Title of Document:	**HANDLING MANUAL**	Issue No. CHM-1-2217	Rev. 4
Customer:		Issue date: October 6, 2006	
Title subject:	ACH Connector for Wire to Wire Contact	Revision date: April 16, 2020	

This handling manual describes the operation points of the crimping and the handling of the ACH connector wire-to-wire contact.
Be sure to read this manual thoroughly before conducting the crimping operation and keep this manual near the machine to use for reference when required.

C O N T E N T S

1. Storage

1.1. 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.
Especially, note that the seal ring and the seal rubber plate exposed to direct sunshine brings about deterioration of the rubber and adhesion of dust, affecting the waterproof performance. 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.

1.2. 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.

2. Part Name and Model Number

Part name		Model No.
ACH connector wire to wire type	Socket contact	SACH-003G-P0.2
	Socket housing	ACHTR-∗∗V-( )
	Plug contact	SACHP-003G-P0.2
	Plug housing	ACHTP-∗∗V-( )

Note$_1$: 2-digit figures in ” ∗∗” denotes the circuit number.
Note$_2$: A letter in ”( )” denotes the color.

3. Applicable Wire

	SACH-003G-P0.2, SACHP-003G-P0.2
Type of contact	003 type
Applicable wire size	AWG #28, #30
Wire insulation outer diameter (mm)	ϕ 0.50 ~ ϕ 0.63 mm
Conductor	Annealed copper stranded wire with tin plating

Note$_3$: Special wires such as bare ones, solid ones, tin-coated ones and shielded ones other than the above cannot be used in principle.

4. Crimping Tool

Product name		Model No.
Semi-automatic press		AP-K2( )
Crimping applicator		MKS-L-10-3
Die set (003 type)	Socket contact	MK/SACH-003-02
	Plug contact	MK/SACHP-003-02
Applicator and die set	Socket contact	APLMK SACH003-02
	Plug contact	APLMK SACHP03-02

Note$_4$: When the crimping operation is conducted by using other than the above applicator and the die set, JST cannot guarantee the connector’s performance.
Note$_5$: A letter comes into “( )“ of the crimping press model number.
e.g.: AP-K2N

5. Check Points of Crimping Operation and Harness Assembly

The operations of crimping and assembly affect the connector reliability.
It is recommended that the crimping and assembly operations and the finished products are 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 a wire to be used. ② Check that a wire is crimped at the normal position. ③ Check that the crimping configuration is normal and excessive burr does not appear. ④ Check that the uncrimped wire is 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. ⑦ Check that the lubricator touches properly the contact. (Refer to item 6.)
	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.

The ACH connector wire-to-wire contact is designed to be thin and compact to meet the demand for narrow pitch and space saving. It is recommended that the appearance inspection be conducted with a microscope or a loupe.

