



Title of Document:	HANDLING MANUAL	Issue No. CHM-1-2788	Rev. 0
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This handling manual describes operation points of crimping and handling the NSHD connector contact (gold-plating).

Be sure to read this manual thoroughly before conducting crimping operation and keep this manual in a place where persons who adjust the crimping tool or crimps the contacts can see at any time.

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JST	Title subject: NSHD Connector (Gold-Plating)	No. CHM-1-2788
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1. Part Name and Model Number

Part name		Model No.
Contact		SNSHD-003G-P0.2
Housing	20, 28 circuits	NSHDR-**V-Z

Note₁: 2-digit figures in “**” denote the circuit number.

2. Storage

2-1 Storing the connectors

Recommended storage condition: Temperature: 5 – 35 °C, Relative humidity 60 % or less
(Under packaging like the state of JST shipment)

Keep off direct sunlight, places exposing to such corrosive gas as industrial gas (generate from a stove and whatnot) and ammonia gas (generate from a toilet and whatnot) and dusty place.
Also, keep the storage room from condensation.

Note that the resin molding part may break due to transportation and handling, such as processing and mating, under dry or low temperature condition.
After unpacking, return the products in the original package to store.

2-2 Storing the crimped contacts

Not leaving the crimped contact to stand in a place exposed to high humidity and direct sunshine, and not placing them directly on the ground. Keep them in a clean storage room.

3. Applicable Wire

	SNSHD-003G-P0.2
Applicable wire size	AWG #32 ~ #28
Wire insulation outer diameter (mm)	φ0.4 ~ φ0.8 mm
Conductor	Annealed copper stranded wire with tin plating

Note₂: Special wires such as solid, shielding, and tin-coated ones other than the above wires cannot be used in principle. When you use such a special wire, contact JST.

4. Crimping Tool

Product name		Model No.
Semi-automatic press		AP-K2*
Crimping applicator		MKS-L-10-3
Die set	Dies	MK/SSH/L-003-02
	Applicator & dies set	APLMK SSH/L003-02

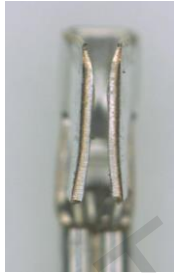
Note₃: When crimping operation is conducted by using other than the above applicator and die set, JST cannot guarantee the connector's performance.

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

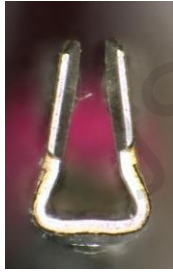
Defects shown below may lead to serious performance defects such as poor contact. Before crimping operation, be sure to check that the product appearance is free from abnormalities.

5-1 Deformation at mating part

① Examples of deformation at the mating part



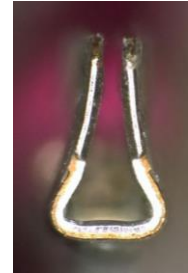
Proper crimping



Too wide mating part
Insufficient contact pressure
may cause electrical discontinuity.



Too narrow mating part
It may cause a collision
with the mating header post.



Note4: Compare the shape of the mating part before and after crimping operation in order to check if there is no abnormality as above.

② Causes of deformation and points of adjustment

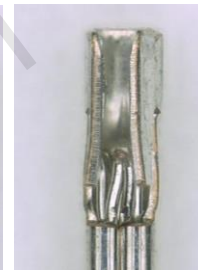
Cause-1: Protruded wire brush length



Proper crimping



Defective product (Too wide mating part)



When protruded wire brush length is long as shown above, the mating part of the contact is clogged with wire conductors, which makes the contact piece widen.

