KEYENCE

Industrial Wireless system
WS-1000 series
WS-A01/B01/G01

Instruction manual
Read this manual before using the product in order to achieve maximum performance.
Keep this manual in a safe place after reading it so that it can be used at any time.

Introduction

This manual explains the handling method, operation procedure, and precautions of the WS-1000 series.
Take care to store this manual in a convenient location so that it is readily accessible for reference whenever necessary.
Please take care that the personnel who will actually operate the product have access to this manual.

■ How to see symbols on the product


means functional ground terminal.

means direct current.

Safety Precautions

●Symbols

The following symbols alert you to important messages. Be sure to read these messages carefully.

DANGER	**Indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
WARNING	**Indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
CAUTION	**Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**Indicates a situation which, if not avoided, could result in product damage as well as property damage.**
Important	**Indicates cautions and limitations that must be followed during operation.**
Point	**Indicates additional information on proper operation.**

●General precautions

DANGER	• Do not use this product for the purpose to protect a human body or part of a human body. • This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere. • Do not use this product in an application which requires functional safety. It should not be used in situations where death or serious property damage is possible, such as nuclear power plants, on aircraft, trains, ships, or vehicles, used within medical equipment, playground equipment, roller coasters and other rides, etc.
WARNING	• Provide a safety circuit that does not pass via the programmable controller to enable failsafe operation of the entire system in the event that the programmable controller fails. • Output circuit or internal circuit malfunctions sometimes prevent control from being performed normally. Be sure to provide a safety circuit in control systems where circuit malfunction may lead to fire or other serious accidents. • Do not touch it as it may be hot during power-up or immediately after stopping.
CAUTION	• Please be sure to check that the function and performance of this product are working properly at start of work or operation. • If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
NOTICE	• Proceed with care when modifying the product, or when using it in a manner that falls outside of the ranges indicated in its specifications, as KEYENCE is unable to guarantee device functionality or performance in such situations. • Use this product in combination with other devices only after careful consideration, as it may fail to satisfy its functionality and performance capabilities as a result of the conditions and environment in which it is used.

Precautions on Regulations and Standards

■FCC Regulations（WS-A01/B01/G01)

This product complies with the following FCC regulations.

. Applicable regulation
FCC Part 15 Subpart B Class A Digital Device, FCC Part 15 Subpart C, FCC Part 15 Subpart E

. Operation is subject to the following two conditions: (1)This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

5150 to 5250 MHz and 5925 to 7125 MHz bands are restricted to indoor operations only.

a. FCC regulations restrict the operation of this device to indoor use only.

b. The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

c. Operation of transmitters in the 5925-7125 MHz band is prohibited for control of or communications with unmanned aircraft systems.

・Compliance with FCC requirement 15.407(c)

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinue transmission in case of either absence of information to transmit or operational failure.

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all Wireless LAN product marketed in US must fixed to US operation channels only.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 24cm between the radiator & your body.

Location and Use (WS-G01)

Indoor production line under various harsh environment (Dirty, also water and chemicals are used.), WS-1000 series are used for communication between fixed equipment.

WS-G01 is limited to use in indoor environments. Installing in an outdoor environment, changing antenna design or changing RF output settings will violate FCC regulations and could lead to serious federal penalty.

This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

The product shall be installed at a location where the radiating antenna can be kept XXcm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

■TELEC

- WS-A01/G01は 6GHz 帯, 5.2GHz帯,および2.4GHz 帯を使用しています。
- WS-B01は6GHz 帯を使用しています。
- 6GHz帯および5.2GHz 帯の電波を屋外で使用することは、電波法で禁止されています。
- 使用する環境によっては、通信できない場合がありますので、運用時は最初に通信確認を実施してください。
- 無線LAN 機器、電子レンジ、工業用加熱設備、医療用高周波設備など本機と同一周波数帯を使用する機器の近くで使用すると、電波干渉が発生し、通信速度が低下したり通信ができなくなる場合があります。
- 金属物の近く、金属粉の多い場所、金属壁で囲まれた場所では通信できない場合があります。
- この機器の使用周波数帯では、産業・科学・医療用機器等のほか工場の製造ラインなどで使用されている移動体識別用の構内無線局（免許を要する無線局）及び特定小電力無線局（免許を要しない無線局）並びにアマチュア無線局（免許を要する無線局）が運用されています。

