

Liquid Leakage Position Sensor K7L-UP-FLK

**Pinpoint Liquid Leakage Detection at Up to 600 m.
Easy Setup and Installation.**



- Even unseen places under the floor can be pinpointed and restored.
- Detection of the extent of leakage and occurrence of a leak in another place.
- Monitoring at Up to 600 m with a Single Controller.
- The disconnection detection function constantly monitors for cable errors.
- A Wide Selection of Outputs from a Relay Output to Communications Output to Suit the System.
- The Sensing Cable is made of fluororesin for improved resistance to chemicals.
- Cables with connectors are easy to install.
- UL approval.

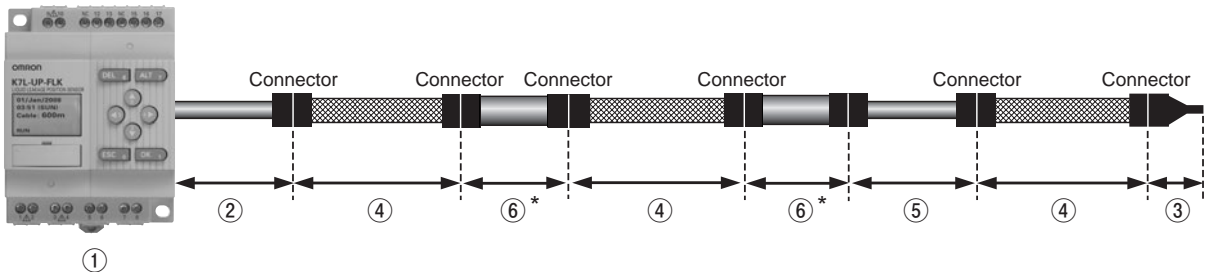


List of Models

	Product name	Model	Quantity
	Liquid Leakage Position Sensor	K7L-UP-FLK 100-240VAC	1
①	Controller (See Note.1)	K7L-UP-FLK 100-240VAC	1
②	Connecting Cable (See Note.2)	F03-21UP-CC	1
③	Terminator (See Note.2)	F03-20UP-TC	1
④	Sensing Cable	F03-16UP-C-2M	2 m
		F03-16UP-C-5M	5 m
		F03-16UP-C-10M	10 m
		F03-16UP-C-30M	30 m
⑤	Junction Cable	F03-21UP-JC	1
⑥	Area Separator	F03-20UP-AS	1
-	Cable Stickers	F03-25	30 Stickers per bag

Note: 1. The Controller cannot be ordered separately.
2. Included with the K7L-UP-FLK, but can be ordered separately.

Basic configuration



* Area Separators can be used to enable accurately identifying the detection area in which a leak has occurred even when the leak occurs near an area boundary.

K7L-UP-FLK

Specifications

Ratings

Item	Model	K7L-UP-FLK
Power supply voltage		100 to 240 VAC 50/60 Hz
Allowable voltage fluctuation range		Rated voltage 85 to 110 % (85 to 264 VAC)
Power consumption		10 VA max. (at maximum load)
Detection method		Inductive method
Operate resistance		50k, 100kΩ (selectable) Must operate below each sensitivity setting. *
Release resistance		350 kΩ min.
Current when electrodes are shorted		2 mA/AC max.
Wiring length		600 m max. (total of Sensing Cable, Connecting Cable, Junction Cable, Area Separator and general-purpose cable) This value is for completely insulated 600-V 3-conductor VCT cable of with a thickness of 0.75 mm ² . No more than 10 Junction Cables can be used. Area Separators are calculated as 10 m each.
Disconnection detection function	Detection signal	10 VDC
	Detection time	45 s max.
	Recovery	After normal wiring
Output	Relay output	NO contacts × 2 outputs (leakage, disconnection, error output, and alarm output) Rated load 3A 250 VAC/30 VDC Resistive load 3A 250 VAC/30 VDC Inductive load 1A 250 VAC/30 VDC Service life Mechanical: 20 million outputs Electrical: 80,000 outputs Failure rate P value 24 VDC at 5 mA (reference value) Contact resistance 100 mΩ max. (default)
	4 to 20-mA output	Allowable load resistance 500 Ω max. Resolution Approx. 10,000 Error ± 1 %FS Steady state 4 mA At error detection 5 mA At disconnection detection 20 mA At leakage detection 6 + 12 × Leakage locations (m)/L (m) mA L: Set distance (default: 600 m)
Other functions		Shift, compensation, Area setting, Output setting, Output reset, Output test, Event log, Key protection, and Backlight ON-time setting
Ambient temperature	Operating	-10 to 55 °C (no icing or condensation)
	Storage	-25 to 65 °C (no icing or condensation)
Ambient humidity	Operating	25 to 85 %RH (no condensation)
	Storage	25 to 85 %RH (no condensation)
Altitude		2000 m max.
External color		Controller: Ivory
Mounting method		Surface mounting, DIN track mounting
Terminal block		Single-line terminal block (Use ferrules.)
Terminal block tightening torque		0.5 to 0.6 N•m
Degree of protection		IP20 (Panel-mounted)
Accessories		Connecting Cable, Terminator, Instruction manual

