Title of Document: **HANDLING MANUAL**	Issue No. CHM-1-2160	Rev. 7
Customer:	Issue date: June 30, 2005	
Title subject: ACH Connector Contact (Normal Type)	Revision date: April 27, 2020	

This handling manual describes the operation points of the crimping and the handling of the ACH connector 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	Contact	Standard type	Type 003	SACH-003G-P0.2
		For thin wire	Type 003B	SACH-003G-P0.2B
	Socket housing	Standard type	2, 3 circuits	ACHR-**V-( )
			1, 4 and 5 circuits	ACHR-**V-A-( )
		Halogen-free type	2, 3 circuits	ACHR-**V-K(HF)
			4 circuits	ACHR-04V-A-K(HF)

Note$_1$: ” **” denotes the two-digit circuit number.
Note$_2$: An alphabet in ”( )” denotes the color.

3. Applicable Wire

Type of contact	Applicable wire size	Wire insulation O.D.	Conductor
Type 003	AWG #28 to #30	ϕ 0.50 ~ ϕ 0.63 mm	Annealed copper stranded tin-plated wire
Type 003B	AWG #30 to #32	ϕ 0.38 ~ ϕ 0.50 mm	

Note$_3$: Special wires such as bare one, solid one, tin-coated one and shielded one other than the above wires 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 (Type 003)	MK/SACH-003-02
Applicator and die set	APLMK SACH003-02

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 character or an alphabet comes into “( ) “ of the crimping press’ circuit number.
e.g.: AP-K2N
Note$_6$: The crimping applicator can be used for both contacts of type 003 and 003B.
Crimp the JST chain terminals by JST specified tool.

5. Check Points of Crimping Operation and Harness Assembly

The operations of crimping and assembly affect the connector's 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
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 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 the aid of a microscope or a loupe.

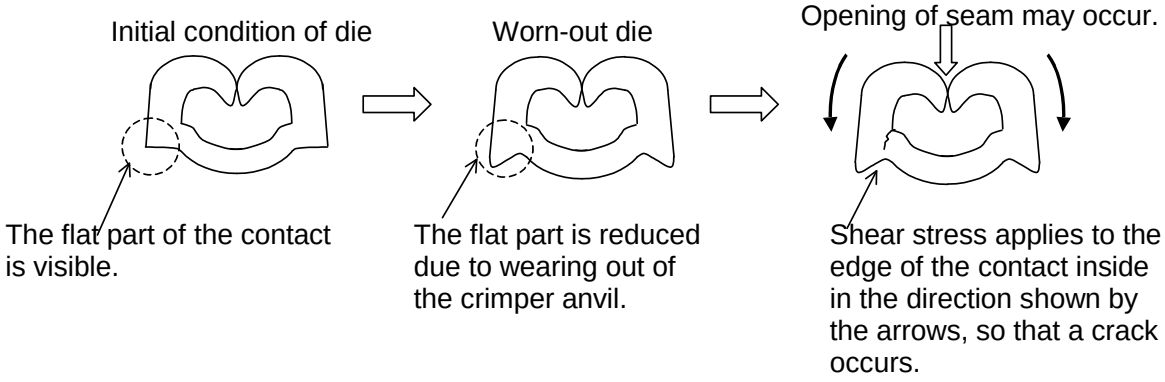
6. Points of Adjustment of Machine

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.

