

# PMC916 Power Monitoring & Control Unit

## Technical Information



## Table of Contents

<b>1 INTRODUCTION</b>	1
1.1 PMC916 Internal Structure & Information Illustration	1
1.2 Technical Specification	2
1.3 PMC916 Terminal Definition	3
1.4 PMC916 mounting Dimension	4
<b>2 FUNCTION PROFILE</b>	5
2.1 Measurements of Power Parameters	5
2.2 Status Monitoring	8
2.3 Remote Control	8
<b>3 COMMUNICATIONS</b>	10
3.1 RS485/MODBUS-RTU Communications Mode	10
3.2 CAN/Hilon Communications Mode	10
3.3 Communications Connection	10
<b>4 SPECIAL FUNCTION ILLUSTRATION</b>	11
4.1 PMC916 Relay Working Characteristic	11
4.2 PMC916 Relay's Relating Voltage and Acting as a Voltage Relay	11
4.3 PMC916 Relay's Relating Current and Acting as a Current Relay	11
4.4 PMC916 Relay's Relating Electric Parameter and Remote Control Setting	11
<b>5 MENU PROFILE</b>	12
5.1 PMC916 Front Panel	12
5.2 PMC916 Menu Profile	13
<b>6 PMC916 ORDER INFORMATION</b>	15

# Introduction



Fig. PMC916 Outlook

## 1 Introduction

The PMC916 (POWER MONITORING & CONTROL UNIT) is an intelligent multipurpose power parameter monitoring and control device which has an extensive range of applications in power systems. The PMC916, which can be employed directly as a power meter, features eight switch signal channels for the monitoring of the switch contact status. The four relay outputs of the PMC916 allows for remote control, and alarm control by relating power parameters as voltage, current, frequency and power.

PMC916 supports user-oriented communication protocol with opening form. Two specifications(PMC916 and PMC916-C) support two kind of communication ports respectively: RS485(PMC916) or CAN(PMC916-C); and support two kinds of communication protocols respectively: MODBUS-RTU(PMC916) or Hilon B(PMC916-C). PMC916 can be connected to the communication of computer-based monitoring and control systems conveniently.

### 1.1 PMC916 Internal Structure & Information Illustration

PMC916 has two MCU inside, which are defined as 'DISPLAY MCU' and 'MASTER MCU'. The task of 'DISPLAY MCU' is to deal with the keyboard and display of PMC916. 'DISPLAY MCU' and 'MASTER MCU' communicate and exchange information by inner bus.

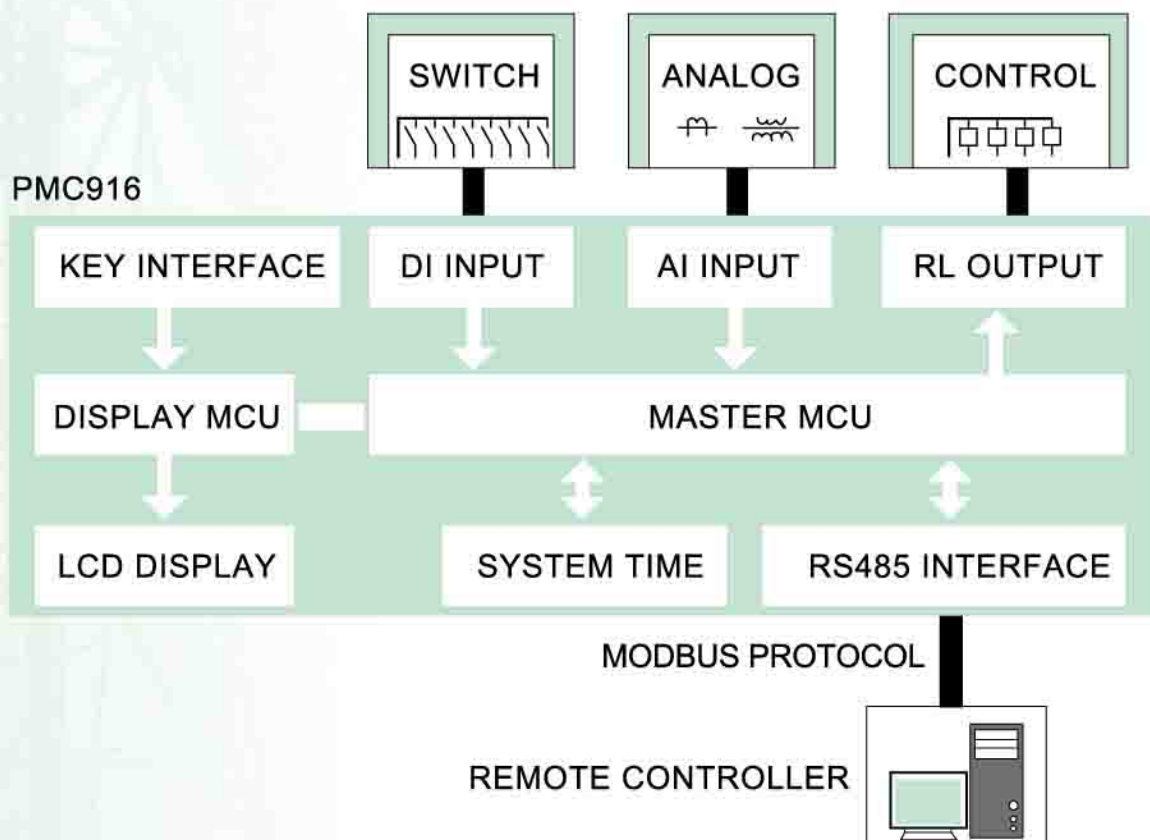


Fig. 2 PMC916 Internal Structure & Information Flow Chart

# Introduction

PMC916 input and output system include: "SWITCH INPUT", "ANALOG INPUT" and "CONTROL OUTPUT" interface management part. The three interface management part all exchange information and receive work & control commands from "MASTER MCU" by inner bus.

