

KPM60 Low-voltage Motor Protector User Instructions V1.2

Danger and Warning
The device may only be installed by professionals.
Caused any malfunction due to not follow the instructions in this manual, Manufacturers will not bear any responsibility.

Electric shock, burning and explosion
Devices can only be qualified by the staff to install and maintain.
Before any operation on the Devices, should be isolated from the voltage input and power supply, and the secondary windings of all current transformers are Short circuit.

1. Summary
KPM60 series low voltage motor protection controller is suitable for the application of three-phase asynchronous motor with rated voltage of 380V to 660V, and rated current of 800A.

2. Features
KPM65's auxiliary power supply supports 85-264VAC, 100-370VDC
8-channel programmable input DI with optical isolation, passive dry node access
4-way relay isolation outputs are used to control the protection motor and output warning signals

3. Technical Parameters
3.1 Symbol comparison table
Table with 4 columns: Symbol, Implication, Symbol, Implication

3.2 Technical indicators
Table with 2 columns: Parameter, Indicator

3.3 Installation Dimensions
Diagram showing the physical dimensions of the KPM60 device, including width (96mm), height (96mm), and terminal spacing (88mm).

9.1 Protect mode

Table with 4 columns: Input signal, Application Annotation, Relay output, Application annotation

9.2 Direct Startup Mode

Table with 4 columns: Input signal, Application Annotation, Relay output, Application annotation

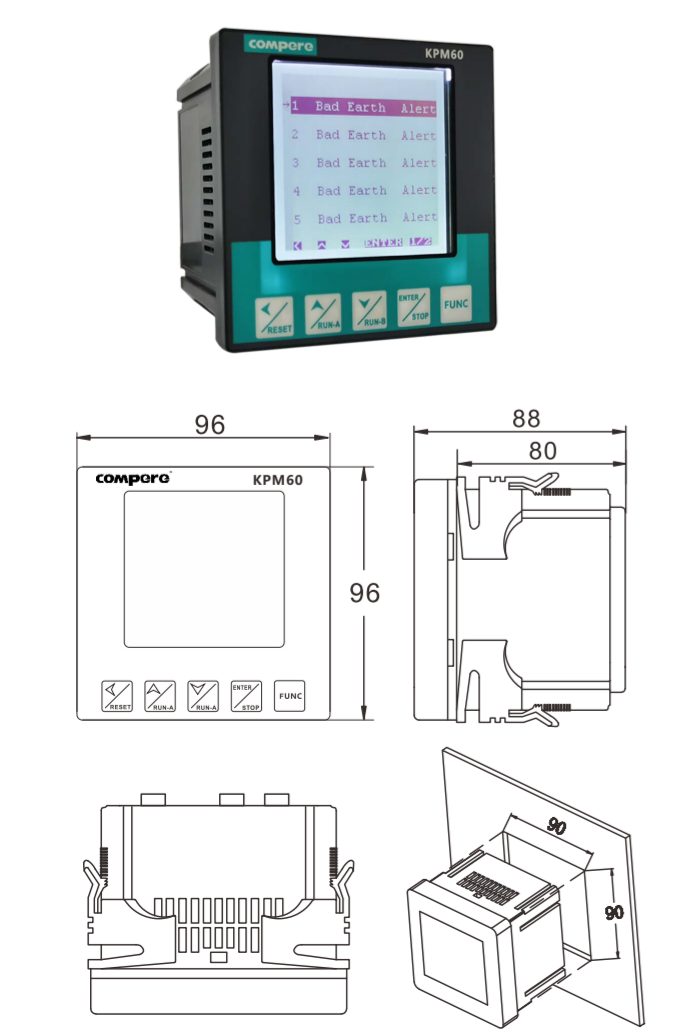
9.3 Bi-directional Start Mode

Table with 4 columns: Input signal, Application Annotation, Relay output, Application Annotation

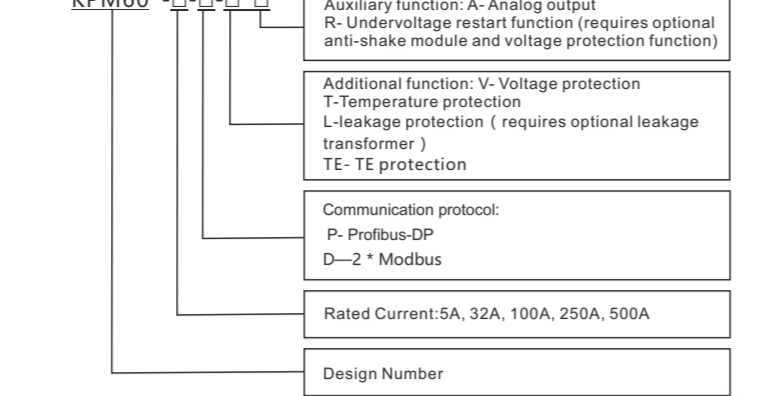
9.4 Star/Triangle and Auto-transformer starting mode

