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 for 150-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

<table>
<thead>
<tr>
<th>Item</th>
<th>Normal Power Controllers</th>
<th>G3ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections</td>
<td>Power Controllers Controlled Using Current Output of 4 to 20 mA</td>
<td>Control Using Communications from a Host Device</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-channel Temperature Controller</td>
<td>Modular Temperature Controller (EJ1)</td>
</tr>
<tr>
<td></td>
<td>Power Controller Power Controller Power Controller</td>
<td>G3ZA Eight SSRs G3ZA Eight SSRs G3ZA Eight SSRs</td>
</tr>
<tr>
<td></td>
<td>4 to 20 mA commands Programmable Controller</td>
<td>RS-485 commands Programmable Controller</td>
</tr>
<tr>
<td></td>
<td>Power controller Power controller Power controller</td>
<td>Power controller Power controller Power controller</td>
</tr>
<tr>
<td></td>
<td>B total</td>
<td>B total</td>
</tr>
<tr>
<td>Control method</td>
<td>Phase Control</td>
<td>Optimum Cycle Control (High-precision Zero Cross Control)</td>
</tr>
<tr>
<td></td>
<td>- Response is fast and high-precision temperature control is possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Harmonics and noise are problems.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Outputs are turned ON and OFF each half cycle.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Zero-cross control is performed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Noise is suppressed while achieving high-speed response with high-precision temperature control.</td>
</tr>
</tbody>
</table>

Refer to Safety Precautions on page 9 for safety information.
Model Number Structure

■ Model Number Legend

G3ZA-□□□□□□ - □ - □

<table>
<thead>
<tr>
<th>No.</th>
<th>Meaning</th>
<th>Code</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No. of control points</td>
<td>4</td>
<td>4 channels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>8 channels</td>
</tr>
<tr>
<td>2</td>
<td>Control method</td>
<td>None</td>
<td>Optimum cycle control</td>
</tr>
<tr>
<td>3</td>
<td>Heater burnout detection</td>
<td>H</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>None</td>
</tr>
</tbody>
</table>

Ordering Information

■ List of Models

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of control channels</th>
<th>Heater burnout detection</th>
<th>Load power supply voltage</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-channel Power Controller</td>
<td>4</td>
<td>Supported</td>
<td>100 to 240 VAC</td>
<td>G3ZA-4H203-FLK-UTU</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Not supported</td>
<td>400 to 480 VAC</td>
<td>G3ZA-4H403-FLK-UTU</td>
</tr>
</tbody>
</table>

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

Upgraded Functionality

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

■ Accessories (Order Separately)

<table>
<thead>
<tr>
<th>Name</th>
<th>Hole diameter</th>
<th>Detection current</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Transformer (CT)</td>
<td>5.8 dia.</td>
<td>0 to 50 A</td>
<td>ES4-CT1</td>
</tr>
<tr>
<td></td>
<td>12.0 dia.</td>
<td>0 to 50 A</td>
<td>ES4-CT3</td>
</tr>
<tr>
<td></td>
<td>30.0 dia.</td>
<td>0 to 150 A</td>
<td>G3ZA-CT150L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN Track</td>
<td>PFP-100N</td>
</tr>
<tr>
<td>End Plates (stoppers)</td>
<td>PFP-M</td>
</tr>
</tbody>
</table>
Specifications

■ Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Load power supply voltage range</th>
<th>100 to 240 VAC</th>
<th>400 to 480 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>100 to 240 VAC (50/60 Hz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>85 to 264 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>16 VA max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load power supply voltage</td>
<td>100 to 240 VAC</td>
<td></td>
<td>400 to 480 VAC</td>
</tr>
<tr>
<td>Load power supply voltage</td>
<td>75 to 264 VAC</td>
<td>340 to 528 VAC</td>
<td></td>
</tr>
<tr>
<td>Manipulated variable input</td>
<td>0.0% to 100.0% (via RS-485 communications)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

■ Performance

- Optimum cycle control
- Soft-start optimum cycle control (See note 2.)
- Three-phase optimum cycle control

Current indication accuracy

- Current Range:
  - 0 to 50 A, ±9 A
  - 0 to 150 A, ±9 A
- 0 to 100%, ±6% (See note.)

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/s² in X, Y, and Z directions

Shock resistance

- 300 m/s² 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
- EN60100-6-4 (EN55011: 1998, A1: 1999 Class A, Group 1
- EN61000-6-2: 2001

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)

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

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 page 11.)

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.

### 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 ensuring high-speed response by turning outputs ON and OFF each half cycle to achieve high-precision temperature control.

### Soft-start Optimum Cycle Control

- 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 on page 11 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 burn-out detection, SSR short-circuit detection, and heater overcurrent detection) will always turn OFF.

### 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 three-phase optimum cycle control.

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

### 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%.

<table>
<thead>
<tr>
<th>Variable type</th>
<th>Parameter</th>
<th>Setting range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch1 to Ch8 Control Switching MV Threshold</td>
<td>0.0% to 100.0%</td>
<td>20.0</td>
<td></td>
</tr>
</tbody>
</table>

Example: For channel 1, soft-start optimum cycle control is performed under the following conditions: control switching MV: 40.0%, MV: 100.0%, soft startup time: 20 s.

1. Ch1 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.
Connections

■ Terminal Arrangement

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

Models with Load Power Supply Voltage of 100 to 240 V

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

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

<table>
<thead>
<tr>
<th>Operation indicator</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>READY (Green)</td>
<td>Lit while power is being supplied.</td>
</tr>
<tr>
<td>SD/RD (Orange)</td>
<td>Lit while communicating with the host.</td>
</tr>
<tr>
<td>OCC (Orange)</td>
<td>Lit while a control output is ON.</td>
</tr>
<tr>
<td>ERROR (Red)</td>
<td>Lights or flashes when an error is detected.</td>
</tr>
</tbody>
</table>

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.

