

ISH® HYBRID CONNECTOR

Instruction Manual

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Rev.	ECN	Date	Prepared by	Checked by	Approved by

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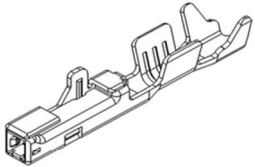
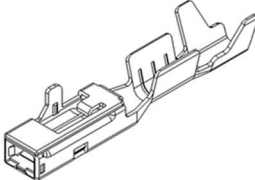
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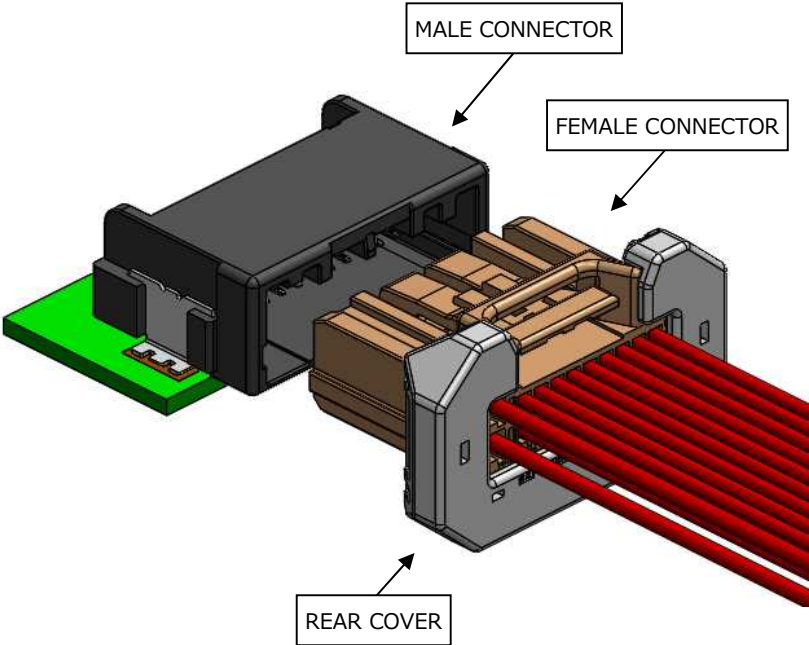
1. Purpose

The Manual explains the handling of ISH HYBRID CONNECTOR.

2. Applicable items

The Manual is applicable to the items listed below.

Name	Terminal Tab Size	Part No.	Image
FEMALE TERMINAL	0.5mm	VT009-02	
	1.5mm	VT011-02	



## 3. Crimping procedure

## 3-1. Applicable wires

Table1. Applicable Wire

Terminal Tab Size	Part No	Applicable Wire
0.5mm	VT009-02	Wire Size : $0.3\text{mm}^2 \sim 0.5\text{mm}^2$ Insulation Outer Diameter : $\phi 1.60\text{mm}$ MAX.
1.5mm	VT011-02	Wire Size : $0.5\text{mm}^2$ Insulation Outer Diameter : $\phi 1.93\text{mm}$ MAX.

## 3-2. Wire strip length

- ① Strip the insulation off at the dimension shown in Fig .1.
- ② Check to see that there is no damage to the conductors or insulation, cut off conductors, short conductors and deformed conductors as shown in Fig. 2.

Do not use wires with damaged conductors, cut off conductors, short conductor and deformed conductors.

Using faulty wires may cause crimping problems.

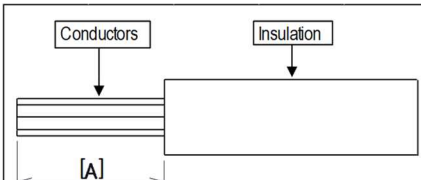
	Terminal Tab Size	Part No	Dimension [A]
	0.5mm	VT009-02	$3.0 \pm 0.1\text{mm}$
	1.5mm	VT011-02	$4.0 \pm 0.1\text{mm}$

Fig 1. Wire strip

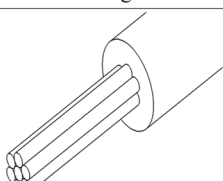
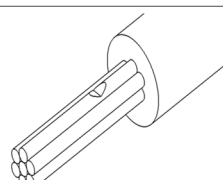
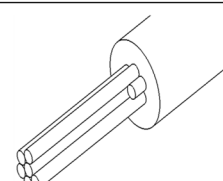
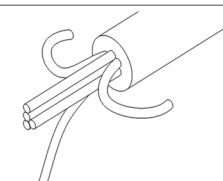
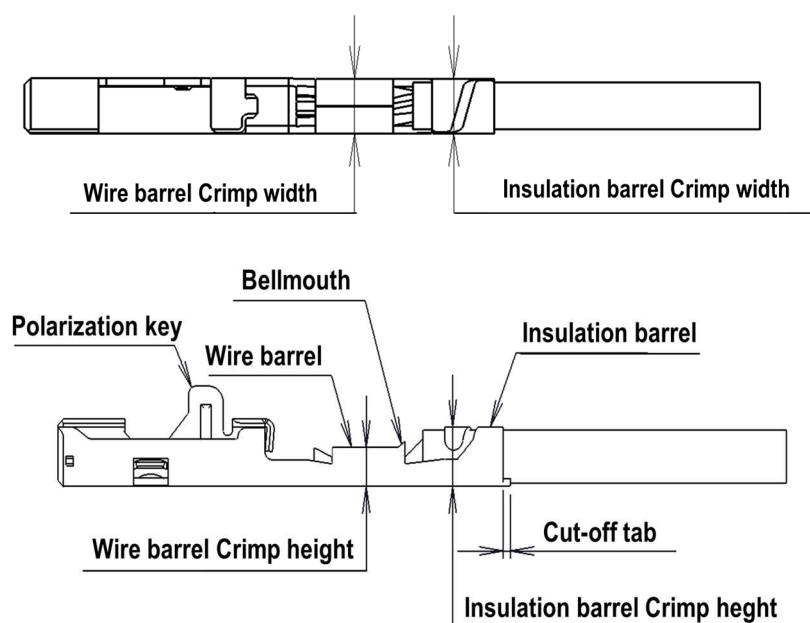
Condition	Image
Good	
Damaged conductors (defect)	
Cut off conductors (defect)	
Deformed conductors (defect)	

Fig 2. Stripped wires (unacceptable examples)

## 3-3. Terminal part names

**Fig 3. Terminal part names**

## 3-4. Crimping requirements

## (1)Crimp dimension

Female Terminals must satisfy the crimp dimension specified in Table 2.

**Table 2. Crimp dimension**

Terminal Tab Size	Part No.	Wire Size	Insulation Outer Diameter	Wire barrel Crimp Height(※)	Wire barrel Crimp width	Insulation barrel Crimp height	Insulation barrel Crimp width
0.5mm	VT009-02	0.3mm <sup>2</sup>	Φ1.60mm MAX.	0.90±0.05mm	1.40±0.04mm	1.60 <sup>+0.10</sup> <sub>- 0.05</sub> mm	1.55±0.05mm
		0.5mm <sup>2</sup>		0.95±0.05mm		1.80±0.05mm	
1.5mm	VT011-02	0.5mm <sup>2</sup>	Φ1.93mm MAX.	1.00±0.05mm	1.60±0.05mm	2.00 <sup>+0.10</sup> <sub>- 0.05</sub> mm	2.00±0.05mm

※Crimp dimensions may be different depending on conductor construction of the wire.

Please contact our Sales Department shown in 15(sheet 24) about wire used, then we will verify it and notify you the appropriate crimp dimensions.

Measuring method for crimp dimension is described below.

Use the micrometer shown in Fig.4 for measurement of each part.



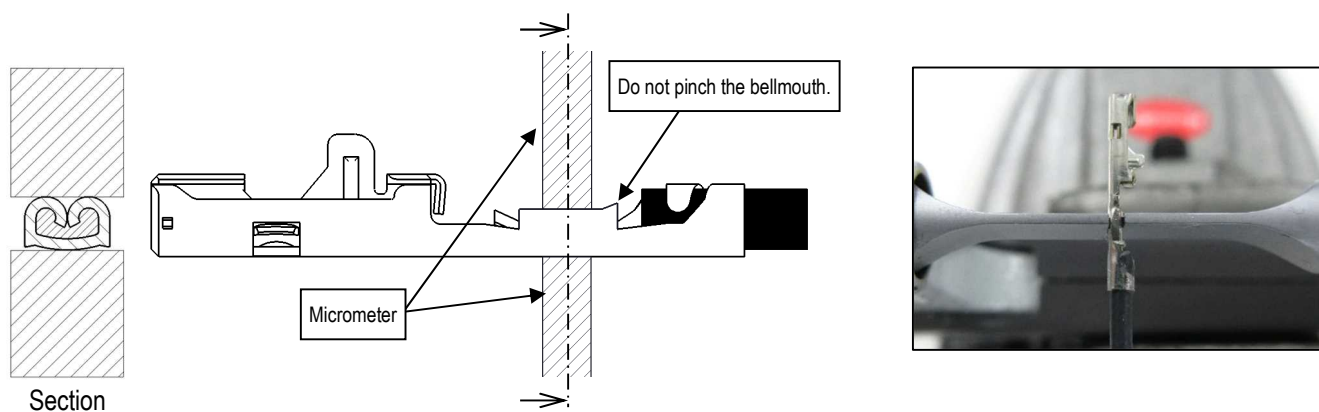
**Fig 4. Micrometer**

(1)-1. Measuring method for wire barrel crimp height is described below.

