

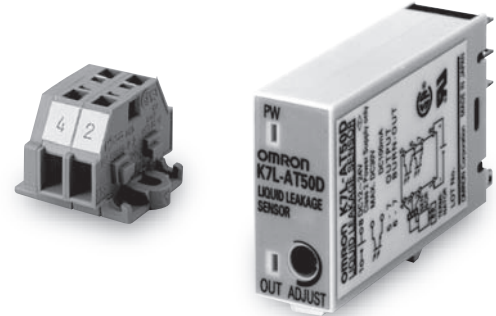
Liquid Leakage Sensor Amplifier/Liquid Leakage Sensor Amplifier with Disconnection Detection Function K7L-AT50/AT50D

CSM_K7L-AT50_AT50D_DS_E_3_2

Reliable detection of a wide variety of liquids ranging from water to liquid chemicals with low conductivity. Four sensing ranges available



- Provides stable detection of liquids with impedance as high as 50 MΩ using inter-electrode resistance detection. Detection of IPA and pure water possible.
- Higher noise immunity with a noise canceller circuit connected to a 3-conductor cable.
- Prevents electrode corrosion with an AC detection method.
- The power supply circuit and detection circuit are isolated, allowing several Amplifiers to be installed in the same place.
- After a disconnection is detected, operating status is held to eliminate instability due to contact of the disconnected part.*1
- Series includes an Explosion-proof Barrier (Sold Separately) to enable usage in hazard atmospheres.
- CE Marking and UL/CSA certification.*2



*1 For the K7L-AT50D.

*2 UL File No. E138234
CSA File No. LR95291-21
CE EMI : EN55011
EMS : EN61000-6-2

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.



Refer to "Safety Precautions" on page 7.

Features

Sensing Bands boast 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

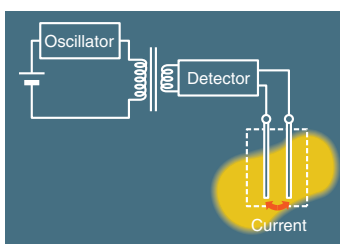
Stable detection of liquids with impedances of up to 50 MΩ and common water. Four sensing ranges are available, ensuring detection suited to the application.



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

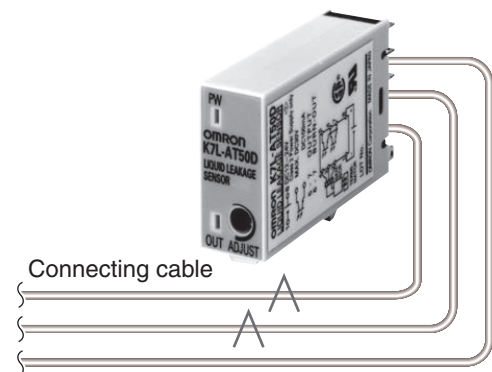
AC Detection Method

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



Noise Canceller Function (Patent Pending)

The K7L incorporates a noise canceller circuit that uses a 3-conductor cable, ensuring a high level of noise immunity.



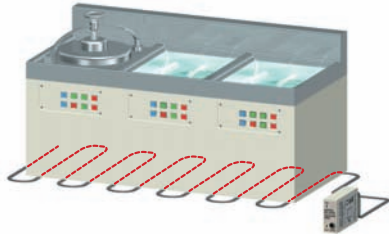
Multiple Installation

The power supply circuit and the detection circuit are isolated, allowing several Amplifiers to be installed in the same place.



Detection of Condensation and Liquid Leakage at Semiconductor Production Installations

Detection is also possible for condensation inside cleaning devices and liquid leaked to the surroundings.



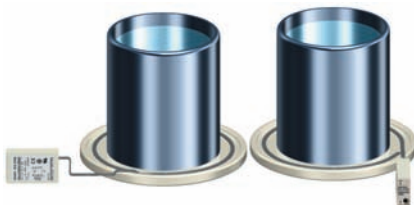
Sensing Band with Excellent Chemical Resistance

SUS316 and polyethylene are used for the Sensing Band's core and sheath to ensure high resistance to both acidic and alkaline liquids.



