

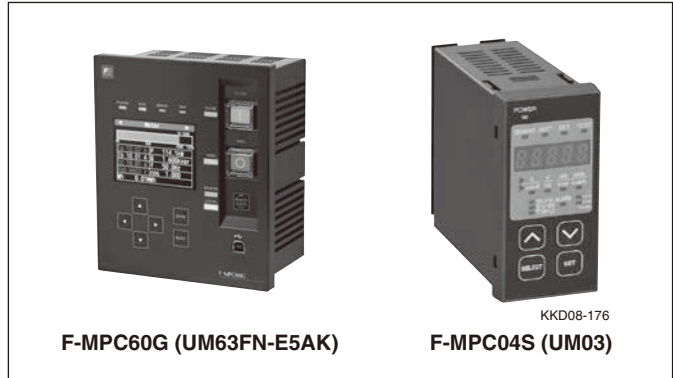
Power Monitoring Equipment General Information

Power monitoring equipment (F-MPC) F-MPC60, F-MPC30, F-MPC04 series

■ Description

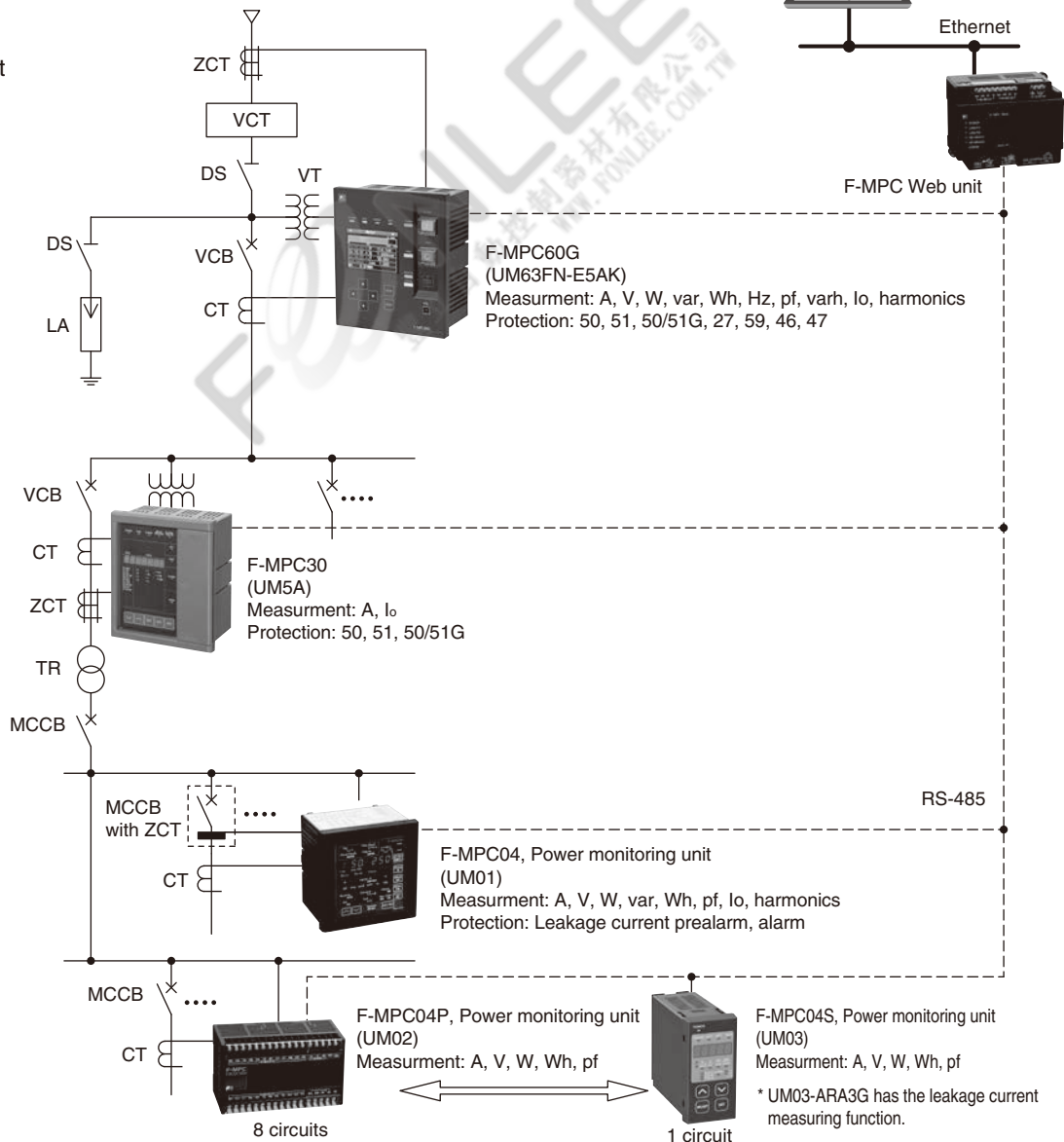
- FUJI power monitoring equipment (F-MPC) realizes fine power management to contribute to energy-saving.
- We can offer you various F-MPC equipment such as F-MPC04 series power monitoring unit that measures electric power of one to multi-circuits, and compact size F-MPC60G, F-MPC30 series multifunctional digital relay that protects, controls, and measures high-voltage distribution facilities.
- As support tool, a power monitoring system software, F-MPC-Net is also available, which collects and analyzes data measured by F-MPC.
- As related products of F-MPC, molded case circuit breaker with ZCT and split type current transformer are introduced.

■ Power monitoring equipment used in power distribution system



High voltage circuit

Low voltage circuit



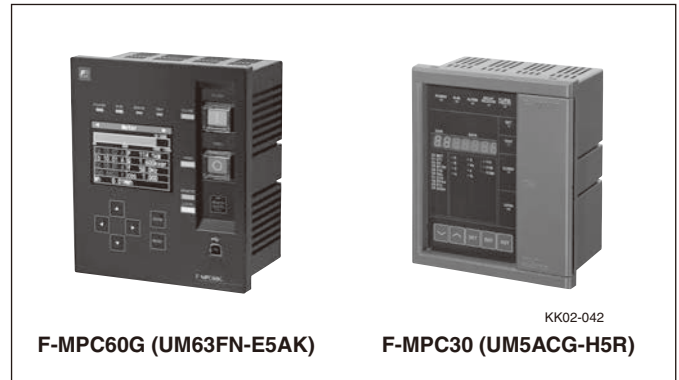
Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G, F-MPC60B, F-MPC30

Multiple function protectors and controllers
F-MPC60, F-MPC30 series

■ Description

- FUJI multiple function protector and controller (F-MPC) performs energy control to contribute to energy-saving. The F-MPC60G, 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.



■ Functions

The functions of F-MPC60 and F-MPC30 series are listed below.

Series		F-MPC60G	F-MPC60B	F-MPC30
Type		UM63FN-E□AK	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		Direct/resistance		Direct/resistance
IO detection	System type	Direct/resistance		Direct/resistance
	① Residual (3XCT)	○	○	○
	② Tertiary winding (100/5A)	○	○	○
	③ ZCT (5 to 100/5A)	○	○	○
	④ ZCT (5 to 400/5A)	○	○	○
	⑤ ZCT (200/1.5mA)	—	—	—
	⑥ ZCT (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 ² t	○	○	○ (without I ² t)
	DT1 (short-time)	○	○	○
	DT2 (definite-time)	○	○	○
Control voltage	Rating	100V DC		100/200V DC
	Allowable range	80 to 143V 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 only)

○ Available — Not available

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G, F-MPC60B, F-MPC30

■ Functions (continued)

Series			F-MPC60G	F-MPC60B	F-MPC30
Type			UM63FN-E□AK	UM43FG-E5AK	UM5ACG-H5R
Installation location			Receiver	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	○	○	—
	Inverse-phase	47	○	○	—
	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	○	○	—
	Inverse phase	Operation Count	○	○	—
	27	Operation Count	○	○	—
	59	Operation Count	○	○	—

*1 with SI, VI, LT, EI, and I²t characteristics

*2 with SI, VI, LT, and EI characteristics

○ Available — Not available

Power Monitoring Equipment

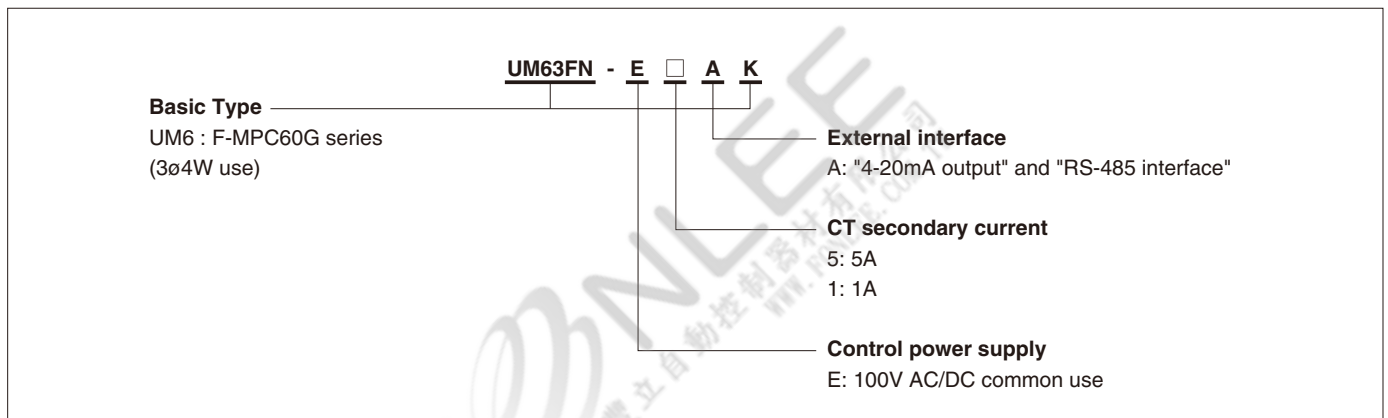
Multiple function protectors and controllers F-MPC60G

■ Features

- **Improved visibility**
Clear visibility and operability via color LCD.
- **Maintains Compatibility with Existing Models**
Succeed to some function of F-MPC60B Series such as same dimension, same terminal block and communication. You can use this model without any design change.
- **Equipped with Waveform Recording Function for System Failure**
Incorporated a function for recording failure waveforms during protective operation. Calendar functions are newly added to support failure analysis.
- **Compliant with the IEC Standards**
Complies with up-to-date contents of the standards. Supporting world wide matters is possible. (CE self-declared compliance)
- **Evolution of Support Functions with the Loader Software**
Equipped with "Relay test assist function (patent pending)" that directs and assists test conditions of selected protecting elements.



■ Type number nomenclature



Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

■ Specifications

• General specifications

Item		Specifications
Control power supply		100 VDC (80 to 143 VDC), 100 VAC (85 to 132 VAC) common * ¹
Inrush current		15 A or less, 4.5 ms or less (100 VAC, 50 Hz) 13 A or less, 7 ms or less (100 VDC)
Power consumption (main unit)		15 W or less with DC input, 20 VA or less with AC input
FUSE		Contained in control power supply (3 A)
Rated frequency		50/60 Hz (setting selection)
Rated current (CT secondary)		AC 5 A/1 A: Specify when ordering
Rated voltage (VT secondary)		110 VAC
Zerophase rated current	CT combination	AC 5 A (CT residual circuit, CT tertiary) Note 2: Ratio of CT tertiary is from 5 to 400 A: 5 A can be set (from 5 to 100 A: 5 A steps, from 110 to 400 A: 10 A steps) Note 3: Io/3Io display selectable for CT tertiary
	CT secondary	0.5 VA or less
Rated load VA	CT secondary	0.5 VA or less
	VT secondary	1.0 VA or less
Insulation resistance		Between collective electric circuits and ground : 100 MΩ or more (500 VDC ohmmeter) Between mutual electric circuits : 5 MΩ or more Between contact circuit terminals : 5 MΩ or more
Vibration resistance		Oscillation frequency 10 Hz, forward/backward & left/right double amplitude 5 mm, up/down double amplitude 2.5 mm, for 30 sec. each Oscillation frequency 16.7 Hz, double amplitude 0.4 mm, forward/backward, left/right, up/down, for 10 min. each Oscillation frequency 10 to 59 Hz, 0.035 mm Oscillation frequency 59 to 150 Hz, 0.5 G 10 to 150 Hz for each axis 8 minutes CLASS I
Shock resistance		30 G, 3-axes 6-directions, 3 times each Peak acceleration 5 G pulse width 11 ms, 3-axes 6-directions, 3 times each
Bump resistance		Peak acceleration 10 G pulse width 16 ms, 3-axes 6-directions, 1000 times each
Earthquake resistance		Oscillation frequency 1 to 8.5 Hz, X-axis (horizontal) 3.5 mm, Y-axis (vertical) 1.5 mm Oscillation frequency 8.5 to 35 Hz, X-axis (horizontal) 1 G, Y-axis (vertical) 0.5 G Method A 1 to 35 Hz, 10 minutes, CLASS I
Dielectric strength		Between collective electric circuits and ground 2 kVAC * ² , Between mutual electric circuits 2 kVAC However, this excludes RS-485 communication, MN signal wire, transducer output terminal, and kWh P output terminals. ON, OFF, between trip contact circuit terminals 1 kVAC, 1 minute.
Electrostatic noise immunity		Metal part contact ± 8 kV, Panel surface (non-metallic, non-contact) ±15 kV * ⁴
Noise resistance		Oscillation frequency 1 MHz, common mode/differential mode First wave crest height 2.8 kV, 1/2 damping time 3 to 6 cycles. Repeating frequency 6 to 10 times/1 period of commercial frequency (asynchronous) JEC2501 waveform 2 (ANSI compliant) Peak voltage 1.5 kV Square wave impulse noise (1 ns/1 μs 10 minutes) However, MN signal wire, communication wire (RS-485), transducer output wire, and kWh pulse output wire have a peak voltage of 1.0 kV (clamp), square wave impulse noise (1 ns/1 μs 10 minutes) Transceiver noise: 10 V/m in 140 MHz band, 430 MHz band, 900 MHz band Mobile (800 MHz/1.5 GHz 0.8 W), PHS (1.9 GHz 10 mW) attached Radiation electromagnetic field immunity: 80 MHz to 1 GHz, 1.4 GHz to 2.7 GHz 10 V/m CLASS III Spot frequency 80, 160, 380, 450, 900, 1850, 2150 MHz Conduction interference immunity: 150 kHz to 80 MHz, 10 V/m, CLASS III Electromagnetic emission Conduction: 150 kHz to 30 MHz, 79 db (up to 500 kHz), 73 db (from 500 kHz) peak value Radiation: 30 MHz to 2.0 GHz, 40 μV/m (up to 230 MHz), 47 μV/m (230 MHz to 1 GHz) (quasi-peak value/10 m position) 76 μV/m (from 1 GHz)(peak/3 m position) Fast transient/burst Control power: ground collective & I/O 2 kV, communication (clamp) 1 kV Commercial frequency electromagnetic field immunity Continuation 30 A/m, 1 to 3 s: 300 A/m
Lightning impulse		Between collective electric circuits and ground However, this excludes MN signal, communication wire (RS-485), transducer output wire, and kWh pulse output wire. : 5 kV 1.2 x 50 μs 3 times each positive and negative Between mutual transformer circuits : 5 kV 1.2 x 50 μs 3 times each positive and negative Between measurement device transformer circuit and control circuit : 5 kV 1.2 x 50 μs 3 times each positive and negative Between mutual control circuits : 3.0 kV 1.2 x 50 μs 3 times each positive and negative Between contact (trip output) and circuit terminal : 3.0 kV 1.2 x 50 μs 3 times each positive and negative Between control power supply circuit terminals : 3.0 kV 1.2 x 50 μs 3 times each positive and negative Between measurement device transformer circuit terminals : 3.0 kV 1.2 x 50 μs 3 times each positive and negative Between communication wire and ground * ⁵ : 1.0 kV 1.2 x 50 μs 3 times each positive and negative
Overload capacity		CT circuit: (continuous) 4 times that of rated value (20/4 A) (short-time) 40 times that of rated value (200/40 A) 1 second x 2 times, 100 times that of rated value (500/100 A) 100 ms x 1 time Io(residual/tertiary) circuit: (continuous) 4 times that of rated value (20/4 A) (short-time) 40 times that of rated value (200/40 A) 1 second x 2 times, 70 times that of rated value (350/70 A) 100 ms x 1 time VT circuit: 1.25 times that of rated value 10 seconds x 1 time

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

• General specifications (Cont.)

Item	Specifications
Ambient temperature	-10°C to 60°C (no dew condensation or frost shall be observed): working guarantee ^{*3} (0°C to 40°C: characteristics guarantee)
Storage temperature	-20°C to 70°C (no dew condensation or frost shall be observed)
Relative humidity	20% to 90% RH (no dew condensation shall be observed)
Usage atmosphere	No corrosive gas or excessive dust shall be observed
Grounding	D class grounding (100 Ω or less)
Mass	Maximum 1.5 kg (UM63FN-E5A measured)
Permissible instantaneous power failure time	20 ms (continuous operation); however, display will disappear

Note: *1 When protection 27UV is used for other than instantaneous operation (operating time 0 s setting) in the control power AC power supply, use together with an uninterruptible power system or AC power supply unit (type: UM2P-A1, separately sold).

*2 Do not apply 2 kVAC between wires.

*3 The guaranteed working temperature is the temperature at which operation is guaranteed within two times that of the guaranteed accuracy value at the JEC characteristic guaranteed temperature, and within the JIS temperature impact accuracy.

*4 The loader (USB) on the front main unit panel is not considered a communication wire.

• External I/O Specifications

Item	Specifications				
Input circuit	100 VDC (143 VDC or less)/100 VAC (132 VAC or less) common [DC input] ON voltage: 40 VDC or more and 70 VDC or less / [AC input] ON voltage: 40 VAC or more and 70 VAC or less Number of input points: Select input 8 points, TC disconnect monitor, CB 52a				
Output circuit	<table border="1"> <tr> <td>CB ON/OFF/trip</td><td> Making current: 15 A (110 VDC), acceptable continuous flowing current: 4 A 15 A (100 VAC inductive load $\cos\phi = 0.4$) allowable continuous current: 4 A Break current: 0.2 A (110 VDC inductive load $L/R = 7$ ms or less) 4 A (100 VAC inductive load $\cos\phi = 0.4$) </td></tr> <tr> <td>Other</td><td> Switching current: 0.2 A (110 VDC inductive load $L/R = 15$ ms or less), acceptable continuous flowing current: 1 A 1 A (100 VAC inductive load $\cos\phi = 0.4$) allowable continuous current: 1 A </td></tr> </table>	CB ON/OFF/trip	Making current: 15 A (110 VDC), acceptable continuous flowing current: 4 A 15 A (100 VAC inductive load $\cos\phi = 0.4$) allowable continuous current: 4 A Break current: 0.2 A (110 VDC inductive load $L/R = 7$ ms or less) 4 A (100 VAC inductive load $\cos\phi = 0.4$)	Other	Switching current: 0.2 A (110 VDC inductive load $L/R = 15$ ms or less), acceptable continuous flowing current: 1 A 1 A (100 VAC inductive load $\cos\phi = 0.4$) allowable continuous current: 1 A
CB ON/OFF/trip	Making current: 15 A (110 VDC), acceptable continuous flowing current: 4 A 15 A (100 VAC inductive load $\cos\phi = 0.4$) allowable continuous current: 4 A Break current: 0.2 A (110 VDC inductive load $L/R = 7$ ms or less) 4 A (100 VAC inductive load $\cos\phi = 0.4$)				
Other	Switching current: 0.2 A (110 VDC inductive load $L/R = 15$ ms or less), acceptable continuous flowing current: 1 A 1 A (100 VAC inductive load $\cos\phi = 0.4$) allowable continuous current: 1 A				

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Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

■ Specifications

• Measurement/Display Specifications

(1) Measurement display in steady state

Item		Valid display range	Accuracy *1	Measurement range *2
Current / demand current *3 / demand current maximum value		0.8% to 100% of CT primary rated current (FS)	±1.0%	0, or 0.8% to 800% of CT primary rated current
		100% to 800% of CT primary rated current (FS)	±5%	
Zero-phase current / zero-phase current maximum value *6		1.5% to 100% of CT primary rated current (FS)	±1.0%	0, or 1.5% to 800% of CT primary rated current
		100% to 800% of CT primary rated current (FS)	±5%	
Voltage	2VT	Line voltage: 5 V to 150 V at VT secondary voltage value(FS)	±1.0%	Line voltage: 0, or 5 to 150 V at VT secondary rated voltage
	3VT	Phase voltage: 5 V to 150 V at VT secondary voltage value(FS) Line voltage: 8.7 V to 260 V at VT secondary voltage value(FS)	±1.0%	Phase voltage: 0, or 5 to 150 V at VT secondary rated voltage Line voltage: 0, or 8.7 to 260 V at VT secondary rated voltage
Frequency		45 to 55 Hz when set to 50 Hz (FS)	±0.5%	45 to 55 Hz when set to 50 Hz
		55 to 65 Hz when set to 60 Hz (FS)		55 to 65 Hz when set to 60 Hz
Power factor		Leading 0.00 to 1.00 to lagging 0.00	±5% (Conversion by 90° phase angle)	Leading 0.00 to 1.00 to lagging 0.00 Measurement range and symbols *5
Active power *3 Demand active power Demand active power maximum value		0.004 to 1 kW at VT, CT transformer secondary (FS) Phase angle 0 to 60° (lagging) Power factor 1.00 to 0.50 (lagging)	±1.0%	0, or 0.004 to 1 kW symbol at VT and CT transformer secondary *5
Reactive power		0.004 to 0.5 kvar at VT, CT transformer secondary Phase angle 0 to 60° (lagging) Power factor 1.00 to 0.50 (lagging)	±1.0% of 1 kvar at transformer secondary (FS)	0, or 0.004 to 1 kvar symbol at VT and CT transformer secondary *5
Active/Reactive electric energy *4		Five-digit display from 0 to 99999 The multiplying factor of the measurement display is fixed according to the CT primary rated current and VT primary rated voltage values	Equivalent to Table 4: Standard Measuring Instruments in JIS C 1216 (Measuring Instruments with Transformers)	Five-digit display from 0 to 99999
Harmonic current	Tertiary, quinary	1.5% to 100% of CT primary rated current (FS)	±2.5%	0, or 1.5% to 800% of CT primary rated current
		100% to 800% of CT primary rated current (FS)	±5%	
	Septenary, overall	1.5% to 100% of CT primary rated current (FS)	±5%	
		100% to 800% of CT primary rated current (FS)	±10%	
	Graph display	Ratio of rated current displayed Tertiary, quinary, septenary display value: (○ ary current value/rating) x 100 Overall display value: $\sqrt{3rd^2+5th^2+7th^2}$ / rating x100	-	The bar graph shows 20%, 50%, 100%, 800% auto range switching
Harmonic voltage	Tertiary, quinary	5 to 150 V at VT secondary voltage value (FS)	±2.5%	0, or 5 to 150 V at VT secondary rated voltage
	Septenary, overall	5 to 150 V at VT secondary voltage value (FS)	±5%	
	Graph display	Ratio of rated voltage displayed Tertiary, quinary, septenary display value: (○ ary voltage value/rating) x 100 Overall display value: $\sqrt{3rd^2+5th^2+7th^2}$ / rating x100	-	The bar graph shows 20%, 50%, 150% auto range switching

(2) Measurement display of accident display / accident record

Item		Valid display range	Accuracy *1	Measurement range *2
Accident (generated phase) maximum current		10% to 2000% of CT primary rated current (FS)	±5%	10% to 2000% of CT primary rated current
Phase other than accident occurrence phase		2% to 2000% of CT primary rated current (FS)		0, or 2% to 2000% of CT primary rated current
Accident (generated phase) maximum voltage (59) Accident (generated phase) minimum voltage (27) Phase other than accident occurrence phase		5 to 150 V at VT secondary rated voltage (FS)	±5%	0, or 5 to 150 V at VT secondary rated voltage
Accident (generated phase) maximum zero-phase current *6		2% to 800% of CT primary rated current (FS)	±5%	2% to 800% of CT primary rated current
Phase other than accident occurrence phase		1.5% to 800% of CT primary rated current (FS)		0, or 1.5% to 800% of CT primary rated current

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

Note: *1 Accuracy does not include errors from the combined transformer.

*2 "0, a to n" means that "0" will be displayed from 0 to less than a.

*3 Demand measurement specification

Item	Specifications
Time period	You can select from 0 min/1 min/5 min/10 min/15 min or 30 min. (1 sec average will be indicated if you set at 0 min.)
Item displayed	Demand current, demand active power Maximum demand current value, maximum active power demand value (past maximum value till reset operation)
Measurement/display range	The same as present measurement value which is an instantaneous value

[Demand time]

A thermal bimetal type demand meter is designed to operate and indicate taking a relatively long time.

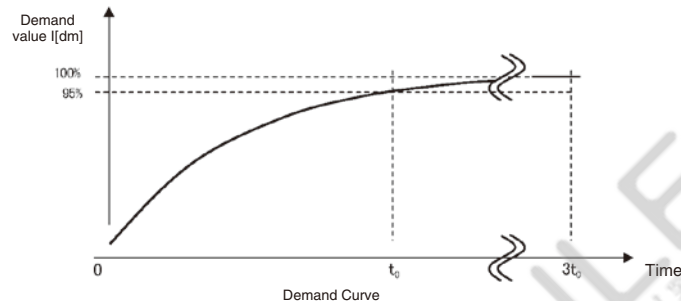
It will not respond to the instantaneous overload or input variation. Its operation and indication will follow the basic formula below.

[Example: demand current] $I[dm] = I[ins] (1 - e^{-3t/t_0})$ — formula (1)

where $I[dm]$: demand meter display value, $I[ins]$: certain constant input value of instantaneous current, t_0 : Average setting time

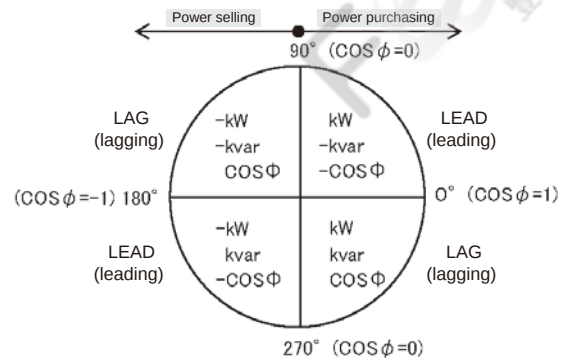
t/t_0	0	0.5	1	1.5	2.0	2.5	3.0
$I[dm]$	0	0.777	0.950	0.970	0.997	0.9994	0.9999

When a certain input is continuously energized, it calculates with the above exponent function and displays the results. The demand time is the time to be required to reach 95% of the display value of a certain current $I[ins]$. Therefore, it requires almost three times the setting time for the display value to indicate about 100% input. The demand time shall be selected based on the target equipment instrument of monitoring or monitoring purpose.



*4 There are two electric energy displays: [1] total electric energy (zero-clear not possible) and [2] periodic electric energy (zero-clear possible).

