Product Manual of PMAC811 Intelligent Motor Protection Controller

Installation & Operation Manual

V1.00

珠海派诺科技股份有限公司

ZHUHAI PILOT TECHNOLOGY CO., LTD.

Safety Precautions

Danger and Warning!

This equipment can only be installed by professionals.

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

Notice!

After removing the package of the instrument, please read all contents of the manual before setting or using it. Please pay more attention to the contents marked as "note".

In order to ensure the good use of the protection function of the motor protection equipment, the user is requested to install, set and use the protection equipment in the way described in this manual.

This manual is not intended to contain all details or changes to the plant, nor to provide all possible contingencies related to installation, operation and maintenance. Please contact us if you want further information or any special questions that are not fully described in this manual.

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Chapter 1 Product Introduction

1.1 Design description

PMAC811 intelligent motor protection controller is a new generation of enhanced high-performance motor protection device which integrates motor protection, measurement, information management, communication and control functions. It is suitable for three-phase AC asynchronous motor with rated voltage of AC380V or AC690V. He replaced the commonly used dispersed elements in the motor control center (MCC), greatly simplifying the control loop of the motor, improving the reliability and advancement of the motor control, and reducing the comprehensive application cost.

The controller adopts modular design, small size, compact structure, expandable, easy to install, and can be installed in 1 / 4 drawer cabinet. It consists of main body, CT module, leakage module and expansion module (special order required).

1.2 Product features

- the product has up to 23 built-in protection functions;
- realize the measurement of three-phase current, grounding / leakage current, current imbalance rate, three-phase line voltage, frequency, power factor, active power, reactive power, active electricity and other electrical parameters of motor circuit;
- built in direct start, bidirectional reversible start, two speed start, star / delta start, autotransformer start and other start modes. Users can choose their own settings according to the motor start mode;
- the main body of the controller provides 8-way switch value inputs for signal inputs such as start stop, circuit breaker status, process interlock, external fault, reset and contactor status;
- provide 5-way relay output to meet various starting modes and protection actions, and have protection trip (or alarm) signal output (refer to the appendix for specific output circuit number);

- provide DCs with one 4-20mA analog output, and multiple parameters can be selected;
- 256 event records, recording device operation records and relevant information in case of failure;
- it is convenient for maintenance and management. Through the display module or communication software, it can detect various electrical parameters, motor operation status, fault information, shutdown times and other parameters;
- flexible restart function can realize various starting requirements according to parameter settings after short-time power failure of motor main circuit.
- easy installation, panel installation, simple wiring, pluggable terminals;
- communication redundancy, 2-way Modbus Communication (1 standard, 1 optional), PROFIBUS-DP communication protocol can be extended through expansion module;
- wide power supply design, common for AC or DC ;

1.3 Product composition

PMAC811 is composed of main body, CT module, leakage module and expansion module. The expansion module needs special ordering, and the main body size is fixed. The size of special CT module is divided into 1A, 5A, 25A, 100A, 250A and 400A.

When the rated current of the motor is greater than 400A, the product adopts indirect access type, that is, the product provides 5A (1A) standard CT + * * A / 5A (* * A / 1A) transformer composition. For example, 500A / 5A, each motor is equipped with three current transformers.

In addition, the transformer of * * A / 5A (* * A / 1A) can be purchased by the user himself or by our company.

Chapter 2 Technical Parameters

2.1 System parameter

Rated voltage of motor: AC 380V or 690V, 1-690V can be set.

Rated current of motor: 0.1~820A.

Controller power supply voltage: AC 85V ~ 265V, DC 100V ~ 300V universal.

Switching value input: internal DC 24V power supply.

Power consumption: 3W for normal operation, 8W for protection starting.

Control relay: 250VAC / 10A, 380VAC / 5A.

Signal relay: 250VAC / 5A.

2.2 Symbol comparison table

Some symbols are used in this manual and the display interface, and the corresponding meanings of these symbols are listed：

Symbol	Meaning	Symbol	Meaning
Ie	Rated current of motor	Iun	Three phase current unbalance rate
Ue	Rated line voltage of motor	Uab, Ubc, Uca	Three phase line voltage
Pe	Rated power of motor	F	Frequency
Ia, Ib, Ic	A, B, C three phase current	Pf	Power factor
Iav	average current	P	Active power
Ig	Grounding current	Q	Reactive power
Id	Leakage current	E	Active electric energy

2.3 Measurement data range and accuracy

Item	Range	Accuracy	Item	Range	Accuracy
I	10% ~ 50%Ie	±2%	Pf	-1 ~ 1	±1%
	50% ~ 200%Ie	±0.5%	F	50/60Hz	±0.05Hz
	200% ~ 800%Ie	±2%	P	0.5 ~ 1000.0kW	±2%
Id	100 ~ 1000mA	±1%	AOUT	4 ~ 20mA	±2%
U	50% ~ 150%Ue	±0.5%	electrical degree	99999999.9 kWh	±1%

2.4 Protect data range and accuracy

Item	Range	Accuracy	Item	Range	Accuracy
I	10% ~ 800%Ie	±3%	U	50% ~ 150%Ue	±3%
Id	100 ~ 1000mA	±1%	AOUT	4 ~ 20mA	±2%

2.5 Electromagnetic properties

Item	Standard NO	Grade
Electrostatic discharge immunity test	GB / T 17626.2-2006 (IEC 61000-4-2)	Level 4
Electrical fast transient burst immunity test	GB / T 17626.4-2008 (IEC 61000-4-4)	Level 4
Surge immunity test (1.2/50μs)	GB / T 17626.5-2008 (IEC 61000-4-5)	Level 4
Radiated Immunity of RF electromagnetic field	GB / T 17626.3-2016 (IEC 61000-4-3)	Level 3

Immunity to conducted disturbances of radio-frequency electromagnetic fields	GB / T 17626.6-2017 (IEC61000-4-6)	Level 3
Power frequency magnetic field immunity	GB / T 17626.8-2006 (IEC61000-4-8)	Level 5
Immunity of damped oscillation wave	GB / T 17626.18-2016 (IEC61000-4-18)	Level 3
Immunity to voltage dips, short interruptions and voltage variations	GB / T 17626.11-2008 (IEC 61000-4-11)	Fit
Ripple immunity of DC power input port	GB / T 17626.17-2005 (IEC 61000-4-17)	Fit
Radiation emission limit	GB 4824-2013 (CISPR11)	Fit
Conducted emission limit	GB 9254-2008 (CISPR22)	Fit

2.6 Use environment

A) Working temperature: - 10 ~ + 55 ℃;

B) Storage temperature: - 25 ~ + 70 ℃;

C) Relative humidity: not more than 95% ;

D) No explosive medium is allowed at the place of use. The surrounding medium shall not contain gas or conductive medium that corrodes metal and destroys insulation. It shall not be full of water vapor and serious mould.

E) The place of use shall be equipped with facilities to prevent rain, snow, wind, sand and ash.

Chapter 3 Dimension and Installation Method

3.1 Overall dimension of controller body

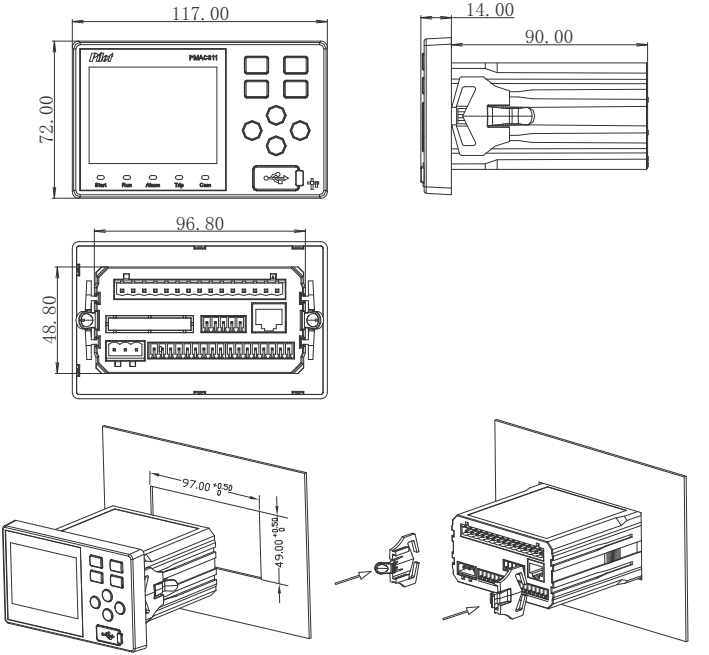


Fig.3-1 Controller appearance specification drawing and installation dimension drawing

Shell back size: 96.8 × 48.8mm, recommended opening size: 97.5 × 49.5mm

3.2 CT module dimensions

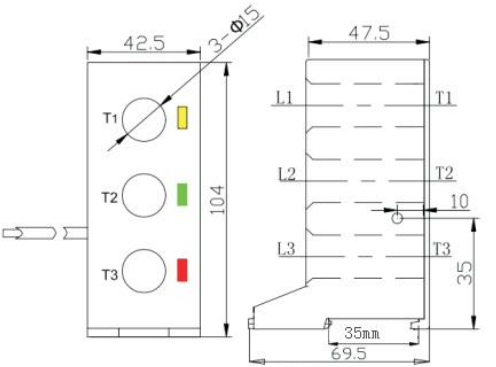
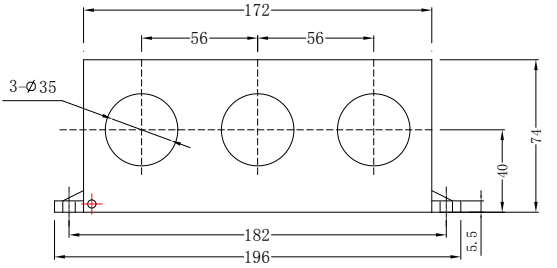


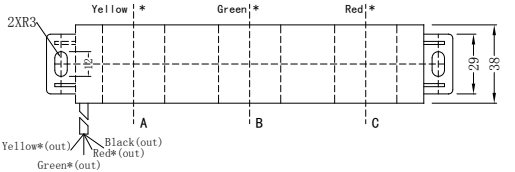
Fig. 3-2 Outline dimension of CT module under 100A

「Note」:

This CT module is installed with standard 35mm guide rail.



