Distributed Multi-loop Power Monitoring Unit User Manual

Applied to:

SFERE700 Series

JIANGSU SFERE ELECTRIC CO., LTD.

1. Overview

Sfere700 distributed multi-loop power monitoring unit is a new generation of electrical parameter monitoring product which is researched and developed by Jiangsu Sfere Electric. It can realize real-time electrical parameter measurement, energy metering, power quality analysis, status monitoring and off-limit alarm functions. Sfere700 can measure 32 three-phase circuits or 96 single-phase circuits at most. It is equipped with color LCD and touch type buttons which are used for convenient operation. It also has compact size and easy installation. All these functions and advantages make Sfere700 to be a good solution for multi-loop electrical parameter monitoring in industrial fields.

Feature

Multi-loop measurement: one monitoring module can measure electrical parameters of 32 three-phase circuits.

Compact structure: ultra narrow installation width is convenient for installing it near load monitoring point and reducing wires; display module adopts screw mounting installation method which is similar as signal lamp in order to occupy less cabinet space.

Color LCD display: information from different loops are shown on one display module with friendly interface.

Simple installation: DIN-rail installation, pluggable terminals

Automatic addressing: communication addresses of measurement modules are automatically assigned through display module.

2. Function

The following list shows the parameters which are directly measured or acquired after calculation on the basis of basic parameters by Sfere700.

Measurement function	Accuracy	Real-time	Extreme value	Demand	Remark
Phase/line voltage	0.2	●	●	—	

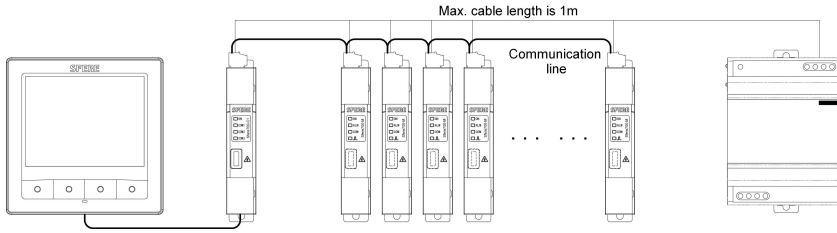
Current	0.2	●	●	●	
Frequency	±0.01Hz	●	●	—	
Phase active power	0.5	●	—	—	
Total active power	0.5	●	●	●	
Phase reactive power	0.5	●	—	—	
Total reactive power	0.5	●	●	●	
Phase apparent power	0.5	●	—	—	
Total apparent power	0.5	●	●	●	
Phase power factor	0.5	●	—	—	
Total power factor	0.5	●	●	—	
Import/export active energy	0.5S	●	—	—	If split-core or flexible coil current transformer is adopted, the accuracy is Class 1.
Import/export reactive energy	2	●	—	—	
Four-quadrant reactive energy	2	●	—	—	
Apparent energy	0.5	●	—	—	
Voltage/current THD	Class A	●	—	—	63rd
Voltage/current harmonic content	Class A	●	—	—	63rd
Voltage/current unbalance	Class B	●	—	—	
Voltage/current sequence component	0.5	●	—	—	
Voltage/current phase	±0.1°	●	—	—	
Voltage crest factor	—	●	—	—	
Current K factor	—	●	—	—	

Note: “●” Yes，“—” No.

3. Model selection

3.1 Composition

Sfere700 is composed of one display module Sfere700-D1, one communication module Sfere700-C1, one power module Sfere700-P, 32 measurement modules Sfere700-M at most, current transformer, switching module and special connection wires.



