Multi-channel Power Controller
G3ZA

CSM_G3ZA_DS_E_3_1

Optimum Cycle Control for High-precision Control with Low Noise

- Smaller than a Normal Power Controller.
- Enables low-noise power control in combination with zero-cross SSRs. (See note.)
- One Controller can control up to 8 SSRs.
- RS-485 communications to set manipulated variables and heater burnout detection. The Smart FB Library for the G3ZA can also be used.
- CE Marking

Main Upgraded Functions

- Soft-start function added for lamp heaters.
- Three-phase optimum cycle control added for three-phase heaters.
- Combining with special CT for150-A current detection.

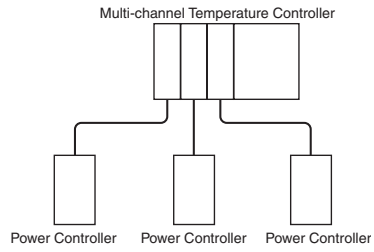
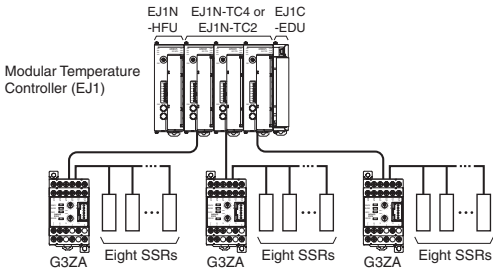
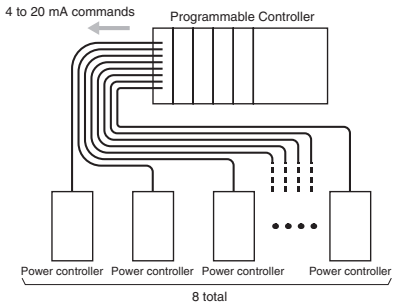
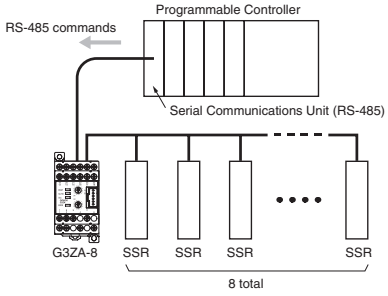
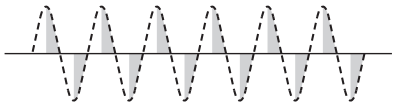
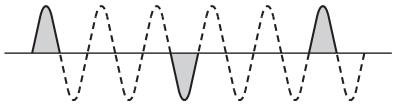
Note: The G3ZA must be used in combination with an SSR without the zero cross function when the soft-start function is used.

Version Upgrade for Improved Functionality (V2)

⚠ Refer to *Safety Precautions* on page 9.

Features

Comparison between the G3ZA and Normal Power Controllers

Item	Normal Power Controllers	G3ZA
Connections	**Power Controllers Controlled Using Current Output of 4 to 20 mA** 	**Control Using Communications from a Host Device** • Direct connection is possible using an EJ1 Modular Temperature Controller. 
		
Control method	**Phase Control** • Response is fast and high-precision temperature control is possible. • Harmonics and noise are problems. 	**Optimum Cycle Control (High-precision Zero Cross Control)** • Outputs are turned ON and OFF each half cycle. • Zero-cross control is performed. • Noise is suppressed while achieving high-speed response with high-precision temperature control. 

Model Number Structure

■ Model Number Legend

G3ZA- □ □ □ □ □ - □ - □
1 2 3 4 5 6 7

No.	Meaning	Code	Specifications
1	No. of control points	4	4 channels
		8	8 channels
2	Control method	None	Optimum cycle control
3	Heater burnout detection	H	Yes
		A	None

No.	Meaning	Code	Specifications
4	Load power supply voltage	2	100 to 240 VAC
		4	400 to 480 VAC
5	Communications specifications	03	RS-485
6	Communications protocol	FLK	CompoWay/F
7	International standards	UTU	Approved by TÜV, UL, and CSA.

Ordering Information

■ List of Models

Name	Number of control channels	Heater burnout detection	Load power supply voltage	Model
Multi-channel Power Controller	4	Supported	100 to 240 VAC	G3ZA-4H203-FLK-UTU
			400 to 480 VAC	G3ZA-4H403-FLK-UTU
	8	Not supported	100 to 240 VAC	G3ZA-8A203-FLK-UTU
			400 to 480 VAC	G3ZA-8A403-FLK-UTU

Note: When using the heater burnout detection function, CTs must be ordered separately.

Upgraded Functions

Refer to page 7 for details. Upgraded functions are marked with “V2”.