Front view



Top view

Fig. 3-3 outline dimension of 250A, 400A CT module

3.3 Overall dimension of leakage CT

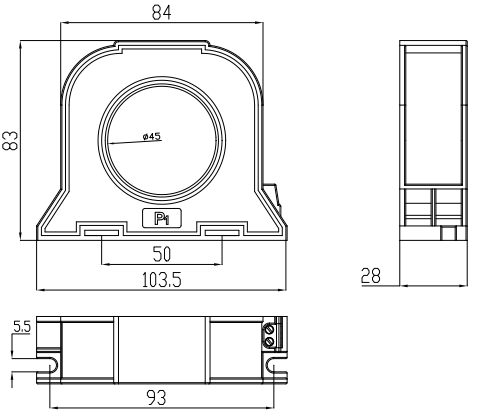


Fig. 3-4 PMAC503L-100A is applicable to rated current of 100A and below

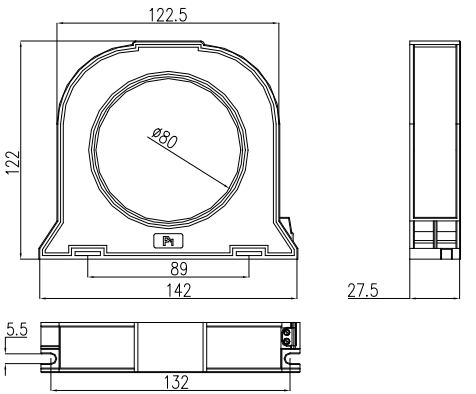


Fig. 3-5 PMAC503L-250A for rated current 120A-250A

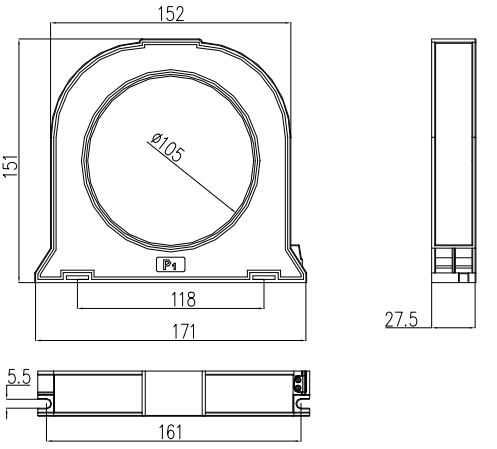


Fig. 3-6 PMAC503L-400A is applicable to rated current of 300A-400A

「Note」:

1. The rated value of all leakage CTS is 1A.
2. All specifications of leakage transformer are not equipped with secondary side outgoing line. Users need to install the appropriate length of secondary side outgoing line according to the needs of the site.

Chapter 4 Controller function configuration

Controller function configuration comparison table

Classification	Function	PMAC811		
		A	B	C
Protection function	Short circuit (quick break) protection	●	●	●
	Thermal overload protection	●	●	●
	Starting overcurrent / running stall	●	●	●
	TE time protection	●	●	●
	Start timeout protection	●	●	●
	Single phase earth protection	●	●	●
	Leakage protection	○	○	○
	Current phase failure protection	●	●	●
	Under load/current unbalance protection	●	●	●
	Under power protection	○	○	○
	Current reverse phase sequence protection	●	●	●
	Under / over voltage protection	○	○	○
	Negative sequence current protection	●	●	●
	Voltage reverse phase sequence protection	○	○	○

	Voltage unbalance protection	○	○	○
	Contactor fault protection	●	●	●
	External fault protection	●	●	●
	Fuse core break alarm	○	○	○
	Negative sequence current section I / II	●	●	●
Control function	Voltage loss restart function	○	○	○
	Power swing restart function	○	○	○
	Direct start /Bidirectional start	●	●	●
	Dual speed starting	●	●	●
	Star delta start	●	●	●
	Autotransformer starting	●	●	●
	Soft start / variable frequency start	●	●	●
Measure	Three-phase current	●	●	●
	Three-phase voltage	○	○	○
	Active / reactive power	○	○	○
	Power factor / frequency	○	○	○
	Active / reactive electricity degree	○	○	○
	Heat capacity	●	●	●
	Current unbalance rate	●	●	●
	Leakage current	○	○	○
	Positive / negative sequence current	●	●	●

	Ground / average current	●	●	●
	2nd-7th harmonic current	●	●	-
	2nd-7th harmonic voltage	○	○	-
	Voltage unbalance rate	○	○	-
	Positive / negative sequence voltage	○	○	○
	Fault recording	●	●	-
	Switching input	8DI	8DI	8DI
Communication	First Modbus	●	●	●
	second Modbus	○	○	-
Others	Relay output	4-way	4-way	4-way
	Signal holding function of power swing operation	1-way	-	-
	Display 2.8 inches	Colour	Colour	black and white
	Opening size	97.5*49.5		
Extension module	Extended Profibus-DP DI/DO	○	-	-

Note：● Standard configuration ○ Matching - No this function

Chapter 5 Motor control and other functions

5.1 Division of motor operation state

PMAC811 divides motor operation into four states: Ready state, Start state, Operation state and Stop state.

Ready state：When the motor is ready, it can be started immediately.

Start state：After receiving the start command, the motor runs until it reaches the state before steady-state operation.

Operation state：Normal operation stage of motor.

Stop state：The state of a motor after it has failed to stop or received a stop signal.

「Note」：

If the motor stops due to a fault, it needs to clear the fault and carry out reset operation, so as to change from the stop state to the ready state. Normal parking will automatically change from parking state to ready state.

5.2 Start-stop operation

There are three kinds of motor start and stop operation: display module key operation, di switch input operation, communication control and other operation modes.

5.3 Protection / control

The relay output has dual functions of starting and stopping control and protection tripping of AC contactor. When the motor is in normal operation, the operation key can act on the corresponding relay to stop the motor normally. When the fault occurs, if the protection action mode is set to trip, the trip signal is automatically associated with the corresponding relay to stop the motor operation.

Another overflow fault output relay is provided. When the fault current of the motor exceeds the allowable breaking current of the contactor, the output pulse signal will break the circuit breaker. (relay defined as overflow protection is required).

For example, in the direct start control mode, the output of relay RL1 [1,2] has dual

functions, i.e. stop and protection trip; when the fault current of motor reaches the allowable breaking current of contactor, the contact of relay RL3 [5,6] outputs pulse signal to break the circuit breaker.

5.4 Fault info output

PMAC811 has motor fault information output relay. The contact [7,9] of relay RL4 is normally open and the contact [8,9] is normally closed. When pmac811 sends alarm or trip fault information, the fault relay contact RL4 relay acts (normally open closed, normally closed open); if the fault information is cleared, the relay contact returns to the initial value.

5.5 Reset mode

After pmac811 protection alarms or trips and enters the shutdown state, if it needs to operate again, reset and clear the fault information first. There are many ways to reset: display panel (reset button) and controller Di input terminal (28 pin reset terminal), or remote reset can be realized through communication port.

5.6 Power loss auto-diagnosis

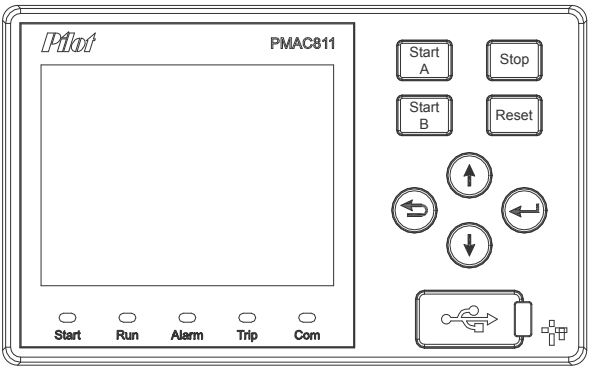
PMAC811 has power loss auto-diagnosis relay output, the auto-diagnosis contact is normally closed, and the controller normally works with power on, and the contact is open; when power loss, the contact is closed. (relay defined as power loss auto-diagnosis is required).

5.7 Emergency stop

PMAC811 provides the input terminal of emergency stop (emergency button). When the input signal reaches this terminal and is closed, it will stop immediately; before the signal is disconnected, it is not allowed to start the motor.

Chapter 6 Panel Display

6.1 Description



Display mainly provides control, data display and setting functions.

Indicator light:

Identification	Extinguish	Always bright	Flicker
Start	Non-start state	Starting state	-
Run	Non- operation state	Running state	-
Alarm	No alarm	Warning	-
Trip	No tripping	Tripping	-
Com	No communication	-	Normal communication

Control key：

"Start A", forward starting motor.

"Start B", reverse starting motor, valid only in bidirectional reversible start.

"Stop" to stop the motor.

"Reset", reset the fault information in case of fault alarm or trip of motor.

Setting key：

“⇦” Return to the previous interface, or set the shift.

“↑” Add button to switch the display interface or modify the setting value.

“↓” Decrease key, switch the display interface or modify the setting value.

“⏎” Confirm key, switch to the setting interface.

Modify parameters：

Example

If it is necessary to set the starting time-out protection - execution mode to trip, the method is as follows:

1.Press confirm key “⏎” ;

2. After moving the cursor to "protection setting", press the confirm key “⏎” to enter.

3.Move the cursor to the line of start timeout, and then stop. At this time, press the confirm key "⏎" and the "trip" Chinese character after the "execution mode" in the menu will turn green. Press again and the "trip" Chinese character will flash, indicating that the current value can be modified,

Select through "↑" and "↓" keys, and finally press the confirm key "⏎" to confirm the content just modified, and press the return key “⇦”. Prompt to confirm saving? Select "yes" by default. Press confirm key "⏎" to save the data. Press the return key “⇦” and select "no", then press the confirm key "⏎" to not save.

All the parameter modification operations in this menu can refer to this example.

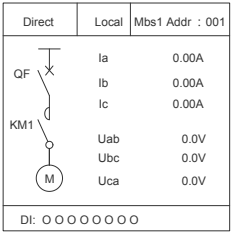
Interface：

Front panel interface: as a debugging interface, it can be connected to the serial communication port of the computer through a special connecting cable.

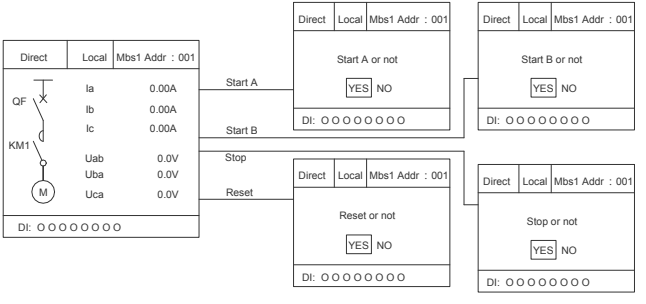
RJ45 interface of rear panel: connected to expansion module.

