PD666-□ Series Digital Multi-function Meter

User Manual

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User Manual

1. Overview

1.1 Application

PD666 –□ series digital multi-function meter (hereinafter referred to as the meter) mainly measures and displays the voltage, current, active power, reactive power, frequency, power factor, positive and negative active energy, four quadrant reactive energy, harmonic content and other parameters in the electrical circuit in real time. It is widely used in low-voltage distribution incoming switch cabinet, feeder switch cabinet, etc. it is designed for power monitoring in power system, communication industry, construction industry, etc. it integrates measurement, communication, transmission and alarm.

Executive standard:

GB/T 22264.1 Mounted digital display electrical measuring instruments-Part 1: definitions and general requirements.

GB/T 22264.2 Mounted digital display electrical measuring instruments-Part 2: Particular requirements for ammeters and voltmeters.

GB/T 22264.3 Mounted digital display electrical measuring instruments-Part 3: Particular requirements for watt meters and reactive power meters.

GB/T 22264.4 Mounted digital display electrical measuring instruments-Part 4: Particular requirements for frequency meters.

GB/T 22264.5 Mounted digital display electrical measuring instruments-Part 5: Particular requirements for phase meters and power factor meters.

GB/T 22264.7 Mounted digital display electrical measuring instruments-Part 7: special requirements for multifunctional instruments.

GB/T 22264.8 Mounted digital display electrical measuring instruments-Part 8: Recommended test methods.

GB/T 17215.211 Alternating current measuring equipment General requirements, tests and test conditions-Part 11: measuring equipment.

GB/T 17215.322 Special requirements for alternating current measuring equipment-Part 22: static active energy meters (0.2S and 0.5s).

GB/T 17215.323 Special requirements for alternating current measuring equipment-Part 23: Static Var energy meters (Class 2 and 3).

1.2 Features

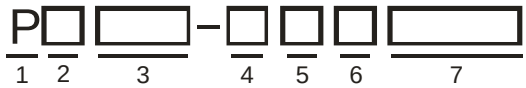
1) With electrical parameter measurement function (voltage, current, power, frequency, power factor, total harmonic content).

2) It has positive and negative active energy metering, four quadrant reactive energy metering and storage functions, and supports multi rate metering function.

3) RS485 interface, support ModBus_RTU.

4) Switch output (alarm), relay output.

1.3 Naming rules



① Product code: Chint digital panel meter

② Group code: D: Multi-function meter

③ Registration code: 666

④ Panel size code:

2：72mm×72mm 3：96mm×96mm

⑤ Auxiliary function selection:

None: default communication function

1.4 Environmental

Specified working temperature range: - 10 ℃ ~ + 45 ℃;

Limit of working temperature range: - 25 ℃ ~ + 70 ℃.

Relative humidity: annual average < 93%, no condensation, no corrosive gas place;

Atmospheric pressure: 86kPa ~ 106kPa.

2. Working principle

Modular structure design, auxiliary function optional. Fixed by fixed clamp, easy to install and universal. The measurement chip is used to sample and calculate the input signal in real time. The MCU processes and displays the sampling result. According to the parameter values programmed by the selected function module and keyboard, the upper and lower limit alarm output and transmission output of the measured value are carried out. The network is realized by communicating with the host computer through RS485 interface.

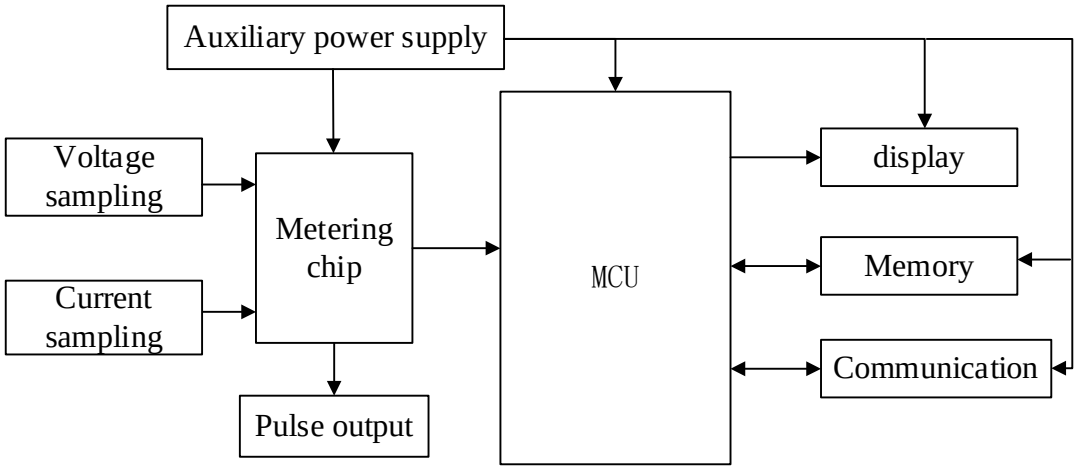


Figure 1 working principle diagram

3. Basic Specifications

Table 1 Technical parameters

Technical parameter			Values
input signal	Connection mode		Three phase four wire, three phase three wire
	Voltage	Rating	AC 450V