*This product may not meet the performance that is described in catalog depending on liquid type that is detected. Please make sure to check and test before to buy it.

Detectable chemical

Type	Name	Another Name	Chemical formula
Alcohol	Methanol	Methyl Alcohol	CH ₃ OH
Acid	Hydrochloric Acid	---	HCl
	Sulfuric Acid		H ₂ SO ₄
	Nitric Acid		HNO ₃
	Acetic Acid 98%		CH ₃ COOH
	Phosphoric Acid		H ₃ PO ₄
	Hydrofluoric Acid		HF
Alkali	Ammonia Solution	28% Ammonia Solution	NH ₃
	Sodium Hydroxide	Caustic Soda	NaOH
	Potassium Hydroxide	Caustic Potash	KOH
Other	Sodium Hypochlorite	---	NaClO
	Sodium Hydrogen Sulfite	Sodium Bisulfite	NaHSO ₃
	Hydrogen Peroxide	Hydrogen Peroxide 30%	H ₂ O ₂

Performance

Item	Model	K7L-UP-FLK													
Leakage location accuracy * (at an ambient temperature of 25 °C)		Total length 100 m max. ± 1 m 101 to 600 m ± 1 %													
Response time		45 s max. Startup time after power is turned ON: approx. 30 s													
Display		LCD, 12 columns \times 4 lines (characters) with backlight Normal: Lit green Error: Flashing green Leakage detected: Lit red Disconnection detected: Flashing red													
Insulation resistance		20 M Ω max. (at 500 MVDC) Measured locations: Between all pairs of (1), (2), and (3), below. (1) Power supply terminals, (2) Relay output terminals, (3) All terminals together excluding (1) and (2)													
Dielectric strength		2,000 VAC 50/60 Hz 1 min. Measured locations: Same as for insulation resistance.													
Vibration resistance		Frequency: 10 to 55 Hz, Acceleration: 50 m/s ² , Single amplitude: 0.35 mm, 10 sweeps of 5 min each in X, Y, and Z directions													
Shock resistance		130 m/s ² , 3 times each for 3 axes in six directions													
Weight (Sensor only)		Approx. 185 g													
Memory protection		EEPROM (non-volatile memory)													
Installation environment		Installation Category II, Pollution Degree 2													
Safety standards		UL508, CAN/CSA-C22.2 No.14 EN61010-1 (IEC61010-1)													
EMC	EMI EN61326-1 (Industrial applications)	Electromagnetic radiation interference: CISPR11 classA Noise terminal voltage: CISPR11 classA													
	EMS EN61326-1 (Industrial applications)	<table border="0"> <tr> <td>Electrostatic discharge immunity</td> <td>EN61000-4-2 : 4 kV (contact) : 8 kV (in air)</td> </tr> <tr> <td>Radiated electromagnetic field immunity</td> <td>EN61000-4-3 : 10 V/m (80 MHz to 1 GHz) : 3 V/m (1.4 to 2 GHz) : 1 V/m (2.0 to 2.7 GHz)</td> </tr> <tr> <td>Fast transient/burst immunity</td> <td>EN61000-4-4 : 2 kV (power line) : 1 kV (I/O signal lines)</td> </tr> <tr> <td>Surge immunity</td> <td>EN61000-4-5 : 1 kV between lines (power line) : 2 kV between grounds (power line) : 1 kV between grounds (sensor line)</td> </tr> <tr> <td>Conducted noise immunity</td> <td>EN61000-4-6 : 3V (0.15 to 80 MHz)</td> </tr> <tr> <td>Power frequency magnetic immunity</td> <td>EN61000-4-8 : 30A/m</td> </tr> <tr> <td>Voltage dip and interruption immunity</td> <td>EN61000-4-11 : 1 cycle 0% (rated voltage) : 10/12 cycle 40% (rated voltage) : 25/30 cycle 70% (rated voltage)</td> </tr> </table>	Electrostatic discharge immunity	EN61000-4-2 : 4 kV (contact) : 8 kV (in air)	Radiated electromagnetic field immunity	EN61000-4-3 : 10 V/m (80 MHz to 1 GHz) : 3 V/m (1.4 to 2 GHz) : 1 V/m (2.0 to 2.7 GHz)	Fast transient/burst immunity	EN61000-4-4 : 2 kV (power line) : 1 kV (I/O signal lines)	Surge immunity	EN61000-4-5 : 1 kV between lines (power line) : 2 kV between grounds (power line) : 1 kV between grounds (sensor line)	Conducted noise immunity	EN61000-4-6 : 3V (0.15 to 80 MHz)	Power frequency magnetic immunity	EN61000-4-8 : 30A/m	Voltage dip and interruption immunity
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* This leakage position accuracy is for main unit (K7L-UP). Sensing cable also has errors separate from the accuracy described.

