

BEFORE USE

Thank you for choosing M-System. Before use, please check contents of the package you received as outlined below.

If you have any problems or questions with the product, please contact M-System's Sales Office or representatives.

■ PACKAGE INCLUDES:

Multi power monitoring module.....(1)
Terminating resistor (110 Ω, 0.5 W).....(1)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

The R7CWTU is programmable by using the PC Configurator Software. For detailed information on the PC configuration, refer to the PMCFG users manual. The PMCFG PC Configurator Software is downloadable at M-System's web site: <http://www.m-system.co.jp>

POINTS OF CAUTION**■ POWER INPUT RATING & OPERATIONAL RANGE**

- Locate the power input rating marked on the product and confirm its operational range as indicated below:
100 – 240V AC rating: 85 – 264V, 50/60 Hz, < 8VA
110 – 240V DC rating: 99 – 264V, < 3W

■ GENERAL PRECAUTIONS

- Before you remove or mount the unit, turn off the power supply and input signal for safety.
- DO NOT set the switches on the module while the power is supplied. The switches are used only for maintenance without the power.

■ ENVIRONMENT

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

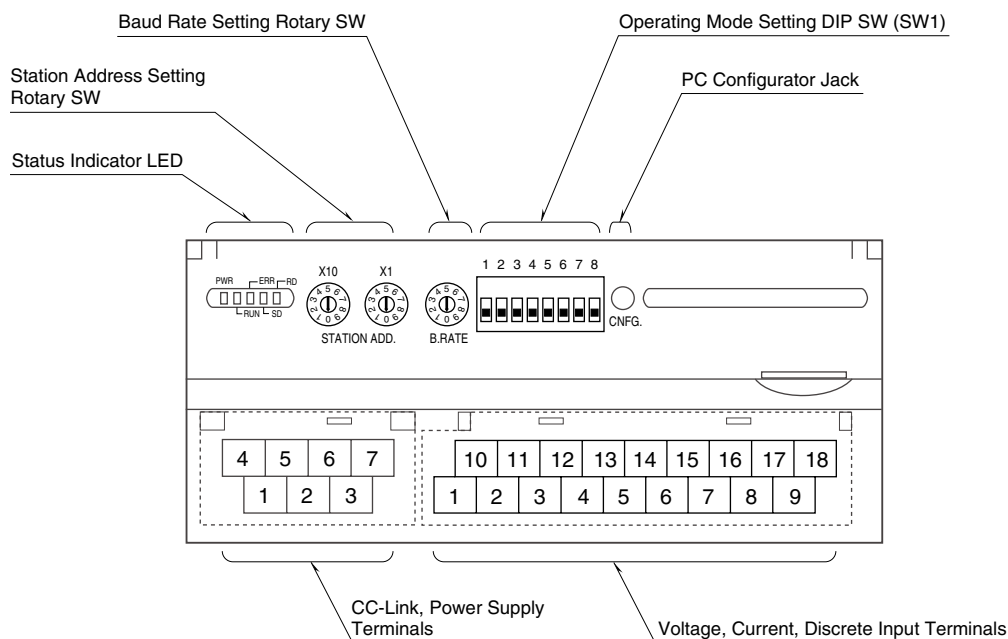
■ WIRING

- Wiring to the unit must be conducted by qualified service personnel.
- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ AND

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

COMPONENT IDENTIFICATION

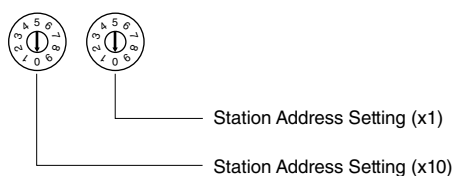


■ STATUS INDICATOR LED

ID	COLOR	STATUS	FUNCTION
PWR	Red	ON	Normal
		Blinking approx. 0.5 Hz	Input overload or no input
		Blinking approx. 2 Hz	Setting error or device error
		OFF	Error in the internal 5V
RUN	Red	ON	Refresh data received normally
ERR	Red	ON	Received data error
SD	Red	ON	Data transmitting
RD	Red	ON	Data receiving

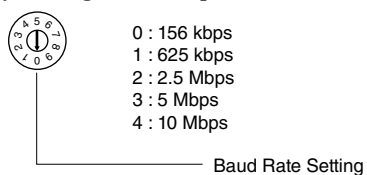
■ STATION ADDRESS

Station Address is selected between 1 and 64 in decimal. The left switch determines the tenth place digit, while the right switch does the ones place digit of the address. (Factory setting: 00)



■ BAUD RATE

Baud Rate is selected with the rotary switch. (Factory setting: 0: 156 kbps)



■ OPERATING MODE SETTING

(*) Factory setting

• System Configuration (SW1-1, 1-2)

SW1-1	SW1-2	SYSTEM CONFIGURATION
OFF	OFF	Three-phase / 3-wire (*)
ON	OFF	Single-phase / 2-wire
OFF	ON	Single-phase / 3-wire
ON	ON	Three-phase / 4-wire

• Balanced or Unbalanced Load (SW1-3)

SW1-3	BALANCED / UNBALANCED
OFF	Unbalanced (*)
ON	Balanced

• Clamp Sensor Type (SW1-4, 1-5, 1-6)

Clamp sensor type setting is common to all circuits. The sensor type and other settings for individual circuit is available with the PC Configurator.

SW1-4	SW1-5	SW1-6	CLAMP SENSOR TYPE
OFF	OFF	OFF	CLSE-R5 (5A) (*)
ON	OFF	OFF	CLSE-05 (50A)
OFF	ON	OFF	CLSE-10 (100A)
OFF	OFF	ON	CLSE-20 (200A)
ON	ON	OFF	CLSE-40 (400A)
OFF	ON	ON	CLSE-60 (600A)

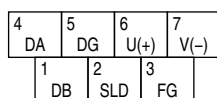
• Configuration Mode (SW1-8)

SW1-8	CONFIGURATION MODE
OFF	DIP switch setting (*) (PC Configurator setting is invalid.)
ON	PC Configurator and communication (DIP switch setting is invalid.)

Note 1: Turn on the power supply to the unit after setting station address, baud rate and operating mode.

Note 2: Be sure to set unused SW1-7 to OFF.

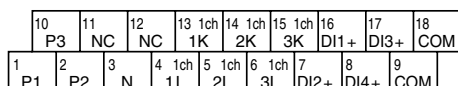
POWER SUPPLY, CC-Link TERMINAL ASSIGNMENT



1. DB White
2. SLD Shield
3. FG FG
4. DA Blue
5. DG Yellow
6. U(+) Power input (+)
7. V(-) Power input (-)

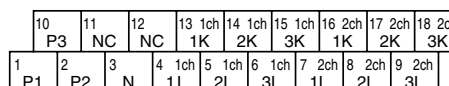
INPUT TERMINAL ASSIGNMENT

• 1 Circuit, 4 point discrete



PIN No.	ID	FUNCTION	PIN No.	ID	FUNCTION
1	P1	Voltage Input P1	10	P3	Voltage Input P3
2	P2	Voltage Input P2	11	NC	Unused
3	N	Voltage Input N	12	NC	Unused
4	1ch 1L	1ch current input 1L	13	1ch 1K	1ch current input 1K
5	1ch 2L	1ch current input 2L	14	1ch 2K	1ch current input 2K
6	1ch 3L	1ch current input 3L	15	1ch 3K	1ch current input 3K
7	DI2 +	Discrete input 2	16	DI1 +	Discrete input 1
8	DI4 +	Discrete input 4	17	DI3 +	Discrete input 3
9	COM	Discrete input common	18	COM	Discrete input common

