PU21 Series

Single-Phase Power Controller

Overview

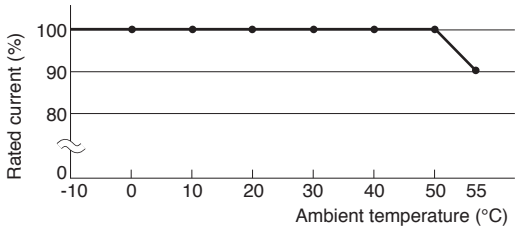
PU21 series is a Single-Phase Power Controller having compact size and lighter in weight.
Two control systems, a Phase control system and a Zero cross control system, are built in and can be changed by remote contacts signal.
In the Phase control, feedback types of voltage, current and power, and no-feedback type are selectable depending on heating characteristics of heaters.
Three kinds of input signals, 4 to 20 mAdc, 1 to 5 Vdc and ON-OFF contact signal, can be changed by terminal connections. Options of heater-burnout alarm function and current limit function are available.
The rapid fuse built-in type and the current transformer built-in type are available.
With the optional unit (with communications), up to 31 PU21 power controller can be connected to a host device like a PC or PLC, allowing their settings and data to be collectively managed.

(Setting communication unit is option)

Features

- **Compact all-in-one configuration**
  Narrow width unit enables a closed mounting.
- **Options**
  The options of heater-burnout alarm function and current limit function are available.
- **Phase-angle control/Zero-cross control**
  The phase-angle control system and the zero-cross control system are selectable.
- **Setting communications unit is prepared**
  Displaying measured values of real time output voltage, current, electric power, resistances of heaters and also settings of each parameter, switching operation are available.
  A unit having communications enable to monitor a data and to set up a parameter by the PC through RS-485.
- **Various protective functions**
  - Thyristor-gate-off at over-current
  - Shutting off the power by the rapid fuse at short-circuit
  - Thyristor-gate-off at over-temperature of the heat-sink

Specifications

Item		Description
General specifications	Phase	Single-phase
	Rated voltage	100, 110, 120, 200, 220, 240, 380, 400, 440Vac, (to be specified)
	Rated current	10, 20, 30, 50, 75, 100, 150, 200, 250, 300, 400, 500A, (to be specified)
	Allowable voltage fluctuation	±10 % of rated voltage
	Rated frequency	50/60 Hz (Automatic setting)
	Allowable frequency fluctuation	±2 Hz of rated frequency
Control input	Control input signal	4 to 20 mAdc (input resistance approx. 100 Ω), 1 to 5 Vdc (input resistance approx. 50 kΩ)
Output	Control system	Phase angle control system and zero-crossing control system
	Output range	Standard type (no feedback): Rated voltage 0 to 98 % Constant-voltage type: Rated voltage 0 to 98 % Constant-current type: Rated current 0 to 100 % Constant-power type: Rated voltage 0 to 98 % x Rated current 0 to 100 %
	Output accuracy	Standard type (no feedback) : Within ± 10 % of rated voltage Constant-voltage type: ±3 % of the rated voltage (Rated voltage is ±10 %, at 1 to 10 times variation load resistance) Constant-current type: Within ±3 % of rated current (Rated voltage is ±10 %, at 1 to 10 times variation load resistance) Constant-power type: Within ±3 % of the rated power (Rated voltage is ±10 %, at 1 to 3 times variation of load resistance) * The temperature range for guaranteed performance is 0 to 50 °C.
Load specifications	Applicable load	Resistive load, inductive load (The inductive load is applicable only in the control of the primary side of a transformer in the phase angle control method. The flux density recommended for the transformer is 1.2 T or less.)
	Minimum load current	0.5 A or more (at 98 % output at the rated voltage)
	Operating temperature and load current	
Over current protection	Operating	Thyristor-gate-off (in over-current, 120 % or more of rated current. This function is required built-in or external CT.) Protect by the built-in rapid fuses at short-circuit of load.
Alarm output	Alarmtypes	Over-current alarm (CT built-in or external): LED2 lighting, alarm contact output 1ON Rapid fuse melting alarm (more than 30 A): LED3 lighting, alarm contact output 1ON Heat-sink overheat alarm (more than 200 A): LED4 lighting, alarm contact output 1ON Abnormal thyristor alarm: LED3 flashing, alarm contact output 2ON Operation alarm: LED1 flashing Heater burnout alarm: LED2 flashing, alarm contact output 2ON * Basic models (without feedback) have only operation error and power failure alarms. There is no alarm contact output.
	Alarm output rating	2outputs, 250 Vac max, 1 A
Ramp	Set range	Built-in variable resistor (0–100 % of the output range) or external variable resistor (10 kΩ).
Output bias	Set range	Built-in variable resistor (0–100 % of the output range) or external variable resistor (10 kΩ). Without a setting communication unit, models with a heater burnout alarm cannot use the built-in variable resistor.
Soft start time	Set range	Approx. 1 to 20 sec.
Run / Stop switching		Switching by contact signal
Phase angle control / zero-cross control switching		Switching by contact signal
External CT input	Set range	0 to 5 Aac of the rated current Rated current 75 A or less: Selectable a CT built-in model.
General specifications	Operating temperature	–10 to +55 °C (Derating for output current is required if the ambient temperature is 50 °C or more.)
	Operating humidity	30 % to 90 % RH (No dew condensation)
	Insulation resistance	Between power supply terminal and protective conductor (GND) terminals: 500 Vdc / 50 MΩ or more
	Withstanding voltage	2000 Vac / 1 min.

