PMC-550J
Low-voltage Motor Protection and Control Device
User Manual

Ceiec Electric Technology

DANGER AND WARNING

This equipment can only be installed by professionals and the manufacturer will bear no responsibility for the failures caused by operations which do not conform to this manual.

Electric shock, Fire or Explosion

- Installation and maintenance of the meter should only be performed by the qualified persons.
- Before any operation on the equipment, voltage input and power supply should be isolated and the secondary windings of all the current transformers should be short-circuited.
- Please ensure that all incoming AC power and other power sources are turned OFF before any operation on the meter.
- All the mechanical components, doors and lids should be put in place before supplying power to the equipment.
- Please input rated voltage to the running equipment.

Failure to abide by the abovementioned instructions may result in severe injury

Default Password: 0000

The information contained in this manual is believed to be accurate at the time of publication; however, Ceiec Electric Technology Inc. assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please consult Ceiec Electric Technology Inc. or your local representative for the latest product specifications.

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1 Introduction

1.1 Overview

The PMC-550J is designed to meet the industrial users' needs of low-voltage motor protection, metering and control. The PMC-550J adopts the advanced network communication technology and cooperates with contactor, soft starter, breaker, etc., providing a professional solution for control, protection, metering and communication. So the PMC-550J is the ideal choice for intelligent MCC and can be widely used in manufacturing industries such as electric power, petrochemical, light industry, coal, paper, steel, metallurgy, etc..

Table 1.1 Function List of the Device

Function	Description
Protection	start overtime protection, thermal overload protection (inverse time), Jam protection, ground protection, phase loss protection, imbalance protection, under power protection, short protection, under voltage protection, over voltage protection, under load protection, tE time protection, overcurrent protection (definite time), interlock protection, LOP protection , phase reversal protection, emergency stop protection, contactor protection, residual I protection, loop abnormal protection.
Start control	Direct start control, Voltage reduced start control (Y-ΔStart control, resistance reduced voltage start, autotransformer voltage reduced start, series reactor voltage reduced start, soft start cooperation), Reversing start control, Two speed start control, Inverter aid start control, Big motor aid start control, against voltage fluctuation function, Restart control, Auto start control, Auto reversing start control.
Metering	3-phase current,3-phase current angle, zero-sequence current, current imbalance rate, 3-phase line voltage, 3-phase voltage angle, active power, reactive power, power factor, frequency, active energy, reactive energy, residual current, insulation resistance.
Maintenance	Run/trip/alarm indication, total running time, running time, stop time, start time, start current, start count, trip count, 3-phase trip current, DI/DO status, SOE logs with time stamp, alarm inquiry, Start report with time stamp.
Communication	MODBUS and Profibus.

1.2 Features

- It adopts metal housing, able to improve the interference resistance capacity and heat dissipation performance;
- Complete motor protection and control function;

- Interlink - when the protection is configured with the interlink output, if the protection acts, the interlink output will act, and the delay time of the interlink output can be set; auto return or manual return can be selected;
- “tE time protection” complies with national standard (GB3836.3-2000) and is applicable for the increased-safety anti-explosion motor;
- Able to judge scale of the fault current, correctly detect the over current failure between the maximum breaking current and air switch short circuit tripping current of the contactor, control the trip of the air switch so as to make the protection more reliable;
- With the against voltage fluctuation function, able to realize the under voltage/voltage loss restart of the motor without the use of UPS so as to ensure the continuity of the production process not affected by short voltage fluctuation;
- With the auto-restart function, in case of short power failure or power switching of the main circuit, able to achieve the various-time sequent start according to the set parameters;
- With programmable logic function, adopting graphical logic settings interface, more than 40 kinds of logic widgets can be selected to meet the demand of different control and protection logics;
- Measure all kinds of parameters, including three phase currents, zero-sequence current, residual current, voltage, power, energy and power factor;
- 4-20mA analog output, able to be proportional to various motor operation parameters;
- Complete control mode, inbuilt with direct start, reversing start control, Two speed control, Voltage reduced start control; Inverter aid start control; Big motor aid start control, etc.; with simple setup, able to achieve the logic conversion of different control functions with high flexibility and universality;
- Optional residual current sensor is used to measure the residual current of the motor circuit, and the insulation resistance is calculated, able to realize online monitoring of the insulation between the motor and the ground.
- Able to store the parameters and information of the latest 64 failures; failure logs with the time marking function and thus marked with the time specific to second of the occurrence of failures;
- Records 8 start report with time stamp, include start volt, start current, start time etc.
- Intuitive display and indication, easy operation, 128×64 large screen lattice LCD, intuitive display and indication of parameters, information and states;
- 5 relay output function; output able to be configured with different functions; separate “Start Control DO” and “Protection/Stop Control DO”;
- Standard 8 DIs configured, able to configure rich state and command signal functions;
- Standard RS-485 port supports standard MODBUS-RTU protocol, and the Modbus register table can be configured to improve the efficiency of communication; standard Profibus-DP port supports standard DPV0 protocol,DPV1 protocol and I&M function, and the Profibus register table can be configured;
- With more reasonable installation dimensions, able to be installed in various cabinets of drawers;

Apply to all kinds of installation modes, such as GCS, GCK, GHK168, MNS, GZT, etc., including 1/4 drawers;

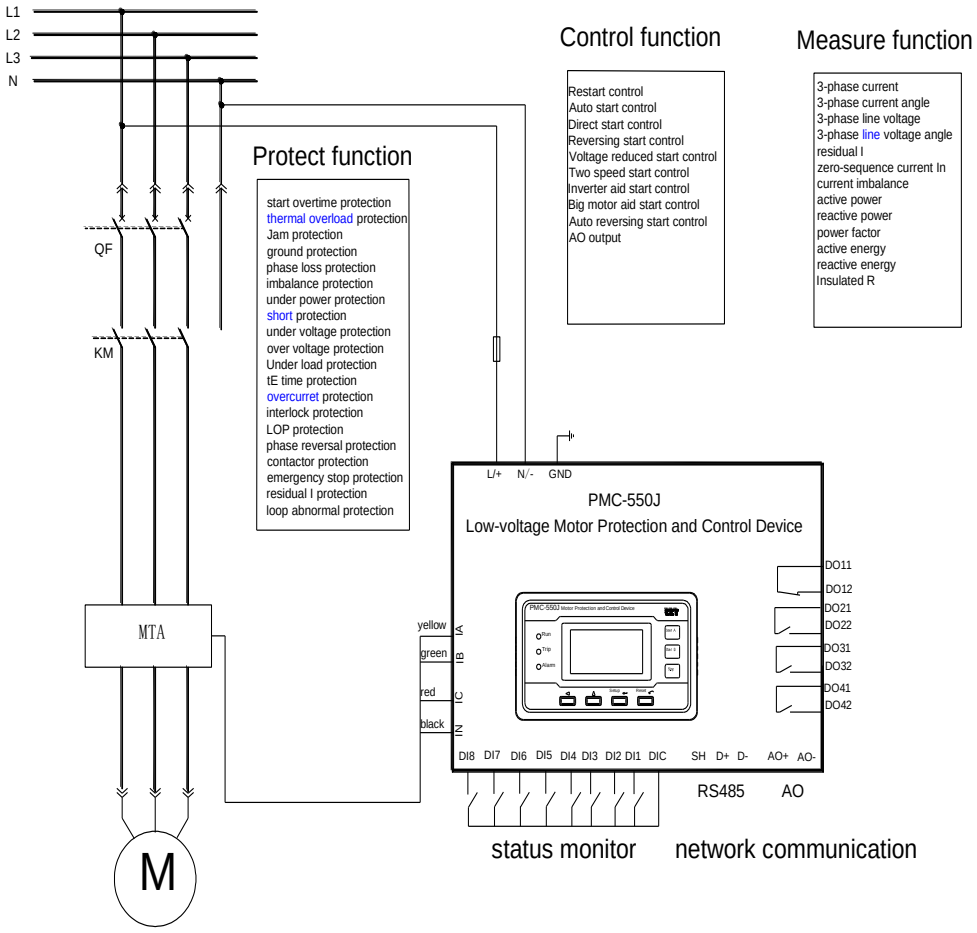


Figure 1.2 Schematic diagram

2 Technical Specification

2.1 Environmental Conditions

Operation temperature: -25℃~+55℃

Storage temperature: -25℃~+70℃

Humidity: 5%~95% (No condensing)

Altitude: 3000m (max)

Atmospheric pressure: 70 kPa~106 kPa

Ingress Protection: IP40

2.2 Rated Parameters

(1) Power supply

DC: 220V & 110V, -20%~+20%

AC: 220V, -20%~+20%

(2) AC inputs

Three phase currents loop (external three phase CT(MTA)):800A、400A、300A、200A、150A、100A、

75A、50A、25A、15A、10A、5A、1A

Zero-sequence current loop (external zero-sequence CT(MIN)): 5A、1A

Residual current loop (external residual CT(MIR)): 1A

AC voltage(line voltage):690V/380V

Frequency: 50Hz/60Hz

(3) Digital Input

Volts free dry contact, 24VDC internally wetted, debounce time is 20ms.

(4) Relay Output capacity

a) DO

Contact Form：Normally closed

Contact Rating：250V AC/24V DC, 8A (Uninterrupted Current)

Operate time：≤10ms

Release time：≤5ms

b) DO2

Contact Form：Normally open/Normally closed (optional)

Contact Rating：250V AC/24V DC, 5A (Uninterrupted Current)

Operate time：≤10ms

Release time：≤5ms

c) DO3~DO5

Contact Form：Normally open

Contact Rating：250V AC/30V DC, 5A (Uninterrupted Current)

Operate time：≤10ms

Release time：≤5ms

Note：The maximum control voltage of the DO is 250VAC, and the control voltage 380VAC is not supported.

(5) Analog output (AO)

Output range: (4~20)mA

Load capacity: 500Ω

(6) Power Consumption

AC voltage circuit: less than 0.75VA/phase (rated)

Device power supply circuit: less than 5W

(7) Overload capacity

AC current circuit:

2x rated current, continuous work

10x rated current for 10s

40x rated current for1s

AC voltage circuit:

1.2 x rated voltage, continuous work

1.4x rated voltage for10s

2.3 Measurement Accuracy

(1) Three Phase voltages :

380V Input 10V~456V (line voltage)

690V Input 10V~828V (line voltage)

(2) Three Phase Currents: (0.05~1.2) x rated current

Zero-sequence Current: (0.05~1.2) x rated current

Residual current:10mA~500mA

(3)Measurements Accuracy:

Three Phase Currents: ±1.0%

Three Phase voltages: ±0.5%

Active power: ±1.0%

Reactive power: ±1.0%

Power factor: ±2.0%

Active energy: ±2.0%

Reactive energy: ±2.0%

Residual current: ±2.0%

Zero-sequence Current: ±1.0%

Frequency: ±0.02Hz

AO: ±2.0%

2.4 Protection Accuracy

Action values:

- Current: ±50mA or ±3% of the pickup value
- Voltage: ±2V or ±3% of the pickup value

Time Delay:

- Definite time: 0s~3s (including 3s), ≤±60ms

  3s~99.9s,≤±2% of the time delay set by user
- Inverse time: 0s~3s (including 3s), ≤±100ms

  >3s, ≤±5% of calculated value

2.5 Electrical Insulation Performance

(1) Dielectric tests

Comply with GB/T 14598.3-2006; 2kV, 1min

(2) Insulation resistance

Comply with GB/T14598.3-2006; ≥100MΩ

(3) Impulse voltage

Comply with GB/T14598.3-2006; 1.2/50μs, 5kV

2.6 Mechanical Tests

(1) Vibration Test

Comply with GB/T11287-2000, Level I

(2) Shock Test

Comply with GB/T14537-1993, Level I

(3) Bump test

Comply with GB/T14537-1993, Level I

2.7 Electromagnetic Compatibility

(1) 1 MHz burst immunity tests

Comply with IEC 60255-22-1:2007, Level III

(2) Electrostatic discharge tests

Comply with IEC 60255-22-2:1996, Level IV

(3) Radiated electromagnetic field disturbance tests

Comply with IEC 60255-22-3:2000, 10V/m, Level III

(4) Electrical fast transient/burst immunity test

Comply with IEC 60255-22-4:2002, Level A

(5) Surge immunity test

Comply with IEC 60255-22-5:2005, Level IV

(6) Immunity to conducted disturbances, induced by radio-frequency fields

Comply with IEC 60255-22-6:2006, Level III

(7) Magnetic Fields Test

Comply with IEC 60255-22-7:2001, Level A

(8) Electromagnetic emission tests

Complies with GB/T14598.16-2002(IEC 60255-25: 2000)

3 Function

The controller judges and calculates various operating conditions and the data in the operating process of the motor, able to realize start overtime protection, thermal overload protection(inverse time), Jam protection, ground protection, phase loss protection, imbalance protection, under power protection, short protection, under voltage protection, over voltage protection, under load protection, tE time protection, overcurrent protection(over current), interlock protection, LOP protection, phase reversal protection, loop abnormal protection, emergency stop protection, residual I protection to ensure motor is running safely.

3.1 Protection Function

Every protection function may work in different state (start state or running state), the detail information are listed in the following table.

Table 3.1 Processing of Protections in start state and running state

Protection Function	Start State	Running State
Start overtime protection	√	--
Thermal overload protection	√	√
Jam protection	--	√
Ground protection	√	√
Phase loss protection	√	√
Imbalance protection	√	√
Under power protection	--	√
Short protection	√	√
Under voltage protection	--	√
Over voltage protection	--	√
Under load protection	--	√
tE time protection	--	√
Overcurrent protection	--	√
Interlock (DI)	√	√
LOP	--	√
Phase reversal protection	√	√
Contactor protection	√	√
Emergency stop alarm	√	√
Residual I protection	√	√
Loop abnormal protection	√	√
Restart	--	√

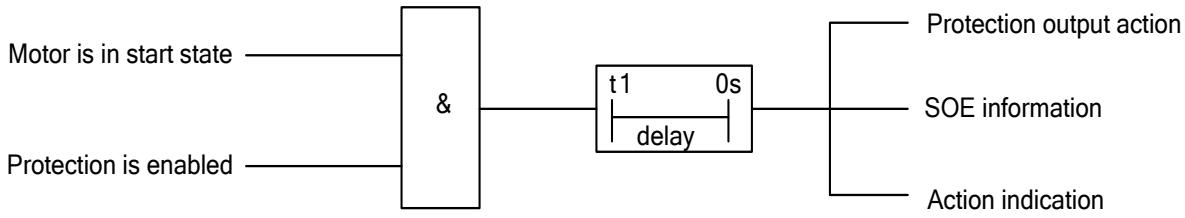
Note: "√" indicates that protection and control function is on, "--"indicates protection and control function is off.

3.1.1 Start overtime protection

When the current suddenly changes from 0 to 2Ie or above, the motor is starting. In such case, the device will record down the start time. After the motor starts, when all the three phase currents are less than 1.1x rated current, it can be determined that the motor start process end. If the motor does not complete the start within the start time, the protection will act.

In normal start process, the 3 phase current change suddenly from zero to the maximum start value, and then gradually decrease. After the start process completes, the current will be less than 1.1 x rated

current. Whether this protection is enabled or not, when the motor start process is over, the device will record start report, the maximum start current and the corresponding start time, and the number of starts (start count) will plus one. When this protection is enabled, and the motor doesn't start successfully in the start time, the protection will act as "trip", and the device will record the three phase tripping currents (Trip IA, Trip IB, Trip IC), and the number of tripping (Trip count) will plus one.



The logic diagram of start overtime protection

3.1.2 Thermal overload protection(inverse time)

The digital thermal element substitutes the conventional thermal element to realize the motor thermal overload protection; it has the feature of inverse time. The user may select proper protection curve to enhance the reliability of the protection.

The model of the digital thermal elements is as follows:

$$t = \frac{80 \times T_{ov}}{K1 \times \left(I / I_{ov}\right)^2 - 1.05^2}$$

t is the time delay of the protection, Tov is the time factor of the curve, Iov is the pickup value while I is the actual current detected by the device. In the process of cold state K1 equals 0.5, in the process of hot state K1 equals 1, the default cooling time is 4Tp, When the motor start from cold state and the start current is 7.2 times the rated current, the action time is Tp. For example: if you choose Iov = 1.0Ie, Tov = 1.0, the Tp = 3.22s.

This protection is designed with thermal overload early warning function. Prewarning pickup can be set as 1%~99% of the heat capacity of thermal overload protection action, when the heat capacity accumulated by the motor is greater than prewarning pickup of the heat capacity of the motor thermal overload protection action, the alarm prompt will be given and the remaining time T away from the protection action will be estimated based on the present current value. This early warning function can be enabled or disabled independently.

There are two heat loss modes–once and equation. When you choose the heat loss mode as equation, the device will calculate and display the cooling time, after the protection acts, the motor will be locked to not close in certain time; after the heat loss is over(heat capacity of the system is less than that of the cooling pickup), the lock will be released automatically, or the lock may be released at any time through

resetting manually. When the heat loss mode is once, after the protection acts, the motor can be started at once.

Reset mode of thermal overload protection can be set separately in thermal overload protection parameter settings menu. When reset mode is set as manual, output needs to be reset manually after the protection returns; when reset mode is set as automatic, output resets automatically after the protection returns.

Generally, Iov is set as 1.0 times the motor rated curren

t. You may set the corresponding Tov according to the data on the nameplate of the motor. For example, when 7.2 x rated current is specified on the motor nameplate and the allowable operating time is 8s, you may obtain the protection level of the motor = 10 and Tov can be 2 from the table below. **Refer to table 5.5.2 table of Characteristics Data of Thermal overload (Inverse Time) Protection.**

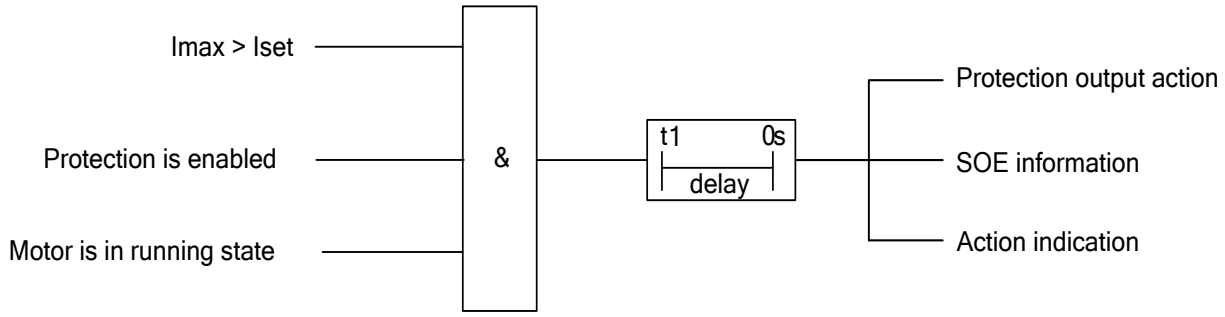
Table 3.2 Table for Fast Search of Time Factor of Low-voltage Motor Thermal Overload Protection

Time factor Tov	Protection level met	Overload multiple	1.05	1.2	1.5	7.2
1.5	10A	Trip time	Not act within 2h	Act within 2h	≤2min	2s<Tp≤10s
2	10				≤4min	4s<Tp≤10s
4	20				≤8min	6s<Tp≤20s
6	30				≤12min	9s<Tp≤30s

3.1.3 Jam protection

The Jam protection is specific to the motor. In the operating process of the motor, if the motor shaft is blocked (commonly called as “brake”) due to too big load or the reason of the device itself, the motor is allowed to operate for a short time according to different overload capacities; however, if the related trouble can’t be shut in time, the motor windings will be too hot thereby and its insulation performance will decrease so that the motor will be burned down. The Jam protection is only available when the motor is running; the Jam protection is different from the short protection, it is characterized by that the motor current rises rapidly based on the normal load current and the device will automatically identify and judge the abnormality after the Jam occurs. The protection may be set as trip, alarm or trip+ alarm.

The setup of the Jam protection current may be equal to half of the Jam current on the nameplate of the motor or 3.5 times the rated current (the Jam current of low-voltage motor generally is 7 times the rated current). The setup of the Jam protection time may refer to the allowable Jam time of the motor, and generally is 0.9 time the allowable Jam time.



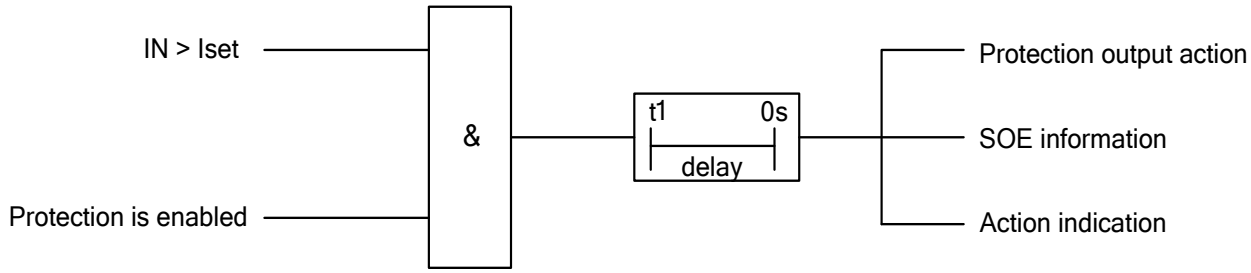
The logic diagram of jam protection

Imax is the maximum current among the three phases, Iset is the current set for Jam protection.

3.1.4 Ground protection

The ground protection provides protection for the motor ground faults. When the zero sequence current exceeds the pickup for the specified time, the protection will act.

The monitoring of the ground fault is carried out with the help of the PMC-MIN or based on a PMC-550J internal calculation of the ground fault current.



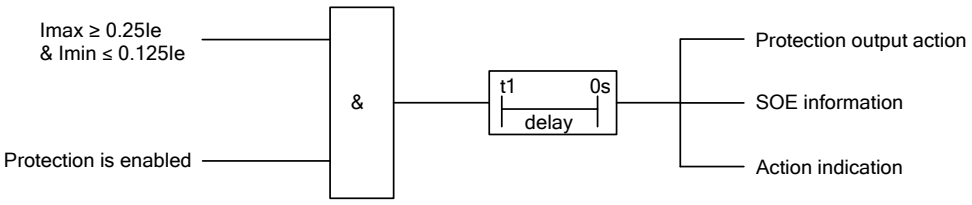
The logic diagram of ground protection

Iset: The current set for ground protection.

3.1.5 Phase loss protection

Approximately 1/3 of the low-voltage motor damages are caused by the operation with phase loss. When one phase of current of the motor is normal and another phase of current is very small or disappears, the phase loss protection will act. The protection may be set as trip, alarm or trip+ alarm.

Action conditions: Imax ≥0.25*Ie and Imin≤0.125Ie.



The logic diagram of phase loss protection

3.1.6 Imbalance protection

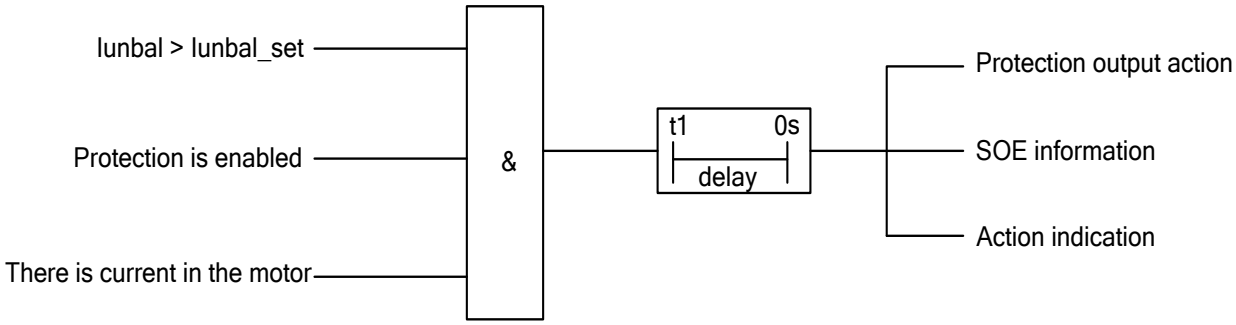
In case of large asymmetry among the 3 phase current, there will be a larger negative sequence current which generates 2 times power frequency current in the rotor, the additional heat for the rotor will increase greatly, endangering the safe operation of the motor.

When the difference between any phase of current exceeds the pickup for the specified time, the protection will act.

The calculation formula for the Imbalance is as follows:

$$\frac{\max[(I_{\max}-I_{av}),(I_{av}-I_{\min})]}{\max(I_{av},I_e)}\times 100\%$$

Imax: the max. current of 3 phases, Imin: the min. current of 3 phases , Iav: the average current of 3 phases , Ie: rated current.

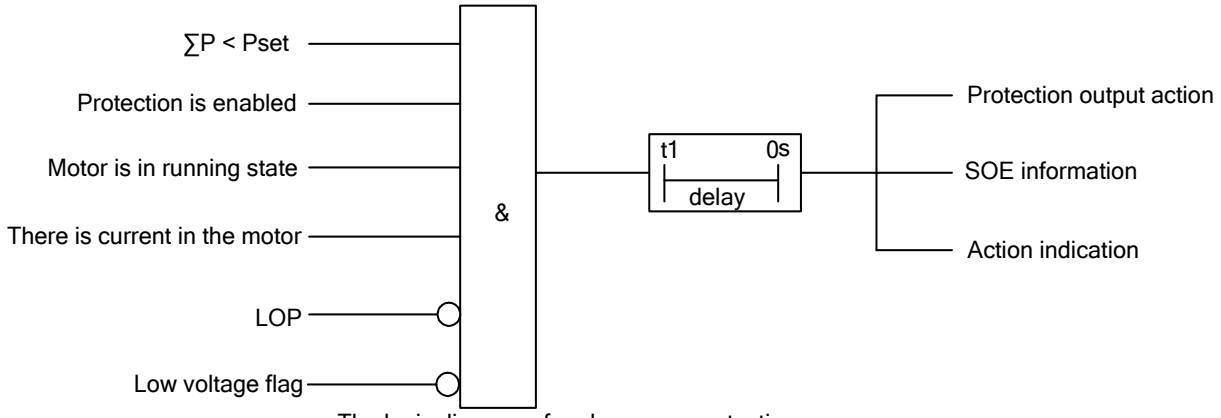


The logic diagram of imbalance protection

3.1.7 Under power protection

The dry running of the magnetic drive pump or the asynchronization between the internal magnetic rotor and external magnetic rotor etc will make the motor under light load and the currents decrease. In order to ensure the reliable running of the magnetic drive pump, the motor light-load monitoring device is required; when the running condition does not change, the motor under light load can automatically power off, stop and give the audible and visual alarm at the same time. The under power protection is designed for this purpose; when the motor load power is less than the under power pickup, the protection will act after the time delay is reached. The protection may be set as trip, alarm or trip+ alarm.

The under power protection is enabled only when the motor is in the running state; and this function will be locked in case of no current , low voltage or LOP. The threshold for low voltage lock is 0.6xUe(Ue is the rated line voltage); and the threshold of the device with current is 6%Ie as lower limit and 7%Ie as upper limit.