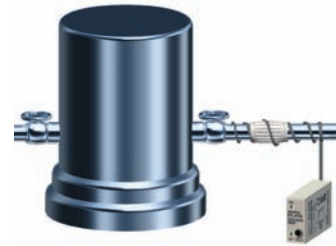
Liquid Leakage Detection for Measuring Baths in CMP Devices

Liquid leaked to drain pans can be detected to prevent damage to devices and cleaning irregularities for wafers.



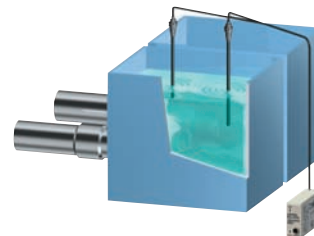
Detection of Liquid Leakage at Pipe Joints for Liquid Chemical Tanks

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

The level of pure water is detected inside plating baths. High sensitivity allows high-accuracy control to prevent cleaning irregularities.



Note: Be sure to ground the baths if two or more K7L Sensors are used in the same tank in an explosion-prevention area.

Ordering Information

	Product name	Model
Amplifier	Liquid Leakage Sensor Amplifier	K7L-AT50
	Liquid Leakage Sensor Amplifier with Disconnection Detection Function	K7L-AT50D
Sensors	Sensing Band	F03-15
		F03-16PE
		F03-16PT
		F03-16SF F03-16SFC
	Point Sensor	F03-16PS
		F03-16PS-F
Mounting Brackets and Stickers	Sensing Band Stickers	F03-25
		F03-26PES
		F03-26PEN
		F03-26PTN
Track-mounted Socket	Point Sensor Mounting Brackets	F03-26PS
	Round terminals can be used.	P2RF-08
	Round terminals cannot be used.	P2RF-08-E
Terminal Blocks		F03-20

Characteristics

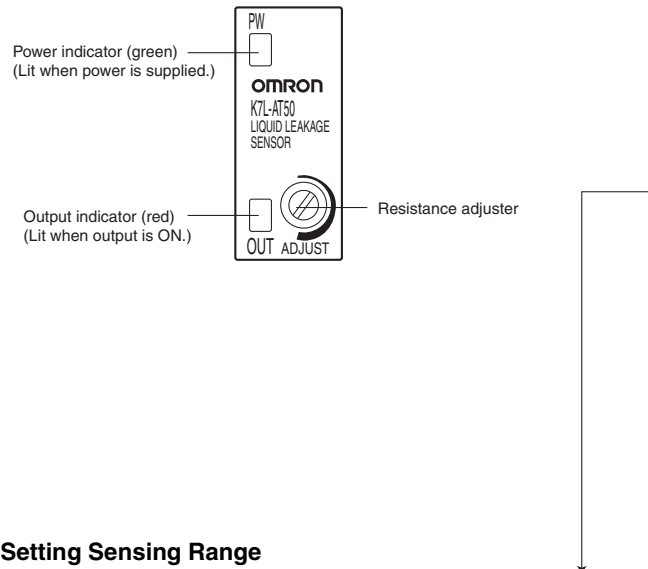
Ambient temperature	Operating: -10 to +55°C
Ambient humidity	Operating: 45% to 85%
Insulation resistance	10 MΩ at 100 VDC between case and current-carrying parts
Dielectric strength	1,000 VAC at 50/60 Hz for 1 min between case and current-carrying parts
Power consumption	1 W max.
Response time	Operate: 800 ms max. Release: 800 ms max. When turning ON power: 2 s max.
Weight	Approx. 14 g

Specifications

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 kΩ Range 3: 0 to 50 kΩ Note: The range 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.		
Disconnection detection function *	Detection signal: 10 VDC max., 200 ms Detection time: 10 s max. Recovery: Operation is recovered 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 is detected; if it is set to the up position, the output turns OFF when liquid is detected.		
Wiring distance	Connecting 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		Terminal Block	Screwdriver for ADJUST
	K7L-AT50	1	1
	K7L-AT50D	1	1
	K7L-AT50D-S	1	1
		Terminator	
	K7L-AT50	---	---
	K7L-AT50D	1	1
	K7L-AT50D-S	---	---

