

GENERAL CATALOGUE 2004/2005

Industrial Components



- Electromechanical Relays
- Timers
- Counters
- Programmable Relays
- Level Controllers
- Limit Switches
- Pushbutton Switches
- Low Voltage Switch Gear
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Advanced Industrial Automation




Cat. No. Y202-EN2-02 ICD

OMRON

Level Controllers

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Level Controllers

Classification	Conductive Level Controller for Single or Two-point level control	Conductive Level Controller	Liquid Leakage Sensor Amplifier
Model	61F-GP-N8(Y)	61F-GPN-BT/BC	K7L-AT50
Appearance			
Detection Method	Conductive	Conductive	Conductive
Supply voltage	24/100/110/120/200/220/230/240 VAC (85..110% of rated Voltage)	24 VDC	12..24 VDC (10..30 VDC with voltage fluctuation)
Detectable Materials	From low conductive (distilled water) to high conductive (sea water/chemicals)	Adjustable sensitivity, with an operating resistance range of 0..100 k Ω , allows use for a wide variety of liquids.	Liquids with resistance as 0..50 M Ω (4 selectable ranges)
Operating range	4..15 k Ω , 70..300 k Ω , 0..50 k Ω	0..100 k Ω	10 m of sensing band length
Control Output	Relay 3 A, 250 VAC (resistive load)	Open collector (NPN): 30 VDC, 100 mA max. Relay SPST-NO 5 A, 240 VAC (Resistive load)	NPN or PNP 100 mA at 30 VDC max
Operation Ambient Temperature/RH	-10..55 Degrees Celsius/45..85% RH	-10..55 °C / 25%..85% RH	-10..55 Degrees Celsius/45..85% RH
Mounting	Socket	Socket	Terminal Block or Socket
Dimensions (mm)	38 x 49 x 70 (W x H x D)	38 x 49 x 70 (W x H x D)	13 x 29 x 46 (W x H x D)
IP grade	-	-	-
Approvals	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE
Remarks	Level probes need to be ordered separately	Level probes need to be ordered separately	Level probes need to be ordered separately
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**Liquid Leakage Sensor Amplifier with
disconnection Detection function**

K7L-AT50D/-AT50D-S



Conductive

12..24 VDC
(10..30 VDC with voltage fluctuation)

Liquids with resistance as 0..50 M Ω
(4 selectable ranges)

10 m of sensing band length

NPN or PNP 100 mA at 30 VDC max.
for liquid leakage detection and
disconnection detection

-10..55 Degrees Celsius/45..85% RH

Terminal Block or Socket

13 x 31 x 46 (W x H x D)

-

UL, CSA, CE

Level probes need to be ordered
seperately

E-25

Level Controllers

Conductive Level Controller 61F-GP-N8

Compact Plug-in Level Controllers for Single or Two-point Level Control of Conductive Materials (Liquids and Solids)

- Wide range of models: long-distance, high and low-sensitivity, and two-wired types available.
- 24/100/110/120/200/220/230/240 VAC operation possible.
- Easy installation on DIN track.
- Low-voltage (AC) electrodes.
- Red LED operation indicator provided.
- Conforms to EMC and LVD Directives.
- UL/CSA approved.



Level Controllers

Model Number Structure

Model Number Legend

61F-GP-N8□
1 2 3

1. Plug-in Type
2. Compact 8-pin Type

3. Applications

- None: General-purpose type
- L: Long-distance type
- H: High-sensitivity type (reverse acting)
- HY: High-sensitivity type (standard acting)
- D: Low-sensitivity type
- R: Two-wired type

Ordering Information

List of Models

Application	Model number	
General-purpose type	61F-GP-N8	
Long-distance type	2 km	61F-GP-N8L 2KM
	4 km	61F-GP-N8L 4KM
High-sensitivity type	61F-GP-N8H	
Low-sensitivity type	61F-GP-N8D	
Two-wired type	61F-GP-N8R	

■ Accessories (Order Separately)

Selection Guide for Electrode Holders and Separators

Electrode Holders

Applications	For city water and other general-use electrodes. Easy-to-replace separate versions facilitate maintenance of electrodes.	When mounting space is limited. Special 3-pole holder of small size and light weight. Ideal for soft drink vendors, etc., where only limited space is available.	For low specific liquids. Used for sewage, sea water, etc., having a low specific resistance. In sewage use, electrode holders must be installed 10 to 20 cm apart from one another. For acids, alkalis and sea water, electrode holders may be as much as 1 meter apart to operate properly.	When resistance to high pressure is required. Ideal for use in tanks where temperature or pressure inside the tank is high, e.g. 250°C	
Mounting style	Flange	Screw	Flange	Screw	
Insulator material	Phenol resin	Phenol resin	Ceramics	Teflon	
Max. temperature	70°C		150°C (without water drips or vapor on the surface of the electrode holder)	250°C (without water drips or vapor on the surface of the electrode holder)	
No. of electrodes	1	---	---	BF-1	BS-1
	3	PS-3S	PS-31	---	---

Electrode Separators

No. of electrodes	Model
1	F03-14 1P
3	F03-14 3P

Selection Guide for Electrodes, Connecting, and Lock Nuts

Applicable liquids	Material	Models for individual electrode assembly components					
		Electrode (1m long)		Connecting nut		Lock nut	
		Model	Indication mark	Model	Inscription	Model	Inscription
Purified city water, industrial water, sewage	Equivalent to SUS 304 (AISI-304)	F03-01 SUS201	1 line	F03-02 SUS201	---	F03-03 SUS201	---
Purified city water, industrial water, sewage, dilute alkaline solution	SUS316 (AISI-316)	F03-01 SUS316	2 lines	F03-02 SUS316	6	F03-03 SUS316	316

Specifications

■ Ratings and Characteristics

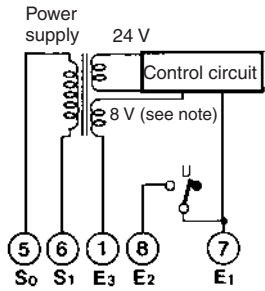
Model/Items	General-purpose Controller 61F-GP-N8	Long-distance Controllers 61F-GP-N8L 2KM (for 2 km) 61F-GP-N8L 4KM (for 4 km)	High-sensitivity Controllers 61F-GP-N8H 61F-GP-N8HY (see note 1)	Low-sensitivity Controller 61F-GP-N8D	Two-wired Controller 61F-GP-N8R
Controlling materials and operating conditions	For control of ordinary purified water or sewage water	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-wired-type electrode holder (incorporating a resistor of 6.8 kΩ)
Supply voltage	24, 100, 110, 120, 200, 220, 230 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.		Approx. 0.4 mA AC max.	Approx. 1 mA AC max.	
Power consumption	Approx. 3.5 VA max.				
Interelectrode operate resistance	Approx. 0 to 4 kΩ	Approx. 0 to 1.3 kΩ (for 2 km) Approx. 0 to 0.5 kΩ (for 4 km)	Approx. 15 kΩ to 70 kΩ (see note 3)	Approx. 0 to 1.3 kΩ	Approx. 0 to 2 kΩ
Interelectrode release resistance	Approx. 15 k to ∞ Ω	Approx. 4 k to ∞ Ω (for 2 km) Approx. 2.5 k to ∞ Ω (for 4 km)	Approx. 300 k to ∞ Ω	Approx. 4 k to ∞ Ω	Approx. 15 k to ∞ Ω
Response time	Operate: 80 ms max. Release: 160 ms max.				
Cable length (see note 2)	1 km max.	2 km max. 4 km max.	50 m max.	1 km max.	800 m max.
Control output	1 A, 250 VAC (Inductive load: $\cos\phi = 0.4$) 3 A, 250 VAC (Resistive load)				
Ambient temperature	Operating: -10°C to 55°C				
Ambient humidity	Operating: 45% to 85% RH				
Insulation resistance (see note 3)	100 MΩ max. (at 500 VDC)				
Dielectric strength (see note 4)	2000 VAC, 50/60 Hz for 1 min.				
Life expectancy	Electrical: 100,000 operations min. Mechanical: 5,000,000 operations min.				

- Note:**
1. The relay in the 61F-GP-N8H de-energizes when there is water present across the electrodes, whereas the relay in the 61F-GP-N8HY energizes when there is water present across the electrodes.
 2. The length when using completely-insulated, 600-V, 3-conductor (0.75 mm²) cable type cables. Usable cable lengths will become shorter as the cable diameter or number of conductors becomes larger.
 3. 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.
 4. Possible to use with 10 kΩ or less, however, this may cause reset failure.

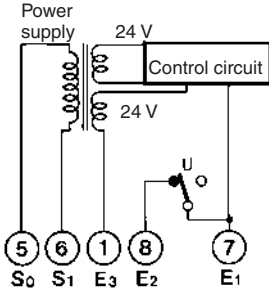
Connections

Internal Circuit Diagrams

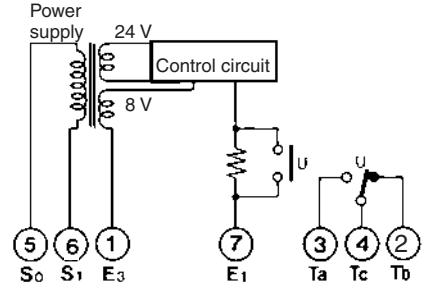
61F-GP-N8/-N8L/-N8D/-N8HY



61F-GP-N8H



61F-GP-N8R



Note: 24 V for the 61F-GP-N8HY.