6.2 Main function

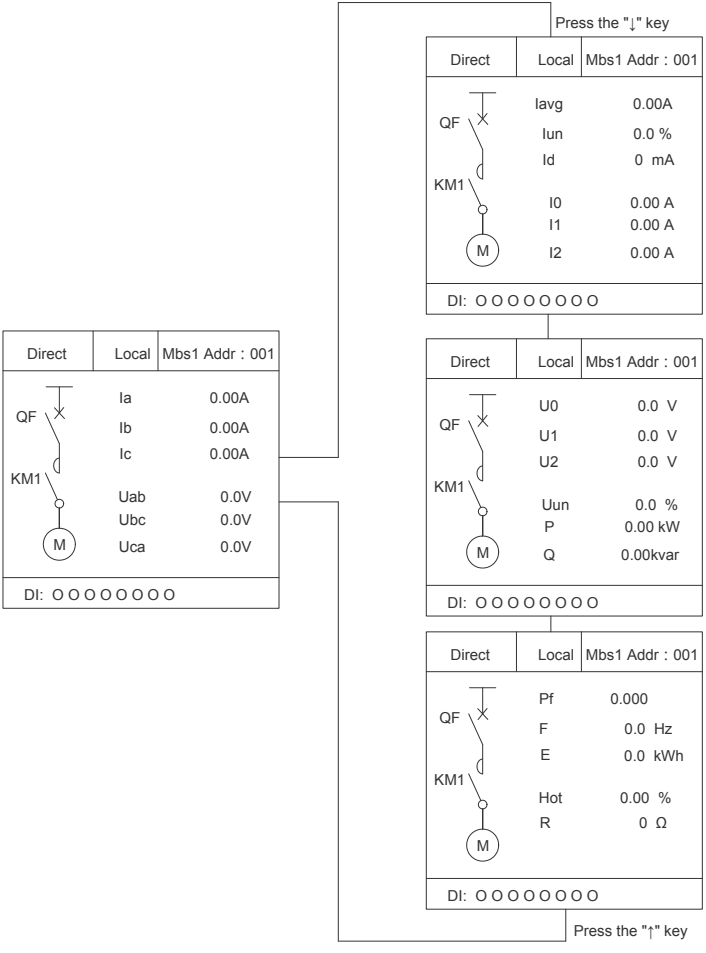
After the display module is powered on and running, the default control interface is as follows：



Press start a, start B, stop and reset respectively as shown below：

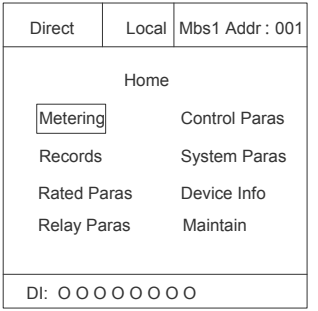


Press "↑" and "↓" one or more times to display the following interface circularly：


Press the "↓" key
Direct
Local
Mbs1 Addr : 001
QF
KM1
M
Iavg 0.00A
Iun 0.0 %
Id 0 mA
I0 0.00 A
I1 0.00 A
I2 0.00 A
DI: O O O O O O O O
Direct
Local
Mbs1 Addr : 001
QF
KM1
M
U0 0.0 V
U1 0.0 V
U2 0.0 V
Uun 0.0 %
P 0.00 kW
Q 0.00kvar
DI: O O O O O O O O
Direct
Local
Mbs1 Addr : 001
QF
KM1
M
Pf 0.000
F 0.0 Hz
E 0.0 kWh
Hot 0.00 %
R 0 Ω
DI: O O O O O O O O
Press the "↑" key
Direct
Local
Mbs1 Addr : 001
QF
KM1
M
Ia 0.00A
Ib 0.00A
Ic 0.00A
Uab 0.0V
Ubc 0.0V
Uca 0.0V
DI: O O O O O O O O

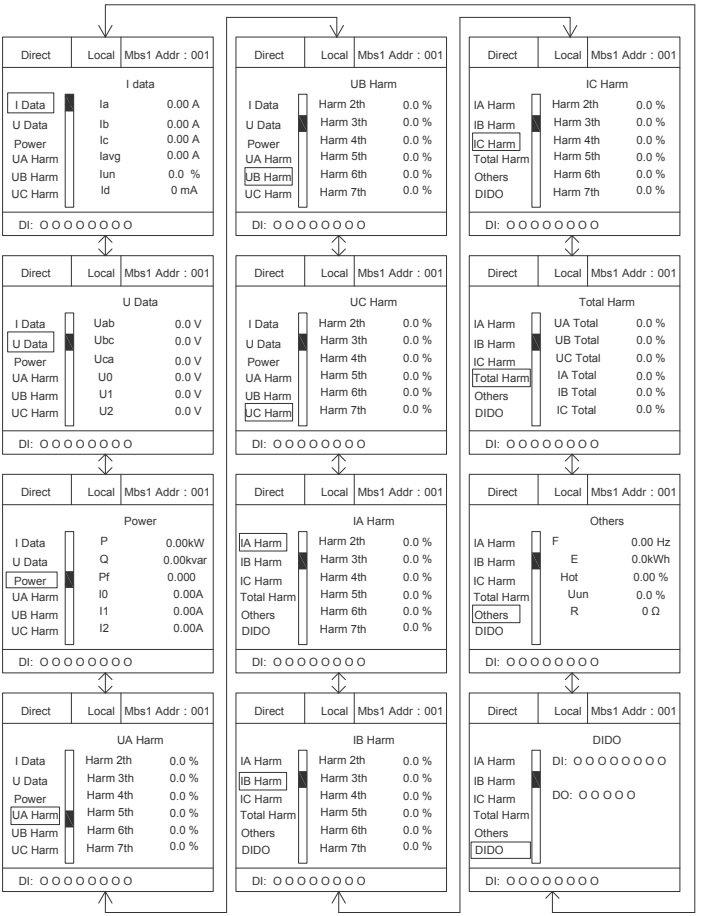
Main interface:

After pressing the Confirm key, the display is as follows:



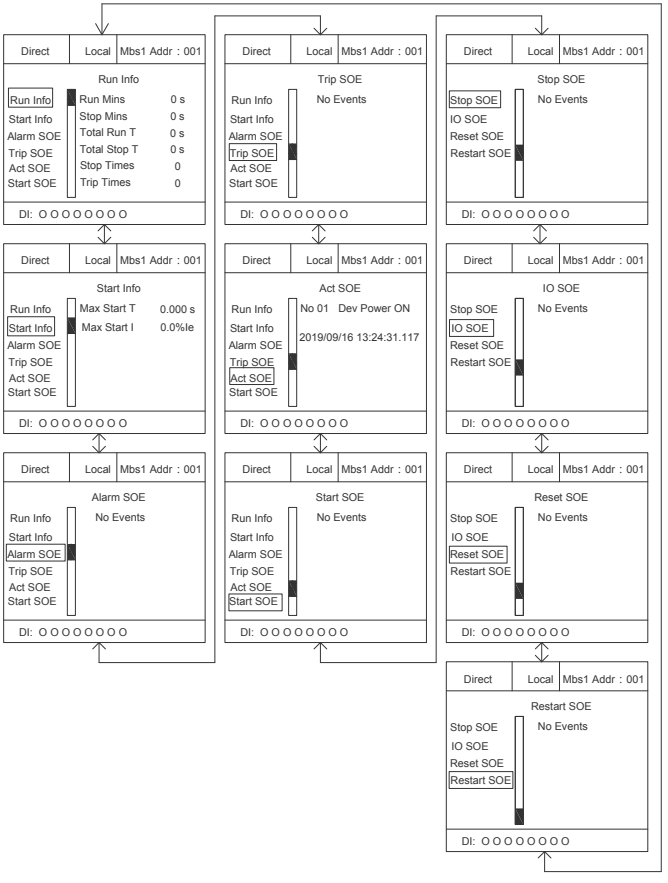
Real time data:

In the default interface, press the confirmation key to enter the "home page" interface, move the cursor to "real time data", press the confirmation key to enter, and then press "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure:


Direct
Local
Mbs1 Addr : 001
I data
I Data
U Data
Power
UA Harm
UB Harm
UC Harm
Ia 0.00 A
Ib 0.00 A
Ic 0.00 A
Iavg 0.00 A
Iun 0.0 %
Id 0 mA
DI: O O O O O O O O O
UB Harm
Harm 2th 0.0 %
Harm 3th 0.0 %
Harm 4th 0.0 %
Harm 5th 0.0 %
Harm 6th 0.0 %
Harm 7th 0.0 %
IC Harm
IA Harm
IB Harm
IC Harm
Total Harm
Others
DIDO
U Data
Uab 0.0 V
Ubc 0.0 V
Uca 0.0 V
U0 0.0 V
U1 0.0 V
U2 0.0 V
UC Harm
Total Harm
UA Total 0.0 %
UB Total 0.0 %
UC Total 0.0 %
IA Total 0.0 %
IB Total 0.0 %
IC Total 0.0 %
Power
P 0.00kW
Q 0.00kvar
Pf 0.000
I0 0.00A
I1 0.00A
I2 0.00A
IA Harm
Others
F 0.00 Hz
E 0.0kWh
Hot 0.00 %
Uun 0.0 %
R 0 Ω
UA Harm
IB Harm
DIDO
DI: O O O O O O O O
DO: O O O O O

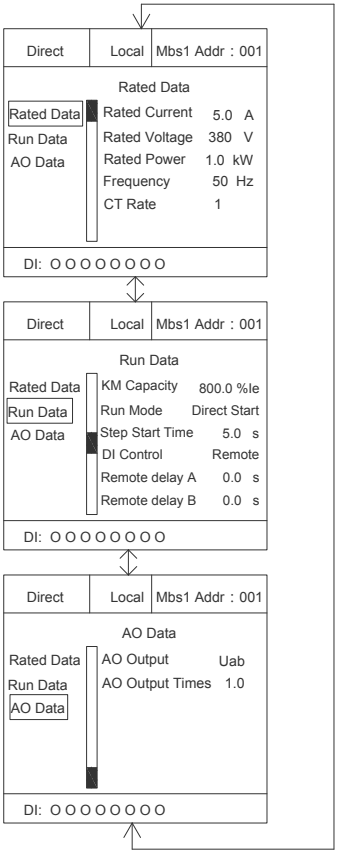
Record information:

In the default interface, press the confirmation key to enter the home interface, move the cursor to record information, press the confirmation key to enter, and then press the "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure：



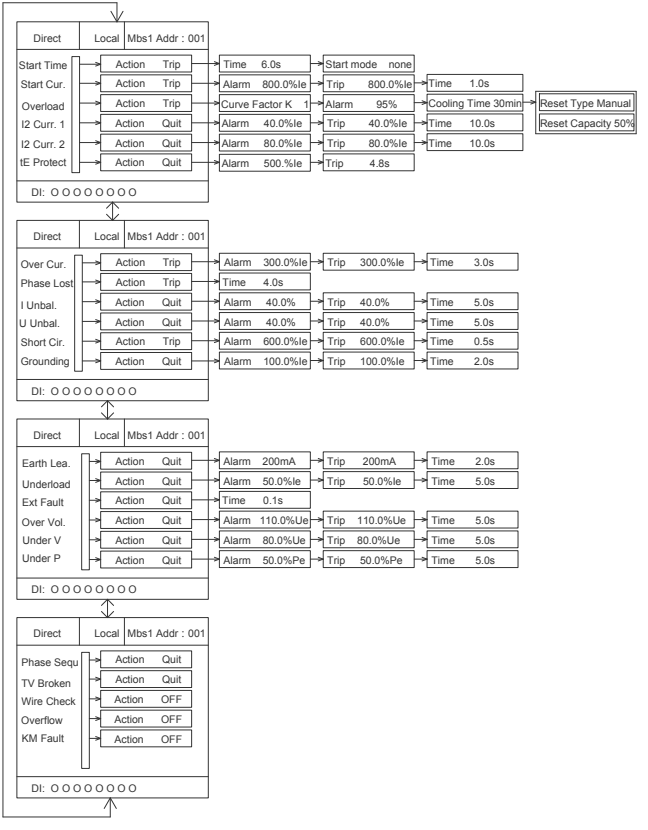
Motor parameters:

In the default interface, press the confirmation key to enter the home interface, move the cursor to the motor parameter, press the confirmation key to enter, and then press the "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure:



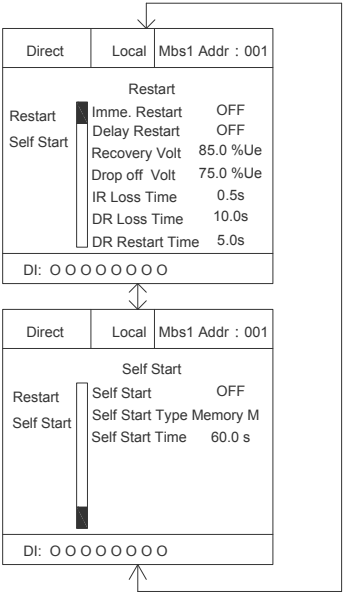
Protection value：

In the default interface, press the confirmation key to enter the home interface, move the cursor to the protection setting value, press the confirmation key to enter, and then press the "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure：



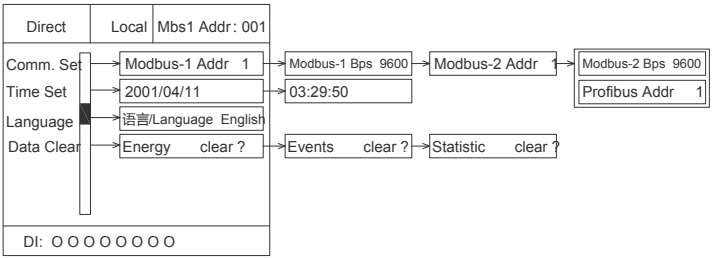
Control parameter :

In the default interface, press the confirm key to enter the home interface, move the cursor to control parameters, press the confirm key to enter, and then press the "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure:



System parameter：

In the default interface, press the confirm key to enter the home interface, move the cursor to the system parameter, press the confirm key to enter, and then press the "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure:

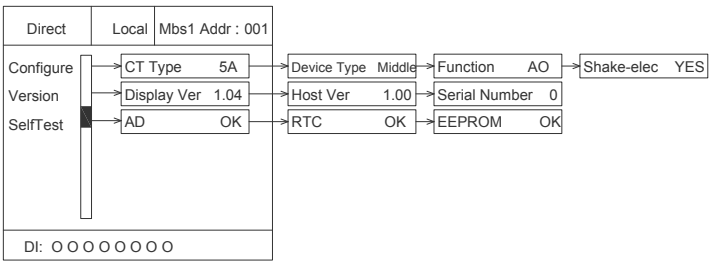


「Note」：

1. The communication parameters include the address and baud rate of the first 485 and the second 485, and the address of PROFIBUS DP.
2. Language setting options Chinese and English.
3. When clearing records, select "yes" to clear the selected records, and select "no" to discard the clearing.

Device information：

In the default interface, press the confirmation key to enter the home interface, move the cursor to the device information, press the confirmation key to enter, and then press the "↑" and "↓" keys to switch to the corresponding interface. As shown in the figure:

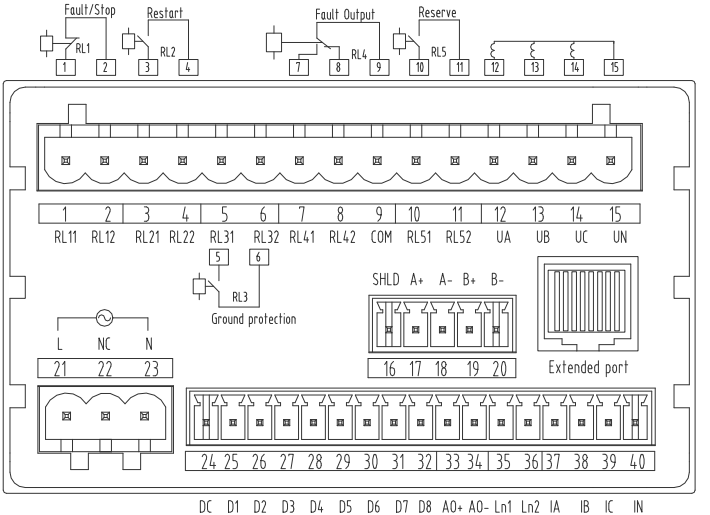


The device information is mainly used to view the basic parameters of the device and cannot be modified.

Factory maintenance： The manufacturer's maintenance interface is for the manufacturer's own use and is not open to users.

Chapter 7 Product terminal function and CT module description

7.1 Product terminal



Terminal function :

Number	Identification	Function	Initial state
1	RL11	Relay 1, fault and stop	Normally closed
2	RL12		
3	RL21	Relay 2, start A	Normally open
4	RL22		

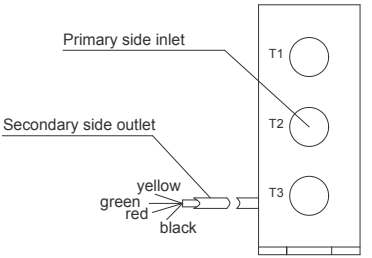
5	RL31	Relay 3, ground protection or start B	Normally open
6	RL32		
7	RL41	Relay 4, fault	Normally open
8	RL42	Relay 4, fault	Normally closed
9	COM	common port	-
10	RL51	Relay 5, fault or operation hold	Normally open
11	RL52		
12	UA	Phase A voltage input	-
13	UB	Phase B voltage input	-
14	UC	Phase C voltage input	-
15	UN	neutral conductor	-
16	SHLD	RS485 shield ground	-
17	A+	RS485 communication port 1	-
18	A-		-
19	B+	RS485 communication port 2	-
20	B-		-
21	L/+	VCC	-
22	NC	Empty terminal	-
23	N/-	GND	-
24	DC	Photoelectric isolation input common terminal	-
25	D1	Switch input 1	-
26	D2	Switch input 2	-

27	D3	Switch input 3	-
28	D4	Switch input 4	-
29	D5	Switch input 5	-
30	D6	Switch input 6	-
31	D7	Switch input 7	-
32	D8	Switch input 8	-
33	AO+	Analog output positive pole	-
34	AO-	Analog output negative pole	-
35	Ln1	Leakage current input 1	-
36	Ln2	Leakage current input 2	-
37	IA	Phase A current input	Secondary current input terminal of three-phase current transformer
38	IB	Phase B current input	
39	IC	Phase C current input	
40	IN	Current signal common terminal	

「Note」:

1. The A, B, C and N phase current input terminals on the main body need to be connected with a special CT module, and the 5A or 1A current input cannot be connected at will.
2. If only one phase or two phases are used for the connection terminals IA, IB, IC and in at the secondary side of the transformer on the main body, other unused input ports shall be short circuited to in. For example, only A-phase transformer is connected. When the secondary side of the transformer is connected to IA and in, jumpers are needed to short-circuit IB, IC and in, otherwise the current zero drift of IB and IC will appear on the measurement display.

7.2 CT module



■ 100A and below:

Current incoming line：

T1，Phase A current incoming line

T2，Phase B current incoming line

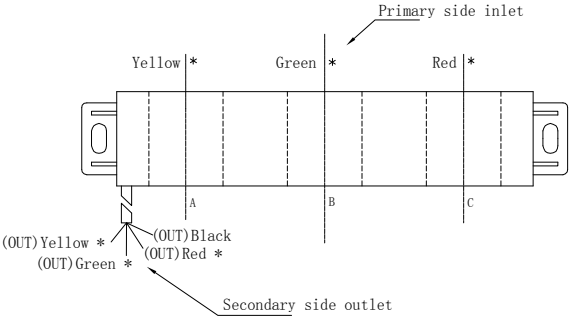
T3，Phase C current incoming line

Current exit line：

The yellow, green, red and black cables of the outgoing line at the secondary side represent the secondary outgoing line end and common end of phase a, B and C current respectively, and connect them to the corresponding current terminals of the main body. The common end shall not be grounded.

Length of outgoing line at secondary side: 1 m for 1a, 1.5 m for others.

■250A and 400A specifications：



Connection type：

The yellow, green, red and black cables of the secondary outgoing line respectively represent the secondary outgoing line terminal and common terminal of phase a, B and C current, and connect them to the corresponding current terminals of the main body. The common terminal shall not be grounded. The length of outgoing line at secondary side is 1.5m.

Chapter 8 Motor Parameter Setting

8.1 Rated current of motor

Setting range: 0.1A ~ 820.0A (it is recommended that the minimum setting value of rated current is 20% of CT specification, and the minimum setting value of rated current is 0.2A when CT specification is 1A).

8.2 Rated voltage of motor

Setting range：1 ~ 690V.

8.3 Rated power of motor

Setting range：0.1 ~ 1000kW。

8.4 CT transformation ratio of main circuit of motor (When adding one level of CT)

Because pmac811 is equipped with its own special split CT module, and the measurement range is up to 820a, it is generally unnecessary for users to configure external CT additionally; if external CT is configured for special needs, the secondary side outgoing line of external CT needs to pass through the primary side wiring hole of corresponding CT module of pmac811, and the external CT transformation ratio needs to be set.

Setting range：1 ~ 820.

For example: the transformation ratio of current transformer is 500:5, and the value of 100 needs to be set here.

When external CT is selected for the user's main circuit, CT with rated current of 5A at secondary side is recommended. When selecting controller, controller with rated current of 5A is recommended. If the secondary side of external CT is 1A, the controller with rated current of 1A of our company shall be equipped.

Note: CT setting is valid only when rated current is 1A or 5A.

8.5 Maximum breaking current of contactor

Setting range：1.0～10.0Ie。

The factory default maximum breaking current is 8.0Ie。

8.6 Device operation mode

Setting range ：Protection mode, Direct start mode, Bidirectional reversible start mode, Control circuit breaker mode, Star delta start two relay mode, Autotransformer two relay start mode.

The factory default operation mode: Direct start mode.

8.7 Two-step start time

This time is used for the control switching time of star angle start, auto coupling start and the time waiting for restart after stopping in bidirectional reversible start.

Setting range：0.5～60.0s。

8.8 Di control authority

Operation authority: panel control is defined as local and communication control as remote; terminal attributes (start / stop terminal, other terminal attributes are not defined) set by software in panel menu include "local", "remote" and "exit". Turn off input DI5 (terminal 29 of the product) is the input point of authority position switch, input of DI5 terminal (high level input is valid) is divided into "local" and "remote", input of DI5 terminal (low level input is valid) is divided into "remote" and "local". The following is the effective description of high level:

1. When the software in the panel menu sets the terminal property to local, the product will be used after initialization:

1) When the authority position switch of DI5 terminal is on, panel control, DI1 forward start and DI3 stop control are effective. Invalid communication control.