■ Accessories (Order Separately)

Name	Hole diameter	Detection current	Model
Current Transformer (CT)	5.8 dia.	0 to 50 A	E54-CT1
	12.0 dia.	0 to 50 A	E54-CT3
	30.0 dia.	0 to 150 A	G3ZA-CT-150L

Name	Model
DIN Track	PFP-100N
	PFP-50N
End Plates (stoppers)	PFP-M

Be sure to read the precautions for correct use and other precautions in the following user’s manual before using the Power Controller.
G3ZA Multi-channel Power Controller User’s Manual (Cat. No. Z200)

Specifications

■ Ratings

Item / Load power supply voltage range	100 to 240 VAC	400 to 480 VAC
Power supply voltage	100 to 240 VAC (50/60 Hz)	
Operating voltage range	85 to 264 VAC	
Power consumption	16 VA max.	
Load power supply voltage	100 to 240 VAC	400 to 480 VAC
Load power supply voltage range	75 to 264 VAC	340 to 528 VAC
Manipulated variable input	0.0% to 100.0% (via RS-485 communications)	
Current transformer input (See note 1.)	Single-phase AC, 0 to 50 A (primary current of CT) Single-phase AC, 0 to 150 A (primary current of CT) V2	
Trigger output	One voltage output for each channel, 12 VDC ±15%, Max. load current: 21 mA (with built-in short-circuit protection circuit)	
Alarm output	NPN open collector, one output Max. applicable voltage: 30 VDC, Max. load current: 50 mA Residual voltage: 1.5 V max., Leakage current: 0.4 mA max.	
Indications	LED indicators	
Control method	Optimum cycle control Soft-start optimum cycle control (See note 2.) V2 Three-phase optimum cycle control V2	
Ambient operating temperature	−10 to 55°C (with no icing or condensation)	
Ambient operating humidity	25% to 85%	
Storage temperature	−25 to 65°C (with no icing or condensation)	
Elevation	2,000 m max.	
Accessories	Instruction Sheet	

Note: 1. CT inputs are provided only on Models with heater burnout detection.

2. Use an SSR without the zero-cross function (G3PA-□BL-VD) for soft-start optimum cycle control. (Refer to *G3PA* for details.)

■ Performance

Current indication accuracy	Current Range 0 to 50 A, ±3 A 0 to 150 A, ±9 A 0 to 100%, ±6% (See note.) (for models with heater burnout detection)
Insulation resistance	100 MΩ min. (at 500 VDC) between primary and secondary
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min between primary and secondary
Vibration resistance	Vibration frequency: 10 to 55 Hz, acceleration: 50 m/s^2 in X, Y, and Z directions
Shock resistance	300 m/s^2 three times each in six directions along three axes
Weight	Approx. 200 g (including terminal cover)
Degree of protection	IP20
Memory protection	EEPROM (non-volatile memory) (number of writes: 100,000)
Installation environment	Overvoltage category III, pollution degree 2 (according to IEC 60664-1)
Approved standards	UL508 (Listing), CSA22.2 No. 14 EN50178 EN61000-6-4 (EN55011: 1998, A1: 1999 Class A, Group 1) EN61000-6-2: 2001

Note: When measured with percentage selected for the current monitor parameter and the maximum current measurable with the CT at 100%.

■ Communications Specifications

Transmission line connections	Multipoint
Communications method	RS-485
Max. transmission distance	500 m
No. of nodes	31 (via multidrop connections)
Synchronization method	Stop-start synchronization
Communications baud rate	9.6, 19.2, 38.4 or 57.6 kbps, Default: 9.6 kbps
Transmission code	ASCII
Communications data length	7 or 8 bits, Default: 7
Communications stop bits	1 or 2 bits, Default: 2
Communications parity	Vertical parity: None, even, or odd, Default: Even
Flow control	None

■ Current Transformer Specifications (Order Separately)

Item	Specification		
Model number	E54-CT1	E54-CT3	G3ZA-CT150L
Max. continuous heater current	50 A	120 A (See note.)	150 A
Detection current with G3ZA connected	50 A		150 A
Dielectric strength	1,000 VAC for 1 min		2,000 VAC for 1 min
Vibration resistance	98 m/s^2, 50 Hz		
Weight	Approx. 11.5 g	Approx. 50 g	Approx. 130 g
Accessories	None	Connection terminals (2) Plugs (2)	None

Note: The maximum continuous current is 50 A for the G3ZA in combination with the E54-CT3.

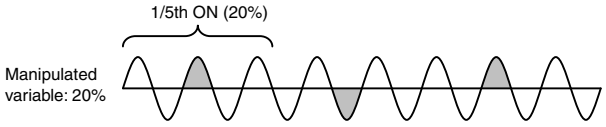
Applicable SSR and Control Methods V2

The G3ZA can be used for a variety of applications by selecting the SSR drive. For example, inrush current can be reduced at startup by selecting soft-start optimum cycle control if a single-phase halogen heater is used.

SSR	Control method	CT (4-channel models only)	Example of supported heater	
Single-phase heater SSR with zero-cross function	Optimum cycle control	0 to 50 A or 0 to 150 A: 4 Units	SIngle-phase heater	
Single-phase heater SSR without zero-cross function	Soft-start optimum cycle control	0 to 50 A or 0 to 150 A: 4 Units	Single-phase halogen heater	V2
Three-phase heater SSR with zero-cross function	Three-phase optimum cycle control	0 to 50 A or 0 to 150 A: up to 2 Units	Three-phase heater	V2

Optimum Cycle Control

- Optimum cycle control is performed by driving SSRs according to load power detection and trigger signals. (Zero-cross SSRs are used.)
- Noise is suppressed while ensure high-speed response by turning outputs ON and OFF each half cycle to achieve high-precision temperature control.



Note: Refer to *Connection Configuration* on page 6 for connecting to an SSR.

