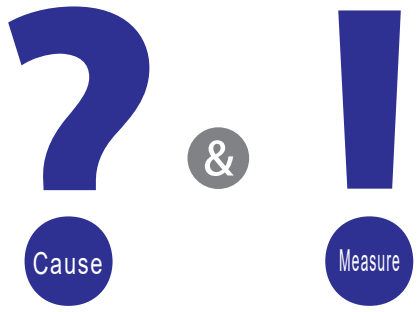
OMRON

The SOLUTIONS

[Industrial Connectors]

Must-read Connector failure and preventive measures



Let's prevent connector failure to ensure prolonged use.

Introduction

We would like to thank you for using our connectors.

We started to develop connectors nearly 40 years ago. In order to do everything possible to meet the needs of our customers, we have been committed to various types of connector development and quality improvement.
We are pleased to inform you that our connectors are used in device and equipment applications in a wide range of fields, and we have been able to achieve a track record in the industrial equipment industry up to the present.
We summarized preventive measures against failures in this guide so that customers will use our connectors more safely.
We appreciate if The Solution - Industrial Connectors - would be helpful in preventive/corrective actions when malfunction occurs.
We appreciate if The Solution would be helpful in preventive/corrective actions when malfunction occurs.
We are going to meet our customers' needs by focusing on core technologies, and appreciate your continued business.

OMRON Corporation

Notes

- "The Solution - Industrial Connectors -" introduces some typical examples of failures found by our customers. Please understand some cases may not apply to "The Solution."
- If you check the condition of a connector before requesting us to analyze it, please just check its appearance and operation before returning it to us. Do not disassemble the connector.
  Please note that if you disassemble a connector, we may not be able to investigate the true cause.

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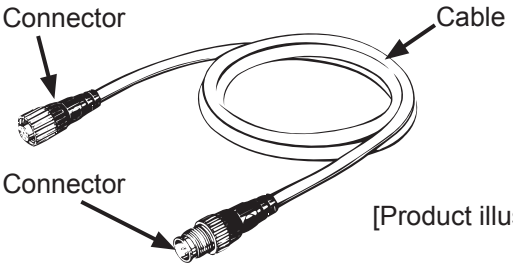
■ Phenomenon check result and cause

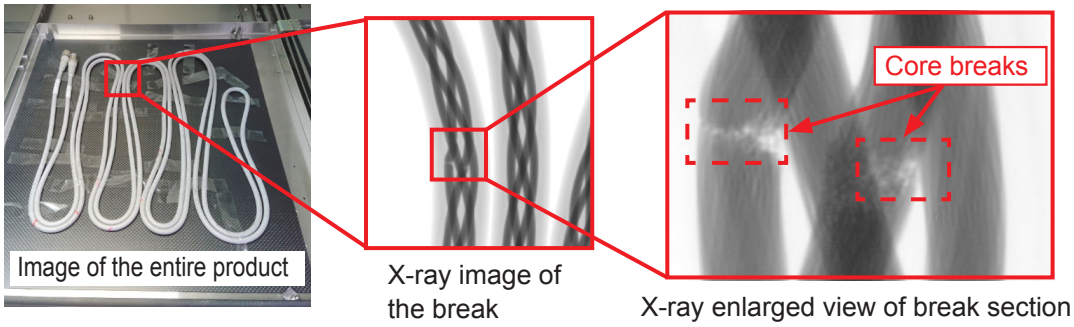
<Phenomenon check result>
Wires in the connector cable are broken and not conducting.
<Estimated cause>
The connector cable is subjected to excessive repetitive bending load and is broken.

■ Case example of phenomenon check result (XS2W-D421-G81-F: Sensor I/O connector)



[Product illustration]

X-ray image for confirming the internal break section of the cable



X-ray image of the break

X-ray enlarged view of break section

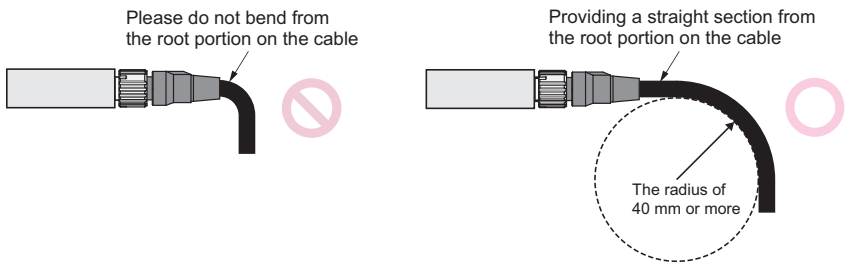
* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

Is the cable installed in a condition where repetitive bending load easily concentrates on the cable?

- Make sure that there is enough room in the cable movement range.
- Make sure that the bending load is not concentrated at the bending point of the cable.
- When securing cables with cable ties, etc., take care to prevent the securing point from becoming the fulcrum of the bending point.
- Any bends made on the cable must have a minimum radius of 40 mm.

If the wire (core wire) in the cable breaks, this may cause a continuity failure.



[Phenomenon: Continuity failure]

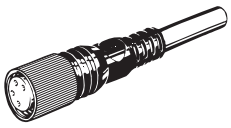
■ Phenomenon check result and cause

<Phenomenon check result>
Wires (core) in the cable are broken and not conducting.
<Estimated cause>
Cable is broken due to a bending load concentrating locally on the cable.

■ Case example of phenomenon check result (XS3W-M321-302-R: Sensor I/O connector)

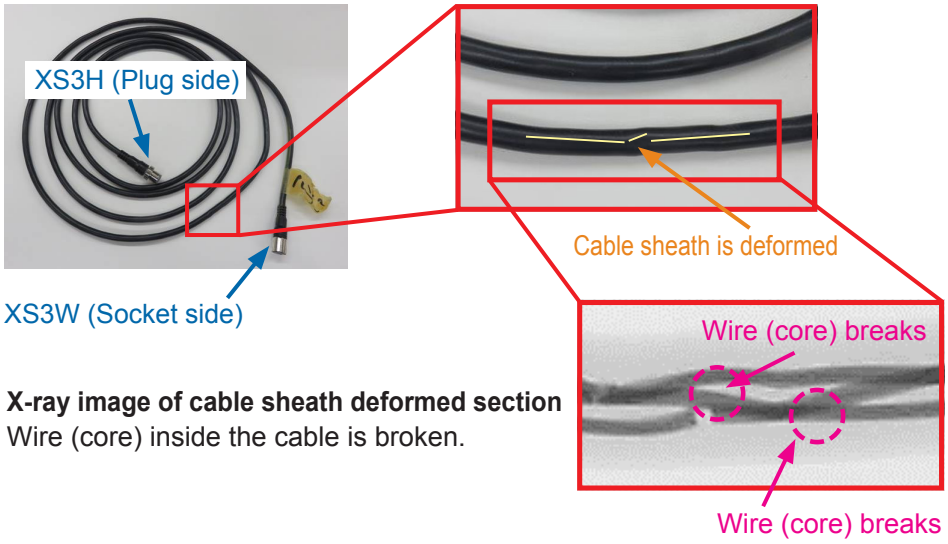
Plug side

Socket side



[Product illustration]

Image of the faulty actual product



X-ray image of cable sheath deformed section
Wire (core) inside the cable is broken.

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

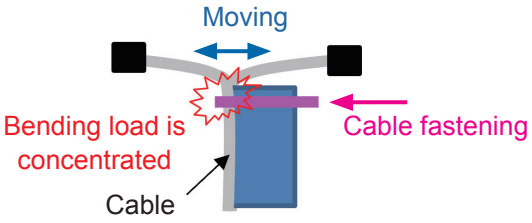
Check!

Is the cable installed in a condition where repetitive bending load easily concentrates on the cable?

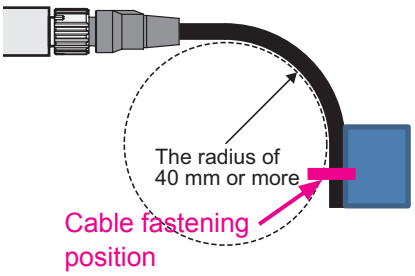
- Make sure that there is enough room in the cable movement range.
- Make sure that the bending load is not concentrated at the bending point of the cable.
- When securing cables with cable ties, etc., take care to prevent the securing point from becoming the fulcrum of the bending point.
- Any bends made on the cable must have a minimum radius of 40 mm.

If the wire (core wire) in the cable breaks, this may cause a continuity failure.

Installed/moving illustration
(Reference example)



Cable fastening illustration
(Reference example)

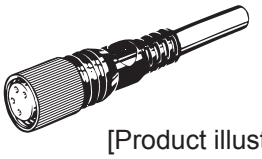


[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

<Phenomenon check result>
Wires (core) in the cable are broken and not conducting.
<Estimated cause>
The cable is subjected to continuous lifting/raising, rotating, and bending loads, and is broken.

