

GS 77C01C01-01E

Overview

This panel-mounted power monitor can help save energy, thus reducing costs, and also help diagnose electrical equipment. It measures electric energy (power) consumed by electrical equipment and displays the value as the integral power consumption.

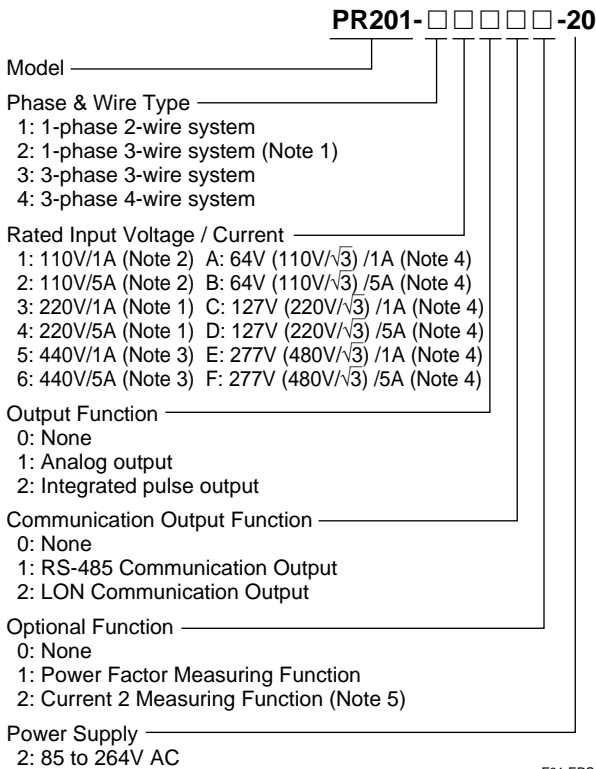
It also displays instantaneous power, voltage, current, and power factor. It can also display, as required, maximum and minimum voltage values as well as maximum current values and the integral power consumption of electrical equipment at certain time intervals.

It provides two outputs: an analog output converted from an instantaneous power to 4 to 20 mA DC, and an integrated pulse output.

Regarding communications features, it can transmit integral power consumption as well as integral power consumption at certain time intervals, instantaneous power, voltage, current, and power factor, through an RS-485 or LON-standard communications interface to a personal computer (PC).

The front-panel switch is used to set and maintain the PT or CT ratio, integrated low-cut power, or the like. The power monitor has the same mounting dimensions as for an instrument with a wide angle of 110 degrees. By replacing an existing instrument with this monitor, communications signals can be acquired.

Model and Suffix Codes



(Note 1) Input specs. of 1-phase 3-wire system can only select rated input 3 and 4. Input voltage is 200VAC (100V+100V).

(Note 2) Rated input 1, 2 (110V) can also be used at 120V input.

(Note 3) Rated input 5, 6 (440V) is the specs. only for 1-phase 2-wire system and 3-phase 3-wire system.

(Note 4) Rated input A to F is the specs. for only 3-phase 4-wire system. Rated input voltage indicates phase voltage. A, B:64V, C, D:127V, E,F:277V indicate 110V/√3, 220V/√3, 480V/√3 respectively. In case of 440V/√3 input, it can be used at E, F:277V of rated input.

(Note 5) Specify this option when the previous style PR201(S1.0) with option "Current 2 measuring Function" is required.

