

Mitsubishi Programmable Controller MELSEC-Q Series Power Measurement Module (QE81WH)



Mitsubishi Electric Corporation, Fukuyama Works
2010

Power Measurement Needs in Production Equipment Systems

Energy Efficiency Management

Meets the need for detailed energy saving monitoring by measuring each production equipment's active energy.

- Power monitoring of each production line process / production equipment.
- Detailed energy consumption rate management
 - For each control timing
 - Short tact processes (for each tire, each semiconductor wafer, etc.)
 - For lines having multiple product types (beverages, etc.)
 - For uncountable products (sheet-shaped products, etc.)

Suitable operation needs

Meets the need for optimal operation of equipments by measuring production equipment's active power or current.

- Reduces wasteful energy consumption during equipment startups (machine overshoots, etc.)

Preventive Maintenance

Meets the need for prevention of sudden failures by measuring active power or current of production equipments.

- Lubricant is supplied when active power (or current) level rises
- Grinder (cutting machine) blade is changed when current increases.

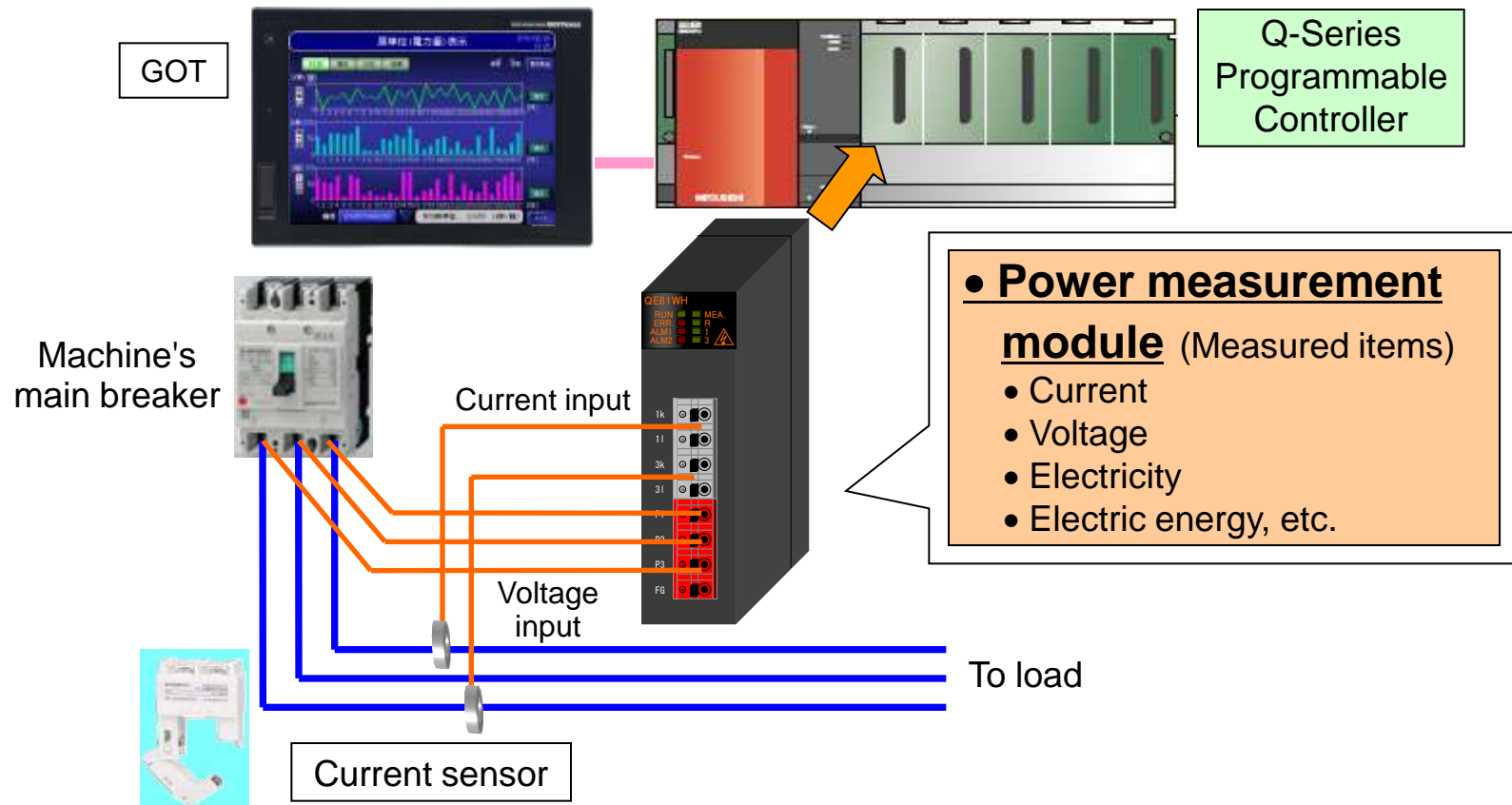
Product quality control

Meets the need for management of production items in abnormal state by detecting voltage and current errors of production equipments.

- Detection of heater wire breakage (current)
- Quality assurance through voltage, current, and frequency management, etc.

Product Concept

- (1) Can be mounted directly into the MELSEC-Q slot → **Space-saving**
- (2) No need for communication module, communication line, or communication ladder program → **Reduction of wiring work and cost**
- (3) Specific energy consumption can be managed by linking electric energy with production units → **Easy measurements & easy specific energy consumption management**