■ Case example of phenomenon check result (XS3F-M421-□□□□: Sensor I/O connector)



[Product illustration]

■ Application
SCARA Robots
Connection to the sensor of robot that performs lifting/raising and rotation operation

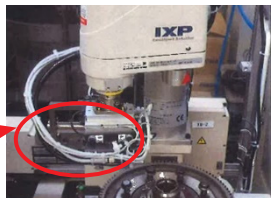
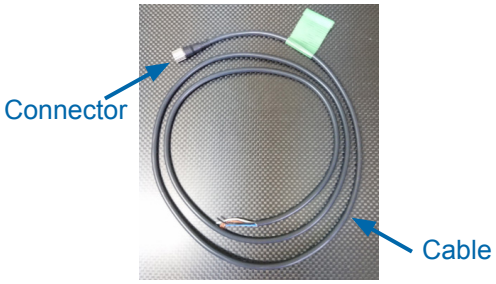
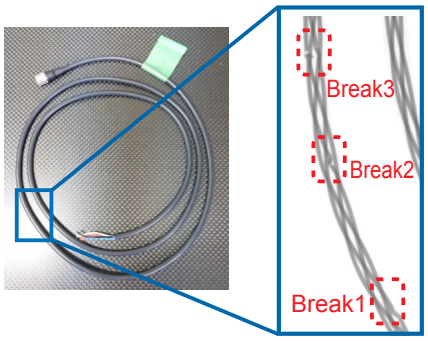
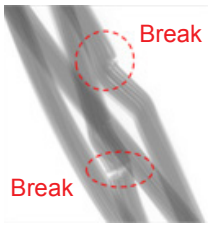
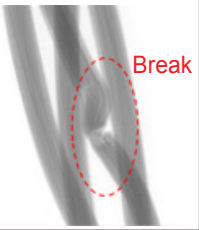
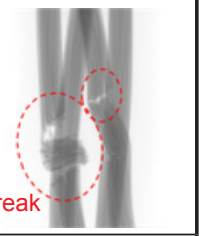


Image of the faulty actual product



X-ray image for confirming the inside of the cable



Break 1 Enlarged image	Break 2 Enlarged image	Break 3 Enlarged image
		
Approx. 43 cm from the connector tip	Approx. 44 cm from the connector tip	Approx. 45 cm from the connector tip

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

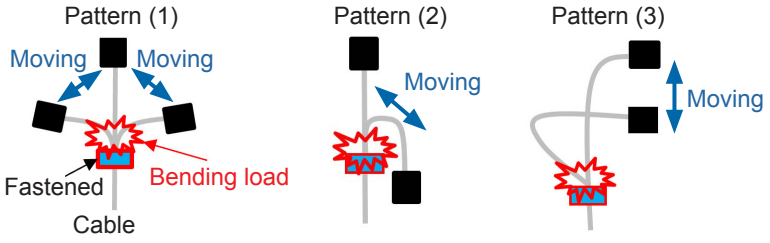
Check!

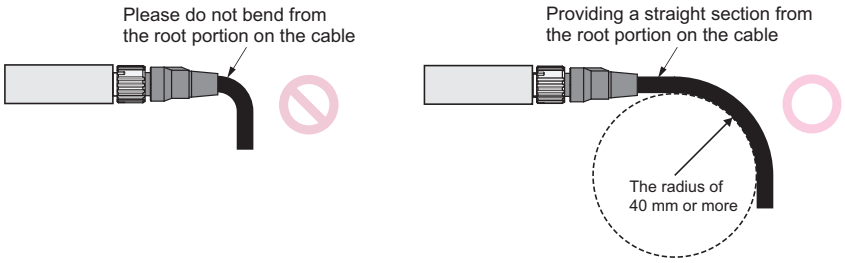
Is the cable installed in a condition where it is continuously subjected to lifting/raising, rotating, and bending loads?

- Make sure that there is enough room in the cable movement range.
- Make sure that the bending load is not concentrated at the bending point of the cable.
- When securing cables with cable ties, etc., take care to prevent the securing point from becoming the fulcrum of the bending point.
- Any bends made on the cable must have a minimum radius of 40 mm.

If the wire (core wire) in the cable breaks, this may cause a continuity failure.

Bending patterns by which bending load is applied to cable (reference example)



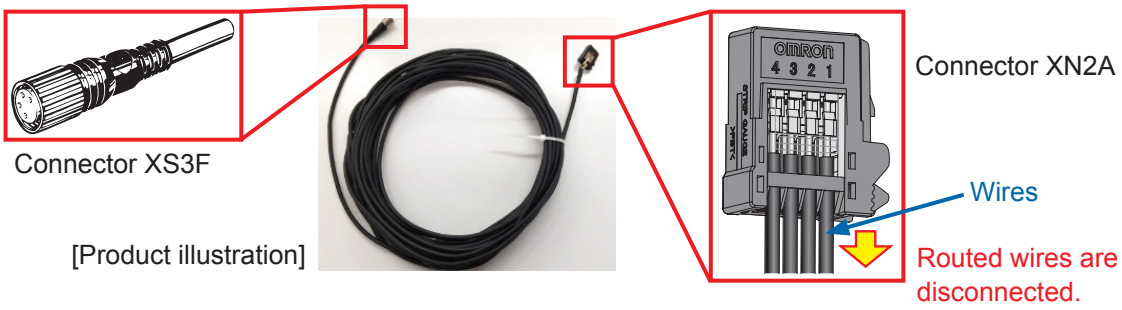


[Phenomenon: Continuity failure]

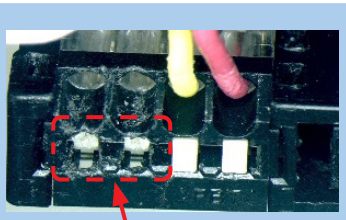
■ Phenomenon check result and cause

<Phenomenon check result>
Wires are not conducting because the wires routed from the connector are disconnected.
<Estimated cause>
Wires are not held in place due to forgetting to lock the operating lever.

■ Case example of phenomenon check result (XS3F-M421-□□□□: Sensor I/O connector)



Operating lever operation status and connector structure

(1) Image of the entire product	(2) e-CON section	(3) e-CON lever section
 Image of the faulty actual product	 Routed wires are disconnected.	 Operating lever is unlocked and wires are not held in place.

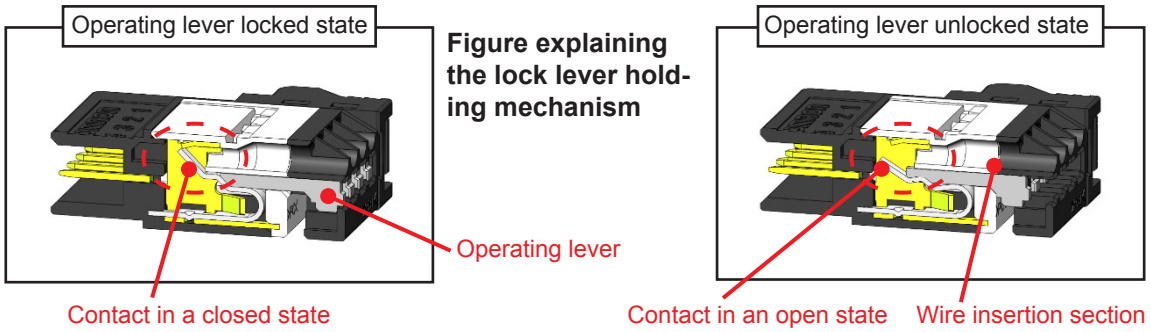


Figure explaining the lock lever holding mechanism

Wires are not held in place as the operating lever is in an unlocked state.

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

After inserting the wires, did you lock the operating lever and check that the wires are held in place?

- Before inserting the wires into a connector, unlock the operating lever. Otherwise, wires cannot be inserted.
- After inserting the wires into the connector, be sure to lock the operating lever and make sure that the wires are held in place.

If the wires are not held in place (i.e. in a disconnected state), the wires are disconnected and this causes a continuity failure.

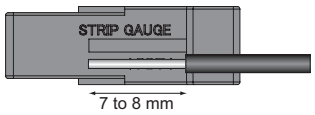
- Refer to the operating lever lock/unlock operation methods and cautions described on the following page.

■ Wiring method using a flathead screwdriver

Assembly Instructions

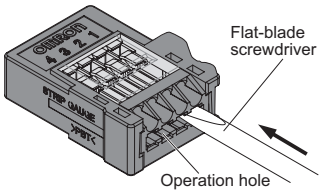
Preparing the Cable

Align the cable with the guide marked STRIP GAUGE on the side of the Connector, strip 7 to 8 mm of the cable sheath, and then twist the wires several times.

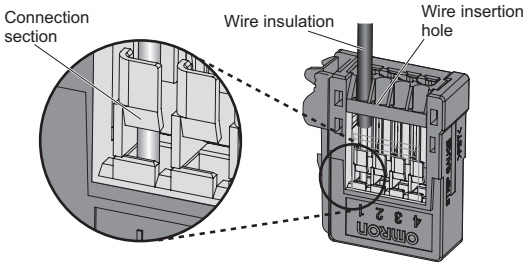


Connecting the Cable to the Connector

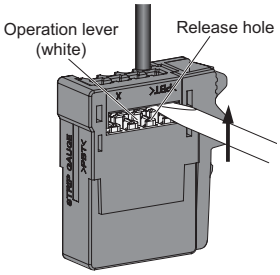
(1) Use a flat-blade screwdriver to push down the white, square operating lever inside the operation slot until it locks.

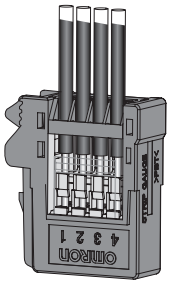


(2) Insert the wire fully to the back of the wire insertion hole. Make sure that the cable sheath is inserted into the hole, and that the end of the wire has passed through the contact section.



(3) Insert the screwdriver into the release slot, and gently pull back the lever until a click is heard by resetting the lever.

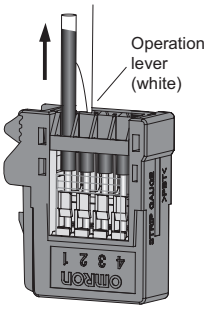




(4) Make sure that the following operations have been performed.
- Check that the operating lever is reset.
- Check that the procedure in step 2 has been followed. (Pull gently on the cable to make sure that there is resistance, indicating that the Connectors are wired correctly.)

Removing Cables from the Connector

(1) Press down on the operating lever to lock the lever before removing the cable.
(2) After removing the cable from the Connector, always reset the operating lever, except when rewiring the Connector. The Connector can be rewired without resetting the operating lever.



Precautions for Correct Use

Wiring

- Insert one wire into each insertion hole. Inserting two or more wires into a single hole may cause unexpected problems.
- Make sure that no power is being supplied to a Connector before wiring, inserting, or removing the Connector. Doing so may result in electric shock.
- Follow the wiring diagrams for the device being used when wiring the cables.
- Strip the cables according to the instructions in the applicable operation manual, making sure not to damage the wires.
- Do not use a screwdriver with a tip larger than the specified width when wiring the Connectors.
- Make sure short-circuits are not created, e.g., by protruding wires.

Inserting and Removing Connectors

- When connecting or disconnecting Connectors, always hold the case of the Connector.
- When mating Connectors, insert the Connector fully into the back of the socket, and then make sure that the Connector will not become loose by lightly pulling it in the opposite direction.

Recommended Screwdriver

- Use a flat-blade screwdriver with a tip of 2 mm max. Do not use screwdrivers that gradually widen towards the base of the screwdriver.
- Using other screwdrivers may cause damage to the adjacent poles.

