SQLC-72L
COMMUNICATION SPECIFICATION

(MODBUS RTU mode protocol)

DAIICHI ELECTRONICS CO., LTD.

Content

1. Communication specification

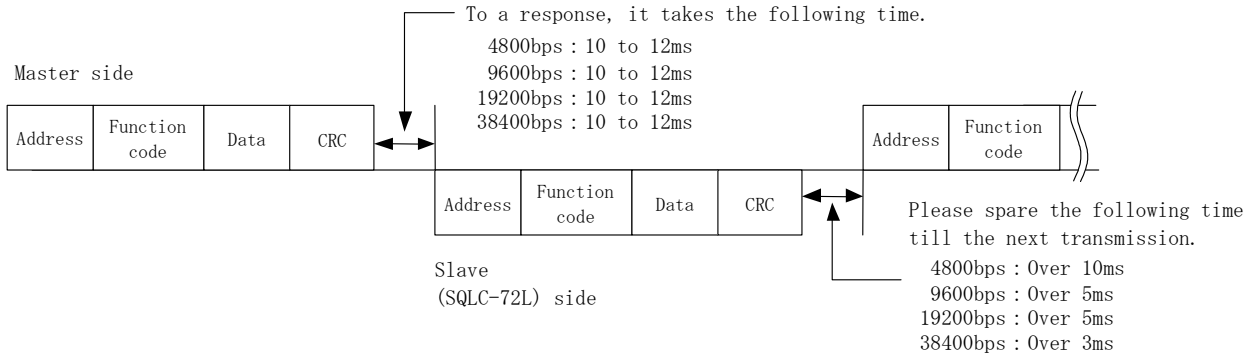
Item	Specification	Default setting
Standard	TIA-485-A (2003)	—
Protocol	MODBUS protocol RTU mode	—
	Use function code : 03H, 04H, 06H, 08H, 10H	
Transmission system	Half-duplex two-wire system	—
Synchronous system	Asynchronous communication method	—
Bit rate (1)	4800bps / 9600bps / 19200bps / 38400bps	9600bps
Modulation code	NRZ	—
Start bit	1 bit	—
Data length	8 bits	—
Parity (1)	NONE / Even number / Odd number	Even number
Stop bit (1)	1 bit / 2 bit	1 bit
Cable length	1000m (The total extension)	—
Address (1)	1 to 247 (Connection is possible to 31 sets.)	1
Error detection	CRC-16 ($X^{16}+X^{15}+X^{2}+1$)	—
Transmission character	Binary	—

Transmission data are sent out from a bit 0.

Note(1) Settings can be changed by setting.

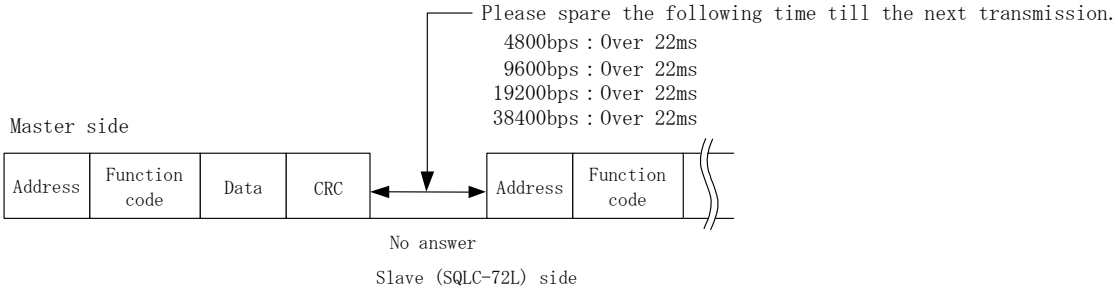
2. Transmission and reception protocol

(1) Usual request (Query)



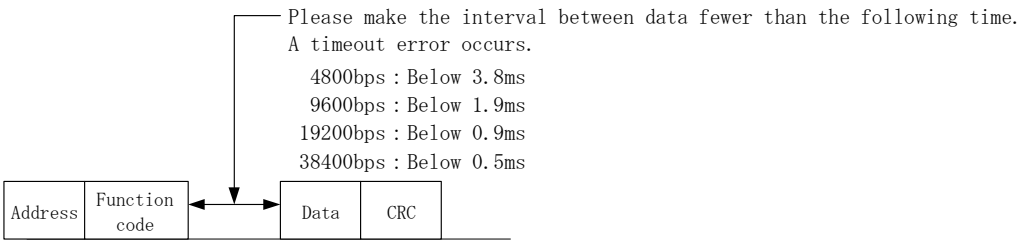
(2) Broadcast request (Query)

If all stations are specified in the address, it becomes a broadcast request. At this time, the slave side becomes unresponsive.



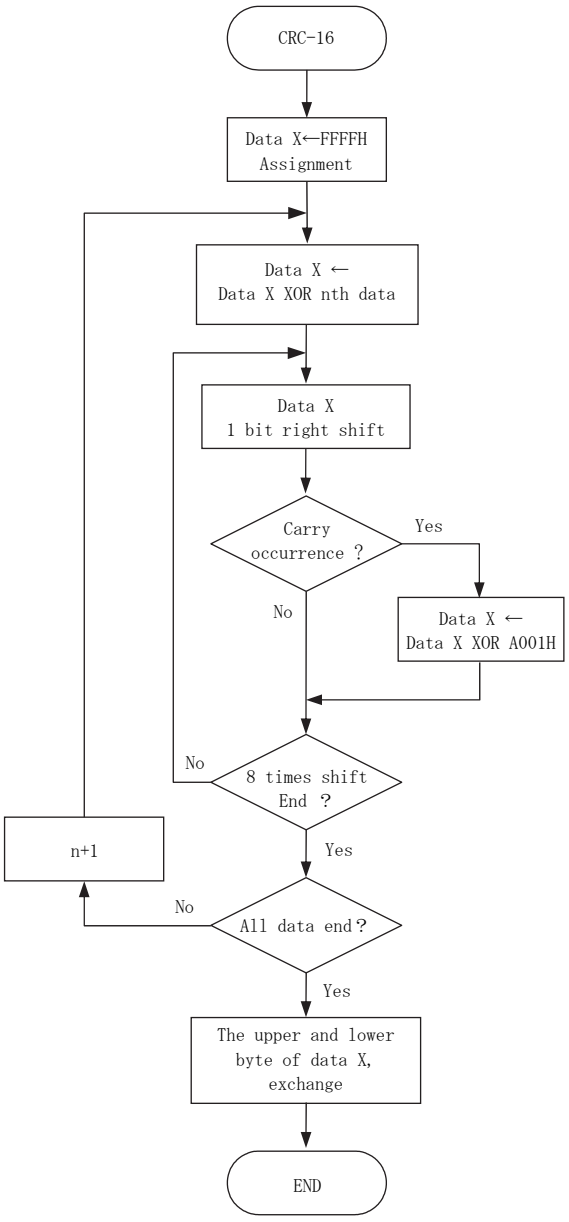
(3) Time-out between data

The interval between data must be 1.5 characters or less.



3. Calculation method of CRC-16

CRC-16 is adopted as error checking in Modbus RTU mode.
An address, a function code, and data are calculated by the following method.



(1) Arithmetic process

① 2 bytes of data-area X is secured to a CRC calculation.

② FFFFH is substituted for ① as initial value.

③ XOR of data X and the nth data (n=1) is calculated. Assign it to data X.

④ The 1-bit right shift of the data X is done.

⑤ If carry occurs in operation of ④, data X and XOR of A001H are taken.

⑥ Operation of ④ - ⑤ is repeated until it shifts 8 times.

⑦ The next data (n+1) and XOR of data X is calculated. Assign it to data X.

⑧ Operation of ④ - ⑦ is repeated until processing of all data is completed.

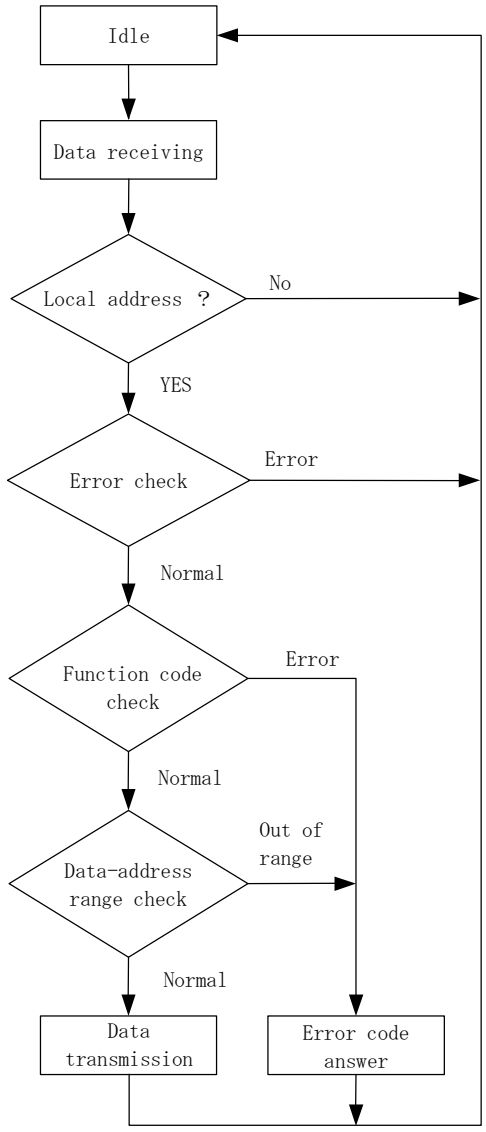
⑨ 1 byte of upper and 1 byte of lower of data-area X for a CRC calculation are exchanged.

