

This manual describes the operating precautions, mounting procedures, wiring procedures and other information regarding the UPM101 Universal Power Monitor. In this manual, illustrations related to the mounting procedures show the UPM101 which has display function. In the related user's manuals, illustrations related to the descriptions of user operations show the UPM100 which has display function.

Introduction ----- P.1	3. Installation Procedures ----- P.2
1. For Safe Use ----- P.1	4. External Wiring ----- P.2-P.3
2. Product Specifications and the Package Contents ----- P.1	5. UPM101 Main Specifications ----- P.4

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You can download the latest manuals from the following website:

<http://www.yokogawa.com/ns/powercert/im/>

Introduction

Thank you for purchasing our UPM101 Universal Power Monitor. The user's manuals listed below are supplied with the UPM101. Read the manuals thoroughly before using the UPM101 to ensure correct and safe use. After reading the manuals, always keep them in an easily accessible convenient place for later reference.

Related User's Manuals and Main Information Included in Manuals

Product user's manuals can be downloaded or viewed at the following URL. To view the user's manual, you need to use Adobe Reader 7 or later by Adobe Systems.

URL: <http://www.yokogawa.com/ns/powercert/im/>

Title	Description	Document Number
Installation	This manual describes operating precautions, mounting procedures, and external wiring procedures. It also presents the main UPM101 specifications (including optional specifications).	IM 77C01J01-00EN
Initial Setup Operations	This manual describes the setting procedures and setting ranges for various parameters (VT ratio, CT ratio, etc.), which pertain primarily to UPM100 and UPM101 which have display function.	
Measured Value Display Operations	This manual describes the display procedures and measuring ranges for various measured values (active energy, etc.), which pertain primarily to UPM100 and UPM101 which have display function. It also provides information on various error messages and procedures for handling errors.	
Parameter Maps	This manual provides illustrations showing the flow of measured value display and parameter setting display. It also presents lists of the measuring ranges and parameter setting ranges.	
Model UPM100, UPM101 Universal Power Monitor Communication Functions	This manual describes the communication functions of UPM100 and necessary information for creating communication program.	IM 77C01H01-10EN

1. For Safe Use

The following symbols are indicated on the product to ensure safe use.



This symbol on the product indicates that the operator must refer to an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the instrument. The manual describes how the operator should exercise special care to avoid electric shock or other dangers that may result in injury or loss of life.



This label denotes that a protective ground terminal is necessary. Be sure to ground this terminal before operating the instrument.

The following symbols are used in the user's manuals.



IMPORTANT

Indicates that operating the hardware or software in a particular manner may damage it or result in a system failure.



NOTE

Draws attention to information that is essential for understanding the operations and/or features of the product.

2. Product Specifications and the Package Contents

2.1 Model and Specifications Check

Make sure the model and suffix codes shown on the name plate attached to the UPM101 match your order.

Model	Suffix Code	Description
UPM101	-x x x x x -2 0	Universal Power monitor (with dedicated CT)
Phase and Wire Type	-1	Single-phase 2-wire (with dedicated one CT)
	-2	Single-phase 3-wire (with dedicated two CTs)
	-3	Three-phase 3-wire (with dedicated two CTs)
	-4	Three-phase 4-wire (with dedicated three CTs)
Rated Input Voltage/Current	4	220V/5A AC (phase voltage 127V AC for three-phase 4-wire) ¹
	6	440V/5A AC (phase voltage 277V AC for three-phase 4-wire)
Output Function	0	Without display function, without pulse output
	1	With display function, without pulse output
	2	Without display function, with pulse output
	3	With display function, with pulse output
Optional Communication Function	0	None (RS-485 communication is provided as standard)
Optional Measuring Function	0	Integral resolution kWh
	1	Integral resolution kWh / power factor
	2	Integral resolution kWh ² / reactive power, integrated reactive power
	3	Integral resolution kW ² / power factor, reactive power, integrated reactive power
	4	Integral resolution Wh
	5	Integral resolution Wh / power factor
	6	Integral resolution Wh ² / reactive power, integrated reactive power
7	Integral resolution Wh ² / power factor, reactive power, integrated reactive power	
Power Supply	-2	85 to 264V AC 50/60Hz
Fixed Code	0	Always "0"

1: 200V (100V + 100V) for single-phase 3-wire.

2: The unit is "kvarh" or "varh" when reactive power is selected.

2.2 UPM101 Rated Power (Secondary-side Rated Power)

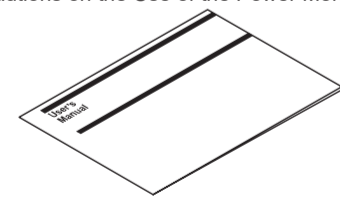
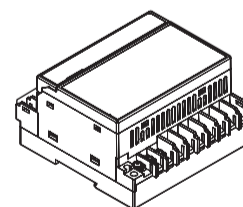
Rated Power	Rated Input Voltage/Current		
	Suffix Code	4	6
Phase and Wiring	1	1000W	2000W
	2	1000W	4000W
	3	2000W	4000W
	4	2000W	4000W

2.3 Checking the Package Contents

The UPM101 is carefully inspected before shipping. When you receive your UPM101, check its exterior to see if there is any damage. Also make sure a complete set of the following items is included in the package.

(1) UPM101

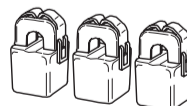
(3) User's Manual
(Precautions on the Use of the Power Monitor Series)



(2) Dedicated CT

(4) Terminal Covers

They are attached to the UPM101 when shipped.



1 CT for single-phase 2-wire
2 CTs for single-phase 3-wire or three-phase 3-wire
3 CTs for three-phase 4-wire

(1) UPM101 (main unit): 1

(2) Dedicated CT : 1 CT for single-phase 2-wire
2 CTs for single-phase 3-wire / three-phase 3-wire
3 CTs for three-phase 4-wire

(3) User's Manuals: 1 set

Name	Document Number
Precautions on the Use of the Power Monitor Series	IM 77C01H01-91Z1

(4) Terminal covers: 2 (with M3 screws) (The covers are attached to the UPM101 when shipped.)

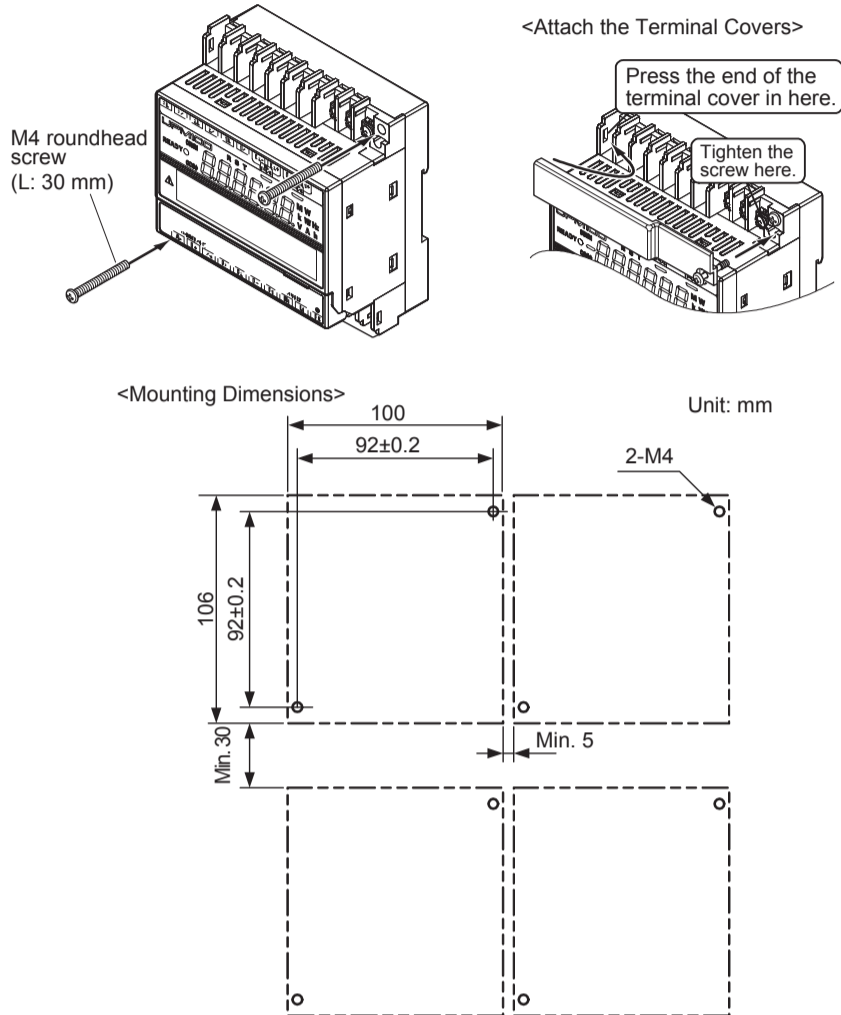
3. Installation Procedures

IMPORTANT

- The UPM101 is designed to be used indoors. It should not be installed outside under any circumstances. Doing so would allow rainwater and dust to penetrate the housing, resulting in an equipment failure.
- Avoid installing the UPM101 in locations subject to the following: sudden jarring, vibrations, corrosive gas, dust, water, oil, solvents, direct sunlight, radiation, strong electric fields, strong magnetic fields.

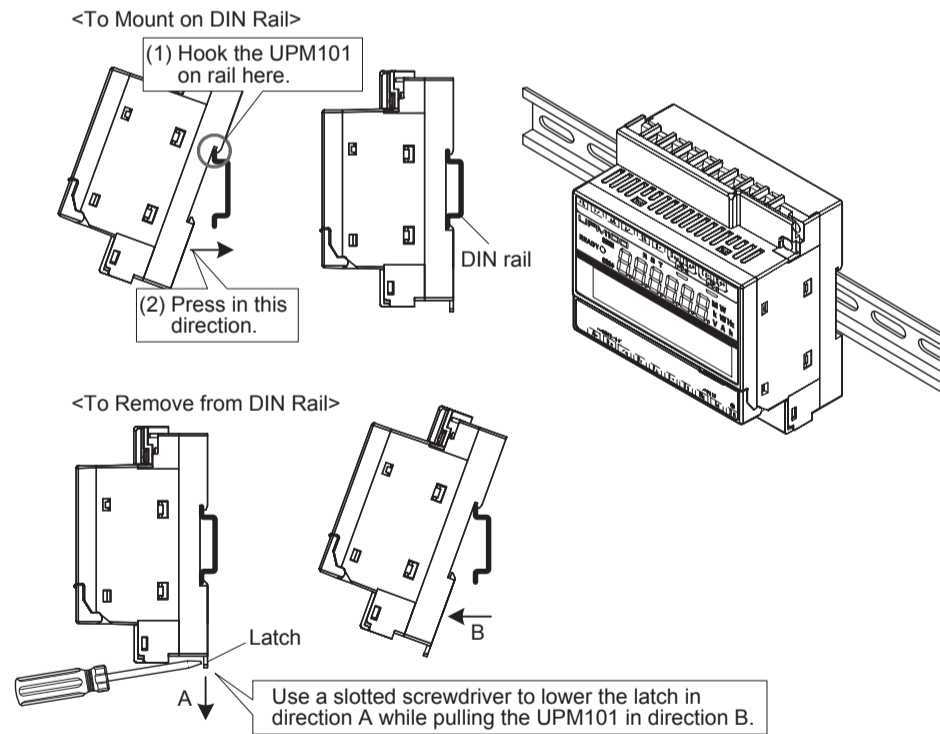
3.1 Wall Mounting

Follow the procedure illustrated below to mount the UPM101 on a wall using two M4 roundhead screws (length: 30 mm). The recommended tightening torque for the mounting screws is 1.2 N·m.



3.2 DIN Rail Mounting

The UPM101 can be mounted on and removed from a DIN rail as shown below.