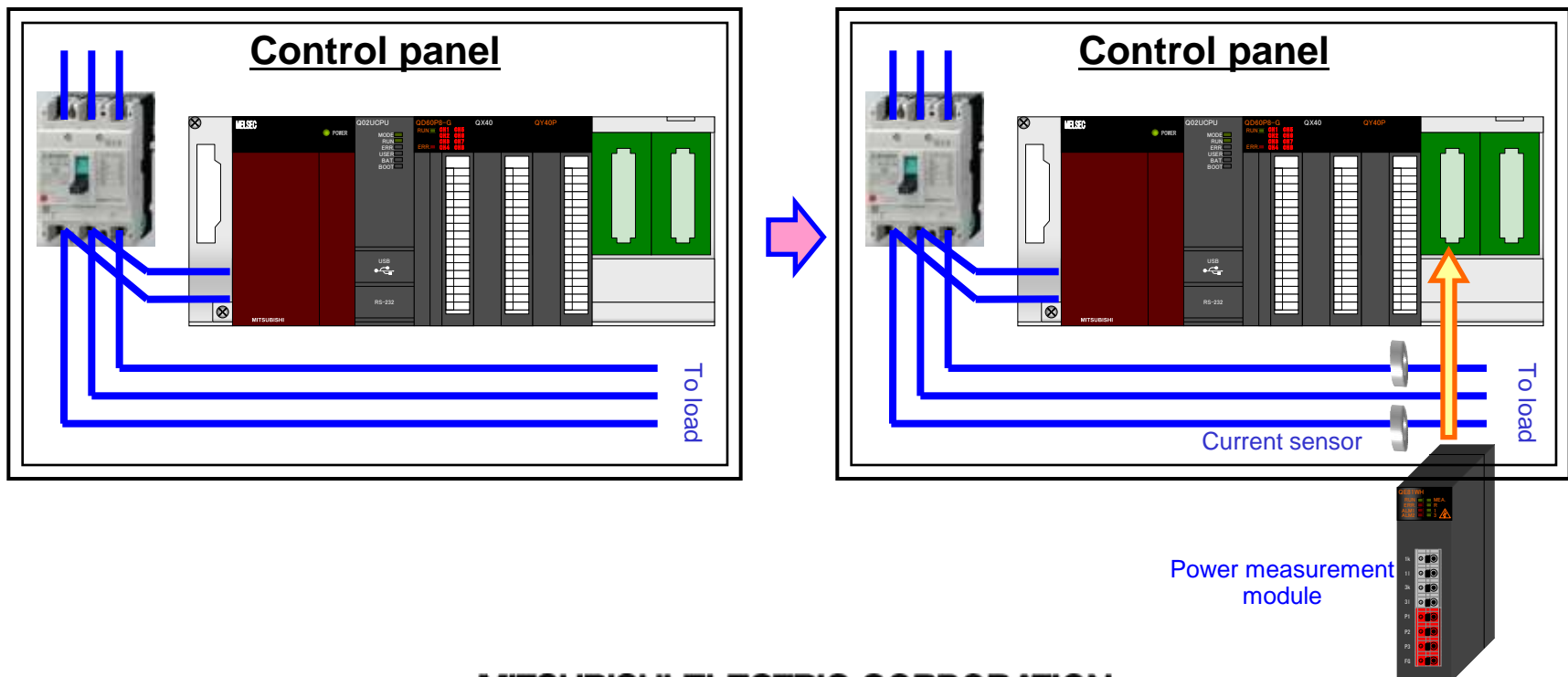


Space-saving

- Mountable into MELSEC-Q series Programmable Controller
- Importation of current by compact sensor



Can be mounted without changing the panel size

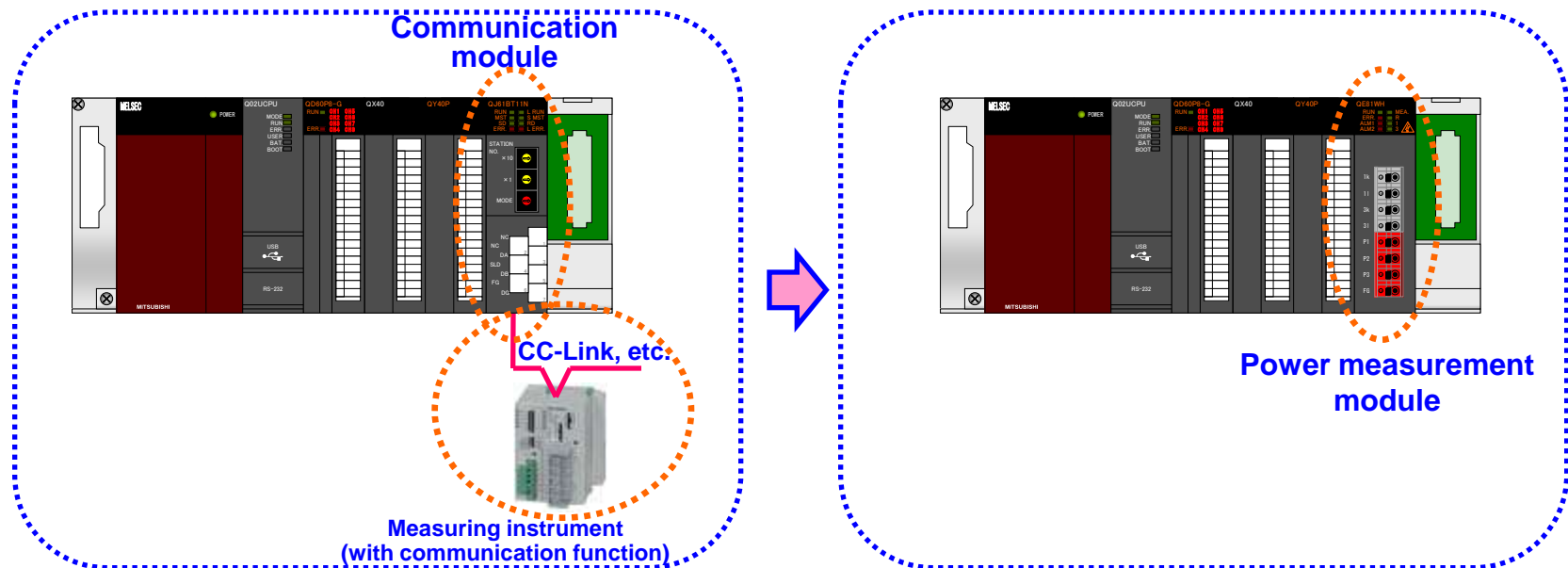


Reduction of Wiring Work and Cost (1)

- Communication module is not required to import data to Programmable Controller (No need for an extensive measurement system)
- Communication programs are not required, leading to the reduction of programming workload.



**Communication module and communication lines are not required
(cost reduction)**

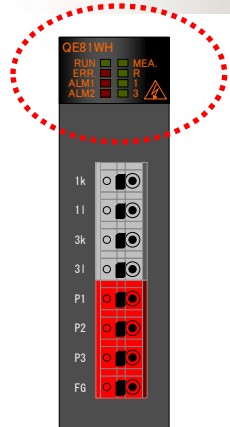


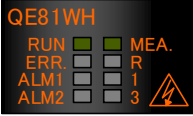
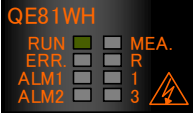

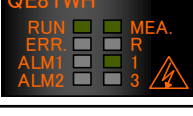

Reduction of Wiring Work and Cost (2)