Soft-start Optimum Cycle Control V2

- Soft-start optimum cycle control is a control method that combines phase control and optimum cycle control.
- Smooth switching for phase control and optimum cycle control enables control of outputs with limited inrush current even for loads with characteristics like halogen heaters.
- Use a single-phase heater SSR (without the zero-cross function) for soft-start optimum cycle control. Refer to G3PA for details on SSRs without the zero-cross function.
- Control is switched according to the Control Switching MV Threshold.
- Set the Soft-start Up/Down Time to control output.
- Current is not detected during phase control. The current value (heater ON current value, heater OFF current value, and effective current value) will be 0 A, and the current error alarm (heater burnout detection, SSR short-circuit detection, and heater overcurrent detection) will always turn OFF.

Setting the Control Switching MV Threshold

The Control Switching MV Threshold function is enabled when soft-start optimum cycle control is used. Setting the Control Switching MV Threshold enables switching to phase control when the current value is below the set value, and switching to optimum cycle control when the current value is above the set value. The default setting is 20.0%.

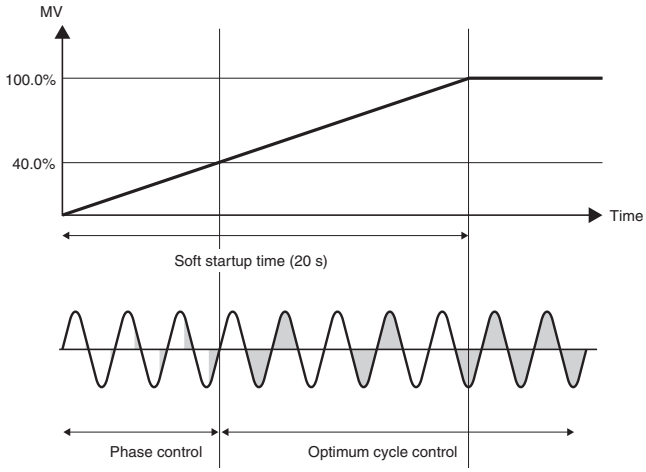
Variable type	Parameter	Setting range	Default
85/C5	Ch1 to Ch8 Control Switching MV Threshold	0.0% to 100.0%	20.0

Example: For channel 1, soft-start optimum cycle control is performed under the following conditions: control switching MV: 40.0%, MV: 100.%, soft startup time: 20 s.

(1) Ch 1 Control Switching MV Threshold is set to 40.0% and Ch1 MV is set to 100.0% by writing to the variable area.

(2) Ch1 Soft Startup Time remains at the default. Setting is not required.

(3) Once the Control Switching MV Threshold is written, the changes are saved and become enabled the next time the power is turned ON.



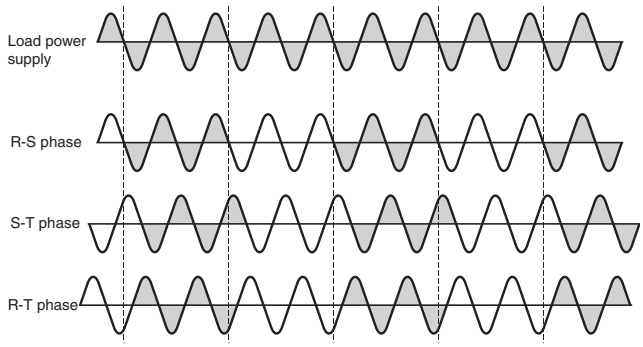
Three-phase Optimum Cycle Control

V2

- Three-phase optimum cycle control is a control method that turns the output ON and OFF every two cycles.
- Turning the output ON and OFF every two cycles enables optimum cycle control for three-phase heaters.
- Use a three-phase heater SSR with a zero-cross function for three-phase optimum cycle control.

Note: Refer to page 6 for details on connecting to three-phase heaters.

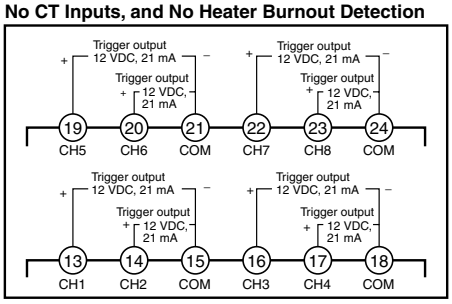
The following figure shows the current waveform of each phase for a MV of 50% when a three-phase heater SSR is connected.



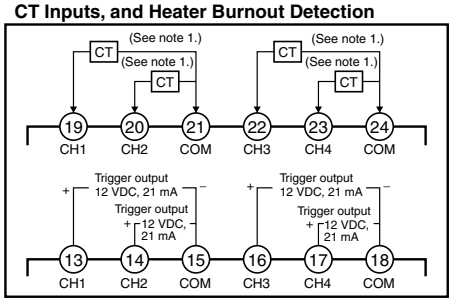
Connections

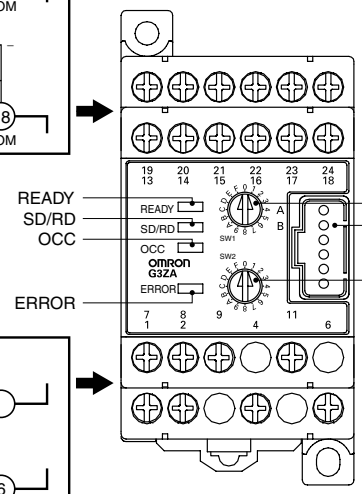
■ Terminal Arrangement

Models with 8 Channels (Control Points), No CT Inputs, and No Heater Burnout Detection

