Unique 18-mm-dia. Capacitive Touch Switch with Choice of Three Actuators is Activated with Only a Very Slight Physical Contact

- Only a slight activation force is required, enabling detecting micro deflections, thin wires, or thin-plate conductors (e.g., steel or stainless).
  Application possible for non-conductors by indirectly connecting to ground.
- Instantaneous operation upon contact with extremely limited hysteresis for high-precision position detection.
- Diameter of only 18 mm with standard built-in amplifier, operation indicator, and sensitivity adjustment.
- Conforms to IEC IP67 *
- Freely replaceable antenna with screw mounting.
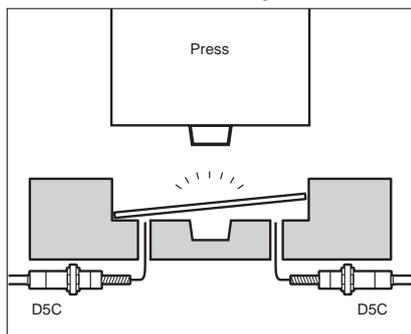- Free attachment to enable changing the antenna shape according to the application.

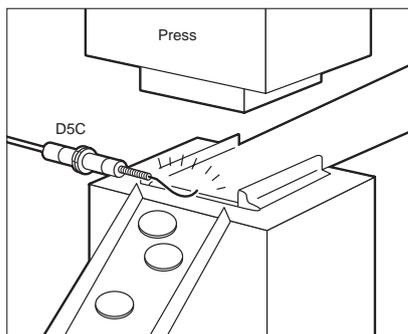* Malfunction may occur if used in locations subject to water or oil.

⚠ Be sure to read *Safety Precautions* on page 6 to 7 and *Safety Precautions for All Limit Switches*.
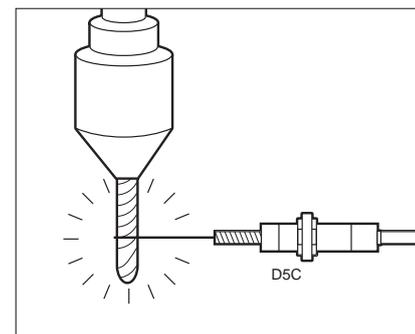
Application Examples
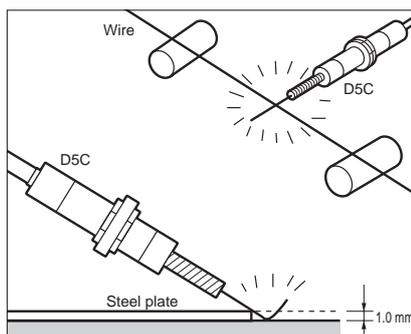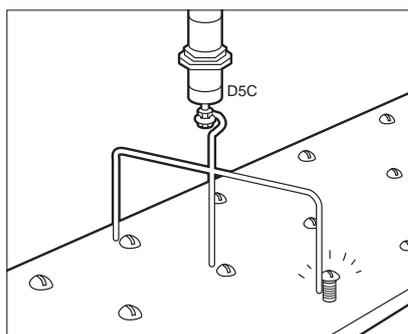
Detection of Incorrectly Set Work

Press

D5C   D5C

Press Position Confirmation

Press

D5C

Detection of Bent Drills

D5C

Detection of Fine Wire or Thin Plate

Wire

D5C

D5C

Steel plate

1.0 mm

Detection of Loose Screws

D5C

Detection of Loose Wires

D5C
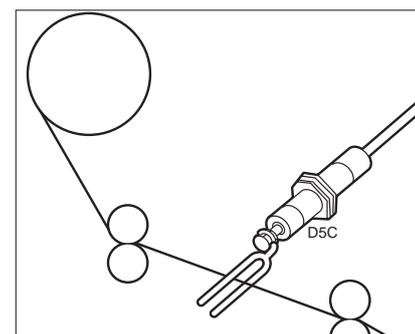
Detection of End of Cloth or Paper
(Detected with indirect ground)

The D5C detects the end of the paper or cloth when the antenna touches ground.

