

Changes for the Better

Programmable Controllers  
MELSEC-Q Series  
Energy Measuring Module

By directly slotting-in to the PLC,  
measurement of a variety of  
energy information is simple!!

# MELSEC series QE81WH



**e&ecoF@ctory**

Making both productivity improvements and cost reductions compatible through visualization of energy information.

for a greener tomorrow

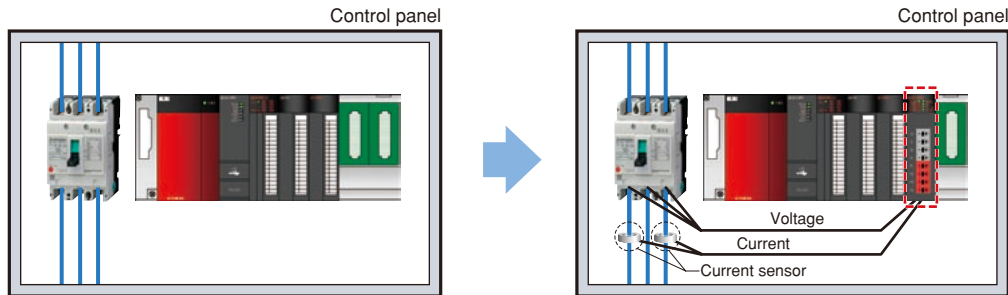


# Features of industry's first\* PLC slot mounted type Energy Measuring Module

\*As of September 2010

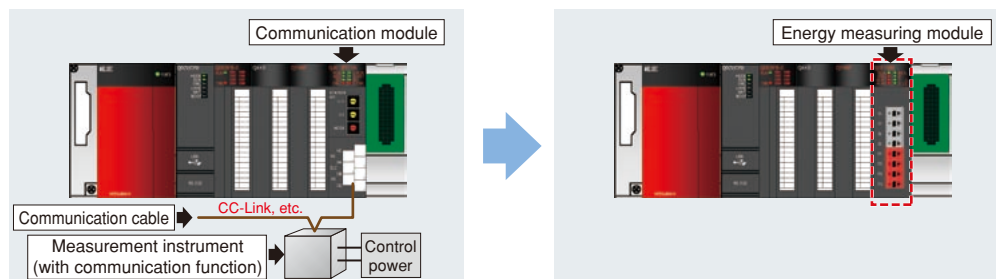
## Feature 1 Achieves addition of measuring instrument without any additional space

By mounting the energy measuring module onto the open slot of the base unit, measuring instrument can be added without changing the layout in the control panel.



## Feature 2 Achieves wire savings and engineering workload reductions

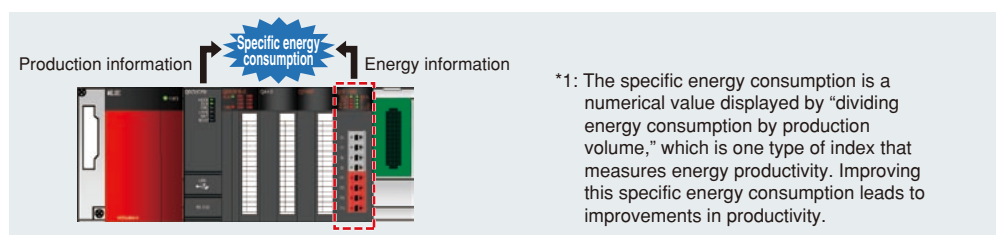
With a communication unit, communication cable and creation of a communication program are no longer needed, cost reductions can be realized by wire savings and engineering workload reductions.



