DDSU666-IX Multichannel Smart Power Sensor

User Manual

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Directory

1. Summary

1.1. Manufacturing standard

IEC62053-22 《Electricity metering equipment(AC)-Particular requirements - Part 22:Startic meters for active energy(classes 0,2S and 0,5S)》

IEC62053-23 《Electricity metering equipment(AC)-Particular requirements - Part 23:Startic meters for reactive energy(classes 2 and 5)》

1.2. Main application

DDSU666-IX Multichannel Smart Power Sensor (hereafter it's called "Sensor" for short) is mainly used for high accurate real-time measurement and display of the voltage, current, active power, reactive power, apparent power, power factor, frequency,active energy,in electrical grid .

The Sensor is composed of Host and electric power module (hereafter it's called "Module" for short)。Through the combination of modules, the sensor can easily measure up to 96 single-phase circuits.The Sensor has the functions of RS485 interface and RJ45 interface.

The Sensor can be widely used in energy management system, substation automation, distribution system automation, power distribution, complete equipment, switchgear, intelligent switchboard, etc., to accomplish industrial automation and communication network.

1.3. Product feature

a) Adopt dot matrix LCD display, the interface is intuitive and friendly; Through display and key combination, you can view the electrical parameter information of each single-phase circuit;

b) Can high-accurately measure the voltage, current, active power, reactive power, apparent power, power factor, frequency, etc. electric parameters in the power network;

c) Can high accurately measure active power energy;

d) Through RS485 interface using Modbus/RTU protocal, or through RJ45 interface using Modbus/TCP protocal,the electrical parameters of all ciruits and the Host can be read;

e) Each Module can measure 4 single-phase circuits.

f) The Host can automatically identify the position of each Module and collect the data of each Module. The Host can identify up to 24 Modules, a total of 96 single-phase circuits

g) Adopt modular structural design, SMT production technology;

2. Structural feasure and work principle

The Sensor has the functions of easy installation, easy disassembly and maintenance, the structural design of the Sensor has been applied for a number of patents.

The casing of the Sensor is made from engineering plastics with corrosive resistance, impact resistance, fireproof and good insulation properties.

The PCB of the host and module is coated with three proofing paint to improve the insulation strength. At the same time, it can be used in the scene of high humidity and high salt spray.

The primary side current is converted into voltage signal through the current transformer, and the voltage information is converted into small signal through the resistance voltage divider net, and then the special metering chip analyzes and processes these signals to obtain electrical parameters . The host has the function of one-loop electrical parameter measurement, collects the data of each cascaded module, and has display, storage, communication and other functions.