To measure the wire barrel crimp height, pinch the top of the wire barrel (winding side) and the bottom of the wire barrel with a micrometer. (see Fig.5)

Secure terminals firmly to obtain accurate measurement.

Do not pinch the bell mouth. The wire barrel crimp height can not measure accurately.

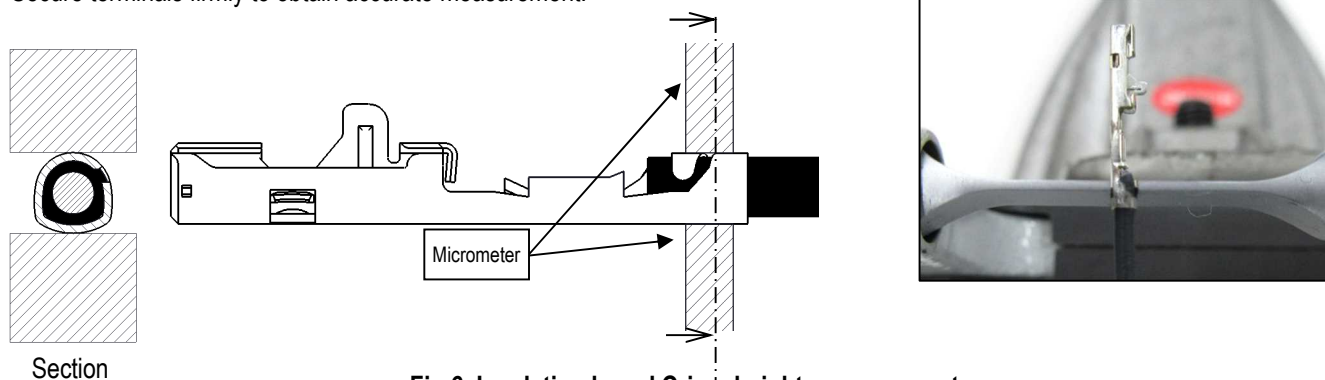


**Fig 5. Wire barrel Crimp height measurement**

(1)-2. Measuring method for insulation barrel crimp height is described below.

To measure the insulation barrel crimp height, pinch the top of the insulation barrel (winding side) and the bottom of the insulation barrel with a micrometer. (see Fig.6)

Secure terminals firmly to obtain accurate measurement.

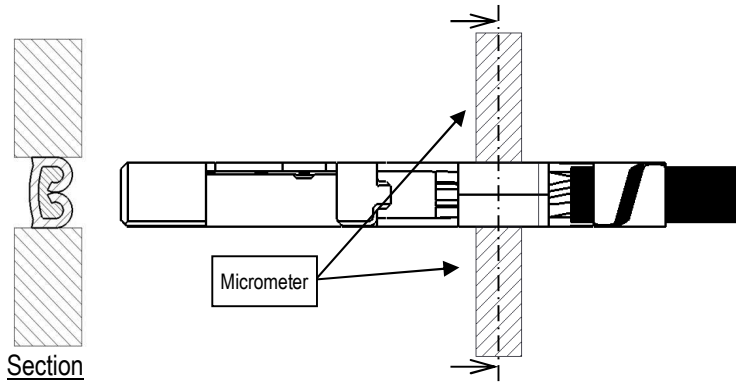


**Fig 6. Insulation barrel Crimp height measurement**

(1)-3. Measuring method for wire barrel crimp width is described below.

To measure the wire barrel crimp width, pinch the side of the wire barrel with a micrometer. (see Fig.7)

Secure terminals firmly to obtain accurate measurement.

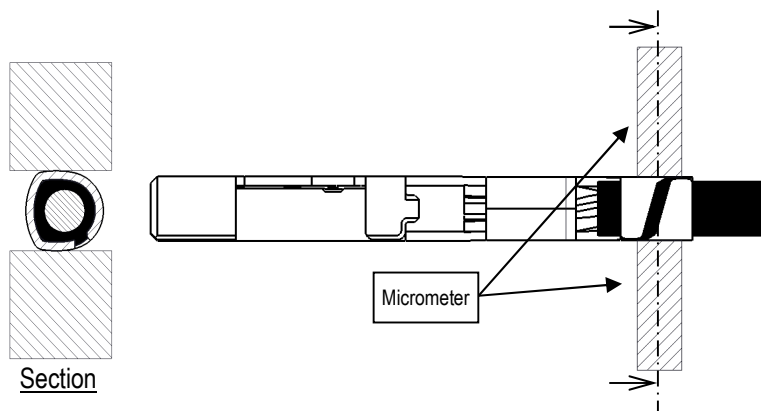


**Fig 7. Wire barrel Crimp width measurement**

(1)-4. Measuring method for insulation barrel crimp width is described below.

To measure the insulation barrel crimp width, pinch the side of the insulation barrel with a micrometer. (see Fig.8)

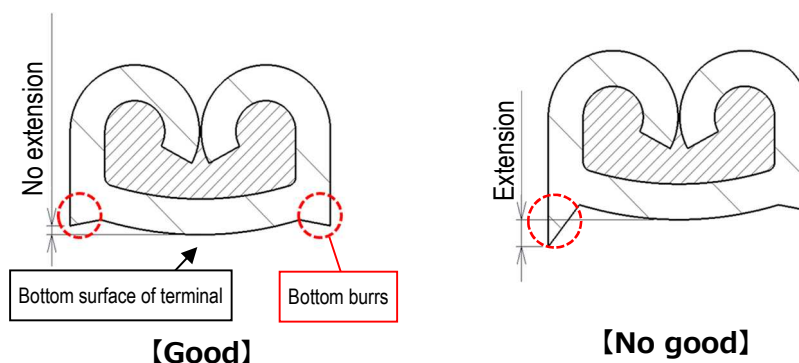
Secure terminals firmly to obtain accurate measurement.



**Fig 8. Insulation barrel crimp width measurement**

## (2) Bottom burrs

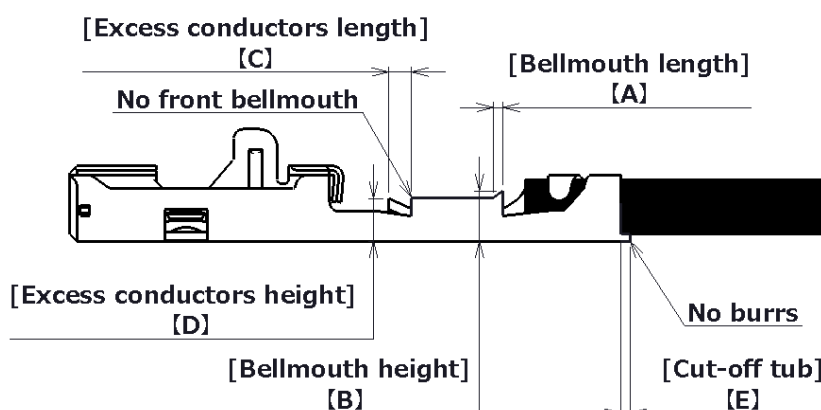
Burrs produced during crimping process must not extend beyond the bottom surface. (see Fig.9)



**Fig 9. Bottom burrs**

## (3) Bellmouth, excess conductors and cut-off tab

Bellmouth, excess conductors and cut-off tab must satisfy the dimensions shown in Fig. 10 and Table 3.



**Fig.10. Bellmouth, excess conductors and cut-off tab**

**Table3.Dimensions: Bellmouth , excess conductors and cut-off tab**

Terminal Tab Size	Part No.	Bellmouth length	Bellmouth height	Excess conductors length	Excess conductors height	Cut-off tab
		A	B	C	D	
0.5mm	VT009-02	0.2 $\begin{smallmatrix} +0.10 \\ -0.05 \end{smallmatrix}$ mm	1.1 $\pm 0.05$ mm	0.95mm MAX.	0.50mm MAX.	0.20mm MAX.
1.5mm	VT011-02	0.3 $\begin{smallmatrix} +0.10 \\ -0.05 \end{smallmatrix}$ mm	1.2 $\pm 0.05$ mm	1.30mm MAX.	0.80mm MAX.	0.20mm MAX.



## (4) Unaligned wire barrel ends

Unaligned wire barrel ends is  $G < 0.1\text{mm}$ . (see Fig.11)

※If wire barrel ends are not aligned, resulting in different dimension of excess conductors or bellmouth between the sides, dimensions must be measured on larger side and be satisfied.

(In the case shown in Fig.12, measure excess conductors:[a],bellmouth:[b].)

