Amphenol Industrial

AI-24-2

CONNECTOR INSTALLATION INSTRUCTIONS

PV Connector H4 PRO Series

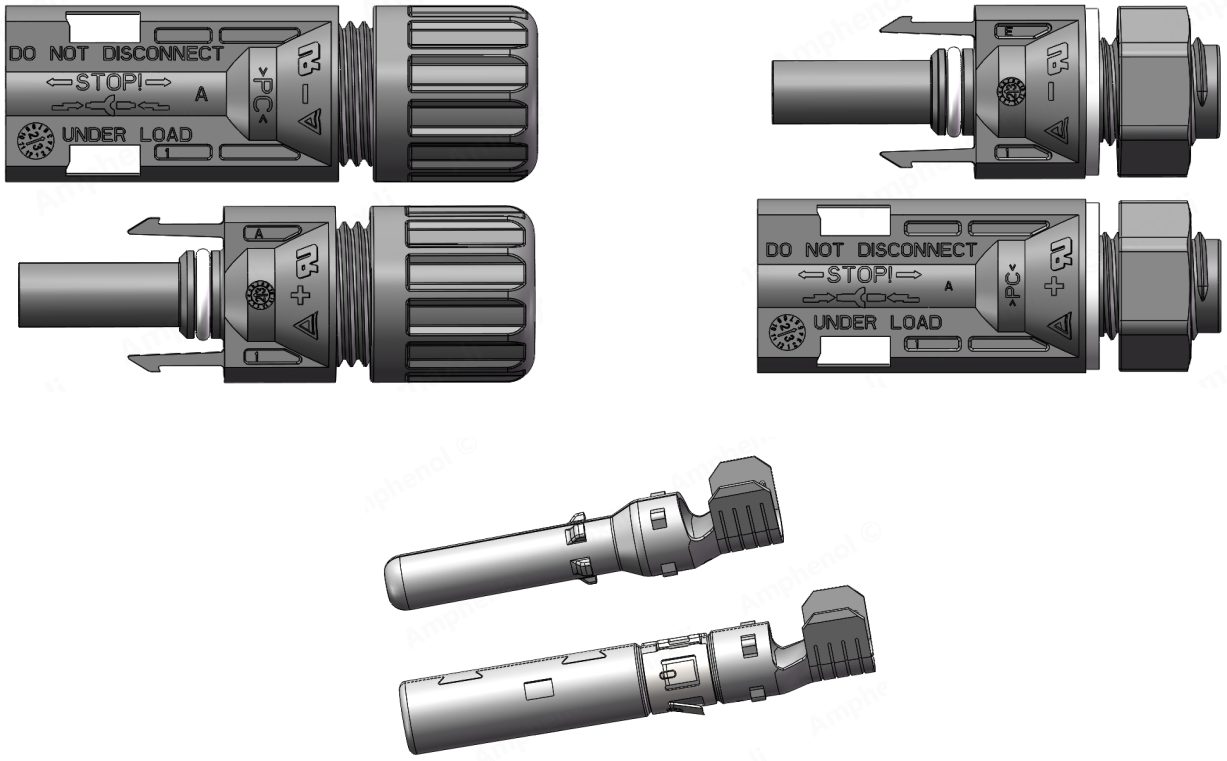


Table of Contents

Part 1: Safety & Caution

1. The connector must be isolated and disconnected from the power supply during the assembly or disassembly process.
2. Do not disconnect under load.
3. The mated Amphenol PV connectors, when assembled according to the specified instructions, are IP68 (under water 1meter for 24 hour) compliant in the function of sealing. However please prevent connectors from being immersed in water.
4. The connector complies with UL 6703 only when assembled according to the specified instructions.
5. Amphenol disclaims any liability in the event of failure to comply with this assembly instruction.
6. Non-Amphenol connectors, including those labeled as “Amphenol-compatible,” cannot be safely mated Amphenol elements. Amphenol connectors must only be mated with Amphenol components. Amphenol is not liable for any damage caused by mating unapproved connectors with Amphenol elements.
7. Third-party laboratory test results serve as a reference only. Customers are responsible for validating connector durability under specific system conditions, including extreme environments. Customers should always incorporate a safety margin in all applications, as overheating may occur.
8. Avoid exposing connectors to chemical substances. The chemical compatibility of thermoplastics, such as Lexan polycarbonate, depends on contact time, temperature, concentration, and external stress. Chemical exposure may cause discoloration, softening, swelling, cracking, or loss of material properties. Do not allow connectors to come into contact with chemicals, including but not limited to: Grease, Oils, Mold Release Agent, Binder, Alcohols, Fatty hydrocarbons, Acid, Aromatic hydrocarbon, Ketones, Halogenated hydrocarbon, Organic solvents (including Gasoline, Kerosene, Ethyl acetate and others), Cleaning agents. For more information, refer to Appendix A (Chemical Exposure Checklist - WI-S047-ENG). The list is not exhaustive, and customers must assess chemical exposure risks in their specific system conditions and use environments. Amphenol does not accept returns for products contaminated with chemicals.
9. Avoid placing split loom over connectors or zip ties directly in contact with connectors (including connector housings)
10. Avoid stacking or bundling multiple connectors together.

