Section 3
Communications Specifications

Communications Distances

V680-D1KP52MT

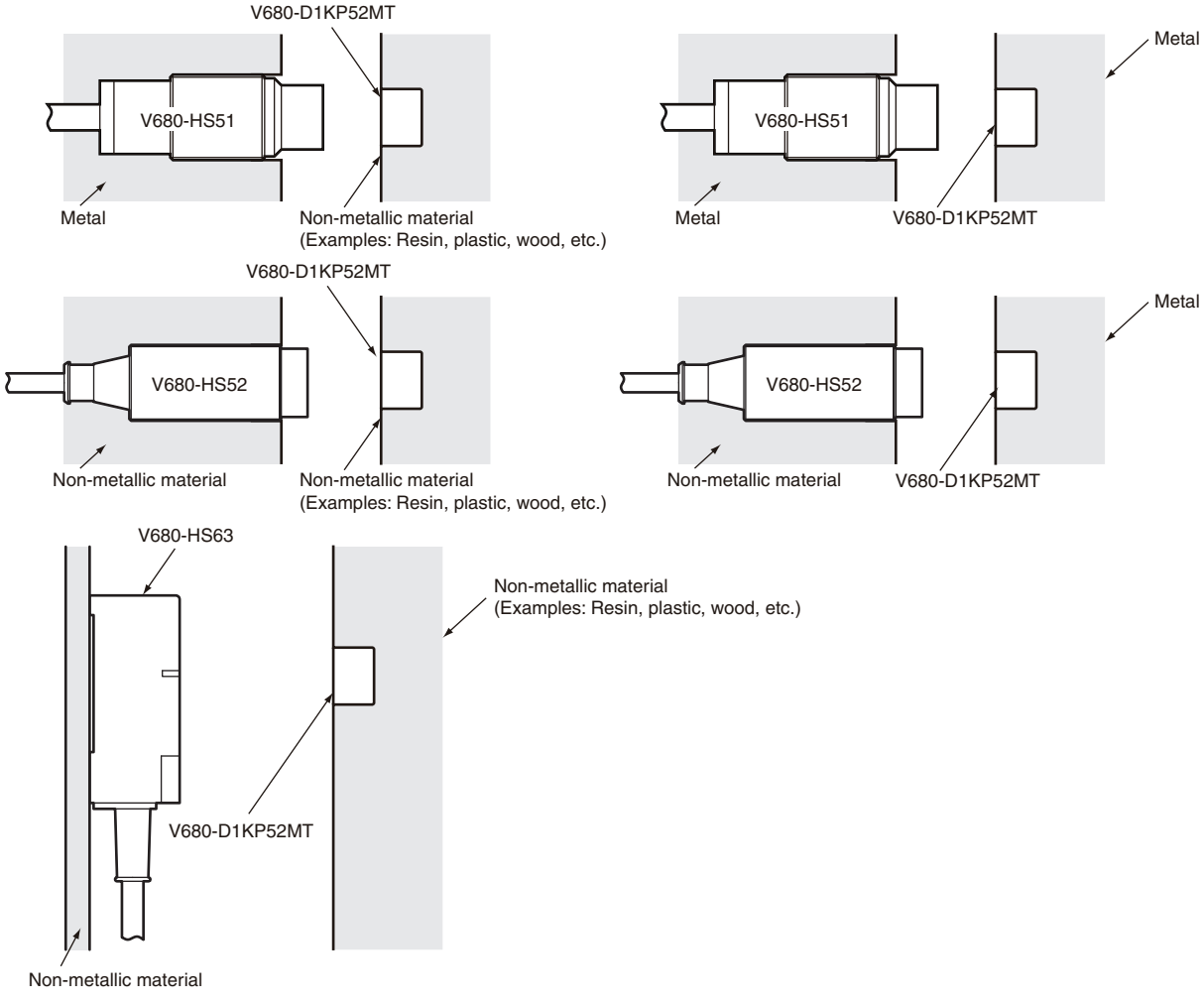
■ Communications Distance Specifications (Certified Performance)

Amplifier	Antenna	ID Tag	Communications distance	
V680-HA63A	V680-HS51	V680-D1KP52MT	Read	0.5 to 6.5 mm (Axis offset: ±2 mm)
			Write	0.5 to 6.0 mm (Axis offset: ±2 mm)
	V680-HS51	V680-D1KP52MT embedded in metal (steel)	Read	0.5 to 3.5 mm (Axis offset: ±2 mm)
			Write	0.5 to 3.0 mm (Axis offset: ±2 mm)
	V680-HS52	V680-D1KP52MT	Read	0 to 9.0 mm (Axis offset: ±2 mm)
			Write	0 to 8.5 mm (Axis offset: ±2 mm)
	V680-HS52	V680-D1KP52MT embedded in metal (steel)	Read	0 to 4.5 mm (Axis offset: ±2 mm)
			Write	0 to 4.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP52MT	Read	0 to 12.0 mm (Axis offset: ±2 mm)
			Write	0 to 9.5 mm (Axis offset: ±2 mm)

CHECK!

When embedding the V680-D1KP52MT into a metal surface, use the V680-HS51, V680-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

• Measurement Conditions

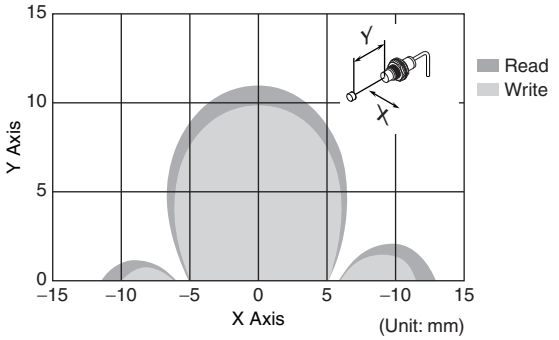


■ Communications Area (Reference)

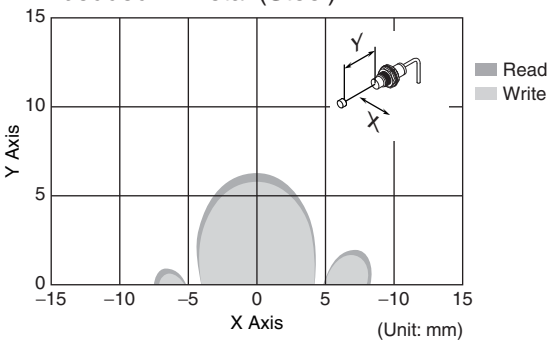
The communications areas given here are for reference only. For information on communications distances, refer to p.44.

The communications area depends on the type of ID Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

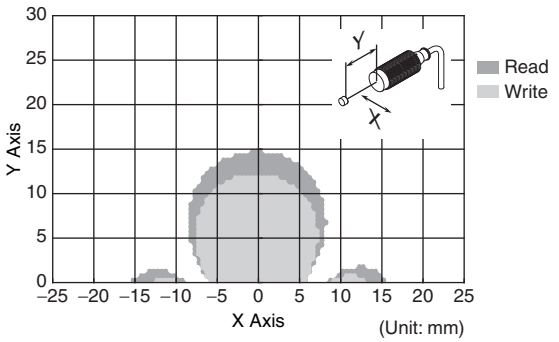
●V680-HS51 & V680-D1KP52MT



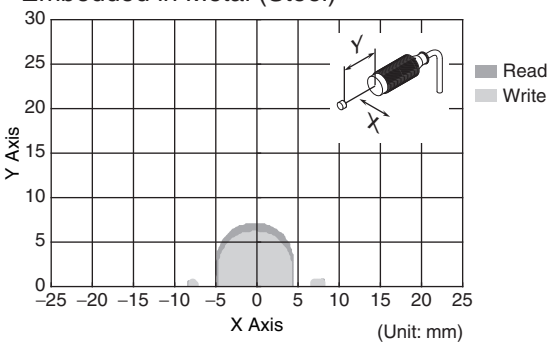
●V680-HS51 & V680-D1KP52MT
Embedded in Metal (Steel)



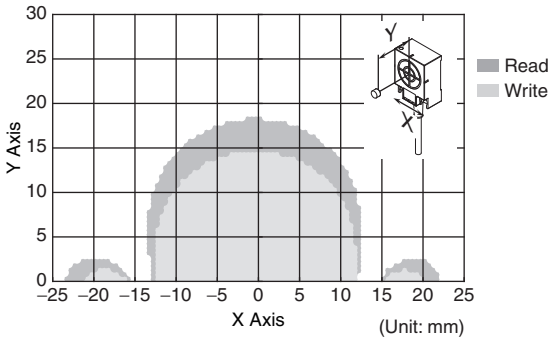
●V680-HS52 & V680-D1KP52MT



●V680-HS52 & V680-D1KP52MT
Embedded in Metal (Steel)



●V680-HS63 & V680-D1KP52MT

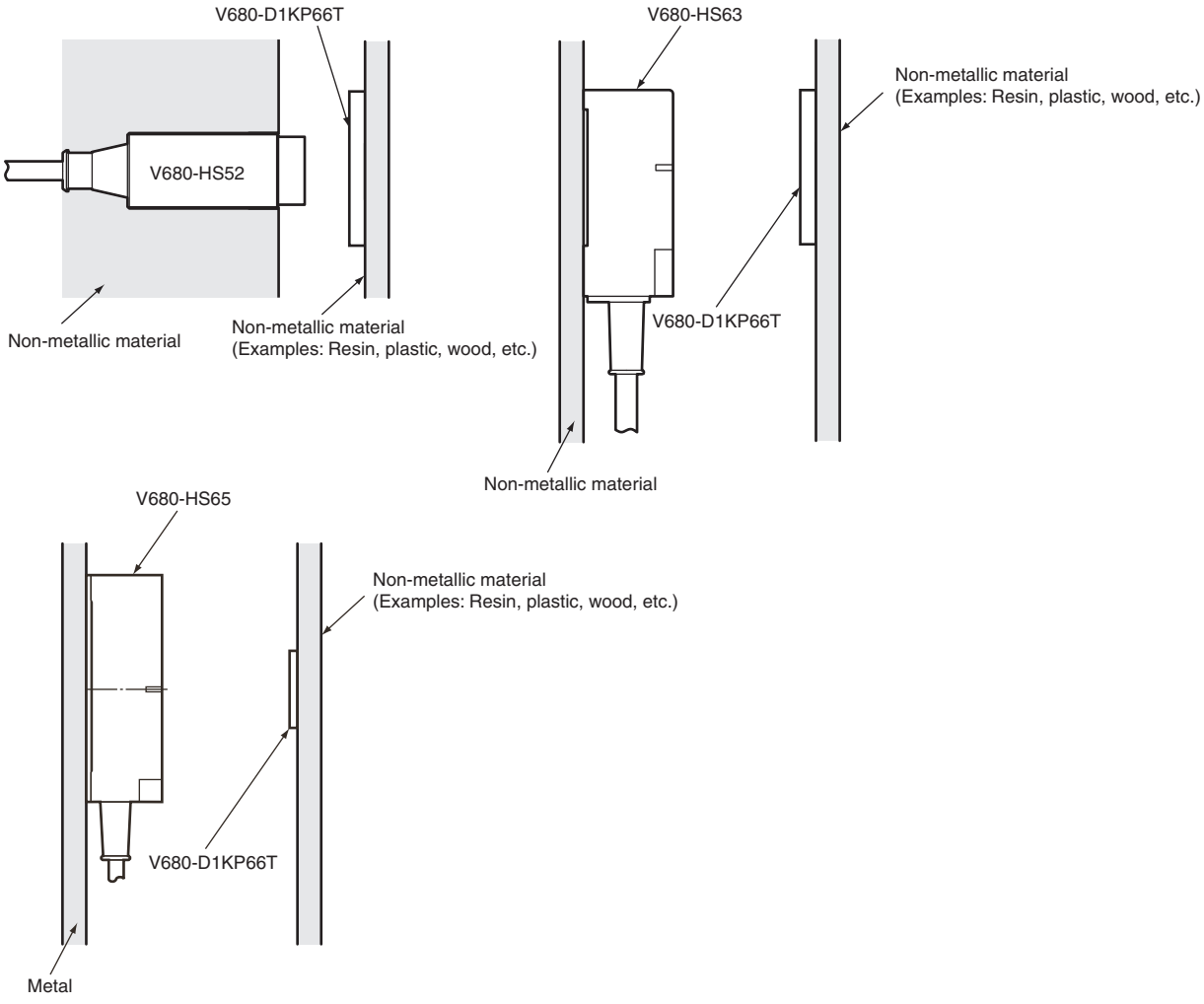


V680-D1KP66T

■ Communications Distance Specifications (Certified Performance)

Amplifier	Antenna	ID Tag	Communications distance	
V680-HA63A	V680-HS52	V680-D1KP66T	Read	0 to 17.0 mm (Axis offset: ±2 mm)
			Write	0 to 17.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP66T	Read	0 to 30.0 mm (Axis offset: ±10 mm)
			Write	0 to 25.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP66T	Read	0 to 47.0 mm (Axis offset: ±10 mm)
			Write	0 to 42.0 mm (Axis offset: ±10 mm)

• Measurement Conditions

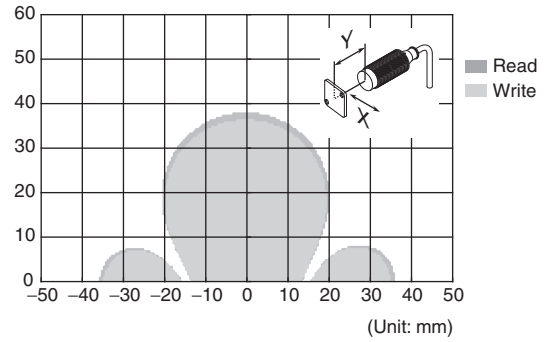


■ Communications Area (Reference)

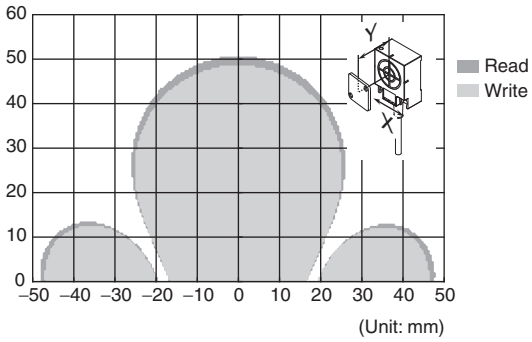
The communications areas given here are for reference only. For information on communications distances, refer to p.46.