4. External Wiring

WARNING

- Turn off the power supply and use a tester or similar device to make sure that the connecting cable is not live before connecting any wires in order to avoid electric shock.
- Do not use CTs other than the supplied dedicated CT. Doing so may damage the UPM101.
- If the UPM101 and its connected equipment are operated outside its specified conditions, excessive heat and/or equipment damage may result. Check the following before turning on the power:
 - Whether or not the power supply and the input signal values satisfy the UPM101 specifications.
 - Whether or not the external wiring is connected to the terminal locations as per the specifications.
- Do not operate the UPM101 in locations where flammable gas, explosive gas or steam is present. It is extremely dangerous to operate the UPM101 in such environments.

IMPORTANT

- Do not use an unused terminal as a relay terminal for another wiring.
- Do not cut the protective ground wire inside or outside the UPM101, or disconnect the protective ground terminal connection. It is extremely dangerous to use the UPM101 in such conditions.
- Do not operate the UPM101 if there is any possibility of problem with protective functions such as the protective ground. In addition, make sure there is no fault in the protective ground before operating the UPM101.

Recommended Crimp-on Terminals

We recommend round crimp-on terminals for use in connecting to the input and power supply terminals.



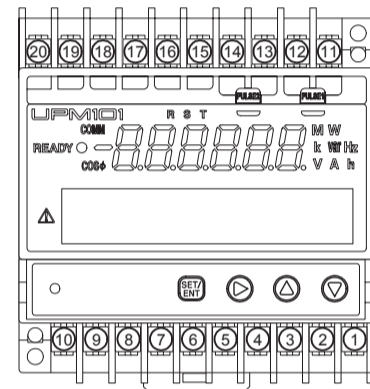
<Round Type>

Specification	Size (dØ²)	Size (B)	Recommended Tightening Torque	Applicable Wire Size
M3.5	3.8	6.6	0.8N·m	1.04 to 2.63 mm²
	3.7	6.6		

<Open-end Type>

Specification	Size (dØ²)	Size (B)	Recommended Tightening Torque	Applicable Wire Size
M3.5	3.7	6.3	0.8N·m	1.04 to 2.63 mm²
	3.7	6.4		

4.1 Terminal Layout



Single-phase 2-wire

No.	Terminal Symbol	Signal Name	No.	Terminal Symbol	Signal Name
1	PE	Protective ground	11	D1+	Pulse output-1 of electric energy (+)
2	L1	Power supply	12	D1-	Pulse output-1 of electric energy (-)
3	N1	Power supply	13	D2+	Pulse output-2 of electric energy (+)
4	P1	Voltage input	14	D2-	Pulse output-2 of electric energy (-)
5	P2	Voltage input	15	1S	Current input
6	NC	Unused terminal	16	1L	Current input
7	NC	Unused terminal	17	NC	Unused terminal
8	SG	RS-485 signal ground	18	NC	Unused terminal
9	B+	RS-485 (+)	19	NC	Unused terminal
10	A-	RS-485 (-)	20	NC	Unused terminal

Single-phase 3-wire

No.	Terminal Symbol	Signal Name	No.	Terminal Symbol	Signal name
1	PE	Protective ground	11	D1+	Pulse output-1 of electric energy (+)
2	L1	Power supply	12	D1-	Pulse output-1 of electric energy (-)
3	N1	Power supply	13	D2+	Pulse output-2 of electric energy (+)
4	P1	Voltage input	14	D2-	Pulse output-2 of electric energy (-)
5	P0	Voltage input	15	1S	Current input
6	P2	Voltage input	16	1L	Current input
7	NC	Unused terminal	17	2S	Current input
8	SG	RS-485 signal ground	18	2L	Current input
9	B+	RS-485 (+)	19	NC	Unused terminal
10	A-	RS-485 (-)	20	NC	Unused terminal

Three-phase 3-wire

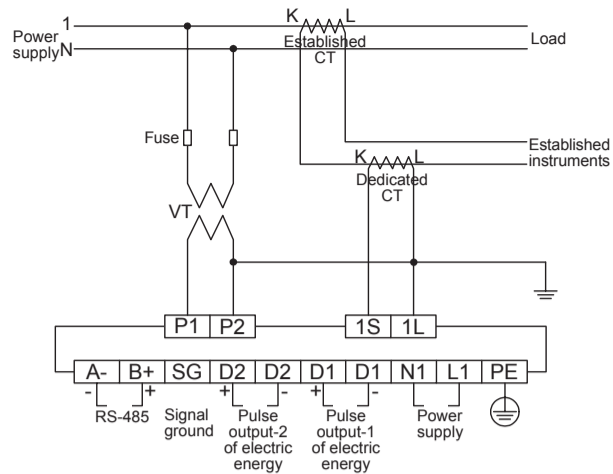
No.	Terminal Symbol	Signal Name	No.	Terminal Symbol	Signal name
1	PE	Protective ground	11	D1+	Pulse output-1 of electric energy (+)
2	L1	Power supply	12	D1-	Pulse output-1 of electric energy (-)
3	N1	Power supply	13	D2+	Pulse output-2 of electric energy (+)
4	P1	Voltage input	14	D2-	Pulse output-2 of electric energy (-)
5	P2	Voltage input	15	1S	Current input
6	P3	Voltage input	16	1L	Current input
7	NC	Unused terminal	17	3S	Current input
8	SG	RS-485 signal ground	18	3L	Current input
9	B+	RS-485 (+)	19	NC	Unused terminal
10	A-	RS-485 (-)	20	NC	Unused terminal

Three-phase 4-wire

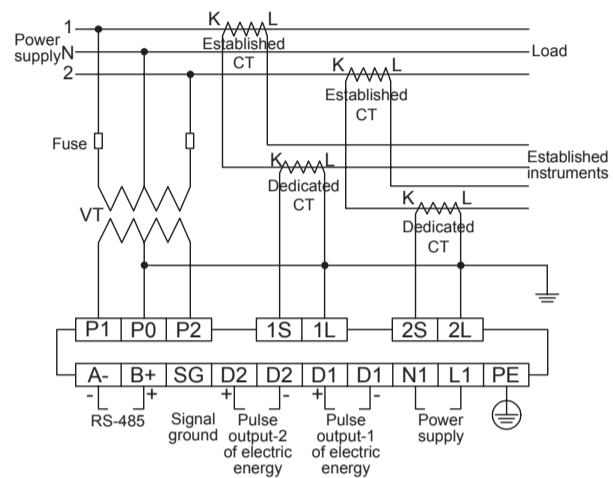
No.	Terminal Symbol	Signal Name	No.	Terminal Symbol	Signal name
1	PE	Protective ground	11	D1+	Pulse output-1 of electric energy (+)
2	L1	Power supply	12	D1-	Pulse output-1 of electric energy (-)
3	N1	Power supply	13	D2+	Pulse output-2 of electric energy (+)
4	P1	Voltage input	14	D2-	Pulse output-2 of electric energy (-)
5	P0	Voltage input	15	1S	Current input
6	P2	Voltage input	16	1L	Current input
7	P3	Voltage input	17	2S	Current input
8	SG	RS-485 signal ground	18	2L	Current input
9	B+	RS-485 (+)	19	3S	Current input
10	A-	RS-485 (-)	20	3L	Current input

4.2 Wiring Diagrams

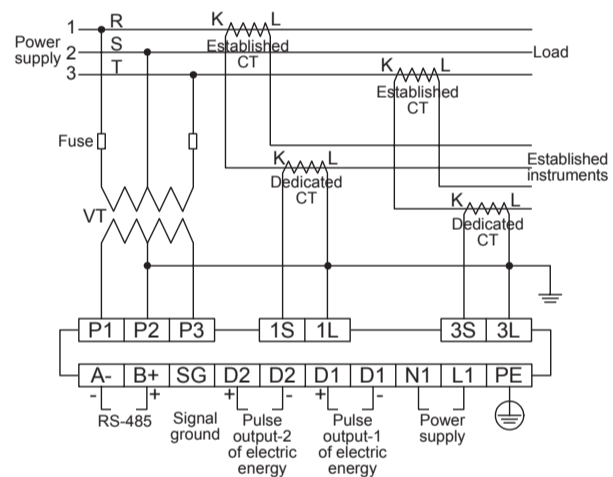
Single-phase 2-wire



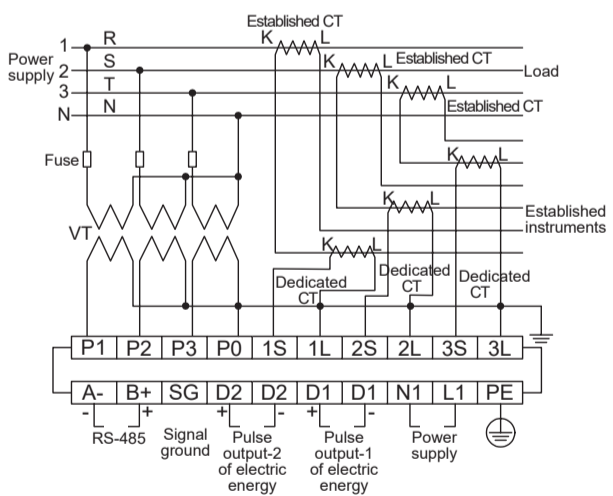
Single-phase 3-wire



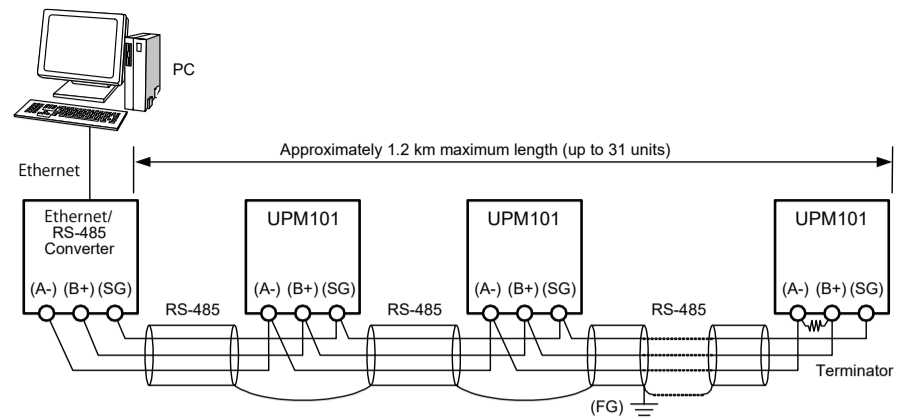
Three-phase 3-wire



Three-phase 4-wire



4.3 Connections for RS-485 Communication



NOTE

- RS-485 communication with the UPM101 is based on a 2-wire system. Note the following:
 - (1) The SG terminal (SG) is connected to match the signal level of the RS-485 communication line. Connect the SG terminal without grounding it.
 - (2) Connect all shield lines (FG) to provide noise protection on the RS-485 communication line, and ground them in one location.
 - (3) When using shielded twisted-pair cable, use the shield line as FG without connecting the SG terminal.



NOTE

- Be sure to use the dedicated CT for the UPM101.
- When connecting the secondary-side cable of the dedicated CT to the UPM101, the cable should be twisted.
- If extending the secondary-side cable of the dedicated CT, use two-core twisted-pair cable.

