Fuji Electric

Innovating Energy Technology

DISTRIBUTION

Digital Multi function Protection relay and Controller

F-MPC60G Series

62G1-E-0243

Digital Multi function Protection relay and Controller

F-MPC60G Series

These are multifunctional digital relays that come with new measurement and display functions and comply with international standards.

F-MPC* refers to a multifunctional digital relay that combines the protection, operation, measurement, monitoring and transmission functions of high-voltage power receiving and distribution equipment into a compact unit.
The new F-MPC60G Series has a new measurement display function, further improving usability.

*F-MPC: Fuji Multiple function Protector and Controller

Adoption of Color LCD

These are multifunctional digital relays with a color LCD display.

Highly visible display of measured values

Multiple measurements can now be displayed on a single screen.
You can check the measured values for each phase at once.

Easy to set up from a setting list

Previous (F-MPC60B)

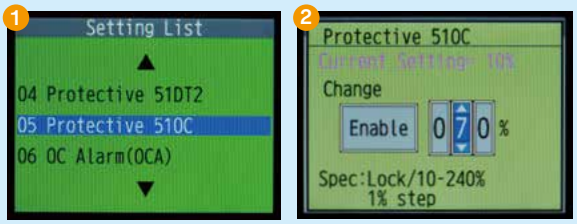
Conventionally, you would have to select the setting item by checking the code in the setting code table

Conventionally, it was necessary to check the code in the setting code table, while referring to the manual for details on data settings.

New F-MPC60G

Features

Easy selection from the screen's setting list and configuration of setting values



Since you can select from the setting list and display the setting range, it is now possible to avoid setting errors due to mistakes when reading the manual.

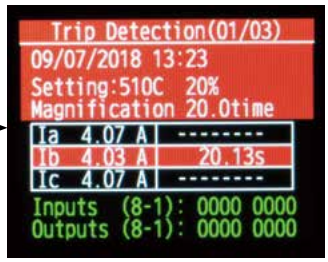
Various measurement, display and recording functions

Waveform recording function for times of system failure

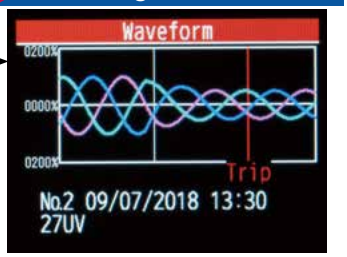
It incorporates a function for recording accident waveforms during protective operation at times of accidents.
It also includes a calendar and clock, which can be used during cause investigation and countermeasures.

Features **Grasp accident status at a glance!**

Protection detection (Pickup) display



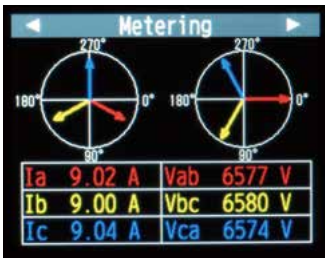
Features **Helps investigate causes during accidents!**



Current, voltage vector display

It is now possible to check the state of phase angles using vector diagrams.
It can be used when doing checks during installation or maintenance.

Features **Grasp voltage and current phases at a glance!**



Maintains compatibility with old and new models

Based on the concepts of the F-MPC60B Series including the same external mounting dimensions, wiring terminal block, communication function, CPU duplication and self-diagnosis function.
Easy to replace with the new model.

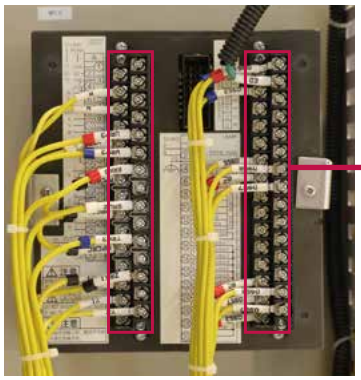
Previous (F-MPC60B)

Features **Easy to replace!**

Since panel cutting is compatible, replacement is easy without modifying the panel.

New F-MPC60G

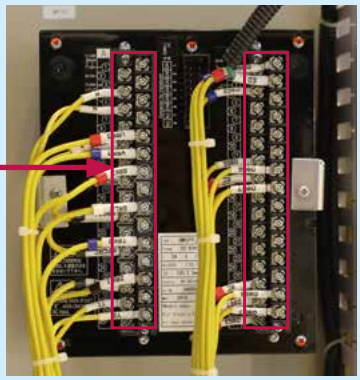
Terminal block



Features **No rewiring!**

Existing terminal blocks can be reused, so there is no need to remove them. The entire terminal can be replaced.

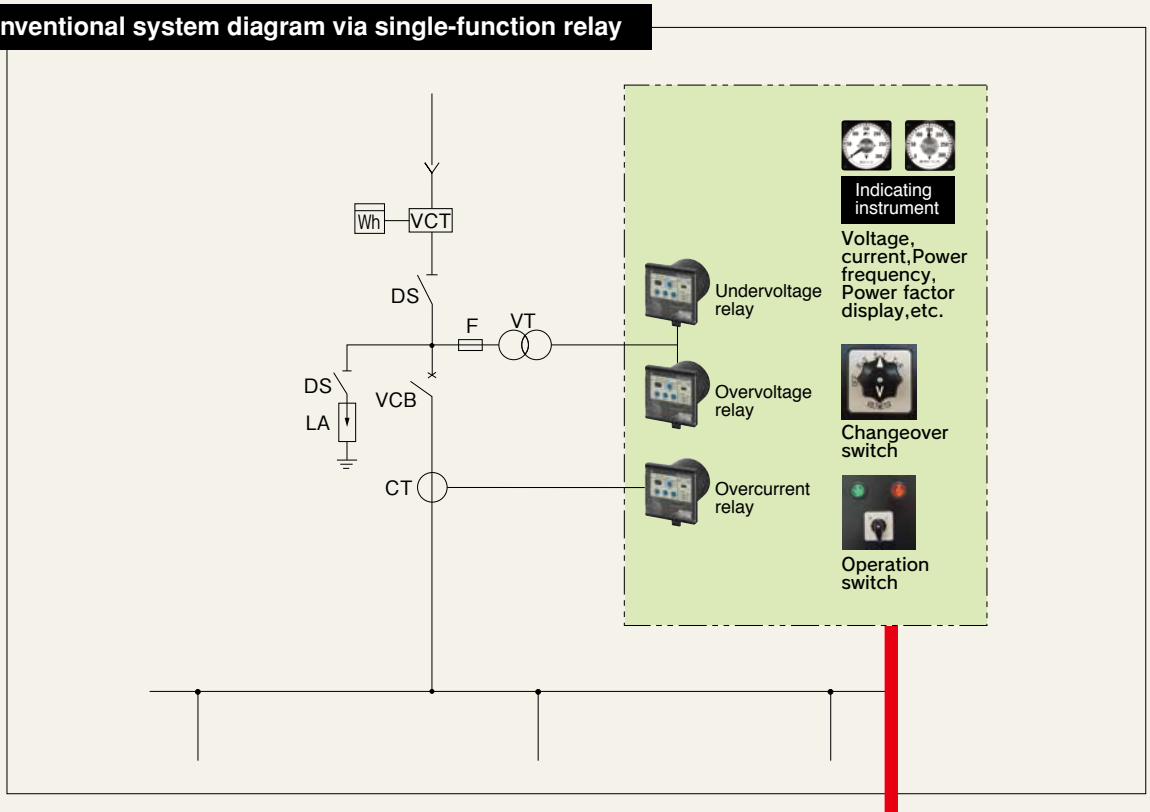
Terminal block



Enables space savings and wire savings!

Space savings and wire savings can be achieved by integrating multiple protective relays, display devices, and operation switches into a single unit.

Conventional system diagram via single-function relay

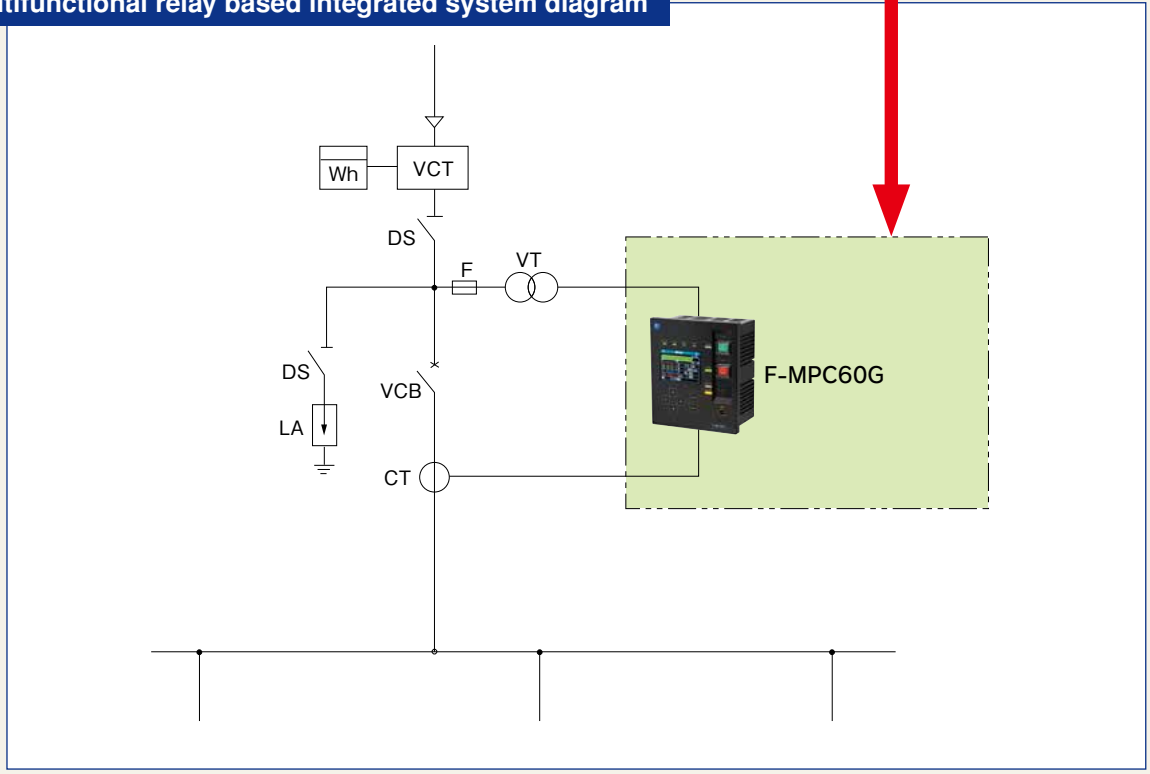


Features

Multiple devices in one!

Multiple protective relays, indicators and operation switches are integrated into a single unit.
Enables space savings and wire savings.

Multifunctional relay based integrated system diagram



F-MPC60G (UM6 type) multifunctional digital relays for high-voltage power-receiving

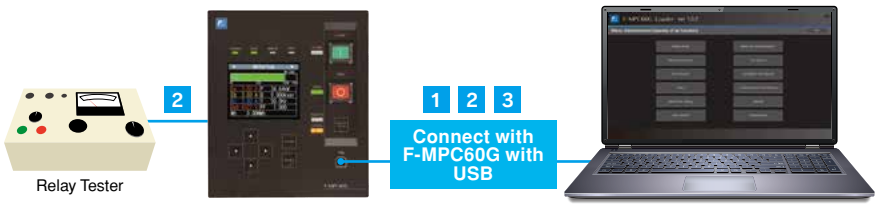
Loader application

The loader software can easily manage the setting values of protective relays with a PC, while also coming with a “relay test function” to easily perform relay tests.

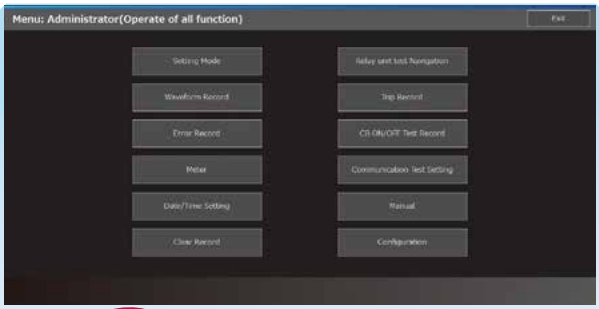
Setting values can be read and written from the multifunctional digital relay, making it easy to manage the setting values of the protective relay.
Recorded information (accidents, accidents waveforms, etc.) can be displayed and saved in order to support analysis at the time of accidents.
The test conditions and judgment values of the selected protective function are displayed to prevent errors in the relay test.

■ By connecting the F-MPC60G with a PC, you can do the following:

1. **Set and save setting values;**
2. **Use the relay test navigator function;**
3. **Use the analysis support function at times of accidents.**



Initial screen



Features

Easy operation with loader software

1. Setting Mode
2. Relay unit test Navigation
3. Waveform Record

Features

Enables management of various histories!

- Trip Record
- Error Record
- CB ON/OFF Test Record
- Meter

Other utility functions required by the loader software

- Communication Test Setting
- Clear Record
- Date/Time Setting
- Configuration
- Manual

1 Setting value set and save function

Function Setting Mode

Features

Collectively managed data can be downloaded (read and saved) and uploaded (write saved data to the main unit) as setting data from the main unit.

* In addition, you can make preparations in advance, since the adjustment data on the loader software can be created without utilizing the main unit.

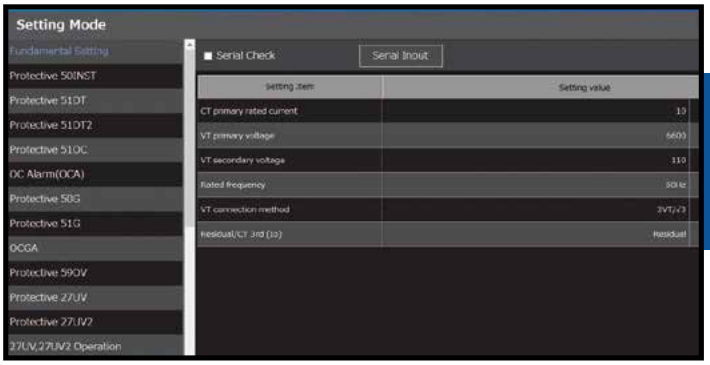
List of setting items

Basic settings: Primary rated current, primary rated voltage, secondary rated voltage, rated frequency	27UV2
50(INST)	27UV, 27UV2 operation setting
51DT	Open/reverse phase
51DT2	Control settings
51OC	Pulse multiplying factor
OC Alarm	Selection input 1 to 8
67DG/OCG	Output relay setting
67DGA/OCGA	Transducer
Common to 67DG/DGA	Measurement display selection
64OVG	Screen settings
59OV	Waveform recording settings
27UV	Time settings

Features

Collectively manage the setting values of each protective relay

Collectively manage the settings of the protective relays using the main unit of the F-MPC60G.



Features

Easy to set setting values

Each setting value made in F-MPC60G can be easily viewed, rewritten and saved in the loader software.

2 Relay unit test Navigation

Do you have experience with this?

