Title of Document: **REPORT**	Issue No. CHM-1-2337	Rev. 2
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This handling manual describes points to check for smooth crimping operation of the NSH connector.

C O N T E N T S

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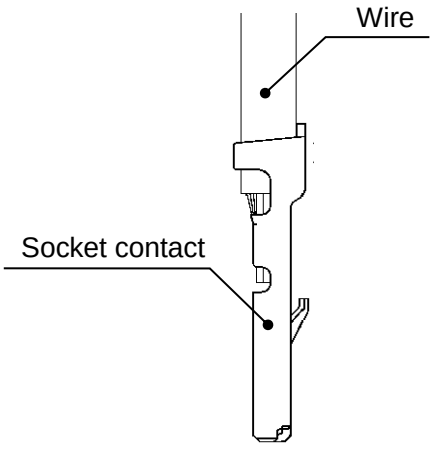
1. Part Name and Model Number

1-1 Model number

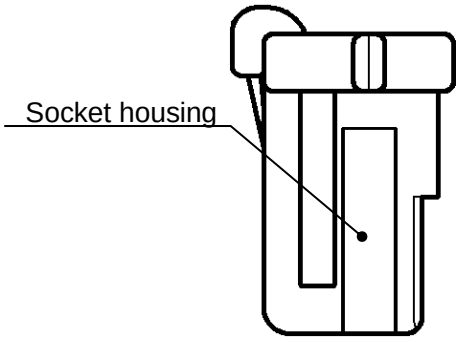
Part name			Model No.
Socket	Contact		SSHL-003T-P0.2
	Housing		NSHR-**V-( )
Header	Top entry type	Connector part	BM**B-NSH( )S (LF)(SN)
		Embossed-taping (With suction tape)	BM**B-NSH( )S-TBT (LF)(SN)
	Side entry type	Connector part	SM**B-NSH( )S (LF)(SN)
		Embossed-taping (Without suction tape)	SM**B-NSH( )S-TB (LF)(SN)

Note$_1$:2-digit figures in "**" denote the circuit number.
Note$_2$: A letter in "( )" denotes the housing color.
Note$_3$: Identification marking "(LF)(SN)" stands for lead-free product.
"(LF)(SN)" shall be displayed on the product label.
Note$_4$: GH connector socket contact (Model No.SSHL-002T-P0.2) cannot be used.

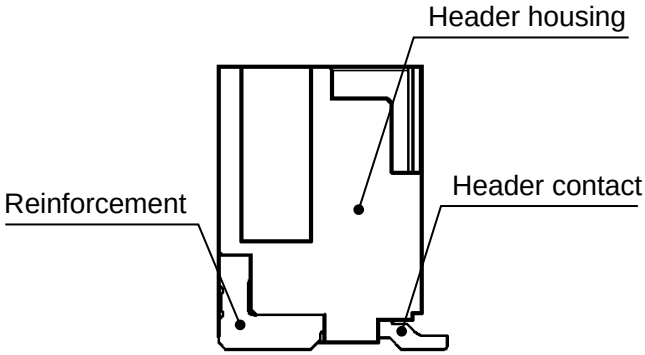
1-2 Each part name



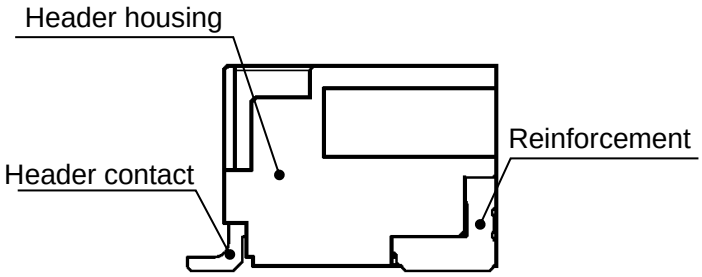
Socket contact



Socket housing



Top entry type header



Side entry type header

Fig.-1

2. Storage

2-1 Product Storage

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), dusty place and 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.

2-2 Storage of processed product

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

3. Applicable Wire

Contact model No.	Applicable wire		
	Conductor size	Conductor spec.	Insulation O.D.
SSHL-003T-P0.2	AWG #32 ~ AWG#28	Annealed copper stranded tin-plated wire	ϕ0.4 ~ ϕ0.8 mm

Note$_5$: Special wires such as bare ones, solid one, tin-coated ones, shielded ones and other than above ones cannot be used in principle. When using such special wires, contact JST.

