Panasonic®

KW2G
Eco-POWER METER
Expansion unit (Analog input)
User's Manual

WUME-KW2GAD-01

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.

- 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.

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.
- Do not use at secondary side circuit of inverter. It might cause exothermic heat or damage.

Copyright and trademark

- Modbus Protocol is a communication protocol that the Modicon Inc. developed for PLC.
- Other company names and the product names are the trademarks or registered trademarks of each company.

Introduction

Thank you very much indeed for purchasing
“KW2G Expansion unit (Analog input)”.
In this manual, we explain the usage of “KW2G Expansion unit (Analog input)” in detail.
Please use it correctly after understanding the content enough.

Table of Contents

Chapter 1 Unit's Outline 3
1.1 Unit's Name and Model Numbers 3
1.2 Combination devices 3
1.3 Other tools 4
1.4 Measurement items 4
Chapter 2 Parts Name and Working 5
2.1 Parts Name 5
Chapter 3 Installation 6
3.1 Measured-circuit 6
3.2 Connection between the main unit and the expansion unit 6
3.3 Terminal arrangement 7
3.4 For input connection 8
3.5 Low Voltage Directive 8
Chapter 4 Settings 9
4.1 Setting for Expansion unit (analog input) 9
4.2 Setting Mode Explanation for Expansion unit (analog input) 11
4.2.1 Mode 2 11
4.2.2 Mode 4 14
Chapter 5 Display of each Value 15
5.1 Unit change 15
5.2 Digital conversion value 15
Chapter 6 Specifications 16
6.1 Unit 16
6.2 Analog input 16
6.3 Applicable standard 17
Chapter 7 Mounting 18
7.1 Dimensions 18

Cautions before using

■ 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.
- ・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.
- ・The power supply terminal and voltage input terminal of the main unit is common. Therefore if 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.

■ 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.
- **・It takes time to update monitor display when many units are connected. However, data update cycle is not changed.**
- **・The unevenness will be large when using outside of rated frequency. In this case, set the shift average frequency big.**

■ 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.

Chapter 1 Unit's Outline

KW2G Eco-POWER METER Expansion unit (Alalog input) measures digital conversion value (voltage/current) from a sensor by connecting to the main unit.

1.1 Unit's Name and Model Numbers

Product name	Model No.	Connecting method
KW2G Eco-POWER METER Expansion unit (Analog input)	AKW2182G	Analog input terminal M3＋ screw *Connect to main unit with the connector.

Note)
It is impossible to measure by only the expansion unit. Connect expansion units to the main unit.
Up to 7 expansion units are connected to 1 main unit.
Use KW2G main unit ver.1.02 or later, or KW2G-H main unit.
If the main unit version is before this, you need to upgrade the main unit.

1.2 Combination devices

●Main unit

Product name	Model No.	Log function	Connecting method	
KW2G Eco-POWER METER Main unit	AKW2010G	Not available	・Power supply terminal (Voltage input terminal)	M3.5＋screw
			・Pulse I/O terminal	M3＋screw
KW2G-H Eco-POWER METER Main unit SD card type	AKW2020G	Available	・RS485 communication terminal	M3＋screw
			・Current transformer(CT)	Connector
			・USB communication	Connector

●Expansion unit

Product name	Model No.	Connecting method
Expansion unit (Power measurement)	AKW2110G	Current transformer (CT) Connector *Connect to main unit with the connector.
Expansion unit (Power measurement + Pulse output)	AKW2160G	Current transformer (CT) Connector Pulse output terminal M3＋ screw *Connect to main unit with the connector.
Expansion unit (Pulse input)	AKW2152G	Pulse input terminal M3＋ screw *Connect to main unit with the connector.

***In this manual, we explain the usage of "KW2G Expansion unit (Analog input)".**

1.3 Other tools

Product name	Functions	Model No
Data collection software KW Monitor	・Monitoring and logging the measured values.	Download from our website. Free of charge
Power display tool KW View	・It makes graph by using data from Eco-POWER METER	Download from our website. Free of charge
Eco-POWER METER Version Upgrade Tool KW Version Upgrade Tool	・You can upgrade the farmware of main unit and expansion unit. ・USB driver is included.	Download from our website. Free of charge

Note) Members registration is required to download.