Part 2: Technical Data

Rated Voltage	1500V DC	
Rated Current	TUV (IEC 62852)	25A @85°C; (2.5mm²)
		41A @85°C; (4.0 mm²)
		45A @85°C; (6.0mm²)
	UL (UL6703)	15A (14AWG)
	UL (UL6703)	35A (12AWG)
		35A (10AWG)
Protection Degree:	IP68 mated (1m@24H) and IP2X unmated	
Safety Class:	II	
Operation Temperature Range:	-40°C to +85°C	
License Holder:	Amphenol Industrial Operations	
Full Address:	20 Valley Street Endicott, New York 13760	

Part 3: Connector and Tool Selection

3.1: Connector Part Number Code Logic

H4 X X X X X X X

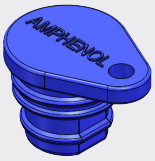
Product	Type	Gender		Connector Type		Terminals - Cable Size		Certifications		Packaging		Contact	
H4	V	F	Female +	C	Cable Connector	0	Less Contacts	T	TUV	M	500pcs/bag 1000pcs/box	S	Stamped
		M	Male -	M	Bulkhead M12	2	2.5mm²/14AW-G(S&F)	D	TUV & UL			Blank	Without Contact
				D	Manual Unlock Cable Connector	4	4mm²/12AWG(S&F)						
				B	Manual Unlock Bulkhead M12	6	6mm²/10AW-G(S&F)						

3.2: S&F Contact Part Number Code Logic (Reel Type Only)

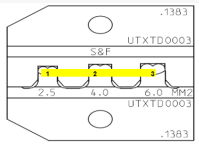
H4 X X X X

Product	Type		Gender		Terminals - Cable Size		Packaging	
H4	S	Stamped & Formed Contact (Socket)	F	Female +	2	2.5mm2/14AWG	R	2000PCS/reel
	F	Stamped & Formed Contact (Pin)	M	Male -	4	4mm²/12AWG&6mm²/10AWG		

3.3: Tools List

(2.5/4.0/6.0mm²) Strip tool for 2.5/4/6mm² PV cable	H4TS0000	
Wrench tool for H4 PRO	H4TW0008	
Open-end back cap spanner for H4 Pro	H4TW200	
Contact depth inspection tool for 2.5/4/6mm²	H4TT0001	
Protection cap for female connector	H4SPF	
Protection cap for male connector	H4SPM	

Crimping Tool

Tool	Part Number
Crimping Die	UTXTD0003 
Locator	H4TP0002 
Crimper	H4TC0003 

Crimp Tool Kit

H4STC0001

Part 4: Assembly Process of Terminal and Cable

4.1: Applicable Cable Selection

4.1.1 Only suitable for the PV cable with cooper conductor. Tin coated wire of conductors is recommended.

4.1.2 The cable OD range from ø4.5mm to ø7.8m, the number of conductor strands is from 7 to 140 for 2.5/4.0/6.0mm² connector.

The cable OD range from ø7.5mm to ø8.8m, the number of conductor strands is from 7 to 140 for 2.5/4.0/6.0mm²connector.

The cable OD range from ø7.5mm to ø8.8m, the number of conductor strands is from 19 to 77 for 10mm²connector.

4.1.3 This connector is only suitable for cables with EN 50618, IEC62930, UL 4703 and USE-2 certification.

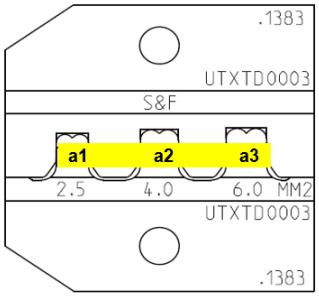
4.1.4 For use with others cable, do crimping and sealing performance verification first or contact Amphenol.

4.1.5 This connector is suitable for use only with Class B and C stranded copper conductors (See NFPA NEC 70 Chapter 9, Table 10)". If the connector is found to be suitable for use with other stranding classes, the connector shall be marked with those class conductors. See the Standard for Wire Connectors, UL 486A-486B.

