Precision Distribution Monitoring Unit

User Manual

Applied to:

BCM101

# 1. Product instruction

1.1 Overview

BCM101 precision distribution monitoring unit is used to monitor electrical parameters of array cabinet, measure electrical parameters such as voltage, current, energy and harmonics of input and output branches and monitor the switch status of all circuit breakers in data center. BCM101 is equipped with trip alarm function and over current alarm function which can be set in every output circuit by two users so as to prevent potential power failure. BCM101 is configured with human-machine interface and communication interface. User can check and set parameters via touch screen at field. Monitoring data can be transmitted to backstage power & environment monitoring system via communication interface so as to realize energy management and efficiency optimization of data center.

1.2 Components

BCM101 precision distribution monitoring unit is composed of main module BCM101-M1/M2, slave module BCM101-S, switch monitoring module BCM101-K, CT module SHI-BCT50II/ SHI-BCT100II, power supply module BCM101-P and touch screen BCM101-HMI. This monitoring unit can be extended with more slave modules and switch monitoring modules through internal bus.
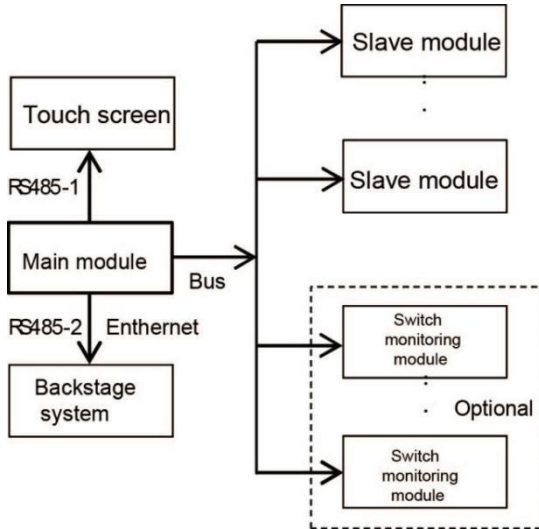
Typical wiring diagram
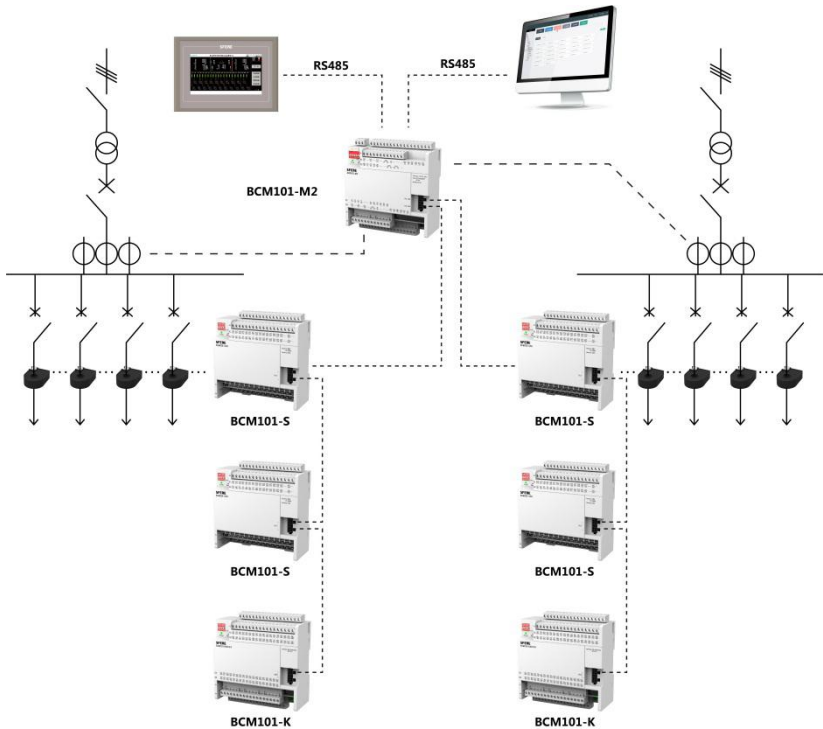
1.3 Functions