## Feature 3 Allows for detailed power measurement at high speed (250ms)

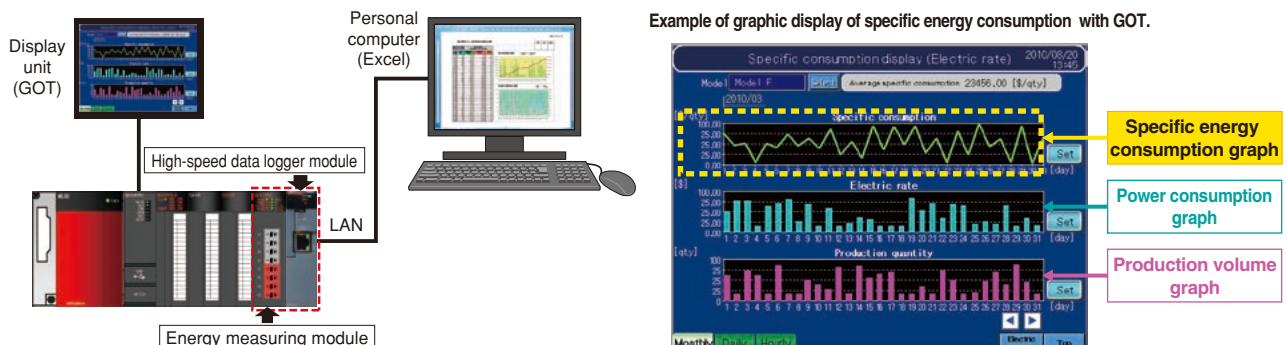
Allows for easy specific energy consumption<sup>\*1</sup> management by matching the "production information" of the CPU unit with the "energy information" of the energy measuring module.

Since measured data is automatically collected in a buffer memory at 250ms, detailed specific energy consumption management is also available.



## Feature 4 Allows for easy construction of a "visualization" system

Allows for easy graphic display of specific energy consumption with a graphic operation terminal (GOT) installed on the control panel at the manufacturing site.<sup>\*2</sup> Combination with the "high-speed data logger module (QD81DL96)" allows specific energy consumption analysis to be easily performed with a PC.<sup>\*2</sup>



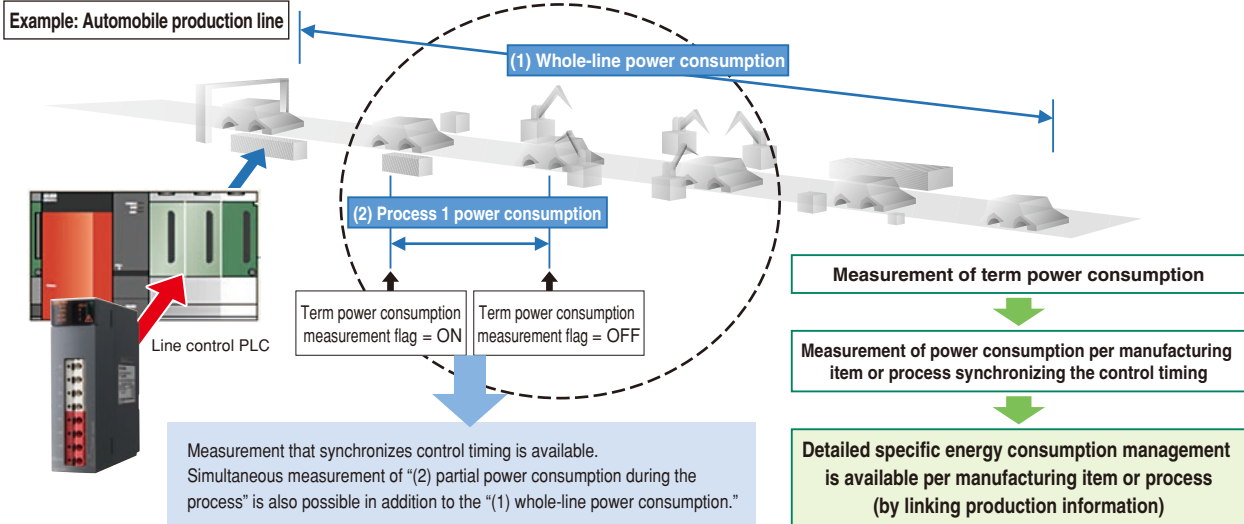
\*2: Any of the sample screen data to display the specific energy consumption, power consumption, production volume, etc., with a GOT and sample files for the high-speed data logger module to perform specific energy consumption management and analysis with a PC can be downloaded free from H@ISEIweb at [www.mitsubishielectric.co.jp/haisei/lvs/](http://www.mitsubishielectric.co.jp/haisei/lvs/)