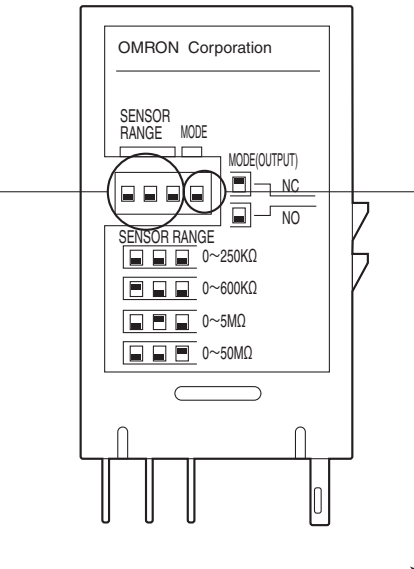
* For the K7L-AT50D.

Nomenclature and DIP Switch Settings



Setting Sensing Range

DIP switch	Range number	Sensing 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 mode
	Output OFF when liquid leakage/Disconnection* detected
	Output ON when liquid leakage/Disconnection* detected

* Disconnection detection is supported only by the K7L-AT50D.

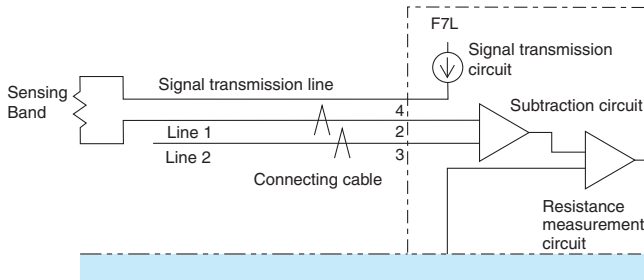
Countermeasures Against Noise

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 the noise canceller function described below.

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

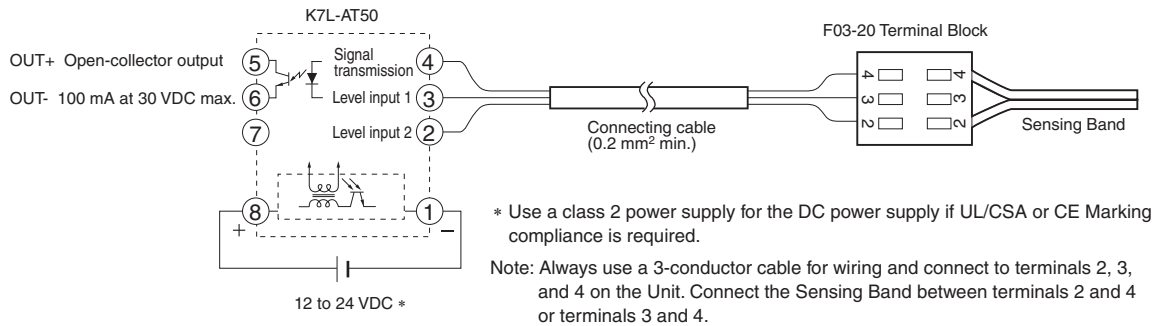
A VCT cable with three conductors (lines) is used. Line 1 is connected to the Sensing Band and line 2 is left open. Lines 1 and 2 are almost in the same position and thus will experience the same noise level. The K7L obtains the difference between these signals. This means that the noise signals in lines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



