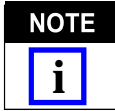




**HIGH-VOLTAGE - MORTAL DANGER**

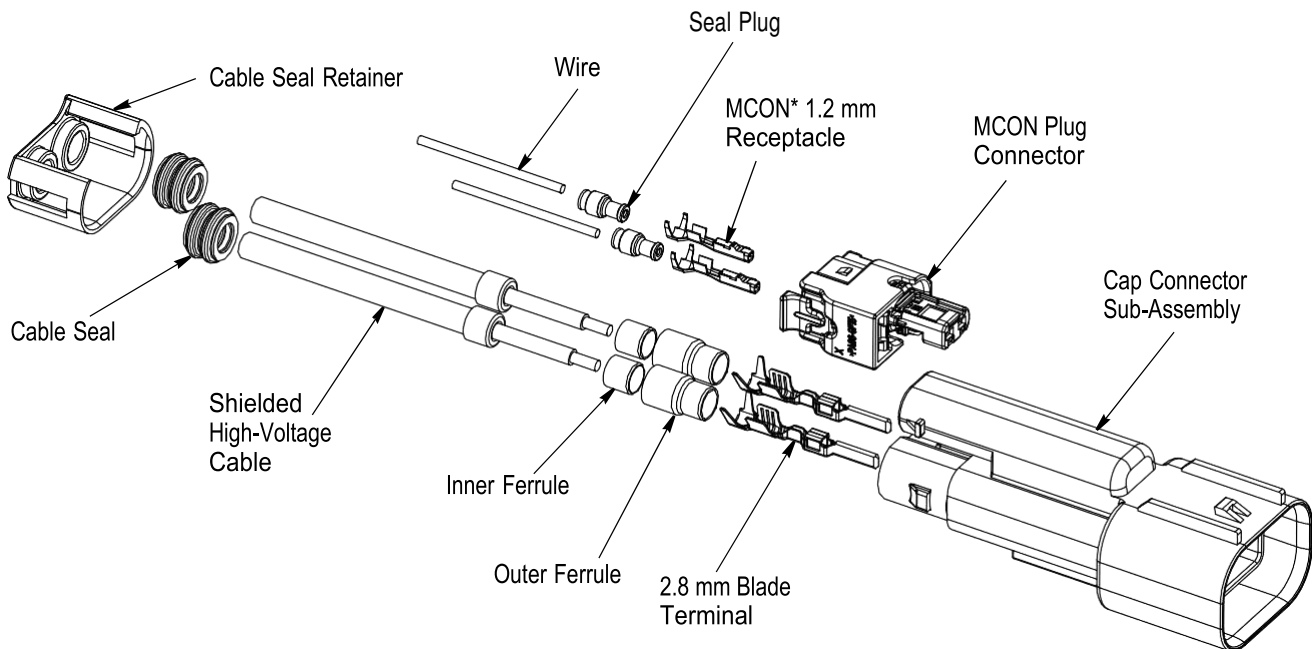
- This connector is intended for use in high-voltage applications. Special care must be applied to ensure that the connector functions as intended.
- If you suspect that the connector has been modified, damaged, contaminated, or otherwise compromised, please discontinue its use immediately.
- This connector should only be serviced by a trained and qualified technician.



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.



These high-voltage connectors must NOT be mated with any other type of connectors.



**HVA280 2phi In-Line High-Voltage  
Cap Connector System**

Figure 1

## 1. INTRODUCTION

This specification covers the requirements for application of the HVA280 2phi In-Line Cap Connector System. The HVA280 2phi cap is designed for a metric wire size range of 2.5 mm<sup>2</sup> to 4 mm<sup>2</sup> with an application voltage of up to 600 VDC. The connector incorporates conductive EMI shields to prevent excess radiated emissions in the application. See Figure 1.

