

Switchboard Instruments

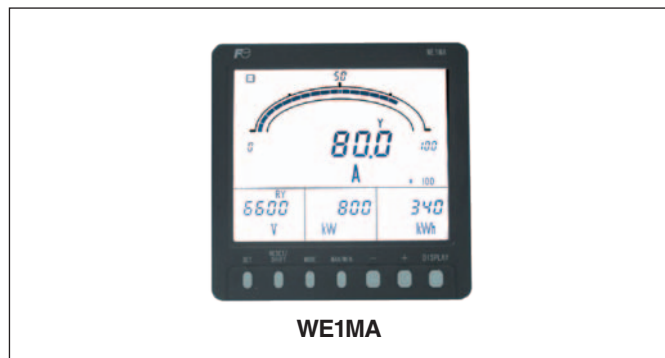
Power line multi-meter WE1MA

Description

Perform measurement and monitoring for 213 points in 52 categories for 3-phase/3-wire, and 3-phase/4-wire

Features

- With one unit, you can measure or monitor the voltage, current, demand current, power, demand power, reactive power, apparent power, power factor, frequency, harmonic effective value (A,V), distortion, harmonic content rate, active energy and reactive energy.
- The unit supports 3-phase/3-wire and 3-phase/4-wire.
- The measurements are displayed using a four-element display: one display on the main monitor and three displays on the sub-monitors along with a bar graph.
- Outputs include four analog circuits, a pulse output, an alarm output and a communications output (according to specification).



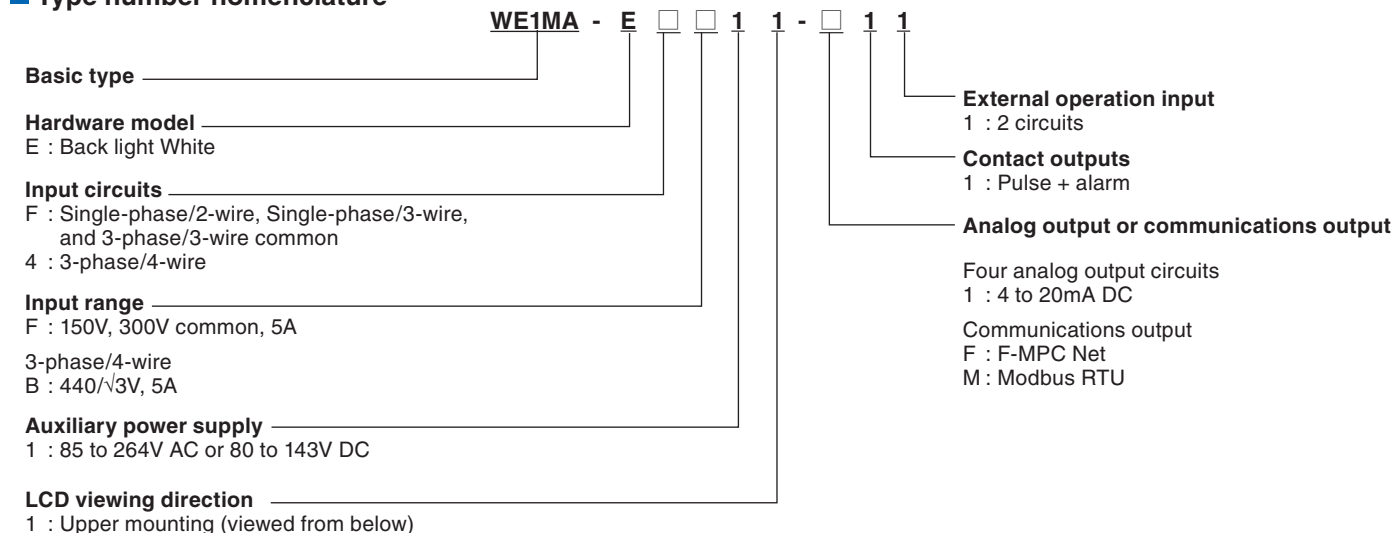
- Communications output supports F-MPC Net, Modbus RTU, and RS-485 (according to user specification).
- All models comply with the RoHS Directive (i.e., lead-free).