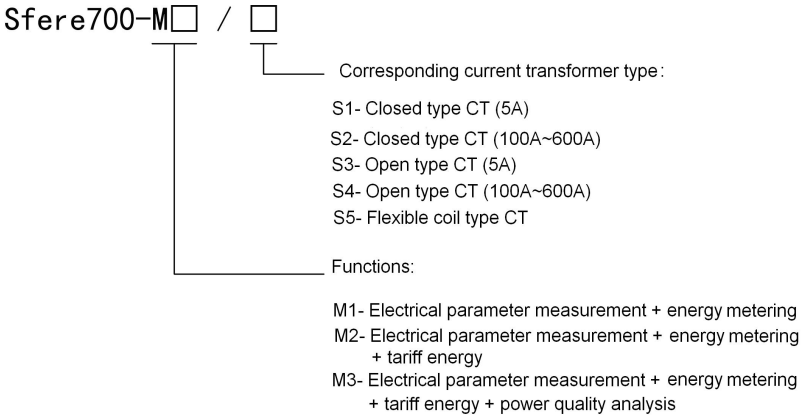
Component		Quantity
Name	Module	
Display module	Sfere700-D1	1
Communication module	Sfere700-C1	1
Measurement module	Sfere700-M	1～32
Power module	Sfere700-P	1

3.2 Instruction for component

The following list shows the functions of Sfere700 series modules.

Name	Model	Function
Display module	SFERE700-D1	TO show measured data from measurement module, and be used to set parameter of measurement module
Communication module	SFERE700-C1	Three digital communication interfaces available, adopting Modbus-RTU protocol. No.1 interface is connected to measurement module Sfere700-M; No.2 interface is connected to host computer; No.3 interface is connected to display module Sfere700-D1.
Measurement module	SFERE700-M	Measure voltage, current, power, frequency, energy, demand, extreme value and harmonics of three-phase grid. One RS485 communication interface, two digital inputs, one relay output, external current transformer. Three models available according to different functions which are Sfere700-M1/M2/M3.
Power module	SFERE700-P	Provide DC24V power supply to the whole monitoring unit.

Model selection for measurement module Sfere700-M



Function instruction

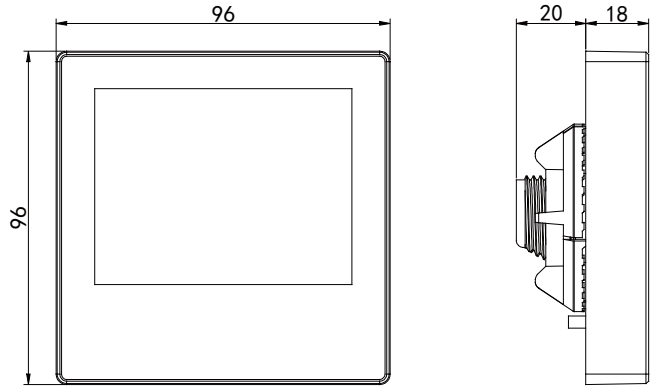
Function	Sfere700-

		M1	M2	M3
Parameter measurement	Three-phase voltage, current and frequency	●	●	●
	Phase and total power and power factor	●	●	●
	Demand, max. value, min. value, average value	●	●	●
	Fundamental voltage, current, power and power factor	—	—	●
Energy metering	Bi-direction energy, apparent energy	●	●	●
	Four-quadrant reactive energy	●	●	●
	Tariff energy	—	●	●
	Fundamental active energy and reactive energy	—	—	●
Power quality	THD	●	●	●
	Sub-harmonic	—	63rd	63rd
	Unbalance	—	●	●
	Crest factor, K factor	—	●	●
	Voltage swell, voltage sag	—	—	●
	Voltage fluctuation and flicker	—	—	●
	Voltage deviation, frequency deviation	—	●	●
Data record	Demand record	—	●	●
	Max value, min value and average value record	—	●	●
	Off-limit alarm records	—	●	●
	SOE event record	—	●	●
	Voltage swell, sag and interruption record	—	—	●
Digital input		2	2	2
Relay output		1	1	1