The logic diagram of under power protection

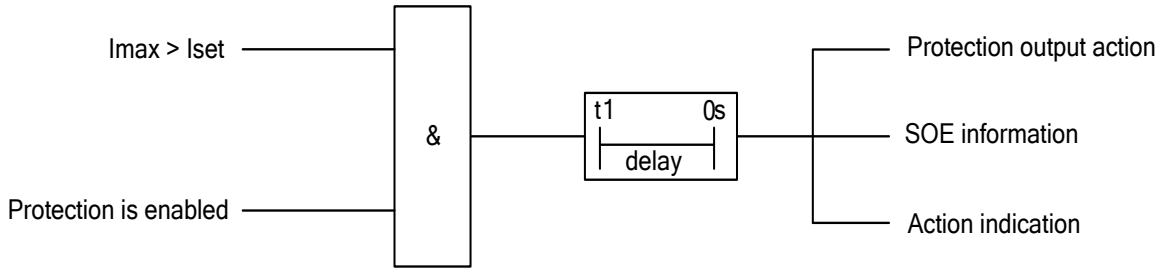
Note: When enabling this function, you must ensure that 3-phase voltage and current polarity is correct and that 3-phase current adopts positive sequence.

3.1.8 Short protection

The short protection is a protection function set in order to prevent serious result caused by the short circuit between the motor phases or windings. When any phase current among the three phases exceeds the pickup, the protection will act after the time delay is reached.

The short protection has the start multiples function. In start process, the pickup will automatically increase to the corresponding multiples. After the start completes, the pickup will automatically recover. The multiples can be set as 1.00~2.00 times the pickup. The protection may be set as trip, alarm or trip+ alarm.

In case of short circuit, large current will exist; therefore, it is necessary to consider the parameters of the contactor.

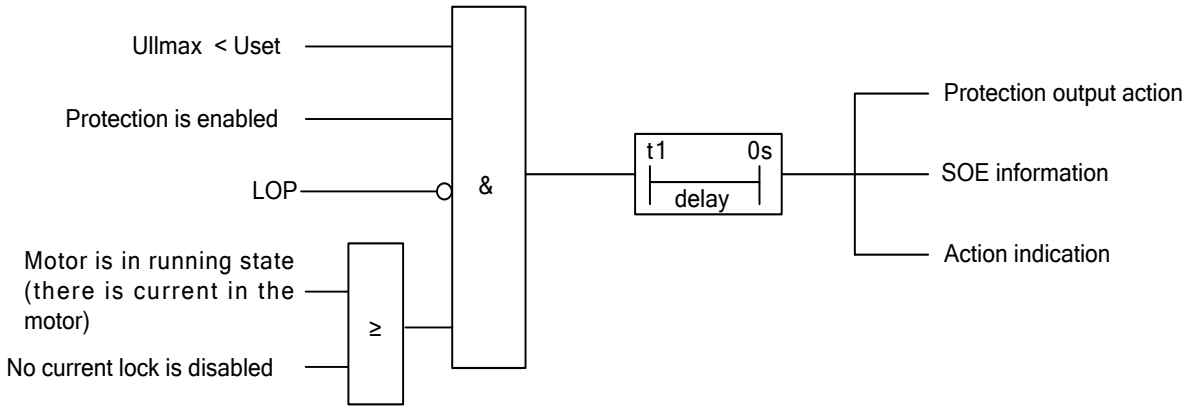


The logic diagram of short protection

Imax: the max. current of 3 phases, Iset : the current set for short protection.

3.1.9 Under voltage protection

When the power supply voltage of the motor decreases, the torque of the motor will decrease by multiples; after the voltage decreases to certain degree, the running of the motor will be affected. Therefore, in order to ensure the normal running of the major motors, some minor motors must be disconnected, so it is necessary to configure the under voltage protection. When all the line voltages of the three phases are less than the pickup and the time delay is reached, the protection will act. This device can be set with the no current lock function. When the no current lock function is enabled, if there is no current in the motor, then the under voltage protection will be locked. In case of LOP, under voltage protection will be locked.



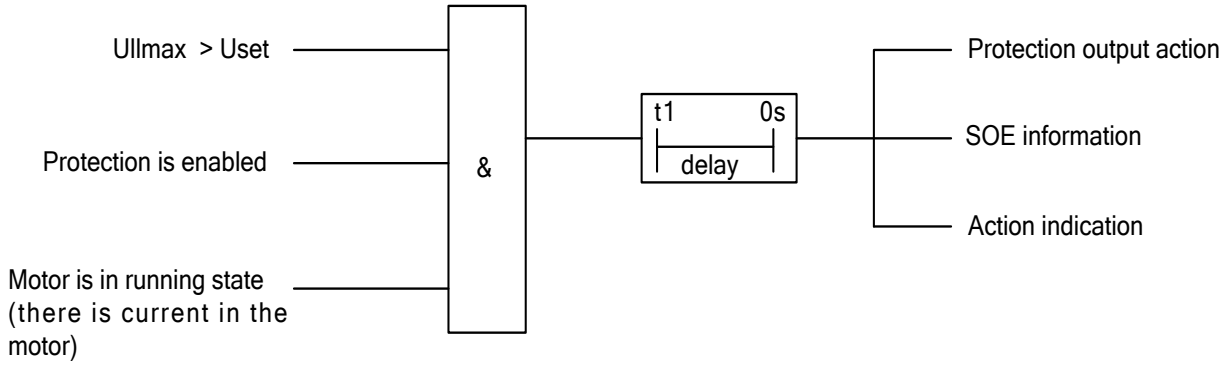
The logic diagram of under voltage protection

Ullmax: the max. line voltage of 3 phases, Uset: the voltage set for under voltage protection.

3.1.10 Over voltage protection

Over voltage may result in the lowered insulation performance of the motor. The device is set with the over voltage protection function, which will be enabled only when the motor in the running state.

When the voltage is greater than the pickup, the protection will act. The protection may be set as trip, alarm or trip+ alarm.



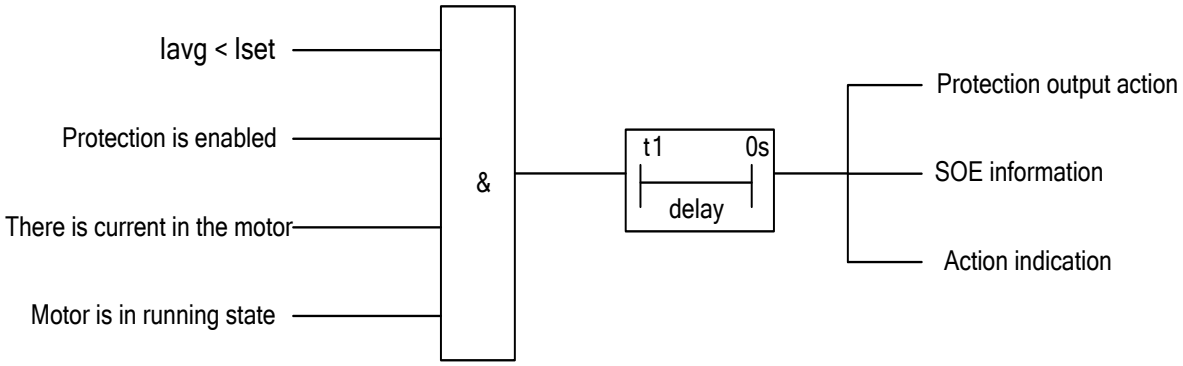
The logic diagram of over voltage protection

Ullmax: the max. line voltage of 3 phases, Uset: the voltage set for over voltage protection.

3.1.11 Under load protection

In the operation process of the motor, due to the change of process conditions or loads, sometimes, the motor may work in the state of light load or no load for long, but the other related devices do not allow it to do so. The under load protection is configured for such purpose. As the idle current of common motors is about 30% of the rated current, this protection can be set properly within the range of 10%~100%.

When Iavg of the three phase currents is less than the pickup, the protection will act after the time delay is reached.



The logic diagram of under load protection

Iavg: The average current; Iset: The current set for under load protection.

3.1.12 tE time protection

This protection is applicable for the increased-safety motor. tE time refers to the time from passing the initial start current Is (the max. current when rated voltage and rated frequency are input from the power supply line with the AC motor in static state) to the increase to the limit temperature after the AC winding reaches the stable temperature for rated operation at the maximum ambient temperature. tE time is provided by the motor manufacturer.

The tE protection is the over current protection of inverse time and will start from 1.2x rated current. The protection curve of 1.2Ie~2Ie adopts Formula (1), 2Ie~7Ie adopts Formula (2), above 7Ie adopts Formula (3):

$$t = \frac{16 \times Tp}{(Is/Ie)-1} \quad (1)$$

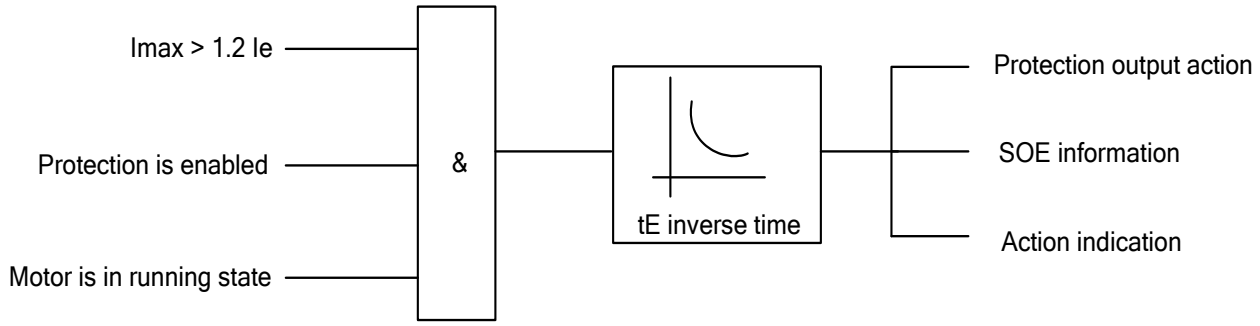
$$t = \frac{16 \times Tp}{(3 \times Is/Ie)-5} \quad (2)$$

$$\mathbf{t=Tp} \quad (3)$$

Tp is the tE time when the start current ratio is 7 and this pickup is set by the user within the scope of 0.1s~99.9s.

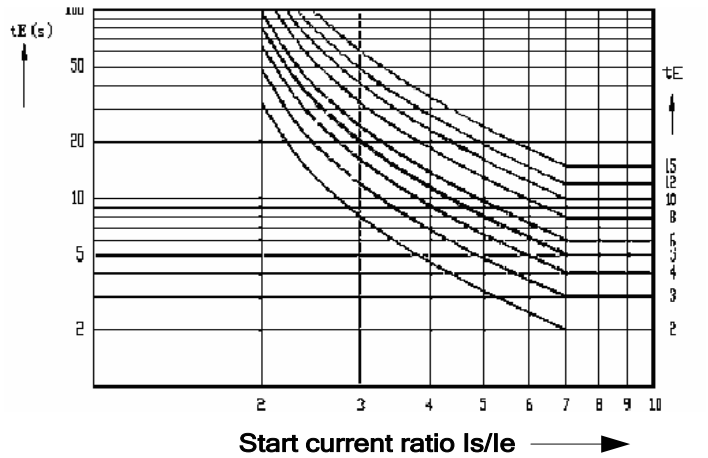
The action characteristic curve is as shown in the following **figure 3.1.3**. The user may choose a proper action curve according to the data provided by the motor manufacturer or on the motor nameplate.

This protection will be enabled only when the motor in the running state and the protection may be set as trip, alarm or trip + alarm.



The logic diagram of tE time protection

It is recommended to select the pickup of tE protection time: The increased-safety motor generally specifies the allowable Jam time of 7 times rated current, the pickup of Tp can be set to 85% of the allowable time. For example, if the allowable Jam time of 7 times rated current of an increased-safety motor is 6.0s, then Tp =5.1, **Refer to table 5.5.3 table of Characteristics Data of tE Inverse Time Protection.**



The current-time characteristic curve of tE time delay and Is/Ie

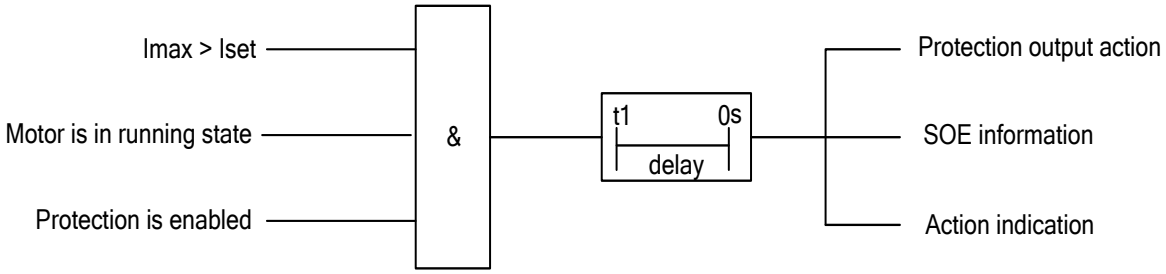
Figure 3.1.3 Time Characteristic Curve of tE Protection Action

3.1.13 Overcurrent protection

When the motor works out of ratings for long, it will cause thermal overload, its insulation will be reduced and thus it will be burnt.

The protection may be set as trip, alarm or trip+ alarm.

The allowable current for the motor generally is 1.8~2.5 times the rating. The pickup for overcurrent may be set according to the specific operation requirements on the site, generally 1.2 times the rating for alarm or 1.4 times the rating for output trip of the contactor.

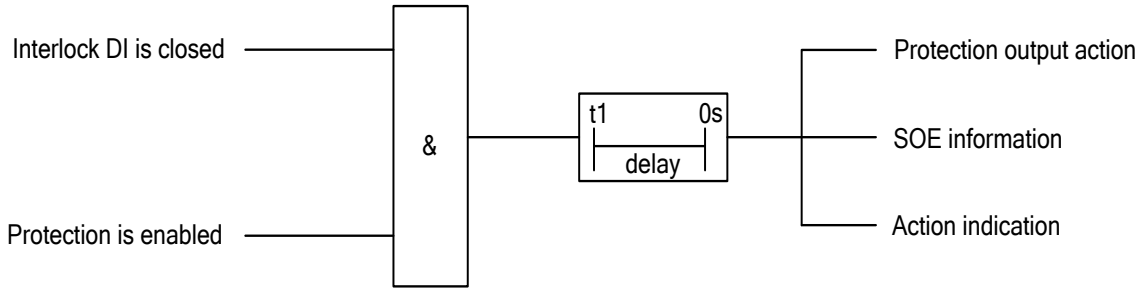


The logic diagram of overcurrent protection

Imax: the max. current of 3 phases, Iset : the current set for overcurrent protection.

3.1.14 Interlock protection

This protection is used for the process interlock protection. A pair of dry contacts provided by the user for PMC-550J is connected to interlock DI (it needs to be configured). The protection will act after the time delay is reached. The type of interlock DI can be set as normally open or normally closed according to the need. The protection may be set as trip, alarm or trip+ alarm.

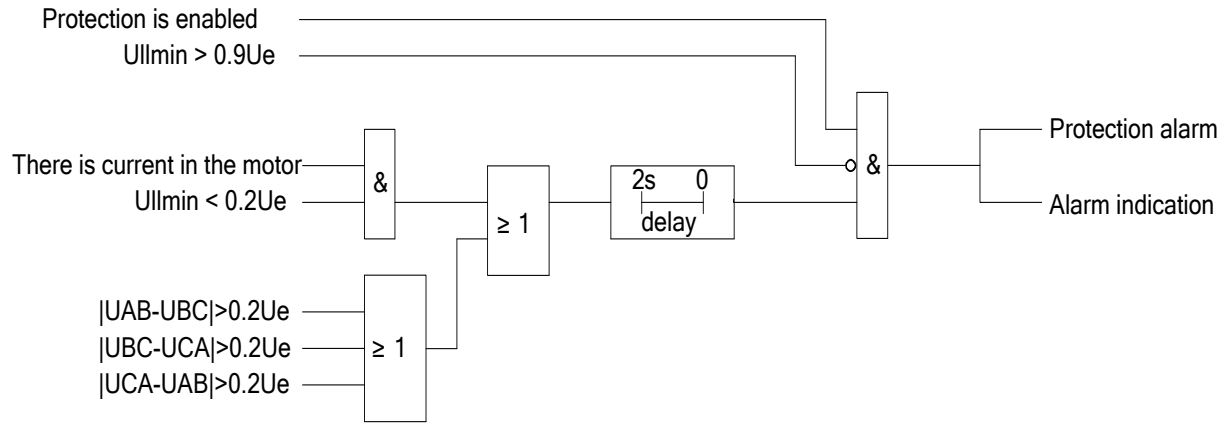


The logic diagram of interlock protection

Note: The logic diagram of interlock protection is typical, and DI type is set as normally open.

3.1.15 LOP protection

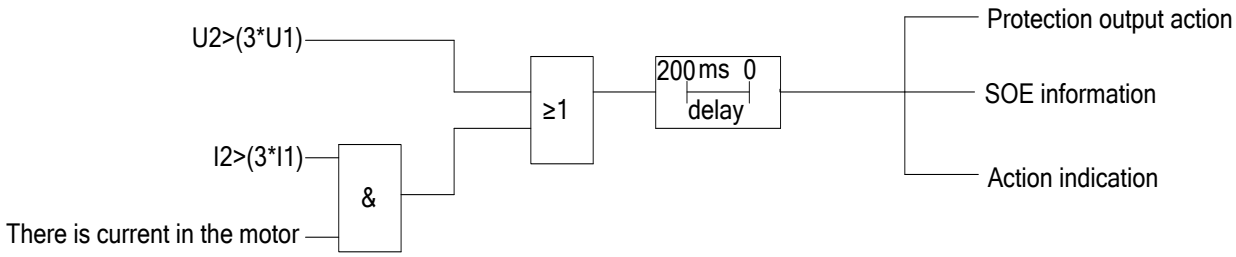
This protection is only available in the running state. When the voltage circuit has a disconnection, after 2s time delays, PMC-550J will give an alarm signal and alarm information to remind the user of conducting an inspection.



The logic diagram of LOP protection

3.1.16 Phase reversal protection

This protection is used to protect the safety of the motor when the controller detects that the phase sequence of the motor is wrong. When the controller detects that the phase sequence of the motor is wrong, after 200ms time delays, this protection will act. This protection may be set as trip/off.



The logic diagram of phase reversal protection

U2: Voltage negative sequence component, U1: Voltage positive sequence component,

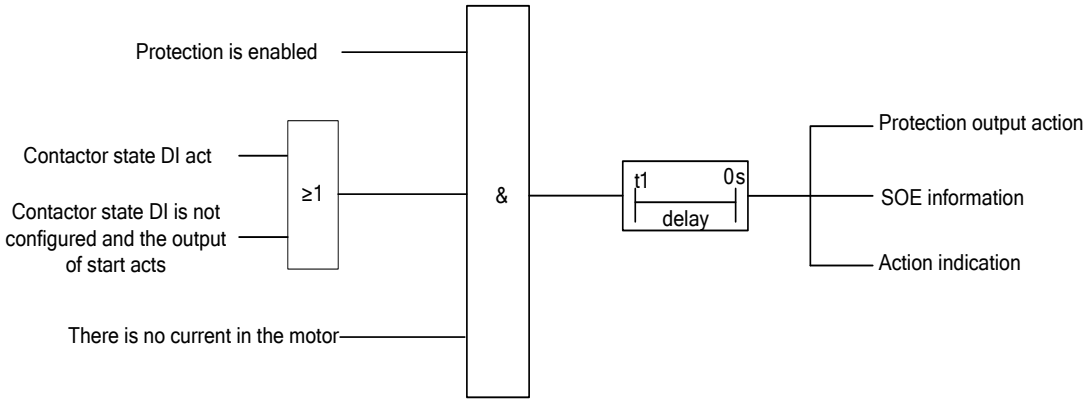
I2: Current negative sequence component, I1: Current positive sequence component.

3.1.17 Loop abnormal protection

This protection is mainly used to monitor the motor circuit and protect the safety of the motor. The protection may be set as trip, alarm or trip+ alarm.

When contactor state DI is not configured in the controller, if start command is received and the link output of the start acts, the protection will act when the controller detects that there is no current in the motor for the specified time. Returns immediately after protection acts at this time, if stop command is received within the delay time of the protection, protection action conditions are cleared.

When contactor state DI is configured in the controller, if the controller detects that there is no current in the motor and contactor state DI is closed, the protection will act when there is no current in the motor for the specified time.

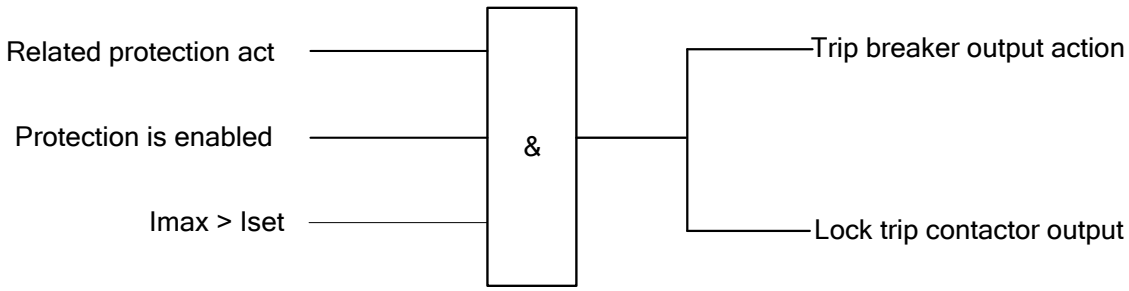


The logic diagram of loop abnormal protection

3.1.18 Contactor protection

Generally, the allowable breaking capacity of the contactor is the 6~8 times the rated current. If the circuit fault current exceeds such range, in operation, the contact will have the phenomena of being burnt or arc discharge, resulting in the higher severity of accidents. In case of short circuit fault, the controller will determine whether to break the contactor by checking whether the motor circuit's fault current is greater than the maximum breaking current of the contactor. If the fault current is less than the maximum breaking current of the contactor, the fault protection will act and be executed by means of breaking the contactor; if the fault current is greater than the maximum breaking current of the contactor, the fault protection will not disconnect the contactor but break the motor circuit by driving the air switch, achieving more reliable protection.

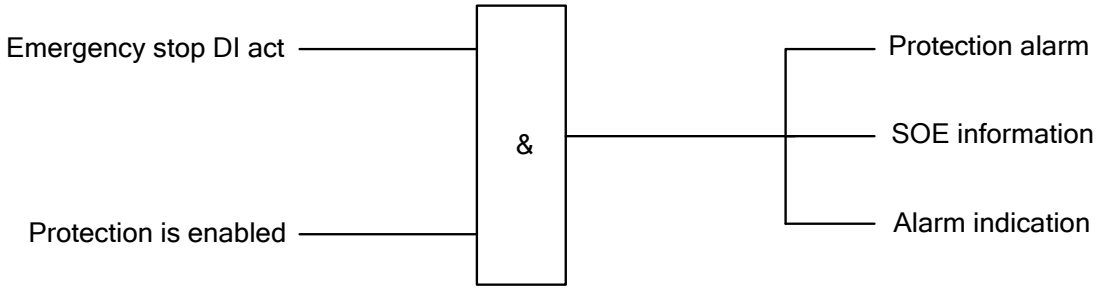
The contactor protection can be enabled, and the maximum breaking current of the contactor can be set by the user.



The logic diagram of contactor protection

3.1.19 Emergency stop alarm

This protection is used for the process of emergency stop. A pair of dry contacts provided by the user for PMC-550J is connected to emergency stop DI. Emergency stop DI is divided into normally closed and normally open, if the DI is normally closed, the alarm information is issued when the DI is opened; if the DI is normally open, the alarm information is issued when the DI is closed. The protection may be set as trip, alarm or trip+ alarm.



The logic diagram of emergency stop alarm

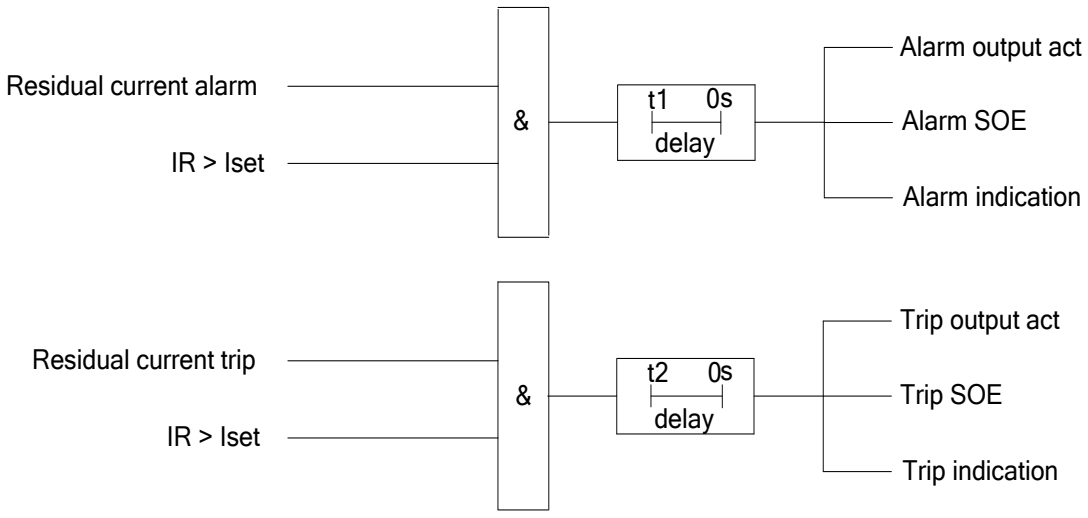
3.1.20 Residual I Protection

The residual I protection needs an external transformer. If the sampled residual current exceeds the pickup for the specified time, the protection will act. The protection may be set as trip, alarm or trip+ alarm.

The residual I protection can provide more accurate ground fault detection and is mainly used for the non-direct ground protection to ensure the personal safety.

The residual I protection has the start multiples function. In start process, the pickup will automatically increase to the corresponding multiples. After the start completes, the pickup will automatically recover. The multiples can be set as 1.00~2.00 times the pickup.

This protection includes two steps, the pickup and the delay time can be independently set for trip and alarm, fully meet the needs of the user.



The logic diagram of residual current protection

3.1.21 Output Configuration

The user can configure R1 output, R2 output and R3 output(Setup→DIDO config→DO config→DO1/DO2/DO3/DO4/DO5). Every protection may be configured with these three outputs, output

configuration is multiple-choice. When the protection acts, the configured output will act (not affecting the trip output and alarm output). The pulse width of RI output, R2 output and R3 output may be set within 0.0s~99.9s. If it is set as 0s, the outputs can only be reset manually; if set as other values, the output will be returned automatically.

Note: You can combine several protections or all protections to the same Rx(one of the R1, R2 and R3) output, when any protection acts, the Rx(one of the R1, R2 and R3) output will also act. You can also combine several Rx(one of the R1, R2 and R3) output to the same protection, when the protection act, all the related Rx(one of the R1, R2 and R3) output will act.

3.2 Control Function

The controller may realize different motor start control modes via the program control and monitor the contactor operation state via the state feedback from the contactor auxiliary contact so as to ensure the reliable electrical interlock.

3.2.1 Restart

The controller has the restart function. After this function is enabled, according to duration of short power failure or the power failure caused by backup power supply, the controller will achieve restart in different modes.

