



# Energy Measuring Unit

Model QE81WH4W

## User's Manual (Hardware)

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

### ABOUT MANUALS

The following manuals are also related to this unit.  
Order each manual as needed, referring to the following list.

Manual name	Manual number(model code)
Energy Measuring Unit User's Manual(Details) QE81WH4W	IB63704(19H861)

### COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES

(1) For programmable controller system

To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to Chapter 9

"EMC AND LOW VOLTAGE DIRECTIVES" of the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For this unit

For the compliance of this unit with the EMC and Low Voltage Directives, refer to Section 6.1 Wiring.

### 1. Features

(1) This Energy Measuring Unit can measure various types of electric quantity just ONE unit..

This Energy Measuring Unit can measure electric energy, reactive energy, current, voltage, power, power factor, and frequency.

Both consumption and regeneration of the electric energy can be measured.

(2) Extensive monitoring functions

In addition to memorizing the maximum and minimum values, two types of alarm monitoring for upper and lower limit can be performed without a ladder.

(3) It also can measure the electric energy for a certain period.

It can measure the electric energy for the duration of time for which the output device is on.

This feature enables to acquire the electric energy needed during device operation or energy per fact.

### 2. Checking packaged contents

The following items for this device are included in the package. Check that no items are missing.

- Energy Measuring Unit x 1
- User's Manual (Hardware) x 1

### 3. Safety Precautions

#### 3.1 Precautions for Operating Environment and Conditions

Do not use this product in the places listed below. Failure to follow the instruction may cause malfunctions and a life decrease of product.

- Places the Ambient temperature exceeds the range 0 – 55°C.
- Places the Relative humidity exceeds the range 5 – 95% or places with dewfall.
- Altitude exceeds 2000 m.
- Places exposed to rain or water drop.
- Dust, corrosive gas, saline and oil smoke exist.
- Vibration and impact exceed the specifications.
- Installed excluding the control panel.

Mitsubishi  
Programmable Controller  
**MELSEC-Q**

#### 3.2 Matters concerning the preparation before use

- Use the unit in the specified usage environment and conditions.
- The setting of this unit (primary voltage, primary current) is necessary before using it.
- ※Please refer to "User's Manual (Details)" about each setting method.

#### 3.3 Installation and Wiring Precautions

**⚠ Danger** • Shut off the external power supply for the unit in all phases before installing or wiring. Failure to do so may cause an electric shock or damage of the unit.

• Any person who is involved in the installation and the wiring of this Sequencer should be fully competent to do the work.

• Use the programmable controller in an environment that meets the general specifications in the User's Manual for the CPU module used. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.

• To mount the unit, while pressing the unit-mounting lever located in the lower part of the unit, fully insert the unit fixing projection(s) into the hole(s) in the base unit and press the unit until it snaps into place. Incorrect mounting may cause malfunction, failure or drop of the unit.

When using the Sequencer in an environment of frequent vibrations, fix the unit with a screw.

• Tighten the screw within the specified torque range. Under tightening can cause drop of the screw, short circuit or malfunction. Over tightening can damage the screw and/or unit, resulting in drop, short circuit, or malfunction.

• Shut off the external power supply for the system in all phases before mounting or removing the unit.

Failure to do so may result in damage to the product.

• Do not directly touch any conductive part of the unit. Doing so can cause malfunction or failure of the unit.

• FG terminal must be grounded according to the D-type ground (Type 3) dedicated for sequencer. Failure to do so may result in an electric shock or a malfunction.

• When using this product, make sure to use it in combination with current sensor (EMU-CT series or EMU2-CT5-4W). Please not to exceed the rating of this product for input of current sensor. For further details, please refer to current sensor manual to maintain the functionality and the accuracy of this product.