  1.この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力無線局並びにアマチュア無線局が運営されていないことを確認してください。

  2.万一、この機器から移動体識別用の構内無線局に対して電波干渉の事例が生じた場合には、速やかに使用周波数を変更するか又は電波の発射を停止した上、下記連絡先にご連絡いただき、混信回避のための処置等（例えば、パーティションの設置など）についてご相談ください。

  3.その他、この機器から移動体識別用の特定小電力無線局あるいはアマチュア無線局に対して有害な電波干渉の事例が発生した場合など、何かお困りのことが起きた場合は、次の連絡先にお問い合わせください

  連絡先：株式会社キーエンス電話：06-6379-1151
- 本機の分解、改造は電波法で禁じられていますので、絶対におこなわないでください。本機は、日本国電波法に基づく特定無線設備に該当し、電波法に定められる基準に従って工事設計認証を取得しております。

■CE and UKCA Markings

Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EU Directive(s)and UK regulations, based on the following specifications. Be sure to consider the following specifications when using this product in the Member States of European Union in the United Kingdom.

RE Directive (CE) and Radio Equipment Regulations (UKCA) (WS-A01/B01/G01)

・Frequency band of operation: Maximum radio-frequency power

2412 to 2472 MHz: 19.86 dBm (WS-A01)

5180 to 5240 MHz: 22.89 dBm (WS-A01)

5955 to 6415 MHz: 22.82 dBm (WS-A01) ; 22.77 dBm (WS-B01)

・The device is restricted to indoor use only when operating in the 5150 to 5250 MHz and 5955 to 6415MHz frequency range.

AT	BE	BG	HR	CY	CZ	DK
EE	FI	FR	DE	EL	HU	IE
IT	LV	LT	LU	MT	NL	PL
PT	RO	SK	SI	ES	SE	UK(NI)
IS	LI	NO	CH	TR		

Remarks: These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive (Electromagnetic Compatibility Regulations) and RE Directive (Radio Equipment Regulations). The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to these Directives and UK regulations.

This device complies with Directive 2014/53/EU and UK Radio Equipment Regulations 2017 SI 2017/1206. issued by the Commission of the European Community.

- Declaration of Conformity

Please added certification standard in your user manual which depended on the test standards your device performed. or

- If the DoC should be a simplified version, please take below as reference –

Hereby, Keyence Corporation declares that the radio equipment type [designation of type of radio equipment] is in compliance with Directive 2014/53/EU and UK Radio Equipment Regulations 2017 SI 2017/1206.

The full text of the EU declaration of conformity is available at the following internet address: https://www.keyence.com/

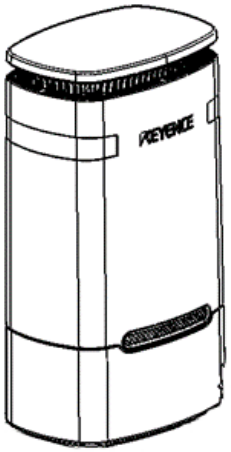
■UL Certification

This product complies with the following UL and CSA standards, and has been certified by UL.
・UL File No. E207185
・Category NRAQ, NRAQ7
・Applicable standard UL61010-1, UL61010-2-201, CAN/CSA C22.2 No.61010-1, CAN/CSA C22.2 No.61010-2-201