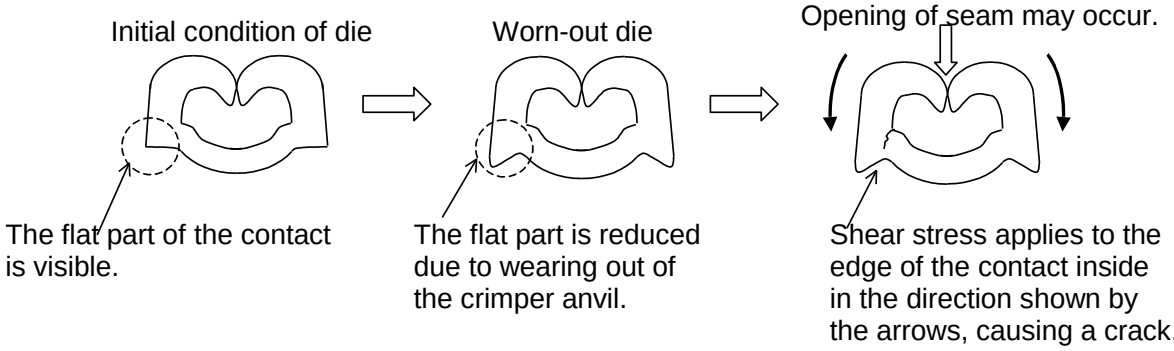
6. Points of Adjustment of Machine

6.1. Abrasion of crimping die

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

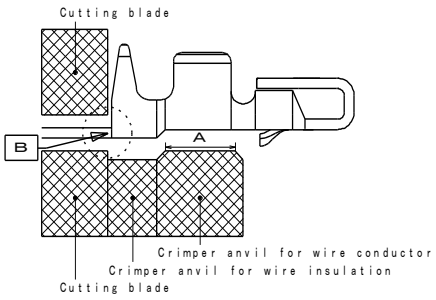
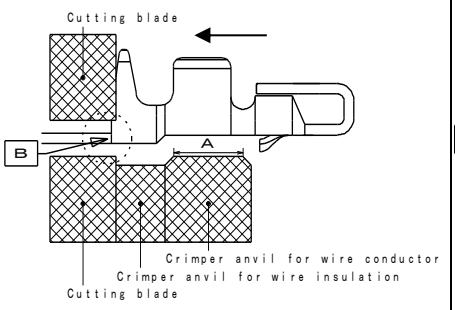
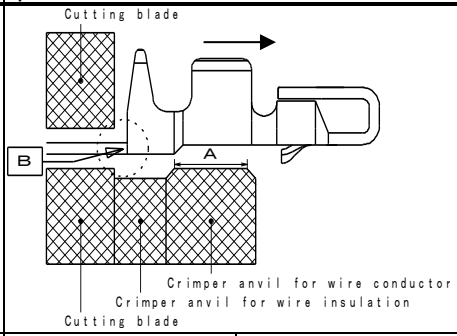
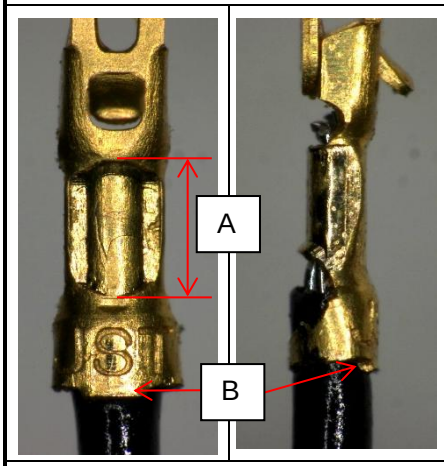
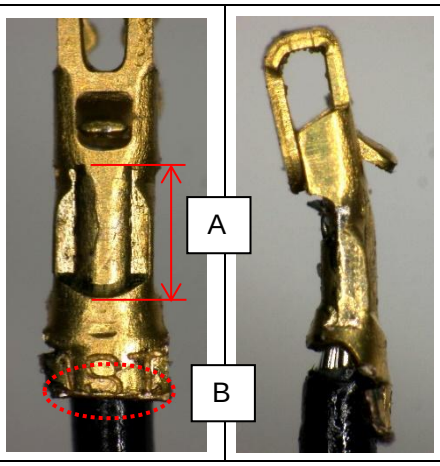
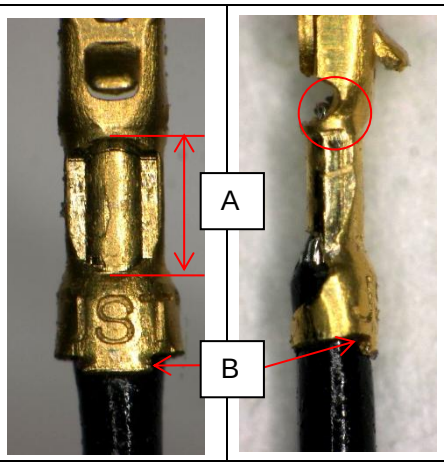
- Replacement timing of crimping die
  ①When the die cracks and it becomes rough.
  ②When the crimped surface of the contact becomes rough excessively.
  (The gloss disappears from the surface of the contact crimping part.)
  ③When the seams open. (See figure below.)
  Note$_6$: In the case that crimping continues beyond the reference timing, a crack may appear on the contact as below.

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



6.2. Deviation of crimping position

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

Proper crimping position	Improper crimping position	
	In the case that the contact deviates from its normal position to the insulation side.	In the case that the contact deviates from its normal position to the mating part side.
		