2) When the authority position switch of DI5 terminal is closed, panel control, DI1 forward start and DI3 stop control are invalid. Effective communication control.

2.When the software in the panel menu sets the terminal property to remote, the

product will be used after initialization:

1) When the authority position switch of DI5 terminal is turned on, the panel control is effective, and DI1 forward start and DI3 stop control. Invalid communication control.

2) When the authority position switch of DI5 terminal is closed, the panel control is invalid, DI1 forward start and DI3 stop control. Effective communication control.

3. When the software in the panel menu sets the terminal attribute as exit, DI1 is defined as forward start and DI3 is defined as stop, and the product is used after initialization.

1) When the authority position switch of DI5 terminal is turned on, the DI1 forward start and DI3 stop control are effective, and the panel control is effective. Invalid communication control;

2) When the authority position switch of DI5 terminal is closed, the DI1 forward start and DI3 stop control are effective, and the panel control is invalid. Effective communication control.

「Note」:

1. In the protection mode, there is no distinction of operation authority.

2. Parameter setting function is independent of control authority.

3. In the panel menu, the name of software setting terminal property is called DI control authority.

8.9 Rated frequency

Setting range：50Hz

8.10 AOUT

The analog output is 4-20mA, and the factory default AOUT object is phase A current.

Optional AOUT objects: none, A-phase current, B-phase current, C-phase current, Leakage current, Three-phase current unbalance rate, AB line voltage, BC line voltage, CA line voltage, Active power.

8.11 Multiple of AOUT

Multiple of AOUT: 1.0-10.0. If the multiple of AOUT is set to 10, it means that 0 corresponds to 4mA, and 10ie corresponds to 20mA. When the object is three-phase current unbalance rate, the multiple setting is invalid.

When the multiple of AOUT is set to 1, the corresponding relations of various variable outputs are as follows：

Category	**20mA correspondence**	**Category**	**20mA correspondence**
A-phase current	Rated current	Three phase current unbalance rate	100%
B-phase current	Rated current	AB line voltage	Rated voltage
C-phase current	Rated current	BC line voltage	Rated voltage
Leakage current	Rated leakage current	CA line voltage	Rated voltage
Power	Rated power		

Note：Rated leakage current default configuration 1000mA.

Chapter 9 Setting of Protection Parameters

9.1 Description

PMAC811 is based on the data acquisition of three-phase current, three-phase line voltage, grounding current, thermistor and switch state input to protect and control the motor comprehensively. The protection function compares the collected data calculated with the protection setting value set by the user recorded by the controller, and controls the relay to perform corresponding actions based on the comparison results.

The parameter setting of PMAC811 series motor protection controller can be done through display module or communication interface. The communication software can be provided free of charge. Please refer to the communication software manual for specific operation.

When PMAC811 leaves the factory, only start-up time-out protection, start-up over-current protection, overload protection, over-current locked rotor protection, open phase protection, short-circuit protection are open, and other protection functions are closed. Users can open and set other protection functions according to their needs. In the setting process of protection setting, care should be taken to avoid causing protection mis-operation or motor damage.

Note: during the setting of each protection parameter, attention shall be paid not to exceed the allowable setting range, otherwise the setting is invalid.。

9.2 Start timeout protection

The starting time-out protection provides protection for the motor during the starting process. During the operation of the motor, the starting time-out protection exits automatically.

The parameters of start-up time-out protection to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip	Trip
Time value	0.5s～60.0s	6s
Starting mode	No / soft starter	Nothing

The setting of the starting time can be 1.2 times of the actual starting time of the motor, i.e. the time from starting to the motor speed reaching the rated speed, with allowance considered.

Protection action characteristics: In the process of motor starting, if the maximum current of three-phase current is ≥ 1.2ie and the duration is greater than the setting value of the starting time-out protection time, the starting time-out protection will act.

When the soft starter is selected as the starting mode, when the maximum value of 0.1ie < three-phase current < 1.2ie is met after entering the starting dynamic state, it must wait for the timeout time before entering the running state.

9.3 Starting overcurrent protection

Starting over-current protection provides over-current protection for the motor during starting. During the operation of the motor, the starting overcurrent protection exits automatically.

Protection action characteristics: in the starting time, the maximum current of three-phase ≥ the protection setting value and reaches the setting time, the protection action.

The starting overcurrent protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Trip
Alarm value	100.0~1000.0%Ie	800%Ie
Trip value	100.0~1000.0%Ie	800%Ie
Time value	0.0-60.0s	1s

9.4 Overload protection

Overload protection is a common and commonly used motor protection function, which mainly protects the motor from overheating and insulation reduction caused by long-term operation above the rated current, thus burning out the motor. The overload protection function provides protection for the motor according to the inverse time limit overload protection curve provided. The curve basis is the formula as follows: T = $KxLn[N^2/(N^2-1.15)]/1.15$, among N =Iav/Ie. It is not put into operation during the starting process and will be put into operation automatically after entering the operation process. If tE time protection is put into operation, overload protection will be locked:

The overload protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Trip
Curve rate	1~18	1
Alarm value	50%-100%	95%
Cooling time	1min～40min. Differential 1min	30min
Reset mode	Manual / Automatic	Manual
Reset heat capacity value	0.0-85.0%	50%

The user can select the curve coefficient according to the motor overload protection level, and the K coefficient corresponding to the curve rate is as follows:

Curve rate	K coefficient	Curve rate	K coefficient
1	10	2	16
3	24	4	40
5	60	6	80

7	100	8	130
9	180	10	280
11	400	12	600
13	800	14	1000
15	1100	16	1200
17	1400	18	1800

The cooling time is that the motor can be reset after the occurrence of overload.

If the overload protection function is put into operation, the hot melt value will trip when it reaches 100%, and the alarm setting value is the hot melt value.

For the setting of cooling time: after the motor stops, its cooling process is simulated as a decay index process, and the cooling speed is controlled by this setting value. According to the cooling conditions of the motor, it can input a typical time of 30 minutes, so that it can be fully cooled. If a shorter cooling cycle is required, especially for small motors, a different time can be entered. If a too short cooling time is selected, the operator may restart an overheated motor and cause damage. Therefore, when selecting a short cooling time, be careful.

The heat capacity is the accumulated heat during the operation of the analog motor; the reset heat capacity is set in the overload protection to prevent the motor from overheating. Only when the heat capacity of the motor is lower than the reset heat capacity, can the reset condition be satisfied.

When the fault reset mode is manual, manual reset operation is required after the overload protection action, and the motor can be started again only after the fault indication and fault trip output are cleared. When it is automatic, there is no need for manual reset operation after the overload protection action. When the heat capacity drops below the reset heat capacity, the overload fault indication and fault trip output are automatically cleared (other protection trips are not affected by this function), and the motor is allowed to be started again.

Protection action characteristics: during the motor operation, if the current is ≥ 1.2 times Ie, the overload protection will act according to the selected protection curve.

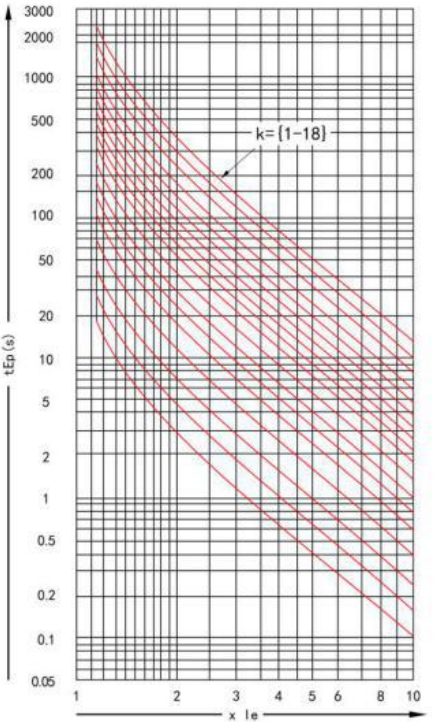


Fig. 8-1 characteristic curve of overload protection

9.5 tE time protection

The time protection function of tE takes into account the ratio of locked rotor current to nominal current of the motor and the maximum allowable motor temperature of the corresponding environmental class.

When the time protection function of tE is turned on, the overload protection function will be turned off automatically. The time protection function of tE conforms to the relevant provisions of gb3836.3-2010 standard. It is suitable for continuous operation, including easy starting and infrequent starting without obvious additional temperature rise. The increased safety explosion-proof motor (such as YA, YA2 series, etc.) with inverse time overload protection device is allowed, which is not suitable for the motor with difficult starting or frequent starting. TE time protection fault must be reset manually.

The te time protection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	0.1~100.0%	50%
Trip value	1.0-15.0s	4.8s

This protection function will provide tE time protection for the motor according to the following curve. The trip setting is the tE time, and the alarm setting is the percentage of tE time.

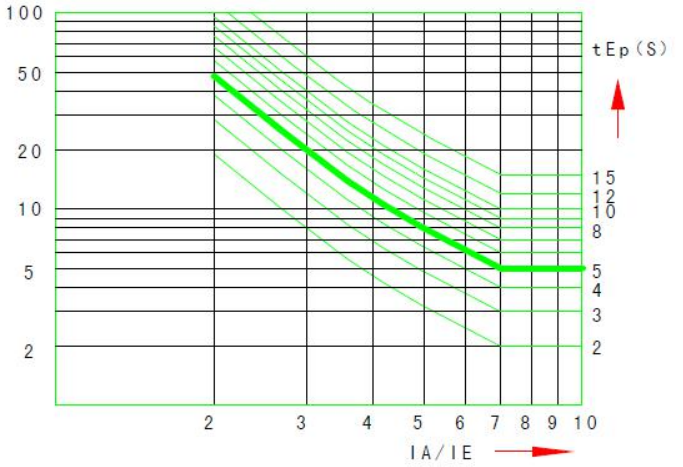


Fig. 8-2 tE protection characteristic curve

Among

① is figure 3 of 5.1.4.3 in GB3836.3-2010 standard.

② time protection action curve of the product.

「Note」:

1. In the actual system, the exit time of the protection also needs to consider the fixed action delay of the relay and the fixed delay of the external mechanical structure.
2. When the series of products are put into time protection, the rated current Ie of the controlled (protected) motor shall not exceed the maximum current value required by its specification and model.
3. When the series of products are put into tE time protection, the set value of action time shall not be greater than 1.7 times of the tE time of the controlled (protected) motor (subject to the actual motor nameplate data)。

9.6 Over current locked rotor protection

The over-current locked rotor protection is a special protection of the motor, which is suitable for the protection of the transmission device, pump, fan, cutting machine and compressor, etc. due to the overload or the mechanical reasons of itself, the motor shaft is stuck (commonly known as "holding brake") and other fault current is very large. The overcurrent and locked rotor protection can be closed; if the protection is opened by the user, it will not be put into operation during the starting process, and will be put into operation automatically after entering the operation process.