Monitoring unit is equipped with touch screen to show measured information and alarm information as follows,

1） Measuring functions

▼ Monitoring unit is equipped with 7 inch touch screen to show the real-time operation status of distribution system and monitor electrical parameters of feeder circuits such as phase voltage, line voltage, zero to earth voltage, phase current, voltage/current unbalance, active power, reactive power, apparent power, power factor, frequency, bi-directional active or reactive energy, voltage THD, current THD and $2^{nd} \sim 63^{rd}$ harmonics content. It is also equipped with two temperatures, two relays outputs and four digital inputs. The monitoring unit can be extended to measure the electrical parameters of 180 feeder circuits at most. The electrical parameters include voltage, current, active power, reactive power, apparent power, power factor, active/reactive energy, current THD and $2^{nd} \sim 31^{st}$ harmonics content. It also can give an alarm when an electrical parameter exceeds corresponding limit.

▼ Energy metering of input and output branch circuits are realized by applying high accuracy energy metering chip to ensure the continuity and reliability of energy metering.

▼ The real-time status of circuit breaker and thunder preventor can be monitored though digital input of monitoring unit. If fault occurs, monitoring unit will give an alarm.

▼ Main module can be equipped with Ethernet port to realize high speed data uploading.

▼ Monitoring unit can measure real-time voltage of branch circuits so as to monitor the status of each feeder circuit and give an alarm when there is loss of power. Voltage and current collected from branch circuits are in one-to-one correspondence which makes power allocation convenient.

▼ Switch status of main circuit and feeder branch circuit can be checked through the primary system diagram shown on touch screen.

▼ Checking and setting parameters can be realized through touch screen.

2）Alarm function

▼   Monitoring unit realize off-limit alarm for main incoming line and feeder branch circuits according to preset secondary threshold value and show alarm information on touch screen. Alarm can be released through touch screen by manual.

▼   All alarm points have enabled control. The alarm function can be selected as on or off. If the enabled control of an alarm is off, there will not be corresponding alarm.

▼   Real-time alarm display and event recording functions are available for judging and checking fault types and logging 1024 pieces of SOE event records, 1024 pieces of real-time alarming records and 12800 pieces of alarming records.

2. Functions of modules

Name	Function
Main module BCM101-M1 BCM101-M2	BCM101-M1 can measure the electrical parameters of one three-phase circuit, and BCM101-M2 can measure the electrical parameters of two three-phase circuits. The electrical parameters include voltage, zero to earth voltage, current, power, frequency, energy, demand, harmonics and temperature. The main modules are equipped with two RS485 communication ports, one Ethernet port, four digital inputs and two relay outputs; they are also equipped with two bus interfaces which can be connected with feeder monitoring module and switch monitoring module. The main modules can record tariff energy and save the energy of ten years. They can record 1024 pieces of SOE event records, 1024 pieces of real-time alarm records and 12800

	pieces of alarm records.
Slave module BCM101-S	BCM101-S can measure the electrical parameters of thirty single-phase circuits. The electrical parameters include voltage, current, power, frequency, energy, demand, extreme values and harmonics. This module is equipped with bus interface which is used to extend the module. It is also equipped with thirty digital inputs which can judge the opening and closing of circuit breaker through voltage values.
Switch monitoring module BCM101-K	BCM101-K can monitor the status of sixty switches with wet contact input. It is equipped with bus interface which is used to extend this module.
Current transformer SHI-BCT50II	SHI-BCT50II is closed current transformer. The max. input signal is 63A.
Current transformer SHI-BCT100II	SHI-BCT100II is closed current transformer. The max. input signal is 120A.
Module connection line BCM101-L1	BCM101-L1 is not only communication line but also power supply line. It is used for the connection between main module and slave module, two slave modules as well as slave module and switch monitoring module. It also provide power supply to slave module and switch monitoring module.
CT connection line BCM101-L3	BCM101-L3 is used to connect current signal between CT and slave module.
Display unit BCM101-HMI	BCM101-HMI is used to display measuring electrical parameters of incoming line/feeder and status of circuit breaker.
Power supply module	BCM101-P is used to provide DC24V working power supply for display unit and external power supply for

| BCM101-P | digital input of switch module. |

2.1 Main module BCM101-M1/M2

2.1.1 Main functions

Functions of firmware

▼ Two incoming circuits: three-phase voltage and current, two zero to earth voltage inputs;