5. UPM101 Main Specifications

5.1 Measuring Functions

- Instantaneous apparent power, apparent energy and regenerative energy
- Instantaneous active power, active energy and optional electric energy
- Instantaneous reactive power and reactive energy (for UPM101 with optional measuring function)
- LEAD and LAG are integrated. If the pulse output is included, either LEAD or LAG is output as pulse output.
- Instantaneous rms voltage and maximum/minimum rms voltages of each phase
- Instantaneous rms current and maximum rms current of each phase
- Instantaneous power factor (for UPM101 with optional measuring function)
- Frequency

5.2 Input / Output Specifications

Phase and Wiring Type: Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire and three-phase 4-wire

Input Frequency: 45 to 65 Hz

Rated Input Voltage: 220V AC (200V AC [100V + 100V] for single-phase 3-wire)
440V AC (127V AC, 277V AC for three-phase 4-wire)

Input Voltage Range: 0 to 264V AC for 220V AC input; 0 to 520V AC for 440V AC input

Allowable Input Voltage: 1.2 times rated voltage (continuous) or 1.5 times (for 10 seconds)

Rated Input Current: 5A AC

Allowable Input Current: 1.2 times rated current (continuous) or 2 times (for 10 seconds)

Approximate Consumed VA: Voltage input 0.4VA/phase, current input 0.01VA/phase

Pulse Output of Electric Energy (option)*: 2 open collectors

Output capacity: 30V DC, 200mA

When output is ON: Within range of 10 to 1270 ms

Pulse unit: Within range of 10 to 500000 (Wh/pulse, varh/pulse) (set on primary-side rated power before VT and CT); however, 1 to 50000 (Wh/pulse, varh/pulse) when "Integral resolution Wh" is specified.

Maximum output frequency: 3Hz

Communication output: RS-485 x 1

5.3 Standard Performance

Accuracy Rating:

Active power: $\pm 2.0\%$ FS (equivalent to JIS C1111 grade 2.0)

rms voltage for each phase: $\pm 2.0\%$ FS (equivalent to JIS C1111 grade 2.0)

rms current for each phase: $\pm 2.0\%$ FS (equivalent to JIS C1111 grade 2.0)

Apparent energy: $\pm 2\%$ of rdg (with rated input)

Active energy: $\pm 2\%$ of rdg (with rated input) (integration not performed on minus "-" side)

Reactive energy: $\pm 2\%$ of rdg (with rated input) (for UPM101 with optional measuring function)

Regenerative energy: $\pm 2\%$ of rdg (with rated input)

Optional electric energy: $\pm 2\%$ of rdg (with rated input)

Frequency: $\pm 1\text{Hz}$

Note: If the input is a distortion wave input, the UPM101 will differ from instruments that are based on different measurement principles (including Yokogawa's PR201, UZ005, UPM01 UPM02 and UPM03).

Computing Accuracy: Reactive power, instantaneous power factor, apparent power 45 to 65Hz: $\pm 1\text{dgt}$ (value calculated from measured value)

Backup at Power Interruption: The final integrated values obtained prior to the power interruption are kept for active/reactive/apparent/regenerative energy.

Insulation Resistance: 100 M Ω or more at 500V DC between any two points of (current input and voltage input), power supply, ground, communication output and pulse output

Withstand Voltage: 2000V AC for one minute between any two points of (current input and voltage input), power supply, ground, communication output and pulse output
1000V AC for one minute between the primary-side of the dedicated CT and voltage input

Integral Low-cut Power: 0.05 to 20.00% of rated power

Operating Temperature and Humidity Ranges: 0 to 50°C / 5 to 90% RH (no condensation allowed)

Effect of Power Factor: At $45 \leq f \leq 65\text{Hz}$

Active power: $\pm 2.0\%$ rdg with respect to power factor 1; $\cos\phi = \pm 0.5$

Reactive power: $\pm 2.0\%$ rdg with respect to reactive factor 1; $\sin\phi = \pm 0.5$

Effect of Supply Voltage Fluctuation: $\pm 1.0\%$ FS (instantaneous value)/85 to 264V AC

Effect of Input Frequency: $\pm 1.0\%$ FS (instantaneous value)/45 to 65Hz

Effect of Ambient Temperature: $\pm 2\%$ FS (instantaneous value)/10°C

Power Supply: 85 to 264V AC

Consumed Power: Maximum 5VA (without display function)
Maximum 7VA (with display function)

5.4 Communication Specifications (RS-485 Communication)

Communication Specifications: RS-485 interface

Communication Protocols: PC link (with SUM, without SUM), MODBUS (ASCII, RTU), UPM01 protocol (effective only when "Integral resolution Wh" is specified)

Transmission Distance: Approx. 1.2 km max. (Using twisted-pair cable with 24 AWG shield)

Maximum Number of Connected Units: 31 (units that can be connected to PC or other device in multi-drop connection)

Connection Type: Conforming to RS-485

Cable: A-, B+, SG: Balanced twisted-pair cable

Terminating resistor: 120 Ω (sold separately; L3035RK)

Transmission Type: Half-duplex communication

Synchronization Type: Start-stop synchronization

Baud Rate: 2400, 9600 or 19200 bps

Data Format:

Start bit: 1 bit

Data length: 7 or 8 bits

Parity: None, even or odd

Stop bit: 1 or 2 bits

Error Detection: Checksum (1 byte, simple addition), CRC-16, LRC (no protocol-based flow control)

End Character Specification: Yes (CR)

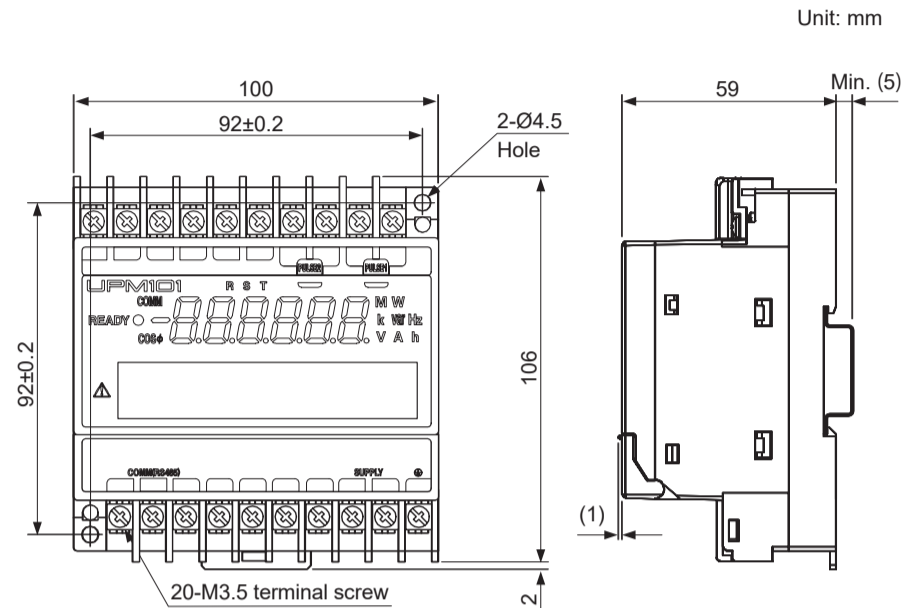
Address (Station Number) Setting: Set in range from 1 to 99 (1 to 31 recommended)

Reset Switch: 1 contact

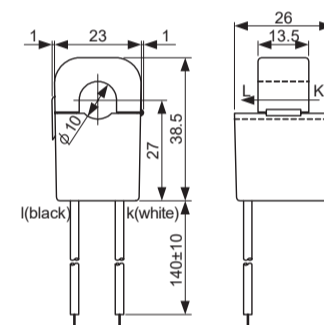
5.5 Power Elements

Function	Formula
Active energy (Wh)	$\int Pdt$
Reactive energy(varh)	$\int Qdt$
Apparent energy (VAh)	$\int VAdt$
Regenerative energy (Wh)	$\int Pdt$
rms voltage (Vrms), rms current (Arms)	$\sqrt{v(t)^2}, \sqrt{i(t)^2}$
Apparent power (VA)	$V_{rms} \cdot I_{rms}$
Active power (P)	$v(t) \cdot i(t)$
Reactive power (Q)	$\sqrt{(VA)^2 - P^2}$
Instantaneous power factor	P / VA

5.6 External Dimensions



External Dimensions of Dedicated CT (Accessory)



5.7 Related Products

Product	Model	Description
Communication Terminator	L3035RK	120 Ω terminating resistor for RS-485

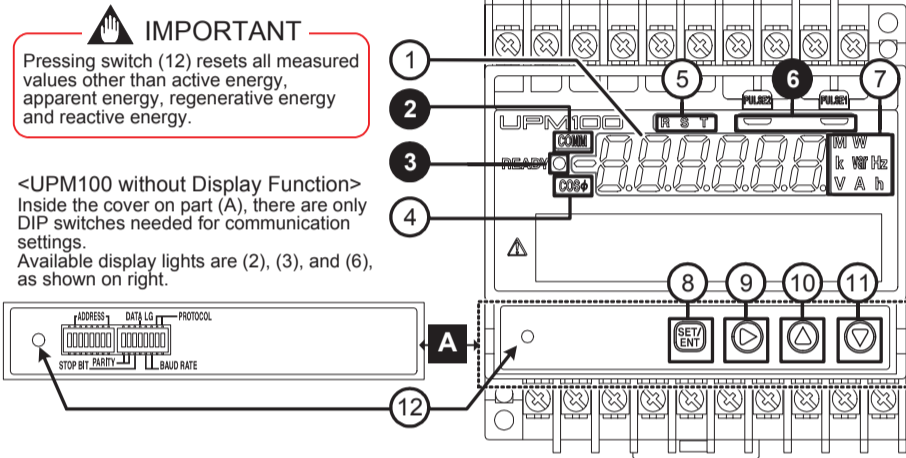
This manual describes the parameter setting procedures, measured value display procedures and measuring ranges. The explanations of user operations in this manual assume the UPM100 or UPM101 has display function. Parameter settings on UPM100 or UPM101 without display function are made through RS-485 communication.

1. Front Panel and Its Functions ----- P.1	5. Settings Related to Communication ----- P.2
2. Conventions Used in This Manual and Basic User Operations ----- P.1	6. Settings Related to Electric Energy ----- P.3
3. Action Flow on Parameter Setting Display ----- P.1	7. Standby Mode Settings ----- P.4
4. VT Ratio and CT Ratio Settings ----- P.2	

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1. Front Panel and Its Functions

In the diagram below, the switch cover, which is attached to part A, is opened so that operation keys (8) through (12) can be seen.



IMPORTANT
Pressing switch (12) resets all measured values other than active energy, apparent energy, regenerative energy and reactive energy.

<UPM100 without Display Function>
Inside the cover on part (A), there are only DIP switches needed for communication settings.
Available display lights are (2), (3), and (6), as shown on right.

- (1) Measured value display: During operations, measured values are displayed in this area. During parameter settings, parameters and their settings are displayed here. When an error occurs, the display shows the error message. (See "4. Troubleshooting" in the Measured Value Display Operations User's Manual.)
- (2) Communication light: This light (green LED) turns on while communication is in progress.
- (3) Power light: This light (green LED) turns on while the power is on. If a communication error occurs, this power light flashes (four times per second) until normal status is restored.
- (4) COS φ light: This light turns on while the instantaneous power factor (optional measuring function) is displayed.
- (5) RST light: This light (red LED) turns on while voltage and/or current values are displayed. For example, the "S" light turns on while the S phase voltage value is displayed with a three-phase 4-wire setup.
- (6) Integrated pulse light: This light (green LED) flashes to match the pulse output when integrated pulses of each power are being output.
- (7) Unit light: This light turns on as the unit corresponding to the measured value. For example, if the measured value is **** kW, then "k" and "W" lights turn on.
- (8) SET/ENT key: This key is used to switch displays and enter parameter settings.
- (9) Move key: This key is used to change a phase when measured value is displayed or to move the digit position (decimal point position) when setting a parameter.
- (10) Up key: This key is used to change the set value when setting a parameter. Pressing this key increases the numeric value.
- (11) Down key: This key is used to change the set value when setting a parameter. Pressing this key decreases the numeric value.
- (12) Reset switch: This switch restarts the UPM100. Pressing this switch resets all measured values other than active energy, apparent energy, regenerative energy and reactive energy.