Communications Performance

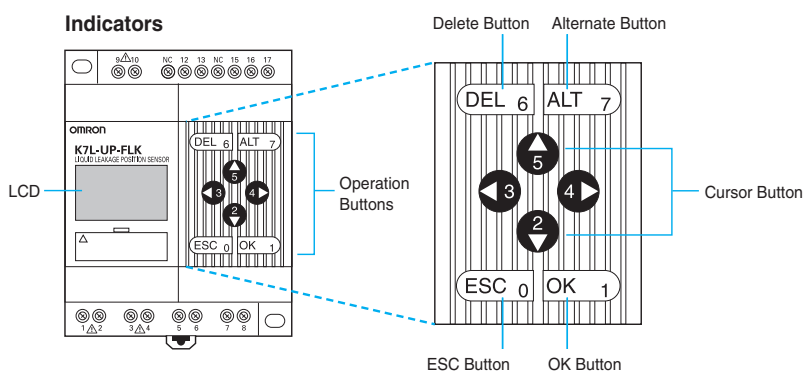
Communications protocol	CompoWay/F	Modbus (RTU mode)
Transmission path connections	Multi-point (32 nodes max. including Master)	
Communications method	RS-485 (two-wire method, half-duplex)	
Synchronization method	Start-stop synchronization	
Baud rate *	4800/9600/19200/38400 bps	
Transmission code	ASCII	Binary
Data length *	7/8 bits	8 bits
Stop bit length *	1/2 bits	Set automatically (no setting) depending on the vertical parity setting. Without vertical parity: 2 bit With vertical parity: 1 bit
Error detection	Vertical parity (none, even odd) BCC (Block Check Character)	Vertical parity (none, even odd) CRC-16 (Cyclical Redundancy Check)
Wait time	00 to 99 ms (Default: 20 ms)	

*Baud rate, data length, stop bit length and vertical parity can be separately set.

This catalog is intended only as a guide to selecting a product. For details on precautions when using the product, be sure to read the [K7L-UP-FLK Liquid Leakage Position Sensor Operation Manual] (Cat. No. Z287). The manual can be downloaded from the following website.
OMRON Industrial website: <http://www.ia.omron.com/>

Part Names and Functions

Operation Area



Button	Name	Function	
		Menu selection	Parameter setting
	DEL Button	—	Deletes the characters or setting.
	ALT Button	—	Use in combination with a button.
	Up Cursor Button	Moves the selected item up.	Moves the selected item up. Moves the number or character forward.
	Down Cursor Button	Moves the selected item down.	Moves the selected item down. Moves the number or character backward.
	Left Cursor Button	—	Moves the selected item to the left.
	Right Cursor Button	—	Moves the selected item to the Right.
	ESC Button	Returns to the previous screen.	Discards the setting and returns to the previous operation.
	OK Button	Enters the selected item.	Enters the setting.