• The dedicated current sensor (EMU-CT50/CT100/CT250/CT400/CT600) is used only for low voltage circuit. It cannot be used with a high voltage circuit. Also, EMU2-CT5-4W should be used with the secondary side (5 A) of transformer transfixed. If it is connected with a high-voltage circuit by mistake, it may cause a burnout of the device and a fire. It is critically dangerous.

• Measurement circuit voltage cannot be input directly into the unit. Please enter the output voltage of the voltage transform unit (QE8WH4VT)

• The dedicated current sensor has a polarity (directionality). Be careful about it when installing the unit.

• Take care not entering any foreign objects such as ships and wire pieces into the unit. It may cause a fire, a failure or a malfunction.

• In order to prevent the unit from incoming foreign objects such as wire pieces during wiring work, a foreign-object preventive label is placed on the unit. While a wiring work is performed, keep the label on the unit. Before operating the system, peel off the label for heat release. If the foreign-object preventive label is not peeled and the system is in use, residual heat inside the unit may reduce the product life.

• The wires to be connected to the unit shall be placed in a duct or fixed together by clamping. If the electric wires are not placed in the duct or clamped together, loosen wires or their movement or careless stretch may cause a breakage of the unit or wire or a malfunction due to poor contact of electric wires.

• Use appropriate size of electric wires. If inappropriate size of electric wire is used, it may cause a fire due to generated heat.

• In case using stranded wire, take measures so that the filament should not vary by using a bar terminal or by processing the point twisted. Use the bar terminal appropriated for the size of electric wires. If inappropriate bar terminal is used, a wire breakage or a contact failure may occur, which may cause a device malfunction, a failure, a burnout, or a fire.

• After inserting the electric wire or a bar terminal, make sure that no missing insertion is existing. Missing insertion may cause a device malfunction, a fire, or an electric shock.

• If the wires connected to the unit are strongly pulled off, it may cause a malfunction or a breakage to the unit or the wire.

• Ensure the wiring to the unit properly, checking the rated voltage and current of the product and the terminal pin assignment. If the input voltage exceed the rated voltage or the wiring is improper, it may cause a fire or a breakage. (Tensile load: 22N or less)

• Do not exceed the specified voltage when doing an insulation resistance test and a commercial frequency withstand voltage test.

• To protect persons who do not have adequate knowledge of electric equipment from electric shocks, any of the following measures should be taken for the panel.

(a) To lock the panel so that only trained persons having adequate knowledge of electric equipment can open it.

(b) To design the structure so that the power is automatically interrupted upon opening of the panel.

The protection class of the panel should be IP2X or higher.

**⚠ Caution**

### 3.4 Precautions for Start-up and Maintenance



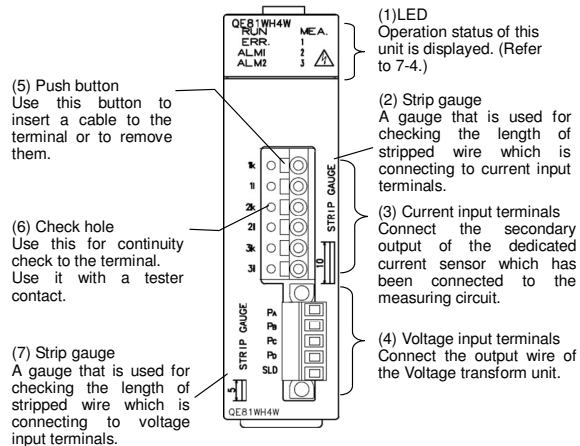
- Use the product within the ratings specified in this manual. If it is used outside the ratings, it may cause not only malfunction or failure but also fire or burnout.
  - Before operating the product, check that active bare wire, etc. does not exist around the product. If any bare wire is found, stop the operation immediately, and take an appropriate action such as isolation protection.
  - Do not disassemble or modify the unit. It may cause failure, malfunction, injury or fire.
  - Attaching and detaching the unit must be performed after the power source is shut off for all outside phases. If all phases are not shut off, it may cause electric shock, failure or malfunction of the unit.
  - Do not touch powered wires. It may cause malfunction.
  - Tighten mounting screws and cleaning unit must be performed after the power source is shut off for all outside phases. If all phases are not shut off, it may cause electric shock, failure or malfunction of the unit.
  - Use a soft dry cloth to clean off dirt of the unit surface.
  - Do not let a chemical cloth remain on the surface for an extended period of time nor wipe the surface with thinner or benzene.
  - Check for the following items to use this unit properly for long time.
- <Daily maintenance>
- (1) No damage on this unit (2) No abnormality with LED indicators (3) No abnormal noise, smell or heat.
- <Periodical maintenance (Once every 6 months to 1 year) >
- (4) No looseness with installation, wire connection to terminal blocks, and connector connection. (Check these items under the electric outage condition.)

