Panasonic ®

KW2M-A
Eco-POWER METER

User's Manual

Cautions for Your Safety

Read the manual carefully before installing, running and maintenance for proper operation. Before using, master the knowledge of the equipment, safety information and all of other notes.

This manual uses two safety flags to indicate different levels of danger.

⚠ WARNING	A handling error could cause serious physical injury to an operator and in the worst case could even be fatal.

●Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. In the USA, see NFPA 70E.

●Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.

●Do not use this product in areas with inflammable gas. It could lead to an explosion.

●Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

●Do not open the secondary side of CT during power on the primary side current.
It might cause electric shock or CT breakdown.

⚠ CAUTION	A handling error could cause serious physical injury to an operator or damage to the equipment.

●To prevent abnormal exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
●Do not dismantle or remodel the product. It could lead to abnormal exothermic heat or smoke generation.
●Do not touch the terminal while turning on electricity. It could lead to an electric shock.
●Use the external devices to function the emergency stop and interlock circuit.
●Connect the wires or connectors securely. The loose connection might cause abnormal exothermic heat or smoke generation.
●Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It might cause exothermic heat or smoke generation.
●Do not undertake construction (such as connection and disconnection) while the power supply is on.
●Never remove the terminal block under applying current to load.
It might cause electric shock or CT breakdown.
●Do not use at secondary side circuit of inverter. It might cause exothermic heat or damage.

Copyright and trademark

Introduction

Thank you very much indeed for purchasing
KW2M-A Eco-POWER METER.
In this manual, we explain the usage of KW2M-A
Eco-POWER METER in detail.
Please use it correctly after understanding the content
enough.

Table of Contents

Cautions before using

■ About this product

<u>**Eco-POWER METER is designed chiefly to manage saving energy.**</u>
<u>**It is neither nor can it be legally used for billing.**</u>

■ Installation environment

◇ Do not use the Unit in the following environments.

・Where the unit will be exposed to direct sunlight and where the ambient temperature is outside the range of -10 to 50 °C.
・Where the ambient humidity is outside the range of 30 to 85 % RH (at 20℃), non-condensing and where condensation might occur by sudden temperature changes
・Where inflammable or corrosive gas might be produced
・Where the unit will be exposed to excessive airborne dust or metal particles
・Where the unit will be exposed to water, oil or chemicals
・Where organic solvents such as benzene, paint thinner, alcohol, or strong alkaline solutions such as ammonia or caustic soda might adhere to the product
・Where direct vibration or shock might be transmitted to the product, and where water might wet the product
・Where the place near high-voltage cable, high-voltage device, power line, power device.
・Where the place near a machinery with transmission function such as amateur radio.
・Where the place near a machinery which occurs the big switching serge

◇ Please use the Unit according to the specifications described in this manual. Otherwise, it may malfunction or cause fire and an electric shock.

・Connect to the power supply in compliance with the rating.
・Refer to the wiring diagram to ensure proper wiring for the power supply, input and output.
・Use the wire that conforms to the rated current.
・Do not perform wiring or installation with a live line. It may also lead to circuit burnout or fire by way of the secondary CT side opening.

■ Installation

・Eco-POWER METER is designed to be used in a control panel.
・If the additional noise effects the power supply line, incorrect measurements may result.
・Installation and wiring must be performed by expert personnel for electrical work or electric piping.
・Do not add an excess power to the display. It might break the inner liquid crystal.
・Although the case is made from fireproof resin, do not mount it next to flammable materials. Also, avoid placing it directly on top of materials that catch fire easily.
・If the operating power supply surge exceeds the following value, the internal circuit could be destroyed, so be sure to use a surge absorption element.

Surge voltage	6,000V

Standard surge waveform
The above value is the surge-voltage resistance at ± (1.2/50) μs of single-polarity full-wave voltage.

Surge wave form
[± (1.2/50) μs single-polarity full-wave voltage]
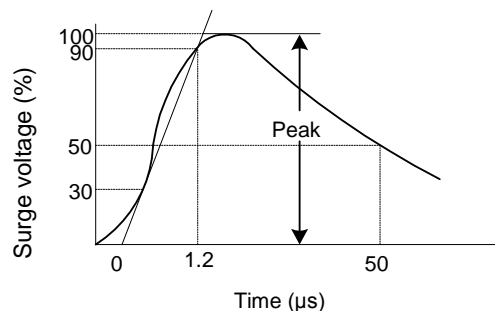
・External noise up to the level shown below is treated as noise voltage, but levels higher than this could lead to malfunctioning or damage to the internal circuit. Although the case is made from fireproof resin, do not mount it next to flammable materials.

	Between operating power supply terminals
Noise voltage	1,500V

Noise wave form (noise simulator)
Rise time: Pulse width: 1 μs, 50 ns
Polarity: Cycle: 10 ms

Note) Accurate measurement may not be possible if excessive noise gets added to the input line.

・This product is designed to be used only with our options.
 Options from other companies are not compatible.

■ As to measurement
・If there is some distortion by harmonic or waveform, it may not measure correctly.
 Please check with the actual system before adopts it.
・It might not measure an instantaneous current such as an inrush current or an welding machine.
・When measuring the below loads, it might not satisfy with the accuracy guarantee.
  Out of rating current, Load with low power factor,
  Load with winding current, Load with ferromagnetic field
・Power factor operation is a method assuming balanced load. The error might be big when it measures unbalanced load.
・If the voltage to be measured is not the rated frequency (commercial frequency), it may take time to stabilize THD (total harmonic distortion).

■ Static electricity
・Discharge static electricity touching the grounded metal etc. when you touch the unit.
・Excessive static electricity might be generated especially in a dry place.

■ Cleaning
・Wipe dirt of the main unit with soft cloth etc. When thinner is used, the unit might deform or be discolored.

■ Power supply
・Connect a breaker to the voltage input part for safety reasons and to protect the device.
 The breaker that connects to the voltage input part must arrange at the position easily reached, and display shows it is the breaker of the equipment.
・Do not turn on the power supply or input until all wiring is completed.

■ Before power on
Please note the following points when turning on power at the first time.
・Confirm there are neither wiring rubbish nor especially an electrical conduction when installed.
・Confirm neither the power supply wiring, the I/O wiring nor the power-supply voltage are wrong.
・Tighten the installation screw and the terminal screw surely.
・Use an electric wire applicable to the rated current.

■ Before change the setup
Set the password carefully.
In order to avoid unexpected change the settings, it can set password. However, if you forget the password you can't change the settings.
We recommend you to note the password when you set and change the password.

■ Precautions on using networks

This product supports various network connections therefore it is likely to be subject to the following security risks.

    1. Leakage and outflow of information via this product

    2. Illegal operation by third party with malicious acts

    3. Interference and shut down by third party with malicious acts

It is recommended to take network security measures such as below for protecting against these risks under your responsibility.

    ・Use this product on the network that has been ensuring safety by using firewall

    ・Check and extermination against the infection of computer viruses and unauthorized program are you make sure that you have performed regularly

    ・To protect against unauthorized attacks, set the user name and password, and to limit the users who can log in.

    ・Restrict access by user authentication so that authentication information (user name, password) and network configuration information and equipment inside information is not leak on the network.

    ・Before you access this product via browser, close other windows.

    ・After you access this product via browser, close all browsers.

    ・Change password regularly.

    ・Do not install the place where it can be disassembled or remodeled easily.

We do not accept liability for the following cases.

    1) Guarantee for any kind of damages to the things/products, caused by physical defects of the product.

    2) When the other conditions than the ones specified in these specifications exist for handling, storage and transportation of the product after the delivery.

    3) When damage is caused by the unpredictable phenomena with the technique that was practiced before the product delivery.

    4) When damage is caused by natural disasters such as an earthquake, flood, fire, war and artificial disasters.

    5) When necessary countermeasures are not taken to establish a system despite the precautions described in this specifications.

Chapter 1 Unit's Outline

With KW2M-A Eco-POWER METER, electrical power (voltage, current, etc.), power factor, frequency, etc. are measured using AC voltage and AC current input via one of the following systems: single-phase two-wire system, single-phase three-wire system, three-phase three-wire system or three-phase four-wire system.
In addition, it measures harmonics and THD for power quality measurement.
Connecting the expansion unit to the main unit can measure up to 8-circuit (up to 24-circuit of single-phase 2-wire system). One unit can measure 2-circuit.

■**Eco-POWER METER is designed chiefly to manage saving energy. It is neither intended nor can it be legally used for billing.**

1.1 Model Number

Model name	Model number
KW2M-A Eco-POWER METER Main unit	AKW263100A
KW2M-A Eco-POWER METER Expansion unit (Power measurement)	AKW272100A

* It can't measure with only the expansion unit. Be sure to use with connecting to main unit.

1.2 Measurement outline

Phase/Wire system	Single-phase two-wire (1P2W) Single-phase three-wire (1P3W) Three-phase three wire (3P3W) Three-phase four-wire (3P4W)	(common)
Applicable power system	100V system, 200V system, 400V system	
Measurement circuit	Main unit	1-system 2-circuit (when measuring 1P2W: 1-system 6-circuit)
	Expansion unit	1-system 2-circuit (when measuring 1P2W: 1-system 6-circuit)
Input measurement voltage	0 to 690VAC *0 to 300V for UL61010-1	
Input measurement current	1 to 65,535A	
Applicable current sensor	Secondary side output: 1A or 5A	

1.3 Measurement items

Item		Unit	Display data range	
Instantaneous power	Active	W	-999.99G to 999.99G	Present value Max. value Min. value
	Reactive	var		
	Apparent	VA		
Total integral power (import)	Active	Wh	0.000k to 9999.9P	Present value
	Reactive	varh		
	Apparent	VAh		
Total integral power (export)	Active	Wh	0.000k to 9999.9P	Present value
	Reactive	varh		
Current		A	0.000 to 99.999k	Present value Max. value Min. value
Voltage		V	0.00 to 999.99k	
Power factor			-1.000 to 0.000 to 1.000	
Frequency		Hz	0.00 to 99.99	
Pulse count value			0.000 to 99999999	Present value
Power conversion value			0.000 to 99999999	Present value

* 'Display data range' is the range to be able to indicate with the main unit display, it is not a range that can be measured.

・Power Quality

Item		Display data range	
Unbalanced current	Each phase	0.00 to 300.00 %	Present value Max. value Min. value
Unbalanced voltage	Each phase		
Current THD (total harmonic distortion)	Each phase	0.00 to 400.00 %	Present value
Voltage THD (total harmonic distortion)	Each phase		
Current harmonics (2nd to 31st)	Each phase		
Voltage harmonics (2nd to 31st)	Phase		
	Line		
Hour Meter	ON-time	0.0 to 99999.9 h	
	OFF-time		
	Stand-by time		
	Maintenance time		

* If the voltage to be measured is not the rated frequency (commercial frequency), it may take time to stabilize THD (total harmonic distortion).

・Demand

Item		Unit	Display data range	
Present demand　　*1	Active	W	0.000k to 999.9M	Present value Max. demand
	Reactive	var		
	Apparent	VA		
	Active (export)	W		
	Reactive (export)	var		
	Current	A		

* Please use this demand function as your standard.
  The demand value calculated with this function is not guaranteed.

<Glossary>
Eco-POWER METER defines as below.

THD (total harmonic distortion)	Ratio of harmonic distortion (voltage or current) for the fundamental frequency. Lower the value shows that the distortion is less.
Harmonics	Sinusoidal wave other than fundamental frequency. It has frequency that is whole-number multiple of the fundamental frequency. The frequency that has 2 times frequency (half wavelength) is called 2nd-order harmonics.
Voltage unbalancing	The different between each phase-voltage due to the load unbalancing. It is calculated as below. $$\frac{|\text{Max. (Min.) voltage of all phase}-\text{average voltage}|}{\text{Average voltage}} \times 100 \ (\%)$$
Current unbalancing	The difference between each-phase current due to the load unbalancing. It is calculated as below. $$\frac{|\text{Max. (Min.) current of all phase}-\text{average current}|}{\text{Average current}} \times 100 \ (\%)$$
Power interruption	Voltage under 5% of rating is kept 5ms or more,
Under voltage	Set the ratio for the rated voltage and it is used for threshold. Voltage under the set ratio is kept 5ms or more, it will judge as under voltage.
Under current	Set the ratio for the rated current and it is used for threshold. Current under the set ratio is kept 5ms or more, it will judge as under current.
Over current	Set the ratio for the rated current and it is used for threshold. Current over the set ratio is kept 5ms or more, it will judge as over current.
Demand by IEC61557-12	Based on IEC61557-12 Performance measuring and monitoring devices (PMD)
Sliding block interval demand	It calculates by measured power via CT with setting interval. Set power interval by 1 to 60(min.) (every 1-min.). It calculates demand during latest finished interval and displays. One interval is started every setting time.
fixed block interval demand	It calculates by measured power via CT with setting interval. Set power interval by 1 to 60 (min.) (every 1-min.) It calculates demand during latest finished interval and displays. After one interval finishes, the next interval starts.
Current demand	It calculates based on a thermal demand meter. It measures an average current (current demand) within setting interval and the max. value is considered as max. current demand.

Chapter 2 Parts Name and Working

2.1 Parts Names

<Front>

Power supply terminals

Voltage input terminals

Display

Operation keys

Indicators

<Bottom view>

Ethernet port
Left: port 1
Right: port 2

RS485 communication terminals

Pulse I/O terminals

Current input terminals
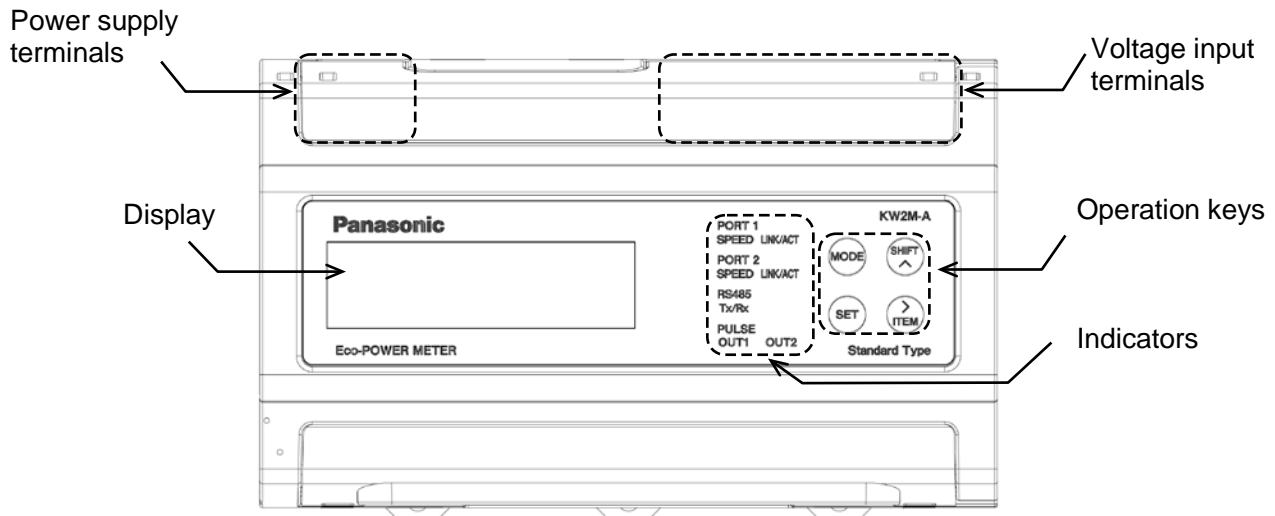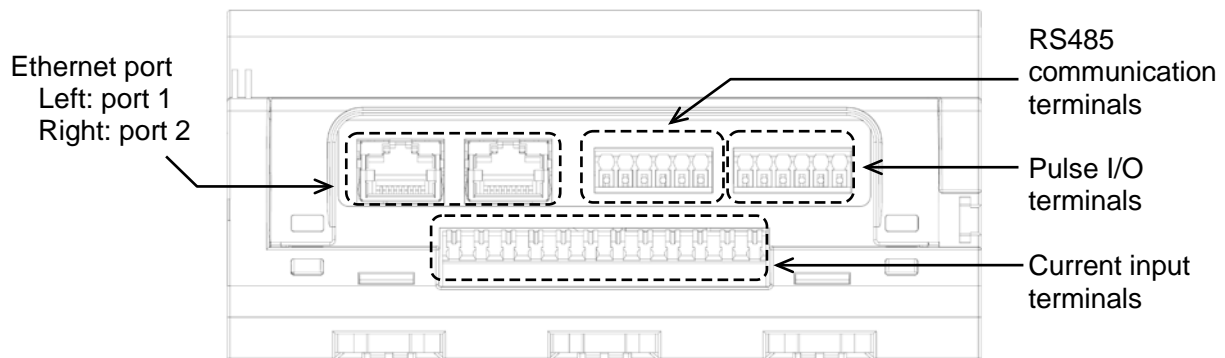
2.2 Key's functions

Key		Functions
<MODE>	Measuring mode	Shift to setting mode
	Setting mode	Shift to setting confirmation mode and measuring mode
<SET>	Setting mode	Set setting items and setting values
<SET> (continuous 3-sec)	Measuring mode Demand mode	All keys locked
	Lock mode	Release the lock mode
<SHIFT/∧> <ITEM/＞>	Measuring mode	Select measuring item to display
	Setting mode	Select a setting value
	Demand mode	Select demand item to display
<MODE>+<SET>	Measuring mode Demand mode	Select unit to display
<MODE>+<SHIFT/∧>	Measuring mode	Shift to demand mode
	Demand mode	Shift to measuring mode

●Lock mode

It is the mode makes all keys unable. In this mode, you can not input by any keys.
When you press <SET> continuously for about 3sec., lock mark is displayed.
Press <SET> continuously for about 3sec. again to release Lock mode.

Chapter 3   Wiring

Be sure to wire correctly according to the terminal arrangement and wiring diagrams.
Please connect a fuse or a breaker to power supply part for safety reasons and to protect the device.
This has no built-in power switch, circuit breaker or fuse for measured voltage input parts.
Therefore it is necessary to install them in the circuit near this unit.
Do not turn on the power supply or input until all wiring is completed.

3.1 Main unit terminal arrangement

Power supply terminals

Terminal number	1	2
Functions	L +	N−
	Power supply	

Voltage input terminals

Terminal number	1	2	3	4	5	6	7
Functions	V1	NC	V2	NC	V3	NC	Vn
	Measured voltage	vacant	Measured voltage	vacant	Measured voltage	vacant	Measured voltage

  *Do not use NC (vacant) terminals in any purpose.

Current input terminals

Terminal number	1	2	3	4	5	6	7	8	9	10	11	12
Functions	K	L	K	L	K	L	K	L	K	L	K	L
	CH1(CT1)		CH1(CT2)		CH1(CT3)		CH2(CT1)		CH2(CT2)		CH2(CT3)	
	Measured current (CH1)						Measured current (CH2)					

RS485 communication terminals

Terminal number	1	2	3	4	5	6
Functions	+	+	-	-	END	END

  *Each terminal is connected internal.

Pulse I/O terminals

Terminal number	1	2	3	4	5	6
Functions	+	-	+	-	+	-
	Pulse input		Pulse output (CH1)		Pulse output (CH2)	

  *It is insulated between OUT1 and OUT2.