		Overload		Duration: 1.2times Instantaneous: 2times/5s		
		Power consumption		≤ 2VA (per phase)		
		Impedance		＞500kΩ		
	Electric current	Rating		AC 5A		
		Current overload		Duration: 1.2 times, Instantaneous: 10 times/5s		
		Current line power consumption		≤ 1VA (per phase)		
		Impedance		< 20m Ω (per phase)		
	Frequency	Input range		45Hz～65Hz		
Power supply	Supply voltage range			AC/DC 85V～264V, 50Hz/60Hz		
	Power consumption			Active power consumption ≤ 3W, apparent power consumption ≤ 15VA		
output	display			Segment code LCD or nixie tube display		
	measure parameter	Voltage		Class 0.5	Resolution 0.1V	GB/T22264
		electric current		Class 0.5	Resolution 0.001A	
		frequency		Class 0.5	Resolution 0.01Hz	
		Active power		Class 0.5	Resolution 0.1W	
		Reactive power		Class 1	Resolution 0.1var	
		Power factor		Class 0.5	Resolution 0.001	
		Active energy		Class C	Resolution 0.01kWh	GB/T17215.322
		Reactive energy		Class 2	Resolution 0.01 kvarh	GB/T17215.323
	electric energy	Energy measurement		Support positive and negative active energy metering, four quadrant reactive energy metering		
		Pulse constant		Active 10000 imp / kWh, reactive 10000 imp / kvarh		
		Multi-function output		Provide active power, reactive power, and second-pulse open-collector electrical signal output via optocoupler isolation, power pulse width: 80±16ms.		
	electric	Total	Voltage	Uh ≥ 3%UN Uh < 3%UN		5% Uh 0.15% UN

	energy quality	harmonic content (※)	electric current	Ih ≥ 10%IN Ih < 10%IN	±5% Ih 0.5% IN
			UN is the nominal voltage and IN is the nominal current Uh is the harmonic voltage and IN is the harmonic current		
	auxiliary function	Communication protocol		ModBus-RTU	
Note 1: The items marked with ※ are optional and need to be mentioned by the customer when ordering. Note 2: For other performance indicators, please refer to GB/T 22264.1 indoor meter requirements.					

Table 2 Electromagnetic compatibility and safety

Security	AC withstand voltage	The voltage between the terminals larger than 40V and the terminals smaller than 40V can withstand AC withstand voltage of AC 2kV / 5mA / 1min
	Pulse voltage	The voltage between the terminals larger than 40V and the terminals smaller than 40V can withstand ± 4kV 1.2/50 μ s pulse voltage (10 times per polarity)
	Insulation resistance	Input and output terminals to case > 100MΩ
	Outage data retention time	Over 10 years
Electro magnetism compatible	Electrostatic discharge immunity	GB/T 17626.2 class 4 (air discharge 15kV)
	Radio frequency electromagnetic field immunity	GB/T 17626.3 class 3 (10V/m)
	Electrical fast transient burst immunity	GB/T 17626.4 class 3 (2kV/5kHz)
	Surge immunity	GB/T 17626.5 class 4 (power supply line 4kV, voltage line 2kV)
	Conducted disturbance immunity of RF field induction	GB/T 17626.6 class 3 (150kHz-80mHz, 10V)

	Attenuation oscillation wave immunity	GB/T 17626.12 class 3 (common mode 2.5kV, differential mode 1kV)
	Radio interference suppression	GB/T 9254 class B

4. Main functions

4.1 Display function

The electrical parameters and energy data of display interface are primary side data (i.e. multiplied by current ratio and voltage ratio).

4.1.1 Display interface

The "∨" key or "∧" key can be used to switch the display interface.

Symbol indicator light on: negative sign (power factor is negative for capacitive, positive for inductive).

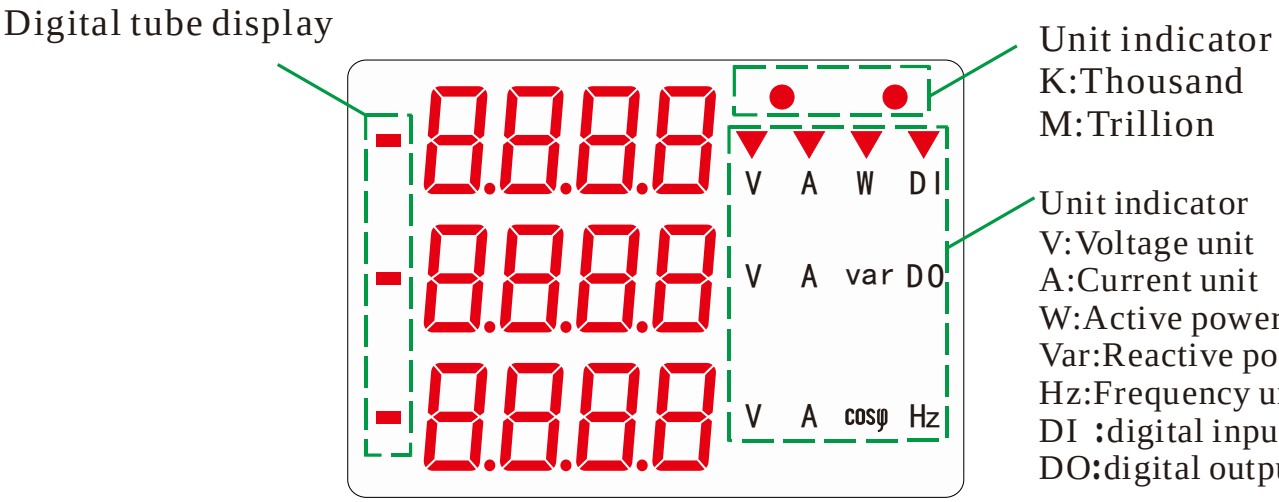


Figure 2 Display interface

4.1.2 Segment code LCD display interface

The "∨" key or "∧" key can be used to switch the display interface.The "ESC" key can be used to switch the electric energy display interface.

