

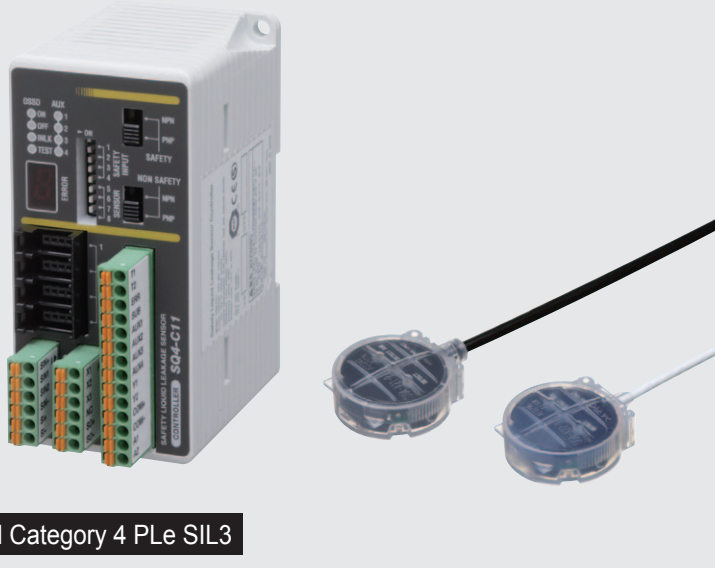
Safety Liquid Leak Sensor

SQ4 SERIES

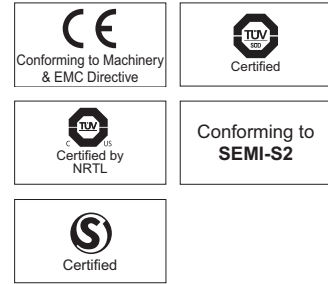
Related Information

- General terms and conditions..... F-17
- Sensor selection guide P.831~
- General precautions P.1405
- Korea's S-mark

NEW

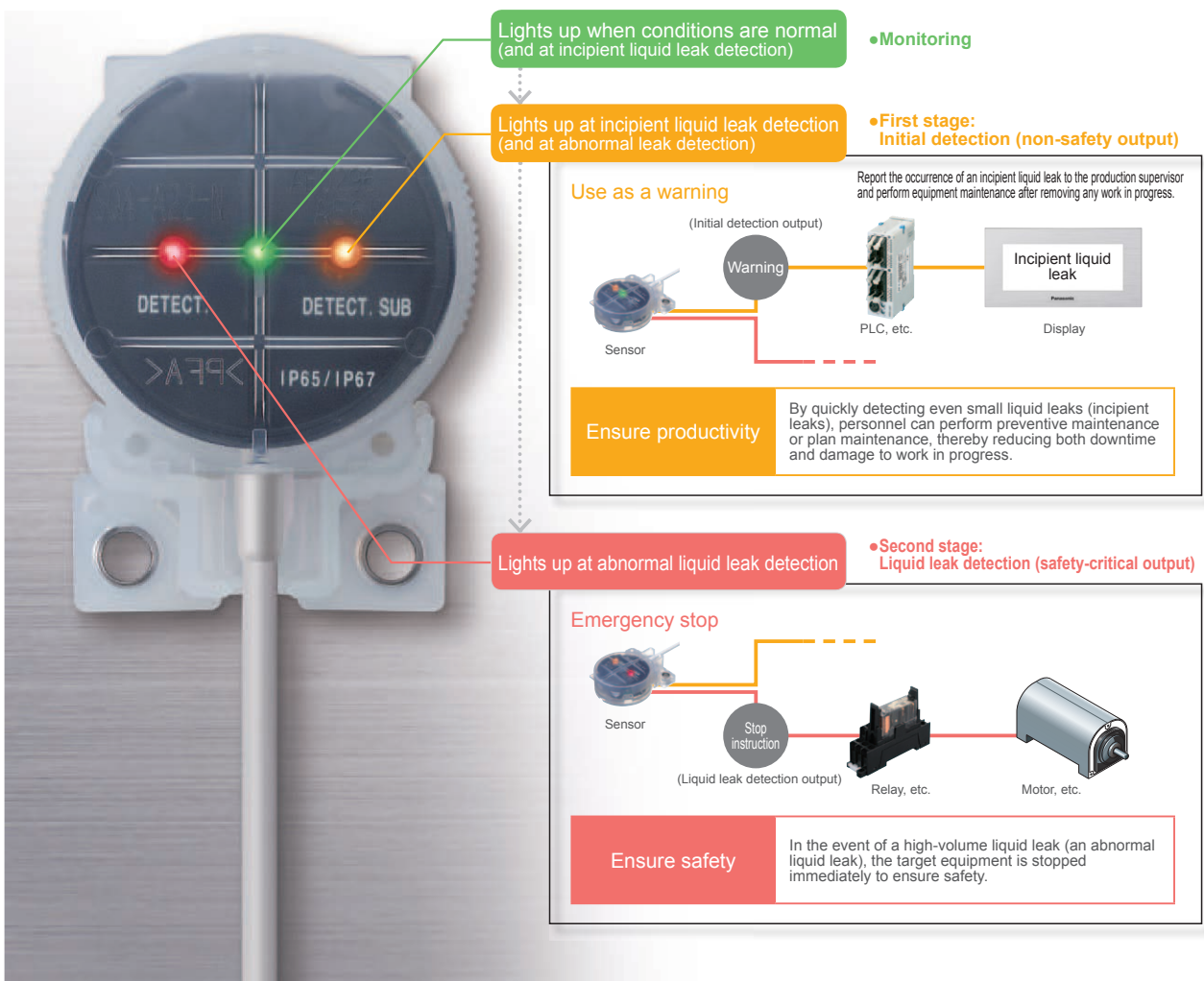


Control Category 4 PLe SIL3



Two-stage detection × Safety certification

Improved productivity! Two-stage detection



- FIBER SENSORS
- LASER SENSORS
- PHOTOELECTRIC SENSORS
- MICRO PHOTOELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- SIMPLE WIRE-SAVING UNITS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- ENDOSCOPE
- LASER MARKERS
- PLC / TERMINALS
- HUMAN MACHINE INTERFACES
- ENERGY CONSUMPTION VISUALIZATION COMPONENTS
- FA COMPONENTS
- MACHINE VISION SYSTEMS
- UV CURING SYSTEMS
- Selection Guide
- Wafer Detection
- Liquid Leak Detection
- Liquid Level Detection
- Water Detection
- Color Mark Detection
- Hot Melt Glue Detection
- Ultrasonic
- Small / Slim Object Detection
- Obstacle Detection
- Other Products

SQ4

EX-F70/
EX-F60

mailbox@sentronic.com
www.sentronic.com

Tel. +41 (0)56 222 38 18
Fax +41 (0)56 222 10 12

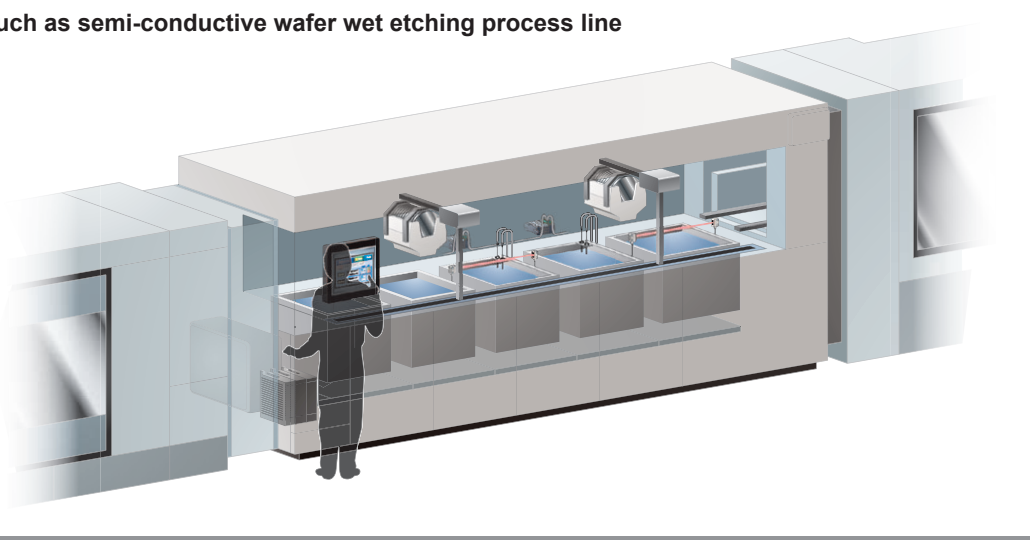
Rugghözli 2
CH - 5453 Busslingen

Produkte, Support und Service

SENTRONIC AG

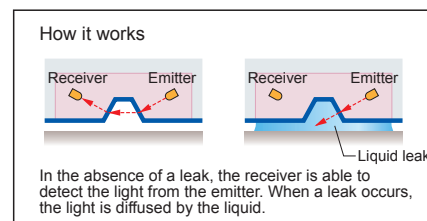
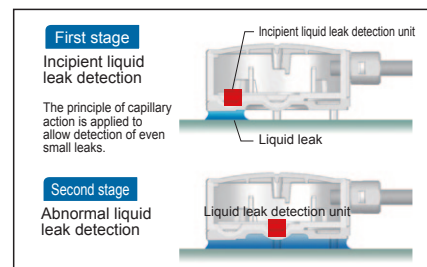
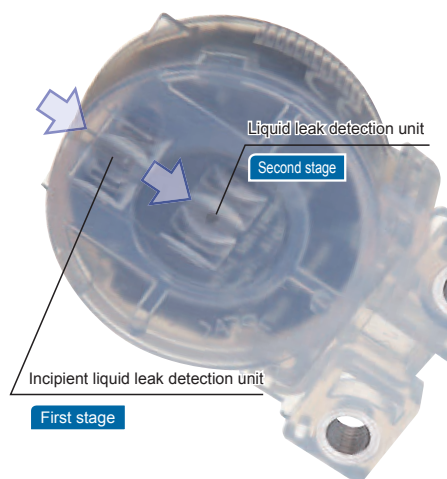
APPLICATIONS

Leak detection such as semi-conductive wafer wet etching process line



Two-stage detection addresses both incipient liquid leaks (by generating a warning) and abnormal liquid leaks (by initiating an emergency stop).

