Title of Document:	HANDLING MANUAL	Issue No. CHM-1-048	Rev. 5
Customer:	GENERAL	Issue date: July 25, 1991	
Title subject:	EL Connector	Revision date: April 3, 2020	

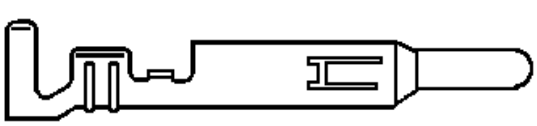
EL connector is designed to be 4.5 mm pitch round-shape wire-to-wire connector, taking advantage of the actual results of the ML connector of round shape and contact lance system.
This handling manual describes operation points of crimping, handling, etc. for good understanding about functions and performances of the EL connector.

C O N T E N T S

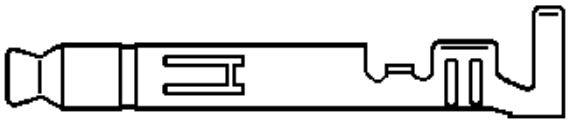
JST	Title subject: EL Connector	No. CHM-1-048

1. Connector Structure

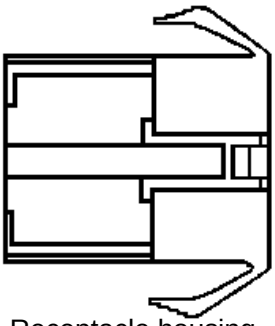
EL connector consists of the pin contact, the socket contact, the receptacle housing (for the pin contact) and the plug housing (for the socket contact) as below.



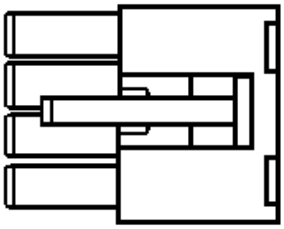
Pin contact
(for receptacle housing)



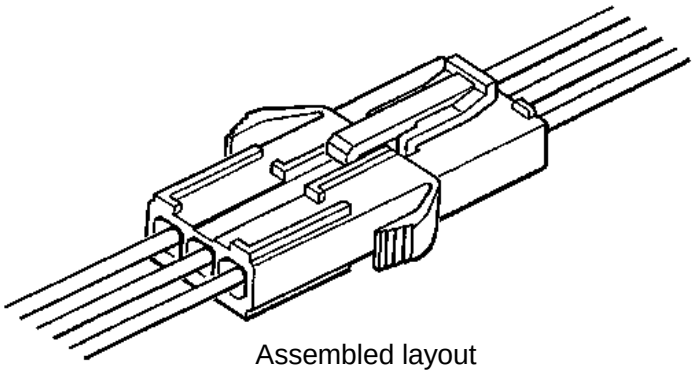
Socket contact
(for plug housing)



Receptacle housing
(for pin contact)



Plug housing
(for socket contact)



Assembled layout

2. Specifications

2-1 Applicable wire

Items	Rated value	
Applicable wire size (Note$_3$)	SLM(F)-01T-P1.3E	0.13 mm^2 ~ 0.5 mm^2 (AWG #26 ~ #20)
	SLM(F)-41T-P1.3E	0.5 mm^2 ~ 1.25 mm^2 (AWG #20 ~ #16)
	SLM(F)-42T-P1.3E	0.3 + 0.3 mm^2 ~ 0.5 + 0.5 mm^2 (AWG #22 + #22 ~ AWG #20 + #20)
Applicable insulation O. D.	SLM(F)-01T-P1.3E	ϕ1.3 ~ ϕ2.7 mm
	SLM(F)-41T-P1.3E	ϕ1.9 ~ ϕ3.4 mm
	SLM(F)-42T-P1.3E	ϕ1.7 + ϕ1.7 mm ~ϕ2.0 + ϕ2.0 mm

Note$_1$: Solid wires, tin-coated ones and other special ones cannot be used in principle.

2-2 Model number

① Pin contact

S L M - ※※ T - (P) 1.3 E

- S: Type of connector (S: Chain type, B: Loose piece type)
- L: L of L connector series
- M: Mating part is male type (Initial of male)
- ※※: Barrel size (Applicable wire range)
  - 01: AWG #26 ~ #20
  - 41: AWG #20 ~ #16
  - 42: AWG #22 + #22 ~ #20 + #20
- T: Tin-plated
- (P): Contact material (with P: Phosphor bronze, without P: Brass)
- 1.3: Mating part width
- E: E of EL connector

② Socket contact

S L F - ※※ T - (P) 1.3 E

- F: Mating part is female type (Initial of female)
- 1.3: Mating part width of applicable pin contact

Other figures and letters indicate the same as pin contact model No.

③ Receptacle housing

EL R - ※※ V (F)

- EL: EL connector
- R: R of receptacle
- ※※: Circuit No. in two digits (e.g.: 3 circuit……03)
- V: UL flammability grade (94V-0)
- (F): with F: Without panel lock, without F: With panel lock

④ Plug housing

EL P - ※※ V

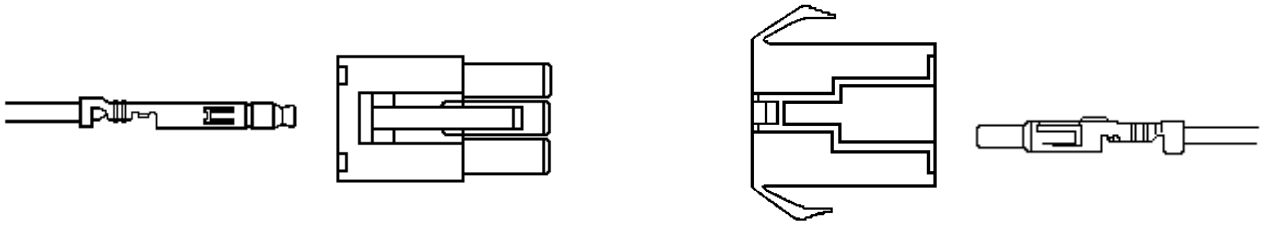
- P: P of plug

Other figures and letters indicate the same as receptacle housing model No.