Lever unlock/lock method using the special jig

Lever unlock using the special jig

XN2Z-0001

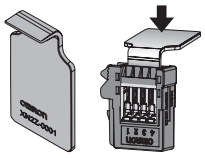
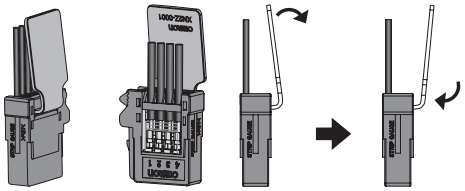


Figure of lever lock using the special jig

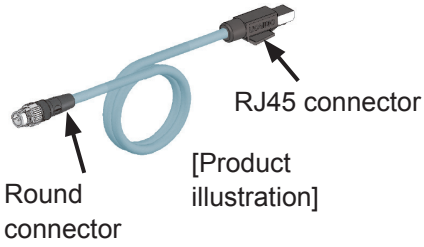


[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

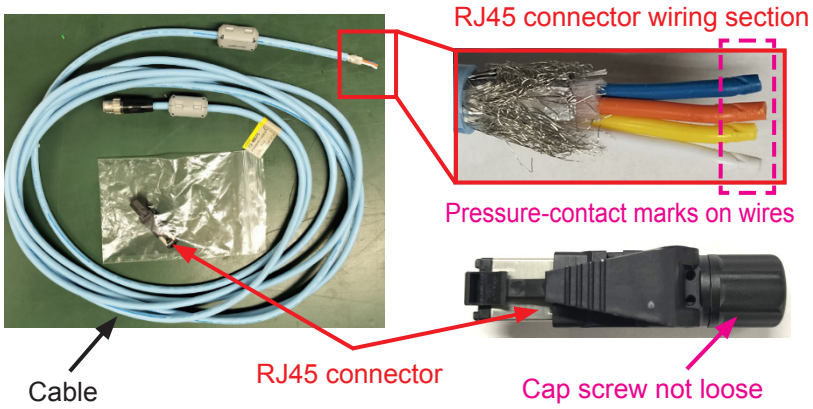
<Phenomenon check result>
The cable is not conducting because it is disconnected from the connector.
<Estimated cause>
Excessive force was applied in the direction that the wires are pulled, causing the cable to disconnect from the connector.

■ Case example of phenomenon check result (XS5W-T421-GMC-KR(AY): Ethernet connector)



[Product illustration]

Image of the faulty actual product



The cable was pressure-contacted to the connector (i.e. connected state) and was disconnected from this state.

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

After the connector is installed, is excessive force applied in the direction that the cable is pulled when the cable is inserted or removed?

- Do not unnecessarily pull a cable after the connector is installed.
- When inserting or disconnecting a connector, be sure to hold the connector by hand and not the cable.
- Do not pull out a cable by holding it.

Doing so may cause the cable to come loose from the connector and cause a continuity failure.

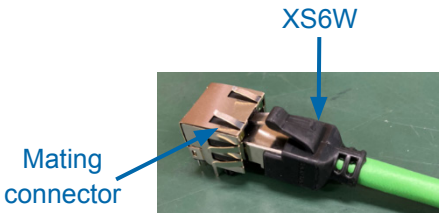
[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

<Phenomenon check result>
The resin part of the connector fitting is deformed, and the contacts at the deformed location are not conducting normally (NG transmission characteristics).
<Estimated cause>
During handling before use, some kind of external force was applied to the connector fitting, causing deformation of the molded resin part of the fitting and preventing proper fitting.

■ Case example of phenomenon check result (XS6W-5PUR8SS500CM-G: RJ45 connector wire harness)

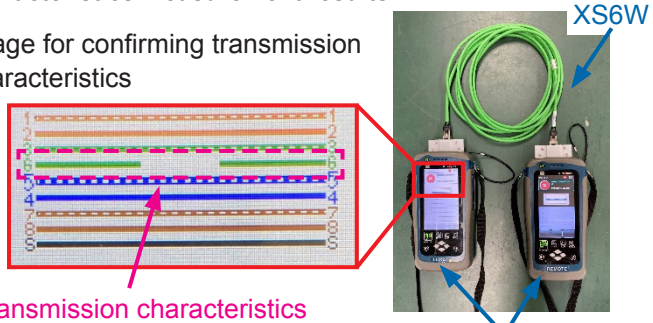
[Product illustration]



Measurement after fitting the mating connector into an XS6W connector

Measurement of transmission characteristics/measurement results

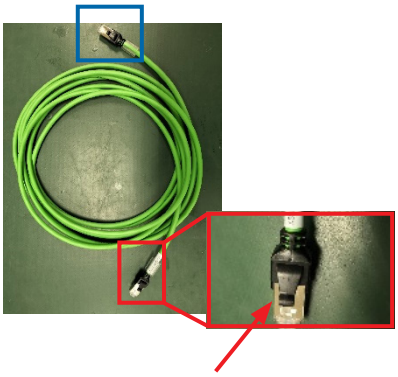
Image for confirming transmission characteristics



Transmission characteristics are not satisfied due to lack of conduction at deformed location

Transmission characteristics measuring equipment

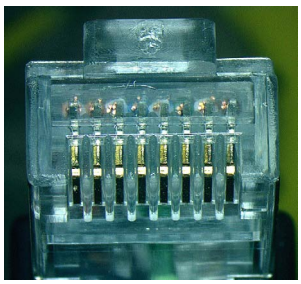
Normal side connector



Faulty side connector

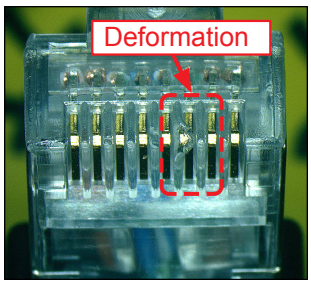
Image of the faulty actual product

Fitting on normal side connector



No deformation of the resin part

Fitting on the faulty side



Deformation of the resin part

There is no conduction as the resin deformed location of the connector fitting obstructs contact with the contact of the mating connector.

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

Is the connector fitting subjected to any external force applied before use?

- Handle the connector with care so the connector is not subjected to external force.
- If external force has been applied, make sure that there is no damage and check for continuity.

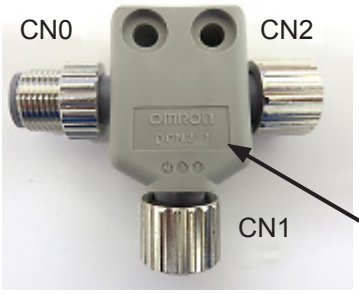
Damage to the fitting will prevent it from fitting into the mating connector, resulting in a continuity failure.

[Phenomenon: Continuity failure]

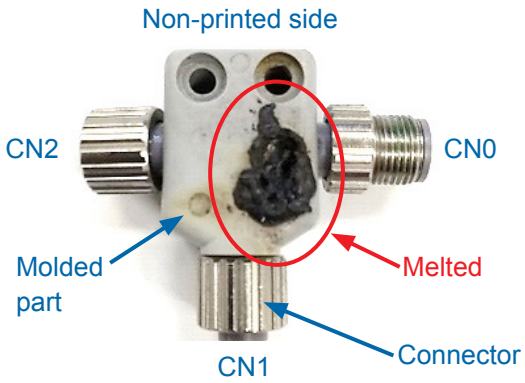
■ Phenomenon check result and cause

<Phenomenon check result>
The cable is not conducting due to a short circuit or melting due to liquid entering inside the connector.
<Estimated cause>
Melting and continuity failure occur as a result of liquid having entered inside from the connector fitting and causing a short circuit because of loose fixtures.

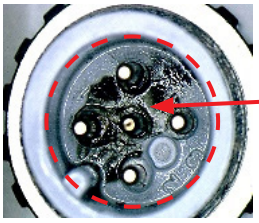
■ Case example of phenomenon check result (DCN2-1:Micro connector for DeviceNet)

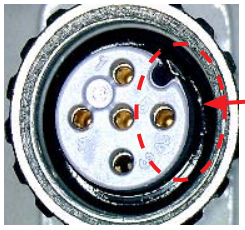


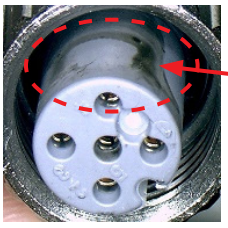
[Product illustration]



Liquid has entered the connector fitting







* It is assumed that a short circuit was caused by liquid entering from the connector fitting which resulted in the body melting.

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

Has the fixture tightening of the connector fitting loosened?

- Periodically check the connector fitting to make sure that the screws are not loose.
  If loose, retighten to the appropriate torque value.
- Tighten the fixture to the appropriate torque value within the range of 0.39 to 0.49 N·m.

Is the connector not fitted, and left unattended and stored in an environment where foreign objects or liquids might get into the fitting?
Also, is work being carried out in an environment where foreign objects or liquids might get into the fitting when inserting or disconnecting a connector?

- When storing and handling connectors, take into consideration the storage and work environment to prevent foreign objects and liquids from entering the connector fitting.

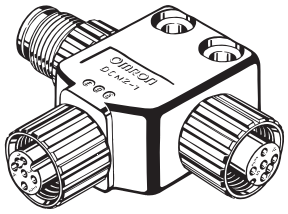
Foreign objects or liquids entering the connector may cause a short circuit, resulting in burnout and continuity failure.

[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

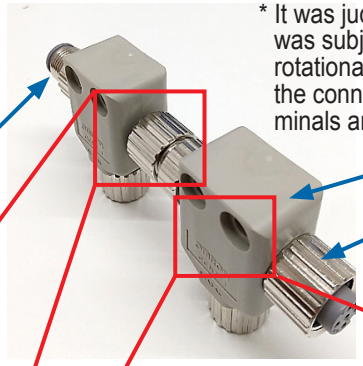
<Phenomenon check result>
The internal circuit of the connector is broken and is not conducting.
<Estimated cause>
The connector is damaged due to excessive external rotational force applied to the connector section after the connector is installed.

■ Case example of phenomenon check result (DCN2-1: Micro connector for DeviceNet)



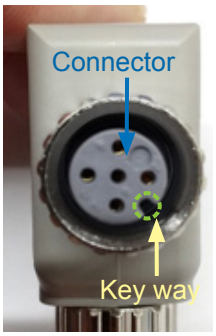
[Product illustration]

Image of the faulty actual product



* It was judged that the connector fitting was subjected to excessive external rotational force that caused damage to the connector and breakage of the terminals and resulted in continuity failure.