		
	When the insulation part is removed and the contact is crimped by force	
A: <u>Position of crimping range of wire conductor</u> The crimping range “A” (crimping mark of crimper anvil) is within the range of the crimping part side.	A: <u>Position of crimping range of wire conductor</u> The crimping range “A” deviates too much from its normal position to the mating part side. In this case, the crimper anvil for the wire conductor comes in contact with the mating part side of the contact, so that the contact-mating part may be deformed.	A: <u>Position of crimping range of</u> The bell-mouth at the insulation side is invisible. The bell-mouth is visible at the mating part side.
B: <u>Cut-off tab</u> The cut-off tab must be visible. (0~ 0.1 mm)	B: <u>Cut-off tab</u> The cut-off tab is invisible. In this case, the wire insulation barrel comes in contacts with the cutting blade, so that the contact feeding defect and the deformation may occur.	B: <u>Cut-off tab</u> The cut-off tab is too long. (0.1mm and more) In this case, the cut-off tab protrudes from the housing when inserting the contact into the housing, so that it may come in contact with other parts.

7. 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 Kohsakuyu Co., Ltd.-made blanking oil, G6316)
In lubricating oil, use a JST-specified lubricator and coat oil throughout the barrel bottom surface and the carrier of the contact. At this time, be careful not to loose the 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.

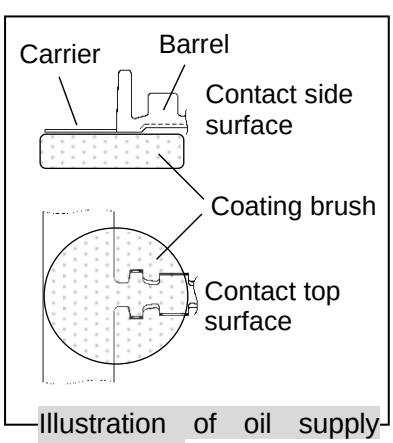
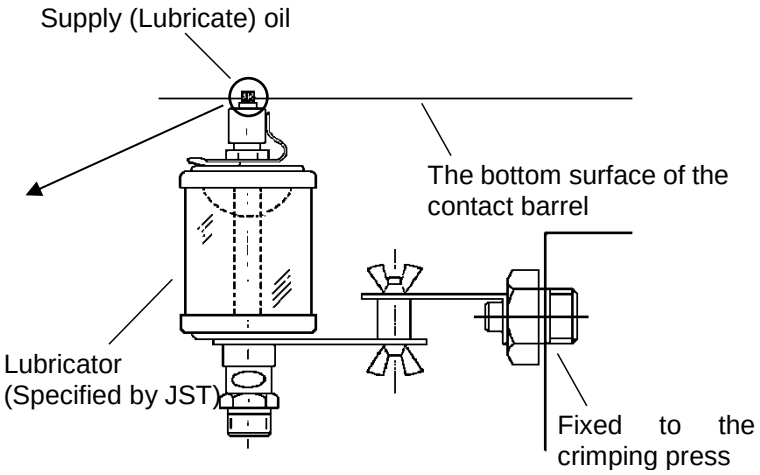


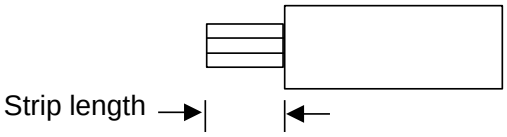
Illustration of oil supply (lubrication)



7.1. 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.

Reference value of wire strip length: 1.2 mm



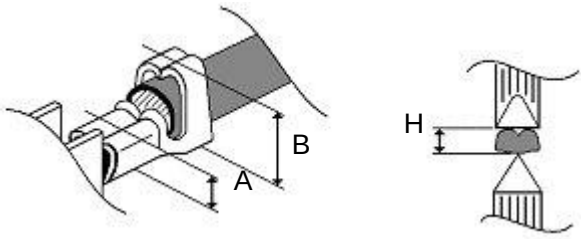
Note$_7$: • Be free from damage and wire breakage, unevenness of the stripped wire length and the insufficient cutting of the wire insulation.
• Do not come apart the conductor. Do not strand the conductor excessively.
• After stripping, do not expose the wire conductors for a long time, because oxidation of the conductor surface advances, resulting in fluctuation of the contact resistance. So, complete the crimping as soon as possible after wire stripping.