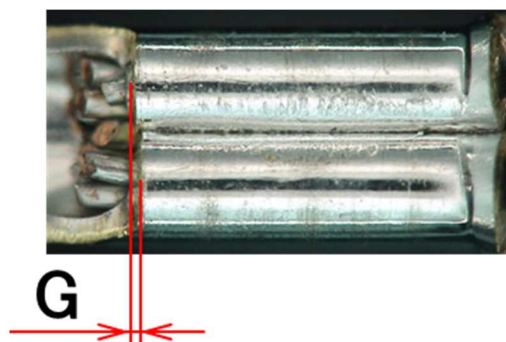


Fig 11. Unaligned wire barrel ends

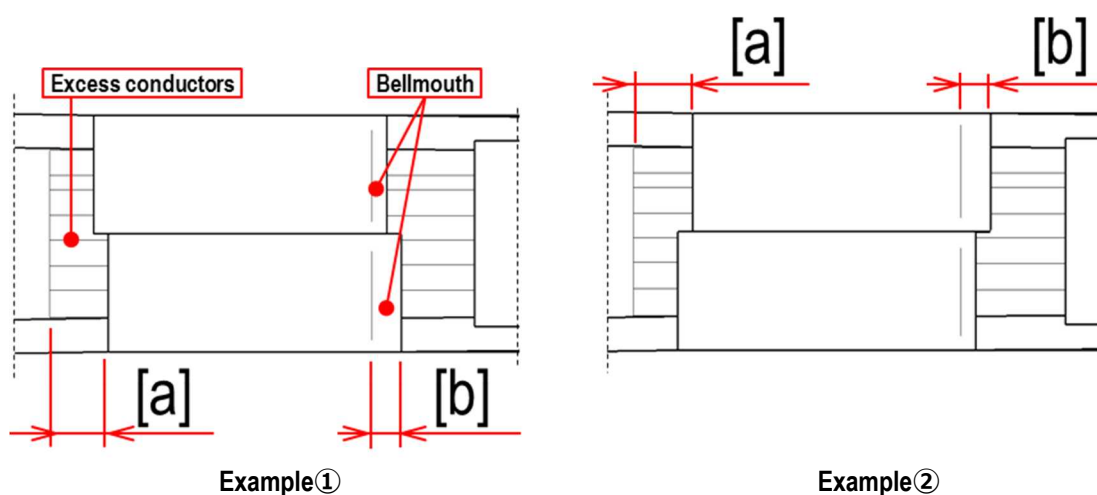


Fig 12. Example of unaligned wire barrel ends

## (5) Rolling

Rolling is  $H < 3^\circ$  from the wire barrel (baseline). (see Fig.13)

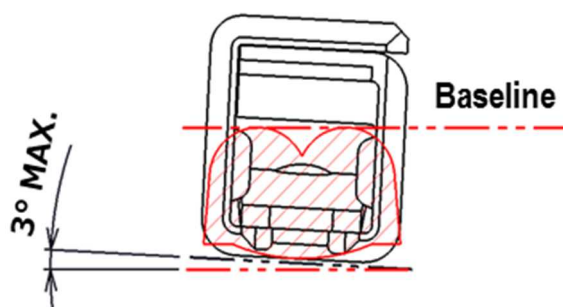
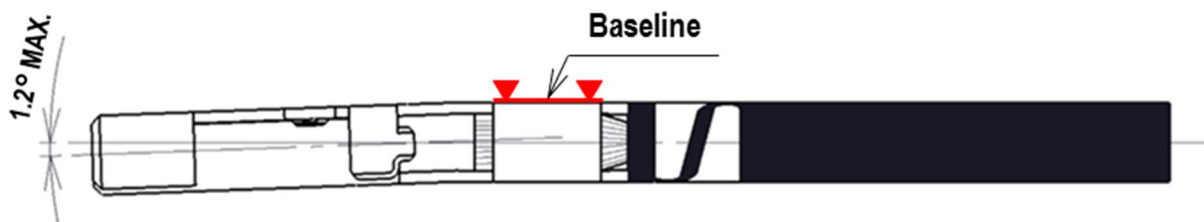


Fig13. Rolling

## (6) Terminal twist

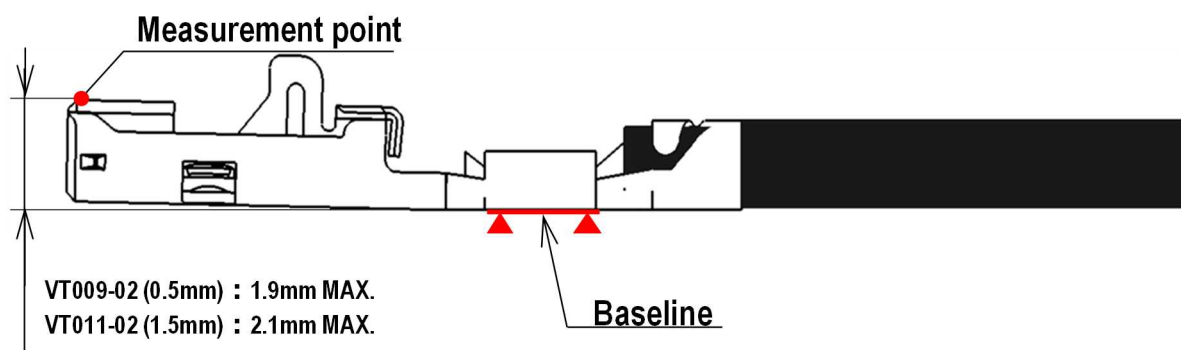
Terminal twist is  $J < 1.2^\circ$  from the wire barrel (baseline). (see Fig. 14)



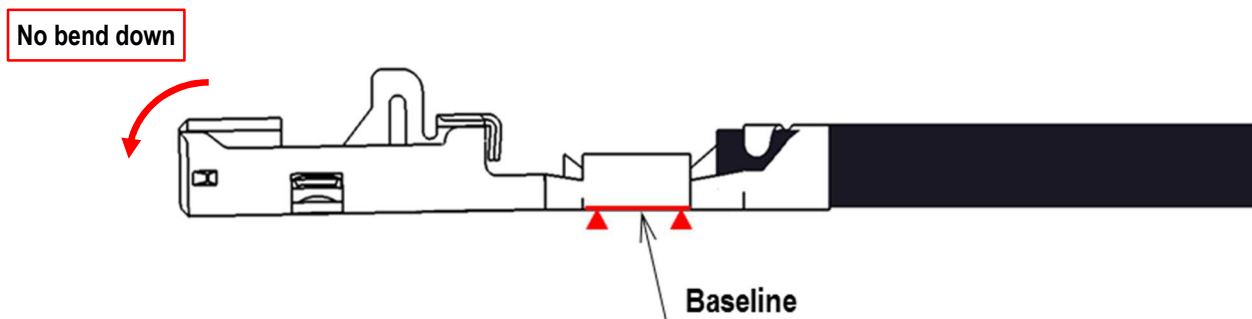
**Fig 14. Terminal twist**

## (7) Bend up and Bend down

Bend up is [ VT009-02 : 1.90mm MAX. ] / [ VT011-02 : 2.1mm MAX. ], and no Bend down, the height from the wire barrel(baseline) to the terminal box(measurement point). (see Fig. 15~16)



**Fig 15. Bend up**



**Fig 16. Bend down**

## 3-5. Defective criteria

Terminals with the following conditions are deemed defective.

## (1) No rear bellmouth

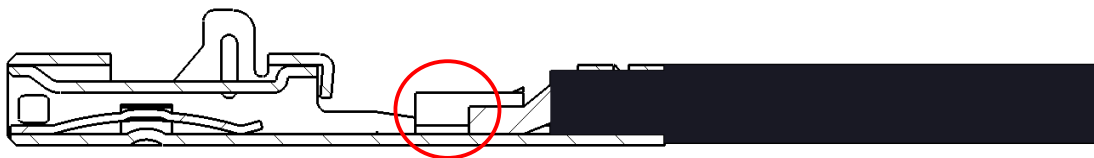
Rear bellmouth is not formed. (see Fig.17)



**Fig 17. No rear bellmouth**

## (2) Insufficient conductors insertion

Conductors are insufficiently inserted into the wire barrel. (see Fig.18)



**Fig 18. Insufficient conductors insertion**

## (3) Excessive conductors out

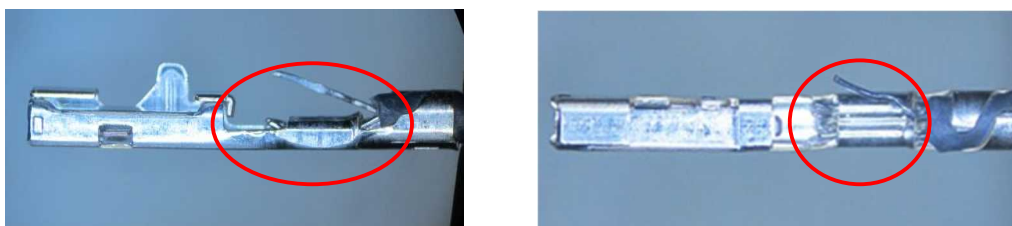
Excess conductors protrude from the wire barrel and does not satisfy the dimension in Table3 of sheet 8. (Fig.19)



**Fig 19 Excessive conductors out**

## (4) Incomplete conductors crimping

Conductors are not crimped inside the wire barrel, or within the female terminal. (see Fig.20)

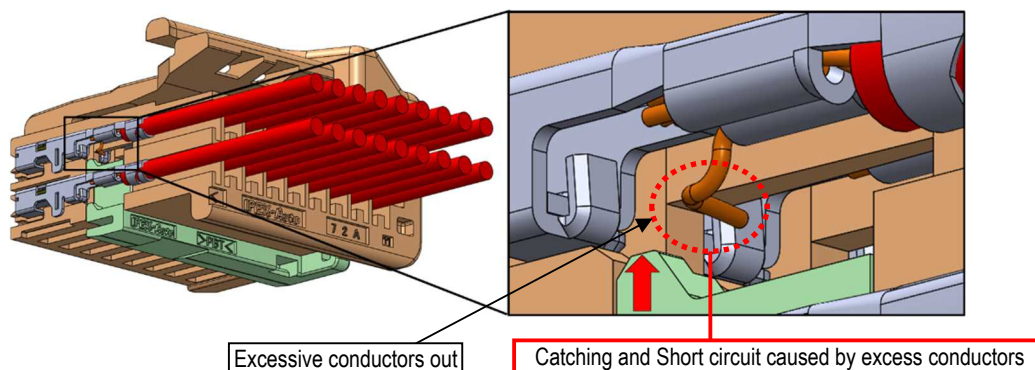


**Fig 20. Incomplete conductors crimping**

※Description of faults : Excessive conductors out & Incomplete conductors crimping.