- ! Test results do not fall into the theoretical values
- ! Wrong application conditions?
- ! Is the theoretical value or error range calculation wrong?
- ! Other protection elements work
- ! Setting values must be changed during testing
- ! It is necessary to return to the original settings when the testing is complete

For relay test navigation

- **Application conditions and theoretical values are automatically calculated and displayed**
- **Automatically locks the setting values that obstruct the relay test from being performed**
- **Automatically returns to the original setting values after the test is completed.**

Features

Eliminates errors in test conditions and theoretical values, and prevents human errors in changing or forgetting to return to the setting values.

Setting method Easy to set up with the navigation system

Make test preparations for each protection element in just 3 steps using the screen.

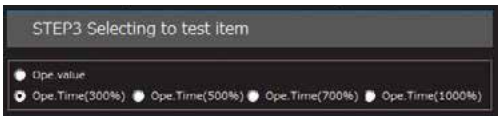
STEP1 Protection element selection

View and select the relay test protection element that can be tested in the connected format.

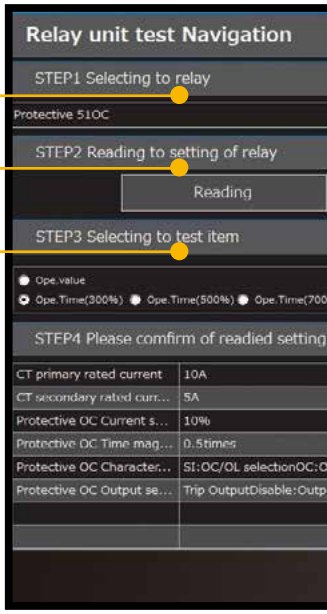
STEP2 Read settings with "Reading" button

Select the protective element in Step 1 to automatically readout the setting values.

STEP3 Test item selection



Select the test items for the selected protection element. Depending on the selected test items, the displayed application conditions and theoretical values may change.

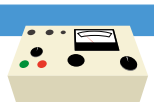


Test start Reduction of relay test errors from start to finish

By using a relay tester, you can easily test the protective element and compare the results with theoretical values in order to reduce test errors from start to finish.

Relay Tester

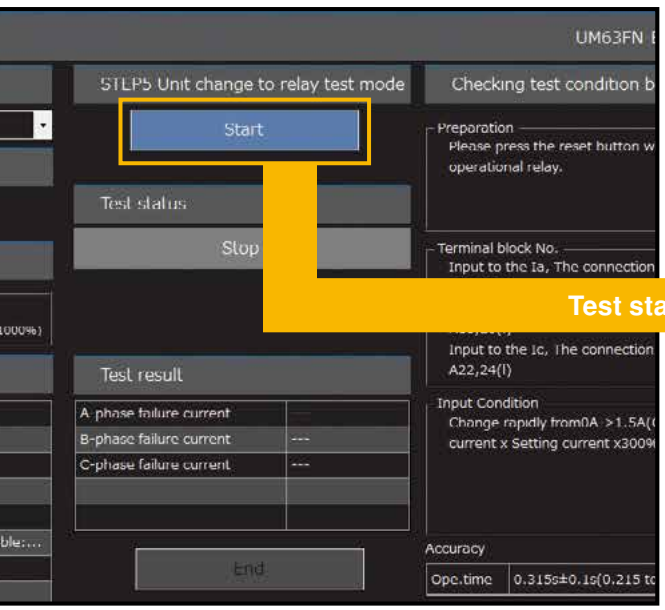
Operate the relay tester in accordance with the instructions for the application points and application conditions.



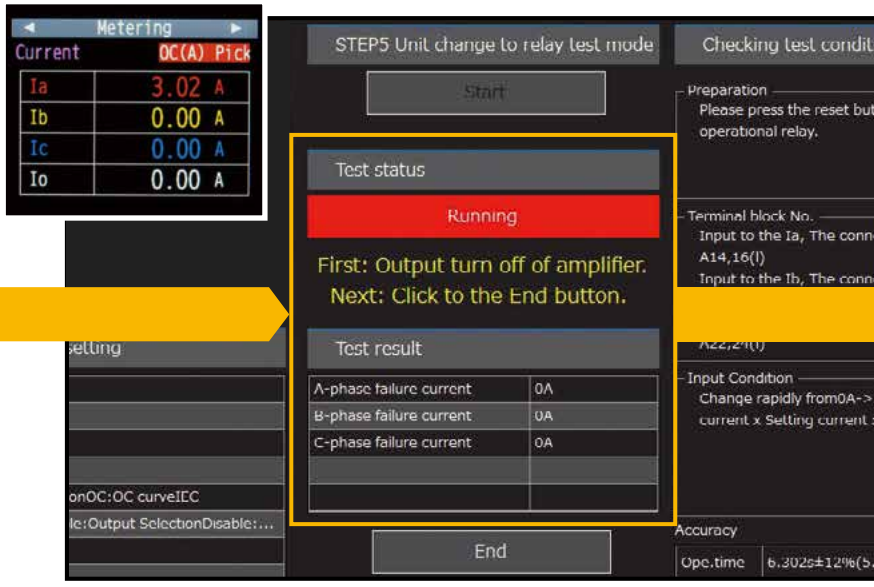
Relay test start

By pressing the relay start button, the setting values that obstruct the relay test you want to perform will automatically enter the LOCK state (disabled state).

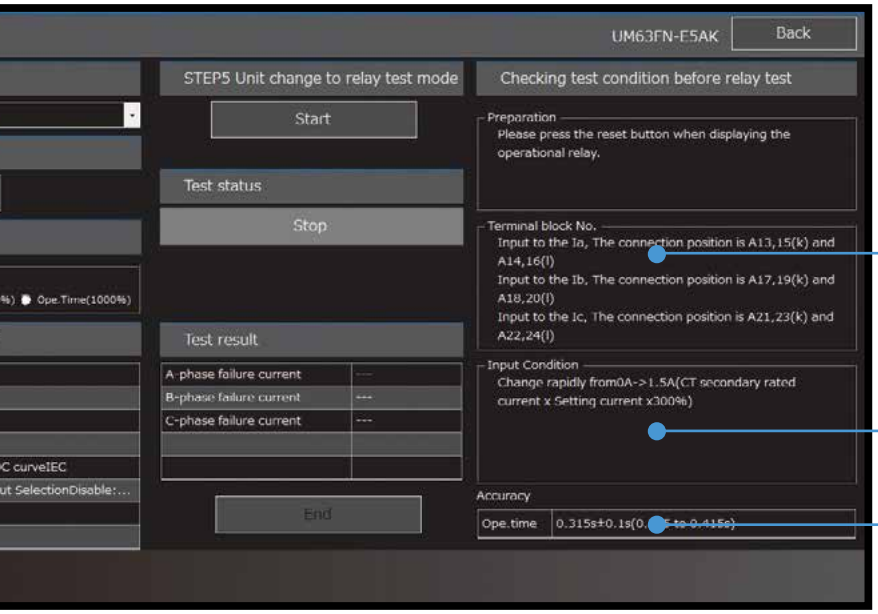
Features **Reduce errors at the start of the test!**



Test start



Running: Guides you to start the relay test. Start the relay test.



Application points

Terminal block No.
Input to the Ia, The connection position is A13,15(k) and A14,16(l)
Input to the Ib, The connection position is A17,19(k) and A18,20(l)
Input to the Ic, The connection position is A21,23(k) and A22,24(l)

Displays the connection terminal number to be applied to F-MPC60G.

Application conditions

Input Condition
Change rapidly from0A->1.5A(CT secondary rated current x Setting current x300%)

Displays the method to be applied during a relay test.

Theoretical values

Accuracy

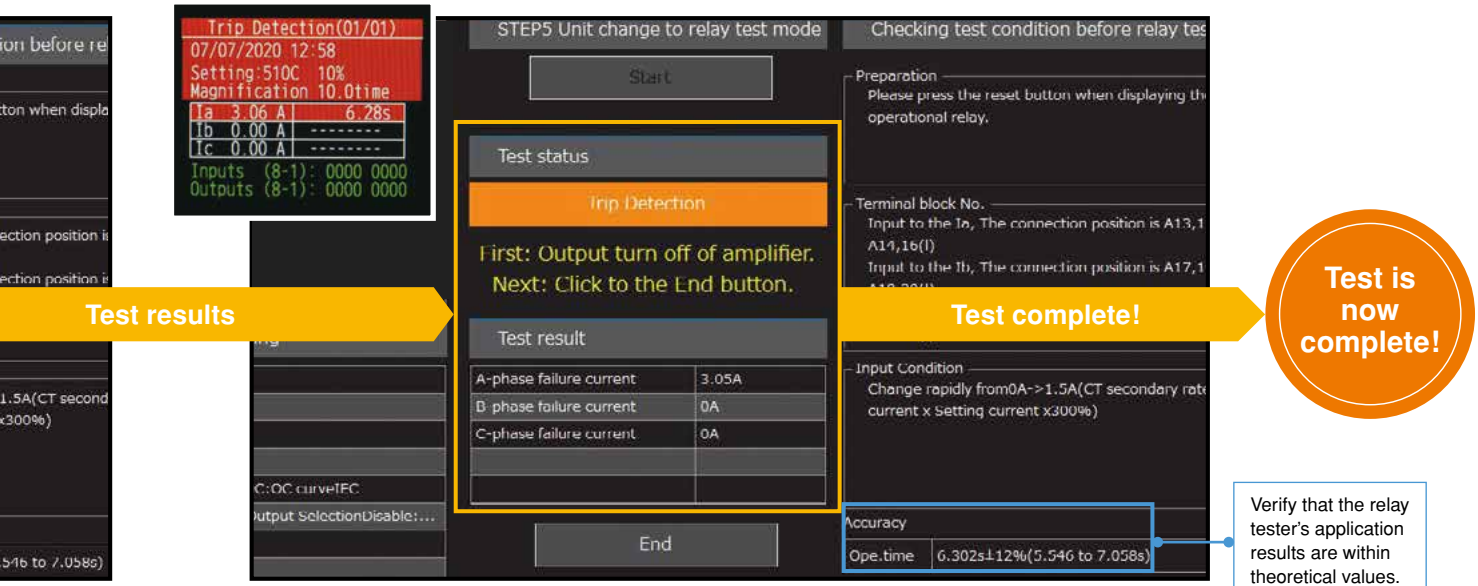
Ope.time	0.315s±0.1s(0.215 to 0.415s)

During the operating value test:
The theoretical operating values are displayed.
During the operating time test:
The theoretical operating time is displayed.

Relay test finish

By pressing the relay test end button, the setting values that obstruct the relay test will automatically be returned from the LOCK state (disabled state) to the original state.

Features **Reduce inadvertent errors at the end of the test!**



Accident detection: Displays the results of the performed relay test. Finish the relay test.

3 Waveform Record

Function Accident analysis support

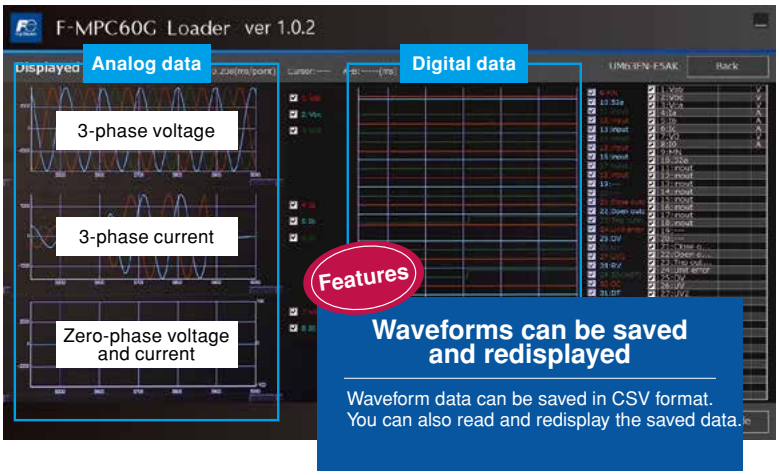
The accident waveforms recorded by the F-MPC60G are displayed in a graph.

Graph display content

Analog data	Digital data
3-phase voltage	Digital input and output 16 points
3-phase current	Protective action detection status 16 points
Zero-phase voltage and current	

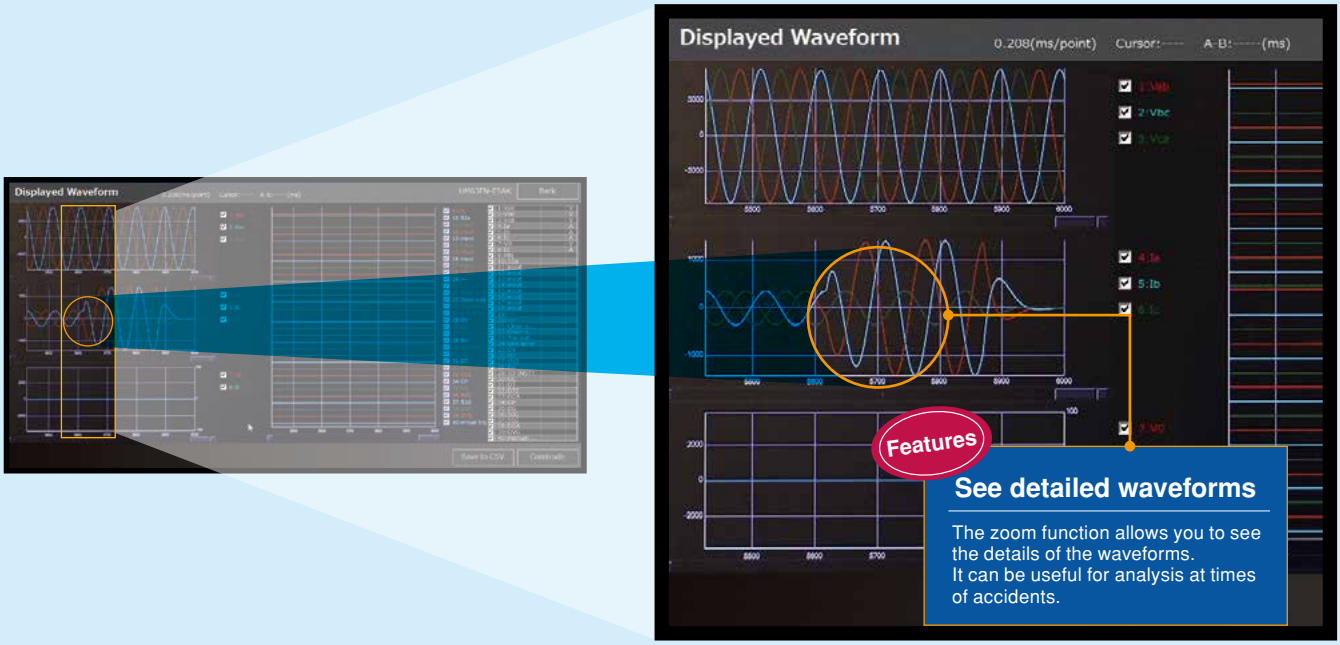
In addition, it comes with the following functions as analysis support tools for the above signals:

- ·Graph zoom function
- ·Comparison function via A-B cursor
- ·Numerical display function of cursor points in graph



Capable of displaying detailed waveforms! Waveforms can help you analyze accidents!