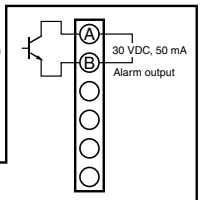


Models with 4 Channels (Control Points), CT Inputs, and Heater Burnout Detection

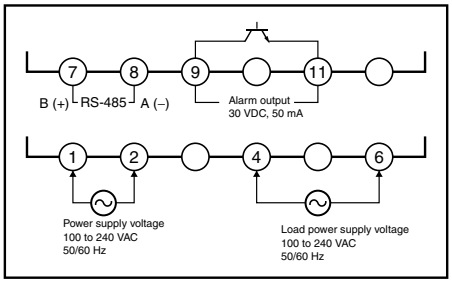




SW1
Alarm output connector (See note 2.)
(only models with load power supply voltage of 400 to 480 V)
SW2

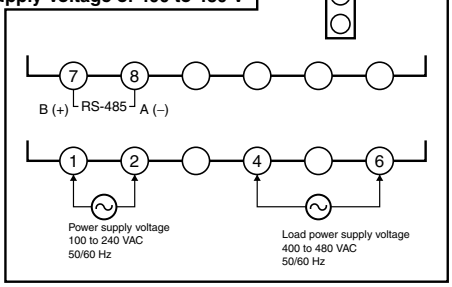


Models with Load Power Supply Voltage of 100 to 240 V



Note: Connect the power supply (100 to 240 VAC) for the G3ZA across terminals 1 and 2 and the load power supply for the SSR loads across terminals 4 and 6.

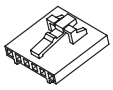
Models with Load Power Supply Voltage of 400 to 480 V



Note: Connect the power supply (100 to 240 VAC) for the G3ZA across terminals 1 and 2 and the load power supply for the SSR loads across terminals 4 and 6.

Note: 1. The following CTs can be used (sold separately):
0 to 50 A: E54-CT1 and E54-CT3
0 to 150 A: G3ZA-CT150L

2. Use C-Grid SL connectors from Molex Inc.



C-Grid SL Housing
Model: 51030-0630

Operation Indicators

Operation indicator	Meaning
READY (Green)	Lit while power is being supplied.
SD/RD (Orange)	Lit while communicating with the host.
OCC (Orange)	Corresponds to the RUN and STOP operating commands. (Lit during operation.)
ERROR (Red)	Lights or flashes when an error is detected.

Setting Switches

- Always turn OFF the power supply before setting the switches. The switch settings are read only when the power supply is turned ON.
- Use a flat-blade screwdriver to set the switches and be sure not to leave a switch set between two settings.

SW1

SW2

Communications Unit Number

Set a communications unit number on SW1 so that the host system can identify the Controller.

SW1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Unit No.	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15

▲ Default

Note: A unique unit number must be set for each node (Controller) on the same communications line. Do not set the same unit number for more than one node.
If 17 or more Units must be connected, refer to the G3ZA Multi-channel Power Controller User's Manual (Cat. No. Z200).

Communications Baud Rate

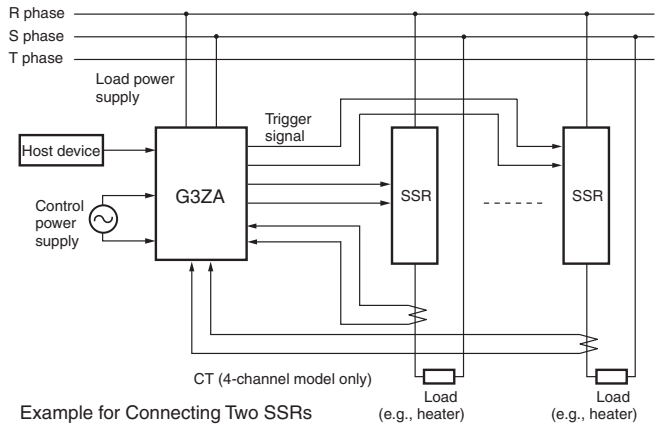
Set the baud rate for communicating with the host system on SW2.

SW2	0	1	2	3	4 to F
Baud rate	9.6	19.2	38.4	57.6	Do not set.

▲ Default

■ Connection Configuration

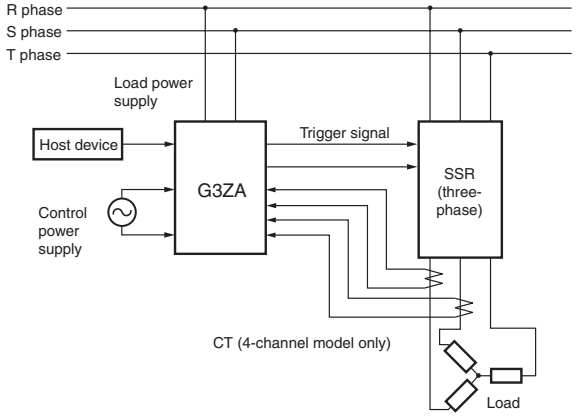
Single-phase SSR



Example for Connecting Two SSRs

Note: Connect a power supply with the same phase as the SSRs to the load power supply terminals on the G3ZA.

