

General Specification

Model PR720
Power and Energy Meter

GS 77C01E31-01EN

■ General

This instrument is a panel-mount energy meter that aggregates many functions in a single unit, such as voltage (x3), current (x3), demand current (x3), power, power demand, reactive power, power factor, frequency, watt hours, reactive energy, and all functions necessary for power management in factories and other buildings. Aiming for energy-saving and equipment maintenance for environmental preservation measures, it displays and outputs the power quantity for all kinds of electrical equipment.

■ Features

- It is common type product of 3-phase 3-wire, single-phase 2-wire, single-phase 3-wire.
- Various electric power and energy can be monitored by using a wide array of measuring functions.
- Bar graph 1 measurement and digital 4 measurement are displayed simultaneously.
- Easily acquire data with the standard-equipped RS-485 communication output (Modbus protocol).
- Same mounting dimensions as the conventional 110-square wide-angle instrument.
- The measured value display comes with a backlight, and you can select always on, off, automatic off, and set the brightness.
- Power supply is AC 85 to 264V, DC 80 to 143V (for both AC and DC uses).
- Using SMARTDAC+ GM and GA10, easily acquire various power data.

■ Measuring Functions

- Instantaneous rms voltage of each phase, Instantaneous rms current of each phase
- Instantaneous active power, Instantaneous reactive power
- Instantaneous power factor, Frequency
- Active energy, reactive energy

*1 Reactive energy LEAD and LAG are integrated.



■ Input and Output Specifications

Phase and wire type: Single-phase 2-wire,
single-phase 3-wire,
three-phase 3-wire (2 VT·2 CT)

Input frequency: 50/60 Hz common use

Rated input voltage: 110V AC, 220V AC common
use

200V AC (100V+100V) for
single-phase 3-wire

Input voltage range: 0 to 132V AC (110V)
0 to 264V AC (220V)

Allowable input voltage: 1.2 times of rated voltage
(continuous)

Twice of rated voltage (for 10 seconds)

Rated input current: 5A AC

Allowable input current: 1.2 times of rated current
(continuous)

10 times of rated current (for 16
seconds)

Power supply: AC 85 to 264V 50/60 Hz 10 VA
DC 80 to 143V 6 W

Basic Specifications

Operating method	Current, Voltage: Effective value computing type. Demand ammeter: Arithmetic method according with bimetallic type. Demand power meter: Arithmetic method according with bimetallic type, or average value within the demand time limit. (One side is selected by setting.) Active power, Reactive power, Watt-hour, var-hour: Time-division multiplication method. Power factor: Calculates for active power and reactive power. Frequency: Zero cross cycle computing type.	
Bar graph display	Bar graph display of the main-monitor factor is done. (Watt-hour and var-hour exclude) A display of a sub monitor factor can also be set.	
Interval setting	Demand current	0 s / 5 s / 10 s / 20 s / 30 s / 40 s / 50 s / 1 min / 2 min / 3 min / 4 min / 5 min / 6 min / 7 min / 8 min / 9 min / 10 min / 15 min / 20 min / 25 min / 30 min (95% time limit)
	Demand power	
The factor in which display setting is possible	Main monitor	Voltage (Each phase and line), Current (Each phase), Demand current (Each phase), Maximum demand current (Each phase), Active power, Demand power, Maximum demand power, Reactive power, Power factor, Frequency, Watt-hour (Power receiving, Power transmission), var-hour (Power receiving LAG/LEAD, Power transmission LAG/LEAD)
	Sub monitor (Left)	Voltage (Each phase and line), Current (Each phase), Active power, Reactive power, Power factor
	Sub monitor (Center)	Voltage (Each phase and line), Current (Each phase), Demand current (Each phase), Maximum demand current (Each phase), Active power, Demand power, Maximum demand power, Reactive power, var-hour (Power receiving LAG/LEAD, Power transmission LAG/LEAD)
	Sub monitor (Right)	Voltage (Each phase and line), Current (Each phase), Demand current (Each phase), Maximum demand current (Each phase), Active power, Demand power, Maximum demand power, Power factor, Frequency, Watt-hour (Power receiving, Power transmission)
	Bar graph	Voltage (Each phase and line), Current (Each phase), Demand current (Each phase), Maximum demand current (Each phase), Active power, Demand power, Maximum demand power, Reactive power, Power factor, Frequency
Input / Output	Communication output (Modbus RTU mode), Pulse output, Alarm output, External operation change input	

About power and reactive power full-scale range selection.