⚠ **The input voltage to each terminal is as follows.**

Terminal	Phase and wire system	Terminal No.	Input voltage	
Power supply	Single-phase two-wire	1 - 2 (L+ - N−)	100-240V AC [100-240V ∿]	
Voltage input terminals				
Measured voltage input	Single-phase two-wire	1 - 7 (V1-Vn)	0-690VAC [0-690V ∿]	(L-L)
	Single-phase three-wire	1 - 5 - 7 (V1-V3-Vn)	0-690VAC [0-690V ∿ :3W] 0-345VAC [0-345V ∿ :3W]	(L-L) (L-N)
	Three-phase three-wire	1 - 5 - 7 (V1-V3-Vn)	0-690VAC [0-690V 3∿]	(L-L)
	Three-phase four-wire	1 - 3 - 5 - 7 (V1-V2-V3-Vn)	0-690VAC [0-690V 3∿] 0-398VAC [0-398V 3N∿]	(L-L) (L-N)

◆Applicable wire (Crimp-type terminal is recommended.)
・Stripping length: 7 to 8mm
・Power supply/Measured voltage
    Screw type: M3
    Tightening torque: 0.5 to 0.6N・m
    Sectional area: single /stranded wire 0.13 to 6mm^2(AWG26 to12)
           ・for 2pcs.
           single/stranded wire 2pcs.×0.5 to 2.5mm^2 (AWG20 to 12)

・Measured current (CT input)
    Screw size: Push IN type
    Sectional area: single /stranded wire 0.13 to 1.5mm^2(AWG24 to16)

    *Use applicable wire according to the measured current.

・RS485 communication
    Screw size: Push IN type
    Sectional area: single /stranded wire 0.13 to 1.5mm^2(AWG24 to16)

    *Use shielded wire for RS485 communication.

・Output/Input
    Screw size: Push IN type
    Sectional area: single /stranded wire 0.13 to 1.5mm^2(AWG24 to16)

3.2 Measured-circuit
・It is not impossible to use to measure several loads by different strain power supply. (2-circuit of same system for 1 unit)
・Each unit (main unit, expansion unit (power measurement, power measurement + pulse output)) can measure 2-circuit of single-phase two-wire system, and 1-circuit of single-phase three-wire system or three-phase three-wire system. Each unit can be used with different phase and wire system. However be sure to check the wiring carefully.
・It is impossible to measure by only the expansion unit. Connect expansion units to main unit.
Up to 3 expansion units are connected to 1 main unit.

*Power source system
・Power source system is the electrical power system from one power source (normally one transformer).
・KW2M-A can measure 1-system max. 24-circuit of 1P2W system and 1-system max. 8-circuit of 1P3W and 3P3W system by connecting a main unit and expansion units.
・In order to measure several systems, it is necessary to use one main unit for each system.

3.3 Connection between the main unit and the expansion unit

・Turn off the power of main unit when connecting expansion units.

・Peel off connector label on the side before connecting.
　(Do not peel off connector labels when not connecting.)
・It expands by connecting each male connector to female connector. Female connector is on the other
　side of male connector.
・After connecting, push the hooks into the unit to fix the expansion unit.
・Up to 3 expansion units can be connected per one main unit.

> Note) Communication will be stopped or the measurement data will be lost when the units are
> removed or connected while turn on power.

Expansion connector (male)

Hook　　　　　　　　　　　　　　　　Hook　　　　　Hook　　Connector label
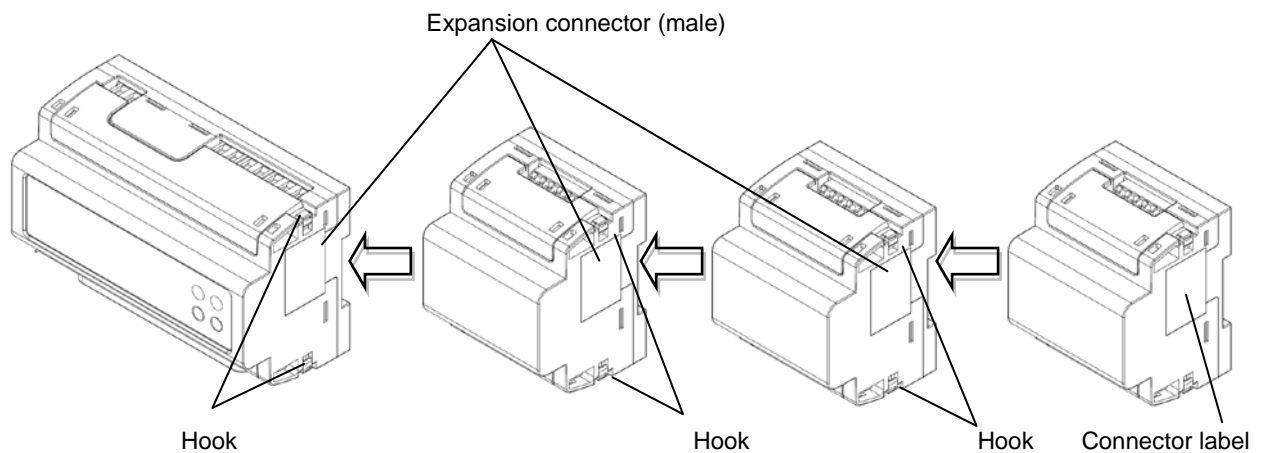
3.4 Wiring Diagrams

Please connect a breaker or a fuse to the power supply and voltage input part for safety reasons and to protect the device.

　　　　·Recommended breaker: 3 to 15A (IEC approved or UL Listed)
　　　　·Recommended fuse　　: Time-lag fuse rated current 2A (IEC approved or UL Listed)

Grounding the secondary side of VT (Voltage transformer) and CT (Current transformer) is not necessary with low-voltage circuit.
*When using several CTs, set each CT approximately 1m apart. If the two CTs are set too close each other, it may not measure accurately due to magnetic field interference.

◆**When measuring a load with rated input voltage**

Single-phase two-wire system
　*One CT is needed to measure single-phase two-wire system.
　*2 CTs are needed to measure 2-circuit and 3 CTs are needed to measure 3-circuit.
　*To measure 2-circuit, wire 1 and 3. To measure 3-circuit, wire 1 and 3 and 5.
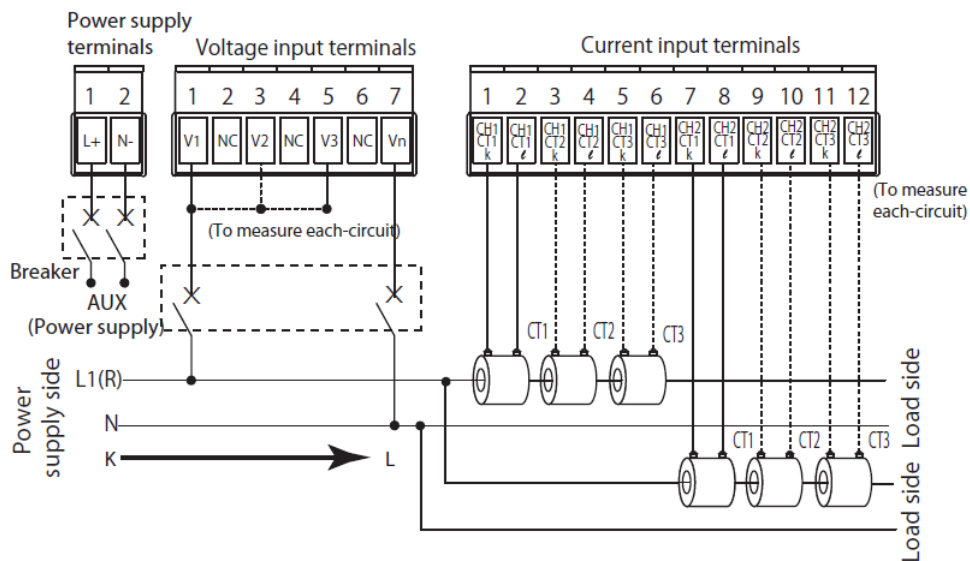
Single-phase three-wire/Three-phase three-wire
　*2 CTs are needed to measure single-phase three-wire system, three-phase three-wire system.
　*4 CTs are needed to measure 2-circuit.
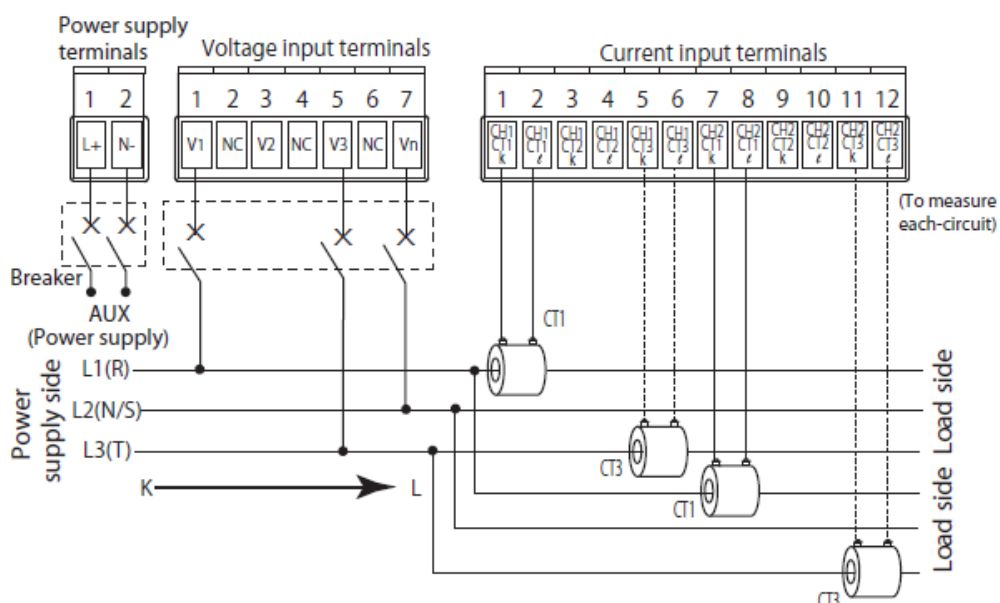
Three-phase four-wire system
   *3 CTs are needed to measure three-phase four-wire system.
   *6 CTs are needed to measure 2-circuit.
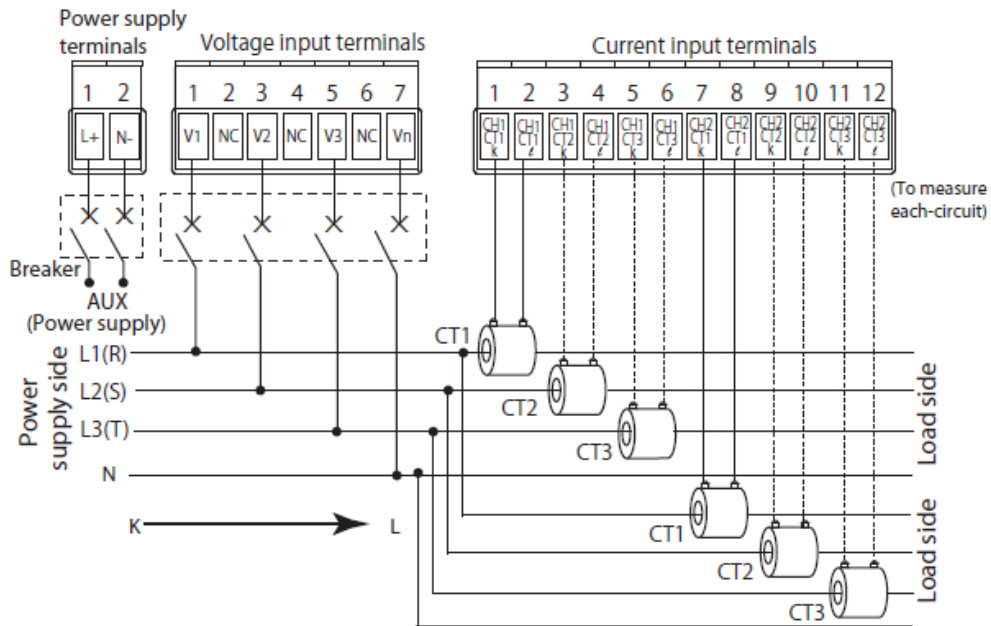
⚠ Vn terminal should be connected to N-phase which is grounded.

◆When measuring a load with exceed input voltage
 Voltage transformer (VT) is needed when you measure a load with over input voltage.
 Use a VT, those secondary voltage rating is 110V.
 Grounding the secondary side of VT and CT is not necessary with low-voltage circuit.
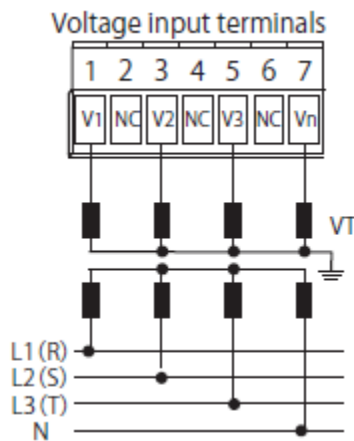
3.5 How to attach the Current Transformer (CT)

⚠️

DANGER
●Never open the secondary circuit of CT under applying current to load.

･Use CT that the secondary side current is 5A or 1A.
･One CT is needed when measuring 1-circuit of 1P2W. Two CTs are needed when measuring 1P3W/3P3W (4 CTs for 2-circuit).Three CTs are needed when measuring 3P4W (6 CTs for 2-circuit). Using all CTs for one unit should be the same.
･Use the applicable wire, or it might cause a breakdown, burnout or electric shock.
･When connecting CT, connect the secondary side to the terminal of the main unit first, and after that wire the primary side to a load electric wire. **Incorrect order might cause an electric shock or break CT.**
･The CT has polarity. Wire correctly according to the K and L marks. **Wrong direction can't measure correctly.**
･If there is some distortion by harmonic or waveform, it may not measure correctly. Please check with the actual system before adopts it.
･Separate the wiring (strong electric part) of the measured voltage input terminal (operating power supply terminal) from the CT cable. It may not satisfy the accuracy due to noise.

◆How to connect CT

(1) Power off the measured devices.
(2) Install applicable CT.
(3) Connect CT to the terminal block.
(4) After confirm all wiring correct, turn on the power of the load and KW2M-A.

(Connection example)
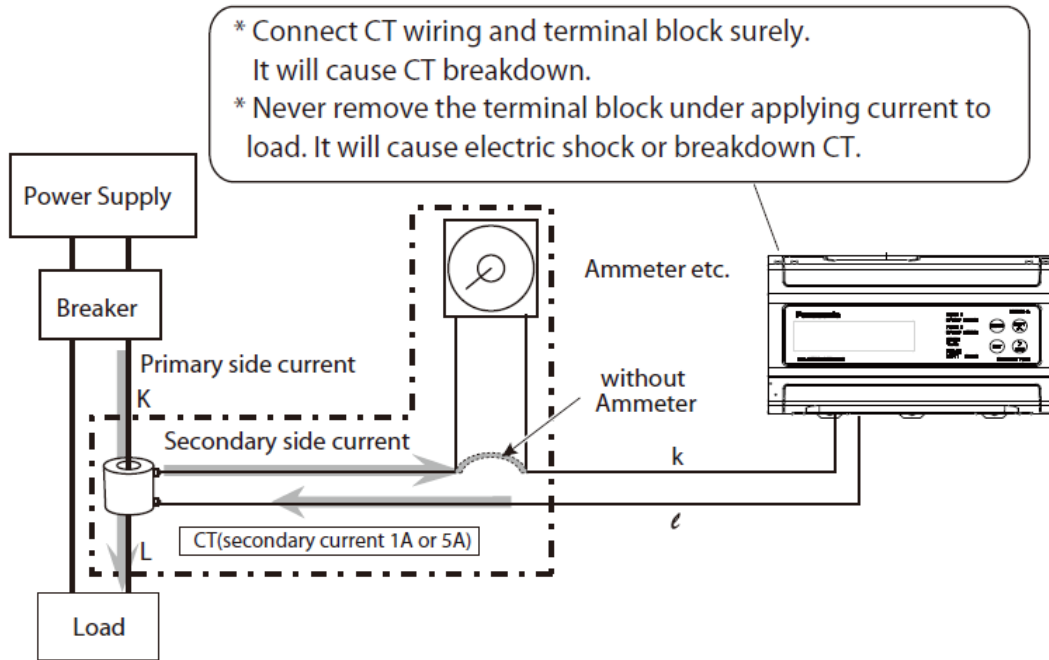
◆How to set the parameters for CT

(1) Select CT type (CT-T) according to the using CT.
    (Select '5A' if secondary side current of using CT is 5A. Select '1A' if secondary side current
     of using CT is 1A.)
(2) Set the primary current of measured CT at primary side current of CT setting mode (CT-1).
    < ex > If the measured CT is 400A/1A or 400A/5A, set to"400".
(3) Connect CT according to the CT direction, power side (K) to load side (L).

3.6 For Input Connection

●Pulse input

・Contact input

Use highly reliable metal plated contacts. Since the contact's bounce time leads directly to error in the count value, use contacts with as short a bounce time as possible. In general, select 30Hz for max.counting speed.

・Non-contact input (Transistor input)

Connect with an open collector. Use the transistor with the following specifications.

V_{CEO}=20V min. I_C=20mA min. I_{CBO}=6μA max

Use transistors with a residual voltage of less than 3V when the transistor is ON.

＊`Short-circuit impedance should be less than 1kΩ.

Open-circuit impedance should be more than 100kΩ.

(When the impedance is 0Ω, drain current is approx. 10mA.)

・Input wiring

Please wire as short as possible by using a shielded wire or a metallic electric wire tube individually.
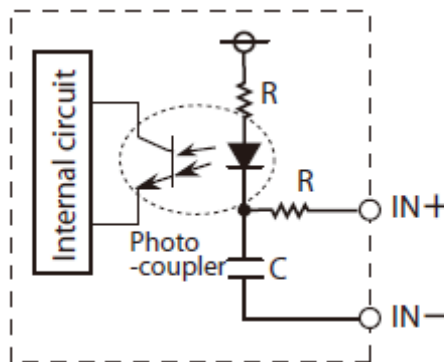
3.7 For Output Connection

●PhotoMOS relay output

・It adopts PhotoMOS relay output, there is no polarity.

Output: Rated capacity 30V AC/DC, 0.1A
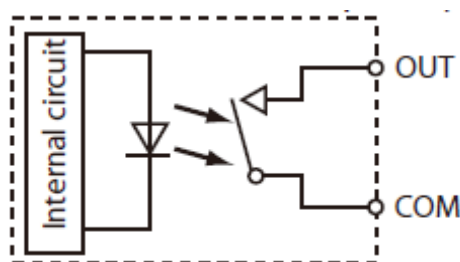
・Do not connect devices that voltage or load exceeds the rated capacity (30V AC/DC,0.1A)

・Please wire less than 100m fir output.

If it is long, it may not work correctly due to floating capacitance.

3.8 RS485 Communication

・When using shielded cable for the RS485 transmission line, ground one end.
  Use a class D dedicated earth for grounding. Do not share a ground with other earth lines. (Fig. 1)
・Be sure to connect with daisy chain the RS485 transmission line between each unit.
  Do not use a splitter. (Fig. 1)
・To avoid noise, separate the transmission line from high-voltage line (power supply, voltage line).

(Fig.1)
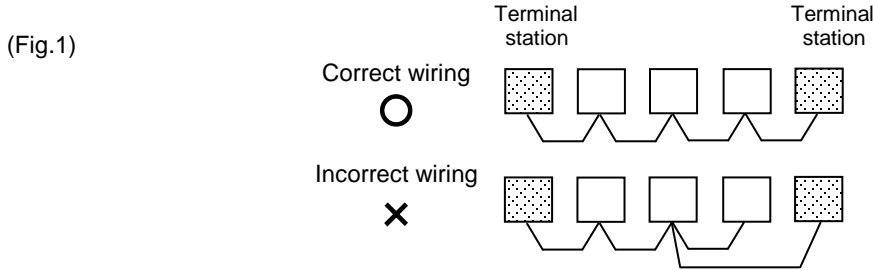
◆How to connect KW2M-A (2-wire) and KW9M (3-wire)
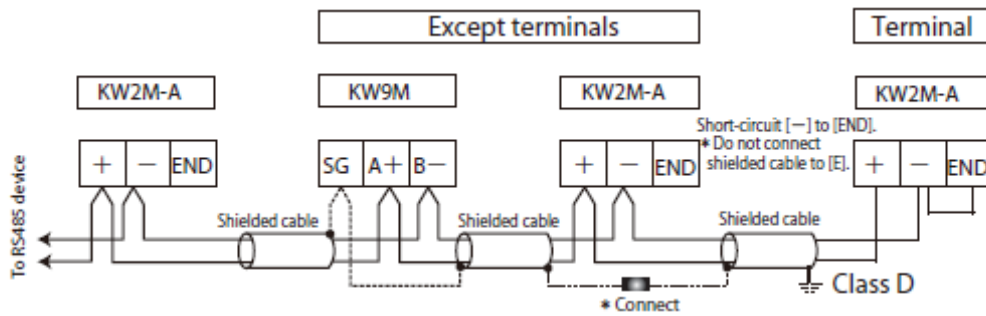
Recommended Cable

Use the transmission cables shown below for Eco-POWER METER RS485 communication system.