Types and ratings

Measurement	Input specifications		Type
	Input circuits	Input range	
Current (max. demand, demand, instantaneous), power (max. demand, demand, instantaneous), voltage, power factor, frequency, reactive power, active energy, reactive energy, harmonic effective value, distortion, and harmonic content rate	Single-phase/2-wire, Single-phase/3-wire, 3-phase/3-wire or all common	150V/300V, 5A	WE1MA-EFF11- □11
Current (max. demand, demand, instantaneous), power (max. demand, demand, instantaneous), voltage, power factor, frequency, reactive power, apparent power, active energy, reactive energy, harmonic effective value, distortion, and harmonic content rate	3-phase/4-wire	440/√3V, 5A	WE1MA-E4B11- □11

The maximum value (maximum demand current. others) , minimum value can be checked by pressing max/min button.

Type number nomenclature



Switchboard Instruments

Power line multi-meter

■ Specifications and performance

● Standard specifications and performance

Item	Specification							
Measurements	Measurement		Display error	Output error	Measurement		Display error	Output error
	Voltage (34 ranges)		±1.0%	±0.5%	nth harmonic effective value	Voltage, current	±1.5%	±1.5%
	Current (76 ranges)		±1.0%	±0.5%	nth harmonic content rate	Voltage	±1.0%	±2.5%
	Power		±1.0%	±0.5%		Current	±2.5%	±2.5%
	Reactive power		±1.0%	±0.5%	5th harmonic conversion effective value	Voltage, current	±1.5%	±1.5%
	Apparent power ^{*1}		±1.0%	±0.5%	5th harmonic conversion effective value	Voltage	±1.0%	±2.5%
	Power factor		±2.0%	±2.0%		Current	±2.5%	±2.5%
	Frequency		±0.5%	±0.5%	Active energy	Power factor of 1	±2.0%	±2.0%
						Power factor of 0.5	±2.5%	±2.5%
					Reactive energy	Power factor of 1	±2.5%	±2.5%
Fundamental wave effective value		Voltage	±1.5%	±1.5%	Reactive energy	Power factor of 0.87	±2.5%	±2.5%
		Current	±1.5%	±1.5%	*1 For 3-phase/4-wire only			
Distortion		Voltage	±1.0%	±2.5%				
		Current	±2.5%	±2.5%				
Time limit setting	Demand current		0s, 5s, 10s, 20s, 30s, 40s, 50s, 1min, 2min, 3min, 4min, 5min, 6min, 7min, 8min, 9min, 10min,					
	Demand power		15min, 20min, 25min, 30min (95% time limit)					
	Harmonic measurement		Average time limit: 0min, 1min, 2min, 5min, 10min, 15min, 30min (average measurement)					
Bar graph error	±10% (% of span)							
Temperature effect	23±10°C permissible differential							
Conforming standards	JIS C 1102-1, -2, -3, -4, -5, -7(1997), JIS C 1111(1989), JIS C 1216(1995), JIS C 1263(1995), EIA standard RS-485 (1983)							
Display refresh time	Approx. 1s (approx. 0.25s for a bar graph) (For the digital display and the bar graph and 10s for the digital display and the bar graph for harmonic measurement.)							