• 2 Circuits



PIN No.	ID	FUNCTION	PIN No.	ID	FUNCTION
1	P1	Voltage Input P1	10	P3	Voltage Input P3
2	P2	Voltage Input P2	11	NC	Unused
3	N	Voltage Input N	12	NC	Unused
4	1ch 1L	1ch current input 1L	13	1ch 1K	1ch current input 1K
5	1ch 2L	1ch current input 2L	14	1ch 2K	1ch current input 2K
6	1ch 3L	1ch current input 3L	15	1ch 3K	1ch current input 3K
7	2ch 1L	2ch current input 1L	16	2ch 1K	2ch current input 1K
8	2ch 2L	2ch current input 2L	17	2ch 2K	2ch current input 2K
9	2ch 3L	2ch current input 3L	18	2ch 3K	2ch current input 3K

STATUS INDICATOR LED

PWR	RUN	ERR	SD *1	RD	STATUS *2
ON	ON	BL	BL	ON	Communicates normally with occasional CRC errors due to noise interference.
ON	ON	BL	BL	ON	Communicates normally but the Baud Rate and/or Station Address switches failed. ERR LED blinks approximately in 0.5 seconds intervals.
ON	ON	BL	BL	OFF	----
ON	ON	BL	OFF	ON	CRC error found in the received data. Unable to respond.
ON	ON	BL	OFF	OFF	----
ON	ON	OFF	BL	ON	Normal communication
ON	ON	OFF	BL	OFF	----
ON	ON	OFF	OFF	ON	Unable to receive data addressed to the station.
ON	ON	OFF	OFF	OFF	----
ON	OFF	BL	BL	ON	Performs the interval-timed responses but CRC error found in receiving the refresh data.
ON	OFF	BL	BL	OFF	----
ON	OFF	BL	OFF	ON	CRC error found in the data addressed to the station.
ON	OFF	BL	OFF	OFF	----
ON	OFF	OFF	BL	ON	Link is not started.
ON	OFF	OFF	BL	OFF	----
ON	OFF	OFF	OFF	ON	No data addressed to the station. Or unable to receive data addressed to the station due to noise interference. (Missing parts of the data sent from the master)
ON	OFF	OFF	OFF	OFF	Unable to receive data due to wire breakdown
ON	OFF	ON	OFF	ON/OFF	Faulty Baud Rate and/or Station Address setting
BL	OFF	OFF	OFF	OFF	Blinking in approx. 0.5 Hz intervals: Input overload or no input Blinking in approx. 2 Hz intervals: Setting error or device error
OFF	OFF	OFF	OFF	OFF	Power input removed. Or power supply failure.

OFF = OFF, ON = ON, BL = Blinking

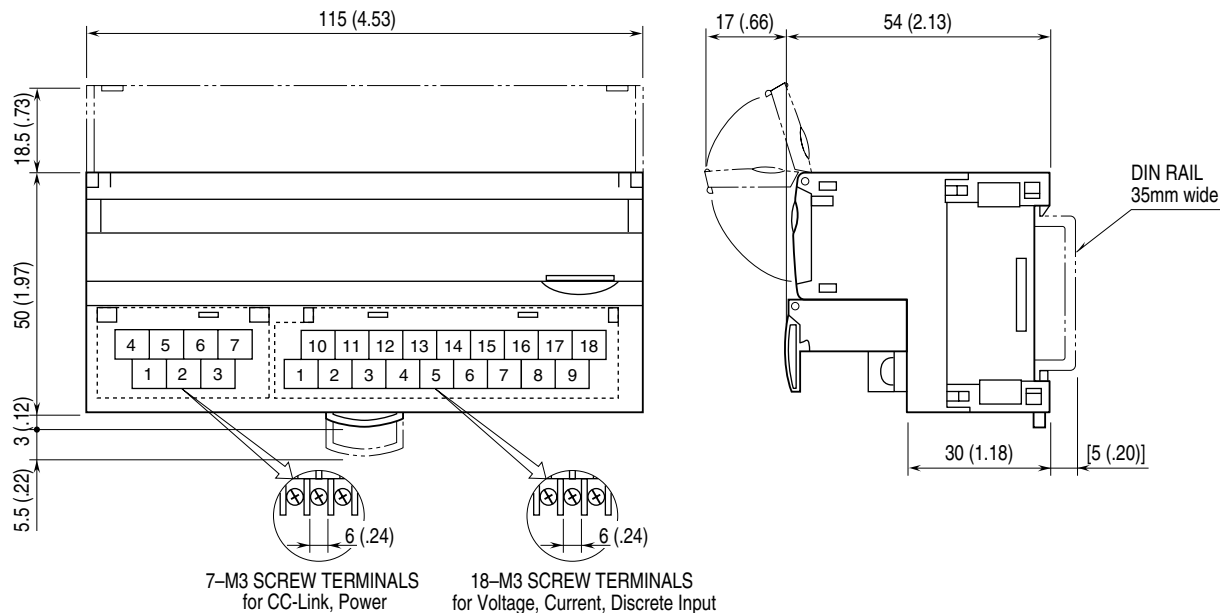
*1. SD LED may look not blinking but ON with high baud rate and fewer connected modules.

*2. LEDs indicated with "----" in STATUS rarely occurs in normal operation (LED failure or the like as possible cause).

TERMINAL CONNECTIONS

Connect the unit as in the diagram below.