Image of continuity failure location

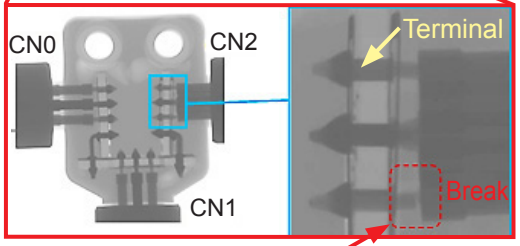


Condition of normal part

Condition of returned part

The returned part had a broken connector and misaligned key way.

X-ray image of the connector inside



The internal circuit was broken.

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

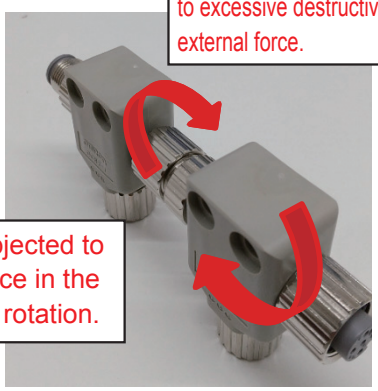
Check!

Is excessive external force being applied to the connector in the direction of rotation when the connector is installed?

- Handle the connector with care so that the connector is not subjected to excessive external force.
- After the connector is fitted and the fixture is tightened, do not apply external force to the product body in the direction of rotation.

Doing so may cause the connector to break and cause a continuity failure.

Reference example of a cause of connector internal damage



[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

<Phenomenon check result>
The connector is not conducting even after it is fitted.
<Estimated cause>
The resin wall of the connector fitting is deformed due to contact or interference of the fitting with something during handling of the connector, and the contacts cannot make contact.

■ Case example of phenomenon check result (XS5W-T421-□□□□: Ethernet connector)

[Product illustration]

Image of the faulty actual product

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

Is the connector touching or interfering with something when the connector is handled?

- Handle the connector fitting carefully so that it does not contact or interfere with other objects.
- If the connector fitting has contacted or interfered with other objects, check for deformation, damage, or other external abnormalities.
  If the connector fitting has contacted or interfered with other objects, refrain from using the connector. (In this case, it is outside the scope of the warranty.)

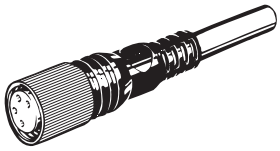
A deformed connector fitting may cause a continuity failure.

[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

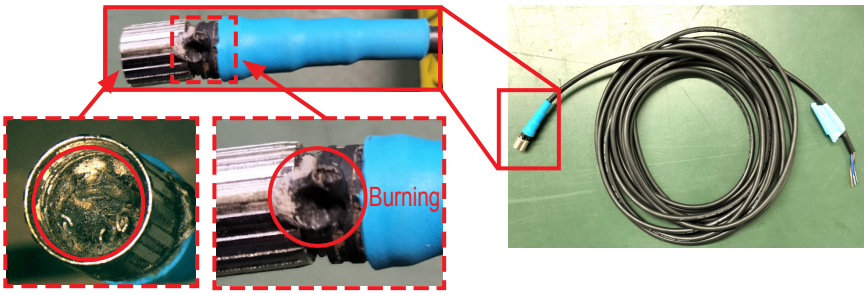
<Phenomenon check result>
The connector part is burnt out and is not conducting.
<Estimated cause>
Foreign materials or liquids entered from the connector fitting, causing a short circuit and resulting in burnout.

■ Case example of actual product check result (XS3F-M321-305-R: Sensor I/O connector)



[Product illustration]

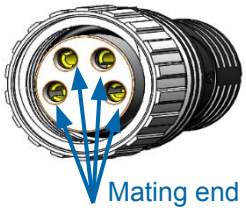
Image of the faulty actual product



Original shape no longer remains due to burning of the fitting

Normal conditions for comparison

Connector fitting



Connector appearance (not fitted)

* All target products are inspected for continuity and withstand voltage, and any abnormality can be detected.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

Has the fixture tightening of the connector fitting loosened?

- Periodically check the connector fitting to make sure that the screws are not loose. If loose, retighten to the appropriate torque value.
- Tighten the fixture to the appropriate torque value within the range of 0.39 to 0.49 N·m.

Is the connector not fitted, and left unattended and stored in an environment where foreign objects or liquids might get into the fitting?
Also, is work being carried out in an environment where foreign objects or liquids might get into the fitting when inserting or disconnecting a connector?

- When storing and handling connectors, take into consideration the storage and work environment to prevent foreign objects and liquids from entering the connector fitting.

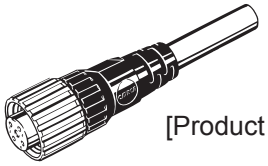
Foreign objects or liquids entering the connector may cause a short circuit, resulting in burnout and continuity failure.

[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

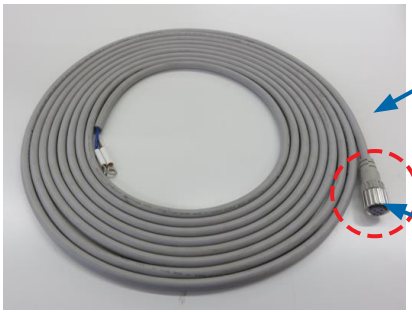
<Phenomenon check result>
The crimp terminal is not conducting.
<Estimated cause>
Wire sheath is made to bite into the crimping section of a crimp terminal during terminal processing at the customer's site.

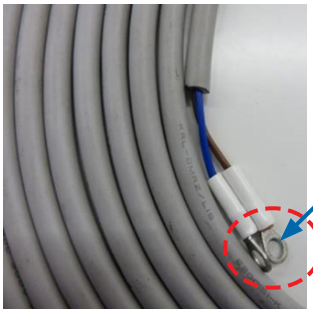
■ Case example of phenomenon check result (XS2F-D421-GA0-F: Sensor I/O connector)



[Product illustration]

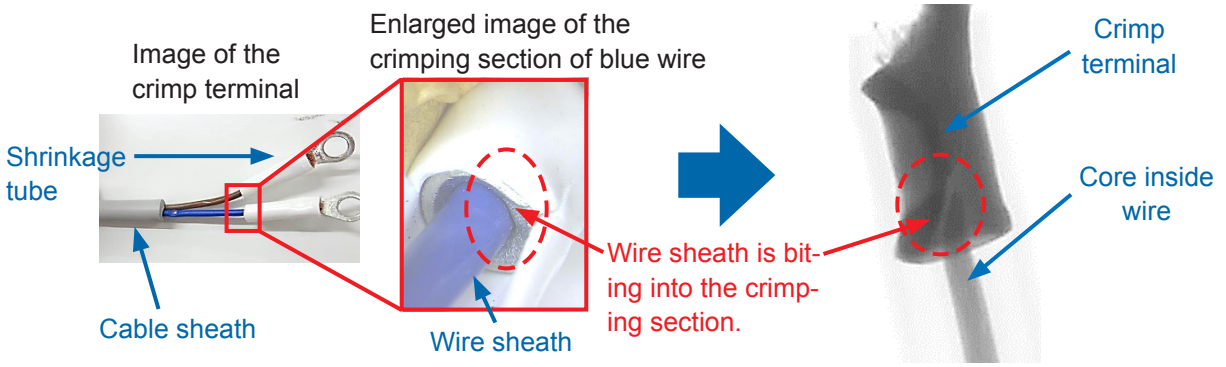
Image of the faulty actual product





X-ray image of crimp terminal of blue wire

Crimping condition of the non-conducting part



* The crimp terminals of the target product are not processed in our assembly process.

■ Details of resolution, checkpoints for preventing phenomenon before use

Are the cable and crimp terminal properly crimped?

- Make sure that the sheath of the cable is not biting into the crimping section of the crimp terminal.
- After crimping, check for continuity.
  * The sheath of wires is insulation material.

Biting in of the wire sheath may cause contact and continuity failure.

[Phenomenon: Continuity failure]

■ Phenomenon check result and cause

<Phenomenon check result>
Wires are not crimped properly.
<Estimated cause>
The specifications have been changed and replaced at the customer's site, and a mistake has been made with terminal crimping.

■ Case example of actual product check result (XW2Z-RY200C: Connecting Cables for Connector-Terminal Block Conversion Units)

Image of the faulty actual product

Condition of normal part

Shrinkage tube is attached to forked crimp terminals.

Condition of returned part

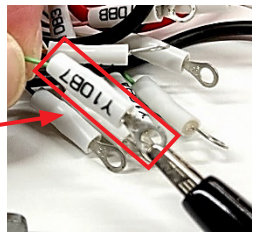
Wire is cut.

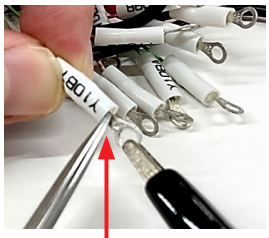
Changed to round crimp terminals.

[Product illustration]

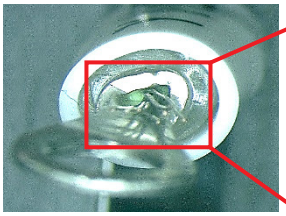
Failed crimping condition of crimp terminal

Crimp terminal is not conducting.



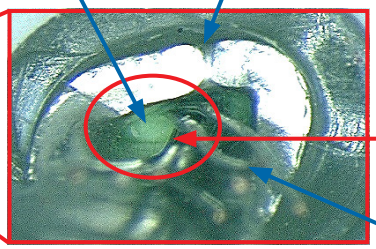


Conducts when the tip of the conductor is pressed down.



Insulator

Crimp terminal



Insulator (light green) is crimped together with the core.

Core

View from the cross-sectional direction of the crimp terminal

Continuity failure caused by erroneous terminal crimping resulting from customer's site change to specifications.

* In the case of a normal part, this can be detected by continuity and withstand voltage inspections.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

Have the product specifications been changed?

• Do not change the product specifications. This will make the product no longer covered by the warranty.

Changing the specifications may cause failures resulting from a secondary accident due to processing errors.

