Fuji Electric

Innovating Energy Technology

ENERGY EFFICIENCY

Power Monitoring System

62F2-E-0080

Solutions for “visualizing electric power” for optimum power operation

The social environment surrounding energy sources has been changing significantly.
Also for electric power, we are in urgent need of having optimum operations.
Fuji Electric FA Components & Systems provides solutions for “visualizing electric power,” and they are essential for realizing optimum operations.

Achieving “visualization of electric power” in every step

Checking the present situation
Check the power use condition **quantitatively**.

Planning energy-saving measures
Analyze the power use condition and plan effective measures for energy saving.

Implementing the energy-saving measures
Implement the energy-saving measures and **check the process.**

Recording and evaluation
Aggregate and record the measurement data.
Evaluate the effect of the energy-saving measures.

What is “visualization of electric power”?

It is a process of knowing how much power is consumed in a facility making the usually invisible “conditions” and “changes” visible using numerical values and graphs. This allows us to know when and where power is consumed and what is the present condition of waste and inconstant use of power, which were not recognized in the past.

> Advantages of introducing visualization technology

1. Compliance with the Revised Energy Conservation Act
2. Sharing information among employees to improve momentum and motivation for energy-saving activities
3. Knowing the working rate and efficiency of a facility to enhance motivation for facility improvement
4. Checking the effect of energy-saving actions and obtaining data that supports reports
5. Collecting measurement data remotely for efficient data acquisition

Fuji Electric's power monitoring system providing "visualization of electric power" and going one step further

We provide a wide range of products and solutions allowing not only **"power monitoring"** as an energy-saving activity but also waveform analysis and even **"power quality monitoring"** that is an action which goes one step further, based on measurements conforming to power quality standards.

"Visualization of electric power" — F-MPC series

Power monitoring for energy saving

- Checking operating condition (online monitoring)
- Energy-saving analysis
- Report preparation

Lineup for achieving solutions

Power monitoring for energy saving

See pages 4 through 8 for details.

F-MPC series

Integrated power monitoring unit:
F-MPC04

Multi-circuit power monitoring unit:
F-MPC04P

Single-circuit power monitoring unit:
F-MPC04S

Single-circuit power monitoring unit:
F-MPC04E

F-MPC Web unit:
UM11-10

+

Power monitoring system software
F-MPC-Net Web
F-MPC-Eco Web

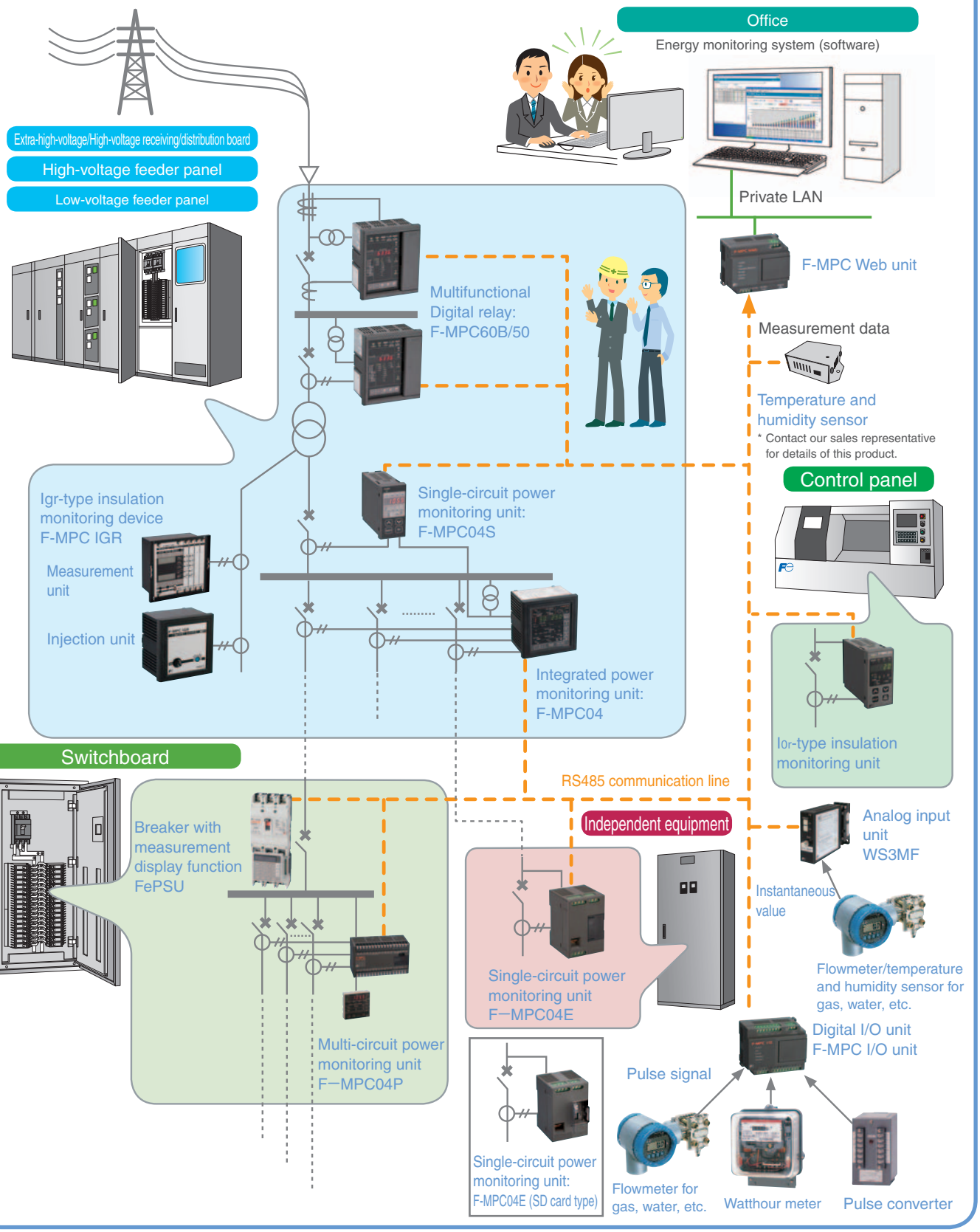
Power monitoring for energy saving & insulation monitoring for preventive maintenance

F-MPC series

The F-MPC series makes it possible to monitor the power consumption and insulation of a range of equipment from high-voltage receiving/distribution boards to low-voltage switchboards and independent pieces of equipment. “Visualization of electric power” in an electric power system can be achieved with our reasonable price.

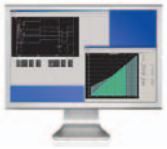
Power/insulation monitoring system: F-MPC series

Products that make up a power/insulation monitoring system and their installation locations



Major product lineup of the F-MPC series

Wide range of products meet your various requests.

Category	Product name	Features
Packaged software	Power monitoring system: F-MPC-Net Web 	● Software to collect measurement data on electric energy and the environment with a monitoring PC to monitor power consumption. ● Data can be monitored on the Web with a viewing PC connected to the LAN. ● Report forms can be created, saved and printed automatically based on the collected data. Trend data of voltage or current and alarm data can also be saved and printed automatically, which is useful for data analysis.
	Energy analysis support system: F-MPC-Eco Web 	● This system provides “analysis support” functions for ensuring energy-saving cycles including consumption rate management, displaying differences from target values, making comparisons in each measurement group, and showing a comparison display of previous data. It also allows “visualization of electric power” for information sharing. ● The power monitoring comparison/analysis graph screens can be monitored on the Web.
Web distribution unit	F-MPC Web unit 	● This unit incorporates a monitoring screen for collecting measurement data from measurement terminals. Since this monitoring screen is shown on the Web, it can be monitored with a browser on any PC connected to the LAN without using the dedicated software. ● It can also be used as a gateway.
Measurement terminals	Integrated power monitoring unit: F-MPC04 	● Multifunctional meter integrating into a single unit the necessary functions for power distribution, circuit information management, and electric energy monitoring. (Distribution systems with up to 10 circuits are supported.) ● The 3rd, 5th, 7th, and total harmonic currents can be measured. ● The unit allows degradation trend diagnosis based on trend data and preventive maintenance using two-level output of leakage current prealarm/earth leakage protective relay. ● Digital input is supported.
	Multi-circuit power monitoring unit: F-MPC04P 	● Multifunctional measuring unit integrating into a single unit the necessary measuring functions for the electric energy monitoring of multiple circuits. ● There is a single-phase two-wire type, 3-phase 3-wire type, and 3-phase 4-wire type and they can measure up to 12 feeders, 8 feeders, and 4 feeders respectively. ● When combined with a separate display, this unit can also be used as an on-site meter.
	Single-circuit power monitoring unit: F-MPC04S 	● Multifunctional measuring unit integrating into a single unit the necessary measuring functions for electric energy monitoring of a single circuit. ● Suitable for measuring small number of electric circuits installed in dispersed locations. ● A model with a leakage current measurement function is also available.
	Single-circuit power monitoring unit: F-MPC04E (RS-485 type/SD card type) 	● Internal-panel-mountable device for single-circuit F-MPC series power monitoring unit. ● User can select between the F-MPC-Net protocol supported by the F-MPC series or the MODBUS RTU protocol. (RS-485 type only) ● The SD card type enables recording of measurement data on an SD card. ● When the separately-sold dedicated display is used, measurement data can be shown on the panel surface.
	Multifunctional Digital relay: F-MPC60B/50 	● Monitoring unit integrating into a single unit the “various meters” attached to high-voltage panels and “protective relay” functionality. ● Constant monitoring of internal operating conditions makes it possible to take immediate action in case of failure. ● The unit makes it possible to monitor the circuit breaker for preventive maintenance and measure accidents to support accident analysis.
	Breaker with measurement display function: FePSU 	● The most suitable type can be selected from a wide range of products of automatic breakers, earth leakage circuit breakers, and breakers with ZCT, from 100A frame to 800A frame. ● A sensor box and measurement display unit have been integrated into the automatic breaker/earth leakage circuit breaker to save space and construction work. The display unit can also be mounted separately, ensuring a flexible structure design suited to the control panel.
I/O unit	Digital I/O: F-MPC I/O unit 	● Input unit that captures digital input of conditions and alarms as well as pulse inputs from integrating Wh meters or of gas or water. ● When combined with the F-MPC Web unit, this device can provide a demand alarm or other digital outputs.

Power monitoring for energy saving & insulation monitoring for preventive maintenance

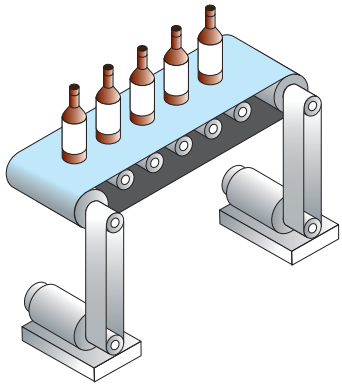
F-MPC series

This energy management system provides various applications for “visualization of electric power” in a number of scenes.

Power/insulation monitoring system: F-MPC series

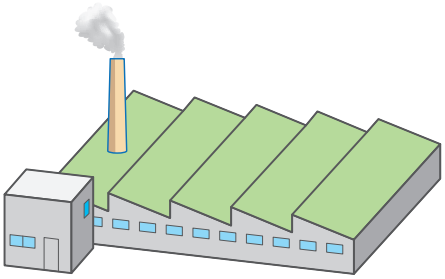
Best-suited applications:

1. We want to start saving energy by configuring a low-cost system that “visualizes electric power.”
2. We'd like to monitor energy-saving conditions easily from a remote location.
3. We need to prepare for expansion to a full-scale energy monitoring system in the future.
4. We want to use demand monitoring for peak shaving of the contracted electricity.
5. We want to monitor insulation conditions in real time.



Food factory

The F-MPC series has a demand monitoring function to send an e-mail when an alarm occurs. When the F-MPC I/O unit is used, buzzer or lamp notification is also possible using contact output.



Manufacturing factory, public building, etc.

●Power monitoring

In factories, system protection is another important issue. The F-MPC50/60B/04 series integrates in a compact unit protection, operation, measurement, monitoring, converter output, and transmission functions.

●Insulation monitoring

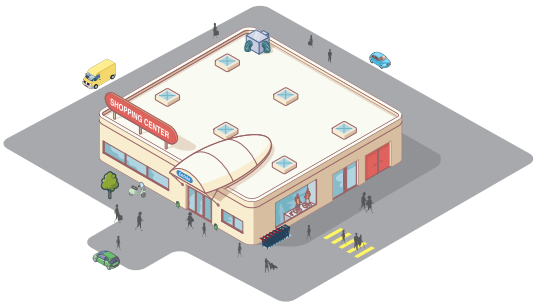
When the insulation monitoring device F-MPC IGR/F-MPC I0R is connected, the F-MPC series enables “constant” monitoring of the insulation condition of the facility/circuits which cannot be checked properly with a conventional earth leakage monitoring device, without the need to stop operations.
In “Security control regulations for home electric works JEAC8021” (Japan Electric Association) and “Public Building Construction Standard Specifications (Electric equipment work)” (supervised by Government Buildings Department of Ministry of Land, Infrastructure, Transport and Tourism of Japan), it is recommended to provide constant monitoring by installing a low-voltage insulation monitoring device.

Retail store (chain store)

The F-MPC series includes products that allow you to build a system to “visualize electric power” even in a single retail store.

Shopping center

The F-MPC series supports energy saving by aggregating the electric energy used for air-conditioning, illumination and so on by each tenant to “visualize electric power.



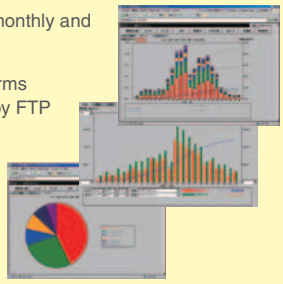
Expandable system/functionality

Small system

A system can be configured at low cost.

The Web server function of the F-MPC Web unit allows you to:

- Eliminate the need for a dedicated PC or software.
- Connect from several PCs simultaneously.
- Send an e-mail when an error occurs.
- Record daily, monthly and yearly reports.
- Send report forms automatically by FTP (CSV files).



Viewing PC

Private LAN

F-MPC Web unit

F-MPC measurement terminal

F-MPC04E F-MPC04P

Expandable

To make a full-scale energy monitoring system

By using the packaged software for monitoring, you can:

- Monitor and save data of medium-to-large systems.
- Distribute screens for viewing.
- Send an e-mail when an error occurs.
- Record daily, monthly and yearly reports.

Monitoring PC

Monitoring software F-MPC-Net Web

RS485/Ethernet gateway

RS485 communication

Receiving watthour meter

Pulse converter

Pulse

F-MPC-I/O

F-MPC04S

F-MPC04P

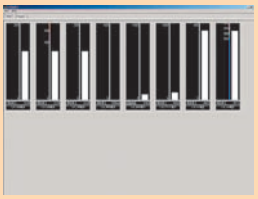
F-MPC measurement terminal F-MPC04

Pulse

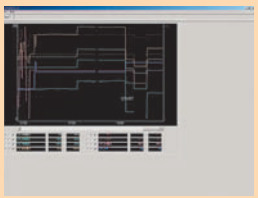
Flowmeter pulse

CT

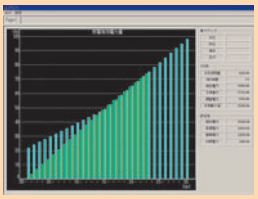
Monitoring screen (sample)



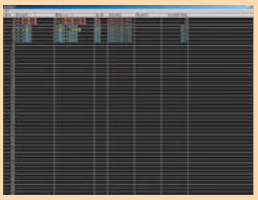
Measured value display



Alarm display



Demand monitoring



Analog trend

Consumption rate display screen

Amusement park

Using the F-MPC series together with Fuji Electric's programmable controller (PLC) helps create an environmentally friendly, comfortable environment.

List of power monitoring system models

F-MPC series

Type		Measurement terminals											
Series		F-MPC04	F-MPC04P			F-MPC04S		F-MPC04E		FePSU			
Appearance													
Model		UM04-ARA4	New: UM02A-AR2 Old: UM02-AR2	New: UM02A-AR3 Old: UM02-AR3	New: UM02A-AR4 Old: UM02-AR4	UM03-ARA3G	UM03-ARA3	UM05-AR3	UM05-AC3	MCCB		ELCB	
										BW□P	BW□U	EW□P	
No. of measuring circuits, display, protective function													
No. of measuring circuits	1φ2W	10	12	—	—	1		1		1			
	1φ3W,3φ3W	10	—	8	—	1		1		1			
	3φ4W	6	—	—	4	—		—		—			
Applicable voltage/No. of buses		2	1			1		1		1			
Display		○	(Optional) New: UM02AX-S, Old: UM02X-S			○		(Optional) UM05X-S		○			
Basic measurement													
Load current	Present value of each phase	○	○			○		○		○			
	Present demand value of each phase	○	—			○		○		○			
	Max. demand value of each phase	○	—			○		○		○			
Line voltage	Present value between lines	○	○			○		○		○			
	Present demand value between lines	○	—			○		○		○			
	Max. demand value between lines	○	—			○		○		○			
Active power	Present value	○ (both directions)	New: ○ (both directions), Old: ○			○ (both directions)		○ (both directions)		○ (both directions)			
	Demand value	○	—			○		○		○ (both directions)			
	Max. demand value	○	○			○		○		○			
Active electric energy	Present value	○	○			○		○		○			
Reverse power flow active power		○	New:○, Old: —			—		○		—			
Harmonic current	Present value	The 3rd, 5th, 7th and total	—			—		—		The 3rd, 5th, 7th,... 19th and total			
	Present demand value	The 3rd, 5th, 7th and total	—			The 3rd, 5th, 7th and total		—		Total of all phases			
	Max. demand value	The 3rd, 5th, 7th and total	—			The 3rd, 5th, 7th and total		—		Total of all phases			
Power factor	Present value	○	○			○		○		○			
Leakage current (I_o)	Present value	○	New: ○, Old: Communication only			○	—	—		—	○	—	
	Demand value	○	—			—	—	—		—	○	—	
	Max. demand value	○	—			○	—	—		—	○	—	
Leakage current (I_{ob})	Present value	○	—			○	—	—		—	○	—	
	Demand value	○	—			—	—	—		—	○	—	
	Max. demand value	○	—			○	—	—		—	○	—	
Reactive power	Present value	○	New: ○, Old: Communication only			○		○		○			
Reactive electric energy	Present value	Communication only	—			○		○		Communication only			
Min. voltage	Min. voltage of each phase	○	Communication only			—		Communication only		—			
Max. voltage	Max. voltage of max. phase	○	Communication only			—		Communication only		—			
Preventive maintenance item													
Current prealarm	Output when the load current exceeds the preset value	○	—			○ ❶		—		○			
Leakage current prealarm	Output when the leakage current exceeds the preset value	○	—			○	—	—		—	○	—	
Protection item													
Power alarm	Output when the power exceeds the preset value	—	—			○ ❶		—		○			
Leakage current alarm	Output when the leakage current exceeds the preset value	○	—			○	—	—		—	○	—	
Overcurrent trip		—	—			—		—		○			
Leakage current trip		—	—			—		—		—	—	○	
External interface													
Communication	RS-485	○	○			○		○	—	○			
	Modbus	○	New:○, Old: —			—		○	—	—			
Electric energy pulse output		○	—			○		—	—	○			
Data recording (SD memory card)		—	—			—		—	○	—			

❶Only one of the current prealarm or power alarm can be selectable in the settings.

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The products identified in this catalog shall be sold pursuant to the terms and conditions identified in the "Conditions of Sale" issued by Fuji Electric FA with each order confirmation.

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⚠ Safety Considerations
- Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
- For safe operation, before using the product read the instruction manual or user manual that comes with the product carefully or consult the Fuji sales representative from which you purchased the product.
- Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives.
- Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, passenger vehicle, and traffic control, are requested to consult with Fuji Electric FA.
- Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.
- For safe operation, wiring should be conducted only by qualified engineers who have sufficient technical knowledge about electrical work or wiring.
- Follow the regulations of industrial wastes when the product is to be discarded.
- For further questions, please contact your Fuji sales representative or Fuji Electric FA.

MINIMUM ORDERS

Orders amounting to **less than ¥10,000** net per order will be charged as ¥10,000 net per order plus freight and other charges.

WEIGHTS AND DIMENSIONS

Weights and dimensions appearing in this catalog are the best information available at the time of going to press. FUJI ELECTRIC FA has a policy of continuous product improvement, and design changes may make this information out of date.
Please confirm such details before planning actual construction.

INFORMATION IN THIS CATALOG IS SUBJECT TO CHANGE WITHOUT NOTICE.

Power Monitoring System

Energy Monitoring System F-MPC-Net Web

■ Features

- You can import electric quantity data measured by the F-MPC series, ON/OFF status, and environmental data such as temperature and flow rate into the energy monitoring software F-MPC-Net, and display them on a PC monitor in various ways.
- You can create, print, and save a report based on the collected data.
- This software helps in analyzing data since it can save and print trend data and warning logs for voltage and current automatically.
- Once the included Web delivery function F-MPC-Net Web is installed, you can display the browsing screen on a browsing PC connected to a LAN.

■ Monitoring function

(1) Measurement/status display
Analog values such as current can be measured and displayed (measurement value display).
Cumulative electric energy such as current can be measured and displayed (status display).
The measured data can also be calculated (for arithmetic operations).

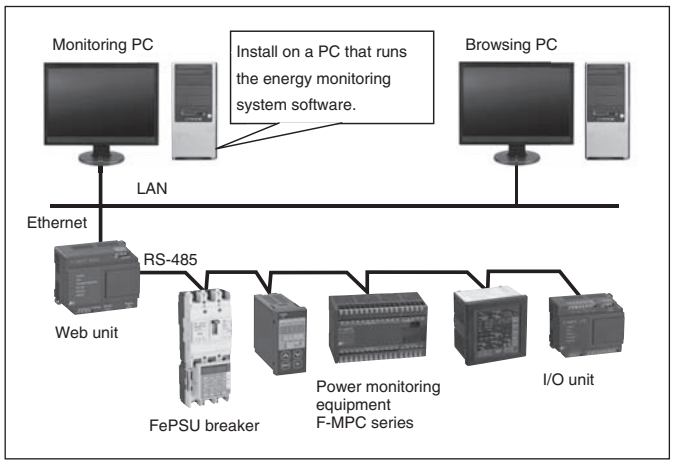
(2) Demand monitoring
Demand monitoring can be performed up to 10 points for 30 minutes (forecast/warning of excess).

(3) Trend display
Trend sampling for analog data (such as current) and electric energy data can be performed.

(4) Warning display (history display) / output
History of signals which issued a warning can be displayed (minor/medium/major fault).
Also, notification can be made by sending an e-mail to a person in charge.

(5) Report output
Daily report, monthly report, and yearly report can be created, printed, and saved.

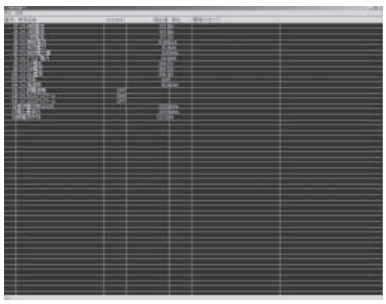
* Set function
Name, display range, unit, warning, calculation, others



Screen name	Max. no. of management points	Remarks
Status indication	6000	
Measurement value indication	6000	
Warning indication	600	
Demand monitor	10	
Analog trend	160	
Electric energy trend	160	
Daily report	3000	
Monthly report	3000	
Yearly report	3000	
Configuration setting	6000	
Warning setting	6000	
Form setting	1000	
Constant setting	100	
Calculation Setting	999	

■ Power Monitoring System Software F-MPC-Net Web

1. Status indication

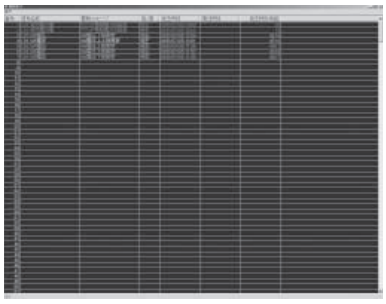


- Displays the current status of the measurement signal.

2. Measurement value indication

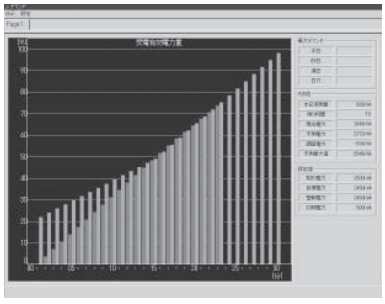
- Displays a graphical representation of data value of the measurement signal. (Also, you can monitor a warning by threshold settings)

3. Warning indication



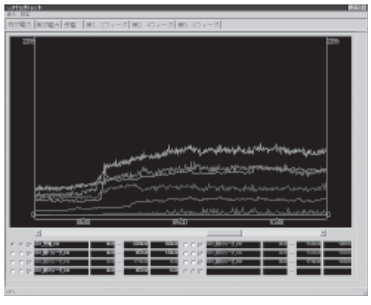
- Displays the history of signals which issued a warning. (Displays three levels: minor/medium/major)

4. Demand monitor



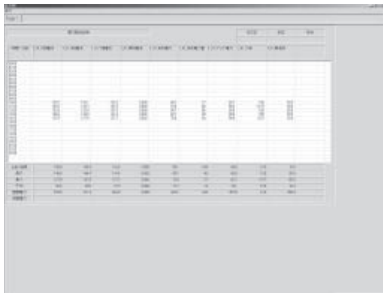
- Performs demand monitoring of accumulative power. (Monitor excess of power and perform forecast/warning)

5. Analog trend



- Displays trend of analog data. (Data for 24 hours can be displayed)

6. Daily report



- Displays a daily report, monthly report, and yearly report. (Past data can be read and displayed)

■ Operating specifications

Hardware	(General-purpose personal computer)
CPU	Celeron 2GHz or higher (Windows XP) Core™2 Duo 2.66GHz or higher (Windows Vista/7)
Memory	1GB or more (Windows XP) 2GB or more (Windows Vista/7)
HDD	20GB or more free space
Monitor	Recommended resolution: 1280 x 1024 dots or higher (17 inch class of normal LCD monitor) Note: If the resolution is less than 1280 x 1024 and the contents cannot be displayed within the screen, they will be shown as a scroll display.

Note: You can also use a serial port (RS-232C) on the PC to make a connection. To do this, a commercial RS-232C/RS-485 converter is needed.

Software		Type
System software	Power monitoring software F-MPC-Net Web (this software)	UM00-NE
OS	Microsoft Windows XP Professional SP2 or later Windows Vista Business or later Microsoft Windows 7 Professional 32-bit or later	– –
Spreadsheet software	Microsoft-Excel 2003 or later Note: This system outputs a report (daily/monthly/yearly) as a file (in CSV format). To handle this output file, Microsoft Excel is needed.	

■ Order/Inquiry

Our power monitoring system allows you to build various systems to suit your situation such as the number of monitoring points and interface environment. When you would like to introduce this system, please contact our sales staff.

Integrated power monitoring unit, UM04

■ Description

Integrating complete functions required for power distribution and power line data management in a single unit (up to 10 circuits for 3-phase 3-wire system)

- Supports multiple power distribution lines
  UM04 allows economical management of each facility and installation by means of communications interface.
- Easy mounting to existing switchboards
  Split-through type CTs enables UM04 s easy mounting to existing boards.
- Flexible energy management
  UM04 manages power line data such as measurement, preventive maintenance, maintenance and electricity quality, and transmit those data to upper level controller, thus promises energy and labor-saving.
- Harmonics current measurement
  The third, fifth, seventh, and total harmonic current can be measured.
- Monitor insulation deterioration and implement preventive maintenance by measuring leakage current.
  Provides deterioration trend analysis with trend data and preventive maintenance with 2-stage output (leakage current pre-alarm and leakage current relays).
- Compatible with MODBUS RTU protocol.
  Select between the MODBUSRTU protocol or the F-MPC-Net protocol for the F-MPC series.

UM04-ARA4

CT-BOX

- Handles digital input.
  Four inputs (ON/OFF status and pulse count digital signals) from the relay connector terminal block.
- Related Equipment
  Molded case circuit breakers with ZCT and split type current transformers are also introduced as related products, RS16 Terminal Relay which outputs leakage current prealarm and the connector terminal-block which outputs kWh pulse, are also explained (UM04 use only).

■ Type number nomenclature

Integrated power monitoring unit

UM04-ARA4

F-MPC04 basic type

■ Types

Description	Specification	Type	Remarks
Integrated power monitoring unit	RS-485, 2VT-conformed	**UM04-ARA4**	
CT-BOX	For CT secondary current 5A	**UM04X-5**	
	For CT secondary current 1A	**UM04X-1**	
Related product			
Terminal Relay	15 output	**RS16-DE04H**	*See page 48.*
Connector cable	Length 1m/2m/3m	**AUX014-20□**	*See page 48.*
Connector terminal block	kWh pulse output For digital input	**AU-CW21B1-04**	*See page 49.*

■ Applicable CT

Current transformer (CT)	CT secondary current	Applicable CT-BOX	Applicable integrated power monitoring unit
Split CT Type CC2C76-□□□1 Type CC2D74-□□□1	1A	UM04X-1	UM04-ARA4
General-purpose CT XX/1A	1A		
General-purpose CT XX/5A	5A	UM04X-5	

Applicable circuit	CT-BOX	
	One unit	Two units
Three-phase/3-wire	5 feeders max.	10 feeders max.
Single-phase/2-wire		
Single-phase/3-wire		
Three-phase/4-wire	3 feeders max.	6 feeders max.

* The number of countable feeders depends on the number of CT boxes.

■ Specifications

• General specifications

Item		Specification
Rating	Rated frequency	50 or 60Hz (Selectable by the setting)
	Rated voltage	Applicable to both 110V and 220V AC, 110V AC for use with a VT secondary circuit
	Rated current	Depends on CT-BOX specifications (5A, 1A in a CT secondary circuit, power consumption: 0.1VA max., excluding power loss in the external cable resistance)
	Zero-phase CT	EW type or MCCB with a ZCT (zero-phase current transformer) type (FUJI model)
Control power supply		85 to 264V AC (By exclusive control power supply terminal)
Inrush current		40A max., 3ms max. (AC) 85A max., 3ms max. (DC)
Control power consumption *1		25VA max. (Power monitoring unit + two CT-BOXes + Terminal Relays with all contacts ON)
Rated input	Voltage input (VT ratio)	100V direct input,200V direct input VT primary/secondary : AC220/110V, AC440/110V, AC440/220V, AC240/110V, AC400/110V, AC3.3k/110V, AC6.6k/110V
	Current input (CT ratio)	Primary rating setting : 10A, 15A, 20A, 25A, 30A, 40A, 50A, 60A, 75A, 80A, 100A, 120A, 150A, 160A, 200A, 250A, 300A, 320A, 400A, 500A, 600A 630A, 750A, 800A, 100A, 1200A, 1250A, 1500A, 1600A, 2000A, 2500A, 3000A, 3150A, 3200A, 4000A, 5000A, 6000A, 7500A
Ambient temperature		-10 to + 55˚C (no icing or no condensation)
Storage temperature		-20 to + 70˚C (no icing or no condensation)
Humidity		20 to 90% RH (no condensation)
Atmosphere		No corrosive gas and no heavy dirt and dust
Alarm and shutdown outputs		Continuous output current: 1A max. (with output of terminal relay, RS16-DE04H) Make and break current: 250V AC 5A, 30V DC 5A max.
Insulation resistance		10MΩ min.: between ground and electric circuits connected together 5MΩ min.: between electric circuits, between contacts
Dielectric strength		2000V AC, 1 minute between ground and electric circuits connected together, excluding T-link and RS-485 signal circuits
Impulse		4.5kV (1.2 × 50μs) between ground and electric circuits connected together, excluding T-link and RS-485 signal circuits
Momentary overload capability		20 times rated current, nine times for 0.5s, once for 2s
Shock resistance		Approx. 300m/s^2, three times in each of X, Y, and Z axes
Noise immunity		1 to 1.5MHz damped oscillation noise having 2.5 to 3kV peak voltage for 2s 1.5kV square wave (rise time: 1ns, pulse width: 1μs) for 10 minutes continuously
Vibration resistance		JIS C 60068-2-6 10-58Hz: single amplitude 0.075mm. 58-150Hz=constant accelation 10m/s^2 X, Y, Z directions 8minutes X10 cycles
Electrostatic noise resistance		Mounting steel panel surface: ± 8kV F-MPC04 (UM04) front panel surface: ± 15kV
Permissible momentary power failure		20ms, continuous operation (excluding display)
Mass		Power monitoring unit UM01: 1000g, CT-BOX: 300g Terminal relay: 200g

Note *1 The control power consumption on the table applies to where CT-BOXes and Terminal relays are connected to the power monitoring unit UM04.

• Measurement and display specifications

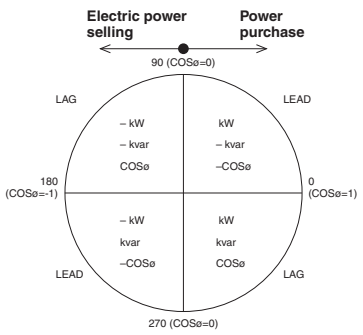
Measurement type	Effective measuring range	The main body display	Communication data	Accuracy (%)	Remarks
Current: I(r), I(s), I(t)	0, 0.5% to 150% of CT secondary rated current	4 digits	4 digits	2.5% FS	"0.00" is displayed, if the measured value is about 1.0% or less.
Voltage: *3 V(uv), V(vw), V(wu)	VT secondary voltage: 3Ø3W : max 264V 3Ø4W (Phase voltage): max.264V 3Ø4W (Line voltage):$\sqrt{3}$x264V			2.5% FS	VT secondary voltade is jointly used as internal control power supply. (For U-V)
Zero-phase current Io	0, 50 to 3600mA			20% FS	"0" is displayed, if the measured value is about 50mA or less.
Active power *4*5	0 to 3.5kW (220V) as converted to current transformer secondary value	4 digits with the code	4 digits with the code	2.5% FS	Two-wattmeter method: Measured when the value is 0.4% or higher of the rated current. (Ir, It, Vuv, Vvw)
Reactive power *4*5	0 to 3.5kvar (220V) as converted to current transformer secondary value			2.5% FS	Two-wattmeter method
Power factor *4	Lead : 0%-100%-Lag : 0%	3 digits with the code	4 digits with the code	5% The "90°" phase angle conversion	
Active electric power	0 to 99999 (kWh) The effective power quantity of the plus	5 digits	*6	Equivalent to ordinary class specified in JIS	2.0% (Power factor of 1 between 5% and 120% of CT primary rated current) 2.5% (Power factor of 0.5 between 10% and 120% of CT primary rated current)
	0 to 99999 (kWh) The effective power quantity of the minus				
The reactive energy	0 to 9999 (kvar) The reactive energy of the plus	none	*6	0.5% (No display)	
	0 to 9999 (kvar) The reactive energy of the minus				
The voltage minimum value	"264V from 85V" in VT secondary of each phase	4 digits		2.5% FS	
The voltage maximum value	"264V from 85V" in VT secondary of maximun-phase			2.5% FS	
Harmonic current	3rd & 5th order : 0, 2.5% to 150% 7th order : 0, 5.0% to 150%			2.5% (7th order: 5%)	*7

Note : *1. The measurement accuracy includes the error in the CT boxes and ZCT. The error in the combined VTs and CTs are not included.
*2. Current, voltage, and power performance characteristics are according to JIS C 1102 (indicating electrical measuring instruments). The measurement display value is the average value over approximately 1 second.
*3. The values in the table are the line voltages for 3-phase, 3-wire systems and the phase voltages for 3-phase, 4-wire systems. For 3-phase, 4-wire applications, the setting in this table can be used to display either the phase voltages or line voltages.
*4. Selling/purchasing for power measurement and lead/lag for power factor measurements are displayed with one sign (blank for positive). The meaning of positive/negative for each measurement item is given below.
*5. The maximum values of the active power and reactive power are ±3.5kW at a 5A secondary current for 3-phase, 3-wire systems, ±0.69kW at 1A for 3-phase, 3-wire systems, ±6.0kW at a 5A secondary current for 3-phase, 4-wire systems, and ±1.2kW at a 1A secondary current for 3-phase, 4-wire systems.
*6. For the F-MPC-Net protocol, the lower four digits of the display are sent. For the MODBUS RTU protocol, 0 to 999999.999kWh is sent and the step value for the total countup depends on the VT ratio and CT ratio.
*7. For 3-phase, 3-wire systems, the harmonic currents for phases R and T are measured. For 3-phase, 4-wire systems, the harmonic currents for phases R, S, and T are measured.