The power range and reactive power range is automatically decided in a current range and voltage range.

The full scale range of a bar graph can be selected out of the following range within a 30~120%, assuming that the rated power (VT ratio × CT ratio) is 100%.

1.0 / 1.2 / 1.4 / 1.5 / 1.6 / 1.8 / 2.0 / 2.4 / 2.5 / 2.8 / 3.0 / 3.2 / 3.6 / 4.0 / 4.2 / 4.5 / 4.8 / 5.0 / 5.6 / 6.0 / 6.4 / 7.2 / 7.5 / 8.0 / 8.4 / 9.0 / 9.6 × 10ⁿ

Ex.: (VT ratio) × (CT ratio) = 1200kW

A full scale range can be selected from the following.

480 / 500 / 560 / 600 / 640 / 720 / 750 / 800 / 840 / 900 / 960 / 1000 / 1200

Note: Assume VT ratio is "2" for calculation in case of 220V input specifications.

Communication Specifications (RS-485)

Communication specifications: RS-485 interface
(Insulated from internal circuit)

Protocol: Modbus protocol RTU mode

Transmission distance: Approx. 1,000 m maximum
(when 24 AWG twisted-pair cable is used)

Maximum number of units to be connected: 31 units
(number of units that can be connected to a PC etc.)

Connection method: EIA RS-485

Cable: A-, B+: Twisted-pair cable,
SG: Signal ground

Terminal resistor: 100Ω, 1W

A terminating resistor is connected to inside in short-circuiting No.17 (-) and No.19 (TERM).

Transmission system: Half duplex two-wire system

Synchronous system: asynchronous communication method

Transmission rate: 4800/9600/19200/38400 bps

Data format:

Start bit: 1 bit

Data length: 8 bits

Parity bit: NONE (Nothing) / ODD (Odd number)
/ EVEN (Even number)

Stop bit: 1 bit / 2 bits

Error detection: CRC-16

Address: 1 to 247 (1 to 31 recommended)

■ Pulse Output Specifications

Possible output: Watt-hour or var-hour

Output form: Optical MOS-FET relay, 1a contact

Contact capacity: AC, DC 125V, 70mA
(Resistance load, inductive load)

Pulse width: 250±10ms (Output pulse width when the output pulse period of rated active power constitutes speed more than 2 pulse/second by setting of a voltage measurement range, a current-measurement range, and an output pulse unit is set to 100 to 130ms.)

■ Alarm Output Specifications

Alarm factor: Demand current, Demand power, Voltage, Alarm OFF. Possible to setting one of them.

Reset method: Automatic reset or Manual reset (Setting)

Output contact: No-voltage a contact (OR of each phase detection)

Contact capacity: AC 250V 5A, DC 125V 0.3A
(Resistance load)

AC 250V 2A, DC 125V 0.1A
(Inductive load)

■ External Operation Input

Function: Alarm reset, Maximum / Minimum value reset, All reset

Minimum operation pulse width: 300ms,
Continuation applying is possible.

Rated input: Input rating becomes the same as that of power supply.

AC100/110V 0.4VA, AC200/220V 1.4VA, DC100/110V 0.4W

AC DC two ways.

Contact capacity: About 3mA (AC, DC100/110V),

About 6mA (AC200/220V)

Standard Performance

Intrinsic error

Meas. item	Measurement range/Display specification	Intrinsic error	
		Digital display	Communication output Pulse output
Watt-hour	Display: Integer, 5 digit. Multiplier: Integral number time of 10. Expansion display is possible to the 3rd place below a decimal point. Electric power is integrated. (Power receiving, Power transmission)	Power factor 1: $\pm 2.0\%$ Power factor 0.5: $\pm 2.5\%$	Power factor 1: $\pm 2.0\%$ Power factor 0.5: $\pm 2.5\%$
var-hour	Display: Integer, 5 digit. Multiplier: Integral number time of 10. Expansion display is possible to the 3rd place below a decimal point. Integrating reactive power of power receiving. (LAG·LEAD) Integrating reactive power of power transmission. (LAG·LEAD)	Power factor 0: $\pm 2.5\%$ Power factor 0.87: $\pm 2.5\%$	Power factor 0: $\pm 2.5\%$ Power factor 0.87: $\pm 2.5\%$