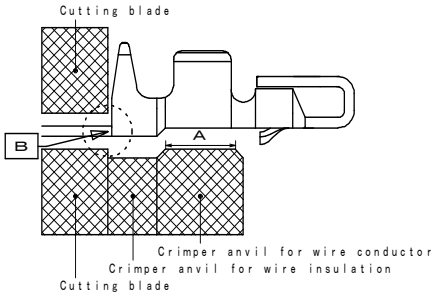
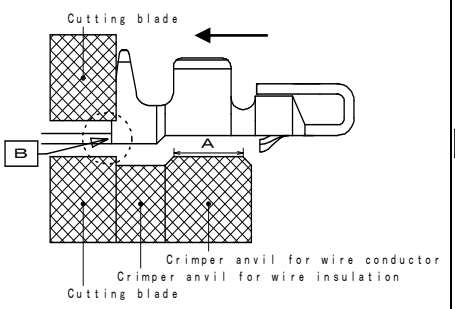
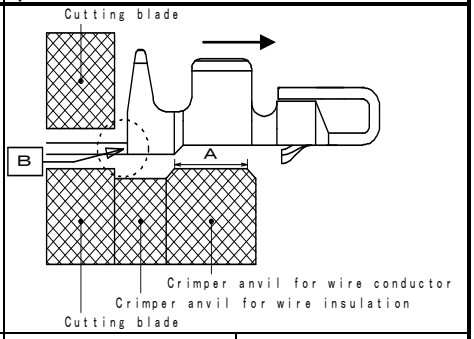
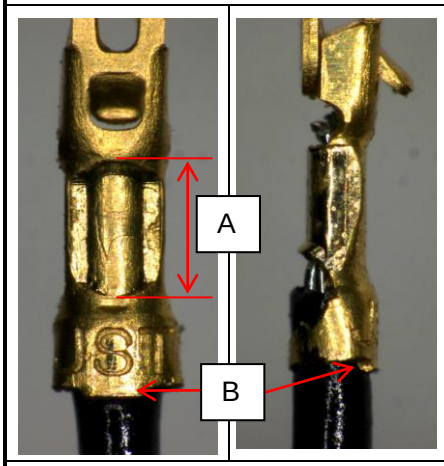
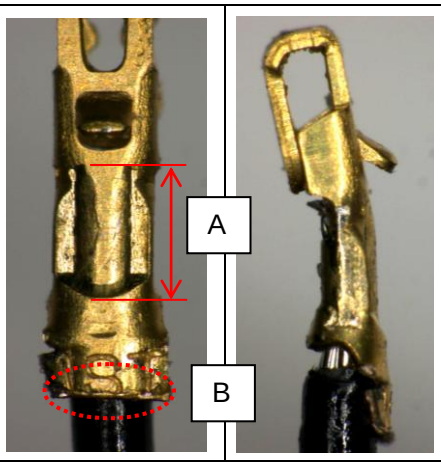
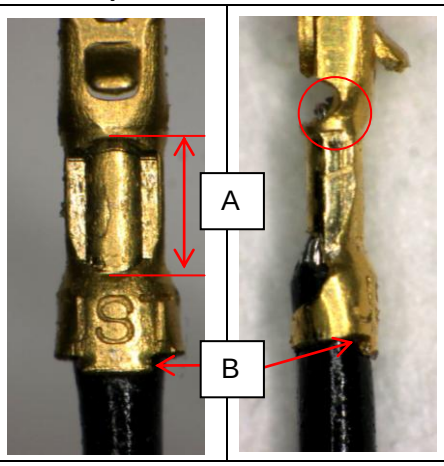
- Replacement timing of crimping die
  ①When the die cracks and it becomes rough.
  ②When the crimped surface of the contact becomes rough excessively.
  (The gloss disappears from the contact's surface.)
  ③When the seams open. (See figure below.)
  Note$_7$: In the case that crimping continues beyond 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 contac 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.