# Installation Examples of the Energy Measuring Module

## Solution example 1

## Energy Savings

Detailed specific energy consumption management is available per manufacturing item or process. Performing a detailed specific energy consumption management leads to reductions in energy consumption of the equipment, and this can promote energy savings.



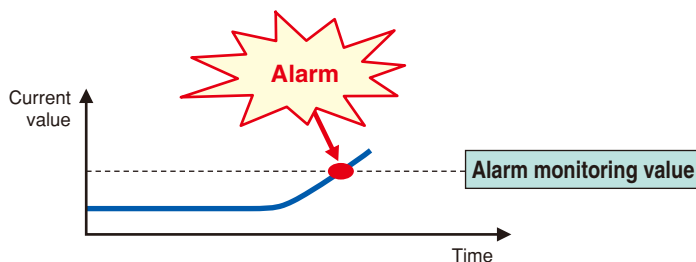
In addition, using the term power consumption measurement function allows you to grasp energy consumption during production time and non-production time. Even during non-production time, energy savings can be promoted by grasping wasteful standby power consumption.

## Solution example 2

## Preventive Maintenance

Continuously measuring power (or current) consumption can prevent catastrophic failures. This can ultimately reduce production loss due to equipment stoppage.

Example: The equipment is refilled with lubricant or the grinding machine (cutter) blade is replaced by detecting an increase in power (or current) consumption.



Setting of upper and lower limit alarm monitoring (Monitoring of equipment failures)

Alarm

Equipment maintenance and repair (Example: Refilling of lubricant, cutter blade replacement)

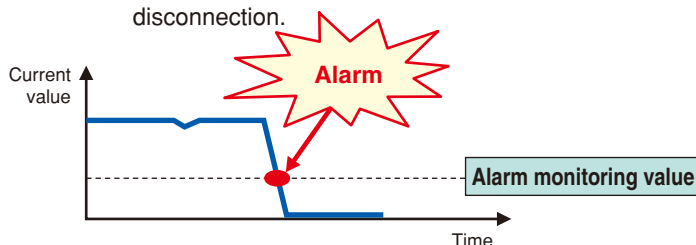
Measures available before equipment stoppage (preventive maintenance)  
Production loss reductions due to production equipment stoppage

## Solution example 3

## Quality Control

Product control is realized in case of a failure by detecting the voltage or current failure of manufacturing equipment.

Example: Detection of defective products by detecting heater disconnection.



Monitoring of upper and lower limit alarms (voltage, current or frequency)

Alarm

Lot rejection of products in case of defective equipment power quality

Prevention of shipment of defective products

## Applicable System

### (1) Applicable CPU units and the number of QE81WH units

The CPU units on which QE81WH can be installed and the number of installable QE81WH units are shown below. The power source capacity may run short depending on combinations with other units installed or the number of installed measurement units. Make sure to consider the power source capacity when installing the units. If the power source capacity runs short, consider the combination of the units to be installed.

#### (a) When installing on a CPU unit

CPU types	Compatible CPU units					Installable quantity
	CPU model name					
Basic model QCPU	Q00JCPU					16
	Q00CPU Q01CPU					24
High-performance model QCPU	Q02CPU	Q02HCPU	Q06HCPU	Q12HCPU	Q25HCPU	64
Process CPU	Q02PHCPU	Q06PHCPU	Q12PHCPU	Q25PHCPU		64
Redundant CPU	Q12PRHCPU	Q25PRHCPU				53
Universal model QCPU	Q00UJCPU					16
	Q00UCPU Q01UCPU					24
	Q02UCPU					36
	Q03UDCPU	Q04UDHCPU	Q06UDHCPU	Q10UDHCPU	Q13UDHCPU	64
	Q20UDHCPU	Q26UDHCPU	Q03UDECPU	Q04UDEHCPU	Q06UDEHCPU	
Q10UDEHCPU	Q13UDEHCPU	Q20UDEHCPU	Q26UDEHCPU			

