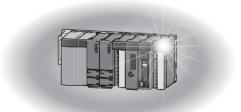


Mitsubishi Programmable Controller

MELSEG Q series

Energy Measuring Module User's Manual (Details)

QE81WH







SAFETY PRECAUTIONS

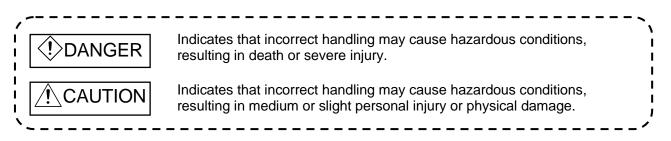
(Read these precautions before using this product.)

This manual contains important instructions for MELSEC-Q series QE81WH.

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the user's manual of the CPU module used.

In this manual, the safety precautions are classified into two levels: "DANGER" and "CAUTION".



Under some circumstances, failure to observe the precautions given under "/!\ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Keep this manual in an accessible place for future reference whenever needed, and make sure it is delivered to the end user.

This product cannot be used for transactions or certification of electric energy, etc. as stipulated by the Measurement Act.

Please use a wattmeter meter (certified product) for transactions and certification of electric energy, etc.

[Precautions for Operating Environment and Conditions]

Caution

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

- Places the Surrounding air temperature exceeds the range 0 °C to +55 °C.
- Places where the average daily temperature exceeds +35 °C.
- Places the Relative humidity exceeds the range 5 % to 95 % or condensation is observed.
- 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.
- Installation on excluding the control board.

[Design Precautions]

Danger

Do not write data into "System Area" in the buffer memory of the intelligent function module.
 Also, do not output (turn ON) the "use prohibited" signal in the output signal sent from the sequencer CPU to the intelligent function module.

Doing so may cause a malfunction to the sequencer system.

Caution

• Do not install the input signal wire together with the main circuit lines or power cables. Keep a distance of 300 mm or more between them. (Except for the terminal input part) Failure to do so may result in malfunction due to noise.

[Installation Precautions]

Caution

- 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 of 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 module, while pressing the module-mounting lever located in the lower part of the module, fully insert the module fixing projection(s) into the hole(s) in the base unit and press the module until it snaps into place.

Incorrect mounting may cause a malfunction, failure or a fall of the module.

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

- Tighten the screws within the specified torque range.
 - Fixing-Module screw (arranged by user): M3 x 12 mm
 - Tightening torque of the fixing-module screws0.36 N•m to 0.48 N•m

When the screw tightening is loose, it causes a fall, short-circuit, and a malfunction.

Over-tightening can damage the screws and the module, and it may cause a fall, short-circuit, or a malfunction.

- Shut off the external power supply for the system in all phases before mounting or removing the module. Failure to do so may result in damage to the product.
- Do not touch directly any conductive parts and electronic parts of the module. Doing so can cause a malfunction or failure of the module.
- Do not ground the secondary side of the current sensor.

[Wiring Precautions]

Danger

• For installation and wiring works, make sure that the power source is shut off for all outside phases. If all phases are not turned off, it may cause an electric shock or product damages.

- FG terminal must be grounded according to the D-type ground (Type 3) dedicated for sequencer. Failure to do so may result in electric shock or malfunction.
- When using this product, make sure to use it in combination with current sensor (EMU-CT***, EMU-CT***-A or EMU2-CT5). Please not to exceed the ratings 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-CT***, EMU-CT***-A (Excluding EMU-CT5-A)) is used only for low voltage circuit. It cannot be used with a high voltage circuit. Also, EMU2-CT5 and EMU-CT5-A should be used with the secondary side (5 A) of the current transformer passing through. In case directly using for the circuit, only the circuit up to 200V can be used. 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.
- Current sensor has a polarity (directionality). Be careful about it when installing the module.
- Do not open the secondary side of current sensor.
- Take care not entering any foreign objects such as chips and wire pieces into the module. It may cause a fire, failure or a malfunction.
- In order to prevent the module from incoming foreign objects such as wire pieces during wiring work, a foreign-object preventive label is placed on the module. While a wiring work is performed, keep the label on the module. 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 module may reduce the product life.
- The wires to be connected to the module shall be put in a duct or fixed together by clamp. If not, the loosing and unstable wire or careless stretching results in poor contact of electric wires. That may cause a breakage of the module or wire or a malfunction.
- Use appropriate size of electric wires. If inappropriate size of electric wire is used, it may cause a fire due to generated heat. For appropriate size of electric wires, refer to 7.5.2 How to connect wires.
- 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 using inappropriate bar terminals, a wire breakage or a contact failure may cause a device malfunction, failure, a burnout or a fire. For details on bar terminals, please refer to "7.5.2 How to connect".
- After wiring, confirm whether there is a wiring forgetting or a faulty wiring. They may cause a device malfunction, a fire, or an electric shock.
- When removing the wires connected to the module, do not pull wires as holding on their electric wire portions. Push the buttons on the terminal, and then remove the wire.
- If the wires connected to the module are strongly pulled off, it may cause a malfunction or a breakage to the module or the wire. (Tensile load: 22 N or less)
- Ensure the wiring to the module 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.
- 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
 - (a) To lock the panel so that only trained persons having adequate knowledge of electric equipment can open it.
 (b) To design the atmetters as that the neuron is sufficiently intermented upon an entry of the neuron.
 - (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.

[Start-up Precautions]

Caution

- Use the product within the ratings specified in this manual. When using it outside the ratings, it not only causes a malfunction or failure but also there is a fear of igniting and damaging by a fire.
- Before operating the product, check that active bare wire and so on does not exist around the product. If any bare wire exists, stop the operation immediately, and take an appropriate action such as isolation protection.
- Do not disassemble or modify the module. It may cause failure, a malfunction, an injury or a fire.
- Attaching and detaching the module must be performed after the power source is shut off for all outside phases. If not all phases are shut off, it may cause failure or a malfunction of the module.
- Do not touch the live terminal. It may cause a malfunction.

[Maintenance Precautions]

Caution

- Cleaning and additional tightening of module-fixing screws must be performed after the input power source is shut off for all outside phases. If not all phases are shut off, it may cause failure or a malfunction of the module.
- Use a soft dry cloth to clean off dirt of the module surface.
- Do not let a chemical cloth remain on the surface for an extended period nor wipe the surface with thinner or benzene.

Check for the following items for using this product properly for long time.

<Daily maintenance>

(1) No damage on this product (2) No abnormality with LED indicators (3) No abnormal noise, smell or heat.

<Periodical maintenance> (Once every 6 months to 1 year)

(4) Confirm there is loosing in installation, wire connection to terminal blocks, and the connection of the connectors. (Check these items under the power failure condition.)

[Storage Precautions]

▲ Caution

- To store this product, turn off the power and remove wires, and put it in a plastic bag. For long-time storage, avoid the following places. Failure to follow the instruction may cause a failure and reduced life of the product.
 - Places the Surrounding air temperature exceeds the range -25 °C to +75 °C.
 - Places where the average daily temperature exceeds +35 °C.
 - Places the Relative humidity exceeds the range 5 % to 95 % or condensation is observed.
 - Dust, corrosive gas, saline and oil smoke exist, and vibration and frequent physical impact occur.
 - Places exposed to rain or water drop.

[Disposal Precautions]

• Dispose of the product as an industrial waste.

Revision history

* Instruction Manual Number is provided at the bottom of the cover page.

Distant		* Instruction Manual Number is provided at the bottom of the cover page
Printed date	*Instruction Manual #	Description of revisions
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		Installation Precautions, Storage Precautions,
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		Section 7.1, Section 7.4, Section 7.5, Section 7.6, Section 8.3,
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		Wiring Precautions, Storage Precautions,
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		Section 2.1, Section 3.1, Section 3.2, Section 4.2, Section 5.2,
		Section 6.1, Section 6.2, Section 6.3, Section 6.4, Section 7.5,
		Section 7.6, Section 7.7, Section 8.1, Section 8.3, Section 9.2,
		Appendix 2, Back cover
		1

This manual does not guarantee to protect or does not give permission to any industrial property and any related rights. Also, our company shall not be held any responsible for any issues related to industrial properties due to product usage described in this manual.

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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 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 the product

For the compliance of this product with the EMC and Low Voltage Directives, refer to Section 7.5 Wiring.

In addition, attach ferrite cores to power line of power supply module.

Ferrite cores used in our testing is below.

KITAGAWA INDUSTRIES CO., LTD., RFC-10

(3) CE marking conformity combination module

This module conforms to CE marking standard in a condition to make combination use with following current censor and cable.

current censor	EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400, EMU-CT600, EMU-CT400-A, EMU-CT600-A	EMU2-CT5
cable or current censor cable	CE marking cable (twisted pair cable) Single wire: AWG24 to AWG17 (φ0.5 mm to 1.2 mm) Stranded wire: AWG20 to AWG16 (0.5 mm ² to 1.3 mm ²)	EMU2-CB-Q5A (required) EMU2-CB-T1M, EMU2-CB-T5M EMU2-CB-T10M, EMU2-CB-T1MS EMU2-CB-T5MS, EMU2-CB-T10MS
Max. cable length	50m	11m (including EMU2-CT5)

Product configuration

The following describes the product configuration.

Model name	Product name	Quantity
QE81WH	Energy Measuring Module	1

Note

Chapter 1: Overview

This manual explains specifications, handling methods, and programming of Energy Measuring Module QE81WH (hereinafter, abbreviated as QE81WH) supporting MELSEC-Q series.

1.1 Features

- (1) This Energy Measuring Module can measure various types of electric quantity.
 It can measure electric energy, reactive energy, current, voltage, electric 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.
- (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.

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

Chapter 2: System Configuration

2.1 Applicable system

The following describes applicable systems.

- (1) Applicable module and the quantity of attachable pieces(a)When mounted with CPU module
 - CPU module to which QE81WH can be attached and the number of attachable pieces are shown below.

Depending on the combination of the attached module and the number of attached pieces, lack of power capacity may occur.

When attaching the module, please consider the power capacity. If the power capacity is insufficient, reconsider the combination of modules to be attached.

	achable CPU Mo		Attachable	
CPL	Ј Туре	CPU Model	quantity.	
		Q00JCPU	16	
	Basic model	Q00CPU	0.1	
	QCPU	Q01CPU	24	
		Q02CPU		
		Q02HCPU		
	High performance model QCPU	Q06HCPU	64	
		Q12HCPU		
		Q25HCPU		
		Q02PHCPU		
		Q06PHCPU	64	
	Process CPU	Q12PHCPU	64	
		Q25PHCPU		
	Redundant CPU	Q12PRHCPU	53	
	Redundant CPU	Q25PRHCPU	55	
		Q00UJCPU	16	
Programmable		Q00UCPU	24	
controller		Q01UCPU		
CPU		Q02UCPU	36	
.		Q03UDCPU		
		Q04UDHCPU		
		Q06UDHCPU	-	
		Q10UDHCPU	-	
		Q13UDHCPU	-	
	Universal model	Q20UDHCPU	-	
	QCPU	Q26UDHCPU	-	
		Q03UDECPU	64	
		Q04UDEHCPU		
		Q06UDEHCPU		
		Q10UDEHCPU	-	
		Q13UDEHCPU	4	
			-	
		Q100UDEHCPU		

Since the number of attachable modules are limited by the power module which used, please refer to the notes on the 2.2 precautions for system configuration.

Atta	Attachable	Remarks		
CPU	Туре	CPU Model	quantity.	
		Q03UDVCPU		
		Q04UDVCPU		
		Q06UDVCPU		
Programmable	High-speed	Q13UDVCPU		
controller	Universal model QCPU	Q26UDVCPU	64	
CPU		Q04UDPVCPU		
		Q06UDPVCPU		
		Q13UDPVCPU		
		Q26UDPVCPU		
		Q06CCPU-V		
		Q06CCPU-V-B		
C Controller modu	رام	Q12DCCPU-V	64	
		Q24DHCCPU-LS		
		Q24DHCCPU-V		
		Q26DHCCPU-LS		

(b) When mounted with MELSECNET/H remote I/O station

The table below shows the network modules applicable to the QE81WH and the number of network modules to be mounted.

Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.

Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable Network Module	Number of modules	Remarks
QJ72LP25-25		
QJ72LP25G	64	
QJ72BR15		

(c) The base unit can be mounted

QE81WH can be installed to any I/O slot of main base unit and extension base unit.

*1 In case of redundant CPU, can be mounted to the extension base unit only. Mounted to the main base unit is not allowed.

*2 Limited within the range of I/O points for the CPU module.

(2) For multiple CPU system

The function version of the first released CT input module is C, and the CT input module supports multiple CPU systems.

When using the CT input module in a multiple CPU system, refer to the following. *QCPU User's Manual (Multiple CPU system)

(3) Applicable software packageQE81WH supported software packages are as follows:(a) Software package for sequencer

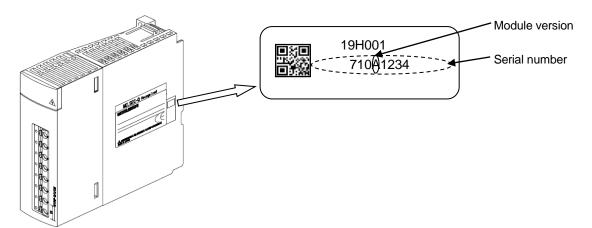
Product name	Model name	Version	Remarks
GX Works2	SW1DNC-GXW2	1 00L or bighor	iQ Platform compatible programmable
GX WORKSZ	SWIDING-GAVVZ	1.90U or higher	controller engineering software
GX Developer	SWnD5C-GPPW		MELSEC sequencer programming software "n" in the model name is 4 or larger.

2.2 Precautions for system configuration

(1) When attaching it to an expansion base without a power module If QE81WH is attached to an expansion base without a power module, refer to the user's manual of the sequencer CPU to be used in order to select the power module and expansion cable.

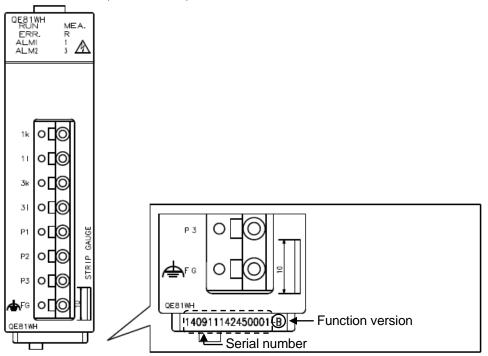
2.3 How to check the function version, serial number, and module version

 How to check the serial number and module version It can be checked with the serial number label (placed on the right side of QE81WH).



(2) How to check the function version and serial number(a) Checking on the front of the module.

The serial number and function version on the rating plate is shown on the front (at the bottom) of the module.



(b) Checking on the System monitor dialog box (Product Information List) To display the system monitor, select [Diagnostics] \rightarrow [System monitor] and click the Product Information List button of GX Developer.

roduct Information List										
Slot	Type	Series	Model name	Points	I/O No.	Master PLC	Serial No	Ver.	Product No.	
PLC	PLC	Q	QOOUJCPU	-	-	-	131020000000000	В	140115140218032-B	
0-0	Intelli.	Q	QE81WH	16pt	0000	-	140720000000000	В	-	
0-1	-	-	None	-	-	-	-	-	-	
0-2	-	-	None	-	-	-	-	-	-	
0-3	-	-	None	-	-	-	-	-	-	

Point

The serial number displayed on the Product Information List dialog box of GX Developer may differ from that on the rating plate and on the front of the module.

- The serial number on the rating plate and front part of the module indicates the management information of the product.
- The serial number displayed on the Product Information List dialog box of GX Developer indicates the function information of the product.

The function information of the product is updated when a new function is added.

Chapter 3: Specifications

3.1 General specifications

	lte	m	Specifications				
	Phase wir	e system	single-phase 2-wire / single-phase 3-wire / three-phase 3-wire				
Rating	Voltage circuit *1	single-phase 2-wire, three-phase 3-wire	110 V AC , 220 V AC				
		single-phase 3-wire	110 V AC (1 - 2 line, 2 - 3 line) 220 V AC (1 - 3 line)				
Current circuit			50 A, 100 A, 250 A, 400 A, 600 A AC (Current sensor is used. Each value refers to the current at the primary side of current sensor.) 5 A AC (Current sensor is used together with current transformer (CT), and the primary-side current is configurable up to 6000 A.) * ²				
	Frequence	су	50Hz to 60 Hz				
Allowable tolerance of main module (excluding current sensor) *3			Current: $\pm 1.0 \%$ (100 % of the rating)Current demand *4: $\pm 1.0 \%$ (100 % of the rating)Voltage: $\pm 1.0 \%$ (100 % of the rating)Electric power: $\pm 1.0 \%$ (100 % of the rating)Electric power demand *4: $\pm 1.0 \%$ (100 % of the rating)Reactive power: $\pm 1.0 \%$ (100 % of the rating)Frequency: $\pm 1.0 \%$ (100 % of the rating)Power factor: $\pm 1.0 \%$ (45 Hz to 65 Hz range of the rating)Power factor: $\pm 3.0 \%$ (against the electric angle 90°)Electric energy: $\pm 2.0 \%$ (5 % to 100 % range of the rating, power factor = 1)Reactive energy: $\pm 2.5\%$ (10 % to 100 % range of the rating, power factor = 0)				
Measura	ble circuit c	ount	1 circuit				
Data upd	ate cycle		250 ms *5				
Respons	e time		2 seconds or less				
Backup for electric blackout			Backup is made using nonvolatile memory. (Stored items: settings, the max./min. values and time of occurrence, electric energy (consumption, regenerated), reactive energy (consumption lag), and periodic electric energy)				
I/O occup	oation		16 points (I/O assignment: intelligence 16 points)				
* • • • • • • • • • • •							

- * 1 : 110 V, 220 V AC direct connection is possible. For the circuit over this voltage, transformer (VT) is necessary (Primary voltage of VT can be set up to 6600 V, and secondary voltage of VT can be set up to 220V as optional setting). Star – delta connection and delta – star connection transformer instead of VT cannot measure definitely to be out of phase. Please use a transformer of the same connection.
- * 2 : 5 A primary current can be set when using the current sensor is as follows.
 5 A, 6 A, 7.5 A, 8 A, 10 A, 12 A, 15 A, 20 A, 25 A, 30 A, 40 A, 50 A, 60 A, 75 A, 80 A, 100 A, 120 A, 150 A, 200 A, 250 A, 300 A, 400 A, 500 A, 600 A, 750 A, 800 A, 1000 A, 1200 A, 1500 A, 1600 A, 2000 A, 2500 A, 3000 A, 4000 A, 5000 A, 6000 A (Primary current of CT can be set up to 6000 A in any. However, secondary current of CT can not be set to other than 5 A).
- * 3 : Please refer to 2 (1) as for the ratio error of the current sensor.
- * 4 : Demand shows the moving average of a set period.
- * 5 : Always accumulating the integrated values of Wh and varh. It can capture short-cycled load fluctuation of 250 ms or less.

3.2 Electrical and mechanical specifications

-	and mechanica em	Specifications								
Consumed V	-	Each phase 0.1 VA (at 110 V AC), Each phase 0.2 VA (at 220 V AC)								
	circuit	<u> </u>								
	Current circuit	Each phase	h phase 0.1 VA (secondary side of current sensor)							
	Internal current consumption (5 V DC)									
Operating te		0 °C to +55	°C (Average d	aily temper	atu	ire +35 °C or b	elow)			
Operating hu			RH (No conde				,			
Storage tem		-25 °C to +7		,						
Storage hum		5 % to 95 %	RH (No conde	ensation)						
Operating all		2000 m or b		,						
Installation a		Inside a con								
Operating er	vironment	No corrosive								
Vibration res		Conforms to JIS B		Frequency		Constant acceleration	Half amplitud	le	Sweep time	
		3502, IEC	Intermittent	5 Hz to 8.4 H	Hz	-	3.5 mm		XYZ	
		61131-2	vibration	8.4 Hz to 150 Hz		9.8 m/s ²	-		each direction 10 times	
			Continuous	5 Hz to 8.4 H	Hz	-	1.75 mm	า	-	
			vibration	8.4 Hz to		4.9 m/s ²	-		-	
				150 Hz						
Impact resist	ance	Conforms to JIS B 3502, IEC 61131-2 (147m/s ² , XYZ each direction 3 times)								
Over voltage		II or less								
Pollution deg	ree *2	2 or less								
Equipment c		Class I								
Applicable	Voltage input	Single wire				AWG24 to AWG17				
wire	terminal				(φ0.5 mm to 1.2 mm)					
(Usable		Stranded wire * ⁴ Single wire				AWG20 to AWG16				
electric						(0.5 mm ² to 1.3 mm ²)				
wire)	Current input					AWG24 to AWG17				
	terminal *3						(φ0.5 mm to 1.2 mm)			
		Stranded wire *4 AWG20 to A								
			(5.5.5		(0.5 mm ² to 1.3 mm ²)					
Tightening to	rque	Module-fixing screws (M3 screw) *5 0.36 N•m to 0.48 N•m								
Commercial withstand vo		Between voltage/current input terminals - FG terminal						2210 V AC 5 sec		
		Between voltage/current input terminals - sequencer power					2210 V AC			
		source and GND terminals 5 sec								
Insulation res	sistance	$5 \text{ M}\Omega \text{ or more} (500 \text{ V DC}) \text{ at locations above}$								
Standard *6		EMC: EN61131-2:2017, EN61326-1:2013								
		LVD: EN611	31-2:2007, EN							
		UL Standard								
			ards: CSA C22	.2 No.142						
		KC Marking	-							
Dimensions		27.4 mm (W) x 98 mm (H) x 90.5 mm (D) excluding protruding portions								
Mass		0.1 kg								

^{*1.} This indicates the assumed area of electric distribution to which the device is connected, the area ranging from public distribution to factory machinery. The category II applies to the device power-supplied from fixed facility. The surge voltage of this product is 2500 V up to the rated voltage of 300 V.

*3. At the connection between the secondary terminal of current sensor (k, l) and the main module terminal (1k, 1l, 3k, 3l), use twisted pair cable.

^{*2.} The index indicates the level of conductive substance at the device's operating environment. Contamination level 2 means only non-conductive substance. However, occasional condensation may lead to temporary conduction.

- *4. If stranded wire is used, a bar terminal must be used. Recommended bar terminal: TGV TC-1.25-11T (Made by Nichifu)
- *5. The module can be fixed easily to the base unit, using the hook on top of the module. However, if it is used under a vibrating environment, we strongly recommend that the module be fixed with screws.
- *6. When combine this unit with a CT (Model: EMU2-CT5, EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400-A, EMU-CT600-A), it becomes UL standard.

Chapter 4: Functions

4.1 List of functions

Functions of QE81WH are provided in Table 4.1-1

The "n" that is used in this and later chapters (for example: Xn0, Yn0, Un¥G0, etc.) refers to the number that appears at the beginning of QE81WH.

No.	Function	Descriptions	Reference section
1	Measurement	It measures current, current demand, voltage, electric power, electric power demand, Reactive power, power factor, frequency, effective energy (consumption, regeneration), reactive energy (consumption lag), and sequentially stores the records into a buffer memory.	Section 4.2.1
2	Periodic electric energy	The electric energy only for a period of time when a certain output signal is ON will be stored in the buffer memory. Periodic energy 1 and 2 can be measured independently.	Section 4.2.2
3	Hold max./min. values	For current demand, voltage, electric power demand, and power factor, each maximum/minimum values and date/time of occurrence are stored.	Section 4.2.3
4	Upper/lower limit alarm monitoring	Of current demand, voltage, electric power demand, and power factor, you can select two items for which their upper/lower limit can be monitored. If it exceeds the upper limit or goes below the lower limit, the specified input signal is turned on.	Section 4.2.4
5	Test	The intelligent function module switch enables pseudo-storage of the specified value into the buffer memory, even with non-existence of input from voltage and current (sensor). Using this module, you can create a sequence, etc.	Section 4.2.5
6		Set the integrated value (electric energy (consumption, regeneration), reactive energy (consumption lag)) to an arbitrary value. It is used to clear integrated value.	Section 4.2.6

Table 4.1-1 List of Functions

4.2 Functions in detail

- 4.2.1 Measuring functions
 - (1) Measured items

Measured items and measured ranges are described as follows: Each measured item is stored in the buffer memory every 250 ms.

Each measured item is stored in the buffer me Measured ite	
	Details
Current	1 - phase current
	2 - phase current ^{*1}
	3 - phase current ^{*1}
	Average current
Current demand	1 - phase current demand
* The average of fluctuation for the set period of	2 - phase current demand ^{*1}
current demand time is indicated.	3 - phase current demand ^{*1}
	Max. value
	Min. value
	Date of max. value occurrence
	Date of min. value occurrence
Voltage	1 - 2 line voltage (voltage V12)
	2 - 3 line voltage ^{*1} (voltage V23)
	3 - 1 line voltage ^{*1} (voltage V31)
	Average voltage
	Max. value
	Min. value
	Date/time of max. value occurrence
	Date/time of min. value occurrence
Electric power	Present value
Electric power demand	Present value
* The average of fluctuation for the set period of	Max. value
electric power demand time is indicated.	Min. value
	Date/time of max. value occurrence
	Date/time of min. value occurrence
Reactive power	Reactive power
Power factor	Present value
	Max. value
	Min. value
	Date/time of max. value occurrence
	Date/time of min. value occurrence
Frequency	Present value
Electric energy	Electric energy (consumption)
	Electric energy (regeneration)
Reactive energy	Reactive energy (consumption lag)
Periodic electric energy	Periodic electric energy 1
	Periodic electric energy 2

*1: If phase wire system is set to single-phase 2-wire, measurement will not be taken.