Table with 4 columns: Input signal, Application Annotation, Relay output, Application Annotation

10. Installation Dimensions



4. Product model

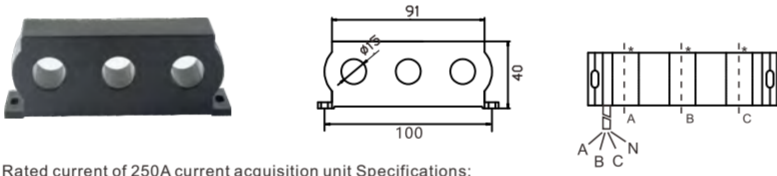


Selection instructions:
Each KPM60 requires at least one host and one current transformer. The host has its own LCD screen and 5 buttons, which can display the on-site power grid parameters, modify the protection settings, modify the system parameters, and query the fault records.

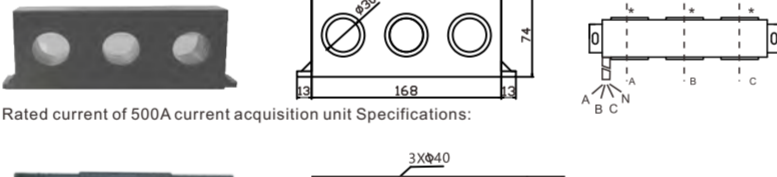
5. Function setting

Table with 5 columns: Function, Content, Standard Configuration, Optional Configuration, Description

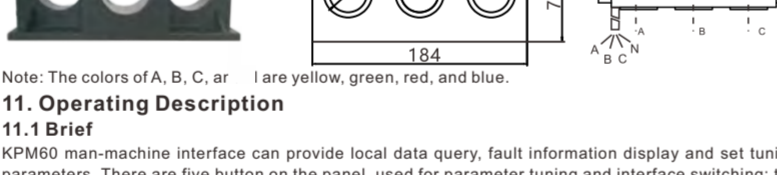
Rated current of 5A, 32A and 100A current acquisition unit specifications:



Rated current of 250A current acquisition unit Specifications:



Rated current of 500A current acquisition unit Specifications:



Note: The colors of A, B, C, and are yellow, green, red, and blue.

11. Operating Description

11.1 Brief
KPM60 man-machine interface can provide local data query, fault information display and set tuning parameters. There are five button on the panel, used for parameter tuning and interface switching.

11.2 Functional Description

Display list: Control interface, Query interface, Set interface.
After the electrical operation on the display module, the default display is control interface, under the interface, if the operation authority of the controller is local display, user action buttons can be control start-up and shutdown of motor;

11.3 Button

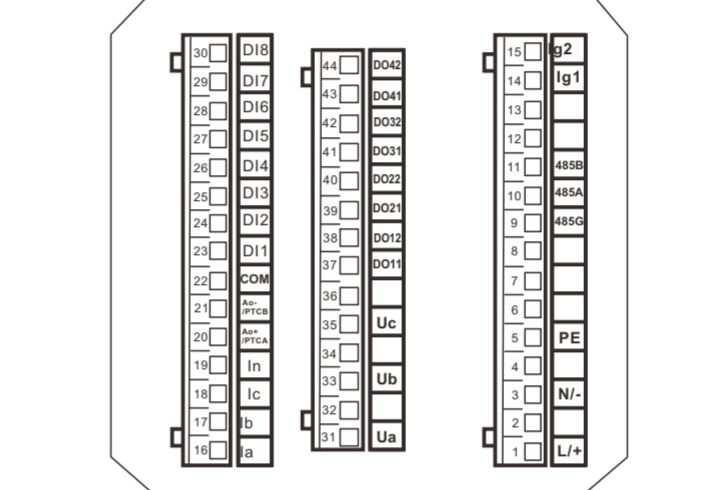
Table with 4 columns: Button name, Query interface, Setting interface, Control interface



