### Optimum Cycle Control for High-precision Control with Low Noise

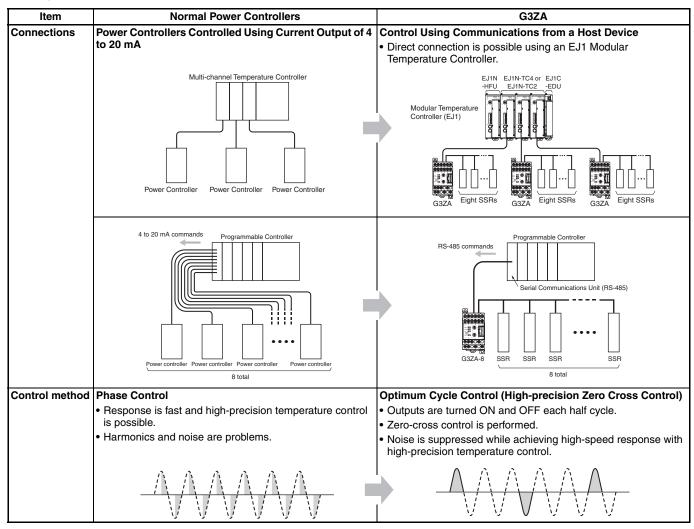
- Smaller than a Normal Power Controller.
- Enables low-noise power control in combination with zero-cross SSRs. (See note.)
- One Controller can control up to 8 SSRs.
- RS-485 communications to set manipulated variables and heater burnout detection. The Smart FB Library for the G3ZA can also be used.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

# **Features**

## Comparison between the G3ZA and Normal Power Controllers



CSM\_G3ZA\_DS\_E\_6\_1



Refer to Safety Precautions on page 9.

# **Model Number Structure**

# Model Number Legend

# 

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	Н	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	υτυ	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	4	Supported	100 to 240 VAC	G3ZA-4H203-FLK-UTU
Controller			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.

# Accessories (Order Separately)

Name	Hole diameter	Detection current	Model
	5.8 dia.	0 to 50 A	E54-CT1
(CT)	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

Load power supply Item voltage range		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 communication	s)	
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)		
Trigger output	One voltage output for each channel, 12 VDC $\pm$ 15%, Max. load current: 21 mA (with built-in short-circuit protection circuit)		
Alarm output	VPN open collector, one output /lax. 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.) Three-phase optimum cycle control		
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, $\pm$ 3 A 0 to 150 A, $\pm$ 9 A 0 to 100%, $\pm$ 6% (See note.) (for models with heater burnout detection)	
Insulation resistance	100 $M\Omega$ 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 <sup>2</sup> in X, Y, and Z directions	
Shock resistance	300 m/s <sup>2</sup> 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	
	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	
	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/s², 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

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
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

## **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.

1/5th ON (20%) Control Capacity: 20%

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

## Soft-start Optimum Cycle Control

- Soft-start 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.
- Set the Soft-start Up/Down Time to control output.
- Current is not detected during Soft-start. 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.

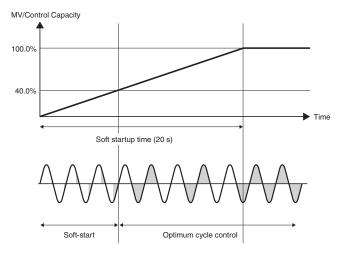
### Setting the Control Switching MV Threshold

The Control Switching MV Threshold function is enabled when softstart optimum cycle control is used. Setting the Control Switching MV Threshold enables switching to soft-start 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.

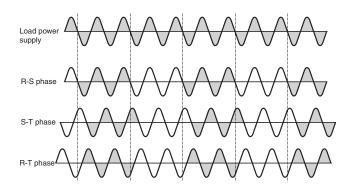
- (1) Ch 1 Control Switching MV Threshold is set to 40.0% and Ch1 MV is set to 100.0% by writing to the variable area.
- (2) Ch1 Soft Startup Time remains at the default. Setting is not required.
- (3) Once the Control Switching MV Threshold is written, the changes are saved and become enabled the next time the power is turned ON.