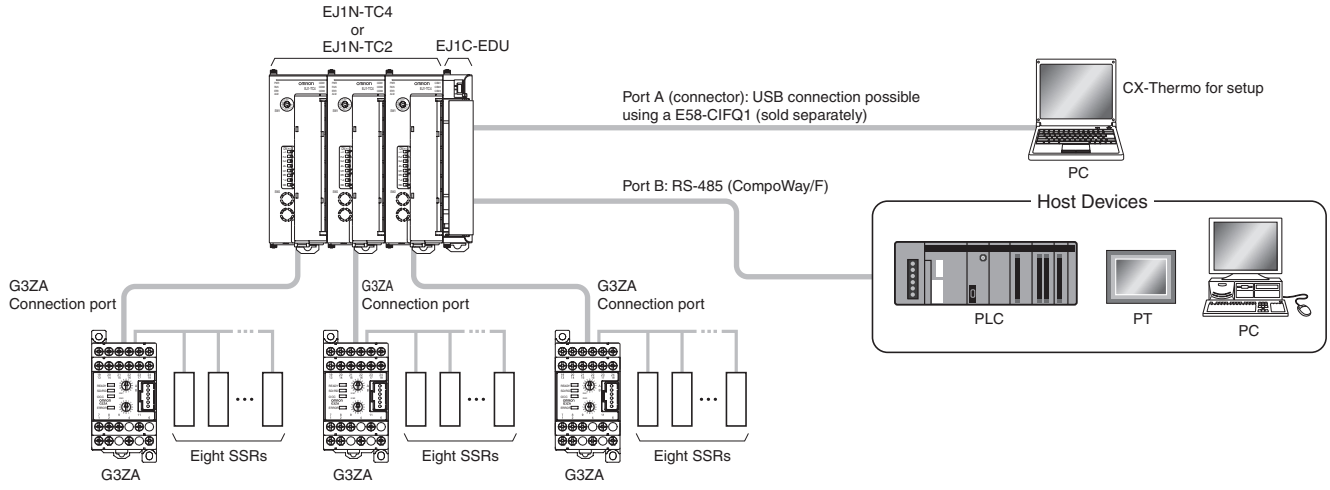
Three-phase SSR V2



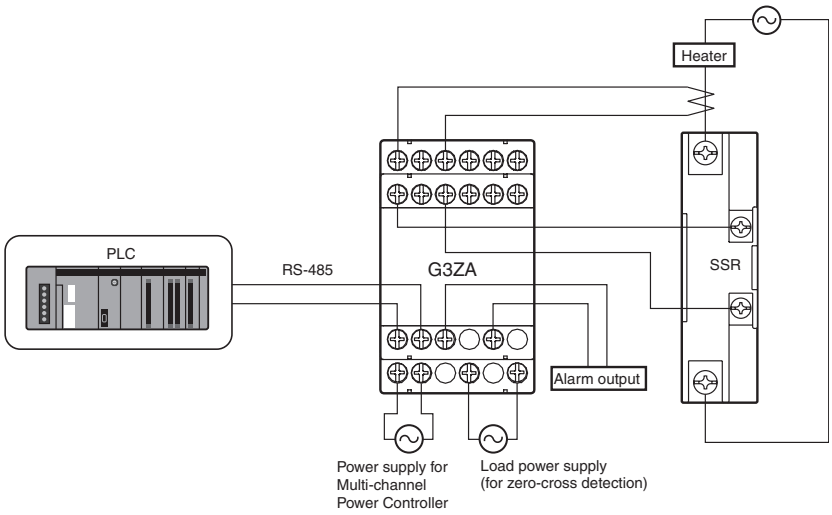
Note: Connect to one of the three phases on the load power supply input terminals of the G3ZA.

■ Host Device Connection Example

Example of Connection to EJ1 Modular Temperature Controller



Example of Connection to PLC



Upgraded Functions V2

Upgraded Functions

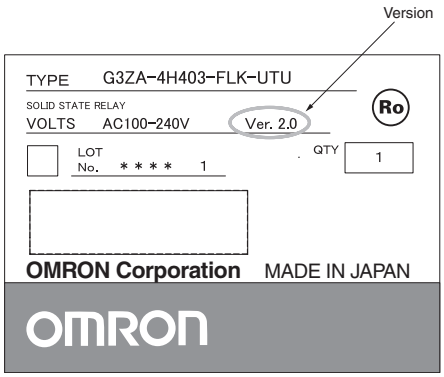
1. Added soft-start optimum cycle control.
2. Added three-phase optimum cycle control.
3. Increased heater burnout detection to 150 A.
4. Achieved effective current value monitoring.
5. Changed current error detection from a fixed value to a variable value.
6. Changed detection time unit to seconds for communications errors.

Upgraded functions are marked with “V2”. V2

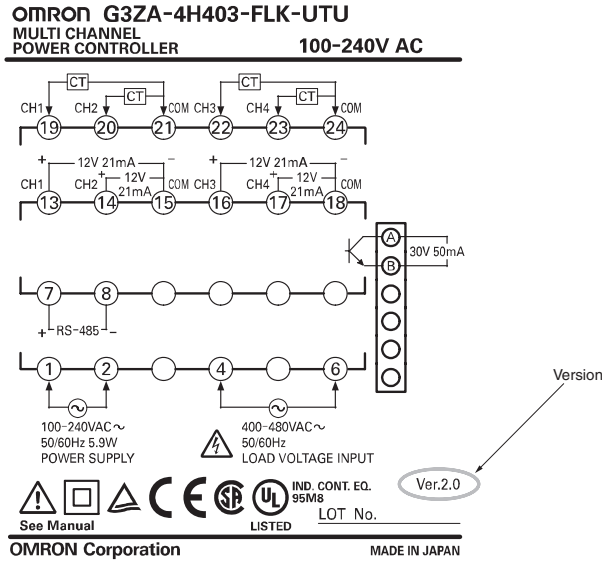
Identifying Upgraded Models

Check the label on the Power Controller or the box to determine the version. Models not marked “Ver. 2.0” are version 1.0.