The communications area depends on the type of ID Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

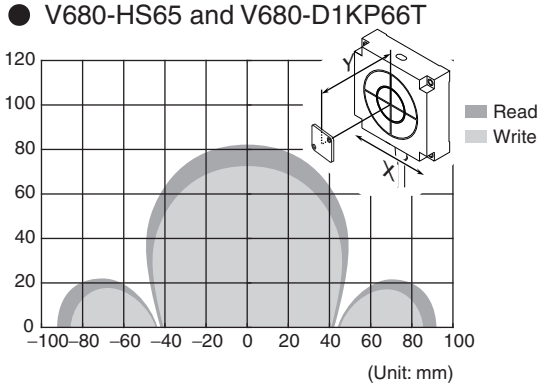
● V680-HS52 and V680-D1KP66T



● V680-HS63 and V680-D1KP66T



● V680-HS65 and V680-D1KP66T

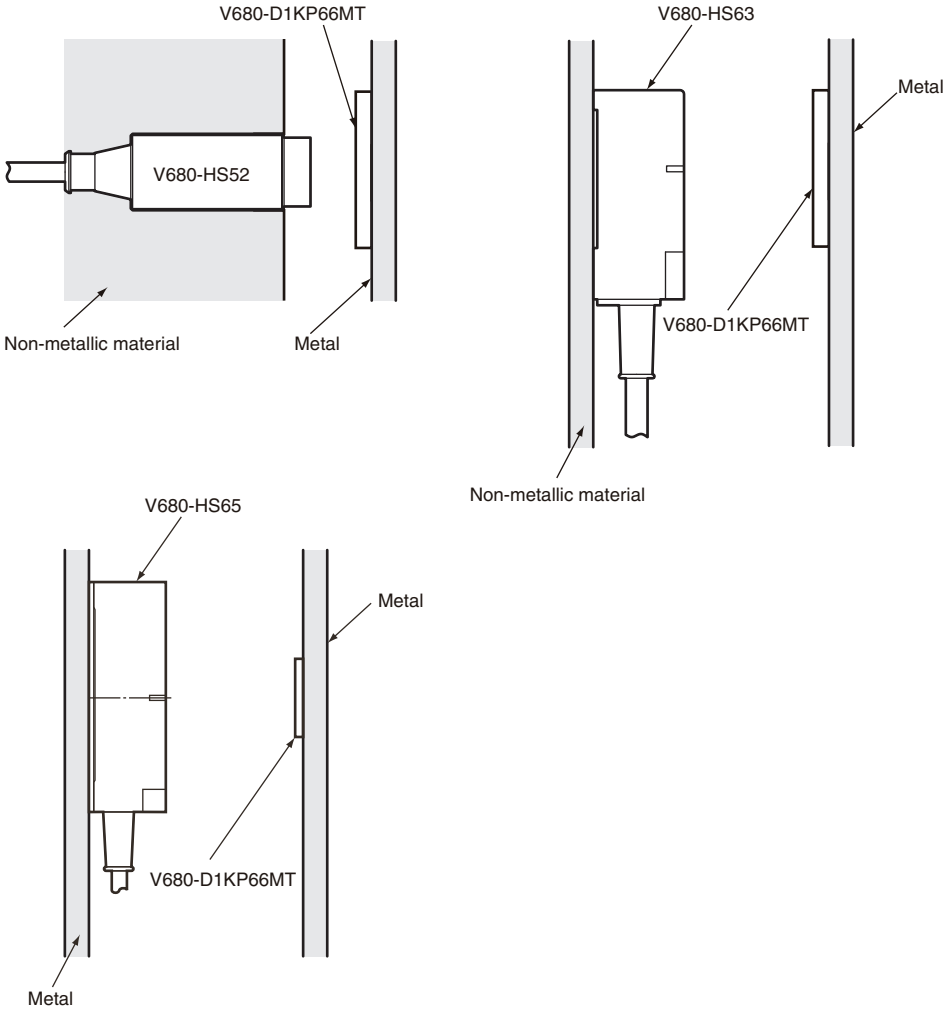


V680-D1KP66MT

■ Communications Distance Specifications (Certified Performance)

Amplifier	Antenna	ID Tag	Communications Distance	
V680-HA63A	V680-HS52	V680-D1KP66MT with metal on back surface (steel)	Read	0 to 16.0 mm (Axis offset: ±2 mm)
			Write	0 to 14.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP66MT with metal on back surface (steel)	Read	0 to 25.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP66MT with metal on back surface (steel)	Read	0 to 25.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)

• Measurement Conditions

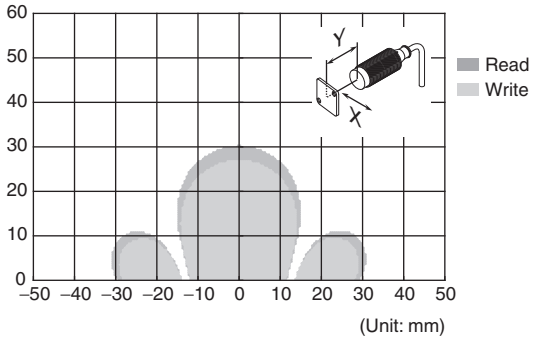


■ Communications Area (Reference)

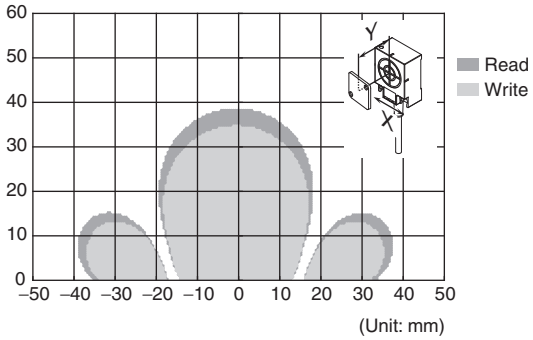
The communications areas given here are for reference only. For information on communications distances, refer to p.48.

The communications area depends on the type of ID Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

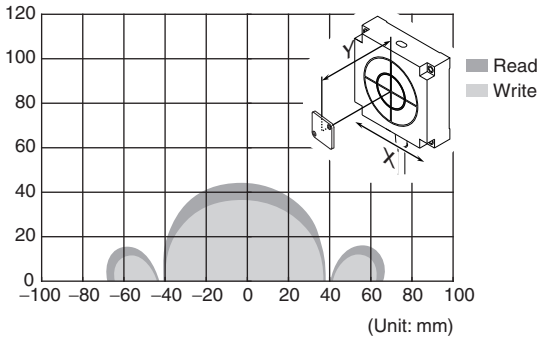
● V680-HS52 and V680-D1KP66MT with Metal on Back Surface (Steel)



● V680-HS63 and V680-D1KP66MT with Metal on Back Surface (Steel)



● V680-HS65 and V680-D1KP66MT with Metal on Back Surface (Steel)

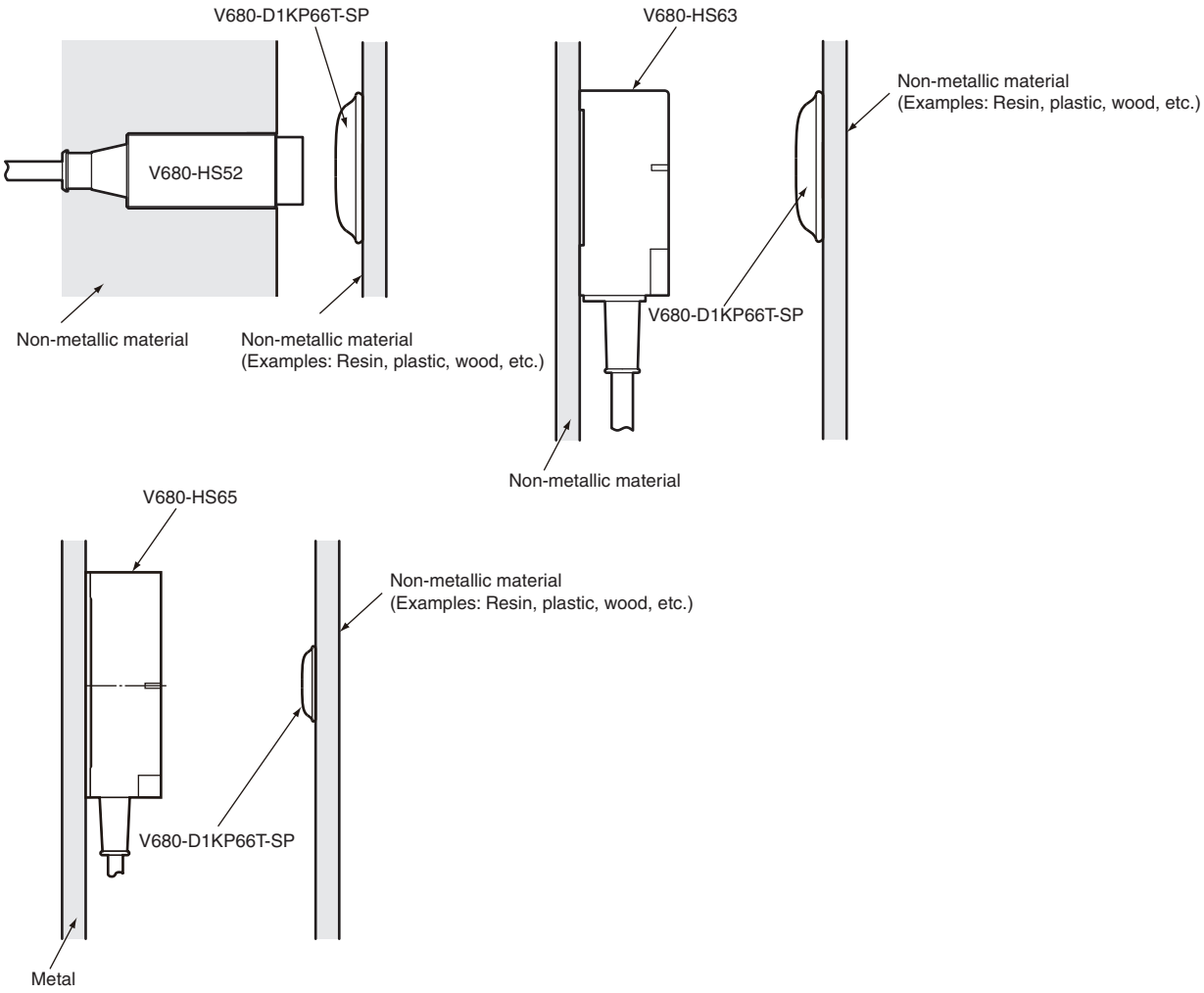


V680-D1KP66T-SP

■ Communications Distance Specifications (Certified Performance)

Amplifier	Antenna	ID Tag	Communications distance	
V680-HA63A	V680-HS52	V680-D1KP66T-SP	Read	0 to 15.0 mm (Axis offset: ±2 mm)
			Write	0 to 15.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP66T-SP	Read	0 to 25.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP66T-SP	Read	0 to 42.0 mm (Axis offset: ±10 mm)
			Write	0 to 37.0 mm (Axis offset: ±10 mm)

• Measurement Conditions

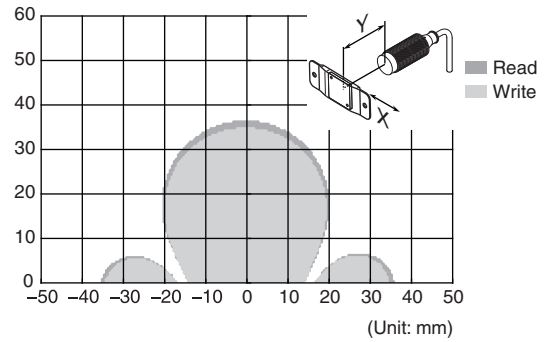


■ Communications Area (Reference)

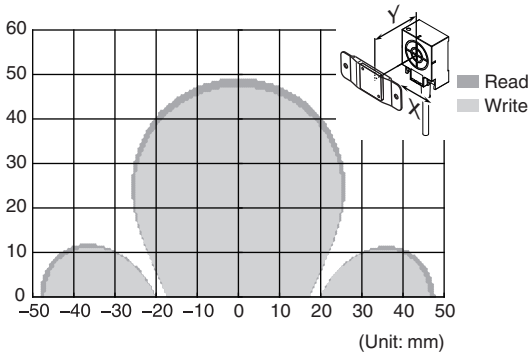
The communications areas given here are for reference only. For information on communications distances, refer to p.50.