▼ Digital input: four dry contacts, internal DC power supply;

▼ Relay output: two relay outputs, AC 250V/5A or DC 30V/5A;

▼ Temperature: two NTC3950;

▼ External communication port: two RS485 ports, RS485-1 is used to be connected with touch screen module BCM101-HMI, and RS485-2 is used to be connected with backstage power environment monitoring system;

▼ External communication interface: one Ethernet port (optional);

▼ Bus interface: two bus interfaces;

Measurement functions

▼ Incoming line monitoring functions of main module:

Measuring real-time electrical parameters of incoming line such as phase voltage, line voltage, zero to earth voltage, phase current, voltage unbalance, current unbalance, active power, reactive power, apparent power, power factor, frequency, bi-directional active and reactive energy, voltage THD, current THD, $2^{nd} \sim 63^{rd}$ harmonics contents and temperature.

Name	Accuracy	Synchronous/ accumulated value	Max./ min. value	Demand	Alarm
Phase voltage	0.2	√	√	-	√
Phase voltage fundamental wave content	0.5	√	-	-	-
Phase voltage harmonic content	0.5	√	-	-	-
Zero to earth voltage	0.2	√	√	-	√
Line voltage	0.2	√	-	-	√
Current	0.2	√	√	√	√
Current fundamental wave content	0.5	√	-	-	-
Current harmonic content	0.5	√	-	-	-
Zero sequence current	0.2	√	√	-	√
Frequency	0.01Hz	√	-	-	√
Phase active power	0.5	√	-	-	√
Total active power	o	√	√	√	√
Phase active power fundamental wave content	0.5	√	-	-	-
Total active power fundamental wave content	0.5	√	-	-	-
Phase reactive power	0.5	√	-	-	-
Total reactive power	0.5	√	√	√	√
Phase reactive power fundamental wave content	0.5	√	-	-	-
Total reactive power fundamental wave content	0.5	√	-	-	-
Phase apparent power	0.5	√	-	-	-
Total apparent power	0.5	√	√	√	√
Phase apparent power fundamental wave content	0.5	√	-	-	-

Total apparent power fundamental wave content	0.5	√	-	-	-
Phase power factor	0.5	√	-	-	-
Total power factor	0.5	√	-	-	√
Temperature	±0.5℃	√	√	-	√
Import/export active energy	0.5S	√	-	-	-
Import/export reactive energy	2	√	-	-	-
Import/export fundamental energy	0.5S	√	-	-	-
Tariff energy	0.5S	√	-	-	-
Voltage THD	Class A	√	-	-	-
Current THD	Class A	√	-	-	-
Voltage 2nd ~63rd harmonic content	Class A	√	-	-	-
Current 2nd ~63rd harmonic content	Class A	√	-	-	-
Voltage phase angle	0.1°	-	-	-	-
Current phase angle	0.1°	-	-	-	-
Voltage sequence component	0.5	√	-	-	-
Current sequence component	0.5	√	-	-	-
Voltage unbalance	0.5	√	-	-	√
Current unbalance	0.5	√	-	-	√
Voltage crest factor	0.5	√	-	-	-
Current K factor	0.5	√	-	-	-

▼ Alarm functions of main module:

Main incoming circuit over voltage alarm, over load alarm - upper limit and ultimate upper limit, under load - lower limit and ultimate lower limit, input frequency off-limit alarm, open phase alarm and switch trip alarm; Each branch circuit two-level over load alarm - upper limit and ultimate upper limit, two-level under load alarm - lower limit and ultimate lower limit and switch

opening alarm.