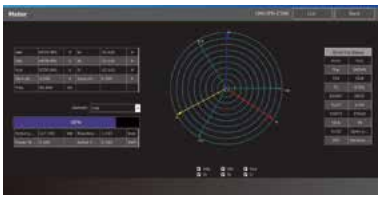
By using the zoom function, you can easily see the detailed waveform status.



Introduction to measured value display and history display functions

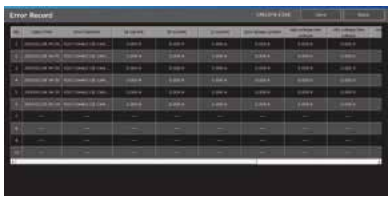
Meter

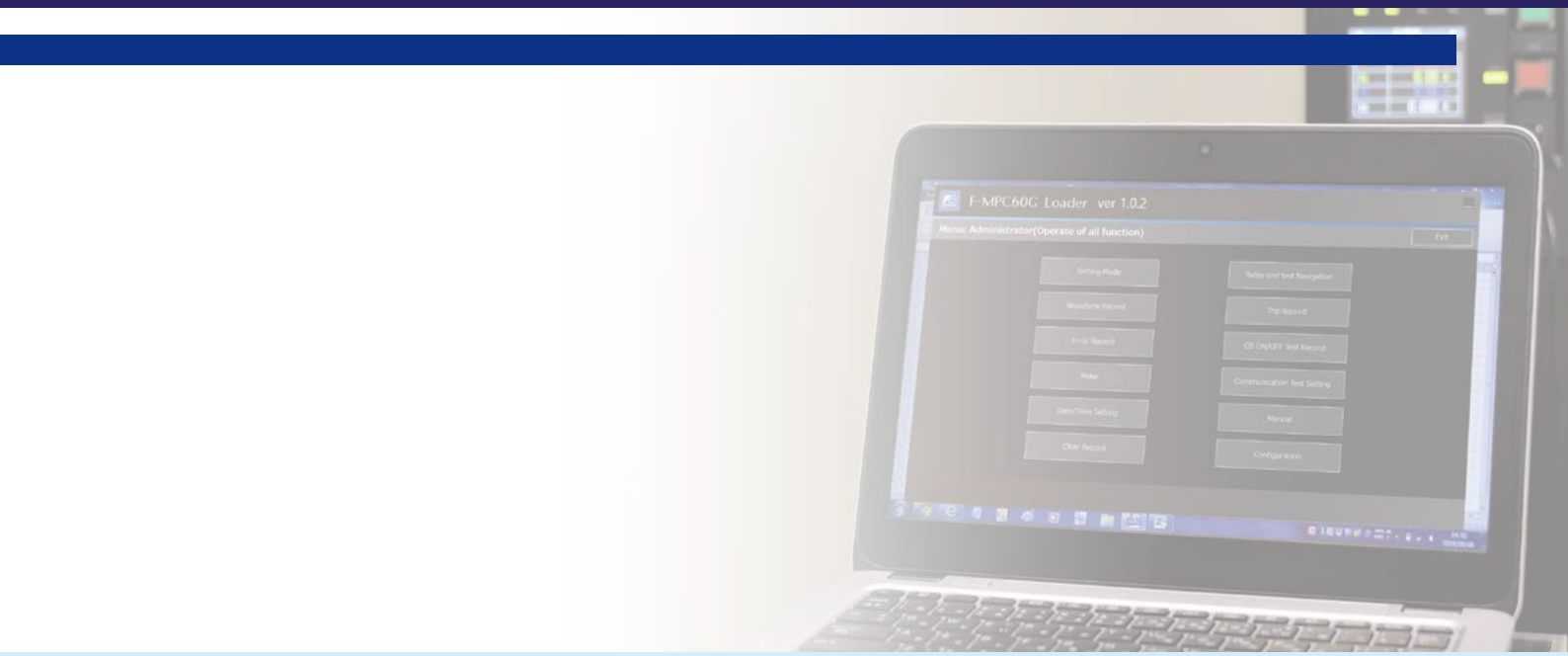
Displays the F-MPC60G measurement data, device failure and protective relay ON/OFF state.



Error Record

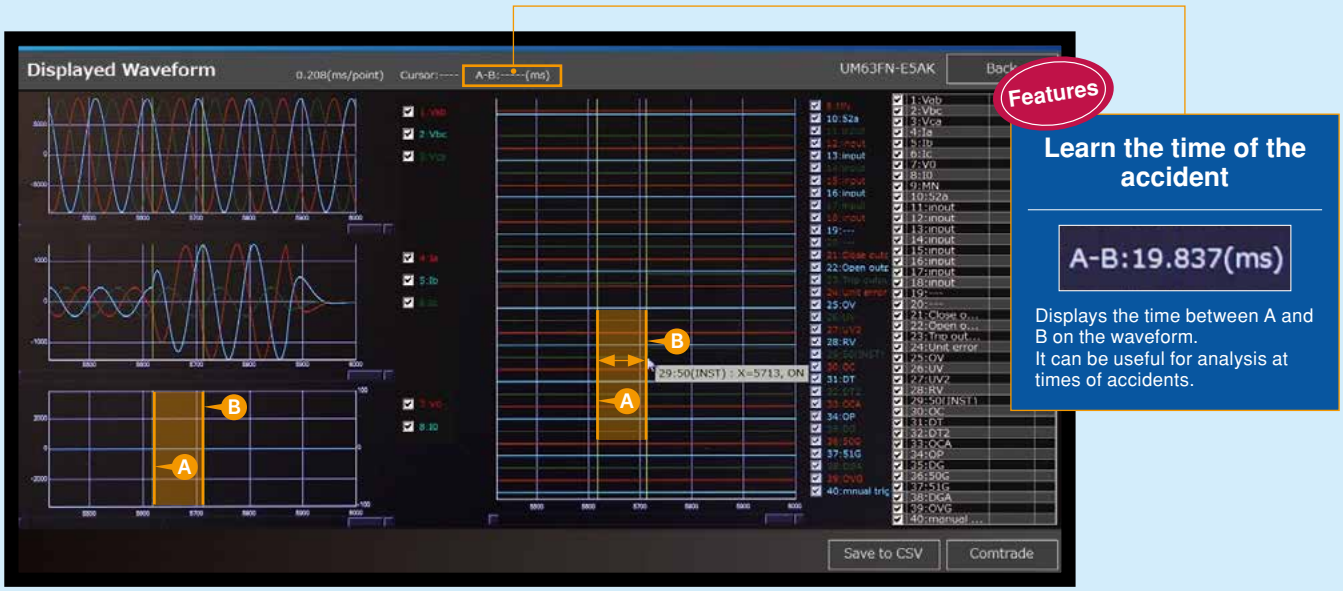
Displays and saves to your PC the failure history for 10 items recorded by F-MPC60G.





Makes time measurements easy and is useful for accident analysis from the time axis!

You can easily measure the time between A and B on a waveform. You can find out what time the accident occurred.

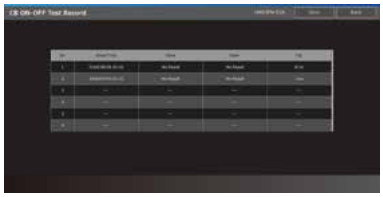


Trip Record

Displays and saves to your PC the accident history for 10 items recorded by F-MPC60G.

CB ON/OFF Test Record

Displays and saves to your PC the circuit breaker operation test history for 6 items recorded by F-MPC60G.



MINIMUM ORDERS

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

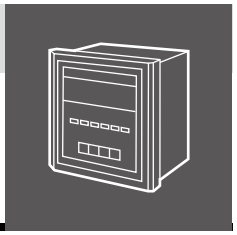
WEIGHTS AND DIMENSIONS

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

INFORMATION IN THIS CATALOG IS SUBJECT TO CHANGE WITHOUT NOTICE.

Power Monitoring Equipment

Digital Multi function Protection relay and Controller F-MPC60G



Page

Power Monitoring Equipment
Digital Multi function Protection relay and Controller 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)

• Network System
Construction of information network system with a host processor is easy by using RS-485 (F-MPC-Net, Modbus RTU), T-Link, or 4–20 mA output.

• 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.

KKD17-233

■ Type number nomenclature

(1) (2) (3) (4) (5) (6) (7) (8)
UM6 2 F P - E 5 A E

(1) F-MPC60G (UM6) Series

(2) Zero-phase current detection method (Grounding method)

Zero-phase current detection method (Grounding method)	Code
3CT residual and tertiary windings (resistance and direct grounded method)	3
ZCT system (Non-grounding method)	2

* Bus unit: UM62 type.

(3) Unit type

Unit type	Code
Power receiving unit	F
Feeder unit	C
Bus unit	B

(4) ZCT measurement range

ZCT measurement range	Code
DG/OCG ZCT 1A	P
DG/OCG ZCT 10A	Q
N/A	N

(5) Control power supply

Control power supply	Code
100 V / 110 V AC, 100 V / 110 V DC dual use	E

(6) CT secondary rated current

CT secondary rated current	Code
5A	5
1A	1

* No description for bus unit

(7) External interface

External interface	Code
T-Link	T
4-20 mA + RS-485 with transducer	A

(8) Compliance with the standards

Conformed standards	Code
JEC specifications	
IEC specifications	E
Three-phase four-wire system	K

Power Monitoring Equipment
Digital Multi function Protection relay and Controller F-MPC60G

■ Types and ratings

Conformed standards (8)	Applicable no. of phase wires	Unit type (3)	Grounding method (2)	ZCT measurement Range (4)	Control power supply (5)	CT secondary rated current (6)	Ground-fault protection system	External interface (Communication method) (7)	Type =Commodity code □: Specify P or Q with (4).
JEC	3-phase 3-wire	Power receiving	Resistance grounding	—	100 V DC (80 to 143 V DC) 100 V AC (85 to 132 V AC)	5A	67DG 50G, 51G	4–20 mA output + RS-485	**UM63FN-E5A**
						1A			**UM63FN-E1A**
						5A		T-Link	**UM63FN-E5T**
						1A			**UM63FN-E1T**
			Non-grounded system	ZCT 1 A or ZCT 10A		5A	67DG	4–20 mA output + RS-485	**UM62F□-E5A**
						1A			**UM62F□-E1A**
						5A		T-Link	**UM62F□-E5T**
						1A			**UM62F□-E1T**
	3-phase 3-wire (1-phase 2-wire)	Feeder	Non-grounded system			5A		4–20 mA output + RS-485	**UM62C□-E5A**
						1A			**UM62C□-E1A**
						5A		T-Link	**UM62C□-E5T**
						1A			**UM62C□-E1T**
IEC	3-phase 3-wire	Power receiving	Non-grounded system			5A		4–20 mA output + RS-485	**UM62F□-E5AE**
						1A			**UM62F□-E1AE**
	3-phase 3-wire (1-phase 2-wire)	Feeder	Non-grounded system			5A			**UM62C□-E5AE**
						1A			**UM62C□-E1AE**
—	3-phase 3-wire	Bus	—	—		—	—	4–20 mA output + RS-485	**UM62BN-EA**
								T-Link	**UM62BN-ET**
IEC	3-phase 4-wire	Power receiving	Resistance grounding	—		5A	50G, 51G	4–20 mA output + RS-485	**UM63FN-E5AK**
						1A			**UM63FN-E1AK**

■ Protecting Elements

Unit	Zero-phase current detection method	Grounding method	Basic type	Protection																				Measurement				Communication (1) T-LINK (2) Choose from 4-20 mA + RS-485
				50	51 Inverse time limit	51 DT Definite time limit	51 DT2 Definite time limit	50 G	51 G Inverse time limit Definite time limit	OCGA Zero-phase current pre-alarm	67 DG	67DG/ 51G Selected Definite time limit	DGA	DGA/ OCGA Selected Definite time limit	64 OVG	27 UV	27 UV2	59 OV	47 Phase reversal	46 Open-phase	OCA Overcurrent pre-alarm	VR Voltage establishment	A W var PF Wh DA DW varh DA_{max} DW_{max} I_0 $I_{0\,max}$ HI	F	V V_{min} HV	V_0 $V_{0\,max}$	
Power receiving	3CT residual, or CT with tertiary winding	Resistance grounding	**UM63FN**	○	○	○	○	○	○	○	○		○		○	○	○	○	○	○	○		○	○	○	○	○
			UM63FN-EoAK	○	○	○	○	○	○	○						○	○	○	○	○	○		○	○	○		(2) only
Power receiving	ZCT	Non-grounded	**UM62F**	○	● *1	○	○					○		○	○	○	○	○	○	○		○	○	○	○		
Feeder			**UM62C**	○	● *1	○	○					○		○		○	○	○	○	○	○	○	○	○ **		○	
Bus			**UM62BN**												○	○	○	○						○	○	○	

Note) 1. The JEC specification is the standard (characteristic type: F-MPC) for the Japanese market. The IEC specification (characteristic type: IEC and IEEE) can also be specified for overseas markets (indicate by appending "E" to the product type).
2. OCA: Overcurrent pre-alarm (Can be used as a pre-alarm if the current is set below the rated overcurrent setting).
3. Feeder unit 67 can be combined with a power receiving or bus unit.
4. The number in the protection column indicates the relay (based on "AC substation controller number JEM 1093").
For example, 27: AC undercurrent relay; 51: AC overcurrent relay; 51G: ground fault overcurrent relay; 64: ground fault overvoltage relay; 67: ground fault directional relay
5. When 51G is selected for a ZCT type power-receiving unit (basic model UM62F), the 51G specification only applies to the current elements of 67.
6. Current (A), voltage (V), power (W), reactive power (var), power factor (PF), frequency (F), zero-phase voltage (Vo), zero-phase current (Io), electric energy (Wh), reactive electric energy (varh), demand current (DA), demand power (DW), maximum demand current (DAmax), maximum demand power (DWmax), minimum voltage (Vmin), maximum zero-phase voltage (Vomax), maximum zero-phase current (Io max), harmonic current (HI), harmonic voltage (HV)

** Can be hidden

• Relevant documents: User's Manual
62F7-J-0215 (Japanese)
62F7-E-0215 (English)
62F7-E-0219 (IEC compliant, English)
62F7-J-0240 (For UM63FNE□AK, Japanese)

Power Monitoring Equipment
Digital Multi function Protection relay and Controller 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 voltage *6		EVT tertiary rated voltage: 110V/190V AC and ZVT(ZPD)(designated)*2 Note. Vo/ $\sqrt{}$ 3Vo display selectable
Zerophase rated current	ZCT combination *6	AC 200mA/1.5mA (JEC-1201) ZCE □ A/ □ 200 to 3000A, ZCED □ / □ 200 to 1500A (Fuji Electric Co., Ltd.) Primary side rating AC 1A/10A : Specify when ordering
	CT combination	AC 5 A/1 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
Rated load VA	CT secondary	0.5 VA or less
	VT secondary	1.0 VA or less
	EVT tertiary *6	5.0 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 *3, 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

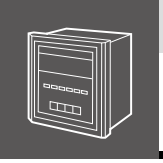
• General specifications (Cont.)