Current measuring object of current 2 measuring function:

1-phase 3-wire system : I₂ current r.m.s. value

3-phase 3-wire and 3-phase 4-wire system :

I₃ current r.m.s. value

LIST OF COMBINATION OF PR201 RATED INPUT

Code	Rated Input	Phase & Wire System			
		1-phase 2-wire	1-phase 3-wire	3-phase 3-wire	3-phase 4-wire
1	110V/1A	○	—	○	○
2	110V/5A	○	—	○	○
3	220V/1A	○	○*	○	○
4	220V/5A	○	○*	○	○
5	440V/1A	○	—	○	—
6	440V/5A	○	—	○	—
A	64V/1A	—	—	—	○
B	64V/5A	—	—	—	○
C	127V/1A	—	—	—	○
D	127V/5A	—	—	—	○
E	277V/1A	—	—	—	○
F	277V/5A	—	—	—	○

○: with —: without *200V AC (100V+100V)
T01.EPS

Ordering Information

- Model, suffix Code : (Example) PR201-32110-20
- PT, CT : (Example) PT440/110V, CT 50/5A
(If not specified, shipment will be made at rated voltage and current for both primary and secondary sides.)
- <When analog output option is specified>
- Primary side input scaling : (Example) 0 to 32kW
(If not specified, shipment will be made at 0W for "L" level and at rated power for "H" level.)
- <When integrated pulse output option is specified>
- Primary side integrated pulse unit : (Example) 0.05kWh/pulse
(If not specified, shipment will be made at 1 x 1kWh/pulse.)
- Integratid pulse ON pulse width : (Example) 50ms
(If not specified, shipment will be made at 50mS.)
- * Please fill ordering information in power Monitor Work Sheet No. 13.

■ Input & Output Specifications

Input Specs.

Phase & wire system: 1-phase 2-wire system, 1-phase 3-wire system, 3-phase 3-wire system, 3-phase 4-wire system

Input frequency: 45 to 65Hz

Rated input voltage: 110V AC, 220V AC, 440V AC, 3-phase 4-wire system: 64V AC, 127V AC, 277V AC

Permissible Input voltage: 1.2 times of rated voltage (continuous), 1.5 times (10 seconds)

Rated input current: 1A AC, 5A AC

Permissible Input current: 1.2 times of rated current (continuous), 2 times (10 seconds), 10 times (3 seconds)

Input (power) measuring range (secondary side of PT, CT when CT, PT are set)

● 1-phase 2-wire system

Input (AC)	RP	Input range	App. Consumed VA	
			Voltage	Current
110V/1A	100W	-120 to +120W	0.2VA	0.2VA
110V/5A	500W	-600 to +600W		
220V/1A	200W	-240 to +240W	0.4VA	
220V/5A	1000W	-1200 to +1200W	0.8VA	
440V/1A	400W	-480 to +480W		
440V/5A	2000W	-2400 to +2400W		

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● 1-phase 3-wire system

Input (AC)	RP	Input range	App. Consumed VA	
			Voltage	Current
200V/1A	200W	-240 to +240W	0.2VA/phase	0.2VA/phase
200V/5A	1000W	-1200 to +1200W		

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● 3-phase 3-wire system

Input (AC)	RP	Input range	App. Consumed VA	
			Voltage	Current
110V/1A	200W	-240 to +240W	0.2VA/phase	0.2VA/phase
110V/5A	1000W	-1200 to +1200W		
220V/1A	400W	-480 to +480W	0.4VA/phase	
220V/5A	2000W	-2400 to +2400W	0.8VA/phase	
440V/1A	800W	-960 to +960W		
440V/5A	4000W	-4800 to +4800W		

T04.EPS

● 3-phase 4-wire system

Input (AC)	RP	Input range	App. Consumed VA	
			Voltage	Current
110V/1A	300W	-360 to +360W	0.2VA/phase	0.2VA/phase
110V/5A	1500W	-1800 to +1800W		
220V/1A	600W	-720 to +720W	0.4VA/phase	
220V/5A	3000W	-3600 to +3600W	0.1VA/phase	
64V/1A	200W	-240 to +240W		
64V/5A	1000W	-1200 to +1200W	0.2VA/phase	
127V/1A	400W	-480 to +480W	0.5VA/phase	
127V/5A	2000W	-2400 to +2400W		
277V/1A	800W	-960 to +960W		
277V/5A	4000W	-4800 to +4800W		