▼ Monitoring function of main module:

Main module is the core of monitoring unit. All the information of measuring module in the system are uploaded to main module; all the operation and monitoring functions to the system are realized through main module.

▼ Internal communication function:

There are two bus interfaces. Each bus interface can be connected with up to three slave modules and two switch monitoring modules, which means 90 feeder branches at most. Two bus interfaces can be connected with up to six slave modules and four switch monitoring modules, which means 180 feeder branches at most.

▼ Backstage communication function：

All local data can be transferred to backstage system through RS485-2 or Ethernet port to realize remote operation.

2.2.2 Dimension and installation
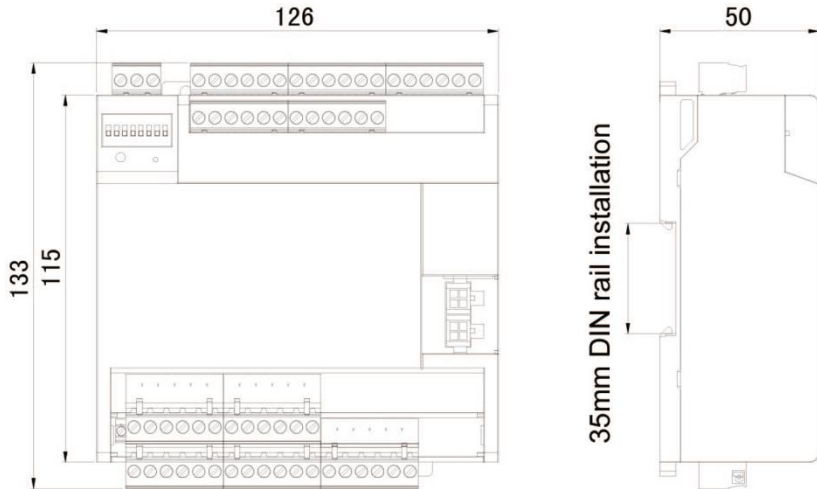
BCM101-M Dimension diagram

2.2.3 Technical parameters

Parameters			Specification
Accuracy			U, I:0.2 class， P, Q, PF：0.5 class Active energy：0.5S class， Reactive energy：2 class
Signal input	Voltage	Rated value	Three-phase AC 3×220/380V， BCM101-M1 can measure one three-phase circuit， BCM101-M2 can measure two three-phase circuits
		Overload	Continuous：1.2Un， Instantaneous：2Un/1min
		Power consumption	≤0.1VA（each phase）
		Impedance	≥1.7MΩ
	Zero to earth voltage		AC 220V
	Current	Rated value	AC5A/AC1A
		Overload	Continuous：1.2In， Instantaneous：10In/5s
		Power consumption	≤0.2VA（each phase）
		Impedance	≤20mΩ
	Frequency		45～65Hz，accuracy：±0.01Hz
Digital input	Type		4 digital inputs, dry contact, internal power supply DC+15V
	Withstand voltage		2kVAC
	Capacity		2 relay outputs,AC250V/5A DC 30V/3A

Relay output	Withstand voltage	2kV AC
Temperature		Two temperatures, NTC3950
Communication		Two RS485 ports, Modbus-RTU protocol, RS485-1 is connected to touch screen BCM101-HMI, RS485-2 is connected to backstage system
		One RJ45 interface, Modbus-TCP protocol (optional)
Bus interface		2
Power supply	Working range	DC：24V±2
	Power consumption	≤5VA
Installation dimension		L×W×H(mm):126×133×50，35mm DIN-rail installation

2.2 Slave module BCM101-S

2.2.1 Main function

Slave module can measure the electrical parameters of thirty single-phase circuits. The electrical parameters include voltage, current, power, energy, demand, extreme values and harmonics. It is equipped with two bus interfaces which are used to extend monitoring modules. It is also equipped with thirty digital inputs which are used to judge the opening and closing of switches through voltage values.

