for a greener tomorrow

MITSUBISHI ELECTRIC
Changes for the Better

FACTORY AUTOMATION

Energy Measuring Unit
EcoMonitorPlus

Energy saving+Preventive Maintenance

Energy measuring +α

EcoMonitorPlus

GLOBAL IMPACT OF MITSUBISHI ELECTRIC

Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

Changes for the Better

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance
Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

"Energy-Saving Model Factory" Mitsubishi Electric Fukuyama Works

All Fukuyama Works employees are involved in eco-factory activities, and their concerted efforts and the know-how obtained from these activities are reflected in the development of eco-products.

Since 1997, designated as a model plant for energy-saving operations, "Energy-Saving Model Factory" that serves as the driving force behind energy-saving activities at Mitsubishi Electric.

Mitsubishi Electric Fukuyama Works

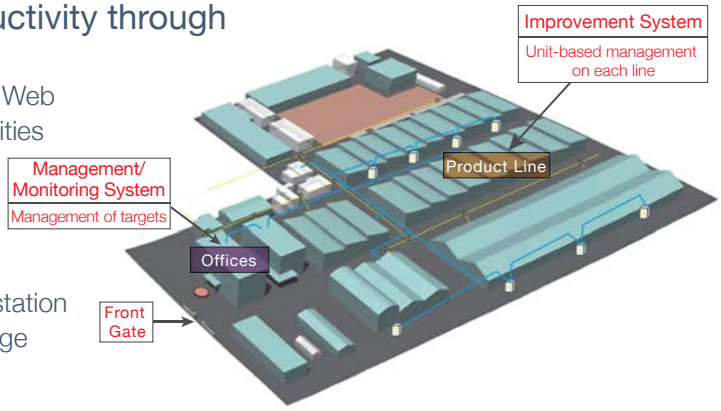
Specific Energy-Saving Efforts

1. Using the Web to improve productivity through unit-based management

   Visualization of energy consumption on the Web
   ⇒Discovery of waste ⇒ Improvement activities by all employees ⇒ Improved productivity

2. Using the Web to manage power usage targets

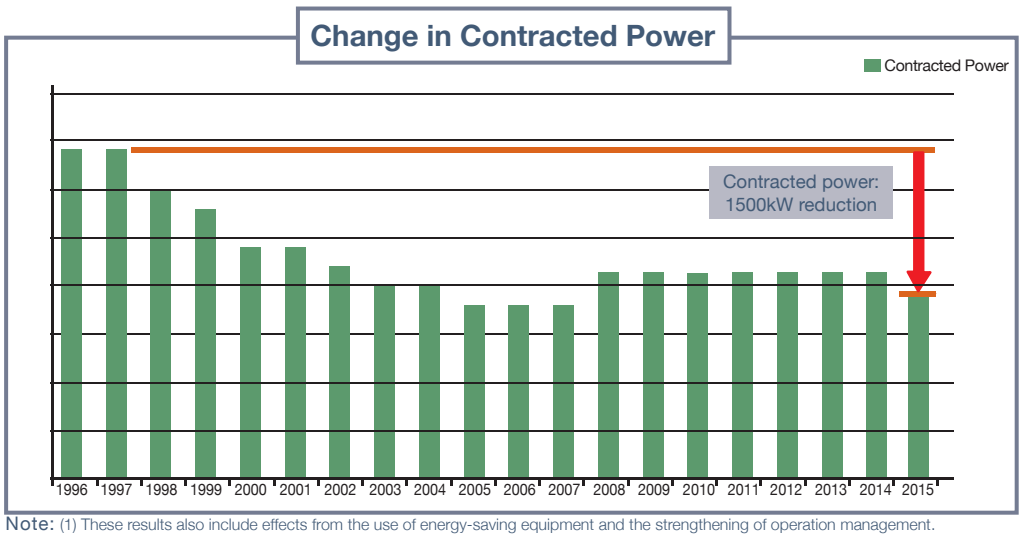
   Assignment of managers at each local substation
   ⇒Utilization of graphs on the Web to manage power usage targets in each department



Energy Cost Reduction Results

Results: 1500kW reduction in 2015 compared to 1997

Reduction of approx. 100 million yen



Note: (1) These results also include effects from the use of energy-saving equipment and the strengthening of operation management.
(2) ISO14001 certification was acquired in December 1997.
(3) The Great East Japan Earthquake occurred in March 2011.

Energy Measuring Unit

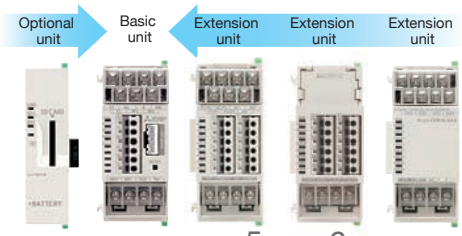
EcoMonitorPlus

Advanced Functionality with EcoMonitorPlus!

Select a combination of units with various measuring instruments and functions according to your needs.
Use the EcoMonitorPlus energy measuring unit to provide additional value through "power monitoring", "construction of a visualization system", "preventive maintenance and safe operation of production facilities", and "improved productivity".

Feature 1 Extension

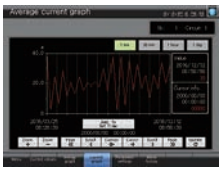
Building block method
for extension without waste



See P5 and P6 for details

Feature 2 Preventive Maintenance

Predictive monitoring of
equipment failure as a tool
for preventive maintenance



See P7 and P8 for details.

Feature 3 System Construction

Data collection according
to needs, and construction
of a visualization system

See P9 and P10 for details.

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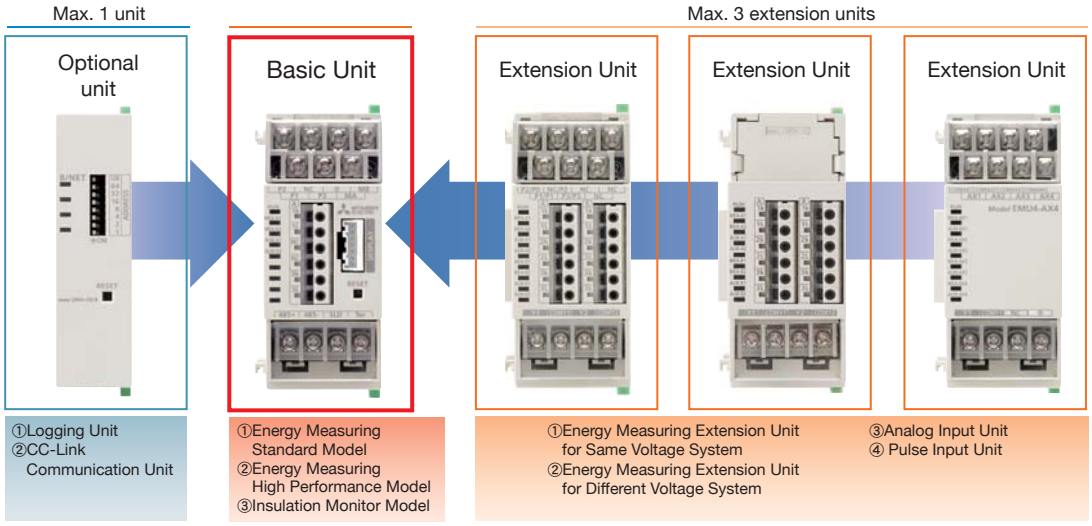
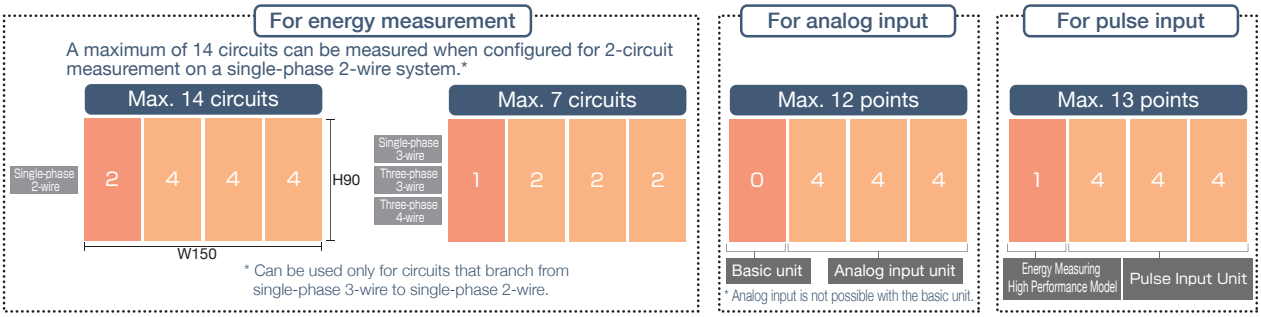
1 Building block method for extension without waste

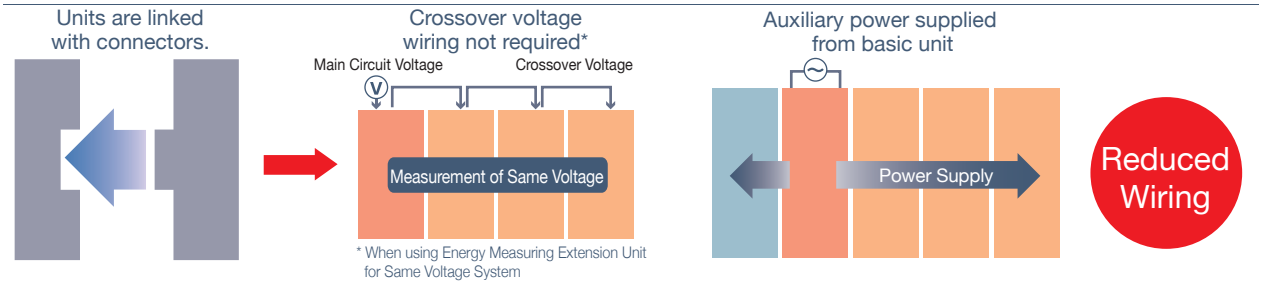
Basic Configuration



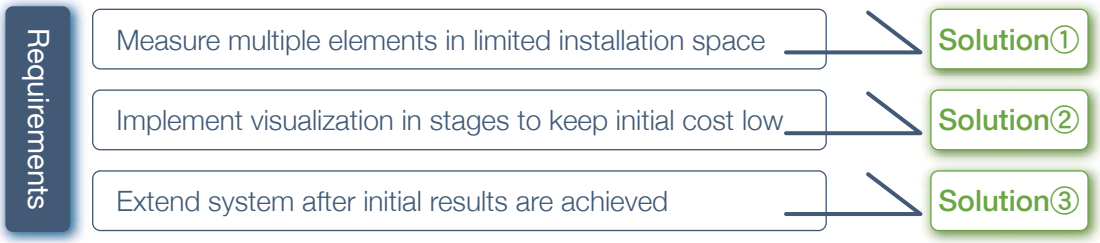
Number of Measurement Points



Structure

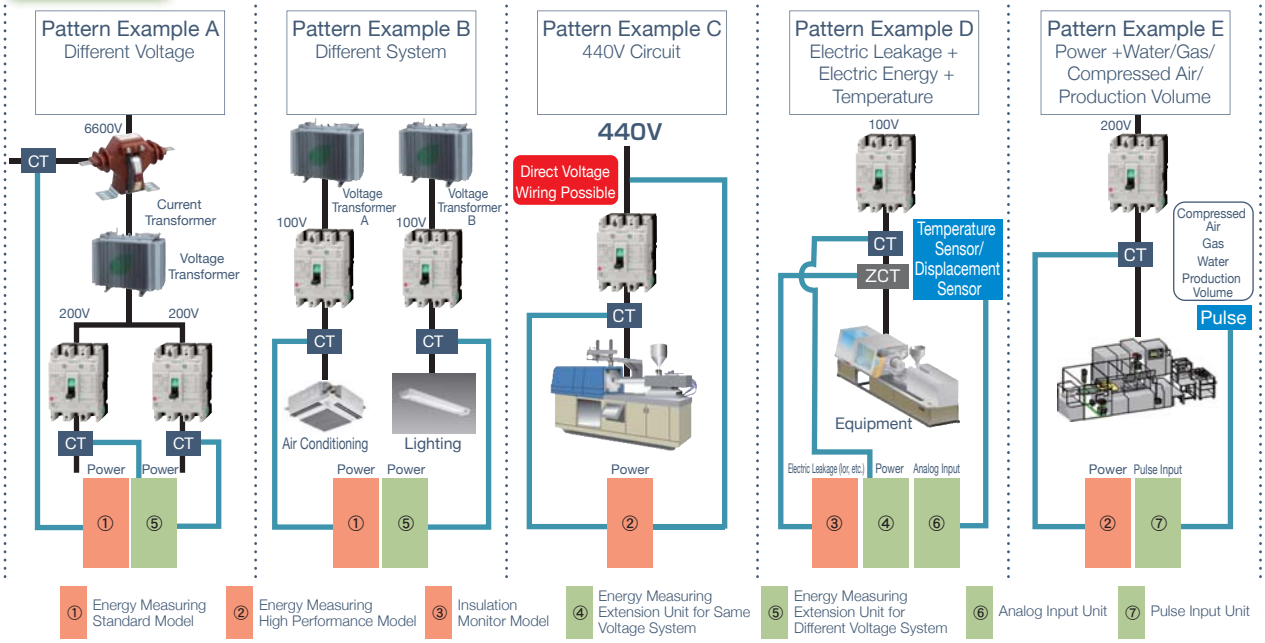


Solutions



Solution①

Combine the basic unit with extension units for use in a wide variety of scenarios.

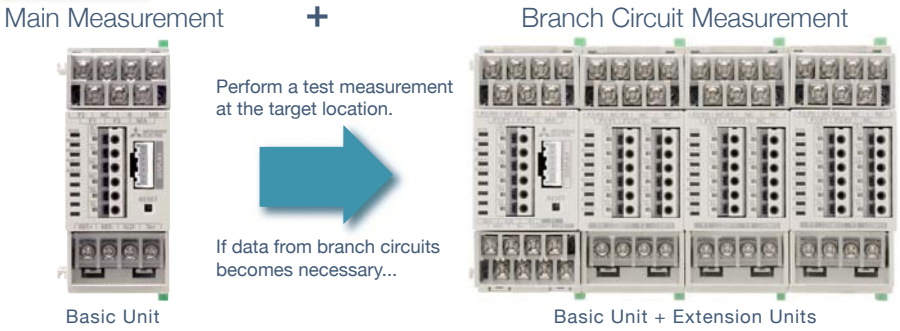


① Energy Measuring Standard Model
② Energy Measuring High Performance Model
③ Insulation Monitor Model
④ Energy Measuring Extension Unit for Same Voltage System
⑤ Energy Measuring Extension Unit for Different Voltage System
⑥ Analog Input Unit
⑦ Pulse Input Unit

* These pattern examples show a schematic representation of one possible combination. Please be sure to check the wiring methods in the operation manual before using this equipment.

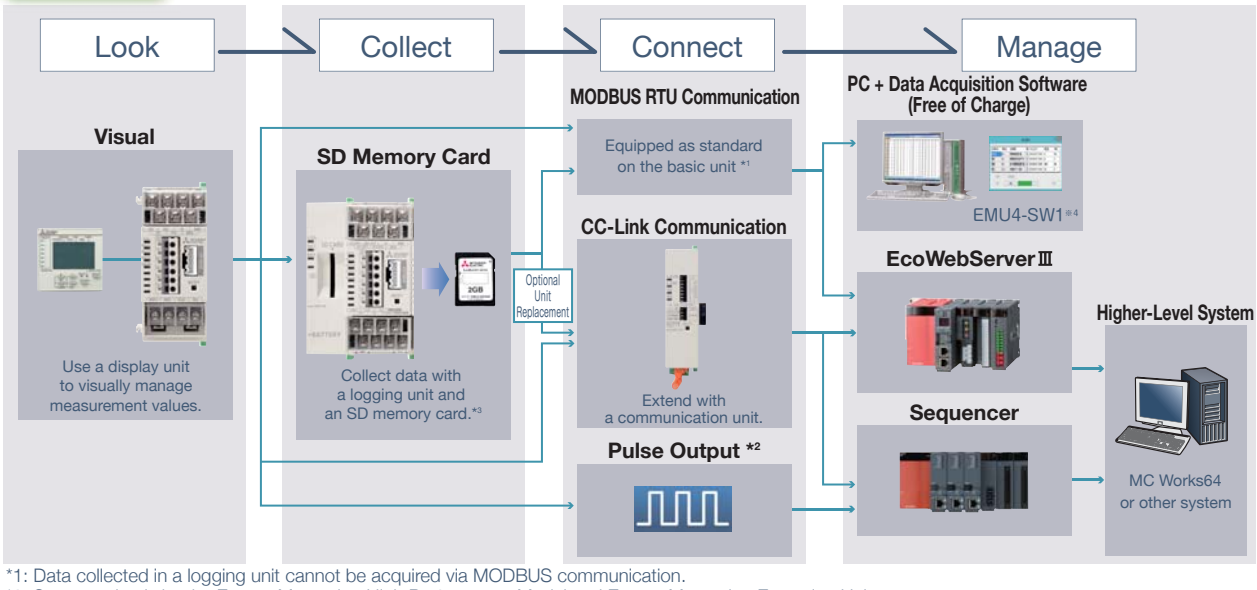
Solution②

Add extension units as you add new measuring points.



Solution③

Extend the system in stages as you increase the number of measurement points.



*1: Data collected in a logging unit cannot be acquired via MODBUS communication.
*2: Supported only by the Energy Measuring High Performance Model and Energy Measuring Extension Units.
*3: Forms and graphs can be created with the form software (Logging Unit Utility) provided free of charge.
*4: A "LAN⇔RS-485 converter" or "USB⇔RS-485 converter" is required when connecting via EcoWebServerⅢ, EMU4-SW1, or MODBUS RTU communication.

2 Predictive monitoring of equipment failure as a tool for preventive maintenance

Mitsubishi Electric's electric leakage measurement method Target: Insulation Monitor Model

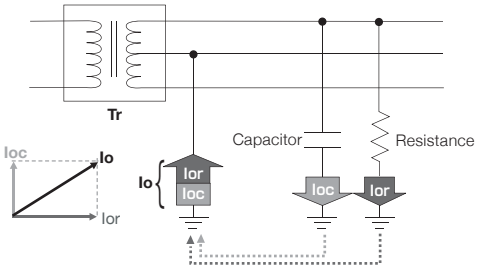
Utilization of Ior method

The Ior measurement method can be used to accurately measure the resistive leakage current (Ior) due to insulation deterioration.

High sensitivity mode (Measurement resolution: 0.01 mA)

In high sensitivity mode, you will never miss slight fluctuations in equipment or signs of abnormality. Use in combination with low sensitivity mode (measurement resolution: 1 mA) as needed according to measurement load.

■Method of leakage current measurement(Io and Ior measurements)

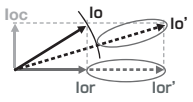


Ior: Leakage current (resistive leakage current) which flows due to degraded insulation
Ioc: Leakage current (leakage current from electrostatic capacity) which flows even if the insulation condition is sound
Io : Composite leakage current of Ior and Ioc (composition of vectors)

Ioc increases for equipment with long wiring distance or inverter devices and filtersinstalled, which makes it difficult to detect insulation deterioration (the amount of change in Io decreases), and Ior measurement is effective.

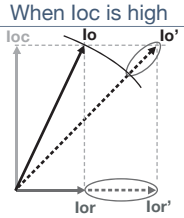
When Ioc is low

= Amount of chance due to insulation deterioration



Amount of change in Io ≒ Amount of change in Ior

When Ioc is high



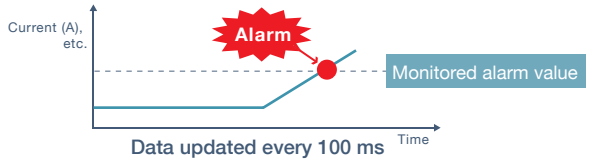
Amount of change in Io < Amount of change in Ior

*1: Accurate measurements are not possible on the secondary side of inverters and servo amplifiers.
*2: Ior measurement is possible on single-phase 2-wire, single-phase 3-wire, and three-phase 3-wire delta circuits. For three-phase 3-wire star circuits, three-phase 4-wire circuits, and special ground circuits such as high-resistance grounding circuits and capacitor grounding circuits, only Io measurement is possible.

Monitoring detailed trends Target: Energy Measuring Model

Identify failure conditions in real time with data updates every 100 ms

Never miss increases in load current or fluctuations in energy that are caused by deteriorating equipment or abnormalities in pumps or motors.



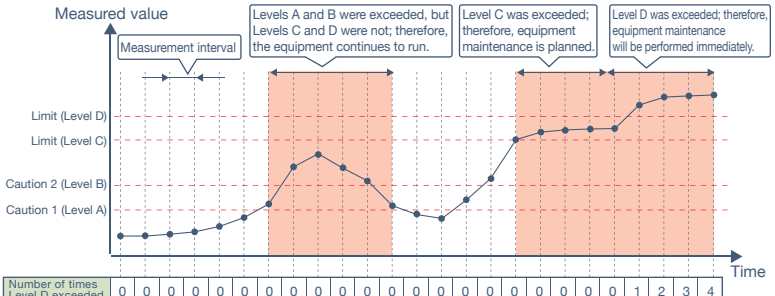
Monitoring equipment status with analog input Target: Analog Input Unit

It is possible to record the number of times that a scaling value that has been converted from an analog input value exceeds the specified value (level).

[Example of use]

You can monitor the status of equipment by reading data from a sensor with a built-in analog output function.

* The compact display unit (EMU4-D65) is used to set the number of times a level is exceeded.



Number of times Level D exceeded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	4
Number of times Level C exceeded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9
Number of times Level B exceeded	0	0	0	0	0	0	0	1	2	3	4	4	4	4	5	6	7	8	9	10	11	12	13	14
Number of times Level A exceeded	0	0	0	0	0	0	1	2	3	4	5	6	6	6	7	8	9	10	11	12	13	14	15	16	17

The number of times each level is exceeded is calculated for each measurement interval that is set in measurement mode.

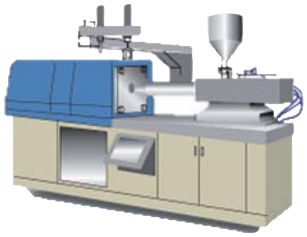
Solutions

Requirements

Reduce the time and effort required to measure insulation resistance values	Solution①
Prevent sudden equipment failure	Solution②
Confirm how long the equipment is running	Solution③

Solution① Use electric leakage measurements to constantly monitor insulation conditions.

Constantly measuring and recording leakage current allows you to confirm insulation conditions, and contributes to reducing load for insulation resistance testing.



Solution② Monitoring the trends in electric leakage, load current, and temperature allows you to perform preventive maintenance to avoid equipment failure.

