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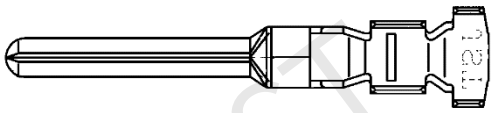
This manual describes points to be noted in crimping and assembly works so as to enhance the reliability further and exercise the features in using HL connector.

C O N T E N T S

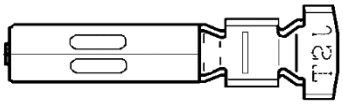
Prepared by:	Checked by:	Reviewed by:	Approved by:
N.Tsuji	-	T.Yamashita	K.Shiota

1. Structure and Name

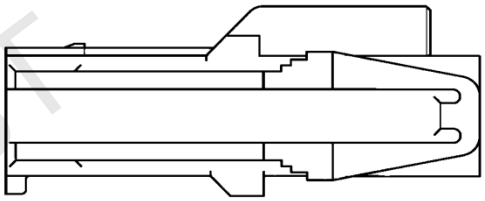
HL connector consists of the pin contact, the socket contact, the receptacle housing (for the pin contact), the plug housing (for the socket contact) and the retainer (for both the plug housing and the receptacle housing) as below.



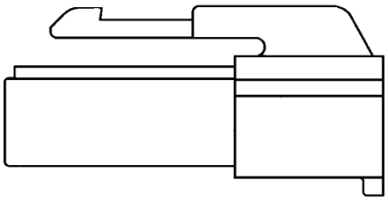
Pin contact



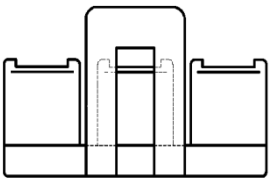
Socket contact



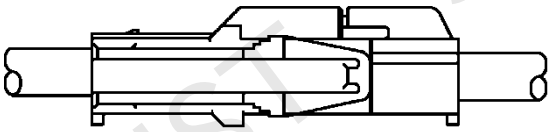
Receptacle housing
(For pin contact)



Plug housing
(For socket contact)



Retainer
(For both plug housing and receptacle housing)



Assembled layout

2. Model Number

Part name	Model No.
Pin contact	SSM-21T-1.4 SSM-21T-P1.4
Socket contact	SSF-21T-P1.4 SSF-21T-P1.4B
Receptacle housing	HLR-∗V
Plug housing	HLP-∗V
Retainer	HLS-∗V

Note$_1$: Figures in an asterisk denote the circuit number (2 to 12).

3. Storage

3-1 Storing the connector

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.
After unpacking, return products in the original package to store.

3-2 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.

4. Applicable Wire

4-1 Applicable wire

Applicable wire size and wire insulation outer diameter:

	SSM-21T-1.4 SSM-21T-P1.4	SSF-21T-P1.4 SSF-21T-P1.4B
Wire size	AWG #22 ~ #18 (0.3 – 0.75 mm^2)	AWG #22 ~ #18 (0.3 – 0.75 mm^2)
Wire insulation O.D	ϕ1.5 ~ ϕ2.2 mm	ϕ1.5 ~ ϕ2.2 mm

UL1007 (annealed copper stranded wire with tin plating) or its equivalent is available.

4-2 Precautions

Special wires such as solid wire, tin-coated wire, shielded wire other than the above wires cannot be used in principle.
When using such special wires, contact JST in advance about the applicability.

5. Crimping Tool

Part name		Model No.
SSM-21T-1.4 SSM-21T-P1.4 SSF-21T-P1.4 SSF-21T-P1.4B	Semi-automatic press	AP-K2( )
	Applicator main body	MKS-L
	Die set	MK/SSF/M-21-14
	Applicator and die set	APLMK SSF/M21-14

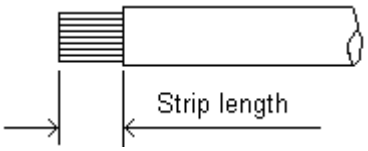
Note$_2$: When crimping operation is conducted by using other than the above applicator and die set, JST cannot guarantee the connector performance.