The communications area depends on the type of ID Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

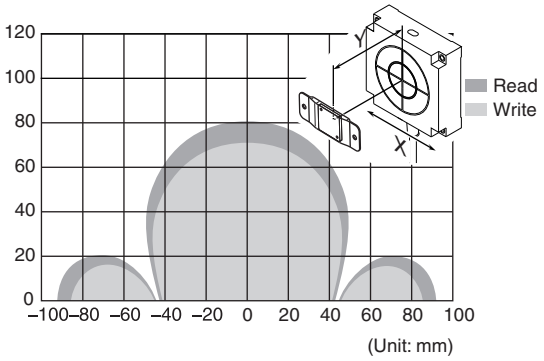
● V680-HS52 and V680-D1KP66T-SP



● V680-HS63 and V680-D1KP66T-SP



● V680-HS65 and V680-D1KP66T-SP

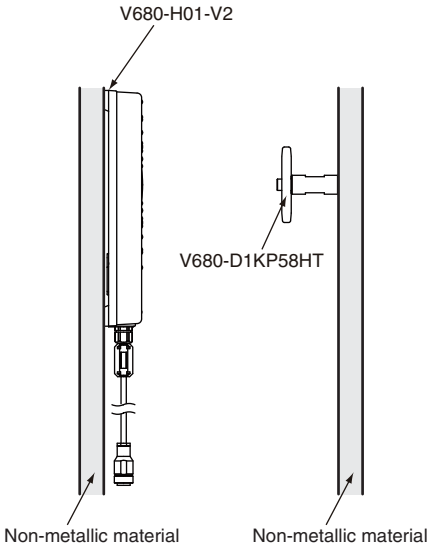


V680-D1KP58HT

■ Communications Distance Specifications (Certified Performance)

Antenna	ID Tag	Communications distance	
V680-H01-V2	V680-D1KP58HT	Read	0 to 150.0 mm (Axis offset: ±10mm)
		Write	0 to 150.0 mm (Axis offset: ±10mm)

• Measurement Conditions

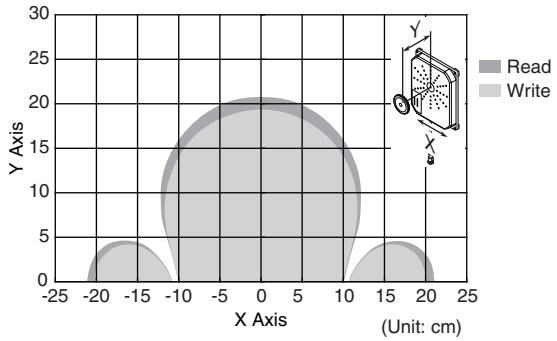


■ Communications Area (Reference)

The communications areas given here are for reference only. For information on communications distances, refer to p.52.

The communications area depends on the type of ID Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

● V680-H01-V2 and V680-D1KP58HT



Communication Time (Reference)

Communications Time (Reference)

■ Communications Time

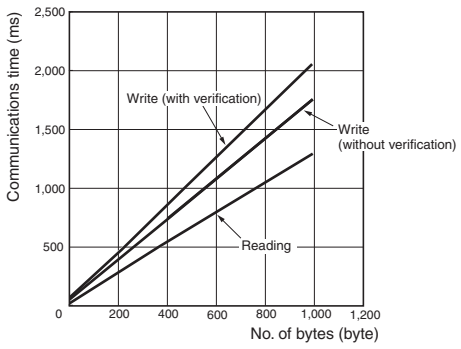
V680-HA63A:V680-HS□□:V680-H01-V2:V680-D1KP□□

Communications speed setting	Command	Communications time N: No. of bytes processed
Normal mode	Read	T = 1.3 N + 31
	Write (with verification)	T = 2.1 N + 58
	Write (without verification)	T = 1.8 N + 56
High-speed mode (See note.)	Read	T = 1.0 N + 29
	Write (with verification)	T = 1.8 N + 51
	Write (without verification)	T = 1.5 N + 47

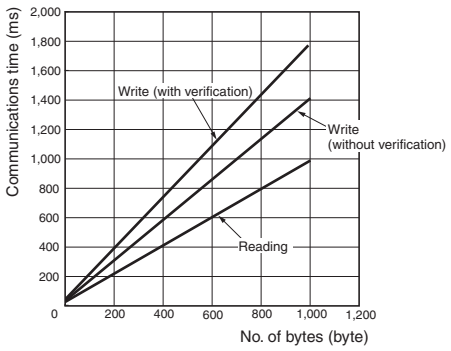
Note: When using multi-access or FIFO communications options, normal-mode communications speed will be used regardless of the high-speed mode setting.

Note: The high-speed mode cannot be used when SW1-1 on the V680-H01-V2 Antenna is turned ON.

Communications speed: Normal mode



Communications speed: high-speed mode

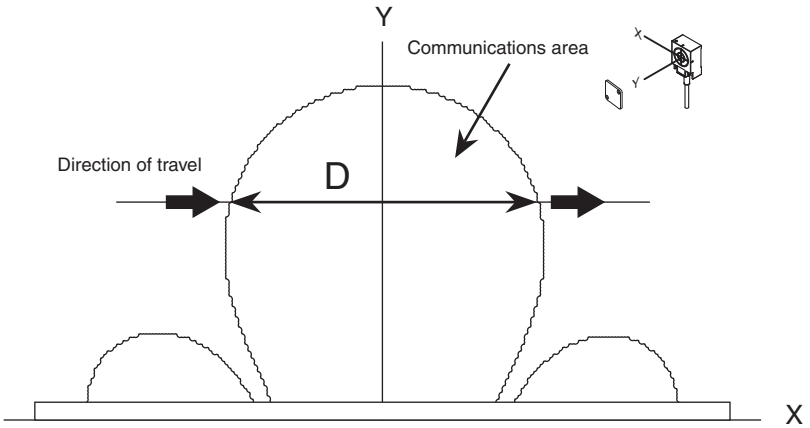


Calculating Tag Speed

When communicating with a moving Tag, specify an AUTO command or POLLING command.
The maximum speed for communicating with the Tag can be calculated simply using the following formula.

$$\text{Maximum speed} = \frac{\text{D (Distance travelled in communications area)}}{\text{T (Communications time)}}$$

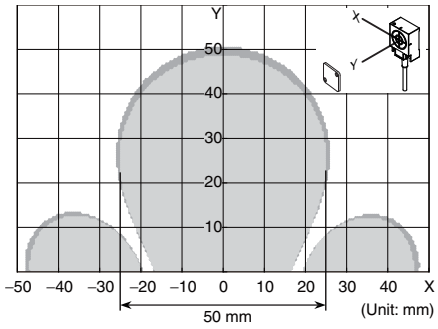
D (Distance travelled in communications area) is calculated from the actual measurement or the communications area between the Antenna and Tag.



Unit: mm

Calculation Example

In this example diagram, the V680-D1KP66T, V680-HA63A, and V680-HS63 are combined and 256 bytes are read.



This diagram shows the following:
Distance travelled in communications area (D) = 50 mm when Y (communications distance) = 20 mm
Communications time, T = 1.3N +31 = 1.3 × 256 + 31 = 363.8 (ms)
Accordingly, the movement speed in this case will be as follows:

$$\frac{\text{Distance travelled in communications area}}{\text{Communications time}} = \frac{50\ (\text{mm})}{363.8\ (\text{ms})}$$

$$= 8.24\ \text{m/min}$$

Note
1. The distance travelled in the communications area depends on the read/write distance and the axis offset. Refer to the diagrams in *Communications Area*.
2. The speed of the Tag is provided as a guideline. Before using the RFID System, run a test to determine the speed under actual operating conditions.
3. The above values do not take into account the processing of errors in communications with the host device or Tags.

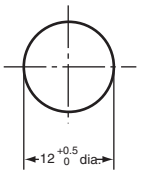
Section 4
Installation

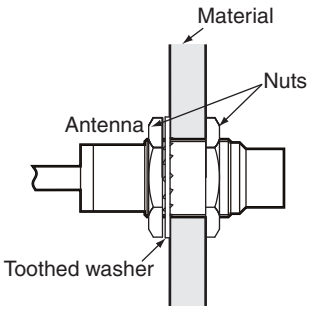
Installing Antennas

V680-HS51

Install the Antenna using the nuts and toothed washers that are provided on both sides of the mounting material, as shown in the diagram below.

Mounting Hole Dimensions





CHECK!

Securely tighten the screws to a maximum torque of 6 N·m.

V680-HS52

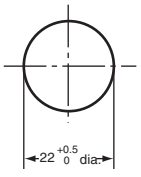
Install the Antenna using the nuts and toothed washers that are provided on both sides of the mounting material, as shown in the diagram below.

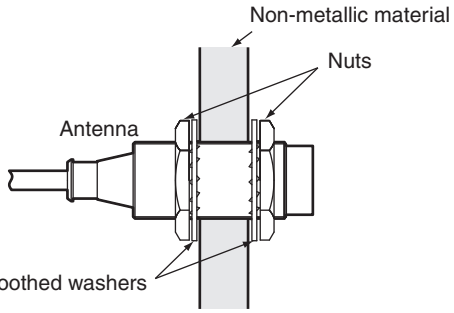
CHECK!

When the Antenna is mounted to a metal object, the communications distance will be reduced by approximately 10% compared with mounting to a non-metallic object. For details on the effect of metal surrounding the Antenna, refer to *Effect of Surrounding Metals on the Antenna (Reference)* on page 61.

P.61

Mounting Hole Dimensions



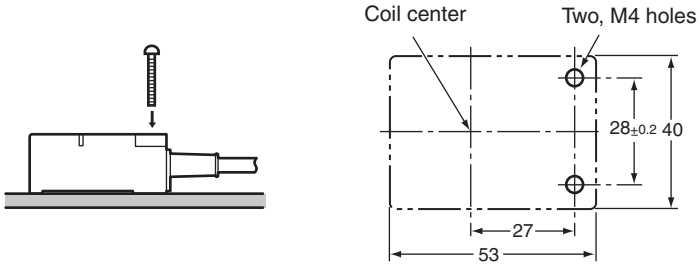


CHECK!

Securely tighten the screws to a maximum torque of 40 N·m.

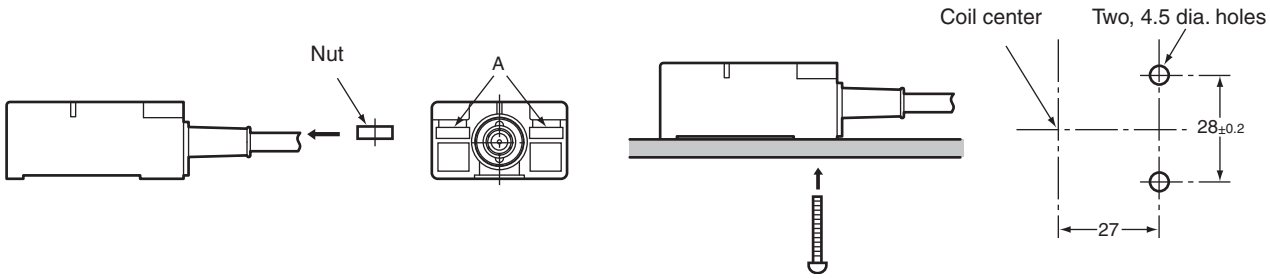
V680-HS63

■ Installation from the Front



■ Installation from the Back

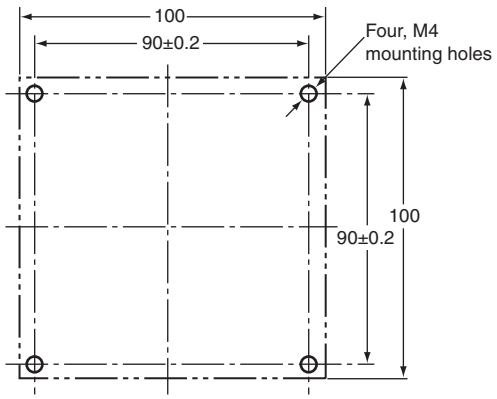
Insert the nuts that come with the Antenna into sections A.



CHECK!

Securely tighten screws to a maximum torque of 1.2 N·m.

V680-HS65



Use M4 screws and spring washers (in four places) for Antenna installation.

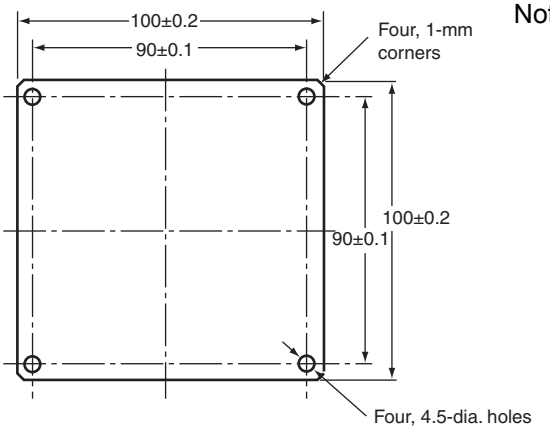
Tighten the screws to a torque of 0.7 to 1.2 N·m.

There are no restrictions on the mounting direction or the direction of access to the Tag, but if the Antenna is to be installed near a device such as a conveyance belt, make sure there is no danger of the Antenna being accidentally struck.

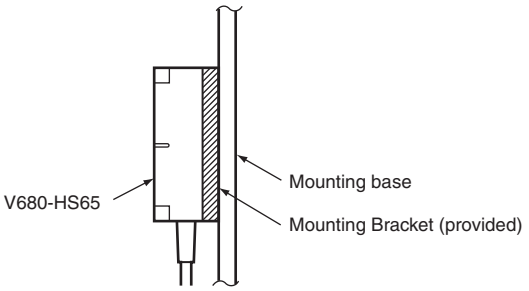
CHECK!

Securely tighten screws to a torque of 0.7 to 1.2 N·m.

■ Mounting Bracket Dimensions (Provided Only with the V680-HS65)

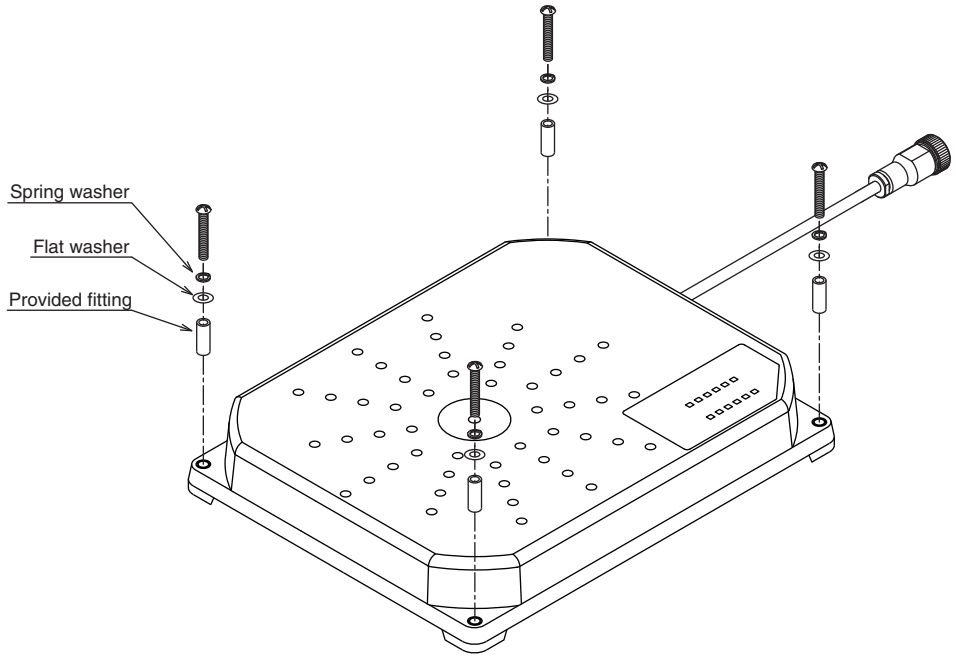


Note: When installing the Antenna, mount it on the enclosed Mounting Bracket. The Mounting Bracket is not necessary, however, if the Antenna is mounted on a metal base that is larger than the Antenna (100 × 100 mm).