Under voltage (voltage loss) restart: The function does not need UPS. After this function is enabled, according to the duration of the line voltage short under voltage/voltage loss or the under voltage/voltage loss caused by backup power supply, the device will restart the motor in different modes.

To realize under voltage/voltage loss restart function, it is necessary to set the following parameters:

(1) Set the restart function as “on”;
(2) Set the restart low voltage as 0.30Ue-0.95Ue;
(3) Set the restart recovery voltage as 0.80Ue-1.60Ue;
(4) Set the quick start (restart) power loss time as off/0.1s-9.9s;
(5) Set the time delay restart power loss time as 0.5s-300.0s;
(6) Set the under voltage (voltage loss) restart time delay as 0.1s-300.0s.

When the voltage of the motor is less than the pickup of the restart low voltage, the device will count time until the motor restart. This duration is called as “power loss time”:

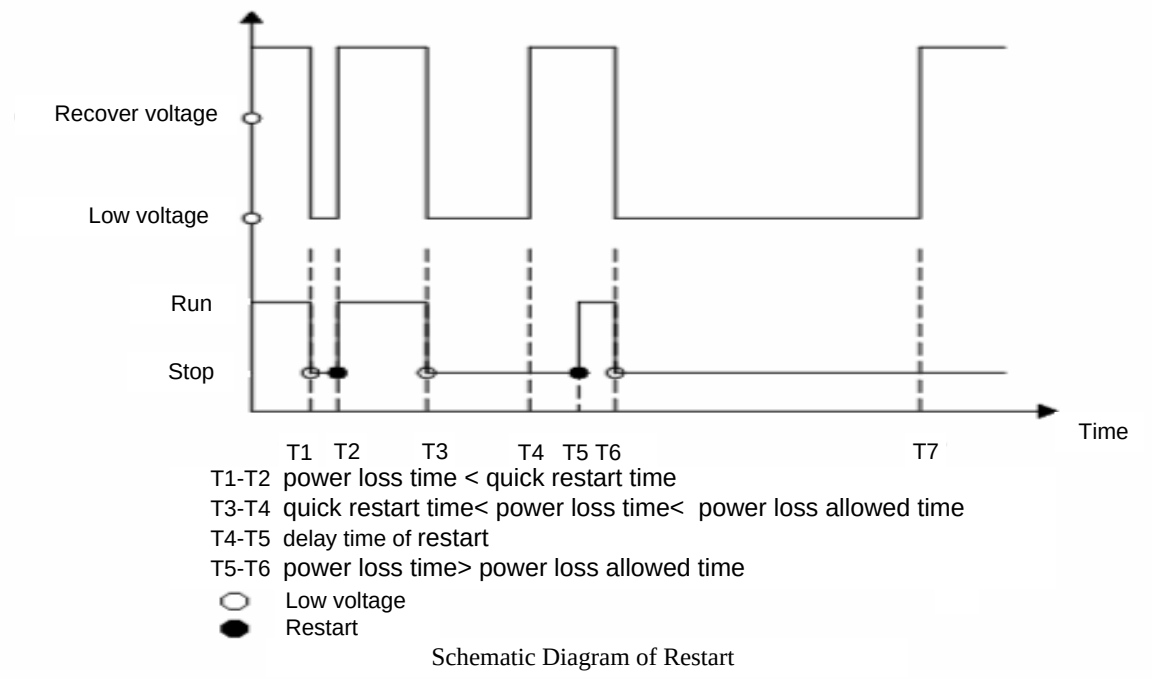
(1) If power loss time < the power loss allowable time of quick restart, the device will immediately restart. This function is called as “against voltage fluctuation”.

(2) If the power loss allowable time of quick restart < power loss time< the power loss allowable time of delayed restart; after the time delay (the restart time delay-0.5s” and “the restart time delay +0.5s), the device will restart.

(3) If the power loss time + the delayed time of delayed restart > the power loss allowable time of delayed restart, the device will not restart.

(4) If quick start is set as “off”, quick restart function will be exited, the device will trigger start DO output action after voltage recovers for the time specified by the start delay, then the motor will restart.

Schematic Diagram of restart:



Schematic Diagram of Restart

The test mode is used to test the restart function. When the test mode is enabled, that there is voltage in the motor before the voltage loss can be determined as voltage loss. When the test mode is disabled, conditions in which the motor can be determined as the voltage loss: (1) there is voltage and current in the motor before voltage loss; (2) there is voltage without a current in the motor before the voltage loss, and contactor (KMA/KMB) configured by the device is in a closed state, loop abnormal protection is disabled. When the device is put into normal operation, please cancel the test mode.

The aid output is the expansion output of under voltage (voltage loss) restart, the aid output will act if the system voltage exceeds the recovery voltage for the time specified by the aid output delay, and the parameters are as follows:

(1)Set the aid output DO, range (none/DO1~DO5)

(2)Set aid output delay, range 0.0s~300.0s

3.2.2 Auto-start Function

During power-on, the device will judge whether the auto start is allowed based on the system setting.

① Set the power-auto-start as “on”;

② Set the auto-start mode as “Start”;

If ① and ② are met, when power-on, the device will restart after the time delay T.

③ Set the power-auto-start as “on”

④ Set the auto-start mode as “Recover”;

If ③ and ④ are met, when power-on, the device will determine whether to restart according to the state of the motor before power loss.

a) If the state is “running” before power loss, the device will restart after the time delay T.

b) If the state is “Stop” and “Start” before power loss, the device will not restart;

⑤Set the power-auto-start as “off”;

If the condition ⑤ is met，this function is disabled，regardless of the auto-start mode which is set as “Recover” and “Start”, the device will not restart after powering on.

Note：

(1)The recovery voltage of the auto-start is the same as the restart.

(2)The delay time of auto-start does not include the initialization time of the device.

3.2.3 Motor Control Authority

The control authority of PMC-550J is "two position" means. The control authority includes “local control” and “remote control” and could be changed through “local/remote” DI. When the “local/remote” DI is opened, the panel control authority is local; when the “local/remote” DI is closed, the panel control authority is remote. Menu Settings: Setup→DIDO config→DI config. The specification of the DI control commands, the panel control authority, and communication remote control authority is such as below:

DI control commands authority: in the DI control command, remote start A, remote start B, remote stop, R-closed trip A and R-closed trip B belong to remote command; local start A, local start B, local stop, L-closed trip A and L-closed trip B belong to local command; emergy start A, emergy start B, emergency stop, stop, Closed trip A and Closed trip B are not affected by control authority.

Panel control authority: panel control authority can be set to disable/emergency/local/remote according to the need, Menu Settings: Setup→System→Control key. When panel control authority is disable, panel control is closed; When panel control authority is emergency, panel control is not affected by control authority; When the panel control authority is local and remote, it is affected by control authority.

Communication remote control authority: for communication (PC) remote operation, if the “local / remote” DI is configured, communication remote control authority is remote; if the “local/remote” DI is not configured, communication remote control is valid whenever it comes. If the remote start command (remote start A, remote start B) is configured, the Communication remote control is automatically invalid.

3.3 Start Control Function

The device can realize different start control modes via the program control; and monitor the contactor operation state via the state feedback from the contactor auxiliary contact to ensure the reliability.

The control modes are listed as following:

- Direct start;
- Reversing start;
- Two speed control;
- Voltage reduced start (including resistance start, Y/△ start, autotransformer start, soft starter cooperation control);
- Inverter aid control;
- Big motor aid control.

3.3.1 Direct Start

The device can control the motor through DI, the front panel and remote control. When the Start A command is given and the device detects that the motor is in the stop state, the Start A output will close, the start contactor will close, then the motor will start. When receiving the stop command or pressing the “stop” button, the motor will stop. **Refer to 6.1 Schematic Diagram of Direct Start Connection.**

3.3.2 Volt-reduced Start

At the moment of the starting of motor, the start current is very big, which can affect the voltage stability of the power system; and some motors’ start need more time, which may be more harmful to the power system. In order to decrease the effect caused by the motor start, the soft starter and voltage reduced starter are generally adopted. The voltage reduced start modes includes resistance start, Y/△ start, autotransformer start, and soft starter cooperation control. **Refer to 6.2 Schematic Diagram of Star Delta Voltage reduced start Connection, 6.3 Schematic Diagram of autotransformer start Connection, 6.4 Schematic Diagram of Reactor Voltage reduced Start Connection.**

For the start model parameters, if Mode 1 is chosen, after Start A command is delivered, the Start A output (voltage reduced start) of the device will act, the contactor of voltage reduced start will be closed and the motor will start. After the start time (DELAY) or the switching current to be set is reached, if there is no current, alarm message will be delivered and the start process will stop. If there is current, Start A output (voltage reduced start) will be disconnected. If within 1s pulse width, the no current conditions are met, Start B output (full voltage start) will be reclosed and the motor will operate normally.

For the start model parameters, if Mode 2 is chosen, after Start A command is delivered, the Start A output (voltage reduced start) of the device will act, the contactor of voltage reduced start will be closed and the motor will start. After the start time (DELAY) or the switching current to be set is reached, if there is no current, alarm message will be delivered and the start process will stop. If there is current, Start B

output (full voltage start) will be reclosed; after 1s delay, Start A output (voltage reduced start) will be disconnected and the motor will operate normally.

For various different start modes, their connection modes may be different, but their control logics are the same.

Under the volt-reduced start mode, in order to ensure the continuity of the product line, full voltage output should be closed directly after power loss to start the motor.PMC-550 can realize this by setting the time of restart direct as described below.

(1) When the time of restart direct is set to 0s, the function is disabled.

(2) When the motor power loss time is less than the time of restart direct, full voltage output is directly closed after restart is successful.

(3) When the motor power loss time is greater than the time of restart direct, the logic of volt-reduced Start is executed after restart is successful.

Note：

1. The start mode 2 is prohibited when you use Star Delta Voltage reduced Start Connection. Otherwise it will cause a short-circuit accident.

2. The condition of current switching is that the motor will switch to full voltage start state when current is less than the pickup of the Switch I for 50ms in the process of voltage reduced, Switch I can be set within the range of off/0.1~3.0Ie.

3.3.3 Reversing Start

In many cases, the motor needs to control frequently its rotation’s directions (forward and reverse). Therefore, this device is designed with such control function.

When “Start A” (forward start) command is sent to the device, Start A output (forward start) will close, and the forward contactor will close, then the motor will run in forward mode. When “Start B” (reverse start) command is sent to the device, Start B output (reverse start) will close, and reverse contactor will close, then the motor will run in reverse mode. When “Stop” command is sent, the contactor trip output will act, and then the motor will stop running. In order to prevent short-circuit between phases, “Start A” output and “Start B” output will not close at the same time.

When the motor is running in the forward mode and the device receives a reverse command, the device will automatically stop the motor; after 5s time delay, if the reverse conditions are met, Start B output will be automatically closed; then the motor will be running in reserve mode. The switching process is similar when the motor in reserve state receives a forward command. **Refer to 6.5 Schematic Diagram of Reversing Control Connection.**

Note: Before use the reversing start control function, you must configure two DIs as the status signal for the KMA state and KMB state. In the running or stop state, if the status signal of the forward contactor and reserve contactor is not correct, the device will give warning.

3.3.4 Two speed Start

The logic of the Two Speed Control is similar to the Reversing Start Control. The device will automatically switch the rated current according to running state of the motor in order to ensure all protection functions can correctly act for protecting the motor. **Refer to 6.6 Schematic Diagram of Two Speed Control Connection.**

3.3.5 Auto reversing Start

For some of the production process which need to frequent control motor running in forward mode and reverse mode (such as the mixer), the PMC-550J is designed with Auto Forward - Reverse Control function. Only when control mode is set as “Reversing Start Control”, this control function will be effective.

When enable “Auto Forward - Reverse Control”, and the cycle is set as “1 to 65535”, if “Start A” (forward start) command is sent to the PMC-550J, Start A output (forward start) will close, then the motor will run in forward mode. When the forward time arrives, the motor stops automatically, when the stop time arrives, Start B output (reverse start) will close, then the motor will run in reverse mode. When the reverse time arrives, the motor stops automatically. The motor will run repeated in forward mode and reverse mode until reach the set number of cycles. If “Start B” command is sent firstly, the motor will firstly run start from the reverse mode, and the other control process is similar. When the cycle is set to “0”, the motor will run constantly, until receive the stop command. Manually press the stop button at any time, the motor will stop running.

3.3.6 Inverter aid Start

Generally in the starting process, start air-cooling system firstly, and then start the inverter. In the stop process, stop the inverter firstly, and then after cooling for a certain time, stop air-cooling system.

After receiving the Start A command, the device will send the start command to start air-cooling system firstly; after a time delay set by user, if the air-cooling system starts normally, the inverter will start. After receiving the stop command, the device will send a stop command to stop the inverter firstly; and then stop the small motor after time delay set by user.

The start and stop of the cold fan motor system may be controlled via two modes: first, the start and stop use one DO of the “start cold fan” output for control; secondly, configure the “trip cold fan” output and “start cold fan” output, two DOs, for control. **Refer to 6.7 Schematic Diagram of Inverter aid Control Connection.**

3.3.7 Big Motor aid Start

The logic principle of the big motor aid control is similar to the inverter aid control. After the device receives the Start A command, the small motor will start firstly; after a time delay set by user, if the small motor starts normally, the big motor will start. After the device receives the stop command, the large motor will stop firstly, and then the small motor will stop after time delay set by user

Similar to the Inverter aid control mode, the small motor may be controlled in two modes with the implementation mode the same as the Inverter aid control mode. **Refer to 6.8 Schematic Diagram of Big Motor aid Control Connection.**

Note: In the mode of Inverter aid start and Big motor aid start, you must configure one DI as the status signal of cooling fan (small motor). If the device detects that the big motor is in the running state and the small motor is in the stop state, it will give warning and trip the Inverter. If the device detects that the inverter is in the running state and the air-cooling system is in the stop state, it will give warning.

3.4 Test mode

The test mode can be set via Test mode menu: Setup→ System→ Test mode, under the test mode, ignoring the current detection of the protection control logic will be easy to use during system debug. Test mode can realize the following logic debug:

Function	illumination
Simulating motor running	Under the test mode, when there is no current in the motor, if the device receives a start command, the motor state changes from stop to running, and if a stop command is received by the device, the motor state changes from running to stop.
Volt-reduced debug	Under the test mode, locking the current detection of volt-reduced start may realize the complete process of volt-reduced start.
Restart debug	Under the test mode, locking the current detection of restart may realize the complete process of restart, only need to add the corresponding voltage to the device.

Note: when the device is put into normal operation, please cancel the test mode.

3.5 Programmable logic

For the general Low-voltage Motor Protection and Control Device, all the protection and control logic is fixed. This limits the use of Low-voltage Motor Protection and Control Device. There are programmable

protection and control logic in PMC-550J. You can flexibly design protection and control logic in the actual application according to the need to meet the demand of field application. Below taking an example of the programmable logic realization of interlock protection to illuminate the use of programmable logic function, figure 3.4 is the corresponding programmable logic diagram (the logic diagram is drew through software "PMCLogic for 550"). In the actual application, the diagram need to be downloaded to the PMC-550J through the PC software(PMCLogic for 550), when DI3 is closed, after a time delays, the device will trigger DO3, light ALARM LED and record the SOE.

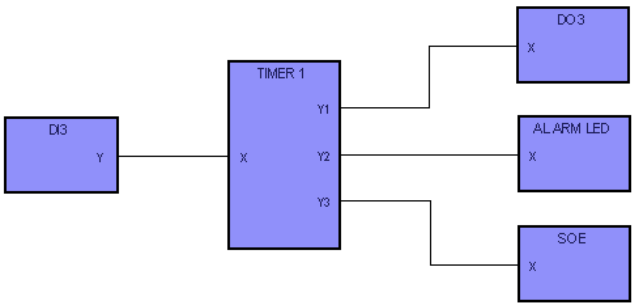


Figure3.4 Programmable Logic Diagram

PMC-550J supports 6 programmable logic, and each logic contain up to 15 programmable widgets. The logic can be edit and download to the device through the PC software (PMCLogic for 550).

Note: The programmable SOE widget supports custom event name, this function only supports English and Numbers and takes the first 16 characters (including Spaces) of logical file name; such as the logic diagram in figure 3.4, the logical file name is "Interlock alarm.pmc", the event name is Interlock alarm, please see the example of the SOE display in the section 4.4.5 figure 4.4.5.2.

3.6 Monitoring and Metering

The device provides lots of motor running information including various parameters and states. The monitoring data may be uploaded to the PC Master via the communications and may also be directly displayed via the display module installed on the switchgear cabinet panel. These data include electric parameters, running states, etc.

Table 3.5 Function List of the Monitoring and Metering

Monitoring Project	Standard	Standard +IN	Standard+IR
failure information	★	★	★
alarm information	★	★	★
3-phase current/ 3-phase current angle	★	★	★

3-phase voltage/ 3-phase voltage angle	★	★	★
power factor	★	★	★
active power/ reactive power	★	★	★
active energy/ reactive energy	★	★	★
frequency	★	★	★
zero sequence current	★	★	★
residual current / insulation resistance			★

Note：Zero sequence current is calculated based on the three-phase current or the input of PMC-MIN.

3.7 Maintenance Information

The controller can provide real-time status information, troubleshooting parameters and rich daily motor maintenance and management information, convenient for knowing about the motor operation condition, calculating the production efficiency and knowing about the contactor's operating life. The controller may assist the manager in realizing more economical and reasonable maintenance and management.

Management information	Trip current
	Trip times
	Start I
	Start time
	Start times
	Total running time
	Running time
	Stop time
	Alarm information
	SOE logs-64 events with time stamp
	Recent 8 start reports with time stamp
	Thermal overload early warning function
	Cooling time
	Used heat capacity
	Input/output status monitoring

Note: the running time is the last duration during which the motor is in running state, the time starts when there is current in the motor, stops when there is no current in the motor.

3.8 Analog Output

The analogue output (AO) of the device is the separation 4~20mA current, equivalent to a transducer of common power, such as current transducer and power transducer. The terminals are marked as (AO+) and (AO-). The setup of the AO function must set three parameter items:

a) Input parameter: This parameter defines the tested parameters positively proportional to the AO. The tested parameters available include 3-phase currents [Ia, Ib, Ic], 3-phase total active power [P] , residual current [IR], zero sequence current [IN].

b) “4mA” parameter: This parameter defines the tested parameters corresponding to the output of the set AO initial values (4mA). The Pickup is -999,999~999,999.

c) “20mA” parameter: This parameter defines the tested parameters corresponding to the output of the set AO initial values in full scale (20mA). The Pickup is 0~999,999.

The above three parameters may be set on the monitor module panel or by the special software via the communication port. Please refer to the protocol text.

The analog output (AO) of PMC-550J inbuilt 24V power supply, so the AI (such as DCS) connected with it couldn’t carry power supply.

3.9 Start report

The PMC-550J provides start report, which record the information of motor start(Includes start current, start time, start voltage and time stamp)in details. There are 8 start report with time stamp totally. You can know the detailed information of motor start through the start report.

3.10 Device Self-diagnosis Function

Key parts including AD chip, memory, etc. are inspected during the device power-on or operation to judge if they are normal. If a certain part is found abnormal, the alarm indicator will be on, the information of wrong self-diagnosis will be displayed and all protection functions will exit.

Note: If you configure a self-check output, when the device self-checking is normal after power-on, the self-check output will act, otherwise the self-check output will return.

3.11 Diagnosis function

The device is equipped with the diagnosis function of voltage and current wiring, which is used in the detection of wiring failure to make the debug easy. The illumination of wiring failure is as shown in table 3.11, and you can inquiry the diagnosis information of voltage and current wiring via the menu Maint→Diagnosis.

Table3.11 The illumination of wiring failure

Fault Types		Description
Voltage	Normal	The wiring of 3-phase voltage is correct.
	Phase seq. error	The reverse phase sequence of 3-phase voltage is detected, and the wiring of any two phase voltages among UA, UB and UC is reverse.
Current	Normal	The wiring of 3-phase current is correct.
	Phase seq. error	The reverse phase sequence of 3-phase current is detected and the wiring of voltage is abnormal, any two phase primary cables of the motor main circuit are mistakenly passed through the inner holes of the MTA or any two phase secondary cables among IA, IB and IC of MTA is revised.
	Reversed: IA and IB	When the main circuit cables of the motor are mistakenly passed through the inner holes of the MTA or the secondary cables of the MTA is mistakenly connected to the terminal of PMC-550J, it will cause this problem. Specific: the phase A primary cable of the main circuit is passed through the phase B inner hole of MTA, the phase B primary cable of the main circuit is passed through the phase A inner hole of MTA; the phase A secondary cable of MTA is connected to the terminal IB of PMC-550J, or the phase B secondary cable of MTA is connected to the terminal IA of PMC-550J.
	Reversed: IB and IC	When the main circuit cables of the motor are mistakenly passed through the inner holes of the MTA or the secondary cables of the MTA is mistakenly connected to the terminal of PMC-550J, it will cause this problem. Specific: the phase B primary cable of the main circuit is passed through the phase C inner hole of MTA, the phase C primary cable of the main circuit is passed through the phase B inner hole of MTA; the phase B secondary cable of MTA is connected to the terminal IC of PMC-550J, or the phase C secondary cable of MTA is connected to the terminal IB of PMC-550J.
	Reversed: IC and IA	When the main circuit cables of the motor are mistakenly passed through the inner holes of the MTA or the secondary cables of the MTA is mistakenly connected to the terminal of

		PMC-550J, it will cause this problem. Specific: the phase C primary cable of the main circuit is passed through the phase A inner hole of MTA, the phase A primary cable of the main circuit is passed through the phase C inner hole of MTA; the phase C secondary cable of MTA is connected to the terminal IA of PMC-550J, or the phase A secondary cable of MTA is connected to the terminal IC of PMC-550J.
	I polarity reversed	The main circuit cables of the motor are passed through the inner holes of the MTA, and this is not done in accordance with the marked direction on the MTA.

3.12 Communication Function

The PMC-550J supports RS485 port and the Modbus RTU protocol, allowing the device's data and information to be transmitted across multiple communications networks to different monitoring systems.

You also can choose the standard Profibus-DP port, which supports DPV0 protocol, DPV1 protocol and I&M function. The motor will be stopped automatically to ensure the reliability of the motor control after the communication is disconnected when the function of DP break is enabled. The function of DP break can be set via the DP break stop menu Setup→System→DP break stop.

3.13 Firmware Upgrade

PMC-550J support firmware upgrade. Through the PC software(PMC Device Upgrader) and RS-485 communication, you can upgrade the device firmware. The function is easy to operate. When the model of the device is Profibus, the device does not support online upgrade. When the device firmware is online upgraded via the RS-485 port, the RS-485 communication wiring is shown in Figure 3.13.

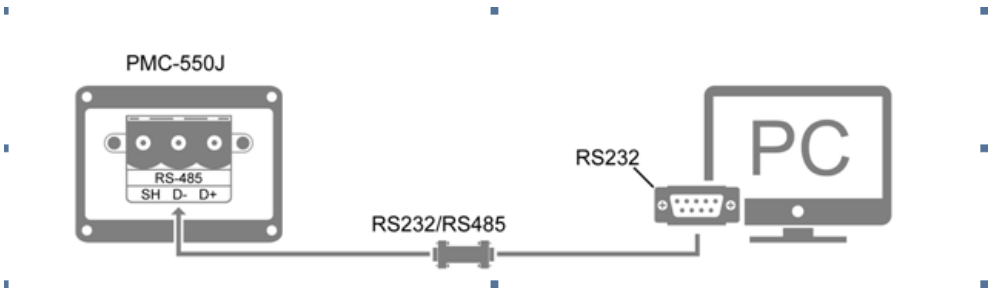


Figure 3.13 Schematic diagram of RS-485 communication wiring

4 Front Panel

The display interface can realize the display of measurement parameters, the inquiry and setting of setup, the inquiry of SOE logs, the Maint information and Version.

4.1 Function of Keys

The display module of PMC-550J is as shown in the figure of Section 6.2. At the bottom of the panel, there are totally 4 buttons, from the left to the right, including <◀>, <▲>, <Setup>, <Reset>. See the functions of the buttons in Table 4.1.1.

Table 4.1.1 Definition of Functions of Keys

Buttons	Mode	
	View menu	Setup parameters
◀	Turns downward	Moves the cursor leftward
▲	Turns upward	Increases a numeric value
Setup	Enters into the current item	Confirms the change and exits
Reset	Returns to the previous menu	Cancel the change and exits

For the <Reset> key, when it is held for 1s, it will indicate reset protection.

On the right of the front panel of the display module of PMC-550J, there are totally 3 control keys, including <Start A>、<Start B>、<Stop>. Their functions as shown in the following table:

Table 4.1.2 Definition of Functions of Control Keys

mode / Buttons	Direct start	Voltage reduced start	Reversing start	Two Speed start	Inverter aid control	Big Motor aid ontrol
Start A	Start command	Start command	Forward start command	Start speed 1	Start command	Start command
Start B	Invalid	Invalid	Reverse start command	Start speed 2	Invalid	Invalid
Stop	Send stop command to the motor					

Note: In order to prevent wrong operation, the control buttons will act when it is pressed for 100ms.

⚠ Panel control authority can be configured as disable/emergy/local/remote according to the need, please carefully operate "Start A, Start B, Stop" button, otherwise easily cause stop and start by mistake such as accident.

4.2 Indicator

There are three indicator light in the front panel : <● Run >、<● Trip >、<● Alarm>.

Indicator	说明
Operation indicator(green)	Flashes once for 2s, on for 1s and off for 1s, which indicates the device running is normal.
Trip indicator(red)	Indicates a trip event has occurred.
Alarm indicator(yellow)	Indicates an alarm event has occurred.

If the trip failure and alarm failure disappeared, press the <Reset> button for 1s then trip indicator and alarm indicator will go out.