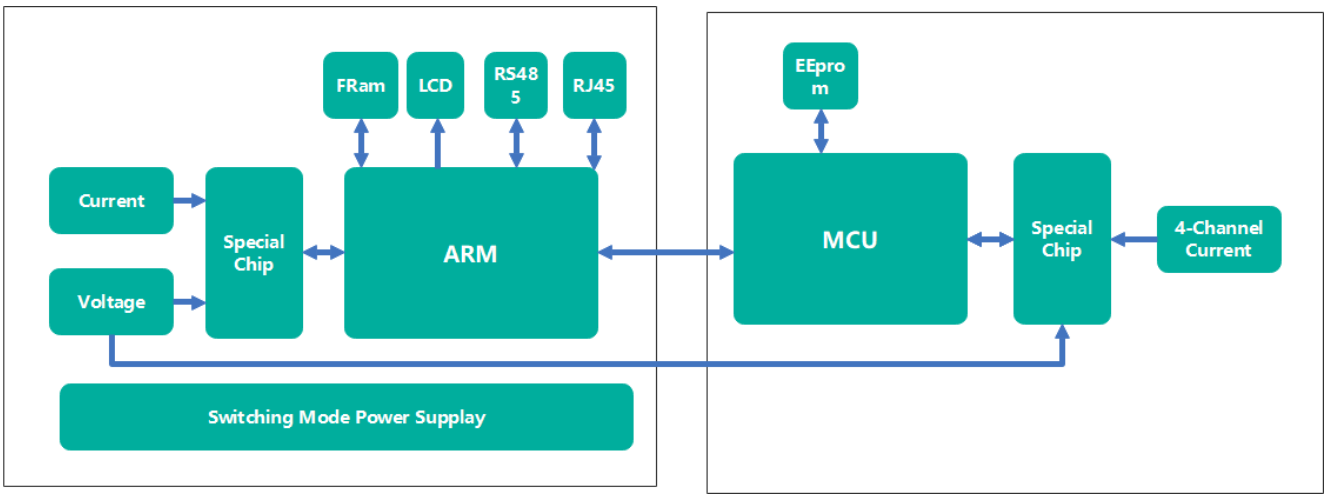


Figure 1 Working principle block diagram

3. Main technical performance and parameters

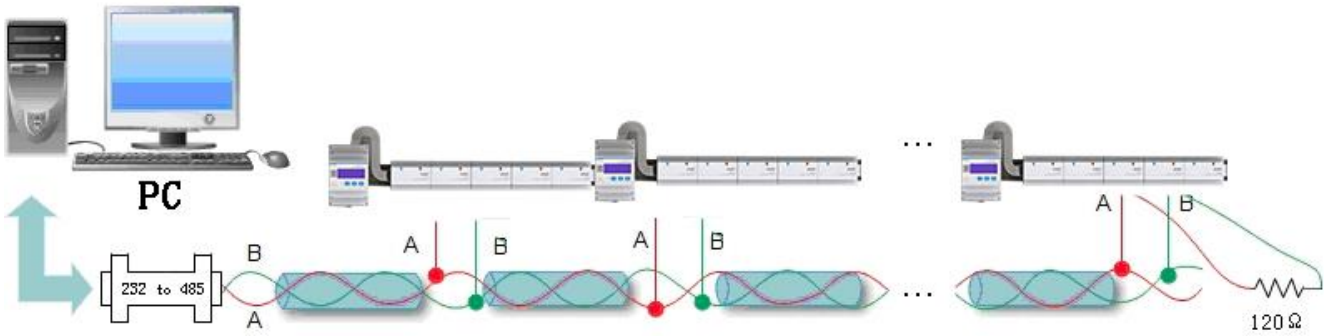
Technical parameters			Index
Accuracy class			Voltage,current,frequency,active power, power factor,active energy,class 0.5
Input	Measuring network		1 phase 2wiree
	voltage	Rated value	AC 220V
		Overload	continuous:1.2 times, instant:2 times/1s
		Power consumption	<1VA(each Module)
		resistance	>2MΩ
	current	Rated value	AC 5A(63A Max)
		overload	continuous:1.2 times, instant:10 times/1s
		Power consumption	<1VA(per Module)
		resistance	<20Ω(each single-phase)
	frequency		45Hz～65Hz
	communication		RS-485 communication interface, ModbusRTU communication protocol, baud rate1200、2400、4800、9600、19200 optional
	Display method		Lattice(256*80)LCD

Power supply	range		AC,DC 100V～300V
	Power consumption		≤15VA
safety	Withstand voltage	RS485/RJ45& Input and auxiliary power	>3kV 50Hz/1min
	Insulation resistance		>100MΩ
	Heat resistance & fireproof		Terminal block:960℃、casing:650℃、application time:30s
EMC	Electrostatic discharge		±8kV
	Fast transition pulse group		±1kV
	High frequency electromagnetic field		80MHz～1000MHz,10V/m
environment	temperature		working:-40～70℃, storage:-40-～70℃
	humidity		≤75%RH, non-condensate, non-corrosive gas
	elevation		≤2500m

4.Conmmunication function

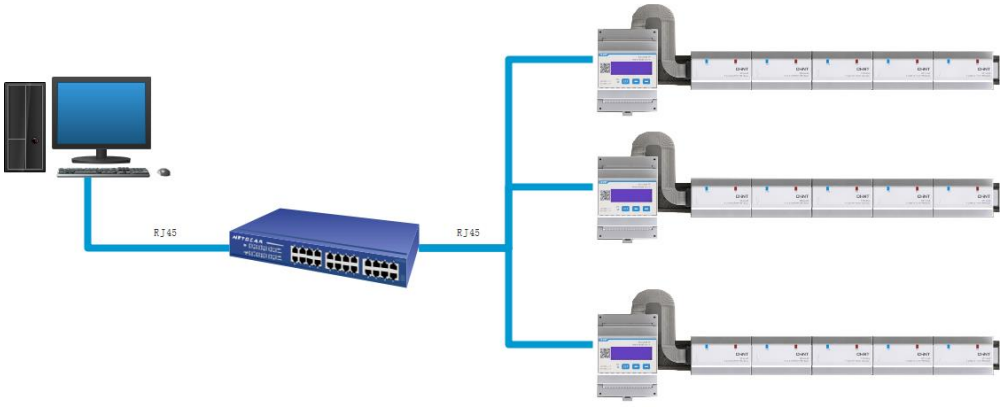
4.1. Instructions of function

The Sensor provides serial asynchronous half-duplex RS-485 communication, and adopts ModBus-RTU communication mode. The max number of the Sensors can be connected in one communication line at the same time is 128pcs; each Sensorscan be set communication address. Communicating junction should be adopted shielded twisted pairs with copper wire mesh; the diameter of the line should be no less than 0.5mm^2. Keep the communication cable far from the high voltage cables and other strong magnetic field environment, The max transmission distance is 1200m.



ModBus protocol in one communication cable adopts host-slave response method as the communicating junction method. At the beginning, the signal of the host computer addresses to one terminal device with only one address (slave computer), then the answer signal sent from the terminal device is transferred to the host computer on the opposite direction. It is: the signal in one single communication cable transfers all the communication data flow along the opposite two directions (half-duplex working mode). ModBus protocol is only allowed to be communicated between the host computer and the terminal device. Data exchange between terminal devices are not allowed, so each terminal device will not occupy the communication circuits while initialization, but only used for respond the polling signals arriving at the terminal.

The Sensor also provides one ethernet communication, and adopts Modbus/Tcp communication protocol.



4.2. Instructions of communication parameters

The Sensor provides standard RS485 communication interface with ModBus/RTU communication protocol(see appendix A), RJ45 communication interface with ModBus/TCP

communication protocol(see appendix B)and the parameter information which communication can read or modify is as following table:

Table 1 Host Electrical Parameters

Parameter address	Parameter code	Instructions of parameters	Bytes	Data type	R/W
Host Electrical Parameters					
2000H	LoopToatol	Loop Total	2	Uint16	R
2001H	FindModuleNum	Number of loops found	4	float	R
2002H	U	Voltage	4	float	R
2004H	I	Current	4	float	R
2006H	P	Active Power	4	float	R
2008H	Q	Reactive Power	4	float	R
200AH	S	Apparent Power	4	float	R
200CH	PF	Power Factor	4	float	R
200EH	F	Frequency	4	float	R
2010H	EP	Positive Active Enegy	4	float	R
2012H	NP	Negtive Active Energy	4	float	R
2014H	ComP	Combined Active Energy	4	float	R