4. Crimping Tool

Contact model No.	Crimping tool		
	Tool name		Model No.
SSHL-003T-P0.2	Crimping machine		AP-K2N
	Applicator	Applicator main body	MKS-L-10-3
		Die	MK/SSH/L-003-02
		Applicator with die	APLMK SSH/L003-02

Note$_6$: When crimping operation is conducted by using other than the above applicator and die set, JST cannot guarantee the performance of the connector.

5. Check Points of Crimping Operation and Harness Assembly

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

Process	Check point	Description
Crimping	Appearance	① Check that model Nos. of the contact and the applicator are adequate for wires to be used. ② Check that 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
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.”

Note$_7$: It is recommended that the appearance be inspected with a microscope or a loupe.

6. Crimping Operation

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 type of wire and 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

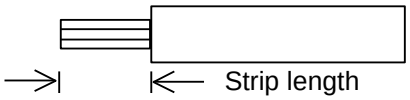


Fig.-2

6-2 Crimping

Before crimping operation, be sure to check that the combination of the contact, wires to be used and the crimping die is correct.
Check the below points for correct crimping at the beginning and the middle of the crimping operation.

6-2-1 Measurement of crimp height

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

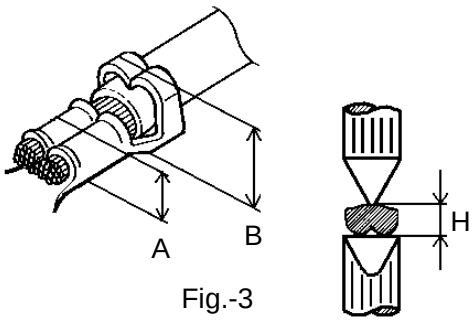


Fig.-3

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

Table of crimp height

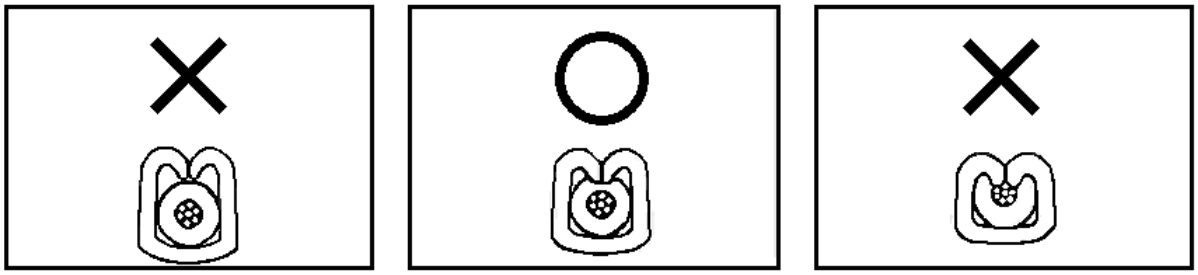
Contact model No.	Wire		Crimp height (mm)	
	Conductor size	Insulation O. D. (mm)	Conductor part	Insulation part
SSHL-003T-P0.2	AWG#32	ϕ0.53	0.38 ~ 0.42	0.90
	AWG#30	ϕ0.58	0.40 ~ 0.44	0.95
	AWG#28	ϕ0.77	0.43 ~ 0.47	1.00

Note$_8$: The crimp height at the insulation part is a reference value. Be sure to check the crimping condition at the insulation part, and conduct the operation.

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 the wire too much and may damage the wire conductors.

Fig.-4

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

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

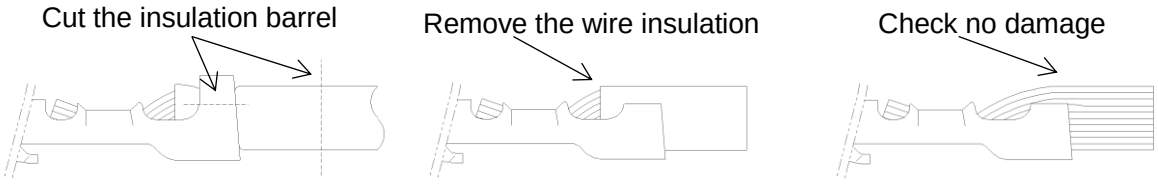


Fig.-5

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 that the tensile strength greatly differs from the normal tensile strength (actual value), check if there is a defect.

Contact model No.	Wire size	Tensile strength (Actual value)	Requirement
SSHL-003T-P0.2	AWG#32	8N ~ 13N	3N min.
	AWG#30	14N ~ 20N	5N min.
	AWG#28	20N ~ 28N	10N min.

