Title of Document:	HANDLING MANUAL	Issue No. CHM-1-2389	Rev. 2
Customer:		Issue date: November 9, 2011	
Title subject:	SH/SHD Connector (003 Type Gold-plated Contact)	Revision date: October 31, 2019	

This handling manual describes operation points of crimping and handling of the SH/SHD connector 003 type gold-plated contact.
Be sure to read this manual thoroughly before conducting crimping operation and keep this manual near the machine to use for reference when required.

C O N T E N T S

1. Part Name and Model Number

Part name		Model No.
Contact	003 type	SSH-003GA-P0.2
Housing		SHR-∗∗V-S(-B)
		SHDR-∗∗V-S(-B)

Note$_1$: "∗∗" denotes 2-digit circuit number.

2. Applicable Wire

Applicable wire size	AWG #28 ~ #32
Wire insulation outer diameter (mm)	ϕ0.4 ~ϕ0.8 mm
Conductor	Annealed copper stranded tin-plated wire

Special wires such as bare wire, solid one, shielding one and tin-coated one are inapplicable.

3. Crimping Tool

Product name		Model No.
Semi-automatic press		AP-K∗
Crimping applicator		MKS-L-10-3
Die set	003 type	MK/SSH/L-003-02
Applicator and die set		APLMK SSH/L003-02

Note$_2$: When crimping operation is conducted by using other than the above applicator and die set, JST cannot guarantee the connector performance.

Note$_3$: Asterisk denotes a figure or an alphabet. (e.g. AP-K2N)

4. Check Points of Crimping Operation and Harness Assembly

The operations of crimping and assembly affects the reliability of the connector.
It is recommended that the operations of crimping and assembly and the finished products be controlled concentrating upon the following check points:

Process	Check point	Description
Crimping	Appearance	① Check that model Nos. of contact and applicator are adequate for wire to be used. ② Check that wire is crimped at normal position. ③ Check that crimp configuration is normal and excessive burr does not appear. ④ Check that uncrimped wire is not left behind. ⑤ Check that contact is not bent, deflected or deformed. ⑥ Check that contact is free from dirt, scratches, stains or discoloration.
	Tensile strength	① Check that crimp height and tensile strength are adequate.
Harness assembly	Appearance	① Check that contact is properly inserted into housing. ② Check that contact is securely locked with housing. ③ Check that housing is free from dirt and foreign matters.
Finished product (Harness)	Appearance	① Follow all descriptions stated above in "Appearance."

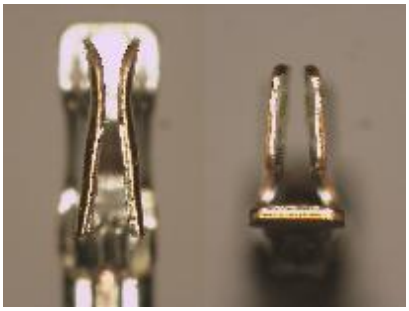
The SH/SHD connector contact is designed to be thin and compact to meet the demand for narrow pitch and space saving.
It is recommended that microscope or loupe be used at appearance inspection.

5. Example of Defective Crimping and Points of Adjustment of Machine

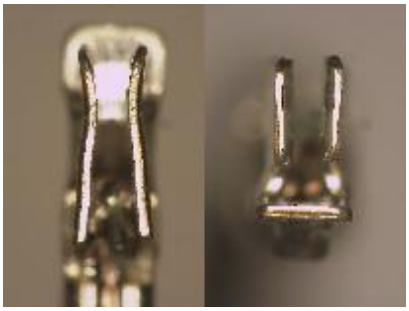
Following defective crimping may lead to serious performance defect such as defective contacting.
Before crimping operation, be sure to check that product appearance is free from abnormality.