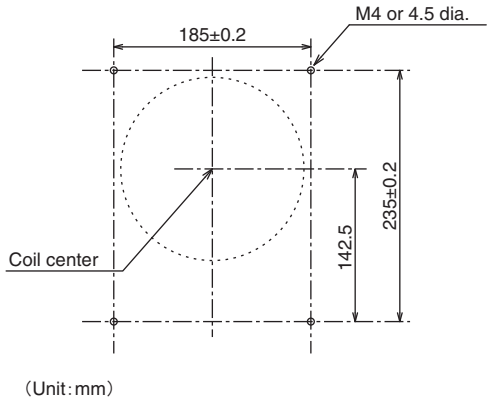


V680-H01-V2

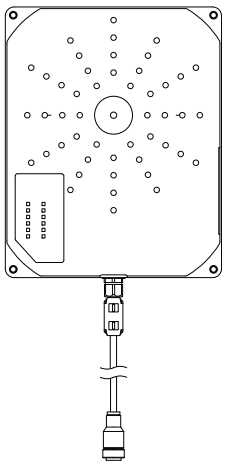
Be sure to insert the provided fittings into the Antenna mounting holes and mount the Antenna with four M4 screws with spring washers and flat washers as shown below.



Mounting Hole Dimensions



(Unit: mm)



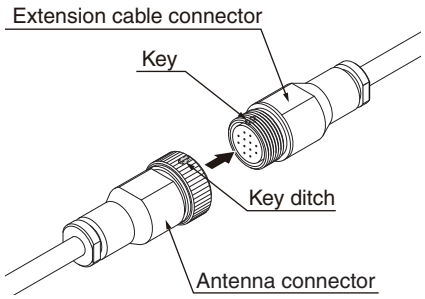
CHECK!

Securely tighten screws to a maximum torque of 1.2 N·m.

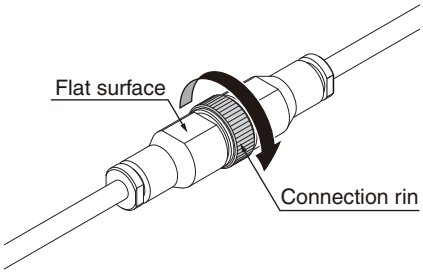
■ Connecting and Disconnecting Extension Cables

▪ Mounting the Antenna

1. Align the key on the extension cable connector with the key slot on the Antenna connector and push the connector all the way in.

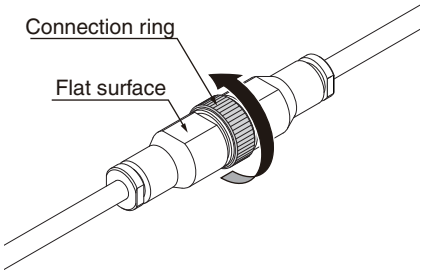


2. Hold the flat surfaces on the Antenna connector with a wrench, and turn the connection ring clockwise to secure the connector

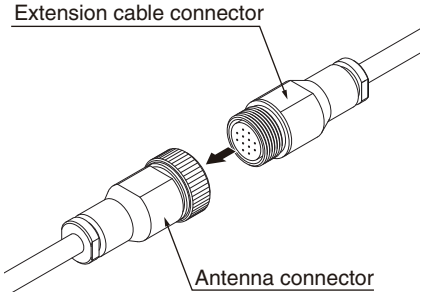


▪ Removing the Antenna

3. Hold the flat surfaces on the Antenna connector with a wrench, and turn the connection ring counterclockwise to loosen the connector.



4. Make sure that the connection ring is sufficiently loose, and then pull the connector straight out.



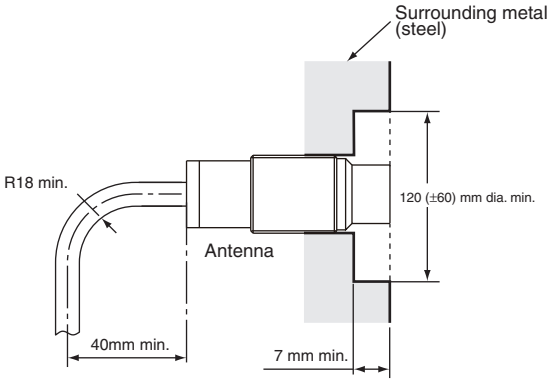
CHECK! When loosening the connection ring, always hold the flat surfaces on the Antenna connector with a wrench. If the connection ring is loosened without holding the Antenna connector, the extension cable may be damaged or wire inside the extension cable may break.

CHECK! The connector cannot be pulled out without first loosening the connection ring. Completely loosen the connection ring before pulling out the connector. Pulling on the cable without sufficiently loosening the connection ring may cause the cable to be damaged or wire inside the cable may break.

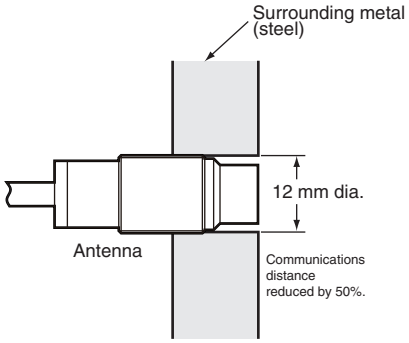
Effect of Surrounding Metals on the Antenna (Reference)

■ V680-HS51

When embedding the Antenna in metal, be sure the metal does not extend beyond the tip of the Antenna.



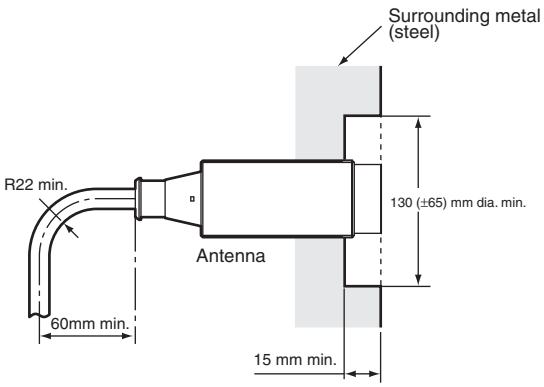
Do not bend the cable into a curve tighter than 18 mm in radius.



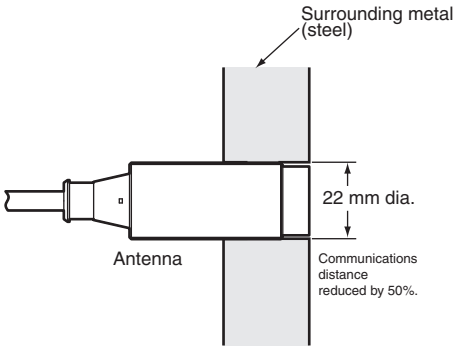
If the metal around the Antenna reaches the coil surface, the communications distance will be reduced significantly compared with mounting to a non-metallic surface.

■ V680-HS52

When embedding the Antenna in metal, be sure the metal does not extend beyond the tip of the Antenna.



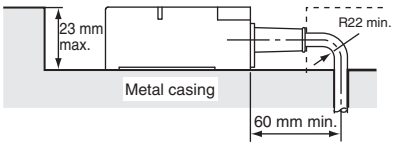
Do not bend the cable into a curve tighter than 22 mm in radius.

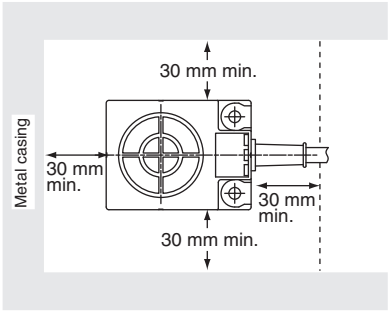


If the metal around the Antenna reaches the coil surface, the communications distance will be reduced significantly compared with mounting to a non-metallic surface.

■ V680-HS63

In addition to surface mounting, it is also possible to embed the V680-HS63 in a metal casing to protect it from being struck by other objects. To prevent malfunctioning, allow a space of at least 30 mm between the Antenna and the sides of the metal casing. If the space is less than 30 mm, the read/write distance will be greatly diminished. In addition, the height of metal casing must not exceed that of the Antenna.

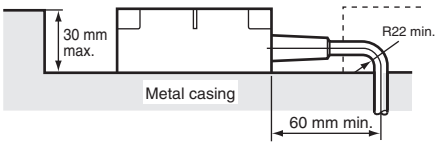


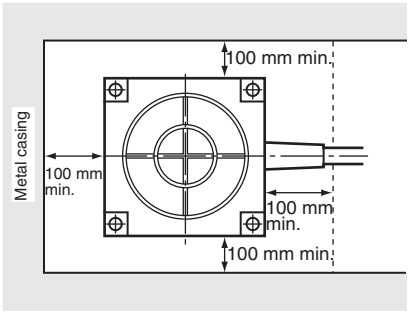


Note
1. Do not bend the cable into a curve tighter than 22 mm in radius.
2. The communications distance will be reduced significantly if the Antenna is installed closer than 30 mm to metal surfaces.

■ V680-HS65

In addition to surface mounting, it is also possible to embed the V680-HS65 in a metal casing to protect it from being struck by other objects. To prevent malfunctioning, allow a space of at least 100 mm between the Antenna and the sides of the metal casing. If the space is less than 100 mm, the read/write distance will be greatly diminished. In addition, the height of metal casing must not exceed that of the Antenna.





Note
1. Do not bend the cable into a curve tighter than 22 mm in radius.
2. The communications distance will be reduced significantly if the Antenna is installed closer than 100 mm to metal surfaces.

■ V680-H01-V2

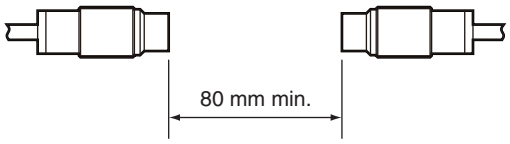
If the Antenna is mounted to a metal object, the communications area will be reduced by approximately 10%compared with mounting to a non-metal object. Consider this influence on performance when mounting the Antenna.

Mutual Interference between Antennas (Reference)

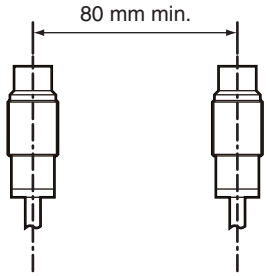
To prevent malfunctioning due to mutual interference when using more than one Antenna, leave sufficient space between them as shown in the following diagrams.

■ V680-HS51

• Installing the Antennas Facing Each Other

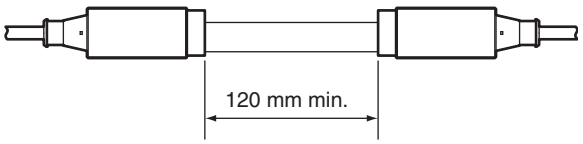


• Installing the Antennas in Parallel

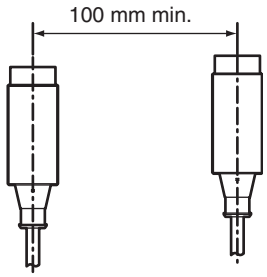


■ V680-HS52

• Installing the Antennas Facing Each Other

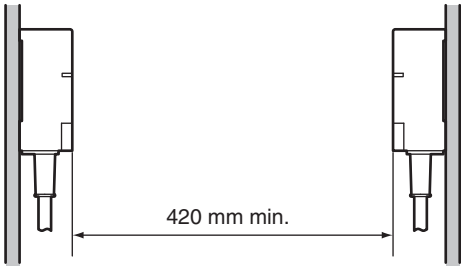


• Installing the Antennas in Parallel

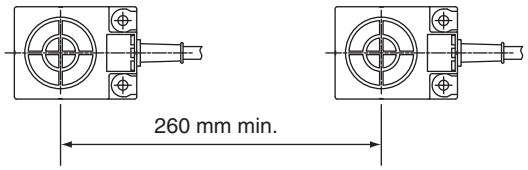


■ V680-HS63

• Installing the Antennas Facing Each Other

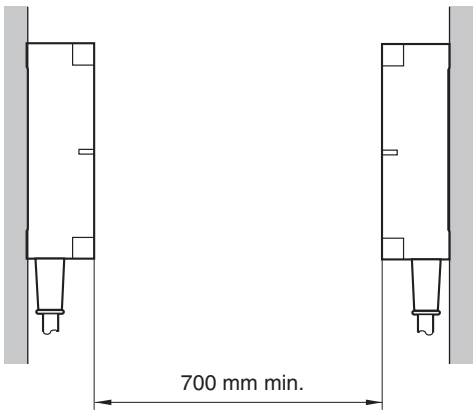


• Installing the Antennas in Parallel

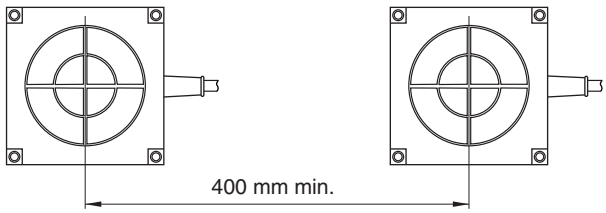


■ V680-HS65

• Installing the Antennas Facing Each Other



• Installing the Antennas in Parallel



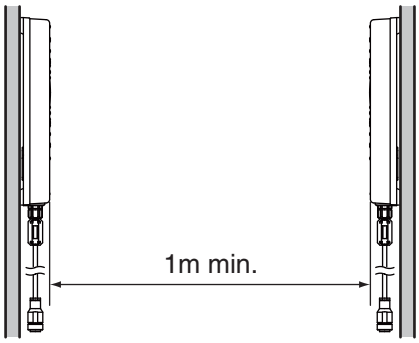
■ V680-H01-V2

When installing multiple Read/Write Antennas adjacently, make sure that the Antenna communications area do not overlap.