6. Crimping Operation

6-1 Wire strip

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

Reference value of wire strip length: 3.0 -3.5 mm

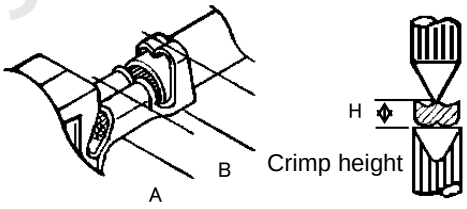


6-2 Crimping

6-2-1 Crimp height

According to wires to be used, adjust the dials of the applicator at the conductor part and the insulation part to a proper crimp height.

Measurement of crimp height

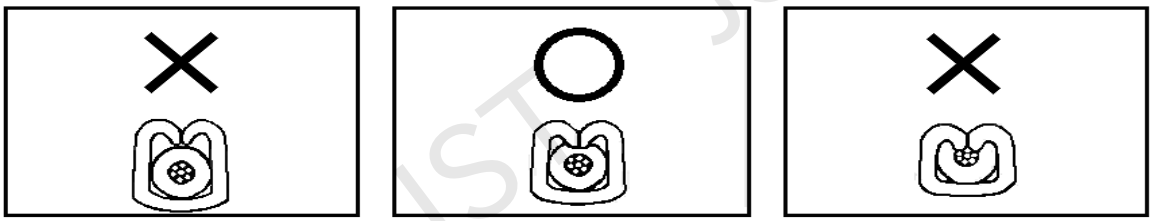


A: The crimp height at the wire barrel should be set to the pre-determined dimensions.

B: Adjust and set the crimp height at the insulation barrel as per finished outer diameter and wire type so that the wire insulation does not come off the contact easily and it is not crimped excessively.

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

Crimping condition at wire insulation barrel



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

Good

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

Checks of crimping condition at wire insulation barrel

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

Cut the insulation barrel

Remove the wire insulation.

Check no damage.

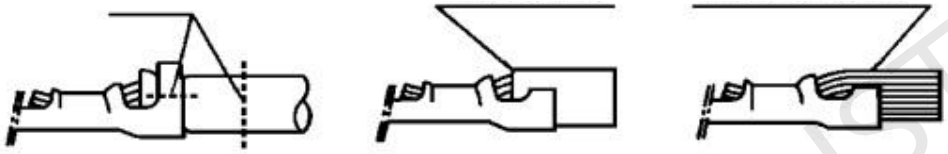


Table of Crimp height

SSM-21T-1.4 SSM-21T-P1.4			SSF-21T-P1.4 SSF-21T-P1.4B		
Wire (UL 1007)	Crimp height (mm)		Wire (UL 1007)	Crimp height (mm)	
Wire size	Conductor part	Insulation part (Ref.)	Wire size	Conductor part	Insulation part (Ref.)
AWG#22	0.90±0.05	2.1	AWG#22	0.90±0.05	2.1
AWG#20	1.00±0.05	2.2	AWG#20	1.00±0.05	2.2
AWG#18	1.10±0.05	2.2	AWG#18	1.10±0.05	2.2

Note3: The crimp height value of the above table is regarded as reference value because the crimping condition varies depending on wire outer diameter and material.
Set the crimp height at the insulation part in line with the confirmation method shown above.

6-2-2 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.

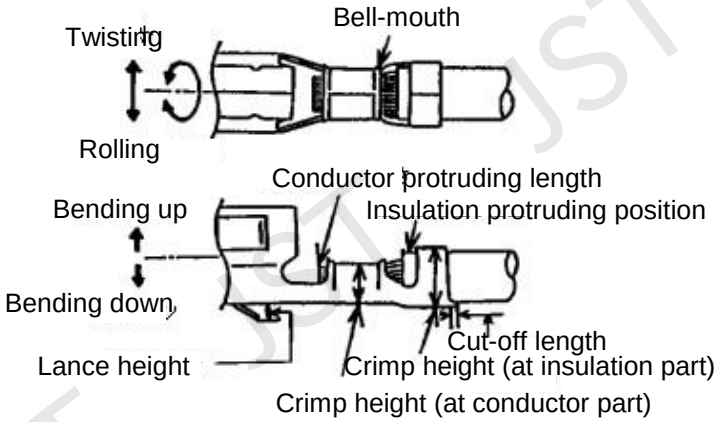
Table of tensile strength at crimped part

Wire size		Actual value (N)	Requirement [N]
AWG#22	0.3 mm^2	81.3 - 89.2	44.1 min.
AWG#20	0.5 mm^2	126 - 135	63.7 min.
AWG#18	0.75 mm^2	186 - 201	78.4 min.