7.2. Crimp height

According to wires to be used, adjust the dials (the conductor part and the insulation part) of the applicator to a proper crimp height.
The crimp height of the insulation part is a reference value for the wire insulation outer diameter.
It depends on the wire insulation outer diameter and the material, so check and set it in crimping according to item 6-2-1 – 6-2-4.

Wire		Crimp height (mm)	
Size	Insulation O. D. (Ref. value)	Conductor part	Insulation part (Ref. value)
AWG #28	ϕ 0.58 mm	0.41 ~ 0.45	0.65
AWG #30	ϕ 0.56 mm	0.39 ~ 0.43	0.63

7.2.1. Measurement of crimp height

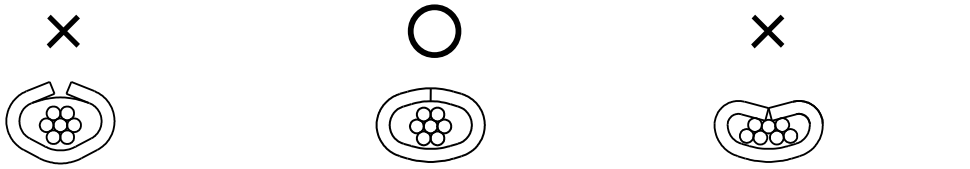


A: The crimp height at the wire barrel should be set to the pre-determined dimensions.
B: Adjust the crimp height of the wire insulation barrel to the extent that the wire insulation is slightly pressed, and set it not to crimp it excessively.
H: Measure the crimp height at the center of the barrel using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

7.2.2. Measurement timing of crimp height

① When operation starts at morning and afternoon, starts after pausing 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.

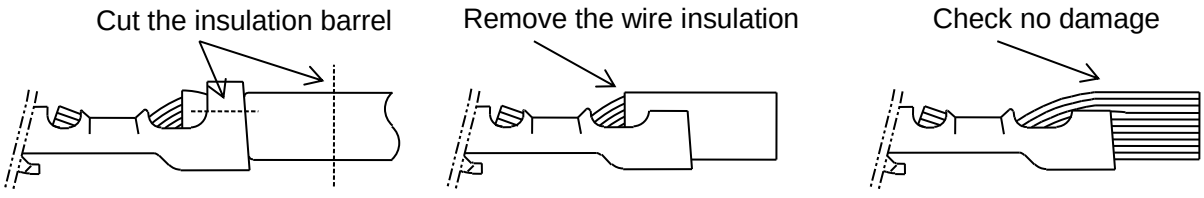
7.2.3. Crimping condition at insulation barrel



×	○	×
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.

7.2.4. Check of crimping condition at insulation barrel

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



7.3. Tensile strength at crimped part

After adjusting the crimp height, check the tensile strength using the test samples, and then, start the continuous crimping operation. In case the tensile strength greatly differs from the normal tensile strength (actual value), check if there is a defect. Even though the wire size is same, the actual value sometime varies depending on the difference of the wire strength.

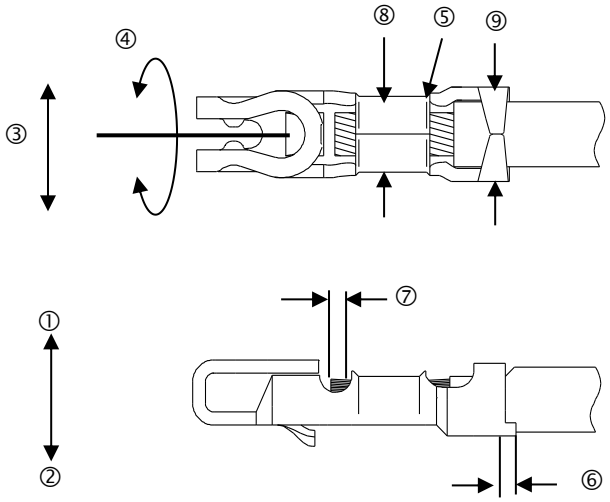
Unit: N

Wire size	Requirement	Actual value
AWG #28	10 min.	19 - 24
AWG #30	5 min.	12 - 14

7.4. Crimping appearance

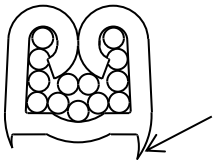
Check the crimping appearance visually for correct crimping with an equipment such as a microscope or loupe.