LED lamps indicate active energy status



Causes of incorrect wiring can easily be identified



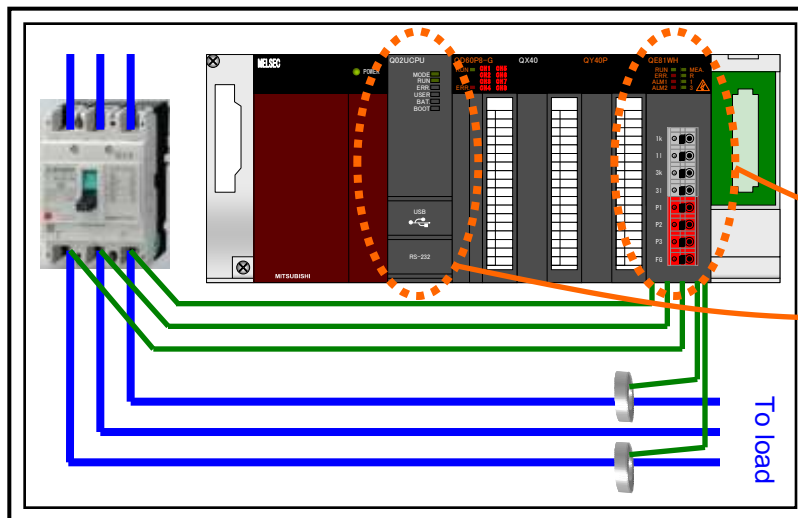
Check items				Status
"MEA."LED	"R" LED	"1" "3" LED		
ON	OFF	"1" LED and "3" LED are both OFF		The module is working properly.
OFF	OFF	"1" LED and "3" LED are both OFF		(1) The type of current sensor may be incorrect. Use of sensor with a rating different from the primary current setting may cause improper measurement. (2) Wiring is not connected, or is connected incorrectly. (3) The voltage lines (P1, P2, P3) may be connected incorrectly.
ON	ON	"1" LED and "3" LED are both ON		(1) Side 1 and Side 3 current sensors may be installed backwards. (2) The voltage lines (P1, P2, P3) may be connected incorrectly.
ON	OFF or ON	Only the "1" LED is ON		(1) Side 1 current sensor is installed backwards, or the positions of Side 1 and Side 3 current sensors may be reversed. (2) P1 and P2, or P1 and P3 connections may be reversed.
ON	OFF or ON	Only the "3" LED is ON		(1) Side 3 current sensor is installed backwards, or the positions of Side 1 and Side 3 current sensors may be reversed. (2) P2 and P3, or the P1 and P3 connections may be reversed.

Easy Measurements & Easy Specific Energy Consumption Management

- Can be measured by mounting directly into the MELSEC-Q slot (* sensor and voltage wiring required).
- Specific energy consumption can be managed by linking electric energy level with production counts (specific energy consumption management for each production item and each process).



Energy-saving + improved productivity

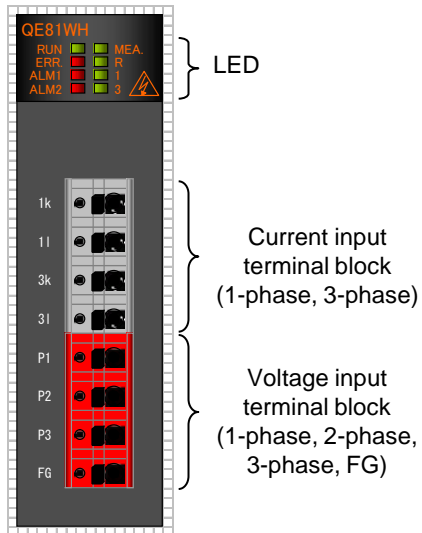


Eliminating causes of poor specific energy consumption results improved productivity

* "Specific energy consumption" is [amount of energy used ÷ production units], and it is an index representing one measure of energy productivity. Improving this specific energy consumption results in improved productivity.

Power Measurement Module Specifications (1)

(1) Appearance & structure



Mitsubishi General
Purpose Programmable
Controller
MELSEC-Q series
**Power Measurement
Module
(Model: QE81WH)**

(2) Functions

No.	Functions	Description
1	Measurement	Following items are measured at 250ms intervals, and stores the result in the serial buffer memory: current (effective value, demand value), voltage, power (effective value, demand value), power factor, frequency, active power (consumption side, regenerative side), reactive power (consumption side lag).
2	Period active energy measurement	Measures active energy only when specified output signal is ON, and stores the result in the serial buffer memory. "Period active energy 1" and "period active energy 2" measurements can be performed independently.
3	Max. & Min. value save	Maximum and minimum values for current demand, voltage, active power demand, and power factor can be saved with their occurrence date and time.
4	Upper / lower limit alarm monitoring	Up to 2 measurement items can be set (current (demand value), voltage, active power (demand value), and power factor), and the upper / lower limits of these items can be monitored. When either upper / lower limit violation occurs, a prescribed input signal switches ON.
5	Test (debug)	The intelligent function module switch settings can be specified so that prescribed values are saved (in pseudo manner) in the buffer memory even when there are no voltage and current (sensor) inputs. By using this module, the test function can be used when creating ladders, etc.

(3) Standards




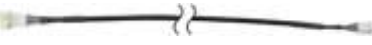

- CE Marking: Self-declaration
- UL: Acquisition planned in 2011

Power Measurement Module Specifications (2)

Item	Specification	Remarks
Phase wiring	Single-phase 2 wires, single-phase 3 wires, 3-phase 3 wires	
Rated current	5A, 50A, 100A, 250A, 400A, 600A (To accommodate 600A or higher, the optional 5A split-type current sensor can be used together with a current transformer.)	Applicable primary currents when using the 5A split-type current sensor (5,10,15, , 6000A)
Rated voltage	110V, 220V (single-phase 2 wires, 3-phase 3 wires), 110V, 220V (single-phase 3 wires) (440V or higher requires an external instrument transformer.)	Applicable primary voltages when using /110V VT (440, , 6600V)
Measured items	Active energy (consumption, regenerative), reactive energy, current, current demand ^(*) , voltage, active power, active power demand ^(*) , frequency, power factor	Measurement of receiving active energy (consumption), and generating active energy (regenerative) is also possible.
Measured factors & unit accuracy	(1) Current, voltage, power, frequency: $\pm 1.0\%$ (for rated input) (2) Power factor: $\pm 3.0\%$ (3) Active energy, reactive energy: $\pm 2.0\%$ (within 5 to 100% of rated range, power factor = 1)	Actual measurement accuracy includes the current sensor accuracy value.
Data update rate	Buffer memory is updated every 250ms	
Power failure compensation	Backed up by power failure compensation non-volatile memory. (Saved items: Setting values, max. / min. values and their occurrence times, active energy (regenerative, consumption), reactive energy, period active energy)	
Number of occupied input / output points	16 occupied input / output points (I/O assignment: intelligent 16 points)	
Display	None (output to Programmable Controller Q-series GOT, etc.) (Displays only RUN, ERR, ALM, MEA, R, 1, 3 on main LED)	Incorrect wiring connection indicator function included.
Mounting	Mounted on Q-Series Programmable Controller base unit.	
Outer dimensions	27.4(W) × 98.0(H) × 90.0(D)mm Excluding protruding areas	

*1: "Demand" is the average movement within the specified time period.