Box Label



Power Controller Label

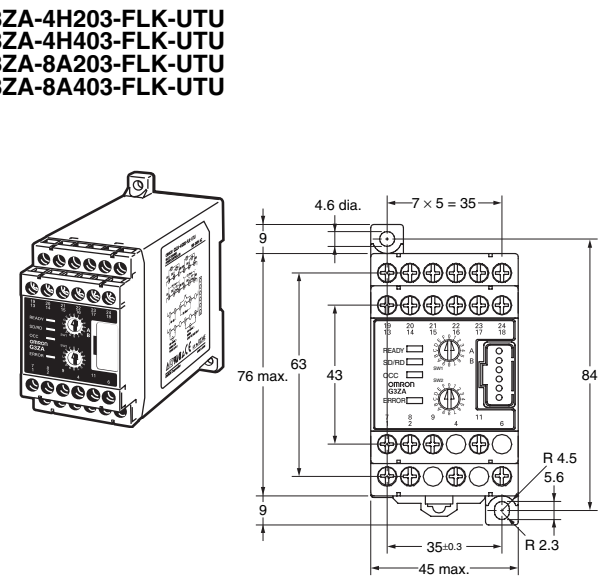


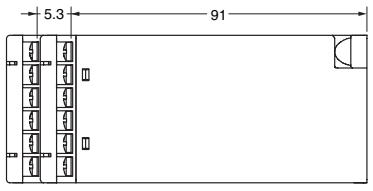
Dimensions

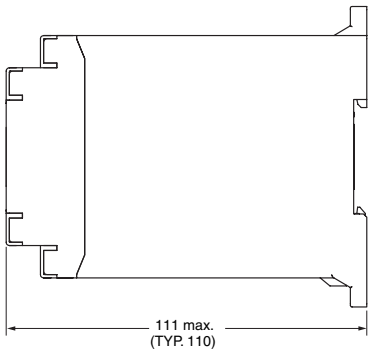
Note: All units are in millimeters unless otherwise indicated.

■ Multi-channel Power Controllers

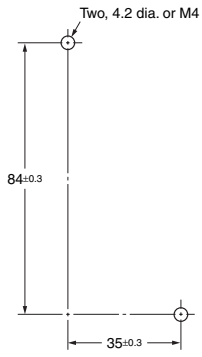
G3ZA-4H203-FLK-UTU
G3ZA-4H403-FLK-UTU
G3ZA-8A203-FLK-UTU
G3ZA-8A403-FLK-UTU







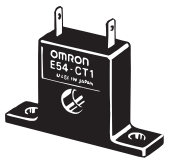
Mounting Hole Dimensions (For Direct Mounting)

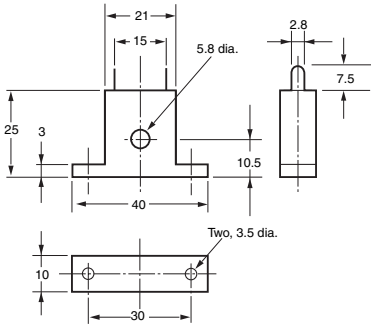


■ Accessories (Order Separately)

Current Transformer (CT)

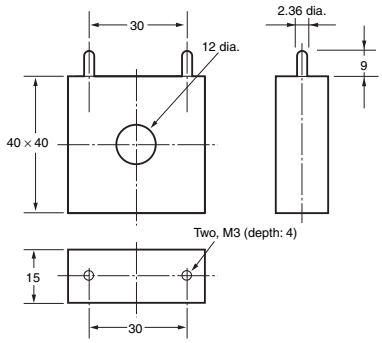
E54-CT1





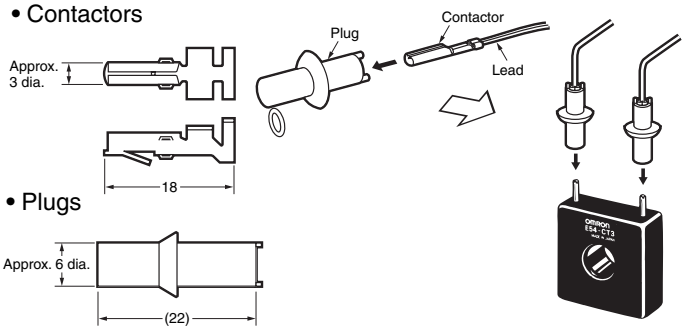
Current Transformer (CT)