D5C

Paper or cloth

Ground surface
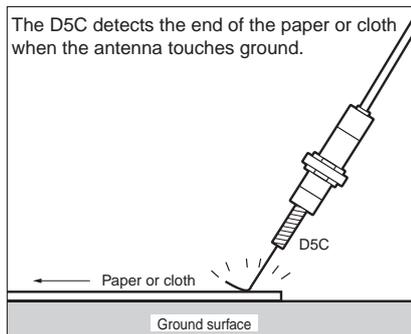
Detection of Seams in Cloth or Paper
(Detected with indirect ground)

The D5C detects the seam when the antenna touches ground pole.

D5C

Ground pole

Paper or cloth

OMRON
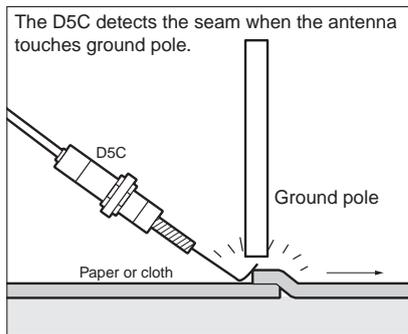
Ordering Information

	Features	·Usable by bending tip of antenna. ·Overtravel of 20 mm max.	·Ideal for high-accuracy position control. ·Overtravel of 3.5 mm max.	·Any actuator can be attached.
	Actuator	Coil spring	Plunger	Free-attachment
Item		Model	Model	Model
Supply voltage (Power supply)	DC	D5C-1DS0	D5C-1DP0	D5C-1DA0
	AC	D5C-1AS0	D5C-1AP0	D5C-1AA0
Antenna only		D5C-00S0	D5C-00P0	D5C-00A0

Note: The lead wire is 3 m.

Specifications

Ratings and Characteristics

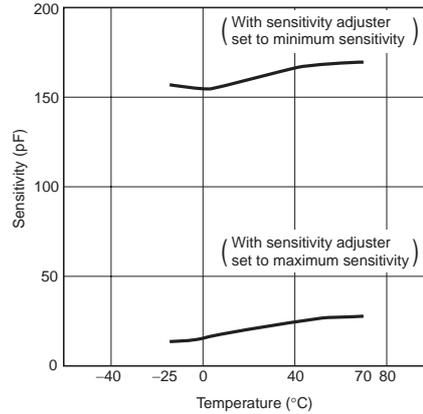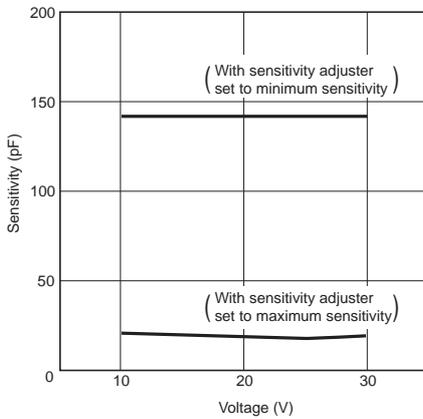|	Type	DC	AC
Item	Model	D5C-1D□0	D5C-1A□0
Degree of protection		Equivalent to IP67	
Mechanical durability		10,000,000 operations min. (at rated overtravel value)	
Supply voltage (operating voltage)		12 to 24 VDC (10 to 30 VDC), (ripple: 10% max.)	100 to 240 VAC (45 to 264 VAC), 50/60 Hz
Rated frequency		---	50/60 Hz
Sensitivity setting range		30 to 100 pF	
Current consumption		17 mA max.	---
Leakage current	Circuit	---	2 mA max.
	Antenna	1 mA max.	1 mA max.
Response time		2 ms max.	8 ms max.
Output current		200 mA max. (resistive load)	
Insulation resistance		50 MΩ min. (at 500 VDC) between lead wires and case	
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal parts	2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal parts
Rated insulation voltage (Ui)		1,000 VAC	
Pollution degree (operating environment)		3 (IEC947-5-1)	
Protection against electric shock		Class II	
Proof tracking index (PTI)		175	
Switch category		D (IEC335)	
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance		1,000 m/s^2 max.	
Ambient temperature		Operating: −25°C to +70°C (with no icing)	
Ambient humidity		35% to 95%RH	
Weight		Approx. 110 g (in case of D5C-1DS0)	Approx. 120 g (in case of D5C-1AS0)