The HVA280 connector system is available in five different keying or polarizing configurations and contains an integrated High Voltage Inter-Lock (HVIL) circuit. Instructions for un-mating of the HVA280 connector system depends on the specific mating plug connector chosen. Options include a “tool actuated” release as well as “time delayed” finger actuation methods.

The HVA280 2phi In-Line Cap Connector incorporates up to two 2.8 mm blade terminals which mate to 2.8 mm receptacle terminals in the mating connectors. The HVIL circuit incorporates 1.2 mm blades which mate with 1.2 mm receptacles at the back of the connector for the HVIL input. The HVIL supply to the mating plug connector incorporates 0.64 mm receptacles which mate with 0.64 mm blade terminals or a shunt in the mating connector depending on the chosen configuration. Termination tooling is available for all of the contacts associated with this connector system. The connector body is molded in orange to denote a high voltage system.

When corresponding with TE Connectivity Personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

- Initial release of document

### 2.2. Customer Assistance

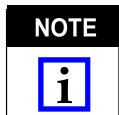
Reference Product Base Part Number 2103201 and Product Code K994 are representative of the HVA280 2phi Cap High-Voltage Connector System. Use of these numbers will identify the product line and help you to obtain product and tooling information. Such information can be obtained through a local Representative, by visiting our website at [www.te.com](http://www.te.com), or by calling PRODUCT INFORMATION or the TOOLING ASSISTANCE CENTER at the numbers at the bottom of page 1.

### 2.3. Drawings

#### A. Customer Drawings

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, the Customer Drawing takes preference.

#### B. Reference Drawings



**Reference Drawing (C-2103201) is available for part number relationships only and is not a saleable item. Refer to this drawing only for compatible part numbers for customer inquiry. For more information on Reference Drawings, call PRODUCT INFORMATION at the number at the bottom of page 1.**

### 2.4. Cable and Subcomponent Specification (Figure 2)

The following cable and subcomponent combinations have been validated by TE and should be used together to ensure optimum connector performance. Alternative cables may be used with the HVA280 connector after ensuring performance through validation testing.



**Do NOT nick, scrape, or cut the wire conductor during the stripping process.**

CABLE TYPE (Option A)	RECOMMENDED SUBCOMPONENTS (Only cable specific components are listed)	
	PART NUMBER	DESCRIPTION
Supplier: Huber + Suhner Construction: 4 mm <sup>2</sup> Cable Part Numbers: 12582674 (Orange) 85002132 (Orange/Black)	2-2141600-2	MCP Blade, 2.8 mm
	1587828-3	Inner Ferrule
	1587829-3	Outer Ferrule
	1587530-2	Cable Seal
	1587940-3	Cable Seal Retainer

Figure 2 (Cont'd)

### 2.5. Specifications

Refer to Application Specifications 114-18051-1 (2,8x0,8mm Flat Contact); and 114-18464 (MCON 1.2 mm Contact System) for related information.

Huber + Suhner is a trademark.

CABLE TYPE (Option B)	RECOMMENDED SUBCOMPONENTS (Only cable specific components are listed)	
	PART NUMBER	DESCRIPTION
Supplier: Judd Wire Construction: 3 mm <sup>2</sup> Cable Part Number: C09494 (Orange)	2-2141600-2	MCP Blade, 2.8 mm
	1587828-2	Inner Ferrule
	1587829-2	Outer Ferrule
	1587530-1	Cable Seal
	1587940-2	Cable Seal Retainer
CABLE TYPE (Option C)		
Supplier: Aptiv Wire Construction: 3 mm <sup>2</sup> Cable Part Number: M6488	2-2141600-2	MCP Blade, 2.8 mm
	1587828-1	Inner Ferrule
	1587829-1	Outer Ferrule
	1587530-3	Cable Seal
	1587940-1	Cable Seal Retainer

Figure 2 (End)

## 2.6. Instructional Material

The following list includes available instruction sheets (408-series) that may provide assembly procedures for product, operation, maintenance and repair of tooling, and customer manuals (409-series) that provides setup, operation, and maintenance of machines.