Display elements and composition	Liquid crystal display		Main monitor			Character height: 11mm, 5 digits		
			Sub-monitor on left			Character height: 6mm, 4 digits		
			Sub-monitor in center and on right			Character height: 6mm, 5 digits		
			Bar graph			20 dots		
LCD viewing angle	Upper mounting (viewed from below): top: 10°, bottom: 60°, left/right: 60°							
Backlight	LED backlight: White, always ON, automatically turns OFF (after 5min with no operation), can be set to always OFF.							
Auxiliary supply	85 to 265V AC, 50/60Hz 10VA (Rated voltage AC100/110V, 200/220V) 80 to 143V DC, 6W (Rated voltage DC100/110V) for both AC and DC uses							
Rush current (Time constant)	Rated voltage 110V AC 2.2A or less (About 3.6ms)							
	Rated voltage 220V AC 4.4A or less (About 3.6ms)							
	Rated voltage 110V DC 1.6A or less (About 3.6ms)							
Input power consumption (VA)	Voltage circuit		0.2VA max.					
	Current circuit		0.1VA max. (5A)					
Overload resistance	Voltage circuit		2 x rated voltage for 10s, 1.2 x rated current for continuous					
	Current circuit		40 x rated voltage for 1s, 20 x rated current for 4s, 10 x for 16 s, 1.2 x rated current for continuous					
	Power supply power		1.5 x rated voltage for 10s, 1.2 x rated current for continuous, 1.5 x rated voltage for 10s at 110V DC, 1.3 x rated voltage for continuous at 110V DC					
Insulation resistance JIS C 1102-1 JIS C 1111	Between electrical circuits and external cabinet (ground)					50MΩ min. with 500V DC tester		
	Between inputs, outputs, and auxiliary power supply							
	Between outputs (analog, communication, pulse, or alarm)							
	Between pulse outputs							
	Between alarm outputs							
	Analog outputs (negative common) are not isolated.							
Withstand voltage JIS C 1102-1 JIS C 1111	Between electrical circuits and external cabinet (ground)					2000V AC (50/60Hz), 1min.		
	Between inputs, outputs, and auxiliary power supply							
	Between outputs (analog, communication, pulse, or alarm)					1500V AC (50/60Hz), 1min.		
	Between pulse outputs							
	Between alarm outputs							
	Analog outputs (negative common) are not isolated.							
Impulse withstand voltage JIS C 1111	Between electrical circuits (except analog outputs and communications outputs) and cabinet (ground)					6kV, 1.2/50μs, positive and negative polarity, three times each		
	Between analog outputs or communications outputs and cabinet (ground)					5kV, 1.2/50μs, positive and negative polarity, three times each		