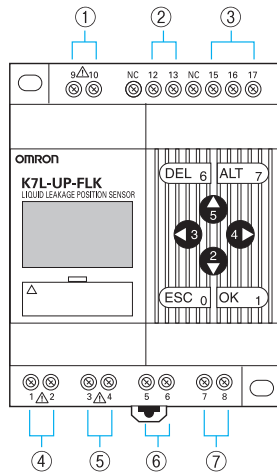
Note: The above operations are provided as examples. For details, read the [K7L-UP-FLK Liquid Leakage position Sensor Operation Manual] (Cat. No.Z287)

The manual can be downloaded from the following website
 OMRON Industrial website <http://www.ia.omron.com/>

K7L-UP-FLK

Connections

Overall Terminal Arrangement



- ① Power supply terminals
- ② External reset input terminals
- ③ Connecting cable terminals
- ④ Alarm output contact terminals
- ⑤ Leakage/disconnection output contacts
- ⑥ RS-485 communications terminals
- ⑦ Linear outputs terminals (4 to 20 mA)

Top Row

9	10	NC	12	13	NC	15	16	17
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Bottom Row

1	2	3	4	5	6	7	8
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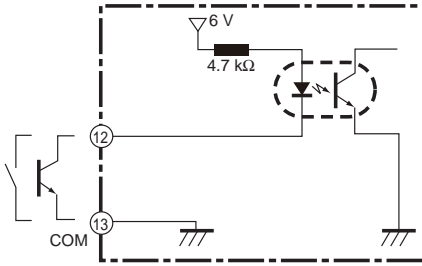
Bottom Row		Top Row		
Terminals No.	Name	Terminals No.	Name	
1	Alarm output contacts	9	Power supply	
2	Alarm output contacts	10	Power supply	
3	Leakage/disconnection output contacts	NC	Free terminal *	
4	Leakage/disconnection output contacts	12	External reset	
5	RS-485 B (+)	13	External reset	
6	RS-485 A (-)	NC	Free terminal *	
7	Linear outputs (+)	15	Detect wire (Red)	
8	Linear outputs (-)	16	Resistance wire (White)	Connecting cable
		17	Signal wire (Black)	

*Do not wire anything to free terminals.

Specific Terminal Arrangements

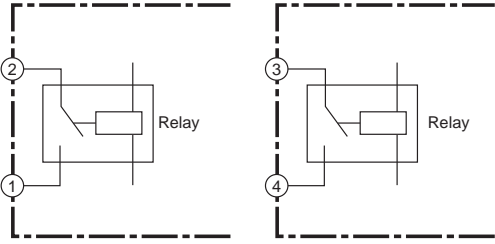
External Reset

Use no-voltage contacts or NPN open collector.



Relay Output

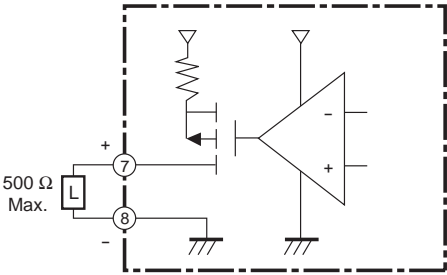
Connect the loads between terminals (1) and (2), and between (3) and (4).



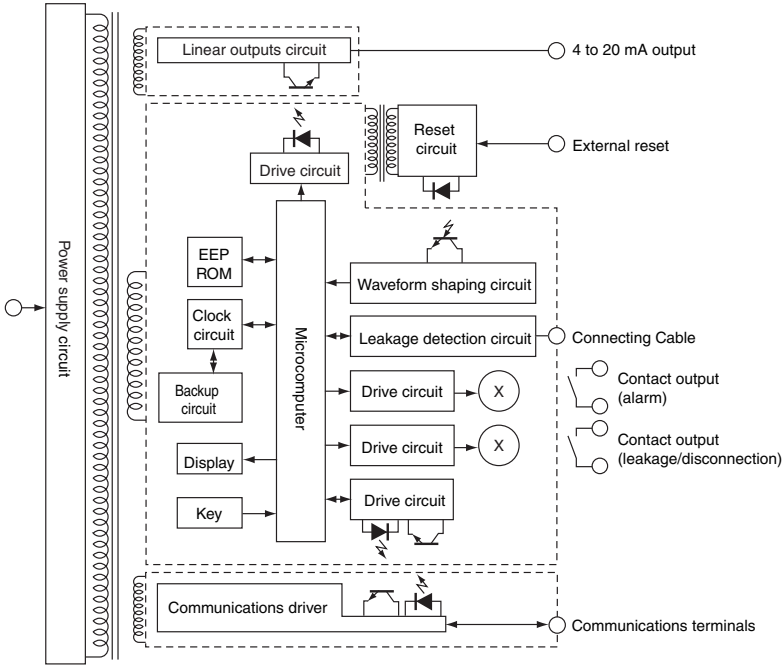
Note: The external reset and 4 to 20-mA output commons are internally isolated.

4 to 20-mA Output

The load capacity is 500 Ω max.