Connections

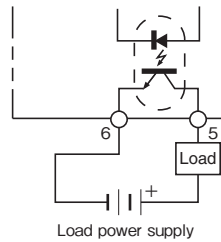
External Connections

K7L-AT50

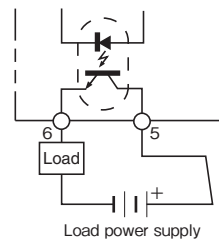


Connection Examples

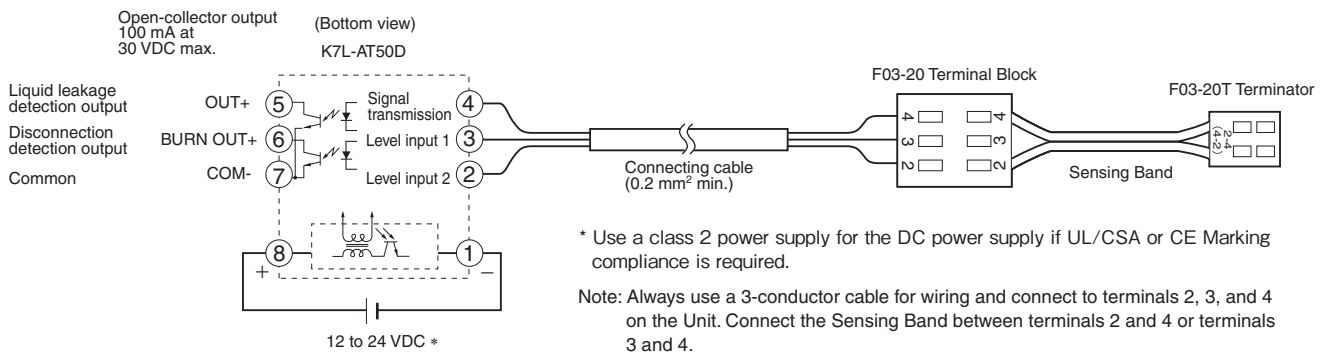
Connection as an NPN Output



Connection as a PNP (Equivalent) Output

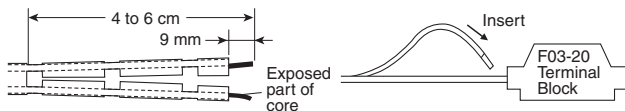


K7L-AT50D



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. More Sensing Bands can be connected simply by wiring in an arch shape.



Note: When you are finished working, sufficiently confirm that there is an electrical connection.

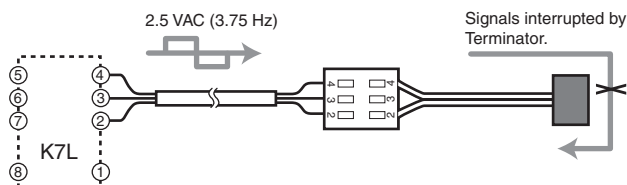
* You can use a commercially available screwdriver, but we recommend either 1) a 210-350/01 Screwdriver or 2) a 209-132 Operating Tool from Wago. Information: [//www.wago.com](http://www.wago.com)

Functions

Disconnection detection function (K7L-AT50D)

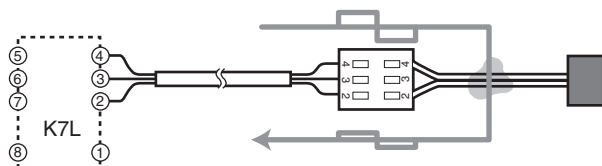
Operation While Monitoring for Liquid Leakage

- 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 form an open loop.



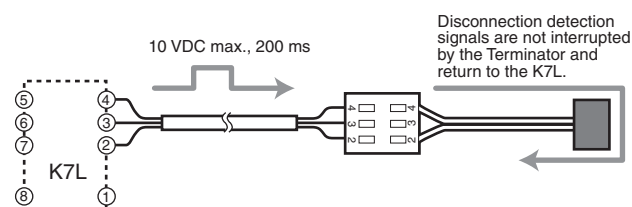
Operation at Liquid Leakage Detection

- 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.



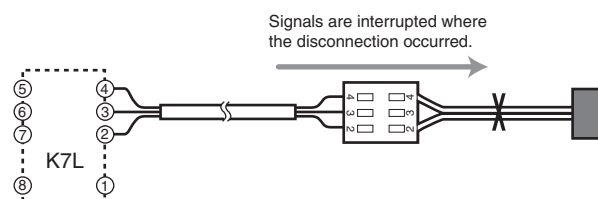
Operation While Monitoring for Disconnection

- 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 indicator will flash, and the disconnection output will turn ON/OFF depending on the position of the DIP switch (right).



- 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.

Safety Precautions

⚠ WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



Precautions for Safe Use

Observe the following points to ensure safe operation.

1. Be sure to use a power supply voltage within the specified range.
2. Do not use the product in locations subject to flammable gases or combustible objects.
3. Insert the connection points into Sockets until the connection is locked securely.
4. Do not short-circuit loads connected to output terminals.
5. Be sure to connect the power supply with the correct polarity.

Precautions for Correct Use

Do not use the Encoder under ambient conditions that exceed the ratings.