Meas. item	Measurement range/Display specification	Intrinsic error	
		Digital display	Communication output
Voltage	AC 150V to 750kV	$\pm 0.5\%$ of F.S	$\pm 0.5\%$ of F.S
Current	Maximum demand, Demand, Instant AC 5A to 30kA	$\pm 0.5\%$ of F.S	$\pm 0.5\%$ of F.S
Active power	Maximum demand, Demand, Instant 150W to 1200MW (Range select) In voltage and current range. One-way deflection or both deflection can be setting.	$\pm 0.5\%$ of F.S	$\pm 0.5\%$ of F.S
Reactive power	LEAD, LAG 150var to 1200Mvar (Range select) In voltage and current range.	$\pm 0.5\%$ of F.S	$\pm 0.5\%$ of F.S
Power factor	LEAD 0.500 to 1.000 to LAG 0.500 or LEAD 0.000 to 1.000 to LAG 0.000 Range select	$\pm 2.0\%$ of F.S	$\pm 2.0\%$ of F.S
Frequency	45 to 55Hz or 55 to 65Hz or 45 to 65Hz Range select	$\pm 0.5\%$ of F.S	$\pm 0.5\%$ of F.S

Note: If this unit directly measures an inverter output, an error may increase due to its operation principle.

Accuracy of bar graph: $\pm 10\%$ (% for span)

Display updating time: About 1 second (Bar graph: 0.25 seconds)

LCD view angle: Upper view angle 10° , Lower view angle 60° , Right and left view angle 60°

Influence by temperature: Within accuracy by $23 \pm 10^\circ\text{C}$.

Auxiliary supply:

AC 85 to 264 V 50/60 Hz 10 VA (Rated voltage, AC100/110V, 200/220V)

DC 80 to 143 V 6 W (Rated voltage, DC100/110V) for both AC and DC uses

Rush current:

Rated voltage AC110V 2.2A or less (About 2.5ms)

Rated voltage AC220V 4.4A or less (About 2.5ms)

Rated voltage DC110V 1.6A or less (About 2.5ms)

Input consumption VA:

Voltage circuit; 0.25 VA or less (110V), 0.5 VA or less (220V)

Current circuit; 0.1VA or less (5A)

Allowable input voltage / current:

Voltage circuit; 2 times 10 seconds, 1.2 times continuation of rated voltage.

Current circuit; 10 times 16 seconds, 1.2 times continuation of rated current.

Insulation resistance: Between electric circuits and case (Earth), Between input and output and auxiliary supply, Between communication output and pulse output and alarm output

Above $50\text{M}\Omega$ at DC 500V

Withstand voltage: Between electric circuits and case (Earth), Between input and output and auxiliary supply, Between communication output and pulse output and alarm output

AC 2000V (50/60Hz) 1 minute

Impulse withstand voltage: Between electric circuits and case (Earth). (A communication output is excluded)

6kV 1.2/50 μs Positive and negative polarities, for each 3 time.

Between input and auxiliary supply. (Grounds an output.)

5kV 1.2/50 μs Positive and negative polarities, for each 3 time.

Vibration: Sweep vibration frequency range: 10 to 55 to 10Hz , Displacement amplitude: 0.15mm, Number of sweep: 5, Sweep velocity: 1 octave/minute

Shock: Peak acceleration: 490m/s^2 ,
Waveform of pulse: Sine half wave, duration of pulse: 11ms
Number of shock: It is each 3 times about a forward reverse to 3 shaft orientations (right-angled to mutual). (Total 18 times)

Operating temperature and humidity limits: -10 to +55 °C , 30 to 85% RH, Non condensing.

Storage temperature limits: -25 to +70 °C

Installation altitude: The altitude of 2,000 m or less.

Protection code: IP40

■ Display and Operation

Bar graph display

The measurement value of the main monitor is indicated by the analog. (Setting which does bar graph display of the measurement value of sub-monitor is also possible.)

Digital display

Measurement monitor can watch 4 elements at the same time.

Main monitor

Sub monitor (Right)

Sub monitor (Center)

Sub monitor (Left)

Scale markings

It sets automatically by measurement-range setting.