(2) Total, maximum, and minimum values

The following describes how to calculate the maximum, minimum, and total values.

Item	Phase wire system	Formula
Average	single-phase 2-wire	Average current = 1-phase current
current	single-phase 3-wire	Average current = (1-phase current + 3-phase current) / 2
	three-phase 3-wire	
Average	single-phase 2-wire	Average voltage = voltage V12
voltage	single-phase 3-wire	Average voltage = (voltage V12 + voltage V23) / 2
	three-phase 3-wire	
Maximum	single-phase 2-wire	Maximum value of 1-phase current demand
current		(The highest value after the max./min. value was reset.)
demand	single-phase 3-wire	Highest value of either 1-phase current demand or 3-phase current
		demand
		(The highest value after the max./min. value was reset.)
	three-phase 3-wire	Highest value among 1-phase current demand, 2-phase current
		demand, or 3-phase current demand
		(The highest value after the max./min. value was reset.)
Minimum	single-phase 2-wire	Minimum value of 1-phase current demand
current		(The lowest value after the max./min. value was reset.)
demand	single-phase 3-wire	Lowest value of either 1-phase current demand or 3-phase current
		demand
		(The lowest value after the max./min. value was reset.)
	three-phase 3-wire	Lowest value among 1-phase current demand, 2-phase current
		demand, or 3-phase current demand
		(The lowest value after the max./min. value was reset.)
Maximum	single-phase 2-wire	Highest value of the 1 - 2 line voltage
voltage		(The highest value after the max./min. value was reset.)
	single-phase 3-wire	Highest value of either the 1 - 2 line voltage or the 2 - 3 line voltage
		(The highest value after the max./min. value was reset.)
	three-phase 3-wire	Highest value among the 1 - 2 line voltage, the 2 - 3 line voltage, or 3
		- 1 line voltage
		(The highest value after the max./min. value was reset.)
Minimum	single-phase 2-wire	Lowest value of the 1 - 2 line voltage
voltage		(The lowest value after the max./min. value was reset.)
	single-phase 3-wire	Lowest value of either the 1 - 2 line voltage or the 2 - 3 line voltage
		(The lowest value after the max./min. value was reset.)
	three-phase 3-wire	Lowest value among the 1 - 2 line voltage, the 2 - 3 line voltage, or 3
		- 1 line voltage
		(The lowest value after the max./min. value was reset.)

(3) Resolution of measured data

Resolution of measured data according to the rating (phase wire system, primary voltage, and primary current) is described as follows.

1) Current, current demand

Rated primary current setting	Multiplier	Resolution*		
I < 40 A	-3	2 digits after the decimal point	0.01 A	
40 A ≤ I < 400 A	-3	1 digit after the decimal point	0.1 A	
400 A ≤ I < 4000 A	-3	Integer	1 A	
4000 A ≤ I	-3	× 10	10 A	

* Digits lower than the resolution are fixed to 0.

2) Voltage

Rated primary voltage setting	Multiplier	Resolution	*
V < 330 V	-3	1 digit after the decimal point	0.1 V
330 V ≤ V < 3300 V	-3	Integer	1 V
3300 V ≤ V	-3	×10	10 V

* Digits lower than the resolution are fixed to 0.

3) Electric power, electric power demand, Reactive power

Full load power W ^{*1}	Multiplier	Resolution*2*3		
I . W <12 kW	-3	3 digits after the decimal point	0.001 kW	
II . 12 kW ≤ W < 120 kW	-3	2 digits after the decimal point	0.01 kW	
Ⅲ. 120 kW ≤ W < 1200 kW	-3	1 digit after the decimal point	0.1 kW	
IV. 1200 kW ≤ W < 12000 kW	-3	Integer	1 kW	
V.12000 kW ≤ W < 120000 kW	-3	×10	10 kW	

^{*1} For calculating full load power W, refer to Table 4.2.1-1 (pages 4-5 to 4-7).

^{*2} Digits lower than the resolution are fixed to 0.

^{*3} In the case of reactive power, the unit will be kvar.

4) Power factor

Power factor	Multiplier	Resolution*		
All setting ranges	-3	1 digit after the decimal point	0.1%	

* Digits lower than the resolution are fixed to 0.

5) Frequency

Frequency	Multiplier	Resolution*		
All setting ranges	-3	1 digit after the decimal point	0.1 Hz	

* Digits lower than the resolution are fixed to 0.

o) Liectic energy, reactive energy, periodic electric energy								
Full load power W ^{*1}	Multiplier Resolution*2			Range [kWh,kvarh]				
I . W < 12 kW	-5	5 digits after the decimal point	0.00001 kWh, kvarh	0.00001 to 9999.99999				
II. 12kW ≤ W < 120 kW	-4	4 digits after the decimal point	0.0001 kWh, kvarh	0.0001 to 99999.9999				
III. 120kW ≤ W < 1200 kW	-3	3 digits after the decimal point	0.001 kWh, kvarh	0.001 to 999999.999				
IV. 1200kW ≤ W < 12000 kW	-2	2 digits after the decimal point	0.01 kWh, kvarh	0.01 to 9999999.99				
V.12000kW ≤ W < 120000 kW	-1	1 digit after the decimal point	0.1 kWh, kvarh	0.1 to 99999999.9				

6) Electric energy, reactive energy, periodic electric energy

^{*1} For calculating full load power W, refer to Table 4.2.1-1 (pages 4-5 to 4-7).

*2 Because the higher resolution than a typical watt-hour meter, the minimum digit values will change more than 2 at once update. According to setting value of input voltage, primary current, primary voltage of VT, secondary voltage of VT, primary current of CT and the condition of load.

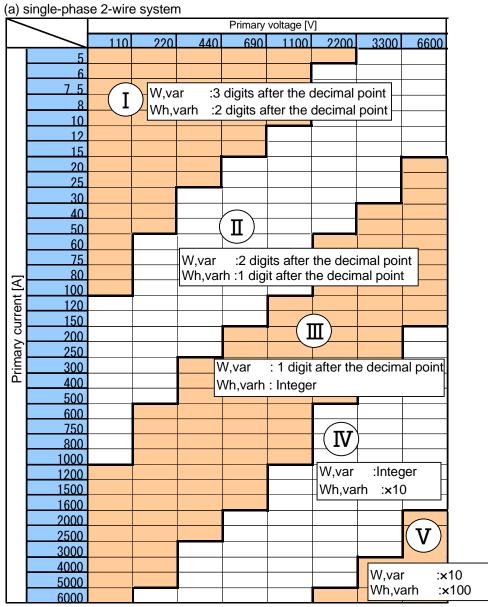
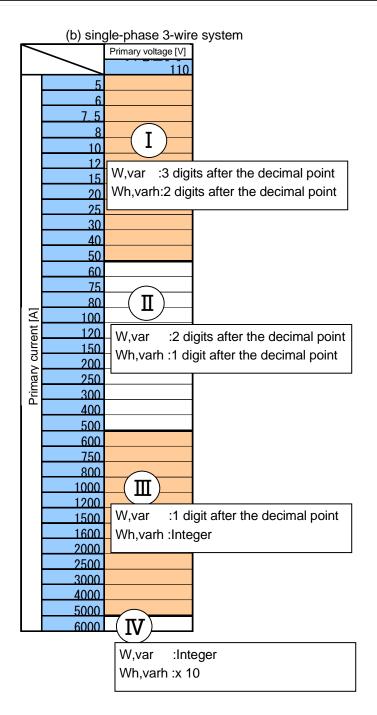


Table 4.2.1-1 How to calculate full load power



4 - 6

	$\overline{}$	wite sy				Prima	ry voltage	[V]		
		110		220	440	690	1100	2200	3300	6600
	5									
	6	(Ι				_			
	7,5		T							
	8	W,var		·3 di	aits afte	er the d	ecimal p			
	10	· ·			-		-			
	12	VVII,V2	1111	.z ui	gits alle	i the u	ecimal p			
	15	L								
	20									
	25					(🔳)				
	30					\bigcirc				
	40				W,var	:2 di	igits afte	r the de	cimal p	oint 🔔
	50				Wh.va	rh :1 di	git after	the dec	imal po	int
	60				,		9.1 0.10			
	75									
7	80									
1 1	100									
Гe	120									
Primary current [A]	150					Ц)–)			
≧	200						1			
Ea	250				W,var	· :1 c	digit afte	r the de	cimal po	oint ⊨
5	300				Wh,va	arh :Int	eger			-
	400						-			
	500 600					<u></u>				
	750									
	750 800						/			
	1000						(\mathbf{N}		
	1200					Г				
	1500						W,var	:Intege	er	
	1600						Wh,varh	n :x 10		
	2000						,	-		
	2500									5
	3000								Γ)	
	4000									
	5000							V	V,var	:×10
	6000								Vh,varh	

(c) three-phase 3-wire system

(4) Restrictions for measuring data

- Measurement cannot be performed immediately after the power loading to the sequencer system (Module ready signal is under the OFF condition).
 - After checking that Module ready (Xn0) is ON, obtain measuring data.
- Measurement cannot be performed immediately after operating conditions are set up to the module. After checking that Operating condition setting completion flag (Xn9) becomes ON, obtain measuring data.
- Behaviors during operation are as follows:

Measuring item	Behavior of the module					
Current	When the input current is less than 0.4 % of the rating current, it					
	becomes 0 A.					
Current demand	Current demand is obtained by current moving average.					
	Therefore, even if current is 0 A, current demand may not be 0 A.					
Voltage	When the input voltage is less than 10 % of the rating voltage, it					
	becomes 0 V.					
	In single-phase three-wire system, indicate "0V" if input voltage is					
	under 22V.					
Electric power,	When current is 0 A (at all phases are 0 A) or when voltage is 0 V					
Reactive power	(all in-between wires are 0 V), it becomes 0 kW.					
Electric power demand	Electric power demand is obtained by electric power moving					
	average. Therefore, even if electric power is 0 kW, electric power					
	demand may not be 0 kW.					
Electric energy	The electric energy is measured with a load that is about 0.4 % or					
	more of all load power. Even if the indicated value is "0",					
	measurement value will increase.					
Power factor	When current is 0 A (at all phases are 0 A) or when voltage is 0 V $$					
	(all in-between wires are 0 V), it becomes 100 %.					
Frequency	Voltage condition					
	When the input voltage is less than 10 % of the rating voltage, it					
	becomes 0 Hz.					
	Frequency condition					
	When it is less than 44.5 Hz, it is fixed to 44.5 Hz.					

4.2.2 Measuring function for periodic electric energy

This function is to measure electric energy for a certain period, and stores it into the buffer memory. It can be used to measure electric energy for a certain tact or energy (standby power) when the facility or equipment is not in operation.

(1) Overview

- 1) It can measure two periodic electric energy (periodic electric energy 1, periodic electric energy 2). Each of these can be measured independently.
- 2) During the time when Periodic electric energy 1 measurement flag (Yn1)/ Periodic electric energy 2 measurement flag (Yn2) is ON, periodic electric energy can be measured.
- 3) Periodic electric energy is stored in the nonvolatile memory, so that it can be retained even at a power source reset.
- 4) I/O signals and buffer memory corresponding to each periodic electric energy 1 and 2 are provided below.

	Buffer memory (Double words)	Periodic electric energy measurement flag	Periodic electric energy data completion flag	Periodic electric energy reset request	Periodic electric energy reset completion flag
Periodic electric energy 1	Un¥G114, 115	Yn1	Xn1	Yn3	Xn3
Periodic electric energy 2	Un¥G116, 117	Yn2	Xn2	Yn4	Xn4

Note

Measurement of periodic electric energy is performed every measuring cycle (250 ms). Therefore, if the time to turn ON Periodic electric energy 1 measurement flag (Yn1) and Periodic electric energy 2 measurement flag (Yn2) is set to 250 ms or less, measurement may not be taken.

- (2) Basic procedure
 - 1) Measuring periodic electric energy
 - (a) Check that Periodic electric energy measurement flag (Yn1/Yn2) is OFF.
 - (b) Check periodic electric energy (Un¥G114, 115/Un¥G116, 117).
 - (c) When starting measurement, set Periodic electric energy measurement flag (Yn1/Yn2) to ON.

This module starts measuring specified periodic electric energy, and Periodic electric energy data completion flag (Xn1/Xn2) will be turned OFF.

(d) When stopping measurement, set Periodic electric energy measurement flag (Yn1/Yn2) to OFF.

This module stops measuring the specified periodic electric energy, and Periodic electric energy data completion flag (Xn1/Xn2) will be turned ON.

(e) Check that Periodic electric energy data completion flag (Xn1/Xn2) becomes ON, and obtain the value of periodic electric energy.

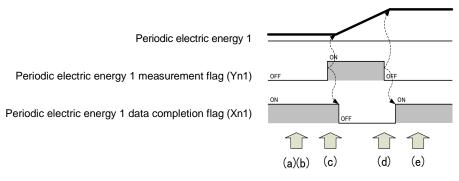


Figure 4.2.2-1 Basic procedure of measuring the periodic electric energy

- 2) Resetting periodic electric power
 - (a) Check that Periodic electric energy measurement flag (Yn1/Yn2) is OFF and that Periodic electric energy reset request (Yn3/Yn4) is OFF.
 - (b) Set Periodic electric energy reset request (Yn3/Yn4) to ON. The specified periodic electric energy is reset to 0 kWh, and Periodic electric energy reset completion flag (Xn3/Xn4) will be turned to ON.
 - (c) Check that Periodic electric energy reset completion flag (Xn3/Xn4) has become ON, and then set Periodic electric energy reset request (Yn3/Yn4) to OFF.

Periodic electric energy reset completion flag (Xn3/Xn4) will be turned OFF.

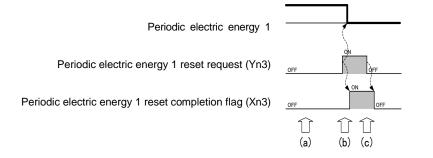
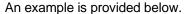


Figure 4.2.2-2 How to reset the periodic electric energy

(3) Sample use case

- 1) Procedure for continuously measuring periodic electric energy
- If you turn Periodic electric energy measurement flag (Yn1/Yn2) to ON only for the extent of time you want to measure, this module accumulates the power starting at the previously measured amount. Usage procedure is the same as 1) in (2).



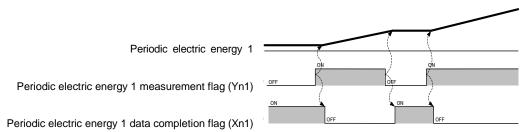


Figure 4.2.2-3 Example of continuous measurement of periodic electric energy

2) Procedure for measuring periodic electric energy after every reset This unit resets the electric energy for each period and then integrates the electric energy. How to use it is shown below.

- (a) Check that Periodic electric energy measurement flag (Yn1/Yn2) is OFF and that Periodic electric energy reset request (Yn3/Yn4) is OFF.
- (b) Set Periodic electric energy reset request (Yn3/Yn4) to ON. The specified periodic electric energy is reset to 0 kWh, and Periodic electric energy reset completion flag (Xn3/Xn4) will be turned ON.
- (c) Check that Periodic electric energy reset completion flag (Xn3/Xn4) has become ON, and then set Periodic electric energy reset request (Yn3/Yn4) to OFF.
 - Periodic electric energy reset completion flag (Xn3/Xn4) will be turned OFF.
- (d) When starting measurement, set Periodic electric energy measurement flag (Yn1/Yn2) to ON.

This module starts measuring the specified periodic electric energy, and Periodic electric energy data completion flag (Xn1/Xn2) will be turned OFF.

(e) When stopping measurement, set Periodic electric energy measurement flag (Yn1/Yn2) to OFF.

This module stops measuring the specified periodic electric energy, and Periodic electric energy data completion flag (Xn1/Xn2) will be turned ON.

(f) Check that Periodic electric energy data completion flag (Xn1/Xn2) becomes ON, and obtain the value of periodic electric energy.

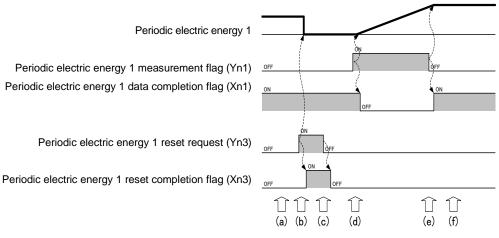


Figure 4.2.2-4 Example of measurement of periodic electric energy after every reset

4.2.3 Max./min. value hold function

It memorizes the max./min. value for each measured item, and retains it until the max./min. value clear is performed.

- (1) Max./min. value memory
 - 1) It memorizes the max. and min. values for the following measured item.
 - Current demand
 - Voltage
 - Electric power demand
 - Power factor
 - 2) It memorizes the date and time of occurrence (year/month/day/hour/minute/second/day of the week) together with the max. and min. values.
 - 3) The max. and min. values and the date of occurrence are stored in the nonvolatile memory, so that these values can be retained even at a power source reset.
- (2) How to clear the max. and min. values
 - 1) You can use the I/O signal to clear the max. and min. values.
 - 2) The max. and min. values immediately after the clear will be the present values and the date of occurrence will be the present date and time.
 - 3) The following describes how to clear the max. and min. values.
 - (a) Check that Max./min. values clear request (YnD) is OFF.
 - (b) Set Max./min. values clear request (YnD) to ON.
 - This module clears all the max./min. values and the date of occurrence, and changes Max./min. values clear completion flag (XnD) to ON.
 - (c) Check that Max./min. values clear completion flag (XnD) is ON, and then set Max./min. values clear request (YnD) to OFF.Max./min. values clear completion flag (XnD) will be turned OFF.

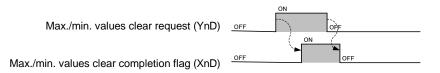


Figure 4.2.3-1 Procedure for clearing max./min. value

4.2.4 Upper/lower limit alarm monitoring function

You can set an upper and lower limit alarm for maximum two points and implement a monitoring function for them. During the alarm monitoring, it can monitor the input signal to check for the occurrence.

(1) Setting the upper/lower limit alarm monitoring

Items set in the buffer memory	Setting range	Description
Alarm item (Un¥G11/Un¥G21)	 0: No monitoring 1: Current demand upper limit 2: Current demand lower limit 3: Voltage upper limit 4: Voltage lower limit 5: Power demand upper limit 6: Power demand lower limit 7: Power factor upper limit 8: Power factor lower limit 	For respective alarm 1 and alarm 2, set the measuring item and either upper or lower limit for monitoring target.
Alarm value (Un¥G12,13 /Un¥G22,23)	-2147483648 to 2147483647 [Unit] Current:×10 ⁻³ A Voltage:×10 ⁻³ V Power:×10 ⁻³ kW PF:×10 ⁻³ %	The value to be monitored for the alarm. Set the value according to the unit of the measuring item that is set as an alarm monitoring item. (Double words)
Alarm reset method (Un¥G14/Un¥G24)	0: Self-retention 1: Auto reset	Set whether or not the alarm-occurrence condition should be retained if the value goes below the upper limit alarm value or goes over the lower limit alarm value after the upper/lower limit alarm occurred.
Alarm delay time (Un¥G15/Un¥G25)	0 to 300 [Unit] second	If it exceeds the upper limit alarm value or if it goes below the lower limit alarm value, and the situation continues for the period of the alarm delay time, then it is considered as an alarm occurrence.

1) Setting items and setting range for the alarm monitoring are described below.

- 2) Setting procedures are as follows:
 - (a) Check that Operating condition setting request (Yn9) is OFF.
 - (b) Set the alarm item in the buffer memory (Un¥G11/Un¥G21), alarm value (Un¥G12,13 /Un¥G22,23), alarm reset method (Un¥G14/Un¥G24), and alarm delay time (Un¥G15/Un¥G25). For the address of buffer memory corresponding the alarm1 and alarm2, refer to Chapter 6.
 - (c) Set Operating condition setting request (Yn9) to ON. Operation starts at each set value, and then, Operating condition setting completion flag (Xn9) is turned ON.
 - (d) Check that Operating condition setting completion flag (Xn9) becomes ON, and then set Operating condition setting request (Yn9) to OFF. Operating condition setting completion flag (Xn9) will be turned OFF.



erating condition setting completion hag (XH3)

Figure 4.2.4-1 Time chart of alarm monitoring setting

3) Each item of the alarm monitoring is stored in the nonvolatile memory, so that values can be retained even at a power source reset.

- (2) Behavior of the upper/lower limit alarm
 - When the alarm reset method is in the "self-retention" setting (example of an upper limit monitoring at alarm 1)
 - (a) If the measured value that was set with the alarm 1 monitoring item exceeds the upper limit and the situation continues and remains for the alarm 1 delay time, Alarm 1 flag (XnA) will turn ON. At the same time, ALM1 LED flashes.
 - (b) Even if the measured value goes below the upper limit, Alarm 1 flag (XnA) retains an ON status (self retention). During the self-retention, ALM1 LED is turned on.
 - (c) By turning Alarm 1 reset request (YnA) to ON, Alarm 1 flag (XnA) will turn OFF. At this time, ALM1 LED is turned off.
 - (d) Check that Alarm 1 flag (XnA) becomes OFF, and then set Alarm 1 reset request (YnA) to OFF.

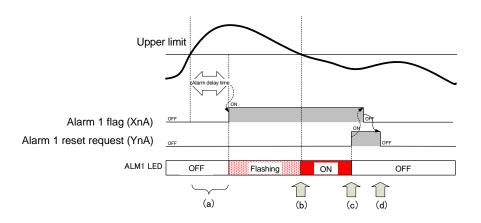


Figure 4.2.4-2 Time chart of the upper/lower limit alarm (alarm reset method = "self-retention")

- 2)When the alarm reset method is in the "auto reset" setting (example of an upper limit monitoring at alarm 1)
 - (a) If the measured value that was set with the alarm 1 item exceeds the upper limit and the situation continues and remains for the alarm 1 delay time, Alarm 1 flag (XnA) will turn ON. At the same time, ALM1 LED flashes.
 - (b) If the measured value goes below the upper limit, Alarm 1 flag (XnA) will turn OFF. At this time, ALM1 LED is turned off.
 - (c) If the measured value that was set with the alarm 1 monitoring item exceeds the upper limit but goes below the upper limit within the alarm 1 delay time, then Alarm 1 flag (XnA) will remain in the OFF status.

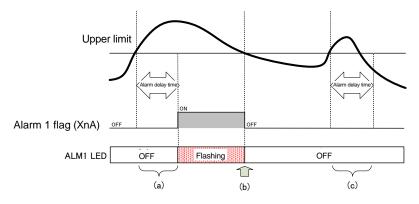


Figure 4.2.4-3 Time chart of the upper/lower limit alarm (alarm reset method = "auto-reset")

3) An example of the alarm 1 was indicated in 1) and 2) above. The alarm 2 will be in accordance with the same behavior.

For the setting items for the buffer memory that corresponds to the alarm 2 and the I/O signals, refer to Chapters 5 and 6. The following describes a case with the alarm 2.

[When the alarm reset method is in the "auto reset" setting (Example of a lower limit monitoring at alarm 2)]

- (a) If the measured value that was set with the alarm 2 item goes below the lower limit and the situation continues and remains for the alarm 2 delay time, Alarm 2 flag (XnB) will turn ON. At the same time, ALM2 LED flashes.
- (b) If the measured value exceeds the lower limit, Alarm 2 flag (XnB) will turn OFF. At this time, ALM2 LED is turned off.
- (c) If the measured value that was set with the alarm 2 monitoring item goes below the lower limit but exceeds the lower limit within the alarm 2 delay time, then Alarm 2 flag (XnB) will remain in the OFF status.

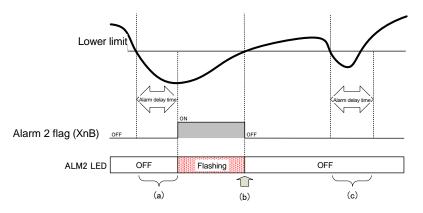
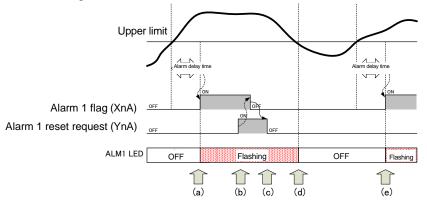
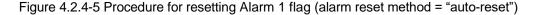


Figure 4.2.4-4 Time chart of the upper/lower limit alarm (alarm reset method = "auto-reset")

(3) How to reset Alarm flag

- 1)When Alarm flag is ON during the alarm occurrence or the self-retention (in the case of the alarm reset method = "self-retention"), Alarm flag can be reset (turned OFF) using Alarm reset request.
- 2) How to reset Alarm flag during alarm occurrence (example of the upper limit alarm monitoring with the alarm 1)
 - (a) If the measured value that was set with the alarm 1 item exceeds the upper limit, Alarm 1 flag (XnA) will turn ON. At the same time, ALM1 LED flashes.
 - (b) By turning Alarm 1 reset request (YnA) to ON, Alarm 1 flag (XnA) will turn OFF. At this time, ALM1 LED will remain flashing (because ALM1 LED is synchronized with the alarm status, it will not turn off).
 - (c) Check that Alarm 1 flag (XnA) becomes OFF, and then set Alarm 1 reset request (YnA) to OFF.
 - (d) If the measured value goes below the upper limit, ALM1 LED will turn off.
 - (e) After that, if the measured value exceeds the upper limit, Alarm 1 flag (XnA) will turn ON again. At the same time, ALM1 LED flashes.