Installation

Attach to a panel of thickness 1 to 5 mm.

Do not install in the following locations.

1. Locations subject to shock or vibration
2. 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.)
3. Locations subject to dust
4. Locations subject to corrosive gases (particularly sulfide and ammonia gases)
5. Outdoors or locations subject to direct sunlight
6. Near devices that generate strong high-frequency noise (e.g., high-frequency welding devices etc.)

Application Precautions

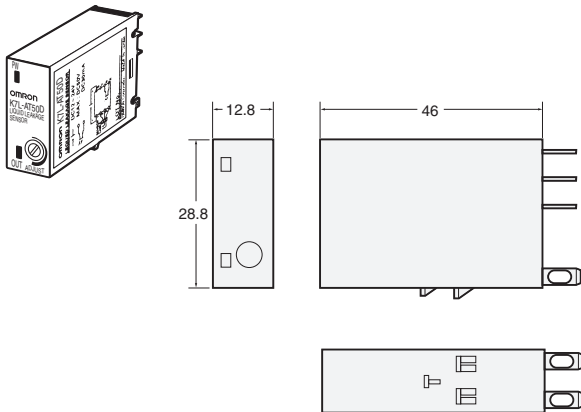
You must allow sufficient leeway in ratings and performance, and provide proper fail-safe or other safety measures when using these products in any of the following applications. Be sure also to consult with your OMRON representative before actually attempting any of these applications.

1. Applications under conditions or environments not specified in user documentation
2. Applications for nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, or safety equipment
3. Applications that may have a serious influence on lives and property and thus require particularly attention to safety

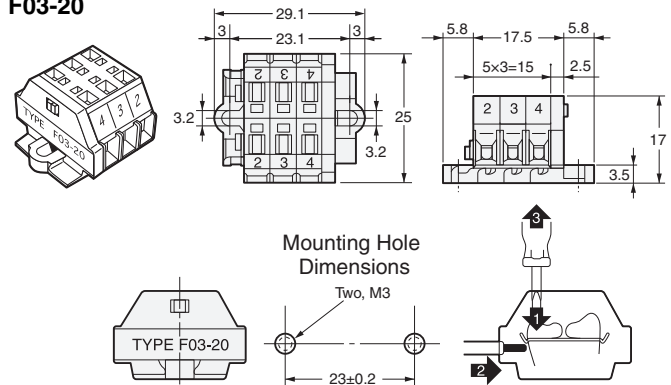
Dimensions

(Unit: mm)

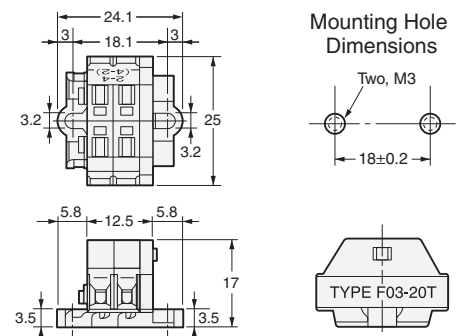
Liquid Leakage Sensor Amplifier K7L-AT50/AT50D



Terminal Block * F03-20



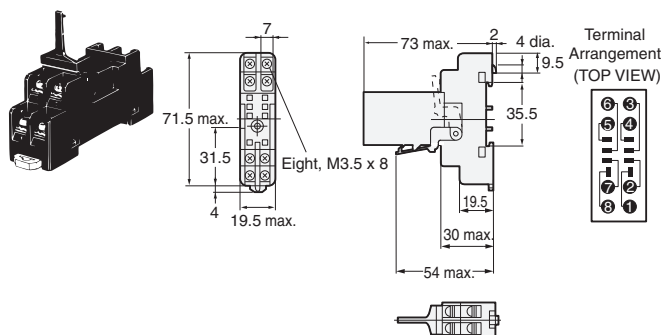
Terminator * F03-20T



* The Terminal Block is made of nylon 66. Mount the Terminal Block in locations not subject to liquid chemicals using M3 screws.