Cable	Conductor		Insulator		Cable diameter	Applicable cable
	Size	Resistance (at 20℃)	Material	Thickness		
Twisted-pair with shield	1.25 mm^2 (AWG16) or more	Max.16.8Ω/km	Polyethylene	Max. 0.5 mm	Approx. 8.5 mm	HITACHI KPEV-S 1.25 mm^2×1P Belden Inc. 9860
	0.5 mm^2 (AWG20) or more	Max.33.4Ω/km	Polyethylene	Max. 0.5 mm	Approx. 7.8 mm	HITACHI KPEV-S 0.5 mm^2×1P Belden Inc. 9207
VCTF	0.75 mm^2 (AWG18) or more	Max.25.1Ω/km	PVC	Max. 0.6 mm	Approx. 6.6 mm	VCTF 0.75 mm^2×2C (JIS)

Cable	Section
Twisted-pair with shield	Shield, Jacket, Conductor, Insulator
VCTF	Jacket, Conductor, Insulator

Notes
1) Use shielded type twist cables.
2) Use only one type of the transmission cables.
2) Do not mix different types of the cables.
3) Use twist pair cables under a bad noise environment.

3.9 Low Voltage Directive

For using under the measurement category III, install varistors or SPD between the lines of power supply and the measured voltage input. Use the varistors or SPD which is complied with European standard and specifications to meet power supply and added current.

When using in the application conforming to EN61010-1/IEC61010-1, make sure to satisfy the following conditions.

1) RS485 communication part and pulse input part secure only basic insulation. In order to secure reinforced (double) insulation demanded by EN 61010-1/ IEC61010-1, secure basic insulation or more with load side and reinforced (double) insulation with RS485 communication system side.
2) Provide the voltage input part with an EN60947-1 or EN60947-3 compliant circuit breaker.
3) Use a wire with basic insulation or more for a wire cramped (or connected) CT
4) Vn terminal should be connected to N-phase which is grounded.

【Environmental conditions】
・Overvoltage category III, Pollution degree 2
・Indoor use
・An ambient temperature of -10 to +50℃
・An ambient non-condensing humidity of 30 to 85%RH (at 20℃)
・Altitude of 2000m or less
【Mount the product in a place with】
・A minimum of dust, and an absence of corrosive gases
・No flammable, explosive gasses
・Few mechanical vibrations or shocks
・No exposure to direct sunlight
・No large capacity electromagnetic switches or cables through which large current is flowing

3.10 Symbol List

Symbol	Explanation
∿	AC Voltage
⎓	DC Voltage
CE	CE Mark Confirmation of conformity of the product with the applicable EU directives and compliance with the essential requirements contained in these directives
▣	Protective insulation, device with protection class II
△ c US	Products with this mark comply with both the Canadian and the American requirements

Chapter 4 Settings

You can set basic parameters for measuring using the keys on Eco-POWER METER. For the parameters for other functions, use Web browser to set.
(URL:http//xxx.xxx.xxx.xxx/setup/index.ntm   Put the setting IP address to 'xxx.xxx.xxx.xxx')

After wiring Eco-POWER METER and CT, power on and set the parameters for power measurement, Eco-POWER METER can measure the electric power. In order to use the other functions, set other parameters according to your use.

◆Keys' functions at setting mode

<MODE>	Shift to setting mode
<SET>	Set the items and values
<SHIFT/∧>, <ITEM/＞＞	Select items and change values

◆Parameters for power measurement   ○: Available   －: Not available

Item		Range	Initial value	Setting	
				Keys	Web
Phase/Wire system		1P2W, 1P3W, 3P3W 3P4W	1P2W		
CT type		1, 5 [A]	5A		
Primary side current of CT		1 to 65535 [A]	5A	○	
VT secondary side voltage		100 to 690 [V]	230V		
VT primary side voltage		100 to 500000 [V]	230V		
Over voltage (ON threshold)		0.0 to 120.0 [%]	0.0%	－	○
Over voltage (OFF threshold)					
Under voltage (ON threshold)					
Under voltage (OFF threshold)					
Over current (ON threshold)					
Over current (OFF threshold)					
Under current (ON threshold)					
Under current (OFF threshold)					
Conversion rate (P) total		0.00 to 99.99/1kWh	10.00	○	
Conversion rate (-P) total					
Hour meter threshold		01 to 100.0 [%]	10.0%		
Target phase for hour meter		Phase1, Phase2, Phase3, All	All		
Cut-off current		0.1 to 50.0%	0.1%	－	
Simple-measurement	Setup	OFF, Fixed voltage/PF, Measure one CT	OFF		
	Voltage	0.0 to 500000.0 [V]	230V		
	PF	0.000 to 1.000	1.000		

◆Parameters for demand measurement   ○: Available   －: Not available

Item	Range	Initial value	Setting	
			Keys	Web
Power demand type	Sliding block, Fixed block	Sliding block		
Power demand interval 1	1 to 60 [min.]	15		
Power demand interval 2	1 to 60 [min.]	1		
Power input	CT (CT input), Pulse(Pulse input)	CT	－	○
Pulse unit	kWh (electric power), PLS (pulse constant)	kWh		
Pulse rate (convert to electric power)	0.001 to 100.000 [kWh]	1.000		
Pulse constant number	1000 to 99000[pulse/kWh]	50000		
Current demand interval	1 to 60 [min.]	15		

◆Parameters for pulse input   〇: Available   －: Not available

Item			Range	Initial value	Setting Keys	Setting Web
Pulse input			30, 2000	30		
Pre-scale			0.001 to 100.000	1.000		
Unit for pulse output (OUT1,OUT2)	kWh		0.001, 0.01, 0.1, 1, 10, 100 (kWh/1pulse)	0.001		
	alarm		Stand-by power, Active power, Reactive power, Apparent power, Over current, Under current, Power interruption, Power factor, Over voltage, Under voltage, Over frequency, Under frequency, Current THD, Voltage THD, Current harmonics, Voltage harmonics, Current unbalancing, Voltage unbalancing, Power demand, Current demand			
	General-purpose		General output			
Target phase for pulse output (OUT1,OUT2)			Total, Phase1, Phase2, Phase3	total		
Target phase for alarm output (OUT1,OUT2)	electric power		Total, All, Phase1, Phase2, Phase3	total		
	current		All, Phase1, Phase2, Phase3, Phase N	All		
	Power interruption Over voltage Under voltage		All, Phase1, Phase2, Phase3, Line 1-2, Line 2-3, Line 3-1	All	－	〇
Integral direction (OUT1,OUT2)			P, -P	P		
Output pulse width			1 to 100 [ms]	1		
Stand-by alarm (threshold) (OUT1,OUT2)			0.1 to 100.0 [%]	100.0		
Stand-by alarm (start time) (OUT1,OUT2)			0 to 9999 [sec.]	0		
Stand-by alarm (phase) (OUT1,OUT2)			Phase1, Phase2, Phase3, All	All		
Power alarm (active/reactive/apparent) threshold (ON/OFF) (OUT1,OUT2)			0.00 to 999999999.999 [kW/kvar/kVA]	999999999.999		
PF alarm threshold (ON/OFF) (OUT1,OUT2)			0.000 to 1.000	0.000		
Over frequency alarm threshold (ON/OFF) (OUT1,OUT2)			0.00 to 100.00 [Hz]	100.00		
Under frequency alarm threshold (ON/OFF) (OUT1,OUT2)				0.00		

○: Available　　－: Not available

Item	Range	Initial value	Setting Keys	Setting Web
Voltage harmonics alarm threshold (ON/OFF) (OUT1,OUT2)	0.00 to 400.0 [%]	400.00	－	○
Current harmonics alarm threshold (ON/OFF) (OUT1,OUT2)				
Current THD alarm threshold (ON/OFF) (OUT1,OUT2)				
Voltage THD alarm threshold (ON/OFF) (OUT1,OUT2)				
Voltage unbalancing alarm threshold (ON/OFF) (OUT1,OUT2)	0.00 to 300.00 [%]	300.00		
Current unbalancing alarm threshold (ON/OFF) (OUT1,OUT2)				
Power demand alarm power type (ON/OFF) (OUT1,OUT2)	Active, Reactive, Apparent, Active(Export), Reactive(Export)	Active		
Power demand alarm threshold(ON/OFF)(OUT1,OUT2)	0.000 to 99999.999 [kW/kvar/kVA]	0		
Current demand alarm threshold (OUT1,OUT2)	0.0 to 120.0 [%]	0		
Preset value (OUT1,OUT2)	0 to 999999	0		

◆Parameters for communication (RS485)　　　　　　　○: Available　　－: Not available

Item	Range		Initial value	Setting Keys	Setting Web
Protocol	MEWTOCOL, MODBUS(RTU),		MEWTOCOL	○	○
Device number	MEWTOCOL	1 to 99	1		
	MODBUS(RTU)	1 to 247			
Transmission speed	38400, 19200, 9600,4800, 2400, 57600, 115200 [bps]		19200		
Transmission format	8b-o(8bit odd), 8b-n(8bit none), 8bit-E(8bit even)		8b-o		
Stop bit	1,2		1		
Response time	1 to 99 [ms]		5		

◆Parameters for communication (Ethernet)　　　　　　　　　○: Available　ー: Not available

Item		Range	Initial value	Setting	
				Keys	Web
MEWTOCOL	Use	Available, Not available	Available		
	Protocol	TCP,UDP	TCP	ー	
	Port number	1024 to 65535	9094		
MODBUS(TCP)	Use	Available, Not available	Available		
	Protocol	TCP,UDP	TCP	ー	
	Port number	502,1024 to 65535	502		
IP address	DHCP	Yes (available), No (not available)	No	○	○
	Fixed IP address	0.0.0.0 to 255.255.255.255	192.168.1.5		
	Subnet mask		255.255.255.0		
	Default gateway		192.168.1.1		
DNS server	Acquisition method	Auto-setting, Manual-setting	Auto-setting	ー	
	DNS server	0.0.0.0 to 255.255.255.255	0.0.0.0		
Web server	Web server settings	Yes (available), No (not available)	Yes	ー	
	User name (administrator)	half-width alphanumeric (64-letter)	admin		
	Password (administrator)	half-width alphanumeric (64-letter)	admin		

◆Parameters for optional functions　　　　　　　　　　　　○: Available　ー: Not available

Item	Range	Initial value	Setting	
			Keys	Web
Auto-off	0 to 99 [min.]	1		
Display update cycle	0.5, 1.0, 2.0, 3.0　[sec.]	1.0 sec		
Reset all integral value	Yes, No	No		
Reset integral value 1	Yes, No	No		
Reset integral value 2	Yes, No	No	○	○
Reset integral value 3	Yes, No	No		
Reset hour meter	Yes, No	No		
Reset count value	Yes, No	No		
Reset logging data	Yes, No	No		
Version				

◆Password　　　　　　　　　　　　　　　　　　　　　　○: Available　ー: Not available

Item	Range	Initial value	Setting	
			Keys	Web
Password change	0000 to 9999	0000	○	○

4.1 Setting Flow

Arrow mark means press each key

········▶ <MODE>   ⟹ <ITEM/＞＞
───▶ <SET>   ━▶ <SHIFT/∧>

Items with * are only for Main unit-CH1.

```
┌─────────────────────────────┐
│ Measuring value display     │
└─────────────────────────────┘
              ⋮
              ▼
┌─────────────────────────────┐
│ Enter password              │
└─────────────────────────────┘
              │
              ▼
```

Setting mode

【Power measurement】	⟹	【Communication】 (RS485) *	⟹	【Communication】 (Ethernet) *	⟹	【Optional functions】 【Password】 (To next page)
Phase/Wire		Protocol *		DHCP setting *2		
CT setting		Device number *		IP address *		
Voltage setting *1		Transmission speed *		Subnet mask *		
		Transmission format *		Default gateway *		
		Stop bit *		Web server settings *		
		Response time *				

*1 'Voltage setting' is common to main unit CH1, CH2, expansion unit CH1, CH2.
*2 'IP address' and 'Subnet mask' are skipped when 'DHCP setting' is set to available.

Setting mode

```
┌─────────────────────────────────────────────────────────────────────────┐
│   【Communication】      ⇒   【Optional functions】  ⇒   【Password】         │
│   (From previous page)                                                     │
│                              Auto-off                   Password setting   │
│                                                                            │
│   Reset count value         Display update cycle                          │
│                                                                            │
│   Reset hour meter          Reset all integral value                      │
│                                                                            │
│   Reset logging data        Reset integral value 1                        │
│                                                                            │
│   Version                   Reset integral value 2                        │
│                                                                            │
│                             Reset integral value 3                        │
└─────────────────────────────────────────────────────────────────────────┘
```

| Confirmation mode | Setting confirmation No | Setting confirmation Yes |

Measuring value display

Press <SET> during each item is displayed to change the setting value.
Press <MODE> to display the confirmation window. Select [Yes] and press <SET> to decide the setting value. However no value is changed, the confirmation window is skipped and it displays the measuring value display.

4.2 Password entry

It is necessary to enter password to shift to setting mode.
Enter [0000] and shift to password setting mode when you set password at the first time.
*When setting password, be careful for handling and note it.

```
+------------------------------------+
:                                    :
:       Measuring value display      :
:                                    :
+------------------------------------+
```

↓ **<MODE>**

```
+------------------------------------+
| M - 1                    Password  |
|                                    |
|                                    |
|                         0 - - -    |
+------------------------------------+
```

↓ **<SET>**

```
+------------------------------------+
| M - 1                     Power    |
|                                    |
|                                    |
+------------------------------------+
```

Press <MODE> and it shifts to password entry window.

Enter password from left to right using <ITEM/>>,
<SHIFT/∧>.

<SHIFT/∧>   Increase

<ITEM/>>   Shift entered digit to the right

Press <SET> after enter the password.

If the password is correct, it shift to setting mode of power measurement.

If the password is wrong, [FAIL] is displayed and it returns to the password entry window.
*If you make wrong password 5 times, you can't set 1-hour after.

```
+------------------------------------+
| M - 1                    Password  |
|                                    |
|                                    |
|                              Fail  |
+------------------------------------+
```

4.3 Password initialize
When you forget the password, initialize it in the following procedures. (Initial: [0000])
It is impossible to decode the set password.

Measuring value display

↓ **<MODE>**

Press <MODE> and it shifts to password entry window.

```
M - 1                P a s s w o r d


                            0 - - -
```

Press <MODE> and <ITEM/＞> for 30 seconds in the password entry window, and it shift to the password initialize window.

↓ **<MODE>+<ITEM/＞> 30sec.**

```
M - 1                P a s s w o r d
                       R e s e t

```

↓ **<SET>**

```
M - 1                P a s s w o r d

                       R e s e t
                           N o
```

<SHIFT/∧>
←————————→
<ITEM/＞>

```
M - 1                P a s s w o r d

                       R e s e t
                           Y e s
```

↓ **<SET>**   ↓ **<SET>**   Not initialize : [No]
                                                  Initialize   : [Yes]

Return to the measuring value display

4.4 How to Set by Keys

■Set before measuring.

Select setting item with <ITEM/>> and press <SET>, and the value will be blinking.

Set with <ITEM/>> and <SHIFT/∧>.

When you select [Yes] with the confirmation window and press <SET>, the setting values are settled.

Setting items with (※) can be set to each CH and each unit.

4.4.1 Settings for power measurement

Phase/Wire system   (※)

Select phase/wire system to measure.

```
M - 1                    P o w e r
                         S y s t e m

                         1 P 2 w
```

Press <ITEM/>>, <SHIFT/∧> to select.

[Set list]
1P2W, 1P3W, 3P3W, 3P4W   (initial: 1P2W)

* When the system is not matched with the measure system, it doesn't measure correctly.

CT setting   (※)

Select using CT type.

```
M - 1                    P o w e r
                             C T
P r i m a r y                5 A
S e c o n d a r y            5 A
```

Press <SET>, to select primary or secondary.

Press <ITEM/>>, <SHIFT/∧> to set.

[Set range]
Primary side   : 1 to 65535 (initial:5)
Secondary side: 5 (5A), 1 (1A) (initial: 5)

SHIFT ∧   Increase

ITEM >   decrease

To use CT with secondary side current 5A: [5]
To use CT with secondary side current 1A: [1]

Voltage setting

Set the rated voltage to measure.

```
M - 1                    P o w e r
                             V T
P r i m a r y              2 3 0 V
S e c o n d a r y          2 3 0 V
```

Press <SET>, to select primary or secondary.

Press <ITEM/>>, <SHIFT/∧> to set the voltage.

[Set range]
Primary side   : 100 to 500000 (initial:230)
Secondary side: 100 to 690 (initial:230)

*Set the rated voltage when it doesn't use VT.

SHIFT ∧   Increase

ITEM >   decrease

4.4.2 Settings for communication (RS485)

Protocol

Select protocol of main unit via serial communication (RS485).

*When protocol is changed, device number, transmission speed (baud rate), transmission format, stop
 bit and response time will be initialized.

```
M - 1              C O M   R S 4 8 5
                     P r o t o c o l

                   M E W T O C O L
```

Press <ITEM/＞>, <SHIFT/∧> to select.
[Set list]
MEWTOCOL, MODBUS(RTU)
        (initial: MEWTOCOL)

Device number

**Set an individual device number for each unit when two or more units are connected to
communicate via serial communication (RS485).**

```
M - 1              C O M   R S 4 8 5
                              N o

                            9 9
```

Press <ITEM/＞>, <SHIFT/∧> to set.
The setting range differs according to the protocol.

[Set range]   MEWTOCOL: 1 to 99
                 MODBUS(RTU): 1 to 247

(SHIFT ∧)   increase

(ITEM ＞)   decrease

Transmission speed (Baud rate)

Select the serial communication (RS485) transmission speed.
Define the transmission speed according to the master's (PLC etc.).

```
M - 1              C O M   R S 4 8 5
                          S p e e d

                        3 8 4 0 0 b p s
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list]
2400, 4800, 9600, 19200, 38400, 57600, 115200 [bps]
 (initial: 19200)

Transmission format

Select serial communication (RS485) transmission format (Data length, Parity).
Define the transmission format according to the master's (PLC etc.).

```
M - 1          C O M   R S 4 8 5
                     F o r m a t

                     8 b i t - o
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list]
8b-o (8bit odd), 8b-n (8bit none), 8b-E (8bit even)
(initial: 8b-o)

Stop bit

Select serial communication (RS485) stop bit.

```
M - 1          C O M   R S 4 8 5
                   S t o p   b i t

                         1 b i t
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list] 1, 2 (initial: 1)

Response time

Set serial communication (RS485) response time of main unit.
When command is received, it sends response after setting response time passes.