Engineering Data (Typical Examples)

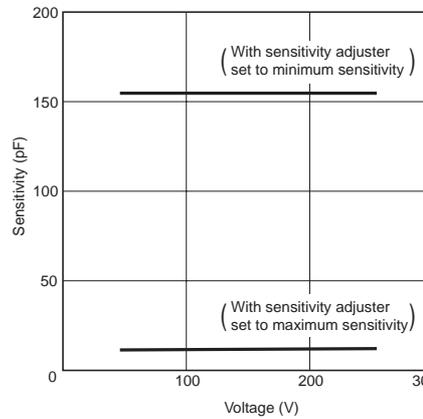**Temperature Characteristics of DC Models**
D5C-1D☐0 (24 VDC)

Sensitivity (pF) vs Temperature (°C)

(With sensitivity adjuster set to minimum sensitivity)

(With sensitivity adjuster set to maximum sensitivity)
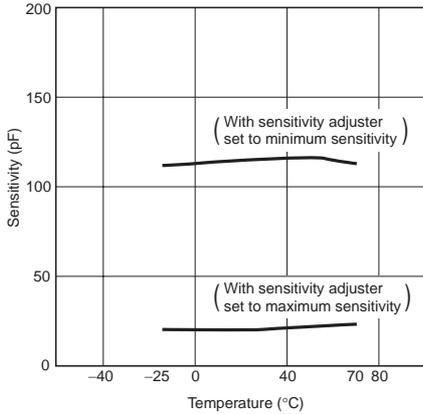
Temperature Characteristics of AC Models
D5C-1A☐0 (100 VAC)

Sensitivity (pF) vs Temperature (°C)

(With sensitivity adjuster set to minimum sensitivity)

(With sensitivity adjuster set to maximum sensitivity)

Voltage Characteristics of DC Model
D5C-1D☐0 (Ambient temperature: 25°C)

Sensitivity (pF) vs Voltage (V)

(With sensitivity adjuster set to minimum sensitivity)

(With sensitivity adjuster set to maximum sensitivity)

Voltage Characteristics of AC Model
D5C-1A☐0 (Ambient temperature: 25°C)

Sensitivity (pF) vs Voltage (V)

(With sensitivity adjuster set to minimum sensitivity)

(With sensitivity adjuster set to maximum sensitivity)

Structure and Nomenclature

Nomenclature

Coil spring actuator (Stainless steel)
O-ring
Contactor
LED operation indicator
Sensitivity adjuster
O-ring
Caution label
Actuator
Case
Mounting nut
Washer
Lead wire
Filled with glass epoxy

Operating Principle

The limit-type Touch Switch vibrates at a high frequency. When an object touches the antenna... → ...the oscillation circuit constant changes, oscillation stops... → ...the switching circuit operations, and an output signal is produced. → Use the specified voltage.

Antenna

Feedback circuit

Oscillator

Detection circuit

NOT circuit

Power supply

Series Classification and Features

D5C-1D□0

| 200 mA max. L/R＝0 | → Power supply 1 12 to 24 VDC |

The D5C by itself can directly switch a load if DC power is provided.