Table 2 1st Module Electrical Parameters

Parameter address	Parameter code	Instructions of parameters	Bytes	Data type	R/W	LoopNum
1st Module Electrical Parameters						
20FEH	Type	Type of Slave Module	2	INT16U	R	
20FFH	Rev	reserve	2	INT16U	R	
2100H	U	Voltage	4	float	R	1
2102H	I	Current	4	float	R	
2104H	P	Active Power	4	float	R	
2106H	Q	Reactive Power	4	float	R	
2108H	S	Apparent Power	4	float	R	
210AH	PF	Power Factor	4	float	R	
210CH	F	Frequency	4	float	R	
210EH	EP	Positive Active Enegy	4	float	R	
2110H	NP	Negtive Active Energy	4	float	R	
2112H	ComP	Combined Active Energy	4	float	R	
2114H	U	Voltage	4	float	R	2
2116H	I	Current	4	float	R	
2118H	PF	Power Factor	4	float	R	
211AH	F	Frequency	4	float	R	

211CH	S	Apparent Power	4	float	R	
211EH	EP	Active Enegy	4	float	R	
2120H	Q	Reactive Power	4	float	R	
2122H	P	Active Power	4	float	R	
2124H	Rev	Reserve	4	float	R	
2126H	Rev	Reserve	4	float	R	
2128H	U	Voltage	4	float	R	3
212AH	I	Current	4	float	R	
212CH	PF	Power Factor	4	float	R	
212EH	F	Frequency	4	float	R	
2130H	S	Apparent Power	4	float	R	
2132H	EP	Active Enegy	4	float	R	
2134H	Q	Reactive Power	4	float	R	
2136H	P	Active Power	4	float	R	
2138H	Rev	Reserve	4	float	R	
213AH	Rev	Reserve	4	float	R	
213CH	U	Voltage	4	float	R	4
213EH	I	Current	4	float	R	
2140H	PF	Power Factor	4	float	R	
2142H	F	Frequency	4	float	R	
2144H	S	Apparent Power	4	float	R	
2146H	EP	Active Enegy	4	float	R	
2148H	Q	Reactive Power	4	float	R	
214AH	P	Active Power	4	float	R	
214CH	Rev	Reserve	4	float	R	
214EH	Rev	Reserve	4	float	R	

Table 3 2nd Module Electrical Parameters

Parameter address	Parameter code	Instructions of parameters	Bytes	Data type	R/W	LoopNum
2st Module Electrical Parameters						
217EH	Type	Type of Slave Module	2	INT16U	R	
217FH	Rev	reserve	2	INT16U	R	
2180H	U	Voltage	4	float	R	1
2182H	I	Current	4	float	R	
2184H	P	Active Power	4	float	R	
2186H	Q	Reactive Power	4	float	R	
2188H	S	Apparent Power	4	float	R	
218AH	PF	Power Factor	4	float	R	
218CH	F	Frequency	4	float	R	

218EH	EP	Positive Active Enegy	4	float	R	
2190H	NP	Negtive Active Energy	4	float	R	
2192H	ComP	Combined Active Energy	4	float	R	
2194H	U	Voltage	4	float	R	2
2196H	I	Current	4	float	R	
2198H	PF	Power Factor	4	float	R	
219AH	F	Frequency	4	float	R	
219CH	S	Apparent Power	4	float	R	
219EH	EP	Active Enegy	4	float	R	
21A0H	Q	Reactive Power	4	float	R	
21A2H	P	Active Power	4	float	R	
21A4H	Rev	Reserve	4	float	R	
21A6H	Rev	Reserve	4	float	R	
21A8H	U	Voltage	4	float	R	3
21AAH	I	Current	4	float	R	
21ACH	PF	Power Factor	4	float	R	
21AEH	F	Frequency	4	float	R	
21B0H	S	Apparent Power	4	float	R	
21B2H	EP	Active Enegy	4	float	R	
21B4H	Q	Reactive Power	4	float	R	
21B6H	P	Active Power	4	float	R	
21B8H	Rev	Reserve	4	float	R	
21BAH	Rev	Reserve	4	float	R	
21BCH	U	Voltage	4	float	R	4
21BEH	I	Current	4	float	R	
21C0H	PF	Power Factor	4	float	R	
21C2H	F	Frequency	4	float	R	
21C4H	S	Apparent Power	4	float	R	
21C6H	EP	Active Enegy	4	float	R	
21C8H	Q	Reactive Power	4	float	R	
21CAH	P	Active Power	4	float	R	
21CCH	Rev	Reserve	4	float	R	
21CEH	Rev	Reserve	4	float	R	

Table 4 1-24 Module Address Info

Module Num	Start Addreess	Loop Total
1	20FEH	4
2	217EH	4

3	21FEH	4
4	227EH	4
5	22FEH	4
6	237EH	4
7	23FEH	4
8	247EH	4
9	24FEH	4
10	257EH	4
11	25FEH	4
12	267EH	4
13	26FEH	4
14	277EH	4
15	27FEH	4
16	287EH	4
17	28FEH	4
18	297EH	4
19	29FEH	4
20	2A7EH	4
21	2AFEH	4
22	2B7EH	4
23	2BFEH	4
24	2C7EH	4

Table 5 PLC Modbus Address Info

Register Address(PLC)	Parameter address	Instructions of parameters	Bytes	Data type	Remark
40001	0000H	Voltage	2	U16	X0.01,,Unit:V
40002	0001H	Reserved	2	U16	
40003	0002H	Reserved	2	U16	
40004	0003H	Reserved	2	U16	
40005	0004H	Reserved	2	U16	
40006	0005H	Reserved	2	U16	
40007	0006H	Reserved	2	U16	
40008	0007H	Reserved	2	U16	
40009	0008H	Reserved	2	U16	
40010	0009H	Frequency	2	U16	X0.01,,Unit:Hz
40011	000AH	1#Current	2	U16	X0.1,,Unit:A