*5 We use one sign, $\pm$, to indicate power selling/purchasing in power measurement or LEAD/LAG in power factor measurement. (left blank in case of $+$) The meaning of $\pm$ is shown below by measurement item.



- [1] Active power kW
 +: Power purchasing (power consumption)
 -: Power selling (reverse flow power)
- [2] Reactive power kvar
 +: lagging current by reactive power measurement method
 -: leading current by reactive power measurement method
 LEAD/LAG will be reversed according to power selling/power purchasing.
- [3] Power factor $\cos \phi$
 +: Lagging power factor
 -: Leading power factor

*6 For CT method, I_0 and $3I_0$ display can be selected and set.

I_0 display : Input current displayed as is as measurement value and accident value.

$3I_0$ display : Three times the input current displayed as measurement value and accident value.

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

■ Specifications

• History data

Item	Display range
50 (INST) operation count	0 to 9,999 (times)
51 (DT) operation count	0 to 9,999 (times)
51 (DT2) operation count	0 to 9,999 (times)
51 (OC) operation count	0 to 9,999 (times)
50G operation count	0 to 9,999 (times)
51G operation count	0 to 9,999 (times)
59 (OV) operation count	0 to 9,999 (times)
27 (UV) operation count	0 to 9,999 (times)
27 (UV2) operation count	0 to 9,999 (times)

Item	Display range
Open phase operation count	0 to 9,999 (times)
Reverse phase operation count	0 to 9,999 (times)
OCA operation count	0 to 9,999 (times)
OCGA operation count	0 to 9,999 (times)
Operating time	0 to 9,999 x 100 (hr)
Switching count	0 to 9,999 x 10 (times)
Actual cutoff count	0 to 9,999 (times)

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

(Note) 1. Count initial value settings can be changed for the count history data.

2. "Operating time" refers to the integrated value of time when the control power of the F-MPC60G Series is normal and input 52a (circuit breaker answer-back signal) of terminal block B-13 is on.

3. The operation count for multi-element protection (such as 50 operating at R/S/T) is only counted as 1 even during multi-operation when there is concurrent occurrence (including delays in output continuity).

4. The actual cutoff count is the number of times the trip relay was turned on by the protective relay (including external trip) during circuit breaker inrush (52a in on-state).

• Specifications of protective relays

Item	Current/voltage operate value characteristic adjustment range	Operating time (timer) characteristic adjustment range	Characteristics	
			Operate value	Operating time
50 (instantaneous)	1.0 to 20.0 times the CT rated current (in steps of 0.1 times), Lock	(Fixed)	±5%	40 ms or less
51DT (fixed time limit)	0.2 to 20.0 times the CT secondary rated current (in steps of 0.1 times), Lock	0.00, 0.05 to 5.00 s (0.01 s steps)	±5%	Less than 1 s ± 50 ms 1 s or more ± 5%
51DT2 (fixed time limit)	20 to 1000% of CT rated current (in steps of 1%), Lock	0.00, 0.05 to 10.00 s (0.01 s steps)	±5%	Less than 1 s ± 50 ms 1 s or more ± 5%
51OC (inverse time limit) IEC: SI, EI, VI, LT, I ² t IEEE: MI, EI, VI	10 to 240% of CT rated current (in steps of 1%), Lock *OC/OL selection **	Time scale factor: 0.2 to 20.0 times (0.1 steps) (Operating time: min 150 ms)	±5%	setting value of 300%: ± 12% 500: ± 7%, 1000%: ± 5% (Lower limit ± 100 ms)
OCA (Overcurrent pre-alarm)	10 to 100% of CT rated current (in steps of 1%), Lock	10 to 200 s (10 s steps)	±10%	±5%
50 G (instantaneous, short time limit)	0.1 to 8.0 times the CT rated current (in steps of 0.1 times), Lock	0.0 to 180.0 (0.1 s steps) *1	±5%	±5% (Lower limit ± 50 ms)
51 G 3CT residual method or CT tertiary IEC: SI, EI, VI, LT IEEE: MI, EI, VI	0.02 to 1.00 times the CT rating (in steps of 0.01 times), Lock	0.5 to 50.0 times (0.1 steps) (Operating time of min 150 ms) *1	±5% (Lower limit ± 100 mA)	setting value of 300%: ± 12% 500: ± 7%, 1000%: ± 5% (Lower limit ± 100 ms)
(inverse time limit selected)				
(fixed time limit selected)	0.02 to 1.00 times rating (in steps of 0.01 times), Lock	0.01 to 600.00 s (0.05 s steps)	±5% (Lower limit ± 100 mA)	±5% (Lower limit ± 50 ms)
OCGA (zero-phase current prealarm)	50 to 100% of 51G pick-up current setting value (in steps of 1%), Lock	0.10 to 600.00 s (0.05 s steps)	±10% (Lower limit ± 100 mA)	±5% (Lower limit ± 50 ms)
59 (OV)	VT secondary: 60 to 150 V (in steps of 1V), Lock	0.0 to 60.0 s (0.1 s steps)	±5%	±5% (Lower limit ± 50 ms)
27 (UV) *2	VT secondary: 10 to 110 V (in steps of 1 V), 52a link on 10 to on 110 V (in steps of 1 V), Lock	0.0 to 60.0 s (0.1 s steps)	±5%	±5% (Lower limit ± 50 ms) When 0 s is set: 35 ms or less
27 (UV 2) *2	VT secondary: 10 to 110 V (in steps of 1 V), Lock	0.0 to 60.0 s (in steps of 0.1 s)	±5%	±5% (Lower limit ± 50 ms) When 0 s is set: 35 ms or less
Open phase (Current detection)	-	-	Imbalance ratio 50 to 80% or more	2 s (fixed) ± 1 s
Reverse phase (Voltage detection)	-	-	-	0.5 s or less

*1 With a function to prevent malfunctions due to exciting current

[1] If the fundamental wave current of zero-phase current is 15% or more of the rated current and the secondary harmonic content ratio is about 15% or more, the device will perform the function to prevent malfunction under inrush exciting current to lock the protection 50G and 51G operation. In the case of 50G with the operating time being 0 s, however, this function will not work.

[2] If the fundamental wave current of load current (CT secondary) is higher than the rated current and the secondary harmonic content ratio is about 15% or more, the device will perform the function to prevent malfunction under inrush exciting current to lock the protection 50G and 51G operation. In the case of protection 50G with the operating time being 0 s, however, this function will not work. The secondary harmonics suppression will be locked when the zero-phase current or one of load currents (A/B/C) reaches the predetermined value.

[3] The second harmonic suppression function in [1] and [2] above can be set as enabled/disabled (Loc).

*2 Voltage determination is selectable from AND, three-phase OR, and 2 OUT OF 3 (2/3 determination).

*3 For characteristics formula, refer to 5. "Protection Characteristics."

*4 When OL is selected, 51OC performs an AND operation with 51DT. (Even if 51DT satisfies trip conditions, 51DT will not operate until 51OC operates.) For details, refer to Appended Figure 5.

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

■ Specifications

• Communications specifications

item		Specifications	
		F-MPC-Net protocol	Modbus RTU protocol
Standard		EIA RS-485	
Data exchange		1:N (this device) polling/selecting	
Maximum transmission distance		1,000 m	
Number of connection stations		Maximum 64 units ^{Note2} /one system (however, the master device is included in the 64 units)	
Address setting		01 to 99	
Transmission speed		4800/9600/19200/38400 bps	
Data format	Start bit	1 bit (fixed)	1 bit (fixed)
	Data length	7/8 bits (select)	8 bit (fixed)
	Parity bit	None/Even number/Odd number (select)	None/Even number/Odd number (select)
	Stop bit	1 bit (fixed)	1/2 bit (auto) ^{Note1}

Note 1: When the Modbus RTU protocol is selected, the character configuration is fixed at 11 bits. The stop bit length is automatically recognized based on whether or not parity is selected.

Note 2: When 32 units are connected, two units are recognized as one unit and the maximum number of connection will be lower.

• Specifications of transducer outputs

Item		Specifications	Acceptable error
Transducer output signal		4 to 20 mA (acceptable load 270 Ω or less)	
Signal type	Current (Ia, Ib, Ic)	4 to 20 mA versus 0 to CT rating	±1.5%
	Line voltage (Vuw, Vvw, Vwu)	(1) 4 to 20 mA versus VT secondary 0 to 150 V (2) 4 to 20 mA versus VT secondary 0 to 150 x √3 V ^{Note1}	
	Phase voltage (Vun, Vvn, Vwn)	(1) 4 to 20 mA versus VT secondary 0 to 150 x √3 V (2) 4 to 20 mA versus VT secondary 0 to 150 V ^{Note1}	
	Active power (W)	4 to 20 mA versus 0 to 1 kW (CT5A conversion)	
	Reactive power (var)	4 to 12 to 20 mA versus -1 kvar to 0 to 1 kvar (CT5A conversion)	
	Frequency (Hz)	4 to 20 mA versus 45 to 55 Hz or 55 to 65 Hz	
	Power factor (PF)	4 to 12 to 20 mA versus LEAD 0.5 to 1 to LAG 0.5	±5%
	Current expansion (Ia, Ib, Ic)	4 to 16 mA versus 0 to CT rating 16 to 20 mA versus CT rating to CT rating x 5 times	±1.5% ±5%
	Single-phase active power	4 to 20 mA versus 0 to 0.5 kW (CT5A conversion)	±1.5%
	Single-phase reactive power	4 to 12 to 20 mA versus -0.5 kvar to 0 to 0.5 kvar (CT5A conversion)	
Zero-phase current (Io)		3CT residual: 4 to 20 mA versus 0 to CT rating	±1.5%
Output response time		2 sec. or less (when rated input is applied, the time will be within 90% ±1% of the final steady value)	

• Negative side of the output signal is common.

• The limiter is applied when the upper/lower limit value is exceeded. The lower limit value and upper limit value are fixed at 4 mA and 20 mA.

• Acceptable error is an error for FS. Example: If CT primary rated current is 400 A, the error is ± 6.0 A or less. Whether input current is 40 A or 400 A, the error is 6.0 A or less. Please note that this device does not offer zero- or spanadjustment function. Make an adjustment externally as necessary.

Note1 (1): At line voltage 100/110/120V, (2): At line voltage (100/110/120V) x √3

* The default setting is described in the table below.

Transducer output channel	Setting when shipped
CH1	No output
CH2	No output
CH3	No output
CH4	No output
CH5	No output
CH6	No output

• Specifications of kWh pulse output

Item	Specifications
Output	Open collector output
Output capacity	Maximum 150 VDC, 100 mA
Pulse width	200 ±20 ms
Output pulse unit	10 ⁴ kWh/pulse (n = - 2 to 4 in setting) 2,000 pulse/kWh (n = F in setting)

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

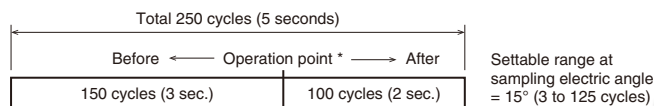
■ Specifications

• Accident waveform recording data specification

Item	Specifications	
Number of waveform records	Maximum of 2	
Waveform record updates	at time of protective operation manual loading	Updated upon operation of one of the 13 protection elements, other than alarm (OCA, OCGA) operations. If an accident occurs more than 2 times, the accidents will be cleared starting from the oldest data No. 2. Select record information > waveform record in normal mode. Place the cursor (blue marker) on the waveform capture below the No. 1 and 2 lists, and press the [ENTER] key. "Do you want to capture the waveform? YES/NO" Select YES to record the waveform.
Record waveform elements (data per point)	Analog input: Current (A, B, C), voltage (ab, bc, ca), etc. (7 elements total) Input: MN, 52a, selection input 1 to 8, etc. (9 elements total), Output: CLOSE, OPEN, trip, device failure (4 elements total) Protection status: 59, 27, 27-2, 47, 50, 51, 51DT, 51DT2, OCA, 46, 50G, 51G, OCGA (13 elements total)	
Number of records	6,000 points (fixed)	
Record accuracy	Sampling electricity angle setting: Select from 3.75° (96 times), 7.5° (48 times), 15° (24 times), 30° (12 times). * The number inside the parentheses is the sampling count per cycle.	
Recording time	50 Hz	3.75° (96 times) setting: about 1.25 sec. (62.5 cycles) 15° (24 times) setting: about 5 sec. (250 cycles) 7.5° (48 times) setting: about 2.5 sec. (125 cycles) 30° (12 times) setting: about 10 sec. (500 cycles)
	60 Hz	3.75° (96 times) setting: about 1.04 sec. (62.5 cycles) 15° (24 times) setting: about 4.16 sec. (250 cycles) 7.5° (48 times) setting: about 2.08 sec. (125 cycles) 30° (12 times) setting: about 8.33 sec. (500 cycles)
Setting range for number of recording cycles after operation point	3.75° (96 times) setting: 3 to 31 cycles 15° (24 times) setting: 3 to 125 cycles	7.5° (48 times) setting: 3 to 62 cycles 30° (12 times) setting: 3 to 250 cycles
Display position	Selecting the waveform record from the top screen in normal mode or from the records information will display a list. No. 1 is the latest data. Select any item and press the [ENTER] key to display a simplified waveform.	
Clear accident record / waveforms	It is only possible to clear everything. Select initialize from the top screen in settings mode, and then select clear accident record/waveforms from the clear record screen. When asked "Initialize? YES/NO," select YES to clear. Select using the [ENTER] key. However, this cannot be cleared while the main unit is displaying an accident. Accident record data will also be cleared.	

Note1: The filter is built into the device's voltage/current input circuit component. Therefore, slow response to abrupt waveform changes may cause waveform record data to differ from actual input waveforms.

Note2: Image of actual waveform recording (e.g., at rated frequency = 50 Hz, sampling electric angle = 15°, number of cycles after operation = 100 cycles)



* The operation point is the moment of protection action (trip output).

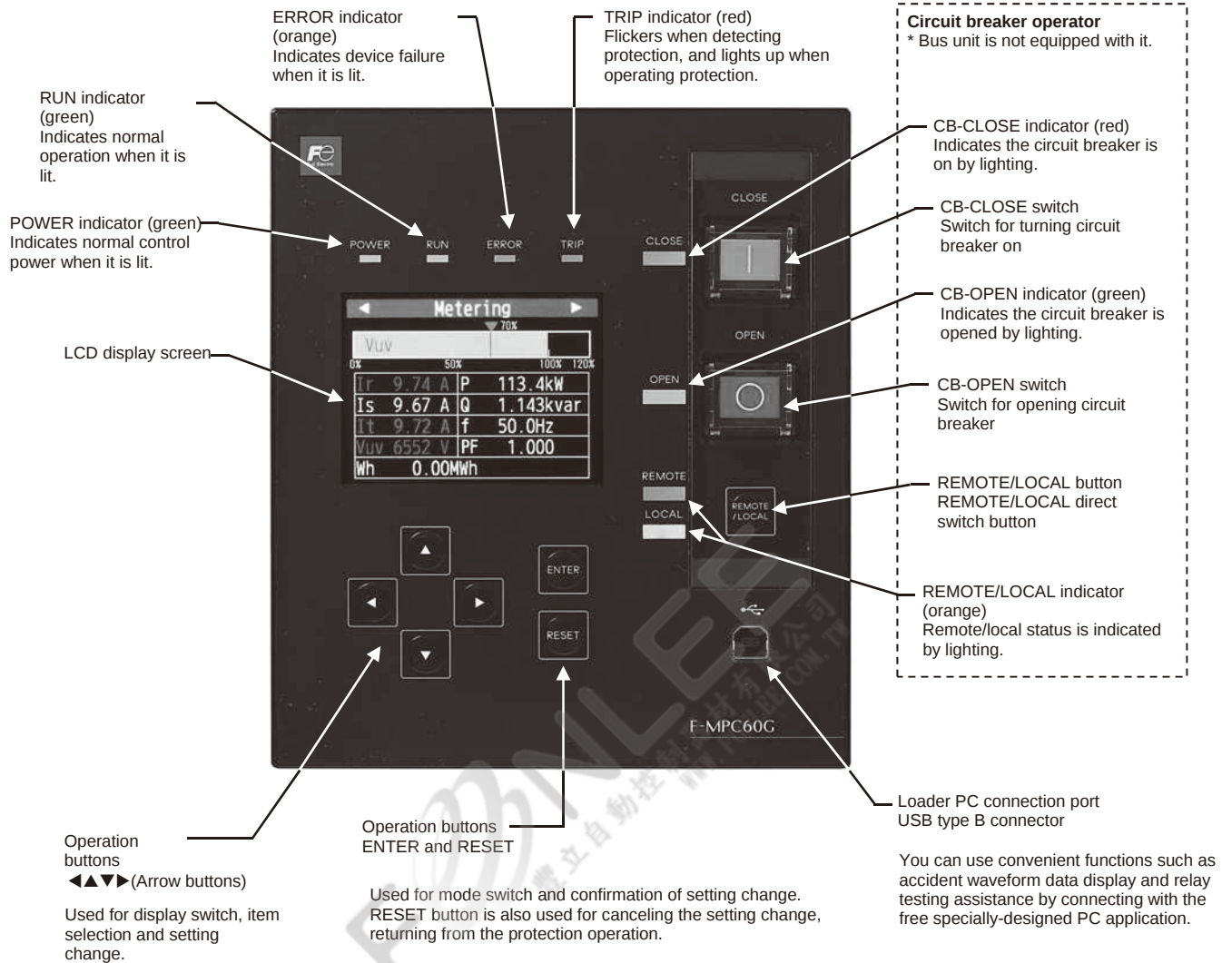
• Clock specifications

Item	Specifications	Remarks
Clock accuracy	Within ± 20 minutes/year	Average ambient temperature: At $\pm 25^\circ\text{C}$
Power outage guarantee	7 days If a power outage exceeds the backup period, it will start up again at 2000-01-01 0:00.	Average ambient temperature: At $\pm 25^\circ\text{C}$ Control power must flow for at least 10 minutes to charge the backup electrical double-layer capacitor.

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

■ Indications & Settings



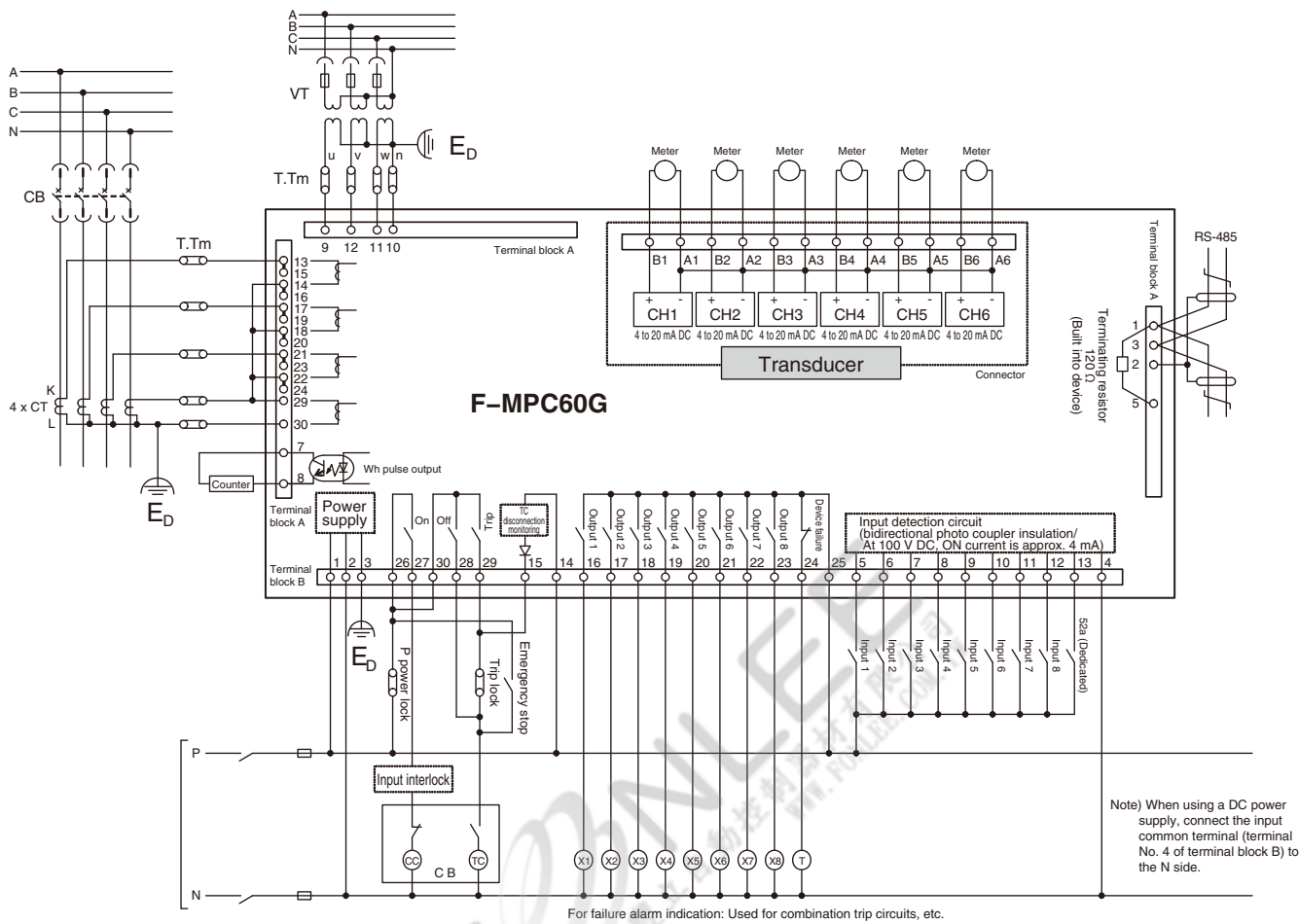
D1

Power Monitoring Equipment

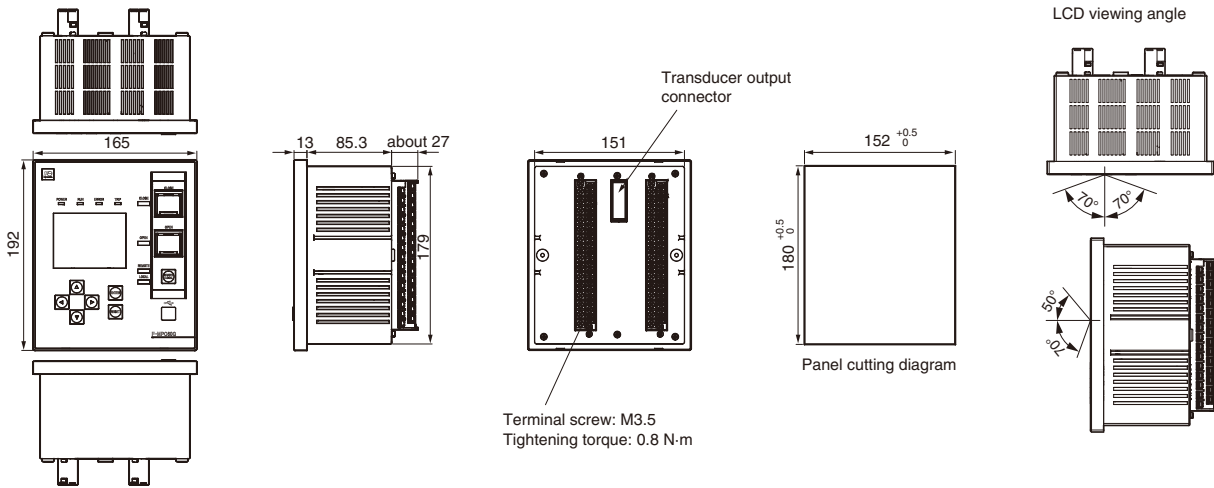
Multiple function protectors and controllers F-MPC60G

- Wiring diagram example
- Power receiving unit external wiring example (UM63FN-E□AK)

D1



External dimensions [unit: mm]



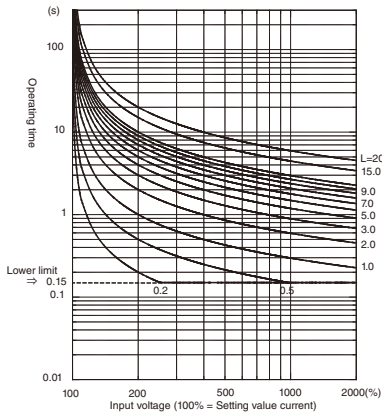
Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60G

D

OC, 51G relay characteristics

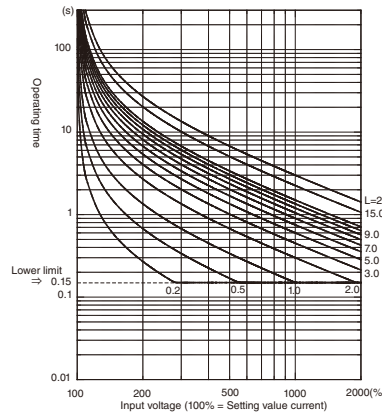
Standard Inverse Time (SI) IEC characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

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

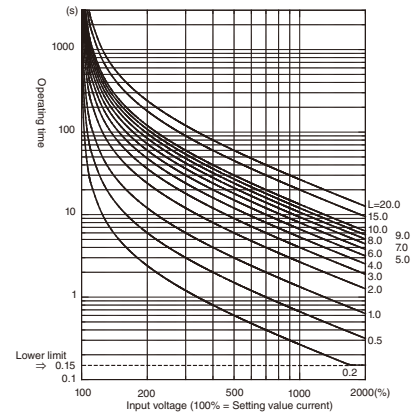
Very Inverse Time (VI) IEC characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

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

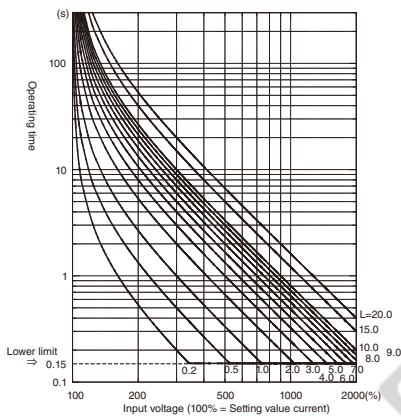
Long Inverse Time (LT) IEC characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

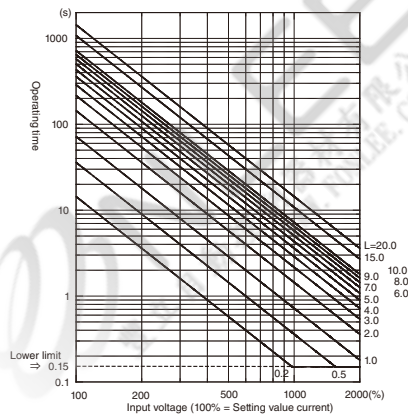
$$t = \frac{120}{I - 1} \times \frac{L}{10} \quad (L: \text{Time factor})$$

Extremely Inverse Time (EI) IEC characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

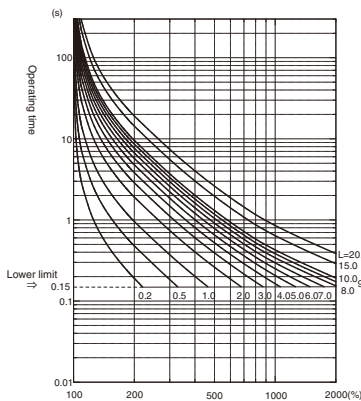
$$t = \frac{80}{I^2 - 1} \times \frac{L}{10} \quad (L: \text{Time factor})$$

I²t characteristic

Note: The time setting (lever) is in steps of 10%.
(Lower limit: 0.2; Upper limit: 20) Part of the lever is omitted in the above characteristic diagram.

$$t = \frac{720}{I^2} \times \frac{L}{10} \quad (L: \text{Time factor})$$

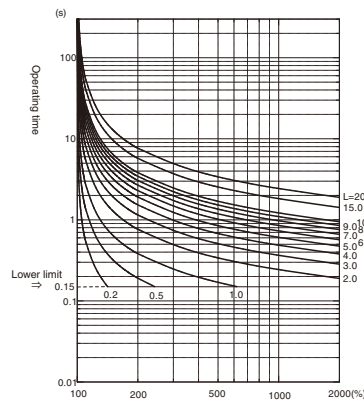
Moderate recoil time (MI) IEEE characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

$$t = \left\{ \frac{0.0515}{I^{0.02} - 1.0} + 0.1140 \right\} \times \frac{L}{10} \quad (L: \text{Time factor})$$

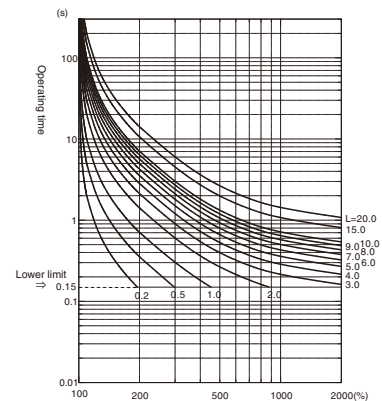
Extremely Inverse Time (EI) IEEE characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

$$t = \left\{ \frac{28.2}{I^2 - 1.0} + 0.1217 \right\} \times \frac{L}{10} \quad (L: \text{Time factor})$$

Very Inverse Time (VI) IEEE characteristic



Note: The time setting (lever) is in steps of 10%.
(Lower limit: OC/51G and 0.2; Upper limit: OC is 20; 51G is 50)
Part of the lever is omitted in the above characteristic diagram.

$$t = \left\{ \frac{119.61}{I^2 - 1.0} + 0.491 \right\} \times \frac{L}{10} \quad (L: \text{Time factor})$$

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC60B

Discontinued
2020

■ Features

• Compact and lightweight

Compact unit that integrates protection, operation, measurement, monitoring, transducer output and transmission functions.