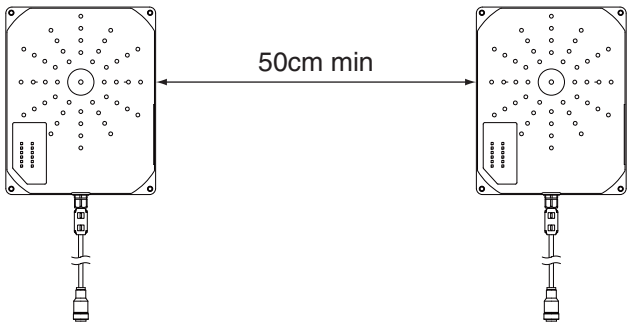
For details on the Antenna communications area, refer to Communications Area (Reference).

As a guide, the following diagrams show the minimum distances required between two Antennas installed facing each other or in parallel. Be sure to provide the distance between Antennas shown here.

• Installing the Antennas Facing Each Other



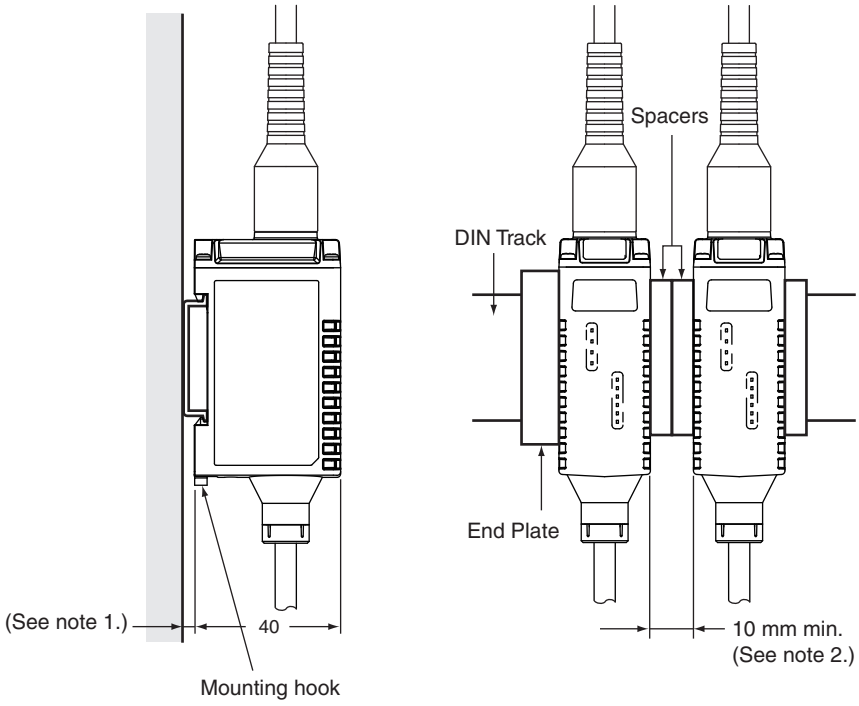
• Installing the Antennas in Parallel



Mounting Amplifiers

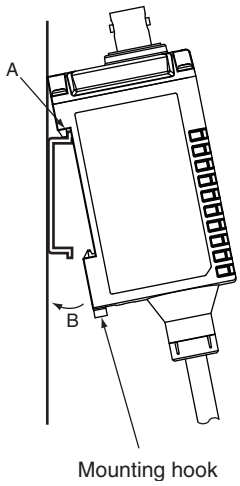
V680-HA63A

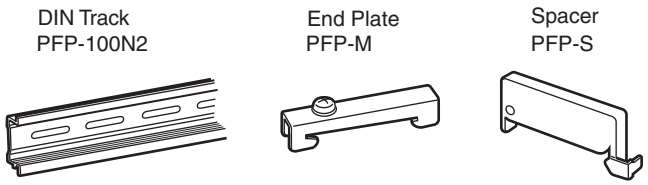
■ Mounting to DIN Track



Note 1. Consider the height of the DIN Track.

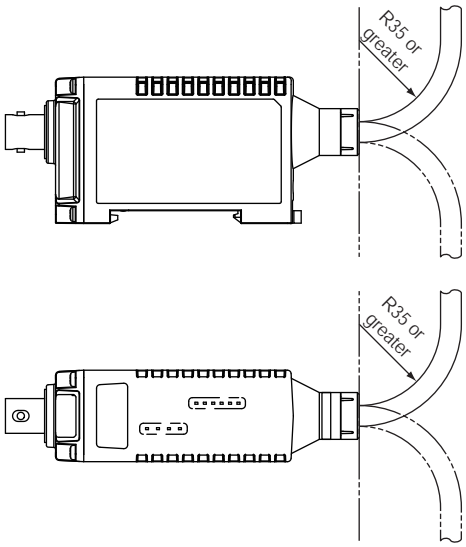
2. Provide a space of at least 10 mm (i.e., at least two spacers) and attach them securely.





1. When mounting the Amplifier to a DIN Track, first hook section A to the Track and then press in direction B.
2. To remove the Amplifier from the DIN Track, first pull out the mounting hook.

Amplifier Cable Bending Radius

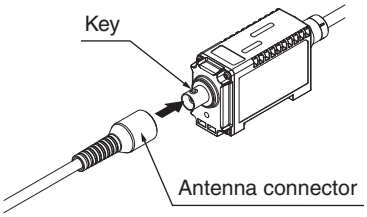


Do not bend the cable past a bending radius of 35 mm.

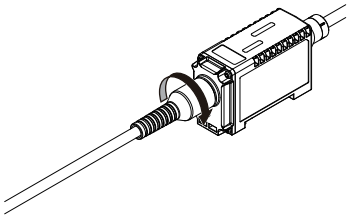
Attaching/Removing Amplifire and Antenna Connectors

■ Attaching the Connector

1. Hold the Antenna connector, align the key, and insert the connector into the Amplifier connector.

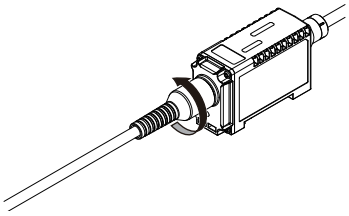


2. Turn the connector clockwise to lock it in place.

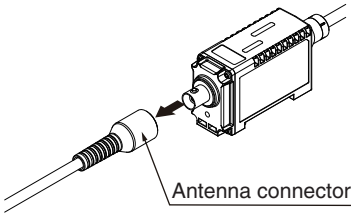


■ Removing the Connector

1. Turn the connector counterclockwise to release the lock.



2. Pull the Antenna connector straight out.



CHECK!

The connector will not come out unless the lock is first released by turning the connector. To remove the cable, release the lock and pull on the connector. Pulling the cable without releasing the lock may break or damage the cable.

CHECK!

Do not pull the Antenna connector over the power of 30 N.
The Antenna connector may be broken.

Installing Tags

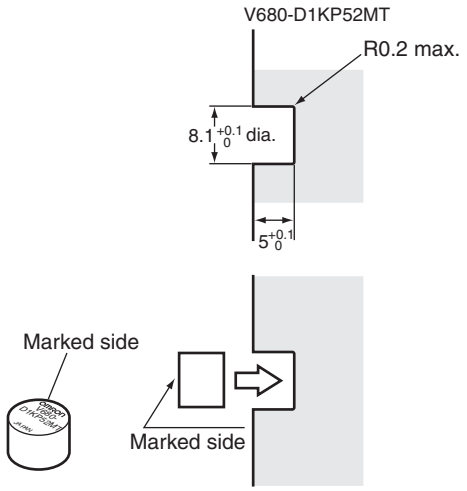
V680-D1KP52MT

■ Tag Installation Direction

Mount Tags as shown in the diagram on the right.

The epoxy adhesives listed in the following table are recommended for the given temperature ranges.

Ambient operating temperature	Product name	Manufacturer
–40 to 70°C	Two-part Epoxy-compound Resin: TB2001 (main agent)/ TB2105C (curing agent)	Three Bond Co., Ltd.
	One-part Moisture-curing Elastic Adhesive TB1530	Three Bond Co., Ltd.
–40 to 150°C	One-part Epoxy Resin: TB2285	Three Bond Co., Ltd.
	Two-part Epoxy Resin: TB2087	Three Bond Co., Ltd.



CHECK!

When embedding the V680-D1KP52MT into a metal surface, use the V680-HS52 Antenna.
Transmission will not be possible if the V680-HS63 Antenna is used.

■ Differences in Surrounding Metals

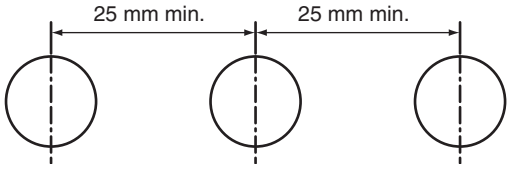
Communications distances are affected by the type of metal in back of or surrounding the Tag, as shown in the following table.

	Steel	SUS	Brass	Aluminum
V680-D1KP52MT	100%	85% to 90%	80% to 85%	80% to 85%

The values for steel are set to 100%

■ Mutual Interference with Tags (Reference)

Provide the mounting distances indicated below to prevent malfunctions due to mutual interference when using more than one Tag.



■ Influence of Angle (Reference)

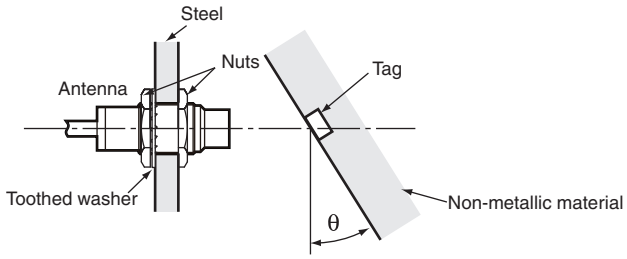
Install Antennas and Tags as close to parallel to each other as possible. Communications are possible even when an Antenna and a Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP52MT**

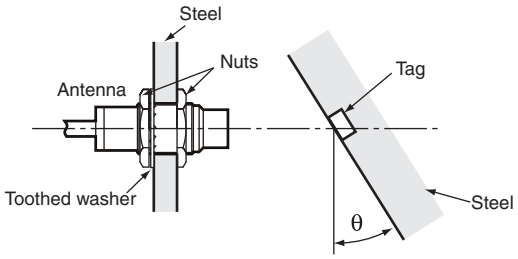
	Tag angle (θ°)				
	0	10	20	30	40
V680-HS51 and V680-D1KP52MT	0%	-1%	-5%	-10%	-15%
V680-HS51 and V680-D1KP52MT (Metal: Steel)	0%	0%	0%	-4%	-28%
V680-HS52 and V680-D1KP52MT	0%	0%	0%	-2%	-6%
V680-HS52 and V680-D1KP52MT (Metal: Steel)	0%	-6%	-13%	-25%	-
V680-HS63 and V680-D1KP52MT	0%	-2%	-5%	-9%	-14%

-: The measurement is no possible because the Tag comes in contact with the Antenna.

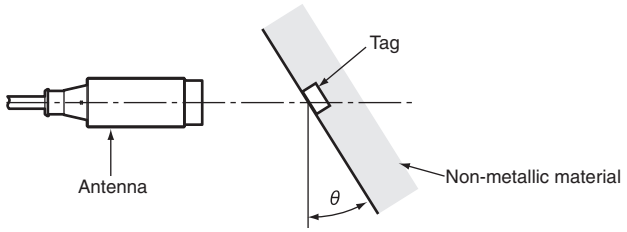
• V680-HS51 and V680-D1KP52MT



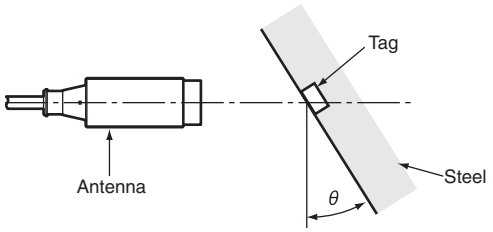
• V680-HS51 and V680-D1KP52MT (Metal: Steel)



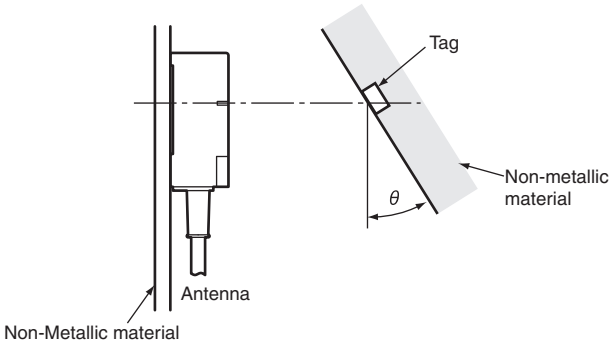
• V680-HS52 and V680-D1KP52MT



• V680-HS52 and V680-D1KP52MT (Metal: Steel)



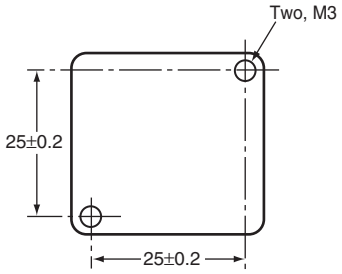
• V680-HS63 and V680-D1KP52MT



V680-D1KP66T

■ Tag Installation Direction

Secure the Tag with M3 screws. Tighten the screws to a torque of 0.6 N·m or less..

