PMAC801 Series
Intelligent Motor Protection Relay

PMAC801 Motor Protection Relay with following features:

- PMAC801 provide 9 kinds standard protection function: **Start Overtime Protection, Overload Protection, Overcurrent Protection, Phase Failure Protection, Current Unbalance Protection, Earth Fault, Short Circuit Protection, Underload Protection**
- 8 kinds optional protection function: Leakage Current Protection, External Fault Protection, Overvoltage Protection, Undervoltage Protection, Under Power Protection, Phase Sequence Error Protection, EEx e Overload Protection, Temperature (PTC/NTC) Protection, Analog Input Protection.
- PMAC801 with measurements of Three Phases Current, Three Phase Voltage, Neutral Current, Active Power, Reactive Power, Power Factor, Frequency, Active Energy.
- Provides 10 types of motor starting control modes including protection, direct starter, reversing direct starter, star/delta starter, and autotransformer starter etc motor starting control modes.
- Main module provide 9 DIs (digital input) for start, stop and reset etc. signals input. If more DIs needed, an extended digital module should be selected.
- Main module provides 5 DOs (digital output) to meet varies of starting control modes and protection action. If more DOs are needed, an extended digital module should be selected.
- Provide 4~20mA analog output.
- 8 trip events can be stored in non-volatile memory.
- Through an extended analog module, 2 analog (4~20mA) input or 1 analog (4~20mA) and 1 hot resistance input can be added.
- Optional dual RS485 communication, support Modbus-RTU or Profibus protocol
- Small size and compact configuration.
- Easy installation. Proper for 35mm DIN rail.
- Suit for motors up to 660V

1. Model Selection

PMAC801	1	2	3	4	DESCRIPTION
					Rated current of controller
	2				2A
	6.3				6.3A
	25				25A
	100				100A
	250				250A
	500				500A
	820				820A
					Communication protocol
		M			MODBUS-RTU
		P			PROFIBUS-DP
		F			2 MODBUS-RTU
					Other protection function
			C		*Leakage current protection*
			X		*EEx e overload protection*
			V		*Voltage protection*
					Accessorial function
				A	*4~20mA analog output*
				R	*Restart function*

Rated Power for Motors and Rated CT Selection (suit for 380V motor)

Rated Power for Motor (KW)	Rated CT
0.1---------1.1	2A
0.1---------3.1	6.3A
3.1---------11	25A
11---------45	100A
45---------132	250A
132---------264	500A
More than 264KW	820A

Notice: Display Module, DI/DO module, Restart Module, Leakage Current CT should be specially ordered

2. Range of Measurement and Pricesion

Item	Range	Precision	Item	Range	Precision
Current	10%～200% Ie	±1%	Power factor	0~1	±1%
	200%～800% Ie	±3%			
Leakage current	10%～100% I n	±1%	Active power	0～600.0KW	±2%
PTC/NTC	10R～10K	±5%	Active energy	99,999,999.9kWh	±5%
Voltage	50%～150%Ue	±1%	Analog output	4mA～20mADC	±2%
Frequency	45HZ～65HZ	±1%	Analog input	4mA～20mADC	±2%

3. EMC Standard

Electrostatic discharge	EN 61000-4-2, Level 3
Electromagnetic field immunity	EN 61000-4-3, Level 3
Fast transient/burst immunity	EN 61000-4-4, Level 4
Surge immunity	EN 61000-4-5, Level 3
Conducted Emission	EN 55022, Class B
Radiated Emission	EN 55022, Class B

4. Protection Value and Technical Specifications

Function	Items	Setting range
Start overtime protection	Start time	2s~60s
	Protection action mode	Trip/alarm
Overload protection	Curve speed K	10 16 24 40 60 80 100 130 180 280 400 600 800 1000 1200 1300
	Hot/Cold curve rate	20%~99%
	Cool time	5min~1000min, step 1min
	Fault reset mode	Manual/automatic
	Protection action mode	Trip/alarm
Overcurrent protection	Protection action value	100%Ie~600%Ie; 0 means protection is disabled.
	Delay time	0.5s~60.0s; step 0.1s
	Protection action mode	Trip/alarm
Phase failure protection	Delay time	1 cycle~250 cycles; step 1 cycle.
	Protection action mode	Trip/alarm
Unbalance protection	Protection action value	20%~60%; 0 means protection is disabled.
	Delay time	0.5s~5.0s; step 0.1s
	Protection action mode	Trip/alarm
Short circuit protection	Protection action value	400%Ie~ allowed cut current of contactor; 0 means protection is disabled.
	Delay time	5 cycle~250 cycles, step 1 cycle.
	Protection action mode	Trip/alarm
Earth fault protection	Protection action value	(20%~100%) Ie; 0 means protection is disabled.
	Delay time	1 cycle~3000 cycles; step 1 cycle.
	Protection action mode	Trip/alarm