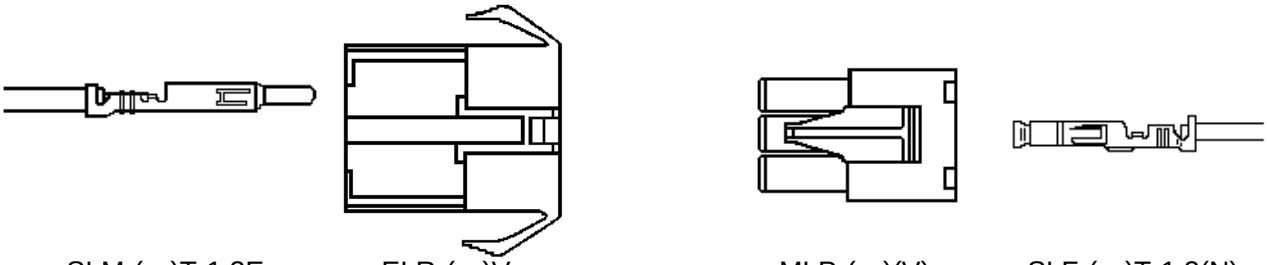
2-3 Mating with ML connector

Mating EL connector (harness) and ML connector (harness) is possible under the contact inserting state.

EL connector Mating ML connector



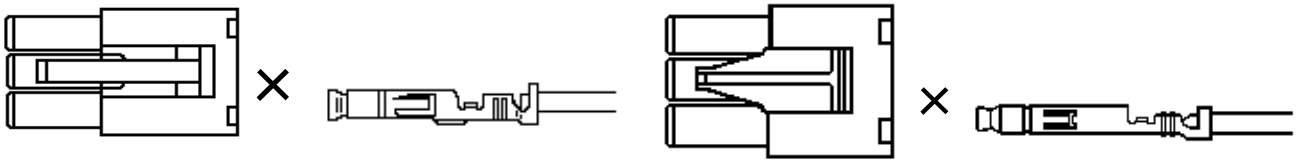
SLF-( )T-1.3E ELP-( )V MLR-( )(V) SLM-( )-1.3(N)



SLM-( )T-1.3E ELR-( )V MLP-( )(V) SLF-( )T-1.3(N)

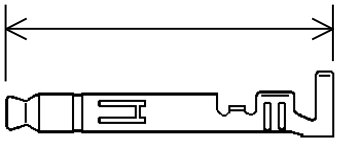
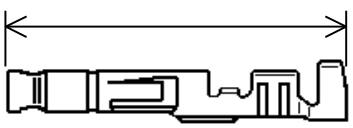
Combining EL connector plug housing with ML connector socket contact and ML connector plug housing with EL connector socket contact are impossible due to the difference in contact length.

Example



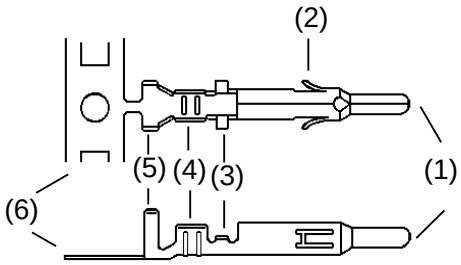
EL connector plug housing × ML connector socket contact ML connector plug housing × EL connector socket contact

Reference: How to see the difference between EL connector and ML connector

Part name		EL connector	ML connector
Housing	Plug	Total length: Long (24.6 mm) Slit at the lock part	Total length: Short (22.0 mm) No slit at the lock part
	Receptacle	Total length: Long (24.6 mm)	Total length: Short (22.0 mm)
Contact	Pin contact Socket contact	Total length: Long (17.7 mm) Body length: Long 	Total length: Short (15.3 mm) Body length: Short 

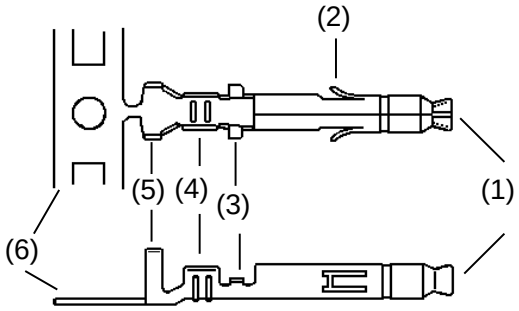
3. Name and Function of Each Part

3-1 Pin contact



(1) Mating part: It mates with the socket contact. (Electrically contacting part)
(2) Lance part: It hooks on the housing.
(3) Stopper part: It prevents the contact from coming through the housing.
(4) Wire barrel: Crimping part of wire conductor
(5) Wire insulation barrel: It holds wire insulation.
(6) Strip carrier: It is the contact carrier.

3-2 Socket contact



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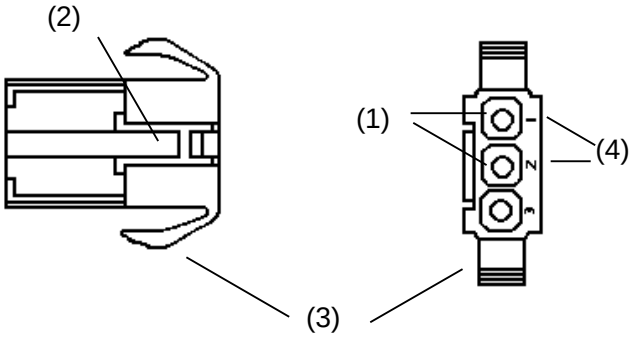
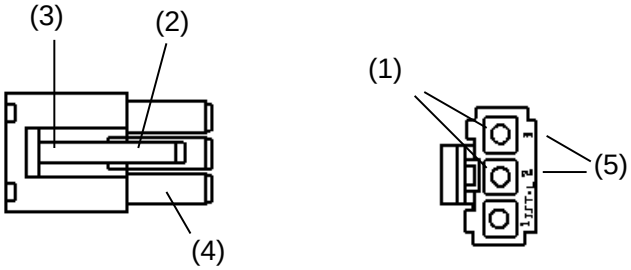
3-3 Receptacle housing



(1) Housing lance catch: It catches the contact lance.
(2) Housing lock catch: It receives the plug housing lock to lock it.
(3): Panel lock part: It fixes the housing to panel.
(4): Cavity No.: It indicates circuit number.