D5C-1A□0

| 200-mA load max. Cosφ = 1 | → Power supply 100 to 240 VAC |

An AC power supply can be detected and an AC load can be switched.
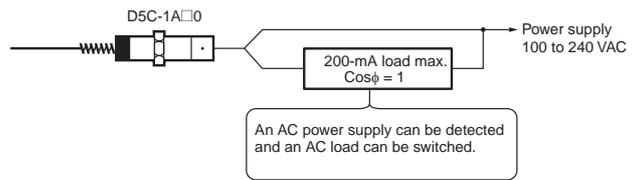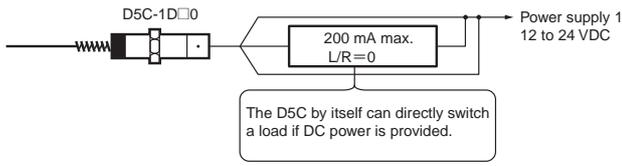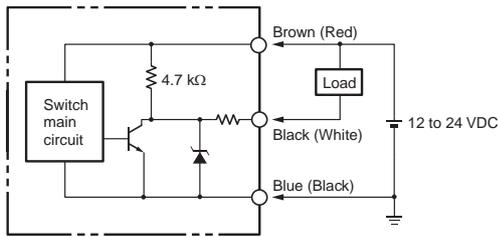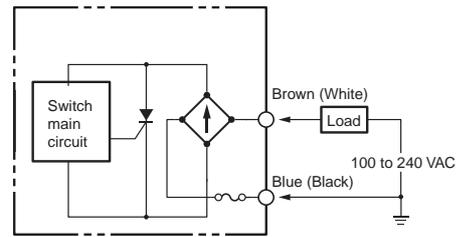
Connections

Output Circuit Diagram

The lead wire colors of the D5C have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.
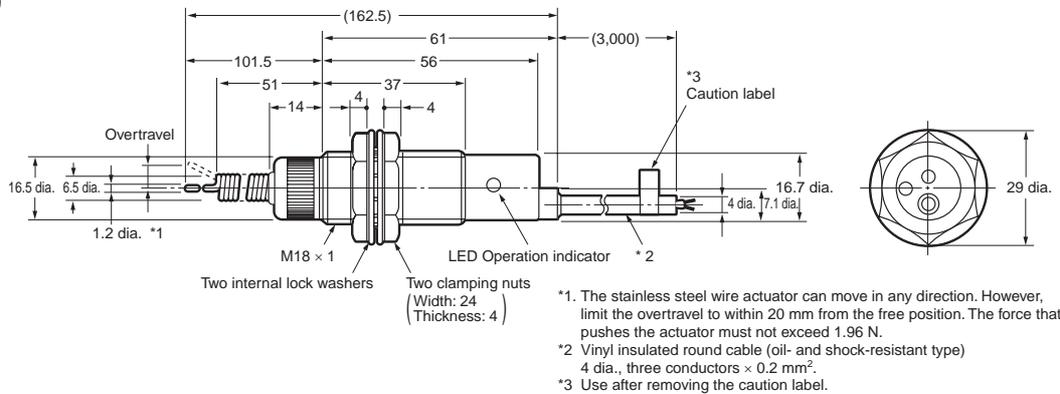
D5C-1D□0 (DC Model)

Switch main circuit — 4.7 kΩ — Brown (Red) — Load
Black (White) — 12 to 24 VDC
Blue (Black)

D5C-1A□0 (AC Model)

Switch main circuit — Brown (White) — Load
100 to 240 VAC
Blue (Black)

Dimensions

(Unit: mm)

DC Models

Coil Spring
D5C-1DS0

(162.5)
61
(3,000)
101.5
56
51
37
14
4
4
*3 Caution label
Overtravel
16.5 dia.   6.5 dia.
16.7 dia.
4 dia.   7.1 dia.
29 dia.
1.2 dia.   *1
M18 × 1
LED Operation indicator
* 2
Two internal lock washers
Two clamping nuts
(Width: 24
Thickness: 4)

*1. The stainless steel wire actuator can move in any direction. However, limit the overtravel to within 20 mm from the free position. The force that pushes the actuator must not exceed 1.96 N.
*2 Vinyl insulated round cable (oil- and shock-resistant type) 4 dia., three conductors × 0.2 mm².
*3 Use after removing the caution label.

Plunger
D5C-1DP0

(85)
61
(3,000)
24
56
37
4
4
*3 Caution label
Overtravel
16.5 dia.   5 dia.
16.7 dia.
4 dia.   7.1 dia.
29 dia.
*1
M18 × 1
LED Operation indicator
* 2
Two internal lock washers
Two clamping nuts
(Width: 24
Thickness: 4)

*1. The overtravel of the stainless steel plunger is within 3.5 mm. Do not apply a force greater than 9.8 N to the plunger.
*2 Vinyl insulated round cable (oil- and shock-resistant type) 4 dia., three conductors × 0.2 mm².
*3 Use after removing the caution label.