6-4 Crimping appearance

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

6-4-1 Bending up/down, twisting and rolling

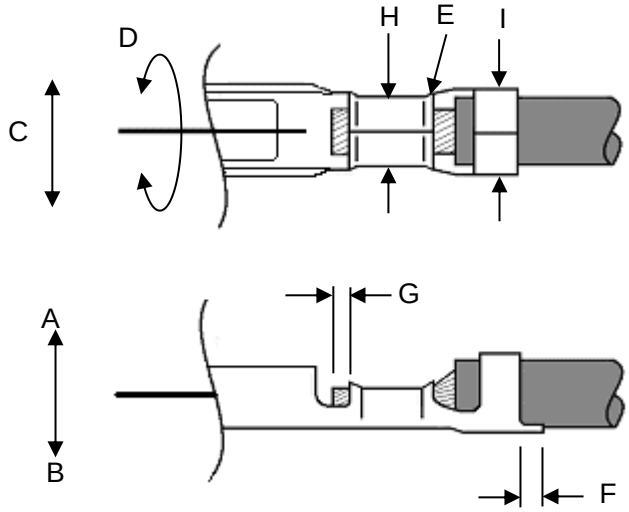


Fig.-6

	Item	Reference value
A	Bending up	2° max.
B	Bending down	3° max.
C	Twisting	2° max.
D	Rolling	5° max.
E	Bell-mouth	0.05 ~ 0.25 mm
F	Cut-off length	0.05 ~0.3 mm
G	Wire conductor protruding length	0.2~ 0.6 mm
H	Crimp width at conductor part	Approx. 0.7 mm
I	Crimp width at insulation part	0.80 mm max.

6-4-2 There must not be large burr or one-sided burr.

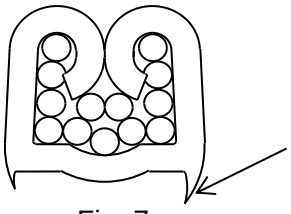


Fig.-7

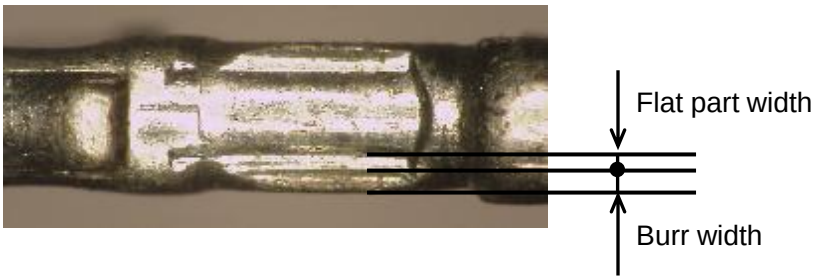
Abrasion of crimping die

It is considered that abrasion of the crimping die causes a burr. When the burr becomes large, a crack of the crimping die may cause electrical discontinuity. Check the appearance of the crimping part of the contact and replace the die with a new one occasionally in order to prevent electrical discontinuity.

Replacement timing of crimping die

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

Appearance at the underside of the wire conductor crimped part



Replacement timing of the crimping die:

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

- When excessive roughness of the crimped contact surface appears. (Gloss of the contact surface disappears.)
- When the seam of the crimped part opens. (See figure below.)

Note$_9$: 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)