```
M - 1          C O M   R S 4 8 5
             R e s p o n s e   T i m e

                           5 m s
```

Press <ITEM/＞>, <SHIFT/∧> to set.

[Set range] 1 to 99 ms (initial: 5)

SHIFT ∧   increase

ITEM ＞   decrease

* If Data Logger Unit (DLU) or Data Logger Light (DLL) is used as a master, set the response time to 5ms or more because DLU or DLL send the response after 1.1ms or less from receive a command when transmission speed is set to 19200bps.

4.4.3 <u>Settings for communication (Ethernet)</u>

DHCP setting

Select DHCP for Ethernet communication.

M - 1	C O M E t h e r n e t
	D H C P
	N o

Press <ITEM/>>, <SHIFT/∧> to select.

[Set list] Yes (available), No (not available)   (initial: No)

IP address

*It skips this item when [Yes] is set for DHCP setting.

Set IP address for Ethernet communication.

M - 1	C O M E t h e r n e t
	I P A d r e s s
	1 9 2 . 1 6 8 . 0 0 1 . 0 0 5

Press <ITEM/>>, <SHIFT/∧> to set.

[Set range]   0. 0. 0. 0 to 255. 255. 255. 255
                        (initial: 192.168.1.5)

SHIFT ∧   increase

ITEM >   decrease

Subnet mask

*It skips this item when [Yes] is set for DHCP setting.

Set subnet mask for Ethernet communication.

M - 1	C O M E t h e r n e t
	S u b n e t m a s k
	2 5 5 . 2 5 5 . 2 5 5 . 0 0 0

Press <ITEM/>>, <SHIFT/∧> to set.

[Set range]   128. 000. 000. 000 to 255. 255. 255. 255
                     (initial: 255.255.255.0)

SHIFT ∧   increase

ITEM >   decrease

Default Gateway

*It skips this item when [Yes] is set for DHCP setting.

Set default gateway for Ethernet communication.

```
M - 1        C O M   E t h e r n e t
        D e f u a l t   G a t e w a y

         1 9 2 . 1 6 8 . 0 0 1 . 0 0 1
```

Press <ITEM/＞>, <SHIFT/∧> to set.

[Set range]   0. 0. 0. 0 to 255. 255. 255.255
(initial: 192.168.1.1)

SHIFT
∧   increase

ITEM
＞   decrease

Web server setting

Select Web server setting for Ethernet communication.

```
M - 1        C O M   E t h e r n e t
                w e b   S e r v e r

                            Y e s
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list]
Yes (available), No (not available)   (initial: Yes)

4.4.4 Settings for optional functions

Auto-off

Display backlight turns off automatically when there is no key operation for a long time.
After it passes the setting time, backlight will turn off.

```
┌──────────────────────────────┐
│ M - 1              O p t i o n │
│            A u t o   O F F      │
│                                │
│                    5 m i n     │
└──────────────────────────────┘
```

Press <ITEM/＞>, <SHIFT/∧> to set.

[Set range] 0 to 99 min. (initial:5)

(SHIFT ∧) increase

(ITEM ＞) decrease

Always turn on   : [0]
Turn off after setting time: [1 to 99]
After turns off the backlight, any key operation makes it turns on.

Update cycle

Select update cycle for measuring window.
It updates the display of measured values every setting time.

```
┌──────────────────────────────┐
│ M - 1              O p t i o n │
│    D i s p l a y   u p d a t e │
│                                │
│                    0 . 5 s     │
└──────────────────────────────┘
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list] 0.5, 1.0, 2.0, 3.0 [s] (initial:1.0)

Reset all integral value

Integral power (active, reactive, apparent) can be reset at one time.

```
┌──────────────────────────────┐
│ M - 1              O p t i o n │
│        A l l   R e s e t       │
│                                │
│                    Y e s       │
└──────────────────────────────┘
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list] Yes, No (initial: No)

Reset all   : [Yes]
Not reset   : [No]

Reset integral value 1

*It skips this item when [Yes] is selected for reset all integral value.
Reset the integral power of 1CH/1-phase (active, reactive, apparent) and integral export power
of 1CH/1-phase (active, reactive).

```
┌──────────────────────────────┐
│ M - 1              O p t i o n │
│        R e s e t   1           │
│                                │
│                    Y e s       │
└──────────────────────────────┘
```

Press <ITEM/＞>, <SHIFT/∧> to select.

[Set list] Yes, No (initial: No)

Reset   : [Yes]
Not reset   : [No]

Reset integral value 2

　　　　　　　　　　*It skips this item when [Yes] is selected for reset all integral value.
**Reset the integral power of 2CH/2-phase (active, reactive, apparent) and integral export power
of 2CH/2-phase (active, reactive).**

Press <ITEM/＞>, <SHIFT/∧> to select.

```
M - 1              O p t i o n
                 R e s e t   2

                         Y e s
```

[Set list] Yes, No (initial: No)

Reset 　　　: [Yes]
Not reset 　: [No]

Reset integral value 3

　　　　　　　　　　*It skips this item when [Yes] is selected for reset all integral value.
**Reset the integral power of 3CH/3-phase (active, reactive, apparent) and integral export power
of 3CH/3-phase (active, reactive).**

Press <ITEM/＞>, <SHIFT/∧> to select.

```
M - 1              O p t i o n
                 R e s e t   3

                         Y e s
```

[Set list] Yes, No (initial: No)

Reset 　　　: [Yes]
Not reset 　: [No]

Reset count value

*It skips this item when [Yes] is selected for reset all integral value.

Reset the count value.

Press <ITEM/＞>, <SHIFT/∧> to select.

```
M - 1                    O p t i o n
            R e s e t    C o u n t

                              Y e s
```

[Set list] Yes, No (initial: No)

Reset   : [Yes]
Not reset   : [No]

Reset hour meter

*It skips this item when [Yes] is selected for reset all integral value.

Reset the values of measured by hour meter, ON-time, OFF-time, Stand-by-time, and Maintenance-time.

Press <ITEM/＞>, <SHIFT/∧> to select.

```
M - 1                    O p t i o n
    R e s e t    H o u r    M e t e r

                              Y e s
```

[Set list] Yes, No (initial: No)

Reset   : [Yes]
Not reset   : [No]

Reset log data

*It skips this item when [Yes] is selected for reset all integral value.

Reset all log data.

Press <ITEM/＞>, <SHIFT/∧> to select.

```
M - 1                    O p t i o n
            R e s e t    L o g

                              Y e s
```

[Set list] Yes, No (initial: No)

Reset   : [Yes]
Not reset   : [No]

Version

You can check the software version.

```
M - 1                    V e r s i o n

B a s e
0 . 1 7
```

It displays the software version.

4.4.5 Password setting

Password setting

You can set password for changing the settings.
It is necessary to enter the password before moving the setting mode.
We recommend you to set password to avoid unexpected change.

M - 2	P a s s w o r d
	0 0 0 0

Press <SET> and [0] on the left is blinking.
Set password using <ITEM/＞>, <SHIFT/∧>.

SHIFT ∧   Increase

ITEM >   Shift entered digit to the right

Set from left to right. Make the digit to set blink.

[Set range] 0000 to 9999 (initial: 0000)

M - 2	P a s s w o r d
	2 3 4 5

Set 4-digit password and press <SET>
After that the confirm window is displayed.

↓ **<SET>**

M - 2	P a s s w o r d
	N o
	2 3 4 5

ITEM >

⟷

M - 2	P a s s w o r d
	Y e s
	2 3 4 5
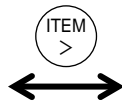
[Set list]   Yes, No (initial: N0)

Confirm: [Yes]
Not confirm: [No]

4.4.6 Confirmation window

Press <MODE> at any setting window and it shifts to confirmation window.

Setting mode

↓ **<MODE>**

M - 2		M - 2
S e t A l l		S e t A l l
N o		Y e s

SHIFT ∧

ITEM >

Confirm the change: [Yes]
Cancel the change: [No]
(initial: No)

<SET>

Cancel

Confirm

<SET>

P l **e** a s e   W a i t
N o w   S e t t i n g   D a t a
> > >

Measuring value display
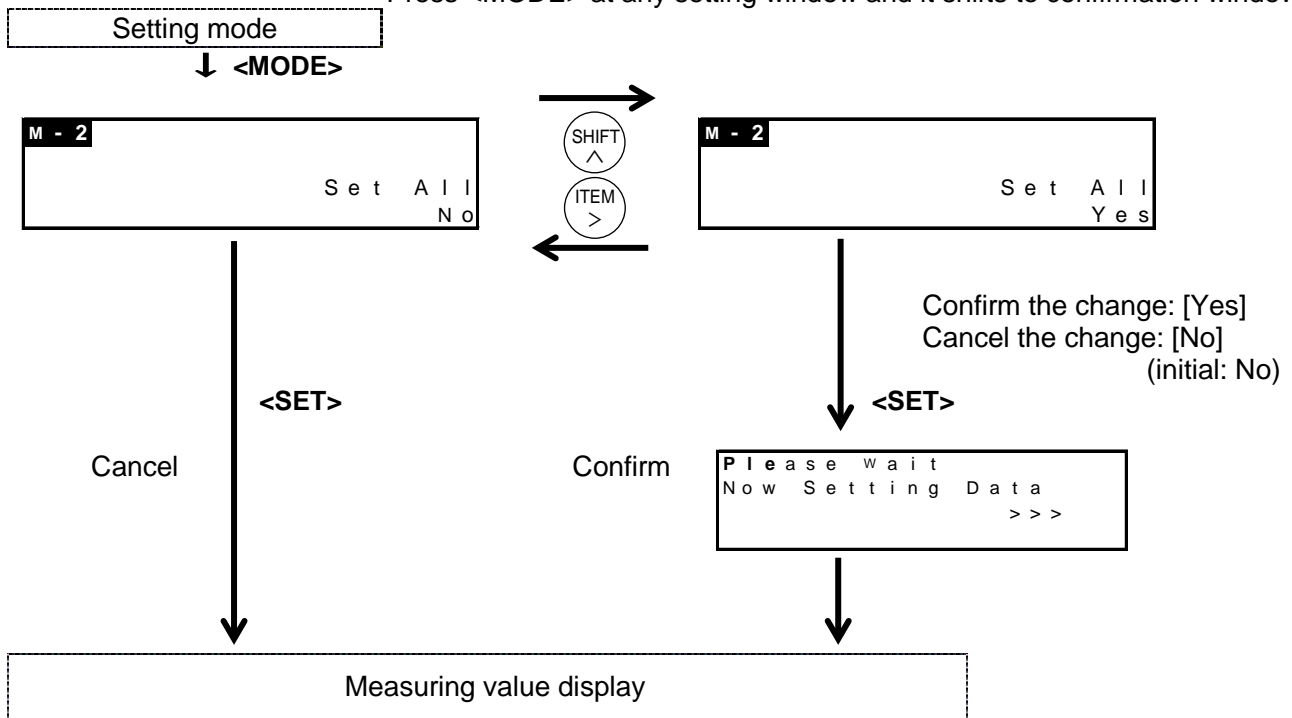
4.5 How to Set by Web browser

You can set by using Web browser.
Access to 'http://xxx.xxx.xxx.xxx/setup/index.htm'. Put the setting IP address to 'xxx.xxx.xxx.xxx'.
It is necessary to enter user name and password to access the website.
     (Initial user name: admin, initial password: admin)
It may take time to get the website according to the communication environment.

4.5.1 Setting item
Select item from tabs to set

	Item	Description
1	Measurement	Set parameters related to power measurement
2	Demand / Power Rates	Set parameters related to demand, conversion rate
3	Input	Set parameters related to pulse input
4	Output	Set parameters related to pulse output
5	Interface	Set parameters related to Ethernet and RS485 communication
6	System setup	Set parameters related to system
7	Write→KW2M	Write parameters to Eco-POWER METER
8	Read←KW2M	Read out parameters from Eco-POWER METER

4.5.2 Settings for Power Measurement

	Item	Description
1	Select unit and CH	Select unit and CH to set.
2	Phase/Wire system	Select phase and wire system to power measurement. <List> 1P2W, 1P3W, 3P3W, 3P4W (initial: 1P2W)
3	Cutoff current	Set a ratio of current for rated current used for cutoff that is not measured. <Range> 0.1 to 50.0% (initial:0.1)
4	Hour meter	Select phase and current that is measured as ON-time by percentage. <List> Target phase : Phase1, Phase2, Phase3, ALL (initial:Phase1) Threshold : 0.1 to 100.0% (initial:10.0)
5	Simple measuring	Select mode and set parameters for simple measuring. <List & Range> Type: OFF (no use) VLT/PF Fixed (Use actual current with fixed voltage and PF) SingleCT (Use phase 1 current and all voltage) (initial:OFF) VLT* : 0.0 to 500000.0V (initial:230V) PF* : 0.000 to 1.000 (initial:1.000) * VLT and PF can be set when 'VLT/PF Fixed' is selected.

Item	Description
6 CT	Set parameters of CT. <Range> Primary side : 1 to 65535 (initial:5) Secondary side: 5 (5A), 1 (1A) (initial: 5)
7 VT*	Set parameters of VT when VT is used. When VT is not used, set parameters of rated voltage to measure. <Range> Primary side : 100 to 500000 (initial:230) Secondary side: 100 to 690 (initial:230)
8 Over current*	Set a ratio of current for rated current used for threshold to judge over current.
9 Under current*	<Range> 0.0 to 120.0% (initial:0.0)
10 Over Voltage*	Set a ratio of voltage for rated voltage used for threshold to judge over voltage.
11 Under Voltage*	< Range > 0.0 to 120.0% (initial:0.0)

* Common to unit and CH.

4.5.3 Settings for Demand and Power Rates
Click ' ◀ ▶ ' to shift window of 'Demand Setup' and 'Conversion rate Setup'.

[Demand Setup]

	Item	Description
1	Power demand type	Select type of power demand measurement. <List> Sliding block, Fixed block (initial: Sliding block)
2	Power demand interval	Set interval time to use for power demand measurement. <Range> Power demand interval 1 : 1 to 60min (initial:15) Power demand interval 2 : 1 to 60min (initial:1)
3	Power input source *1	Select input type to use for demand measurement, current measurement or pulse input. <List> CT, Pulse (initial: CT)
4	Pulse-Power Conversion Method *2	Select and set electric power value per 1-pulse or pulse constant value input by an outer pulse detector. <Range> Pulse rate : 0.001 to 100.000 kWh/pulse(initial:0.001) Pulse constant : 1000 to 99000 pulse/kWh(initial:50000)
5	Current demand interval	Set interval to use for current demand calculation. < Range > 1 to 60min(initial:15)

*1 Power input source is setting for main unit CH1.
*2 Pulse-Power Conversion Method is available when [Pulse] is selected for 'Power input source'.

[Conversion rate Setup]
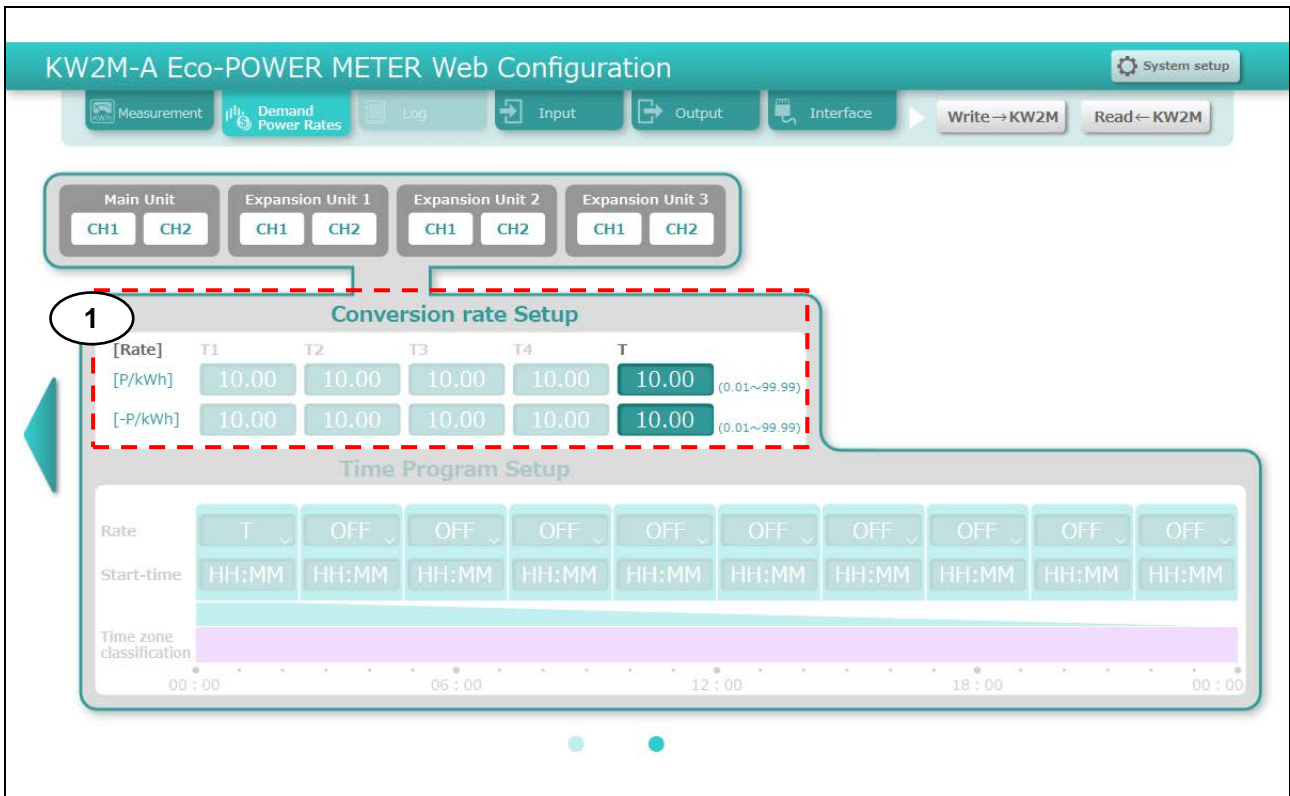
Item	Description
1 Conversion rate Setup	Set the conversion rate per integral active power (import and export) 1 kWh. < Range > P/kWh : 0.01 to 99.99 (initial:10.00) -P/kWh : 0.01 to 99.99 (initial:10.00)

4.5.4 Settings for Pulse Input

Item		Description
1	Max counting speed	Select pulse input max. counting speed. < List > 30Hz, 2kHz (initial:30Hz)
2	Pre-scale	Set pre-scale value used to convert count value of pulse input. < Range > 0.001 to 100.00 (initial:1.000)

4.5.5 Settings for Pulse Output

It uses the measurement value of main unit CH1 for pulse output CH1, it uses the measurement value of main unit CH2 for pulse output CH2.

[Integral power pulse]

	Item	Description
1	Select CH *	Select CH to set.
2	Output type	Select pulse output type. < List > Integral power pulse, Alarm, General output (initial: Integral power pulse)
3	Unit for output	Set unit used for pulse output. < List > 0.001, 0.01, 0.1, 1, 10, 100kWh (initial:0.001)
4	Direction	Select the direction of power (import or export) for using as a threshold for pulse output. < List > P, -P (initial: P)
5	Target phase	Select phase to monitor in order to judge the output. * Select 'Total' when it measures 3P3W. < List > Phase1, Phase2, Phase3, Total (initial: Total)
6	Pulse width	Set pulse width. < Range > 1 to 100ms (initial:1)

[Alarm]
With checks to several boxes, it output alarm when it meets one of these conditions.