General specifications	Power loss	Rated current	Max. Power loss
		10 A	9 W
		20 A	22 W
		30 A	34 W
		50 A	44 W
		75 A	64 W
		100 A	96 W
		150 A	125 W
		200 A	200 W
		250 A	235 W
		300 A	280 W
		400 A	390 W
		500 A	505 W
	Cooling system	Self-cooling for the rated current of 150 A or lower, or by a cooling fan for the rated current of 200 A higher	
	Weight	Approx. 2 kg (Rated current 10 A / 20 A types) Approx. 3 kg (Rated current 30 A to 75 A types) Approx. 6 kg (Rated current 100 A to 150 A types) Approx. 7 kg (Rated current 200 A to 250 A types) Approx. 12 kg (Rated current 300 A to 500 A types)	

Options

● Heater burnout alarm

Detects the heater burnout by built-in or external CT.
When heater burnout is detected, LED blinks and alarm contact output becomes ON. The selection of phase angle control / zero-cross control is impossible if there is no display unit.

● Current limit

Sets the maximum limit of the load current detected by built-in or external CT. Current limit function does not work with zero-cross control system.

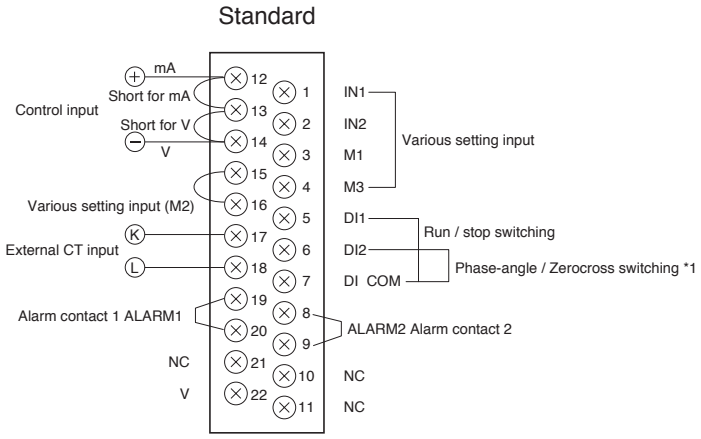
● Optional display unit

Capable of displaying outputs and alarms, setting a heater disconnection alarm, communicating with the host device, and executing other functions.

Item	Description
Setting items	Manual output value (0 to 100 %), high / low limits (0 to 100 %), ramp setting (0 to 100 %), soft-start time setting (1 to 20 seconds), heater burnout alarm setting (load resistance 0 to 100 %, available in models with heater burnout alarm only), phase-angle control system / zero-cross control system selection, feedback system selection, current limit)
Display	Output value (voltage, current, alarm, various setting), alarm, parameters, load resistance value
Communication	RS-485 MODBUS protocol (Capable of setting, outputs, alarms, heater burnout alarm setting)

Connection of Setting Terminals

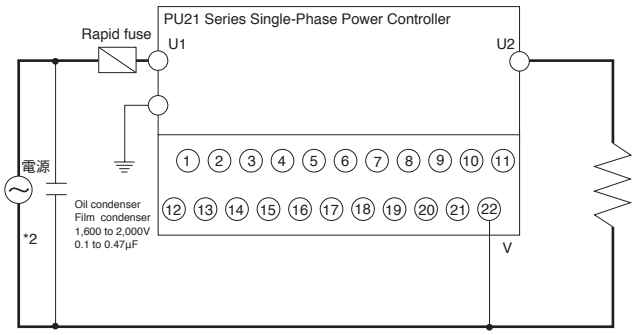
● Setting terminals



*1 For the unit with the optional heater burnout alarm (without the display unit), the trigger of initial resistance value is set by contact input between the control input terminals (6) and (7).

