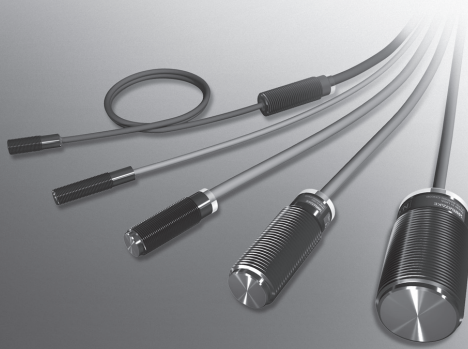


# Stainless Steel Sensing Face Proximity Switch



**Model FL7S** | The FL7S is a proximity switch having a stainless steel sensing face and housing, and is specially designed for welding applications on the automobile manufacturing line.



- The sensing face is integrated into a stainless steel housing having high shock resistance and superior abrasion resistance
- Switches have a spatter and slag proof special coating
- An electromagnetic field noise elimination circuit is built in
- The lineup includes M8, M12, M18 and M30 models

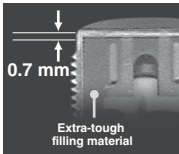
\* Connector-type cables are also available for the FL7S Series.

- Ex.: PA5-4ISX □ FK-E (incombustible cable)  
PA5-4ISX □ UK-E (flame-resistant cable)

- PHOTOELECTRIC SENSORS & SWITCHES
- MEASUREMENT SENSORS
- PROXIMITY SWITCHES
- LIMIT SWITCHES
- SAFETY KEY SWITCHES
- CYLINDRICAL
- SQUARE
- TECHNICAL GUIDE

- FL7M (DC2) Regular
- FL7M (DC2) Long Distance No-Polarity
- FL7M (DC2) Spatter-Guarded
- FL7S
- FL7M-C (DC2) Environment-Resistant
- FL7M-A (DC2) Aluminum-Chip Resistant
- FL7M (DC2) Unshielded
- FL7M (AC/DC2)
- FL7M (DC3)

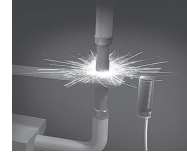
## ADVANTAGES OF FL7S SWITCHES



The sensing face is integrated into a single stainless steel housing.



Special spatter-resistant coating



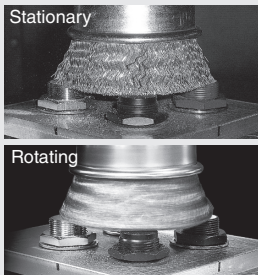
Highly resistant to electromagnetic field noise from welding!

## FL7S SERIES ENDURANCE TEST RESULTS

Two endurance tests were made in order to develop a switch that could meet the severe requirements demanded by users in the field. The FL7S Series has proven to have superior performance in both tests.

### ● Sensing face strength tests

**TEST-1**  
The Metal Brush Test (measurement of abrasion resistance)



Test condition  
Brush: Stainless steel brush  
Rotation speed: 130 cycles/min

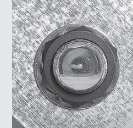
With conventional switches, welding sparking leads to hard-to-remove spatter and slag. The big problem is the scratches caused by the abrasive metal brush used to remove the stuck spatter and slag. Azbil has solved this major problem by creating for the FL7S Series a stainless steel sensing face that resists abrasion. The Metal Brush Test shows that this switch has excellent endurance.

FL7M-7J6HD



Survives 5 min of brushing

FL7M-7J6HW



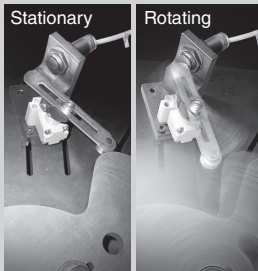
Survives 25 min of brushing

FL7S-5W6W-CN03



Still working well!  
Operation is normal even after 200 minutes!