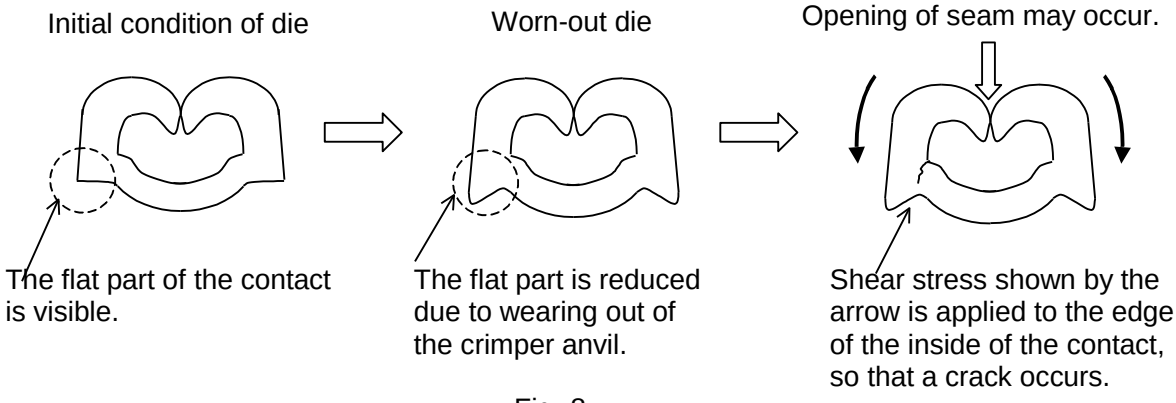


Fig.-8

6-4-3 Examples of defective crimping

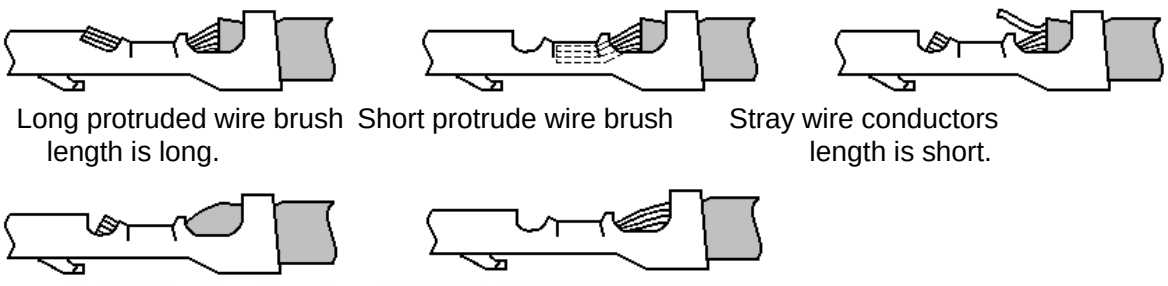


Fig.-9

6-5 Precautions for crimping operation

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

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

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

④ When chips or excessive roughness are observed on the crimping die, replace it without delay.

⑤ As abrasion of the crimping die and insufficient adjustment of the applicator may cause the defective crimping appearance, do not fail to conduct daily inspection.

6-6 Control of crimping operation

To conduct secure crimping operation, record the following items for the semi-automatic press and the crimping applicator.

① Model No. or control No. of semi-automatic press and applicator
② Contact lot No.
③ The number of crimping and cumulative total
④ Crimp height
⑤ Wire retention force
⑥ Crimping appearance and record of adjustment and replacement of crimping die

6-7 Precautions for the storage and the handling of the crimped contact

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

① Protect the contacts by wrapping with thick paper to prevent from the deformation and the adhesion of foreign matters, 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 deform the contact and troubles such as defective contacting.

④ Do not stain the contact with household goods such as oils, detergent, seasoning, and fruit juice. If stained, never use such a stained contact.

⑤ Do not use the improperly crimped contact and deformed one.

⑥ When the crimped contact is taken out of the bundle, do not pull a wire but hold it 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 Before inserting the crimped contact into the housing

Before inserting the contact into the housing, check below points:

① Check that the combination of the housing and the contact is proper.
(GH connector contact, “SSHL-002T-P0.2” cannot be inserted into the NSH connector.)

② 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.

③ Do not stain the contact with household goods such as oils, detergent, seasoning and fruit juice. If stained, never use such a stained contact.

④ Do not use the improperly crimped contact and deformed contact such as the lance and the mating part.

⑤ In bundling the wire harnesses, do not handle them so roughly that shock such as throwing and dropping applies to it. Rough handling may cause the connector deformation and breakage. When the bundle of the crimped contacts is loosened, do not pull the crimped contacts forcibly even if they get entangled.

7-2 Inserting the crimped contact into the housing

① How to insert the contact
Hold the contact and the housing with the lances up and insert the contact straightly into the entrance hole of the housing. (Do not pry in or insert diagonally.)

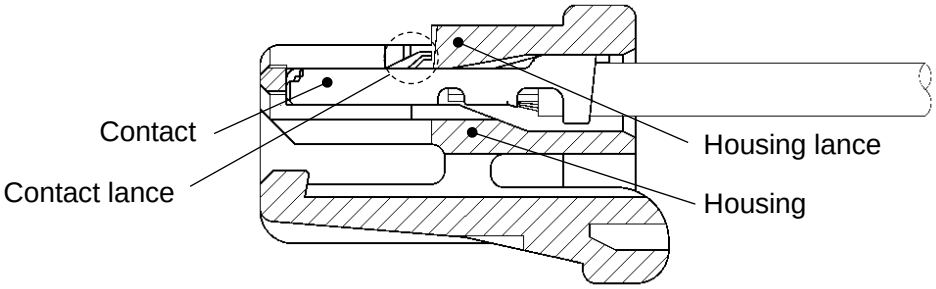


Fig.-10

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 feeling of response.

