# Floatless Level Switch (Basic Type)
# 61F-G□

CSM_61F-G__DS_E_4_1

## Basic Building-block Controllers That Mount Directly to Panels for Easier Maintenance

- Easy maintenance with building-block Relay Units.
- Easy identification of operating status with LED operation indicator.
- Lineup includes models for tropical regions and for high temperatures. Achieve stable detection even in high-temperature environments.

⚠ Refer to *Safety Precautions for Floatless Level Controllers.*

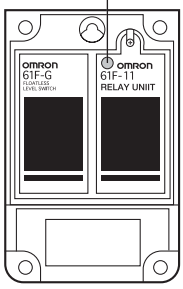
# Model Number Structure

**61F-□□**
**1 2**

**1. Control Application**
- G: Automatic water supply and drainage
- G1: Automatic water supply with idling prevention or water shortage alarm
- G2: Automatic water supply and drainage with abnormal water increase alarm
- G3: Automatic water supply and drainage with full tank and water shortage alarm
- G4: Automatic water supply with water level indicator for water supply tank and water receiving tank and prevention of idling due to water shortage
- I: Liquid level indication and alarm (no two-wire models)

**2. Type**
- Blank: General-purpose
- L 2KM: Long-distance (for 2 km)
- L 4KM: Long-distance (for 4 km)
- H: High-sensitivity
- D: Low-sensitivity
- R: Two-wire
- T: High-temperature

Position of LED indicator




# Ordering Information

| Type | General-purpose | Long-distance, 2 km | Long-distance, 4 km | High-sensitivity |
|---|---|---|---|---|
| | Model | Model | Model | Model |
| **Application G** | 61F-G | 61F-GL 2KM | 61F-GL 4KM | 61F-GH |
| **Application G1** | 61F-G1 | 61F-G1L 2KM | 61F-G1L 4KM | 61F-G1H |
| **Application G2** | 61F-G2 | 61F-G2L 2KM | 61F-G2L 4KM | 61F-G2H |
| **Application G3** | 61F-G3 | 61F-G3L 2KM | 61F-G3L 4KM | 61F-G3H |
| **Application G4** | 61F-G4 | 61F-G4L 2KM | 61F-G4L 4KM | 61F-G4H |
| **Application I** | 61F-I | 61F-IL 2KM | 61F-IL 4KM | 61F-IH |
| **Relay Unit** | 61F-11 | 61F-11L 2KM | 61F-11L 4KM | 61F-11H |

| Type | Low-sensitivity | 2-wire | Tropical environments | High-temperature |
|---|---|---|---|---|
| | Model | Model | Model | Model |
| **Application G** | 61F-GD | 61F-GR | 61F-G-TDL | 61F-GT |
| **Application G1** | 61F-G1D | 61F-G1R | 61F-G1-TDL | 61F-G1T |
| **Application G2** | 61F-G2D | 61F-G2R | 61F-G2-TDL | 61F-G2T |
| **Application G3** | 61F-G3D | 61F-G3R | 61F-G3-TDL | 61F-G3T |
| **Application G4** | 61F-G4D | 61F-G4R | 61F-G4-TDL | 61F-G4T |
| **Application I** | 61F-ID | --- | 61F-I-TDL | 61F-IT |
| **Relay Unit** | 61F-11D | 61F-11R | --- | 61F-11T |

**Note:** When ordering, specify the desired operating voltage at the end of the model number.

Example: 61F-G [110/220 VAC]
└ Desired supply voltage

# Specifications

## ■ Standard Models

### Specifications

| Items | General-purpose Controller<br>61F-□ (TDL)<br>(see note 1 and 2) | High-temperature Controller<br>61F-□T<br>(see note 1) | Long-distance Controllers<br>61F-□L 2KM<br>(for 2 km)<br>61F-□L 4KM<br>(for 4 km)<br>(see note 1) | High-sensitivity Controllers<br>61F-□H<br>(see note 1) | Low-sensitivity Controller<br>61F-□D<br>(see note 1) | Two-wire Controller<br>61F-□R<br>(see note 1) |
|---|---|---|---|---|---|---|
| **Controlling materials and operating conditions** | For control of ordinary purified water or sewage water | For control of ordinary purified water or sewage water in cases where the ambient temperature is high. | For control of ordinary purified water in cases where the distance between sewage pumps and water tanks or between receiver tanks and supply tanks is long or where remote control is required. | For control of liquids with high specific resistance such as distilled water | For control of liquids with low specific resistance such as salt water, sewage water, acid chemicals, alkali chemicals | For control of ordinary purified water or sewage water used in combination with Two-wire Electrode Holder (incorporating a resistor of 6.8 kΩ) It is possible to wire with less than one wiring against general 61F's wiring. |
| **Supply voltage** | 100, 110, 120, 200, 220 or 240 VAC; 50/60 Hz | | | | | |
| **Operating voltage range** | 85% to 110% of rated voltage | | | | | |
| **InterElectrode voltage** | 8 VAC | | | 24 VAC | 8 VAC | |
| **InterElectrode current** | Approx. 1 mA AC max. | | | | | |
| **Power consumption** | 61F-G□: 3.5 VA max.; G1F-G1□, G1F-G2□, or G1F-I□: 5.5 VA max.; G1F-G3□: 7.5 VA max.; G1F-G4□: 14.5 VA max. | | | | | |
| **InterElectrode operate resistance** | 0 to approx. 4 kΩ | 0 to approx. 5 kΩ | 0 to approx. 1.8 kΩ (for 2 km)<br>0 to approx. 0.7 kΩ (for 4 km) | Approx. 15 kΩ to 70 kΩ<br>(see note 5) | 0 to approx. 1.8 kΩ | 0 to approx. 1.1 kΩ |
| **InterElectrode release resistance** | Approx. 15 k to ∞ Ω | Approx. 15 k to ∞ Ω | 4 k to ∞ Ω (for 2 km)<br>2.5 k to ∞ Ω (for 4 km) | Approx. 300 k to ∞ Ω | Approx. 5 k to ∞ Ω | Approx. 15 k to ∞ Ω |
| **Cable length (see note 3)** | 1 km max. | 600 m max. | 2 km max.<br>4 km max. | 50 m max. | 1 km max. | 800 m max. |
| **Control output** | 2 A, 220 VAC (Inductive load: cosϕ = 0.4)<br>5 A, 220 VAC (Resistive load) | | | | | |
| **Ambient temperature** | Operating: –10 to 55°C (–10 to 70°C for 61F-□T) | | | | | |
| **Ambient humidity** | Operating: 45% to 85% RH | | | | | |
| **Insulation resistance (see note 4)** | 100 MΩ min. (at 500 VDC) | | | | | |
| **Dielectric strength (see note 4)** | 2000 VAC, 50/60 Hz for 1 min. | | | | | |
| **Life expectancy** | Electrical: 500,000 operations min.<br>Mechanical: 5,000,000 operations min. | | | | | |
| **Weight** | 61F-G□: Approx. 380 g, G1F-G1□, G1F-G2□, or G1F-I□: Approx. 750 g; G1F-G3□: Approx. 930 g;<br>G1F-G4□: Approx. 1,710 g | | | | | |

**Note: 1.** The □ in the model name represents G, G1, G2, G3, G4, and I.

**2.** The suffix "TDL" attached to the model name represents models designed for tropical regions (storage humidity of 45% to 90%). For details, refer to *Safety Precautions for Floatless Level Controllers*.