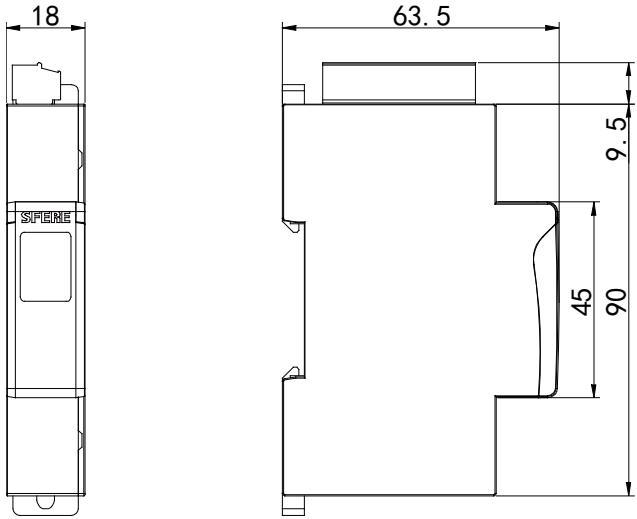
4. Installation

4.1 Dimension

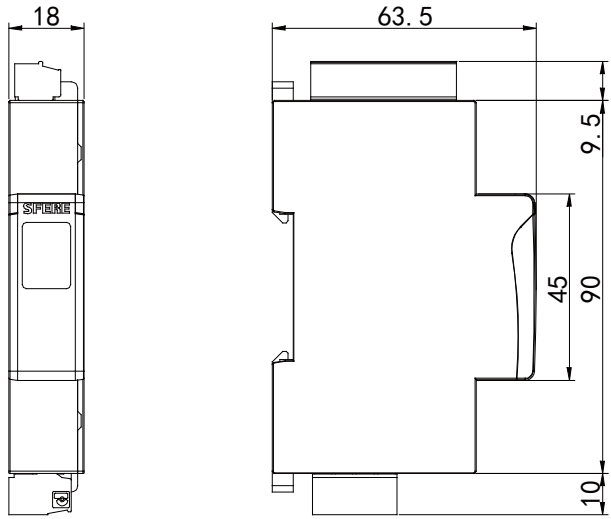
4.1.1 Sfere700-D1



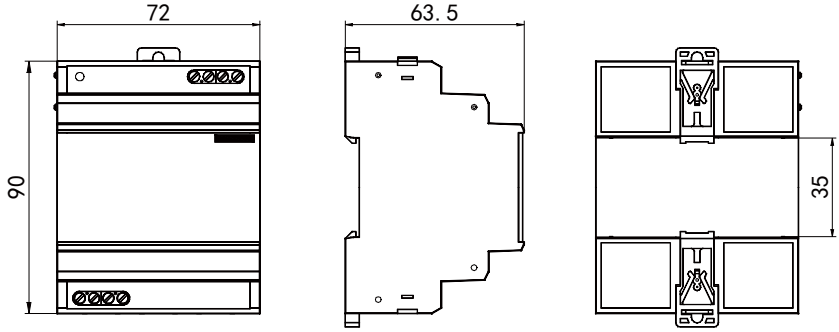
4.1.2 Sfere700-C1



4.1.3 Sfere700-M