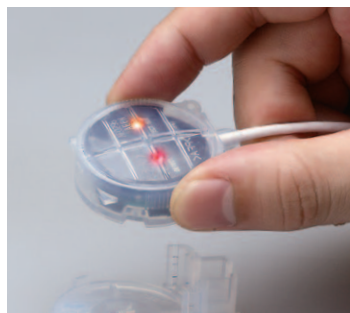
On the bottom of the sensor are two detection units, one located at the front and one at the center. If a liquid leak occurs in front of the sensor, the front detection unit will detect even a small incipient leak. When the leak increases in volume and reaches the center of the sensor, it will be detected as an abnormal leak. While previous implementations of two-stage liquid leak detection have relied on two separate sensors installed at different heights, the **SQ4** delivers the same full-featured detection capability in a single sensor unit.



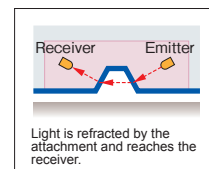
The SQ4 can also detect human error (improper installation).

In addition to detecting liquid leaks, the **SQ4** can detect both human error (such as a failure to install the sensor) and sensor malfunctions. If the sensor itself or the sensor and its mounting bracket have become dislodged, have been improperly installed, or are suffering from a broken cable connection, light from the emitter will not reach the receiver, causing the device to generate the same output as if a liquid leak had occurred.

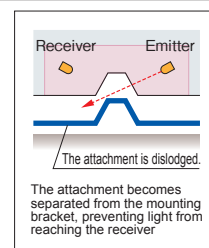
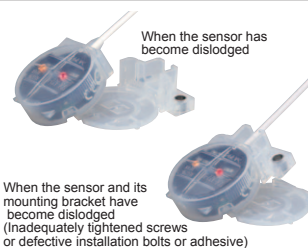
Knurling on the sides of the sensor head makes it easy to grip.



When conditions are normal
Sensor light from the emitter is able to reach the receiver.



When the sensor has been installed improperly



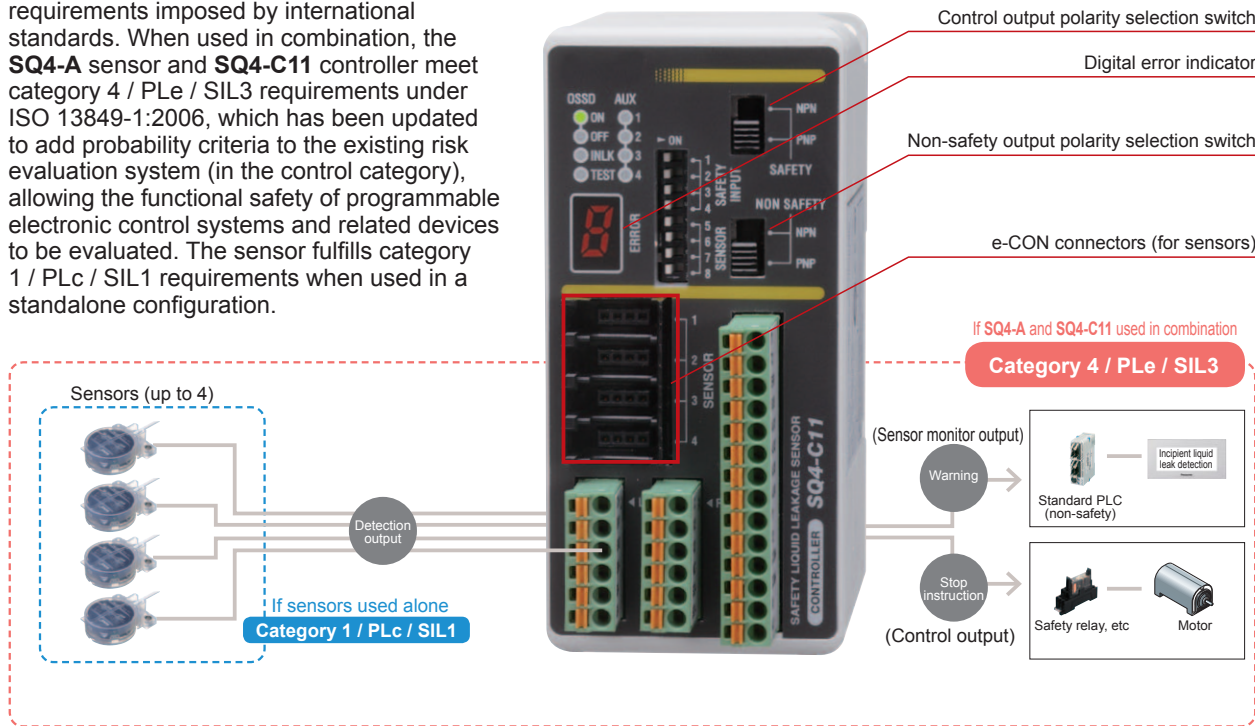
The SQ4 can also be used alone.

The **SQ4** can also be used without a controller, allowing the benefits of two-stage detection to be added to existing equipment by augmenting or replacing existing detection systems.

The SQ4 is the first device of its kind in the industry* to earn safety certification, demonstrating that it delivers safety performance of the highest caliber.

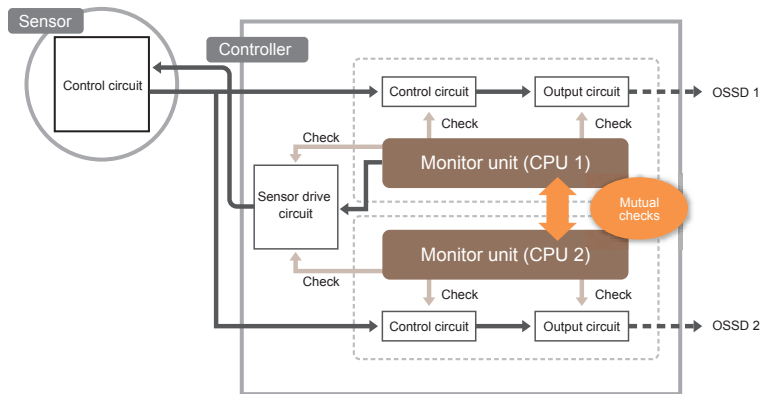
The **SQ4** system is designed to fulfill safety requirements imposed by international standards. When used in combination, the **SQ4-A** sensor and **SQ4-C11** controller meet category 4 / PLc / SIL3 requirements under ISO 13849-1:2006, which has been updated to add probability criteria to the existing risk evaluation system (in the control category), allowing the functional safety of programmable electronic control systems and related devices to be evaluated. The sensor fulfills category 1 / PLc / SIL1 requirements when used in a standalone configuration.

*As of October 2010; according to research by Panasonic Electric Works SUNX.



Dual CPUs deliver an advanced level of safety control.

The controller's two independent CPUs mutually check the unit's operating state, and redundant signal processing and output circuits ensure safety. Failure mode and effects analysis (FMEA)* further increases operational safety.

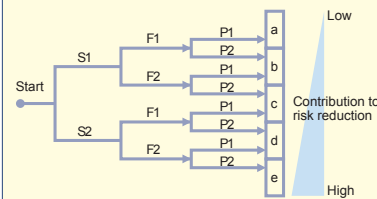


*FMEA comprises a systematic method for analyzing latent failures and defects so that they can be prevented from manifesting themselves.

ISO 13849-1: 2006

PLr (Required performance level)

Performance level (PL) applied in order to achieve the required risk reduction



S: Severity of injury
 S1: Slight (normally reversible injury)
 S2: Serious (normally irreversible injury or death)

F: Frequency and/or exposure to hazard
 F1: Seldom to less often and/or the exposure time is short
 F2: Frequent to continuous and/or the exposure time is long

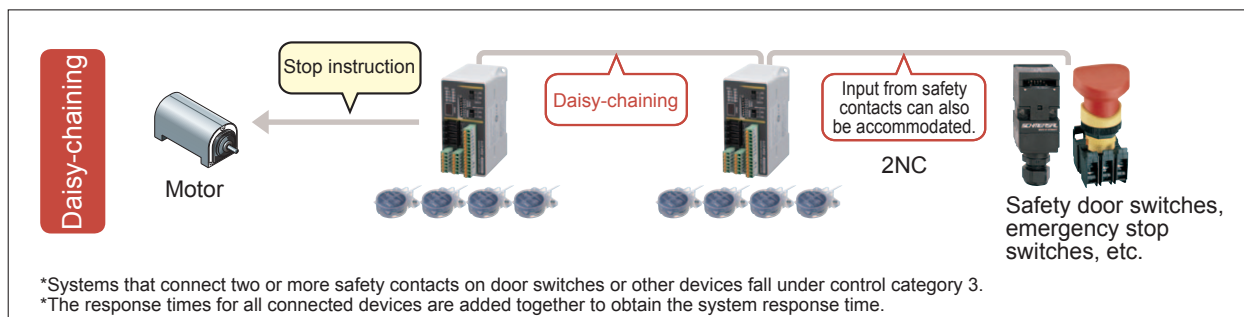
P: Possibility of avoiding hazard or limiting harm
 P1: Possible under specific conditions
 P2: Scarcely possible

- FIBER SENSORS
- LASER SENSORS
- PHOTOELECTRIC SENSORS
- MICRO PHOTOELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- SIMPLE WIRE-SAVING UNITS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- ENDOSCOPE
- LASER MARKERS
- PLC / TERMINALS
- HUMAN MACHINE INTERFACES
- ENERGY CONSUMPTION VISUALIZATION COMPONENTS
- FA COMPONENTS
- MACHINE VISION SYSTEMS
- UV CURING SYSTEMS
- Selection Guide
- Wafer Detection
- Liquid Leak Detection
- Liquid Level Detection
- Water Detection
- Color Mark Detection
- Hot Melt Glue Detection
- Ultrasonic
- Small / Slim Object Detection
- Obstacle Detection
- Other Products

SQ4
EX-F70/
EX-F60

Reduce wiring and lower costs by daisy-chaining controllers and other safety equipment.