Internal Block Diagram



K7L-UP-FLK

Main Functions

Liquid Leakage Monitoring

Detection of Changes in Liquid Leakage

- Extent of Leakage
Any spreading of leakage from the current location is detected.
- Detection of Second Leakage location
Leakage at a separate location from the current leakage location is detected.

Up to 600 m of Cable for a Single Sensor

A maximum length of 600 m is possible by combining Sensing Cables with other cables. When Cables are connected, the length of Sensing Cable is automatically displayed. The length of the F03-21UP-JC Junction Cables is not included in the displayed cable length. The distance displayed for each Area Separator is equivalent to 10 m of Sensing Cable.

A Selection of Detection Sensitivities

Two levels of leakage detection can be selected.

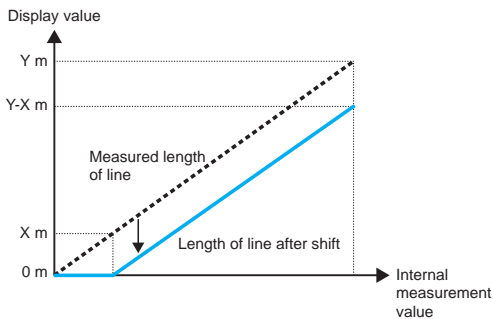
Disconnection Detection

Cable disconnections from the Controller to the Terminator are detected.

Input

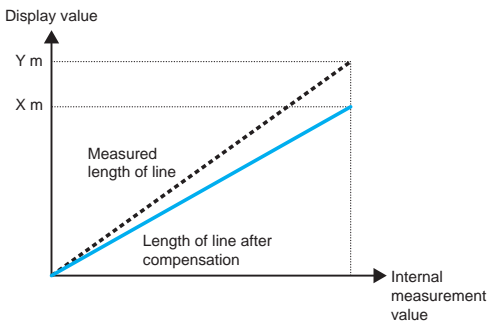
Shift Function

This function changes the 0-m position for the Sensing Cable. When there is a distance between the Controller and the location where the leakage is detected, the display can be made easier to understand by changing any distance to 0 m.



Compensation Function

This function changes the length of the Sensing Cable to any value. When there is a discrepancy between the actual length and the measured length, this value can be revised to any value for compensation.



Output

Relay Output

Can be set to normally open or normally closed.

Output Reset

Any of three patterns can be selected for the output reset method.

RS-485 Communications

Either CompoWay/F or Modbus can be selected as the communications protocol.

Linear Output

4 to 20-mA output can be selected.

Other

Display Language

Either English or Japanese can be selected.

Event Log

Timestamps for up to 20 events and leakage occurrences can be retained.

Output Testing

Testing can be conducted without connecting the Sensing Cable.

Key Protection

Unintended setting changes can be prevented.

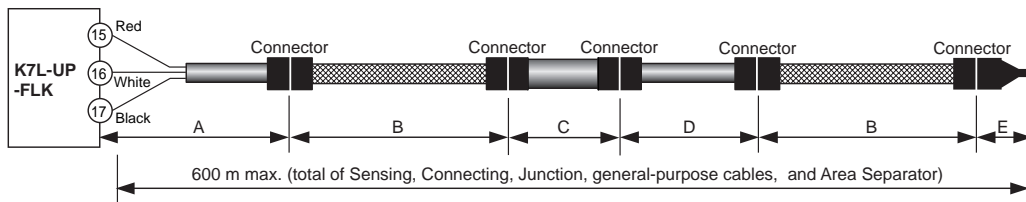
Backlight ON Time

The backlight can be set to always remain ON or to turn OFF after a specified time.

Area Settings

Laek positions in meters can be divided into up to 20 areas. F03-20UP-AS Area Separators can be used to enable accurately identifying the detection area in which a leak has occurred even when the leak occurs near an area boundary.

Cable Connection Example



	Product name	Model
A	Connecting Cable	F03-21UP-CC
B	Sensing Cable	F03-16UP-C-□M *1
C	Area Separator *2	F03-20UP-AS
D	Junction Cable *3	F03-21UP-JC
E	Terminator	F03-20UP-TC