Avoid sudden equipment failure by setting the threshold value and monitoring alarms.

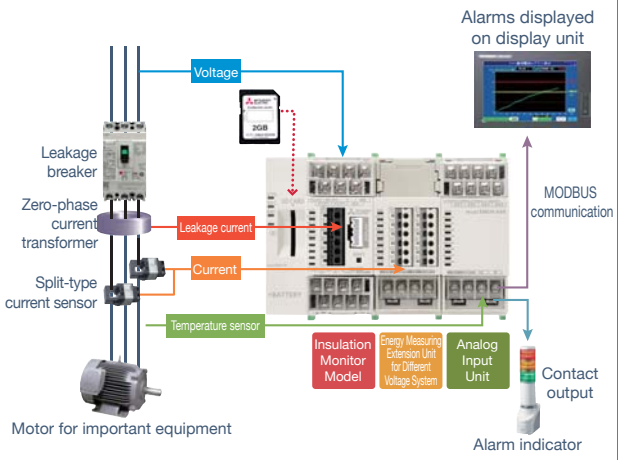
These types of equipment require preventive maintenance!

①Equipment that can result in significant loss if it fails
②Equipment that runs continuously or for many hours
③Equipment with cables that easily deteriorate due to moisture or oil

Monitor the conditions of production equipment in order to discover abnormalities early!

Production site

Visualization at production site!



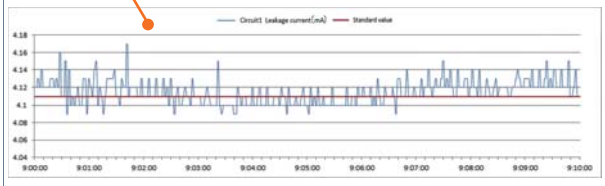
①The trend in leakage current is monitored, and an alarm is output if the set threshold value is exceeded.
②An alarm screen is displayed on the display unit (GOT) for visualization at the production site!

Monitor the trends in leakage current and temperature in order to check equipment conditions!

Office

Use form software!

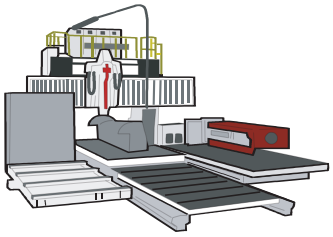
An hour's worth of data updated at one-second intervals can be viewed to confirm the flow of data and its trends.



①Use the logging unit to record measurement data, and then use an SD memory card and the free form software to create graphs on your computer!
②Count the number of times that the set threshold value is exceeded. If this number exceeds the standard value, perform maintenance on the equipment!

Solution③ Using an Energy Measuring Unit and a Pulse Input Unit to visualize the actual amount of time that equipment is running.

Confirm the actual amount of time that equipment is running, in order to estimate when the equipment should be updated.



3 Data collection according to needs, and construction of a visualization system

Selecting a data collection method

①SD memory card (optional)
②CC-Link communication (optional)
③MODBUS RTU communication (equipped as standard)

Optional Units

●Logging Unit

Use of a logging unit allows you to save logging data values for a variety of measured items (amount of power, voltage, and current) to an SD memory card in CSV file format.

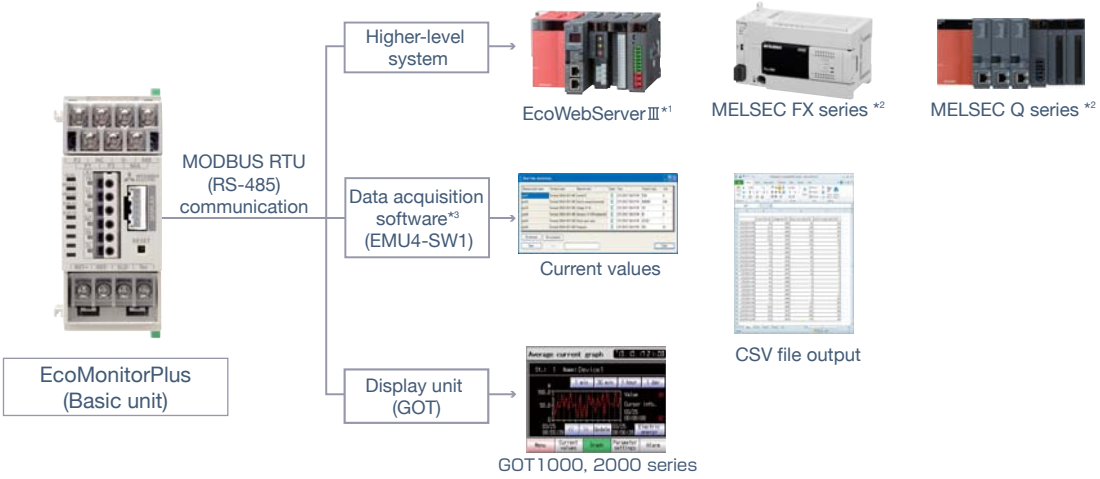

Logging Unit

●Communication Unit

Connecting a CC-Link communication unit allows you to easily extend to a visualization system or a sequencer system for EcoWebServerⅢ.


CC-Link communication Unit

Example of devices connected for MODBUS RTU communication



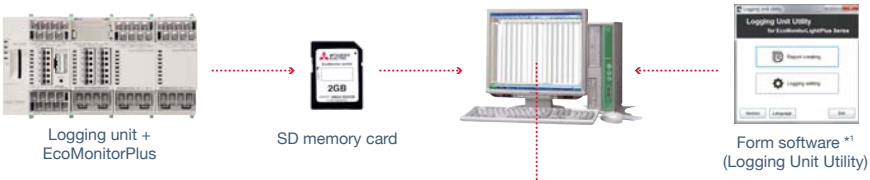
*1: A "MODBUS TCP⇔MODBUS RTU converter" is required when connecting to EcoWebServerⅢ.
*2: A unit that supports MODBUS RTU (RS-485) communication is required when connecting to a sequencer.
*3: Data collection software (EMU4-SW1) can be downloaded for free from the Mitsubishi LVS website.

Solutions

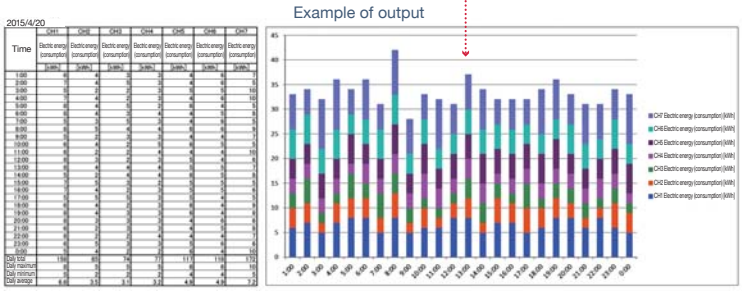
Requirements	Solutions
It is too much trouble to make forms.	Solution①
View measurement data at your desk in the office.	Solution②
Visualization by connecting directly to FA devices and computers.	Solution③

Solution① Use free software to save time and effort to make forms.

You can use free form software for the logging unit to easily make forms and graphs.



Example of output

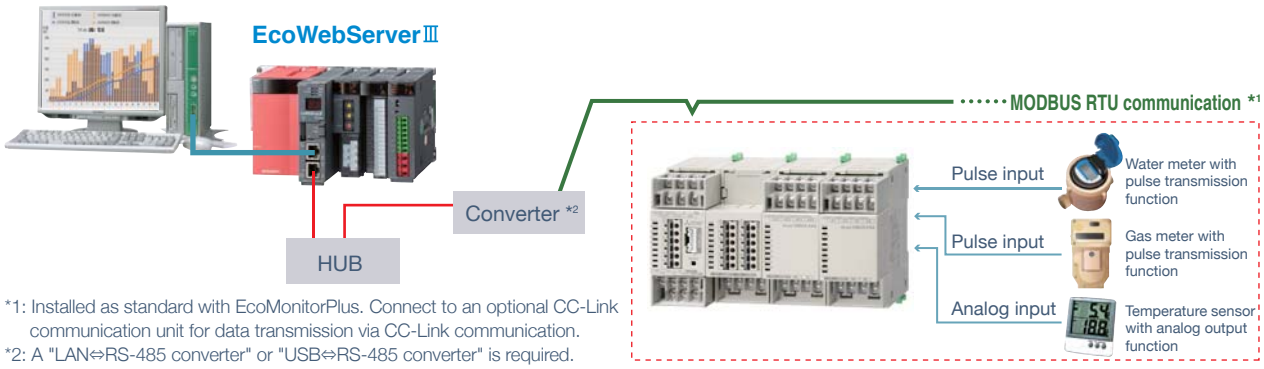


*1: The Logging Unit Utility can be downloaded for free from the Mitsubishi LVS website.

Solution② Use the energy saving data collection server (EcoWebServerⅢ) to visualize data in a web browser.

By using EcoWebServerⅢ for data collection, users can easily confirm energy information at their computers via the company intranet. With an Analog Input Unit and a Pulse Input Unit, you can perform the integrated management of power, equipment, and utilities such as temperature, water, and gas.

Visualization system using EcoWebServer Ⅲ

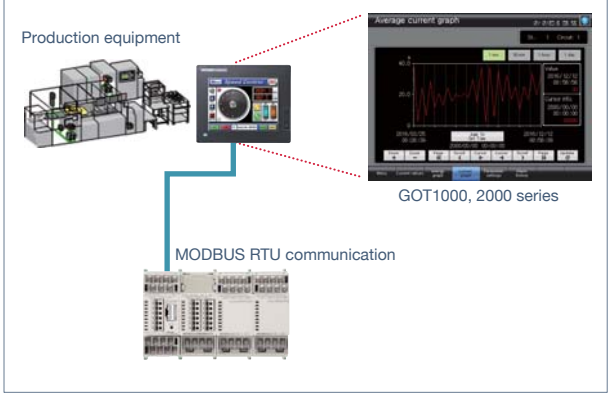


*1: Installed as standard with EcoMonitorPlus. Connect to an optional CC-Link communication unit for data transmission via CC-Link communication.
*2: A "LAN⇔RS-485 converter" or "USB⇔RS-485 converter" is required.

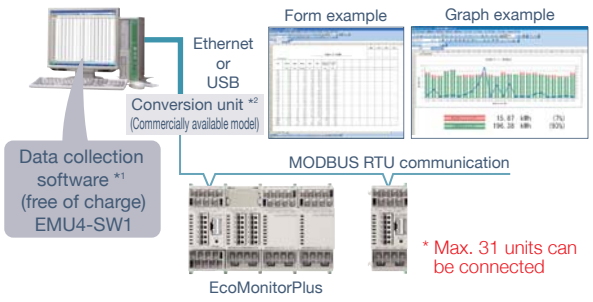
Solution③ Use MODBUS RTU communication to connect to an FA device or a computer.

The basic unit is equipped with MODBUS RTU communication as standard, making it easy to build an open system.

Visualization with a display unit



Inexpensive visualization system with free software



*1: Data collection software (EMU4-SW1) can be downloaded for free from the Mitsubishi LVS website.
*2: A "LAN⇔RS-485 converter" or "USB⇔RS-485 converter" is required.
*3: In order to create forms and graphs, you must first prepare the form and graph formats.

Form Software: Logging Unit Utility Features

(1) Easily create forms

With the Logging Unit Utility, logging data that has been saved on an SD memory card from the logging unit can be copied and pasted in Excel® files to create forms. When creating a form you can select which style to use (Excel® file templates), allowing you to create forms with the desired format. You can also use the included sample form styles for a variety of uses such as energy-saving management and preventive maintenance.

(2) Logging settings

You can easily create a setting data file (set.csv) to set logging conditions in the logging unit.

List of sample form style sheets

Sheet	Use	Form type				
		Monthly	Weekly	Daily	Detailed (Minutes)	Detailed (Seconds)
Trend [Detailed]	Monitoring of upper/lower limits for current and voltage (Preventive maintenance)				●	●
Trend [Monthly/Weekly/Daily]	Management of amount of energy used by department or floor (Promotion of energy conservation)	●	●	●		
Form	Reports on amount of energy used (Energy management)	●	●	●		
Basic unit	Management of basic units of energy (Promotion of energy conservation)	●	●	●		
Correlation analysis	Correlation analysis of two types of data, such as amount of power for air conditioning and temperature (Promotion of energy conservation)		●	●		

Form output examples

●Trend (Weekly): Data analysis to promote energy conservation

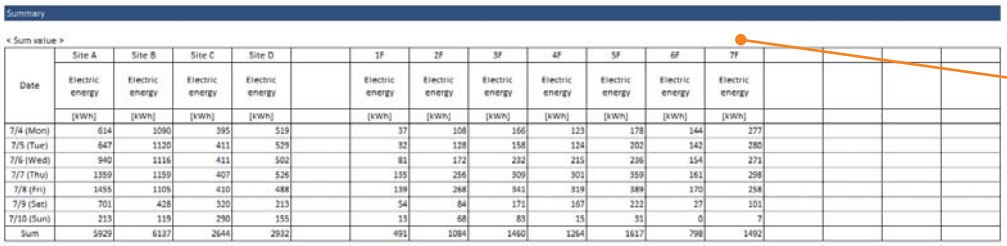
Confirm the aggregate values for each day with numerical figures.

Use a stacked bar graph to confirm the trend in total energy volume, as well as the ratio of amounts of energy used for elements such as departments and floors.

Confirm the ratios for total usage per week.

Use a line graph to confirm the trends in energy usage for each element, and to compare energy usage between elements.

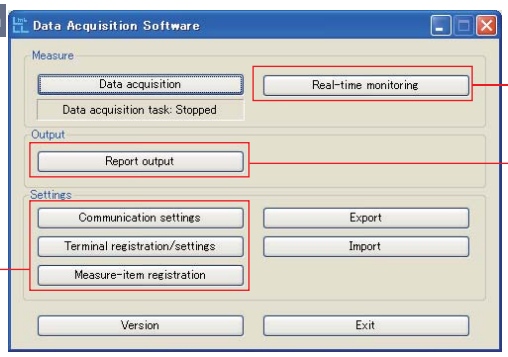
●Forms: Reduce the work involved in creating energy usage reports



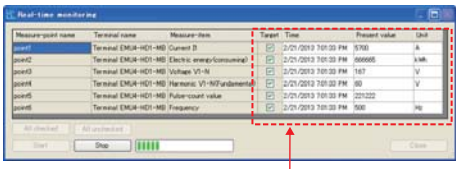
Confirm the aggregate values for each day with numerical figures.

Examples of Data Acquisition Software (EMU4-SW1) Display Screens

Main Screen



(1)Current Values Display



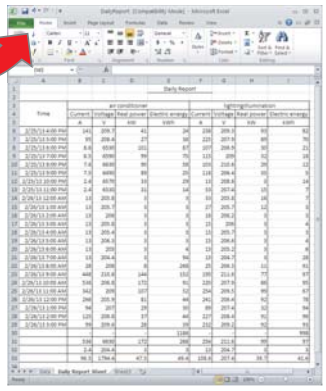
Selected measurement items are displayed in real time

Current values are updated every one second

(2)Logging data is output in Excel format.

Monthly, daily and detailed (one minute) data is output in Excel format.

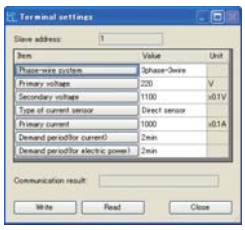
You can output any reports you want by saving data in a report format to the specified folder.



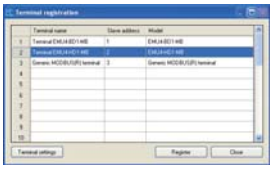
(3) Communications are used for settings

Communication Settings

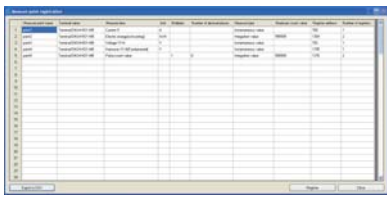
Terminal Settings



Terminal Registration



Measurement Point Registration



* The form software logging unit utility and data acquisition software (EMU4-SW1) are different software.

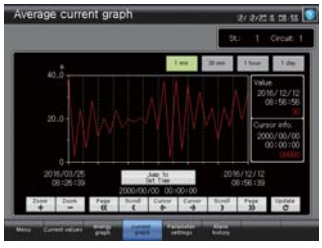
Examples of GOT2000 Screens

It is an example of a graph display screen of current value, current, and electric energy amount of various kinds of energy information such as power, current and voltage.

■GT27

Main Screen

Graph Screen



Current Value Screen

Alarm Screen

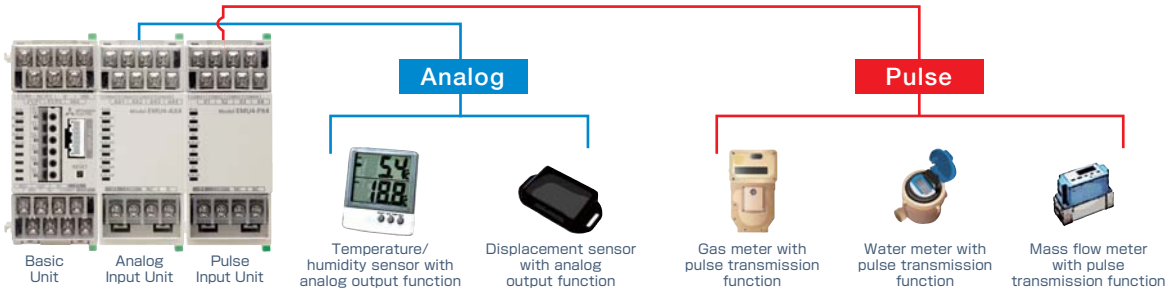
4 Other Features

Solutions

Requirements	
Manage energy other than electricity	Solution①
Take measurements without voltage input	Solution②
Display the amount of energy used in units of CO_2 emissions or rate charged	Solution③
Input a voltage of 440V directly into a measuring device	Solution④
Confirm communication with higher-level devices without power	Solution⑤
Connect measuring devices and CT with universal cables	Solution⑥
Confirm device wiring before board shipment	Solution⑦

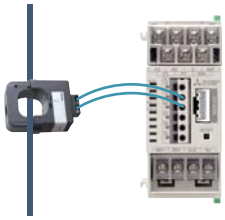
Solution① Use an analog or pulse input unit to identify energy usage other than electricity.

Analog data can be entered from a temperature/humidity or displacement sensor (with analog output function)! Pulses can be entered from meters with a pulse transmission function!



Solution② Simple measurement functions

Use simple measurement functions to easily take measurements without voltage input!

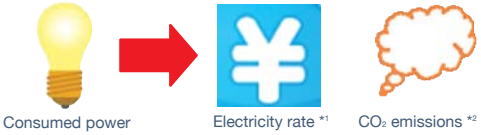


The fixed values (setting values) for voltage and power factor, and the measured current value are used to calculate each measurement element.

* The accuracy of measurements for each element is not guaranteed.
* An auxiliary power supply is required. (Auxiliary power supply rating: 100 to 240V)

Solution③ Power conversion function

You can convert power measurements into the units you need!



Select from the following units: None, Wh, KWh, MWh, J, m^2, m^3, L, kL, sec, min, hours, units, g, kg, t, ¥, $

*1: This function cannot be used for charging electricity rates.
*2: This value is calculated by multiplying power consumption by a CO_2 conversion factor.

Solution④ Voltage input with 440V direct

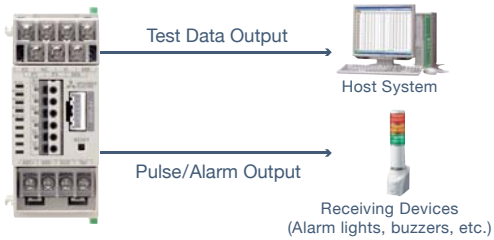
No VT necessary for voltage input!
Space-saving installation to panel, reduced cost!

VT not necessary

* Applicable to EMU4-HM1-MB, EMU4-LG1-MB and EMU4-VA2.
* The auxiliary power rating is 100～240V.

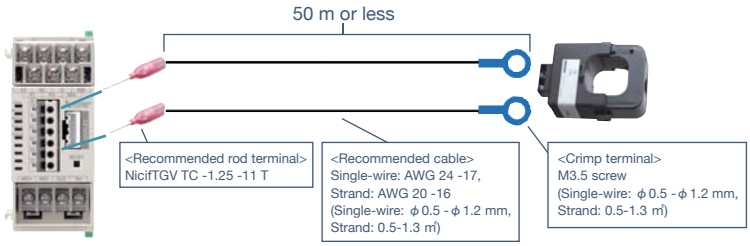
Solution⑤ Test function

By supplying auxiliary power, it is possible to output alarm / pulse test signal and communication data to the host system!



Solution⑥ Universal cable connection

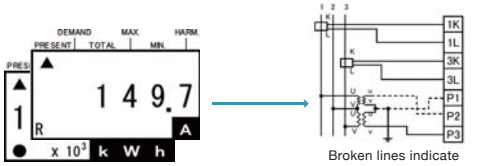
It is unnecessary and economical to arrange dedicated cables!



*: Except when using EMU2-CT5(-4 W).

Solution⑦ Misconnection Distinction Support

Check the abnormality of the phase angle of the voltage and the current, identify the wiring mistake, support discrimination of misconnection!



Examples of Display Check Screens

Broken lines indicate location of misconnection.

Example of Misconnection

*: The above examples are sample images. Refer to the operation manual for actual screens, the check method, directions for use, etc.
*: Refer to the operation manual for the table for distinction.

1 Selection of Basic Unit/ Extension Unit

①Selection of basic unit

Purpose	Model	Number of circuits measured
Power measurement	EMU4-BM1-MB	1 circuit (single-phase 2-wire system: 2 circuits)
Power measurement + additional features	EMU4-HM1-MB	1 circuit (single-phase 2-wire system: 2 circuits)
Leakage current measurement	EMU4-LG1-MB*1	1 circuit

*1: Current, voltage, electric energy, etc. can not be measured.

Measurement of multiple circuits is required.

②Selection of extension unit

Purpose	Model	Number of circuits measured
Measurement of circuits with same voltage	EMU4-A2*2*3	2 circuits (single-phase 2-wire system: 4 circuits) *4
Measurement of circuits with different voltages	EMU4-VA2*2*3	2 circuits (single-phase 2-wire system: 4 circuits) *4
Identifying temperature/ humidity Identifying flow rate	EMU4-AX4*2*3	4 points of analog input
Monitoring of operation of multiple facilities	EMU4-PX4*2*3	4 points of pulse or contact input

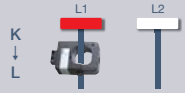
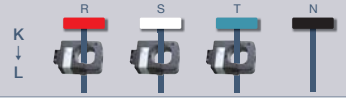
*2: Up to 3 extension units can be added to a basic unit.
*3: Cannot be used with only an extension unit.
*4: Can be used only for circuits that branch from single-phase 3-wire to single-phase 2-wire.