PMC916 communicate and exchange information with monitoring and control system by RS485/CAN communication port, and adjust time with system clock at the same time.

## 1.2 Technical Specification

### Standards:

IEC61000-4-2 (EN61000-4-2) Electrostatic Discharge Test	Level 3
IEC61000-4-3 (EN61000-4-3) Radiated, Radio-frequency, Electromagnetic Field Immunity Test	Level 3
IEC61000-4-4 (EN61000-4-4) Electric Fast Transient/Burst Immunity Test	Level 4
IEC61000-4-5 (EN61000-4-5) Surge Immunity Test	Level 3
IEC61000-4-6 (EN61000-4-6) Immunity Test to Conducted Disturbance	Level 2
IEC61000-4-11 (EN61000-4-11) Voltage Dip	
EN55011 Radiated Disturbance	Class A

### Measurement Technical Indicators

Parameters	Accuracy	Range
Voltage	0.5%	0-999,999V
Current	0.5%	0-32000A
Power Factor $\cos\phi$	1.0%	$0.6 <  \cos\phi  < 1$
Active	1.0%	0-999,999KW
Reactive	1.0%	0-999,999Kvar
Apparent	1.0%	0-999,999KVA
Kilowatt-hour	2.0%	0-999,999,99
Frequency	0.2Hz	45-75Hz

### Operating Parameters

Operating Power Supply: AC220V, range: 85V-265V  
or DC220V, range: 110V-300V

Power Consumption:  $\leq 15W$

Operating Temperature/ Storage Temperature:  $-5^{\circ}C \sim +55^{\circ}C$  /  $-20^{\circ}C \sim +70^{\circ}C$

LCD Resolving Capability: 128 X 64(POINT)

Weight: 977g

Protection Level: IP40(face)

Input Characteristic: Current Measurement: 5A/1A(extra indication is needed when order if you need 1A measured current)  
Voltage Measurement: 220V(AC phase voltage true RMS)  
Remote Signal Resolving Capability: (2ms(SOE time resolving capability))



# Introduction

Output Characteristic:

Remote Control Relay Action Parameter: 250V 8A AC&30V 8A DC, Resistive Load

Communication:

Communication Port: RS485, CAN

Communication Protocol: MODBUS-RTU, Hilon B

Communication Rate:

MODBUS : 300/600/1200/2400/4800/9600 bps

Hilon:5/10/20/50/100/125 K bps

## 1.3 PMC916 Terminal Definition

PMC916 serial number and definition of the wiring terminal on back panel.

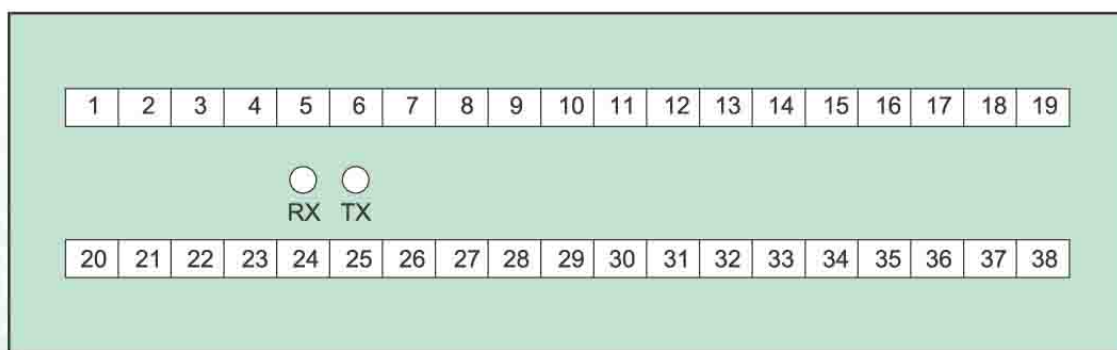


Fig 3 PMC916 wiring terminal

Serial No.	Definition	Description
1	PE	Protection earth
2	RS485+/CANH	RS485 bus+/CAN bus high
3	RS485-/CANL	RS485 bus-/CAN bus low
4	RS485+/CANH	RS485 bus+/CAN bus high
5	RS485-/CANL	RS485 bus-/CAN bus low
6	SHLD	Shield earth
7	I11	A phase current input terminal
8	I12	A phase current output terminal
9	I21	B phase current input terminal
10	I22	B phase current output terminal
11	I31	C phase current input terminal