	Item	Description
1	Select CH *	Select CH to set.
2	Output type	Select pulse output type. < List > Integral power pulse, Alarm, General output (initial: Integral power pulse)
3	Stand-by power	Select phase to monitor and set threshold to use for output. <List & Range> Target phase : Phase1, Phase2, Phase3, ALL (initial: ALL) Threshold: 0.1 to 100.0% (initial: 0.1%) Elapsed: 0 to 9999min (initial: 0)
4	Active power	Select phase to monitor and set threshold to use for output. *Select 'Total' when measuring 3P3W.
5	Reactive power	<List & Range>

6	Apparent power	Target phase:Phase1, Phase2, Phase3, ALL, Total
		                                                                                (initial: Total)
		OFF threshold : 0.00 to 9999999999.99
		                                                                (initial: 9999999999.99)
		ON threshold : 0.00 to 9999999999.99 (initial: 9999999999.99)

7	Over current	Select phase to monitor. *The threshold is the ratio that is set at 'Setting for Power Measurement'.
8	Under current	
9	Power interruption	< List > Target phase:Phase1, Phase2, Phase3, ALL (initial: ALL)

Item		Description
10	Power factor	Select phase to monitor and set threshold to use for output. *Select 'All' when measuring 3P3W. < List & Range > Target phase:Phase1, Phase2, Phase3, ALL (initial: ALL) OFF threshold : 0.00 to 9999999999.99 (initial: 9999999999.99) ON threshold : 0.00 to 9999999999.99 (initial: 9999999999.99)
11	Count value	Set a value of count to use for alarm output. <Range> 0 to 999999 (initial: 0)
12	Over Voltage	Select phase to monitor. *The threshold is the ratio that is set at 'Setting for Power Measurement'.
13	Under Voltage	< List > Target phase:Phase1, Phase2, Phase3, ALL (initial: ALL)
14	Over frequency	Select phase to monitor and set threshold to use for output. < List & Range >
15	Under frequency	Target phase:Phase1, Phase2, Phase3, ALL (initial: ALL) OFF threshold : 0.00 to 100.00Hz (initial:100.00) ON threshold : 0.00 to 100.00Hz (initial:100.00)
16	Current THD	Select phase to monitor and set threshold to use for output.
17	Voltage THD	< List & Range >
18	Current harmonics	Target phase:Phase1, Phase2, Phase3, ALL (initial: ALL)
19	Voltage harmonics	OFF threshold : 0.00 to 400.00% (initial:400.00) ON threshold : 0.00 to 400.00% (initial:400.00)
20	Current unbalancing	Select phase to monitor and set threshold to use for output. < Range >
21	Voltage unbalancing	OFF threshold : 0.00 to 300.00% (initial:300.00) ON threshold : 0.00 to 300.00% (initial:300.00)

22	Power demand	Select demand type to monitor and set threshold to use for output.
		
		< List & Range >
		Power Type : Active, Reactive, Apparent, Active(Export),
		                    Reactive(Export) (initial: Active)
		OFF threshold : 0.000 to 999999999.999
		                    (initial:999999999.999)
		ON threshold : 0.000 to 999999999.999
		                    (initial:999999999.999)

23	Current demand	Select phase to monitor and set threshold to use for output. < List & Range > Target phase:Phase1, Phase2, Phase3, ALL (initial: ALL) OFF threshold : 0.00 to 120.00% (initial:0.00) ON threshold : 0.00 to 120.00% (initial:0.00)

4.5.6 Settings for Ethernet and RS485 communication
Click ' ◀ ▶ ' to shift window of 'Ethernet Setup' and 'RS485 Setup'.

[Ethernet Setup]

Item	Description

1 IP address	Select setting method of IP address.
	When you set manually, IP address, subnet mask and default gateway can be set by yourself.
	
	< Range >
	Setting IP address: Obtain an IP address automatically,
	                 Use the following IP address
	IP address: 001. 000. 000. 000 to 255. 255. 255. 255
	        (initial: 192.168.1.5)
	Subnet mask: 128. 000. 000. 000 to 255. 255. 255. 255
	        (initial: 255.255.255.0)
	Default gateway: 001. 000. 000. 000 to 255. 255. 255.255
	        (initial: 192.168.1.1)

2 MEWTOCOL-COM	Set protocol and port number. < List & Range > Protocol: TCP, UDP (initial: TCP) Port number: 1024 to 65535 (initial:9094)
3 MODBUS-TCP	Set protocol and port number. < List & Range > Protocol: TCP, UDP (initial: TCP) Port number: 502, 1024 to 65535 (initial:502)

[RS485 Setup]

	Item	Description
1	Protocol	Select communication protocol < List > MEWTOCOL, MODBUS RTU (initial: MEWTOCOL)
2	Device number	Set device number. < Range > MEWTOCOL:1 to 99 MODBUS RTU:1 to 247
3	Transmission speed	Select transmission speed. < List > 2400, 4800, 9600, 19200, 38400, 57600, 115200bps (initial:19200)
4	Transmission format	Select transmission format. < List > Parity: none, odd, even (initial: odd) Stop bit:1bit, 2bit (initial:1bit)
5	Response time	Set response time. < Range > 1 to 99ms (initial:5)

4.5.7 System setup

[System setup]
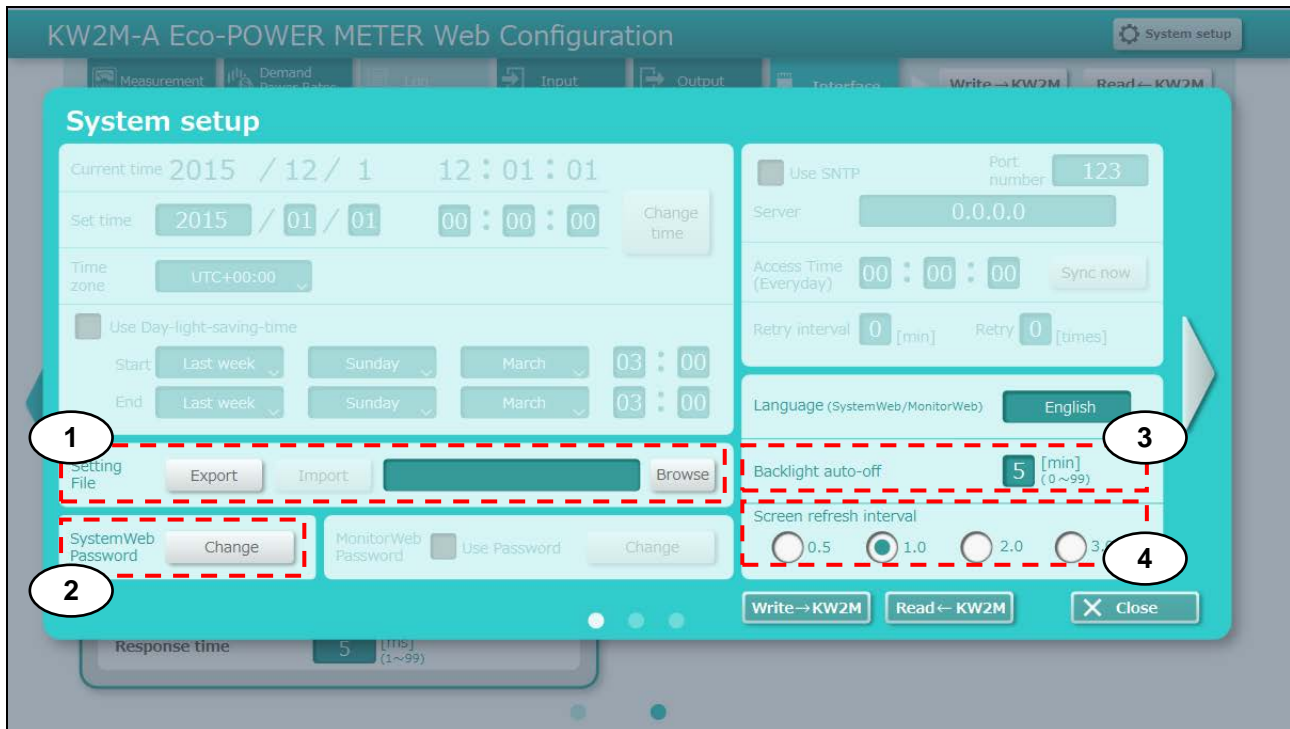
Item	Description
1 Setting File	It saves setup conditions of Eco-POWER METER to your PC and it writes setup conditions, which are saved in PC, to Eco-POWER METER. <Item> Export: Save setup conditions of Eco-POWER METER to PC. Import: Read out setup conditions saved in PC. Browse: Select setup file which are saved in PC.
2 System Web Password	Set password to access Web page.
3 Backlight auto-off	Display backlight turns off automatically when there is no key operation for a long time. After it passes the setting time, backlight will turn off. < Range > 0 to 99min (initial:5)
4 Screen refresh interval	Select refresh interval for measuring window. It updates the display of measured values every setting time. < List > 0.5, 1.0, 2.0, 3.0s (initial:1.0)

[Reset Data]
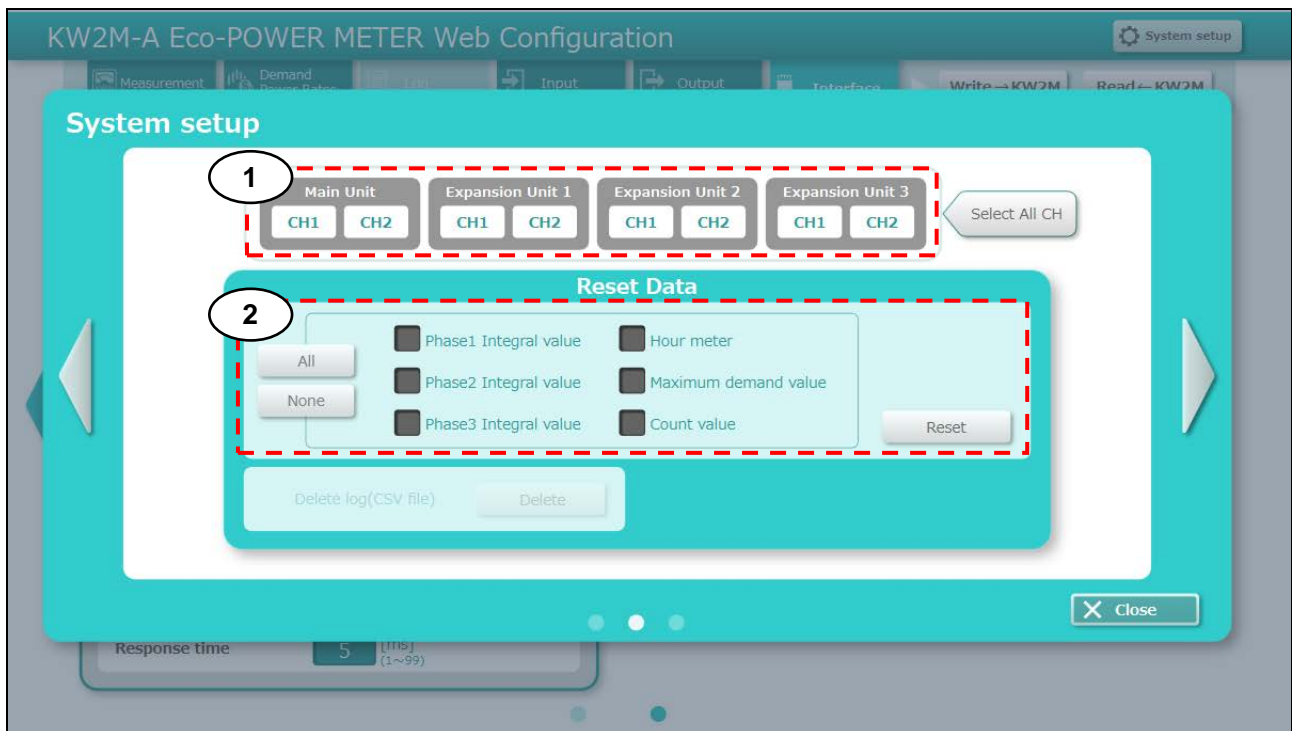
	Item	Description
1	Select unit and CH	Select unit and CH to reset.
2	Select item	Select data item to reset. After selecting item, click 'Reset' to reset.

Chapter 5 Various Functions

5.1 Power quality measurement and logging function
KW2M-A Eco-POWER METER can measure harmonics and THD for power quality measurement, therefore it is helpful to improve the power quality.

[Max. demand]
Maximum value of measured demand value (active, reactive, apparent, active (export), reactive (export), current)) are considered to the max. demand value. And it records the max. demand value.

5.2 Pulse output function
You can use 2-type pulse output, OUT1 and OUT2.
Refer to 4.5.5 Settings for pulse measurement for setting.

[OUT1][OUT2] are blinking when pulse output.

5.2.1 Output depends on integral electric power
Set the unit for pulse output of integral power value and pulse output turns on every time when integral electric power reaches the unit. (Pulse width: about 100ms)
It judges at the same time of sampling cycle.

5.2.2 Stand-by alarm
When it detects stand-by power (current) of the measured load, pulse output turns on in order to notice.

Set threshold (current) (C) and stand-by time (T) to judge stand-by power.
When the measured load is satisfied the setting conditions, pulse putout turns on in order to notice.
When it exceeds the setting threshold, it turns off and reset it.

(Working flow chart)
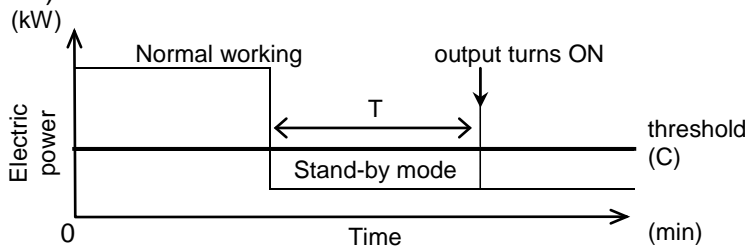
5.2.3 Under voltage alarm
When it falls below the setting voltage, pulse output turns on in order to notice.
When it exceeds, the output turns off.

5.2.4 Over voltage alarm
When it exceeds the setting voltage, pulse output turns on in order to notice.
When it falls below, the output turns off.

5.2.5 Power interruption alarm
When it detects the voltage under 5% of rated voltage for 5ms or more, pulse output turns on in order to notice.

5.2.6 Under current alarm
When it falls below the setting current, pulse output turns on in order to notice.
When it exceeds, the output turns off.

5.2.7 Current alarm
When it exceeds the setting current, pulse output turns on in order to notice.
When it falls below, the output turns off.

5.2.8 Power alarm
When it exceeds the setting instantaneous electric power (active, reactive, apparent, active (export), reactive (export)), pulse output turns on in order to notice.
When it falls below, the output turns off.

5.2.9 Other alarms
Output turns on or off according to each alarm setting.
    PF alarm, over frequency alarm, under frequency alarm, voltage harmonics alarm,
    current harmonics alarm、voltage THD alarm, current THD alarm, voltage unbalancing alarm,
    current unbalancing alarm, power demand alarm, current demand alarm

5.2.10 Output depends on count value
Set the preset value and pulse output turns on the time when count value reaches the preset value.
Refer to the next in detail.

5.2.11 Level output
It runs on or off the output by writing 0 (OFF) or 1 (ON) to the designated data register (OUT1: DT50294, OUT2: DT50295) via communication by external control.

5.3 Counter function
●Operation mode
  Maintain output hold count HOLD

[Output]	OFF							ON			

[Counting] ←———————————————— possible ————————————————→

[Addition]	0	1	2	3	···	n-2	n-1	n	n+1	n+2	n+3

n: Preset value
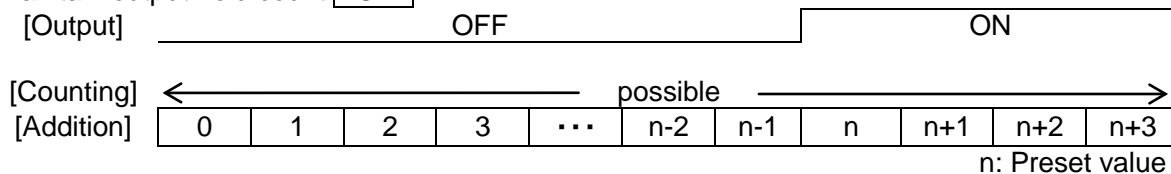
 (1) Output control is maintained after count-up completion and until reset. However counting is possible despite of count-up completion.
 (2) It reverts"0" after counting up full scale, but output control is maintained. However output is OFF if count value or preset value is changed.

●Change the Preset Value
It is possible to change the preset value even during counting. However note the following points.
◇When the pre-scale value is "1.000".（PSCL=1.000）
 (1) If the preset value is changed to the value less than the count value, counting will continue until it reaches full scale, returns to "0" and then reaches the new preset value.
 (2) If the preset value is changed to "0", it will not count up at start with "0". It counts up when the counting value comes to "0" again (after reach to full scale). However output is OFF if count value or preset value is changed.
 (3) When the count value is fixed, output is changed according to the changing of preset value as below.
  ①If the preset value is changed to the value less than the count value or same as count value, output is ON.
    （Count value ≧ Preset value）
  ②If the preset value is changed to the value more than the count value, output is OFF.
    （Count value ＜ Preset value）
◇When the pre-scale is not "1.000".（PSCL≠1.000）
  Even if the preset value is changed after counting to full scale, output is not changed.

5.4 Demand function
You can select demand calculation methods for KW2M-A Eco-POWER METER from the bellows.

・According to IEC61557-12
   1. Sliding block interval demand
   2. Fixed block interval demand
   3. Current demand

Please use this simple demand function as your standard. The value is not guaranteed.

Caution
Definition of Demand
It is demand measurement in order to use by yourself as your standard.

5.4.1 Block interval demand
It calculates demand by setting interval and displays.
You can select sliding block or fixed block for interval.
It output demand alarm according to the setting conditions.

Sliding block
Set power interval by 1 to 60(min.) (every 1-min.). It calculates demand during latest finished interval and displays.
One interval is started every time that set for 'power demand interval 2'.

Ex.) Power demand interval: 15 min.　Power demand interval 2: 1 min.
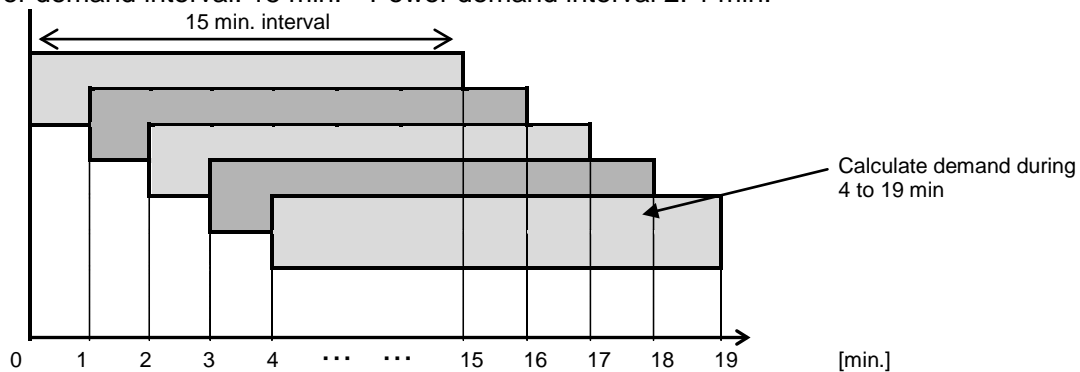
Fixed block
Set power interval by 1 to 60 (min.) (every 1-min.) It calculates demand during latest finished interval and displays. After one interval finishes, the next interval starts.

49
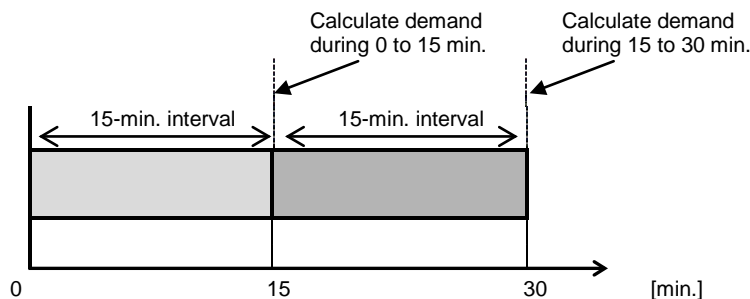
5.4.2 Current Demand
Current demand calculates the demand based on a thermal demand meter.

Current demand =
(Average of current – last current demand value) × 90%(fixed) + Last current demand value

In case of that a stable current flows for interval time, 90% of current value is displayed.
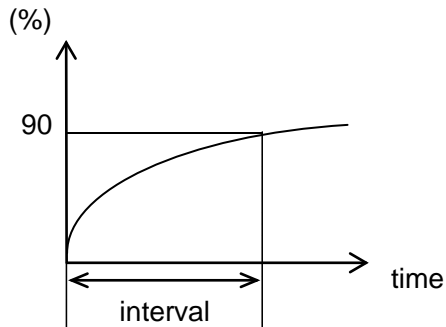
5.4.3 Max. demand value
Maximum value of measured demand value (active, reactive, apparent, active (export), reactive (export), current)) are considered to the max. demand value. And it records the max. demand value.