40012	000BH	2#Current	2	U16	X0.1,,Unit:A
40013	000CH	3#Current	2	U16	X0.1,,Unit:A
40014	000DH	4#Current	2	U16	X0.1,,Unit:A
40015	000EH	5#Current	2	U16	X0.1,,Unit:A
40016	000FH	6#Current	2	U16	X0.1,,Unit:A
40017	0010H	7#Current	2	U16	X0.1,,Unit:A
40018	0011H	8#Current	2	U16	X0.1,,Unit:A
40019	0012H	9#Current	2	U16	X0.1,,Unit:A
40020	0013H	10#Current	2	U16	X0.1,,Unit:A
40021	0014H	11#Current	2	U16	X0.1,,Unit:A
40022	0015H	12#Current	2	U16	X0.1,,Unit:A
40023	0016H	13#Current	2	U16	X0.1,,Unit:A
40024	0017H	14#Current	2	U16	X0.1,,Unit:A
40025	0018H	15#Current	2	U16	X0.1,,Unit:A
40026	0019H	16#Current	2	U16	X0.1,,Unit:A
40027	001AH	17#Current	2	U16	X0.1,,Unit:A
40028	001BH	18#Current	2	U16	X0.1,,Unit:A
40029	001CH	19#Current	2	U16	X0.1,,Unit:A
40030	001DH	Reserve	2	U16	
40031	001EH	Reserve	2	U16	
40032	001FH	Reserve	2	U16	
40033	0020H	Reserve	2	U16	
40034	0021H	Reserve	2	U16	
40035	0022H	Reserve	2	U16	
40036	0023H	Reserve	2	U16	
40037	0024H	Reserve	2	U16	
40038	0025H	1# active power low word	2	S32	X0.1,,Unit:W
40039	0026H	1# active power high word	2		
40040	0027H	2# active power low word	2	S32	X0.1,,Unit:W
40041	0028H	2# active power high word	2		
40042	0029H	3# active power low word	2	S32	X0.1,,Unit:W
40043	002AH	3# active power high word	2		
40044	002BH	4# active power low word	2	S32	X0.1,,Unit:W
40045	002CH	4# active power high word	2		
40046	002DH	5# active power low word	2	S32	X0.1,,Unit:W
40047	002EH	5# active power high word	2		
40048	002FH	6# active power low word	2	S32	X0.1,,Unit:W

40049	0030H	6# active power high word	2		
40050	0031H	7# active power low word	2	S32	X0.1,,Unit:W
40051	0032H	7# active power high word	2		
40052	0033H	8# active power low word	2	S32	X0.1,,Unit:W
40053	0034H	8# active power high word	2		
40054	0035H	9# active power low word	2	S32	X0.1,,Unit:W
40055	0036H	9# active power high word	2		
40056	0037H	10# active power low word	2	S32	X0.1,,Unit:W
40057	0038H	10# active power high word	2		
40058	0039H	11# active power low word	2	S32	X0.1,,Unit:W
40059	003AH	11# active power high word	2		
40060	003BH	12# active power low word	2	S32	X0.1,,Unit:W
40061	003CH	12# active power high word	2		
40062	003DH	13# active power low word	2	S32	X0.1,,Unit:W
40063	003EH	13# active power high word	2		
40064	003FH	14# active power low word	2	S32	X0.1,,Unit:W
40065	0040H	14# active power high word	2		
40066	0041H	15# active power low word	2	S32	X0.1,,Unit:W
40067	0042H	15# active power high word	2		
40068	0043H	16# active power low word	2	S32	X0.1,,Unit:W
40069	0044H	16# active power high word	2		
40070	0045H	17# active power low word	2	S32	X0.1,,Unit:W
40071	0046H	17# active power high word	2		
40072	0047H	18# active power low word	2	S32	X0.1,,Unit:W
40073	0048H	18# active power high word	2		
40074	0049H	19# active power low word	2	S32	X0.1,,Unit:W
40075	004AH	19# active power high word	2		
40076	004BH	Reserve	2	U16	
40077	004CH	Reserve	2	U16	
40078	004DH	Reserve	2	U16	
40079	004EH	Reserve	2	U16	
40080	004FH	Reserve	2	U16	
40081	0050H	Reserve	2	U16	
40082	0051H	Reserve	2	U16	
40083	0052H	Reserve	2	U16	
40084	0053H	Reserve	2	U16	
40085	0054H	Reserve	2	U16	

40086	0055H	Reserve	2	U16	
40087	0056H	Reserve	2	U16	
40088	0057H	1# reactive power low word	2	S32	X0.1,,Unit:var
40089	0058H	1# reactive power high word	2		
40090	0059H	2# reactive power low word	2	S32	X0.1,,Unit:var
40091	005AH	2# reactive power high word	2		
40092	005BH	3# reactive power low word	2	S32	X0.1,,Unit:var
40093	005CH	3# reactive power high word	2		
40094	005DH	4# reactive power low word	2	S32	X0.1,,Unit:var
40095	005EH	4# reactive power high word	2		
40096	005FH	5# reactive power low word	2	S32	X0.1,,Unit:var
40097	0060H	5# reactive power high word	2		
40098	0061H	6# reactive power low word	2	S32	X0.1,,Unit:var
40099	0062H	6# reactive power high word	2		
40100	0063H	7# reactive power low word	2	S32	X0.1,,Unit:var
40101	0064H	7# reactive power high word	2		
40102	0065H	8# reactive power low word	2	S32	X0.1,,Unit:var
40103	0066H	8# reactive power high word	2		
40104	0067H	9# reactive power low word	2	S32	X0.1,,Unit:var
40105	0068H	9# reactive power high word	2		
40106	0069H	10# reactive power low word	2	S32	X0.1,,Unit:var
40107	006AH	10# reactive power high word	2		
40108	006BH	11# reactive power low word	2	S32	X0.1,,Unit:var
40109	006CH	11# reactive power high word	2		
40110	006DH	12# reactive power low word	2	S32	X0.1,,Unit:var
40111	006EH	12# reactive power high word	2		
40112	006FH	13# reactive power low word	2	S32	X0.1,,Unit:var