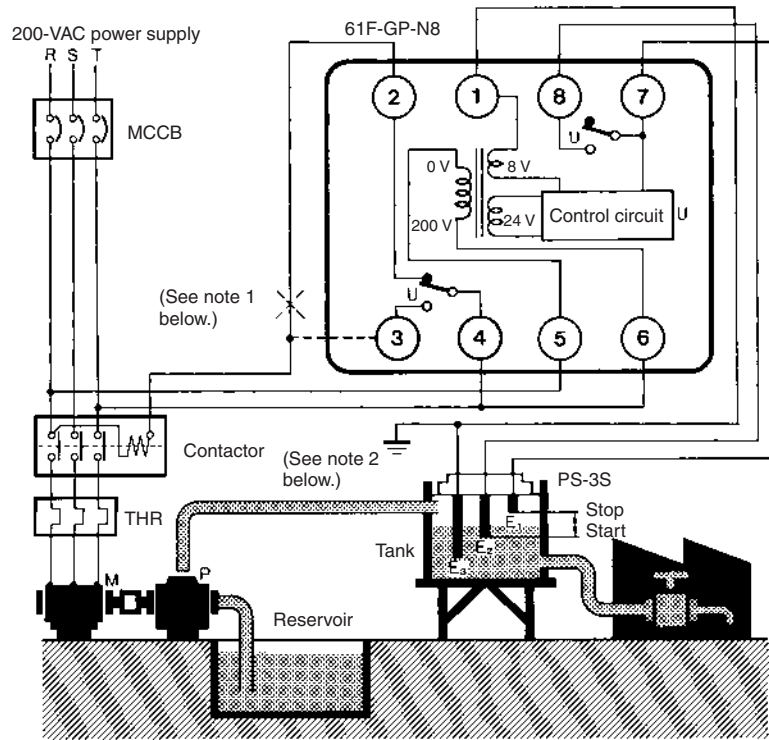
Automatic Water Supply and Drainage Control

1. Water Supply

- Connect electromagnetic switch coil terminal A to terminal 2.
- The pump stops when the water level reaches E1 and starts when the water level drops below E2.

2. Drainage

- Connect the electromagnetic switch coil terminal A to terminal 3.
- The pump starts when the water level reaches E1 and stops when the water level drops below E2.



- Note:**
1. The diagram shows the connections for water supply. When draining, change the connection from terminal 2 to terminal 3.
 2. The earth terminal must be earthed.

Operation

The Conductive Level Controller consists of a plug-in controller connected to a set of stainless steel probes. These are cut to length and inserted vertically into the liquid. A low voltage is applied between these probes and the earth probe (or tank, if it is electrically conductive). The water provides a current between the earth probe and the high-level probe. The output relay in the Controller is energized when the water level reaches the high-level probe and de-energized when the water level falls below it.

For two-point control a low-level probe is used as well. In this case the relay does not de-energize until the water level falls below the low-level probe. Using the low-level probe allows a wide differential between switching a pump on and off, and can avoid excessive pump operation during tank emptying or filling. If this differential is not required, the low-level probe need not be connected.

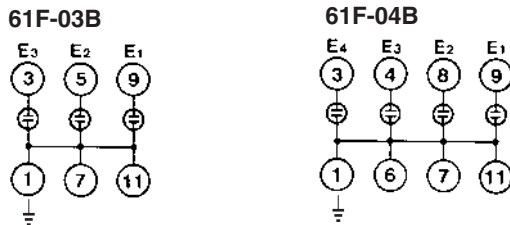
Surge Suppressor Unit (61F-03B/04B)

A high-capacity protective device is available which protects 61F-series Floatless Level Controllers against faults arising from electrical surges (such as indirect strokes of lightning) when the Controllers are employed in elevated water tanks or in high-altitude locations.

Specifications

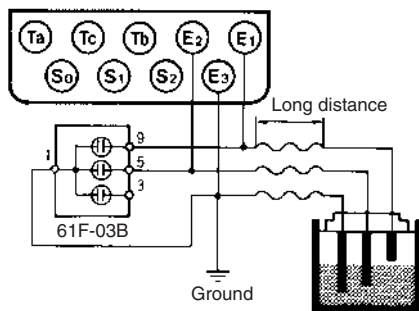
Discharge start voltage	90 V ±20 VDC
Impulse withstand voltage	200,000 V (1 x 40 μs)
Impulse withstand current	6,000 A (1 x 40 μs)

Internal Connections

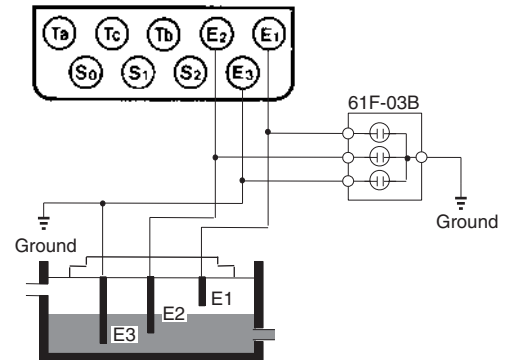


Precautions

1. Mount the Surge Suppressor Unit as close to the Controller as possible.
2. When grounding the Surge Suppressor Unit in the vicinity of the Controller, connect the ground side of the Surge Suppressor Unit to electrode E3.



3. When connecting the Surge Suppressor Unit, wire as shown in the following example (with three electrodes).



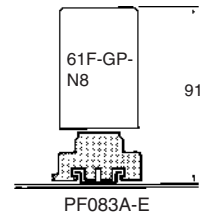
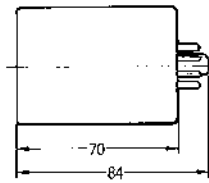
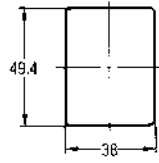
Connection Sockets

- PF113A-E Track-mounted Socket
- PL11 Back-connecting Socket

Level Controllers

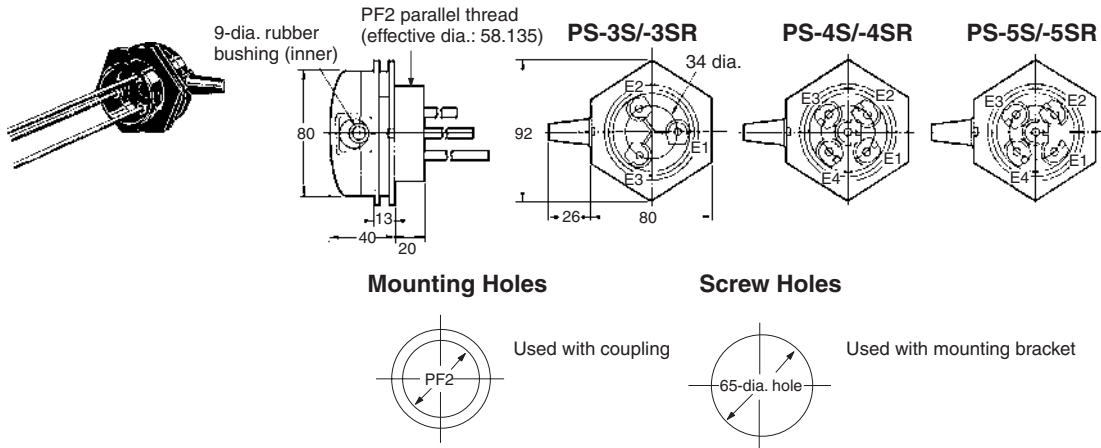
Dimensions

Note: All units are in millimeters unless otherwise indicated.