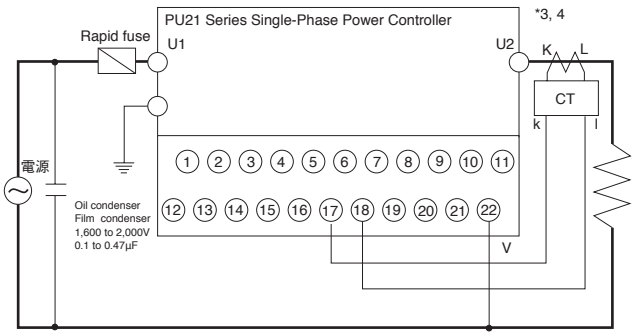
● Main circuit terminals / power terminals

- For the CT built-in for a rated current of 10 A to 75 A, or standard type (no feedback).



*2 A surge generated from switch or other power circuit device may affect operation of the PU21. If using a transformer or heater with large temperature coefficient is connected, the use of a surge-absorbing device is recommended. (See the above diagram.)

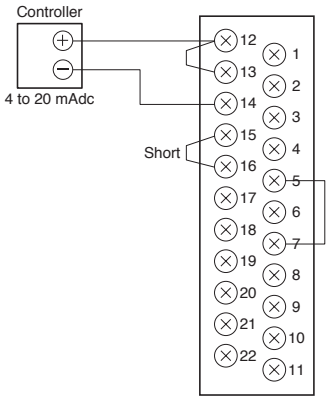
- For the CT mounted externally for a rated current of 10 to 500 A (except the unit without feedback)



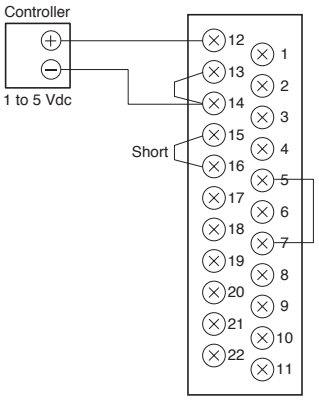
*3 CT secondary output is 5 A. CT is absolutely necessary for the unit with current or power feedback. For the unit with voltage feedback, current transformer is necessary for over-current alarm, heater burnout alarm, and current limit function.

*4 Do not connect ground to secondary side of CT.

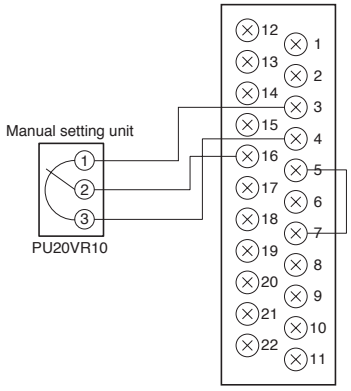
● Current signal (4 to 20 mAdc)



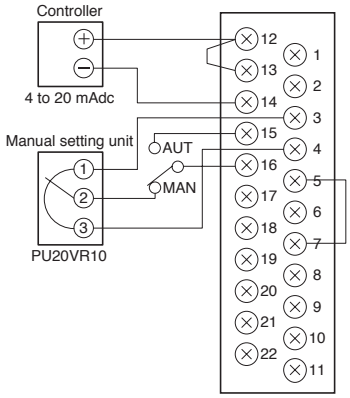
● Voltage signal (1 to 5 Vdc)