The overcurrent and locked rotor protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Trip
Alarm value	100.0%Ie ~ 800.0%Ie	300.0%Ie
Trip value	100.0%Ie ~ 800.0%Ie	300.0%Ie
Time value	0.5s ~ 60.0s	3s

The setting value of locked rotor current shall be based on the maximum allowable locked rotor current provided by the motor manufacturer, which can be set as half of the allowable locked rotor current, generally 1.5-2.5ie.

For the delay time of locked rotor, refer to the setting of the allowable locked rotor time of the motor. Generally, the setting is 0.9 times of the allowable locked rotor time.

Protection action characteristics: during the operation of the motor, when the three-phase maximum current ≥ the set value and reaches the set time, the protection action.

9.7 Open-phase protection

Open-phase protection is very harmful to the motor. In actual operation, the customer can consider putting the protection into operation.

The open-phase protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip	Trip
Delay time	0.10s ~ 120.0s，	4.0s

Protection action characteristics: during the startup or operation of the device, if the controller detects that the phase break occurs and reaches the set time, the open-phase protection action。

9.8 Current unbalance protection

Unbalanced three-phase supply current is also a main cause of motor thermal damage. The unbalanced protection can be turned off. If the protection is turned on by the user, it will be put into operation during the starting process.

The current unbalance protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	20% ~ 60%	40%
Trip value	20% ~ 60%	40%
Time value	0.5s ~ 120.0s	5.0s

Because the data of motor is less, the standard of setting unbalance is based on experience. For a known equilibrium situation, 40% of the starting value is recommended as a starting point, and the starting value can be lowered until it is higher than the level that will generate frequent trips. For a motor with light load, a large unbalanced current will not cause damage to the motor. In this case, the starting value can be increased or a longer delay time can be set.

The calculation formula of unbalance rate is as follows：

$$\mathrm{Im}ax - \mathrm{Im}in \Big/ \max(Iav, Ie) \times 100\%$$

Among Imax: Maximum three-phase current.

Imin: minimum three phase current.

The denominator of the formula takes the maximum value of the average current and rated current of the current motor as the denominator.

Protection action characteristics: during the startup or operation of the device, if the three-phase current unbalance rate is ≥ the set value of the unbalance rate and reaches the set time, the device acts on the protection output.

9.9 Short circuit protection

Motor short circuit protection is set for motor inter phase short circuit and motor winding inter turn short circuit. Short circuit protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Trip
Alarm value	400% ~ 1000%Ie	600.0%Ie
Trip value	400% ~ 1000%Ie	600.0%Ie
Time value	0.0s ~ 30.0s	0.5s

Protection action characteristics: during the operation of the device, if the current of any phase ≥ the setting value and reaches the setting time, the device drives the shunt release of the circuit breaker to act and disconnect the AC contactor after a delay of 200ms.

9.10 Ground-fault protection

The ground-fault protection is used to protect the short circuit fault of the phase line to the metal shell of the motor. The ground-fault protection can be closed. If the protection is opened by the user, it will be put into operation during the starting process.

The ground-fault protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	20.0%～800.0%Ie	100.0%Ie
Trip value	20.0%～800.0%Ie	100.0%Ie
Time value	0.0s～60.0s	2s
Trip value	Contactor / circuit breaker	Circuit breaker

The magnitude of the ground fault current depends on the position of the fault point on the motor coil. It is hoped to set a low ground fault action value to protect as many stator coils as possible and prevent the motor shell from becoming dangerous due to electrification.

In the direct grounding system, the delay time should be set as short as possible to avoid system damage; in the grounding system through resistance, the grounding current value is limited to a safer range, and a longer delay time of several seconds can be selected.

Protection action characteristics:

When the tripping setting is configured as a circuit breaker, if the grounding current is ≥ the setting value and the time delay reaches the time setting value, the protective action drives the shunt release of the circuit breaker, and the contactor will trip with a delay of 200m.

When the tripping setting is configured as a contactor, if the grounding current is ≥ the setting value and reaches the delay of the time setting value, the product judges that the grounding current of the motor is ≥ the maximum breaking current of the

contactor, the protective action drives the shunt tripper of the breaker, and the contactor trips with a delay of 200m. On the contrary, the product judges that the grounding current of the motor is less than the maximum breaking current of the contactor, and the protection directly trips the contactor.

9.11 Leakage protection

The leakage protection function provides more accurate ground fault detection, which is mainly used to ensure personal safety. The current signal of leakage protection is taken from external leakage transformer.

The leakage protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	50～1000mA	200mA
Trip value	50～1000mA	200mA
Time value	0.0s～60.0s	2.0s

When the fault current is greater than the allowable breaking current of the set contactor, the controller outputs a signal to drive the shunt tripper of the circuit breaker through the overflow fault relay to disconnect the motor circuit.

Protection action characteristics: during the startup or operation of the device, if the leakage current is ≥ the setting value and reaches the setting delay, the device acts on the protection output.

「Note」：

In any application where the short-circuit current is higher than the allowable breaking current of the contactor, a fuse or circuit breaker must be used to cut off the short-circuit current to prevent damage to the contactor and expand the fault.

9.12 Under load protection

Motor under load generally does not need protection, but for the load situation may appear abnormal mutation, such as the sudden fracture of the pipeline conveyor belt and other occasions need to put under load protection.

Under load protection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip	Exit
Alarm value	20.0 ~ 100.0%Ie	50.0%Ie
Trip value	20.0 ~ 100.0%Ie	50.0%Ie
Time value	0.5s ~ 1200.0s	5.0s

For water pump, pipeline conveyor and other equipment, lower action setting value can be set, such as 60% Ie. Generally, the execution mode of under load protection can be set as alarm to remind the staff.

Protection action characteristics: during the operation of the motor, if the average value of three-phase current is less than or equal to the set value and reaches the set delay, the device acts on the protection output.

9.13 External fault protection

The external fault protection is connected through the switch value input contact. When there is an external fault, the controller will give an alarm signal or stop the motor no matter the motor is in the ready or running state; the motor can be restarted only after the external fault is reset and cleared.

The external fault protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip	Exit
Delay time	0. ~ 600.0s	0.1s

9.14 Overvoltage protection

The over-voltage protection function can protect the over-voltage fault in the primary circuit of the motor.

The overvoltage protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	105.0 ~ 150.0%Ue	110.0%Ue
Trip value	105.0 ~ 150.0%Ue	110.0%Ue
Delay time	0.1s ~ 300.0s	5.0s

In general, the motor can work continuously under 1.2 times of Ue, and the setting value can be set to 120% Ue or higher.

Protection action characteristics: during operation, if any phase line voltage ≥ the set value to the end of the delay time, the controller acts on the protection output.

9.15 Undervoltage protection

Too low voltage will cause the motor speed to decrease and stop running. The undervoltage protection function can protect the undervoltage fault in the primary circuit of the motor. The TV disconnection protection is put into blocking undervoltage protection.

The undervoltage protection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Undervoltage	Exit
Alarm value	45.0 ~ 95.0%Ue	80.0%Ue
Trip value	45.0 ~ 95.0%Ue	80.0%Ue
Delay time	0.5s ~ 60.0s	5.0s

In general, when the voltage of the motor is reduced to below 70%, the speed of the motor will be unstable and the heat will rise rapidly. You can set the action setting

value to about 70%, or adjust it according to the load.

Protection action characteristics: during operation, if the voltage of any phase line is less than or equal to the set value until the end of the delay time, the controller acts on the protection output.

9.16 Under power protection

When the motor runs under load, because of the low power factor, the current of the motor may not be very small. The under power protection function will implement better under load protection for the motor.

Under power protection parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	20.0～95.0%Pe	50.0%Pe
Trip value	20.0～95.0%Pe	50.0%Pe
Delay time	1.0s～1200.0s	5.0s

Protection action characteristics: in the operation process, if the total power of three-phase is less than or equal to the setting value until the end of the delay time, the controller acts on the protection output.

9.17 Phase-sequence protection

The phase sequence error may cause the motor to reverse, and the phase-sequence protection function prevents the motor from starting under the condition of the phase sequence error.

The phase-sequence protection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip	Exit

9.18 TV disconnection protection

After TV disconnection, the voltage signal received by the controller is abnormal, which leads to the abnormal control of the motor.

The voltage disconnection protection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Alarm	Exit

9.19 Wiring check

If wiring check is allowed, the external contactor status will be checked after the controller is powered on. If there is any fault, the alarm relay will be output. Refer to Chapter 11 for details. Turn off wiring check in protection mode.

The factory default wiring check is off.

Wiring inspection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Input	Exit

9.20 Overflow protection

When the fault current is greater than the allowable breaking current of the contactor, the controller outputs an opening signal through the overflow fault relay to control the tripping of the circuit breaker, so as to prevent the contact of the contactor from being damaged by the tripping of the contactor. Overflow fault requires to configure the outlet of overflow fault relay, otherwise it is invalid.

The overflow protection parameters to be set include:

Parameter	Range	Default
Mode of execution	Exit / Input	Exit

「Note」: Overflow fault in control circuit breaker mode and star angle start two relay mode, star angle start three relay open-loop mode, star angle start three relay close mode, auto coupling start two relay mode, auto coupling start three relay

open-loop mode, auto coupling start three relay close mode is invalid.

9.21 Negative sequence current section I protection

When the three-phase current is unbalanced, the negative sequence current will be generated. When the negative sequence current reaches a certain degree, if the protection is put into operation, the protection action will be generated. The negative sequence current section I and II protection are relatively independent.

Parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	10.0～800.0%Ie	40.0%Ie
Trip value	10.0～800.0%Ie	40.0%Ie
Delay time	1.0s～60.0s	10.0s

9.22 Negative sequence current II protection

When the three-phase current is unbalanced, the negative sequence current will be generated. When the negative sequence current reaches a certain degree, if the protection is put into operation, the protection action will be generated. The negative sequence current section I and II protection are relatively independent.

Parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip / Total	Exit
Alarm value	10.0～800.0%Ie	80.0%Ie
Trip value	10.0～800.0%Ie	80.0%Ie
Delay time	1.0s～60.0s	10.0s

9.23 Voltage unbalance protection

The voltage unbalance protection prevents the motor from overheating due to the unbalanced voltage of the system.

In the process of starting and running the motor, the controller calculates the three-phase voltage unbalance degree of the motor. When the voltage unbalance degree is detected to be greater than the fixed value, the voltage unbalance protection starts and executes according to the timing limit mode.

Parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Alarm / Trip	Exit
Alarm value	20.0～60.0%	40.0%
Trip value	20.0～60.0%	40.0%
Delay time	1.0s～1200.0s	5.0s

Protection action characteristics: in the operation process, if the voltage imbalance is greater than the set value until the end of the delay time, the controller acts on the protection output. The voltage unbalance rate Ivur is calculated as follows:

1 calculated by Ivur formula: Ivur = ((Umax Umin) / Umax) * 100%

Where Umax and UMIN are the maximum and minimum values of the three-phase line voltages of VAB, VBC and VCA respectively.