Item	Specifications
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 kV 1.2 x 50 µs 3 times each positive and negative Between contact (trip output) and circuit terminal : 3 kV 1.2 x 50 µs 3 times each positive and negative Between control power supply circuit terminals : 3 kV 1.2 x 50 µs 3 times each positive and negative Between measurement device transformer circuit terminals : 3 kV 1.2 x 50 µs 3 times each positive and negative Between communication wire and ground *5 : 1 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 1time
	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 1time
	VT circuit: 1.25 times that of rated value 10 seconds x 1 time
	EVT circuit: 1.5 times that of rated value 5 seconds x 1 time *6
Ambient temperature	-10°C to 60°C (no dew condensation or frost shall be observed): working guarantee *4 (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 observed
Grounding	D class grounding (100 Ω or less)
Mass	1.5 kg
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 EVT and ZVT (ZPD) selection is via connection pin switching. For ZVT (ZPD) combinations, use the ZPD-2 (refer to *page 34*). Select a combination of EVT (110 V/190 V) and ZVT (ZPD).
*3 Do not apply 2 kVAC between wires.
*4 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.
*5 The loader (USB) on the front main unit panel is not considered a communication wire.
*6 UM63FN-E □ AK is not compatible with ZCP combinations and EVT tertiary.

• 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	CB ON/OFF/trip	Making current: 15 A (110 VDC), acceptable continuous flowing current: 4 A Break current: 0.2 A (110 VDC inductive load L/R = 7 ms or less)	
	Other	Switching current: 0.2 A (110 VDC inductive load L/R = 15 ms or less), acceptable continuous flowing current: 1 A	



Power Monitoring Equipment
Digital Multi function Protection relay and Controller F-MPC60G

■ Specifications

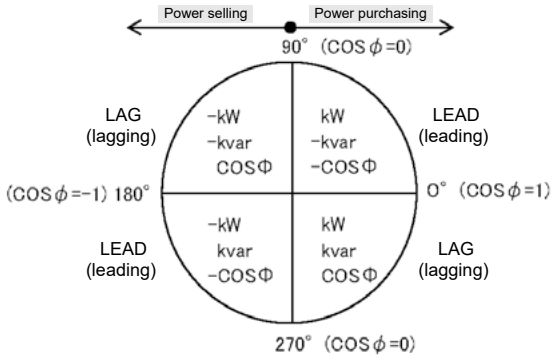
• Measurement/Display Specifications

The measurement display value of this unit displays the current, voltage, zero-phase current and zero-phase voltage on the primary side of the transformer.

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)		±1.5% *9	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 *8		ZCT *10	Rated current 1 A: 0.05 to 1.5 A of ZCT primary current (FS)		±1.5%	0, or 0.05 to 4.00 A of ZCT primary rated current
			Rated current 10 A: 0.5 to 15 A of ZCT primary current (FS)			0, or 0.5 to 40.0 A of ZCT primary rated current
		CT re-sidual	1.5% to 100% of CT primary rated current (FS)		±1.5% *9	0, or 1.5% to 800% of CT primary rated current
			100% to 800% of CT primary rated current (FS)		±5%	
Zero-phase voltage / zero-phase voltage maximum value *6 *7 *10	Average value selection	EVT	Tertiary rated voltage 110V	1.5% to 40% of EVT tertiary voltage (FS)	±1.5%	0, or 1.5% to 190% of EVT tertiary voltage
				40% to 150% of EVT tertiary voltage (FS)	±5%	
			Tertiary rated voltage 190V	1.5% to 40% of EVT tertiary voltage (FS)	±1.5%	0, or 1.5% to 110% of EVT tertiary voltage
				40% to 100% of EVT tertiary voltage (FS)	±5%	
		ZVT (ZPD)	1.5% to 40% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)		±1.5%	0, or 1.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V
			40% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)		±5%	
	Instantaneous value selection	EVT	Tertiary voltage 110V	1.5% to 150% of EVT tertiary voltage (FS)	±5%	0, or 1.5% to 190% of EVT tertiary voltage
			Tertiary voltage 190V	1.5% to 100% of EVT tertiary voltage (FS)	±5%	0, or 1.5% to 110% of EVT tertiary voltage
		ZVT (ZPD)	1.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)		±5%	0, or 1.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V
Voltage			5 to 150 V at VT secondary voltage		±1.5%	0, or 5 to 150 V at VT secondary rated voltage
	UM63FN-E □ AK	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 Demand active power *3 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)		±1.5% *9	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%	
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%	
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)		±5%	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

Item		Valid display range		Accuracy *1	Measurement range *2
ZCT *10	Accident (generated phase) maximum zero-phase current *8	Rated current 1 A: 0.05 to 4.00 A of ZCT primary current (FS)		±5%	0, or 0.05 to 15A of ZCT primary rated current
	Phase other than accident occurrence phase	Rated current 10 A: 0.5 to 40.0 A of ZCT primary current (FS)			0, or 0.5 to 150A of ZCT primary rated current
CT re-sidual	Accident (generated phase) maximum zero-phase current *8	2% to 800% of CT primary current		±5%	2% to 800% of CT primary rated current
	Phase other than accident occurrence phase	1.5% to 800% of CT primary current			0, or 1.5% to 800%A of CT primary rated current
EVT *10	Accident (generated phase) maximum zero-phase voltage *6	Tertiary rated voltage 110V	2.5% to 150% of EVT tertiary voltage (FS)	±5%	2.5% to 190% of EVT tertiary voltage
	Phase other than accident occurrence phase		1.5% to 150% of EVT tertiary voltage (FS)		0, or 1.5% to 190% of EVT tertiary voltage
	Accident (generated phase) maximum zero-phase voltage *6	Tertiary rated voltage 190V	2.5% to 100% of EVT tertiary voltage (FS)		2.5% to 110% of EVT tertiary voltage
	Phase other than accident occurrence phase		1.5% to 100% of EVT tertiary voltage (FS)		0, or 1.5% to 110% of EVT tertiary voltage
ZVT (ZPD) *10	Accident (generated phase) maximum zero-phase voltage *6	2.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)		±5%	2.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)
	Phase other than accident occurrence phase	1.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)			0, or 1.5% to 150% of zero-phase voltage at complete ground fault 6600V/√3=3810V (FS)

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 Average demand time can be selected from 0/1/5/10/15/30 minutes.
*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, ±, to indicate power selling/purchasing in power measurement or LEAD/LAG in power factor measurement. (left blank in case of +) The meaning of ± 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 COSφ
+: Lagging power factor
-: Leading power factor

*6 The zero-phase voltage display shows the calculated value of □□□□ V/√3. Where □□□□ V is the VT primary voltage.
Vo display example: If the VT primary voltage is 6600V and there is a complete ground fault (100% rating), 3810V will be displayed as 6600V/√3.
Vo√3 Display example: When the VT primary voltage is 6600V and there is a complete ground fault (100% rating), 6600V is displayed as (6600V/√3) × √3.
*7 Zero-phase voltage measurement (average value or instantaneous value) can be selected by settling.
Average value: The average value for about 1.0 seconds is displayed as the measured value.
Instantaneous value: Displays the instantaneous value about every 0.04 seconds as a measured value.
*8 For CT method, Io and 3Io display can be selected and set.
Io display : Input current displayed as is as measurement value and accident value.
3Io display : Three times the input current displayed as measurement value and accident value.
*9 Accuracy of UM63FN-E □ AK is ±1.0%.
*10 The UM63FN-E □ AK does not include the measurement and display functions of ZCT, EVT, and ZVT.

• 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)
67 (DG) 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)
27-2 (UV2) operation count	0 to 9,999 (times)

Item	Display range
64 (OVG) operation count *	0 to 9,999 (times)
Open phase operation count	0 to 9,999 (times)
Reverse phase operation count	0 to 9,999 (times)
VR operation count *	0 to 9,999 (times)
OCA operation count	0 to 9,999 (times)
DGA/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).
* Historical data such as "67 (DG) operation count", "64 (OVG) operation count", "VR operation count", and "DGA operation count" are not included in E □ AK.

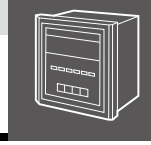
Power Monitoring Equipment
Digital Multi function Protection relay and Controller F-MPC60G

■ Specifications

• 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 16.0 times the CT rated current (in steps of 0.1 times), Lock *8	(Fixed)	±5%	40 ms or less	
51DT (fixed time limit)		0.2 to 16.0 times the CT secondary rated current (in steps of 0.1 times), Lock *9	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^2t IEEE: MI, EI, VI *3		20 to 240% of CT rated current (in steps of 1%), Lock *OC/OL selection *7 *10	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) *2	±5%	±5% (Lower limit ± 50 ms)	
51 G 3CT residual method or CT tertiary IEC: SI, EI, VI, LT IEEE: MI, EI, VI (inverse time limit selected)		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) *2	±5% (Lower limit ± 100 mA)	setting value of 300%: ± 12% 500: ± 7%, 1000%: ± 5% (Lower limit ± 100 ms)	
(fixed time limit selected)		0.02 to 1.00 times rating (in steps of 0.01 times), Lock	0.10 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) *11		VT secondary: 110 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) *12		VT secondary: 20 to 100 V (in steps of 1 V), 52a link on 20 to on 100 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) *13		VT secondary: 20 to 100 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	
64 (OVG) *14		2.5 to 40.0% of the rating (in steps of 0.5%), Lock	0.0 to 120.0 s (in steps of 0.1 s)	*4	±5% (Lower limit ±50 ms)	
67DG *14	3CT residual or CT tertiary	Zero-phase voltage: 2.5 to 40.0% of the rating (in steps of 0.5%)	0.10 to 600.00 s (in steps of 0.05 s)	*4	±5% (Lower limit ±50 ms)	[3CT residual] or [CT tertiary] Type: UM63FN
		Zero-phase current: 0.02 to 1.00 times of the rating (in steps of 0.01 times)		±5% (Lower limit ±100 mA)		
		Maximum sensitivity phase angle: 0° (fixed) Operation phase angle range: ±80°		±12.5°		
67DG/51G (OCG) *6 *14	ZCT system *1	Zero-phase voltage: 2.5 to 40.0% of the rating (in steps of 0.5%)	0.10 to 600.00 s (in steps of 0.05 s)	*4		[ZCT] Type: UM62F, UM62C
		Zero-phase current (Rating 1 A): 0.10 to 1.00 A of the rating (in steps of 0.05 A), Lock *5		±10% of setting value		
		Zero-phase current (Rating 10 A): 0.1 to 10.0 A of the rating (in steps of 0.05 A), Lock *5				
		Maximum sensitivity phase angle: 20, 30, 45, 60° Operation phase angle range: ±80°		±12.5°		
DGA *14	3CT residual or CT tertiary	Zero-phase voltage: 2.5 to 40.0% of the rating (in steps of 0.5%)	0.10 to 600.00 s (in steps of 0.05 s)	*4	±5% (Lower limit ±50 ms)	[3CT residual] or [CT tertiary] Type: UM63FN
		Zero-phase current: 50 to 100% of the DG operating current setting value (in steps of 1%), Lock		±10% (Lower limit ±100 mA)		
		Maximum sensitivity phase angle: 0° (fixed) Operation phase angle range: ±80°		±12.5°		
DGA/OCGA *6 *14	ZCT system *1	Zero-phase voltage: 2.5 to 40.0% of the rating (in steps of 0.5%)	0.10 to 600.00 s (in steps of 0.05 s)	*4		[ZCT] Type: UM62F, UM62C
		Zero-phase current: 50 to 100% of the DG operating current setting value (in steps of 1%), Lock		±10% of setting value (Lower limit ±10 mA)		
		Maximum sensitivity phase angle: 20, 30, 45, 60° Operation phase angle range: ±80°		±12.5°		
Open phase		-	-	Imbalance ratio 50 to 80% or more	2 s (fixed) ± 1 s	
Reverse phase		-	-	-	0.5 s or less	
Voltage establishment (VR) *14		VT secondary: 10 to 110 V (in steps of 1 V), Lock	0.00, 0.10 to 60.00 s (0.05 s steps)	±5% (Lower limit ±2 V)	±5% (Lower limit ±100 ms)	

*1 Use 200 mA/1.5 mA for zero-phase current transformer.
*2 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] DG, DGA, OCG, and OCGA do not have this function (the second harmonic content rate is not judged).
[4] The second harmonic suppression function in [1] and [2] above can be set as enabled/disabled (Loc).
*3 Voltage determination is selectable from AND, three-phase OR, and 2 OUT OF 3 (2/3 determination).
*4 At EVT combination (excluding EVT tolerance): JEC-2511 5 V class equivalent Type: [2.3% + {(Rating value) / (voltage setting value)} × 0.16] × 2 At ZVT combination: ±25%
*5 This product is for ungrounded systems. As a general rule, use a grounding system of 10 A or less for GTR grounding systems. For a grounding system for higher currents, select a type with a zero-phase operating current specification of 1.0 to 10 A.
*6 The 67DG detection in the feeder unit is performed by the zero-phase voltage signal (MN signal wire) from the power-receiving unit (UM6□F) or bus unit (UM62B) and the zero-phase current input to the unit.
*7 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.
*8 The current operating ampere setting range at UM63FN-E□AK 50INST (instantaneous) is CT secondary rated current of 1.0 to 20.0 times.
*9 The current operating ampere setting range at UM63FN-E□AK 51DT (fixed time delay) is CT secondary rated current of 0.2 to 20.0 times.
*10 The current operating ampere setting range at UM63FN-E□AK 51OC (inverse time delay) is CT rated current of 10 to 240%.
*11 UM63FN-E□AK: 60 to 150 V
*12 UM63FN-E□AK: 10 to 110 V, on10 to 110 V
*13 UM63FN-E□AK: 10 to 110 V
*14 UM63FN-E□AK: Not applicable.



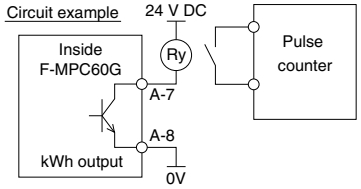
• Specifications of transducer outputs

Item			Specifications	Acceptable error	Power receiving	Feeder	Bus
Transducer output signal *1			4 to 20 mA (acceptable load 270 Ω or less)	-	-	-	-
Signal type	Current (Ir, Is, It)		4 to 20 mA versus 0 to CT rating	±1.5%	○	○	-
	Voltage (Vuv, Vvw, VWu)		4 to 20 mA versus VT secondary 0 to 150 V		○	○	○
	UM63FN-E □ AK	Line voltage	(Vab, Vbc, Vca): 4 to 20 mA versus VT secondary 0 to 150 V 4 to 20 mA versus VT secondary 0 to 150 x √3 V				
		Phase voltage	(Van, Vbn, Vcn): 4 to 20 mA versus VT secondary 0 to 150 x √3 V 4 to 20 mA versus VT secondary 0 to 150 V				
	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 (Ir, Is, It)		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 voltage (Vo) *2		4 to 20 mA versus 0% to 136% 100% : EVT is rated/ √3, ZVT is 3810V EVT 110V : 0 to 150 V (4 to 20 mA) EVT 190V : 0 to 260 V(4 to 20 mA) ZVT : 0 to 5195 V (4 to 20 mA)	±1.5%	○	-	○
	Zero-phase current (Io)		3CT residual: 4 to 20 mA versus 0 to CT rating ZCT [rated 1 A] : 4 to 20 mA versus 0 to 1 A ZCT [rated 10 A] : 4 to 20 mA versus 0 to 10 A	±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)				

Note *1 The tolerance is the error with respect to FS. Select 6 amounts in the transducer output signal by settling.
*2 UM63FN-E□AK: Not applicable.