4.2: Crimping Tool Selection

Please choose the crimping die based on the terminal and cross section area of cable conductor. Use of the wrong crimping die may lead to the connector overheating, and lower the reliability of the connector.

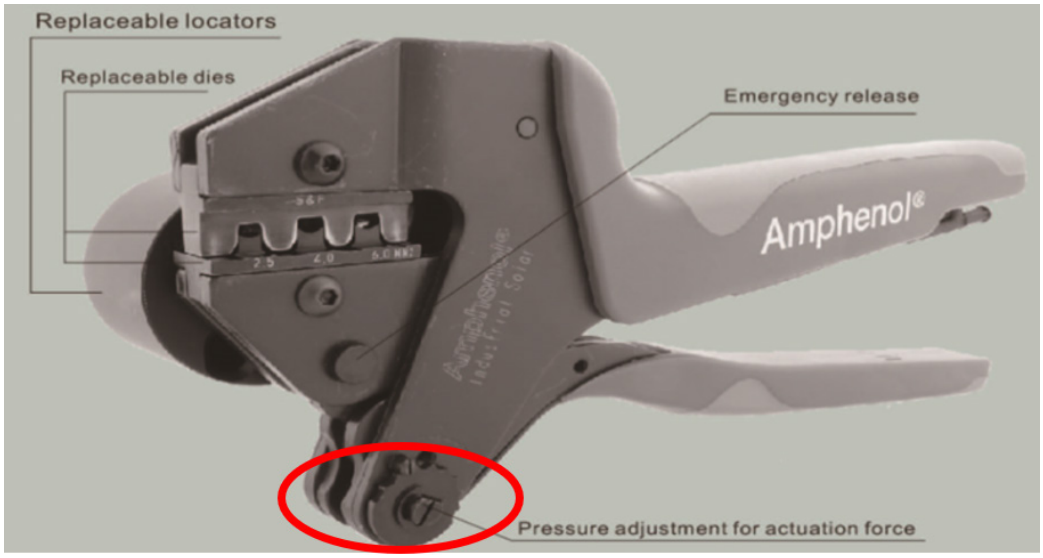
Crimping Die Layout



Stamping Contact Size	Cable Conductor IEC 60228 class 2,5,6		Crimp Die		Crimping		Pull force min (N)	Conductor Compression Ratio
	AWG	Cross section area (mm²)	Part number	Position	Height (mm)	Width (mm)		
S&F 2.5	14	2.08	UTXTD0003	a1	2.10	3.40	>223	70%~90%
S&F 4&6	12	3.31		a2	2.39	4.00	>312	
	10	5.26		a3	2.70	4.25	>356	

4.3: Adjust Crimping Tool

If needed, following below steps to adjust the pressure force to optimize crimping.



I. Loosen the screw (A) with a screwdriver.

II. Turn the dial counter (B) clockwise (+) to increase the crimping force. This also reduces the jaw spread.

III. Turn the dial clockwise (-) to reduce the strength of the crimping force. This also increases the jaw spread. Do exceed 180N.

IV. After changing the setting, make sure the screw is adequately tightened.

4.4: Crimping quality verification

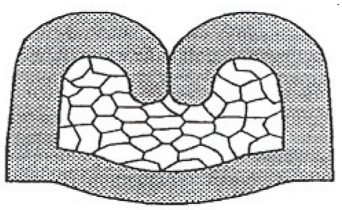
Great variations exist in the diameter, quantity and cross section of strands between PV cables made by different manufactures, so the above dimensions are only for reference. In order to get quality crimping, please verify the pull force and crimping cross section.

Pull force between the contact and cable should meet to UL486a-486b, refer to the table in section 4.2

The cross section inspection standard:

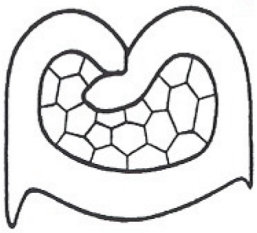
- The crimp shall have all cable strands compressed into a hexagonal shape with minimal voids.
- No cracks/fractures in crimp material or wire stranding
- Ensure symmetrical and uniform distribution of strands
- All strands are captured within crimp
- Crimp wings are fully closed at surface. Crimping wings are curled evenly and uniform
- The burr on the base of the crimp must not exceed 0.1mm, and will not scratch the sealing component in the next assembly process
- Crimping cross section criteria can be found in USCAR21as below

Conductor crimp attributes considered ideal



- Symmetric
- Compaction of all strands (no round strands)
- Wings touch only conductor
- Terminal stock free of cracks / breaks
- Core wings "Locked" (no gap) at top of crimp