**3.** The length when using completely-insulated, 600-V, 3-conductor (0.75 $mm^2$) cabtire cables. Usable cable lengths will become shorter as the cable diameter or number of conductors becomes larger. For details, refer to *Safety Precautions for Floatless Level Controllers*.

**4.** The insulation resistance and dielectric strength indicate values between power terminals and Electrode terminals, between power terminals and contact terminals, and between Electrode terminals and contact terminals.

**5.** Possible to use with 15 kΩ or less, however, this may cause reset failure.

**6.** High-sensitivity Controllers use advanced operation.
When the power supply voltage is applied, if there are some liquids between the electrodes (ground and operation electrodes), the internal relay will not operate.
When the power supply voltage is applied, if there are no liquids between the electrodes (ground and operation electrodes), the internal relay will operate.

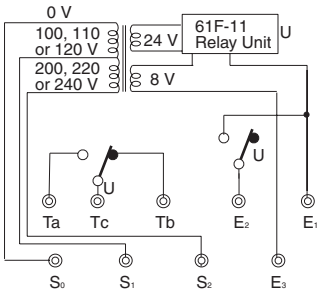
• Advanced Operation

With advanced operation, the internal relay operates as soon as control power is supplied to the G1F and is reset when current flows between the poles. Wiring is the same as for models with sequential operation.

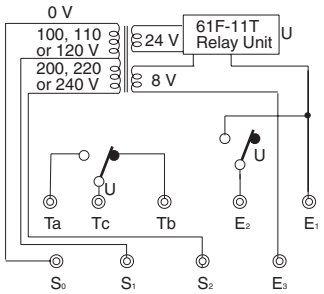
## Internal Circuit Diagrams

The schematic diagrams shown below typify the internal connections of the various 61F models. The designations Ta, Tb, and Tc (sometimes referred to collectively as “U”) may occur more than once in a product, however, the “a” terminal is always an NO contact, a “b” terminal is an NC contact, and the “c” terminal is the common terminal.

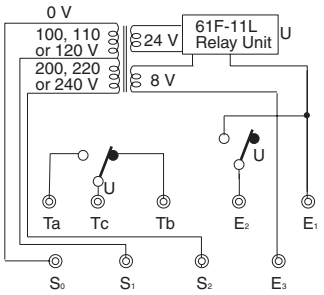
**61F-G**



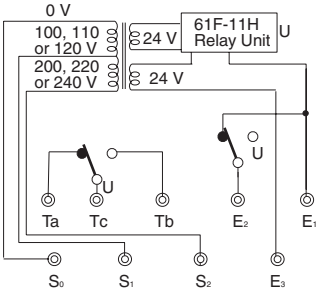

**61F-GT**



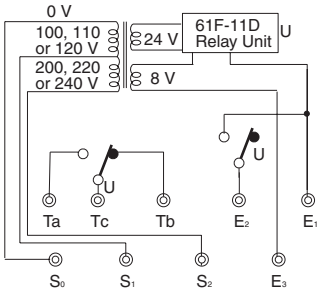

**61F-GL**



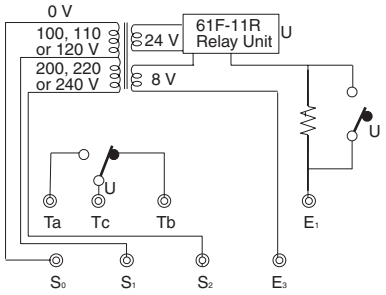

**61F-GH (See note.)**




**61F-GD**




**61F-GR**

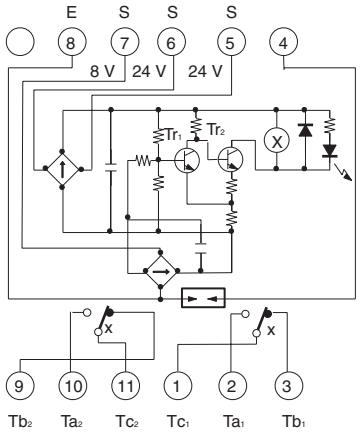


**Note:** The 61F11H relay deenergizes when there is water present across the Electrodes, whereas the 61F relay energizes when there is water present across the Electrodes.
Also, the terminal connections of those Controllers provided with LED indicators differ from those which have no indicators.

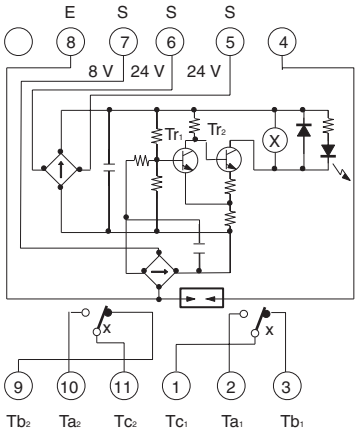
## 61F-11 Relay Units

| Item | 61F-11 | 61F-11T | 61F-11L | 61F-11H | 61F-11D | 61F-11R |
|---|---|---|---|---|---|---|
| **Interchangeable with general-purpose model (61F-11)** | --- | Provided | Provided | Not provided | Provided | Not provided |
| **Color of band on name plate** | --- | Red | Yellow | Blue | Black | Green |