Please make sure there is no excessive conductors out and incomplete conductors crimping.

When the retainer is inserted, excess conductors could be caught in the gap between the female housing and the retainer. Therefore there is a possibility of defects such as failure to be locked or short circuit between adjacent female terminals. (see Fig.21)

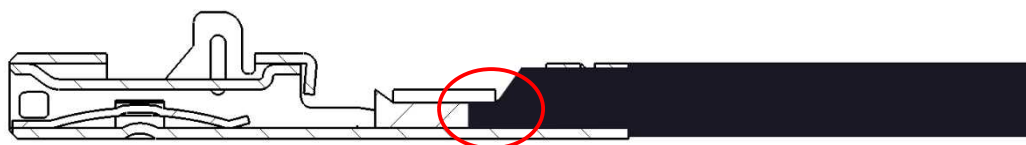


**Fig 21. Defect by excess conductors**

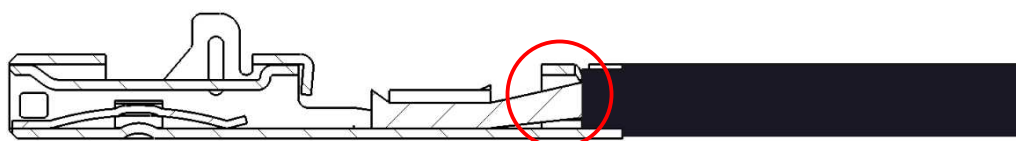
(5) Incomplete insulation crimping

Strip length is too short and insulation is crimped inside the wire barrel (see Fig.22).

Strip length is too long and insulation does not fit completely inside the insulation barrel (see Fig.23).



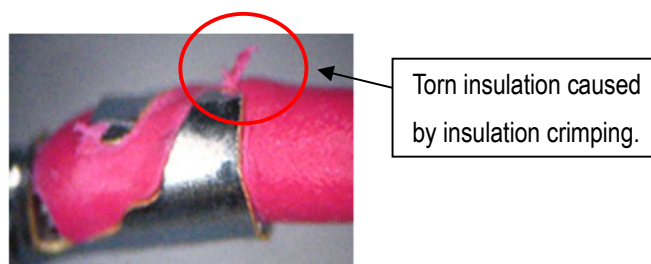
**Fig 22. Strip too short**



**Fig 23. Strip too long**

(6) Torn insulation

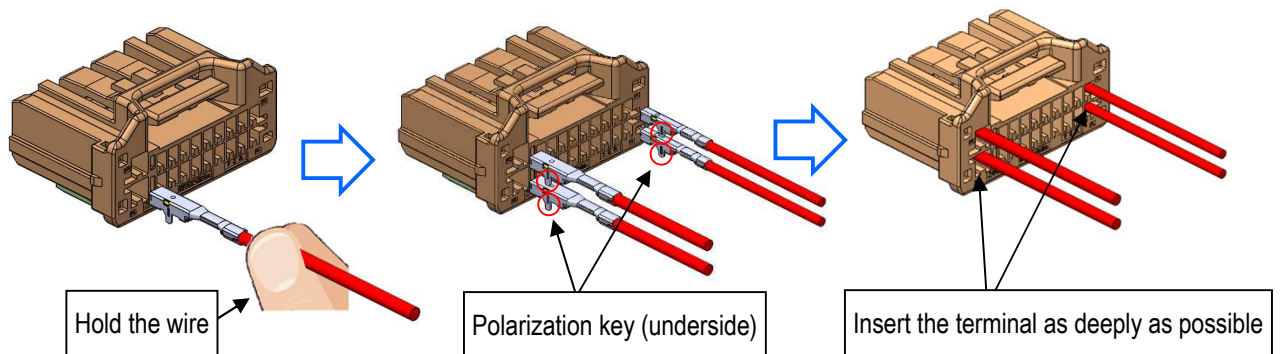
Insulation is torn by insulation barrel. (see Fig.24)



**Fig 24. Torn insulation**

#### 4. Terminal insertion

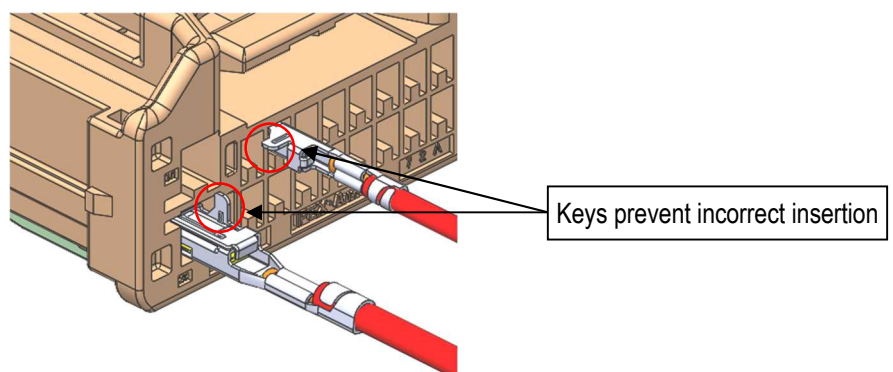
- ① Ensure that the terminal is crimped correctly and there is no damage, deform or dirt present.
- ② Hold the wire to insert the terminal as shown in Fig.25.
- ③ Insert the terminal into the corresponding corehole of the housing, as deeply as possible, in the orientation as shown in Fig. 25.
- ④ Once the terminal is inserted, ensure that the terminal retention is fastened by pulling the wire lightly towards you.



**Fig 25.Terminal insertion direction**

#### Notes:

- ① Terminals must be inserted in the orientation instructed. Forcibly inserting terminals in any other orientation may result in damage or deformation. Furthermore, if the terminals are inserted with incorrect orientation, terminal key prevents insertion into coreholes. (see Fig.26)
- ② Once the terminal is inserted, do not apply excessive pulling force to the wire.

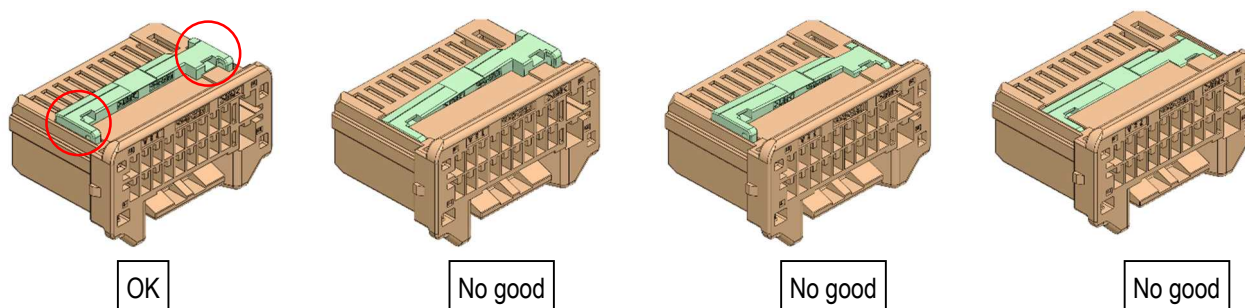


**Fig26.Incorrect terminal insertion**

## 5. Retainer installation

- ① Make sure that both ends of the retainer protrude from bottom of the female housing surface before inserting the female terminal into the female housing.

If one end or both ends of retainer are engaged with the female housing, pay attention not to deform the female housing, and release the retainer by the method in 6(sheet 16).



**Fig.27. Checkpoint before engaging retainer and the female housing.**

- ② Push the retainer perpendicularly to the female housing in order of [1]⇒[2] in Fig.28 after terminal insertion is complete.

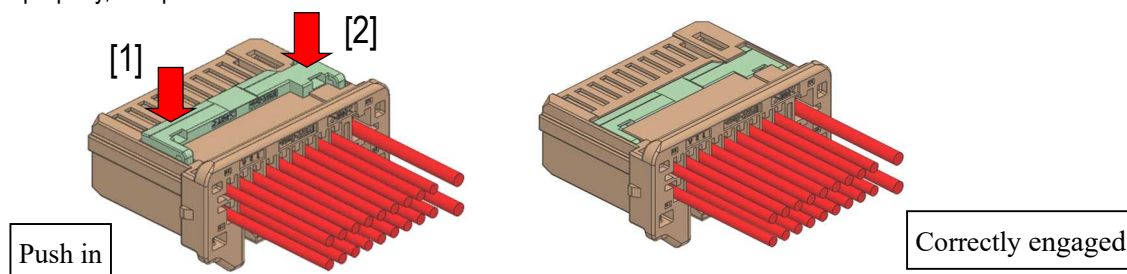
(It is possible to insert it in the female housing at about 20N.)