#### (b) When installing on a MELSECNET/H remote I/O station

Compatible network units			Installable quantity <sup>1)</sup>
QJ72LP25-25	QJ72LP25G	QJ72BR15	64

<sup>1)</sup> Limited to be within the number of I/O points on the network units.

### (2) Base unit on which QE81WH can be installed

QE81WH can be installed in any I/O slot (\*2) of the basic base unit or an extension base unit.

\*2: In the case of a redundant CPU, QE81WH can be installed only on an extension base unit. It cannot be installed on the basic base unit. The number of installable QE81WH units is limited to be within the number of I/O points on the CPU unit.

### (3) Applicable software packages

Software packages compatible with QE81WH are shown below.

Product name	Model	Remarks
GX Developer	SWnD5C-GPPW-E	MELSEC PLC programming software. The "n" in the model name is "4" or higher.

## General Specifications & Measured Items

### (1) General specifications

Item		Specification
Phase wire system		Single-phase 2-wire, single-phase 3-wire, 3-phase 3-wire
Instrument rating	Voltage circuit	Single-phase 2-wire, 3-phase 3-wire
		Single-phase 3-wire
	Current circuit	110VAC, 220VAC common use
		110VAC (between wires 1-2, between wires 2-3), 220VAC (between wires 1-3)
Frequency	AC50A, 100A, 250A, 400A, 600A (Dedicated split-type current sensor is used. In all cases, the current sensor's primary current is indicated.) AC5A (Dedicated split-type current sensor is used. The 5A current sensor is used in combination with a current transformer (CT) in a two-step configuration. In this case, the maximum primary current setting is 6000A.)	
Tolerance	Main unit (see table (3) below for the current sensor tolerance)	Current, demand current <sup>1)</sup> : ±1.0% (relative to 100% rating)
		Voltage: ±1.0% (relative to 100% rating)
		Power, demand power <sup>1)</sup> : ±1.0% (relative to 100% rating)
		Frequency: ±1.0% (45 to 65Hz range)
Number of measurement circuits		1 circuit
Data refresh period		250ms (fixed) Note: Constant cumulative count of power level and reactive power level (also includes short-cycle load changes)
Response time		2sec or less
Power outage compensation		Backup to non-volatile memory (Saved items: Setting values, max./min. values and their occurrence times, power level (regenerative, consumption), reactive power level, period power level)
Number of occupied I/O points		16 points (I/O assignment: intelligent 16 points)

<sup>1)</sup> "Demand" is the moving average over the specified time period.

### (2) Measuring items

	Measured items	
	Details	
Current	Single-phase current, 2-phase current <sup>2)</sup> , 3-phase current <sup>2)</sup> , total current	
Current demand <sup>1)</sup>	Single-phase demand current, 2-phase demand current <sup>2)</sup> , 3-phase demand current <sup>2)</sup> , max. demand current	
	Min. demand current, max. demand current occurrence date/time, min. demand current occurrence date/time	
Voltage	Voltage between wires 1-2, voltage between wires 2-3 <sup>2)</sup> , voltage between wires 3-1 <sup>2)</sup> , total voltage	
	Max. voltage, min. voltage, max. voltage occurrence date/time, min. voltage occurrence date/time	
Power	Power	
Demand power <sup>1)</sup>	Demand power, max. demand power, min. demand power	
	Max. demand power occurrence date/time, min. demand power occurrence date/time	
Power factor	Power factor, max. power factor, min. power factor, max. power factor occurrence date/time, min. power factor occurrence date/time	
Frequency	Frequency	
Electric energy	Electric energy (consumption), electric energy (regenerative)	
Reactive energy	Reactive energy (consumption lagging)	
Term electric energy	Term electric energy 1, term electric energy 2	

<sup>1)</sup> Indicates the moving average over the specified time period.