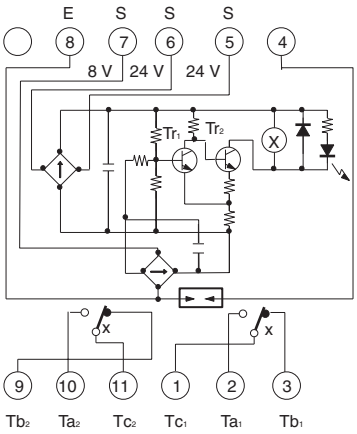
**61F-11**



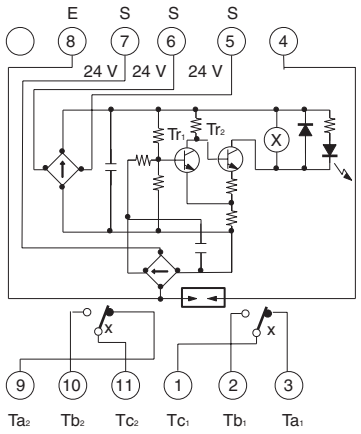

**61F-11T**



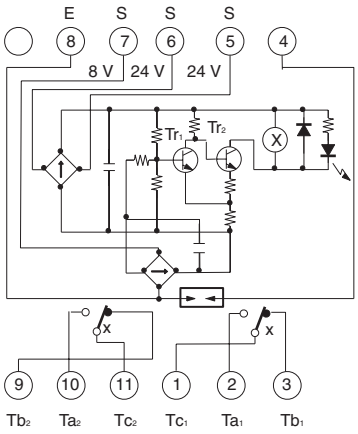

**61F-11L**



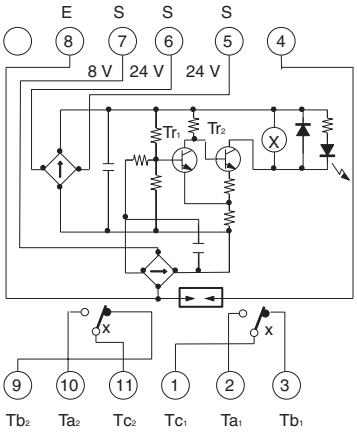

**61F-11H (see note)**




**61F-11D**




**61F-11R**



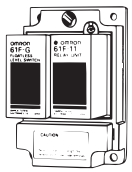
# ■ Connections

## Automatic Water Supply and Drainage Control

**Basic Type**

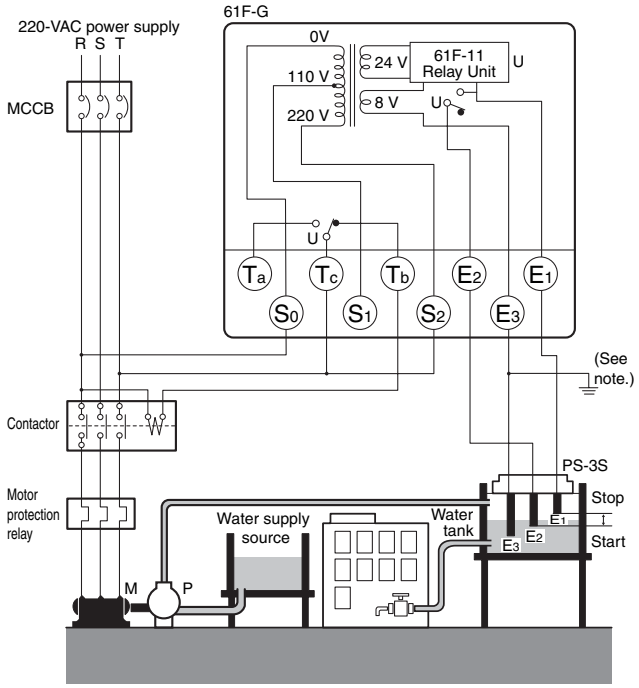
**61F-G**

**Dimensions: page 13**



### Automatic Water Supply Control

**Connections**

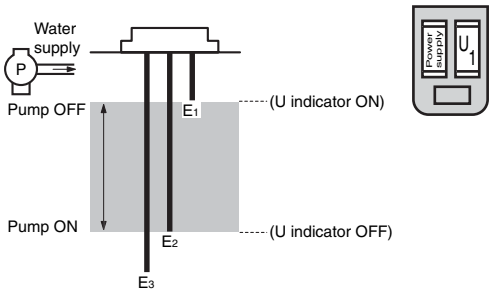



**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect Tb to the contactor's coil terminal.
- Power Supply Connections (for models with 110/220-V power)
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.

**Principles of Operation**

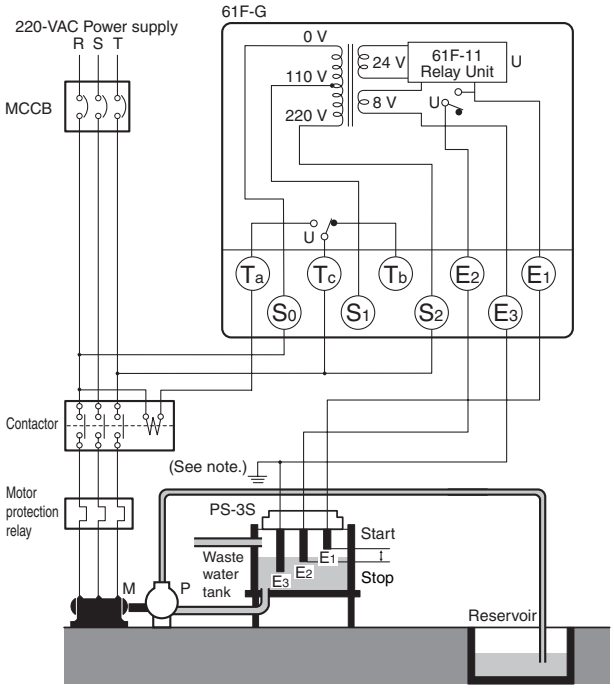
**Relay Unit Location**




The pump stops (indicator ON) when the water level reaches $E_1$ and starts (indicator OFF) when the water level drops below $E_2$.

### Automatic Drainage Control

**Connections**

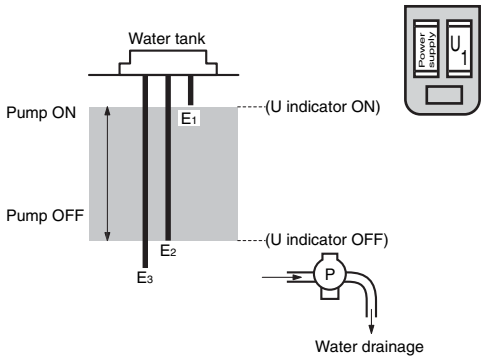



**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect Ta to the contactor's coil terminal. (Do not connect Tb.)
- Power Supply Connections (for models with 110/220-V power)
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.

**Principles of Operation**

**Relay Unit Location**



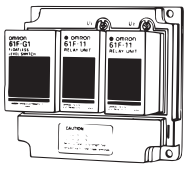

The pump starts (indicator ON) when the water level reaches $E_1$ and stops (indicator OFF) when the water level drops below $E_2$.

# Automatic Water Supply Control with Pump Idling Prevention and Automatic Water Supply Control with Abnormal Water Shortage Alarm

## Basic Type

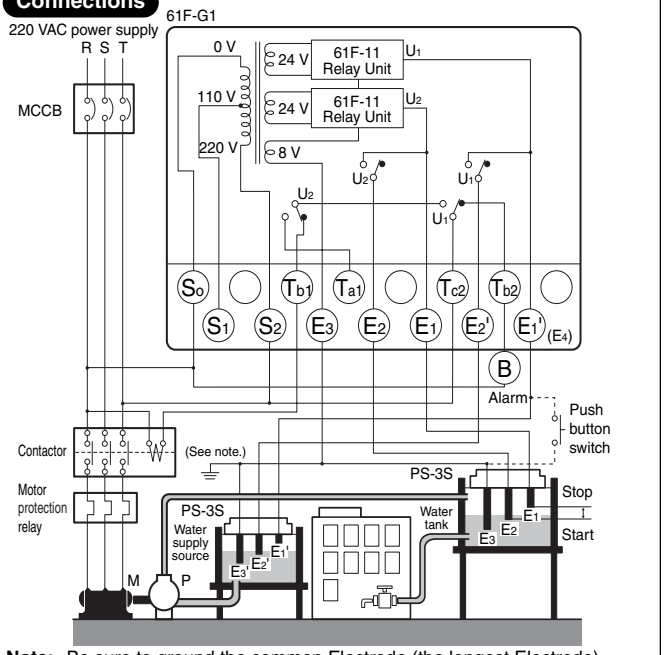
**61F-G1**

**Dimensions: page 13**



## Automatic Water Supply Control with Pump Idling Prevention

### Connections



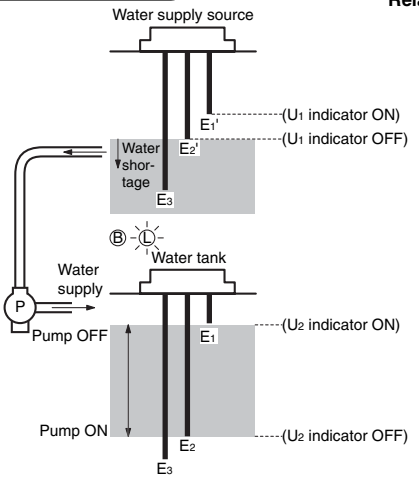

**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.
- Insert a pushbutton switch (NO) between $E_1$' and $E_3$, as shown by the dotted lines above.
- Do not press the pushbutton if the low-water alarm sounds and the pump stops during normal operation ($U_1$ indicator ON, water below $E_2$').