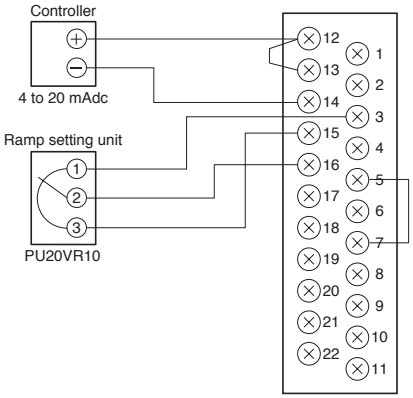
● **Manual setting unit only**



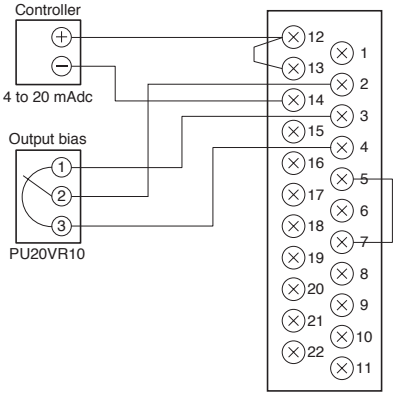
● **Manual setting unit and with auto / man switching**
Current signal (4 to 20 mAdc)



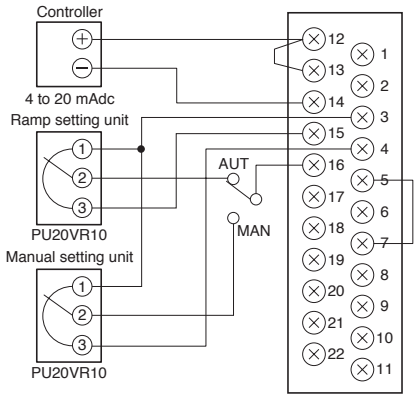
● **With ramp setting unit (Ramp using control input signal)**
Current signal (4 to 20 mAdc)



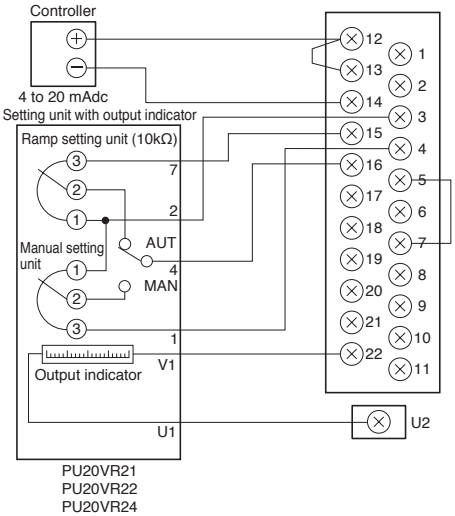
● **With output bias setting unit**
Current signal (4 to 20 mAdc)



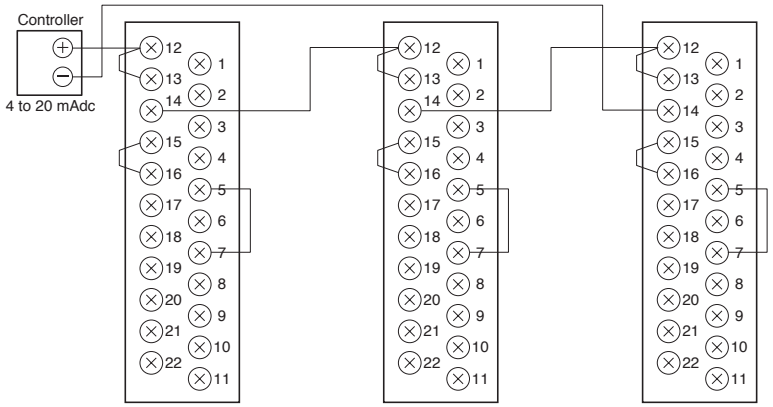
● **Manual setting unit, ramp setting unit with auto / Man switching**
Current signal (4 to 20 mAdc))



● **Setting unit with output indicator**
Current signal (4 to 20 mAdc)
Cannot be used for zero-cross control.

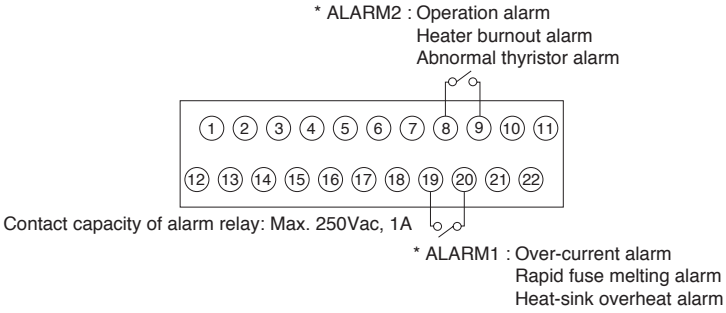


● Operation of multiple instruments
Current signal (4 to 20 mAdc)



● Alarm output

An alarm output is between the setting terminals (19) and (20) (for Alarm 1) , (8) and (9) (for Alarm 2).