<sup>2)</sup> When the phase wire system is set to single-phase 2-wire, these parameters are not measured.

### (3) Current sensor specifications

Model name	Split-type current sensor					5A current sensor
	EMU-CT50	EMU-CT100	EMU-CT250	EMU-CT400	EMU-CT600	EMU2-CT5
Rated primary current	50A	100A	250A	400A	600A	5A
Rated secondary current	16.66mA	33.33mA	66.66mA			1.66mA
Rated load	0.1VA					
Ratio error	±1% (5-100% of rating)					
Mass	0.1kg		0.7kg		0.1kg	

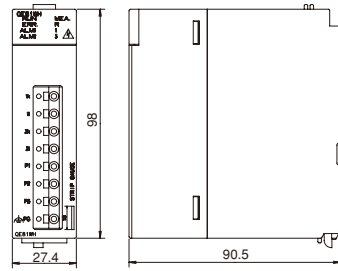


## Sensors, Cables / Dimensions

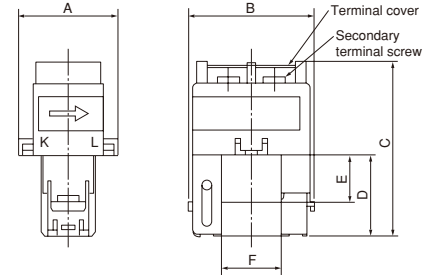
Units: mm

Item name	Model	Outer dimensions dwg.
MELSEC-Q Series energy measuring module	QE81WH	①
Split-type current sensor	EMU-CT50	②
	EMU-CT100	
	EMU-CT250	③
	EMU-CT400	
5A current sensor	EMU2-CT5	④
QE Series dedicated 5A current sensor cable	EMU2-CB-Q5A	⑤
	EMU2-CB-T1M	
Current sensor extension cable (standard)	EMU2-CB-T5M	⑥
	EMU2-CB-T10M	
	EMU2-CB-T1MS	
Current sensor extension cable (separate)	EMU2-CB-T5MS	⑦
	EMU2-CB-T10MS	
	EMU2-CB-T10MS	

① QE81WH

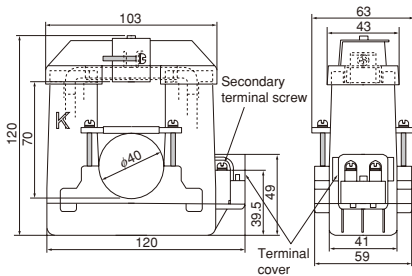


② EMU-CT50/100/250

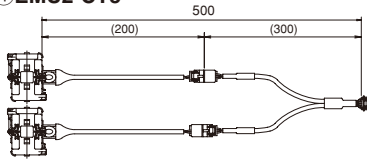


Model name	A	B	C	D	E	F
EMU-CT50/CT100	31.5	39.6	55.2	25.7	15.2	18.8
EMU-CT250	36.5	44.8	66	32.5	22	24