### Test Operation/Recovering from Power Interruptions

If the supply water level is below $E_1$' when starting operation or when recovering from a power interruption, press the pushbutton to momentarily close the circuit ($U_1$ indicator turns ON) to start the pump.

### Principles of Operation

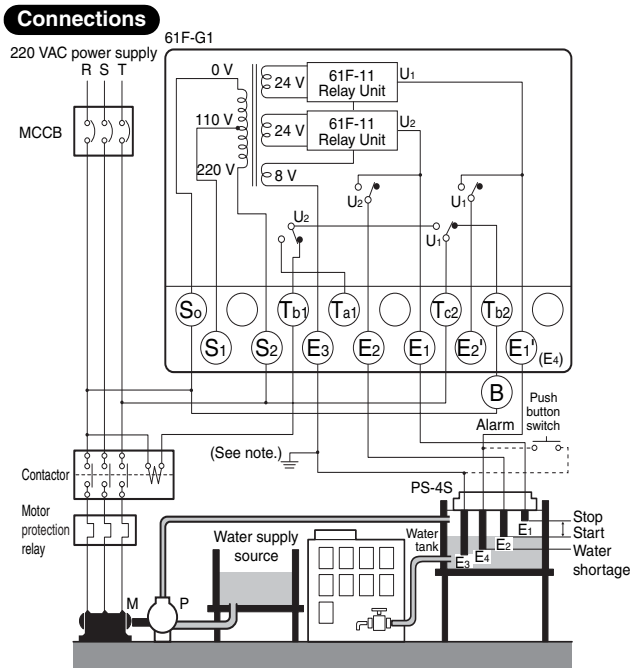



### Relay Unit Location


- The pump starts ($U_2$ indicator OFF) when the water level drops below $E_2$ and stops ($U_2$ indicator ON) when the water level reaches $E_1$.
- When the level of the water supply source drops below $E_2$', the pump stops ($U_1$ indicator OFF). Pump idling is prevented and the alarm sounds.

## Automatic Water Supply Control with Abnormal Water Shortage Alarm

### Connections



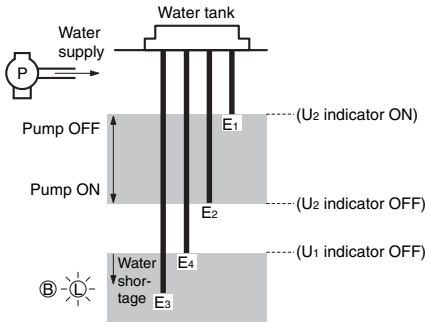

**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.
- Insert a pushbutton switch (NO) between $E_3$ and $E_4$.
- If the pump stops when the pushbutton switch is released, press it again.

### Test Operation/Recovering from Power Interruptions

If the supply water level is below $E_4$ when starting operation or when recovering from a power interruption, press the pushbutton to momentarily close the circuit ($U_1$ indicator turns ON) to start the pump.

### Principles of Operation



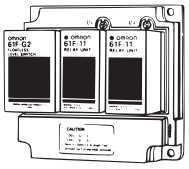

### Relay Unit Location


- The pump stops ($U_2$ indicator ON) when the water level reaches $E_1$ and starts ($U_2$ indicator OFF) when the water level drops below $E_2$.
- If the water level drops below $E_4$ for any reason, the pump stops ($U_1$ indicator OFF) and the alarm sounds.

# Automatic Drainage Control and Water Supply with Abnormal Water Increase Alarm

## Basic Type

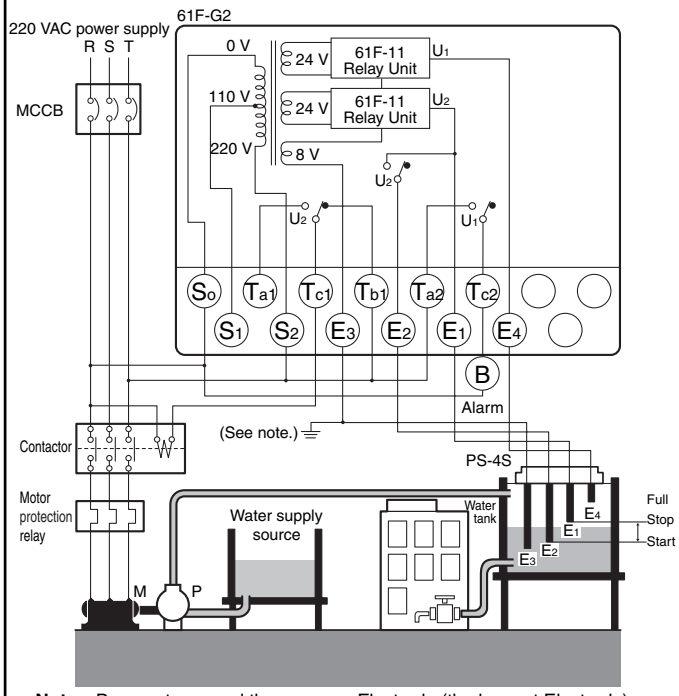
**61F-G2**



**Dimensions: page 13**

### Automatic Water Supply with Overfull Tank Alarm

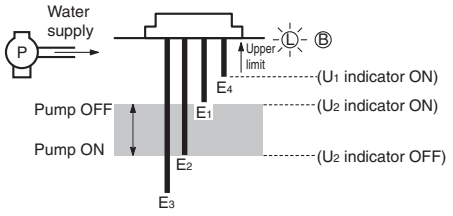
**Connections**



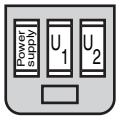

**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect $Tb_1$ to the power supply.
- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.

**Principles of Operation**



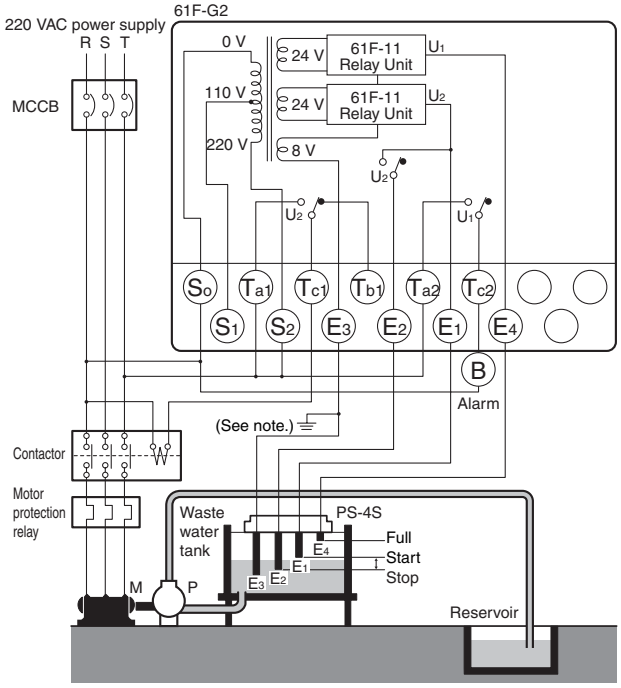

**Relay Unit Location**




- The pump starts ($U_2$ indicator OFF) when the water level drops below $E_2$ and starts ($U_2$ indicator ON) when the water level reaches $E_1$.
- If the water level reaches $E_4$ for any reason, the alarm sounds ($U_1$ indicator ON).