[Phenomenon: Contact failure]

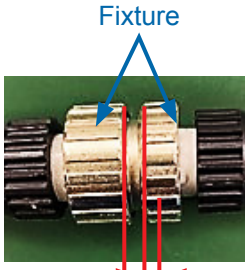
■ Phenomenon check result and cause

<Phenomenon check result>
The fixture tightening is loose, and the connector fitting is unstable.
<Estimated cause>
The fixture may be insufficiently tightened or loose.

■ Case example of phenomenon check result (DCA2-5CN20W1:DeviceNet)

[Product illustration]

○ : Fixture in tightened condition



×: Fixture in loose tightening condition

* Tightening of fixture has loosened.

When tightening of the fixture is loose or the fixture is insufficiently tightened, the connector fitting condition (contact condition) becomes unstable and this may result in contact failure.

■ Details of resolution, checkpoints for preventing phenomenon before use

Has the fixture tightening of the connector fitting loosened?

- Periodically check the fixture tightening to make sure that it is not loose.
- When fitting the connector, tighten the fixture to within the recommended torque (0.39 to 0.49 N·m).

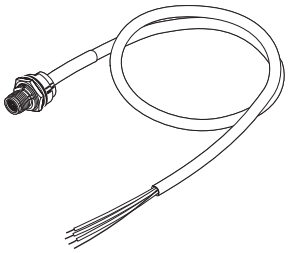
When tightening of the fixture is loose, the connector fitting condition (contact condition) is unstable and this may result in contact failure.

[Phenomenon: The fixture cannot be tightened]

■ Phenomenon check result and cause

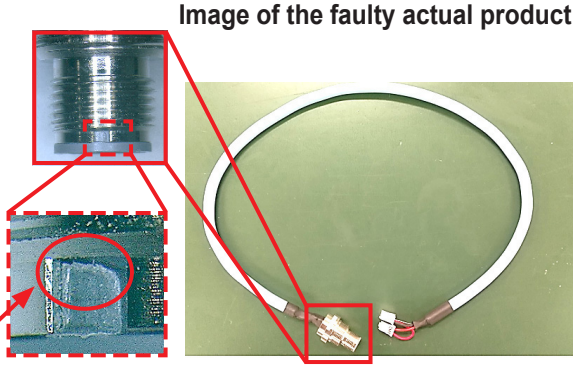
<Phenomenon check result>
When the fixture is tightened, the fixture turns which prevents it from being tightened.
<Estimated cause>
Because of a mistake in the fixture tightening method, the housing ribs have been scraped, and the anti-rotation mechanism of the fixture is not functioning.

■ Case example of actual product check result (DCA1-5CNC5M1: DeviceNet micro connector)



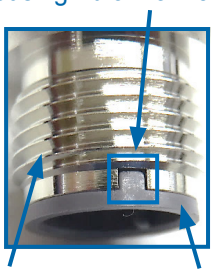
[Product illustration]

Image of the faulty actual product



Scraped housing rib

* Role of ribs: To prevent rotation of the housing



Housing rib of normal part

Body

Housing

* As the work of tightening the target product is not performed in the assembly process, the failure targeted here does not occur.

■ Details of resolution, checkpoints for preventing phenomenon before use

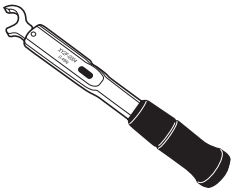
When the connector is fitted in, is the resin part being forcibly tightened by mistake instead of the fixture?

- Using pliers or other tools to tighten locations other than the fixture will grind the ribs of the connector housing.
- Be sure to tighten the connector fixture by hand or using a special tool (XY2F-0004) to within the recommended torque (0.39 to 0.49 N·m).

When the connector is damaged, the fixture cannot be tightened.

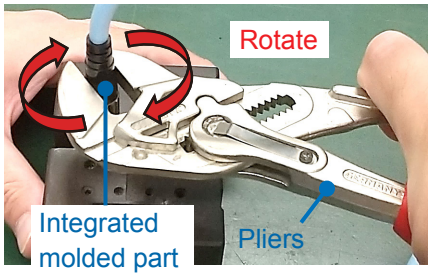
Torque Wrench
XY2F-0004

Special tool

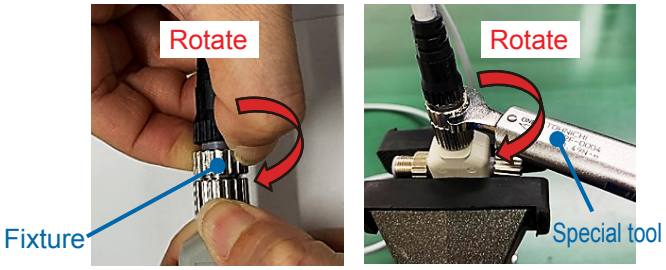


Cause of housing rib position misalignment (reference example)

Gripping and tightening **the integrated molded part** with pliers **will result in damage to the housing.**



Tighten **the fixture** by hand or using a special tool (at the specified torque). **This way, the housing will not break.**

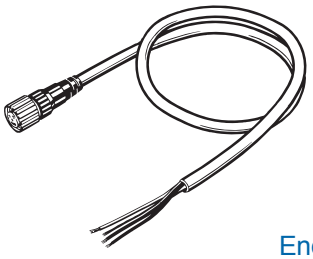


[Phenomenon: The cable sheath is scratched]

■ Phenomenon check result and cause

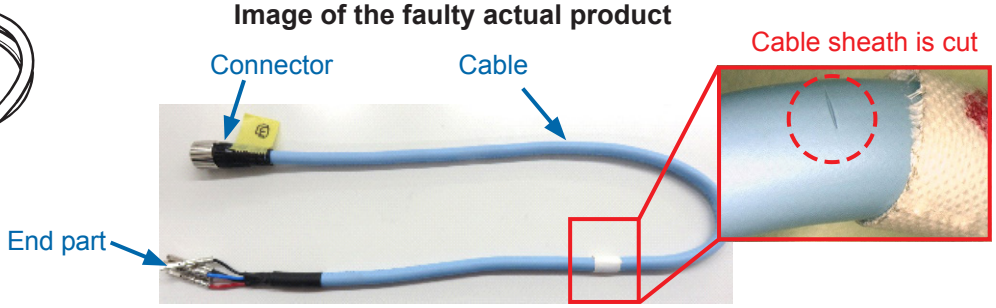
<Phenomenon check result>
The cable sheath has a cut as if cut by a knife.
<Estimated cause>
When cutting the packing bag, the cutting edge of a utility knife or other cutting tool touched the cable.

■ Case example of actual product check result (DCA1-5CNC5F1: DeviceNet micro connector)



[Product illustration]

Image of the faulty actual product



* The target product uses a special cable cutter, and scratches such as those on faulty parts do not occur in the assembly process.

■ Details of resolution, checkpoints for preventing phenomenon before use

When cutting the packing bag, does the cutting edge of a utility knife touch the cable?

- If the tip of the utility knife touches the wire, a cut will be made in the sheath.
- When using a knife such as a utility knife to open packing boxes, bags, etc., take care to prevent the blade tip from touching the product.

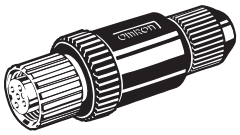
Cuts in the wire sheath may impair product performance.

[Phenomenon: The cover lock cannot be tightened]

■ Phenomenon check result and cause

<Phenomenon check result>
The cover lock cracks and cannot be tightened.
<Estimated cause>
Excessive external force was applied to the cover lock during assembly and handling, and it cracked.

■ Case example of actual product check result (XS2C-D5S9: Sensor I/O connector)



[Product illustration]

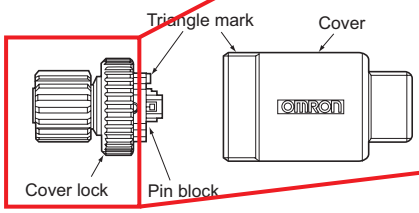
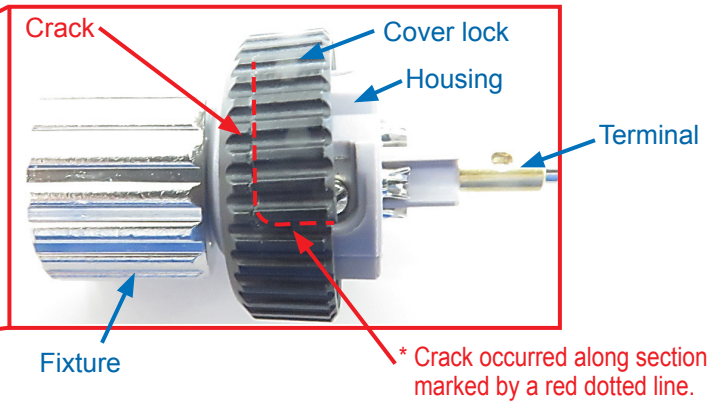


Image of the faulty actual product



* In the production process of the target product, there are no processes where the product is subjected to external force.
* The condition of the target product can be detected by visual inspection.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

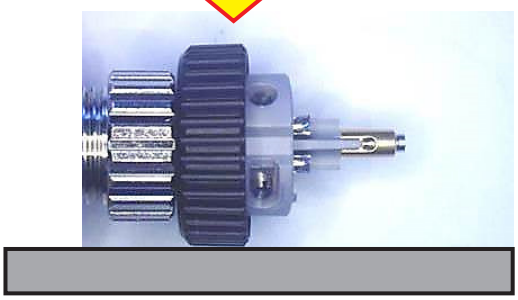
Was the cap section subjected to excessive external force during storage, handling, or connector assembly work?

• The cap will crack if it is subjected to external force.

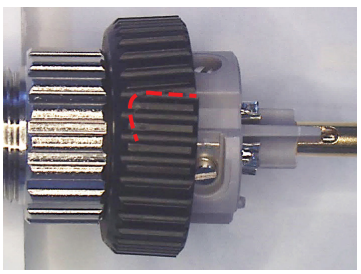
When the cap is cracked, the connector can no longer be assembled.

Cause of cracks occurring in a cap (reference example)

Cap section is subjected to an external force.



Some hard object pressed against the cap



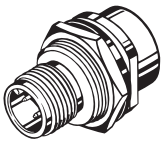
* Crack occurred along section marked by a red dotted line.