4.3 Display Structure

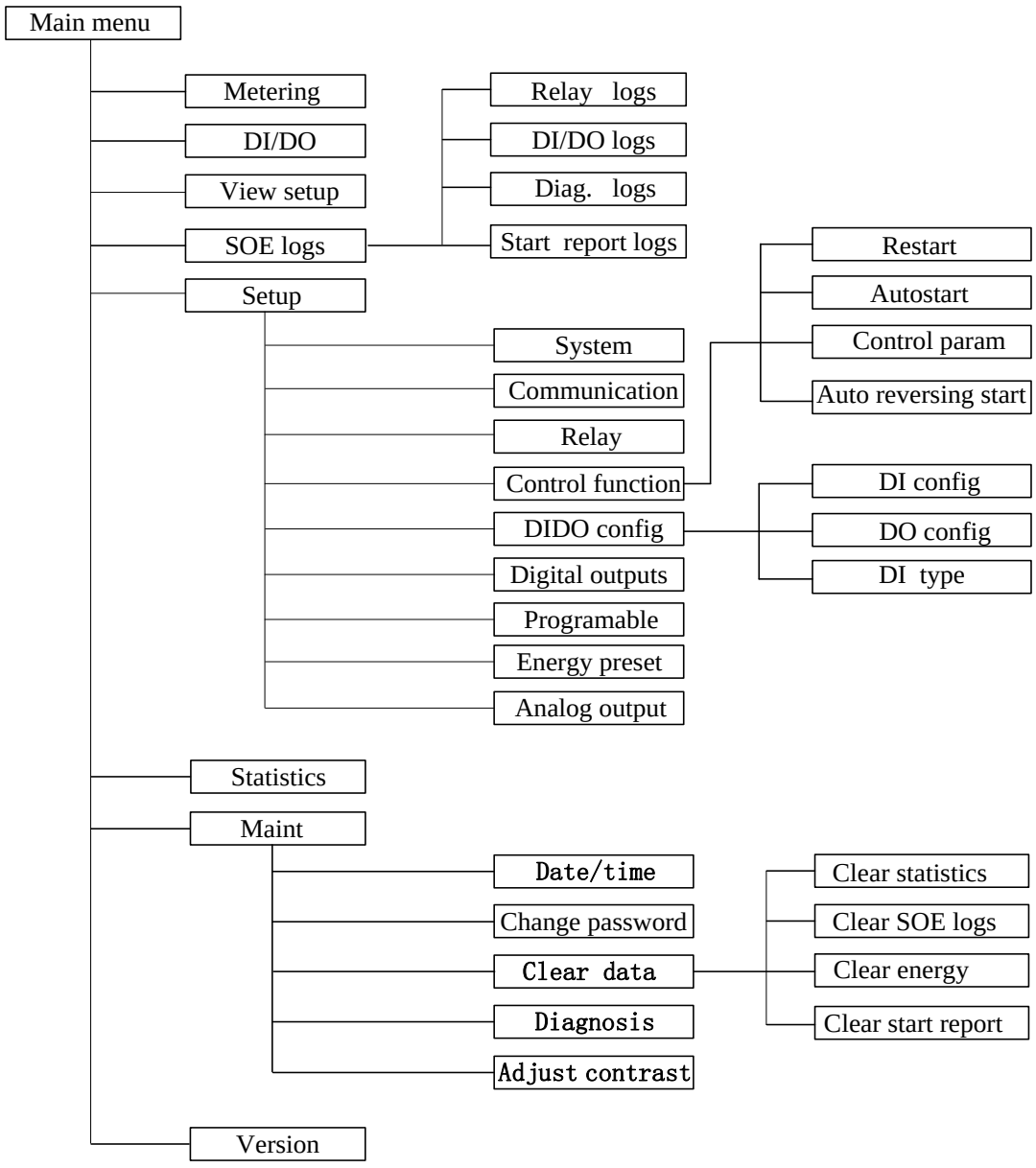


Figure 4.3 Display Structure Chart

4.4 Display prospectus

The display module starts the self-diagnosis after power-on and displays related Version. The power-on page is shown below:

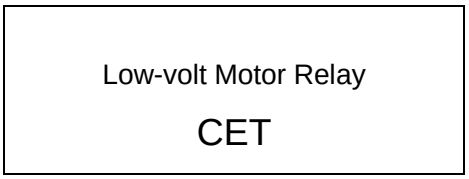


Figure 4.4a Power-on Page

After the device passes the self-diagnosis, you may enter the default menu, where you can view I, U, % (the displayed value indicates that measured current is expressed as the percentage of rated current), COM flag(glitter indicates that the device is in communication state), motor state(stop, start, run, forward, reverse, speed1, speed2) and DI state (1-close, 0-open, DI1,DI2 …etc from left to right displayed in proper order, DI number according to the model), DO state(1-close, 0-open, DO1,DO2 … etc from left to right are displayed in proper order, DI number according to the model). If the programmable logic diagram has been downloaded to the PMC-550J, Ⓛ will be displayed on the right of the voltage U.

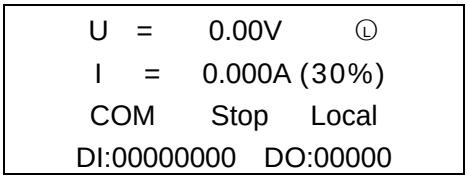


Figure4.4b Default Menu

In order to prolong the useful life of the LCD, the PMC-550J is provided with the screen protection function. When no operation is within 5 minutes, the LCD enters into the screen saver, the backlight is off, and display will jump to the default Menu. After entering the screen saver, pressing any panel button will light the backlight.

In the default interface, press the <Setup> buttons to enter the main menu, where you can see 8 options in total, i.e. Metering, DI/DO, View setup, SOE logs, Setup, Statistics, Maint, and Version. Press the <◀>and<▲> buttons to choose the desired option, then the chosen option will be highlighted. Press the <Setup> buttons to enter the submenu.

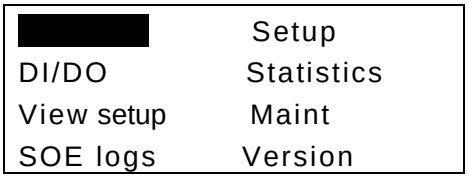


Figure 4.4c Main Menu

4.4.1 Metering

Press the <◀>and<▲>buttons to choose the desired option, the measurements are as follows:

Metering (Page 1)

Ia =	100.000A	0°
Ib =	100.000A	240°
Ic =	100.000A	120°
In=	0.126A	

Metering (Page 2)

Uab =	380.00V	0°
Ubc =	380.00V	240°
Uca =	380.00V	120°
f =	50.00Hz	

Metering (Page 3)

P	=	70.000kW
Q	=	0.000 kvar
PF	=	0.999
Iunbal =		0%

Metering (Page 4)

kWh Imp	=
	100.06kWh
kvarh Imp	=
	132.80kvarh

Metering (Page 5)

Cooling Time	=	
		20.1s
Heat capacity	=	
		30.0%

Metering (Page 6)

Residual I =	
	0mA
Insulated R =	
	1000.000kΩ

Figure 4.4.1 Measurement Page

Note：1. For the device of zero-sequence current model, when zero sequence type set in ground protection is 3I0, 3I0 will be displayed instead of In; for the device of residual I model, 3I0 will be displayed instead of In.

2. If the device is not equipped with residual I protection function, the residual I and insulation R will not be displayed.

3. If the device is equipped with Profibus communication function, the residual I and insulation R will not be displayed.

4.4.2 DI/DO

The device may display the information about the DI/DO in real time. For DI, "●" indicates it is connected, "○" indicates it is disconnected; for DO, "●" indicates the relay coil is powered on and acts and "○" indicates the relay is powered off and returns. The DI/DO status display format is as follows:

a) DI status

DI status (Page 1)

DI1	local /remote	●
DI2	remote start A	●
DI3	remote start B	○
DI4	emergency stop	○

DI status (Page 2)

DI5	local start A	○
DI6	KMA state	○
DI7	KMB state	○
DI8	inverter state	○

b) DO status

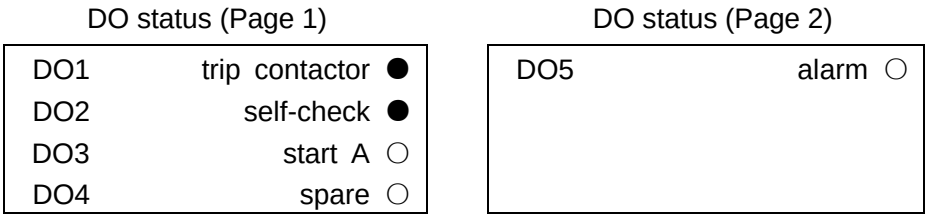


Figure 4.4.2 DI/DO Status Page

Note：The display number of DI/DO is determined by the model.

4.4.3 Setup

On the Setup page, you may modify the System parameter, Communication parameter, Relay parameter, Control function, DIDO config, Digital outputs parameter, Programable, Energy preset and Analog output. You need to input the password to set such parameters. Default password: 0000.

There are two modes in “Setup” menu: view mode and modify mode. In view mode, you may select the option required to be modified via the <◀>and<▲>buttons; at this time, the big cursor state is displayed and then press the <Setup↵>button to enter the modify mode; then the cursor becomes small. Press the <▲>button to modify the parameters; you may move cursor via the <◀> button. When finished modifying, press the <Setup↵> button to confirm and meanwhile back to the view mode. Press the <Reset↶> button to cancel the change and meanwhile back to the view mode.

When the revision state backs to the revision state, press the <Setup↵> button to save the revised content or press the <Reset↶> button not to save it. When the set value is higher than the system default maximum value or lower than the system minimum value, it will automatically become the maximum value or the minimum value after you press the <Reset↶> button.

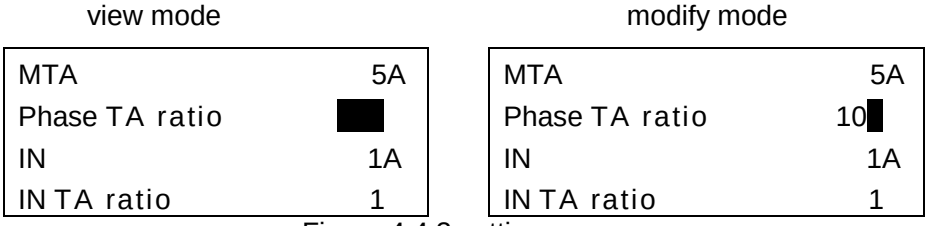


Figure 4.4.3 settings page

a) System parameter

You can modify MTA, Phase TA ratio, IN, IN TA ratio, Ie, Primary Ue, Secondary Ue, Control key, Stop DI type, SBO, DI power, Test mode, Frequency, Language, DP break stop. In the

view mode, you may select the option required to be modified via the <◀>and<▲> buttons. Press the<Setup↵> button to enter the modify mode.

System param (Page 1)

MTA	5A
Phase TA ratio	100
IN	1A
IN TA ratio	1

System param (Page 2)

Ie	1.0A
Primary Ue	220V
Secondary Ue	100V
Control key	disable

System param (Page 3)

Stop DI type	NO
SBO	on
DI power	DI8⇐DI1
	0000010

System param (Page 4)

Test mode	on
Frequency	50Hz
Language	English
DP break stop	yes

Figure 4.4.3.1 system param page

Note:

1) If the device is not equipped with zero-sequence current function, the "IN" and "IN TA ratio" will not be displayed.

2) DP break stop will be only displayed in the device which is Profibus model.

b) Communication parameter

For the Communication parameter page, if the device is Modbus model, you can modify ID, Baudrate and Parity. If the device is Profibus model，you can modify ID.

Modbus model

Protocol	Modbus
ID	
Baudrate	9600
Parity	8E1

Profibus model

Protocol	Profibus
ID	

Figure 4.4.3.2 Communication parameter page

c) Relay parameter

For the Relay parameter, you may press the<◀>and<▲> buttons to turn pages. Choose the desired protection and enter to modify the desired value.

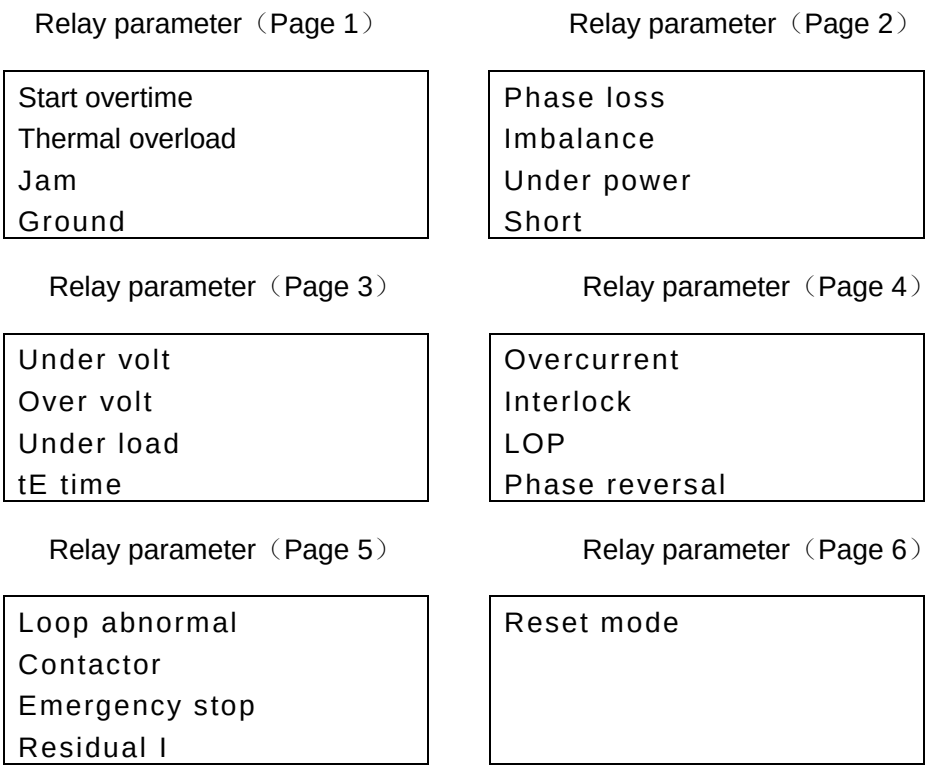


Figure 4.4.3.3 relay parameter page

Note: If the device is not equipped with residual current protection function, the "Residual I" will not be displayed.

Below is the example of "Jam protection" that describes the steps to set interface parameters. Assume that the protection is set to "trip + alarm", current fixed value is 3.0Ie, delay time is 4.0s, link output is R2 and related to DO3. Specific setting procedure as follows:

① In the main menu, choose the "Setup" and press the< Setup > button;

② In the place where the cursor lies, enter the correct password, then press the< Setup > button to enter the submenu;

③ Move the cursor downward, choose the "Relay" option and press < Setup > button to enter the submenu;

④ Choose "Jam" option and press the < Setup > button;

⑤ Enter "Jam" protection menu, change the "Config" to "trip + alarm";

⑥ Move the cursor downward, choose the "Pickup" option and change the parameter to 3.0;

⑦ Move the cursor downward, choose the "Delay" option and change the parameter to 4.0;

⑧ Move the cursor downward and setting link output (R1, R2, R3). Move the cursor to the left of R2 and press the < Setup > button . "☐"Cancel the link output ,"☑" select the link

output;

⑨ Enter “Setup→DIDO config→DO confing” menu,move the cursor to “DO3” and change the DO3 to “R2”;

When you complete above operation, you may see the “Jam” menu and “DO config” menu as follows:

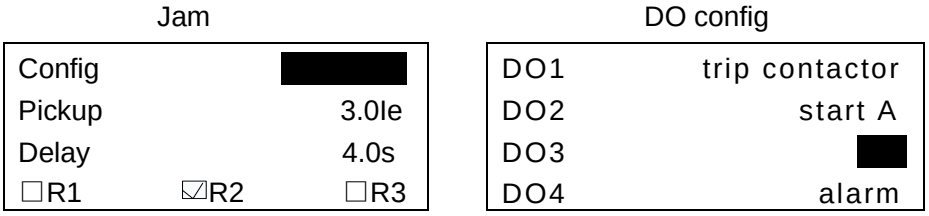


Figure 4.4.3.3 Jam protection configure page

Corresponding to the above setup, when Jam protection acts, the PMC-550J will have 3 relays to be acted, they are DO3, DO4 and DO1.

d) Control function

In the “Control function” menu, you can set and view control parameters, including Restart, Autostart, Control param, Auto reversing start. If the mode is not equipped with “reversing”, the “Auto reversing start” will not be displayed. As shown below:

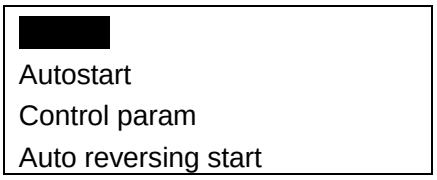


Figure 4.4.3.4 control function page

In addition to the control parameter setting menu, the other menu is similar. Now just only illuminate how to set control parameters.

The first line is used for setting start mode. When you have set start mode, the control parameter will be displayed automatically. At this time, you could set correlative parameters. The parameters of direct start and volt-reduced start show as follows. Other start mode parameter settings will not expatiate.

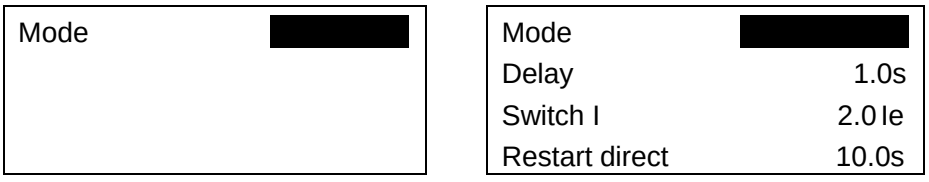


Figure 4.4.3.5 control param page

e) DIDO config

DIDO config has three submenus: DI config, DO config and DI type, you can set DI type as normally open or normally closed.

DI config：The DI types include common state, local/remote, interlock, emergency stop, remote start

A, remote start B, local start A, local start B, KMA state (inverter state/big motor), KMB state (cold fan state/small motor), QF state, start lock NO, remote stop, local stop, reset protect, R-close trip A,R-close trip B, stop, emergy start A, emergy start B, L-close trip A, L-close trip B, Close trip A, Close trip B, start lock NC. You may choose the proper type according to the actual demand.

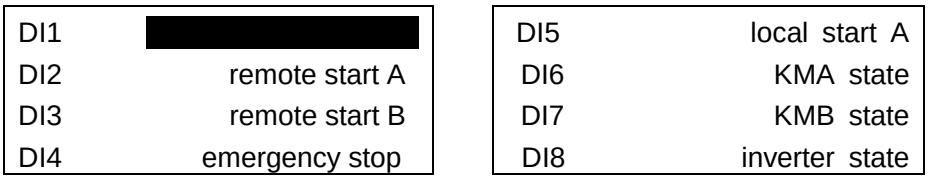


Figure 4.4.3.6 DI config page

When configure DI in panel, the DI type does not allow the same configuration except the common state, remote start A, remote start B, local start A, local start B, remote stop, local stop, start lock NO, start lock NC. For example, DI1 is configured to interlock, DI2 is also configured to interlock, this situation is not allowed, then press the <Reset> button will enter Repeat configuration interface. as shown below:

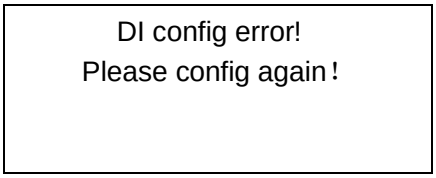


Figure 4.4.3.7 repeat configuration page

At this point press <Setup>button or<Reset> button to re-enter the DI setup menu.

DO config：The DO types include spare, trip contactor, self-check, start A (volt-reduced/start Inverter / start big M), start B (full-volt/start cold fan/start small M), alarm, trip breaker, trip small M, R1, R2, R3, motor running. You may choose the proper type according to the actual demand.

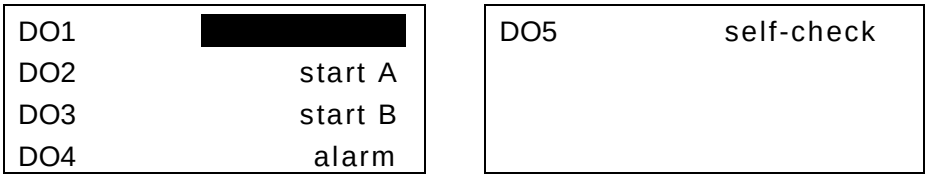
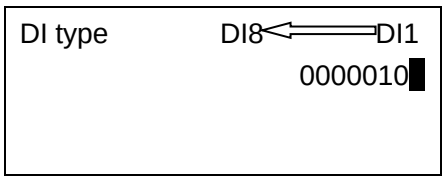


Figure 4.4.3.8 DO config page

When configure DO in panel, the DO type does not allow the same configuration except the spare. The specific display and option are similar to DI configuration.

DI type: it is used to set the DI type as normally open or normally closed, taking an example of 8DI, settings page is shown as below, and DI1~DI8 are displayed from right to left in proper order, “1” indicates that DI type is normally closed, “0” indicates that DI type is normally open.



Now take an example of DI1 configured as local/remote to illuminate the use of DI type, if the DI type is set to: 00000000, DI1 is normally open，the control authority is remote when the DI1 is closed; if the DI type is set to: 00000001, DI1 is normally closed, the control authority is remote when the DI1 is opened.

f) Digital outputs

In the “Digital outputs” menu, you can set the return time of link output relay, the range is Latch/ 0.1-99.9s. The display menu is shown below:

Figure 4.4.3.9 output param page

g) Programmable

PMC-550J supports 6 programmable logic. There are eight kinds of widgets that can be set parameters by panel, includes on off module, 50P module, 27P module, 37P module, 50N module, Timer1 module, Timer2 module, Expand module2. The parameters of other widgets have been set in editing logic diagram, Can not be changed in display.

Below is the example of “logic 1” that describes how to set programmable logic parameter. First, download the logic diagram to “logic 1”. If download successfully, the logic that have not be downloaded will show invalid, and you couldn’t enter the menu of setting programmable parameters), refer to figure 4.4.3.10. Choose the “logic 1” option and press < Setup > button to enter the submenu. There are two state of widget: “using” and “no use”, refer to figure 4.4.3.11. If the state of widget is “using”, choose the widget and press < Setup > button to enter the submenu (Parameter setting methods are the same as protection parameter).

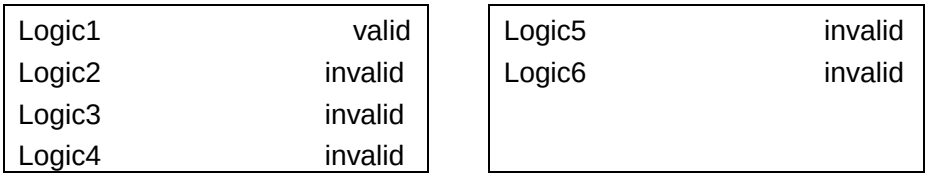


Figure 4.4.3.10 logic diagram page

On off module	no use	50N module	no use
50P module	using	Timer1 module	using
27P module	no use	Timer2 module	no use
37P module	using	Expand module	no use

Figure 4.4.3.11 widget page

h) Energy preset

In the “Energy preset” menu, you can set the active energy and reactive energy, set range 0.00~9999999.99, the display menu is shown below:

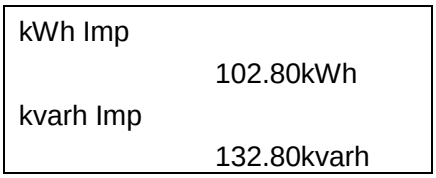


Figure 4.4.3.12 energy preset page

i) Analog output

In the “Analog output” menu, you can set analog output parameters. The setup method is the same as that of the Relay param. The display menu is shown below:

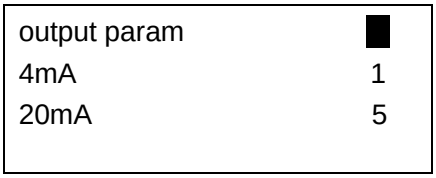


Figure 4.4.3.13 Analog output page

Note: If the device is not equipped with analog output function, the menu will not be displayed.

In the “View setup” menu, the display content is similar with “Setup” menu. You can’t change the parameters but you can query the parameters via pressing the<◄>and<▲> buttons.

4.4.4 Parameters List

4.4.4.1 Device Parameters List

Table4.4.4.1 Device Parameters List

Menu 1 Menu 2 Menu 3	illumination	Content	Default
Enter password	Please enter right password	0~9999	0000
System			
MTA	The specification of MTA	1/5/10/15/25/50/75/100/150/200/300/400/800(A)	200A
Phase TA ratio	3-phase current ratio	1~1000/1~5000	1

[Note1]			
IN	The specification of zero-sequence CT	1/5(A)	5A
IN TA ratio	The zero-sequence current ratio	1~1000	40
Ie[Note2]	Rated current	0.2A~5000.0A	140.0A
Primary Ue	Primary rated voltage, line voltage	100V~800V	380V
Secondary Ue	Secondary rated voltage, line voltage	100V~800V	380V
Control key[Note3]	Control buttons enable	disable/emergy/local /remote	disable
Stop DI type	the DI which is configured as stop is normally open or normally closed	NO/NC	NC
SBO	DO Remote control preset selection	off/on	on
DI power [Note 4]	DI sampling mode	00000000/ 11111111	00000000
Test mode	Test function selection	on/off	off
Frequency	Rated frequency selection, in accordance with system frequency	50Hz/60Hz	50Hz
Language	Display language selection	Chinese/English	English
DP break stop	Stop selection when DP breaks	yes/no	no
Communication			
Protocol	Modbus/Profibus		
ID	Communication address	Modbus: 1~247 Profibus: 1~125	1
Baudrate	Communication baud rate(only Modbus supports)	1200/2400/4800/9600/ 19200	9600
Parity	Communication parity(only Modbus supports)	8N2/8O1/8E1/8N1/8O2/ 8E2	8E1
Relay			
Start overtime	Parameter settings of start overtime protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Delay	Delay time	0.1s~99.9s	30.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Thermal overload	Parameter settings of thermal overload protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	trip+alarm
Pickup	Current threshold	1.00Ie~6.00Ie	1.00Ie
Time factor	Time factor	0.1~99.9	2.0
Heat loss	Cooling methods	equation/once	equation

Prewarning	Thermal overload early warning function selection	off/1~99%	30%
Heat threshold	Return threshold	off/1~100%	off
Reset mode	Reset mode selection	manual/auto	manual
R1/R2/R3	Link output	R1/R2/R3	Select none
Jam	Parameter settings of jam protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Pickup	Current threshold	1.0Ie~10.0Ie	3.5Ie
Delay	Delay time	0.1s~99.9s	4.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Ground	Parameter settings of ground protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	trip+alarm
Pickup	Current threshold	0.1Ie~8.0Ie	1.0Ie
Delay	Delay time	0.0s~99.9s	0.1s
Type	Zero-sequence current calculation method selection	3I0/IN	3I0
R1/R2/R3	Link output	R1/R2/R3	Select none
Phase loss	Parameter settings of phase loss protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	trip+alarm
Delay	Delay time	0.1s~99.9s	2.5s
R1/R2/R3	Link output	R1/R2/R3	Select none
Imbalance	Parameter settings of imbalance protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	alarm
Percentage	Imbalance threshold	10%~100%	30%
Delay	Delay time	0.1s~99.9s	5.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Under power	Parameter settings of under power protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Pe	Rated power of motor	0.1kW~999.9 kW	75.0kW
Pickup	Power threshold	0.10Pe~0.95Pe	0.40Pe
Delay	Delay time	0.5s~99.9s	5.0s
R1/R2/R3	Link output	R1/R2/R3	Select

			none
Short [Note **5]**	Parameter settings of short protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	trip+alarm
Pickup	Current threshold	3.0Ie~10.0Ie	7.5Ie
Start multiple	Current threshold multiple in the start process	1.00~2.00	2.00
Delay	Delay time	0.0s~99.9s	0.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Under volt	Parameter settings of under volt protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Pickup	Voltage threshold	0.3Ue~0.95Ue	0.45Ue
Delay	Delay time	0.1s~99.9s	9.0s
No_I lock	No current lock function	on/off	on
R1/R2/R3	Link output	R1/R2/R3	Select none
Over volt	Parameter settings of over volt protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Pickup	Voltage threshold	1.05Ue~1.60Ue	1.20Ue
Delay	Delay time	0.1s~99.9s	4.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Under load	Parameter settings of under load protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Pickup	Current threshold	0.10Ie~1.00Ie	0.40Ie
Delay	Delay time	1s~999s	20s
R1/R2/R3	Link output	R1/R2/R3	Select none
tE time	Parameter settings of tE time protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Time factor	Time factor	0.1s~99.9s	6.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Overcurrent	Parameter settings of overload protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off