3-4 Plug housing



(1) Housing lance catch: It catches the contact lance.
(2) Housing lock: It locks the receptacle housing.
(3) Lock lever: It is pushed when the connector is released.
(4): Cylindrical shell: It prevents from prying and insulation of the contact in mating.
(5): Circuit No.: It indicates circuit number.

4. Storage

4-1 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.

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.

4-2 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.

5. Crimping Tool

Contact	Crimping press	Applicator		
		Applicator main body	Dies	Applicator with dies
SLM-01T-(P)1.3E	AP-K2N	MKS-L	MK/SLF/M-01-13E	APLMK SLF/M01-13E
SLF-01T-(P)1.3E		MKS-SC Note4)	SC/SLF/M-01-13E	APLSC SLF/M01-13E
SLM-41T-(P)1.3E		MKS-L	MK/SLF/M-41-13E	APLMK SLF/M41-13E
SLF-41T-(P)1.3E		MKS-SC Note4)	SC/SLF/M-41-13E	APLSC SLF/M41-13E
SLM-42T-(P)1.3E		MKS-L	MK/SLF/M-42-13E	APLMK SLF/M42-13E
SLF-42T-(P)1.3E		---	---	---

Note2: Stripper crimper applicator
Note3: The both pin contacts and socket one can be crimped with the same applicator.
Note4: When crimping operation is conducted by using other than the above applicator and die set, JST cannot guarantee the performance of the connector.

6. Crimping Operation

Use the proper applicator and adjust the crimp height of the crimping dies before operation so that the specified tensile strength can be obtained.

6-1 Wire strip length

Contact	Strip length (mm)
SLM(F)-01T-(P)1.3E	3.0 ~ 3.5
SLM(F)-41T-(P)1.3E	
SLM(F)-42T-(P)1.3E	

6-2 Applicable wire, crimp height and tensile strength

Contact	Wire size (AWG #)	Crimp height (mm) (C.H. at insulation part)	Specified tensile strength (N)
SLM(F)-01T-(P)1.3E	0.12 mm^2 (#26) 0.2 mm^2 (#24) 0.3 mm^2 (#22) 0.4 mm^2 0.5 mm^2 (#20)	0.70 ±0.05 (1.9) 0.75 ±0.05 (2.0) 0.80 ±0.05 (2.1) 0.80 ±0.05 (2.1) 0.85 ±0.05 (2.2)	19.6 min. 29.4 min. 44.1 min. (53.9 min.) 63.7 min.
SLM(F)-41T-(P)1.3E	0.5 mm^2 (#20) 0.75 mm^2 (#18) 1.25 mm^2 (#16)	0.95 ±0.05 (2.3) 1.00 ±0.05 (2.4) 1.10 ±0.05 (2.5)	63.7 min. 78.4 min. 98 min.
SLM(F)-42T-(P)1.3E	0.3 + 0.3 mm^2 (#22 + #22) 0.3 + 0.5 mm^2 (#22 + #20) 0.5 + 0.5 mm^2 (#20 + #20)	1.05 ±0.05 (1.8) 1.10 ±0.05 (2.1) 1.15 ±0.05 (2.3)	44.1 min. 0.3 mm^2: 44.1 min. 0.5 mm^2: 63.7 min. 63.7 min.

Note5: The crimp height at the insulation part is reference when UL1007 is used.

6-3 Precautions for crimping operation

① Set the crimp height at wire barrel within the specified control range.

② Adjust the crimp height at the insulation barrel according to the finished wire outer diameter, and set so that the wire insulation does not come off the insulation barrel and is not crimped excessively. (Refer to item 6-5 “Check method of crimping.”)

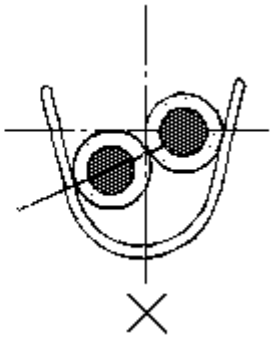
③ After adjusting the crimp height, check the tensile strength using test samples, and then, start continuous crimping operation. (Refer to item 6-5 “Check method of crimping.”)

④ Inspect the appearance in crimping operation to check that the crimped contact is free from burrs at the wire barrel part and deformation at the insulation barrel.

6-4 Two-wire crimping

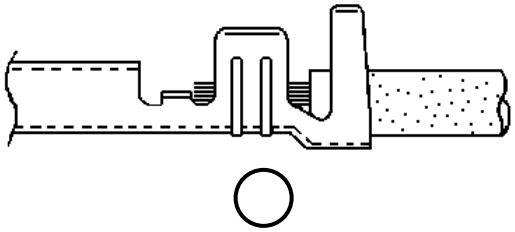
In addition to the note on one wire crimping, pay attention to the following points for two wires crimping.

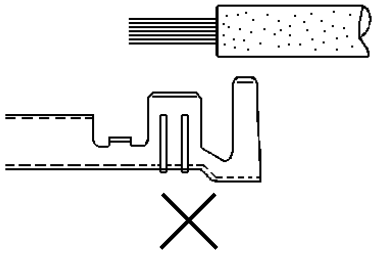
① Place two wires horizontally and crimp them.



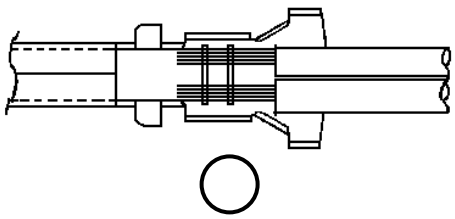
Wire setting at the angle of 15° or more is impossible.