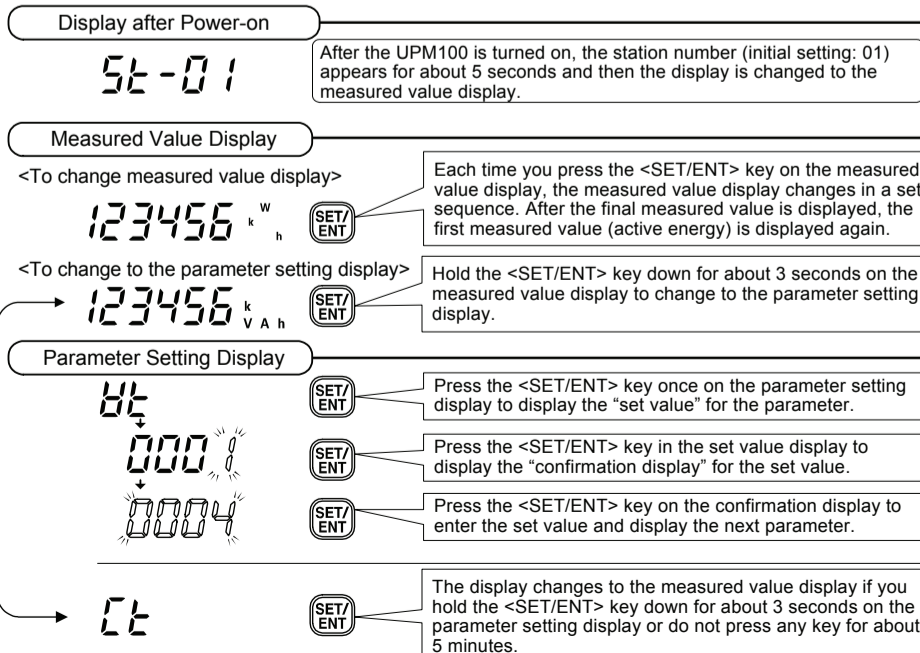
2. Conventions Used in This Manual and Basic User Operations

2.1 Conventions Used in This Manual

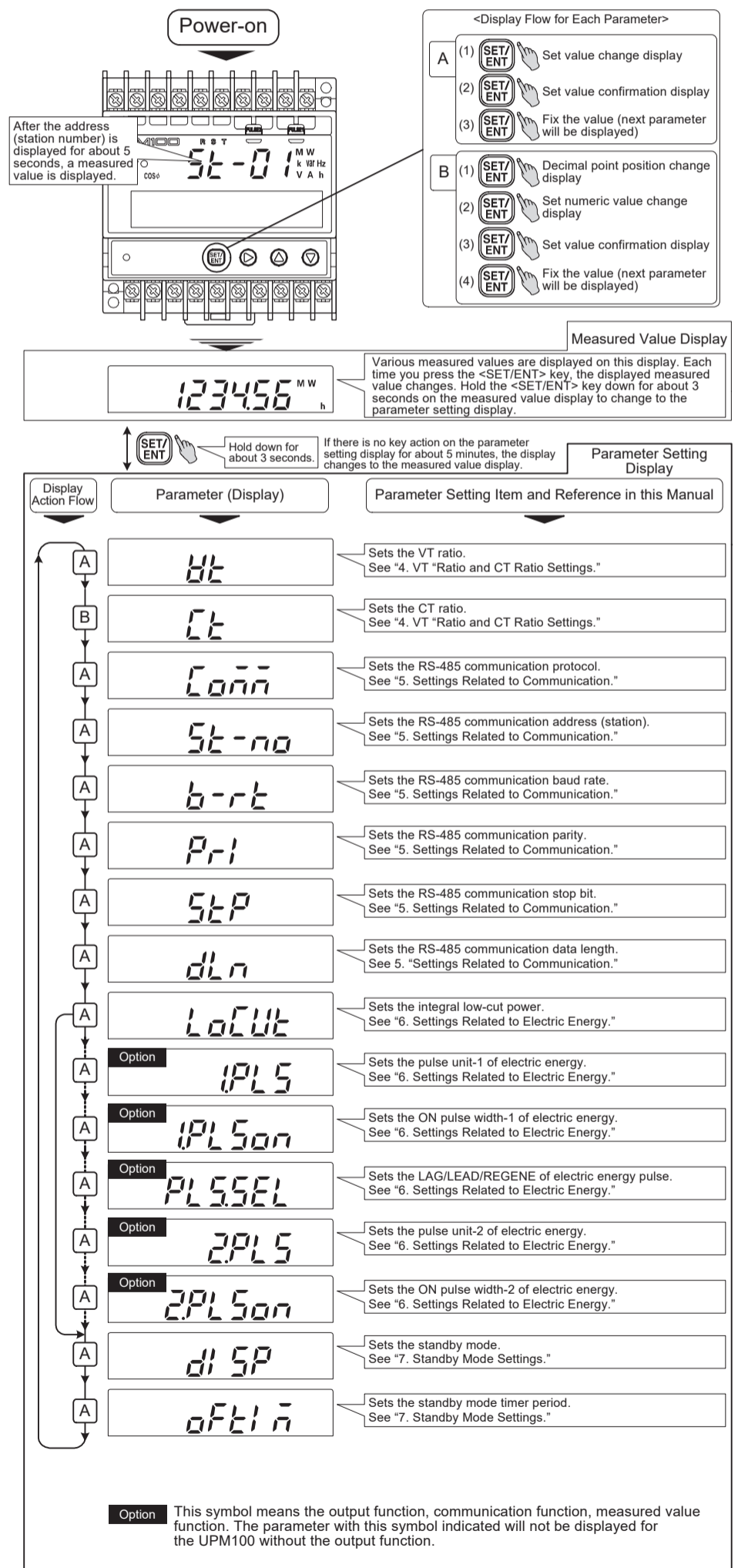
The following operation keys appear in this manual:

is the <SET/ENT> key. is the <Move> key. is the <Up> key. is the <Down> key.

2.2 Basic Operations



3. Action Flow on Parameter Setting Display



4. VT Ratio and CT Ratio Settings

This chapter describes how to set the VT and CT ratios.

Parameter Symbol	Parameter Name	Setting Range	Initial Setting
<i>Vt</i>	VT ratio (VT)	1 to 6000 <Variable numeric parameter>	1
<i>Ct</i>	CT ratio (CT)	0.05 to 32000 <Variable numeric parameter/ the decimal point position can be changed> (with 5 significant digits; can be set to the second place of a decimal point.)	1.00

The following example explains how to set VT ratio "4" for 440V/110V and CT ratio "10" for 50A/5A.

Display	Key Operation	Description
Display after Power-on <i>St-01</i>		After the power is turned on, the station number (initial setting: 01) is displayed for about 5 seconds on the UPM100 display and then the measured value display is displayed.
Measured Value Display <i>123456</i> ^w _h	Hold down for about 3 seconds.	Hold the <SET/ENT> key down for about 3 seconds on the measured value display to change to the parameter setting display.
Parameter Setting Display VT Ratio Setting (1) <i>Vt</i>	Press once.	Press the <SET/ENT> key once to display the set value for the parameter.
Set value <i>000</i>	Press three times.	The digit which can be set flashes. Press the <UP> key to display "4."
(2) <i>0004</i> Numeric value change	Press once.	After the value is set, press the <SET/ENT> key once. All digits will flash (confirmation display).
Confirmation display (3) <i>0004</i>	Press once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "CT."
CT Ratio Setting (4) <i>Ct</i>	Press once.	Press the <SET/ENT> key once to display the set value for the parameter. (Since the decimal point position for the CTratio can be changed, it flashes first.)
Set value <i>00.00</i> Decimal point flashes	Press once.	The decimal point position is not changed here, so press the <SET/ENT> key once here to move the set value change display. (To move the decimal point, press the <Move> key to change the decimal point position.)
(5) <i>00.00</i>	Press twice.	The digit which can be set flashes. Press the <Move> key until the digit you want to set flashes.
Numeric value change <i>01.00</i>	Press once.	Press the <Up> key to display "1."
<i>01.00</i>	Press once.	Press the <Move> key until the digit you want to set flashes.
<i>01.00</i>	Press once.	Press the <Down> key to display "0."
Numeric value change <i>01.000</i>	Press once.	After the value is set, press the <SET/ENT> key once. All digits will flash (confirmation display).
Confirmation display (6) <i>01.000</i>	Press once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "COMM."
Hold the <SET/ENT> key down for about 3 seconds to return to the measured value display.		
<Common Operation for All Variable Numeric Parameters> If there is an error in the set value on the set value confirmation display (with all digits flashing), you should perform the following operation.		
Confirmation display <i>0004</i> Return to parameter (VT) display	Press once.	Press the <Move> key on the set value confirmation display (with all digits flashing) to return to the parameter's initial status. When this is done, the set value is not updated, and the previous set value is kept.

IMPORTANT

Set the VT ratio and CT ratio so that the product of the ratio does not exceed 9999 (MW) by calculated by secondary-side rated power × VT ratio × CT ratio.
For the UPM101, set the CT ratio of the established CT where the dedicated CT is to be attached.

NOTE

The set value will not be entered if you hold the <SET/ENT> key down for about 3 seconds on the parameter set value confirmation display. To move from the parameter setting display to the measured value display, conduct the display change operation while the parameters (VT, etc.) are being displayed.

5. Settings Related to Communication

This chapter describes settings related to RS-485 communication.

Parameter Symbol	Parameter Name	Setting Range	Initial Setting
<i>Comm</i>	RS-485 communication protocol (COMM)	PC link (without SUM) <i>PCLK1</i> (PCLK1) PC link (with SUM) <i>PCLK2</i> (PCLK2) MODBUS (ASCII) <i>ASC</i> (MASC) MODBUS (RTU) <i>RTU</i> (MRTU) UPM01 Protocol <i>UPM01</i> (UPM01) <Selective parameter>	PCLK2
<i>St-no</i>	RS-485 station number (ST-NO)	1 to 99 (1 to 31 recommended) <Variable numeric parameter>	1
<i>b-rt</i>	RS-485 communication baud rate (B-RT)	2400, 9600, 19200 (bps) <Selective parameter>	9600 (bps)
<i>Pri</i>	Parity (PRI)	None: <i>none</i> (NONE) Even: <i>even</i> (EVEN) Odd: <i>odd</i> (ODD) <Selective parameter>	NONE
<i>Stp</i>	Stop bit (STP)	1 or 2 bits <Selective parameter>	1
<i>dln</i>	Data length (DLN)	7 or 8 bits <Selective parameter>	8

5.1 Settings for UPM100 with Display Function

The procedure shown below should be employed after turning the UPM100 power on, changing from the measured value display to the parameter setting display, and displaying the "COMM" parameter (communication protocol).

Display	Key Operation	Description
Communication Protocol Setting (1) <i>Comm</i>	Press once.	Press the <SET/ENT> key once to display the set value (selected parameter).
Set value <i>PCLK1</i>	Press or .	Press the <Up> key or <Down> key to display the parameter (protocol) you want to set.
Parameter change <i>ASC</i>	Press once.	After setting the parameter, press the <SET/ENT> key once. The set value flashes (confirmation display).
Confirmation display (3) <i>ASC</i>	Press once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "ST-NO."
Address (Station Number) Setting (4) <i>St-no</i>	Press once.	Press the <SET/ENT> key once to display the set value. The digit which can be set flashes.
Set value <i>01</i>	Press .	Press the <Move> key to change the digit to be set. Use the <Up> key or <Down> key to change the numeric value.
(5) <i>01</i> Numeric value change	Press once.	Press the <SET/ENT> key once to make the set value flash (confirmation display).
Confirmation display (6) <i>01</i>	Press once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "B-RT."
Hold the <SET/ENT> key down for about 3 seconds to return to the measured value display.		

Perform steps (1) through (3) to set the baud rate, parity, stop bit and data length.