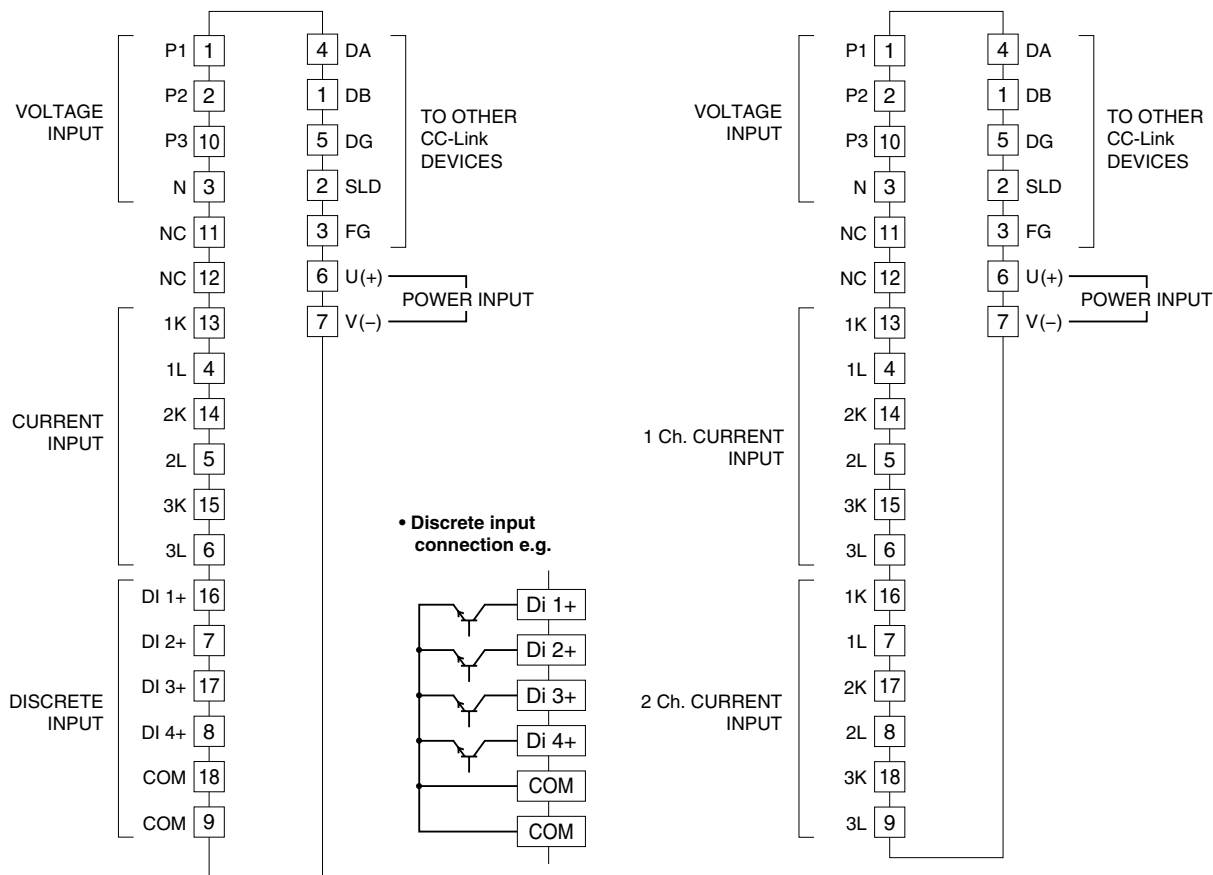
EXTERNAL DIMENSIONS unit: mm (inch)



CONNECTION DIAGRAM

• 1 Circuit, 4-point Discrete Inputs

• 2 Circuits



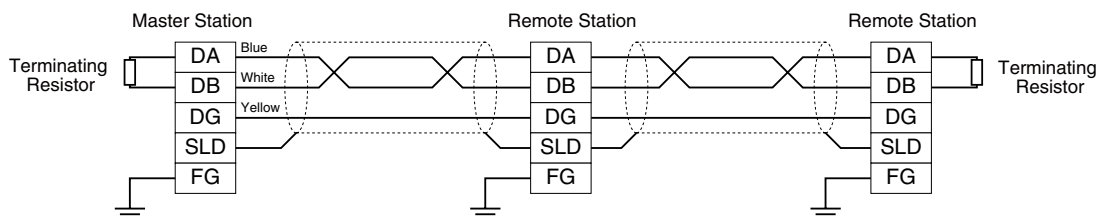
INPUT WIRING

System / Application	Terminal	System / Application	Terminal
Single phase / 2-wire		Single phase / 3-wire Three phase / 3-wire unbalanced load (2CT)	
Three phase / 3-wire, balanced load		Three phase / 4-wire, balanced load	
Three phase / 4-wire, unbalanced load			

Note: Use CLSE for CT.
Grounding is unnecessary for low-voltage circuit.

COMMUNICATION CABLE CONNECTIONS

MASTER CONNECTION



Note: Be sure to turn ON the terminating resistor located at both ends of the modules.
Crosswire between terminals DA – DB.
Master unit is connectable at both ends and at other points.

WIRING INSTRUCTIONS

■ SCREW TERMINAL

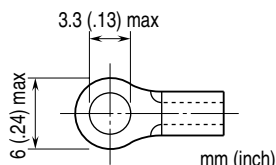
Torque: 0.5 N·m

■ SOLDERLESS TERMINAL

Refer to the drawing below for recommended ring tongue terminal size. Spade tongue type is also applicable.

Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)

Recommended manufacturer: Japan Solderless Terminal MFG. Co., Ltd, Nichifu Co., Ltd



CC-Link - COMMUNICATION

■ CC-Link COMMUNICATION

Version	Version 1.10
Station address	1 through 64
Baud rate	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
Station type	Remote Device
Data allocation	One (1)

■ READING/WRITING VIA CC-Link

In order to read measured data from or write new settings to the R7CWTU, access registers in the unit via CC-Link according to the tables below. All registers are composed of two words in signed integer. Negative values are in two's complements. Refer to "CC-Link - OPERATIONS" in this manual for register numbers and their contents.

• Master to Slave (R7CWTU)

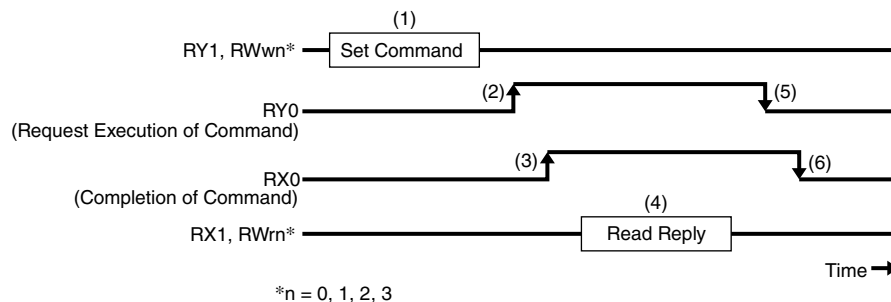
Bit data	RY0	Set ON in order to execute the command. (Set OFF after RX0 turns ON.)
	RY1	Command 0: Reading 1: Writing
Word data	RWw0	Register number
	RWw1	-
	RWw2	Data to write (LSW)
	RWw3	Data to write (MSW)

• Slave (R7CWTU) to Master

Bit data	RX0	Turns ON when the command executed (Turns OFF after RY0 set OFF)
	RX1	Same as RY1
	RX1A	R7CWTU system error
	RX1B	Ready
Word data	RWr0	Same as RWw0
	RWr1	Error code
	RWr2	Data to read (LSW)
	RWr3	Data to read (MSW)

■ READING/WRITING PROCEDURE

The sequence (1) through (6) shown in below is the procedure to read/write a set of data. When you need to read/write continuously, repeat the sequence.



■ DETAIL OF READING/WRITING SEQUENCE

Sequence (1)

• Reading command

Set register number in RWw0.

Set RY1 OFF.

• Writing command

Set register number in RWw0.

Set the data to write in RWw2 and RWw3.

Set RY1 ON.

• Master to Slave (R7CWTU)

COMMAND	READING	WRITING
RY1	OFF	ON
RWw0	Register number	Register number
RWw2	----	Data to write (LSW)
RWw3	----	Data to write (MSW)

Sequence (2)

Set RY0 ON.

Receiving a command, the unit copies RY1, RWw0, RWw2, RWw3 to RX1, RWr0, RWr2, RWr3.

• Master to Slave (R7CWTU)

REQUIRE	READING	WRITING
RY0	ON	ON

• Slave (R7CWTU) to Master

ACKNOWLEDGE	READING	WRITING
RX1	OFF	ON
RWr0	Register number	Register number
RWr2	----	Data to write (LSW)
RWr3	----	Data to write (MSW)

Sequence (3)

Following the completion of a command, the unit sets reply data in RWr2 and RWr3, and sets RX0 ON.