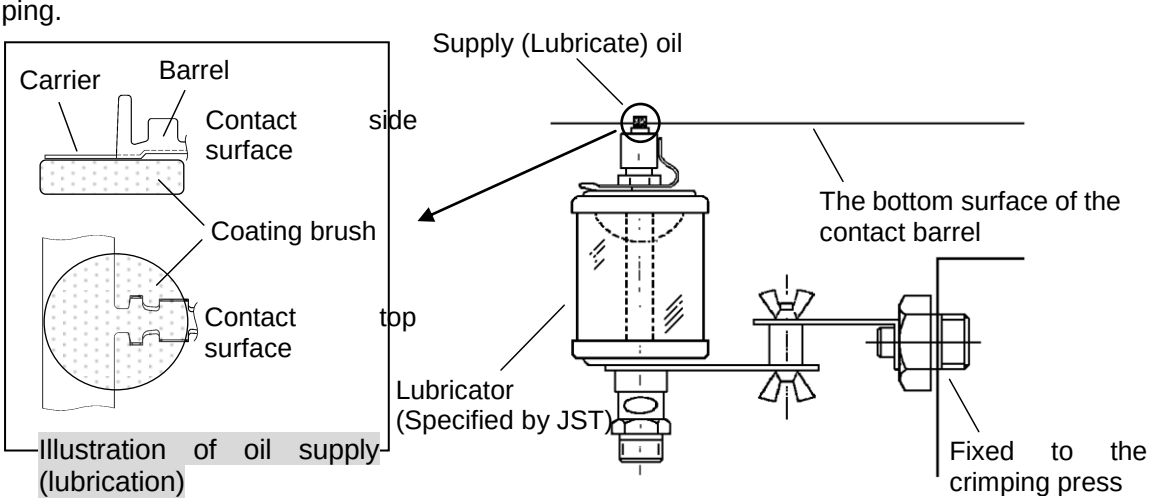


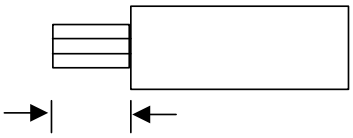
Illustration of oil supply (lubrication)

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



Strip length

Note$_8$: • Be free from damages 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 the oxidation of the conductor's surface advances, which may result in the fluctuation of the contact resistance. So, complete the crimping as soon as possible after wire stripping.

7.2. Crimp height

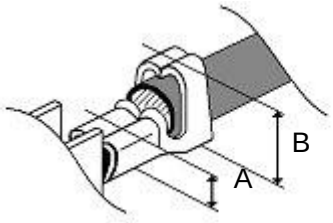
According to wires to be used, adjust the dials (the conductor part and the insulation part) of the applicator to a proper crimp height.

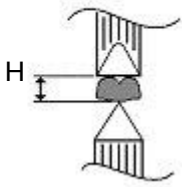
The crimp height of the insulation part is a reference value for the wire insulation's outer diameter.

It depends on the wire insulation's outer diameter and the material, so check and set it in crimping according to item 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
AWG #32	ϕ 0.39 mm	0.37 ~ 0.41	0.55

7.2.1. Measurement of crimp height



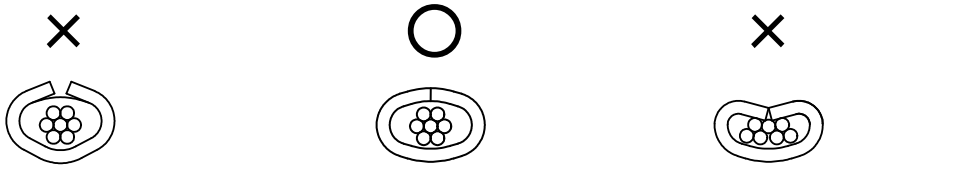


A: The crimp height at the wire barrel should be set to the pre-determined dimensions.
B: Adjust the crimp height of the wire insulation barrel to the extent that the wire insulation is slightly pressed, and set it not to crimp it excessively.
H: Measure the crimp height at the center of the barrel using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

7.2.2. Measurement timing of crimp height

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

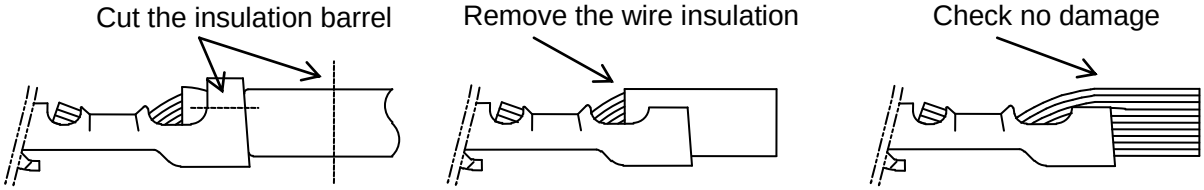
7.2.3. Crimping condition at insulation barrel



×	○	×
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 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.

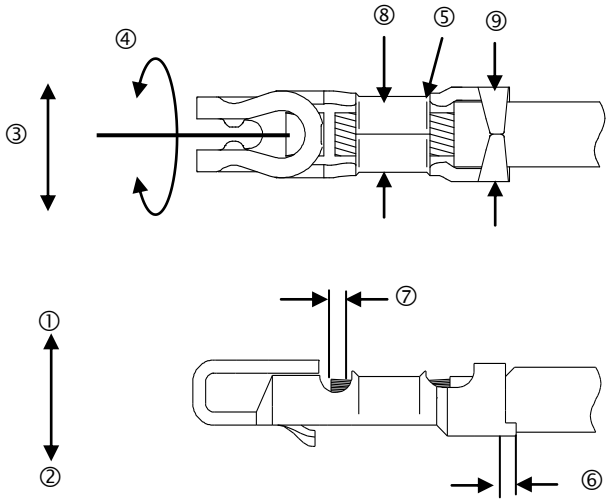
Unit: N

Wire size	Requirement	Actual value
AWG #28	10 min.	23
AWG #30	5 min.	14 ~ 16
AWG #32	3 min.	10 ~12