5-1 Deformation at mating part

① Examples of deformation at the mating part



Proper crimping



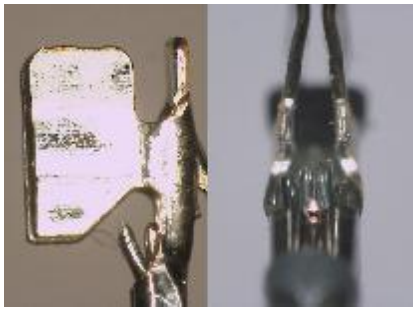
Wide mating part
Insufficient contact pressure
may cause electrical discontinuity.

Narrow mating part
It may cause a crashing
with mating header post.

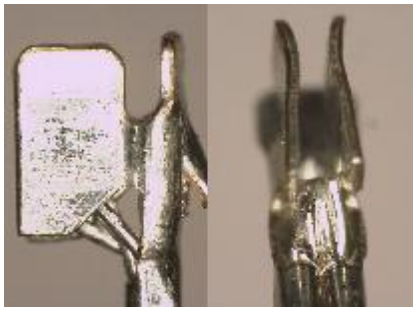
Note$_4$: Compare the configuration of the mating part before and after crimping operation in order to check if there is any abnormalities as above.

② Cause of deformation and points of adjustment

Cause-1: Wire conductor protruding length



Proper crimping



Defective product
(Mating part is excessively widen.)

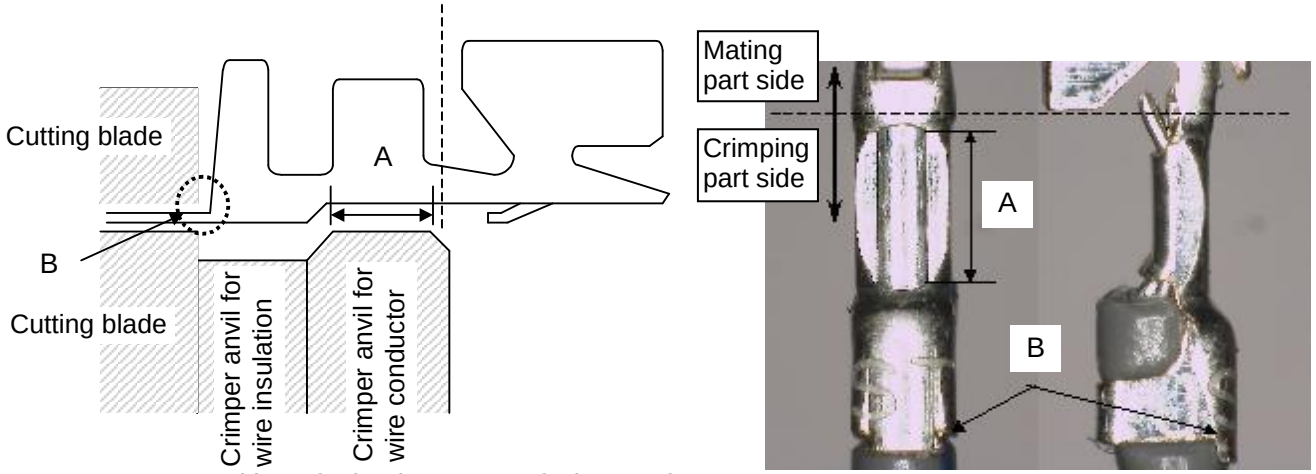
When wire conductor protruding length is long as shown above, the mating part of the contact is clogged with wire conductors, so that the mating part is widened.
In such cases, be sure to adjust wire conductor protruding length to become short as proper crimping product.

- When a scratch is observed on the tip of the protruding part of wire conductor and the back of the mating part even if the mating part is not clogged with wire conductors like defective example, same adjustment is required because wire conductors may deform the mating part of the contact.

- When wire conductors come in contact with the outside of the mating box part, the mating part may be deformed to be narrow.

Cause-2: Deviation of crimping position
When crimping position is not adjusted properly, the mating part may be deformed.