5.4.4 Demand alarm output
・It output with pulse output terminal. (open collector)
・It output only when [alarm] is set for unit for pulse output.
・It doesn't output alarm if power demand alarm threshold is set to '0.000'kW.

5.4.5 Working at power failure and at recovery
<At power failure>
・It stops the demand measurement.
・It records monthly max. demand log, max. demand value in the internal memory.
<At recovery>
・It stops the demand measuring until next span starts. When the next span starts, it will start demand measuring.

Chapter 6   Display of each Value
6.1 Working of Monitor display

【Shift the display mode】

Press <SHIFT/∧> during pressing <MODE>, it shifts measuring mode, logging mode and demand mode.

Press <MODE> to shift the setting mode.

initial

```
          ┌───────────────────┐ ─────────────────────┐
          │  Power monitoring │ ◄──── <MODE> ────     │
    ┌────►│      mode         │                   │   │
    │     └───────────────────┘                   │   │
    │              │ <MODE>+<SHIFT/∧>              │   ▼
    │              ▼                          ┌─────────────────┐
    │     ┌───────────────────┐   <MODE>      │                 │
    │     │     Log mode      │ ────────────► │   Setting mode  │
    │     └───────────────────┘               │                 │
    │              │ <MODE>+<SHIFT/∧>          └─────────────────┘
    │              ▼                               ▲
    │     ┌───────────────────┐                    │
    │     │    Demand mode    │ ───── <MODE> ──────┘
    │     └───────────────────┘
    │              │
    └──────────────┘
       <MODE>+<SHIFT/∧>
```

6.2 Working of Monitor Display

6.2.1 Single-phase two-wire system

Arrow mark shows to press each key.　　→ <ITEM/＞> 　⇒ SHIFT/▽>

```
┌─────────────────────────────────────────────────────────────────────┐
│                    Instantaneous power                                │
│  ┌──────────────┐  ⇒  ┌──────────────┐  ⇒  ┌──────────────┐         │
│  │    Active    │     │   Reactive   │     │   Apparent   │         │
│  └──────────────┘     └──────────────┘     └──────────────┘         │
└─────────────────────────────────────────────────────────────────────┘
                                  ↓
┌─────────────────────────────────────────────────────────────────────┐
│                    Total integral power                               │
│  ┌──────────────┐  ⇒  ┌──────────────┐  ⇒  ┌──────────────┐         │
│  │    Active    │     │   Reactive   │     │   Apparent   │         │
│  └──────────────┘     └──────────────┘     └──────────────┘         │
└─────────────────────────────────────────────────────────────────────┘
                                  ↓
┌─────────────────────────────────────────────────────────────────────┐
│                    Total integral export power                        │
│        ┌──────────────┐  ⇒  ┌──────────────┐                         │
│        │    Active    │     │   Reactive   │                         │
│        └──────────────┘     └──────────────┘                         │
└─────────────────────────────────────────────────────────────────────┘
                                  ↓
                          ┌──────────────┐
                          │   Current    │
                          └──────────────┘
                                  ↓
                          ┌──────────────┐
                          │   Voltage    │
                          └──────────────┘
                                  ↓
                          ┌──────────────┐
                          │ Power factor │
                          └──────────────┘
                                  ↓
                          ┌──────────────┐
                          │  Frequency   │
                          └──────────────┘
                                  ↓
                          ┌──────────────┐
                          │ Current THD  │
                          └──────────────┘
                                  ↓
                          ┌──────────────┐
                          │ Voltage THD  │
                          └──────────────┘
                                  ↓
┌─────────────────────────────────────────────────────────────────────┐
│                    Current n-order harmonics                          │
│  ┌──────────┐ ⇒ ┌──────────┐ ⇒ ┌──────────┐ ⇒ ┌──────────┐          │
│  │   2nd    │   │   3rd    │   │  ·····   │   │   31st   │          │
│  └──────────┘   └──────────┘   └──────────┘   └──────────┘          │
└─────────────────────────────────────────────────────────────────────┘
                                  ↓
┌─────────────────────────────────────────────────────────────────────┐
│                    Voltage n-order harmonics                          │
│  ┌──────────┐ ⇒ ┌──────────┐ ⇒ ┌──────────┐ ⇒ ┌──────────┐          │
│  │   2nd    │   │   3rd    │   │  ·····   │   │   31st   │          │
│  └──────────┘   └──────────┘   └──────────┘   └──────────┘          │
└─────────────────────────────────────────────────────────────────────┘
                                  ↓
                          ┌──────────────┐
                          │ Pulse input  │
                          │    value     │
                          └──────────────┘
                                  ↓              To next page
```

From the previous page

```
┌─────────────────────────────┐
│     Conversion value P      │
│     (integral power)        │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│    Conversion value –P      │
│   (integral export power)   │
└─────────────────────────────┘
              │
              ▼
┌───────────────────────────────────────────────────────────────┐
│            Return to instantaneous power                       │
└───────────────────────────────────────────────────────────────┘
```

6.2.2 Single-phase three-wire system

Arrow mark shows to press each key.　　　　➡ <ITEM/＞＞>　　⇨ <SHIFT/∧>

```
┌──────────────────────────────────────────────────────────────┐
│                    Instantaneous power                         │
│  ┌──────────────┐      ┌──────────────┐      ┌──────────────┐ │
│  │    Active    │  ⇨   │   Reactive   │  ⇨   │   Apparent   │ │
│  └──────────────┘      └──────────────┘      └──────────────┘ │
└──────────────────────────────────────────────────────────────┘
                              ⬇
┌──────────────────────────────────────────────────────────────┐
│                    Total integral power                        │
│  ┌──────────────┐      ┌──────────────┐      ┌──────────────┐ │
│  │    Active    │  ⇨   │   Reactive   │  ⇨   │   Apparent   │ │
│  └──────────────┘      └──────────────┘      └──────────────┘ │
└──────────────────────────────────────────────────────────────┘
                              ⬇
┌──────────────────────────────────────────────────────────────┐
│                 Total integral export power                    │
│        ┌──────────────┐      ┌──────────────┐                 │
│        │    Active    │  ⇨   │   Reactive   │                 │
│        └──────────────┘      └──────────────┘                 │
└──────────────────────────────────────────────────────────────┘
                              ⬇
          ┌──────────────────────────────────┐
          │             Current              │
          └──────────────────────────────────┘
                              ⬇
┌──────────────────────────────────────────────────────────────┐
│                          Voltage                               │
│     ┌──────────────┐      ┌──────────────┐                    │
│     │ Phase-voltage│  ⇨   │ Line-voltage │                    │
│     └──────────────┘      └──────────────┘                    │
└──────────────────────────────────────────────────────────────┘
                              ⬇
          ┌──────────────────────────────────┐
          │           Power factor           │
          └──────────────────────────────────┘
                              ⬇
          ┌──────────────────────────────────┐
          │            Frequency             │
          └──────────────────────────────────┘
                              ⬇
          ┌──────────────────────────────────┐
          │        Current unbalancing       │
          └──────────────────────────────────┘
                              ⬇
          ┌──────────────────────────────────┐
          │        Voltage unbalancing       │
          └──────────────────────────────────┘
                              ⬇
          ┌──────────────────────────────────┐
          │           Current THD            │
          └──────────────────────────────────┘
                              ⬇
┌──────────────────────────────────────────────────────────────┐
│                        Voltage THD                             │
│   ┌────────────────┐      ┌────────────────┐                  │
│   │Phase-voltage THD│  ⇨   │Line-voltage THD│                 │
│   └────────────────┘      └────────────────┘                  │
└──────────────────────────────────────────────────────────────┘
                              ⬇
┌──────────────────────────────────────────────────────────────┐
│                 Current n-order Harmonics                      │
│  ┌──────────┐    ┌──────────┐    ┌──────────┐    ┌──────────┐│
│  │ 2nd order│ ⇨  │ 3rd order│ ⇨  │  ·····   │ ⇨  │31st order││
│  └──────────┘    └──────────┘    └──────────┘    └──────────┘│
└──────────────────────────────────────────────────────────────┘
                              ⬇            To next page
```

Instantaneous power
| Active | ⇨ | Reactive | ⇨ | Apparent |

Total integral power
| Active | ⇨ | Reactive | ⇨ | Apparent |

Total integral export power
| Active | ⇨ | Reactive |

Current

Voltage
| Phase-voltage | ⇨ | Line-voltage |

Power factor

Frequency

Current unbalancing

Voltage unbalancing

Current THD

Voltage THD
| Phase-voltage THD | ⇨ | Line-voltage THD |

Current n-order Harmonics
| 2nd order | ⇨ | 3rd order | ⇨ | ····· | ⇨ | 31st order |

To next page

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Phase-voltage n-order Harmonics			
2nd order	3rd order	·····	31st order

2nd order $\Rightarrow$ 3rd order $\Rightarrow$ ····· $\Rightarrow$ 31st order

Line-voltage n-order Harmonics			
2nd order	3rd order	·····	31st order

Pulse input value

Conversion value P
(integral power)

Conversion value -P
(integral export power)

Return to instantaneous power

6.2.3 Three-phase three-wire system

Arrow mark shows to press each key.　　　➡ <ITEM/＞＞　　⇨ <SHIFT/∧>

```
┌─────────────────────────────────────────────────────────────┐
│                   Instantaneous power                        │
│  ┌──────────┐      ┌──────────┐      ┌──────────┐            │
│  │  Active  │  ⇨   │ Reactive │  ⇨   │ Apparent │            │
│  └──────────┘      └──────────┘      └──────────┘            │
└─────────────────────────────────────────────────────────────┘
                            ⬇
┌─────────────────────────────────────────────────────────────┐
│                   Total integral power                       │
│  ┌──────────┐      ┌──────────┐      ┌──────────┐            │
│  │  Active  │  ⇨   │ Reactive │  ⇨   │ Apparent │            │
│  └──────────┘      └──────────┘      └──────────┘            │
└─────────────────────────────────────────────────────────────┘
                            ⬇
┌─────────────────────────────────────────────────────────────┐
│                Total integral export power                   │
│       ┌──────────┐        ┌──────────┐                       │
│       │  Active  │   ⇨    │ Reactive │                       │
│       └──────────┘        └──────────┘                       │
└─────────────────────────────────────────────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │        Current        │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │      Line-voltage     │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │      Power factor     │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │       Frequency       │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │   Current unbalancing │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │   Voltage unbalancing │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │      Current THD      │
                └───────────────────────┘
                            ⬇
                ┌───────────────────────┐
                │      Voltage THD      │
                └───────────────────────┘
                            ⬇
┌─────────────────────────────────────────────────────────────┐
│                 Current n-order Harmonics                    │
│ ┌──────────┐    ┌──────────┐    ┌─────────┐    ┌──────────┐  │
│ │ 2nd order│ ⇨  │ 3rd order│ ⇨  │ ••••• │ ⇨  │31st order│  │
│ └──────────┘    └──────────┘    └─────────┘    └──────────┘  │
└─────────────────────────────────────────────────────────────┘
                            ⬇            To next page
```

From the previous page

Line-voltage n-order Harmonics				
2nd order	⇒	3rd order	⇒	‥‥‥ ⇒ 31st order

Pulse input value

Conversion value P (integral power)

Conversion value -P
(integral export power)

Return to instantaneous power

6.2.4 Three-phase four-wire system

Arrow mark shows to press each key.　　　━━▶ <ITEM/＞＞　　⟹ <SHIFT/∧>

```
┌──────────────────────────────────────────────────────────────────┐
│                       Instantaneous power                          │
│   ┌──────────────┐  ⟹  ┌──────────────┐  ⟹  ┌──────────────┐       │
│   │    Active    │      │   Reactive   │      │   Apparent   │      │
│   └──────────────┘      └──────────────┘      └──────────────┘      │
└──────────────────────────────────────────────────────────────────┘
                                 ↓
┌──────────────────────────────────────────────────────────────────┐
│                       Total integral power                         │
│   ┌──────────────┐  ⟹  ┌──────────────┐  ⟹  ┌──────────────┐       │
│   │    Active    │      │   Reactive   │      │   Apparent   │      │
│   └──────────────┘      └──────────────┘      └──────────────┘      │
└──────────────────────────────────────────────────────────────────┘
                                 ↓
┌──────────────────────────────────────────────────────────────────┐
│                    Total integral export power                     │
│       ┌──────────────┐  ⟹  ┌──────────────┐                        │
│       │    Active    │      │   Reactive   │                        │
│       └──────────────┘      └──────────────┘                        │
└──────────────────────────────────────────────────────────────────┘
                                 ↓
┌──────────────────────────────────────────────────────────────────┐
│                             Current                                │
│       ┌──────────────┐  ⟹  ┌──────────────────┐                    │
│       │    Current   │      │  N-phase current │                    │
│       └──────────────┘      └──────────────────┘                    │
└──────────────────────────────────────────────────────────────────┘
                                 ↓
┌──────────────────────────────────────────────────────────────────┐
│                             Voltage                                │
│     ┌───────────────┐  ⟹  ┌───────────────┐                        │
│     │ Phase-voltage │      │  Line-voltage │                        │
│     └───────────────┘      └───────────────┘                        │
└──────────────────────────────────────────────────────────────────┘
                                 ↓
                    ┌────────────────────────┐
                    │      Power factor       │
                    └────────────────────────┘
                                 ↓
                    ┌────────────────────────┐
                    │        Frequency        │
                    └────────────────────────┘
                                 ↓
                    ┌────────────────────────┐
                    │   Current unbalancing   │
                    └────────────────────────┘
                                 ↓
                    ┌────────────────────────┐
                    │   Voltage unbalancing   │
                    └────────────────────────┘
                                 ↓
                    ┌────────────────────────┐
                    │       Current THD       │
                    └────────────────────────┘
                                 ↓
                    ┌────────────────────────┐
                    │       Voltage THD       │
                    └────────────────────────┘
                                 ↓              To next page
```
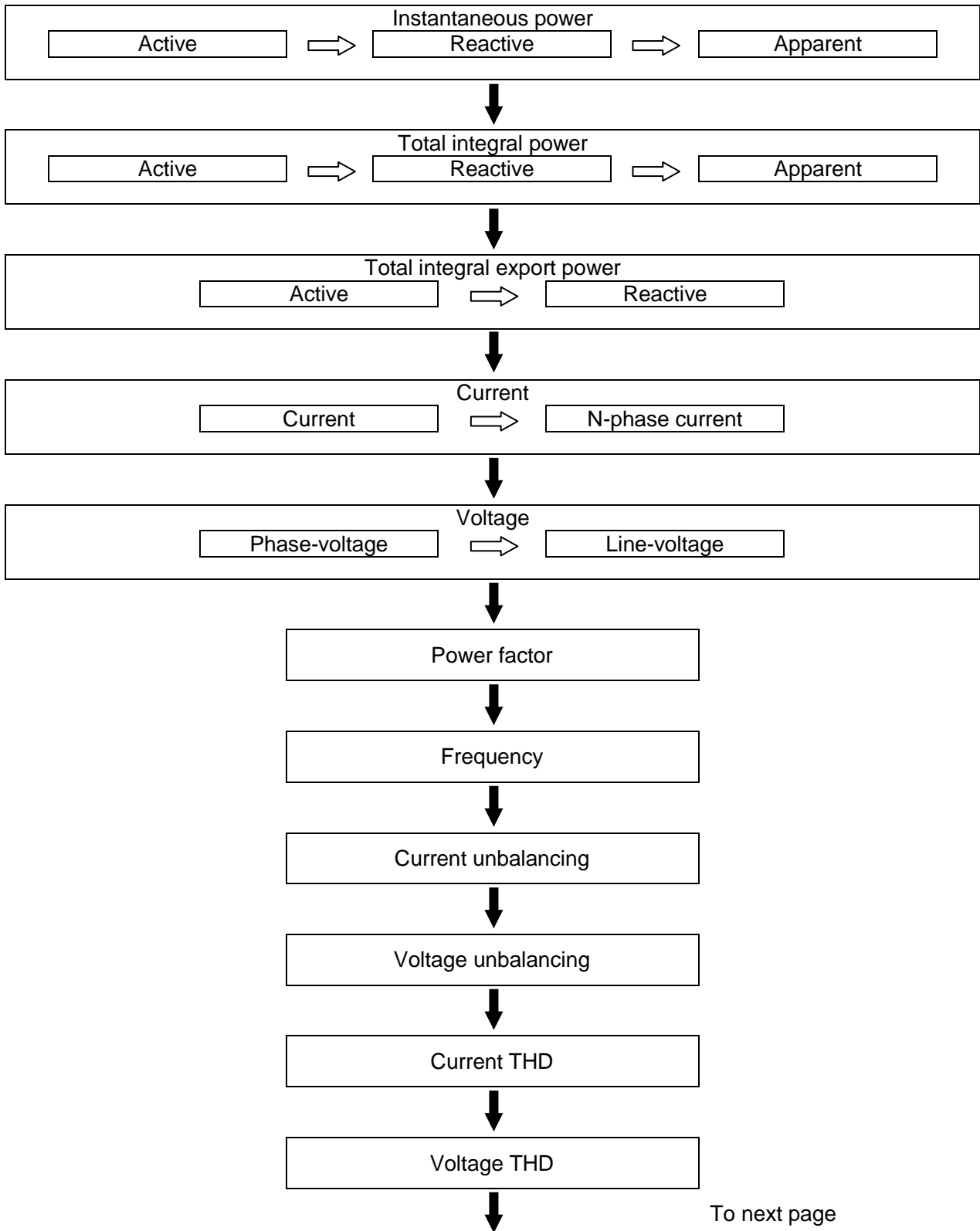
From the previous page

Current n-order Harmonics			
2nd order	3rd order	$\cdots$	31st order

↓

Phase-voltage n-order Harmonics			
2nd order	3rd order	$\cdots$	31st order

↓

Line-voltage n-order Harmonics			
2nd order	3rd order	$\cdots$	31st order

↓

Pulse input value

↓

Conversion value P (integral power)

↓

Conversion value -P
(integral export power)

↓

Return to instantaneous power

6.2.5 Instantaneous power

・The present instantaneous power of all phases or all circuits is displayed.
・Press <SHIFT/∧> to change active, reactive and apparent.

<1P2W/1P3W/3P4W>
Active   Reactive

```
M - 1        1    1 2 3 . 4 5 k w              1 - 2        1              k v a r
P            2              k w                Q            2              k v a r
             3              k w                             3              k v a r
             Σ              k w                             Σ              k v a r
```

Apparent

```
2 - 2        1              k V A
S            2              k V A
             3              k V A
             Σ              k V A
```
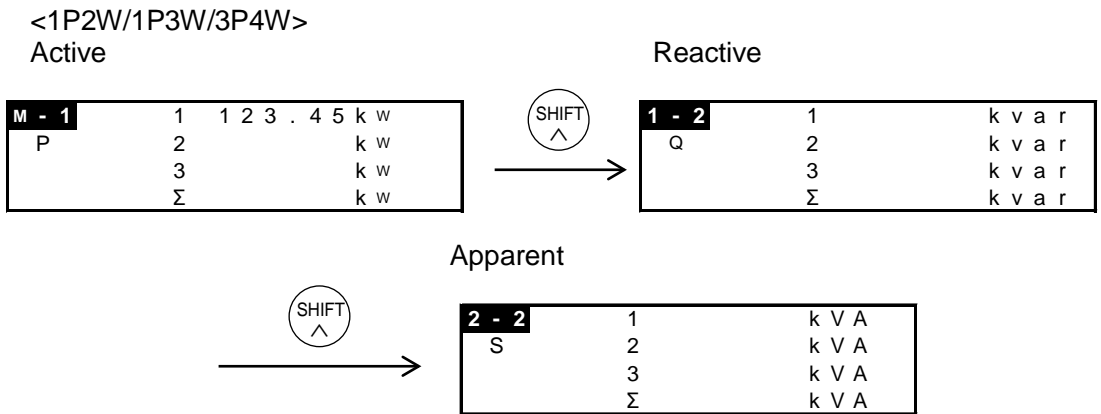
・Eco-POWER METER displays the power as below.