### 3.5 Disposal Precautions

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

## 4. Name and function of each part

### 4.1 Names and functions of parts of QE81WH are provided below.



Names of signals of terminal block

Terminal symbol	Name of terminal
1k	1-phase current input terminal (power source side)
1l	1-phase current input terminal (load side)
2k	2-phase current input terminal (power source side)
2l	2-phase current input terminal (load side)
3k	3-phase current input terminal (power source side)
3l	3-phase current input terminal (load side)
PA PB PC PD	Voltage input terminals (Connect the output wire of the voltage transform unit)
SLD	shield terminal



### Supplementary

Check the stripping length using the strip gauge of QE81WH main unit.

### 4.2 Names and functions of LEDs

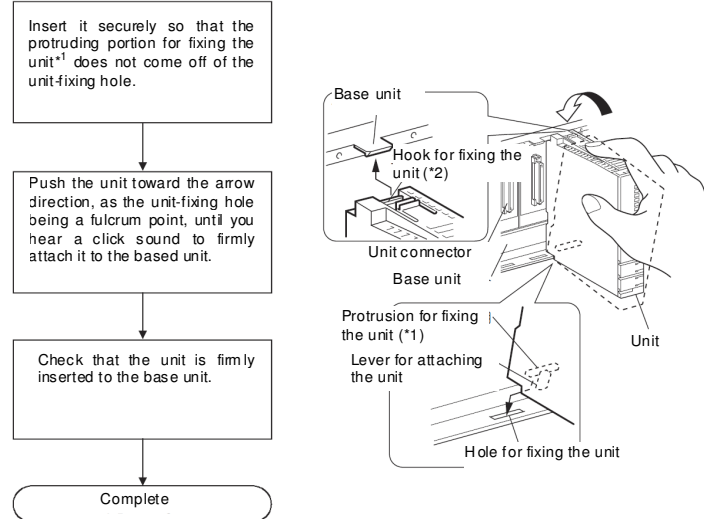
The following describes names and functions of LEDs.

Name	Color	Role	Indicator condition
RUN LED	Green	Displays the operation status of this unit.	ON: Normal operation OFF: 5V power discontinuity, watch dog timer error
ERR. LED	Red	Displays errors and conditions of this unit.	ON: Error occurring (except out-of-range error) <sup>*1</sup> Flashing: Out-of-range error <sup>*1</sup> OFF: Normal operation
ALM1 LED	Red	Displays alarm 1 occurrence status.	Flashing: Alarm 1 occurring ON: Alarm 1 occurring → Not occurring (In the case of alarm 1 reset method = self-retention) OFF: Alarm 1 not occurring
ALM2 LED	Red	Displays alarm 2 occurrence status.	Flashing: Alarm 2 occurring ON: Alarm 2 occurring → Not occurring (In the case of alarm 2 reset method = self-retention) OFF: Alarm 2 not occurring
MEA. LED	Green	Displays the status of measurement of this unit.	Flashing: Measurement existing (consumption) ON: Measurement existing (regeneration) OFF: Measurement not existing (no measurement)
1 LED	Green	Displays the status of measurement (regeneration) at side 1 of this unit.	ON: Measurement at side 1 existing (regeneration) OFF: Other than the above
2 LED	Green	Displays the status of measurement (regeneration) at side 2 of this unit.	ON: Measurement at side 2 existing (regeneration) OFF: Other than the above
3 LED	Green	Displays the status of measurement (regeneration) at side 3 of this unit.	ON: Measurement at side 3 existing (regeneration) OFF: Other than the above