The sign "±" in electric measuring

The sign “±" is used to display "LEAD/LAG" in power-factor, measuring and “electric power selling/purchase” in electric power measuring. No signs are used if a value is "+". The sign “±" has the following meanings depending on the measured items.

• Active power: kW
  +: Power purchase (Consumed electric power)
  –: Electric power selling (Inverse electric power flow)
• Reactive power: kvar
  +: Lagging current by reactive volt-ampere meter method
  –: Leading current by reactive volt-ampere meter method
  * “LEAD/LAG” reverses with electric power selling/purchase.
• Power factor: COSϕ
  +:LEAD –: LAG



• Demand measurement

Item	Specification
Current (I(r), I(s), I(t)) Effective power Zero-phase current (rms:Io, 50/60Hz:Iob) Harmonics currents, voltage	Time: Select one from 0, 1 to 15 minutes (1 minute increments) and 30 minutes it at the initial setting (common to all 10 circuits). Display item: 1. Demand values 2. Maximum demands (maximum values recorded before the last reset operation)

● Specifications of a leakage current relay

Sensitive current

Setting value	200/500/1000/2000/3000mA or Lock (Io or Iob selectable)
Operating Level	50 to 100% of setting value (Operate at less than 50%, no opearate at 100%)

Operation time characteristics

Setting time	Inertia non-operating time	Operating time
0.1s	–	100ms max.
0.3s	150ms min.	0.3s max.
0.5s	250ms min.	0.5s max.
1.0s	500ms min.	1.0s max.
3.0s	1,500ms min.	3.0s max.

Note: • Sensitive current and operation time can be set by an arbitrary combination.
• The values on the table is for a trip relay's specifications. The pre-alarm relay operates at half the operating level on the table, and its operation time is 10s fixed. The pre-alarm relay can be used as an alarm against leakage current increase in case of cable insulation deterioration or flood.

● Data display at fault occurrence

Pre-alarm of load current, pre-alarm of leakage current relay (auto-reset), maximum current indication at circuit interruption (indication reset by resetting)

● kWh-pulse-output specifications (for products with a kWh-pulse-output feature)

Transistor open collector output: 35V DC, 50mA max., (residual voltage at ON state: 2.5V max.)
Output pulse width: 200ms ±20ms
Output period: 1,000ms min.
Output pulse rate: 10^n kWh/pulse, n =-2, -1, 0, 1, 2, or 3 (selected from VT and CT ratio.)

● ZCT with Leakage Current Relay

The UM04 can be used together with a MCCB with ZCT or a zero-phase current transformer.

■ Communications specifications

Item		Specifications	
		F-MPC-Net protocol *	MODBUS RTU protocol *
Standard		EIA-485	
Transmission method		Half duplex, 2-wire	
Data exchange method		1:N (UM04) polling/selecting	
Transmission distance		1,000m (total length)	
Number of stations		31 max. per system (excluding master)	
Transmission speed		4,800/9,600/19,200bps (selectable)	
Address setting		1 to 99	
RS-485 terminal names		DXA, DXB	Connect DXA as D1(+) and DXB as D0(-).
Transmitted characters		ASCII	Binary
Data format	Start bits	1 bit (fixed)	1 bit (fixed)
	Data length	7 or 8 bits (selectable)	8 bit (fixed)
	Parity bit	None, even, or odd (selectable)	None, even, or odd (selectable)
	Stop bits	1 bit (fixed)	No parity: 2 bits (fixed) Others: 1 bit (fixed)
	BCC	Even vertical parity	CRC-16

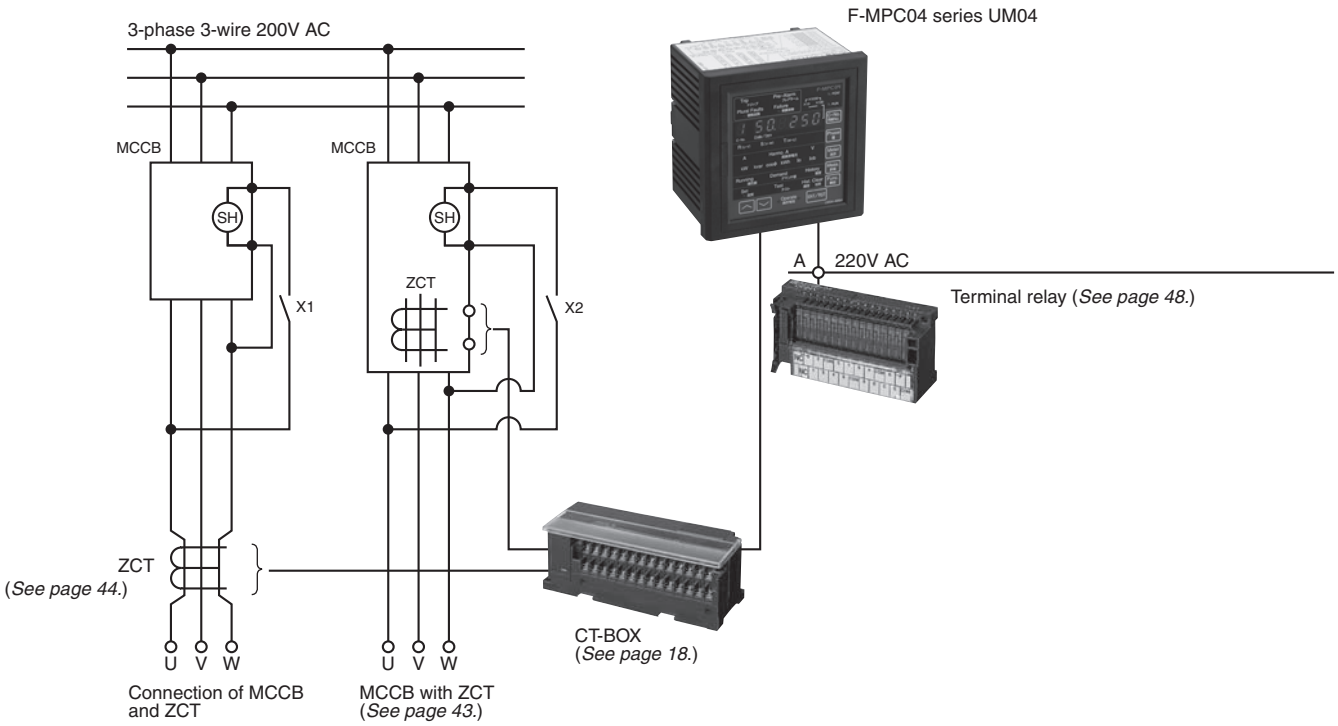
* The F-MPC-Net or MODBUS RTU protocol can be set for communications for the UM04.

■ Digital input specifications

Item	Specification	Remarks
Number of inputs	4	Communications transmissions and UM04 display of ON/OFF status and pulse count.
Exterior input signals	No-voltage contact input or transistor open-collector input	
Input specifications	24V DC, approx. 5mA flow OFF level: 1mA max.	
Minimum input signal width	50ms	

■ System configuration

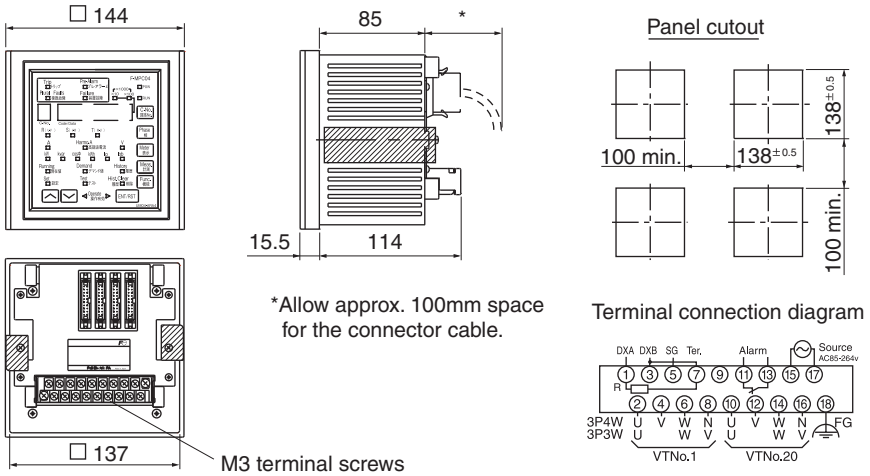
With an integrated power monitoring unit UM04, you can easily construct a low-voltage power distribution system equipped with leakage current measuring, leakage current pre-alarm, and earth leakage circuit shutdown.



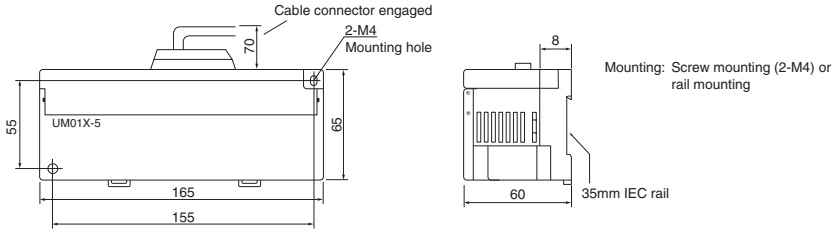
(SH) : Shunt trip device

■ Dimensions, mm

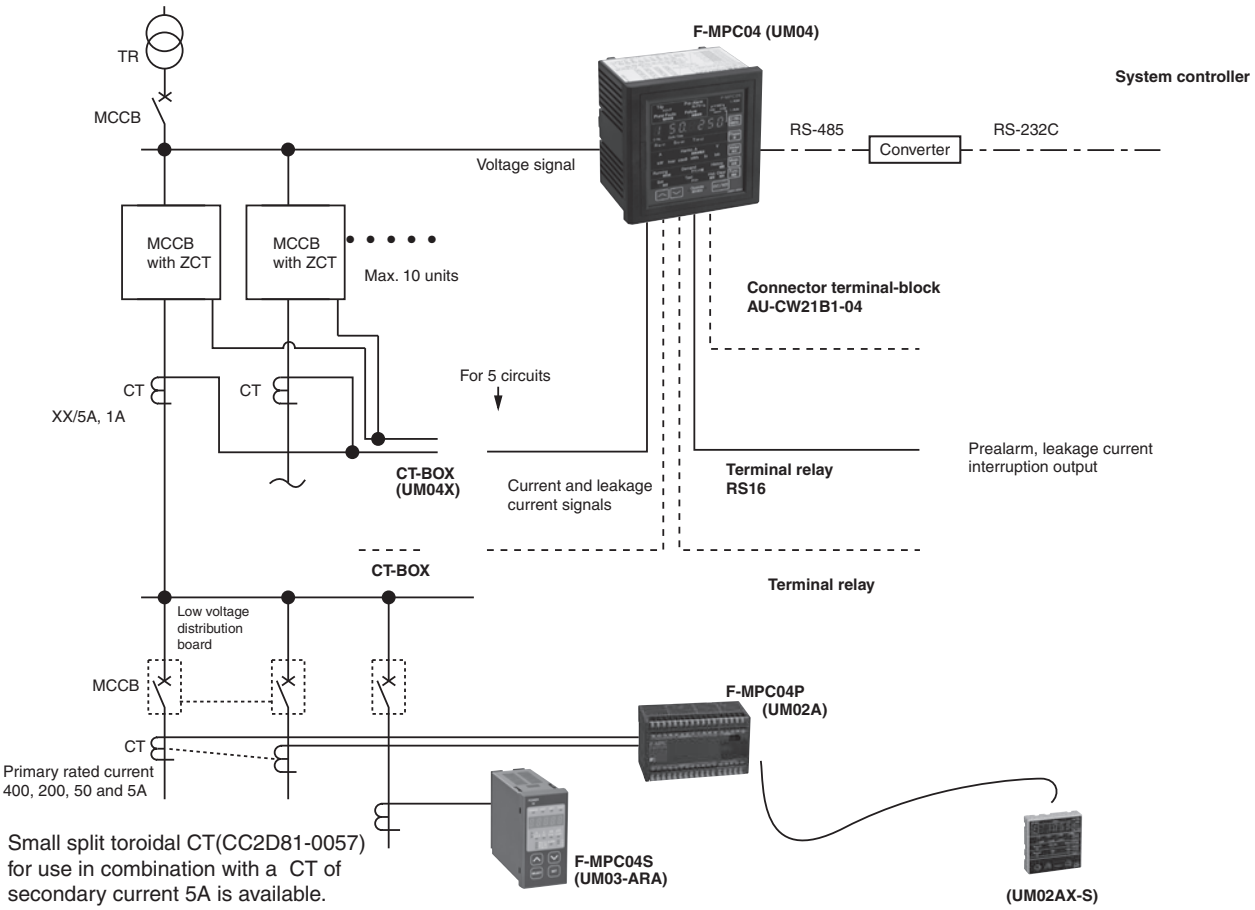
• Integrated power monitoring unit, UM04



• CT-BOX, UM04X



■ System configuration example
Low voltage



Small split toroidal CT(CC2D81-0057) for use in combination with a CT of secondary current 5A is available.

Multi-circuit Power Monitoring Unit

■ Features

● Monitoring unit

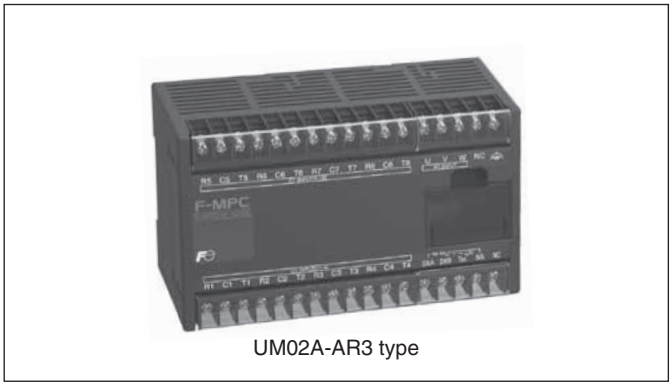
- Product to be attached on the panel for multi-circuit of F-MPC product category power monitoring unit
- Digital multifunction multi-meter integrated with measuring functions necessary for electric energy monitoring on one unit.
- Possible to perform measurement of several circuits in one unit.
  Possible to measure up to 12 feeders, 8 feeders and 4 feeders with single-phase two-wire type, three-phase threewire type and three-phase four-wire type respectively.
  *Distribution system that is connected to one common bus line is the scope of measurement.
- RS-485 communication is equipped as standard.
- Measurement of active electric energy of inverse load flow is added to measurement items of current product.
- Size and weight is reduced: -40% in external shape and -40% in mass (compared to current product) while keeping the same amount of applied circuits.
- Power consumption is reduced 50% as well (Compared to current product)

● Indicator (separately sold)

- Possible to display measurement data on the panel using a separately sold indicator.
- Visibility is improved by increasing the size of letters and numbers. (Compared to current product)
- Expression methods such as measurement display items are improved by increasing the number of LEDs. (Compared to current product)
- Operability is improved by adopting selection SW type for each function (Measurement: Meter, Phase: Phase and Function: Func.). (Compared to current product)

■ Product and type

Product name		Type
Multi-circuit power monitoring unit (three-phase three-line 8 circuits)		**UM02A-AR3**
Multi-circuit power monitoring unit (single-phase two-line 12 circuits)		**UM02A-AR2**
Multi-circuit power monitoring unit (three-phase four-line 4 circuits)		**UM02A-AR4**
Indication and addressing unit		**UM02AX-S**
Screw attachment fitting (set of 10 pieces)		**BZ0SET**
Split type CT Primary rated current (Manufactured by Fuji Electric Technica)	5A	**CC2D81-0057**
	50A	**CC2D81-0506**
	100A	**CC2D71-1004**
	200A	**CC2D65-2008**
	400A	**CC2D54-4009**
	800A	**CC2D52-8009**



UM02A-AR3 type

■ Specifications

● General specifications

Item		Specifications
Rating	Voltage	100 to 240 V AC (permissible operational voltage range: 85 to 264 V AC) AR2: Between P1 - N terminals, AR3: Between U - V terminals, AR4: Between P1 - P2 terminals
	Frequency	50/60 Hz (permissible range: 47.5 to 63 Hz)
	Current (CT primary/secondary)	AC5A/7.34mA, AC50A/73.4mA, AC100A/33.3mA, AC200A/66.7mA, AC400A/133.3mA, AC800A/133.3mA
Power source	Load VA	7VA
	Inrush current	30A, 3ms (240V) 15A, 3ms (100V)
Insulation resistance		Between collective electric circuits - Ground (Housing, DIN rail) 10 MΩ or more Between collective I/O circuits - Ground 10 MΩ or more Collective electric circuits - Collective I/O circuits 5 MΩ or more
Vibration resistance performance		10 to 58 Hz: One-way amplitude 0.075 mm, 58 to 150 Hz: Constant acceleration 10 m/s^2 8 min. × 10 cycles in each direction of X, Y and Z (in a condition with slip prevention fitting attached)
Shock resistance		Semisinusoidal wave 294m/s^2, 11ms, Three times in each direction of X, Y and Z (in a condition with slip prevention fitting attached)
Dielectric strength		Between collective terminals - Ground (Housing, DIN rail) 2,000 V AC One min. Collective electric circuits - Collective I/O circuits 2,000 V AC One min.
Noise resistance judgment criterion B		Square wave 1 ns × 1 µs Noise of square wave of 1.5 kV Applied for 10 min. consecutively
		Radiation electromagnetic field 20 V/m (i)
		Static electricity Gap discharge: 8 kV, contact discharge (housing): 4 kV
		Burst Control power: 2kV, CT input (clamp): 2 kV, I/O (clamp): 1 kV
Overload capacity	Current circuit	1.1 times of full scale (1.25 times of rated current) Two hours
	Voltage circuit	1.1 times of full scale Two hours
Operating ambient temperature		–10 to 55°C
Storage temperature		–20 to 70°C
Relative humidity		20 to 90%RH (no dew condensation shall be observed)
Atmosphere		No corrosive gas or excessive dust shall be observed
Permissible instantaneous power failure time		20ms (communication and measurement are interrupted)
Mass		[Measurement unit] Approx. 300 g (excluding CT) [indicator] Approx. 70 g (excluding connection cable)

(i) The operation of power monitoring unit may temporarily stop under strong radio wave environment.

■ Specifications (continued)

● Measurement specifications

Item	Scope of guaranteed effective accuracy		Indication and addressing unit	Accuracy (i)
Current (ii) (Measure N phase current as well for AR4)	0.4 to 125% of CT rating * Ho wever, 50 A CT: 0.4 to 100% 100 A CT : 0.4 to 120% Activ e electric energy is described in the accuracy column		Four digits	±1.5% FS However, ±2.5%FS for S phase current of AR3 and N phase current of AR4
Active power (iii) (Negative value for inverse load flow)				
Reactive power (iii) (Reactive power measurement method)			Four digits	±1.5% FS
Active electric energy (iii) Forward active electric energy Active electric energy of inverse load flow			Five digits	Equivalent to JIS regular grade ±2.0% by power factor 1.0 and 5 to 120% of CT rating current ±2.5% by power factor 0.5 and 10 to 120% of CT rating current
Maximum value of active power (iii) (Forward active electric energy only)	Same as above (possible to set demand time of 0, 1, 5, 10 and 30 min.)		Four digits	±1.5% FS
Power factor (reactive power measurement method)	0 to ±1.000		Four digits	±5% (Conversion by 90° phase angle)
Voltage (ii) Minimum value of each phase-to-phase voltage (iv) Maximum value of the maximum phase-to-phase voltage (iv)	For AR2 (single-phase two-line) and AR3 (three-phase three-line) Voltage 85 to 264V (conversion by direct and VT secondary voltage)	For AR4 (three-phase four-line), phase-to-phase voltage 50 to 279 V (Conversion by direct and VT secondary voltage) Line voltage 87 to 484 V	Four digits None	±1.5% FS However, the voltage between W - U of AR3 and between P1 - P2 of AR2 is ±2.5% FS

(i) Accuracy performance excludes externally attached CT and VT.
(ii) AR3 calculates by automatically judging three-phase three-line type, single-phase three-line type and single-phase two-line type. For single-phase two-line, Vvw, Vwu, Is and It become zero.
(iii) Active power, reactive power and active electric energy are measured in the range of voltage: 85 to 264 V and current: 0.4 to 125%.
(iv) The minimum value and maximum value of voltage are only for the communication data and cannot be displayed on the indicator and addressing unit.
(v) F-MPC-Net: four digits and MODBUS: nine digits are sent as communication data.
However, only active electric energy data of F-MPC-Net supports sending data of nine digits.

● Communication specification

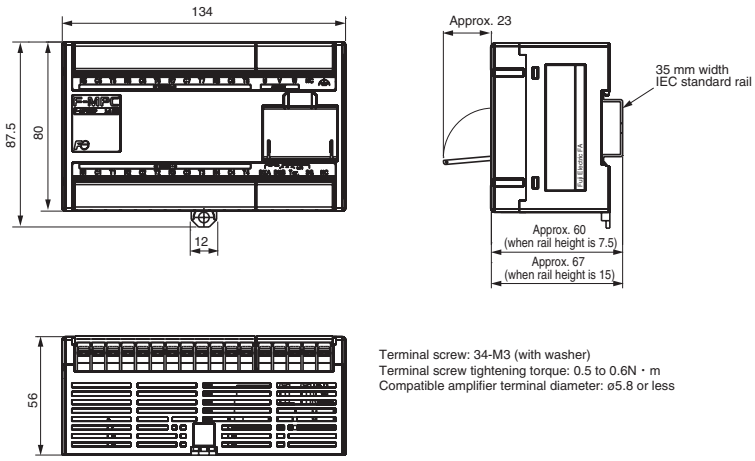
RS-485 communication is used by selecting F-MPC-Net communication or MODBUS/RTU communication protocols.

Item		Specifications	
		F-MPC-Net	MODBUS/RTU
Standard		EIA-485	
Transmission method		Half duplex two-line type	
Data exchange method		1: N (Power monitoring unit) Polling/selecting	
Synchronization method		Start-stop synchronization method	
Transmission distance		1,000 m (total length)	
Number of connection units		Maximum 64 units (i) One system (however, the master device is included in the 64 units)	
Transmission speed		4,800/9,600/19,200/38,400bps (Select)	
Station address setting		1 to 99 (ii) (MODBUS/RTU communication are also 1 to 99)	
Connection method		Terminal block	
RS-485 terminal name		DXA, DXB	Connect by replacing DXA to D1 (+) and DXB to D0 (-).
Transmission character		ASCII code	Binary
Data type	Start bit	1 bit (fixed)	1 bit (fixed)
	Data length	7 bits / 8 bits (select)	8 bits (fixed)
	Parity bit	None / Even number / Odd number (select)	None / Even number / Odd number (select)
	Stop bit	1 bit (fixed)	No parity: 2 bits (fixed), Others: 1 bit (fixed)
	BCC	Even number horizontal parity	CRC-16

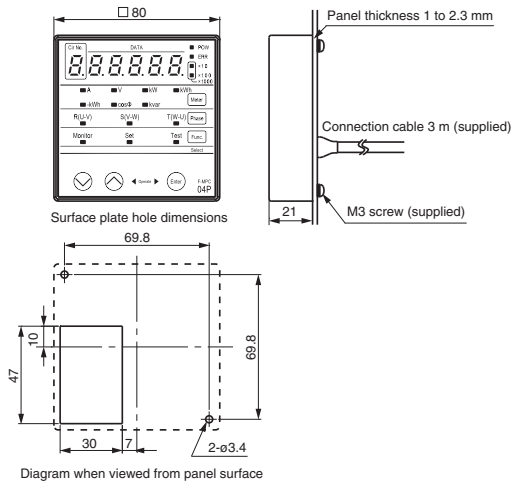
Note 1: Setting of factory shipment is F-MPC-Net protocol; Communication speed: 19,200 bps; Data length: 7 bits; Parity: Odd number. (A special indicator [Type: UM02AX-S] is necessary to change the communication setting of factory shipment.)
(i) When 32 units are connected, two units are recognized as one unit and the maximum number of connection will be lower.
(ii) Communication code is set using the rotary switch. In addition, use an address in the range of 1 to 99 for the power monitoring unit with MODBUS/RTU as well. The communication will be invalid when the communication code is set at "00."

■ Dimension, mm

UM02A-AR3

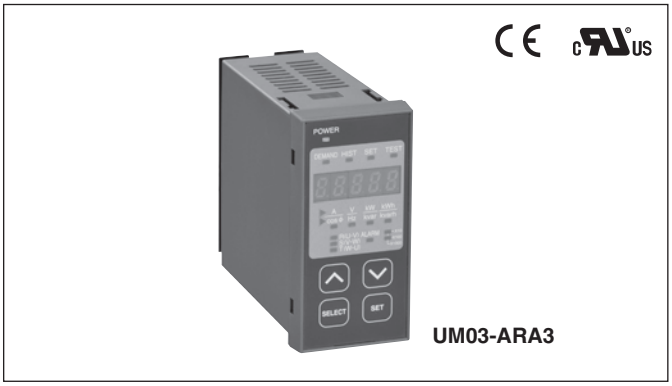


UM02AX-S



Single-circuit Power Monitoring Unit

Single circuit power monitoring unit, UM03



■ Description

Integrating measuring functions required for power monitoring in one unit

● Output functions for preventive maintenance selectable
- Power alarm/current prealarm
- kWh pulse output
- Leakage current alarm, leakage current prealarm output (model with leakage current measuring function) only

● Capable of measuring inrush current of welders
- High-speed sampling and calculation of voltage and current

● Compact design allows installation almost anywhere.
- Space-saving construction simplifies installation.
- Suited for monitoring individual equipment, section, and floor

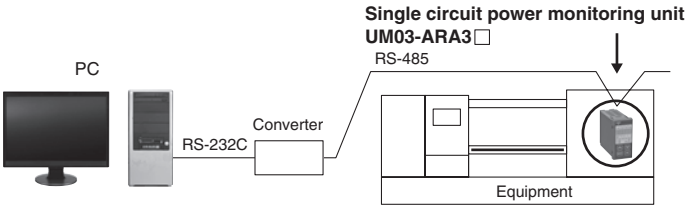
● Networking capability
- RS-485 interface.
- Can be connected to power distribution system same way as the power monitoring equipment F-MPC 60B, 30, 04 (UM04, UM02) series products

■ Type numbers

Single circuit power monitoring unit		Type
Leakage current measuring function	Not provided	**UM03-ARA3**
	Provided	**UM03-ARA3G**

Note : As CTs, use type numbers CC2D81-0057, CC2D81-0506, CC2D65-2008, CC2D54-4009, CC2B65-2008, and CC2B54-4009. Refer to page 45. General-purpose CTs (secondary rated current 5A or 1A) cannot be connected directly. Use the general-purpose CT (5A) together with type number CC2D81-0057. Use dedicated ZCT as combination ZCT with the UM03-ARA3.

■ System configuration



■ Specifications

• General specifications

Applicable circuit		Single circuit 3-phase 3-wire: 2-CT, single-phase 3-wire: 2-CT, single-phase 2-wire: 1-CT
Control power supply		100 to 200V AC (85 to 264V AC) 50/60Hz (45 to 66Hz)
Inrush current		15A, 3ms or less (at 110V AC, 50Hz) 30A, 3ms or less (at 220V AC, 50Hz)
Control power consumption		Approx. 7VA (at 220V AC) Approx. 5VA (at 110V AC)
VT consumed burden		Approx. 0.2VA
Continuous overload capability	Current input circuit	110% of maximum setting value (150% of rated current), 2 hours
	Voltage input circuit	291V AC (1.1×264V AC), 2 hours
Short-time overload capability	Current input circuit	2000% of max. setting value (150% of rated current), 9 times for 0.5s
	Voltage input circuit	200% of max. setting value (264V AC), 9 times for 0.5s
Vibration		10 to 58Hz 0.075mm (one-way amplitude) 58 to 150Hz: constant acceleration 10m/s^2, 10 cycles for 8 min in each X, Y, and Z directions
Shock		300m/s^2, in each X, Y, and Z directions, 2 times
Withstand voltage / Insulation resistance (500V DC megger)		2kV /10MΩ Between power supply terminals connected together and other terminals connected together 2kV /10MΩ Between measurement input terminals connected together and other terminals connected together 2kV /10MΩ Between alarm output terminals connected together and other terminals connected together 500V /10MΩ Between watthour pulse output terminals connected together and other terminals connected together
Ambient temperature		-10 to +55˚C
Storage temperature		-20 to +70˚C
Humidity		20 to 90%RH (no condensation)
Atmosphere		Free from corrosive gases and excessive of dusts
Grounding		Type D ground (100 or less)
Allowable momentary power failure time		20ms (operation will continue)
Altitude		2,000m or less
Mass		Approx. 400g (main unit only, CT excluded)

• Measurement specifications

Item	Effective measurement range	Display	Accuracy *1
Current (R/S/T), demand current Max. demand current value	• With CT (200A AC) 0, 0.4% of In (0.8A) to 300A	4-digit	1.5%: R- and T-phase 2.5%: S-phase
Demand value and max. demand value of total harmonic current *2	• With CT (400A AC) 0, 0.4% of In (1.6A) to 600A	4-digit	2.5%
Active power () Demand power Max. active demand power value	• With CT (5A) 0, 0.4% of In (0.2A) to 50A 0, to 1.5 times CT rating (for 5A)	4-digit	1.5%
Reactive power ()	(converted into CT secondary: 7.5A)	4-digit	3%
Power factor ()	(Max. display range: up to 9,999A)	3-digit	5% (Converted into a phase angle of 90˚)
Active electric energy (+only)	• Demand time setting: 0, 1 to 15min	5-digit	Equivalent to JIS ordinary class (pf: 0.5-1.0- –0.5)
Reactive electric energy (absolute value addition)	(by 1min step) 30min setting: Available	5-digit	5%
Voltage	Converted into an input voltage 60 to 264 V AC	4-digit	1.5% 2.5%: Vv-w
Frequency *3	45 to 66Hz *2	3-digit	0.5%
Leakage current (Io/Iob) *4 Max. demand value	0, 10 to 1000mA	4-digit	2.5%

Note: *1 The measurement accuracy is a value for FS (full span).
*2 The total harmonic current relates only to phase R and phase T. Only the demand value and max demand value are displayed. The current value is not displayed.
*3 If the frequency is out of the measurement range (lower than 45 Hz or higher than 66 Hz), 0.0 [Hz] is displayed.
*4 Maesurement of leakage current is possible only with UM03-ARA3G.

• Output specifications

Item		UM03-ARA3	UM03-ARA3G	Specification
Watt-hour pulse output		Provided	Provided	Transistor open collector output 35V DC 100mA
Alarm output	Current prealarm (OCA), power alarm *	Provided	Provided	Replay output 250V AC 1A
	Leakage current prealarm (OCGA) (Io operation)	Not Provided	Provided	
	Leakage current alarm (OCG)	Not Provided	Provided	

Note: * Choose the current prealarm (OCA) output or power alarm by change of setting.

Watthour pulse output details

Output specifications	35V DC 100mA (residual 2.5V or less at ON)
Output pulse width	100ms20ms
Output interval	200ms or more
Pulse multiplication rate	10^nkWh/pulse (n=–3 to 2 setup)

Alarm output details

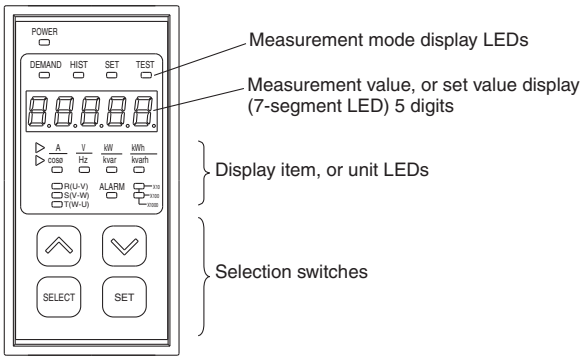
	Setting range		Accuracy	
	Operate value	Time	Operate value	Time
Current prealarm (OCA) *1	I: 20 to 120% of rated value, Lock (5% step)	Depending on the demand time setting	5% (rated min 1.5%)	10%
Power alarm *1	0 to 9999kW (1kW step)			
Leakage current alarm (OCG) (Io operation)	Operate current 100, 200, 500mA, Lock	0.1, 0.3, 0.5, 1.0s	75%5% of setting value	75%5% of setting value (min25ms)
Leakage current prealarm (OCGA)	505mA 100 to 500mA (50mA step), Lock	0.1, 0.3, 0.5, 1.0, 10s or demand time *2	5%	5%

Note: *1 Select either the current pre-alarm output or the power alarm output through setup.
*2 When demand time is selected, the unit operates on I_{ob} (leakage current only with fundamental wave).

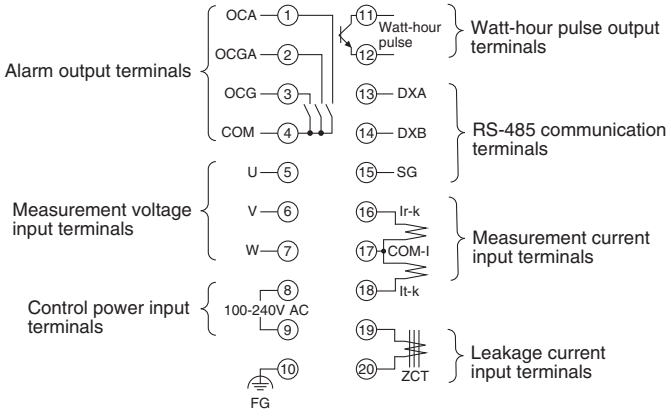
■ Communications specifications

Item		Specification	Factory setting
Standard		EIA-485	–
Transmission system		2-wire half duplex	–
Data exchange		1: N polling/selecting	–
Transmission distance		1000m (total length)	–
No. of connectable units		max.32 (including master)	–
Station number setting		1 to 99	Without station number setup
Transmission characters		ASCII	–
Transmission speed		4800, 9600, or 19200 bps (selectable)	19200 bps
Data format	Number of start bits	1 (fixed)	–
	Data length	7 or 8 bits (selectable)	7 bits
	Parity bit	None, even,or odd (selectable)	Odd
	Number of stop bits	1 (fixed)	–
	BCC	Even horizontal parity	–

■ Front panel

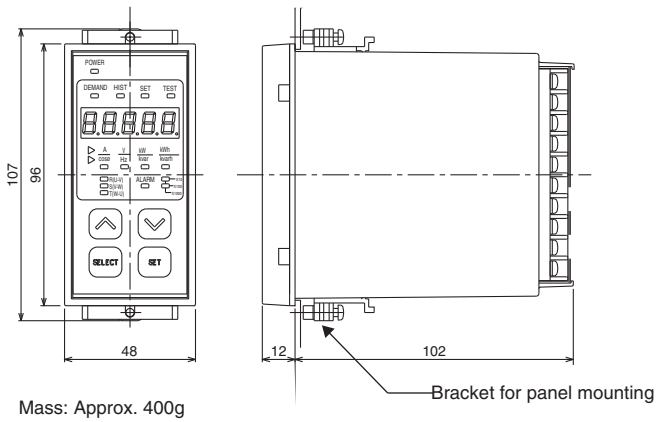


• Terminal layout



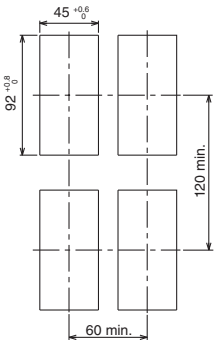
Note: Alarm output terminal ② ③ and ZCT input terminal ⑲ ⑳ of the UM03-ARA3 (without leakage current measuring function) are NC terminals. Do not connect anything to these terminals.

■ Dimensions, mm



Mass: Approx. 400g

Panel cutting



Single-circuit Power Monitoring Unit F-MPC04E Series

■ Features

[Common]
- An in-panel F-MPC-series Energy Monitoring Unit for one circuit.
- A compact, lightweight design that is 1/2 the size and 1/3 the weight of the F-MPC04S. This unit can be mounted easily because it has the same outline as the EMPC04E series.
- Measurement accuracy equivalent to JIS ordinary class is provided. Electric energy can be measured accurately even in light-load.
- Power consumption is also 30% less than the F-MPC04S.
- Easy setup with rotary and DIP switches.
- A separately sold Display enables in-panel display of measured data.