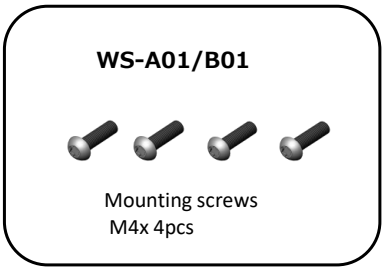
Be sure to consider the following specifications when using this product as a UL certified product.
・Use AWG #16 to #22 copper wires (stranded wires) with a temperature rating of 105 °C or higher, and strip off 7 mm of the wire's insulation for the wiring for the terminal block.
・Indoor use only.
・Install this product at the altitude of 2000 m or less.
・Use this product with one of the following power supplies.
- UL/CSA certified power supply that provides Class 2 output as defined in the NFPA70 (NEC: National Electrical Code) and CEC (Canadian Electrical Code).
- UL/CSA certified power supply that has been evaluated as a Limited power Source as defined in UL60950-1 and CAN/CSA-C22.2 No. 60950-1.
・Ensure the circuits to be connected to the input/output terminals are SELV circuits.

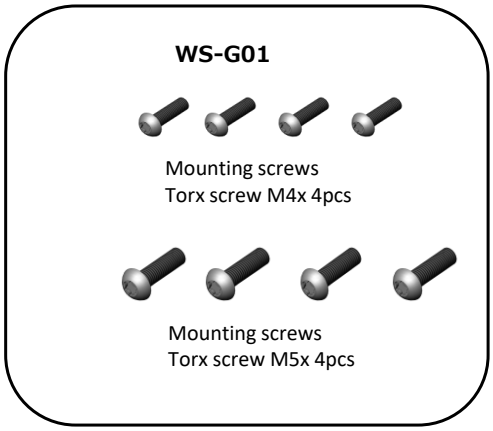
Checking the Package Contents

Wireless units
・WS-A01/B01/G01



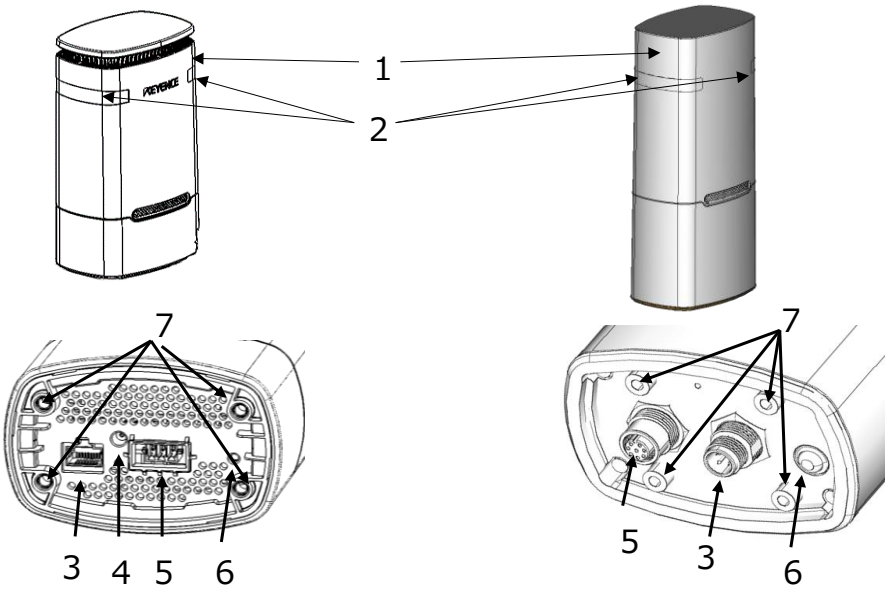
Unit x1





Name and Function of each parts

WS-A01/B01 **WS-G01**



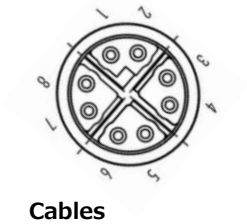
NAME		Function
1	Antenna	Wireless antennas are internal.
2	Wireless Status Indicator	These indicate the wireless status see below table)
3	Ethernet port (LAN)	RJ45 (WS-A01/B01) supports 1000BASE-T/100BASE-TX
		M12 connector(WS-G01) supports 1000BASE-T/100BASE-TX
4	LINK/ACT	Green On :It is linking properly. Green blinking :It is linking properly while sending or receiving data. Off :It is not linked.
5	Power supply	Terminal block (WS-A01/B01) is for connecting the power supply(DC18-30V)
		M12 Connector(WS-G01) is for connecting the power supply(DC18-30V)
6	Reset switch	By pressing and holding 3 seconds or longer, you can return the unit settings to default status.
7	Mounting holes	Mounting used with these holes (x4)