(2) Example of calculation

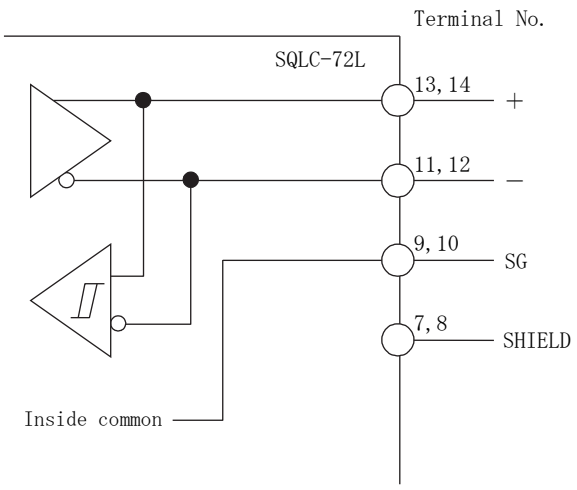
CRC Object range

1 byte	1 byte	2 byte	2 byte	2 byte
Address	Function code	Data address	Number of request data	CRC
01H	04H	00H 00H	00H 19H	31C0H

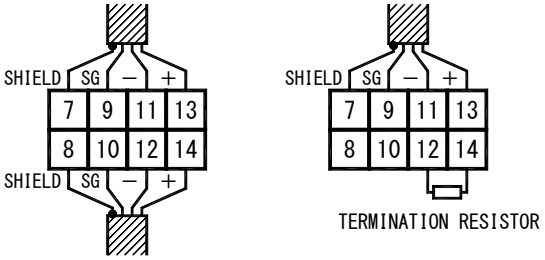
4. Communication process flow chart



5. SQLC-72L communication specification terminal arrangement



Communication output terminals 7 and 8, 9 and 10, 11 and 12, 13 and 14 are connected internally. When transition wiring, connect as shown below. Connect the attached resistor to the terminal equipment as shown in the figure.



Transition wiring　　Terminal equipment

6. MODBUS protocol RTU mode

6.1 Function code

The next function code is supported by this product.

Code	Name	Data address	Contents	MODBUS original function
03	Setting value request	40001～	Readout of setting value	Read holding registers
	Status request	40101～	Alarm output, DI, detection status readout	
	Model information request	40501～	Readout of model information (Type code, phase wire, rated voltage)	
04	Measurement value request	30001～	Readout of general measurement value 1 (Instantaneous value, Maximum value, Minimum value)	Read input registers
		30501～	Readout of general measurement value 2 (Instantaneous value)	
		30601～	Readout of general measurement value 3 (Maximum value, minimum value)	
16 (10H)	Setting change	40001～	Changing the setting value	Write multiple holding registers
06	Maximum value, Minimum value reset	40301～	Reset the maximum value, minimum value.	Write signal register
08	Loopback test	—	Communication test of master and slave is performed.	Diagnostic

6.2 Abnormal response

In case the message transmitted from the master is judged to be abnormal, this product does the next abnormal answer.

(1) In case it becomes a no answer
① : In case a message transmission error occurs. (Overrun, Framing, Parity error, CRC)
② : In case the data interval of a message exceeds a regulation value (1.5 characters).
③ : In case the message frame exceeding 8 bytes is received.

(2) In case an error code is returned.
In the error that does not correspond to (1), the following abnormal response is returned.
At this case, the code that added 80H to the requested code is returned.
And, the generated error code is returned as data.

Error code list

Error code	Contents
01H	Function code besides regulation is received.
02H	Data address is out of range.
03H	Request data that exceeds the number of data to reply. Out of setting range.
04H	The meter received a setting change request while in the setting mode.

1 byte	1 byte	1 byte	2 byte
Address	Function code (+80H)	Error code	CRC
01H	84H	02H	C2C1H

6.3 Setting value request

Read the setting value from this product. There is no broadcast. Function code is 03H.

(1) Data request (Query)

In case it performs setting value request, it is necessary to designate the start address of data to acquire.
When a data address is transmitted, please subtract 40001 from the address in data-address list.
Please assign the number of requested data as the number of data.

1	2	3	4	5	6	7	8
Address	Function code	Data address		Number of data		CRC	
01H	03H	0000H		0002H		C40BH	

Data address list

Function code	Data address	Comminication data	Data address	Comminication data
03	40001	Phase wire system (1P2/1P3/3P3/3P4)	40026	Current upper limit 2
	40002	Phase display (L123N/RSTN/UVWN)	40027	Current upper limit 2 output (DO1-2 assignment)
	40003	Number of input CT (3P3 : 2CT/3CT)	40028	Current lower limit
	40004	Leakage measurement ON/OFF	40029	Current lower limit output (DO1-2 assignment)
	40005	Secondary rated voltage (110/220/440V)	40030	OA detection exclusion
	40006	Primary rated voltage	40031	Demand current time limit
	40007	Current sensor	40032	Demand current upper limit 1
	40008	Primary rated current	40033	Demand current upper limit 1 output (DO1-2 assignment)
	40009	Active power / reactive power digits	40034	Demand current upper limit 2
	40010	Electric energy count unit	40035	Demand current upper limit 2 output (DO1-2 assignment)
	40011	Pulse output 1 element	40036	Demand power time limit
	40012	Pulse output 1 unit	40037	Demand power upper limit 1
	40013	Pulse output 2 element	40038	Demand power upper limit 1 output (DO1-2 assignment)
	40014	Pulse output 2 unit	40039	Demand power upper limit 2
	40015	Control input function	40040	Demand power upper limit 2 output (DO1-2 assignment)
	40016	Tidal current measurement	40041	Earth leakage sensitivity current 1
	40017	Reactive power calculation method	40042	Leakage current 1 output (DO1-2 assignment)
	40018	Contact 1 function : Alarm / pulse	40043	Leakage sensitivity current 2
	40019	Contact 1 reset method	40044	Leakage current 2 output (DO1-2 assignment)
	40020	Contact 1 delay time	40045	Use ZCT
	40021	Contact 2 function : Alarm / pulse	40046	Inrush current mask level
	40022	Contact 2 reset method	40047	Inrush current mask time
	40023	Contact 2 delay time	40048	Backlight operation
	40024	Current upper limit 1	40049	Backlight brightness
	40025	Current upper limit 1 output (DO1-2 assignment)	40050	Setting management No.

(2) Response

If data request is performed normally, the following response will be returned from this product side.

Example) Data address : 40001, Number of data : 2.

1	2	3	4	5	6	7	8	9
Address	Function code	Answer byte count	Phase wire system		Phase display		CRC	

- Phase wire system

Phase wire system	Communication data
3-phase 4-wire	0001H
3-phase 3-wire	0002H
1-phase 3-wire	0003H
1-phase 2-wire	0004H

- Phase display

Phase display	Communication data
L1-L2-L3-N	0001H
R-S-T-N	0002H
U-V-W-N	0003H

- Number of input CT (3-phase 3-wire only)

Number of input CT	Communication data
2CT	0001H
3CT	0002H

- Leakage measurement ON/OFF

Leakage measurement ON/OFF	Communication data
ON	0001H
OFF	0000H

- Secondary rated voltage

Secondary rated voltage	Communication data
110V	0001H
220V	0002H
440V	0003H

- Primary rated voltage (VT ratio data is sent during readout)
  VT ratio data ＝ Primary rated voltage ÷110V

Primary rating (V)	Communication data	Primary rating (V)	Communication data	Primary rating (V)	Communication data
110.0V	0001H (1)	690V (2)	003DH (61)	6.60kV	003CH (60)
110V	0001H (1)	880V	0008H (8)	11.00kV	0064H (100)
220.0V	0002H (2)	990V	0009H (9)	13.20kV	0078H (120)
220V	0002H (2)	1100V	000AH (10)	13.80kV (2)	007DH (125)
380V (2)	0003H (3)	1650V	000FH (15)	16.50kV	0096H (150)
400V (2)	001FH (31)	2200V	0014H (20)	18.40kV (2)	00A7H (167)
415V (2)	0020H (32)	2.20kV	0014H (20)	20.00kV (2)	00B5H (181)
440V	0004H (4)	3300V	001EH (30)	22.00kV	00C8H (200)
460V (2)	0005H (5)	3.30kV	001EH (30)		
480V (2)	0006H (6)	6600V	003CH (60)		

Note(2) Fraction occurs when divided by 110V. Therefore, it becomes endemic set value data.