1.4 Measurement items

Item	Data range
Digital conversion value	-999999 to 999999

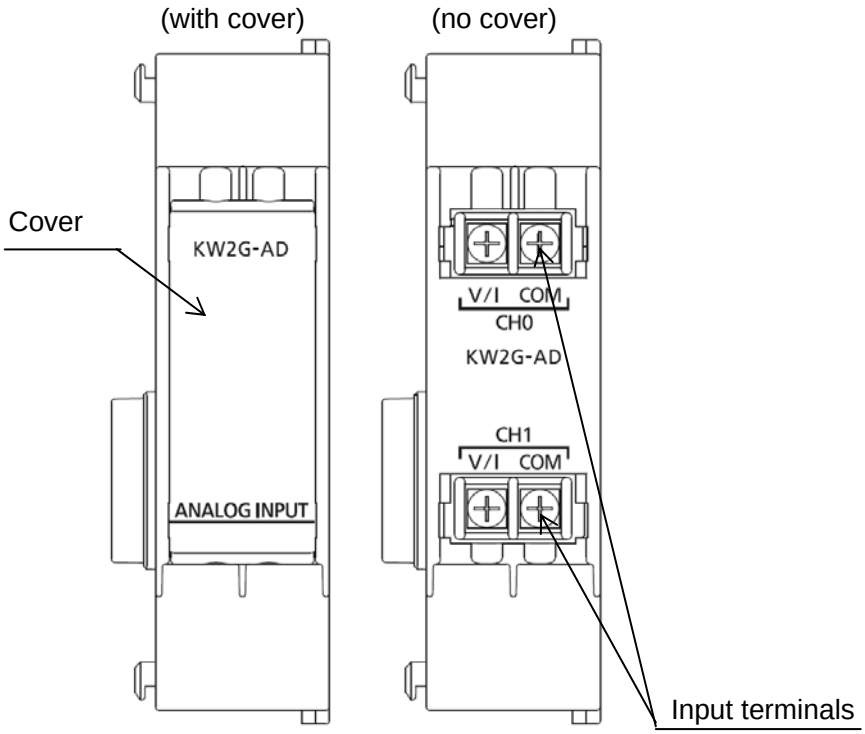
Note) Displayed digit of digital conversion value differs according to the pre-scale set by pre-scale setting mode.

Chapter 2 Parts Name and Working

2.1 Parts Name

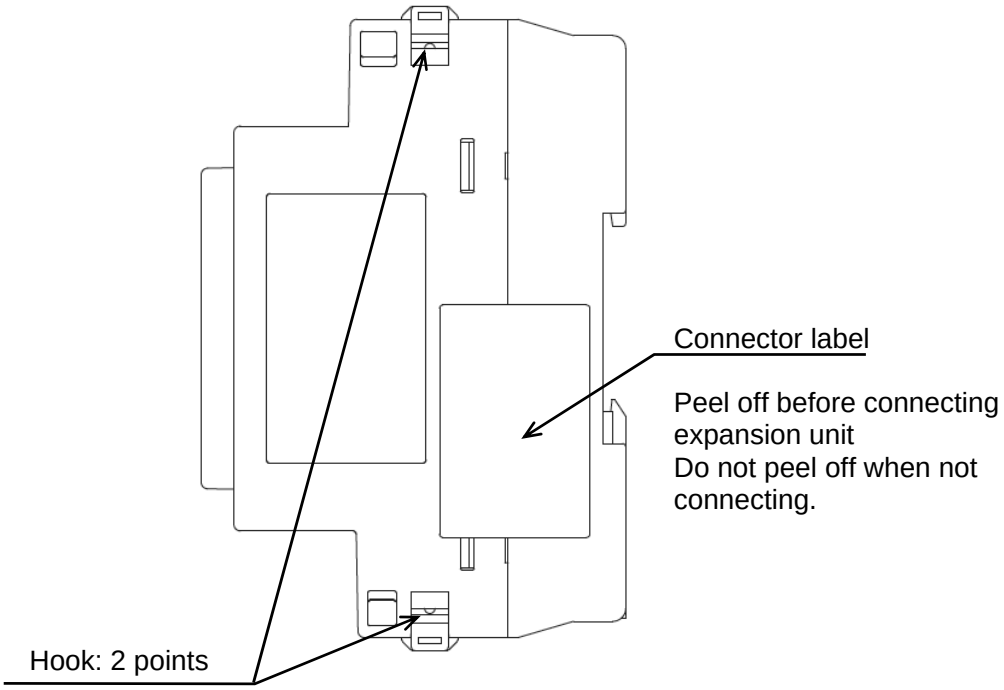
Front view

<Expansion unit (Analog input)>



Side view

<Expansion unit (Analog input)>



Push the hooks into the unit to fix the expansion unit.