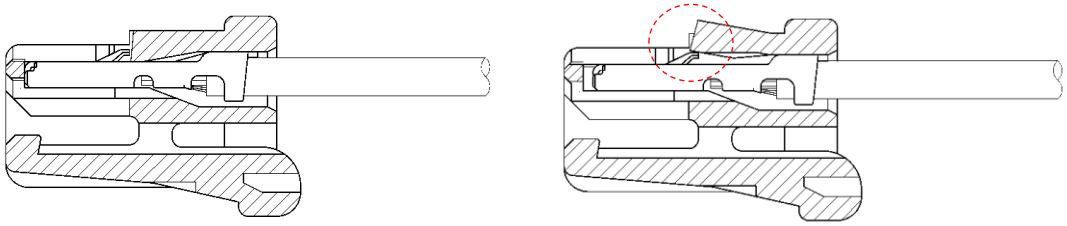


Fig.-11

② After contact insertion
Check secure locking per each insertion by pulling a wire back and forth softly with force of approx. 3N in order to check that the contact does not come off the housing. Besides, check whether there is the backlash in the direction of the insertion axis.
(When a wire is pulled with too much force, the contact lance may be deformed and the contact may come off housing.)

③ Precautions for insertion
- The direction of the contact against the housing must be proper.
- Do not use a pin such an insertion jig, because the tip of the pin accidentally reaches the contact mating part and it may cause poor contact or deformation of the contact.
- Do not incline the contact in the direction that its contact lance is pressed or do not pry in up-and-down or right-and-left, because the contact lance or the mating part may be deformed.

8. How to Extract Crimped Contact from Housing in Case of Mis-Insertion

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

① Do not reuse the housing and the contact that have used once but use new ones.
(Method of extracting the contact from the housing is as below.)

② In an inevitable case that the improperly inserted contact is extracted from the housing and reused:

- Only a specified person conducts the operation.
- In case such a contact and a housing are reused, the reuse should be once.
  From twice, use the new contact and housing.
  (If an abnormality is found on the housing or the contact, replace it with the new one at once.)
  Never reuse the housing.
- After the modification completes, be sure to check secure locking as shown in item 6-2.

How to extract contact

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 with releasing the lock and extract the contact from the housing.

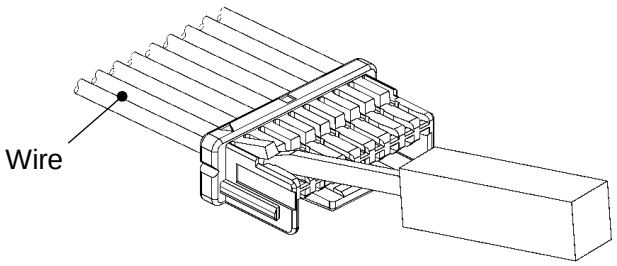
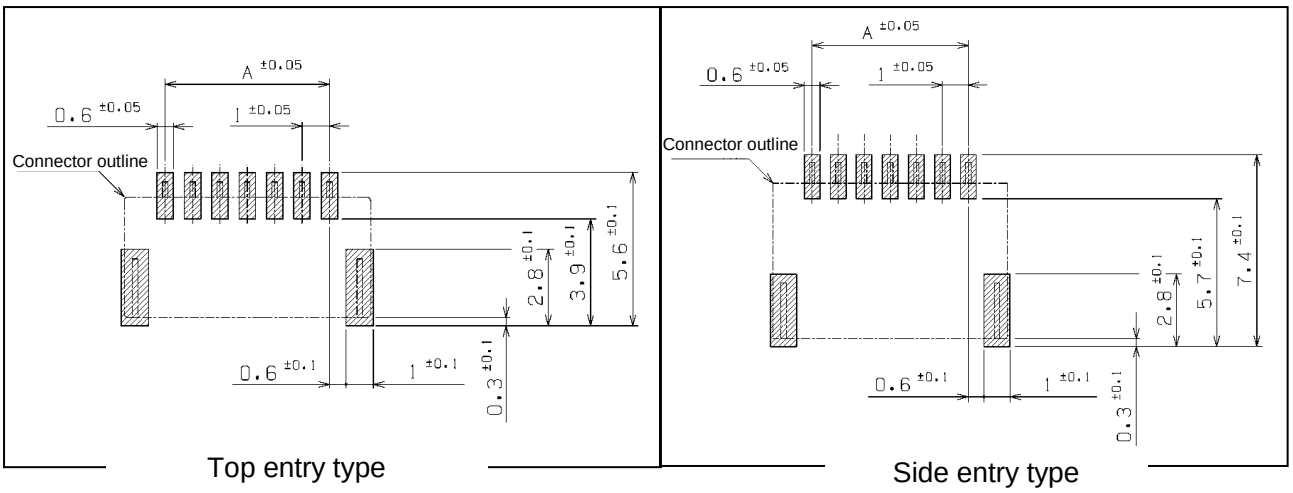