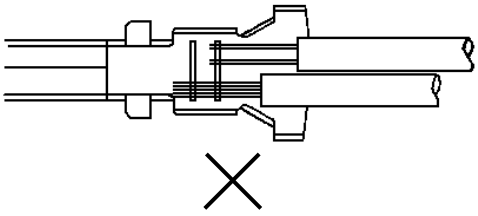
② Put wire conductors into the wire barrel to crimp.





③ Align the end of wires.

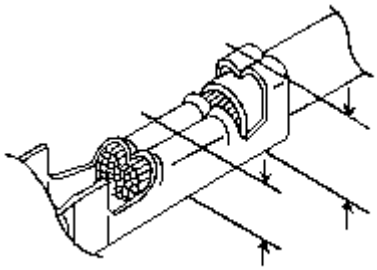


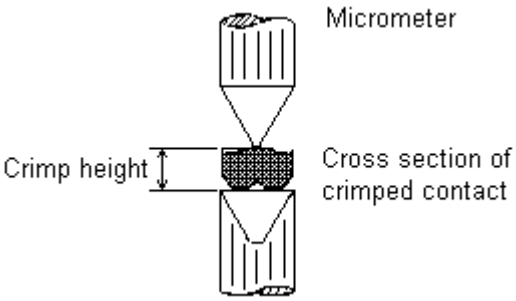


6-5 Check method of crimping

① Measurement of crimp height

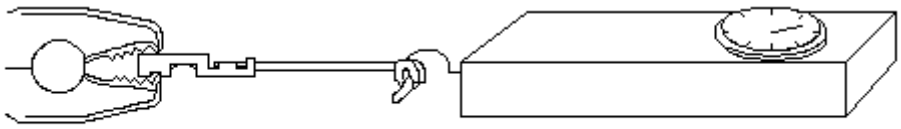
After crimping, measure the crimp height at the center of the wire barrel of the contact with micrometer specified by JST.





② Tensile strength test at the crimped part

Remove the wire insulation part of the specimen which is crimped correctly, and pull the specimen with a push-pull gauge as shown below.
Pull the specimen gradually so as not to apply abrupt shock.

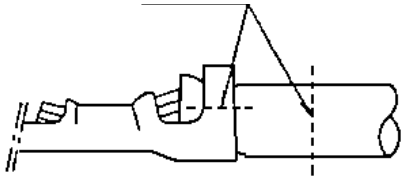


Pull with pliers, etc. Push-pull gauge (0 ~ 147N)

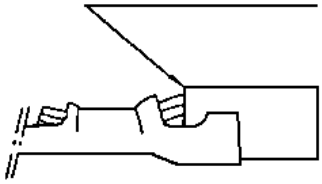
③ Check of crimping condition at the wire insulation barrel

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

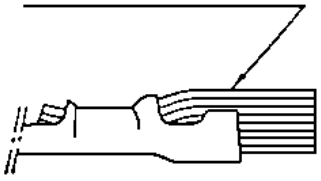
Cut the insulation barrel



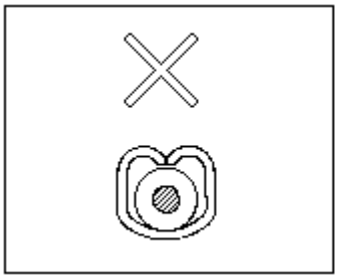
Remove the wire insulation.



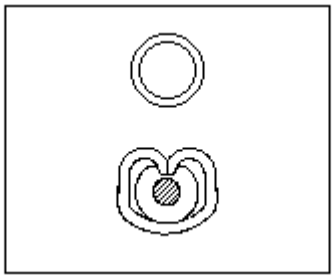
Check no damage



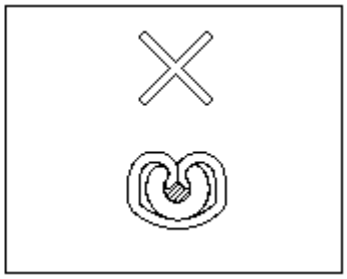
<u>Crimping condition at the wire insulation barrel</u>



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



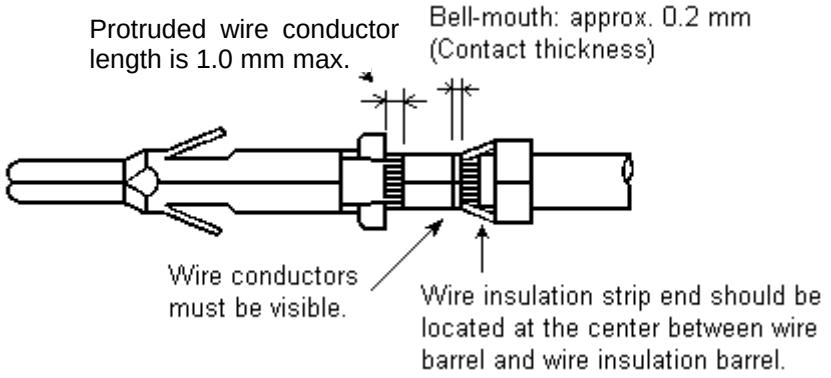
Good

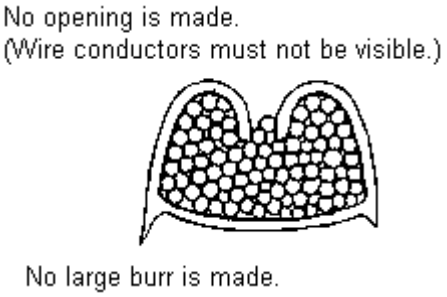


Excessive crimping
(pressed excessively)
The barrel bites the wire,
which may damage
the wire conductors.