Name	Accuracy	Synchronous /accumulated value	Max./ min. value	Demand	Alarm
Voltage	0.2	√	-	-	-
Current	0.2	√	√	√	√
Current fundamental wave content	0.5	√	-	-	-
Current harmonic content	0.5	√	-	-	-
Active power	0.5	√	√	√	√
Active power fundamental content	0.5	√	-	-	-
Reactive power	0.5	√	-	-	-
Reactive power fundamental wave content	0.5	√	-	-	-
Apparent power	0.5	√	-	-	-

Apparent power fundamental wave content	0.5	√	-	-	-
Power factor	0.5	√	-	-	-
Import/export active energy	0.5	√	-	-	-
Import/export reactive energy	2	√	-	-	-
Current THD	Class A	√	-	-	-
Current 2nd ~31ST harmonic content	Class A	√	-	-	-

2.2.2 Dimension and installation
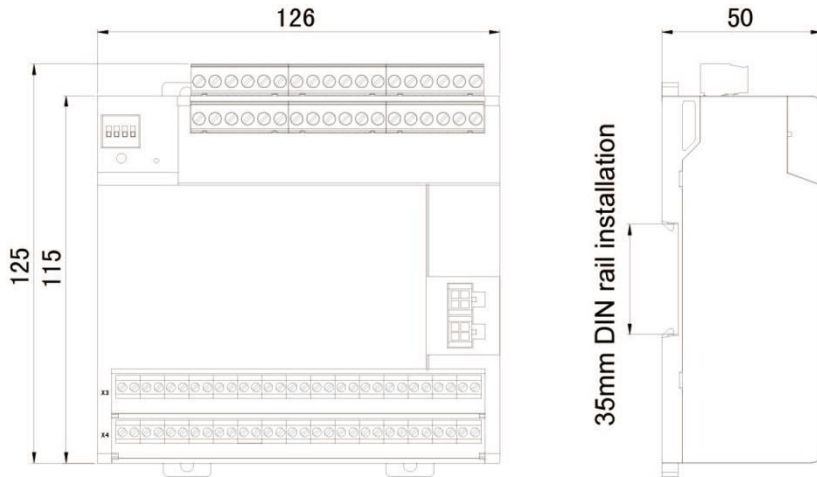
BCM101-S Dimension diagram

2.2.3 Technical parameters

Parameter			Specification
Accuracy			U, I: 0.2 class， P, Q, PF：0.5 class Active energy：1 class， Reactive energy：2 class
Signal input	Voltage	Rated value	Single phase AC 220V
		Overload	Continuous：1.2Un，

|			Instantaneous：2Un/1min
		Power consumption	≤0.1VA（each phase）
		Impedance	≥1.7MΩ
	Current	Rated value	External current transformer with max. current 100A
		Overload	Continuous：1.2In， Instantaneous：10In/5s
		Power consumption	≤0.2VA（each phase）
		Impedance	≤20mΩ
	Frequency		45～65Hz，accuracy：±0.01Hz
Digital input status			30 digital inputs, judging the opening and closing of circuit breaker through voltage value. If voltage > 120V, circuit breaker closes; if voltage < 110V, circuit breaker opens.
Bus interface			2
Power supply			Supplied by bus
Installation dimension			L×W×H(mm):126×125×50 ， 35mm DIN-rail installation

2.3 Switch monitoring module BCM101-K
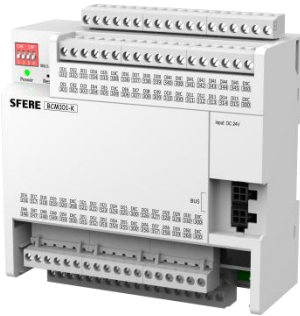
2.3.1 Main functions

    Switch monitoring module is used to monitor the status of sixty switches. It is equipped with wet contact input and two bus interfaces. It can be extended with measuring modules.

