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OMRON

Device Selection Guide for Water Level Control Applications

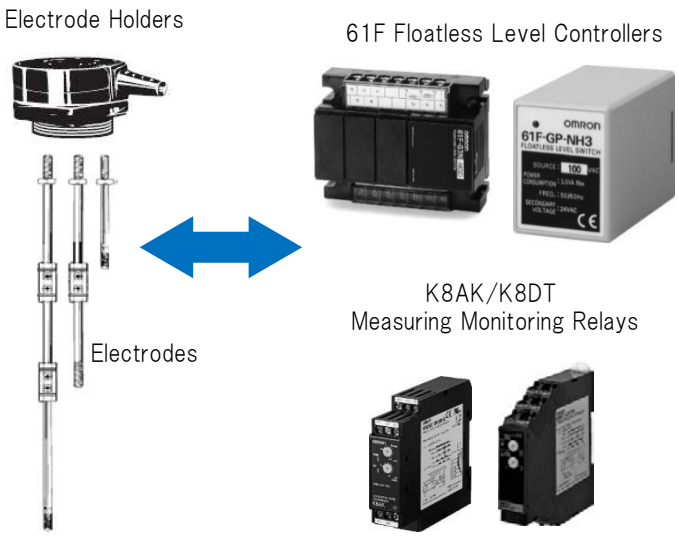
Introduction

This Device Selection Guide for Water Level Control Applications is designed to help you select Level Controllers, Electrodes, and Sensing Bands according to the needs of specific water level control applications and goals.
Please use this guide to help you select devices for your water level control applications.

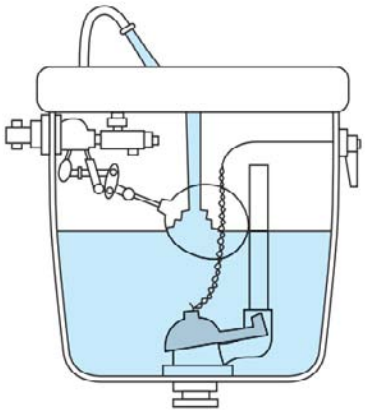
Water Level Control

A toilet would be an example of water level control from everyday life. Using a float to control the water supply is commonly seen in toilet tanks. Float-controlled water supply uses no electricity. It is a low-cost mechanical control method that saves energy.
However, application of this method is limited because the float can be damaged, mechanical parts can corrode, unnecessary mechanical operation can occur, the length of the float arm is restricted, etc.
The induction method used in the equipment presented in this guide, however, uses an electric Level Controller with no moving parts that can handle a wide range of general-purpose water level control and other liquid level control applications in the steel, food, chemical, pharmaceutical, semiconductor, and other industries, as well as in water purification and water treatment plants.
In comparison with static capacitance and ultrasonic methods, there is less chance of unnecessary operation for water surface changes such as those caused by waves the induction method allow stable water level detection at a low cost.

Induction



Float-control Water Supply



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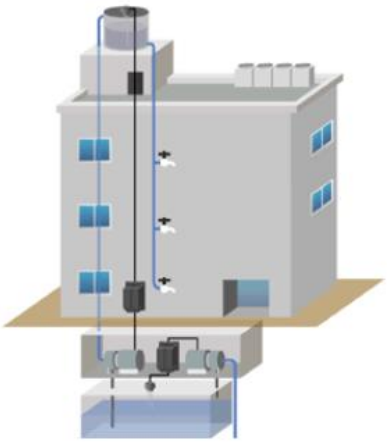
Water Level Control Application Examples

The following are a few examples of water level control applications.

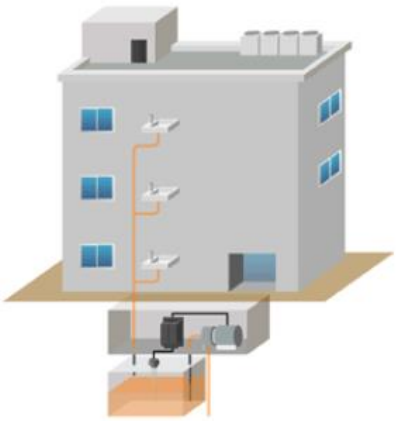
Controlling Water Supply to Elevated Water Tanks in Buildings

Clean water is automatically supplied to an elevated water tank with a pump.



Controlling Waste Water Discharge to Waste Water Tanks under Buildings

Domestic waste water is collected in tanks and discharged with a pump to public sewage lines.



Material Level Control for Food Machines

Level control is performed in small tanks in liquid filling machines, drink vending machines, etc.

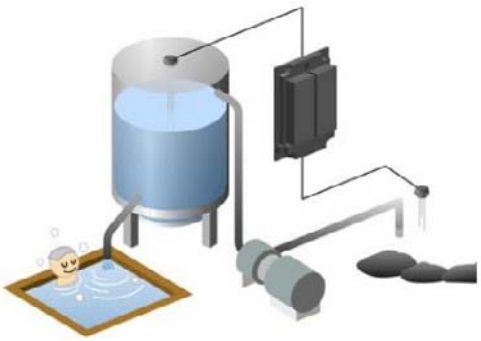
Level Control in Chemical or Pharmaceutical Tanks

A low-sensitivity 61F Floatless Level Controller is used to control the level of conductive chemicals and pharmaceuticals. However, it cannot be used when explosion-proofing is required.

Water Level Control Application Examples

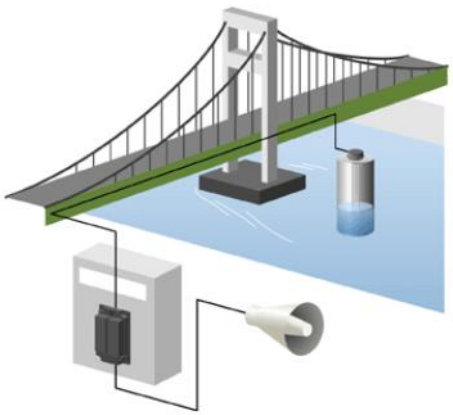
Automatic Supply of Hot Water for Hot Springs and Detection of Hot Spring Water Shortage

Water is supplied from the hot springs to a holding tank. Also, pumps can be prevented from operating dry when the springs are not producing hot water and an alarm can be output to a suitable location.



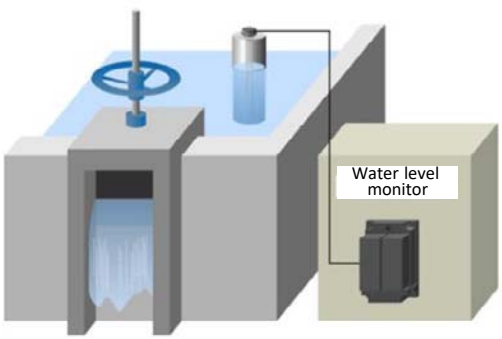
Detection of River Water Levels

Rising water levels and water shortages in rivers can be detected to provide notification and alarms to downstream areas. Breakwater tubes can also be used in this case.



Monitoring Water Levels in Storage Ponds

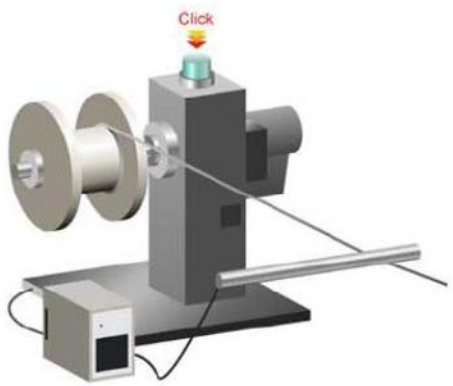
Water levels are monitored in ponds for disaster relief and agriculture. Commands are output to open and close gates.



Wire Winding Detection

<u>Not just liquids, but any conductive detection object can be detected.</u>

One side of the 61F is connected to an Electrode and wire and the other side is connected to ground. The winding machine must also be grounded, so conductivity is created through ground to enable detecting the wire.
Also, by using a bar, the grounding range with the detection object can be expanded to enable allowing for the width that the wire moves when it is wound evenly.



Basic Configuration of Water Level Control Devices

Water level control devices are basically composed of three components: a Level Controller, an Electrode Holder, and Electrodes. When you select products, select each of these components for your application.

Level Controllers

Select the Level Controller according to the control method, mounting method, object to detect, length of wiring, etc.

61F-series Level Controllers

K8AK-LS

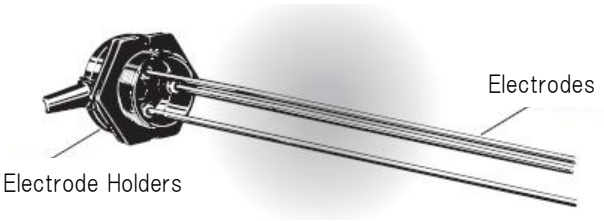
K8DT-LS

Electrode Holders

Select the Electrode Holder according to the environment in the tank and the installation environment of the tank.