3) How to reset Alarm flag during self-retention (in the case the alarm reset method = "self-retention" only)

Refer to the procedure described in (2) 1).

(4) Precautions during the alarm monitoring

- 1) When current demand time and electric power demand time are set to anytime except 0 second, current demand and electric power demand become lower than the actual values (closer to 0) immediately after the power source ON and the CPU reset. When current demand and electric power demand are being monitored for their lower limit, the alarm occurrence flag may turn ON. Thus, to avoid this from happening, follow the procedure below.
 - (a) Set the alarm monitoring target to "no monitoring" immediately after the power source ON and the CPU reset.
 - (b) After passing for a 3-times longer period than the demand time, set the alarm monitoring target again, and start the alarm monitoring.

4.2.5 Test function

This function is to output pseudo-fixed value to a buffer memory for debugging sequence program. The value can be output to the buffer memory without input of voltage and current.

- (1) How to use the test function
 - 1) Using the intelligent function module switch setting, you can start the test mode to output the fixed value.
 - 2) For procedure for the intelligent function module switch setting.For GX Works2, refer to 7.6.2.For GX Developer, refer to 7.7.2.
 - To finish the test mode, the set value is returned by the intelligent function module switch setting, and after that, it enters to a measuring mode by resetting it. (It resumes with the previous set value, electric energy and periodic electric energy.)
- (2) Content of fixed-output

For the value to be output to the buffer memory, refer to Table 6.1-1 to 6.1-3 in 6.1 Buffer memory assignment.

- (3) LED display when using the test function All LED lights.
- (4) I/O signals when using the test function

Unit READY (Xn0) only ON. Other input and output signals are all OFF.

(5) Precautions for using the test function

Because fixed-output is output to the buffer memory, isolate the actual device to avoid unexpected operation before running the sequence program.

4.2.6 Integrated value set function

This is a function that can set the integrated value (electric energy (consumption, regeneration), reactive energy (consumption lag)) to an arbitrary value. It is used to clear integrated value.

(1) Setting procedure

(a) Set the integrated value setting target in the buffer memory. Setting range is as follows:

Setting value	Description	
0	No set	
1	Electric energy (consumption)	
2	Electric energy (regeneration)	
3	Reactive energy (consumption lag)	

- (b) Set the integrated value setting value in the buffer memory.
 - Configurable range: 0 to 999999999
 - The unit used for the setting value is the same as that used for the electric energy and reactive energy that are output to the buffer memory. For details, refer to section 6.3.2.
- (c) Turn Integrated value set request (YnC) from OFF to ON to enable the setting.
 - Integrated value set completion flag (XnC) turns ON after Integrated value set request (YnC) is set OFF to ON.
- (d) After checking that integrated value set completion flag (XnC) turns ON and setting is completed, set the integrated value set request (YnC) to OFF.

After detected that the integrated value set request (YnC) turns OFF, the integrated value set completion flag (XnC) turns OFF.

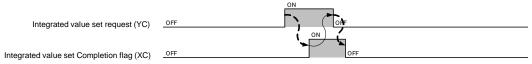


Figure 4.2.6 Integrated value setting procedure

(2) Default value

Integrated value setting target (Un\G51) is set to 0 (No set). Integrated value setting value (Un\G52, Un\G53) is set to 0.

Chapter 5: I/O signals to CPU module

5.1 List of I/O signals

I/O signals of QE81WH are listed in Table 5.1-1

Input signal	(signal direction from QE81WH to CPU	LIST OF I/O SIGI Output sigi	nal (signal direction from CPU module to	
	module)	QE81WH)		
Device #	Signal name	Device #	Signal name	
Xn0	Module ready	Yn0	Use prohibited *1	
Xn1	Periodic electric energy 1 data completion flag	Yn1	Periodic electric energy 1 measurement flag	
Xn2	Periodic electric energy 2 data completion flag	Yn2	Periodic electric energy 2 measurement	
Xn3	Periodic electric energy 1 reset completion flag	Yn3	Periodic electric energy 1 reset request	
Xn4	Periodic electric energy 2 reset completion flag	Yn4	Periodic electric energy 2 reset request	
Xn5	Use prohibited *1	Yn5	Use prohibited *1	
Xn6	Use prohibited *1	Yn6	Use prohibited *1	
Xn7	Use prohibited *1	Yn7	Use prohibited *1	
Xn8	Data acquisition clock	Yn8	Use prohibited *1	
Xn9	Operating condition setting completion flag	Yn9	Operating condition setting request	
XnA	Alarm 1 flag	YnA	Alarm 1 reset request	
XnB	Alarm 2 flag	YnB	Alarm 2 reset request	
XnC	Integrated value set completion flag	YnC	Integrated value set request	
XnD	Max./min. values clear completion flag	YnD	Max./min. values clear request	
XnE	Use prohibited ^{*1}	YnE	Use prohibited ^{*1}	
XnF	Error flag	YnF	Error clear request	

Table 5.1-1 List of I/O signals

Point

*1 These signals cannot be used by the user since they are for system use only. If these are set to on or off by the sequence program, the performance of the QE81WH cannot be guaranteed.

5.2 Details of I/O signals

Detailed explanation about I/O signals of QE81WH is provided as follows:

- 5.2.1 Input signals
 - (1) Module ready (Xn0)
 - (a) When the power of CPU module is turned on or the CPU module reset is performed, it will turn ON as soon as the measurement is ready.
 - (b)This signal (Xn0) is turned OFF when energy measuring module displays a hardware error, and RUN LED is turned off.
 - (2) Periodic electric energy 1 data completion flag (Xn1)
 - (a) When Periodic electric energy 1 measurement flag (Yn1) is turned OFF and calculation of the periodic electric energy 1 is stopped, then this signal (Xn1) turns ON. While calculating the periodic electric energy 1, this signal (Xn1) turns OFF.
 - (b) In order to acquire the data under the condition where the periodic electric energy 1 is checked after the accumulation of the periodic electric energy is stopped, obtain the data while this signal (Xn1) is ON.

*For specific usage procedures, refer to section 4.2.2.

- (3) Periodic electric energy 2 data completion flag (Xn2)
 The usage procedure is the same as Periodic electric energy 1 data completion flag (Xn1).
 Refer to (2).
- (4) Periodic electric energy 1 reset completion flag (Xn3)
 - (a) When Periodic electric energy 1 reset request (Yn3) is turned ON, and the periodic electric energy 1 that is stored in the buffer memory is reset, then this signal (Xn3) turns ON.
 - (b) When the period electric energy 1 reset request (Yn3) is set to OFF, this signal (Xn3) is turned OFF.

*For specific usage procedures, refer to section 4.2.2.

- (5) Periodic electric energy 2 reset completion flag (Xn4)
 The usage procedure is the same as Periodic electric energy 1 reset completion flag (Xn3).
 Refer to (4).
- (6) Data acquisition clock (Xn8)
 - (a) When the power is supplied to the CPU module and immediately after the initial computation is performed, this signal (Xn8) is turned ON and count of the output period of data acquisition clock is started. After that, this signal turns ON at the timing when the measurement data is completely written into the buffer memory after the elapse of the output period of data acquisition clock.

If the settings of the phase wire system, primary voltage, primary current, primary voltage of VT, secondary voltage of VT, primary current of CT and output period of data acquisition clock are changed, this signal turns ON immediately after the change of the settings and count of the output period of data acquisition clock is started.

(b) This signal (Xn8) turns OFF 150 ms after it turns ON.

- (7) Operating condition setting completion flag (Xn9)
 - (a) When turning Operating condition setting request (Yn9) to ON and changing the following settings, this signal (Xn9) turns ON.
 - Phase wire system (Un¥G0)
 - Primary voltage (Un¥G1)
 - Primary current (Un¥G2)
 - Primary voltage of VT (Un¥G5)
 - Secondary voltage of VT (Un¥G6)
 - Primary current of CT (Un¥G7)
 - Current demand time (Un¥G3)
 - Electric power demand time (Un¥G4)
 - Alarm 1 item (Un¥G11)
 - Alarm 1 value (Un¥G12, 13)
 - Alarm 1 reset method (Un¥G14)
 - Alarm 1 delay time (Un¥G15)
 - Alarm 2 item (Un¥G21)
 - Alarm 2 value (Un¥G22, 23)
 - Alarm 2 reset method (Un¥G24)
 - Alarm 2 delay time (Un¥G25)
 - output period of data acquisition clock (Un¥G60,61)
 - (b) When Operating condition setting request (Yn9) is OFF, this signal (Xn9) turns OFF.
- (8) Alarm 1 flag (XnA)
 - (a) If the measured value of the alarm 1 item (Un¥G11) exceeds the upper limit (in the case of the lower alarm, it goes under the lower limit), and if the situation continues and passes the alarm 1 delay time (Un¥G15), then this signal (XnA) turns ON.
 - (b) Operations after this signal (XnA) is turned ON are different depending on the setting of the alarm 1 reset method (Un¥G14).
 - [When the alarm 1 reset method (Un¥G14) is "auto reset"]

If the measured value of the alarm 1 monitoring target becomes below the upper limit (in the case of lower limit alarm, it exceeds the lower limit), then this signal (XnA) turns OFF.

[When the alarm 1 reset method (Un¥G14) is "self retention"]

Even if the measured value of the alarm 1 monitoring target becomes below the upper limit (in the case of lower limit alarm, it exceeds the lower limit), this signal (XnA) retains ON. Then, when Alarm 1 reset request (YnA) is turned to ON, this signal (XnA) turns OFF.

(c) When the measured value of the alarm 1 monitoring target is set to "not monitoring", this signal (XnA) turns OFF.

*For the actual behavior of alarm monitoring, refer to 4.2.4.

(9) Alarm 2 flag (XnB)

The usage procedure is the same as Alarm 1 flag (XnA). Refer to (8).

- (10) Integrated value set completion flag (XnC)
 - (a) When Integrated value set request (YnC) is turned ON, and preset of each integrated value such as electric energy (consumption), electric energy (regeneration), reactive energy (consumption delay) is completed, this signal (XnC) turns ON.
 - (b) When Integrated value set request (YnC) is turned OFF, this signal (XnC) turns OFF.
- (11)Max./min. values clear completion flag (XnD)
 - (a) When Max./min. values clear request (YnD) is turned ON and the data of max./min. value (maximum value, minimum value and their date and time of occurrence) are cleared, this signal (XnD) turns ON.
 - (b) When Max./min. values clear request (YnD) is turned OFF, this signal (XnD) turns OFF.

(12) Error flag (XnF)

- (a) If an outside-set-value error occurs, and if a hardware error occurs, this signal (XnF) turns ON.
- (b) The description of the occurred error can be checked with a latest error code (Un¥G3000). * For description of error codes, refer to section 9.1.
- (c) If an outside-set-value error occurs, this signal (XnF) is turned OFF by setting a value within the range again.

5.2.2 Output signals

- (1) Periodic electric energy 1 measurement flag (Yn1)
 - (a) When switching this signal (Yn1) from the ON status to the OFF status, the periodic electric energy 1 is measured, and will be stored into the buffer memory.
 - (b) When this signal (Yn1) is turned OFF, Periodic electric energy 1 data completion flag (Xn1) is turns ON at the time that the periodic electric energy 1 is checked for that period, and then the periodic electric energy 1 is retained.
 - (c) In order to read the checked data of the periodic electric energy 1, using the sequence program, use Periodic electric energy 1 data completion flag (Xn1) as the interlock condition.

*For specific usage procedures, refer to section 4.2.2.

(2) Periodic electric energy 2 measurement flag (Yn2)

The usage procedure is the same as that of Periodic electric energy 1 measurement flag (Yn1). Refer to (1).

- (3) Periodic electric energy 1 reset request (Yn3)
 - (a) When this request (Yn3) is turned ON from the OFF status, Periodic electric energy 1 reset completion flag (Xn3) turns ON, and the periodic electric energy 1 that has been stored in the buffer memory is reset.
 - (b) Regardless of the status of Periodic electric energy 1 measurement flag (Yn1), either OFF or ON, the periodic electric energy can be reset using this request (Yn3). When Periodic electric energy 1 measurement flag (Yn1) is ON, and the measurement is taking place, the measurement will resume immediately after the reset.
 - (c) When this request (Yn3) is set to OFF, Periodic electric energy 1 reset completion flag (Xn3) turns OFF.

*For specific usage procedures, refer to section 4.2.2.

(4) Periodic electric energy 2 reset request (Yn4)

The usage procedure is the same as that of Periodic electric energy 1 reset request (Yn3). Refer to (3).

- (5) Operating condition setting request (Yn9)
 - (a) When switching this request (Yn9) from the OFF status to the ON status, the following operating conditions will be set.
 - Phase wire system (Un¥G0)
 - Primary voltage (Un¥G1)
 - Primary current (Un¥G2)
 - Current demand time (Un¥G3)
 - Electric power demand time (Un¥G4)
 - Primary voltage of VT (Un¥G5)
 - Secondary voltage of VT (Un¥G6)
 - Primary current of CT (Un¥G7)
 - Alarm 1 item (Un¥G11)
 - Alarm 1 value (Un¥G12, 13)
 - Alarm 1 reset method (Un¥G14)
 - Alarm 1 delay time (Un¥G15)
 - Alarm 2 item (Un¥G21)
 - Alarm 2 value (Un¥G22, 23)
 - Alarm 2 reset method (Un¥G24)
 - Alarm 2 delay time (Un¥G25)
 - output period of data acquisition clock (Un¥G60,61)
 - (b) When the operating condition setting is completed, Operating condition setting completion flag (Xn9) turns ON.
 - (c) When this request (Yn9) is turned OFF, Operating condition setting completion flag (Xn9) turns OFF.
- (6) Alarm 1 reset request (YnA)
 - (a) When Alarm 1 flag (XnA) is reset, this request (YnA) turns ON.
 - (b) When this request (XnA) is switched from the OFF status to the ON status, Alarm 1 flag (XnA) will forcibly be turned OFF regardless of the present alarm occurrence status.
 - (c) Confirm that the alarm 1 occurrence flag (XnA) is turned OFF, then set this signal (YnA) to OFF.
- (7) Alarm 2 reset request (YnB)

The usage procedure is the same as that of Alarm 1 reset request (YnA). Refer to (6).

- (8) Integrated value set request (YnC)
 - (a) If you want to set the measured values of electric energy (consumption, regeneration) and reactive electric energy to arbitrary values, you use this signal (YnC).
 - (b) After writing the integrated value set target (Un¥G51) and integrated value set value (Un¥G52,53), set this signal (YnC) from OFF to ON to set the integrated value. When the integrated value setting is completed, Integrated value set completion flag (XnC) turns ON.
 - (c) When this request (YnC) is set to OFF, Integrated value set completion flag (XnC) turns OFF.

- (9) Max./min. values clear request (YnD)
 - (a) When the max./min. value data (max./min. value and their date/time of occurrence) is reset, this request (YnD) turns ON.
 - (b) When switching this request (YnD) from the OFF status to the ON status, the max./min. value data will be cleared. When clearing the max./min. data is completed, Max./min. values clear completion flag (XnD) turns ON.
- (10) Error clear request (YnF)
 - (a) When switching this request (YnF) from the OFF status to the ON status while an outside-set-value error is present, Error flag (XnF) turns OFF, and the latest error code in the buffer memory (Un¥G3000) will be cleared.
 - (b) At the same time as clearing the error above, the value that was set in the buffer memory below will be replaced with the previously set value, and Integrated value setting target (Un¥G51) and Integrated value setting value (Un¥G52, 53) will be changed to 0.

[Set value to be replaced with the previously set value]

- Phase wire system (Un¥G0)
- Primary voltage (Un¥G1)
- Primary current (Un¥G2)
- Current demand time (Un¥G3)
- Electric power demand time (Un¥G4)
- Primary voltage of VT (Un¥G5)
- Secondary voltage of VT (Un¥G6)
- Primary current of CT (Un¥G7)
- Alarm 1 item (Un¥G11)
- Alarm 1 value (Un¥G12, 13)
- Alarm 1 reset method (Un¥G14)
- Alarm 1 delay time (Un¥G15)
- Alarm 2 item (Un¥G21)
- Alarm 2 value (Un¥G22, 23)
- Alarm 2 reset method (Un¥G24)
- Alarm 2 delay time (Un¥G25)
- output period of data acquisition clock (Un¥G60,61)
- (c) While a hardware error is present (error code: 0000H to 0FFFH), it will not be cleared even if this signal (YnF) turns ON.

Chapter 6: Buffer memory

6.1 Buffer memory assignment

The following describes buffer memory assignment.

Point

In the buffer memory, do not write data to the "system area" or area where data writing data from sequence programs is disabled. Doing so may cause malfunction.

(1) Configurable sections (Un¥G0 to Un¥G99)

Item	Address (Decimal)	Data Type	Description	Default value	R/W	Back up*1	Output value during the test mode* ²
Setting value	0	Pr	Phase wire system	3	R/W	0	3
	1	Pr	Primary voltage	2	R/W	0	2
	2	Pr	Primary current	2	R/W	0	2
	3	Pr	Current demand time	120	R/W	0	120
	4	Pr	Electric power demand time	120	R/W	0	120
	5	Pr	Primary voltage of VT	0	R/W	0	0
	6	Pr	Secondary voltage of VT	0	R/W	0	0
	7	Pr	Primary current of CT	0	R/W	0	0
	8 to 10	-	System area	-	-	-	-
	11	Pr	Alarm 1 item	0	R/W	0	5
	12 13	Pr	Alarm 1 value	0	R/W	0	1000
	14	Pr	Alarm 1 reset method	0	R/W	0	0
	15	Pr	Alarm 1 delay time	0	R/W	0	5
	16 to 20	-	System area	-	-	-	-
	21	Pr	Alarm 2 item	0	R/W	0	6
	22 23	Pr	Alarm 2 value	0	R/W	0	-1000
	24	Pr	Alarm 2 reset method	0	R/W	0	1
	25	Pr	Alarm 2 delay time	0	R/W	0	300
	26 to 50	-	System area	-	-	-	-
	51	Pr	Integrated value setting target	0	W	×	0
	52 53	Pr	Integrated value setting value	0	W	×	0
	54 to 59	-	System area	-	-	-	-
	60 61	Pr	Output period of data acquisition clock	0	R/W	0	0
	62 to 99	-	System area	-	-	-	-

Table 6.1-1 Configurable sections (Un¥G0 to Un¥G99)

*1 Even if the power failure is restored, data is held because data is backed up by the nonvolatile memory. *2 For the procedure for using the test mode, refer to section 4.2.5.

(2) Measurement sections (Un¥G100 to Un¥G2999)

ltem	Address (Decimal)	Data Type	Description	Default value	R/W	Back up*1	Output value during the test mode* ²
Electric energy	100	Md	Multiplier of electric energy and reactive energy	-4	R	×	-4
	101	-	System area	-	-	-	-
	102 103	Md	Electric energy (consumption)	0	R	0	123456789
	104 105	Md	Electric energy (regeneration)	0	R	0	234567890
	106 107	Md	Reactive energy (consumption lag)	0	R	0	345678901
	108 to 113	-	System area	-	-	-	-
	114 115	Md	Periodic electric energy 1	0	R	0	789012345
	116 117	Md	Periodic electric energy 2	0	R	0	890123456
	118 to 199	-	System area	-	-	-	-
Current	200	Md	Multiplier of current	-3	R	×	-3
	201	-	System area	-	-	-	-
	202 203	Md	1-phase current	0	R	×	10100
	204 205	Md	2-phase current	0	R	×	10200
206 207		Md	3-phase current	0	R	×	10300
	208	-	System area	-	-	-	-
	209 210 211	- Md	System area 1-phase current demand	- 0	- R	- ×	- 11100
	212 213	Md	2-phase current demand	0	R	×	11200
	214 215	Md	3-phase current demand	0	R	×	11300
	216	-	System area	-	-	-	-
	217 218 219	- Md	System area Average current	0	R	×	- 10400
	220 221	Md	Maximum current demand	0	R	0	10500
	222	Md	Year of time of max. current demand	*3	R	0	2011H
	223	Md	Month and day of time of max. current demand	*3	R	0	0102H
	224	Md	Hour and minute of time of max. current demand	*3	R	0	0304H
	225	Md	Second and day of the week of time of max. current demand	*3	R	0	0501H
	226 227	Md	Minimum current demand Year of time of min. current	*3	R	0	10600
	228	Md	demand Month and day of time of min.	*3	R	0	2012H
	229	Md	current demand	*3	R	0	0203H
			Hour and minute of time of min				
	230 231	Md Md	Hour and minute of time of min. current demand Second and day of the week of	*3	R R	0	0405H 0602H

Table 6.1-2 Measurement sections (Un¥G100 to Un¥G2999) 1/3

*1 Even if the power failure is restored, data is held because data is backed up by the nonvolatile memory.

*2 For the procedure for using the test mode, refer to section 4.2.5.

*3 The data becomes value at power on.

	Table		urement sections (Un¥G100	10 011+02	.555) 2/5		
Item	Address (Decimal)	Data Type	Description	Default value	R/W	Back up*1	Output value during the test mode* ²
Voltage	300	Md	Multiplier of voltage	-3	R	×	-3
Voltage	301	-	System area	-	-	-	-
	302 303	Md	1 - 2 line voltage	0	R	×	20100
	304 305	Md	2 - 3 line voltage	0	R	×	20200
	306 307	Md	3 - 1 line voltage	0	R	×	20300
	308 to 313	-	System area	-	-	-	-
	314 315	Md	Average voltage	0	R	×	20400
	316 to 319	-	System area	-	-	-	-
	320 321	Md	Maximum voltage	0	R	0	20500
	322	Md	Year of time of max. voltage	*3	R	0	2013H
	323	Md	Month and day of time of max. voltage	*3	R	0	0304H
	324	Md	Hour and minute of time of max. voltage	*3	R	0	0506H
	325	Md	Second and day of the week of time of max. voltage	*3	R	0	0703H
	326 327	Md	Minimum voltage	*3	R	0	20600
	328	Md	Year of time of min. voltage	*3	R	0	2014H
	329	Md	Month and day of time of min. voltage	*3	R	0	0405H
330		Md	Hour and minute of time of min. voltage	*3	R	0	0607H
	331	Md	Second and day of the week of time of min. voltage	*3	R	0	0804H
	332 to 399	-	System area	-	-	-	-
Electric power	400	Md	Multiplier of electric power	-3	R	×	-3
	401 402	- Md	System area Electric power	- 0	- R	- ×	- 30100
	403 404 405	Md	Electric power demand	0	R	×	30200
	405 406 to 419	-	System area	-	-	-	-
	420		Maximum value of electric power			-	_
	420	Md	demand Year of time of max. electric	0	R	0	30300
	422	Md	power demand	*3	R	0	2015H
	423	Md	Month and day of time of max. electric power demand	*3	R	0	0506H
	424	Md	Hour and minute of time of max. electric power demand	*3	R	0	0708H
	425	Md	Second and day of the week of time of max. electric power demand	*3	R	0	0905H
	426 427	Md	Minimum value of electric power demand	*3	R	0	30400
	428	Md	Year of time of min. electric power demand	*3	R	0	2016H
	429	Md	Month and day of time of min. electric power demand	*3	R	0	0607H
	430	Md	Hour and minute of time of min. electric power demand	*3	R	0	0809H
	431	Md	Second and day of the week of time of min. electric power demand	*3	R	0	1005H
	432 to 499	-	System area	-	-	-	-
			d data ia hald haaayaa data				

Table 6.1-2 Measurement sections (Un¥G100 to Un¥G2999) 2/3

*1 Even if the power failure is restored, data is held because data is backed up by the nonvolatile memory. *2 For the procedure for using the test mode, refer to section 4.2.5.