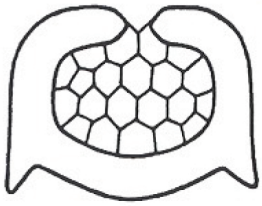
Conductor crimp attributes considered acceptable but not ideal



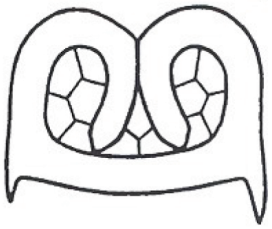
Overlapping wings

Extreme “ram-horning”

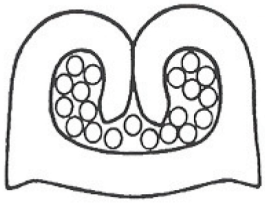
Conductor crimp attributes that are unacceptable*



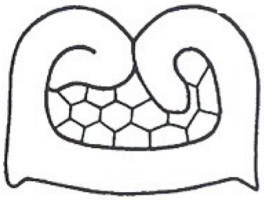
Open wings with core exposed or folded down into core but not touching (not locked)



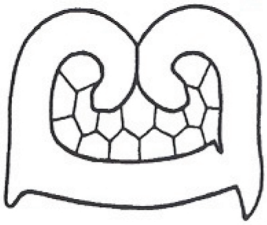
One or both wings penetrate (“crash”) to the terminal floor or wall



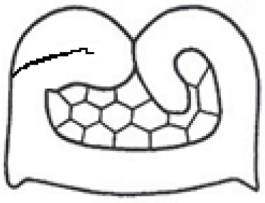
Low / No strand compaction. Round strands in core crimp are never acceptable



One or both wing details do not capture strands

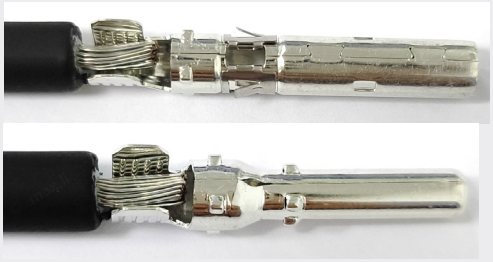
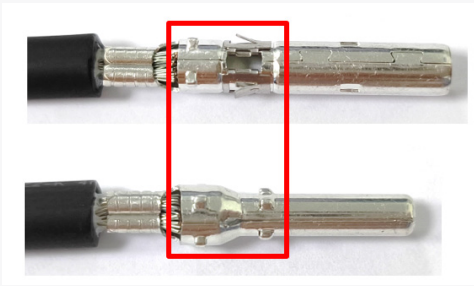


Terminal stock cracked / broken



One or both wings folded back

4.5: Crimping Operation

Process	Tools	Process Control
Stripping	H4TS0000	Striping Length 7.0±0.5mm, don't damage or cut the wire strands.  L=7±0.5mm
Insert the cable into the contact	N/A	• Put the contact at right crimping die and position. • Insert stripped cable into contact barrel and ensure all conductor strands are captured. 
Crimping	H4TC0003	• Close the hand shank of the tool until they open automatically. • Crimp to meet the requirements in section 4.4. • Regularly check crimping height, and adjust the crimping force to get the perfect crimping quality. • The location characteristic couldn't be damaged 

4.6: Crimping Tool Operation

1. Misuse may cause personal injury, keep crimper out of reach from children.
2. Do not insert fingers into the jaws of the tool.
3. Before using the crimper, clean the die to prevent oil or other chemical material from polluting the contact and connector.
4. Apply light oil to crimping die after using it (avoid blade and terminal contact with oil). Contacts must not be contaminated to oil and chemical.
5. Crimp tool and crimp dies are prone to wear, regularly check the quality of Crimping Height, pull out force. Tool and die wear can be compensated by removing the lock screw and turning the adjuster.

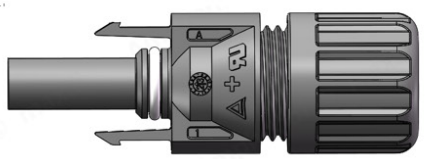
Part 5: Connector Assembly Process

5.1: Cable end assembly

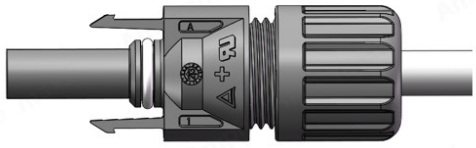
5.1.1: Insert the Crimped Contact into the Body

Insert terminal into back of male or female connector. A “click” should be heard or felt when the terminal is seated in the right position. Terminals cannot be removed once seated (Terminals are crimped per tool application 3.2 to 3.4) See below pictures 5.1.1 to pictures 5.1.4.

