Type DDSU666.004Single phase electronic energy meter

(DIN-Rail)

Operation Manual

ZTY0.464.1036

Zhejiang Chint Instrument & Meter Co., Ltd.

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Table of Contents

1. Brief Introduction

1.1 Main application & applicable range

Type DDSU666 single phase electronic energy meter (din-rail) (hereinafter referred to as the "instrument") is designed based on power monitoring and energy metering demands for electric power system, communication industry, construction industry, etc. as a new generation of intelligent instrument combining measurement and communication function, mainly applied into the measurement and display for the electric parameters in the electric circuit including voltage, current, power, frequency, power factor, active energy, etc. The network can be realized through RS485 communication interface and external device. Adopting the standard DIN35mm din rail mounting and modular design, it is characterized with small volume, easy installation and easy networking, widely applied into the internal energy monitoring and assessment for industrial and mining enterprises, hotels, schools, large public buildings.

Complied standards:

IEC62052-11《Electricity metering equipment(AC)-General requirements, tests and test conditions- Part11:Metering equipment》;

IEC62053-21《Electricity metering equipment(AC)-Particularrequirements-Part21: Static meters for active energy(classes 1 and 2)》;

MODUS-RTU protocol.

1.2 Product Features

1) Metering the positive and negative active power;
2) Adopting wide LCD, it has clear vision.
3) RS485 communication function with communication protocol complied with DL/T645-2007 and Modbus-RTU;
4) Adopting DIN35mm standard din rail mounting, structural modular design, it is characterized with small volume, easy installation and easy networking.

1.3 Model composition and meanings

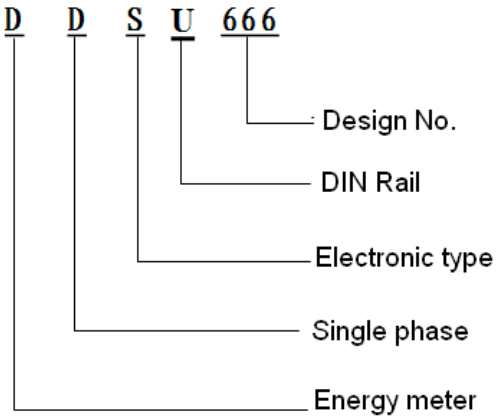


Figure1. Model No. & meanings

1.4 Applicable environmental condition.

Regulated working temperature range: -25℃～+60℃;

Limited working temperature range: -35℃～+70℃;

Relative humidity(Annually average):75%;

Atmospheric pressure:86kPa～106kPa。

2. Working Principle

The working principle block diagram of the instrument is shown in figure 2:

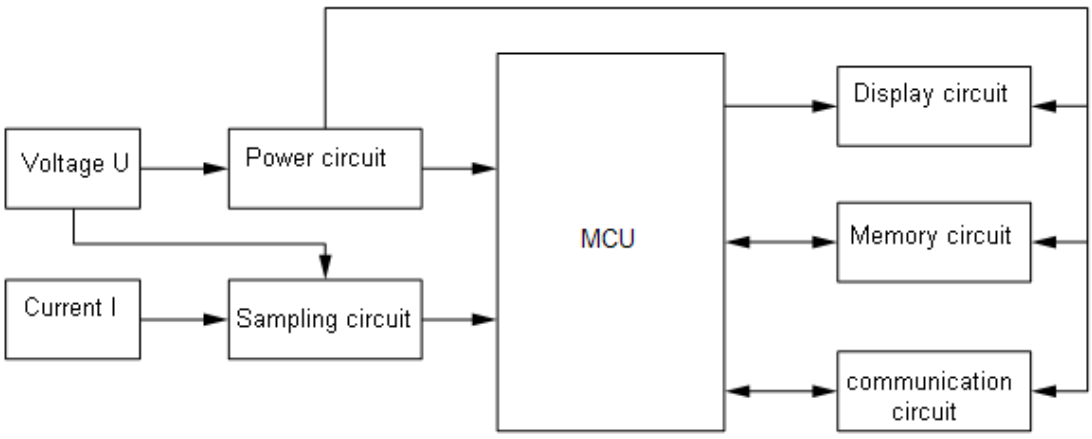


Figure 2 Work principle block diagram

3. Main Technical Performance & Parameters

3.1 Model specification

Table 1 Model specification

Model	Accuracy class	Frequency	Reference voltage	Current specification	Instrument constant	Type
DDSU666.004	Active Class 1	50Hz	220 V	5(80)A	800imp/kWh	Direct connection
DDSU666.004	Active Class 0.5S	50Hz	220 V	1.5(6)A	6400imp/kWh	Via transformer

Note: Please take the physical sign as standard.