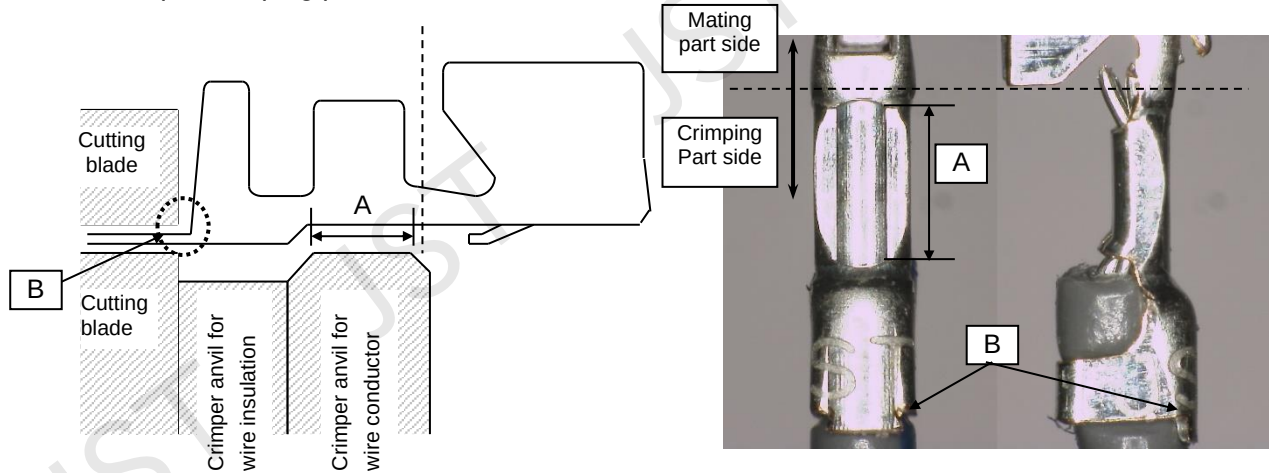
In such cases, be sure to adjust it short as proper crimping products.

- 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 narrowed.

Cause-2: Deviation of crimping position

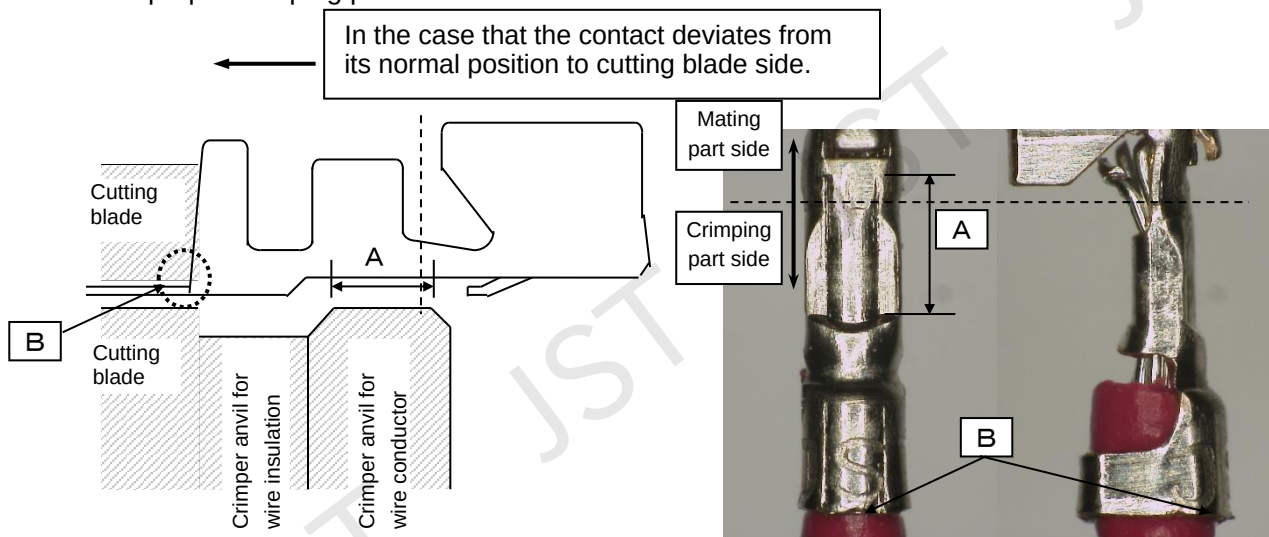
When crimping position is not adjusted properly, the mating part may be deformed.