Leakage current protection* (It can't coexist with earth fault protection.)	Protection action value	(20%~100%) I n; 0 means protection is disabled.
	Delay time	1 cycle~3000 cycles; step 1 cycle.
	Protection action mode	Trip/alarm
Underload protection	Protection action value	(20%~100%)Ie; 0 means protection is disabled.
	Delay time	0.5s~60.0s; step 0.1s.
	Protection action mode	Trip/alarm
External fault protection	Delay time	0.1s~60.0s; step 0.1s.
	Protection action mode	Trip/alarm
Overvoltage protection *	Protection action value	(105%~150%)Ue; 0 means protection is closed.
	Delay time	0.5s~60.0s; step 0.1s.
	Protection action mode	Trip/alarm
Undervoltage protection *	Protection action value	(45%~95%)Ue; 0 means protection is disabled.
	Delay time	0.5s~60.0s; step 0.1s.
	Protection action mode	Trip/alarm
Under power protection *	Protection action value	(20%~95%)Pn; 0 means protection is disabled.
	Delay time	0.5s~60.0s; step 0.1s.
	Protection action mode	Trip/alarm
Phase sequence error protection *	Function	Disable /Enable
EEx e motor overload protection*	Function	Disable /Enable
Analog input protection*	Protection action value	4.0~20.0mA; 0 means protection is disabled.
	Delay time	0.5s~60.0s; step 0.1s.
	Protection action mode	Trip/alarm
Temperature protection *	Hot sense resistance	PTC/NTC/ Disable
	Action resistance	0.1kΩ~10.0 kΩ(For PTC, action value should be bigger than return value. For NTC, reverse.)
	Return resistance	0.1kΩ~10.0 kΩ
	Delay time	1s
	Protection action mode	Trip/alarm

Note:

1. "*" means optional protection function

2. If user decrease protection action value to 0, the protection function will be disabled

Measuring &Control

Measuring

Measuring parameter:

PMAC801 can measure and display below parameters:

- RMS current of each phase
- Three phase /phase voltage
- Zero phase sequence current
- Active power
- Reactive power
- Power factor
- Frequency
- Active energy

Trip Record

8 trip events can be stored in non-volatile memory.

Indicator LEDs

Display module has 5 LEDs ”Start”, “Run”, ”Alarm”, “Trip” and “Communication”

Statistic

- Total running time
- Total stopped time
- Total stop operation times
- Total trip times

Communication

- Modbus RTU485
- Two modubs
- Profibus

Display and control keys

LCD module has control keys and display these parameters.

Control

Starting control

PMAC801 provides ten motor starting control modes via the control relay output.

Operating

Motor can be controlled through **display module**, **remote DI** or **communication** respectively.

Fault info output

It provides a relay for fault information output. Its contact is open normally. When alarm or trip protection takes place, the contact will be closed. After the fault is eliminated, the contactor is opened again.

Power diagnosis

PMAC801 provides a relay for power diagnosis output.

Reset

the controller should be reset to clear fault indication before restarting motor. Reset operation can be implemented via reset keypad of display module

Emergent stop

PMAC801 provides an emergent stop operation input

Restart

In case of a voltage dip, PMAC801 will restart the motor in certain cases according to the length of the dip, after the voltage restores.

Control keypads

Start A: Start motor in direction CW.
Start B: Start motor in direction CCW.
Stop: Stop motor.
Reset: In the stopping or stopped state, pressing the key 2s can eliminate fault information..

Module

(Option)

Display module

PMAC801D1 LCD module
It has 5 LEDs, 8 keypads and 1debug port.
Support start/stop control, data inquire, parameter setup.

Extended Digital module

The digital module is divided into 3 types according to the number of DI/DO.