### Automatic Drainage Control with Overfull Tank Alarm

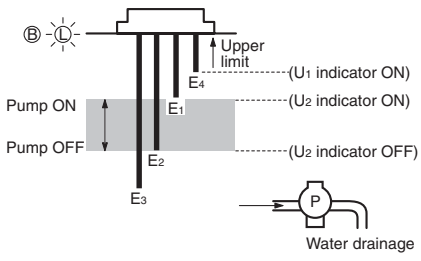
**Connections**



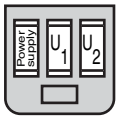

**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect $Ta_1$ to the power supply.
- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.

**Principles of Operation**




**Relay Unit Location**

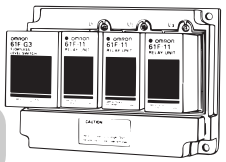



- The pump starts ($U_2$ indicator OFF) when the water level reaches $E_1$ and stops ($U_2$ indicator ON) when the water level drops below $E_2$.
- If the water level reaches $E_4$ for any reason, the alarm sounds ($U_1$ indicator ON).

# Automatic Water Supply and Drainage Control with Abnormal Water Increase and Water Shortage Alarms

## Basic Type

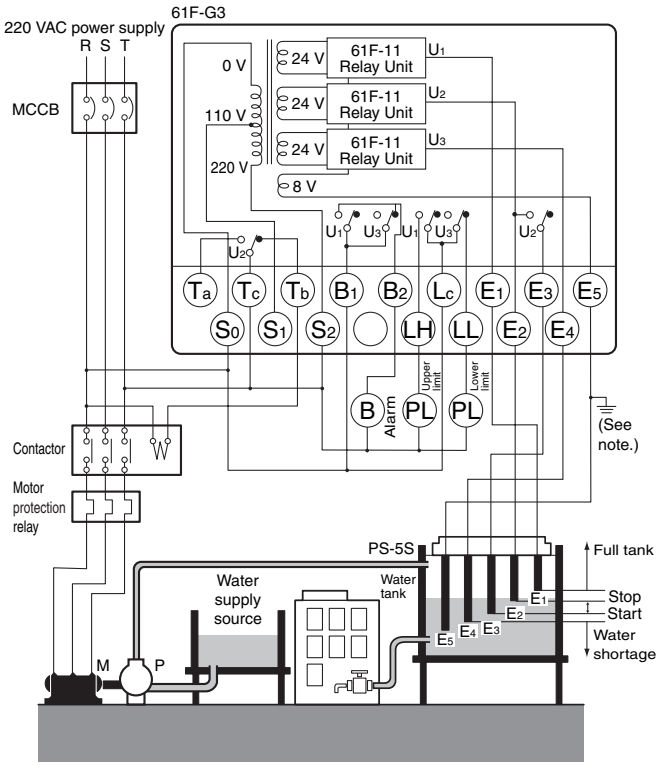
**61F-G3**



**Dimensions: page 13**

### Automatic Water Supply with Abnormal Water Increase and Water Shortage Alarms

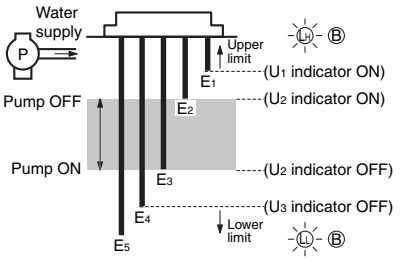
#### Connections



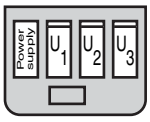

**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect Tb to the contactor's coil terminal.
- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.

#### Principles of Operation



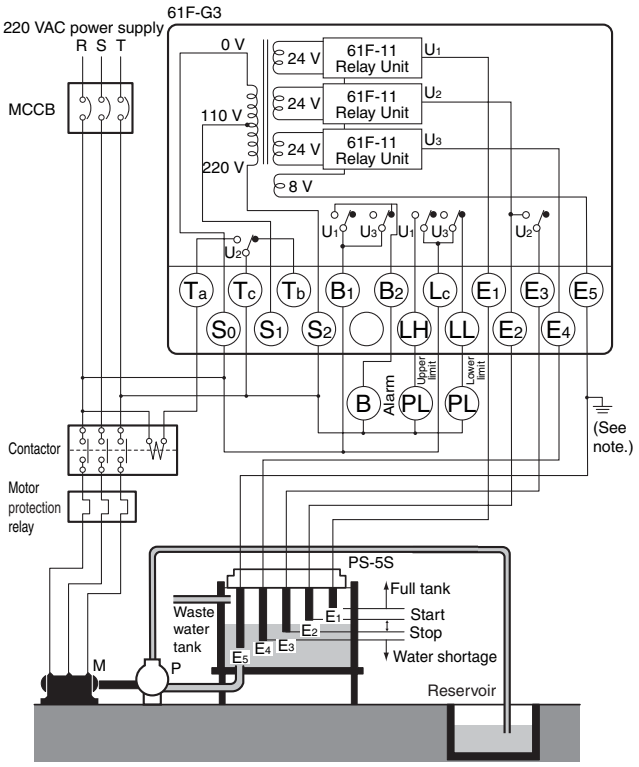

#### Relay Unit Locations




- The pump stops ($U_2$ indicator ON) when the water level reaches $E_2$ and starts ($U_2$ indicator OFF) when the water level drops below $E_3$.
- If the water level rises to $E_1$ for any reason, the upper-limit indicator turns ON and the alarm sounds ($U_1$ indicator ON). If the water level drops below $E_4$ for any reason, the lower-limit indicator turns ON and the alarm sounds ($U_3$ indicator OFF).

### Automatic Drainage Control with Abnormal Water Increase and Water Shortage Alarms

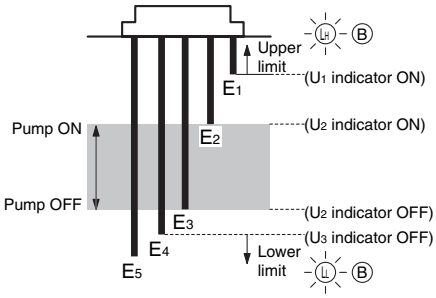
#### Connections



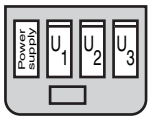

**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect Ta to the contactor's coil terminal. (Do not connect Tb.)
- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.