40113	0070H	13# reactive power high word	2		
40114	0071H	14# reactive power low word	2	S32	X0.1,,Unit:var
40115	0072H	14# reactive power high word	2		
40116	0073H	15# reactive power low word	2	S32	X0.1,,Unit:var
40117	0074H	15# reactive power high word	2		
40118	0075H	16# reactive power low word	2	S32	X0.1,,Unit:var
40119	0076H	16# reactive power high word	2		
40120	0077H	17# reactive power low word	2	S32	X0.1,,Unit:var
40121	0078H	17# reactive power high word	2		
40122	0079H	18# reactive power low word	2	S32	X0.1,,Unit:var
40123	007AH	18# reactive power high word	2		
40124	007BH	19# reactive power low word	2	S32	X0.1,,Unit:var
40125	007CH	19# reactive power high word	2		
40126	007DH	Reserve	2	U16	
40127	007EH	Reserve	2	U16	
40128	007FH	Reserve	2	U16	
40129	0080H	Reserve	2	U16	
40130	0081H	Reserve	2	U16	
40131	0082H	Reserve	2	U16	
40132	0083H	Reserve	2	U16	
40133	0084H	Reserve	2	U16	
40134	0085H	Reserve	2	U16	
40135	0086H	Reserve	2	U16	
40136	0087H	Reserve	2	U16	
40137	0088H	Reserve	2	U16	
40138	0089H	1# apparent power low word	2	U32	X0.1,,Unit:VA
40139	008AH	1# apparent power high word	2		
40140	008BH	2# apparent power low word	2	U32	X0.1,,Unit:VA

40141	008CH	2# apparent power high word	2		
40142	008DH	3# apparent power low word	2	U32	X0.1,,Unit:VA
40143	008EH	3# apparent power high word	2		
40144	008FH	4# apparent power low word	2	U32	X0.1,,Unit:VA
40145	0090H	4# apparent power high word	2		
40146	0091H	5# apparent power low word	2	U32	X0.1,,Unit:VA
40147	0092H	5# apparent power high word	2		
40148	0093H	6# apparent power low word	2	U32	X0.1,,Unit:VA
40149	0094H	6# apparent power high word	2		
40150	0095H	7# apparent power low word	2	U32	X0.1,,Unit:VA
40151	0096H	7# apparent power high word	2		
40152	0097H	8# apparent power low word	2	U32	X0.1,,Unit:VA
40153	0098H	8# apparent power high word	2		
40154	0099H	9# apparent power low word	2	U32	X0.1,,Unit:VA
40155	009AH	9# apparent power high word	2		
40156	009BH	10# apparent power low word	2	U32	X0.1,,Unit:VA
40157	009CH	10# apparent power high word	2		
40158	009DH	11# apparent power low word	2	U32	X0.1,,Unit:VA
40159	009EH	11# apparent power high word	2		
40160	009FH	12# apparent power low word	2	U32	X0.1,,Unit:VA
40161	00A0H	12# apparent power high word	2		
40162	00A1H	13# apparent power low word	2	U32	X0.1,,Unit:VA
40163	00A2H	13# apparent power high word	2		
40164	00A3H	14# apparent power low word	2	U32	X0.1,,Unit:VA
40165	00A4H	14# apparent power high word	2		
40166	00A5H	15# apparent power low word	2	U32	X0.1,,Unit:VA

40167	00A6H	15# apparent power high word	2		
40168	00A7H	16# apparent power low word	2	U32	X0.1,,Unit:VA
40169	00A8H	16# apparent power high word	2		
40170	00A9H	17# apparent power low word	2	U32	X0.1,,Unit:VA
40171	00AAH	17# apparent power high word	2		
40172	00ABH	18# apparent power low word	2	U32	X0.1,,Unit:VA
40173	00ACH	18# apparent power high word	2		
40174	00ADH	19# apparent power low word	2	U32	X0.1,,Unit:VA
40175	00AEH	19# apparent power high word	2		
40176	00AFH	Reserve	2	U16	
40177	00B0H	Reserve	2	U16	
40178	00B1H	Reserve	2	U16	
40179	00B2H	Reserve	2	U16	
40180	00B3H	Reserve	2	U16	
40181	00B4H	Reserve	2	U16	
40182	00B5H	Reserve	2	U16	
40183	00B6H	Reserve	2	U16	
40184	00B7H	Reserve	2	U16	
40185	00B8H	Reserve	2	U16	
40186	00B9H	1# power factor	2	U16	X0.001
40187	00BAH	2# power factor	2	U16	X0.001
40188	00BBH	3# power factor	2	U16	X0.001
40189	00BCH	4# power factor	2	U16	X0.001
40190	00BDH	5# power factor	2	U16	X0.001
40191	00BEH	6# power factor	2	U16	X0.001
40192	00BFH	7# power factor	2	U16	X0.001
40193	00C0H	8# power factor	2	U16	X0.001
40194	00C1H	9# power factor	2	U16	X0.001
40195	00C2H	10# power factor	2	U16	X0.001
40196	00C3H	11# power factor	2	U16	X0.001
40197	00C4H	12# power factor	2	U16	X0.001
40198	00C5H	13# power factor	2	U16	X0.001