※1: For details, check with the list of error codes. (Refer to section 9.1)

## 5. Attaching and removing the unit

### 5.1 How to attach to the base unit



- Attach to the base unit of MELSEC-Q series.
- When attaching the unit, make sure to insert the protruding portions for fixing the unit into the holes on the base unit. In doing so, insert it securely so that the protruding portion of the unit does not come off of the holes. Do not force to attach the unit; otherwise the unit may break.
- When installing the unit at a vibrating area with strong impact, tighten the unit to the base unit using screws.  
Fixing-Unit screw (arranged by user): M3 x 12mm  
Tightening torque of the fixing-unit screws: 0.36 – 0.48 N·m

## 6. How to wire

### 6.1 Wiring

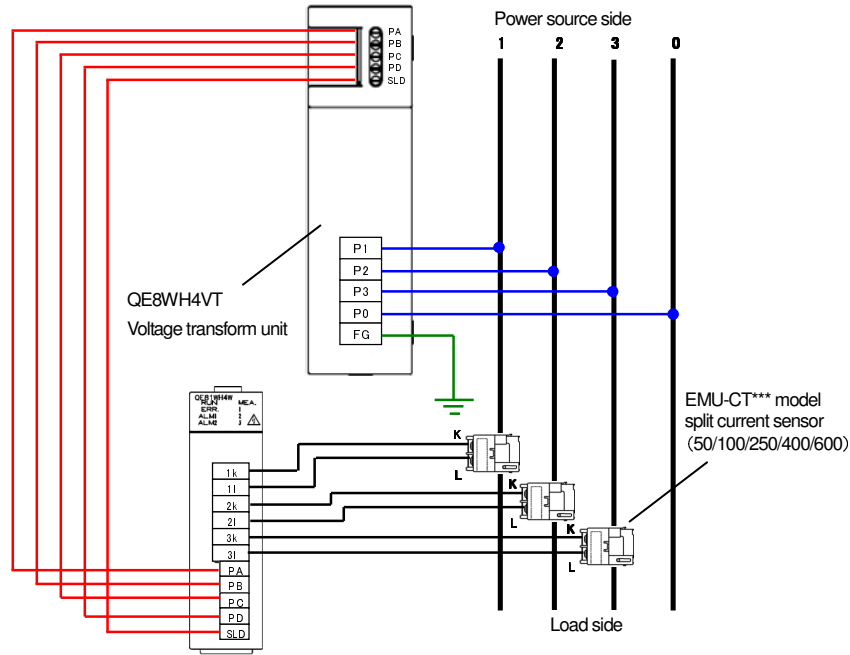
Follow the wiring diagram for external connection of QE81WH4W.

Current sensor (EMU-CT50/CT100/CT250/CT400/CT600, EMU2-CT5-4W) is necessary for the connection of the current circuit.

