

Energy Measuring Unit Extension for the system with the same voltage  
 Energy Measuring Unit Extension for the system with the different voltage Model EMU4-A2 / EMU4-VA2  
 User's Manual (Digest)

If you are considering using this unit for special purpose such as nuclear power plants, aerospace, medical care or passenger vehicles please refer to our sales representative.

- Before using this unit, please read both this manual and Details carefully and pay attention to safety to handle this unit correctly.
- Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

#### ABOUT MANUALS

You can download User's manual (Details) of this unit from the following site.  
<http://www.mitsubishielectric.co.jp/fa/download/search.do?mode=manual&kisyu=ems>  
 MODBUS is a registered trademark of SCHNEIDER ELECTRIC USA, INC in the United States.

### 1. Features

- This unit is an optional device dedicated to Energy Measuring Unit (EcoMonitorPlus).
- Adding this unit enables measurement of multiple circuits.
- Model EMU4-VA2 enables measurement of the system with the different voltage.

### 2. Checking package contents

This following items for this device and included in package. Check that no items are missing.  
 (1) Energy Measuring unit x1 (2) User's Manual (Digest) x1

### 3. Safety Precautions

#### 3.1 Precautions for Operating Environment and Conditions

This unit is premised on being used in pollution degree 2 <sup>(Note)</sup> environment. When used in higher pollution degree, protect this unit from pollution on another device side to be incorporated.

Over voltage category of measuring circuit in this unit is CAT III <sup>(Note)</sup>, and that of auxiliary power circuit (MA, MB) is CAT III <sup>(Note)</sup>. Do not use this product in the places listed below. Failure to follow the instruction may cause malfunctions and a life decrease of product.

- Places the Ambient temperature exceeds the range -5 to +55°C.
- Altitude exceeds 2000m.
- Places in strong electromagnetic field or places large amounts of external noise exist.
- Places exposed to direct sunlight
- Places exposed to rain or water drop.
- Places the average daily temperature exceeds +35°C.
- Dust, corrosive gas, saline and oil smoke exist.
- Vibration and impact exceed the specifications.
- Places metal fragments or conductive substance are flying.
- Places the Relative humidity exceeds the range 30 to 85% or places with dewfall.

This unit is the open type device, which are designed to be housed within another device for prevention of electric shock. House this unit within the device such as the control panel before use. (Indoor use)

For the precautions for the compliance of the system incorporating this unit with the EMC Directives, refer to the User's Manual (Details).  
 (Note) For the definition of the pollution degree and the over voltage category, refer to EN61010-1/2010.

#### 3.2 Matters concerning the precaution before use

- Use the unit in the specified usage environment and conditions.
- To use this unit, Base unit (EMU4-BM1-MB, EMU4-HM1-MB, EMU4-LG1-MB, EMU4-CNT-MB) is necessary. As for Base unit, refer to User's manual (Details) of each Base unit.
- To set this unit, dedicated small-size display unit (EMU4-D65) is necessary. For the setting method, refer to User's manual (Details) of the display unit.

#### 3.3 Installation and Wiring Precautions

**Danger**

- Shut off the external power supply for the unit in all phases before installing or wiring. Failure to do so may cause an electric shock or damage of this unit.
- Work under the electric outage condition when installing and wiring. Failure to do so may cause electric shock, a failure of the unit, a fire etc.