• High-voltage power receiving (ZVT and EVT compatible)

Compatible with high-voltage power receiving ZVT and EVT.

• Flexibly responds to circuit changes

Makes it easy to change settings such as CT ratios through its intuitive operation.

CT primary current: 5 A to 7500 A

VT primary voltage: 210 V to 110 kV

• Network system

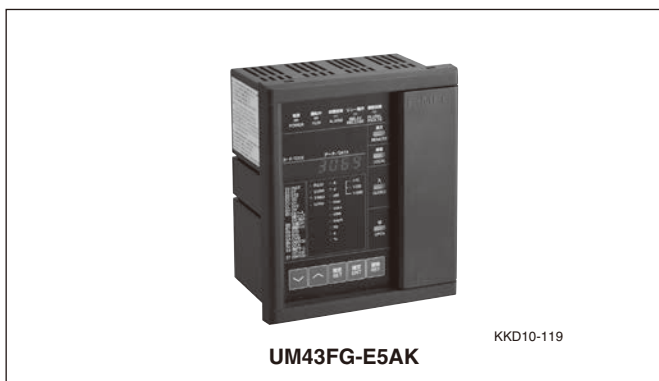
Makes it easy to build information network systems that connect with upper-level computers via RS-485 (F-MPC-Net, Modbus RTU), T-Link or 4-20 mA output.

• Prevention of erroneous cutoff

Erroneous cutoff is prevented, even in the event of part failure, via a duplicated CPU and analog circuit and AND output processing.

• Self-monitoring function

It constantly monitors the internal operating state so that it can respond quickly in the event of failure.

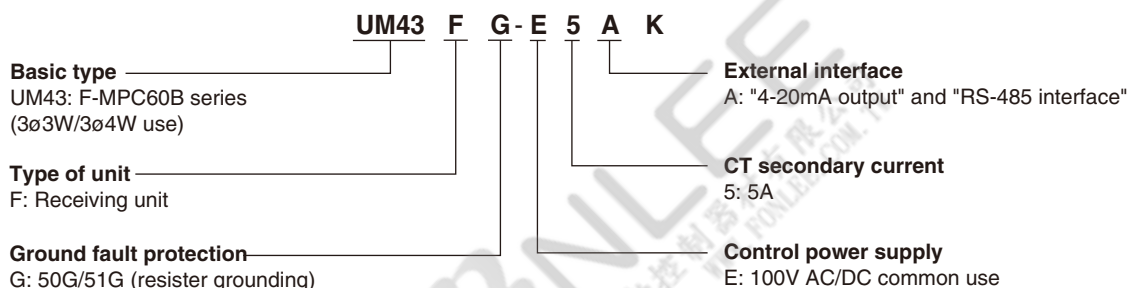


• Improved maintainability

Facilitates preventive maintenance through circuit breaker monitoring and supports accident analysis through accident measurement.

• Simplifies overcurrent relay and protective coordination

■ Type number nomenclature



■ 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		10M Ω (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/1 μ s, for 10 minutes.
Overload resistance		CT circuit: at rating 40times, a second, 2 times VT circuit: at rating 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: $\pm$ 8kV Aerial discharge: $\pm$ 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 (100 Ω 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.

Discontinued
2020Power Monitoring Equipment
Multiple function protectors and controllers F-MPC60B

■ 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 $8 \times$ CT rating ¹	$\pm 1.5\%$ (0, 0.8 to 100%), $\pm 5\%$ (100 to 800%)
Zero-phase current/Max. zero-phase current	CT: 0, 2% to CT rating to $8 \times$ CT rating	$\pm 1.5\%$: 0, 2% to CT rating, $\pm 5\%$: others
Active power Demand active power/ Reactive power	± 0.004 to ± 1 kW at VT secondary circuit (The value is converted into the VT rated voltage)	$\pm 1.5\%$: 0, ± 0.004 to ± 1 kW See the figure below.
Power factor	Lead 0% - 100% - Lag 0%	$\pm 5\%$ (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	$\pm 1.5\%$
Phase voltage	5.5 to 150V on VT secondary side	$\pm 1.5\%$
Frequency	45 to 55Hz (50Hz), 55 to 65Hz (60Hz)	$\pm 0.5\%$
Max. demand value	Same as the above range	—
Harmonics current	3rd, 5th, 7th, overall harmonics	—

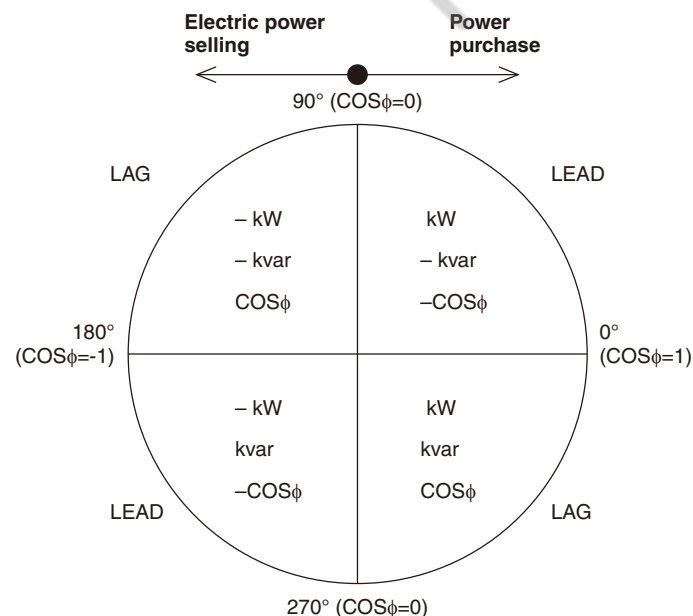
¹ The fault current up to 2000% (accuracy: $\pm 5\%$) can be displayed.

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

* 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
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

* 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 (Definite 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 ² t	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 (OV)	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.

Discontinued
2020Power Monitoring Equipment
Multiple function protectors and controllers F-MPC60B

■ Specifications

• 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 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
	Line voltage (Vab, Vbc, Vca)	For VT secondary 0 to 150V, 4 to 20mA *1 0 to 150V $\times \sqrt{3}$, 4 to 20mA *2
	Phase voltage (Van, Vbn, Vcn)	For VT secondary 0 to 150V/ $\sqrt{3}$, 4 to 20mA *1 0 to 150V, 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 to 1kvar (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 $\times \sqrt{3}$, AC.

• Specifications of kWh pulse output

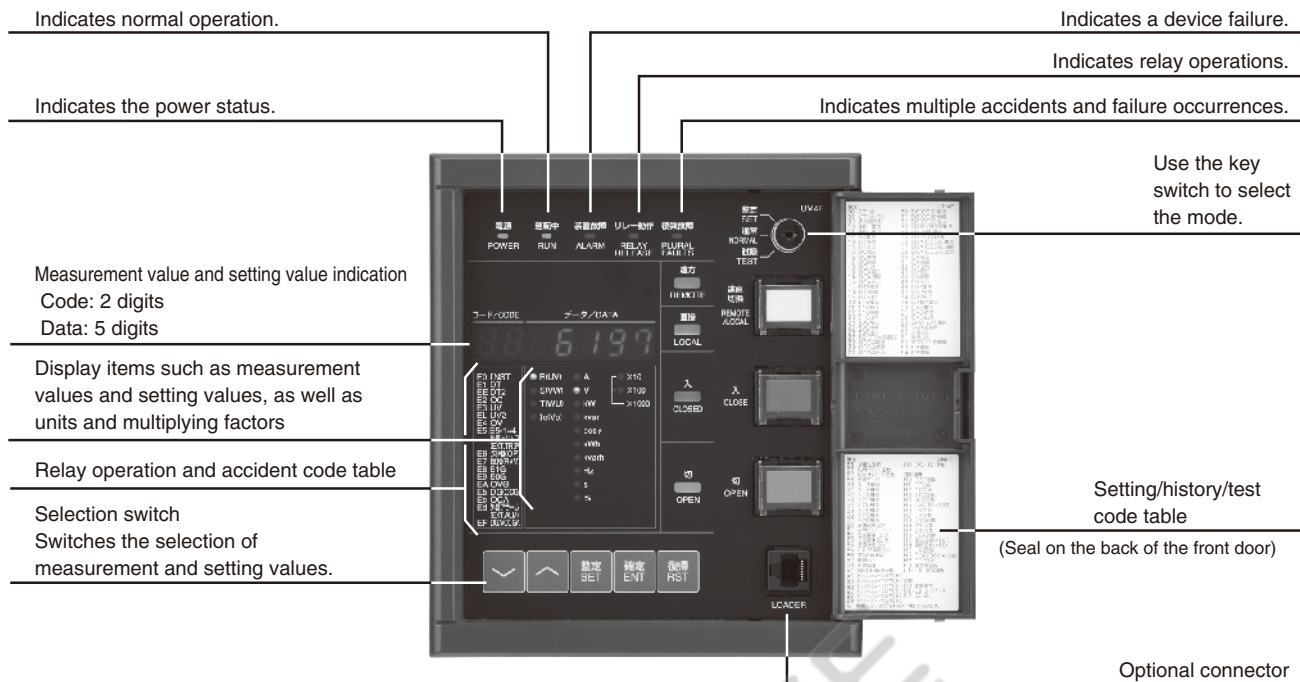
Type of output	Transistor, open collector
Ratings	Max. 150V DC, 100mA
Pulse width	200 $\pm$ 20ms
Pulse rate	10 ⁿ kWh per pulse (n=-2 to 4) (integer), or 2000 pulses per kWh

Power Monitoring Equipment

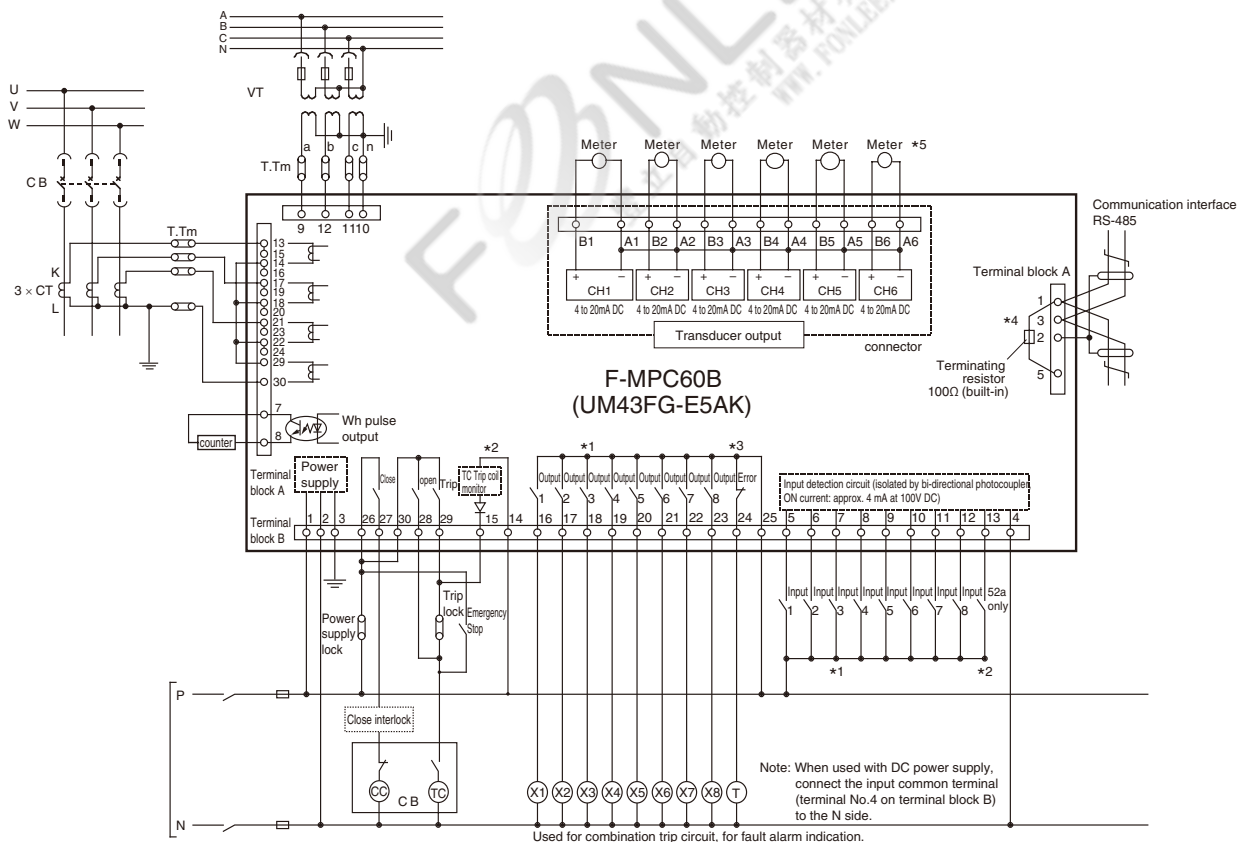
Multiple function protectors and controllers F-MPC60B

Discontinued
2020

■ Indications & Settings



■ Example of external wiring diagrams

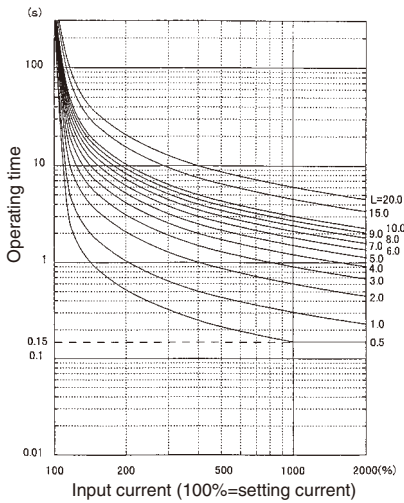


- Note:
- *1 Use selective input 1 to 8 and selective output 1 to 8 by selecting the function type by setup.
 - *2 Outputs of "ON, OFF, TRIP and equipment error" are used exclusively. Inputs of "52a: the answer back signal of CB ON" and "the monitoring of TC coil" are used exclusively.
 - *3 Equipment 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 □ . See page D1-213 "Input/output specifications."

Discontinued
2020Power Monitoring Equipment
Multiple function protectors and controllers F-MPC60B

■ Time-current characteristic

Standard inverse (SI) characteristics

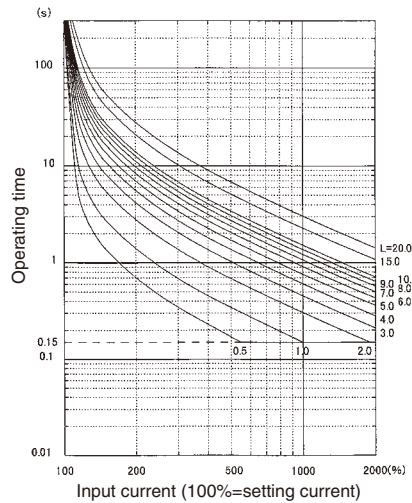


Note:

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.

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

Very inverse (VI) characteristics

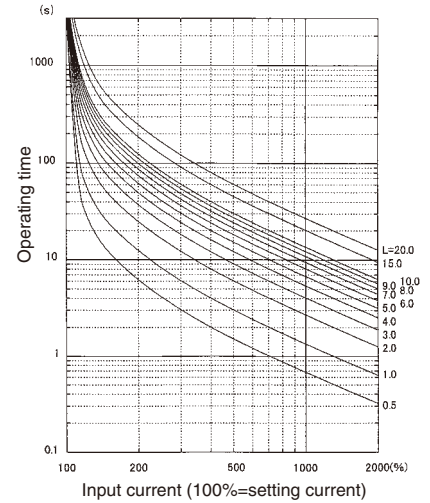


Note:

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.

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

Very inverse (LT) characteristics

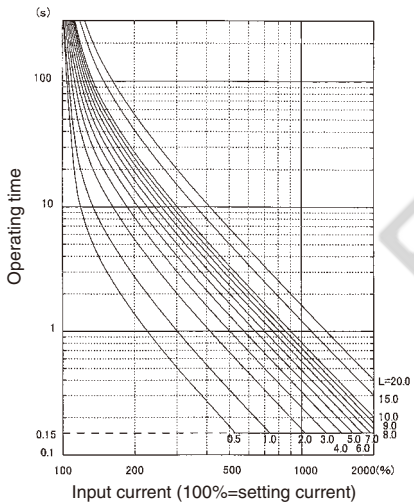


Note:

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.

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

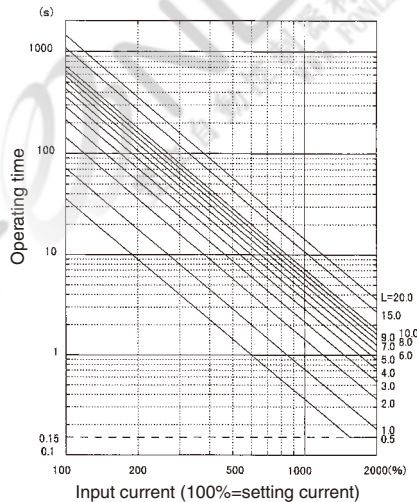
Extremely inverse (EI) characteristics



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.

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

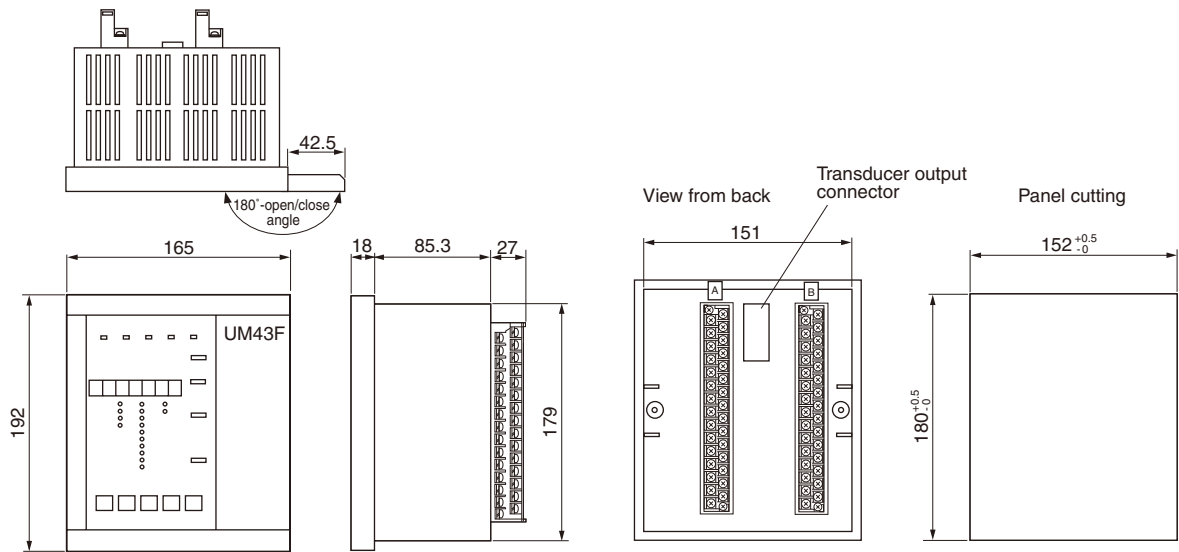
I²t characteristics

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.

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

■ Dimensions, mm



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

D1

■ Characteristics of overcurrent relay (OCR)

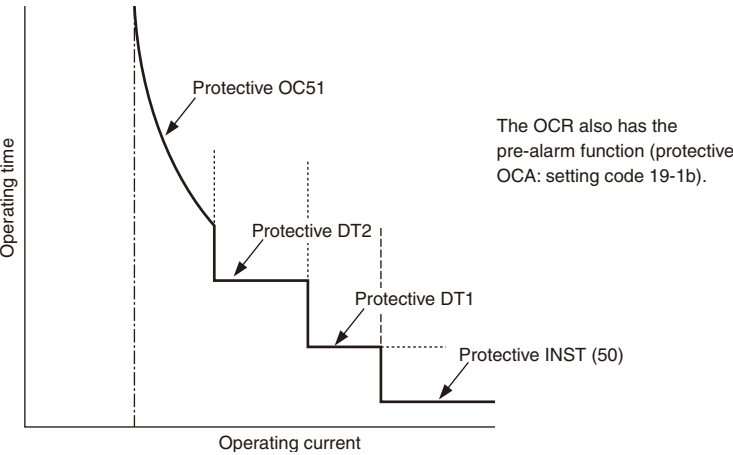
The characteristics of overcurrent relays (OCR) are, in general, divided into the protective INST (50) (setting code 10, 11), the protective DT1 (setting code 12 to 14), protective DT2 (setting code 1c, 1d, 1E) and the protective OC 51 (setting code 15 to 18). The characteristics of protective OC 51 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 (2% step) *1	0 to 10s (0.1s step)
Protective OC (51)		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.



Power Monitoring Equipment
Multiple function protectors and controllers F-MPC30

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.

■ Features

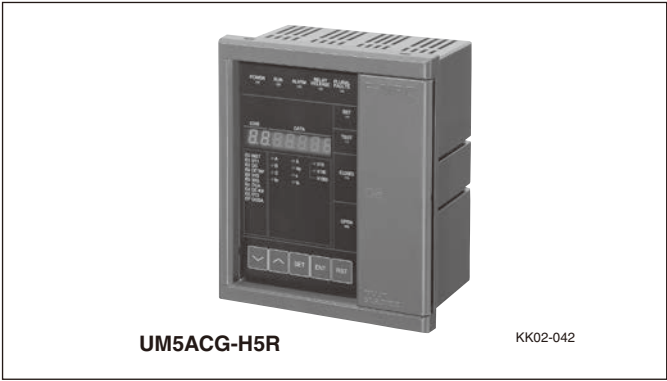
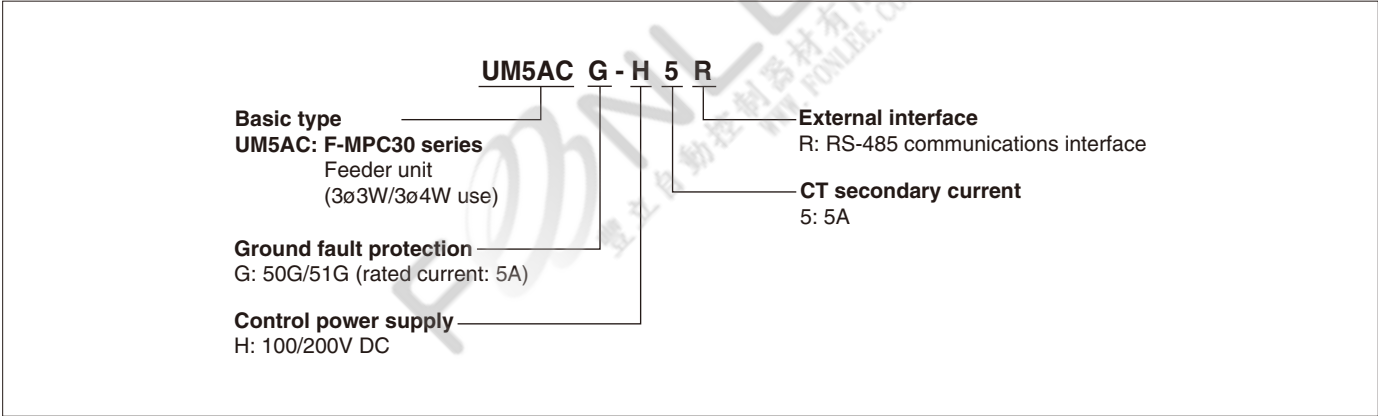
Economical system configuration

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.

■ Type number nomenclature



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.

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC30

■ 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	10MΩmin. 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).