2.3.2 Dimension and installation
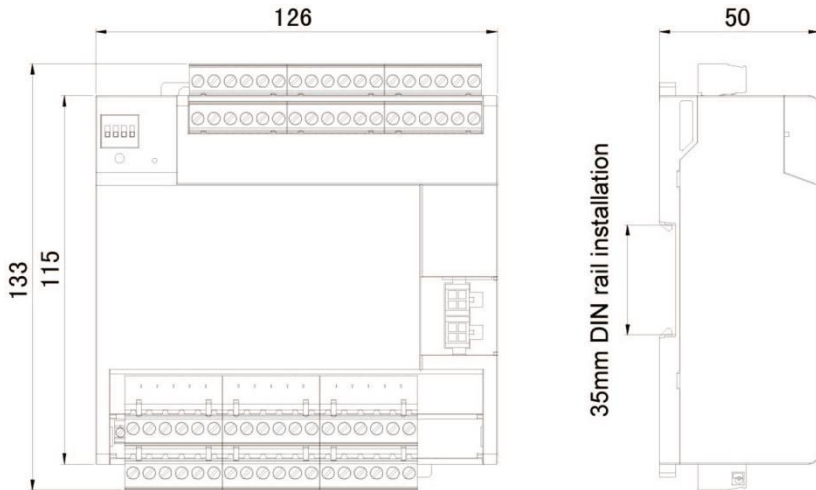
BCM101-K Dimension diagram

2.3.3 Technical parameters

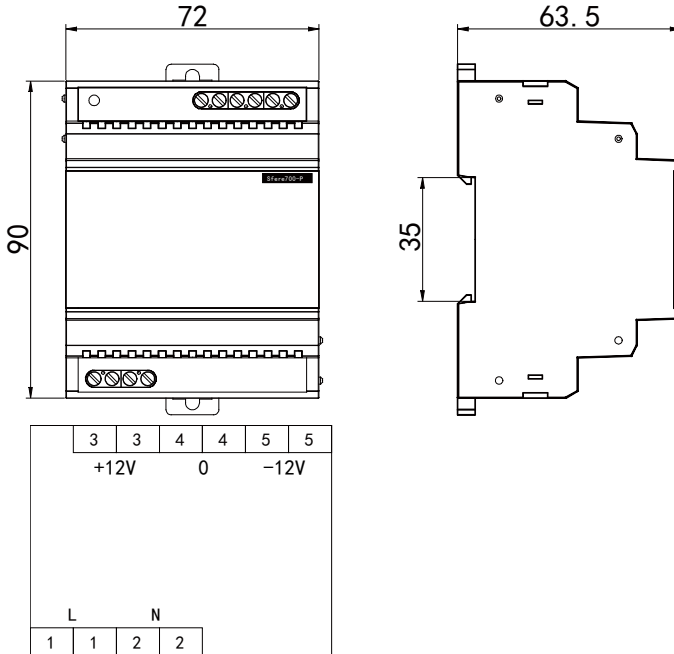| Parameters	Specification
Circuits	60 circuits, wet contact input (need auxiliary power supply)
Input voltage range	24V±2V
Insulation	2kV
Bus interface	2
Installation dimension	L×W×H(mm):126×133×50，35mm DIN rail installation

2.4 Power supply module BCM101-P

2.4.1 Main function

BCM101-P provides power supply to the whole monitoring unit. It supplies +24V power to main module at first and then supplies power to other modules through bus.