Chapter 3 Installation

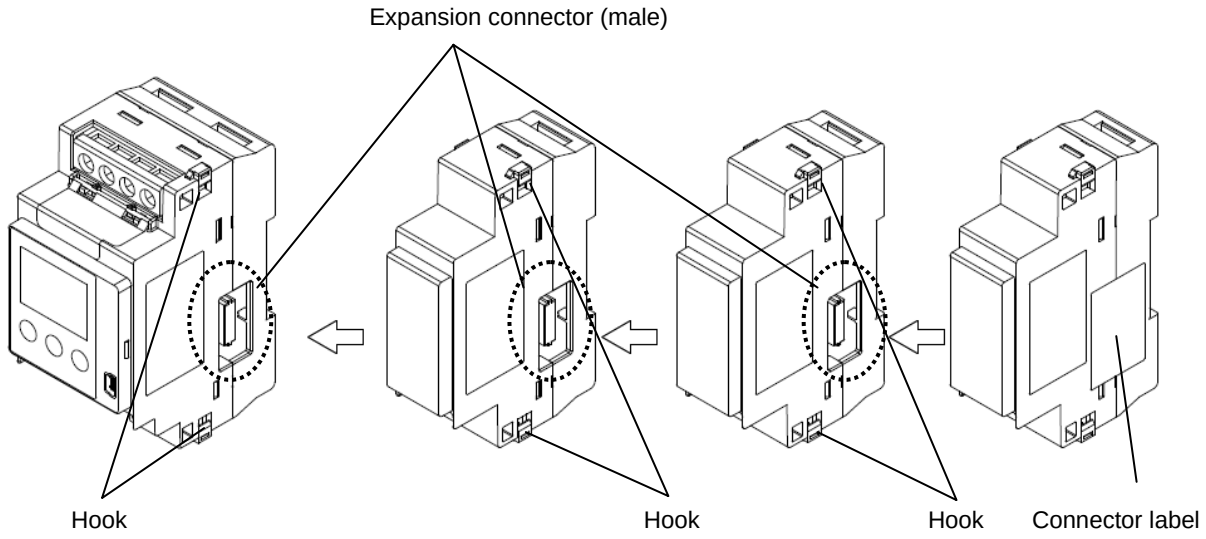
3.1 Measured-circuit

・It is impossible to measure by only the expansion unit. Connect expansion units to the main unit.
Up to 7 expansion units are connected to 1 main unit. You can use with the combination of AKW2110G, AKW2160G, AKW2152G and AKW2182G as expansion units.

3.2 Connection between the main unit and the expansion unit

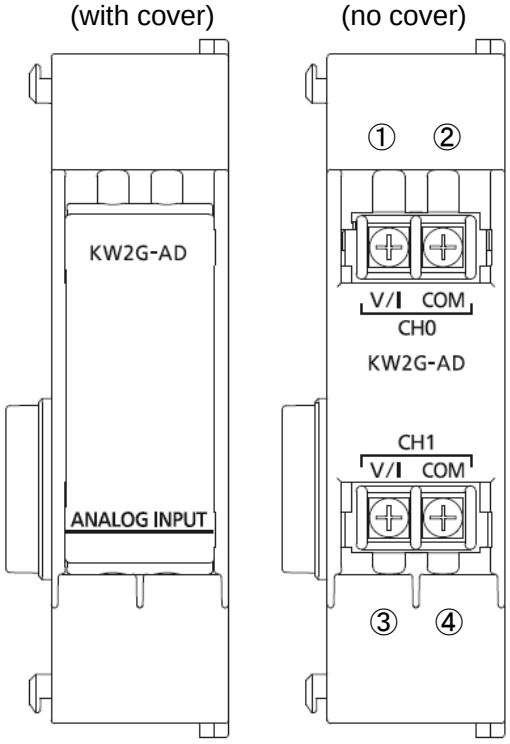
・Turn off the power of main unit when connecting expansion units.
・Peel off connector label on the side before connecting.
(Do not peel off connector labels when not connecting.)
・It expands by connecting each male connector to female connector. Female connector is on the other side of male connector.
・After connecting, push the hooks into the unit to fix the expansion unit.
・Up to 7 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.



3.3 Terminal arrangement

Be sure to wire accordingly to the wiring diagrams.
After completing the wiring, attach the cover for your safety.
Do not perform wiring or installation with a live line. It may be broken down the unit.

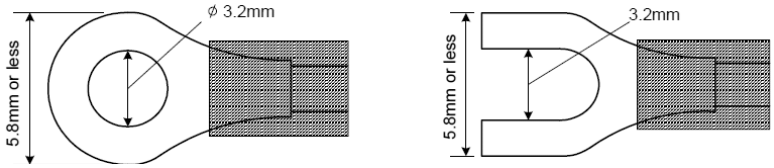


No.		Function			Screw
Top	①	CH0	V/I	Voltage/ Current	M3
	②	CH0	COM	Common	
Bottom	③	CH1	V/I	Voltage/ Current	
	④	CH1	COM	Common	

∗ COM terminals ② and ④ are connected internal.

Caution for Wiring

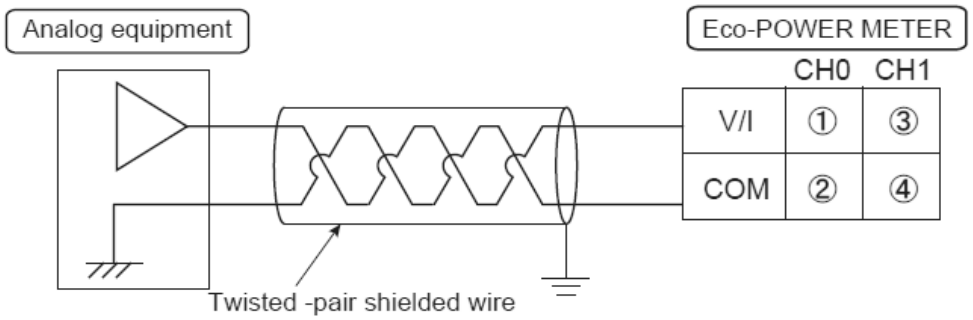
1) Terminal fastening torque should be 0.5 to 0.6N·m for M3 screw. In case of using a crimping terminal, use it with insulating sleeve applicable to M3 screw.
width: 5.8mm or less



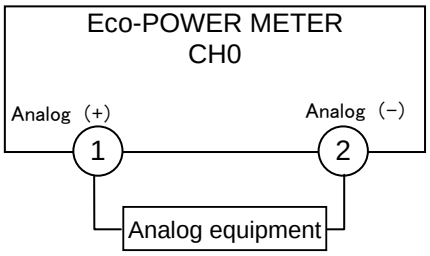
2) Use with 10m or less of the input line.
3) Use flame-resistant cable for each wiring.