You can select optional logging units and communication units as needed to extend your system!

2 Selection of Current Sensor (CT) and Zero-Phase Current Transformer (ZCT)

①Selection of dedicated CT

Select according to the circuit breaker's rated current, phase wire system, and power line diameter

Phase wire system	Number of required CTs
Single-phase 2-wire system (1P2W)	
Single-phase 3-wire system / Three-phase 3-wire system (1P3W/3P3W)	
Three-phase 4-wire system (3P4W)	

Please use a commercially available current sensor cable. (See P19 and P20 for details.)
* Except for EMU2-CT5/EMU2-CT5-4W

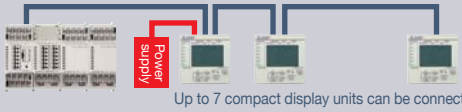
Selection of dedicated CT

	Breaker AT	Model supporting dedicated CT	UL·CE support
Direct measurement	~50A	EMU-CT50-A	×
		EMU-CT50	○
	~100A	EMU-CT100-A	×
		EMU-CT100	○
	~250A	EMU-CT250-A	×
		EMU-CT250	○
	~400A	EMU-CT400-A	○
	~600A	EMU-CT600-A	○
Combined with current transformer for instruments	Current transformer rating	Model supporting dedicated CT	UL·CE support
	~30,000A/5A	EMU-CT5-A	×
		EMU2-CT5	○
		EMU2-CT5-4W	○

②Selection of dedicated ZCT

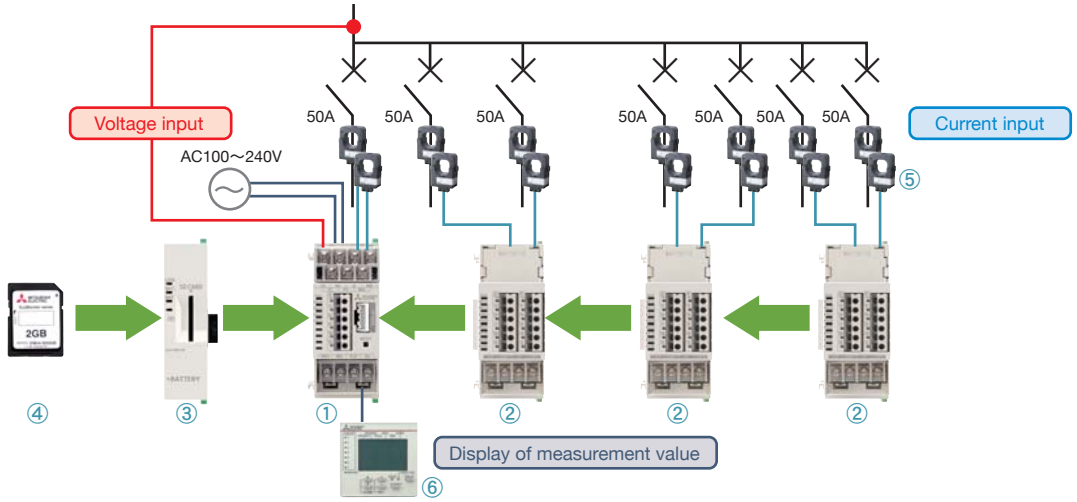
Check wire diameter, voltage (use at low pressure 600 V or lower) and select from ZCT hole diameter.(See P25)
Please use a general-puroduct for the ZCT cable to be connected to the measuing instrumend. (See P19 for details)

3 Selection of Display Unit(EMU4-D65)*1

Usage method	Required instruments	Configuration example
Setting instruments by bringing this device, when not using a display on the main unit continuously	Display unit (EMU4-D65) x 1	 (Change connections)
Visual management of the measurement of multiple circuits with a single device by switching displays	Display unit (EMU4-D65) x 1	Fixed and install to switch displays for measurement data for 7 circuits 
Visual management of multiple points of measurement data for each circuit with individual displays	Dsplay unit (EMU4-D65) Display unit connection cable (EMU2-CB1-DP) Display unit power cable (EMU4-CB-DPS) Commercially available DC power supply	 Up to 7 compact display units can be connected.

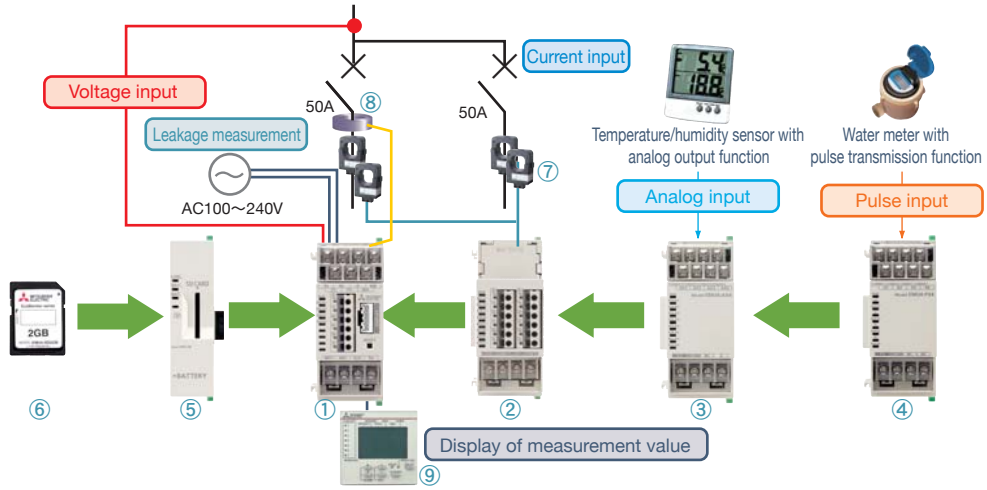
*1: At least one compact display unit is required for the main measuring instrument. (A cable (1m) for connecting the compact display unit to the main unit is included.)

①Power measurement of 7 circuits (3-phase 3-wire system, low voltage circuit, rated primary current 50 A)



	Product name	Mode	Quantity
①	Energy Measuring Unit [Energy Measuring Standard Model]	EMU4-BM1-MB	1
②	Energy Measuring Unit [Energy Measuring Extension Unit for Same Voltage System]	EMU4-A2	3
③	Logging Unit	EMU4-LM	1
④	SD memory card for logging unit	EMU4-SD2GB	1
⑤	Split-type current sensor	EMU-CT50-A	14
⑥	Display unit	EMU4-D65	1

②Leakage measurement of 1 circuit + power measurement of 2 circuits (3-phase 3-wire system, low voltage circuit, rated primary current 50 A) + analog input (4 points) + pulse input (4 points)



	Product name	Mode	Quantity
①	Energy Measuring Unit [Insulation Monitor Model]	EMU4-LG1-MB	1
②	Energy Measuring Unit [Energy Measuring Extension Unit for Same Voltage System]	EMU4-A2	1
③	Analog input unit	EMU4-AX4	1
④	Pulse input unit	EMU4-PX4	1
⑤	Logging Unit	EMU4-LM	1
⑥	SD memory card for logging unit	EMU4-SD2GB	1
⑦	Split-type current sensor	EMU-CT50-A	4
⑧	Split-type zero-phase current converter	CZ-22S	1
⑨	Display unit	EMU4-D65	1

Energy Measuring Unit(Basic Unit*1)

Lineup of three types of basic measuring units

Suitable for visualization of "energy" in a simple way.

① Equipped with basic functions for monitoring of voltage, current, power and electric energy.
② Standard-equipped with MODBUS RTU communication.

Product name	Energy Measuring Unit [Energy Measuring Standard Model]
Model	EMU4-BM1-MB

In addition to the functions of the Standard Model, this model comes with additional functions for the measurement of 3-phase 4-wire and pulse count.

① Same basic functions as the Standard Model.
② Standard-equipped with MODBUS RTU communication.
③ Three-phase 3-wire, 440V direct voltage input is available.
④ Capable of displaying harmonic current, voltage, apparent power, periodic electric energy and electric energy conversion value.
⑤ Pulse · contact input / output possible

Product name	Energy Measuring Unit [Energy Measuring High Performance Model]
Model	EMU4-HM1-MB

Capable of measuring the leakage current of the low-voltage circuit.

① Measurement of leakage current.
② Equipped with a MODBUS RTU communication function.
③ Capable of measuring Ior (resistive leakage current).
④ Equipped with alarm functions.

Product name	Energy Measuring Unit [Insulation Monitor Model]
Model	EMU4-LG1-MB

*1: Basic unit cannot be used as an extension unit.

Energy Measuring Unit(Extension Unit)

Lineup of four types of extension measuring units

For measurement of circuits of same voltage.

① Measurement of two circuits (per unit).
② The same number of contacts or pulses as the number of circuits can be output for each circuit.
③ Connection wiring for voltage not necessary for measurement of same voltage (capable of measuring same voltage that measured by the unit connected on the left side).

Product name	Energy Measuring Unit [Energy Measuring Extension Unit for Same Voltage System]
Model	EMU4-A2

For measurement of circuits of different voltages.

① Measurement of two circuits (per unit).
② The same number of contacts or pulses as the number of circuits can be output for each circuit.
③ Measurement of different transformer system by each unit (capable of measuring voltage different from that measured by the unit connected on the left side).

Product name	Energy Measuring Unit [Energy Measuring Extension Unit for Different Voltage System]
Model	EMU4-VA2

For measurement of temperature, humidity, vibration etc.

① Four points of analog data can be input
② Measurement can be performed with a cycle of 1 ms×CH number or 50 ms×CH number (setting change)
③ Contact output possible
④ Capable of calculating the value of moving average (averaging over an arbitrary period)

Product name	Analog Input Unit
Model	EMU4-AX4

For measurement of the production number and flow rate (water · gas · air), operation monitoring of equipment!

① Possible to input 4 pulses or contacts (Switching setting of pulse input / contact input for each input CH)
② Monitoring equipment operation time with contact input
③ Contact output possible

Product name	Pulse Input Unit
Model	EMU4-PX4

Optional Units

For customers who want to easily manage data using SD memory cards!

Product name	Logging Unit
Model	EMU4-LM

For customers who want to connect to CC-Link communication!

Product name	CC-Link communication Unit
Model	EMU4-CM-C

▶ Options for Logging Unit

Product	Model	External view
SD memory card for logging unit	EMU4-SD2GB	
Lithium battery for logging unit	EMU4-BT	

Logging units include one lithium battery (EMU4-BT) when purchased.

Accessories

▶ Split-type Current Sensor

Product	Model	External view	UL·CE compatibility
Split-type current sensor*1*2	EMU-CT5-A		×
	EMU-CT50-A		×
	EMU-CT100-A		×
	EMU-CT250-A		×
	EMU-CT400-A		○
	EMU-CT600-A		○
	EMU-CT50		○
	EMU-CT100		○
	EMU-CT250		○

* 1: Use commercially available cables for the connection of current sensors. Applicable electric wire (described on P19 and 20)
* 2: Current sensor cable can be extended up to 50 m. (except for EMU2-CT5, EMU2-CT5-4W.)

▶ Display Unit

Product	Product	External view
Display unit	EMU4-D65*5*6	
Display unit connecting cable	EMU2-CB1-DP*7	
Extension cable	EMU2-CB-T1M	
	EMU2-CB-T5M	
	EMU2-CB-T10M	
Display unit power cable	EMU4-CB-DPS*7*8	*Refer to outline drawing See P30

* 5: One unit is required for EMU-D65 setting of the device.
* 6: EMU4-D65 includes a connection cable (1 m) to the instrument main unit.
* 7: Required only when connecting multiple EMU4-D65.
* 8: When connecting multiple EMU4-D65, commercially available DC power supply is necessary.

▶ Split-type 5A Current Sensor

Product	Model	Cable length	External view	UL·CE compatibility
5A split-type current sensor	EMU2-CT5	0.5m		○
	EMU2-CT5-4W	0.5m		○
5A split-type current sensor cable	EMU2-CB-Q5A*3	0.5m		○
	EMU2-CB-Q5A-4W*4	0.5m		○
Extension cable (Standard type)	EMU2-CB-T1M	1m		○
	EMU2-CB-T5M	5m		○
	EMU2-CB-T10M	10m		○
Extension cable (Separete type)	EMU2-CB-T1MS	1m		○
	EMU2-CB-T5MS	5m		○
	EMU2-CB-T10MS	10m		○

* 3: Required when using EMU2-CT5. (It becomes one set with two current sensors and cables.)
* 4: Required when using EMU2-CT5-4W. (It becomes one set with three current sensors and cables.)

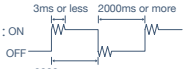
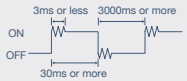
▶ Zero-phase Current transformer

Product	Model	External view	UL·CE compatibility
Split-type zero-phase current converter	CZ-22S		×
	CZ-30S		×
	CZ-55S		×
	CZ-77S		×
	CZ-112S		×
Through-type zero-phase current converter	ZT15B		×
	ZT30B		×
	ZT40B		×
	ZT60B		○
	ZT80B		○
	ZT100B		○
Zero-phase current transformer with primary conductor	ZTA600A	*Refer to outline drawing See P29	×
	ZTA1200A		×
	ZTA2000A		×

* 9: The zero-phase current transformer can be wired up to 50 m.

Energy Measuring Unit

■Basic Unit

Item			Specification		
Model			Energy Measuring Standard Model EMU4-BM1-MB	Energy Measuring High Performance Model EMU4-HM1-MB	Insulation Monitor Model EMU4-LG1-MB
Phase wire system			Single-phase 2-wire/ single-phase 3-wire, 3-phase 3-wire common	Single-phase 2-wire/ single-phase 3-wire, 3-phase 3-wire/ 3-phase 4-wire common	Single-phase 2-wire/ single-phase 3-wire, 3-phase 3-wire/ 3-phase 4-wire common
Instrument ratings	Voltage circuit	Single-phase 2-wire/ 3-phase 3-wire	110V, 220V AC common *1	110V, 220V, 440V AC common*2	110V, 220V, 440V AC common*12
		Single-phase 3-wire	110V AC (between wires 1 and 2, and wires 2 and 3), 220V AC (between wires 1 and 3)	110V AC (between wires 1 and 2, and wires 2 and 3), 220V AC (between wires 1 and 3) 220V AC (between wires 1 and 2, and wires 2 and 3), 440V AC (between wires 1 and 3)	110V AC (between wires 1 and 2, and wires 2 and 3), 220V AC (between wires 1 and 3) 220V AC (between wires 1 and 2, and wires 2 and 3), 440V AC (between wires 1 and 3)
		3-phase 4-wire	—	Minimum: 63.5V/110V AC, Maximum: 277V/480V AC*3	Minimum: 63.5V/110V AC, Maximum: 277V/480V AC*13
	Current circuit		50A, 100A, 250A, 400A, 600A (Dedicated split-type current sensor is used. All values indicate primary current values of current sensor.) 5A (Dedicated 5A current sensor is used. Current transformer (CT) is used in two-step configuration together with the 5A current sensor in order to allow a maximum primary current value setting of 30,000A) *4		1A (Mitsubishi ZCT is used. Primary current value of ZCT is indicated.)
	Frequency		50/60Hz (automatic frequency selection)		
Auxiliary power rating			100V – 240V AC (+10%, -15%) 50/60Hz		
No. of measurement circuits			1 circuit(2 circuits in single-phase 2-wire system and 2 circuits measurement setting)		1 circuit
Consumption VA	Voltage circuit		For each phase: 0.1VA (110V AC), 0.2VA (220V AC)	For each phase: 0.1VA (110V AC), 0.2VA (220V AC), 0.4VA (440V AC)	
	Current circuit		For each phase: 0.1VA (current sensor primary side)		
	Auxiliary power circuit*11		110V AC:2.0VA AC220V:3.0VA		
Measurement items			Current, demanded current, voltage, power, demanded power, reactive power, power factor, frequency, electric energy (regenerative, consumption), reactive electric energy*7, current imbalance rate, voltage imbalance rate, operating time		—
			—	Apparent power, periodic electric energy, harmonic current, harmonic voltage, pulse count value, pulse conversion value, electric energy conversion value	Leakage current, demanded leakage current, resistance leakage current*8, demanded resistance leakage current*8, resistance leakage current difference conversion value*8*9
Main unit tolerances*5			Current, voltage, power, reactive power, apparent power, frequency: ±1.0% (relative to rated input) Power factor: ±3.0% Electric energy: ±2.0% (in 5 to 100% range of rated values; power factor = 1) Reactive electric energy: ±2.5% (in 10 to 100% range of rated values; power factor = 0)	Current, voltage, power, reactive power, apparent power, frequency: ±1.0% (relative to rated input) Power factor: ±3.0% Electric energy: ±2.0% (in 5 to 100% range of rated values; power factor = 1) Reactive electric energy: ±2.5% (in 10 to 100% range of rated values; power factor = 0) Harmonic current, harmonic voltage: ±2.5%	Low sensitivity mode Leakage current Io, resistive leakage current Ior: ±2.5% (relative to 10 to 100% of rating) Leakage current Io, resistive leakage current Ior: ±2.5 mA (relative to 10% of rating or lower) High sensitivity mode Leakage current Io, resistive leakage current Ior: ±2.5 mA
Data update cycle			100msec		Leakage current: 2 sec, resistive leakage current: 2 sec
External input specification	Input signal format		—	Non-voltage a contact, 1 input (Select function from below)	—
	Function		—	Contact/pulse input	—
		Contact input	—	Contact ON time: 2000ms or more / Contact OFF time: 2000ms or more / Chattering time: 3ms or less 	—
		Pulse input	—	Pulse ON time: 30ms or more / Pulse OFF time: 30ms or more / Chattering time: 3ms or less 	—
	Rated input voltage/current		—	5V DC, 7 mA	—
External output specification	Output signal format		—	Non-voltage a contact, 1 output (Select function from below)*6	
	Function		—	Alarm/pulse output	Alarm/pulse output
		Alarm output	—	Contact output of alarm generating status Select monitoring target from below. Monitoring of current demand upper limit, monitoring of current demand lower limit Monitoring of N-phase current demand upper limit Monitoring of line voltage upper limit Monitoring of line voltage lower limit Monitoring of phase voltage upper limit Monitoring of phase voltage lower limit Monitoring of power demand upper limit, monitoring of power demand lower limit Monitoring of power factor upper limit, monitoring of power factor lower limit Monitoring of pulse conversion value upper limit Monitoring of current imbalance rate upper limit Monitoring of voltage imbalance rate upper limit	Contact output of alarm generating status Select monitoring target from below Leakage current first stage alarm Leakage current second stage alarm Resistance leakage current first stage alarm Resistance leakage current second stage alarm Limit alarm of number of first stage alarm occurrences of leakage current Limit alarm of number of second stage alarm occurrences of leakage current Limit alarm of number of first stage alarm occurrences of resistance leakage current Limit alarm of number of second stage alarm occurrences of resistance leakage current
		Output pulse width	—	0.1~0.15S	—
	Rated switching voltage/current		—	35V DC 75 mA, 24V AC 75 mA (Power factor = 1)	
Power interruption backup	Recorded item		Setting values, electric energy (consumption, regenerative), reactive electric energy, periodic electric energy, operating time, pulse count value, pulse conversion value, electric energy conversion value, maximum value, minimum value (Stored in the nonvolatile memory)		•Setting values •Number of alarm occurrences •Maximum value (Stored in the nonvolatile memory)
Compatible standard			Cemarking (EMC: EN-61326-1: 2013, Safety:EN-61010-1: 2010), UL: UL61010-1*14*15		
Operating environment	Operating temperature range		-5℃ to +55℃ (ave. daily temp. of 35℃ or lower)		
	Operating humidity range		30% to 85%RH (no condensation)		
	Storage temperature range		-10℃ to +60℃ (ave. daily temp. of 35℃ or lower)		
	Altitude		2,000 m or lower		
Commercial-frequency withstand voltage			All terminals at once (excluding communication circuit, frame GND terminal) -Between outer box AC 2000		
			Current input / voltage input all together -auxiliary power supply all at once AC2000V 1 minute		Leakage current input / voltage input all at once - auxiliary power supply all at once AC2000V 1 minute
			Current input / voltage input / auxiliary power supply terminal all together-External input / output -Display unit connector -Communication terminal All at once AC2000 V for 1 minute		Leakage current input / voltage input / auxiliary power supply terminal all together 1 External output - Display unit connector - Communication terminal All at once AC2000 V for 1 minute
Insulation resistance			At the same locations as above: 10 MΩ or more (500V DC)		
Compatible wire	Auxiliary power/ voltage input terminal		WG26-16 (single wire/stranded wires) (Single wire: ϕ0.65mm to ϕ1.2 mm, Stranded wires: 0.3mm² to 1.25mm²)		
	Current input		Single wire: AWG24-17, Stranded wires: AWG20-16 *10 (Single wire: ϕ0.5mm to ϕ1.2 mm, Stranded wires: 0.5mm² to 1.3 mm²)		
	Input/output terminal		—	AWG22-16 (single wire/stranded wires) (Single wire: ϕ0.65mm to ϕ1.2 mm, Stranded wires: 0.3mm² to 1.25 mm²)	
Weight			0.2 kg		
External dimensions (unit: mm)			37.5 (W) x 90 (H) x 94 (D) mm (excluding protruding parts) (Maximum size including projections: 41.5 (W) x 90 (H) x 94 (D))		

* 1: 110V and 220V can be connected directly. Externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (primary voltage can be set to up to 110000V, and secondary voltage can be set between 1 and 220V). For details, see the instruction manual.
* 2: 110V, 220V and 440V can be connected directly. Externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (primary voltage can be set to up to 110000V, and secondary voltage can be set between 1 and 220V). For details, see the instruction manual.
* 3: 63.5V/110V –277V/480V can be connected directly. An externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (primary voltage can be set to up to 110000V, and secondary voltage can be set between 1 and 220V). For details, see the instruction manual.
* 4: The settable primary current when using the 5A current sensor is as follows:
5A, 6A,7.5A,8A,10A,12A, 15A, 20A, 25A, 30A, 40A, 50A, 60A, 75A, 80A, 100A, 120A, 150A, 200A, 250A, 300A, 400A, 500A, 600A, 750A, 800A, 1000A, 1200A, 1500A, 1600A, 2000A, 2500A, 3000A, 4000A, 5000A, 6000A, 7500A, 8000A, 10000A, 12000A, 20000A, 25000A, 30000A(CT primary side can be set freely up to 30000A. However, CT secondary side is fixed at 5A.)
* 5: Refer to the specifications of options (split-type current sensor, 5A current sensor) on page 24 for the current sensor error rates.
* 6: Refer to the instruction manual for the detail on the setting of pulse unit.
* 7: Measurements are conducted based on a setting other than 2-circuit measurement timewith setting.
* 8: It measures only in the case of Single-phase 2-wire, Single-phase 3-wire, 3-phase 3-wire.
* 9: Resistance partial leakage current lorset arbitrarily is the reference value, and the difference value from this reference value is "resistance partial leakage current differential conversion value".
*10: Recommended bar terminal: NichihuTGV TC-1.25-11T.
*11: Connected with optional units, it increases AC110V:4.5VA, AC220V:5.0VA.Connected with display units, it increases AC110V:1.5VA, AC220V:2.0VA.
*12: 110V, 220V and 440V can be connected directly. Externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (maximum:600V AC). For details, see the instruction manual.
*13: 63.5V/110V –277V/480V can be connected directly. Externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (maximum:600V AC). For details, see the instruction manual.
*14: It conforms to UL standard only when it is combined with the following current sensor.
EMU2-CT5, EMU2-CT5-4W, EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400-A, EMU-CT600-A
*15: ZCT complies with UL in combination with ZT60B, ZT80B, ZT100B.