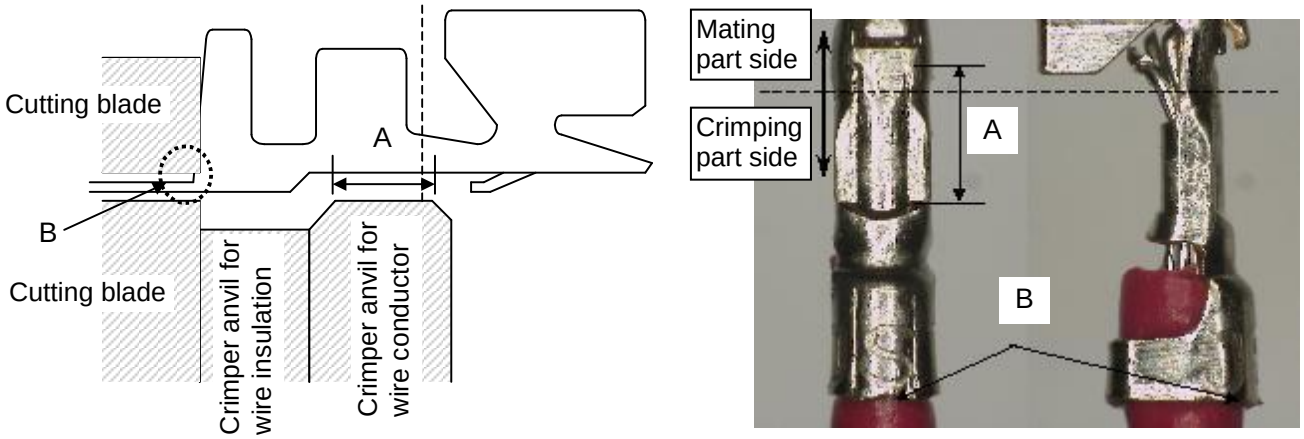
- Proper crimping position



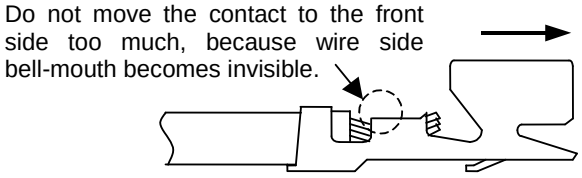
A: Position of crimping range of wire conductor
Crimping range “A” (crimping mark of crimper anvil) is within the range of crimping part side (Bottom side from the dotted line of the photo).
B: Cut-off tab
Cut-off tab must be visible.

- Improper crimping position

In the case that the contact deviates from its normal position to cutting blade side.



A: Position of crimping range of wire conductor
Crimping range “A” deviates from its normal position to the mating part side.
In this case, the crimper anvil for wire conductors comes in contact with the mating part side of the contact, so that the contact mating part may be deformed to narrow.
B: Cut-off tab
Cut-off tab cannot be visible. In this case, wire insulation barrel comes in contacts with cutting blade, so that contact feeding defect and deformation may occur.
Note$_5$: When the contact setting position is adjusted to the mating part side (opposite side to the crimping part side), adjust it so that bell-mouth can be visible.



5-2 Abrasion of crimping die

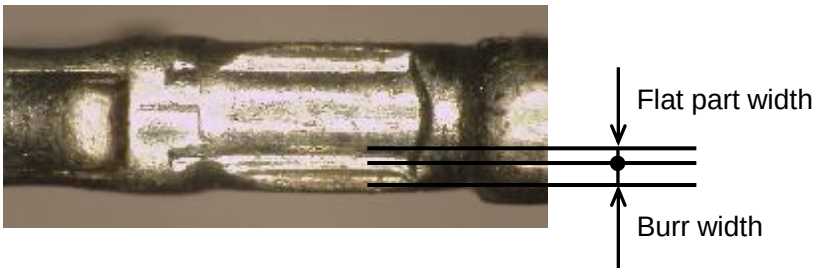
Regarding a crack caused by abrasion of the crimping die, check the appearance of the crimping part of the contact and replace the die with a new one occasionally in order to prevent discontinuity.