• Slave (R7CWTU) to Master

REPLY	READING	WRITING
RX0	ON	ON
RWr1	Error code	Error code
RWr2	Data to read (LSW)	----
RWr3	Data to read (MSW)	----

• Error Codes

ERROR CODE	COMMAND	CONTENTS
100H	Reading	No error
111H		Command error
112H		Device error (Time out)
113H		Device error (Communication)
200H	Writing	No error
211H		Command error
212H		Device error (Time out)
213H		Device error (Communication)

Note: Check the R7CWTU's fault, if device error repeats.

Sequence (4)

Confirm RX0 is ON, and then read in reply data.

Sequence (5)

Set RY0 OFF.

• Master to Slave (R7CWTU)

COMPLETION	READING	WRITING
RY0	OFF	OFF

Sequence (6)

Confirming RY0 set OFF, the unit sets RX0 and RX1 OFF and clears RWr0 through RWr3 (sets OFF).

ACKNOWLEDGING COMPLETION	READING	WRITING
RX1	OFF	OFF
RWr0	0	0
RWr1	0	0
RWr2	0	0
RWr3	0	0

CC-Link - OPERATIONS

■ CC-Link REGISTER ACCESS SETTING

RGTR.	PARAMETER
4943	<p>Deactivate CC-Link register writing protection</p> <p>Writing a preset passcode in this register deactivates the writing protection via CC-Link.</p> <p>When the CC-Link passcode set in this register matches the preset one, setting '1' or '2' in the register address 4945 becomes available to enable writing in CC-Link registers.</p> <p>Reading out the register value is not possible. It reads always '-1' regardless of the code setting.</p> <p>After writing is complete, be sure to set a value other than the passcode ('0' is recommended) to activate the writing protection again.</p>
4945	<p>CC-Link register access setting</p> <p>0 : Write disable (*)</p> <p>1 : Write enable</p> <p>2 : Write enable count values</p> <p>Other : Write disable</p> <p>This setting is erased when the power supply to the unit is removed. It always starts with '0' (Write disable) when the power supply is turned on. Set '1' or '2' before starting writing at other registers.</p> <p>When the CC-Link register writing protection is enabled, this register setting cannot be changed from '0' to '1' or '2' unless a correct security code is set in the register address 4943.</p>

(*) Factory setting

■ SYSTEM OPERATIONS

System operations include switching high tariff/low tariff, resetting accumulated values and rebooting.

RGTR.	PARAMETER
5329	<p>Switch tariff (Circuit 1)</p> <p>0 : High tariff (peak time) (*)</p> <p>1 : Low tariff (off-peak time)</p>
5330	<p>Reset energy count (Circuit 1)</p> <p>1 : Reset all values</p> <p>2 : Reset all MAX / MIN values and set the present values.</p> <p>3 : Reset all average (demand) values</p> <p>Specify the extent of count resetting. The register is automatically set to '0' when the resetting procedure is complete after one of these values is written at this address. If another value is written before '0' has been set, the former resetting procedure ends indefinitely.</p> <p>Specific values can be preset to each register by writing at this address from the host.</p>
5331	<p>Reboot system</p> <p>Write '10001' to reboot the system. (Any other values can be written but invalid.)</p>
5332	<p>Backup / restore setting</p> <p>20002 : Backup the present setting</p> <p>30003 : Restore the device with the backup setting data</p> <p>The register is automatically set to '0' when the procedure is complete after one of these values is written at this register. If another value is written before '0' has been set, the former procedure ends indefinitely.</p>
5334	<p>CC-Link register writing protection passcode</p> <p>Setting a passcode to control writing registers via CC-Link.</p> <p>0 : Cancel writing protection (*)</p> <p>1 to 999 999 999: The set value is used for the passcode</p> <p>The passcode must be set to the register address 4943 before setting '1' or '2' in the address 4945 to deactivate the writing protection.</p> <p>The value in this register is encrypted when it is read out. Only '0' (Cancel protection) is read out as it is.</p> <p>When a new code is set in this register, the register address 4945 is immediately reset to '0' so that a next command will be already limited in access.</p>
5336	<p>Loop test (Circuit 1)</p> <p>Measuring is stopped when '1' is set in this address. Then any value can be written in measurement value registers (1 through 87) for loop test purposes.</p> <p>CC-Link register access setting (4945) must be separately set to Write Enable mode.</p> <p>Measuring is restarted when '0' is set in this address.</p>
5337	<p>Switch tariff (Circuit 2)</p> <p>Switching tariff for Circuit 2. Same as with the register 5329.</p>
5338	<p>Reset energy count (Circuit 2)</p> <p>Resetting energy count for Circuit 2. Same as with the register 5330.</p>
5339	<p>Loop test (Circuit 2)</p> <p>Turning Circuit 2 to the loop test mode. Same as the register 5336.</p>

(*) Factory setting

CC-Link - SETTING

■ SYSTEM SETTING

RGTR.	PARAMETER	UNIT
5601	System configuration 0 : Single-phase / 2-wire (1CT) 1 : Single-phase / 3-wire (2CT) 2 : Three-phase / 3-wire, balanced load (1CT) 3 : Three-phase / 3-wire, unbalanced load (2CT) (*) 4 : Three-phase / 4-wire, balanced load (1CT) 5 : Three-phase / 4-wire, unbalanced load (3CT)	---
5602	CT rating, Primary (Circuit 1) 1 to 20 000 : Current (A) Factory setting : 5 Valid only for the sensor type CLSE-R5. Selected sensor's rating is automatically set for other types of sensors.	A
5603	CT sensor type (Circuit 1) 0 : CLSE-R5 (*) 1 : CLSE-05 2 : CLSE-10 3 : CLSE-20 4 : CLSE-40 5 : CLSE-60 6 : Reserved 7 : Reserved	---
5604	VT rating, Primary 0 to 400 000 : Voltage (V) Factory setting : 110	V
5606	VT rating, Secondary 50 to 500 : Voltage (V) Factory setting : 110 The secondary can be set up to 500V. However, this does not mean the unit accepts 500V for input. Do not use with the condition exceeding input rating written in the specification sheet of the unit.	V
5607	Frequency input 0 : Voltage (*) 1 : Current	---
5608	Low-end cutout, Current (Circuit 1) 0 to 999 : Rated current \times 0.001 \times Specified value Factory setting : 10	%/10
5609	Low-end cutout, Voltage 0 to 999 : Rated voltage \times 0.001 \times Specified value Factory setting : 10	%/10
5610	CT rating, Primary (Circuit 2) Same as with the register 5602.	A
5611	CT sensor type (Circuit 2) Same as with the register 5603.	---
5612	Low-end cutout, Current (Circuit 2) Same as with the register 5608.	%/10

(*) Factory setting

■ DEMAND SETTING

RGTR.	PARAMETER	UNIT
5857	Average (demand) current update interval 0 : External trigger signal 1 to 60 : Minutes Factory setting : 30	Minutes
5858	Average (demand) power update interval 0 : External trigger signal 1 to 60 : Minutes Factory setting : 30	Minutes

■ STYLE SETTING

RGTR.	PARAMETER
5987	Power factor (PF1 through PF3, PF) sign 0 : Standard (IEC), Identical to the active energy (*) 1 : Special type 1 (IEEE), Positive in LAG, Negative in LEAD
5988	Reactive power (Q1 through Q3, Q) sign 0 : Standard (IEC), Positive from PF = 1.0 to 180° in LAG direction; Negative for the other direction (*) 1 : Special type 1, Positive in LAG, Negative in LEAD
5989	Reactive power (Q1 through Q3) calculation (Q = Q1 + Q2 + Q3) 0 : Standard (*) $Q_n = \sqrt{S_n^2 - P_n^2}$ 1 : Reactive power meter method $Q_n = \frac{1}{N_{smp}} \sum_{i=1}^{N_{smp}} (U_{ni} - N_{ui}) I_{i + (N_{smp} / 4)}$
5990	Apparent power (S) calculation 0 : Standard (*) $S = \sqrt{P^2 + Q^2}$ 1 : Sum $S = S1 + S2 + S3$

(*) Factory setting

Note: '1,' '2,' '3' in expressions like Q1, Q2, Q3 indicate 'R,' 'S,' 'T' respectively.