E54-CT3



E54-CT3 Accessories

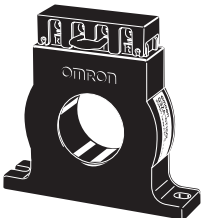
• Contactors

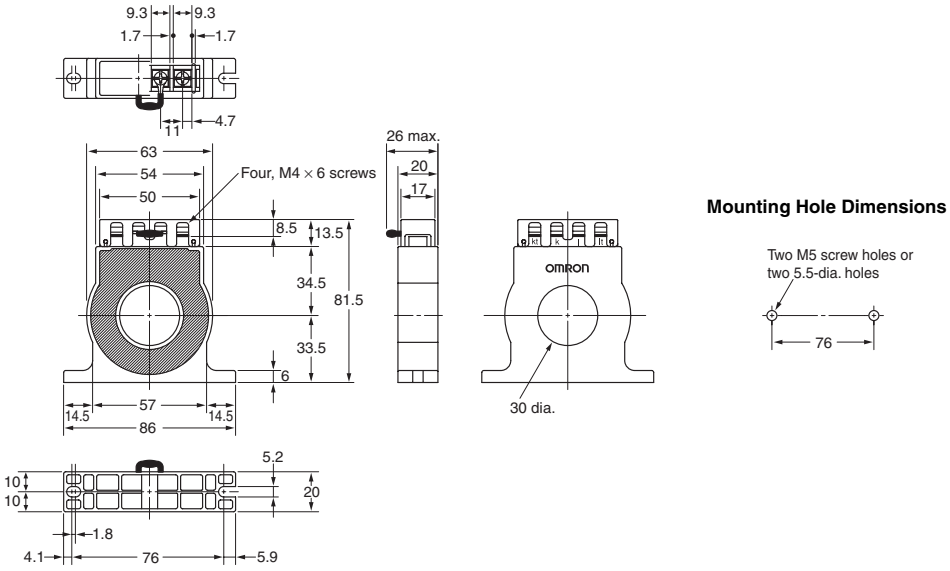


• Plugs

Current Transformer (CT)

G3ZA-CT150L



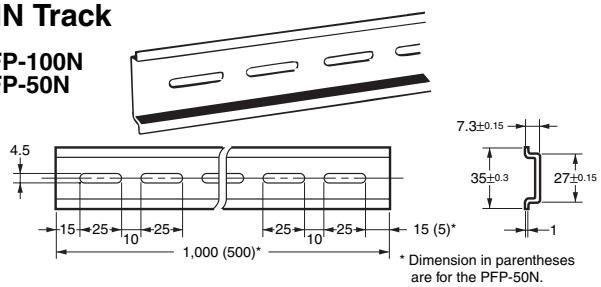


Mounting Hole Dimensions

Note: The G3ZA-CT150L is for use only in combination with the G3ZA.
Wire terminal k and terminal l. (Do not use terminal kt and terminal lt.)

DIN Track

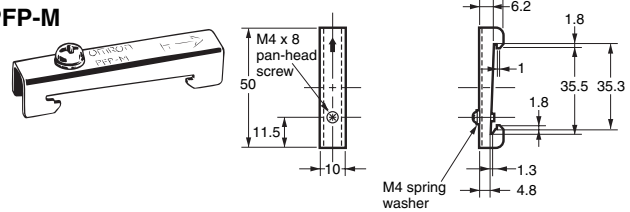
PFP-100N
PFP-50N



* Dimension in parentheses are for the PFP-50N.

End Plate (Stopper)

PFP-M



Safety Precautions

Refer to *Safety Precautions for All Power Controllers*.

⚠ WARNING

Do not touch the terminals and the wires while power is being supplied. Doing so may possibly result in electric shock. Make sure that the terminal cover is installed before using the product.

⚠ CAUTION

Do not allow pieces of metal, wire clippings, or fine metallic chips or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.

Do not use the product in locations of flammable or explosive gases. Doing so may occasionally result in minor or moderate explosion, causing minor or moderate injury, or property damage.

Do not attempt to disassemble, repair, or modify the product. Doing so may occasionally result in minor or moderate injury due to electric shock.

Perform correct setting of the product according to the application. Failure to do so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.

Ensure safety in the event of product failure by taking safety measures, such as installing a separate monitoring system to provide alarms for preventing excessive temperature rise. Product failure may occasionally prevent control operation, resulting in damage to the connected facilities and equipment.

Tighten the terminal screws securely using a tightening torque within the following ranges. Loose screws may occasionally cause fire, resulting in minor or moderate injury, or damage to the equipment.
Terminal screws: 0.40 to 0.56 N·m

■ Precautions for Safe Use

1. Do not use the product in the following locations.
   - Locations subject to direct radiant heat from heating equipment
   - Locations where the product may come into contact with water or oil
   - Locations subject to direct sunlight
   - Locations where dust or corrosive gases (in particular, sulfuric or ammonia gas) are present
   - Locations subject to extreme temperature changes
   - Locations where icing or condensation may occur
   - Locations subject to excessive shocks or vibration
2. Use this product within the rated load and power supply.
3. Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON.
4. Use/store within the rated temperature and humidity ranges.
5. Minimum mounting distance of G3ZA is 10 mm.
   When mounting the G3ZA near the SSRs, mount the G3ZA so as to not interfere with the heat dissipation of the SSR.
6. Use the specified size of insulated-type crimp terminals (M3, width: 5.8 mm max.) for wiring and attach insulative sleeves. To connect bare wires, use AWG22 (cross section: 0.326 mm^2) to AWG14 (cross section: 2.081 mm^2) to wire the power supply terminals and AWG22 (cross section: 0.326 mm^2) to AWG16 (cross section: 1.039 mm^2) for other terminals.
7. Be sure to confirm the correct terminal and polarity when wiring the terminal block and connectors.
8. Do not connect any conductors to unused terminals.
9. In order to prevent inductive noise, wire the lines connected to the product separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using shield lines.
10. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils, or other devices that have an inductance component).
    Do not install the product near devices generating strong high-frequency fields or surges. When using a noise filter, check the voltage and current and install it as close to the product as possible.
11. For a safety disconnection of the power-line in the application, the equipment must be provided with disconnecting devices suitable for isolation.
    (e.g., circuit breakers defined in IEC60947-2, power switches defined in IEC60947-3, power plugs, etc.)