7.4. Crimping appearance

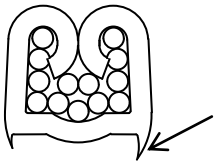
Check the crimping appearance visually for correct crimping with an equipment such as a microscope or loupe.

Part name of crimped contact

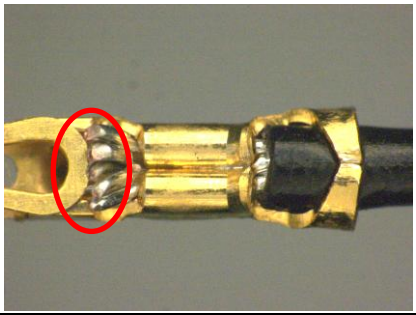
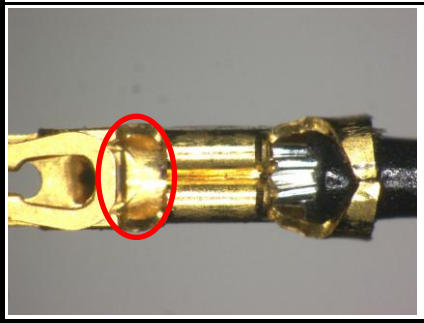
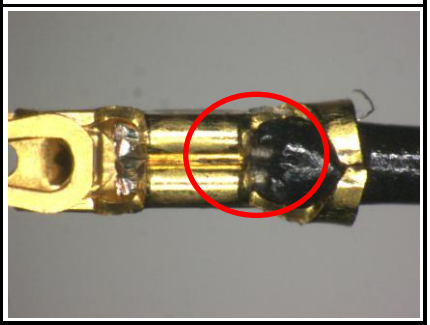
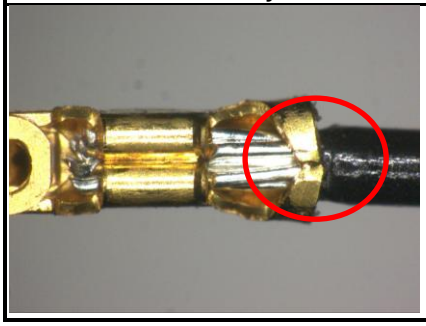
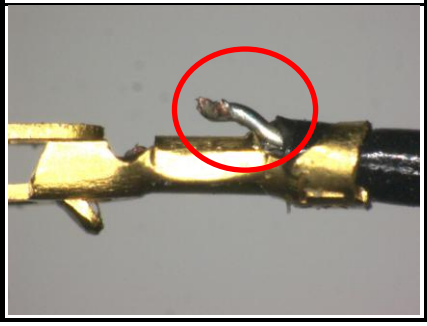


	Check item	Reference value
①	Bending up	5° max.
②	Bending down	5° max.
③	Twisting	5° max.
④	Rolling	5° max.
⑤	Bell-mouth	0.05 ~ 0.25 mm
⑥	Cut-off length	0 ~ 0.1 mm
⑦	Wire conductor protruded brush length	0.03 ~ 0.20 mm
⑧	Crimp width at wire conductor part	0.7 mm
⑨	Crimp width at wire insulation part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

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



7.4.2. Examples of defective crimping

Wire conductor protruded brush length is long.	Wire conductor protruded brush length is short.	Wire barrel bites wire insulation.
		
Wire insulation is not crimped sufficiently.	Wire conductor comes off.	
		