3.2Percentage error

Table 2 Percentage error of single phase energy meter not exceeding the below corresponding limited value

Type	Current range	Power factor	Percentage error limit of each class instrument（%）	
			Class 0.5S	Class 1
Via CT	$0.01I_n \le I < 0.05I_n$	1	±1.0	±1.5
	$0.05I_n \le I \le I_{max}$	1	±0.5	±1.0
	$0.02I_n \le I < 0.1I_n$	0.5L、0.8C	±1.0	±1.5
	$0.1I_n \le I \le I_{max}$	0.5L、0.8C	±0.6	±1.0
Direct connection	$0.05I_b \le I < 0.1I_b$	1	-	±1.5
	$0.1I_b \le I \le I_{max}$	1	-	±1.0
	$0.01I_b \le I < 0.2I_b$	0.5L、0.8C	-	±1.5
	$0.2I_b \le I \le I_{max}$	0.5L、0.8C	-	±1.0
remark	I_n：secondary rated current of CT; I_b：calibrated current of the energy meters; L:inductive； C：capacitive			

3.3 Start

Table 3 Under the referenced voltage and table 4, the energy meter can be started and continuously measure the energy

Instrument	Accuracy class of the energy meter		Power factor
	Class 0.5S	Class 1	
Direct connection	-	$0.004I_b$	1
Via transformer	0.001In	0.002In	

3.4 Defluction

The electric energy meter should have good anti-defluction logic. When the voltage loop with 1.15 times of referenced voltage and the current loop is disconnected, the energy will not produce more than one pulse.

3.5 Electrical parameters

Table 4 Electrical parameters

Specified operating voltage range	0.9Un～1.1Un
Extended operating voltage range	0.8Un～1.15Un
Ultimate operating voltage range	0 Un～1.15Un
Power consumption of the voltage circuit	≤1W/8VA
Power consumption of the current circuit	≤2.5VA

3.6 Other technical parameters

Table 5 Other technical parameters

Measuring range	0～999999.99 kWh（only display 6 bit,，automatic shift of decimal point）
Display mode	LCD display
Communication protocol	DL/T 645-2007《communication protocol of the multi-function meters》(assumed) Modbus-RTU protocol

4 Adoption for key components

Table 6 Adoption for key components

Metering chip	SH79F7019
Crystal	32.768KHz
Power transformer	ZTY6.170.234
Printed wiring board	ZTY8.067.2306，

	ZTY8.067.2307， ZTY8.067.2308
Current transformer	ZTY6.176.301

5. Main functions

5.1 Metering function

1) Accurately metering the positive and negative active power;
2) The storage data of the electric energy meter will not lost after powering off.

5.2 Displayed functions

When the energy meter is in normal working condition (on load state), the positive pulse indicator should be flashed. If long time for no flashing or light for the indicator, please check whether the wiring mode of the energy meter is right or not.