RP=Rated Power
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When outer set of PT, CT, check to see the primary side input power is less than 10000 MW and the value calculated by the formula below is within above input measuring range list.

$$\text{Input range (W)} = \frac{\text{Primary side input power (W)}}{(\text{PT ratio}) \times (\text{CT ratio})}$$

Rated power factor: LEAD 0.5 to 1 to LAG 0.5

<Optional integrated control signal>

Input point: 1 point

Input signal: contact or voltage

	Contact signal	Voltage signal
ON signal	below 200Ω	±1V DC, below 200Ω
OFF signal	over 100kΩ	4.5 to 25V DC

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ON signal: Optional integration start (reset, integration start)

OFF signal: Optional integration stop

(Note) Control of optional integration can also be made through communication. Control by communication is once made, only control by communication is made thereafter.

Integrated lowcut power: Integrated lowcut power below lowcut power is not made by integrated power, optional integrated power and integrated pulse output. Set integrated lowcut power for input to this instrument.

Parameter setting screen item	Setting range	Fixed decimal point
Integrated lowcut power	0.1 to 99.9W	0.5W when shipment

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Output Specs.

Output point: 1 point (commonly used for analog and integrated pulse outputs)

<Analog Output>

Function: Conversion of output instantaneous power into DC current.

Output signal (instantaneous power) : 4 to 20mA DC

Permissible load resistance: 0 to 750Ω

Input scaling: Indicates instantaneous power range to be converted. Input scaling can be set by "H" and "L" levels of analog output on parameter setting screen. Set "L" and "H" levels within measuring range of this instrument. Also set span (difference between "L" level and "H" level) so as it would be more than 50% of rated power. If not specified when ordering, it would be shipped "L" level at OW, and "H" level at rated power (W).

<Integrated pulse output>

Function: Outputs pulse in proportion to integrated power

Output signal: Open collector

Output capacity: 200mA, 30V DC

Integrated pulse unit: Indicates actual kWh corresponding 1 pulse input to this instrument. It can be set through integrated pulse unit characteristic and mantissa sections on parameter setting screen.

Rated power	Setting range
100W	5.556 × 10 ⁻⁶ to 1.000 × 10 ⁻¹ kWh/pulse
200W	
300W	
400W	
500W	
600W	
800W	
1000W	6.667 × 10 ⁻⁶ to 1.000 × 10 ⁻¹ kWh/pulse
1500W	1.000 × 10 ⁻⁵ to 1.000 × 10 ⁻¹ kWh/pulse
2000W	1.334 × 10 ⁻⁵ to 1.000 × 10 ⁻¹ kWh/pulse
3000W	2.000 × 10 ⁻⁵ to 1.000 × 10 ⁻¹ kWh/pulse
4000W	2.667 × 10 ⁻⁵ to 1.000 × 10 ⁻¹ kWh/pulse

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(Note) When power OFF, integrated power on display is maintained. As for integrated pulse output, error of less than 1 pulse of integrated power arises.

Integrated pulse ON pulse width: Indicates ON time of pulse to output. It can be set on parameter setting screen. Set it so as not to exceed maximum ON pulse width obtained by the formula below:

Maximum On pulse width (ms)

$$= \frac{\text{pulse unit [kWh/pulse]} \times 3600 \times 1000^2}{\text{rated power [W]} \times 1.2} - 10$$

Setting range	Remarks	Initial value if not specified
10 to 1270ms	Set at 10ms unit	50ms

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■ Communication Output specs.

Output point: 1 point (Commonly use for RS-485 and LON communications)

Function: Refer "Communication Output"

■ Standard Performance

Accuracy rating: Instantaneous power, voltage r.m.s. value, current r.m.s. value ±0.5% of rated value (at 23°C±2°C)
 (Equivalent JIS C 1102 0.5 grade)
 Integrated power energy
 ±(Power measuring accuracy+0.5% of rdg) (at 23°C±2°C)
 Power factor
 ±2% of rated value (at 23°C±2°C)
 Analog output
 ±0.5% of span (at 23°C±2°C)
 (Equivalent JIS C 1111 0.5 grade)
 However, ±1% of span in case span is 50 to 80% of rated power.