• 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^nkWh/pulse (n = - 2 to 4 in setting)
	2,000 pulse/kWh (n = F in setting)



• Communications specifications

item		T-Link *	Specifications	
			F-MPC-Net protocol	Modbus RTU protocol
Standard		-	EIA RS-485	
Data exchange		1:N (this device) polling/selecting		
Maximum transmission distance		700m	1,000 m	
Number of connection stations		Up to 32 slave stations	Maximum 64 units/one system (however, the master device is included in the 64 units)	
Address setting		01 to 99/Lock (Factory setting: Lock)	01 to 99/Lock (Factory setting: Lock)	
Transmission speed		500kbps	4800/9600/19200/38400 bps (Factory setting: 19200bps)	
Data format	Start bit	designated	1 bit (fixed)	1 bit (fixed)
	Data length		7/8 bits (select) (Factory setting: 7bits)	8 bit (fixed)
	Parity bit		None/Even number/Odd number (select) (Factory setting: Odd number)	None/Even number/Odd number (select)
	Stop bit		1 bit (fixed)	1/2 bit (auto) Note6

Note 1: Use KPEV-SB (0.5mm2), CPEV-SB (φ0.9mm) or equivalent for the communication cable, and connect the shield wire to the SG terminal (Terminal block A No.2).
Note 2: Do not branch the communication cable, connect terminating resistors to both ends of the communication cable. If this unit is the end of communication, short-circuit No. 3 and No. 5 of terminal block A. Built-in terminating resistor 120Ω.
Note 3: Use a communication cable with a transmission distance of 700 m or less for T-link and 1,000 m or less for RS-485.
Note 4: Keep the wiring route away from high-voltage equipment and power lines (cables) as much as possible.
Note 5: For details on the communication procedure, refer to "Communication application manual
(T-link: 62F7-E-0216 F-MPC-Net: 62F7-E-0217, 62F7-E-0254 Modbus RTU: 62F7-E-0218, 62F7-E-0255)".
Note 6: 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.
*UM63FN-E□AK : T-link communication function is not supported.

(Semi-standard)
JEC-2500 (Protective relay for electric power), JEC-2501 (Electromagnetic compatibility test of protective relay), JEC-2512 (Ground fault relay), JEC-2511 (Voltage relay), JIS C4602 (Overcurrent relay for high voltage power reception)), JIS C4609 (High voltage power receiving ground fault direction relay), JIS C1102-1,2,3,4,5,7 (Indicating electricity meter), JEC-2518 (Digital overcurrent relay), JIS C1111 (AC-DC) Transducer), JIC C1216 (electric meter [model with transformer]), IEC60255-1 (common) IEC60255-21 (vibration, shock, seismic resistance), IEC60255-26 (electromagnetic compatibility requirement) IEC60255-27 (safety requirement)), IEC60255-127 (OV/UV) IEC60255-151 (OC)

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■ Specifications

• Accident waveform recording data specification

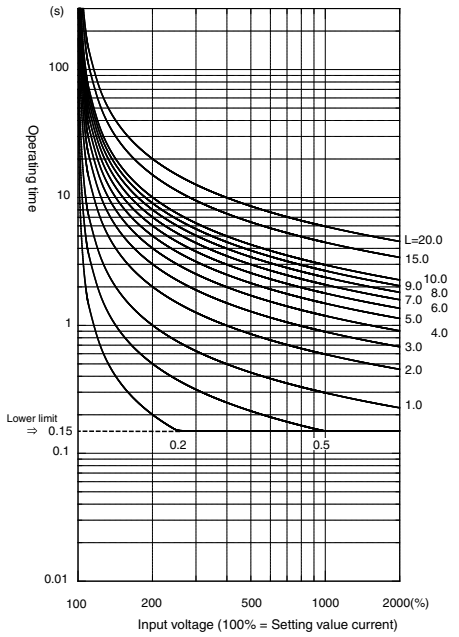
Item		Specifications	
Number of waveform records		Maximum of 2	
Waveform record updates		Updated upon operation of one of the 13 protection elements, other than alarm (OCA, OCGA) operations (or updated upon manual loading). If an accident occurs more than 2 times, the accidents will be cleared starting from the oldest data No. 2.	
Record waveform elements (data per point)		Analog input	8 elements total (Current (R, S, T), voltage (uv, vw, wu), zero-phase current, zero-phase voltage) E□AK: 7 elements total (without zero-phase voltage)
		Input	10 elements total (MN, 52a, selection input 1 to 8) E□AK: 9 elements total (without MX)
		Output	4 elements total (CLOSE, OPEN, trip, device failure)
		Protection status	15 elements total (59, 27UV, 27UV2, 47, 50, 51, 51DT, 51DT2, OCA, 46, 67, 50G, 51G, DGA/OCGA, 64) E□AK: 13 elements total (without 67, DGA)
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	Before protection operation	3.75° (96 times) setting: about 1.25 sec. 7.5° (48 times) setting: about 2.5 sec. 15° (24 times) setting: about 5 sec. 30° (12 times) setting: about 10 sec.
		After protection operation	3 cycles (fixed, 60 ms)
	60 Hz	Before protection operation	3.75° (96 times) setting: about 1.04 sec. 7.5° (48 times) setting: about 2.08 sec. 15° (24 times) setting: about 4.16 sec. 30° (12 times) setting: about 8.33 sec.
		After protection operation	3 cycles (fixed, 60 ms)

• Clock specifications

Item	Specifications	Remarks
Clock accuracy	Within ±20 minutes/year	Average ambient temperature: At ±25°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 ±25°C Control power must flow for at least 10 minutes to charge the backup electrical double-layer capacitor.

■ 51(OC), 51G(OCG) relay characteristics

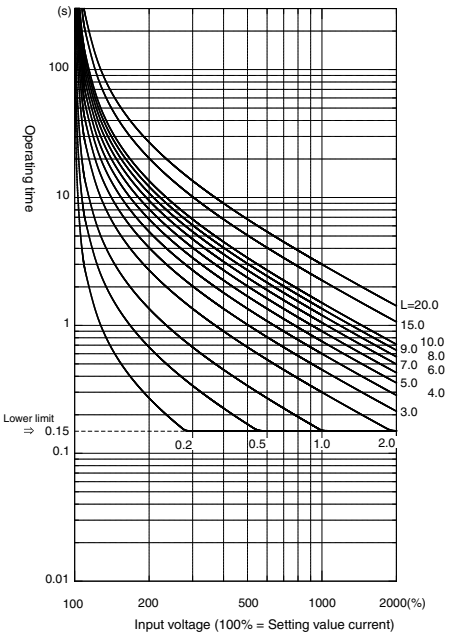
Standard Inverse Time (SI) IEC characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 51 is 0.2, 51G is 0.5; Upper limit: 51 is 20.0, 51G is 50.0)
Part of the lever is omitted in the above characteristic diagram.

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

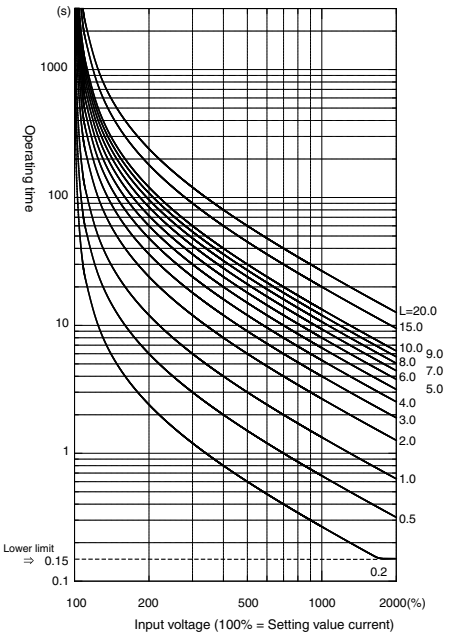
Very Inverse Time (VI) IEC characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 51 is 0.2, 51G is 0.5; Upper limit: 51 is 20.0, 51G is 50.0)
Part of the lever is omitted in the above characteristic diagram.

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

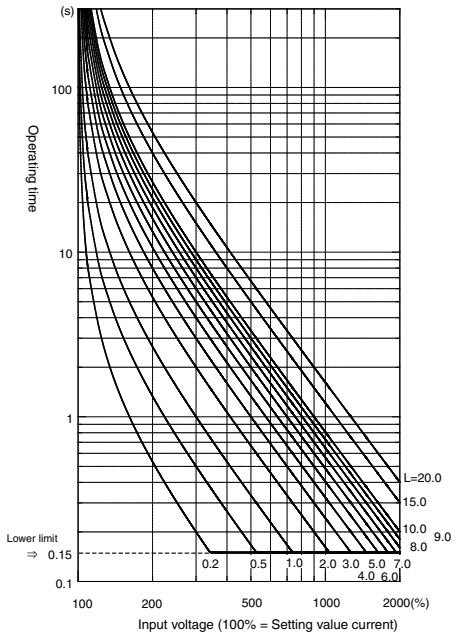
Long Inverse Time (LT) IEC characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 51 is 0.2, 51G is 0.5; Upper limit: 51 is 20.0, 51G is 50.0)
Part of the lever is omitted in the above characteristic diagram.

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

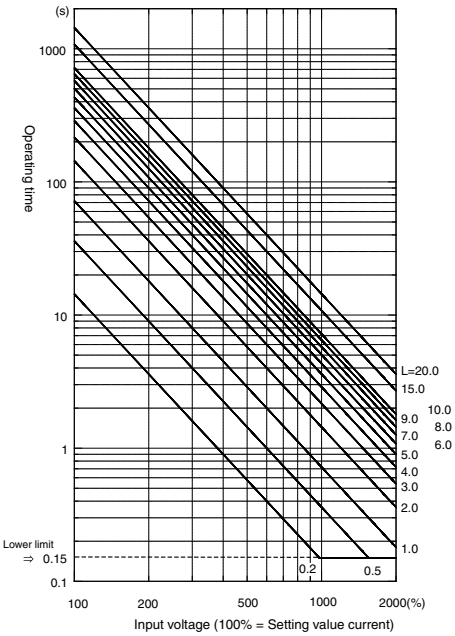
Extremely Inverse Time (EI) IEC characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 51 is 0.2, 51G is 0.5; Upper limit: 51 is 20.0, 51G is 50.0)
Part of the lever is omitted in the above characteristic diagram.

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

I²t characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 0.2; Upper limit: 20.0)
Part of the lever is omitted in the above characteristic diagram.

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

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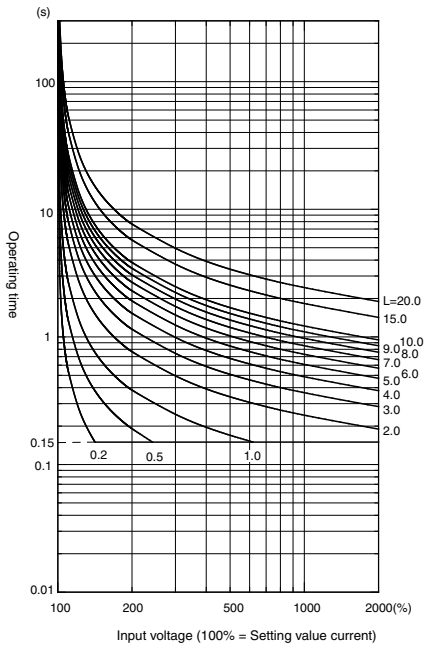
■ 51(OC), 51G(OCG) relay characteristics (Cont.)

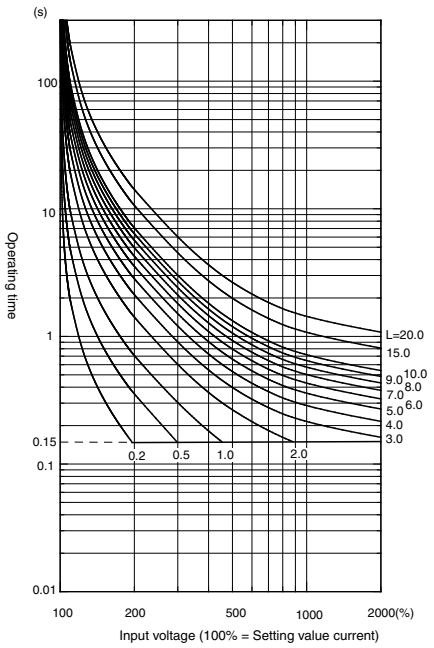
Moderate recoil time (MI) IEEE characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 0.2; Upper limit: 20.0)
Part of the lever is omitted in the above characteristic diagram.

$$t = \left\{ \frac{0.0515}{I^{0.02} - 1} + 0.1140 \right\} \times \frac{L}{10}$$ (L: Time factor)

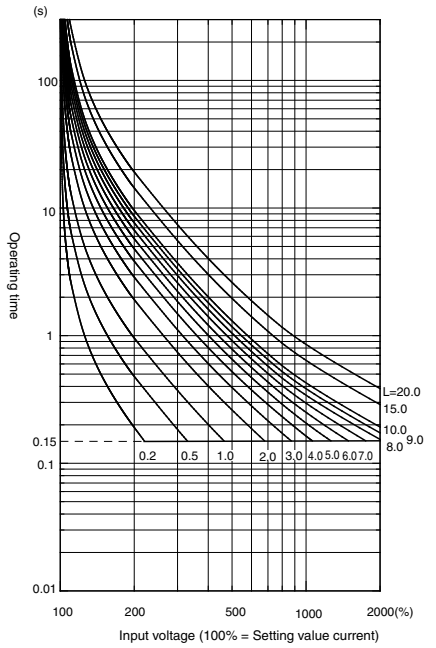
Very Inverse Time (VI) IEEE characteristic



Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 0.2; Upper limit: 20.0)
Part of the lever is omitted in the above characteristic diagram.

$$t = \left\{ \frac{19.61}{I^2 - 1} + 0.491 \right\} \times \frac{L}{10}$$ (L: Time factor)