Wireless Status LED table (WS-A01/B01/G01)

LED status		Normal mode	Initial setting mode
Green	ON	Connected	-
	Blinking slowly	Standby mode	-
	Blinking(fast)	Test mode	-
Orange	ON	-	Connected
	Blinking slowly	-	Standby mode
	Blinking(fast)	-	Test mode
Red	ON	Error	-
	ON blinking	Error(Test)	-
Dark Red	ON	System booting	

Ethernet Port(WS-G01)

M12 Male X-coded



Cables

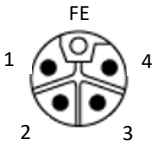
Ethernet cable (M12 X-coded 8-pin) NFPA79-compatible

Ethernet M12-RJ45
OP-88664 (2 m)
OP-88665 (5 m)
OP-88666 (10 m)

Conversion connector
M12 D-coded 4-pin
OP-88633

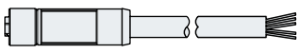
Power supply connector(WS-G01)

M12 MALE L-coded



PIN	Name
1	DC 24V
2	NC
3	GND
4	NC

Cables

Appearance	Description	Model	Length
	M12 female ↔ loose wire power supply cable	OP-88782	2 m
		OP-88783	5 m
		OP-88784	10 m
	M12 female ↔ M12 male power supply cable	OP-88785	0.3 m
		OP-88786	2 m
		OP-88787	10 m

Specifications

General specifications

Item	WS-A01	WS-B01	WS-G01
Power supply voltage	DC 24V(±25%)		
Power consumption	750mA(max.)		
Surrounding air temperature	0 to +50℃ (no freezing)		
Relative humidity	Up to 85%RH (no condensation)		
Storage temperature	-20 to 60℃		
Storage humidity	Up to 85%RH (no condensation)		
Operating atmosphere	No excessive dust or corrosive gases		
Operating altitude	2,000m or less		
Pollution degree	3		
Insulation resistance	50MΩ or more (500V DC megger used to perform measurements between the power terminal and case		
Vibration resistance	10 to 500Hz Power Spectral Density: 0.033G2/Hz X, Y, Z direction		
Protection level	N/A		IP67*
Weight	Approx. 500g		Approx. 1kg(T.B.D.)

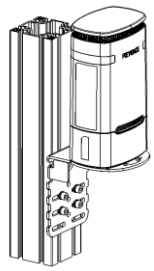
＊IP67 is for indoor use only

< Necessity of Waterproof & Dustproof in factory>
The harsh environment in factories, which generates dust and fine particles and uses water during equipment cleaning, combined with long periods of equipment usage, can lead to equipment failure, decreased production efficiency, and shortened equipment lifespan. To prevent these issues, waterproof and dustproof equipment can be used to equipment can be used to prevent water and conductive particles from entering the equipment, thereby avoiding equipment failure.
Additionally, in factories, there are often environments where oil mist is present.
Even in such environments, protecting the electronic circuits of the equipment can have a secondary effect of preventing equipment failure.

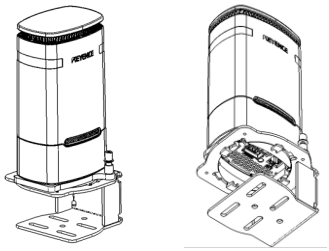
Performance specifications

Item		WS-A01	WS-B01	WS-G01
Standards		IEEE802.11a/b/g/n/ac/ax		
Band		2.4/5/6GHz	6GHz	2.4/5/6GHz
Band width	2.4GHz	20/40MHz	NA	20/40MHz
	5GHz	20/40/80MHz	NA	20/40/80MHz
	6GHz	20/40/80/160MHz		
Antenna		Internal (Omni-directional)		
Security	Backhaul (6GHz only)	WPA3-SAE		
	Access Point (2.4/5GHz only)	WEP WPA2-PSK/AEP WPA3-SAE	N/A	WEP WPA2-PSK/AEP WPA3-SAE
LAN	Data rate	100BASE-TX/1000BASE-T		
	Connector	RJ45		M12