**Caution**

- Any person who is involved in the installation and the wiring of this unit should be fully competent to do this work.
- Secure spatial distance more than 100 mm in all directions (other than back)
- When tapping or wiring, take care not to entering any foreign objects such as chips and wire pieces into this unit.
- Check the connection diagram when wiring. Wrong wiring may cause failure of the unit, a fire or electric shock.
- For protection against noise, **transmission lines and input/output lines shall not be placed close to or bound together with the power lines and high-voltage lines.**
- Strip the wires with proper length. Overlong stripping length may cause short to next wire and electric shock. Shorter stripping length may cause contact failure.
- Take care not to short to next terminal by a filament. (Do not plate the wires with solder.)
- Do not connect more than two wires to one terminal of a terminal block for preventing loose contact and wires dropout.
- Use appropriate size of electric wires. If inappropriate size of electric wire is used, it may cause a fire due to generated heat.
- Tighten the screw within the specified torque. Under tightening can cause drop of the screw, short circuit or malfunction. Over tightening can damage the screw and/or unit, resulting in drop, short circuit or malfunction.
- After tightening the screws, be sure to check all the screws tightened. Loose screw may cause malfunction of the unit, a fire or electric shock.
- Be sure to attach the terminal cover to prevent electric shock.
- Use the crimp-type terminal appropriated for the size of electric wires. If inappropriate crimp-type terminal is used, a wire breakage or a contact failure may occur, which may cause a device malfunction, a failure, a burnout or a fire.
- FG terminal must be grounded according to the D-type ground (ground resistance is not exceed 100Ω).
- Do not directly touch any conductive part of the unit. Doing so can cause electric shock, failure or malfunction of the unit.
- When using this product, make sure to use it in combination with the current sensor (EMU-CT\*\*\*, EMU-CT\*\*\*-A, EMU2-CT5, EMU2-CT5-4W). Please not to exceed the rating of this product for input of the current sensor. For further details, please refer to the manual for the current sensor to maintain the functionality and the accuracy of this product.
- The dedicated current sensor (EMU-CT\*\*\*, EMU-CT\*\*\*-A) is used only for low voltage circuit. It cannot be used for a high voltage circuit. EMU2-CT5 and CT5-4W should be used with the secondary side (5A) of transformer transfixed. If it is connected with a high-voltage circuit by mistake, it may cause a burnout of the device and a fire. It is critically dangerous.
- The dedicated current sensor has a polarity (directionality). Be careful about it when installing the unit.
- The wires to be connected to this unit shall be placed in a duct or fixed together by cramping. If the electric wires are not placed in the duct or cramped together, loosen wires or their movement or careless stretch may cause a breakage of the unit or wire or a malfunction due to poor contact of electric wires.
- If the wires connected to this unit are strongly pulled off, it may cause a malfunction or a breakage to the unit or the wire.
- Do not exceed the specified voltage when doing an insulation resistance test and a commercial frequency withstand voltage test.
- To prevent persons with little knowledge about electric equipment from electric shock, panel must be taken either following measure. Lock the panel so that only those who get an education about electric equipment and have sufficient knowledge can unlock, or shut off power supply automatically by opening the panel. Cover the dangerous part of this unit.

#### 3.4 Precautions for Use

- This unit cannot be used for deal and proof of electric energy measurement stipulated in Measurement Act.

**Caution**

- Use this unit within the ratings specified in this manual. If it is used outside the ratings, it may cause not only malfunction or failure but also fire burnout.
- Do not disassemble or modify this unit. It may cause failure, malfunction, injury or fire.
- Do not touch the live part such as connection terminal. It may cause electric shock, electric burn injury or burnout of the device. If any exposed conductor is found, stop the operation immediately, and take an appropriate action such as isolation protection.

#### 3.5 Maintenance Precautions

- Use a soft dry cloth to clean off dirt of the unit surface. Do not let a chemical cloth remain on the surface for an extended period of time nor wipe the surface with thinner or benzene.
- Check for the following items to use this unit properly for long time.
  - (1) Daily maintenance
    - (a) No damage on this unit
    - (b) No abnormality with LED
    - (c) No abnormal noise, smell or heat
  - (2) Periodical maintenance (Once every 6 months to 1 year)
    - No looseness with installation and wire connection

**Caution**

- Do periodical maintenance under the electric outage condition. Failure to do so may cause electric shock, failure of the unit or a fire. Tighten the terminal regularly to prevent a fire. In case a display unit is attached to a sensor unit, get off the display unit during maintaining or tightening terminals.

#### 3.6 Storage Precautions

To store this unit, turn off the power and remove wires, and put it in a plastic bag.  
 For long-time storage, avoid the following places. Failure to follow the instruction may cause a failure and reduced life of the unit.