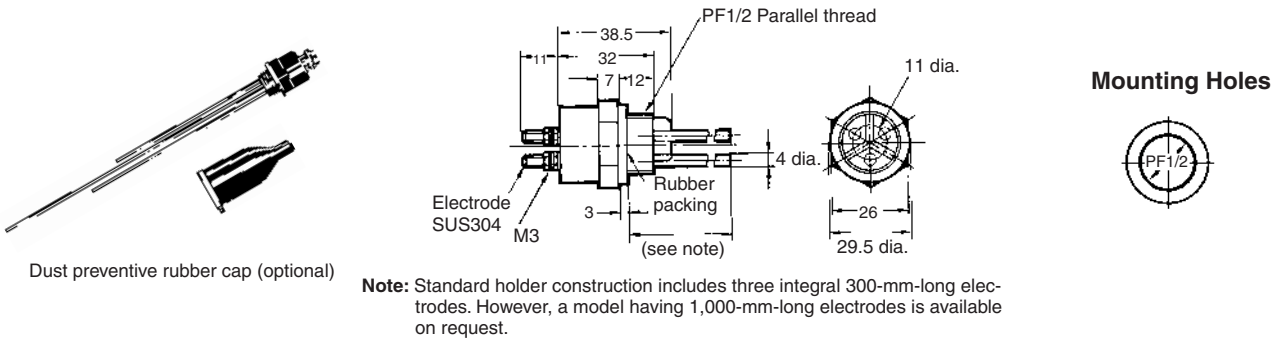


Electrode Holders

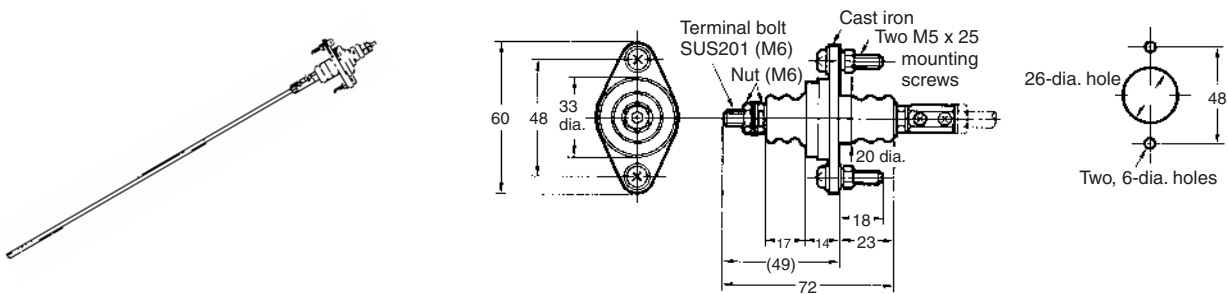
PS-□S



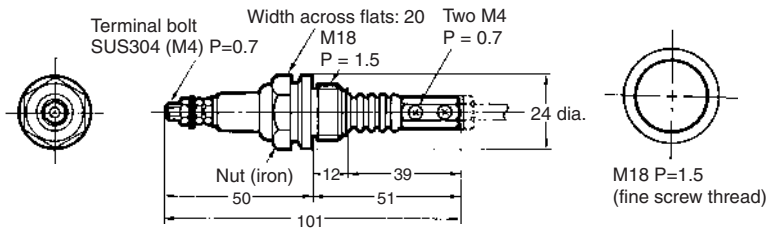
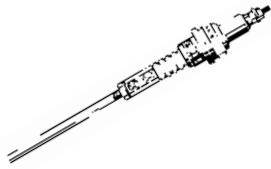
PS-31



BF-1



BS-1



Electrode Separators

F03-14 1P (for Single Pole)



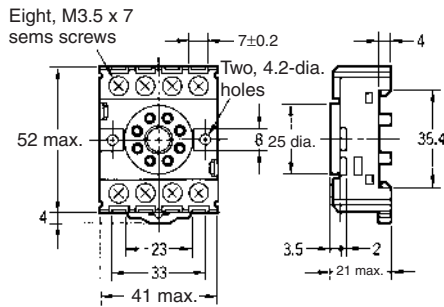
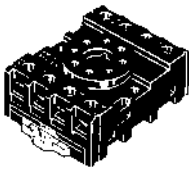
F03-14 3P (for Three Poles)



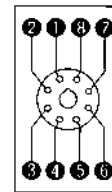
Connecting Sockets

Track Mounted Socket

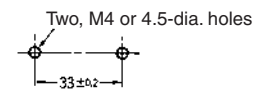
PF083A-E



Terminal Arrangement/ Internal Connections (Top View)

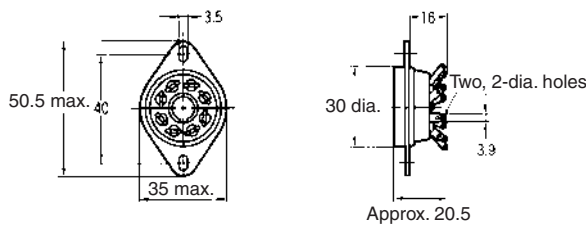


Mounting Holes

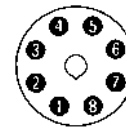


Back Connecting Socket

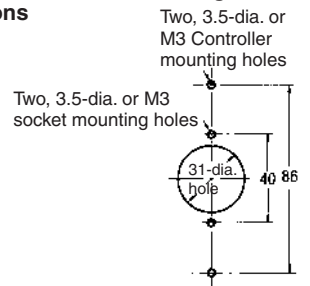
PL08



Terminal arrangement/ Internal Connections (Bottom View)



Mounting Holes

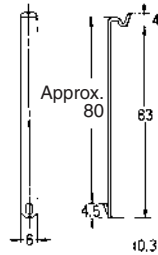
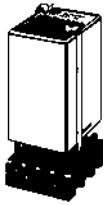


Level Controllers

Holding Brackets

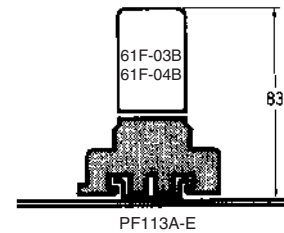
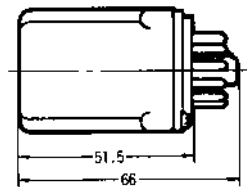
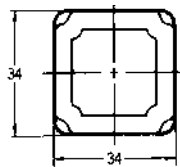
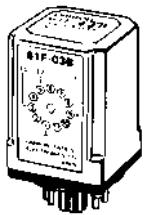
To mount the 61F-GP-N8 Conductive Level Controller on the PF083A Track Mounted Socket, use the PFC-N8 Mounting Brackets attached to the Socket as an accessory.

PFC-N8



Surge Suppressor Unit

61F-03B
61F-04B



Application Examples

- Level control in tanks, reservoirs, sewage plants, underground wells, mixing plants etc.
- Level control for element protection in pipes, channels, and irrigation systems.
- Flow detection in pipes, channels, and irrigation systems.
- Ice bank control in cold drink dispensers, ice makers, water chillers, bulk milk tanks, etc.
- Dispensing of liquids by volume.
- Indication of liquid buildup due to filter blockages.
- Pollution/foul water detection for rivers, drains, etc.
- Alarm control warning of abnormal or dangerously high or low levels.

Application

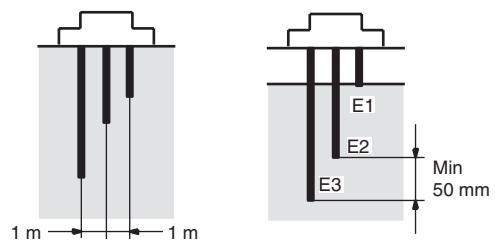
When using electrodes in sea water or sewage, provide a sufficient interval (normally 1 m) between the electrodes. If the sufficient interval cannot be provided, employ a low-sensitivity-type Floatless Level Controller.

When taping one of the electrodes to prevent it from contacting the other electrodes in water, do not tape the electrode entirely but leave at least 100 mm of its end uncovered.

When the required length of the electrode is more than 1 m, use a separator at each joint of two electrodes so as to prevent the electrodes from contacting one another.

Note: Avoid use of the separators in dust-containing liquids.

Usually, electrodes are used in a set of three: long, medium, and short. Connect the short electrode to E1, the medium electrode to E2, and the long electrode to E3. Make E3 at least 50 mm longer than E2.



Electrodes are in actual contact with the liquid. Standard electrodes are made of stainless steel and usable in purified water, sea water, sewage, acid (except acetic acid, sulfuric acid, etc.) and alkaline liquids, although they may corrode depending upon the temperature and working conditions.

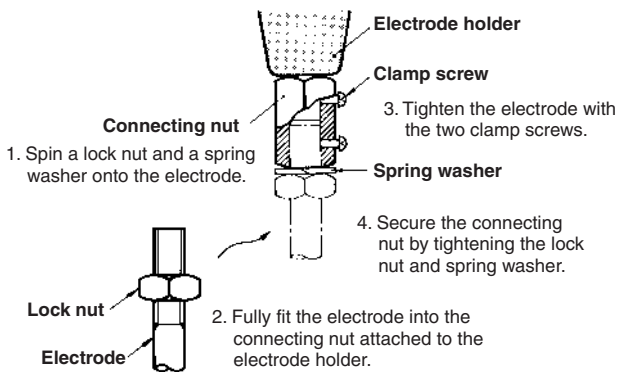
Note that the 61F-GP-N8 Conductive Level Controller is capable of controlling liquids with specific resistances of up to 30 kΩ-cm when the Controller employs a PS-3S electrode holder with the electrode(s) submerged to a depth of 30 mm max.

Kind of water	Specific resistance	Applicable type
City water	5 to 10 kΩ-cm	Standard type
Well water	2 to 5 kΩ-cm	Standard type
Industrial water	5 to 15 kΩ-cm	Standard type
Rainwater	15 to 25 kΩ-cm	Standard type
Sea water	0.03 kΩ-cm	Low-sensitivity type
Sewage	0.5 to 2 kΩ-cm	Low-sensitivity type
Distilled water	100 kΩ-cm or less	High-sensitivity type
	Over 100 kΩ-cm	Consult OMRON

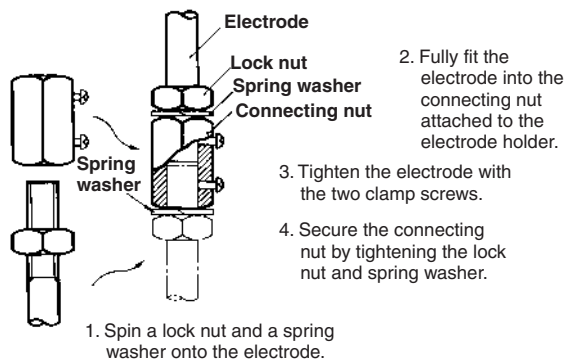
Precautions

■ How to Mount Electrodes

Connecting Electrodes to Electrode Holders



Connecting One Electrode to Another



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. F043-E1-02

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

Conductive Level Controller 61F-GPN-BT/-BC

Battery (24 VDC) allows use in locations without AC power supply. AC sine-wave voltage between electrodes enables stable detection with no electric corrosion.