40199	00C6H	14# power factor	2	U16	X0.001
40200	00C7H	15# power factor	2	U16	X0.001
40201	00C8H	16# power factor	2	U16	X0.001
40202	00C9H	17# power factor	2	U16	X0.001
40203	00CAH	18# power factor	2	U16	X0.001
40204	00CBH	19# power factor	2	U16	X0.001
40205	00CCH	reserve	2	U16	
40206	00CDH	reserve	2	U16	
40207	00CEH	reserve	2	U16	
40208	00CFH	reserve	2	U16	
40209	00D0H	reserve	2	U16	
40210	00D1H	reserve	2	U16	

Register Address(PLC)	Parameter address	Instructions of parameters	Bytes	Data type	Remark
40501	01F4H	reserve	2	U16	
40502	01F5H	reserve	2	U16	
40503	01F6H	1# KWh low word	2	U32	X0.1,,Unit:kWh
40504	01F7H	1# KWh high word	2		
40505	01F8H	2# KWh low word	2	U32	X0.1,,Unit:kWh
40506	01F9H	2# KWh high word	2		
40507	01FAH	3# KWh low word	2	U32	X0.1,,Unit:kWh
40508	01FBH	3# KWh high word	2		
40509	01FCH	4# KWh low word	2	U32	X0.1,,Unit:kWh
40510	01FDH	4# KWh high word	2		
40511	01FEH	5# KWh low word	2	U32	X0.1,,Unit:kWh
40512	01FFH	5# KWh high word	2		
40513	0200H	6# KWh low word	2	U32	X0.1,,Unit:kWh
40514	0201H	6# KWh high word	2		
40515	0202H	7# KWh low word	2	U32	X0.1,,Unit:kWh
40516	0203H	7# KWh high word	2		
40517	0204H	8# KWh low word	2	U32	X0.1,,Unit:kWh
40518	0205H	8# KWh high word	2		
40519	0206H	9# KWh low word	2	U32	X0.1,,Unit:kWh
40520	0207H	9# KWh high word	2		
40521	0208H	10# KWh low word	2	U32	X0.1,,Unit:kWh
40522	0209H	10# KWh high word	2		

40523	020AH	11# KWh low word	2	U32	X0.1,,Unit:kWh
40524	020BH	11# KWh high word	2		
40525	020CH	12# KWh low word	2	U32	X0.1,,Unit:kWh
40526	020DH	12# KWh high word	2		
40527	020EH	13# KWh low word	2	U32	X0.1,,Unit:kWh
40528	020FH	13# KWh high word	2		
40529	0210H	14# KWh low word	2	U32	X0.1,,Unit:kWh
40530	0211H	14# KWh high word	2		
40531	0212H	15# KWh low word	2	U32	X0.1,,Unit:kWh
40532	0213H	15# KWh high word	2		
40533	0214H	16# KWh low word	2	U32	X0.1,,Unit:kWh
40534	0215H	16# KWh high word	2		
40535	0216H	17# KWh low word	2	U32	X0.1,,Unit:kWh
40536	0217H	17# KWh high word	2		
40537	0218H	18# KWh low word	2	U32	X0.1,,Unit:kWh
40538	0219H	18# KWh high word	2		
40539	021AH	19# KWh low word	2	U32	X0.1,,Unit:kWh
40540	021BH	19# KWh high word	2		
40541	021CH	reserve[120]	120	U16	

5. External instructions and installastion

5.1. External drawing and dimension----Host

Figure 2 Host diagram

5.2. External drawing and dimension----Module

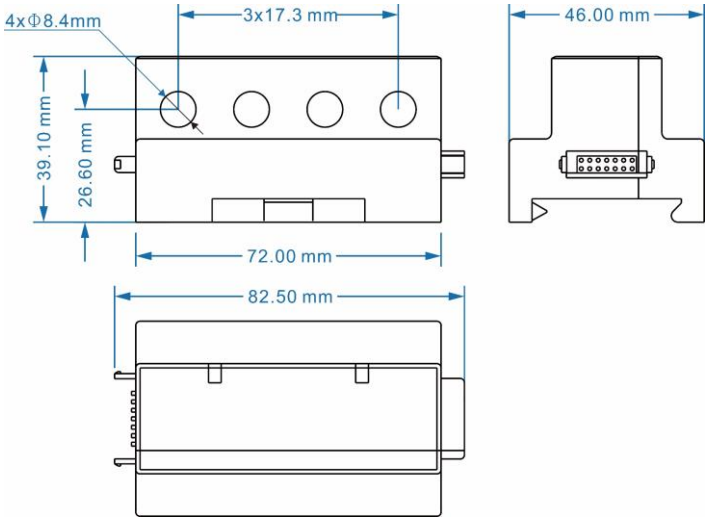


Figure 3 Module diagram

5.3. Wiring method

a) Signal input

b) RS-485 communication

A1	B1

RS-485 communication terminals

The Sensor provides 1-way 485 communication interface of industrial Modbus protocol, can realize network communication for max. 247 slave computers at the same time.

Electrical parameters: characteristic impedance is 120Ω, input resistance≥48kΩ.