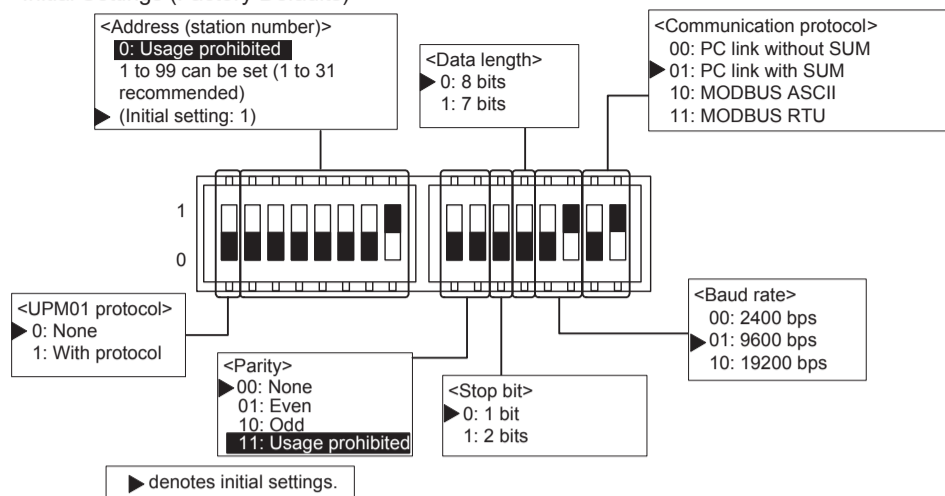
<Common Operation for All Selective Numeric Parameters>
If there is an error in the set value on the set value confirmation display (with all digits flashing), you should perform the following operation.

Confirmation display <i>01</i> Return to parameter (COMM) display		Press the <Move> key, <Up> key, or <Down> key on the set value confirmation display (with all digits flashing) to return to the parameter's initial status. When this is done, the set value is not updated, and the previous set value is kept.
<i>Comm</i>	Press one of above once.	

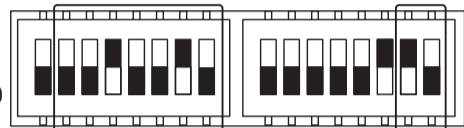
5.2 Settings for UPM100 without Display Function

Use the DIP switches to enter the settings on UPM100 without display function. Referring to the diagram below, set the binary values, with the first bit on the left.

<Initial Settings (Factory Defaults)>



<Example Settings for Station Number "18" (0010010) and Communication Protocol "MODBUS ASCII" (10)>



<Binary Number Quick Reference Chart>

The following table is a binary number quick reference chart for use in setting addresses (station numbers) with DIP switches.

1	0000001	21	0010101	41	0101001	61	0111101	81	1010001
2	0000010	22	0010110	42	0101010	62	0111110	82	1010010
3	0000011	23	0010111	43	0101011	63	0111111	83	1010011
4	0000100	24	0011000	44	0101100	64	1000000	84	1010100
5	0000101	25	0011001	45	0101101	65	1000001	85	1010101
6	0000110	26	0011010	46	0101110	66	1000010	86	1010110
7	0000111	27	0011011	47	0101111	67	1000011	87	1010111
8	0001000	28	0011100	48	0110000	68	1000100	88	1011000
9	0001001	29	0011101	49	0110001	69	1000101	89	1011001
10	0001010	30	0011110	50	0110010	70	1000110	90	1011010
11	0001011	31	0011111	51	0110011	71	1000111	91	1011011
12	0001100	32	0100000	52	0110100	72	1001000	92	1011100
13	0001101	33	0100001	53	0110101	73	1001001	93	1011101
14	0001110	34	0100010	54	0110110	74	1001010	94	1011110
15	0001111	35	0100011	55	0110111	75	1001011	95	1011111
16	0010000	36	0100100	56	0110100	76	1001100	96	1100000
17	0010001	37	0100101	57	0110101	77	1001101	97	1100001
18	0010010	38	0100110	58	0110110	78	1001110	98	1100010
19	0010011	39	0100111	59	0110111	79	1001111	99	1100011
20	0010100	40	0101000	60	0111100	80	1010000		

6. Settings Related to Electric Energy

This chapter describes settings related to electric energy.

Parameter Symbol	Parameter Name	Setting Range	Initial Setting
LOCUT	Integral low-cut power (LOCUT)	0.05 to 20.00 (%) (percent of rated power) <Variable numeric parameter>	0.05 (%)
1PLS	Pulse unit -1 of electric energy (1.PLS)	Increments of 10 Wh/pulse in range of 10 to 500000 (Wh/pulse) (Display: 000.01 to 500.00 kWh/pulse) <Variable numeric parameter> *: 1 to 50000 Wh/pulse when "Integral resolution Wh" is specified.	1.00 kWh/pulse
1PLSON	ON pulse width-1 of electric energy (1.PLSON)	Increments of 10 ms in range of 10 to 1270 ms <Variable numeric parameter>	50 (ms)
PLSEL	Pulse of electric energy LAG/LEAD/REGEN E (PLS.SEL)	Reactive energy LAG, LEAD or regenerative energy <Selective parameter>	REGENE or LAG* * For reactive power option
2PLS	Pulse unit -2 of electric energy (2.PLS)	Increments of 10 Wh/pulse or varh/pulse in range of 10 to 500000 (Wh/pulse, varh/pulse)* (Display: 000.01 to 500.00 kvarh/pulse) <Variable numeric parameter> *: 1 to 50000 Wh/pulse or 1 to 50000 varh/pulse when "Integral resolution Wh" is specified.	1.00 kWh/pulse or 1.00 kvarh/pulse* * For reactive power option
2PLSON	ON pulse width-2 of electric energy (2.PLSON)	Increments of 10 ms in range of 10 to 1270 ms <Variable numeric parameter>	50 (ms)

6.1 Integral Low-cut Power Setting

Integral low-cut power serves to prevent the instantaneous values for active power, apparent power, and reactive power (optional) from being integrated if they are below the integral low-cut power setting. Integral low-cut power is set as a percentage of the rated power value. In the example presented here, integral low-cut power is set to "0.1%." The procedure shown below should be employed after turning the UPM100 power on, changing from the measured value display to the parameter setting display, and displaying the "LOCUT" parameter (integral low-cut power).

Display	Key Operation	Description
Integral Low-cut Power Setting		
(1) LOCUT	Press SET/ENT once.	Press the <SET/ENT> key once to display the parameter's set value.
Set value		
0005	Press DOWN five times.	The digit which can be set flashes. Press the <Down> key to display "0."
0000	Press MOVE three times.	Next, press the <Move> key to make the first digit flash.
0010	Press UP once.	Press the <Up> key to display "1."
0010	Press SET/ENT once.	After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
(3) 0010	Press SET/ENT once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter.
Hold the <SET/ENT> key down for about 3 seconds to return to the measured value display.		

6.2 Settings Related to Integrated Pulse Output

If your UPM100 has integrated pulse output, the pulse unit and ON pulse width must be set. Set the ON pulse width so that the maximum ON pulse width as calculated in the following equation is not exceeded.

$$\text{Pulse width (ms)} = \text{Pulse unit} \times 3600 \times 1000^2 / \text{Secondary-side rated power} \times \text{VT ratio} \times \text{CT ratio} \times 1.2 \times 2 \text{ (The pulse unit is kWh or kvarh.)}$$

In the example presented here, the pulse unit-1 of electric energy is set to "500 Wh/pulse", ON pulse width-1 of electric energy is set to "100 ms", electric energy pulse LAG/LEAD/REGEN* is set to "LEAD", pulse unit-2 of electric energy is set to "500 Wh/pulse", and ON pulse width-2 of electric energy is set to "100 ms."

*: If "reactive power option" is specified at ordering, either the reactive energy LAG side, LEAD side or regenerative energy is output as the pulse output-2 of electric energy. Select "LAG," "LEAD" or "REGEN" in the parameter "PLS.SEL".

The procedure shown below should be employed after turning the UPM100 power on, changing from the measured value display to the parameter setting display, and displaying the "1.PLS" parameter (pulse unit-1 of electric energy).

Display	Key Operation	Description
Pulse Unit-1 of Electric Energy Setting		
(1) 1PLS	Press SET/ENT once.	Press the <SET/ENT> key once to display the set value of parameter.
Set value		
00100	Press DOWN once.	The digit which can be set flashes. Enter the setting in "kW" unit. (The "k" unit light is on.) Press the <Down> key to display "0."
00000	Press MOVE once.	Press the <Move> key to make the digit you want to set flash.
(2) 00050	Press UP five times.	Press the <Up> key to display "5."
00050	Press SET/ENT once.	After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
Confirmation display		
(3) 00050	Press SET/ENT once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "1.PLSON."
ON Pulse Width-1 of Electric Energy Setting		
(4) 1PLSON	Press SET/ENT once.	Press the <SET/ENT> key once to display the parameter set value.
Set value		
0050	Press DOWN five times.	The digit which can be set flashes. Press the <Down> key to display "0."
0000	Press MOVE twice.	Press the <Move> key to make the digit you want to set flash.
(5) 00100	Press UP once.	Press the <Up> key to display "1."
0100	Press SET/ENT once.	After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
Confirmation display		
(6) 0100	Press SET/ENT once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "PLS.SEL."
Pulse Output-2 of Electric Energy LAG/LEAD/REGEN Setting		
(7) PLSSEL	Press SET/ENT once.	Press the <SET/ENT> key once to display the parameter set value.
Set value		
LAG	Press UP or DOWN .	Press the <Up> key or <Down> key to display "LEAD."
LEAD	Press SET/ENT once.	After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
REGENE		
Confirmation display		
(9) LEAD	Press SET/ENT once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "2.PLS" (pulse unit-2 of electric energy).
Pulse Unit-2 of Electric Energy Setting		
(10) 2PLS	Press SET/ENT once.	Press the <SET/ENT> key once to display the parameter set value.
Set value		
00100	Press DOWN once.	The digit which can be set flashes. Enter the setting in "kvar" unit. (The "k" unit light is on.) Press the <Down> key to display "0."
00000	Press MOVE once.	Press the <Move> key to make the digit you want to set flash.
(11) 00050	Press UP five times.	Press the <Up> key to display "5."
00050	Press SET/ENT once.	After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
Confirmation display		
(12) 00050	Press SET/ENT once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "2.PLSON."
ON Pulse Width-2 of Electric Energy Setting		
(13) 2PLSON	Press SET/ENT once.	Press the <SET/ENT> key once to display the parameter set value.
Set value		
0050	Press DOWN five times.	The digit which can be set flashes. Press the <Down> key to display "0."
0000	Press MOVE twice.	Press the <Move> key to make the digit you want to set flash.
(14) 00100	Press UP once.	Press the <Up> key to display "1."
0100	Press SET/ENT once.	After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
Confirmation display		
(15) 0100	Press SET/ENT once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "DISP."
Hold the <SET/ENT> key down for about 3 seconds to return to the measured value display.		

7. Standby Mode Settings

This chapter describes the standby mode settings. Standby mode is a function which turns off the LED display if there is no key action within the previously determined time period while measured values are displayed. If there is no key action while the parameter setting display is displayed, the display will change to the measured value display after about 5 minutes. The LEDs then turn off after the previously determined time (standby mode timer) elapses. To display measured values (i.e., turn on the LEDs) while in the standby mode, press any operation key once.

Parameter Symbol	Parameter Name	Setting Range	Initial Setting
	Standby mode (DISP)	ON or OFF <Selective parameter>	ON
	Standby mode timer (OFTIM)	1 to 60 minutes <Variable numeric parameter>	10 (min)

Display	Key Operation	Description
Standby Mode Setting (1)	Press once.	Press the <SET/ENT> key once to display the parameter set value.
Set value (2)	Press or . Press once.	Press the <Up> key or <Down> key to display "ON" or "OFF." After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
Confirmation display (3)	Press once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter "OFTIM" (standby mode timer).
Standby Mode Timer Setting (4)	Press once.	Press the <SET/ENT> key once to display the parameter set value.
Set value (5)	 Press once.	Press the <Move> key to change the digit to be set. Use the <Up> key or <Down> key to change the numeric value. After setting the parameter, press the <SET/ENT> key once. All digits flash (confirmation display).
Confirmation display (6)	Press once.	Press the <SET/ENT> key on the confirmation display to enter the set value and display the next parameter.
Hold the <SET/ENT> key down for about 3 seconds to return to the measured value display.		