Electrodes

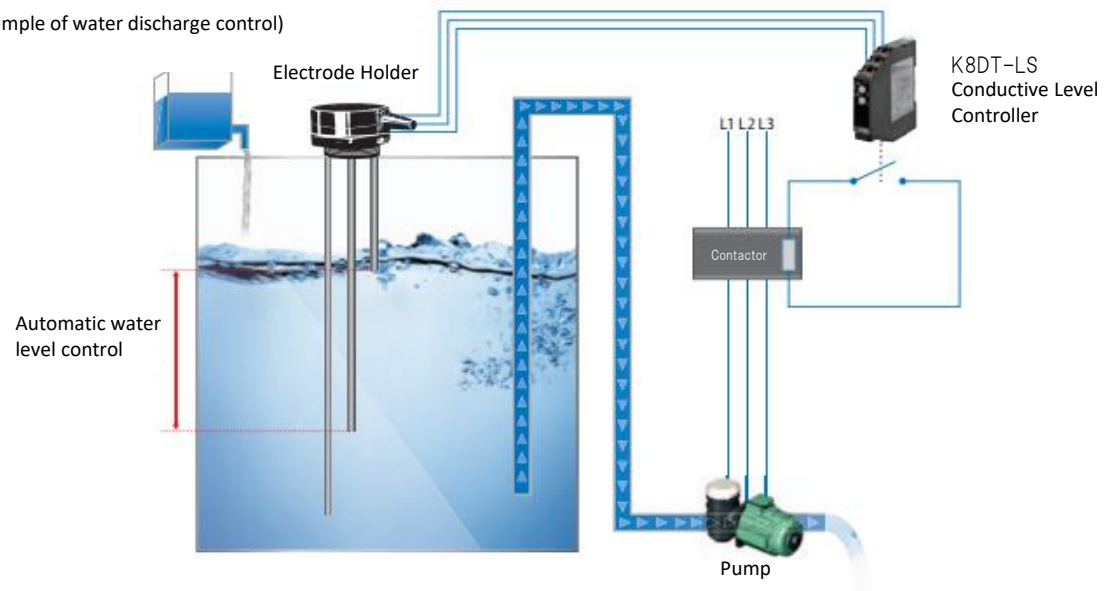
Select the Electrodes according to the environment in the tank and the control range.



■ Configuration Example for Water Level Control

Tank Water Level Control

(Example of water discharge control)



Basic Configuration of Water Level Control Devices

■ Products Used for Water Level Control: Level Controllers, Electrode Holders, and Electrodes

	Level Controllers					
	61F				K8 Series	
Type	Compact, Plug-in	Plug-in	Compact	Basic Controllers	Controllers with Screw Terminals	Controllers with Push-In Plus Terminals
Appearance						
Model numbers	61F-GP-N -GP-N8	61F-G1P -G2P -IP	61F-GN -G1N -G2N -G3N -G4N -IN	61F-G -G1 -G2 -G3 -G4 -I	K8AK-LS	K8DT-LS
Features	·A Connecting Socket is required. ·Models with 11-pins have independent DPDT contacts.	·A Connecting Socket is required. ·Can be mounted to DIN Track. ·220 VAC, 5A	·Can be mounted to DIN Track. ·Smaller than basic models.	·Prewired when delivered (reduces wiring work).	·Relay outputs. ·22.5 mm width. ·Built-in ON-delay timer. ·Screw terminals.	·Transistor outputs. ·Relay outputs. ·17.5 mm width. ·Built-in ON-delay timer. ·Push-In Terminals

+

	Electrode Holders		
Appearance			
Model numbers	PS-3S PS-4S PS-5S	BF-1 BF-3 BF-5	BS-1 BS-1T

+

	Electrodes		
Type	Standard Electrodes	Underwater Electrodes	Electrode Bands
Appearance			
Model numbers	F03-01 F03-60	PH-1 PH-2	F03-05 3P F03-05 4P F03-05 5P
Features		A Holder is not required.	

Recommended Selection of OMRON Water Level Controllers

Water Level Control Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

First choice.

Simple automatic water supply and discharge

Compact, Plug-in Controller

61F-GP-N/-GP-N8

Preventing pumps from operating dry and outputting alarms for water shortage or water rise

Plug-in Controller

61F-G□N

Compact Controller

61F-G□N

Reduced wiring

Basic Controller

61F-G□

Water level control and detection built into equipment

First choice.

Controllers with Push-In Plus Terminals

K8DT-LS1

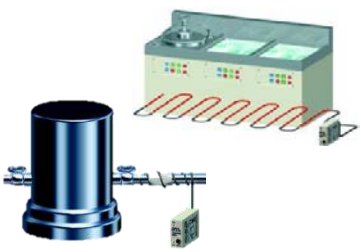
Extremly thin! Width of 17.5 mm

Controllers with Screw Terminals

K8AK-LS1

Slim Design! Width of 22.5 mm

Equipment leakage detection in factory buildings



First choice.

Controllers with Push-In Plus Terminals

K7L-AT50B/-UB

Controllers with Screw Terminals

K7L-AT50/-U

Selecting a Suitable Water Level Controller

＜61F Series＞

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

1 What is the goal of controlling the water level?

Function Selection by Application

- Automatically supplying water to elevated tanks on buildings
- Outputting alarms for water shortage or water rise in elevated tanks
- Automatically discharging waste water from tanks to sewage lines
- Detecting water leakage in facilities, from pipes, and on floors.

2 Where is the application?

Selecting Controllers Based on the Location

- Small control panels where space must be saved
- Built into equipment. Space is limited
- Easy maintenance. Fast wiring / Plug-in installation
- Location subject to vibration where secured wiring is required

3 What is the tank operating environment and contents?

Selecting models based on application environment and controlled item

- The tank and control panel for the Controller are separated by a long distance.
- Control is required for oil or pure water.
- Control is required for sewage, chemicals, or pharmaceuticals.
- The environment is subject to lightning or noise.

4 What type of tank is used?

Selecting Holders and Electrodes based on the tank where the water level is controlled.

- Deep tanks
- Small tanks inside equipment
- Tanks for food items
- High-temperature, high-pressure tanks

Flow to Select a Water Level Controller

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

The flow to select a Level Controller is given below using the compact 61F-GN Level Controllers as an example.

The 61F-GN Level Controllers can be used for supply, discharge, and most other types of water level control. The flow is for a combination of the GN-series Level Controller with an Electrode Holder and Electrodes.

1. Select the Level Controller according to the application goal.

Automatic Water Supply

Storing a Set Amount of Water in a Receiving Tank
61F-G□

- Outputting an alarm when the receiving tank reaches an abnormally low level
  61F-G1□
- Stopping the pump when the storage tank is dry
  61F-G1□
- Outputting an alarm when the receiving tank reaches an abnormally high level
  61F-G2□
- Alternating operation of two pumps
  61F-AN+61F-G□□
  61F-APN2+61F-G□□

→ Outputting an alarm when the receiving tank reaches an abnormally high or low level
61F-G3□

→ Displaying the water level in the storage tank and preventing the pump from operating dry
61F-G4□

Automatic Water Discharge

Fixed-amount discharge from a waste water tank
61F-G□

- Outputting an alarm when the waste water tank reaches an abnormally high level
  61F-G2□
- Alternating operation of two pumps
  61F-AN+61F-G□□
  61F-APN2+61F-G□□

→ Outputting an alarm when the waste water tank reaches an abnormally high or low level
61F-G3□

Displaying the Water Level

Displaying the upper limit, middle, and lower limit tank levels and outputting alarms for the upper and lower limits
61F-I□

2. Allow for the application environment and conditions.

General Environment and Conditions

Ambient temperature of −10 to 55°C and 1 km or shorter distance between 61F Level Controller and water tank
The models given above are suitable.

Long-distance Applications

61F Level Controller and water tank separated by 2 km or less
61F-□□L 2KM
61F Level Controller and water tank separated by 4 km or less
61F-□□L 4KM

High-sensitivity Application

For control of liquids with high specific resistance, such as distilled water
61F-□□H

→ For control of liquids that resist the flow of electricity, such as for the detection of ice, highly pure steam, or humidity
61F-UHS
61F-HSL

Low-sensitivity Application

For control of liquids with low specific resistance such as salt water, sewage water, acid chemicals, alkali chemicals
61F-□□D

Locations with High Ambient Temperatures

Applications with ambient temperatures between −10 and 70°C
61F-□T (For a Plug-in Controller, only automatic water supply or discharge with the 61F-GP-NT is possible.)
Heat resistive under Japanese fire laws.
61F-IP-22

Other Conditions

Detection is not possible for oils, powders, and any material that do not conduct.

Flow to Select a Water Level Controller

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

3. Select the model of the Level Controller based on the installation conditions.

Directly Mounting to a Panel

Mounting directly to a panel with terminals in one row to facilitate work
61F-☐ Basic Controller → JEM sizes with terminals top and bottom
61F-☐N Compact Controller

Plug-in Installation

Mounting a Socket, performing wiring, and then plugging in the Controller to downsize the panel
61F-G☐P Plug-in Controller → Downsizing panels
61F-GP-N (Only automatic supply and discharge are possible.)
61F-GP-N8 (Only automatic supply and discharge are possible.)

Two-wire Connection for Reduced Wiring

Using water tank Electrodes with 2 wires
61F-☐☐R (For a Plug-in Controller, only automatic water supply or discharge with the 61F-GP-NR is possible.)