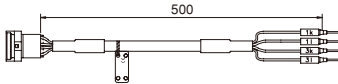
③ EMU-CT400/600



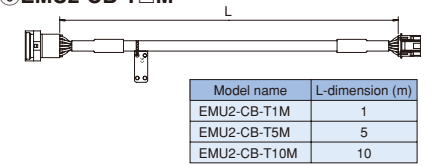
④ EMU2-CT5



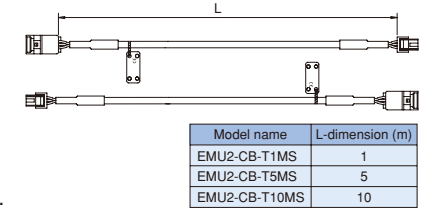
⑤ EMU2-CB-Q5A



⑥ EMU2-CB-T□M



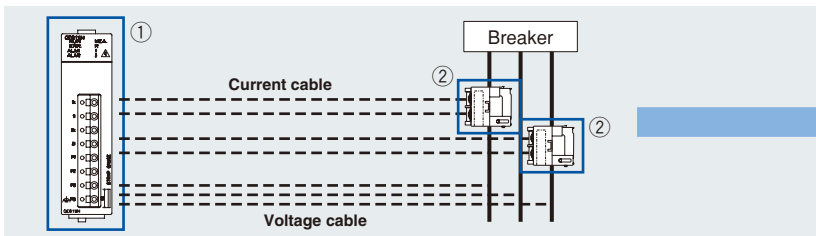
⑦ EMU2-CB-T□MS



## Combination of options

Select a current sensor to be used according to the current value of the measurement circuit. The following are the schematic diagrams. For official connection diagrams, refer to page 6.

1. For measurement circuit current of 50A to 600A ▶ Current input is available from our split-type current sensor.



### Equipment configuration example

(in the case of the single-phase 3-wire or 3-phase 3-wire with a measurement circuit current of 100A)

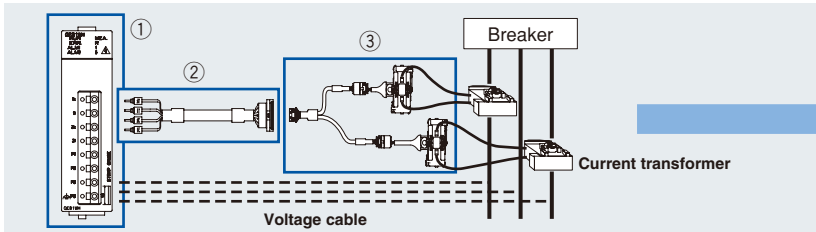
Item name	Model name	Qty.
① MELSEC-Q Series energy measuring module	QE81WH	1
② Split-type current sensor	EMU-CT100	2

Note 1: Current and voltage cables are supplied by the customer.  
Note 2: Lay cables with a maximum distance of 50m between QE81WH and the current sensor.

2. For measurement circuit current of over 600A, or where a current transformer (5A rating) is already installed

▶ Current input is available by using our 5A current sensor.

(1) When not using an extension cable (when the QE81WH is near the measuring point)



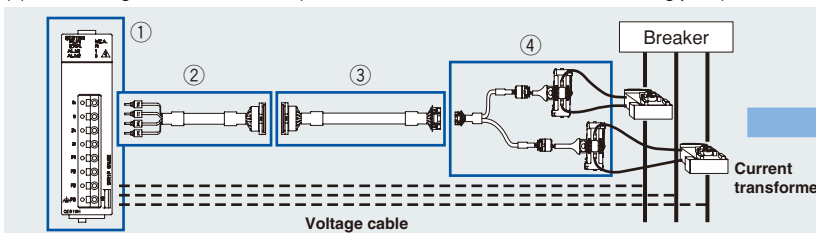
### Equipment configuration example

(in the case of single-phase 3-wire or 3-phase 3-wire)

Item name	Model name	Qty.
① MELSEC-Q Series energy measuring module	QE81WH	1
② QE Series dedicated 5A current sensor cable	EMU2-CB-Q5A	1
③ 5A current sensor	EMU2-CT5	1

Note: The voltage cable and current transformer are supplied by the customer.

(2) When using an extension cable (when the QE81WH is far from the measuring point)



### Equipment configuration example

(in the case of single-phase 3-wire or 3-phase 3-wire)

Item name	Model name	Qty.
① MELSEC-Q Series energy measuring module	QE81WH	1
② QE Series dedicated 5A current sensor cable	EMU2-CB-Q5A	1
③ Extension cable (standard type)	EMU2-CB-T1M <sup>*1</sup>	1
④ 5A current sensor	EMU2-CT5	1

\*1: This case has the cable extension distance at 1m and the standard type is used. When using the separate type, use "EMU2-CB-T1MS." For the method of extending the cable, refer to page 6.