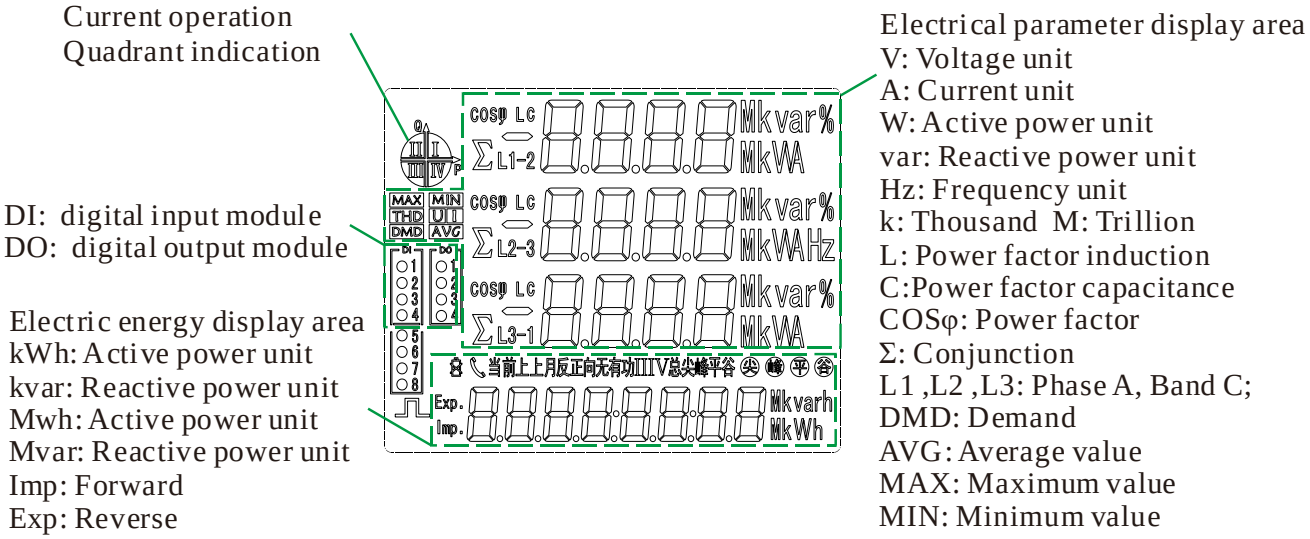


Figure 3 LCD display interface

4.2 Programming function

4.2.1 Programming parameter

In the programming state, the instrument menu adopts a hierarchical structure and is displayed by three rows of menu information.The default password is 701. When the password is wrong, you can view the programming parameters, but you can't change them.The default password can only be changed by communication.

Table 3 programming menu

Level 1 menu	Level 2 menu	Level 3 menu	explain
SYS	IrAt	1～9999	Current ratio is used to set the current ratio of input circuit When the current is connected to the line through the transformer, IrAt = rated current of primary circuit / rated current of secondary circuit; IrAt should be set to 1 when the current is directly connected.

	UrAt	0.1～999.9	Voltage ratio, used to set the input circuit voltage ratio: When the voltage is connected to the line through the transformer, UrAt= rated voltage of primary circuit / rated voltage of secondary circuit; When the voltage is directly connected, UrAt should be set to 1.0.
	nEt	0～1	Select the connection mode: 0: n.34 means three-phase four wire; 1: n.33 means three-phase three wire.
	CLrE	0～1	Setting to 1 means that the meter energy data is allowed to be cleared, and it will be automatically set to zero after clearing.
	codE	1～9999	Program password settings.
	d ISP	0～30	Rotation time (seconds) 0: fixed display; 1-30: time interval of actual rotation display.
	bLCd	0～30	Backlight time control (minutes) 0: normally on; 1-30: no key operation, backlight on time.
	PLUS	0～2	Pulse output: 0: active energy pulse; 1: reactive energy pulse; 2: second pulse
Conn	Addr	1～247	Communication address: Set the local communication address of the instrument, and the address shall not be the same as other slave addresses in the whole communication bus.
	bAud	0～4	Communication baud rate: 0: the baud rate of communication is 1200bps; 1: the baud rate of communication is 2400bps; 2: the baud rate of communication is 4800bps; 3: the baud rate of communication is 9600bps; 4: the baud rate of communication is 19200bps;
	Prot	1～5	Communication protocol switching: 1：Dl/T 645-2007； 2: N.2, Modbus RTU, no check bit, 2 stop bits; 3: n.1, Modbus RTU, no check bit, 1 stop bit; 4: E.1, Modbus RTU, even check bit, 1 stop bit; 5: o.1, Modbus RTU, odd check bit, 1 stop bit;

Note 2: voltage transformation ratio multiplied by current transformation ratio cannot be greater than 2500000.

4.2.2 Programming operation flow

Key Description: "SET" key means "OK", or "cursor shift" (when inputting numbers), "ESC" key means "exit", "∨" key means "minus", and "∧" key means "plus". Input the password (default 701) and enter the submenu item of "system settings" (for instruments with only two rows of numbers, when the system sets the third row of numbers to display, the first row will be hidden).