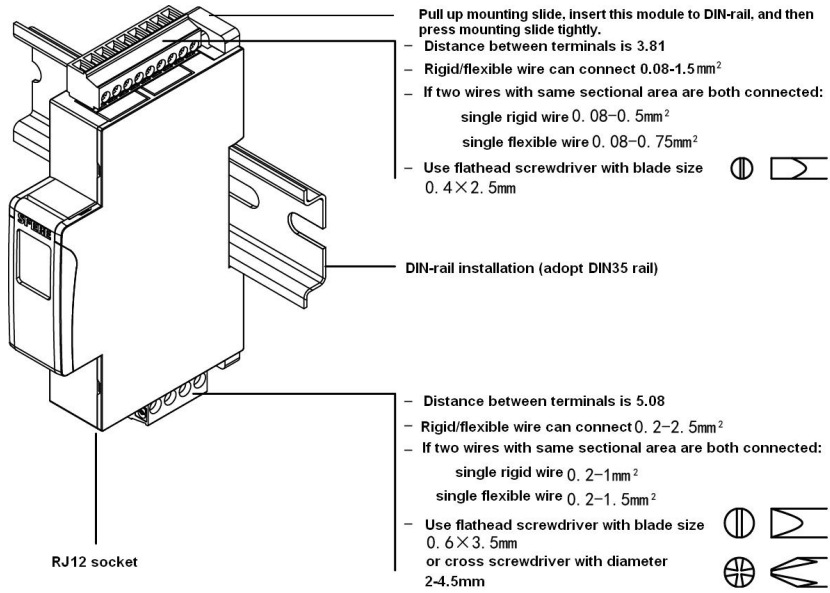


4.1.4 SFERE700-P



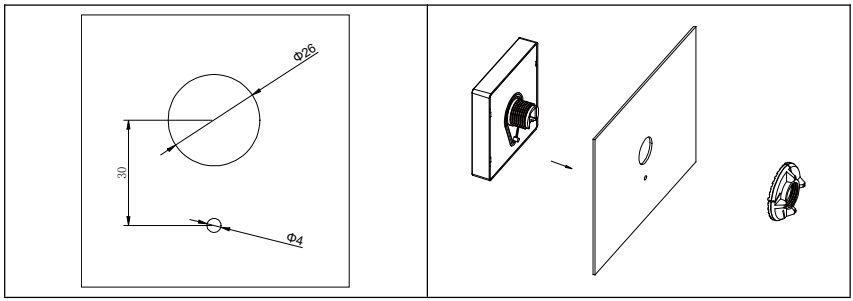
4.2 Installation

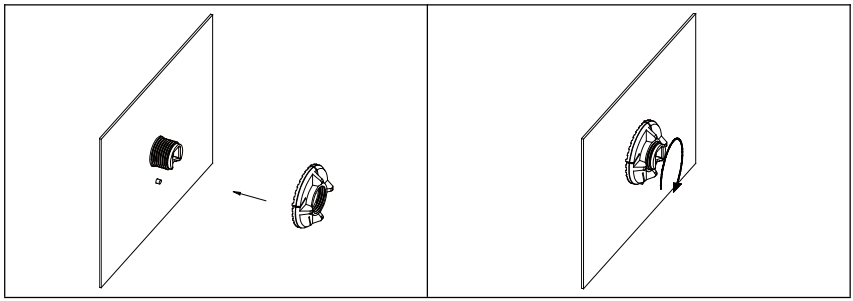
4.2.1 Sfere700-M/C1/P/Z2 installation method