[Phenomenon: Rattling when fitting connectors]

■ Phenomenon check result and cause

<Phenomenon check result>
There is rattling in a connector fitted state.
<Estimated cause>
There is damage to the positioning key due to a mistake during connector fitting work.

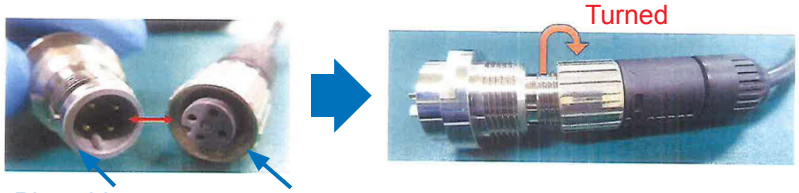
■ Case example of actual product check result (XS2M-D424-4: Sensor I/O connector)



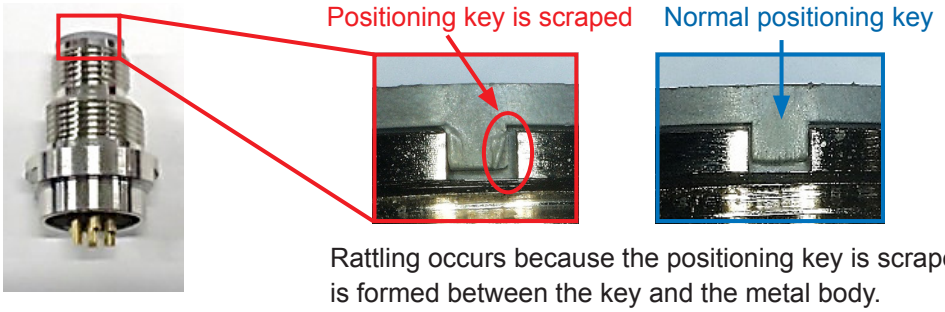
[Product illustration]

Image of the faulty actual product

When the mating connector is fitted and the socket side connector is turned, the inside of the plug side connector rattles.



Images of the housing positioning key section



Rattling occurs because the positioning key is scraped and a clearance is formed between the key and the metal body.

* In our assembly process, there are no processes where the connector is subjected to external force.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

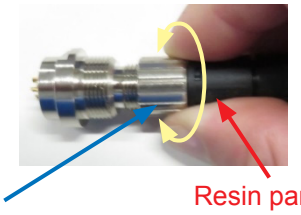
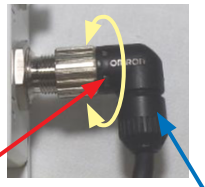
When tightening the fixture, is the XS2C connector body rotated together with the fixture?

- When fitting XS2C after installing XS2M to the panel, tighten only the fixture on the XS2C side to within the appropriate torque (0.39 to 0.49 N·m). Do not tighten the resin part.

The positioning key is scraped and rattling occurs.

Cause of connector rattling (reference example)

<table>
<tr>
<td>The fixture and XS2C body were turned together.

XS2C straight type
 
Resin part</td>
<td> 
In particular, an XS2C L easily turns and is damaged as it is L-shaped.

XS2C L type</td>
</tr>
</table>

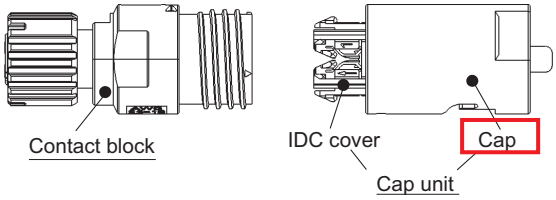
[Phenomenon: Cracks in connector cap]

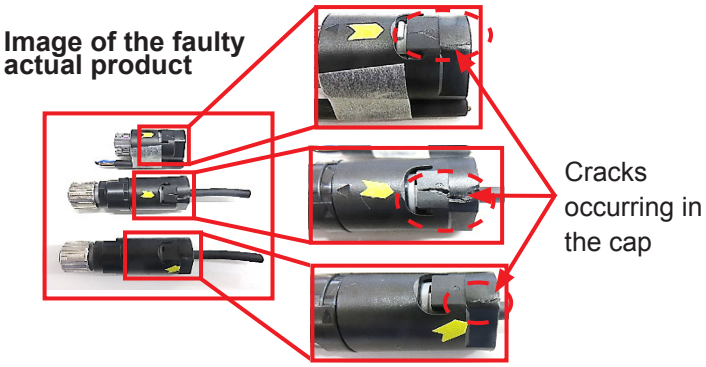
■ Phenomenon check result and cause

<Phenomenon check result>
Cracks are occurring in the connector cap.
<Estimated cause>
An incorrectly sized tool was used to tighten the connector cap.

■ Case example of actual product check result (XS5C-D418: Sensor I/O connector)

[Product illustration]





* The specification of the target product is such that it is assembled by the customer, so wiring is not performed in our assembly process.

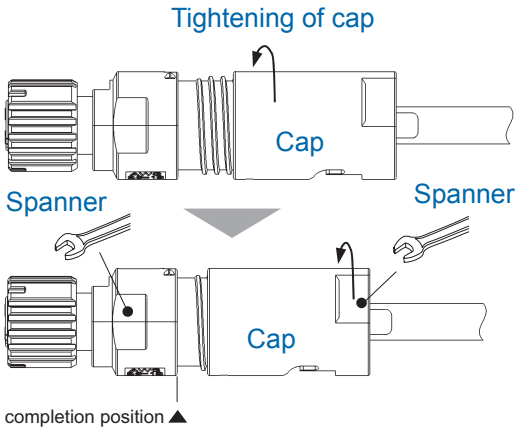
■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

Is the tool you are using the correct size for the cap?

- Failure to use the correct size tool for the cap may result in cracks forming in the housing when the cap is tightened.
- To tighten the cap, after pushing in the cap unit and temporarily tightening the screw lightly by hand, tighten the cap using a wrench or spanner*1 of size 15 mm.

If not using the correct size tool, cracks may form in the cap.

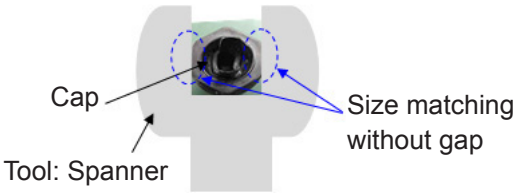


(*1) If tightened with a tool that has a large width across flats, the cap may be damaged.

Cause of housing cracks (reference example)

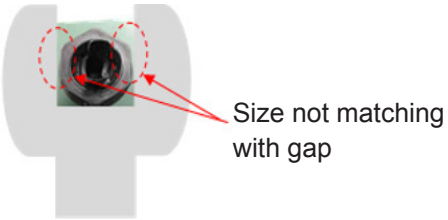
Cap and size of tool matching

No gap between tool and cap tightening section



Cap and size of tool not matching

Gap between tool and cap tightening section



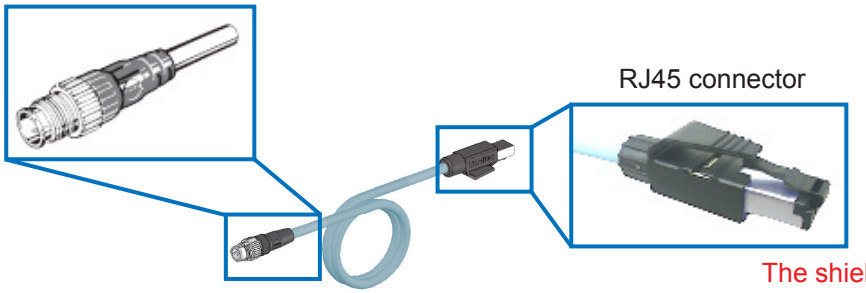
[Phenomenon: Shield braid misalignment]

■ Phenomenon check result and cause

<Phenomenon check result>
The shield braid of the connector cable peeks out from the connector.
<Estimated cause>
The cable sheath shifted due to excessive repetitive bending.

■ Case example of actual product check result (XS5W-T421-GMC-K: Ethernet connector)

M12 connector



[Product illustration]

Image of the faulty actual product

RJ45 connector

The shield braid peeks out

* The condition of the target product can be detected by visual inspection.

■ Details of resolution, checkpoints for preventing phenomenon before use

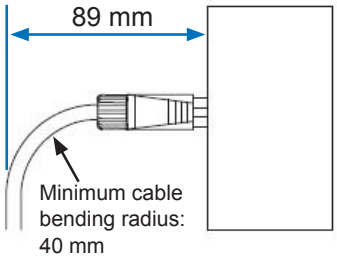
Check!

Is the cable repeatedly bent from the connector part?

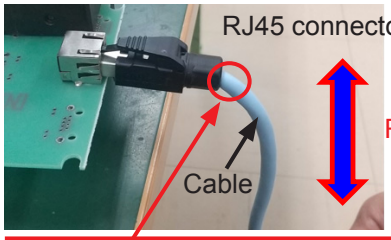
- Do not bend the cable from the connector part.
- Install and use the cable in such a way that repeated stress is not concentrated on the cable bending section.
- Ensure a minimum bending radius of 40 mm for the cable.

The cable sheath is displaced from the connector, and the shield wire peeks out from the connector.

Rigid type (RJ45 connector)

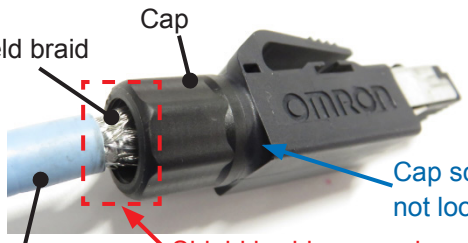


Mechanism by which shield braid misalignment occurs as a result of cable bending (reference example)

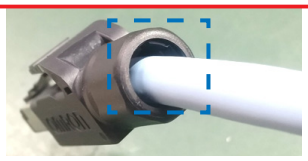


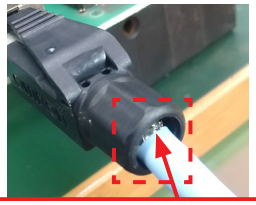
Cable repeatedly bent from the connector root section several dozens of times

Repeated bending



Before bending: Shield braid not exposed





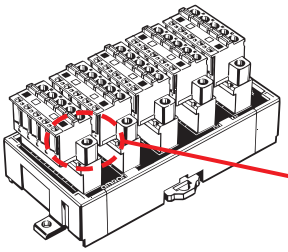
After bending: Shield braid exposed

[Phenomenon: Fitting is not possible]

■ Phenomenon check result and cause

<Phenomenon check result>
The connector fixing screw on one side is not fully tightened.
<Estimated cause>
Only one side of the connector fixing screw is over-tightened.