#### Principles of Operation




#### Relay Unit Locations



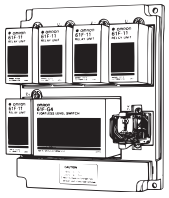

- The pump starts ($U_2$ indicator ON) when the water level reaches $E_2$ and stops ($U_2$ indicator OFF) when the water level drops below $E_3$.
- If the water level rises to $E_1$ for any reason, the upper-limit indicator turns ON and the alarm sounds ($U_1$ indicator ON). If the water level drops below $E_4$ for any reason, the lower-limit indicator turns ON and the alarm sounds ($U_3$ indicator OFF).

# Automatic Water Supply Control with Water Source Level Indication, Prevention of Pump Idling Due to Water Shortage, and Indication of Water Level in Tank

## Basic Type

**61F-G4**

**Dimensions: page 13**



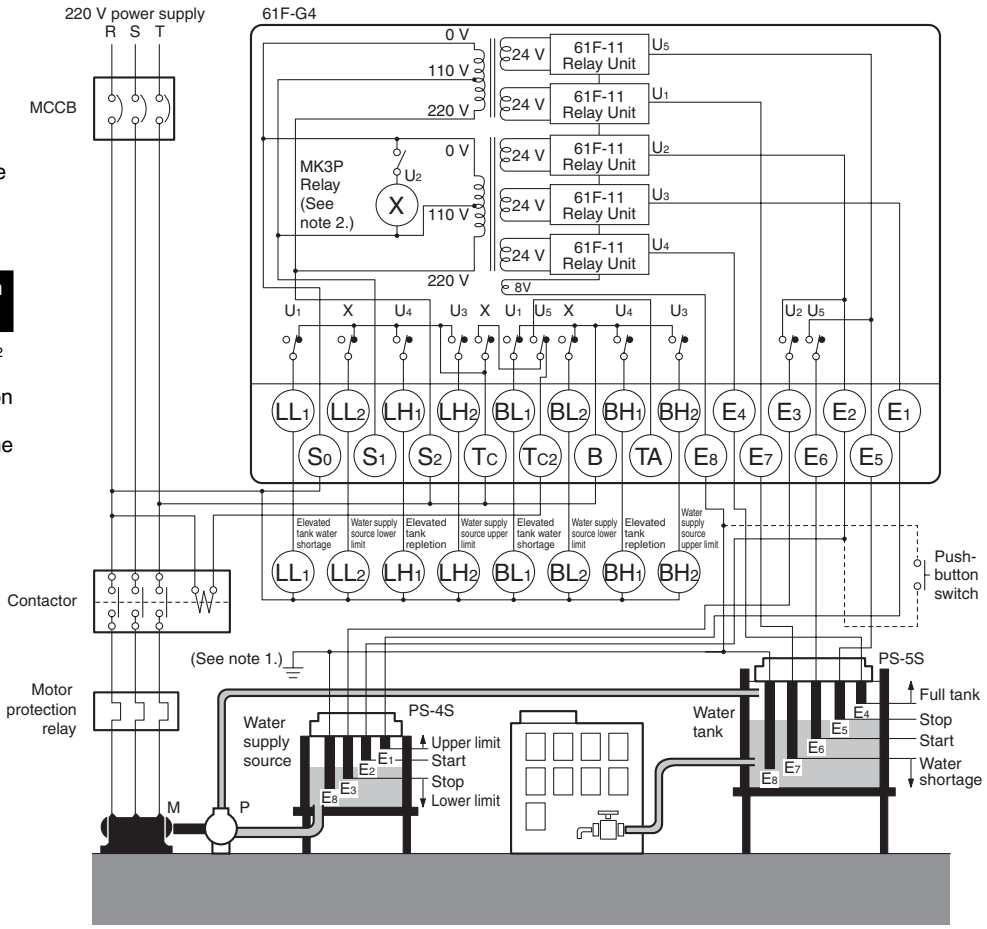
**Automatic Water Supply Control with Water Source Level Indication, Prevention of Pump Idling Due to Water Shortage, and Indication of Water Level in Tank**

## Connections

- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.
- Insert a pushbutton switch (NO) between $E_2$ and $E_8$, as shown by the dotted lines above.
- Do not press the pushbutton if the low-water alarm sounds and the pump stops during normal operation (water below $E_3$).

### Test Operation/Recovering from Power Interruptions

If the supply water level is below $E_2$ when starting operation or when recovering from a power interruption ($U_2$ indicator OFF), press the pushbutton to momentarily close the circuit to start the pump.

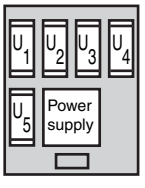



**Note:** Be sure to ground the common Electrode (the longest Electrode).

## Principles of Operation

- Insert four Electrodes in the water supply source and five Electrodes in the elevated water tank.
- The lower-limit indicator for the water supply source remains ON while the water source level is below $E_3$ ($U_2$ indicator OFF).
- When the water level rises to $E_2$, the lower-limit indicator turns OFF ($U_2$ indicator ON) and the pump is ready for operation.
- The upper-limit indicator in the water supply source lights when the water level reaches $E_1$ ($U_3$ indicator ON).
- The water-shortage indicator for the elevated tank remains ON while the water level in the elevated tank is below $E_7$. The indicator turns OFF ($U_1$ indicator ON) when the water level rises to $E_7$.
- The pump stops ($U_5$ indicator ON) when the water level reaches $E_5$ and starts ($U_5$ indicator OFF) when the water level drops below $E_6$.
- If the water level reaches $E_4$ for any reason, the abnormal water increase indicator for the elevated tank turns ON ($U_4$ indicator ON).

**Relay Unit Location**

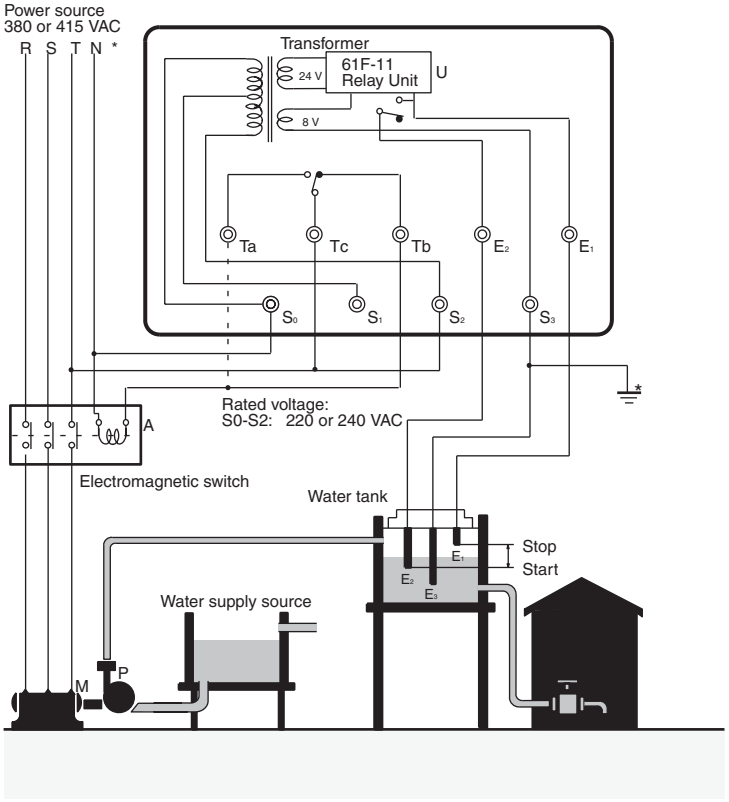


# ■ Connection with Three-phase Four-line Circuit

When supplying power from N-phase to the Controller in three-phase four-line circuit, refer to the following diagrams.
Line voltage (R-S, S-T, or R-T): 380 or 415 VAC
Phase voltage (N-R, N-S, or N-T): 220 or 240 VAC