- Places the Ambient temperature exceeds the range -10 to +60°C.
- Places the Relative humidity exceeds the range 30 to 85% or places with dewfall.
- Dust, corrosive gas, saline and oil smoke exist.
- Vibration and impact exceed the specifications.
- Places exposed to rain, water drop or direct sunlight.
- Places metal fragments or conductive substance are flying.

- Places the average daily temperature exceeds +35°C.

### 3.7 Disposal Precautions

When disposing of this unit, treat it as industrial waste.

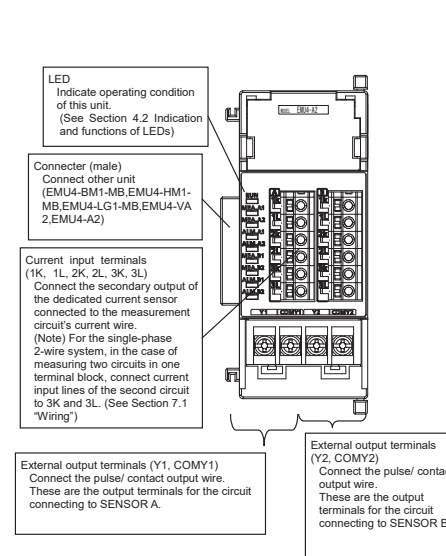
### 3.8 About packaging materials and this manual

For reduction of environment load, packaging materials are produced with cardboard.

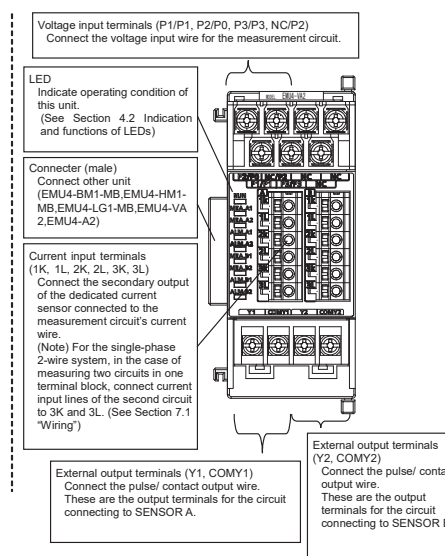
## 4. Name and function of each part

### 4.1 Name of each part

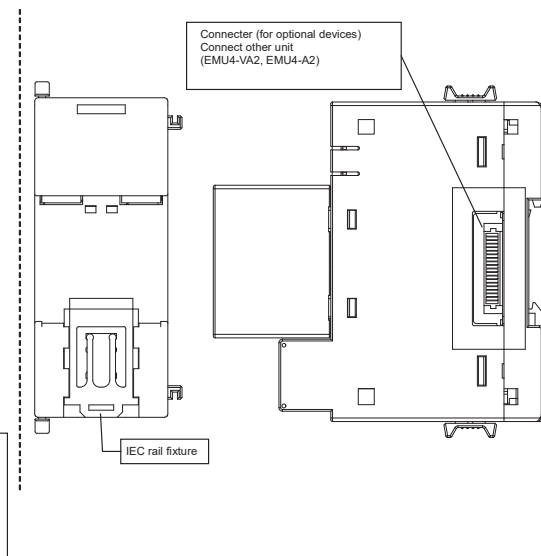
#### (1) EMU4-A2



#### (2) EMU4-VA2



#### (3) Back and right side (common to EMU4-A2 and EMU4-VA2)



### 4.2 Indication and functions of LEDs

The names and operations of LEDs are as follows.