- Current sensor

Current sensor	Communication data
5A	0001H
50A	0002H
100A	0003H
200A	0004H
400A	0005H
600A	0006H

- Primary rated current : CT ratio data = Primary rated current ÷5A×10

Primary rating (A)	Communication data	Primary rating (A)	Communication data	Primary rating (A)	Communication data
5.00A	000AH (10)	120.0A	00F0H (240)	2000A	0FA0H (4000)
6.00A	000CH (12)	150.0A	012CH (300)	2500A	1388H (5000)
7.50A	000FH (15)	200.0A	0190H (400)	3000A	1770H (6000)
8.00A	0010H (16)	250.0A	01F4H (500)	3500A	1B58H (7000)
10.00A	0014H (20)	300.0A	0258H (600)	4000A	1F40H (8000)
12.00A	0018H (24)	400A	0320H (800)	4500A	2328H (9000)
15.00A	001EH (30)	500A	03E8H (1000)	5000A	2710H (10000)
20.00A	0028H (40)	600A	04B0H (1200)	6000A	2EE0H (12000)
25.00A	0032H (50)	750A	05DCH (1500)	7500A	3A98H (15000)
30.00A	003CH (60)	800A	0640H (1600)	8000A	3E80H (16000)
40.0A	0050H (80)	900A	0708H (1800)	9.00kA	4650H (18000)
50.0A	0064H (100)	1000A	07D0H (2000)	10.00kA	4E20H (20000)
60.0A	0078H (120)	1200A	0960H (2400)	12.00kA	5DC0H (24000)
75.0A	0096H (150)	1500A	0BB8H (3000)	15.00kA	7530H (30000)
80.0A	00A0H (160)	1600A	0C80H (3200)	20.00kA	9C40H (40000)
100.0A	00C8H (200)	1800A	0E10H (3600)	30.00kA	EA60H (60000)

Numbers in parentheses indicate decimal number data.

- Active power / reactive power digits

Active power / reactive power digits	Communication data
3 digits	0003H
4 digits	0004H

- Electric energy count unit

Electric energy count unit	Communication data
0.00001kWh	FFFBH (-5)
0.0001kWh	FFFCH (-4)
0.001kWh	FFFDH (-3)
0.01kWh	FFFEH (-2)
0.1kWh	FFFFH (-1)
1kWh	0000H (0)
10kWh	0001H (1)
100kWh	0002H (2)
1000kWh	0003H (3)

- Pulse output 1 element and pulse output 2 element

Pulse output element	Communication data
Electric energy (Incoming)	0001H
Electric energy (Outgoing)	0002H
Reactive energy (Incoming) LAG	0003H
Reactive energy (Incoming) LEAD	0004H
Reactive energy (Outgoing) LAG	0005H
Reactive energy (Outgoing) LEAD	0006H
OFF	0000H

- Pulse output 1 unit and pulse output 2 unit

Pulse output unit	Communication data
0.0001kWh/pulse	FFFCH (-4)
0.001kWh/pulse	FFFDH (-3)
0.01kWh/pulse	FFFEH (-2)
0.1kWh/pulse	FFFFH (-1)
1kWh/pulse	0000H (0)
10kWh/pulse	0001H (1)
100kWh/pulse	0002H (2)
1,000kWh/pulse	0003H (3)
10,000kWh/pulse	0004H (4)
100,000kWh/pulse	0005H (5)
1,000,000kWh/pulse	0006H (6)

- Control input function (DI)

Control input function (DI)	Communication data
Alarm output reset	0001H
Maximum / minimum value reset	0002H
All reset	0003H
Status input	0004H

- Tidal current measurement

Tidal current measurement	Communication data
OFF : General measurement	0001H
ON : Tidal current measurement	0002H

- Reactive power calculation method

Reactive power calculation method	Communication data
$Q=UI\sin\phi$	0001H
$Q=\sqrt{(S^2-P^2)}$	0002H

- Contact 1 function and contact 2 function

Contact function	Communication data
Pulse	0001H
Alarm	0002H
OFF	0000H

- Contact 1 reset method and contact 2 reset method

Contact reset method	Communication data
Auto reset	0001H
Manual reset	0002H

- Contact 1 delay time and contact 2 delay time

Contact delay time	Communication data
0 to 300 seconds (1 second step)	0000H to 012CH (0 to 300)

- Upper limit ／ Lower limit output setting (Common to each element)

Output	Communication data
Contact 1	0001H
Contact 2	0002H
Contact 1, Contact 2	0003H
OFF	0000H

- Current upper limit 1 and current upper limit 2

Upper limit value	Communication data
1 to 200% (1% step), OFF	0001H to 00C8H (1 to 200), OFF : 00C9H (201)

- Current lower limit

Lower limit value	Communication data
1 to 200% (1% step), OFF	0001H to 00C8H (1 to 200), OFF : 0000H (0)

- 0A detection exclusion

0A detection exclusion	Communication data
ON (Exclusion)	0001H
OFF	0000H

- Demand current time limit, Demand power time limit

Time limit	Communication data	Time limit	Communication data	Time limit	Communication data
0 second	0000H (0)	1 minute	003CH (60)	8 minutes	01E0H (480)
5 seconds	0005H (5)	2 minutes	0078H (120)	9 minutes	021CH (540)
10 seconds	000AH (10)	3 minutes	00B4H (180)	10 minutes	0258H (600)
20 seconds	0014H (20)	4 minutes	00F0H (240)	15 minutes	0384H (900)
30 seconds	001EH (30)	5 minutes	012CH (300)	20 minutes	04B0H (1200)
40 seconds	0028H (40)	6 minutes	0168H (360)	25 minutes	05DCH (1500)
50 seconds	0032H (50)	7 minutes	01A4H (420)	30 minutes	0708H (1800)

- Demand current and demand power upper limit (Upper limit 1 and upper limit 2)

Upper limit value	Communication data
5 to 200% (1% step), OFF	0005H to 00C8H (5 to 200), OFF : 00C9H (201)

- Earth leakage sensitivity current 1 and earth leakage sensitivity current 2

Earth leakage sensitivity current	Communication data
0.05A	0001H
0.1A	0002H
0.2A	0003H
0.4A	0004H
0.8A	0005H
OFF	0000H

- Use ZCT

Use ZCT	Communication data
Type 1	0001H
Type 2	0002H
Type 3	0003H

- Inrush current mask level

Inrush current mask level	Communication data
1 to 100% (1% step), OFF	0001H to 0064H (1 to 100), OFF : 0000H (0)

- Inrush current mask time

Inrush current mask time	Communication data
0 to 300 seconds (1 second step)	0000H to 012CH (0 to 300)

- Backlight operation

Backlight operation	Communication data
Always ON	0001H
Auto OFF	0002H
Always OFF	0003H

- Backlight brightness

Backlight brightness	Communication data
Brightness 1	0001H
Brightness 2	0002H
Brightness 3	0003H
Brightness 4	0004H
Brightness 5	0005H

- Setting management No.

Setting management No.	Communication data
0 to 9999	0000H to 270FH

6.4 Status request

Used to read the instrument status. There is no broadcast. Function code is 03H.

(1) Data request (Query)

In case it performs a setting values request, it is necessary to designate the data address of data to acquire.
If a data address is transmitted, please subtract 40001 from the address in data-address list.
Please assign the number of requested data as the number of data.

1	2	3	4	5	6	7	8
Address	Function code	Data address		Number of data		CRC	

Data-address list

Function code	Data address	Item
03	40101	Alarm output, DI state
	40102	Detection state 1
	40103	Detection state 2
	40104	Detection state 3

(2) Response

If status request is performed normally, the following response will be returned from this product side.

Example) Data address : 40101, Number of data : 1.

1	2	3	4	5	6	7
Address	Function code	Answer byte count	Alarm output, DI state		CRC	

- Alarm output and DI status bit assignment

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Bit	Item	0	1
1	Alarm output 1 state	No detection	With detection
2	Alarm output 2 state		
3	DI state ([3])	No input (OFF)	With input (ON)
4	—	—	—
5	—	—	—
6	—	—	—
7	—	—	—
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

Note([3]) If the control input function is set to other than "Status input", 0 is returned.