CC-Link - MEASURED VARIABLES

Each measured variable has different engineering unit (Refer to the table below). For example, when 40000 is read at the register 41 for the 1 – 2 delta voltage, the actual voltage value equals to $400.0V = 40000 \times 0.01$, as the engineering unit for this item is V/100 (0.01V).

Readable range for each parameter depends upon the parameter type, as shown in the table below. For example, Current unit is applied to Line current or Neutral current, and Voltage unit is applied to the 1 – 2 delta voltage or the minimum value voltage.

TYPE	UNIT	RANGE
Current	mA	0 to 2 000 000 000 mA
Voltage	V/100	0 to 20 000 000.00 V
Active power	W	-2 000 000 000 to 2 000 000 000 W
Reactive power	var	-2 000 000 000 to 2 000 000 000 var
Apparent power	VA	0 to 2 000 000 000 VA
Power factor	1/10 000	-1.0000 to 1.0000
Frequency	Hz/100	0 or 40.00 Hz to 70.00 Hz
Active energy	kWh/10	0 to 99 999 999.9 kWh *1
Reactive energy	kvarh/10	0 to 99 999 999.9 kvarh *1
Apparent energy	kVAh/10	0 to 99 999 999.9 kVAh *1
Energy count time	h/10	0 to 99 999 999.9 hours *1
Harmonic distortion	%/10	0 to 999.9 %
Phase angle between phase voltages	°	-180 to +180°

*1. Reset to 0 at overflow

■ MOMENTARY VALUE

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
1	4001	I	Current	mA
3	4003	U	Voltage	V/100
5	4005	P	Active power	W
7	4007	Q	Reactive power	var
9	4009	S	Apparent power	VA
11	4011	PF	Power factor	1/10 000
13	4013	F	Frequency	Hz/100
15	4015	DIR	Phase difference direction (0 = inductive or lag, 1 = capacitive or lead)	---
33	4033	I1	Current, Line 1	mA
35	4035	I2	Current, Line 2	mA
37	4037	I3	Current, Line 3	mA
39	4039	IN	Neutral current	mA
41	4041	U12	Delta voltage, 1 – 2	V/100
43	4043	U23	Delta voltage, 2 – 3	V/100
45	4045	U31	Delta voltage, 3 – 1	V/100
47	4047	U1N	Phase voltage, Phase 1	V/100
49	4049	U2N	Phase voltage, Phase 2	V/100
51	4051	U3N	Phase voltage, Phase 3	V/100
53	4053	P1	Active power, Phase 1	W
55	4055	P2	Active power, Phase 2	W
57	4057	P3	Active power, Phase 3	W
59	4059	Q1	Reactive power, Phase 1	var
61	4061	Q2	Reactive power, Phase 2	var
63	4063	Q3	Reactive power, Phase 3	var
65	4065	S1	Apparent power, Phase 1	VA
67	4067	S2	Apparent power, Phase 2	VA
69	4069	S3	Apparent power, Phase 3	VA
71	4071	PF1	Power factor, Phase 1	1/10 000
73	4073	PF2	Power factor, Phase 2	1/10 000
75	4075	PF3	Power factor, Phase 3	1/10 000
77	4077	DIR1	Phase difference direction, Phase 1 (0 = inductive or lag, 1 = capacitive or lead)	---
79	4079	DIR2	Phase difference direction, Phase 2 (0 = inductive or lag, 1 = capacitive or lead)	---
81	4081	DIR3	Phase difference direction, Phase 3 (0 = inductive or lag, 1 = capacitive or lead)	---
83	4083	UT12	Phase angle between Phase 1 – 2 voltages	°
85	4085	UT23	Phase angle between Phase 2 – 3 voltages	°
87	4087	UT31	Phase angle between Phase 3 – 1 voltages	°

ENERGY

Writing the following registers enables energy presetting. Set CC-Link Register Access in order to write in the energy and fractions.