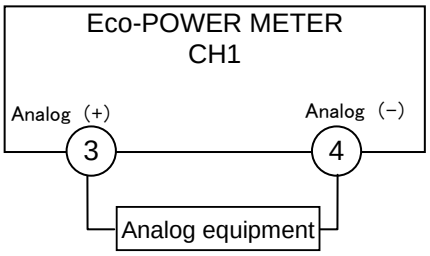
3.4 For input connection

●Analog input



Note)
・Use double-core twisted-pair shielded wires. It is recommended to ground them. However, depending on the conditions of the external noise, it may be better not to ground the shielding.
・Do not have the analog input wiring close to AC wires, power wires, or load.
・Digital conversion value is not stable when it is not wired.





3.5 Low Voltage Directive

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

(1) Pulse output part and communication 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 for output part and secure basic insulation or more with communication system side for communication part.
(2) Provide the voltage input part with an EN60947-1 or EN60947-3 compliant circuit breaker. 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.
(3) Use a wire with basic insulation or more for a wire cramped (or connected) CT.

【Environmental conditions】
- ・Overvoltage category Ⅱ, 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

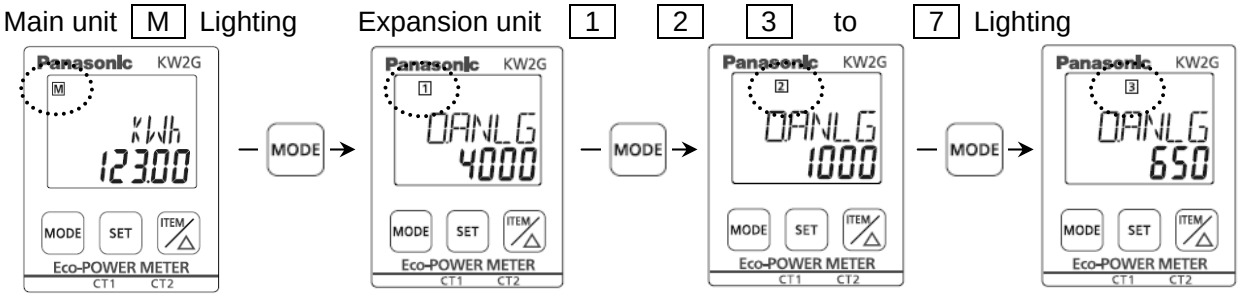
【Mount the product in a place with】
- ・A minimum of dust, and an absence of corrosive gases
- ・No flammable, explosive gasses
- ・Few mechanical vibrations or shocks
- ・No exposure to direct sunlight
- ・No large capacity electromagnetic switches or cables through which large current is flowing

Chapter 4 Settings

4.1 Setting for Expansion unit (analog input)

【Unit change】

Before setting, press <MODE> to shift display of main unit (M) and expansion units (1 to 7) to set.