Part name of crimped contact

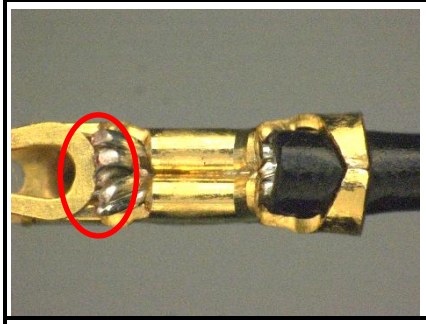
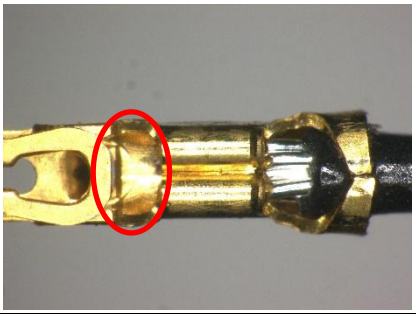
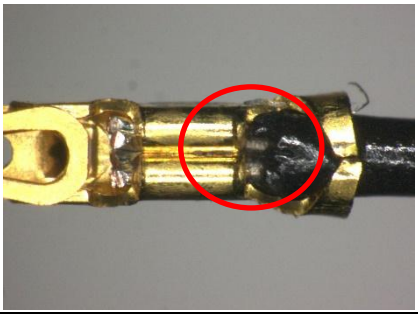
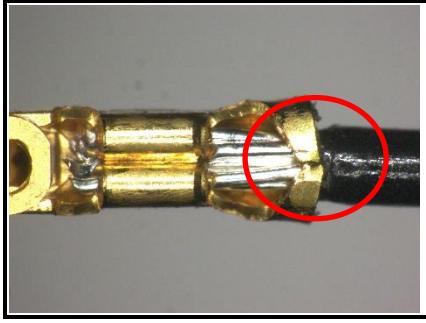
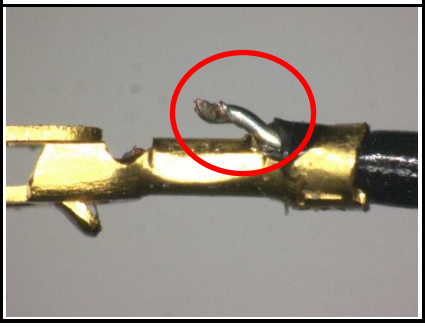


Check item		Reference value
①	Bending up	5° max.
②	Bending down	5° max.
③	Twisting	5° max.
④	Rolling	5° max.
⑤	Bell-mouth	0.05 ~ 0.25 mm
⑥	Cut-off length	0 ~ 0.1 mm
⑦	Wire conductor protruded brush length	0.03 ~ 0.20 mm
⑧	Crimp width at wire conductor part	0.7 mm
⑨	Crimp width at wire insulation part	0.95 mm max.

7.4.1. There must not be large burr or one-sided burr.



6-4-2 Examples of defective crimping

Long protruded wire brush	Short protruded wire brush	Wire insulation bitten with wire barrel
		
Poor crimping on the insulation part	Stray wire conductors	
		

7.5. Precautions for crimping operation

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

② Do not crimp without the contacts and crimping twice, because they may cause an outstanding burr at the crimped part and may lead to the abrasion of the crimping die quickly.

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

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

⑤ When the crimping operation is conducted with the wire holding spring damaged or extracted, the wire conductors may come off or the wire barrel bites the wire insulation.

7.6. 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 adjustment and replacement records of crimping die

7.7. Precautions for the handling of the crimped contact

As the crimped contact before inserting into the housing is subject to deformation, etc. by external forces, pay careful attention to the following 5 points for the storage and the handling:

① The number of the crimped contacts for one bundle should be 50 pcs. max. Protect the contacts by wrapping with paper to prevent from the deformation and the adhesion of foreign matter, 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 at room temperature.