6. Protection parameter list

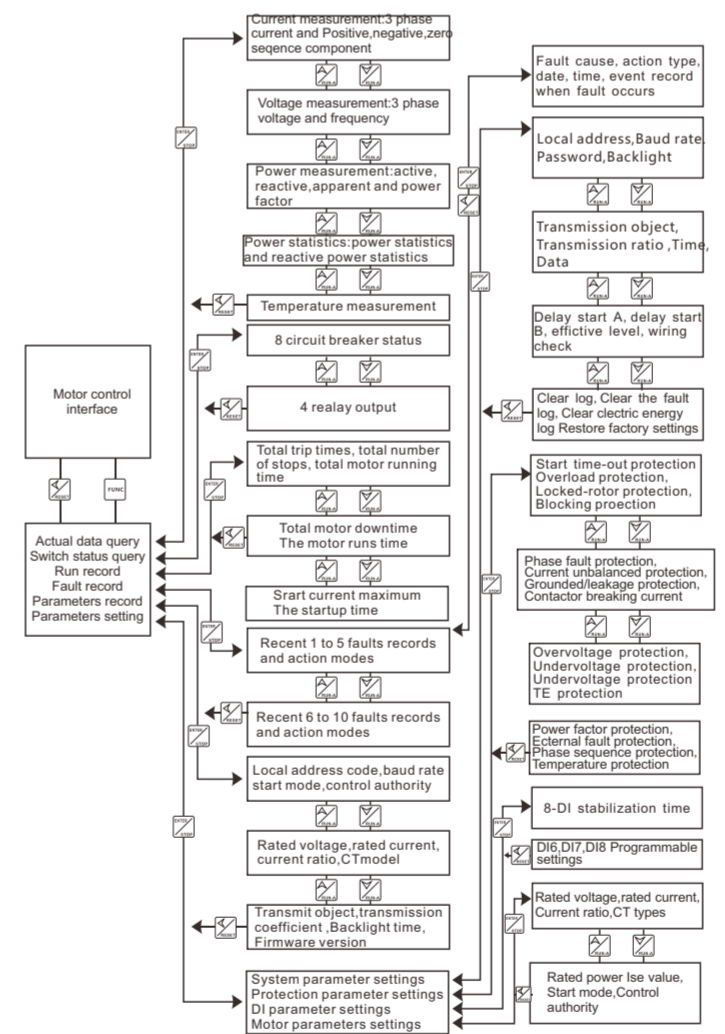
Table with 4 columns: Item, Content, Range

7. Terminal block distribution



The KPM60 has an 8-channel digital input terminal with a 24V DC power supply. It can only be connected to the dry node switching signal. These 8-channel digital inputs have different definitions in different control modes.

There is 1 channel leakage transformer input, 1 channel 485 input, transmission function and temperature function can only choose one. KPM60 has 160\*160 LCD screen and 5 buttons for motor control operation and viewing setting parameters.



12. Protection Function Description

12.1 Start time-out protection

The motor starting current is relatively large, if the start time is too long, easy to make the motor heat damage, to this end, the device provides start time-out protection.

12.2 Overload protection

A motor overload protection is a common protection function, used to protect the motor overload for a long time lead to winding heat, resulting in damage to the motor winding insulation damage to the motor.

Equation for heat accumulation: T = Tfr \* (Ieq / Ie)^2 - 1.05^2

When Ieq < 1.05 \* Ie, the heat accumulation, thermal protection equation is:

Equation for heat accumulation: T = Tfr \* (Ieq / Ie)^2 - 1.05^2

among them, Ieq = sqrt(k1 \* I1^2 + k2 \* I2^2), K1, K2 are positive and negative sequence current heating time constant, in the start time K1 take 0.5, after running, take "1". K2 take 3-10, generally set to 6; I1 I2 is positive and negative sequence current.

Tfr: Overheating time constant; k: Cooling coefficient, generally take 4; When the heat accumulation value reaches a certain level, the relay output adjusts, after tripping, the heat capacity does not fall below 15%, does not allow the starting motor, emergency press the parking reset button, can manually remove the thermal memory value.

Related parameters table with columns: Function, Parameter name, Setting range, Default value, Define

Table with 5 columns: Function, Parameter name, Setting range, Default value, Define

Meaning of the terminal

Table with 5 columns: No., Name, Function, Remark

8. Motor control and other functions

8.1 Division of motor operating conditions
This product divides motor operation into five states: ready state, starting state, operating state, parking cooling state, and parking state.

8.2 Start and stop operation
Motor start and stop have three modes of operation: local operation (motor protector host key operation, hereinafter referred to as host key), remote terminal operation (via terminal operation), remote communication control operation.

8.3 Local/Remote selection
The operating authority of the controller can be set via the terminal DI5 input of the motor. There are three modes of operation: "Local Operation", "Remote Terminal" and "Remote Communication".

8.4 Protection/Control
Protection (control) relay output has the double function of starting and stopping control of AC contact and protecting tripping.

8.5 Fault information output
The motor has the motor fault information output relay, the contact is normally open. After the controller sends out the alarm or trip fault information, the fault relay contact point is closed; if the fault information is clear, then the relay contact are opened.

8.6 Reset
After the controller protects the trip and enters the parking lot, if need to operate again, it is necessary to reset the fault information firstly. Reset in a variety of ways: The host has a reset button, the controller has a reset terminal, and through the communication port to achieve remote reset.

8.7 Switch input and relay output setting
The KPM60 provides three programmable input points DI6, DI7, DI8, programmable inputs can be defined as the following functions:

8.8 Blocked-rotor protection
Locked-rotor protection is to prevent the motor during the start, due to the rotor stuck to stop the rotation, causing the current rise, resulting in motor damage.