9.24 Contactor fault protection

Contactor fault protection is provided to protect the motor from more serious damage if the device refuses to operate in case of protection trip due to detection of contactor circuit fault.

Parameters to be set include：

Parameter	Range	Default
Mode of execution	Exit / Input	Exit

When any fault of the motor trips, after the product sends out the tripping contactor command, if there is no action and there is still current at the auxiliary point, the delay time is 200ms, which acts on the shunt release and signal relay to maintain.

Chapter 10 Control Parameter Setting

10.1 Undervoltage restart

For the motor circuit of continuous operation, in case of short-term power loss of the system, in order to recover the process flow as soon as possible, the motor needs to restart automatically when the power supply is restored.

The restart function provides the automatic restart function of the motor when the system loses power for a short time, and has two restart functions: "immediate restart" and "delayed restart". The two restart functions can be enabled or disabled respectively. Immediate restart has the function of anti-shaking.

Parameters to be set：

Parameter	Range	Default
Immediate restart setting	Exit / Input	Exit
Delay restart setting	Exit / Input	Exit
Recovery voltage setting	70.0%~95.0%Ue	85%Ue
Drop voltage setting	50.0%~90.0%Ue	75%Ue
Immediate restart and power loss time	0.1~1.0s	0.5s
Delay restart power loss time	2.0~300.0s	10.0s
Delay restart delay time	0.1~300.0s	5.0s

When the motor is in the running state, for the three-phase three wire power supply system, the timing starts when it is judged that the voltage of one of the lines drops to the drop voltage. If it is a three-phase four wire power supply system, the equipment is connected to the neutral line, and is equipped with a single-phase flicker function, it is judged that when the minimum one phase voltage of the three-phase voltage loses power or falls below the set drop voltage, the protector starts timing.

If the main circuit voltage recovers to "recovery voltage" within the "immediate restart and power loss time", the protector will immediately issue a start command, restart the motor, and the device will no longer judge the "delayed restart" logic

judgment.

If the "immediate restart" fails, (i.e. quitting the "immediate restart" or putting the "immediate restart" into operation, but the voltage does not recover to the "recovery voltage" within the "time of immediate restart and power loss"), but recovers to the "recovery voltage" within the "time of delayed restart and power loss". Then the protector sends out the start command after the set "delay restart delay time" to restart the motor.

Note：

1. The motor can be started in batches by setting different "delay restart delay time".

2. The set value of recovery voltage shall be greater than the set value of drop voltage.

10.2 Self-starting

Self-starting function is also called power on restart function.

After the function is put into operation, during the process of power on or voltage drop recovery of the controller, the controller can realize the restart after the voltage recovery (the voltage recovery value refers to the recovery voltage setting in the voltage loss restart).

Parameters to be set：

Parameter	Range	Default
Self-starting input / exit	Exit / Input	Exit
Self-starting mode	Memory mode / start mode	Memory mode
Self-starting delay time	0.1~300.0s	60.0s

If the system self-starting input / exit is set to " input" and the start mode is "memory mode", the controller will judge whether it needs to restart according to the state before power failure. If it is in operation state before power failure, the restart command will be sent after "self-starting delay time" after power on. If the motor is in other states before power failure, the restart command will not be sent. If the system self-starting input / exit is "exit", the function exits.

If the system self-starting input / exit is "on" and the start mode is "start mode", when the voltage recovery is detected after power on, the device will automatically send the restart command after "self-starting delay time". If the system self-starting input / exit is "exit", the function exits。

Note :If the undervoltage restart function is put into use, the self starting function is invalid.

Chapter 11 System Parameter Setting

11.1 Communication settings

Address setting range: 1～247（Modbus-RTU）.

1～123（Profibus-DP）.

Baud rate setting range：4800, 9600, 19200, 38400. The factory default baud rate is 9600.

11.2 Time settings

Setting range：2001-2099 年.

11.3 Language settings

Setting range：0 Chinese.

1 English.

11.4 Clear record

The clearing records include: Power clearing, Event clearing and Statistical clearing.

Chapter 12 Switch input and relay output configuration

12.1 Protection mode

Terminal coding	Signal input	Usage notes	Relay output	Usage notes
25	DI1	Universal DI1	DO1	Motor trip signal output
26	DI2	Universal DI2		
27	DI3	Universal DI3	DO2	Starting A (under voltage restart or self-starting only)
28	DI4	Universal DI4		
29	DI5	Local / remote	DO3	Overflow (including grounding) protection signal output
30	DI6	Contactor 1 Status		
31	DI7	Breaker status	DO4	Motor fault signal output
32	DI8	External fault 1	DO5	PMAC811-A has this node, which is defined as the output of power swing operation signal

12.2 Direct start mode

Terminal coding	Signal input	Usage notes	Relay output	Usage notes
25	DI1	Forward start	DO1	Motor trip and stop output
26	DI2	Universal DI2		
27	DI3	Stop	DO2	Starting A
28	DI4	Universal DI4		

29	DI5	Local / remote	DO3	Overflow (including grounding) protection signal output
30	DI6	Contactor 1 Status		
31	DI7	Breaker status	DO4	Motor fault signal output
32	DI8	External fault 1	DO5	PMAC811-A has this node, which is defined as the output of power swing operation signal

12.3 Bidirectional reversible start mode

Terminal coding	Signal input	Usage notes	Relay output	Usage notes
25	DI1	Forward start	DO1	Motor trip and stop output
26	DI2	Reverse start		
27	DI3	Stop	DO2	Starting A
28	DI4	Contactor 2 Status		
29	DI5	Local / remote	DO3	Starting B
30	DI6	Contactor 1 Status		
31	DI7	Breaker status	DO4	Motor fault signal output
32	DI8	External fault 1	DO5	PMAC811-A has this node, which is defined as the output of power swing operation signal

12.4 Control breaker mode

Terminal coding	Signal input	Usage notes	Relay output	Usage notes
25	DI1	Forward start	DO1	Space
26	DI2	Universal DI2		
27	DI3	Stop	DO2	Starting A
28	DI4	Reset		
29	DI5	Local / remote	DO3	Stop and overflow protection output
30	DI6	Universal DI6		
31	DI7	Breaker status	DO4	Motor fault signal output
32	DI8	Universal DI8	DO5	PMAC811-A has this spare node output

12.5 Star / delta 2R start and autotransformer start modes

Terminal coding	Signal input	Usage notes	Relay output	Usage notes
25	DI1	Starting signal	DO1	Self-diagnosis fault output
26	DI2	Universal DI2		
27	DI3	Stop	DO2	Starting A
28	DI4	Contactor 2 Status		
29	DI5	Local / remote	DO3	Starting B
30	DI6	Contactor 1 Status		

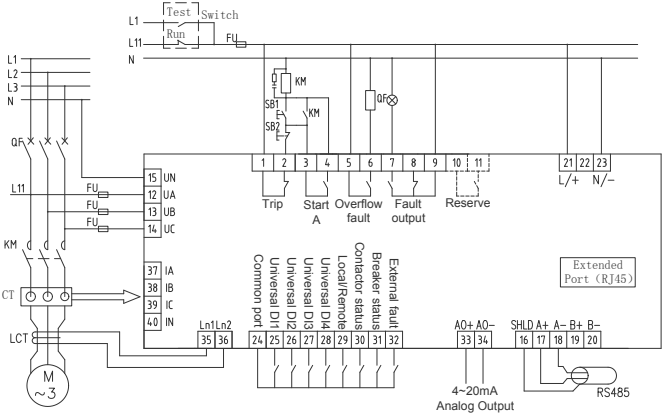
31	DI7	Breaker status	DO4	Motor fault signal output
32	DI8	External fault	DO5	PMAC811-A has this node, which is defined as the output of power swing operation signal

12.6 Three relay modes of star / delta start and autotransformer start

Terminal coding	Signal input	Usage notes	Relay output	Usage notes
25	DI1	Starting signal	DO1	Motor fault signal output
26	DI2	Universal DI2		
27	DI3	Stop	DO2	Starting A
28	DI4	Contactor 2 Status		
29	DI5	Local / remote	DO3	Starting B
30	DI6	Contactor 1 Status		
31	DI7	Breaker status	DO4	Starting C
32	DI8	External fault	DO5	PMAC811-A has this node, which is defined as the output of power swing operation signal

Chapter 13 Typical operation mode wiring

13.1 Protection mode wiring

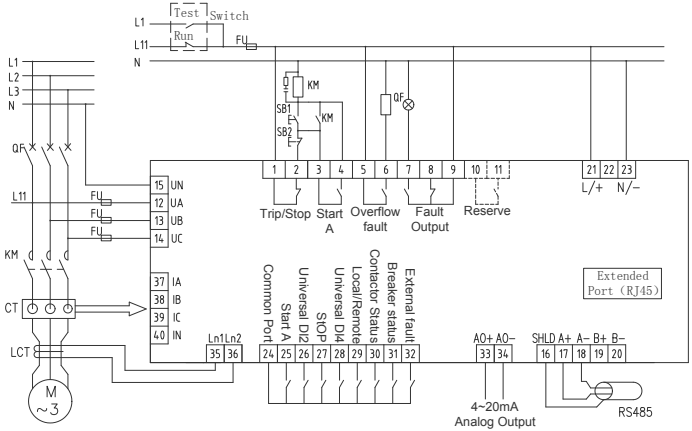


In the protection mode, the trip relay in the controller is in series in the coil circuit of the AC contactor km. When the protection trip occurs, the trip relay is disconnected, the coil of contactor km is de energized, contactor km is released, and the motor stops. After the fault trip, press the reset key to clear the fault indication, then the trip relay will automatically recover and enter the ready state, allowing the motor to start again.

「Note」:

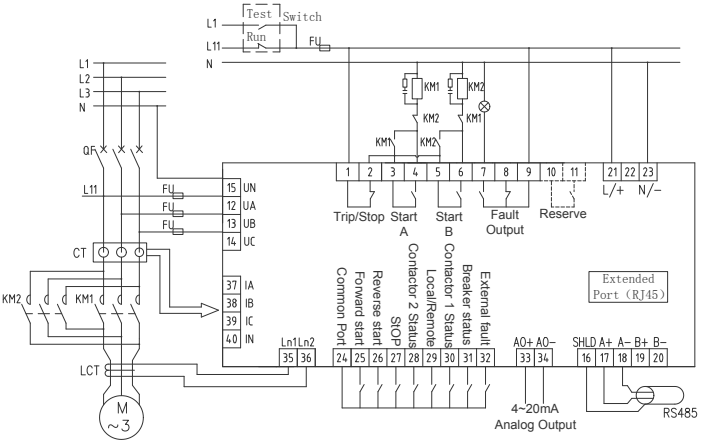
1. The resistance capacitance circuit connected at both ends of the contactor coil in the figure is surge suppressor, which can improve the service life of the controller contact.
2. Do not ground the secondary side output common terminal of CT module matched with protector in all schematic wiring diagrams.
3. In all schematic wiring diagrams, the spare relay output [10, 11] of the protector is PMAC811-A product model, and PMAC811-B / C product model does not have this node.
4. The above three items will not be noted in all the following schematic wiring diagrams.