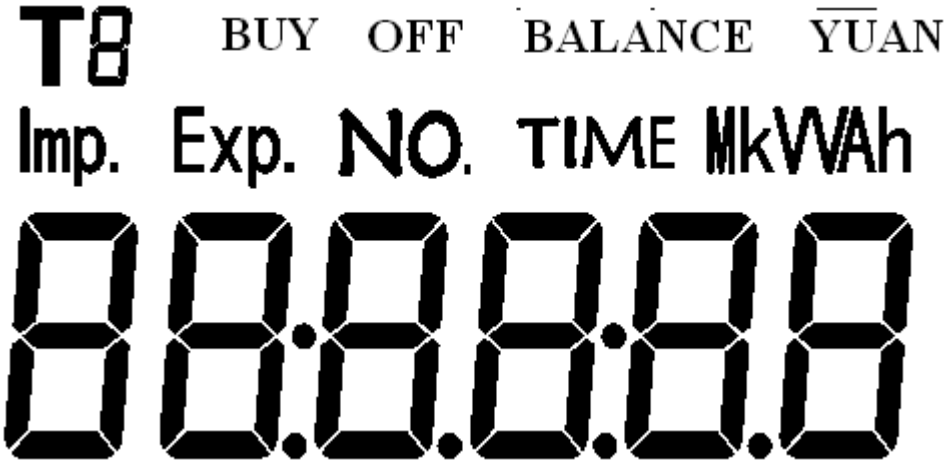


Table 7 LCD logo meanings

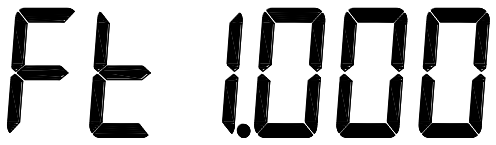
Symbol	Meaning
V	The unit of the voltage, the display data of indicating LCD is voltage
A	The unit of the current, the display data of indicating LCD is current
W	The unit of the active power, the display data of indicating LCD is active power
var	The unit of the reactive power, the display data of indicating LCD

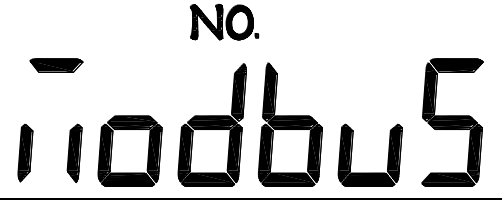
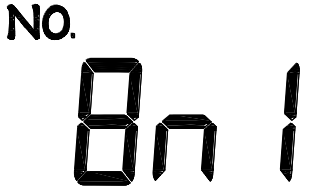
	is reactive power
Hz	The unit of the frequency, the display data of indicating LCD is frequency
kWh	The unit of the active energy, the display data of indicating LCD is active energy

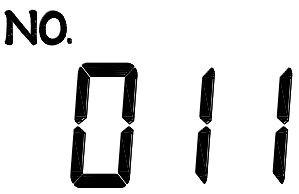
The display time of the measurement data is five seconds and information sample for every page of the measured information of measurement data (if not consistent with the instrument panel, please take the object as standard.)

Light time of the background: 1 min.

Table 8 Display Instruction

Page	Content	Instruction
Page1		Means the current display voltage is U, the unit is “V”, the left picture is U=220.0V。
Page2		Means the current display current is I, the unit is “A”, the left picture is I=5.000A.
Page3		Means the current display is the active power P，the unit is “kW”， the left picture is P=1.100kW.
Page4		Means the current display is the power factor Ft， the left picture is Ft=1.000.

Page5		Means the current display is frequency F, the left picture is F=50.00Hz.
Page6		Means the current positive active energy EImp, the unit is “kWh”, the left picture is EImp=1.20kWh.
Page7		Means the current negative active energy EExp, the unit is “kWh”, the left picture is EExp=1.00kWh.
Page8		Means the current combination active energy total ComEp, the unit is “kWh”, the left picture is ComEp=2.20kWh.
Page 9		Means the current combination reactive energy total ComEp, the unit is “kWAh”, the left picture is ComEp=2.80kWh.
Page 10		Means the current communication protocol is Modbus.
Page 11		Means the current display 645 communication protocol.

Page 12		Means the current communication address is 11.
Page 13		Means the current communication baud rate is 9600.

5.3 Communication function

The instrument adopts RS485 communication mode with baud rate to be set as 1200, 2400bps, 4800bps and 9600bps.

For a same communication circuit, it can at most be connected with thirty-two instruments at the same time, with each instrument to be set as their communication address. For the communication connection, it should use shielded twisted pair with copper mesh with wire diameter not below $0.5mm^2$. On wiring arrangement, the communication line shall be away from strong cable or other strong electric field with the maximum transmission distance to be 1200m. For the typical networking connection mode, please see the below figure, users can select other suitable connection mode based on detailed conditions.