8.9 Blocking protection
Blocking protection is to prevent serious overload of the motor during operation, the motor rotor stops turning, damaging the motor due to increasing current. The blocking protection is put into operation after the motor is running, according to the maximum phase current and rated current ratio as the basis for judging, when the current ratio is greater than the set value, the stall protection is started and executed according to the time limit.

8.10 Phase Failure Protection
Broken phase fault protection is very harmful to the electrical machine, and it will put into operation in the process of starting. Broken phase fault operation of the motor is also very great harmful to motor, if protection is turned on by the user, it is protected during motor start-up.

8.11 Current Unbalance Protection
Current unbalance protection prevents overheating of the motor due to unbalanced three-phase current. Unbalanced protection can be closed, if the user is protected at this time to open, in the start of the process is put into.

8.12 Ground Fault/Leakage Protection
The ground protection current signal is calculated by the three-phase current vector and the current signal of the leakage protection is taken from the external current transformer. Earth leakage protection and ground protection can only take one of the two.

8.13 Temperature Protection
The KPM60 provides a temperature protection function, which can be set to monitor the temperature of the motor winding. The temperature protection is put into operation after the motor is running, according to the maximum phase current and rated current ratio as the basis for judging, when the current ratio is greater than the set value, the protection starts, and according to the time-limit.

8.14 Relay Output Settings
The KPM60 provides three programmable input points DI6, DI7, DI8, programmable inputs can be defined as the following functions:

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### 12.8 Underload protection

Motor underload is generally not need to be protected, but, the occasion requires underload protection such as load may appear abnormal mutation, for sudden rupture of assembly line conveyor belt and so on. This situation needs to be put into underload protection.

Protection operation characteristic: If average of three currents overload setting value until the time is out, underload protection acts reliably.

Related parameters

Function	Parameter name	Setting range	Default value	Define
Underload protection	Protection action	Alarm, trip, disable	Disable	
	Action setting value	Ground 20%le~95%le	40%le	
	Time setting value	0.1~99.99s	10.0s	

### 12.9 Overvoltage protection

Overvoltage will cause the motor core to saturate, greatly increasing the motor excitation current, thereby burning the motor. Overvoltage protection prevents the motor from operating under unacceptable high pressure conditions.

Overvoltage protection, if turned on, has been input, when the maximum line voltage is detected higher than the voltage setting value, the overvoltage protection is activated and executed in a limit time mode.

Related parameters

Function	Parameter name	Setting range	Default value	Define
Overvoltage	Protection action	Alarm, trip, disable	Disable	
	Action setting value	105%le~150%le	120%le	
	Time setting value	0.1~25.5s	5.0s	

### 12.10 Undervoltage Protection

When the system voltage is too low, the motor torque is insufficient, long-term operation will lead to the motor burn, the undervoltage protection function can avoid the motor in the low voltage conditions are not allowed to run.

The undervoltage protection is energized during the start-up of the motor. When any line voltage is monitored below the voltage setting, the undervoltage protection is initiated and executed in a limit time.

Related parameters

Function	Parameter name	Setting range	Default value	Define
Undervoltage	Protection action	Alarm, trip, disable	Disable	
	Action setting value	50%le~95%le	70%le	
	Time setting value	0.1~25.5s	2.0s	

### 12.11 Underpower protection

When the motor is running at low load, the current of the motor is not necessarily small due to the low power factor. The undercurrent protection function protects the motor by monitoring the active power.

Under power protection is applied after the motor has entered the operating state. When the active power is lower than the set setting value, the under-power protection is activated and executed in a limit time.

Related parameters

Function	Parameter name	Setting range	Default value	Define
Underpower protection	Protection action	Alarm, trip, disable	Disable	
	Action setting value	Ground 20%le~95%le	40%le	
	Time setting value	0.1~99.99s	10.0s	

### 12.12TE Protection(Adapt to increased safety type motor)

TE time protection is suitable for continuous operation, including easy start and infrequent start-up will not produce significant additional temperature rise, allows the use of anti-time overload protection device of the increased safety explosion-proof motor(example: YA, YA2 series, etc). It is not suitable for motors that are difficult to start or start frequently.

Increased the safety and explosion-proof motor nameplate data "TE" time for the AC winding at the maximum ambient temperature to reach the rated operation stability after the temperature, from the time it takes to block the current to the time required to rise to the limit temperature.

When the TE time protection function is turned on, the overload protection function will be automatically turned off. TE time protection function in line with GB3836.3-2010 standard requirements, TE time protection failure must be manually reset.

Function	Parameter name	Setting range	Default value	Define
TE protection	Protection action	Alarm, trip, disable	Disable	
	Action setting value	1.0s~15.0s	4.8s	Allowed to run at 7 times the rated current

TE time protection property list, the curve up to the standard of IEC79-7, GB3836.3-2000.

