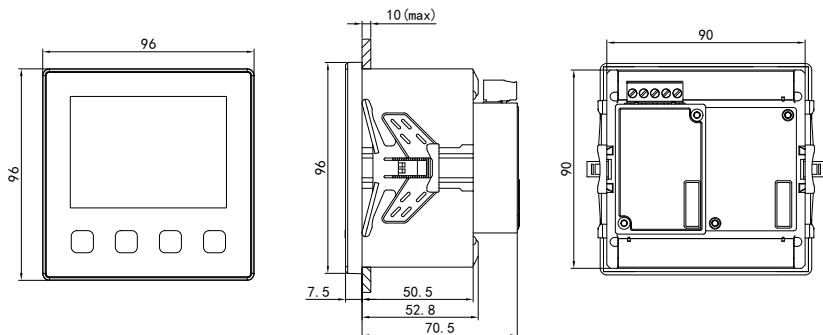
<table border="1"> <tr> <td colspan="2">◀ Max Power ▶</td> <td>7.5</td> </tr> <tr> <td>P</td> <td>10.25</td> <td>kW</td> </tr> <tr> <td>Q</td> <td>6.365</td> <td>kvar</td> </tr> <tr> <td>S</td> <td>20.00</td> <td>kVA</td> </tr> <tr> <td>PF</td> <td>1.000</td> <td>kW</td> </tr> <tr> <td colspan="2">◀ ▶</td> <td>⏏</td> </tr> </table>		◀ Max Power ▶		7.5	P	10.25	kW	Q	6.365	kvar	S	20.00	kVA	PF	1.000	kW	◀ ▶		⏏	<p>Max. values of P/Q/S/PF.</p> <p>Pmax = 10.25kW</p> <p>Qmax = 6.365kvar</p> <p>Smax=20.00kVA</p> <p>PFmax = 1.000</p>
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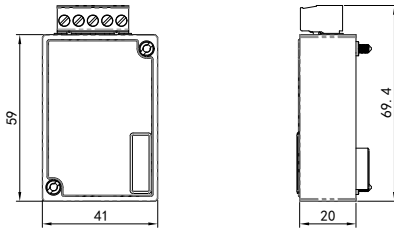
2.8 Communication

SFERE720C has digital communication interface. User can read meter status and measured value or do programming and setting parameters through the communication interface. SFERE720C is defaulted to be equipped with one RS-485 communication interface adopting Modbus-RTU protocol. Communication should be connected with shielded twisted pair line. One busbar can be connected with 32 meters at most. Starting and ending terminal of busbar should be connected with terminal resistance.

3. Installation

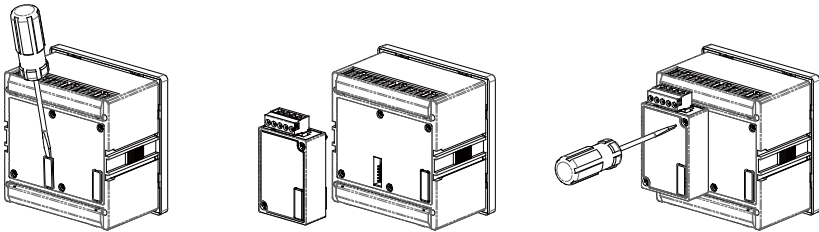
3.1 Dimension





3.2 Installation method

- 1) Choose a right place on the fixed distribution cabinet for cutout by size 91×91mm;
- 2) Take off the supporting clips of the meter;
- 3) Insert the meter into the cutout;
- 4) Insert and push the supporting clips to fix the meter.



4. Communication

Meter is defaulted to be equipped with one communication, RS-485 interface, Modbus-RTU protocol. It also can be extended with one communication interface via extended module. As for detailed information of communication, please refer to AHM1 Communication User Manual.

5. Technical specifications

Electric Characteristics			
Accuracy	Voltage and current		0.2%
	Power, Power Factor		0.2%
	Frequency		±0.01Hz
	Active power		IEC62053-22, class 0.2S
	Reactive power		IEC62053-23, class 2
Data update rate		1s	
Input	Wiring mode		1P2W、3P3W、3P4W
	Voltage	Rated value	400 VAC L-N (690 VAC L-L)
		Overload	1.2VIn
		Impedance	≥1MΩ
	Current	Rated value	1A or 5A
		Overload	Continuous: 1.2In
			Instantaneous: 10In/5s
		burden	≤0.1VA
Rated value	≤20mΩ		
Grid frequency		(45~65)Hz	
Auxiliary supply	Working range	AC/DC (80~270) V	
	consumption	≤10VA	
Energy pulse output		pulse width (80±20%) ms	
Digital input		AC220V input, isolation: 2000VAC	
Relay output		Contact rated at AC 250V/5A or DC 30V/5A	
		Isolation: 2500VAC	
Communications			
RS485 port		Modbus-RTU, 2-wire, up to 38400bps	
Mechanical Characteristics			
IP index		IP65 (front panel) and IP20 (meter body)	
Dimensions		96×96×55mm	

Environmental Characteristics	
Operating temperature	(-25~70)°C
Storage temperature	(-30~80)°C
Relative humidity	(5~95)% (no gel)
Insulation	IEC 61010-1
Electromagnetic Compatibility	
Immunity to electrostatic discharge	IEC 61000-4-2-Level III
Immunity to radio-frequency field	IEC 61000-4-3- Level III
Immunity to electrical fast transients/bursts	IEC 61000-4-4- Level IV
Immunity to impulse waves	IEC 61000-4-5- Level IV
Immunity to conducted disturbances	IEC 61000-4-6- Level III
Immunity to power frequency magnetic fields	IEC 61000-4-8- Level III
Immunity to voltage dips and short interruptions	IEC 61000-4-11- Level III