*3 The data becomes value at power on.

ltem	Address (Decimal)	Data Type	Description	Default value	R/W	Back up*1	Output value during the test mode* ²
Reactive	500	Md	Multiplier of reactive power	-3	R	×	-3
power	501	-	System area	-	-	-	-
	502 503	Md	Reactive power	0	R	×	40100
	504 to 699	-	System area	-	-	-	-
Power factor	700	Md	Multiplier of power factor	-3	R	×	-3
	701	-	System area	-	-	-	-
	702 703	Md	Power factor	0	R	×	50100
	704 to 719	-	System area	-	-	-	-
	720 721	Md	Maximum power factor	0	R	0	50200
	722 Md		Year of time of max. power factor	*3	R	0	2017H
	723	Md	Month and day of time of max. power factor	*3	R	0	0708H
	724	Md	Hour and minute of time of max. power factor	*3	R	0	0910H
	725	Md	Second and day of the week of time of max. power factor	*3	R	0	1106H
	726 727	Md	Minimum power factor	*3	R	0	50300
	728	Md	Year of time of min. power factor	*3	R	0	2018H
	729	Md	Month and day of time of min. power factor	*3	R	0	0809H
	730	Md	Hour and minute of time of min. power factor	*3	R	0	1011H
731		Md	Second and day of the week of time of min. power factor	*3	R	0	1200H
	732 to 799	-	System area	-	-	-	-
Frequency	800	Md	Multiplier of frequency	-3	R	×	-3
	801	-	System area	-	-	-	-
	802 803	Md	Frequency	0	R	×	60100
	804 to 2999	-	System area	-	-	-	-

Table 6.1-2 Measurement sections (Un¥G100 to Un¥G2999) 3/3

*1 Even if the power failure is restored, data is held because data is backed up by the nonvolatile memory.

*2 For the procedure for using the test mode, refer to section 4.2.5.

*3 The data becomes value at power on.

(3) Common sections (Un¥G3000 to Un¥G4999)

Table 6.1-3 Common sections (Un¥G3000 to Un¥G4999)							
Item	Address (Decimal)	Data Type	Description	Default value	R/W	Back up* ¹	Output value during the test mode* ²
Error	3000	-	Latest error code	0	R	0	1
	3001	-	Year of time of error	0	R	0	2019H
	3002	-	Month and day of time of error	0	R	0	0910H
	3003	-	Hour and minute of time of error	0	R	0	1112H
	3004 -		Second and day of the week of time of error	0	R	0	1301H
	3005 to 4999	-	System area	-	-	-	-

Table 6.1-3 Common sections (Un¥G3000 to Un¥G4999)

*1 Even if the power failure is restored, data is held because data is backed up by the nonvolatile memory.

 $^{\ast}2$ For the procedure for using the test mode, refer to section 4.2.5.

6 Buffer memory

6.2 Configurable sections (Un¥G0 to Un¥G99)

6.2.1 Phase wire system (Un¥G0)

Phase wire system for target electric circuits is configured below.

- (1) Setting procedure
 - (a) Set the phase wire in the buffer memory. Setting range is as follows:

Setting value	Description
1	single-phase 2-wire
2	single-phase 3-wire
3	three-phase 3-wire

- (b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting. (Refer to 5.2.2 (5).)
- (2) Default value

It is set to a three-phase 3-wire (3).

6.2.2 Primary voltage (Un¥G1), Primary voltage of VT (Un¥G5), Secondary voltage of VT (Un¥G6)

• Primary voltage (Un\G1): set the primary voltage of the target electric circuit.

- Primary voltage of VT (Un\G5): when use for primary voltage of voltage transformer that is not in the primary voltage (Un\G1) setting, set the voltage of the primary side of voltage transformer.
- •Secondary voltage of VT (Un\G6): when use for primary voltage of voltage transformer that is not in the primary voltage (Un\G1) setting, set the voltage of the secondary side of voltage transformer.
- (1) Setting procedure
 - (a) Set the primary voltage, primary voltage of VT and secondary voltage of VT in the buffer memory. Setting range is as follows:

When set other than "1 to 9" the value of this setting, set to "0:any setting" this setting, and set primary / secondary voltage of VT (Un¥G5 / Un¥G6).

When the value of this setup is set as "1 to 9", primary/ secondary voltage of VT are disabled.

Prima	ry voltage (Un¥G1)	Primary voltage	Secondary voltage
Setting value	Description	of VT (Un\G5)	of VT (Un\G6)
0	Any setting	1 to 6600	1 to 220
1	110 V (Direct connection)		
2	220 V (Direct connection)		
3	220/110 V		
4	440/110 V	0 to 6600	0 to 220
5	690/110 V	(However, this setting is	(However, this setting is
6	1100/110 V	disabled)	disabled)
7	2200/110 V		
8	3300/110 V		
9	6600/110 V		

(b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting. (Refer to 5.2.2 (5).)

(2) Default value

Primary voltage (Un¥G1) is set to 220 V (2). Primary voltage of VT (Un¥G5) is set to 0. Secondary voltage of VT (Un¥G6) is set to 0.

6.2.3 Primary current (Un¥G2), primary current of CT (Un¥G7)

Primary current (Un¥G2): set the primary current of the target electric circuit.

- Primary current of CT (Un\G7): when use for primary current of current transformer that is not in the primary current (Un\G2) setting, set the current of the primary side of current transformer. Secondary current of CT cannot be set. Because secondary current of CT is fixed to 5A
- (1) Setting procedure
 - (a) Set the primary current and primary current of CT in the buffer memory. Setting range is as follows: Please choose the settings to match the current sensor to be used.

When set other than "1 to 5, 501 to 536" the value of this setting, set to "0: any setting" this setting, and set primary current of CT (Un¥G7).

Primary curre	ent (Un¥G2)	Primary current of CT	Current concer
Setting value	Description	(Un¥G7)	Current sensor
0	Any potting	1 to 6000	EMU2-CT5,
0	Any setting	1 10 0000	EMU-CT5-A
1	50 A		EMU-CT50,
1	50 A		EMU-CT50-A
2	100 A		EMU-CT100,
2	100 A		EMU-CT100-A
3	250 A		EMU-CT250,
3	250 A		EMU-CT250-A
4	400 A	0 to 6000	EMU-CT400,
4	400 A	(However, this setting is	EMU-CT400-A
5	600 A	disabled)	EMU-CT600,
5	000 A		EMU-CT600-A
501	5/5 A		
502	6/5 A		
503	7.5/5 A		EMU2-CT5,
504	8/5 A		EMU-CT5-A
505	10/5 A		

When the value of this setup is set as "1 to 5, 501 to 536", primary current of CT is disabled.

Primary curre	ent (Un¥G2)	Primary current of CT	
Setting value	Description	(Un¥G7)	Current sensor
506	12/5 A		
507	15/5 A		
508	20/5 A		
509	25/5 A		
510	30/5 A		
511	40/5 A		
512	50/5 A		
513	60/5 A		
514	75/5 A		
515	80/5 A		
516	100/5 A		
517	120/5 A		
518	150/5 A		
519	200/5 A		
520	250/5 A	0 to 6000	
521	300/5 A	(However, this setting is	EMU2-CT5, EMU-CT5-A
522	400/5 A	disabled)	EMO-CTS-A
523	500/5 A		
524	600/5 A		
525	750/5 A		
526	800/5 A		
527	1000/5 A		
528	1200/5 A		
529	1500/5 A		
530	1600/5 A		
531	2000/5 A		
532	2500/5 A		
533	3000/5 A		
534	4000/5 A		
535	5000/5 A		
536	6000/5 A		

- (b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting. (Refer to 5.2.2 (5).)
- (2) Default value

Primary current (Un\G2) is set to 100 A (2). Primary current of CT (Un¥G7) is set to 0.

6.2.4 Current demand time (Un¥G3)

Set a time duration for which the average fluctuation of current demand is measured from the measured current value.

If current demand time is set short, the response to change of current will be quick; however, the fluctuation range may be too large. Adjust the duration according to the load and purposes.

- (1) Setting procedure
 - (a) Set current demand time in the buffer memory.
 - Configurable range: 0 to 1800 (seconds)
 - Set the value in seconds.
 - If set to 0 seconds, current demand will be the same value as current.
 - (b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting. (Refer to 5.2.2 (5).)
- (2) Default value It is set to 120 seconds.
- 6.2.5 Electric power demand time (Un¥G4)

Set a time duration for which the average fluctuation of electric power demand is measured from the measured power value.

If electric power demand time is set short, the response to change of power will be quick; however, the fluctuation range may be too large. Adjust the duration according to the load and purposes.

- (1) Setting procedure
 - (a) Set electric power demand time in the buffer memory.
 - Configurable range: 0 to 1800 (seconds)
 - Set the value in seconds.
 - If set to 0 seconds, electric power demand will be the same value as electric power.
 - (b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting. (Refer to 5.2.2 (5).)
- (2) Default value

It is set to 120 seconds.

6.2.6 Alarm 1 item (Un¥G11), alarm 2 item (Un¥G21)

Set which measuring item will be monitored for the upper/lower limit alarm. Alarm 1 and 2 operate independently.

- (1) Setting procedure
 - (a) Set the item for alarm 1 and 2 in the buffer memory. Setting range is as follows:

Setting value	Description
0	No monitoring
1	Current demand upper limit
2	Current demand lower limit
3	Voltage upper limit
4	Voltage lower limit
5	Electric power demand upper limit
6	Electric power demand lower limit
7	Power factor upper limit
8	Power factor lower limit

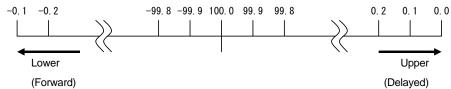
(b) Measuring items for the monitoring target are as follows:

Description	Meas	uring item of monitoring	target	
Description	single-phase 2-wire	single-phase 3-wire	three-phase 3-wire	
Current demand upper limit Current demand lower limit	1-phase current demand	1-phase current demand 3-phase current demand *1	1-phase current demand 2-phase current demand 3-phase current demand *1	
Voltage upper limit Voltage lower limit	1 - 2 line voltage	1 - 2 line voltage 2 - 3 line voltage *1	1 - 2 line voltage 2 - 3 line voltage 3 - 1 line voltage *1	
Electric power demand upper limit Electric power demand lower limit	Electric power demand			
Power factor upper limit Power factor lower limit	Power factor *2			

*1 When multiple number of measuring items are targeted for monitoring, the alarm judgment condition will be as following.

	Alarm judgment conditions	
Upper/lower limits	Condition for occurrence	Condition for
		non-occurrence
Current demand upper limit	Any one of alarm item	All alarm item go below the
Voltage upper limit	exceeds the alarm value.	alarm value.
Current demand lower limit	Any one of alarm item go	All alarm item exceeds the
Voltage lower limit	below the alarm value	alarm value





- (c) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting. (Refer to 5.2.2 (5).)
- (2) Default value

It is set to not monitoring (0).

6.2.7 Alarm 1 value (Un¥G12,13), alarm 2 value (Un¥G22, 23)

Set the upper/lower limit monitoring value for the target that was set in alarm 1 item and alarm 2 item.

- (1) Setting procedure
 - (a) Set the monitoring values for alarm 1 and 2 in the buffer memory.
 - Configurable range: -2147483648 to 2147483647
 - The unit of the setting value is the same as below which was used for the measuring value of the monitored target configured in alarm 1 item and alarm 2 item.

Alarm 1 item	Unit of alarm 1 value	
Alarm 2 item	and alarm 2 value	
Current demand upper limit		
Current demand lower limit	×10 ⁻³ A	
Voltage upper limit	×10⁻³ V	
Voltage lower limit		
Electric power demand upper limit	W	
Electric power demand lower limit	(×10 ⁻³ kW)	
Power factor upper limit	×10 ⁻³ %	
Power factor lower limit	×10°%	

(b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting.

(2) Default value

It is set to 0.

6.2.8 Alarm 1 reset method (Un¥G14), Alarm 2 reset method (Un¥G24)

Set the reset method of the alarm1 and alarm 2.

For differences in behavior of alarm monitoring for different reset methods, refer to 4.2.4 (2).

- (1) Setting procedure
 - (a) Set the reset method for alarm 1 and 2 in the buffer memory. Setting range is as follows:

Setting value	Description
0	Self-retention
1	Auto reset

- (b) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting.
- (2) Default value

It is set to self retention (0).

6.2.9 Alarm 1 delay time (Un¥G15), alarm 2 delay time (Un¥G25)

Set the alarm delay time for the alarm 1 and alarm 2.

Alarm delay time means a grace period that takes from the moment when it exceeds the upper limit or goes under the lower limit of the alarm 1 value or alarm 2 value until the alarm flag is turned ON. For detailed behavior, refer to 4.2.4 (2).

- (1) Setting procedure
 - (a) Set the delay time for alarm 1 and alarm 2 in the buffer memory.
 - Configurable range: 0 to 300 (seconds)
 - Set the value in seconds.
 - If set to 0 seconds, an alarm will occur when the alarm monitoring value is exceeded.
 - (b) Turn Operating condition setting request (Yn9) from OFF to ON to and enable the setting.
- (2) Default value

It is set to 0 seconds.

6.2.10 Set Integrated value setting target (Un¥G51) and Integrated value setting value (Un¥G52, 53)

Set the integrated value to any value.

- (1) Setting procedure
 - (a) Set the integrated value setting target in the buffer memory. Setting range is as follows:

Setting value	Description
0	No set
1	Electric energy (consumption)
2	Electric energy (regeneration)
3	Reactive energy (consumption lag)

- (b) Set the integrated value setting value in the buffer memory.
 - Configurable range: 0 to 999999999
 - The unit used for the setting value is the same as that used for the electric energy and reactive energy that are output to the buffer memory.
 For details, refer to section 6.3.2.
- (c) Turn Integrated value set request (YnC) from OFF to ON to enable* the setting.
- (d) After checking that integrated value set completion flag (XnC) turns ON and setting is completed, set the integrated value set request (YnC) to OFF.

After detected that the integrated value set request (YnC) turns OFF, the integrated value set completion flag (XnC) turns OFF.

Integrated value set request (YC)	OFF	
	OFF	ON OFF
Integrated value set Completion flag (XC)		

Figure 6.2.10 Integrated value setting procedure

(2) Default value

Integrated value setting target (Un\G51) is set to 0 (No set). Integrated value setting value (Un\G52, Un\G53) is set to 0. 6.2.11Output period of data acquisition clock (Un¥G60, 61)

Set the output period of Data acquisition clock (Xn8).

- (1) Setting procedure
 - (a) Set output period of data acquisition clock (Un¥G60, 61) in the buffer memory.
 - Configurable range: 0 to 86400000 (ms)
 - * When the output period of data acquisition clock is set to 0, Data acquisition clock (Xn8) is always OFF.
 - (b) Because the data update interval is 250 ms, Data acquisition clock (Xn8) runs every 250 ms. Note that the output period of data acquisition clock is not a multiple of 250 ms, Data acquisition clock turns ON at the time of the first data update after the elapse of the output period of data acquisition clock.

<Example> When the output period of data acquisition clock is 800 ms:

Measurement data update count = 800 ms/250 ms = quotient 3 + remainder 50 ms Thus, the input device (Xn8) turns ON once in every four times the measurement data is updated.

As a result, it is same as the case where the output period of data acquisition clock is 1000 ms.

(c) Turn Operating condition setting request (Yn9) from OFF to ON to enable the setting.

(2) Default value

It is set to 0 (ms).

6 Buffer memory

6.3 Measurement sections (Un¥G100 to Un¥G2999)

This product divides the measuring data into the Data and Multiplier, and output them to Buffer memory. Actual measuring data is obtained by the following formula.

Measuring data = Data \times 10ⁿ (Multiplier is n).

(Example)

The values output to the Buffer memory are as follows when total current is measured 123.456A. Data (Un¥G218, 219): 123456

Multiplier (Un¥G200): -3

The actual measuring data is obtained from the value of Buffer memory as follows.

Measuring data = Data \times 10⁻³ = 123.456 A

6.3.1 Multiplier of electric energy and reactive energy (Un¥G100)
 Multiplier of electric energy and reactive energy are stored.
 As to how the multiplier is determinate, refer to section 4.2.1 (3).

- (1) Details of stored data
 - (a) Storage format

Data are stored as 16-bit signed binary in the buffer memory.

- Data range: -5 to -1
- (b) Update timing

It will be updated when phase wire system (Un¥G0), primary voltage (Un¥G1), and primary current (Un¥G2), primary voltage of VT(Un¥G5), secondary voltage of VT(Un¥G6), primary current of CT(Un¥G7) are set.

- 6.3.2 Electric energy (consumption) (Un¥G102,103), electric energy (regeneration) (Un¥G104,105) Stores the electric energy of the consumption side and the regeneration side will be stored.
 - (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range: 0 to 999999999

When the stored data exceeds 999999999, stored data turns to 0 and continues measuring.

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

Unit can be determined by multiplier of electric energy and reactive energy (Un¥G100), as shown below.

Multiplier of electric energy and reactive energy (Un¥G100)	Unit
-5	×10 ⁻⁵ kWh
-4	×10 ⁻⁴ kWh
-3	×10 ⁻³ kWh
-2	×10 ⁻² kWh
-1	×10 ⁻¹ kWh

(c) Update timing

6.3.3 Reactive energy (consumption lag) (Un¥G106, 107)

Delayed consumption of the reactive energy is stored.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: 0 to 999999999

When the stored data exceeds 999999999, stored data turns to 0 and continues measuring.

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

Unit can be determined by the electric energy and the multiplier of the reactive energy (Un¥G100), as shown below.

Electric energy, multiplier of the reactive energy (Un¥G100)	Unit
-5	×10⁻⁵ kvarh
-4	×10 ⁻⁴ kvarh
-3	×10 ⁻³ kvarh
-2	×10 ⁻² kvarh
-1	×10 ⁻¹ kvarh

(c) Update timing

It will be updated every measuring cycle (250 ms).

6.3.4 Periodic electric energy 1 (Un¥G114, 115), periodic electric energy 2 (Un¥G116, 117)

Stores the periodic electric energy 1 and periodic electric energy 2. The periodic electric energy of the consumption side is measured.

For specific usage procedures for the periodic electric energy, refer to section 4.2.2.

- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range: 0 to 999999999

When the stored data exceeds 999999999, stored data turns to 0 and continues measuring.

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

Unit can be determined by the electric energy and the multiplier of the reactive energy (Un¥G100), as shown below.

Electric energy, multiplier of the reactive energy (Un¥G100)	Unit
-5	×10⁻⁵ kWh
-4	×10 ⁻⁴ kWh
-3	×10 ⁻³ kWh
-2	×10 ⁻² kWh
-1	×10 ⁻¹ kWh

(c) Update timing

6.3.5 Multiplier of the electric current (Un¥G200)

The multiplier of the electric current is stored.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as 16-bit signed binary in the buffer memory.
 - Data range: -3 (fixed)
 - (b) Update timing Because it is fixed at -3, there is no update.
- 6.3.6 1-phase current (Un¥G202, 203), 2-phase current (Un¥G204, 205), 3-phase current (Un¥G206, 207)

The electric current (effective value) of each phase is stored.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: 0 to 99999990 (0 to 99999.990 A)
 - *Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.
 - (b) Unit
 - ×10⁻³ A *Unit is fixed.
 - (c) Update timingIt will be updated every measuring cycle (250 ms).
- 6.3.7 1-phase current demand (Un¥G210, 211), 2-phase current demand (Un¥G212, 213), 3-phase current demand (Un¥G214, 215)

Stores the electric current (effective value) at each phase that is measured based on the moving average for the duration of time configured in the electric current demand time (Un¥G3).

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: 0 to 99999990 (0 to 99999.990 A)
 - *Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.
 - (b) Unit
 - ×10⁻³ A *Unit is fixed.
 - (c) Update timing

6.3.8 Average current (Un¥G218, 219)

Stores the Average current.

For procedure for storing the Average current using phase wire system, refer to section 4.2.1 (2).

- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range:0 to 99999990 (0 to 99999.990 A)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

×10⁻³ A *Unit is fixed.

(c) Update timing

It will be updated every measuring cycle (250 ms).

6.3.9 Maximum value of electric current demand (Un¥G220,221), minimum value of electric current demand (Un¥G226,227)

Stores the max./min. values of the electric current demand among phases.

For procedure for storing the max./min. the electric current demand using phase wire system, refer to section 4.2.1 (2).

- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range: 0 to 99999990 (0 to 99999.990 A)
- *Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.
- (b) Unit

×10⁻³ A *Unit is fixed.

(c) Update timing

It will be updated every measuring cycle (250 ms) if it exceeds the current max. value or goes under the current min. value.

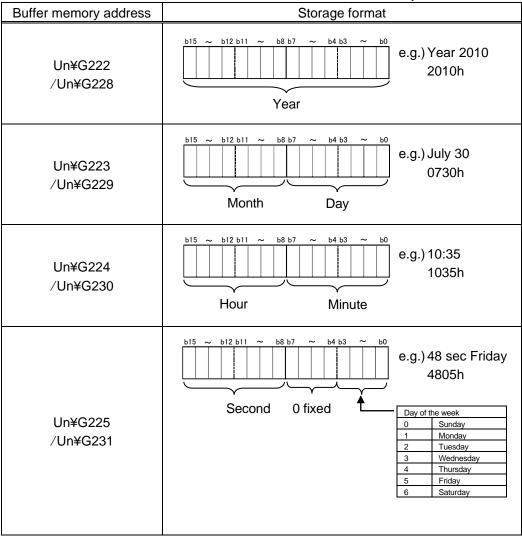
6.3.10 Year of time of the max. current demand (Un¥G222),

month and day of time of the max. current demand (Un¥G223), hour and minute of time of the max. current demand (Un¥G224), second and day of the week of time of the max. current demand (Un¥G225), year of time of the min. current demand (Un¥G228), month and day of time of the min. current demand (Un¥G229), hour and minute of time of the min. current demand (Un¥G230), second and day of the week of time of the min. current demand (Un¥G231)

Stores year, month, day, hour, minute, second, and the day of the week of time of maximum value of electric current demand (Un¥G220, 221) and minimum value of electric current demand (Un¥G226, 227) were updated.

- (1) Details of stored data
 - (a) Storage format

As indicated below, data are stored as BCD code in the buffer memory.



(b) Update timing

It will be updated every measuring cycle (250 ms) if it exceeds the current max. value or goes under the current min. value.

6.3.11 Multiplier of the electric voltage (Un¥G300)

The multiplier of the electric voltage is stored.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as 16-bit signed binary in the buffer memory.
 - Data range: -3 (fixed)
 - (b) Update timing Because it is fixed at -3, there is no update.
- 6.3.121 2 line voltage (Un¥G302, 303), 2 3 line voltage (Un¥G304, 305), 3 1 line voltage (Un¥G306, 307)

The electric voltage between every combination of wires (effective value) is stored.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: 0 to 99999900 (0 to 99,999.900 V)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

- (b) Unit
 - $\times 10^{-3}$ V *Unit is fixed.
- (c) Update timingIt will be updated every measuring cycle (250 ms).

6.3.13 Average voltage (Un¥G314, 315)

Stores the Average voltage.

For procedure for storing the Average voltage using phase wire system, refer to 4.2.1 (2).

(1) Details of stored data

- (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: 0 to 99999900 (0 to 99,999.900 V)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

×10⁻³ V *Unit is fixed.

(c) Update timing

6.3.14 Maximum voltage (Un¥G320, 321), minimum voltage (Un¥G326, 327)

Stores the max./min. values of the voltage among in-between wires.

For procedure for storing the max./min. voltage using phase wire system, refer to section 4.2.1 (2).

- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range: 0 to 99999900 (0 to 99,999.900 V)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

 $\times 10^{-3}$ V *Unit is fixed.

(c) Update timing

It will be updated every measuring cycle (250 ms) if it exceeds the current max. value or goes under the current min. value.

6.3.15 Year of time of the max. voltage (Un¥G322),

month and day of time of the max. voltage (Un \pm G323),

hour and minute of time of the max. voltage (Un \pm G324),

second and day of the week of time of the max. voltage (Un¥G325),

year of time of the min. voltage (Un¥G328),

month and day of time of the min. voltage (Un¥G329),

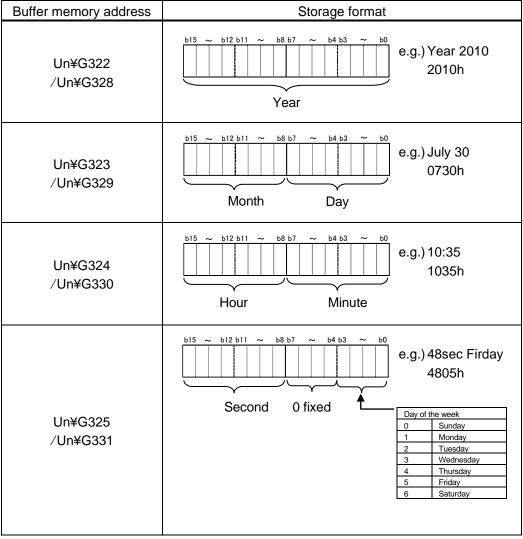
hour and minute of time of the min. voltage (Un¥G330),

second and day of the week of time of the min. voltage (Un¥G331)

Stores year, month, day, hour, minute, second, and the day of the week of time of maximum voltage (Un¥G320, 321) and minimum voltage (Un¥G326, 327) were updated.

- (1) Details of stored data
 - (a) Storage format

As indicated below, data are stored as BCD code in the buffer memory.



(b) Update timing

It will be updated every measuring cycle (250ms) and if it exceeds the max. value or goes under the min. value.