# Introduction

12	I32	C phase current output terminal
13	I41	Zero-sequence current input terminal
14	I42	Zero-sequence current output terminal
15	NC	Non-connection
16	U1	A phase voltage input
17	U2	B phase voltage input
18	U3	C phase voltage input
19	Un	Voltage common(earth terminal)/B phase voltage input(3-Phase 3-Wire System)
20	L/+	AC power supply L terminal/ DC power supply +
21	N/-	AC power supply N terminal/ DC power supply -
22	DICOM	Passive remote signal switch common
23	DI1	Passive remote signal switch input 1#
24	DI2	Passive remote signal switch input 2#
25	DI3	Passive remote signal switch input 3#
26	DI4	Passive remote signal switch input 4#
27	DI5	Passive remote signal switch input 5#
28	DI6	Passive remote signal switch input 6#
29	DI7	Passive remote signal switch input 7#
30	DI8	Passive remote signal switch input 8#
31	RL11	Remote control 1# relay upper connection
32	RL12	Remote control 1# relay lower connection
33	RL21	Remote control 2# relay upper connection
34	RL22	Remote control 2# relay lower connection
35	RL31	Remote control 3# relay upper connection
36	RL32	Remote control 3# relay lower connection
37	RL41	Remote control 4# relay upper connection
38	RL42	Remote control 4# relay lower connection

## Wiring terminal illustration:

- 3-Phase 4-Wire System voltage measurement, Un connected to Voltage common terminal or earth terminal.
- 3-Phase 3-Wire Wye System voltage measurement, if PT secondary connection is 3-wire, Un should be connected to Voltage common terminal.
- 3-Phase 3-Wire Wye System voltage measurement, if PT secondary connection is double-wire, Un should be connected to Voltage common terminal as called B.

## 1.4 PMC916 mounting Dimension

PMC916 should be mounted on the switchgear panel; slots on the panel should be 141mm x 96mm in size.

# Function Profile

## 2 Function Profile

### 2.1 Measurements of Power Parameters

Measurements of power parameters include 3-phase Voltage Measurements, 3-phase Current Measurements, power factor Measurements, then calculate other extended power parameters such as power, Kilowatt-hour, etc..

Current, Zero-sequence Current	Ia, Ib, Ic, In
Line_line Voltage /Phase Voltage	Uab, Ubc,Uca / Ua, Ub, Uc
3-phase Power Factor*	Pfa, PFb,PFc, LD(lead), LG(lag)
System Frequency and Power Factor	F, PF
System Power	P, Q
3-phase Frequency	Fa, Fb, Fc
3-phase Active Power*	Pa, Pb, Pc
3-phase Reactive Power*	Qa, Qb, Qc
3-phase Apparent Power*	Sa, Sb, Sc
3-phase Active Kilowatt-hour*	KWH, KWHa, KWHb, KWHc
3-phase Reactive Kilowatt-hour*	KWARH, KWARHa, KWARHb, KWARHc

#### \*Voltage & Current Measurements

Measured voltage signals are obtained through collecting and processing, and the true RMS of 3 line\_line voltage or phase voltage is displayed on the screen of PMC16. we adopt direct input if the measured voltage is 0.4KV, and use voltage transformer as input if the measured voltage is 0.69KV-35KV.

PMC16 allows for a voltage measurement of up to 999999V.

Measured current signals are obtained through collecting and processing, and the true RMS of 3-phase current is displayed on the screen of PMC16. we adopt direct input if the measured current is no more than 5A, and use current transformer as input if the measured current is above 5A.

PMC16 allows for a current measurement of up to 32000A.

The secondary circuit current of the zero-sequence current transformer used in zero-sequence current measurements is 0.02-1A. Measured current signals are obtained through collecting and processing, and the true RMS of zero-sequence current is displayed on the screen of PMC16.

