

The MODBUS protocol for series CE-A is completely compatible with MODBUS developed by Gould Modicon for use in Modicon PLC systems.

5.1 Format of data

5.1.1 Format of message

5.1.1.1 Function code 0x03 — To read the contents of registers from the slave equipment.

The Message from the master equipment:

Address of the slave equipment	0x01-0xFF	1 byte
Function code	0x03	1 byte
Address of the first register	0x01-0xFF	2 bytes
Quantity of Registers		2 bytes
CRC code		2 bytes

The correct responded message from the slave equipment:

Address of the slave equipment	0x01-0xFF	1 byte
Function code	0x03	1 byte
Byte count	2 x N*	1 byte
Data section (contents of registers)		N* x 2 bytes
CRC code		2 bytes

*N = Quantity of Registers

5.1.1.2 Function code 0x10 — To set (write) data of registers of the slave equipment

The Message from the master equipment

Address of the slave equipment	0x01-0xFF	1 byte
Function code	0x10	1 byte
Address of the first register		2 bytes
Quantity of Registers		2 bytes
Byte count	2 x N*	1 byte
The data written to the registers		2 x N*
CRC code		2 bytes

*N = Quantity of Registers

The correct responded message from the slave equipment:

Address of the slave equipment	0x01-0xFF	1 byte
Function code	0x10	1 byte
Address of the first register		2 bytes
Quantity of Registers		2 bytes
CRC code		2 bytes

Note: 1. For all Address of register, Quantity of registers and Contents of register (Data), their high order byte is before their low order byte. But the low order byte of CRC code is before its high order byte.

2. The length of the register is 16 bits (2 bytes).

5.1.2 Format of commands and explanation of the registers

(All undermentioned commands are illustrated with CE-AJ41)

5.1.2.1 List of definitions of registers for electrical parameters data

Address of register (Hex)	Contents of register	Quantity of registers	Attribute of register	Range of data
0x0010	Voltage of phase A	1	Read only	0~12000
0x0011	Current of phase A	1	Read only	0~12000
0x0012	Voltage of phase B	1	Read only	0~12000
0x0013	Current of phase B	1	Read only	0~12000
0x0014	Voltage of phase C	1	Read only	0~12000
0x0015	Current of phase C	1	Read only	0~12000
0x0016	P: active power	1	Read only	-12000~+12000
0x0017	Q: reactive power	1	Read only	-12000~+12000
0x0018	Cosφ: power factor	1	Read only	-10000~+10000
0x0019	F: frequency	1	Read only	45000~65000
0x001A	Active energy	2	Read only	0xFFFFFFFF ~0x7FFFFFFF
0x001C	Reactive energy	2	Read only	0xFFFFFFFF ~0x7FFFFFFF
The three more output of AJ51(2):				
0x001E	PA:active power of phaseA	1	Read only	-12000~+12000
0x001F	PB:active power of phaseB	1	Read only	-12000~+12000
0x0020	PC:active power of phaseC	1	Read only	-12000~+12000

5.1.2.2 List of definitions of registers for transducer's name, address and baudrate:

Address of register (Hex)	Contents of register	Quantity of registers	Attribute of register	Range of data
0x0020	Address and baudrate	1	Read/write	Address (0-256) Baudrate (03-07)
0x0021	Transducer's name	2	Read only	Depend on part number (4 bytes)

5.1.2.3 The explanation of register "To clear the data of energy"

Address of register (Hex)	Contents of register	Quantity of registers	Attribute of register	Range of data
0x00A7	Clear the data of energy	1	Write	0x0000

5.1.2.4 Examples:

For all Address of register, Quantity of registers and Contents of register (Data), their high order byte is before their low order byte. But the low order byte of CRC code is before its high order byte.

A: Example for the command "To read the all data":

Address of slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
0x01	0x03	0x00	0x10	0x00	0x0E	0xC5	0xCB

Note: 1. 0x00 is the high order byte of the register, and 0x10 is the lower order byte of the register.