Female Connector

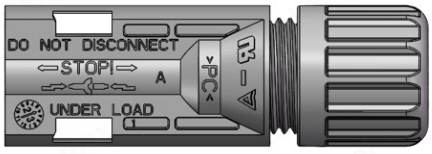


Picture 5.1.1

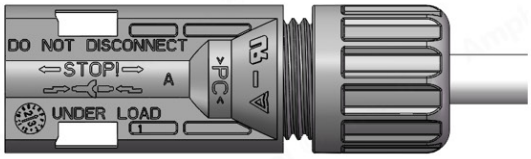


Picture 5.1.2

Male Connector



Picture 5.1.3



Picture 5.1.4

⚠ If the terminals are not inserted in the correct position, the connector itself will not be fully assembled, the contacts will not mate as intended, which will cause the connector to overheat and possibly cause a fire or safety risk.

Inspection

Use the contact depth inspection tool to check if the contact was in right position. The edge of connector housing should be located within the white area of the contact depth inspection tool.

Female Connector

Male Connector

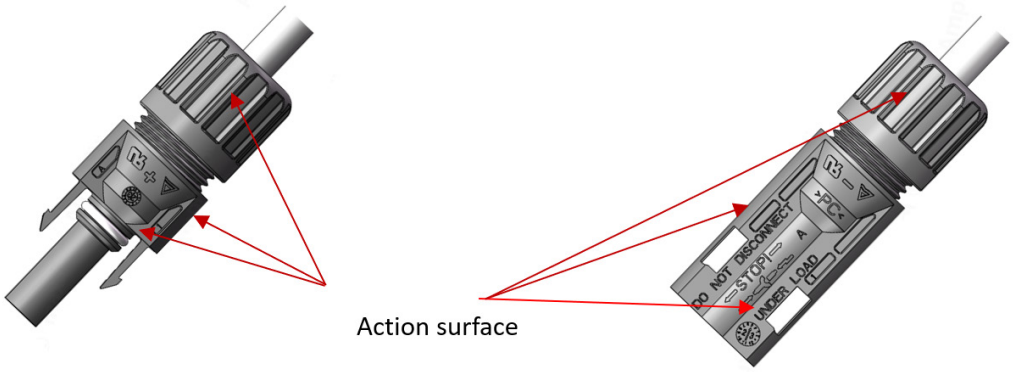
5.1.2: Tightening the Back Cap

H4 Pro connector back cap must be screwed up with a proper torque range of 2.6 to 2.9 N·m.

Over torquing may damage insulation on the cable, lead to a sealing failure and electrical leakage.

Under torquing may lead to a sealing failure, and compromise the reliability of the connector.

Action surface of connector, screw end cap and hold body of connector, as below picture 5.1.5.



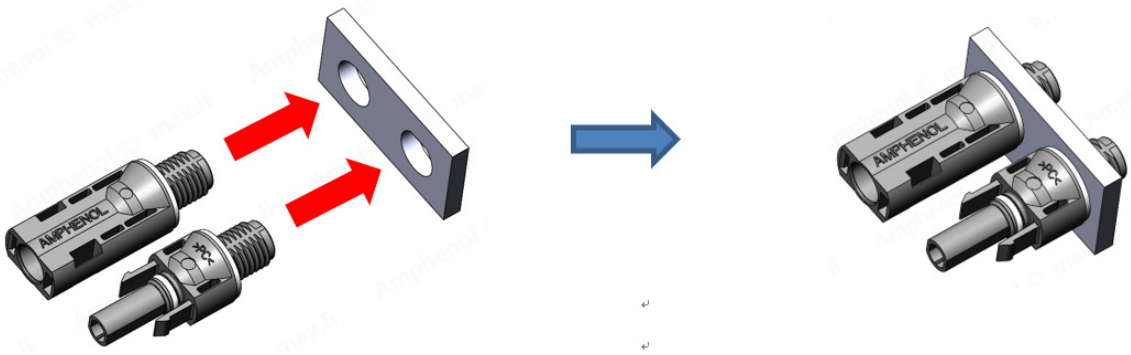
Picture 5.1.5

Amphenol specified wrench tool (H4TW0008) can be used in this step. Customer can choose to use open-end back cap spanner (Use H4TW200) if customer uses electric torque controlled wrench tool to tighten the cap.