## 61F-G□, 220 or 240 VAC

### Water Supply



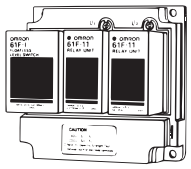

**Note:** Be sure to ground terminal E3.

## Liquid Level Indication and Alarm

### Basic Type

**61F-I**

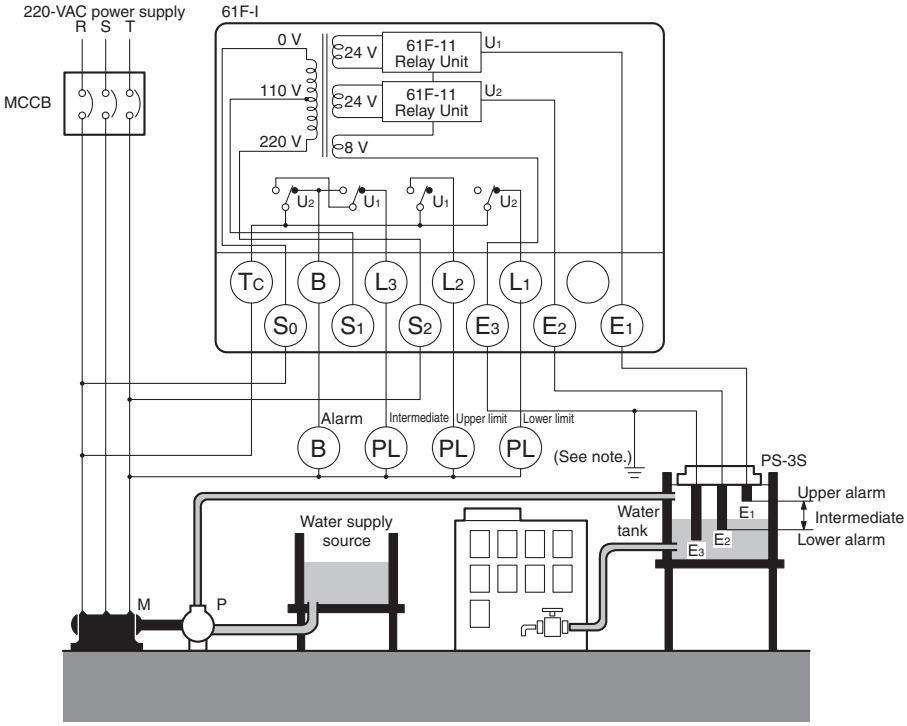
**Dimensions: page 13**



**Liquid Level Indication and Alarm**

### Connections

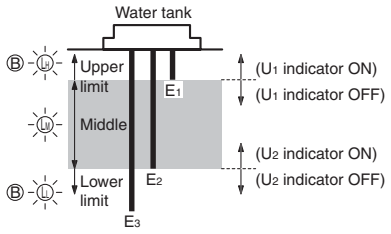
- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.



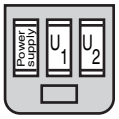

**Note:** Be sure to ground the common Electrode (the longest Electrode).

### Principles of Operation

- When the water level drops below $E_2$, the lower-limit indicator turns ON and the alarm sounds ($U_2$ indicator OFF).
- When the water level reaches $E_2$, the alarm turns OFF and the intermediate indicator turns ON ($U_2$ indicator ON).
- When the water level rises to $E_1$, the upper-limit indicator turns ON and the alarm sounds ($U_1$ indicator ON).




**Relay Unit Location**

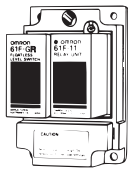


# ■ Two-Wire Connections

## Automatic Water Supply and Drainage Control

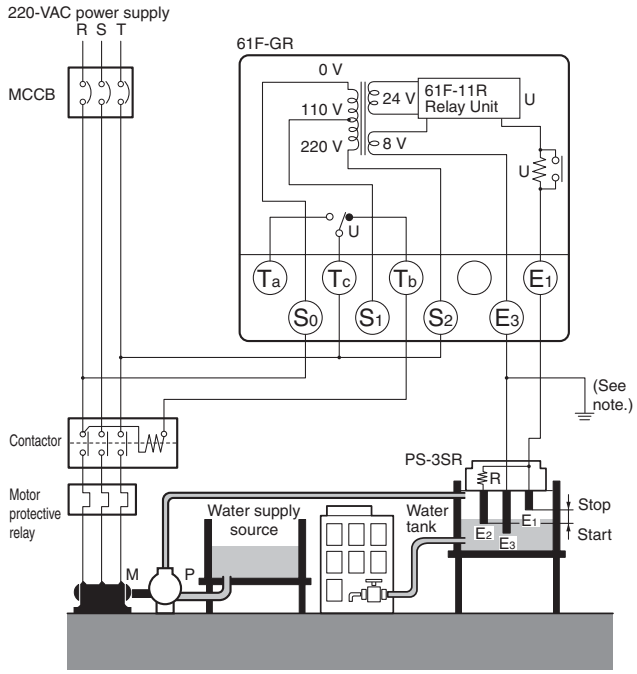
**Basic Type**

**61F-GR**



### Automatic Water Supply Control

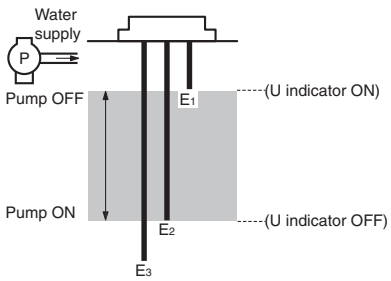
**Connections**




**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect Tb to the contactor's coil terminal.
- Power Supply Connections
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.
- With 2-wire connections, only two wires are required between the 61F-GR and Electrode Holder, but three wires are required for the Electrodes.
- The Electrode Holder must be specified for 2-wire connections. (Resistance R is built into Electrode Holders for 2-Wire Connections.)
- The Relay Unit must also be specified for 2-wire connections.

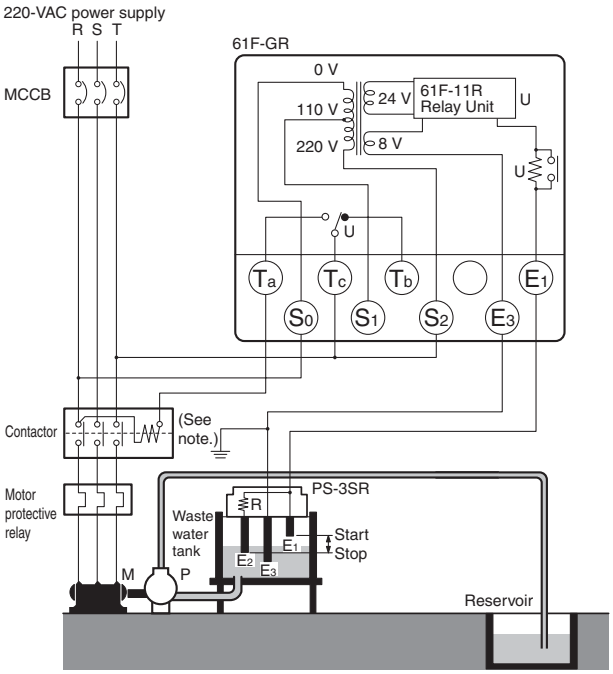
**Principles of Operation**




The pump stops (U indicator ON) when the water level reaches $E_1$ and starts (U indicator OFF) when the water level drops below $E_2$.