- Replacement timing of crimping die

① When a crack and roughness appear on the die.

② The size of burr exceeds the following condition in appearance check of underside of wire conductor crimped part.

Appearance at underside of wire conductor crimped part



Replacement timing of crimping die:

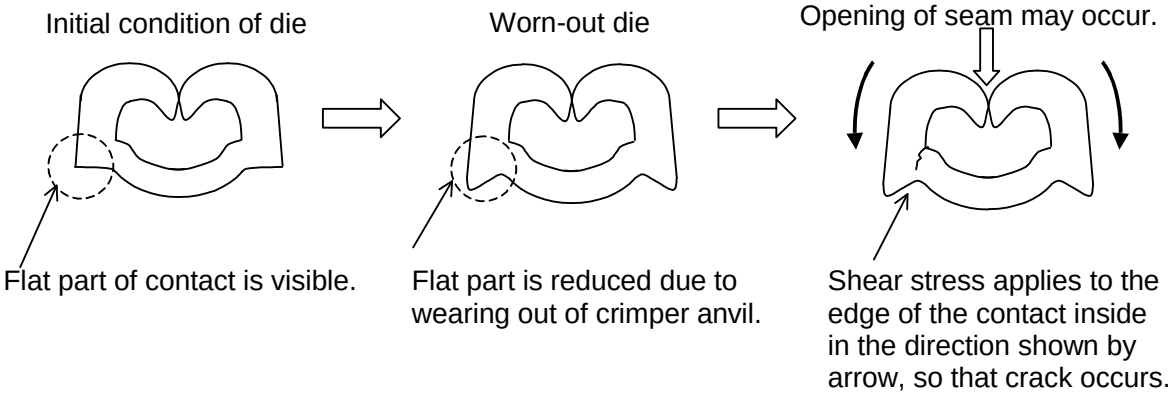
$$\frac{\text{Burr width}}{\text{Flat part width + Burr width}} > \frac{1}{3}$$

③ When excessive roughness of the crimped contact surface appeared. (Gloss of the contact surface disappears.)

④ When opening appears at seam of the crimped part. (See figure below.)

Note$_6$: In the case that crimping is conducted beyond the reference timing, a crack may appear on the contact as shown below.

- Mechanism of occurrence of crack (Cross section at wire conductor part)



6. Crimping Operation

Before crimping operation, be sure to check that combination of contact, wire to be used, and crimping die are correct.
As the gold-plated contact tends to cut into the face of the crimper dies rather than the tin-plated contact, lubricate oil to the contact in crimping.(Oil: Nihon Kohsakuyu Co., Ltd.-made blanking oil, G6316)
In lubricating oil, use a JST-specified lubricator and coat oil throughout the barrel bottom surface and the carrier of the contact. At this time, be careful not to loose the fabric fiber of the lubricator which coats oil, because coating becomes insufficient.
Moreover, in case that an interval is made due to pause until crimping after oil lubracation, crimp the contact after oil is lubricated to the bottom surface of the barrel.