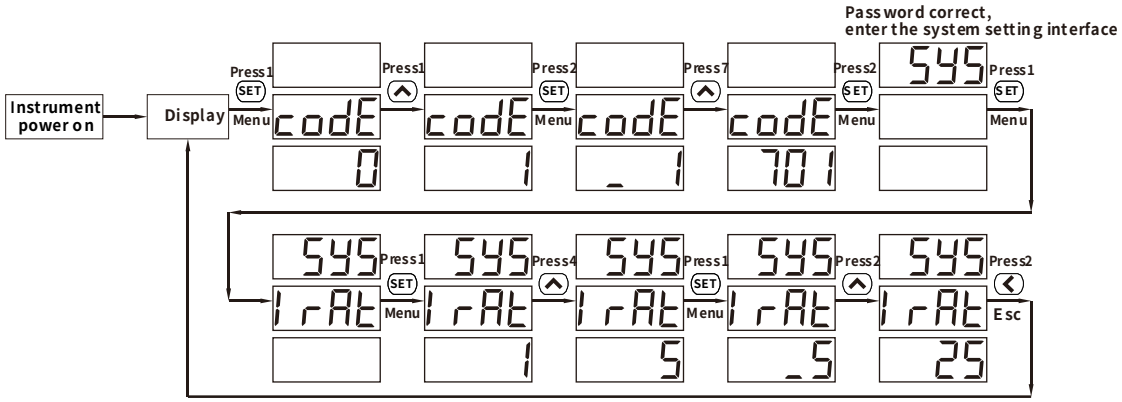


Figure 4 Current ratio setting (example changing current ratio to 25)

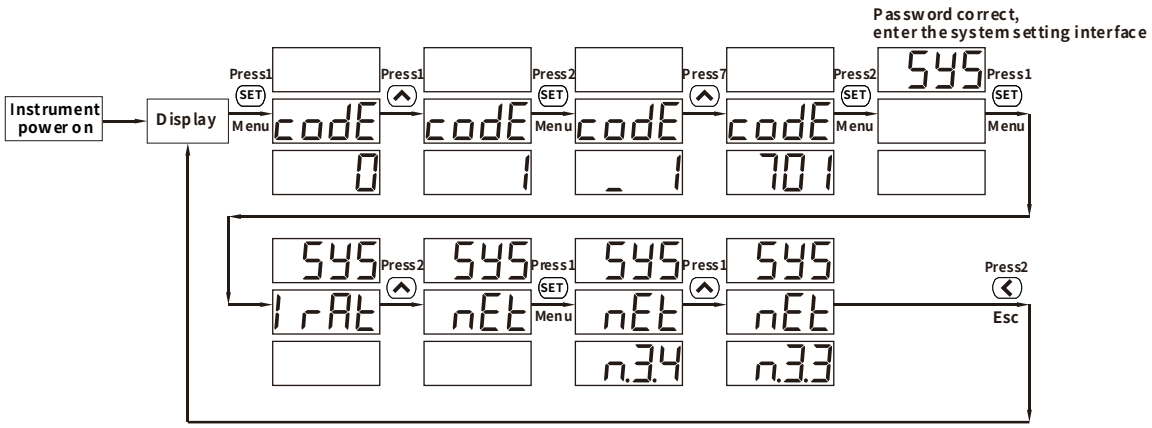


Figure 5 Wiring setting (example setting is three-phase three wire connection)