Sensors and Cables

Item Name	Model	Outer Appearance	Sales Unit
Split-type current sensor	EMU-CT50		1 piece
	EMU-CT100		
	EMU-CT250		
	EMU-CT400		
	EMU-CT600		
Split-type 5A current sensor	EMU2-CT5		1 set (Two 5A current sensors, with one 0.5m cable)
Split-type 5A current sensor cable	EMU2-CB-Q5A		1 piece
Split-type current sensor extension cable (standard type)	EMU2-CB-T1M (1m)		1 piece
	EMU2-CB-T5M (5m)		
	EMU2-CB-T10M (10m)		
Split-type current sensor extension cable (separate type)	EMU2-CB-T1MS (1m)		1 piece
	EMU2-CB-T5MS (5m)		
	EMU2-CB-T10MS (10m)		

Visualization by Using GOT

【Visualization of Production Site】


⇒ Display of measurement data with **GOT** installed in production equipment

<Procedure>

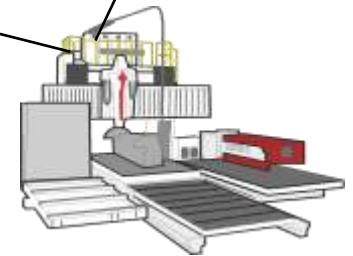
① Download a free sample screen from **MITSUBISHI ELECTRIC H@iSEIweb:**

www.mitsubishielectric.co.jp/haisei/lvs/

<Data Saving Period>

The default data saving period is 2 pages that can be controlled with .

The data saving period can be easily be changed by changing a program.



<Recommended GOT Model>

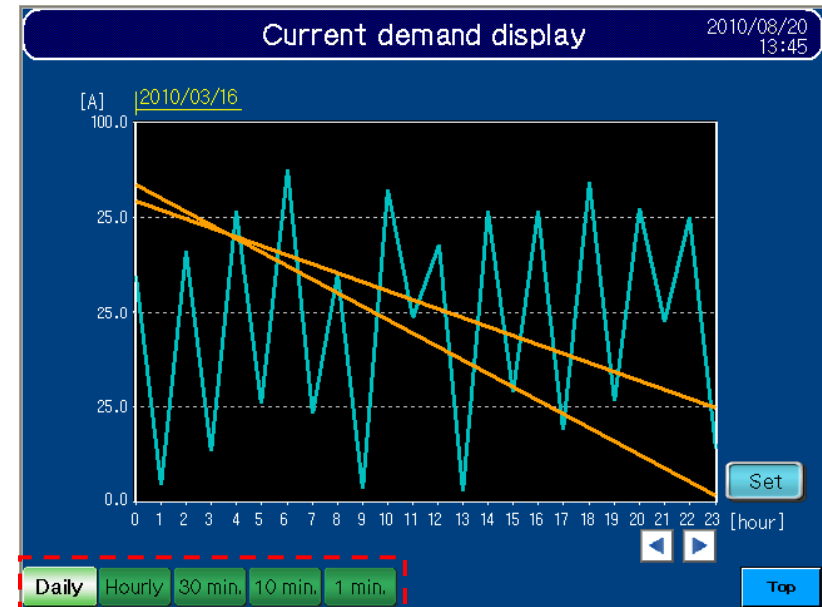
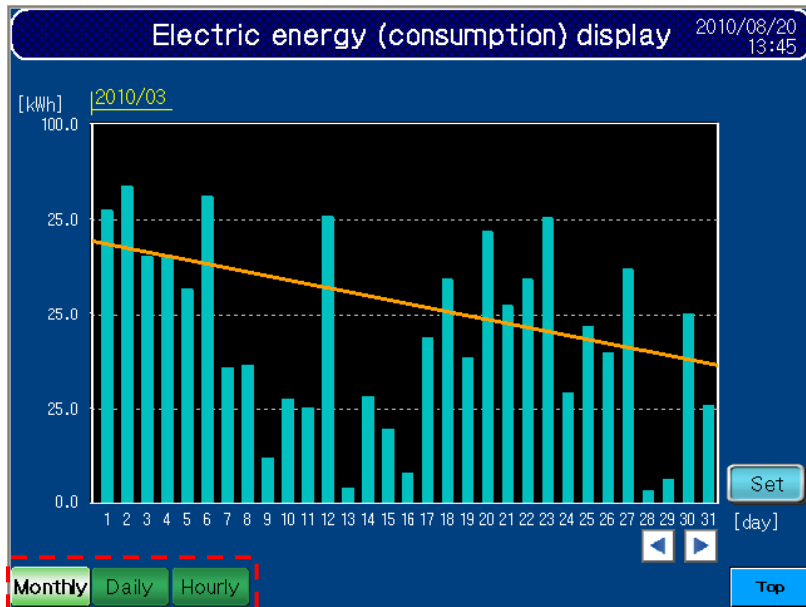
GOT1000 Series

Resolution : VGA

(Best suited for sample display)

GOT Sample Display (1)