Note: The voltage cable and current transformer are supplied by the customer.

\* For the current and voltage cables to be prepared by you, use the compatible cables shown below. For current cables, use twist pair cables.

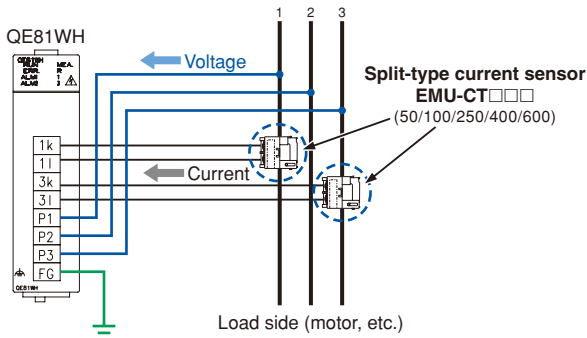
Compatible cables (usable cable)	Single cable: $\phi 1.2\text{mm}$ ( $\phi 0.5\text{mm}$ to $\phi 1.2\text{mm}$ ); Strand cable: $1.3\text{mm}^2$ ( $0.5\text{mm}^2$ to $1.3\text{mm}^2$ )
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\* When you use stranded cables, it is recommended to use solderless terminals for connection of the main body.

Recommended rod terminal:	TGV TC-1.25-11T (Nichifu brand) or equivalent
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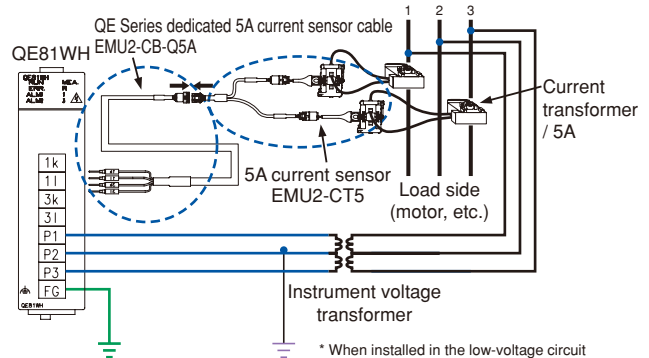
## Connection Diagrams

### For 3-phase 3-wire type



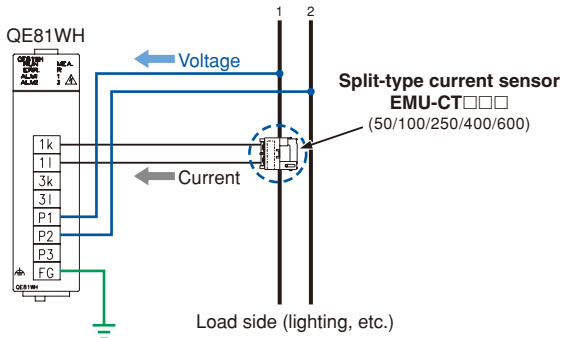
\* Cables between QE81WH and the split-type current sensor are supplied by the customer.

### For 3-phase 3-wire type (instrument voltage transformer / current transformer used together)



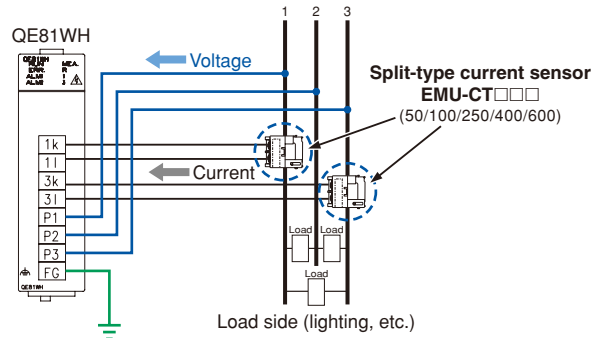
\* When installed in the low-voltage circuit (600V or less), it is not required to ground the cable on the secondary side of the instrument voltage transformer.