Name	Color	Function	Status
RUN LED	Red	Indicate operating status of this unit.	ON: Normal condition OFF: Power off or hardware failure (Note 1)
MEA, A1 LED	Red	Indicate measuring status of the circuit A1.	ON: In the middle of measuring OFF: Halting measurement
MEA, B1 LED	Red	Indicate measuring status of the circuit B1.	ON: In the middle of measuring OFF: Halting measurement
MEA, A2 LED (Note 2)	Red	Indicate measuring status of the circuit A2.	ON: In the middle of measuring OFF: Halting measurement
MEA, B2 LED (Note 2)	Red	Indicate measuring status of the circuit B2.	ON: In the middle of measuring OFF: Halting measurement
ALM, A1 LED	Red	Indicate occurrence status of upper/lower limit alert of the circuit A1.	ON: An error occurs (Note 1) Blink: Upper/lower limit alert is issued OFF: No alert
ALM, B1 LED	Red	Indicate occurrence status of upper/lower limit alert of the circuit B1.	ON: An error occurs (Note 1) Blink: Upper/lower limit alert is issued OFF: No alert
ALM, A2 LED (Note 2)	Red	Indicate occurrence status of upper/lower limit alert of the circuit A2.	ON: An error occurs (Note 1) Blink: Upper/lower limit alert is issued OFF: No alert
ALM, B2 LED (Note 2)	Red	Indicate occurrence status of upper/lower limit alert of the circuit B2.	ON: An error occurs (Note 1) Blink: Upper/lower limit alert is issued OFF: No alert

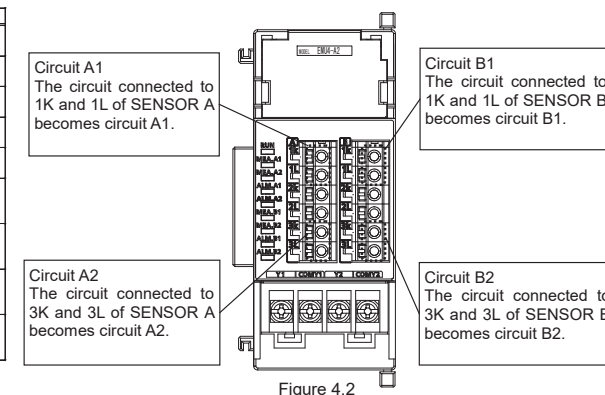


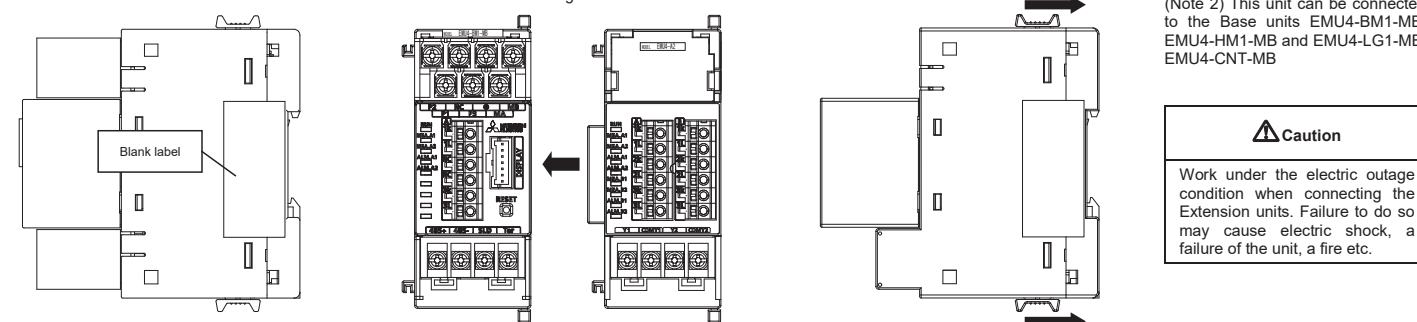
Figure 4.2

(Note 1) For details, refer to Chapter 14 "Error codes" of "User's Manual (Details)".

(Note 2) For the single-phase 2-wire system, in the case of measuring two circuits in one terminal block, these indicate the measuring status of the circuit A2 or B2. (See Figure 4.2)

## 5. Connecting to Base unit

- (1) Peel off the blank label on the right side of the Base unit.
- (2) Insert the connector (male) of the Extension unit into the connector (female) of the Base unit and make both units stick together.
- (3) Slide connection hooks (green-colored) on the top and bottom of the Extension unit to lock the unit.