< Detection state 1 >

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

No.	Occurrence factor				No.	Occurrence factor			
	3P3W	1P3W	1P2W	3P4W		3P3W	1P3W	1P2W	3P4W
1	Current (L1) upper limit 1				9	Current (L1) lower limit			
	I(L1)	I(L1)	I	I(L1)		I(L1)	I(L1)	I	I(L1)
2	Current (L2) upper limit 1				10	Current (L2) lower limit			
	I(L2)	I(N)	—	I(L2)		I(L2)	I(N)	—	I(L2)
3	Current (L3) upper limit 1				11	Current (L3) lower limit			
	I(L3)	I(L3)	—	I(L3)		I(L3)	I(L3)	—	I(L3)
4	Current (N) upper limit 1				12	Current (N) lower limit			
	—	—	—	I(N)		—	—	—	I(N)
5	Current (L1) upper limit 2				13	—			
	I(L1)	I(L1)	—	I(L1)					
6	Current (L2) upper limit 2				14	—			
	I(L2)	I(N)	—	I(L2)					
7	Current (L3) upper limit 2				15	—			
	I(L3)	I(L3)	—	I(L3)					
8	Current (N) upper limit 2				16	—			
	—	—	—	I(N)					

< Detection state 2 >

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

No.	Occurrence factor				No.	Occurrence factor			
	3P3W	1P3W	1P2W	3P4W		3P3W	1P3W	1P2W	3P4W
17	Demand current (L1) upper limit 1				25	Demand power upper limit 1			
	Id(L1)	Id(L1)	Id	Id(L1)					
18	Demand current (L2) upper limit 1				26	Demand power (L1) upper limit 1			
	Id(L2)	Id(N)	—	Id(L2)					
19	Demand current (L3) upper limit 1				27	Demand power (L2) upper limit 1			
	Id(L3)	Id(L3)	—	Id(L3)					
20	Demand current (N) upper limit 1				28	Demand power (L3) upper limit 1			
	—	—	—	Id(N)					
21	Demand current (L1) upper limit 2				29	Demand power upper limit 2			
	Id(L1)	Id(L1)	Id	Id(L1)					
22	Demand current (L2) upper limit 2				30	Demand power (L1) upper limit 2			
	Id(L2)	Id(N)	—	Id(L2)					
23	Demand current (L3) upper limit 2				31	Demand power (L2) upper limit 2			
	Id(L3)	Id(L3)	—	Id(L3)					
24	Demand current (N) upper limit 2				32	Demand power (L3) upper limit 2			
	—	—	—	Id(N)					

< Detection state 3 >

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33

No.	Occurrence factor				No.	Occurrence factor			
	3P3W	1P3W	1P2W	3P4W		3P3W	1P3W	1P2W	3P4W
33	Leakage current upper limit 1				41	—			
34	Leakage current upper limit 2				42	—			
35	—				43	—			
36	—				44	—			
37	—				45	—			
38	—				46	—			
39	—				47	—			
40	—				48	—			

6.5 Model information request

Used to read model information, rated voltage and rated current from this product.
There is no broadcast. Function code is 03H.

(1) Data request (Query)

In case it performs a model information request, it is necessary to designate the data address of data to acquire. When a data address is transmitted, please subtract 40001 from the address in data-address list. Please assign the number of requested data as the number of data.

1	2	3	4	5	6	7	8
Address	Function code	Data address		Number of data		CRC	
01H	03H	01F4H		0003H		45C5H	

Data address list

Function code	Data address	Item
03	40501	Model information, Type code
	40502	Model information, Phase wire
	40503	Model information, Secondary rated voltage

(2) Response

If data request is performed normally, the following response will be returned from this product side.

Example) Data address : 40501, Number of data : 3.

1	2	3	4	5	6	7	8	9	10	11
Address	Function code	Answer byte count	Type code		Phase wire		Secondary rated voltage		CRC	

- Model information, Type code

Type	Communication data
SQLC-72L	0013H

- Model information, Phase wire

Phase wire	Communication data
3P3W [3-phase 3-wire] (2VT2CT)	0001H
1P3W [1-phase 3-wire]	0002H
1P2W [1-phase 2-wire]	0005H
3P4W [3-phase 4-wire]	0006H
3P3W [3-phase 3-wire] (2VT3CT)	0007H

- Model information, Secondary rated voltage

Secondary rated voltage	Communication data
AC110V or 110/$\sqrt{3}$V	0001H
AC220V or 220/$\sqrt{3}$V	0002H
AC440V or 440/$\sqrt{3}$V	0003H

6.6 Measurement value request

Read the measurement value from this product. There is no broadcast. Function code is 04H.

(1) Data request (Query)

In case it performs setting value request, it is necessary to designate the start address of data to acquire.
If a data address is transmitted, please subtract 30001 from the address in data-address list.
Please assign the number of requested data as the number of data.

1	2	3	4	5	6	7	8
Address	Function code	Data address		Number of data		CRC	
01H	04H	0000H		001DH		3003H	

Data-address list (1/3)

Function code	Data address	3P3W	1P3W	1P2W	3P4W
04	30001	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Voltage (L1N)
04	30002	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Voltage (L2N)
04	30003	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Voltage (L3N)
04	30004	Voltage (L12)	Voltage (L1N)	Voltage	Voltage (L12)
04	30005	Voltage (L23)	Voltage (L3N)	0000H (Fixation)	Voltage (L23)
04	30006	Voltage (L31)	Voltage (L13)	0000H (Fixation)	Voltage (L31)
04	30007	Current (L1)	Current (L1)	Current	Current (L1)
04	30008	Current (L2)	Current (N)	0000H (Fixation)	Current (L2)
04	30009	Current (L3)	Current (L3)	0000H (Fixation)	Current (L3)
04	30010	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Current (N)
04	30011	Demand current (L1)	Demand current (L1)	Demand current	Demand current (L1)
04	30012	Demand current (L2)	Demand current (N)	0000H (Fixation)	Demand current (L2)
04	30013	Demand current (L3)	Demand current (L3)	0000H (Fixation)	Demand current (L3)
04	30014	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Demand current (N)
04	30015	Active power	Active power	Active power	Active power
04	30016	Demand power	Demand power	Demand power	Demand power
04	30017	Wh (Incoming) upper	Wh (Incoming) upper	Wh (Incoming) upper	Wh (Incoming) upper
04	30018	Wh (Incoming) lower	Wh (Incoming) lower	Wh (Incoming) lower	Wh (Incoming) lower
04	30019	Wh (Outgoing) upper	Wh (Outgoing) upper	Wh (Outgoing) upper	Wh (Outgoing) upper
04	30020	Wh (Outgoing) lower	Wh (Outgoing) lower	Wh (Outgoing) lower	Wh (Outgoing) lower
04	30021	Reactive power	Reactive power	Reactive power	Reactive power
04	30022	varh (Incoming LAG) upper	varh (Incoming LAG) upper	varh (Incoming LAG) upper	varh (Incoming LAG) upper
04	30023	varh (Incoming LAG) lower	varh (Incoming LAG) lower	varh (Incoming LAG) lower	varh (Incoming LAG) lower
04	30024	varh (Incoming LEAD) upper	varh (Incoming LEAD) upper	varh (Incoming LEAD) upper	varh (Incoming LEAD) upper
04	30025	varh (Incoming LEAD) lower	varh (Incoming LEAD) lower	varh (Incoming LEAD) lower	varh (Incoming LEAD) lower
04	30026	varh (Outgoing LAG) upper	varh (Outgoing LAG) upper	varh (Outgoing LAG) upper	varh (Outgoing LAG) upper
04	30027	varh (Outgoing LAG) lower	varh (Outgoing LAG) lower	varh (Outgoing LAG) lower	varh (Outgoing LAG) lower
04	30028	varh (Outgoing LEAD) upper	varh (Outgoing LEAD) upper	varh (Outgoing LEAD) upper	varh (Outgoing LEAD) upper
04	30029	varh (Outgoing LEAD) lower	varh (Outgoing LEAD) lower	varh (Outgoing LEAD) lower	varh (Outgoing LEAD) lower
04	30030	Apparent power	Apparent power	Apparent power	Apparent power
04	30031	Power factor	Power factor	Power factor	Power factor
04	30032	Frequency	Frequency	Frequency	Frequency
04	30033	Leakage current	Leakage current	Leakage current	Leakage current
04	30034	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum voltage (L1N)
04	30035	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum voltage (L2N)
04	30036	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum voltage (L3N)

Function code	Data address	3P3W	1P3W	1P2W	3P4W
04	30037	Maximum voltage (L12)	Maximum voltage (L1N)	Maximum voltage	Maximum voltage (L12)
04	30038	Maximum voltage (L23)	Maximum voltage (L3N)	0000H (Fixation)	Maximum voltage (L23)
04	30039	Maximum voltage (L31)	Maximum voltage (L13)	0000H (Fixation)	Maximum voltage (L31)
04	30040	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum voltage (L1N)
04	30041	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum voltage (L2N)
04	30042	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum voltage (L3N)
04	30043	Minimum voltage (L12)	Minimum voltage (L1N)	Minimum voltage	Minimum voltage (L12)
04	30044	Minimum voltage (L23)	Minimum voltage (L3N)	0000H (Fixation)	Minimum voltage (L23)
04	30045	Minimum voltage (L31)	Minimum voltage (L13)	0000H (Fixation)	Minimum voltage (L31)
04	30046	Maximum current (L1)	Maximum current (L1)	Maximum current	Maximum current (L1)
04	30047	Maximum current (L2)	Maximum current (N)	0000H (Fixation)	Maximum current (L2)
04	30048	Maximum current (L3)	Maximum current (L3)	0000H (Fixation)	Maximum current (L3)
04	30049	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum current (N)
04	30050	Minimum current (L1)	Minimum current (L1)	Minimum current	Minimum current (L1)
04	30051	Minimum current (L2)	Minimum current (N)	0000H (Fixation)	Minimum current (L2)
04	30052	Minimum current (L3)	Minimum current (L3)	0000H (Fixation)	Minimum current (L3)
04	30053	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum current (N)
04	30054	Maximum demand current (L1)	Maximum demand current (L1)	Maximum demand current	Maximum demand current (L1)
04	30055	Maximum demand current (L2)	Maximum demand current (N)	0000H (Fixation)	Maximum demand current (L2)
04	30056	Maximum demand current (L3)	Maximum demand current (L3)	0000H (Fixation)	Maximum demand current (L3)
04	30057	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum demand current (N)
04	30058	Minimum demand current (L1)	Minimum demand current (L1)	Minimum demand current	Minimum demand current (L1)
04	30059	Minimum demand current (L2)	Minimum demand current (N)	0000H (Fixation)	Minimum demand current (L2)
04	30060	Minimum demand current (L3)	Minimum demand current (L3)	0000H (Fixation)	Minimum demand current (L3)
04	30061	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum demand current (N)
04	30062	Maximum active power	Maximum active power	Maximum active power	Maximum active power
04	30063	Minimum active power	Minimum active power	Minimum active power	Minimum active power
04	30064	Maximum demand power	Maximum demand power	Maximum demand power	Maximum demand power
04	30065	Minimum demand power	Minimum demand power	Minimum demand power	Minimum demand power
04	30066	Maximum reactive power	Maximum reactive power	Maximum reactive power	Maximum reactive power
04	30067	Minimum reactive power	Minimum reactive power	Minimum reactive power	Minimum reactive power
04	30068	Maximum apparent power	Maximum apparent power	Maximum apparent power	Maximum apparent power
04	30069	Minimum apparent power	Minimum apparent power	Minimum apparent power	Minimum apparent power
04	30070	Maximum power factor	Maximum power factor	Maximum power factor	Maximum power factor
04	30071	Minimum power factor	Minimum power factor	Minimum power factor	Minimum power factor
04	30072	Maximum frequency	Maximum frequency	Maximum frequency	Maximum frequency
04	30073	Minimum frequency	Minimum frequency	Minimum frequency	Minimum frequency
04	30074	Maximum leakage current	Maximum leakage current	Maximum leakage current	Maximum leakage current