The controller's safety input function can be used to connect wiring used to daisy-chain controllers together as well as input from safety contacts (2NC) on emergency stop switches, safety door switches, and other devices. In this way, safety output can be aggregated onto a single line to reduce safety circuit wiring and lower costs.



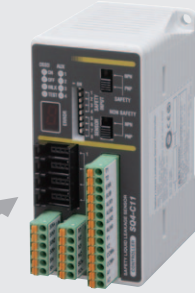
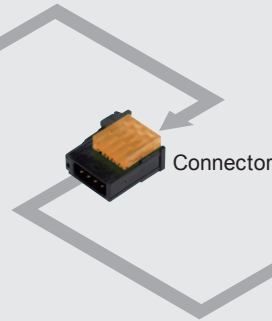
PRODUCT CONFIGURATION

Whole set: Category 4, PLe, SIL3

Sensor: Category 1, PLc, SIL1

Sensor **SQ4-A2**-□-□



Mounting bracket set **MS-SQ4-2** □
 Attachment
 Mounting bracket



Controller **SQ4-C11**

ORDER GUIDE






Sensors

Type	Appearance	Sensing object (Note 1)	Model No.	Output
For standard liquid	 Material: Polypropylene	Water etc.	SQ4-A21-P	PNP open-collector transistor
			SQ4-A21-N	NPN open-collector transistor
For chemical liquid	 Material: PFA	Sulfuric acid, Hydrochloric acid, Phosphoric acid, Ammonia, Fluorinert (Note 2), Galden (Note 2) or Fluorine etc.	SQ4-A22-P	PNP open-collector transistor
			SQ4-A22-N	NPN open-collector transistor

Notes: 1) The agents mentioned above are examples. It may not be detected depending on viscosity the agent. Before using this device, check the detecting liquid and installation condition.
 2) Fluorinert™ is the world wide trademark of 3M. Galden is the world wide trademark of Solvay Solexis.

Mounting bracket set

Make sure to purchase the sensor and controller as a set.

Type	Appearance		Sensing object	Model No.
	Attachment	Mounting bracket		
For standard liquid	 Material: Polypropylene	 Material: PVC	Water etc.	MS-SQ4-21
For chemical liquid	 Material: PFA	 Material: PFA	Liquids with comparatively high surface tension such as Sulfuric acid, Hydrochloric acid, Phosphoric acid, and Ammonia	MS-SQ4-22
		 Material: PVC	Liquids with comparatively low surface tension such as Fluorinert (Note), Galden (Note), and Hydrogen fluoride	MS-SQ4-23
			Liquids such as low-concentration hydrogen fluoride	MS-SQ4-24

Note: Fluorinert™ is the world wide trademark of 3M. Galden is the world wide trademark of Solvay Solexis.

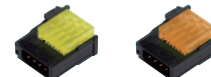
Connectors

Make sure to purchase the connector when using the controller.


Designation	Model No.	Description
Hook-up connector (e-CON)	CN-EP2	For SQ4-A21 -□ (PVC cable) It is used to connect to the controller. Yellow 5 pcs. per set
	CN-EP3	For SQ4-A22 -□ (PFA cable) It is used to connect to the controller. Orange 5 pcs. per set

Hook-up connector

• CN-EP2 • CN-EP3



Controller

Type	Appearance	Model No.	Description
Safety controller		SQ4-C11	Up to 4 safety liquid leak sensors can be connected. Control Category 4, PLe SIL3

SPECIFICATION**Sensors**

Item	Model No.	Type	For standard liquid	For chemical liquid
		PNP output	SQ4-A21-P	SQ4-A22-P
		NPN output	SQ4-A21-N	SQ4-A22-N
Sensing object			Water (Standard liquid) (Note 2)	Sulfuric acid, Hydrochloric acid, Phosphoric acid, Ammonia, Fluorinert (Note 3), Galden (Note 3), Hydrofluoric acid etc. (Note 2)
Supply voltage			12 to 24 V DC $\pm 10\%$ Ripple P-P 10 % or less	
Current consumption			30 mA or less	
Utilization category			DC-12, DC-13	
Leakage detection output (Abnormal leakage detection, Safety output)			<PNP output type> PNP open-collector transistor • Maximum source current: 50 mA • Applied voltage: Same as the supply voltage (between detection output and +V) • Residual voltage: 2.5 V or less (at 50 mA source current)	<NPN output type> NPN open-collector transistor • Maximum sink current: 50 mA • Applied voltage: Same as the supply voltage (between detection output and 0 V) • Residual voltage: 2 V or less (at 50 mA sink current)
Response time			10 ms or less	
Output operation			ON when initial detection, OFF when detection leakage or wrong installation	
Initial leakage detection output (Initial leakage, Non-safety output)			<PNP output type> PNP open-collector transistor • Maximum source current: 50 mA • Applied voltage: Same as the supply voltage (between detection auxiliary output and +V) • Residual voltage: 2.5 V or less (at 50 mA source current)	<NPN output type> NPN open-collector transistor • Maximum sink current: 50 mA • Applied voltage: Same as the supply voltage (between detection auxiliary output and 0 V) • Residual voltage: 2 V or less (at 50 mA sink current)
Response time			50 ms or less	
Output operation			ON when normal condition, OFF when initial detection or accidental leakage	
Protection			IP65 / IP67 (IEC)	
Ambient temperature			-10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed) (Note 4), Storage: -10 to +55 °C +14 to +131 °F	
Ambient humidity			35 to 85 % RH, Storage: 35 to 85 % RH	
Emitting element			Infrared LED (modulated)	
Material			Enclosure: Polypropylene	Enclosure: PFA
Cable			0.18 mm ² 4-core PVC cabtire cable, 2 m 6.562 ft long	0.1 mm ² 4-core PFA cabtire cable, 2 m 6.562 ft long
Weight			Net weight: 45 g approx., Gross weight: 110 g approx.	

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.
 2) The agents mentioned above are examples. It may not be detected depending on viscosity the agent.
 Before using this device, check the detecting liquid and installation condition.
 3) Fluorinert™ is the world wide trademark of 3M. Galden is the world wide trademark of Solvay Solexis.
 4) Liquid being detected should be also kept within the rated ambient temperature range.

SPECIFICATION

Controller

Item	Model No.	SQ4-C11
Applicable standards	International standard	ISO 13849-1 (Category 4, PL _e), IEC 61508-1 to 7 (SIL3), IEC 62061 (SIL3)
	Japan	JIS B 9705-1 (Category 4), JIS C 0508-1 to 7 (SIL3)
	Europe (EU) (Note 2)	EN 55011 Class A, EN 61000-6-2, EN 50178, EN ISO 13849-1 (Category 4, PL _e), EN 61508-1 to 7 (SIL3)
	North America (Note 3)	ANSI/UL 508, CAN/CSA C22.2 No.14
	South Korea	S1-G-1-2009, S2-W-5-2009
	SEMI	Conforming to SEMI-S2-0310a
Power voltage	24 V DC ⁺¹⁰ ₋₁₅ % Ripple P-P 10 % or less	
Consumption current	200 mA or less	
Control output [OSSD 1 (Y1), OSSD 2 (Y2)]	PNP open-collector transistor / NPN open-collector transistor (switch method)	
	<Selecting PNP output>	<Selecting NPN output>
	<ul style="list-style-type: none"> • Maximum source current: 200 mA • Applied voltage: Same as power voltage (between control output to +V) • Residual voltage: 2.5 V or less (at 200 mA source current) 	<ul style="list-style-type: none"> • Maximum sink current: 200 mA • Applied voltage: Same as power voltage (between control output to 0 V) • Residual voltage: 2.0 V or less (at 200 mA sink current)
Response time	20 ms or less (excluding the response time of the sensor)	
Operation mode (Output operation)	ON when initial detection, OFF when detection leakage or wrong installation	
Utilization category	DC-12, DC-13	
Sensor monitor output (AUX1, 2, 3, 4, Non-safety output)	PNP open-collector transistor / NPN open-collector transistor (switch method)	
	<Selecting PNP output>	<Selecting NPN output>
	<ul style="list-style-type: none"> • Maximum source current: 60 mA • Applied voltage: Same as power voltage (between sensor monitor output to +V) • Residual voltage: 2.5 V or less (at 60 mA source current) 	<ul style="list-style-type: none"> • Maximum sink current: 60 mA • Applied voltage: Same as power voltage (between sensor monitor output to 0 V) • Residual voltage: 2.0 V or less (at 60 mA sink current)
Response time	100 ms or less (excluding the response time of the sensor)	
Operation mode (Output operation)	ON when normal condition, OFF when initial detection or accidental leakage	
Utilization category	DC-12, DC-13	
Lockout output	OFF for lockout (Rating: Same as sensor monitor output)	
Auxiliary output	Negative logic output of control output 1 / 2 (OSSD 1 / 2) (Rating: Same as sensor monitor output) [Auxiliary output ON when control output 1 / 2 (OSSD 1/2) is OFF]	
Functions	Interlock / lockout cancel / Test input / External device monitor / Safety input / Control output polarity selection / Non-safety output polarity selection / Sensor connection number setting	
Protection	IP20 (IEC) (However, it should be in IP54 protection structure of control panel)	
Ambient temperature	-10 to +55 °C +14 to +131 °F (No dew condensation or icing allowed), Storage: -10 to +55 °C +14 to +131 °F	
Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH	
PFHD	2.55 × 10 ⁻⁹ (when connecting 4 safety liquid connecting sensors)	
MTTFd	100 years or more	
Material	Main unit case: PC / ABS (alloy)	
Weight	Net weight: 170 g approx., Gross weight: 440 g approx.	