**TEST-2**  
Repetitive Shock Test (measurement of shock resistance)



Test condition  
Brush: Stainless steel brush  
Rotation speed: 130 cycles/min

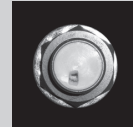
Repetitive shocks when welding parts hit the switch head result in a shortening of switch life. The FL7S Series' greatly strengthened stainless steel sensing face is the answer to this problem! The repetitive shock test has proven that this switch has robust shock resistance.

FL7M-7J6HD



Housing survives 310 repetitions

FL7M-7J6HW



Housing survives 5,000 repetitions

FL7S-5W6W-CN03

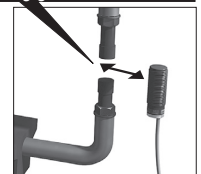


Still working well!  
Operation is normal even after 200,000 repetitions!

### ● Resistance to electromagnetic field noise from welding! Usable range (for FL7S-2/5/8 Series)


Welding current (A) (DC or AC)	Distance between welding gun and switch (mm)							
	12.7	25.4	51	76	102	127	152	306
10,000	160mT	80mT	40mT	25mT	20mT	16mT	13mT	7mT
20,000	315mT	160mT	80mT	50mT	40mT	30mT	25mT	13mT
30,000	470mT	235mT	120mT	80mT	60mT	50mT	40mT	20mT

Ex.: When the welding current is 10,000A, the switch operates without error even when it is installed as close as approx. 12.7 mm from the welding gun.




## SELECTION GUIDE

### ● Preleaded connector type

Appearance Shape example (M18)	Outer diameter	Sensing distance (Ferrous material only)	Operation Mode		Connector				Catalog listing
			Wiring	Output	+	-	Output	non-polarity	
	M8	1.5 mm	2-wire no-polarity	N.O.	-		3 - 4		FL7S-1W6W-CN03
	M8	1.5 mm	3-wire NPN	N.O.	1	3	4	-	FL7S-1W6W-CN03B
	M8	1.5 mm	3-wire PNP	N.O.	1	3	4	-	FL7S-1A6W-CN08
	M12	2 mm	2-wire no-polarity	N.O.	-		3 - 4		FL7S-2W6W-CN03
	M12	2 mm	2-wire no-polarity	N.O.	-		1 - 4		FL7S-2W6W-CN03B
	M18	5 mm	2-wire no-polarity	N.O.	-		3 - 4		FL7S-5W6W-CN03
M18	5 mm	2-wire no-polarity	N.O.	-		1 - 4		FL7S-5W6W-CN03B	
M30	8 mm	2-wire no-polarity	N.O.	-		3 - 4		FL7S-8W6W-CN03	
M30	8 mm	2-wire no-polarity	N.O.	-		1 - 4		FL7S-8W6W-CN03B	

### ● Preleaded type

Appearance Shape example (M18)	Outer diameter	Sensing distance (Ferrous material only)	Operation Mode		Catalog listing
			Wiring	Output	
	M8	1.5 mm	2-wire no-polarity	N.O.	FL7S-1W6W-L5
	M12	2 mm	2-wire no-polarity	N.O.	FL7S-2W6W-L5
	M18	5 mm	2-wire no-polarity	N.O.	FL7S-5W6W-L5
	M30	8 mm	2-wire no-polarity	N.O.	FL7S-8W6W-L5