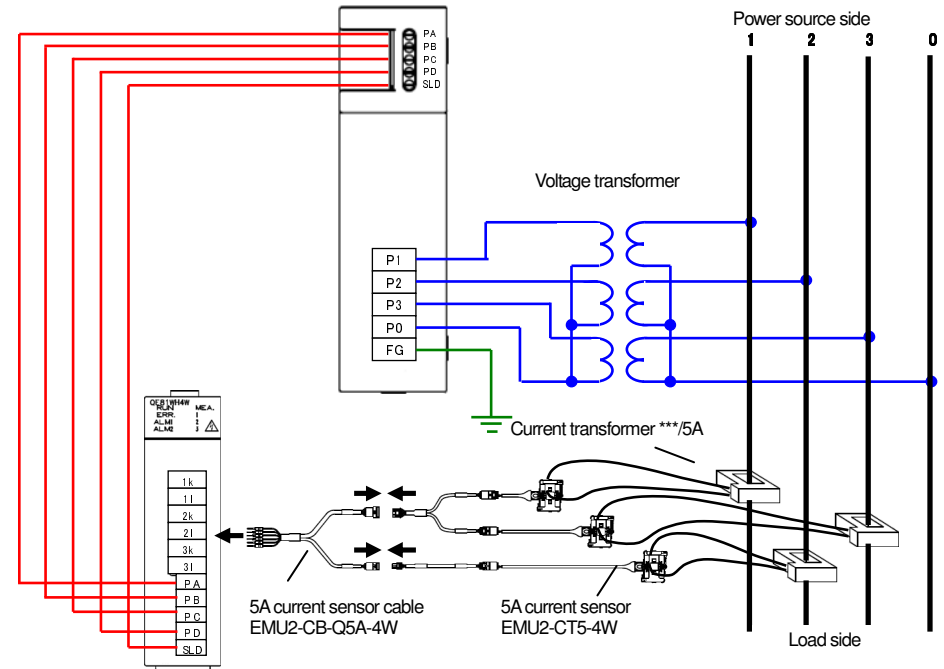
Voltage transform unit (QE8WH4VT) is necessary for the connection of the voltage circuit. In addition, up to five QE81WH4W units can be connected to one voltage transform unit.

Please refer to the User's Manual (Details) of this unit, and the installation method and the detailed specifications of the current sensor and the voltage transform unit.

Three-phase 4-wire(with the voltage transform unit / Separated type current transformer)



Three-phase 4-wire(with the voltage transform unit / voltage transformer / current transformer)



#### ⚠ Caution

- Input signal wire shall not be bound together with or placed close to the main circuit and power line. Keep 300 mm or longer distance between them.(Except for the terminal input section) It may cause malfunction due to noise
- The input wiring of the measurement circuit uses separate cables which is different from other signal cables, and do not be affected by surge and the instruction of the interchange side.
- In actual use, connect the SLD terminal to a shield.

- Make sure that before connecting the cable, the direction of the current sensor is correct for attachment. K to L is the correct direction. K: power source side, L: load side.
- The available range of the voltage transform unit is from 55/95V AC to 227/480V AC. When this product is used in a circuit more than 227/480V AC, voltage transformer is required.
- The available phase voltage of the transformer is up to 6600V. Connect the secondary side of the transformer to the terminal (P1, P2, P3, P0) of the Voltage transform unit. Make sure that terminal symbols are correct. This product cannot connect with the secondary side of the transformer directly.

### 6.2 How to connect wires

- Use appropriate electric wires and tighten a screw by appropriate torque as described right.
- Insert a wire to the terminal all the way until it touches the end.

#### <Voltage input terminals>

- Stripping length of the used wire in use has to be 5 to 6mm. Check the stripping length using the strip gauge of QE81WH4W unit.

- When stranded wire is used, twist the tip.

#### <Current input terminals>

- When attaching and detaching cables to/from the terminal, use the push button. Check that the wire is securely inserted.

- Stripping length of the used wire in use has to be 10 to 11mm. Check the stripping length using the strip gauge of QE81WH4W unit.

- When stranded wire is used, a bar terminal or the tip-twisting are required to avoid wire scattering.

Recommended bar terminals for current input terminals: TGV TC1.25-11T (NICHIFU TERMINAL INDUSTRIES CO.,LTD)

	Voltage input terminals	Current input terminals
Single wire	AWG16-28	AWG16-22
Stranded wire		AWG14-24
Tightening torque [N·m]	0.25	-

- UL/c-UL listed corresponds, use the wires according to the following conditions.