5.2: Bulkhead End Assembly

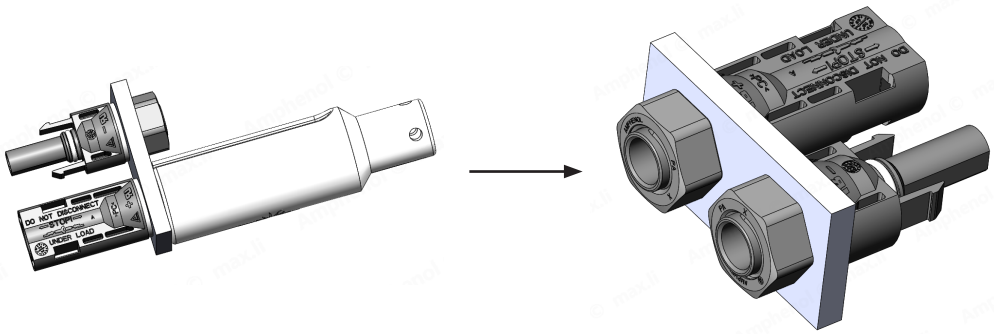
5.2.1: Connector Assembly

Mount the connectors to the panel of invertor or converter, see picture 5.2.1.



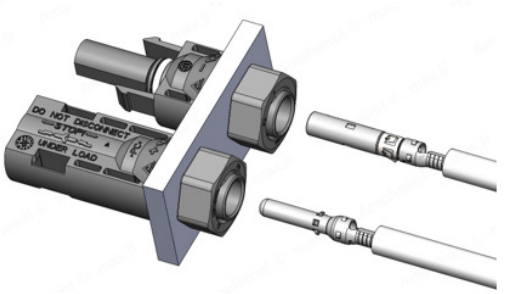
Picture 5.2.1

Use the wrench tool to tighten the nut to the panel, see picture 5.2.2. The nut must be screwed to a proper torque range of 1.1 to 1.4 N·m.

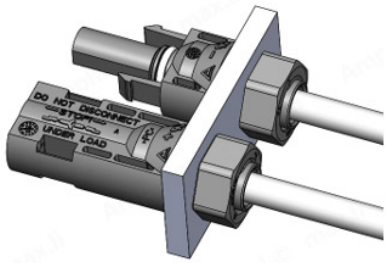


Picture 5.2.2

Insert terminal into back of male and female connector. A “click” should be heard or felt when the terminal is seated in right position. Terminals cannot be removed once seated.



Picture 5.2.3



Picture 5.2.4

⚠ If the terminals are not inserted in the correct position, the connector itself will not be fully assembled, the contacts will not mate as intended, which will cause the connector to overheat and possibly cause a fire or safety risk.

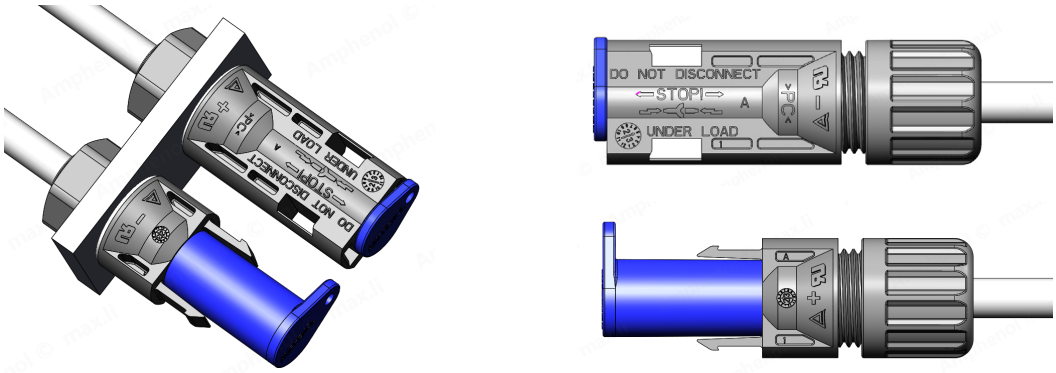
Inspection

Use the contact depth inspection tool to the check if the contact is in the right position. The edge of connector housing should be located within the white area of the contact depth inspection tool.

5.3: Protection before Mating

If the male and female connector is not inserted in a timely manner, measures should be taken to prevent dust, moisture, and other pollutants from the connector, that may result in terminal oxidation, or sealing failure.