Item	Specification						
Analog outputs	No. of outputs	4 circuits					
	Output specifications	4 to 20mA DC (550Ω max.)					
	Supported output elements	Voltage (R-Y-B), current (R-Y-B), demand current (R-Y-B), power, demand power, reactive power, apparent power, power factor, frequency, distortion, fundamental wave effective value, 5th harmonic conversion content rate (automatic switching to maximum phase A or V), 5th harmonic conversion effective value, nth harmonic content rate, nth harmonic effective value (for phases A and V)					
	Response time	1s max. (time until ±1% of the last steady value is reached), Harmonic measurement: 10s max.					
	Output ripple	Maximum of 2 x inherent error (% of output span)					
Outputs are not isolated (negative common).							
Pulse output*4	Active energy or reactive energy Output method: Optical MOS-FET SPST-NO relay Contact capacity: AC/DC 125V, 70mA (resistive load/inductive load) Pulse width: 250±10ms (100 to 130ms depending on range setting and output pulse unit setting) The output pulse unit can be set in the following ranges. The output pulse unit will not change even if the measurement range is changed.						
	• 3-phase/3-wire, 3-phase/4-wire: Full load power (kW, kvar) = $\sqrt{3} \times \text{Rated voltage (V)} \times \text{Rated current (A)} \times 10^{-3}$ • Single-phase/3-wire: Full load power (kW, kvar) = $2 \times \text{Rated voltage (V)} \times \text{Rated current (A)} \times 10^{-3}$ • Single-phase: Full load power (kW, kvar) = $\text{Rated voltage (V)} \times \text{Rated current (A)} \times 10^{-3}$						
	Full load power (kW, kvar)		Output pulse unit (kWh (kvarh)/pulse)			Multiplying factor	
	Less than 1		0.1	0.01	0.001	0.0001	0.01*3
	1 min. to less than 10		1	0.1	0.01	0.001	0.1
	10 min. to less than 100		10	1	0.1	0.01	1
	100 min. to less than 1,000		100	10	1	0.1	10
	1,000 min. to less than 10,000		1,000	100	10	1	100
	10,000 min. to less than 100,000		10,000	1,000	100	10	1,000
	100,000 min. to less than 1,000,000		100,000	10,000	1,000	100	10,000
Alarm output *4	Alarm elements: Set any of the following: demand current, demand power, 5th harmonic conversion content rate, nth harmonic content rate, distortion, voltage, alarm OFF. Reset method: Automatic reset or manual reset (setting) Contact delay time: 0 to 300s (1s steps) Output contacts: No-voltage NO (OR output of each phase) Contact capacity: 250V AC 8A, 125V DC 0.3A (resistive load), 250V AC 2A, 125V DC 0.1A (inductive load)						
	Alarm elements	Item	Specification				
	Demand current	Function	Alarm display and alarm output when demand measurement value ≥ upper-limit set value				
		Setting accuracy	±1.0% (% of full scale)				
		Setting range	5% to 100% of max. scale value (1% steps)				
	Demand power	Setting accuracy	±1.0% (% of full scale)				
		Setting range	5% to 100% of max. scale value (1% steps)				
	5th harmonic conversion content rate	Function	Alarm display and alarm output (detection at maximum phase) when measurement value ≥ Upper-limit set value				
		Setting accuracy	Current: ±2.5%, Voltage: ±1.0%, as percentage of content rate				
	nth harmonic content rate	Setting range	Current	5th harmonic conversion content rate, nth harmonic content rate (n = 3, 4, 5, 7, 9, 11, 13, or 15), distortion 5% to 100% (1% steps)			
			Voltage	5th harmonic conversion content rate, nth harmonic content rate (n = 3, 4, 5, 7, 9, 11, 13, or 15), distortion 5% to 20% (0.1% steps)			
	Distortion	Detection characteristics	Average value mode: Detection when the average measurement value exceeds the setting given above Inverse time limit mode: Detection according to inverse time limit characteristics of instantaneous value (only for 5th harmonic conversion content rate)				
		Function	Alarm display and alarm output (detection for maximum phase) when measurement value ≥ upper-limit set value Alarm display and alarm output (detection for minimum phase) when measurement value ≥ lower-limit set value				
	Voltage	Setting accuracy	±1.0% (with full scale as 150%)				
		Setting range	30% to 150% (1% steps) with full scale as 150%				
	External operation input	No. of inputs	2 circuits and functions (4 types) switchable using settings				
		External reset	The alarm output or maximum/minimum value can be reset by adding an external voltage signal. Alarm output reset and maximum/minimum value reset can be switched using settings. The input has the same ratings as the auxiliary power supply.				
		External display switching	The display can be switched by adding an external voltage signal. Measurement element switching and phase switching can be set. The input has the same ratings as the auxiliary power supply.				
		Minimum operation pulse width: 300ms continuous application supported (1) 100/110V AC 0.4 VA, 200/220V AC 1.4VA, 100/110V DC 0.4W, Accepts both AC and DC. Contact capacity: Approx. 3mA (100/110V AC/DC), approx. 6mA (200/220V AC) (2) 24V DC 0.3W, 48V DC 1.2W, Contact capacity: Approx. 10mA (24 V DC), approx. 20mA (48V DC)					
Vibration: 0.15mm single amplitude, 10 to 55Hz, 1 octave per minute for 5 sweeps Shock: 490m/s2, three times each in X, Y, and Z directions							
Vibration and shock resistance JIS C 1102-1 JIS C 0040, 0041							
Operating temperature and humidity range	-10 to 55°C, 30% to 85% RH (no condensation)						
Operating temperature and humidity range	-25 to 70°C						