Optional integration function: This function integrates power energy during the time optional integration starts to operate and display it by digital. There are 2 methods to control optional integration, one is made through optional integrating control signal and the other is made through communication. When optional integration control is made through communication, optional integration control

signal thereafter becomes invalid. Therefore, make control through either one of the above 2 methods. When optional integration changes over from stop to start, integration starts after optional integrated power is reset.

Backup when power off (power meter): Integrated power holds last integrated value when power off.

Optional integration has not this function.

Response speed of instantaneous power (analog output):

Within 1 second (until enter into ±1% of last value)

Up date of transmit data: Power, voltage, current, power factor within 500ms

Insulation resistance: 100MΩ (500V DC) between any two points of voltage input, current input, optional integrated control signal, output, communication output, power supply and ground

Withstand voltage: 2000V AC/minute between any two points of voltage input, current input, output, power supply and ground

2000V AC/minute between communication output and (input, power supply)

1000V AC/minute between communication output and (output, ground).

500V AC/minute between optional integrated control signal and (input, output, communication output, power supply and ground)

Impulse withstand voltage: 5kV (1.2/50μs) between input and output, input and ground, power supply and ground

Temperature range: -10 to 55°C

Humidity range: 5 to 90% RH (no condensation)

Effect of power supply voltage fluctuation: ±0.3% of RV (instantaneous value)/85 to 264V AC

±1.0% of RV (power factor)/85 to 264V AC

Effect of temperature change: ±0.5% of RV (instantaneous value)/10°C

±2.0% of RV (power factor)/10°C

Effect of input frequency: ±0.3% of RV (instantaneous value)/45 to 65Hz

±1.0% of RV (power factor)/45 to 65Hz

(RV=Rated Value)

Power voltage: 85 to 264V AC, 45 to 65Hz

Power dissipation: 6VA (at 100V AC)

8VA (at 200V AC)

■ Display Operation

PT ratio CT ratio:

Setting of PT and CT ratio makes display

converting input of this instrument into

primary side input value of PT and CT.

Setting can be done on parameter setting screen.

PT ratio setting range	CT ratio setting range
1 to 32000	0.05 to 32000

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Integrated power:

□□□□□[kWh] or □□□□□[MWh]

(w/o symbol, partially decimal fixed point

integer 5 digits)

Input power rating x PT ratio x CT ratio	Display, decimal point
30W to 99999kW	0 to 99999kWh
100kW to 999.99kW	0.00 to 999.99MWh (kWh+10 ³)
1MW to 9.9999MW	0.0 to 9999.9MWh (kWh+10 ³)
10MW over	0 to 99999kWh (kWh+10 ³)