<Sample Display ①>



Display range can be changed

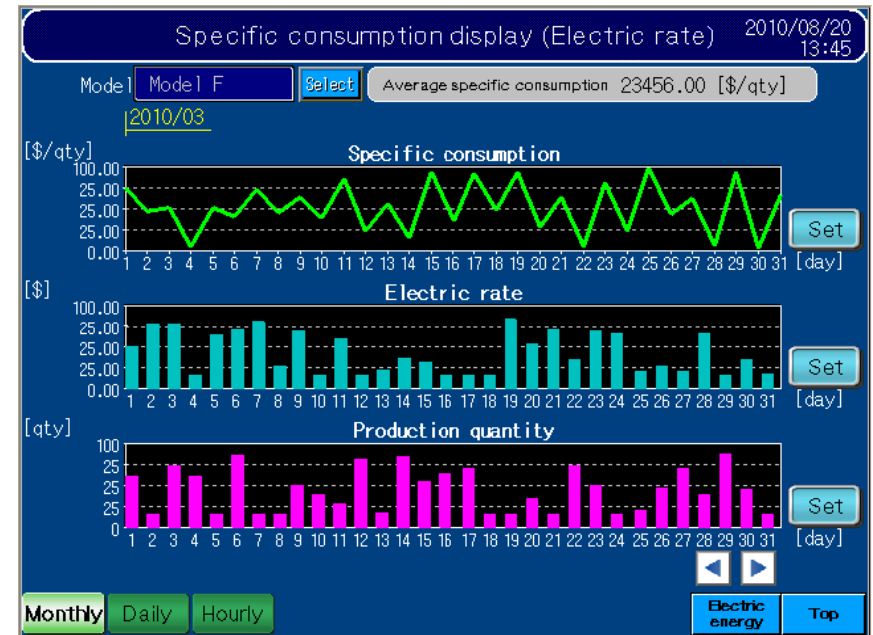
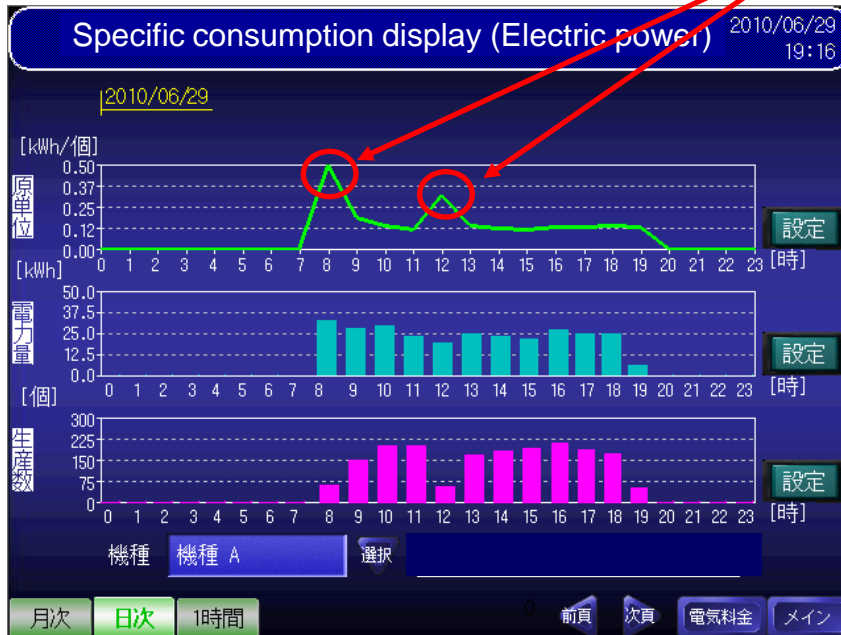
During which hour the electricity consumption is high can be seen through a graph

During which hour the average electricity consumption is high can be seen through a graph

GOT Sample Display (2)

<Sample Display②>

Aggravation of Specific Energy Consumption = Improvement Spots



Specific energy consumption graph can easily be made, and losses (spots that need to be improved) can be checked.

Electricity fee specific consumption can be visualized easily. It can lead to the rise of energy saving consciousness in production sites.

Visualization with PC (1)

【Visualization with Upper PC】

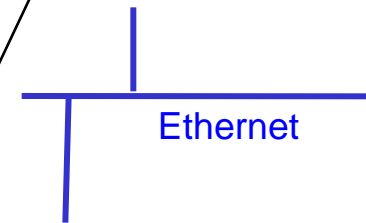
⇒ Display of data collected through supervisor PC's **high-speed data logger unit**

<Procedure>

- ① Set layout, graph, calculating formula on the PC
- ② Send the layout file set above to the high-speed data logger unit by using PC's setting tool



Supervisor PC



Ethernet



High-Speed Data Logger Unit
QD81DL96



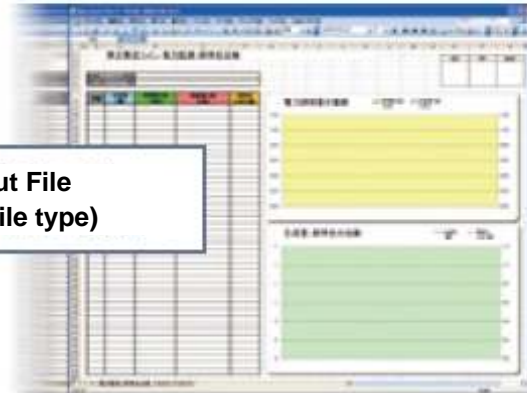
Sample Excel file can be downloaded free from
MITSUBISHI ELECTRIC H@iSEIweb:
www.mitsubishielectric.co.jp/haisei/lvs/

Visualization with PC (2)

<Procedure Image>



Layout File
(Excel file type)