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.
 2) Regarding EU Machinery Directive, a Notified Body, TÜV SÜD, has certified with the type examination certificate.
 3) With regards to the standards in the US, under the US regulation 29 CFR 1910.7, TÜV SÜD, a Nationally Recognized Testing Laboratory (NRTL) certified by OSHA, has certified with the safety certificate based on UL / ANSI standards.
 With regards to the standards in Canada, under the safety regulations based on CEC (Canadian Electric Code), TÜV SÜD, a Certification Body accredited by SCC, has certified with the safety certificate based on CSA standards.

- FIBER SENSORS
- LASER SENSORS
- PHOTO-ELECTRIC SENSORS
- MICRO PHOTO-ELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- SIMPLE WIRE-SAVING UNITS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- ENDOSCOPE
- LASER MARKERS
- PLC / TERMINALS
- HUMAN MACHINE INTERFACES
- ENERGY CONSUMPTION VISUALIZATION COMPONENTS
- FA COMPONENTS
- MACHINE VISION SYSTEMS
- UV CURING SYSTEMS
- Selection Guide
- Wafer Detection
- Liquid Leak Detection
- Liquid Level Detection
- Water Detection
- Color Mark Detection
- Hot Melt Glue Detection
- Ultrasonic
- Small / Slim Object Detection
- Obstacle Detection
- Other Products

SQ4

EX-F70/
EX-F60

mailbox@sentronic.com
www.sentronic.com

Tel. +41 (0)56 222 38 18
Fax +41 (0)56 222 10 12

Rugghözli 2
CH - 5453 Busslingen

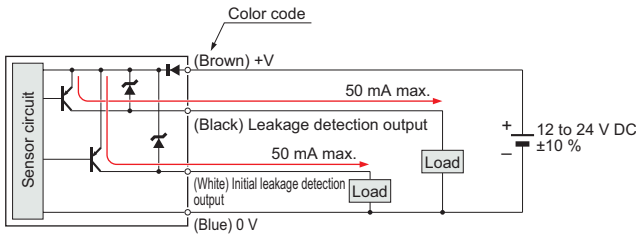
Produkte, Support und Service

SENTRONIC AG

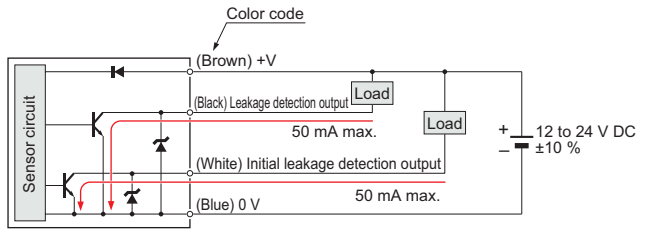
I/O CIRCUIT AND WIRING DIAGRAMS

Sensors

SQ4-A□-P PNP output type



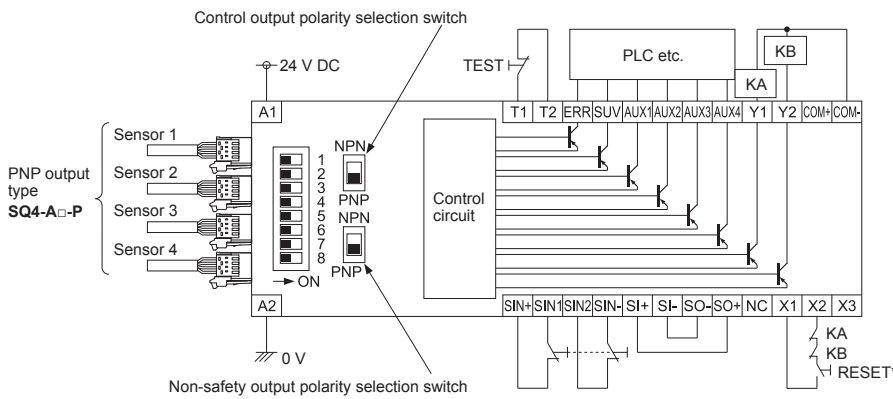
SQ4-A□-N NPN output type



Controller

SQ4-C11 Controller

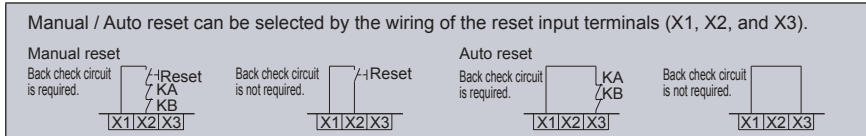
For operation with PNP output



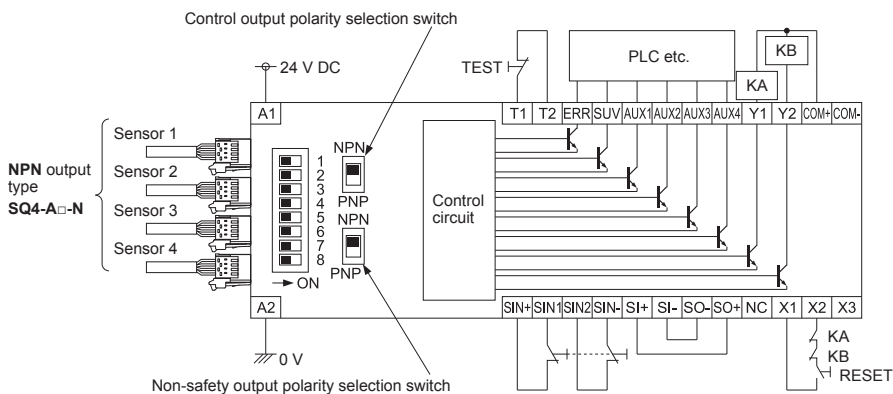
KA, KB: External devices

(Forced guide relay, magnet contactor or monitored valve)

*RESET



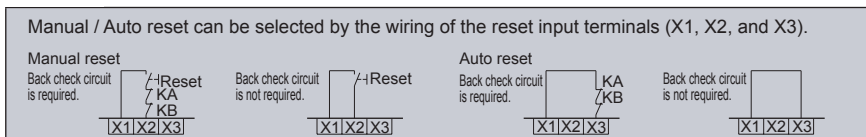
For operation with NPN output



KA, KB: External devices

(Forced guide relay, magnet contactor or monitored valve)

*RESET



PRECAUTIONS FOR PROPER USE

Refer to General precautions.



- This product is a sensor for detecting leak of fluids.
- When this product is used with safety devices, construct the system such that the device itself.

- Before using this device, check whether the device performs properly with the functions and capabilities as per the design specifications.
- Avoid using this device in an explosive atmosphere because this product does not have an explosive-proof protective construction.

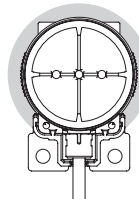
Installation



- There is the detection mount difference by directivity of a liquid leakage. When there are a direction from which a liquid leakage happens, and an inclination, please install the nose-of-cam side (opposite side of a cable) of a sensor towards a top.
- Use the mounting bracket **MS-SQ4-□** (optional) which suits the liquid to detect.
- Periodical checking of operation is recommended with the liquids which are not dangerous (water, alcohol, etc.).
- The amount of detection may change with the conditions of the installation surface.
- Be sure to use the mounting bracket **MS-SQ4-□** (optional) when installing this device to avoid human error, etc. Reliable detection cannot be guaranteed when this sensor is used alone.

Leakage detection condition and variation factor

- Leak detection part of this product properly detects the leakage in the following condition.
 1. Detection range: Area except backward of this product (liquid must enter to the detection range)
 2. Material of installation surface: Hard vinyl chloride or Stainless steel
 3. Surface condition for installation: Glossy surface (surface roughness: corresponding 0.4 μmRa) and clean surface.
 4. Installation surface angle: Horizontal



Detection range

- This product may not detect properly liquid in following element.
 1. Liquid kind, consistency (surface tension) and air bubble incorporation.
 2. Material, roughness, angle, dirtiness and liquid absorption of surface of installed surface of sensor.
 3. Wrong selection of dedicated mounting bracket.
- Check the detecting liquid and the installation condition before use.