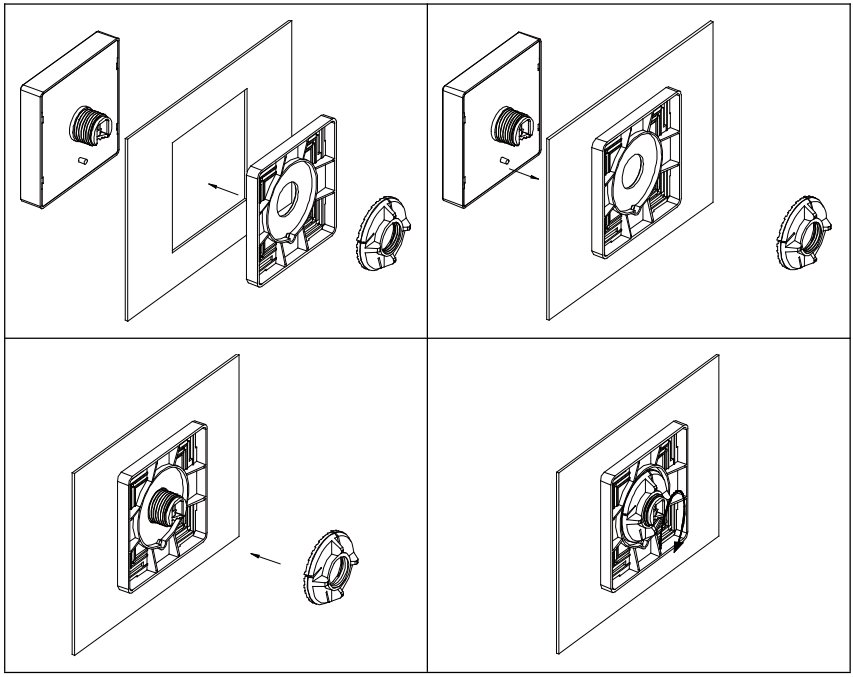
4.2.2 Sfere700-D1 installation

Installation method 1





Installation method 2 (used for cut-out size 91×91mm,76×76mm,67×67mm)



5. Technical specification

5.1 Sfere700-M measurement module

Working environment	
Working temperature	-20°C～70°C
Storage temperature	-40°C～85°C
Relative humidity	≤95%RH，no condensation
Working altitude	≤2500m
Protection	IP20
Insulation	Signal, power supply and output terminal to case resistance>100MΩ
Withstand voltage	≥2kV
EMC	Better than III
Working power supply	
Rated range	DC:24V±20%
Power consumption	≤0.5W
Voltage input	
Range	3×220V/380V
Resolution	0.1 V
Impedance	≥1.7 MΩ/phase
Power consumption	≤0.1 VA /phase
Over voltage	Continuous 1.2Un, instantaneous: 2Un/10s
Frequency	45-65 Hz
Current input	
Range	External current transformer, please refer to 7.5 current transformer
Relay output	
Type	Solid state relay
Capacity	AC: 0.12A/280V; DC:0.12A/400V
Isolation voltage	5000 V AC

Action time	2ms max
Release time	1ms max
Pulse output width	80ms±20%
Energy pulse frequency	≤10Hz
Digital input	
Sensitivity	DC12V power supply, closed ≤10kΩ, open ≥15kΩ
Isolation voltage	4000 V AC
Scanning time	1 ms
Filtering time	30 ms
Communication interface	
Physical interface	RS485
Communication speed	19200bps at most
Communication protocol	Modbus-RTU
Isolation voltage	4000 V AC

5.2 Sfere700-C1 communication module

Working environment	
Working temperature	-20°C～70°C
Storage temperature	-40°C～85°C
Relative humidity	≤95%RH，no condensation
Working altitude	≤2500m
Protection	IP20
Insulation	Signal, power supply and output terminal to case resistance>100MΩ
Working power supply	
Rated range	DC 24V
Power consumption	≤0.5W
Communication interface	

Communication interface 1	Detachable screw terminal, connect to Sfere700-M
Communication interface 2	RJ12, connect to host computer
Communication interface 3	Detachable screw terminal, connect to Sfere700-D1
Physical interface	RS485
Communication speed	9600bps at most
Communication protocol	Modbus-RTU
Isolation voltage	2500 V AC
Real-time clock	
Error	≤0.5s/day

5.3 Sfere700-D1 Display module

Parameter	Specification
Connection	RJ12 cable, connect to communication module Sfere700-C1
Display	3.5"TFT LCD, resolution 320×240, 16700 colors
Button	4 capacitive touch buttons, backlight
Breathing light	Working frequency 1Hz when backlight is off, working frequency 2Hz when alarm.
Protection	Front case IP67
Working temperature	-20～70℃
Storage temperature	-30～80℃
Relative humidity	≤95%RH（no condensation）
Working range	(24±20%)VDC
Power consumption	≤2W

5.4 Sfere700-P power supply module

Parameter	Specification
Input voltage	AC/DC：80V～270V
Output voltage	DC：24V
Output power	≤20W
Accuracy	±1%
Efficiency	≥75%
Withstand voltage	2000V AC