## 6. Attaching and removing the unit

### 6.1 Mounting on IEC rail

- Applicable IEC rail (35mm)
- Mounting
  - (1) Pull IEC rail fixture downward
  - (2) Catch
  - (3) Push in
  - (4) Push the IEC rail fixture upward
- Removing
  - (1) Hold the unit and pull IEC rail fixture downward
  - (2) Pull the unit

### 6.2 Mounting on JIS agreement type attachment

- JIS agreement type attachment
- Mounting
  - (1) Push the stopper of the IEC rail above
  - (2) Hitch 3 chases at upper part of the module to the hook on the attachment plate
  - (3) Push the module down and fit in the spring fitting in chases at the lower part of the module.
- Removing
  - (1) Push down the spring fitting
  - (2) Lift the lower part of module slowly and remove in reverse order of Attaching.

## 7. How to wire

### 7.1 Wiring

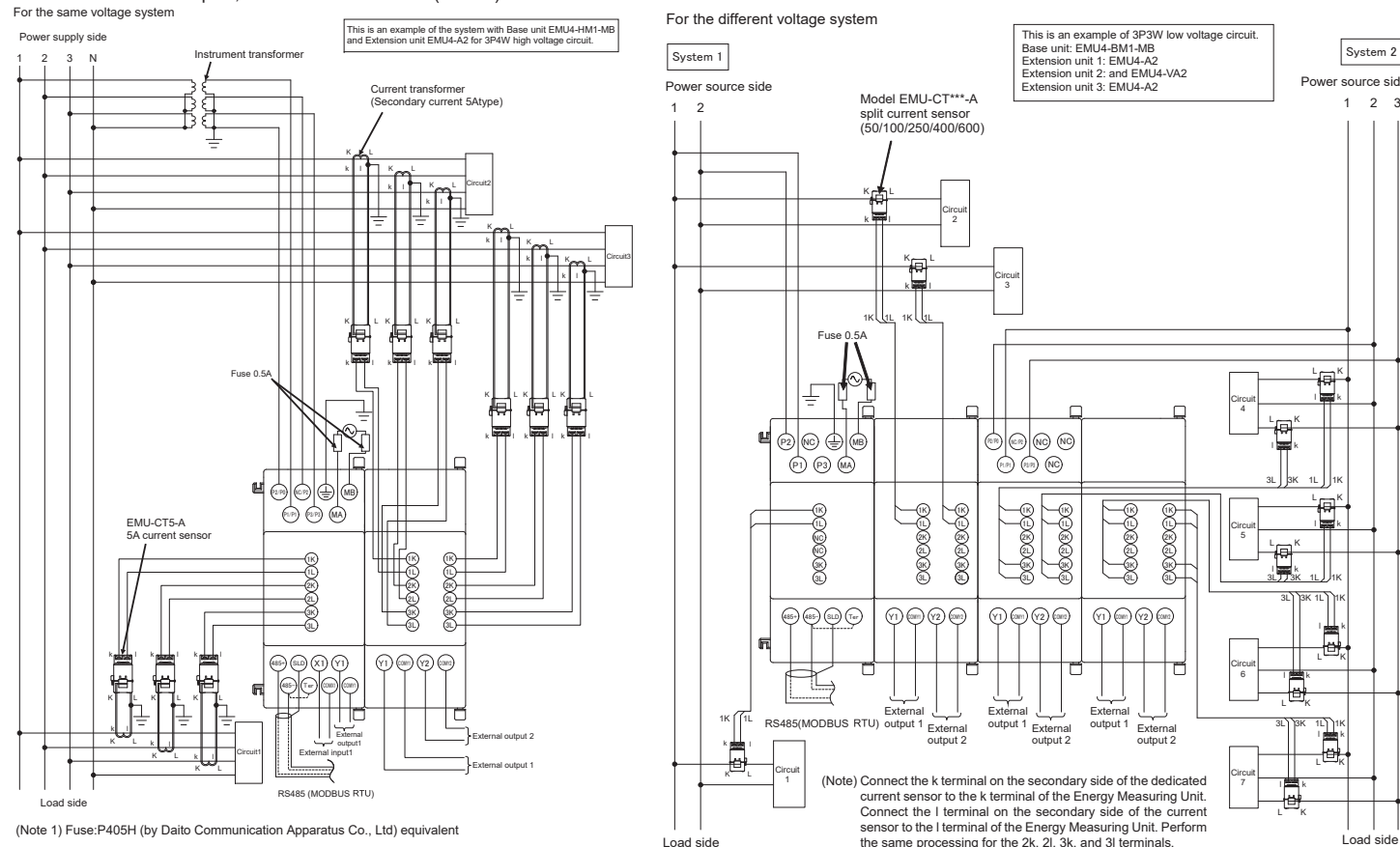
Follow the wiring diagram for external connections of this unit.