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASURE-MENT SENSORS

STATIC CONTROL DEVICES

ENDOSCOPE

LASER MARKERS

PLC / TERMINALS

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Wafer Detection

Liquid Leak Detection

Liquid Level Detection

Water Detection

Color Mark Detection

Hot Melt Glue Detection

Ultrasonic

Small / Slim Object Detection

Obstacle Detection

Other Products

SQ4

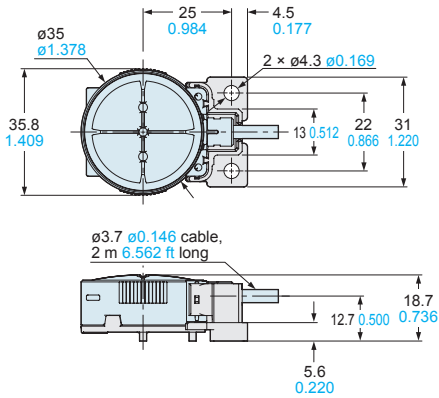
EX-F70/
EX-F60

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

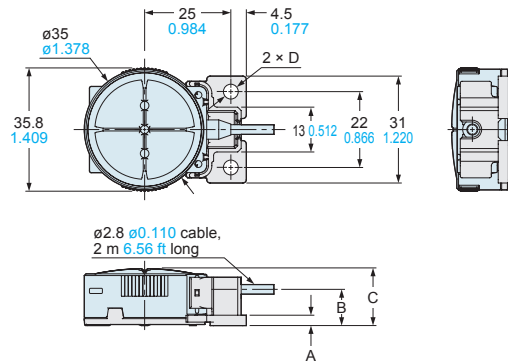
SQ4-A21-□ Sensor

Assembly dimensions with mounting bracket for MS-SQ4-21



SQ4-A22-□ Sensor

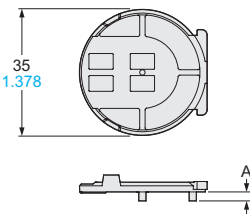
Assembly dimensions with mounting bracket



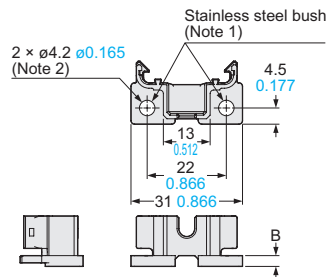
Mounting bracket set model No.	A	B	C	D
MS-SQ4-22	5.4 0.213	12.7 0.500	18.7 0.736	2x4.2 0.165
MS-SQ4-23	3.4 0.134	10.5 0.413	16.5 0.650	2x4.3 0.169
MS-SQ4-24	5.6 0.220	12.7 0.500	18.7 0.736	2x4.3 0.169

MS-SQ4-□ Mounting bracket set

Attachment



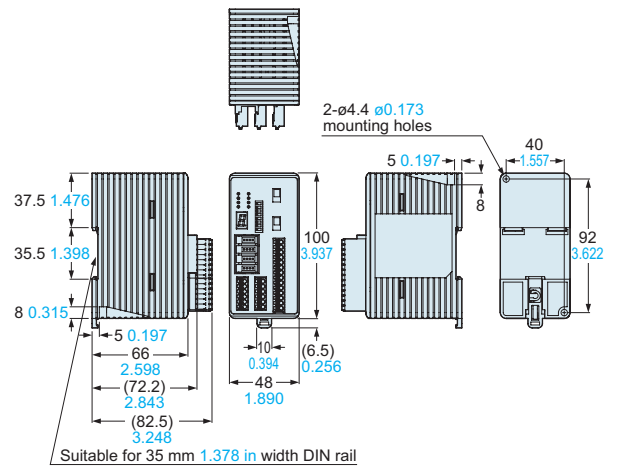
PVC / PFA mounting bracket



Model No.	A	B
MS-SQ4-21	2.5 0.098	5.6 0.220
MS-SQ4-22	2.5 0.098	5.4 0.213
MS-SQ4-23	0.3 0.012	3.4 0.134
MS-SQ4-24	2.5 0.098	5.6 0.220

Notes: 1) Drawing above is for PFA mounting bracket.
PVC mounting brackets do not incorporate stainless steel bushes.
2) The size of mounting holes is 4.3 mm 0.169 in

SQ4-C11 Controller



Suitable for 35 mm 1.378 in width DIN rail

EX-F70 SERIES EX-F60 SERIES

Related Information

General terms and conditionsP.1
 General precautions.....P.986~

Sensor selection guide.....P.11~ / P.727~



* Passed the UL 991 Environment Test

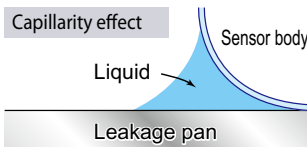
* UL 61010C-1 compatible, Passed the UL 991 Environment Test based on SEMI S2-0200. [Category applicable for semiconductor manufacturing: TWW2, Process Equipment] [Applicable standards: UL 61010C-1] [Additional test / evaluation standards as per intended use: UL 991, SEMI S2-0200]

High-speed detection even a little liquid leak

EX-F70 SERIES

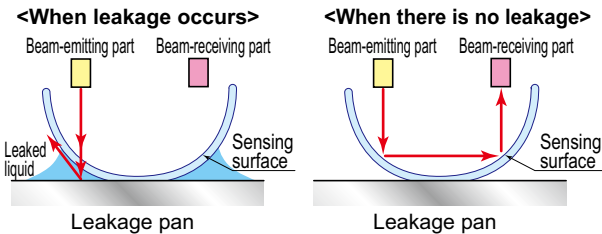
Reliable detection

The unique effect of capillarity enables reliable detection of small leaks and viscous liquids.



New type of detection method

When a leak occurs, the beam from the beam-emitting part scatters through the leaked liquid and is not transmitted to the beam-receiving part.



The beam from the beam-emitting part scatters through the leaked liquid and is not transmitted to the beam-receiving part.

The beam from the beam-emitting part reflects off of the surface of the sensor and is transmitted to the beam-receiving part.

No need for sensitivity adjustment

No need for sensitivity adjustment with adjuster, so initial mounting is easy.

Easy operation check

This sensor is equipped with a NORMAL indicator (green) which lights up when mounting correctly, and a FAULT indicator (red) which lights up when sensing the leaked liquid or when mounted incorrectly (forgetting to mount exclusive mounting bracket). So, the operation can be checked easily.

Safe design

If the sensor is not mounted correctly, if the cable is cut or disconnected, or if the sensor is not operating correctly, the output is the same as when the beam is not received (LEAK). Design deals with human errors such as, forgetting to mount, etc.

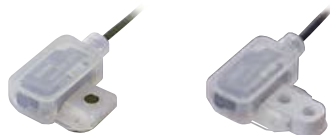
Easy installation & reset

Facilitates easy installation: the SUS mounting bracket type can be installed using only a single screw and the PVC mounting bracket type can be installed using only two screws or an adhesive. No component replacement required for resetting after leak detection. The simple shape makes it easy to wipe off the leaked liquid.

PVC mounting bracket available

EX-F72

A mounting bracket made of PVC (polyvinyl chloride) is available. This type of mounting bracket can be utilized without problems within environments that would corrode normal metal brackets.



SUS mounting bracket type EX-F71

PVC mounting bracket type EX-F72

Selection Guide
Wafer Detection
M-DW1
HD-T1
Liquid Leak Detection
EX-F70 / EX-F60
Liquid Level Detection
EX-F1
Color Mark Detection
LX-100
FZ-10
Small / Slim Object Detection
NA1-11
Metal-sheet Double-feed Detection
GD
Other Products



ORDER GUIDE
P.738~

SPECIFICATIONS
P.739~

I/O CIRCUIT DIAGRAMS
P.741

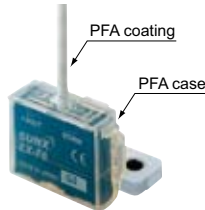
PRECAUTIONS FOR PROPER USE
P.742

DIMENSIONS
P.743~

EX-F60 SERIES

PFA enclosure gives excellent chemical resistance

The sensor enclosure and the cable sheath are made from PFA which is highly resistant to chemicals. Accurate sensing can be obtained even if there are leaks of chemicals such as sulfuric acid, hydrochloric acid or ammonia.

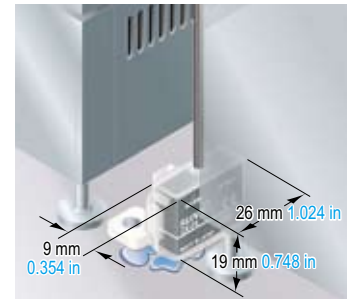


Easy installation & reset

The simplified shape makes it easy to clean up after liquid leaks, simply by wiping off the liquid, and no parts need to be replaced.

Compact, space-saving

Even with its built-in amplifier, the size is compact at W26 × H19 × D9 mm **W1.024 × H0.748 × D0.354 in**, so that it can be used even in narrow spaces.



EX-FC1

Wire-saving unit made especially for connecting leak detection sensors!

Saves wiring! Now connects up to 8 leak detection sensors

EX-FC1 is a simple wire-saving unit for exclusive use with EX-F71/72, EX-F61/F62 leak detection sensors. (It can be used with general sensors as well.)

EX-FC1 integrates the outputs from up to 8 leak detection sensors into a single OR output, yielding significant wiring and space savings.

* Even with only one leak detection sensor connected, an OFF signal is output if the sensor detects liquid leakage, or if the unit has been installed incorrectly.

Slim & compact

Space savings are significant, as the ultra-thin & compact EX-FC1 has main unit body dimensions of only W20 × H80 × D52 mm **W0.787 × H3.150 × D2.047 in**.

Connects easily with one-touch connector

Connections are made by simply inserting the leak detection sensor cable leads into the snap male connector SL-CP1, then crimp until the connector snap-locks! This saves the user the time and the trouble of stripping the insulation from each lead before attaching the leads to terminals.



ORDER GUIDE

Leak detection sensors

Type		Appearance	Sensing object	Cable length	Model No.	Output		
General purpose	SUS mounting bracket type		Water, Fluorinert™ (Note 1, 2)	2 m 6.562 ft	EX-F71	NPN open-collector transistor		
	PVC mounting bracket type				EX-F71-PN	PNP open-collector transistor		
	Chemical-resistant	PFA mounting bracket type				3 m 9.843 ft	EX-F61	NPN open-collector transistor
		PVC mounting bracket type					EX-F61-PN	PNP open-collector transistor
Chemical-resistant	PVC mounting bracket type		Agent, such as Sulfuric acid, Hydrochloric acid, Phosphoric acid or Ammonia etc. (Note 1, 3)	EX-F62	NPN open-collector transistor			
				EX-F62-PN	PNP open-collector transistor			

Notes: 1) Highly viscous liquid may not be detected stably.
2) Fluorinert™ is the world wide trademark of 3M.
3) The agents mentioned above are examples.
For details, please contact our office.