## SPECIFICATIONS

Catalog listing	Preleaded connector type	FL7S-1□6W-CN08	FL7S-1W6W-CN03(B)	FL7S-2W6W-CN03(B)	FL7S-5W6W-CN03(B)	FL7S-8W6W-CN03(B)
	Preleaded type	-	FL7S-1W6W-L5	FL7S-2W6W-L5	FL7S-5W6W-L5	FL7S-8W6W-L5
<b>Actuation method</b>		High-frequency oscillation type				
<b>Rated sensing distance</b>		1.5±0.15 mm <sup>*1</sup>		2±0.2 mm <sup>*1</sup>	5±0.5 mm <sup>*1</sup>	8±0.8 mm <sup>*1</sup>
<b>Standard target object</b>		Iron 8 x 8 mm, t=1 mm		Iron 12 x 12 mm, t=1 mm	Iron 18 x 18 mm, t=1 mm	Iron 30 x 30 mm, t=1 mm
<b>Differential travel</b>		Max. 15% of sensing distance				
<b>Rated supply voltage</b>		12/24 Vdc				
<b>Operating voltage range</b>		10 to 30 Vdc				
<b>Current consumption</b>		10 mA max.				
<b>Control output</b>	Voltage drop at ON	2V max.	4.8V max. (switching current 30 mA)		5.5V max. (switching current 30 mA)	
	Leakage current	10 μA max.	0.8 mA max.			
	Switching current	100 mA max.	3 mA to 100 mA			
<b>Operating frequency</b>		5 Hz	4 Hz	5 Hz		
<b>Temperature characteristics</b>		-10 to +15% of sensing distance (25°C) (-10 to +60°C)		±10% of sensing distance (25°C) (-10 to +60°C)		
<b>Operating indicator</b>		Lights (red) at output ON				
<b>Operating temperature range</b>		-10 to +60°C				
<b>Storage temperature range</b>		-10 to +60°C				
<b>Dielectric strength</b>		500 Vac, 50/60 Hz between case and electrically live metals				
<b>Vibration resistance</b>		55 Hz, 1 mm peak-to-peak amplitude, 2 hours in X, Y and Z directions				
<b>Shock resistance</b>		294 m/s <sup>2</sup> , 6 times in X, Y and Z directions				
<b>Protection</b>		IP67 <sup>*2</sup>				
<b>Electromagnetic field noise resistance</b>		100mT <sup>*3</sup>		250mT <sup>*3</sup>		
<b>Sensing face thickness</b>		0.4 mm		0.7 mm		
<b>Weight</b>	-CN□□	30 g	50 g	50 g	70 g	130 g
	-L5	-	190 g	200 g	220 g	280 g
<b>Circuit protection</b>		Reverse connection protection circuit, output short-circuit		Electromagnetic field noise elimination circuit		
<b>Material</b>	<b>Switch body</b>	Stainless steel 303 (with spatter and slag proof special coating)				

\* 1: Does not detect non-ferrous metals.

\* 2: Avoid using this switch in an environment always subject to splashing water or oil.

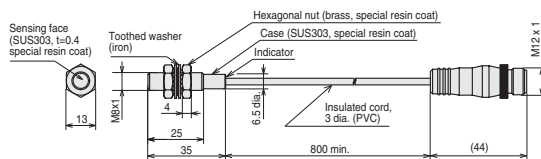
\* 3: AC/DC magnetic field 85 ms or less

## EXTERNAL DIMENSIONS

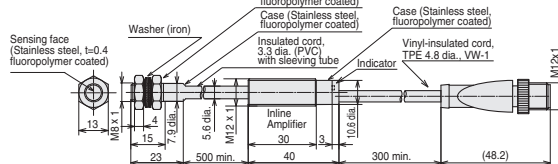
(unit: mm)

### ● Prelead connector type

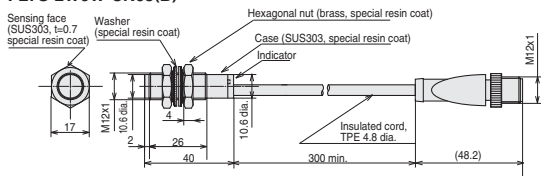
FL7S-1□6W-CN08



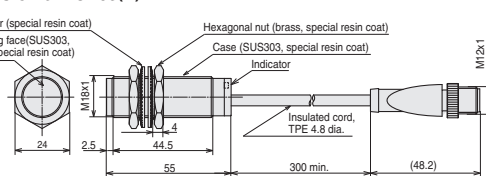
FL7S-1W6W-CN03(B)



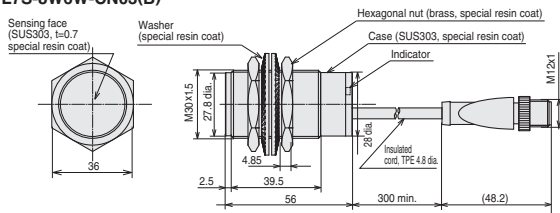
FL7S-2W6W-CN03(B)