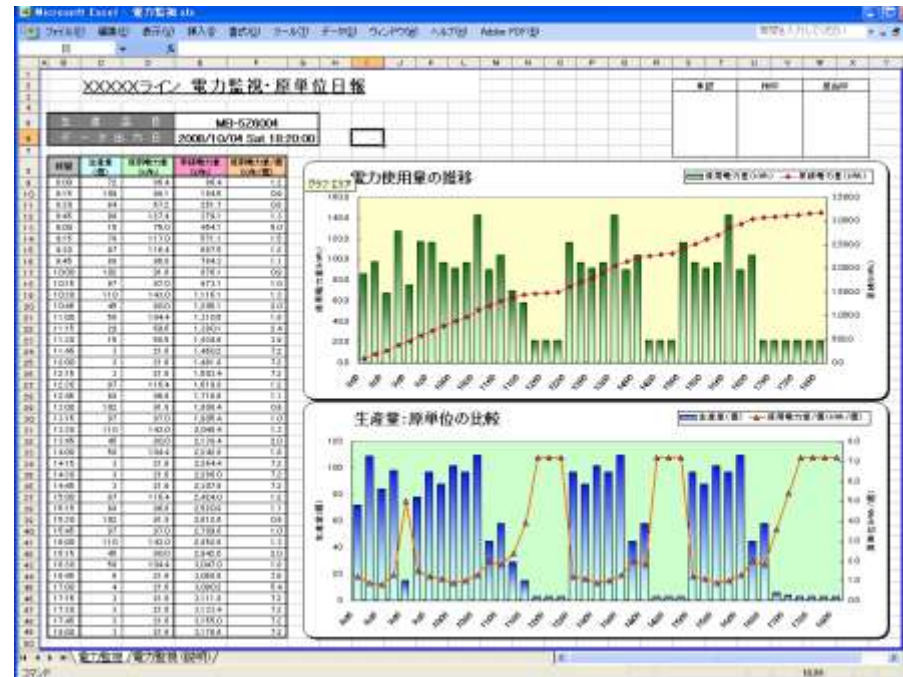


高速データロガーユニット
設定ユーティリティで
レイアウトファイルを転送

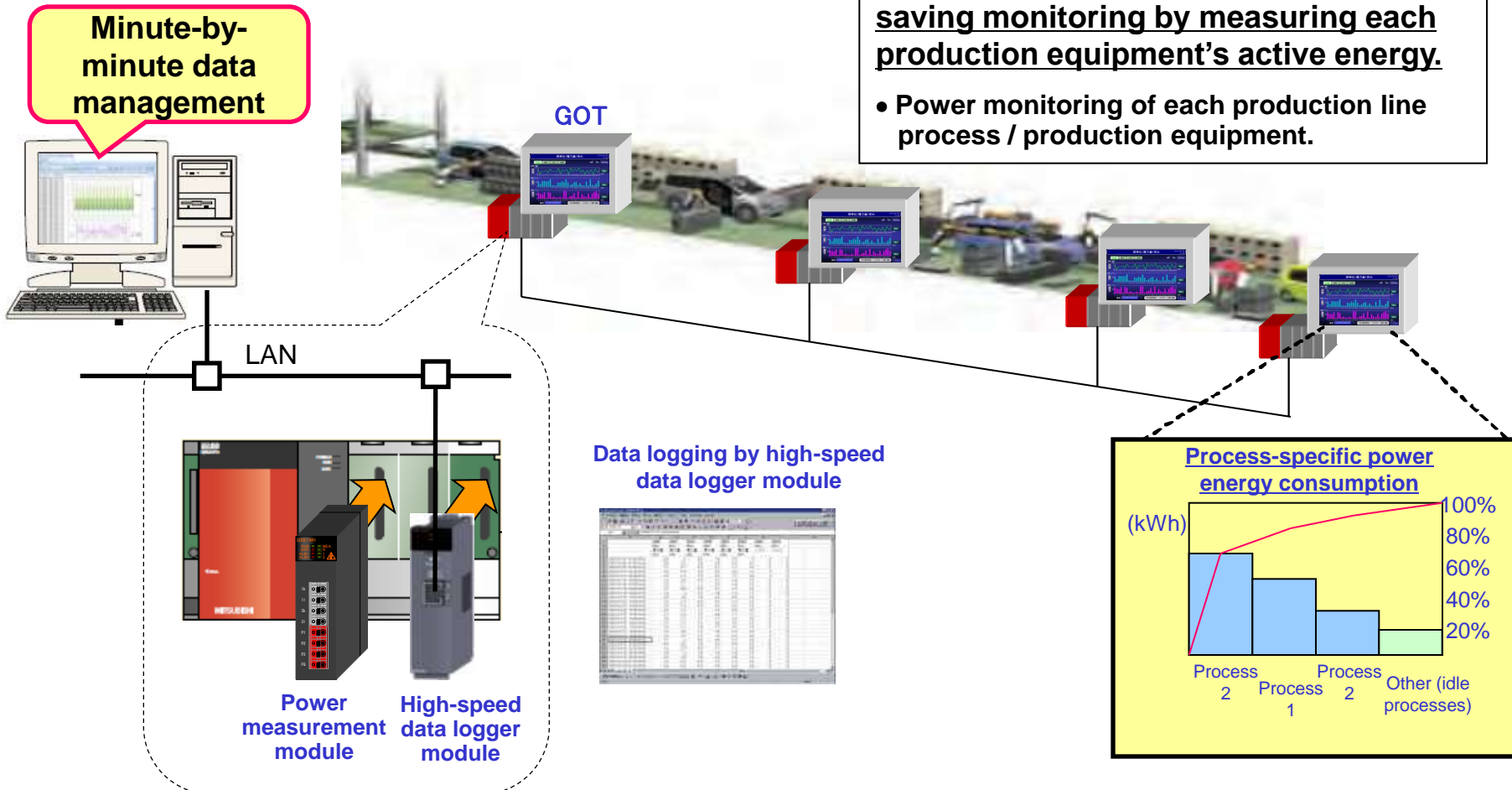


High-speed data logger module

Specific energy consumption management is easy by linking production data accumulated with High-speed Data Logger Unit and energy information from QE81WH.



Power Monitoring for Each Production Line Process / Production Equipment

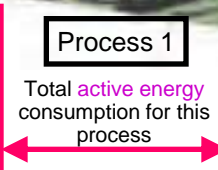


Specific Energy Consumption Management for Each Control Timing

Meets the need for detailed energy saving monitoring by measuring each production equipment's active energy.

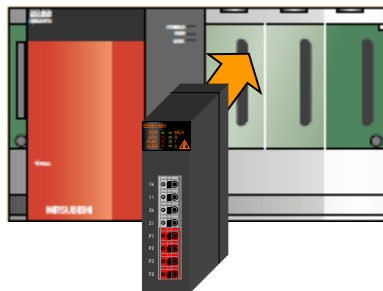
- Energy management linked with control timing
- Detailed specific energy consumption management

Line controlling
Programmable
Controller



At the control point,
the period active energy measuring flag
= ON.

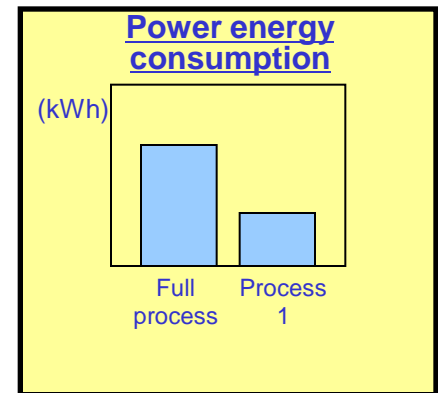
At the control point, the period active energy measuring flag = OFF.



Power measurement module

Measurement synchronized with the control timing is possible.