Free-attachment
D5C-1DA0

Lock nut

M4 × 0.7 *1

16.5 dia.

Self-locking nut

Two flat washers

Two internal lock washers

M18 × 1

Two clamping nuts
(Width: 24
Thickness: 4)

LED Operation indicator

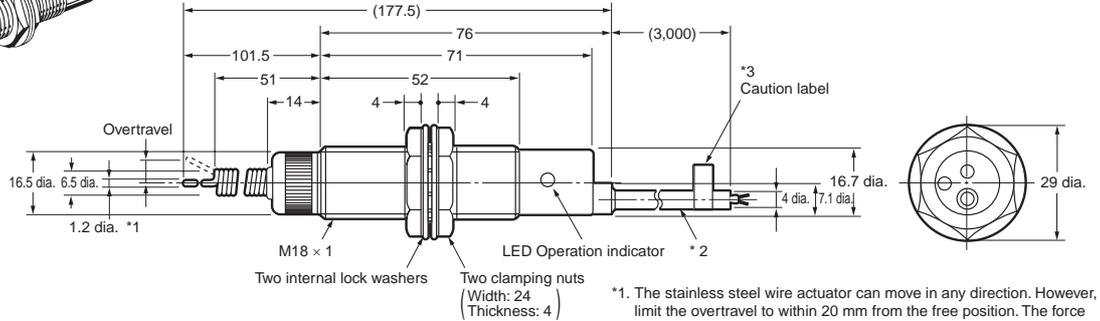*3 Caution label

16.7 dia.

4 dia. 7.1 dia.

29 dia.

* 2

(89)
61
56
37
28
14
4
4
(3,000)
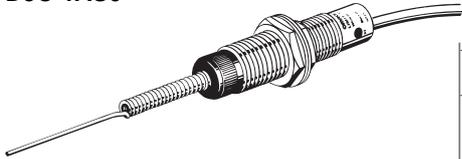
*1. Limit the total length of actuator wire to 1 m or less.
When mounting the Switch to a metal plate, do not exceed an area of 200 cm^2.
*2 Vinyl insulated round cable (oil- and shock-resistant type)
4 dia., three conductors × 0.2 mm^2.
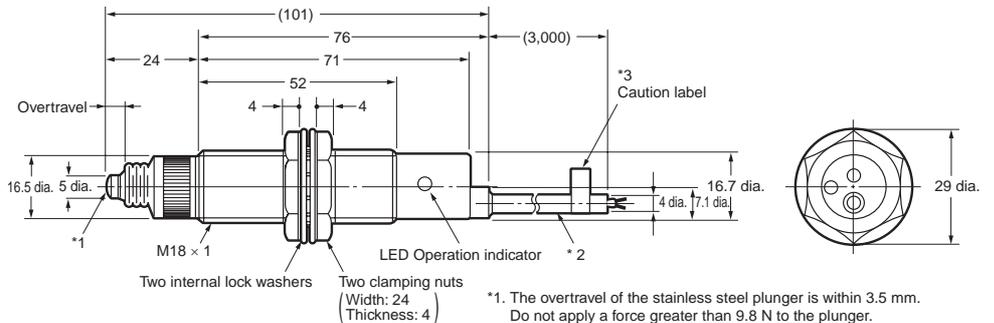*3 Use after removing the caution label.

AC Models

Coil Spring
D5C-1AS0

Overtravel

16.5 dia. 6.5 dia.

1.2 dia. *1

M18 × 1

Two internal lock washers

Two clamping nuts
(Width: 24
Thickness: 4)

LED Operation indicator

*3 Caution label

16.7 dia.

4 dia. 7.1 dia.

29 dia.

* 2

(177.5)
76
71
101.5
51
14
52
4
4
(3,000)

*1. The stainless steel wire actuator can move in any direction. However, limit the overtravel to within 20 mm from the free position. The force that pushes the actuator must not exceed 1.96 N.
*2 Vinyl insulated round cable (oil- and shock-resistant type)
4 dia., three conductors × 0.3 mm^2.
*3 Use after removing the caution label.