You will hear audible click when the retainer is engaged properly.

- ③ Check that the retainer is pushed in completely, i.e. aligned with the bottom surface of the housing.

When the retainer cannot be pushed in completely, do not push forcefully. Check that the terminals are inserted correctly and sufficiently, and repeat the insertion procedure in 4(sheet 13).

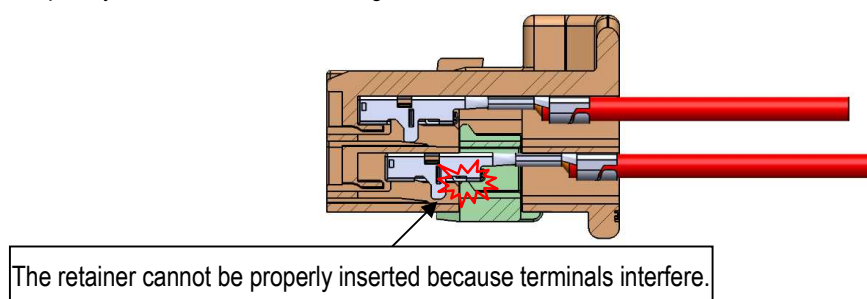
Insert all the terminals properly, and push the retainer until audible click is heard.



**Fig 28.Installation of Retainer**

- ③ When terminals are insufficiently inserted as shown in Fig.29, the retainer cannot be installed.

Insert the terminals completely, and install the retainer again.



The retainer cannot be properly inserted because terminals interfere.

**Fig29.Insufficient retainer installation**

## Notes

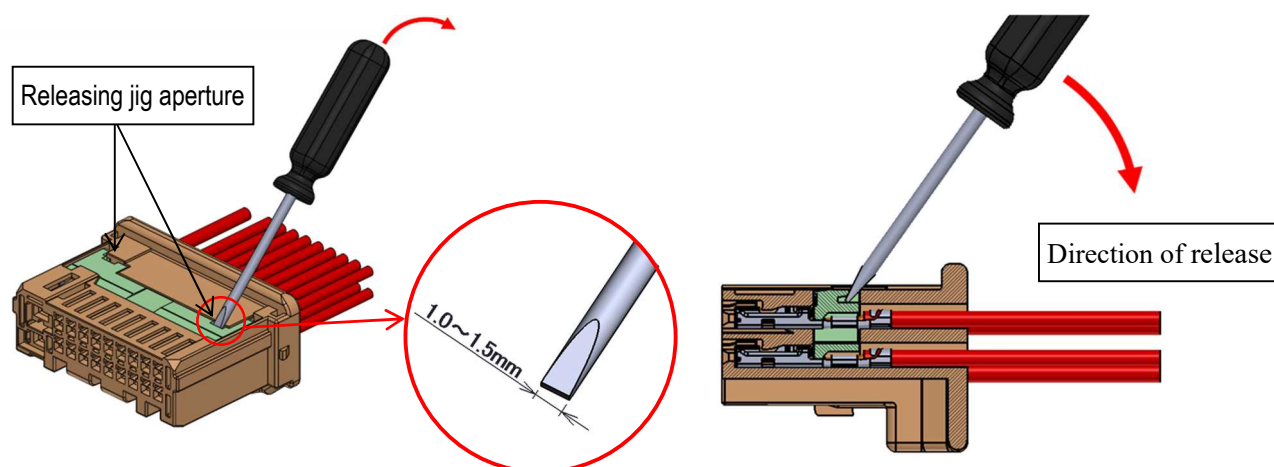
- ① If there is any damage or deformation, do not use the damaged item.

Replace the item with a new one.



## 6. How to release the retainer

- ① Insert a screwdriver with a width of 1.0mm to 1.5mm into the releasing jig aperture (2 places) in the bottom surface of the female housing, and push out the retainer. (see Fig.30).



**Fig 30. How to release the retainer**

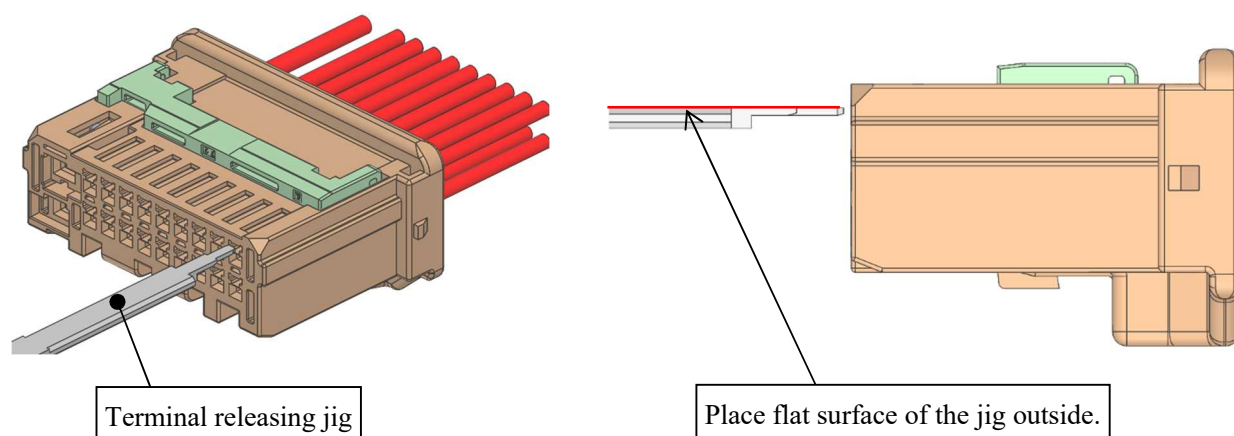
## Notes

- ① Do not use the screwdriver for any other part of the housing other than the releasing apertures. Doing so may cause damage or reduced performance.
- ② Completed at the position where the releasing apertures comes out from the bottom surface of the female housing. Therefore must not release the retainer anymore. It may cause damage or deformation of the female housing.
- ③ Check for any deformation or damage on both of the retainer and the female housing after releasing the retainer, before continuing any operation.
- ④ If there is any damage or deformation, do not use it. Replace the item with a new one.
- ⑤ Only use the specified screwdriver for releasing the retainer.
- ⑥ Do not use screwdriver with damage or deformation.

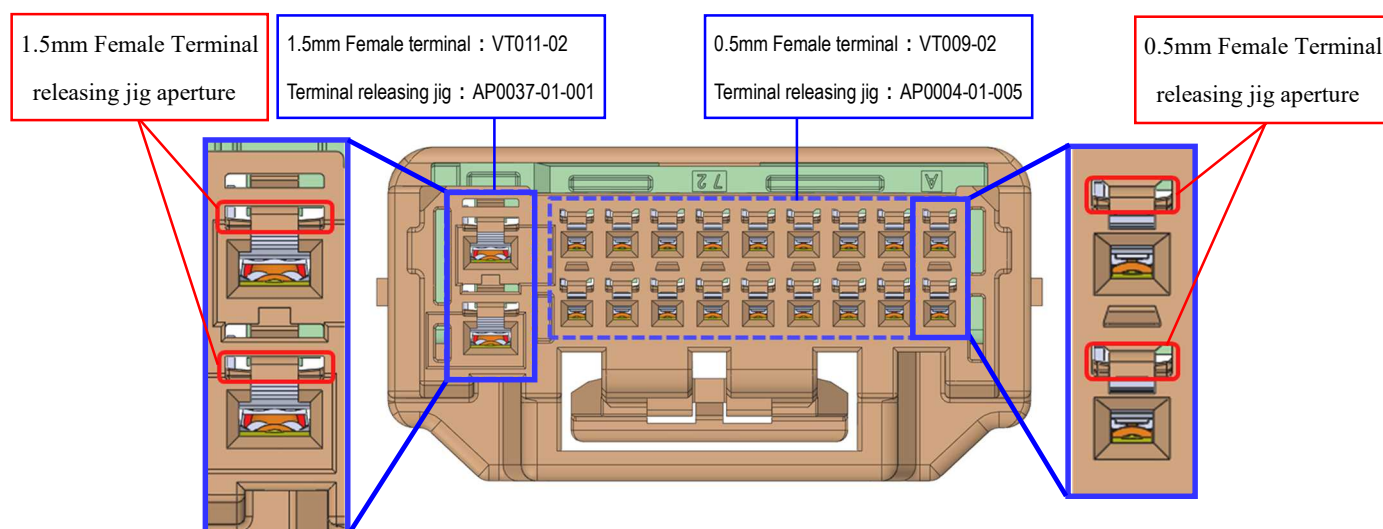
## 7. How to release female terminals

(※ Use the exclusive jig, or a jig of which tip shape dimension is corresponded to Fig33.)

- ① Ensure that the rear holder and the retainer have been removed.
- ② Hold the wire and push in the female terminal lightly. Place the female terminal releasing jig into the releasing apertures of the female housing (see Figs. 31 and 32).
- ③ Push the releasing jig fully into the lance, then lever up the lance as shown in Fig.34 and 35 .  
Keep the jig in the place and pull the terminal out by holding the wire.
- ④ If there is any difficulty in pulling out the terminal, do not pull it forcefully. Check that the jig is in the correct place, that it is pushed fully in, etc. and repeat the procedures ① to ③.