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 storage and handling of 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, which may result 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 the wire, the string, etc. 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

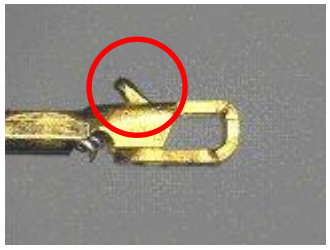
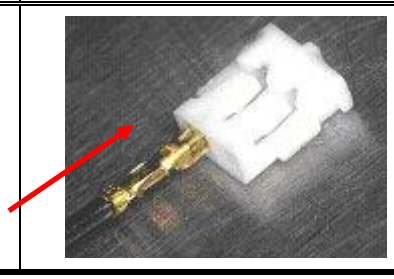
The harness assembly operation is a very important process to decide the connector's performance and the harness quality. Careful operation is required for the harness assembly as well as the said crimping operation.

8.1. Precautions before inserting crimped contact into 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 crimped contact into housing

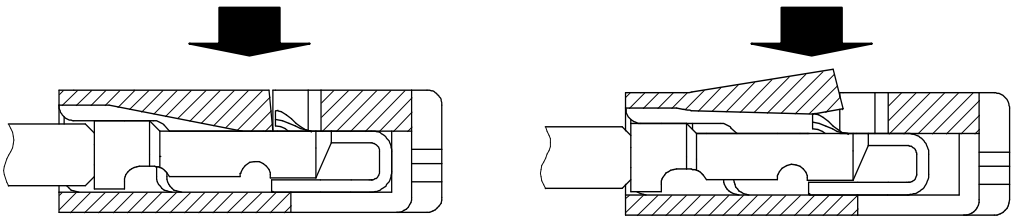
① Hold the contact with the lance part up, and straightly insert the contact into the housing.
(Do not pry or diagonally insert the contact.)

Lance part	Contact inserting direction
	

② Insert the contact into the housing without stopping to the innermost.
When the contact is fully inserted into the housing, there is a click, so you can check that the insertion has completed.

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 caught with the housing lance, so the contact comes off the housing by pulling the wire softly.

ACH connector



Good　　Incomplete insertion

8.3. When contact is inserted in 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.)

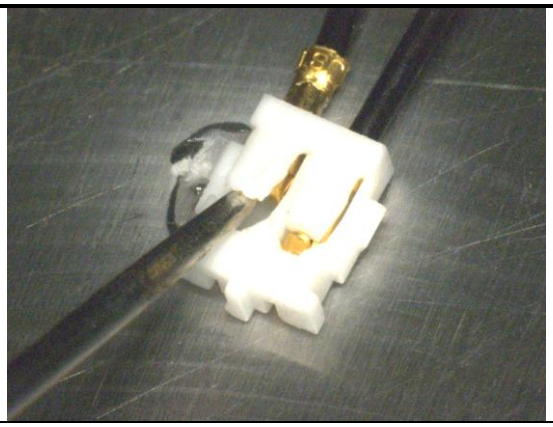
- In case such contact and housing are reused in some reason, the reuse should be once. From twice, use the new contact and housing.
- When the extracted contact is reused, check that it has no deformation and no damage. If deformed or damaged, use the new contact.
- Only specified person conducts the 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.

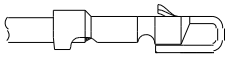
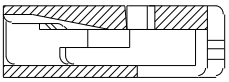
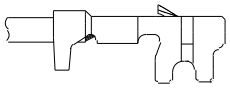
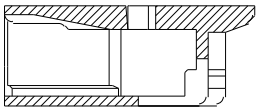
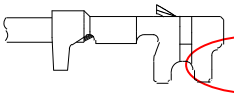
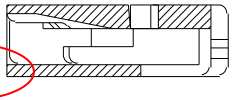
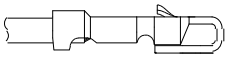
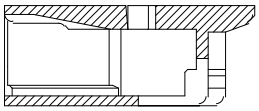
How to extract contact



Contact: The reuse is possible. (Only once)
Housing: The reuse is impossible.

Precautions for connector combination

ACH connector has normal type and H-type; they use the same header side.
The H-type has a wide pushing area for improving the mating operation. The part which the normal type and the H-type can be commonly used is the header side only.
But, the socket contact and housing of the normal type and the H-type have a different shape; they cannot be shared.