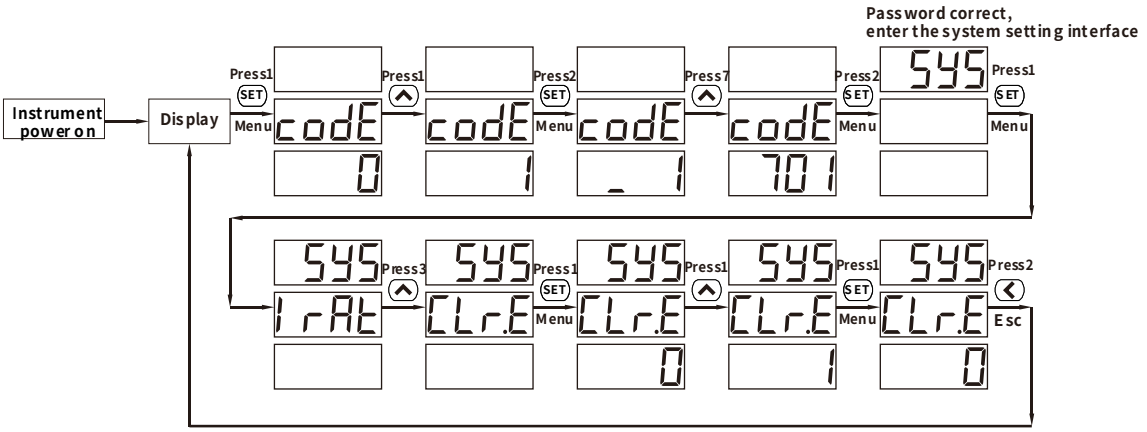


Figure 6 Energy clearing operation

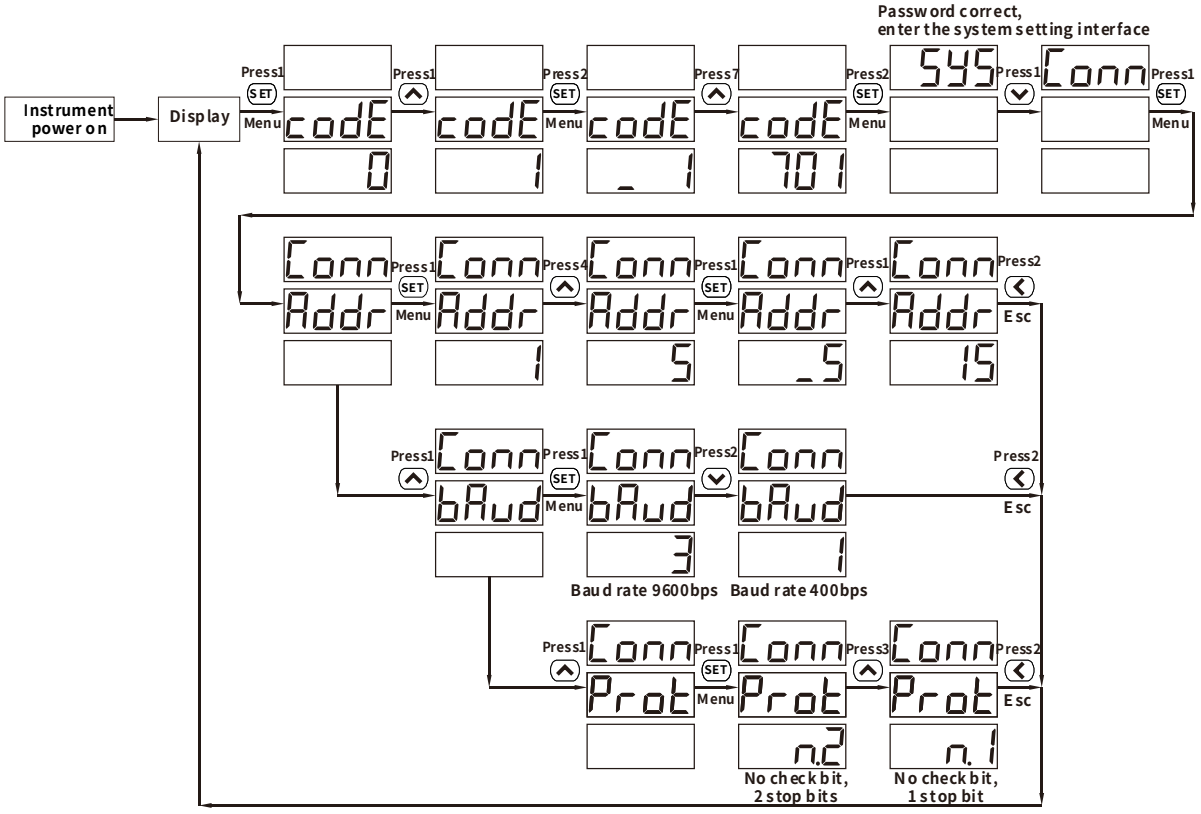


Figure 7 Communication parameter setting

4.3 Communication

The instrument can support two communication protocols: ModBus-RTU and DL/T645-2007. Protocol switching can be realized by programming.

DLT 645-2007 supports reading and writing address, modifying baud rate, (current) total forward active power, (current) total reverse active power, (current) total one quadrant reactive power, (current) total two quadrant reactive power, (current) total three quadrant reactive power, (current) total four quadrant reactive power, (current) total combined active power, voltage data block, current data block and instantaneous active power Data block of power rate, instantaneous reactive power, power factor, grid frequency and time. It supports the setting of communication address and table number, time zone table, time period table and public holiday data, and does not support the event recording function. Please refer to DL / T 645-2007 protocol for details. See the table below for ModBus-RTU communication protocol.

Factory setting (default): ModBus-RTU protocol, check bit and stop bit (n.2), baud rate (9600bps), table address is 1, single-precision floating-point size end mode is 0: ABCD (high byte In front, low byte in the back).

ModBus_RTU protocol read command is 03H, write command is 10H.

Table 4 Modbus protocol address table

parameter address	Parameter code	Parameter description	data type	data Length word	Read write properties
Keyboard parameters (see programming parameter description for specific functions, actual value of parameters with (*) = communication parameter value × 0.1)					
0000H	REV.	Version number	16Bit signed	1	R
0001H	UCode	Code (1 ～ 9999)	16Bit signed	1	R/W
0002H	ClrE	Electric energy clearing Clr. E (1: electric energy clearing)	16Bit signed	1	R/W
0003H	net	Network selection (0: three phase four wire, 1: three phase three wire)	16Bit signed	1	R/W
0006H	IrAt	Current transformer multiplying ratio IrAt (1 ～ 9999)	16Bit signed	1	R/W
0007H	UrAt	Voltage transformer multiplying ratio	16Bit signed	1	R/W