■Extension Unit

Item			Specification	
Model			Energy Measuring Extension Unit for Different voltage system EMU4-VA2	Energy Measuring Extension Unit for Same Voltage System EMU4-A2
Phase wire system			Single-phase 2-wire/single-phase 3-wire, 3-phase 3-wire/3-phase 4-wire common	(Same as the unit connected on the left side*9)
Instrument ratings	Voltage circuit	Single-phase 2-wire/ 3-phase 3-wire	110V, 220V, 440V AC common*1	
		Single-phase 3-wire	110V AC (between wires 1 and 2, and wires 2 and 3), 220V AC (between wires 1 and 3) 220V AC (between wires 1 and 2, and wires 2 and 3), 440V AC (between wires 1 and 3)	
		3-phase 4-wire	Minimum: 63.5V/110V AC, Max.: 277V/480V AC*2	
	Current circuit		50A, 100A, 250A, 400A, 600A (Dedicated split-type current sensor is used. All values indicate primary current values of current sensor.) 5A (Dedicated 5A current sensor is used. Current transformer (CT) is used in two-step configuration together with the 5A current sensor in order to allow a maximum primary current value setting of 30,000A) *3	
	Frequency		50/60Hz (automatic frequency selection)	
Auxiliary power rating			Same as measuring unit main unit (supplied from basic unit)	
No. of measurement circuits			2 circuits (single-phase 2-wire system and 2 circuits Measurement setting 4 circuits)	
Consumption VA	Voltage circuit		For each phase: 0.1VA (110V AC), 0.2VA (220V AC), 0.4VA (440V AC)	—
	Current circuit		For each phase: 0.1VA (current sensor primary side)	
	Auxiliary power circuit*11		AC110V: 1.0VA AC220VA:1.5VA	
Measurement items			Current, demanded current, voltage, power, demanded power, reactive power, power factor, frequency, electric energy (regenerative, consumption), reactive electric energy*6, current imbalance rate, voltage imbalance rate, operating time	
			Apparent power, harmonic current, harmonic voltage, electric energy conversion value	
Main unit tolerances*4			Current, voltage, power, reactive power, apparent power, frequency: ±1.0% (relative to rated input) Power factor: ±3.0% Electric energy: ±2.0% (in 5 to 100% range of rated values; power factor = 1) Reactive electric energy: ±2.5% (in 10 to 100% range of rated values; power factor = 0) Harmonic current, harmonic voltage: ±2.5%	
Data update cycle			100msec	
External input specification	Input signal format		—	—
	Function		—	—
		Contact input	—	—
		Pulse input	—	—
	Rated input voltage/current		—	—
External output specification	Output signal format		Non-voltage a contact, 2 output (Select function from below)*5	
	Function		Alarm/pulse output	
		Alarm output	Contact output of alarm generating status Select monitoring target from below. Monitoring of current demand upper limit, monitoring of current demand lower limit Monitoring of N-phase current demand upper limit Monitoring of line voltage upper limit Monitoring of line voltage lower limit Monitoring of phase voltage upper limit Monitoring of phase voltage lower limit Monitoring of power demand upper limit, monitoring of power demand lower limit Monitoring of power factor upper limit, monitoring of power factor lower limit Monitoring of current imbalance rate upper limit Monitoring of voltage imbalance rate upper limit	
		Output pulse width	0.1~0.15S	
	Rated switching voltage/current		35V DC 75 mA, 24V AC 75 mA (Power factor = 1)	
Power interruption backup	Recorded item		Setting values, electric energy (consumption, regenerative), reactive electric energy, periodic electric energy, operating time, pulse count value, pulse conversion value, electric energy conversion value, maximum value, minimum value (Stored in the nonvolatile memory)	
Compatible standard			CE marking (EMC: EN-61326-1: 2013, Safety: EN-61010-1: 2010), UL: UL61010-1*8	
Operating environment	Operating temperature range		-5℃ to +55℃ (ave. daily temp. of 35℃ or lower)	
	Operating humidity range		30% to 85%RH (no condensation)	
	Storage temperature range		-10℃ to +60℃ (ave. daily temp. of 35℃ or lower)	
	Altitude		2,000 m or lower	
Commercial-frequency withstand voltage			Between all terminals (excluding communication circuit and frame GND terminal) and external casing: 2,000V AC for 1 min	
			Between all current/voltage inputs and all auxiliary power terminals: 2,000V AC for 1 min	
			Between all current/voltage inputs, auxiliary power terminals and all contact/pulse inputs, pulse/alarm outputs, communication terminals: 2,000V AC for 1 min	
Insulation resistance			At the same locations as above: 10 MΩ or more (500V DC)	
Compatible wire	Auxiliary power/ voltage input terminal		A WG22-16 (single wire/stranded wires) (Single wire: ϕ0.65 to ϕ1.2 mm, Stranded wires: 0.3mm² to 1.25mm²)	—
	Current input		Single wire: AWG24-17, Stranded wires: AWG20-16 *7 (Single wire: ϕ0.5mm to ϕ1.2 mm, Stranded wires: 0.5mm² to 1.3 mm²)	
	Input/output terminal		AWG22-16 (single wire/stranded wires) (Single wire: ϕ0.65mm to ϕ1.2 mm, Stranded wires: 0.3mm² to 1.25 mm²)	
Weight			0.2kg	
External dimensions (unit: mm)			37.5 (W) x 90 (H) x 94 (D) mm (excluding protruding parts) (Maximum size including projections: 41.5 (W) x 90 (H) x 94 (D))	

* 1: 110V, 220V and 440V can be connected directly. Externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (primary voltage can be set to up to 110000V, and secondary voltage can be set between 1 and 220V). For details, see the instruction manual.
* 2: 63.5V/110V –277V/480V can be connected directly. An externally mounted voltage transformer (VT) for instrument is needed for voltages greater than those (primary voltage can be set to up to 110000V, and secondary voltage can be set between 1 and 220V). For details, see the instruction manual.
* 3: The settable primary current when using the 5A current sensor is as follows:
5A, 6A, 7.5A, 8A, 10A, 12A, 15A, 20A, 25A, 30A, 40A, 50A, 60A, 75A, 80A, 100A, 120A, 150A, 200Av250A, 300A, 400A, 500A, 600A, 750A, 800A, 1000A, 1200A, 1500A, 1600A, 2000A, 2500A, 3000A, 4000A, 5000A, 6000A, 7500A, 8000A, 10000A, 12000A, 20000A, 25000A, 30000A(CT primary side can be set freely up to 30000A. However, CT secondary side is fixed at 5A.)
* 4: Refer to the specifications of options (split-type current sensor, 5A current sensor) on page 24 for the current sensor error rates.
* 5: Refer to the instruction manual for the detail on the setting of pulse unit.
* 6: Measurements are conducted based on a setting other than 2-circuit measurement time with setting.
* 7: Recommended rod terminal: NichifuTGV TC-1.25-11T.
* 8: It conforms to UL standard only when it is combined with the following current sensor.
EMU2-CT5, EMU2-CT5-4W, EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400-A, EMU-CT600-A
* 9: It is measured with the same phase type.

Specification

■Extension Unit

Item			Specification	
Model			Analog Input Unit EMU4-AX4	Pulse Input Unit EMU4-PX4
Consumption VA (unit only)			110V AC: 2.0VA 220V AC: 2.5VA	
Input specifications	Number of input contacts		4	
	Input signal format		Differential input (0 - +5V, 0 to +20mA)	Non-voltage contact (supplied from the main unit)
	Insulation type		Photocoupler insulation	
	Rated input voltage/ current		Voltage: 0 to +5V (Input resistance: 1MΩ) Current: 0 to +20mA (Input resistance: 250Ω) * Input range (voltage/current) can be switched. (Switch each channel in the settings.)	DC6.5V, 10mA
	Input pulse conditions		—	Pulse-on time: 30 ms or more Pulse-off time: 30 ms or more Chattering time: 3 ms or less
	Measured items		AD conversion value, scaling value *2, number of times level exceeded	Pulse input: Pulse count value, pulse conversion value Contact input: Operation time, contact conditions * External input (pulse input/contact input) can be switched. (Switch each channel in the settings.)
	Range of measurement values		AD conversion value: 0 to 4095 Scaling value: -32,767 to 32,767	Pulse count value: 0 to 999,999 Pulse conversion value: 0.001 to 999,999,000
	Accuracy		AD conversion value: Input rating ±1.0% (23℃±10℃)	—
	Data update cycle		1 ms x number of channels *1 50 ms x number of channels *1	—
External output	Output signal type		Non-voltage a contact, 1 output	
	Functions	Alarm elements	Scaling value upper/lower limit monitoring, scaling value upper limit monitoring, scaling value lower limit monitoring	Pulse conversion value upper limit monitoring
		Alarm reset method	Select Auto or Latching	Auto
	Rated switching voltage/current		DC35V, 75mA or AC24V, 75mA (Power factor: 1)	
	Insulation type		Semiconductor relay insulation	
Compatible standards *1			CE marking (EMC: EN61326-1:2013, Safety: EN-61010-1:2010), UL: UL61010-1	
Operating environment	Operating temperature range		-5℃ to +55℃	
	Operating humidity range		30% to 80% RH (no condensation)	
	Storage temperature range		-10℃ to +60℃	
	Altitude		2,000 m or less	
Compatible wire	External input terminal		—	Stranded wire: AWG22-16（0.3mm² to 1.25mm²） Single wire: AWG22-16（ϕ0.65mm to ϕ1.2mm）
	Analog input terminal		Stranded wire: AWG22-16（0.3mm² to 1.25mm²） Single wire: AWG22-16（ϕ0.65mm to ϕ1.2mm）	—
	Contact output terminal		Stranded wire: AWG26-18（0.12mm² to 0.8mm²） Single wire: AWG26-18（ϕ0.4mm to ϕ1.0mm）	
	FG terminal		Stranded wire: AWG26-18（0.12mm² to 0.8mm²） Single wire: AWG26-18（ϕ0.4mm to ϕ1.0mm）	—
Tightening torque	External input terminal		—	0.5 to 0.6N•m
	Analog input terminal		0.5 to 0.6N•m	—
	Contact output terminal		0.5 to 0.6N•m	
	FG terminal		0.5 to 0.6N•m	—
External dimensions (Units: mm)			37.5 (W) x 90 (H) x 92.9 (D) (Excluding protruding parts) (Dimensions including protruding parts: 41.5 (W) x 90 (H) x 94 (D))	

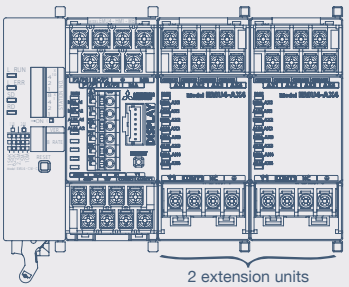
*1: This value varies according to the number of channels that are set to allow AD conversion, as shown below.
*2: This value can be averaged with in the desired range (1 to 100 points).

Number of channels set to allow AD conversion		1	2	3	4
Measurement mode	1ms	1ms	2ms	3ms	4ms
	50ms	50ms	150ms	150ms	200ms

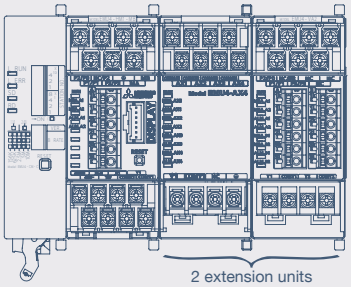
■Precautions (For details, see Sales and Service YAMA263 on the Mitsubishi Electric LVS website.)

1. If you are already using a basic unit (product version A) and are considering an extension that includes a combination of a CC-Link communication unit (EMU4-CM-C) and an analog input unit (EMU4-AX4)/pulse input unit (EMU4-PX4), please limit the number of extension units to 2 or less.
   Example 1: Extension unit EMU4-AX4/EMU4-PX4 x 2
   Example 2: Extension unit EMU4-AX4/EMU4-PX4 x 1 + Extension unit EMU4-AX4/EMU4-PX4 x 1
   Example 3: Extension unit EMU4-AX4/EMU4-PX4 x 1

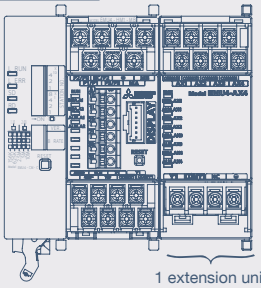
Example 1



Example 2



Example 3



2. If you use a compact display unit (product version A) to display the measurement values for an analog input unit (EMU4-AX4)/pulse input unit (EMU4-PX4), an error screen will appear. If you have extended an analog input unit (EMU4-AX4)/pulse input unit (EMU4-PX4) and are considering the use of a compact display unit (product version A) that you have already purchased, please contact Customer Service for assistance.

▶Specifications of MODBUS RTU Communication

Item	Specification
Physical interface	RS-485 2wires half duplex
Communication protocol	MODBUS RTU mode
Transmission method	Asynchronous
Transmission wiring type	Multi-drop bus (either directly on the trunk cable, forming a daisy-chain)
Baud rate	2400, 4800, 9600, 19200, 38400bps (default: 19,200 bps)
Data bit	8
Stop bit	1,2 (default: 1)
Parity bit	ODD, EVEN, NONE(default:EVEN)
Slave address	1~255 (FFh) (default: 1) 0: Broadcast
Response time	1s or shorter from completion of receiving query data to response transmission
Terminating resistor	120Ω 1/2W
Transmission distance	1,200m
Maximum connectable devices	31 devices
Recommended cable	SPEV (SB) -MPC-0.2×3P (Or more Mitsubishi cable industries)

■Display Unit

Item		Specification
Model		EMU4-D65
Auxiliary power supply		9V DC*1
Auxiliary power		—
Consumption VA		—
Display device		LCD (with backlight)
Display refresh interval		1000 ms
Measurement value display	Wh+A+4 element	Display of four elements: Electric energy, current and four other elements (selectable) (The number of display digits of electric energy is six digits.)
	Harmonic detail	Display of detailed harmonic order data of harmonic current and harmonic voltage*2
	Other	Display determined elements for each unit
Alarm display	Alarm status display	Display of upper-/lower-limit alarm generating status and contact output status
	Alarm value display	Display of upper-/lower-limit alarm values and generating time
Setting	EMU setting	Setting of EcoMonitorPlus/EcoMonitorPro (phase wire, primary voltage, primary current, sensor type, demand time limit, pulse unit, measuring mode, etc.)
	Clock setting	Setting of internal clock of EMU4-LM
	Alarm setting	Setting of upper-limit alarm value and lower-limit alarm value
	Display setting	Setting of LCD (with backlight) contrast and backlight ON status
Data reset		Reset integrated values such as maximum value, minimum value, electric energy(consumption / regeneration), reactive electric energy , pulse count value, pulse conversion value
Data preset		Preset the integrated value such as electric energy (consumption · regeneration), reactive electric energy, pulse count value, pulse conversion value etc
Connection to energy measuring unit		Dedicated cable (supplied with product) used for connection. Cable extension: 10 m max.*3
Max. number of connectable units		7 units (For one basic unit)*3
Installation method		Installs to IEC rail or panel
Operating temperature range		-5℃ to +55℃ (ave. daily temp. of +35℃ or lower)
Operating humidity range		30% to 80%RH (no condensation)
Storage temperature range		-10℃ to +60℃ (ave. daily temp. of +35℃ or lower)
Weight		0.1 kg

*1: Supplied from energy measuring unit. However, when two or more units are connected, use commercial power supply units (compatible product: Cosel PBA15F-9-N1).
*2: Maximum value, minimal value and upper-/lower-limit alarm data are not displayed.
*3: When two or more units are connected, use the display unit connection cable (option). When extending the cable length, use the extension cable (option).

■Logging Unit

▶Basic Specification

Item		Specification
Model		EMU4-LM
Auxiliary power supply rating		6.4V DC (supplied from energy measuring unit)
Power interruption backup		Total power interruption backup time of the battery (EMU4-BT) is one year (ave. daily temp. of 35℃ or lower). It is recommended to replace the battery every three years.
	Set value	Saved in non-volatile memory * Data will not be lost even if power outage occurs.
	Logging data System log data	Saved in volatile memory * Data will be lost if power outage occurs when the battery voltage is low (BAT.LED is lit).
	Timer operation	Timer operation continues by using the battery in the event of power outage. * Timer operation stops if the battery voltage is low (BAT.LED is lit) when power outage occurs. After power is recovered, timer operation starts from 2013/01/01 00:00:00.
Clock accuracy		1 min/month
Output data storage media*1		SD memory card (SD, SDHC)
Compatible model		Energy measuring unit (EcoMonitorLight) Model: EMU4-BD1-MB, EMU4-HD1-MB Energy measuring unit (EcoMonitorPlus) Model: EMU4-BM1-MB, EMU4-HM1-MB, EMU4-LG1-MB, EMU4-VA2, EMU4-A2, EMU4-AX4, EMU4-PX4
Compatible standard		EMC: EN-61326-1:2006
Operating environment	Operating temperature range	-5℃ to +55℃ (ave. daily temp. of +35℃ or lower)
	Operating humidity range	30% to 85%RH (no condensation)
	Storage temperature range	-10℃ to +60℃ (ave. daily temp. of +35℃ or lower)
	Altitude	2,000m or lower
CEmarking·Weight		0.1 kg *Wight of logging unit only
External dimensions (unit: mm)		25 (W) x 99 (H) x 60 (D) mm *Dimensions of logging unit only
Parts sold separately		SD memory card (EMU4-SD2GB)*1*2
Consumables sold separately		Battery (EMU4-BT)*2

*1: Use Mitsubishi SD memory card (EMU4-SD2GB).
If an SD memory card other than above is used, data in the SD memory card may become damaged or problems such as a system shutdown may occur. Regarding the use of commercially available SD memory cards, access our FA website. Note that the customer is responsible for verifying safe use of those SD memory cards.
*2: To purchase parts and consumables that are sold separately, contact the dealer from which the product was purchased.

Specification

▶Logging Specification

Item		Specification
Logging mode	Automatic update	Automatic overwrite/update
	Date/time designation	Automatic start/stop according to start time setting
Logging data type	Detailed data	Measurement data is saved according to set "Detailed Data Logging Cycle" (1 sec, 1 min, 5 min, 10 min, 15 min, 30 min). * Output as a detailed data file
	1-Hour data	Measurement data is saved in 1-hour cycles. * Output as 1-hour and 1-day data files.
Number of logging elements	Detailed data	Detailed data logging cycle of 1 sec → Maximum of 4 elements Detailed data logging cycle of other than 1 sec → Maximum of 10 elements
	1-Hour data	Maximum of 10 elements
Internal memory logging period	Detailed data	Maximum logging period

Number of measurements *1	1 circuit	2 circuit	3 circuit	4 circuit	5 circuit	6 circuit	7 circuit
Logging cycle: 1sec	20hours	6hours		3hours		2hours	
Logging cycle: 1min	20days	6days		3days		2days	
Logging cycle: 5min	100days	30days		15days		10days	
Logging cycle: 10min	200days	60days		30days		20days	
Logging cycle: 15min	300days	90days		45days		30days	
Logging cycle: 30min	600days	180days		90days		60days	

Internal memory logging period	1-Hour data	Number of measurements *1	1 circuit	2 circuit	3 circuit	4 circuit	5 circuit	6 circuit	7 circuit
			620 days (approx.20 months)	186 days (approx. 6 months)		93 days (approx. 3 months)		62 days (approx. 2 months)	

SD memory card (2GB) Logging period*2	Number of measurements *1	1 circuit	2 circuit	3 circuit	4 circuit	5 circuit	6 circuit	7 circuit
	Logging cycle: 1sec	approx.10 months	approx.6 months	approx.5 months	approx.4 months	approx.3 months	approx.2 months	approx.2 months
	Logging cycle: 1min	10 years or more	10 years or more	10 years or more	8 years	6 years	5 years	4 years
	Detailed data logging cycle of 5 min,10 min,15 min,30 min → 10 years or more							

System log data	3,600 records
Logging data and system log data output format	CSV format (ASCII code)

*1: The number of measurement circuits varies depending on the connected unit. For details, refer to the instruction manual (detail).
*2: The indicated period is the time period during which data can be saved in a 2GB SD memory card without exceeding its capacity.
The amount of data varies depending on the number of characters. The logging period indicates output at maximum capacity.

■CC-Link Communication Unit

▶Basic Specification

Item		Specification
Model		EMU4-CM-C
Auxiliary power supply･rating		6.4V DC (supplied from energy measuring unit)
Compatible model		Energy measuring unit (EcoMonitorLight) Model: EMU4-BD1-MB, EMU4-HD1-MB Energy measuring unit (EcoMonitorPlus) Model: EMU4-BM1-MB, EMU4-HM1-MB, EMU4-LG1-MB, EMU4-VA2, EMU4-A2, EMU4-AX4, EMU4-PX4
Compatible standard		EMC: EN-61326-1: 2006
Operating environment	Operating temperature range	-5°C to +55°C (ave. daily temp. of +35°C or lower)
	Operating humidity range	30% to 85%RH (no condensation)
	Storage temperature range	-10°C to +60°C (ave. daily temp. of +35°C or lower)
	Altitude	2,000m or lower
CE marking･Weight		0.1 kg *Wight of CC-Link communication unit only
External dimensions (unit: mm)		25(W)×99(H)×60(D)

▶CC-Link Communication Specification

Item	Specification
Number of Occupied Station	1 Station Remote device station (I/o) data and word data can be transmitted
CC-Link Ver.1.10 Ver.2.00 (Set by Version charge switch)	Ver.1.10, Ver 2.00 (Set by version charge switch)
Remote Station Number (Station Number)	1 to 64
Baud Rate	156k, 625k, 2.5M, and 10Mbps (changes according to setting) (The interstation cable length and maximum total extension distance vary according to the transmission speed.)
Max.connected device	A maximum of 42 units can be connected if configured using only this module.
Cable terminating resistance	Use a specified cable for CC-Link communication connection. Resistance values for terminating resistance are different according to the type of specialized cable used.