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
129	4129	EP	Active energy, high tariff, incoming	kWh/10
131	4131	EQ	Reactive energy, high tariff, LAG	kvarh/10
133	4133	ES	Apparent energy, high tariff	kVAh/10
135	4135	EP-	Active energy, high tariff, outgoing	kWh/10
137	4137	EQ-	Reactive energy, high tariff, LEAD	kvarh/10
139	4139	EQ+LAG	Reactive energy, high tariff, incoming, LAG	kvarh/10
141	4141	EQ+LEAD	Reactive energy, high tariff, incoming, LEAD	kvarh/10
143	4143	EQ-LAG	Reactive energy, high tariff, outgoing, LAG	kvarh/10
145	4145	EQ-LEAD	Reactive energy, high tariff, outgoing, LEAD	kvarh/10
147	4147	TIMER	Energy count time, high tariff	h/10
149	4149	EQ+P	Reactive energy, high tariff, incoming	kvarh/10
151	4151	EQ-P	Reactive energy, high tariff, outgoing	kvarh/10
153	4153	EPA	Active energy, high tariff, (incoming – outgoing)	kWh/10
155	4155	EQA	Reactive energy, high tariff, (incoming + outgoing)	kvarh/10
161	4161	L-EP	Active energy, low tariff, incoming	kWh/10
163	4163	L-EQ	Reactive energy, low tariff, LAG	kvarh/10
165	4165	L-ES	Apparent energy, low tariff	kVAh/10
167	4167	L-EP-	Active energy, low tariff, outgoing	kWh/10
169	4169	L-EQ-	Reactive energy, low tariff, LEAD	kvarh/10
171	4171	L-EQ+LAG	Reactive energy, low tariff, incoming, LAG	kvarh/10
173	4173	L-EQ+LEAD	Reactive energy, low tariff, incoming, LEAD	kvarh/10
175	4175	L-EQ-LAG	Reactive energy, low tariff, outgoing, LAG	kvarh/10
177	4177	L-EQ-LEAD	Reactive energy, low tariff, outgoing, LEAD	kvarh/10
179	4179	L-TIMER	Energy count time, low tariff	h/10
181	4181	L-EQ+P	Reactive energy, low tariff, incoming	kvarh/10
183	4183	L-EQ-P	Reactive energy, low tariff, outgoing	kvarh/10
185	4185	L-EPA	Active energy, low tariff, (incoming – outgoing)	kWh/10
187	4187	L-EQA	Reactive energy, low tariff, (incoming + outgoing)	kvarh/10
193	4193	EP_L	Active energy fraction, high tariff, incoming	kWh/(10×2 ³²)
195	4195	EQ_L	Reactive energy fraction, high tariff, LAG	kvarh/(10×2 ³²)
197	4197	ES_L	Apparent energy fraction, high tariff	kVAh/(10×2 ³²)
199	4199	EP-_L	Active energy fraction, high tariff, outgoing	kWh/(10×2 ³²)
201	4201	EQ-_L	Reactive energy fraction, high tariff, LEAD	kvarh/(10×2 ³²)
203	4203	EQ+LAG_L	Reactive energy fraction, high tariff, incoming, LAG	kvarh/(10×2 ³²)
205	4205	EQ+LEAD_L	Reactive energy fraction, high tariff, incoming, LEAD	kvarh/(10×2 ³²)
207	4207	EQ-LAG_L	Reactive energy fraction, high tariff, outgoing, LAG	kvarh/(10×2 ³²)
209	4209	EQ-LEAD_L	Reactive energy fraction, high tariff, outgoing, LEAD	kvarh/(10×2 ³²)
211	4211	TIMER_L	Energy fraction count time, high tariff	seconds/1 000
213	4213	EQ+P_L	Reactive energy fraction, high tariff, incoming	kvarh/(10×2 ³²)
215	4215	EQ-P_L	Reactive energy fraction, high tariff, outgoing	kvarh/(10×2 ³²)
217	4217	EPA_L	Active energy fraction, high tariff, (incoming – outgoing)	kWh/(10×2 ³²)
219	4219	EQA_L	Reactive energy fraction, high tariff, (incoming + outgoing)	kvarh/(10×2 ³²)
225	4225	L-EP_L	Active energy fraction, low tariff, incoming	kWh/(10×2 ³²)
227	4227	L-EQ_L	Reactive energy fraction, low tariff, LAG	kvarh/(10×2 ³²)
229	4229	L-ES_L	Apparent energy fraction, low tariff	kVAh/(10×2 ³²)
231	4231	L-EP-_L	Active energy fraction, low tariff, outgoing	kWh/(10×2 ³²)
233	4233	L-EQ-_L	Reactive energy fraction, low tariff, LEAD	kvarh/(10×2 ³²)
235	4235	L-EQ+LAG_L	Reactive energy fraction, low tariff, incoming, LAG	kvarh/(10×2 ³²)
237	4237	L-EQ+LEAD_L	Reactive energy fraction, low tariff, incoming, LEAD	kvarh/(10×2 ³²)
239	4239	L-EQ-LAG_L	Reactive energy fraction, low tariff, outgoing, LAG	kvarh/(10×2 ³²)
241	4241	L-EQ-LEAD_L	Reactive energy fraction, low tariff, outgoing, LEAD	kvarh/(10×2 ³²)
243	4243	L-TIMER_L	Energy fraction count time, low tariff	seconds/1 000
245	4245	L-EQ+P_L	Reactive energy fraction, low tariff, incoming	kvarh/(10×2 ³²)
247	4247	L-EQ-P_L	Reactive energy fraction, low tariff, outgoing	kvarh/(10×2 ³²)
249	4249	L-EPA_L	Active energy fraction, low tariff, (incoming – outgoing)	kWh/(10×2 ³²)
251	4251	L-EQA_L	Reactive energy fraction, low tariff, (incoming + outgoing)	kvarh/(10×2 ³²)

■ AVERAGE VALUE

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
257	4257	I AVG	Current AVG	mA
259	4259	I1 AVG	Current AVG, Line 1	mA
261	4261	I2 AVG	Current AVG, Line 2	mA
263	4263	I3 AVG	Current AVG, Line 3	mA
265	4265	IN AVG	Neutral current AVG	mA
273	4273	I AVG 1	Current AVG, History 1	mA
275	4275	I1 AVG 1	Current AVG, Line 1, History 1	mA
277	4277	I2 AVG 1	Current AVG, Line 2, History 1	mA
279	4279	I3 AVG 1	Current AVG, Line 3, History 1	mA
281	4281	IN AVG 1	Neutral current AVG, History 1	mA
289	4289	I AVG 2	Current AVG, History 2	mA
291	4291	I1 AVG 2	Current AVG, Line 1, History 2	mA
293	4293	I2 AVG 2	Current AVG, Line 2, History 2	mA
295	4295	I3 AVG 2	Current AVG, Line 3, History 2	mA
297	4297	IN AVG 2	Neutral current AVG, History 2	mA
305	4305	I AVG 3	Current AVG, History 3	mA
307	4307	I1 AVG 3	Current AVG, Line 1, History 3	mA
309	4309	I2 AVG 3	Current AVG, Line 2, History 3	mA
311	4311	I3 AVG 3	Current AVG, Line 3, History 3	mA
313	4313	IN AVG 3	Neutral current AVG, History 3	mA
321	4321	I AVG 4	Current AVG, History 4	mA
323	4323	I1 AVG 4	Current AVG, Line 1, History 4	mA
325	4325	I2 AVG 4	Current AVG, Line 2, History 4	mA
327	4327	I3 AVG 4	Current AVG, Line 3, History 4	mA
329	4329	IN AVG 4	Neutral current AVG, History	mA
513	4513	P AVG	Active power AVG	W
515	4515	Q AVG	Reactive power AVG	var
517	4517	S AVG	Apparent power AVG	VA
529	4529	P AVG 1	Active power AVG, History 1	W
531	4531	Q AVG 1	Reactive power AVG, History 1	var
533	4533	S AVG 1	Apparent power AVG, History 1	VA
545	4545	P AVG 2	Active power AVG, History 2	W
547	4547	Q AVG 2	Reactive power AVG, History 2	var
549	4549	S AVG 2	Apparent power AVG, History 2	VA
561	4561	P AVG 3	Active power AVG, History 3	W
563	4563	Q AVG 3	Reactive power AVG, History 3	var
565	4565	S AVG 3	Apparent power AVG, History 3	VA
577	4577	P AVG 4	Active power AVG, History 4	W
579	4579	Q AVG 4	Reactive power AVG, History 4	var
581	4581	S AVG 4	Apparent power AVG, History 4	VA