FL7S-5W6W-CN03(B)



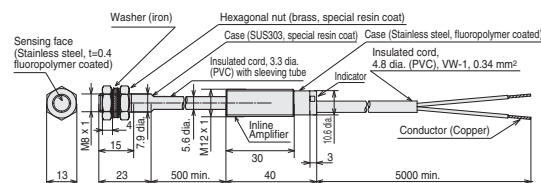
FL7S-8W6W-CN03(B)



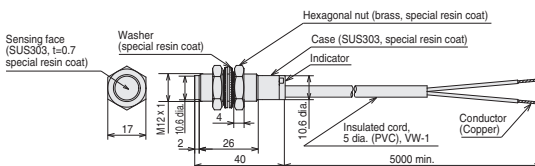
Note: When the switch is flush-mounted in metal, be sure to mount it so that the top of the sensing face projects 2 to 2.5 mm from the metal surface.

### ● Prelead type

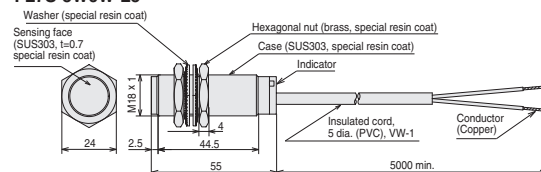
FL7S-1W6W-L5



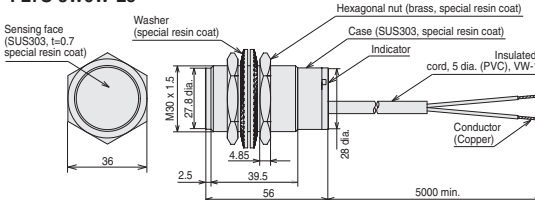
FL7S-2W6W-L5



FL7S-5W6W-L5



FL7S-8W6W-L5



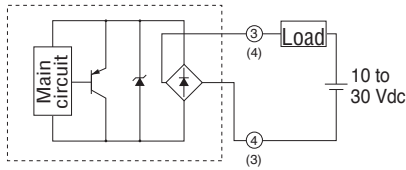
Note: When the switch is flush-mounted in metal, be sure to mount it so that the top of the sensing face projects 2 to 2.5 mm from the metal surface.

## OUTPUT CIRCUIT AND WIRING

### ● Prelead type

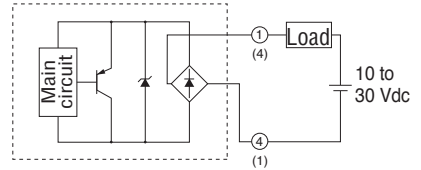
#### 2-wire non-polarity type

##### ● -CN03



•The load can be connected to either of the power supplies.

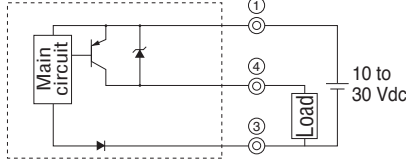
##### ● -CN03B



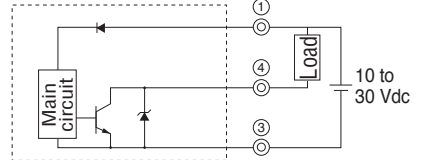
•The load can be connected to either of the power supplies.

#### 3-wire type

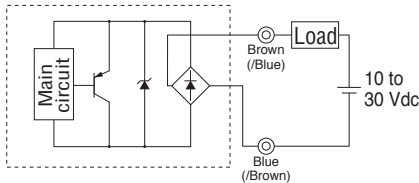
##### ● PNP



##### ● NPN



### ● Prelead type



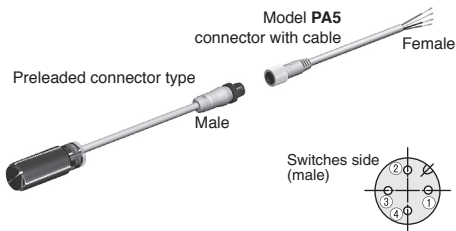
•The load can be connected to either of the power supplies.