● Error indications

If an error is detected, the lamps of LED1 to LED4 on the front panel are lit or flash as follows.

● Goes off ○ Lights ◑ Flashes

* For the unit without feedback, an operation alarm and an abnormal power voltage only are indicated by lamps.

LED display	Error No.	Error contents	Operation condition after an alarm activated
Over-current alarm ○ ○ ● ● LE01 LE02 LE03 LE04	Err1	This alarm activates when the current exceeding 1.2 times of the rated current. The thyristor gate is turned off to protect the thyristor from an over-current.	Operation will stop. (Thyristor gate-off)
Rapid fuse melting alarm ○ ● ○ ● LE01 LE02 LE03 LE04	Err2	This alarm activates when the rapid fuse is blown out due to a momentary over-current.	Operation will stop. (Thyristor gate-off)
Heat sink overheat ○ ● ● ○ LE01 LE02 LE03 LE04	Err3	This alarm activates when the heat sink is overheated. The thyristor gate is turned off to protect the thyristor from an over-tmeperature.	Operation will stop. (Thyristor gate-off)
Operation alarm ◑ ● ● ● LE01 LE02 LE03 LE04	Err4	This alarm activates when the control circuit abnormality is detected by self-diagnostic function.	Operation will continue.
Heater burnout alarm (option) ○ ◑ ● ● LE01 LE02 LE03 LE04	Err5	This alarm activates when the heater burnout is detected.	Operation will continue.
Abnormal thyristor alarm ○ ● ◑ ● LE01 LE02 LE03 LE04	Err6	This alarm activates when the fault of thyristor element is detected.	Operation will continue. *
Abnormal power voltage ○ ○ ○ ○ LE01 LE02 LE03 LE04	Err7	This alarm activates when the power voltage is abnormal (85 Vac or lower in 100 V system, 170 Vac or lower in 200 V system, and 340 Vac or lower in 400 V system.	Operation will continue.

* If the unit is damaged by short-circuit, turn off the main power supply to stop the operation.

Communication specification (Options)

● Communication protocol

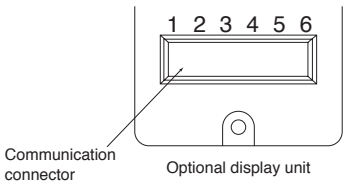
This unit is applied for either Modbus RTU mode or Modbus ASCII mode. Used mode is selectable by the display unit.

● Communication specification

Item		RTU mode	ASCII mode
Interfaces		RS-485	
Communication type		Half-duplex asynchronous type	
Transmission rate		9600 / 19200 bps	
Communication code		Binary (RTU mode)	ASCII (ASCII mode)
Error check	Vertical direction	Parity	
	Horizontal direction	CRC-16	LRC
Character configuration	Start bit	1-bit	
	Data length	8-bit	7-bit / 8-bit
	Parity bit	None / Even / Odd	None / Even / Odd
	Stop bit	1-bit / 2-bit	
Start code of message		None	: (Colon)
End code of message		None	CR, LF
Data time interval		28-bit time or less	1 sec. or less
Number of setting communication units		Max. 31 units	

● Communication connector

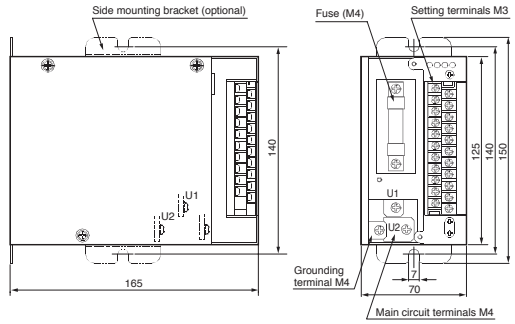
No.	RS-485
1	SA
2	SB
3	Connect to terminal 1
4	Connect to terminal 2
5	SG