Upper limit (or lower limit) setting index

An upper limit (or lower limit) set point is displayed.

Unit display

It sets automatically by measurement-range setting.

Multiplying factor display

It displays on the lower right of the main monitor at the time of watt-hour and var-hour display.

DISPLAY



It is the switch that changes a phase (line) display of current (voltage).

If it is not operated for 10 minutes after a display change, it returns to the original phase (line) display. In setting mode, it is used as a switch that terminates setting mode.



The switch from which integrated value of the amount of electric power is switched to normal display (5 digits of integer) and expansion indication (integer 2 digits + below decimal point, 3 digits) variously. If it is not operated for 10 minutes after a display change, it will usually return to a display. It is used also as a switch which changes to setting mode. If it continues pushing 3 seconds or more, it will change to setting mode. In setting mode, it is used as a switch that determines a set point.



If this switch is pushed 1 second or more continuously, it will reset an alarm, the maximum value, and the minimum value (factor which it is displaying on the main monitor).

In setting mode, it uses it as a switch to which it moves a setting item (move up).



The switch to which measurement displays element of main monitor is changed.

If it is not operated for 10 minutes after a display change, it returns to the original measurement display factor. In set mode, it is used as a switch that changes a setting value.

MAX/MIN



The switch to which general measurement display (usually) and the maximum minimum measurement display are changed.

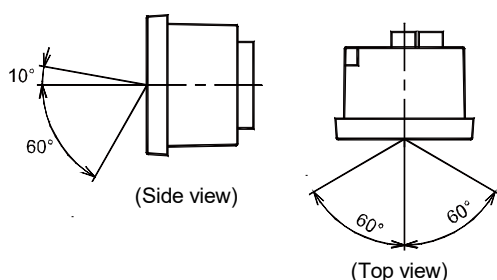
In setting mode, it uses it as a switch to which it moves a setting item (move down).



In setting mode, it is used as a switch that changes a setting item.

■ Caution on handling

Mount the LCD to obtain an optimum angle, since the contrast changes according to the monitoring angle.

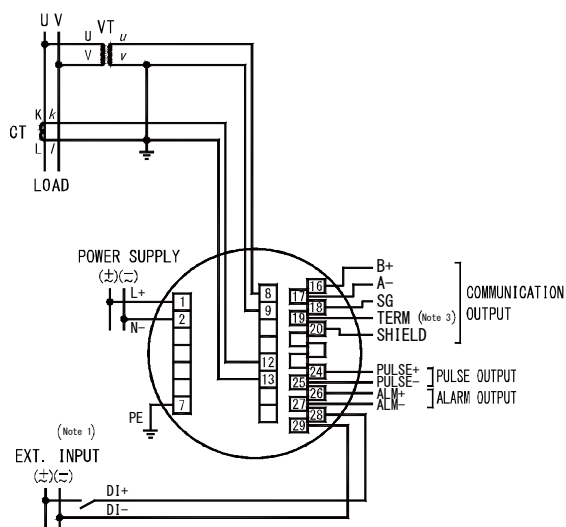


Display viewing angle

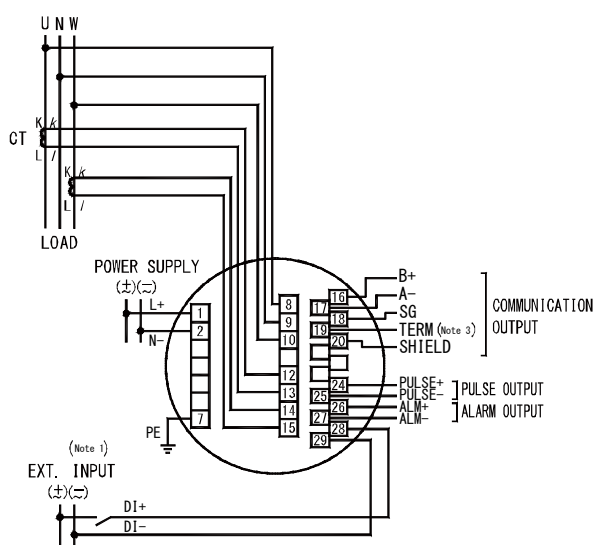
■ Connection Diagrams

Connection drawing (Note 2)