- Outputs can be set to self-hold at ON or OFF using special circuits.
- Adjustable sensitivity, with an operating resistance range of 0 to 100 kΩ, allows use for a wide variety of liquids.
- Relay contact chattering conventionally caused by waves eliminated using open collector output, reducing contact wear.
- Bears CE marking and is a UL recognized component.

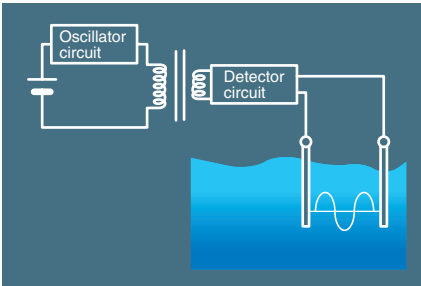


Level Controllers

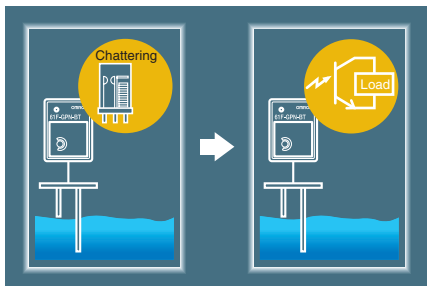
Features

The 61F can now run on DC power to allow energy savings, greater safety, and use in emergency situations.

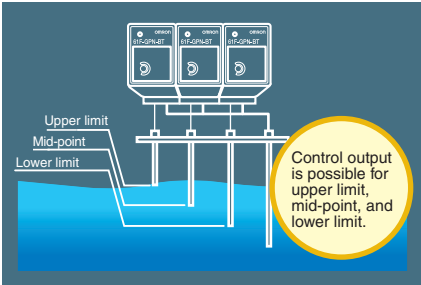
Combines DC Power Supply with AC Sensing Method
AC sine-wave signals are sent to electrodes using a built-in DC-AC converter, preventing electric corrosion and ensuring safety.



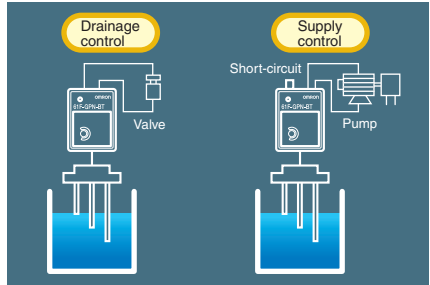
Open Collector Output
Signals can be used as direct input for a PLC. PNP output is also possible using the connection method.



Supports Multi-channel Sensing
Power supply circuits and detection circuits are isolated, allowing more than one Controller to be used in the same tank.



Same Wiring for Supply and Drainage
Supply control and drainage control can be performed with the same wiring (short terminals 7 and 8 for supply control). This makes it easy to perform wiring and confirm connection.



Ordering Information

Product name	Model number	
Conductive Level Controller	61F-GPN-BT	61F-GPN-BC
	Open collector (NPN)	Relay contact (SPST-NO)
Front Socket	PF113A-E	
Electrode Holder	(See note.)	

Note: A variety of Holders are available to suit different types of application. For details, refer to *61F Floatless Level Controller (F030-E1-8)*.

Specifications

■ Ratings

	61F-GPN-BT	61F-GPN-BC
Rated voltage	24 VDC	
Allowable voltage range	85% to 110% of the rated voltage	
Interelectrode voltage	5 VAC max.	
Operation resistance (See note 1.)	Variable (0 to 100 kΩ)	
Error	For scale of 0: +10 kΩ; For scale of 100: ±10 kΩ	
Release resistance	200% max. of the operation resistance	
Switching between supply and drainage	Terminals 7 and 8 open: Automatic drainage operation Terminals 7 and 8 shorted: Automatic supply operation	
Output specifications	Open collector (NPN) 30 VDC, 100 mA max.	SPST-NO 5 A, 240 VAC (Resistive load) 2 A, 240 VAC (Inductive load: $\cos\phi=0.4$)
Life expectancy	---	Electrical: 100,000 operations min. Mechanical: 20,000,000 operations min.
Wiring distance (See note 2.)	100 m max.	

Note: 1. The 61F may not operate at resistance settings close to zero. Adjust the sensitivity to match actual usage conditions.
2. The figure for wiring distance above is for when 600-V 3-core cable with a cross-sectional area of 0.75 mm² is used.

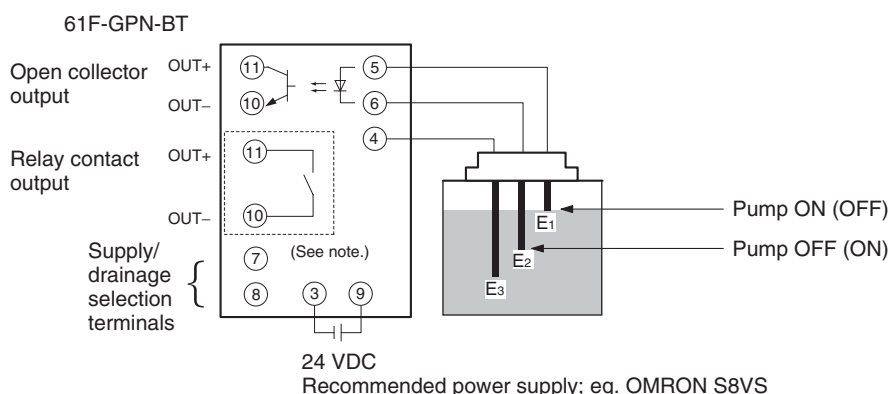
■ Characteristics

Ambient operating temperature	-10 to 55°C
Ambient operating humidity	25% to 85%
Insulation resistance	100 MΩ min. (at 500 VDC)
Dielectric strength (See note.)	2,000 VAC, 50/60 Hz for 1 minute
Power consumption	2 W max.
Response time	Operating: 1.5 s max. Releasing: 3.0 s max.

Note: The dielectric strength is measured between power terminals and electrode terminals, power terminals and output terminals, and between electrode terminals and output terminals.

Connections

■ Automatic Drainage Operation



Note: [] The part within the dotted-line box is for the 61F-GPN-BC (relay-output type) only.

■ Automatic Water Supply Operation

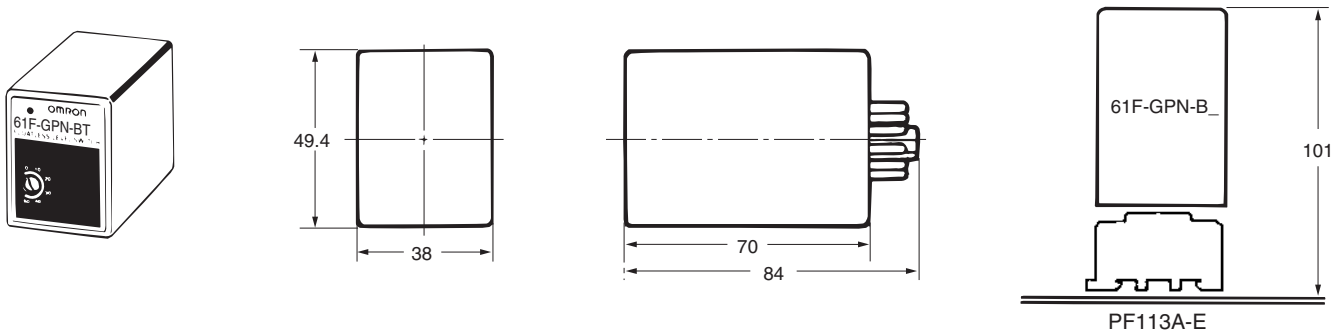
Short terminals 7 and 8 for automatic water supply operation. (Operation shown in parentheses in the diagram above.)

■ Reading Signals for the Liquid Level Only (No Control)

Only E1 and E3 are used. Output will turn ON when the liquid level reaches E1 if terminals 7 and 8 are open, and will turn OFF if terminals 7 and 8 are closed. Also, to take signals for liquid level at several points, use terminal 4 as a common for all of the Controllers and use terminal 5 of each Controller as an electrode.

Note: If terminals 7 and 8 are shorted, operation of the 61F relay is "de-energizing" (i.e., energized normally and de-energized when liquid is present across the electrodes). Therefore, if the power supply connected across terminals 3 and 9 is interrupted, the output from terminals 10 and 11 will turn OFF, enabling detection of power interruptions.

Dimensions



Level Controllers

Application Examples

Applications

Drainage control for semiconductor wafer cleaning installations.

Meet safety standards by using DC power supply for all devices in a panel.

Liquid level control for waste-heat recovery boilers in co-generation systems.

Liquid level control for solar power generation systems.

Liquid level control for remote regions without AC power supply.

Cut costs by using the 61F in situations where ultrasonic/electrostatic capacity level controllers were used because only DC power supply was available.

Number of controllers required:
2
↓
1

Precautions

General Precautions

Before using the Controller under conditions not described in the relevant documents or applying the Controller to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the Controller are sufficient for the systems, machines, and equipment and be sure to provide the systems, machines, and equipment with double safety-mechanisms.

Safety Precautions

In order to ensure safe operation, be sure to observe the following points.

- Use a power supply voltage within the specified range.
- Do not use the Controller in locations subject to flammable gases or objects.
- Insert the Socket until it securely clicks into place.
- Do not short the load connected to the output terminals.
- Do not connect the power supply in reverse.