### For single-phase 2-wire type



\* Cables between QE81WH and the split-type current sensor are supplied by the customer.

### For single-phase 3-wire type



\* Cables between QE81WH and the split-type current sensor are supplied by the customer.

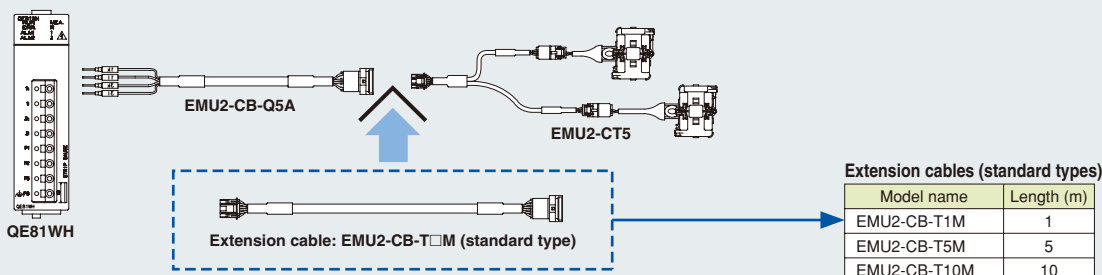
Note: In each case, make sure to establish a ground.

## Method of Extending Cables

When a current transformer is used, the 5A current sensor (EMU2-CT5) and 5A current sensor cable dedicated to the QE Series are used as a set.

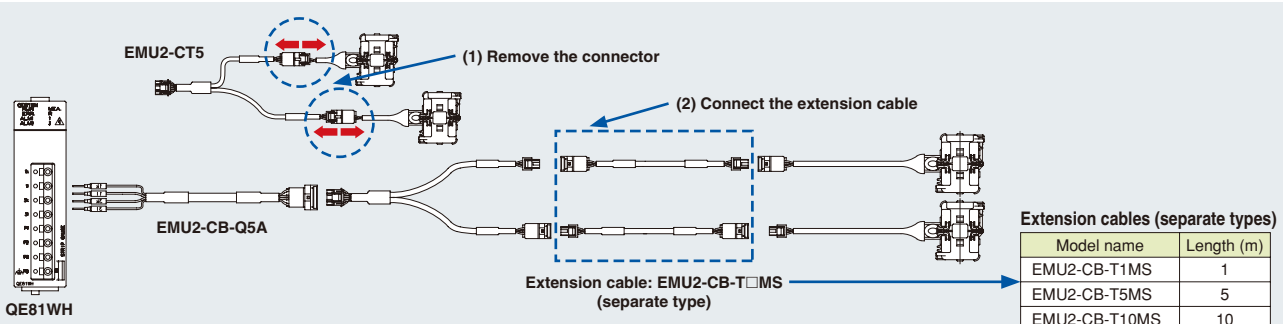
In this case, it is possible to extend the cable following the procedures shown below.

### 1. Method of connecting an extension cable between EMU2-CB-Q5A and EMU2-CT5



\* It is possible to extend up to 11m including EMU2-CB-Q5A (0.5m) and EMU2-CT5 (0.5m). (10m for a single extension cable)

### 2. Method of extending EMU2-CT5 itself



\* It is possible to extend up to 11m including EMU2-CB-Q5A (0.5m) and EMU2-CT5 (0.5m). (10m for a single extension cable)



# Mitsubishi Electric Programmable Controllers Energy Measuring Module

## Precautions before use

This publication explains the typical features and functions of the L Series programmable controllers and does not provide restrictions and other information on usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi Electric products; and to other duties.

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- To use the products given in this publication properly, always read the relevant manuals before use.
- The products have been manufactured as general-purpose parts for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

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for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



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