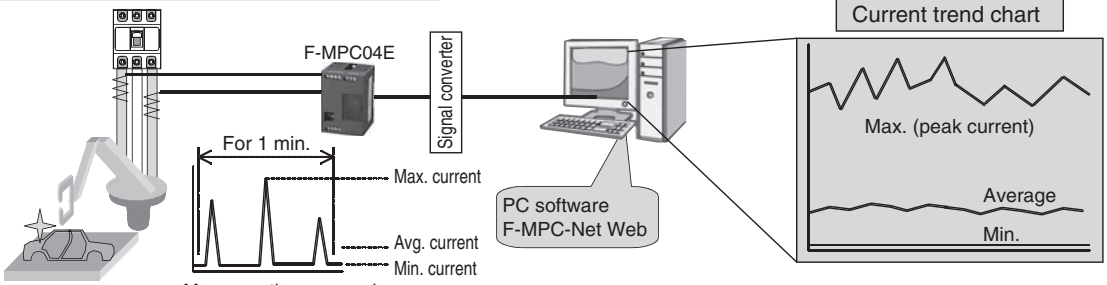
[UM05-AR3]
- Standard-feature RS-485 communications. (UM05-AR3 only)

[UM05-AC3]
- Collected data can be stored on an SD card and displayed on a PC. No need to build a communication system. (The model with communications capabilities is UM05-AR3)
- A PC application to easily analyze and make graphs of recorded data on the SD card is available (can be downloaded from the Web site).

UM05-AR3 type

UM05-AC3 type

Capture the peak current on a spot welder.

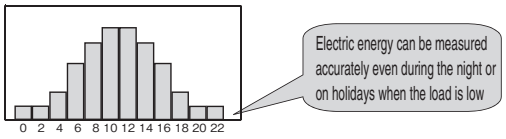


Measures the max. and min. RMS for 1 cycle

Monitors fluctuation of 1 cycle max. current

Measure accurately even when the load is low

Accuracy equivalent to JIS ordinary class, in which electric energy can be measured accurately even when the load is low

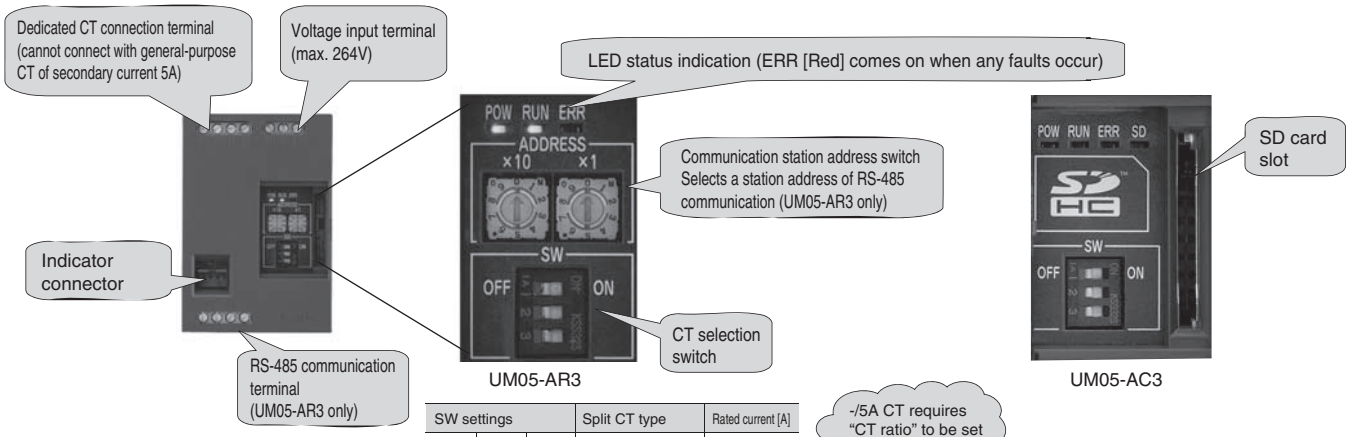


* The primary side of an inverter can be monitored.

■ Types and Ratings

Product name			Type = product code
One-circuit Energy Monitoring Unit RS-485 communication type			UM05-AR3
One-circuit Energy Monitoring Unit SD card type			UM05-AC3
Display and Setup Unit			UM05X-S
Split-type CT	Primary rated current	5A	CC2D81-0057
(Made by Fuji Electric Technica)		50A	CC2D81-0506
		100A	CC2D71-1004
		200A	CC2D65-2008
		400A	CC2D54-4009
		800A	CC2D52-8009

■ Connection terminals and switch

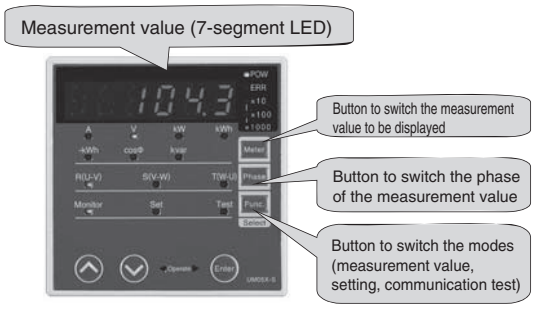


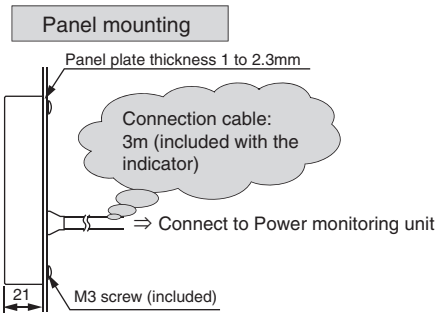
SW settings			Split CT type	Rated current [A]
OFF	OFF	OFF	CC2D81-0057	-/5
OFF	OFF	ON	CC2D81-0506	50
OFF	ON	OFF	CC2D71-1004	100
OFF	ON	ON	CC2D65-2008	200
ON	OFF	OFF	CC2D54-4009	400
ON	OFF	ON	CC2D52-8009	800

-/5A CT requires "CT ratio" to be set with the indicator.

■ F-MPC04E: Dedicated indicator (optional)

Dedicated indicator used via one-to-one connection with the F-MPC04E.
This indicator is mounted on the panel surface and used to display the measurement values.
This is also used to change the settings of F-MPC04E power monitoring unit.





Setting items on Indicator If you want to use a 5A rating CT or an external VT or to change MODBUS/RTU, settings must be changed from the factory default settings using the indicator.

Setting items	Description	Factory default settings
CT rating	If 5A rating CT is used, set the primary rated current general-purpose CT. (Configurable to 7500A or less)	–
VT ratio	For a system with a voltage of more than 264V, set the VT ratio of an external VT. (Configurable to 6600/110V or less)	Direct input
Pulse multiplying factor	If you want to monitor the electric energy on a granular level, you can change this to "normal - multiplying factor 1".	"Normal"
Communication mode	Select the communication protocol from "F-MPC-Net" or "MODBUS/RTU".	F-MPC-Net
Communication parameter	Select communication parameters. (Baud rate: 4.8 to 38.4kbps, bit length: 7/8bit, Parity: Odd/even/none)	19.2kbps, 7bit, odd

■ Specifications

● Basic Specifications

Item		Specification
Ratings	Voltage	100 to 240V AC (allowable operating voltage range: 85 to 264V AC) (Same input terminals are used for measurement and control power supply. Control power supply is input across the U and V terminals.)
	Frequency	50/60Hz (allowable range :47.5 to 63Hz)
	Current (CT primary/secondary)	5A/7.34mA AC, 50A/73.4mA AC, 100A/33.3mA AC, 200A/66.7mA AC, 400A/133.3mA AC, and 800A/133.3mA AC
Power supply	Load VA	6VA
	Inrush current	30A, 3ms(240V) 15A, 3ms(100V)
Insulation resistance		Between all electric circuits and ground (case/DIN rail): 10MΩ min. Between all I/O circuits and ground: 10MΩ min. Between all electric circuits and all I/O circuits: 5MΩ min.
Vibration resistance		10 to 58Hz, 0.075mm one-way amplitude, 58 to 150Hz, 10m/s^2 constant acceleration 10 cycles for 8 min each in X, Y, and Z directions (with bracket to prevent shifting)
Shock resistance		294m/s^2 sine half wave for 11ms 3 times each in X, Y, and Z directions (with bracket to prevent shifting)
Dielectric strength		Between all terminals and ground (case/DIN rail): 2,000V AC for 1 min Between all electric circuits and all I/O circuits: 2,000V AC for 1 min

Item		Specification
Noise immunity Criteria B		Damped oscillating waveform at 1 to 1.5MHz with peak voltage of 2.5 to 3kV for 2 s
		Square wave, 1.5kV, 1ns/1μs continuously for 10 min
		Radiated electromagnetic field: 20V/m *1
		Static electricity: Air discharge: 8kV, Contact discharge (case): 4kV
		Burst noise: Control power supply: 2kV, CT input (clamp): 2kV, I/O (clamp): 1kV
Overload capability	Current circuits	1.1 times maximum scale value (1.25 times rated current) for 2 hours
	Voltage circuits	1.1 times maximum scale value for 2 hours
Ambient operating temperature		-10 to 55°C
Storage temperature		-20 to 70°C
Relative humidity		20% to 90% (with no condensation)
Atmosphere		No corrosive gas or excessive dust or dirt
Permissible momentary power interruption time		20ms (Communications and measurements are interrupted.)
Mass		Measurement Unit: Approx. 120g (without CT) Display: Approx. 70g (without connecting cable)

Note : Operation of the Energy Monitoring Unit may temporarily stop when subjected to strong radiowaves.

[UM05-AR3]

● Measurement Specifications

(1) Current Value Display

Item		Measurement range	Accuracy*1
Voltages	3-phase line voltages*2 (Vuv, Vvw, and Vwu)	85 to 264V	Vuv and Vvw : ±1.0% FS Vwu : ±2.5%FS
Currents	3-phase current (Ir, Is, and It)*2	0.4% to 125% of rating (50A CT: 0.4% to 100%, 100A CT: 0.4% to 120%)	Ir and It : ±1.0% FS Is : ±2.5%FS
Active power*3	Reverse power flow is negative.	Depends on current and voltage measurement ranges (current x voltage x √–3)	±1.0%FS
Reactive power*3	(Reactive power measurement method)	Same as above.	±1.5%FS
Active power consumption*3	Forward active power consumption	Display: 6 digits F-MPC-Net communications: 4 digits MODBUS communications: 9 digits	Equivalent to JIS normal class. 2.0% at power factor of 1.0 and 5% to 120% of rated current 2.5% at power factor of 0.5 and 10% to 120% of rated current
	Reverse active power consumption		
Power factor	(Reactive power measurement method)	0 to ±1.000	±3.0%FS (90° phase angle conversion)

Notes : • The accuracy does not include the error of an externally connected CT or VT.
• A 3-phase 3-wire, single-phase 3-wire, or single-phase 2-wire system is automatically detected and measured.For a single-phase 2-wire system, Vvw, Vwu, Is, and It will be zero.
• The active power, reactive power, and active power consumption are measured for the following ranges: 85 to 264V and 0.4% to 125% current.

(2) Period Measurement Values

Item		Display	Communications	Accuracy	Remarks
Voltages	Maximum period voltages (Vuv and Vvw) Average period voltages (Vuv and Vvw) Minimum period voltages (Vuv and Vvw)	×	○	±2.5%FS (VT error is not included.)	The maximum and minimum values are the actual values for one cycle of a commercial frequency. During the period (1 min), the previous maximum, average, and minimum values are retained.
Currents	Maximum period currents (Ir and It) Average period currents (Ir and It) Minimum period currents (Ir and It)	×	○	±2.5%FS (CT error is not included.)	

Note : The values for each minute are sent in communications responses. (They do not appear on the display.)

[UM05-AC3]

• Measurement specifications

Item		Measurement range	Accuracy *1
Voltage	3-phase line voltages*2 (Vuv, Vvw, and Vwu)	85 to 264V	Vuv, Vvw: ±1.0%FS Vwu: ±2.5%FS
Current	3-phase current (Ir, Is, and It)*2	0.4 to 125% of rating (50A CT: 0.4 to 100%, 100A CT: 0.4 to 120%)	Ir, It: ±1.0%FS Is: ±2.5%FS
Active power *3	Reverse power flow is negative.	Depending on current/voltage measurement range (current x voltage x √3)	±1.0%FS
Reactive power *3	(Reactive power measurement method)	Same as above	±1.5%FS
Active power consumption*3	Forward active power consumption	Indicator: 6 digits	JIS ordinary class or equivalent Power factor 1.0, 2.0% at 5% to 120% of rated current Power factor 0.5, 2.5% at 10% to 120% of rated current
	Reverse active power consumption		
Power factor	(Reactive power measurement method)	0 to ±1.000	±3.0%FS (90° phase-angle conversion)

*1 The measurement accuracy does not include the error of the external CT and VT.
*2 The system automatically determines whether it is a three-phase three-wire, single-phase three wire, or single-phase two-wire, and then performs the measurement. In the case of a single-phase two-wire, Vvw, Vwu, Is, and It is zero.
*3 Active power, reactive power, and active electric energy are measured within the following range: Voltage: 85 to 264V, Current: 0.4 to 125%.

Item		Specification	
		F-MPC-Net	MODBUS/RTU
Standard		EIA-485	
Transmission method		Half-duplex, 2-wire	
Data transfer method		1:N (Energy Monitoring Unit), polling/selective	
Synchronization method		Start-stop	
Transmission distance		1,000m (total distance)	
No. of connected nodes		64 max.*1 per network (The master is counted as a node.)	
Baud rate		4,800, 9,600, 19,200, or 38,400 bps (selectable)	
Address setting		1 to 99*2 (MODBUS/RTU protocol: 1 to 99)	
Connection method		Terminal block	
RS-485 terminal names		DXA and DXB	Use DXA for the D1(+) connection and DXB for the D0(-) connection.
Transmitted characters		ASCII	Binary
Data format	Start bits	1 (fixed)	1 (fixed)
	Data length	7 or 8 bits (selectable)	8 bits (fixed)
	Parity bit	None, even, or odd (selectable)	None, even, or odd (selectable)
	Stop bits	1 (fixed)	No parity: 2 bits (fixed) Other: 1 bit (fixed)
	BCC	Even horizontal parity	CRC-16

Default settings: F-MPC-Net protocol, 19,200bps baud rate, 7-bit data length, and odd priority.(A UM05X-S Display and Setup Unit is required to change the default communications settings.)
*1 If 32 device nodes are connected, each device node is counted as two nodes, reducing the maximum number of connected nodes.
*2 Communications addresses are set on rotary switches. Even for MODBUS/RTU, set the address on the Energy Monitoring Unit to between 1 and 99. Communications are disabled if the communications address is set to 00.

• SD memory card

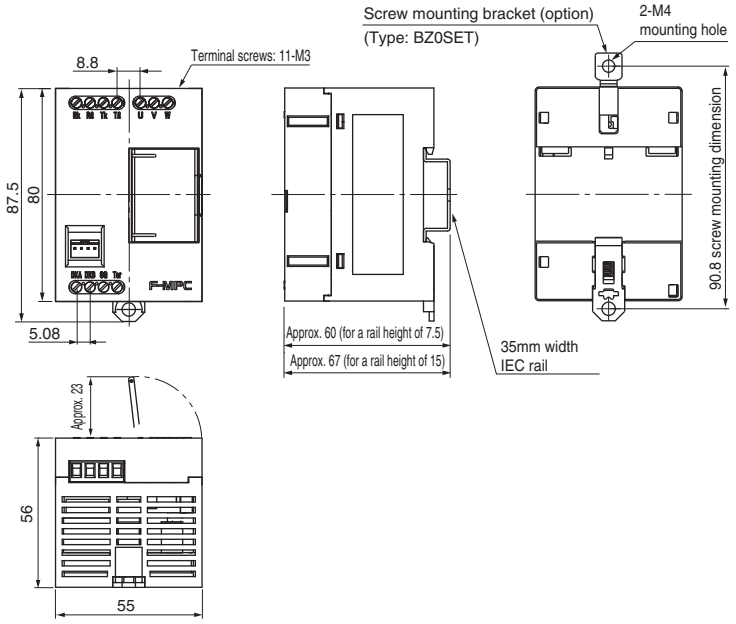
There are two types of recorded data in the SD memory card: 1-hour period and set period.

Recording measurement value		Recording period	Remarks
1-hour period	Max. value: Ir, It, Vuv, Vvw Ave. value: Ir, It, Vuv, Vvw Min. value: Ir, It, Vuv, Vvw Period value [difference]: Electric energy Negative electric energy	1 hour (fixed)	Save data as a CSV file for each day. (about 1Mbyte for a month) If the card is not inserted, data for 35 days is recorded on the internal memory. *1*2
Set period	Max. value: Ir, It, Vuv, Vvw Ave. value: Ir, Is, It, Vuv, Vvw, Vwu, kW, kvar Min. value: Ir, It, Vuv, Vvw Period value [difference]: Electric energy, negative electric energy Instantaneous value: cosϕ	Select 1, 2, 5, 6, 10, 15, 20, 30 (min.) or "Do not record". (Factory default setting is "Do not record".)	Save data as a CSV file for each day. (max. 9Mbyte for a month) data is recorded only when the card is inserted. To change the set period, a dedicated indicator is required. If the set period is used for recording, ERR LED flashes when the card is not inserted. *1*2

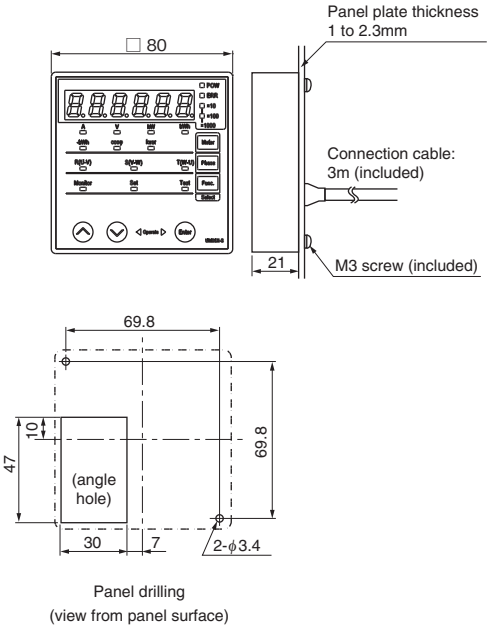
Notes : • An SD card is not included. You have to purchase an SD/SDHC card (32GB or smaller) separately.
• The recording period is based on the time of the internal clock. To adjust the time of the internal clock, an optional indicator is required.
*1 Maximum/minimum value is determined from the measurement value per cycle of commercial frequency (50/60Hz).
*2 Do not remove the SD card or turn the control power off when the card is being accessed.

■ Dimensions [Unit: mm]

• UM05-AR3

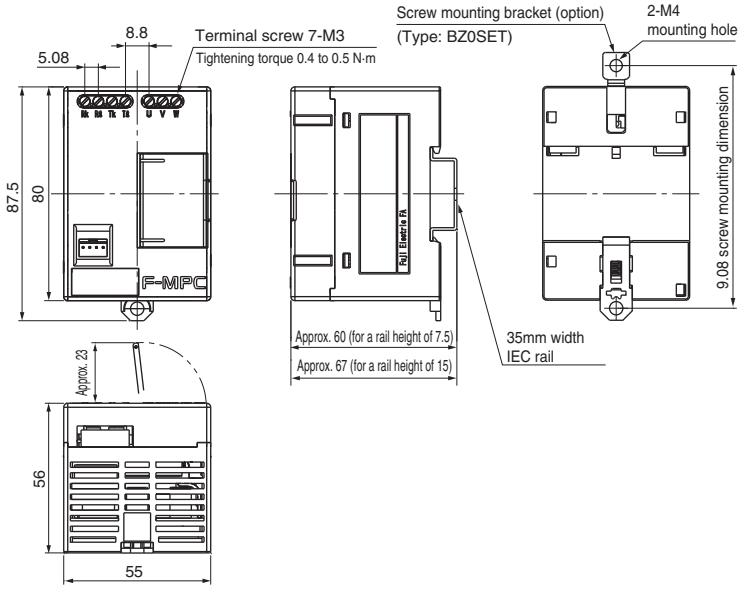


• UM05X-S



Panel drilling
(view from panel surface)

• UM05-AC3



F-MPC Web Unit

■ Features

We propose a way to save energy that allows quick connection/collection and data visualization by anyone from anywhere.

- **Power monitoring Web server function**
  You can view the electric power monitoring screen from a Web browser on your PC.
- **Easy setting with a setup utility**
  We have a utility to automatically recognize the connected F-MPC series system and to set monitoring points through easy operation.
  The setup utility can be downloaded from our Web site (http://www.fujielectric.co.jp/fcs/jpn).
- **Daily/monthly/yearly report data accumulation function makes it easy to create reports and works with an analysis tool**
  You can record daily/monthly/yearly reports on the internal memory, view them on a Web browser, and import them to your PC. This daily/monthly/yearly report CSV File can work with the analysis tool for energy saving.
- **Compact design that allows the unit to be installed almost anywhere**
  A palm-sized compact body (W100 x H80 x D56) allows you to mount it on a normal distribution board and DIN rail.
- **Flexible scalability from small systems to large ones**
  Monitor up to 256 points just with this unit. If there are more than 256 monitoring points, multiple F-MPC Web units can be used to support a large system with up to 6,000 monitoring points by installing the F-MPC-Net package.

■ Model/Type (= product code)

Product name	Type (= product code)
F-MPC Web Unit	BW800RAU-3P

■ Specification

● General specifications

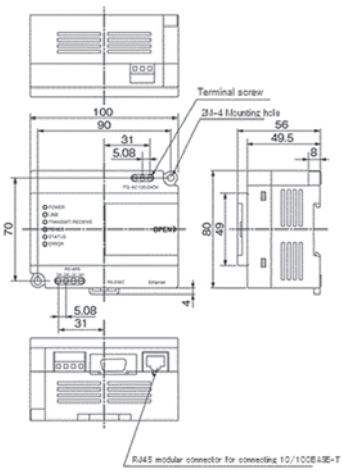
Item		Specifications
Control power		AC 100 to 240V (AC85 to 264V)
Rated frequency		50/60 (47 to 63) Hz
Power consumption		Steady state: 5 W or less
Leakage current		0.75 mA or less
Inrush current		40 A or less
Rated impulse withstand voltage		2.5kV IEC61010-1
Installation (overvoltage) category		II IEC61010-1
Power failure backup		Lithium primary battery (battery replacement life expectancy: 5 years (average temperature 25ºC))
Operating ambient temperature		-10 to +55ºC Average 35ºC or less (no dew condensation)
Storage temperature range		-20 to +70ºC (no dew condensation)
Humidity range		85% or less (40ºC)
Emission	Terminal voltage	0.15 to 0.5 MHz: 79/66dB (Q-peak/Ave)
		0.5 to 30 MHz: 73/60dB (Q-peak/Ave)
		Standard JIS C 1806-1
	Radiation electromagnetic field	30 to 230 MHz: 40dB (Q-peak,10m)
		230 to 1000 MHz: 47dB (Q-peak,10m)
		Standard JIS C 1806-1
Dielectric strength and insulation resistance		Between control power terminal and terminal of other circuit or against ground: AC2500 Vrms 1 min./10 MΩ or more (500 V DC megger)
Vibration		19.6 m/s2, 16.7 Hz, each direction of x, y, z for 30 min.
Shock		294m/s2, 3 directions, 3 times each
Mounting method		DIN rail or M4 screws (screw tightening torque mounting area: 0.8 Nm, wiring area: 0.5 Nm)
Mass		250 g (including the battery)

F-MPC Web Unit

● Function specifications

Item		Specifications		Remarks
Communication	Ethernet 10/100base-T	Web server		• Function to set various parameters such as IP address • Display of electric power monitoring screen
		FTP server		Accumulated data is sent by CSV file format
		Gateway (TCP)		Ethernet - RS-485 communication conversion function
		Time setting (TCP)		Function to automatically set the internal clock to be in synch with the specified computer
	RS-485	F-MPC Net protocol		Possible to communicate up to 31 units of F-MPC product category
Data accumulation	Clock	Clock function for periodic accumulation		Battery backup for power failure (total power failure time of one year in 25°C)
	Accumulation media	Internal nonvolatile memory		
	Number of data points	256 points maximum	128 points maximum	Two modes of 256 points max. or 128 points max. can be selected (including calculation setting of 10 points maximum (virtual measuring point))
	Daily report (one hour cycle)	40 days	70 days	• Available term of data accumulation changes according to the mode setting for maximum points • Overwrites the oldest data when full • Records in individual cycles respectively for the annual, monthly and daily reports
	Monthly report (one-day cycle)	13 months	25 months	
	Annual report (one-month cycle)	2 years	3 years	

Note: If a device with 32 nodes is connected, the maximum number of connected nodes may be reduced because one connection is counted as two.

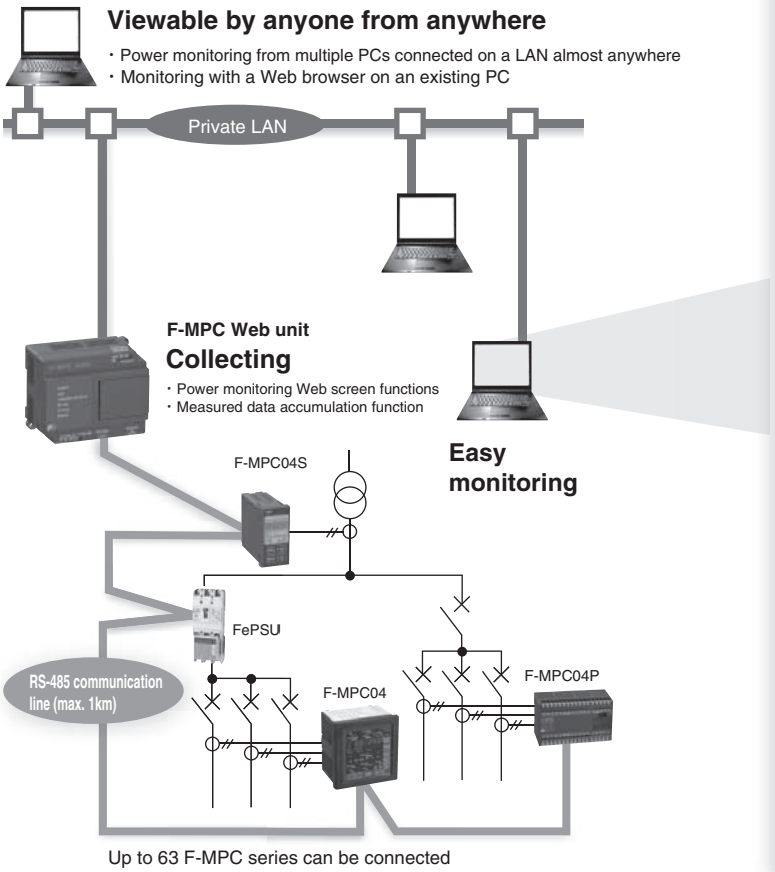


● Monitoring screen specifications

Monitoring screen	Specifications	Remarks
Integral electric energy	Displays the monitoring data of the electric energy annual, monthly and daily reports in graphs	Displays the electric energy of the accumulated data
Trend (Note 1)	Displays the trend graph of 2 hours, 4 hours, 24 hours and 5 days of the analog measurement value	Displays the analog measurement value of current, voltage, etc. of the accumulated data
Demand	Displays up to two points of the demand monitoring results Possible to send email according to the generation of demand warning (email server is required separately for sending email)	Two points from the electric energy of the accumulated data can be selected for the demand monitoring items
Power factor (Note 1)	Displays the trend graph of 2 hours, 4 hours, 24 hours and 5 days of the power factor	Displays the power factor measurement value of the accumulated data
Warning log	Displays up to 30 warning logs Possible to send email according to the generation of warning (email server is required separately for sending email)	Contents of warning are the monitoring results of the warning setting set by the setting utility (possible to set warning up to 40 settings) Warning logs will be cleared when the device is restarted.
Annual, monthly and daily reports	Displays the annual, monthly and daily reports of the electric energy.	Displays the electric energy of the accumulated data
Group	Displays for comparison of integral electric energy categorized in groups through stacked bar graph and pie graph	Displays the electric energy of the accumulated data Groups are categorized according to the setting utility.
Measurement value	Displays measurement values of each circuit in a list	Displayable measurement values are of measurement items saved in the accumulated data Display update cycle of the measurement value is approx. 30 seconds
Time correction	Corrects the internal clock of the device	

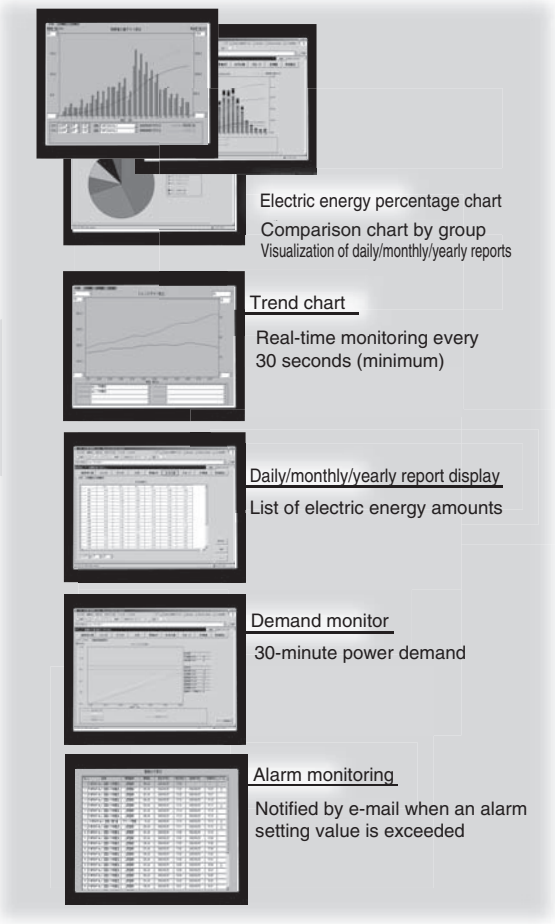
(Note2) Displayed data of trend and power factor The displayed data of the trend graph will be cleared when the device is restarted. In addition, the oldest data will be deleted when the displayable time range is exceeded.
2 hours: Displays data of past 2 hours in a 30 sec. cycle (30 sec. × 240 cycles)
4 hours: Displays data of past 4 hours in a 1 min. cycle (1 min. × 240 cycles)
24 hours: Displays data of past 24 hours in a 6 min. cycle (6 min. × 240 cycles)
5 days: Displays data of past 5 days in a 30 min. cycle (30 min. × 240 cycles)

■ System Configuration



Up to 63 F-MPC series can be connected

(Note) If a device with 32 nodes connected, the maximum number of connected nodes may be reduced.



F-MPC I/O Unit

■ Features

- The energy monitoring system uses the F-MPC-Net communications protocol to monitor ON/OFF status, measure pulse signals, output alarm relays, and read flow meters.
- Use the DI/DO Unit to input ON/OFF signals, count total pulses, and control the ON/OFF status of relay outputs.
- Use RS-485 2-wire communications to send input status to a host, control relay outputs with ON/OFF commands from the host, and more.

■ Type and Ratings

Product name	Specification	Type
DI/DO Unit	6 inputs (contact or transistor inputs) and 4 relay outputs (250V AC 1A)	**UM11-D0604**

■ Specifications

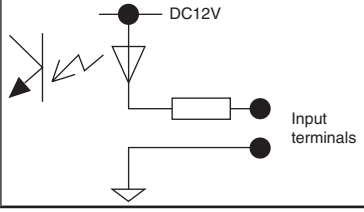
● Basic Specifications

Item		Specification
Control power supply	Ratings	100 to 240V AC (allowable range: 85 to 264VAC), 50/60Hz (allowable range: 47 to 63Hz)
	Consumed VA	Max. 8.5VA
	Inrush current	20A max.
Ambient temperature		–10 to 55°C
Storage temperature		–20 to 70°C
Relative humidity		20% to 90% (with no condensation)
Atmosphere		No corrosive gas or excessive dust or dirt
Enclosure		IP20
Insulation resistance		Between all control power supply terminals and other terminals: 10MΩ min.
Commercial frequency dielectric strength		Between all control power supply terminals and other terminals: 2,000V AC for 1 min
Noise immunity		Damped oscillating waveform at 1 to 1.5MHz with peak voltage of 2.5 to 3kV for 2 s, square wave, 1.5kV, 1ns/1μs continuously for 10 min Burst noise: Control power supply: 2kV, communications line: 1kV; Surge: Control power supply: 2kV, communications line: 1kV
Static electricity noise immunity		Air discharge: 8kV, Contact discharge (case): 4kV
Shock resistance		294 m/s^2 [30G] 3 times each in 3 directions (no malfunction for 147m/s^2 [15G] in 2 directions)
Vibration resistance		19.6m/s^2, 16.7Hz for 30 min each in X, Y, and Z directions
Permissible momentary power interruption time		20ms (Operation continues.)
Mounting method		Screw mounting or mounting to IEC 35mm rail
Mass		250g

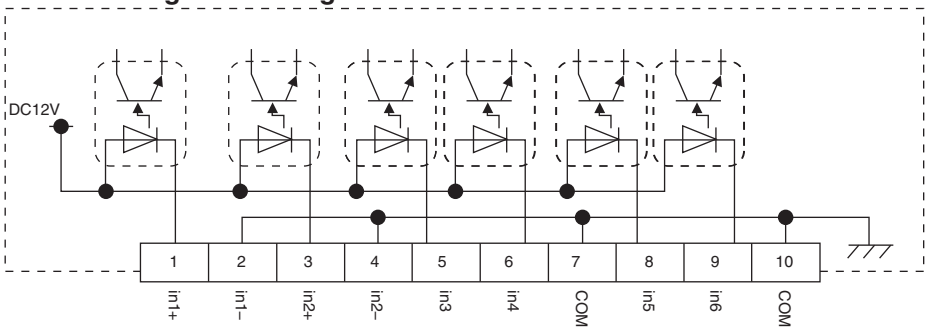
● I/O Specifications

(1) DI (Digital Input)

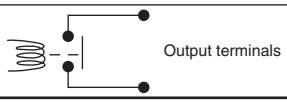
There are 6 digital inputs, and they can be used to read ON/OFF status and count pulses. With 2 of the 6 digital inputs, pulse widths of 10 ms or longer can be counted. With the other 4 digital inputs, pulse widths of 50 ms or longer can be counted. ON/OFF status can also be sent via communications. The total count values for pulses can also be sent via communications.

Item	Specification	Remarks
Digital input type	Contact or transistor inputs	The service power supply voltage is always applied.
Minimum input signal width	in1 and in2: 10ms, in3 to in6: 50ms	For a pulse input, the ON period and OFF period must be the same or longer than the minimum input signal width.
Operating time measurement	Time error: ±1.0% (minimum value: ±1s)	The total ON time is calculated in seconds.
ON current	ON for 4mA or higher	While an input is ON, a current of approx. 5mA will flow.
OFF current	OFF for lower than 1mA	
Internal Circuits	Input circuit for 1 input 	There are two terminals each for the in1 and in2 inputs. The in3 and in4 inputs share a common, and the in5 and in6 inputs share a common. The ground terminal is internally connected to the common terminals.

Circuit Configuration Diagram



(2) DO (Digital Output)
There are 4 digital outputs and their ON/OFF status can be controlled via communications.

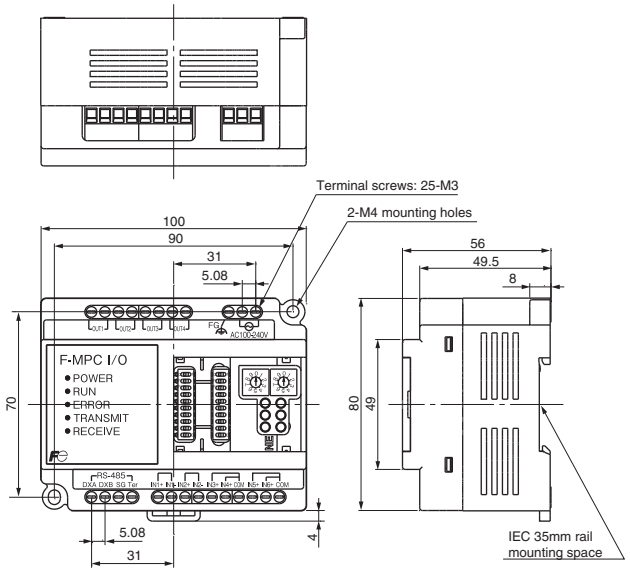
Item	Specification	Remarks
Digital output type	Relay outputs (NO contacts)	Equivalent to RB105 card relays.
Continuous carry current	250V AC 1A (continuous carry current)	
Maximum switching frequency		
Switching life	600,000 operations at 220V AC 1A, resistive load 200,000 operations at 220V AC 1A, inductive load 900,000 operations at 110V AC 1A, resistive load 300,000 operations at 110V AC 1A, inductive load 600,000 operations at 24V DC 1A, resistive load 120,000 operations at 24V DC 1A, inductive load	Value for conduction factor of 40% with switching frequency of 1,800 times per hour. Inductive load time constant: L/R = 15ms
Internal circuits		There are two terminals for each output.