6-2-3 Crimping appearance

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

Part name of the crimped contact



Item	Ref. value
Bending up	Approx. 3° max.
Bending down	Approx. 3° max.
Twisting	Approx. 3° max.
Rolling	Approx. 3° max.
Bell-mouth	Approx. 0.1 ~ 0.4 mm
Wire conductor protruding length	Approx. 0.5 ~ 1.0 mm

Examples of defective crimping

Long protruded wire brush

Bitten insulation with wire barrel

Short protruded wire brush

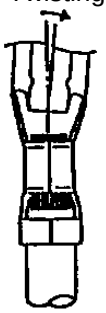
Poor crimping on wire insulation

Stray wire conductors

Bending up/down, twisting and rolling

Bending up (bending down)

Twisting



Rolling

Bending up/down, twisting and rolling

Note that bending up/down, twisting and rolling may lead to deteriorating the contact insertion in the housing, lowering the contact retention force or poor mating.

6-2-4 Precautions for the handling of the crimped contact

As the crimped contact before inserting into the housing is subject to the deformation by external force, pay careful attention to the following points for the handling:

① Protect the contacts by wrapping with thick paper to prevent from deformation of the contact and the adhesion of foreign substances.
When you bundle the harnesses, limit the number of the harnesses so as not to be deformed and protect the contact part.

② 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 and other defects.

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 the harness assembly as well as the said crimping operation.

7-1 Inserting the crimped contact into the housing

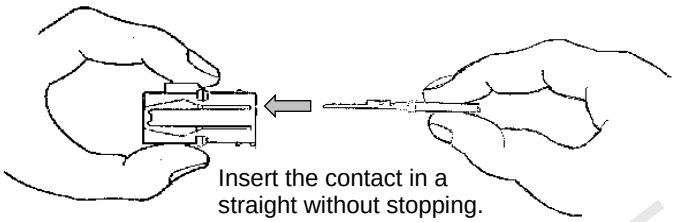
Before inserting the contact into the housing, check the following points:

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 use the contact (including the contact lance and the mating part) improperly crimped and deformed.

7-2 How to insert the contact in the housing

① Hold the contact with the contact lance part up, meet the contact lance guide of the housing with the contact lance, and insert the contact in the housing.



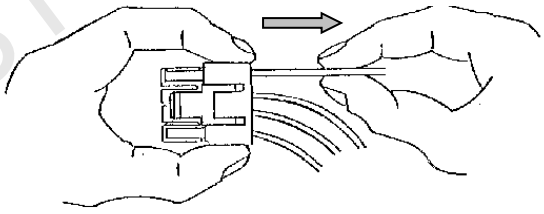
Note in inserting
Never insert the contact while leaning the tab in the pressing direction or prying up/down or right/left, because the contact tab and the mating part may be deformed.

② Insert the contact in the housing innermost without stopping.
When the contact is fully inserted, you can hear an audible click sound and you feel the sense of the insertion.

7-3 Check at inserting the crimped contact into the housing

Pull wires with force of approx. 10N which is gently pulled by thumb and forefinger and check secure locking of the contact into the housing.

Pull wires softly.

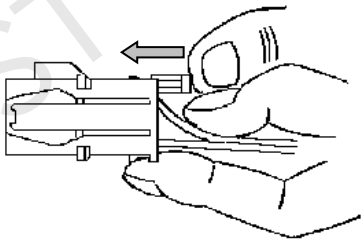


Note that the lance is sometimes deformed and come off by pulling wires too much.

7-4 Inserting the retainer

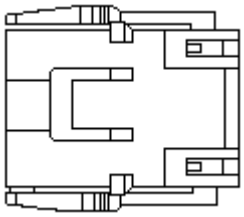
① Insert the retainer after all contacts are completely inserted into the housing.
The contact cannot be inserted after inserting the retainer.

② How to insert the retainer
Turn the comb of the retainer toward the wire side as shown below and push it without stopping until being locked.
When locked, there is an audible click.

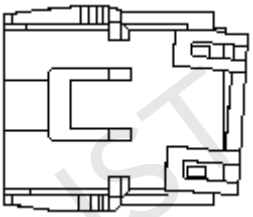


Make the retainer parallel to the housing so that the both-sided locks of the retainer are inserted at the same time, push and insert the both sides of the retainer without stopping.