In this manual, the "UPM100" means the "UPM100" or "UPM101," and the illustrations show the "UPM100 with display function."

*1: The unit is "kVAh" or "MVAh" for apparent energy. A minus sign (-) is displayed for regenerative energy.
*2: The unit is "kWh" or "kVAh" for "Integral resolution Wh," and "MWh" or "MVAh" for "Integral resolution kWh."

This manual describes the measured value display procedures and measuring ranges for the UPM100 and UPM101 which have display function.

1. Action Flow on Measured Value Display ----- P. 1
2. Measured Value Display ----- P.1-P.2
3. Measured Value Resetting Procedures ----- P.2
4. Troubleshooting ----- P.2

1. Action Flow on Measured Value Display

Display	Key Operation	Description
Display after Power-on 5t-01		After the UPM100 is turned on, the address (station number) (initial setting:01) is displayed for about 5 seconds and then the measured value display is displayed.
Active Energy 123456 MWh	Press [SET/ENT] once. The next measured value is displayed.	The active energy is displayed. For details, see "2. Measured Value Display."
Regenerative Energy -123456 MWh	Press [SET/ENT] once. The next measured value is displayed.	The regenerative energy is displayed. For details, see "2. Measured Value Display."
LAG Reactive Energy Option 12345 Mvarh	Press [SET/ENT] once. The next measured value is displayed.	The LAG reactive energy is displayed. For details, see "2. Measured Value Display."
LEAD Reactive Energy Option -12345 Mvarh	Press [SET/ENT] once. The next measured value is displayed.	The LEAD reactive energy is displayed. For details, see "2. Measured Value Display."
Apparent Energy 123456 MVAh	Press [SET/ENT] once. The next measured value is displayed.	The apparent energy is displayed. For details, see "2. Measured Value Display."
Optional Electric Energy 123456 Wh	Press [SET/ENT] once. The next measured value is displayed.	The active energy during any given time period is displayed. For details, see "2. Measured Value Display."
Instantaneous Active Power 1234 kW	Press [SET/ENT] once. The next measured value is displayed.	The instantaneous active power or instantaneous regenerative power is displayed. For details, see "2. Measured Value Display." A minus sign (-) is always displayed for regenerative power measurement.
Instantaneous Reactive Power Option 12.34 kvar	Press [SET/ENT] once. The next measured value is displayed.	The instantaneous reactive power is displayed. For details, see "2. Measured Value Display."
Instantaneous Apparent Power 12.34 kVA	Press [SET/ENT] once. The next measured value is displayed.	The instantaneous apparent power is displayed. For details, see "2. Measured Value Display."
Instantaneous Voltage Maximum value: 1234 V Minimum value: 1234 V	Press [SET/ENT] once. The next measured value is displayed.	The instantaneous voltage is displayed. For details, see "2. Measured Value Display."
Instantaneous Current Maximum value: 12.34 kA	Press [SET/ENT] once. The next measured value is displayed.	The instantaneous current is displayed. For details, see "2. Measured Value Display."
Instantaneous Power Factor Option COSφ 00.123 COSφ 00.123	Press [SET/ENT] once. The next measured value is displayed.	The instantaneous power factor is displayed. LEAD is displayed as the numerical value after "d", and LAG is displayed after "G". For details, see "2. Measured Value Display."
Frequency 456 Hz	Press [SET/ENT] once. The active energy is displayed.	The frequency is displayed. For details, see "2. Measured Value Display."

To go to the parameter setting display, hold the <SET/ENT> key down for about 3 seconds.

Option This symbol means the optional measuring function. The parameter with this symbol indicated will not be measured and displayed for the UPM100 without the optional measuring function.

2. Measured Value Display

This chapter describes display procedures, display ranges and other information for UPM100 with display function. For UPM100 without display function, see the communication function User's Manual (IM 77C01H01-10E).

2.1 Active Energy, Apparent Energy and Regenerative Energy

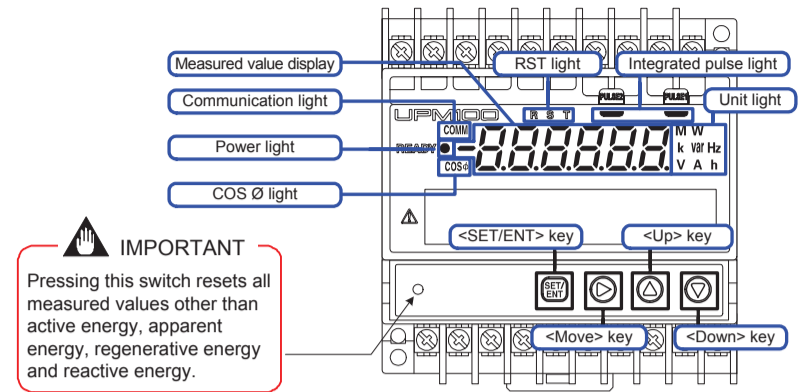
The active energy and regenerative energy up to the present moment is indicated in "kWh" or "MWh" unit (it is output in kWh unit during communication). The apparent energy is indicated in "kVAh" or "MVAh" unit (it is output in "kVAh" unit during communication). However, if the instantaneous active power or instantaneous apparent power is less than the previously determined "integral low-cut power," then it is not integrated. Active energy, apparent energy and regenerative energy is recorded even during a power interruption. Individual electric energy is displayed as shown in the table below, in accordance with the measurement conditions.

For apparent energy, the unit is "VA" instead of "W." For regenerative energy, a minus sign (-) is always displayed. When "Integral resolution Wh" is specified at ordering, Type (3) in the table is applied without the condition of "Secondary-side rated power x VT ratio x CT ratio" and the display unit is "kWh" or "kVAh" only.

For Types (2) and (3), you can press the <Down> key to display as many as three digits following the decimal point. (See the example display operations.)

Type	Secondary-side Rated Power x VT ratio x CT ratio	Integral Display Range	Remarks
(1)	Less than 1 MW	0 to 999999 kWh ^{*1}	Six digits, without decimal point
(2)	1 MW or greater, but less than 10 MW	0.00 to 9999.99 MWh ^{*1}	Six digits, with decimal point
(3)	10 MW or greater	0.0 to 99999.9 MWh ^{*1,2}	Six digits, with decimal point

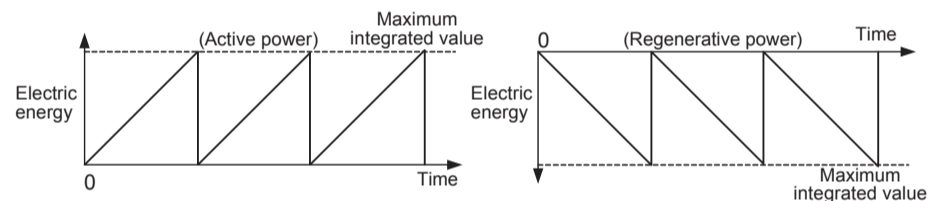
<Part Names>



<Example of Display Operation>

Type	Measured Value Display	Key Operation	Description
(1)	345678 kWh		<ul style="list-style-type: none"> Decimal point cannot be moved through key operations Display unit: kWh or kVAh
(2)	34567.8 MWh	Press [Down] once.	The numbers in the rectangular box left are the measured value to be displayed. Press the <Down> key once to display three digits after the decimal point. Press the <Down> key once again to return to the initial measured value display. Display unit: MWh or MVAh
(3)	34567.8 MWh	Press [Down] once. Press [Down] once. Press [Down] once.	The numbers in the rectangular box left are the measured value to be displayed. Press the <Down> key once to display two digits after the decimal point. Press it again to display three digits after the decimal point. With three digits after the decimal point displayed, press the <Down> key to return to the initial measured value display. Display unit: MWh (kWh or kVAh when "Integral resolution Wh" is specified).

* Electric energy (active power, regenerative power, reactive power and apparent power) are set to "0" as shown below if they exceed the maximum integral value.



2.2 Reactive Energy (Optional Measuring Function)

The reactive energy up to the present moment is indicated in "kvarh" or "Mvarh" unit (it is output in "kvarh" unit during communication). LAG (+) and LEAD (-) are separately integrated and displayed. (A plus sign (+) is not displayed for LAG (+).) However, if the instantaneous reactive power is less than the previously determined "integral low-cut power," then it is not integrated. Reactive energy is recorded even during a power interruption. Reactive energy is displayed as shown in the table below, in accordance with the measurement conditions. When "Integral resolution Wh" is specified at ordering, Type (3) in the table is applied without the condition of "Secondary-side rated power x VT ratio x CT ratio."

For Types (2) and (3), you can press the <Down> key to display as many as three digits following the decimal point. (Display operations can be performed in the same manner as in the example display operations in "2.1 Active Energy, Apparent Energy and Regenerative Energy.")

Type	Secondary-side Rated Power x VT ratio x CT ratio	Integral Display Range	Remarks
(1)	Less than ±1 Mvar	±0 to ±99999 kvarh	Five digits, without decimal point
(2)	±1 Mvar or greater, but less than ±10 Mvar	±0.00 to ±999.99 Mvarh	Five digits, with decimal point
(3)	±10 Mvar or greater	±0.0 to ±9999.9 Mvarh	Five digits, with decimal point

2.3 Optional Electric Energy

While optional integration is running, the active energy is displayed (and output through communication) in "Wh" unit. However, if the instantaneous active power is less than the previously determined "integral low-cut power," then it is not integrated. Optional integration is started/stopped through RS-485 communication. (Optional integration start [D0062]/optional integration stop [D0063]) Please see the communication user's manual (IM 77C01H01-10E).

- Integration is not performed while optional integration is stopped. Instead, the immediately preceding optional electric energy is displayed.
- When optional integration is reactivated, the optional electric energy is reset and integration starts.
- Maximum integration display: 999999 Wh

2. Instantaneous Active/Regenerative Power, Instantaneous Apparent Power and Instantaneous Reactive Power

- Instantaneous active/regenerative power is an active/regenerative power at a given point of time displayed in "W", "kW", or "MW" unit, with a minus sign (-) if it is a negative value. (It is output in "W" unit during communication.) (A minus sign (-) is always displayed for regenerative power measurement.)
- Instantaneous apparent power is an apparent power at a given point of time displayed in "VA", "kVA", or "MVA" unit, with a minus sign (-) if it is a negative value. (It is output in "VA" unit during communication.)
- Instantaneous reactive power is a reactive power at a given point of time displayed in "var", "kvar", or "Mvar" unit, with a minus sign (-) if it is a negative value. (It is output in "var" unit during communication.)

The table below shows the measured value display ranges for instantaneous active power. The same ranges apply for instantaneous apparent power and instantaneous reactive power, except the unit is "VA" instead of "W" for instantaneous apparent power, and "var" instead of "W" for instantaneous reactive power.

Secondary-side Rated Power x 1.2 x VT Ratio x CT Ratio	Measuring Range	Remarks
6 W or greater, but less than 100 W	0.00 to 99.99 W	
100 W or greater, but less than 1 kW	0.0 to 999.9 W	
1 kW or greater, but less than 10 kW	0 to 9999 W	
10 kW or greater, but less than 100 kW	0.00 to 99.99 kW	
100 kW or greater, but less than 1 MW	0.0 to 999.9 kW	
1 MW or greater, but less than 10 MW	0 to 9999 kW	
10 MW or greater, but less than 100 MW	0.00 to 99.99 MW	
100 MW or greater, but less than 1 GW	0.0 to 999.9 MW	
1 GW or greater	0 to 9999 MW	

2.4 Instantaneous Voltage and Current

- Instantaneous voltage is a voltage rms value at a given point of time displayed in "V" or "kV" unit. (It is output in "V" unit during communication.) Instantaneous voltage, maximum and minimum values for each phase and between individual pairs of wires can be measured and displayed.