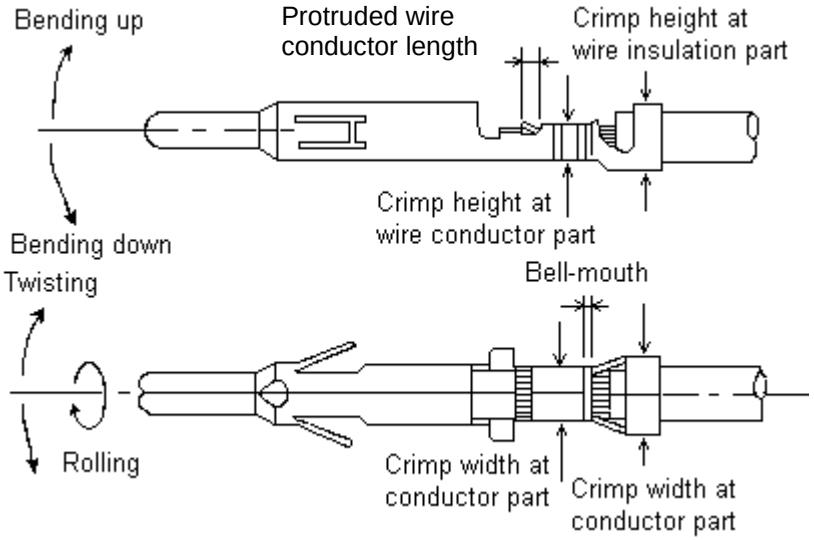
6-6 Crimping appearance

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





① Part name of crimped contact

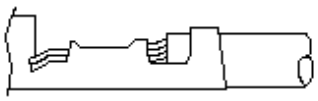


Item		Ref. value
Bending up		3° max.
Bending down		3° max.
Twisting		3° max.
Rolling		3° max.
Bell-mouth		0.1 ~ 0.4
Protruded conductor length		0.5 ~ 1.0
Crimp width at conductor part	SLM(F)-01T-(P)1.3E	1.6
	SLM(F)-41T-(P)1.3E	2.0
	SLM(F)-42T-(P)1.3E	2.0
Crimp width at insulation part	SLM(F)-01T-(P)1.3E	2.6
	SLM(F)-41T-(P)1.3E	3.4
	SLM(F)-42T-(P)1.3E	3.7

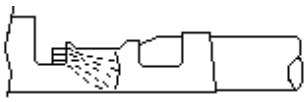
② Bending up, bending down, twisting and rolling

Bending up/down, twisting and rolling:
Note that bending up/down, twisting and rolling may cause the difficulty in the insertion of the contact into the housing, the deterioration in the contact retention force and poor mating.

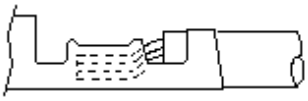
③ Examples of defective crimping



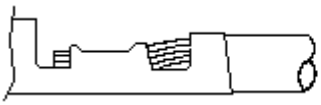
Long protruded wire brush



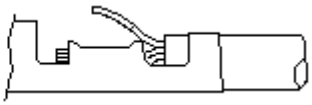
Bitten wire insulation



Short protruded wire brush



Short protruded wire insulation



Stray wire conductors

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, etc. by external forces, pay careful attention to the following 4 points for the storage and the handling:

① Protect the bundle of the contacts by wrapping with paper to prevent from the deformation and the 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. Especially, never spray fumy insecticide in the place where the crimped contact are stored, because such spray may rust it.

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.

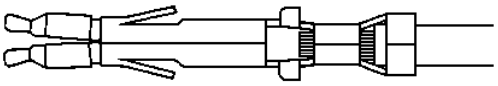
④ When the crimped contact is taken out of the bundle, do not pull a wire but hold the wire near the crimped section and take it out.

7. Harness Assembly Operation

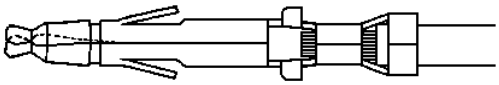
7-1 Check of the contact appearance
Check the contact appearance before inserting the crimped contact into the housing.

① Check that the contact mating part is not deformed.

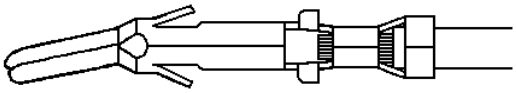
Never reuse the contact with the mating part deformed. Be sure to replace it with a new one.



The mating part expanded



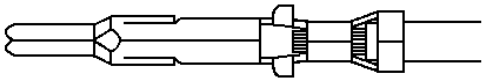
The mating part crushed



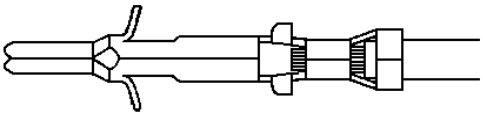
The mating part bent

② Check that the contact lance part is not deformed.

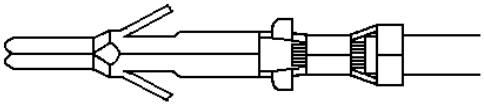
Restoring the lance shape is possible but doing twice or more is impossible.
(Refer to item 8-2-1 “How to use the extraction jig” for the repair method.)



The lance crushed



The lance opened too much



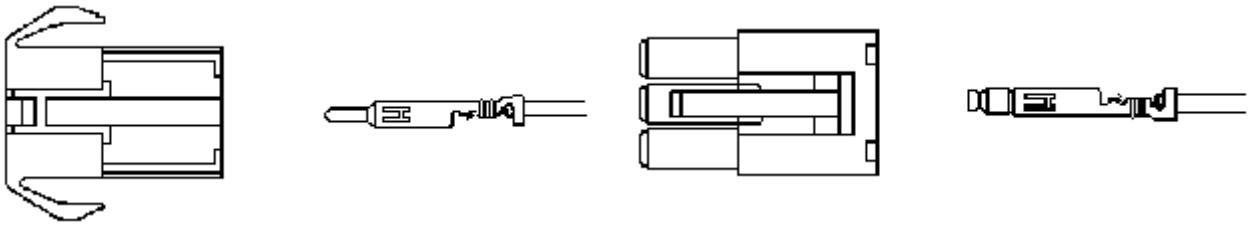
Normal state

7-2 Inserting the crimped contact into the housing

When the crimped contact is inserted into the housing, note the following points.

① Combination of the contact and the housing
The socket contact should be inserted into the plug housing, and the pin contact should be inserted into the receptacle housing.