**Fig31. Housing and Direction of release**

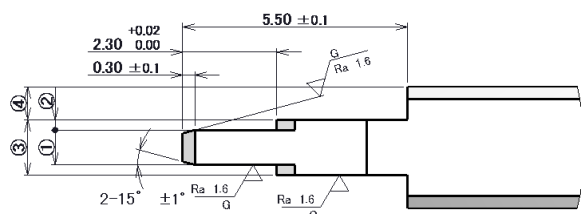
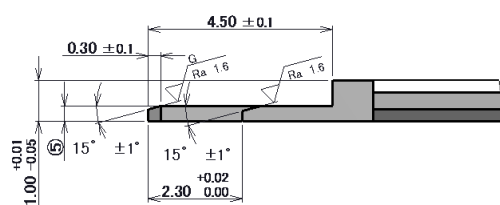
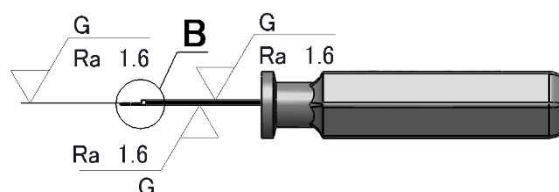
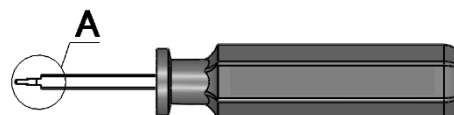


**Fig 32. Releasing apertures location**

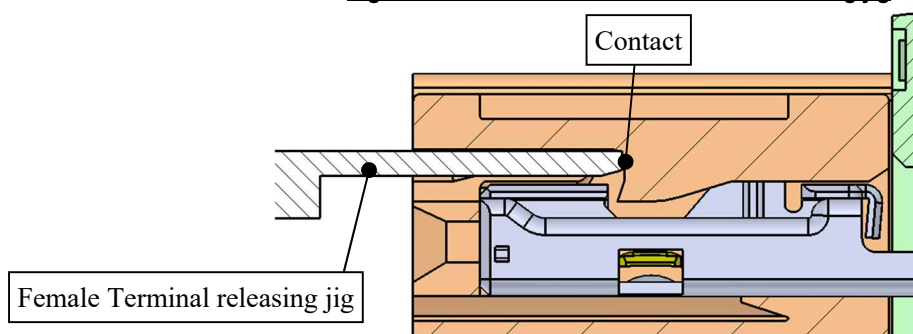
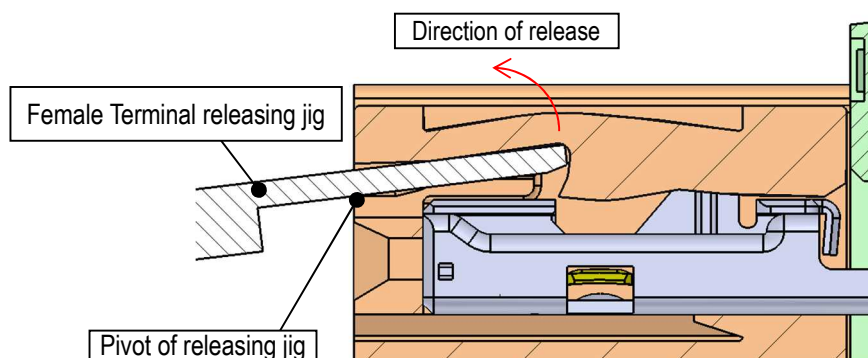


**Table4.Female Terminal releasing jig Part No**

Terminal Tab Size	Female Terminal Part No.	Terminal releasing jig Part No.
0.5mm	VT009-02	AP0004-01-005
1.5mm	VT011-02	AP0037-01-001

**DETAIL A****DETAIL B**

Terminal Tab Size	Female Terminal Part No.	Terminal releasing jig Part No.	Dimensions				
			①	②	③	④	⑤
0.5mm	VT009-02	AP0004-01-005	0.85 <sup>+0.02</sup> <sub>-0.04</sub> mm	0.25 <sup>+0.02</sup> <sub>0.00</sub> mm	1.35 <sup>0.00</sup> <sub>-0.02</sub> mm	0.80±0.1mm	0.37 <sup>0.00</sup> <sub>-0.02</sub> mm
1.5mm	VT011-02	AP0037-01-001	1.15 <sup>+0.02</sup> <sub>-0.04</sub> mm	0.63 <sup>+0.02</sup> <sub>0.00</sub> mm	2.40 <sup>0.00</sup> <sub>-0.02</sub> mm	0.30±0.1mm	0.49 <sup>0.00</sup> <sub>-0.02</sub> mm

**Fig33. Dimensions : Female Terminal releasing jig****Fig34. Correct orientation of the releasing jig and the housing lance****Fig35. Female Terminal releasing jig in operation**

## Notes

- ① Do not pry with the releasing jig or female terminals during operation. Check for any deformation or damage on the female terminals and the housing after releasing the female terminals. (see Fig.36)
- ② Do not continue applying force once the lance has reached the ceiling, or the ceiling will be deformed or releasing jig may be damaged by excessive force. Take sufficient care when handling. (see Fig.37)
- ③ If there is any damage or deformation on the terminal or the housing, do not use the damaged item.

Replace the item with a new one.

- ④ Only use the terminal releasing jig specified.
- ⑤ Do not insert the releasing jig into the cavities (see Fig.38)

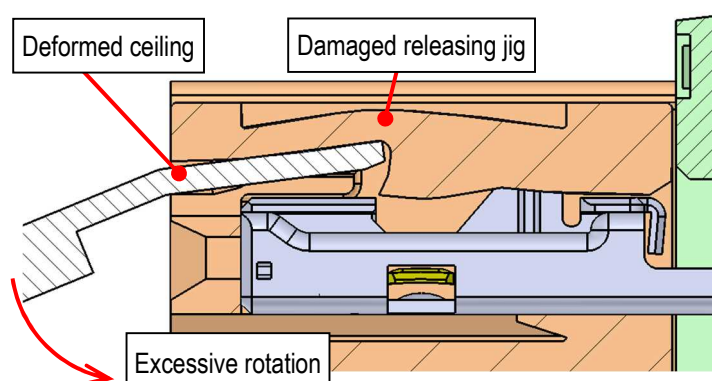
If the releasing jig is inserted into the cavities by mistake, the terminal may be damaged.

Replace the terminal with a new terminal.

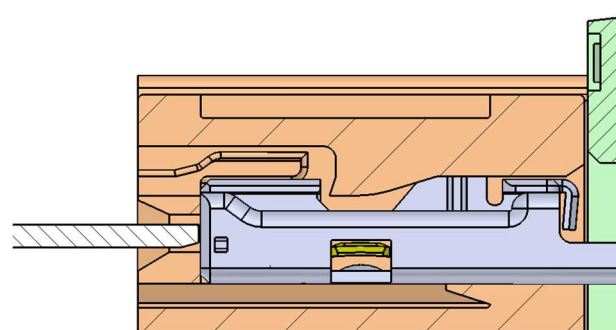
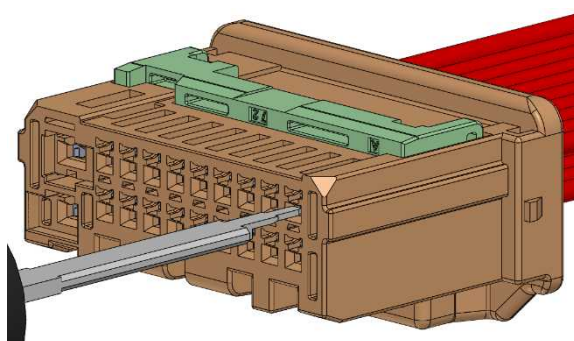
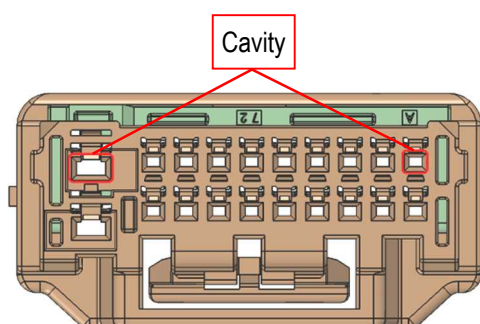
- ⑥ Care must be taken not to damage edge of the jig (e.g. from dropping, etc.)
- ⑦ Use appropriate jig to release terminal from the female housing. (see Fig.32)



**Fig36.Damage caused by releasing jig**



**Fig37.Deformed ceiling, Damaged releasing jig**



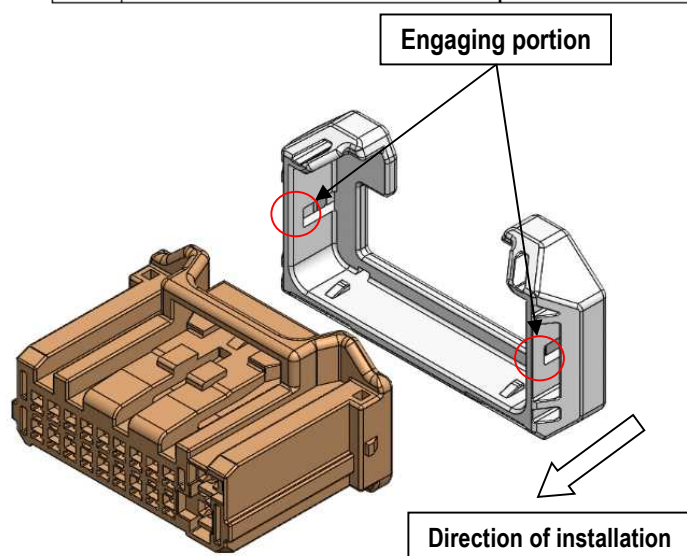
**Fig 38. Incorrect insertion of the releasing jig**