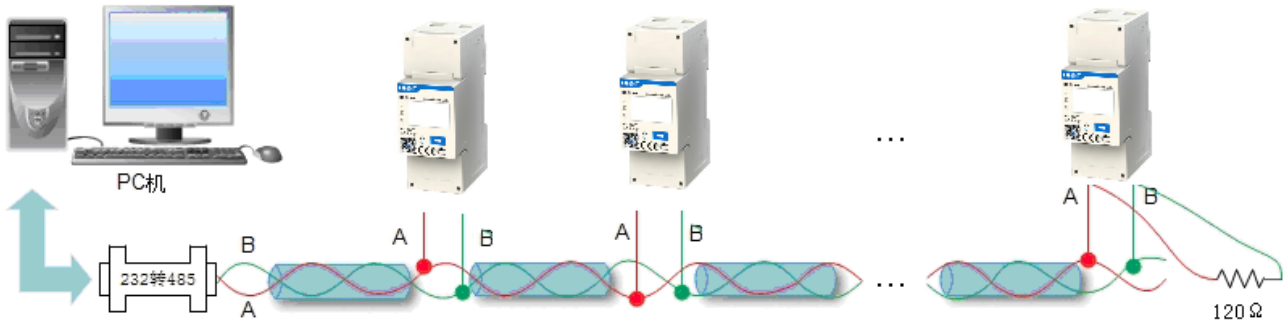


Figure 3 Schematic diagram of communication connection

When the instrument is set to be ModBus-RTU transmission mode, ModBus-RTU communication protocol adopts host-slave response in one communication line. Firstly, the host computer's signal will seek for a terminal device (slave) with only one address, which conforms to DL/T645-2007 communication protocol, be noted when the data is read or written; the energy data supports active

energy total; the variable data supports voltage, current, instant active power, instant reactive power, power factor; support communication address settings; please refer to DL/T 645-2007 protocol.

Data frames of DL/T 645-2007 protocol switching to ModBus-RTU communication protocol are as below:

FE FE FE FE 68 xx xx xx xx xx xx 68 14 0E 33 33 35 3D 35 33 33 33 33 33 33 33 33 33 CS 16

Note:xx xx xx xx xx xx is the communication address of the meter; CS is the check code.

When the instrument is set to be ModBus-RTU transmission mode, ModBus-RTU communication protocol adopts host-slave response in one communication line. Firstly, the host computer's signal will seek for a terminal device (slave) with only one address, then the terminal device will produce response signal and transmit to the host computer in opposite direction, that is, half duplex working mode. This protocal only allows communication between the host (PC, PLC, etc.) and the terminal device, rather than data exchanges between the independent terminal devices. Thus, each terminal device will not occupy the communication circuits in their initialization, and only be limited to response the query signal to the host computer.

The instrument can provide ModBus-RTU communication protocol (see appendix A), for the parameter information to be read or modified by the communication, please see the below table.

Table 9 Communication parameter information

Parameter address	Parameter code	Parameter instructions	Data type	Data lenght Word	R/W property
Programmed parameters					
0000H	UcodE	Programmed code codE	int	1	R
0001H	REV.	The version of the software	int	1	R/W
0002H	CLrE	Energy clearing CLr.E	int	1	R/W
0003H	RESERVED	Reserved	int	1	R/W
0004H	RESERVED	Reserved	int	1	R/W
0005H	ChangeProtocol	Protocol switch settings	int	1	R/W
0006H	Addr	This address is valid only when Modbus-RTU	int	1	R/W
0007H	RESERVED	Reserved	int	1	R/W
0008H	RESERVED	Reserved	int	1	R/W

0009H	RESERVED	Reserved	int	1	R/W
000AH	RESERVED	Reserved	int	1	R/W
000BH	RESERVED	Reserved	int	1	R/W
000CH	BAud	Baud rate	int	1	R/W
000DH	RESERVED	Reserved	int		
000EH	RESERVED	Reserved	int	1	R/W
000FH	RESERVED	Reserved	int	1	R/W
0010H	RESERVED	Reserved	int	1	R/W
Secondary side electricity data					
2000H	U	A phase voltage	float	2	R/W
2002H	I	A phase current	float	2	R/W
2004H	P	Instant total active power	float	2	R/W
2006H	Q	Instant total reactive power	float	2	R/W
2008H	S	Instant total apparent power	float	2	R/W
200AH	PF	Total power factor	float	2	R/W
200CH	RESERVED	Reserved	float	2	R/W
200EH	Freq	Power grid frequency	float	2	R/W
2010H	RESERVED	Reserved	long	2	R/W
Secondary side energy data					
4000H	Ep	Positive active total energy	float	2	R/W

Change Protocol switching mode, it is Modbus-RTU protocol when the data is 2, it is DL/T645-2007 protocol when the data is 1.