2. Please see above 5.1.2.1 list of definitions of register of electrical parameters data for the sequence of the output data.

B: Example for the command “To modify the address and baudrate”:

(Change the address from 01 to 02; set new baudrate to 9600 bps <code 06>)

Address of slave equipment	Function code	Address of the first register		Quantity of registers		Data bytes count		Data written to register		CRC-L	CRC-H
		0x00	0x20	0x00	0x01	0x02	0x02	0x06	0x20		
0x01	0x10	0x00	0x20	0x00	0x01	0x02	0x02	0x06	0x20	0x52	

Note: Codes for baudrate setting: 03-1200bps, 04-2400bps, 05-4800bps, 06-9600bps, 07--19200bps.

C: Example for the command “To read the transducer’s name and configuration”:

Address of slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
		0x00	0x20	0x00	0x03		
0x01	0x03	0x00	0x20	0x00	0x03	0x04	0x01

D: Example for the command “To clear the data of energy”:

Address of slave equipment	Function code	Address of the first register		Quantity of registers		Data bytes count		Data written to register		CRC-L	CRC-H
		0x00	0xA7	0x00	0x01	0x02	0x00	0x00	0xBF		
0x01	0x10	0x00	0xA7	0x00	0x01	0x02	0x00	0x00	0xBF	0x47	

5.2 Data

List of the format of data responded after the read command (suppose the rated value of voltage is 380V, the rated value of current is 5A):

No.	Parameter name	Input value	Hex. Data (100%)		Decimal Data (100%)	Note
			High byte	Low byte		
1	VA	380V	27	10	10000	True RMS
2	IA	5A	27	10	10000	True RMS
3	VB	380V	27	10	10000	True RMS
4	IB	5A	27	10	10000	True RMS
5	VC	380V	27	10	10000	True RMS
6	IC	5A	27	10	10000	True RMS
7	P	5700W	27	10	10000	Pa+Pb+Pc
8	Q	5700Var	27	10	10000	Qa+Qb+Qc
9	COSφ	1.0000	27	10	10000	Average of 3 phases
10	F	50Hz	C3	50	50000	Value of phase A
11	Kwh	5.7Kw/h	4 bytes (high order ahead)		Maximum accumulative value is 0x7FFFFFFF	Active energy
12	Kvarh	5.7Kvar/h	4 bytes (high order ahead)		Maximum accumulative value is 0x7FFFFFFF	Reactive energy

5.3 Orders for other products

5.3.1、 For AJ31/AJ32,to read all data:

Address of slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
0x01	0x03	0x00	0x10	0x00	0x0C	0x44	0x0A

Please see above 5.1.2.1 list of definitions of register of electrical parameters data for the sequence of the output data.

Without the voltage and current of phase B.

The other orders are the same.

5.3.2、 For AJ11/AJ12, to read all data:

Address of slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
0x01	0x03	0x00	0x10	0x00	0x0A	0xC4	0x08

Please see above 5.1.2.1 list of definitions of register of electrical parameters data for the sequence of the output data. Without the voltage and current of phase B&C,

The other orders are the same.

5.3.3、 For AI32, to read all data:

Address of slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
0x01	0x03	0x00	0x10	0x00	0x03	0x04	0x0E

Please see above 5.1.2.1 list of definitions of register of electrical parameters data for the sequence of the output data.

Only have the current of phase A, B and C.

The other orders are the same.

5.3.4、 For AI12/AU11/AK10/AK22, to read all data:

Address of slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
0x01	0x03	0x00	0x10	0x00	0x01	0x85	0xCF

AI12: there is only one element current

AU11: there is only one phase voltage

AK10: the low byte of the return data stands for the 1~8 channel switching value data

AK22: the high byte of the return data stands for the 9~16 channel switching value, while the low byte stands for 1~8 channel, the lowest bit is for channel 1.

The other orders are the same.

The order of read all data for the unlisted products, please infer by the qty of the data.