# Function Profile

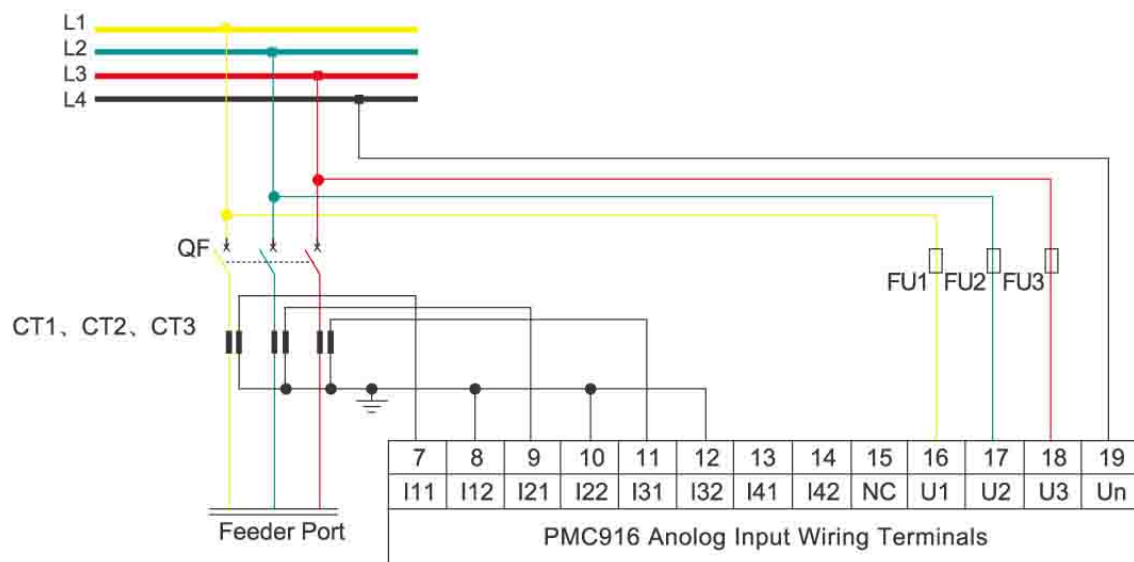


Fig.4 Wiring for PMC916 collecting voltage and current under 0.4KV

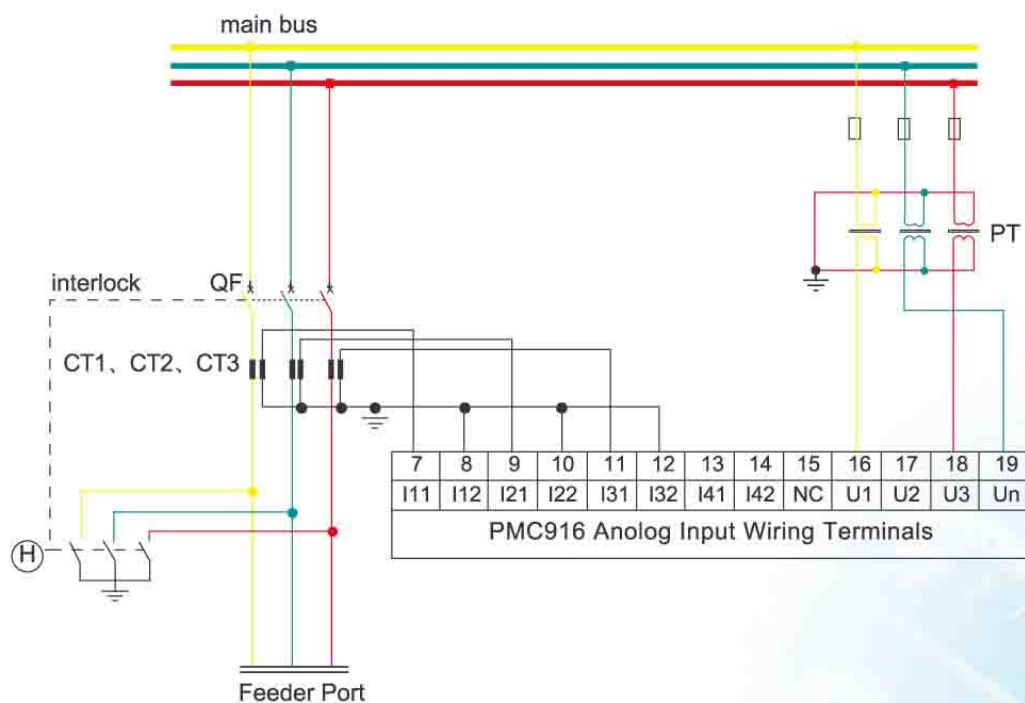


Fig.5 Wiring for PMC916 collecting voltage and current under 10KV



# Function Profile

We should use voltage transformer if the measured voltage is above 400V and use current transformer if the measured current is above 5A. There are some regulations about wiring and parameters setting of PMC916 measurements according to the measured power system and the number of the voltage & current transformer. The details are as follows:

Voltage Level/system	CT Number	PT Specification	Current wiring terminals	Voltage wiring terminals	Illustration
400V/3-Phase 4-Wire System	3	None	I1 to 7,8 I2 to 9,10 I3 to 11,12 Current common to 12	U1 to 16 U2 to 17 U3 to 18 Common N to 19	Current common 12 to ground
690V/3-Phase 3-Wire System	3	Double-coil $2x\sqrt{3}$ 100V	I1 to 7,8 I2 to 9,10 I3 to 11,12 Current common to 12	U21 to 16 U23 to 18 Common U22 to 19	Current common 12 to ground Voltage common 19 to ground
690V/3-Phase 4-Wire System	3	3x100V	I1 to 7,8 I2 to 9,10 I3 to 11,12 Current common to 12	U21 to 16 U22 to 17 U23 to 18 Common U2N to 19	Current common 12 to ground Voltage common 19 to ground
690V/3-Phase 3-Wire System	3	Double-coil $2x100V$	I1 to 7,8 I2 to 9,10 I3 to 11,12 Current common to 12	U21 to 16 U23 to 18 Common U22 to 19	Current common 12 to ground Voltage common 19 to ground
10KV/3-Phase 3-Wire System	3	Double-coil $2x\sqrt{3}$ 100V	I1 to 7,8 I2 to 9,10 I3 to 11,12 Current common to 12	U21 to 16 U23 to 18 Common U22 to 19	Current common 12 to ground Voltage common 19 to ground
35KV/3-Phase 4-Wire System	3	3x100V	I1 to 7,8 I2 to 9,10 I3 to 11,12 Current common to 12	U21 to 16 U22 to 17 U23 to 18 Common U2N to 19	Current common 12 to ground Voltage common 19 to ground

You can choose one current transformer CT(to measure B phase current), two CT(to measure A & C phase current), and three CT. PMC916 can only measure and control the power parameters of single phase loop when only one CT is in use; when two CT are used we can gain the third phase current by calculating.