2.4.2 Dimension and installation

2.4.3 Technical parameters

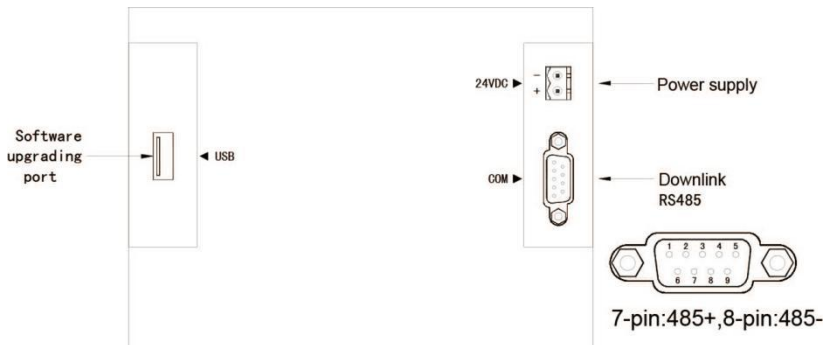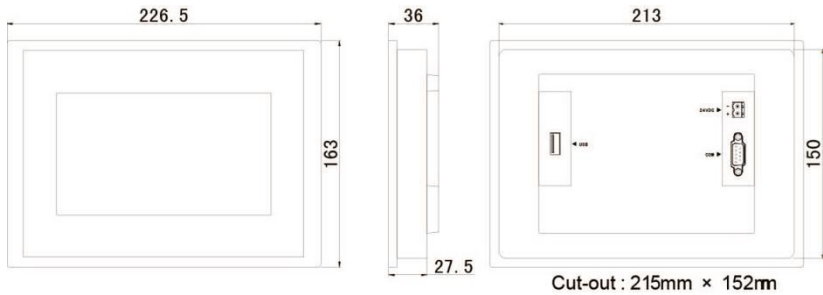| Parameter	Specification
Input voltage	AC、DC：80V～270V
Output voltage	DC：±12V
Output power	≤20W
Accuracy	±5%
Efficiency	>75%
Isolation strength	AC 2kV/min
Installation dimension	L×W×H(mm):72×90×63.5，35mm DIN rail installation

2.5 Touch screen module BCM101-HMI

2.5.1 Main function

Touch screen module is used to display measuring information and alarm information as well as set parameters of monitoring unit.

### 2.5.2 Dimension and installation

Cut-out : 215mm × 152mm

7-pin:485+,8-pin:485-

2.5.3 Technical parameters

Parameter		Specification
Display mode		7 inch touch LCD, resolution 800*480
Interface	Port	RS485，7-pin 485+，8-pin 485-； Modbus-RTU protocol
	USB	USB2.0
Power supply	Working range	(24±20%)VDC
	Power consumption	≤7W
Installation dimension		L×W×H(mm):226.5×163×36， Cut-out (mm):215×152