*3 The multiplying factor is 0.01, but 0.1 is displayed for the multiplying factor.

(Four digits are displayed for the integer portion, and four digits are displayed below the decimal point for the expanded display.)

*4 A combination of two of the following outputs can be used: pulse output and alarm output.

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Power line multi-meter

• Communications specifications

Communications specification	Item	Specification		
F-MPC Net	Standard	EIA RS-485 (1983)	Cable length	1000m (total length)
	Transmission method	2-wire half-duplex	Address	1 to 99 and not used (Loc)
	Synchronization method	Asynchronous	No. of connectable units	Up to 31 units per system (including other devices)
	Bit rate	4800/9600/19200bps		
Modbus RTU communications output	Standard	EIA RS-485 (1983)	Cable length	1000m (total length)
	Synchronization method	Asynchronous	Address	1 to 247 (31 units max. can be connected)
	Bit rate	4800/9600/19200/38400bps		

■ Measurement range

• Voltage measurement range (34 ranges)

150.0V (110V)	1500V (1100V)	18.00kV (13.2kV)	180.0kV (132kV)
150V (110V)	2400V (1650V)	18.00kV (13.8kV)	210.0kV (154kV)
300.0V (220V)	3000V (2200V)	24.00kV (16.5kV)	270.0kV (187kV)
300V (220V)	3.00kV (2200V)	25.00kV (18.4kV)	300.0kV (220kV)
500V (380V)	4500V (3300V)	30.0 kV (22kV)	400.0kV (275kV)
600V (440V)	4.50kV (3300V)	45.0 kV (33kV)	500.0kV (380kV)
600V (460V)	9000V (6600V)	90.0 kV (66kV)	750.0kV (550kV)
600V (480V)	9.00kV (6600V)	120.0 kV (77kV)	
1200V (880V)	15.00kV (11kV)	150.0 kV (110kV)	

• Current measurement range (76 ranges)

5.00A	20.00A	80.0A	250A	1.00kA	2.00kA	6.00kA	15.00kA
6.00A	20.0A	100.0A	300.0A	1200A	2500A	7500A	15.0kA
7.50A	25.00A	100A	300A	1.20kA	2.50kA	7.50kA	20.00kA
8.00A	25.0A	120.0A	400A	1500A	3000A	8000A	20.0kA
10.00A	30.00A	120A	500A	1.50kA	3.00kA	8.00kA	30.00kA
10.0A	30.0A	150.0A	600A	1600A	4000A	9.00kA	30.0kA
12.00A	40.0A	150A	750A	1.60kA	4.00kA	10.00kA	
12.0A	50.0A	200.0A	800A	1800A	5000A	10.0kA	
15.00A	60.0A	200A	900A	1.80kA	5.00kA	12.00kA	
15.0A	75.0A	250.0A	1000A	2000A	6000A	12.0kA	

• Current display sensitivity: Sets the full scale of the current meter.
The sensitivity can be set to between 40% and 120% of the CT ratio.

• Power (apparent power range)
480W to 1000MW range selection, maximum scale setting 40 to 115%

• Power factor
LEAD0.5 to 1 to LAG0.5 or LEAD0 to 1 to LAG0 range selection

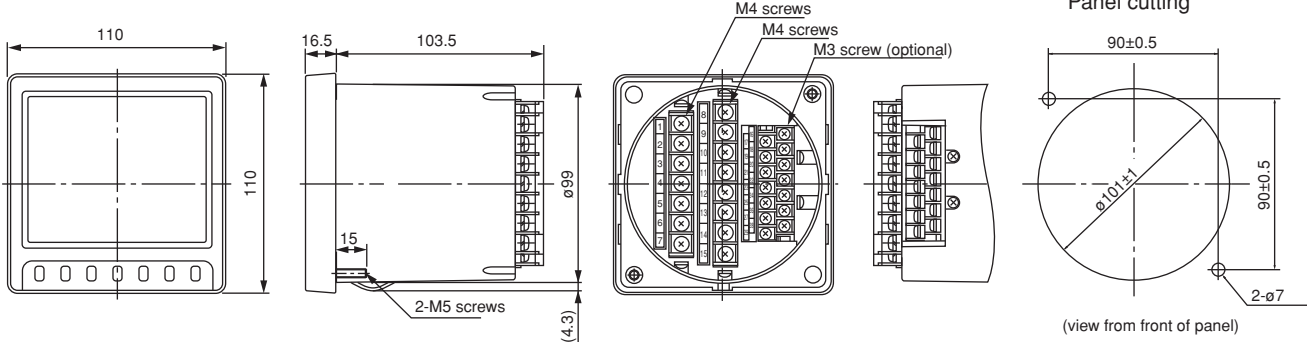
• Reactive power
LEAD, LAG360var to 1000Mvar range selection, maximum scale setting 30% to 115%

• Frequency
45 to 55Hz or 55 to 65Hz, 45 to 65Hz range selection

Note:
When choosing input range<F>,Default setting of voltage measurement range is 6600/110V.
When choosing input range,Default setting of voltage measurement range is 600/ 440/√3V.

■ Dimensions and mounting precautions

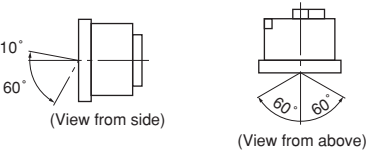
• Dimensions, mm



• Mounting precautions

(1) The contrast of the LCD display depends on the angle at which it is viewed. Mount the display at the proper angle and position.

Upper mounting



(2) Use a mounting panel with a thickness of 10mm max. and mount the unit to the panel using the enclosed M5 nuts.
(3) Use a tightening torque of 2.75 to 3.82 N·m.