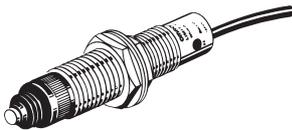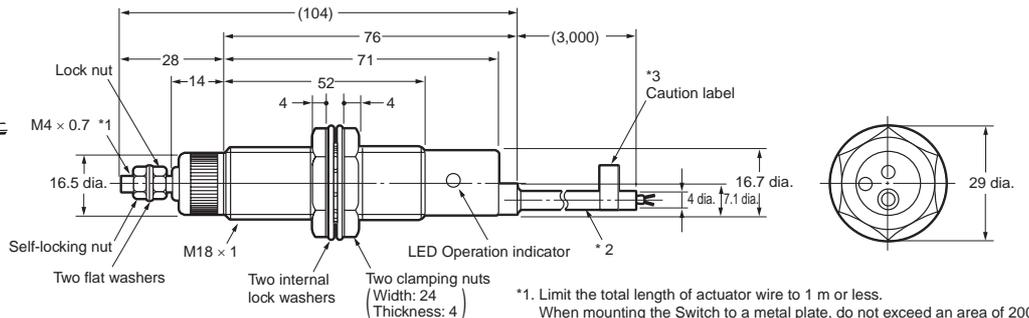## Plunger
D5C-1AP0

Overtravel

16.5 dia. 5 dia.

*1

M18 × 1

Two internal lock washers

Two clamping nuts
(Width: 24
Thickness: 4)

LED Operation indicator

*3 Caution label

16.7 dia.

4 dia. 7.1 dia.

29 dia.

* 2

(101)
76
71
24
52
4
4
(3,000)

*1. The overtravel of the stainless steel plunger is within 3.5 mm.
Do not apply a force greater than 9.8 N to the plunger.
*2 Vinyl insulated round cable (oil- and shock-resistant type)
4 dia., three conductors × 0.3 mm^2.
*3 Use after removing the caution label.

Free-attachment
D5C-1AA0

Lock nut

M4 × 0.7 *1

16.5 dia.

Self-locking nut

Two flat washers

M18 × 1

Two internal lock washers

Two clamping nuts
(Width: 24
Thickness: 4)

LED Operation indicator

*3 Caution label

16.7 dia.

4 dia. 7.1 dia.

29 dia.

* 2

(104)
76
71
28
14
52
4
4
(3,000)

*1. Limit the total length of actuator wire to 1 m or less.
When mounting the Switch to a metal plate, do not exceed an area of 200 cm^2.
*2 Vinyl insulated round cable (oil- and shock-resistant type)
4 dia., three conductors × 0.3 mm^2.
*3 Use after removing the caution label.

OMRON

Safety Precautions

Refer to *Safety Precautions for All Limit Switches*.

⚠ CAUTIONS

Make sure that the antenna does not come into contact with the human body, otherwise an electric shock may be received.
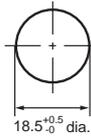

Precautions for Correct Use

Mounting

Do not tighten the nuts with excessive force. The maximum permissible tightening force of each nut with a washer is 29.4 N·m.

Mounting Hole Dimension

$18.5^{+0.5}_{-0}$ dia.

### Grounding of Antenna and Sensing Object

<Size of Sensing Object>

• Grounded Object

If the sensing object is the following grounded conductor, its size will not affect the operation of the D5C. Check for the presence of insulators sticking to the sensing object or the corrosion of the sensing object, however, so that the ground resistance will not exceed 3 kΩ.

Contact with Grounded Conductor
The sensing object is equivalently grounded through ground resistor R.
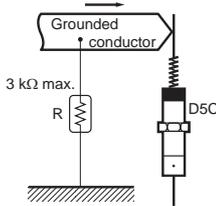
R: 3 kΩ max.
The sensing object must not come into contact with the human body

• Non-grounded Object

If the sensing object is the following non-grounded conductor, the D5C will operate if the capacitance between the sensing object and the ground is 30 pF or more. The larger the surface area of the sensing object is, the higher its capacitance will be. The shorter the distance between the sensing object and the ground is, the higher the capacitance will be. Furthermore, the capacitance greatly varies with the ground condition (e.g., dry sand, concrete, or wet soil).