Combination \ Illustration			Contact	Housing	Allowable combination
①	Contact	Normal type			○
	Housing	Normal type	**8.4.1. SACH-003G-P0.2( )**	**ACHR-**V-( )-( )**	
②	Contact	H-type			○
	Housing	H-type	**SACH-003G-P0.2H**	**ACHR-**V-H-( )**	
③	Contact	H-type	 		✕
	Housing	Normal type	The contact hits the wall of the mating entrance and it cannot be inserted in the housing.		
			8.4.1.1.1. SACH-003G-P0.2H	**ACHR-**V-( )-( )**	
④	Contact	Normal type	 		✕
	Housing	H-type	*The contact can be inserted in housing but not be retained.		
			SACH-003G-P0.2( )	**ACHR-**V-H-( )**	

As shown in the above table, combine the same type contact and housing in using.

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

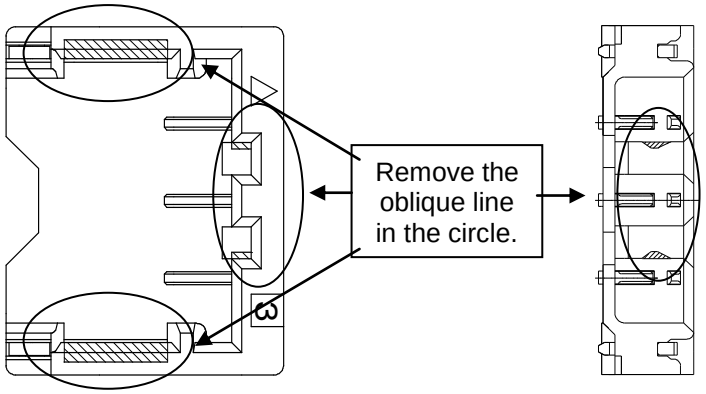
Note the following points.

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

Contact to be used	Housing to be used		Applicable header
SACH-003G-P0.2 SACH-003G-P0.2B	2 & 3 circuits	ACHR-**V-( )	BM**B-ACH( )S-GAN (LF)(SN)
		ACHR-**V-K(HF)	BM**B-ACHKS-GAN(HF)
	1, 4 & 5 circuits	ACHR-**V-A-( )	BM**B-ACH( )S-A-GAN (LF)(SN)
		ACHR-04V-A-K(HF)	BM04B-ACHKS-A-GAN(HF)

$Note_9$: "**" denotes the two-digit circuit number.
$Note_{10}$: An alphabet in "( )" denotes the color.

In the inspection, we recommend using the header that the locking part is removed and is mounted on the PC board.