Data-address list (2/3)

Function code	Data address	3P3W	1P3W	1P2W	3P4W
04	30501	0000H (Fixation)	Average phase voltage	0000H (Fixation)	Average phase voltage
04	30502	Average line voltage	0000H (Fixation)	0000H (Fixation)	Average line voltage
04	30503	Average current	Average current	0000H (Fixation)	Average current
04	30504	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30505	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30506	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30507	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30508	Average demand current	Average demand current	0000H (Fixation)	Average demand current

Function code	Data address	3P3W	1P3W	1P2W	3P4W
04	30509	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Active power (L1)
04	30510	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Active power (L2)
04	30511	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Active power (L3)
04	30512	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Demand power (L1)
04	30513	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Demand power (L2)
04	30514	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Demand power (L3)
04	30515	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Reactive power (L1)
04	30516	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Reactive power (L2)
04	30517	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Reactive power (L3)
04	30518	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30519	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30520	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30521	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30522	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Apparent power (L1)
04	30523	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Apparent power (L2)
04	30524	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Apparent power (L3)
04	30525	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Power factor (L1)
04	30526	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Power factor (L2)
04	30527	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Power factor (L3)

Data-address list (3/3)

Function code	Data address	3P3W	1P3W	1P2W	3P4W
04	30601	0000H (Fixation)	Maximum average phase voltage	0000H (Fixation)	Maximum average phase voltage
04	30602	0000H (Fixation)	Minimum average phase voltage	0000H (Fixation)	Minimum average phase voltage
04	30603	Maximum average line voltage	0000H (Fixation)	0000H (Fixation)	Maximum average line voltage
04	30604	Minimum average line voltage	0000H (Fixation)	0000H (Fixation)	Minimum average line voltage
04	30605	Maximum average current	Maximum average current	0000H (Fixation)	Maximum average current
04	30606	Minimum average current	Minimum average current	0000H (Fixation)	Minimum average current
04	30607	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30608	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30609	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30610	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30611	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30612	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30613	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30614	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30615	Maximum average demand current	Maximum average demand current	0000H (Fixation)	Maximum average demand current
04	30616	Minimum average demand current	Minimum average demand current	0000H (Fixation)	Minimum average demand current
04	30617	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum active power (L1)
04	30618	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum power (L2)
04	30619	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum active power (L3)
04	30620	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum active power (L1)
04	30621	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum active power (L2)
04	30622	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum active power (L3)

Function code	Data address	3P3W	1P3W	1P2W	3P4W
04	30623	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum demand power (L1)
04	30624	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum demand power (L2)
04	30625	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum demand power (L3)
04	30626	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum demand power (L1)
04	30627	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum demand power (L2)
04	30628	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum demand power (L3)
04	30629	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum reactive power (L1)
04	30630	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum reactive power (L2)
04	30631	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum reactive power (L3)
04	30632	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum reactive power (L1)
04	30633	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum reactive power (L2)
04	30634	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum reactive power (L3)
04	30635	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30636	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30637	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30638	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30639	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30640	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30641	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30642	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)
04	30643	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum apparent power (L1)
04	30644	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum apparent power (L2)
04	30645	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum apparent power (L3)
04	30646	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum apparent power (L1)
04	30647	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum apparent power (L2)
04	30648	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum apparent power (L3)
04	30649	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum power factor (L1)
04	30650	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum power factor (L2)
04	30651	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Maximum power factor (L3)
04	30652	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum power factor (L1)
04	30653	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum power factor (L2)
04	30654	0000H (Fixation)	0000H (Fixation)	0000H (Fixation)	Minimum power factor (L3)

(2) Response

If measurement value requirements are performed normally, the following response will be returned from this product side.

Example) Data address : 30001, Number of data : 29 (3P3W)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Address	Function code	Answer byte count	00	00	00	00	00	00	L12 line voltage U(L12)		L23 line voltage 圧 U(L23)		L31 line voltage U(L31)	

16	17	18	19	20	21	22	23	24	25	26	27	28	29
L1 phase current I(L1)		L2 phase current I(L2)		L3 phase current I(L3)		00	00	L1 phase demand current Id(L1)		L2 phase demand current Id(L2)		L3 phase demand current Id(L3)	

30	31	32	33	34	35	36	37	38	39	40	41	42	43
00	00	Active power P		Demand power Pd		Wh (Incoming) Upper		Wh (Incoming) Lower		Wh (Outgoing) Upper		Wh (Outgoing) Lower	

44	45	46	47	48	49	50	51	52	53	54	55	56	57
Reactive power var		varh (Incoming LAG) Upper		varh (Incoming LAG) Lower		varh (Incoming LEAD) Upper		varh (Incoming LEAD) Lower		varh (Outgoing LAG) Upper		varh (Outgoing LAG) Lower	

58	59	60	61	62	63
varh (Outgoing LEAD) Upper		varh (Outgoing LEAD) Lower		CRC	

Data scaling

Item		Input				Communication data (4)	Intrinsic error
Voltage	3P3W 1P2W	AC0 - 150V, AC0 - 300V, AC0 - 600V				0000H to 2710H (0 to 10000)	±0.5%
	3P4W	AC0 - 150V, AC0 - 300V, AC0 - 600V (Line)				0000H to 2710H (0 to 10000)	
		AC0 - 150/√3V, AC0 - 300/√3V, AC0 - 600/√3V (Phase)				0000H to 168EH (0 to 5774)	
	1P3W	AC0 - 300V				0000H to 2710H (0 to 10000)	
Current, Demand current		AC0 - 5A / 50A / 100A / 200A / 400A / 600A (Depending on current sensor)				0000H to 2710H (0 to 10000)	±0.5%
Active power Demand power	3P3W 1P3W 3P4W	Current sensor	5A	110V	-1kW - 0 - +1kW	D8F0H to 0000H to 2710H (-10000 to 0 to +10000)	±0.5%
				220V	-2kW - 0 - +2kW		
				440V	-4kW - 0 - +4kW		
			50A	110V	-10kW - 0 - +10kW		
				220V	-20kW - 0 - +20kW		
				440V	-40kW - 0 - +40kW		
			100A	110V	-20kW - 0 - +20kW		
				220V	-40kW - 0 - +40kW		
				440V	-80kW - 0 - +80kW		
			200A	110V	-40kW - 0 - +40kW		
				220V	-80kW - 0 - +80kW		
				440V	-160kW - 0 - +160kW		
			400A	110V	-80kW - 0 - +80kW		
				220V	-160kW - 0 - +160kW		
				440V	-320kW - 0 - +320kW		
			600A	110V	-120kW - 0 - +120kW		
				220V	-240kW - 0 - +240kW		
				440V	-480kW - 0 - +480kW		