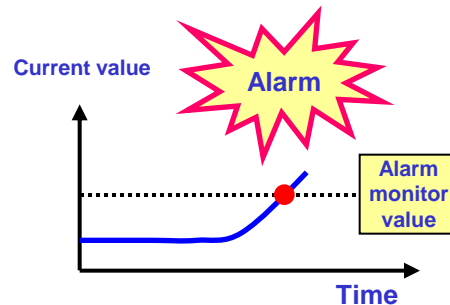
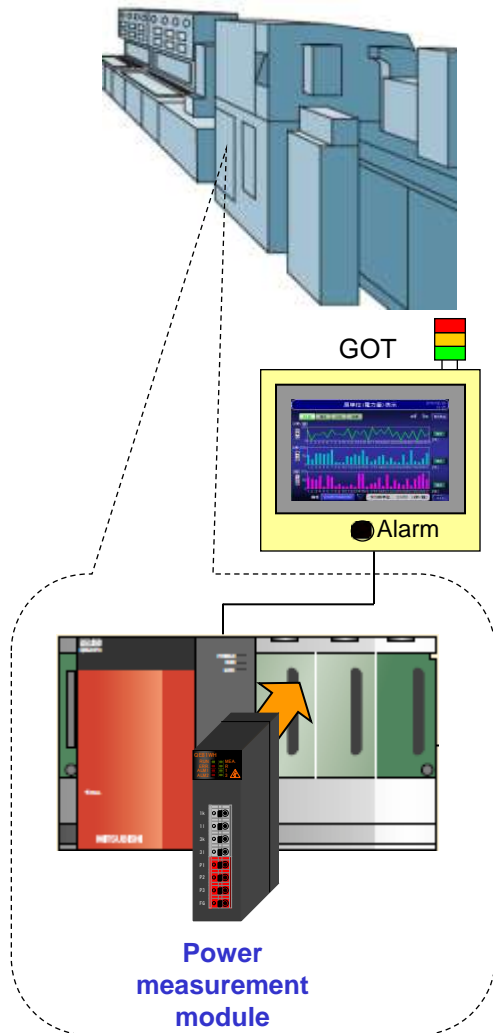
The Power measurement module can measure "active energy of the whole production line", as well as a "active energy (period active energy) for partial process" simultaneously.



Preventive Maintenance for Equipments (Error Monitoring)

Meets the need for prevention of sudden failures by measuring active power or current of production equipments.

- Lubricant is supplied when active power (or current) level rises
- Grinder (cutting machine) blade is changed when current increases



Upper / lower limit alarm monitoring (active power or current) (Equipment's error monitoring)



Equipment maintenance / repair

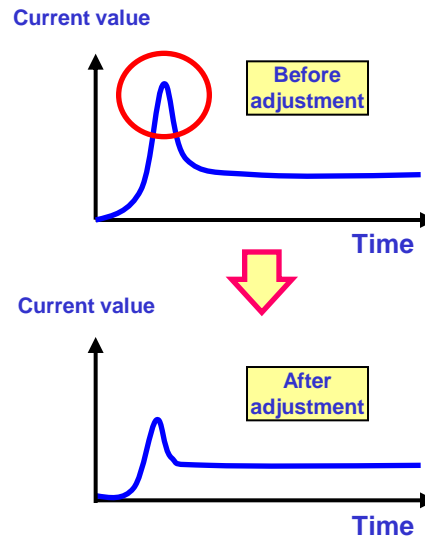
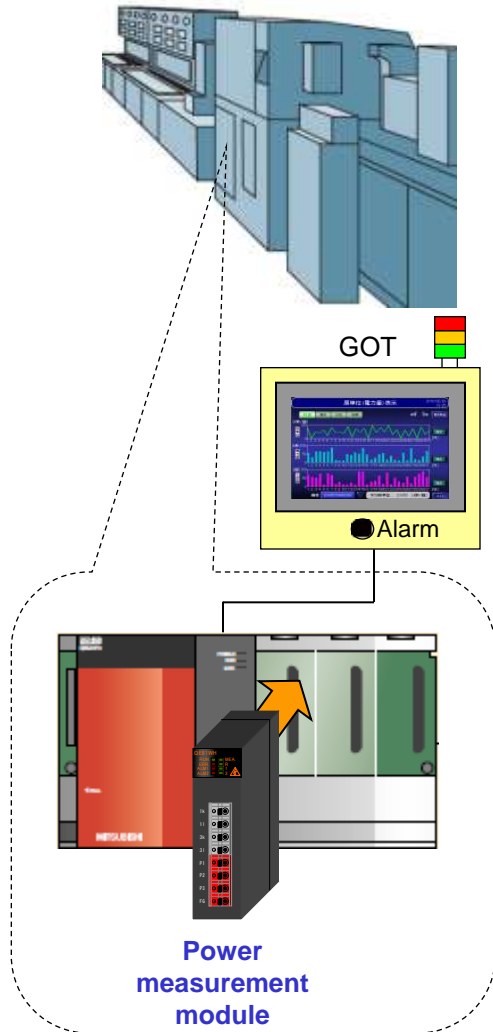


Shortening of equipment downtime leads to reduction of production loss

Optimal Equipment Operation

Meets the need for optimal operation of equipments by measuring production equipment's active power or current.

- Reduces wasteful energy consumption during equipment startups (machine overshoots, etc.)



Current monitoring during operation

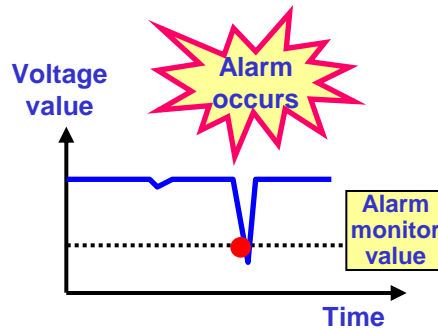
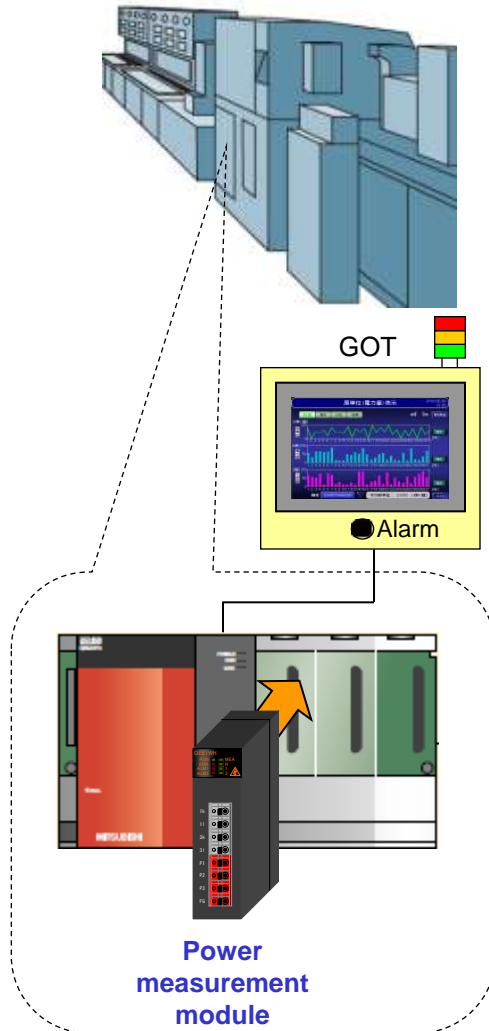
Control method (sequence) is changed

Optimal equipment operation
+ energy-saving

Product Quality Control

Meets the need for management of production items in abnormal state by detecting voltage and current errors of production equipments.