ED1: 4DI, 4DO
ED2: 8DI, 2DO
ED3: 11DI

Extended Analog module

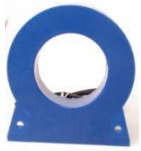
EA1: 4-20mA analog current input, and 1 PTC/NTC (temperature protection)
EA2: 4-20mA analog current inputs

Power Supply Module

If a system has AC and DC power supply to the device at the same time or the restart function is needed, the power supply module can be selected.

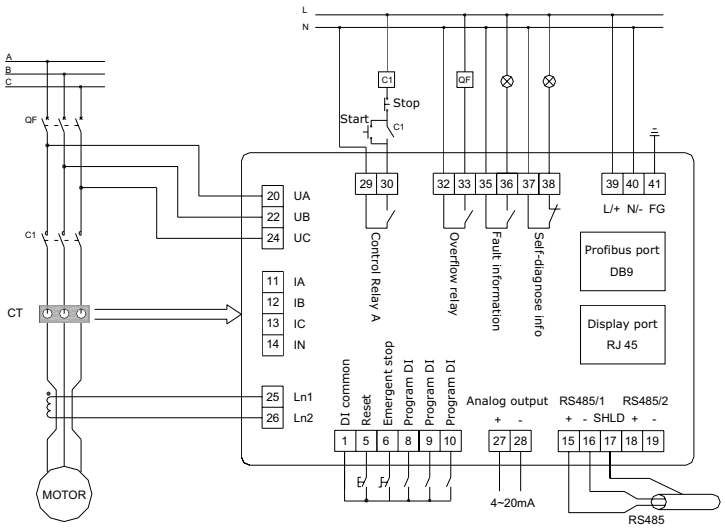
PL-1 : 220VDC and 220VAC, 3-6s
PL-2: 380VAC
PL-3: 220VAC, 9s

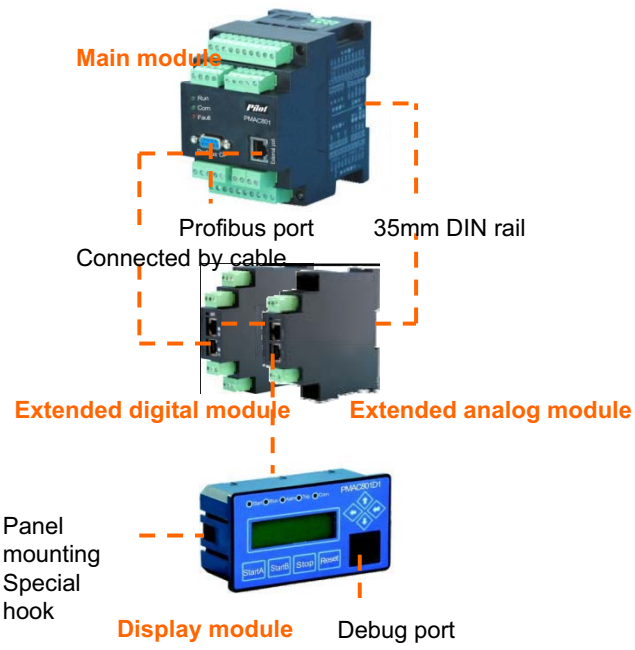
Leakage Current Transformer



CT

Typical connection





Technical

Specifications

Phase Current Input	
Conversion	True RMS, sample time1.25ms
Range	10% ~200% Ie 200% ~ 800% Ie
Accuracy	±0.5% (10% ~200% Ie) ±3% (200% ~ 800% Ie)
Ground Fault Current Input	
Conversion	True RMS, sample time1.25ms
Range	10% ~100% I△n
Accuracy	±1%
Voltage Input	
Conversion	True RMS, sample time1.25ms
Range	50% ~150% Ue
Volt accuracy	±0.5%
Power Reading	
Conversion	True RMS, sample time1.25ms
Range	0.5~600KW
Accuracy	±2%
Communication	
Type	RS485
Protocol	Modbus-RTU or Profibus-DP
Baud rate	2400, 4800,9600,19200
Address	1~247 (Modbus-RTU) 3~123 (Profibus-DP)
Environment	
Operating temp.	-10 ~+55℃
Storage temp.	-25 ~+70℃
Humidity	10~ 85%
Power Supply	
AC Normal	85-265V AC or 100-300V DC
Frequency	50Hz or 60Hz
Power consumption	<5w
EMC Test	
Electrostatic discharge EN61000-4-2, level 3	
Electromagnetic field immunity EN61000-4-3, level 3	
Fast transient/ burst immunity EN61000-4-4, level 4	
Surge immunity EN61000-4-5, level 3	
Conducted/ radiated emission EN55022, class B	