③ Do not stack too much quantity of the crimped contacts nor place anything on them, because the weight of themselves deforms the contact, resulting in troubles such as defective contacting.

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

⑤ As for the unused chain contacts after crimping, fasten the end on the reel with a wire and a string, so as not to unravel. Then, put it in a carton box and store the box in a clean room at room temperature.

8. Harness Assembly Operation

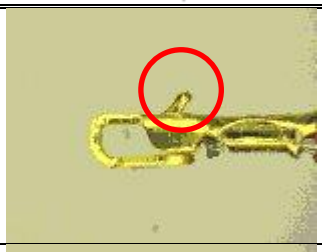
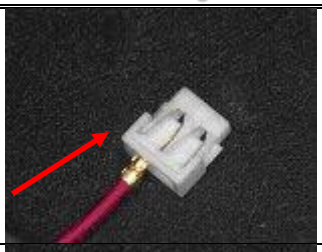
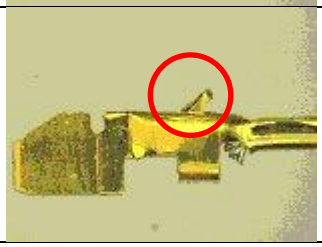
The harness assembly operation is a very important process to decide the connector performance and the harness quality. Careful operation is required for the harness assembly as well as the said crimping operation.

8.1. Precautions before inserting the crimped contact into the housing

① Do not place other things on or near the working table and do not conduct any other works on the same working table.
② Do not stain the contact with household goods such as oils, detergent, seasoning, fruit juice and insecticide. If stained, never use the stained contact.
③ Do not use the poor crimping contact and the deformed one.
④ The rough handling of the crimped contacts in binding may cause the deformation.
⑤ When the bound harnesses are loosened, do not pull the crimped contacts by force even if they get entangled.

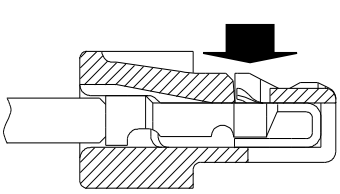
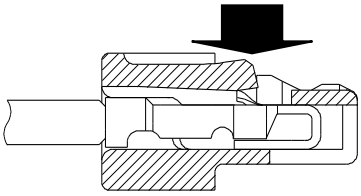
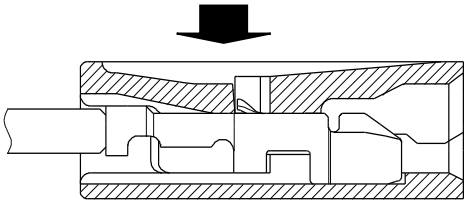
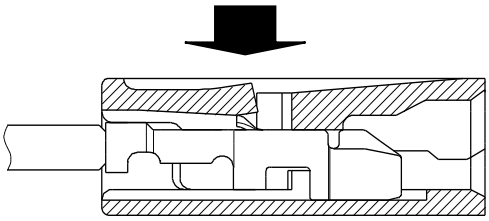
8.2. Inserting the crimped contact into the housing

① Hold the contact with the lance part up, and straightly insert the contact into the housing.
(Do not pry or diagonally insert the contact.)

	Lance part	Contact inserting direction
Socket contact （SACH-003G-P0.2）		
Plug contact （SACHP-003G-P0.2）		

② Insert the contact into the housing without stopping to the innermost.
When the contact is fully inserted into the housing, you can check that the insertion has completed with an audible clicking.

③ Check secure locking per each insertion by pulling a wire softly in order to check that the contact does not come off the housing. Besides, check visually that each contact is securely locked to the housing lance as shown below.
In case of the insufficient insertion, the contact is not engaged with the housing lance, so the contact comes off the housing by pulling the wire softly.

	Good	Insufficient insertion
Socket contact (SACH-003G-P0.2)		
Plug contact (SACHP-003G-P0.2)		

8.3. When the contact is inserted in an improper circuit

① Do not use the contact and the housing but use new ones. However, the reuse of the contact only is possible if you observe the next item.

② Follow the below points when the improperly inserted contact is extracted and reused
(The method of extracting the contact from the housing is as item 7-4.)