Contact with Non-grounded Conductor
The sensing object is equivalently grounded through capacitor C.
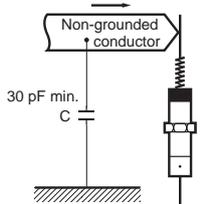
Generally, the conductor will be detectable if the ambient humidity is 60% to 70%RH and the surface area of the conductor is approximately 300×500 mm.

C: 30 pF min.

<Conditions of Sensing Object>

• The detection of conductors (e.g., iron, stainless steel, aluminum, and brass objects) poses no particular problem. A conductor coated with paint cannot be detected, however, because there is no electrical continuity between the antenna and the conductor.

• Non-conductive objects (e.g., plastic, ceramic, glass, and cloth objects) can be detected by grounding them indirectly.
(Refer to *Application Examples* on page 1.)
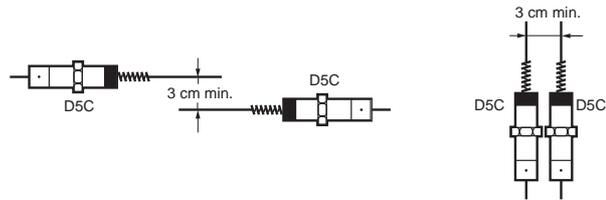
Antenna

<Shape and Extension>

If a metal plate is used as an antenna by connecting it to the built-in or separated antenna of the D5C, the surface area of the metal plate must be 200 cm² maximum (Fig. 1). The antenna can be extended, provided that the total length of the antenna is 1 m maximum (Fig. 2) and that the bottom of the antenna is at least 10 cm (Fig. 3) away from the ground. Refer to the illustrations below

The D5C may be damaged if the antenna is excessively large or heavy or if the antenna is used in locations with excessive vibration or shock. Be sure to check the locations before use.

Fig. 1   Fig. 2   Fig. 3

<Parallel Arrangement>
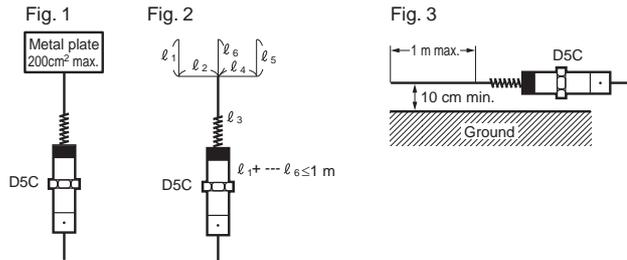
If there are multiple D5Cs are located in parallel, make sure that the distance between adjacent antennas is at least 3 cm.

Maintenance

• Make sure that the portion of the antenna that comes into contact with sensing objects is free of oil, dirt, or rust, or any other insulator. Otherwise, the D5C will not operate.

• The degree of protection of the D5C is IP67. The D5C cannot be, however, used in the water or oil.

• Locations with Sprayed Water or Oil
The D5C may malfunction in locations where the D5C is frequently exposed to sprayed water or oil. Especially, the D5C may malfunction more frequently if it is exposed to sprayed water-soluble cutting oil. In such locations, be sure to take appropriate measures to protect the D5C from oil and water.

Wiring and Connections

• Be sure to wire the D5C correctly according to the color of each cord. Incorrect wiring may damage the internal components of the D5C or the D5C may malfunction.

• A maximum of two models can be connected in series provided that 100 to 240 V is supplied. DC models cannot be connected in series.
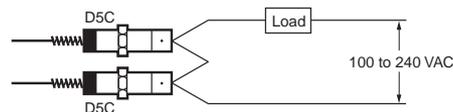
• Be sure to supply power to the D5C via the load. If power is supplied to the D5C directly, the fuse will blow.
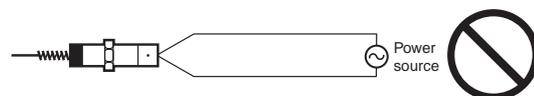
• If there are wire power lines or high-tension lines close to the cable of the D5C, be sure to wire the cable of the D5C away from power lines or high-tension lines or lay the cable in an exclusive, shielded conduit.