Baud rate: 1200bps, 2400bps, 4800bps, 9600bps, 19200bps optional.

c) Voltage

Schematic diagram of volatge terminals

The Sensor can work when voltage is AC100V~300V.

d) Ethernet Communication

Supports one RJ45 interface and uses Modbus/tcp protocol. The default port is 502, and three clients can be connected at the same time; Supports sticky frame processing.

5.4. diagnosis、analysis、exclusion of common fault

5.4.1 no display when the sensor is power on

Make sure the supplied power is suitable for this series of Sensor or not before power on, and check if the connection of the Sensor is correct or not carefully, if the connection diagram is different from that in the casing of the Sensor, please take according to the connection diagram in the casing. Turn the multi-meter gear to 1000V AC, and check if the power supply (voltage line)has the required voltage for working.

5.4.2 No change of the measurements while the input signal changes

Check and ensure the connection of the signal input terminals is right, contact is reliable, can measure on-off condition of the corresponding signal input terminals through on-off gear of the multi-meter.

5.4.3 The symbol of power、power factor and power data is incorrect

Check again the input voltage, current corresponding, phase and direction are consistent.

5.4.4 Communication failure

Enter communication settings interface, check if the four parameters of the Sensor including communication address、baud rate、check bit、 stop bit are the same as the

setting of the host computer, and there are no a number of slave devices (two or above) with the same address in the network.

If the fault still cannot be solved with the above method, or other abnormal phenomena occurs, please contact Zhejiang CHINT Instrument & Meter Co.,Ltd.

6. Programming instruction (To be added 2022-04-03)

7. Precaution

7.1. Instructions of communication parameters

a) The Sensor should be reheated 15min for accurate measurement after power on.

b) The Sensor should not be shocked, impacted and have violent vibration, the operating environment should conform to the technical requirements.

8. Mantenance and repair

The Sensor should have a metering test every year, if the error of the Sensor is out of the range, please send the Sensor back to the factory as the faulty Sensor.

If users find any quality problem within 18 months from the date of dispatch, our company is responsible for repairing or replacing for free, on the condition that users operate according to the manual's provision with correct operation and the factory' s seal is complete.

9. Packge, transportation and storage

9.1. Package

The packge of the Sensor should use the material which can meet environmental requirements, the package is required to conform to the provision of GB/T 15464-1995.

9.2. Transportation and storage

The transportation and storage of the Sensor should conform to the provision of JB/T 9329-1999. the storage environment temperature is -40℃～70℃，relative humidity should be no more than 85%, and the harmful substance content in the air should be less than what can cuase the corrosion of the Sensor.

Appendix A Communication protocol

1. Communication format

Transmission of information is adopted asynchronous mode and byte as the unit. The communication data transmitted between the host and slave computer is the format of 11-digit bits, including 1 start bit(0), 8 data bits and 2 stop bits(1).

Format of information frame:

Start	Address code	Function code	Data field	CRC check code	End
Pause time for more than 3.5 characters	1 byte	1 byte	N bytes	2 bytes	Pause time for more than 3.5 characters

2 Communication information transmitting procedure

When communication command is transmitted from the host computer to the slave device ,the slave device which matches the address code sent by the host computer receives communication command. If CRC checks without any fault, then corresponding operation is carried out, after that the implement result (data) is returned to the host computer. The returned information contains address code, function code, implement date and CRC check code. No information will be returned upon erroneous CRC verification code.

2.1 Address code

Address code is the first byte of each communication frame, the range is 1～247. Each slave must have an exclusive address code in the bus, only the slave device which matches the address code sent by the host computer can respond returned information. When the slave device returns back information, returned data all begins with respective address code. The address code sent from the host computer indicates the slave address, and the returned address code of the slave computer indicates the slave address.The corresponding address code indicates the source of the information.

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. The slave will respond, it indicates the slave have responded the host and carry out relative operations .The returned function code of the slave is the same as the function code sent by the host.

The Sensor supports the following two function codes:

Function code	Definition	Operation
03H	Read register	Read the data of one or several registers
04H	Read register	Read the data of one or several registers
06H	Write one register	Write one 16-digit binary data into a register
10H	Write multi-port register	Write n 16-digit binary data into n continuous registers

2.3 Data field

The data field is different with different function codes. These data can be numerical values, reference addresses and so on. For different slave devices, 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.

3 Function code

3.1 Function code 03H:Read register

For example: The host intends to read slave address 01H, 2 register data whose start register address is 0CH, then the host will send:

Host to send		Sent data
Address code		01H
Function code		03H
Start register	High byte	00H

address	Low byte	0CH
The number of registers	High byte	00H
	Low byte	02H
CRC check code	Low byte	04H
	High byte	08H

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

Slave to return		Returned information
Address code		01H
Function code		03H
The number of bytes		04H
Data of register 0CH	High byte	00H
	Low byte	00H
Data of register 0DH	High byte	13H
	Low byte	88H
CRC check code	Low byte	F7H
	High byte	65H

3.2 Function code 10H:Write multi-port register

For example:The host intends to keep the data 0002H、1388H、000AH into 01H slave address, 3 registers whose start register address is 00H, the host will send:

Host to send		Sent information
Address code		01H
Function code		10H
Start register address	high byte	00H
	low byte	00H
The number of registers	high byte	00H
	low byte	03H
Number of written bytes		06H

Data of 00H to be written	high byte	00H
	low byte	02H
Data of 01H to be written	high byte	13H
	low byte	88H
Data of 02H to be written	high byte	00H
	low byte	0AH
CRC check code	low byte	9BH
	high byte	E9H

The slave will return:

Slave to return		Returned information
Address code		01H
Function code		10H
Start register address	high byte	00H
	low byte	00H
The number of registers	high byte	00H
	low byte	03H
CRC check code	low byte	80H
	high byte	08H

4 16-digit CRC check code

The host and slave 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. The check code can check the communication information of the host or slave is correct or not.