■ MAXIMUM / MINIMUM VALUE

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
769	2769	I MAX	Current MAX	mA
771	2771	U MAX	Voltage MAX	V/100
773	2773	P MAX	Active power MAX	W
775	2775	Q MAX	Reactive power MAX	var
777	2777	S MAX	Apparent power MAX	VA
779	2779	PF MAX	Power factor MAX	1/10 000
781	2781	F MAX	Frequency MAX	Hz/100
801	2801	I1 MAX	Current MAX, Line 1	mA
803	2803	I2 MAX	Current MAX, Line 2	mA
805	2805	I3 MAX	Current MAX, Line 3	mA
807	2807	IN MAX	Neutral current MAX	mA
809	2809	U12 MAX	Delta voltage MAX, 1 – 2	V/100
811	2811	U23 MAX	Delta voltage MAX, 2 – 3	V/100
813	2813	U31 MAX	Delta voltage MAX, 3 – 1	V/100
815	2815	U1N MAX	Phase voltage MAX, Phase 1	V/100
817	2817	U2N MAX	Phase voltage MAX, Phase 2	V/100
819	2819	U3N MAX	Phase voltage MAX, Phase 3	V/100
821	2821	P1 MAX	Active power MAX, Phase 1	W
823	2823	P2 MAX	Active power MAX, Phase 2	W
825	2825	P3 MAX	Active power MAX, Phase 3	W
827	2827	Q1 MAX	Reactive power MAX, Phase 1	var
829	2829	Q2 MAX	Reactive power MAX, Phase 2	var
831	2831	Q3 MAX	Reactive power MAX, Phase 3	var
833	2833	S1 MAX	Apparent power MAX, Phase 1	VA
835	2835	S2 MAX	Apparent power MAX, Phase 2	VA
837	2837	S3 MAX	Apparent power MAX, Phase 3	VA
839	2839	PF1 MAX	Power factor MAX, Phase 1	1/10 000
841	2841	PF2 MAX	Power factor MAX, Phase 2	1/10 000
843	2843	PF3 MAX	Power factor MAX, Phase 3	1/10 000
865	2865	THD I1 MAX	Current total harmonic distortion MAX, Line 1	%/10
867	2867	THD I2 MAX	Current total harmonic distortion MAX, Line 2	%/10
869	2869	THD I3 MAX	Current total harmonic distortion MAX, Line 3	%/10
871	2871	THD IN MAX	Neutral current total harmonic distortion MAX	%/10
873	2873	THD U12 MAX	Delta voltage total harmonic distortion MAX, 1 – 2	%/10
875	2875	THD U23 MAX	Delta voltage total harmonic distortion MAX, 2 – 3	%/10
877	2877	THD U31 MAX	Delta voltage total harmonic distortion MAX, 3 – 1	%/10
879	2879	THD U1N MAX	Phase voltage total harmonic distortion MAX, Phase 1	%/10
881	2881	THD U2N MAX	Phase voltage total harmonic distortion MAX, Phase 2	%/10
883	2883	THD U3N MAX	Phase voltage total harmonic distortion MAX, Phase 3	%/10
897	2897	I MAX AVG	Current MAX AVG	mA
899	2899	I1 MAX AVG	Current MAX AVG, Line 1	mA
901	2901	I2 MAX AVG	Current MAX AVG, Line 2	mA
903	2903	I3 MAX AVG	Current MAX AVG, Line 3	mA
905	2905	IN MAX AVG	Neutral current MAX AVG	mA
907	2907	P MAX AVG+	Active power MAX AVG, incoming	W
909	2909	P MAX AVG–	Active power MAX AVG, outgoing	W
911	2911	Q MAX AVG+	Reactive power MAX AVG, incoming	var
913	2913	Q MAX AVG–	Reactive power MAX AVG, outgoing	var
915	2915	S MAX AVG	Apparent power MAX AVG	VA
929	2929	I MIN	Current MIN	mA
931	2931	U MIN	Voltage MIN	V/100
933	2933	P MIN	Active power MIN	W
935	2935	Q MIN	Reactive power MIN	var
937	2937	S MIN	Apparent power MIN	VA
939	2939	PF MIN	Power factor MIN	1/10 000
941	2941	F MIN	Frequency MIN	Hz/100
961	2961	I1 MIN	Current MIN, Line 1	mA
963	2963	I2 MIN	Current MIN, Line 2	mA
965	2965	I3 MIN	Current MIN, Line 3	mA
967	2967	IN MIN	Neutral current MIN	mA

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
969	2969	U12 MIN	Delta voltage MIN, 1 – 2	V/100
971	2971	U23 MIN	Delta voltage MIN, 2 – 3	V/100
973	2973	U31 MIN	Delta voltage MIN, 3 – 1	V/100
975	2975	U1N MIN	Phase voltage MIN, Phase 1	V/100
977	2977	U2N MIN	Phase voltage MIN, Phase 2	V/100
979	2979	U3N MIN	Phase voltage MIN, Phase 3	V/100
981	2981	P1 MIN	Active power MIN, Phase 1	W
983	2983	P2 MIN	Active power MIN, Phase 2	W
985	2985	P3 MIN	Active power MIN, Phase 3	W
987	2987	Q1 MIN	Reactive power MIN, Phase 1	var
989	2989	Q2 MIN	Reactive power MIN, Phase 2	var
991	2991	Q3 MIN	Reactive power MIN, Phase 3	var
993	2993	S1 MIN	Apparent power MIN, Phase 1	VA
995	2995	S2 MIN	Apparent power MIN, Phase 2	VA
997	2997	S3 MIN	Apparent power MIN, Phase 3	VA
999	2999	PF1 MIN	Power factor MIN, Phase 1	1/10 000
1001	3001	PF2 MIN	Power factor MIN, Phase 2	1/10 000
1003	3003	PF3 MIN	Power factor MIN, Phase 3	1/10 000

■ TOTAL HARMONIC DISTORTION (THD)

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
1281	8281	THD I1	Current total harmonic distortion, Line 1	%/10
1283	8283	THD I2	Current total harmonic distortion, Line 2	%/10
1285	8285	THD I3	Current total harmonic distortion, Line 3	%/10
1287	8287	THD IN	Neutral current total harmonic distortion	%/10
1289	8289	THD U12	Delta voltage total harmonic distortion, 1 – 2	%/10
1291	8291	THD U23	Delta voltage total harmonic distortion, 2 – 3	%/10
1293	8293	THD U31	Delta voltage total harmonic distortion, 3 – 1	%/10
1295	8295	THD U1N	Phase voltage total harmonic distortion, Phase 1	%/10
1297	8297	THD U2N	Phase voltage total harmonic distortion, Phase 2	%/10
1299	8299	THD U3N	Phase voltage total harmonic distortion, Phase 3	%/10