Installation (WS-A01/B01)



Mounting using OP-88802



Mounting using OP-88801

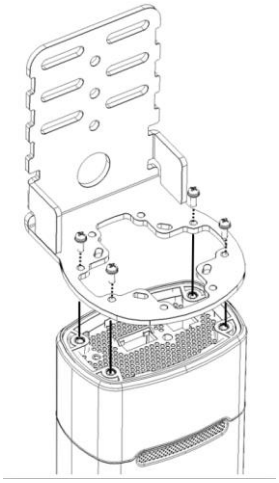
Attaching the optional L type mounting bracket (OP-88802)

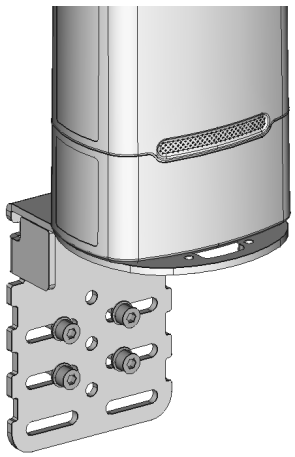
Attach the bracket using the screws included WS-A01/B01

Attach the bracket on bottom side, and then fix the bracket with the screws.

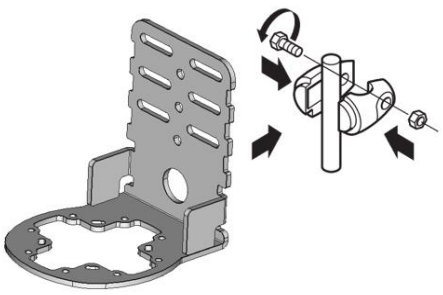
• Tightening torque:1.4 to 1.6 N.m

Mounting Example





Attaching the optional mounting for pole (OP-88803)



Use hexagon wrench in 4mm

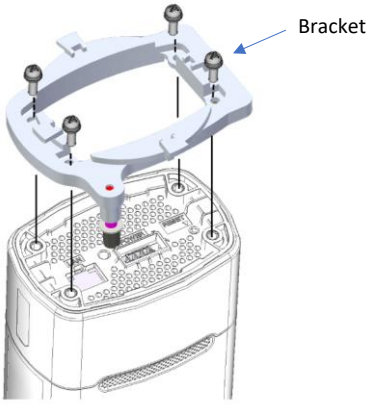
Use prepare φ12 brace separately

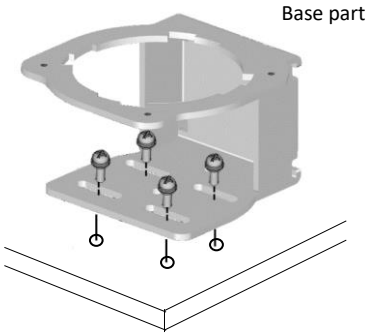
Attaching the optional U type mounting bracket (OP-88801)

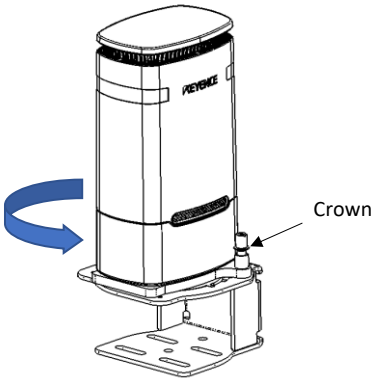
1. Attach the bracket using screws included with WS-A01/B01
2. Fix the base part using screws(M5).
3. Attach to the base part and then rotate.
4. Tighten the crown by hand.