16-digit CRC check code is calculated by the host, it's located at the end of the transmit information frame. The slave recalculates the CRC of the received information and compares if the calculated CRC goes in line with the received CRC, if not, there is 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 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(1010 0000 0000 0001) 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.

5 Error handling

When the Sensor 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:

Address code	Function code (the highest digit is 1)	Error code	low byte of CRC check code	high byte of CRC check code
1 byte	1 byte	1 byte	1 byte	1 byte

Error code is as follows:

01H	Illegal function	the Sensor does not support the received function code

	code	
02H	Illegal register address	The received register address exceeds the register address range of the Sensor
03H	Illegal data value	The received data exceeds the data range of the corresponding address

Appendix B Modbus/TCP Communication protocol

1.Communication format

ON the TCP/IP layer, the data frame contains the message header, function code and data。

Message frame format:

MBAP header	function code	data
7 bytes	1 bytes	n bytes

MBAP header（Modbus Application Protocal）is divided into 4 domains, a total of 7 bytes.

domain	Length(byte)	Descripstion	Client	Server
Transmission flag	2	Indicates a query / reply transmission	Made by Client	Copy this value when answering
Protocol flag	2	0=Modbus	Made by Client	Copy this value when answering
Length	2	Subsequent byte count	Made by Client	Generate By Server
Unit mark	1	Remote terminal identifier	Made by Client	Copy this value when answering

Function Code：

The Sensor supports the following 4 function codes：

Function	define

Code	
03H	Read n or 1 Register
04H	Read n or 1 Register
06H	Write 1 Register
10H	Write n Registers

2. introduction

2.1 Function Code 03H: Read Register

Master send:

00 01 00 00 00 06 0B 03 01 80 00 42

Sensor answer:

00 01 00 00 00 87 0b 03 84 00 01 00 01 00 01 00 c0 00 a8 00 00 00 0a 01 f6 27 1a 00 c0 00 a8 00 00 00 64 00 ff 00 ff 00 ff 00 00 00 c0 00 a8 00 00 00 01 00 c0 00 a8 00 00 00 01 00 00 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 69 6f 74 2d 73 6d 61 72 74 65 2e 63 68 69 6e 74 2e 63 6f 6d 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Frame analysis:

Master send:

00 01 00 00 00 06 0B 03 01 80 00 42			
	Data	Length(byte)	Description
Map header	00	1	Transmission flag:High Byte
	01	1	Transmission flag:Low Byte
	00 00	2	Protocol flag
	00 06	2	Len
	0B	1	Unit mark
Function code	03	1	Function code

Data	01 80	2	Start Address
	00 42	2	Number of Registers

Sensor answer:

00 01 00 00 00 87 0b 03 84 00 01 00 01 00 01 00 c0 00 a8 00 00 00 0a 01 f6 27 1a 00 c0 00 a8 00 00 00 64 00 ff 00 ff 00 ff 00 00 00 c0 00 a8 00 00 00 01 00 c0 00 a8 00 00 00 01 00 00 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 69 6f 74 2d 73 6d 61 72 74 65 2e 63 68 69 6e 74 2e 63 6f 6d 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00			
	Data	Length(byte)	Description
Map header	00	1	Transmission flag:High Byte
	01	1	Transmission flag:Low Byte
	00 00	2	Protocol flag
	00 87	2	Len
	0b	1	Unit mark
Function code	03	1	
Data	84	1	Byte number
	…	n	data

2.2 Function code 10H: write n registers

Client send:

05 0C 00 00 00 09 0b 10 07 EB 00 01 02 00 0C

Server answer:

05 0C 00 00 00 06 0b 10 07 EB 00 01

Frame analysis:

Client send:

05 0C 00 00 00 09 0b 10 07 EB 00 01 02 00 0C			
	Data	Length(byte)	Description
Map header	00	1	Transmission flag:High Byte
	5C	1	Transmission flag:Low Byte
	00 00	2	Protocol flag
	00 09	2	Len
	0b	1	Unit mark
Function code	10	1	Function code
Data	07 EB	2	Start register address
	00 01	2	The number of registers
	02	1	Number of written bytes
	00 0C	2	Data

Server answer:

05 0C 00 00 00 06 0b 10 07 EB 00 01			
	Data	Length(byte)	Description
Map header	00	1	Transmission flag:High Byte
	5C	1	Transmission flag:Low Byte
	00 00	2	Protocol flag
	00 06	2	Len
	0b	1	Unit mark
Function code	10	1	Function code
Data	07 EB	1	Start register address
	00 01	n	Number of written bytes

Note: When using Modbus/TCP, if the master send no data to the Sensor to keep communication within 1 minutes interval, the Sensor will disconnect the connection. And then the Sensor will reconnect to the master.

Dear Clients:

Please help me to do one thing: when the product is reaching the end of its useable life, in order to protect our environment, please do well in recovery of the products or the component materials. Please also deal with the materials which can not be recycled.

Thank you very much for your help and support!

Manufacturer:Zhejiang CHINT Instrument & Meter Co.,Ltd.

Address:Bridge Industrial Zone,325603 Wenzhou,Zhejiang,China

P.C:325603

Tel.:86-577-62877777

FAX:86-577-62891577

Technical Support Hotline:0577-62877777-9561

Service Hotline:0577-62919999　8008577777

Counterfeit Complaints Hotline:0577-62789987

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