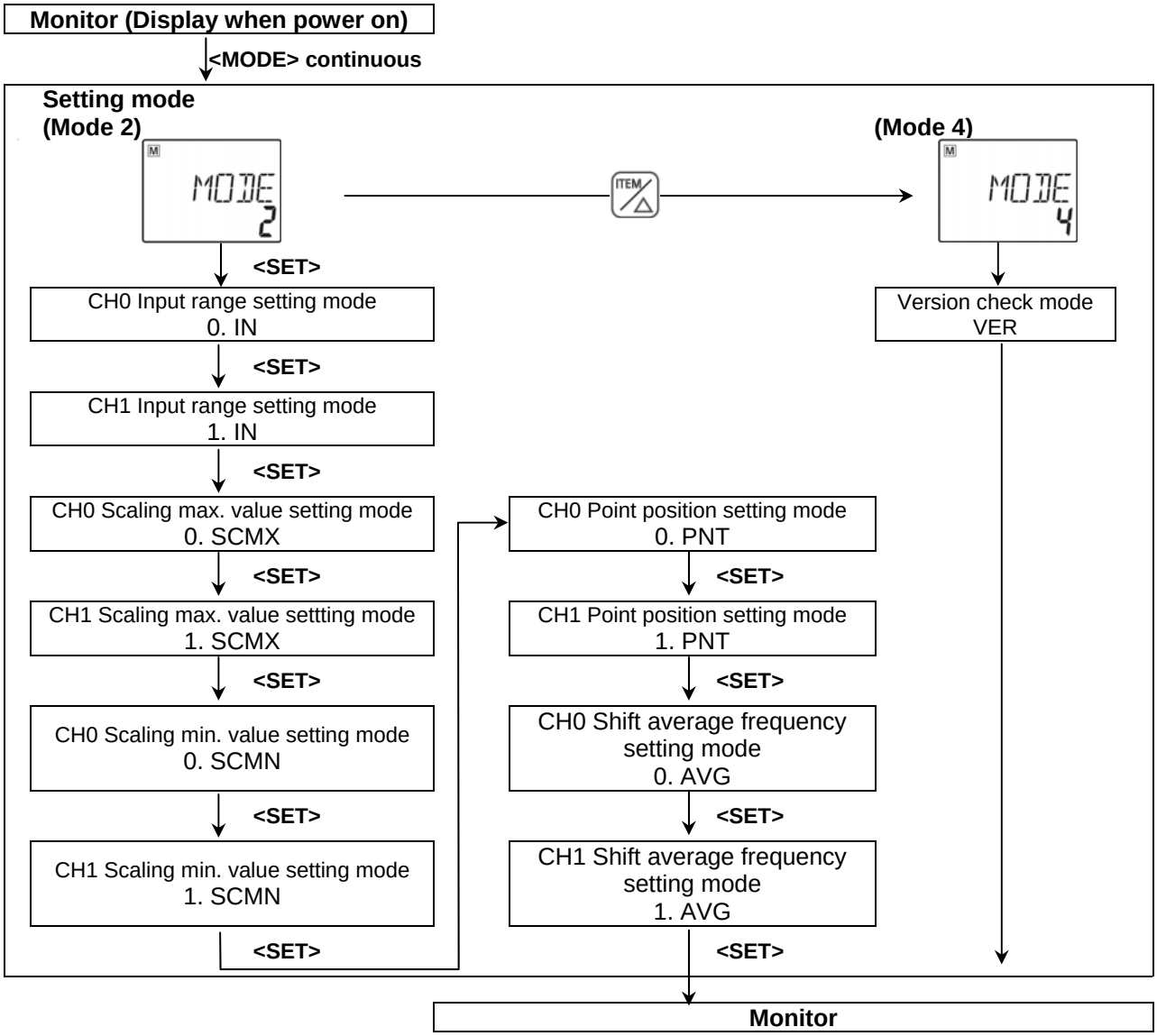
◆Initial value list

Mode 2			
Item	Initial value	Item	Initial value
Input range	0-5V	Point position	1
Scaling max. value	4000	Shift average frequency	0
Scaling min. value	0		

Setting flow chart for Expansion unit (analog input)

Mode 2…Mode for setting of each parameter for analog measurement

Mode 4…Version check mode　　You can check the version of each unit.



Press <MODE> to return Monitor.

4.2 Setting Mode Explanation for Expansion unit (analog input)

■The value with under line "___" is initial setting among each setting value. ☆Set before measurement.

4.2.1 Mode 2

(Mode for setting of each parameter for analog measurement)

Input range setting mode 0. IN/1. IN

Mode defines input range.

・Select from 0-5V /1-5V /0-20mA /4-20mA.

Scaling max. value setting mode 0.SCMX/1.SCMX

Mode defines scaling max. value.

・It can set the range of -999999 to 999999. (Initial 4000)

Scaling min. value setting mode 0.SCMN/1.SCMN

Mode defines scaling min. value.

・It can set the range of -999999 to 999999. (Initial 0)

Point position setting mode 0. PNT/1. PNT

Mode defines the decimal point position for measurement value display.

・Select form 0.0001/0.001/0.01/0.1/1. (Initial 1)

・The position of decimal point set with this mode is applied to digital conversion value, scaling max.value and scaling min. value.

Shift average frequency setting mode 0. AVG/1. AVG

Mode defines shift average frequency for measurement value.

When unevenness of the measurement value is large, you can suppress the unevenness by setting bigger average frequency.

・Select from 0 / 2 / 4 / 8 / 16.

Setting of the shift average frequency reflects to measurement value.

Mode 2 Setting flow chart

Monitor

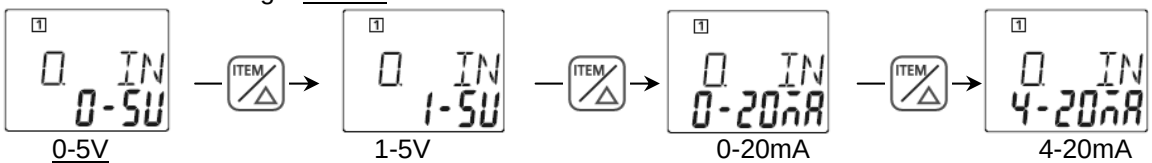
↓ **<MODE> continuous press**

MODE 2 Lighting

↓ **<SET>**

CH0 Input range setting mode

Press <ITEM/△> to change 0-5V ⇒ 1-5V ⇒ 0-20mA ⇒ 4-20mA.



0-5V 1-5V 0-20mA 4-20mA

↓ **<SET>**

CH1 Input range setting mode

Press <ITEM/△> to change 0-5V ⇒ 1-5V ⇒ 0-20mA ⇒ 4-20mA.

0-5V 1-5V 0-20mA 4-20mA

↓ **<SET>**

CH0 Scaling max. value setting mode

Set scaling max. value using <ITEM/△>,<SET>+<ITEM/△>.

(-999999 to 999999, initial: 4000)

ITEM/△	Increase
SET + ITEM/△	Decrease

↓ **<SET>**

CH1 Scaling max.value setting mode

Set scaling max. value using <ITEM/△>,<SET>+<ITEM/△>.

(-999999～999999, initail: 4000)

ITEM/△	Increase
SET + ITEM/△	Decrease

↓ **<SET>**

CH0 Scaling min. value setting mode

Set scaling min. value using <ITEM/△>, <SET>+<ITEM/△>.

(-999999～999999, initial: 0)

ITEM/△	Increase
SET + ITEM/△	Decrease

↓ **<SET>**

CH1 Scaling min. value setting mode

Set scaling min. value using <ITEM/△>, <SET>+<ITEM/△>.