■ Case example of phenomenon check result (DCN1-3N: Terminal unit for DeviceNet)



[Product illustration]

Image of the faulty actual product

Image in the horizontal direction

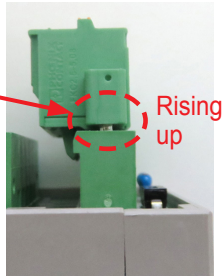
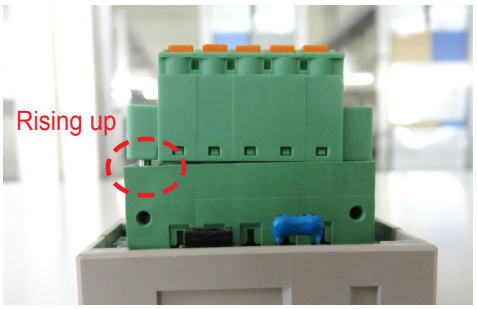


Image in the front direction



The connector fixing screw on one side rises up as it is not fully tightened.

■ Details of resolution, checkpoints for preventing phenomenon before use

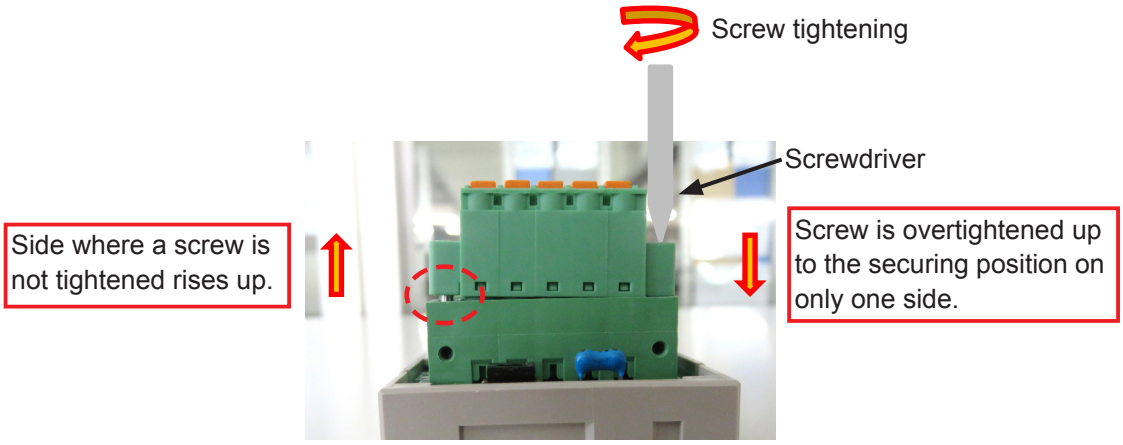
Check!

Is the connector fixing screw tightened too much on only one side?

- Do not overtighten the screw on only one side first.
- Tighten the screws after temporarily tightening them evenly on the left and right sides.

Overtightening causes connector fitting failure.

Screw tightening work that causes the connector to rise up (reference example)

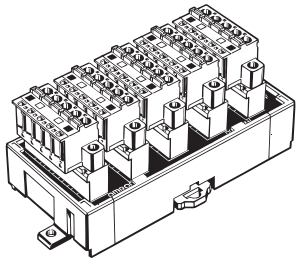


[Phenomenon: Terminal block case damage]

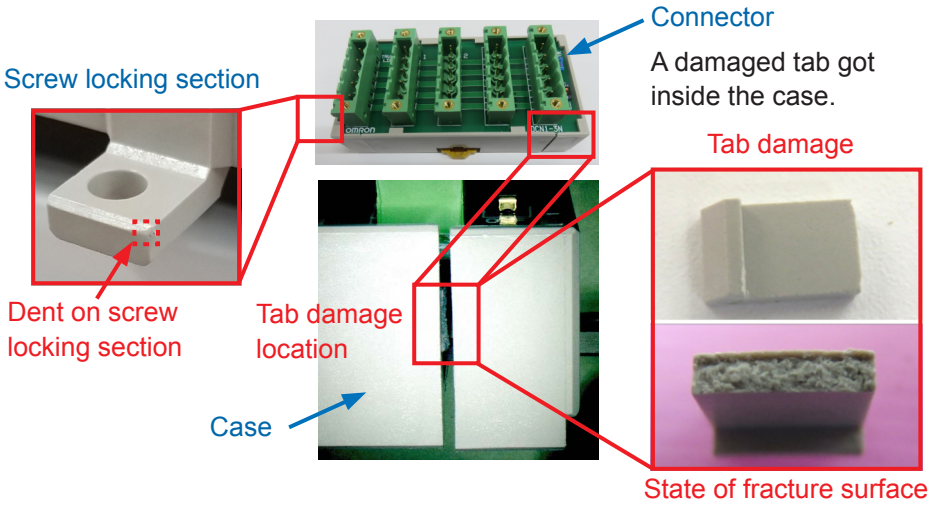
■ Phenomenon check result and cause

<Phenomenon check result>
The tab part is broken and the case is about to come loose.
<Estimated cause>
Falling when handling terminal block.

■ Case example of actual product check result (DCN1-3N: DeviceNet1 bifurcated tap)



[Product illustration]



* The condition of the target product can be detected by visual inspection.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

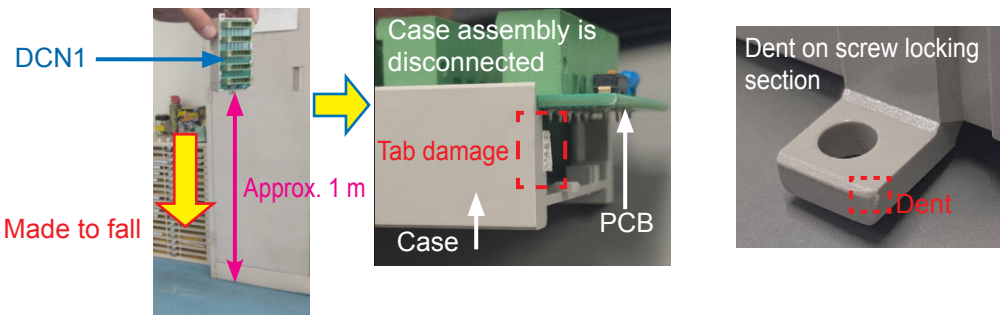
Was the terminal block dropped in handling or installation work of the terminal block?

- Handle terminal blocks with care to avoid dropping them.
- Refrain from using terminal blocks that have been dropped. Failure to do so may cause a secondary accident.

* Note that dropped terminal blocks are not covered by the warranty.

If a terminal block is dropped, the terminal block case will be damaged.

Cause of case damage caused by terminal block falling (reference example)

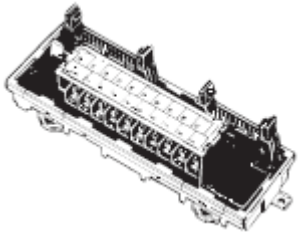


[Phenomenon: Terminal block cover disconnected]

■ Phenomenon check result and cause

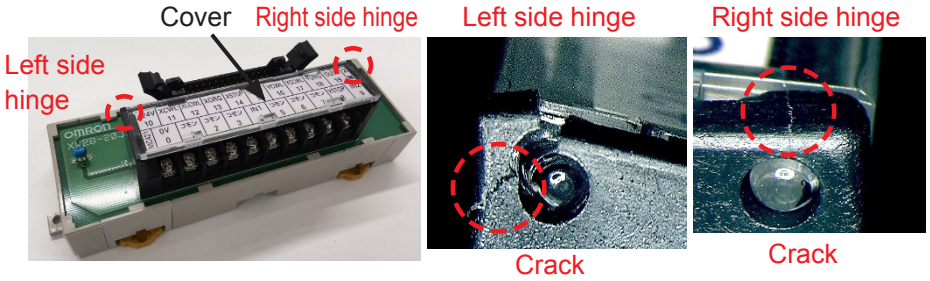
<Phenomenon check result>
The housing hinge is cracked, and the cover is disconnected.
<Estimated cause>
Excessive external force was applied during cover opening/closing work.

■ Case example of actual product check result (XW2B-20J6-6: MC unit special terminal block)



[Product illustration]

Image of the faulty actual product



* In the assembly process of target product, the hinge is not subjected to excessive loads.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

Was excessive external force applied to the cover part during cover opening/closing work?

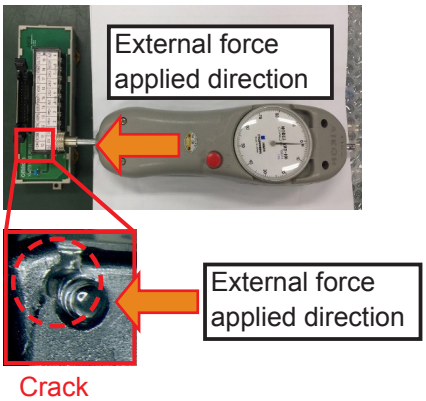
• As the hinge has a thin-walled shape due to the amount of molded resin, excessive external force (approx. 20 to 30 N or more) may cause the hinge to crack. For this reason, handle it with care.

Failure to do so will result in damage to the housing hinge sections or cause the cover to come loose.