Display	1P2W	1P3W	3P4W
1	1st circuit	R-phase	R-phase
2	2nd circuit	---	S-phase
3	3rd circuit	T-phase	T-phase
Σ	Total (1+2+3)	Total (R+T)	Total (R+S+T)

<3P3W>
Active   Reactive

```
M - 1                                         M - 1
P                                             Q

             x . x x x k w                                 x . x x x k v a r
```

Apparent

```
M - 1
S

             x . x x x k V A
```
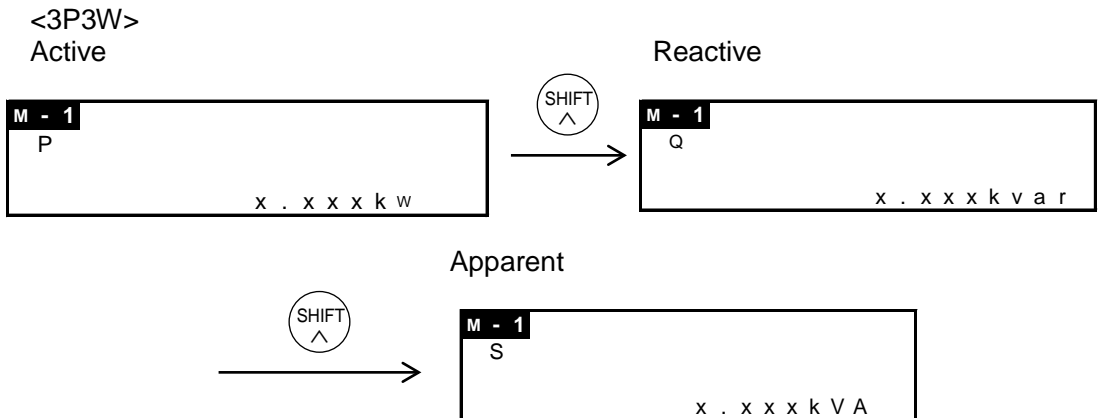
6.2.6 Total integral power

・The present total integral power is displayed.
・Press <SHIFT/∧> to change active, reactive and apparent.
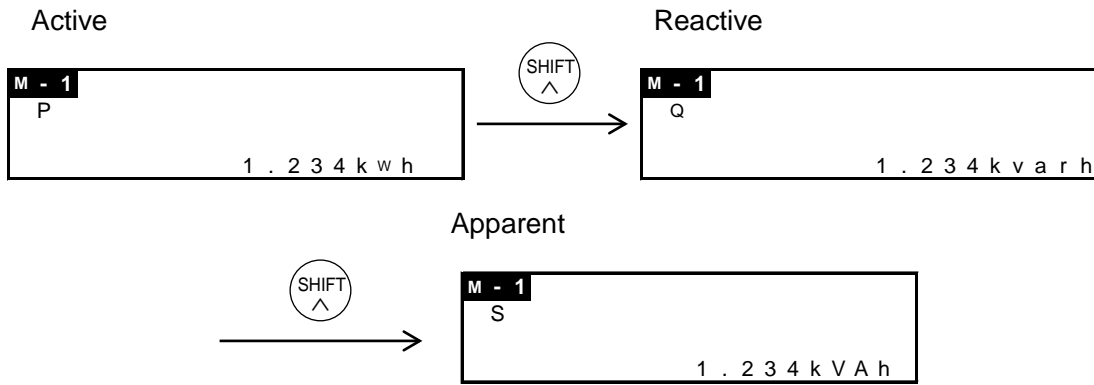
Active   Reactive

```
M - 1                                    M - 1
 P                                        Q
                                          
           1 . 2 3 4 k w h                          1 . 2 3 4 k v a r h
```

(SHIFT ∧) →

Apparent

(SHIFT ∧) →

```
M - 1
 S
           1 . 2 3 4 k V A h
```

・Total integral power is measured and displayed from 0.000 (kWh/kvarh/kVAh) to
 9999.9 (PWh/Pvar/PVA).
・The decimal point is changed automatically.

```
→  0.000kWh  →  99.999kWh  →  100.00kWh  →  999.99kWh  → 1000.0kWh  ─┐
                                                                      │
    └──  9999.9PWh  ←   ….   ← 10.000MWh  ←  9999.9kWh  ←  ──────────┘
```
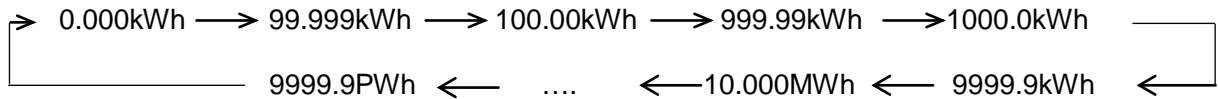
(After reach the full scale, 9999.9PWh, the value reverts to 0.000 but continues to measure.)

6.2.7 Total integral export power

・The present total export power is displayed.
・Press <SHIFT/∧> to change active, reactive and apparent.

Active   Reactive

```
M - 1      1            k w h            M - 2      1            k v a r h
 - P       2            k w h             - Q       2            k v a r h
           3            k w h                       3            k v a r h
 T 4       Σ            k w h             T 1       Σ            k v a r h
```

(SHIFT ∧) →
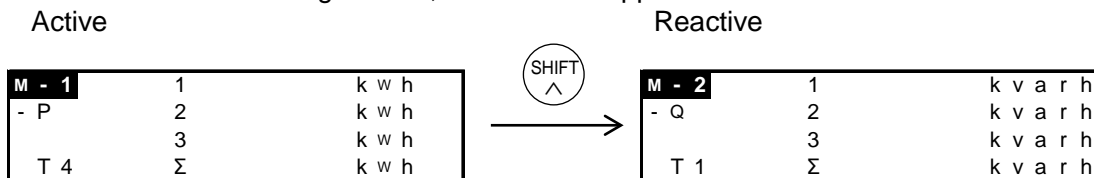
*It doesn't light [Σ] with 3P3W system.

・Total integral power is measured and displayed from 0.000 (kWh/kvarh/kVAh) to
 9999.9 (PWh/Pvar/PVA).
・The decimal point is changed automatically.

```
→  0.000kWh  →  99.999kWh  →  100.00kWh  → 999.99kWh  → 1000.0kWh  ─┐
                                                                     │
    └──  9999.9PWh  ←   ….   ← 10.000MWh  ←  9999.9kWh  ←  ─────────┘
```
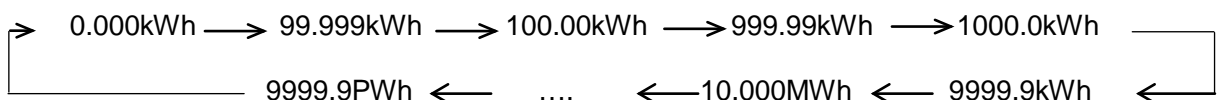
(After reach the full scale, 29999999, the value reverts to 0.000 but continues to measure.)

6.2.8 Current
・The present current value is displayed. (N-phase current is displayed for 3P4W.)

M - 1	1	A
I	2	k A
	3	k A
	A	A

SHIFT ∧ →

1 - 2	1	A
I	2	A
	3	A
	N	A
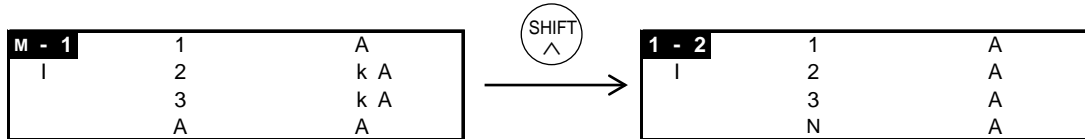
・It measures from 0.1% of CT secondary current.
・When input current exceeds 200% or the display range, it displays "- - - - -".
 Check and confirm the measurement environment.
・Current measuring points   Eco-POWER METER measures the current as below.

Display	1P2W	1P3W	3P3W 3P4W
1	1st circuit R-current	R-current	R-current
2	2nd circuit R-current	N-current	S-current
3	3rd circuit R-current	T-current	T-current
A	Average	Average of R and T	Average
N	—	—	N-current *only 3P4W

6.2.9 Voltage
・The present voltage is displayed.
・Press <SHIFT/∧> to change phase voltage and line voltage.
 (Line voltage is not displayed for 1P2W system. Phase voltage is not displayed for 3P3W system.

Phase voltage

M - 1	1	V
U	2	V
	3	V
	A	V

SHIFT ∧ →

Line voltage

M - 1	1 2	V
U	2 3	V
	3 1	V
	A	V
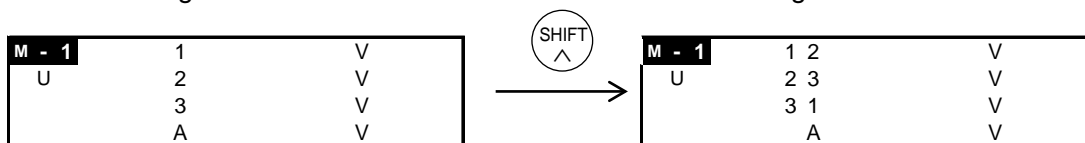
・When input voltage is under 3V (when VT ratio is 1.), it displays "0.00" and doesn't measure.
・When input voltage exceeds 828V or the display range, it displays "- - - - -".
 Check and confirm the measurement environment.
・Voltage measuring points   Eco-POWER METER measures the voltage as below.

Display	1P2W	1P3W	3P3W	3P4W
1	R-voltage (L1-N) or 1st circuit R-voltage	R-voltage (L1-N)		R-voltage (L1-N)
2	None or 2nd circuit R-voltage	None	No display	S-voltage (L2-N)
3	None or 3rd circuit R-voltage	T-voltage (L3-N)		T-voltage (L3-N)
A	Average	Average of R and T		Average
1 2		R-voltage (L1-N)	RS-voltage (L1-L2)	RS-voltage (L1-L2)
2 3	No display	T-voltage (L3-N)	ST-voltage (L2-L3)	ST-voltage (L2-L3)
3 1		TR-voltage (L3-L1)	TR-voltage (L3-L1)	TR-voltage (L3-L1)
A		Average of R and T	Average	Average

6.2.10 Power factor

・The present power factor of the load is displayed.

<1P2W/1P3W/3P4W>   <3P3W>

```
┌──────────────────────────┐     ┌──────────────────────────┐
│ M - 1        1           │     │ M - 1                    │
│ P F          2           │     │ P F                      │
│              3           │     │                          │
│              A           │     │                  1 2 3   │
└──────────────────────────┘     └──────────────────────────┘
```

*Power factor operation is a method assuming balanced load. The error might be big when it measures unbalanced load.

6.2.11 Frequency

・The present frequency is displayed.

<1P2W/1P3W/3P4W>   <3P3W>

```
┌──────────────────────────┐     ┌──────────────────────────┐
│ M - 1        1      H z  │     │ M - 1                    │
│   F          2      H z  │     │   F                      │
│              3      H z  │     │                          │
│              A      H z  │     │                   H z    │
└──────────────────────────┘     └──────────────────────────┘
```

6.2.12 Current unbalance

・The present current unbalance is displayed. (No display for 1P2W.)

```
┌──────────────────────────┐
│ M - 1                    │
│   I                      │
│                          │
│          1 0 0 . 0 0 %   │
└──────────────────────────┘
```

6.2.13 Voltage unbalancing

・The present voltage unbalancing is displayed. (No display for 1P2W.)

```
┌──────────────────────────┐
│ M - 1                    │
│   U                      │
│                          │
│          1 0 0 . 0 0 %   │
└──────────────────────────┘
```

6.2.14 Current THD
・The present THD for current is displayed.

M - 1	1	%
T H D i	2	%
	3	%
	A	%

6.2.15 Voltage THD
・The present THD for voltage displayed.

M - 1	1	%
T H D u	2	%
	3	%
	A	%

M - 1	1 2	%
T H D u	2 3	%
	3 1	%
	A	%

6.2.16 Current n-order Harmonics
・The present current n-order harmonics is displayed.
・Press <SHIFT/∧> to change display.
2nd order, 3rd order, 4th order ・・・・・ up to 31st order

M - 1	1	%
H - I 2	2	%
	3	%
	A	%

6.2.17 Voltage n-order Harmonics
・The present voltage n-order harmonics is displayed.
・Press <SHIFT/∧> to change display.
2nd order, 3rd order, 4th order ・・・・・ up to 31st order

M - 1	1	%
H - U 2	2	%
	3	%
	A	%

6.2.18 Pulse Input Value

・The present pulse input value is displayed.
・Pulse input status (ON or OFF) is confirmed via communication. (MEWTOCOL and MODBUS)

Pulse input

```
M - 1
C N T


          1 2 3 4 5 6 7 8 9 0 1
```

*Turn on the unit during IN1 is shorted, first 1-pulse is not counted. After that, when pulse is input pulse it count the pulse.

6.2.19 Conversion value for integral active power

・The conversion value for the present integral active power (P) is displayed.
  (Only total conversion value is displayed for 3P3W system.)
・Press <SHIFT/∧> to change total, phase 1 (1st circuit), phase 2 (2nd circuit) and phase 3 (3rd circuit).

<1P2W/1P3W/3P4W>
 Total

```
M - 1       1
C H G       2
            3
            Σ   1 2 3 4 5 6 7 8 9 0 1
```

<3P3W>
 Total

```
M - 1       1
C H G       2
            3
            Σ   1 2 3 4 5 6 7 8 9 0 1
```

*The conversion value exceeds "99999999",
 "— — — — — — — —" is displayed.
Check and confirm the measurement environment.

6.2.20 Conversion value for integral export power

・The conversion value for the present integral export active power (-P) is displayed.
   (Only total conversion value is displayed for 3P3W.)
・Press <SHIFT/∧> to change total, phase 1 (1st circuit), phase 2 (2nd circuit) and phase 3 (3rd circuit).

<1P2W/1P3W/3P4W>
 Total

M - 1	1
C H G -	2
	3
	Σ

6.3 Working of Logging Mode

Each measured value is displayed as below. It differs according to the selected phase/wire system.
Arrow mark shows to press each key.

➡ <ITEM/＞>   ⇨ <SHIFT/∧>   ⇒ <SET>   ⇒ <SET>+<ITEM/＞>
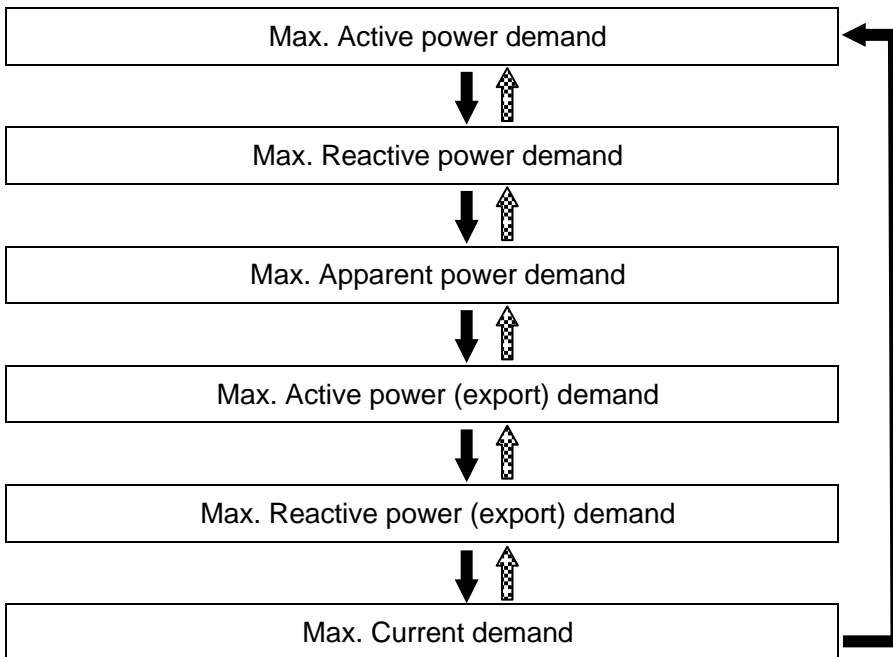
6.3.1 Max. demand value

・Log data of peak demand is displayed.
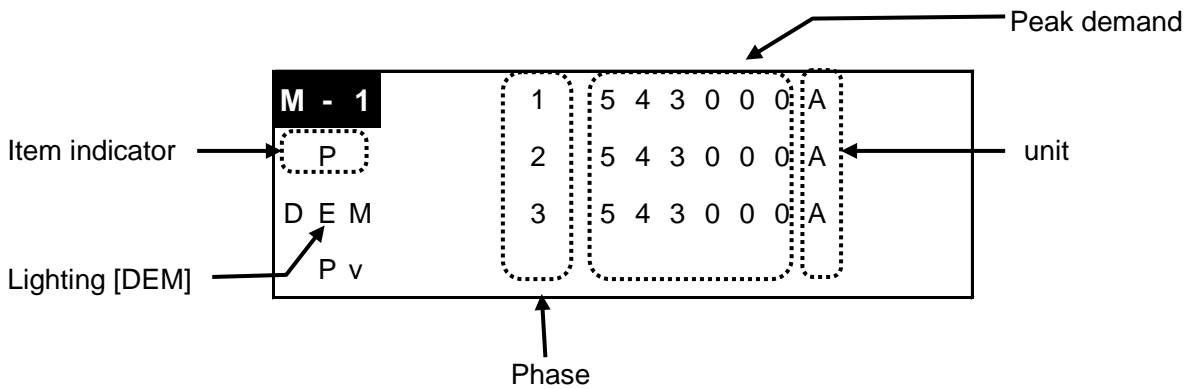
・Press <ITEM/＞> to change items to display.

Item	Display	
	Indicator	unit
Active power Peak demand	P	kW
Reactive power Peak demand	Q	kvar
Apparent power Peak demand	S	kVA
Active power (export) Peak demand	-P	kW
Reactive power (export) Peak demand	-Q	kvar
Current Peak demand	I	A

6.4 Working of Demand Mode
Each measured value is displayed as below. It differs according to the selected demand type.

6.4.1 Block Interval Demand (Sliding block、fixed block)

Arrow mark shows to press each key.