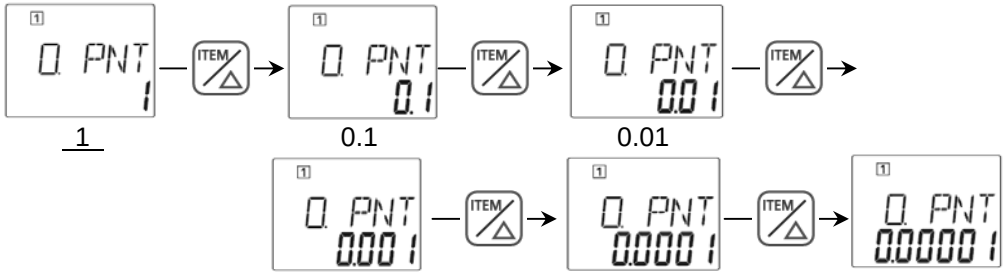
(-999999～999999, initial: 0)

ITEM/△	Increase
SET + ITEM/△	Decrease

↓ **<SET>**

CH0 Point position setting mode

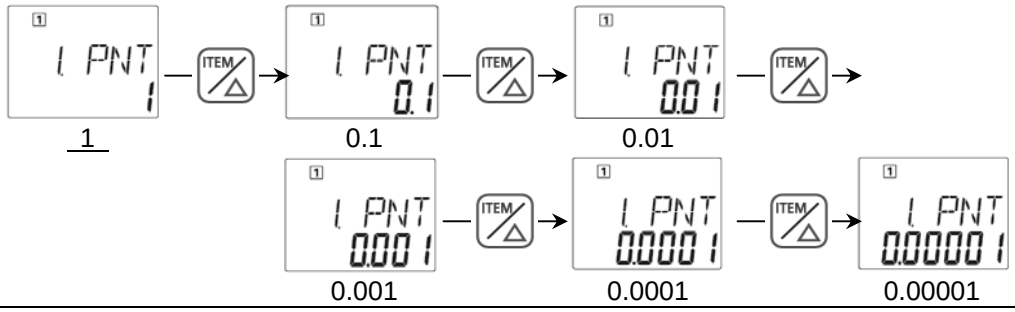
Press <ITEM/△> to change 1 ⇒ 0.1 ⇒ 0.01 ⇒ 0.001 ⇒ 0.0001 ⇒ 0.00001.



↓ **<SET>**

CH1 Point position setting mode

Press <ITEM/△> to change 1 ⇒ 0.1 ⇒ 0.01 ⇒ 0.001 ⇒ 0.0001 ⇒ 0.00001.

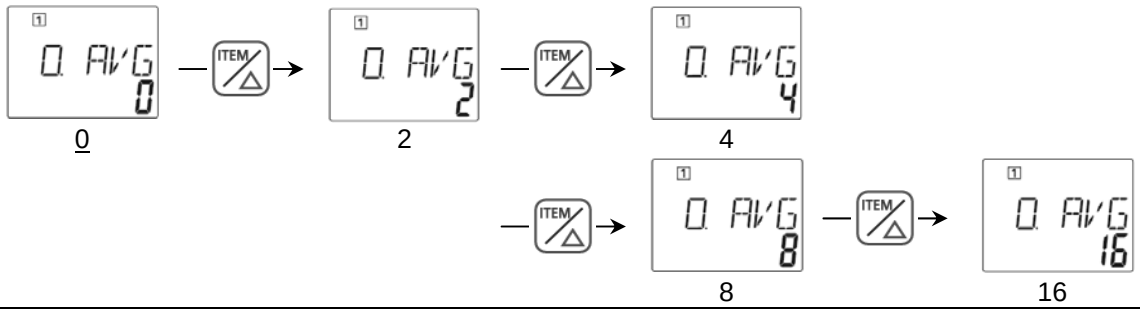


1 0.1 0.01 0.001 0.0001 0.00001

⬇ <SET>

CH0 Shift average frequency setting mode

Press <ITEM/△> to change 0 ⇒ 2 ⇒ 4 ⇒ 8 ⇒ 16.

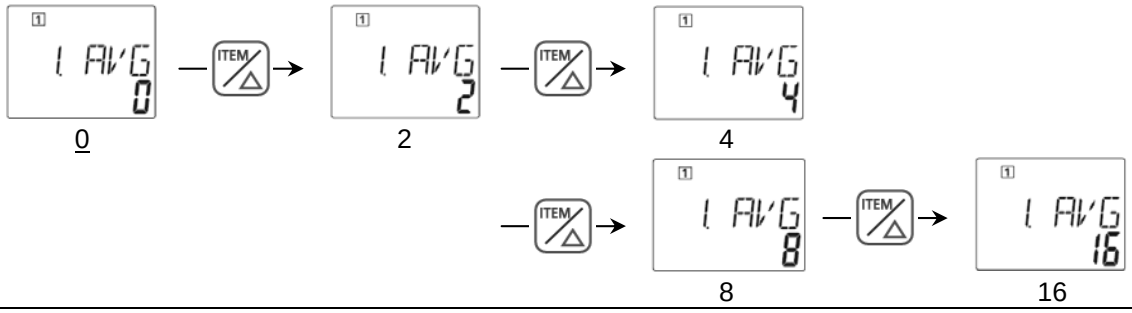


0 2 4 8 16

⬇ <SET>

CH1 Shift average frequency setting mode

Press <ITEM/△> to change 0 ⇒ 2 ⇒ 4 ⇒ 8 ⇒ 16.