# Function Profile

## 2.2 Status Monitoring

PMC916 can monitor eight passive switch signals or passive pulse signals, and provide common terminal DICOM as well. As illustrated in fig.6, terminal 'DIx' is the input terminal of switch or pulse signals, while terminal 'DICOM' is the common terminal of switch or pulse signals. Please look at fig. 6 to find the details of the wiring.

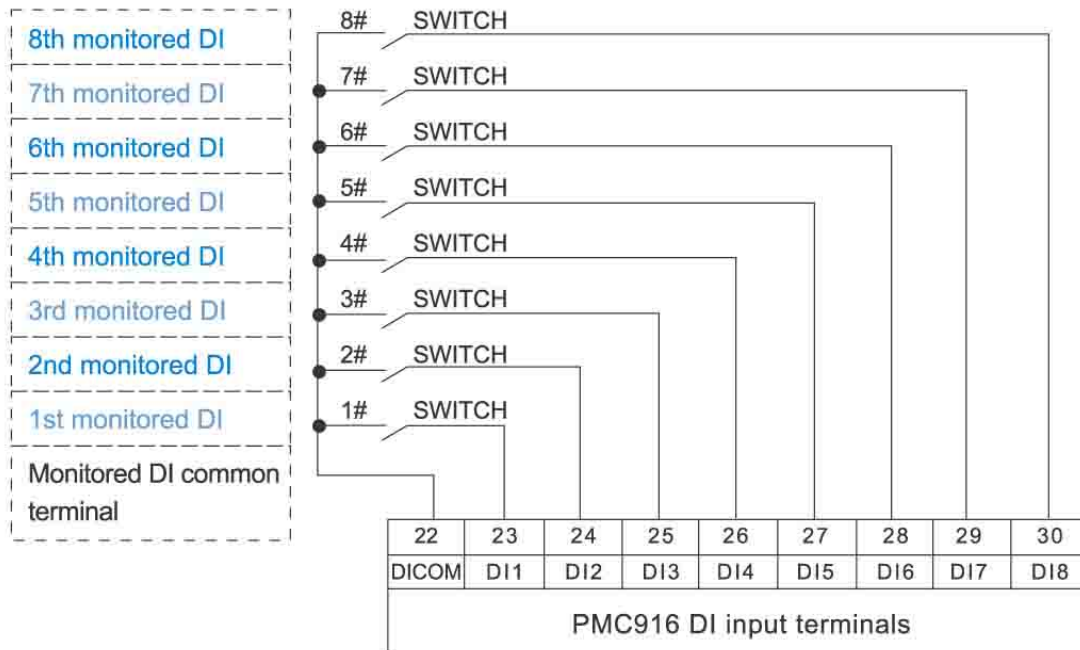


Fig.6 Wiring for Monitoring the Remots Signal Switch

The type of the signals received by switch input channel can be selected according to the actual requirement, a few of the signals can be set as switch signals, and the others can be set as pulse signals. The default signal type of PMC916 is switch. This setting is at Signaling Func of Device Setup in the main menu. The corresponding indicator light on the panel is on when the status of the switch signal is 'close'; and if the status of the switch signal is 'open' the light will turn down.

When one or more channel input functions are set to pulse functions, PMC916 will take count of the pulse of this one or more channel, when the signal goes to the upper side of the pulse, corresponding pulse counting plus one. Light of this channel on the panel is invalid.

Switch monitoring device must differentiate the time order of sequence of events (SOE) when monitoring many switches. The SOE resolution capacity of PMC916 is 2ms, PMC916 can differentiate and take record of a SOE as long as the time between the SOE of two monitored switches is no less than 2ms.

## 2.3 Remote Control

The PMC916 is equipped with four relay output channels, which are both normally open connections. Four relay output can be set up for manual control, remote control and power parameters beyond limit alarming control.

# Function Profile

**Manual control:** operate by using the buttons on the panel of PMC916;

**Remote control:** operate by using the communication bus at background of monitoring and control system;

**Power parameters beyond limit alarming control:** PMC916 can perform beyond limit alarming by relating the power parameters and relay, the power parameters can be related are as bellows:

- Measured and monitored current : time limit for over current and instant break, time limit for earth fault;
- Measured and monitored voltage;
- Lower voltage or loss voltage, over voltage;
- Measured frequency: low frequency and over frequency;
- Measured power factor: low power factor;
- Relay delay time and return time

Below is a sketch map of PMC916 monitoring and protecting a circuit with 10KV feeder, 10KV/0.4KV transformer and 0.4KV low voltage incoming line.