5 m 16.404 ft cable length type

5 m **16.404 ft** cable length type (standard: 2 m **6.562 ft** or 3 m **9.843 ft**) is also available.
When ordering this type, suffix "-C5" to the model No.
(e.g.) 5 m **16.404 ft** cable length type of EX-F71-PN is "EX-F71-PN-C5".

Simple wire-saving unit for leak detection sensor

Appearance	Model No.	Output
	EX-FC1	Relay contact 1 a

FIBER SENSORS
LASER SENSORS
PHOTO-ELECTRIC SENSORS
MICRO PHOTO-ELECTRIC SENSORS
AREA SENSORS
SAFETY COMPONENTS
PRESSURE SENSORS
INDUCTIVE PROXIMITY SENSORS
PARTICULAR USE SENSORS
SENSOR OPTIONS
WIRE-SAVING SYSTEMS
MEASUREMENT SENSORS
STATIC CONTROL DEVICES
LASER MARKERS

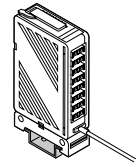
Selection Guide
Wafer Detection
M-DW1
HD-T1
Liquid Leak Detection
EX-F70 / EX-F60
Liquid Level Detection
EX-F1
Color Mark Detection
LX-100
FZ-10
Small / Slim Object Detection
NA1-11
Metal-sheet Double-lead Detection
GD
Other Products

OPTIONS

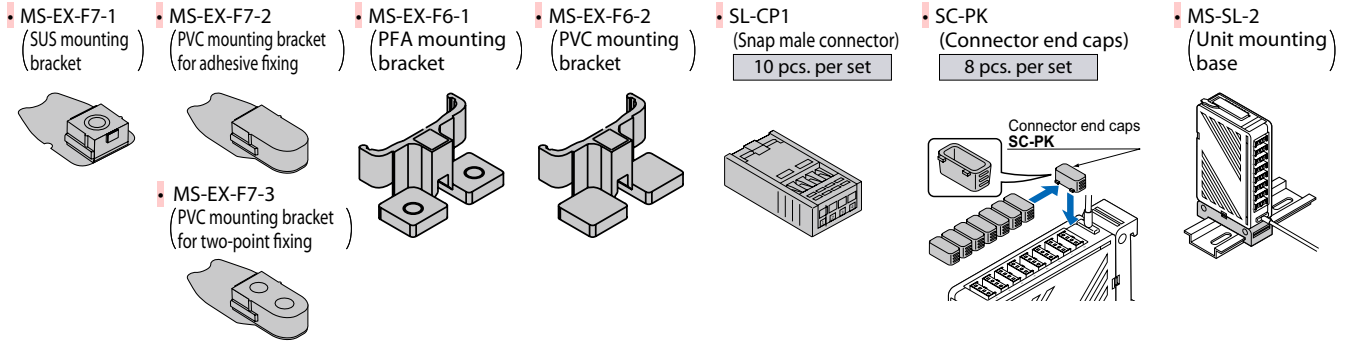
Designation	Model No.	Description
Unit mounting bracket	MS-DIN-3	Mounting bracket for EX-FC1

Unit mounting bracket

- MS-DIN-3



Accessories



SPECIFICATIONS

Sensors

Item	Model No.	Type	General purpose		Chemical-resistant	
			SUS mounting bracket type	PVC mounting bracket type	PFA mounting bracket type	PVC mounting bracket type
		NPN output	EX-F71	EX-F72	EX-F61	EX-F62
		PNP output	EX-F71-PN	EX-F72-PN	EX-F61-PN	EX-F62-PN
Sensing object			Water, Fluorinert™ (Note 2, 3)		Agent, such as Sulfuric acid, Hydrochloric acid, Phosphoric acid or Ammonia etc. (Note 2, 4, 6)	
Supply voltage			12 to 24 V DC ± 10 %		Ripple P-P 10 % or less	
Current consumption			10 mA or less (PNP output type: 15 mA or less)		15 mA or less	
Output			<NPN output type> NPN open-collector transistor <ul style="list-style-type: none"> Maximum sink current: 50 mA Applied voltage: 30 V DC or less (between output and 0 V) Residual voltage: 1.0 V or less (at 50 mA sink current) 0.4 V or less (at 16 mA sink current) 		<PNP output type> PNP open-collector transistor <ul style="list-style-type: none"> Maximum source current: 50 mA Applied voltage: 30 V DC or less (between output and +V) Residual voltage: 1.0 V or less (at 50 mA source current) 0.4 V or less (at 16 mA source current) 	
Utilization category			DC-12 or DC-13			
Output operation			In normal state: ON, When leak detected or the sensor is mounted improperly: OFF			
Short-circuit protection			Incorporated			
Response time			50 ms or less			
FAULT indicator			Red LED (lights up when the leak liquid is detected, or the sensor is mounted improperly)			
NORMAL indicator			Green LED (lights up when the sensor is mounted properly)			
Pollution degree			3 (Industrial environment)			
Protection			IP67 (IEC) (Refer to P.984 for details of standards.)			
Ambient temperature			-10 to +60 °C +14 to +140 °F (No dew condensation or icing allowed) Storage: -20 to +70 °C -4 to +158 °F (Note 5)			
Ambient humidity			35 to 85 % RH, Storage: 35 to 85 % RH			
Ambient illuminance			Incandescent light: 1,000 lx at the light-receiving face			
Emitting element			Infrared LED (non-modulated)			
Material			Enclosure: Polypropylene		Enclosure: PFA	
Cable			0.1 mm ² 3-core PVC cabtyre cable, 2 m 6.562 ft long		0.1 mm ² 3-core PFA cabtyre cable, 3 m 9.843 ft long	
Cable extension			Extension up to total 50 m 164.042 ft is possible with 0.3 mm ² , or more, cable.			
Weight			Net weight: 25 g approx.		Net weight: 60 g approx.	
Accessories			MS-EX-F7-1 (SUS mounting bracket) (Note 7): 1 pc.	MS-EX-F7-2, MS-EX-F7-3 (PVC mounting bracket) (Note 7): 1 pc. each for two-point-fixing and adhesive-fixing	MS-EX-F6-1 (PFA mounting bracket): 1 pc.	MS-EX-F6-2 (PVC mounting bracket): 1 pc.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.

2) Highly viscous liquid may not be detected stably.

3) Fluorinert™ is the world wide trademark of 3M.

4) The agents mentioned above are examples. For details, please contact our office.

5) Liquid being detected should also be kept within the rated ambient temperature range.

6) PVC mounting bracket may not be used depending on type or viscosity etc. of the agent. For details, please contact our office.

7) The mounting bracket for EX-F71(-PN) is not interchangeable with that of EX-F72(-PN) due to the different sensitivity settings of each sensor.

SPECIFICATIONS

Simple wire-saving unit

Designation		Simple wire-saving unit for leak detection sensor
Item	Model No.	EX-FC1
Applicable connector		SL-CP1
Supply voltage		12 to 24 V DC \pm 10 % Ripple P-P 10 % or less
Current consumption		50 mA or less (for the unit itself), 135 mA or less (including the sensor input current when all outputs of sensors are ON)
Output		Relay contact 1a <ul style="list-style-type: none"> Switching capacity: 30 V 1 A DC (resistive load) Min. applied load: 10 mV 10 μA DC Electrical lifetime: 100,000 switching operations or more (rated load, switching frequency 20 operations/min.) Mechanical lifetime: 50 million switching operations or more (switching frequency 180 operations/min.)
Utilization category		DC-12 or DC-13
Output operation		The output relay is ON when the input signal from the sensor is ON (Note 2)
Response time		5 ms or less (excluding the response time of the sensor)
Input No.		8 Nos.
Indicators	Normal	Green LED \times 8 (light up when the sensor is connected to each channel and the connection setting switch is set to ON)
	Error	Red LED \times 8 (light up when the leak liquid is detected by a sensor connected to each channel or a sensor is mounted improperly)
	Output	Orange LED [lights up when the output relay is ON (normal)]
Pollution degree		3 (Industrial environment)
Ambient temperature		-10 to +60 °C +14 to +140 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F
Ambient humidity		35 to 85 % RH, Storage: 35 to 85 % RH
Material		Enclosure: ABS, Unit mounting base: POM, Terminal part: PBT
Cable		0.2 mm ² 4-core cabtyre cable, 2 m 6.562 ft long
Cable extension		Extension up to total less than 10 m 32.808 ft is possible, with 0.3 mm ² , or more, cable.
Weight		Net weight: 85 g approx.
Accessories		SL-CP1 (Snap male connector): 8 pcs., MS-SL-2 (Unit mounting base): 1 pc., SC-PK (Connector end cap) : 8 pcs.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.

2) Even with only one leak detection sensor connected, an OFF signal is output if the sensor detects liquid leakage, or if the unit has been installed incorrectly.