Item		Input				Communication data (4)	Intrinsic error
Active power Demand power	1P2W	Current sensor	5A	110V	-500W - 0 - 500W	EC78H to 0000H to 1388H (-5000 to 0 to +5000)	±0.5%
				220V	-1kW - 0 - +1kW		
				440V	-2kW - 0 - +2kW		
			50A	110V	-5kW - 0 - +5kW		
				220V	-10kW - 0 - +10kW		
				440V	-20kW - 0 - +20kW		
			100A	110V	-10kW - 0 - +10kW		
				220V	-20kW - 0 - +20kW		
				440V	-40kW - 0 - +40kW		
			200A	110V	-20kW - 0 - +20kW		
				220V	-40kW - 0 - +40kW		
				440V	-80kW - 0 - +80kW		
			400A	110V	-40kW - 0 - +40kW		
				220V	-80kW - 0 - +80kW		
				440V	-160kW - 0 - +160kW		
			600A	110V	-60kW - 0 - +60kW		
				220V	-120kW - 0 - +120kW		
				440V	-240kW - 0 - +240kW		
Reactive power	3P3W 1P3W 3P4W	Current sensor	5A	110V	LEAD 1kvar - 0 - LAG 1kvar	D8F0H to 0000H to 2710H (-10000 to 0 to +10000)	±0.5%
				220V	LEAD 2kvar - 0 - LAG 2kvar		
				440V	LEAD 4kvar - 0 - LAG 4kvar		
			50A	110V	LEAD 10kvar - 0 - LAG 10kvar		
				220V	LEAD 20kvar - 0 - LAG 20kvar		
				440V	LEAD 40kvar - 0 - LAG 40kvar		
			100A	110V	LEAD 20kvar - 0 - LAG 20kvar		
				220V	LEAD 40kvar - 0 - LAG 40kvar		
				440V	LEAD 80kvar - 0 - LAG 80kvar		
			200A	110V	LEAD 40kvar - 0 - LAG 40kvar		
				220V	LEAD 80kvar - 0 - LAG 80kvar		
				440V	LEAD 160kvar - 0 - LAG 160kvar		
			400A	110V	LEAD 80kvar - 0 - LAG 80kvar		
				220V	LEAD 160kvar - 0 - LAG 160kvar		
				440V	LEAD 320kvar - 0 - LAG 320kvar		
			600A	110V	LEAD 120kvar - 0 - LAG 120kvar		
				220V	LEAD 240kvar - 0 - LAG 240kvar		
				440V	LEAD 480kvar - 0 - LAG 480kvar		
	1P2W	Current sensor	5A	110V	LEAD 500var - 0 - LAG 500var	EC78H to 0000H to 1388H (-5000 to 0 to +5000)	±0.5%
				220V	LEAD 1kvar - 0 - LAG 1kvar		
				440V	LEAD 2kvar - 0 - LAG 2kvar		
			50A	110V	LEAD 5kvar - 0 - LAG 5kvar		
				220V	LEAD 10kvar - 0 - LAG 10kvar		
				440V	LEAD 20kvar - 0 - LAG 20kvar		
			100A	110V	LEAD 10kvar - 0 - LAG 10kvar		
				220V	LEAD 20kvar - 0 - LAG 20kvar		
				440V	LEAD 40kvar - 0 - LAG 40kvar		
			200A	110V	LEAD 20kvar - 0 - LAG 20kvar		
				220V	LEAD 40kvar - 0 - LAG 40kvar		
				440V	LEAD 80kvar - 0 - LAG 80kvar		
			400A	110V	LEAD 40kvar - 0 - LAG 40kvar		
				220V	LEAD 80kvar - 0 - LAG 80kvar		
				440V	LEAD 160kvar - 0 - LAG 160kvar		
			600A	110V	LEAD 60kvar - 0 - LAG 60kvar		
				220V	LEAD 120kvar - 0 - LAG 120kvar		
				440V	LEAD 240kvar - 0 - LAG 240kvar		

Item		Input				Communication data (4)	Intrinsic error
Apparent power	3P3W 1P3W 3P4W	Current sensor	5A	110V	0 - 1kVA	0000H to 2710H (0 to 10000)	±0.5%
				220V	0 - 2kVA		
				440V	0 - 4kVA		
			50A	110V	0 - 10kVA		
				220V	0 - 20kVA		
				440V	0 - 40kVA		
			100A	110V	0 - 20kVA		
				220V	0 - 40kVA		
				440V	0 - 80kVA		
			200A	110V	0 - 40kVA		
				220V	0 - 80kVA		
				440V	0 - 160kVA		
			400A	110V	0 - 80kVA		
				220V	0 - 160kVA		
				440V	0 - 320kVA		
			600A	110V	0 - 120kVA		
				220V	0 - 240kVA		
				440V	0 - 480kVA		
	1P2W	Current sensor	5A	110V	0 - 500VA	0000H to 1388H (0 to 5000)	±0.5%
				220V	0 - 1kVA		
				440V	0 - 2kVA		
			50A	110V	0 - 5kVA		
				220V	0 - 10kVA		
				440V	0 - 20kVA		
			100A	110V	0 - 10kVA		
				220V	0 - 20kVA		
				440V	0 - 40kVA		
			200A	110V	0 - 20kVA		
				220V	0 - 40kVA		
				440V	0 - 80kVA		
			400A	110V	0 - 40kVA		
				220V	0 - 80kVA		
				440V	0 - 160kVA		
			600A	110V	0 - 60kVA		
				220V	0 - 120kVA		
				440V	0 - 240kVA		
Power factor		LEAD 0 - 1 - LAG 0				0000H to 1388H to 2710H (0 to 5000 to 10000)	±2.0%
Frequency		45 - 65Hz				1194H to 1964H (4500 to 6500)	±0.5%
Leakage current		AC0 - 0.8A				0000H to 2710H (0 to 10000)	±2.5%
Electric energy (Incoming/Outgoing)		0 - 999999999 (5)				000000H to 3B9AC9FFH (0 to 999999999)	Power factor 1 :±2.0% Power factor 0.5 :±2.5%
Reactive energy (Incoming/Outgoing, LAG/LEAD)		0 - 999999999 (5)				000000H to 3B9AC9FFH (0 to 999999999)	Power factor 0 :±2.5% Power factor 0.87 :±2.5%

Note(4) Communication data range, during low input data.

- Current : 201% of full scale, less than 0.5% of secondary rated current is “0000H” (0).
- Voltage : 101% of full scale, less than 20% of secondary rated voltage is “0000H” (0).
- Active power, reactive power : 201% of full scale, less than 0.5% of secondary rated power and reactive power is “0000H” (0)
- Power factor : Less than 20% of voltage full scale or less than 2% of current full scale is "FFFFH" (-1)
- Frequency : ±1% of measurement range, 45 to 65Hz : 44.8 to 65.2Hz「1180H to 1978H」(4480 to 6520)
  Less than 20% of voltage full scale is "0000H"
- Active power, reactive power : Negative data is expressed in 2's complement (-10000 to 0 to 10000 : D8F0H to 0000H to 2710H)
- Leakage current: 120% of full scale (12000)

Note(5) Multiply electric energy (reactive energy) data by electric energy count unit data to obtain kWh (kvarh).
Example) Electric energy (kWh) = Electric energy data × Electric energy count unit data
= 1234×100 = 123400kWh

6.7 Setting value change

Used to change the setting information for the product. There is no broadcast. Function code is 16 (10H).

(1) Data request (Query)

When changing the set value, it is necessary to specify the start address of the data to be changed, the number of data, and the number of write bytes.
When a data address is transmitted, please subtract 40001 from the address in data-address list.

1	2	3 4	5 6	7	8 9	10 11	12 13	14 15
Address	Function code	Start address	Number of data	Number of write bytes	Write data 1	Write data 2	Write data 3	CRC

Data address list

Function code	Data address	Comminication data	Data address	Comminication data
16 (10H)	40001	Phase wire system (1P2/1P3/3P3/3P4)	40026	Current upper limit 2
	40002	Phase display (L123N/RSTN/UVWN)	40027	Current upper limit 2 output (DO1-2 assignment)
	40003	Number of input CT (3P3 : 2CT/3CT)	40028	Current lower limit
	40004	Leakage measurement ON/OFF	40029	Current lower limit output (DO1-2 assignment)
	40005	Secondary rated voltage (110/220/440V)	40030	OA detection exclusion
	40006	Primary rated voltage	40031	Demand current time limit
	40007	Current sensor	40032	Demand current upper limit 1
	40008	Primary rated current	40033	Demand current upper limit 1 output (DO1-2 assignment)
	40009	Active power / reactive power digits	40034	Demand current upper limit 2
	40010	Electric energy count unit	40035	Demand current upper limit 2 output (DO1-2 assignment)
	40011	Pulse output 1 element	40036	Demand power time limit
	40012	Pulse output 1 unit	40037	Demand power upper limit 1
	40013	Pulse output 2 element	40038	Demand power upper limit 1 output (DO1-2 assignment)
	40014	Pulse output 2 unit	40039	Demand power upper limit 2
	40015	Control input function	40040	Demand power upper limit 2 output (DO1-2 assignment)
	40016	Tidal current measurement	40041	Earth leakage sensitivity current 1
	40017	Reactive power calculation method	40042	Leakage current 1 output (DO1-2 assignment)
	40018	Contact 1 function : Alarm / pulse	40043	Leakage sensitivity current 2
	40019	Contact 1 reset method	40044	Leakage current 2 output (DO1-2 assignment)
	40020	Contact 1 delay time	40045	Use ZCT
	40021	Contact 2 function : Alarm / pulse	40046	Inrush current mask level
	40022	Contact 2 reset method	40047	Inrush current mask time
	40023	Contact 2 delay time	40048	Backlight operation
	40024	Current upper limit 1	40049	Backlight brightness
	40025	Current upper limit 1 output (DO1-2 assignment)	40050	Setting management No.