Pickup	Current threshold	1.0Ie~10.0Ie	1.2Ie
Delay	Delay time	0.1s~99.9s	30s
R1/R2/R3	Link output	R1/R2/R3	Select none
Interlock	Parameter settings of interlock protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
type	the interlock DI which is configured as stop is normally open or normally closed	NO/NC	NO
Delay	Delay time	0.0s~99.9s	0.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
LOP	Parameter settings of LOP protection		
Config	Output mode selection	off/alarm	alarm
R1/R2/R3	Link output	R1/R2/R3	Select none
Phase reversal	Parameter settings of phase reversal protection		
Config	Output mode selection	off / trip	off
R1/R2/R3	Link output	R1/R2/R3	Select none
Loop abnormal	Parameter settings of loop abnormal protection		
Config	Output mode selection	off/alarm/trip/trip+alarm	off
Delay	Delay time	0.1s~99.9s	1.0s
R1/R2/R3	Link output	R1/R2/R3	Select none
Contactor	Parameter settings of contactor protection		
Config	Contactor protection function selection	on/off	on
Pickup	The maximum breaking current of contactor	4.0Ie~10.0Ie	8.0Ie
Emergency stop	Parameter settings of emergency stop alarm		
Config	emergency stop alarm function selection	on/off	off
Residual I [Note **6]**	Parameter settings of residual I protection		
Alarm config	Alarm function selection	on/off	off
Trip config	Trip function selection	on/off	off

Alarm pickup	Alarm current threshold	20~500mA	70mA
Trip pickup	Trip current threshold	20~500mA	150mA
Start multiple	Current threshold multiple in the start process	1.00~2.00	2.00
Alarm delay	Alarm delay time	0.0 s ~99.9 s	1.0s
Trip delay	Trip delay time	0.0 s ~99.9 s	0.1s
R1/R2/R3	Link output	R1/R2/R3	Select none
Reset mode [Note **7]**	Reset mode settings		
Trip reset	Trip reset mode	manual/auto	manual
Alarm reset	Alarm reset mode	manual/auto	manual
Control function			
Restart	Parameter settings of restart		
Config	Restart function selection	on/off	off
Quick start	Immediately start time	off/0.1s~9.9s	2.5s
Allowed time	Allowable time of power loss	0.5s~300.0s	20.0s
Start delay	Start delay time	0.1s~300.0s	0.1s
Low volt	Low voltage threshold	0.30Ue~0.95Ue	0.45Ue
Recover volt	Recover voltage threshold	0.80Ue~1.60Ue	0.80Ue
Aid OUT	Link output selection	none/DO1~DO5	none
Aid out delay	Aid out delay time	0.0s~300.0s	1.0s
Autostart	Parameter settings of automatic start function		
Config	Automatic start function selection	on/off	off
Mode	Automatic start mode selection	recover/start	recover
Delay	Delay time	0.1s~99.9s	0.1s
Control param	Refer to 4.4.4.2 Control Parameters Expatiation		
Auto reversing start [Note **8]**	Parameter settings of automatic reversing start		
Config	Automatic reversing start function selection	on/off	off
Forward time	Forward rotation time	1s~999s	600
Reverse time	Reverse rotation time	1s~999s	600
Stop time	Stop rotation time	1s~999s	300
Times	Rotation number	0~65535	0
Programable [Note 9]			

On off module	Parameter settings of the on off module		
Config	Control mode selection	on/off	off
50P module	Parameter settings of the 50P module		
Pickup	Current threshold	0.01Ie~10.00Ie	1.00Ie
27P module	Parameter settings of the 27P module		
Pickup	Voltage threshold	0.1~6.0Ue	1.0Ue
37P module	Parameter settings of the 37P module		
Pickup	Power threshold	0.1~999.9kW	30.0kW
50N module	Parameter settings of the 50P module		
Pickup	Current threshold	0.01~10.00Ie	1.00Ie
Timer1 module	Parameter settings of the timer1 module		
Act delay1	Act delay time	0.0s~99.9s	1.0s
Return delay1	Return delay time	0.0s~99.9s	1.0s
Timer2 module	Parameter settings of the timer2 module		
Act delay 2	Act delay time	0.0s~99.9s	1.0s
Return delay 2	Return delay time	0.0s~99.9s	1.0s
Expand module	Parameter settings of the expand module		
Expand time	Expand delay time	0.0s~99.9s	1.0s
Act mode	Act mode selection	expand/delay	expand
Digital outputs			
R1	Return time of link output R1	Latch/0.1s~99.9s	1.0s
R2	Return time of link output R2	Latch/0.1s~99.9s	1.0s
R3	Return time of link output R3	Latch/0.1s~99.9s	1.0s
Energy preset			
kWh Imp	active energy	0~9999999.99kWh	0.00kWh
kvarh Imp	reactive energy	0~9999999.99kvarh	0.00kvarh
Analog output			
Output param	Parameter settings of analog output	Ia/Ib/Ic/P/Ir/In	Ib
4mA	Setting value of 4mA output	-999999~999999	0
20mA	Setting value of 20mA output	0~999999	200

Note 1: The 3-phase current ratio：The biggest specifications of MTA is 800A, Corresponding to the maximum power of motor is 400kW. For larger power motor need to be configured standard TA. Such as 500kW motor, you need to configure a 1200A/5A standard TA and you also need to configure the PMC-MTA-5A. At the same time, the 3-phase current ratio should be set to 240(1200/5). When the MTA specification is 1A, the 3-phase current ratio could be set from 1 to 5000; when the MTA specification is 5A, the 3-phase current ratio could be set from 1 to 1000; other case the 3-phase current ratio could only set to 1.

Note 2: The setup range of Rated current is relate with MTA specifications, specific relationship is as follows table(The MTA of 10A/15A/50A/75A/150A/200A is no longer recommended, so the rated current range of the six specifications is not described).The following table shows the relationship between rated current set range and the specification of the MTA, and not as a basis for selection of MTA, in order to guarantee to select appropriate MTA, please refer to the 3-phase current sensor selection table provided by the company.

MTA specifications	Rated current setup range
1A	0.2A~1.0A
5A	0.8A~5.0A
25A	5.0A~25.0A
100A	25.0A~100.0A
300A	100.0A~300.0A
400A	240.0A~400.0A
800A	320.0A~800.0A

Note 3: When “disable” is selected, the panel control button is invalid; When “Emergy” is selected , the panel control button is always valid and unrelated to “local/remote” DI; When “local” is selected and “local/remote” DI is opened, panel control button is valid; When “remote” is selected and “local/remote” DI is closed, panel control button is valid.

Note 4: There are two kinds of DI power for DC and AC sampling respectively, specific setup menu is as the following table. DI power is corresponding DI1~DI8 from right to left, each bit position corresponds to a DI, When the bit is 1, the corresponding DI is AC sampling; When the bit is 0, the corresponding DI is DC sampling. Shown in the following table, such as 00000101, the sampling type of DI1 and DI3 are AC sampling, others are DC sampling.

Setup menu	DI power 0 0 0 0 0 1 0 1
illumination	DI8⇐DI1

Note 5: In the short protection, Pickup* Start multiple<10Ie.

Note 6: If the device is not equipped with residual current protection function, the protection menu will not be displayed.

Note 7: When the "Reset mode" is set to manual, "trip output" and "alarm output" need to reset manually after fault disappears. When the "Reset mode" set to automatic, "trip output" and "alarm output" will be automatic return after fault disappears. When the "trip output" isn't configured and the "Reset mode" is set to manual, the start command will be locked after protection trip until reset manually.

Note 8: When the "Reversing Start" was selected, the "Auto reversing start" menu will be displayed.

Note 9: There are six kinds of programmable logic totally. Every programmable logic has the same parameters, only by logic 1 example for parameters Settings.

4.4.4.2 Control Parameters Expatiation

Setup→ Control function→ Control param. In the application, you should select right start mode according to the actual situation. First, you should set start mode and then you can set the related parameters. The detailed parameters are as follow table:

Table 4.4.4.2 Control Parameters List

Start mode	Control param			
	Item	illumination	Content	Default
direct	Mode	The motor start mode	direct	direct
volt-reduced	Mode	The motor start mode	volt-reduced	volt-reduced
	Delay	The delay time of voltage-reduced start	1.0 s~99.9 s	25.0s
	Switch I	Current threshold from voltage-reduced to full voltage	off/0.1Ie~3.0Ie	off
	Restart direct	When the voltage loss time is less than this time, the device will directly restart the motor to full voltage state.	off/0.1s~99.9s	off
	Start mode	The start model of voltage-reduced start	mode1/mode2	mode1
reversing	Mode	The motor start mode	reversing	reversing
two speed	Mode	The motor start mode	two speed	two speed
	Current 1	The rated current of the motor Speed 1	0.2Ie~5.0Ie	1.0Ie
	Current 2	The rated current of the motor Speed 2	0.2Ie~5.0Ie	0.5Ie
inverter aid	Mode	The motor start mode	inverter aid	inverter aid
	Delay	The delay time of inverter aid control	1.0s~99.9s	10s
big motor aid	Mode	The motor start mode	big motor aid	big motor

				aid
	Delay	The delay time of big motor aid control	1.0s~99.9s	10s

4.4.4.3 DI/DO Configure List

Setup→DIDO config→DI config, DO config. When you want to configure DI and DO, please reference to specific engineering drawings. The detailed illumination of DI/DO configuration refers to table 4.4.4.3.1 and table 4.4.4.3.2.

Table4.4.4.3.1 DI Configure List

DI config		
Function	**Item**	**illumination**
status signal	common state	State signal monitoring, not participating protection and control logic, configuring two or more DI to the same function is allowed.
	local/remote	Local and remote authority control; when this DI is closed, the control authority is remote; when this DI is open, the control authority is local.
	interlock	Interlock trip signal.
	KMA state	Contactor status. In the “Inverter aid Start”, KMA state is Inverter state signal. In the “Big Motor aid Start”, KMA state is big motor state signal. In the others control mode, KMA state is contactor A state signal.
	KMB state	Contactor status. In the “Inverter aid Start”, KMB state is cooling fan state signal. In the “Big Motor aid Start”, KMB state is small motor state signal. In the others control mode, KMB state is contactor B state signal.
	QF state	The status of air switch.
control command	emergency stop	Emergency stop signal, not affected by control authority.
	stop	Stop signal, not affected by control authority.
	remote stop	Remote stop signal, the command is valid when the control authority is remote, and configuring two or more DI to the same function is allowed.
	local stop	Local stop signal, the command is valid when the control authority is local, and configuring two or more DI to the same function is allowed.
	remote start A	Remote start A control signal, the command is valid when the control authority is remote, and configuring two or more DI to the same function is allowed.
	remote start B	Remote start B control signal, the command is valid when the control authority is remote, and configuring two or more DI to the same function is allowed.
	local start A	Local start A control signal, the command is valid when the control authority is local or the local/remote DI does not be configured, configuring two or more DI to the same function is allowed.
	local start B	Local start B control signal, the command is valid when the control authority is local or the local/remote DI does not be configured, configuring two or more DI to the same function is allowed.

	R-close trip A	Single DI controls the forward start and stop of the motor, affected by control authority. The control authority of this DI is remote.
	R-close trip B	Single DI controls the reverse start and stop of the motor, affected by control authority. The control authority of this DI is remote.
	start lock NO	All the start command will be prohibited when this DI is closed, configuring two or more DI to the same function is allowed.
	start lock NC	All the start command will be prohibited when this DI is opened, configuring two or more DI to the same function is allowed.
	reset protect	The function of this DI is same as reset key.
	emergy start A	Emergency start A control signal, not affected by control authority.
	emergy start B	Emergency start B control signal, not affected by control authority.
	L-close trip A	Single DI controls the forward start and stop of the motor, affected by control authority. The control authority of this DI is local.
	L-close trip B	Single DI controls the reverse start and stop of the motor, affected by control authority. The control authority of this DI is local.
	Close trip A	Single DI controls the forward start and stop of the motor, not affected by control authority.
	Close trip B	Single DI controls the reverse start and stop of the motor, not affected by control authority, the control authority of this DI is local.

Table 4.4.4.3.2 DO Configure List

DO config	
Item	**illumination**
spare	Spare output.
trip contactor	The DO which opening contactor.
self-check	The device self-check alarm signal output.
start A	Closing output, the function is different in different control modes. Refer to table 4.4.4.3.3
start B	Closing output, the function is different in different control modes. Refer to table 4.4.4.3.3
alarm	Protection alarm signal output.
trip breaker	The DO which opening air switch.
trip cold fan / trip small M	Trip cold fan in the inverter aid control and trip small motor in the big motor aid control.
R1	Protection link output 1.
R2	Protection link output 2.
R3	Protection link output 3.
motor running	When the motor is in the running status, this DO will be acted.

Note：

(1) It will be delayed 6s to process after the power on of PMC-550J, the signal is Level signal and lock start command after delaying 150ms. The trip state will be keeping after trip relay acts.

When emergency stop alarm is enabled, the DI action of emergency stop alarm will produce emergency stop alarm information and light alarm lights. In device parameters, you can set the stop DI for closed contacts or open contacts.

(2) For the start command, the device will delay 6s after power up then begin to test the command. In order to prevent disturbance, please make sure that the pulse width of the command is greater than 150ms so that the device can execute the corresponding command; if it is less than 150ms, the device will clear it as disturbance.

(3) Close trip A and Close trip B are not affected by control authority, special execution logic: if a DI is configured as Closed trip A or Close trip B, when the DI is closed, the motor will start; when the DI is opened, the motor will stop. The control authority of R-close trip A and R-close trip B is remote, the control authority of L-close trip A and L-close trip B is local, their control logic is the same as that of Close trip A and Close trip B.

(4) The logic of emergency start comprise of "reset + start". If all the protection return, emergency start firstly resets output and clears heat, and then execute start command; if protection acts and does not return , emergency start A/B command is invalid.

(5) The device provides two motor control modes: single DO control and two DO control. If the trip contactor is not configured, the device will choose the single DO control mode; after receiving the start command, start A or start B will be closed and kept in this state; after receiving stop command, they will be opened.

(6) Protection link output: if this protection acts (trip, alarm or trip +alarm), the related Link output will also act.

(7) self-check：Generally, this output is configured on the normally-closed DO, when the output acts, it indicates that the device passes the self-check.

(8) In different control modes, the function of start DI/DO is different. Specify refer to table 4.4.4.3.3.

Table 4.4.4.3.3 Start DI/DO Configure List

Start mode	DI control command		DO output	
	Start A	Start B	Start A	Start B
direct	Start A	invalid	Start A output	invalid
volt-reduced	voltage reduced start command	invalid	voltage reduced output	full voltage output
reversing	forward start command	reverse start command	forward start output	reverse start output
two speed	speed 1 start command	speed 2 start command	speed 1 output	speed 2 output

inverter aid	start inverter	invalid	inverter output	cold fan output
big motor aid	start big motor	invalid	big motor output	small motor output

DIDO Configuration Example: 8DI/5DI+direct. Specific configuration refer to table 4.4.4.3.4

Table 4.4.4.3.4 The DI/DO Configure of direct start

DI	Function	DO	Function
DI1	local/remote	DO1	trip contactor
DI2	local start A	DO2	start A
DI3	local stop	DO3	trip breaker
DI4	remote start A	DO4	alarm
DI5	common state	DO5	spare
DI6	QF state		
DI7	KMA state		
DI8	common state		

4.4.5 SOE logs

In the SOE Logs menu, you may view Relay logs, DI/DO logs, Diag. logs, Start report logs. There are 64 events with time stamp totally. Choose the desired protection and press the <Setup> buttons to enter the submenu. Then press the <◀>and<▲>buttons to show SOE Logs.

```
Relay   logs
DI/DO   logs
Diag.   logs
Start   report logs
```

Figure 4.4.5.1 SOE Logs Page

a. SOE Logs: The SOE Logs includes Relay logs, DI/DO logs, Diag. logs. There are 64 events with time stamp totally. Below is the display example of Short protection alarm, programmable logic action (the logic diagram of Interlock alarm protection in section 3.5 is taken as an example), DI1 log, DO1 log, A/D sample error, Adjust param error, the display menus are shown below.

Relay logs:

```
01. Short alarm
UAB= 10.12V   UBC=333.92V
UCA=331.08V
IA= 1100.0A   IB= 1111.2A
IC= 138.36A   IN=   0.11A
09/12/30     13:28:59:725
```

```
02. Interlock alarm
UAB= 381.12V   UBC=381.59V
UCA=381.03V
IA= 20.15A   IB= 20.58A
IC= 20.33A   IN=   0.00A
09/12/30     23:59:59:999
```

DI/DO logs：

01.DI1 R-close trip A open 11/08/30 13:38:42:657	02.DO1 trip contactor act 11/08/30 13:39:29:248

Diag. logs

01. A/D sample error 1250mV 000000 11/08/19 15:26:37:356	02. Adjust param error 11/08/19 14:38:46:328

Figure 4.4.5.2 SOE logs page

Note: The display of AD sampling error is different to others. As show above, the "1250mV" is error value; BIT0~BIT5 represent the input channel UAB, UBC, IA, IB, IC, IN(IR).

b. Start report logs：The start report records start I, start time, start V and time stamp. The start I is the maximum current value in the motor start process, start time is the time for the motor start from the beginning to the end, and start V is the minimum voltage in the motor start process. There are 8 start reports with time stamp totally, and the display menus are shown below.

01. Start I = 974.21A Start time = 15.5s Start V = 342.50V 11/08/30 13:38:42:657

Figure 4.4.5.3 Start report logs page

4.4.6 Statistics

In the Statistics menu, the following data will be displayed: the last 3-phase tripping current (Trip IA, Trip IB, Trip IC), number of trips(Trip times), start current, start time, number of starts (Start times), total running time, running time, stop time. You may turn pages via the <◀>and<▲>buttons.

Statistics (page1)

Trip IA	123.456A
Trip IB	123.465A
Trip IC	123.456A
Trip times	15

Statistics (page2)

Start I	5.456A
Start time	3.00s
Start times	56

Statistics (page3)

Total running time	500h
Running time	10h
Stop time	900h

Figure 4.4.6 Statistics page

4.4.7 Maint

In the Maint menu, you may modify the Date/time, Change password, Clear data, Diagnosis and Adjust contrast. You may choose the desired option via the <◀>and<▲>buttons. You need to input the password to set such parameters. Default password: 0000.

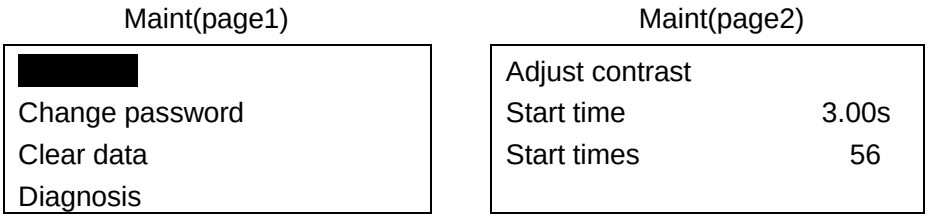


Figure 4.4.7 Maint page

1. Date/Time: In the Date and Time menu, you may view and modify the time of the device. the display menu is shown below:

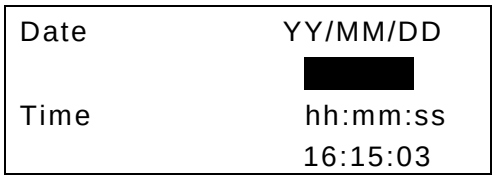


Figure 4.4.7.1 Date/Time page

2. Change password: In the Change password menu, you may modify the password. If the new password entered for the first time is different from that for the second time, the prompt “Password differ!” will be displayed; at this time, press the <Setup↵>button to re-enter the new password. Press the <Reset↶> button on the page 1 and page 2, and then the menu will back to the Maint. The password is not saved.

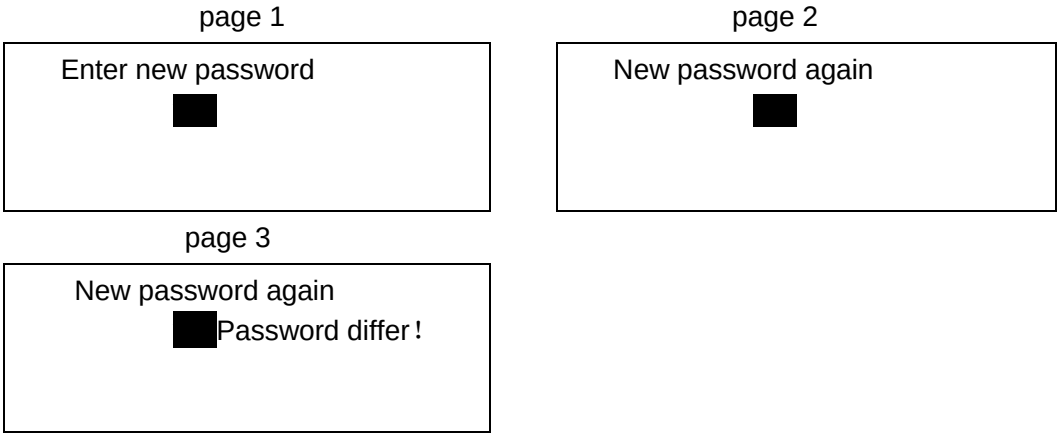


Figure 4.4.7.2 Change password page

3. Clear data: In the Clear Data menu, you may clear statistics information, SOE, energy and start report. You may choose the desired option via the <◀>and<▲>buttons.

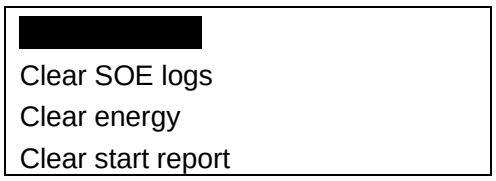


Figure 4.4.7.3.1 Clear data page

Below is the example of clear statistics information, others data clear method is the same as that of clear statistics. Choose the Clear statistics menu and press the <Setup> buttons to enter the submenu. You may choose “YES” or “NO” via the <◀> and <▲> buttons, then press the <Setup> buttons to affirm choice and press the <Reset> button to exit and back to the previous menu.

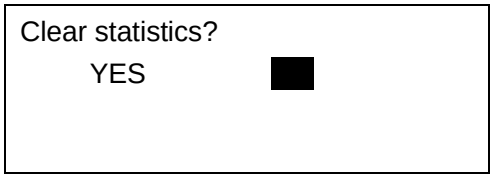


Figure 4.4.7.3.2 Clear data page

4. Diagnosis: the Diagnosis menu is used to display the diagnostic status of the wiring of the voltage and current, and the specific menu page is as follows:

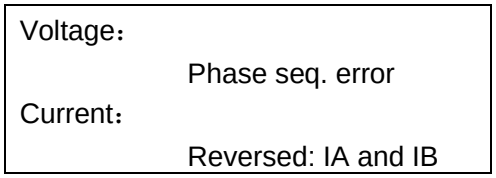


Figure 4.4.7.4 Diagnosis page

Note:

Voltage wiring diagnosis: Normal and Phase seq. error.

Current wiring diagnosis: Normal, Phase seq. error, Reversed: IA and IB, Reversed: IB and IC, Reversed: IC and IA and I polarity reversed.

5. Adjust contrast: in the “Adjust contrast” menu, you may modify the LCD screen contrast. Press the <Setup> button to enter the modify mode; at this time, press the<▲>button to modify the parameters. When finished modifying, press the <Setup>button to save the change. Press the<Reset> button to exit and back to the previous menu.

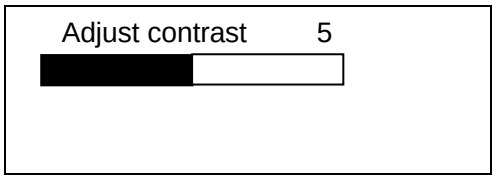


Figure 4.4.7.5 Adjust contrast page

4.4.8 Version

In the Version menu, you may view version information. The display format is as follows:

Software ver	2.00.09
Protocol ver	2.1
Ver date	15.03.30
S/N	0905121234

Figure 4.4.8 Version page

5 Installation and Connection

5.1 Machine Installation

5.1.1 Mechanical Dimensions

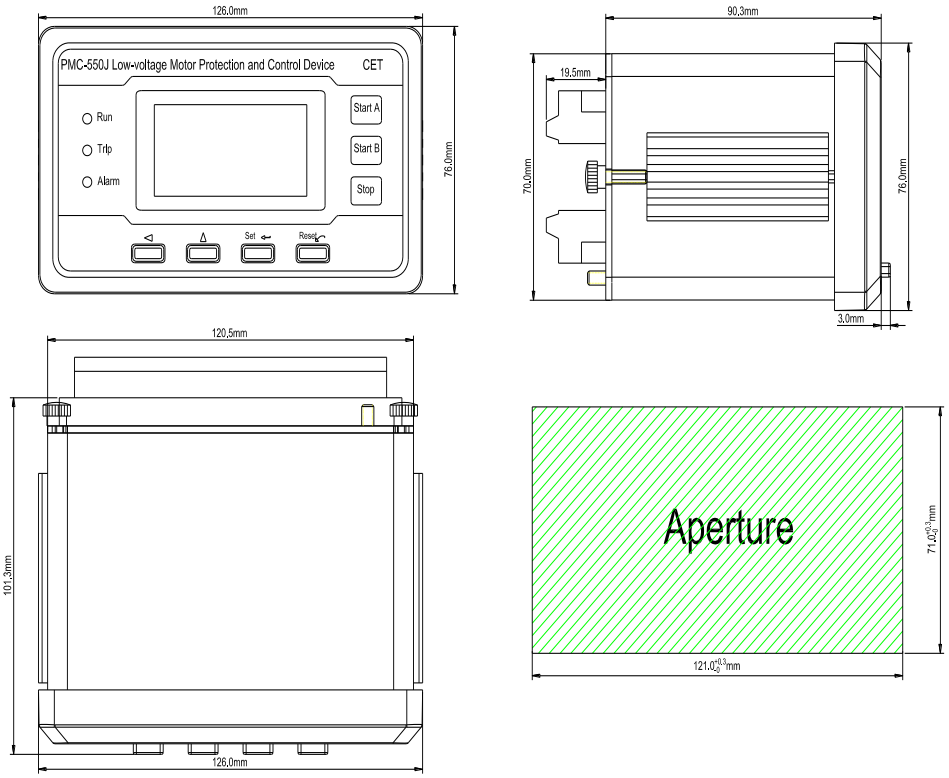


Figure 5.1.1 Mechanical Dimensions

Device Size: 126.0mm(length)×76.0mm(width)×90.3mm(depth)

Aperture Size: 121.0mm(length)×71.0mm(width)

5.1.2 Installation diagram

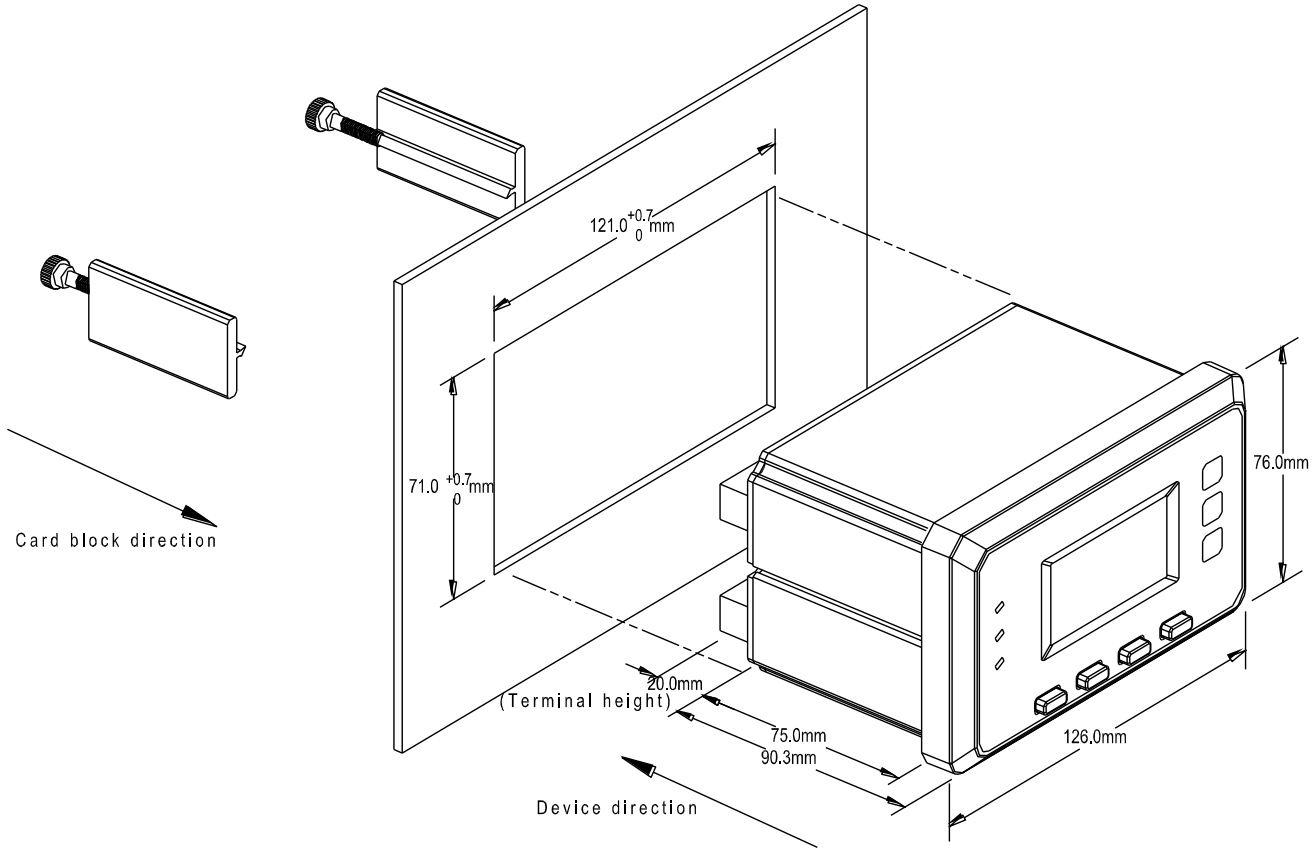


Figure 5.1.2 Installation diagram

The device is moved to the threaded hole area of the switchgear cabinet in the direction of the arrow, fixed card block can be entered into the card slot along the card slot of two sides of the device.