- Proper crimping position



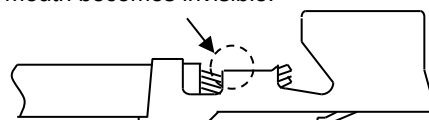
- A: Position of crimping range of wire conductor
Crimping range "A" (crimping mark of crimper anvil) is within the range of crimping part side (Bottom side from the dotted line of the photo).
- B: Cut-off tab
Cut-off tab must be visible.

- Improper crimping position



- 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, and the contact mating part sometimes is narrowed.
- B: Cut-off tab
Cut-off tab cannot be visible. In this case, wire insulation barrel comes in contacts with cutting blade, which sometimes becomes the cause of contact feeding defect and shape defect.
- Notes: 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.

Do not move the contact to the front side too much, because wire side bell-mouth becomes invisible.



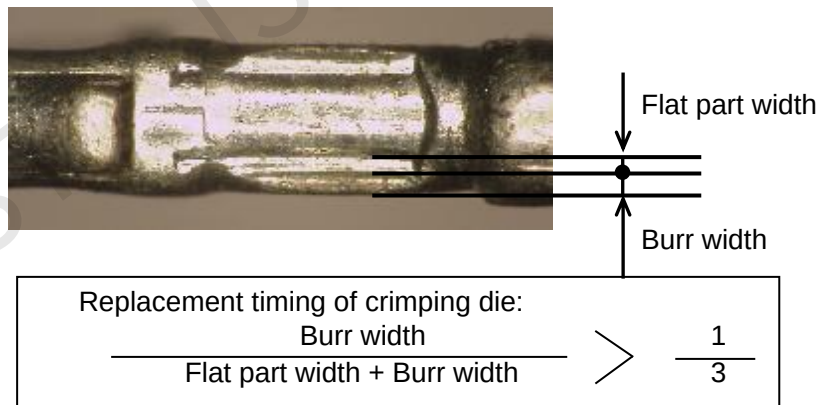
5-2 Abrasion of crimping die

As the crimping dies with cracks due to the abrasion causes electrical discontinuity, check the appearance of the crimping part and replace the dies if necessary.

- Replacement timing of crimping die

- ① The size of the burr exceeds the following condition in the appearance check of the lower wire conductor crimped part.

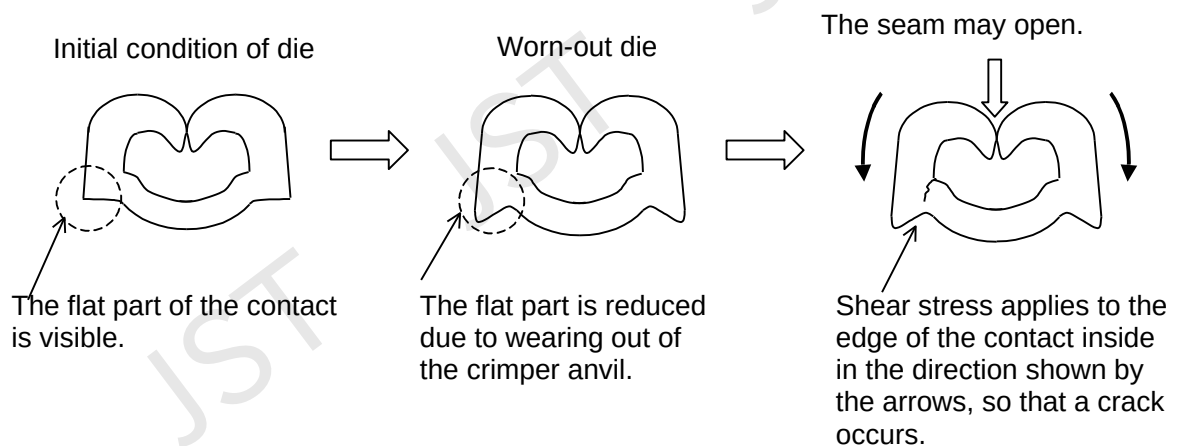
Appearance at the lower wire conductor's crimped part