Correct Use

Mounting

Mount to a panel of thickness 1 to 5 mm.

Do not mount the Controller in the following places.

- Locations subject to strong vibrations or shocks.
- Locations outside the specified temperature and humidity ranges, or locations prone to condensation. (The Controller detects high impedances. Do not use in locations subject to high humidity levels.)
- Locations subject to dust.
- Locations subject to corrosive gases (in particular, sulphurized gas or ammonia gas).
- Outdoors, or in locations subject to direct sunlight.
- Near devices that generate strong, high-frequency noise (e.g., high-frequency welders, machines).

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Liquid Leakage Sensor Amplifier K7L-AT50/-AT50D

- Detects liquids with impedance as high as 50 MΩ
- Polyethylene used for Sensing Band to ensure high degree of chemical resistance.
- Model with disconnection detection function available.



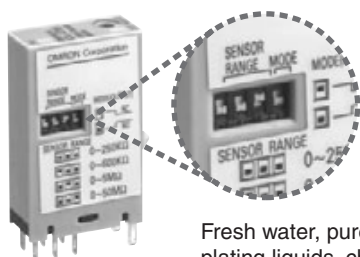
Level Controllers

Features

Sensing Band boasts high degree of chemical resistance. The K7L can be used in a wide range of applications from semiconductor production installations to food-processing equipment.

Inter-electrode Resistance Detection

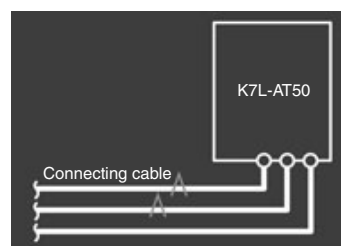
Stable detection of liquids with impedances of up to 50 MΩ and common water. Four sensing ranges are available ensuring detection suited to the application.



Fresh water, pure water, distilled water, plating liquids, chemical liquids, IPA (isopropyl alcohol)

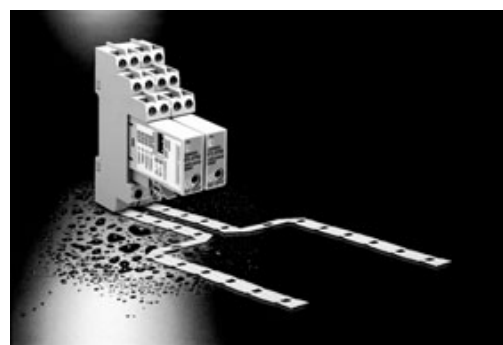
Noise Canceller Function (PAT.)

Incorporates a noise canceller circuit that uses a 3-conductor cable, ensuring a high level of noise immunity.



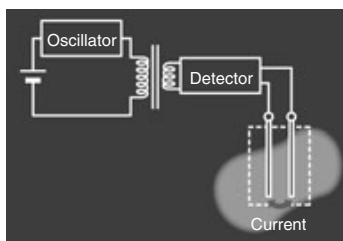
Multiple Installation

The power supply circuit and the detection circuit are isolated and so several Amplifiers can be installed in the same place.



AC Detection Method

The K7L internally oscillates AC signals provided to the Sensing Band at approximately 3.75 Hz, protecting the Sensing Band from electric corrosion, and ensuring safe operation.



Sensing Band with Excellent Chemical Resistance

SU316 and polyethylene are used for the Sensing Band's core and sheath respectively ensuring high resistance to both acidic and alkaline liquids.



Application Examples

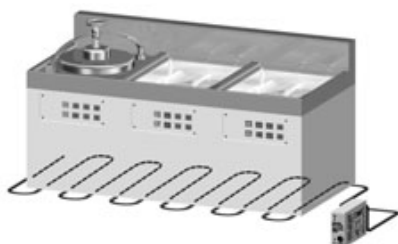
Liquid Leakage Detection for Measuring Baths in CMP Devices

Detects liquid leaked to drain pans, and prevents damage to devices and cleaning irregularities for wafers.



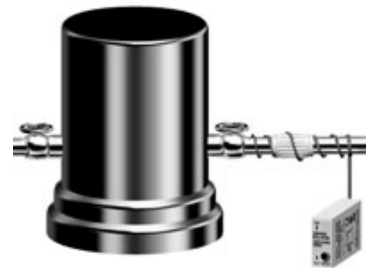
Detection of Condensation and Liquid Leakage at Semiconductor Production Installations

Detects condensation inside cleaning devices and liquid leaked to the surroundings.



Detection of Liquid Leakage at Pipe Joints for Chemical Liquid Tanks

Liquid leakage at a pipe joint can be detected by wrapping the Sensing Band around the joint.



Detection of Cleaning Fluid Level for Plating Devices

Detects the level of pure water inside plating baths. High sensitivity allows high-accuracy control that prevents cleaning irregularities.



Liquid Leakage Sensor Amplifier K7L-AT50

Ultra-miniature Sensor Amplifier reliably detects a wide variety of liquids ranging from water to chemical liquids with low conductivity. Four sensing ranges available.

- Detects liquids with impedance as high as 50 MΩ using inter-electrode resistance detection. Detection of IPA and pure water possible.
- Four selectable sensing ranges ensure detection suited to the characteristics of the liquid.
- Incorporates a noise canceller circuit connected to a 3-conductor cable, ensuring a high level of noise immunity and reliable operation. (PAT.)
- Sends AC signals to the Sensing Band, preventing electric corrosion.
- The power supply block and Sensing Band are isolated, allowing the installation of more than one device in the same place.
- Polyethylene is used for the Sensing Band, ensuring high resistance to chemicals.
- CE and UL/CSA approval.



Level
Controllers

Ordering Information

Item	Model	Material
Liquid Leakage Sensor Amplifier	K7L-AT50	---
Sensing Band	F03-16PE	Sheath: Polyethylene Core: Stainless steel SUS316
	F03-16PT	Sheath: Fluoroplastic Core: Stainless steel SUS316
Sensing Band Sticker with Adhesive	F03-26PES	Polyethylene
Sensing Band Sticker without Adhesive	F03-26PEN	Polyethylene
	F03-26PTN	Fluoroplastic
Terminal Block	F03-20	---
Track-mounted Socket	P2RF-08-E	---
	P2RF-08	---

- Note:**
1. One piece of the F03-20 Terminal Block is included as an accessory with the K7L-AT50.
 2. F03-16PE Sensing Bands are available in 1 m, 2 m, 5 m, 10 m, 15 m, 20 m, 25 m, and 50 m as standard lengths. For example, if a 4-m-long F03-16PE Sensing Band is required, place an order for F03-16PE 5M (5 m in length). If you need a 12-m-long F03-16PE Sensing Band, place an order for F03-16PE 15M (15 m in length).
 3. F03-16PT Sensing Bands are available in 1 m, 2 m, 5 m, 10 m, 15 m, and 20 m as standard lengths.
 4. The minimum order quantity of the F03-26PES or F03-26PEN Sensing Band Sticker is one set (containing 30 pieces).
 5. The minimum order quantity of the F03-20 or F03-26PTN is one set (containing 10 pieces).

Specifications

■ Ratings

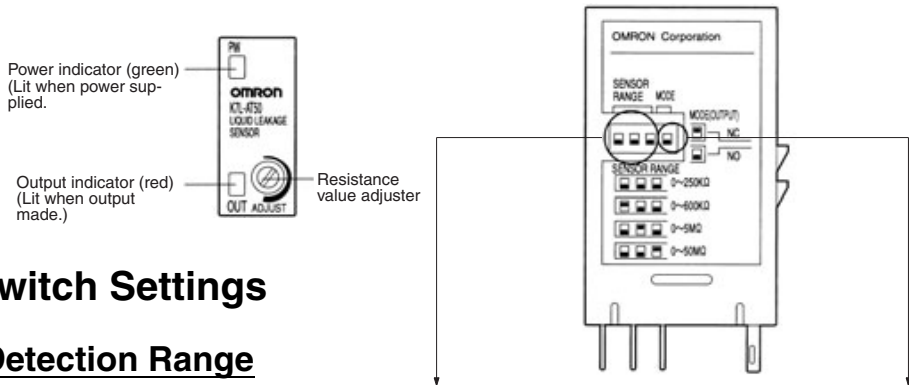
Rated power supply voltage	12 to 24 VDC (Allowable voltage fluctuation range: 10 to 30 VDC)
Operate resistance	0 Ω to 50 MΩ, variable Range 0:0 to 250 kΩ Range 1:0 to 600 kΩ Range 2:0 to 5 MΩ Range 3:0 to 50 MΩ Note: The range used is set using the DIP switch on the side of the Sensor Amplifier. (Refer to <i>DIP Switch Settings</i> .) Set the corresponding pin of the DIP switch in the up position. (For range 0, set all 3 pins in the down position.) The adjuster (ADJUST) on the top of the Sensor Amplifier sets the resistance value for detection within the set range. It is factory-set to the upper limit. (Normally, the K7L can be used with the adjuster at this setting.) With any range, resistance values can be set from 0 Ω.
Release resistance	105% min. of operate resistance
Output configuration	NPN open collector transistor output with 100 mA at 30 VDC max. Note: If the rightmost pin of the DIP switch on the side of the Sensor Amplifier is set to the down position, the output turns ON when liquid is detected; if it is set to the up position, the output turns OFF.
Wiring distance	Wiring cable: 50 m max. Sensing Band length: 10 m max. Note: These values are possible on condition that a completely insulated 3-conductor VCT cable with a thickness of 0.75 mm ² and a dielectric strength of 600 V is used together with a Liquid Sensing Band specified by OMRON. (A 0.2-mm ² cable can also be used.)
Accessories	F03-20 Terminal Block (for connecting wiring cable and Sensing Band) Screwdriver for ADJUST setting. (Purchase the Sensing Band, Sensing Band Sticker, wiring cable, and Socket separately.)