Installation Notes

a) Installation Environment

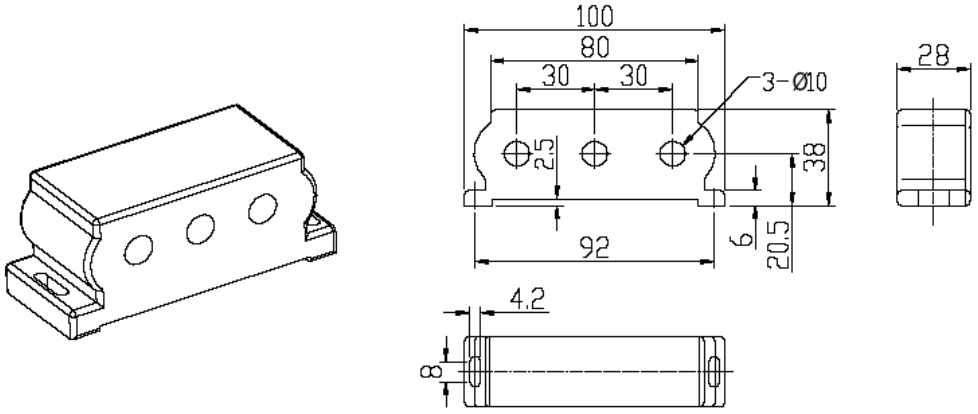
The device shall be installed in a dry, clean place away from heat and strong electromagnetic field.

b) Installation Location

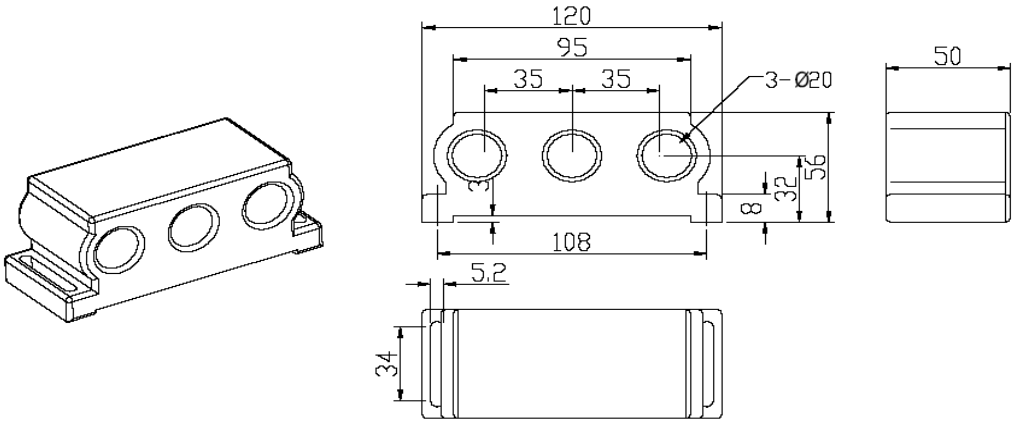
Normally installed in switchgear cabinet, so that can make it from the oil, dirt, dust, corrosive gas or other harmful substances invasion. Before installation, you should ensure that there is enough space to place the line, terminal, short boards, and other necessary equipment.

5.1.3 MTA

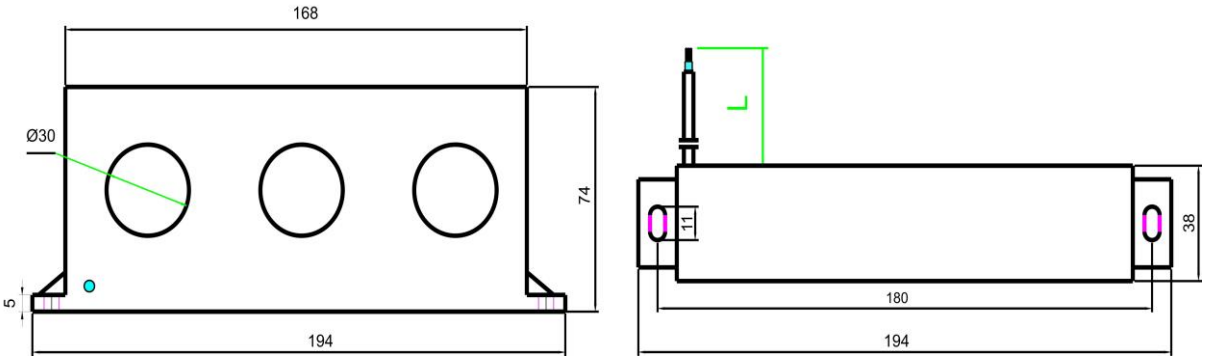
1. MTA-1A/5A, Inner diameter: 10mm



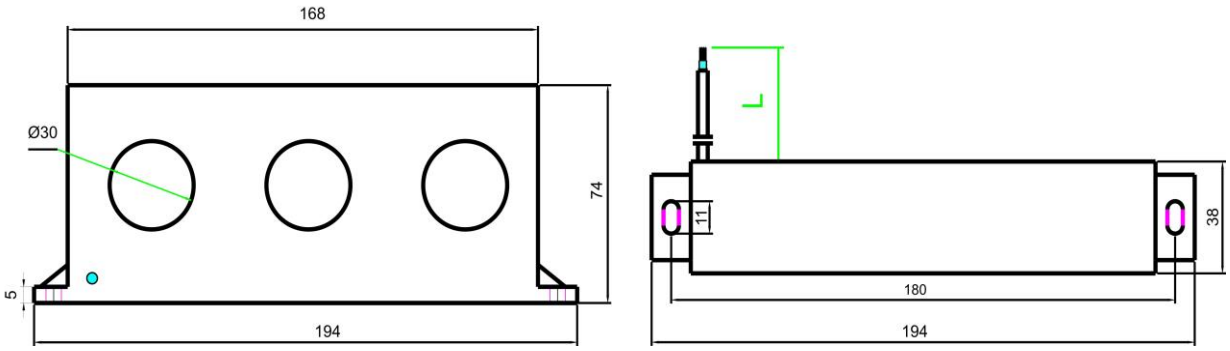
2. MTA-25A, Inner diameter: 20mm



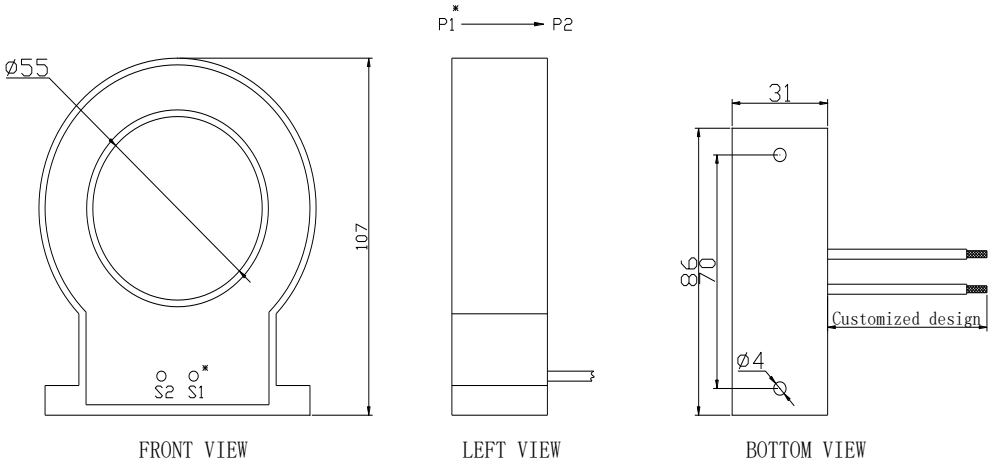
3. MTA-100A, Inner diameter: 30mm



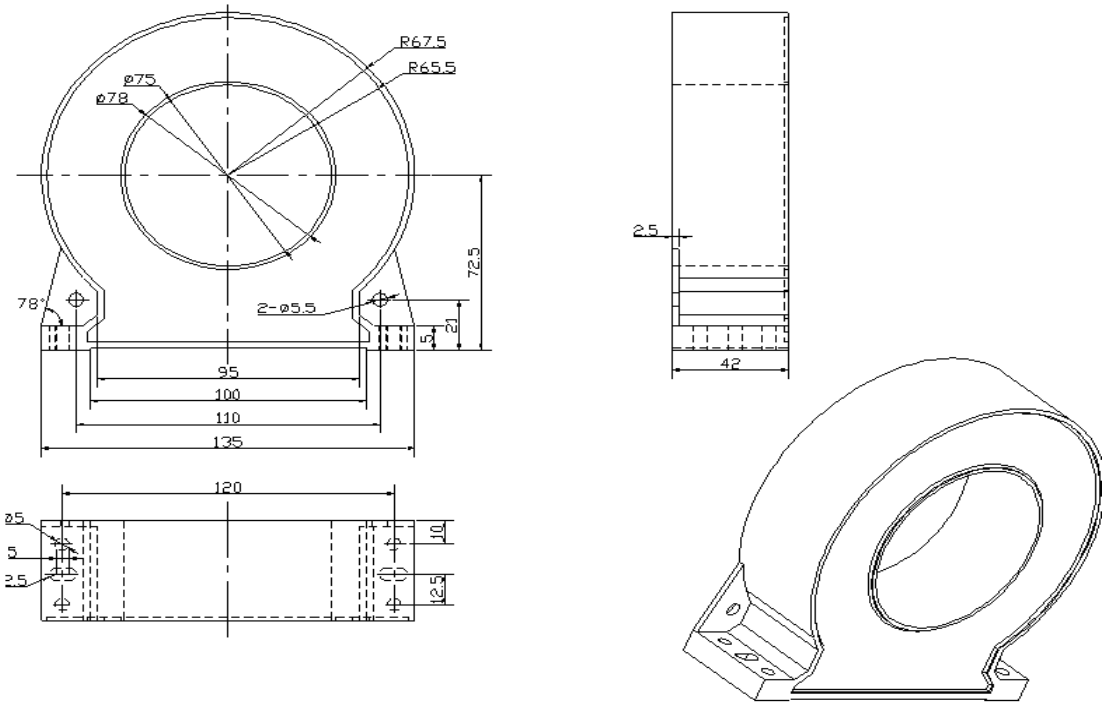
4. MTA-300A, Inner diameter: 30mm



5. MTA-400A,Inner diameter: 55mm, 3pcs for one group

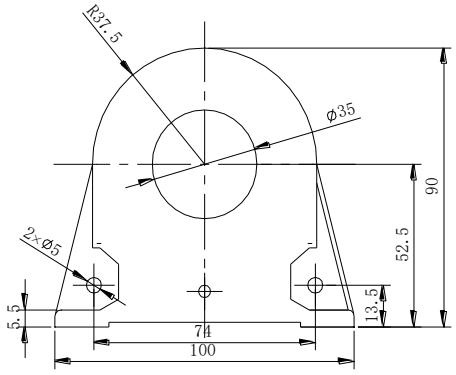


6. MTA-800A, Inner diameter: 75mm, 3pcs for one group

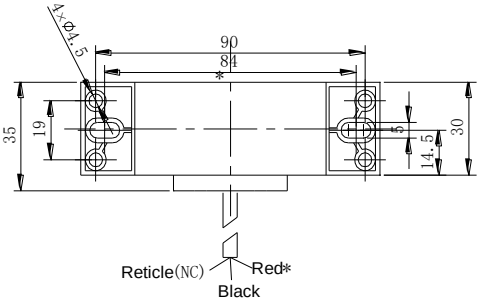


5.1.4 Residual Current Sensor

1. PMC- MIR-35, Inner diameter: 35mm

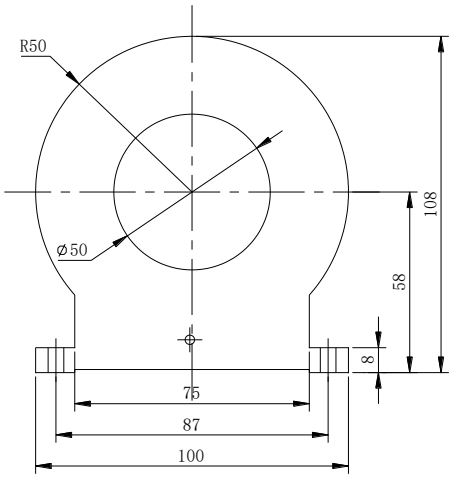


MAIN VIEW

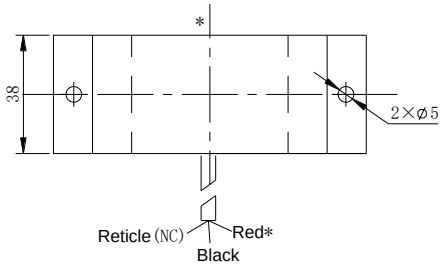


VERTICAL VIEW

2. PMC-MIR-50, Inner diameter: 50mm

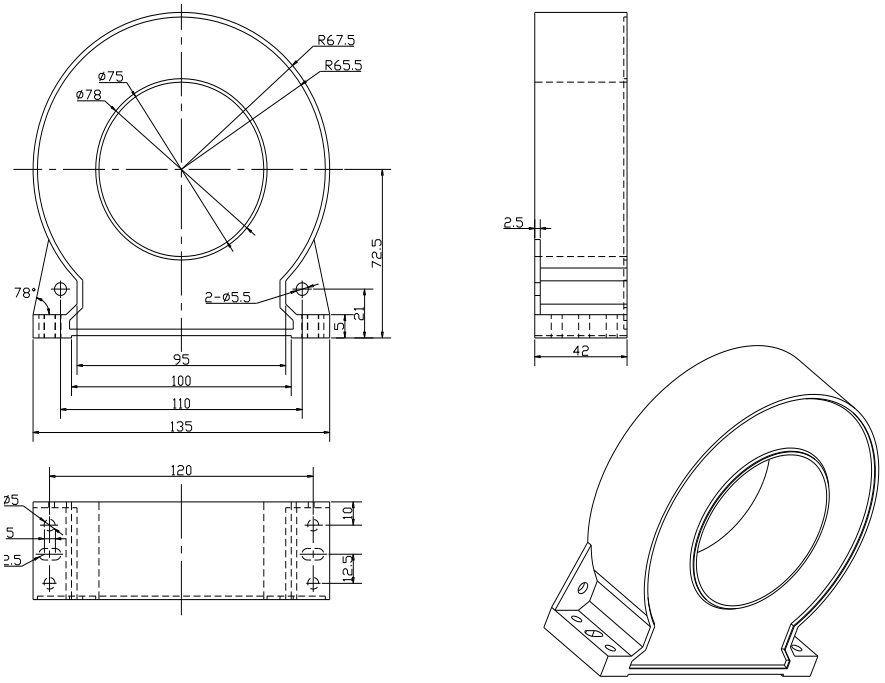


MAIN VIEW

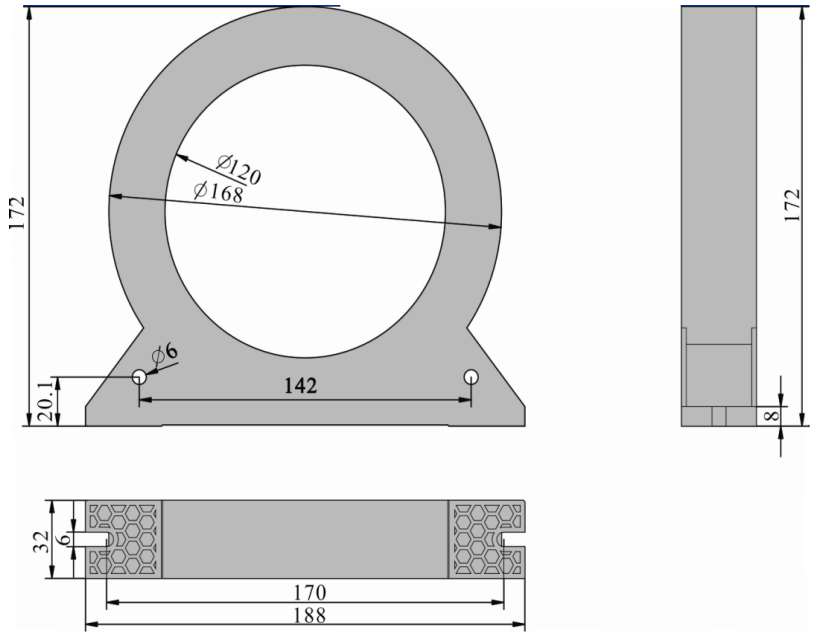


VERTICAL VIEW

3. PMC-MIR-75, Inner diameter: 75mm



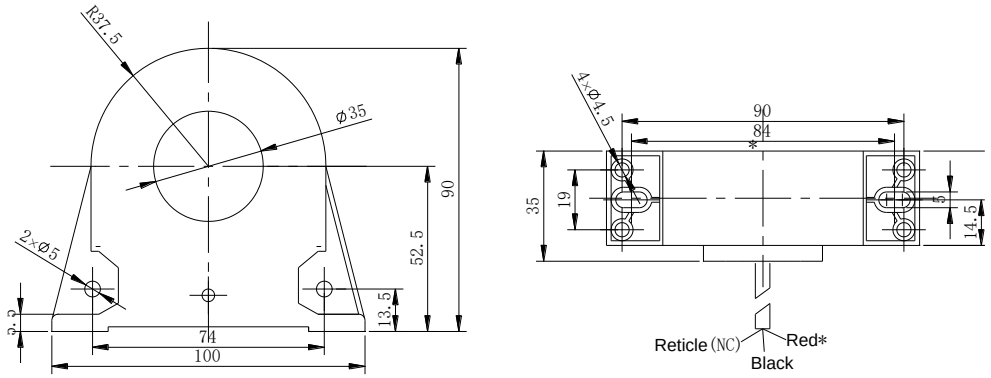
4. PMC-MIR-120, Inner diameter: 120mm



Note: The rated current of all residual current sensors is 1,000mA.

5.1.5 Zero-sequence current transformer

PMC-MIN-1A, MIN-5A, Inner diameter: 35mm



MAIN VIEW VERTICAL VIEW

5.2 Device Terminal Descriptions

5.2.1 Figure of Device Terminals

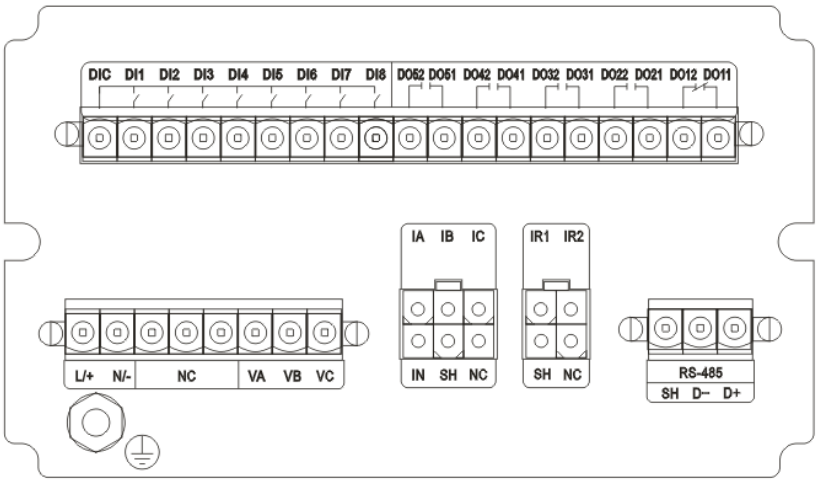


Figure 5.2.1.1 8DI+5DO+RS-485 Terminal Diagram (Residual current)

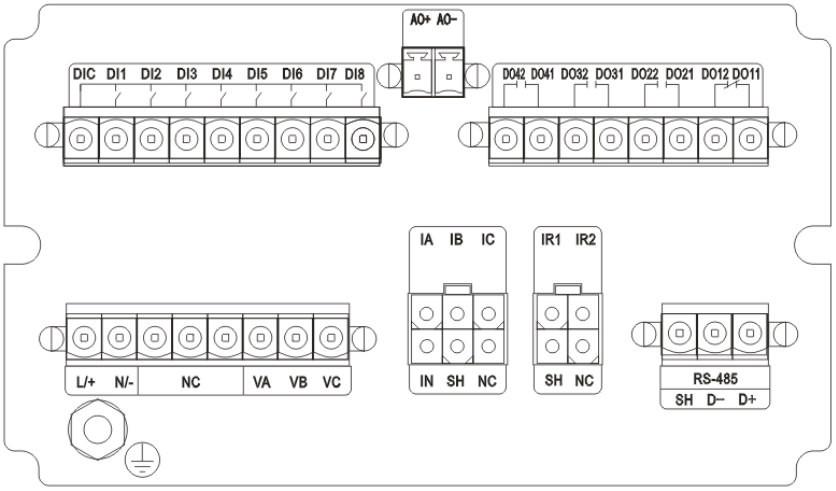


Figure 5.2.1.2 8DI+4DO+1AO+RS-485 Terminal Diagram (Residual current)

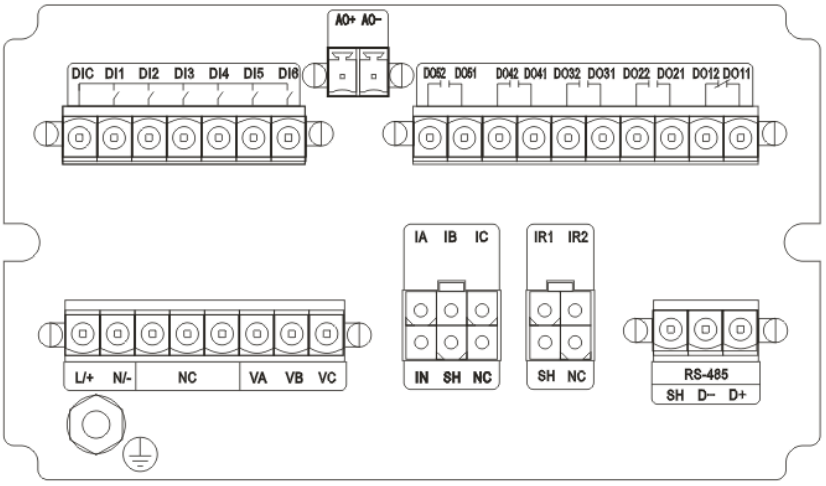


Figure 5.2.1.3 6DI+5DO+1AO+RS-485 Terminal Diagram (Residual current)

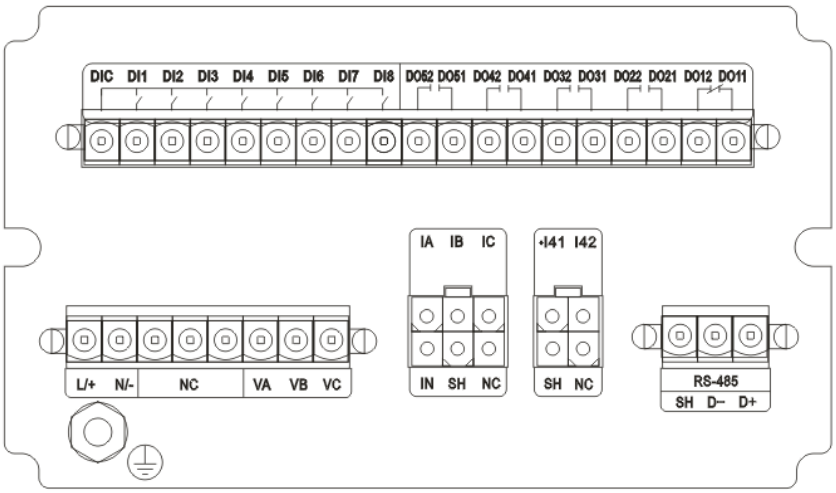


Figure 5.2.1.4 8DI+5DO+RS-485 Terminal Diagram (Zero-sequence current)

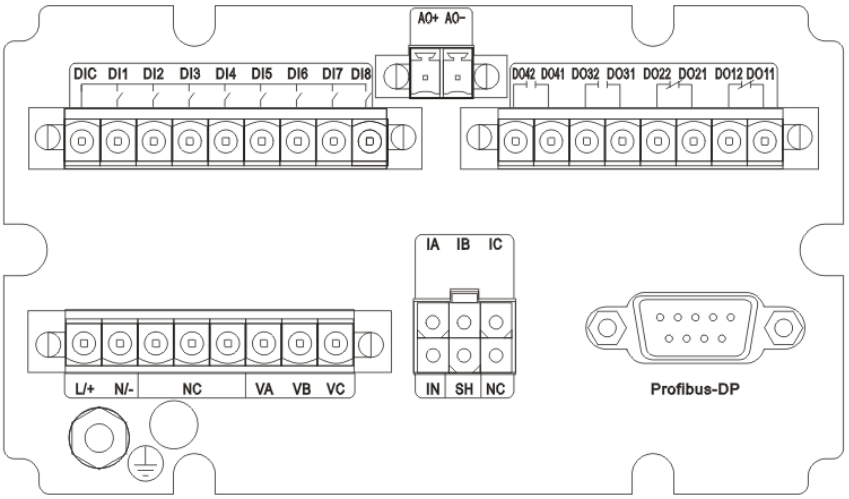


Figure 5.2.1.5 8DI+4DO+1AO+Profibus-DP Terminal Diagram

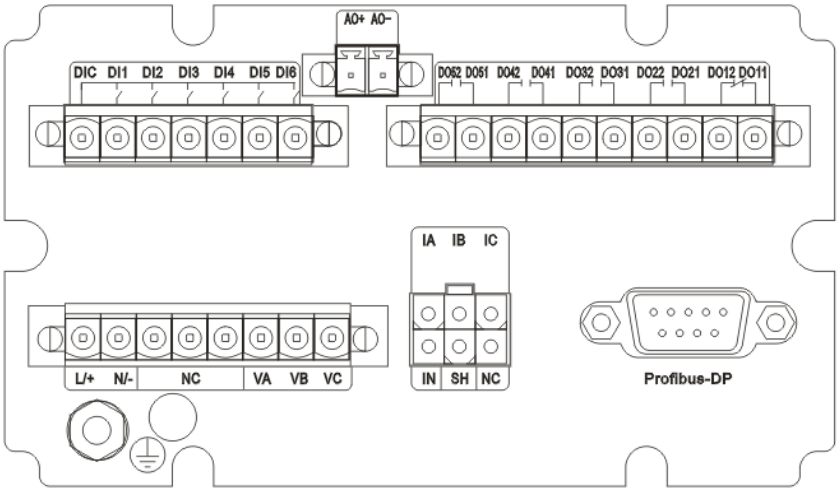


Figure 5.2.1.6 6DI+5DO+1AO+Profibus-DP Terminal Diagram

Note: If the device is not equipped with residual current protection function or Zero-sequence current function, the residual current terminal (IR1,IR2) and Zero-sequence current terminal(I41、I42) will be NC terminal.