0 2 4 8 16

⬇ <SET>

Monitor

4.2.2 Mode 4

(Version check mode)

Version check mode	**VER**

Mode to check version of the software.

It displays version of the software.

Mode 4 Setting flow chart

Monitor

↓ **<MODE> continuous press**

MODE 2 Lighting

↓ **<ITEM/△> 1 time**

MODE 4 Lighting

↓ **<SET>**

Version check mode
It displays the version of software. 

↓ **<SET>**

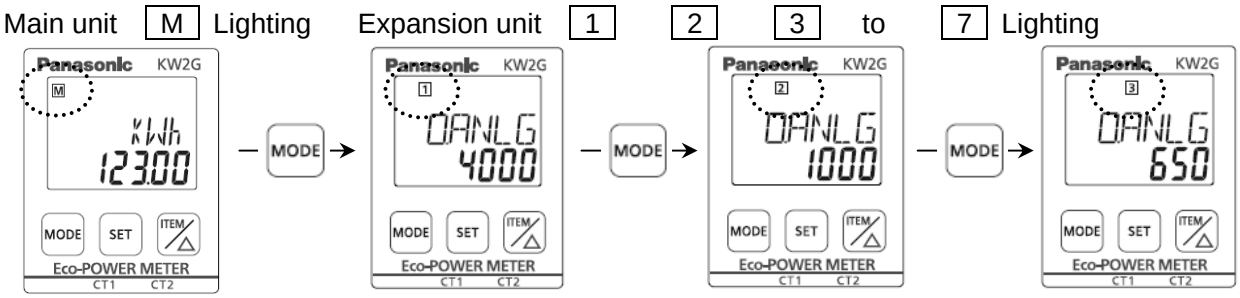
Monitor

Chapter 5 Display of each Value

5.1 Unit change

【Unit change】

Press <MODE> to shift display of main unit (M) and expansion units (1 to 7).

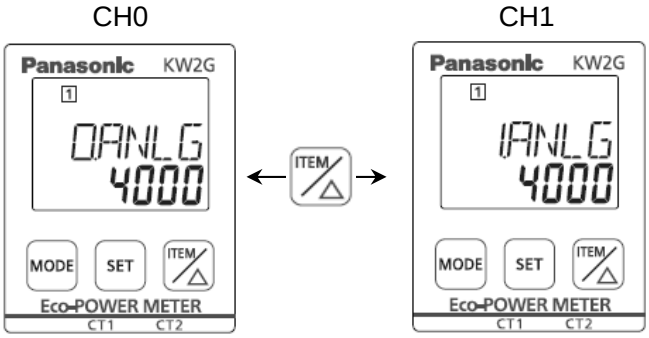


5.2 Digital conversion value

・It displays present digital conversion value.

Press <ITEM/△> to shift CH0 digital conversion value and CH1 digital conversion value.

Example



Chapter 6 Specifications

6.1 Unit

Rated operating voltage	100-240V AC (Add to main unit)	
Rated frequency	50/60Hz common	
Rated power consumption	0.5VA/unit (240VAC at 25℃)	
Inrush current	Max. 30A (240VAC at 25℃)	
Allowable operating voltage range	85 to 264V AC (85 to 110% of rated operating voltage)	
Allowable momentary power-off time	10ms	
Ambient temperature	-10 to +50℃ (-25 to +70℃ at storage)	
Ambient humidity	30 to 85%RH (at 20℃) non-condensing	
Breakdown voltage(initial)	Between the isolated circuits:1500V/1min Detective current: 10mA	Outer edge (enclosure) ー All terminals
	Between the isolated circuits: 500V/1min Detective current: 10mA	Main unit all terminals ー Expansion unit all terminals *2
Insulation resistance(initial)	Between the isolated circuits: 100MΩ or more (measured at 500V DC)	Same as the breakdown voltage.
Vibration resistance	16.7Hz total amplitude (double amplitude):4mm (1h on 3 axes) *1	
Shock resistance	DIN rail mounting: Min. 294m/s^2 (5 times on 3 axes)	
Connectable unit number	Max. 7 (for 1 main unit)	
Size	25×95×65 mm	
Mounting method	DIN rail mounting	
Weight	85g	

*1 Based on JIS C1216 5.2.3(5) and 5.2.3(6)
*2 Between each channel of expansion unit is not insulated.

6.2 Analog input

Input channel		2 channels
Input range	Voltage	0 to 5V / 1 to 5V (Set with setting mode)
	Current	0 to 20mA / 4 to 20mA (Set with setting mode)
Digital conversion value		0 to 4000 (Decimal) *1
Resolution		1/4000 (12bit)
Total accuracy		Within ±1%F.S. (-10 to +50℃)
Input impedance	Voltage	440kΩ
	Current	125Ω
Absolute maximum rating	Voltage	-0.3 to +10V
	Current	-2 to +30mA
Input protection		Diode

*1 Digital conversion value differs according to the setting scaling value.
When analog input value exceeds the upper or lower limit, it keeps the limit value for digital conversion value.