Note: UL File No. E138234
 CSA File No. LR95291-21
 CE EMA: ESD EN50082-2, EN61000-4-2
 REM.Filed EN50082-2, ENV5140
 Conducted Immunity EN50082-2, ENV50141
 Fast Transient/Burst EN50082-2, EN61000-4-4
 EMI: Radiated/Conducted EN50081-2, EN55011

■ Characteristics

Ambient temperature	Operating: -10°C to 55°C
Ambient humidity	Operating: 45% to 85%
Insulation resistance	10 MΩ at 100 VDC between case and current-carrying parts
Dielectric strength	1,000 VAC at 50/60 Hz for 1 min between case and current-carrying parts
Power consumption	1 W max.
Response time	Operate: 800 ms max. Release: 800 ms max.
Weight	Approx. 14 g

Nomenclature



■ DIP Switch Settings

Setting Detection Range

DIP switch	Range number	Detection range
	Range 0	0 to 250 kΩ
	Range 1	0 to 600 kΩ
	Range 2	0 to 5 MΩ
	Range 3	0 to 50 MΩ

DIP switch	Output
	Output OFF when liquid leakage detected.
	Output ON when liquid leakage detected.

- Set a detection range according to the impedance of the liquid to be detected. (If the detection range DIP switches are set in a way not shown above, the actual range used will be the largest one by default.) For the setting procedure refer to the label on the side of the Sensor Amplifier.
- It is possible to set the resistance value within the set detection range using the resistance value adjuster. At time of delivery, it is set to the largest possible value and for normal use this setting can be used.
- The resistance value adjuster is a precision component. Do not apply a torque to the resistance value adjuster in excess of the specified one. Doing so may cause the resistance value adjuster to be damaged.
Applicable torque:
 - Rotational torque: 9.81 m N·m max.
 - Detent strength: 29.4 m N·m min.

Operation

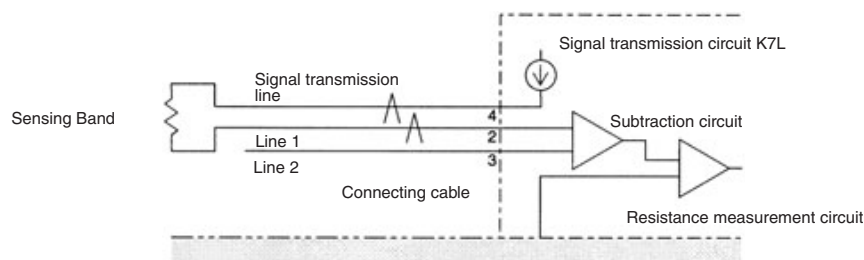
■ Countermeasures Against Noise

Noise Canceller Function for Highly Sensitive Impedance Detection

The K7L Liquid Leakage Sensor Amplifier detects liquids with impedance as high as 50 MΩ and connects to the Sensing Band through a cable that can be extended up to 50 meters. Countermeasures against external noise are especially important for the Sensing Band and connecting cable because they pick up external noise like an antenna. The K7L incorporates a noise canceller function as described below.

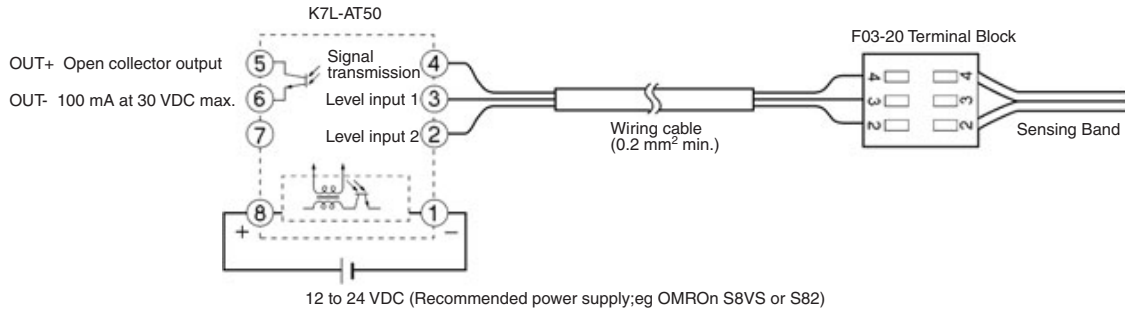
Connected with 3-conductor Cable that Offsets Inductive Noise (Patent Pending)

A VCT cable with three conductors (lines) is used. Line 1 is connected to the Sensing Band and line 2 is left open. Lines 1 and 2 are almost in the same position and thus will experience the same noise level. The K7L obtains the difference between these signals. This means that the noise signals in lines 1 and 2 are offset against each other and a reading for the signal, without inductive noise, can be made.



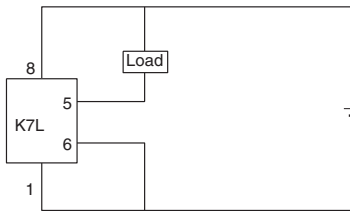
Level Controllers

Connections

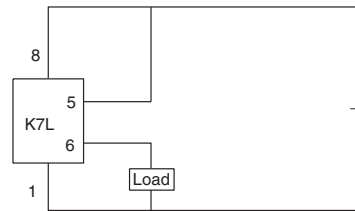


Connections Example

NPN Output



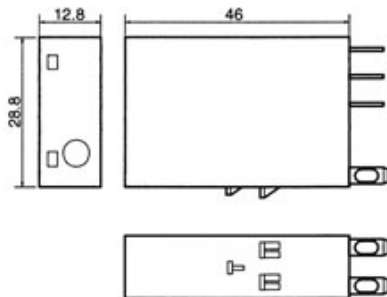
PNP Output



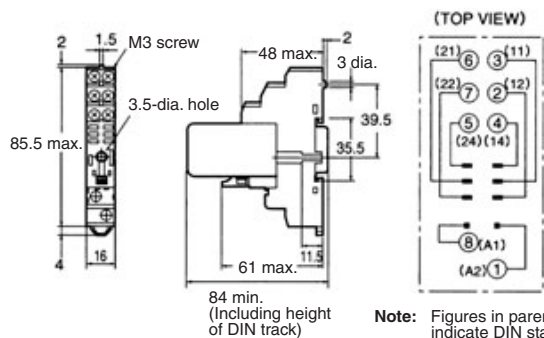
Dimensions

Note: All units are in millimeters unless otherwise indicated.

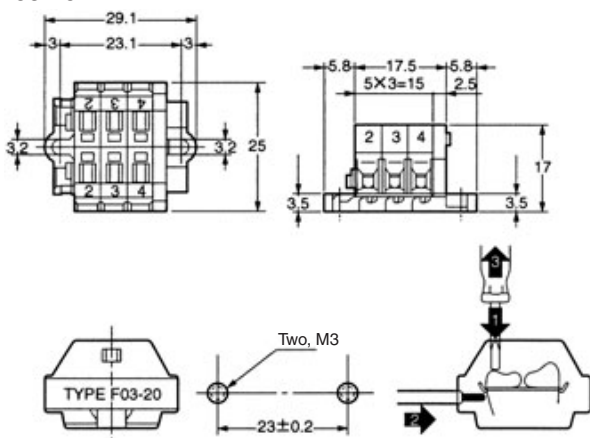
Liquid Leakage Sensor Amplifier K7L-AT50



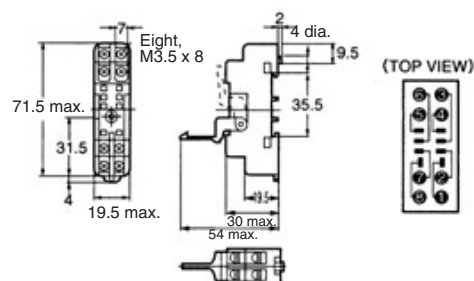
Track-mounted Sockets (See note 2.) P2RF-08-E



Terminal Block (See note 1.) F03-20



P2RF-08 (Round terminals can be used.)

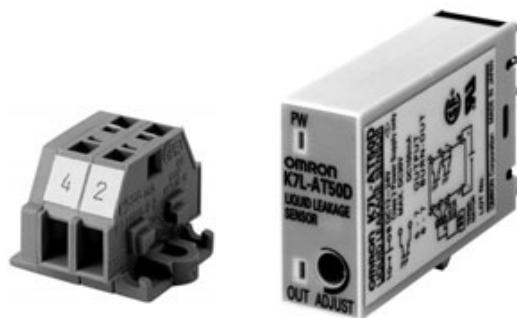


Note: 1. The Terminal Block is made of 66 nylon. Mount the Terminal Block in locations not subject to chemical fluids using M3 screws.
2. Secure the Sockets with M3 screws at a torque of 0.78 to 1.18 N·m.

Liquid Leakage Sensor Amplifier with Disconnection Detection Function K7L-AT50D/-AT50D-S

Detect disconnections between the Sensor Amplifier and a Terminator connected to the end of the Sensing Band.