$t_{th}/t_{sc}$	1s	4.0s	4.3s	5.0s	5.5s	6.0s	15.0s
3.0	4.00	16.00	17.20	20.00	22.00	24.00	60.00
3.2	3.48	13.91	14.96	17.39	19.13	20.87	52.17
3.40	3.08	12.31	13.23	15.38	16.92	18.46	46.15
3.60	2.76	11.03	11.86	13.79	15.17	16.55	41.83
3.80	2.50	10.00	10.75	12.50	13.75	15.00	37.5
4.00	2.29	9.14	9.83	11.43	12.57	13.71	34.29
4.20	2.11	8.42	9.05	10.53	11.59	12.63	31.59
4.40	1.95	7.80	8.39	9.76	10.73	11.71	29.27
4.60	1.82	7.27	7.82	9.09	10.00	10.91	27.27
4.80	1.70	6.81	7.32	8.51	9.36	10.21	25.53
5.00	1.60	6.40	6.88	8.00	8.80	9.60	24.00
5.20	1.51	6.04	6.49	7.55	8.33	9.06	22.64
5.40	1.43	5.71	6.14	7.14	7.85	8.57	21.43
5.60	1.36	5.42	5.83	6.78	7.46	8.14	20.34
5.80	1.29	5.16	5.55	6.45	7.10	7.74	19.35
6.00	1.23	4.92	5.29	6.00	6.77	7.38	18.46
6.20	1.18	4.71	5.06	5.68	6.47	7.06	17.65
6.40	1.13	4.51	4.85	5.33	6.20	6.76	16.90
6.60	1.08	4.32	4.65	5.41	5.95	6.49	16.22
6.80	1.04	4.16	4.47	5.19	5.75	6.23	15.58
7.00	1.00	4.00	4.30	5.00	5.5	6.00	15.00
8.00	1.00	4.00	4.30	5.00	5.5	6.00	15.00

### 12.13 Contactor Breaking Current Protection

Judging whether the maximum phase current is greater than the setting, the contactor allows breaking current, if not, all exports are moves to the contact control export; If so, all protect exports are moves in the circuit breaker points shunt release export control.

Contact breaking current protection if turned on, it has been put into protection, when monitoring the maximum phase current is greater than the setting of the contactor to allow breaking current, the direct jump circuit breaker.

Related parameters

Function	Parameter name	Setting range	Default value	Define
Contact breaker protection	Protection action	Alarm, trip, disable	Disable	
	Action setting value	600%~1000%le	800%le	

### 12.14 Undervoltage Auto-restart

Low voltage motor control power often direct quote from 380V power system when the system voltage appears short fault (commonly known as "shake of voltage"), easily lead to shutdown of the motor. The device provides the motor with the loss of voltage restarting function, so that the motor in the power supply and the system is restored to normal condition, can automatically restart to the normal operation.

Immediately restart: when the motor undervoltage protection parking or lost voltage sags interval in 0.5 seconds, due to inertia that motor rpm drop is very small, can be directly to restart the motor. This function in the power grid, "shaking", can ensure the continuous normal operation of equipment.

Time delay reset: when the motor undervoltage protection parking or lost voltage due to voltage sags time interval in the 0.5s-60s (time can be set). At this time the current change greatly, at the same time to start multiple motor will lead to excessive starting current. Therefore, the device will be in accordance with the restart delay to restart the motor (delay time can be set).

Related parameters

Function	Parameter name	Setting range	Default value	Define
Undervoltage Auto-restart	Protection action	Enable/Disable	Disable	
	Restore voltage	75%~100%Ue	85%Ue	
	Power loss time(s)	0.5~60.0s	10.0s	Maximum delayed restart power loss time
	Delay start time(s)	0.1~300.0s	5.0s	Delayed restart time