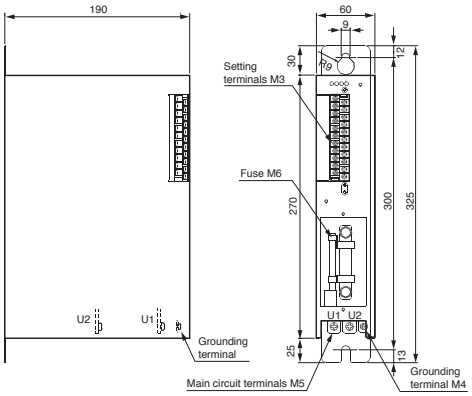
Dimensions

(Unit: mm)

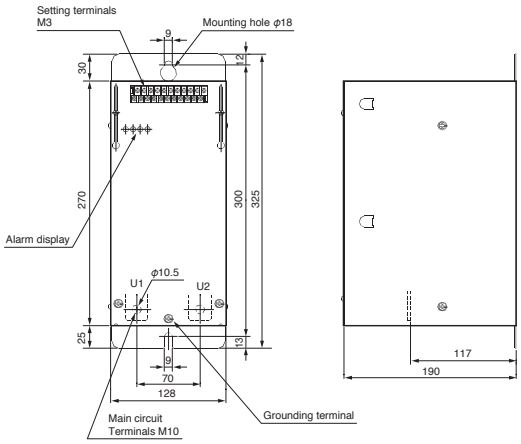
● 10A, 20A



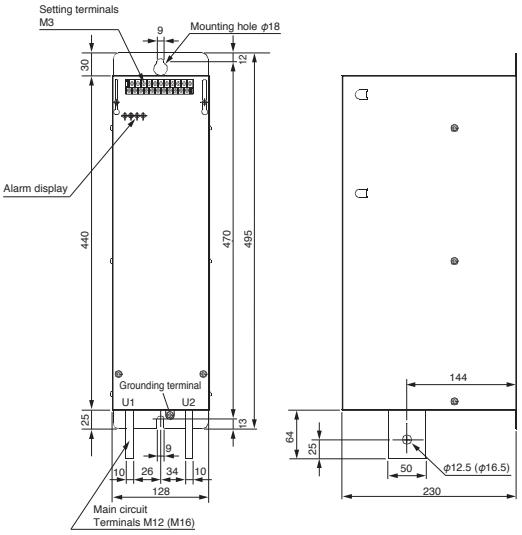
● 30 to 75A



● 100 to 250A



● 300 to 500A



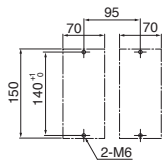
* Main output terminal of 500 A model is M16.

Installation dimensions

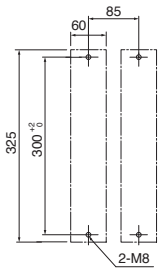
* On both top and bottom of the unit, it is requested a space which is more than height of the unit itself for cooling.

(Unit: mm)

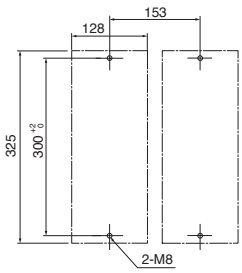
● **In case of 10A and 20A**



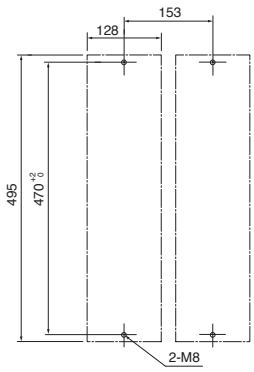
● **In case of 30A to 75A**



● **In case of 100A to 250A**



● **In case of 300A to 500A**



Model number composition

I II III IV V VI VII VIII **Example: PU21A0120N3N1**

I	II	III	IV	V	VI	VII	VIII	Description
Basic model No.	Control system	Rated current	Power voltage	Optional display unit	Option	Fuse / Current transformer	Additional processing	
PU21								Single phase power controller
	A							Phase angle control Standard type (no feedback) / Zerocross control *1
	V							Phase angle control (Constant voltage) / Zerocross control *3
	C							Phase angle control (Constant current) / Zerocross control *2 *3
	P							Phase angle control (Constant power)) / Zerocross control *2 *3
		01						10 A
		02						20 A
		03						30 A
		05						50 A
		07						75 A
		10						100 A
		15						150 A
		20						200 A
		25						250 A
		30						300 A
		40						400 A
		50						500 A
			10					100 V
			11					110 V
			12					120 V
			20					200 V
			22					220 V
			24					240 V
			38					380 V
			40					400 V
			44					440 V
				N				Non optional display unit *3
				A				Bilt-in optional display unit (with communication / main body installation)
					0			None
					1			Heater burn-out alarm *2 *3
					2			Current limit function *2 *4
					3			Heater burn-out alarm + current limit function *2 *4 *5
						N		Fuse: None / CT: None
						F		Fuse: built-in / CT: None
						C		Fuse: None / CT: built-in *6
						D		Fuse: built-in / CT: built-in *6
							0	None
							1	With inspection data