FIBER
SENSORSLASER
SENSORSPHOTO-
ELECTRIC
SENSORSMICRO
PHOTO-
ELECTRIC
SENSORSAREA
SENSORSSAFETY
COMPONENTSPRESSURE
SENSORSINDUCTIVE
PROXIMITY
SENSORSPARTICULAR
USE
SENSORSSENSOR
OPTIONSWIRE-
SAVING
SYSTEMSMEASURE-
MENT
SENSORSSTATIC
CONTROL
DEVICESLASER
MARKERSSelection
GuideWafer
Detection

M-DW1

HD-T1

Liquid Leak
DetectionEX-F70 /
EX-F60Liquid Level
Detection

EX-F1

Color Mark
Detection

LX-100

FZ-10

Small / Slim
Object Detection

NA1-11

Metal-sheet
Double-head Detection

GD

Other
Products

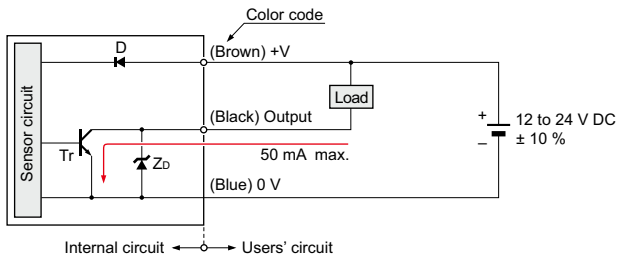
FIBER SENSORS
LASER SENSORS
PHOTO-ELECTRIC SENSORS
MICRO PHOTO-ELECTRIC SENSORS
AREA SENSORS
SAFETY COMPONENTS
PRESSURE SENSORS
INDUCTIVE PROXIMITY SENSORS
PARTICULAR USE SENSORS
SENSOR OPTIONS
WIRE-SAVING SYSTEMS
MEASUREMENT SENSORS
STATIC CONTROL DEVICES
LASER MARKERS
Selection Guide
Wafer Detection
M-DW1
HD-T1
Liquid Leak Detection
EX-F70 / EX-F60
Liquid Level Detection
EX-F1
Color Mark Detection
LX-100
FZ-10
Small / Slim Object Detection
NA1-11
Metal-sheet Double-feed Detection
GD
Other Products

I/O CIRCUIT AND WIRING DIAGRAMS

EX-F70 EX-F60

NPN output type

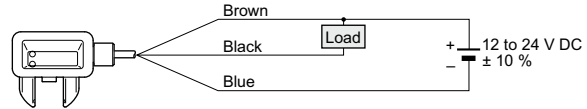
I/O circuit diagram



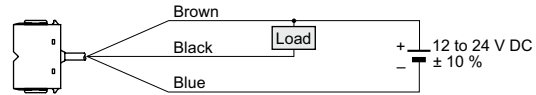
Symbols ... D : Reverse supply polarity protection diode
 Zd: Surge absorption zener diode
 Tr : NPN output transistor

Wiring diagram

EX-F70



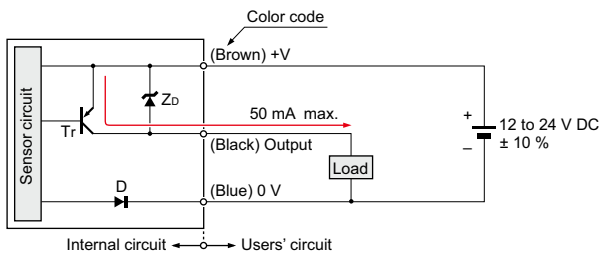
EX-F60



EX-F70-PN EX-F60-PN

PNP output type

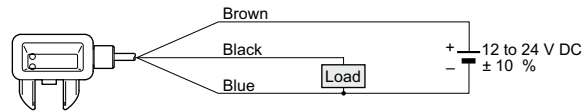
I/O circuit diagram



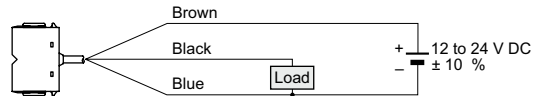
Symbols ... D : Reverse supply polarity protection diode
 Zd: Surge absorption zener diode
 Tr : PNP output transistor

Wiring diagram

EX-F70-PN



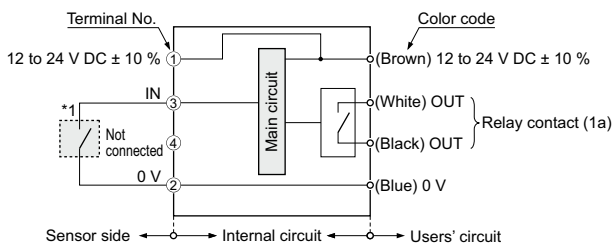
EX-F60-PN



EX-FC1

Simple wire-saving unit for leak detection sensor

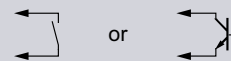
I/O circuit diagram (for one channel)



Note: The output does not incorporate a short circuit protection circuit.
 Do not connect it directly to a power supply or a capacitive load.

* 1

Non-voltage contact or NPN open-collector transistor
 (Amplifier built-in leak detection sensor)



PRECAUTIONS FOR PROPER USE

Refer to p.986~ for general precautions.

FIBER
SENSORS

LASER
SENSORS

PHOTO-
ELECTRIC
SENSORS

MICRO
PHOTO-
ELECTRIC
SENSORS

AREA
SENSORS

SAFETY
COMPONENTS

PRESSURE
SENSORS

INDUCTIVE
PROXIMITY
SENSORS

PARTICULAR
USE
SENSORS

SENSOR
OPTIONS

WIRE-
SAVING
SYSTEMS

MEASURE-
MENT
SENSORS

STATIC
CONTROL
DEVICES

LASER
MARKERS

Selection
Guide

Wafer
Detection

M-DW1

HD-T1

Liquid Leak
Detection

**EX-F70 /
EX-F60**

Liquid Level
Detection

EX-F1

Color Mark
Detection

LX-100

FZ-10

Small / Slim
Object Detection

NA1-11

Metal-sheet
Double-head Detection

GD

Other
Products



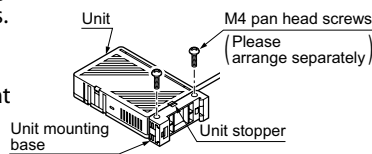
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

EX-FC1

Mounting

<In case of using screws>

- Mount using M4 pan head screws with a tightening torque of 0.8 N·m or less. However, in case of side mounting, make sure to mount the unit such that the unit stopper faces front.

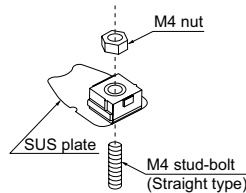


EX-F71(-PN) EX-F72(-PN)

Mounting

EX-F71(-PN)

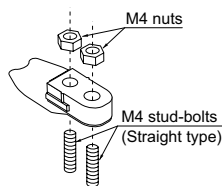
- Insert the M4 stud-bolt (length 10 mm 0.394 in or more) welded on the user's facilities into the mounting hole of the SUS mounting bracket and screw with an M4 nut (please arrange separately). The tightening torque should be 0.98 N·m or less.



EX-F72(-PN)

<In case of using the two-point-fixing PVC mounting bracket>

- Insert M4 stud-bolts (length 10 mm 0.394 in or more) welded on the user's facilities into the mounting holes of the two-point-fixing mounting bracket and screw with M4 nuts (please arrange separately). The tightening torque should be 0.49 N·m or less.

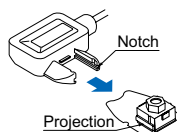


<In case of using the PVC mounting bracket for adhesive fixing>

- Use adhesive to stick fast the mounting bracket on the mounting surface. Please note that if the adhesive sticks out from the bottom surface of the mounting bracket or is 0.5 mm 0.020 in, or more thick, the sensor body cannot be fitted to the mounting bracket.

How to fit the sensor body to the exclusive mounting bracket

- Match the notch in the sensor body with the projection of the exclusive mounting bracket and slide till a click is felt.
- When mounting, make sure to use the brackets included with the unit in order to eliminate human error (such as forgetting to install). If the included brackets are not used, stable sensing is rendered impossible. Also, because sensitivity settings differ between the EX-F71(-PN) and the EX-F72(-PN), their brackets cannot be interchanged.

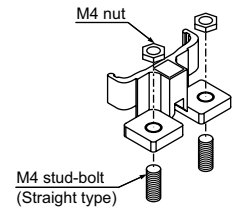


EX-F61(-PN) EX-F62(-PN)

Mounting

EX-F61(-PN)

- Insert the M4 stud-bolt (length 10 mm 0.394 in or more) welded on the user's facilities into the mounting hole of the PFA mounting bracket and screw with an M4 nut (please arrange separately). The tightening torque should be 0.98 N·m or less.

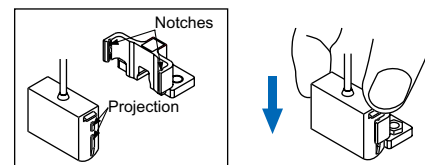


EX-F62(-PN)

- Please note that if the excess adhesive from the bottom surface of the exclusive mounting bracket is remained, the sensing capability may be affected. Use adhesive for vinyl chloride (PVC).

How to fit the sensor body to the exclusive mounting bracket

- Align the projections in the sensor body with the notches of the exclusive mounting bracket and slide till a click is felt.



How to remove the sensor body from the exclusive mounting bracket

- Pinch the projections of the sensor body and pull the body upwards. Never pull the cable, since it may cause a cable break.



All models

Others

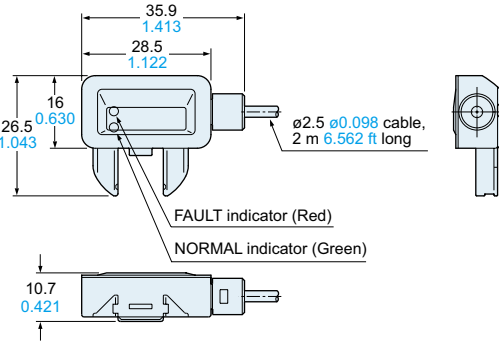
- Avoid using the product in an explosive atmosphere because this product does not have an explosive-proof protective construction.
- In case air bubbles are drawn into the sensing part, take care that it may take some time for sensing to stabilize, or sensing may even become unstable.
- When conducting maintenance after operation, wipe all liquid from the sensor and mounting bracket with a soft cloth. If there is liquid remained or scratch on the sensing surface or the exclusive mounting bracket, normal operation can not be performed.
- Do not use during the initial transient time (leak detection sensor: 30 sec. approx., EX-FC1: 0.5 sec. approx.) after the power supply is switched on.
- Since this sensor employs non-modulated infrared LED, take sufficient care against extraneous light. Do not expose the sensing part directly to the extraneous light.
- Take care that EX-F7(-PN) and EX-FC1 does not come in direct contact with oil, grease or organic solvents, such as, thinner, etc.
- In case this sensor is used where electrostatic charge is present, use a metal leak pan, which should be connected to an actual ground.