### Three-phase Optimum Cycle Control

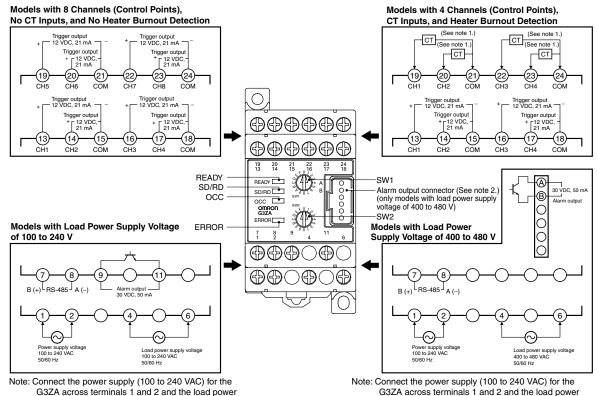
- Three-phase optimum cycle control is a control method that turns the output ON and OFF every two cycles.
- Turning the output ON and OFF every two cycles enables optimum cycle control for three-phase heaters.
- Use a three-phase heater SSR with a zero-cross function for threephase optimum cycle control.
- 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 Control Capacity of 50% when a three-phase heater SSR is connected.



# Connections

## Terminal Arrangement



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: 50-57-9406 (70066-0180)

	Part Number	Packaging	Wire size
Housing	50-57-9406		-
Crinp Terminal	16-02-0069	Reel	AWG#24 to 30
Terminal	16-02-0086	Reel	AWG#22 to 24
	16-02-0096	Bag	AWG#24 to 30
	16-02-0102	Bag	AWG#22 to 24
Hand	63811-8800		AWG#24 to 30
Crimp Tool	63811-8700		AWG#22 to 24

## **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.





## **Communications Unit Number**

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

supply for the SSR loads across terminals 4 and 6.

SW1	0	1	2	3	4	5	6	7	8	9	А	В	С	D	Е	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 Multichannel Power Controller User's Manual (Cat. No. Z200).

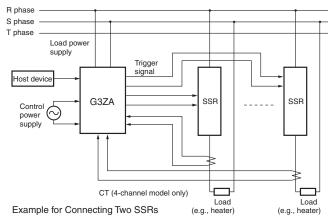
## Communications Baud Rate

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.

# ■ Connection Configuration

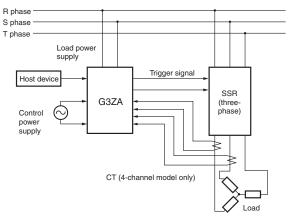
## Single-phase SSR



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

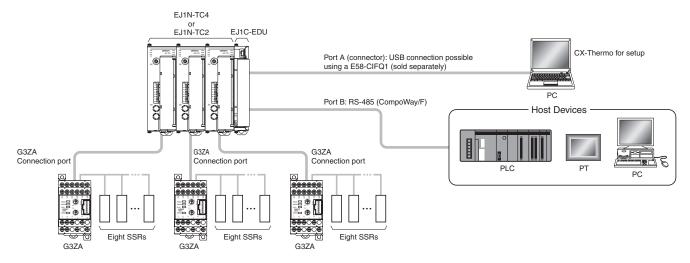
Host Device Connection Example

## Three-phase SSR

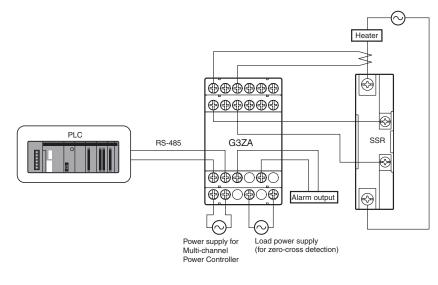


Note: Connect to one of the three phases on the load power supply input terminals of the G3ZA.

# Example of Connection to EJ1 Modular Temperature Controller



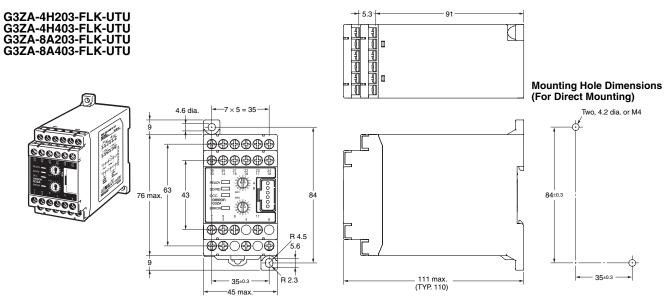
## Example of Connection to PLC



# Dimensions

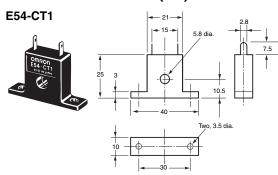
Note: All units are in millimeters unless otherwise indicated.