Mounting example

・Tightening torque: 1.4 to 1.6 N.m

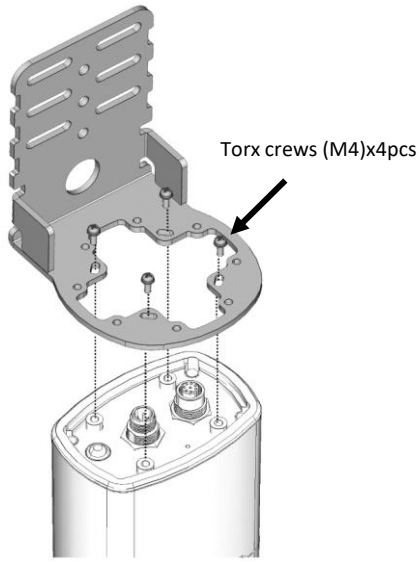


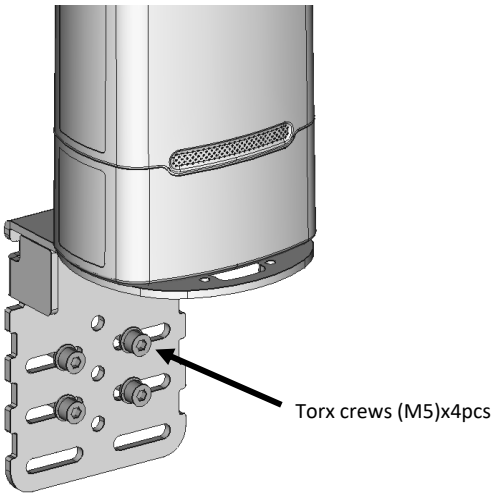




Installation (WS-G01)

Attaching the optional L type mounting bracket (OP-88803)
Attach the bracket using the Torx screws included with WS-G01
Attach the bracket on bottom side, and then fix the bracket with the screws.
• Tightening torque:1.4 to 1.6 N.m (M4)/ 2.8 to 3.2 N.m(M5)
Mounting examples

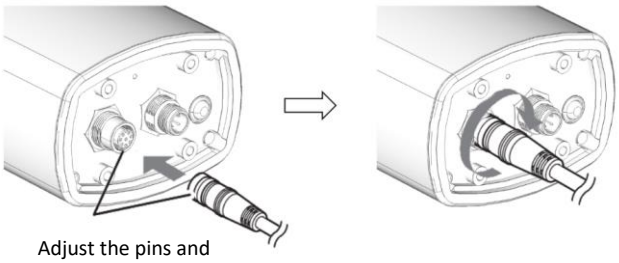




Cables(WS-G01 only)

Connecting the cable
■When supplying power with the Power cable
・Align the pins of the connector for the power cable with the protrusion connection of the cable connector, and connect the cable to the sensor. And then, tighten the connector by turning the screw on the connector in the clockwise direction.

・Tightening torque : 0.6 to 0.8 N.m



NOTICE	**When connecting the connector, insert it without tipping and tighten it well.** **If the tightening is weak, vibration can loosen the connector and cause bad connections.** **Also, the enclosure rating may not be maintained with loose connection.** *** After tightening the connector screw by hand, retighten it approximately 90° to 120° with pliers or similar tool.**

Connect the Ethernet cable in the same way as needed.

Installation cautions

■Installation environment

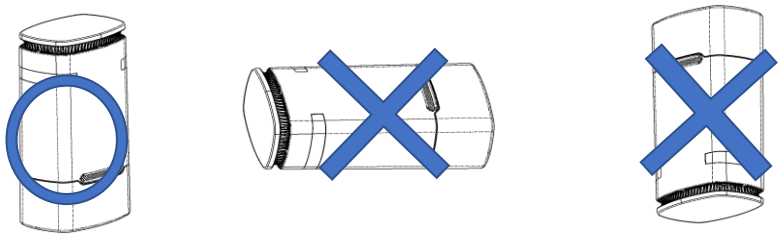
Do not install WS-1000 Series devices in the following locations:

- Locations outside. Indoor use only(based on Radio Law)
- Locations where series devices are exposed to direct sunlight.
- Locations where the surrounding air temperature range exceeds 0 to +50°C.
- Locations where relative humidity exceeds 85% RH.
- Locations subject to condensation due to rapid change in temperature.
- Locations where corrosive or flammable gases are present.
- Locations where there is excessive dust, salt, iron powder, or soot.
- Locations where series devices are subject to direct vibrations or mechanical shocks.
- Locations where series devices are exposed to splashes of substances such as water*1, oil, chemical agents.*1
- Locations where strong magnetic or electrical fields are generated.
- Locations where the altitude exceeds 2,000 m.