Cause of cracks forming in terminal block cover (reference example)

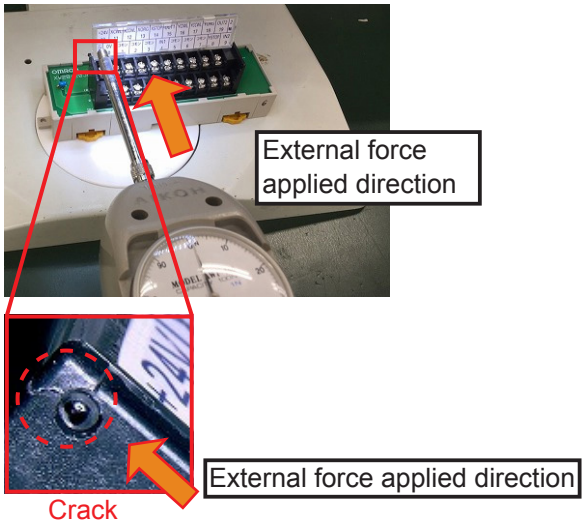
Cover closed state

Crack is formed when external force is applied in the cover/hinge direction from the side,



Cover opened state

Crack is formed when external force is applied in the cover/hinge direction from the side,



[Phenomenon: Terminal block damage]

■ Phenomenon check result and cause

<Phenomenon check result>
The terminal block is damaged, and parts have come loose.
<Estimated cause>
Damage due to terminal block falling.

■ Case example of actual product check result (XW2R-J40G-T: Connector-Terminal Block Conversion Units)

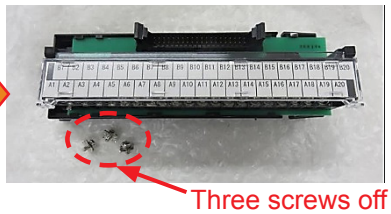
[Product illustration]

Image of the faulty actual product

Deformation of individual packing box

Individual packing box cover opened state

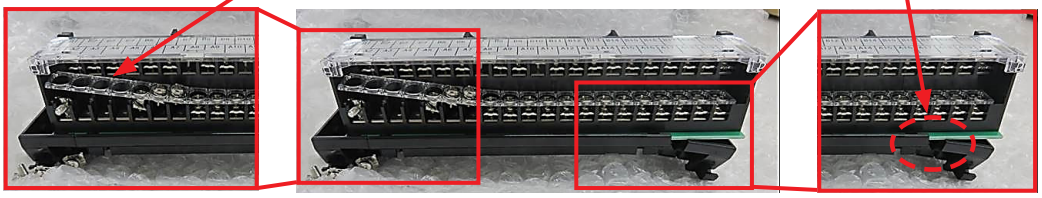
After removal from individual packing box



Three screws off

Transparent cover off

Right base off



* The condition of the target product can be detected by visual inspection.

■ Details of resolution, checkpoints for preventing phenomenon before use

Check!

Was the terminal block dropped?

- Be careful not to drop the terminal block during operation or handling.
- Refrain from using terminal blocks that have been dropped. Failure to do so may cause a secondary accident.
  * Note that dropped terminal blocks are not covered by the warranty.

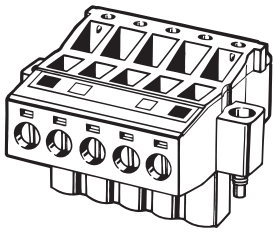
If a terminal block is dropped, it will be damaged.

[Phenomenon: Connector cover rising up]

■ Phenomenon check result and cause

<Phenomenon check result>
The connector cover is open and has risen up.
<Estimated cause>
After the wire connection, the wire was subjected to excessive tensile force, causing the cover to break and rise up.

■ Case example of actual product check result (XW4B-05C4-TF-D: Interface wiring system)



[Product illustration]

Image of the faulty actual product

Connector cover has risen due to damage

* The cover of target product is designed in a fit-in lock system, and will not rise up unless it is subjected to an excessive load.
* Suppose that rising up occurs in-process, it can be detected by visual inspection.

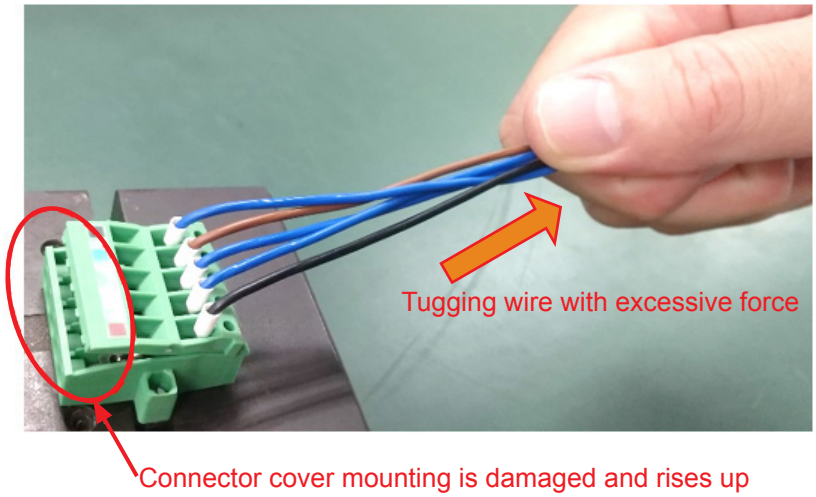
■ Details of resolution, checkpoints for preventing phenomenon before use

Is the wire subjected to excessive tensile force in handling after the connection of wires?

- If the wire is subjected to excessive tensile force, the connector cover will be damaged and become disconnected.
- After wire is connected to a connector, handle the wire with care so that it is not subjected to tensile force.

Failure to do so will damage the connector cover mounting and cause the cover to rise up.

Cause of cover rising up (reference example)

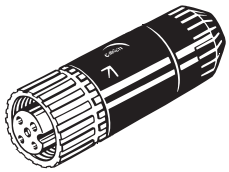


[Connector damage (1)]

■ Phenomenon check result and cause

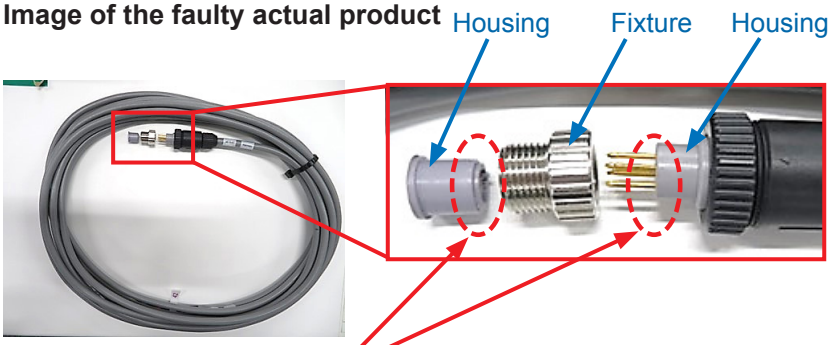
<Phenomenon check result>
The housing of the connector is damaged and has separated.
<Estimated cause>
The connector was subjected to excessive cable tensile force during wiring, installation, handling, etc., which resulted in damage.

■ The malfunction case (XS2G-D423: Sensor I/O connector)



[Product illustration]

Image of the faulty actual product



Joint locations (ultrasonic welded sections) of molded parts are damaged and separate.

* As the work of applying tensile pressure to the cable is not performed in the assembly process of target product, the failure targeted here does not occur.

■ Details of resolution, checkpoints for preventing phenomenon before use

Is the connector being subjected to excessive cable tensile force?

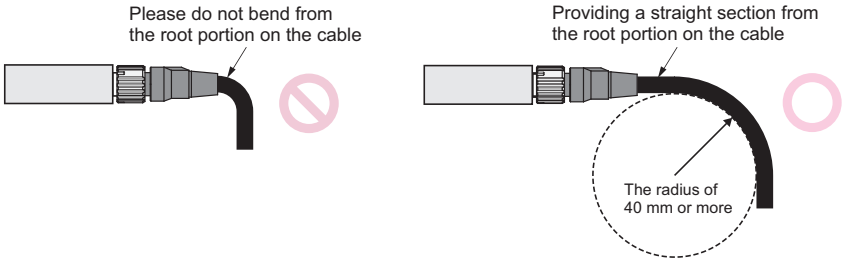
The following describes precautions (excerpts from catalog description).
Check the descriptions and pay attention to wiring, setup, work methods, etc.

[Wiring]

- Follow the wiring diagrams when wiring the cables.
  During use, confirm whether connections are possible (cable is sufficiently long, etc.).
- Lay the cables so that external force is not applied to the connectors.
  Otherwise, the degree of protection (IP67) may not be achieved.

[Setup]

- Do not install connectors in such a way that connector fittings or cable wiring root sections are directly subjected to a load.
  Failure to do so could damage the connectors or break the wires inside the cables.
- Any bends made on the cable must have a minimum radius of 40 mm.



[Connector damage (2)]

[Inserting and disconnecting connectors]

- When inserting or disconnecting a connector, be sure to hold the connector by hand and not the cable.
- Do not pull the cables by holding them.

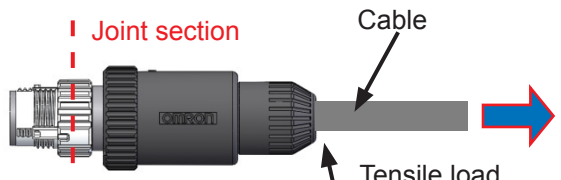
[Precautions for correct use]

- Do not pull excessively on connectors or cables.
- Do not step on or place any objects on connectors. Failure to do so may damage connectors.
- To prevent breaks on the wires inside cables or damage to connectors, install connectors or cables in a location where they will not be stepped on.
  If connectors or cables must be installed where they might be stepped on, protect them with covers.

Failure to do so may damage connectors.

Cable tensile direction on connectors and breaking load (reference example)

(1) Cable connection direction (parallel)

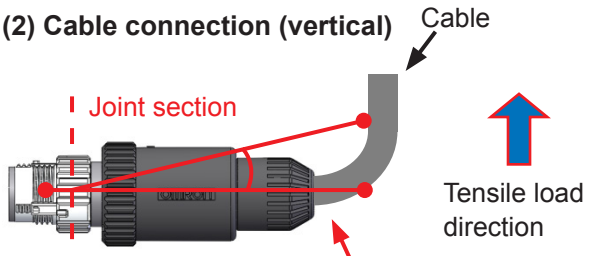


External force and load less likely to be placed near joint section.

[During parallel tensile load Joint section is damaged by a load of several hundreds of N.]

External force and load less likely to be placed on connector.

(2) Cable connection (vertical)



External force and load more likely to be placed near joint section.

[During parallel tensile load Joint section is damaged by a load of several tens of N.]

If the cable is bent from the root of the connector, external force and load is more likely to be placed as the connector is pulled and moves.

memo

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