4. Select the Electrode Holder and Electrodes for the water tank.

Water Quality

Applications for clean water and tap water
PS-☐S
PS-☐SR (2-wire)

Greater mounting strength
BF-☐
BF-☐(2-wire)

For control of liquids with high specific resistance, such as sewage
BF-1

Corrosive chemicals, such as acidic chemicals
BS-1T (Specify SUS, Hastelloy, or titanium.)

Electrodes

Applications for tap water or sewage
F03-01 SUS304 Electrodes
F03-60 SUS304 Electrode Set
(one electrode and one connecting nut with two lock nuts and two washers)

Liquids that require resistance to corrosion
F03-01 SUS316 Electrodes
F03-60 SUS316 Electrode Set
(Electrode Sets are not available with Hastelloy and titanium electrodes, but they can be ordered separately as individual products.)

Water Tank Temperature and Pressure

Applications at temperatures up to 250°C and pressures up to 1.96 Mpa
BS-1

Shape of water tank

Water level control with depth of 100 m from water surface
PS-31 (Integrated Electrode Holder and Electrodes)
(Applications for building into equipment or for small tanks)
PH-☐ (An Electrode Holder is not required.)

→ Water level control with depth of 50 m from water surface
F03-05 Electrode Band
(PS or BF Electrode Holder)

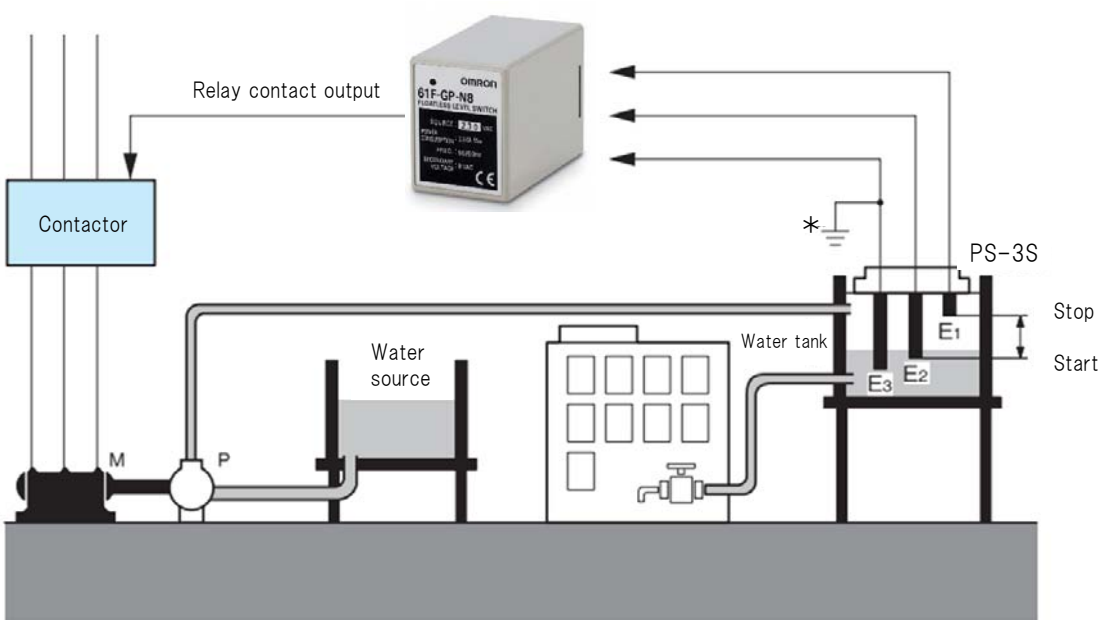
Electrodes and Optional Parts

Connecting adjacent Electrodes (standard: 1 m)
F03-01 Electrodes
F03-02 Connecting Nut
F03-03 Lock Nuts (with washers)
To use a long electrode, use a Separator every meter.
F03-14 Electrode Separators
PS-series, Concrete Tank Mounting Frame
F03-13
PS-series, Mounting Frame for Tank with No Coupling
F03-12
Electrode Holder Protective Cover for Outdoor Application
F03-11

Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

1. Automatic Water Supply Operation



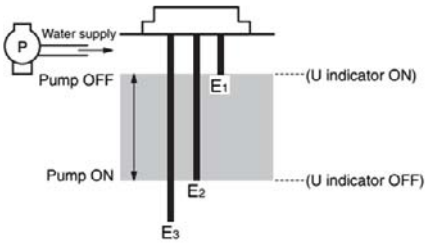
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

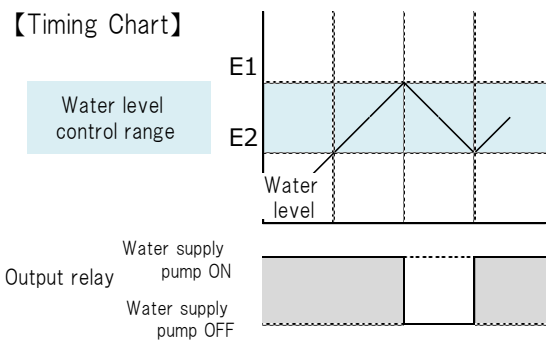
Model	Level Controller model number
Compact, Plug-in Controller with 8 Pins	61F-GP-N8 (100 VAC) 61F-GP-N8 (200 VAC)
Compact, Plug-in Controller with 11 Pins	61F-GP-N (100 VAC) 61F-GP-N (200 VAC) 61F-GP-N (110 VAC) 61F-GP-N (220 VAC)
Compact Controller	61F-GN (100/200 VAC)
Basic Controller	61F-G (100/200 VAC)

■ 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.



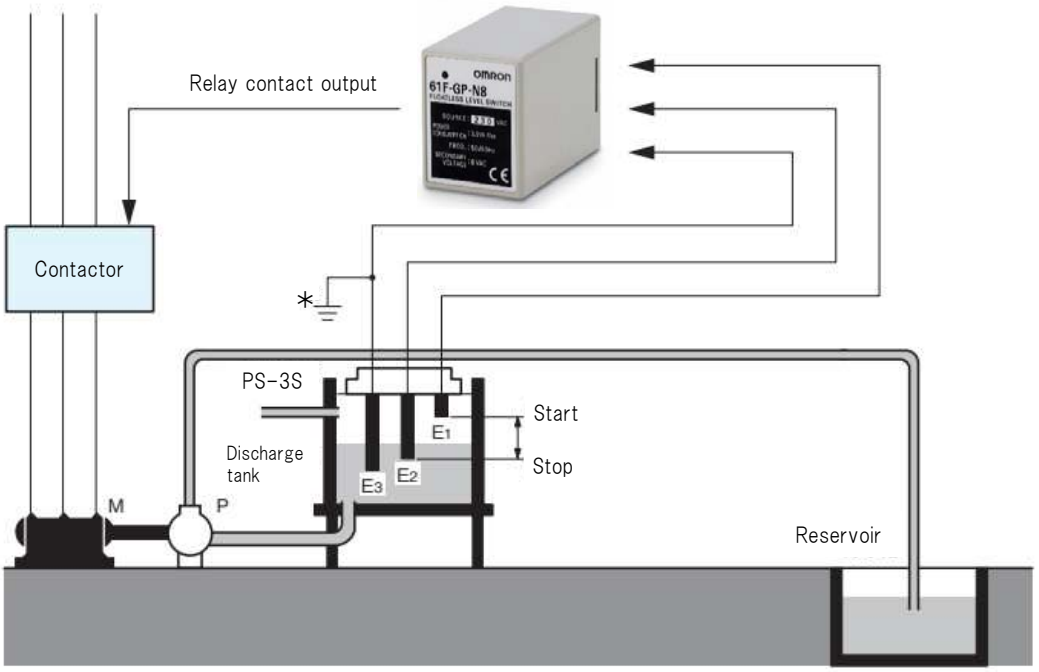
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

2. Automatic Water Discharge Operation



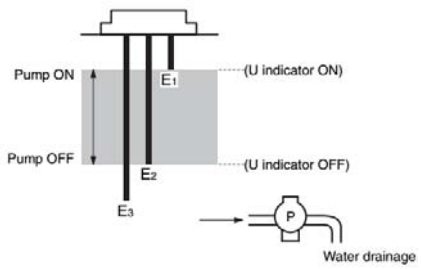
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

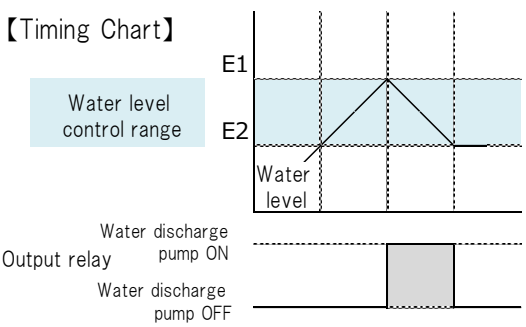
Model	Level Controller model number
Compact, Plug-in Controller with 8 Pins	61F-GP-N8 (100 VAC) 61F-GP-N8 (200 VAC)
Compact, Plug-in Controller with 11 Pins	61F-GP-N (100 VAC) 61F-GP-N (200 VAC) 61F-GP-N (110 VAC) 61F-GP-N (220 VAC)
Compact Controller	61F-GN (100/200 VAC)
Basic Controller	61F-G (100/200 VAC)

■ 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.