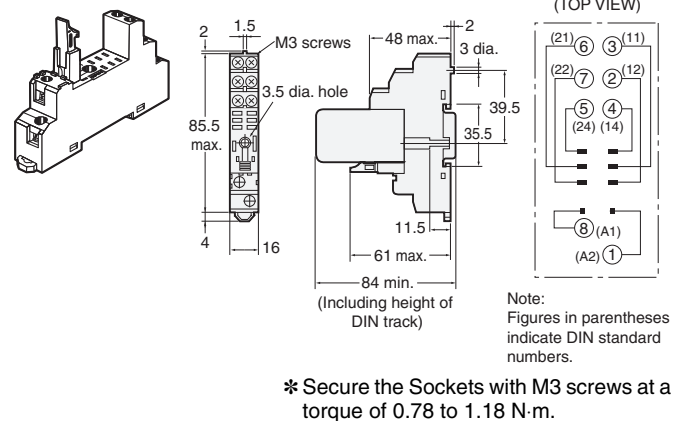
Track-mounted Sockets *

P2RF-08 (Round terminals can be used.)



Track-mounted Sockets *

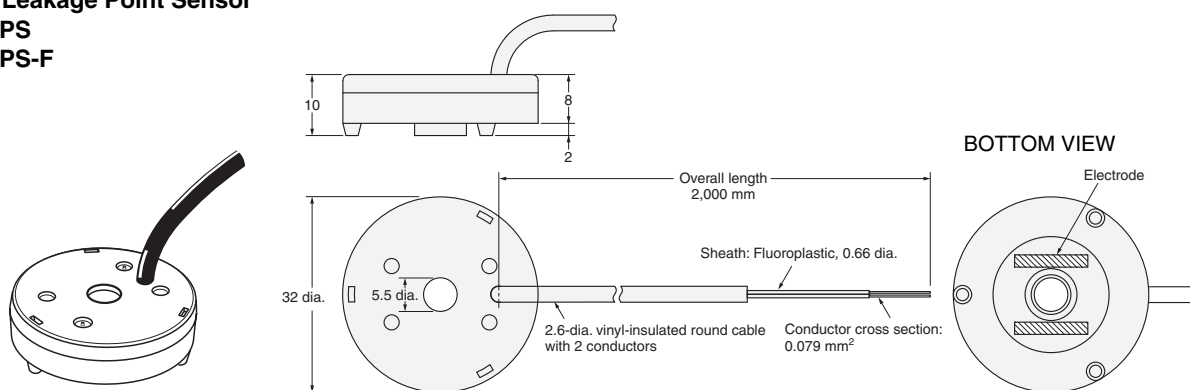
P2RF-08-E



Liquid Leakage Point Sensor

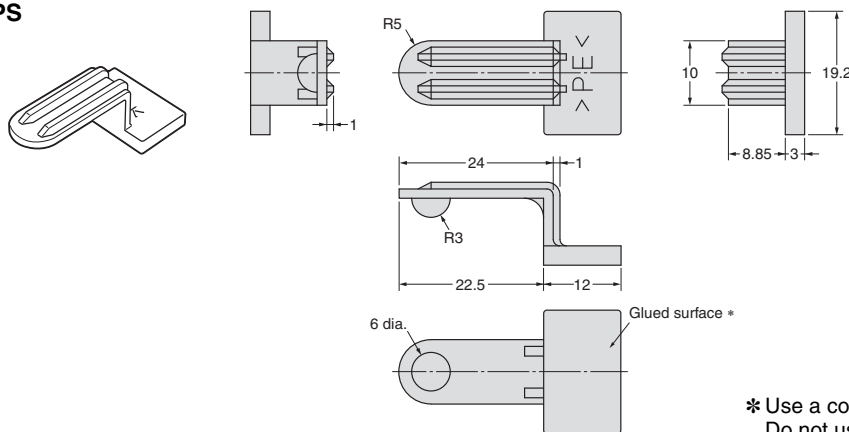
F03-16PS

F03-16PS-F



Point Sensor Mounting Bracket

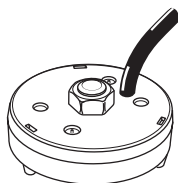
F03-26PS



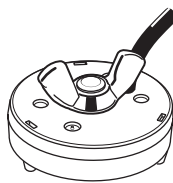
Mounting Methods

Stud Screw Mounting

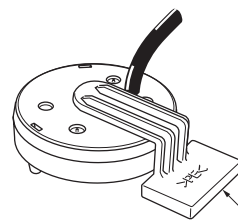
1. Securing the Sensor with a Nut



2. Securing the Sensor with a Wing Nut



Special Bracket Mounting



* Use a commercially available bonding agent for PVC.