		UrAt(*) (1-9999 means voltage ratio 0.1-999.9)			
0009H	PLUS	Pulse output	16Bit signed	1	R/W
000AH	Disp	Rotation time (seconds)	16Bit signed	1	R/W
000BH	B.LCD	Backlight time control (minutes)	16Bit signed	1	R/W
002BH	RESERVED	retain	16Bit signed	1	R/W
002CH	Protocol	Protocol switching (1: DL / t645-2007; 2: N.2; 3: n.1; 4: E.1; 5: o.1)	16Bit signed	1	R/W
002DH	Baud	Baud rate of communication baud (0:1200;1:2400;2:4800;3:9600;4:19200)	16Bit signed	1	R/W
002EH	Addr	Correspondence address Addr (1 ～ 247)	16Bit signed	1	
002FH	reserved	reserved	16Bit signed	1	
0030H	reserved	reserved	16Bit signed	1	
0031H	reserved	reserved	16Bit signed	1	
0032H	reserved	reserved	16Bit signed	1	
0033H	reserved	reserved	16Bit signed	1	
0034H	reserved	reserved	16Bit signed	1	
Secondary power data					
2000H	Uab	Three phase line voltage data in V (× 0.1V)	Single precision floating point	2	R
2002H	Ubc		Single precision floating point	2	R
2004H	Uca		Single precision floating point	2	R
2006H	Ua	Three phase voltage data in V (× 0.1V) (invalid for three-phase three wire)	Single precision floating point	2	R
2008H	Ub		Single precision floating point	2	R
200AH	Uc		Single precision floating point	2	R
200CH	Ia	Three phase current data in a (× 0.001A)	Single precision floating point	2	R
200EH	Ib		Single precision floating point	2	R
2010H	Ic		Single precision floating point	2	R
2012H	Pt	Combined active power in W (× 0.1W)	Single precision floating point	2	R

2014H	Pa	Active power of phase a, unit: W (× 0.1W)	Single precision floating point	2	R
2016H	Pb	Active power of phase B, unit: W (× 0.1W) (invalid for three phases)	Single precision floating point	2	R
2018H	Pc	Active power of phase C, unit:W (× 0.1W)	Single precision floating point	2	R
201AH	Qt	Combined reactive power in var (× 0.1var)	Single precision floating point	2	R
201CH	Qa	Reactive power of phase a, in var (× 0.1var)	Single precision floating point	2	R
201EH	Qb	Reactive power of phase B, in var (× 0.1var) (invalid for three phases)	Single precision floating point	2	R
2020H	Qc	Reactive power of phase C, unit var (× 0.1var)	Single precision floating point	2	R
2022H	St	Combined apparent power in VA (× 0.1va)	Single precision floating point	2	R
2024H	Sa	Apparent power of phase A in VA (× 0.1va)	Single precision floating point	2	R
2026H	Sb	Apparent power of phase B in VA (× 0.1va)	Single precision floating point	2	R
2028H	Sc	Apparent power of phase C in VA (× 0.1va)	Single precision floating point	2	R
202AH	PFt	Combined phase power factor (positive: inductive, negative: capacitive) (× 0.001)	Single precision floating point	2	R
202CH	PFa	Phase a power factor (positive: inductive, negative: capacitive) (invalid for three-phase three wire) (× 0.001)	Single precision floating point	2	R
202EH	PFb	Phase B power factor (positive: inductive, negative: capacitive) (invalid for three phases) (× 0.001)	Single precision floating point	2	R
2030H	PFc	Phase C power factor (positive: inductive, negative: capacitive) (invalid for three-phase three wire) (× 0.001)	Single precision floating point	2	R
2038H	UWDa	Total harmonic content of phase a voltage (percentage)	Single precision floating point	2	R
203AH	UWDb	Total harmonic content of phase B voltage (percentage)	Single precision floating point	2	R

203CH	UWDc	Total harmonic content of phase C voltage (percentage)	Single precision floating point	2	R
203EH	IWDa	Total harmonic content of phase a current (percentage)	Single precision floating point	2	R
2040H	IWDb	Total harmonic content of phase B current (percentage)	Single precision floating point	2	R
2042H	IWDc	Total harmonic content of phase C current (percentage)	Single precision floating point	2	R
2044H	Freq	Frequency in Hz (× 0.01Hz)	Single precision floating point	2	R
2050H	DmPt	Total active power demand	Single precision floating point	2	R
Secondary side data of electric energy					
101EH	ImpEp	Total electric energy of (current) positive active power	Single precision floating point	2	R
1020H	reserved	reserved	Single precision floating point	2	
1022H	reserved	reserved	Single precision floating point	2	
1024H	reserved	reserved	Single precision floating point	2	
1026H	reserved	reserved	Single precision floating point	2	
1028H	ExpEp	Total electric energy of (current) reverse active power	Single precision floating point	2	R
102AH	reserved	reserved	Single precision floating point	2	
102CH	reserved	reserved	Single precision floating point	2	
102EH	reserved	reserved	Single precision floating point	2	
1030H	reserved	reserved	Single precision floating point	2	
1032H	Q1Eq	(current) total electric energy of the first quadrant reactive power	Single precision floating point	2	R
1034H	reserved	reserved	Single precision floating point	2	
1036H	reserved	reserved	Single precision floating point	2	
1038H	reserved	reserved	Single precision floating point	2	

103AH	reserved	reserved	Single precision floating point	2	
103CH	Q2Eq	(current) total electric energy of the second quadrant reactive power	Single precision floating point	2	R
103EH	reserved	reserved	Single precision floating point	2	
1040H	reserved	reserved	Single precision floating point	2	
1042H	reserved	reserved	Single precision floating point	2	
1044H	reserved	reserved	Single precision floating point	2	
1046H	Q3Eq	(current) total reactive energy of the third quadrant	Single precision floating point	2	R
1048H	reserved	reserved	Single precision floating point	2	
104AH	reserved	reserved	Single precision floating point	2	
104CH	reserved	reserved	Single precision floating point	2	
104EH	reserved	reserved	Single precision floating point	2	
1050H	Q4Eq	Total electric energy of the fourth quadrant reactive power	Single precision floating point	2	R
1052H	reserved	reserved	Single precision floating point	2	
1054H	reserved	reserved	Single precision floating point	2	
1056H	reserved	reserved	Single precision floating point	2	
1058H	reserved	reserved	Single precision floating point	2	R

All power data read out by communication are secondary values, excluding transformation ratio. Negative numbers are represented by complementary codes. The specific conversion method is shown in the table below.