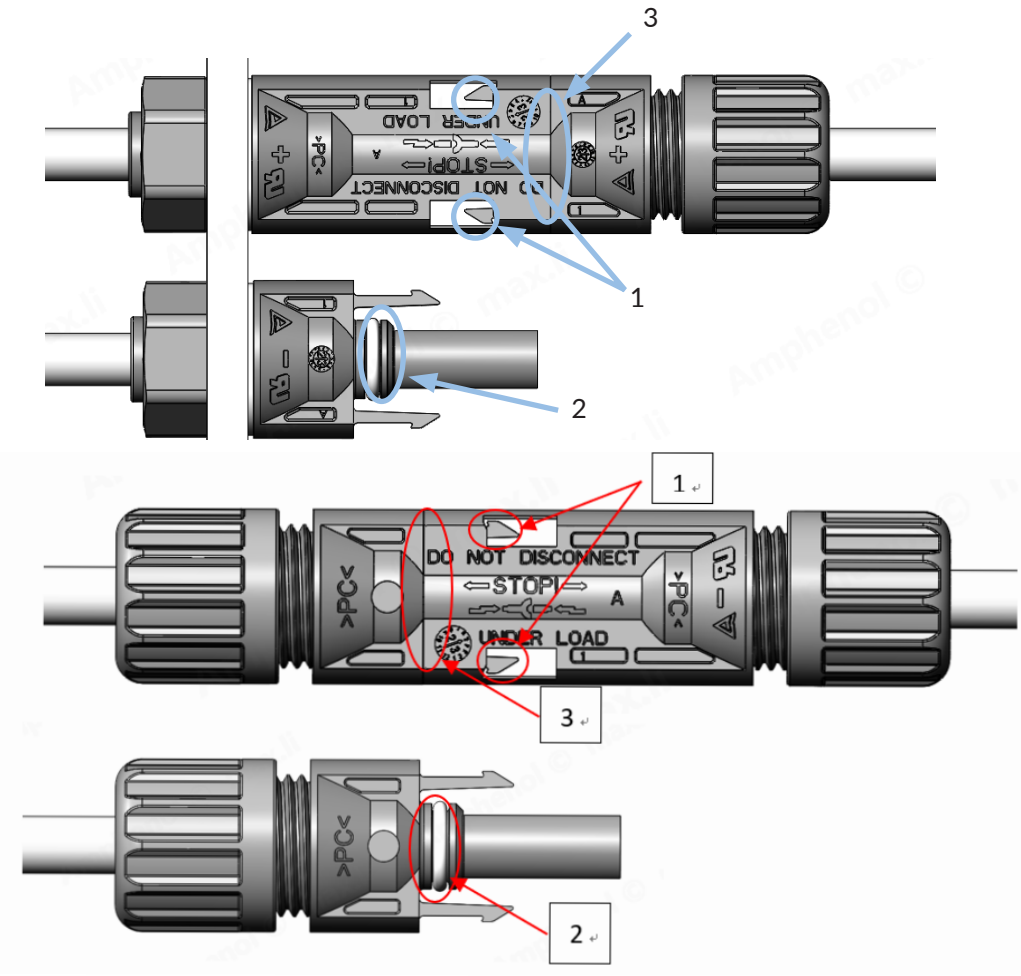
Dust caps are recommended (female end use H4SPF and male end use H4SPM) for protection.



5.4: Mating the male and female connectors

After mating the male and female connectors, check the below items to confirm the male and female connectors were mated correctly.

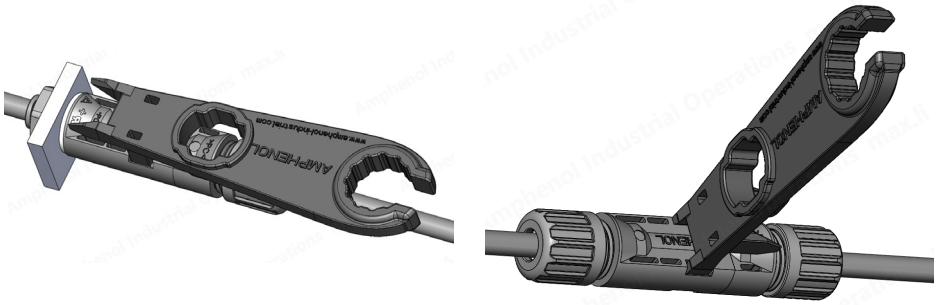
1. The latch is engaged as below.
2. O-ring pressed inside and is not visible.
3. There is very small gap between the interface of male and female (gap≤0.3mm).



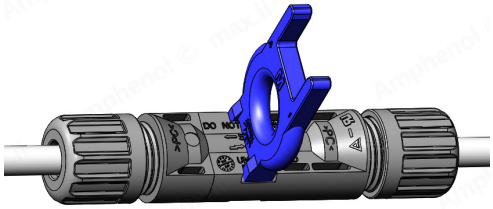
5.5: Unmating the male and female connectors

Use the specified tool to open the connectors. Don't pull directly or shake the connector back and forth wildly to open the connector.

Amphenol specified wrench tool (H4TW0008) or Universal tool (H4TU0000) should be used in this step for H4 PRO Series, see below picture.