- Detection of heater wire breakage (current)
- Quality assurance through voltage, current, and frequency management, etc.



Upper / lower limit alarm monitoring (voltage, current, or frequency)
(Power error monitoring during equipment operation)

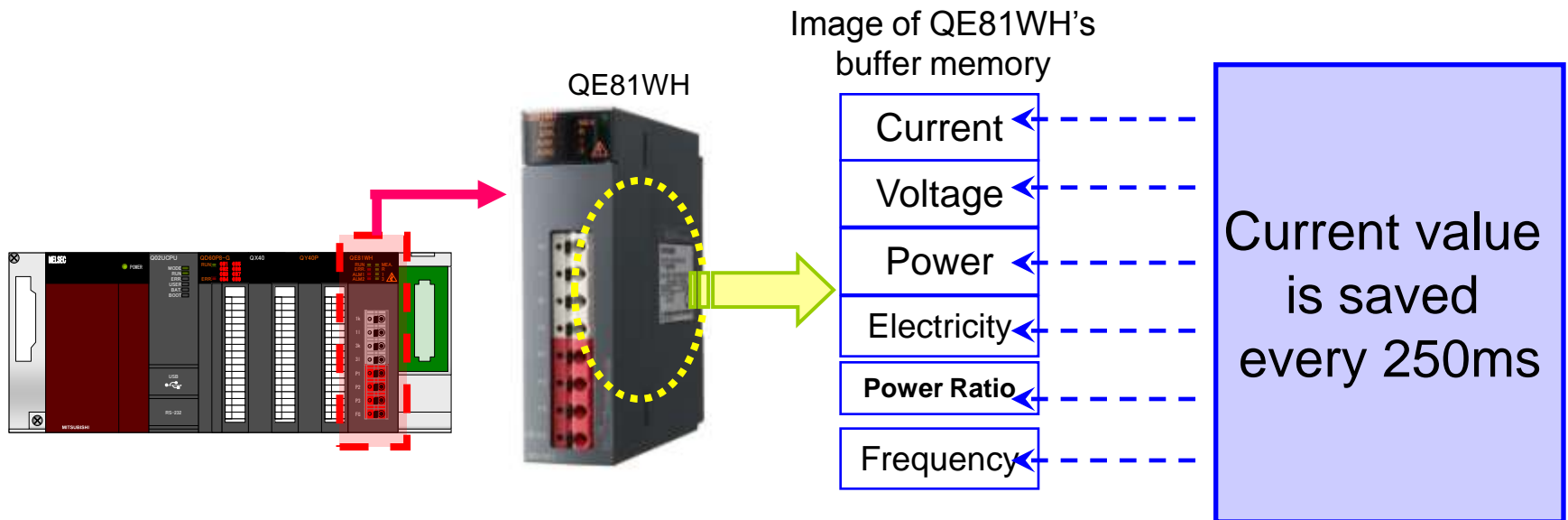
Alarm

A product is removed from the production line when equipment power error occurs

Prevents faulty products from being shipped.

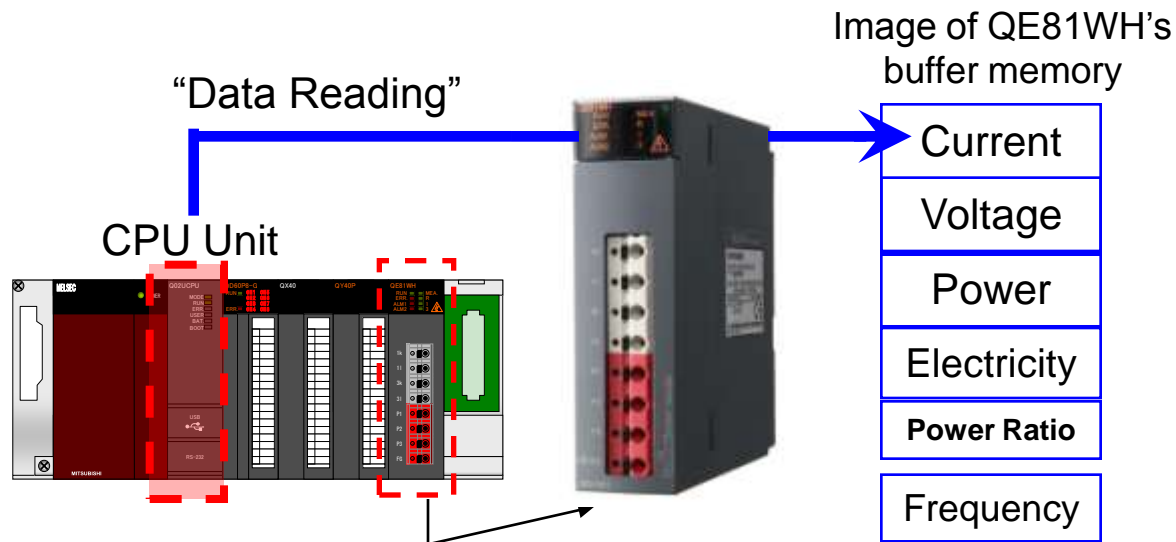
【Energy Data of QE81WH】

⇒ Current value is saved to QE81WH's buffer memory every 250ms



【Reading of Energy Data】

⇒ “Data reading program” is executed to QE81WH’s buffer memory from CPU

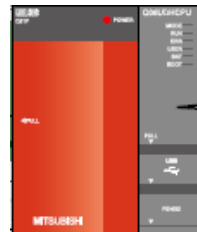


【Save Location of Energy Data Collected by QE81WH】

- ① CPU's device memory (built-in)
- ② CPU's external memory
(ATA card)
- ③ GOT memory (built-in)
- ④ GOT memory (external)
- ⑤ High-speed Data Logger Unit

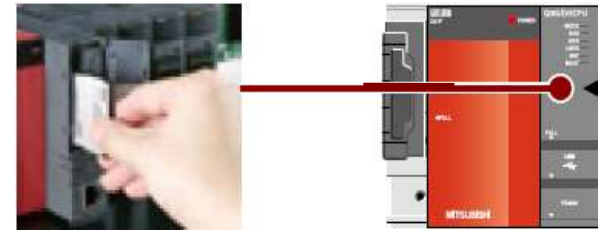
※ Measurement data cannot be saved into QE81WH module

①



CPU's device memory (built-in)

②



CPU's external ATA card

③

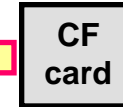


GOT built-in memory

④



GOT external CF card



⑤



High-speed Data
Logger Unit

THE END