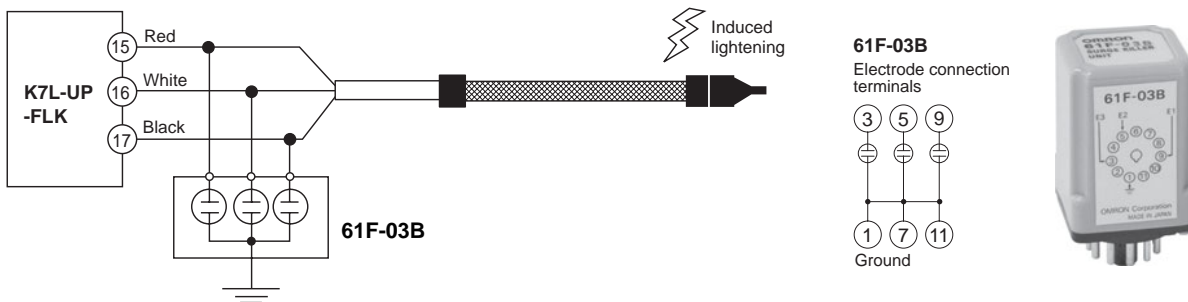
*1. The blank (□) in the model number represents 2, 5, 10, or 30.

*2. Area Separators are calculated as 10 m each.

*3. No more than 10 Junction Cables can be used.

Surges

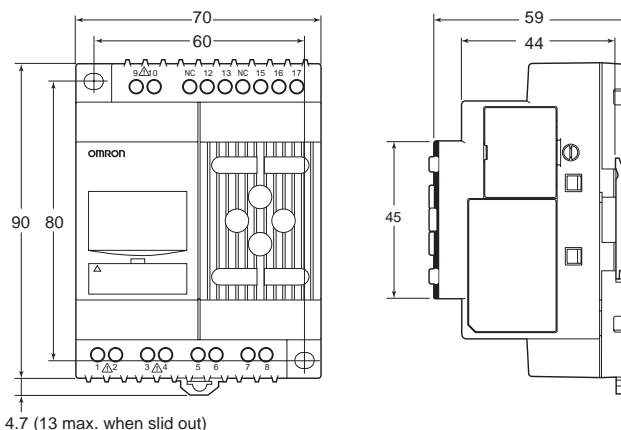
In an environment where surges can be expected, use the Sensor in conjunction with a 61F-03B Surge Suppressor Unit. Install the Surge Suppressor Unit near the Controller. If it is installed too far from the Controller, the surge suppression may not be sufficient.



Dimensions

(Unit: mm)

Controller

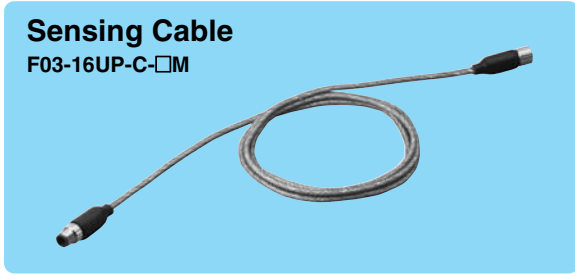


F03-□□UP

F03-□□UP

Sensing Cable

F03-16UP-C-□M



- Made of fluoro-resin for superior resistance to chemicals.
- Flexible cables make wiring easy.
- There is little out gas, enabling worry-free use in a clean room.

Structure and Dimensions

(Unit: mm)

Structure	
Dimensions	

* L: 2m, 5m, 10m, 30m

Specifications

Number of electrodes		3
Cable materials	Signal wire	Tin-plated annealed copper
	Resistance wire	Kernalloy
	Detect wire	Nickel
	Insulation coating	Fluoro-resin
Connector materials	Metallic parts	Brass with nickel plating
	Resin parts	Polyolefine resin
Insulation resistance		10 MΩ min.
Ambient temperature		-10 to 55 °C
Ambient humidity		25 to 85 %
Weight (2m)		Approx. 80 g

Note: The blank -□M suffix in the model number indicates that 2, 5, 10, or 30 m can be selected.

Sensing Cable Chemical Resistance

Liquid	Corrosion resistance
Water	A
Ammonia	B
Hydrochloric acid	C
Sulfuric acid	B
Phosphoric acid	B
Caustic soda	B
Sodium sulfite	B
Sodium hypochlorite	C
Hydrogen fluoride	C

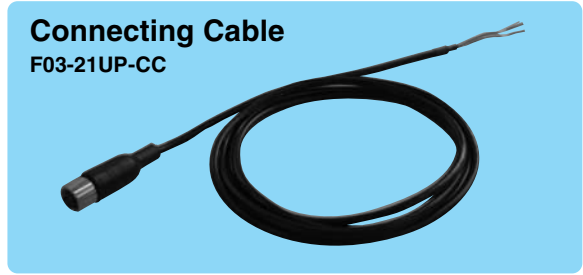
A: Not affected at all or only very slightly affected.