# Multi-channel Power Controllers

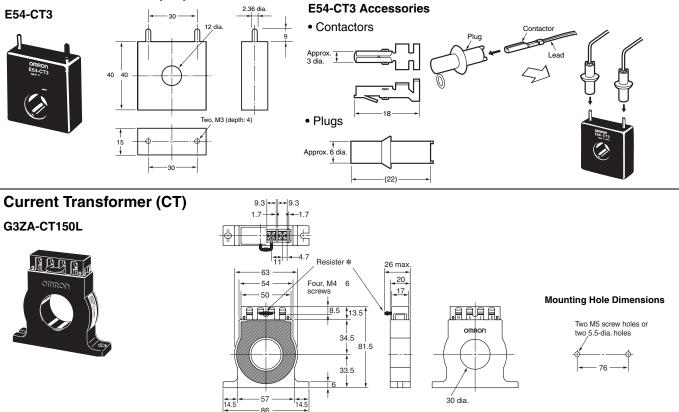


# ■ Accessories (Order Separately)

### Current Transformer (CT)



### **Current Transformer (CT)**

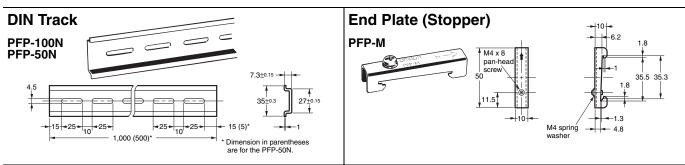


4.1→+||→−5.9 Note: The G3ZA-CT150L is for use only in combination with the G3ZA (Ver.2.0 or higher). Wire terminal k and terminal I. (Do not use terminal kt and terminal It.)

**⊷**1.8

10 10

\* Do not remove the attached resister.



20

#### 

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.

### 

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<sup>2</sup>) to AWG14 (cross section: 2.081 mm<sup>2</sup>) to wire the power supply terminals and AWG22 (cross section: 0.326 mm<sup>2</sup>) to AWG16 (cross section: 1.039 mm<sup>2</sup>) 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 highfrequency 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.

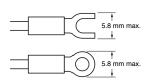
- Check the G3ZA settings and select the correct CT from the following when wiring a CT.
  - E54-CT1
  - E54-CT3
  - G3ZA-CT150L

9

# Precautions for Correct Use

### <u>Wiring</u>

Use M3 crimp terminals.

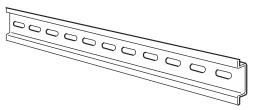


Use wires that withstand a minimum of 70°C.

### **DIN Track**

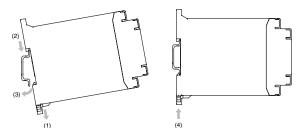
Secure the DIN Track with screws in at least three locations.

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



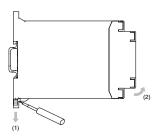
#### Mounting the G3ZA

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**

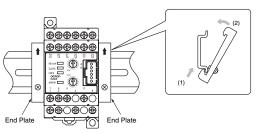
Use a flat-blade screwdriver to pull down the DIN Track mounting hook (1) and then pull out on the bottom of the G3ZA (2).



### **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.



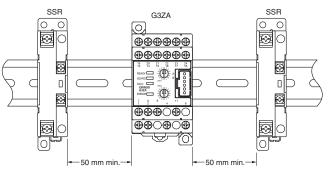
Note: Always mount one End Plate on each side of the G3ZA.

### 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:

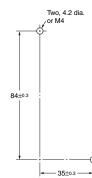
When applying 25 A to the G3PE-225B (a manipulated variable of 100%), separate the SSRs from the G3ZA by at least 50 mm.

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.

#### **Read and Understand This Catalog**

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

#### Warranty and Limitations of Liability

#### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

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#### **Application Considerations**

#### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- · Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- · Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

#### **PROGRAMMABLE PRODUCTS**

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

#### Disclaimers

#### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

#### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

#### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

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Industrial Automation Company

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