■Accessories

▶Split-type Current Sensor

Item		Specification				
Model		EMU-CT50-A	EMU-CT100-A	EMU-CT250-A	EMU-CT400-A	EMU-CT600-A
Rated primary current		50A AC	100A AC	250A AC	400A AC	600A AC
Rated secondary current		16.66mA	33.33mA	66.66mA	66.66mA	66.66mA
Rated load		0.1VA				
Maximum use voltage		460V AC				
Applicable wire size (reference)	IV wire	38㎟	60㎟	200㎟	500㎟	
	CV wire	22㎟	60㎟	150㎟	400㎟	
Ratio error		±1% (5 to 100% of rating, RL ≦ 10 Ω)				
Phase difference variation		—			Ⅲ	
Measurement category		—			2	
Degree of contamination		-5 ~ +55°C (daily average temperature of 35°C or less)				
Operating temperature range		30% ~ 85% RH (no condensation)				
Operating humidity range		—			EN61010-2-32	
CE marking compatible standard		—			460V	
Weight		0.05kg	0.1kg	0.2kg	0.3kg	0.4kg

*: Maximum voltage means voltage to ground.
*: Use an electric wire of the size of penetrating this current sensor for a primary side cable, do not use a non-insulation electric wire or a metal for a primary cable.

Item		Specification		
Model		EMU-CT50	EMU-CT100	EMU-CT250
Rated primary current		50A AC	100A AC	250A AC
Rated secondary current		16.66mA	33.33mA	66.66mA
Rated load		0.1VA		
Maximum use voltage		460V AC		
Applicable wire size (reference)	IV wire	60㎟ or less		150㎟ or less
	CV wire	38㎟ or less		150㎟ or less
Ratio error		±1% (5 to 100% of rating, RL ≦ 10 Ω)		
Phase difference variation		±30 min. (5 to 100% of rating, RL ≦ 10 Ω)		
Measurement category		Ⅲ		
Degree of contamination		2		
Operating temperature range		-5 ~ +55°C (daily average temperature of 35°C or less)		
Operating humidity range		5 ~ 95% RH (However, there is no condensation)		
CE marking compatible standard		EN61010-2-32		
Maximum voltage compatible with CE marking		460V		
Weight		0.1kg		

*: Maximum voltage means voltage to ground.
*: Use an electric wire of the size of penetrating this current sensor for a primary side cable, do not use a non-insulation electric wire or a metal for a primary cable.

▶5A Splite-type current sensor

Item		Specification	
Model		EMU2-CT5,EMU2-CT5-4W	EMU-CT5-A
Rated primary current		5A AC	5A AC
Rated secondary current		1.66mA	1.66mA
Rated load		0.1VA	0.1VA
Maximum use voltage		260V	460V AC
Applicable wire size (reference)	IV wire	22㎟	38㎟
	CV wire	14㎟	22㎟
Ratio error		±1% (5 ~ 100% of rating)	±1% (5 ~ 100% of rating)
Phase difference variation		Ⅲ	—
Measurement category		2	—
Degree of contamination		-5°C ~ +55°C (daily average temperature of 35°C or less)	-5°C ~ +55°C (daily average temperature of 35°C or less)
Operating humidity range		5% ~ 95% RH (no condensation)	30% ~ 85% RH (no condensation)
CE marking compatible standard		EN61010-2-32	—
Maximum voltage compatible with CE marking		260V	—
Weight		0.1kg	0.05kg

*: Maximum voltage means voltage to ground.
*: Use an electric wire of the size of penetrating this current sensor for a primary side cable, do not use a non-insulation electric wire or a metal for a primary cable.

Specification

■Accessories

▶Split-type Zero-phase Current Transformer

Item	Specification				
Model	CZ-22S	CZ-30S	CZ-55S	CZ-77S	CZ-112S
Hole diameter (mm)	22	30	55	77	112
Allowable current (A)	50	100	300	600	1000
Weight (kg)	0.5	0.6	1.8	2.8	2.8
Rated short-time current	50 kA (peak-to-peak value: 100 kA)				

▶Through-type Zero-phase Current Transformer

Item	Specification					
Model	ZT15B	ZT30B	ZT40B	ZT60B	ZT80B	ZT100B
Hole diameter (mm)	15	30	40	60	80	100
Allowable current	Refer to the following table, "Zero-phase Current transformer (ZCT) inside Diameter, Maximum Through-wire Diameter and Allowable Current."					
Weight (kg)	0.2	0.4	0.6	2.0	2.6	3.3
Rated short-time current	50 kA (peak-to-peak value: 100 kA)					

▶Zero-phase Current Transformer with Primary Conductor

Item	Specification		
Model	ZTA600A	ZTA1200A	ZTA2000A
Allowable current (A)	600	1200	2000
Weight (kg)	6.5	11	27
Rated burden	3		
Number of polarities	AC600V		
Rated short-time current	100 kA (peak value)		

▶Zero-phase Current transformer (ZCT) inside Diameter, Maximum Through-wire Diameter and Allowable Current

Wiring method			Maximum through-wire diameter (mm²) (Allowable current (A) of wire)									
Phase wire	No. of wires	Wire type	ZT15B	ZT30B	ZT40B	ZT60B	ZT80B	ZT100B	CZ-22S	CZ-30S	CZ-55S	CZ-77S	CZ-112S
Single-phase 2-wire	2	600V polyvinyl-insulated wire (IV)	8	60	100	325	—	—	22	60	250	500	—
			(61)	(217)	(298)	(650)			(115)	(217)	(556)	(842)	
		600V cross-linked polyethylene-insulated wire Single-core wire (CV wire)	3.5	38	100	250	500	800	22	38	200	500	1000
			(44)	(190)	(355)	(620)	(920)	(1285)	(130)	(190)	(545)	(920)	(1470)
Single-phase 3-wire 3-phase 3-wire	3	600V polyvinyl-insulated wire (IV)	8	38	100	250	500	—	22	38	200	500	—
			(61)	(162)	(298)	(556)	(842)		(115)	(162)	(469)	(842)	
		600V cross-linked polyethylene-insulated wire Single-core wire (CV wire)	2	38	60	200	400	600	14	38	150	400	1000
			(31)	(190)	(255)	(545)	(815)	(1005)	(100)	(190)	(455)	(815)	(1470)
3-phase 4-wire	4	600V polyvinyl-insulated wire (IV)	8	38	60	200	400	—	14	38	150	325	—
			(61)	(162)	(217)	(469)	(745)		(88)	(162)	(395)	(650)	
		600V cross-linked polyethylene-insulated wire Single-core wire (CV wire)	—	22	60	150	325	600	8	22	150	325	600
				(130)	(255)	(455)	(725)	(1005)	(72)	(130)	(455)	(725)	(1005)

*: Note that the wire thickness may vary slightly depending on the manufacturer.
*: The IV wire applies to cases where insulators are used.
*: The IV wire applies to cases where insulation in a covered conduit in air.
(Cables of 600mm² or more have various structures. The values are shown for reference.)

■Optional Parts

▶SD Memory Card for Logging Unit

Item	Specification
Model	EMU4-SD2GB
Memory capacity	2GB
Weight	2g

▶Lithium battery for Logging Unitt

Item	Specification
Model	EMU4-BT
Type	Manganese dioxide lithium battery
Nominal voltage	3V
Battery capacity	240mAh
Weight	3.8g

*: Logging units include one lithium battery when purchased.
*: Cumulative power failure compensation time for one year (daily average temperature 35 degrees or less), exchange recommended every 3 years.

■Software

▶Data Acquisition Software (EMU4-SW1)

Item		Specification
Recommended system environment	OS	・Microsoft Windows Vista Ultimate 32bit SP2 ・Microsoft Windows 7 Professional (32bit/64bit) SP1 ・Microsoft Windows 8.1 Pro (32bit/64bit) ・Microsoft Windows 10 (32bit/64bit)
	Microsoft. NET Framework	・Microsoft .NET Framework 2.0 ・Microsoft .NET Framework 3.5 ・Microsoft .NET Framework 3.5.1
	Microsoft Excel	・Microsoft Excel 2007 SP3 (32bit/64bit) ・Microsoft Excel 2010 SP1 (32bit/64bit) ・Microsoft Excel 2013 SP1 (32bit/64bit) ・Microsoft Excel 2016 (32bit/64bit)
Basic specifications	Max. amount of connections	31 units
	Languages	Japanese, English
Data collection functions	Periodic collection	Data is collected and logged in 1-min. or 1-hour cycles. (Operated in background by the OS task scheduler.)
	Current value display	Constant communication is performed to display current values (Cannot be displayed during periodic collection.)
	Max. amount of collection points	124 items
Setting functions	Communication settings	MODBUS RTU communication settings (such as baud rate, stop bit length and parity bit)
	Terminal registration	Register the terminal performing data collection
	Terminal settings	Terminal settings functions (such as phase wire, rated current and rated voltage)
	Measured items registration	Measured items of collected data are registered.
	Export/Import	Set values of communication, terminals and measured items are saved in or read out from a file.
Report output	Output format	Paste aggregate data in an Excel template file. (Excel template files can be freely edited.)
	Output types	Monthly, daily and detailed (1-min intervals)

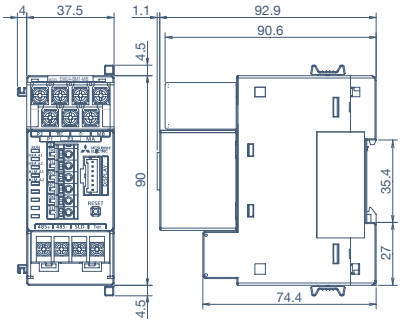
▶Logging Unit Utillty

Item			Specification
System requirements	OS		・Microsoft Windows 7 Professional SP1（32bit/64bit) ・Microsoft Windows 8.1 Pro Update（32bit/64bit) ・Microsoft Windows 10 Pro（32bit/64bit)
	NET Framework		・Microsoft .NET Framework 4 Client Profile
	Microsoft Excel		・Microsoft Excel 2010 SP2 (32bit) ・Microsoft Excel 2013 SP1 (32bit) ・Microsoft Excel 2016 (32bit)
	CPU		Conformity with OS system requirements
	RAM		Conformity with OS system requirements
	Hard disk		Software requires approximately 20 MB of free space to install (additional space is required for saving document files created by the software).
	Display		XGA or higher resolution display monitor (65,536 colors, 1024 x 768 pixels or more)
	Input device		Mouse and keyboard
	External interface		SD memory card slot or SD memory card reader/writer
Supported languages			Japanese, English
Report creation	Output format		Logging data pasted to template Excel file (template Excel file is freely editable)
	Max. number of sheets		Logging data can be pasted to maximum of 31 sheets (for data of 31 logging units)
	Document type	Monthly report	Output of 1-day interval data of a period of 1 month
		Weekly report	Output of 1-hour interval data of a period of 7 days
		Daily report	Output of 1-hour interval data of a period of 1 day
		Details (min)	Output of 30-/15-/10-/5-/1-minute interval data of specified period (1 to 24 hours)
		Details (sec)	Output of 1-sec interval data of a period of 1 hour
Logging setting			Creation/editing of logging setting data file (set.csv)

Energy Measuring Unit(Basic unit)

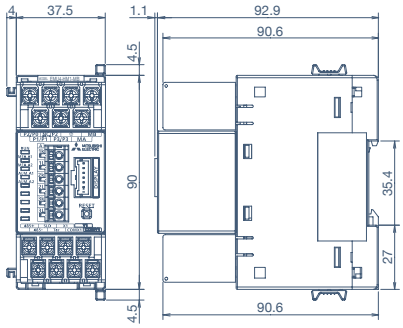
[Energy Measuring Standard Model]

EMU4-BM1-MB



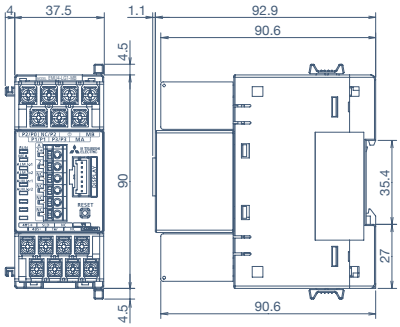
[Energy Measuring High Performance Model]

EMU4-HM1-MB



[Insulation Monitor Model]

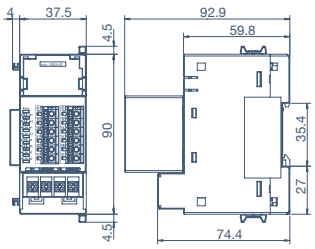
EMU4-LG1-MB



Energy Measuring Unit(Extension unit)

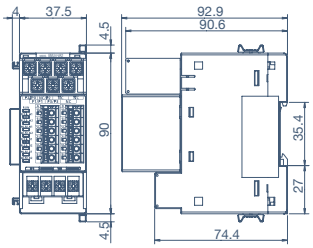
[Energy Measuring Extension Unit for Same Voltage System]

EMU4-A2



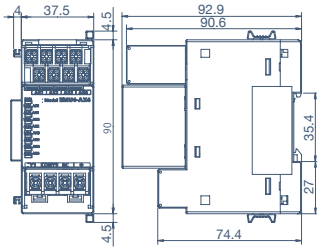
[Energy Measuring Extension Unit for Different Voltage System]

EMU4-VA2



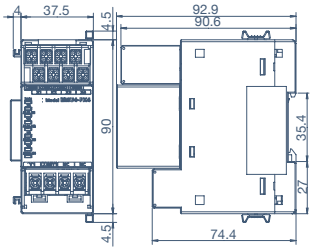
[Analog input unit]

EMU4-AX4



[Pulse input unit]

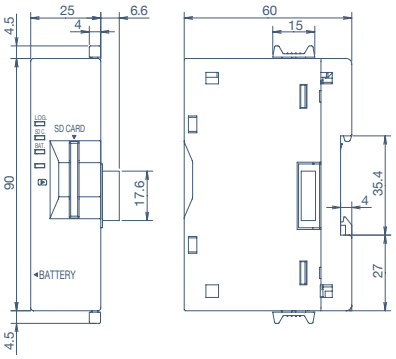
EMU4-PX4



Logging/Communication Unit

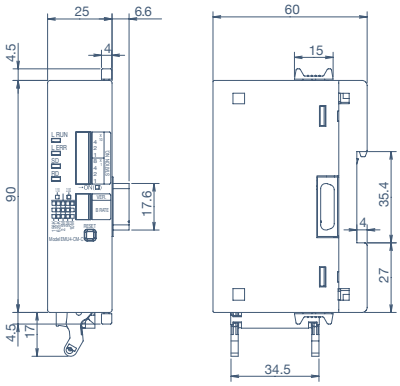
[Logging Unit]

EMU4-LM



[CC-Link Communication Unit]

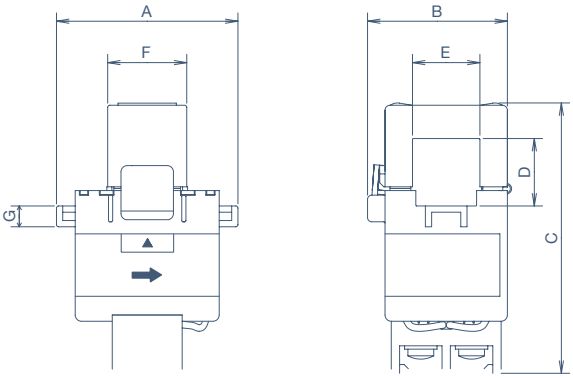
EMU4-CM-C



Accessories

[Split-type Current Sensor]

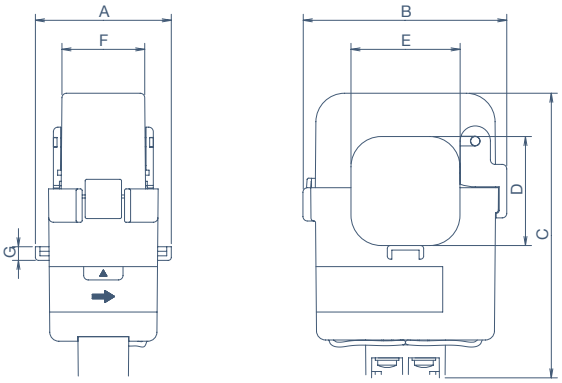
EMU-CT5-A, EMU-CT50-A, EMU-CT100-A



Model	A	B	C	D	E	F	G
EMU-CT5-A/CT50-A	37.4	31.6	57.5	12.2	12.8	14.0	5.0
EMU-CT100-A	43.6	33.6	65.0	16.2	16.2	19.0	5.0

[Split-type Current Sensor]

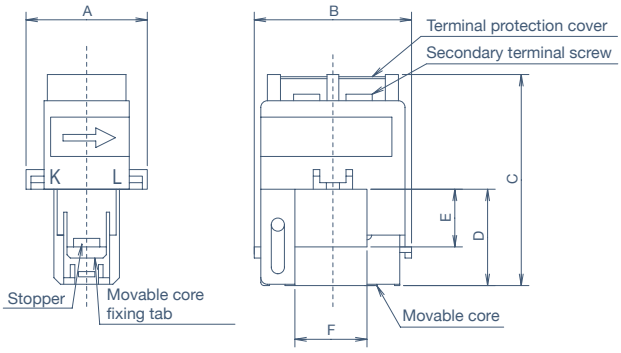
EMU-CT250-A, EMU-CT400-A, EMU-CT600-A



Model	A	B	C	D	E	F	G
EMU-CT250-A	42.6	49.4	74.5	24.0	24.0	25.2	4.5
EMU-CT400-A/CT600-A	44.9	67.2	94.0	36.0	36.0	27.0	4.5

[Split-type Current Sensor]

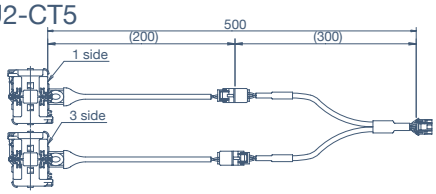
EMU-CT50, EMU-CT100, EMU-CT250



Model	A	B	C	D	E	F
EMU-CT50/CT100	31.5	39.6	55.2	25.7	15.2	18.8
EMU-CT250	36.5	44.8	66.0	32.5	22.0	24.0

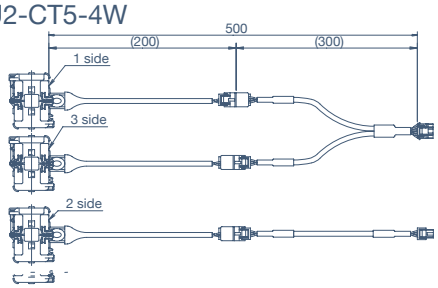
[5A Split-type Current Sensor]

EMU2-CT5



[5A Split-type Current Sensor (3-phase 4-wire)]

EMU2-CT5-4W



[5A Split-type Current Sensor Cable]

EMU2-CB-Q5A

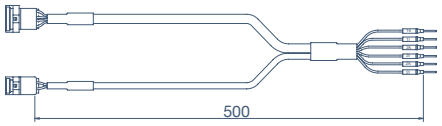
[Extension Cable]

EMU2-CB-T＊＊M

Model	EMU2-CB-T1M	EMU2-CB-T5M	EMU2-CB-T10M
L dimension	1m	5m	10m

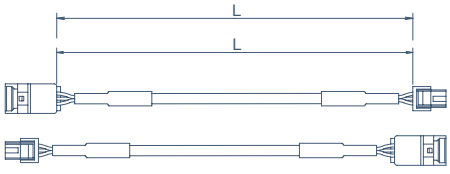
[5A Split-type Current Sensor (3-phase 4-wire)]

EMU2-CB-Q5A-4W



[Extension Cable (separate Type)]

EMU2-CB-T＊＊MS



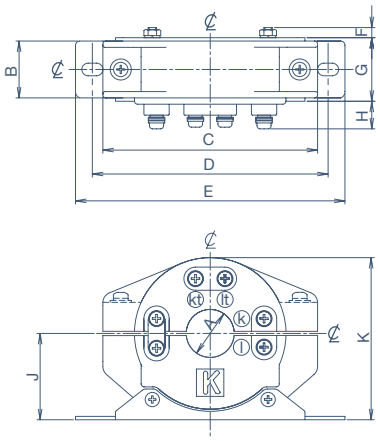
Model	EMU2-CB-T1MS	EMU2-CB-T5MS	EMU2-CB-T10MS
L dimension	1m	5m	10m

＊＊= 1 . 5 . 10

Accessories

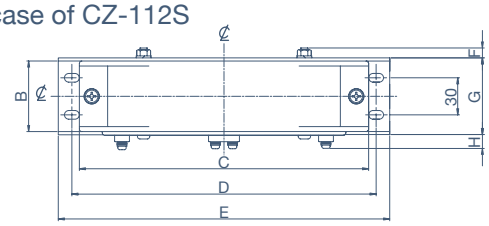
[Split type Zero-phase Current Transformer]

In case of CZ-22S・30S・55S・77S



[Split type Zero-phase Current Transformer]

In case of CZ-112S

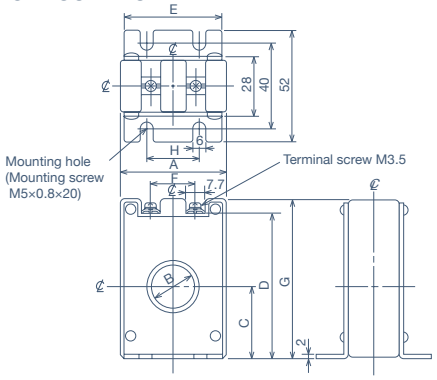


■CZ-22S to CZ-112S Dimensional variation Table

	CZ-22S	CZ-30S	CZ-55S	CZ-77S	CZ-112S
A	22	30	55	77	112
B	27	27	32	41	57
C	100	114	148	198	234
D	112	130	160	210	246
E	128	144	177	232	268
F	5	5	8	10	8
G	30	30	36	45	62
H	12	12	12	12	12
J	41	47	66	90	109
K	77	89	124	171	207

[Through-type Zero-phase Current Transformer]

ZT15B・30B・40B

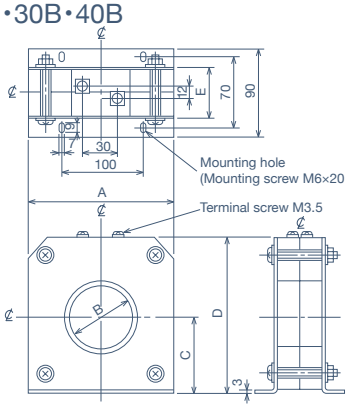


■ZT15B/30B/40B Dimensional variation Table

	ZT15B	ZT30B	ZT40B
A	48	68	85
B	15	30	40
C	29	37	43
D	62	82	92
E	46	66	81
F	15	30	40
G	70	90	100
H	25	50	50

[Through-type Zero-phase Current Transformer]