6.3.16 Multiplier of power (Un¥G400)

The multiplier of power is stored.

- (1) Details of stored data
 - (a) Storage format

Data are stored as 16-bit signed binary in the buffer memory.

- Data range: -3 (fixed)
- (b) Update timing Because it is fixed at -3, there is no update.
- 6.3.17 Electric power (Un¥G402,403)

The electric power (effective value) is stored.

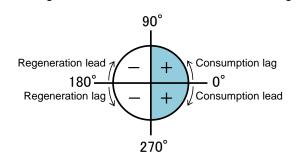
- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

If the power is negative, represents the regenerative power.

- Data range:-999999999 to 999999999 (-9999999.999 to 999999.999 kW)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1. *The sign of the data is as shown in the following figure.



(b) Unit

×10⁻³ kW *Unit is fixed.

(c) Update timing

6.3.18 Electric power demand (Un¥G404,405)

Stores the electric power that is measured based on the moving average for the duration of time configured in the electric power demand time (Un¥G4).

- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

If the power is negative, represents the regenerative power.

- Data range: -9999999999 to 999999999 (-9999999.999 to 999999.999 kW)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

 $\times 10^{-3}$ kW *Unit is fixed.

(c) Update timing

It will be updated every measuring cycle (250 ms).

6.3.19 Maximum value of electric power demand (Un¥G420, 421), minimum value of electric power demand (Un¥G426, 427)

Stores the max./min. values of the electric power demand.

- (1) Details of stored data
 - (a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

If the power is negative, represents the regenerative power.

- Data range: -9999999999 to 999999999 (-9999999.999 to 999999.999 kW)
- *Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.
- (b) unit

×10⁻³ kW *Unit is fixed.

(c) Update timing

It will be updated every measuring cycle (250 ms) if it exceeds the current max. value or goes under the current min. value.

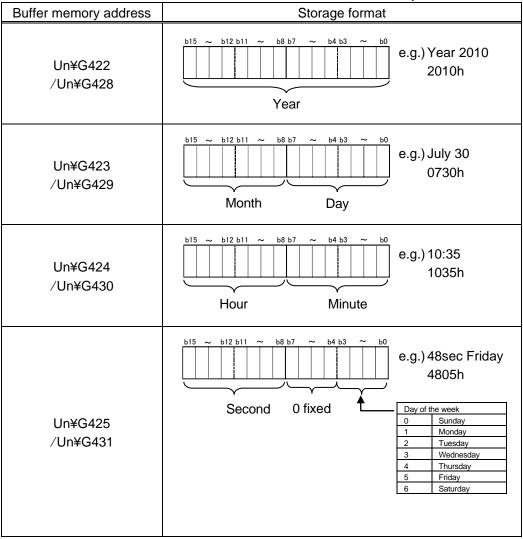
6.3.20 Year of time of the max. electric power demand (Un¥G422),

month and day of time of the max. electric power demand (Un¥G423), hour and minute of time of the max. electric power demand (Un¥G424), second and day of the week of time of the max. electric power demand (Un¥G425), year of time of the min. electric power demand (Un¥G428), month and day of time of the min. electric power demand (Un¥G429), hour and minute of time of the min. electric power demand (Un¥G430), second and day of the week of time of the min. electric power demand (Un¥G430),

Stores year, month, day, hour, minute, second, and the day of the week of time of maximum value of electric power demand (Un¥G420, 421) and minimum value of electric power demand (Un¥G426, 427) were updated.

- (1) Details of stored data
 - (a) Storage format

As indicated below, data are stored as BCD code in the buffer memory.



(b) Update timing

It will be updated every measuring cycle (250 ms) if it exceeds the current max. value or goes under the current min. value.

6.3.21 Multiplier of reactive power (Un¥G500)

The multiplier of reactive power is stored.

- (1) Details of stored data
 - (a) Storage format
 Data are stored as 16-bit signed binary in the buffer memory.
 Data range: -3 (fixed)
 - (b) Update timing Because it is fixed at -3, there is no update.

6.3.22 Reactive power (Un¥G502, 503)

The reactive power is stored.

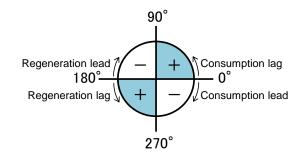
(1) Details of stored data

(a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range: -9999999999 to 999999999 (-9999999.999 to 999999.999 kvar)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1. *The sign of the data is as shown in the following figure.



(b) Unit

×10⁻³ kvar *Unit is fixed.

(c) Update timing

It will be updated every measuring cycle (250 ms).

6.3.23 Multiplier of power factor (Un¥G700)

The multiplier of the power factor is stored.

- (1) Details of stored data
 - (a) Storage format

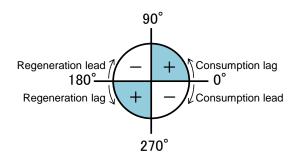
Data are stored as 16-bit signed binary in the buffer memory. - Data range: -3 (fixed)

(b) Update timing Because it is fixed at -3, there is no update.

6.3.24 Power factor (Un¥G702, 703)

Stores the power factor.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: -100000 to 100000 (-100.000 to 100.000%)
 - *Restrictions for measured data including resolution and measuring range, refer to section 4.2.1. *The sign of the data is as shown in the following figure.



- (b) Unit
 - ×10⁻³% *Unit is fixed.
- (c) Update timingIt will be updated every measuring cycle (250 ms).
- 6.3.25 maximum power factor (Un¥G720, 721), minimum power factor (Un¥G726, 727)

The max./min. power factors are stored.

- (1) Details of stored data
 - (a) Storage format
 - Data are stored as double-word 32-bit signed binary in the buffer memory.
 - Data range: -100000 to 100000 (-100.000 to 100.000%)

*For the resolution, refer to Section 4.2.1.

(b) Unit

×10⁻³% *Unit is fixed.

(c) Update timing

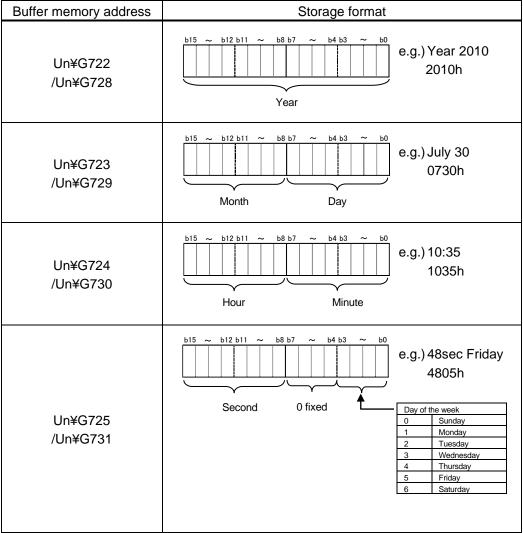
6.3.26 Year of time of the max. power factor (Un¥G722),

month and day of time of the max. power factor (Un¥G723), hour and minute of time of the max. power factor (Un¥G724), second and day of the week of time of the max. power factor (Un¥G725), year of time of the min. power factor (Un¥G728), month and day of time of the min. power factor (Un¥G729), hour and minute of time of the min. power factor (Un¥G730), second and day of the week of time of the min. power factor (Un¥G731)

Stores year, month, day, hour, minute, second, and the day of the week of time of maximum power factor (Un¥G720, 721) and minimum power factor (Un¥G726, 727) were updated.

- (1) Details of stored data
 - (a) Storage format

As indicated below, data are stored as BCD code in the buffer memory.



(b) Update timing

It will be updated every measuring cycle (250 ms) if it exceeds the current max. value or goes under the current min. value.

6.3.27 Multiplier of the frequency (Un¥G800)

The multiplier of the frequency is stored.

- (1) Details of stored data
 - (a) Storage formatData are stored as 16-bit signed binary in the buffer memory.Data range: -3 (fixed)
 - (b) Update timing Because it is fixed at -3, there is no update.

6.3.28 Frequency (Un¥G802, 803)

Stores the frequency.

(1) Details of stored data

(a) Storage format

Data are stored as double-word 32-bit signed binary in the buffer memory.

- Data range: 0 to 999900 (0 to 999.900 Hz)

*Restrictions for measured data including resolution and measuring range, refer to section 4.2.1.

(b) Unit

×10⁻³ Hz *Unit is fixed.

(c) Update timing

6.4 Common sections (Un¥G3000 to Un¥G4999)

6.4.1 Latest error code (Un¥G3000)

The latest error code that is detected with this module will be stored. *For the list of error codes, refer to section 9.1.

- (1) Details of stored data
 - (a) Storage format

Data are stored as 16-bit signed binary in the buffer memory.

- Data range: 0000h (normal), 0001h to FFFFh (error code)

(b) Update timing

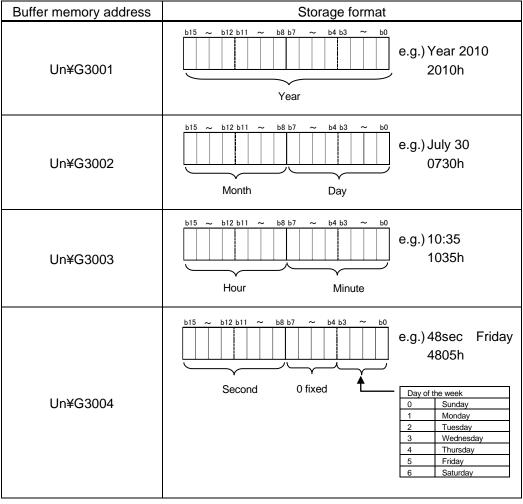
It will be updated at the time of error occurrence and error recovery.

6.4.2 Year of time of the error (Un¥G3001), month and day of time of the error (Un¥G3002), hour and minute the error (Un¥G3003), second and day of the week of time of the error (Un¥G3004)

The year, month, day, hour, minute, second, and day of the week of time of the error will be stored.

- (1) Details of stored data
 - (a) Storage format

As indicated below, data are stored as BCD code in the buffer memory.



(b) Update timing

It will be updated at the time of error occurrence and error recovery.

Chapter 7: Setting and procedure for operation

7.1 Precautions for handling

- (1) Do not drop or apply strong shock to the module case.
- (2) Do not remove the printed-circuit board of the module from the case. Doing so may cause failure.
- (3) Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- (4) A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring.
 Do not remove the film during wiring.
 Remove it for heat dissipation before system operation.
- (5) Module fixing screws must be tightened within the specified range as described below. Loose screws may cause short-circuit, failure, or malfunction.
 - *1 The module can be fixed easily to the base unit, using the hook on top of the module. However, if it is used under a vibrating environment, we strongly recommend that the module be fixed with screws.

Table 7.1-1 Tightening torque				
Locations of screws	Torque range			
Module-fixing screws (M3 screw) *1	0.36 N•m to 0.48 N•m			

(6) To attach the module to the base unit, firmly insert the protruding portions for fixing the module into the holes on the base unit, and make sure the module is securely attached to the module holes as fulcrum points.

Insecure attachment of the module may case malfunction, failure, and a falling.

(7) Before touching the module, make sure that you need to discharge static electricity on your body by touching a metal that is grounded.

Otherwise, it may cause failure or malfunction to the module.

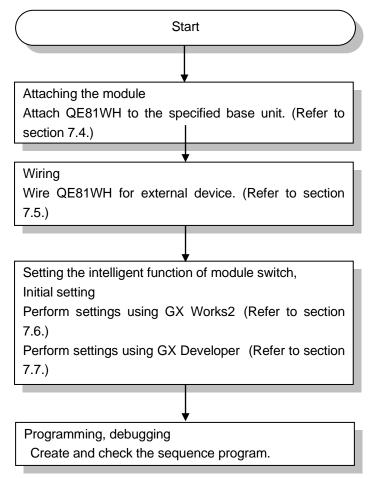


Figure 7.2-1 Procedure for operation

7.3 Name and function of each part

QE81WH MEA. ERR R (1)LED ALM1 ALM2 13 A Operation status of this module is displayed. (Refer to table.7.3-1.) 1k 0 (5) Push button (2) Current input terminals Use this button to 11 0 0 Connect the current wire of insert a cable to the terminal or to remove the measuring circuit with the 3k 0 them. secondary output of the 31 o О dedicated current sensor. GAUGE P1 О (6) Check hole (3) Voltage input terminals P2 0 STRIP Ο Use this for continuity Connect the voltage input check to the terminal. wire of the measuring circuit. οГ 0 Use it with a tester contact. G G O (4) Strip gauge QE81WH A gauge that is used for checking the length of stripped wire.

Names and functions of parts of QE81WH are provided below.

Figure 7.3-1 Appearance of the module

(1) Names and functions of LEDs

The following describes names and functions of LEDs.

Table 7.3-1 Names and functions of LEDs	

Name	Color	Role	ON/OFF condition			
RUN LED	Green	Displays the operation status of this module.	ON: OFF:	Normal operation 5V power discontinuity, watch dog timer error		
ERR. LED	Red	Displays errors and conditions of this module.	ON: Flashing: OFF:	Error occurring (except out-of-range error) ^{*1} Out-of-range error ^{*1} Normal operation		
ALM1 LED	Red	Displays alarm 1 occurrence status.	Flashing: ON: OFF:	Alarm 1 occurring Alarm 1 occurring \rightarrow Not occurring (In the case of alarm 1 reset method = self-retention) Alarm 1 not occurring		
ALM2 LED	Red	Displays alarm 2 occurrence status.	Flashing: ON: OFF:	Alarm 2 occurring Alarm 2 occurring \rightarrow Not occurring (In the case of alarm 2 reset method = self-retention) Alarm 2 not occurring		
MEA. LED	Green	Displays the status of measurement of	ON: OFF:	Measuring electric energy (consumption) or electric energy (regeneration) Other than the above		
R LED	Green	this module. Displays the status of measurement (regeneration) of	OFF: ON: OFF:	Measuring electric energy (regeneration) Other than the above		
1 LED	Green	this module. Displays the status of measurement (regeneration) at side 1 of this module.	ON: OFF:	Measuring 1-phase electric energy (regeneration) Other than the above		
3 LED	Green	Displays the status of measurement (regeneration) at side 3 of this module.	ON: OFF:	Measuring 3-phase electric energy (regeneration) Other than the above		

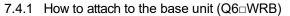
*1 For details, check with the list of error codes. (Refer to section 9.1)

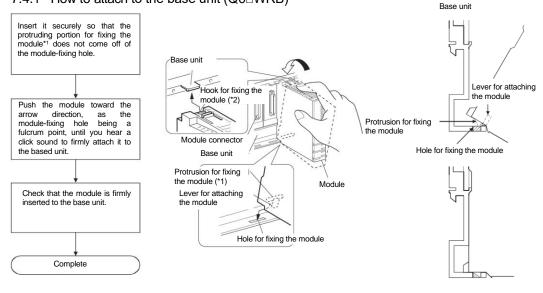
(2) Names of signals of terminal block The following describes names of signals of terminal block.

Table 7.3-2 Names of signals of terminal block

Terminal symbol	Name of terminal			
1k	1-phase current input terminal (power source side)			
11	1-phase current input terminal (load side)			
3k	3-phase current input terminal (power source side)			
31	3-phase current input terminal (load side)			
P1	1-phase voltage input terminal			
P2	2-phase voltage input terminal			
P3	3-phase voltage input terminal			
FG	Frame GND terminal			

7.4 Attaching and removing the module

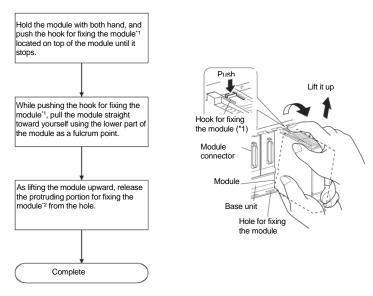




Caution

- Attach to the base of MELSEC-Q series.
- When attaching the module, make sure to insert the protruding portions for fixing the module into the holes on the base unit. In doing so, insert it securely so that the protruding portion of the module does not come off of the holes. Do not force to attach the module; otherwise the module may break.
- When installing the module at a vibrating area with strong impact, tighten the module to the base unit using screws. Module-fixing screws: M3 x 12mm (Prepare them yourself.)
 *: Tightening torque range: 0.36 N•m to 0.48 N•m
- Attaching and detaching the module and the base unit should be performed 50 times or less (to conform to JIS B3502). If the count exceeds 50 times, it may cause a malfunction.

7.4.2 How to detach it from the base unit (Q6 WRB)



• When module-fixing screws are used, make sure to remove the screws for detaching the module first, and then remove the protruding portion for fixing the module from the holes. Do no force to remove the module; it may break the protruding portions for fixing the module.

7.5 Wiring

- 7.5.1 Precautions for wiring
 - (1) Connect cables. For connecting voltage transformer and current transformer, refer to the corresponding wiring diagram.
 - (2) For wiring, check with the wiring diagram and check phase wire system for the connecting circuit.
 - (3) For the current circuit input, Mitsubishi's current sensor is required. (Refer to section 7.5.3)
 - (4) If a current sensor is located in a strong magnetic field such as an area nearby a transformer or high-current cable bus bar, the voltage circuit input may be influenced, which in turn affects the measured value. Thus, please ensure sufficient distance between devices.

Condition	Distance
Power line carrying 600 V or lower	300 mm or longer
and 600 A or lower	
Other power lines	600 mm or longer

- (5) For input wiring of the measurement circuit, use separate cables from other external signals in order to prevent from AC surge and induction.
- (6) Keep any object off the cables.
- (7) Protect cable coating from scratch.
- (8) Cable length should be routed in length with a margin, please take care to avoid causing stress to pull the terminal block. (Tensile load: less than 22 N)
- (9) Please do not connect two or more cables to one terminal hole of the current input terminal block. The engagement of the terminal becomes weak, and cable may fall out.
- (10)For the actual usage, connect the FG terminal to ground. (D-type ground: Type 3) Connect it directly to the ground terminal.

7.5.2 How to connect wires

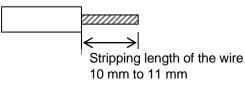
(1) Follow the wiring diagram for external connection to QE81WH.

(2) Use appropriate electric wires as described below.

At the connection between the secondary terminal of current (EMU-CT***, EMU-CT***-A) sensor and current input terminals, use twisted pair cable.

Applicable wire	Single wire: AWG24 to AWG17 (ϕ 0.5 mm to 1.2 mm)
(Usable electric wire)	Stranded wire: AWG20 to AWG16 (0.5 mm ² to 1.3 mm ²)

(3) Stripping length of the used wire in use has to be 10 to 11 mm. Check the stripping length using the strip gauge of QE81WH main module.



(4) When stranded wire is used, a bar terminal must be used.

	Recommended bar terminal	TGV	TC-1.25-11T (Made by Nichifu) or equivalent
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- (5) When attaching and detaching cables to/from the terminal, use the push button. Check that the wire is securely inserted.
- (6) Insert a wire to the terminal all the way until it touches the end.

7.5.3 How to wire

Follow the wiring diagram (Figure 7.5.3(1)-(a) \sim 7.5.3(2)-(c)) for external connection of QE81WH. (1) In the case using 5A current sensor.

(a) Case of using EMU2-CT5

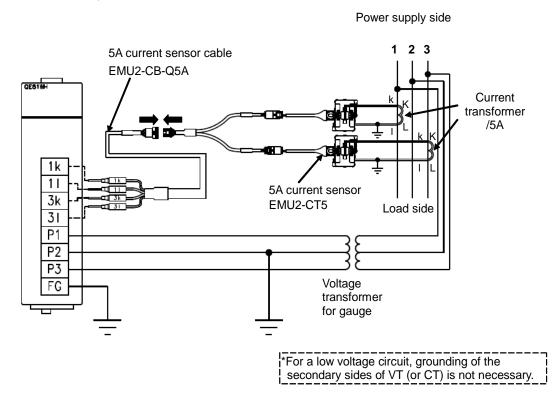


Figure 7.5.3(1)-(a) In the case of Three-phase 3-wire system (with the voltage transformer for gauge/current transformer)

(b) Case of using EMU-CT5-A

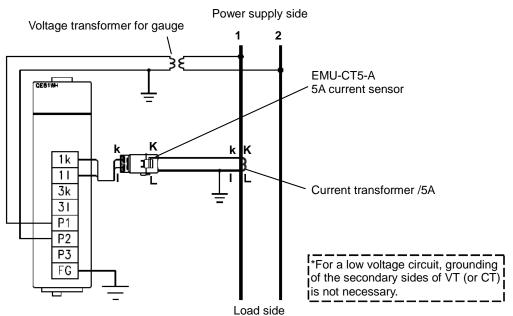
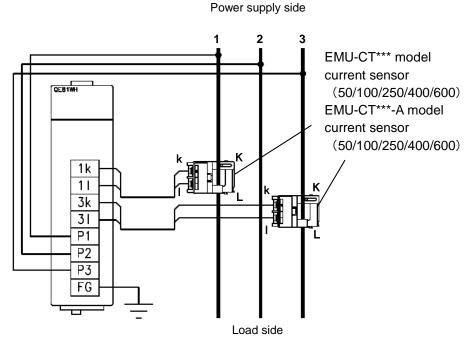
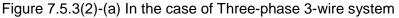


Figure 7.5.3(1)-(b) In the case of Single-phase 2-wire system (with the voltage transformer for gauge/current transformer)

- (2) In the case using split-type current sensor.
 - (a) Case of Three-phase 3-wire system





(b) Case of Single-phase 2-wire system

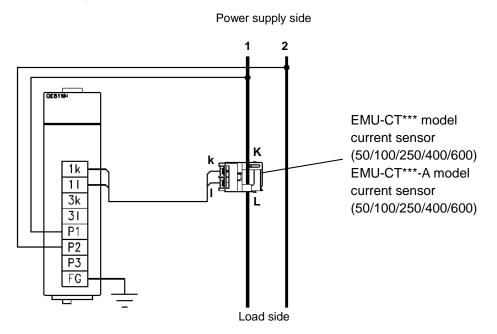
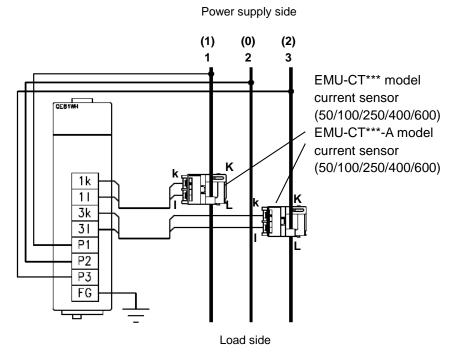
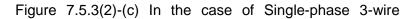


Figure 7.5.3(2)-(b) In the case of Single-phase 2-wire system



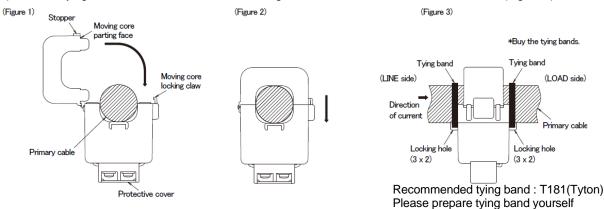
(c) Case of Single-phase 3-wire system



7.5.3.1 Current circuit connection

A dedicated current sensor (EMU-CT ***, EMU-CT ***-A, EMU2-CT5) is required to connect the current circuit.

- How to attach EMU-CT5/CT50/CT100/CT250-A
- Press the locking claw of the moving core, please open the moving core by removing the engagement (Figure 1). Before inserting the cable, check the symbols K and L to fit the current sensor in the correct direction. (The direction from the power supply side to the load side is indicated with →.) (Figure 3)
- 2) After checking that the core parting faces are free from dirt, close the moving core. Push down the moving core until the stoppers are securely locked. (Locking claw of the moving core is applied to the stopper, you hear click.) (Figure 2)
- 3) Pass the tying bands into the current sensor locking holes to secure the sensor with the cable. (Figure 3)



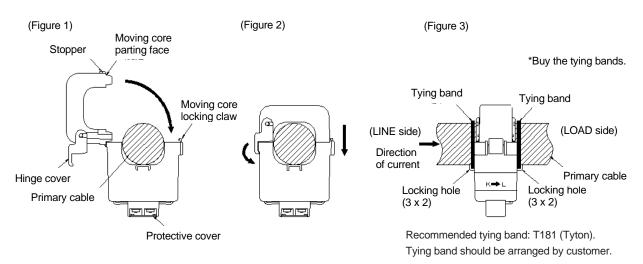
✓ Supplementary

- Make sure that before connecting the cable, the orientation of the current sensor is correct for attachment. K to L is the correct direction. K: power source side, L: load side.
- Do not bend the moving core in a direction other than the operation direction (shown in Fig. 1). The current sensor may be damaged.
- Refer to the table below for appropriate size of electric wires.

		EMU-CT5-A	EMU-CT50-A	EMU-CT100-A	EMU-CT250-A
Usable wires	IV cable	38 mm ² or less	38 mm ² or less	60 mm ² or less	200 mm ² or less
size (reference)	CV cable	22 mm ² or less	22 mm ² or less	60 mm ² or less	150 mm ² or less

Size of electric wires conforms to what is described in the catalog of general PVC insulated wires. Thickness of external PVC insulation is different for different wire. Check with the external dimension diagram of this product and make sure the wire can go through the given space.