- ② When the crimped contact surface becomes rough. (The gloss of the contact surface disappears.)
- ④ When the seam of the crimped part opens. (See figure below.)

Note₆: If 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)



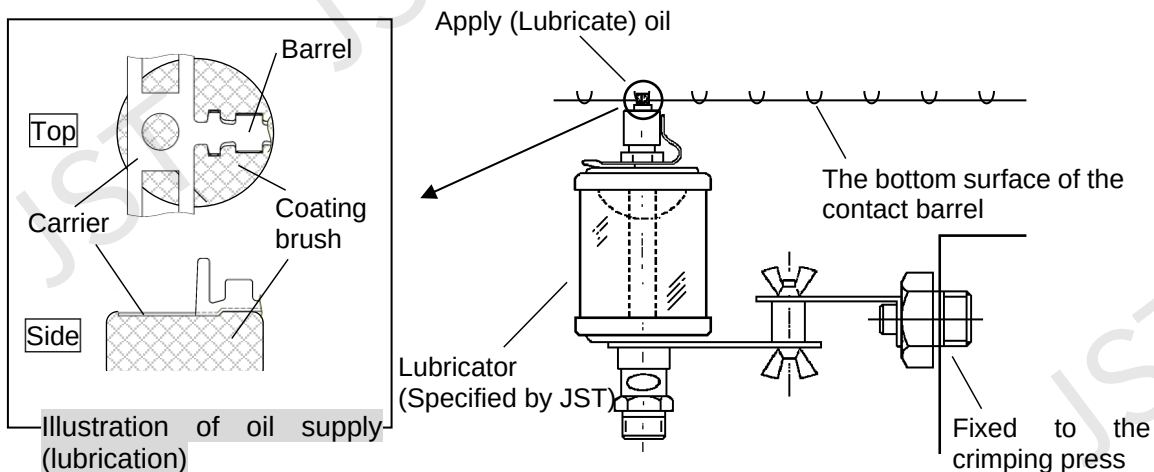
6. Crimping Operation

Before crimping operation, be sure to check that the combination of the contact, wires, and the crimping die is correct.

As the gold-plated contact tends to cause more troubles such as biting into the face of the crimper dies rather than the tin-plated contact, lubricate JST specified oil to the contact as shown below in crimping. (Oil: Nihon Kohsakyu 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 loosen the coating brush 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 lubrication, lubricate oil before crimping.

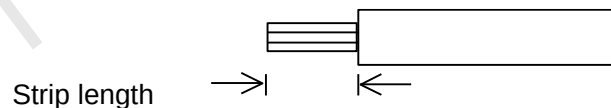


6-1 Wire strip length

Referring to the reference value of the wire strip length stated below, conduct wire stripping.

As the wire strip length differs depending on the wire type and the crimping method, decide the best wire strip length considering the processing condition. When a wire is stripped, do not damage, or cut off the wire conductors

Reference value of wire strip length: 1.5 mm



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

6-2 Crimp height

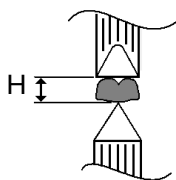
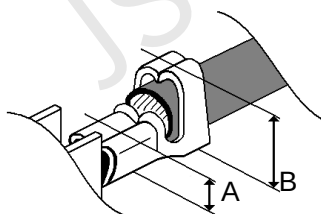
According to wires to be used, adjust the dials of the applicator to a proper crimp height.