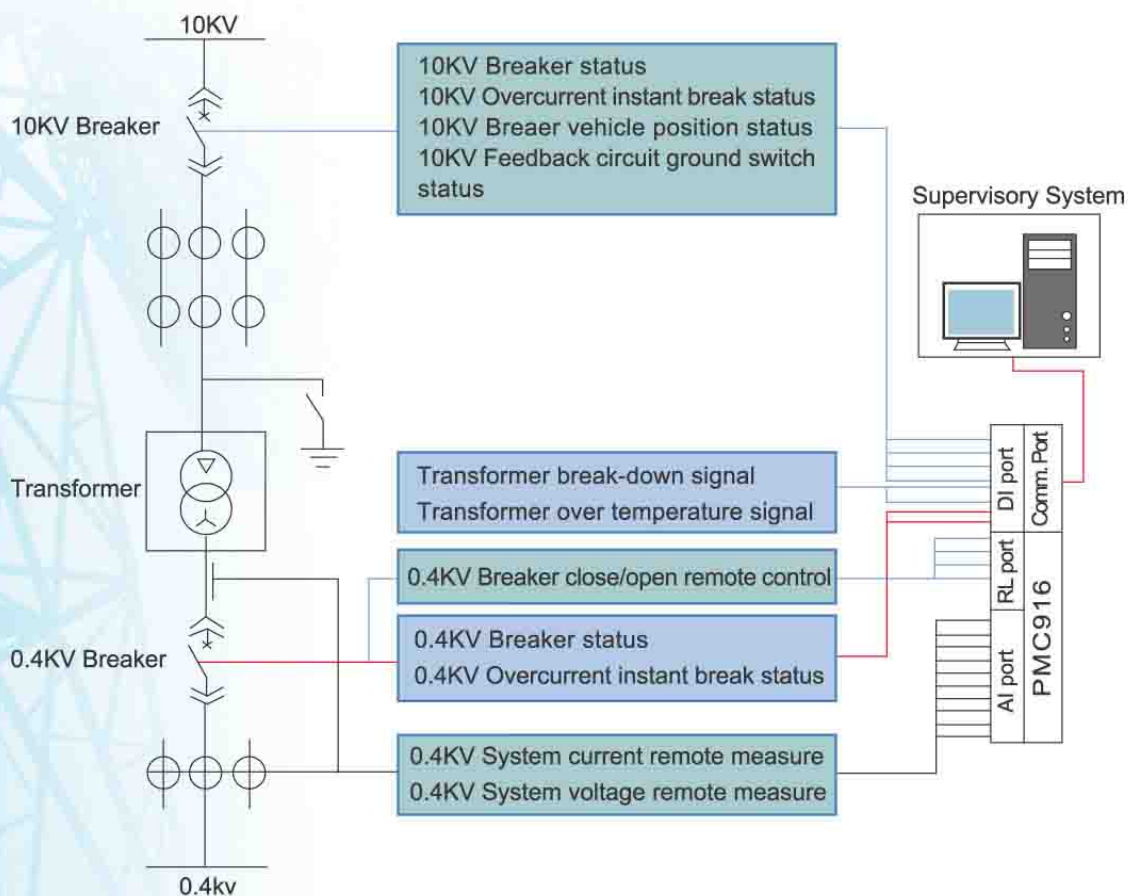


Fig.7 Sketch Map of PMC916 Monitoring and Protecting a circuit with MV & LV



# Communications

## 3 Communications

PMC916 has two specifications: one support RS485 communication port and use MODBUS-RTU communication protocols; the other support CAN communication port and use Hilon B communication protocols

### 3.1 RS485/MODBUS-RTU Communications Mode

Communication port: RS485

Communication connection: double line(RS485+, RS485-), shield twisted-pair

Communication work mode: half duplex

Communication rate: 300/600/1200/2400/4800/9600 bps

Node capability: 32

### 3.2 CAN/Hilon Communications Mode

Communication port: CAN bus

Communication connection: double line(CANH, CANL), shield twisted-pair

Communication work mode: half duplex

Communication speed: 5/10/20/50/100/125 Kbps

Node capability: limit is 110, and 64 recommended

### 3.3 Communications Connection

Straight-line Wiring Method for Communications connection, and impedance matching is about 120 ohms