*1 Optional display unit, heater burnout alarm or current limit function are not selectable for standard type, no feedback.
*2 A current transformer is required for model with current feedback, power feedback, heater burn-out alarm or current limit function.
*3 For the unit with the heater burnout alarm without the display unit, the phase-angle control system and the zero-cross control system is not changeable.
*4 The current limit function does not operate with the zero-cross control system.
*5 The unit with both heater burnout alarm and current limit function is only selectable for the unit which has an optional display-unit.
*6 Current transformer built-in option is only selectable for rated current 10 to 75 A model.

Accessories

● Built-in rapid fuse

Basic model No.	Accessory type	Current capacity	Rated voltage	Singlephase / Three-ph	Description	Indication of the body
PU20					Accessories for PU21	
	FU				Fuse	
		010A	1	1	PU21 (Single phase) 10 A, Rapid fuse for 100 / 200 V *1	350KH-15
			4	1	PU21 (Single phase) 10 A, Rapid fuse for 400 V *1	600KH-15
		020A	4	1	PU21 (Single phase) 20 A, Rapid fuse for 100 / 200 V *1	350KH-30
			1	1	PU21 (Single phase) 20 A, Rapid fuse for 400 V *1	600KH-30
		030A	1	0	PU21 (Single phase) 30 A, Rapid fuse for 100 / 200 V *2	250GH-50S
			4	0	PU21 (Single phase) 30 A, Rapid fuse for 400 V *2	660GH-50S
		050A	1	0	PU21 (Single phase) 50 A, Rapid fuse for 100 / 200 V *2	250GH-75S
			4	0	PU21 (Single phase) 50 A, Rapid fuse for 400 V *2	660GH-80S
		075A	1	0	PU21 (Single phase) 75 A, Rapid fuse for 100 / 200 V *2	250GH-100S
			4	0	PU21 (Single phase) 75 A, Rapid fuse for 400 V *2	660GH-100S
		100A	1	0	PU21 (Single phase) 100 A, Rapid fuse for 100 / 200 V *2	250GH-160S
			4	0	PU21 (Single phase) 100 A, Rapid fuse for 400 V *2	660GH-160S
		150A	1	0	PU21 (Single phase) 150 A, Rapid fuse for 100 / 200 V *2	250GH-200S
			4	0	PU21 (Single phase) 150 A, Rapid fuse for 400 V *2	660GH-200S
		200A	1	0	PU21 (Single phase) 200 A, Rapid fuse for 100 / 200 V *2	250GH-315S
			4	0	PU21 (Single phase) 200 A, Rapid fuse for 400 V *2	660GH-315S
		250A	1	0	PU21 (Single phase) 250 A, Rapid fuse for 100 / 200 V *2	250GH-350S
			4	0	PU21 (Single phase) 250 A, Rapid fuse for 400 V *2	660GH-350S
		300A	1	0	PU21 (Single phase) 300 A, Rapid fuse for 100 / 200 V *2	250GH-450S
			4	0	PU21 (Single phase) 300 A, Rapid fuse for 400 V *2	660GH-450S
		400A	1	0	PU21 (Single phase) 400 A, Rapid fuse for 100 / 200 V *2	250GHW-630S
			4	0	PU21 (Single phase) 400 A, Rapid fuse for 400 V *2	660GH-630S
		500A	1	0	PU21 (Single phase) 500 A, Rapid fuse for 100 / 200 V *2	250GHW-710S
			4	0	PU21 (Single phase) 500 A, Rapid fuse for 400 V *2	660GH-710S