Part names and functions

Bar graph display

Analog display of measurement value on main monitor
(Settings can be made for bar graph display of the measurement value on the sub-monitor.)

Digital display

Four elements can be measured and monitored at the same time.

- Main monitor
- Sub-monitor on right
- Sub-monitor in center
- Sub-monitor on left

SET



This switch is used to toggle between a normal display (five integer digits) and an expanded display (two integer digits and three digits below the decimal point) for the total value of each power level.

After the display is switched, it will return to a normal display if there is no operation for 10 minutes.

The switch can also be used to switch into setting mode.

When the switch is pressed for 3s or longer, the mode will switch to setting mode.

In setting mode, the switch is used to enter set values.

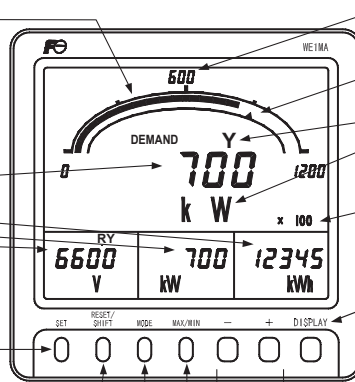
RESET/SHIFT



Use this switch to reset alarms.

The switch can also be used to reset maximum and minimum values for display of maximum and minimum measurements.

In setting mode, the switch is used to move between setting items.



Scale numbers

This is automatically set using the measurement range setting.

Upper limit or lower limit setting index

This displays the set value of the upper limit or lower limit.

Phase display

Unit display

This is automatically set using the measurement range setting.

Multiplying factor display

The multiplying factor is displayed in the lower right part of the main monitor when power level and reactive power level are displayed.

DISPLAY



Use this switch to toggle the phase display (between wires) for current (or voltage).

After the display is switched, it will return to the original phase display (between wires) if there is no operation for 10 minutes.

In setting mode, the switch is used to end setting mode.



Use this switch to switch the measurement display elements for the main monitor.

After the display is switched, it will return to the original measurement display element if there is no operation for 10 minutes. In setting mode, the switch is used to change set values.

MAX/MIN



Use this switch to toggle between the normal measurement display and the maximum/minimum measurement display.

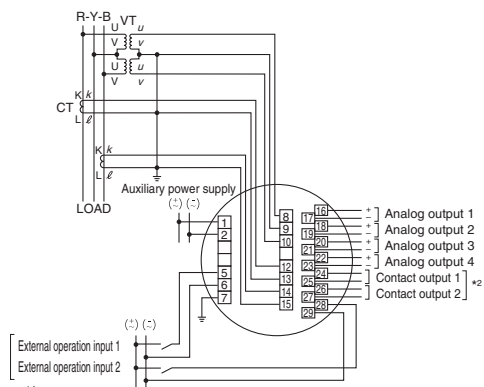
MODE



Use this switch to toggle between normal measurement display and harmonic (voltage/current) display. In setting mode, the switch is used to switch setting items.

Wiring diagrams

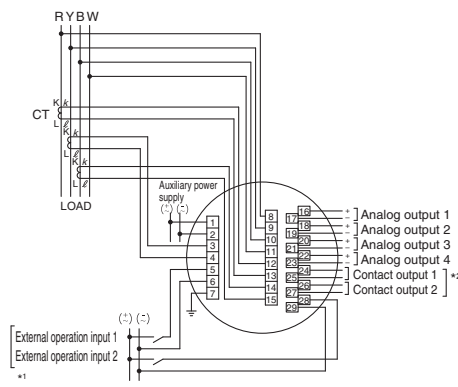
• 3-phase, 3-wire *3 (2VT, 2CT)



Note:

- Single-phase/2-wire and single-phase/3-wire can also be applicable. Refer to the users manual for details.

• 3-phase, 4-wire *3 (440V/.3V x3, 3CT)

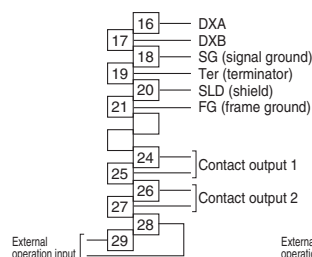


Note:

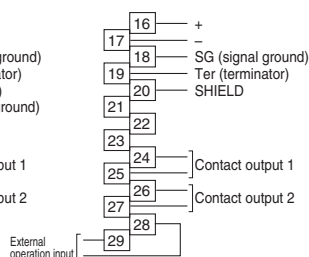
- Refer to the users manual for voltage 2 input.