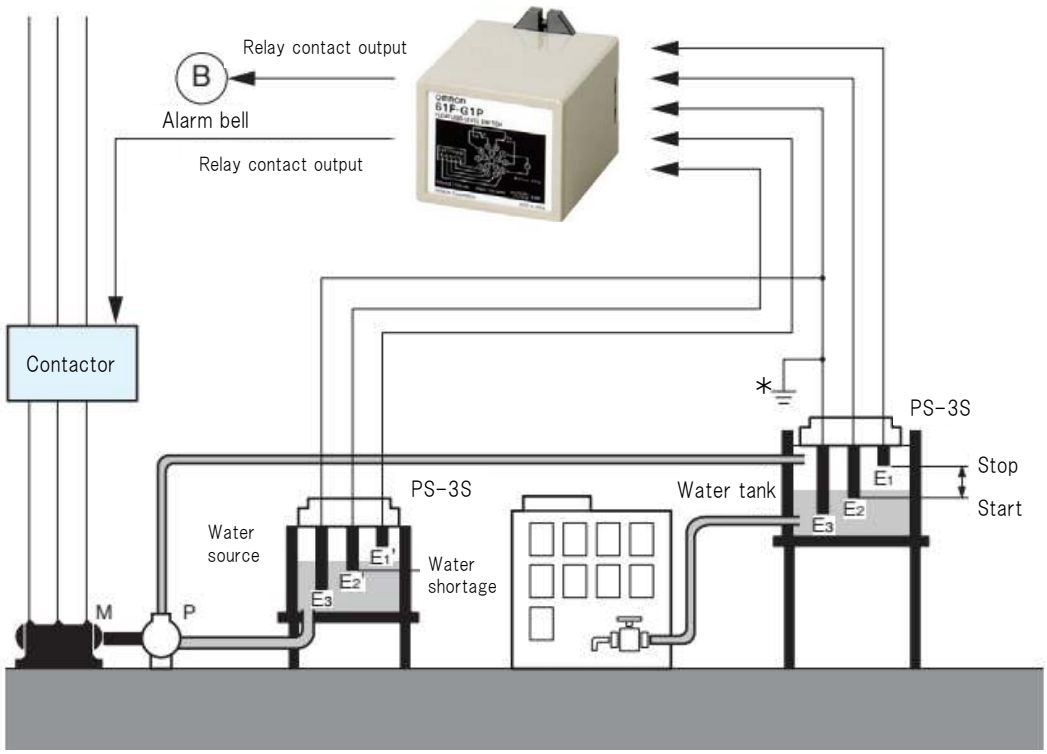
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

3. Automatic Water Supply Operation with Dry Pump Operation Prevention



＊Make sure that the common pole (the longest Electrode) is grounded securely.

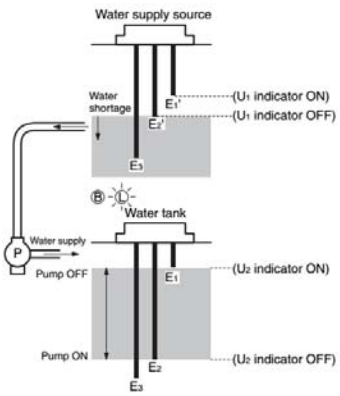
First choice.

Model	Level Controller model number
Plug-in Level Controller with 14 Pins	61F-G1P (100 VAC) 61F-G1P (200 VAC)
Compact Controller	61F-G1N (100/200 VAC)
Basic Controller	61F-G1 (100/200 VAC)

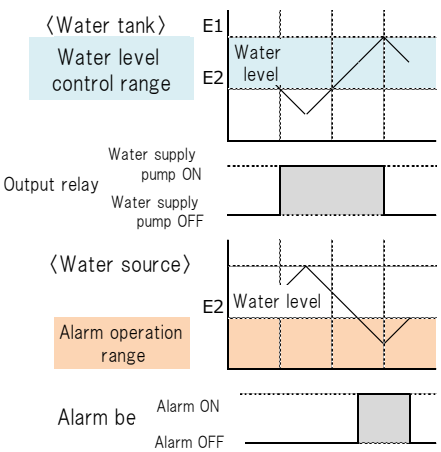
■ Principles of Operation

・The pump starts (U_2 indicator OFF) when the water level drops below E_2 and stops (U_2 indicator ON) when water level reaches E_1.

・The pump is forced to stop when the water supply source level drops below E_2' (U_1 indicator OFF) to prevent the pump from idling and gives an alarm.



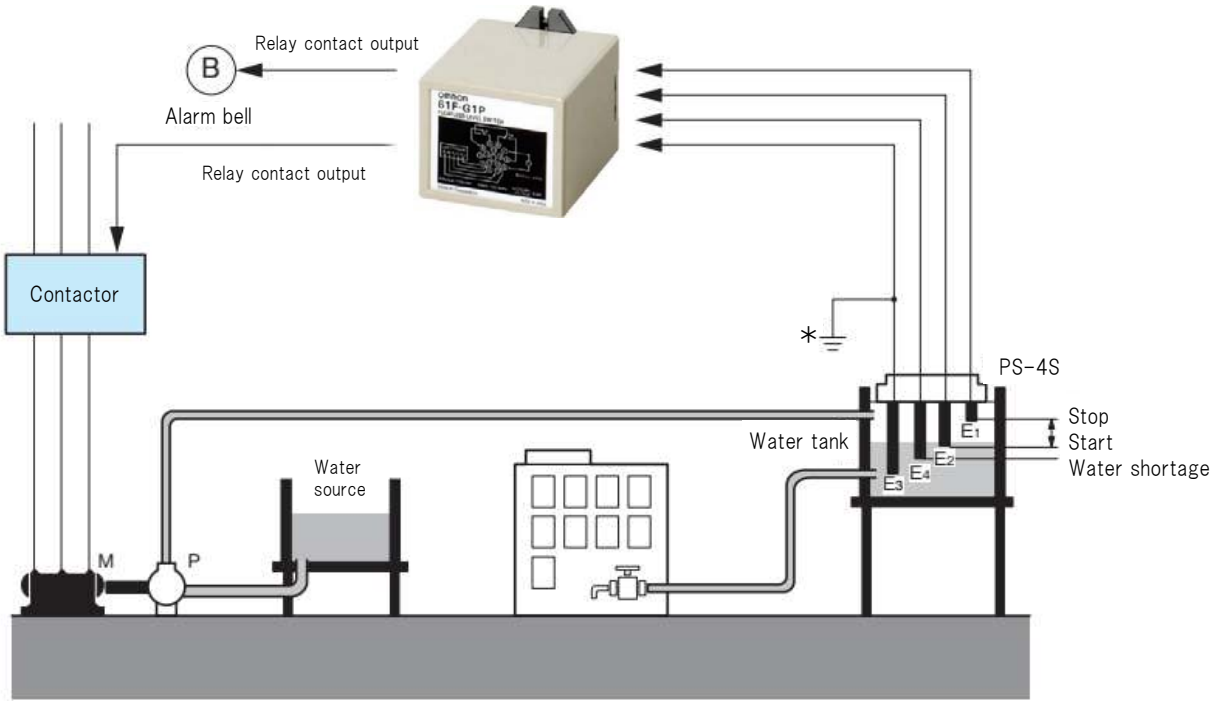
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

4. Automatic Water Supply Operation with Low Water Level Alarm



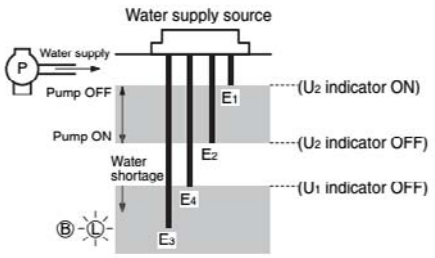
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

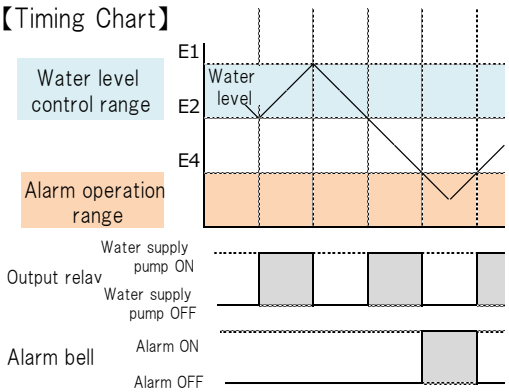
Model	Level Controller model number
Plug-in Level Controller with 14 Pins	61F-G1P (100 VAC) 61F-G1P (200 VAC)
Compact Controller	61F-G1N (100/200 VAC)
Basic Controller	61F-G1 (100/200 VAC)

■ Principles of Operation

・The pump stops (U_2 indicator ON) when the water level reaches E_2 and starts (U_2 indicator OFF) when water Level drops below E_2.
・If the water level drops below E_4 for any reason, an alarm is given (U_1 indicator OFF).