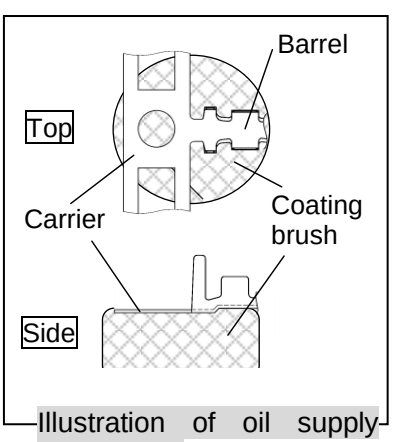
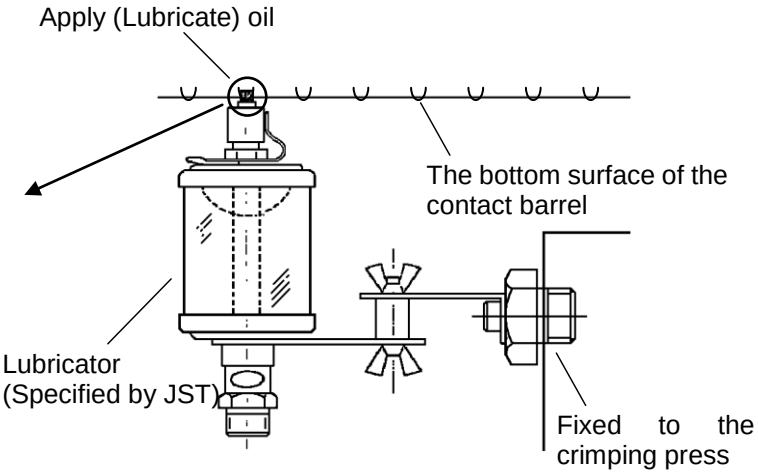


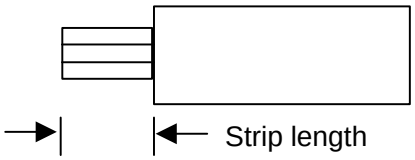
Illustration of oil supply (lubrication)



6-1 Wire strip length

Referring to the reference value of wire strip length stated below, conduct wire stripping.
As wire strip length differs depending on type of wire and crimping method, decide the best wire strip length considering processing condition. When wire is stripped, do not damage or cut off wire conductors.

Reference value of wire strip length: 1.5 mm



Do not leave such a stripped wire for long time in order to prevent oxidation of the conductor surface, since such oxidation may lead fluctuation of contact resistance.
After stripping, complete crimping operation as soon as possible.

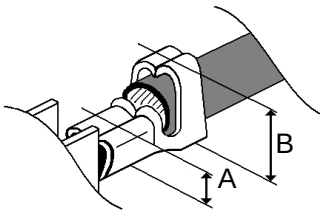
6-2 Crimp height

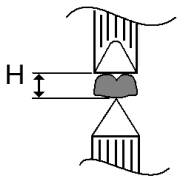
According to wire to be used, adjust dials of applicator to a proper crimp height.

Note$_7$: The crimp height of the insulation part is a reference value.
It depends on wire insulation outer diameter and material, so set the crimp height of the insulation part in crimping according to item 6-2-4.

Wire		Crimp height (mm)		
Size	Insulation O. D. (mm)	Conductor part		Insulation part
		Target	Range	
AWG #28	ϕ0.77	0.44	0.43 ~ 0.47	1.00
AWG #30	ϕ0.58	0.41	0.40 ~ 0.44	0.95
AWG #32	ϕ0.53	0.39	0.38 ~ 0.42	0.90

6-2-1 Measurement of crimp height



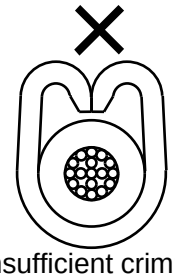


A: Crimp height at wire barrel should be set to the pre-determined dimensions.
B: Adjust the crimp height at wire insulation barrel to the extent that wire insulation is slightly pressed, and set it so that crimping is not excessively.
H: Measure the crimp height at the center of the barrel using a specified micrometer.

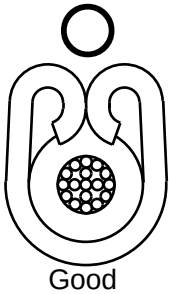
6-2-2 Measurement timing of crimp height

①When the operation starts at morning and afternoon, starts after pausing and finishes.
②When the contact reel is exchanged.
③When the applicator is adjusted. (After trouble-shooting, etc.)
④When the crimping dies are exchanged.

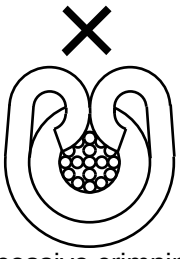
6-2-3 Crimping condition at insulation barrel



Insufficient crimping
(pressed weak)
When tension is applied to a wire, the wire insulation easily comes off the contact.