● Communications Specifications

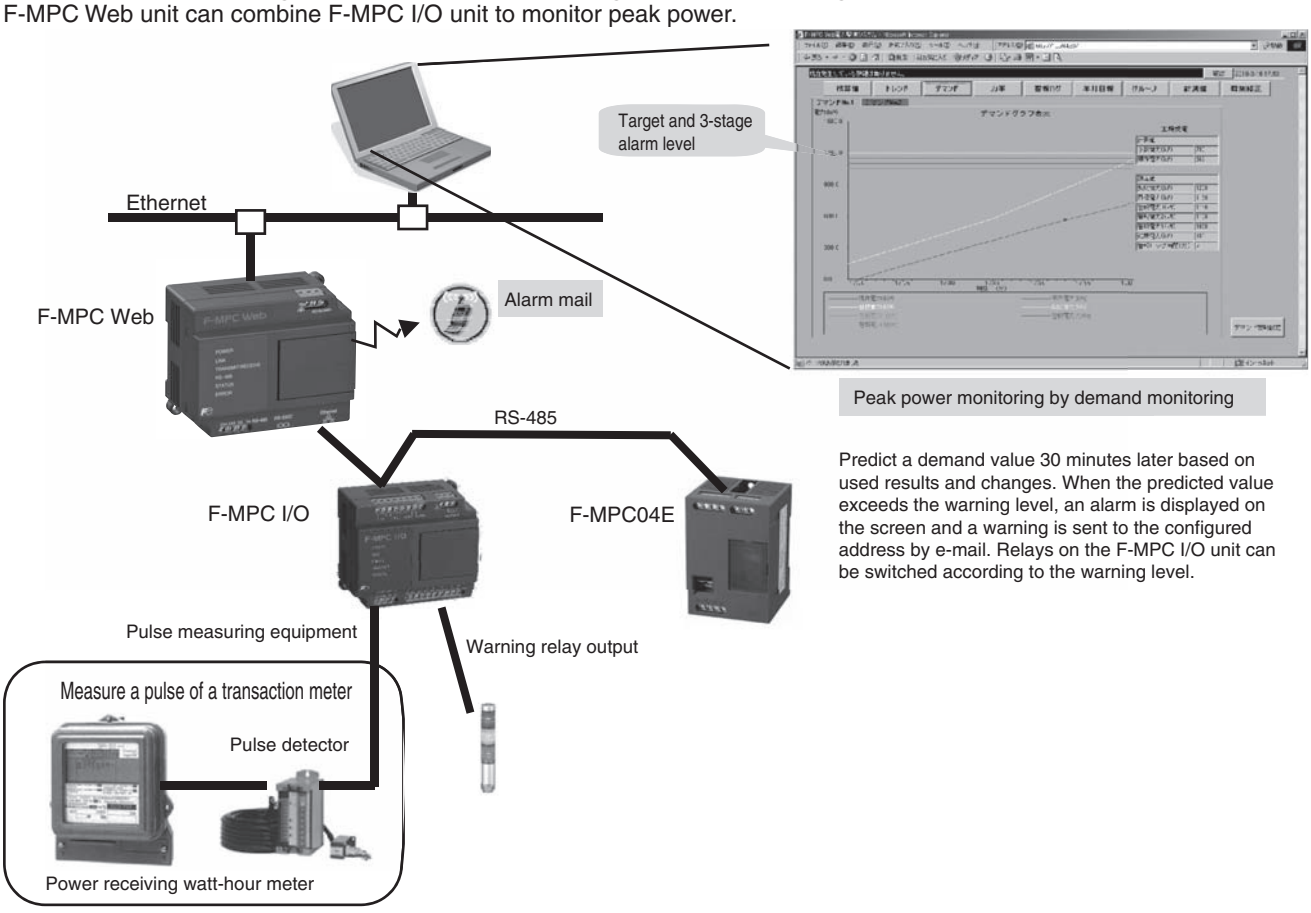
Item		Specification	
		F-MPC-Net	MODBUS/RTU
Standard		EIA-485	
Transmission method		Half-duplex, 2-wire	
Data transfer method		1:N (I/O Unit), polling/selective	
Transmission distance		1,000m (total distance)	
No. of connected nodes		64 max. per network (The host is counted as a node.) (See note 1.)	
Baud rate		4,800, 9,600, 19,200, or 38,400 bps (selectable)	
Address setting		1 to 99 (See note 2.)	
RS-485 terminal names		DXA and DXB	Use DXA for the D1(+) connection and DXB for the D0(-) connection.
Transmitted characters		ASCII	Binary
Data format	Start bits	1 (fi xed)	1 (fi xed)
	Data length	7 or 8 bits (selectable)	8 bits (fi xed)
	Parity bit	None, even, or odd (selectable)	None, even, or odd (selectable)
	Stop bits	1 bit (fi xed)	No parity: 2 bits (fi xed), Other: 1 bit (fi xed)
	BCC	Even horizontal parity	CRC-16

(See note 1.) If 32 device nodes are connected, the maximum number of connected nodes may be reduced.
(See note 2.) Communications addresses are set on rotary switches. Even for MODBUS/RTU, set the address on the I/O Unit to between 1 and 99. Communications are disabled if the communications address is set to 00.

● Dimensions



■ **Peak Power Monitoring with F-MPC Web (monitoring on power receiving watt-hour meter pulse)**
F-MPC Web unit can combine F-MPC I/O unit to monitor peak power.



Peak power monitoring by demand monitoring

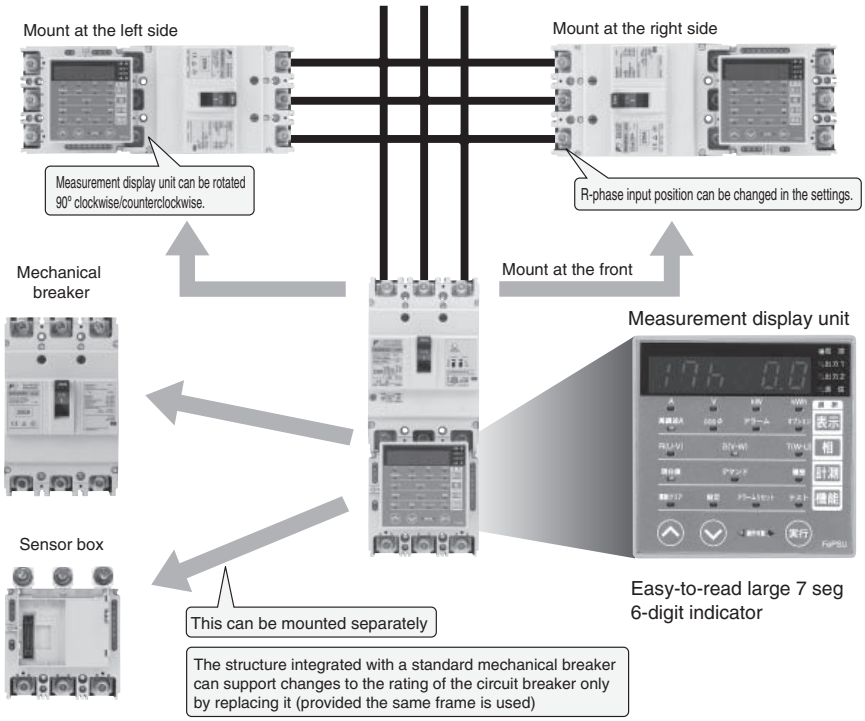
Predict a demand value 30 minutes later based on used results and changes. When the predicted value exceeds the warning level, an alarm is displayed on the screen and a warning is sent to the configured address by e-mail. Relays on the F-MPC I/O unit can be switched according to the warning level.

Auto-breaker/Earth Leakage Circuit Breaker with Measurement Display (FePSU)

■ Features

- Various combinations
  You can choose the best model from a broad product line: 125A to 800A frame of auto-breaker/earth leakage circuit breaker/circuit with ZCT breaker.
- Space-saving and work-saving
  A breaker/earth leakage circuit breaker integrated with a sensor box and measurement display unit saves mounting space.
- Various mounting connection methods (front, rear, flush) are supported.
- Various mounting types and easy-to-read display.

(Picture No. KKD09-064)



■ Table of Products

- Auto-breaker

Frame (A)	125	250	400	630	800
Basic type		**BW250EAP-3P**	**BW400EAP-3P**	**BW630EAP-3P**	**BW800EAP-3P**
	BW125JAP-3P	**BW250JAP-3P**			
			BW400SAP-3P		
	BW125RAP-3P	**BW250RAP-3P**	**BW400RAP-3P**	**BW630RAP-3P**	**BW800RAP-3P**

- Earth leakage circuit breaker

Frame (A)	125	250	400	630	800
Basic type		**EW250EAP-3P**	**EW400EAP-3P**	**EW630EAP-3P**	**EW800EAP-3P** ①
	EW125JAP-3P	**EW250JAP-3P**			
			EW400SAP-3P		
	EW125RAP-3P	**EW250RAP-3P**	**EW400RAP-3P**	**EW630RAP-3P**	**EW800RAP-3P** ①

(Note 1) Not applicable to a rated current 100VAC.

- Breaker with ZCT

Frame (A)	125	250	400	630	800
Basic type	**BW125JAU-3P**	**BW250JAU-3P**			
			BW400SAU-3P		
	BW125RAU-3P	**BW250RAU-3P**	**BW400RAU-3P**	**BW630RAU-3P**	**BW800RAU-3P**

- Sensor box/measurement display unit

Frame (A)	125	250	400	630	800
Sensor box	**BW9PSCA**	**BW9PSGA**	**BW9PSHA**	**BW9PSJA**	**BW9PSKA**
Measurement display unit	**BW9PL0A** (125 to 800A, common among frames)				

■Type number nomenclature

EW400EAP-3P 400 B X W K FAC/DC24-48V Q1 A L

(1) (2) (3) (4) (5) (6) (7) (8) (9)(10)

(Note) See the table for combinations of mountable internal accessories.

(1) Basic type

125AF	250AF	400AF	630AF	800AF
Auto-breaker				
	BW250EAP-3P	**BW400EAP-3P**	**BW630EAP-3P**	**BW800EAP-3P**
BW125JAP-3P	**BW250JAP-3P**			
		BW400SAP-3P		
BW125RAP-3P	**BW250RAP-3P**	**BW400RAP-3P**	**BW630RAP-3P**	**BW800RAP-3P**
Earth leakage circuit breaker				
	EW250EAP-3P	**EW400EAP-3P**	**EW630EAP-3P**	**EW800EAP-3P**
EW125JAP-3P	**EW250JAP-3P**			
		EW400SAP-3P		
EW125RAP-3P	**EW250RAP-3P**	**EW400RAP-3P**	**EW630RAP-3P**	**EW800RAP-3P**
Breaker with ZCT				
BW125JAU-3P	**BW250JAU-3P**			
		BW400SAU-3P		
BW125RAU-3P	**BW250RAU-3P**	**BW400RAU-3P**	**BW630RAU-3P**	**BW800RAU-3P**

(2) Rated current (A)

125AF	250AF	400AF	630AF	800AF
40	**125**	**250**	**500**	**700**
50	**150**	**300**	**600**	**800**
60	**160**	**350**	**630**	
75	**175**	**400**		
100	**200**			
125	**225**			
	250			

(3) Rated sensitive current/maximum operating time

Code	Rated sensitive current	Maximum operating time
B	30mA	0.1s
K	100/200/500/1000mA switch	0.1/0.4/1/2s switch

(Note) This specification is only for an earth leakage circuit breaker.

(4) Mounting connection method

Code	Name
None	Front mounting type
X	Rear mounting type
E	Flush mounting type

(Note) A plug-in mounting and draw-out type cannot be specified.

(5) Auxiliary switch

Code			
W	Standard	Lead-wire system	1
V			2
1	Low level circuit, and others		1
2			2

(6) Alarm switch

Code			
K	Standard	Lead-wire system	1
J			2
8	Low level circuit, and others		1
9			2

• Option arrangement type

	Length	Type
Measurement display unit extension cable	1 m	BP71
	3 m	BP73
	5 m	BP75

(Note) This is necessary when the display unit is mounted separately.

• Single-unit arrangement type

Product name	Frame size	Type	Accessory
Sensor box	125AF	BW9PSCA	Insulation terminal cover, insulation terminal cover mounting screw
	250AF	BW9PSGA	
	400AF	BW9PSHA	
	630AF	BW9PSJA	
	800AF	BW9PSKA	
Measurement display unit	Common	BW9PL0A	Standard cable, metal fitting, metal fitting mounting screw

• Order type if this system is to be added to an existing breaker or used without any breaker.

(7) Shunt trip device (Internal) Code: F ☐ (specify the following voltages in ☐)

Code = Voltage rating	
125/250AF	400/630/800AF
AC/DC24V	**AC/DC24-48V**
AC/DC48V	**–**
AC100-120V/DC100-110V	**AC100-240V/DC100-220V**
AC120-130V	**–**
AC200-240V/DC200-220V	**–**
AC277V	**AC277V**
AC380-440V	**AC380-550V**
AC440-480V	**–**
AC500-550V	**–**

(7) Undervoltage trip device (Internal) Symbol: R ☐ (specify the following voltages in ☐)

Code = Voltage rating	
125/250AF	400/630/800AF
DC24V	**AC/DC24V**
DC48V	**AC/DC48V**
DC100-110V	**–**
DC125V	**–**
AC100-110V	**AC100-110V**
AC110-130V	**AC120-130V/DC125V**
AC200-240V	**AC200-240V/DC200-220V**
AC277V	**AC277V**
AC380-440V	**AC380-480V**
AC440-480V	**–**

(7) Shunt trip device (External) Code: F ☐ (specify the following voltages in ☐)

Code = Voltage rating
125/250AF
DC24V
DC48V
DC100-110V
AC100V (50Hz) /AC100-110V (60Hz)
AC110-130V
AC220-240V
AC380-440V

(Note) Models with terminal blocks are standard. No lead wire system can be ordered.

(7) Undervoltage trip device (External) Code: R ☐ (specify the following voltages in ☐)

Code = Voltage rating
125/250AF
DC24V
DC48V
DC100-110V
AC100V (50Hz) /AC100-110V (60Hz)
AC110-130V
AC200-240V
AC380-440V

(Note) Models with terminal blocks are standard. No lead wire system can be ordered.

(8) Handle key lock

Code	Name	
Q1	Cap type	400AF or more

(Note) Plate type (Q2) and 125AF/250AF cap types can be supported with optional products.

(9) Accessory terminal block

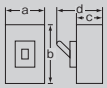
Code
A

(10) Internal accessories (only for earth leakage circuit breaker)

Code	
T	Trip lead
L	Leak current operation output switch

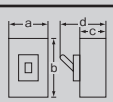
■ Specifications

• Auto-breaker

Frame (AF)				125		250			400			630		800	
Basic type (= product code)				BW125JAP	BW125RAP	BW250EAP	BW250JAP	BW250RAP	BW400EAP	BW400SAP	BW400RAP	BW630EAP	BW630RAP	BW800EAP	BW800RAP
Number of poles and elements				3P3E		3P3E			3P3E			3P3E		3P3E	
Rated insulation voltage Ui [V]			AC	690											
Rated impulse withstand voltage Uimp [kV]				6		6			8			8		8	
Rated current In [A] Reference ambient temperature: 40°C				40,50,60,75,100,125		125,150,160,175,200,225,250			250,300,350,400			500,600,630		700,800	
Rated frequency [Hz]				50-60											
Rated breaking capacity [kA]	JISC8201-2-1 [Icu/Ics]	AC	690V	–	–	–	–	–	–	10/5	15/8	–	15/8	–	15/8
			500V	8/4	10/5	5/3	8/4	10/5	18/9	20/10	36/18	20/10	36/18	20/10	36/18
			440/415/400/380/V	30/15	50/25	18/9	30/15	50/25	30/15	36/18	50/25	36/18	50/25	36/18	50/25
			240/230V	50/25	100/50	36/18	50/25	100/50	50/25	85/43	100/50	50/25	100/50	50/25	100/50
DC application				Not possible (3)											
Isolation compliant				Compliant											
Reverse connection				Not possible											
Utilization category				Cat.A											
Dimensions [mm] 			a	90		105			140			210		210	
			b	260		265			357			375		375	
			c	68		68			103			103		103	
			d	95		95			146			146		146	
Front mounting type product mass [kg]				2		2.5			7.2			11		11.7	
Connection method	Front mounting type			○ (screw terminals)		○ (screw terminals)			○ (flat terminals)			○ (flat terminals)		○ (flat terminals)	
	Rear mounting type		X	○		○			○			○		○	
	Flush mounting type		E	○		○			○			○		○	
Option accessory included	Auxiliary switch		W	○		○			○			○		○	
	Alarm switch		K	○		○			○			○		○	
	Shunt trip device		F	○		○			○			○		○	
	Undervoltage trip device		R	○		○			○			○		○	
	Lead terminal block		A	○		○			○			○		○	
	Handle key lock device (Cap type)		Q1	– (1)		– (1)			○			○		○	
Optional parts	Auxiliary switch		W	○		○			○			○		○	
	Alarm switch		K	○		○			○			○		○	
	Shunt trip device		F	○		○			○			○		○	
	Undervoltage trip device		R	○		○			○			○		○	
	External operating handle	Panel mounting	V	○		○			○			○		○	
		Mounting method	N	○		○			○			○		○	
	Terminal cover (4)	Short	TS	○ BW9BUCA-S3		○ BW9BUGA-S3			–			–		–	
		Long	TL	○ BW9BUCA-L3		○ BW9BUGA-L3			○ BW9BUHA-L3			○ BW9BUJA-L3		○ BW9BUJA-L3	
	Insulation barrier	Interphase barrier	B	○		○			○			○		○	
	Handle key lock	Cap type	Q1	○		○			–			–		–	
		Scissors type	QN	–		–			○			○		○	
		Plate type	Q2	○		○			○			○		○	
	Handle locking cover		L1	○		○			○			○		○	
	Flat terminal		S	–		○			–			–		–	
	Mechanical interlocking device	Front mounting	M1	○		○			○			○		○	
		Flush mounting	M2	○		○			○			○		○	
		Panel mounting	M3	○		○			○			○		○	
Certified standard	Certified standard			Specified Electrical Appliance and Material (2)		Not applicable									
	JISC8201-2-1			Self-declaration											
	IEC60947-2			–											
	EN60947-2 (CE marking)			–											
	GB14048.2 (CCC certified)			–											
Overcurrent tripping method				Thermal-magnetic											
Trip button				Provided											

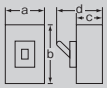
(1) Please order the optional product (handle locking cover: BW9Q1CA).
(2) Not applicable to a rated current of 125A.
(3) Cannot be used for a DC circuit with PSU.
(4) The terminal cover is a type in the table (dedicated).

• Earth leakage circuit breaker

Frame (AF)				125		250			400			630		800	
Basic type (= product code)				EW125JAP	EW125RAP	EW250EAP	EW250JAP	EW250RAP	EW400EAP	EW400SAP	EW400RAP	EW630EAP	EW630RAP	EW800EAP	EW800RAP
Phase and wire system				3φ3W,1φ3W,1φ2W		3φ3W,1φ3W,1φ2W			3φ3W,1φ3W,1φ2W			3φ3W,1φ3W,1φ2W		3φ3W,1φ3W,1φ2W	
Number of poles and elements				3P3E		3P3E			3P3E			3P3E		3P3E	
Rated operational voltage AC [V]				Applicable to 100, 230, and 440		Applicable to 100, 230, and 440			Applicable to 100, 230, and 440			Applicable to 100, 230, and 440		Applicable to 200 and 440 (3)	
Rated impulse withstand voltage Uimp [kV]				6		6			6			6		6	
Rated current In [A] Reference ambient temperature: 40°C				40,50,60,75,100,125		125,150,160,175,200,225,250			250,300,350,400			500,600,630		700,800	
Rated frequency [Hz]				50-60											
High-speed type	Rated sensitive current (IΔn) [mA]			30											
	Operating time [sec]			0.1 or less											
High-speed/time delay trip type	Rated sensitive current (IΔn) [mA]			100/200/500/1000 switch											
	Maximum operating time [sec]			0.1/0.4/1/2 switch											
	Inertia non-operating time (Δt) [sec] (at 2IΔn)			0/0.2/0.5/1											
Rated breaking capacity [kA]	JISC8201-2-2 [Icu/Ics]	AC	440/415/400/380/V	30/15	50/25	18/9	30/15	50/25	30/15	36/18	50/25	36/18	50/25	36/18	50/25
			240/230/100V	50/25	100/50	36/18	50/25	100/50	50/25	85/43	100/50	50/25	100/50	50/25	100/50
Isolation compliant				Compliant											
Reverse connection				Not possible											
Utilization category				Cat.A											
Dimensions [mm] 			a	90		105			140			210		210	
			b	260		265			357			375		375	
			c	68		68			103			103		103	
			d	95		95			146			146		146	
Front mounting type product mass [kg]				2.1		2.7			7.8			12.3		13	
Connection method	Front mounting type			○ (screw terminals)		○ (screw terminals)			○ (flat terminals)			○ (flat terminals)		○ (flat terminals)	
	Rear mounting type		X	○		○			○			○		○	
	Flush mounting type		E	○		○			○			○		○	
Option accessory included	Auxiliary switch		W	○		○			○			○		○	
	Alarm switch		K	○		○			○			○		○	
	Shunt trip device		F	○		○			○			○		○	
	Undervoltage trip device		R	○		○			○			○		○	
	Lead terminal block		A	○		○			○			○		○	
	Handle key lock device (Cap type)		Q1	– (1)		– (1)			○			○		○	
Optional parts	Auxiliary switch		W	○		○			○			○		○	
	Alarm switch		K	○		○			○			○		○	
	Shunt trip device		F	○		○			○			○		○	
	Undervoltage trip device		R	○		○			○			○		○	
	External operating handle	Panel mounting	V	○		○			○			○		○	
		Mounting method	N	○		○			○			○		○	
	Terminal cover (4)	Short	TS	○ BW9BUCA-S3		○ BW9BUGA-S3			–			–		–	
		Long	TB	○ BW9BUCA-L3		○ BW9BUGA-L3			○ BW9BUHA-L3			○ BW9BUJA-L3		○ BW9BUJA-L3	
	Insulation barrier	Interphase barrier	B	○		○			○			○		○	
	Handle key lock	Cap type	Q1	○		○			–			–		–	
		Scissors type	QN	–		–			○			○		○	
		Plate type	Q2	○		○			○			○		○	
	Handle locking cover		L1	○		○			○			○		○	
	Flat terminal		S	○		○			–			–		–	
	Mechanical interlocking device	Front mounting	M1	○		○			○			○		○	
		Flush mounting	M2	○		○			○			○		○	
		Panel mounting	M3	○		○			○			○		○	
Certified standard	Certified standard			Specified Electrical Appliance and Material (2) PS E		Not applicable									
	JISC8201-2-2			Self-declaration											
	IEC60947-2			–											
	EN60947-2 (CE marking)			–											
	GB14048.2 (CCC certified)			–											
Overcurrent tripping method				Thermal-magnetic											
Trip button				Provided											
Megger test switch				Provided											
Leak current display method				Mechanical button											

(1) Please order the optional product (handle locking cover: BW9Q1CA).
(2) Not applicable to a rated current of 125A.
(3) If you need to apply 100VAC to a circuit, please contact us.
(4) The terminal cover is a type in the table (dedicated).

• Breaker with ZCT (FePSU)

Frame (AF)				125		250		400		630	800
Basic type (= product code)				BW125JAU	BW125RAU	BW250JAU	BW250RAU	BW400RAU	BW630RAU		
Number of poles and elements				3P3E		3P3E		3P3E		3P3E	3P3E
Rated insulation voltage Ui [V]			AC	690							
Rated impulse withstand voltage Uimp [kV]				6		6		6		6	6
Rated current In [A] Reference ambient temperature: 40°C				40,50,60,75,100,125		125,150,160,175,200,225,250		250,300,350,400		500,600,630	700,800
Rated frequency [Hz]				50-60							
Rated breaking capacity (kA)	JISC8201-2-2 [Icu/Ics]	AC	440/415/400/380/V	30/15	50/25	30/15	50/25	36/18	50/25	50/25	50/25
			240/230V	50/25	100/50	50/25	100/50	85/43	100/50	100/50	100/50
DC application				Not possible							
Isolation compliant				Compliant							
Reverse connection				Not possible							
Utilization category				Cat.A							
Dimensions [mm] 			a	90		105		140		210	210
			b	260		265		357		375	375
			c	68		68		103		103	103
			d	95		95		146		146	146
Front mounting type product mass [kg]				2.3		2.8		8.1		12.6	13.2
Connection method	Front mounting type			○ (screw terminals)		○ (screw terminals)		○ (flat terminals)		○ (flat terminals)	○ (flat terminals)
	Rear mounting type		X	○		○		○		○	○
	Flush mounting type		E	○		○		○		○	○
Option accessory included	Auxiliary switch		W	○		○		○		○	○
	Alarm switch		K	○		○		○		○	○
	Shunt trip device		F	○		○		○		○	○
	Undervoltage trip device		R	○		○		○		○	○
	Lead terminal block		A	○		○		○		○	○
	Handle key lock device (Cap type)		Q1	– (1)		– (1)		○		○	○
Optional parts	Auxiliary switch		W	○		○		○		○	○
	Alarm switch		K	○		○		○		○	○
	Shunt trip device		F	○		○		○		○	○
	Undervoltage trip device		R	○		○		○		○	○
	External operating handle	Panel mounting	V	○		○		○		○	○
		Mounting method	N	○		○		○		○	○
	Terminal cover (3)	Short	TS	○ BW9BUCA-S3		○ BW9BUGA-S3		–		–	–
		Long	TB	○ BW9BUCA-L3		○ BW9BUGA-L3		○ BW9BUHA-L3		○ BW9BUJA-L3	○ BW9BUJA-L3
	Insulation barrier	Interphase barrier	B	○		○		○		○	○
	Handle key lock	Cap type	Q1	○		○		–		–	–
		Scissors type	QN	–		–		○		○	○
		Plate type	Q2	○		○		○		○	○
	Handle locking cover		L1	○		○		○		○	○
	Flat terminal		S	○		○		–		–	–
	Mechanical interlocking device	Front mounting	M1	○		○		○		○	○
		Flush mounting	M2	○		○		○		○	○
		Panel mounting	M3	○		○		○		○	○
Certified standard	Certified standard			Specified Electrical Appliance and Material (2) 		Not applicable					
	JISC8201-2-2			Self-declaration							
	IEC60947-2			–							
	EN60947-2 (CE marking)			–							
	GB14048.2 (CCC certified)			–							
Overcurrent tripping method				Thermal-magnetic							
Trip button				Provided							

(1) Please order the optional product (handle locking cover: BW9Q1CA).
(2) Not applicable to a rated current of 125A.
(3) The terminal cover is a type in the table (dedicated).

■ Common Specifications

• Control power

Item		Specifications
Control power	Voltage range	100–240V AC/DC (85 to 264V)
	Inrush current	2A or less, about 10ms
	Power consumption	3.5VA max

• Output

Item	Specifications
Output	2 transistor open-collector outputs
Output specification	35VDC, 100mA or less (residual voltage when ON is 2.5V or less)

• Wh pulse output

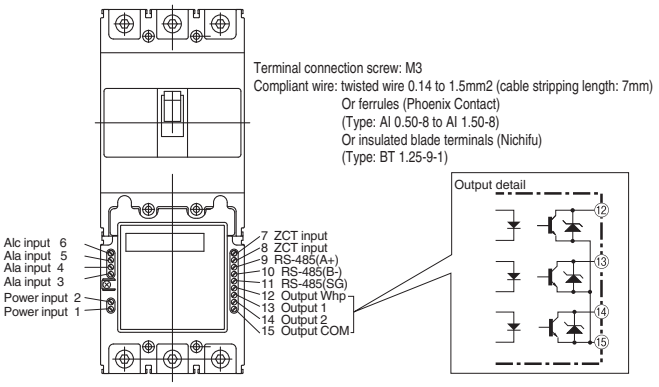
Hardware specifications	Output pulse width	Output cycle	Pulse constant
Transistor open-collector output 35VDC, 100mA or less (residual voltage when ON is 2.5V or less)	100ms ± 20ms	Min 200ms or more	0.01, 0.1, 1kWh/ pulse

• Communication specifications

Item	Specifications	
Standard	EIA RS-485	
Transmission	Half duplex (2-wire)	
Data exchange	1:N (this unit) polling/selecting	
Transmission distance	1,000m (total length)	
Number of connected stations	Max. 31/line	
Station address	1 to 99 (set)	
Transmission character	ASCII code	
Transmission speed	4,800/9,600/19,200 bps (selection)	
Data format	Start bit	1 bit (fixed)
	Data length	7/8 bits (selection)
	Parity bit	None/even/odd (selection)
	Stop bit	1 bit (fixed)
	BCC	Even horizontal parity

• Terminal number

Terminal number	Name	Application
1	Control power input 1	Connected with the power supply for operating FePSU. (Power supply range: 85 to 264V AC/DC common) (Power consumption: 3.5VA max. Inrush current: 2A or less, about 10ms)
2	Control power input 2	
3	Axa input	Connected to use a W signal (auxiliary SW) line of the combined breaker/earth leakage circuit breaker. This is an NO contact input.
4	Axc input	
5	Ala input	Connected to use a K signal (alarm SW) line of the combined breaker/earth leakage circuit breaker. This is an NO contact input.
6	Alc input	
7	ZCT input	Connected with (Z1) and (Z2) terminals respectively when combined with a breaker with ZCT.
8	ZCT input	
9	RS485 (A+)	Connected to communicate with a host device or other devices.
10	RS485 (B-)	
11	RS485 (SG)	
12	Output Whp	Connected to use the energy output pulses.
13	Output 1	Used for the application assigned to the Alarm output 1.
14	Output 2	Used for the application assigned to the Alarm output 2.
15	Output COM	Common terminal for outputs 12 to 14



• Measurement/function specifications

Measurement/ Function item Accuracy	Measuring contents	Display	Communication	History	Effective measurement range (Max. number of display digits)	Remarks
Load current ±1.5%FS (100% or less)	Present value of each phase	○	○		0.33% to 200%·Ie (4 digits)	FS = Ie (Frame rated current) Flicker 200% of value when it is over 200% Accuracy in the range of 100 to 200% is ±1.5%
	Demand present value of each phase	○	○			
	Max. demand value/occurrence time of each phase	○	○	○		
Line voltage ±1.5%FS	Present value (WU is ±2.5%) of each line	○	○		60 to 484 (4 digits)	FS = 440V Flicker 484 when it is over 484V
	Demand present value of each line	○	○			
	Max. demand value/occurrence time of each line	○	○			
Active power ±1.5%FS	Present value (negative value is also measured)	○	○		Measurement range of current/ voltage (4 digits)	FS = Ie x 440V x √3 Negative "-" sign
	Demand value (Also negative value is measured)	○	○			
	Max. demand value/occurrence time (No negative value is measured)	○	○	○		
Active electric energy ±2%	Cumulative value (no negative value is measured)	○	○	○	Measurement range of current/ voltage (6 digits)	Accuracy is guaranteed within the range of 3.3 to 100% x Ie and power factor 1 to ±1.5
Harmonics current ±2.5%FS	3rd, 5th, 7th to 19th and total present value of each phase	○	○		1% to 200%·Ie (4 digits)	Ie = Frame rated current Fundamental wave content is not included in the total harmonics.
	Total demand present value of each phase	○	○			
	Total max. demand value/occurrence time of each phase	○	○			
Power factor ±5%	Present value	○	○		Delay 0 to 1 to Lead 0 (4 digits)	Accuracy is 90° phase-angle conversion
Leakage current (Io) ±2.5%FS	Present value	○	○		10 to 1,000mA (4 digits)	Only FAB with ZCT can be measured. FS = 1,000mA (Io = Total leakage current including harmonics)
	Demand value	○	○			
	Max. demand value/occurrence time	○	○	○		
Leakage current (Io b) ±2.5%FS	Present value	○	○		10 to 1,000mA (4 digits)	Only FAB with ZCT can be measured. FS = 1,000mA (Iob = Fundamental wave leakage current)
	Demand value	○	○			
	Max. demand value/occurrence time	○	○	○		
Reactive power ±3%FS	Present value		○		Measurement range of current/ voltage	FS = Ie x 440V x √3 Lead "-" sign
Reactive electric energy ±3%	Cumulative value (additions of each lead (-)/delay (+))		○		Measurement range of current/ voltage	
Current prealarm ±5%	Can be set within the range of 20 to 120% of In in 5% steps Flicker "CP****" when detected	○	○	○	• "*****" flicker display is a maximum measurement value. • The latest item is displayed on the display unit when more than one alarm occurs. • Up to 10 alarm histories and trip histories can be recorded. If they exceed 10, they are cleared in order from oldest to newest automatically. The occurrence time is also displayed if the clock is set.	
Power alarm ±5%	Can be set with 1 to 99kw: 1 step, 100 to 199kW: 5 steps, 200 to 610kW: 10 steps Flicker "PA****" when detected	○	○	○		
Leakage current prealarm (1) ±5%	Can be set within the range of 50 to 500mA in 50mA steps Flicker "EP*****" when detected	○	○	○		
Leakage current alarm (1) ±5%	100, 200, 500mA can be set (the operating value is 75% of the setting value) Flicker "EA****" when detected	○	○	○		
Neutral line phase-loss alarm 130V ±5V, 1 second or less	Flicker "P2" when detected (Phase loss at the power supply side on this unit can be detected. Phase loss at the load side cannot be detected.)	○	○	○		
Overcurrent trip	Display "OC****" when tripped at about 2·In or less	○	○	○		
	Display "OC.AL" when tripped at about 2·In to 6·In	○	○	○		
	Display "OC.H" when tripped at about 6·In or more	○	○	○		
Leak current trip	Display "EL" (this works when an EAL contact signal is input to FePSU.)	○	○	○		
Clock function ±3 minutes/month	yy year, mm month, dd date, hh hour, mm minute	○	○	○	• If the control power is turned off, the clock is reset. If necessary, set the clock again. (The measurements in the above table can be performed without setting the clock.) • A communication function can be used to update the time from host device via broadcast communication.	

(Note 1) Only a breaker with ZCT is supported

F-MPC Analog Input Unit

Allows energy monitoring by inputting analog signals from devices such as pressure-flowmeters and thermohygrometers.

■ Features

- Provides an analog input/communication output conversion unit for a power monitoring system F-MPC.
- Supports various analog inputs: 4 to 20 mADC, 1 to 5 VDC, 0 to 10 VDC, etc.
  Supports F-MPC-Net and Modbus as communication outputs.
- Supports two circuits of analog input. However, the two circuits must have the same signal specifications.
- All types of products conform to the RoHS Directive.