DIMENSIONS (Unit: mm in)

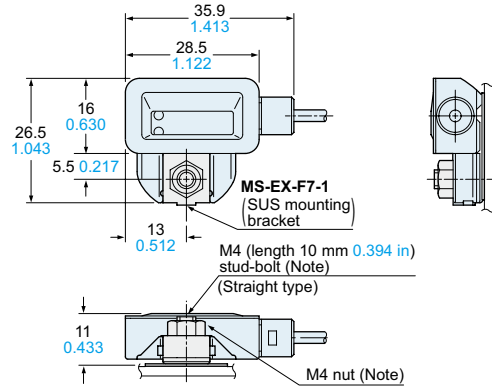
The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.com>

EX-F71(-PN) EX-F72(-PN)

Sensor



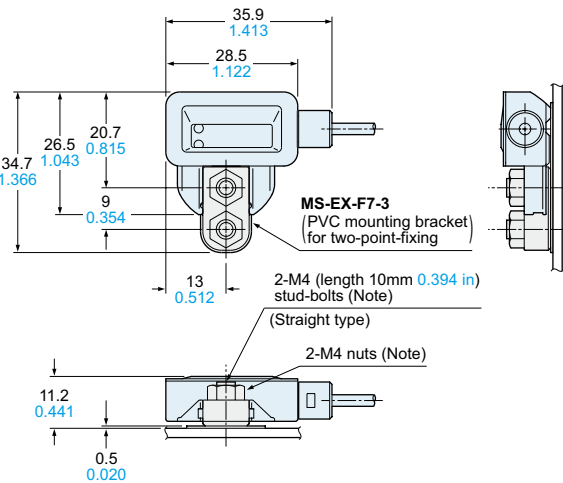
Assembly dimensions with mounting bracket for EX-F71(-PN)



Note: A M4 stud-bolt has been welded to this unit.
M4 nut is not supplied with the sensor.
Please arrange it separately.

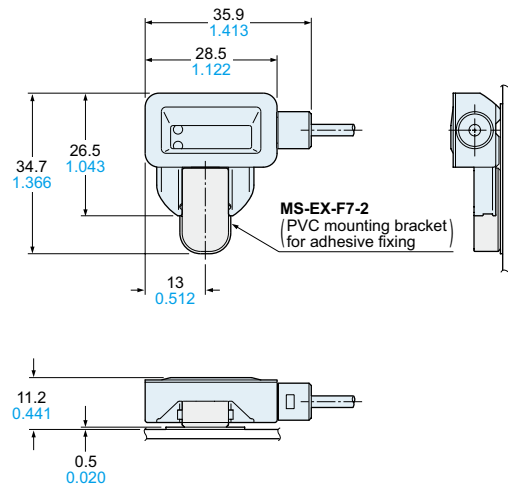
Assembly dimensions with mounting bracket for EX-F72(-PN)

MS-EX-F7-3 / For two-point-fixing



Note: M4 stud-bolts have been welded to this unit.
M4 nuts are not supplied with the sensor.
Please arrange it separately.

MS-EX-F7-2 / For adhesive fixing



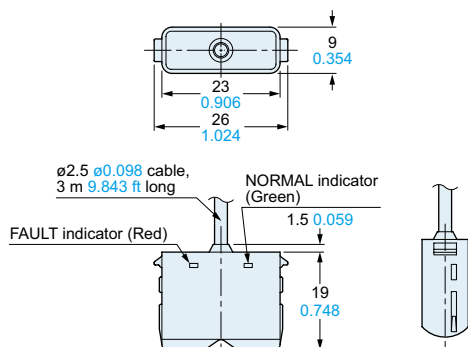
- FIBER SENSORS
- LASER SENSORS
- PHOTO-ELECTRIC SENSORS
- MICRO PHOTO-ELECTRIC SENSORS
- AREA SENSORS
- SAFETY COMPONENTS
- PRESSURE SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- LASER MARKERS
- Selection Guide
- Wafer Detection
- M-DW1
- HD-T1
- Liquid Leak Detection
- EX-F70 / EX-F60
- Liquid Level Detection
- EX-F1
- Color Mark Detection
- LX-100
- FZ-10
- Small / Slim Object Detection
- NA1-11
- Metal-sheet Double-feed Detection
- GD
- Other Products

DIMENSIONS (Unit: mm in)

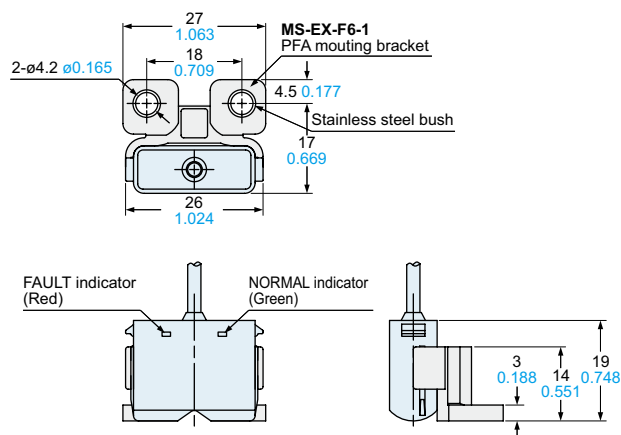
The CAD data in the dimensions can be downloaded from the SUNX website: <http://www.sunx.com>

EX-F61(-PN) EX-F62(-PN)

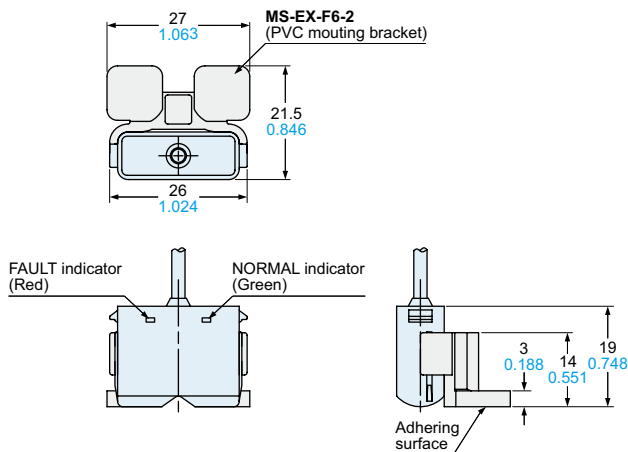
Sensor



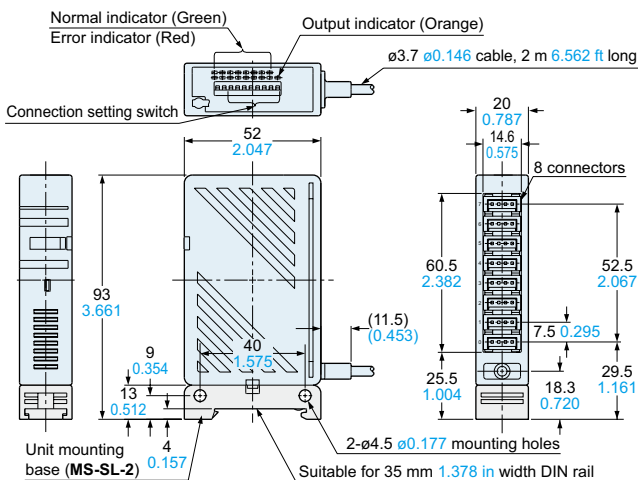
Assembly dimensions with mounting bracket for EX-F61(-PN)



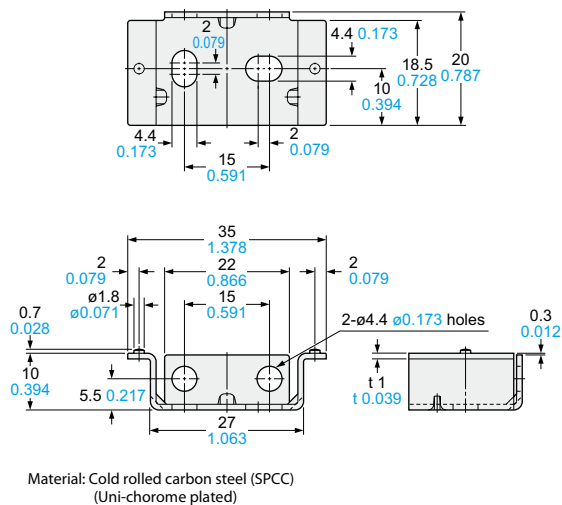
Assembly dimensions with mounting bracket for EX-F62(-PN)



EX-FC1 Simple wire-saving unit for leak detection sensor



MS-DIN-3 Amplifier mounting bracket (Optional)



- FIBER SENSORS
- LASER SENSORS
- PHOTO-ELECTRIC SENSORS
- MICRO PHOTO-ELECTRIC SENSORS
- AREA SENSORS
- SAFETY COMPONENTS
- PRESSURE SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- LASER MARKERS

- Selection Guide
- Wafer Detection
- M-DW1
- HD-T1
- Liquid Leak Detection
- EX-F70 / EX-F60
- Liquid Level Detection
- EX-F1
- Color Mark Detection
- LX-100
- FZ-10
- Small / Slim Object Detection
- NA1-11
- Metal-sheet Double-Feed Detection
- GD
- Other Products