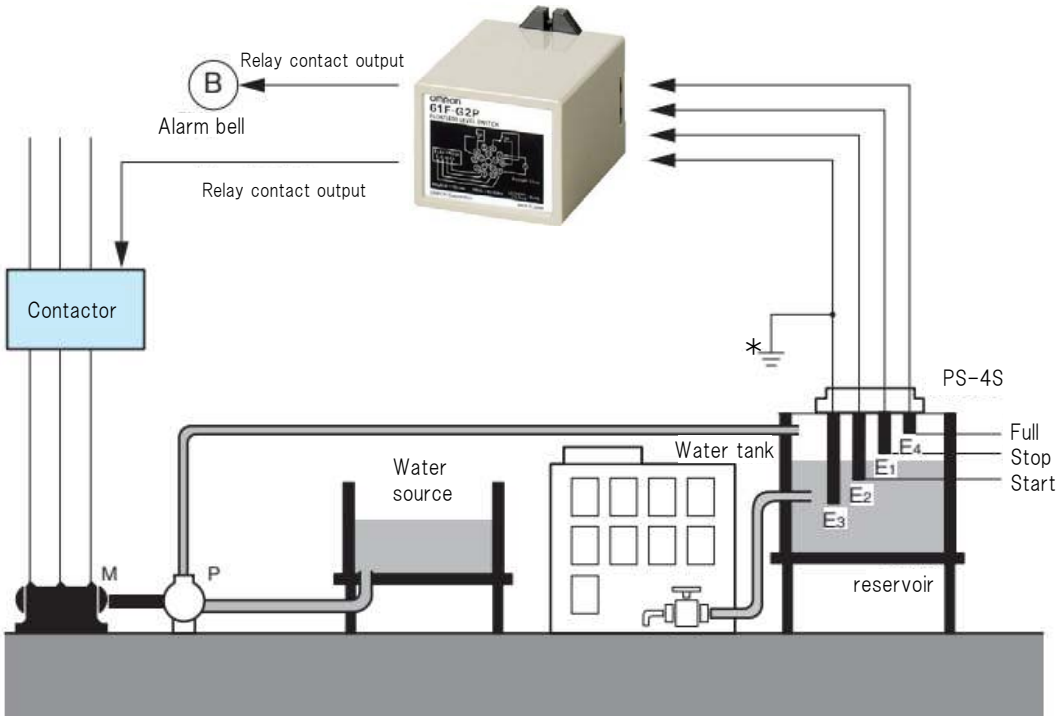
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

5. Automatic Water Supply Operation with High Water Level Alarm



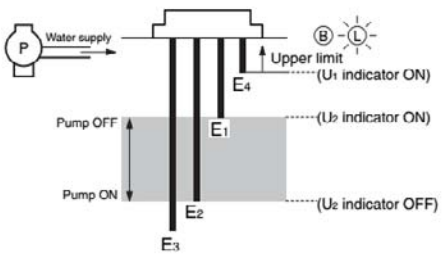
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

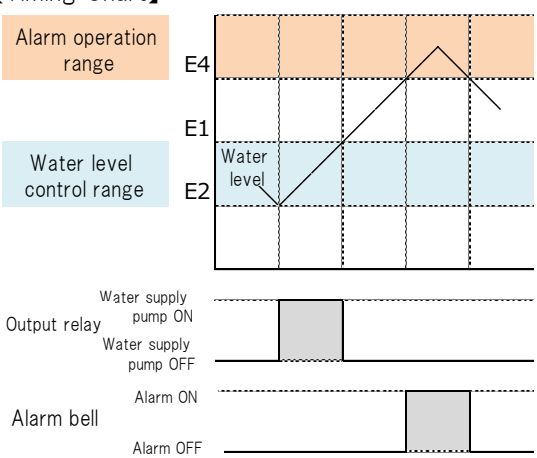
Model	Level Controller model number
Plug-in Level Controller with 14 Pins	61F-G2P(100 VAC) 61F-G2P(200 VAC)
Compact Controller	61F-G2N (100/200 VAC)
Basic Controller	61F-G2 (100/200 VAC)

■ Principles of Operation

・The pump starts (U_2 indicator OFF) when the water level reaches E_2 and stops (U_2 indicator ON) when the water level rises above E_2.
・If the water level reaches E_4 for any reason, an alarm is given (U_1 indicator ON).



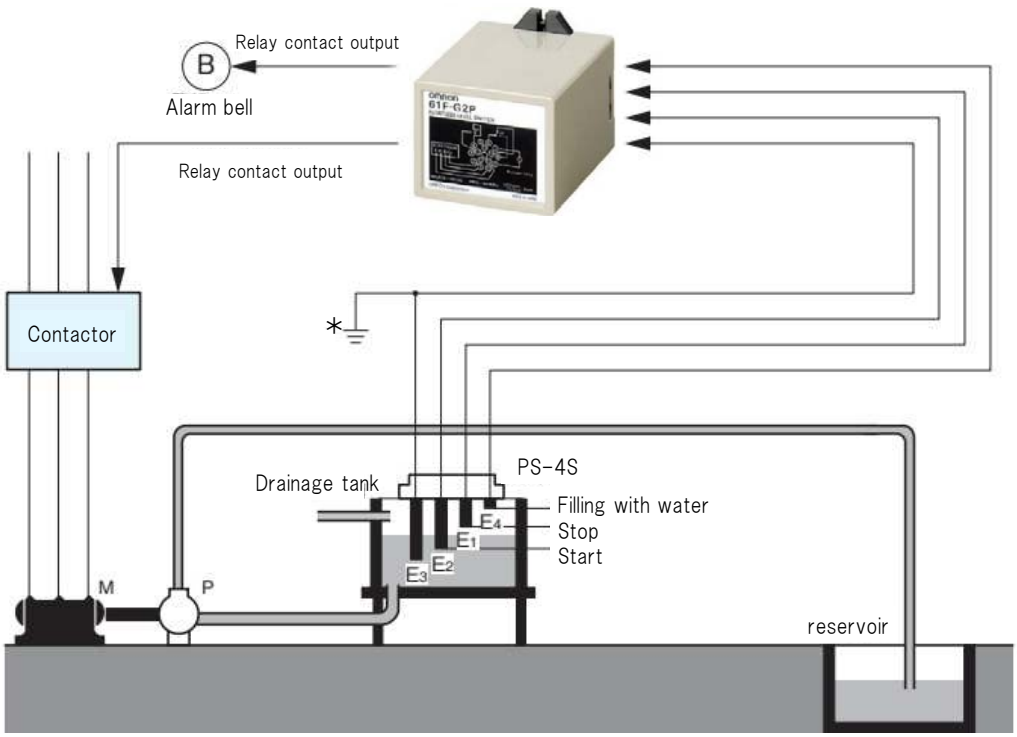
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

6. Automatic Water Discharge Operation with High Water Level Alarm



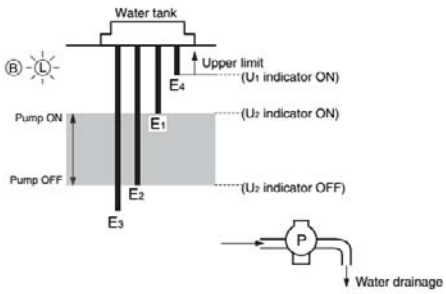
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

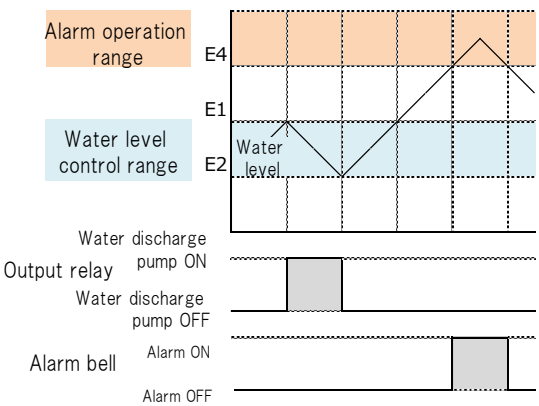
Model	Level Controller model number
Plug-in Level Controller with 14 Pins	61F-G2P (100 VAC) 61F-G2P (200 VAC)
Compact Controller	61F-G2N (100/200 VAC)
Basic Controller	61F-G2 (100/200 VAC)