		Contact	
		Pin	Socket
Housing	Plug	×	○
	Receptacle	○	×

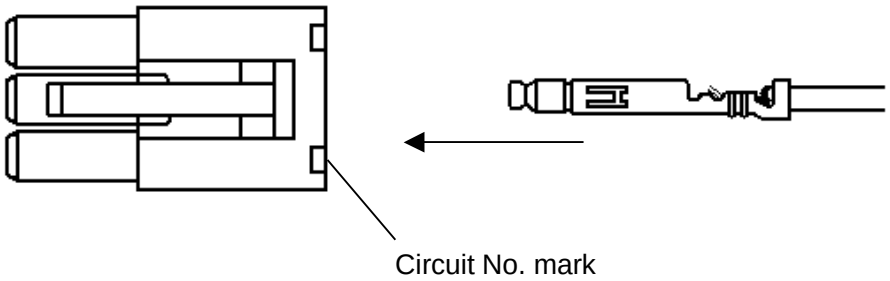


Receptacle housing　　Plug housing

② Inserting direction of the contact into the housing

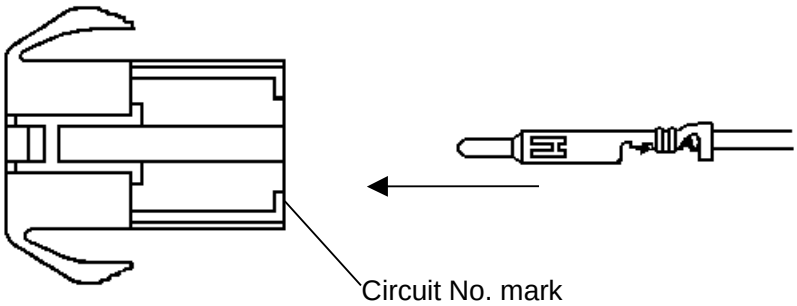
(1) Inserting the contact into the plug housing

Insert the crimped contact into the housing from circuit No. marking side (opposite direction to cylindrical shell part).



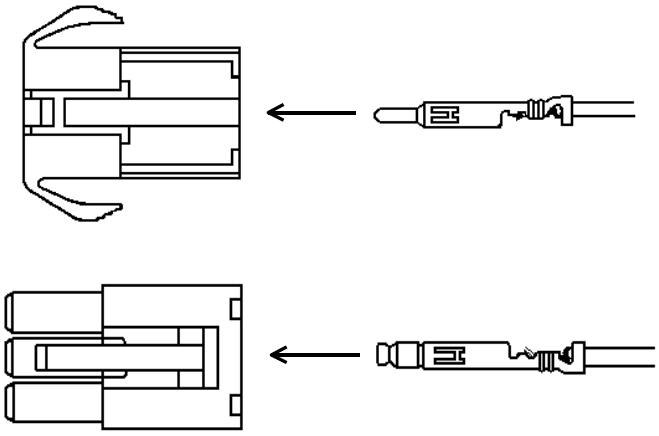
(2) Direction of inserting the crimped contact into the receptacle housing

Insert the crimped contact into the receptacle housing from circuit No. marking side (opposite direction to the panel lock).



7-3 Precautions for inserting the crimped contact into the housing

① Insert the crimped contact parallel to the housing without prying or stopping.
Diagonal insertion and prying insertion may cause deformation of the contact and fatigue of the lance.



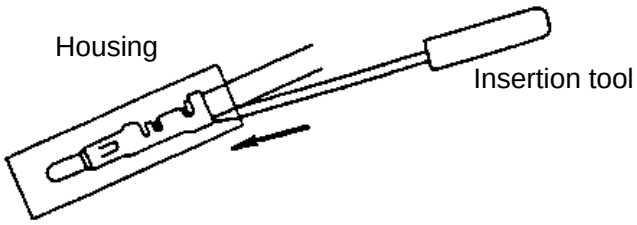
Insert the contact straightly into the housing.

② When the insertion is difficult, do not insert it forcibly but check the insertion direction and no abnormalities on the contact and the housing.

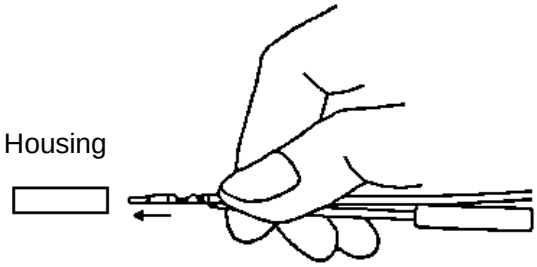
③ The use of the contact insertion tool
When thin wires such as AWG #26 are inserted, use the contact insertion tool (LIT-2013) for easy insertion.

How to use the insertion tool

Method 1: Push the rear part of the contact pre-inserted in the housing by using an insertion tool to Insert in the innermost fully.



Method 2: Softly hold the insertion tool along with the wire by thumb and fingertip and insert them into the housing until stopping.

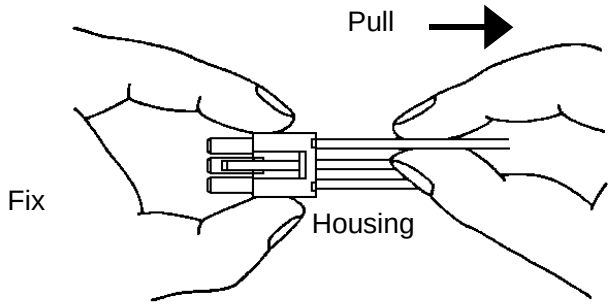


Note$_6$: When using the insertion tool, be sure to push the rear of the contact with care not to deform the contact by pushing too much.

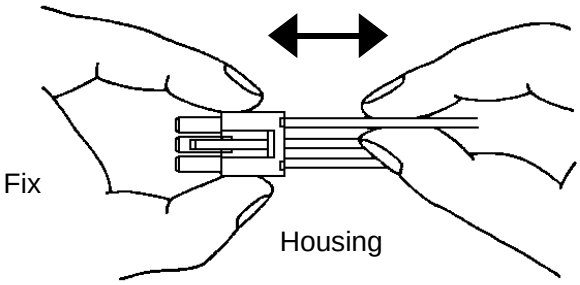
7-4 Check at inserting the crimped contact into the housing

Check secure locking per each insertion whether the contact is inserted into the housing or not.