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

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.

<table>
<thead>
<tr>
<th>SW2</th>
<th>Baud rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9.6</td>
</tr>
<tr>
<td>1</td>
<td>19.2</td>
</tr>
<tr>
<td>2</td>
<td>38.4</td>
</tr>
<tr>
<td>3</td>
<td>57.6</td>
</tr>
<tr>
<td>4</td>
<td>Do not set.</td>
</tr>
</tbody>
</table>

Default
## Connection Configuration

### Single-phase SSR

- R phase
- S phase
- T phase

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

### Three-phase SSR

- R phase
- S phase
- T phase

**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 for Connecting Two SSRs**

- **Example for Connecting Eight SSRs**

### Example of Connection to PLC

- **Heater**
- **Power supply for Multi-channel Power Controller**
- **Load power supply (for zero-cross detection)**
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.

New 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

OMRON Corporation MADE IN JAPAN

Power Controller Label

OMRON G3ZA-4H403-FLK-UTU
MULTI CHANNEL POWER CONTROLLER
100-240V AC

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
■ Accessories (Order Separately)

**Current Transformer (CT)**

E54-CT1

```
25 3
30 10.5
21 15
40 10.8
```

E54-CT3

```
48 30 dia.
12 dia.
20 30 dia.
```

E54-CT3 Accessories

- **Contactors**
  - Approx. 3 dia.
  - Plug
  - Contactor
  - Lead

- **Plugs**
  - Approx. 6 dia.

**Current Transformer (CT)**

G3ZA-CT150L

```
4.8
1.3
1.8
1.0
```

**Mounting Hole Dimensions**

- Two M5 screw holes or two 5.5-dia. holes

**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

```
4.5
```

PFP-50N

```
4.5
```

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

**End Plate (Stopper)**

PFP-M

```
M4 x 8
```

M4 spring washer

1.5
1.8
6.2
4.8
1.3
Safety Precautions

**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.

**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 not to 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 mm²) to AWG14 (cross section: 2.081 mm²) to wire the power supply terminals and AWG22 (cross section: 0.326 mm²) to AWG16 (cross section: 1.039 mm²) 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)

Two, 4.2 dia. or M4
Terms and Conditions of Sale

1. Offer; Acceptance. These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Corporation, LLC, and its subsidiaries ("Omron"). Any reference to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.

2. Prices; Payment Terms. Unless otherwise expressly agreed in writing by Omron:
   a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
   b. Such carrier shall act as the agent of Buyer and deliver to such carrier shall constitute delivery to Buyer.
   c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron).
   d. Delivery and shipping dates are estimates only; and
   e. Omron will invoice Products as it deems necessary to protect against normal handling and extra charges apply to special conditions.

3. Discounts. Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.

4. Interest. Omron, at its option, may charge Buyer 1-1/2% interest per month or any other interest rate which in any case shall not exceed the maximum rate permitted by law, for any unpaid accounts.

5. Orders. Omron will accept no order less than $200 net billing.

6. Governmental Approvals. Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.

7. Taxes. All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties on Buyer's use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.

8. Financial. If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron shall have the right to hold any shipments or require 100% prepayment and security or payment in advance. If Buyer fails to make payment or otherwise comply with the terms of any related agreement, Omron may, at its option and in addition to other remedies, cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts due and unpaid amounts payable by Buyer with respect to any invoice or claims or expenses regarding the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained.

9. Cancellation; Etc. Orders are not subject to rescheduling or cancellation without notice by Omron. Omron reserves the right to increase or decrease prices in effect at the time of the order. Buyer shall in any event remain liable for all costs involved in, obtaining any government approvals required for the importation or sale of the Products.

10. Force Majeure. Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.

11. Shipping, Delivery. Unless otherwise expressly agreed in writing by Omron:
   a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
   b. Such carrier shall act as the agent of Buyer and deliver to such carrier shall constitute delivery to Buyer.
   c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron).
   d. Delivery and shipping dates are estimates only; and
   e. Omron will invoice Products as it deems necessary to protect against normal handling and extra charges apply to special conditions.

12. Claims. Any claim by Buyer against Omron for shortage or damage to the Products before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products in good order.

13. Warranties. (a) Exclusive Warranty. Omron's exclusive warranty is that the Products are free from defects in materials and workmanship. Omron disclaims any and all warranties to the contrary. This warranty shall expire twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS.

14. Limitation on Liability; Etc. OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

15. Indemnification. Buyer shall indemnify and hold harmless Omron Companies and their employees from and against all liabilities, losses, claims, costs and expenses (including attorneys' fees, interest and investigative services) which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.

16. Property, Confidentiality. Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron Companies. All information supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.

17. Export Controls. Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other prescribed persons; and (iii) disclosure to non-citizens of regulated technology or information.

18. Miscellaneous. (a) Waiver. No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) Assignment. Buyer may not assign its rights hereunder without Omron's written consent. (c) Law. These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). Any dispute must be presented to the courts between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (d) Severability. If any provision hereof is rendered invalid, such invalidity shall not invalidate any other provision. (e) Setoff. Buyer shall have no right to set off any amounts against any of the obligations of Omron for payment of any amounts due to Buyer. (f) Language. All communications herein, including "including without limitation": and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.
Complete “Terms and Conditions of Sale” for product purchase and use are on Omron’s website at www.omron247.com – under the “About Us” tab, in the Legal Matters section.

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