To use this unit, Base unit (EMU4-BM1-MB, EMU4-HM1-MB, EMU4-LG1-MB, EMU4-CNT-MB) is necessary.

When using this unit, current sensor (EMU-CT\*\*\*, EMU-CT\*\*\*-A, EMU2-CT5 or EMU2-CT5-4W) is necessary.

(Note) "\*\*\*\*" indicates the rated current of the current sensor (50/100/250/400/600).

For the other examples, refer to "User's Manual (Details)".



(Note 1) Fuse:P405H (by Daito Communication Apparatus Co., Ltd) equivalent

### Caution

- For protection against noise, transmission lines and input/output lines shall not be placed close to or bound together with the power lines and high-voltage lines. Keep distance as below between them. (except for the terminal block) If there is concern about the influence of noise even if the distance is as follows, we recommend using a shielded cable.
- | Condition                      | Distance      |
|--------------------------------|---------------|
| High-voltage line 600V or less | 300mm or more |
| Other high-voltage line        | 600mm or more |
- For the actual usage, connect the FG terminal to ground. (D-type ground: Type 3) Connect it directly to the ground terminal.
  - Do not connect to FG terminal during the insulation resistance test and pressure test. Refer to "User's manual (Details)" Chapter 12 "Specifications" for the applying place.
  - The current sensors dedicated to this unit EMU-CT400/600 resemble the split current transformer for general gauges CW-5SL closely in appearance. However, characteristics are completely different. Be sure to connect the dedicated current sensor. Connecting CW-5SL to this unit directly may cause failure of the device, a burnout or a fire.

- Maximum voltage of the circuit connected to EMU4-VA2 is 277 / 480V. For the circuit over this voltage, use the transformer. Using the transformer, primary voltage is configurable up to 11000V. Secondary voltage is fixed to 110V. (Special primary voltage of VT can be set up to 11000V in any, and special secondary voltage of VT can be set up to 220V in any.)
- For MODBUS RTU communication wiring, recommended to have the extra length wires about 200mm (When extended to B / NET transmission from MODBUS RTU communication, use of MODBUS RTU communication wiring is possible).

- Make sure that before connecting the cable, the orientation of the current sensor is correct for attachment. K to L is the correct direction. K: power source side, L: load side
- EMU-CT\*\*\* and EMU-CT\*\*\*-A are extendable up to 50m.
- EMU2-CT5 and EMU2-CT5-4W are extendable up to 11 m, using together with an extension cable. To extend the wire further, use the current transformer CW-5S(L) for split-type instrument in combination, extending the secondary wiring on CW-5S(L) side.
- EMU-CT\*\*\* and EMU-CT\*\*\*-A are used only for low voltage circuit. (Maximum voltage: 460V) It cannot be used for a high voltage circuit. EMU2-CT5 and EMU2-CT5-4W should be used with the secondary side (5A) of transformer transfixed. If they are used for the circuit directly, they should be used under 200V. (Maximum voltage: 260V)

### 7.2 How to connect wires

<Voltage input terminals, External input/output terminals>

- Use appropriate crimp-type terminal. Applicable crimp-type terminal is shown in the tables below.
- Use electric wires as below, and tighten the terminal screws by the torque as below.