*1 Rapid fuse only
*2 Rapid fuse and indicator fuse

Accessories

● External current transformer

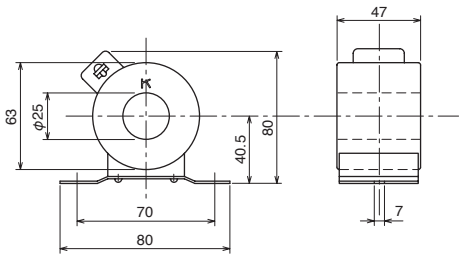
Basic model No.	Accessory type	Capacity	Description	Note	Indication of the body
PU20			Accessories for PU21		
	CT		Current transformer (CT)		
		100AT	For 10, 20, 50, 100 A *1		CPI-1TR 100AT
		150AT	For 30, 75, 150 A *2		CPI-1TR 150AT
		200AT	For 200 A		CPI-1TR 200AT
		250AT	For 250 A		CPI-1TR 250AT
		300AT	For 300 A		CPI-1TR 300AT
		400AT	For 400 A		CPI-1TR 400AT
		500AT	For 500 A		CPI-1TR 500AT

*1 Use the power controller with the number of through-turns shown below, as appropriate for the rated current.
10 A : Through-holes 10, 20 A : Through-holes 5, 50 A : Through-holes 2, 100 A : Through-holes 1

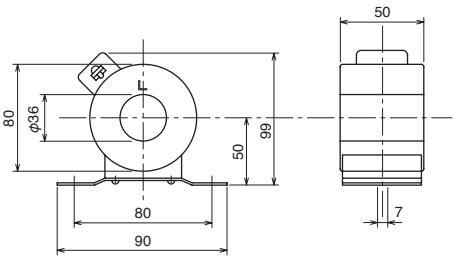
*2 Use the power controller with the number of through-turns shown below, as appropriate for the rated current.
30 A : Through-holes 5, 75 A : Through-holes 2, 150 A : Through-holes 1

(Unit: mm)

• For 10 to 300 A



• For 400 to 500 A

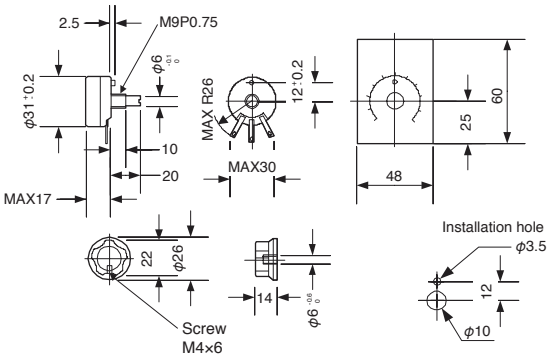


● External setting unit

Basic model No.	Accessory type	Kind of the setting device	Rated voltage for indicator	Description	Indication of the body
PU20				Accessories for PU2	
	VR			External setting unit	
		1	**0**	Variable resistor 10 kΩ Ramp setting, output bias setting, manual setting, current limit setting	-
		2	**1**	Voltage indicator (for 0 to 150 V), Manual setting, ramp setting, Auto / Manual selector switch	JAM
			2	Voltage indicator (for 0 to 250 V), Manual setting, ramp setting, Auto / Manual selector switch	JAM
			4	Voltage indicator (for 0 to 500 V), Manual setting, ramp setting, Auto / Manual selector switch	JAM

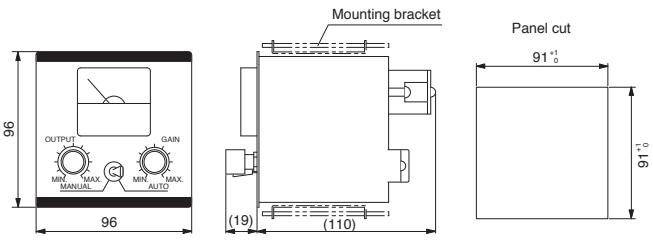
(Unit: mm)

• PU20VR10



Weight : Approx. 50 g

• PU20VR21, PU20VR22, PU20VR24



● Terminal cover

Basic model No.	Accessory type	Single phase	Type	Description	Indication of the body
PU20				Accessories for PU21	
	CV			Terminal cover	
		1	**1**	PU21 (Single phase), Terminal cover for 300, 400, 500 A	-

● Cooling fan

Basic model No.	Accessory type	Type	Description	Indication of the body
PU20			Accessories for PU21	
	FM		Cooling fan	
		001	PU21 (Single phase), Cooling fan for 100 A	UP12B15
		002	PU21 (Single phase), Cooling fan for 200 to 400 A	UP12B22

Please read the "Terms and Conditions" from the following URL before ordering or use:

http://www.azbil.com/products/bi/order.html

Specifications are subject to change without notice.

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