■ HARMONIC

RGTR.		ID	PARAMETER	UNIT
Circuit 1	Circuit 2			
1537	8537	HD I1 2	Current harmonic, Line 1, 2nd	%/10
1538	8538	HD I1 3	(id.) 3rd	%/10
1539	8539	HD I1 4	(id.) 4th	%/10
1540	8540	HD I1 5	(id.) 5th	%/10
1541	8541	HD I1 6	(id.) 6th	%/10
1542	8542	HD I1 7	(id.) 7th	%/10
1543	8543	HD I1 8	(id.) 8th	%/10
1544	8544	HD I1 9	(id.) 9th	%/10
1545	8545	HD I1 10	(id.) 10th	%/10
1546	8546	HD I1 11	(id.) 11th	%/10
1547	8547	HD I1 12	(id.) 12th	%/10
1548	8548	HD I1 13	(id.) 13th	%/10
1549	8549	HD I1 14	(id.) 14th	%/10
1550	8550	HD I1 15	(id.) 15th	%/10
1551	8551	HD I1 16	(id.) 16th	%/10
1552	8552	HD I1 17	(id.) 17th	%/10
1553	8553	HD I1 18	(id.) 18th	%/10
1554	8554	HD I1 19	(id.) 19th	%/10
1555	8555	HD I1 20	(id.) 20th	%/10
1556	8556	HD I1 21	(id.) 21st	%/10
1557	8557	HD I1 22	(id.) 22nd	%/10
1558	8558	HD I1 23	(id.) 23rd	%/10
1559	8559	HD I1 24	(id.) 24th	%/10
1560	8560	HD I1 25	(id.) 25th	%/10
1561	8561	HD I1 26	(id.) 26th	%/10
1562	8562	HD I1 27	(id.) 27th	%/10
1563	8563	HD I1 28	(id.) 28th	%/10
1564	8564	HD I1 29	(id.) 29th	%/10
1565	8565	HD I1 30	(id.) 30th	%/10
1566	8566	HD I1 31	(id.) 31st	%/10
1601	8601	HD I2 2	Current harmonic, Line 2, 2nd	%/10
:	:	:	:	
1630	8630	HD I2 31	31st	
1665	8665	HD I3 2	Current harmonic, Line 3, 2nd	%/10
:	:	:	:	
1694	8694	HD I3 31	31st	
1729	8729	HD IN 2	Neutral current harmonic, 2nd	%/10
:	:	:	:	
1758	8758	HD IN 31	31st	
1793	8793	HD U12 2	Delta voltage harmonic, 1 – 2, 2nd	%/10
:	:	:	:	
1822	8822	HD U12 31	31st	
1857	8857	HD U23 2	Delta voltage harmonic, 2 – 3, 2nd	%/10
:	:	:	:	
1886	8886	HD U23 31	31st	
1921	8921	HD U31 2	Delta voltage harmonic, 3 – 1, 2nd	%/10
:	:	:	:	
1950	8950	HD U31 31	31st	
1985	8985	HD U1N 2	Phase voltage harmonic, Phase 1, 2nd	%/10
:	:	:	:	
2014	9014	HD U1N 31	31st	
2049	9049	HD U2N 2	Phase voltage harmonic, Phase 2, 2nd	%/10
:	:	:	:	
2078	9078	HD U2N 31	31st	
2113	9113	HD U3N 2	Phase voltage harmonic, Phase 3, 2nd	%/10
:	:	:	:	
2142	9142	HD U3N 31	31st	

■ DISCRETE INPUT

RGTR.	PARAMETER
3073	Discrete input 1 status 0 : OFF 1 : ON
3074	Discrete input 2 status 0 : OFF 1 : ON
3075	Discrete input 3 status 0 : OFF 1 : ON
3076	Discrete input 4 status 0 : OFF 1 : ON

■ DISCRETE INPUT COUNT

RGTR.	PARAMETER
3137	Discrete input 1 count Pulse train input at Discrete input 1 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
3138	Discrete input 2 count Pulse train input at Discrete input 2 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
3141	Discrete input 3 count Pulse train input at Discrete input 3 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.
3143	Discrete input 4 count Pulse train input at Discrete input 4 is counted. The counter resets to 0 when a pulse is added at 999 999 999 counts.

■ DEVICE STATUS

RGTR.	PARAMETER																																		
8001	<p>Input overload Bit assignment as shown below.</p> <table border="1" style="margin-left: 20px;"> <tr> <td>Bit</td> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td></td> <td>I3.2</td><td>I2.2</td><td>I1.2</td><td>F</td><td></td><td>U31</td><td>U23</td><td>U12</td><td></td><td>U3N</td><td>U2N</td><td>U1N</td><td></td><td>I3</td><td>I2</td><td>I1</td> </tr> </table> <p>'1' is placed at the bit where an overload is detected. I3.2, I2.2 and I1.2 are assigned to current values for Circuit 2.</p>	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		I3.2	I2.2	I1.2	F		U31	U23	U12		U3N	U2N	U1N		I3	I2	I1
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																			
	I3.2	I2.2	I1.2	F		U31	U23	U12		U3N	U2N	U1N		I3	I2	I1																			
8002	Reserved																																		
8003	<p>System error Bit assignment as shown below.</p> <table border="1" style="margin-left: 20px;"> <tr> <td>Bit</td> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td></td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>STAT</td><td>AVG</td><td>ENE</td><td>SET</td><td>FDT</td><td>PRG</td> </tr> </table> <p>PRG : Control software error FDT : Factory calibration data error SET : User setting data error ENE : Energy data error AVG : Average data error STAT : Maximum / minimum data error '1' is placed when the respective errors are detected. All measuring operations stop while one or more system errors are detected.</p>	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0												STAT	AVG	ENE	SET	FDT	PRG
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																			
											STAT	AVG	ENE	SET	FDT	PRG																			

■ DIAGNOSTICS

RGTR.	PARAMETER	UNIT
9217	Processing delays	times
9219	Processing delay sequence number	No.

■ DEVICE INFORMATION

RGTR.	PARAMETER																											
9601	Device ID 7701 : R7xWTU																											
9602	Device version Version number × 100 (e.g. Version 1.00 = 100)																											
9603	Serial No. Each character is stored in the following address: <table border="1"> <thead> <tr> <th>Register</th> <th>Upper Byte</th> <th>Lower Byte</th> </tr> </thead> <tbody> <tr> <td>9603</td> <td>2nd</td> <td>1st</td> </tr> <tr> <td>9604</td> <td>4th</td> <td>3rd</td> </tr> <tr> <td>9605</td> <td>6th</td> <td>5th</td> </tr> <tr> <td>9606</td> <td>8th</td> <td>7th</td> </tr> </tbody> </table>	Register	Upper Byte	Lower Byte	9603	2nd	1st	9604	4th	3rd	9605	6th	5th	9606	8th	7th												
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9605	6th	5th																										
9606	8th	7th																										
9607	Tag name This register is writable. Each character is stored in the following address: <table border="1"> <thead> <tr> <th>Register</th> <th>Upper Byte</th> <th>Lower Byte</th> </tr> </thead> <tbody> <tr> <td>9607</td> <td>2nd</td> <td>1st</td> </tr> <tr> <td>9608</td> <td>4th</td> <td>3rd</td> </tr> <tr> <td>9609</td> <td>6th</td> <td>5th</td> </tr> <tr> <td>9610</td> <td>8th</td> <td>7th</td> </tr> <tr> <td>9611</td> <td>10th</td> <td>9th</td> </tr> <tr> <td>9612</td> <td>12th</td> <td>11th</td> </tr> <tr> <td>9613</td> <td>14th</td> <td>13th</td> </tr> <tr> <td>9614</td> <td>16th</td> <td>15th</td> </tr> </tbody> </table>	Register	Upper Byte	Lower Byte	9607	2nd	1st	9608	4th	3rd	9609	6th	5th	9610	8th	7th	9611	10th	9th	9612	12th	11th	9613	14th	13th	9614	16th	15th
Register	Upper Byte	Lower Byte																										
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9611	10th	9th																										
9612	12th	11th																										
9613	14th	13th																										
9614	16th	15th																										
9623	Extension function flag Reading the following values depending upon the function: 0002H : RS-485 (Modbus RTU) 0010H : Three-phase / 4-wire system 0080H : LonWORKS 0100H : CC-Link 2000H : Modbus/TCP This register is read as follows depending upon model numbers. R7LWTU : 0090H (144) R7CWTU : 0110H (272) R7MWTU : 0012H (18) R7EWTU : 2010H (8208)																											
9627	Number of circuits 1 : 1 circuit (R7xWTU-211-AD4) 2 : 2 circuits (R7xWTU-221-AD4)																											
9628	Number of counters 0 : None (R7xWTU-221-AD4) 4 : 4 points (R7xWTU-211-AD4)																											

LIGHTNING SURGE PROTECTION

M-System offers a series of lightning surge protector for protection against induced lightning surges. Please contact M-System to choose appropriate models.