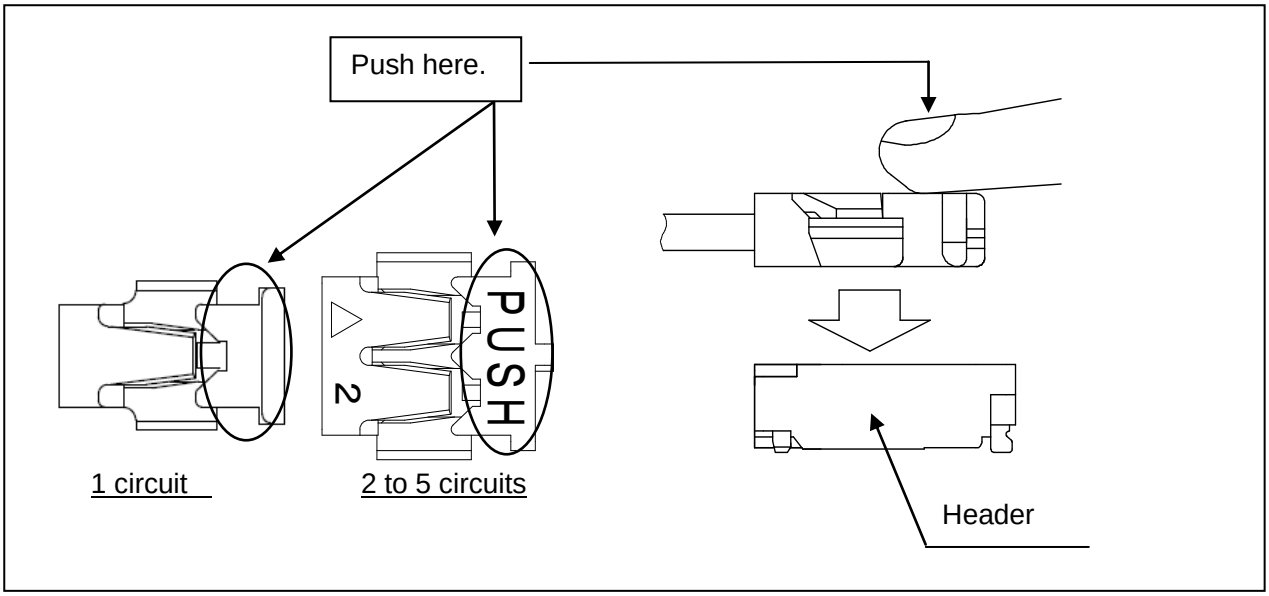


- Use the header free from the deformation, the damage and the stains. When they are found, replace with a new one at once. The periodical replacement of the header is also necessary.
(Within about 100 cycles of the mating and unmating operation)
- Mate and unmate the connector with care, holding the housing without prying.
When an inspection board is used, design it considering that the mating and unmating works are not difficult.

10. Handling Precautions

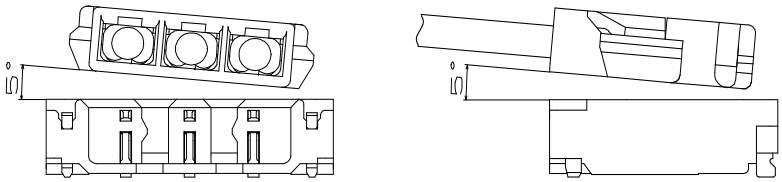
10.1. Mating operation

Mate the socket with the header on the mating axis.
Push the “PUSH” part of the socket housing and check secure mating.

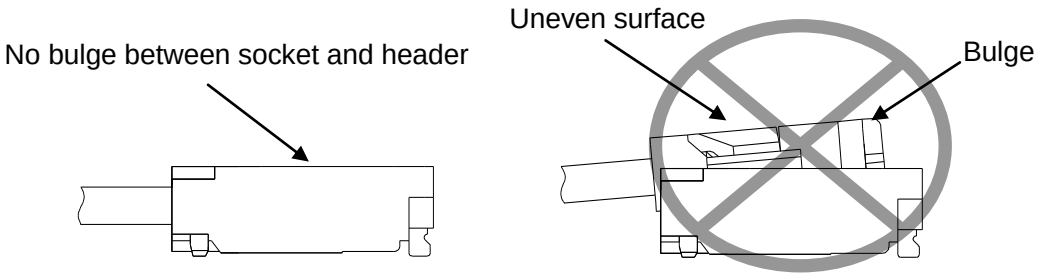


Precautions

① Mate the connector with the counterpart as parallel as possible (MAX. 5°).
Do not mate the connectors by force by pushing one end of the socket or prying wires, because the housing may be damaged or the contact may be deformed.

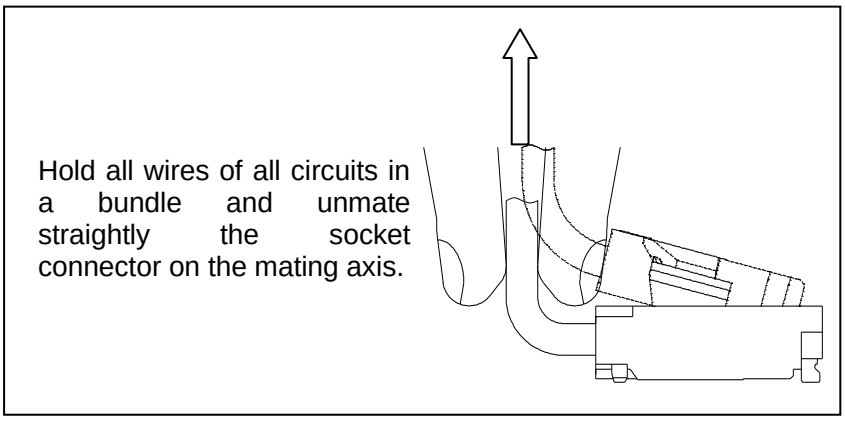


② After mating the connectors, check secure mating, referring to the following.
In case of insufficient mating, retry the mating, referring to item 9-2.
(When the socket bulges a little from the header due to insufficient mating, push it in without removing.)