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC30

• Specifications of protective relays

	Setting range of current/voltage operate 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 to 10s 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

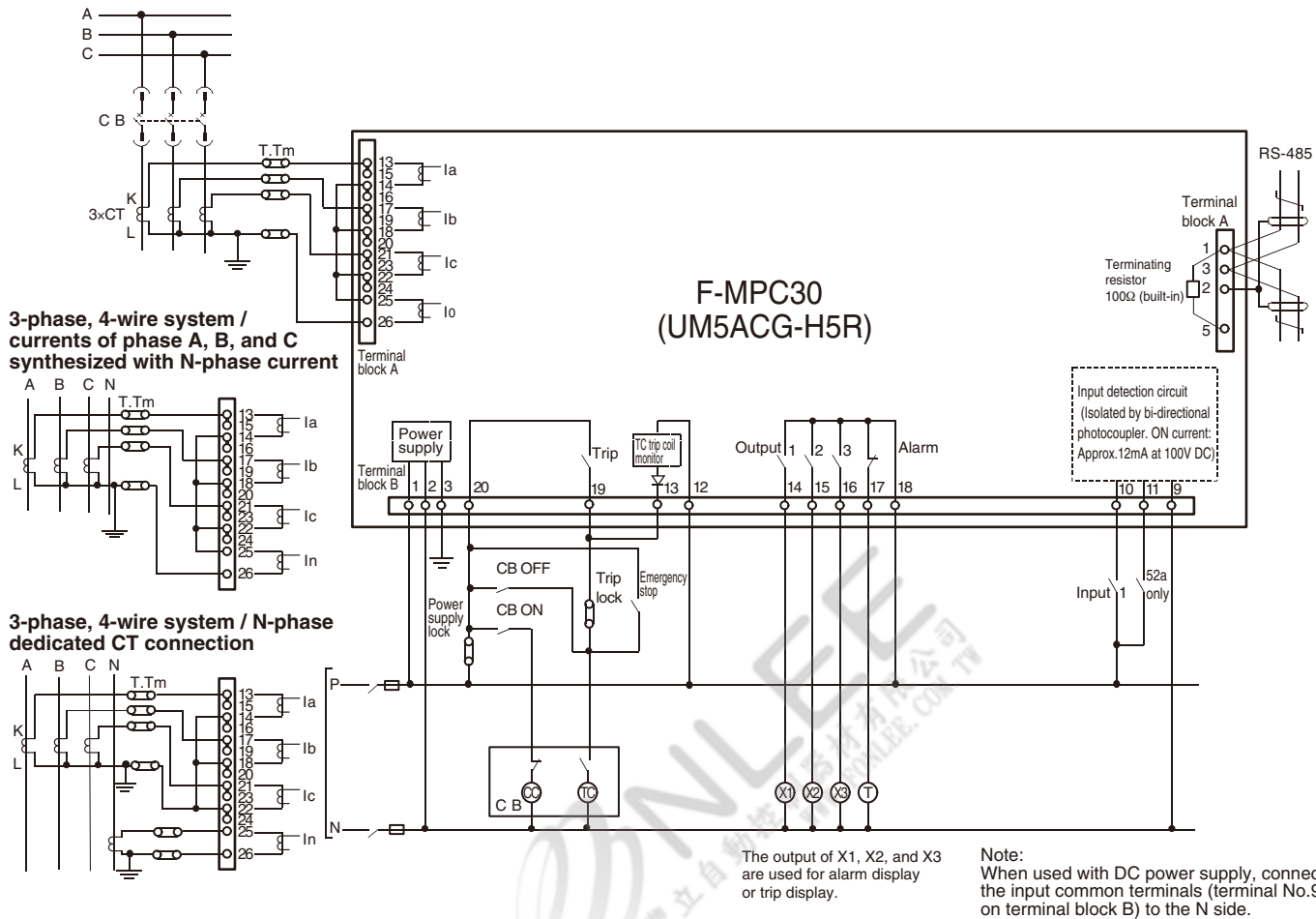
D1

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC30

■ Example of external wiring diagram (External 3 CTs)

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



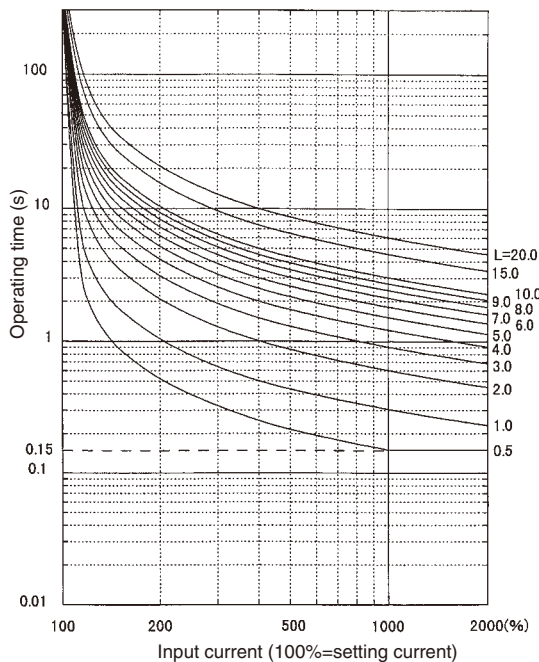
- Note:
- Use selective input 1 and selective output 1 to 3 by selecting the function type by setup. See page D1-220 for details.
 - Outputs of "TRIP and device error" are used exclusively. Inputs of "52a: the answer back signal of CB ON" and "the monitoring of TC coil" are used exclusively.
 - Device 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 □. See page D1-220 "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.

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC30

Time-current characteristics of an overcurrent relay

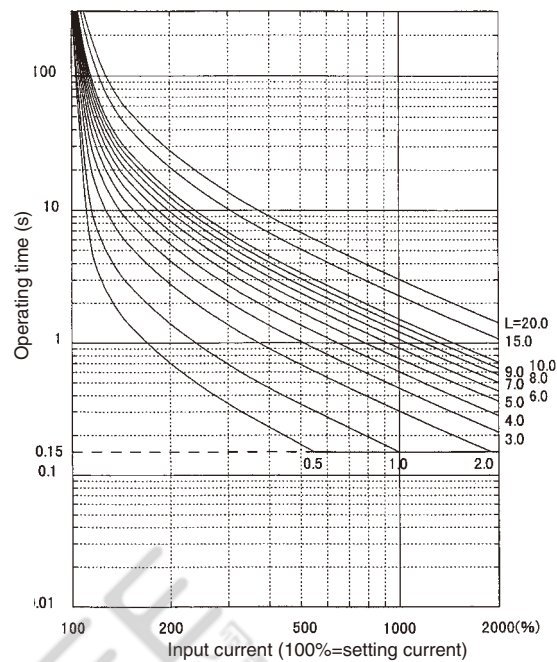
Standard inverse (SI) characteristics



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.

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

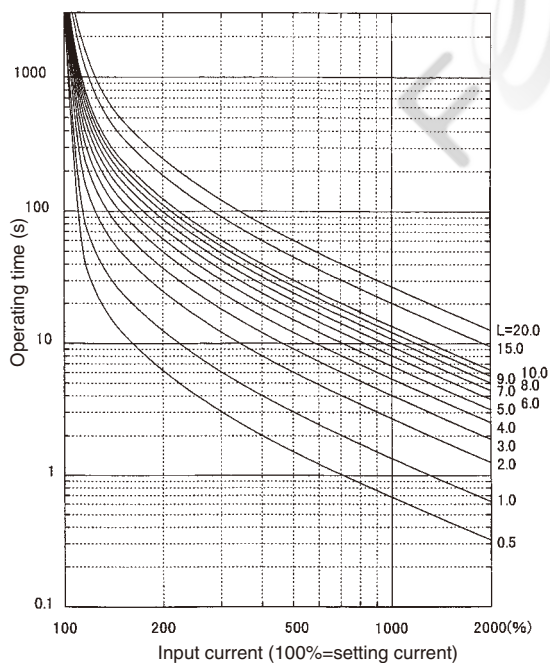
Very inverse (VI) characteristics



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.

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

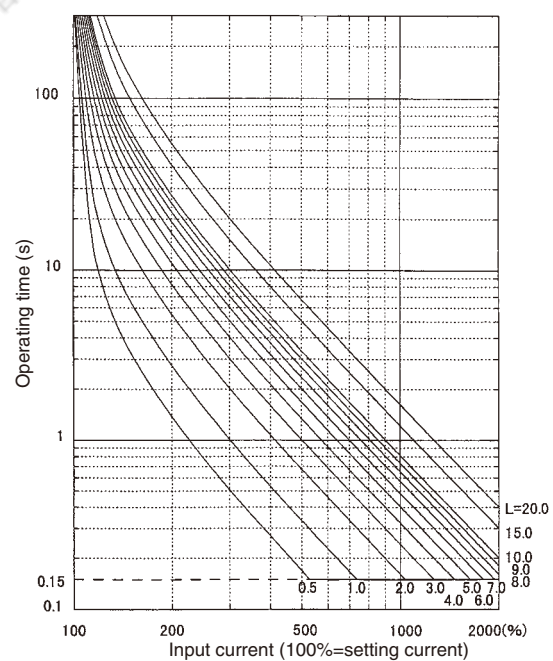
Long time inverse (LT) characteristics



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.

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

Extremely inverse (EI) characteristics



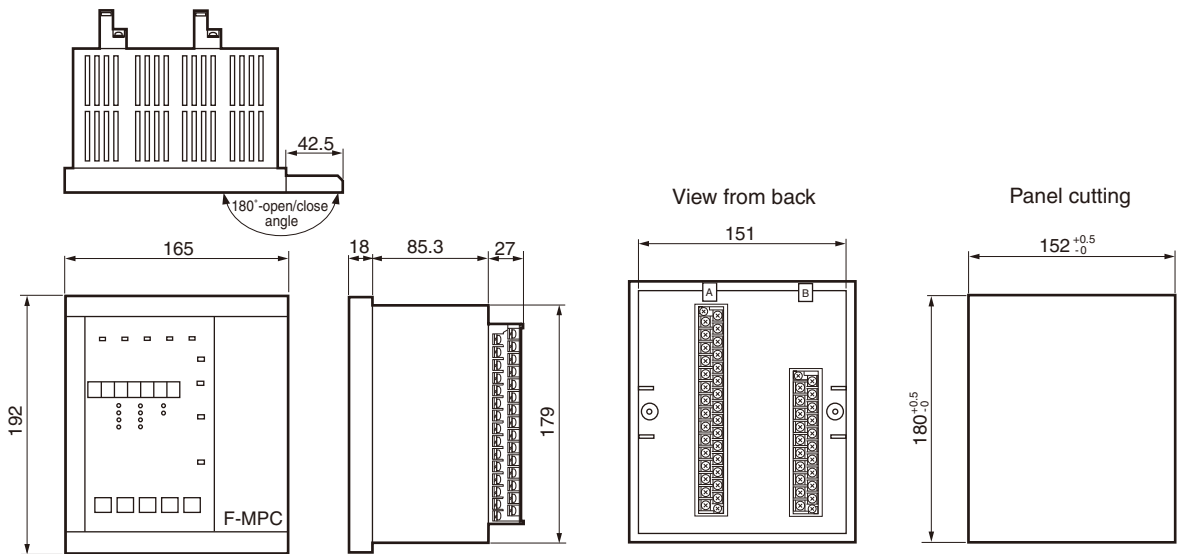
Note:
Time setting (lever) is of 0.1 times step (Lower limit: 0.5, upper limit: 20.0). Indication of a part of the lever is omitted in the characteristics indicated above.

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

Power Monitoring Equipment

Multiple function protectors and controllers F-MPC30

■ Dimensions, mm



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

■ Characteristics of overcurrent relay (OCR)

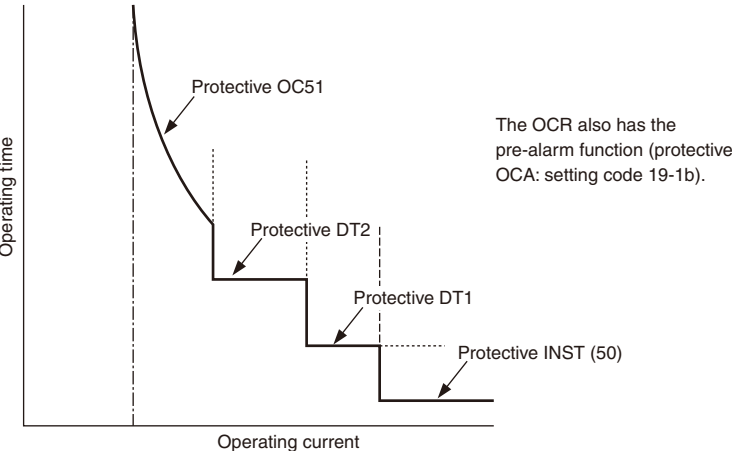
The characteristics of overcurrent relays (OCR) are, in general, divided into the protective INST (50) (setting code 10, 11), the protective DT1 (setting code 12 to 14), protective DT2 (setting code 1c, 1d, 1E) and the protective OC 51 (setting code 15 to 18). The characteristics of protective OC 51 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 (2% step) *1	0 to 10s (0.1s step)
Protective OC (51)		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).

■ Features

Includes an energy-saving pattern control feature that contributes to customer energy-saving measures.
Easy to connect, easy to set up, easy to monitor, easy to control.

This single unit can connect to anything.

- Dedicated software not required. Can be easily initialized and configured with a general browser.
- Cumbersome device configurations can be completed with just 3 clicks.
- Equipped with a control program that supports energy-saving measures, while also enabling energy-saving automated operation.
- Comes standard with various interfaces such as Modbus, Ethernet and microSD. Enables data collection and centralized monitoring.
- Notifies you of abnormalities via email.
- Scheduled for Fall 2018
 - Equipped with a USB host function that makes it possible to store forms in batch on a USB memory.
Makes form management easy even in environments without a network connection.
 - Self-declared CE compliance with English language display.



■ Models and Types

Product name	Type
F-MPC Web unit	UM12-10

■ Specifications

● General specifications

Item	Specifications
Control power	Rating Consumer VA Inrush current
	100-240 V AC (permissible range: 85-264 V AC) 50/60 Hz (permissible range: 47 to 63 Hz) 17 VA or less At 110 V AC: 15 A or less; At 220 V AC: 30 A or less
Isolation resistance	Control power terminal - ground: 10 MΩ or higher; Communication terminals - ground: 10 MΩ or higher; Control power terminal - communication terminal: 5 MΩ or higher (500 V DC megger)
Vibration	10-58 Hz: One-way amplitude 0.075 mm; 58-150 Hz: Constant acceleration 10 m/s ² ; X, Y, Z: 8 minutes x 10 cycles in each direction
Impact	300 m/s ² ; 11 ms; X, Y, Z: 3 times in each direction
Withstand voltage	Control power terminal - ground: 2,000 V AC for 1 minute; RS-485 terminals - ground: 500 V AC for 1 minute; Control power terminal - RS-485 terminals: 2,000 V AC for 1 minute
Noise resistance	Square wave: Continuous application of 1 ns x 1 μs square wave noise for 10 minutes; Control power circuit: 1.5 kV; Communication (RS-485, Ethernet, USB); Circuit: Clamp 1.0 kV Radiation electromagnetic field (transceiver): 10 V/m; Electrostatic, gap discharge: 8 kV; Contact discharge (housing): 4 kV; Burst control power circuit (control power - ground) 2 kV Communication (RS-485, Ethernet, USB) circuit: Clamp 1 kV; Radiation electromagnetic field immunity: 80-1000 MHz, 10 V/m; Conduction immunity: 0.15-80 MHz Commercial-use external magnetic field: 30 A/m
Lightning impulse withstand voltage	Control power terminal - ground: 2.5 kV (1.2 x 50 μs) Surge: Control power 2 kV, communication line 1 kV, RS-485 terminals - ground 1.0 kV (1.2 x 50 μs), control power terminal - communication terminal 1.0 kV (1.2 x 50 μs)
Operating ambient temperature	-10 to 55 °C
Storage temperature	-20 to 70 °C
Relative humidity	20 to 90% RH (no condensation)
Usage atmosphere	No corrosive gas or excessive dust.
Usage altitude	Altitude 2,000 m or less
Permissible instantaneous power failure time	20 ms (at 100 V AC)
Power interruption compensation	Lithium primary battery (RTC backup only)
Installation (overvoltage) category	II (IEC 61010-1)
Pollution degree	2 (IEC 61010-1)
Protective structure	IP20 (IEC 61010-1)
Mounting method	DIN rail or M4 screw (tightening torque up to 1.5 N•m)
Mass	Approx. 240 g (including battery)

*Design life: 10 years or more at an average ambient temperature of 40°C

*Battery replacement life: 5 years (average ambient temperature of 25°C)

● Communication specification

Ethernet

Item	Specifications	Remarks
Standard	10Base-T/100Base-Tx	IEEE802.3
No. of channels	Maximum 2ch	Auto - MDIX compatible
Internet	IP	IPv4 support (Factory-default: Ch 1:192.168.0.1, Ch 2:192.168.1.1); Temporary reset by pushing and holding SW1 button for 5 seconds
Web server	HTTP	Various settings, monitoring data transmission, and remote control
FTP client	FTP(active/passive)	Function for transmitting collected data to server
Gateway	TCP	Ethernet - RS-485 (Modbus RTU, F-MPC-Net) communication converter
NTP client	NTP	Automated set-up for the built-in clock
Email client	SMTP	Ability to send specified email via internal events (time, triggers) Supported authentication protocols: SMTP AUTH PLAIN, SMTP AUTH LOGIN, SMTP AUTH CRAM-MD5, POP before SMTP (APOP)
DNS client	DNS	Host name resolution function
DHCP client	DHCP	Automatic IP allocation function
Modbus TCP client	Modbus TCP	Modbus TCP server IO memory response read-only
Loader command client	SX loader command	Loader command IO memory response read-only

Power Monitoring Equipment

F-MPC Web unit

● **Communication specification (continued)**

RS-485

Item	Specifications	Remarks
Standard	EIA-485	
No. of channels	2ch	Settings such as protocol and baud rate can be configured for each channel
Communication protocol	F-MPC-Net, Modbus RTU	Selection (each channel can be individually set), (factory default is F-MPC-Net)
Communication method	Master/slave system	This unit is a master
Performance	Baud rate/bit length/parity/maximum no. of connections	4800, 9600, 19200, 38400 bps / 7, 8-bit / None, odd, even / 63 units* (factory default is 19200, 7-bit, odd)
Bias resistance	100 kΩ (OFF) / 675 Ω (ON) switch	To comply with Modbus standard (Factory default is OFF 100 kΩ)

*Calculated via 2 units when the unit supports a maximum of 31 connections.

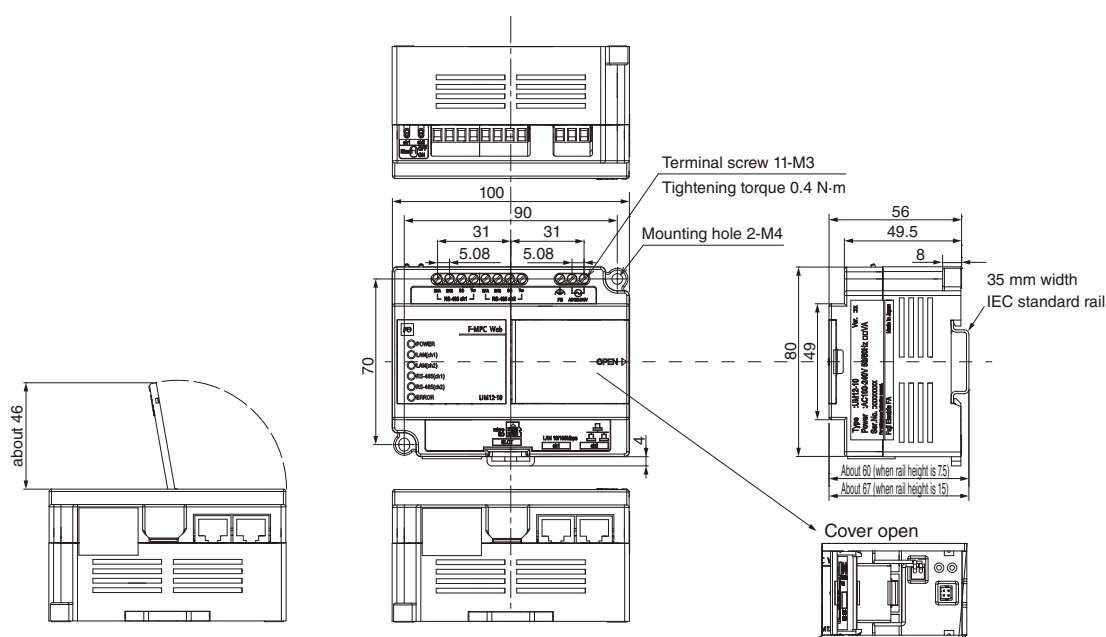
●Screen specification

Item	Sub-item	Contents
Basic settings	Basic settings	User, network, time settings
	Communication settings	Communication port (RS-485, Ethernet) settings
	Download	Settings information download
	Upload	Settings information, software package upload
	Configuration file management	User macro management
	F-MPC Web information	Refer to info on main body
	Breakdown information details	Critical/minor breakdown information
	Version information	Software version information
	Log download	RAS warning log download
	IO/MEM state	I/O information (Factory default: 19200, 7-bit, odd)
Monitoring screen	Monitoring information	Uploading/downloading of various definition files; shutting down and restarting the system
	Usage rating	Rating information and usage for each interval (1-minute, 30-minute, 1-hour, 1-day, 1-month)
	Usage comparison	2-signal comparison graph for each interval (bars/lines)
	Trends	Line graph for each interval (up to 4)
	Yearly, monthly, daily reports	Viewing of yearly, monthly, and daily reports, as well as batch download of forms
	Demand monitoring	Demand monitoring graph
	Alarm logs	Viewing of alarm and output logs, as well as output control
	Measurement values list	Display of collected measurement values list
Collection settings	Automatic settings	Automatic recognition and setting of devices
	Signal settings	Device and signal settings to register
	Inter-item operation settings	Creating new signals by combining signals
	Group settings	Creation of group trees
	Demand settings	Demand monitoring settings and pattern control settings
	Threshold alarm settings	Threshold alarm and bit alarm settings
	Email and FTP settings	Email and FTP forwarding settings

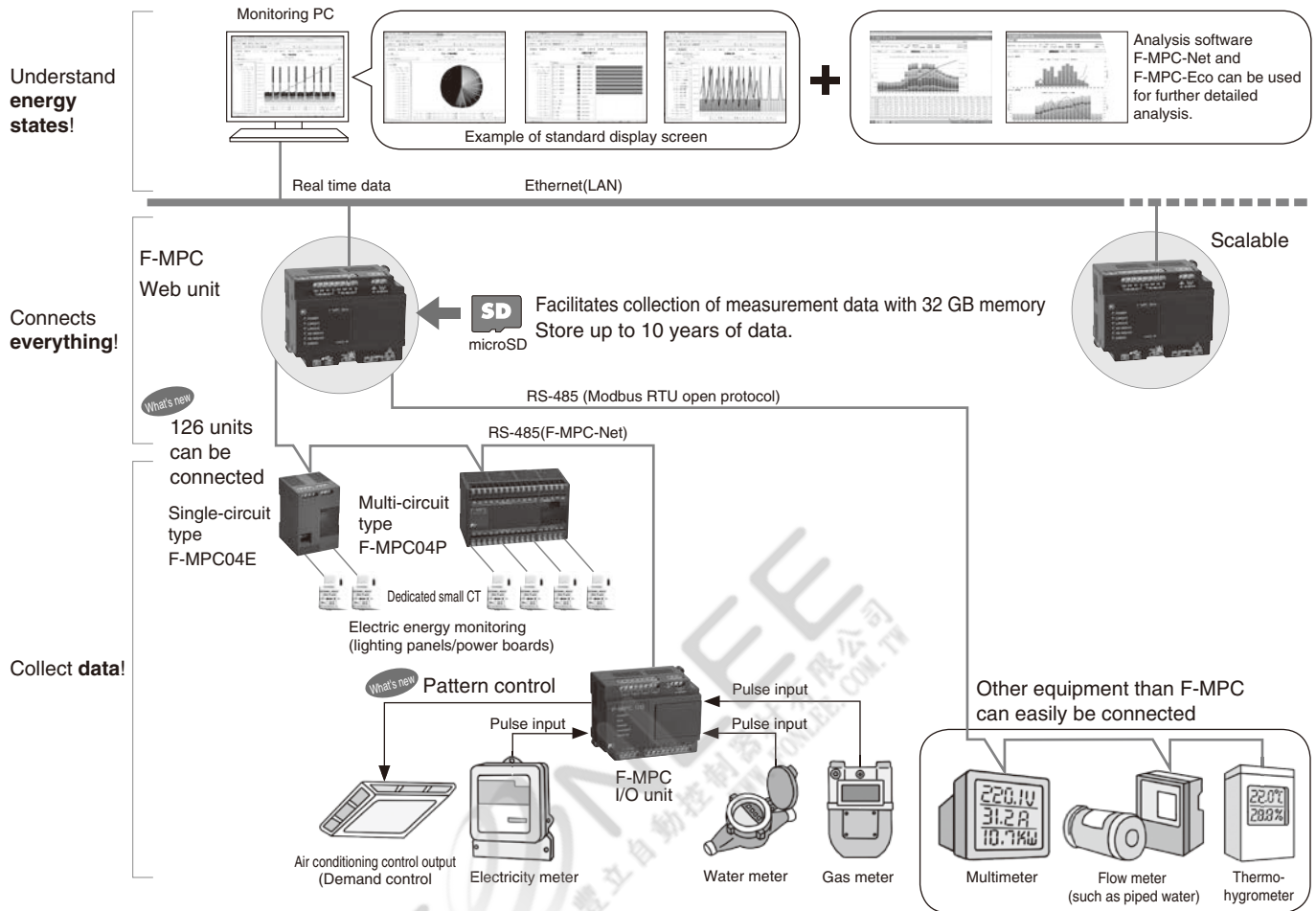
●Storage data specification

Item	Specifications	Remarks
Data points	Up to 1,000 points	1-minute interval data 1 file/day
Daily report (1-minute interval)	With SD card: 3 years or up to 80.0% capacity Without SD card: 3 months or up to 70.2% capacity	30-minute interval data 1 file/day
Daily report (30-minute interval)	With SD card: 5 years or up to 80.0% capacity Without SD card: 3 months or up to 70.2% capacity	1-day interval data 1 file/month
Monthly report	With SD card: 10 years or up to 80.0% capacity Without SD card: 5 years or up to 70.2% capacity	1-day interval data 1 file/month
Annual report	With SD card: 10 years or up to 80.0% capacity Without SD card: 5 years or up to 70.2% capacity	1-month interval data 1 file/year
Storage medium	Internal non-volatile memory or external non-volatile memory	Internal: Flash memory External: Micro SD card (sold separately); also compatible with SDHC
At power failure	Data before power failure is saved.	Excludes data being collected immediately before power failure
Data transmission method	Transfer via csv format	FTP: Periodic transfer of accumulated request data to PC via FTP SMTP: Periodic transfer of accumulated request data to PC via email http: Manual import to PC via zip compression