■ Specifications

Type		WS3MF
Insulation		Photocoupler type
Reference accuracy		±0.2%
Temperature characteristic		0.2% (% with reference to span)
Input circuit	No. of circuits	2
	Input signal	See codes shown on the right
	Input resistance	Voltage input: approx. 1 MΩ Current input: approx. 100 Ω
Auxiliary power supply	Power supply range and consumption VA	80 to 264 VAC (110 VAC: 3.5 VA, 220 VAC: 5.0 VA) 80 to 264 VDC (110 V/220 VDC: 3.0 W)
	Inrush current (time constant)	Rated voltage 110 VAC 1.7 A or less (approx. 1.0 ms) Rated voltage 220 VAC 3.3 A or less (approx. 1.0 ms) Rated voltage 110 VDC 1.2 A or less (approx. 1.0 ms) Rated voltage 220 VDC 2.4 A or less (approx. 1.0 ms)
Communication output	Standard	EIA RS-485
	Transmission system	Half-duplex 2-wire system
	Synchronization system	Start-stop system
	Protocol	F-MPC-Net or Modbus
	Transmission rate	Transmission code
	Start bit	1 bit
	Data length	F-MPC-Net: 7 bits, Modbus: 8 bits
	Parity	Odd
	BCC (CRC)	F-MPC-Net: even horizontal parity Modbus: CRC-16
	Stop bit	1 bit
	Address	1 to 99 (changeable with switch setting)
	Transmission character	ASCII codes
	Transmission distance	1000 m (total extension)
	No. of units connected	64 max./system (including other devices)
	Termination resistor	Termination resistor (100 Ω) is connected to the transmission path by short-circuiting DXB terminal and Ter. terminal
Insulation resistance		50 MΩ or higher (500 VDC)
Dielectric strength Input, output, power supply, to ground Between inputs		2000 VAC for 1 min
Range of working temperatures and humidity		-10 to +55°C, 90% RH max. (no condensation)
Storage temperature		-20 to +70°C
Weight		Approx. 180 g (socket WS212 type supplied)

■ Type number nomenclature

WS3MF-□□Y□Y□Y1

Input signal

23	DC0 to 50 mV
33	DC0 to 60 mV
11	DC0 to 100 mV
12	DC0 to 1 V
13	DC0 to 5 V
14	DC0 to 10 V
15	DC1 to 5 V
50	DC ± 50 mV
51	DC ± 60 mV
52	DC ± 100 mV
53	DC ± 1 V
42	DC ± 5 V
24	DC ± 10 V
27	DC0 to 1 mA
54	DC0 to 5 mA
55	DC0 to 10 mA
56	DC0 to 16 mA
16	DC4 to 20 mA
57	DC ± 1 mA
58	DC ± 5 mA
59	DC ± 10 mA

Design order

Auxiliary power supply

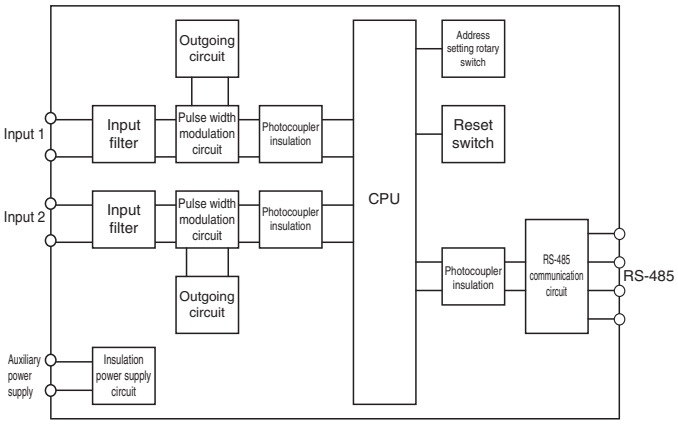
0	AC · DC80 to 264V

Output signal

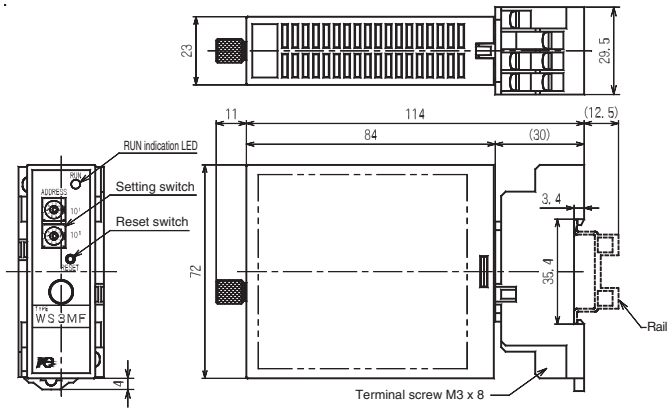
F	F-MPC-Net communication output (RS-485)
M	Modbus communication output (RS-485)

(Note) Socket (WS212) supplied as standard equipment

■ Block Diagram

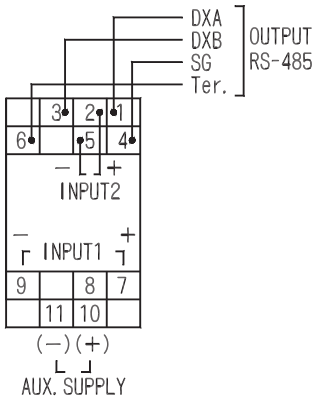


■ Dimensions [Unit: mm]



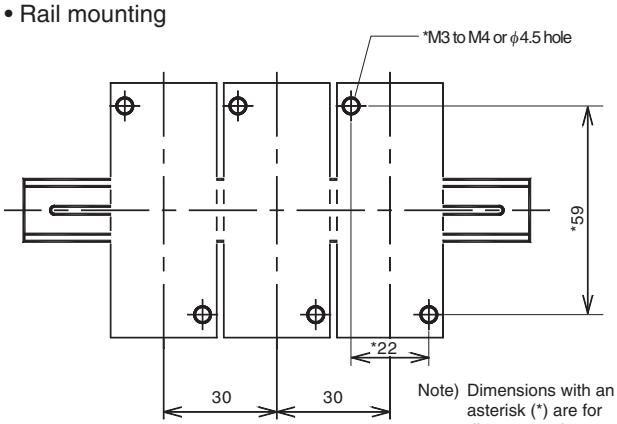
■ External Connection Diagram

Socket (WS212)



■ Mounting Dimensions [Unit: mm]

• Rail mounting



Note) Dimensions with an asterisk (*) are for direct mounting.

■ Other Specifications

• Electric and mechanical strength

Item	Specification
Overload capacity	Current input circuit: 10 times the rated current for 5 sec, 1.2 times continuously Voltage input circuit: twice the rated current for 10 sec, 1.2 times continuously Auxiliary power supply circuit: 1.5 times 220 VAC for 10 sec, 264 VAC continuously
Noise immunity	Damping oscillation wave: 1 to 1.5 MHz with peak voltage 2 kV Square wave: square wave noise of 100 nsec x 1 μsec 1 kV Radio wave noise: 10 V/m Static electricity: air discharge ±8 kV, contact discharge ±4 kV
Vibration	10 to 55 Hz: half amplitude 0.15 mm
Shock	Three times in the X, Y and Z directions each with shock of 294 m/s2

• Other functions

Item	Specification
Indication: RUN	When power is supplied, the LED (green) is illuminated during normal operation. When a communication abnormality, etc. is generated, the LED starts blinking according to the condition.
Address	01 to 99 (changeable by rotary code switch setting) The factory setting is 00 (communication function locked).

Molded case circuit breakers with ZCT

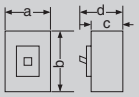
■ Description

A leakage current monitoring and breaking system can be easily constructed by combining one of the following models with a UM04 integrated power monitoring unit or a UM03-ARA3G single-circuit power monitoring unit with leakage current measurement.

MCCB with ZCT

ZCT

■ Specifications, MCCB with ZCT for line protection

Frame (AF)			125		250		400		630	800
Type			**BW125JAZ**	**BW125RAZ**	**BW250JAZ**	**BW250RAZ**	**BW400JAZ**	**BW400RAZ**	**BW630RAZ**	**BW800RAZ**
Number of poles and number of elements			3P3E		3P3E		3P3E		3P3E	3P3E
Rated insulation voltage Ui [V]		AC	690		690		690		690	690
Rated impulse withstand voltage Uimp [kV]			6		6		6		6	6
Rated current In [A] Reference ambient temperature: 40˚C			15,20,30,40,50,60,75,100,125		125,150,160,175,200,225,250		250,300,350,400		500,600,630	700,800
Rated frequency [Hz]			50-60							
Rated breaking capacity[kA]		AC 440/415/400/380V	30	50	30	50	36	50	50	50
JISC8201-2-1 Ann2[Icu]		AC 240/230V	50	100	50	100	85	100	100	100
Isolation complaint			Compliant							
Reverse connection			Possible							
Utilization category			Cat.A							
Dimensions [mm]		a	115		130		178		248	248
		b	155		165		257		275	275
		c	68		68		103		103	103
		d	95		95		146		146	146
Mass			1.5		2		6.2		9.5	10
Connection method	Front		(screw terminals)		(screw terminals)		(flat terminals)		(flat terminals)	(flat terminals)
Standard Internal accessories *1	Auxiliary switch	W	●		●		●		●	●
	Alarm switch	K	●		●		●		●	●
	Trip device	F	●*3		●*3		●*3		●*3	●*3
	Test terminal	T_1, T_2	●		●		●		●	●
	ZCT output	Z_1, Z_2	●		●		●		●	●
Certified standards	Certified standards		Specified Electrical Appliance and Material *2 (PS E)		Not applicable.					
	JISC8201-2-1		Self declaration							
	IEC60947-2		—							
	EN60947-2 (CE marking)		—							
Overcurrent tripping method			Thermal-magnetic							
Trip button			Provided							

●: Available

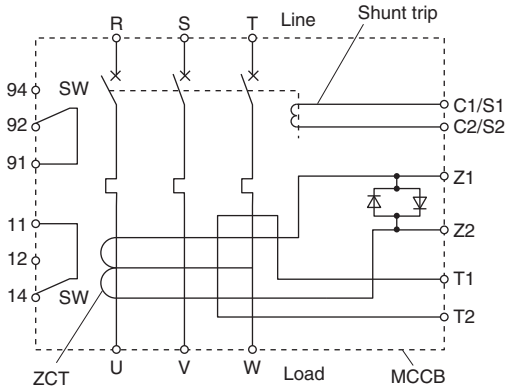
*1 The auxiliary switch, alarm switch, and tripping device are provided as accessories. Only models with terminal blocks are available. Lead wires are not provided.

*2 Not applicable for a rated current of 125A.

*3 Specify 100 to 120V AC/100 to 110V DC or 200 to 240V AC/200 to 220V DC for the voltage rating.

*4 The voltage rating is 100 to 240V AC/100 to 220V DC for all models.

■ Internal wiring



*S1, S2 : Shunt trip coil input terminal
*Z1, Z2 : ZCT output terminal
*T1, T2 : ZCT trip test current input terminal

■ EW series zero-phase current transformers (low-voltage circuit use)

Description	Type	Rated current (A)	Sensor hole diameter (mm)	Hole-through cable			Mass (kg)
				1ø2W	1ø3W, 3ø3W	3ø4W	
Round hole through-type	EW-ZB-30M05	50	30	IV 14mm²	IV 8mm²	IV 8mm²	0.22
	EW-ZB-30M1	100	30	IV 60mm²	IV 50mm²	IV 38mm²	0.32
	EW-ZB-58M2	200	58	IV 125mm²	IV 100mm²	IV 80mm²	0.6
	EW-Z70A4	400	70	IV 400mm²	IV 325mm²	IV 250mm²	1.1
	EW-Z70A6	600	70	IV 400mm²	IV 325mm²	IV 250mm²	1.1
	EW-Z90	800	90	IV 500mm²	IV 500mm²	IV 500mm²	3.1
	EW-Z115	1200	115	–	–	–	4.8
	EW-Z160	2000	160	–	–	–	10
	EW-Z250	3000	250	–	–	–	28.5
Split through-type	EW-ZD30	100	30	IV 60mm²	V 50mm²	IV 38mm²	0.55
	EW-ZD45	200	45	IV 125mm²	V 100mm²	IV 80mm²	0.89
	EW-ZD65	400	65	IV 325mm²	V 250mm²	IV 200mm²	1.15

Description	Type	Rated current (A)	Sensor hole diameter (mm)	Hole-through conductor		Mass (kg)
				3ø3W	3ø4W	
With conductors, 3-pole	EW-Z3B40	400	70	5×40mm	–	2.8
	EW-Z3B50	500	70	6×40mm	–	3.1
	EW-Z3B60	600	90	6×50mm	–	7.6
	EW-Z3B80	800	90	8×50mm	–	8.8
	EW-Z3B100	1000	90	12×50mm	–	11.5
	EW-Z3B120	1200	115	10×75mm	–	15.2
	EW-Z3B160	1600	160	12×100mm	–	30.5
	EW-Z3B200	2000	160	6×100mm×2	–	30.5
	EW-Z3B300	3000	250	8×150mm×2	–	68.6
With conductors, 4-pole	EW-Z4B40	400	90	–	5×40mm	6.4
	EW-Z4B50	500	90	–	6×40mm	6.9
	EW-Z4B60	600	90	–	6×50mm	11.5
	EW-Z4B80	800	90	–	8×50mm	14.1
	EW-Z4B100	1000	115	–	12×50mm	15.5
	EW-Z4B120	1200	115	–	10×75mm	24.9
	EW-Z4B160	1600	160	–	12×100mm	36.4
	EW-Z4B200	2000	160	–	6×100mm×2	36.4
	EW-Z4B300	3000	250	–	8×150mm×2	80.3

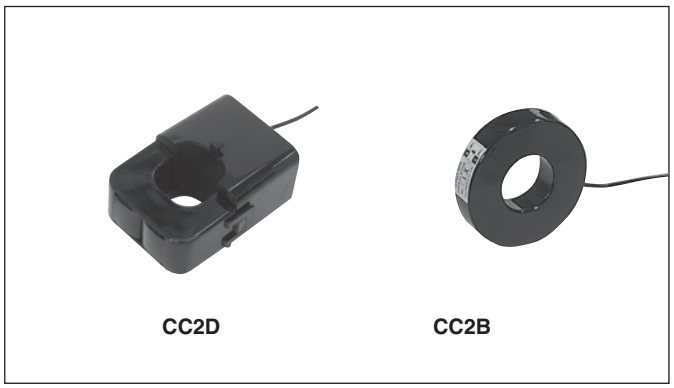
Note : Twist the ZCT secondary wires (normally once every 50mm) and separate the wires from power line.

Current transformers, CC2

■ Description

Designed for even easier handling. Line-up consists of two types; models exclusively used for FUJI power monitoring unit (F-MPC 04 series), and models for general-purpose instrumentation.

- Improved design enables easier mounting.
- Large K→ L display allows easier identification of primary conductor direction.
- Hook attached makes it easier to secure the primary conductor with a cable-tie.



CC2D CC2B

■ Specifications

- CTs are dedicated CTs. Genaral-purpose CTs (secondary rated current 5A or 1A) cannot directly be connected bacause there is a risk of damage.

CT for F-MPC04P (type number UM02), and F-MPC04S (type number UM03)

Model	Compact split		Square split		Toroidal	
Type	CC2D81-0057	CC2D81-0506	CC2D65-2008	CC2D54-4009	CC2B65-2008	CC2B54-4009
Dimesions	Fig.1	Fig.1	Fig.2	Fig.3	Fig.4	Fig.5
Rated primary current	5A	50A	200A	400A	200A	400A
Linear output limit	Depends on the measurement range of the main unit.					
Rated secondary current	7.34mA	73.4mA	66.67mA	133.33mA	66.67mA	133.33mA
Through hole diameter	ø10		ø24	ø36	ø24	ø36
Rated frequency	50 to 60Hz		50 to 60Hz			
Overcurrent strength	10In continuous	1.0In continuous	1.0In continuous			
Ratio error	1%/In 1.5%/0.2In					
Phase difference	150'90'/In, 180'120'/0.2In		60'/In, 90'/0.2In			
Rated burden	0.2693mVA (5Ω load resistance)		44.4mVA (10Ω load resistance)	0.18VA (10Ω load resistance)	44.4mVA (load resistance of 10Ω or less)	177.8mVA (load resistance of 10Ω or less)
Insulation resistance	500VDC/100MΩ or more (between sensor core and output lead wire)				500VDC/100MW or more (between through hole and output lead wire)	500VDC/100MW or more (between through hole and output terminal)
Dielectric strength	2000VAC/min (between sensor core and output lead wire)				2,500VAC/min (between through hole and output lead wire)	2,500VAC/min (between through hole and output terminal)
Output protection	—		3Vp built-in clamp diode	3Vp built-in clamp diode	—	
Operating conditions	–20 to 75C, 80%RH or lower (No condensation)		–20 to 75C, 80%RH or lower (No condensation)			
Split portion securing method	Clamp		Clamp		—	
Mounting method	Hanger		Hanger			
Connection	Heat-resistant IV cable 0.3mm^2 x 1,000mm		Heat-resistant IV cable AWG18, 1,000mm		PVC cable 0.3mm^2 x 1,000mm	M3 screw terminal
Mass	45g		200g	300g	60g	180g

■ Specifications

CT for F-MPC04 (type number UM04)

Model	Square split			Toroidal split	
Type	CC2D74-1001	CC2D74-2001	CC2D74-4001	CC2C76-8001	CC2C76-12X1
Dimesions	Fig.3			Fig.6	
Rated primary current	100A	200A	400A	800A	1,200A
Linear output limit	Depends on the measurement range of the main unit.				
Rated secondary current	1A				
Through hole diameter	ø36			ø60	
Rated frequency	50 to 60Hz				
Overcurrent strength	1.0In continuous				
Ratio error	1%/In 1.5%/0.2In			1%/In 1.5%/0.2In 3%/0.05In	
Phase difference	9090'/In	6060'/In	80'/In	80'/In, 100'/0.2In	
Rated burden	0.5VA (0.5W load resistance)				
Insulation resistance	500VDC/100MΩ or more (between sensor core and output lead wire)			500VDC/100MΩ or more (between through hole and output)	
Dielectric strength	2000VAC/min (between sensor core and output lead wire)			2500VAC/min (between through hole and output)	
Output protection	1.4Vp with built-in clamp diode				
Operating conditions	–20 to 75C, 80%RH or lower (No condensation)				
Split portion securing method	Clamp				
Mounting method	Hanger				
Connection	Heat-resistant IV cable AWG18, 1,000mm			Vinyl cabtire cable 0.75mm^2 x 1,000mm 2-core	
Mass	300g			500g	
Combination CT-BOX	UM04X-1			UM04X-1	

Note: • To cope with extension of CT output wire, CT with connector and relay cable are available.
• For CTs without build-in output protection diode, be sure to draw a primary current after connecting a rated load. Drawing a primary current without connecting the rated load is dangerous bacause high voltage appears at the output terminal.
• CT-BOX to be used together with general-purpose CT (10 to 7500A/5A) is the UM04X-5.

■ **Dimensions, mm**

Fig1 CC2D81

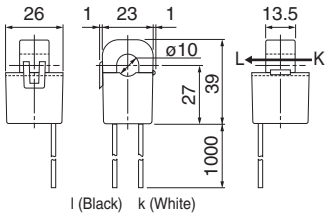


Fig2 CC2D65

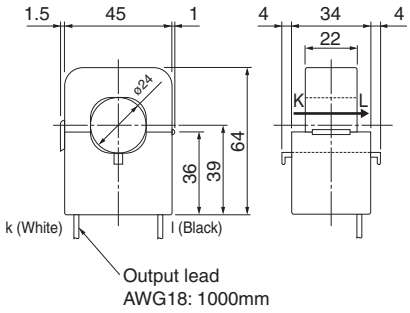


Fig3 CC2D54, CC2D74

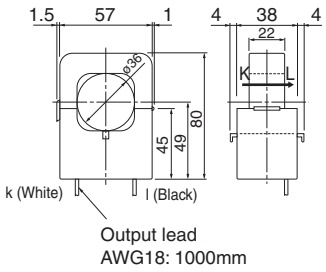


Fig4 CC2B65

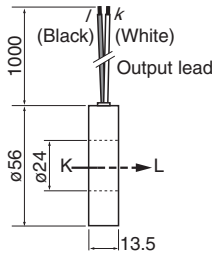


Fig5 CC2B54

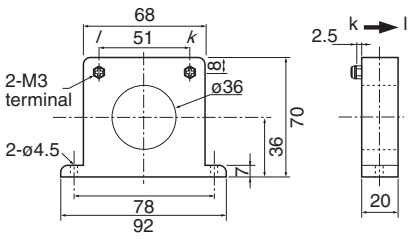
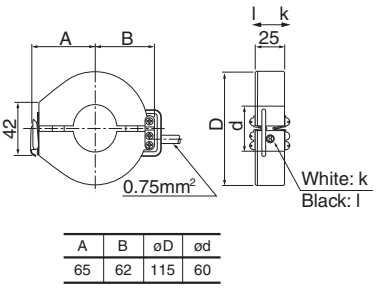


Fig6 CC2C76

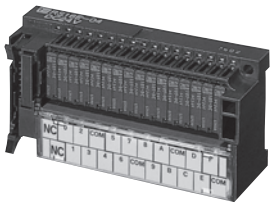


A	B	øD	ød
65	62	115	60

Terminal relay RS16

■ Description

The RS16 relay, in combination with F-MPC04 (type: UM01) power monitoring unit, outputs the current prealarm signal and leakage current pre alarm signal, and the signal to trip circuit breakers.

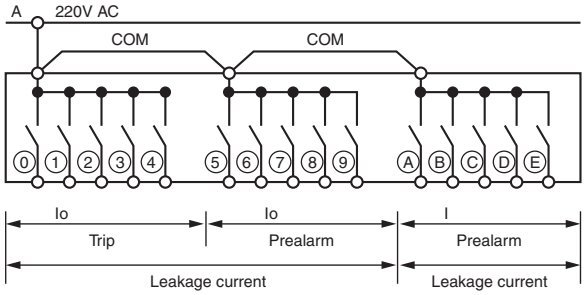


RS16-DE04H

■ Specifications

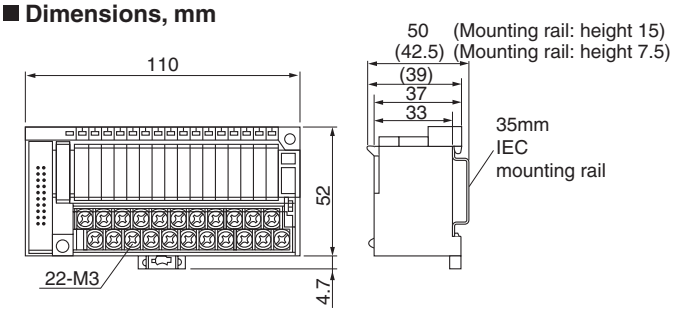
Type		RS16-DE04H
No. of connectable circuits		5
Operate time		10ms or less
Release time		10ms or less
Vibration	Malfunctions durability	10–55Hz 1mm double amplitude (0.61N max.)
	Mechanical durability	10–55Hz 1mm double amplitude (0.61N max.) 3 times in each X, Y, Z direction, total 18 times
Shock	Malfunctions durability	100m/s^2
	Mechanical durability	200m/s^2, 2 hours in each X, Y, Z direction, total 6 hours
Operating ambient temperature		-25 to 55°C(no icing or no condensation)
Operating ambient humidity		35 to 85%RH
Terminal screw size		M3
Tightening torque		0.5–0.7N • m
Mounting		Rail mounting (screw mounting also available)
Applicable crimp terminal		R1.25–3 (Max 6mm)
Applicable wire size		Max. 1.4mm dia.
LED color	Operation indication	Red
	Power source indication	Green
Coil surge suppressor		Diode
Max. No. of rely insertion		50
Insulation resistance (initial)		100MΩ (500V DC megger)
Dielectric strength	Between contact and coil	2000V AC, 1 minute
	Between same polarity contacts	1000V AC, 1 minute
	Between reverse polarity contacts	2000V AC, 1 minute
	between heteropolar coils	500V AC, 1 minute
Mass		200g

■ Terminal arrangement

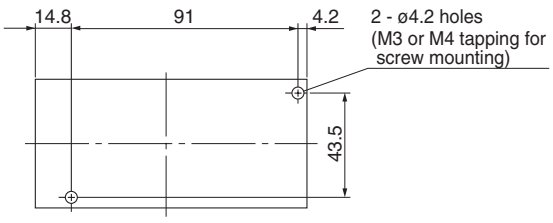


3-phase 3-wire	3-phase 4-wire
⓪ :Io trip (No.1 or 6)	Io trip (No.1 or 4)
① :Io trip (No.2 or 7)	Io trip (No.2 or 5)
② :Io trip (No.3 or 8)	Io trip (No.3 or 6)
③ :Io trip (No.4 or 9)	Unused
④ :Io trip (No.5 or 0)	Unused
⑤ :Io prealarm (No.1 or 6)	Io prealarm (No.1 or 4)
⑥ :Io prealarm (No.2 or 7)	Io prealarm (No.2 or 5)
⑦ :Io prealarm (No.3 or 8)	Io prealarm (No.3 or 6)
⑧ :Io prealarm (No.4 or 9)	Unused
⑨ :Io prealarm (No.5 or 0)	Unused
Ⓐ :I prealarm (No.1 or 6)	I prealarm (No.1 or 4)
Ⓑ :I prealarm (No.2 or 7)	I prealarm (No.2 or 5)
Ⓒ :I prealarm (No.3 or 8)	I prealarm (No.3 or 6)
Ⓓ :I prealarm (No.4 or 9)	Unused
Ⓔ :I prealarm (No.5 or 0)	Unused
Ⓕ :Unused	Unused

■ Dimensions, mm



Panel drilling



■ Connector cable

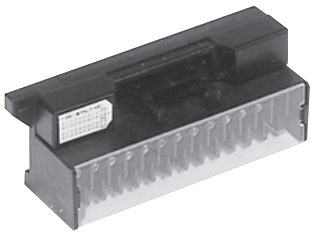
For connecting CT-BOX, Terminal relay RS16, and Connector terminal block AU-CW.

1m long	AUX014-201
2m long	AUX014-202
3m long	AUX014-203

Connector terminal-block, AU-CW21B1

■ Description

The AU-CW21B connector terminal-block, in combination with the FMPC04 (type: UM04) power monitoring unit, can output a kWh pulse.



SB-277

AU-CW21B1

■ Specifications

Type	Front mounting	**AU-CW21B1-04**
	Rear mounting	**AU-CW21B1-04R**
Insulation voltage		60V AC/DC
Continuous current		1A (at 40˚C)
No. of terminals		21
No. of connectors		20
Terminal screw size		M3.5
Insulation resistance		100Ω or more
Dielectric strength		500V 1min
Allowable ambient temperature		–5 to +40˚C
Allowable ambient humidity		45 to 85%RH
Flame resistance		UL94-V1
Connection cable	Multi-core cable	AUX014-20□ *
	Flat cable	AUX024-20□ *

Note: * Specify cable length by replacing □ with 1: 1m, 2: 2m, or 3: 3m.

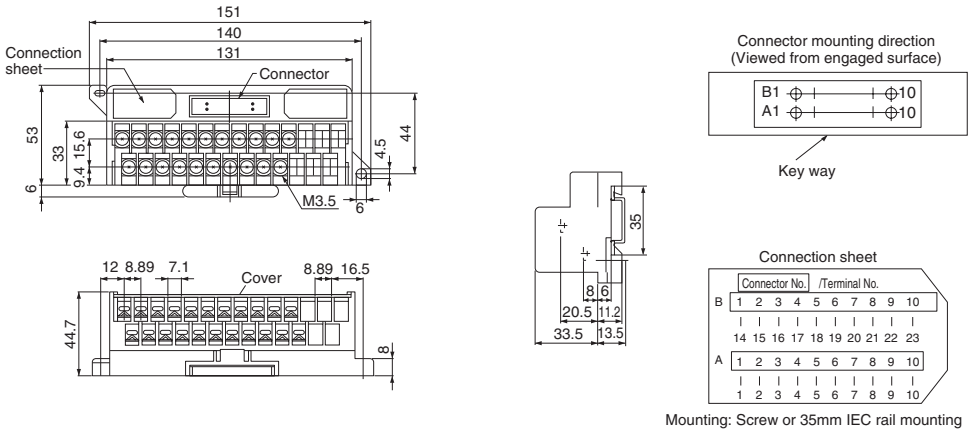
■ Ordering information

Specify the following:
1. Type number

■ Terminal arrangement and output

		Pulse output circuit No.	Remarks
Terminal No.	23	Circuit 1 pulse output	Circuit 1 to 6 pulse outputs are valid in 3-phase 4-wire system.
	22	Circuit 2 pulse output	
	21	Circuit 3 pulse output	
	20	Circuit 4 pulse output	
	19	Circuit 5 pulse output	
	18	Circuit 6 pulse output	
	17	Circuit 7 pulse output	
	16	Circuit 8 pulse output	
	10	Circuit 9 pulse output	
	9	Circuit 10 pulse output	
	15, 2	Common (–)	

■ Dimensions, mm



Mounting: Screw or 35mm IEC rail mounting

Multiple function protectors and controllers F-MPC60B, F-MPC30 series

■ Description

- FUJI multiple function protector and controller (F-MPC) performs energy control to contribute to energy-saving. The F-MPC60B and F-MPC30 are a kind of multifunctional digital relays.
- Although these series are very compact, they integrate multiple functions in a compact body, such as protection, measurement, operation, and monitoring of high-voltage power distribution and switching facilities. They can also transmit data obtained from these functions to upper level controllers.

KKD10-119

F-MPC60B (UM43FG-E5AK)

KK02-042

F-MPC30 (UM5ACG-H5R)

■ Functions

The functions of F-MPC60B and F-MPC30 series are listed below.

Series		F-MPC60B	F-MPC30
Type		**UM43FG-E5AK**	**UM5ACG-H5R**
Installation location		Receiving or feeder	Feeder
Application (phase: line)		3:3, 3:4	3:3, 3:4
VT voltage	Input	2VT/3VT star	—
	Voltage indication	Between phases, between lines	—
Ground fault system	System type	Direct/resistance	Direct/resistance
IO detection	①Residual (3XCT)	○	○
	②Tertiary winding (100/5A)	○	○
	③ZCT (5 to 100/5A)	○	○
	④ZCT (5 to 400/5A)	○	○
	⑤ZCT (200/1.5mA)	—	—
	⑥ZCT (100/1A) or (70/1A) or secondary I input (0.002 to 0.4A)	—	—
E0 detection * Feeder: Depending on MN signal.	EVT (3Ry= 110V)	—	—
	EVT (3Ry= 190V)	—	—
	ZPD-1 (FUJI-made)	—	—
	MN signal output	—	—
	MN signal input	—	—
Protective characteristic (current)	SI, VI, LT, EI, I^2t	○	○ (without I^2t)
	DT1 (short-time)	○	○
	DT2 (definite-time)	○	○
Control voltage	Rating	100V DC	100/200V DC
	Allowable range	80 to143V DC	80 to 286V DC
Transducer output selection	No. of output pole	6	—
	(Function and terminal)	Select	—
No. of DI/DO		8 : 8	1 : 3
No. of CPU		2	1
External plug		—	○
CB close/open	CB making slow-down monitoring function	○	—
	Harmonic voltage (3, 5, 7, Total)	—	—
	Harmonic current (3, 5, 7, Total)	○	—
	Demand current	○	—
Display mode	All or part: changeable	○	— (All only)

○ Available — Not available

■ **Functions (continued)**

Series			F-MPC60B	F-MPC30
Type			**UM43FG-E5AK**	**UM5ACG-H5R**
Installation location			Receiver or feeder	Feeder
Protection	Overcurrent Instantaneous	50	○	○
	Overcurrent Short-time	51DT1	○	○
	Overcurrent Definite-time	51DT2	○	○
	Overcurrent Inverse-time *1	51	○	○ *2
	Ground-fault Instantaneous	50G	○	○
	Overcurrent Inverse-time *2	51G	○	○
	Ground fault directional	67	—	—
	Phase-loss	46	○ *3	—
	Inverse-phase	47	○ *3	—
	Voltage established	84	—	—
	Undervoltage	27	○	—
	Overvoltage	59	○	—
	Ground-fault overvoltage	64	—	—
	Current prealarm	OCA	○	○
	Ground-fault current prealarm	OCGA	○	○
Measurement	Current (r, s, t)	A	○	○
	Voltage (line)	V	○	—
	Voltage (phase)		○	—
	Active power (±)	W	○	—
	Reactive power (±)	Var	○	—
	Power-factor (±)	PF	○	—
	Frequency	Hz	○	—
	Active electric energy (+)	WHM	○	—
	Active electric energy (–)	WHM	○	—
	Reactive electric energy (+)	VarH	○	—
	Reactive electric energy (–)	VarH	○	—
	Ground fault (zero-phase) voltage	V0	—	—
	Ground fault (zero-phase) current	A0	○	○
	Harmonic current (3, 5, 7, Total)	HA	○	—
	Harmonic voltage (3, 5, 7, Total)	HV	—	—
	Demand current (r, s, t)	DA	○	—
	Demand active power	DW	○	—
	Max. zero-phase current value		○	○
	Max. zero-phase voltage value		—	—
	Max. demand current value (r, s, t)		○	—
	Max. demand power		○	—
	Total electric energy (+)		○	—
	Total electric energy (–)		○	—
	Min. voltage value (between lines)		○	—
Preventive maintenance	50(INST)	Operation Count	○	○
	51DT1	Operation Count	○	○
	51DT2	Operation Count	○	○
	51	operation Count	○	○
	67DG	Operation Count	—	—
	50G	Operation Count	○	○
	51G	Operation Count	○	○
	OCA	Operation Count	○	○
	OCGA	Operation Count	○	○
	Phase loss	Operation Count	○ *3	—
	Inverse phase	Operation Count	○ *3	—
	27	Operation Count	○	—
	59	Operation Count	○	—

*1 with SI, VI, LT, EI, and I^2t characteristics
*2 with SI, VI, LT, and EI characteristics
*3 Available for version 1 or later.

○ Available — Not available

Multiple function protectors and controllers F-MPC60B series, UM43FG-E5AK

■ Description

Although the F-MPC60B series is very compact, it integrates multiple functions in one body, such as protection, measurement, operation, and monitoring of high-voltage power distribution and switching facilities. It can also transmit the data obtained with these functions to upper level controllers.

■ Features

Flexibility
In accordence with changes in circuit conditions such as CT ratio, the setting of the F-MPC60B can be easily changed.

Improved maintainability
Preventive maintenance and fault analysis can be easily made with the functions that display operation history and fault data.

High reliability
To prevent operation errors such as circuit disconnection, the F-MPC60B series has dual CPUs that check with each other for confirmation and dual output circuits from which output signals are always checked.

KKD10-119

UM43FG-E5AK

RS-485 communication interface
Two protocol types are available: MPC-Net protocol and MODBUS protocol.*

Note: * MODBUS protocol is available for version 1 or later.

■ Specifications

• General specifications

Type		UM43FG-E5AK
Control power supply		100V DC (80 to 143V) / 100V AC (85 to 132V) common use
Control power consumption		Max. 15W
Power consumption of CT, VT		Max. 1.0VA
Rated current (CT secondary current)		5A AC ("1A AC" model is also available (non-standard).)
Rated voltage	Line voltage	Select "110V AC" or " 110x$\sqrt{3}$ AC" (VT secondary voltage)
	Phase voltage	Select "110V /$\sqrt{3}$ AC" or "110V AC" (VT secondary voltage)
Zero-phase current		5A AC
Insulation resistance		10MΩ (min.) between ground and electric circuits connected together
Vibration resistance		16.7Hz 1.96m/s^2, 0.4mm double amplitude, 10 minutes each in X, Y, and Z directions
Shock resistance		300m/s^2, three times each in X, Y, and Z directions
Withstand voltage		2kV AC 1 minute between ground and electric circuits connected together, excluding, RS-485 signal, MN signal, and kWh-pulse output signal cables
Noise resistance		JEC2500 (conforming to ANSI), square wave, 1.5kV, 1ns/1μs, for 10 minutes.
Overload resistance		CT circuit: at ratting 40times, a second, 2 times VT circuit: at ratting 1.25 times, 10 second
Lightning impulse noise resistance		5.0kV (between ground and electrical circuits connected together)
Dropout tolerance		20ms (Operation continues, however, display goes out.)
Electrostatic discharge		Contact discharge: ±8kV Aerial discharge: ±15kV
Ambient temperature		Operating: -10 to + 60˚C (operation guaranteed) 0 to + 40˚C (characteristics guaranteed) (no icing) *1 Storage: - 25 to + 70˚C (no icing)
Humidity		20 to 90% RH (no condensation)
Atmosphere		No corrosive gas and no heavy dirt and dust.
Grounding		Class D grounding (100Ω or less)
Applicable standard		JEC2500 (Protective relays for electric power systems), JEC-2510 (Overcurrent relays), JEC-2511 (Voltage relays), JIS C4602 (Overcurrent relays for 6.6kV receiving), JIS C1102-1 to -9 (Direct acting analogue electrical instrument and their accessories), IEC255-3 (1989), -5, -6
Mass		1.4kg

*1: The operation guaranteed temperature is a temperature at which operation is guaranteed within two times of the guaranteed accuracy value at JEC characteristics guaranteed temperature, or within the accuracy of influence of JIS temperature.