➡ <ITEM/＞＞>   ⇒ <SHIFT/∧>   ▨▨▶ <SET>   ▨▨▶ <SET>+<ITEM/＞＞>

Present demand

| Active power | ⇒ | Reactive power | ⇒ | Apparent power |

Present demand (export power)

| Active power (active) | ⇒ | Reactive power (export) |

Pulse conversion value
for integral power

Present demand (current)

Return to Present demand
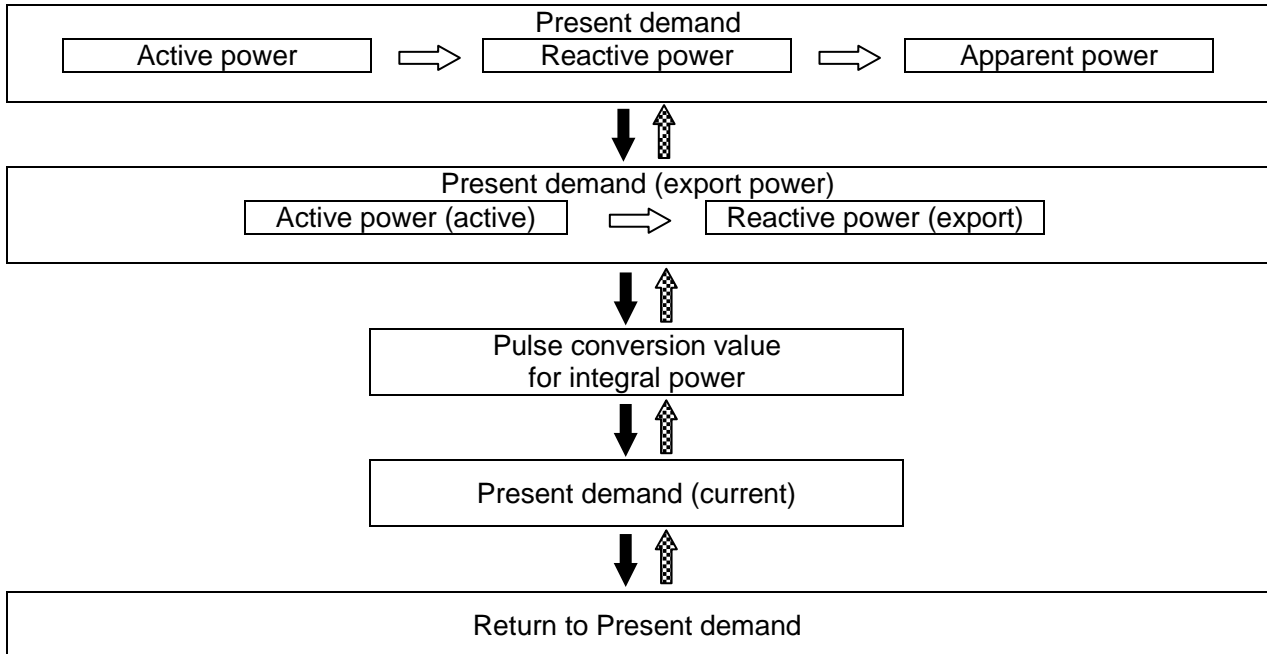
Present power demand

・Each demand value is displayed.
・Press <SHIFT/∧> to change active power, reactive power, apparent power.

Active power present demand
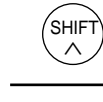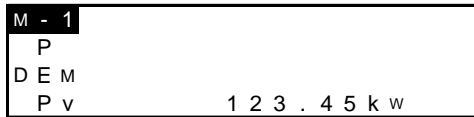
```
M - 1
  P
D E M
  P v        1 2 3 . 4 5 k W
```

(SHIFT ∧) →

Reactive power present demand

```
M - 2
  Q
D E M
  P v        1 2 3 . 4 5 k v a r
```

Apparent power present demand

(SHIFT ∧) →

```
1 - 1
  S
D E M
  P v        1 2 3 . 4 5 k V A
```
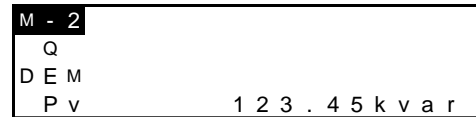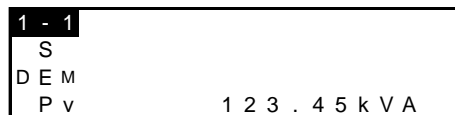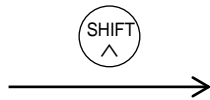
* [−−−−−−−−] is displayed during the following cases.
　・Until passing the setting time to start monitoring demand
　・Demand value exceeds the display range
　・Clock is changed between demand time span
　・Until starting next time span at power failure

Present export power demand
・Each demand value is displayed.
・Press <SHIFT/∧> to change active power (export), reactive power (export).

Active power (export)
present demand
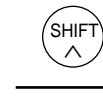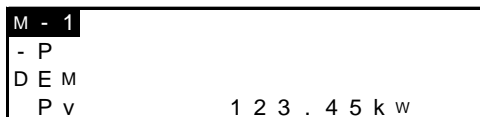
```
M - 1
- P
D E M
  P v        1 2 3 . 4 5 k W
```

(SHIFT ∧) →

Reactive power (export)
present demand

```
M - 2
- Q
D E M
  P v        1 2 3 . 4 5 k v a r
```
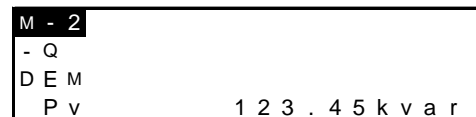
* [−−−−−−−] is displayed during the following cases.
　・Until passing 1 minute after starting monitoring demand
　・Demand value exceeds the display range

Pulse conversion value for integral power
・Present value of pulse conversion value for integral power.

```
M - 1
P L S


              1 2 3 . 4 5 k ʷ h
```

Present current demand
・Present value of current demand is displayed.

```
M - 1       1    1 2 . 3 4 5 A
   I        2               A
D E ᴍ       3               A
   P ᵥ
```

Chapter 7 Specifications

7.1 General specification (for main unit and expansion unit)

Supply voltage range	100 to 240V AC
Rated frequency	50/60Hz
Nominal power consumption	Approx. 15VA (240V AC at 25℃)
Inrush current	30A or less (240V AC/DC at 25℃)
Allowable momentary power-off time	10ms
Ambient temperature	Operation -10 to + 50℃
	Storage -25 to + 70℃
Ambient humidity	30 to 85%RH (at 20℃) non-condensing
Breakdown voltage (initial)	Between the isolated circuits: 2,000V/1min

	a) enclosure ⇔ all terminals
	b) primary insulated circuits ⇔ secondary insulated circuits
	   (Double insulation)
	   ・power supply terminals ⇔other terminals
	   ・voltage input terminals ⇔ other terminals

Insulation resistance (initial)	Between the isolated circuits: 100 MΩ or more
Vibration resistance	10 to 150Hz (7.5 minutes/cycle) single amplitude:0.075mm (1h on 3 axes)
	10 to 55Hz (1 minute/cycle) single amplitude:0.375mm (1h on 3 axes)
Shock resistance	Min. 294m/s^2 (5 times on 3 axes)
Display method	LCD with backlight
Display updated cycle	500, 1000, 2000, 3000 ms (set with setting mode)
Power failure memory method (when power is off)	Internal memory
Sea level altitude	Under 2,000m
Overvoltage category	III
Pollution degree	2
Dimensions W/H/D	Main unit 85 x 140 x 65 mm Expansion unit 85 x 70 x 65 mm
Weight	Main unit Approx. 450g Expansion unit Approx. 200g

7.2 Measurement Specifications

Power measurement (for main unit and expansion unit)

Measured circuit number	Main unit	2-circuit of 1-system (6-circuit of 1-system for 1P2W)		
	Expansion unit	2-circuit of 1-system (6-circuit of 1-system for 1P2W)		
Max. measured circuit number	8-circuit of 1-system (24-circuit of 1-system for 1P2W) (3 Expansion units are connected to main unit.)			
Measured data	AC sine			
Phase/wire system	Single-phase two-wire (1P2W) (max.3-circuit) Single-phase three-wire (1P3W) (common) Three-phase three wire (3P3W) Three-phase four-wire (3P4W)			
Applicable power system	100V system, 200V system, 400V system			
Measured frequency	50/60Hz			
Sampling rate	Sampling	1.024MHz (approx.1.0μs)		
	Data update	100ms 22.5s for Harmonics (2nd to 31st except THD)		
Voltage	Direct input voltage	1P2W	L-L	0-690V AC *0-300V AC for UL standard
		1P3W	L-L	0-690V AC *0-300V AC for UL standard
			L-N	0-350V AC *0-152V AC for UL standard
		3P3W	L-L	0-690V AC *0-300V AC for UL standard
		3P4W	L-N	0-690V AC *0-300V AC for UL standard
			L-L	0-398V AC *0-173V AC for UL standard
	Impedance	2 MΩ or more (L-N; V1/V2/V3/Vn)		
	Resolution	0.01V		
	Power consumption	Approx. 0.2VA (L-N; V1/V2/V3 - Vn)		
	Accuracy *1	±0.2% *±0.5% for 2-phase of 1P3W, 3-1 voltage of 3P3W and line voltage of 3P4W.		
	Input voltage with VT	Primary voltage *3 100 to 500000V		
		Secondary voltage *3 100 to 690V		
Current	Input current (with CT)	Primary current	65,535A or less	
		Secondary current	1A or 5A (set with setting mode)	
	Max. current	10A (200% of the rating)		
	Overload capacity	1000% of the rating for 3s		
	Resolution	0.001A		
	Power consumption	Approx. 0.2VA (between K and L of CT)		
	Accuracy *1	±0.2% *2 *±0.5% for 2(N)-phase of 1P3W and 2(S)-phase of 3P3W.		
Power	Accuracy *1	±0.5% Active power Class 0.5S (IEC 62053-22) Reactive power Class 2 (IEC 62053-23)		

*1 Without error of current transformers (CT) and voltage transformers (VT)
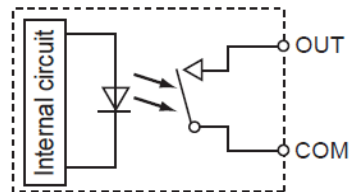
*2 When it measures current under 5% of rating, it may not satisfy the accuracy according to setting of CT. (Max.error 0.5%)

*3 When it input direct, set primary voltage and secondary voltage to the same value.

7.3 Output Specifications (only for main unit)

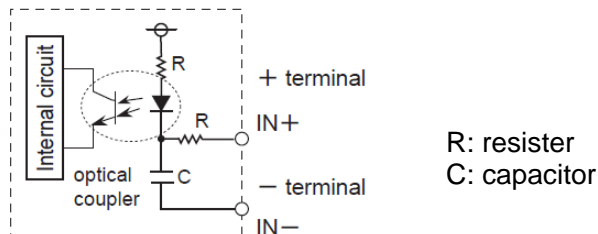| Number of output point		2 points *Insulate between output terminals
Insulation method		MOSFET relay
Output type		1a
Output capacity		100mA, 30V AC/DC
Output mode (OUT1/OUT2)		・Pulse by integral power ・Output by alarm or events (set with setting mode)
Pulse by integral power	Pulse width	1 to 100ms (set with setting mode)
	Pulse output unit	0.001kWh/ 0.01kWh/ 0.1kWh/ 1kWh/ 10kWh/ 100kWh
Alarm Event	Type	Stand-by alarm/ Under voltage alarm/ Over voltage alarm/ Power interruption alarm/ Under current alarm/ Over current alarm/ Active power alarm/ Reactive power alarm/ Apparent power alarm/ PF alarm/ Over frequency alarm/ Under frequency alarm/ Voltage harmonics alarm/ Current harmonics alarm/ Voltage THD alarm/ Current THD alarm/ Unbalanced voltage alarm/ Unbalanced current alarm/ Power demand alarm/ Current demand alarm/ counter output/ level output (external control)
	Alarm reset	Self-reset (according to the setting) / Manual-reset
Protection element		Varistor
Alarm output	Indicator	Lighting alarm mark and blinking backlight
	Output signal	2 points (can set separately) Normal; OFF Alarm; ON
	Output capacity	100mA, 30V AC/DC

<Internal output circuit>

7.4 Input Specifications (only for main unit)

Number of input point	1 point	
Insulation method	Designated insulation for input (insulate to the other functions)	
Input method	Contact/ non-voltage a contact or open-collector	
Input signal	Non-voltage	・Impedance; Max. 1kΩ 　(when short-circuit current: Max. 10mA) ・Residual voltage when shorted; Max. 3V ・Impedance when open: Min. 100kΩ
Input mode	Pulse input or synchronized with input from outer device	
Max. counting speed	2000Hz / 30Hz	
Min. input signal width	0.25ms (when 2000Hz is set) / 16.7ms(when 30Hz is set) ON:OFF ratio＝1:1	

Pre-scale	Decimal point	Under 3-digit
	Range	0.001 to 100.000 (set with setting mode)

Output mode (when pulse output is selected)	HOLD	
Protective elements	Zener diode	

Pulse input	Input signal	1,000 to 99,000 pulse/kWh (set with setting mode) (External pulse converter is necessary.)		
	Pulse rate	0.001 to 100.000 kWh/pulse		
	Input condition	2000Hz	Pulse width	0.25ms or more
			Pulse interval	0.5ms or more (OFF time 0.25ms or more)
		30Hz	Pulse width	16.7ms or more
			Pulse interval	33.4ms or more (OFF time 16.7ms or more)
	Operation voltage/current	5VDC 10mA		

<Internal input circuit>

R: resister
C: capacitor

7.5 Demand monitor and control specifications (common to 9, 10)

Demand type	IEC61557-12 demand 　1. Sliding block interval 　2. Fixed block interval 　3. Current demand
Power input type	Current transformer input Pulse input　*1　　　　　　　　(set with setting mode)
Demand span	1 to 60 min. (set with setting mode)
Measurement item	Present demand
Data update cycle	1 min.
Display	Present demand (active/ reactive/ apparent/ 　　　　　　　　active(export)/ reactive(export)/ current)
Saved data	Max.demand

*1 Only CH1 of main unit is available.
　Only current transformer input is available for CH2 of main unit and expansion unit.

7.6 Communication Specifications

<RS485>

Interface	Conforming to RS485
Communication method	Half-duplex
Synchronous system	Synchronous communication method
Isolation status	Isolated with the internal circuits
Protocol	MEWTOCOL, MODBUS(RTU) (select with setting mode)
Number of connected unit	99 (max.)　　*1
Transmission distance	1200m　　　*2
Transmission speed	115200,57600,38400,19200,9600,4800,2400bps (select with setting mode)
Transmission format	Data length	8bit (fixed)
	Parity	Not available / odd number / even number (select with setting mode)
	Stop bit	1bit, 2bit (select with setting mode)

*1 For RS485 converter on the computer side, we recommend SI-35 and SI-35USB (from LINE EYE Co.,Ltd.). When using SI-35,SI-35USB or PLC from our company (which can be connected up to 99 units), up to 99 can be connected. In case using this system with the other devices, up to 31 can be connected.

*2 Please check with the actual devices when some commercial devices with RS485 interface are connected. The number of connected devices, transmission distance, and transmission speed may be different according to using transmission line.

< Ethernet >

Port number	2 port
Interface	IEEE802.3u,100BASE-T/10BASE-TX
Connector shape	RJ45
Transmission	Transmission speed	100Mbps / 10Mbps
	Transmission method	Base band
	Max. segment length	100m
Transmission cable	UTP (Category 5)
Protocol (DNS, DHCP)	TCP/IP, UDP / IP
Web server	Setting
Functions	Auto-negotiation *1 MDI / MDI-X Auto-crossover

*Ethernet is the trademark of Xerox of USA.
*1 It changes the transmission speed automatically with auto-negotiation function.

7.7 Self-diagnostic

When error is happened, error code will be indicated.

List of Error Code

| No.	Name	Action to take
W0001	DHCP server access error	Connect to DHCP server.
W0002	Obtain the illegal IP address by DHCP server	Confirm DHCP server.
W0003	IP address duplication	Change IP address.
W0013	During lock out web server according to authentication failure	Leave it 10 minutes
E0042	Remove the expansion units	Turn off power and connect the expansion unit
E0049	Hard ware error	Turn on power again When it doesn't recovery, change main unit because of the life is short.
E0091	Internal memory error 1	Turn on power again When it doesn't recovery, change main unit because of the life is short
E0092	Internal memory error 2	Turn on power again When it doesn't recovery, change main unit because of the life is short

Chapter 8　Mounting

8.1 Dimensions

8.1.1 Main unit

(Unit: mm)
(Clearance: ±1.0)
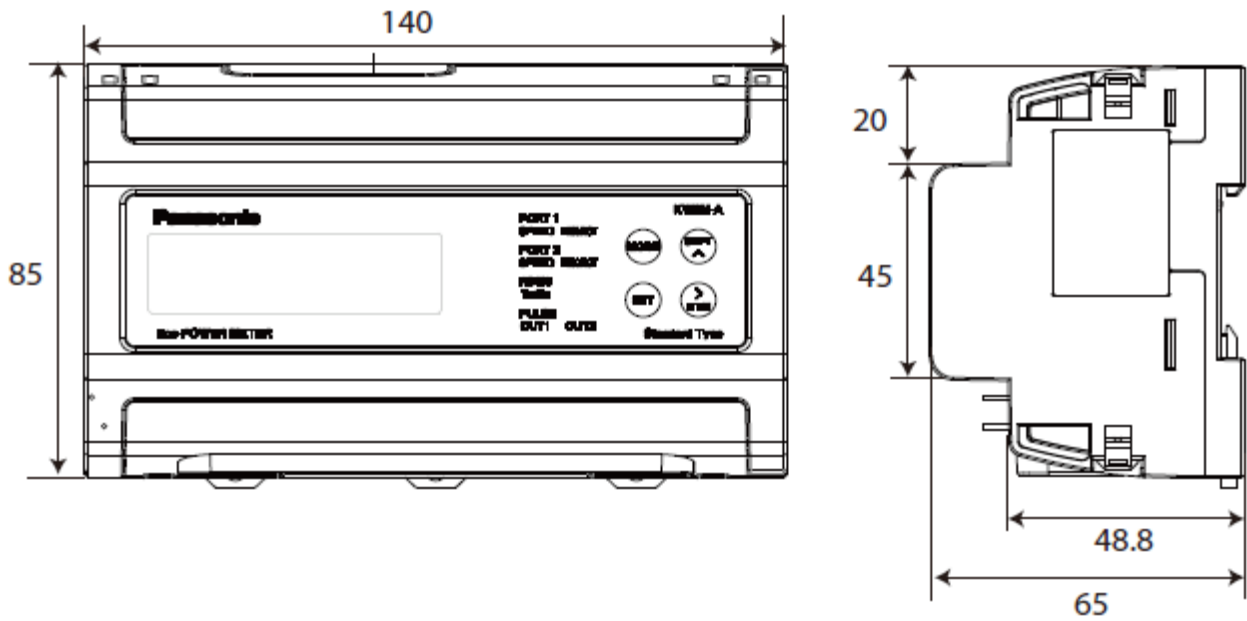
8.1.2 Expansion unit
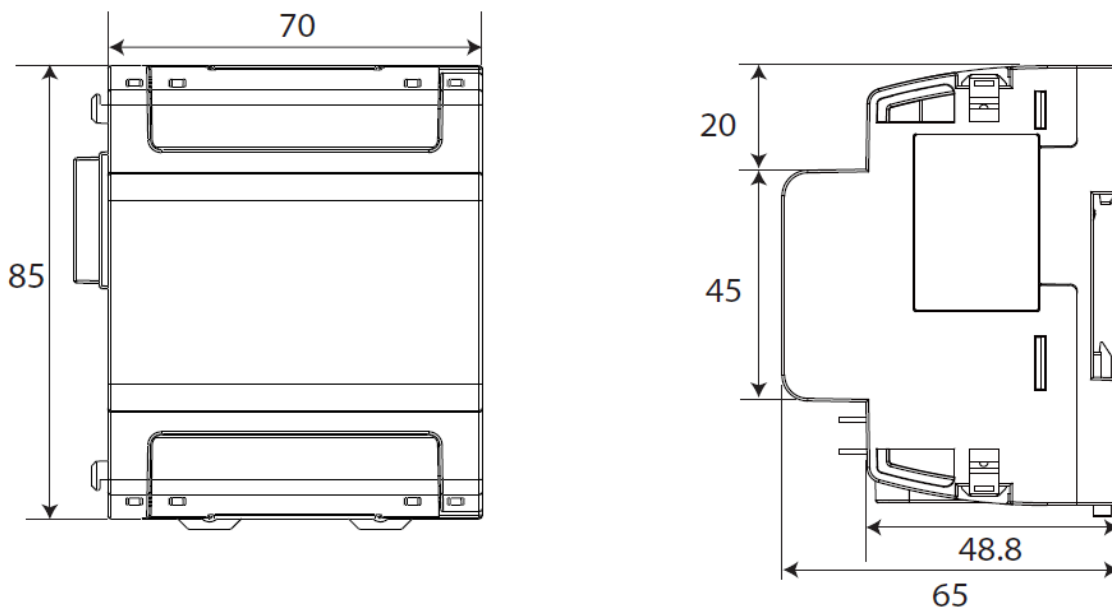
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Please contact ....

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Specifications are subject to change without notice.　　　　WUME-KW2MA-01