Note7: The crimp height of the insulation part is a reference value.

It depends on the wire insulation's outer diameter and the material, so check and set it to the best one in crimping according to item 6-2-4.

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

6-2-1 Measurement of crimp height



A: The crimp height at the wire barrel should be set to the pre-determined dimensions.

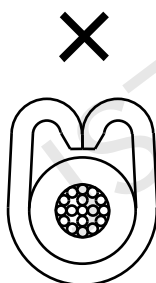
B: Adjust the crimp height at the wire insulation barrel to the extent that the wire insulation is slightly pressed, and set it so that crimping is not excessive.

H: Measure the crimp height at the center of the barrel using a micrometer.

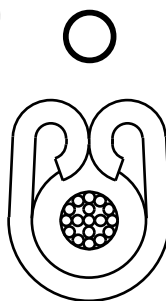
6-2-2 When to measure crimp height

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

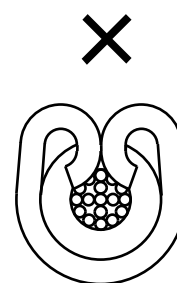
6-2-3 Crimping condition at insulation barrel



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



Good

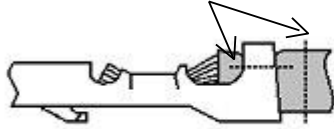


Excessive crimping
(pressed excessively)
The barrel bites wire too
much and may damage
the wire conductors.

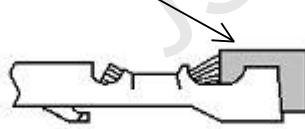
6-2-4 Checks of crimping condition at insulation barrel

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

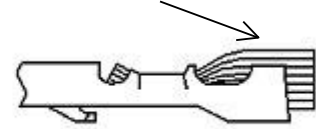
Cut the insulation barrel



Remove the wire insulation



Check no damage



6-3 Tensile strength at crimped part

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

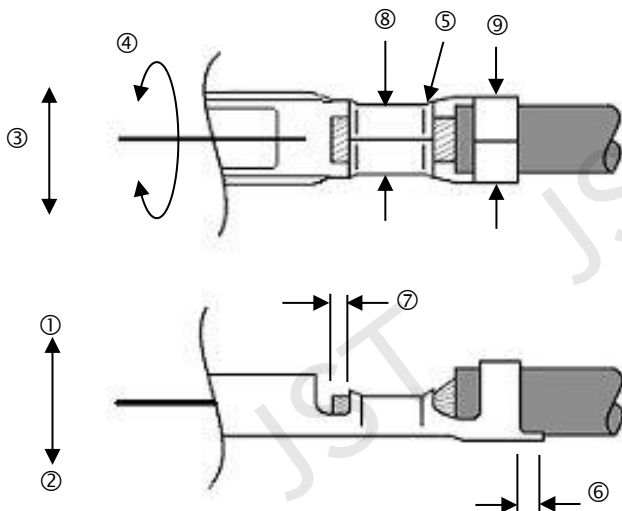
Unit: N

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

6-4 Crimping appearance

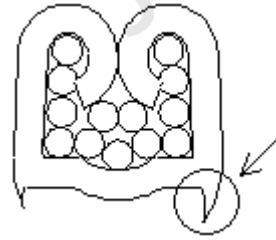
Check the crimping appearance visually for correct crimping with equipment such as a microscope or loupe.

Part name of crimped contact

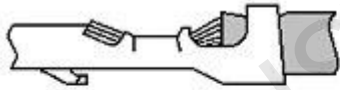


Check item	Reference value
① Bending up	8° max.
② Bending down	5° max.
③ Twisting	5° max.
④ Rolling	5° max.
⑤ Bell-mouth	0.05 ~ 0.25 mm
⑥ Cut-off length	0.05 ~ 0.3 mm
⑦ Protruded wire brush length	0.1 ~ 0.5 mm
⑧ Crimp width at wire conductor part	approx. 0.7 mm
⑨ Crimp width at wire insulation part	0.8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

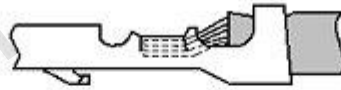
6-4-1 There must not be large burr or one-sided burr.