Liquid Leakage Sensor Amplifier K7L Q&A

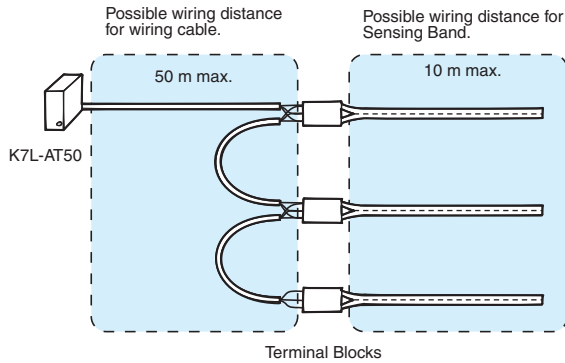
Some questions that are frequently asked about the K7L are given below. Use this information when selecting a model.

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

A Yes.

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

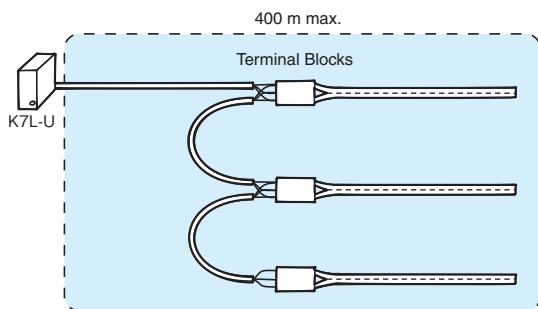
K7L-AT50



Note: 1. When wiring, be sure not to exceed the maximum possible wiring distances for both the connecting cable and the Sensing Band. Exceeding these distances may lead to faulty operation. Connect one Sensing Band to each Terminal Block.

2. Not applicable to K7L-AT50D.

K7L-U



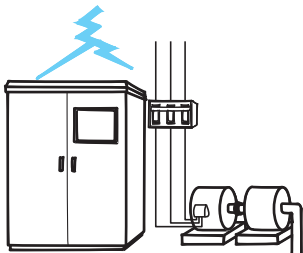
Note: 1. When wiring, be sure not to exceed the maximum possible wiring distances for both the connecting cable and the Sensing Band. Exceeding these distances may lead to faulty operation. Connect one Sensing Band to each Terminal Block.

2. Not applicable to K7L-UD.

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

A Yes.

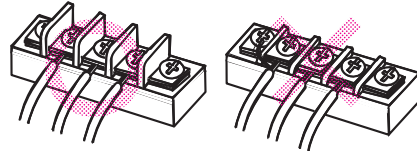
Because the surge withstand capability is different, however, do not use in locations where it will be exposed to impulses and surges, such as outdoor roofs or in pump panels. Also, items such as the power supply voltage and the connection sockets are different. Check these items before application.



Q 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?

A 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 connecting cables or Sensing Bands.

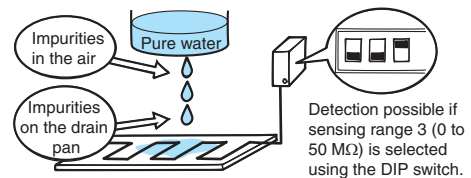


Note: For explosion-proof areas, use F03-20 Liquid Leakage Sensor, which has been certified for intrinsic safety and explosion-proof capability.

Q Can the K7L Amplifier detect pure water?

A Yes.

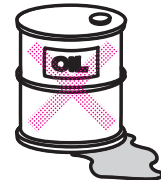
Even pure water, which has a resistance exceeding 10 MΩ·cm, can nearly always be detected if the K7L is used at its maximum sensitivity. This is because impurities are mixed with the water when it is leaked and the resistance drops.



Q Can the K7L Amplifier detect oil?

A 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.



Terms and Conditions Agreement

Read and understand this catalog.

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

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(b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

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NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products.

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Performance Data.

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