Method 1: Check secure locking by pulling a wire with force of 9.8N ~ 19.6N which is gently caught and pulled by thumb and forefinger.



Method 2: Push and pull the inserted wire in back-and-forth direction to find the backlash of the contact.



Feeling looseness:OK

Disconnection of wire:NOT OK
Modify the lance and insert the contact again.

Note$_7$: After inserting the contact, do not rotate the wire for checking the insertion. When tensile load applies to the wire during the rotation, the contact may come off the housing.
Note$_8$: If such an abnormality as poor crimping and deformation is found on the contact, do not use it.

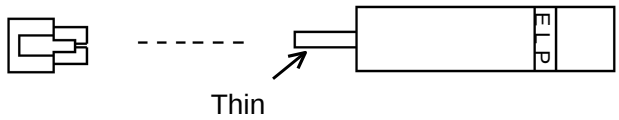
7-5 Contact insertion check by tool

As quantitatively confirmation method of inserting the contact in the housing, there is the method to confirm it by using the jig. Be sure to use the inspection tool specified by JST.

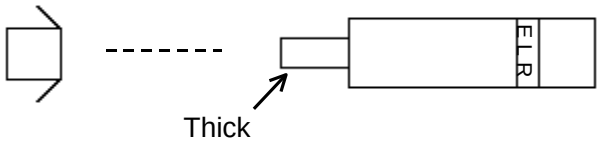
- Inspection tool for single circuit (in the case of a small quantity and various kinds)

  Model No. of tools

  for plug housing FG-13ELP



  for receptacle housing FG-13ELR

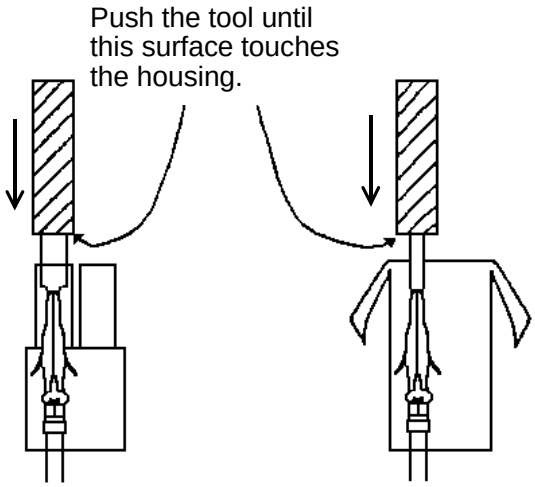


How to use the inspection tool

① Insert the pin part of the tool into the housing from the direction of the housing mating part.

② Press the tool into the housing until it touches the housing.

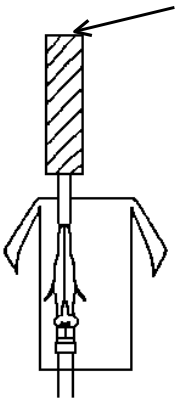
③ Check that the contact does not come off.



④ Check that yellow indication part can be seen.

Visible .....Good

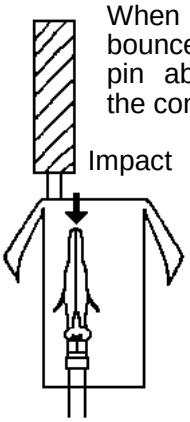
Invisible.....Defective
(Modify the contact lance and insert it again.)



※Handling notes:

When the pin of the tool touches the contact as shown in the right figure, large impact applies to the contact, leading to the contact disconnection from the housing even if it is fully inserted.

Be sure to replace the disconnected contact and the housing with the new ones, because they are extremely damaged or deformed.



When the contact comes off the housing due to impact, replace it with the new one.

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

8-1 When extracting the contact from the housing

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

① Do not reuse the housing that the contact has been extracted in principle.

② In reusing, observe the following points.

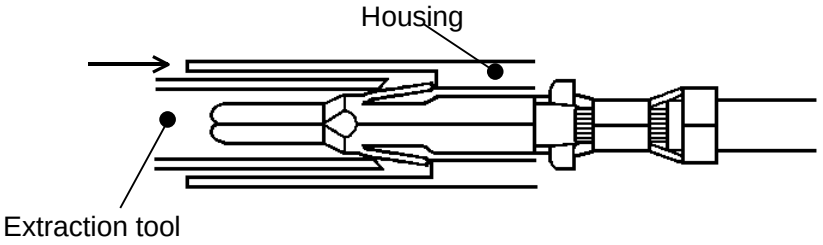
(1) Only a specified person extracts the contact.
(2) The reuse of the contact should be only once.
(3) Carefully check that the extracted contact is free from deformation before reusing. (See next page.)
(4) After putting the contact lance back to its original position, insert the contact into the housing.
(5) When the contact is reused, check more strictly than usual after inserting the contact whether the contact comes off or not by pulling wires with the force of approx. 29.4N.

8-2 How to extract the contact

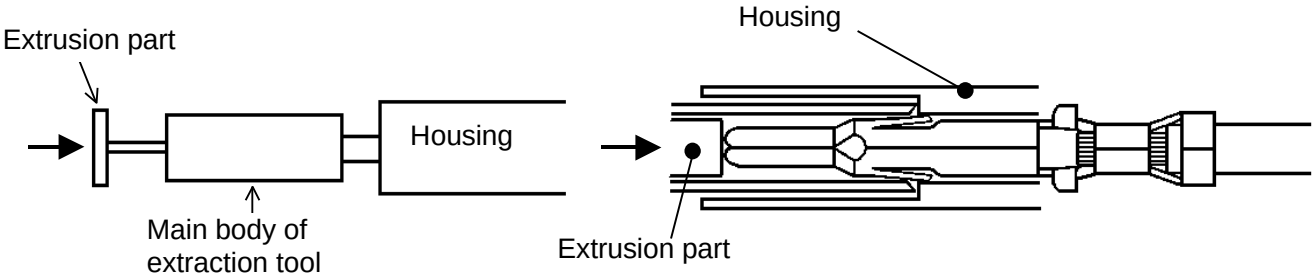
Be sure to use JST specified tool, LEJ-13, when extracting the contact from the housing due to mis-wiring.