Document Number	Document Title
408-2498	Crimping Head Cross Reference for Pneumatic Tools
408-4070	Pneumatic Head Assembly 679304-1
408-4303	Pneumatic CERTI-CRIMP* Tool Holder Assembly 356302-1
408-7424	Checking Terminal Crimp Height Gaging Die Closure
408-8928	1.2-mm Sealed MCON Plug Connectors
408-9930	PRO-CRIMPER* III Hand Crimping Tool Frame Assembly 354940-1
409-5862	626 Pneumatic Tooling Assemblies 189721-[ ] and 189722-[ ]
411-18087	ERGO CRIMP* Hand Tool 539635-1
411-18169	ERGO CRIMP Die 539723-2

## 3. REQUIREMENTS

### 3.1. Safety

Do not stack contact packages so high that the shipping containers buckle or deform.

### 3.2. Shelf Life

The contacts should remain in the shipping containers until ready for use to prevent deformation to the contacts and/or damage to the housings. The products should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

### 3.3. Chemical Exposure

Do not store contacts near any chemicals listed below, as they may cause stress corrosion cracking in the contacts.

Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur	Nitrites	Tartrates

### 3.4. Material

The connector assemblies are made of thermoplastic materials and the terminals and shields are tin and silver-plated copper alloy.

### 3.5. Circuit Identification

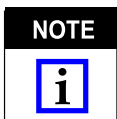
The terminal cavities are numbered on the inner housing of each connector at the wire entry end

### 3.6. Assembly Procedures

The following procedures show the details of the cable assembly and insertion of the cable assembly into the cap subassembly.

1. Slide the seal retainer and seals onto the cables in the order shown in Figure 3.

Judd Wire is a trademark.



*Depending on the length of the cables, you may choose to install the cable seals and seal retainer after the terminal and ferrules have been applied. This will reduce the risk of damage and contamination of the seals during the manufacturing process.*

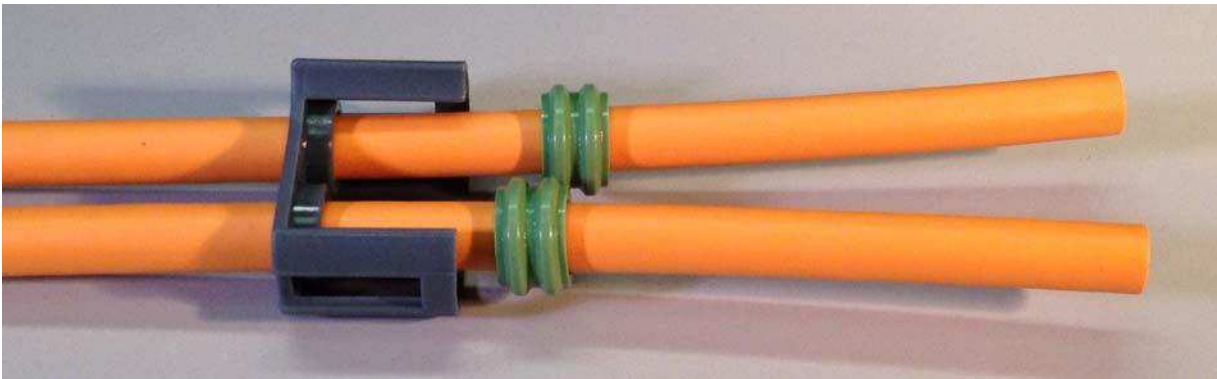
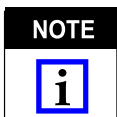


Figure 3



*For clarity, the following steps illustrate only one of the two cables being processed. These steps will need to be taken for both of the cables required in the final assembly.*

2. Strip 5.50 mm from the outer jacket, braided shield, and inner jacket off of each cable to expose the center conductor. See Figure 4.