- How to attach EMU-CT400/CT600-A
- Press the locking claw of the moving core, please open the moving core by removing the engagement (Figure 1). At this time, the hinge cover opens automatically. Before inserting the cable, check the symbols K and L to fit the current sensor in the correct direction. (The direction from the power supply side to the load side is indicated with →.) (Figure 3)
- 2) After checking that the core parting faces are free from dirt, close the moving core. Push down the moving core until the stoppers are securely locked. (Locking claw of the moving core is applied to the stopper, you hear click.) After the stopper is securely locked, close the hinge cover. (Figure 2)
- 3) Pass the tying bands into the current sensor locking holes to secure the sensor with the cable. (Figure 3)



✓ Supplementary

- Make sure that before connecting the cable, the orientation of the current sensor is correct for attachment. K to L is the correct direction. K: power source side, L: load side.
- Do not bend the moving core in a direction other than the operation direction (shown in Fig. 1). The current sensor may be damaged.
- Refer to the table below for appropriate size of electric wires.

		EMU-CT400-A	EMU-CT600-A
Usable wires	IV cable	500 mm ² or less	500 mm ² or less
size (reference)	CV cable	400 mm ² or less	400 mm ² or less

Size of electric wires conforms to what is described in the catalog of general PVC insulated wires. Thickness of external PVC insulation is different for different wire. Check with the external dimension diagram of this product and make sure the wire can go through the given space.

How to attach EMU-CT50/CT100/CT250

Follow the procedure below to attach to the cable of the target circuit.

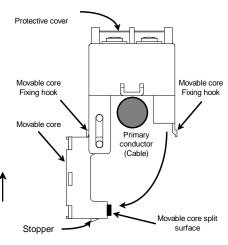
- Open the movable core, as shown in the figure on the right. Lift slowly the hooks located on both sides of the movable core, and
- detach them from the stopper. Do not force to open it. You may break the hook.
 2) Do not let the cable touch on the core-spilt surface. Thus, carefully
- 2) Do not let the cable touch on the core-split surface. Thus, carefully pass the cable from underneath. Before passing the cable, check the direction symbols of K and L, in order to attach the sensor in the correct orientation. (Direction from power source

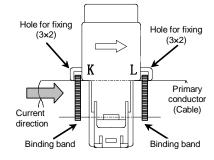
side (K) to load side (L) is indicated with the arrow.)

 Make sure no dust or foreign object is attached on the split-core surface, and after that, close the movable core. Lift the movable core until the

stoppers are firmly locked. (When the hooks on both side of movable core are locked to the stoppers, you will hear click sound twice.)

- 4) Put a binding cable through a hole for fixing the current sensor, and then tie it with the cable. Do not tie it too tightly. (Holes for fixing the current sensor are located on both side of the current sensor.)
- 5) Cut off the extra portion of binding cable, using a nipper, etc, to avoid interference of the cable.
- 6) Lift a protective cover of the secondary terminal, by holding the center portion of the protective cover, and remove it. And then, connect the given sensor cable. Check the terminal symbols printed on the secondary terminal surface, so that connection is performed correctly.





✓ Supplementary

- When opening the movable core on current sensor, **do not widen the hook for fixing the movable core too widely.** It may break the hook.
- Refer to the table below for appropriate size of electric wires.

		EMU-CT50	EMU-CT100	EMU-CT250
Usable wires	IV cable	60 mm ² or less	60 mm ² or less	150 mm ² or less
size (reference)	CV cable	38 mm ² or less	38 mm ² or less	150 mm ² or less

Size of electric wires conforms to what is described in the catalog of general PVC insulated wires. Thickness of external PVC insulation is different for different wire. Check with the external dimension diagram of this product and make sure the wire can go through the given space.

■ How to attach EMU-CT400/CT600

Follow the procedure below to attach the cable to the target circuit.

- 1) Release the band 1) to the arrow direction (top), and detach the core cover.
- 2) Remove the terminal cover, and shift the secondary short switch into "short".
- Loosen the screw 2), and open the core band to remove the core. Make sure that no dust, etc attaches on the core.
- 4) Loosen the screw 3). Put this module onto the cable, and fix the module by tightening the screw 3) using the metal bracket that is directly attached to the cable. Tighten the screw as tightly as the metal bracket will not bend.
- Align the symbol of "K" on the removed core and the "K" on the module to return the core as in the original location. And then, tighten the core band using the screw 2).
- 6) Attach the core cover and fix it with the band 1).
- 7) Connect the secondary terminal with multiple-circuit power measuring module, turn the secondary short switch into "open", and then attach the terminal cover.

✓ Supplementary

• Refer to the table below for appropriate size of electric wires.

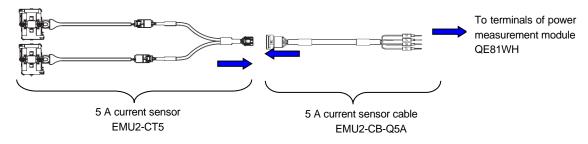
			wiics.		
		EMU-CT400		EMU-CT600	
		1 wire	2 wire	1 wire	2 wire
Usable wires	IV cable	5002	325 mm ²	500 mm ²	205
size (reference)	CV cable	500 mm ²	325 mm-	500 mm ²	325 mm ²

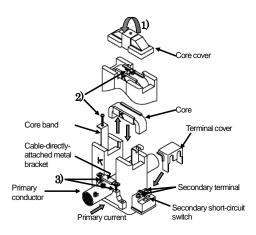
Size of electric wires conforms to what is described in the catalog of general PVC insulated wires. Thickness of external PVC insulation is different for different wire. Check with the external dimension diagram of this product and make sure the wire can go through the given space.

How to attach EMU2-CT5

- Transfix EMU2-CT5 current sensor to the secondary-side wire of current transformer (/5A rated). Make sure to use it in a correct combination with 5 A current sensor conversion cable: EMU2-CB-Q5A

- EMU2-CT5 has polarities. Make sure to connect to the right symbol on the terminal. Power source side: (k side), load side: (l side).





Follow the procedure below to attach the cable to the target circuit.

- Slide the lock pin to the arrow direction.
 But the electric wire through
- 2) Put the electric wire through the clamp, and close the clamp again.
- 3) Use your finger to hold the

clamp in the full close position, and push the lock pin until it locks.

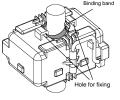
- Caution
- The lock pin is made of metal. If you let it touch electrically charged portions, it may cause electric shock or device failure or fire. Be careful handling the lock pin.

Lock pin

Primary conductor (Cable)

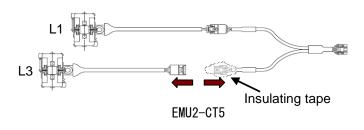
Clamp

- Physical impact to the core may cause breakage. It may directly influence the performance. Be careful
 handling the core.
- The mating surface on the core is very sensitive. Even a small foreign object on the surface may affect the measurement performance.
- Excessive force to the core during open clamp may cause breakage. Incorrect direction may cause inaccurate measurement.
- For both the transfixing wire and the binding band for fixing the sensor, use the size of W=2.6 mm or less. To fix them together
 Put a binding band through a hole for fixing the current sensor, and tie it with the cable. Do not tie it too tightly.
 (Total four holes for fixing the current sensor exist on both sides of the current sensor).



When wiring single-phase 2-wire circuit

5 A current sensor is not used L3. As shown below, L3 remove connector , and connector with insulating tape.



Extending the cable of 5 A current sensor

If the cable from current sensor is too short, you can extend it by using an extension cable as shown below. Extension cable (standard)

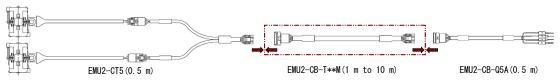
Model name	EMU2-CB-T1M	EMU2-CB-T5M	EMU2-CB-T10M
Cable length	1 m	5 m	10 m

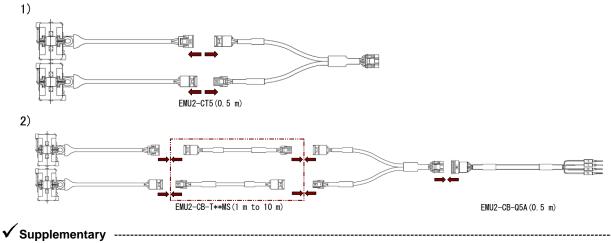
Extension cable (separate)

Model name	EMU2-CB-T1MS	EMU2-CB-T5MS	EMU2-CB-T10MS
Cable length	1 m	5 m	10 m

Connecting 5 A current sensor and the cable

Connecting 5 A current sensor and extension cable (standard)



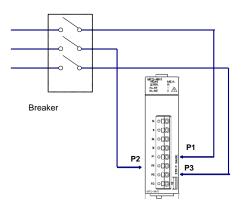


Connecting 5 A current sensor and extension cable (separate)

- Cable extension for EMU2-CT5 is 10 m max. (Total cable length is 11 m max.)
- Use extension cable (separate) when 1-phase and 3-phase are set apart.

7.5.3.2 Voltage circuit connection

- If a 220 V or higher circuit is used, use a transformer.
- The transformer which has primary voltage of VT less than 6600 V and secondary voltage of VT not more than 220 V can be used. For connection to P1 to P3 terminals on QE81WH, connect the secondary of transformer. Make sure that terminal symbols are correct.
- In order to perform maintenance work such as changing the wire layout and replacing equipment, we recommend that you connect protective device (breaker) for the voltage input circuit (P1, P2, and P3 terminals).



7.5.3.3 FG terminal connection

- For the actual usage, connect the FG terminal to ground. (D-type ground: Type 3) Connect it directly to the ground terminal.
- Do not connect to FG terminal during the insulation resistance test and pressure test.

7.6 Setting from GX Works2

This section explains setting from GX Works2 necessary to use QE81WH. Before performing this setting, install GX Works2 and connect the Management CPU with the PC using a USB cable. For details, refer to the manual of CPU module.

Point	
	the unit, enable the switch setting, parameter setting and auto refresh,
write the s	ettings to the CPU module, and reset the CPU module or power on the
programma	able controller again.

7.6.1 Addition the unit

Add the model name of the energy measuring module to use the project.

(1) Addition procedure

Open the "New Module" window.

Project window→[Intelligent Function Module]→Right-click→[New Module...]

New Module	X J
Module Selection	
Module Type	Energy Measuring Module
Module Name	QE81WH
Mount Position Base No, -	Mounted Slot No. Acknowledge I/O Assignment Y address 0000 (H) 1 Slot Occupy [16 points]
Title setting	
	OK Cancel

Figure 7.6.1-1 Dialog box of "I/O assignment"

Table 7.6.1-1	Setting items	on the "I/O	assignment" ta	ab

Item		Description
Module Selection	Module Type	Set [Energy Measuring module].
	Module Name	Set the name of the module to mount.
Mount Position	Base No.	Set the base No. where the module is mounted.
	Mounted Slot	Set the slot No. where the module is mounted.
	No.	
	Specify start XY	The start I/O number (hexadecimal) of the target module is set,
	address	according to the mounted slot No. Any start I/O number can be
		set.
Title Setting	Title	Set any title.

7.6.2 Setting the intelligent function of the module switch

Set the operation mode.

(1)Setting procedure

Open the "Switch Setting" window.

Project window→[Intelligent Function Module]→Module name→[Switch Setting]

Switch Setting 0000:QE81WH	×
Item Operation mode	Setting value Measuring mode
* This dialog setting is linked to the Default value will be shown in the PLC parameter contains an out of	
	OK Cancel

Figure 7.6.2-1 Dialog box to set the intelligent function of the module switch

Table 7.6.2-1 Setting the inte	elligent function of the module switch
--------------------------------	--

Item	Description	Setting value
Operation mode	Measurement mode and test mode are changed.	Measuring mode (default), Test mode
	5	

7.6.3 Parameter Setting

Set the parameters.

Setting parameters on the screen omits the parameter setting in a program.

(1)Setting procedure

Open the "Parameter" window.

Project window→[Intelligent Function Module]→Module name→[Parameter]

Item	CH1
Rate setting	Set rated value.
Phase wire system	3: Three-phase 3-wire system
Primary voltage	2: 220V
Primary voltage of VT	0 V
Secondary voltage of VT	0 V
Primary current	2: 100A
Primary current of CT	0 A
Demand time setting	Set demand time.
Current demand time	120 Seconds
Electric power demand time	120 Seconds
Data acquisition clock function	Set data acquisition clock function.
Output period of data acquisition clock	0 ms
Alarm 1 monitoring function	Set value for Alarm 1 monitoring function.
Alarm 1 item	0: No monitoring
Alarm 1 value	0
Alarm 1 reset method	0: Self-retention
Alarm 1 delay time	0 Seconds
Alarm 2 monitoring function	Set value for Alarm 2 monitoring function.
Alarm 2 item	0: No monitoring
Alarm 2 value	0
Alarm 2 reset method	0: Self-retention
Alarm 2 delay time	0 Seconds

(4) Denaut value is of No Instituting . (4) To monitor Alarm 1 (if the value for Alarm 1 monitoring item is set from 1 to 8), setting Alarm 1 monitoring value, Alarm 1 reset method, and Alarm 1 delay time is required. (5) When upper limit (lower limit) is set for Alarm 1 monitoring item, Alarm 1 flag will be turned to ON when the present value exceeds (goes below) the alarm 1 monitoring value and elapses the alarm 1 delay time.

Figure 7.6.3-1 Dialog box to monitor all buffer memories (a case where the module is attached to the slot 0)

(2)Double-click the item to change the setting, and input the setting value.

- Items to input from the pull-down list
 Double-click the item to set to display the pull-down list. Select the item.
- Items to input from the text box

Double-click the item to set, and input the setting value.

ltem		Setting value		Reference
	1:single-phase 2-wire Phase wire system 2:single-phase 3-wire		Section 6.2.1	
		3:three-phase 3-wire 0:Any setting 1:110V 2:220V 3:220/110V 4:402(410)(
	Primary voltage	4:440/110V 5:690/110V 6:1100/110V 7:2200/110V 8:3300/110V 9:6600/110V		Section 6.2.2
	Primary voltage of VT	0 V to 6600 V		Section 6.2.2
	Secondary voltage of VT	0 V to 220 V		Section 6.2.2
Rate setting	Primary current	0:Any setting 1:50A 2:100A 3:250A 4:400A 5:600A 501:5/5A 502:6/5A 503:7.5/5A 503:7.5/5A 505:10/5A 506:12/5A 506:12/5A 509:25/5A 510:30/5A 511:40/5A 511:50/5A 513:60/5A 515:80/5A	516:100/5A 517:120/5A 518:150/5A 519:200/5A 520:250/5A 521:300/5A 522:400/5A 522:400/5A 523:500/5A 526:800/5A 527:1000/5A 527:1000/5A 529:1500/5A 531:2000/5A 531:2000/5A 533:3000/5A 533:5000/5A 536:6000/5A	Section 6.2.3
	Primary current of CT	0 A to 6000 A		Section 6.2.3
Demand time setting	Current demand time 0 to 1800 seconds		Section 6.2.4	
Demand time setting	Electric power demand time	d 0 to 1800 seconds		Section 6.2.5
Data acquisition clock function	Output period of data acquisition clock	flag non-use:0 flag use:1 ms to 86400000 ms		Section 6.2.11
Alarm 1 monitoring function	Alarm 1 item	0:No monitoring 1:Current demand upper limit 2:Current demand lower limit 3:Voltage upper limit 4:Voltage lower limit 5:Electric power demand upper limit 6:Electric power demand lower limit 7:Power factor upper limit 8:Power factor lower limit		Section 6.2.6
	Alarm 1 value	-2147483648 to 21	47483647	Section 6.2.7
	Alarm 1 reset method	0:Self-retention 1:Auto reset		Section 6.2.8
	Alarm 1 delay time	0 to 300 seconds		Section 6.2.9
Alarm 2 monitoring function	Alarm 2 item	0:No monitoring 1:Current demand up 2:Current demand lo 3:Voltage upper limit 4:Voltage lower limit 5:Electric power dem 6:Electric power dem 7:Power factor upper 8:Power factor lower	wer limit nand upper limit nand lower limit limit	Section 6.2.6
	Alarm 2 value	-2147483648 to 21	47483647	Section 6.2.7
	Alarm 2 reset method	0:Self-retention 1:Auto reset		Section 6.2.8
		0 to 300 seconds		

7.6.4 Auto Refresh

This function transfers data in the buffer memory to specified devices. Programming of reading/writing data is unnecessary.

(1)Setting procedure

1) Start "Auto Refresh" .

Project window→[Intelligent Function Module]→Module name→[Auto Refresh]

2) Click the item to set, and input the destination device for auto refresh.

felectric energy, ergy (y (consumption) y (regeneration) (y (consumption lag) ic energy 1 ic energy 2 urrent ent ent ent ent ent	ransfer the buffer memory data to the specified device.	
y (consumption) y (regeneration) ggy (consumption lag) icic energy 1 rice energy 2 urrent ent ent ent		
y (consumption) y (regeneration) rgy (consumption lag) ric energy 1 ric energy 2 urrent ent ent ent ent		
y (regeneration) rgy (consumption lag) ric energy 1 ric energy 2 urrent ent ent ent		
rgy (consumption lag) ric energy 1 ric energy 2 urrent ent ent		
ric energy 1 ric energy 2 urrent ent ent		
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Point	
	Available devices are X, Y, M, L, B, T, C, ST, D, W, R, and ZR.
	When a bit device X, Y, M, L, or B is used, set a number that is
	divisible by 16 points (example: X10, Y120, M16).
	Data in the buffer memory are stored in 16 points of devices
	starting from the set device No. (Example: When X10 is set, the
	data are stored in X10 to X1F).

This function is to set integrated value (electric energy (consumption, regeneration) and reactive energy (consumption lag)) to any value. If you want to clear integrated value, set it to 0.

(1)Setting procedure

- 1) Start "Intelligent unit monitor"
 - Project window \rightarrow [Intelligent Function Module] \rightarrow Module name \rightarrow Right-Click \rightarrow [Intelligent monitor]
- 2) Set the integrated value setting target(Un¥G51) and integrated value setting value (Un¥G52,53)
- 3) Turn integrated value setting request (YnC) from OFF to ON to enable the setting.
 - (Refer to 5.2.2).

	Lu	Current Value	Device	Data Tara	
	Item	Current value	Device	Data Type	
	Input Signal (X) Module READY		X0	Bit	
			X0 X1		
	Periodic electric energy1 data completion flag			Bit	
	Periodic electric energy 2 data completion flag		X2	Bit	
	Periodic electric energy1 reset completion flag		×3	Bit	
	Periodic electric energy 2 reset completion flag		X4	Bit	
	Data acquisition clock		X8	Bit	
	Operating condition setting completion flag		X9	Bit	
	Alarm 1 flag		XOA	Bit	
	Alarm 2 flag		XOB	Bit	
is on after the set is completed	Integrated values set completion flag		X00	Bit	
	Max/min.value clear completion flag		- XOD	Bit	
	Error flag		X0F	Bit	
	 Output Signal (Y): 				
	Periodic electric energy1 measurement flag		М	Bit	
	Periodic electric energy 2 measurement flag		Y2	Bit	
	Periodic electric energy 1 reset request		Y3	Bit	
	Periodic electric energy 2 reset request		Y4	Bit	
	Operating condition setting request		Y9	Bit	
	Alarm 1 reset request		YOA	Bit	
	Alarm 2 reset request		YOB	Bit	
to input from the pull-down list	integrated values clear request		YOC	Bit	
	Max/min.value clear request		YOD	Bit	
	Error clear request		YOF	Bit	
to input from the pull down list	Buffer Memory Monitor				
to input from the pull-down list	Integrated value setting target		U0¥G51	Word[Unsigned]	
to be entered from the text box	Integrated value setting value		UO¥G52	Double Word[Signed]	
	🔁 Latest error code		U0¥G3000	Error Code	
	Error detection time (Year/Month/Day/Hour/Minute/	s	U0¥G3001	Time	
	E OH1				
	Multiplier of electric energy, reactive energy		U0¥G1 00	Word[Signed]	
	Electric energy (consumption)		U0¥G1 02	Double Word[Signed]	
	Electric energy (regeneration)		U0¥G1 04	Double Word[Signed]	
	Reactive energy (consumption lag)		U0¥G1 06	Double Word[Signed]	
	Periodic electric energy 1		U0¥G114	Double Word[Signed]	
	Periodic electric energy 2		U0¥G116	Double Word[Signed]	
	Multiplier of current		U0¥G200	Word[Signed]	
	1-phase current		U0¥G202	Double Word[Signed]	
	2-phase current		U0¥G204	Double Word[Signed]	
	3-phase current		U0¥G206	Double Word[Signed]	
	1 -phase current demand		U0¥G210	Double Word[Signed]	
	2-phase current demand		U0¥G212	Double Word[Signed]	
	3-phase current demand		U0¥G214	Double Word[Signed]	
	Average current		U0¥G218	Double Word[Signed]	
	Maximum current demand		U0¥G220	Double Word[Signed]	

 After checking that the Integrated value setting completion flag (XnC) is in the ON status, turn off the integrated value setting request (YnC).

The integrated value setting completion flag (XnC) is OFF, after detect the status is OFF. After detecting Integrated value setting request (YnC) is in the OFF status, Integrated value setting completion flag (XnC) turns to OFF.

(2)Default value

Integrated value setting target (Un¥G51) is set to 0 (No set). Integrated value setting value (Un¥G52,53) is set to 0.

7.6.6 Debugging program

QE81WH provides a test function so that you can debug a program with no input of voltage or current. Pseudo-value can be stored into the buffer memory. For detailed explanation for the test function, refer to 4.2.5.

- (1) Setting intelligent function of the module switch
 - 1) Configure the operation mode in switch setting as shown below. (Refer to 7.6.2) Operation mode : Test mode
 - 2) From the "Online" menu, select "Write to PLC" to display the dialog box of Write to PLC, and then execute the writing to PLC parameter. After resetting the CPU module, the value will become effective.

Switch Setting 0000:QE81WH	×
Item	Setting value
Operation mode	Measuring mode
Default value will be shown in the PLC parameter contains an out of	

- (2) Starting the test function
 - 1) Reset the CPU module.
 - 2) QE81WH starts in the test function mode. All LEDs are turned on. Pseudo-values are stored in the buffer memory.
- (3) Finishing the test function (Move back to the measuring mode)
 - 1) Following 1) in step (1), Configure the operation mode in switch setting as shown below. Operation mode : measuring mode
 - 2) Following 2) in step (1), write the data into PLC.
 - 3) Reset the CPU module, then the operation goes back to the measuring mode.

7.7 Setting from GX Developer

This section explains setting from GX Developer necessary to use QE81WH. Before performing this setting, install GX Developer and connect the Management CPU with the PC using a USB cable. For details, refer to the manual of CPU module.

- 7.7.1 I/O assignment setting
 - (1) Double-click the dialog box of "PLC Parameter" in the GX Developer Project.
 - (2) Click "I/O assignment".
 - (3) Set the following item to the slot*1 to which QE81WH has been attached.

			.C 1	ile PLC RAS Device	Program	Bo	oot file SFC	[1/O assignment]
1/0	Assignmen Slot	t(*) Type		Model name	Points		StartXY 🔺	
0	PLC	PLC	-			-		Switch setting
1	0(×-0)	Intelli.	-	QE81WH	16points	-	0000	B + 1 + + + + +
2	1(*-1)		-			-		Detailed settin
3	2(*-2)		-			-		
4	3(*-3)		-			-		
5	4(*-4)		-			-		
6	5(*-5)		-			-		

Figure 7.7.1-1 Dialog box of "I/O assignment"

Item	Descriptions
Туре	Select "Intelli.".
Model name	Enter the model name of the module.
Points	Select 16 points.
Start XY	Enter the initial I/O number of QE81WH.

*1 is a case where QE81WH is attached to the slot 0.

- 7.7.2 Setting the intelligent function of the module switch
 - (1) In the "I/O assignment" of 7.7.1, click the Switch setting button to display the dialog box of "I/O module, intelligent function module switch setting".
 - (2) The intelligent function module switch setting displays switches 1 to 5; however, only the switch 5 is used for this purpose. Switch setting is configured using 16-bit data. Settings are as shown in Table 7.7.2-1

Swi	tch setti	ng for 1/0	and intelligent fu	nction	module						×	
						Inpu	t format	DEC.	•	◀	- Select '	DEC.".
	Slot	Туре	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5 🔺]			
0	PLC	PLC										
1	0(*-0)	Intelli.	QE81WH					0				
2	1(*-1)											
3	2(*-2)											
4	3(*-3)											
5	4(*-4)											
	5(*-5)											
	6(*-6)											
8	7(*-7)											
	8(*-8)											
	9(*-9)											
	10(*-10)											
	11(*-11)											
	12(*-12)											
	13(*-13)											
15	14(*-14)							•				
			End		Ca	ncel						

Figure 7.7.2-1 Dialog box to set the intelligent function of the module switch

Swith No.	Switch name	Description
1	Not used	-
2	Not used	-
3	Not used	-
4	Not used	-
5	Test mode transition	 0: Measuring mode (Even if it is not set, measuring mode is performed) 1: Test mode * For details of test mode, refer to 4.2.5.