8-2-1 How to use the extraction tool

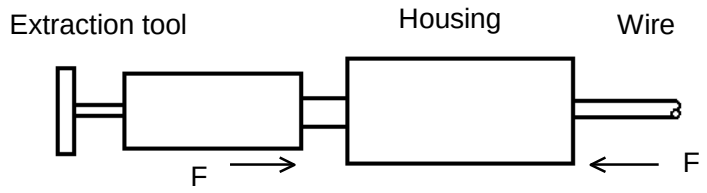
① Push the extraction tool into the housing until stopping. At this time, make the contact extrusion part of tool free.



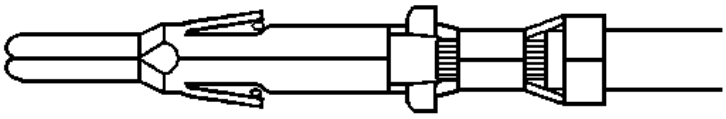
② Push the extrusion part under the condition that the housing and the main body of the extraction tool are fixed.



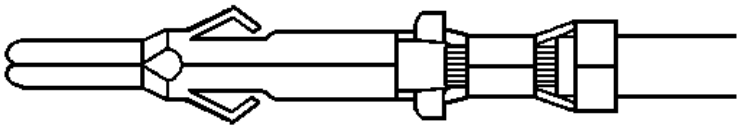
③ When the extraction is difficult, insert the tool while the contact is pushed in the housing.



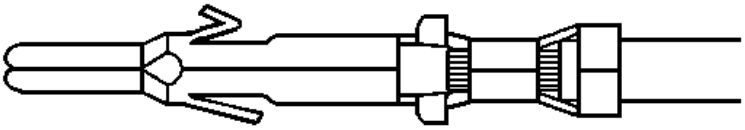
Remarks: When an abnormality as shown below happens, be sure to replace both the housing and the contact with new ones.



Cutting residues of the housing adhered to the contact lance

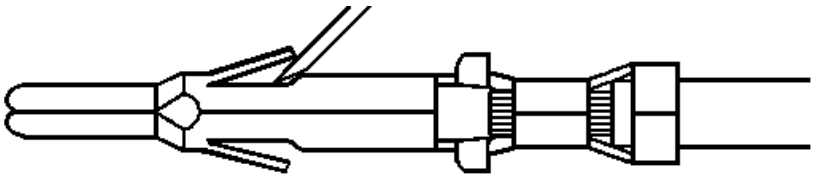


Contact lance bent



The contact lance bent back

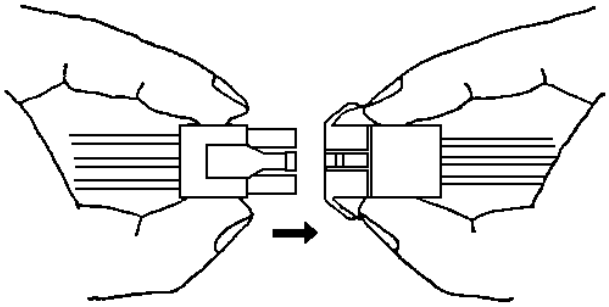
8-2-2 How to put the contact lance back to its original position
Return the contact lance to its original position by using such a tool as a precision driver and knife.



9. Mating and Unmating of Connector

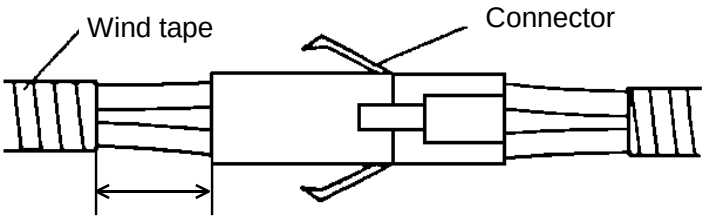
Hold not wires but the housing and mate the connector on the same axis as much as possible.

Holding the housing, mate and unmate the connector.



Note$_9$: When wires are held too tightly together with the housings, the center of the contact deflects, which may prohibit from smooth contact insertion.

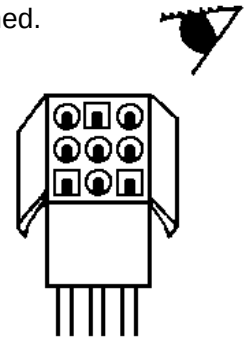
Note$_{10}$: When the harness wires are taped or bent, keep a distance from the housing as far as possible (40mm or more).



Tape or bend the wire 40 mm away from the connector.

Note$_{11}$: When the mating and unmating operation is not conducted smoothly, check whether the inserted contact is deformed or not. (Refer to item 7-1 “Check of contact appearance.”)

Check that the contact is not deformed.



10. Handling Precautions

① Careful operation is required for the storage and the transport of the housing and the harness in a stacking condition, because the housing may be deformed.
Stacking allowance in the storage and the transport are up to 5 stacks of the carton box for the housing, and up to 300 mm stack height with as little load as possible at the housing part (especially lock lever part) for the harness.

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

③ Do not mate the pin and the socket contacts without inserting them 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 of the connector.
(Example: the receptacle side for the plug side)
Never use a different type pin like a tester pin.
Replace the testing connector periodically for conductivity inspection.

⑤ Do not spray fumy insecticide in the place where the connector and the harnessed product are stored, or harness operation is conducted, because such spray may cause rusting of the metal part.

⑥ Assemble the plug and the receptacle housings and insert the assembly to the panel under ordinary temperature (10°C ~ 35°C) where possible.

⑦ Do not dry the housing and the contact at the crimped part in varnish drying furnace by force, because unstable contact resistance of the connector and breakage of each lock part may be caused.

⑧ Be sure to use JST specified tool for inspection of contact insertion.