[EMU4-A2]

	Applicable wire	Tightening torque	Applicable crimp-type terminal
External output terminals	Stranded wire:AWG22 to16 (0.3 to 1.3mm <sup>2</sup> ) Single wire:AWG22 to16 (φ0.65 to 1.25mm)	0.5 to 0.6 N·m	For M3 screw of external diameter below 6.1mm

[EMU4-VA2]

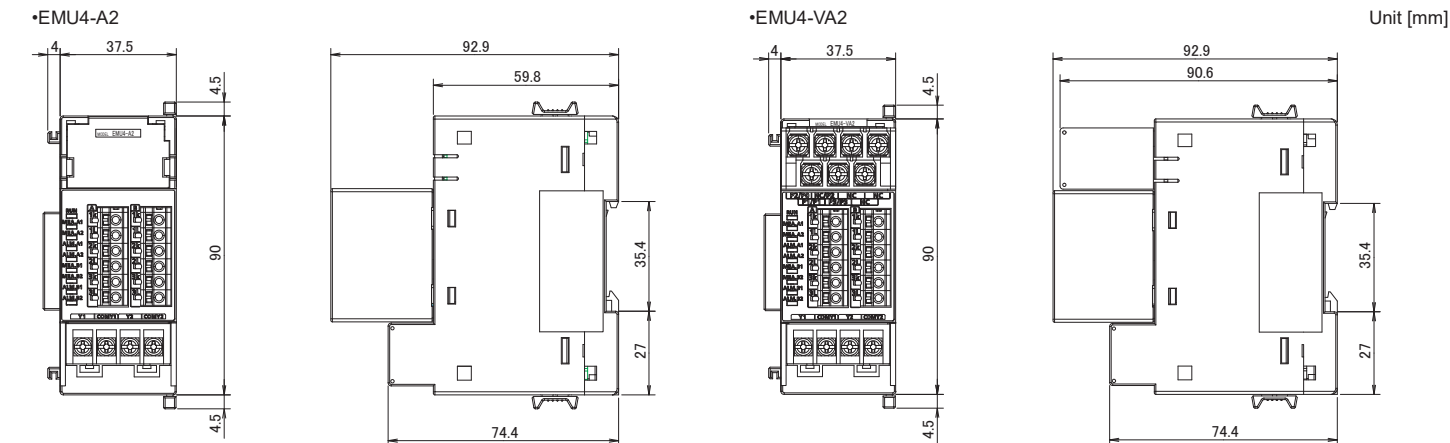
	Applicable wire	Tightening torque	Applicable crimp-type terminal
Voltage input terminals	Stranded wire:AWG22 to16 (0.3 to 1.3mm <sup>2</sup> ) Single wire:AWG22 to16 (φ0.65 to 1.25mm)	0.8 to 1.0 N·m	For M3.5 screw of external diameter below 7.1mm
External output terminals	Stranded wire:AWG22 to16 (0.3 to 1.3mm <sup>2</sup> ) Single wire:AWG22 to16 (φ0.65 to 1.25mm)	0.5 to 0.6 N·m	For M3 screw of external diameter below 6.1mm

<Current input terminals>

- Stripping length of the used wire in use has to be 10 to 11mm.
- In case using stranded wire, take measures so that the filament should not vary by using a bar terminal or by processing the point twisted.
- When attaching and detaching cables to/from the terminal, use the push button. Check that the wire is securely inserted.
- Insert a wire to the terminal all the way until it touches the end.
- Use appropriate electric wires as shown below.