For CLr.E energy clearance, please write 1 to clear the total energy.

Baud rate:

0:1200bps； 1:2400bps； 2:4800bps； 3:9600bps。

5.4 Output function

The energy pulse output interface of the energy meter is passive photoelectric isolated output with the output pulse waveform to be 80±16ms square wave.

The pulse indicator of the energy meter adopts light-emitting diode to display which has long lifetime.

6. Outline &Mounting Dimension

Outline dimension: 36mm×98mm×65mm；

Din rail mounting dimension: 35mm, with configuration to be shown as figure 4:

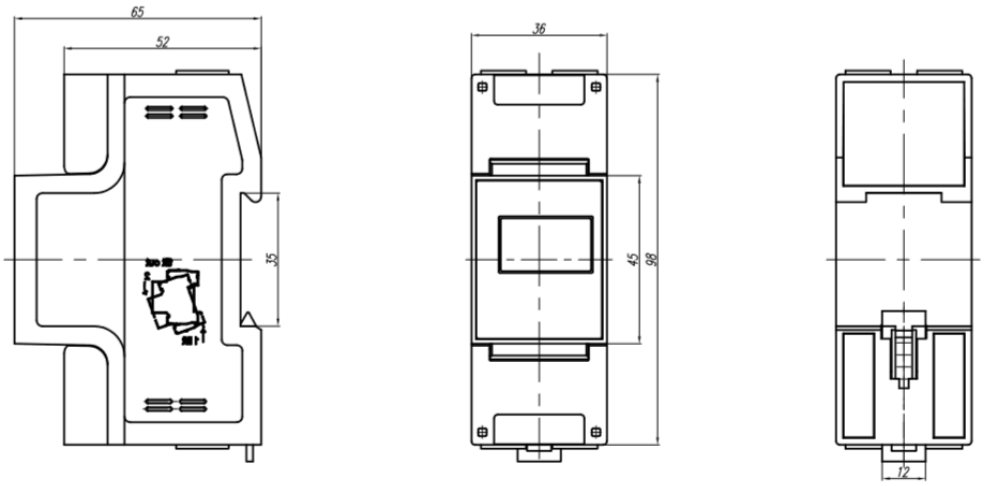


Figure 4 Configuration

7. Installation & Operation Instruction

7.1 Inspection

1) Before installation, firstly check whether the model No. and specification of the product on the package is the same as the object. If not, please contact the supplier.

2) Check whether the product shell in the carton is damaged, if is, please contact the supplier.

7.2 Installation

Directly clip the instrument on the rail and install it on the distribution box.

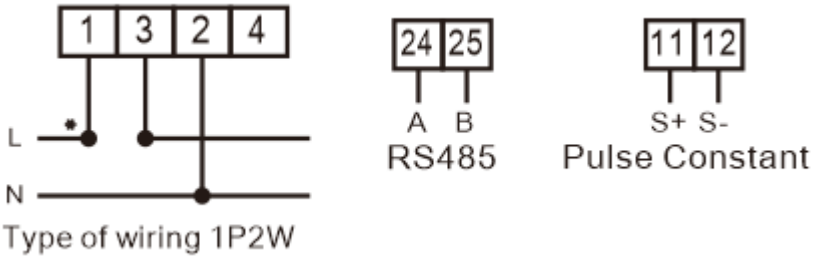
1）When installing, firstly clip one terminal of the slot and then clip to the rail with power.

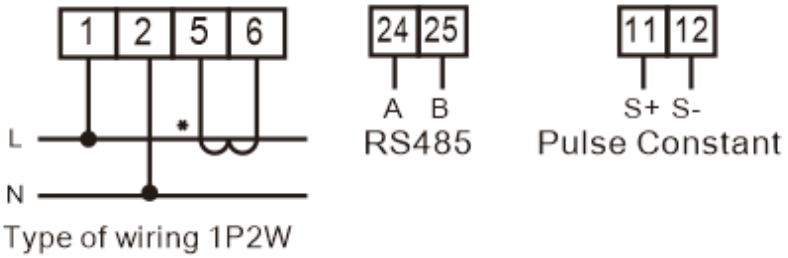
2）When disassembling, press the movable card with a screwdriver and take out the instrument.