- Constantly monitors for disconnections between the Sensor Amplifier and the Sensing Band.
- Failure to detect liquid leakage due to disconnection in the Sensing Band prevented.
- Notification of disconnection detection made using LED indicator and transistor output.
- After a disconnection is detected, in order to avoid instability due to further contact of the disconnected part, the operating status is held.
- This model retains all the characteristics of the K7L-AT50 (detection sensitivity, sensing ranges, and AC detection method).
- Meets UL/CSA standards. (See information on standards on page 26.)



Level
Controllers

Ordering Information

Name	Model number
Liquid Leakage Sensor Amplifier with Disconnection Detection Function Set	K7L-AT50D
Liquid Leakage Sensor Amplifier with Disconnection Detection Function Sensor Amplifier Only	K7L-AT50D-S
Terminator (2P)	F03-20T

Note: The Socket, Terminal Block, Sticker, and Sensing Band are the same as for the K7L-AT50.

Specifications

■ Ratings

Rated power supply voltage	12 to 24 VDC (Allowable voltage fluctuation range: 10 to 30 VDC)
Operate resistance	0 Ω to 50 MΩ, variable Range 0: 0 to 250 kΩ Range 1: 0 to 600 kΩ Range 2: 0 to 5 MΩ Range 3: 0 to 50 MΩ Note: The range used is set using the DIP switch on the side of the Sensor Amplifier. (Refer to <i>DIP Switch Settings</i> .) Set the corresponding pin of the DIP switch in the up position. (For range 0, set all 3 pins in the down position.) The adjuster (ADJUST) on the top of the Sensor Amplifier sets the resistance value for detection within the set range. It is factory-set to the upper limit. (Normally, use with the adjuster set to the upper limit.) With any range, resistance values can be set from 0 Ω.
Disconnection detection function	Detection signal: 10 VDC max., 200 ms Detection time: 10 s max. Release: Released by resetting the power supply.
Release resistance	105% min. of operate resistance
Output configuration	NPN open collector transistor output with 100 mA at 30 VDC max. for both liquid leakage detection and disconnection detection. Note: If the rightmost pin of the DIP switch on the side of the Sensor Amplifier is set to the down position, the output turns ON when liquid/disconnection is detected; if it is set to the up position, the output turns OFF.
Wiring distance	Wiring cable: 50 m max. Sensing Band length: 10 m max. Note: These values are possible on condition that a completely insulated 3-conductor VCT cable with a thickness of 0.75 mm ² and a dielectric strength of 600 V is used together with a Liquid Sensing Band specified by OMRON. (A 0.2-mm ² cable can also be used.)
Accessories	F03-20 Terminal Block (for connecting wiring cable and Sensing Band) Screwdriver for ADJUST setting. F03-20T Terminator (provided with K7L-AT50D only) (Purchase the Sensing Band, Sensing Band Sticker, wiring cable, and Socket separately. The Terminal Block is 3P; the Terminator is 2P.)

Note: UL File No. E138234
CSA File No. LR95291-21

■ Characteristics

The characteristics are the same as for the K7L-AT50. Refer to page 22 for details.

Nomenclature

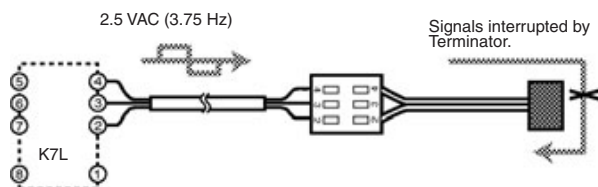
The nomenclature and DIP switch settings are the same as for the K7L-AT50. Refer to page 23 for details.

Operation

■ Disconnection Detection Function

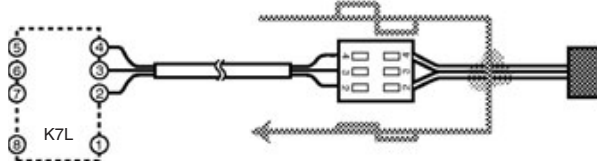
Operation During Monitoring for Liquid Leakage

- Short-wave signals (2.5 VAC, 3.75 Hz) for liquid leakage detection are output from terminal 4 of the K7L.
- When there is no liquid leakage, the liquid leakage detection signals that are output are interrupted by the Terminator and the core of the Sensing Band will be an open loop.



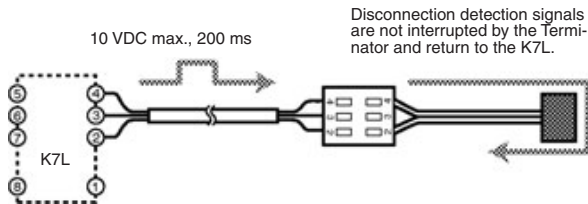
Operation at Liquid Leakage Detection

- When liquid leakage occurs within the sensing range, the liquid leakage detection signals output from terminal 4 are input to terminal 2 through the leaked liquid.
- The voltage of the input signals will vary with the resistance of the leaked liquid. This voltage is compared with the detection level set at the K7L.
- As a result of the comparison, if the K7L determines that liquid leakage has occurred, the K7L's output LED will light, and the liquid detection output will either turn ON or OFF.



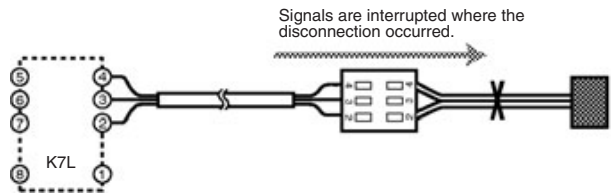
Operation During Monitoring for Disconnection

- Output of disconnection detection signals starts within 2 s of power being supplied to the K7L and is repeated at 7-s intervals.
- Disconnection signals are DC signals of 10 V max. that are output for approximately 200 ms. During this time, the K7L is in disconnection monitoring mode, i.e. it monitors for disconnections only and the liquid leakage detection signals are stopped.
- If there is no disconnection, the disconnection detection signals (10 VDC) that are output pass through the Terminator and return to the K7L. The K7L takes this as normal, i.e., there is no disconnection.



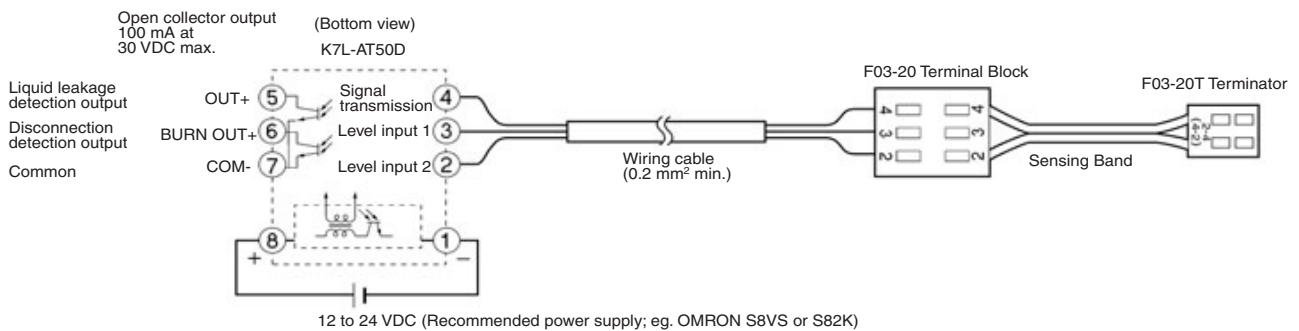
Operation at Disconnection Detection

- If there is a disconnection, the signals will be interrupted at the place where the disconnection occurred, and will not return to the K7L.
- If the signals do not return, when the K7L is in disconnection monitoring mode it will determine that a disconnection has occurred. The output LED will flash, and the disconnection output will turn ON.



- Note:**
1. Disconnection detection is only performed between terminals 2 and 4. Therefore, be sure to connect the Sensing Band between terminals 2 and 4.
 2. The K7L will switch from liquid leakage detection to disconnection detection if either of the following conditions occur while liquid leakage is detected.
 - Disconnection occurs between the K7L and the place where liquid is leaked.
 - While liquid leakage is detected, disconnection occurs between the place where liquid is leaked and the Terminator (F03-20T) and, subsequently, the leaked liquid is removed (e.g., wiped up or dried).
 3. During disconnection detection, liquid leakage will not be detected. Once disconnection has been detected, reset the power supply to stop disconnection detection.

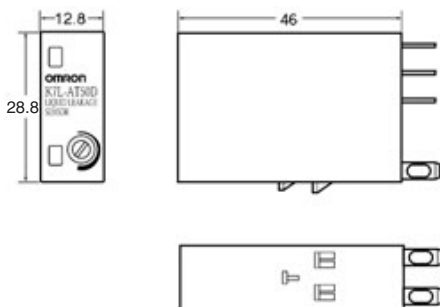
Block Diagram for External Connections



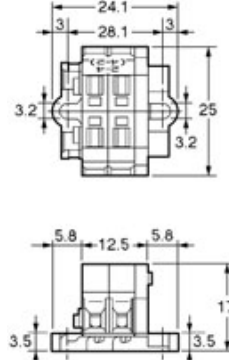
Dimensions

Note: All units are in millimeters unless otherwise indicated.