5.2.2 Terminal Descriptions

Identifying	Description
IA/IB/IC/IN	3-phase current input (in conjunction with PMC-MTA)
VA/VB/VC	3-phase voltage input
IR1/IR2	Residual current input (in conjunction with PMC-MIR)
I41/I42	Zero-sequence current input (in conjunction with PMC-MIN)
DI1~DI8/DIC	DI1~DI8,DI Common
DO11~DO52	DO1~DO5
AO+/AO-	Analog output 4mA~20mA
D+/D-/SH	RS-485 port
Profibus-DP	Profibus-DP port
L/+、N/-	Power supply
GND	Device protected ground

5.3 Terminal Connection

There are 2 rows of terminals on the rear panel of PMC-550J. During wiring, pay attention to the phase sequence and polarity; otherwise, the measurements will be directly affected.

Analog output terminal tightening torque: 1.7Lb-In/0.2Nm；
Other terminal tightening torque: 3.5Lb-In/0.4Nm.

5.3.1 Power Supply Wiring

The working power supplies required by PMC-550J include AC power supply and DC power supply.

5.3.2 Ground Wiring

The housing of PMC-550J must be connected with the ground in order to ensure the normal operation of the device and personal safety. You may connect the grounding bolt (marked with GND) on the housing to the switchgear cabinet earth terminal (marked with PE) with lead wire.

5.3.3 AC Input Wiring

(1) 3-phase voltage input (VA, VB, VC)

For all measurements related to power and energy, the phase and frequency should refer to the VAB; so the VAB must be properly connected to ensure the accuracy of the power, energy and frequency readings. However, VAB does not affect the measurements of the voltage and current of the other lines (except the phase angle).

(2) Three-phase current input（IA、IB、IC、IN）

The current of motor is converted by MTA and then connected to PMC-550J. The main circuit cables of the motor are passed through the inner hole of the MTA in the right direction.

The secondary cable of MTA is 4 core soft wire with shielding. The wire sectional area is 0.5mm^2, the wire length is 1.5m. The yellow one is connected to the terminal IA of PMC-550J; the green one is connected to the terminal IB of PMC-550J; the red one is connected to the terminal IC of PMC-550J; the black one is connected to the terminal IN of PMC-550J; the shield wire of MTA should be connected to the terminal SH of PMC-550J.

For PMC-MTA-400A and PMC-MTA-800A, the secondary cable is 2 core soft wire with shielding, each wire sectional area is 0.5mm^2. Three MTA that each corresponds to one phase of main circuit comprise a set, and the red wire of three MTA are respectively connected to the IA, IB, IC terminals of PMC-550J (the primary phase must be corresponding to the Secondary phase); Black wire of the three MTA should be connected together to the IN terminal of PMC-550J; three MTA shield wire should be connected together to the SH terminal of PMC-550J.

Note: The MTA can not be installed at the bottom of frequency converter, the switching circuit of Star Delta Voltage reduced Start, the switching circuit of Reversing Control Start etc. The rated input of IA/IB/IC on the PMC-550J is 1.25V AC voltage and inputting current or high voltage to the three terminals will damage the device. The secondary cable shielding layer of MTA should be connected to SH terminal. Ensure that the phase and the polarity of current or voltage is correct, otherwise it will affect the measurement function, lead to error protection action.

(3)Residual current input (IR1, IR2)

You may select the MIR according to the motor capacity. The main circuit cable of the motor(IA, IB, IC, IN) cross the MIR inner hole, then you should connect the secondary cable of MIR to the terminal IR1 and IR2 of PMC-550J.

(4)Zero-sequence current input (I41, I42)

You may select the MIN (1A or 5A) according to the secondary current of the standard zero-sequence CT. The secondary cable of the standard zero-sequence CT cross the MIN inner hole, then you should connect the secondary cable of MIR to the terminal I41 and I42 of PMC-550J.

5.3.4 Digital Input Wiring

The device has 8 or 6 digital input, marked DIC,DI1,DI2,DI3,DI4,DI5,DI6,DI7,DI8. These inputs are dry contact and used to detect the status of external contacts. The DIC is the positive common. The digital input (DI) is 24VDC internally wetted. It will damage the device if you input voltage(such as220VAC)to the DIs.

If you want to connect the wet contact with 220V/110VAC/DC excitation, you need to use the PMC-KI (Figure 5.3.4). About the use of PMC-KI, please refer to its user manual. “DI power”(Setup→System→DI

power) should be set according to the excitation types. When the excitation is 220VDC/110DC, the “DI type” should be set to “0” (DC sample). When the input signal is 220VAC/110AC, the “DI power” should be set to “0” (AC sample).You could set “DI power” separately for each DI.

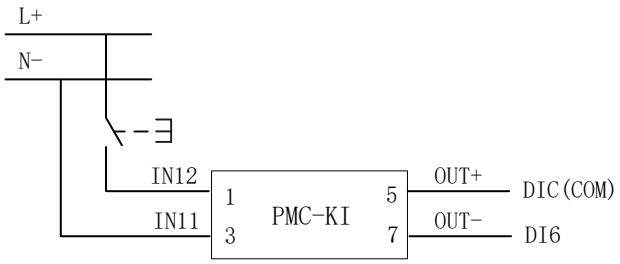


Figure 5.3.4 Schematic Diagram of PMC-KI

5.3.5 Relay Output Wiring

The device has 5 or 4 Relay, marked DO1(DO11, DO12), DO2(DO21, DO22), DO3(DO31, DO32), DO4(DO41, DO42), and DO5(DO51, DO52). The DO1 is normally closed contact, usually used as a trip export. According to device model, DO2 could be selected as normally open or normally closed contact. The DO3, DO4 and DO5 are normally open contact.

5.3.6 Analog Output Wiring

The AO of PMC-550J with inbuilt 24V power supply .Before wiring, please confirm the type of the AI module of the DCS (without power supply).

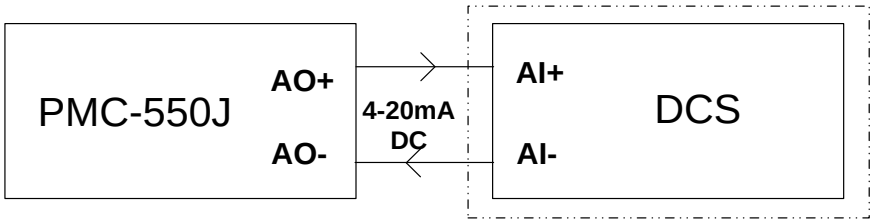


Figure 5.3.6 Schematic Diagram of AO Connection

5.3.7 Communication Wiring

(1)RS-485 Wiring

The device has a Standard RS-485 communication port, marked D+, D-. RS-485. Communication circuit using the 485 specialized isolated chip and protection circuit, which could prevent damage from common /differential mode interference、lightning stroke and wrong wiring.

You could connect 32 devices in a bus at most. The communication cable use shielded twisted-pair cable. The total length can't exceed 1200m. The positive and negative polarity of the RS-485 port for each device must be connected correctly. In engineering field, the terminal ⏚ of host and PMC-550J device must be reliably connected to the ground(marked with PE on the ground copper platoon of low voltage switchgear cabinet or communication cabinet); The shielded cable SH of RS-485 can not be connected to the ground(marked with PE); communication links can not be connected as "T" type; when

communication cable is too long or communication link equipment is too many, you should match a 120Ω resistor at the end of communication link in order to improve communications reliability. Typical wiring diagrams are shown in figure 5.3.7.1:

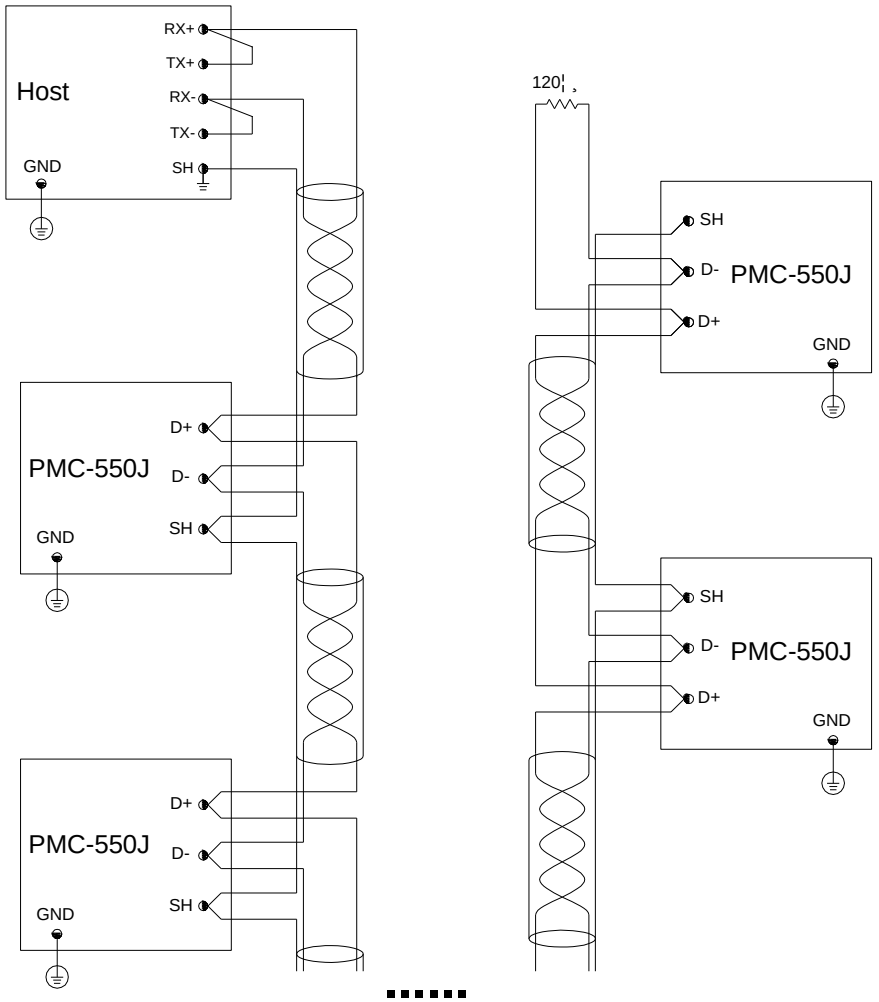


Figure5.3.7.1 Wiring Diagram of RS-485 Communication

(2) Profibus-DP Wiring

Profibus-DP communication physical interface is the standard DB9 port, and communication cable is connected with 9 pin D connector. The pin definitions of Profibus-DP communication port is as follows table:

Table 5.3.7 Pin Definitions of Profibus-DP Communication

PIN NO.	SIGNAL NAME	MEANING
1	SHIELE(NOTE1)	Shield，Protective Ground
2	M24V(NOTE1)	Minus 24V Output Voltage
3	RxD/TxD-P	Receive/Transmit-Data-P
4	CNTR-P(NOTE1)	Control-P

5	DGND	Data Ground
6	VP(NOTE2)	Voltage-Plus
7	P24V(NOTE1)	Plus 24V Output Voltage
8	RxD/TxD-N	Receive/Transmit-Data-N
9	CNTR-N(NOTE1)	Control-N
Note 1: signals are optional. **Note 2: the signal is only necessary at the end of the Profibus-DP bus cable.**		

If the device directly communicates with computer, the Profibus-DP Masters communication card needs to be installed in the computer.

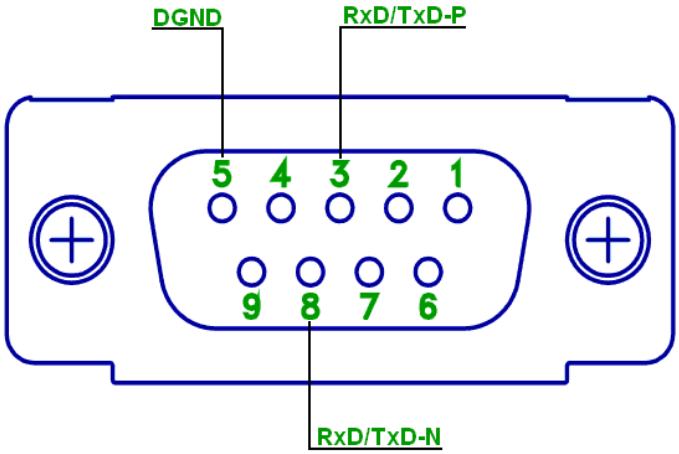


Figure5.3.7.2 Schematic Diagram of Pin Definitions of Profibus-DP Communication

5.4 Troubleshooting

1. No Display

- Please check if the power supply and other connections are connected correctly. The supply voltage should be within the specified range.
- Turn off PMC-550J and the upper monitor and power on again.

2. Abnormal Operation after Power-on

- If the device Run indicator does not flash, it will indicate that the power supply is not on or the power voltage is out of the allowable range.
- Turn off PMC-550J and the upper monitor and power on again.

3. How to realize the function of interlock trip?

- First, you should connect “interlock contact” to interlock protection DI .Then, properly set the parameters of interlock protection. Related menu: Setup→DIDO config→DI config; Setup→Relay→Interlock； Setup→DIDO config→DO config.

4. Abnormal RS-485 Communication

- Please check if the baud rate, ID and parity of the host computer/PLC are the same as the PMC-550J.
- Please check if the RS-232/RS-485 converter is normal.
- Please check the integrity of the entire RS485 communications network (short circuit, broken circuit, ground, if the shield line is grounded properly on single end).
- For long distance communications, it is recommended to connect with 120 Ω resistance at the end communication line.
- Turn off PMC-550J and PC host and then turn on again.

5. Abnormal Profibus Communication

- Please check if the ID of the host computer/PLC is the same as the PMC-550J.
- Please check if the integrity of the entire Profibus communications network is normal, if the connection is normal.
- Turn off PMC-550J and PC host and then turn on again.

6. Incorrect voltage or current readings

- Please check if the MTA are programmed correctly.
- Please check if the GND terminal is properly connected.
- Please check if the MTA is in good working order.
- For the inverter circuit, MTA should be installed before the inverter.

7. The power or power factor reading is incorrect, but the voltage and current readings are correct

- Compare the actual connection with the chosen wiring diagram to ensure correct phase sequences for voltage and current.
- Confirm MTA cable wear core direction and location is correct.
- For the reversing control motor, MTA is not in the switch loop.

8. The device reports A/D sampling error, with a sampling of null drift

- Please check if the device is properly grounded. Repeat that IN can not be grounded.
- If you can not identify the problem, please call our Service Hotline at 0755-25273351.

9. The device acts correctly but the output of the relay cannot act correctly

- Please check if the wiring of protection is correct and reliable.
- Please check if the protection output parameters are correct.
- If the above two items are correct, please call our Service Hotline at 0755-25273351.

10. The DI does not correctly reflect the actual signal

- Please check if the external auxiliary contact can act correctly and reliably
- Please check if the DI is connected correctly and reliably.

11. The contactor breaking capacity protection cannot break the air switch

- Please check the parameters of this protection are set correctly.
- Please check if the air switch is connected correctly and reliably and the air switch has field coil.

5.5 Protection control function instructions

5.5.1 Parameter settings

Protection parameters need to be set by professionals according to the motor nameplate, electric drawings and Actual operation situation. You could refer to table 4.4.4.1. The user could set protection parameters through display and communication. If you set parameters through display, please refer to chapter 4.4.4 of this document. If you set parameters through communication, please refer to help documentation of the setting software. If you want to choose MTA for motor, please refer to “selection table of PMC-MTA”.

5.5.2 Fast Search of Thermal overload Protection Characteristic Data

Table 5.5.2 Thermal overload Protection Parameter List (Iov=1.0Ie, thermal state, Unit: s)

Tov / I/Ie	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
1.5	69.72	139.43	209.15	278.87	348.58	418.30	488.02	557.73
2.0	27.61	55.22	82.83	110.44	138.05	165.66	193.27	220.88
3.0	10.13	20.26	30.39	40.52	50.65	60.78	70.91	81.04
4.0	5.370	10.74	16.11	21.48	26.85	32.22	37.59	42.96
5.0	3.348	6.695	10.04	13.39	16.74	20.09	23.43	26.78
6.0	2.292	4.585	6.877	9.170	11.46	13.75	16.05	18.34
7.2	1.577	3.153	4.730	6.307	7.884	9.460	11.04	12.61
8.0	1.272	2.544	3.816	5.088	6.360	7.631	8.903	10.18
9.0	1.001	2.003	3.004	4.005	5.006	6.007	7.009	8.010
10.0	0.809	1.618	2.427	3.236	4.045	4.854	5.662	6.471

5.5.3 Fast Search of tE Time Protection Characteristic Data

Table 5.5.3 tE time Protection Parameter List (Unit: s)

Tp / I/Ie	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
1.5	32.00	64.00	96.00	128.00	160.00	192.00	224.00	256.00

2.0	16.00	32.00	48.00	64.00	80.00	96.00	112.00	128.00
3.5	2.909	5.818	8.727	11.64	14.55	17.45	20.36	23.27
4.0	2.286	4.571	6.857	9.143	11.43	13.71	16.00	18.29
5.0	1.60	3.20	4.80	6.40	8.00	9.60	11.20	12.80
6.0	1.231	2.462	3.692	4.923	6.154	7.385	8.615	9.846
7.0	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
10.0	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00

5.5.4 Fast Search of rated current of motor

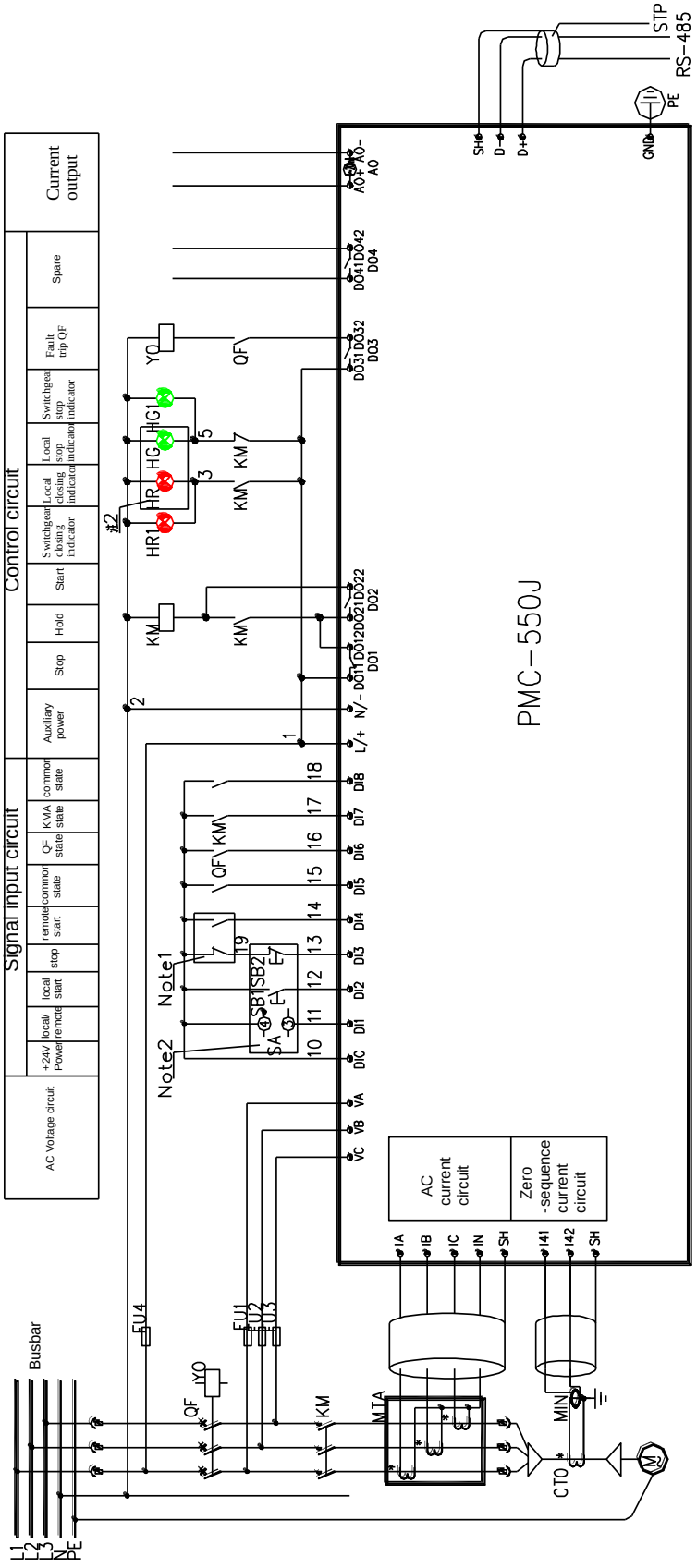
This table is only for reference when there is no motor nameplate available. Please always consider the actual rating on the motor nameplate.

Table 5.5.4 Motor Parameter List

Rated capacity	Rated current	Current transformer selection	Rated capacity	Rated current	Current transformer selection
0.25kW	0.69A	MTA-1A	22kW	41.0A	MTA-100A
0.75kW	1.83A	MTA-5A	30kW	55.5A	MTA-100A
1.1kW	2.58A	MTA-5A	37kW	67.9A	MTA-100A
1.5kW	3.43A	MTA-5A	45kW	82.3A	MTA-100A
2.2kW	4.85A	MTA-5A	55kW	101.0A	MTA-300A
3.0kW	6.31A	MTA-25A	75kW	134.0A	MTA-300A
5.5kW	11.0A	MTA-25A	90kW	160.0A	MTA-300A
7.5kW	14.9A	MTA-25A	110kW	195.0A	MTA-300A
11kW	21.3A	MTA-25A	160kW	279.0A	MTA-300A
15kW	28.8A	MTA-100A	200kW	348.0A	MTA-400A
18.5kW	34.7A	MTA-100A	315kW	544.0A	MTA-800A

6 Typical Connection

6.1 Schematic Diagram of Direct Start Connection

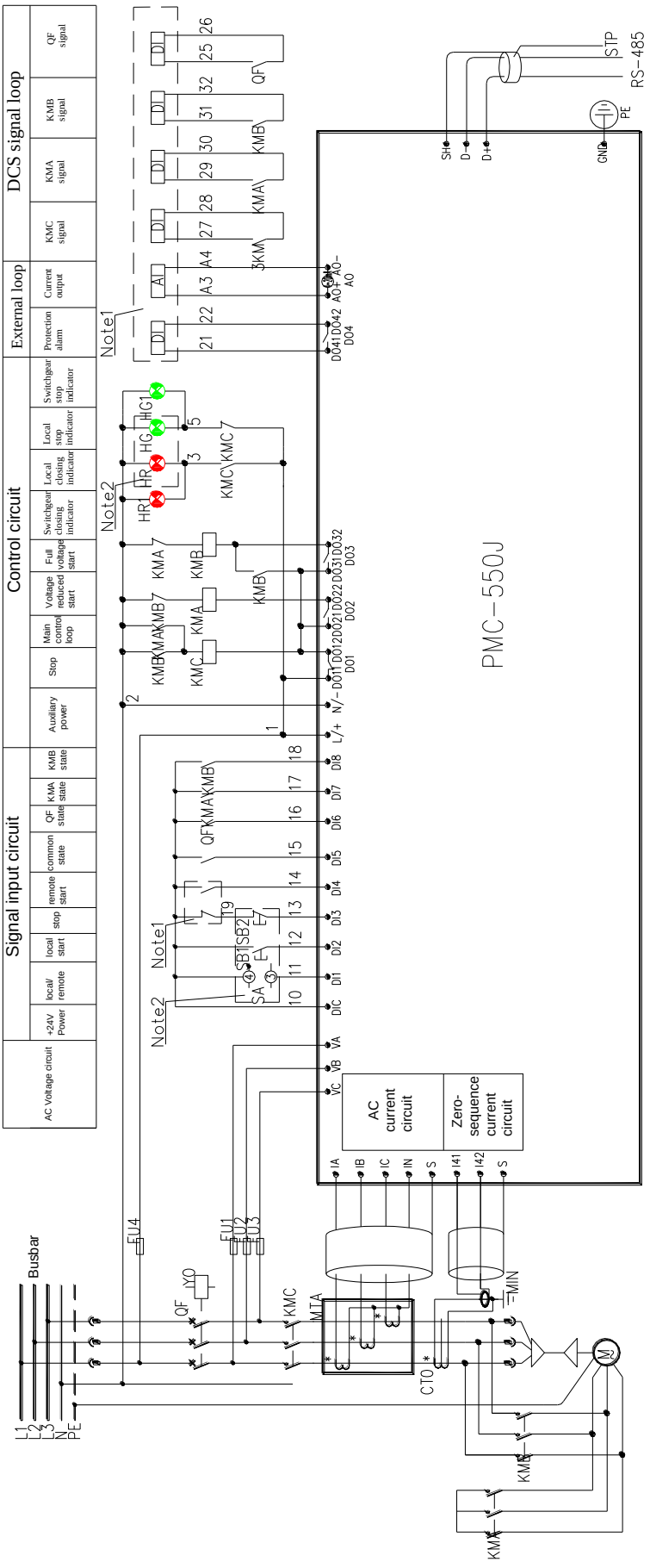


Item	IO configure	Reference scheme II: when the device model is 8DI+4DO+1AO, this is a DI/DO configuration of PMC-550J											
Scheme I	8DI+5DO	DI config								DO config			
Scheme II *	8DI+4DO+1AO	DI1	local/remote	DI3	stop	DI5	common state	DI7	KMA state	DO1	trip contactor	DO3	trip breaker
		DI2	local start A	DI4	remote start A	DI6	QF state	DI8	common state	DO2	start A	DO4	spare
SchemeIII	6DI+5DO+1AO												

Note:
1.This wiring diagram is schematic diagram of direct start connection, which is used in 380V TN-S system.
The IO configuration refer to top table. The diagram is drawn to scheme Ⅱ.
2.Note1: From DCS or external operating system. Note2: From operating box.