		Config.
Protection	Start overtime	●
	Overload	●
	Overcurrent	●
	Phase failure	●
	Current unbalance	●
	Short circuit	●
	Earth fault	●
	Leakage current	○
	Temperature (PTC/ NTC)	○
	Overvoltage	○
	Undervoltage	○
	Under power	○
	Phase sequence error	○
	EEx e overload (tE)	○
	Analog input	○
Mode	Motor starting control mode	●
DI	9 DIs in main module	●
	Extended to 11DIs	○
DO	5 DOs in main module	●
	Extended to 4DOs	○
COM	Modbus-RTU	○
	Profibus-DP or 2 Modbus	○
Measure	3I, In, I_unbal.	●
	U, P, Q, PF, F, kwh, I△n	○
AO	1 4~20mADC analog output	○
AI	2 4~20mADC analog input	○
SOE	8 records of trip events	○
Statistic	Total running time	○
	Total stopped time	○
	Total stop operation time	○
	Total trip time	○
Restart	Motor restart	○

Remark: ●=standard ○= optional

Technical

Specifications

Protection

Start Overtime	
Starting time	2s ~60s
Range	<=10%Ie or >=120%Ie
Delay	2s ~60s
Accuracy	±0.1s
Overload Curves	
Trip time	In contrast to current
Accuracy	±0.1s
Detection level	>=105%Ie
Thermal Cooling Time	
Range	5min ~1000min
Accuracy	±1min
Over Current	
Range	100% ~600% Ie, or OFF
Delay	0.5s ~60s
Accuracy	±0.1s
Phase Failure	
Range	0.02s ~ 5s
Accuracy	±0.02s
Current Unbalance	
Range	20% ~60%
Trip delay	0.5s ~5s
Accuracy	±0.1s
Calculation method	Imax – Imin/max (Iav, Ie) x100%
Short Circuit	
Range	400%Ie ~800% or OFF
Delay	0.1s ~5s
Accuracy	±0.02s
Earth Fault	
Range	20% ~100% Ie, or OFF
Delay	0.02s~ 60s
Accuracy	±0.02s
Leakage Current	
Range	20% ~100% I△n, or OFF
Delay	0.02s~ 60s
Accuracy	±0.02s

Undercurrent	
Range	20% ~100% Ie, or OFF
Delay	0.5s ~ 60s
Accuracy	±0.1s
Temperature	
Sensor Type	PTC/ NTC or OFF
Range	100Ω ~ 10,000Ω
Delay	1s
Accuracy	±0.1s
Overvoltage	
Range	105%~150% Ue, or OFF
Delay	0.5s ~60s
Accuracy	±0.1s
Undervoltage	
Range	45%~95% Ue, or OFF
Delay	0.5s ~60s
Accuracy	±0.1s
Under Power factor	
Range	20%~95% Pn, or OFF
Delay	0.5s ~60s
Accuracy	±0.1s
Phase Sequence Error	
Protection	ON or OFF
EEx e Overload (tE)	
Protection	ON or OFF
Analog Input	
Range	4-20mA
Delay	0.5s ~ 60s
Accuracy	±0.1s
Alarm	programmable 4-20mA
Trip	programmable 4-20mA

Remark:
Ie: rated current of motor
Ue: rated line voltage of motor
I△: leakage current
Pn: rated power of motor

PMAC801--①--②--③--④--⑤
(main module)

Order information

①: Rated Current			
2	2A	**250**	250A
6.3	6.3A	**500**	500A
25	25A	**820**	820A
100	100A		

②: Communication Protocol	
M	MODBUS-RTU
P	PROFIBUS-DP
F	DUAL MODBUS-RTU

③: Other Protection Function	
C	*Leakage Current Protection*
X	*EEx e Overload Protection*
V	*Voltage Protection*

④: Accessorial Function	
A	*One 4-20mA Analog Output*
R	*Restart Function*

⑤ : Control Relay Type	
Z	220VDC/3A

Notes:

1. The basic protection function include start overtime protection, overload protection, overcurrent protection, phase failure protection, current unbalance protection, earth fault protection, short circuit protection, underload protection, external error input protection. Trip Events, Statistics
2. The functions dedicated with italics can be selected together.
3. The leakage current protection needs an additional leakage CT.
4. Voltage protection function includes overvoltage, undervoltage, underpower, phase sequence error protection.
5. If voltage protection function or restart function are selected, voltage measurement function will be active automatically

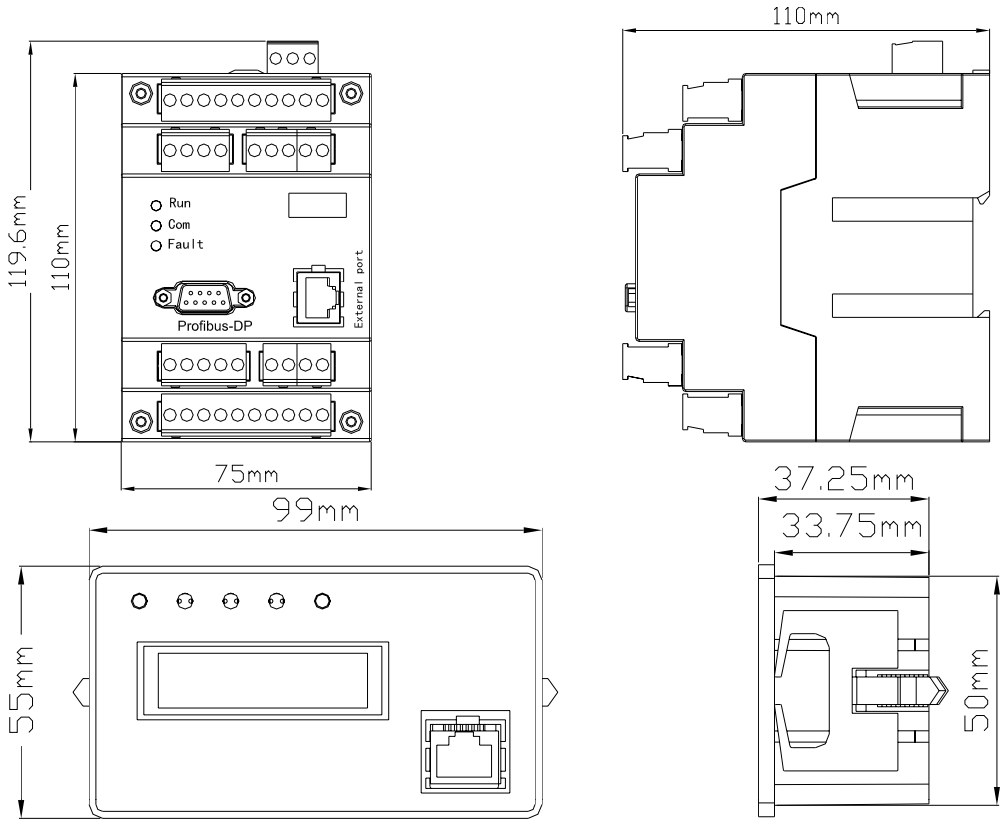
Include: vlotage, power, power factor, frequency, energy.

6. If temperature protection function or analog input protection function is needed, the extended analog module EA1 should be selected.
7. If the control circuit is DC system, the “Z” item can be selected.

Accessorial Modules		
Display Module	PMAC801D1	Display panel for local control.
Extended Digital Module	ED1	4DI, 4DO
	ED2	8DI, 2DO
	ED3	11DI
Extended Analog Module	EA1	One 4~20mA analog input, one PTC/NTC input (temperature protection)
	EA2	Two 4~20mA analog input
Power Supply Module	PL1	When the system voltage is interrupted, it provides power to PMAC801 to work for 3~6s. It is proper for 220VAC or 220VDC input.
	PL2	It is proper for 380VAC input.
	PL3	When the system voltage is interrupted, it provides power to PMAC801 to work for 9s. It is proper for 220VAC input.
Leakage CT	LCT100	The inside diameter is 50mm. It is proper for motor with rated current 10~100A.
	LCT250	The inside diameter is 75mm. It is proper for motor with rated current 100~250A.
	LCT400	The inside diameter is 100mm. It is proper for motor with rated current 250~400A.
	LCT630	Foursquare CT . It is proper for motor with rated current >400A.

Installation

Dimension



Installation