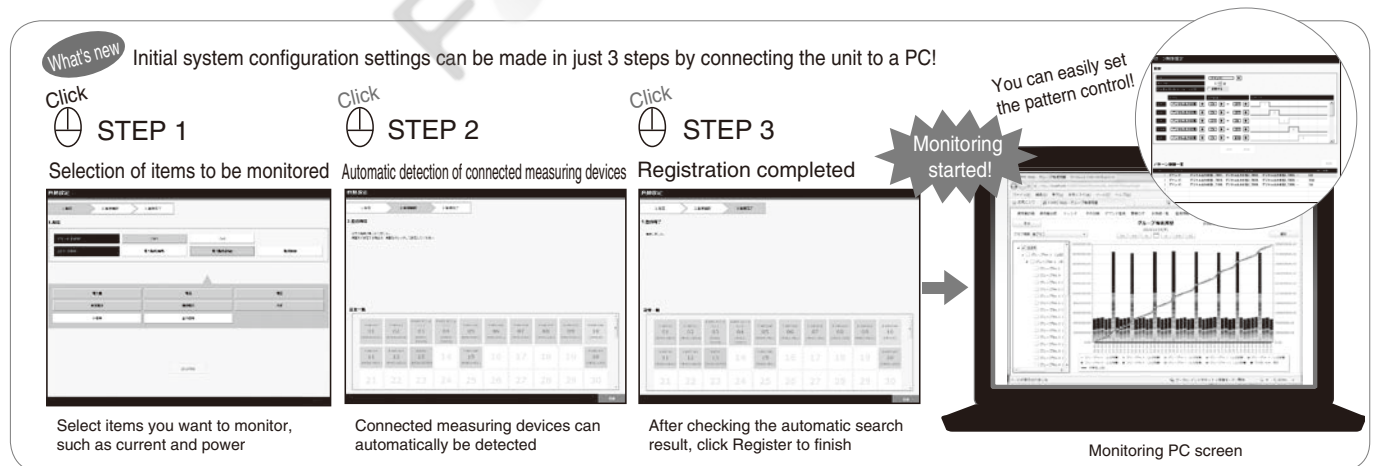
■ **Dimensions, mm**



■ System configuration



D1

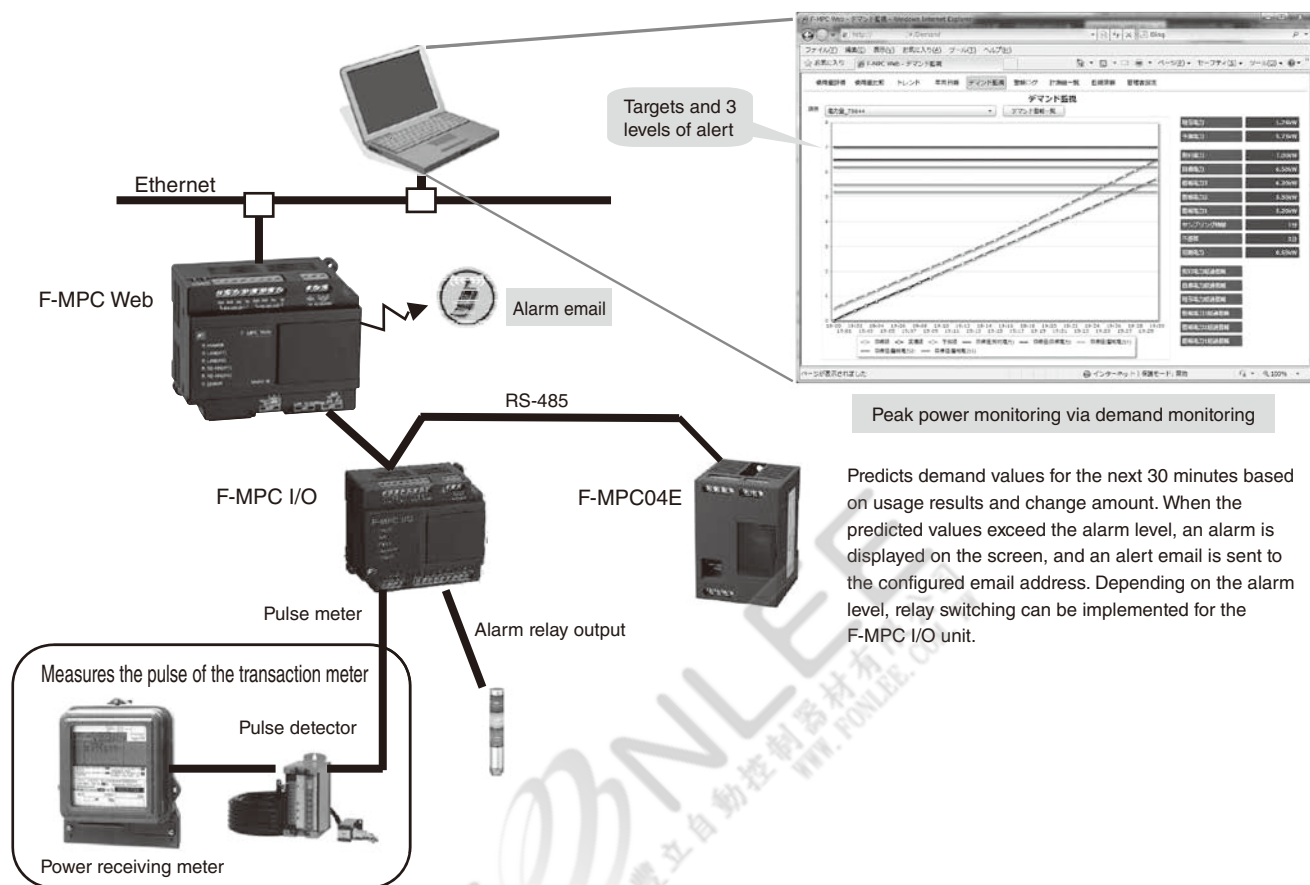


Power Monitoring Equipment

F-MPC Web unit

■ Peak power monitoring by F-MPC Web (Monitoring via power receiving meter pulse)

The F-MPC I/O unit and F-MPC Web unit can be combined to monitor peak power.



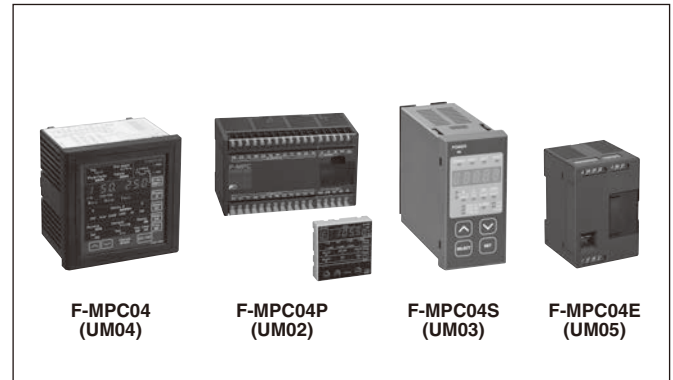
Power Monitoring Equipment

Power monitoring unit F-MPC04, F-MPC04P, F-MPC04S, F-MPC04E

Power monitoring unit F-MPC04 series

■ Description

- F-MPC04 series power monitoring equipment, designed for used in low voltage circuits, can perform electric power management and monitoring from high to low voltage circuit efficiently and economically, used together with F-MPC60B and F-MPC30 series.
- F-MPC04 series consists of 3 types: type UM04 integrated power monitoring unit that can monitors up to 10 feeders, type UM02 multi-circuit power monitoring unit that is space-saving and can monitor up to 8 feeders in three-phase three-wire system, and type UM03 single circuit power monitoring unit, being compact, that has optimum output functions for preventive maintenance, and is best suited for installation in a unit of facility, section, and floor.
- RS-485 communications interface is standard. With our application software of F-MPC-Net power monitoring system, you can automatically display, print, and save the data measured by F-MPC 04 on your PC.



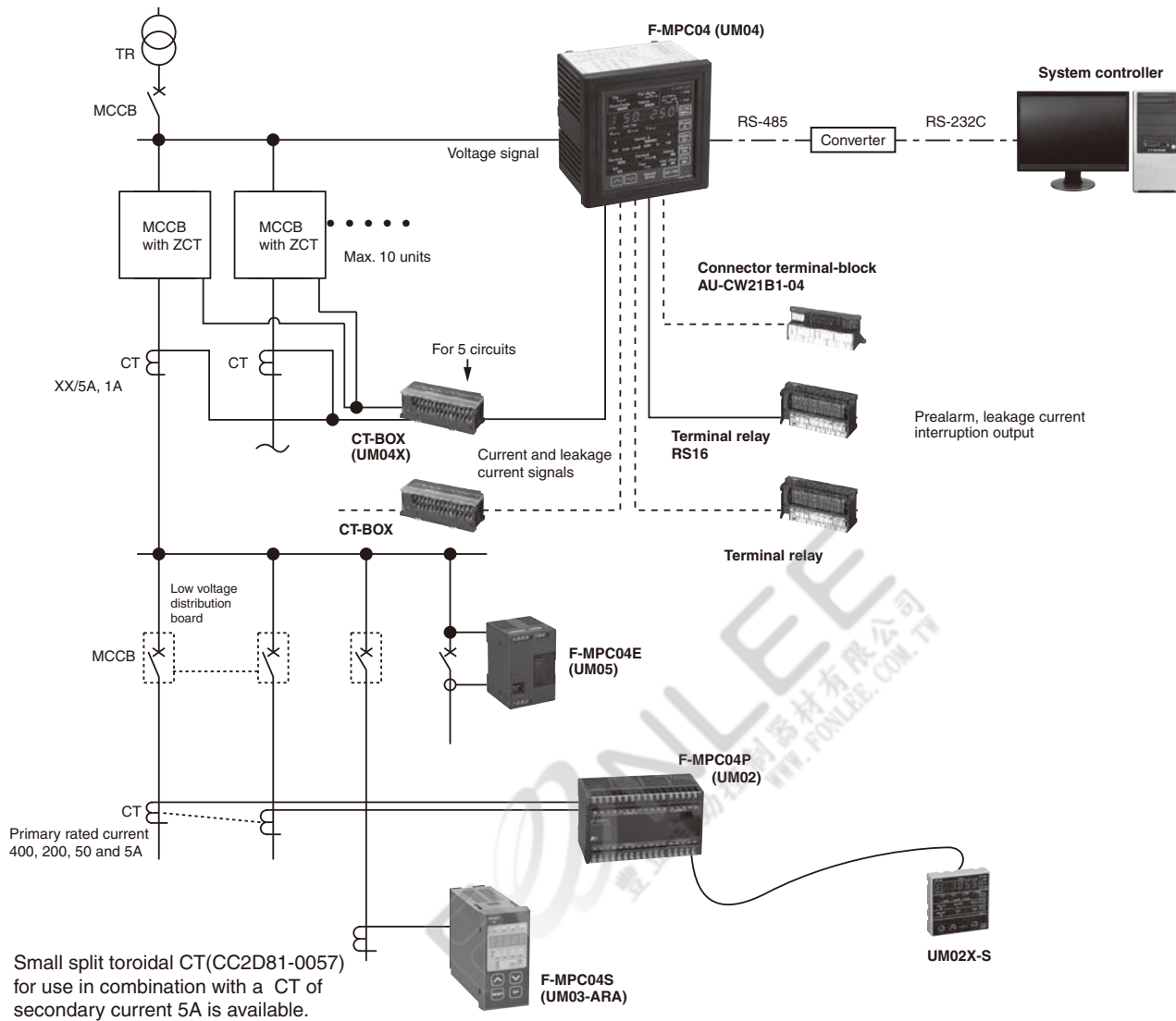
Type			F-MPC04	F-MPC04P			F-MPC04S		F-MPC04E			
			UM04-ARAE	UM02-AR2	UM02-AR3	UM02-AR4	UM03-ARA3G	UM03-ARA3	UM05-AR3	UM05-AC3		
			Integrated power monitoring unit	Multi-circuit power monitoring unit			Single-circuit power monitoring unit		Single-circuit power monitoring unit			
Measuring function	No. of phase and wire	1-phase 2-wire	10 circuits	12 circuits	—	—	1 circuit	1 circuit	1 circuit			
		1-phase 3-wire	10 circuits	—	8 circuits	—						
		3-phase 3-wire										
		3-phase 4-wire	6 circuits	—	—	4 circuits	—	—	—			
	No. of voltage circuit		2	1			1	1	1			
	Measuring item	Voltage [V]	○		○		○	○	○			
		Current [A]	○		○		○	○	○			
		Power [W]	○		○		○	○	○			
		Active power [Wh]	○		○		○	○	○			
		Reactive power [var]	○		○		○	○	○			
		Reactive energy [varh]	○		—		○	○	○			
		Power-factor	○		○		○	○	○			
		Leakage current [Io]	○		—		○	—	—			
	Maintenance item	Demand	Current	○		—		○	○	—		
				Power	○		—		○	○	—	
				Max. current	○		—		○	○	—	
				Max. power	○		○		○	○	—	
		Max. voltage value	○		○		○	—	○			
		Min. voltage value	○		○		—	—	○			
	Harmonic current		○		—		—	—	—			
	Protection	Current prealarm (OCA)		○		—		○ (Demand only)		—		
Leakage current prealarm (OCGA)		○		—		○	○	—				
Leakage current trip (OCG)		○		—		○	—	—				
Communications interface			RS-485, Modbus	RS-485			○	—	RS-485, Modbus —			
Display and setting			○	Display and setting unit UM02X-S			RS-485	RS-485	Display and setting unit UM05X-S			
Devices to be connected	Current sensor (Current Transformer:CT)		○ **1	CT: 5, 50, 100, 200, 400, 800A								
	ZCT (separately installed)		○	—			○	—	—	—		
	MCCB with ZCT		○	—			○	—	—	—		

Note *1: FMPC 04 (UM04) is connected to CT via CT-BOX. For combination of F-MPC04 (UM04), CT-BOX and CT, See page D1-231 and D1-255; "Applicable CT."

Power Monitoring Equipment

Power monitoring unit F-MPC04, F-MPC04P, F-MPC04S, F-MPC04E

■ System configuration example
Low voltage



Power Monitoring Equipment

Power monitoring unit F-MPC04

D

Integrated power monitoring unit, UM04

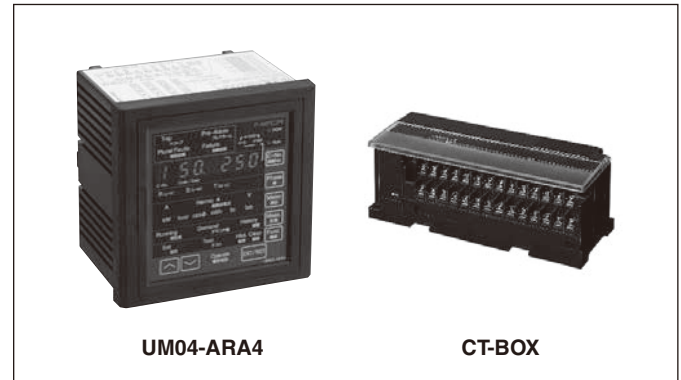
■ Description

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.

■ Type number nomenclature

Integrated power monitoring unit



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).

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 D1-257.
Connector cable	Length 1m/2m/3m	AUX014-20□	See page D1-257.
Connector terminal block	kWh pulse output For digital input	AU-CW21B1-04	See page D1-258.

■ 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.

Power Monitoring Equipment

Power monitoring unit F-MPC04

■ 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 × 50 μs) 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.

Power Monitoring Equipment

Power monitoring unit F-MPC04

• 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): $\sqrt{3} \times 264V$			±2.5% FS	VT secondary voltage is jointly used as internal control power supply. (For U-V)
Zero-phase current I ₀	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. (I _r , I _t , V _{uv} , V _{wv})
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)	none	*6	±0.5% (No display)	
	The reactive energy of the plus				
	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 maximum-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.

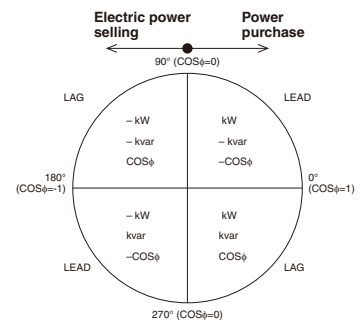
*6. For the F-MPC-Net protocol, the lower four digits of the display are sent. For the MODBUS RTU protocol, 0 to 999999.999kWh is sent and the step value for the total countup depends on the VT ratio and CT ratio.

*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



Power Monitoring Equipment

Power monitoring unit F-MPC04

• Demand measurement

Item	Specification
Current (I(r), I(s), I(t)) Effective power Zero-phase current (rms:I ₀ , 50/60Hz:I _{0b}) Harmonics currents, voltage	Time: Select one from 0, 1 to 15 minutes (1 minute increments) and 30 minutes 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 (I ₀ or I _{0b} selectable)
Operating Level	50 to 100% of setting value (Operate at less than 50%, no operate 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: 10ⁿ 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)
	Data length	7 or 8 bits (selectable)
	Parity bit	None, even, or odd (selectable)
	Stop bits	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	

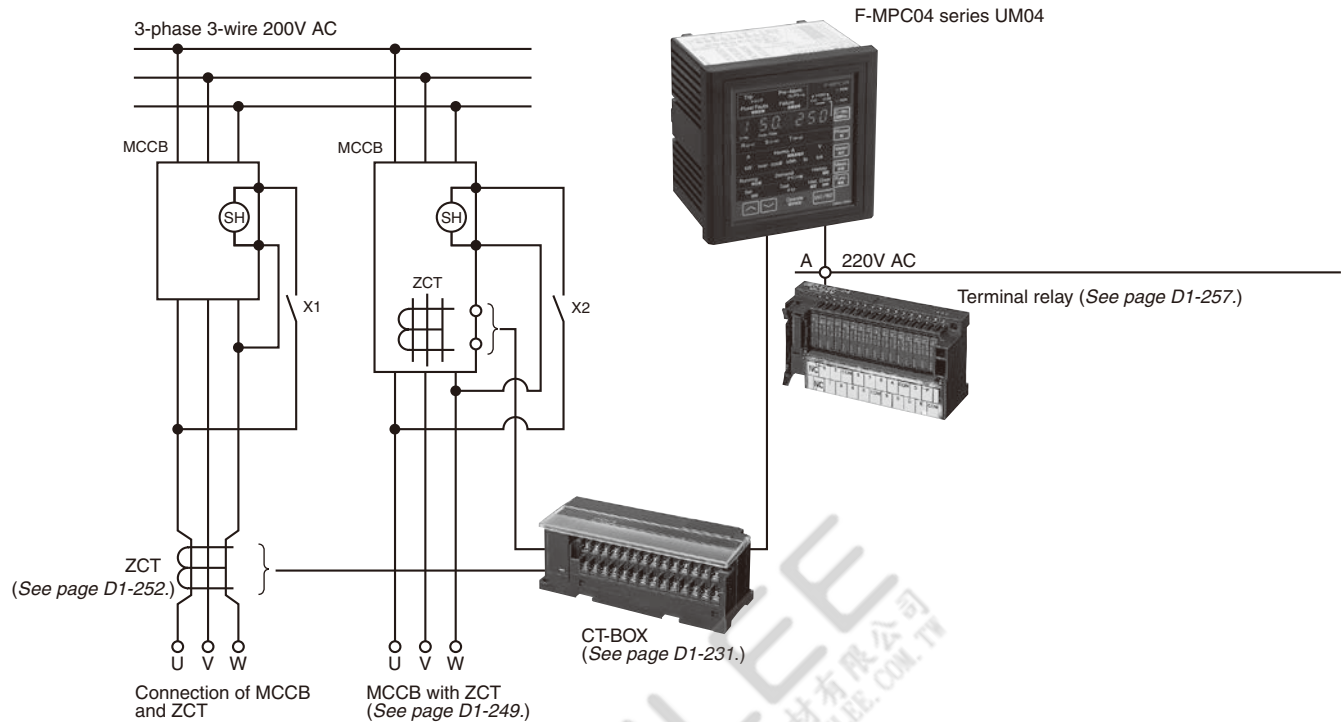
Power Monitoring Equipment

Power monitoring unit F-MPC04

D

■ System configuration

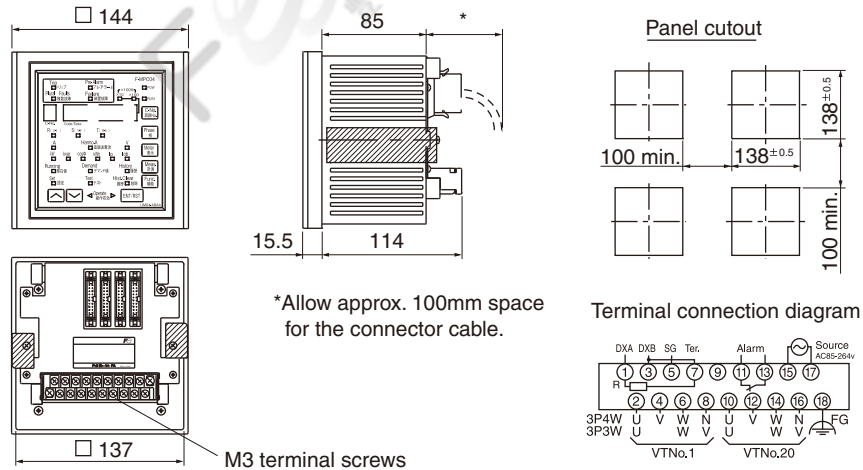
With an integrated power monitoring unit UM04, you can easily construct a low-voltage power distribution system equipped with leakage current measuring, leakage current pre-alarm, and earth leakage circuit shutdown.



(SH) : Shunt trip device

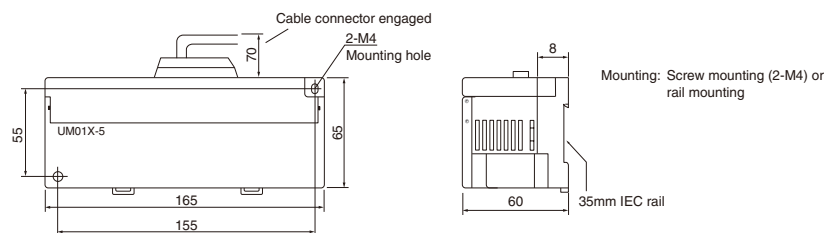
■ Dimensions, mm

• Integrated power monitoring unit, UM04



*Allow approx. 100mm space for the connector cable.

• CT-BOX, UM04X



Power Monitoring Equipment

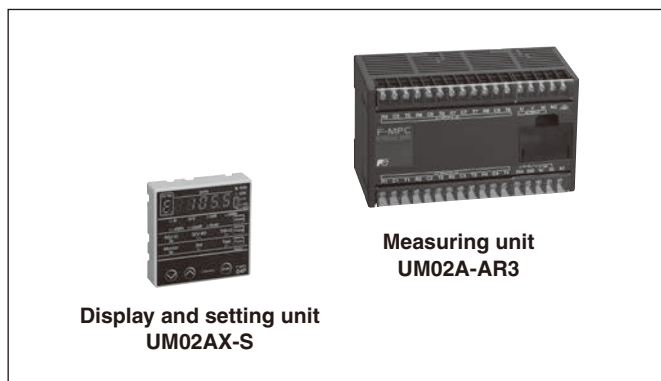
Power monitoring unit F-MPC04P

Multi-circuit power monitoring unit, UM02A

■ Description

Integrating measuring functions required for power monitoring in one unit

- A single unit measures multiple circuits
A single UM02A can measure up to 8 feeders in 3-phase 3-wire, 12 feeders in single-phase 2-wires and up to 4 feeders in 3-phase 4-wire circuit.
- Easy installation into existing switchboards
Compact UM02A can be easily installed into on-site power distribution or lighting panel, irrespective of new panel or existing panel, to create power monitoring system economically.
- On-site measuring instrument
UM02A can be used as an on-site measuring instrument by combining with an optional display and setting unit UM02AX-S.
- Communication interface
As UM02A has an RS-485 communications interface as standard, it can communicate with other power monitoring equipment with RS-485



■ Type number nomenclature

Multi-circuit power monitoring unit (Measuring unit)

UM02A-AR 3

Basic type

UM02A-AR: Measuring unit

Applicable circuit

- 2: Single-phase 2-wire, up to 12 feeders
- 3: 3-phase 3-wire, Single-phase 3-wire, Single-phase 2-wire, up to 8 feeders
- 4: 3-phase 4-wire, up to 4 feeders

■ Type and applicable circuit

Description	Applicable circuit	Type
Measuring unit	Single-phase 2-wire, up to 12 feeders	UM02A-AR2
	3-phase 3-wire, Single-phase 3-wire, Single-phase 2-wire, up to 8 feeders	UM02A-AR3
	3-phase 4-wire, up to 4 feeders	UM02A-AR4
Sold separately		
Display and setting unit	The TP48X socket and connecting cable are provided as accessories.	UM02AX-S

Power Monitoring Equipment

Power monitoring unit F-MPC04P

D

■ Specifications F-MPC04P (UM02)

• General specifications

Item		Specification
Ratings	Voltage	Direct input: 100 or 200V AC, 400V AC (AR4 only) VT primary/ secondary: 220, 440V AC, 3.3k, 6.6kV AC/110V AC, 440/220V AC ^{*1}
	Current	Split CT: 5, 50, 200, 400A AC Small split current sensor CT: 5A AC (primary rated set range 10 to 7500A) ^{*1}
Control power supply		100/200V AC common use (85 to 264V AC) AR2: between terminals P1-N, AR3: between terminals U-V, AR4: between terminals P1-P2
Inrush current		15A max., 3ms max. (100V AC 50Hz) 30A max., 3ms max. (200V AC 50Hz)
Control power consumption		20VA or less (or approx. 15VA at 200V AC, 10VA at 100V AC)
Ambient temperature		Operating: -10 to 55°C (no icing or no condensation) Storage: -20 to 70°C (no icing or no condensation)
Humidity		20 to 90% RH (no condensation)
Atmosphere		Free from corrosive gases and excessive dusts or particles
Insulation resistance		10MΩ min. between electric circuits and ground
Dielectric strength		2000V AC, 1 minute (2500V AC, 1 minute for AR4) between control power circuits and ground
Lightning impulse noise resistance		4.5kV (1.2 × 50μs) between control power circuits and ground (6.0kV for AR4)
Momentary overload capability		20 times rated current, 9 times for 0.5s.
Vibration resistance		JIS C 60068-2-6 10 to 58Hz: single amplitude of 0.075mm, 58 to 150Hz, constant acceleration of 10m/s ² 8 minutes x 10 cycles in each of X, Y, and Z directions
Shock resistance		JIS C 60068-2-27 Half sine wave 300m/s ² , for 11 ms x 3 times in each of X, Y, and Z directions
Noise immunity		1.5kV square wave (rise time: 1ns, pulse width: 1μs) for 10 minutes continuously
Permissible momentary power failure		20ms (continuous operation) except RS-485 communications
Mass		Measuring unit: Approx. 500g, Display and setting unit: Approx. 200g

Note ^{*1} Make VT and CT ratio settings through the display and setting unit UM02X-S or from the host controller.

• Measurement specifications

Item	Effective measurement range		Display	Accuracy ^{*1}
Current (N-phase current measured in AR4)	With split CT (200A and 400A AC) combined 0, 0.4% of In to 500A		4 digits	±1.5%
Active power	With small split current sensor (50A AC) combined 0, 0.4% of In to 50A with small split current sensor (5A) combined ^{*4} 0 to n times CT rating			±2.5% for S-phase current of AR3 and N-phase current of AR4
Reactive power ^{*2}				
Power-factor			□. □□	±5% (converted into a phase angle of 90°)
Active electric energy ^{*2}			5 digits	Equivalent to JIS ordinary class ^{*4}
Max. active power ^{*3}	Same as above. (with a demand time set to 0, 1, 5, 10, 15, or 30min.)		4 digits	±1.5%
Min. voltage each phase ^{*2}	AR2, R3 85 to 264V (directly or VT secondary voltage conversion) The minimum and maximum voltage are average values for 0.3s.	AR4 Phase voltage 50 to 288V (directly or VT secondary voltage conversion) Line voltage 86 to 498V The minimum and maximum voltage are average values for 0.3s.	4 digits	±1.5%
Max. voltage ^{*2}				±1.5%

Notes ^{*1} Measurement accuracy does not include CT and current sensor.