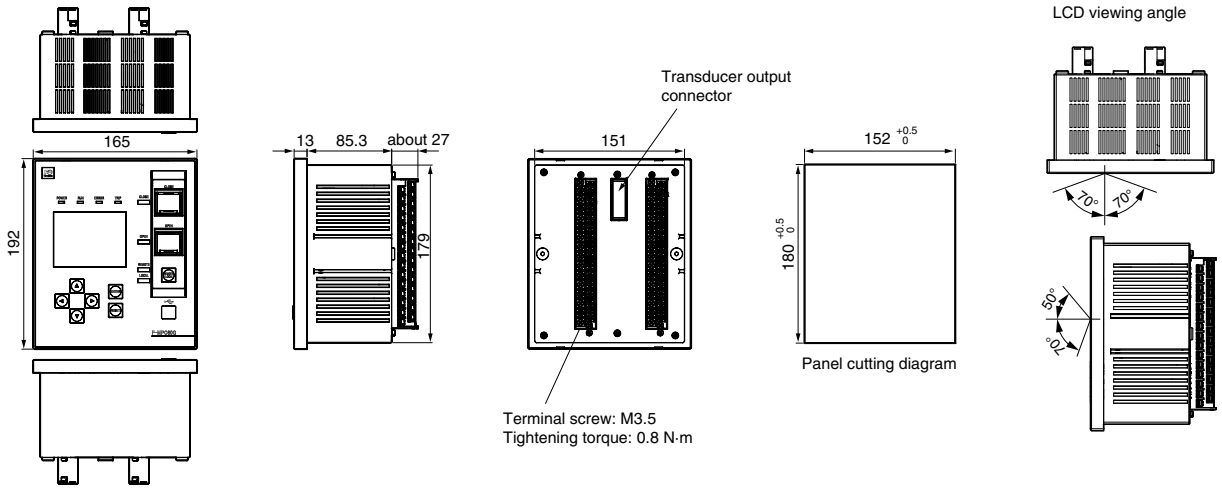
Extremely Inverse Time (EI) IEEE characteristic



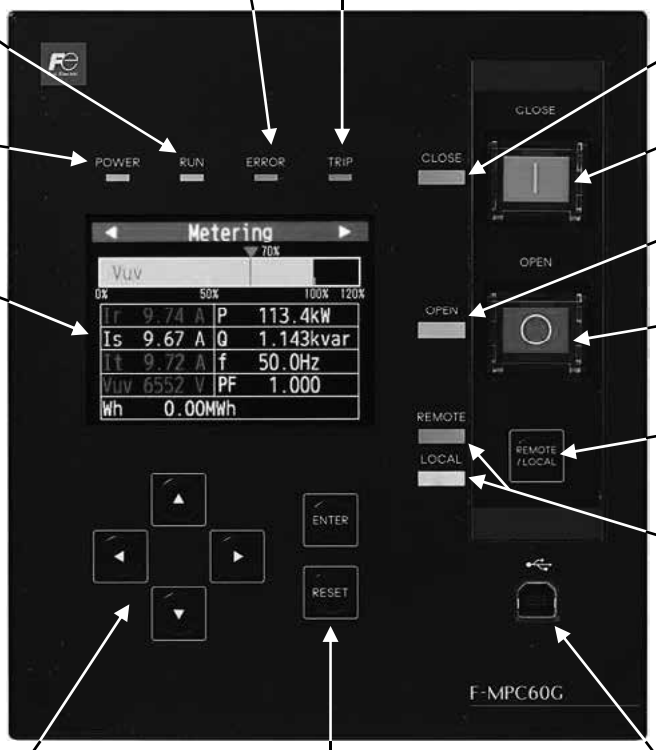
Note: The time setting (lever) is in steps of 0.1 times.
(Lower limit: 0.2; Upper limit: 20.0)
Part of the lever is omitted in the above characteristic diagram.

$$t = \left\{ \frac{28.2}{I^2 - 1} + 0.1217 \right\} \times \frac{L}{10}$$ (L: Time factor)

■ External dimensions [unit: mm]



■ Indications & Settings



ERROR indicator (orange)
Indicates device failure when it is lit.

TRIP indicator (red)
Flickers when detecting protection, and lights up when operating protection.

RUN indicator (green)
Indicates normal operation when it is lit.

POWER indicator (green)
Indicates normal control power when it is lit.

LCD display screen

Circuit breaker operator
* Bus unit is not equipped with it.

CB-CLOSE indicator (red)
Indicates the circuit breaker is on by lighting.

CB-CLOSE switch
Switch for turning circuit breaker on

CB-OPEN indicator (green)
Indicates the circuit breaker is opened by lighting.

CB-OPEN switch
Switch for opening circuit breaker

REMOTE/LOCAL button
REMOTE/LOCAL direct switch button

REMOTE/LOCAL indicator (orange)
Remote/local status is indicated by lighting.

Operation buttons
◀▲▼▶(Arrow buttons)

Used for display switch, item selection and setting change.

Operation buttons
ENTER and RESET

Used for mode switch and confirmation of setting change.
RESET button is also used for canceling the setting change, returning from the protection operation.

Loader PC connection port
USB type B connector

You can use convenient functions such as accident waveform data display and relay testing assistance by connecting with the free specially-designed PC application.

Power Monitoring Equipment
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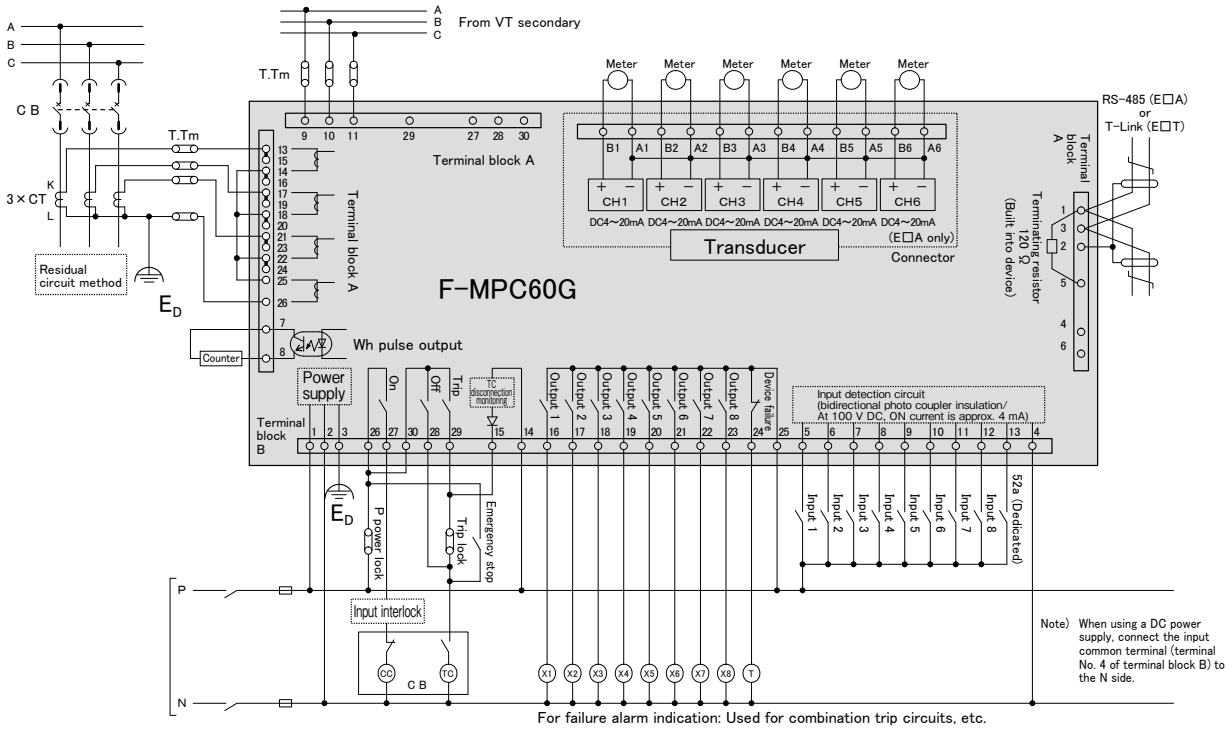
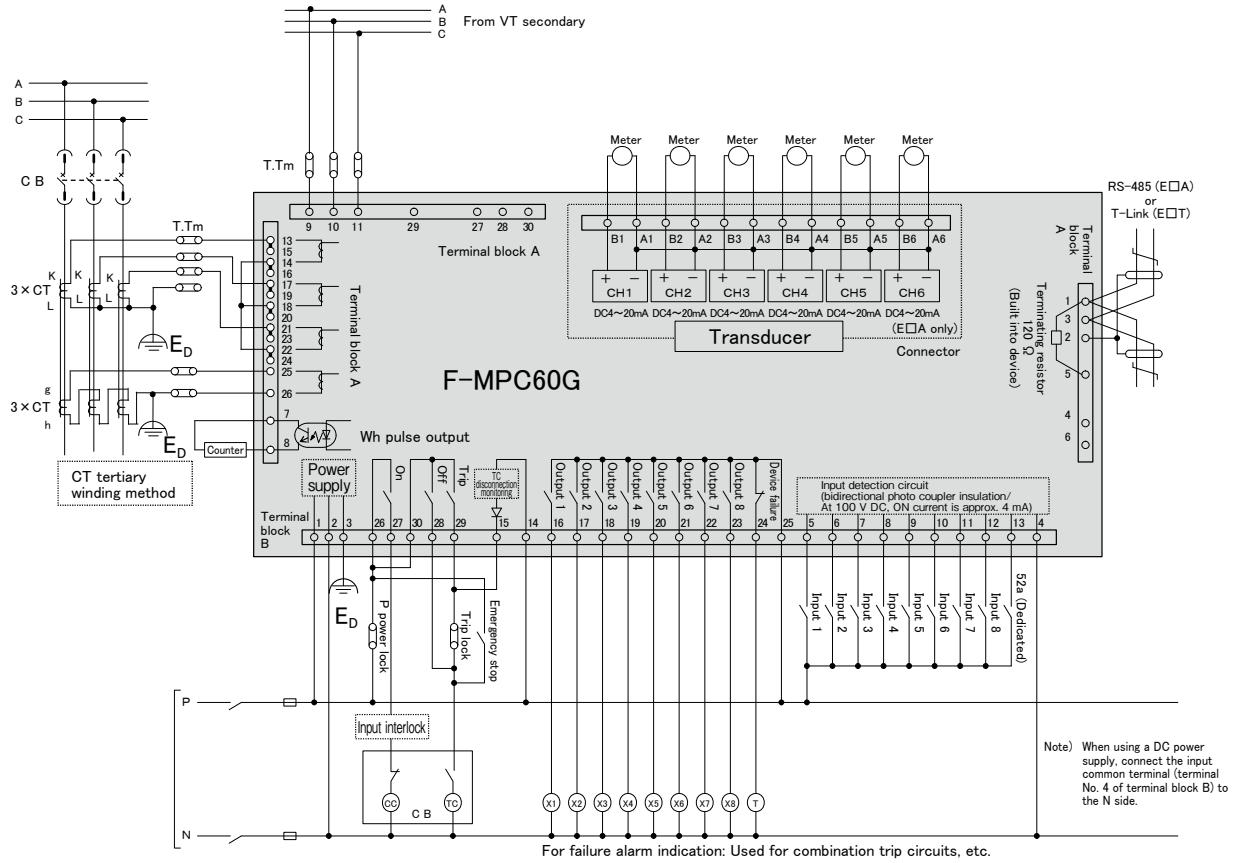
■ Wiring diagram example

● Power receiving unit UM63F (3CT type) [Ground fault current: residual circuit method]



Note (1) Inputs 1 to 8 and outputs 1 to 8 can be used by selecting (assigning) functions via the settings.
(2) The "ON, OFF, trip, device failure" output and "52a (CB ON answerback) and trip coil TC disconnection monitor" input are dedicated.
(3) The device failure output is the b contact output (normally it is excited, and in the event of an error, it will enter a non-excited state and the contact will be closed). For this reason, there will be about 4 s of delay before the contact is opened after power is supplied. Therefore, when creating an external sequence (in the case that externally-connected devices are held by one-shot signals), please consider using a timer as necessary.
(4) When driving a load of more than the output contact capacity, be sure to use it in combination with a power relay. (Refer to *page 17* for the external I/O specifications).
(5) When using the communication function (RS-485, T-LINK) and the main unit is at the end of the communication line (termination), short-circuit pins No. 3 and No. 5 of terminal block A. (It has a built-in terminating resistor of 120 Ω). For non-terminated units, use it with no connection between Nos. 3 and 5.
(6) Specify transmission (RS-485 or T-LINK) and transducer output using the types shown on *page 15*.
(7) "Trip coil TC disconnection monitor" input pins B-Nos.14 and 15 have polarity. Connect No.14 to the P side of the control power supply.

● **Power receiving unit UM63F (3CT type) [Ground-fault current: CT tertiary winding method]**



Note (1) Inputs 1 to 8 and outputs 1 to 8 can be used by selecting (assigning) functions via the settings.
(2) The "ON, OFF, trip, device failure" output and "52a (CB ON answerback) and trip coil TC disconnection monitor" input are dedicated.
(3) The device failure output is the b contact output (normally it is excited, and in the event of an error, it will enter a non-excited state and the contact will be closed). For this reason, there will be about 4 s of delay before the contact is opened after power is supplied. Therefore, when creating an external sequence (in the case that externally-connected devices are held by one-shot signals), please consider using a timer as necessary.
(4) When driving a load of more than the output contact capacity, be sure to use it in combination with a power relay. (Refer to *page 17* for the external I/O specifications).
(5) When using the communication function (RS-485, T-LINK) and the main unit is at the end of the communication line (termination), short-circuit pins No. 3 and No. 5 of terminal block A. (It has a built-in terminating resistor of 120 Ω). For non-terminated units, use it with no connection between Nos. 3 and 5.
(6) Specify transmission (RS-485 or T-LINK) and transducer output using the types shown on *page 15*.
(7) "Trip coil TC disconnection monitor" input pins B-Nos.14 and 15 have polarity. Connect No.14 to the P side of the control power supply.