13.2 Direct start mode wiring



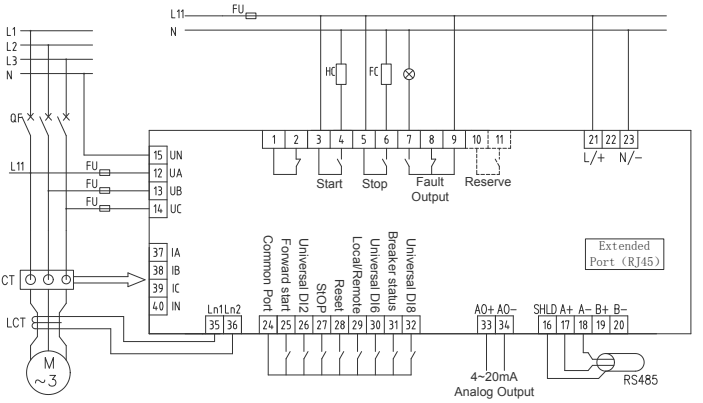
In the direct start mode, when the controller is powered on, if the wiring check is opened, first check whether the contactor KM is in the release state. If it is not in the release state, report "wiring error", and the fault relay is closed; if the wiring is correct, enter the ready state for starting. When the controller receives the start command, the start-up a relay will pull in to send out the start pulse, the contactor KM will be powered on to absorb and realize self-holding, the "start" light of the display module will be on during the start process; when the start is over, the "start" light of the display module will be off, and the "run" light will be on. When the controller receives the stop command or there is a protection trip action, the stop / trip relay is disconnected, the contactor km loses power and releases, and the motor stops; after stopping, if there is no fault, it will directly enter the ready state; if there is a fault, it needs to reset and clear the fault to enter the ready state, and then the motor can be started again。

13.3 Bidirectional reversible start mode wiring



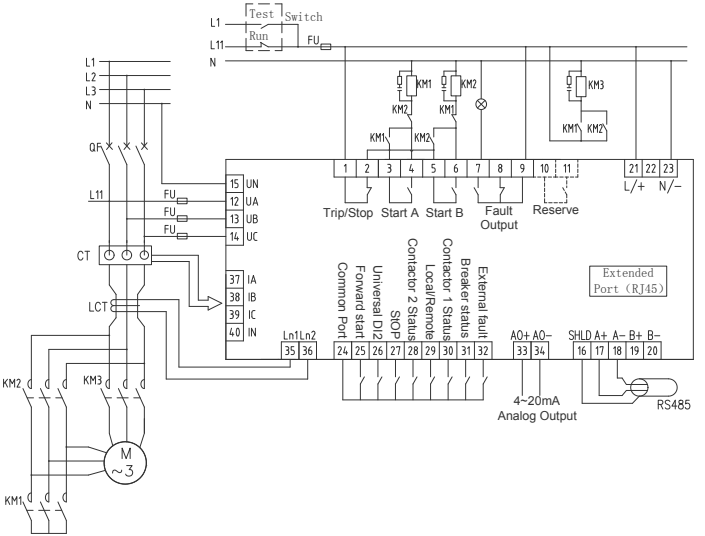
Under the bidirectional reversible starting mode, the wiring inspection is the same as the direct starting; when the controller receives the starting a (pulse) command and the starting a relay is closed, the contactor KM1 is powered on and self-maintained. During the starting process, the "start" light of the display module is on, indicating that the motor is in the forward starting process; after the starting, the "run" light of the display module is on. When the controller receives the stop command or a protection trip occurs, the stop / trip relay is disconnected, the contactor KM1 is released, and the motor stops. Press "start B", start the motor reversely, and start the B (pulse) relay to close, then the contactor KM2 will be electrified and absorbed to realize self-holding, and the "start" light of the display module will be on during starting; after starting, the "start" light will be off and the "run" light will be on. When the controller receives the stop command or there is a protection trip action, the stop / trip relay is disconnected, the contactor KM2 is released, and the motor stops; after the stop process, it enters the ready state. If the controller receives the start command which is opposite to the current running direction during the operation of the motor, it shall first perform the stop operation, wait for the two-step starting time, and then perform the starting process.

13.4 Control breaker mode wiring



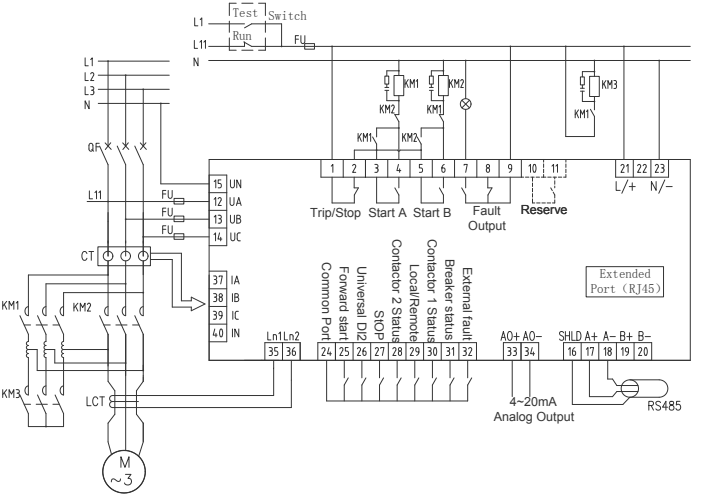
In the control circuit breaker mode, when the controller receives the start command, the output pulse of the start relay is used as the closing pulse of the circuit breaker, and the "start" light on the display panel is on during the start process; at the end of the start, the "start" light is off, and the "run" light is on. When the controller receives the stop command or there is a protection trip action, the stop / trip relay output pulse is used as the opening pulse of the circuit breaker, and the motor stops; after the stop process, it enters the ready state.

13.5 Star / delta start mode wiring



In star delta starting mode, when the controller receives the starting command and the starting a (pulse) relay is closed, the contactors KM1 and KM3 are powered on and closed, and the "start" light of the display module is on during starting, indicating that the motor is in Y starting process. When the set two-step starting time is up, the relay a is off and the relay B (pulse) is on, then the contactors KM1 and KM3 lose power and release, the contactors KM2 and KM3 are on and on, and automatically switch to the triangle operation state. After starting, the "start" light is off and the "run" light is on. When the controller receives the stop command or a protection trip occurs, relay B is disconnected, contactor KM2 and KM3 are released, and the motor stops; after the stop process, it enters the ready state.

13.6 Autotransformer Start mode wiring



The starting mode of autotransformer is the same as star delta starting mode logic.

Appendix A Basic Settings and FAQs

1. Basic settings

Before normal operation, please make the following system parameter settings:

(1) rated current of motor;

(2) if the controller is equipped with a special CT module and an external CT to measure the primary current of the motor, it is necessary to input the correct CT ratio;

(3) set appropriate breaking current of contactor, default setting is 8 times Ie;

(4) confirm the operation mode;

(5) confirm the operation authority;

(6) confirm whether the device address and communication baud rate are consistent with the upper computer;

Before normal operation, it is also necessary to set parameters for the protection functions to be used:

By default, only start-up time-out protection, start-up over-current protection, overload protection, over-current locked rotor protection, open phase protection and short-circuit protection are turned on. If it is necessary to turn on the protection other than these six protections, please set according to the action value and delay time range of each protection described in Chapter 8。

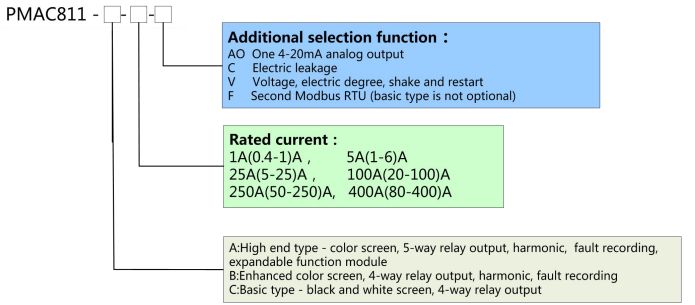
2. Handling of common problems

Possible problems	Possible reasons	Possible solutions
Equipment does not work normally after power on	Power failed to connect to device	Check whether the correct working voltage is applied to the L / + and N / - terminals of the equipment
The measured value is incorrect or does not meet the expectation	Incorrect voltage measurement	Check whether the measured voltage matches the rated parameters of the equipment
	Incorrect current measurement	Check whether the measured current matches the rated parameters of the equipment. Check whether the parameter setting of CT transformation ratio is correct.
	Incorrect power measurement	Check whether the phase sequence corresponding to voltage and current is correct. Check whether the current terminal with the same name is wrong.
The switch state does not change	Wiring error	Check whether the external wiring is correct
Relay does not operate	No control command received	Check if the communication link is correct
Relay mis-operation	Incorrect relay operation mode	Check that the current relay is in the correct mode
Upper computer cannot communicate with equipment	Incorrect device communication address	Check whether the device address is consistent with the definition
	Device communication baud rate incorrect	Check whether the baud rate of device communication is consistent with the definition

	The communication link is not connected to the terminal resistance	Check if 120 ohm resistance is added
	Communication link disturbed	Check whether the communication shield is well grounded
	Communication line interruption	Check if the communication cable is disconnected
The upper computer cannot start / stop the motor	Permission is not right.	Check whether the control permission is set correctly

Appendix B Ordering Information

Ordering information of controller body



「Note」：

1. One standard Modbus RTU communication, tE time protection and grounding protection (internal vector and algorithm).
2. The current of three-phase current transformer (1-400) A is direct connection type, with protection level of 5P10, and the transformer is matched by the company.
3. When the rated current of the motor is greater than 400A, the product adopts indirect access type, that is, the product provides 5A (1A) standard CT + * * A / 5A (* * A / 1A) transformer composition. For example, 500A / 5A, each motor is equipped with three current transformers.
4. Line length of three-phase current transformer: 1 m for 1A, 1.5 m for others.
5. If small current leakage protection is required, CT of leakage transformer shall be provided, with specification of 1A.
6. If you need PROFIBUS DP communication function (the product does not come with

PROFIBUS DP communication connector), increase the number of DI / DO, analog input and other functions, please give special instructions when ordering.

Example：

PMAC811-B-25A-AO, color display, 4 relay outputs, with harmonic and fault recording functions, transformer rated current 25A, standard configuration of 1 Modbus communication, 1 analog output of 4-20mA.

Order information of leakage transformer

PMAC503L-100	Suitable for motors with rated current of 10-100A
PMAC503L-250	Suitable for motors with rated current of 100-250A
PMAC503L-400	Suitable for motors with rated current of 250-400A

「Note」：

When the leakage function is selected, the leakage transformer shall be ordered according to the actual situation.

Statement：

- The information provided in this manual can be modified without prior notice.
- Zhuhai Pilot Technology Co., Ltd. reserves the right to interpret the information.

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