Figure 4

3. Strip 11.60 mm from the outer jacket and shield, ensuring that you do not damage the inner jacket. See Figure 5.

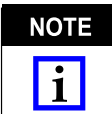


Figure 5

4. Strip 19.10 mm from the outer jacket ensuring that you do not damage the braided shield. See Figure 6.



Figure 6



*At this point you can choose to either begin the ferrule installation as shown or you may first crimp the 2.8 mm blade terminal. The larger wire sizes, including 3 mm<sup>2</sup> and 4 mm<sup>2</sup> incorporate ferrules that are large enough to fit over the blade terminal making terminal installation feasible at this point. However, since smaller wires and ferrules may be used, the instructions will proceed assuming ferrule application must be completed prior to terminal application.*

5. Install the inner ferrule to the location shown so it is flush with the edge of the outer jacket. See Figure 7.



Figure 7



6. Fold the braided shield over the inner ferrule as shown in Figure 8.



Figure 8

7. Install the outer ferrule over the inner ferrule wrapped with the braided shield until it stops. See Figure 9.



Figure 9

8. Crimp the outer ferrule using the crimp tooling and dimensions listed in Figure 21. See Figure 10.

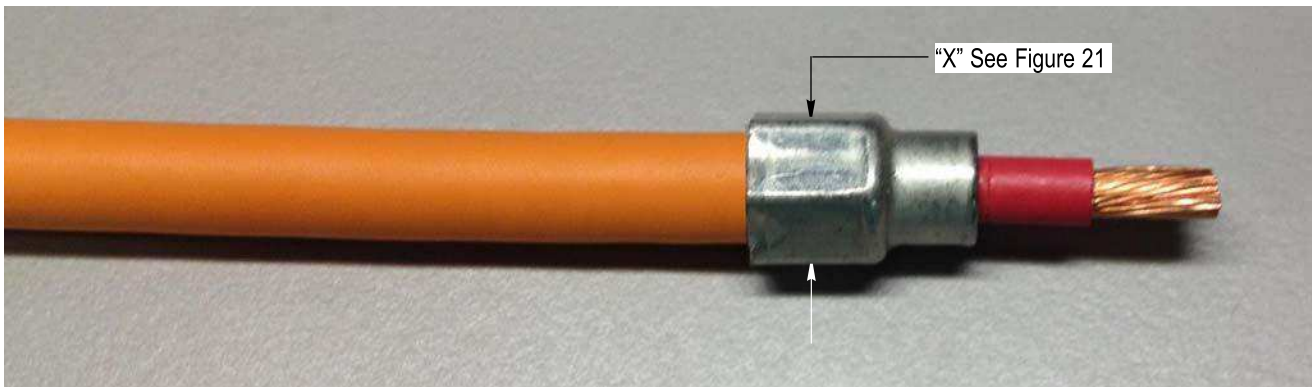


Figure 10

9. Apply the MCP 2.8 mm blade terminal as shown using the crimp tooling and dimensions listed in Figure 21. The dimension from the locking tang on the terminal to the front of the outer ferrule must be  $20.55 \pm 1.0$  mm. See Figure 11.