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- Integrated power data is reset to zero when the data exceed maximum display value.
- Optional integrated power:
□□□□□[Wh] (w/o symbol, integer 5 digits)
- Instantaneous power:
±□□□.□[W] to ±□□□□[MW] (w/symbol, floating decimal point 4 digits, minimum resolution:0.1W)
- Voltage r.m.s. value:
□□□.□[V] to □□□□[kV] (w/o symbol, floating decimal point 4 digits, minimum resolution:0.1V)
- Current r.m.s. value:
□.□□□[A] to □.□□□[kA] (w/o symbol, floating decimal point 4 digits, minimum resolution:0.001A)
- Voltage maximum value:
□□□□.□[V] to □□□□□[kV] (w/o symbol, floating decimal point 4 digits, minimum resolution:0.1V)
- Voltage minimum value:
□□□□□[V] to □□□□□[kV] (w/o symbol, floating decimal point 4 digits, minimum resolution:0.1V)
- Current maximum value:
□□□□□[A] to □□□□□[kA] (w/o symbol, floating decimal point 4 digits, minimum resolution:0.001A)
- Instantaneous power factor:
d□.□□□ to 1.000 to G□.□□□[COSφ]
(w/o symbol, fixed decimal point 4 digits, minimum resolution:0.001COSφ, d:Lead, G:Lag)
- kWh LED: Light on during display of integrated power [kWh].
- Wh LED: Light on during display of optional integrated power [Wh].
- W LED: Light on during display of instantaneous power [w].
- V LED: Light on during display of voltage r.m.s. value [V].
- A LED: Light on during display of current r.m.s. value [A].
- COSφ LED: Light on during instantaneous power factor [COSφ]
- X10³ LED: Light on when displaying instantaneous value is kilo unit. Or light on when integrated power [kWh] is Mega unit.
- X10⁶ LED: Light on when displaying instantaneous value is mega unit.
- COMM LED: Green light on when RS-485 or LON communication. As for LON communication, red light on and off when network parameter is under construction, and red light on when communication trouble or service.

SET/ENT Switch: This switch changes-over display of integrated power, optional integrated power, instantaneous power, voltage r.m.s. value, current r.m.s. value and instantaneous power factor. Also, it selects parameter setting item and input/output adjust item.

R, S, T (phase indicator)

Light on phase that the data is displayed in data display.

Current display: R, S, T

Voltage display: R-S, S-T, T-R

R, S, T (3-phase 4-wire system)

➤ (Range switch)

This switch is used for display line change-over, and for movement column position of setting data and decimal point position.

▲ (Numeric up switch)

This switch is used for increment of setting parameter and input/output adjustment data.

▼ (Numeric down switch)

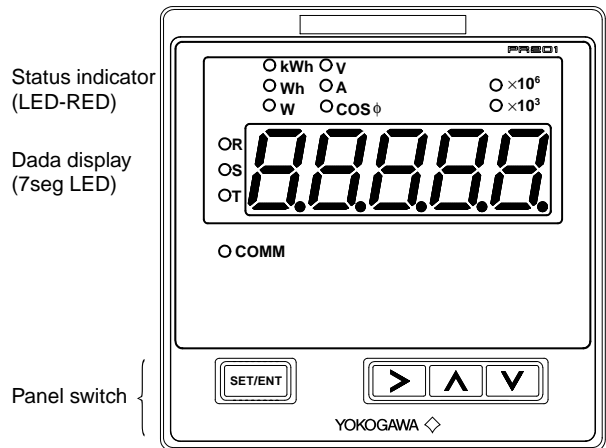
This switch is used for decrement of setting parameter and input/output adjustment data.

Note 1: Instantaneous power value is displayed with symbol in case only negative.

Note 2: When display of maximum value, '—' is displayed at the top with light on and off.

Note 3: When display of minimum value, '—' is displayed at the top with light on and off.

Note 4: Instantaneous power factor is displayed only when measuring option is designated.



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■ Communication Output

RS-485 or LON communication outputs can optionally be selected

<Communication data>

Following measuring value can be read out by converting input into PT•CT primary side input.

- Integrated power
- Optional integrated power (present value)
- Optional integrated power (last value)
- Instantaneous power
- Voltage r.m.s. value
- Current r.m.s. value
- Instantaneous power factor or Current 2 r.m.s. value
- Voltage maximum value

- Voltage minimum value
- Current maximum value
- Current 2 maximum value

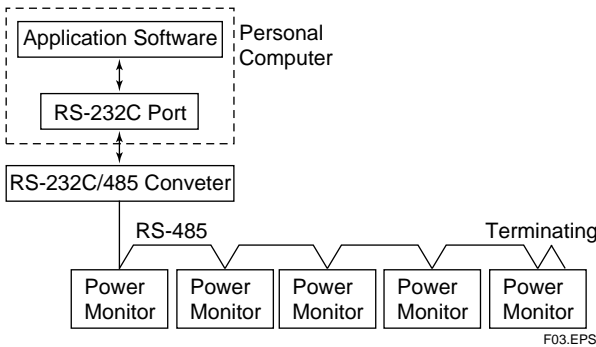
Also, start/stop of optional integrated power and reset of maximum and minimum values of voltage r.m.s. value and maximum value of current r.m.s. value can be done through communication.