## 8. Rear cover installation (Rear cover : Individual part)

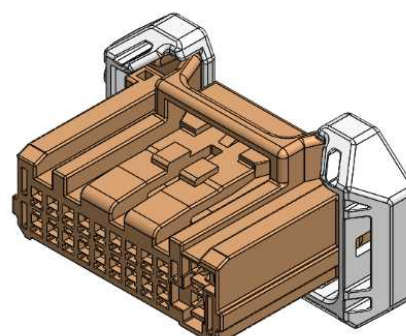
- ① Verify that pin numbers of the female housing and the rear cover are the same and also the female housing corresponds to rear cover. In addition, check that there is no damage, deform or dirt present.
  - ※ There are two lock portions at right and left side respectively.
- ② Check the directions of the female housing and the rear cover are correct.
- ③ Push the rear cover to female housing horizontally until the rear cover makes an audible click.
  - ※ It is possible to install at 55N MAX.
  - ※ It is possible to install the rear cover to the female housing which is either inserted or not inserted the terminals. When handling the terminal inserted female housing, it should be careful not to catch the wire between the female housing and the rear cover.
- ④ Cannot remove the rear cover after installed one time.
  - ※ Forcibly remove the female housing and the rear cover, it may result in damage.
  - ※ Do not reuse the forcibly removed female housing and rear cover.

**Table 5. REAR COVER & FEMALE HOUSING**

No. of Poles	NAME	FEMALE CONNECTOR PART NO.	REAR COVER PART NO.
20	ISH CONNECTOR HYBRID 20P	V0124-020B-01 V0124-020B-11	V0124-94020-01



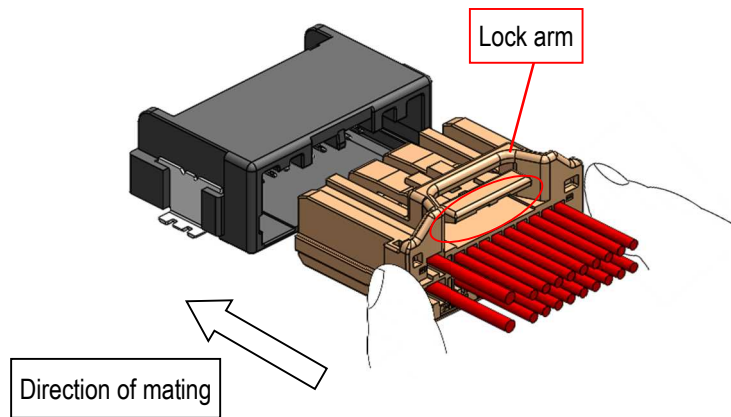
**Fig 39.Direction of installation**



**Fig 40. Installation of Rear cover**

## 9. Mating of connector

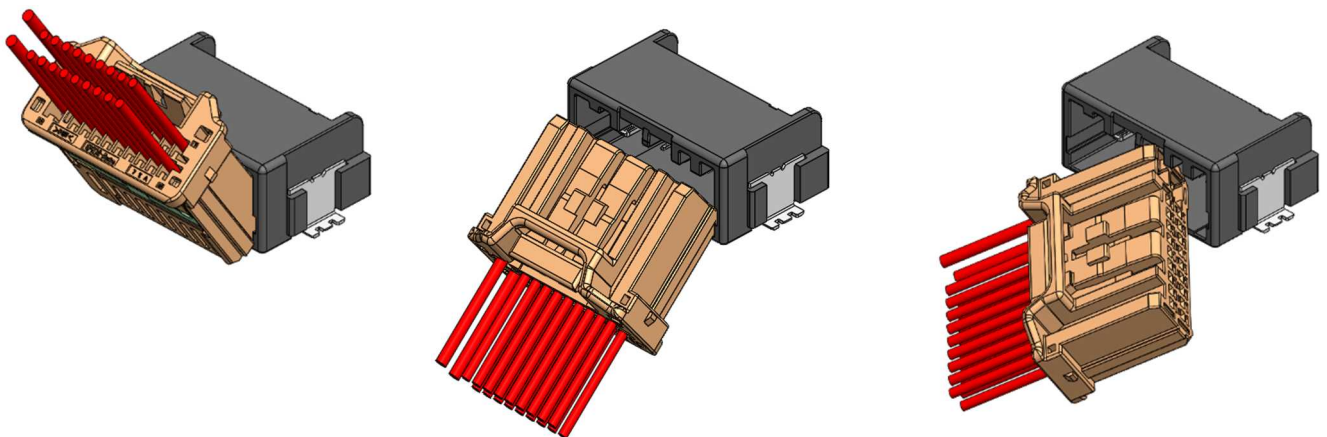
- ① Push the female connector that has been installed the retainer in the direction of mating until makes an audible click (see Fig. 41). While mating the female connector, please do not touch the lock arm to prevent insufficient mating.
- ② After that, pull the female connector lightly to check that the female connector is locked.



**Fig 41. Direction of mating**

### Notes

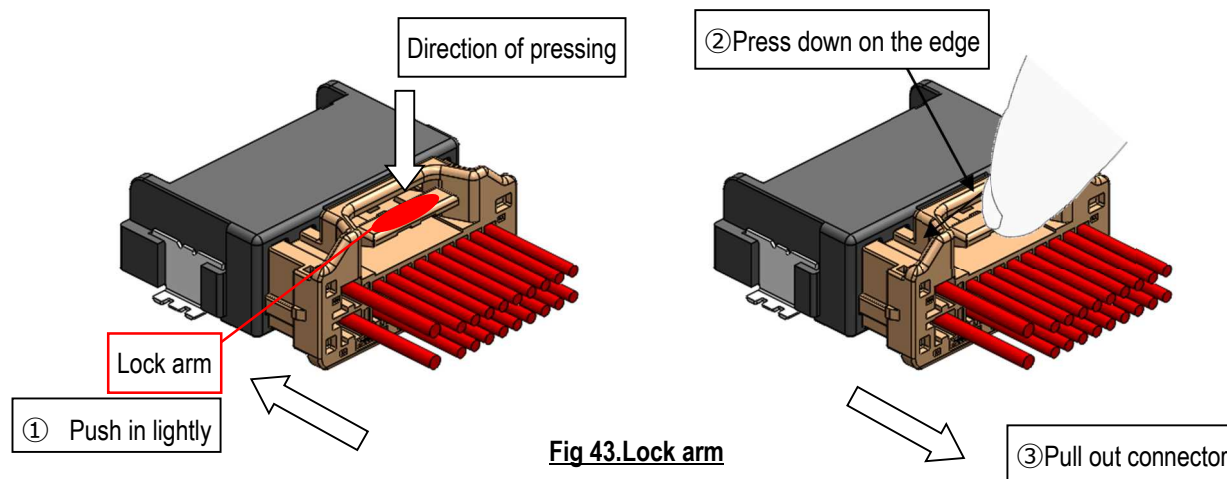
- ① Only mate the connector in the direction instructed above. Do not forcefully mate in any orientation shown in Fig.40. Doing so may cause damage or deformation to connectors.
- ② If there is any damage or deformation, do not use the damaged item. Replace the item with a new one.



**Fig 42. Mating orientations (not advisable)**

## 10. Unmating of connector

- ① Hold the female connector and push it in lightly.
- ② While holding the female connector in, press down fully on the end of the arm (see Fig. 43).
- ③ Keep pressing the lock down, and pull out the female connector.



### Notes

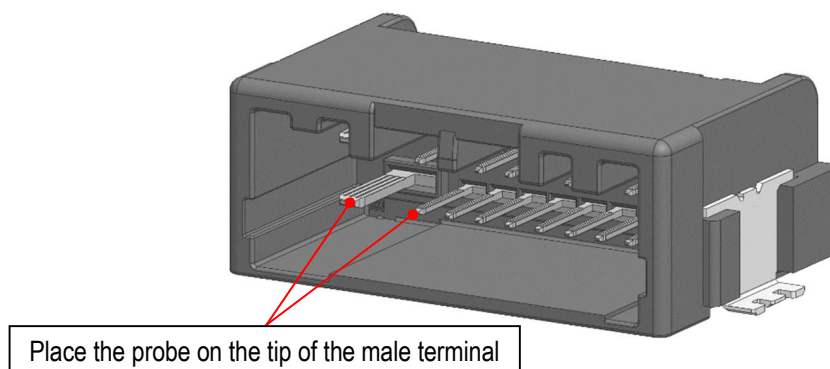
- ① Do not pull out the female connector without the lock arm fully pressed down.  
It may cause damage or deformation to the connector.
- ② Hold and pull the female connector (not the wires), when disengaging the female connectors.
- ③ If there is any damage or deformation, do not use the damaged item.  
Replace the item with a new one.