7.3 Wiring mode

7.3.1 Instruction of wiring terminal

Before powering, you must check whether the wiring mode of the instrument is correct, and the wiring diagram is shown as below:





Type of wiring 1P2W

8. Diagnosis, analysis and elimination of common faults

Fault phenomenon	Analysis of causes	Troubleshooting	Remark
Display fault	The wiring may not connected according to the wiring diagram of the meter	Check if the actual connection is the same as the requirement of the wiring diagram. Pay special attention to “N” position of the voltage, the high&low end of the current and terminal labeling are different from actual number.	While checking the connection, be sure the meter is in the state of disconnection, guarantee the safety of human life.
Communication fault	The communication setting information of the meter may be incorrect	Check if the communication setting information such as communication address, baud rate, verification mode is the same as the PC settings.	

If the above method cannot eliminate the fault, please contact with the after-sale service of digital meter from Zhejiang CHINT Instrument Co., Ltd.

9. Transportation & Storage

The package of the instrument shall adopt materials complied with environmental protection, under package condition, the instrument and accessories shall be stored in the dry and ventilated places, to avoid humidity and corrosive gas erosion, with the limited environmental temperature for storage to be -40℃～+70℃ and relative humidity not exceeding 75%.

The package of the instrument shall comply with the provisions of GB/T 13384-2008 of General specifications for packings of mechanical and electrical products with the environmental temperature requirement and transportation for the normal storage complied with the provisions of GB/T 25480-2010 of Basic environmental conditions and testing methods for instruments transportation and storage

Complete set of package for single product, including:

1) One set of instrument
2) One operation manual
3) One bag of desiccant
4) Certificate

10. Maintenance & Service

We guarantee free reparation and change for the multi-meter if found any unconformity with the standard, under circumstance of that the users fully comply with this instructions and complete seal after delivery within 18 months.

Appendix A: MODBUS-RTU Communication Protocol

A.1 Communication format

Information transmission adopts asynchronous mode, taking byte as the unit. The communication date transmitted between the host and slave computer is the format of 10-digit characters, including one start bit(0), 8 data bits without check bit, two stop bits(1)(other format can be customized).

Format of information frame:

Table A.1

Start	Address code	Function code	Data field	CRC check code	End
More than 3.5-character dead time	1 character	1 character	n characters	2 characters	More than 3.5-character dead time

A.2 Communication information transmitting procedure

When communication command is transmitted from the host computer to the slave computer, the slave computer which matches the address code sent by the host computer receives the communication command. If CRC checks without any fault, then the corresponding operation will be carried out, after that the implement result (date) is returned to the host computer. The returned information contains address code, function code, implement date and CRC check code.

A.2.1 Address code

Address code is the first byte of each communication frame, with the range from 1 to 247. Each slave must have an exclusive address code in the bus, only the slave computer which matches the address code sent by the host computer can respond returned information. When the slave computer returns the information, the returned data will begin with their respective address codes. The address code sent from the host computer indicates the slave address, the returned address code from the slave computer indicates the slave address, while the corresponding address code indicates where the information comes from.

A.2.2 Function code

It’s the second byte of each communication frame. It’s sent by the host and tells the slave computer what actions should be carried out through function code. The slave will respond, and the functional code is the same as that sent by the host computer, which indicates that the slave computer has responded the host and complemented the relative operation.

The instrument supports the following two function codes:

Table A.2

Function code	Definition	Operation

03H	Read register	Read one or several register data
10H	Write multichannel register	Write n 16-bit binary data into n continuous registers

A.2.3 Data area

The data field will be different based on different function codes. These data can be numerical values, reference addresses and so on. For different slave computers, both the address and data information are different, and the communication information table should be provided.

The host utilizes communicate command (function code 03H and 10H) to read and modify the data registers of the slave freely. But the data length which is read or write at one time should not be out of the effective range of the data register's address.