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.)

Connecting Cable

F03-21UP-CC



- Cable for connecting the Controller and Sensing Cable.

Dimensions

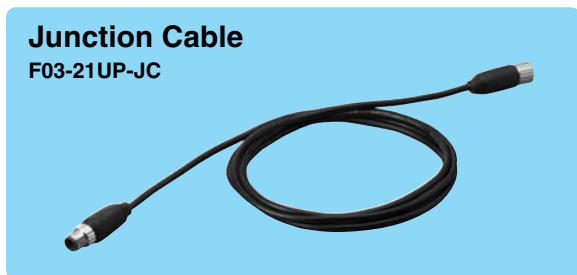
(Unit: mm)

Dimensions	
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Note: For recommended ferrules, refer to page 12.

Specifications

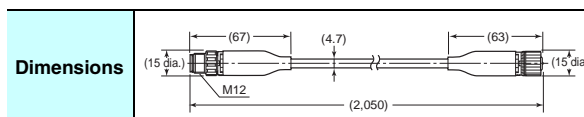
Number of electrodes		3
Cable materials	Signal wire	Tin-plated annealed copper
	Resistance wire	Tin-plated annealed copper
	Detect wire	Tin-plated annealed copper
	Insulation coating	PVC
Connector materials	Metallic parts	Brass with nickel plating
	Resin parts	Polyolefine resin
Insulation resistance		10 MΩ min.
Ambient temperature		-10 to 55 °C
Ambient humidity		25 to 85 %
Weight		Approx. 82 g



Junction Cable
F03-21UP-JC

- Junction Cable for connecting between Sensing Cables.

Dimensions (Unit: mm)



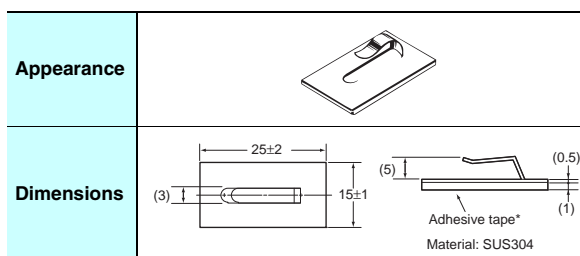
Note: Cut the middle of cable and connect it with commercial-triplex cable when you extend the junction cable.

Specifications

Number of electrodes		3
Cable materials	Insulation coating	PVC
	Connector materials	
Connector materials	Metallic parts	Brass with nickel plating
	Resin parts	Polyolefine resin
Insulation resistance		10 MΩ min.
Ambient temperature		-10 to 55 °C
Ambient humidity		25 to 85 %
Weight		Approx. 100 g

Cable Sticker

F03-25



< **Area Separator** >

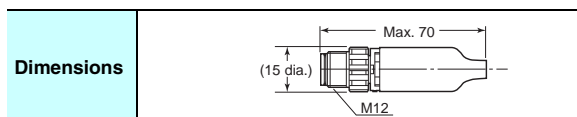
Leak positions in meters can be divided into up to 20 areas. F03-20UP-AS Area Separators can be used to enable accurately identifying the detection area in which a leak has occurred even when the leak occurs near an area boundary.



Terminator
F03-20UP-TC

- This is an end connector for connecting to the end of Sensing Cable.

Dimensions (Unit: mm)



Specifications

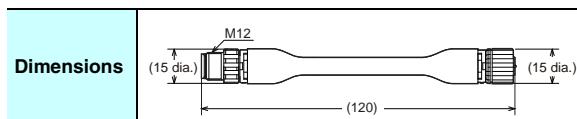
Number of electrodes		3
Connector materials	Metallic parts	Brass with nickel plating
	Resin parts	Polyolefine resin
Ambient temperature		-10 to 55 °C
Ambient humidity		25 to 85 %
Weight		Approx. 17 g



Area Separator
F03-20UP-AS

- Connector for dividing the areas.
- Connecting to area boundary.

Dimensions (Unit: mm)



Specifications

Number of electrodes		3
Connector materials	Metallic parts	Brass with nickel plating
	Resin parts	Polyolefine resin
Insulation resistance		10 MΩ min.
Ambient temperature		-10 to 55 °C
Ambient humidity		25 to 85 %
Weight		Approx. 32 g

K7L-UP-FLK

Precautions

⚠ Caution

Tighten the terminal screws to the recommended torque of 0.5 to 0.6 N·m. Failure to do so may occasionally cause physical damage due to fire.