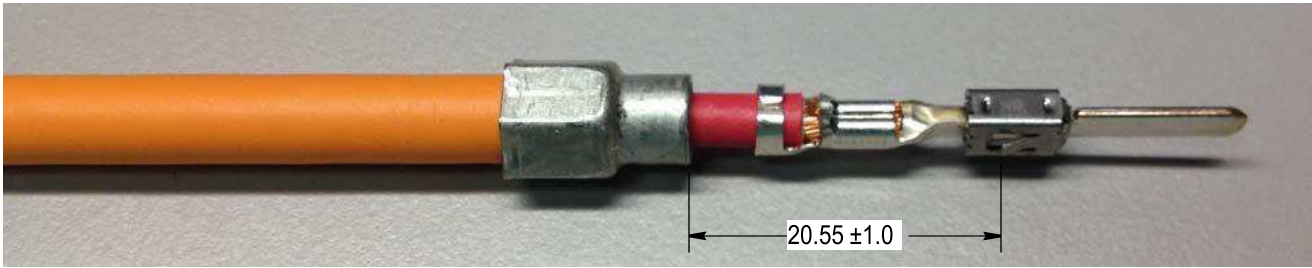


Figure 11

**NOTE**



*If you chose to apply the seals and seal retainer after the terminal/ferrule application, now is the time to apply them. The seals and retainer must be applied from the blunt end of the cable. They cannot be passed over the terminal/ferrule assembly.*

10. The crimped cable subassembly should appear as shown in Figure 12.



Figure 12

11. Obtain the HVA280 2phi cap outer housing subassembly and prepare to install the crimped cable subassembly. See Figure 13.



Figure 13

12. The terminals can be installed into the outer housing subassembly individually or at the same time. It may be easier to detect that the terminals are latched in when installing them individually. The terminal will “pop” into place with audible and tactile feedback indicating it is fully seated. See Figure 14.

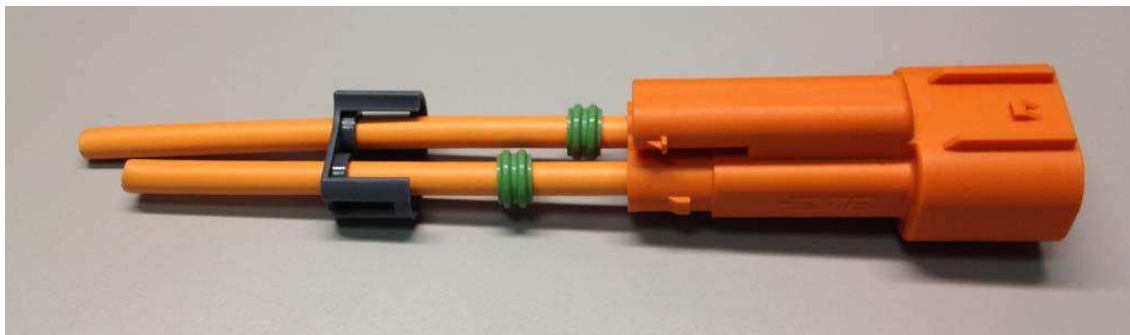


Figure 14

13. Slide the cable seals along the cables and push them into the seal holes at the back of the outer housing subassembly. The first rib will be relatively easy to insert, then the second rib of the seal can remain exposed as shown in Figure 15. It will be fully seated in the next step.

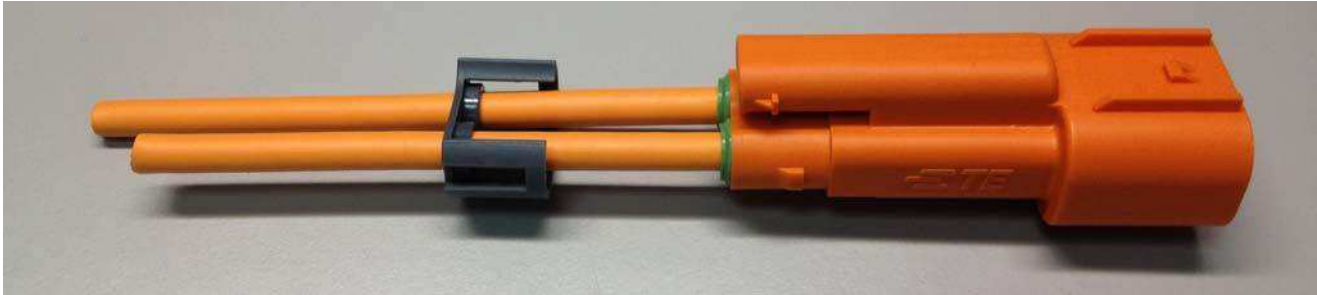


Figure 15

14. Slide the cable seal retainer along the cables and press it against the outer housing subassembly until it snaps into place. The cable seal retainer is designed to fully seat the cable seals during this process.