Single-phase 2-wire → V1
 Single-phase 3-wire → V1, V2
 Three-phase 3-wire → V1: across R-S, V3: across S-T
 Three-phase 4-wire → V1: R phase, V2: S phase, V3: T phase

Secondary-side Rated Voltage x 1.2 x VT Ratio	Measuring Range	Remarks
100 V or greater, but less than 1 kV	0.0 to 999.9 V	
1 kV or greater, but less than 10 kV	0 to 9999 V	
10 kV or greater, but less than 100 kV	0.00 to 99.99 kV	
100 kV or greater, but less than 1 MV	0.0 to 999.9 kV	
1 MV or greater	0 to 9999 kV	

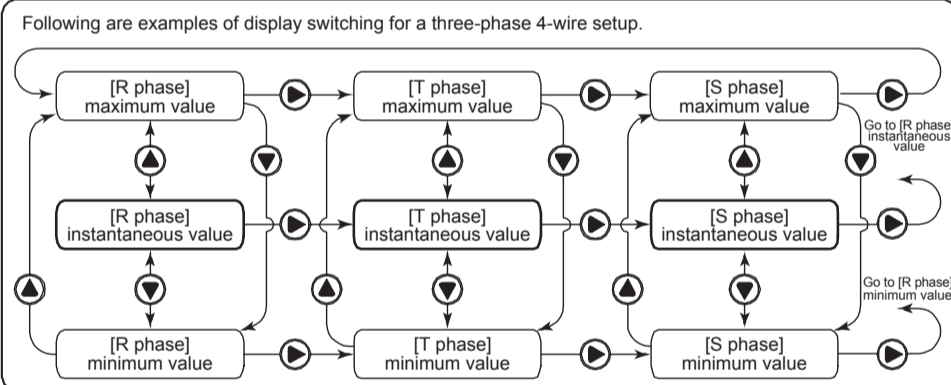
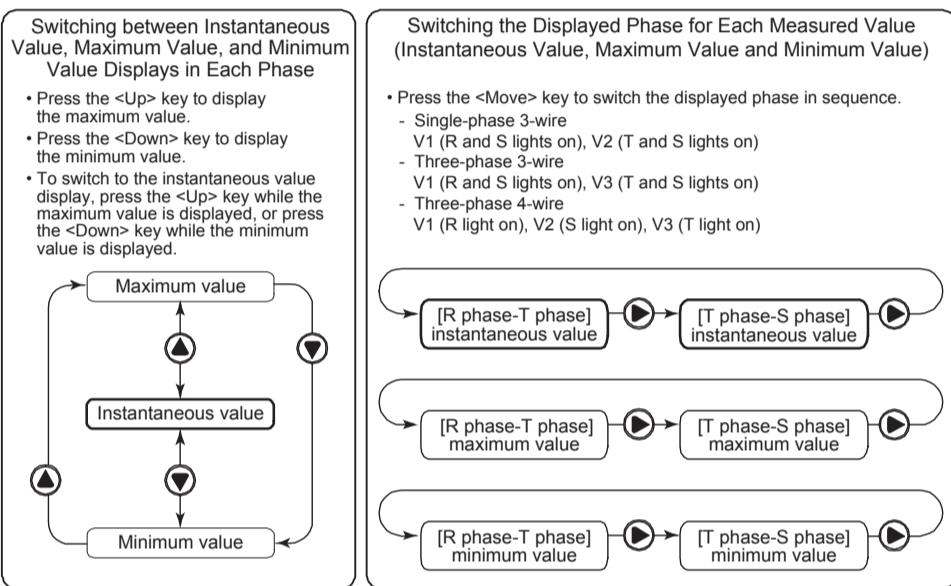
- Instantaneous current is a current rms value at a given point of time displayed in "A" or "kA" unit. (It is output in "A" unit during communication.) Instantaneous current, maximum value for each phase can be measured and displayed.

Single-phase 2-wire → I1
 Single-phase 3-wire → I1, I2
 Three-phase 3-wire → I1: R phase, I2: T phase
 Three-phase 4-wire → I1: R phase, I2: S phase, I3: T phase

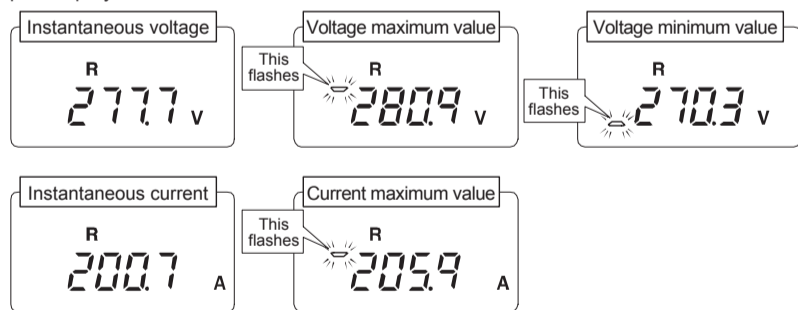
Secondary-Side Rated Current x 1.2 x CT Ratio	Measuring Range	Remarks
0.06 A or greater, but less than 10 A	0.000 to 9.999 A	
10 A or greater, but less than 100 A	0.00 to 99.99 A	
100 A or greater, but less than 1 kA	0.0 to 999.9 A	
1 kA or greater, but less than 10 kA	0 to 9999 A	
10 kA or greater, but less than 100 kA	0.00 to 99.99 kA	
100 kA or greater	0.0 to 999.9 kA	

2.4.1 Display Switching Procedure between Instantaneous Voltage and Current

The following procedure is used to switch between instantaneous voltage, maximum value and minimum value displays, and to switch to individual phases. The instantaneous current display can be switched in the same operation, except the current minimum value cannot be displayed.



<Example Displays for Various Measured Values>

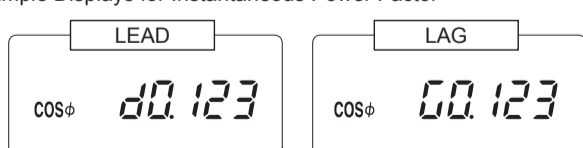


2.5 Instantaneous Power Factor

The instantaneous power factor at a given point of time is displayed. (The power factor value is the rms power factor.)

LEAD: -, LAG: +
 Measuring Range: -0.500 to 1.00 to +0.500
 Minimum Resolution: 0.001

<Example Displays for Instantaneous Power Factor >



2.6 Frequency

The frequency (Hz) of the voltage line input to V1 is displayed and output.

Measuring Range: 45.0 to 65.0Hz
 Minimum Resolution: 0.1Hz

3. Measured Value Resetting Procedures

This chapter describes the procedures for resetting measured values of voltage maximum/minimum values, current maximum value, active energy, regenerative energy, reactive energy (LEAD/LAG) and apparent energy.

3.1 Resetting Voltage Maximum/Minimum Values and Current Maximum Value

The following procedure simultaneously resets voltage maximum value, voltage minimum value, and current maximum value.

Display	Key Operation	Description
Measured Value Display 123456 ^w _h	Hold SET/ENT and Down for 5 seconds or longer.	Any measured value is displayed on the measured value display. Holding down the <SET/ENT> and <Down> keys simultaneously for 5 seconds or longer resets the measured value after about one second.

3.2 Resetting Electric Energy

This section describes the procedure for resetting active energy, LAG reactive energy, LEAD reactive energy, apparent energy and regenerative energy.

The procedure shown below is used to reset the active energy. Other electric energy can be reset in the same operation. The displayed electric energy is reset.

Display	Key Operation	Description
Active Energy 123456 ^w _h	Hold SET/ENT and Up for 5 seconds or longer.	The active energy is displayed on the measured value display. Holding down the <SET/ENT> and <Up> keys simultaneously for 5 seconds or longer resets the measured value after about one second.

4. Troubleshooting

4.1 Errors at Power-on

The following errors may occur at power-on.

Error Indications				Type of Error	Status			Remedy
Measured value display	Power light	Communication light	Integrated pulse light		Power computation	Communication	Pulse output	
E000	Undetermined	Lights off	Lights off	RAM error	Stopped	Stopped	Stopped	This is an equipment failure. Have the equipment repaired.
E001				ROM error				
E002				System data error				
E003				Calibration data error				
E004				Parameter error				
E005	Lights off	Normal operations	Lights off	Backup data error	Operates in Error Status 2			

Communication Parameter	Communication Protocol	Address	Baud Rate	Parity	Stop Bit	Data Length
Error Status 1	PC link with SUM	FF	9600 bps	None	1 bit	8 bits
Error Status 2						

In Error Status 2 on a UPM100 without display function, the UPM100 operates according to the communication parameters set by the DIP switches.

4.2 Errors during Operation

The following errors may occur during operations.

Error Indications				Type of Error	Status			Remedy
Measured value display	Power light	Communication light	Integrated pulse light		Power computation	Communication	Pulse output	
E006	Lights off	Normal operations	Normal operations	EEPROM error	Normal operations	Normal operations	Normal operations	This is an equipment failure. Have the equipment repaired.
E007			Lights off	ADC error	Stopped		Stopped	
r-out	Lights on	Normal operations	Normal operations	Excessive input	Normal operations	Normal operations	Normal operations	Check the input.
Flashes ¹	Flashes at 125-ms intervals			Communication error			Normal operations	The unit is restored when a normal frame is received.

¹: The following are the details of excessive and insufficient inputs.

- When the power, current, or voltage which is 120% or greater of the primary-side ratings is input, r-out and the measured value will flash alternately.
Remedy: Reduce the input to less than 120%.
- When voltage which is less than 10% of the primary-side rating is input, r-out and the measured value flash alternately.
Remedy: Increase the input to 10% or more.
- When power factor is outside measuring range, r-out and 00500 or 00500 flash alternately.
Remedy: Set the power factor within the range.
- When the frequency is outside measuring range, r-out and 450 flash alternately.
Remedy: Set the frequency within the range.
- When the instantaneous reactive power is outside measuring range, r-out and measured value flash alternately.
Remedy: Set the input of 5% or more of primary-side rated current.

4.3 Errors during Parameter Setting Procedures

The following errors may occur while setting parameters.