## 11. Handling of Product

### 11-1. Conductivity test

#### 11-1-1. Male Connector

- ① When carrying out conductivity test of the male connector, place the probe on the tip of the male terminal.  
(Load: 0.5N MAX.)  
If load exceeds 0.5N, male terminal may be damaged or deformed. (see Fig. 44)
- ② If there is any damage or deformation, do not use the damaged item.  
Replace the item with a new one.



**Fig 44. Conductivity test for male terminals (contacts)**



## 11-1-2.Female Connector

① Do not recommend to perform a conductivity test using the mated male connector.

If the same male connector is used for conductivity test, the connectors are repeatedly mated and unmated, and the male terminal could be bent. These may cause of the female terminal spring deformation, or the contact failure caused by adhesion the particles of friction according to excessive insertion and removal actions.

② To test electrical conductivity of female connector, place a probe pin at prescribed point (0.5N MAX.) on outside of the female terminal.(see Fig.44)

③ Do not insert a probe pin into female terminal box, as this may damage the female terminal spring.

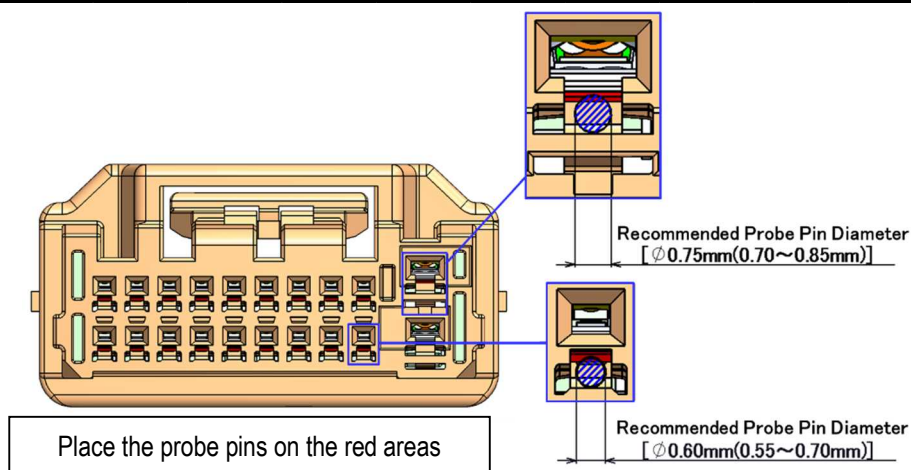
Do not use female terminal, if the probe pin has been inserted. Replace the female terminal.

④ Probe pin must be bigger than the gap between female housing and female terminal.(see Table 6)

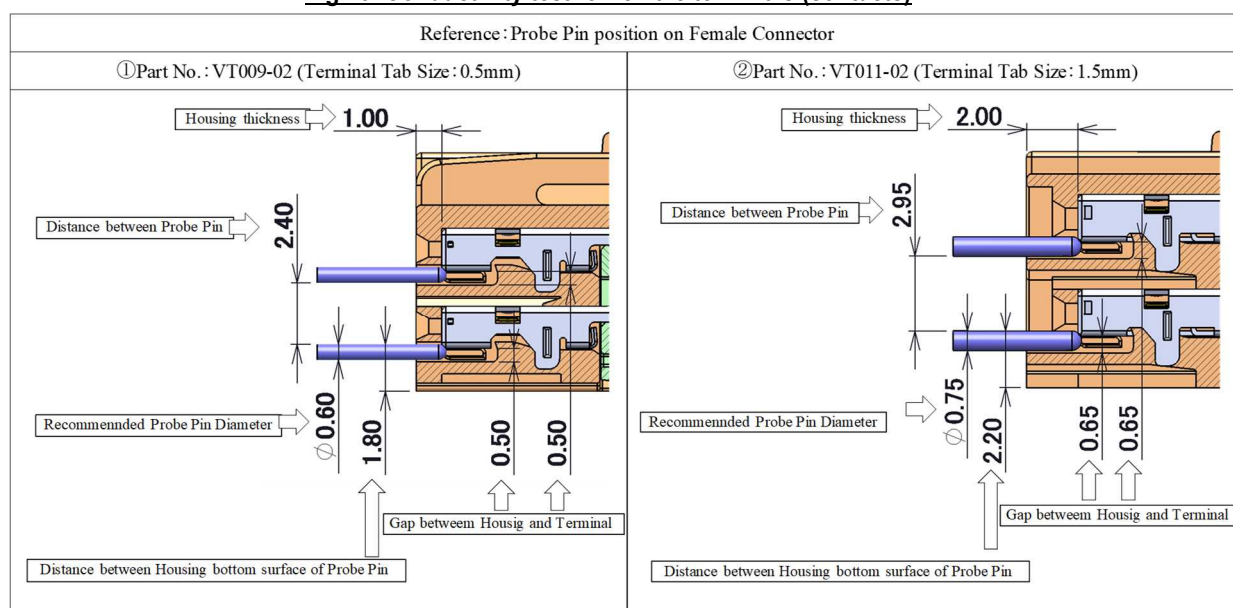
⑤ Once tested, check there is no deformation (e.g. collapse, etc.) of female housing.

**Table 6.Recommended Probe Diameter.**

Terminal Tab Size	Female Terminal Part No.	Gap between Housing and Terminal	Recommended Probe Pin Diameter
0.5mm	VT009-02	0.50mm	Φ0.60mm (0.55~0.70mm)
1.5mm	VT011-02	0.65mm	Φ0.75mm (0.70~0.85mm)



**Fig 45. Conductivity test for female terminals (contacts)**



## 11-2. Arrangement of Wires

- ① When arranging the wires horizontally, to avoid excessive stress to the sidewalls and female terminals, and the female terminal leaning in the core hole, please keep the wires straight (at least 15mm) from connector as shown in Fig46.
- ② Once straight portion is secured, arrange the wires with adequately large R.

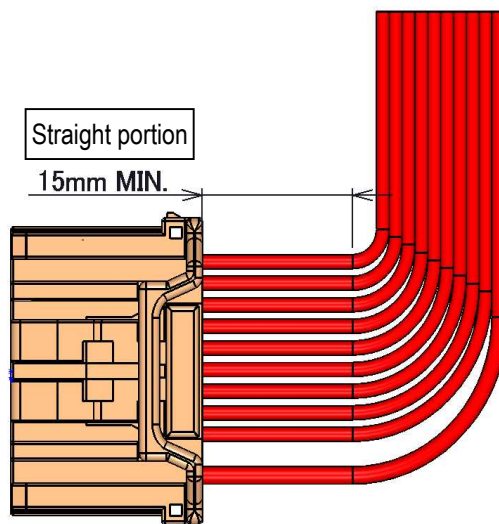


Fig 46. Arrangement of wires

## 12.Storage of housings and terminals

- ① Store housings and terminals in a warehouse which is controlled temperature and humidity.  
(Recommend : Temperature 27°C MAX. , Humidity 65% MAX.)
- ② Store housings in a cardboard box. Avoid storing in a way that may cause damage to the boxes, e.g. placing boxes on top of other boxes or storing in a precarious way to cause the boxes to fall.  
Housing may be deformed if the boxes have been damaged.
- ③ Store terminals in a cardboard box. Avoid storing in a way that may cause damage to the boxes, e.g. placing boxes on top of other boxes or storing in a precarious way to cause the boxes to fall.  
Reel(s) or terminal(s) may be deformed if the boxes have been damaged.

## 13.Jigs

- ① Use the terminal releasing jig specialized for releasing terminals.
- ② Table 7 shows the name of the releasing jig and their part number
- ③ To purchase any of the jigs, please contact the Sales Dept. of our company at the following in 15(sheet 24).

Table 7.Terminal releasing jig &amp; Part No.

Jig Name	Procedures	Female Housing Part No.	Female Terminal Part No.	Jig Part No.	Procedures detailed on
Female Terminal releasing jig	Releasing Terminal	V0124-020B-01 V0124-020B-11	VT009-02 (0.5mm Female Terminal)	AP0004-01-005	sheet 15~17
			VT011-02 (1.5mm Female Terminal)	AP0037-01-001	
		V0124-028B-02	VT009-02 (0.5mm Female Terminal)	AP0004-01-005	
			VT011-02 (1.5mm Female Terminal)	AP0037-01-001	

## 14. Other notes

- ① Handle products with care. Do not place excessive force/impact to connectors main bodies or wires.
- ② Store products in a dry place without any dust or dirt.  
Avoid storage for an extended period or any way that may cause damage or deformation to connectors.
- ③ While transporting of products should ensure that no excessive force must be applied to the connectors and wires, and that no rain water, dust and dirt, etc. are present.
- ④ Handle products with care. If there is any damage, deformation, discoloration, etc. to wires, housings, and any other parts, do not use the damaged item. Replace the item with a new one.
- ⑤ Do not touch the contact part of the connector with fingers or with any object.
- ⑥ Do not apply excessive current. Doing so may cause fire and melting damage.
- ⑦ Do not disassemble products.
- ⑧ Do not insert any terminals into housing other than those specified.
- ⑨ Follow this Manual for using the products. Do not use in any way other than instructed.

## 15. Contact

Yokohama Office Sales Dept.

I-PEX Inc.

TEL: +81-45-472-7111 FAX: +81-45-472-7130