Table 5

Parameter name	Conversion formula	Company	Parameter item
Voltage	U = URMSx(x=a、b、c)×(UrAt×0.1)×0.1	V	Ua,Ub,Uc,Uab,Ubc,Uca
electric current	I = IRMSx(x=a、b、c) ×IrAt×0.001	A	Ia,Ib,Ic
Active power	P = Px(x=t、a、b、c)×(UrAt×0.1)×IrAt×0.1	W	Pt,Pa,Pb,Pc
Reactive power	Q = Qx(x=t、a、b、c)×(UrAt×0.1)×IrAt×0.1	var	Qt,Qa,Qb,Qc
power factor	PF = PFx(x= t、a、b、c)×0.001		PFt,PFa,PFb,PFc
frequency	F = Freq×0.01	Hz	F
electric energy	Ep = E× (UrAt×0.1)×IrAt	kWh kvarh	ImpEp，ExpEp，Q1Eq，Q2Eq，Q3Eq，Q4Eq

Note 1: when the voltage transformer magnification is 1, read the URAT data of the voltage transformer magnification register as 10.

Note 2: the standard IEEE754 format is adopted for single precision floating point, with a total of 32 bits (4 bytes).

5. Installation dimensions

Table 6 Installation dimensions

Model	Panel dimension (L × W)	Main part dimension (length M × width N × depth D)	Hole spacing dimension (length × width)
PD666-2S□	72mm×72mm	66mm×66mm×92mm	68mm×68mm
PD666-3S□	96mm×96mm	90mm×90mm×84mm	92mm×92mm

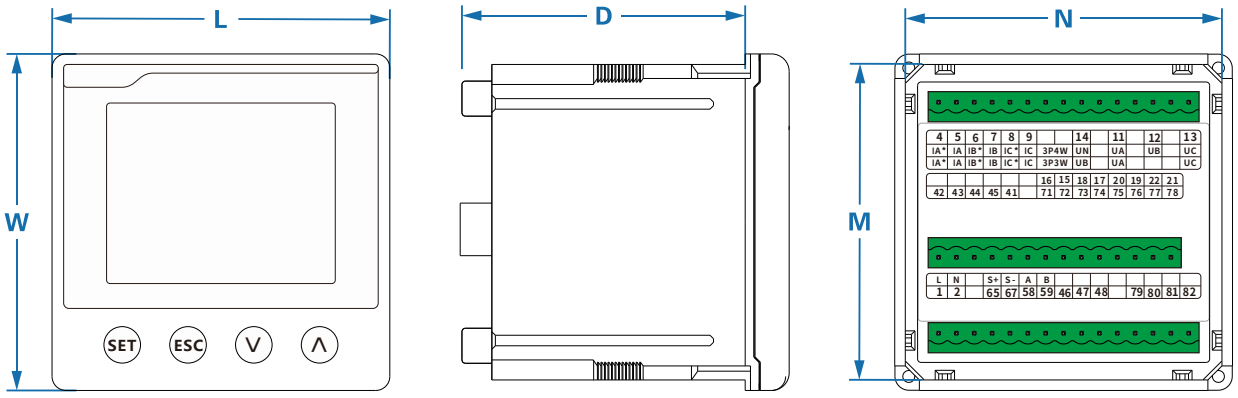


Figure 8 Dimension diagram

6. Installation guide

6.1 Installation inspection

1) Before installation, check whether the model and specification of the product marked on the package box are consistent with the real object. If not, please contact the supplier;

2) Check whether the shell of the product in the packing box is damaged. If there is any damage, please contact the supplier;

6.2 Installation steps

The installation mode is embedded installation, and the fixed mode is fixed clip type. The specific operation is as follows:

1) On the fixed distribution board, select a suitable place to open an installation hole with the same size as the opening of the installed instrument;

2) Take out the instrument and clamp, and insert the instrument into the installation hole of the power distribution panel;

3) Push the retainer into the instrument slot from the back to the front until the instrument is fixed on the mounting plate.

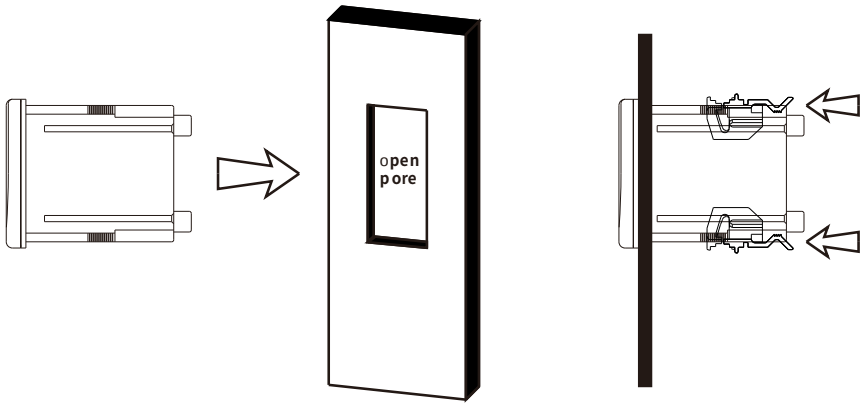


Figure 9 Installation drawing

6.3 Typical wiring

The input signal and auxiliary power supply must be cut off before the instrument wiring operation.Before power on, check whether the instrument wiring is correct and consistent with the wiring diagram on the instrument shell.