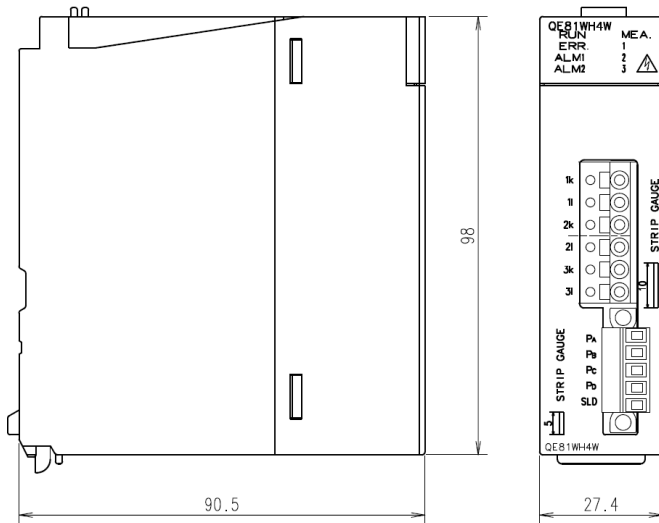
Voltage input terminals: AWG14-30 (Single wire / Stranded wire)

Current input terminals: AWG16-22 (Single wire) , AWG14-24 (Stranded wire)

60/75°C copper conductor only.

## 7. Dimensions

Note: Unit of number is mm.



## 8. Specifications

Item	Specifications
Model	QE81WH4W
Phase-wire system	three-phase 4-wire
Rating	Voltage circuit 63.5/110 – 277/480V AC (Selected from: 63.5/110V, 100/173V, 105/182V, 110/190V, 115/199V, 120/208V, 127/220V, 200/346V, 220/380V, 230/400V, 240/415V, 242/420V, 250/430V, 254/440V, 265/460V, 277/480V. Each value refers to the primary voltage of voltage transform unit.)
	Current circuit 50 A, 100 A, 250 A, 400 A, 600 AAC (The dedicated split type current sensor is used. Each value refers to the current at the primary side of the current sensor.) 5 AAC (The dedicated split type current sensor is used. 5 A current sensor is used together with the current transformer (CT), and the primary-side current is configurable up to 6000 A.)
	Frequency 50Hz-60Hz
Allowable tolerance of unit (excluding the current sensor)	Current : ±1.0% (100% of the rating) Voltage : ±1.0% (100% of the rating) Electric power : ±1.0% (100% of the rating) Reactive power: ±1.0% (100% of the rating) Apparent power: ±1.0% (100% of the rating) Frequency : ±1.0% (45 – 65 Hz range of the rating) Power factor : ±3.0% (against the electric angle 90°) Electric energy : ±2.0% (5 – 100% range of the rating, power factor = 1) Reactive energy : ±2.5% (10 – 100% range of the rating, power factor = 0)
Measurable circuit count	1 circuit
Operating temperature	0 – 55°C (Average daily temperature 35°C or below)
Operating humidity	5 – 95% RH (No condensation)
Storage temperature	-25 – +75°C
Operating altitude	2000 m or below
Commercial frequency withstand voltage	Between voltage/current input terminals - SLD terminal: 2210 V AC3 sec Between voltage/current input terminals - sequencer power source and GND terminals: 2210 V AC3 sec
Standard	EMC:EN61131-2:2007, EN61326-1:2006 LVD:EN61131-2:2007, EN61010-1:2001
Installation area	Inside a control panel
Product life expectancy	10 years (used under the operating conditions of Section 3.1.)

## 9. Warranty

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

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



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

## 10. Customer Service

Please contact us at the following locations.

1 - 8 Midori-cho, Fukuyama-shi, Hiroshima, 720 - 8647, Japan

Phone (084) 926 - 8142

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.