^{*2} In measurement mode display is the number of digits of RS-485 communications data. The display and setting unit does not display communications data on reactive power, minimum voltage, and maximum voltage values.

^{*3} Max active power and active electric energy values can be reset by the display and setting unit and host controller. And, when VT ratio or CT ratio is changed, these are automatically reset.

^{*4} With 1-turn or 3-turn primary winding selected for the 5A small split current sensor, the lower limit of minute current measurement is selected as specified below.

Classification	Measurement and display range	Measurement lower limit (Electric energy starting current)	Accuracy	
			Current and power	Electric energy
1 turn	0, 2% to rating × 10	2% of rating	0 to rating: ±1.5% of rating	±2.5%
3 turns	0, 0.7% to rating × 3	0.7% of rating	Exceeding rating: ±1.5% (FS)	(5% to 100% of rating, load power factor -0.8 to 1.0 to +0.8)

Note: ^{*} Sampling interval/measurement display value (communication) of current and power, and sampling and integration intervals of electric energy are shown below. In the case of an intermittent load, such as a welding machine, accurate measurement may be disturbed and therefore the use of the single-circuit F-MPC04S (refer to page D1-229) is recommended.

Power Monitoring Equipment

Power monitoring unit F-MPC04P

• Sampling interval and display value

Type	Sampling interval/display value of current and power (Communication)	Sampling and cumulative interval of power
UM02A-AR2	Approx. 0.2s / Average voltage for approx. 1.5s	Approx. 0.2s
UM02A-AR3	Approx. 0.2s / Average voltage for approx. 1.5s	Approx. 0.2s
UM02A-AR4	Approx. 0.1s / Average voltage for approx. 0.4s	Approx. 0.1s

■ Display and setting unit UM02X-S, specifications

Item	Specification	Remarks
Control power supply	Supplied from the measuring unit UM02-AR	
Measuring unit UM02A-AR communications specifications	EIA-485 (always 19200bps fixed)	
Number of connectable measuring unit UM02A-AR	5 max.	UM02A-AR2, AR3, AR4
Max. cable length between UM02A-AR and UM02AX-S	23m	Total length between UM02AX-S and all UM02A-ARs
Display item	Operating status, measurement value VT, CT setting value, fault	Selective indication by a switch
Setting	Voltage, current (CT), demand time, pulse multiplication rate, No. of turns of CT secondary winding, host controller communications mode (different communications interface)	UM02A-AR incorporates a different RS-485 interface to communicate with a host controller.

Note : The display and setting unit UM02AX-S provides a function to start initial communications to recognize the UM02A-AR automatically when UM02AX-S is turned on. If on-site indication is not necessary once the setting to the measuring unit UM02A-AR is complete, UM02A-AR fully operates even without UM02AX-S.

■ Communications specifications

Item	Specification
Standard	EIA-485
Transmission system	2-wire half duplex
Data exchange	1: N (F-MPC04P, UM02-AR) polling/selecting
Transmission distance	1000m (total length)
No. of connectable units	Max.32 (including master)
Station number setting	01 to 99 (set with digital switch)
Transmission characters	ASCII
Transmission speed	4800, 9600, 19200 or 38400 bps (selectable)
Data format	Number of start bits
	1 (fixed)
	Data length
	7 or 8 bits (selectable)
	Parity bit
	None, even, or odd (selectable)
	Number of stop bits
	1 (fixed)
	BCC
	Even horizontal parity

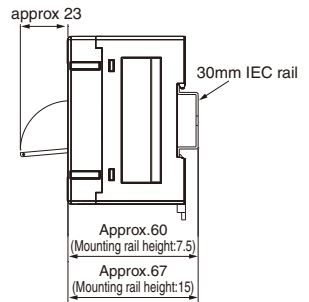
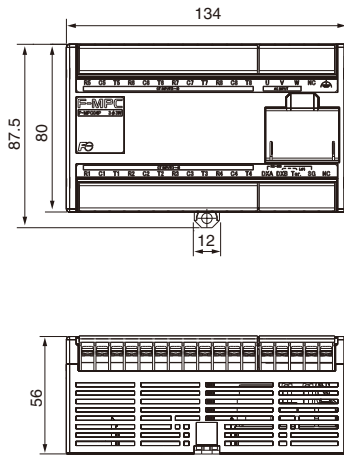
Note : Use the display and set unit to change the transmission setting.
The communications specifications cannot be changed through the host controller.

Power Monitoring Equipment

Power monitoring unit F-MPC04P

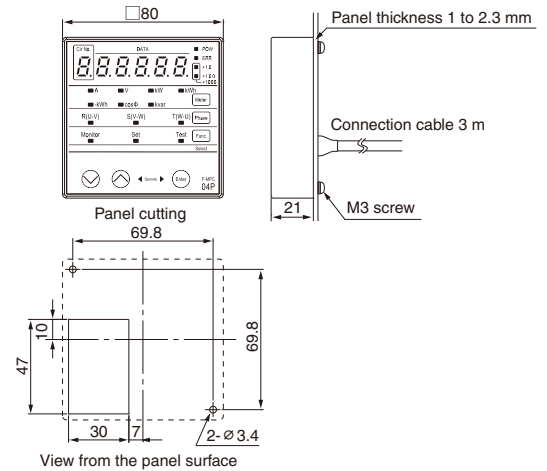
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- Dimensions, mm
- Measuring unit UM02A-AR

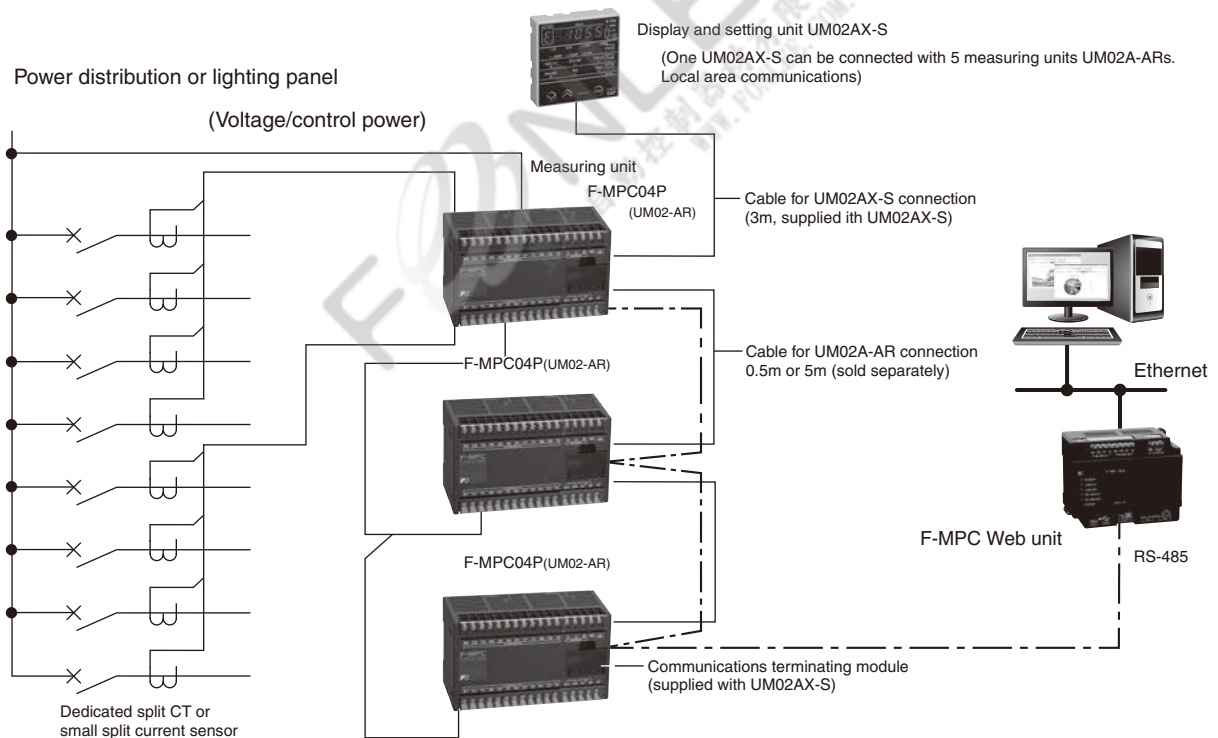


Terminal screw : 34 - M3 (with washer)
Terminal screw tightening torque : 0.5 to 0.6 N·m
Applicable amplifier terminal diameter: ϕ 5.8 or less

- Display and setting unit UM02AX-S



System configuration



Note: * The display and setting unit UM02AX-S is a local area communications master and can monitor and be able to set maximum five measuring units, UM02A-ARs.

** Station address setting of measuring unit UM02A-AR

Use a digital switch on the measuring unit to set a different station address (communication address to host controller).

In local area communication of the display and setting unit UM02AX-S, the UM02AX-S will automatically read out the address of the measuring units connected with cables for unit connection, and communicate with them.

Power Monitoring Equipment

Power monitoring unit F-MPC04S (UM03)

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 D1-255. 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.

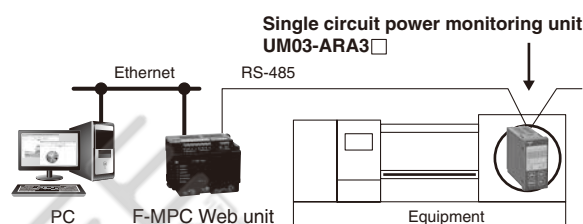
■ Specifications

● 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 wathour 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 Ω or less)
Allowable momentary power failure time		20ms (operation will continue)
Altitude		2,000m or less
Mass		Approx. 400g (main unit only, CT excluded)



■ System configuration



Power Monitoring Equipment

Power monitoring unit F-MPC04S (UM03)

• 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 Measurement 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	Replay output 250V AC 1A
	Leakage current prealarm (OCGA) (Io operation)	Not Provided	
	Leakage current alarm (OCG)	Not Provided	

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

Watt-hour pulse output details

Output specifications	35V DC 100mA (residual 2.5V or less at ON)
Output pulse width	100ms±20ms
Output interval	200ms or more
Pulse multiplication rate	10 ⁿ kWh/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 (min±25ms)
Leakage current prealarm (OCGA)	50±5mA 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 Iob (leakage current only with fundamental wave).

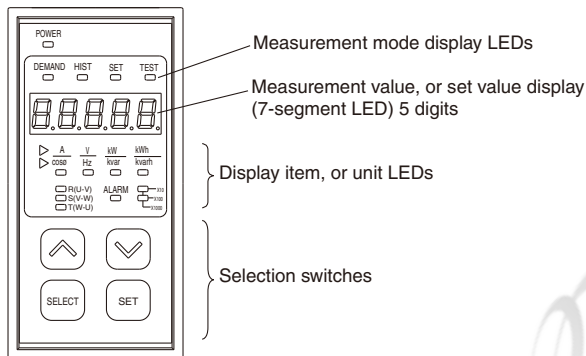
Power Monitoring Equipment

Power monitoring unit F-MPC04S (UM03)

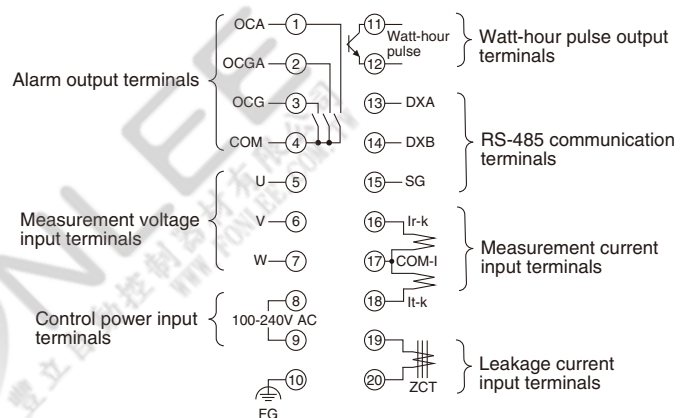
■ Communications specifications

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)
	Parity bit	None, even, or odd (selectable)
	Number of stop bits	1 (fixed)
	BCC	Even horizontal parity

■ Front panel

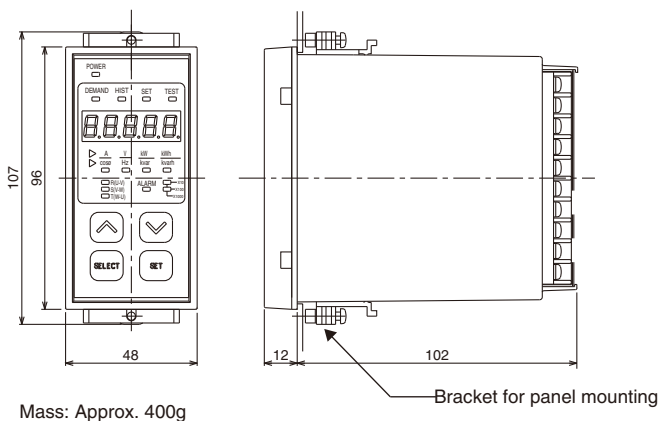


• Terminal layout

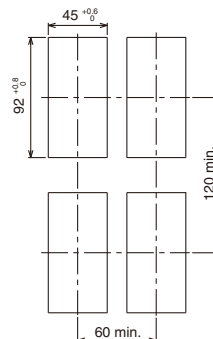


Note: Alarm output terminal ② ③ and ZCT input terminal ⑲ ⑳ of the UM03-ARA3 (without leakage current measuring function) are NC terminals. Do not connect anything to these terminals.

■ Dimensions, mm



Panel cutting



Power Monitoring Equipment

Power monitoring unit F-MPC04E (UM05)

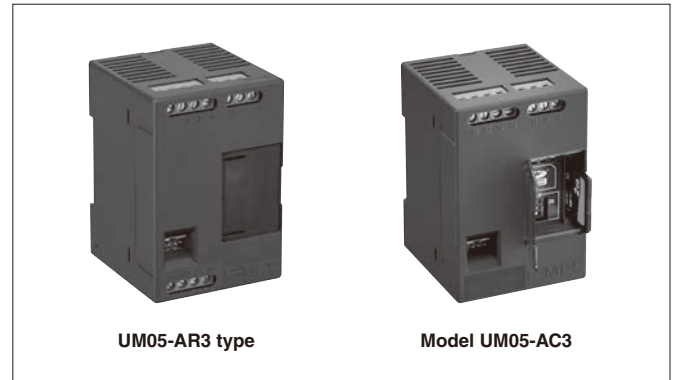
■ Features

[Common]

- The F-MPC Series is a single-circuit internally mounted power monitoring unit.
- More compact and lightweight at only 1/2 the external dimensions and 1/3 the mass (compared with F-MPC04S).
- JIS regular grade measurement accuracy. It can measure electric energy (watt hours) even at light loads.
- Reduces power consumption by 30% (compared with the F-MPC04S).
- Easy set-up with rotary switch and dip switch.
- Measurement data can also be displayed on the panel by using the separately sold indicator.

[UM05-AR3]

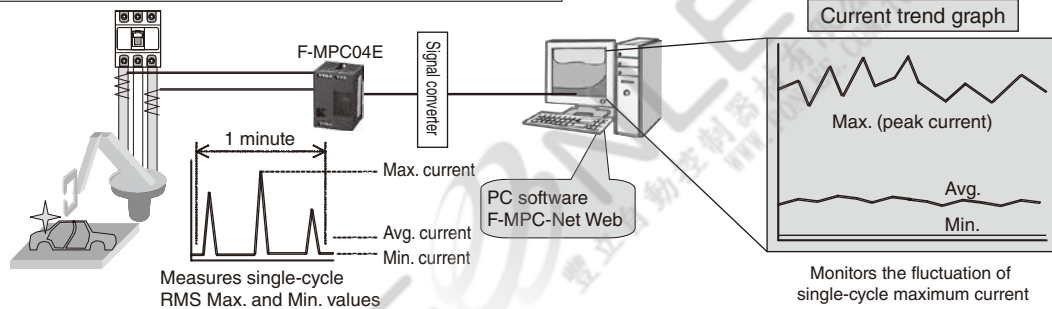
- Comes equipped with an RS-485 communication function (UM05-AR3 only).



[UM05-AR3]

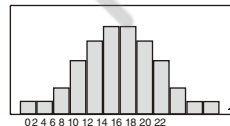
- Collected data can be stored on an SD card and displayed on a PC. There is no need to build a communication system. (UM05-AR3 is the type that comes with a communication function.)
- Comes with a PC application for easily analyzing and graphing the data stored on SD cards (You can download it from our website.)

Capture the peak current of devices such as spot welders.



Accurate measurement even at low loads

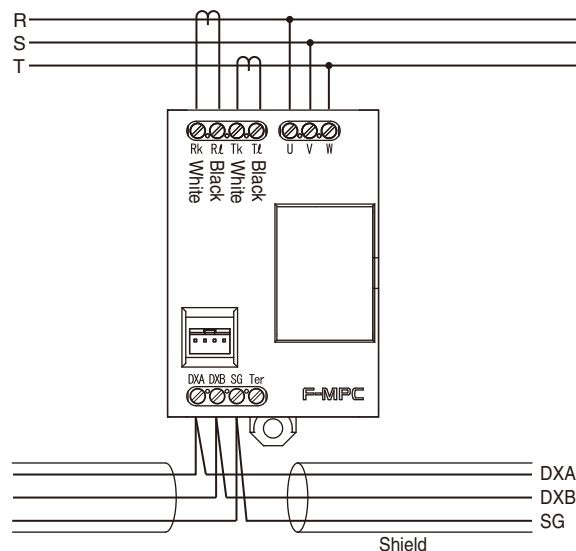
JIS regular grade accuracy that ensures accurate measurement of electric energy (watt-hours) even at low loads



Measures electric energy (watt-hours) accurately even during low-load nights and holidays

*The primary side of the inverter can also be monitored.

■ Wiring diagram



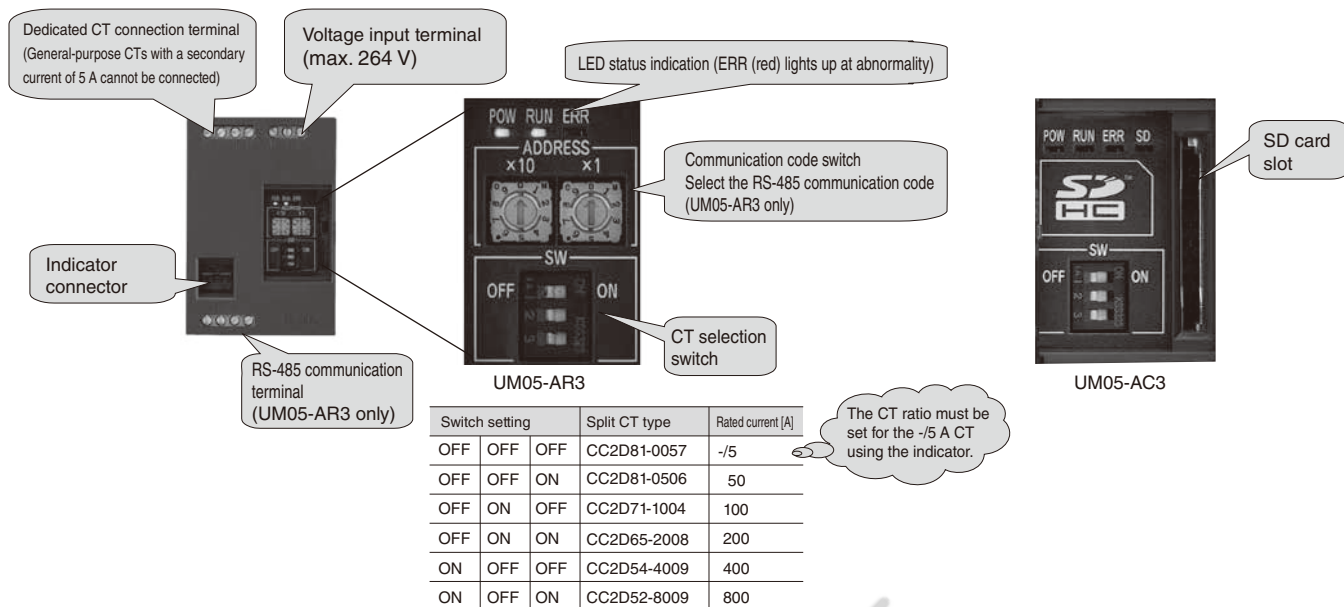
■ Model, type, part class

Part name			Type
Single-circuit, power monitoring unit, RS-485 communication type			UM05-AR3
Single-circuit, power monitoring unit, SD card type			UM05-AC3
Indicator and setter (F-MPC04E only)			UM05X-S
Screw mounting bracket (10 ct. set)			BZ0SET
Split CT (Manufactured by Fuji Electric Technica)	Primary rated current	5A	CC2D81-0057
		50A	CC2D81-0506
		100A	CC2D71-1004
		200A	CC2D65-2008
		400A	CC2D54-4009
		800A	CC2D52-8009

Power Monitoring Equipment

Power monitoring unit F-MPC04E (UM05)

■ Connection Terminal and Switch



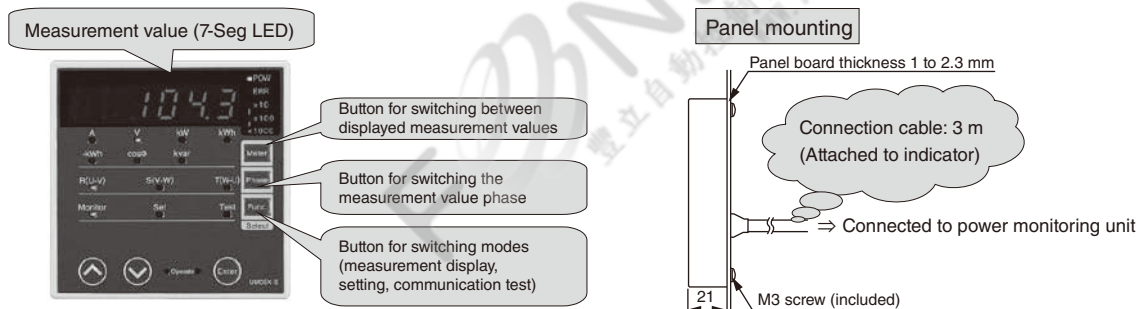
■ F-MPC04E: Indicator and Setter (Option)

This is a dedicated indicator and setter to be used when creating a 1-to-1 connection with the F-MPC04E.

Use it to display measurement values by mounting it to the panel surface.

It can also be used to change the settings of the F-MPC04E power monitoring unit.

(Note) Only for the F-MPC04P: It cannot be used with the indicator and setter.



Indicator and setter setting items

Setting items	Contents of the setting	UM05-AR3	UM05-AC3	Factory default
CT ratio	When using a 5 A rated CT, set the primary rated current of the general-purpose CT. (Can be set at 7500 A or lower)	○	○	—
VT ratio	For 264 V systems or higher, set the VT ratio for the external VT. (Can be set at 6600/110 V or lower)	○	○	Direct input
Pulse multiplying factor	You can switch to "Standard-Squared", if you want to monitor electric energy (watt-hours) in finer units.	○	○	"Standard"
Communication mode	Select the communication protocol: F-MPC-Net or MODBUS RTU.	○	—	F-MPC-Net
Communication parameter	Select the communication parameter. (Baud rate: 4.8 to 38.4 kbps; Bit length: 7 to 8 bits; Parity: odd/even/none)	○	—	19.2 kbps, 7-bit, odd
Clock time	Set the time of the internal clock that is used to determine the timing of SD card recording. Set the year, month, day, hour, and minutes. (The clock time is not set at the factory, so please set it using the indicator and setter.)	—	○	—
Fixed interval recording time	Set when you want to record at intervals shorter than 1 hour. You can set 1, 2, 5, 6, 10, 15, 30 [minutes], or "Do not record".	—	○	Do not record

In the following cases, it is necessary to change the factory defaults by using the indicator and setter.

When using a [UM05-AR3] 5 A rated CT; When using an external VT; When changing the MODBUS RTU

When using a [UM05-AC3] 5 A rated CT; When using an external VT; When setting the clock; When you want to record at intervals shorter than 1 hour

*The clock time is not set at the factory. If the clock is not set, recording data will be displayed as 2000-01-01 0:00 when first powering on.

Power Monitoring Equipment

Power monitoring unit F-MPC04E (UM05)

■ Specifications

● General specifications(common to UM05-AR3 and UM05-AC3)

Item	Specifications
Rating	Voltage 100 to 240 V AC (permissible operational voltage: 85 to 264 V AC) [Measurements and control power: shared input terminal; Control power: between U-V 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 supply	Load VA 6VA Inrush current 30 A, 3 ms (240 V) 15 A, 3 ms (100 V)
Insulation resistance	10 MΩ or higher between electrical circuits and ground (housing/DIN rail) 10 MΩ or higher between I/O circuits and ground 5 MΩ or higher between electric circuits and I/O circuits
Vibration resistance performance	10 to 58 Hz: One-way amplitude 0.075 mm, 58 to 150 Hz: Constant acceleration 10 m/s ² 8 minutes × 10 cycles in each X, Y, Z direction (When equipped with a non-slip clasp)
Shock resistance	Half-sine wave 294 m/s ² , 11 ms, 3 times in each X, Y, Z direction (When equipped with a non-slip clasp)
Withstand voltage	2000 V AC for 1 minute between terminals and ground (housing/DIN rail) 2000 V AC for 1 minute between electric circuits and I/O circuits

Item	Specifications
Noise resistance judgment criterion B	Damping oscillation wave: 1 to 1.5 MHz; Peak voltage: 2.5 to 3 kV damping oscillation waveform (2 s) Square wave: Continuous application of 1 ns × 1 μs 1.5 kV square wave noise for 10 minutes Radiation electromagnetic field: 20 V/m *1 Electrostatic Gap discharge: 8 kV; Contact discharge (housing): 4 kV Burst Control power: 2 kV; CT input (clamp): 2 kV; I/O (clamp): 1 kV 1.1 times maximum scale value (1.25 times rated current) for 2 hours
Overload capacity	Current circuit Voltage circuit 1.1 times maximum scale value for 2 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)
Usage atmosphere	No corrosive gas or excessive dust shall be observed
Permissible instantaneous power failure time	20ms (communication and measurement are interrupted)
Mass	[Measurement unit] UM05-AR3 approx. 120 g (excluding CT) [Indicator and setter] Approx. 70 g (excluding connection cables)

*1 The operation of the power monitoring unit may temporarily stop under strong radio waves.

[UM05-AR3]

● Measurement specifications

(1) Present value indication

Item	Measurement range	Accuracy *1
Voltage	3-phase line voltage *2 (Vuv, Vvw, Vwu)	85 to 264V Vuv, Vvw: ±1.0% FS Vwu: ±2.5% FS
Current	3-phase current (Ir, Is, It) *2	0.4 to 125% of rating (50 A CT: 0.4 to 100%, 100 A CT: 0.4 to 120%) Ir, It: ±1.0% FS Is: ±2.5% FS
Active power *3	Reverse power flow is negative	According to current and voltage measurement range (Current × voltage × √3) ±1.0% FS
Reactive power *3	(Reactive power measurement method)	Same as above ±1.5% FS
Active electric energy *3	Forward active electric energy Reverse power flow active electric energy	Indicator: 6 digits F-MPC-Net communication: 4 digits MODBUS communication: 9 digits 0 to ±1.000 Equivalent to JIS regular grade 2.0% at power factor of 1.0 and rated current between 5 and 120% 2.5% at power factor of 0.5 and rated current between 10 and 120% ±3.0% FS (Conversion by 90° phase angle)
Power factor	(Reactive power measurement method)	0 to ±1.000 ±3.0% FS (Conversion by 90° phase angle)

*1 The accuracy performance excludes external CT and VT tolerance.