Power Monitoring Equipment
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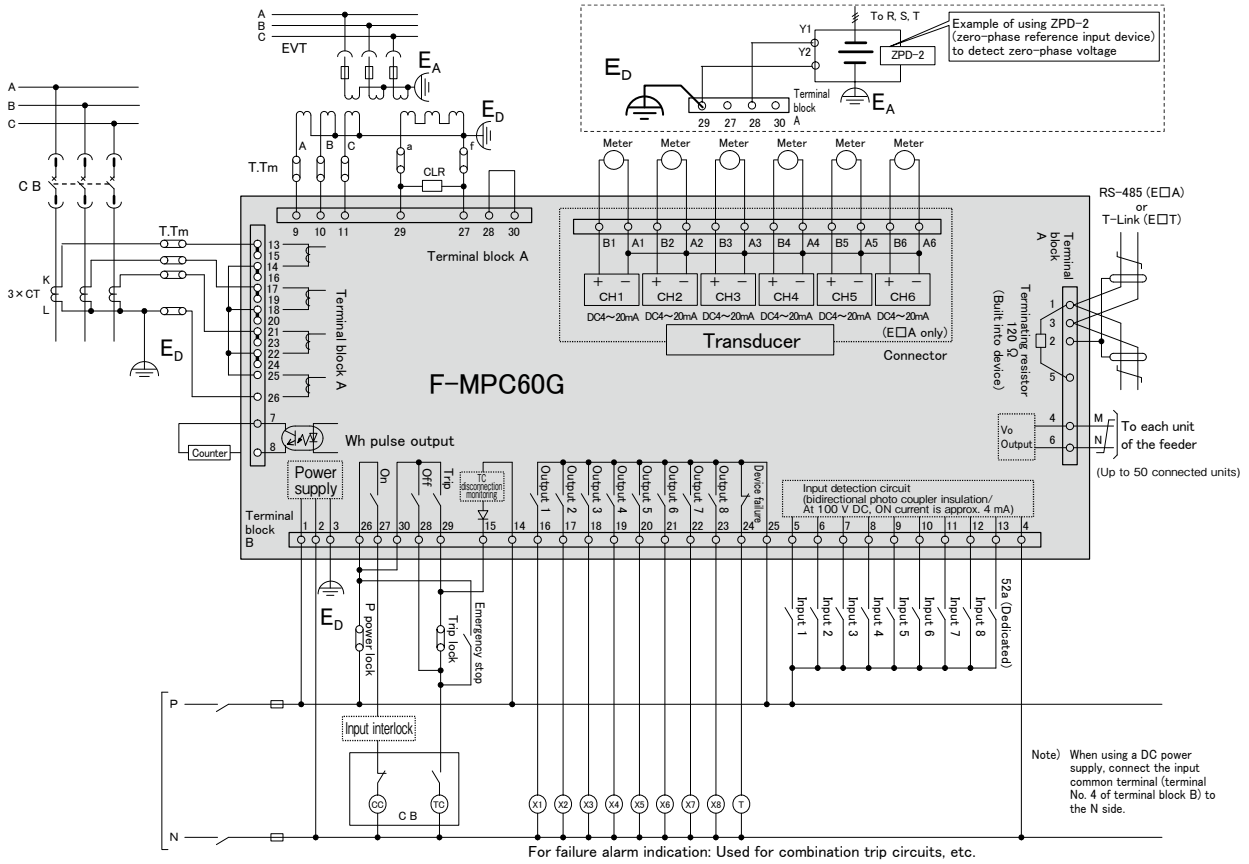
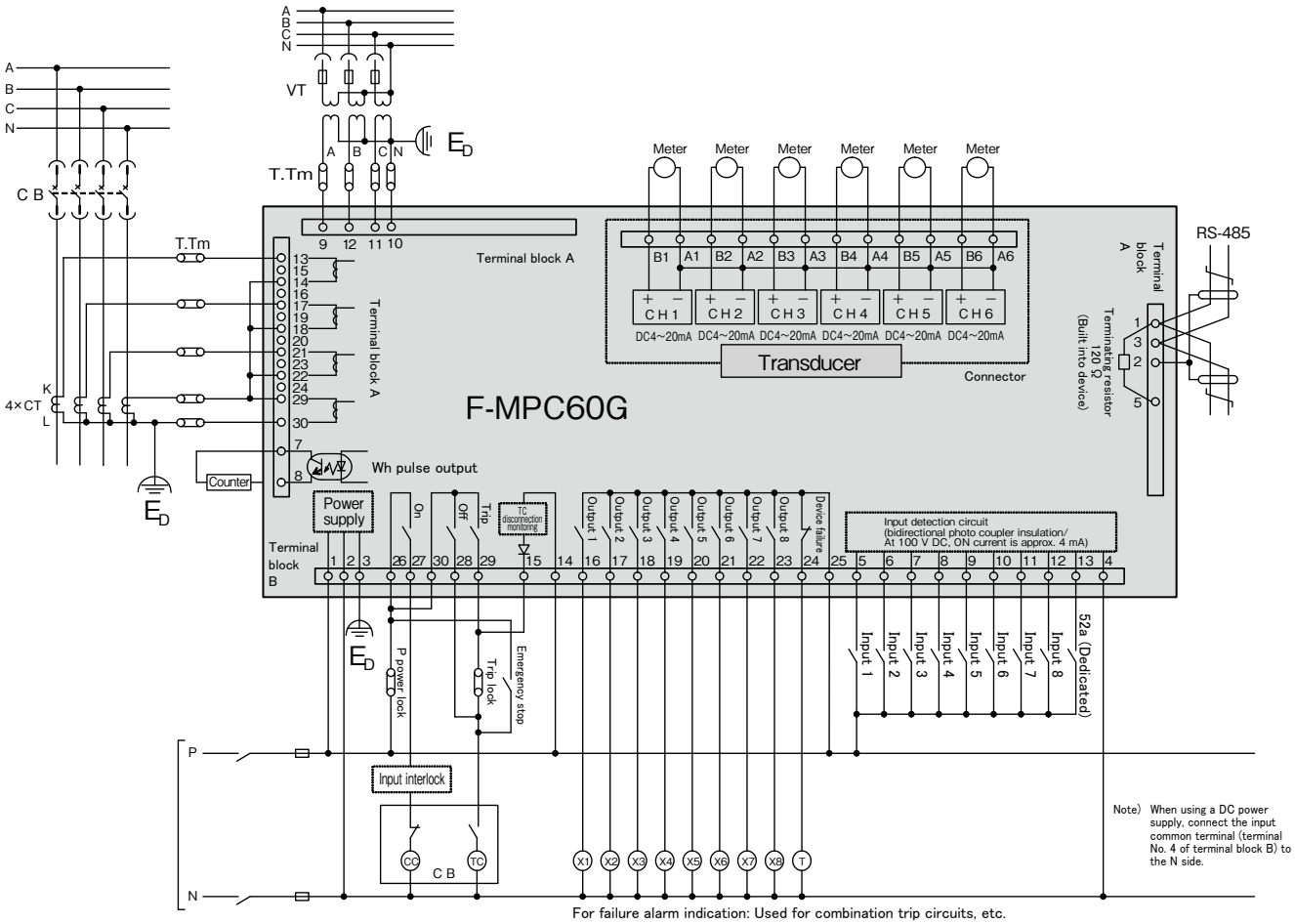
■ Wiring diagram example

● Power receiving unit UM63F (3CT type) [Ground-fault voltage: EVT or ZVT method]



Note (1) Inputs 1 to 8 and outputs 1 to 8 can be used by selecting (assigning) functions via the settings.
(2) The "ON, OFF, trip, device failure" output and "52a (CB ON answerback) and trip coil TC disconnection monitor" input are dedicated.
(3) The device failure output is the b contact output (normally it is excited, and in the event of an error, it will enter a non-excited state and the contact will be closed). For this reason, there will be about 4 s of delay before the contact is opened after power is supplied. Therefore, when creating an external sequence (in the case that externally-connected devices are held by one-shot signals), please consider using a timer as necessary.
(4) When driving a load of more than the output contact capacity, be sure to use it in combination with a power relay. (Refer to *page 17* for the external I/O specifications).
(5) When using the communication function (RS-485, T-LINK) and the main unit is at the end of the communication line (termination), short-circuit pins No. 3 and No. 5 of terminal block A. (It has a built-in terminating resistor of 120 Ω). For non-terminated units, use it with no connection between Nos. 3 and 5.
(6) When using the EVT method, connect the EVT signal to No. 27 (f) and No. 29 (a) of terminal block A, and then short-circuit pin Nos. 28 and 30.
(7) When using the ZVT method, connect the ZVT signal to No. 28 (Y1) and No. 29 (Y2) of terminal block A.
(8) Use twisted wires (or twisted strands) for the MN signal wire and Vo.
(9) Specify transmission (RS-485 or T-LINK) and transducer output using the types shown on *page 15*.
(10) "Trip coil TC disconnection monitor" input pins B-Nos.14 and 15 have polarity. Connect No.14 to the P side of the control power supply.

● **Example of 3-phase 4-wire unit external connection (UM63FN-E□-AK)**



Note (1) Inputs 1 to 8 and outputs 1 to 8 can be used by selecting (assigning) functions via the settings.
(2) The "ON, OFF, trip, device failure" output and "52a (CB ON answerback) and trip coil TC disconnection monitor" input are dedicated.
(3) The device failure output is the b contact output (normally it is excited, and in the event of an error, it will enter a non-excited state and the contact will be closed). For this reason, there will be about 4 s of delay before the contact is opened after power is supplied. Therefore, when creating an external sequence (in the case that externally-connected devices are held by one-shot signals), please consider using a timer as necessary.
(4) When driving a load of more than the output contact capacity, be sure to use it in combination with a power relay. (Refer to *page 17* for the external I/O specifications).
(5) When using the communication function (RS-485, T-LINK) and the main unit is at the end of the communication line (termination), short-circuit pins No. 3 and No. 5 of terminal block A. (It has a built-in terminating resistor of 120 Ω). For non-terminated units, use it with no connection between Nos. 3 and 5.
(6) Specify transmission (RS-485 or T-LINK) and transducer output using the types shown on *page 15*.
(7) "Trip coil TC disconnection monitor" input pins B-Nos.14 and 15 have polarity. Connect No.14 to the P side of the control power supply.

Power Monitoring Equipment
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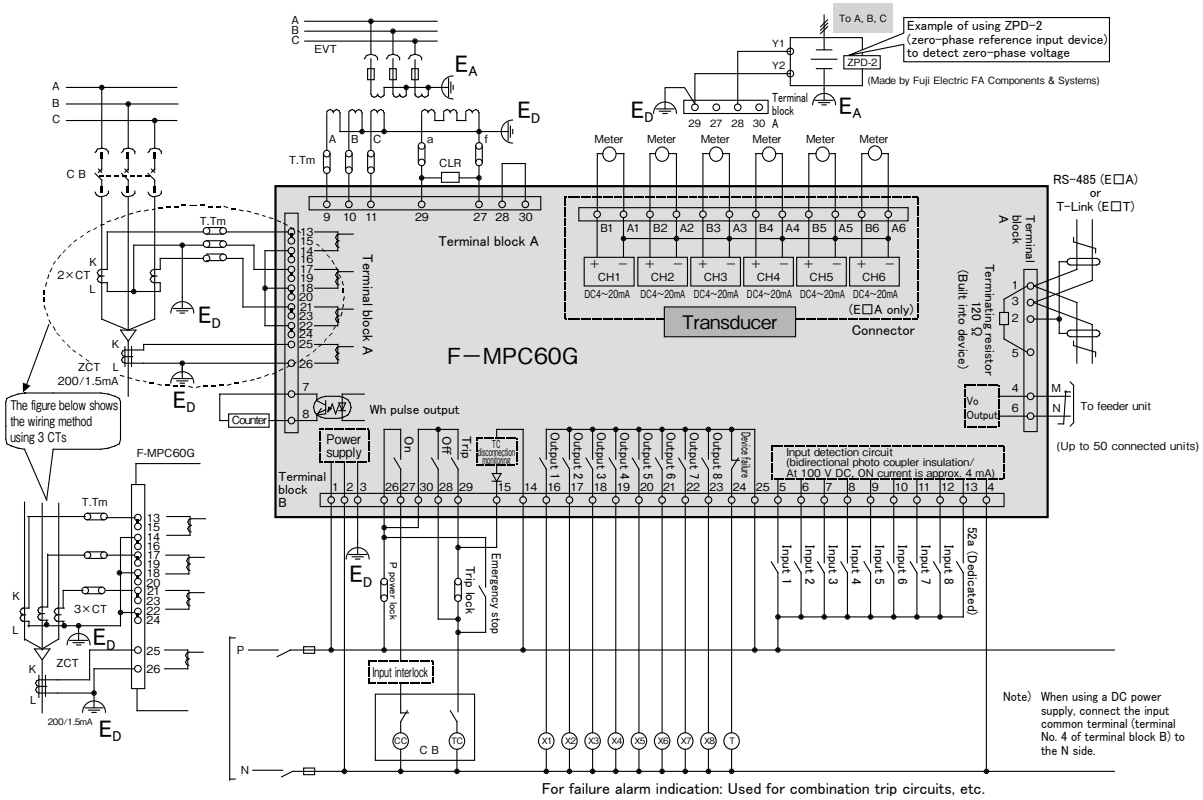
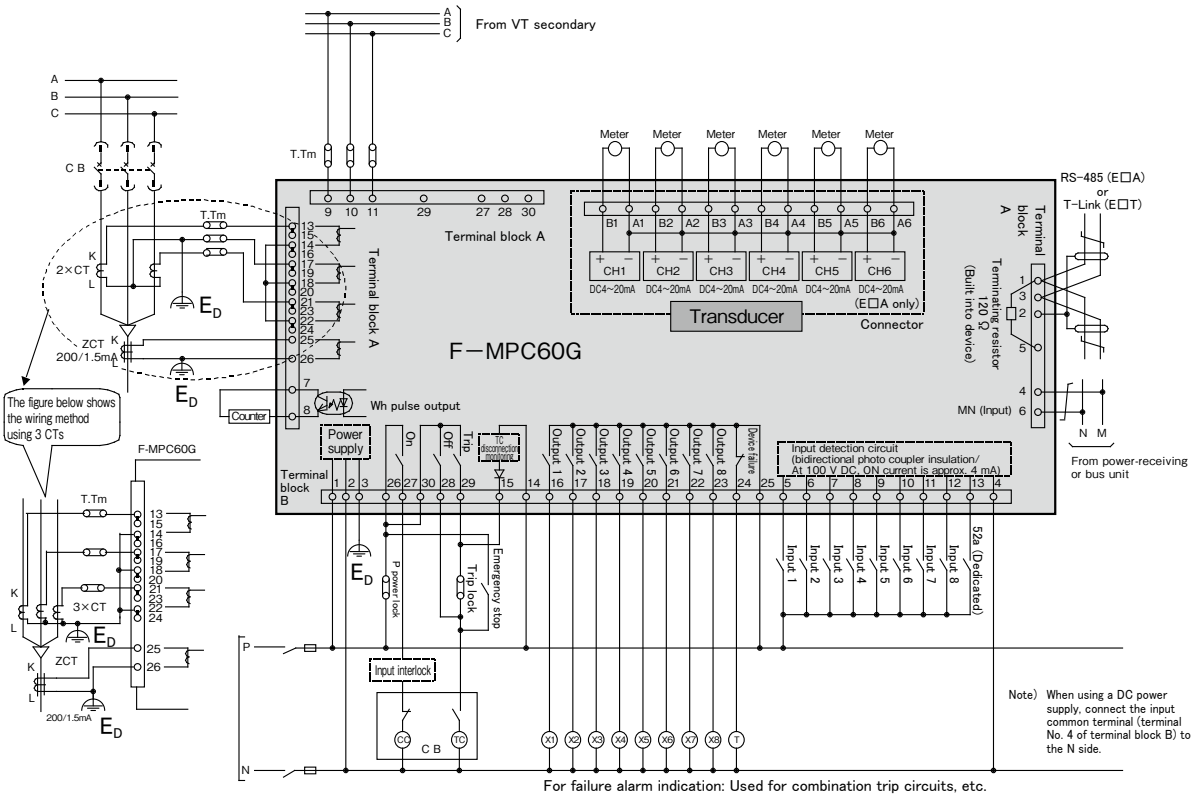
■ Wiring diagram example

● Power receiving unit external wiring diagram example (UM62F)