■ Principles of Operation

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



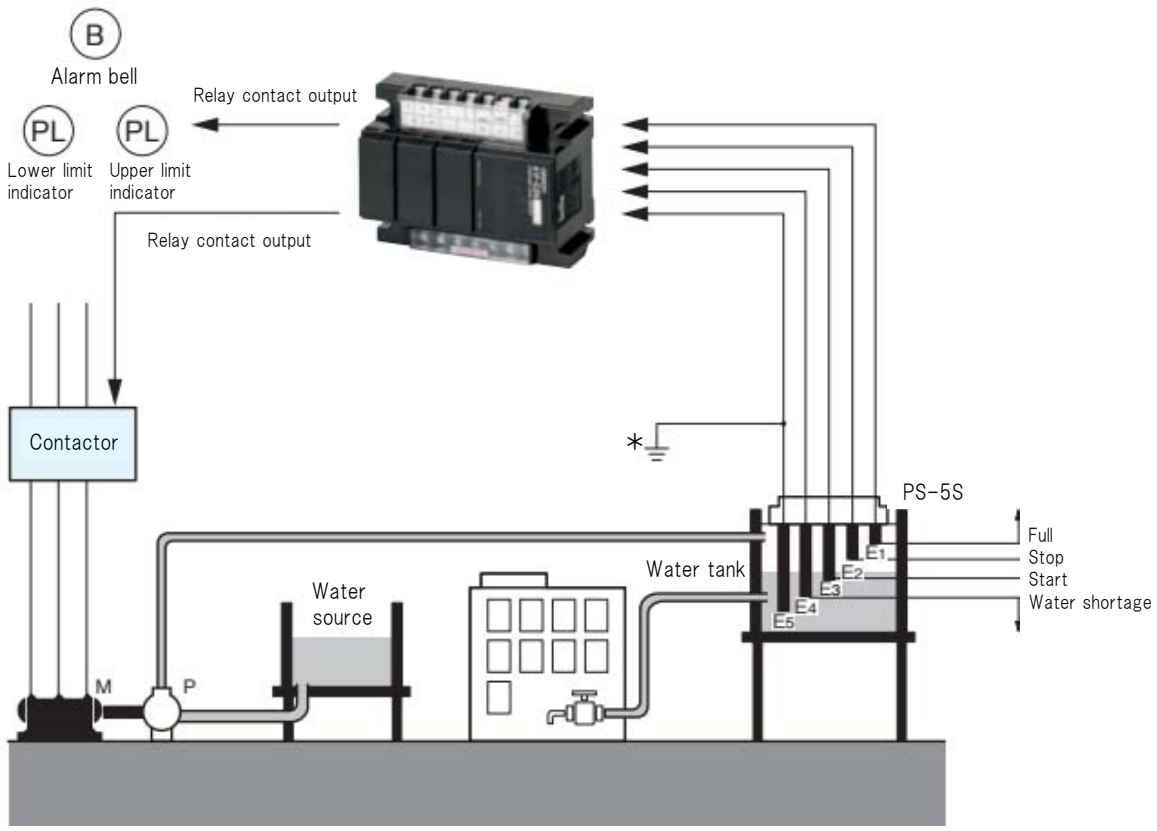
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

7. Automatic Water Supply Operation with Full and Low Water Level Alarms



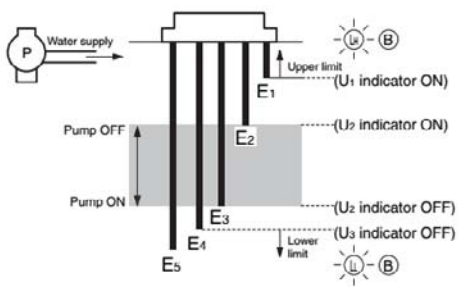
*Make sure that the common pole (the longest Electrode) is grounded securely.

Model	Level Controller model number
Compact Controller	61F-G3N (100/200 VAC)
Basic Controller	61F-G3 (100/200 VAC)

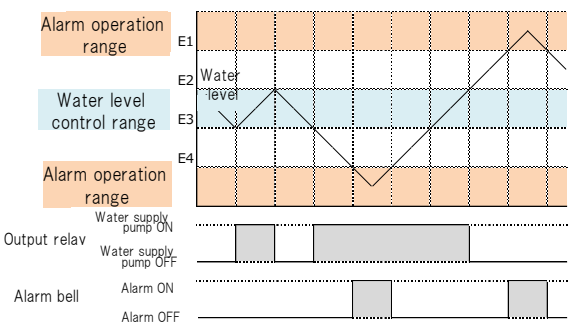
First choice.

■ Principles of Operation

・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 an alarm is given (U_1 indicator ON). If the water level drops below E_4 for any reason, the lower-limit indicator turns ON and an alarm is given (U_3 indicator OFF).



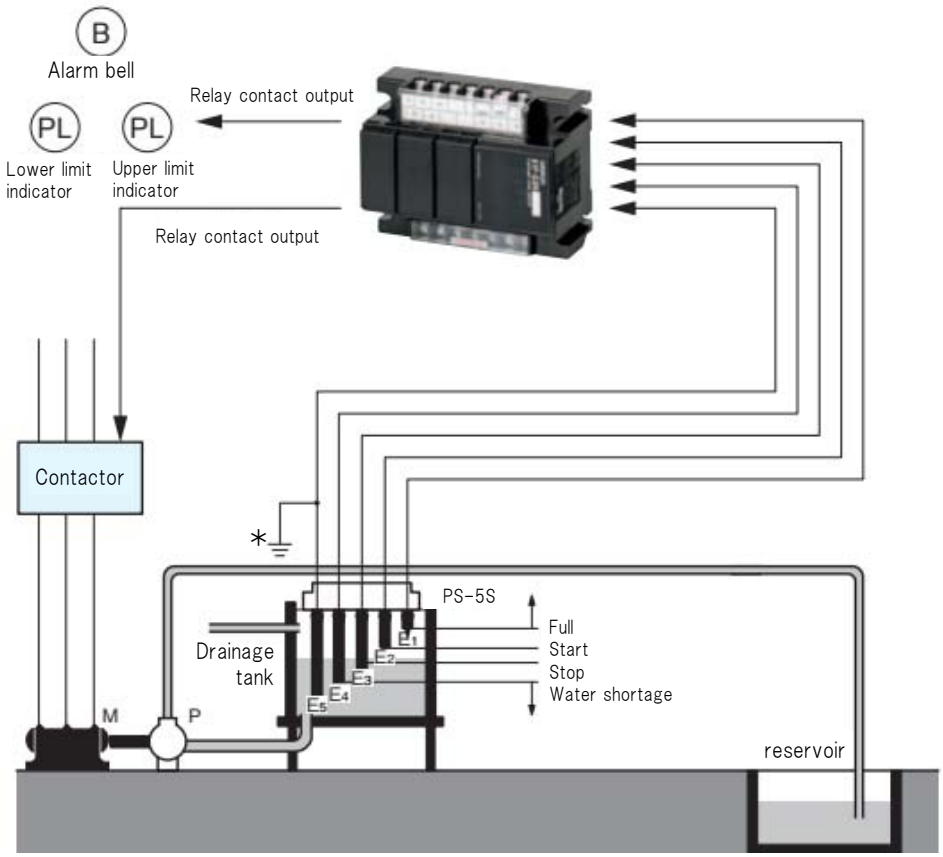
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

8. Automatic Water Discharge Operation with Full and Low Water Level Alarms



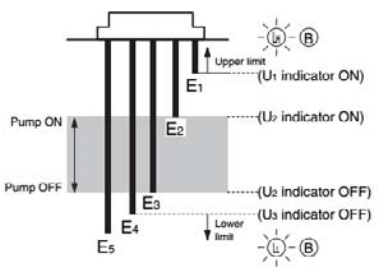
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

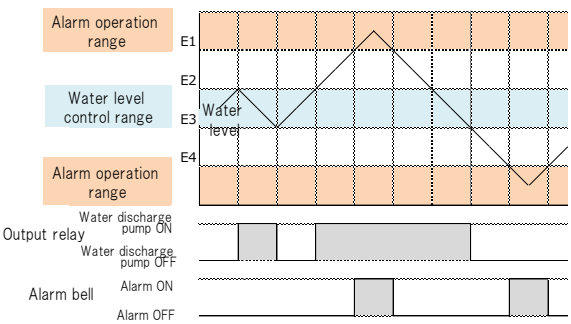
Model	Level Controller model number
Compact Controller	61F-G3N (100/200 VAC)
Basic Controller	61F-G3 (100/200 VAC)

■ Principles of Operation

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



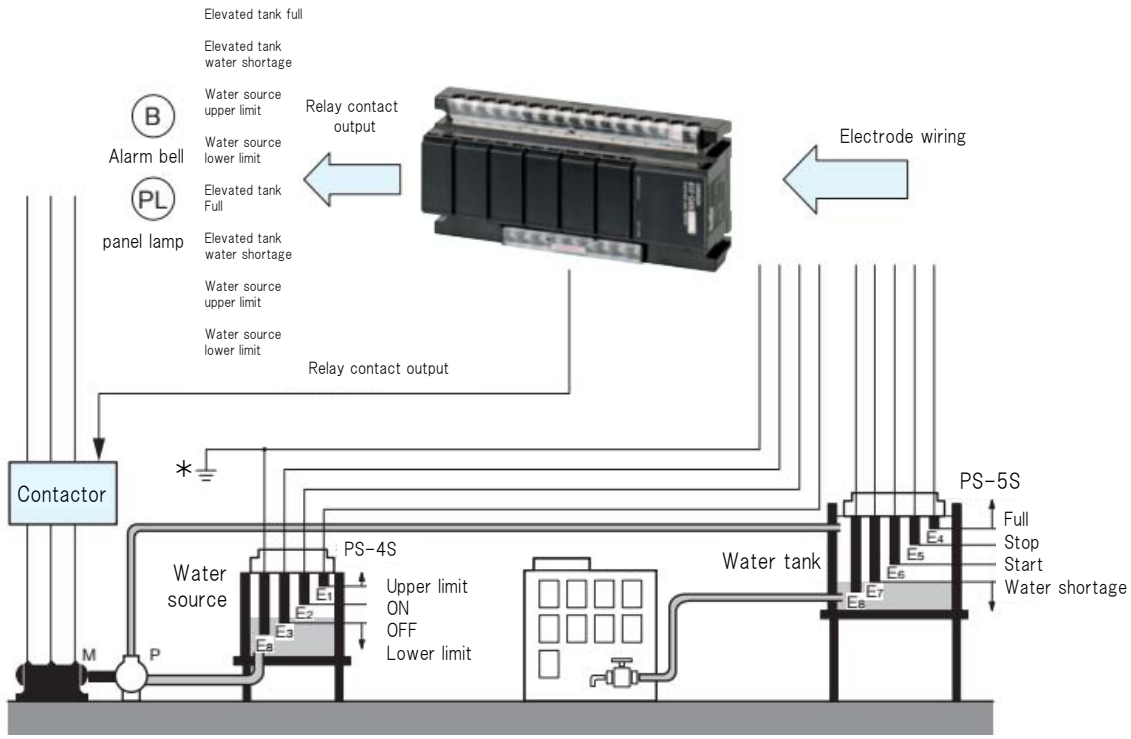
【Timing Chart】



Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

9. Automatic Water Supply Operation with Water Full/Shortage Alarms for an Elevated Tank and Water Level Indications for the Water Source (Prevention of Operating the Pump Dry)