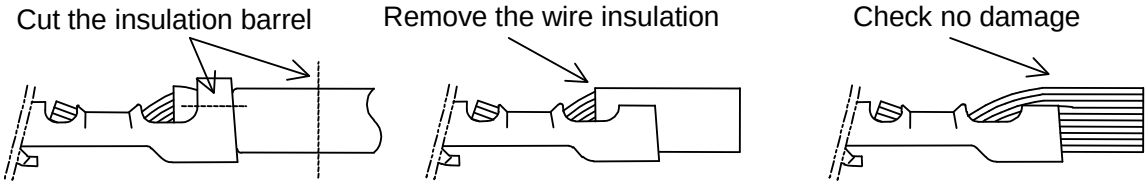
Good



Excessive crimping
(pressed excessively)
The barrel bites wire too much and may damage wire conductors.

6-2-4 Check of crimping condition at insulation barrel

Cut only the wire insulation barrel, remove the wire insulation and check if the wire conductors are not damaged as below.



6-3 Tensile strength at crimped part

After adjusting crimp height, check tensile strength using the test samples, and then, start continuous crimping operation. In case tensile strength greatly differs from the normal tensile strength (actual value), check if there is a defect. Depending on the strength of wires, the actual value may be different even if wire size is same.

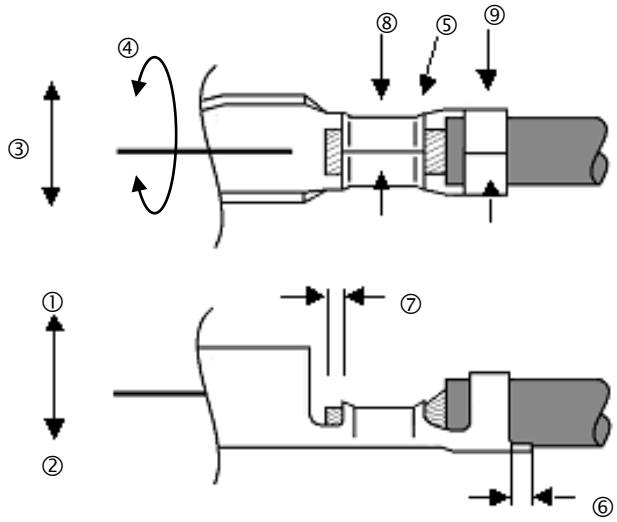
Unit: N

Wire size	Requirement	Actual value
AWG #28	10 min.	20 ~ 28
AWG #30	5 min.	14 ~ 20
AWG #32	3 min.	8 ~ 13

6-4 Crimping appearance

Check crimping appearance visually for correct crimping with equipment such as a loupe.

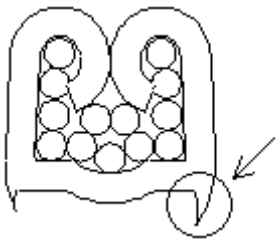
Part name of crimped contact



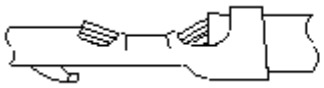
Item		Reference value
①	Bending up	8° max.
②	Bending down	5° max.
③	Twisting	5° max.
④	Rolling	5° max.
⑤	Bell-mouth	0.05 ~ 0.25 mm
⑥	Cut-off length	0.05 ~ 0.3 mm
⑦	Wire conductor protruding length	0.1 ~ 0.5 mm
⑧	Crimp width at conductor part	Approx. 0.7 mm
⑨	Crimp width at insulation part	0.8 mm max.

Remarks: As long as the crimped contact can be inserted into the housing, bending up of the contact may be allowed.

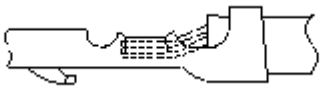
6-4-1 There must not be large burr or one-sided burr.