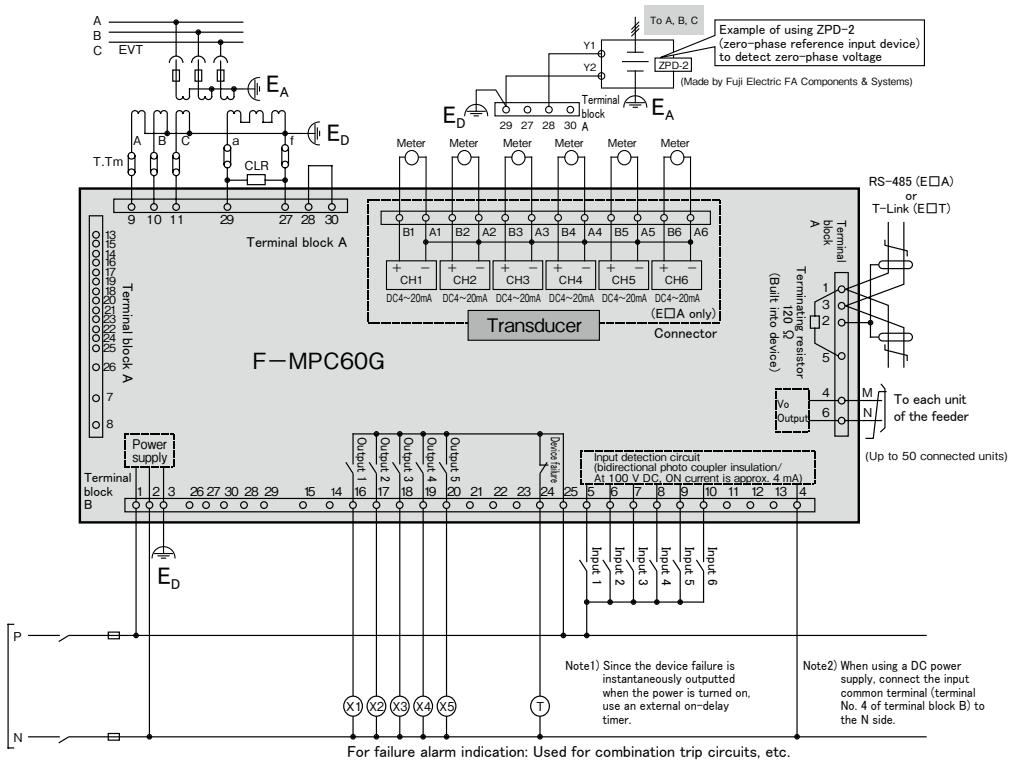
● **Example of feeder unit external connection (UM62C)**



Power Monitoring Equipment
Digital Multi function Protection relay and Controller F-MPC60G

■ Wiring diagram example

● Example of bus unit external connection (UM62B)



Power Monitoring Equipment
AC Power Supply Unit for F-MPC60G/60B/50 Series

■ Features

This device is an AC/DC power supply unit that is to be used with an AC control power supply when operating a multifunctional digital relay.

- The protection 27 (UV) function and the use of this instrument are shown below.

Protection 27 (UV) function	This device (UM2P-A1)	Remarks
27 operating time 0s or 27 not used	Not required.	Protection 50 (INST) Protection 27 activates.
27 operating time 1.0s or less	Required.	Protection 27 activates.
27 operating time exceeds 1.0s	Required. Also requires external capacitors, etc.	Refer to Note 2 in the table below.

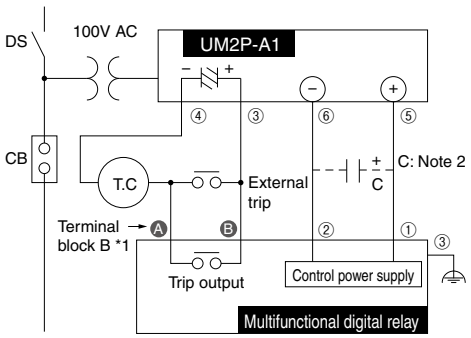
- In addition to the F-MPC control power supply, the output power supply comes with a built-in circuit breaker capacitor trip power supply (capacitor capacity of 1500 µF).
- Only one multifunctional digital relay can be connected to the unit.

KKD08-178

■ Model, type, and specification

Item		Specification	
Type		**UM2P-A1**	
Control power supply		Rated voltage: 100 V AC 50/60 Hz (Tolerable voltage fluctuation range: 85 to 125 V AC)	
Control power supply load		20 VA or less (load: at F-MPC60 connection)	
Ambient temperature		-10°C to 50°C	
Relative humidity		20% to 90% RH (No condensation)	
Storage temperature		-20°C to 70°C	
Atmosphere		No corrosive gas or excessive dust	
Insulation resistance		Between electric circuits - ground 10 MΩ or more with 500 V DC megger	
Vibration resistance		16.7 Hz 1G, double amplitude 0.4 mm, 3 directions 10 minutes each	
Shock resistance		30G, 3-axis 6 directions, 3 times each	
Dielectric strength		Between electric circuits - ground 2 kV AC (1 minute)	
Anti-noise		Square wave 1.5 kV (1 ns/1 µs 10 minutes)	
Lightning impulse		Between electric circuits - ground 4.5 kV 1.2/50 µs	
Mass		About 1.5 kg	
Display	Power supply	Green LED Control power supply pilot light	
	Charging	Red LED Shows trip capacitor charging state	
Output power supply	For F-MPC60	F-MPC60 Control power supply and Di input dedicated (Output voltage when connected: 80 to 143 V DC)	
		At instantaneous power failure F-MPC60 Operation (protective relay function) duration: 140 ms or more	
	Capacitor trip	Rated charging voltage	130 V DC (trip capacitor capacity: 1,500 µF (typ))
		Charging time	Within 2 seconds
		Trippable time	30 seconds or more Note 1
		Forced discharge	Front side Via discharge push button switch

Outline of combined devices



*1 Pin number table

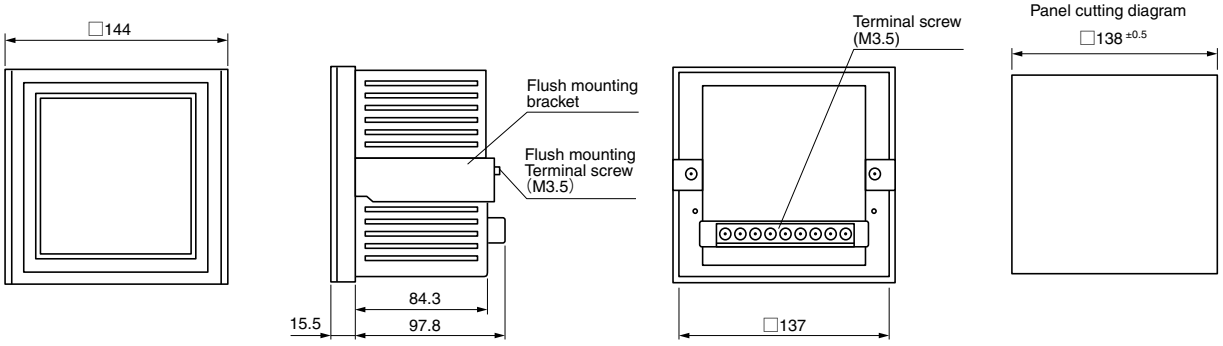
	F-MPC50	F-MPC60G/60B
A	⑲	㉙
B	⑳	㉚

(Note 1) When a power failure occurs after charging at 60 V AC, the residual voltage of the trip capacitor charge after 30 seconds of power failure will be 75 V DC or more

(Note 2) Since the guaranteed power failure time is 1 second, if the bus and power-receiving unit UV (undervoltage) relay function is used and the operation time is set for more than 1 second, the UV relay cannot be operated by this power supply unit alone during a power failure.
When used with a UV operating time in excess of 1s, use it in conjunction with an external capacitor (not provided; requires a withstand voltage of 200 V DC or more) for the "multifunctional digital relay control output" component of this power supply unit by referencing the below table.
Capacitor example: Nichicon's LNT2D153MSE, etc.

Protection 27 (UV) operating time	External capacitor capacity	Capacitor example
1.2 s to 2.0 s	1,500 µF	Nichicon's LNT2D152MSE
2.2 s to 5.0 s	6,800 µF	Nichicon's LNT2D682MSE
6.0s or more	1,600 × t (µF)	t: Protection 27 operating time (setting value)

■ External dimensions [unit: mm]



Power Monitoring Equipment
Zero-Phase Reference Input Device (ZVT) (For F-MPC60G/60B/50 Series)

■ Application

These units are used in combination with F-MPC60G/60B/50 Series multifunctional digital relay (multifunctional digital relays cannot be used with other ZVTs).
The power receiving unit or bus unit receives a zero-phase voltage signal from type ZPD-2 and outputs it as a phase-pulse signal if it is at or above the specified (set value) level. The feeder unit operates as a ground directional relay (67DG) by discriminating the phase if the pulse-phase signal and the unit's zero-phase current signal are at or above the specified (set value) level.

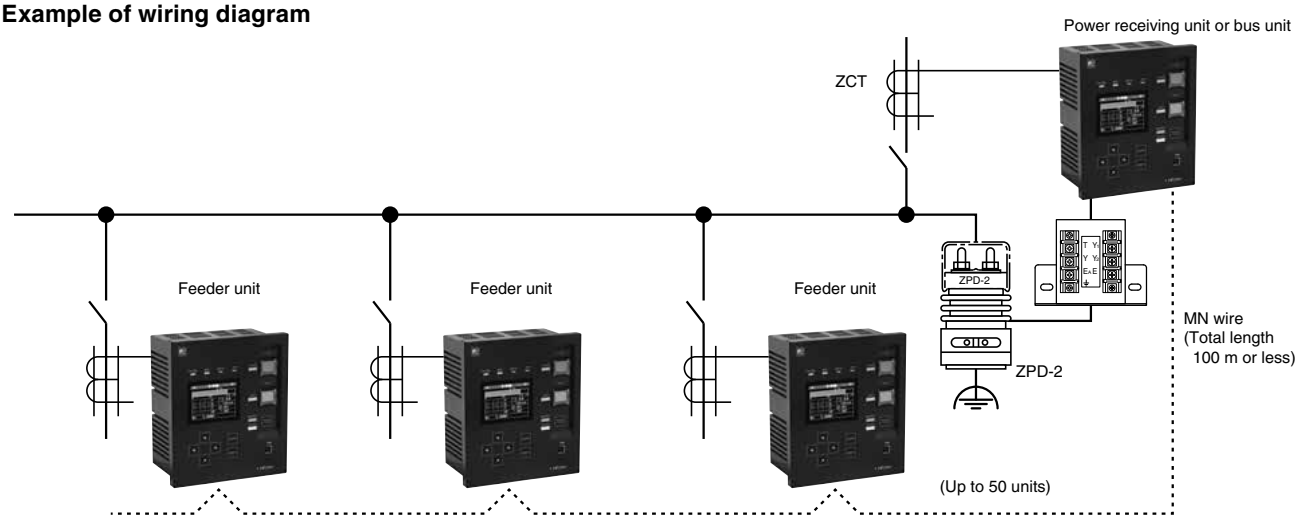
(Note) Make the total length of the MN signal wire 100 m or less, and make the number of connected feeder units 50 or less. Use twisted strand (or twisted wire) for the MN signal wire. The ZPD-2 is connected to the power-receiving unit or bus unit in a one-to-one connection.

■ Model, type, product code, and specifications

Item	Specification
Structure	Indoor-use epoxy resin post-insulator type (voltage converter separate mounting type)
Type	**ZPD-2**
Product code	HZ1JE
Rated voltage	6.6 kV
Capacitance	250 pF × 3 phases
Dielectric strength	22 kV AC / 1 minute, lightning impulse 60 kV
Connection cable length	1 m (Note 2)
Compatible models	QHA-DG3, QHA-DG5, QHA-VG1, QHA-VR1, New-AUTO.V, F-MPC50, F-MPC60G, F-MPC60B (Note 1, Note 2)

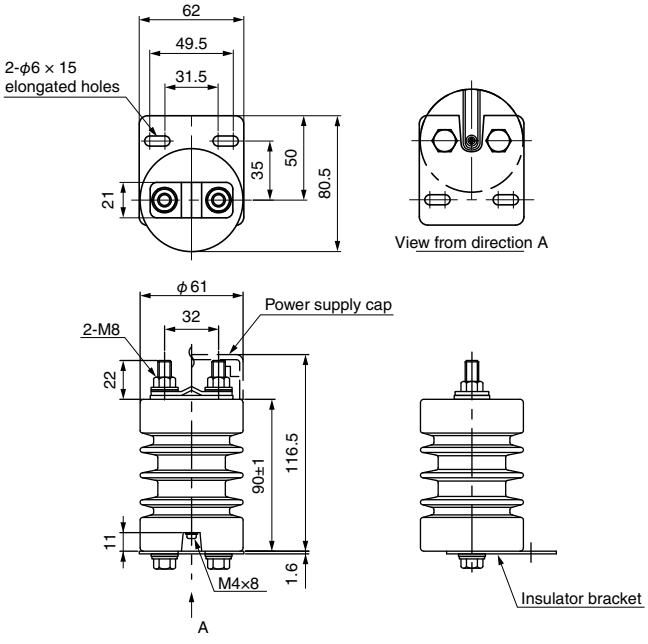
(Note 1) When applying ZPD-2 to QHA and New-AUTO.V, refer to the notes on page 21 of the Protective Relay for High-Voltage Power Receiving and Distribution (62G1-J-0068b) catalog.
(Note 2) For a cable length of 3 m, specify the ZPD-2M3 type.

■ Example of wiring diagram

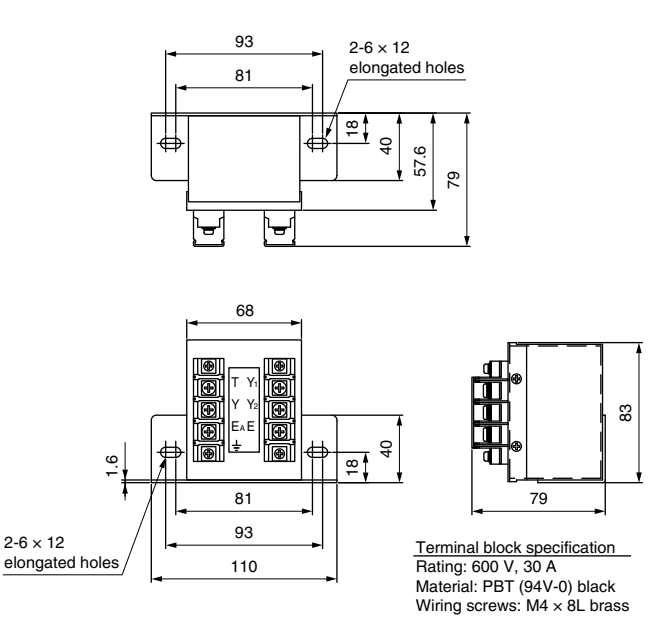


■ External dimensions [unit: mm]

ZPD-2 zero-phase voltage detection insulator (3 per set)



ZPD-2 zero-phase voltage transformer



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Fuji Electric FA Components & Systems Co., Ltd.

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