*2 Measurement is made after automatically determining 3-phase 3-wire, single-phase 3-wire, and single-phase 2-wire types. For single-phase 2-wire types, Vvw, Vwu, Is, and It are zero.

*3 Active power, reactive power, and active electric energy are measured at voltage: 85 to 264 V and current: 0.4% to 125%.

(2) Period measurement values

Item	Indicators	Communicator	Precision	Remarks
Voltage	Period voltage max. value (Vuv, Vvw) Period voltage avg. value (Vuv, Vvw) Period voltage min. value (Vuv, Vvw)	x	○	±2.5% FS (Excludes VT tolerance)
Current	Period current max. value (Ir, It) Period current avg. value (Ir, It) Period current min. value (Ir, It)	x	○	±2.5% FS (Excludes CT tolerance)

Note) Responds by transmitting values every minute (not displayed on indicator).

[UM05-AC3]

● Measurement specifications

Item	Measurement range	Accuracy *1
Voltage	3-phase line voltage *2 (Vuv, Vvw, Vwu)	85 to 264V Vuv, Vvw: ±1.0% FS Vwu: ±2.5% FS
Current	3-phase current (Ir, Is, It) *2	0.4 to 125% of rating (50 A CT: 0.4 to 100%, 100 A CT: 0.4 to 120%) Ir, It: ±1.0% FS Is: ±2.5% FS
Active power *2	Reverse power flow is negative	According to current and voltage measurement range (Current × voltage × √3) ±1.0% FS
Reactive power *2	(Reactive power measurement method)	Same as above ±1.5% FS
Active electric energy *2	Forward active electric energy Reverse power flow active electric energy	Indicator: 6 digits Equivalent to JIS regular grade 2.0% at power factor of 1.0 and rated current between 5 and 120% 2.5% at power factor of 0.5 and rated current between 10 and 120% ±3.0% FS (Conversion by 90° phase angle)
Power factor	(Reactive power measurement method)	0 to ±1.000 ±3.0% FS (Conversion by 90° phase angle)

*1 The accuracy performance excludes external CT and VT tolerance.

*2 Measurement is made after automatically determining 3-phase 3-wire, single-phase 3-wire, and single-phase 2-wire types. For single-phase 2-wire types, Vvw, Vwu, Is, and It are zero.

*3 Active power, reactive power, and active electric energy are measured at voltage: 85 to 264 V and current: 0.4% to 125%.

● Communication specifications

Use RS-485 communication by selecting either the F-MPC-Net communication or Modbus RTU communication protocol.

Item	Specifications
Standard	F-MPC-Net Modbus RTU
Transmission method	EIA-485
Data exchange method	Half duplex two-wire type
Synchronization method	1: N (Power monitoring unit) Polling/selecting
Transmission distance	Start-stop synchronization method 1000 m (total length)
Number of connection units	Maximum 64 units *1 One system (however, the master device is included in the 64 units)
Transmission speed	4800/9600/19200/38400 bps (selectable)
Station address	1 to 99 *2 (Modbus RTU communication also supports 1 to 99) setting
Connection method	Terminal block
RS-485 terminal names	DXA, DXB
Transmission character	Connect by reading DXA as D1 (+) and DXB as D0 (-).
Start bit	ASCII code Binary
Data length	1 bit (fixed)
Parity bit	7 bits / 8 bits (select)
Stop bit	8 bit (fixed)
BCC	None / Even number / Odd number (select)
	None / Even number / Odd number (select)
	No parity: 2 bits (fixed) Other: 1 bit (fixed)
	Even number horizontal parity CRC-16

The factory default at time of shipping is the F-MPC-Net protocol with communication speed: 19200 bps; data length: 7 bits; parity: odd. (To change the factory default communication settings, you need to use the [UM05X-S] dedicated indicator.)

*1 When connecting units that support 32 connected units, two units are recognized as one unit and the maximum number of connections will be lower.

*2 The communication code is set using the rotary switch. Furthermore, you can also make use of power monitoring unit addresses 1 to 99 for Modbus RTU.

The communication will be invalid when the communication code is set at "00."

● SD memory card

Two types of data can be recorded on the SD memory card: one-hour interval and setting interval data.

Record measurement values	Recording interval	Remarks
1-hour interval Max. value: Ir, It, Vuv, Vvw Avg. value: Ir, It, Vuv, Vvw Min. value: Ir, It, Vuv, Vvw Period value [difference]: electric energy (watt-hours) Reverse power flow electric energy (watt-hours)	1-hour (fixed)	Saves in single-day units in CSV file format. (1 month of data is about 1 MB) The internal memory can retain 35 days of data when not using a memory card. *1, *2
Setting interval Max. value: Ir, It, Vuv, Vvw Avg. value: Ir, Is, It, Vuv, Vvw, Vwu, kW, kvar Min. value: Ir, It, Vuv, Vvw Period value [difference]: electric energy (watt-hours), reverse power flow electric energy (watt-hours) Instantaneous value: cosφ	Select 1, 2, 5, 6, 10, 15, 20, 30 (minutes), or "Do not record." (The factory default is "Do not record.")	Saves in single-day units in CSV file format. (1 month of data is a max. of 9 MB) Records only when mounted with a memory card. You need to use the dedicated indicator to change the setting interval. An ERR LED will flash if you attempt to set the fixed recording interval without first mounting a memory card. *1, *2

(Note 1) An SD card is not included. Customers should purchase an SD or SDHC card with a capacity of 32 GB or smaller.

(Note 2) The recording interval is based on the time of the internal clock. To adjust the clock time, a separately sold indicator is required.

*1 The maximum and minimum values are determined from the measurement values of each cycle of the commercial frequency (50/60 Hz).

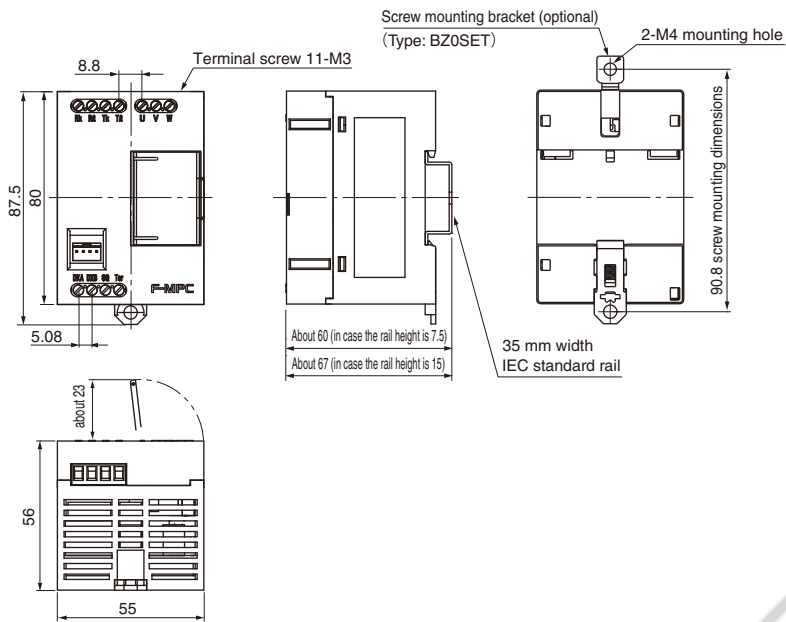
*2 When accessing the SD card, do not dismount and remount it or turn off the control power.

Power Monitoring Equipment

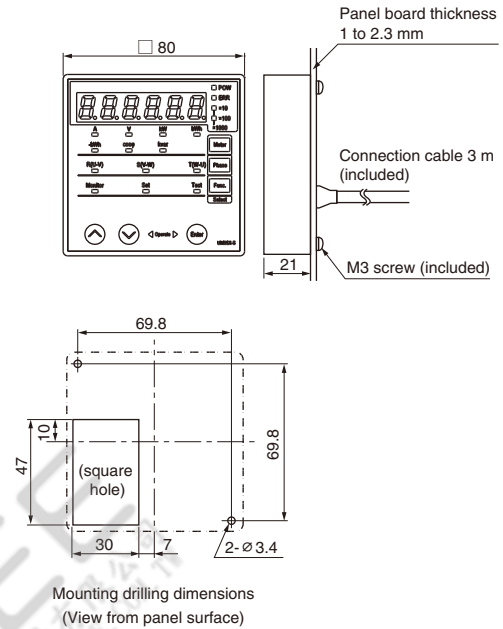
Power monitoring unit F-MPC04E (UM05)

■ Dimensions, mm

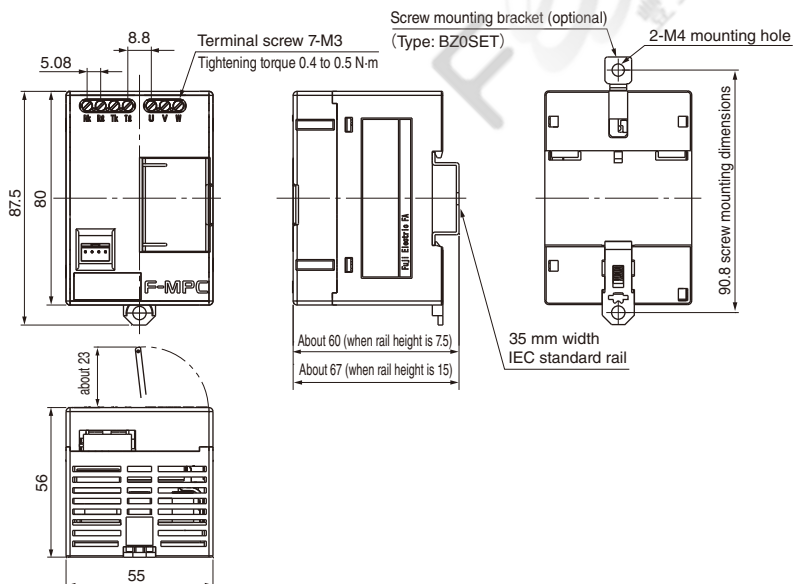
· UM05-AR3



· UM05X-S



· UM05-AC3



■ Features

You can implement on/off state monitoring and capture pulse signal measurements, alarm relay output, and flow meter data for energy monitoring systems that utilize the F-MPC-Net communication protocol.

- The DI/DO unit can input on-off signals, count accumulated pulse values, and control the on-off state of the relay output.
- 2-wire RS-485 communication enables the unit to transmit the input state to the host and control relay output based on on-off directives from the host.



■ Models and Types

Part name	Specifications	Type
DI/DO unit	6 inputs (contact or transistor input) 4 relay outputs (250 V AC, 1 A)	UM11-D0604

■ Specifications

● General specifications

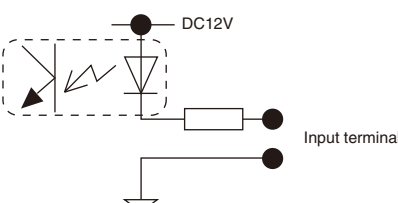
Item	Specifications	
Control power	Rating	100 to 240 V AC (permissible range: 85 to 264 V AC) 50/60 Hz (permissible range: 47 to 63 Hz)
	Consumer VA	Max. 8.5VA
	Inrush current	20A or less
Ambient temperature	-10 to 55°C	
Storage temperature	-20 to 70°C	
Relative humidity	20 to 90% RH (no condensation)	
Usage atmosphere	No corrosive gas or excessive dust.	
Protective structure	IP20	
Insulation resistance	10 MΩ or higher between control power terminals and other terminals	
Power frequency withstand voltage	2,000 V AC for 1 minute between control power terminals and other terminals	
Noise resistance	1 to 1.5 MHz; Peak voltage: 2.5 to 3 kV damping oscillation waveform (2 s) Continuous application of 1 ns × 1 μs 1.5 kV square wave noise for 10 minutes Burst Control power: 2 kV; Communication line: 1 kV Surge Control power: 2 kV; Communication line: 1 kV	
Electrostatic noise immunity	Gap discharge: 8 kV, contact discharge (housing): 4 kV	
Shock resistance	294 m/s ² [30G] 3-direction 3-times each (Ensure no 2-way malfunction at 147 m/s ² [15G])	
Vibration resistance	19.6 m/s ² , 16.7 Hz, 30 minutes in each X, Y, Z direction	
Permissible instantaneous power failure time	20 ms (continuous operation)	
Mounting method	Screw mounting, IEC 35 mm rail mounting	
Mass [g]	250g	

● Input/output specification

(1) DI

It has 6 DI points and can read on-off states and count pulses. Among the 6 points, 2 points can count pulse widths of 10 ms or higher, and the other 4 points can count pulse widths of 50 ms or higher.

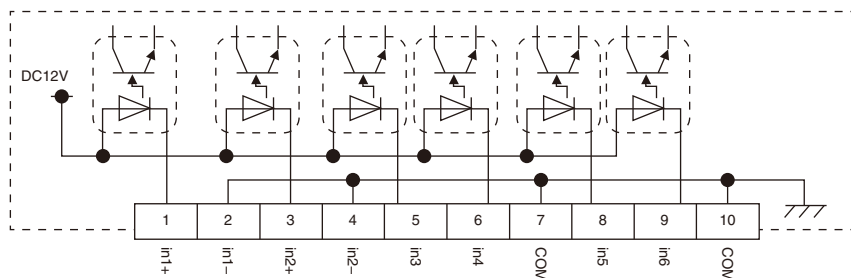
Transmits on-off states via communication. Furthermore, the number of counted pulses can be transmitted via communication.

Item	Specifications	Remarks
Digital input type	Contact or transistor input	With service power voltage constantly applied
Minimum input signal width	10 ms: in1 and in2 50 ms: in3 to in6	For pulse input, ON and OFF periods must be greater than or equal to the minimum input signal width.
Operating time measurement	Time tolerance ±1.0% (Min. ±1 s)	Integrates total ON time in seconds
ON current	ON at 4 mA or higher	When ON, a current of approx. 5 mA is applied.
OFF current	OFF when less than 1 mA	
Internal circuit	Input circuit per point 	The IN1 and IN2 input terminals have 2 terminals per point. IN3 and IN4 are common. IN5 and IN6 are likewise common. The GND terminal is commonly connected internally.

Power Monitoring Equipment

F-MPC I/O unit

Circuit configuration diagram



(2) DO

It has 4 DO points and can implement on-off output control via communication.

Item	Specifications	Remarks
Digital output type	Relay output (NO contact)	Card relay RB 105 equivalent
Continuous rated thermal current	250 V AC, 1 A (continuous rated thermal current)	
Max. operating cycles per hour	1,800 cycles/hour	
Make/break durability	600,000 cycles [220 V AC, 1 A resistive load] 200,000 cycles [220 V AC, 1 A inductive load] 900,000 cycles [110 V AC, 1 A resistive load] 300,000 cycles [110 V AC, 1 A inductive load] 600,000 cycles [24 V DC, 1 A resistive load] 120,000 cycles [24 V DC, 1 A inductive load]	1,800 operating cycles per hour, current carrying factor of 40% Under inductive load, time constant L/R = 15 ms
Internal circuit		The output terminals have 2 terminals per point.

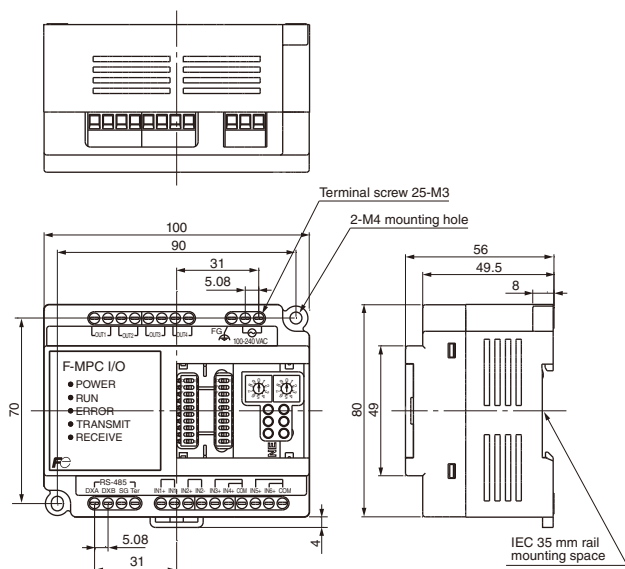
● Communication specification

Item		Specifications	
		F-MPC-Net	Modbus RTU
Standard		EIA-485	
Transmission method		Half duplex two-wire type	
Data exchange method		1:N (main unit) polling/selecting	
Transmission distance		1,000 m (total length)	
Number of connection units		Maximum 64 units/1 system (however, the host device is included in the 64 units) (Note 1)	
Transmission speed		4800/9600/19200/38400 bps (selectable)	
Station address setting		1 to 99 (Note 2)	
RS485 terminal names		DXA,DXB	Connect by reading DXA as D1 (+) and DXB as D0 (-).
Transmission character		ASCII code	Binary
Data type	Start bit	1 bit (fixed)	1 bit (fixed)
	Data length	7 bits / 8 bits (select)	8 bit (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

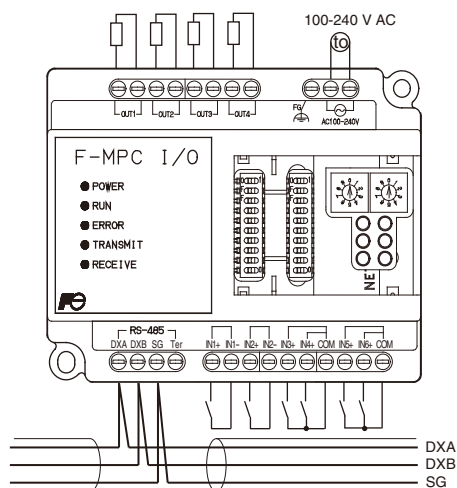
(Note 1) When including units that support 32 connected units, the maximum number of connections will be lower.

(Note 2) The communication code is set using the rotary switch. Furthermore, you can also make use of main unit addresses 1 to 99 for Modbus RTU. The communication will be invalid when the communication code is set to "00."

■ Dimensions, mm



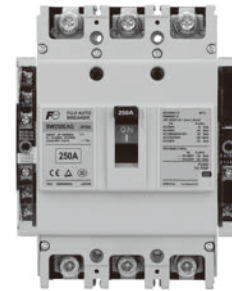
■ Wiring diagram



ZCT Equipped Breakers

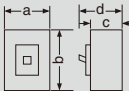
■ Features

By combining the breaker with a centralized power distribution monitoring unit (type: UM04) or single-circuit power monitoring unit with leakage current meter (type: UM03-ARA3G), you can easily construct a leakage current monitoring and cutoff system.



(Photo No. KKD10-049)

■ Specifications

Frame (AF)				125	250	400	630	800			
Basic type				BW125JAZ	BW125RAZ	BW250JAZ	BW250RAZ	BW400SAZ	BW400RAZ	BW630RAZ	BW800RAZ
No. of poles and 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]				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
Reference temperature 40°C											
Rated frequency (Hz)				50-60							
Rated breaking capacity [kA]	JISC8201-2-1 Ann2 [Icu]	AC	440/415/400/380 V	30	50	30	50	36	50	50	50
			240/230V	50	100	50	100	85	100	100	100
Isolation compliance				Compliant							
Reverse connection				Yes							
Selectivity classification				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	
Product mass [kg]				1.5	2			6.2	9.5	10	
Connection method	Front mounting type			(Screw terminal)		(Screw terminal)		(Flat terminal)		(Flat terminal)	(Flat terminal)
	Rear connection type X										
	Flush mounting			E							
Standard option accessory [1]	Auxiliary switch			W	●	●		●	●	●	
	Alarm switch			K	●	●		●	●	●	
	Shunt trip device			F	●(3)	●(3)		●(4)	●(4)	●(4)	
	Test terminal			T ₁ , T ₂	●	●		●	●	●	
	ZCT output			Z ₁ , Z ₂	●	●		●	●	●	
Compliance	Electrical Appliances and Material Safety Act			Specified electrical product [2]		Not applicable					
	JISC8201-2-1			Self-declared compliance							
	IEC60947-2			—							
	EN60947-2 (CE marking)			—							
Overcurrent tripping mechanism				Thermal-magnetic type							
Trip button				Yes							

● Standard accessories

(Note 1) Comes standard with an auxiliary alarm switch and shunt trip device. Terminal block type only. There are no lead wire types.

(Note 2) Only units with a rated current of 125 A are excluded.

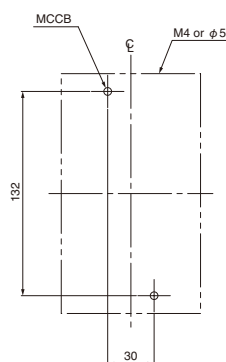
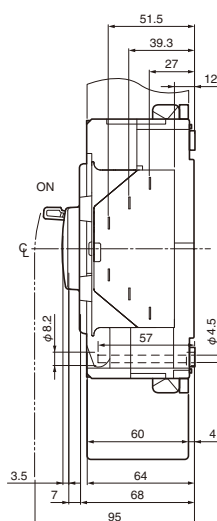
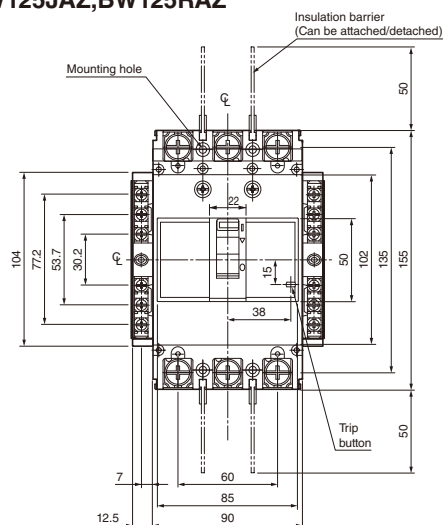
(Note 3) Specify a voltage rating of either 100-120 V AC/100-110 V DC or 200-240 V AC/200-220 V DC.

(Note 4) Can be used at a voltage rating of 100-240 V AC/100-220 V DC.

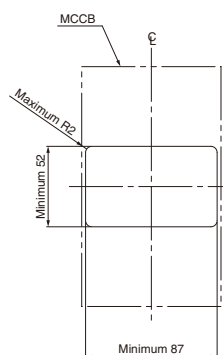
Power Monitoring Equipment Related equipment

■ **Dimensions (Front mounting type), mm**

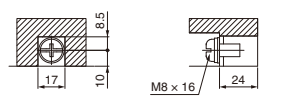
BW125JAZ,BW125RAZ



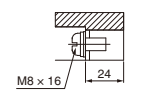
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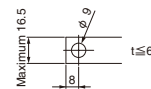
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Terminal section details

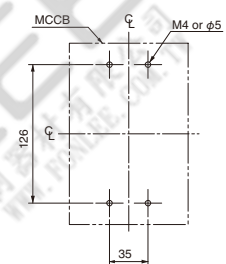
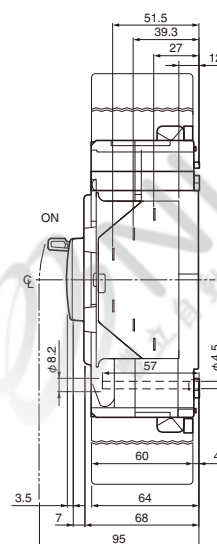
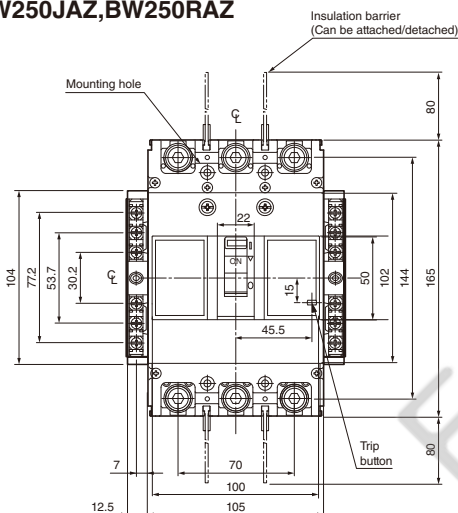


Hexagon socket head bolt

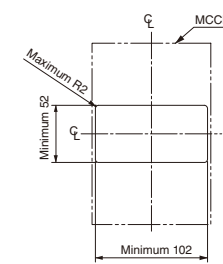


Terminal section

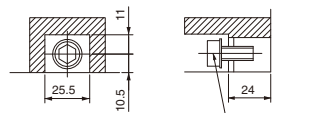
BW250JAZ,BW250RAZ



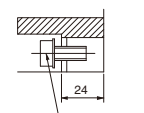
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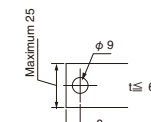
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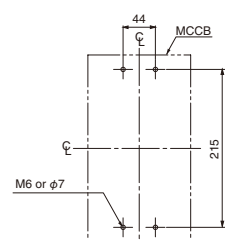
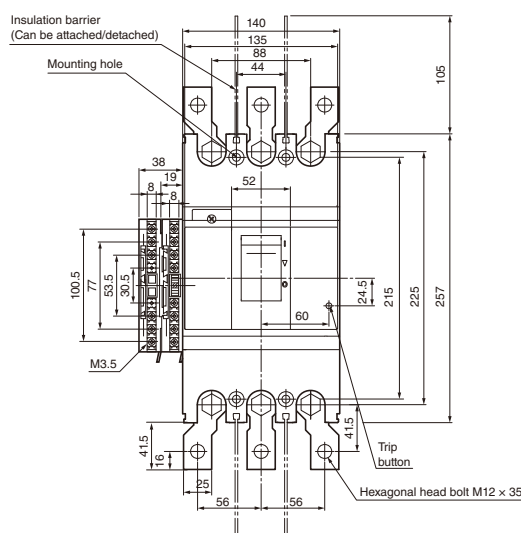
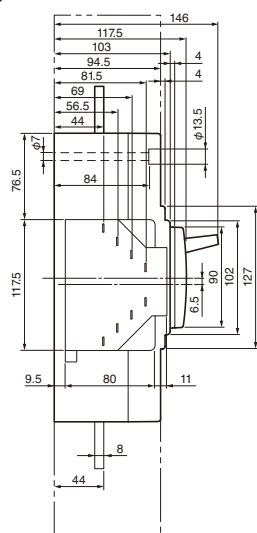