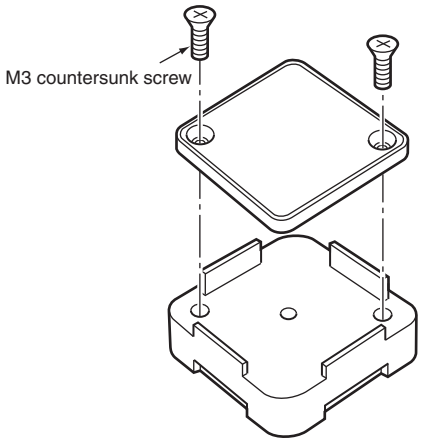


■ Effect of Metal behind Tags (Reference)

The V680-D1KP66T communications distance is reduced if there is any metal material behind the Tag. If the Tag is to be mounted to metal, then either use a V600-A86 Attachment (sold separately) or insert a non-metal spacer (such as plastic or resin). The relationship between the distance from the Tag to the metal surface and the communications distance is shown below.

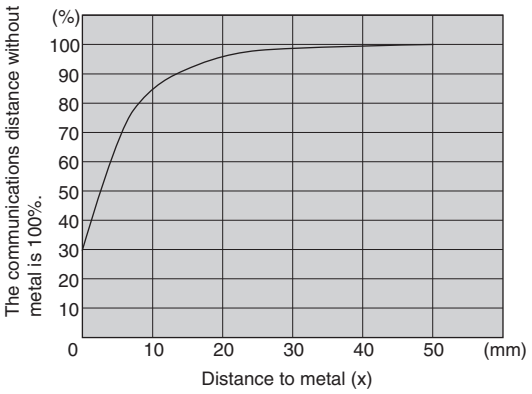
The Attachment is 10 mm thick, and more than one Attachment can be stacked.

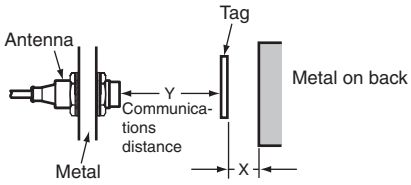
V600-A86 Attachment Installation



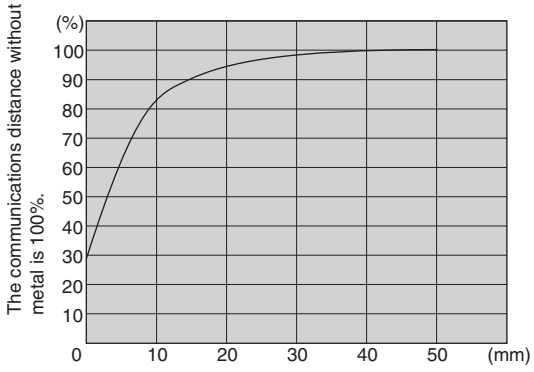
Install so that the mounting holes are aligned.

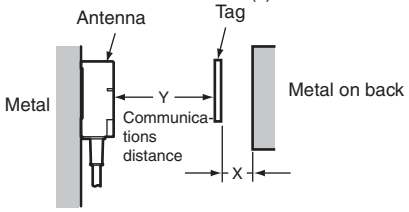
● V680-HS52 and V680-D1KP66T



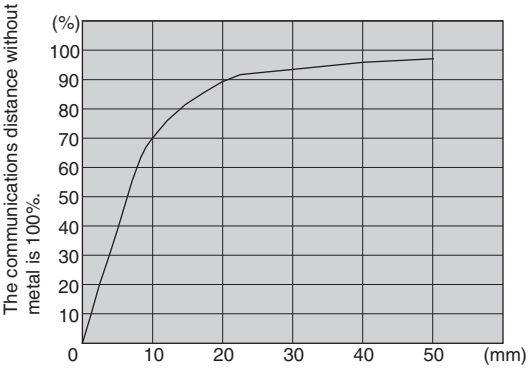


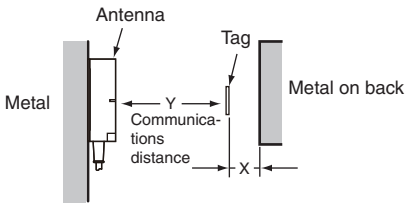
● V680-HS63 and V680-D1KP66T





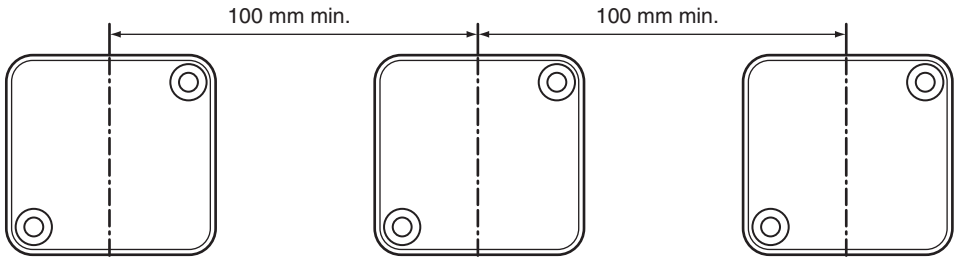
● V680-HS65 and V680-D1KP66T





■ Mutual Interference with Tags (Reference)

To prevent malfunctioning due to mutual interference when using more than one Tag, leave sufficient space between them as shown in the following diagram.



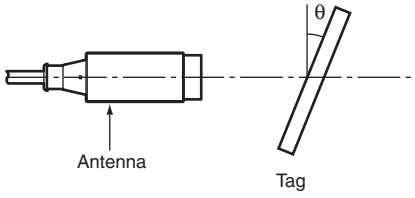
■ Influence of Tag Angle (Reference)

Install Antennas and Tags as close to parallel to each other as possible. Communications are possible even when an Antenna and a Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

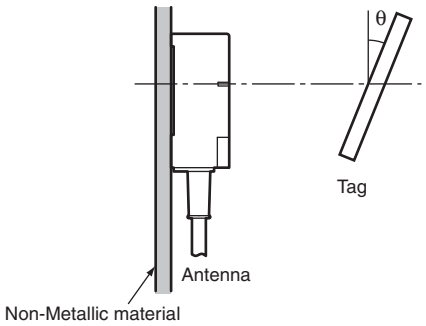
▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP66T**

	Tag angle (θ°)				
	0	10	20	30	40
V680-HS52 and V680-D1KP66T	0%	-1%	-2%	-4%	-7%
V680-HS63 and V680-D1KP66T	0%	-2%	-3%	-5%	-9%
V680-HS65 and V680-D1KP66T	0%	-1%	-3%	-6%	-11%

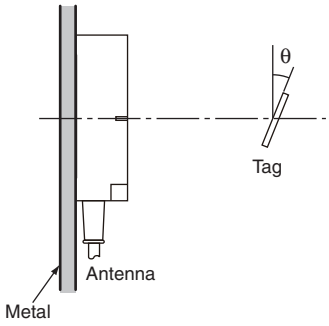
• V680-HS52 and V680-D1KP66T



• V680-HS63 and V680-D1KP66T



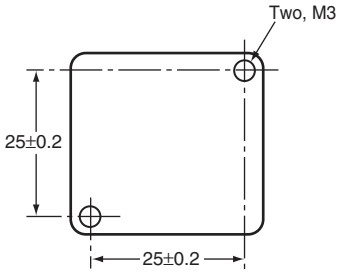
• V680-HS65 and V680-D1KP66T



V680-D1KP66MT

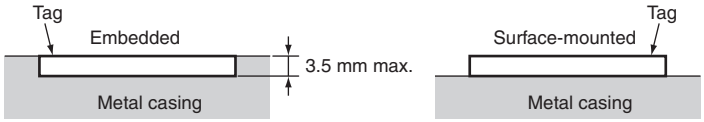
■ Tag Installation Direction

Mount the V680-D1KP66MT to a metal surface, and secure the Tag with M3 screws. Tighten the screws to a torque of 0.6 N·m or less.

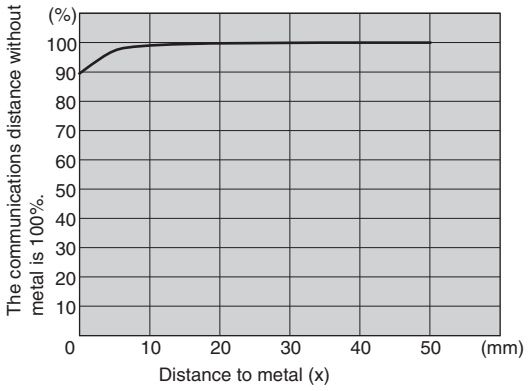


■ Effect of Surrounding Metals

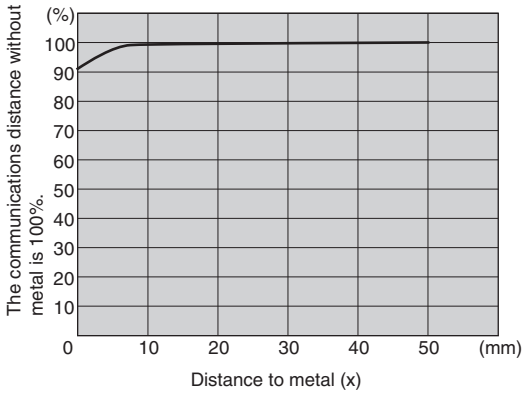
The V680-D1KP66MT can be surface-mounted or it can be embedded in metal. If it is embedded in metal, the height of the metal casing must not exceed that of the Tag.



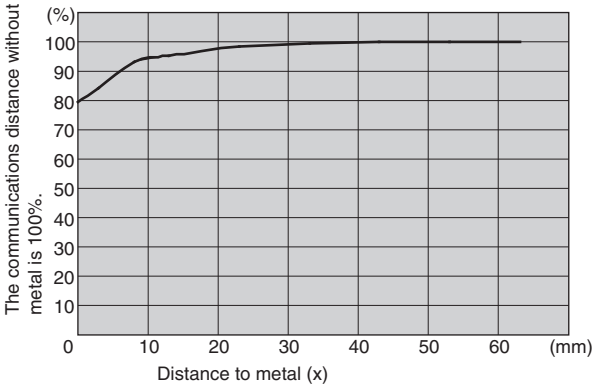
● V680-HS52 and V680-D1KP66MT

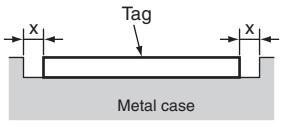


● V680-HS63 and V680-D1KP66MT



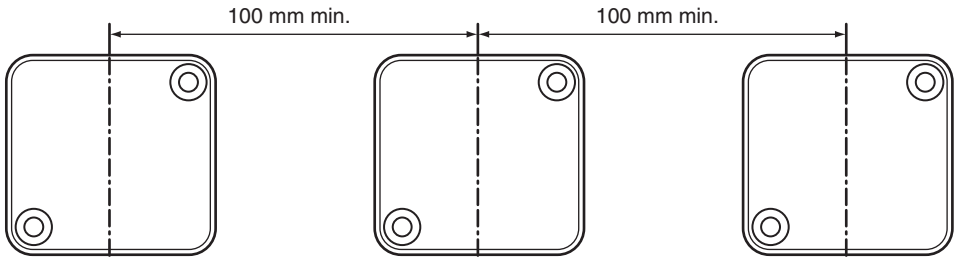
● V680-HS65 and V680-D1KP66MT





■ Mutual Interference with Tag (Reference)

To prevent malfunctioning due to mutual interference when using more than one Tag, leave sufficient space between them as shown in the following diagram.



■ Influence of Tag Angle (Reference)

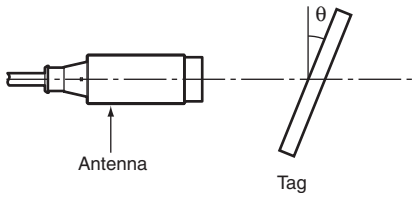
Install Antennas and Tags as close to parallel to each other as possible. Communications are possible even when an Antenna and a Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP66MT**

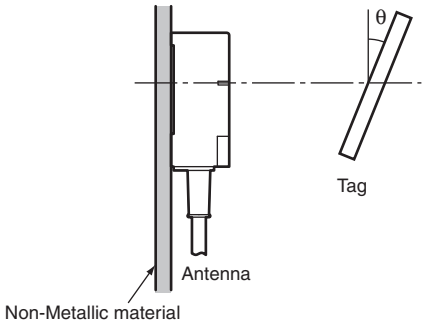
	Tag angle (θ°)				
	0	10	20	30	40
V680-HS52 and V680-D1KP66MT (Metal: Steel)	0%	-1%	-2%	-5%	-9%
V680-HS63 and V680-D1KP66MT (Metal: Steel)	0%	-1%	-4%	-7%	-13%
V680-HS65 and V680-D1KP66MT (Metal: Steel)	0%	-1%	-6%	-15%	-

-: The measurement is no possible because the Tag comes in contact with the Antenna.

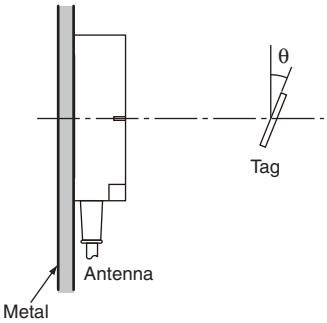
• V680-HS52 and V680-D1KP66T (Metal: Steel)



• V680-HS63 and V680-D1KP66T (Metal: Steel)



• V680-HS65 and V680-D1KP66T (Metal: Steel)

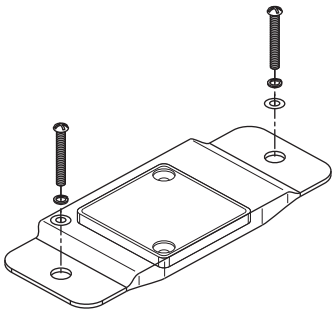


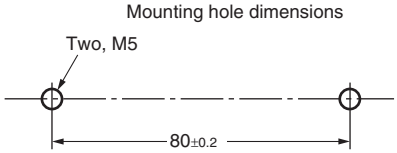
V680-D1KP66T-SP

■ Tag Installation Direction

Mount the ID Tags with M5 screws and washers.Tightening torque: 1.2 N.m.

There are no restrictions to the mounting direction of the ID Tags or the direction of movement for Antennas.