*1 WS-G01 is waterproof and dustproof (IP67).

■ Installation orientation

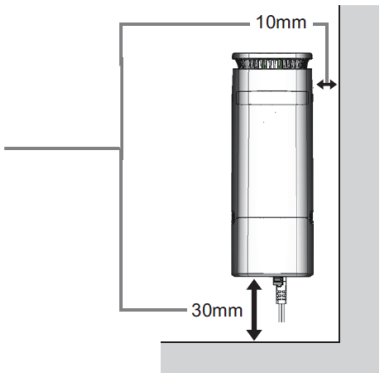
When installing, make sure that the ventilation on the top and Connectors on the bottom.
Laying down or inverted placement is prohibit.



・Surrounding space

Install it in a place where there is good visibility. Be sure to install it 10 mm or more away in the horizontal orientation, and 30 mm or more away in the vertical orientation from the surrounding walls and other devices.

Leave a space of 10 mm
in the horizontal orientation,
and a space of 30 mm
in the vertical orientation
for heat dissipation.



Point

When the ambient temperature (on bottom surface of unit) exceeds the upper limit of ambient operating temperature, lower the temperature, for example, by installing forced air cooling or providing more space around the unit to improve ventilation.

Inspection and Daily Care

・Inspection

When the Power Supply Unit or other units are used for a long time, connectors may become loose. Continued use in this state may lead to malfunction.
For this reason, periodically inspect the body and wired sections on the unit.
The main inspection items are as follows:

- Are the connections on each unit disconnected or loose?
- Are the connector connections disconnected or loose?
- Are the screws on the terminal block loose?
- Are the wiring cables between units and other devices damaged?

・Daily Care

The Power Supply Unit and other units become dirty through prolonged use.
Wipe off any dirt on the units with a clean, dry cloth.
Remove any dust or dirt on connectors and other small parts with a cotton wool bud after once disconnecting the connector.

Connecting and Setting Power Supply

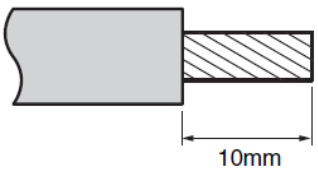
● Terminal Block Specifications

Items	Description
Compatible cable size	AWG24 to 16 (0.2mm2 to 1.3mm2)
Stripped cable length	10 mm

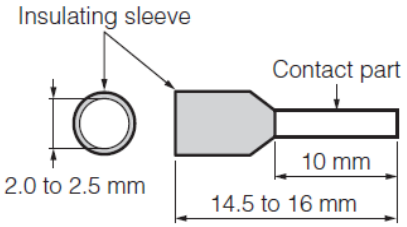
● Cables

Cables used for terminal blocks

(1) When using a stranded and solid wire as it is
  (a) Ensure that no wire strands are coming out of the end of stranded wires.
  (b) Do not solder the ends of wires.



(2) When using a ferrule terminal with an insulating sleeve.
Depending on the thickness of the wire's sheath, it may be difficult to fit into an insulating sleeve.
Refer to the outline drawing when selecting wires

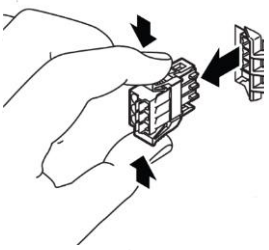


Recommended manufacturer	Model name	Contact sectional area	Contact part length
Phoenix Contact Co., Ltd.	AI 0.25-10YE	0.25mm^2	10mm
	AI 0.34-10TQ	0.34mm^2	10mm
	AI 0.5-10WH	0.5mm^2	10mm

■ Connecting to terminal blocks

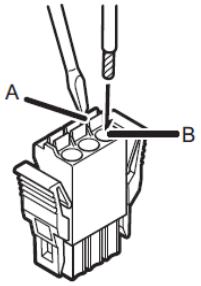
The procedure for connecting wires to the terminal blocks is as follows.