6.3.1 Auxiliary power supply

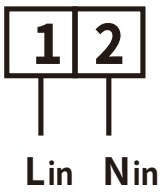


Figure 10 Auxiliary power supply

1Terminal 2 and terminal 2 are auxiliary power input.Terminal block

6.3.2 Signal input

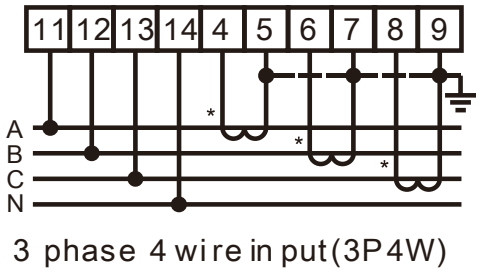


Figure 11 Three phase four wire signal input

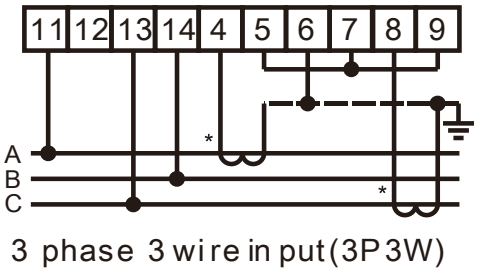


Figure 12 Three phase three wire signal input

Current signal line: terminal 4 is connected to IA * (high end of phase a current input), terminal 5 is connected to IA (low end of phase a current output), terminal 6 is connected to IB * (high end of phase B current input), terminal 7 is connected to IB (low end of phase B current output), terminal 8 is connected to IC * (high end of phase C current input), and terminal 9 is connected to IC (low end of phase C current output).

Voltage signal line (three-phase four wire): terminal 11 is connected to phase a voltage UA, terminal 12 is connected to phase B voltage UB, terminal 13 is connected to phase C voltage UC, and terminal 14 is connected to zero line UN.

Voltage signal line (three-phase three wire): terminal 11 is connected to phase a voltage UA, terminal 13 is connected to phase C voltage UC, and terminal 14 is connected to phase B voltage UB.

The input signal shall not be higher than the nominal input value of the instrument, otherwise the AC voltage shall be connected through PT and the AC current shall be connected through CT.

6.3.3 Auxiliary function port

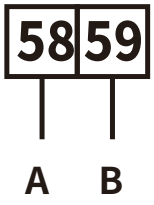


Figure 13 pulse output

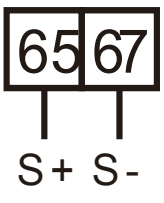


Figure 14 pulse output

The type and quantity of auxiliary functions depend on the specific model, and the wiring diagram of the instrument shell shall prevail.

7. Common troubleshooting

Table 7 Common troubleshooting

Fault phenomenon	Cause analysis	Exclusion method	remarks
The instrument cannot be powered on	Wrong wiring	Check: check whether the wiring is consistent with the wiring diagram; use a multimeter to measure whether the voltage of the auxiliary power supply is within the nominal range of the instrument.	When checking the relevant lines, make sure that the signal current, voltage and auxiliary power supply are disconnected to ensure personal safety.
Communication failure	The setting of communication address, baud rate and check mode of upper computer is inconsistent with the table;	Check: check whether the setting of the upper computer is consistent with the communication setting information of the instrument, such as communication address, baud rate and verification mode.If there is no problem with the setting, add a matching resistance on the bus (510 ohm is recommended).	

If you can't solve the problem according to the above method, please contact our customer service.

8. Transportation and storage

The instruments and accessories should be stored in a ventilated and dry place under the packaging conditions to avoid being affected by damp and corrosive gas. The limit ambient temperature for storage is -40 ℃ ～+70℃, The relative humidity is not more than 85%.

The packaging of instruments meets the requirements of GB / T 13384-2008 general technical

conditions for packaging of mechanical and electrical products. The ambient temperature requirements for conventional storage and transportation meet the requirements of GB / T 25480-2010 basic environmental conditions and test methods for transportation and storage of instruments.

Package completeness of single product, including:1）1 instrument; 2) operation manual; 3) desiccant bag; 4) certificate.

9. Warranty and service

Within 18 months from the date of delivery, if the quality problem is found, the manufacturer shall repair or replace the instrument free of charge under the condition that the user complies with the requirements of the manual and the lead seal of the manufacturer is in good condition.

Dear customers:

Please help us to do one thing, when the product is at the end of its life, in order to protect our environment, please do a good job in recycling the product or its parts and materials.For materials that cannot be recycled, please handle them well.Thank you very much for your cooperation and support.

Statement

1. The products, services or functions you purchase are subject to the commercial contracts and terms signed with our company. All or part of the products, services or functions described in this manual may not be included in the scope of products you purchase.

2. Unless otherwise agreed in the contract, the company does not make any express or implied representation or warranty on the contents of this manual.

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