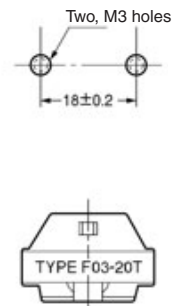
K7L-AT50D Liquid Leakage Sensor Amplifier



F03-20T Terminator



Mounting Hole Dimensions



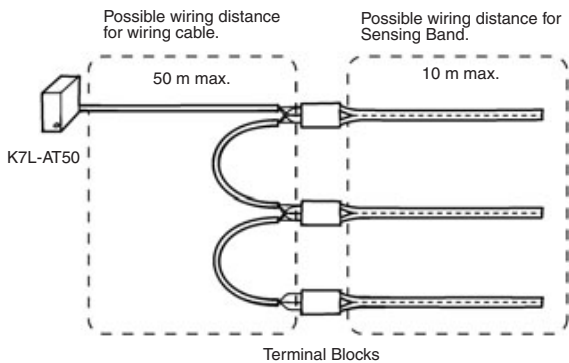
FAQs

Some questions that are frequently asked about the K7L are given below. Use this information when selecting a model.

Can one K7L be used for detection in more than one place?

Yes.

By using Terminal Blocks to connect Sensing Bands in parallel, detection can be performed in more than place with only one K7L.

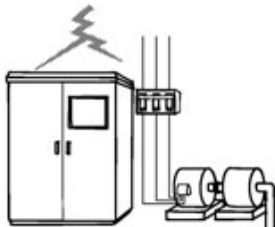


Note: When wiring, be sure not to exceed the maximum possible wiring distances for both the wiring cable and the Sensing Band. Exceeding these distances may lead to faulty operation. Connect one Sensing Band to the each Terminal Block.

Can the K7L be used as a replacement for the 61F-GPN-V50 Water Leakage Detector?

Yes.

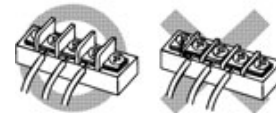
Because the surge withstand capability is different, however, do not use in locations where it will be exposed to impulses and surges such as outdoor roofs or pump panels. Also, items such as the power supply voltage and the connection sockets are different. Confirm these items before application.



Can a different terminal block (e.g. a commercially available terminal block or a terminal block constructed by the user) be used instead of the one provided?

Yes.

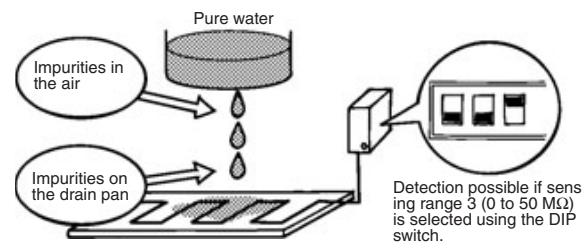
When using another terminal block, however, be sure to check that all the terminals are mutually isolated, and that there is no danger of ground faults in wiring cables or Sensing Bands.



Can the K7L detect pure water?

Yes.

Even pure water, which has a resistance exceeding 10 MΩ·cm, can nearly always be detected if the K7L is used at its maximum sensitivity. This is because impurities are mixed with the water when it is leaked and the resistance drops.



Can the K7L detect oil?

In most cases, no.

If, however, it contains impurities such as metal powder, as is the case with cutting oil and used engine oil, detection may be possible (actual instances of detection have been observed). The user should confirm whether the required kind of detection is possible before application.



Sensing Band F03-16PE/-16PT



- SUS316 used for core and polyethylene used for sheath to ensure high resistance to both acidic and alkaline liquids.
- Sensing Band Stickers that use the same material as the Sensing Band's insulating resin are available in 2 types: adhesive-tape type and screw type.
- Compared to the F03-16PE (polyethylene), the F03-16PT has higher resistance to both high temperatures and chemicals.
- Small holes enable the detection of leakage even when installed upside down.

Level Controllers

Specifications

	F03-16PE	F03-16PT
Sheath	Polyethylene	Fluoroplastic
Core	Stainless steel SUS316	Stainless steel SUS316
Ambient operating temperature	-15 to 55°C	-50 to 200°C
Applications	<ul style="list-style-type: none"> • Early detection of water leakage in computer rooms etc. • Used in locations with low-conductivity materials. 	<ul style="list-style-type: none"> • For detection of solvent/chemical leakage inside semiconductor wafer scrubber equipment. • For high temperature liquid leakage detection.
Weight	Approx. 16 g (1 m)	Approx. 16 g (1 m)

Operation

■ Chemical Resistivity for the Sensing Band

Material	Sheath		Core	Material	Sheath		Core
	Polyethylene	Fluoroplastic	SUS316		Polyethylene	Fluoroplastic	SUS316
Water	A	A	A	Toluene	C	B	B
Acetone	C	A	A	Phenol	B	B	A
Ammonia	A	A	A	Butanol	B	A	---
Ethanol	B	A	A	Fluorine	A	A	C
Hydrochloric acid	A	A	C	Hexane	C	A	---
Hydrogen peroxide solution	A	A	A	Benzene	C	A	A
Xylene	B	A	A	Methanol	B	A	A
Cyclohexane	C	A	---	Sulfuric acid	C	A	B
Trichloroethylene	C	A	A	Phosphoric acid	A	B	B

- Note:**
1. A: Not affected at all or only very slightly affected.
 B: Slightly affected but, depending on the conditions, sufficient for use.
 C: Affected but may still be used. (Replace the Sensing Band immediately after detection.)
 2. In order to prevent secondary fire damage, consider the effect of the atmosphere of the environment and the solution to be detected on the Sensing Band.
 3. If the Sensing Band changes shape or color when a liquid is detected, replace the Sensing Band.

■ Sensing Band

	F03-16PE	F03-16PT
Appearance		
Structure		

Note: Specify length (in meter units) when ordering.

When cleaning with a mop, for example, do not make contact with the Sensing Band.

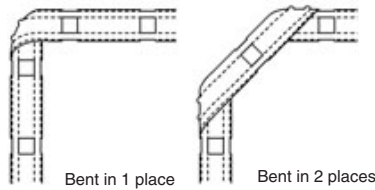
■ Sensing Band Sticker

	F03-26PES	F03-26PEN	F03-26PTN
Appearance			
Structure	 Note: The shape of the adhesive tape shown above is for securing the F03-16PE.	 Two, 3.5 dia. Cut section	 Two, 3.5 dia. Material: Fluoroplastic PTA
Sensing Band	F03-16PE		F03-16PT

■ Connecting the Sensing Band

Bending the Sensing Band

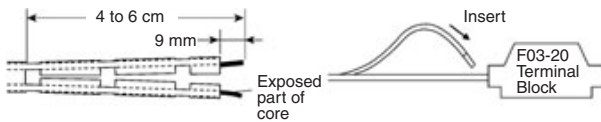
In order to change the direction of the Sensing Band, bend the Sensing Band in one or two places where the core is not exposed.



Note: Bend the Sensing Band approximately 4 cm (i.e., twice the distance between places where the core is exposed) away from places where the Sticker is attached. If the Sensing Band is bent at places further away than this, the Sensing Band may come away from the surface.

Stripping and Connecting Terminals

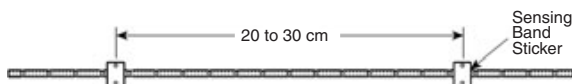
1. Cut into the Sensing Band approximately 4 to 6 cm in from the end as shown in the diagram below.
2. Strip away approximately the last 9 mm of the sheath to expose the core (SUS line).
3. To connect to the Terminal Block, push down the top of the terminal with a screwdriver and insert the core from the side. (Refer to *Dimensions* on page 24.) More Sensing Bands can be connected simply by wiring in an arch shape.



Note: Check that the wiring is secure before using the K7L in applications.

Interval Between Stickers

When securing the Sensing Band with Stickers, attach the Stickers at intervals of 20 to 30 cm in places where the core is not exposed.



- Note:**
1. When using the F03-26PES (adhesive-tape model), be sure to wipe all moisture, oil, and dust from the surface to which the Sticker is to be attached. Failure to do so may result in insufficient adhesion, and the Sticker may peel away from the surface.
 2. When using the F03-26PEN (screw model), before installing the Sensing Band, it is necessary to perform stud welding. For details on the pitch of the studs, refer to the information on the dimensions of Sensing Band Stickers.

Warranties, Limitations of Liability

■ WARRANTY

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

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

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

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

■ SUITABILITY FOR USE

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

Take all necessary steps to determine the suitability of the products for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this products.

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

Disclaimers

■ CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased products.

■ DIMENSIONS AND WEIGHTS

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

Precautions

■ Correct Use

Observe the following points to ensure safe operation.

- Be sure to use a power supply voltage within the specified range. Not doing so may result in burning or malfunction.
- Do not use the product in locations subject to flammable gases or combustible objects. Not doing so may result in fire.
- Insert the connection points into Sockets until the connection is locked securely. Not doing so may result in burning or malfunction.
- Do not short-circuit loads connected to output terminals. Doing so may result in burning.
- Be sure to connect the power supply with the correct orientation. Not doing so may result in malfunction.

■ Safe Use

Installation

Attach to a panel of thickness 1 to 5 mm.

Do not install in the following locations.

- Locations subject to shock or vibration.
- Locations where the temperature or humidity lies outside the specified range, or where condensation is likely to occur. (To detect liquids with high impedances, do not use in locations with high humidity.)
- Locations subject to dust.
- Locations subject to corrosive gases (particularly sulfide and ammonia gases).
- Outdoors or locations subject to direct sunlight.
- Near devices that generate strong high-frequency noise (e.g., high-frequency welding devices etc.).

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. F049-E1-05

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