Table 7 7 2-1	Setting the	intelligent	function of	of the	module switch
	Octaing the	mongon	Turiotion		

(3) When the setting is completed, click the Complete setting button.

(4) From the "Online" menu, select "Write to PLC" to display the dialog box of Write to PLC, and then execute the writing to PLC parameter. After resetting the CPU module, the value will become effective.

7.7.3 Initial setting

This section explains the setting of the operating condition for phase wire system, primary voltage, primary current, current demand time, and voltage demand time, primary voltage of VT, secondary voltage of VT, primary current of CT that are required for measurement. Once each value is set, these values will be stored in the nonvolatile memory of the module, so that reconfiguration is not needed. You can also perform the setting using sequence program. In this case, you need to create a program, as referring to Chapter 8.

Follow the procedure below for each setting.

- (1) Check the current setting
- (2) Set the Buffer memory
- (1) Check the current setting
 - From the "Online" menu, select "Monitor" "Buffer memory batch ...". The dialog box to monitor all buffer memories. After setting the address as shown below, click the Start monitoring button to check the current buffer memory status.
 - Module initial address: Set the initial address of this module. Buffer memory address: 0
 - (Display: 16-bit integer, numerical value: check the number in decimal)
 - 2) Check each item. The following shows items for operating condition settings. For specific setting value, see the provided references.

Buffer memory	Item	Reference
address		
Un¥G0	Phase wire system	Section 6.2.1
Un¥G1	Primary voltage	Section 6.2.2
Un¥G2	Primary current	Section 6.2.3
Un¥G3	Current demand time	Section 6.2.4
Un¥G4	Electric power demand time	Section 6.2.5
Un¥G5	Primary voltage of VT	Section 6.2.2
Un¥G6	Secondary voltage of VT	Section 6.2.2
Un¥G7	Primary current of CT	Section 6.2.3

Table 7.7.3-1 List of setting items

🔲 Buffer me	mory batch monitor-1		×
Module start ad	ldress: 0 (Hex)		
Buffer memory	address: 0 © DEC	C HEX	
Monitor format	: 📀 Bit & Word 🛛 Display:	16bit integer Value: DEC Start monitor	
	C Bit	C 32bit integer C HEX	
		Stop monitor	
	C Word	C Real number (single precision)	_
		Real number (double precision)	
		C ASCII character Option setup	
		O HOOI Character Option Setup	
Address	+FEDC +BA98 +765	4 +3 2 1 0	
00000	0000 0000 0000	0 0011 3	
00001	0000 0000 0000		1
00002	0000 0000 0000	2	
00003	0000 0000 0111		
00004	0000 0000 0111		
00005	0000 0000 0000		1
00006	0000 0000 0000		
00007	0000 0000 0000		
80000	0000 0000 0000		
00009	0000 0000 0000		
00010	0000 0000 0000		
00011 00012	0000 0000 0000		
00012			
00013	0000 0000 0000		
00014	0000 0000 0000		
00016	0000 0000 0000		
00017	0000 0000 0000		
00018	0000 0000 0000		
00019	0000 0000 0000		
00020	0000 0000 0000		
00021	0000 0000 0000		
00022	0000 0000 0000	0 0000 0	
00023	0000 0000 0000	0 0000 0 -	
		·	
•			

Figure 7.7.3-1 Dialog box to monitor all buffer memories (a case where the module is attached to the slot 0)

- (2) Set the Buffer memory
 - 1) In the dialog box to monitor all buffer memories, click the Device test button to display the Device test dialog box.
 - 2) In the Word device / buffer memory, specify the module initial address and buffer address, and click the Set button to apply the setting.

	Device test	
i	Bit device Device	Close
4), 6)→	Y9	Hide history
	FORCE ON FORCE OFF Toggle force	
,	Word device/buffer memory	
2)→	C Device	_
	Buffer memory Module start I/O	
	Address 0 V HEX V	
	Setting value 2 DEC 16 bit integer	✓ Set
	Program Label reference program	
	Execution history	
	Device Setting condition	Find
		Find next
		Re-setting Clear
		0.000

Figure 7.7.3-2 Device test dialog box (a case where this module is attached to the slot 0)

- 3) Change the setting in 2).
- In the section of bit device setting in the device test dialog box, select "Y9"* and click the FORCE ON button.
- 5) When the setting is completed without any problem, the Device "X9"* changes to ON. Check this using the procedure as follows:
 - (a) From the "Online" menu, select "Monitor" "Device batch ...". The dialog box to monitor all devices is displayed.
 - (b) Set "X0"* to the device, and click "Start monitor"
 - (c) Check that Device "X9"* is in the ON status.

Device batch	monitor-1		
Device: 🛛 🗙 🛛 Monitor format:	ⓒ Bit & Word Display: C Bit C Word	 ☞ 16bit integer ✓ 32bit integer ☞ HEX ○ Real number (single precision) ○ Real number (double precision) ○ ASCII character 	T/C set value Reference program MAIN Start monitor Stop monitor
Device +H	7 B D C +B A 9 & +7 1	5 5 4 +3 2 1 0	
X0 0	0000 0010 0	0 0 0 1 1 1 519	Option setup
X10 0	0000 0000 0		

Figure 7.7.3-3 Checking the device "X9"* in the dialog box to monitor all devices

- 6) After checking that the device "X9" is in the ON status, select "Device: "Y9" in the dialog box of device test, and then click the FORCE OFF button. Setting is completes.
- 7) If the Device "X9"* is not in the ON status, this means an error because the set value is out of range (ERR.LED is flashing). Modify the setting, and change the device "Y9" to the OFF status, then change it back to the ON status.
- * Indicates a number in the case where the initial I/O number (initial XY) is set to 0.

7.7.4 Setting function for integrated value

This function is to set integrated value (electric energy (consumption, regeneration) and reactive energy (consumption lag)) to any value. If you want to clear integrated value, set it to 0.

- (1) Check the current setting
 - From the "Online" menu, select "Monitor" "Entry data monitor". After registering the address as shown below, click the <u>Start monitoring</u> button to check the current buffer memory status.

Items	Buffer memory	Display		
Integrated value setting target	Un¥G51	16bit		
Integrated value setting value	Un¥G52, 53	32bit		
Electric energy(consumption)	Un¥G102	16bit		
Integrated value set request	YC	16bit		
Integrated value set completion flag	XC	16bit		

Table 7.7.4-1 List of setting items

2) Check item.

(a) Set integrated value setting target (Un¥G51) in the buffer memory. Setting range is as follows:

Setting value	Description			
0	No set			
1	Electric energy (consumption)			
2	Electric energy (regeneration)			
3	Reactive energy (consumption lag)			

Table 7.7.4-2 List of setting items

(b) Set integrated value setting value (Un¥G52, 53) in the buffer memory.

- Configurable range: 0 to 999999999

- The unit used for the setting value is the same as that used for the electric energy and reactive energy that are output to the buffer memory.

For details, refer to section 6.3.1.

Entry data monitor-2					
Device	ON/OFF/Current value	Setting value	Connect	Coil	Device comment
U0\G51	1				
U0\G52(D)	0				
UO\G102	1234				
УОС	0				
xoc	0				

Figure 7.7.4-1 Dialog box to Entry data monitor (a case where the module is attached to the slot 0)

- (2) Set the Buffer memory
 - 1) In the dialog box to monitor all buffer memories, click the Device test button to display the Device test dialog box.
 - 2) In the Word device / buffer memory, specify the module initial address and buffer address, and click the Set button to apply the setting.

	Device test
	- Bit device Close
4), 6)→ ¦	FORCE ON FORCE OFF Toggle force
2)→	Word device/buffer memory C Device U0¥G81 C Buffer memory Module start I/O U (Hex) Address 51 HEX Setting value
	DEC 16 bit integer Set Program

Figure 7.7.4-2 Device test dialog box (a case where this module is attached to the slot 0)

- 3) Change the setting in 2).
- 4) In the section of bit device setting in the device test dialog box, select "YC"* and click the FORCE ON button.
- 5) When the setting is completed without any problem, the Device "XC"* changes to ON.

Entry data monitor-2					
Device	ON/OFF/Current value	Setting value	Connect	Coil	Device comment
UO\G51	0				
U0\G52(D)	0				
U0\G102	0				
YOC	1	`			
xoc	1	,			
	\\	1			

Figure 7.7.4-3 Checking the device "XC"* in the dialog box to Entry data monitor

- 6) After checking that the device "XC"* is in the ON status, select "Device: "YC"* in the dialog box of device test, and then click the FORCE OFF button. Setting is completes.
- 7) If the Device "XC"* is not in the ON status, this means an error because the set value is out of range (ERR.LED is flashing). Modify the setting, and change the device "YC" to the OFF status, then change it back to the ON status.
- * Indicates a number in the case where the initial I/O number (initial XY) is set to 0.
- (3) Default value

Integrated value setting target (Un¥G51) is set to 0 (No set). Integrated value setting value (Un¥G52,53) is set to 0.

7.7.5 Debugging program

QE81WH provides a test function so that you can debug a program with no input of voltage or current. Pseudo-value can be stored into the buffer memory. For detailed explanation for the test function, refer to 4.2.5.

Test function stores pseudo-values for setting value and error information as well as measured value. If you use these data to control the sequence program that controls external devices, there is a chance that erroneous control may occur. For safety of external devices, use this function after disconnecting the device.

- (1) Setting intelligent function of the module switch
 - 1) In the "I/O assignment setting" of 7.7.1, click the Switch setting button to display the dialog box of "I/O module, intelligent function module switch setting". (Refer to 7.7.2)
 - The intelligent function module switch setting displays switches 1 to 5; however, only the switch 5 is used for this purpose. Switch setting is configured using 16-bit data. Setting is as follows: Switch 5: "1"
 - 3) When the setting is completed, click the End button.
 - 4) From the "Online" menu, select "Write to PLC" to display the dialog box of Write to PLC, and then execute the writing to PLC parameter. After resetting the CPU module, the value will become effective.
- (2) Starting the test function
 - 1) Reset the CPU module.
 - 2) QE81WH starts in the test function mode. All LEDs are turned on. Pseudo-values are set effective in the buffer memory.
- (3) Finishing the test function (Move back to the measuring mode)
 - 1) Following 1) and 2) in step (1), configure the intelligent function switch setting as shown below.
 - Switch 5: "0"
 - 2) Following 3) and 4) in step (1), complete the setting and write the data into PLC.
 - 3) Reset the CPU module, then the operation goes back to the measuring mode.

Chapter 8: Programming

This chapter explains about programming for QE81WH. When you apply sample programs introduced in this chapter into the actual system, make sure to verify in advance that there is no problem with the target system control.

Follow the procedure in Figure 8.1-1 to create a sample program using QE81WH.

The default setting allows you to use either GX Works2 (refer to 7.6), GX Developer (refer to 7.7) or the sequence program to make setting; however, if the setting is made for the first time by using GX Works2 or GX Developer, the program for initial setting can be eliminate, which will reduce time for scanning.

8.1 Programming procedure

Follow the procedure in Figure 8.1-1 to create a program for acquiring the measured data, alarm monitoring, calculating periodical electricity amount using QE81WH.

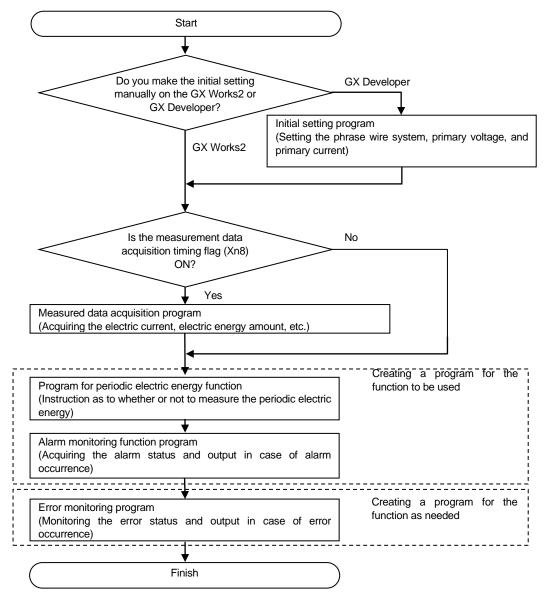


Figure 8.1-1 Programming chart

8.2 System configuration and usage conditions for sample program

A sample program under the following system and the usage condition is shown below.

(1) System configuration

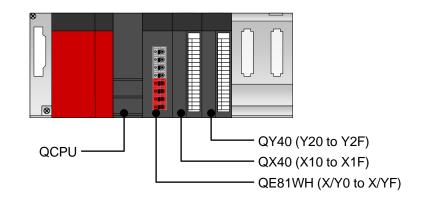


Figure 8.2-1 Sample system configuration using a sample program

- (2) Setting conditions for the intelligent function of the module switch
 - Setting is as follows:

Switch No.	Switch name	Description
1	Not used	-
2	Not used	-
3	Not used	-
4	Not used	-
5	Test mode transition	0 (measuring mode)

(3) Programming conditions

(a) Setting the operating conditions

- Phase wire : Three-phase 3-wire
- Primary voltage : 220 V
- Primary current : 250 A
- Current demand time : 30 sec
- Electric power demand time : 30 sec
- Primary voltage of VT :0
- Secondary voltage of VT :0
- Primary current of CT :0

(b) Alarm monitoring setting

- Alarm 1 item
- : 100000 (100 A)

: Current demand upper limit

: Current demand upper limit

- Alarm 1 reset method : Auto reset
- Alarm 1 delay time : 5 sec
- Alarm 2 item
- Alarm 2 value

- Alarm 1 value

- : 120000 (120 A) - Alarm 2 reset method : Self-retention
- Alarm 2 delay time : 5 sec

- (c) Data acquisition clock setting
 - Output period of data acquisition clock : 1000 (1sec)
- (4) Before creating a program

Before creating a program, attach QE81WH to the base unit, and connect it to external devices.

Electric current sensor: EMU-CT250

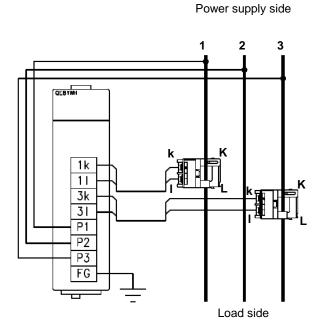


Figure 8.2-2 Example of wiring using a sample program

8.3 Sample programming

- 8.3.1 Sample program when make the initial setting using GX Works2 or GX Developer.
 - (1) List of devices

	Table 8.3.1-1 List of devices			
Device	Function			
D20	Device that stores latest error code			
X0	Module ready			
ХА	Alarm 1 flag			
ХВ	Alarm 2 flag			
XF	Error flag	QE81WH		
Y1	Periodic electric energy 1	(X/Y0 to X/YF)		
11	measurement flag			
Y2	Periodic electric energy 2			
12	measurement flag			
	Device that the user will turn ON in	QX40		
X10	order to support measurement of	(X10 to X1F)		
	periodic electric energy			
	Device that turns ON to send an			
Y20	output to the external device when			
	the alarm 1 occurs			
Y21	Device that turns ON to send an	QY40		
	output to the external device when	(Y20 to Y2F)		
	the alarm 2 occurs	(1-0-10-1-1-)		
	Device that turns ON to send an			
Y22	output to the external device in the			
	case of an error			

(2) List of buffer memories to be used

Table 8.3.1-2 List of buffer memories to be used

Device	Description	Setting value	Remarks
U0¥G3000	Latest error code	-	Stores latest error code

(3) Sample program

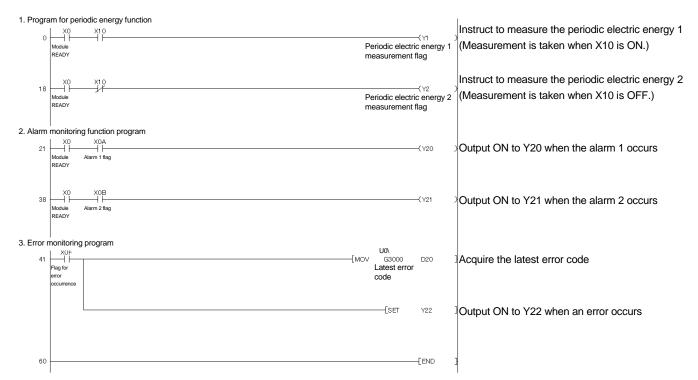


Figure 8.3.1-1 Example of sample program

8.3.2 Sample program when make the initial setting using sequence program.

(1) List of devices

(1) List of devices Table 8.3.2-1 List of devices				
Device		Function		
D0, D1	Device that stores Multiplier of electric	energy		
D2, D3	Device that stores electric energy (cons	sumption)		
D4, D5	Device that stores Average current			
D6, D7	Device that stores Average voltage			
D8, D9	Device that stores electric energy			
D10, D11	Device that stores reactive energy			
D12, D13	Device that stores power factor			
D14, D15	Device that stores frequency			
D20	Device that stores latest error code			
X0	Module ready			
X8	Output period of data acquisition clock			
Х9	Operating condition setting completion flag			
ХА	Alarm 1 flag			
ХВ	Alarm 2 flag	QE81WH		
XF	Error flag	(X/Y0 to X/YF)		
Y1	Periodic electric energy 1 measurement flag			
Y2	Periodic electric energy 2 measurement flag			
Y9	Operating condition setting request			
X10	Device that the user will turn ON in order to support measurement of periodic electric energy	QX40 (X10 to X1F)		
Y20	Device that turns ON to send an output to the external device when the alarm 1 occurs			
Y21	Device that turns ON to send an output to the external device when the alarm 2 occurs	QY40 (Y20 to Y2F)		
Y22	Device that turns ON to send an output to the external device in the case of an error			

Table 8.3.2-2 List of buffer memories to be used				
Device	Description	Setting	Remarks	
		value		
U0¥G0	Phase wire system	3	Three-phase 3-wire	
U0¥G1	Primary voltage	2	220 V	
U0¥G2	Primary current	3	250 A	
U0¥G3	Current demand time	30	30 sec	
U0¥G4	Electric power demand time	30	30 sec	
U0¥G5	Primary voltage of VT	0	When Primary voltage(U0¥G1) is except 0	
U0¥G6	Secondary voltage of VT	0	When Primary voltage(U0¥G1) is except 0	
U0¥G7	Primary current of CT	0	When Primary current (U0¥G2) is except 0	
U0¥G11	Alarm 1 item	1	Current demand upper limit	
U0¥G12, 13	Alarm 1 value	100000	100 A	
U0¥G14	Alarm 1 reset method	1	Auto reset	
U0¥G15	Alarm 1 delay time	5	5 sec	
U0¥G21	Alarm 2 item	1	Current demand upper limit	
U0¥G22, 23	Alarm 2 value	120000	120 A	
U0¥G24	Alarm 2 reset method	0	Self-retention	
U0¥G25	Alarm 2 delay time	5	5 sec	
U0¥G60,61	Output period of data	1000	1 sec	
00=00,01	acquisition clock			
U0¥G100	Multiplier of electric energy	-	Stores multiplier of electric energy	
U0¥G102, 103	Electric energy (consumption)	-	Stores electric energy	
U0¥G218, 219	Average current	-	Stores Average current	
U0¥G314, 315	Average voltage	-	Stores Average voltage	
U0¥G402, 403	Active energy	-	Stores active energy	
U0¥G502, 503	Reactive energy	-	Stores reactive energy	
U0¥G702, 703	Power factor	-	Stores power factor	
U0¥G802, 803	Frequency	-	Stores frequency	
U0¥G3000	Latest error code	-	Stores latest error code	

(2) List of buffer memories to be used

(3) Sample program

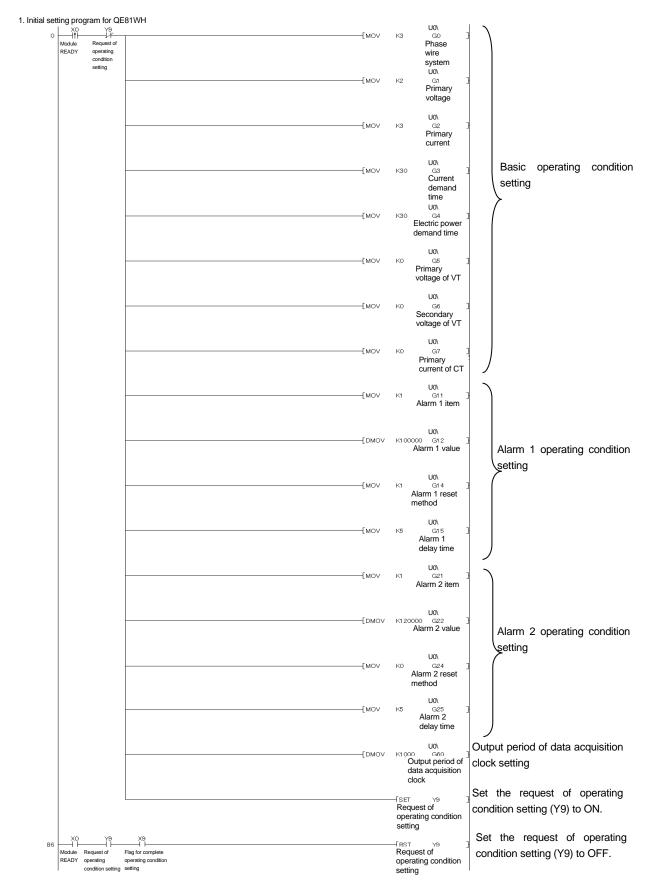
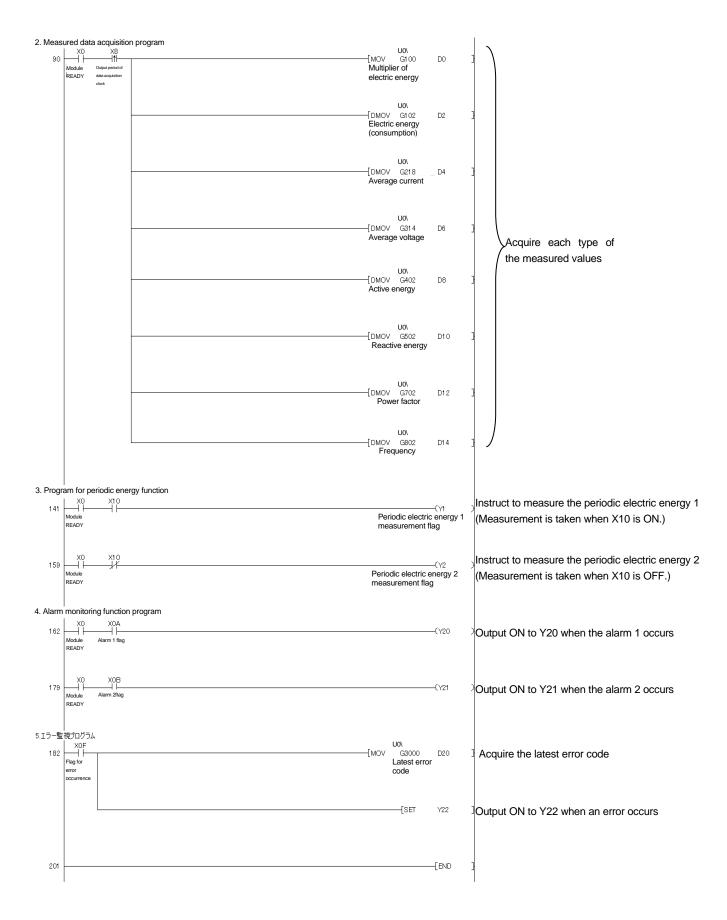


Figure 8.3.2-1 Example of sample program





9 Troubleshooting

Chapter 9: Troubleshooting

	<u>/</u> Caution
•	If an abnormal sound, bad-smelling smoke, fever break out from this unit, switch it off promptly
	and do not use it.

9.1 List of error codes

When the data are written to the CPU module from this module or when a reading error occurs, error codes will be stored into the following buffer memory.

Table 9.1-1 Latest error code, storage destination upon error occurrence	Э
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Latest error code	Time of error occurrence
Un¥G3000	Un¥G3001 to Un¥G3004

Table below shows error codes.