<Conversion value correspondence table>

When 0 to 5V is set

Input voltage (V)	A/D conversion value
0.0	0
1.0	800
2.0	1600
3.0	2400
4.0	3200
5.0	4000

When 1 to 5V is set

Input voltage (V)	A/D conversion value
1.0	0
2.0	1000
3.0	2000
4.0	3000
5.0	4000

When it is out of the range

Under 0V (Minus value)	0
Over 5V	4000

When it is out of the range

Under 0V (Minus value)	0
Over 5V	4000

When 0 to 20mA is set.

Input current (mA)	A/D conversion value
0	0
2.5	200
5	1000
7.5	1500
10	2000
12.5	2500
15	3000
17.5	3500
20	4000

When 4 to 20mA is set

Input current (mA)	A/D conversion value
4	0
6	500
8	1000
10	1500
12	2000
14	2500
16	3000
18	3500
20	4000

When it is out of the range

Under 0mA (Minus value)	0
Over 20mA	4000

When it is out of the range

Under 4mA (Minus value)	0
Over 20mA	4000

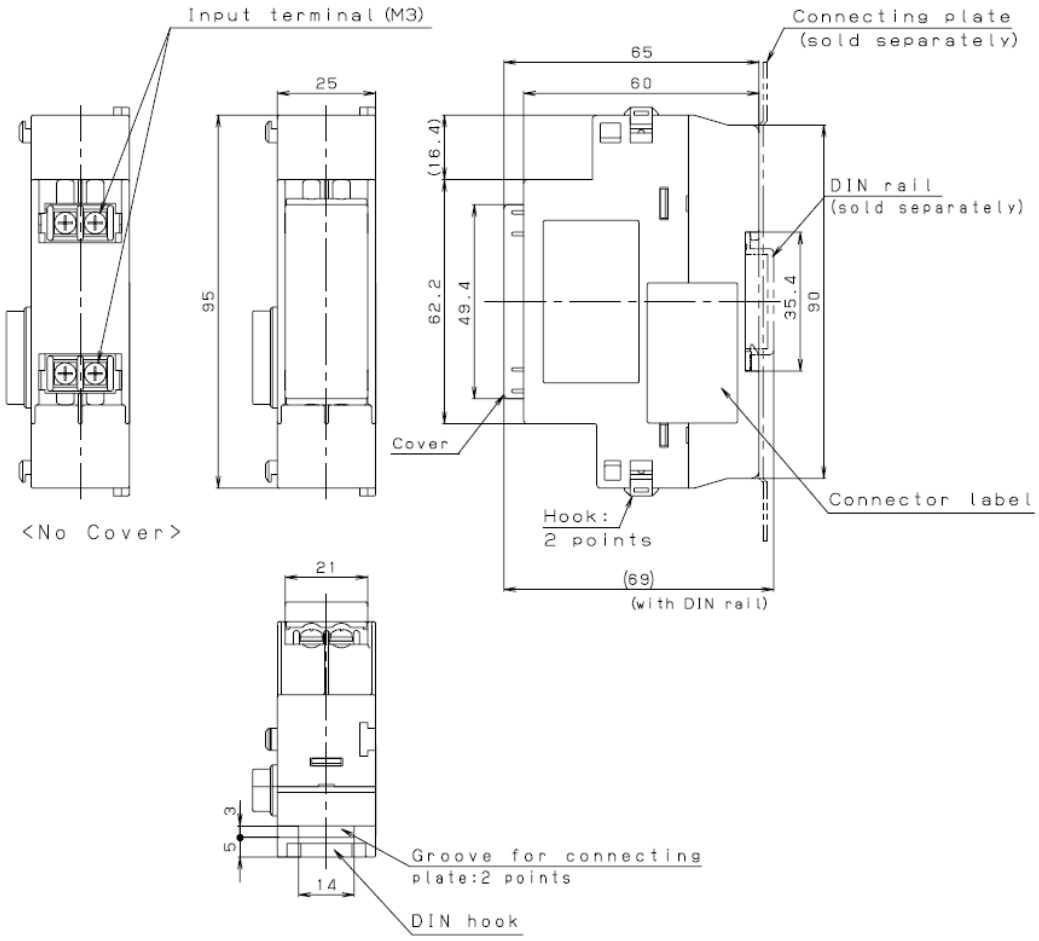
6.3 Applicable standard

Safety standard	EN61010-1		
EMC	EMI EN61326-1	Radiation interference field strength	CISPR11 class A
		Noise terminal voltage	CISPR11 class A
	EMS EN61326-1	Static discharge immunity	EN61000-4-2
		RF electromagnetic field immunity	EN61000-4-3
		EFT/B immunity	EN61000-4-4
		Surge immunity	EN61000-4-5
		Conductivity noise immunity	EN61000-4-6
		Power frequency magnetic field immunity	EN61000-4-8
		Voltage dip / Instantaneous stop / Voltage fluctuation immunity	EN61000-4-11

Chapter 7 Mounting

7.1 Dimensions

(Unit: mm)
(tolerance:±1.0)



Revision History

Issue Date	Manual no.	Content of revision
October 2012	WUME-KW2GAD-01	First issue New issue for the KW2G Expansion unit (Analog input) by eidition of KW2G User's manual (ARCT1F520E-2).