### Automatic Drainage Control

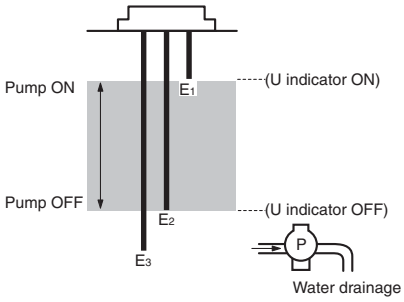
**Connections**




**Note:** Be sure to ground the common Electrode (the longest Electrode).

- Connect Ta to the contactor's coil terminal. (Do not connect Tb.)
- Power Supply Connections (for models with 110/220-V power)
  110 VAC: Connect $S_0$ and $S_1$.
  220 VAC: Connect $S_0$ and $S_2$.
- With 2-wire connections, only two wires are required between the 61F-GR and Electrode Holder, but three wires are required for the Electrodes.
- The Electrode Holder must be specified for 2-wire connections. (Resistance R is built into Electrode Holders for 2-Wire Connections.)
- The Relay Unit must also be specified for 2-wire connections.

**Principles of Operation**



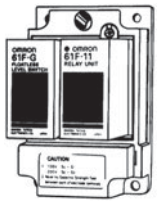

The pump starts (U indicator ON) when the water level reaches $E_1$ and stops (U indicator OFF) when the water level drops below $E_2$.

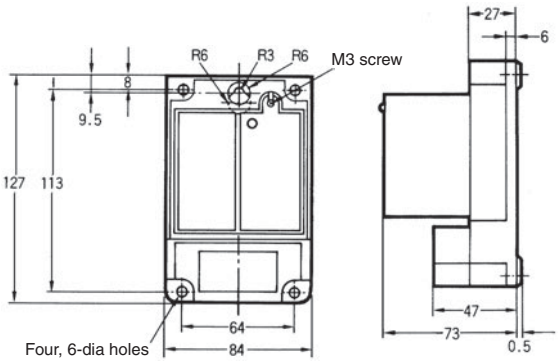
# Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

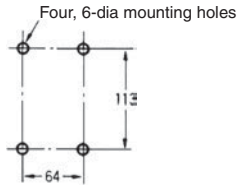
## ■ Standard Models

### 61F-G

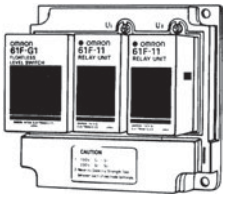


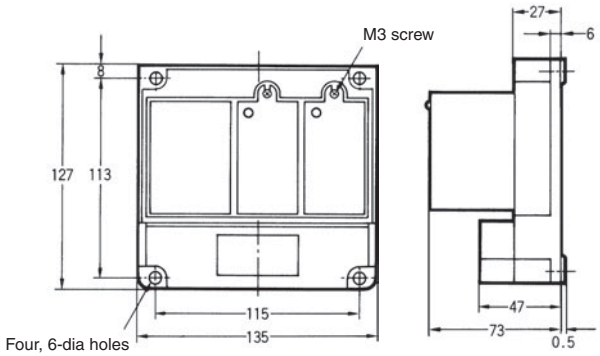



**Mounting Holes**

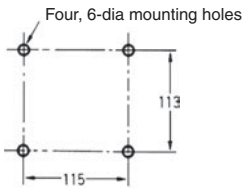



### 61F-G1
### 61F-G2
### 61F-I

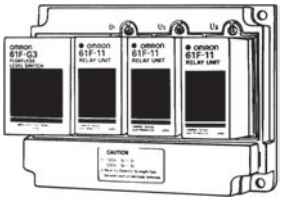


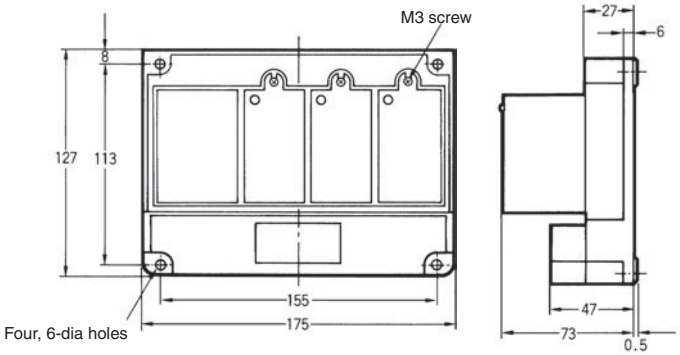



**Mounting Holes**

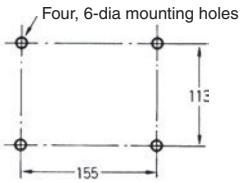



### 61F-G3

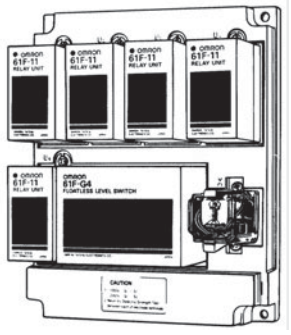


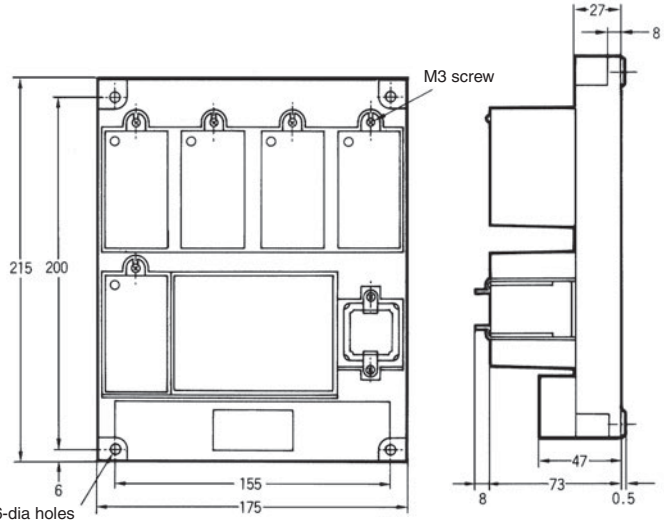



**Mounting Holes**

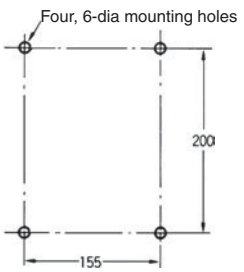



### 61F-G4






**Mounting Holes**




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

In the interest of product improvement, specifications are subject to change without notice.