6-4-2 Examples of defective crimping

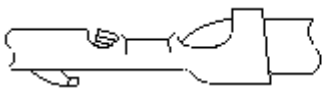


Wire conductor protruding length is long.

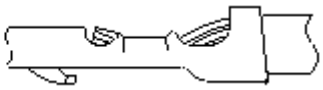


Wire conductor protruding length is short.

Wire conductor comes off.



Wire barrel bites wire insulation.



Wire insulation is not crimped sufficiently.

6-5 Precautions for crimping operation

① Conduct crimping operation properly and inspect the crimping appearance of the crimped product with microscope or loupe.

② Do not conduct empty crimping and crimping twice, because they may cause outstanding burr at the crimped part and may lead to abrasion of the crimping die quickly.

③ As cutting residue (powder), etc. adhered to the crimping die part affects life of the dies, clean the crimping part occasionally and conduct appropriate crimping.

④ As abrasion of the crimping die and insufficient adjustment of the applicator may cause crimping appearance defect, do not fail to conduct daily inspection.

6-6 Precautions for storage and handling of crimped contact

As the crimped contact before inserting into the housing is subject to deformation, etc. by forces, pay careful attention to the following 4 points for storage and handling:

① Protect the contacts by wrapping with thick paper to prevent from deformation of the mating part and adhesion of foreign substances, and keep them in an adequate box.

② Do not place the contacts in humid area, under direct sunshine and directly on the floor. Store them in a clean room with ordinary temperature and humidity.

③ Do not stack too much quantity of the crimped contacts nor place anything on them, because the weight of themselves may cause deformation of the contact and troubles such as defective contacting.

④ When the crimped contact is taken out of the bundle, do not pull wire but hold wire near the crimped section and take it out.

7. Harness Assembly Operation

Harness assembly operation is a very important process to decide the connector performance and the harness quality. Careful operation is required for harness assembly as well as the said crimping operation.

7-1 Precautions before inserting crimped contact into housing

① Do not place other things on or near working table and do not conduct any other works on the same working table to prevent from operation mistake.

② Do not stain contact with household goods such as oils, detergent, seasoning and fruit juice. If stained, never use stained contact.

③ Do not use the improperly crimped contact and deformed one.

④ Rough handling of the crimped contacts at bundling may cause deformation.

⑤ When a bundle of the crimped contacts are loosened, do not pull the crimped contacts forcibly even if they get entangled.

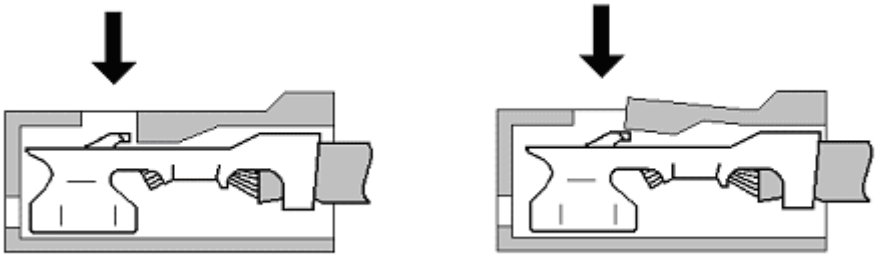
7-2 Inserting crimped contact into housing

① Hold the contact with its lance part up, and insert it into the housing without prying or inserting diagonally.

② Insert the contact into the housing without stopping to innermost.
When the contact is fully inserted into the housing, the housing lance clicks and there is feeling of response.

③ Check secure locking per each insertion by pulling wire softly in order to check that the contact does not come off the housing. Besides, check visually that each contact lance is securely caught with the housing one as shown below.
Do not pull wires too much, because the housing breakage and wire cutting may be caused.