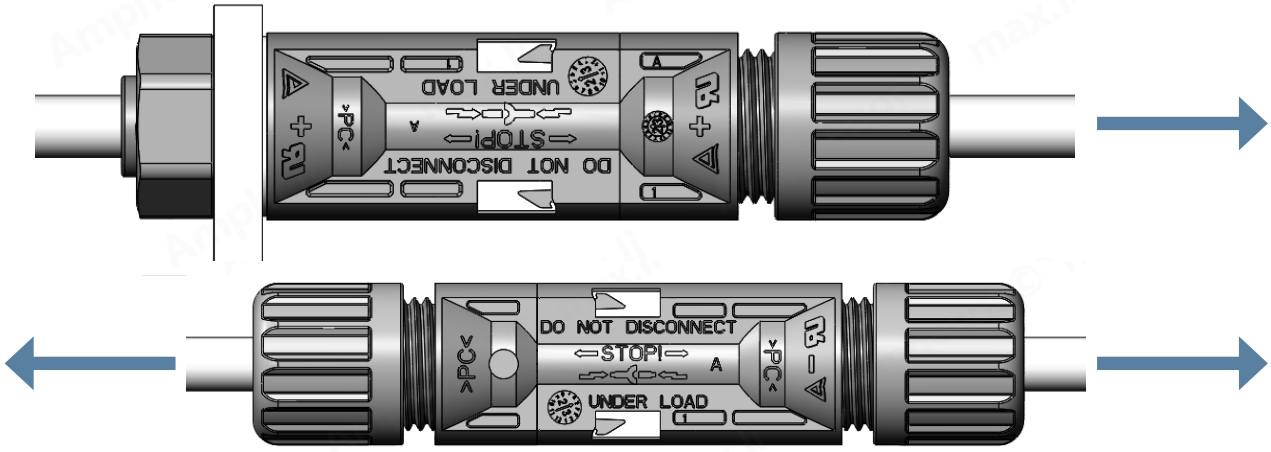
Wrench Tool Disconnect



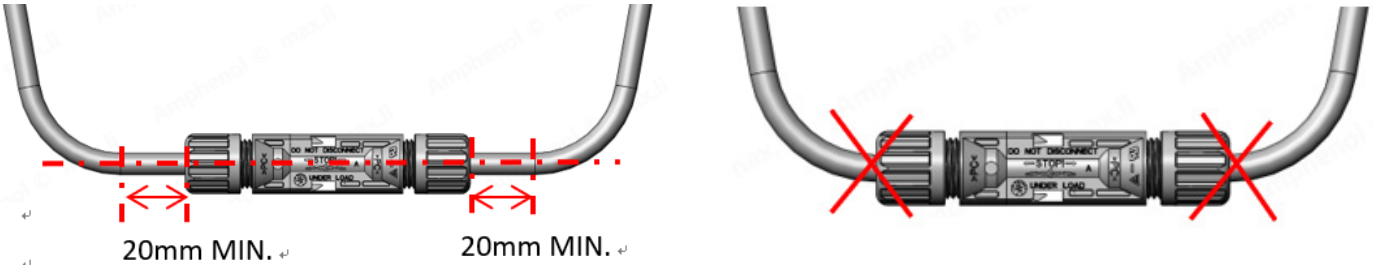
Universal Tool Disconnect

6: Cable Routing:

- The locking fixture of H4 series can withstand pull forces of 89N min along the axial.



- External stress on the cable should be avoided; excessive cable stress along the axial for extended amounts of time; added cable stress and torque should be prohibited, and may impact sealing and reliability of the connector.
- In order to avoid excessive cable stress to connector, the cable beside connector should be kept straight, straight cable length should be at least 20mm MIN.



- Refer to cable manufacturer's specification for minimum bending radius of cable.

7: Storage Requirement

We recommend that you store connector components at a temperature between-30℃to +60℃ and with a relative humidity of less than 70%. The components must not be exposed to moisture due to direct rainfall, condensation etc. Ensure that the individual components do not come into contact with acids, alkalis, gases, acetone or any other chemical substance that could impact the materials use. The connector can stored for two years if these conditions are met.

8: Revision Record

Rev	Description	Date	Name
A	First Release	Mar/18/2024	Max Li

(Prepared by) : _____ (Checked by) : _____

(Date) : Mar/18/2024 (Date) : _____

Amphenol Technology Shenzhen Ltd

Building C, 2nd Industrial Zone of Xia Shi Jia, Jiangshi Community, Gongming Sub-district, Guangming New District, Shenzhen, PRC CHINA

Tel: +86 755 2881 8389

Fax:+86 755 2991 83