③ Check after inserting the retainer
Check visually that both the right and left locks of the retainer are securely fastened to the both front and back sides of the housing.



Assembly layout



Only one side is locked.

Note$_4$: Do not push the contact in the housing by the retainer (as an insertion jig) after pre-inserting the contact, because the contact may come off the housing.

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

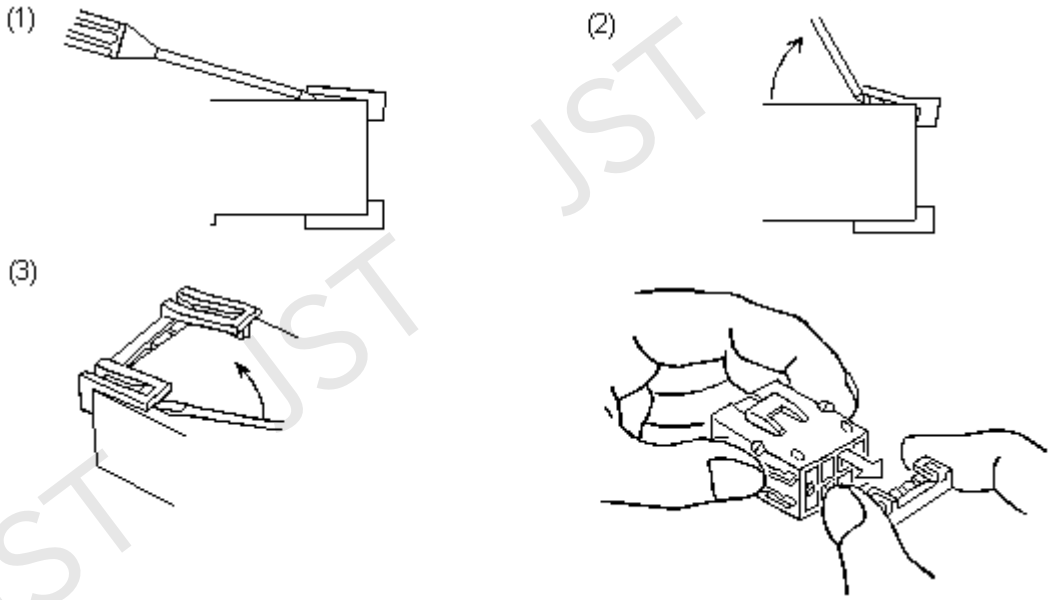
When the crimped contact is inserted into an improper circuit hole, conduct the following points:

① Do not reuse the housing where the contact was extracted but use the new one in principle.
(The method of extracting the contact from the housing is as below.)

② When the housing where the miss-inserted contact was extracted is reused, take the following notes:

- Only a specified person conducts extracting contact.
- The reuse should be once.
- The housing lance should be pushed down to the original state without fail.