Fig.-12

Note$_{10}$: Do not reuse the housing with its housing lance raised but use the new one.
Inspect the appearance of the extracted contact to check whether the contact part is damaged or not.
If any abnormalities were found, replace it with new one.

9. Header

9-1 Recommended PC board pattern



Top entry type　　Side entry type

Dimension-A: 2.0 mm for 2 circuits
(Circuit No. –1) mm for 3 to 5 circuits
Recommended metal mask thickness: 150µm

9-2 Reflow soldering method

Solder the connector at the temperature lower than the temperature profile of reflow soldering shown in the item of resistance to soldering heat of the product specification. As the recommended reflow temperature condition depends on solder paste and PC board to be used, soldering check is necessary before the operation.

The following configuration of the metal mask is recommended for mounting operation;
- Blanking part: same area as land area on PC board
- Thickness: 150 µm

When the metal mask more than 150 µm in thickness is used, control the amount of solder by making the blanking area of the metal mask smaller than the land area on PC board.

Blister in reflow soldering
Considering the handling of this connector in mating operation, tenacious heat-resistant polyamide resin is used for the material of the header housing. But 'blister' may generate on the outer surface of the header housing during the process of reflow soldering, depending on the moisture-absorbing condition of the header housing and the condition of reflow soldering. However, 'blister' is not caused by the decomposition of the resin; it does not affect the performances of the connector.

9-3 Solder iron method

When soldering or resoldering the connector on a PC board, use a soldering iron with temperature of 350°C quickly within 3 seconds.
Do not apply an external force by such an operation as pressing the contact solder tail part with the tip of the soldering iron.
If done, dismount and exchange the connector, and conduct soldering again.
Do not reuse the dismounted connector.

10. Mating and Unmating Connector

10-1 Mating the connector

Holding the socket and all wires together, insert the socket straightly into header until you hear a click with its feeling.
After inserting the connector, check secure locking whether there is a backlash around the inserted contact on the mating direction and the contact does not come off the housing by pulling a wire softly with force of approx.5N. (If there is no click feeling, the insertion may be incomplete, so try again the contact insertion. The redo operation should be kept to minimum.)

Note$_{11}$: When holding all wires together, do not collect wires at the center from the pitch (lateral) direction but hold them from the top and the bottom as below.
(In case that wires are collected at the center and handled, the connector is deformed like a sector, and it may be broken.)

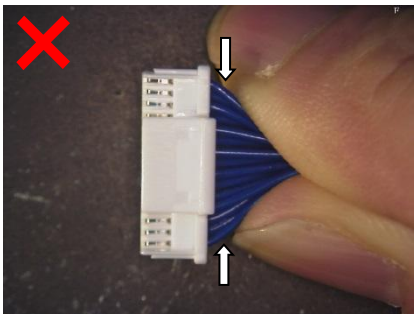


Photo-1
Wires are collected at the center and held.

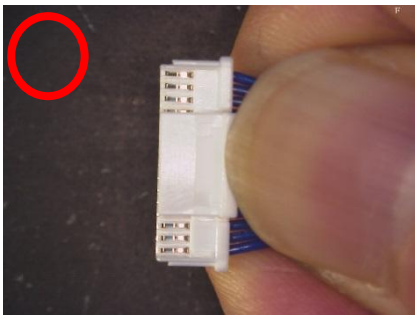


Photo-2
Wires are held from the top and bottom.

Note$_{12}$: When the insertion operation on the mating axis is difficult, insert the connector within 15 degrees against the mating axis.
(The insertion operation at over 15 degrees may damage the connector such as the expansion of the mating part.)