ZT15B・30B・40B

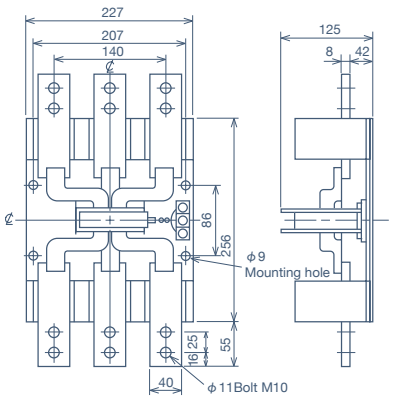


■ZT60B/80B/100B Dimensional variation Table

	ZT60B	ZT80B	ZT100B
A	140	160	185
B	60	80	100
C	73	82	93
D	150	169	190
E	46	48	50

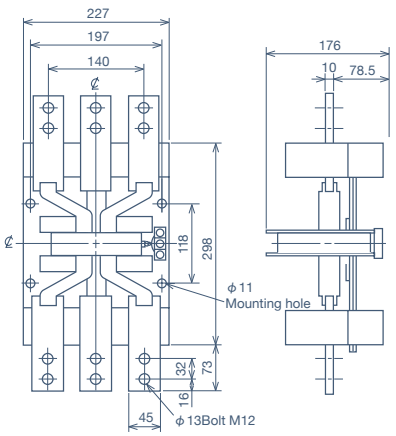
[Zero-phase Current Transformer with primary conductor]

ZTA600A (600A)



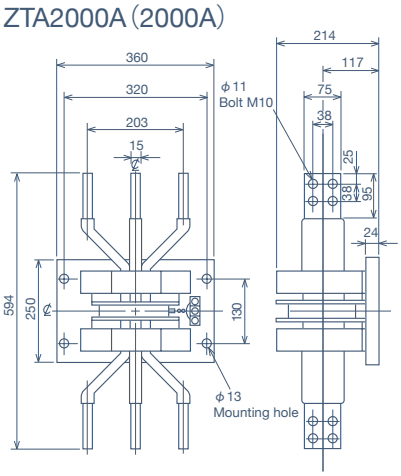
[Zero-phase Current Transformer with primary conductor]

ZTA1200A (1200A)



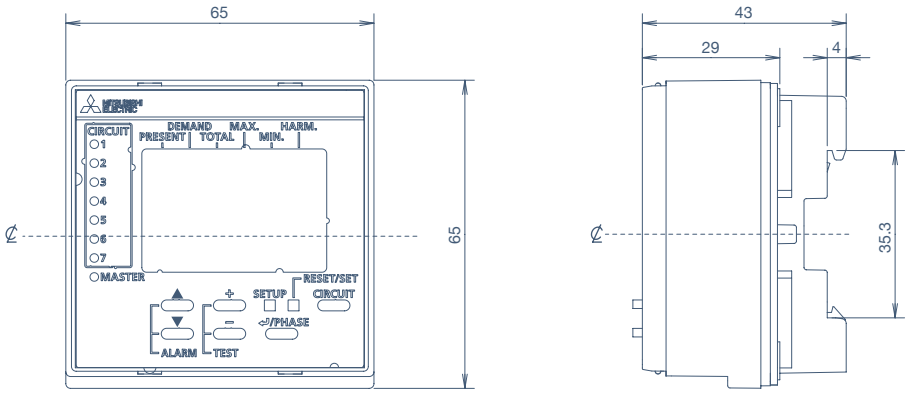
[Zero-phase Current Transformer with primary conductor]

ZTA2000A (2000A)

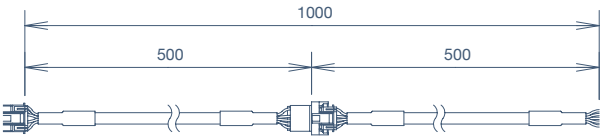


[Display Unit]

EMU4-D65



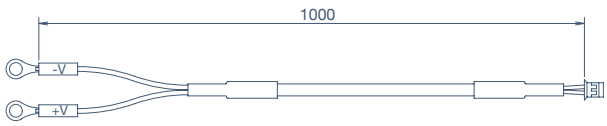
[Display Unit Connection Cable]



* Included in display unit (EMU4 -D65).

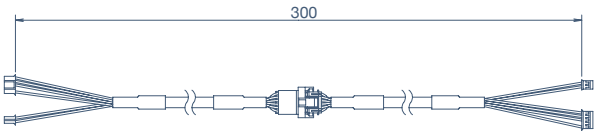
[Display Unit Power Cable]

EMU4-CB-DPS



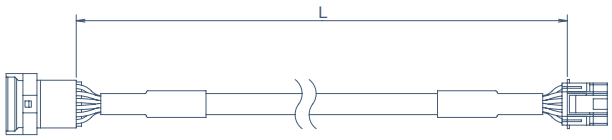
[Display Unit Connecting Cable]

EMU2-CB1-DP



[Extension Cable]

EMU2-CB-T＊＊M

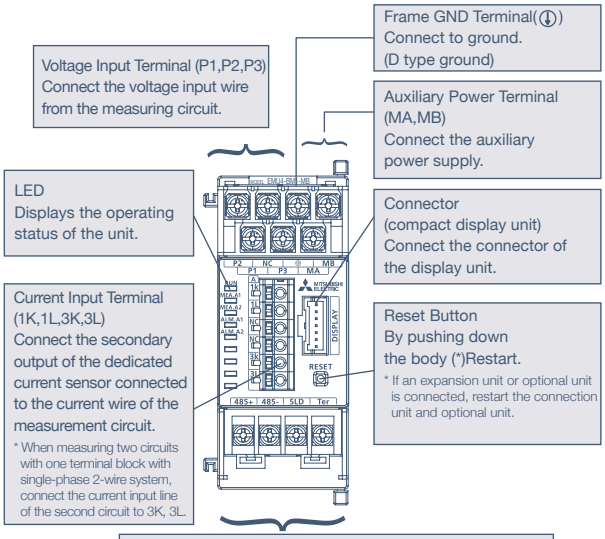


Model	EMU2-CB-T1MS	EMU2-CB-T5MS	EMU2-CB-T10MS
L dimension	1m	5m	10m

Product name	Model	Cable length	Remarks
Display unit power cable	EMU4-CB-DPS	1m	Display unit power cable is required for connection commercially available DC power supply and compact display unit. Display unit power cable is required for connection two or more compact display units to one energy measurement unit.
Display Unit connectingcable (For connection between display units)	EMU2-CB1-DP	0.3m	Display unit connecting cable is required for connection two or more compact display units to one energy measuring unit.
Extension cable	EMU2-CB-T1M	1m	Extension cables are used for connection between the energy measuring unit and the compact display unit. The maximum extension distance is 10 m (total length of extension cables).
	EMU2-CB-T5M	5m	
	EMU2-CB-T10M	10m	

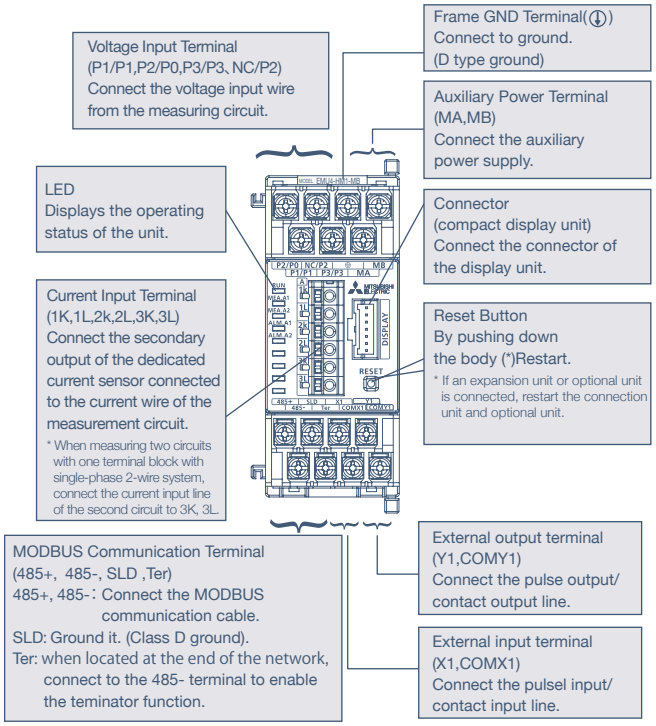
Energy Measuring Standard Model

EMU4-BM1-MB



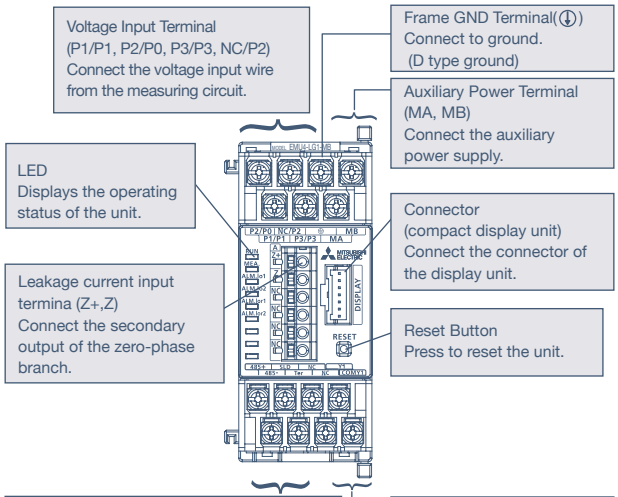
Energy Measuring High Performance Model

EMU4-HM1-MB



Insulation Monitor Model

EMU4-LG1-MB



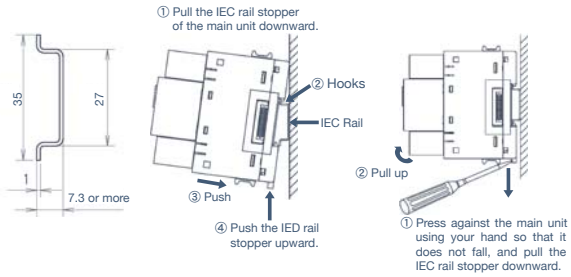
Installation Procedures

⚠ CAUTION

•All installation and connection work must be performed by technicians having specialized knowledge in matters such as electrical construction.

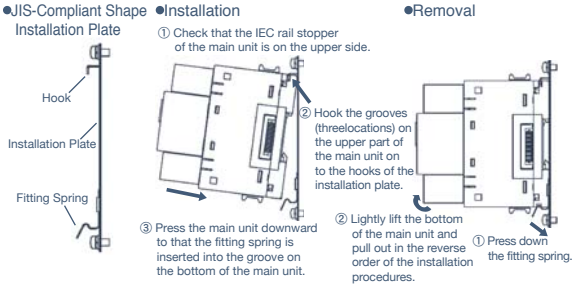
IEC Rail Installation

●Applicable IEC Rail ●Installation ●Removal



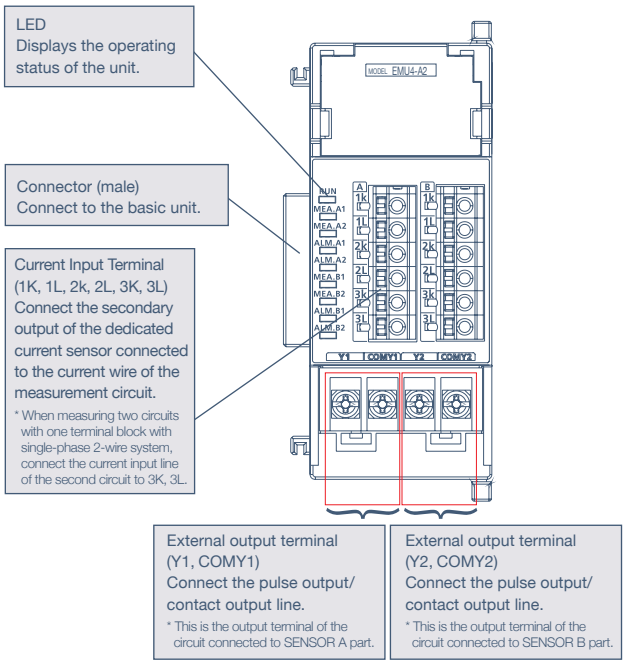
JIS-Compliant Dimensions Installation

●JIS-Compliant Shape Installation Plate ●Installation ●Removal



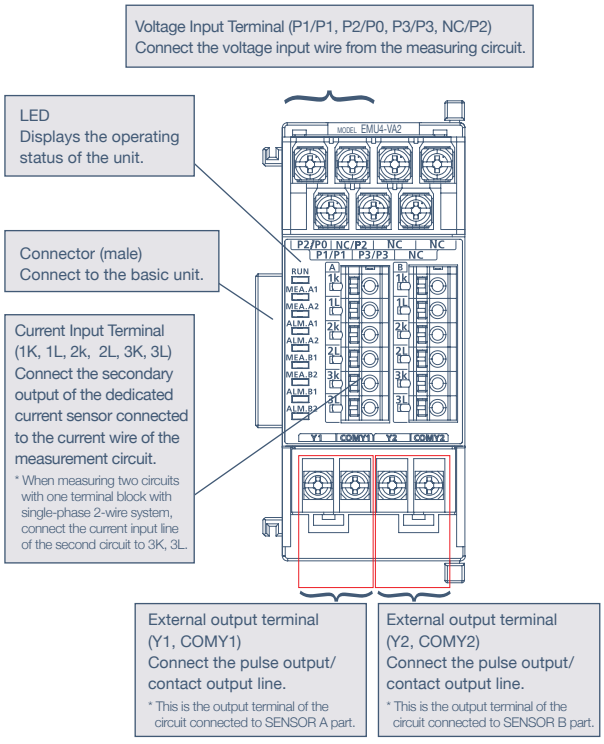
Energy Measuring Extension Unit for Same Voltage System

EMU4-A2



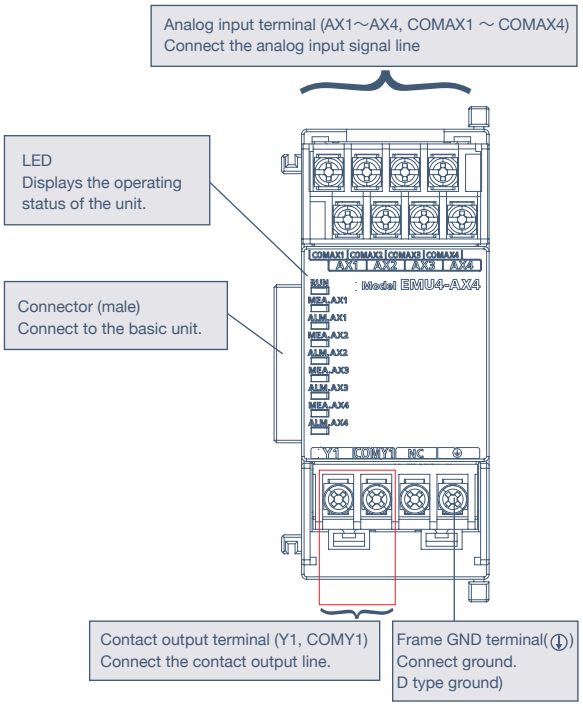
Energy Measuring Extension Unit for Different Voltage System

EMU4-VA2



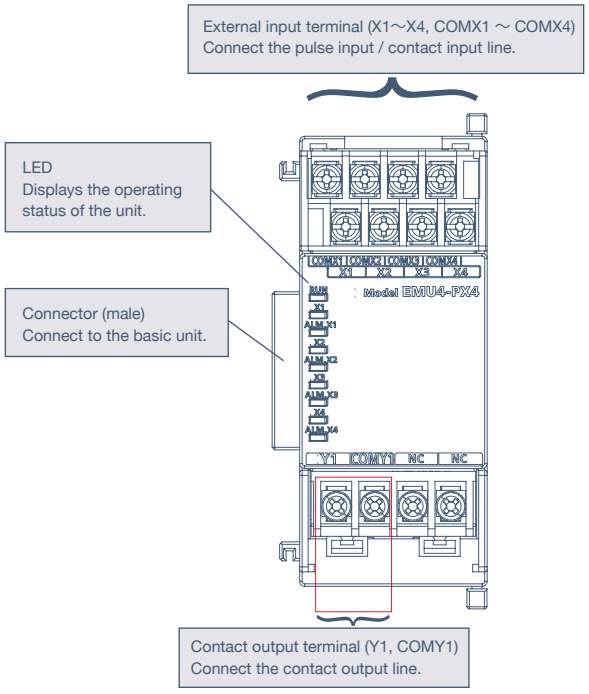
Analog Input Unit

EMU4-AX4



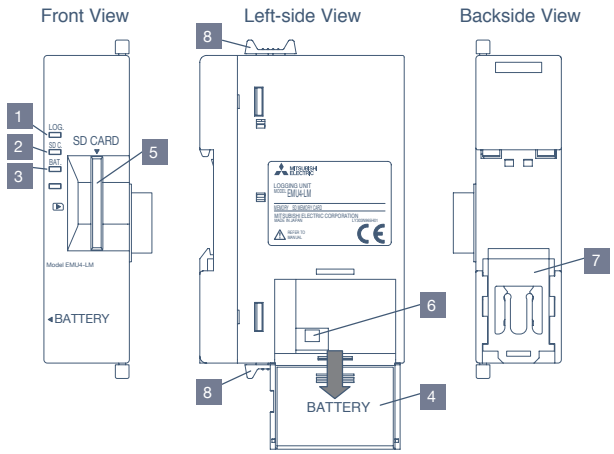
Pulse Input Unit

EMU4-PX4



Logging Unit

EMU4-LM



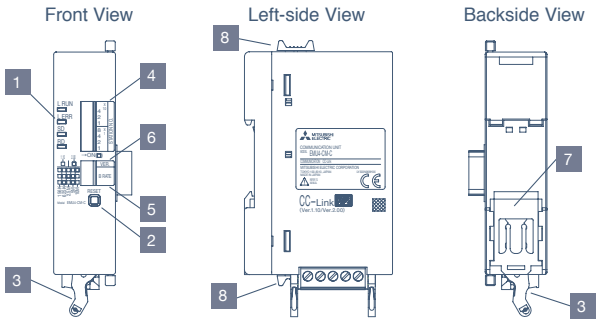
▶Names and Functions of Each Part

No.	Name	Function
1	LOG.LED	Displays logging operation status. Lit up: Logging is being performed. Not lit up: Logging operation is stopped. Slow flashing*1 (5 sec.): Changing of logging conditions settings has been completed. Fast flashing*2 (30 sec.): Changing of logging conditions settings has failed. Fast flashing*2: Error has occurred.*3
2	SDC.LED	Displays SD memory card communication status. Lit up: Communication is being performed. Not lit up: Communication is stopped. Fast flashing*2: SD memory card error.*3
3	BAT.LED	Displays the battery voltage status Lit up: Battery voltage is low*4. Not lit up: Battery voltage is normal
4	Battery box	Contains the battery for performing backup of current time, logging and system log data.
5	SD memory card slot	Slot for inserting the SD memory card
6	Battery connector	Connector for connecting the battery.
7	IEC rail stopper	Used for fixing to the IEC rail.
8	Coupling tab	Used for fixing the logging unit. to the energy measuring unit.

*1: Slow flashing: Lit up for 0.5 sec. → Not lit up for 0.5 sec. → Lit up for 0.5 sec. (pattern is repeated)
*2: Fast flashing: Lit up for 0.25 sec. → Not lit up for 0.25 sec. → Lit up for 0.25 sec. (pattern is repeated)
*3: If this is lit up, refer to “Error Display and Recovery Procedures” of the “Operation Manual (Detailed Version)”.
*4: Turning the power off when the battery voltage is low deletes the current time and logging data. (Set values for logging ID, logging mode, logging start time, detailed data logging cycle and logging items are not deleted due to being stored in non-volatile memory.) Replace thebattery if BAT. LED lights up.

CC-Link Communication Unit

EMU4-CM-C



▶CC-Link Communication Unit EMU4-CM-C

No.	Name	Function
1	L RUN/L ERR/ SD/RD LED	Displays the CC-link communication status.
2	Reset switch	Press after setting or changing the STATION, B RATE, VER.
3	CC-Link communication connector	Connect the CC-link signal wire.
4	STATION switch	Station setting switch: Set the CC-Link station number.
5	B RATE switch	Baud rate setting switch. Set the CC-Link transmission speed.
6	VER. switch	Switch for changing the CC-Link version.
7	IEC rail stopper	Used for fixing the IEC rail.
8	Coupling tab	Used for fixing the CC-Link communication unit to the energy measuring module.

Display Unit

EMU4-D65

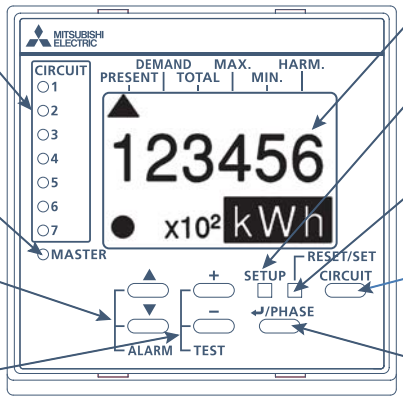
(Front side)

Circuit display:
Lit circuit no. indicates the circuit displayed on the screen. When alarm is generated, the LED of the pertinent circuit no. flashes.

Master LED:
Lights when operating as a master unit. It does not light when operating as a slave unit.

▲,▼keys:
Used to change measurement data or select menu item.

+, – keys:
Displays/hides maximum values and minimum values and switches harmonic order data.



LCD display device:
Displays the values measured by energy measuring unit and setting information.

SETUP key:
Used to activate the setting modeand exit from it.

REST/SET key:
Used to reset/preset data.

CIRCUIT key:
Changes and displays measurement circuits.

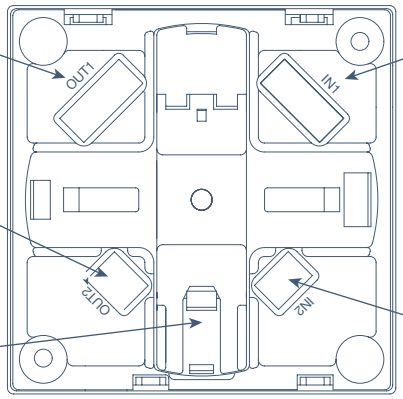
↵/PHASE key:
Changes and displays the phase data of current/voltage.Also used to enter settings.

(Back side)

Connect the connector OUT 1:
Used to connect with the adjacent display unit.

Connect the connector OUT 2:
Used to connect with the adjacent display unit.