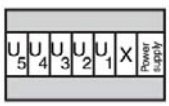
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

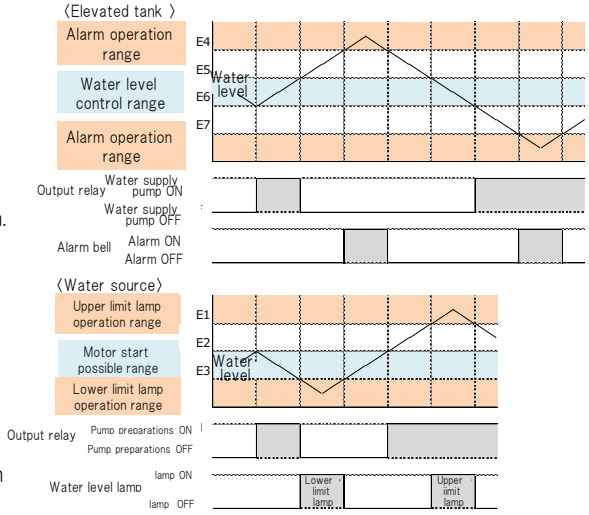
Model	Level Controller model number
Compact Controller	61F-G4N (100/200 VAC)
Basic Controller	61F-G4 (100/200 VAC)

■ Principles of Operation

Relay Unit Layout



【Timing Chart】

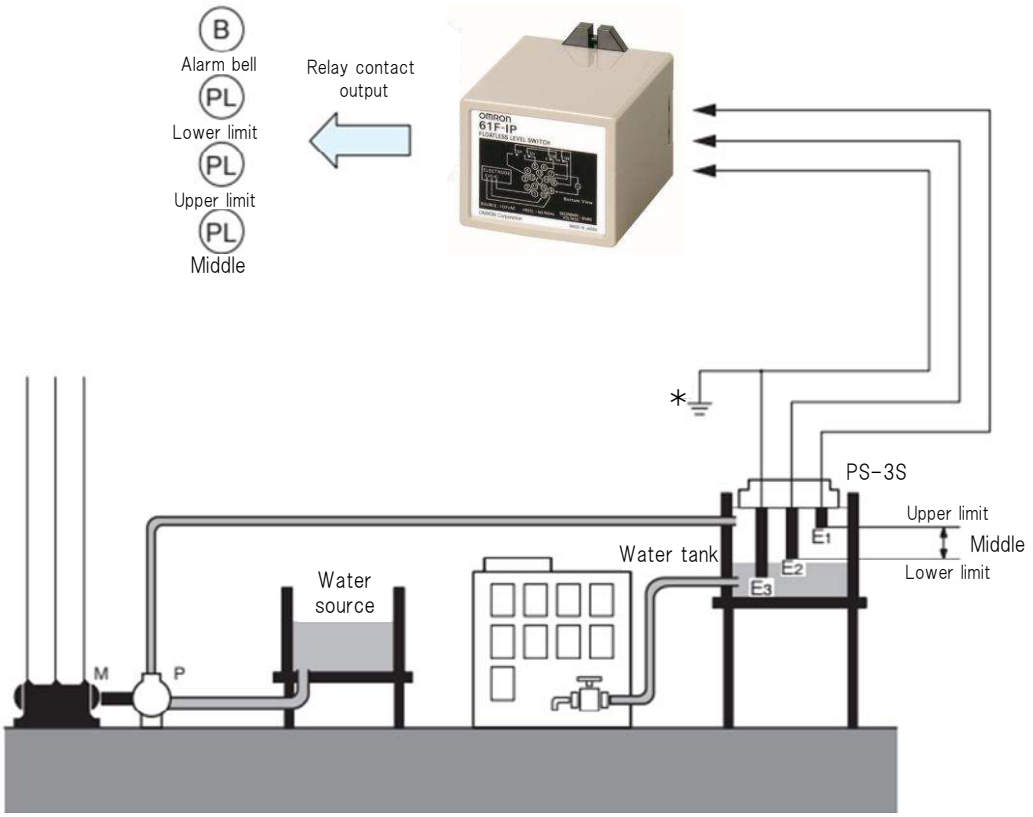


・The lower-limit indicator for the water supply source remains ON while the water source level is below E_3 (U_2 indicator OFF).
・When the water level rises to E_2, the lower-limit indicator turns OFF (U_2 indicator ON) and the pump is ready for operation.
・When the water level reaches E_1, the upper-limit indicator turns ON (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 tank repletion indicator for the elevated tank turns ON (U_4 indicator ON).

Selecting Level Controllers Based on the Application

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

10. Water Level Indicators and Alarms (with No Automatic Water Supply and Discharge Operation)



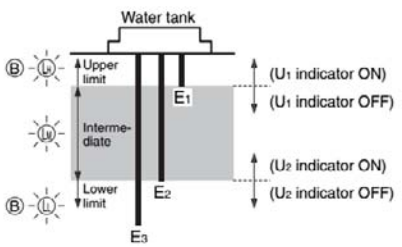
＊Make sure that the common pole (the longest Electrode) is grounded securely.

First choice.

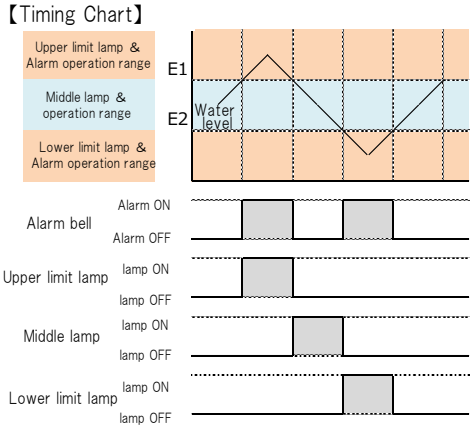
Model	Level Controller model number
Plug-in Controller with 14 pins	61F-IP (100 VAC) 61F-IP (200 VAC)
Compact Controller	61F-IN (100/200 VAC)
Basic Controller	61F-I (100/200 VAC)

■ Principles of Operation

・When the water level drops below E_2, the lower-limit indicator turns ON and an alarm is given (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 an alarm is given (U_1 indicator ON).



【Timing Chart】



Selecting a Level Controller Based on the Application or Application Environment

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

Item	Type	G Type	G1 Type	G2 Type	G3 Type
Application	Automatic Water Supply Operation	○	○	○	○
	Automatic Water Discharge Operation	○ *1		○ *1	○ *1
	Prevention of Operating Pump Dry				
	Abnormal Low Level Alarm		○		○
	Abnormal High Level Alarm		○ *2	○	○
	Water Level Control in Receiving Tank and Monitoring Water Source for Abnormal Levels				
	Level Display and Upper/Lower Limit Alarms		○ *2		
	Alternative Operation for Two Pumps				
Appearance	Compact Level Controllers (JEM size)	 61F-GN	 61F-G1N	 61F-G2N	 First choice. 61F-G3N
	Basic Controllers	 61F-G	 61F-G1	 61F-G2	 61F-G3
	Compact, Plug-in Controllers	 First choice. 61F-GP-N、-N8	———	———	———
	Plug-in Controllers	———	 First choice. 61F-G1P	 First choice. 61F-G2P	———
Features		Most general-purpose Level Controllers.	Supply-only Level Controllers that prevent pump idling.	Powerfully prevents abnormal water increase.	Powerfully prevents abnormal water increase and shortage.
Series	General purpose, 1 km *6	○	○	○	○
	Long distance for 2 km *6	○	○	○	○
	Long distance for 4 km *6	○	○	○	○
	High-sensitivity application	○	○	○	○
	Super-high-sensitivity application				
	Low-sensitivity application	○	○	○	○
	High-temperature application	○	○ *3	○ *3	○
	Tropical environment	○ *4	○ *4	○ *4	○ *4
	Heat resistance (under Japanese fire laws)				
	Two-wire connection	○	○ *7	○ *7	○

*1. The wiring can be changed to select supply or discharge.
*2. Can be used to prevent operating dry or abnormal low level applications.
*3. This does not apply to the 61F-G□N and 61F-G□P.
*4. Models for tropical environments are available only for Basic Controllers and Compact Plug-in Controllers with 11 pins.
*5. UHS only.
*6. The length when using completely insulated, 600-V, 3-conductor (0.75 mm²) cabtyre cables. Usable cable lengths will become shorter as the cable diameter or number of conductors becomes larger.
*7. This does not apply to the 61F-G1P and 61F-G2P.