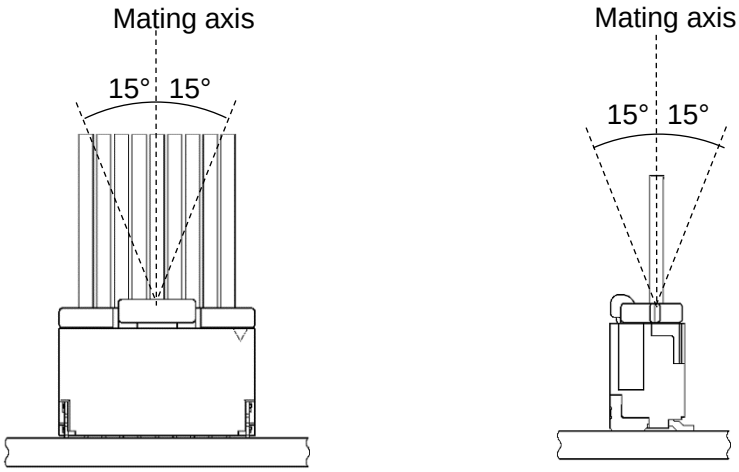


Fig.-13

10-2 Unmating the connector

While the unlocking part is pushed, hold all wires together under the completely unlocking condition and pull out the socket straightly from the header on the mating axis.
If the connector is pulled out by force without unlocking completely, some troubles such as the breakage of the lock may arise.

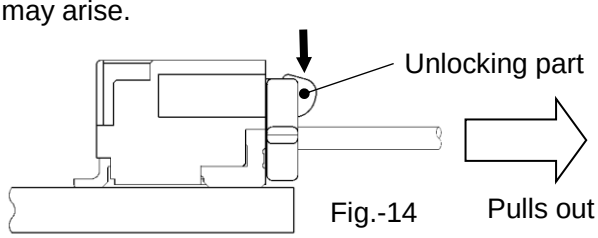


Fig.-14

Note$_{13}$: When the withdrawal operation on the mating axis is difficult, withdraw the connector within 15 degrees against the mating axis.
(The withdrawal operation at the angle of 15 degrees or more may damage the connector such as the expansion of the mating part.)
In case that only several wires are held with the lock released in unmating the connector as shown in Photo-1, the socket turns; it may be pulled out at the angel of 15 degrees or more. So, hold all wires together as shown in Photo-2.