(2) Response

If data change is performed normally, the following response will be returned from this product side.

1	2	3	4	5	6	7	8
Address	Function code	Start address		Number of data		CRC	

- Phase wire system

Phase wire system	Communication data
3-phase 4-wire	0001H
3-phase 3-wire	0002H
1-phase 3-wire	0003H
1-phase 2-wire	0004H

- Phase display

Phase display	Communication data
L1-L2-L3-N	0001H
R-S-T-N	0002H
U-V-W-N	0003H

- Number of input CT (3-phase 3-wire only)

Number of input CT	Communication data
2CT	0001H
3CT	0002H

- Leakage measurement ON/OFF

Leakage measurement ON/OFF	Communication data
ON	0001H
OFF	0000H

- Secondary rated voltage

Secondary rated voltage	Communication data
110V	0001H
220V	0002H
440V	0003H

- Primary rated voltage (When setting is changed)

Primary rating (V)	Communication data	Primary rating (V)	Communication data	Primary rating (V)	Communication data
110.0V	0001H (1)	690V	000BH (11)	6.60kV	0015H (21)
110V	0002H (2)	880V	000CH (12)	11.00kV	0016H (22)
220.0V	0003H (3)	990V	000DH (13)	13.20kV	0017H (23)
220V	0004H (4)	1100V	000EH (14)	13.80kV	0018H (24)
380V	0005H (5)	1650V	000FH (15)	16.50kV	0019H (25)
400V	0006H (6)	2200V	0010H (16)	18.40kV	001AH (26)
415V	0007H (7)	2.20kV	0011H (17)	20.00kV	001BH (27)
440V	0008H (8)	3300V	0012H (18)	22.00kV	001CH (28)
460V	0009H (9)	3.30kV	0013H (19)		
480V	000AH (10)	6600V	0014H (20)		

- Current sensor

Current sensor	Communication data
5A	0001H
50A	0002H
100A	0003H
200A	0004H
400A	0005H
600A	0006H

● Primary rated current (When setting is changed)

Primary rating (A)	Communication data	Primary rating (A)	Communication data	Primary rating (A)	Communication data
5.00A	0001H (1)	120.0A	0011H (17)	2000A	0021H (33)
6.00A	0002H (2)	150.0A	0012H (18)	2500A	0022H (34)
7.50A	0003H (3)	200.0A	0013H (19)	3000A	0023H (35)
8.00A	0004H (4)	250.0A	0014H (20)	3500A	0024H (36)
10.00A	0005H (5)	300.0A	0015H (21)	4000A	0025H (37)
12.00A	0006H (6)	400A	0016H (22)	4500A	0026H (38)
15.00A	0007H (7)	500A	0017H (23)	5000A	0027H (39)
20.00A	0008H (8)	600A	0018H (24)	6000A	0028H (40)
25.00A	0009H (9)	750A	0019H (25)	7500A	0029H (41)
30.00A	000AH (10)	800A	001AH (26)	8000A	002AH (42)
40.0A	000BH (11)	900A	001BH (27)	9.00kA	002BH (43)
50.0A	000CH (12)	1000A	001CH (28)	10.00kA	002CH (44)
60.0A	000DH (13)	1200A	001DH (29)	12.00kA	002DH (45)
75.0A	000EH (14)	1500A	001EH (30)	15.00kA	002EH (46)
80.0A	000FH (15)	1600A	001FH (31)	20.00kA	002FH (47)
100.0A	0010H (16)	1800A	0020H (32)	30.00kA	0030H (48)

● Active power / reactive power digits

Active power / reactive power digits	Communication data
3 digits	0003H
4 digits	0004H

● Electric energy count unit

Electric energy count unit	Communication data
0.00001kWh	FFFBH (-5)
0.0001kWh	FFFCH (-4)
0.001kWh	FFFDH (-3)
0.01kWh	FFFEH (-2)
0.1kWh	FFFFH (-1)
1kWh	0000H (0)
10kWh	0001H (1)
100kWh	0002H (2)
1000kWh	0003H (3)

<Caution>
The values that can be set vary depending on the combination of primary rated voltage and primary rated current settings.
Refer to the table below and set an appropriate value.

■ 3P3W, 3P4W : Full load power (kW,kvar) = $\sqrt{3}$ × Rated voltage (V) × Rated current (A) × 10^{-3}
■ 1P3W : Full load power (kW,kvar) = 2 × Rated voltage (V) × Rated current (A) × 10^{-3}
■ 1P2W : Full load power (kW,kvar) = Rated voltage (V) × Rated current (A) × 10^{-3}

Full load power (kW,kvar)		Electric energy count unit			
	Below 1	0.01kWh	0.001kWh	0.0001kWh	0.00001kWh
Over 1	Below 10	0.1kWh	0.01kWh	0.001kWh	0.0001kWh
Over 10	Below 100	1kWh	0.1kWh	0.01kWh	0.001kWh
Over 100	Below 1,000	10kWh	1kWh	0.1kWh	0.01kWh
Over 1,000	Below 10,000	100kWh	10kWh	1kWh	0.1kWh
Over 10,000	Below 100,000	1,000kWh	100kWh	10kWh	1kWh
Over 100,000	Below 1,000,000	Cannot be set	1,000kWh	100kWh	10kWh
Over 1,000,000	Below 10,000,000	Cannot be set	Cannot be set	1,000kWh	100kWh

● Pulse output 1 element and pulse output 2 element

Pulse output element	Communication data
Electric energy (Incoming)	0001H
Electric energy (Outgoing)	0002H
Reactive energy (Incoming) LAG	0003H
Reactive energy (Incoming) LEAD	0004H
Reactive energy (Outgoing) LAG	0005H
Reactive energy (Outgoing) LEAD	0006H
OFF	0000H

- Pulse output 1 unit and pulse output 2 unit

Pulse output unit	Communication data
0.0001kWh/pulse	FFFCH (-4)
0.001kWh/pulse	FFFDH (-3)
0.01kWh/pulse	FFFEH (-2)
0.1kWh/pulse	FFFFH (-1)
1kWh/pulse	0000H (0)
10kWh/pulse	0001H (1)
100kWh/pulse	0002H (2)
1,000kWh/pulse	0003H (3)
10,000kWh/pulse	0004H (4)
100,000kWh/pulse	0005H (5)
1,000,000kWh/pulse	0006H (6)

<Caution>
The values that can be set vary depending on the combination of primary rated voltage and primary rated current settings.
Refer to the table below and set an appropriate value.

■ 3P3W, 3P4W : Full load power (kW,kvar)＝$\sqrt{3}$×Rated voltage (V)×Rated current (A)×10^{-3}
■ 1P3W : Full load power (kW,kvar)＝2×Rated voltage (V)×Rated current (A)×10^{-3}
■ 1P2W : Full load power (kW,kvar)＝Rated voltage (V)×Rated current (A)×10^{-3}

Full load power (kW,kvar)		Pulse output unit			
Below 1		0.1kWh/p	0.01kWh/p	0.001kWh/p	0.0001kWh/p
Over 1	Below 10	1kWh/p	0.1kWh/p	0.01kWh/p	0.001kWh/p
Over 10	Below 100	10kWh/p	1kWh/p	0.1kWh/p	0.01kWh/p
Over 100	Below 1,000	100kWh/p	10kWh/p	1kWh/p	0.1kWh/p
Over 1,000	Below 10,000	1000kWh/p	100kWh/p	10kWh/p	1kWh/p
Over 10,000	Below 100,000	10,000kWh/p	1,000kWh/p	100kWh/p	10kWh/p
Over 100,000	Below 1,000,000	100,000kWh/p	10,000kWh/p	1,000kWh/p	100kWh/p
Over 1,000,000	Below 10,000,000	1,000,000kWh/p	100,000kWh/p	10,000kWh/p	1,000kWh/p

- Control input function

Control input function	Communication data
Alarm output reset	0001H
Maximum / minimum value reset	0002H
All reset	0003H
Status input	0004H

- Tidal current measurement

Tidal current measurement	Communication data
OFF : General measurement	0001H
ON : Tidal current measurement	0002H

- Reactive power calculation method

Reactive power calculation method	Communication data
$Q=UI\sin\phi$	0001H
$Q=\sqrt{(S^2-P^2)}$	0002H

- Contact 1 function and contact 2 function

Contact function	Communication data
Pulse	0001H
Alarm	0002H
OFF	0000H

- Contact 1 reset method and contact 2 reset method

Contact reset method	Communication data
Auto reset	0001H
Manual reset	0002H

- Contact 1 delay time and contact 2 delay time

Contact delay time	Communication data
0 to 300 seconds (1 second step)	0000H to 012CH (0 to 300)

- Upper limit ／ lower limit output setting (Common to each element)

Output	Communication data
Contact 1	0001H
Contact 2	0002H
Contact 1, Contact 2	0003H
OFF	0000H

- Current upper limit 1 and current upper limit 2

Upper limit value	Communication data
1 to 200% (1% step), OFF	0001H to 00C8H (1 to 200), OFF : 00C9H (201)

- Current lower limit

Lower limit value	Communication data
1 to 200% (1% step), OFF	0001H to 00C8H (1 to 200), OFF : 0000H (0)