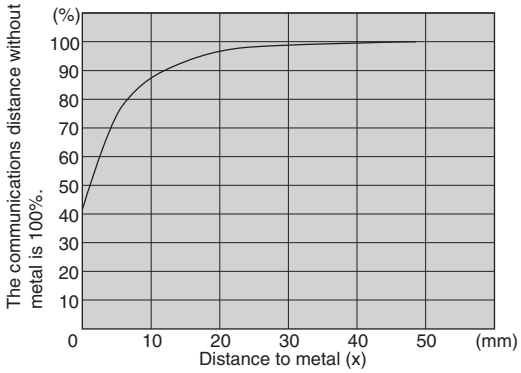


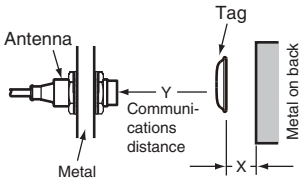


■ Effect of Metal behind Tags (Reference)

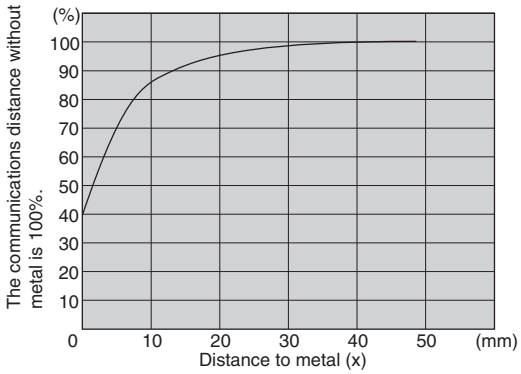
Mounting ID Tags to metal workpieces or palettes will affect the communications capabilities. Place non-metallic parts (e.g., plastic or resin) between the metallic parts by referring to the following relationship between the distance between the ID Tag and the metallic body versus the communications distance.

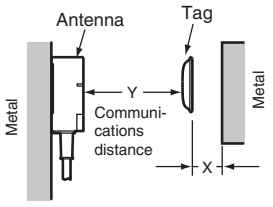
● V680-HS52 and V680-D1KP66T-SP



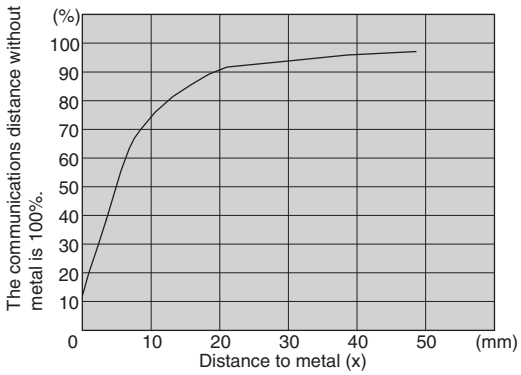


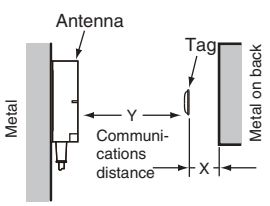
● V680-HS63 and V680-D1KP66T-SP





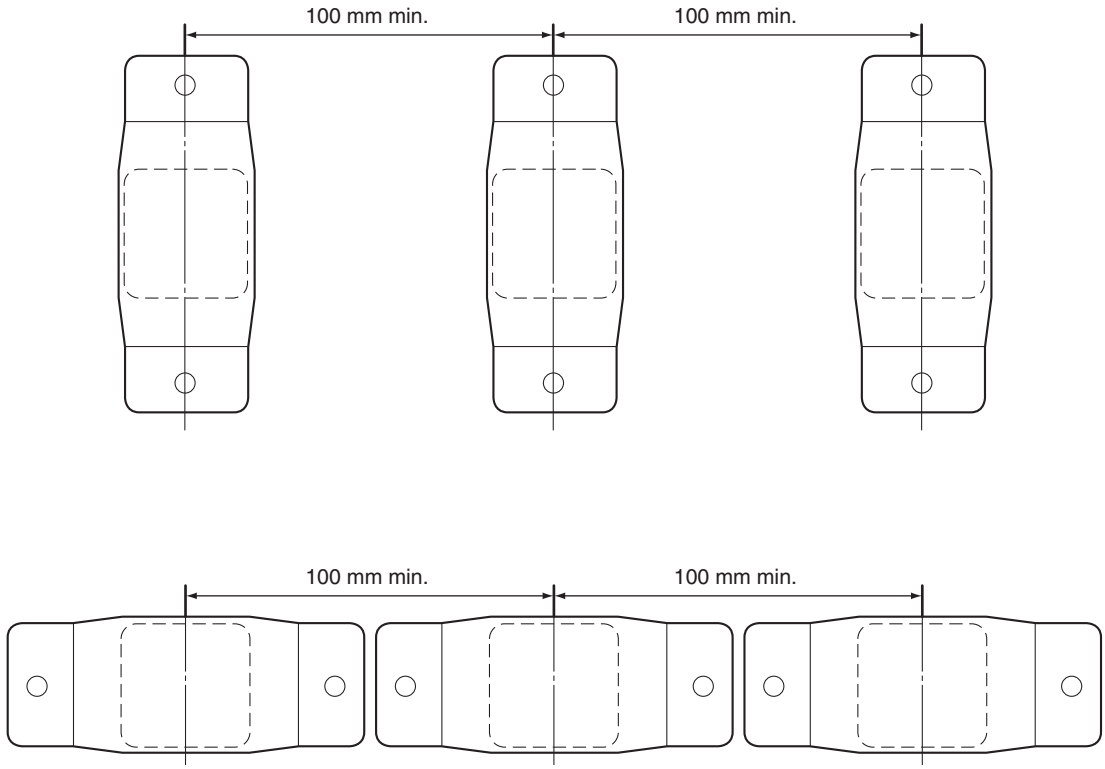
● V680-HS65 and V680-D1KP66T-SP





■ Mutual Interference with Tag (Reference)

To prevent malfunctioning due to mutual interference when using more than one Tag, leave sufficient space between them as shown in the following diagram.



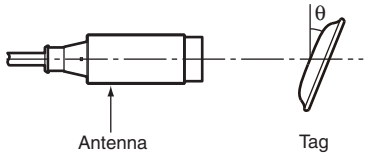
■ Influence of Tag Angle (Reference)

Install Antennas and Tags as close to parallel to each other as possible. Communications are possible even when an Antenna and a Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

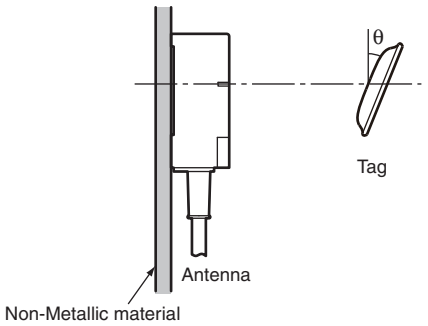
▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP66T-SP**

	Tag angle (θ°)				
	0	10	20	30	40
V680-HS52 and V680-D1KP66T-SP	0%	-1%	-2%	-4%	-7%
V680-HS63 and V680-D1KP66T-SP	0%	-2%	-3%	-5%	-9%
V680-HS65 and V680-D1KP66T-SP	0%	-1%	-3%	-6%	-11%

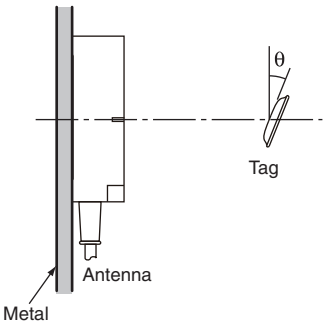
• V680-HS52 and V680-D1KP66T-SP



• V680-HS63 and V680-D1KP66T-SP



• V680-HS65 and V680-D1KP66T-SP



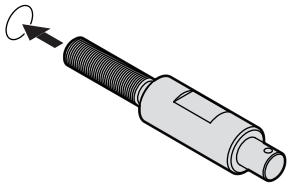
V680-D1KP58HT

■ Tag Installation Direction

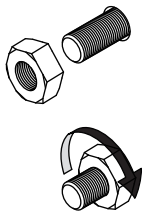
The Tags have a limited life span. Therefore, install them in locations in which they can be easily replaced. Use the following procedure to mount the V680-A80 Attachment when required.

1. Mount the Attachment to the workpiece.

CHECK! Use a tightening torque of 21 to 42 N·m.

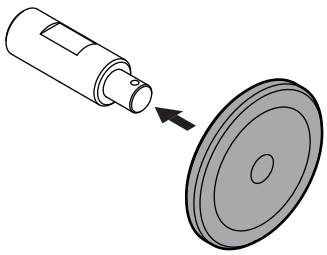


2. Tighten the lock nut.

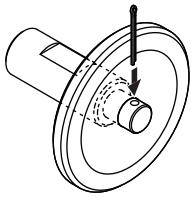


3. Mount the Tag to the Attachment.

CHECK! The Tag can be mounted in either direction.



Insert the split pin into the 3.2-dia. hole and open the tip of the pin to secure.



CHECK! Two nuts and one split pin are provided with the V680-A80 Attachment. Replacement split pins must be provided by the user.

Split pin	Nominal: 3.2 mm × 20 mm (length)

■ Influence of Metal Behind Tag (Reference)

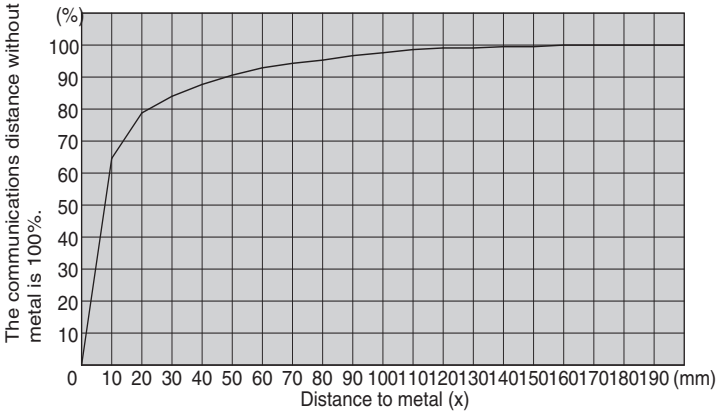
Take the influence of metal behind Tags into consideration when mounting them.

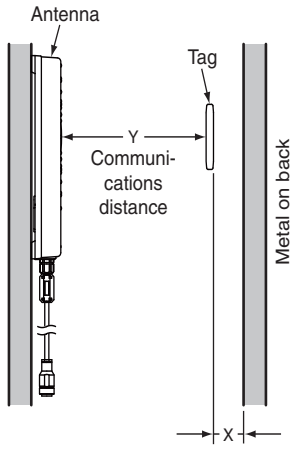
The communications distance is adversely affected if there is any metal material around the Tag. The degree of influence depends on the type, size, and shape of the material around the Tag. The following graphs show the influence of metal objects behind the Tag for reference.

• Influence of Metal

The following diagram shows the rate of reduction in the communications distance when metal is located behind the Tag. The horizontal axis in the diagram indicates the distance between the Tag and the metal plate, and the vertical axis indicates the relative communications distance at 100% without a metal plate, i.e, the rate of reduction in communications distance.

● V680-H01-V2 and V680-D1KP58HT



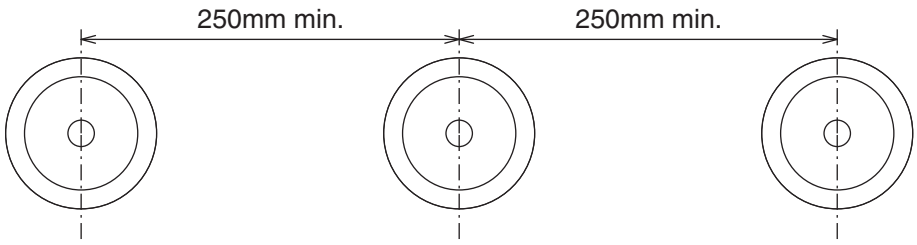


Material: Steel (t = 1.5 mm)

Shape: 295 mm × 295 mm

■ Mutual Interference with Tag (Reference)

Provide the mounting distances indicated below to prevent malfunctions due to mutual interference when using multiple Tags.



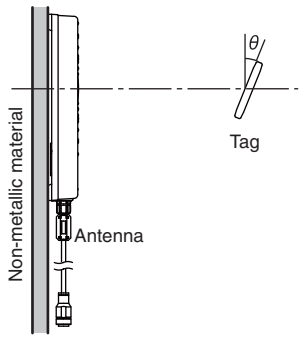
■ Influence of Tag Angle (Reference)

The maximum communications distance can be obtained when the Antenna and Tag are installed in parallel. When the Tag is installed on an angle, the communications distance is reduced. Consider the effect of the Tag angle when installing the Tag. As reference data, the following diagram shows the rate of reduction in communications distance according to the Tag angle. The horizontal axis indicates the angle when the Tag surface and Antenna surface are in parallel at 0°. The vertical axis indicates the relative communications distance when the angle is 0° at 100%, i.e., the rate in reduction of the communications distance.

▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP58HT**

	Tag angle (θ°)								
	0	10	20	30	40	50	60	70	80
V680-H01-V2 and V680-D1KP58HT	0%	-2%	-5%	-10%	-15%	-20%	-30%	-40%	-60%

• V680-H01-V2 and V680-D1KP58HT



Section 5
Chemical Resistance

Chemical Resistance of the Antennas

Applicable Models

V680-HS51 V680-HS52-W/R V680-HS63-W/R V680-HS65-W/R V680-H01-V2

ABS resin is used for case material and epoxy resin for filling material. Refer to the following lists and do not use chemicals that affect ABS and epoxy resin.

■ Chemicals That Cause Deformations, Cracks, Etc.

ABS resin	Epoxy resin
Trichlene, acetone, xylene, toluene, gasoline, creosol, methylene chloride, phenol, cyclohexane, aqua regia, chromic acid, sulfuric acid (90% RT), methyl ethyl ketone, aniline, nitrobenzine, monochlorobenzine, pyridine, nitric acid (60% RT), formic acid (80% RT)	Aqua regia, chromic acid, sulfuric acid (90% RT), nitric acid (60% RT), ammonia solution, acetone, methylene chloride, phenol

■ Chemicals That May Cause Discoloration, Swelling, Etc.