Applicable wire	Applicable crimp-type terminal
Stranded wire: AWG20 to16 (0.5 to 1.3mm <sup>2</sup> ) Single wire: AWG24 to17(φ0.5 to 1.2mm)	TGV TC-1.25-11T (by NICHIFU) equivalent

## 8. Dimensions



## 9. Specifications

Item		Specifications	
		EMU4-A2	EMU4-VA2
Phase-wire system		Same as the unit connected to the left side	Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire, and three-phase 4-wire (common use)
Measurement item		Electric energy (consumption, regeneration), Current, Current demand, Voltage, Electric power, Electric power demand, Reactive power, Apparent power (Note 1), Current unbalance rate, Voltage unbalance rate, Power factor, Frequency, Harmonic current, Harmonic voltage, Reactive energy, Electric energy equivalent, Operating time, Phase angle	
Rating	Voltage circuit	Single-phase 2-wire, Three-phase 3-wire	110V, 220V, 440V AC
	Current circuit	Single-phase 3-wire	110VAC (between 1-and 2-side, 2-and 3-side), 220VAC (between 1-and 3-side)/ 220VAC (between 1-and 2-side, 2-and 3-side), 440V AC (between 1-and 3-side)
		Three-phase 4-wire	Min: 63.5V/110V AC, Max: 277V/480V AC
Frequency		50/60Hz (Auto detect)	
Transient overvoltage		Measuring circuit: CATIII, Auxiliary power supply: CAT III.	
Measurable circuit count		2 circuits (4 circuits when 2 circuits measuring setup and 1P2W wiring)	
External output	Output signal type	No voltage a-contact 2 output (1 point per circuit)	
	Rated open/close voltage/current	35V DC 75mA or 24V AC 75mA (Power factor = 1)	
Operating Environment	Operating temperature	-5 to +55°C (Under the conditions indicated in section 3.1)	
	Operating humidity	30 to 85% RH (No condensation)	
	Storage temperature	-10 to +60°C	
	Operating altitude	2000m or below	
Standard (Note 1)		CE marking (EMC: EN-61326-1: 2013, Safety: EN-61010-1: 2010) UL: UL61010-1	
The number of insert and remove between the units		200 times	

(Note 1) When the model is combined with a B/NET Communication Unit (Model: EMU4-CM-B), it becomes out of a conformity standard.

When the model is combined with a current sensor (Model : EMU2-CT5, EMU2-CT5-4W, EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400-A, EMU-CT600-A), it conforms with the UL standard.

## 10. Contained harmful substances

(1) 电器电子产品有害物质限制使用标识

根据《电器电子产品有害物质限制使用管理办法》，该标记适用于在中国销售的电器电子产品，其中的数字为产品的环保使用期限。只要遵守本产品在使用方面的注意事项，从生产日期起的环保使用期限内不会造成环境污染或对人体、财产产生深刻的影响。  
注) 产品正常使用废弃后，应按照国家及地方的法律法规完成该电器电子产品的回收和再利用。

(2) 产品中有有害物质的名称及含量

本产品中所含有的 6 种有害物质的名称、含有信息及含有部件如下表所示。

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
基板	×	○	○	○	○	○
箱子	○	○	○	○	○	○
端子盖	○	○	○	○	○	○
螺钉	○	○	○	○	○	○
铭牌	○	○	○	○	○	○
接线	○	○	○	○	○	○
接线皮	○	○	○	○	○	○

本表格依据 SJ/T11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

且虽然目前业界没有成熟的替代方案，但是符合欧盟 RoHS 指令要求。

## 11. Warranty

- The charge-free warranty is effective until the earlier of 1 year after the date of your purchase or 18 months after manufacturing. Repair shall be charged for the case failures occur due to your intent or fault even during the charge-free warranty period.

- Please check ALM A1 LED and ALM A2 LED turn off the light. (ALM A1 LED and ALM A2 LED lighting show errors occur)

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

- Our company shall not be liable to compensate for any loss arising from events not attributable to our company, opportunity loss and lost earning of the customer due to failure of the product, and loss, secondary loss, accident compensation, damage to other products besides our products and other operations caused by a special reason regardless of our company's predictability.

### Caution

If an abnormal sound, bad-smelling smoke, fever break out from this unit, switch it off promptly and don't use it.

## 12. Customer Service

### MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, Japan

Please refer to "catalog" or "user's manual (Details)" for more details.