6-4-2 Examples of defective crimping



Long protruded wire conductors



Short protruded wire conductors



Stray wire conductor

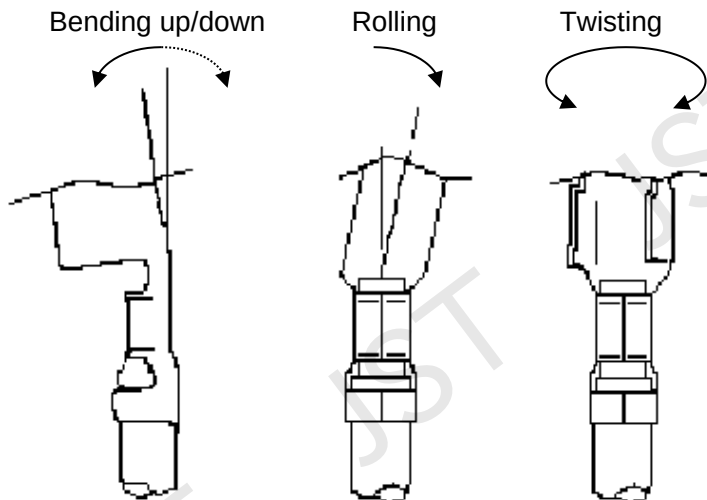


Bitten wire insulation
with wire barrel



Poorly crimped wire insulation

6-4-3 Bending up, bending down, twisting and rolling



Bending up/down, twisting and rolling

Note that bending up/down, twisting and rolling may lead to deterioration of the contact insertion and the contact retention force as well as poor crimping.

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6-5 Precautions for crimping operation

- ① Conduct crimping operation properly and inspect the crimping appearance of the crimped product with a microscope or loupe.
- ② Do not crimp with no contacts and twice, because they may cause outstanding burrs at the crimped part and may lead to the abrasion of the crimping die quickly.
- ③ As cutting residues (powder), etc. adhered to the crimping die part affects the life of the dies, clean the crimping part and its vicinity occasionally and conduct appropriate crimping.
- ④ Abrasion of the crimping die and insufficient adjustment of the applicator may cause the poor crimping appearance. Do not fail to conduct daily inspection.

6-6 Precautions for the handling of the crimped contact

The crimped contact is subject to deformation, etc. by external force before inserting into the housing, pay careful attention to the following 3 points for storage and handling:

- ① Protect the contacts by wrapping with thick paper to prevent the deformation of the contact surface and adhesion of foreign substances. Keep them in a clean room with normal temperature and normal humidity.
- ② Do not overstack the bundle of the crimped contacts or place anything on them, because the weight may cause deformation of the contact, poor contact and other defects.
- ③ When the crimped contact is taken out of the bundle, do not pull a wire but hold the wire near the crimped section and take it out.

7. Harness Assembly Operation

The harness assembly operation is a very important process for the connector performance and the harness quality. Careful operation is required for the harness assembly.

7-1 Before inserting the crimped contact into the 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 mistakes.
- ② Do not contaminate the contact with household goods such as oils, detergent, seasoning or fruit juice. If contaminated, do not use the contact.
- ③ Do not use improperly crimped contact or deformed contacts.
- ④ In bundling, do not handle the crimped contacts roughly because they may be deformed.
- ⑤ When the bundle of the crimped contacts is loosened, do not pull the crimped contacts by force even if they get entangled.