1 Remove the terminal block from the controller.



Reference When shipped, the power connector is packaged in a connected state.

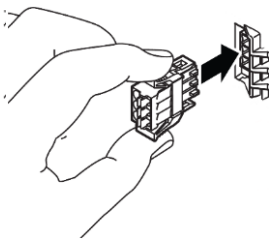
2 While pushing the A part with a screwdriver, insert the wire in the B part.



3 Release the screwdriver after inserting it all the way.

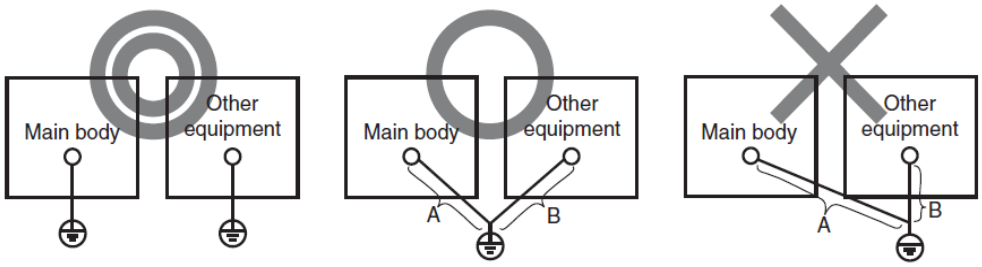
Pull the wire slightly and make sure it is fixed.

4 Attach the terminal block to the controller.



■ Precautions on grounding

- Ground each device separately using D-type grounding facilities. Ensure that the grounding resistance in this situation is 100 or less.
- If separate grounding is not possible, ground all the devices from a common point. In this situation, all cables must be the same length.
- If the power wiring is placed close to the functional ground wires, that may cause operational malfunctioning due to the influences of high voltages and high currents. Keep the functional ground wires and the power wiring apart from each other by 100 mm or more.



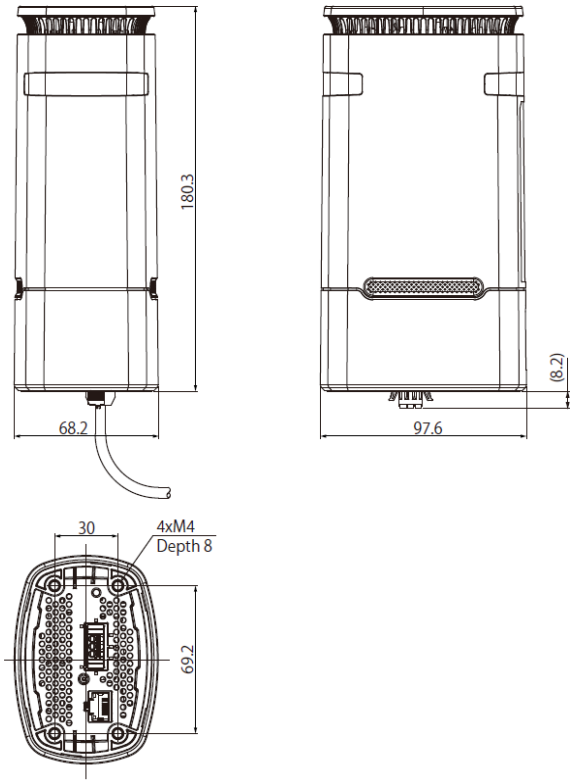
D-type ground (type 3 ground)
Ground resistance 100 Ω or less

A = B
D-type ground (type 3 ground)
Ground resistance 100 Ω or less

A > B
A < B

Dimensions

■ **WS-A01/WS-B01**



■ **WS-G01**

Under construction

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