<RS-485 Communication>

Function: Various measuring values can be read out through personal computer by command/response mode. Readout of measuring value would be made individually or in block.

Also, control of optional integration and initialization of maximum and minimum values can be done through personal computer.

System Configuration:



Note: RS-232C/485 Converter is recommended to use our ML1 in AUTO mode.

Communication specs.: RS-485 Interface

Transmit distance: Maximum about 1.2km
(When use of 24AWG twist pair cable)

Connection mode:

- (1) RS-485 standard Multi-drop connection
Maximum 32 stations (including upper personal computer)
- (2) Terminating resistor: 120Ω
(ON by terminal short)
- (3) Not insulated with inner circuit

Connecting Terminal: 3 terminals back face

- A: Balanced type twist pair cable –
- B: Balanced type twist pair cable +
- C: Shield

Transmit mode: Half duplex communication

Synchronizing mode: Start-stop synchronization

Transmit speed: Can be set through parameter setting screen

Setting Range	
9600 / 4800 / 2100 / 1200	

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Data format: Start bit 1 bit
 Data bit 8 bits
 Parity None
 Stop bit 1 bit

Error detect: SUM CHECK (simply adding 2 bytes)

Xon/Xoff Control: None

Terminating character designation: Yes (CR)

Station number setting: Can be set through parameter setting

screen

Setting range
1 to 31

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Communication error disposal: If data received is other than command, reading is ignored and no disposal be made. (noise or erroneous data would be ignored).

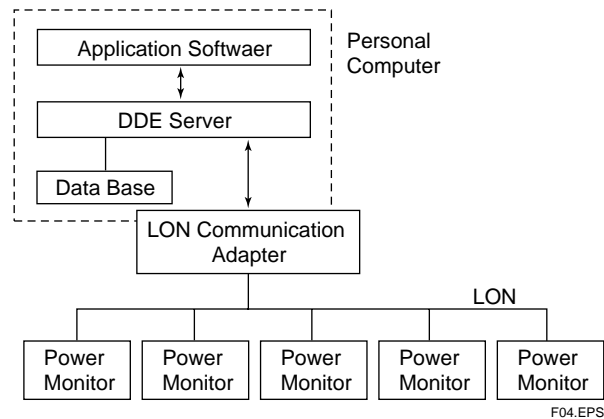
Make time-out disposal through upper computer.

Set time-out time more than 1 second.

<LON Communication>

Function: Measuring data can be simply read out on personal computer through LON communication adapter and DDE: server without consciousness of communication. Also, control of optional integration and initialization of maximum and minimum values can be done through personal computer. Please contact us as to connection with other instruments.

System Configuration:



Instruments recommended to use for system construction:

- (1) Personal Computer
 - PC/AT compatible instrument
 - CPU Pentium more than 100MHz
 - Memory more than 16MB 3.5 inch 1.44MB FDD
 - HDD empty capacity more than 6MB
 - Windows Version 95/98
 - Can equip with either one of <1> <2> <3> of Item (2)
- (2) Communication port, slot and communication adapter
(Either one of <1> <2> <3> and <4> are required)
 - <1> PCI Slot to store extension board
 - Echelon Type
 - 74401 PCLTA-20/FT-10 PCI Interface
 - 77040 FTM-10 Modular Transceiver
 - <2> RS-232C port
 - Echelon type
 - 73351 SLTA-10 Serial LonTalk Adapter
 - <3> PCMICA Slot
 - Echelon Type

- 73200 PCC-10 PC Card Network Adaptor
- 78302-2 Conductor Cable Assembly
- <4> Driver Soft for above <1> to <3>
- Echelon Type
- 58030-01 Connectivity Starter Kit

(3) DDE Server

- Echelon Type
- 33000 LonManager DDE Server

(4) Data Base

- Yokogawa M&C PR921-11 Network parameter definition file

(5) Application Software

- Software for Microsoft Windows with DDE function (Microsoft Type Microsoft Excel, Visual Basic or various SCADA softwares, etc.)