■ Specifications

• Input/output specifications

Input circuit		Applicable to both 100V DC (max. 143V) and 100V AC (max. 132V) Pick up voltage: 40 to 70V DC/40 to 70V AC
Output circuit	Circuit breaker ON/OFF/trip	Making current: 15A (110V DC), allowable continuous current: 4A
	Other than above	Making/breaking current: 0.2A (110V DC, inductive load L/R = 15ms or less), allowable continuous current: 1A

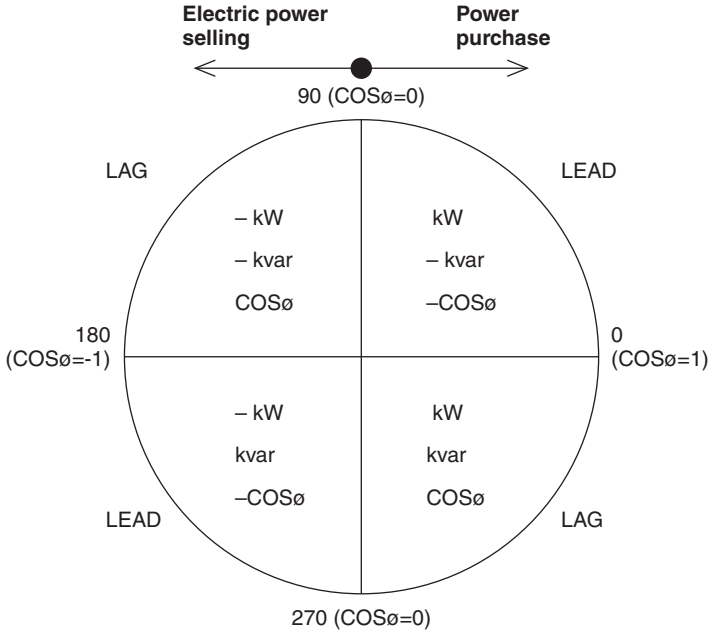
• Measurement and display specifications

	Effective measuring and display range	Accuracy *2
Current/Demand current/ Max. demand current	0, 0.8% to CT rating to 8 × CT rating *1	±1.5% (0, 0.8 to 100%), ±5% (100 to 800%)
Zero-phase current/Max. zero-phase current	CT: 0, 2% to CT rating to 8 × CT rating	±1.5%: 0, 2% to CT rating, ±5%: others
Active power Demmand active power/ Reactive power	±0.004 to ±1kW at VT secondary circuit (The value is converted into the VT rated voltage	±1.5% : 0, ±0.004 to ±1kW See the figure below.
Power factor	Lead 0% - 100% - Lag 0%	±5% (Lagging: no sign, leading: - sign) See the figure below.
Active electric energy *3 Reactive electric energy	0 to 99999, multiplying factor: 1, 10, 100, 1000	Equivalent to ordinary instruments shown in Table 4 specified in JIS C 1216 (instrument with a transformer)
Line voltage	9.5 to 260V on VT secondary side	±1.5%
Phase voltage	5.5 to 150V on VT secondary side	±1.5%
Frequency	45 to 55Hz (50Hz), 55 to 65Hz (60Hz)	±0.5%
Max. demand value	Same as the above range	–
Harmonics current	3rd, 5th, 7th, overall harmonics	–

*1 The fault current up to 2000% (accuracy: ±5%) can be displayed.
*2 "0, a to n%" means that "0" is indicated if a value is less than a%.
*3 There are two indications in the electric energy indication; total electric energy indication (zero clear disable) and periodic electric energy indication (zero clear is enable).

The sign "±" in electric measuring

The sign "±" is used to display "LEAD/LAG" in power-factor. measuring and "electric power selling/purchase" in electric power measuring. No signs are used if a value is "+". The sign "±" has the following meanings depending on the measured items.



- Active power: kW
  +: Power purchase (Consumed electric power)
  –: Electric power selling (Inverse electric power flow)
- Reactive power: kvar
  +: Lagging current by reactive volt-ampere meter method
  –: Leading current by reactive volt-ampere meter method
  * "LEAD/LAG" reverses with electric power selling/purchase.
- Power factor: COSϕ
  +:LAG –: LEAD

■ Specifications

• History data

Item	Display range	Display code
50 (INST) operation count	0 to 9999	H0
51DT1 operation count	0 to 9999	H1
51 (OC) operation count	0 to 9999	H2
51G operation count	0 to 9999	H3
50G operation count	0 to 9999	H4
59 (OV) operation count	0 to 9999	H6
27 (UV) operation count	0 to 9999	H7

Item	Display range	Display code
46 operation count	0 to 9999	H9
47 operation count	0 to 9999	HA
OCA operation count	0 to 9999	Hb
Running time	0 to 9999 × 100 (h)	Hc
ON/OFF operation	0 to 9999 × 10 (times)	Hd
OCGA operation count	0 to 9999	Hn
51DT2 operation count	0 to 9999	HP

* Other history display: Fault value display (on occurrence of a fault), history maximum values of zero-phase current/voltage, maximum demand value (A, W), and minimum instantaneous voltage

* The display codes are the codes to be displayed on this F-MPC60B (UM43FG-E5AK).

• Specifications of protective relays

Item	Setting range of current/ voltage operate value	Setting range of operate time (timer)	Characteristics	
			Operate value	Operate time
50 (Instantaneous)	1 to 20 times of CT rated current (in 0.2 times step), Lock	Fixed	±5%	40ms or less
51DT1 (Definite time)	1 to 20 times of CT rated current (in 0.2 times step), Lock	0 to 5s (in 0.05 step)	±5%	Less than 1s ±50ms More than 1s ±5%
51DT2 (Definte time)	20 to 240% of CT rated current (2% step), Lock	0 to 10s (0.1s step)	±5%	Less than 1s ±50ms More than 1s ±5%
51 (Inverse time) SI, EI, VI, LT, I^2t	20 to 240% of CT rated current (2% step), Lock	Time multiplication: 0.5 to 20 times, (in 0.1 times step) (Minimum operation time: 150ms)	±5%	Setting = 300%: ±12% 500, 1000%: ±7% (lower limit ± 100ms)
50G, 50N (Instantaneous/definite time)	0.2 to 8 times of CT rated current (in 0.1 times step), Lock	0.0 to 10s to 180s *1	±5%	±5% (lower limit ±50ms)
51G , 51N SI, EI, VI, LT	0.02 to 1.00 times of CT rated current (in 0.01 times step), Lock	Time multiplication: 0.5 to 20 times (in 0.1 times step) (Minimum operation time: 150ms) *1	±5% (min. ± 100mA)	Setting = 300%: ±12% 500, 1000%: ±7% (lower limit ± 100ms)
59V (0V)	VT secondary voltage: 60 to 150V (1V step), lock	0.0 to 5.0s to 60s (in 0.5s step) (in 1s step)	±5%	±5% (min. ±50ms)
27V (UV)	VT secondary voltage: 10 to 100V (1V step), lock	0.0 to 5.0s to 60s (in 0.5s step) (in 1s step)	±5%	±5% (min. ±35ms)
46 (Open-phase)	–	–	Unbalanced rate 50 - 80%	2s (fined)
47 (Phase sequence relay)	–	–	–	0.5s on less
OCA (Overcurrent pre-alarm)	10 to 100% of CT rated current (in 5% step), Lock	10 to 200s (in 10s step)	±10%	±5%
OCGA (Leakage current pre-alarm)	50, 60, 70, 80% of the setting value of "51G operating current", Lock	10 to 200s (in 10s step)	±10% (min±200mA)	±5%

*1 When a current exceeds 15% of the rated fundamental wave current, the malfunction preventive function against the exciting inrush current activates. (When the contents of the second higher harmonics are about 15% or higher, the feature will lock outputs.) Note that with the 50G relay, the malfunction preventive function against the exciting inrush current will not activate if you set the operate time at 0s.

• Communications specifications

Protocol	MODBUS protocol mode	MPC-Net mode
Standard	EIA-485	EIA-485
Data exchange method	polling/selecting system	1: N polling/selecting system
Transmission distance	1000m (total length)	1000m (total length)
No. of connectable units	Up to 32 units (including master unit)	Up to 32 units (including master unit)
Station number address	01 to 99	01 to 99
Transmission speed	4800/9600/19200 bps (selectable)	4800/9600/19200 bps (selectable)
Data format	Number of start bits: 1 (fixed) Data length: 8 bits (fixed) Parity bit: None/even/odd (selectable) Stop bits: 1 bit or 2 bit (automatic selection) 1 bit: for "even or odd" parity 2 bit: for "none" parity	Number of start bits: 1 (fixed) Data length: 7/8 bits (selectable) Parity bit: None/even/odd (selectable) Stop bits: 1 (fixed) BCC= Even horizontal parity

■ Specifications

• Specifications of transducer outputs

Transducer output signal		4 to 20mA DC (external load resistance: 270Ω or less)	
Signal type	Current (Ia, Ib, Ic)	4 to 20mA for 0 to CT rated current	Accuracy 1.5%
	Line voltage (Vab, Vbc, Vca)	For VT secondary 0 to150V, 4 to 20mA *1 0 to 150V ×√3, 4 to 20mA *2	
	Phose voltage (Van, Vbn, Vcn)	For VT secondary 0 to 150V/√3, 4 to 20mA *1 0 to150V, 4 to 20mA *2	
	Active power (W)	For 0 to 1kW (CT5A, VT110V AC conversion), 4 to 20mA	
	Reactive power (var)	For –1 to 0 to1kvar (CT5A, VT110V AC conversion), 4 to 12 to 20mA	
	Frequency (Hz)	For 45 to 55Hz or 55 to 65Hz, 4 to 20mA	
	Power factor	For LEAD 0.5 to 1 to 0.5 LAG, 4 to 12 to 20mA	

Note: • Output signals are connected to a common terminal (minus side).
• An upper or lower limiter operates when the output signal is about to exceed the upper or lower limit.
The upper limit is fixed at 20mA, and the lower limit is fixed at 20mA.
*1: Applied line voltage: 100V/110V/120V AC.
*2: Applied line voltage: 100V/110V/120V AC ×√3, AC.

• Specifications of kWh pulse output

Type of output	Transistor, open collector
Ratings	Max. 150V DC, 100mA
Pulse width	200 ± 20ms
Pulse rate	10^n kWh per pulse (n=-2 to 4) (integer), or 2000 pulses per kWh

■ Type number nomenclature

UM43 F G - E 5 A K

Basic type
UM43: F-MPC60B series
(3ø3W/3ø4W use)

Type of unit
F: Receiving unit

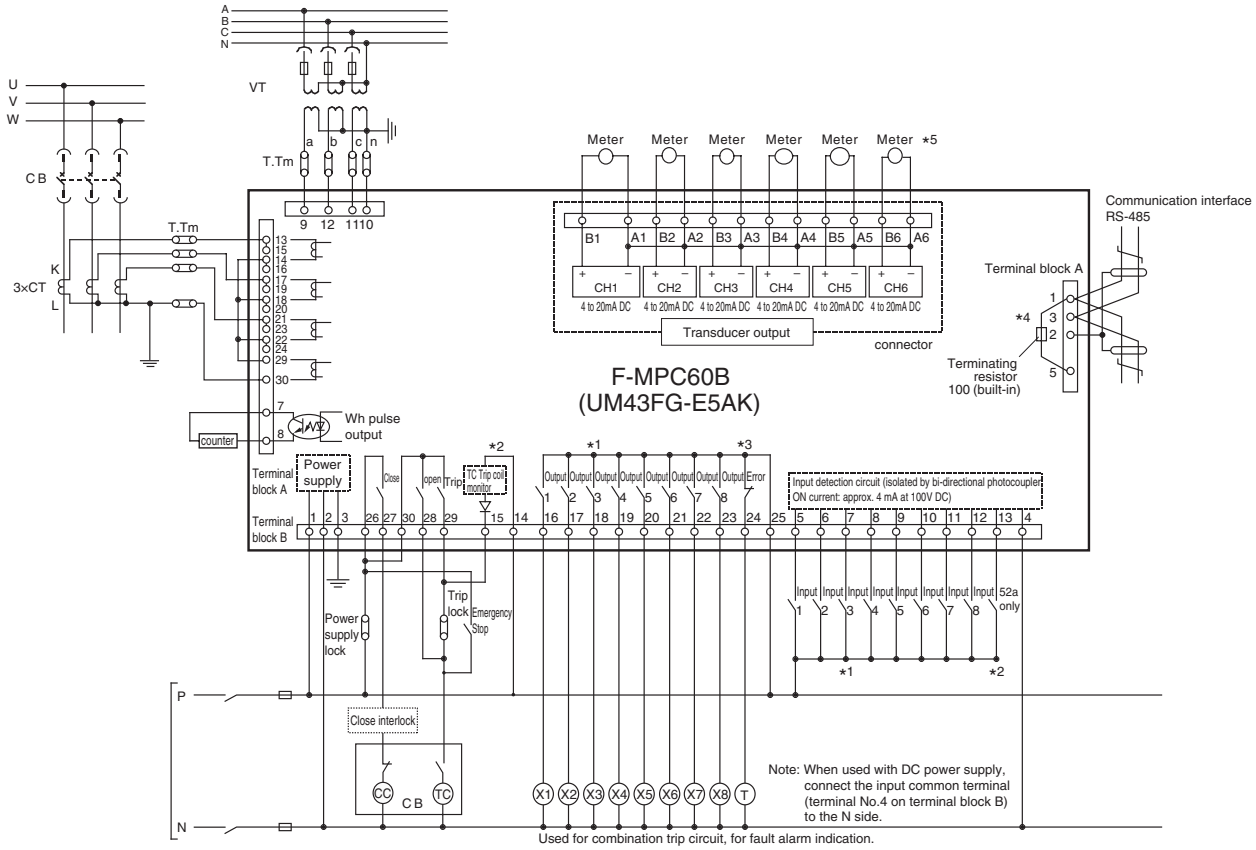
Ground fault protection
G: 50G/51G (resister grounding)

External interface
A: "4-20mA output" and "RS-485 interface"

CT secondary current
5: 5A

Control power supply
E: 100V AC/DC common use

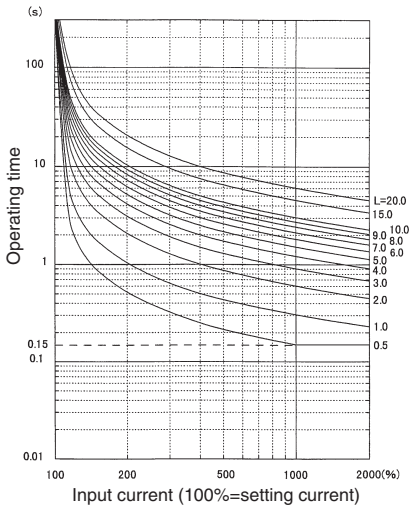
■ Example of etxternal wiring diagrams



Note: *1 Use selective input 1 to 8 and selective output 1 to 8 by selecting the function type by setup.
*2 Outputs of “ON, OFF, TRIP and equipment error” are used exclusively. Inputs of "52a: the answer back signal of CB ON" and "the monitoring of TC coil" are used exclusively.
*3 Equipment error output is a normally closed contact (normally excited, and if an error occurs, excitation terminates and contact opens). Therefore, a time delay of about 100ms occurs before the contact opens, since the power has been on (in operation). Consider the use of a timer, if necessary, if you create an external sequence.
*4 If this unit, being provided with RS-485 communication function, is located at the termination of a communication line, connect terminals No.3 and 5. With this, the 100Ω terminating resistor is connected across the RS-485 bus.
*5 Use twisted wires (cables) as the output cable of transducer.
• If you have to connect a heavy load exceeding relay’s contact rating, be sure to use it in combination with FUJI’s miniature power relay HH6 series.
See page 53 “Input/output specifications.”

■ Time-current characteristic

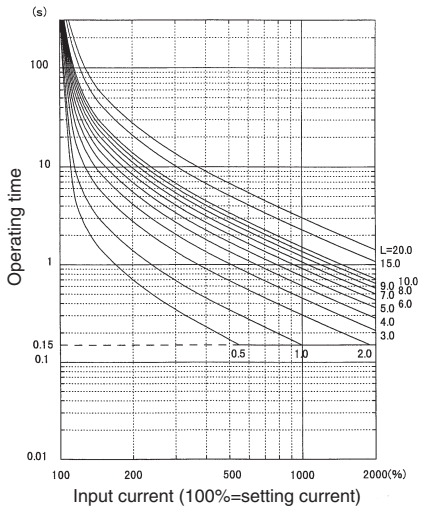
Standard inverse (SI) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{0.14}{I^{0.02} - 1} \times \frac{L}{10}$$ (L: time magnification)

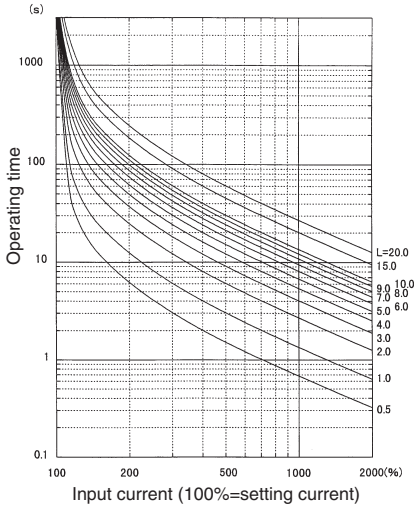
Very inverse (VI) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{13.5}{I - 1} \times \frac{L}{10}$$ (L: time magnification)

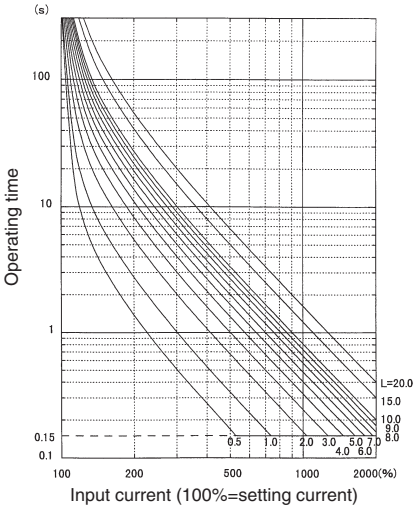
Very inverse (LT) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{120}{I - 1} \times \frac{L}{10}$$ (L: time magnification)

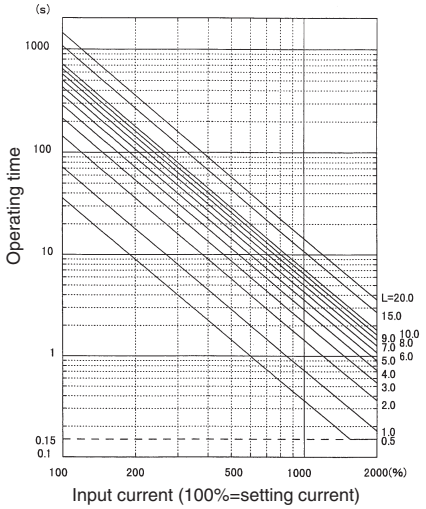
Exremely inverse (EI) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{80}{I^2 - 1} \times \frac{L}{10}$$ (L: time magnification)

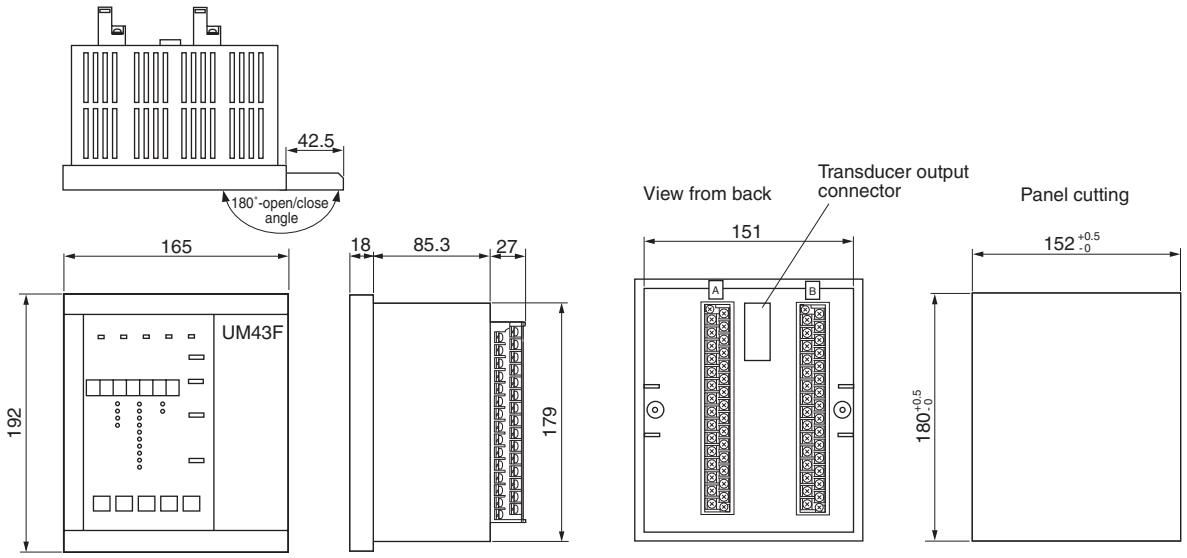
I²t characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{720}{I^2} \times \frac{L}{10}$$ (L: time magnification)

■ Dimensions, mm



Minimum clearance from adjacent upper and lower devices or panel plate: 100mm

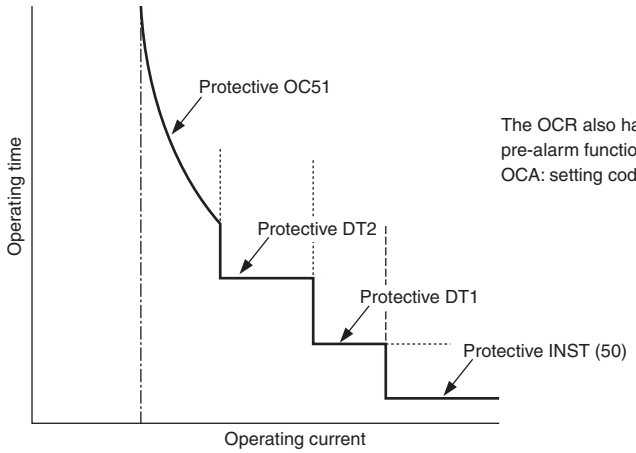
■ Characteristics of overcurrent relay (OCR)

The characteristics of overcurrent relays (OCR) are, in general, divided into the protective INST (50) (setting code 10, 11), the protective DT1 (setting code 12 to 14), protective DT2 (setting code 1c, 1d, 1E) and the protective OC 51 (setting code 15 to18). The characteristics of protective OC 51 consist of 5 kinds of inverse characteristic curves, such as standard inverse (SI) characteristics, very inverse (VI) characteristics, long time inverse (LT) characteristics, extremely inverse (EI) characteristics and I^2t characteristics). Combination of the protective INST (50), protective DT1, protective DT2 and OC 51 carries out coordinative protection.

Outline of characteristic of overcurrent relay

Item	Operating current	Operating time
Protective INST (50)	1 to 20 times of CT rated current 5A (0.2 times step)	Fixed (40ms or less)
Protective DT1		0 to 5s (0.05s step)
Protective DT2	20 to 240% of CT rated current 5A	0 to 10s (0.1s step)
Protective OC (51)	(2% step) *1	Select from 5 characteristic curves. Time magnification: 0.5 to 20 times (0.1 times step)

*1: The operating time of protective OC51 is saturated at about 150ms.
The operating time will be saturated at 20 times of CT rated current when the setting exceeds 200%.
For example, the operating time becomes 833% (= 2000%/(240%×100)) of the CT rated current in 240% setting.



The OCR also has the pre-alarm function (protective OCA: setting code 19-1b).

F-MPC60B Transformer protective unit

■ Features

- Protection, measurement, and communication functions provided as standard.
- The erroneous-breaking preventive function by adopting duplicated analog circuit and AND-output circuit.
- With its self-monitoring function, this unit quickly responds in case a fault occurs.
- The network system can be easily configured via Modbus (RTU).

UM45T-H5R

■ Type numbers

UM45T - H 5 R

F-MPC60B series
Transformer protective unit

Control power
H: 100/200V DC, 100V AC, common use

External interface
R: RS-485 interface is provided as standard

CT secondary rated current
5: 5A

■ Specifications

● General specifications

Item	Specifications
Applicable transformer	Two-winding transformer, Three-winding transformer
Control power supply (Standard)	100/200V DC (80-286V DC), 100V AC (85-132V AC), common
Power consumption (main unit)	15W or less (100/200V DC) 25VA or less (100V AC)
Rated frequency	50/60Hz (Changeover)
Rated current (CT secondary side)	5A AC
Rated vurden (CT secondary side)	1.0VA or less
Insulation resistance	10MΩ or more between electric circuits and ground 5MΩ or more between electric circuits, between circuit terminals
Withstand voltage	2kV AC between electric circuits and ground, excluding between primary-secondary-tertiary in CT circuit same-phase, and RS-485 signal line 1kV AC between circuit terminals
Vibration resistance	• 10Hz, double amplitude 5mm (front, back, left and right), 2.5mm (up and down) • 1.96m/s^2 16.7Hz double amplitude 0.4mm, 10 minutes in each of 3 directions.
Shock resistance	300m/s^2, 3 times in each of 3 directions
Noise immunity	Oscillating frequency 1MHz, primary peak value 2.8kV, 1/2 attenuation time 3-6 cycles Repetitive frequency 6-10 times/1 cycle of commercial power frequency (asynchronous) JEC 2500 Wave 2 (equivalent to ANSI)
	Peak voltage: Square wave 1.5kV impulse (1ns/100ns, 10 minutes)
	Radio noise: Frequency 150MHz-, 400MHz-, 900MHz-band, Rated output 10V/m Mobile phone (800MHz/1.5MHz 0.8W), PHS (1.90GHz 10mW) closely contact
Electrostatic noise immunity	In contact with metal part: ±8kV, Panel surface (no contact with nonmetal part): ±15kV
Overload capacity	CT circuit: 40 times the rating, 1 second, twice
Ambient temperature	0 to 40˚C: Characteristics guaranteed (No icing or no condensation)
Storage temperature	-20 to 70˚C
Relative humidity	20 to 90%RH (no condensation)
Atmosphere	No corrosive gas or excessive dust
Grounding	Class D grounding (100Ω or less)
Mass	1.4kg
Instantaneous power failure time	20ms (operation continues) though the indication disappears
Lightning impulse withstand voltage	4.5kV between electric circuits and ground

Conformity standard: JEC-2500 (Protective relays for electric power system), JEC-2510 (Over current relays), JIS C 1102-1,2 (Direct acting indicating analogue electrical measuring instruments and their accessories), IEC255-5, 6 (Electrical relays Part 5, 6).

● External I/O specifications

Item	Specifications	
Input circuit	ON voltage: 70V or less AC/DC , OFF voltage: 40V or more AC/DC40V	
Output circuit	CB trip	Making current: 15A (110V DC), 10A (220V DC) Resistive load Allowable continuous current: 4A
	Other than above	Making/breaking current: 0.2A (110V DC, inductive load L/R=15ms) Allowable continuous current: 1A Making/breaking current: 0.1A (220V DC, inductive load L/R=15ms) Allowable continuous current: 1A

● Measurement and display specifications

Item	Effective display range	Accuracy *2	Measuring range	No. of Display digit
Differential circuit current Idr, Ids, Idt	Reference current converted effective value 3 to 100% *1	±5%	0, 3 to 100%	3 digits
Differential circuit fault current (87RDf, 87HOC)	Reference current converted effective value 3 to 100% *1	±5%	0, 3 to 1000%	4 digits
	100 to 1000%	Error ratio ±10%		

Note: • "0, a to n" means that "0" is indicated when the value is between "0 to a".
*1 Differential circuit current Id is expressed in the following equation.
Id (%) = {(Primary input current/Primary reference current) – (Secondary input current/Secondary reference current) – (Tertiary input current/Tertiary reference current)} x 100
*2: Range of 3 to 100%: For example at 50%, 45 to 55% Range of 100 to 1000%: For example at 200%, 180 to 220%

● History data specifications

Item	Display range	Code
Operation hours	0-9,999 (times)	**Hc**
Operation count	0-9,999 (times)	**Hd**

Item	Display range	Code
87RDf	0-9,999 (times)	**HF**
87HOC	0-9,999 (times)	**HH**

Note: "Code" in the above table is indicated with the upper two digits of the 7-segment LED of this unit.

● Specifications of protective relays

Division	Item	Setting range etc.	Characteristics	
			Tolerance (Error)	Operating time, reset time
87RDf Ratio differential	Operating formula	Id > Kd× I (kd: Ratio conversion coefficient) and Id > Ki (Current sensitivity) Id=I1+I2+I3(Vector sum of converted reference current) I= |I1|+|I2|+|I3|		Operating time: 50ms or less Reset time: 100ms (300% of setting value)
	Reference current setting	2.9 to 8.7A (in 0.1A step)		
	Characteristics: Current sensitivity Ki	Reference current setting × 30%(Fixed), lock	Control point *1 Within ±5% Others Within ±10%	
	Characteristics: Ratio characteristics Kd	30, 40, 50% (Selective setting)	Control point *2 Within ±10% Others Within ±20%	
	Characteristics: Harmonics suppression	Not operate at second harmonics 15, 25% or more (15, 25% selective setting) *3	15%: 10 to 15% 25%: 20 to 25%	
	Characteristics: Phase characteristics	Ratio characteristics setting: 30%: 180°±20° 40%: 180°±29° 50%: 180°±39°		
	Characteristics: Reset value	90% or more of measured operate value		
	Characteristics: Frequency characteristics	Variation of operate value and ratio characteristics	±5%	
		Harmonics suppression characteristics	15%: 5 to 15% 25%: 10 to 25%	
87HOC (Differential circuit overcurrent)	Operating formula	Id > (Current setting value)		Operating time: 40ms or less Reset time: 100ms or less
	Characteristics: Current setting	2.0 to 10.0 times of reference current setting (in 1.0 step), lock	±5%	
	Characteristics: Reset value	90% or more of measured operate value		
	Characteristics: Frequency characteristics	±5% of rated value		
87RDf 87HOC (Common)	Non-operating time setting at startup	Lock, 0.1 to 999s (in 0.1s step) When non-operating time setting at startup is set, the functions of 87Rdf and 87HOC are locked within the setting time after startup. Use this function when harmonics suppression does not work effectively at startup, like the starting current does not contain much harmonics.		

Note: *1 Tolerance at control point (Coil Ⅰ, min. reference current setting tap, min. ratio tap) is shown.
*2 Tolerance at control point (Coil Ⅰ to coli Ⅱ, flow-out current 200% against each ratio tap) is shown.
*3 The preventive function against malfunction due to exciting inrush current works (locked) when the second harmonics contains 15% or 25% or more of the fundamental wave.

• Operation of fail-safe relay

Division			Remarks
87RDF	Operation formula	Id > Ki	Synchronized with main relay setting
	Current setting	Reference current setting x 27% (fixed)	
87HOC	Current sensitivity	90% or more of current setting value	Synchronized with main relay setting

● Communication specifications

• Modbus mode

Item	Specifications	
Standard	EIA RS-485	
Communication method	2-wire type, half-duplex	
Synchronous method	Start-stop synchronization	
Connecting form	1 : N (N: UM45T-H5R)	
Transmission distance	1000m	
No. of connectable stations	Max. 32 (including a master unit)	
Station address	01 to 99	
Transmission speed	4800/9600/19200bps	
Data format	Start bit	1 (fixed)
	Data length	8 (fixed)
	Parity bit	Odd, even, or none (selectable)
	Stop bit	1/2 (automatically selectable) 1/2: with or without parity
Transmission code	HEX value (Modbus RTU mode)	
Error detection	CRC-16	
Terminal symbol	D1(+): DXA, D0(-): DXB	

• F-MPC-Net mode

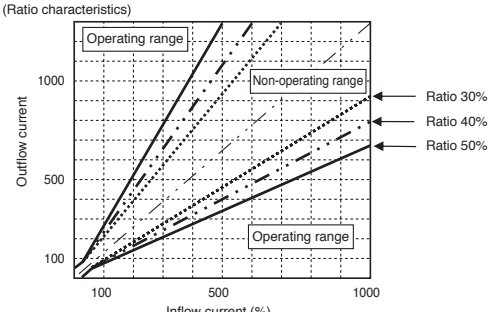
Item	Specifications	
Standard	EIA RS-485	
Communication method	2-wire type, half-duplex	
Synchronous method	Start-stop synchronous transmission	
Connecting form	1 : N (N: UM45T-H5R)	
Transmission distance	1000m	
No. of connectable stations	Max. 32 (including a master unit)	
Station address	01 to 99	
Transmission speed	4800/9600/19200bps	
Data format	Start bit	1 (fixed)
	Data length	7/8 (selectable)
	Parity bit	None, odd, or even (selectable)
	Stop bit	1 (fixed)
Transmission code	ASCII code	
Error detection	Horizontal parity: even parity	

Note: • Use KPEV-SB (0.5mm^2), CPEV-SB (0.9mm dia.) or equivalent communication cable. Connect the shielding wire to the SG terminal (No. 2 of terminal block A).
• Communication cable must not be branched. Connect terminating resistors at both ends of communication cable. If the UM45T is located at the edge of communication line, short-circuit No. 3 and No. 5 of terminal block A. The UM45T is equipped with a built-in terminating resistor of 100Ω.
• Use the communication cable such that its transmission distance becomes 1,000m or less.
Keep the wiring as far from high voltage equipment or power cables as possible.

● Number of external I/O

Item	Specifications		Remarks
CT input	Primary AC input	A (r, s, t) 3CT	CT rated secondary current 5A
	Secondary AC input	A (r, s, t) 3CT	
	Tertiary AC input	A (r, s, t) 3CT	
Contact output	Trip 1	87RDf, 87HOC (Differential) 1 point	(Fixed)
	Unit fault	NC normally-energized 1 point	(Fixed)
	Alarm output	NO 8 points	*Selective output
100V DC input	Trip coil disconnection monitoring	1 point	(Fixed)
	CB52a	1 point	(Fixed)
	General-use input	3 points	*Selective input

● RDf relay Operating characteristic



Multiple function protectors and controllers F-MPC30 series, UM5ACG-H5R

■ Description

The F-MPC30 series is a multiple function protectors and controllers in the power monitoring equipment, which integrates protective, measurement, and transfer functions for power feeder facilities. Versatile functions such as preventive maintenance and history data and abnormal value recording can be achieved with excellent economy and reliability. These works have been very complicated as you must have used individual power monitoring devices in combination.

UM5ACG-H5R KK02-042

■ Features

Economical system configuration
Includes measurement and protective functions limited to the current ranges most frequently used, thus allowing the construction of economical systems.

Improved operating reliability
Includes an automatic monitor function, an automatic diagnostic function supported by continuous monitoring and automatic inspection, and a fail-safe function, thus ensuring high operating reliability while minimizing daily and regular inspection tasks.

Easily designed coordination protection
Provided with 51DT1 and 51DT2 definite time trip characteristics that simplify the designing of coordination protection between overcurrent relays.

RS-485 communications interface
Two protocol types are available:
MPC-Net protocol and MODBUS protocol.

■ Specifications

• General specifications

Type	**UM5ACG-H5R**
Control power supply	100/200V DC (80 to 286V DC) 100V AC (85 to 132V) common use
Control power consumption	Max. 15W (100/200V DC), Max 25 VA (100V AC)
Power consumption of CT, VT	Max. 1.0VA
Rated current (CT secondary current)	5A AC ("1A model" is also available (non-standard))
Zero-phase current	5A AC
Insulation resistance	10MΩ min. between ground and electric circuits connected together
Vibration resistance	16.7Hz, 0.4mm double amplitude, 1.96m/s^2, 10 minutes each in X, Y, and Z directions
Shock resistance	300m/s^2, three times each in X, Y, and Z directions
Withstand voltage	2kV AC 1 minute between ground and electric circuits connected together, excluding RS-485 signal lines
Noise resistance	JEC 2500 (conforming to ANSI), square wave, 1.5kV, 1ns/1μs, for 10 minutes
Overload resistance	CT circuit: at rating 40 times, a second, 2 times
Lightning impulse noise resistance	4.5kV (between ground and electrical circuits connected together)
Dropout tolerance	20ms (Operation continues, however, display goes out.)
Electrostatic discharge	Contact discharge: ±8kV, Aerial discharge: ±15kV
Ambient temperature	–10 to +60˚C (operation guaranteed), 0 to +40˚C (characteristic guaranteed) (no icing) *1
Storage temperature	–25 to +70˚C (no icing)
Humidity	20 to 90%RH (no condensation)
Atmosphere	No corrosive gas and no heavy dirt and dust.
Grounding	Class D grounding (100Ω or less)
Applicable standard	JEC2500 (Protective relays for electric power systems), JEC-2510 (Overcurrent relays), JIS C4602 (Overcurrent relays for 6.6kV receiving), JIS C1102-1 to -9 (Direct acting analogue electrical instrument and their accessories), IEC255-3 (1989) -5, -6.
Mass	1.4kg

*1: The operation guaranteed temperature is a temperature at which operation is guaranteed within two times of the guaranteed accuracy value at JEC characteristics guaranteed temperature, or within the accuracy of influence of JIS temperature.