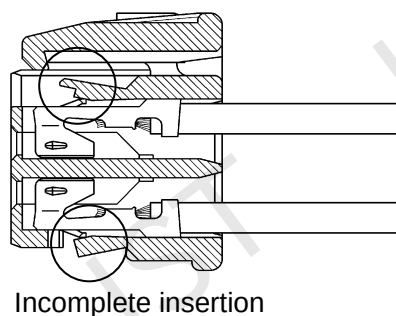
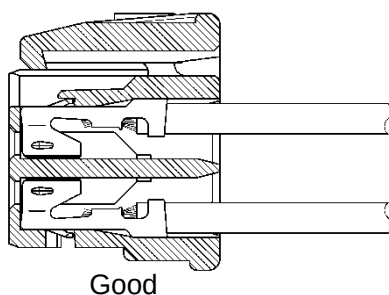
7-2 Inserting the crimped contact into the housing

- ① Insert the contact in a straight in the housing insertion hole. (If it is inserted diagonally, the contact may be deformed or it may stick out from the housing lance.)
Be careful not to insert the inverted contact to the housing.
- ② Do not use such a pin as an insertion jig, because the tip of the pin accidentally reaches the contact mating part, which may cause poor contact and contact deformation.
- ③ Insert the contact into the housing without stopping to the innermost.
When the contact is fully inserted into the housing, the housing lance clicks and there is the feeling of the response.

Insertion point:

Neither lean the contact toward the direction that the contact lance is pressed nor insert the contact prying up and down or right and left, because the contact lance and the mating part may be deformed.

- ④ Whenever the contact is inserted in the housings, make sure that the contact is securely inserted in the housing by pulling the wires so softly that they do not cut. Besides, check visually that each contact lance is securely caught with the housing one as shown below.
Do not pull the wire too strongly to break the housing or cut the wire.



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

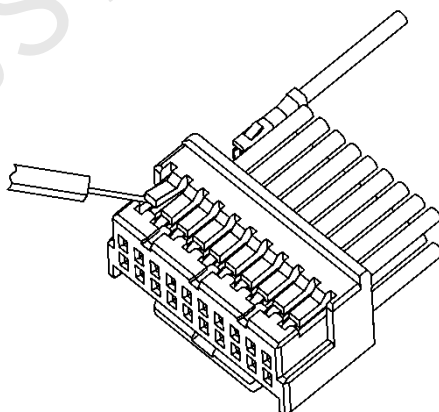
When the contact is inserted into an improper circuit hole, conduct the following points:

- 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 a wire softly and extract the contact from the housing.

Note₈: Do not reuse the housing which lance has been raised, 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 contact reuse should be once, and check that the extracted contact is free from damages.



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 the 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 is pried easily during the inspection, which may result in poor contact.
- 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.
- Mate and unmate the connector with care, holding the housing so as not to pry.
When an inspection board is used, design it considering that the mating and unmating work is not difficult.

Contact	Circuit No.	Housing	Applicable header
NSHD-003G-P0.2	20, 28	NSHDR-***V-Z	BM**B-NSHDZS-GAN

Note₉: 2-digit figures in “(*2)” denote the circuit number.

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9. Check Points of Crimping Operation and Harness Assembly

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

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

The contact is designed to be thin and compact to meet the demand for narrow pitch and space saving. We recommend using a microscope or loupe at the appearance inspection.

10. Mating and Unmating Connector

The PBT resin used for NSHD connector hardly absorb moisture, so stable dimension and mechanical strength (including locking strength and contact retention force) and insertion feeling with a sense of clicking are obtained with no influence by temperature condition. On the other hand, the resistance to shock is inferior to polyamide resins; the housing may be broken due to an unusual load.

We request you to handle with care.

10-1 Mating the connector

Hold the socket housing securely and insert it into the header in a straight against to the header post. Even after clicking, insert the socket housing with secure until stopping.

When the socket housing is inserted diagonally, the socket lock runs onto the header locking part and locking failure may be caused.