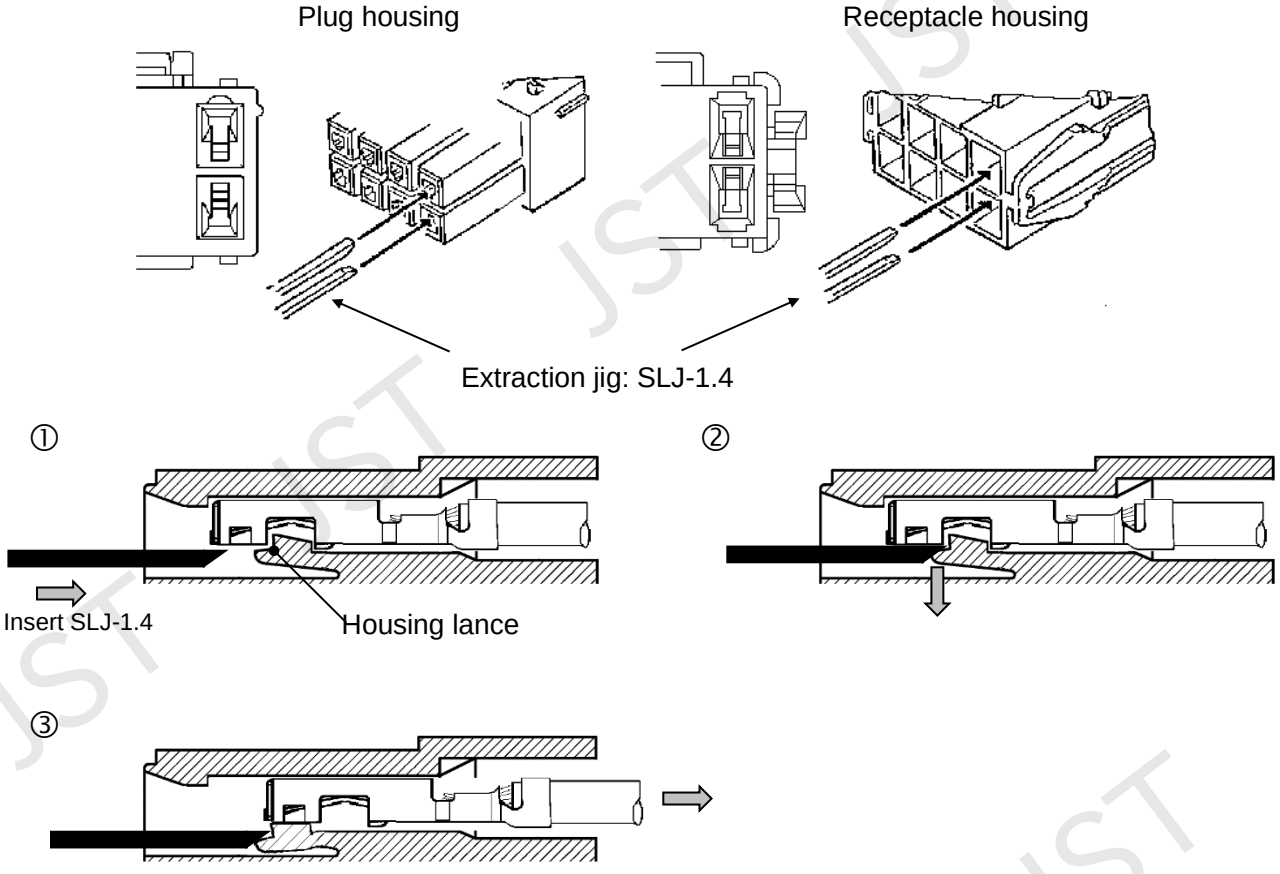
8-1 Extracting the retainer



(1)→(2) Insert the extraction tool almost parallel to the housing into one side of the retainer lock part and lift the retainer to unlock with extraction tool.
Do not lift the retainer over the height of the retainer receiver part of the housing, because excessive lifting may break the retainer.

(3) After unlocking, pull the retainer backward to extract it from the housing.

8-2 Extracting the contact



① Prepare the contact extraction tool, SLJ-1.4.

② Insert SLJ-1.4 parallel to the housing into between the tongue part at the tip of the housing lance and the contact from the mating direction.

③ Press the tongue part down to release the housing lance.

④ In the condition that the housing lance has been released, pull the wire softly and extract the crimped contact from the housing.
When the wire cannot be extracted even if pulling the wire gently, do not pull it forcibly but try again back to step ①.

9. Control Points of Crimping Operation and Harness Assembly

The operations of crimping and assembly affect the reliability (defective rate) 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 wires are crimped at the normal position. ② Check that the crimped configuration is normal and excessive burr does not appear. ③ Check that uncrimped wires are not left behind. ④ Check that the contact is not bent, deflected or deformed. ⑤ Check that the contact is free from dirt, scratches, stains or discoloration.	Item 6
	Crimp height	Check that the crimp height is appropriate.	
	Tensile strength	Check that the tensile strength is appropriate.	
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 there is no miss-wiring. ④ Check that the housing is free from dirt, scratches, stains or discoloration.	Item 7
Finished products	Appearance	① Follow all descriptions stated above in “Appearance.”	---

10. Handling Precautions

① Do not stain the contact with household goods such as oils, detergent, seasoning and fruit juice.
If stained, never use the stained contact.

② When the harness product is mated and unmated with the counterpart connector mounted on PC boards, do the operation with holding the housing main body.
When it is difficult to hold the main body due to some of the connector connecting and mounting condition, hold wires to apply even loads to wires with holding the housing main body by your finger, and do the mating and unmating operation.
(The mating and unmating operation with applying a load to some wires may lead to connector breakage.)