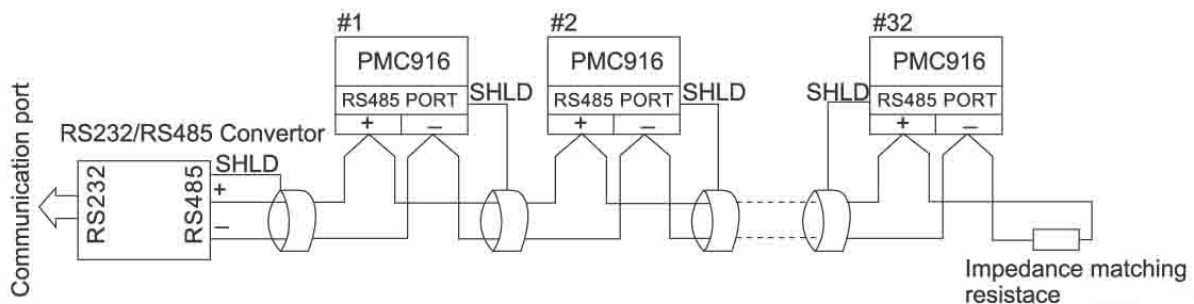


Fig.8 Straight-line Wiring Method of PMC916 for Communications connection

#### Loop Wiring Method

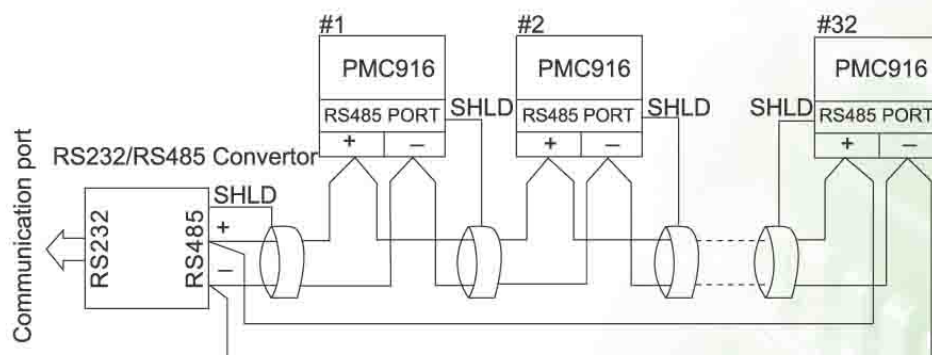


Fig.9 Loop Wiring Method for Communications connection



# Special Function Illustration

## 4 Special Function Illustration

### 4.1 PMC916 Relay Working Characteristic

The contact of PMC916 output relay is normally open contact; when relay is related to any power parameter and this power parameter is beyond limit, the relay contact can be set to delay action after beyond limit from menu, the delay time can be adjusted (total time range: 0-99s, smallest time interval: 0.1s, among this zero second value means act at once); the output time of contact after the action of relay can be set from menu (total time range: 1-99s, smallest time setting & smallest time interval are both 1s, zero second value means normally holding).

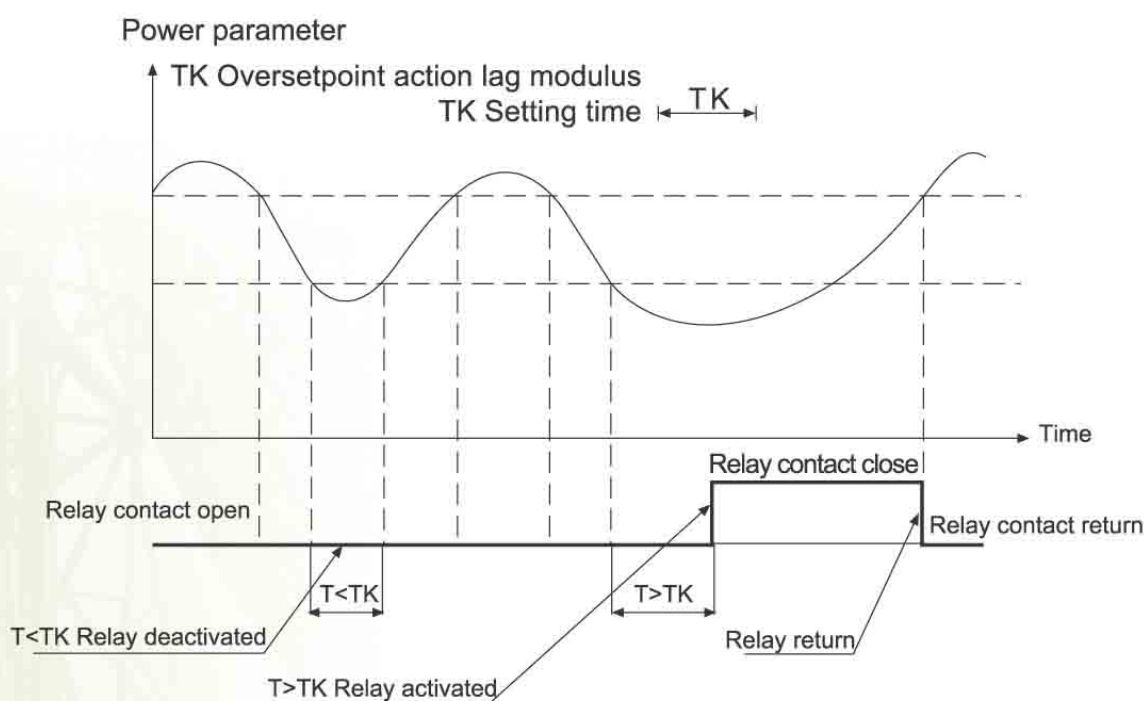


Fig. 10 PMC916 Relay Working Characteristic graph

### 4.2 PMC916 Relay's Relating Voltage and Acting as a Voltage Relay

The second relay of PMC916 can relate low voltage, considering low voltage and loose voltage may happen at the same time, the related relay contact is normally close when voltage is normal, and open when low voltage and loss voltage happen, TK adjustable range is 0.1-99s.

### 4.3 PMC916 Relay's Relating Current and Acting as a Current Relay

The first relay of PMC916 can relate to alarming function of current beyond limit action, relay can delay action when current beyond limit happen, TK adjustable range is 0.1-99s.

### 4.4 PMC916 Relay's Relating Electric Parameter and Remote Control Setting

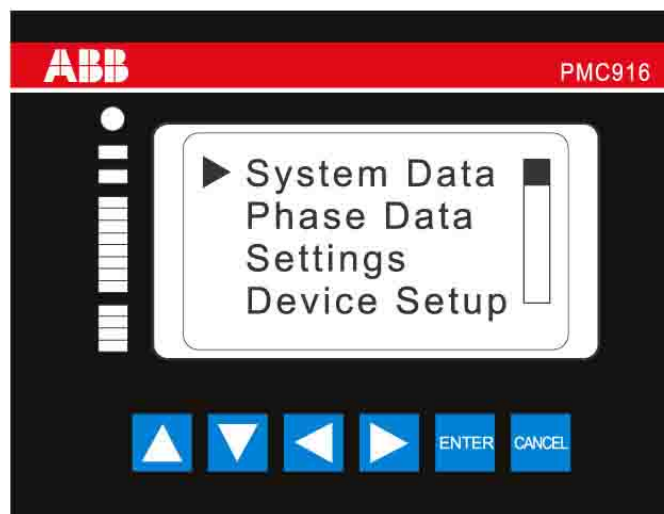
PMC916 relay set RL1 to act current alarming, and set RL2 to act voltage alarming, other power parameter can be related to any relay.