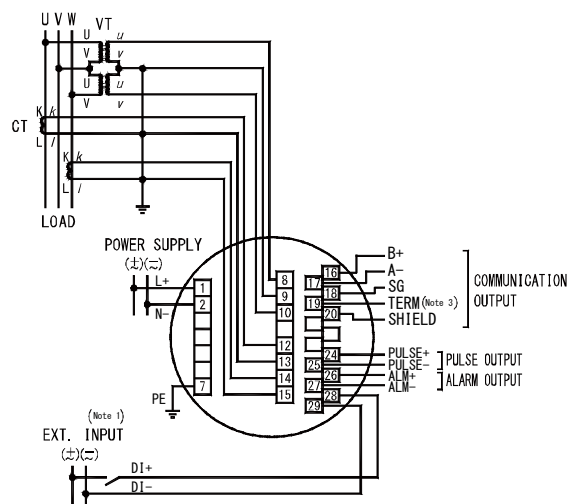
1) Single-phase 2-wire



2) Single-phase 3-wire



3) Three-phase 3-wire



Note 1: By setting, it can switch an external operation input. Alarm reset. Maximum, minimum value reset. Alarm and maximum, minimum value all reset.

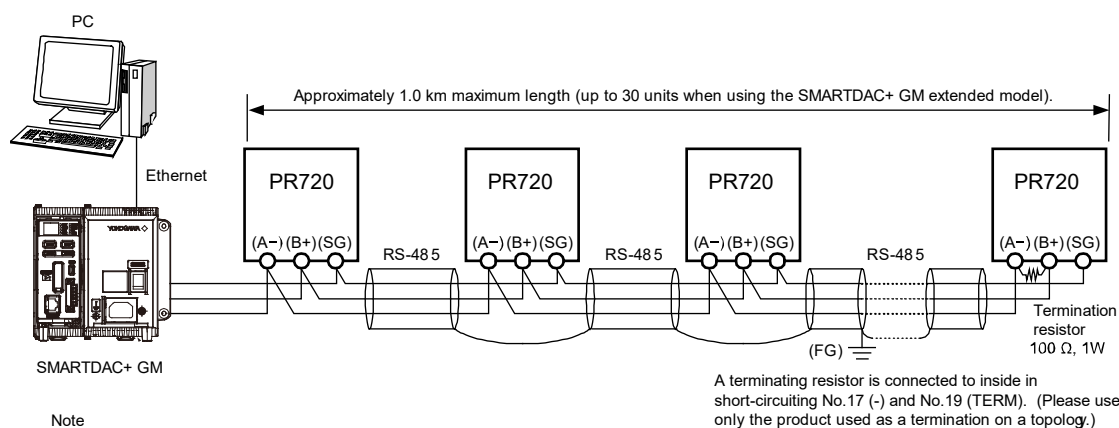
Note 2: In case of low-voltage circuit, secondary side earthing of VT and CT is unnecessary. And, VT is unnecessary in case it used 110V or direct 220V.

Note 3: A terminating resistor is connected to inside in short-circuiting No.17 (-) and No.19 (TERM). (Please use only the product used as a termination on a topology.)

Caution on connection

- (1) Mount the terminal cover without fail for safety after the end of connections.
- (2) Separate the input wiring and output wiring from each other without fail, and take a preventive measure against malfunction due to external noises.
- (3) Connect the grounding terminal PE (No. 7 terminal) to the ground without fail for enhancing the shield effect. Keep the grounding resistance between the grounding terminal and the ground to be lower than 100Ω.
- (4) Keep a distance of more than 30cm between this unit and the circuit breaker as well as between this unit and the relay contact signal line.
- (5) Please use a transmission line into a twisted-pair cable with a shield. And, please use as the same thing including the inside of a board. And, in case there are many induction noises, please earth in the most effective place (one point).
- (6) It is recommended to mount a surge killer outside when connecting an inductive load to the pulse output and alarm output. If no surge killer is mounted, the contact life may shorten.