• Input/output specifications

Input circuit		100/200V DC (286V DC or less) common use Pick-up voltage: 40 to 70V DC (Input current; 1.2mA at 100V DC, 2.4mA at 200V DC)
Output circuit	Circuit trip	The closing current: 15A (110V DC), 10A (220V DC), the allowable continuous conduction current: 4A
	Other than above	The switching current: 0.2A (110V DC, inductive load L/R = 15ms or less) The allowable continuous conduction current: 1A
		The making current: 0.1A (220V DC, inductive load L/R = 15ms or less) The allowable continuous conduction current: 1A

• Measurement and display specifications

	Effective measuring and display range	Accuracy *2
Current	0, 0.8% to CT rating to 8 × CT rating *1	±1.5% (0, 0.8 to 100%), ±5% (100 to 800%)
Zero-phase current	CT: 0, 2% to CT rating to 8 × CT rating	±1.5% (0, 2% to CT rating), ±5% (more than CT rating)

*1 The fault current up to 2000% (accuracy: ±5%) can be displayed.
*2 "0, a to n%" means that "0" is indicated if a value is less than a%.

• History data and display ranges

Item	Display range	Display code
50 (INST) operation count	0 to 9999	H0
51DT1 operation count	0 to 9999	H1
51 (OC) operation count	0 to 9999	H2
51G operation count	0 to 9999	H3
50G operation count	0 to 9999	H4

* Other history display: Fault value display (on occurrence of a fault), history maximum values of zero-phase current/voltage, maximum demand value (A, W), and minimum instantaneous voltage

Item	Display range	Display code
OCA operation count	0 to 9999	Hb
Running time	0 to 9999 × 100 (h)	Hc
Close operation count	0 to 9999 × 10 (times)	Hd
OCGA operation count	0 to 9999	Hn
51DT2 operation count	0 to 9999	HP

* The display codes are the codes to be displayed on this F-MPC30 (UM5ACG-H5R).

• Specifications of protective relays

	Setting range of current/voltage operatel value	Setting range of operate time (timer)	Characteristics (accuracy)	
			Operate value	Operate time
50 (Instantaneous)	1 to 20 times of CT rated current (in 0.2 times step), Lock	Fixed	±5%	40ms or less
51DT1 (Definite-time)	1 to 20 times of CT rated current (in 0.2 times step), Lock	0 to 5s (in 0.05s step)	±5%	Less than 1s ±50ms More than 1s ±5%
51DT2 (Definite-time)	20 to 240% of CT rated current (in 2% step), Lock	0 to 10s (in 0.1s step)	±5%	Less than 1s ±50ms More than 1s ±5%
51 (Inverse time) SI, EI, VI, LT	20 to 240% of CT rated current (in 2% step), Lock	Time multiplication: 0.5 to 20 times (in 0.1 times step) (Min. operation time: 150ms)	±5%	Setting value 300%: ±12% 500, 1000%: ±7% (lower limit ±100ms)
50G, 50N (Instant/definite time)	0.1 to 8 times of CT rated current (in 0.1 times step), Lock	0.0 to10s to 180s (in 0.1s step.) (in 1s step.) *1 *2	±5%	±5% (lower limit ±50ms)
51G, 51N SI, EI, VI, LT	0.02 to 1.00 times of CT rated current (in 0.01 times step), Lock	Time multiplication: 0.5 to 20 times (in 0.1 times step) (Min. operation time: 150ms)*1	±5% (min. ±100mA)	Setting value 300%: ±12% 500, 1000%: ±7% (lower limit ±100ms)
OCA (Overcurrent pre-alarm)	10 to 100% of CT rated current (in 5% step), Lock	10 to 200s (in 10s step)	±10% (min. ±100mA)	±5%
OCGA (Leakage current pre-alarm)	50, 60, 70, 80% of the setting value of "51G operating current", Lock	10 to 200s (in 10s step)	±10% (min. ±200mA)	±5%

Notes: *1 When a current exceeds 15% of the rated fundamental wave current, the malfunction preventive function against the exciting inrush current activates. (When the contents of the second higher harmonics are about 15% or higher, the feature will lock outputs.) Note that with the 50G relay, the malfunction preventive function against the exciting inrush current will not activate if you set the operate time at 0s.

• Communications specifications

Protocol	MODBUS protocol mode	MPC-Net mode
Standard	EIA-485	EIA-485
Data exchange method	Polling/selecting system	1: N polling/selecting system
Transmission distance	1000m (total length)	1000m (total length)
No. of connectable units	Up to 32 units (including master unit)	Up to 32 units (including master unit)
Station number address	01 to 99	01 to 99
Transmission speed	4800/9600/19200 bps (selectable)	4800/9600/19200 bps (selectable)
Data format	Number of start bits: 1 (fixed) Data length: 8 bits (fixed) Parity bit: None/even/odd (selectable) Stop bits: 1 bit or 2 bit (automatic selection) 1 bit: for "even or odd" parity 2 bit: for "none" parity	Number of start bits: 1 (fixed) Data length: 7/8 bits (selectable) Parity bit: None/even/odd (selectable) Stop bits: 1 (fixed) BCC: Even horizontal parity

■ Type number nomenclature

UM5AC G - H 5 R

Basic type
UM5AC: F-MPC30 series
Feeder unit
(3ø3W/3ø4W use)

Ground fault protection
G: 50G/51G (rated current: 5A)

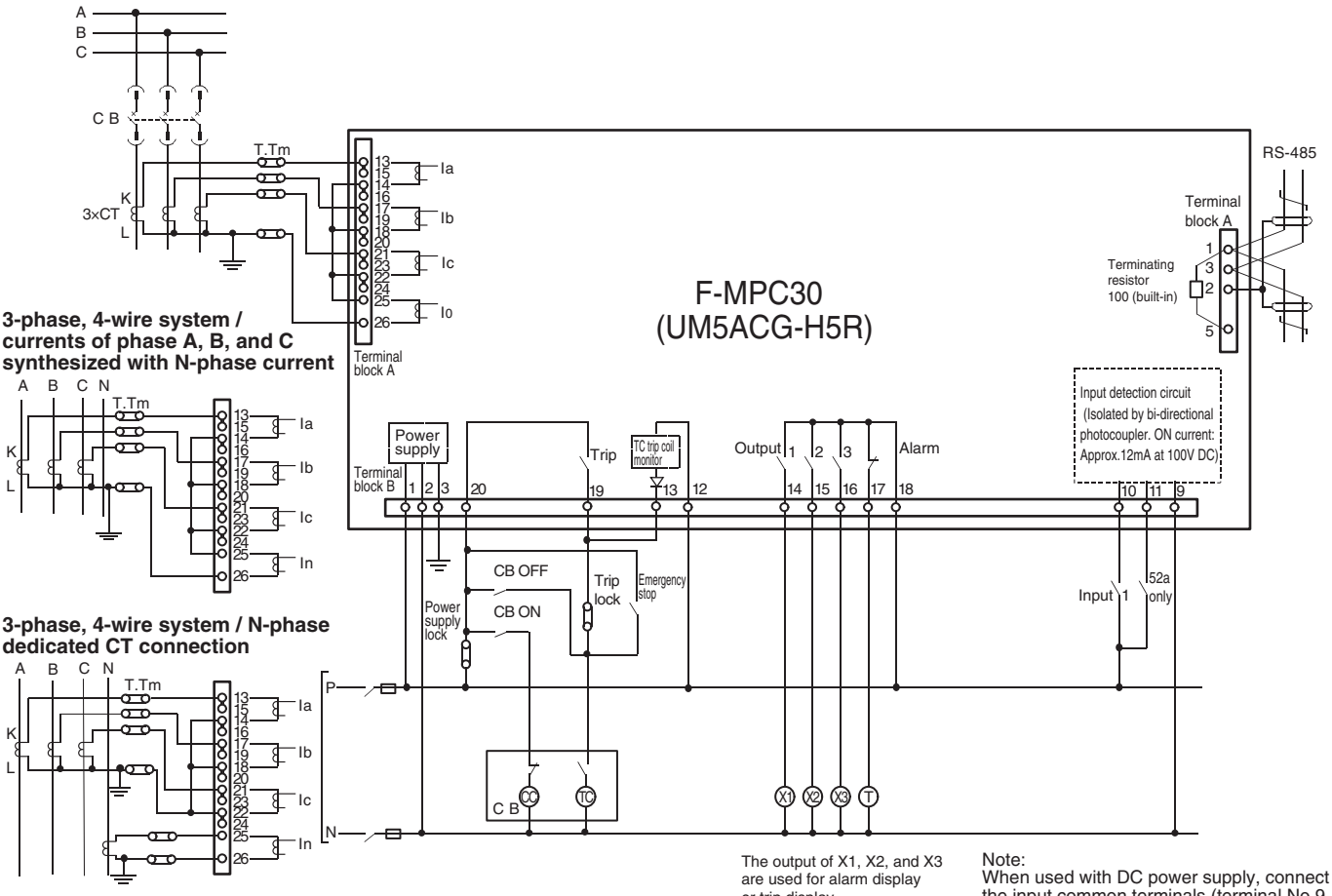
Control power supply
H: 100/200V DC

External interface
R: RS-485 communications interface

CT secondary current
5: 5A

■ Example of external wiring diagram (External 3 CTs)

3-phase, 4-wire system / zero-phase current



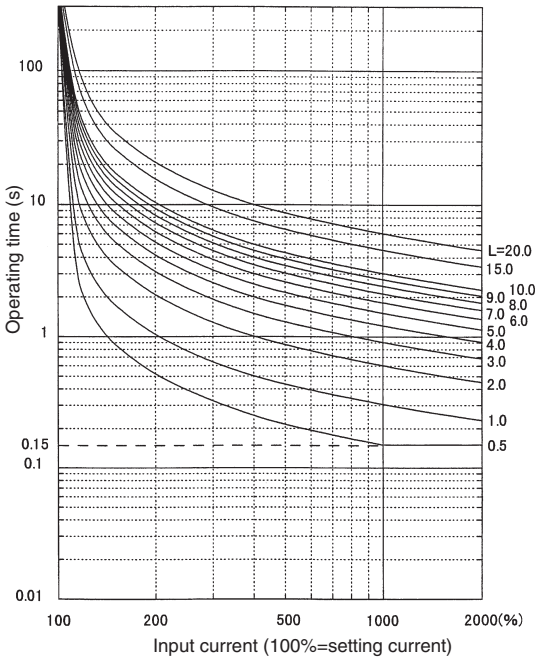
3-phase, 4-wire system / currents of phase A, B, and C synthesized with N-phase current

3-phase, 4-wire system / N-phase dedicated CT connection

Note:
- Use selective input 1 and selective output 1 to 3 by selecting the function type by setup. *See page 63 for details.*
- Outputs of “TRIP and device error” are used exclusively. Inputs of "52a: the answer back signal of CB ON" and "the monitoring of TC coil" are used exclusively.
- Device error output is a normally closed contact (normally excited, and if an error occurs, excitation terminates and contact opens). Therefore, a time delay of about 100ms occurs before the contact opens, since the power has been on (in operation). Consider the use of a timer, if necessary, if you create an external sequence.
- If you have to connect a heavy load exceeding relay’s contact rating, be sure to use it in combination with FUJI’s miniature power relay HH6 series. *See page 63* “Input/output specifications.”
- If this unit, being provided with RS-485 communication function, is located at the termination of a communication line, connect terminals No.3 and 5. With this, the 100Ω terminating resistor is connected across the RS-485 bus.

■Time-current characteristics of an overcurrent relay

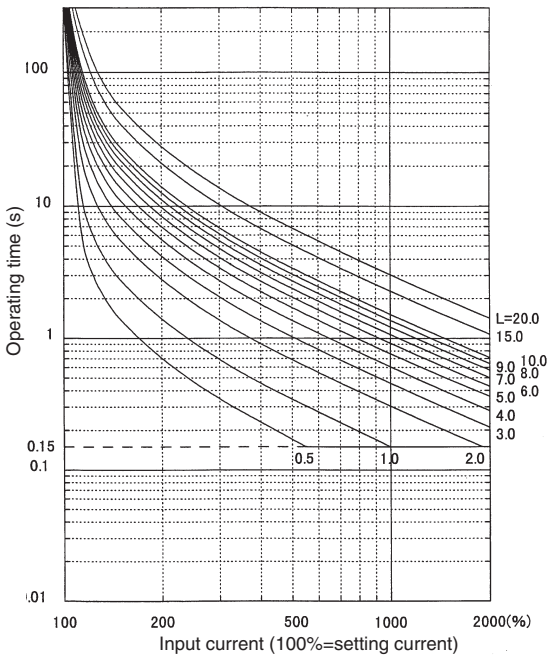
Stnadard inverse (SI) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{0.14}{I^{0.02} - 1} \times \frac{L}{10}$$ (L: Time magnification)

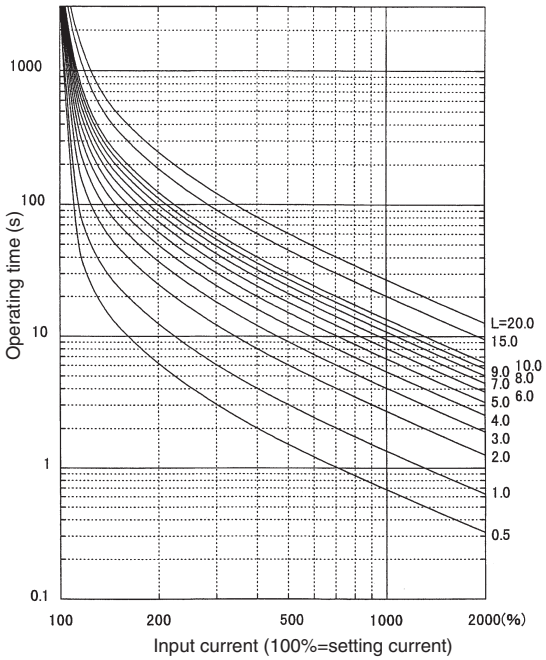
Very inverse (VI) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{13.5}{I - 1} \times \frac{L}{10}$$ (L: Time magnification)

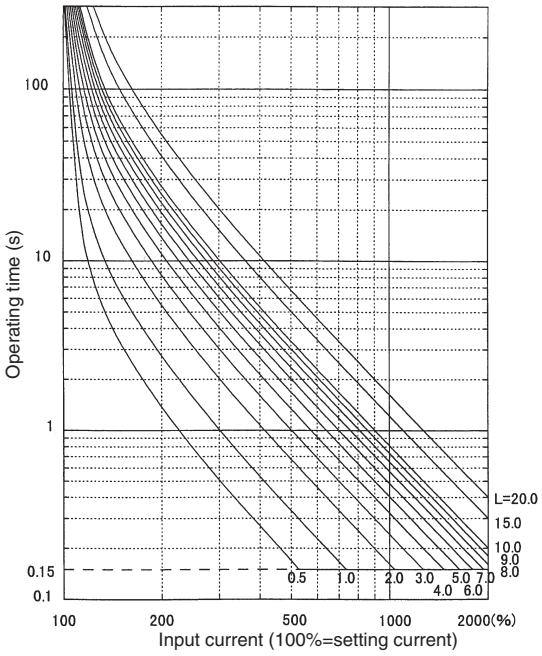
Long time inverse (LT) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{120}{I - 1} \times \frac{L}{10}$$ (L: Time maginification)

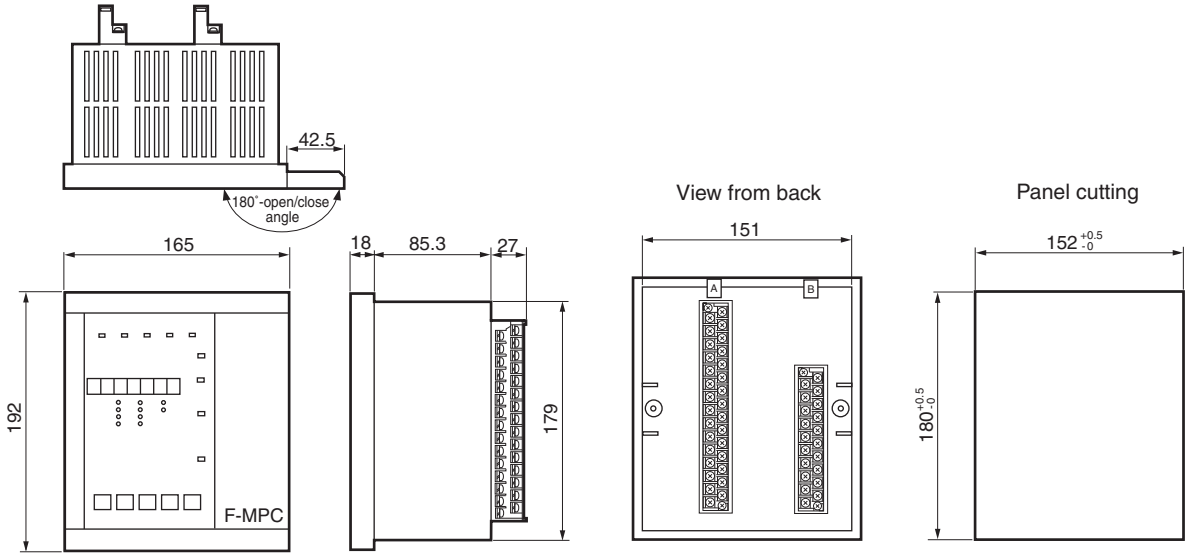
Extremely inverse (EI) characteristics



Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

$$t = \frac{80}{I^2 - 1} \times \frac{L}{10}$$ (L: Time maginification)

■ Dimensions, mm



Minimum clearance from adjacent upper and lower devices or panel plate: 100mm

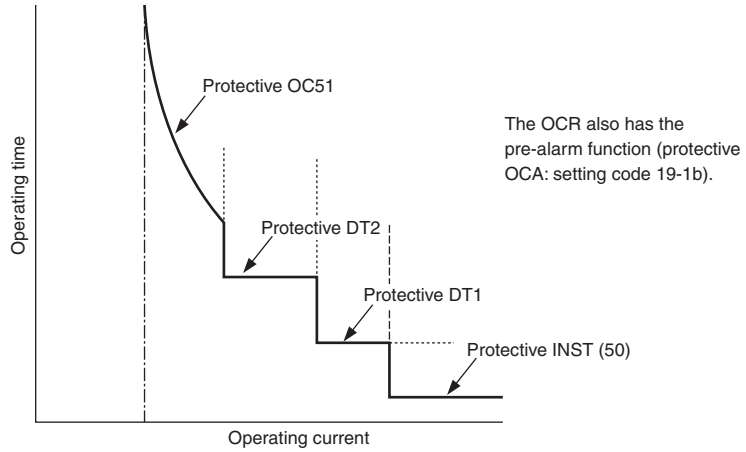
■ Characteristics of overcurrent relay (OCR)

The characteristics of overcurrent relays (OCR) are, in general, divided into the protective INST (50) (setting code 10, 11), the protective DT1 (setting code 12 to 14), protective DT2 (setting code 1c, 1d, 1E) and the protective OC 51 (setting code 15 to18). The characteristics of protective OC 51 consist of 4 kinds of inverse characteristic curves, such as standard inverse (SI) characteristics, very inverse (VI) characteristics, long time inverse (LT) characteristics, extremely inverse (EI) characteristics. Combination of the protective INST (50), protective DT1, protective DT2 and OC 51 carries out coordinative protection.

Outline of characteristic of overcurrent relay.

Item	Operating current	Operating time
Protective INST (50)	1 to 20 times of CT rated current 5A (0.2 times step)	Fixed (40ms or less)
Protective DT1		0 to 5s (0.05s step)
Protective DT2	20 to 240% of CT rated current 5A	0 to 10s (0.1s step)
Protective OC (51)	(2% step) *1	Select from 4 characteristic curves. Time magnification: 0.5 to 20 times (0.1 times step)

*1: The operating time of protective OC 51 is saturated at about 150ms.
The operating time will be saturated at 20 times of CT rated current when the setting exceeds 200%.
For example, the operating time becomes 833% (= 2000%/(240%×100)) of the CT rated current in 240% setting.



The OCR also has the pre-alarm function (protective OCA: setting code 19-1b).

Grid Interconnection Unit

■ Features

- For grid interconnection
  Provides an all-in-one digital multifunctional relay that integrates functions required for protection and monitoring for grid interconnection into a compact unit.
- Network system
  Allows easy construction of an information network system with the host computer by RS-485 and 4 to 20 mA outputs.
- Prevention of erroneous cutoff
  Prevents erroneous cutoff in the unlikely event of part failure by using redundancy of the analog circuit and AND output processing.
- Self-monitoring function
  Constantly monitors the internal operating conditions with a single CPU and is capable of quickly responding in the unlikely event of a failure.

(Photo No. KKD10-116)

■ Rating/Type/Product Code)

Unit name	Control power supply voltage	No. of external CTs	Communication system	Type = product code
For grid interconnection	100 VDC (80 to 143 VDC) 100/200 VAC (85 to 264 VAC)	2CT, 3CT	4-20 mA+RS-485	UM50GS-W5A

■ Type and Functions

Classification	Model Basic type	Protection			Measurement			Transducer output	Pulse output	Demand meter Ry
		64 OVG	67P RP Reverse power	91L UP Underpower	A, DA DA_{max}	V, F, V_0 $V_{0\,max}$ V_{min}	W, DW, var, PF, Wh, varh, DW_{max}			
For grid interconnection	UM50GS	○	○	○	○	○	○	W (2 points)	Wh	DW

(Note 1) For details of the transducer output, see "Transducer output specifications" on 3-20.

■ Specifications

(Note) For the input/output specification, communication specification, dimensions and connection diagram, see the User's Manual or contact us.

• General specifications

Item	Specification
Control power supply	100 VDC (80 to 143 VDC) and 100/200 VAC (85 to 264 VAC) common
Inrush current	11 A max., 5 ms max. (100 VAC, 50 Hz) 7 A max., 30 ms max. (100 VDC)
Power consumption (main unit)	DC control power supply: 15 W max. AC control power supply: 25 VA max.
Rated current (CT secondary)	5 AAC Rated consumption (VA): 1.0 VA max.
Rated voltage (VT secondary)	110 VAC Rated consumption (VA): 1.0 VA max.
Rated zero-phase voltage	ZPD (dedicated) *1
Insulation resistance	Between ground and electric circuits connected together: 10 MΩ min. (500 VDC Megger) Between electric circuits: 5 MΩ min. Between contact circuit terminals: 5 MΩ min.
Vibration resistance	Vibration frequency: 10 Hz, forward-backward/left-right double amplitude: 5 mm, up-down double amplitude: 2.5 mm, for 30 sec in each direction Vibration frequency: 16.7 Hz, double amplitude: 0.4 mm, for 10 min in each of the forward-backward, left-right and up-down double directions
Shock	Three times in 6 directions along 3 axes each with shock of 300 m/s2
Dielectric strength	Between ground and electric circuits connected together: 2 kVAC, for 1 min*2 Not including the communication, transducer and Wh pulse output terminals Between electric circuits: 2 kVAC, for 1 min Not including the communication, transducer and Wh pulse output terminals Between trip contact circuit terminals: 1 kVAC, for 1 min
Grounding	Class D grounding (100 Ω max.)
Weight	1.4 kg
Allowable instantaneous power failure period	Normal operation continues for 2 sec min. in power failure from 170 VAC

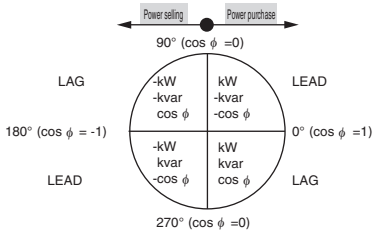
*1: Use ZPD-2 (manufactured by Fuji Electric FA Components & Systems Co., Ltd.).

Item	Specification
Noise immunity	Vibration frequency: 1 MHz, first wave peak value: 2.8 kV, 1/2 damping time: 3 to 6 cycles Repetition frequency: 6 to 10 times/cycle of commercial frequency (asynchronous) JEC2500 waveform 2 (ANSI-compliant)
	Square wave impulse noise with peak voltage of 1.5 kV (1 nsec/1 µsec for 10 min.) For communication line, transducer and Wh output line: square wave impulse noise with peak voltage of 1.0 kV by clamping (1 nsec/1 µsec for 10 min.)
	Transceiver noise: 10 V/m in the 140 MHz, 430 MHz and 900 MHz bands with mobile phone (800 MHz/1.5 GHz 0.8 W) and PHS (1.9 GHz 10 mW) closely attached
Electrostatic noise immunity	Metal contact: ±8 kV, panel surface (nonmental, aerial): ±15 kV
Lightning impulse	Between ground and electric circuits connected together; not including communication, transducer and Wh pulse output 5.0 kV 1.2 x 50 µsec 3 times each of positive and negative Between transformer circuits 5.0 kV 1.2 x 50 µsec positive and negative 3 times each Between instrument transformer circuit and control circuit 5.0 kV 1.2 x 50 µsec positive and negative 3 times each Between control circuits 3.0 kV 1.2 x 50 µsec positive and negative 3 times each Between contact (trip output) circuit terminals 3.0 kV 1.2 x 50 µsec positive and negative 3 times each Between control power supply circuit terminals 3.0 kV 1.2 x 50 µsec positive and negative 3 times each Between instrument transformer circuit and terminal 3.0 kV 1.2 x 50 µsec positive and negative 3 times each
Overload capacity	CT circuit: 40 times the rating, twice for 1 sec VT circuit: 1.25 times the rating, once for 10 sec
Ambient temperature	-20 to 60°C (no condensation or freezing)
Temperature characteristic	Characteristic values at 0°C and 40°C with reference to value at ambient temperature of 20°C Operating value: within ±5%, operating time: within ±10% Characteristic values at -20°C and 60°C: operating value: ±10%, operating time: within ±20%
Storage temperature	-25 to 70°C (no condensation or freezing)
Relative humidity	20 to 90% RH (no condensation)
Operating atmosphere	No corrosive gas or excessive dust

• Measurement/display specifications

Item		Effective display range	Display range and accuracy*1
Current/demand current		0.4 to 120% of CT rating	±1.5% (FS): 0, 0.4 to 120%
Active power/reactive power/ demand active power		±0.004 to ±1 kW at transformer secondary circuit conversion	±1.5% (FS): 0, ±0.004 to ±1 kW (kW: reverse power flow "-" sign/kvar: lead "-" sign)*3
Power factor		Lead 0% to 100% to lag 0%	±5% (lag: no sign/lead: "-")*3
Active/reactive energy*2		0 to 99999, multiplying factor: 1, 10, 100, 1000	Equivalent to ordinary instruments shown in Table 4 of JIS C 1216 (instrument with a transformer)
Voltage/voltage instantaneous power failure history minimum value		5 to 150% of VT secondary (110 VAC)	±1.5% (FS): 0, 5 to 150%
Zero-phase voltage/zero-phase voltage history maximum value	ZPD	0.5 to 100%	1.5% (FS): 0, 1.5 to 40% ±5% (FS): 40 to 100%
Frequency		45 to 55 Hz (50 Hz), 55 to 65 Hz (60 Hz)	±0.5 (FS)%

*1: 0 and a to n means that "0" is indicated in the range from 0 to less than a
*2: There are two types of power indication: (1) total energy (cannot be cleared to zero) and (2) periodic energy (can be cleared to zero).
*3: The sign ± is used to indicate power selling/purchase in power measurement and LEAD/LAG in power factor measurement (indication for "+" is blank). The meaning of ± is as shown in the figure below for the respective measurement items.



(1) Active power kW
+: Power purchase (power consumption)
-: Power selling (reverse power flow)
(2) Reactive power kvar
+: Lagging current by reactive volt-ampere meter method
-: Leading current by reactive volt-ampere meter method
* "LEAD/LAG" reverses with power selling/purchase.
(3) Power factor COS ϕ
+: Lag power factor
-: Lead power factor

• Protective relay specifications

Item	Operating value setting range	Operating time (timer) setting range	Characteristic	
			Operating value	Operating time
64 (OVG)	2.0, 2.5, 3.0 to 40% (in increments of 1.0%) of rating, Lock	0.0 to 5.0 to 120 sec (in steps of 0.1 sec) (in steps of 1.0 sec)	*1	±5% min±50ms
67P (RP)	0.25, 0.5, 1.0, 1.5, 2.0 to 10% (in increments of 1.0%) of rated power, Lock	0.1 to 1.0 to 15 sec (in steps of 0.1 sec) (in steps of 0.5 sec)	±5% min±1.0W *2	±5% min±50ms
91L (UP)	0.5, 1.0, 1.5, 2.0 to 10% (in increments of 1.0%) of rated power, Lock	0.1 to 1.0 to 15 sec (in steps of 0.1 sec) (in steps of 0.5 sec)	±5% min±1.0W *2	±5% min±50ms
Demand power meter relay	20 to 100% (in increments of 5%) of rated power, Lock (return: 95% of operating value setting)	According to demand time period	±20% of operating time setting when 106% of the operating value setting (rated voltage, power factor: 1.0) is applied	

*1: Equivalent to JEC-2511 5 V class (based on the following formula) [2.3% + {(Rating)/(Voltage setting value)} x 0.16] x 2
With ZPD: ±25%
*2: The operating value accuracy: value at a power factor of -1.0 and 1.0; operating value error minimum value: VT and CT secondary power value
Rated power at rated voltage (110 V) and rated current (5 A): √3 x 100 V x 5 A = 953 W

• Transducer output specifications

Item		Specification	Allowable error
No. of transducer output points		2 (active power for both points)	
Allowable load		500 Ω max.	
Response time		2 sec max. (in abrupt change of 10 to 100% and 100 to 10%)	
Output signal range (tentative selection)	Pattern 1	4 to 20 mA for 0 to VT, CT secondary rating 100% (√3 x 110 V x 5 A = 953 W)	±1.0% (cos ϕ = 1.0 to 0.8)
	Pattern 2	4 to 20 mA for 0 to VT, CT secondary rating 100% (√3 x 110 V x 5 A = 953 W) 2.4 to 4 mA for reverse power -10% to 0	
	Pattern 3	4 to 20 mA for 0 to VT, CT secondary power 833 W	
Ripple (with 500 Ω load)		2 x 1% max. for Vp-p	

(Note 1) Output signals are connected to a common terminal (negative side).
(Note 2) An upper or lower limiter is activated when the output signal exceeds the upper or lower limit. The lower limit is fixed at 4 mA or 2.4 mA and the upper limit at 20 mA.

AC power unit

■ Features

This unit is an AC/DC power supply unit, which is used together with a multifunctional digital relay powered by AC control power, and is capable of instantaneous power failure backup.
This unit incorporates the power supply for capacitor trip device as well.

- The usage of this unit concerning the 27 (UV) protective function is shown below.

27 (UV) protective function	AC power unit (UM2P-A1)	Remarks
27 operating time = 0s, or 27 is not used.	Unnecessary	Protection 50 (INST) & protection 27 operate.
27 operating time ≤ 1.0s	Necessary	Protection 27 operates.
27 operating time > 1.0s	Necessary External capacitor required.	See Note *2 of the table shown below.

- This unit incorporates the power supply for capacitor trip device (capacitance 1500μF) used for circuit breaker in addition to the one for F-MPC's control circuit.
- One multifunctional digital relay can be connected to this one AC power unit.

UM2P-A1

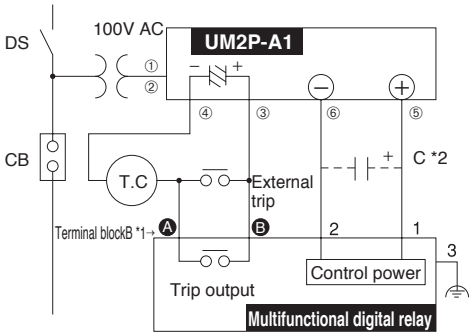
■ Specifications

Item	Specifications	
Type	UM2P-A1	
Input voltage	Rated voltage	100V AC
	Allowable voltage tolerance	85 to 125V AC
Output voltage	Control power for multifunctional digital relay	80 to 143V DC (at control power 85 to 125V AC)
	Power supply for capacitor trip device	80 to 175V DC (at input control power ON)
Output current	Control power for multifunctional digital relay: 0.15A (MPC60B control power capacity + Di input current) at 110V DC Power supply for capacitor trip device: C = 1500μF Only one AC power unit can be connected to one F-MPC60B/50.	
Power failure compensation time (Allowable instantaneous power failure duration)	Control power for multifunctional digital relay: 1s or more (Protective relay is operable for 1s after power failure occurrence) Power supply for capacitor trip device: Charging voltage 75V DC or more after 30s elapses upon power failure occurrence at 60V AC.	
Ambient temperature	-10 to +60°C (no icing or no condensation)	
Inrush current	15A or less, 4.5mA or less (100V AC 50Hz)	
Display	LED (Capacitor charging level indication of capacitor trip device)	
Insulation resistance	10MΩ or more (500V DC) between electric circuits and ground, and between electric circuits *1	
Withstand voltage	2kV AC 1 minute between electric circuits and ground, and between electric circuits *1	
Lightning impulse withstand voltage	1.2/50μs 4.5kV between electric circuits and ground	
Control power voltage	85 to 125V AC	

Note: *1 "Between electric circuits" means "between ① - ② connected together and ③ - ④ - ⑤ - ⑥ connected together."
*2 As the power failure compensation time is 1s, if UV (undervoltage) relay function is enabled and 1s or more of the operating time is set with a power receiving unit only, the UV relay cannot operate with this AC power unit only upon power failure occurrence.
If the UV relay operating time has to be set to 1s or more, use an external capacitor (not supplied, 200V DC or more of withstand voltage) to connect to the multifunctional digital relay's control output section of this unit, referring to the table below.
*3 For the input power to UM2P-A1, supply 100V AC from the CB primary side.
In case the power is supplied from the secondary side, the UM2P-A1 is in power failure state upon CB open so that F-MPC cannot indicate the fault state.

Protection 27 (UV) operating time	External capacitor capacitance	Example of capacitor
1.2 to 2.0s	1500μF	LNT2D152MSM, NICHICON CORPORATION-made
2.2 to 5.0s	6800μF	LNT2D682MSM, NICHICON CORPORATION-made
6.0s or more	1600 x t (μF)	t: Protection 27 operating time (setting value)

■ Overview of devices combined



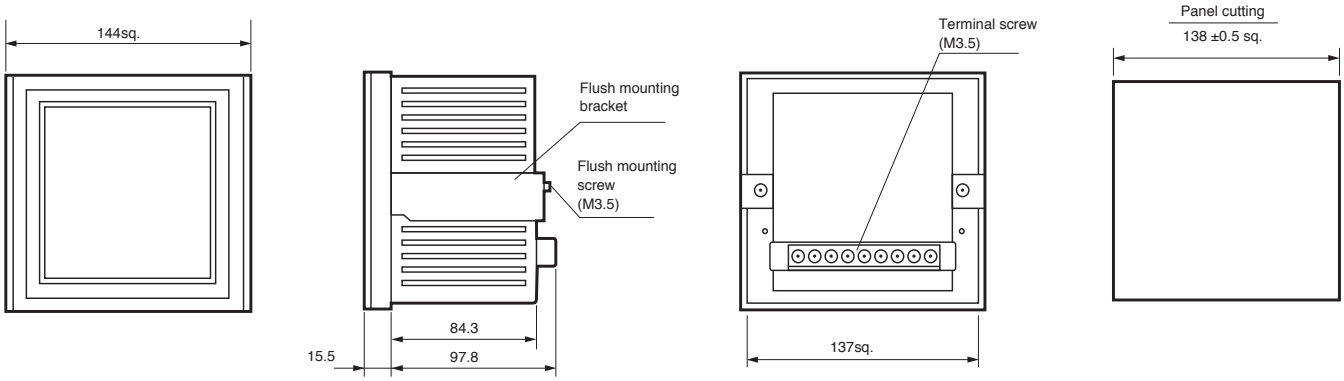
*1 Correspondent terminal number

	F-MPC50	F-MPC60B
Ⓐ	19	29
Ⓑ	20	30

*2 The power cut guarantee time of this power unit UM2P-A1 is 1 second. Therefore, the protection 27(Under Voltage)" cannot normally operate in power cut when it is set at exceeding 1 second in 27(Under Voltage) operation time.
Connect when the operating time of 27(under voltage) is 1seconds or more. "condenser the withstand voltage is over 200VDC" to "the control output part of the multifunctional relay: F-MPC", referring to the fallowing table, Note that the condenser is not included in the accessories and should be prepared by customers.