(Note) Products of Echelon can be bought from their representative in Japan
Midoriya Electric Company
Tel : (03) 3561-8851

Communication Specs.: LON Interface

Transmit distance: Total extension 500m, Between node max. 400m

(When use of 22AWG twist pair cable)

Connecting mode:

- (1) LON standrd Fleetology connection
Max. 64 node (including upper computer)
- (2) Terminating resistor: 51Ω (one end)
- (3) Transformer insulation (FTT-10A)

Connecting Terminal:

- 3 terminals back face
- A,B: Balanced type twist paircable
- C: Shield
- Node No.: 1 to 63

Transmit mode: Half duplex communication

Transmit speed: 78kbps

Data format: LonTalk protocol standard

Error detect: CRC check

■ Shape, Mounting & Accessories

External dimension: 110x110x111mm (HxWxD)
φ99mm main body belly

Mounting method: Panel mouting
(Refer panel cut dimension)

Material:

Case: unflammmable ABS plastic (black)

Terminal board: unflammmable ABS plastic (black)

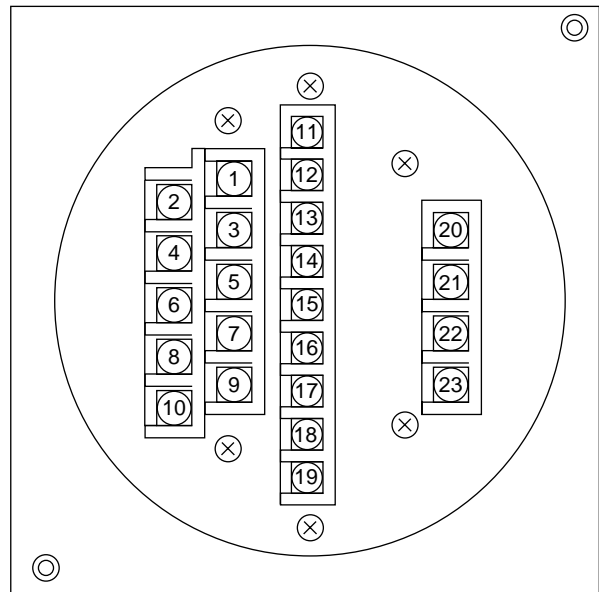
Weight: Abt 500g

Connecting method: M3 screw terminal connection (output, communication, optional integrated control signal)
M4 screw terminal connection (input, power supply)

■ Accessories:

Label...2, Nut M5...2, Washer M5...2 Spring washer M5...2 Short bar...1

■ Terminal Arrangement



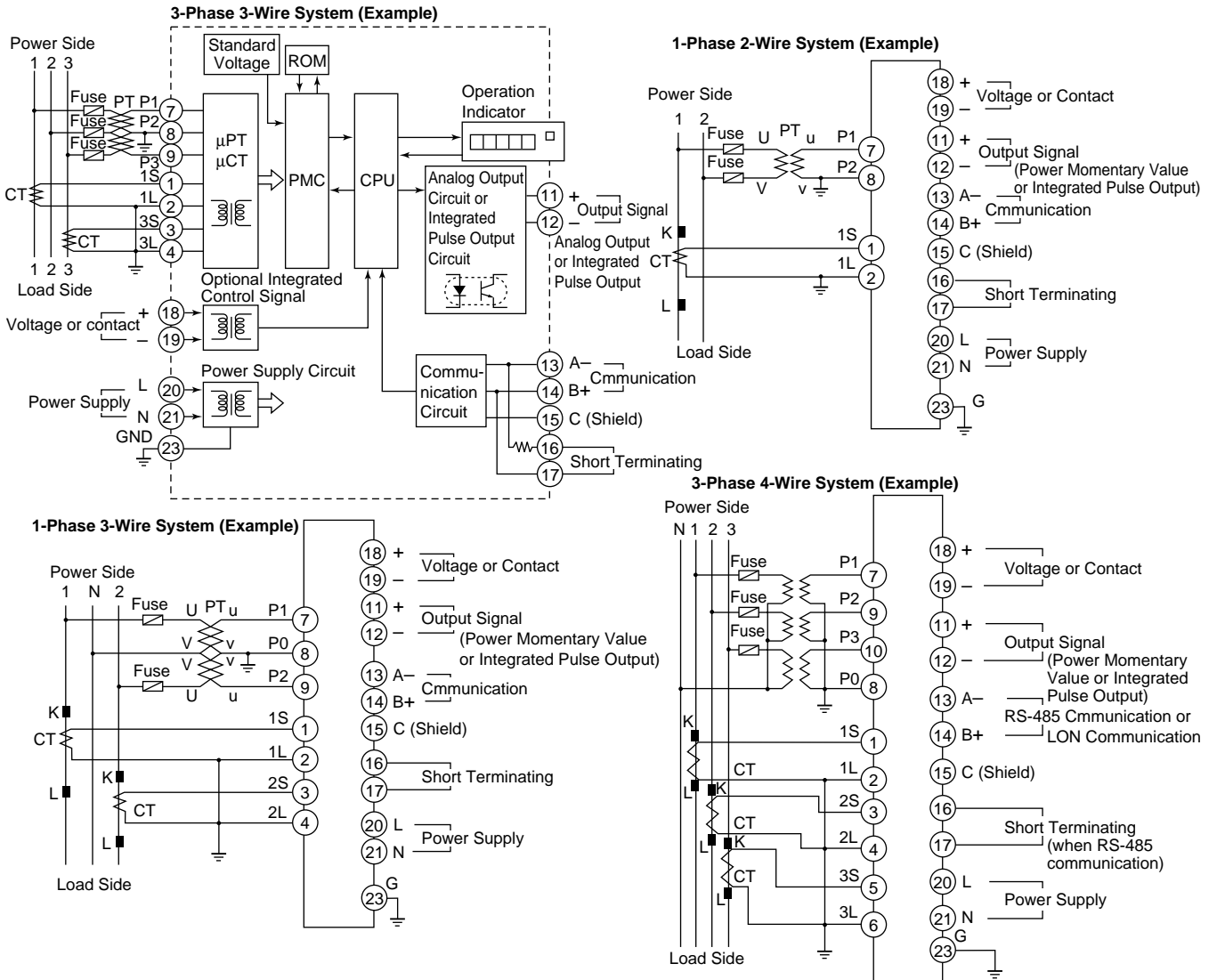
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TML No.	Signal				
	1-phase 2-wire	1-phase 3-wire	3-phase 3-wire	3-phase 4-wire	
1	1S	1S	1S	1S	Input
2	1L	1L	1L	1L	
3		2S	3S	2S	
4		2L	3L	2L	
5				3S	
6				3L	
7	P1	P1	P1	P1	
8	P2	P0	P2	P0	
9		P2	P3	P2	
10				P3	
11			+		Output
12			-		
13			A		Communication
14			B		
15			C		
16					Communication Terminating
17					
18			+		Optional Integrated Control Signal
19			-		
20			L		Power Supply
21			N		
22					
23			GND		

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Block Diagram

In case measuring side input rating is equal to the rating of monitor, direct connection to this instrument can be made without PT, CT. Don't grounding input circuit when without PT and CT.



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External Dimension

Unit: mm