3. Typical application

3.1 System wiring diagram
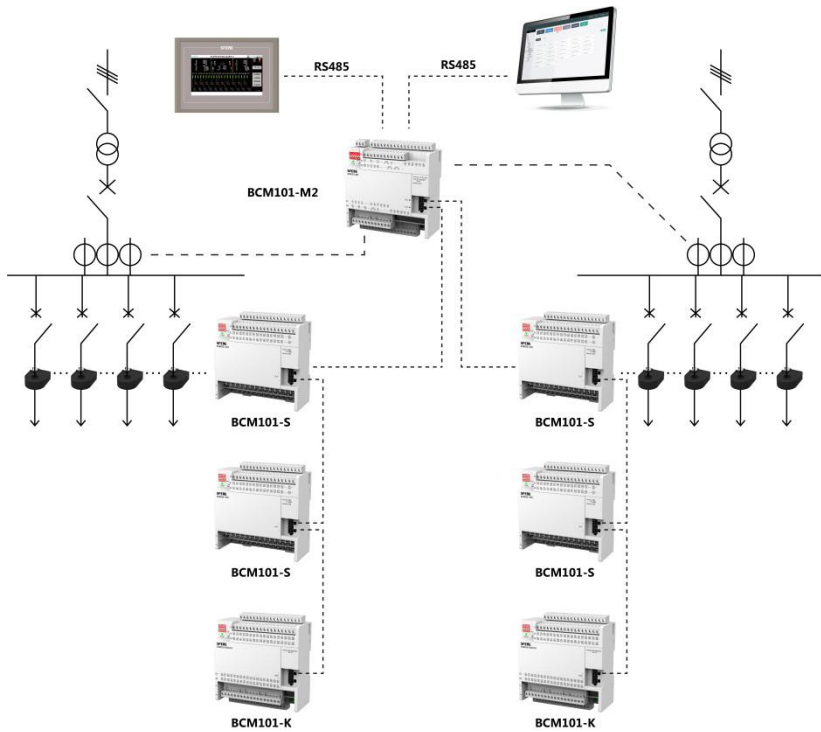
3.1.1 Single incoming line system
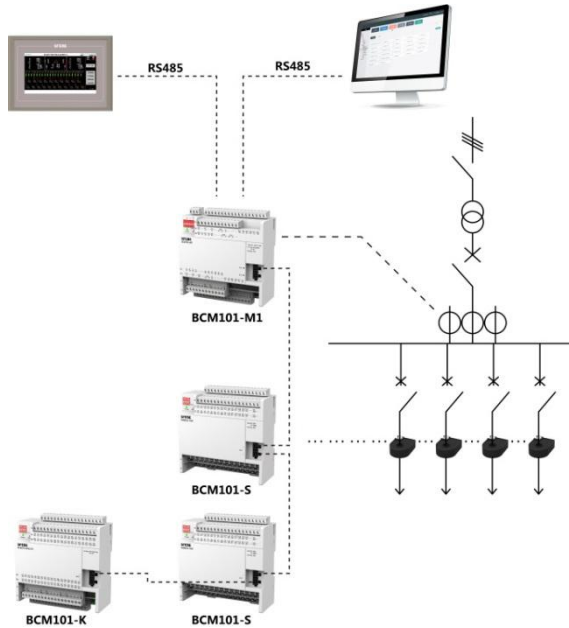
Single incoming line system, take 36 branch circuits in total as example.

Model	Quantity	Remark
Touch screen BCM101-HMI	1	One at most
Main module BCM101-M1	1	BCM101-M1 is for single incoming line system.
Slave module BCM101-S	2	Thirty branch circuits at most for each module. If there are more branch circuits, please extend the slave module.
Switch monitoring module BCM101-K	1	Sixty switches at most for one switch monitoring module.

Module connection line BCM101-L1	3	Quantity of BCM101-L1 is same as that of slave module and switch monitoring module.
Current transformer SHI-BCT50 Ⅱ	36	Quantity of current transformers is same as feeder circuits.
CT connection line BCM101-L3	36	Quantity of BCM101-L3 is same as that of current transformers.
Power supply module BCM101-P	1	If there are more than sixty circuits, two BCM101-P will be necessary. One is used for supplying power to modules, and the other is used for supplying external power to digital inputs of switch monitoring module.

3.1.2 Double incoming line system

Double independent incoming lines system, take branch circuits 120 in total as example.

Monitoring units are installed in power distribution cabinet to realize switch status monitoring of incoming line circuit, feeder circuit and feeder branch circuits.

Model	Quantity	Remark
Touch screen BCM101-HMI	1	One at most.
Main module BCM101-M2	1	BCM101-M2 for double incoming line system.
Slave module BCM101-S	4	BCM101-S only can be used for one

		incoming line, but not be used between two incoming lines. Therefore, if the branch circuits of doubling incoming line system are 72 in total which means 36 for each line, four BCM101-S will be necessary.
Switch monitoring module BCM101-K	2	BCM101-K only can be used for one incoming line, but not be used between two incoming lines. Therefore, if the branch circuits of doubling incoming line system are 52 in total which means 26 for each line, two BCM101-K will be necessary.
Module connection line BCM101-L1	6	Quantity of BCM101-L1 is same as that of slave modules and switch monitoring modules.
Current transformer SHI-BCT50 II	120	Quantity of current transformers is same as that of feeder circuits.
CT connection line BCM101-L3	120	Quantity of BCM101-L3 is same as that of current transformers.
Power supply module BCM101-P	2	If there are more than sixty circuits, two BCM101-P will be necessary. One is used for supplying power to modules, and the other is used for supplying external power to digital inputs of switch monitoring module.