Remote control function is invalid when the relay is related to power parameter.

# Menu Profile

## 5 Menu Profile

### 5.1 PMC916 Front panel



Left indicator lights on the panel from the top down are as bellows:

**FAULT:** light on when alarm

**POWER:** light on after working power is turned on

**RUN:** twinkle with 1Hz frequency when normally work

**Eight Continuous Remote Signal Indicator:** light on after remote signal switch on

**Four Continuous Relay Indicator:** light on after relay contact close

**Six operating button on the bottom of front panel, from left to the right:**

UP: select menu content and value

DOWN: select menu content and value

LEFT: select menu content and value

RIGHT: select menu content and value

ENTER: confirm the selected menu content and value

CANCEL: deselect the selected menu content and value, quit menu

The middle of front panel is LCD display area, all the menu content and value can display in this area.

# Menu Profile

## 5.2 PMC916 Menu Profile

PMC916 has a system of detailed menu, and operating is very easy. Main functions of the menu are as the table below:

Top Menu	Sub-Menu	
System Data	System Power	System power
	System Freq <sup>abbr1</sup> /PF	System frequency/power factor
	System Energy	System Kilowatt_hour
Phase Data	Current	Circuit current(two pages ,use LEFT and RIGHT to shift)
	L_L Voltage	Line_line voltage
	L_N Voltage	Phase voltage*
	Phase Freq <sup>abbr1</sup>	3-phase frequency*
	Phase PF	3-phase power factor*
	Phase Act <sup>abbr2</sup> Power	3-phase active power*
	Phase React <sup>abbr3</sup> Power	3-phase reactive power*
	Phase Apt <sup>abbr2</sup> Power	3-phase apparent power*
	Phase Act <sup>abbr2</sup> Eng	3-phase active Kilowatt_hour*
	Phase React <sup>abbr3</sup> Eng	3-phase reactive Kilowatt_hour*
Settings	Over Current	Over current setting
	Instantaneous	Instant setting
	Earthing	Earth connection setting
	Low Voltage	Low voltage setting
	Over Voltage	Over voltage setting
	Low Frequency	Low Frequency setting
	Over Frequency	Over Frequency setting
	Low PF	Low power factor setting
	I Fault Relay	Current alarming output
	U Fault Relay	Voltage alarming output
	F Fault Relay	Frequency alarming output
	PF Fault Relay	Power factor alarming output
	Quit Settings	Quit Settings status

# Menu Profile

Device setup	INCOM Setup	Communications setting
	Password Setup	Password setting
	Transform <sup>abbr1</sup> Ratio	Transformer setting
	Signaling Func	Input functions setting(eight pages, use LEFT and RIGHT to shift )
	Auto Sending	Auto sending enable/disable
	RL1 Output Time	Relay 1 output time
	RL2 Output Time	Relay 2 output time
	RL3 Output Time	Relay 3 output time
	RL4 Output Time	Relay 4 output time
	System Time Set	Set the system date & time
	System Type Set	Set the system type
	Quit Setup	Quit setup status
Device Operate	SOE Inquire	Inquire about SOE
	Clear All SOE	Clear all the SOE
	Clear Energy	Clear kilowatt_hour
	Return Alarm	Return alarm
	Do Control	Local control
	Clr Rmt Pulse	Clear pulse count
	Quit Operate	Quit operate status
Status	System Time	System date & time
	Signaling Stat <sup>abbr5</sup>	Signal status(two pages, use LEFT and RIGHT to shift)
	Relay Status	Status of the relay
	Line Status	Status of the Alarming
	Remote Pulse	Count the remote pulse(eight pages, use LEFT and RIGHT to shift)
System Info <sup>abbr6</sup>	Name: PMC916(name of the device) Base Ver: main version Disp Ver: version of the display	

(note: the parameter with \* behind does not exist in 3-phase 3-wire system. Word with abbr upright is abbreviation of: abbr1-frequent, abbr2-active, abbr3-reactive, abbr4-transformer, abbr5-status, abbr6-information.)



# Order Information

## 6 PMC916 Order Information

### Order Specifications

Serial Number	Type	Capability	Order number	Explanation
1	PMC916	Operating power supply: AC220V range: 85V-265V DC220V range:110V-300V Measured voltage: Direct input: 0-220V AC Input from PT: 100V Measured current:0-5A AC Measured zero-sequence current:0-1A AC Remote signal number can be measured: 8 Relay number: 4 Communications port: RS485 Communications protocol: MODBUS-RTU	INTA911004R0700	Extra indication is needed if you need 0-1A measured current.
2	PMC916-C	Operating power supply: AC220V range: 85V-265V DC220V range:110V-300V Measured voltage: Direct input: 0-220V AC Input from PT: 100V Measured current:0-5A AC Measured zero-sequence current:0-1A AC Remote signal number can be measured: 8 Relay number: 4 Communications port: CAN Communications protocol: Hilon-B	INTA911004R0701	Extra indication is needed if you need 0-1A measured current.



We reserve the right to make changes in the course of technical development.

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