Communications output terminal arrangement

(1) F-MPC Net



(2) RS-485, Modbus RTU



Notes:

*1 Functionality for external operation input can be switched between external reset and external display switching by using settings.

*2 For contact outputs, you can select from the following: pulse outputs, alarm outputs. (by user specification)

*3 Secondary grounding for VT and CT is not required if a low-voltage circuit is used. Also, VT is not required if 110V or 220V direct input is used.

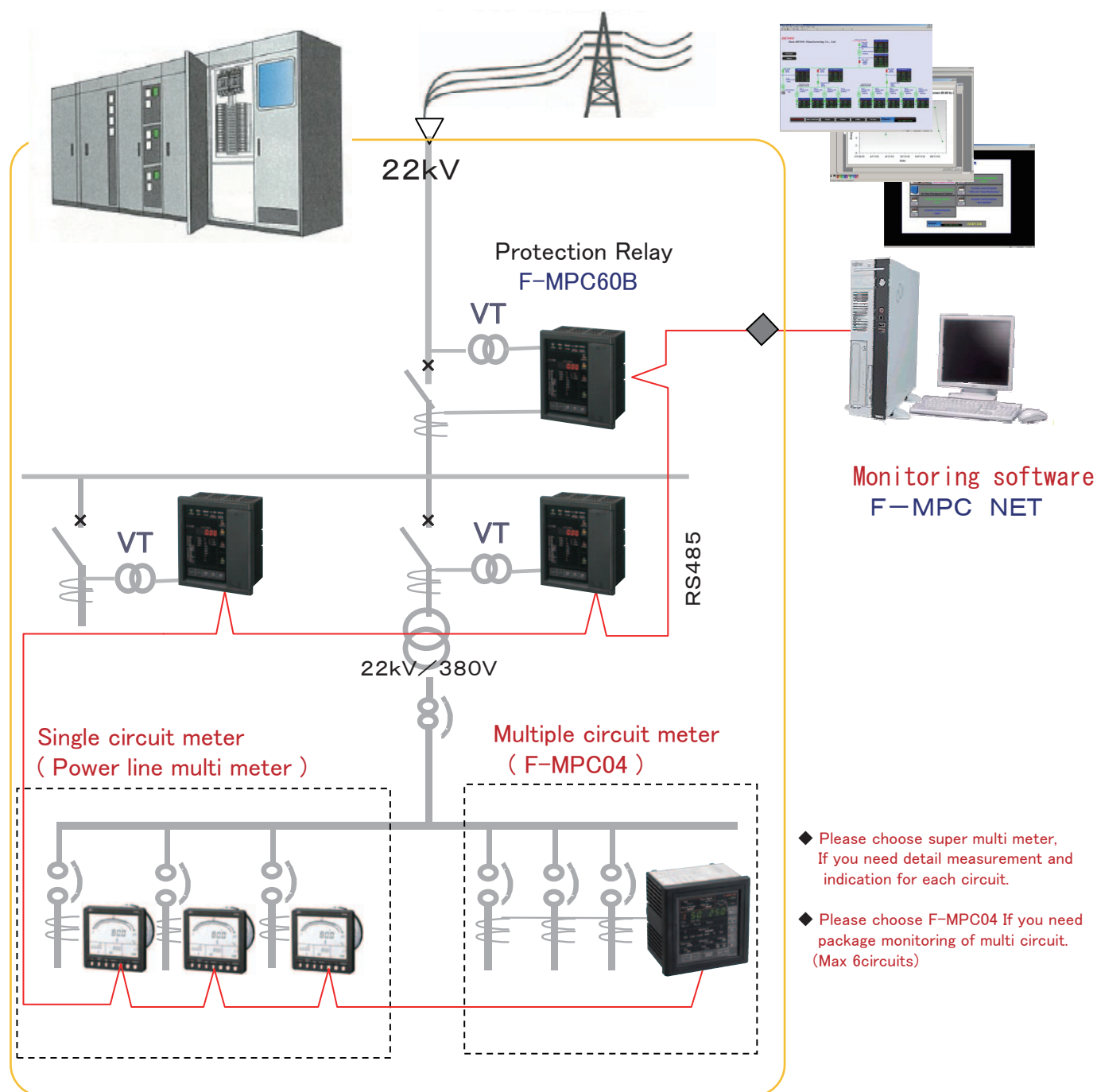
• Please contact us for further information.