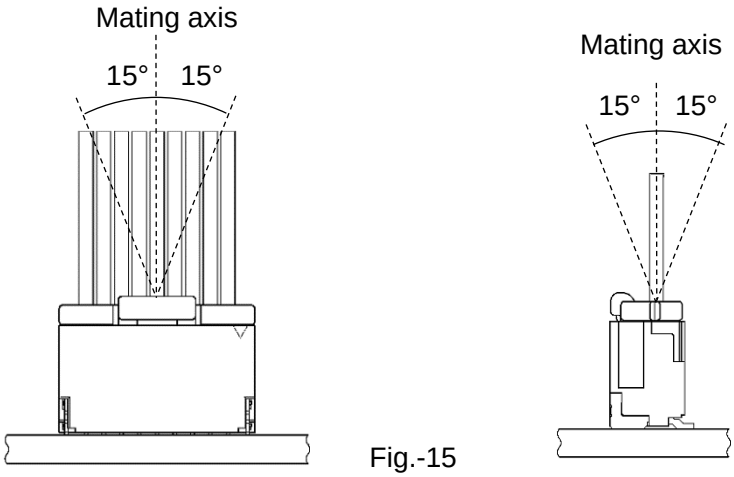


Fig.-15

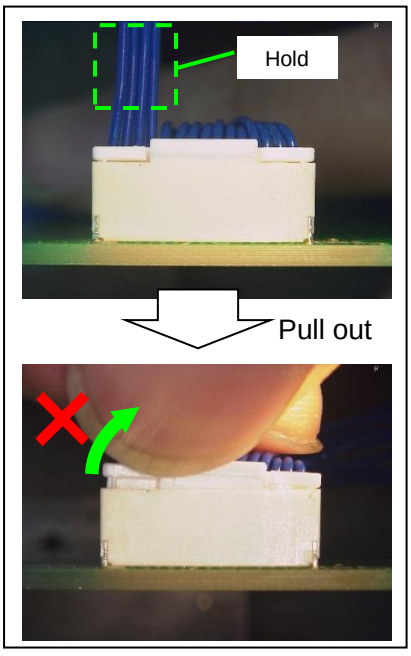


Photo-1: By holding several wires

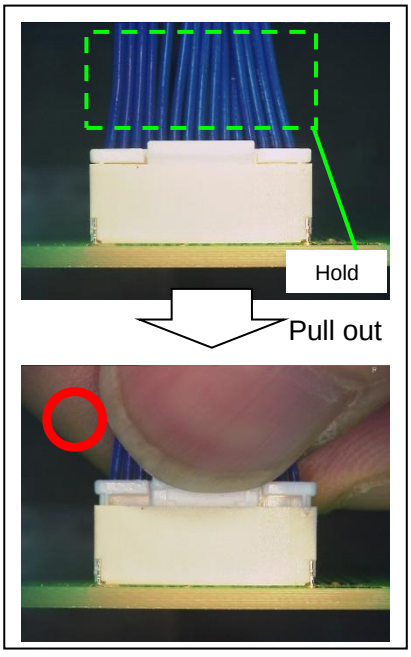


Photo-2: By holding all wires together

10-3 Routing of wire

As the NSH connector is secure locking type, breakage of the connector itself, such as the soldering part and the lock part, or breakage of PC board may occur due to the handling direction of the harness after mating the connector, or the tensile strength.
In order to prevent such troubles and to bring out fully the performance of the connector, note the following points in handling the wire harness:

- Do not always apply external force to the connector other than tension or load generated in normal wire handling.

- Provide a moderate slack for a wire so that the mating and unmating operation of the connector becomes easy, and conduct the operation on the mating axis with holding wires in bundle.

- Handle a wire so as not to apply to the connector other than external force of wire buckling level, considering an enough length to route and fixing of a wire.

- Do not use the NSH connector at the movable part to the utmost.
  If it is used there, fasten wires not to conduct directly the movement and the vibration of the wire to the connector contacting part as shown below.

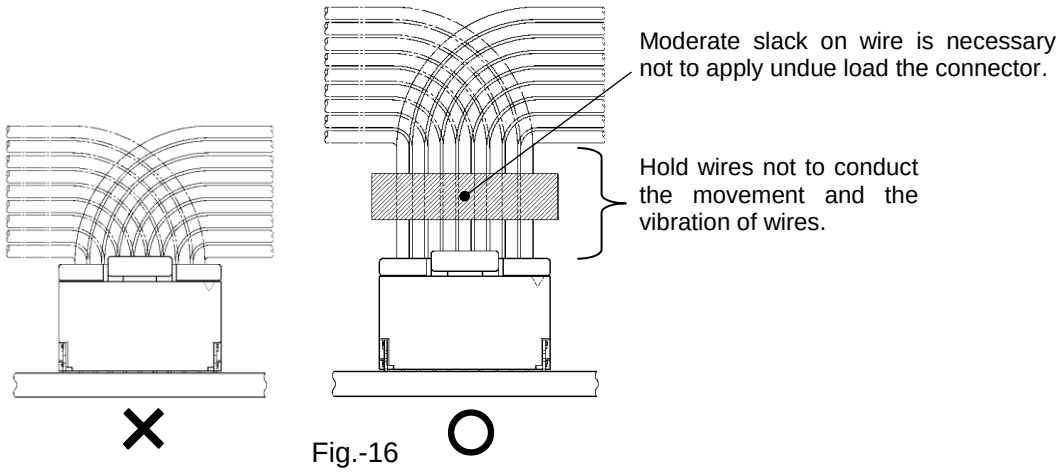


Fig.-16

11. Handling Precautions

Considering the mating feeling, PBT resin, which has a low dimensional change rate in absorbing moisture, is adopted in this connector. As the resistance to shock of PBT resin is lower than that of PA resin, troubles, such as cracks and the deformation of the housing and the breakage of the lock part and the lance part, may be caused when it is subject to shock due to handling in operation and during transportation.
In order to prevent such troubles and to bring out fully the performance of the connector, note the following points in handling:

① Careful operation is required for the storage and the transport of the housing and the harness in a stacking condition.
Stacking allowance in storage are up to 5 stacks of the carton box for the housing, and store and transport the harnessed product so as not to apply an impact to the housing part.

② Fasten the tip of the remaining chain contact in the reel with a wire or a string to the reel so as not to unravel, and store it in a carton box.

③ Do not mate the socket contact without inserting it into the housing in order to prevent from the deformation of the contact part.

④ When electrical continuity test for the harness is conducted, use the counterpart connector.
Never use a different type pin like a tester one because the contacting part may be deformed.

⑤ Carefully check that the connector for electrical continuity is 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.
Do the mating and unmating operation of the connector with care, holding the housing without prying.
When an inspection board is used, design it considering that the mating and unmating works are not difficult.

⑥ Do not spray fumy insecticide in the place where the connector and the harnessed product are stored, or the harness operation is conducted, because such spray may rust or corrode the metal part.

⑦ Do the assembly operation and the mating operation of the connector under the condition with ambient temperature (10 ~ 35°C) as much as possible.