PMC-550J The schematic diagram of direct start connection in 380V TN-S system

6.2 Schematic Diagram of Star Delta Voltage reduced Start Connection

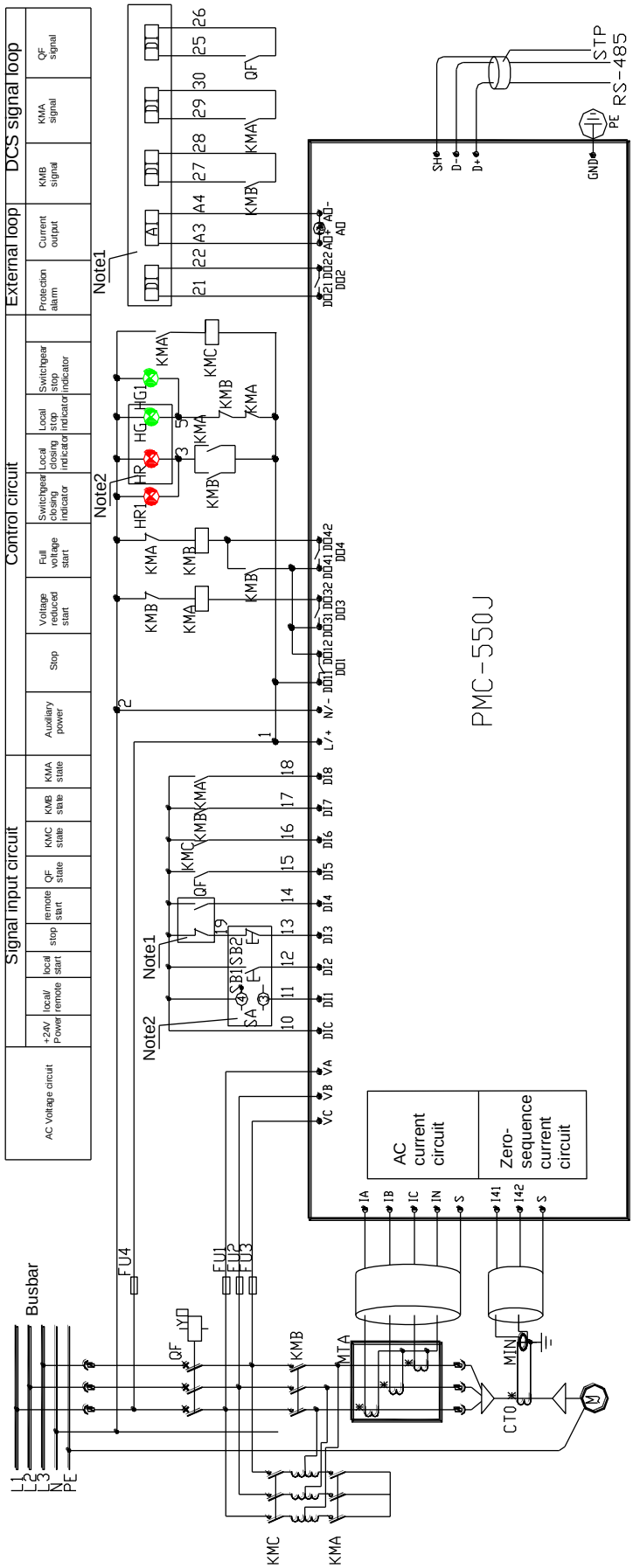


Item	IO configure	Reference scheme II: when the device model is 8DI+4DO+1AO, this is a DIDO configuration of PMC-550J											
Scheme I	8DI+5DO	DI config								DO config			
* Scheme II	8DI+4DO+1AO	DI1	local/remote	DI3	stop	DI5	common state	DI7	KMA state	DO1	trip contactor	DO3	full-volt
		DI2	local start A	DI4	remote start A	DI6	QF state	DI8	KMB state	DO2	volt-reduced	DO4	alarm
SchemeIII	6DI+5DO+1AO												

Note:
1.This wiring diagram is schematic diagram of star delta voltage reduced start connection, which is used in 380V TN-S system.
The IO configuration refer to top table. The diagram is drawn to scheme II.
2.Note1:From DCS or external operating system. Note2: From operating box.

PMC-550J The schematic diagram of star delta voltage reduced start connection in 380V TN-S system

6.3 Schematic Diagram of Autotransformer Voltage reduced Start Connection

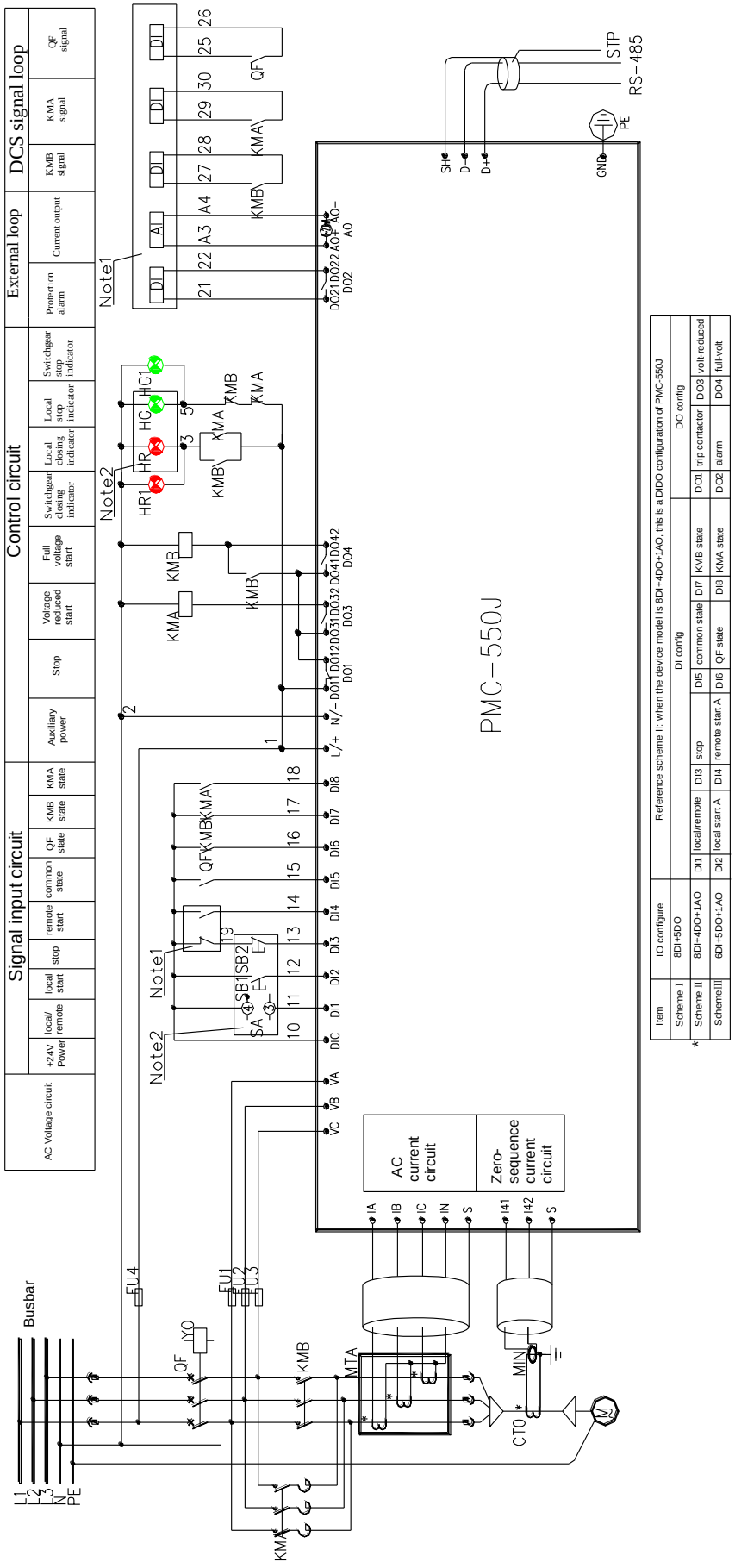


Item	IO configure	Reference scheme II: when the device model is 8DI+4DO+1AO, this is a DI/DO configuration of PMC-550J										
Scheme I	8DI+5DO	DI config							DO config			
Scheme II	8DI+4DO+1AO	DI1	local/remote	DI3	stop	DI5	QF state	DI7	KMB state	DO1	trip contactor	DO3	volt-reduced
Scheme III	6DI+5DO+1AO	DI2	local start A	DI4	remote start A	DI6	common state	DI8	KMA state	DO2	alarm	DO4	full-volt

Note£ °
1.This wiring diagram is schematic diagram of autotransformer voltage reduced start connection, which is used in 380V TN-S system.
The IO configuration refer to top table. The diagram is drawn to scheme II.
2.Note1:From DCS or external operating system.Note2:From operating box.

PMC-550J The schematic diagram of autotransformer voltage reduced start connection in 380V TN-S system

6.4 Schematic Diagram of Reactor Voltage reduced Start Connection

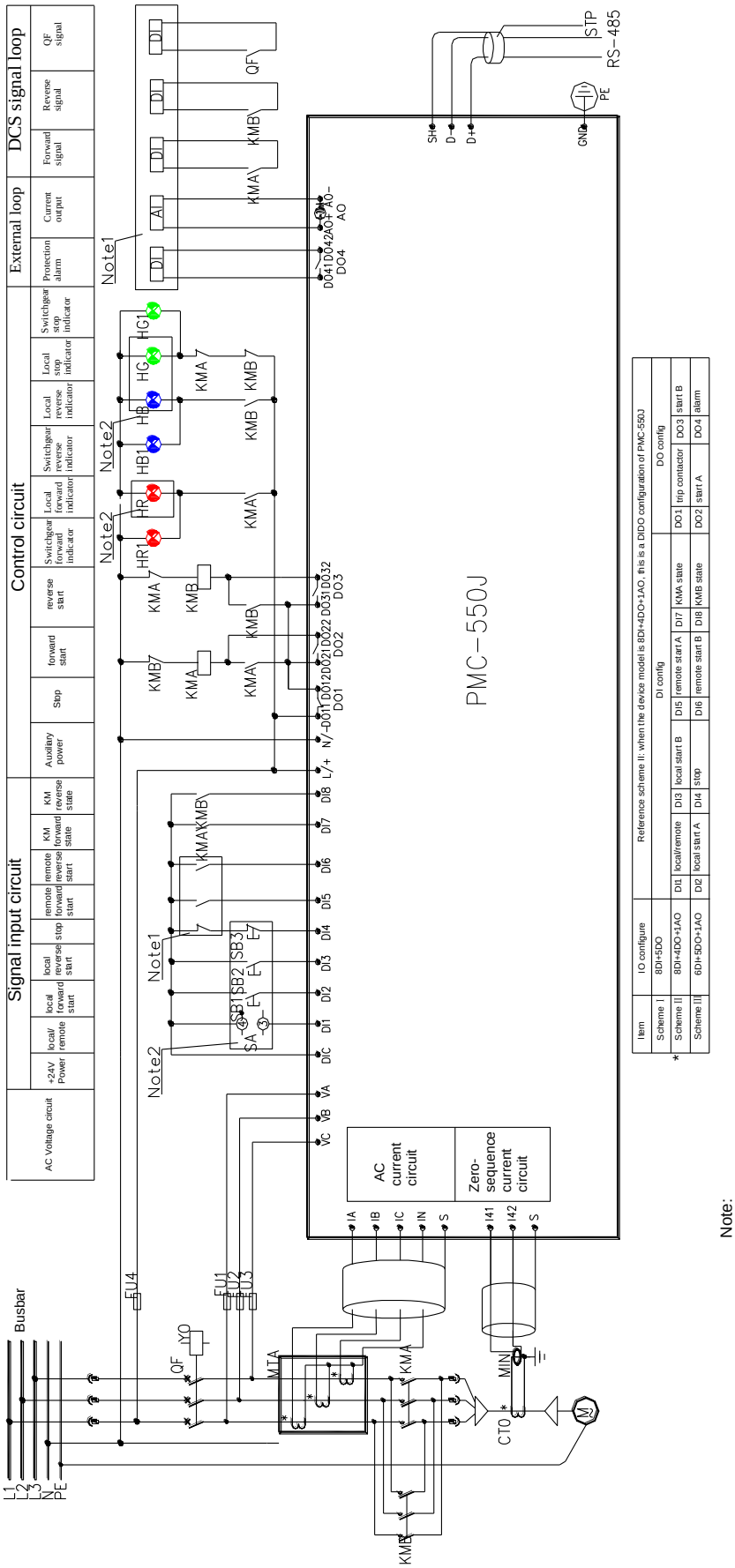


Item	IO configure	Reference scheme II: when the device model is 8DI+4DO+1AO, this is a DIDO configuration of PMC-550J											
		DI config								DO config			
Scheme I	8DI+5DO												
* Scheme II	8DI+4DO+1AO	DI1	local/remote	DI3	stop	DI5	common state	DI7	KMB state	DO1	trip contactor	DO3	volt-reduced
		DI2	local start A	DI4	remote start A	DI6	QF state	DI8	KMA state	DO2	alarm	DO4	full-volt
SchemeIII	6DI+5DO+1AO												

Note:
1.This wiring diagram is schematic diagram of reactor voltage reduced start connection, which is used in 380V TN-S system.
The IO configuration refer to top table. The diagram is drawn to scheme II.
2.Note1:From DCS or external operating system. Note2: From operating box.

PMC-550J The schematic diagram of reactor voltage reduced start connection in 380V TN-S system

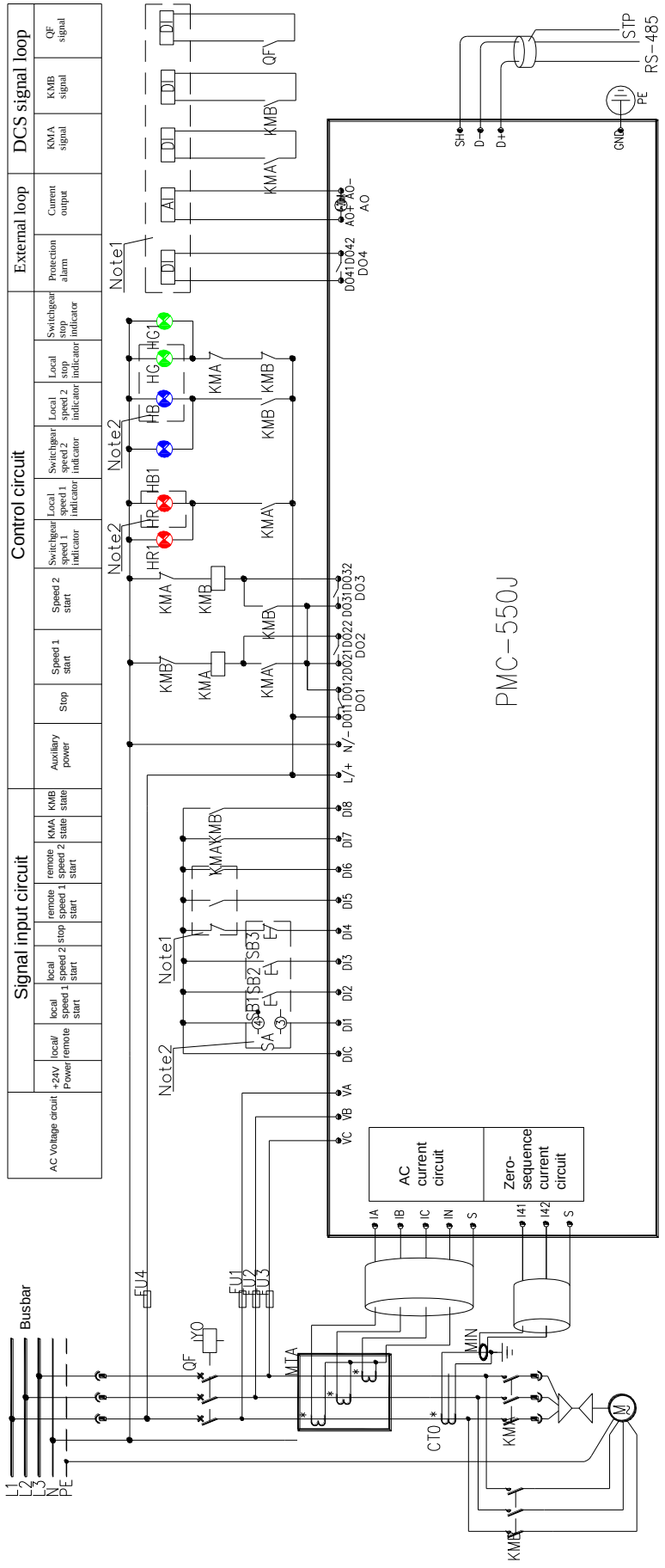
6.5 Schematic Diagram of Reversing Control Connection



Note:
1. This wiring diagram is schematic diagram of reversing start connection, which is used in 380V TN-S system.The IO configuration refer to top table. The diagram is drawn to scheme II .
2.Note1:From DCS or external operating system. Note2: From operating box.

PMC-550J The schematic diagram of reversing start connection in 380V TN-S system

6.6 Schematic Diagram of Two speed Start Connection



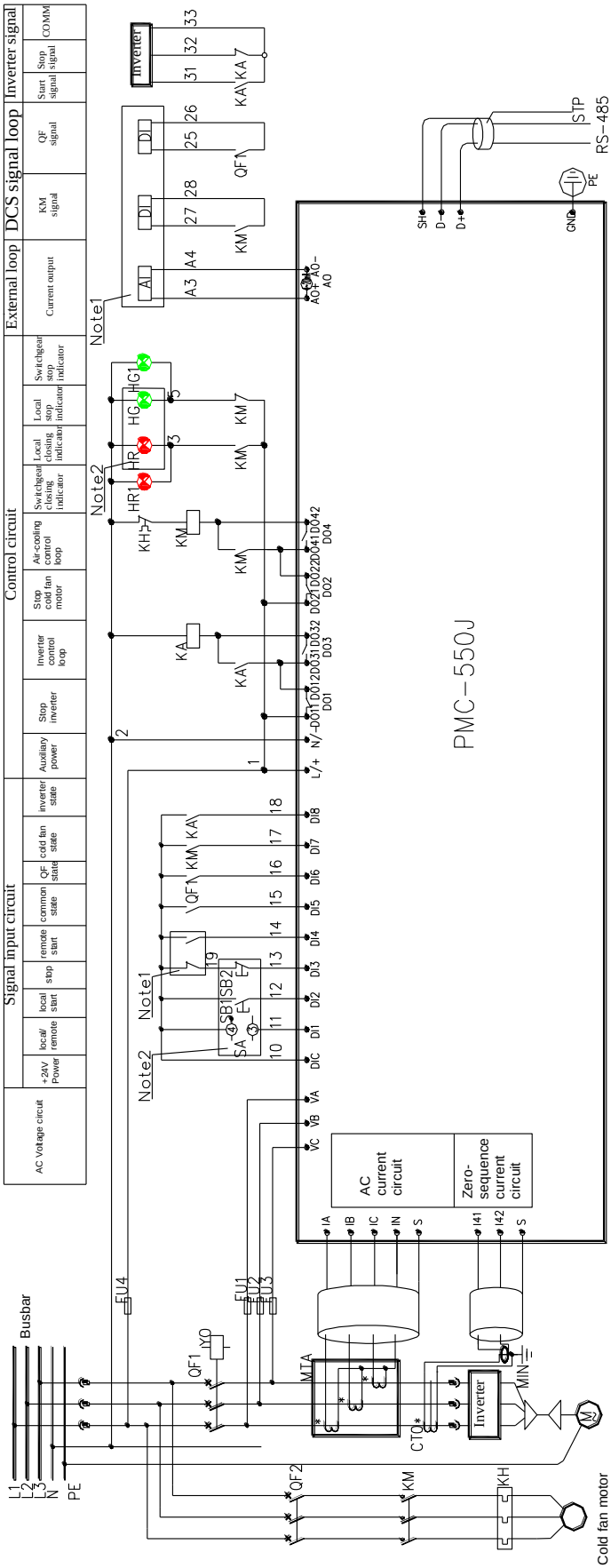
Item	IO configure	Reference scheme II: when the device model is 8DI+4DO+1AO, this is a DIDO configuration of PMC-550J											
Scheme I	8DI+5DO	DI config								DO config			
Scheme II	8DI+4DO+1AO	DI1	local/remote	DI3	local start B	DI5	remote start A	DI7	KMA state	DO1	trip contactor	DO3	start B
SchemeIII	6DI+5DO+1AO	DI2	local start A	DI4	stop	DI6	remote start B	DI8	KMB state	DO2	start A	DO4	alarm

*

Note:
1.This wiring diagram is schematic diagram of two speed start connection, which is used in 380V TN-S system. The IO configuration refer to top table. The diagram is drawn to scheme Ⅱ.
2.Note1:From DCS or external operating system. Note2: From operating box.

PMC-550J The schematic diagram of two speed start connection in 380V TN-S system

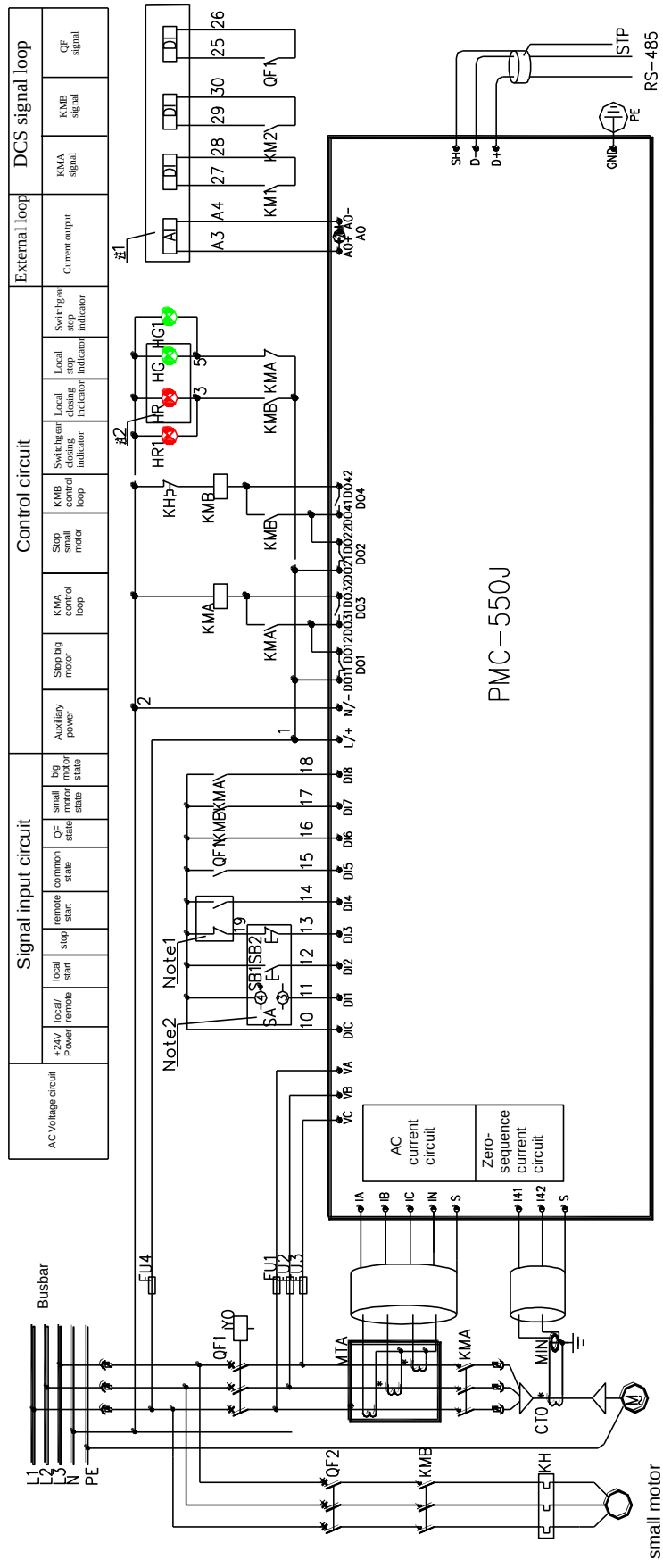
6.7 Schematic Diagram of Inverter aid Start Connection



Item	IO configure	Reference scheme II: when the device model is 8DI+4DO+1AO, this is a DI/DO configuration of PMC-550J											
Scheme I	8DI+5DO	DI config								DO config			
* Scheme II	8DI+4DO+1AO	DI1	local/remote	DI3	stop	DI5	common state	DI7	cold fan state	DO1	trip contactor	DO3	start inverter
SchemeIII	6DI+5DO+1AO	DI2	local start A	DI4	remote start A	DI6	QF state	DI8	inverter state	DO2	trip cold fan	DO4	start cold fan

PMC-550J The schematic diagram of inverter aid start connection in 380V TN-S system

6.8 Schematic Diagram of Big Motor Aid Start Connection



Note:
1.This wiring diagram is schematic diagram of big motor aid start connection, which is used in 380V TN-S system. The IO configuration refer to top table. The diagram is drawn to scheme II.
2.Note1:From DCS or external operating system. Note2: From operating box.

PMC-550J The schematic diagram of big motor aid start connection in 380V TN-S system

7 After-sale Service

7.1 Quality Guarantee

In quality guarantee period, all our devices will have the quality guarantee free of charge for any failure caused by design, material and workmanship defects. If any of such devices is checked to meet the aforesaid quality guarantee condition, it will be repaired and replaced free of charge.

We may ask users to post the devices to the factory to check if they are within the guarantee and repair them where necessary.

7.2 Device Upgrade

CET offers free firmware upgrade for the PMC-550J for our customers. Please contact your CET or representative for further information.

7.3 Limitation of Liability

The following issues are not covered by quality guarantee:

- Damage caused by incorrect installation, usage or storage.
- Improper operation or application conditions beyond the specified standard.
- Unauthorized repairs by organizations or persons without the written consent from Ceiec Electric Technology Inn.
- Exceeding the free quality insurance period.