**NOTE**



*Ensure that both latching features on the cable seal retainer have snapped into place over the outer housing subassembly latch features. The final assembly should look as shown in Figure 16.*



Figure 16

15. The HVA280 2phi cap connector has a provision for a panel mount clip which may be installed at any time during the connector assembly process. Align the clip with the clip mounting feature on the bottom of the connector as shown in Figure 17.



Figure 17



Apply force to the clip until it snaps in place as shown in Figure 18.



Figure 18

16. Depending on the application requirements, the MCON 2p plug connector which brings the HVIL circuit to the HVA280 2phi cap connector may be mated now or after the HVA280 2phi cap connector is mated to the HVA280 plug connector.

Align the MCON 2p plug connector with the HVA280 2phi cap connector as shown in Figure 19.



Figure 19

17. Mate the MCON 2p plug connector to the HVA280 2phi cap connector until the MCON connector latches in place, see Figure 20. The seal retainer on the HVA280 2phi cap connector acts as a polarization feature for the MCON connector ensuring it can only be mated in the correct orientation.

If the MCON connector in your application contains a CPA, latch the CPA at this time. The HVA280 2phi cap connector is now ready to be mated.



Figure 20

### 3.7. Connector Mating

The HVA280 2phi cap connector mates to all of the different HVA280 2phi/2phm plug connectors offered by TE Connectivity. For mating/un-mating instructions, reference the following application specifications for the HVA280 2p plug connectors:

114-13259 (HVA280 2phi High-Voltage Plug Connector)

114-13305 (HVA280 2phi High-Voltage Plug Connector with Shunted HVIL)

These application specifications detail mating/un-mating procedures to an HVA280 header. The process is identical for mating/un-mating with the HVA280 2phi cap connector.

### 4. QUALIFICATIONS

The HVA280 2phi cap connector is validated to the following specifications:

IEC 60528: Degrees of Protection by Enclosures (IP Code), IP6K9K (Mated), IP67 (Mated), and IP2B (Unmated)

SAE/USCAR-2

SAE/USCAR-37

### 5. TOOLING

A list of tooling recommendations is provided in Figure 21. Modified designs and additional tooling concepts may be available to meet other application requirements. For additional information, contact the TOOLING ASSISTANCE CENTER or the PRODUCT INFORMATION number listed at the bottom of page 1.

APPLICATION TOOLING FOR FERRULES							
CABLE	DIE SET	"X" After Crimping	MANUAL TOOLING		ELECTRIC TOOLING		
Judd Wire 3 mm <sup>2</sup>	2063013-3	6.80 ±0.10	9-1478240-0		1490076-2		
Huber + Suhner 4 mm <sup>2</sup>	2063013-6	7.40 ±0.10					
APTIV 3 mm <sup>2</sup>	2063013-4	6.20±0.10					