Operating time of 27(UV)	Capacity	Example of condenser
1.2s to 2.0s	1500μF	LNT2D152MSM, NICHICON CORPORATION-made
2.2s to 5.0s	6800μF	LNT2D682MSM, NICHICON CORPORATION-made
6.0s or more	1600μF x t (μF)	t: operating time of 27(UV)

■ Dimensions, mm



Zero-Phase Potential Device for F-MPC50/60B Series

■ Application

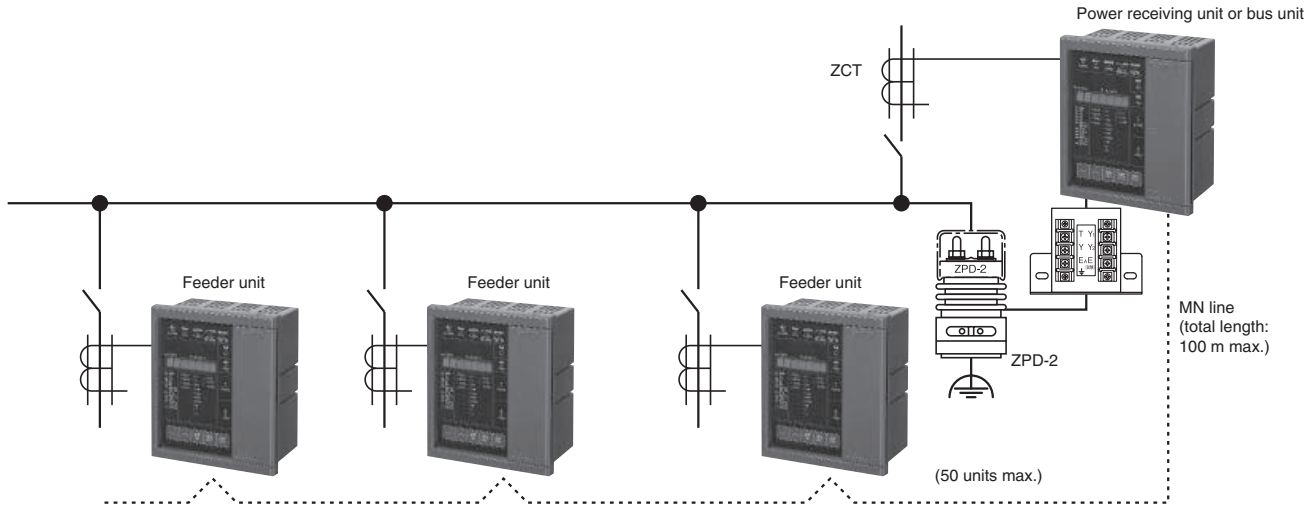
Can be combined with the F-MPC60B and 50 Series digital multifunctional relays (digital multifunctional relays cannot be combined with other ZPD for use).
The power receiving unit or bus unit receives a zero-phase voltage signal from ZPD-2 and outputs it as a phase pulse signal if it is at the designated (set value) level or higher. The feeder unit, if this phase pulse signal and its own zero-phase current signal are at the designated (set value) level or higher, performs phase discrimination and operates as a ground directional relay (67DG).
(Note) Ensure that the total extension of the MN signal line does not exceed 100 m and the number of feeder units connected does not exceed 50. Ensure that the MN signal line is twisted (or use a twisted line).
ZPD-2 and the power receiving unit or bus unit are connected 1:1.

■ Model/Type/Specification

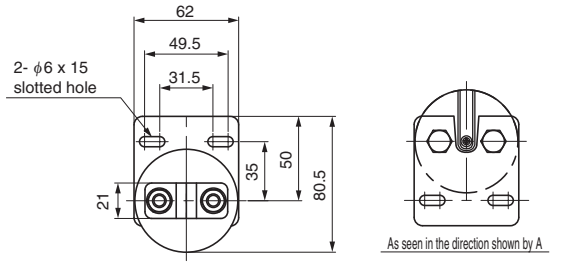
Structure	Indoor epoxy resin post insulator type
Type	**ZPD-2**
Product code	HZ1JE
Rated voltage [kV]	6.6
Capacitance [pF]	250 x 3 phases
Insulation class	6A 22 kVAC/1 min, lightning impulse 60 kV/10 sec

ZPD-2 is the successor of ZPD-1 and compatible in terms of characteristics. ZPD-1 has been discontinued.

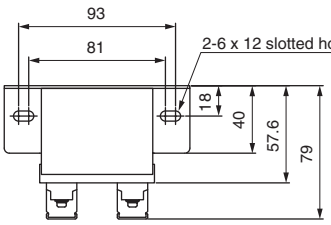
■ Connection Diagram Example



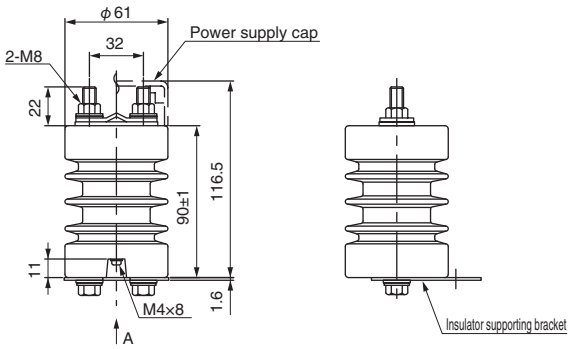
■ Dimensions [Unit: mm]

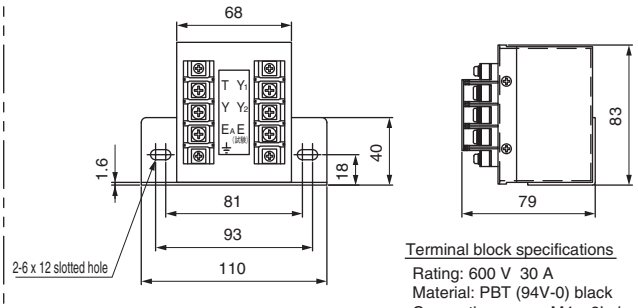


Zero-phase voltage detecting insulator of ZPD-2 (3 pcs in 1 set)



Zero-phase voltage transformer of ZPD-2





Terminal block specifications
Rating: 600 V 30 A
Material: PBT (94V-0) black
Connecting screw: M4 x 8L brass

Popular type DIN 96 × 48 size with 4.5-digit display

■ Discription

- Product with operating keys with no surface (provided on the front panel)
- Products with various functions and option outlets are available.

■ Features

- Small and thin size of 96 (W) × 48 (H) × 75 (D) mm
- Supports measurement of DC voltage and current, measurement of AC voltage and current, process signal measurement and temperature measurement (thermocouple and resistance temperature sensor) (multiple and wide range of measurements is possible (however, high voltage products and large current products are excluded))
- Display is in 4.5 digits and letter height is 14.2 mm using large and high-luminance red LED.
- Operation keys are of a surface-less type (provided on the front panel) and are optimum for general-purpose devices (scaling function, linearization function and external control function are built-in).

(EU directive 2002/95/EC)

- BCD output product is available as an option (TTL output or open collector specification).
- Terminal: M3 screw (power source area and signal input area)
- All types conform to RoHS directive (lead-free).

■ Type number nomenclature

WA9 □ 1 □ – 0□

Power source

1	AC100 to 240V
3	DC5 to 12V
4	DC12 to 24 V

Input

1	DC voltage measurement
2	DC current measurement
4	AC voltage measurement (true RMS value)
5	AC current measurement (true RMS value)
6	AC large current measurement (5A: true RMS value)
B	Process signal measurement
C	Temperature measurement (thermocouple)
D	Temperature measurement (resistance temperature sensor)
E	DC high voltage measurement (measurement of ±700 V)
F	AC high voltage measurement (700 V true RMS value)

Output (External control is supplied as standard.)

1	None (product only for displaying)
2	BCD output (TTL specification)
3	BCD output (open collector specification)

■ List of products

• DC voltage measurement Type: WA9□11-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
11	±199.99mV	Offset: ±19999 Full scale: ±19999	100MΩ	±50V
12	±1.9999V			
13	±19.999V		1MΩ	±250V
14	±199.99V			

(Note) Accuracy: ± (0.1% of rdg (displayed value) + 2 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH)

• DC high voltage measurement Type: WA9□1E-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
15	±700.0V	Offset: ±19999 Full scale: ±19999	10MΩ	±700V

(Note) Accuracy: ± (0.1% of rdg (displayed value) + 3 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH)

• DC current measurement Type: WA9□12-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
22	±1.9999mA	Offset: ±19999 Full scale: ±19999	10Ω	±50mA
23	±19.999mA			
24	±199.99mA		0.1Ω	±3A
25	±1999.9mA			

(Note) Accuracy: ± (0.2% of rdg (displayed value) + 3 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH)

• AC voltage measurement (display of true RMS value) Type: WA9□14-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
11	±199.99mV	Offset: ±19999 Full scale: ±19999	100MΩ	±50V
12	±1.9999V			
13	±19.999V		1MΩ	±250V
14	±199.99V			

(Note) 1. Accuracy: ± (0.2% of rdg (displayed value) + 20 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH)
(applies to sine wave of 5% or more of full scale)
2. Response speed: Approx. 1 sec. (display of 10 to 90%)
3. Range of frequencies: 40 Hz to 1 kHz

• AC high voltage measurement (display of true RMS value)
Type: WA9□1F-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
15	700.0V	Offset: ±19999 Full scale: ±19999	100MΩ	700V

(Note) 1. Accuracy: ± (0.2% of rdg (displayed value) + 20 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH)
2. Response speed: Approx. 1 sec. (display of 10 to 90%)
3. Range of frequencies: 40 Hz to 1 kHz

• AC large current measurement (display of true RMS value) Type: WA9□16-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
26	5A	Offset: ±19999 Full scale: ±19999	CT (10Ω or less)	8A

(Note) 1. Accuracy: ± (0.5% of rdg (displayed value) + 20 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH) (applies to sine wave of 5% or more of full scale)
2. Response speed: Approx. 1 sec. (display of 10 to 90%)
3. Range of frequencies: 40 Hz to 1 kHz

• Temperature measurement (thermocouple) Type: WA9□1C-0□

Range	Sensor	Resolution	Display	Accuracy*	Maximum allowable input
KA	K	0.1°C	–50 to +199.9°C	±0.5% of FS	±5V
KB			–50 to +1200.0°C	±0.2% of FS	
J	J		–50 to +1000.0°C		
T	T		–50 to +400.0°C	±0.6% of FS	
S	S		0 to +1700.0°C	±0.4% of FS	
R	R		–10 to +1700.0°C		
B	B		100 to +1800.0°C	±0.4% of FS	

*Accuracy measurement conditions: 23°C±5°C, 35 to 85% RH
* Measurement accuracy of range B: Applies to 500°C or more.

(Note) 1. Cold contact compensation error: ±2°C
2. Sensor internal resistance: 50Ω or less
3. Decimal point: Displayed at fixed position in each range
4. Burnout warning: "-----" is displayed

• AC current measurement (display of true RMS value)
Type: WA9□15-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
23	19.999mA	Offset: ±19999 Full scale: ±19999	10Ω	50mA
24	199.99mA		0.1Ω	3A
25	1999.9mA			

(Note) 1. Accuracy: ± (0.2% of rdg (displayed value) + 20 digit) (measurement conditions: 23°C ±5°C, 35 to 85% RH) (applies to sine wave of 5% or more of full scale)
2. Response speed: Approx. 1 sec. (display of 10 to 90%)
3. Range of frequencies: 40 Hz to 1 kHz

• Process signal measurement Type: WA9□1B-0□

Range	Measurement range	Display	Input impedance	Maximum allowable input
2A	4 to 20mA	Offset: ±19999 Full scale: ±19999	10Ω	±50mA
1V	1 to 5V		1MΩ	±50V
3V	0 to ±10			

(Note) 1. Accuracy and range (2 A): ± (0.2% of rdg (displayed value) + 3 digits)
(Measurement conditions: 23°C ±5°C, 35 to 85% RH)
(Note) 2. Accuracy and range (1 V, 3 V): ± (0.1% of rdg (displayed value) + 3 digits)
(Measurement conditions: 23°C ±5°C, 35 to 85% RH)

• Temperature measurement (resistance temperature sensor)
Type: WA9□1D-□□

Range	Sensor	Resolution	Display	Accuracy*
PA	Pt–100Ω	0.1°C	–100.0 to +199.9°C	±0.2% of FS
JPA	JPt–100Ω			
PB	Pt–100Ω	1°C	–100 to +600°C	±0.6% of FS
JPB	JPt–100Ω		–100 to +500°C	

*Accuracy measurement conditions: 23°C±5°C, 35 to 85% RH

(Note) 1. Resistor current: Approx. 1 mA
2. External resistance: 10Ω or less per lead line
3. Decimal point: Displayed at fixed position in each range
4. Burnout warning: "OL" is displayed at disconnection of A or B. "-----" is displayed at disconnection of C

■ Specifications

Display	Red 7-segment LED, letter height approx. 14.2 mm
Display range	-19999 to 19999 (display of 4.5 digits)
Zero display / Dead zone	Reading-zero suppression / No dead zone for AC input products as well
Power source	- AC 100 to 240 V (allowable range: 90 to 264 V), - DC 5 to 12 V (allowable range: 4.5 to 13.2 V) - DC 12 to 24 V (allowable range: 10.8 to 26.4 V)
Power consumption	AC rated product: Approx. 4.5 VA (TYP), DC rated product: Approx. 1.7 W
Sampling speed	Max. 25 times/sec.
Over-range warning	"O.L." or "–O.L." is displayed for input signal of maximum display or more
Main functions	Scaling function (excluding for temperature measurement), linearization function, averaging process function, digital zero backup function, external control "hold, digital zero, peak hold, pattern select" function (short circuit between terminals)
Built-in EEPROM Allowable re-writing times	1 million times minimum (Other than when the parameter setting is changed, rewriting of EEPROM is performed also when digital zero is turned ON from OFF in a condition where digital zero backup is set to ON.)
Service temperature and humidity range	0 to 50°C, 35 to 85% RH (no dew condensation)
Storage temperature range	-10 to 70°C (however, no icing or no condensation)
Outline dimensions (mm)	96 (W) × 48 (H) × 75 (D)
Dielectric strength	- AC 1500 V for one min.: Between power source - signal input / external control input / BCD output terminal (AC power source product) - DC 500 V for one min.: Between power source - signal input / external control input / BCD output terminal (DC power source product) - DC 500 V for one min.: Between input signal - BCD output and external control terminal (common) - AC 1500 V for one min.: Between case - each terminal (common)
Insulation resistance	100 MΩ or more between each terminal described above (with DC 500 V mega)
Mass	Approx. 160 g (for AC power source product), approx. 150 g (for DC power source product)
Accessory	Instruction manual, unit seal and socket connector

■ External control

Hold	Hold ON at short circuit of HOLD terminal and COM terminal or by "0" level
Digital zero	Digital zero ON by short circuit of DZ terminal and COM terminal or by "0" level
Peak hold	Peak hold function ON at short circuit of PH terminal and COM terminal or by "0" level
Pattern select	Selection of scaling data pattern by combination of open/short circuit (or "1" level / "0" level) of P. SELO terminal and P. SEL 1 terminal
Control signal "0" level	0 to 1.5 V against COM
Control signal "1" level	3.5 to 5 V against COM

■ Option specifications

• BCD output

• TTL output

Measurement data	Tri-state parallel BCD
Polarity signal	“1” level when the display is showing negative value
Over signal	“1” level when the display is showing exceeded value
Printing command signal	Positive pulse output after completion of measurement
Output logic	Possible to switch (excluding printing command signal)
Output signal	TTL level Fine out 2 CMOS compatible

• Enable

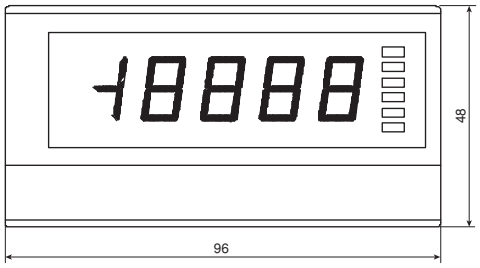
Function	BCD output is in high impedance (TTL output) / transistor OFF (open collector output) by short circuit of ENABLE terminal and COM terminal or by “0" level.
Control signal “0” level	0 to 1.5 V against COM
Control signal “1” level	3.5 to 5 V against COM

• Open collector output (NPN type)

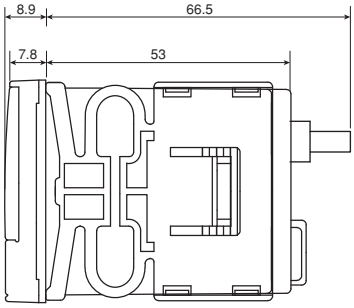
Measurement data	Transistor “ON” when the negative logic is “1”
Polarity signal	Transistor “ON” when the display is showing negative value
Over signal	Transistor “ON” when the display is showing exceeded value
Printing command signal	Transistor “ON” after completion of measurement
Output logic	Possible to switch (excluding printing command signal)
Transistor output	Voltage DC 30 V max. Current 10 mA max. 1.2 V or less when output saturation voltage is 10 mA

■ Dimensions, mm

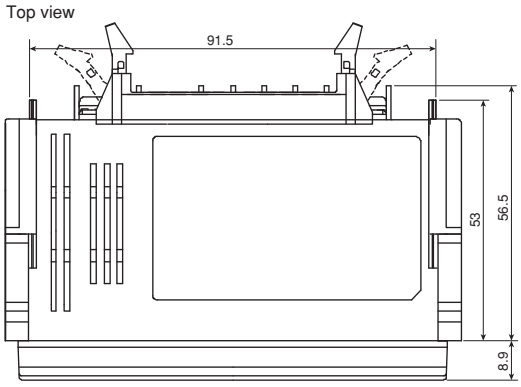
Front view

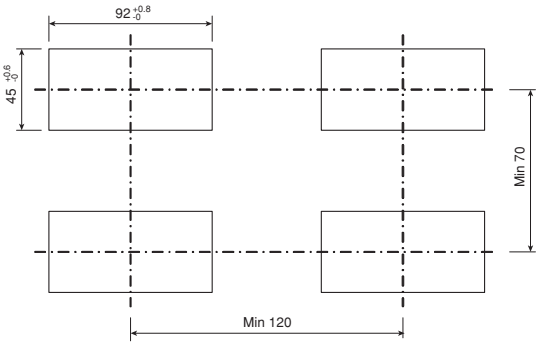


Right side view



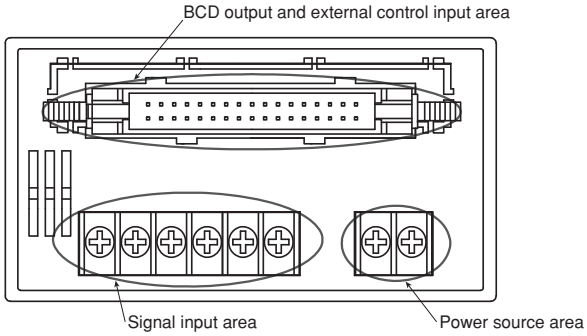
Top view



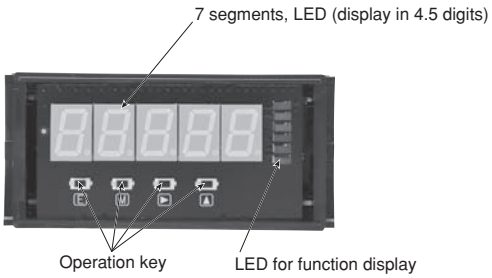


Panel cutting (panel plate thickness 0.8 to 5 mm)

Rear surface terminal explanation drawing



Explanation diagram of operation key in front panel
(condition where front panel is removed)

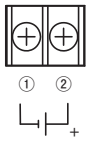


■ Wiring diagram [Terminal: M3 screw]

• Power source

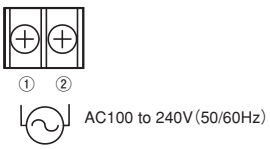
WA931□-0□
WA941□-0□

DC drive power source

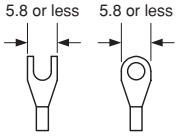


WA911□-0□

AC drive power source



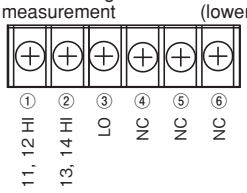
• Conforming crimp terminal



• Input

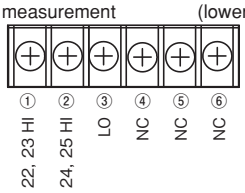
WA9□11-0□
WA9□14-0□

DC AC voltage measurement (lower terminal)



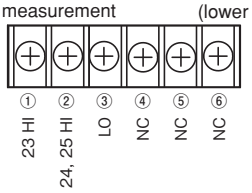
WA9□12-0□

DC current measurement (lower terminal)



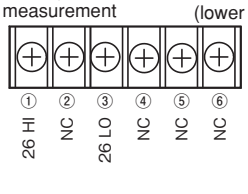
WA9□15-0□

AC current measurement (lower terminal)



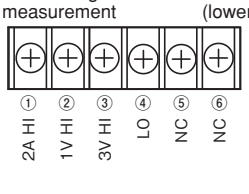
WA9□16-0□

AC large current measurement (lower terminal)



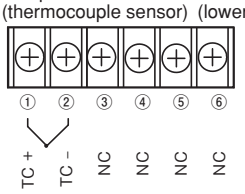
WA9□1B-0□

Process signal measurement (lower terminal)



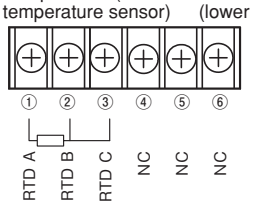
WA9□1C-0□

Temperature (thermocouple sensor) (lower terminal)



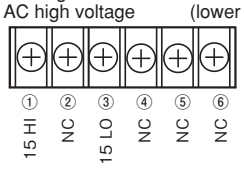
WA9□1D-0□

Temperature (resistance temperature sensor) (lower terminal)



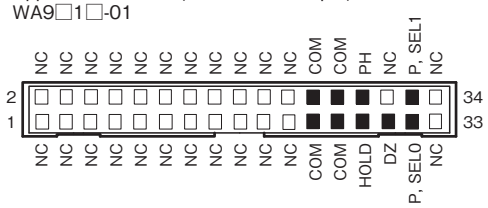
WA9□1E-0□
WA9□1F-0□

15 ranges of DC and AC high voltage (lower terminal)

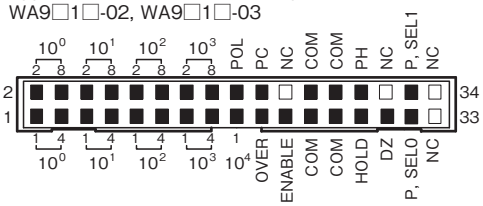


• Output

Upper side terminal (with no BCD output)
WA9□1□-01



Upper side terminal (with BCD output)
WA9□1□-02, WA9□1□-03



Upper side terminal connector:
HIF-3BA-34D-2.54DS
(Hirose Electric Co., Ltd.)

Supplied connector:
HIF-3BA-34D-2.54R
(Hirose Electric Co., Ltd.)

Conforming to RoHs and CE marking

■ Features

- Possible to select with or without isolation between input and power source
- Improvement in visibility by high-luminance LED (3 1/2 display)

■ DC voltage measurement

Range	Measurement range	Accuracy	Input impedance	Maximum allowable input
22	±1.9999mV	± (0.1% of FS)	100MΩ	±50 V
23	±1.999V			
24	±19.99V		Approx. 1 MΩ	±120 V
25	±199.9V			±250 V

■ DC current measurement (insulated power source type only)

Range	Measurement range	Accuracy	Input impedance	Maximum allowable input
22	±1.999mA	± (0.2% of FS)	100Ω	±50mA
23	±19.99mA		10Ω	±150mA
24	±199.9mA		1Ω	±500mA
25	±1.999mA		0.1Ω	±3mA

■ Power source specifications

- Non-insulation type
  Power source voltage: 5V DC±5%
  Power consumption: Approx. 60 mA
- Insulation type
  Power source voltage: 4.75 to 26.4 V DC
  Power consumption: Approx. 100 mA

■ General specifications

Display: 7-segment LED (letter height 10 mm)
Operation method: Double integral method
Input circuit: Single ended type
Sampling speed: Approx. 2.5 times/sec.
Polarity display: Automatically displays when the calculation result is negative.
Maximum display: 1999
Over range warning: Flashes displaying 000 or -000 for input signal exceeding the measurement range.
Decimal point: Possible to set by the socket on the display surface panel
External control: Hold (by input LO terminal and hold terminal short circuit)
Service temperature and humidity range: 0 to 50°C, 35 to 85% RH (no dew condensation)
Storage temperature and humidity range: -10 to 70°C 60% RH or less (no dew condensation)
Outline dimensions: 48 mm (W) × 24 mm (H) × 39.7 mm (D)
Mass: Approx. 40 g
Dielectric strength: Between power source terminal and input terminal
500 V AC for one min. (insulated type only)
1500 V AC between case and each terminal for one min.
Insulation resistance: Between power source and input terminal
500 V DC 100 MΩ or more (insulated type only)
Accessory: Instruction manual

■ Component of type

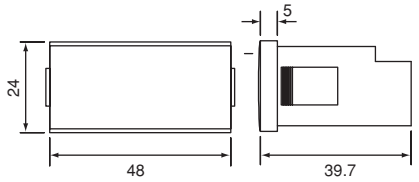
WA21□0-□□

Power source (two types)
: 1. Non insulated power source (for 5 V DC)
  2. Insulated power source (for 5 to 24 V DC)

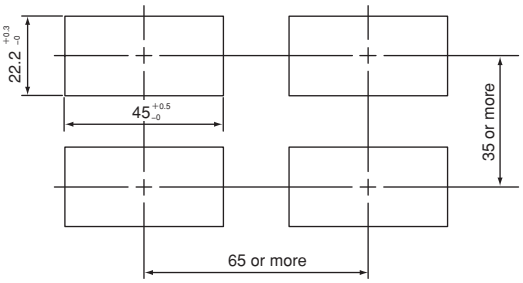
Input range
: 11. ±199.9mV
  12. ±1.999V
  13. ±19.99V
  14. ±199.9V
  ✶22. ±1.999mA
  ✶23. ±19.99mA
  ✶24. ±199.9mA
  ✶25. ±1.999A

*Power source: Supports 2. Insulated power source only.

■ Dimensions, mm

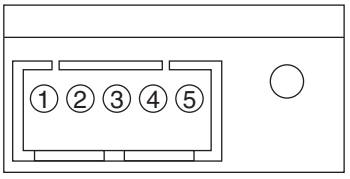


■ Panel cutting (panel plate thickness 0.8 to 3.5 mm)



■ Wiring diagram (terminal structure: Press-tightening terminal)

(Connection line diameter size: AWG 23 to 16)



Terminal No.	Name	Explanation
1	HI	Input signal + side
2	LO	Input signal - side
3	HOLD	External control terminal
4	0V	Power source terminal - side
5	+V	Power source terminal + side

Power source insulation system: ⑤ terminal + 5 to 24 V, LO and 0 V are not connected internally.
Power source non-insulation system: ⑤ terminal + 5 V, LO and 0 V are connected internally.

Meter relay WD3215 series

Conforming to RoHs and CE marking

■ Features

- Compact case DIN size [48 mm (W) × 24 mm (H) × 88 mm (D)]
- Digital scaling by operating on front surface
- Two-step setting comparative output (relay photo-coupler)

■ Input specifications

- DC voltage measurement

Range	Measurement range	Display	Input impedance	Maximum allowable input
11	±99.99mV	Offset: ±9999 Full scale: ±9999	100MΩ or more	±50V
12	±999.9V		100MΩ or more	±50V
13	±9.999V		Approx. 1MΩ	±50V
1V	1 to 5V		Approx. 1MΩ	±50V

Accuracy : ± (0.03% of rdg+ 2 digits) (at 23°C±5°C)

- DC current measurement

Range	Measurement range	Display	Input impedance	Maximum allowable input
2A	4 to 20mA	Offset: ±9999 Full scale: ±9999	Approx. 50Ω	±60mA

Accuracy : ± (0.1% of rdg+ 2 digits) (at 23°C±5°C)

■ General specifications

- Measurement area
  Measurement function: Select one type between DC voltage and DC current (single range)
  Input circuit: Single ended
  Operation method: Double integral method
  Sampling speed: Max. 12.5 times/sec. (50 Hz) or 15 times/sec. (60 Hz)
  Display: Red 7-segment LED display (letter height 8 mm)
  Polarity display: Displays "–" when the calculation result is negative.
  Over range warning: Flashes displaying OL or -OL for input signal exceeding the measurement range.
  Maximum display: ±9999 (full 4 digits)
  Decimal point: Possible to set at required position using the front sheet switch
  Zero display: Reading zero suppression
- Comparison area
  Control method: Microcomputer calculation method
  Setting range: -9999 to 9999
  Comparison operation: By sampling speed
  Comparison condition: (Upper and lower limit judgment)

Comparison condition	Judgment result	
Measurement value > Upper limit judgment value	AL2	OUT3
Lower limit judgment value ≤ Measurement value ≤ Upper limit judgment value	OFF	OUT2
Lower limit judgment value > Measurement value	AL1	OUT1

  Setting condition: Lower limit judgment value < Upper limit judgment value
  Hysteresis: Possible to set from 1 to 999 digits for each comparison judgment value
  Output form: Relay contact output (b contact output is not supported)
  Output rating: 24 V DC 1 A (resistive load)
- External control area
  Digital zero: Digital zero ON by short circuit or equal electric potential between DZ terminal and COM terminal
- External power source area
  Rating: 24 V DC±5%
  Maximum load: 25 mA
- Analog output area (Simultaneous installation with RS-485 is not possible.)
  Output function: Select either 4 to 20 mA or 0 to 10 V DC
  Output specifications:

Type	Load resistance	Accuracy	Ripple
4 to 20mA	0 to 250Ω	± (0.5% of FS)	25mVp-p or less
0 to 10V	10kΩ or more	± (0.5% of FS)	50mVp-p or less

- RS-485 area (Simultaneous installation with analog output is not possible.)
  Synchronization method: Start-stop synchronization
  Communication method: Two-line type half duplex (polling/selecting method)
  Transmission speed: 38400 bps, 19200 bps, 9600 bps, 4800 bps, 2400 bps
  Start bit: 1 bit
  Data length: 7 bits
  Error detection: Even parity, BCC (block check character) checksum
  Stop bit: 2 bits
  Letter code: ASCII code
  Delimiter: CR + LF
  Transmission control procedure: Non-procedure
  Used signal name: Non-inversion (+), inversion (-)
  Number of connecting units: 31 units maximum for meters
  Route length: 500 m maximum (total)

■ Common specification

Backup: Setting data is saved by EEPROM (number of writing times 100,000 times)
Service temperature and humidity range: 0 to 50°C, 35 to 85% RH (no dew condensation)
Storage temperature and humidity range: -20 to 70°C 60% RH or less (no dew condensation)
Power source voltage: 24 V DC±20%
Power consumption: Approx. 4 W
Outline dimensions: 48 mm (W) × 24 mm (H) × 87.8 mm (D)
*Including screw terminal
Mass: Approx. 100 g
Dielectric strength: Between power source terminal, input terminal and each output terminal
DC 500 V One min.
DC 500 V between input terminal and each output terminal for one min.
Between case and power source terminal, input terminal and each output terminal
Insulation resistance: 500 V DC 100 MΩ or more between terminals described above
Accessory: Instruction manual, mounting adapter, unit seal

■ Component of type

WD3215 □□-□□

- Basic type
- Input range
  - : 11. ±99.99mV
  - : 12. ±999.9mV
  - : 13. ±9.999V
  - : 1V. 1 to 5V
  - : 2A. 4 to 20mA
- Comparative output
  - : 1. Relay contact output
  - : 2. Photo-coupler output
- Option output
  - : 1. None
  - : 4. RS-485 interface
  - : 6. Analog output (4 to 20 mA)
  - : 7. Analog output (0 to 10 V)

■ Wiring diagram

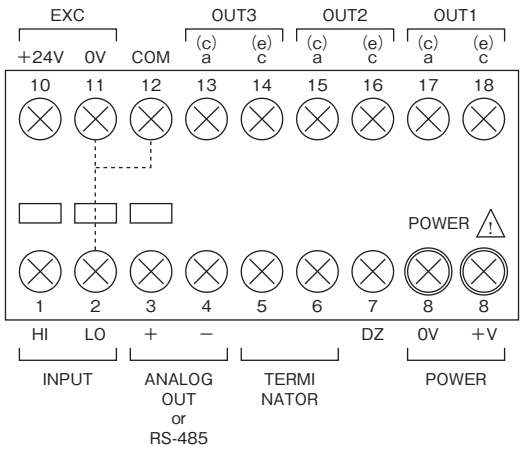
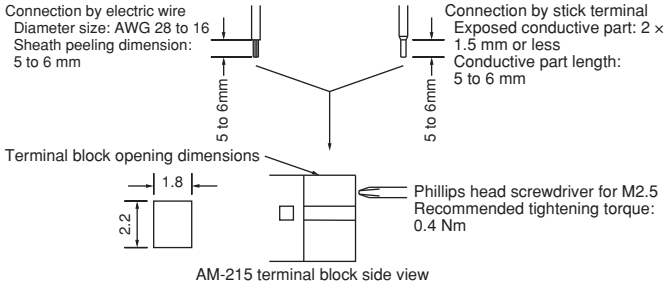


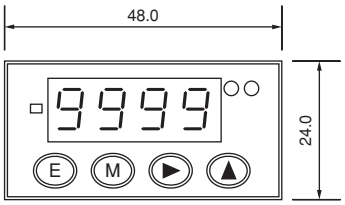
*Figure inside parentheses at comparative output indicates the wiring at photo-coupler output.

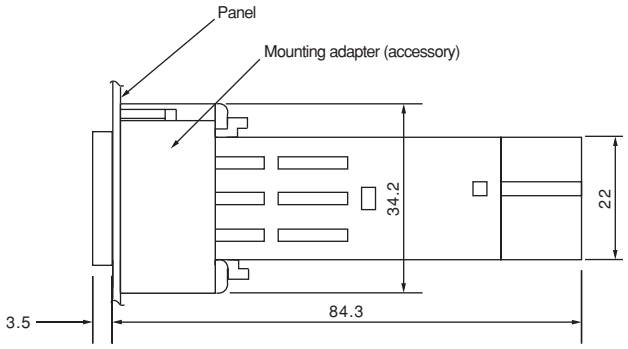
■ Usable wiring material



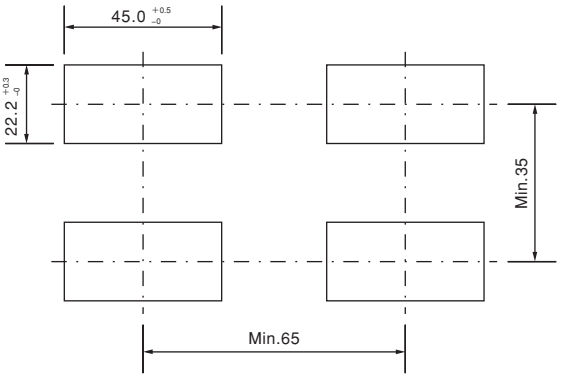
AM-215 terminal block side view

■ Dimensions, mm





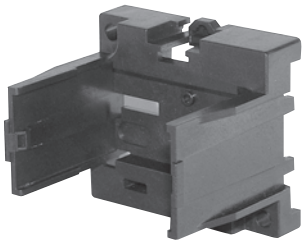
■ Panel cutting



*Recommended panel plate thickness: 1 to 8 mm

■ Accessories

• Adapter for DIN rail mounting
  Type: ZZP*CTK368715P1



When mounting

⚠ Safety Considerations

- Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
- For safe operation, before using the product read the instruction manual or user manual that comes with the product carefully or consult the Fuji sales representative from which you purchased the product.
- Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives.
- Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, passenger vehicle, and traffic control, are requested to consult with Fuji Electric FA.
- Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.
- For safe operation, wiring should be conducted only by qualified engineers who have sufficient technical knowledge about electrical work or wiring.
- Follow the regulations of industrial wastes when the product is to be discarded.
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