Table 9.1-2 List of error codes

Error code (HEX)	Error level	Descriptions	Action	Reference
0001h 0002h 0003h	Mid	Hardware error with the module.	Turn the power OFF/ON. If the error recurs, the module may have a failure. Consult with a nearest sales agent or our company branch for the symptom of the failure.	-
1001h	Low	Phase wire method (Un¥G0) is set out of range.	Check phase wire method, and set it within 1-3.	Section 6.2.1
1002h	Low	Primary voltage (Un¥G1) is set out of range.	Set it within 0 to 9 according to the primary voltage.	Section 6.2.2
1003h	Low	Primary current (Un¥G2) is set out of range.	Set it within the range* of 0 to 5, 501 to 536 according to the primary current.	Section 6.2.3
1004h	Low	Current demand time (Un¥G3) is set out of range.	Set current demand time within the range* of 0 to 1800 (seconds).	Section 6.2.4
1005h	Low	Electric power demand time (Un¥G4) is set out of range.	Set electric power demand time within the range* of 0 to 1800 (seconds).	Section 6.2.5
1006h	Low	Alarm 1 item (Un¥G11) is set out of range.	Set alarm 1 item within 0 to 8.	Section 6.2.6
1007h	Low	Alarm 2 item (Un¥G21) is set out of range.	Set alarm 2 item within 0 to 8.	Section 6.2.6
1008h	Low	Alarm 1 reset method (Un¥G14) is set out of range.	Set alarm 1 reset method within 0 to 1.	Section 6.2.8
1009h	Low	Alarm 2 reset method (Un¥G24) is set out of range.	Set alarm 2 reset method within 0 to 1.	Section 6.2.8

Error code (HEX)	Error level	Descriptions	Action	Reference
100Ah	Low	Alarm 1 delay time (Un¥G15) is set out of range.	Set alarm 1 delay time within the range* of 0 to 300 (seconds).	Section 6.2.9
100Bh	Low	Alarm 2 delay time (Un¥G25) is set out of range.	Set alarm 2 delay time within the range* of 0 to 300 (seconds).	Section 6.2.9
100Ch	Low	Integrated value setting value (Un¥G52, 53) is set out of range.	Set electric energy preset value within the range* of 0 to 9999999999 in the double word format (32-bit integer).	Section 6.2.10
100Dh	Low	Primary voltage of VT is set out of range.	Set primary voltage of VT within the range* of 0 to 6600 (V). However, this setting cannot set 0 (any setting) when primary voltage (Un¥G1) is 0.	Section 6.2.2
100Eh	Low	Secondary voltage of VT is set out of range.	Set secondary voltage of VT within the range* of 0 to 220 (V). However, this setting cannot set 0(any setting) when primary voltage (Un¥G1) is 0.	Section 6.2.2
100Fh	Low	Primary current of CT is set out of range.	Set primary current of CT within the range* of 0 to 6000 (A). However, this setting cannot set 0(any setting) when primary current (Un¥G2) is 0	Section 6.2.3
0000h	-	Normal	-	-

* Also check that it is set in decimal.

9.2 Troubleshooting

9.2.1 When "RUN" LED is turned off

	9.2.1-1 When RON LED IS turned on	
Check item	Action	Reference
Is power source is supplied?	Check that supply voltage of the power source is within the rating.	-
Is capacity of the power source module sufficient?	Calculate the consumption current of CPU module, I/O module, and intelligent function module attached to the base unit, and check that the power capacity is sufficient.	-
Is the watchdog time an error?	Reset CPU module, and check whether it is turned on. If RUN LED is not turned on even after doing the above, the module may have a failure. Consult with a nearest sales agent or our company branch for the symptom of the failure.	-
Is the module properly attached to the base unit?	Check the module attachment status.	Section 7.4
Is the slot type set to "empty" in the I/O assignment setting of the PC parameter at GX Developer?	Set the slot type to "Intelligent".	Section 7.7.1
Did you set installation slot number incorrectly when adding a new unit at GX Works2?	Please set the installation slot number correctly.	Section 7.6.1

Table 9.2.1-1 When "RUN" LED is turned off

QE81WH

9.2.2 When "ERR." LED is turned on or flashing

(1) If it is ON

Table 9.2.2-1 When "ERR." LED is turned on

Check item	Action	Reference
	Check latest error code (Un¥G3000), and take a	
	corrective action as described in section 9.1. After	
	that, reset CPU module, and check whether it is	
Did onu orrer ecour?	turned on.	Section
Did any error occur?	If "ERR." LED is turned on even after doing the	9.1
	above, the module may have a failure. Consult	
	with a nearest sales agent or our company branch	
	for the symptom of the failure.	

(2) If it is flashing

Table 9.2.2-2 When	"ERR." LED is flashing

Check item	Action	Reference
	The set value may be out of range. Check that the	
	operating condition settings and the integrated	Section
	value are correct.	5.2.2
	Correct configuration or changing the request for	Section
Did on v orrest o cove?	error clear (YF*) to ON will recover the error.	6
Did any error occur?	When the error is cleared using the error clear	Section
	request (YF*), the operation continues with the	7.6.3
	previous setting.	Section
	* In the case where the initial I/O number of this	7.7.3
	module is 0	

9.2.3 If electric energy cannot be measured

The following check has to be performed while current is flowing from the power source side to the load side.

Check item		Action	Reference	
"MEA." LED	"R" LED	"1" "3" LED	Action	Reference
OFF	OFF	Both "1" and "3" LED are OFF.	The type of current sensor may be incorrect. In addition, if the rating of the used sensor is different from the primary current, measurement cannot be taken correctly. Wiring is not done or may be wrong. Refer to 7.5 to check the wiring. Voltage wiring may be incorrect. Check connection of P1, P2, and P3.	
ON	ON	Both "1" and "3" LED are ON.	Current sensors on both 1 side and 3 side may be installed in the reverse direction. Check the connection. Voltage wiring may be incorrect. Check connection of P1, P2, and P3.	Section 7.5
		Only "1" is ON.	Current sensor on side 1 may be installed in the reverse order or current sensors on side 1 and side 3 may be swapped. Check the connection. Connection between P1 and P2 or P1 and P3 may be reversed. Check the connection.	
	OFF or ON	Only "3" is ON.	Current sensor on side 3 may be installed in the reverse order or current sensors on side 1 and side 3 may be swapped. Check the connection. Connection between P2 and P3 or P1 and P3 may be reversed. Check the connection.	
	OFF	Both "1" and "3" LED are OFF.	Measurement is taken normally. Check for the correct buffer memory address and data format (double word: 32-bit integer).	Chapter 6

9.2.4 If the electric current and voltage that are measured using this module do not match with the ones measured with other gauge

Table 9.2.4-1 If current and voltage that are measured using this module do not match with the ones measured with other gauge

Check item	Action	Reference
Are phase wire method, primary current, and primary voltage correct?	Check the value in the buffer memory for checking the phase wire method, primary current and primary voltage. When the value in the buffer memory is changed, you need to turn the request for operating condition setting into ON. Otherwise, it will not be applied to the measurement.	Section 6.1
Does the compared gauge measure the effective value correctly?	This module stores the effective value into the buffer memory. If the compared device uses the average value instead of the effective value, the resulted value may largely differ when there is current distortion in the measurement circuit.	-
Is the secondary of CT short-circuited?	Make sure that the secondary of CT is not short-circuited. If it is connected to Mitsubishi's current transformer CW-5S(L), check that the secondary switch is not short-circuited.	-
Are you using other current sensor than recommended ones?	Only the dedicated current sensors can be connected to this module. Check that other company's sensor is not being used.	-

9.3 Q&A

9.3.1	General
Q	To what degree is the module durable against overvoltage and over current? Is external
	protective circuit required?
	Momentary*: Up to 2 times as high as rated voltage and 20 times as high as rated current.
	Continuous : Up to 1.1 times as high as rated voltage and rated current.
Α	* Momentary means: Energizing 9 times for 0.5 seconds at 1-minute intervals, and then 1 time
	for 5 seconds.
	External protective circuit is not required.
•	
Q	Can the module be used as an electric energy meter?
	This module can be used to measure the electric energy and to manage the use of electric
Α	energy.
	However, it cannot be used for deal and proof of electric energy measurement stipulated in the
	measurement law.
0	
Q	Are errors in wiring verifiable easily?
	They are verifiable by the illuminating condition of "MEA.," "R," "1," and "3" LEDs on the front of
A	
	Refer to Section 9.2.3 for details.
Q	Is it OK to open the secondary terminals of the current sensor?
	The secondary side of the models EMU2-CT5, EMU-CT50, EMU-CT100, EMU-CT250,
	EMU-CT5-A, EMU-CT50-A, EMU-CT100-A, EMU-CT250-A, EMU-CT400-A, and EMU-CT600-A
	is equipped with the protective circuit against opening of secondary terminals. Opening them
	during the wiring work causes no problems. However, for safety, please do not continuously
	energize the module with the terminals open.
Α	The secondary side of the models EMU-CT400 and EMU-CT600 is equipped with the protective
	circuit against opening of secondary terminals. However, during the wiring work, be sure to turn
	the secondary side short-circuit switch to short. After completion of work, be sure to turn the
	secondary short-circuit switch to open. Note that failing to turn the switch open results in an
	inaccurate measurement.
Q	Is measurement of inverter circuit possible?
	Measuring the secondary side of the inverter is impossible due to the large fluctuation of
	frequency.
Α	Make measurement on the primary side of the inverter. However, since a current waveform on
	the primary side of the inverter has a distortion containing the harmonic components, a slight
	error occurs.

Α

Α

If a load such as welding equipment exists, a current flows only for a short period (e.g. 2-cycle waveform of commercial frequency (50 Hz: 40 ms, 60 Hz: 33 ms)). Is accurate measurement possible?

This module makes measurement with a sampling period of 4340 Hz (for both 50 Hz and 60 Hz). However, measuring part of buffer memory data (Un¥G100 to Un¥G2999) is updated every 250 ms. The electrical amount such as current, voltage, electric power, power factor, and frequency is measured in a cycle of 250 ms period.

It is impossible to measure the instantaneous short–term amount of electricity. The amount of electricity and reactive power amount are measured separately from the momentary data described above, using a sampling period of 4340 Hz continuously without intermittence.
Therefore, measuring the load for a short period is possible.

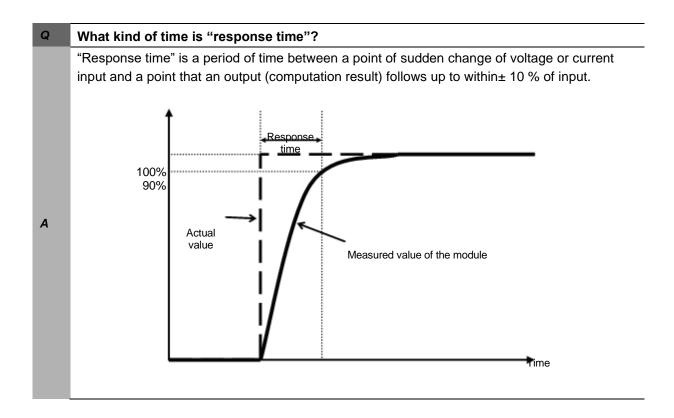
Q Obtained values may be different from other measuring instruments. Why is it so?

There are various possible causes. Check the following first, please:

- [1] Check for wiring errors (polarity of current sensors, connections of current circuits, and connections of voltage circuits, in particular).
- [2] On the split-type current sensor, check for the poor engagement or separation of fitting surfaces.
- [3] On the split-type current sensor, check for pinching of foreign object between fitting surfaces.
- [4] Check that the measuring instrument used for comparison indicates a correct RMS value.
 - [5] If the measuring instrument used for comparison measures an average value instead of rms value, distortion in the current of the circuit to be measured causes a significant difference of values. This module measures an rms value.
 - [6] Check for the short-circuit on the secondary side of the current transformer (CT).
 - [7] Current sensor connectable to the module is the dedicated current sensor only. Check that the proper current sensor is connected or not.

9.3.2 Q&A about Specifications

Q	What accuracy does "measuring accuracy" mean?
A	In terms of the amount of electricity, it means a range of tolerances in reading values. For example, when the reading value is "10 kWh," a tolerance is ± 0.2 kWh.
~	In terms of measuring elements other than the amount of electricity, it means tolerance for the
	rated input. For a current, when a rated current is set to 250 A, ±1 % of 250 A is a tolerance.
-	
Q	Is accuracy of a current sensor included?
	Accuracy of a current sensor is not included in accuracy of the module.
Α	A maximum value of tolerance is obtained by summing tolerance of the module and that of a
	current sensor.
Q	To what degree an area of microcurrent is measured?
	A current value is measured from the area exceeding 0.4 % of the rated current. In an area
	below 0.4 %, measurement result is indicated as "0" (zero).
Α	However, in that case, still, the amount of electricity is being measured. Even if the indicated
	value is "0," measurement value will increase in continuing measurement for a long time.
	The amount of electricity is measured with a load that is about 0.4 % or more of all load power.



9.3.3 Q&A about Installing

Q	What is wire diameter that allows installing a current sensor?
A	The nominal cross-sectional areas of the conductor of 600-V vinyl coated wires that can penetrate (values for reference), refer to 7.5.3.1. The above shows the standard nominal cross-sectional areas. Due to the outer difference of finished vinyl insulation and deformation (bending) depending on manufacturers, a wire may not penetrate. Make verification on site.
Q	What are the points when installing a current sensor?
А	Models EMU2-CT5, EMU-CT*** and EMU-CT***-A are split-type. If split surfaces are not engaged sufficiently or a foreign object exists between the split surfaces, adequate

performances are not obtained. Pay attention in installation.

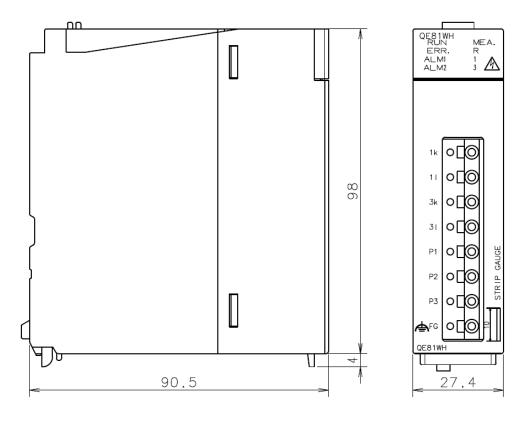
9.3.4	Q&A about Connection
Q	Does polarity exist in connection between a current sensor and the module?
A	Yes, it does. Make connections so that secondary terminals of current sensor (k, l) and terminal symbols of module agree with each other. If polarity is incorrect, the current value is measurable, but the electric power and the electrical energy can not be measured correctly.
Q	Are there any key points in avoiding errors in wiring?
A	Check polarity of current sensor on the primary current side. Power supply side of the circuit is indicated as "K," and the load is indicated as "L." An arrow indicates the direction from K to L. For a 3-wire circuit, check that the current sensor and the module are connected correctly for the 1-side circuit and 3-side circuit. Besides, check that voltage inputs are connected correctly among P1, P2, and P3.
Q	How do wires extend between a current sensor and the module?
A	Model EMU-CT***, EMU-CT***-A are extendable up to 50 m. Model EMU2-CT5 is extendable up to 11 m, using together with extension cable. To extend the wire further, use the current transformer CW-5S(L) for split-type instrument in combination, extending the secondary wiring on CW-5S(L) side.

9.3.5 Q&A about Setting

Q	Is the setting required?
A	At least, settings of phase wires, primary current and primary voltage are required. Specify settings in accordance with a circuit to be connected.
Q	If a primary current setting value is different from that of rated current on a connected current sensor, does it cause a breakdown?

Appendix

Appendix 1: External dimensions



Unit [mm]

Appendix 2: Optional devices

(1)Specifications

Split type current sensor

Item	Specifications					
Model	EMU-CT50 EMU-CT100 EMU-CT2			EMU-CT400 EMU-CT6		
Rated primary current	50 A AC	100 A AC	250 A AC	400 A AC	600 A AC	
Rated secondary current	16.66 mA	33.33 mA	66.66 mA	66.66 mA	66.66 mA	
Rated burden	0.1 VA					
Ratio error	±1 %(5 % to 100 % of rating, RL \leq 10 Ω)					
Phase displacement	±30 min. (5 % to 100 % of rating, RL \leq 10 Ω)					
Pollution degree	2					
Working temperature range	−5 °C to +55 °C (daily mean temperature: +35 °C or less)					
Working humidity range	5 % to 95 %RH (no condensation)					
CE marking conformity standard	EN61010-2-032					
Weight (per one)	0.1 kg 0.7 kg					

*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.

*EMU-CT400 and EMU-CT600 are stopped.

*QE81WH produced after September 2024 cannot be used in combination with Discontinued current sensor(EMU-CT400, EMU-CT600).

*Please check the maximum voltage for the combination measurement unit.

Item	Specifications				
Model	EMU-CT50-A EMU-CT100-A		EMU-CT250-A	EMU-CT400-A	EMU-CT600-A
Rated primary current	50 A AC 100 A AC		250 A AC	400 A AC	600 A AC
Rated secondary current	16.66 mA	33.33 mA	66.66 mA	66.66 mA	66.66 mA
Rated burden					
Ratio error	±1 %(5 % to 100 % of rating, RL≦10 Ω)				
Phase displacement	of rating, ±60 min. or les	s(10 % to 100 % RL=10 Ω) s(5 % of rating, l0 Ω)	±40 min. or less (5 % to 100 % of rating, RL=10 Ω)	±40 min.(5 % to 100 % of rating, RL≦10 Ω)	
Pollution degree		-		2	2
Working temperature range	−5 °C to +55 °C (daily mean temperature: +35 °C or less)				
Working humidity range	30 % to 85 %RH (no condensation)				
CE marking conformity standard	- EN61010-2-032				0-2-032
Weight (per one)	0.1 kg	0.1 kg	0.2 kg	0.3 kg	0.4 kg

*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.

*Please check the maximum voltage for the combination measurement unit.

*When using EMU-CT600-A to comply with UL/c-UL standards, please use it within the range of -5 °C to +50 °C.

5A current sensor

Item	Specifications				
Model	EMU2-CT5	EMU-CT5-A			
Rated primary current	5 A	AC			
Rated secondary current	1.66 mA				
Rated burden	0.1 VA				
Ratio error	±1 %(5 % to 100 % of rating, RL \leq 10 Ω)	± 1 % (5 % to 100 % of rating, RL=10 Ω)			
Phase displacement	\pm 30 min.(5 % to 100 % of rating, RL≦10 Ω)	±45 min. or less(10 % to 100 % of rating, RL=10 Ω) ±60 min. or less(5 % of rating, RL=10 Ω)			
Pollution degree	2	-			
Working temperature range	−5 °C to +55 °C (daily mean temperature: +35 °C or less)	−5 °C to +55 °C (daily mean temperature +35 °C or less)			
Working humidity range	5 % to 95 %RH (no condensation)	30 % to 85 %RH (no condensation)			
CE marking conformity standard	EN61010-2-032	-			
Weight (per one)	0.1 kg	0.1 kg			

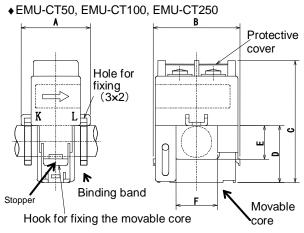
*Use an electric Insulated wire of the size of penetrating this current sensor for a primary side cable, do not use a non-insulation electric wire or a metal for a primary cable.

*Please check the maximum voltage for the combination measurement unit.

QE81WH

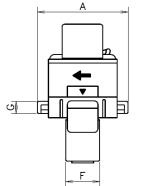
(2)External dimensions

Current sensor



Model	Α	В	С	D	Е	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
						Uni

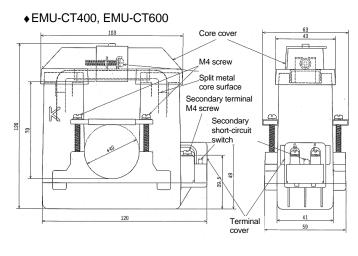
♦ EMU-CT5-A, EMU-CT50-A, EMU-CT100-A



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Model	Α	в	с	D	ш	F	G
EMU-CT5-A	37.4	31.6	57.5	12.2	12.8	1/	5
EMU-CT50-A	37.4	31.0	57.5	12.2	12.0	14	5
EMU-CT100-A	43.6	33.6	65	16.2	16.2	19	5

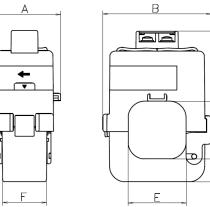
Unit [mm]



Unit [mm]

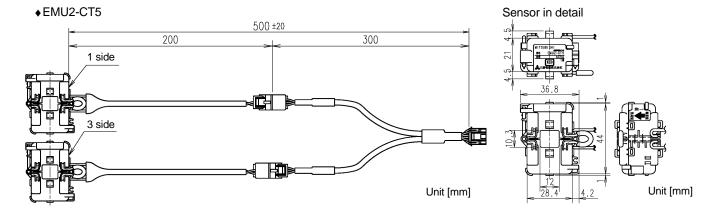
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◆ EMU-CT250-A, EMU-CT400-A, EMU-CT600-A



Model	Α	В	С	D	Ε	F	G
EMU-CT250-A	42.6	49.4	74.5	24	24	25.2	4.5
EMU-CT400-A EMU-CT600-A	44.9	67.2	94	36	36	27	4.5

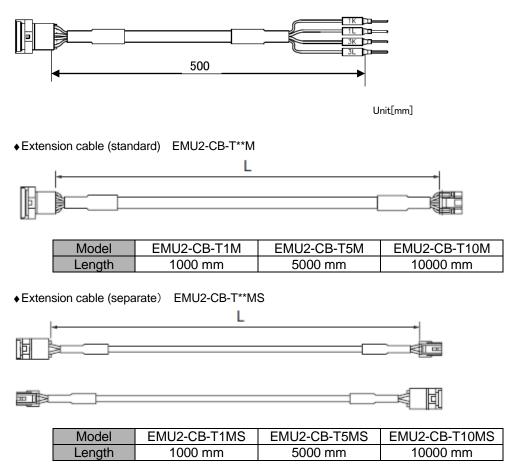
Unit [mm]



U

Dedicated cable

♦5A current sensor cable EMU2-CB-Q5A



Appendix 3: Addition or change of functions

The following table lists functions added or changed to the QE81WH and GX Works2, serial number of compatible QE81WH, and software version of compatible GX Works2.

Added or changed contents	serial number with the QE81WH ^{*1}	Software version with the GX Works2
Support with GX Works2	Upper 6 digits is 120911 or later	1.90U or later

*1: Shown on the front (at the bottom) of the module. When a serial number is not displayed on the front of module, the module does not support added or changed contents.

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Warranty

For using this product, please thoroughly read the following product warranty descriptions.

1. Gratis Warranty Period and Gratis Warranty Coverage

If any failure or defect (hereinafter collectively called "failures") for which our company is held responsible occurs on the product during the gratis warranty period, our company shall replace the product for free through the distributor at which you purchased the product or our service company.

However, if an international travel is required for replacement, or a travel to an isolated island or remote location equivalent is required for replacement, the actual cost incurred to send an engineer(s) shall be charged. [Gratis Warranty Period]

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.

- [Gratis Warranty Coverage]
 - (1) The gratis warranty shall apply only if the product is being used properly in the conditions, with the methods and under the environments in accordance with the terms and precautions described in the instruction manual, user's manual, caution label on the product, etc.
 - (2) Replacement shall be charged for the following cases even during the gratis warranty period.
 - 1) Failures occurring due to your improper storage or handling, carelessness or fault, and failures arising from the design contents of hardware or software you use.
 - 2) Failures arising from modification you performed on the product without prior consent of our company.
 - 3) Failures occurring in the event that the product is assembled into the device you use and that are acknowledged as avoidable if the device is equipped with a safety mechanism that comply with the legal regulations applicable to the device or with functions/architecture which are considered as necessary to be equipped under conventions of the industry.
 - 4) Failures due to accidental force such as a fire, abnormal voltage, etc. and force majeure such as an earthquake, thunderstorm, wind, flood, etc.
 - 5) Failures due to matters unpredictable based on the level of science technology at the time of product
 - 6) Other failures which are beyond responsibility of our company or which you admit that our company is not held responsible for.

2. Fare-Paying Repair Period after Production Discontinued

- (1) The period our company may accept product replacement with charge shall be seven (7) years after production of the product is discontinued.
 - Production stoppage shall be announced in the technical news, etc. of our company.
- (2) The product (including spare) cannot be supplied after production is discontinued.

3. Exemption of Compensation Liability for Opportunity Loss, Secondary Loss, etc.

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 gratis warranty period.

4. Change of Product Specifications

Please be advised in advance that the specifications described in catalogs, manuals or technical materials are subject to change without notice.

5. Application of Products

- (1) For use of our general-purpose sequencer MELSEC-Q series and Energy Measuring Unit QE81WH, they shall be used for a purpose which shall not lead to a material accident even when a failure or malfunction of the sequencer occurs, and a backup or fail-safe function shall be implemented systematically at external of the device in the event of a failure or malfunction.
- (2) Our general-purpose sequencers are designed and manufactured as general-purpose products which are targeted for general industry applications. Therefore, use of the sequencer for purposes in nuclear power plants and other power plants of each electric power company which greatly affect public, or for purposes in each JR company and the Defense Agency requiring a special quality assurance system shall be excluded from its applications.

However, the sequencer may be used for such purposes if the customer acknowledges that it should be used for limited purpose only and agrees not to require special quality.

Also, if you are considering to use this device for purposes that are expected to greatly affect human life or property and require high reliability especially in safety or control system such as aviation, medical care, railroad, combustion/fuel device, manned carrier device, entertainment machine, safety equipment, please consult with our service representative to exchange necessary specifications.

Energy Measuring Module

Please refer to our website for service network. Our website address: https://www.mitsubishielectric.com/fa/



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