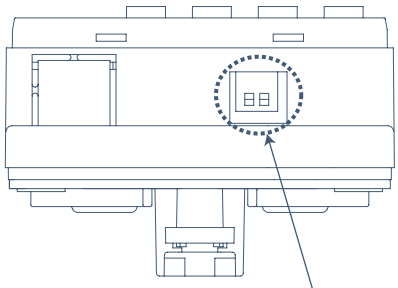
IEC rail stopper:
Used for fixing to the IEC rail.



Connect the connector IN 1:
Used to connect to the energy measuring unit, connecting with the adjacent display unit.

Connect the connector IN 2:
Used to connect to the adjacent display unit, and to the display unit electrical equipment.

(Bottom side)



Master / slave setting switch:
Make master / slave settings. When it is OFF, it becomes the master.
(At factory shipment, it is set to "Master".)Make sure to change the setting before turning on the power.

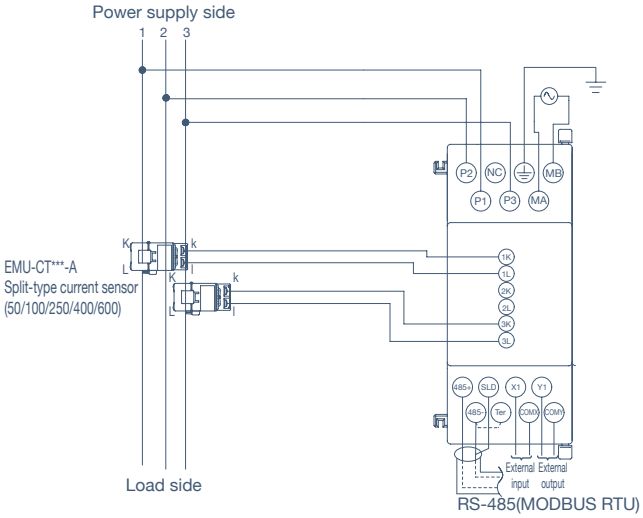
	Master	Slave
Switch 1	OFF	ON
Switch 2	OFF	OFF

If you change the setting during operation, please turn on the power again.

Connection View

Single-phase 3-wire/3-phase 3-wire (in the case of low-voltage circuit)

■UL noncompliant case

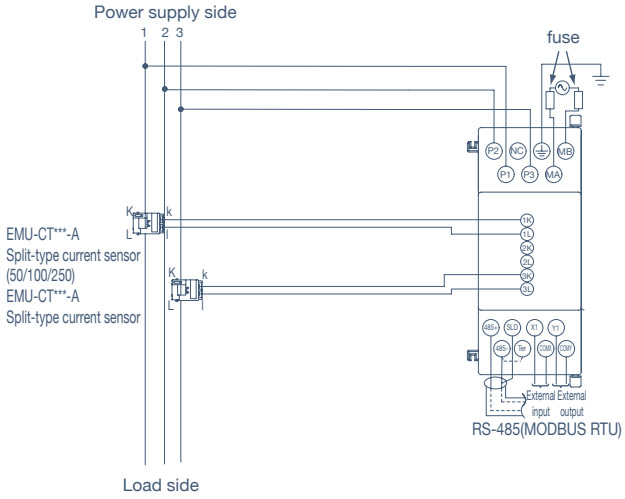


Name	Model	Quantity
Energy Measuring Unit	EMU4-HM1-MB	1
Split-type current sensor	EMU-CT***-A (50/100/250/400/600)	2

* EMU-CT *** -A (400/600) conforms to UL standard

Single-phase 3-wire/3-phase 3-wire (in the case of low-voltage circuit)

■In case of UL conformity

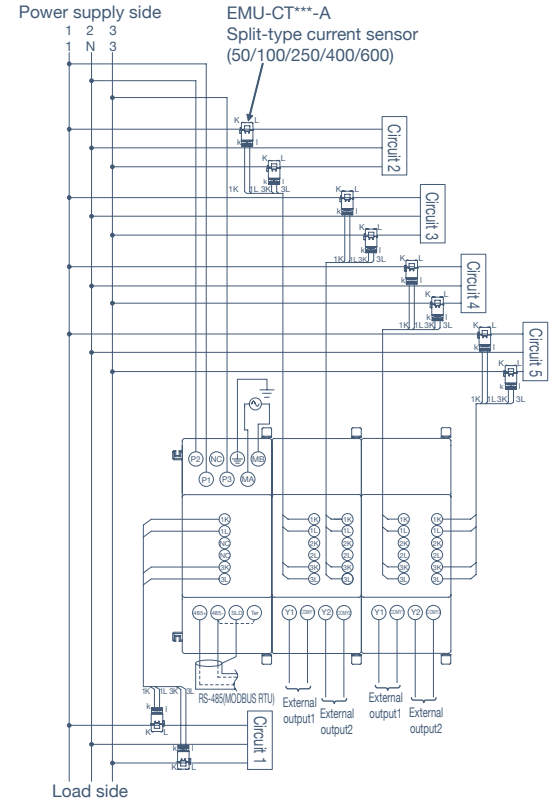


Name	Model	Quantity
Energy Measuring Unit	EMU4-HM1-MB	1
Split-type current sensor	EMU-CT***(50/100/250) EMU-CT***-A(400/600)	2

* Fuse is necessary when conforming to UL.

Single-phase 3-wire/3-phase 3-wire (in the case of low-voltage circuit)

■ULnoncompliant case

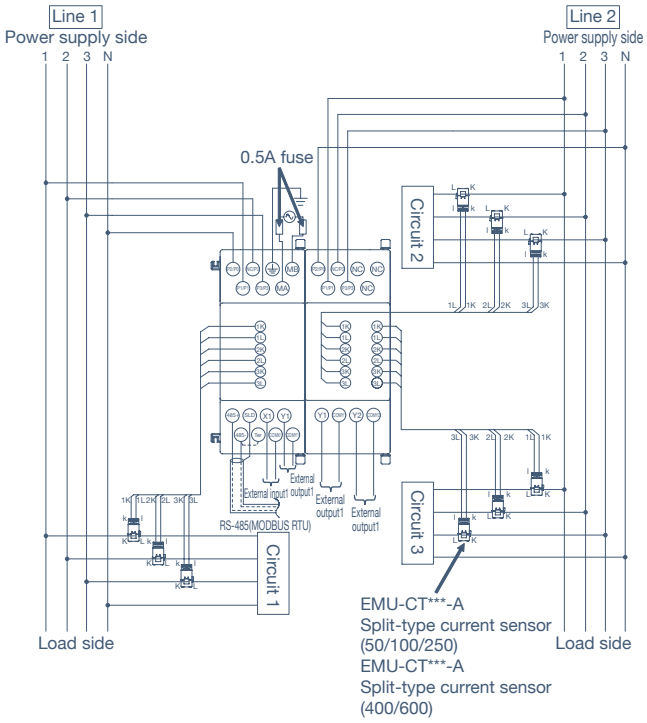


Name	Model	Quantity
EcoMonitorPlus (Standard Model)	EMU4-BM1-MB	1
EcoMonitorPlus (Extension Unit for Same Voltage System)	EMU4-A2	2
Split-type current sensor	EMU-CT***-A (50/100/250/400/600)	10

* EMU-CT *** -A (400/600) conforms to UL standard

3-phase 4-wire (in the case of low-voltage circuit)

■In case of UL conformity

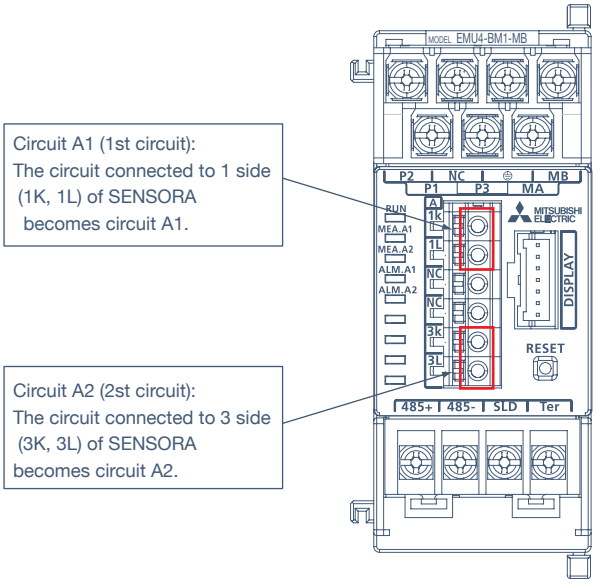


Name	Model	Quantity
EcoMonitorPlus (High Performance Model)	EMU4-HM1-MB	1
EcoMonitorPlus (ExtensionUnit for Different Voltage System)	EMU4-VA2	1
Split-type current sensor	EMU-CT***(50/100/250) EMU-CT***-A(400/600)	9

* Fuse is necessary when conforming to UL.

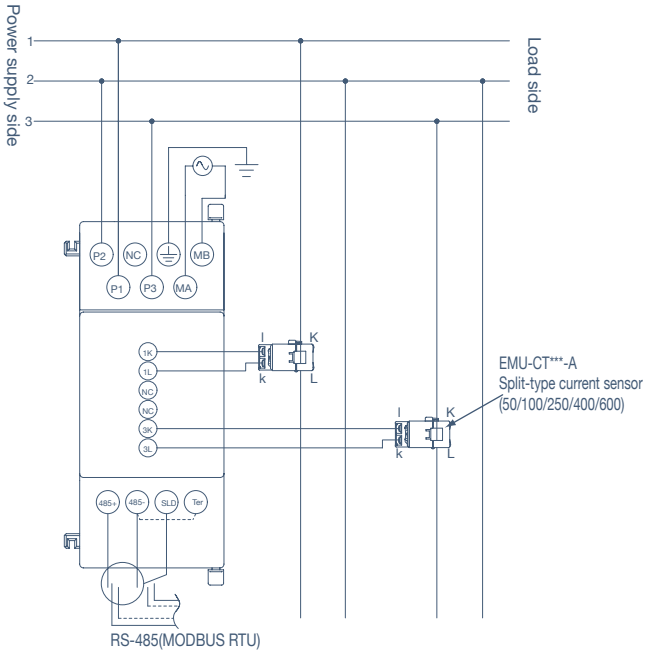
Single-phase 2-wire (in the case of low-voltage circuit) 2 Circuit Measuring Function

With this instrument, when phase line type is 1P2W, 2 circuits measurement can be performed by setting.
This function measures 1P2W between 1-N branched from 1P3W and 1P2W between 3-N.
Connect current sensors to 1 side (1 K, 1 L) and 3 side (3 K, 3 L) and measure 2 circuits. When two circuit measurement is set, only the same primary current can be set on 1 side and 3 side.



Single-phase 2-wire (in the case of low-voltage circuit)

■UL noncompliant case

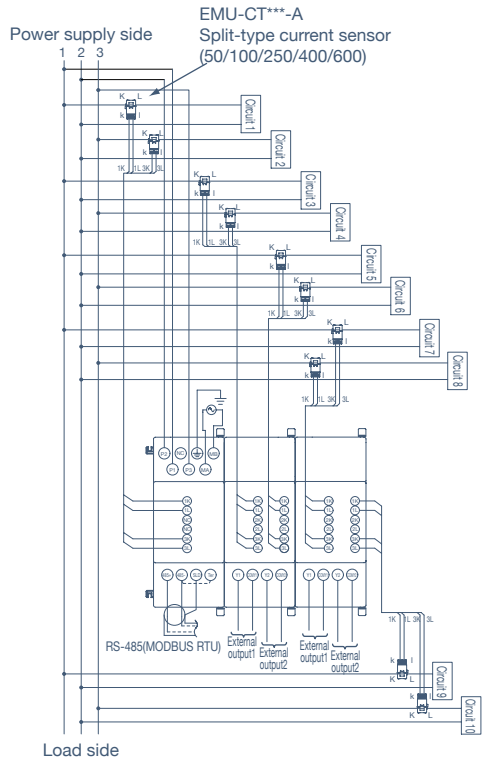


Name	Model	Quantity
Energy Measuring Unit	EMU-BM1-MB	1
Split-type current sensor	EMU-CT***-A (50/100/250/400/600)	2

* EMU-CT *** -A (400/600) conforms to UL standard

Single-phase 2-wire (in the case of low-voltage circuit)

■UL noncompliant case

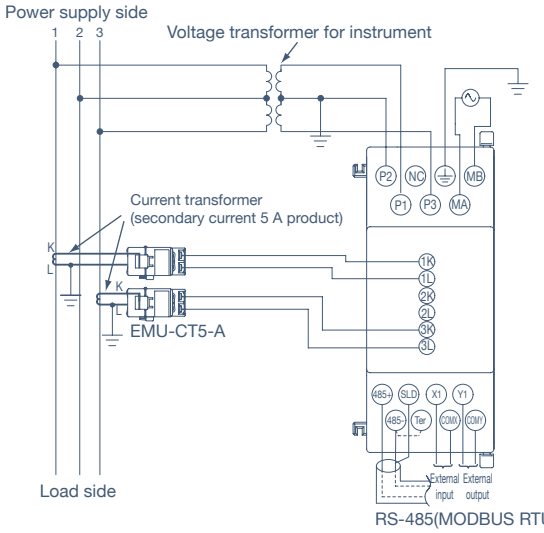


Name	Model	Quantity
Energy Measuring Unit	EMU-BM1-MB	1
Energy Measuring Unit (Extension Unit for Same Voltage System)	EMU4-A2	2
Split-type current sensor	EMU-CT***-A (50/100/250/400/600)	10

* EMU-CT *** -A (400/600) conforms to UL standard

Single-phase 3-wire/3-phase 3-wire (in the case of high-voltage circuit)

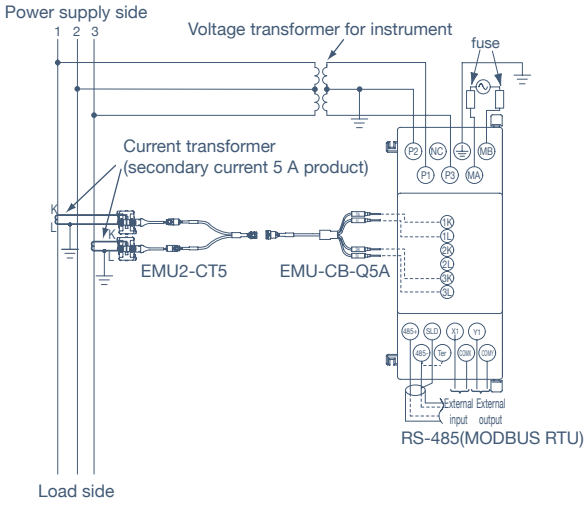
■UL noncompliant case



Name	Model	Quantity
Energy Measuring Unit	EMU4-HM1-MB	1
Split-type current sensor	EMU-CT5-A	2

Single-phase 3-wire/3-phase 3-wire (in the case of high-voltage circuit)

■In case of UL conformity

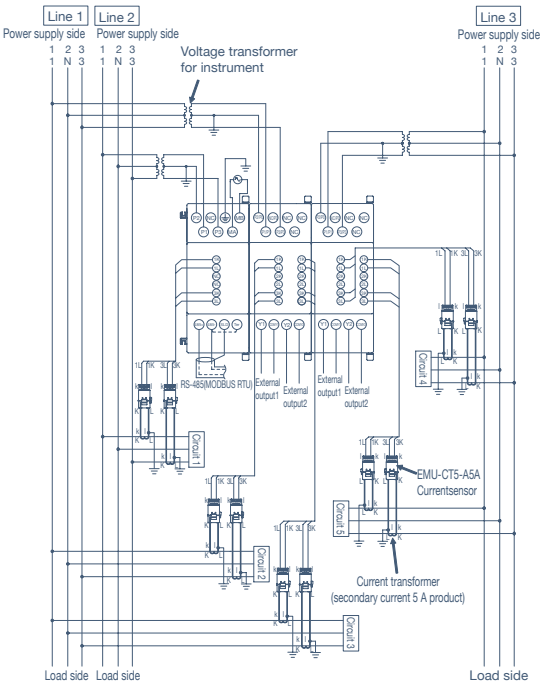


Name	Model	Quantity
Energy Measuring Unit	EMU4-HM1-MB	1
Split-type current sensor	EMU2-CT5	1
Split-type 5 A current sensor cable	EMU2-CB-Q5A	1

* Fuse is necessary when conforming to UL.

Single-phase 3-wire/3-phase 3-wire (in the case of high-voltage circuit)

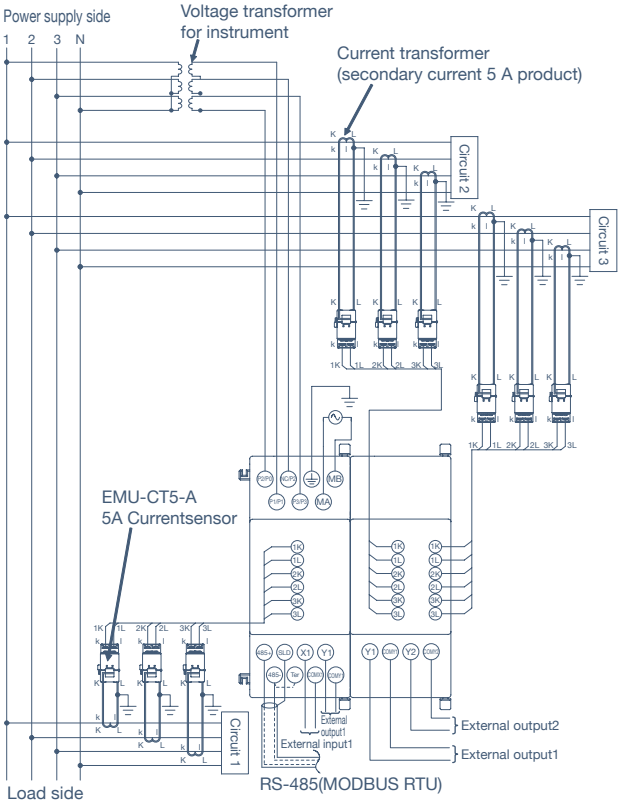
■UL noncompliant case



Name	Model	Quantity
EcoMonitorPlus (Standard Model)	EMU4-BM1-MB	1
EcoMonitorPlus (Increased product of different voltage system)	EMU4-VA2	2
5A Currentsensor	EMU-CT5-A	10

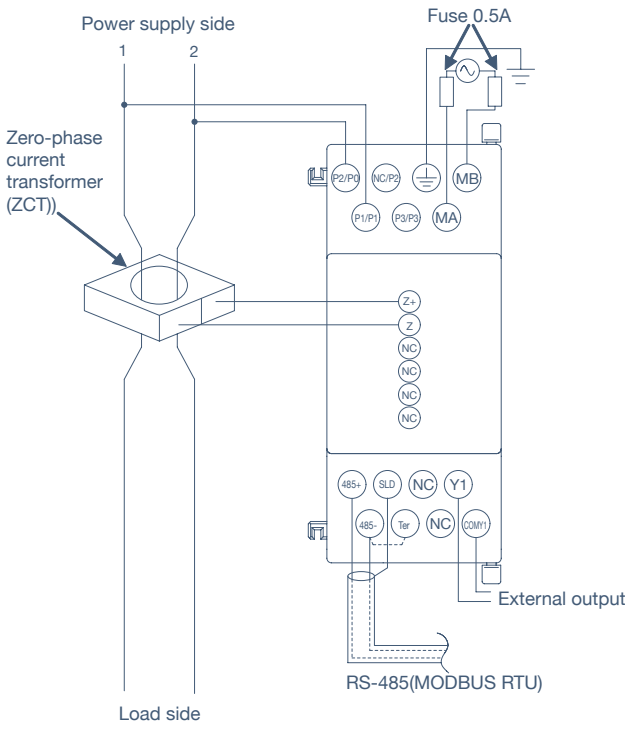
3-phase 4-wire (When instrument transformer is used)

■UL noncompliant case

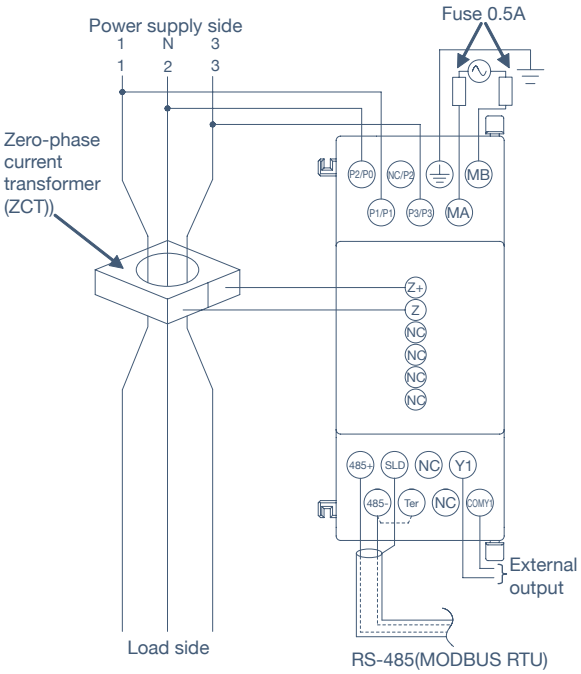


Name	Model	Quantity
EcoMonitorPlus (High Performance Model)	EMU4-HM1-MB	1
EcoMonitorPlus (Extension Unit for Same Voltage System)	EMU4-A2	1
5A Currentsensor	EMU-CT5-A	9

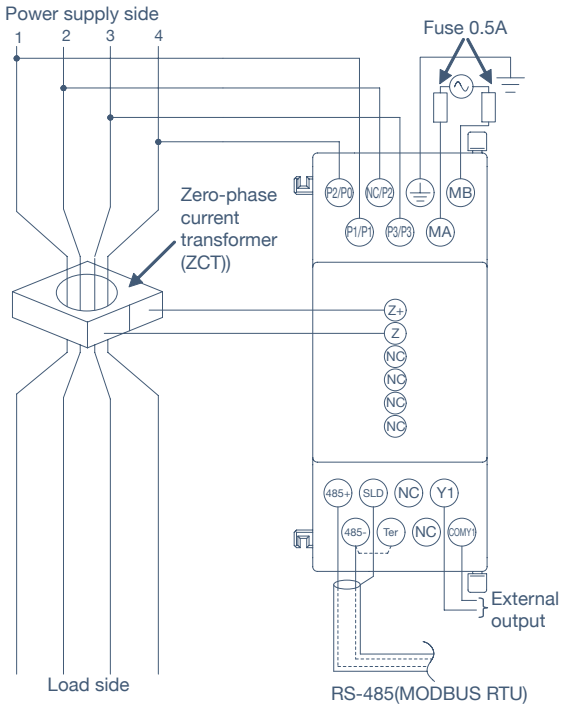
Single-phase 2-wire (in the case of high-voltage circuit)



Single-phase 3-wire/3-phase 3-wire (in the case of low-voltage circuit)