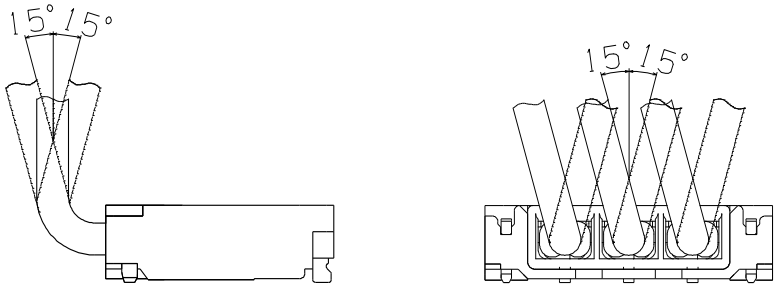


10.2. Unmating operation

Hold all wires of all circuits in a bundle and unmate straightly the socket connector on the mating axis.

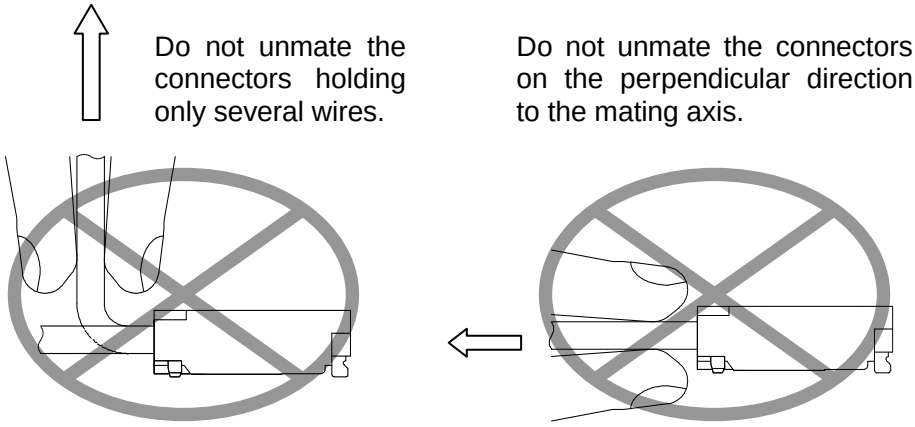


Unmate the connector by holding wires at the angle within 15 degrees to the mating axis.



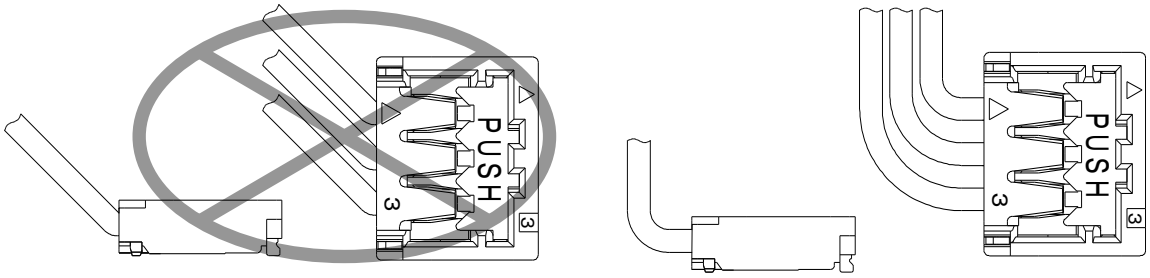
Precautions

Do not unmate the connectors holding only several wires or in the perpendicular direction to the mating axis because such handling may cause connector troubles such as contact deformation, housing cracks or cuttings.



10.3. Precautions

Handle the wires with care so as not to apply a larger load than tension due to wire bend to the connector.
Provide a space above the connector in order to form the wire by bending and do not apply tension to the connector as below.



10.4. Precautions for storage

① Store the contact and the housing in a clean place at room temperature.
Keep them free from damp, dust and direct sunshine.

② Careful operation is required for the storage and the transport of the housing and the harness in a stacking condition. Such stacking may deform the housing.

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

④ In electrical continuity inspection of the connector assembly, assemble the connector with the applicable header.
Never use the different type pin like a tester pin because the contacting part may be deformed.

- Carefully check that the connector for electrical continuity is free from the deformation, the damage and stains. When they are found, replace with a new one at once. The periodical replacement of the header should be conducted as well.

- Mate and unmate the connector with care, holding the housing without prying.
When the inspection board is used, design it considering so that the mating and unmating works are not difficult.

⑤ 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 the metal part.