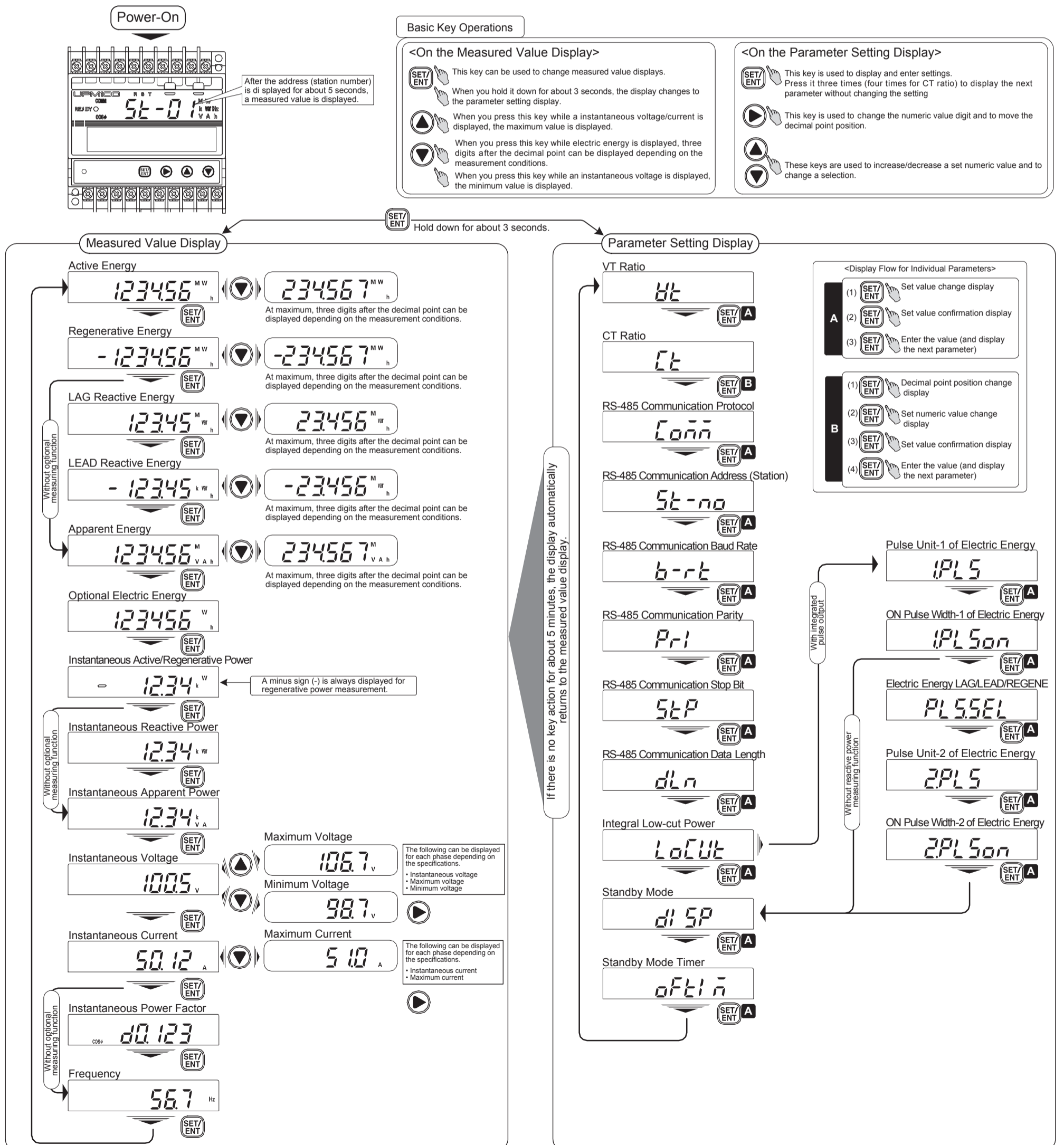
Error Indications				Type of Error	Status			Remedy
Measured value display	Power light	Communication light	Integrated pulse light		Power computation	Communication	Pulse output	
r-out	Lights on	Normal operations	Normal operations	Setting is outside the range.	Normal operations	Normal operations	Normal operations	Press the <Move> key to go back to the parameter. Pressing the <SET/ENT> key cancels the setting and restores the previous set value.

²: If the integrated ON pulse width setting is outside the range due to the VT ratio and CT ratio settings, pulse output will be stopped.

This manual describes the parameter maps showing the flow of measured value displays and parameter displays. It also provides a summary of the measuring ranges and parameter setting ranges for reference purposes.

- 1. Basic Key Operations and Parameter Maps ----- P.1
- 2. Display Ranges for Measured Values ----- P.2
- 3. Setting Ranges for Parameters ----- P.2

1. Basic Key Operations and Parameter Maps



2. Display Ranges for Measured Values

2.1 Active Energy

Type	Secondary-side Rated Power × VT Ratio × CT Ratio	Integration Display Range	Remarks
(1)	Less than 1 MW	0 to 999999 kWh	Six digits, without decimal point
(2)	1 MW or greater, but less than 10 MW	0.00 to 9999.99 MWh	Six digits, with decimal point
(3)	10 MW or greater	0.0 to 99999.9 MWh ¹	Six digits, with decimal point

1: When "Integral resolution Wh" is specified, the type (3) is applied for the integration display range. The unit is kWh. Optional Electric Energy: 0 to 999999 Wh

2.2 Regenerative Energy

Type	Secondary-side Rated Power × VT Ratio × CT Ratio	Integration Display Range	Remarks
(1)	Less than 1 MW	0 to -999999 kWh	Six digits, without decimal point
(2)	1 MW or greater, but less than 10 MW	0.00 to -9999.99 MWh	Six digits, with decimal point
(3)	10 MW or greater	0.0 to -99999.9 MWh ²	Six digits, with decimal point

2: When "Integral resolution Wh" is specified, the type (3) is applied for the integration display range. The unit is kWh.

2.3 Reactive Energy

Type	Secondary-side Rated Power × VT Ratio × CT Ratio	Integration Display Range	Remarks
(1)	Less than ±1 Mvar	±0 to ±99999 kvarh	Five digits, without decimal point
(2)	±1 Mvar or greater, but less than ±10 Mvar	±0.00 to ±9999.99 Mvarh	Five digits, with decimal point
(3)	±10 Mvar or greater	±0.0 to ±99999.9 Mvarh ³	Five digits, with decimal point

3: When "Integral resolution Wh" is specified, the type (3) is applied for the integration display range. The unit is kvarh.

2.4 Apparent Energy

Type	Secondary-side Rated Power × VT Ratio × CT Ratio	Integration Display Range	Remarks
(1)	Less than 1 MVA	0 to 999999 kVAh	Six digits, without decimal point
(2)	1 MVA or greater, but less than 10 MVA	0.00 to 9999.99 MVAh	Six digits, with decimal point
(3)	10 MVA or greater	0.0 to 99999.9 MVAh ⁴	Six digits, with decimal point

4: When "Integral resolution Wh" is specified, the type (3) is applied for the integration display range. The unit is kVAh.

2.5 Instantaneous Active Power

Secondary-side Rated Power × 1.2 × VT Ratio × CT Ratio	Measuring Range	Remarks
6W or greater, but less than 100W	0.00 to 99.99 W	
100W or greater, but less than 1kW	0.0 to 999.9 W	
1kW or greater, but less than 10kW	0 to 9999 W	
10kW or greater, but less than 100kW	0.00 to 99.99 kW	
100kW or greater, but less than 1MW	0.0 to 999.9 kW	
1MW or greater, but less than 10MW	0 to 9999 kW	
10MW or greater, but less than 100MW	0.00 to 99.99 MW	
100MW or greater, but less than 1GW	0.0 to 999.9 MW	
1GW or greater	0 to 9999 MW	

2.6 Instantaneous Reactive Power

Secondary-side Rated Power × 1.2 × VT Ratio × CT Ratio	Measuring Range	Remarks
6var or greater, but less than 100var	0.00 to 99.99 var	
100var or greater, but less than 1kvar	0.0 to 999.9 var	
1kvar or greater, but less than 10kvar	0 to 9999 var	
10kvar or greater, but less than 100kvar	0.00 to 99.99 kvar	
100kvar or greater, but less than 1Mvar	0.0 to 999.9 kvar	
1Mvar or greater, but less than 10Mvar	0 to 9999 kvar	
10Mvar or greater, but less than 100Mvar	0.00 to 99.99 Mvar	
100Mvar or greater, but less than 1Gvar	0.0 to 999.9 Mvar	
1Gvar or greater	0 to 9999 Mvar	

2.7 Instantaneous Apparent Power

Secondary-side Rated Power × 1.2 × VT Ratio × CT Ratio	Measuring Range	Remarks
6VA or greater, but less than 100VA	0.00 to 99.99 VA	
100VA or greater, but less than 1kVA	0.0 to 999.9 VA	
1kVA or greater, but less than 10kVA	0 to 9999 VA	
10kVA or greater, but less than 100kVA	0.00 to 99.99 kVA	
100kVA or greater, but less than 1MVA	0.0 to 999.9 kVA	
1MVA or greater, but less than 10MVA	0 to 9999 kVA	
10MVA or greater, but less than 100MVA	0.00 to 99.99 MVA	
100MVA or greater, but less than 1GVA	0.0 to 999.9 MVA	
1GVA or greater	0 to 9999 MVA	

2.8 Instantaneous Voltage

Secondary-side Rated Voltage × 1.2 × VT Ratio × CT Ratio	Measuring Range	Remarks
100V or greater, but less than 1kV	0.0 to 999.9 V	
1kV or greater, but less than 10kV	0 to 9999 V	
10kV or greater, but less than 100kV	0.00 to 99.99 kV	
100kV or greater, but less than 1MV	0.0 to 999.9 kV	
1MV or greater	0 to 9999 kV	

2.9 Instantaneous Current

Secondary-side Rated Current × 1.2 × VT Ratio × CT Ratio	Measuring Range	Remarks
0.06A or greater, but less than 10A	0.000 to 9.999 A	
10A or greater, but less than 100A	0.00 to 99.99 A	
100A or greater, but less than 1kA	0.0 to 999.9 A	
1kA or greater, but less than 10kA	0 to 9999 A	
10kA or greater, but less than 100kA	0.00 to 99.99 kA	
100kA or greater	0.0 to 999.9 kA	

2.10 Instantaneous Power Factor

LEAD: -, LAG: +
Measuring Range: -0.500 to 1.00 to +0.500
Minimum Resolution: 0.001

2.11 Frequency

Measuring Range: 45.0 to 65.0Hz
Minimum Resolution: 0.1Hz

3. Setting Ranges for Parameters

Parameter Symbol	Parameter Name	Setting Range	Initial Setting
<i>vt</i>	VT ratio (VT)	1 to 6000 <Variable numeric parameter>	1
<i>ct</i>	CT ratio (CT)	0.05 to 32000 <Variable numeric parameter (decimal point can be moved)> (with 5 significant digits; can be set to the second place of a decimal point.)	1.00
<i>com</i>	RS-485 communication protocol (COMM)	PC link (without SUM) <i>PCLK1</i> (PCLK1) PC link (with SUM) <i>PCLK2</i> (PCLK2) MODBUS (ASCII) <i>ASC</i> (M ASC) MODBUS (RTU) <i>RTU</i> (M RTU) UPM01 protocol <i>UPM01</i> <Selective parameter>	PCLK2
<i>st-no</i>	RS-485 station number (ST-NO)	1 to 99 (1 to 31 recommended) <Variable numeric parameter>	1
<i>b-rt</i>	RS-485 communication baud rate (B-RT)	2400, 9600, 19200 (bps) <Selective parameter>	9600 (bps)
<i>prl</i>	Parity (PRI)	None: <i>none</i> (NONE) Even: <i>even</i> (EVEN) Odd: <i>odd</i> (ODD) <Selective parameter>	NONE
<i>stp</i>	Stop bit (STP)	1 or 2 bits <Selective parameter>	1
<i>dln</i>	Data length (DLN)	7 or 8 bits <Selective parameter>	8
<i>locut</i>	Integral low-cut power (LOCUT)	0.05 to 20.00 (%) (percent of rated power) <Variable numeric parameter>	0.05 (%)
<i>pls</i>	Pulse unit-1 of electric energy (1.PLS)	Increments of 10 Wh/pulse in range from 10 to 500000 (Wh/pulse) * (display: 000.01 to 500.00 kWh/pulse) <Variable numeric parameter> *: 1 to 50000 Wh/pulse for Integral resolution Wh	1.00 kWh/pulse
<i>pls-on</i>	ON pulse width-1 of electric energy (1.PLSON)	Increments of 10 ms in range from 10 to 1270 ms <Variable numeric parameter>	50 (ms)
<i>pls-sel</i>	Electric energy pulse LAG/LEAD/REGENE (PLS.SEL)	Select either reactive energy LAG, LEAD or regenerative energy <Selective parameter>	REGENE (regenerative energy) or LAG* *: When reactive power option is specified.
<i>2pls</i>	Pulse unit-2 of electric energy (2.PLS)	Increments of 10 Wh/pulse or varh/pulse in range from 10 to 500000 (Wh/pulse or varh/pulse) * (display: 000.01 to 500.00 kvarh/pulse) <Variable numeric parameter> *: 1 to 50000 Wh/pulse or 1 to 50000 varh/pulse for Integral resolution Wh	1.00 kWh/pulse or 1.00 kvarh/pulse * *: When reactive power option is specified.
<i>2pls-on</i>	ON pulse width-2 of electric energy (2.PLSON)	Increments of 10 ms in range from 10 to 1270 ms <Variable numeric parameter>	50 (ms)
<i>disp</i>	Standby mode (DISP)	ON or OFF <Selective parameter>	ON
<i>oftim</i>	Standby mode timer (OFTIM)	1 to 60 minutes <Variable numeric parameter>	10 (min)