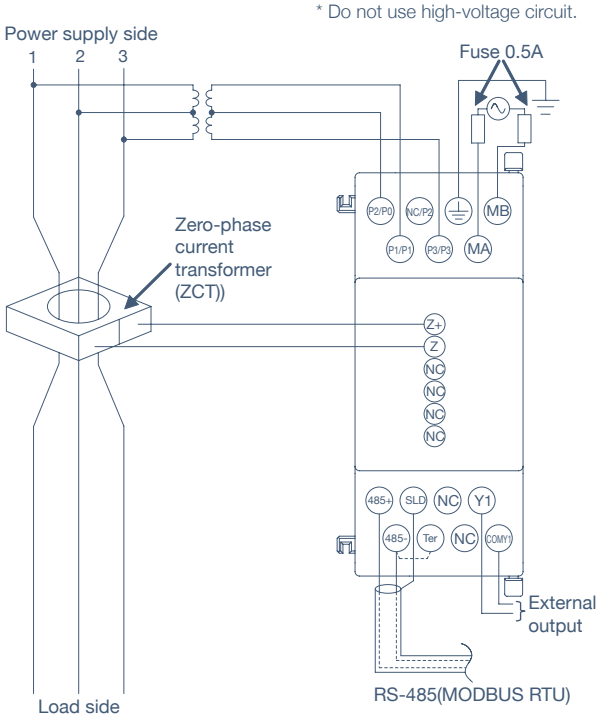


3-phase 4-wire (in the case of low-voltage circuit)



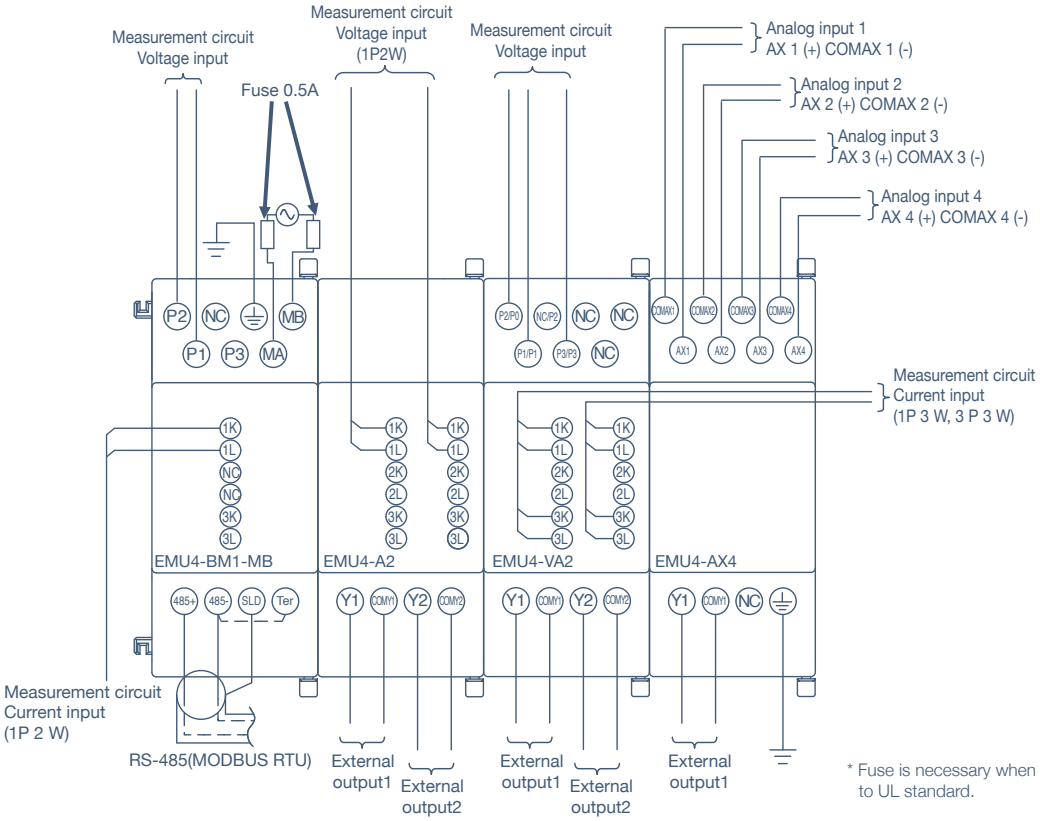
3-phase 4-wire (When instrument transformer is used)

* Do not use high-voltage circuit.



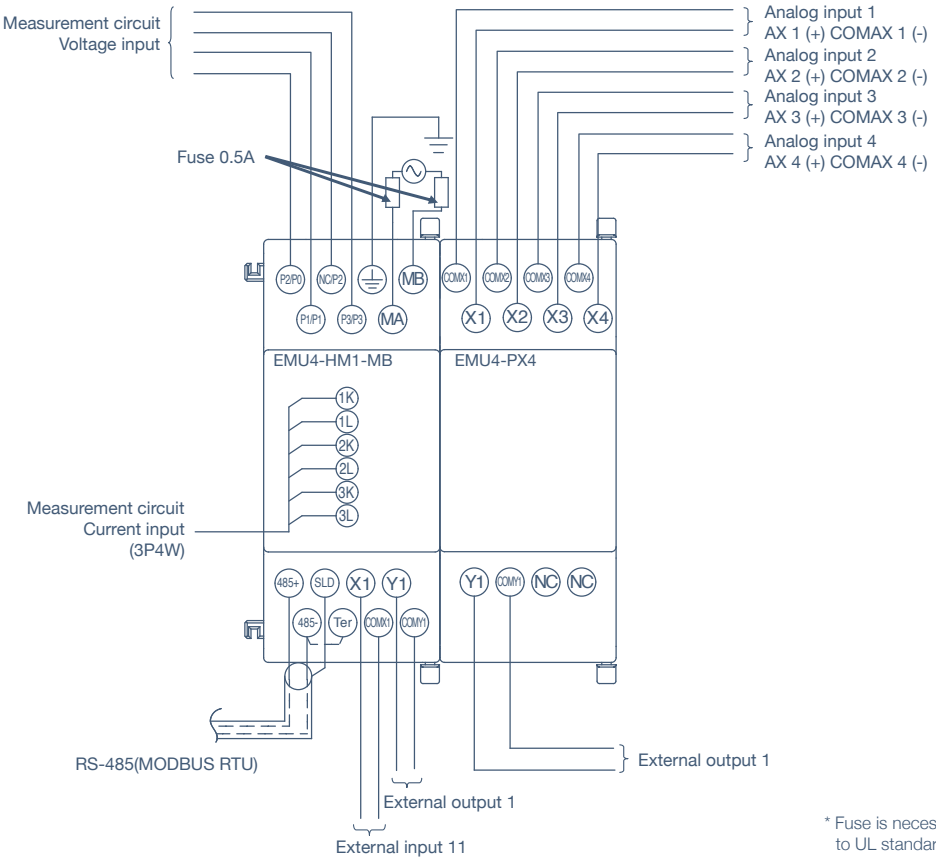
*:Our zero-phase current transformer (CZ, ZT series) is dedicated to low voltage circuit.
*: Our polarity (directionality) is not available for Zero phase current transformer (CZ, ZT series).
*: Fuse is necessary when conforming to UL standard.
*: ZT60B, ZT80B, ZT100B conform to UL standard.

Analog input unit (EMU4-AX4) :When one display unit is connected to one energy measurement unit (When combined with the basic unit (EMU4-BM1-MB), expansion unit (EMU4-A2, EMU4-VA2))



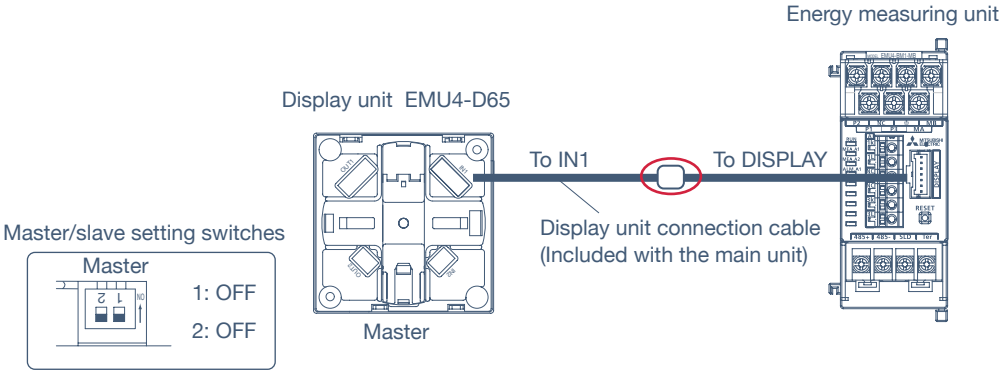
* Fuse is necessary when conforming to UL standard.

Pulse input unit (EMU4 to PX4): (When combined with basic unit (EMU4-HM1-MB))



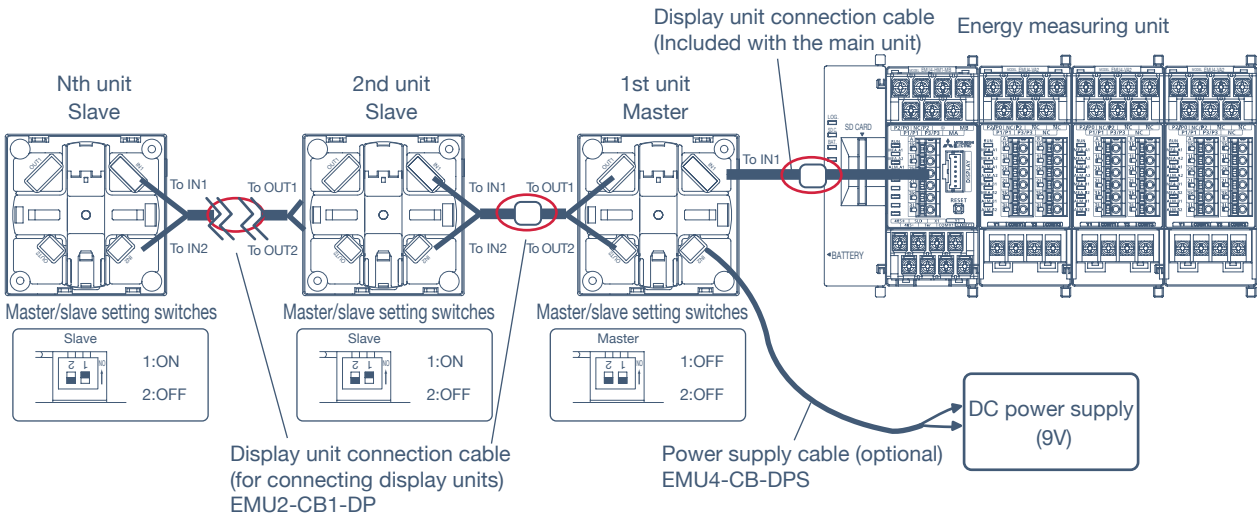
* Fuse is necessary when conforming to UL standard.

Connecting 1 display unit to 1 energy measuring unit



- When connecting a single display unit to a single energy measuring unit, be sure to set the switches on the bottom of the main unit to "Master". (The unit will not operate if these switches are not set correctly.) These switches are set to "Master" when the unit is shipped from the factory.
- If a display unit will be disconnected and then reconnected to a different energy measuring unit, be sure to turn the power to the energy measuring unit off before disconnecting the display unit.

Connecting 2 or more (up to 7) display units to 1 energy measuring unit

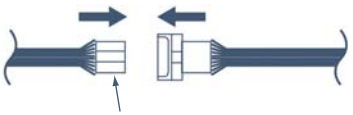


- When connecting 2 or more units, power must be supplied by a 9V DC power supply. (Connectable products: Cosel made PBA15F-9) A power supply cable (EMU4-CB-DPS) will also be required.
- A maximum of 7 display units can be connected.
- If a display unit will be disconnected and then reconnected to a different energy measuring unit, be sure to turn the power to the energy measuring unit off before disconnecting the display unit.
- When connecting multiple display units to a single energy measuring unit, be sure to set the switches on the bottom of one of the display units to "Master" and the switches for the other display units to "Slave". (The units will not operate if these switches are not set correctly.) These switches are set to "Master" when the units are shipped from the factory.

Extending the length of connection cables

Extension cables can be inserted in the areas marked with red circles in the diagram above, to extend connections by up to 10m.

(1) Disconnect the joint connectors on the cables.



Press the locking tab in while pulling the connectors.

(2) Insert an extension cable, and then connect the connectors at both ends.

Insert the connectors securely until you hear a clicking sound.

- Use the standard extension cable models (EMU2-CB-T1M, EMU2-CB-T5M, EMU2-CB-T10M).
- Use any combination of extension cables up to a total extension length of 10m.

Precautions for Operating Environment and Conditions for Use

●This unit is premised on being used in a pollution degree 2*1 environment. Protect this unit from pollution on the side where another device is to be assembled when using in an environment with a different pollution degree.

●The measurement category of the measuring circuit in this unit is CAT Ⅱ*1 and the energization voltage category of the auxiliary power circuit (MA and MB) is also CAT Ⅱ.

●Do not use this product in the types of locations listed below. Use in such locations can result in malfunctions and decreased product life.

- The ambient temperature exceeds the operating range temperature (-5 to +55 °C).
- The relative humidity exceeds the operating range (30-85% RH) or the place where condensation occurs.
- There are large amounts of dust, corrosive gas, saline or oily smoke.
- Exposed to rain or water drops.
- Metal fragments or conductive substance are scattered.
- The average daily temperature exceeds 35 °C.
- There is excessive vibration or impacts.
- Exposed to direct sunlight.
- There is a strong electromagnetic field or there are large amounts of external noise.
- The altitude exceeds 2,000 m.

⚠ CAUTION

<Protection against Electric Shock>

●This unit is an open type device, meaning that it is designed to be housed within another device in order to prevent electric shock. Be sure to always house this unit within another device such as a grounded control panel before use.

●It is necessary to implement either of the following measures for the control panel in order to protect persons lacking sufficient knowledge about electrical equipment from electric shock.

- Lock the panel so that only those who have been trained and have sufficient knowledge about electrical equipment can unlock the control panel, or structure the control panel so that the power supply is automatically turned off when the panel is opened.
- Cover the sections of this module having dangerous voltage. (Required protection code is IP2X or higher.)

*1: Refer to EN61010-1/2010 for the definition of pollution degrees and measurement categories.

Precautions for Pre-operation Preparation

●Be sure that the installation location complies with operating environment and use conditions.

●Be sure to specify the phase wire system, and primary voltage and current for each sensor type before operation.

Precautions for Installation and Connection

Be sure to always read the operation manual before installation and connection.

⚠ CAUTION

＜Electrical Work Precautions＞

●All installation and connection work must be performed correctly by technicians having specialized knowledge in matters such as electrical construction and wiring.

●Perform all installation and wiring work with the power turned off (no parts are energized) and do not perform live-wire work. Failure to do so can result in electric shock, and equipment malfunction or fire.

●Be very careful when creating screw holes or performing wiring so that no foreign material such as chips or cut wire ends get into the unit.

●Thoroughly check the connection diagram when wiring. Improper wiring can result in unit malfunction, or fire or electric shock.

●Do not place transmission or input/output signal wires **close to or bound together with power or high-voltage lines** in order to prevent noise interference.

●Always be sure to place wires to be connected to this module in a duct or clamp wires together to secure them. Failure to secure wires can result in electric wires moving due to looseness or unexpected stretching that causes module breakage or malfunction due to poor wire connections.

●If installing transmission or input/output signal wires next to power and high-voltage lines, maintain the separation distance shown in below table.

Item	Distance
Power lines of 600 V or less	300 mm or more
Other power lines	600 mm or more

＜Types of Terminal Blocks＞

●Strip wires to the proper length. Excessively long stripping length can result in a short circuit with neighboring wires. Excessively short stripping length can result in poor wiring connections and contact failure.

●Be careful not to cause a short circuit with a nearby pole due to the filament of a core wire. (Do not plate core wires with solder.)

●Do not connect three or more signal wires to one terminal of a terminal block. Doing so can result in weak clamping and wire disconnection.

●Use appropriate sizes of electric wires. Use of an inappropriate size can result in fire due to heat generation.

●Use overcurrent prevention devices (such as a fuse or circuit breaker) for circuits with wires connected to an auxiliary power circuit (MA or MB) in order to prevent short circuiting of connected power wires. (Select an appropriate rating in order to prevent fusing of wires.)

●Tighten screws to the specified torque. Excessive tightening can damage the screw and terminal.

●After tightening the screws, be sure to check that you have not forgotten to tighten a screw. A loose screw can result in module malfunction, fire or electric shock.

●Be sure to attach the terminal cover in order to prevent electric shock.

●Do not directly touch any energized part or terminals of the module. Doing so can result in electric shock, or module failure or malfunction.

●Do not pull wiring parts by hand when removing wires connected to this unit. Pulling on wires still connected to this unit can result in module or wiring damage.

＜Connection with Current Sensor＞

●When using this unit, be sure to use the dedicated current sensor (EMU -CT50, EMU -CT100, EMU -CT250, EMU -CT5 -A, EMU -CT50 -A, EMUCT100 -A, EMU -CT250 -A, EMU -CT 400 -A, EMU -CT 600 -A, EMU 2 -CT 5, EMU 2 -CT 5 -4 W). The secondary side (5 A) of the current transformer can not be directly input to this instrument. The input of the current sensor should not exceed the ratings of this product. Refer to the instruction manual of the current sensor to maintain the function and accuracy of this instrument.

●A dedicated current sensor (EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT50-A or EMU-CT100-A, EMU-CT250-A, EMU-CT400-A, EMU-CT600-A) is only used for low-voltage circuits. It cannot be used for a high-voltage circuit. Use EMU-CT5-A, EMU2-CT5 or CT5-4W transfixed to the secondary side (5A) of transformer. Connecting with a high-voltage circuit by mistake is extremely dangerous and can cause unit burnout or fire. Refer to “Specifications: Accessories (Split Current and 5A Current Sensors)” on P24 for maximum voltages that can be used with current sensors.

●Dedicated current sensors have a given polarity (directionality). Be careful to install in the proper polarity.

＜Connecting with Frame GND Terminal＞

●Do not exceed the range of specified voltage values when performing insulation resistance or commercial frequency withstand voltage tests. Do not connect the frame GND terminal to ground when performing such tests.

●Ground the frame GND terminal according to actual conditions of use. Use a D-type ground connection (ground resistance is 100 Ω or less).

●Use a crimp-type terminal appropriate for the size of electric wires. Use of an inappropriate crimp-type terminal can result in wire breakage or contact failure that causes module malfunction, failure, burnout or fire.

Precautions Regarding Use

●This unit cannot be used for transactions or proof of power use as stipulated by the Measurement Act.

●Before operating this module, thoroughly check that there are no energized bare wires or similar hazards nearby. If there are any exposed conductors or similar hazards, stop operation immediately and implement appropriate measures such as insulation protection.

●A power outage while specify settings will result in such settings not being properly set. Specify the settings again after power has been restored.

⚠ DANGER
●Do not touch live part. Doing so can result in electric shock, electric burn injury and equipment damage. ●Do not perform installation or wiring with equipment energized and do not perform live wire work.

⚠ CAUTION
●Do not touch charged parts. Doing so can result in electric shock, electric burn injury and equipment damage ●Use within the rating ranges indicated in this manual. Using outside of the rating ranges can not only result in misoperation or equipment malfunction but can also cause fire or burnout. .

Precautions for Maintenance and Inspection

●Wipe off surfaces using a soft cloth. Do not allow any type of chemical cloth to remain touching the unit for an extended period, and do not use benzene, thinner or similar chemicals for cleaning.

●Check for the following items in order to ensure proper operation and long product life of this unit.

(1)Daily Inspection

①No damage to the unit

②LED and LCD screens are operating properly.

③There are no abnormal noises, odor, heat generationor similar problems.

(2)Periodic Inspection

Inspect the following items from every six months to one year.

・There is no looseness in installation or wiring connections of terminals.

⚠ CAUTION	Always be sure to perform periodic inspection with all power turned off. Failure to do so can result in electric shock, equipment malfunction or fire. Periodically tighten terminals. Failure to do so can result in fire.

Precautions for Storage

●Before storage, turn off the power, remove wires, and place the unit in a plastic bag.

●Do not store the module in the types of locations described below when storing for an extended period. Storing in such places can result in malfunction and reduced service life.

・The ambient temperature exceeds the storage range temperature (-10 to +60 °C).
・The average daily temperature exceeds 35 °C.
・There is excessive vibration or impacts.
・Metal fragments or conductive substance are scattered.
・The relative humidity exceeds the humidity range (30-85% RH).
・There are large amounts of dust, corrosive gas, saline or oily smoke.
・Exposed to rain, water drops or direct sunlight.

About disposal of the battery

●When the lithium battery is built in, please process the lithium battery in accordance with the rule of cities, towns and villages.

⚠ CAUTION	The removed lithium battery has a possibility that electric power capacity remains. Since there is a possibility of contacting other metal, and generating heat, exploding and igniting, please manage individually.

Precautions for Disposal

●Properly dispose of this unit in accordance with the Waste Disposal and Public Cleansing Act.

About Packaging Materials and Operation Manual

●Packaging materials are made of cardboard and the operation manual is printed on recycled paper in order to reduce the load on the environment.

Repairing at Time of Malfunction/Error

●If a product listed in this catalog malfunctions, read the troubleshooting section of the operations manual (detailed version) and confim the symptoms. if the problem is not listed, please contact the dealer you purchased this product.

*: Refer to the operation manual (Detailed Version) for details.

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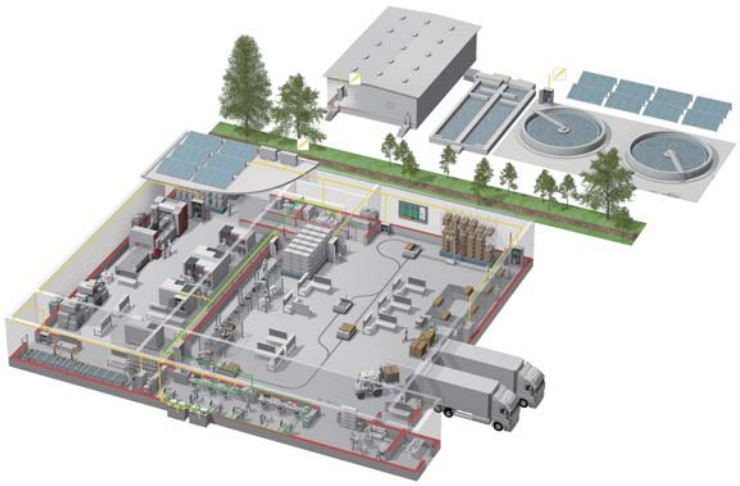

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* All products are not available in all countries.

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