- 0A detection exclusion

0A detection exclusion	Communication data
ON (Exclusion)	0001H
OFF	0000H

- Demand current time limit, Demand power time limit

Time limit	Communication data	Time limit	Communication data	Time limit	Communication data
0 second	0000H (0)	1 minute	003CH (60)	8 minutes	01E0H (480)
5 seconds	0005H (5)	2 minutes	0078H (120)	9 minutes	021CH (540)
10 seconds	000AH (10)	3 minutes	00B4H (180)	10 minutes	0258H (600)
20 seconds	0014H (20)	4 minutes	00F0H (240)	15 minutes	0384H (900)
30 seconds	001EH (30)	5 minutes	012CH (300)	20 minutes	04B0H (1200)
40 seconds	0028H (40)	6 minutes	0168H (360)	25 minutes	05DCH (1500)
50 seconds	0032H (50)	7 minutes	01A4H (420)	30 minutes	0708H (1800)

- Demand current and demand power upper limit (Upper limit 1 and upper limit 2)

Upper limit value	Communication data
5 to 200% (1% step), OFF	0005H to 00C8H (5 to 200), OFF : 00C9H (201)

- Earth leakage sensitivity current 1 and earth leakage sensitivity current 2

Earth leakage sensitivity current	Communication data
0.05A	0001H
0.1A	0002H
0.2A	0003H
0.4A	0004H
0.8A	0005H
OFF	0000H

- Use ZCT

Use ZCT	Communication data
Type 1	0001H
Type 2	0002H
Type 3	0003H

- Inrush current mask level

Inrush current mask level	Communication data
1 to 100% (1% step), OFF	0001H to 0064H (1 to 100), OFF : 0000H (0)

- Inrush current mask time

Inrush current mask time	Communication data
0 to 300 seconds (1 second step)	0000H to 012CH (0 to 300)

- Backlight operation

Backlight operation	Communication data
Always ON	0001H
Auto OFF	0002H
Always OFF	0003H

- Backlight brightness

Backlight brightness	Communication data
Brightness 1	0001H
Brightness 2	0002H
Brightness 3	0003H
Brightness 4	0004H
Brightness 5	0005H

- Setting management No.

Setting management No.	Communication data
0 to 9999	0000H to 270FH

6.8 Maximum / minimum reset request

Used to perform maximum / minimum reset for this product.
When 00H is specified for the address, there will be broadcast. Function code is 06H.

(1) Maximum / minimum reset request (Query)

When making a maximum / minimum reset request, it is necessary to send the write data including the data address and the element to be reset.
If a data address is transmitted, please subtract 40001 from the address in data-address list.

1	2	3	4	5	6	7	8
Address	Function code	Data address		Write data		CRC	
01H	06H	012CH		03FFH		094FH	

Data address list

Function code	Data address	Item
06	40301	Maximum / minimum reset

- Maximum / minimum reset write data bit assignment

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

No.	Output contents	No.	Output contents
1	Voltage (Maximum, Minimum)	9	Demand current (Maximum, Minimum)
2	Current (Maximum, Minimum)	10	Demand power (Maximum, Minimum)
3	Active power (Maximum, Minimum)	11	—
4	Reactive power (Maximum, Minimum)	12	—
5	Apparent power (Maximum, Minimum)	13	—
6	Power factor (Maximum, Minimum)	14	—
7	Frequency (Maximum, Minimum)	15	—
8	Leakage current (Maximum)	16	—

(2) Response

If data change is performed normally, the following response will be returned from this product side.
If broadcast (address 00H) is specified, there is no response.

1	2	3	4	5	6	7	8
Address	Function code	Start address		Change data		CRC	

The same data as the write data of the maximum / minimum reset element is returned to the change data.

6.9 Loopback test

The loopback test is a function to test whether the master and slave (SQLC-72L) are communicating normally.
Arbitrary data is returned as it is.
There is no broadcast. Function code is 08H.

(1) Loopback request (Query)

When performing a loopback test, it is necessary to send data and diagnostic codes used for diagnosis.
Specify 0000H as the diagnostic code. Specify any value from 0000H to FFFFH for the diagnostic data.

1	2	3	4	5	6	7	8
Address	Function code	Diagnosis code		Diagnosis data		CRC	
01H	08H	0000H		04D2H		6296H	

(2) Response

If loopback request is performed normally, the following response will be returned from this product side.

1	2	3	4	5	6	7	8
Address	Function code	Diagnosis code		Diagnosis data		CRC	

The same data sent by the master in (1) is returned as the diagnosis code and diagnostic data.

7. Test mode [Transmission data when checking communication output]

Element	Measurement data range	Test mode			
		Seq : Sequence number	100%	50%	0%
Voltage (RN)	0 to 5774	1000	5774	2887	0
Voltage (SN)		1100	5774	2887	0
Voltage (TN)		1200	5774	2887	0
Voltage (RS)	0 to 10000	1300	10000	5000	0
Voltage (ST)		1400	10000	5000	0
Voltage (TR)		1500	10000	5000	0
Current (R)	0 to 10000	1600	10000	5000	0
Current (S)		1700	10000	5000	0
Current (T)		1800	10000	5000	0
Current (N)		1900	10000	5000	0
Demand current (R)	0 to 10000	2000	10000	5000	0
Demand current (S)		2100	10000	5000	0
Demand current (T)		2200	10000	5000	0
Demand current (N)		2300	10000	5000	0
Active power	-10000 to 0 to 10000	2400	10000	5000	0
Demand power		2500	10000	5000	0
Electric energy (Incoming)	0 to 999999999	200000	999999999	555555555	0
Electric energy (Outgoing)		300000	999999999	555555555	0
Reactive power	-10000 to 0 to 10000	2600	10000	5000	0
Reactive energy (Incoming LAG)	0 to 999999999	400000	999999999	555555555	0
Reactive energy (Incoming LEAD)		500000	999999999	555555555	0
Reactive energy (Outgoing LAG)		600000	999999999	555555555	0
Reactive energy (Outgoing LEAD)		700000	999999999	555555555	0
Apparent power	0 to 10000	2700	10000	5000	0
Power factor	0 to 5000 to 10000	2800	10000	5000	0
Frequency	4500 to 6500	5000	6500	5500	4500
Leakage current	0 to 10000	2900	10000	5000	0
Maximum voltage (RN)	0 to 5774	3000	5774	2887	0
Maximum voltage (SN)		3100	5774	2887	0
Maximum voltage (TN)		3200	5774	2887	0
Maximum voltage (RS)	0 to 10000	3300	10000	5000	0
Maximum voltage (ST)		3400	10000	5000	0
Maximum voltage (TR)		3500	10000	5000	0
Minimum voltage (RN)	0 to 5774	3600	5774	2887	0
Minimum voltage (SN)		3700	5774	2887	0
Minimum voltage (TN)		3800	5774	2887	0
Minimum voltage (RS)	0 to 10000	3900	10000	5000	0
Minimum voltage (ST)		4000	10000	5000	0
Minimum voltage (TR)		4100	10000	5000	0
Maximum current (R)	0 to 10000	4200	10000	5000	0
Maximum current (S)		4300	10000	5000	0
Maximum current (T)		4400	10000	5000	0
Maximum current (N)		4500	10000	5000	0
Minimum current (R)		4600	10000	5000	0
Minimum current (S)		4700	10000	5000	0
Minimum current (T)		4800	10000	5000	0
Minimum current (N)		4900	10000	5000	0

Element	Measurement data range	Test mode			
		Seq：Sequence number	100%	50%	0%
Maximum demand current (R)	0 to 10000	6000	10000	5000	0
Maximum demand current (S)		6100	10000	5000	0
Maximum demand current (T)		6200	10000	5000	0
Maximum demand current (N)		6300	10000	5000	0
Minimum demand current (R)		6400	10000	5000	0
Minimum demand current (S)		6500	10000	5000	0
Minimum demand current (T)		6600	10000	5000	0
Minimum demand current (N)		6700	10000	5000	0
Maximum active power	-10000 to 0 to 10000	6800	10000	5000	0
Minimum active power		6900	10000	5000	0
Maximum demand power		7000	10000	5000	0
Minimum demand power		7100	10000	5000	0
Maximum reactive power		7200	10000	5000	0
Minimum reactive power		7300	10000	5000	0
Maximum apparent power	0 to 10000	7400	10000	5000	0
Minimum apparent power		7500	10000	5000	0
Maximum power factor	0 to 5000 to 10000	7600	10000	5000	0
Minimum power factor		7700	10000	5000	0
Maximum frequency	4500 to 6500	5100	6500	5500	4500
Minimum frequency		5200	6500	5500	4500
Maximum leakage current	0 to 10000	7800	10000	5000	0

DAIICHI ELECTRONICS CO., LTD.

Tokyo Office : 11-13, Hitotsuya 1-chome, Adachi-ku, Tokyo, 121-8639, JAPAN.
TEL : +81-3-3885-2411 , Fax : +81-3-3858-3966

Kyoto Office : 1-19, Ichinobe-Nishikawahara, Jyoyou-shi, Kyoto, 610-0114, JAPAN.
TEL : +81-774-55-1391 , Fax : +81-774-54-1353

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