A.3 Brief introduction of function code

A.3.1 Function code 03H：Read register

For example: The slave address which the host intends to read is 01H, the start register address is two register data of 0CH, sent by the host:

Table A.3

The host sends		Send message
Address code		01H
Function code		03H
Start register address	High byte	00H
	low byte	0CH
Register number	High byte	00H
	low byte	02H
CRC 校验码	low byte	04H
	High byte	08H

If the data of the slave register 0CH, 0DH is 0000H, 1388H, the slave will return:

Table A.4

The slave returns	Return message
Address code	01H

Function code		03H
Bytes		04H
Register 0CH data	High byte	00H
	low byte	00H
Register 0DH data	High byte	13H
	low byte	88H
CRC check code	low byte	F7H
	High byte	65H

A.3.2 Function code 10H：Write multi-port register

For example：The host intends to save data of 0002H, 1388H, 000AH into the slave address of 01H，the start register address is the three registers of 00H, sent by the host:

Sent by the host:

Table A.5

The host sends		Send message
Address code		01H
Function code		10H
Start register address	High byte	00H
	low byte	00H
Register number	High byte	00H
	low byte	03H
Write bytes		06H
The data to be written in 00H register	High byte	00H
	low byte	02H
The data to be written in 01H register	High byte	13H
	low byte	88H
The data to be written in 02H register	High byte	00H
	low byte	0AH
CRC check code	low byte	9BH

	High byte	E9H

Returned by the slave

Table A.6

The slave returns		Return message
Address code		01H
Function code		10H
Start register address	High byte	00H
	low byte	00H
Register number	High byte	00H
	low byte	03H
CRC check code	low byte	80H
	High byte	08H

A.4 16-digit CRC check code

The host or slave computer can be judged by the check code to see if the received information is correct or not. The interruption by electronic noises or other factors may cause errors during information transmission.

16-digit CRC check code is calculated by the host, located at the end of the transmit information frame. The slave recalculates the received information of CRC and compares if the calculated CRC goes in line with the received CRC, if not, there is an error. Only 8 data bits are used during CRC calculation, both the start bits and the stop bits are not involved in the calculation.

The calculation method of CRC check code is stated as follows：

1) Pre-arrange one 16-digit register as a hexadecimal FFFF (i.e. fully 1), the register is called CRC register;

2) Make the first 8-digit binary data (the first byte of the communication information frame) with the lower 8 digits of the 16-digit CRC register by XOR calculation, the result is placed in CRC register;

3) Shift the content of CRC register rightward by one digit (towards the lower digit) and fill in the highest digit with 0, check the shift-out digit after rightward shifting;

4) If the shift-out digit is 0: repeat step 3) (shift rightward one digit again);

If the shift-out digit is 1: make CRC register with multinomial A001 by XOR calculation

5) Repeat step 3) and 4) until shift rightward for 8 times, then all the 8 digits are processed;

6) Repeat step 2) and 5), process the next byte of the communication information frame;

7) After calculating all the bytes of the communication information frame (exclude CRC check code) according to the above steps, the content of the CRC register to be get is: 16-digit CRC check code.

A.5 Error handling

When the meter detects other errors except the error of CRC check code, the information will be returned to the host, the highest digit of the function code is 1, i.e. the function code returned to the host from the slave is adding 128 base on the function code sent from the host. The error returned from the slave is as follows:

Table A.7

Address code	Function code（top digit is 1）	Error code	CRC check code low byte	CRC check code High byte
1 byte	1 byte	1 byte	1 byte	1 byte

Error code is as follows：

Table A.8

01H	Illegal function code	The function code received is not supported by the instrument
02H	Illegal register address	The register address received is out of the register address range
03H	Illegal data value	The data value received is out of the corresponding address data range

Dear clients,

Please assist us: when the product life is end, to protect our environment, please recycle the product or components, while for the materials that cannot be recycled, please also deal with it in a proper way. Really appreciate your cooperation and support.

Name of Company: Zhejiang Chint Instrument & Meter Co., Ltd.

Address: Wenzhou Bridge Industrial Zone, Yueqing, Zhejiang, China.

Zip Code：325603

Telephone：0577-62877777

Fax：0577-62891577

Technical hotline：0577-62919999

Fake Complaint： 0577-62789987

Website: http: //www.chint.com

Email：ztyb@chint.com

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