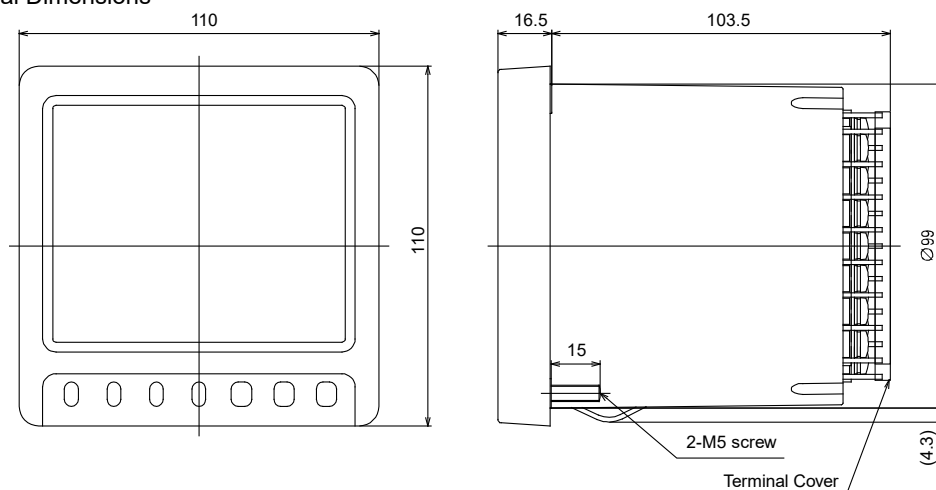
■ Example of Connection Diagram



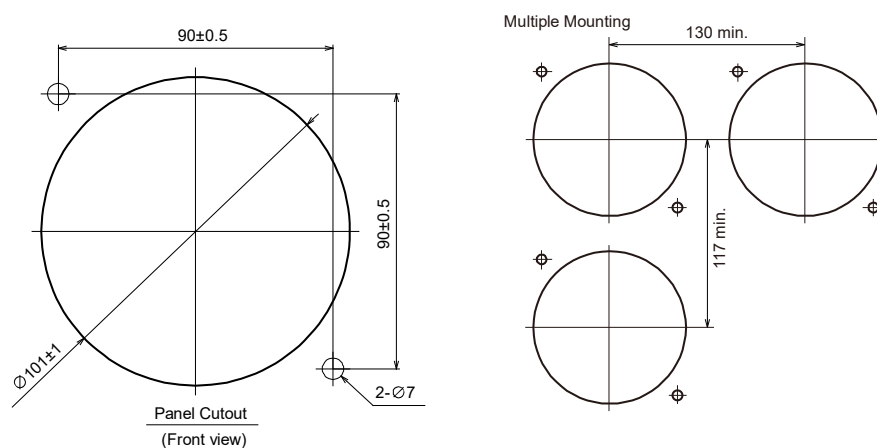
■ External Dimensions, Panel Cutout Dimensions

Unit: mm

● External Dimensions



● Panel Cutout Dimensions



General tolerance = \pm (value of tolerance class IT18 based on JIS B 0401-2016) / 2

■ Mounting and Shape

Materials: Case; Polycarbonate resin (PC)

Mounting Method: Panel mounting (refer to Panel Cutout Dimensions)

Connection Method:

M3 screws for terminal connections; pulse output, RS-485 communication, digital input, alarm output

M4 screws for terminal connections; voltage input, current input, and power supply

Dimension: 110mm (Width) x 110mm (Height) x 104mm (Depth)

Body diameter: 99mm ϕ

With terminal cover

Outward color: Black (Munsell N1.5)

Weight: Approx. 600g

■ Model and Suffix Codes

Model	Suffix Codes							Descriptions
PR720								Power and Energy Meter
Suffix Codes	-3							Universal three-phase three-wire system (single-phase two-wire, single-phase three-wire, and three-phase three-wire systems)
		2						Universal voltage input (150V/300V)/5A
			2					1 digital input, 1 pulse output
				0				RS-485 communication
					3			Demand measurement
						-6		100-240V AC \pm 10% (50/60Hz), 80-143V DC
							U	U, V and W indications
							-0	Always 0

■ Ordering Information

Specify the model and suffix codes.

Example: PR720-32203-6U-0

■ Accessories

2 Nuts: M5 size

■ Related Instruments

Product	Model	Descriptions
Data logger	GM10	*
Clamp-on Current Transformers	CTW130	800A/5A
	CTW100	500A/5A
	CTW35	300A/1A
	CTW20	200A/1A
	CTW15	100A/1A
	CTW10	100A/1A

* See the General Specifications (GS 04L55B01-01EN)