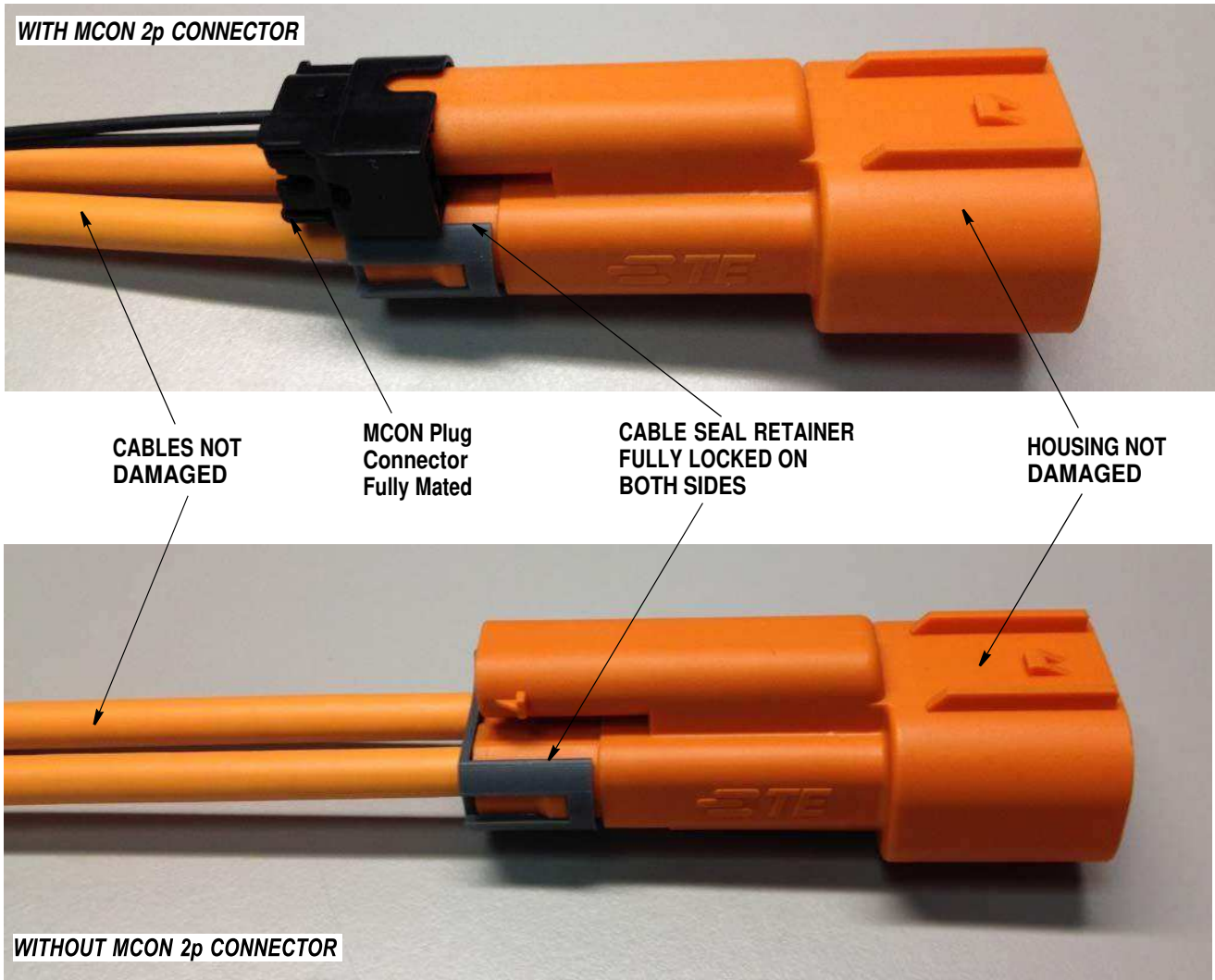
APPLICATION TOOLING FOR MCP 2.8 mm BLADE CONTACTS (REF 114-18051-1)							
CABLE	CCH	CCW	ICW	DIE SET	MANUAL TOOLING	ELECTRIC TOOLING	APPLICATOR
Judd Wire 3 mm <sup>2</sup>	1.92 ±0.05	3.05	4.1 ±0.2	539723-2	539635-1	354500-1	2151634-1
Huber + Suhner 4 mm <sup>2</sup>	2.15 ±0.05					1-354500-5	
APTIV 3 mm <sup>2</sup>	1.92±0.05					1-354500-6 1725900-2 3-1725950-1	

Huber + Suhner and Judd Wire are trademarks of their respective owners.

Figure 21

### 6. VISUAL AID

The illustration below shows a typical application of this product. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling



**FIGURE 22. VISUAL AID**