## CONNECTOR WITH CABLE

Be sure to use a Model PA5 connector with cable when connecting a prelead connector or connector-type switch.

### ● Model PA5 connector with cable

Shape	Power supply	Cord properties	Cord length	Catalog listing	Lead colors
	DC	Vinyl-insulated cord with high resistance to oil and vibration (UL/NFPA79 CM, CL3)	2 m	PA5-4ISX2SK	1: brown, 2: white, 3: blue, 4: black
			5 m	PA5-4ISX5SK	1: brown, 2: white, 3: blue, 4: black
			2 m	PA5-4ILX2SK	1: brown, 2: white, 3: blue, 4: black
			5 m	PA5-4ILX5SK	1: brown, 2: white, 3: blue, 4: black

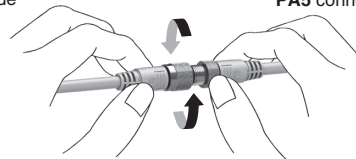


### ● Tightening the connector

Align the grooves and rotate the fastening nut on the PA5 connector by hand until it fits tightly with the connector on the switches side.

Switches side

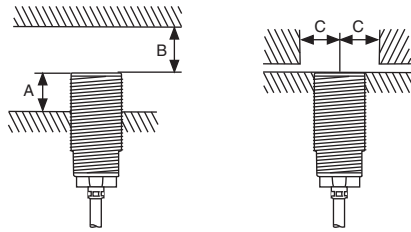
PA5 connector side



## PRECAUTIONS FOR USE

### 1. Influence of surrounding metal

Metal other than the target object surrounding the switch may influence operating characteristics. Leave space between the switch and surrounding metal as shown below.



Shaded areas indicate surrounding metal other than the target object.

**A:** Distance from sensing face of proximity switch to mounting surface

**B:** Distance from surface of iron plate to sensing face of proximity switch.

Dimensions in parentheses apply if a hexagonal nut is attached to the front.

**C:** Distance from surface of iron plate to center of proximity switch when A=0

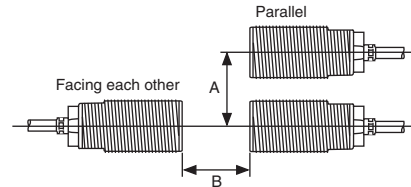
Catalog listing	A(mm)	B(mm)	C(mm)
FL7S-1 □	0	4.5	8
FL7S-2 □	0	6	12
FL7S-5 □	2.5	15	16
FL7S-8 □	2.5	24	23

### 3. Mounting

Catalog listing	Max tightening torque (N·m)
FL7S-1 □	8
FL7S-2 □	15
FL7S-5 □	30
FL7S-8 □	60

### 2. Mutual interference prevention

When mounting proximity switches either parallel to or facing each other, mutual interference may cause the switch to malfunction. Maintain at least the distances indicated in the figures below.



Catalog listing	A(mm)	B(mm)
FL7S-1 □	16	20
FL7S-2 □	24	30
FL7S-5 □	36	50
FL7S-8 □	60	100

Before use, thoroughly read the "Precautions for use" and "Precautions for handling" in the Technical Guide on pages C-095 to C-101 as well as the instruction manual and product specification for this switch.

Please read "Terms and Conditions" from the following URL before ordering and use.

<https://www.azbil.com/products/factory/order.html>

*[Notice] Specifications are subject to change without notice.  
No part of this publication may be reproduced or duplicated  
without the prior written permission of Azbil Corporation.*

Other product names, model numbers and company names may be trademarks of the respective company.

## Azbil Corporation

Advanced Automation Company

*Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.*

1-12-2 Kawana, Fujisawa  
Kanagawa 251-8522 Japan

URL: <https://www.azbil.com>

1st Edition : Jan. 2018