• Contact output combinations

	Contact output combinations
	Pulse + alarm
Contact output 1	Pulse output
Contact output 2	Alarm output

Power monitoring system of Fuji Electric FA

- It can do package monitoring from high voltage to low voltage.
- We have the most suitable components to make up a full scale power monitoring system.
- Electric Energy can be package monitored by PC



■ Protection Relay F-MPC60B

- This is multifunction relay which brings functions of protection, measuring, monitoring, transmission.
- It can protect many protection factors by itself. (detail below)
- Even when internal fault occur, it will prevent a miss-trip by The internal CPU, duplication of analog circuit, AND output treatment.
- It always monitor internal movement by itself.
- It can be coordinated with higher network system by RS485,MODBUS, Analog output 4-20mA.



■ List of functions & products

Unit					Protection															Measurement					Communication	
Number of operational phase wires	Name	Grounding	Zero-phase current detection	Basic product type	50	51 Inverse time	51 DT • DT2 Definite time	51 G Inverse time	51 G	67 DG/ 51G Selection Definite time	64 0V/G	27 UV • UV2	59 0V	47 Reverse phase	46 Phase loss	OCGA Zero-phase current pre-alarm	DGA/OCGA Selection	OCA Overcurrent pre-alarm	Voltage build up	VR	A, W, var, PF, Wh, DA, DW H1, A 0, A 0 max, DA max, DW max	varh	V, F, HV, V min	V 0, V 0 max	Select either (1) T link or (2) 4-20mA + RS-485	
3-phase/ 3-wire	Power receiving	Resistance grounding A, direct grounding	Residual circuit	UM43FG	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Resistance grounding B		UM43FD	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3-phase/ 3-wire	Power receiving	Non-grounding	ZCT method	UM42F	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3-phase/ 3-wire (Single-phase/ 2-wire)	Feeder			UM42C	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3-phase/ 3-wire	Bus cable			UM4B	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Note 1: A rough guideline of classification in the above list is the resistance grounding A shall be a low resistance: approximately 200 A or more; and the resistance grounding B shall be a high resistance: 5 to 100 A or so.

Note 2: The 3-phase 3 cable power receiving unit UM43F ☐ can be applicable to feeders.

[Related document] User's manual FEH850

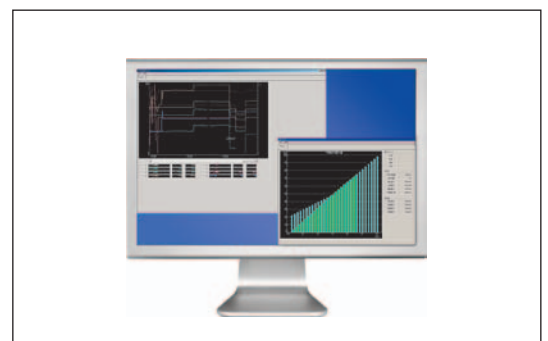
■ Multiple circuit meter F-MPC04

- This is multifunction meter which has function which is needed for management of power distribution and monitoring electric energy.
- It can measure max 10circuits by 3phase 3lines.
(6 circuits by 3 phase 4 lines)
- 3rd 5th 7th , It can measure total harmonic current.
- It can output 2stages of earth leakage protective relay/ leakage current pre-alarm and deterioration diagnosis by Using the trend data.
- Digital input is possible. (up to 4 points of digital signal)



■ Monitoring software F-MPC NET

- ON/OFF information, the data of temperature and flow measured by F-MPC and super multi meter, can be visually shown on the screen of PC.
- It can analyze many things by its collected data. Also, Trend data of voltage and current can be Stored automatically.
- 30 minutes demand monitoring up to 10 points are possible.
- It can display the signal history such as alarm history and inform person in charge by e-mail.



Safety Considerations

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

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