ABS resin	Epoxy resin
Hydrochloric acid, alcohol, Freon, sodium hydroxide, hydrogen peroxide, benzine, sulfuric acid (10% RT), nitric acid (10% RT), phosphoric acid (85% RT), ammonia solution	Sulfuric acid (10% RT), nitric acid (10% RT), hydrochloric acid (30% RT), acetic acid (50% RT), oxalic acid, calcium hydroxide, benzine, creosol, alcohol, cyclohexane, toluene, xylene, benzine, grease

■ Chemicals That Do Not Affect ABS Resin or Epoxy Resin

ABS resin	Epoxy resin
Ammonia, kerosine, mineral oil, developer, Yushiroken S50, Chemi-Cool Z, Velocity No. 3, Yushiroken EEE-30Y, petroleum, grease, acetic acid, oxalic acid, calcium hydroxide, phosphoric acid (30% RT), hydrochloric acid (10% RT), potassium hydroxide	Ammonia, hydrochloric acid (10% RT), potassium hydroxide, petroleum, gasoline, Yushiroken S50, Chemi-Cool Z, Velocity No. 3, Yushiroken EEE-30Y

Note: The above results are from tests conducted a room temperature (23°C). Even if the chemicals do not affect the ABS or epoxy resins at room temperature, they may affect the resins at higher or lower temperatures. Check the chemicals carefully in advance.

Chemical Resistance of Tags

Applicable Model

V680-D1KP52MT

PPS resin is used for case material and epoxy resin for filling material. Refer to the following lists and do not use chemicals that affect PPS and epoxy resin.
Tags cannot be used in applications with explosion-proof specifications.

■ Chemicals That Cause Deformations, Cracks, Etc.

PPS resin	Epoxy resin
Aqua regia	Aqua regia, chromic acid, sulfuric acid (90% RT), nitric acid (60% RT), ammonia solution, acetone, methylene chloride, phenol

■ Chemicals That May Cause Discoloration, Swelling, Etc.

PPS resin	Epoxy resin
Nitric acid (60% RT)	Sulfuric acid (10% RT), nitric acid (10% RT), hydrochloric acid (30% RT), acetic acid (50% RT), oxalic acid, calcium hydroxide, benzine, creosol, alcohol, cyclohexane, toluene, xylene, benzine, grease

■ Chemicals that Do Not Affect PPS Resin or Epoxy Resin

PPS resin	Epoxy resin
Hydrochloric acid (37%RT), sulfuric acid (98%RT), nitric acid (40%RT), Hydrogen fluoride solution (40%RT), chromic acid (40%RT), hydrogen peroxide (28%RT), sodium hydroxide solution (60%RT), ammonia solution (28%RT), sodium chloride (10%RT), sodium carbonate (20%RT), sodium hypochlorite, phenol solution (5%RT), glacial acetic acid, acetic acid, oleic acid, Methyl alcohol (95%RT), ethyl alcohol (95%RT), Ethyl acetate, sebacic acid, diethylhexyl, acetone, diethyl ether, n-heptane, 2-2-4 trimethylpentane, benzine, toluene, aniline, mineral oil, gasoline, insulating oil, dichloroethylene, carbon tetrachloride	Ammonia, hydrochloric acid (10% RT), potassium hydroxide, petroleum, gasoline, Yushiroken S50, Chemi-Cool Z, Velocity No. 3, Yushiroken EEE-30Y, methyl ethyl ketone, sodium hydroxide (10%RT)

Note: The above results are from tests conducted a room temperature (23°C). Even if the chemicals do not affect the PPS or epoxy resins at room temperature, they may affect the resins at higher or lower temperatures. Check the chemicals carefully in advance.

Applicable Models

V680-D1KP66T/66MT V680-D1KP58HT

PPS resin is used for case material. Refer to the following lists and do not use chemicals that affect PPS and epoxy resin.

Chemical		At room temperature	At 90°C
Hydrochloric acid	37%	A	A
	10%	A	A
Sulfuric acid	98%	A	B
	50%	A	A
	30%	A	A
	3%	A	A
Nitric acid	60%	B	C
	40%	A	B
	10%	A	A
Hydrogen fluoride solution	40%	A	A
Chromic acid	40%	A	A
Hydrogen peroxide solution	28%	A	B
	3%	A	A
Sodium hydroxide solution	60%	A	A
	10%	A	A
	1%	A	A
Ammonia solution	28%	A	B
	10%	A	B
Sodium chloride	10%	A	A
Sodium carbonate	20%	A	A
	2%	A	A

Chemical		At room temperature	At 90°C
Sodium hypochlorite		A	A
Phenol solution	5%	A	A
Glacial acetic acid		A	A
Acetic acid		A	A
Oleic acid		A	A
Methyl alcohol	95%	A	A
Ethyl alcohol	95%	A	A
Ethyl acetate		A	A
Sebacic acid diethylhexyl		A	A
Acetone		A	A
Diethyl ether		A	A
n-heptane		A	A
2-2-4 trimethylpentane		A	A
Benzene		A	A
Toluene		A	A
Aniline		A	A
Mineral oil		A	A
Gasoline		A	A
Insulating oil		A	A
Dichloroethylene		A	A
Carbon tetrachloride		A	A

A: Has no adverse effect, B: May cause discoloration, swelling, etc., C: Causes deformation, cracks, etc.

CHECK!

The above table shows the extent of changes in PPS resin exposed to each chemical at room temperature and at 90°C. If actual chemicals, concentrations, and temperatures are different from those shown in the tables, always conduct tests under the actual conditions in which the Tags are to be used.

Applicable Models

V680-D1KP66T-SP

■ Chemical Resistance of Fluoroplastic PFA (Reference)

PFA: Tetrafluorethylene-Perfluoroalkylvinyletheir Copolymer

Fluoroplastic PFA does not react with most chemicals except molten alkali metal, hot pressurized fluorine (F_2), and some halogen derivatives. The following tables show the results of tests in which PFA was soaked in or exposed to commonly used organic and inorganic chemicals. In these tests, a compression-molded test piece (1.3 mm thick) was soaked in the chemical at a specified temperature for a week (168 houre) and taken out of the chemical, then the weight change, tensile strength, and elongation of the test piece were immediately measured. If the change in the tensile strength is 15 % or less, the cange in the elongation is 10 % or less, and the increase in the weight is less than 0.5 %, the results of the test can be considered normal.

If PFA is exposed to trichloroacetic acid, tri-n-butyl phosphate, perchloroethylene, carbon thtrachloride, and other liquids (which easily make resin surfaces wet) at a high temperature, it tends to increase its weight due to absorption and reduce its tensile strength. Even when PFA absorbs chemicals and solvents, its molecular structure will not change, If, however, PFA is subject to temperature or pressure changes or mechanical damage when it has absorbed chemicals, the chemicals will repeatedly expand and contract inside pfa, causing mechanical problems such as cracks and bulging. In fact, this problem occurs with any kind of plastic.

▪ Inorganic Chemicals

Chemical name	Test temperature (°C)	Resulting characteristics (%)		Weight increase rate (%)
		Tensile strength	Elongation	
concentrated hydrochloric acid	120	98	100	0.0
Concentrated sulfuric acid	120	95	98	0.0
Hydrofluoric acid (60%)	23	99	99	0.0
Fuming sulfuric acid	23	95	96	0.0
Aqua regia	120	99	100	0.0
Chromic acid (50%)	120	93	97	0.0
Consentrated nitric acid	120	95	98	0.0
Fuming nitric acid	23	99	99	0.0
Concentrated ammonia solution	66	98	100	0.0
Caustic soda (50%)	120	93	99	0.4
Hydrogen peroxide solution (30%)	23	93	95	0.0
Bromine	23	99	100	0.5
Chlorine	120	92	100	0.5
Ferrous chloride (25%)	100	93	98	0.0
Zinc chloride (25%)	100	96	100	2.7
Chlorosulfonic acid	151	91	100	2.7
Concentrated phosphoric acid	100	93	100	0.0

▪ Organic Chemicals

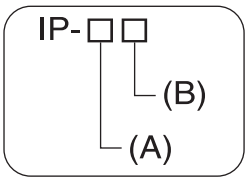
Chemical name	Test temperature (°C)	Resulting characteristics (%)		Weight increase rate (%)
		Tensile strength	Elongation	
Glacial acetic acid	118	95	100	0.4
Acetic anhydride	139	91	99	0.3
Trichloroacetic acid	196	90	100	2.2
Isooctane	99	94	100	0.7
Naphtha	100	91	100	0.5
Mineral oil	180	87	95	0.0
Toluene	110	88	100	0.7
o-creosol	191	92	96	0.2
Nitrobenzene	210	90	100	0.3
Benzyl alcohol	205	93	99	0.3
Aniline	185	94	100	0.3
n-butylamine	78	86	97	0.4
Ethylenediamine	117	96	100	0.1
Tetrahydrofuran	66	88	100	0.1
Benzaldehyde	179	90	99	0.5
Cyclohexane	156	92	100	0.4
Methyl ethyl ketone	80	90	100	0.4
Acetophenone	202	90	100	0.6
Dimethylphtalate	200	98	100	0.3
n-butyl acetate	125	93	100	0.5
Tri-n-butyl phosphate	200	91	100	2.0
Methylene chloride	40	94	100	0.8
Perchloroethylene	121	86	100	2.0
Carbon tetrachloride	77	87	100	2.3
Dimethyl formamide	154	96	100	0.2
Dimethyl sulfoxide	189	95	100	0.1
Dioxane	101	92	100	0.6
Reference: *Fluoroplastics Handbook*, The Nikkan Kogyo Shimbun Ltd. (Takaomi Satogawa)				

Degree of Protection

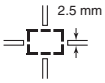
Ingress protection degrees (IP-□□) are determined by the following tests. Be sure to check the sealing capability under the actual operating environment and conditions before actual use.

IP indicates the ingress protection symbol.

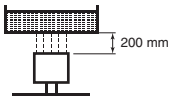
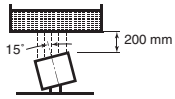
■ IEC (International Electrotechnical Commission) Standards IEC 60529: 2001

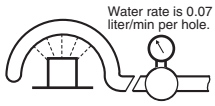
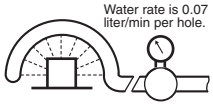
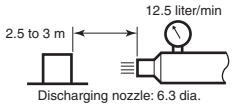
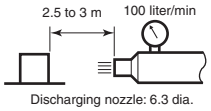
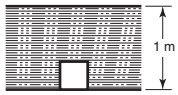


(A) First Digit: Degree of Protection from Solid Materials

Degree	Degree	
0		No protection
1		Protects against penetration of any solid object such as a hand that is 50 mm or more in diameter.
2		Protects against penetration of any solid object, such as a finger, that is 12.5 mm or more in diameter.
3		Protects against penetration of any solid object, such as a wire, that is 2.5 mm or more in diameter.
4		Protects against penetration of any solid object, such as a wire, that is 1 mm or more in diameter.
5		Protects against penetration of dust of a quantity that may cause malfunction or obstruct the safe operation of the product.
6		Protects against penetration of all dust.

(B) Second Digit: Degree of Protection Against Water

Degree	Protection		Test method (with pure water)
0	No protection	Not protected against water.	No test
1	Protection against water drops 	Protects against vertical drops of water towards the product.	Water is dropped vertically towards the product from the test machine for 10 min. 
2	Protection against water drop 	Protects against drops of water approaching at a maximum angle of 15°□to the left, right, back, and front from vertical towards the product.	Water is dropped for 2.5 min each (i.e., 10 min in total) towards the product inclined 15° to the left, right, back, and front from the test machine. 

Degree	Protection		Test method (with pure water)
3	Protection against sprinkled water 	Protects against sprinkled water approaching at a maximum angle of 60° from vertical towards the product.	Water is sprinkled for 10 min at a maximum angle of 60° to the left and right from vertical from the test machine. 
4	Protection against water spray 	Protects against water spray approaching at any angle towards the product.	Water is sprayed at any angle towards the product for 10 min from the test machine. 
5	Protection against water jet spray 	Protects against water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
6	Protection against high pressure water jet spray 	Protects against high-pressure water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
7	Protection underwater 	Resists the penetration of water when the product is placed underwater at specified pressure for a specified time.	The product is placed 1 m deep in water (if the product is 850 mm max. in height) for 30 min. 
8 (See Note)	Protection underwater 	Can be used continuously underwater.	The test method is determined by the manufacturer and user.

Note: OMRON Test Method

Usage conditions: 10 m or less under water in natural conditions

1.No water ingress after 1 hour under water at 2 atmospheres of pressure.

2.Communications performance must be met after 100 repetitions of 30 minutes in 5°C water and 30 minutes in 85°C water.

■ Oil resistance (OMRON in-house standard)

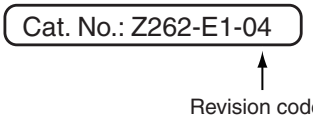
Protection	
Oil-resistant	No adverse affect from oil drops or oil spray approaching from any direction.
Oil-proof	Protects against penetration of oil drops or oil spray approaching from any direction.

Note: This OMRON in-house standard confirms resistance to cutting and other oils. It is equivalent to the former JEM standard.

MEMO

Revision History

A manual revision code appears as a suffix to the catalog number at the bottom of the front and rear pages.



Revision code	Date	Revised contents
01	May 2007	Original production
02	July 2007	Added item for V680-HS65 Antenna, and the overseas regulations and standards.
02A	September 2007	Added information on metal on back surface of the V680-HS65, corrected Tag specifications, and made other minor corrections.
03	December 2007	Added item for V680-HS51 Antenna, V680-D1KP66T-SP Tag, the overseas regulations and standards, and made other minor corrections.
03A	June 2008	Added item for the overseas regulations and standards, and made other minor corrections.
04	November 2008	Added item for V680-H01-V2 Antenna, V680-D1KP58HT Tag, and made other minor corrections.

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