Selecting a Level Controller Based on the Application or Application Environment

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

Item	Type	G4 Type	I Type	UHS and HSL Types
Application	Automatic Water Supply Operation	○		○ *5
	Automatic Water Discharge Operation			○ *5
	Prevention of Operating Pump Dry	○		
	Abnormal Low Level Alarm	○		
	Abnormal High Level Alarm	○		
	Water Level Control in Receiving Tank and Monitoring Water Source for Abnormal Levels	○		
	Level Display and Upper/Lower Limit Alarms	○	○	
	Alternative Operation for Two Pumps			
Appearance	Compact Level Controllers (JEM size)	First choice.  61F-G4N	 61F-IN	———
	Basic Controllers	 61F-G4	 61F-I	———
	Compact, Plug-in Controllers	———	———	———
	Plug-in Controllers	———	First choice.  61F-IP	 61F-UHS、61F-H
Features		All functions for constant level control and level display alarms.	Level display and easy-to-use alarms.	Ideal for level control of fluid with very low electrical conductivity.
Series	General purpose, 1 km*6	○	○	○
	Long distance for 2 km*6	○	○	
	Long distance for 4 km *6	○	○	
	High-sensitivity application	○	○	
	Super-high-sensitivity application	○		
	Low-sensitivity application	○	○	
	High-temperature application	○	○ *3	
	Tropical environment	○ *4	○ *4	
	Heat resistance (under Japanese fire laws)			
	Two-wire connection	○	○	

*1. The wiring can be changed to select supply or discharge.
*2. The wiring can be changed to select supply or discharge.
*3. This does not apply to the 61F-G□N and 61F-G□P.
*4. Models for tropical environments are available only for Basic Controllers and Compact Plug-in Controllers with 11 pins.
*5. UHS only.
*6. The length when using completely insulated, 600-V, 3-conductor (0.75 mm²) cabtyre cables. Usable cable lengths will become shorter as the cable diameter or number of conductors becomes larger.

Control and Detection Applications of Water Level Controllers

<61F Series>

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

The specific resistances (typical values) of the most common types of 'water' for which level control is used are given below along with the Level Controllers that can be used for each.
○: Detection possible.

Advantage: There is a lower chance of false operation for leakage currents. Long-distance wiring is possible.

Disadvantage: Only liquids with a low resistance can be detected.

Advantage: Liquids with high resistance can also be detected.

Disadvantage: There is a greater chance of false operation for leakage currents. Long-distance wiring is not possible.

Low ← Sensitivity → High

Type		Long distance to 4 km	Long distance to 2 km	Low-sensitivity Controller	General-purpose Controller	High-sensitivity Controller	Super-high-sensitivity Controller
Specific resistance (Ω·cm)		5k or less	10k or less	10k or less	30k or less	30k to 300k	100k to 10M
Detected liquid	Tap water (5k to 10k)	—	○	○	◎	—	—
	Well water (2k to 5k)	○	○	○	◎	—	—
	Rainwater (15k to 25k)	—	—	○	◎	—	—
	Sewage (0.5k to 2k)	○	○	○	◎	—	—
	Sea water (0.03k)	○	○	○	◎	—	—
	Distilled water (250k to 300k or higher)	—	—	—	—	○	○
	Chemicals	The specific resistance of chemicals varies with the concentration. Check the specific resistance based on the chemical concentration. Refer to NTLPxREF Specific Resistances of Liquids on the next page.					
		Some chemicals will cause the Electrodes to corrode. Select the best Electrodes based on their resistance to corrosion. Refer to Appendix Table 4 Electrode Resistance to Corrosion by Various Liquids on page 33.					
	Oils	The specific resistances of oils is too high, so they cannot be detected even with Super-high-sensitivity Controllers. Level control of oils is therefore not possible. Note: Mineral oil: 10 to the power of 10 = 10,000 MΩ·cm					
	Viscous liquids	Viscous liquids can be detected if their specific resistance is suitable, but even after the surface of the liquid drops, the liquid adheres to the Electrodes, resulting in unnecessary operation due to conduction between adjacent Electrodes. Level control of viscous liquids is therefore not possible.					
	Powders	Powders can be detected if their specific resistance is suitable, but humidity or other factors will cause them to adhere to the Electrodes, preventing normal level detection. Level control of powders is therefore not possible.					

The specific resistances (typical values) of typical liquids are provided on the next pages. Use them as reference when you select a Level Controller.

Control and Detection Applications of Water Level Controllers

<61F Series>

Infrastructure water level control or detection
(buildings, storage ponds, rivers, etc.)

Reference Data: Specific Resistances of Various Liquids

Type	Temperature (℃)	Concentration (%)	Specific resistance (Ω·cm)
Beer (company A) Port wine (company K) Whiskey (company T) Sake (company K grade 1)	12 12 12 12	— — — —	830.0 966.0 14,608.0 1,743.0
Nitric acid ($AgNO_3$)	18	5.0 60.0	39.5 4.8
Barium hydroxide $Ba(OH)_2$	18	1.25 2.5	40.0 20.9
Calcium chloride ($CaCl_2$)	18	5.0 20.0 35.0	15.6 5.8 7.3
Cadmium chloride ($CdCl_2$)	18	1.0 20.0 50.0	181.0 33.5 73.0
Cadmium sulfate ($CdSO_4$)	18	1.0 5.0 35.0	240.0 68.5 23.8
Nitric acid (HNO_3)	18	5.0 31.0 62.0	3.9 1.3 2.0
Phosphoric acid (H_3PO_4)	15	10.0 60.0 87.0	17.7 5.5 14.1
Sulfuric acid (H_2SO_4)	15	5.0 30.0 50.0 5.0	4.8 1.4 12.5 117.6
Potassium bromide (KBr)	15	21.0 5.0	14.5 2.9
Calcium chloride (KCl)	18	36.0 5.0	14.5 3.6
Potassium chlorate ($KClO_3$)	15	99.4	27.2
Potassium cyanide (KCN)	18	30.0 97.0	19.0 9.8
Potassium carbonate (K_2CO_3)	15	5.0 5.0 3.25	17.8 4.5 6.8
Potassium fluoride (KF)	15	6.5 40.0	15.3 4.0
Potassium iodide (KI)	15	5.0 55.0	31.4 2.4
Potassium nitrate (KNO_3)	18	5.0 22.0	22.1 6.2
Potassium hydroxide (KOH)	18	4.2 33.6 42.0	6.8 1.9 2.4
Potassium sulfide (K_2S)	18	3.18 29.97 47.26	11.8 2.2 3.9

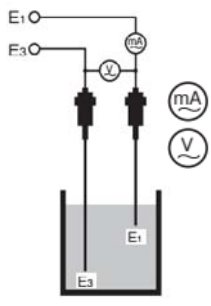
Type	Temperature (℃)	Concentration (%)	Specific resistance (Ω·cm)
Copper sulfate ($CuSO_4$)	18	2.5 17.5	92.6 21.8
Ferrous sulfate ($FeSO_4$)	18	0.5 3.0	65.0 21.7
Hydrogen bromide (HBr)	15	5.0 15.0	5.2 2.0
Hydrochloric acid (HCl)	15	5.0 20.0 40.0	2.5 1.3 1.9
Hydrogen fluoride (HF)	18	0.004 0.015 0.242 29.8	4,000.0 2,000.0 275.0 2.9
Mercuric chloride ($HgCl_2$)	18	0.229 5.08	22,727.0 2,375.0
Hydrogen iodide (HI)	15	5.0	7.5
Potassium sulfate (K_2SO_4)	18	5.0 10.0	21.8 11.6
Sodium chloride (NaCl)	18	5.0 25.0	14.9 5.6
Sodium carbonate (Na_2CO_3)	18	5.0 15.0	22.2 12.0
Sodium iodide (NaI)	18	5.0 40.0	33.6 4.7
Sodium nitrate ($NaNO_3$)	18	5.0 30.0	22.9 6.2
Sodium hydroxide (NaOH)	15	2.5 20.0 42.0	9.2 2.9 8.4
Sodium sulfate (Na_2SO_4)	18	5.0 15.0	24.4 11.3
Ammonia (NH_3)	15	0.1 4.01 3.05	3,984.0 913.0 5,181.0
Ammonium chloride (NH_4Cl)	18	5.0 25.0	50.5 2.5
Ammonium nitrate (NH_4NO_3)	15	5.0 50.0	16.9 2.7
Ammonium sulfate ($(NH_4)_2SO_4$)	15	5.0 31.0	18.1 4.3
Zinc chloride ($ZnCl_2$)	15	2.5 30.0 60.0	36.2 10.8 27.1
Zinc sulfate ($ZnSO_4$)	18	5.0 30.0	52.4 22.5

Reference: Measurement Method for Resistance between

If you do not know the specific resistance of the liquid to be detected, you can measure the resistance between Electrodes with the following formula and a tester.

$$R = \frac{V}{I}$$

R: Resistance of liquid between Electrodes (kΩ)
V: Voltage shown on voltmeter (V)
I : Current shown on ammeter (mA)
Use the value of R to select the 61F model.



Use an ammeter that can be accurately read to around 1 mA with as low of an impedance as possible.

Use a voltmeter that can be read to within a few volts with as high of an impedance as possible.