Hexagon socket head bolt

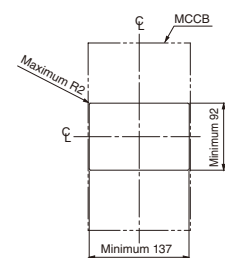


Terminal section

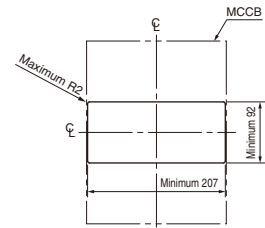
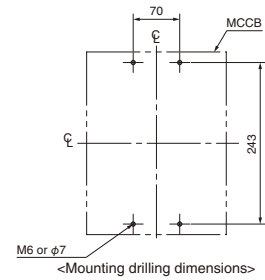
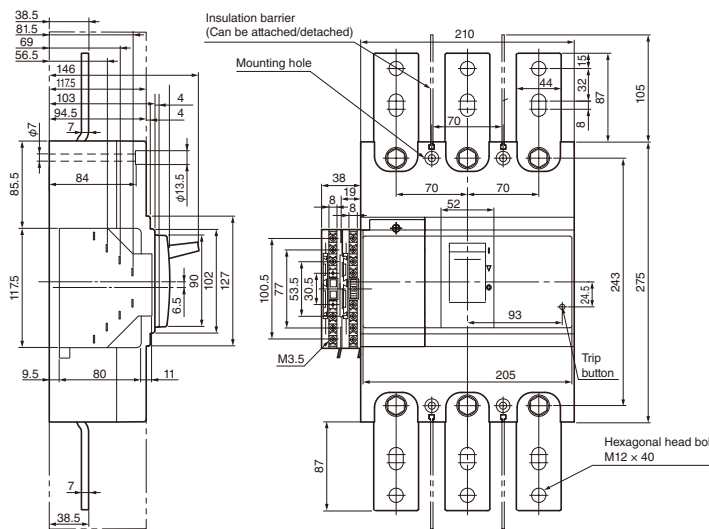
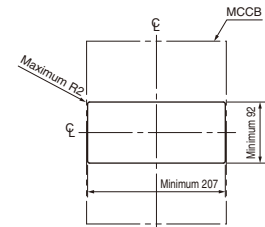
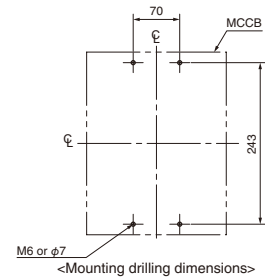
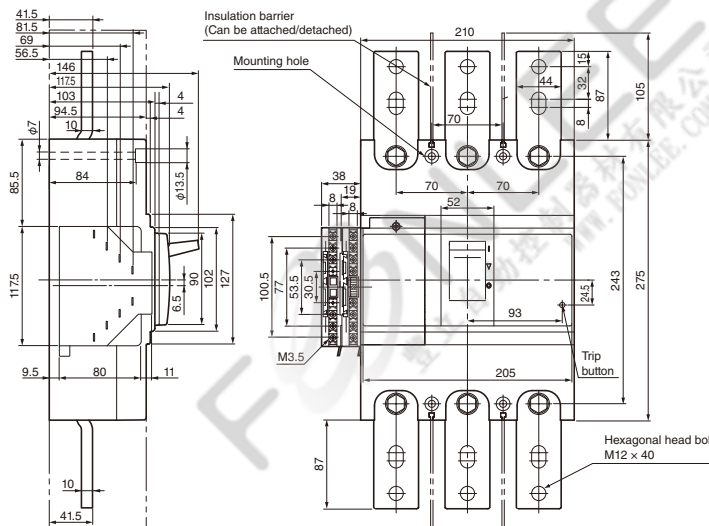
BW400SAZ,BW400RAZ



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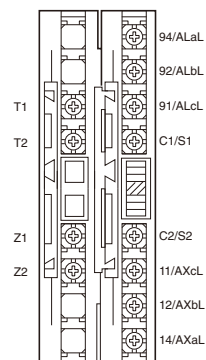
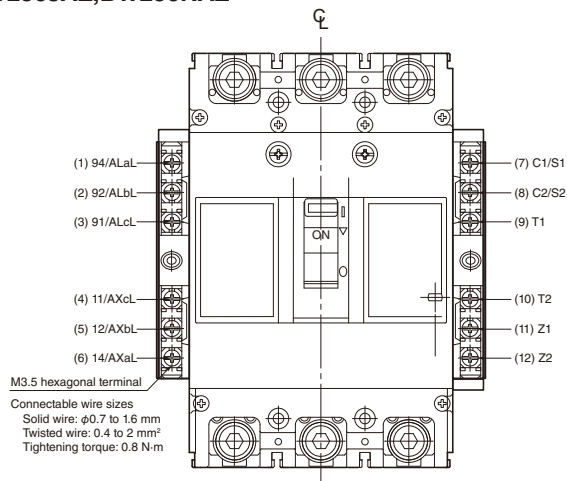
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BW630RAZ**BW800RAZ**

● Terminal arrangement diagram

**BW125JAZ, BW125RAZ,
BW250JAZ, BW250RAZ**

**BW400SAZ, BW400RAZ,
BW630RAZ, BW800RAZ**



Power Monitoring Equipment

Related equipment

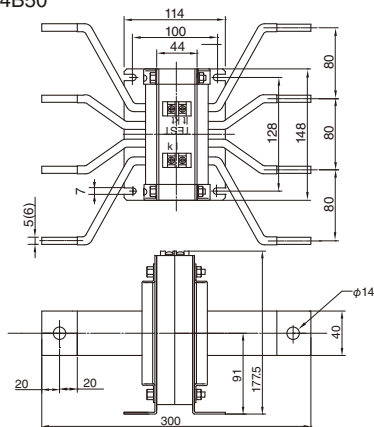
Zero-phase current transformer

● Specifications

Model (low voltage)		Rated current [A]	Hole-through diameter (φ)	Hole-through cable			Case color	Mass (approx.) [kg]	
Type				1 φ 2W	1 φ 3W, 3 φ 3W	3 φ 4W			
Hole-through type	Standard product	RM112-ZCT3005	50	30	IV 14 mm ²	IV 8 mm ²	IV 8 mm ²	Black (phenol)	0.14
		RM112-ZCT3010	100	30	IV 60 mm ²	IV 50 mm ²	IV 38 mm ²	Black (phenol)	0.14
		RM112-ZCT4220	200	42	IV 100 mm ²	IV 80 mm ²	IV 60 mm ²	Black (phenol)	0.22
		RM112-ZCT5830	300	58	IV 125 mm ²	IV 100 mm ²	IV 80 mm ²	Black (phenol)	0.42
		RM112-ZCT7040	400	70	IV 400 mm ²	IV 325 mm ²	IV 250 mm ²	Black (phenol)	0.54
		RM112-ZCT7060	600	70	IV 400 mm ²	IV 325 mm ²	IV 250 mm ²	Black (phenol)	0.54
		RM112-ZCT9060	600	90	IV 500 mm	IV 500 mm	IV 500 mm	Black (epoxy)	2.0
		RM112-ZCT9080	800	90	IV 500 mm ²	IV 500 mm ²	IV 500 mm ²	Black (epoxy)	2.0
		EW-Z115	1200	115	—	—	—	Gray (epoxy)	4.8
	EW-Z160	2000	160	—	—	—	Gray (epoxy)	10	
	EW-Z250	3000	250	—	—	—	Gray (epoxy)	28.5	
	Split type	EW-ZD30	100	30	IV 60 mm ²	IV 50 mm ²	IV 38 mm ²	Black (phenol)	0.55
		EW-ZD45	200	45	IV 125 mm ²	IV 100 mm ²	IV 80 mm ²	Black (phenol)	0.89
EW-ZD65		400	65	IV 325 mm ²	IV 250 mm ²	IV 200 mm ²	Black (phenol)	1.15	
Model (low voltage)		Rated current [A]	Hole-through diameter (φ)	Hole-through conductor		Case color	Mass (approx.) [kg]		
Type				3 φ 3W	3 φ 4W				
Conductor equipped	3 poles	EW-Z3B40	400	70	5 × 40 mm	—	Black (phenol)	2.8	
		EW-Z3B50	500	70	6 × 40 mm	—	Black (phenol)	3.1	
		EW-Z3B60	600	90	6 × 50 mm	—	Black (epoxy)	7.0	
		EW-Z3B80	800	90	8 × 50 mm	—	Black (epoxy)	8.0	
		EW-Z3B100	1000	90	12 × 50 mm	—	Black (epoxy)	11.0	
		EW-Z3B120	1200	115	10 × 75 mm	—	Gray (epoxy)	15.2	
		EW-Z3B160	1600	160	12 × 100 mm	—	Gray (epoxy)	30.5	
		EW-Z3B200	2000	160	6 × 100 mm × 2	—	Gray (epoxy)	30.5	
		EW-Z3B300	3000	250	8 × 150 mm × 2	—	Gray (epoxy)	68.6	
	4 poles	EW-Z4B40	400	90	—	5 × 40 mm	Black (epoxy)	6.0	
		EW-Z4B50	500	90	—	6 × 40 mm	Black (epoxy)	6.5	
		EW-Z4B60	600	90	—	6 × 50 mm	Black (epoxy)	9.0	
		EW-Z4B80	800	90	—	8 × 50 mm	Black (epoxy)	11.0	
		EW-Z4B100	1000	115	—	12 × 50 mm	Gray (epoxy)	15.5	
		EW-Z4B120	1200	115	—	10 × 75 mm	Gray (epoxy)	24.9	
		EW-Z4B160	1600	160	—	12 × 100 mm	Gray (epoxy)	36.4	
		EW-Z4B200	2000	160	—	6 × 100 mm × 2	Gray (epoxy)	36.4	
		EW-Z4B300	3000	250	—	8 × 150 mm × 2	Gray (epoxy)	80.3	

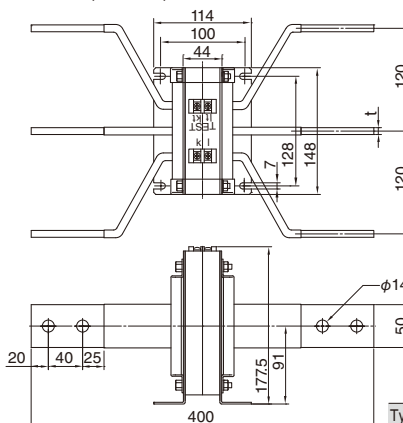
*Make sure to twist the ZCT secondary wire (estimated twisting: 1 twist/5 cm) and separate the wire from the power cable.

EW-Z4B40, Z4B50



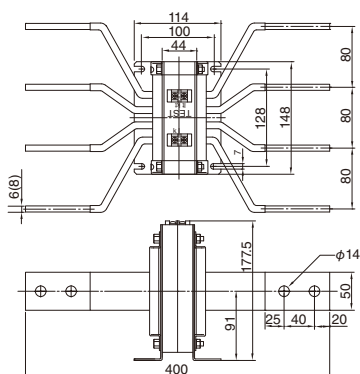
*The dimensions in parentheses () correspond to the EW-Z4B50.

EW-Z3B60, Z3B80, Z3B100



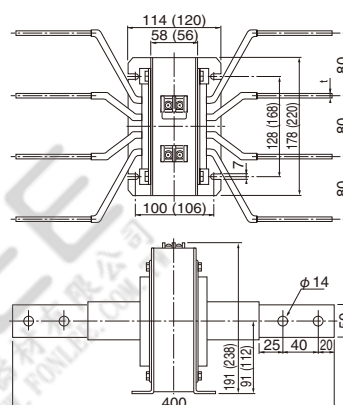
Type	EW-Z3B60	EW-Z3B80	EW-Z3B100
t	6	9	12

EW-Z4B60, Z4B80

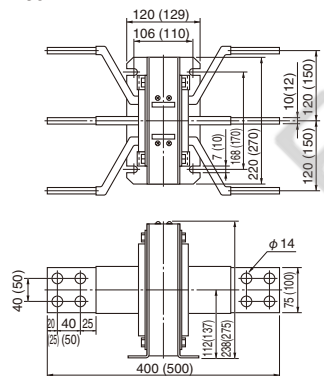


*The dimensions in parentheses () correspond to the EW-Z4B80.

Z4B100

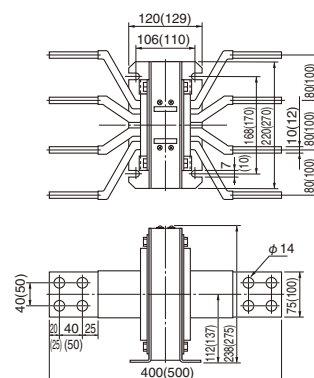


EW-Z3B120, Z3B160



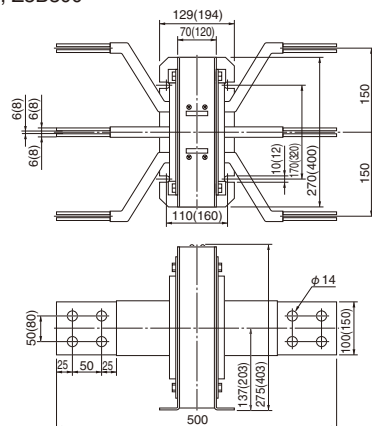
*The dimensions in parentheses () correspond to the EW-Z4B160.

EW-Z4B120, Z4B160



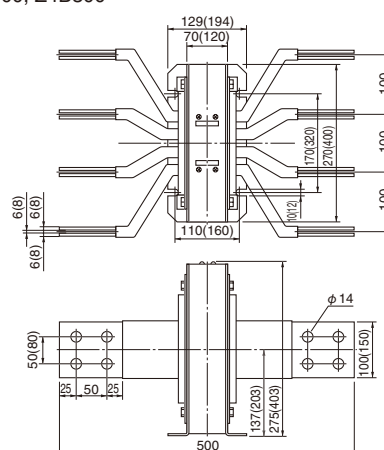
*The dimensions in parentheses () correspond to the EW-Z3B160.

EW-Z3B200, Z3B300



*The dimensions in parentheses () correspond to the EW-Z3B300.

EW-Z4B200, Z4B300



*The dimensions in parentheses () correspond to the EW-Z4B300.

F-MPC04P (type: UM02A), F-MPC04S (type: UM03), F-MPC04E (type: UM05) combination CT

■ Features

- A split-type CT can be mounted without disconnecting existing cables, making it ideal for measuring and monitoring the electric energy of existing circuits.
- We also offer a hole-through type CT as a low-cost version that can be used for measuring and monitoring the electric energy of new circuits.

■ Models and Types

● F-MPC04P (type: UM02A), single-circuit F-MPC04S (type: UM03), F-MPC04E (type: UM05) combination CT

A combination CT is a dedicated CT. General-purpose CT (secondary rated current 5 A or 1 A) cannot be directly connected. Otherwise, damage may occur.

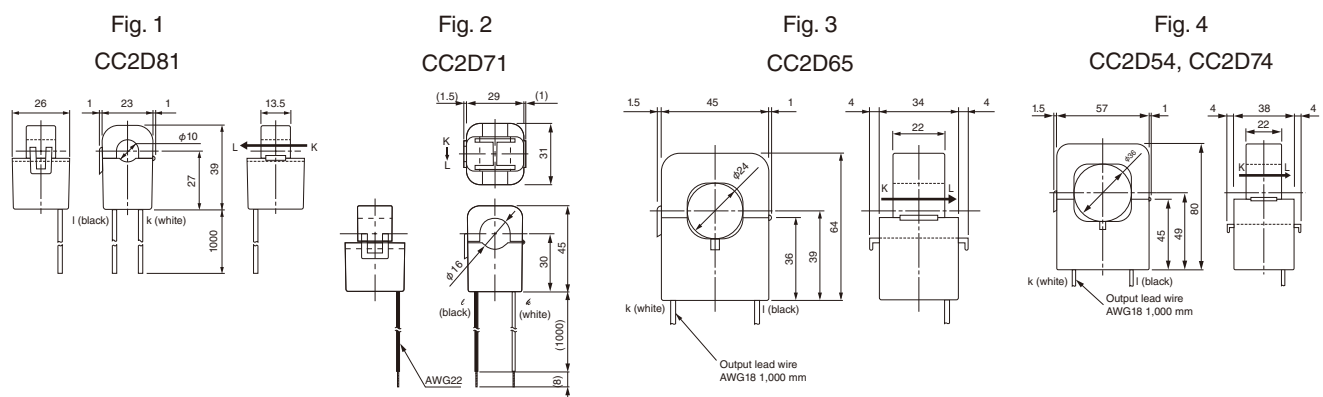
Models	Small split type		Square split type				Round through type	
								
	Fig. 1	Fig. 1	Fig. 2	Fig. 3	Fig. 4	Fig. 5	Fig. 6	Fig. 7
Type	CC2D81-0057	CC2D81-0506	CC2D71-1004	CC2D65-2008	CC2D54-4009	CC2D52-8009	CC2B65-2008	CC2B54-4009
Rated primary current	5A	50A	100A (only F-MPC04S not applicable)	200A	400A	800A (only F-MPC04S not applicable)	200A	400A
Linearity output limit	According to the main unit measurement range							
Rated secondary current	7.34 mA	73.4 mA	33.33 mA	66.67 mA	133.33 mA		66.67 mA	133.33 mA
Through hole diameter	φ 10		φ 16	φ 24	φ 36	φ 60	φ 24	φ 36
Rated frequency	50Hz/60Hz							
Excessive electric current resistance amount	10 In/continuous	10 In/1 sec.	40 In/1 sec.				1.2 In/continuous 40 In/1 sec.	
Rate error	±1%/In ±1.5%/0.2 In					±1%/In ±1.5%/0.3 In	±1%/In ±1.5%/0.2 In	
Phase difference	150 min. ±90 min./In, 180 min. ±120 min./0.2 In		1±1°/In 1±1.5°/0.2 In	±60 min./In ±90 min./0.2 In				
Rated load	0.2693 mVA (Load resistance 5 Ω)	26.93 mVA (Load resistance 5 Ω)	11.1 mVA (Load resistance 10 Ω)	44.4 mVA (Load resistance 10 Ω)	0.18 VA (Load resistance 10 Ω)	0.177 VA (Load resistance 10 Ω)	44.4 mVA (Load resistance 10 Ω or less)	177.8 mVA (Load resistance 10 Ω or less)
Insulation resistance	DC500V/100MΩ or more (Between the core and the output lead line)						DC500V/100MΩ or more (Between the through hole and the output lead line)	DC500V/100MΩ or more (Between the through hole and the output terminal)
Dielectric strength	2000 V AC/1 min. (Between the core and the output lead line)						2500 V AC/1 min. (Between the through hole and the output lead line)	2500 V AC/1 min. (Between the through hole and the output terminal)
Output protective device	7.5 Vp built-in clamping diode			3 Vp built-in clamping diode			-	
Usage ambient conditions	-20 to 75°C 80%RH or less No condensation							
Method for fixing a divided portion	Clamp						-	
Main body mounting method	Hanger						-	
Connection	Heat-resistance vinyl electric wire 0.3 mm ² (AWG22) × 1,000 mm			Heat-resistance vinyl electric wire 0.75 mm ² (AWG18), 1,000 mm		Heat-resistance vinyl electric wire AWG18, 1,000 mm	Heat-resistance vinyl electric wire 0.3mm ² ×1,000 mm	M3 terminal block
Mass	about 45 g		about 80 g	about 200 g	about 300 g	about 500 g	about 60 g	about 180 g

*1 Type: CC2D81-0057 can be used alone or in combination with the secondary lines of existing general-purpose CT (10 A to 7500 A/5 A). Set the CT primary rated current by selecting from 10 to 7500 A.

*2 The single-circuit F-MPC04S (type: UM03) is not compatible with CC2D71-1004 and CC2D52-8009.

■ Dimensions , mm

Please also refer to the next page.



Power Monitoring Equipment

Related equipment

F-MPC04 (type: UM04) combination CT

■ Models and Types

● F-MPC04 (type: UM04) combination CT

A dedicated combination CT box (type: UM04X-1) is required when using in combination with the F-MPC04 (UM04).

Please note that the type of CT box will vary depending on the secondary current of the combination CT being used.

Models	Square split type			Round split type	
					
	Fig. 4	Fig. 4	Fig. 4	Fig. 8	Fig. 8
Type	CC2D74-1001	CC2D74-2001	CC2D74-4001	CC2C76-8001	CC2C76-12X1
Rated primary current	100A	200A	400A	800A	1,200A
Linearity output limit	According to the main unit measurement range				
Rated secondary current	1 A				
Through hole diameter	φ36			φ60	
Rated frequency	50Hz/60Hz				
Excessive electric current resistance amount	1.0 In/continuous 40 In/1 sec.				
Rate error	±1%/In ±1.5%/0.2 In			±1%/In ±1.5%/0.2In ±3%/0.05 In	
Phase difference	90±90 minutes/In	60±60 minutes/In	±80 minutes/In	±80 min./In, ±100 min./0.2 In	
Rated load	0.5 VA (Load resistance 0.5 Ω)				
Insulation resistance	500 V DC/100 MΩ or higher (Between the core and the output lead line)			DC500V/100MΩ or more (Between the through hole and the output lead line)	
Dielectric strength	2000 V AC/1 min. (Between the core and the output lead line)			2500 V AC/1 min. (Between the through hole and the output lead line)	
Output protection	±1.4 Vp built-in clamping diode				
Usage ambient conditions	-20 to 75°C 80%RH or less No condensation				
Method for fixing a divided portion	Clamp				
Main body mounting method	Hanger				
Connection	Heat-resistance vinyl electric wire 0.75 mm ² (AWG18) × 1,000 mm			VCTF 0.75 mm ² × 1,000 mm 2-core	
Mass	300 g			500 g	
Combination CT box	UM04X-1			UM04X-1	

*UM04X-5 is the CT box to use when combining with a general-purpose CT (10 to 7500 A/5 A).

■ Dimensions , mm

Fig. 5

CC2D52

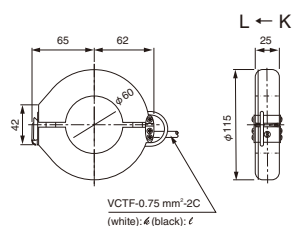


Fig. 6

CC2B65

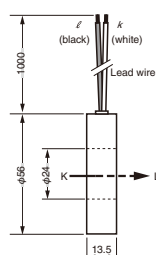


Fig. 7

Model CC2B54

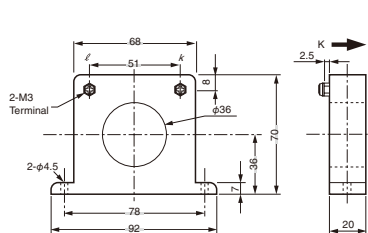
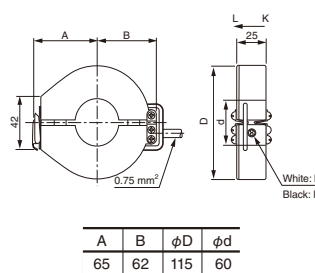


Fig. 8

CC2C76-□□□□



A	B	φD	φd
65	62	115	60

Power Monitoring Equipment

Terminal relay RS16

D

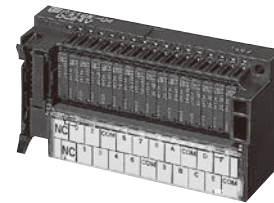
Terminal relay RS16

■ 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.

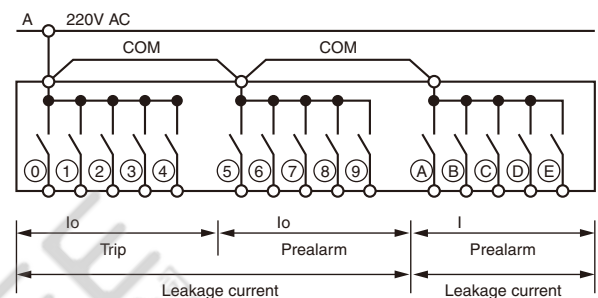
■ Specifications

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



RS16-DE04H

■ Terminal arrangement



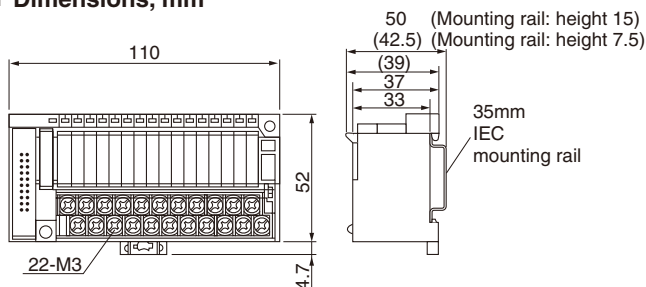
3-phase 3-wire

① :Io trip (No.1 or 6)
 ② :Io trip (No.2 or 7)
 ③ :Io trip (No.3 or 8)
 ④ :Io trip (No.4 or 9)
 ⑤ :Io trip (No.5 or 0)
 ⑥ :Io prealarm (No.1 or 6)
 ⑦ :Io prealarm (No.2 or 7)
 ⑧ :Io prealarm (No.3 or 8)
 ⑨ :Io prealarm (No.4 or 9)
 ⑩ :Io prealarm (No.5 or 0)
 A :I prealarm (No.1 or 6)
 B :I prealarm (No.2 or 7)
 C :I prealarm (No.3 or 8)
 D :I prealarm (No.4 or 9)
 E :I prealarm (No.5 or 0)
 F :Unused

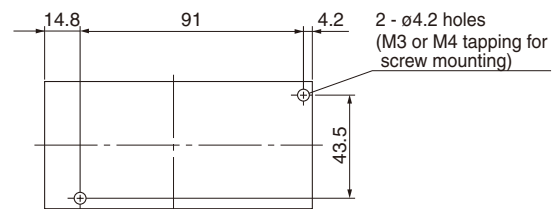
3-phase 4-wire

Io trip (No.1 or 4)
 Io trip (No.2 or 5)
 Io trip (No.3 or 6)
 Unused
 Unused
 Io prealarm (No.1 or 4)
 Io prealarm (No.2 or 5)
 Io prealarm (No.3 or 6)
 Unused
 Unused
 I prealarm (No.1 or 4)
 I prealarm (No.2 or 5)
 I prealarm (No.3 or 6)
 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

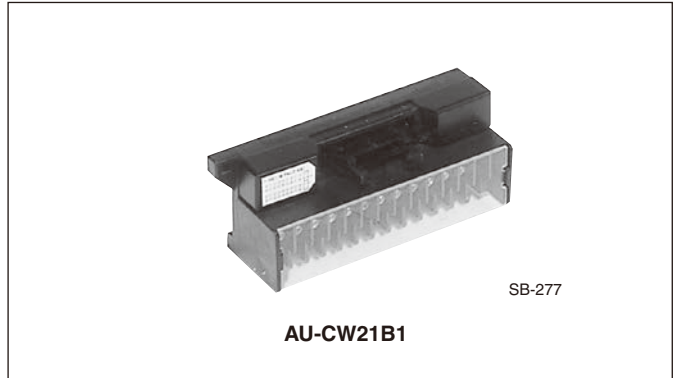
Power Monitoring Equipment

AU-CW21B1

Connector terminal-block, AU-CW21B1

■ Description

The AU-CW21B connector terminal-block, in combination with the F-MPC04 (type: UM04) power monitoring unit, can output a kWh pulse.



■ Specifications

Type	Front mounting	AU-CW21B1-04
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		100MΩ 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	Multi-core cable	AUX014-20□ *
cable	Flat cable	AUX024-20□ *

■ Ordering information

Specify the following:

1. Type number

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

■ Terminal arrangement and output

Terminal No.		Pulse output circuit No.	Remarks
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