• Remove the caution label on the end of the cable before wiring the cable.

D5C-1A□0 (AC Models)

- Be aware that the D5C-1A□0 not in operation has a leakage current of approximately 2 mA. Especially, if the load is a relay with a current flow of 10 mA or less, a reset failure may result due to the residual voltage. Therefore, connect a bleeder resistor as shown below so that the residual voltage will be less than the reset voltage of the load.
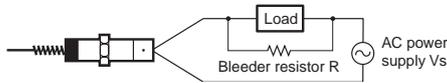
The bleeder resistance and permissible power are obtained from the following formula.

$$R \leq \frac{Vs}{10-I} \, (K\Omega) \quad P > \frac{Vs^2}{R} \, (mW)$$

P: W number of bleeder load (Practically, the wattage must be a few times larger than the obtainable value.)
I: Load current (mA)

- If a DC relay or DC counter is used as a load connected through an electronic timer or current rectification circuit, pay the utmost attention so that the leakage current of the D5C AC model will not cause the load to malfunction.

Sensitivity Adjustment

- The sensitivity of the D5C can be adjusted by turning the adjuster on the rear side with a flat-blade screwdriver.
- The sensitivity increases by turning the adjuster clockwise (max. 30 pF) and decreases by turning the adjuster counterclockwise (min. 100 pF).
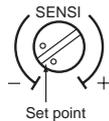
- Be sure to turn the adjuster with a torque of 0.08 N·m or less. If excessive torque is applied, the adjuster will break.

Grounding

<For DC and AC Models>

- In order to maintain the operational reliability of the D5C, be sure to ground the blue or black wire of the power cable.
  (Refer to *"Output Circuit Diagram"* on page 4.)
- Operation may fail if the D5C is not grounded.

<DC Models>

- The service power supply of the PC (Programmable Controller) is not available to the D5C-1D□0. The negative line of the service power supply of the PC is not grounded. Therefore, the D5C may not operate.
  Furthermore, if the negative line of the service power supply is grounded, the noise resistance of the PC will drop.

<AC Models>

- Provided that single-phase 200 V is supplied to the D5C-1A□0, if one phase is grounded, the power supply will be short-circuited and a machinery breakdown will result. Use an isolating transformer and ground the secondary side of the transformer instead.
- In the above case, be sure to ground the secondary side, otherwise the D5C may not operate.
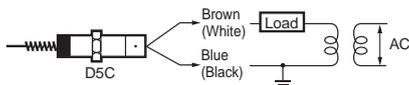
The lead wire colors of the D5C have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.

Others

- Do not disassemble the D5C, otherwise the internal wiring will be damaged and the D5C will fail to operate.
- The sealing of the D5C uses nitrile butadiene rubber (NBR), which is highly oil resistive. If exposed to some types of oil or chemical indoors or outdoors, however, the NBR may deteriorate. Contact your OMRON representative for details.
- When mounting the antenna to the D5C, be sure to tighten the antenna to a torque of 0.39 to 0.83 N·m. If the antenna is not tightened securely, the built-in contact may break.
- If an appropriate antenna is mounted to a free attachment model, hold the nut on the outer side with a wrench so that the nut will not move. Then tighten the nut on the inner side within a torque range of 0.78 and 1.18 N·m.
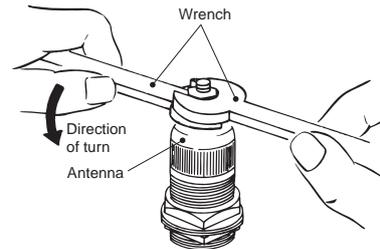
Read and Understand This Catalog

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

Warranty and Limitations of Liability

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

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

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

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

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

Application Considerations

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

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products.   This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given.   This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.

- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.

- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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

PROGRAMMABLE PRODUCTS
OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS
Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice.   When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request.   Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

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

PERFORMANCE DATA
Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS
The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

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

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