- In case that the contact and the housing are reused in some reason, the reuse should be once. From twice, use the new contact and housing.
- When the extracted contact is reused, check that it has no deformation and no damage. If deformed or damaged, use the new contact.
- Only a specified person conducts the operation.
- After modification completes, be sure to check the secure locking of the inserted contact. When the contact comes off the housing, use the new contact and housing.

8.4. How to extract crimped contact from housing in case of mis-insertion

① Raise the housing lance by a sharp-pointed tool (like needle or jig) as shown in the below photo to unlock.

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

ACH connector wire-wire type

9. Inspection of Finished Product (Continuity Check)

9.1. Simple wiring inspection using a tester

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

9.2. Wiring inspection using an inspection jig

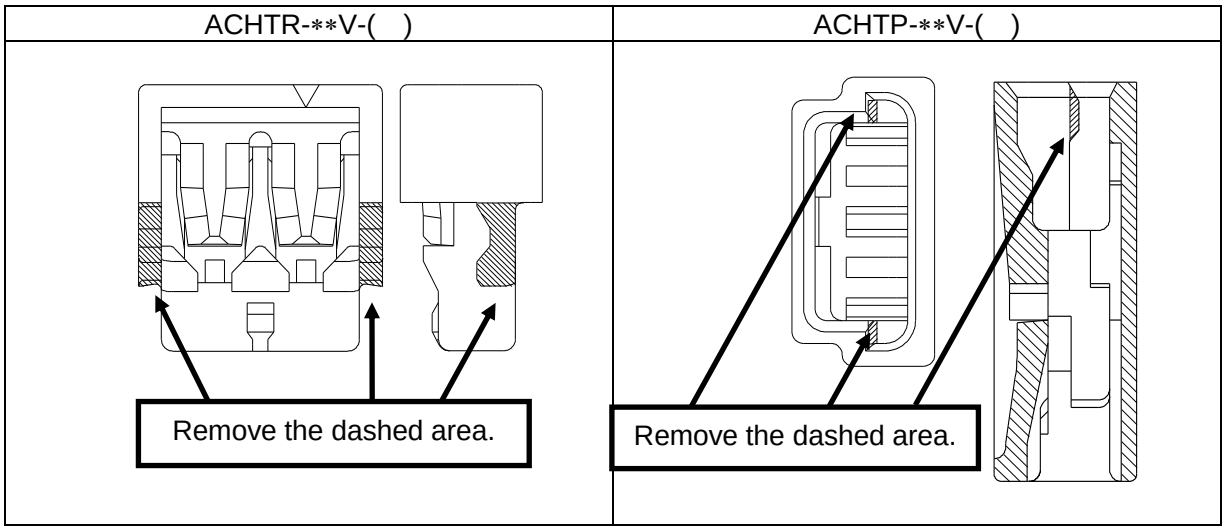
Note the following points.

- Use the header applicable to the housing for inspection. (Refer to the table below.)

Inspection target		Jig side	
Contact	Housing	Contact	Housing
SACH-003G-P0.2	ACHTR-**V-( )	SACHP-003G-P0.2	ACHTP-**V-( )
SACHP-003G-P0.2	ACHTP-**V-( )	SACH-003G-P0.2	ACHTR-**V-( )

Note$_8$: 2-digit figures "**" denotes the circuit number.
Note$_9$: A letter in "( )" denotes the color.

We recommend the inspection of the jig side by using the housing which lock hook is removed. (See the following figures.)



- Use the header free from deformation, damage and stains. When they are found, replace with the new one at once. The periodical replacement of the header is also necessary.
  (Within about 100 cycles of the mating and unmating operation)
- Mate and unmate the connector with care, holding the housing not to pry.
  When an inspection board is used, design it to conduct the mating and unmating works smoothly.

10. Handling Precautions

10.1. Mating the connector

Insert the connector on the same axis as parallel to the mating axis as possible.

10.2. Unmating the connector

Holding the socket housing and the plug one with secure, unmate the connector straightly on the mating axis.

10.3. Handling wires

Do not apply an external load other than tension and load which generate by handling the wire harness.

In handling the wire, do not apply an external load to the connector and the wire by taking such a consideration as keeping an enough length and fixing the wire.

When tension applies to the connector and the wire, the contact part and the crimping part are damaged, resulting in poor contact.