### 12.15 Power Factor Protection

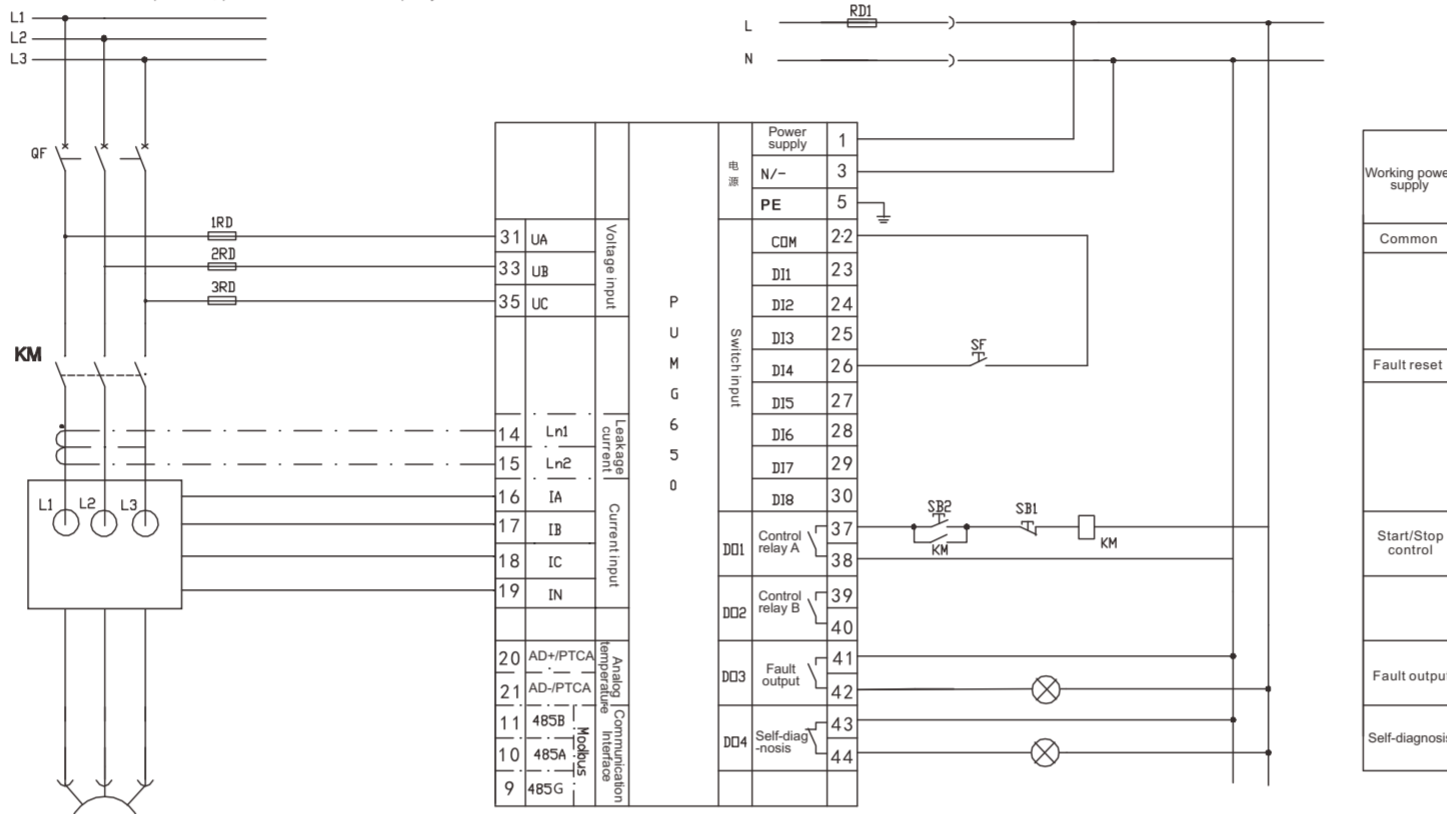
For low-side motors, the power factor changes more frequently than motor current or active power. Therefore, power factor protection is particularly suited to the distinction between no-load operation and failure (such as tearing of the conveyor belt or transmission shaft breakage).

Related parameters

Function	Parameter name	Setting range	Default value	Define
Power factor Protection	Protection action	Alarm, trip, disable	Disable	
	Action setting	0.1~1	0.1	
	Time setting	0.1~60.0s	0.5s	

### 13.Common Field Wiring Diagram

KPM60 series supports a variety of start control mode, due to limited space, this manual only provides typical wiring diagrams for KPM60 in protected mode, direct start mode and bidirectional start mode. For more typical wiring diagrams, please contact the relevant personnel. If you encounter problems with the use of the product, please contact the company's technical staff.



Protective mode wiring diagram

Description  
1. Under protected mode, the normally open contact string of the control relay DO1 is in the coil loop of the contactor KM, when the controller is powered up, DO1 contacts are closed immediately, operation start button SB2 then motor start, the protection trip occurs, relay DO1 is disconnected, the contactor KM's coil is de-energized, the contactor KM is released, the motor stops.  
2. When the motor has a protection alarm or protection trip, press the reset button to clear the fault indication. The relay DO1 will automatically close and enter the ready state, allowing the motor to start again.  
3. Dotted lines indicate optional features.

### 14. Precautions

#### 14.1 Basic settings

Before operating properly, make sure to set the following system parameters:

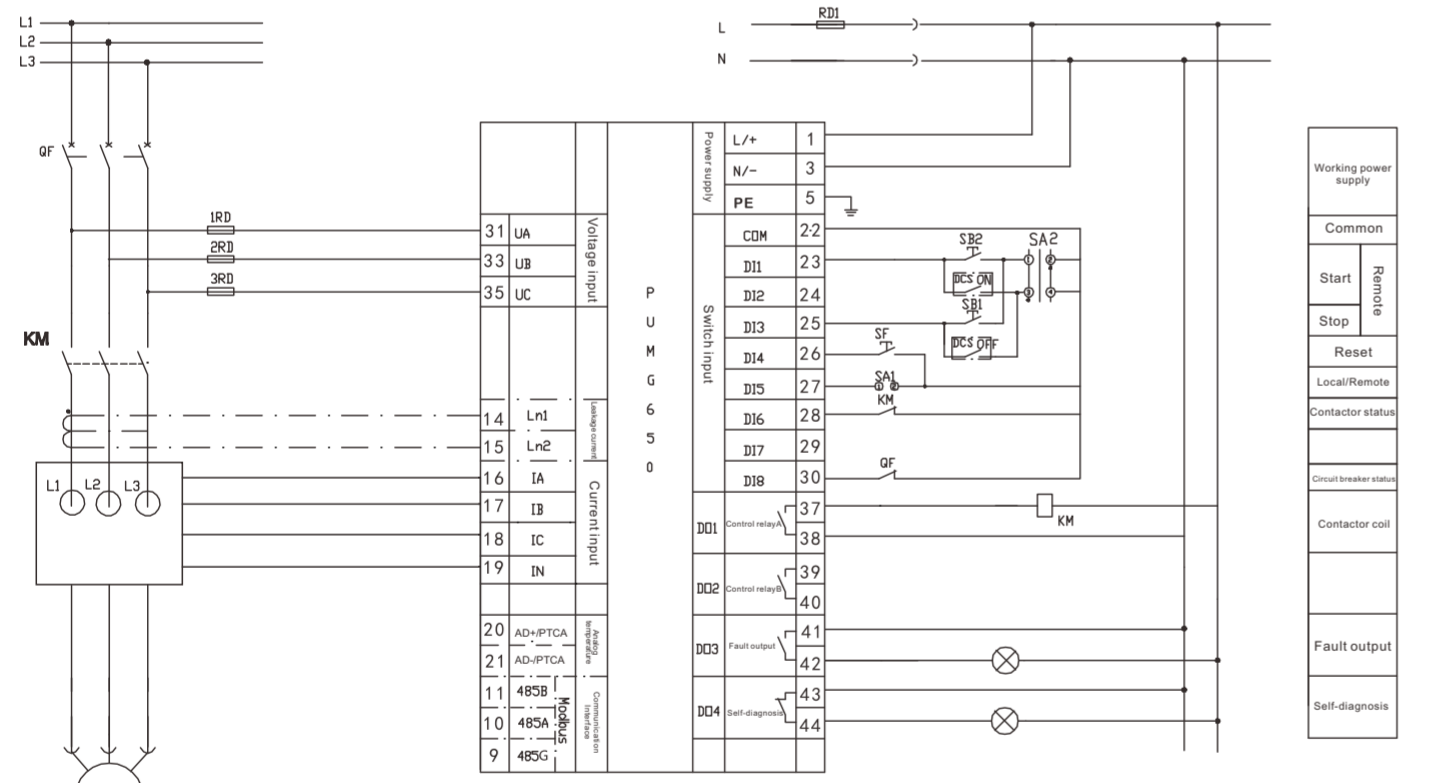
- Rated current of the motor.
- Enter the correct CT rated current value.
- CT ratio is a backup item, is also used by the manufactures to provide 5A CT, external use of other transformers.
- Set the appropriate contactor breaking current, the default setting is 8 times the Ie.
- Confirm the operating mode.
- Confirm the operating authority.
- Confirm the device address and communication baud rate are consistent with the host computer.
- Before the normal operation, you also need to set the protection function to be used for parameter setting.
- In the protection of the stall, unbalanced protection, grounding / leakage protection, short circuit protection, underload protection, overvoltage protection, undervoltage protection, under power protection, if the protection mode is exited, the protection is disabled; if you need to turn on these protection, set the range of the action values and delay times for each protection in the protection function description.

#### 14.2.Common Problem

Fault phenomenon	Possible reason	Possible solution
The device does not start working properly after power-up	The power supply failed to join the device	Check that the correct operating voltage is added to the device L+ and N / - terminals
The measured value is incorrect or does	Voltage measurement is incorrect	Check whether the measured voltage matches the device rating
	current measurement is incorrect	Check that the measured current matches the device rating parameters
Relay does not operate	Sensor or signal processing circuit board failure	Check that the CT ratio setting is correct
	No control commands have been received	Check that the sensor wiring or repair
Relay error action	The relay operating mode is not correct	Check that the communication link is correct
	Device address is incorrect	Check that the current relay is in the correct mode
PC cannot communicate with the device	The communication link is not correct	Check whether the device communication baud is consistent with the definition
	The communication link is disturbed	Check that the communication shield is well grounded
The PC cannot start / stop the motor	Permission is wrong	Check that the correct permissions are set correctly
	function switch is not open	Open the protective function switch
Unable to enter parameter setting	Bad contact cable	Check the sensor cable
	Incorrect password	Contact the dealer or the company after sales service department
Ground fault does not work	Ground protection is not turned on	Turn on the ground protection switch
	Poor cable contact	Check sensor cable