Version 1.0 Usage Precautions

Version 1.0 is for single-phase loads only. Connect a single-phase zero-cross SSR. Do not connect a three-phase SSR, or to an SSR that is not magnet relay or zero-cross.

Version 2.0 Usage Precautions

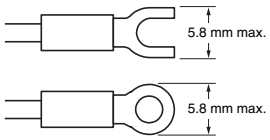
- Check the G3ZA settings and select the correct SSR from the following when wiring an SSR.
  - SSR with zero-cross function for single-phase heaters
  - SSR without zero-cross function for single-phase heaters
  - Three-phase SSR

  Do not connect a magnet relay.
- Check the G3ZA settings and select the correct CT from the following when wiring a CT.
  - E54-CT1
  - E54-CT3
  - G3ZA-CT150L

■ Precautions for Correct Use

Wiring

Use M3 crimp terminals.

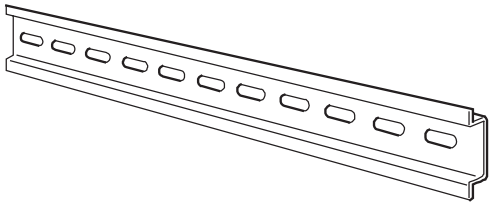


Use wires that withstand a minimum of 70°C.

DIN Track

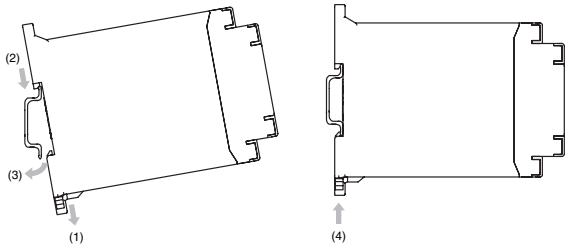
Secure the DIN Track with screws in at least three locations.

DIN Track: PFP-50N (50 cm)/PFP-100N (100 cm)



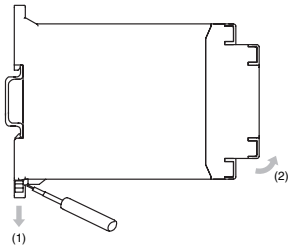
Mounting the G3ZA

Mount the G3ZA as shown in the diagram. First, pull down the DIN Track mounting hook (1) and hook the top of the G3ZA on the DIN Track (2). Then press the G3ZA onto the DIN Track far enough so that it can be locked in place (3) and push the DIN Track mounting hook up to lock the G3ZA in place (4).



Removing the G3ZA

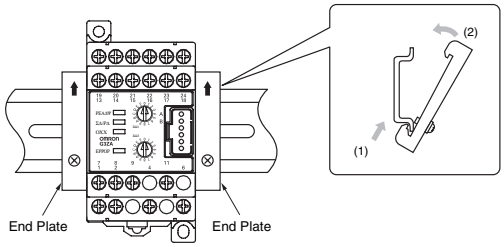
Use a flat-blade screwdriver to pull down the DIN Track mounting hook (1) and then pull out on the bottom of the G3ZA (2).



Mounting End Plates

Be sure to mount an End Plate on each side of the G3ZA so that it does not slide on the DIN Track.

To mount an End Plate, hook the bottom of the End Plate on the bottom of the DIN Track (1), place the top of the End Plate on the DIN Track (2), and then pull down on the End Plate. Tighten the screw on the End Plate to secure it.



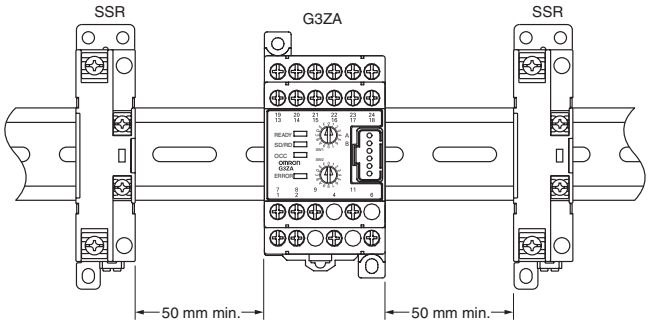
Note: Always mount one End Plate on each side of the G3ZA.

Installation Example

When installing the SSRs next to the G3ZA, provide sufficient space between the G3ZA and SSRs, as shown in the following diagram.

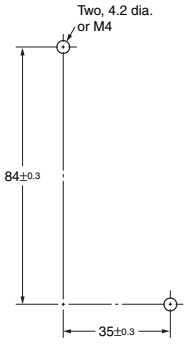
Reference example:
When applying 25 A to the G3PB-225B-VD (a manipulated variable of 100%), **separate the SSRs from the G3ZA by at least 50 mm**.

Do not touch the G3ZA while power is being supplied.



Mounting with Screws

Mounting Dimensions (Unit: mm)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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2008.11

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