SH connector



Good　　Incomplete insertion

7-3 How to extract crimped contact from housing in case of mis-insertion

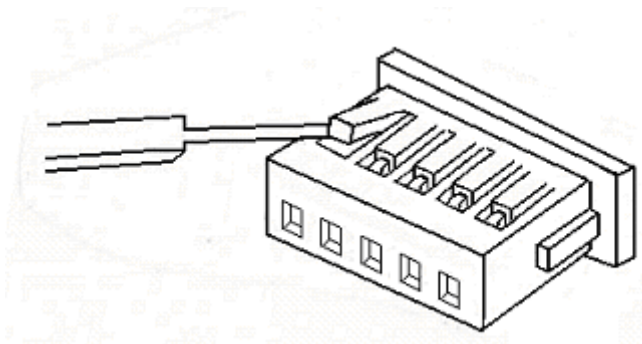
When the contact is inserted into improper circuit hole, conduct the following points:

① Raise the housing lance with a sharp-pointed tool like a needle or jig as shown in the figure, and release the lock.

② Pull wire softly and extract the contact from the housing.

Note$_8$: Do not reuse the housing whose lance has been raised once, but use a new one.
Do not reuse the extracted contact in principle, but use a new one.
When the extracted contact is reused in some reason, the reuse should be once, and check that the extracted contact is free from damage.

SH connector



8. Inspection of Finished Product (Continuity Check)

8-1 Simple wiring inspection using a tester

- Do not insert a tester stick into the mating part, because the mating part may be deformed.
- Contact a tester stick with wire insulation side inserting it from the contact entrance of the connector housing, and conduct the inspection.

8-2 Wiring inspection using an inspection jig

Note the following points:

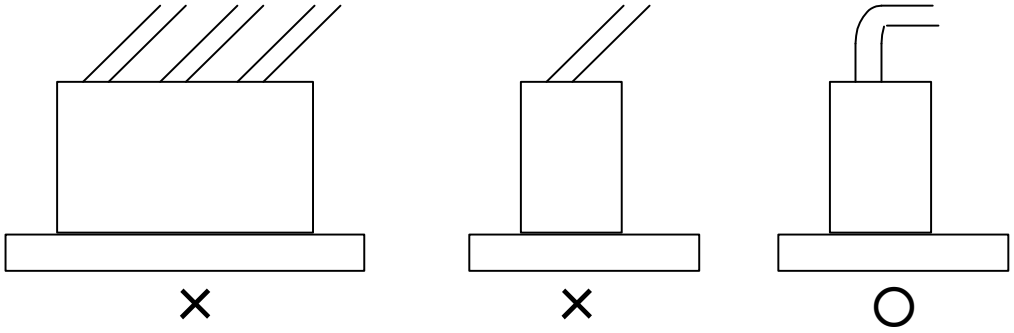
- Use the header applicable to the housing for inspection. (Refer to the table below.)
  Do not remove the housing wall of the header. If removed, the contact may be pried easily during inspection and poor contact may be caused.
- Use the header free from deformation, damage and stains. When they are found, replace with a new one at once. Periodical replacement of the header should be conducted as well.
- Carefully mate and unmate the connector, holding the housing so as not to pry.
  When an inspection board is used, design it considering that mating and unmating works are not difficult.

Contact	Housing to be used	Applicable header
SSH-003GA-P0.2	SHR-**V-S(-B)	BM**B-SRSS-G (LF)(SN) SM**B-SRSS-G (LF)(SN)
	SHDR-**V-S(-B)	BM**B-SRDS-G (LF)(SN) SM**B-SRDS-G (LF)(SN)

Note$_9$: "**" denotes the 2-digit circuit number.

9. Handling Precautions

① Conduct wire handling carefully so as not to apply tension stemmed from wire bending.
Keep a distance from the connector and form wires so as not to apply any tension.



② Insert the connector on the same axis against the mating axis as long as you can.
Do not diagonally force it in the housing, because the damage on the housing or the deformation on the header may be caused.

③ The insertion of the socket into the deformed header may damage the housing or deform the contact.

④ In unmating the connector, hold wires in bundles and withdraw the connector within 20 degrees