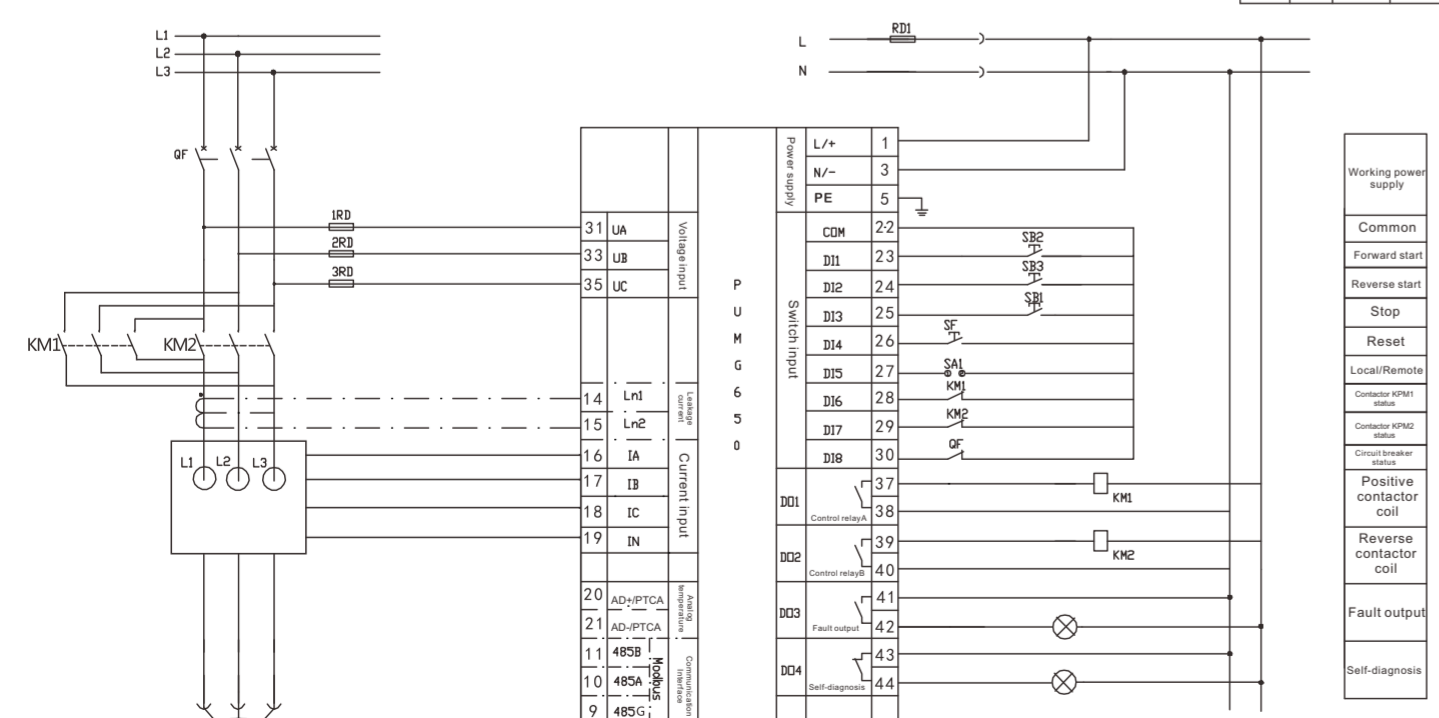
#### 15. Contact

Henan Compere Smart Technology CO., LTD.  
Telephone:+86-371-86181681  
Fax:+86-371-67890037  
Web:www.compere.com/en/home  
Address:No.41 Dongming Road, Zhengzhou, Henan, China  
The final interpretation of this manual is owned by Henan Compere Smart Technology CO., LTD.



Wiring diagram of direct start mode

1. In the direct start mode, after the controller receives the start command in the ready state, the internal relay DO1 is closed, the contactor KM coil is electrically closed, and the motor is started. When the controller receives the opening command or a protection trip occurs, the relay DO1 is disconnected, the KM coil is de-energized, and the motor is stopped.  
2. When the motor has a protection alarm or protection trip, press the reset button to clear the fault indication. When the parking process is over, it can receive a restart command when it enters the ready state.  
3. Dotted lines indicate optional features.



Wiring principle of bidirectional start mode

1. In the bidirectional start mode, in the ready state, when the protector receives the "start A" command, the internal relay DO1 is closed, the contactor KM1 was forced to pull; when the controller received a stop command or protection trip, DO1 relay is disconnected; motor stops. In the ready state, when the protector receives the "start B" command, the internal relay DO2 is closed and the contactor KM2 is energized; when the controller receives the stop command or the protection trip occurs, the DO2 relay is disconnected and the contactor KM2 Power loss freed, motor stop.  
2. When the motor has a protection alarm or protection trip, press the reset button to clear the fault indication. When the parking process is over, it can receive a restart command when it enters the ready state.  
3. Dotted line marked as optional function.