Check the backlash in the direction of the insertion axis and secure locking by pulling the socket housing so softly that the lock does not break.

10-2 Unmating the connector

Hold wires and unmate the connector on the mating axis.

Do the unmating operation of the socket after releasing the lock completely.

When the connector is unmated without unlocking fully, the socket lock hits the lock hook of the header, and releasing the lock sometimes becomes difficult.

In such a case, push the socket housing until stopping once for securely unlocking, and unmate the connector again.

10-3 Wire handling

As the NSHD connector is secure locking type connector, the breakage of the connector itself such as the soldering part and the lock part, and the breakage of the PC board may occur due to the handling direction of the harness after mating the connector or tensile strength.

In order to prevent such troubles and to bring out fully the connector performance, here are the things you keep in handling the wire harness:

- Do not always apply any external force to the connector other than tension or a load generated in normal wire harness operation.
 - * When handling the wire harnesses, take such a consideration as keeping enough length and fixing wires not to apply a larger load than wire buckling level to the connector.
- Provide moderate slack for a wire to make the mating and unmating of the connector easy, and conduct the operation on the mating axis.
 - * Even if the connector is unmated in a straight on the mating axis, the operation with holding several wires, not all may cause the same action as prying withdrawal.
- Do not use the NSHD connector at the movable part to the utmost.
When using it at the moveable part, fasten wires not to conduct directly the movement and the vibration of the wire to the connector contacting part as shown below.

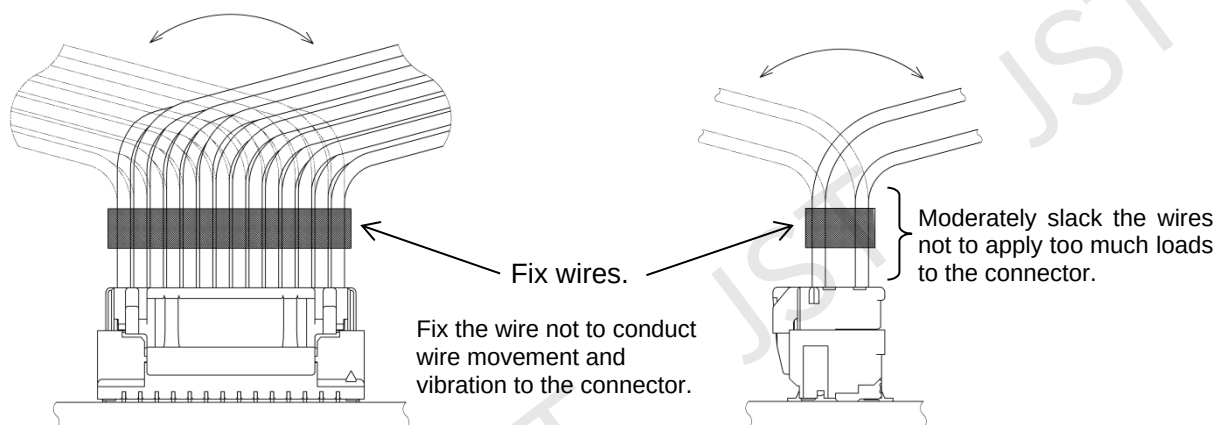


Fig.1

- When the edge of the socket housing does not touch that of the header housing in mating as shown in below, the socket housing touches the header contact, and the contact may be deformed.

In mating, operate the header housing along the socket one on the almost same axis.

The socket housing touches the header contact, and the header contact is deformed.

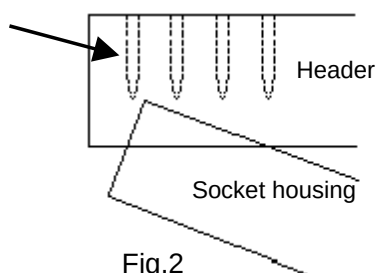


Fig.2