Do not use the product in an environment with flammable or explosive gas. Doing so may occasionally cause minor or moderate personal injury or physical damage due to explosion.



Do not touch the terminals while the power is ON. Doing so may occasionally cause electric shock.



Do not open the top or side covers of the case or remove masking seals. Doing so may occasionally cause electric shock or physical damage to the product.



Do not disassemble, repair, or modify the product. Doing so may occasionally cause electric shock, minor injury, fire, or damage to the product.



Safety Precautions

- Do not use, store, or transport the product in the following environments.
 - Locations exposed to direct sunlight
 - Outdoor locations or locations exposed to wind or rain
 - Locations with temperatures or humidity outside of the specified range
 - Locations subject to condensation
 - Locations subject to sudden changes in temperature or humidity
 - Locations subject to strong vibration or shock
 - Locations where the product will be exposed to water spray, oil, or saltwater
 - Locations exposed to corrosive gas (particularly sulfurous acid gas, ammonia gas, etc.)
 - Locations with excessive dust and dirt
- When mounting to a DIN Track, make sure that there are no loose screws and that the product is securely mounted. If screws come loose, the DIN Track, the product, or wiring may be shaken loose due to vibration or shock.
- Use a DIN Track that is 35 mm in width (OMRON model number: PFP-50N/-100N).
- When surface mounting, use M4 screws and tighten the screws to the specified torque of 1.03 N·m max.
- Check to make sure there are no mistakes in the specifications or wiring before turning ON the power.
- Make sure that the power supply voltage and the load are within the specifications and ratings.
- Use the following crimp terminals for wiring.
Phoenix Contact
 - Connecting Cable: AI0.25-6BU (AWG24)
 - Other: AI0.34-8TQ (AWG22)
AI0.5-8WH (AWG20)
AI0.75-8GY (AWG18)
- Do not pull on the cables.
- Conduct operation tests before using the product.
- Install an external switch or circuit breaker that complies with applicable IEC 60947-1 and IEC 60947-3 requirements, and label it clearly so that the operator can quickly turn OFF the power.
- Do not use the product in locations subject to static electricity or electric fields.
- Install the product as far away as possible from devices that generate strong high frequency or surges.
- To prevent inductive noise, separate the wiring for the product from high-voltage or high-current power lines. In addition, do not route the wiring for the product in parallel with or bundled with

power lines. Using separate conduits or ducts and shielded cables can also be effective.

- Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product.
- Do not install the product near heat-producing devices (such as devices with coils or windings).
- Do not connect anything to unused terminals.
- Firmly secure the connectors for Connecting Cables, Junction Cables, Area Separators, Sensing Cables, and Terminators.
- Do not clean the product with paint thinners. Use commercial alcohol.
- Dispose of the product as industrial waste.
- Be sure to touch the unit after touching the contacted metal and discharging static electricity of the human body.

Precautions for Correct Use

- Use the following OMRON products for leakage detection.
 - Sensing Cable: F03-16UP-C-□M
 - Connecting Cable: F03-21UP-CC
 - Junction Cable: F03-21UP-JC
 - Area Separator: F03-20UP-AS
 - Terminator: F03-20UP-TC
- After leakage has been detected, wipe the fluid from the Sensing Cable. If the Sensing Cable deteriorates despite being wiped off, then replace it.
- Do not subject Sensing Cables, Connecting Cables, Junction Cables, Area Separators, or Terminators to vibration or shock.
- When laying cable in a place where people pass through, use a protective duct.
- Do not install the connectors on the Sensing Cables or the Connecting Cables, Junction Cables, Area Separators, or Terminators in the areas where leaks are being detected. If chemical solution adheres to any of these, replace them.
- Do not install the Sensing Cable where it will be pressed against a metal edge.
- Warm-up for 15 minutes min. after turning on the power.
- Do not bend or tightly tie up extra Sensing Cable.
- Be sure that you understand the manual before making device settings. When short-circuiting the sensing line, use a commercially available metal brush for 45 seconds min.
- This product detects changes in the electrical resistance of liquids. The performance of the product specified in this document may not be obtained for some types of liquids. Always perform tests in advance before purchasing the product to confirm applicability.

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.

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

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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Application Considerations

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OMRON Corporation Industrial Automation Company

Tokyo, JAPAN

Contact: www.ia.omron.com

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69-2132 JD Hoofddorp
The Netherlands

Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC

One Commerce Drive Schaumburg,
IL 60173-5302 U.S.A.

Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967

Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China

Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

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