

**DANGER**



**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.

**NOTE**



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.

## 1. INTRODUCTION

This specification covers the requirements for application of the sealed two-position HVA280-2phi high-voltage plug connector. This plug connector is designed for an application voltage of up to 600 VDC. The plug connector incorporates conductive EMI shields to prevent excess radiated emissions in the application. The plug connector assembly body is molded in RAL2003 orange to denote a high-voltage system.

The plug connector incorporates up to two MCP 2.8-mm receptacle terminals, which mate with up to two 2.8-mm blade terminals in the header assembly. Termination tooling is available for both types of terminals and the plug connector ferrules (the inner ferrules will be crimped inside of the outer ferrules).

When corresponding with 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.

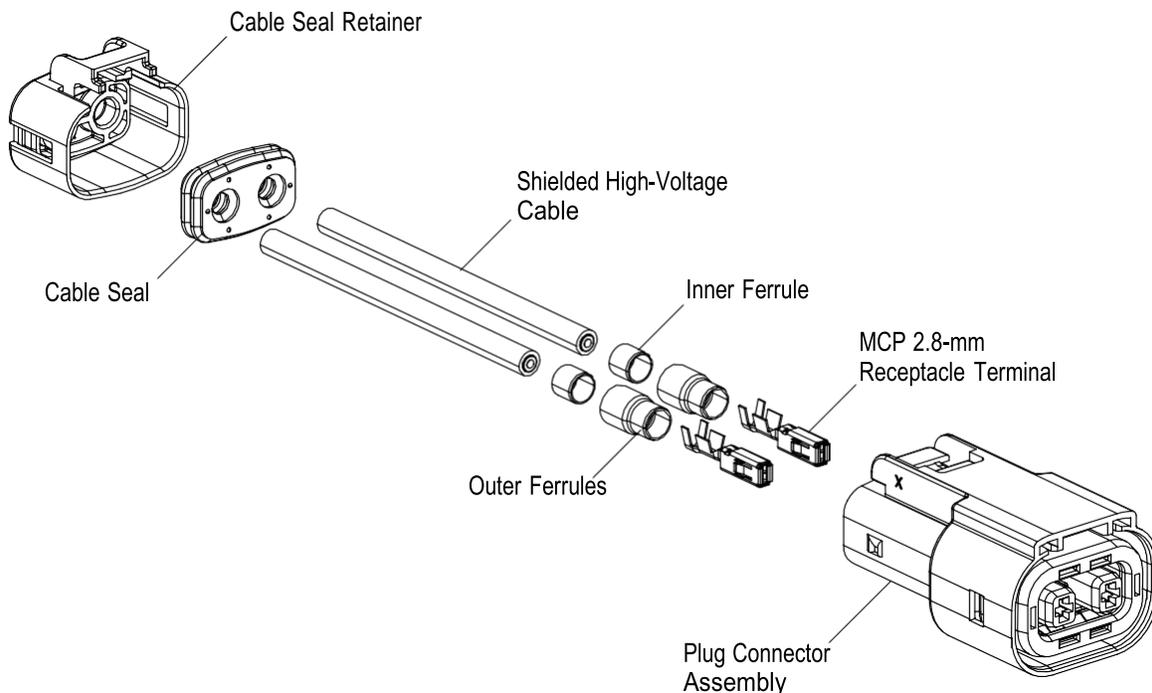


Figure 1

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

Revisions to this application specification include:

- Removed cable sizes from Section 1
- Modified Figure 2, combined Paragraphs 2.6 and 3.5
- Added “shielded” and validation clarity to Paragraph 3.5
- Modified Step 9 of Paragraph 3.6
- Moved referenced specifications from Section 4 to Paragraph 2.5
- Added tooling to Section 5
- Added Notes regarding changes to order of crimping operations on Page 6

### 2.2. Customer Assistance

Reference Product Base Part Number 1587819 and Product Code K28 are representative of HVA280-2phi high-voltage plug connector. 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

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.

### 2.4. Specifications

Product Specification 108-2394 provides product performance and test information.

Application Specification 114-18148 provides product description and application requirements of MCP 2.8-mm receptacle terminals.

### 2.5. Standards and Publications

Standards and publications developed by the International Electrotechnical Commission (IEC) and the Society of Automotive Engineers (SAE)/United States Council for Automotive Research (USCAR) provide industry test and performance requirements. Documents available which pertain to this product are:

IEC 60529, “Degrees of Protection Provided by Enclosures (IP Code)”, IP6K9K (Mated), IP67 (Mated), and IP2xB (Unmated)

SAE/USCAR-2, “Performance Specification for Automotive Electrical Connector Systems”

SAE/USCAR-37, “High-Voltage Connector Performance Supplement to SAE/USCAR-2”

## 3. REQUIREMENTS

### 3.1. Safety

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

### 3.2. Shelf Life

The product should remain in the shipping containers until ready for use to prevent deformation to the terminals or damage to the connectors. Product 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 product near any chemicals listed below, as they may cause stress corrosion cracking in the product.

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

### 3.4. Material

The plug connector assembly is made of thermoplastic materials and the terminals are silver over copper. The connector shields and ferrules are made of tin over copper.

### 3.5. Cable Selection and Termination Components

The HVA280 connector system accepts shielded cable sizes 2.0, 2.5, 3.0, and 4.0 mm<sup>2</sup>. Cable and termination component combinations validated by TE should be used to ensure optimum connector performance.

At the time of publication of this document, combinations for cable sizes 2.0 and 2.5 mm<sup>2</sup> have not been validated by TE. For validation testing, contact PRODUCT INFORMATION at the number at the bottom of page 1. Combinations for cable sizes 3.0 and 4.0 mm<sup>2</sup> are listed in Figure 2.

Alternative cable may be used after ensuring performance through validation testing by TE.

CABLE	RECOMMENDED CABLE-SPECIFIC TERMINATION COMPONENTS	
	PART NUMBER	DESCRIPTION
Supplier: HUBER+SUHNER Construction: 4 mm <sup>2</sup> Part Numbers: 12582674 (Orange) 85002132 (Orange/Black)	1-968853-3	MCP 2.8-mm Receptacle Terminal
	1587828-3	Inner Ferrule
	1587829-3	Outer Ferrule
	1587826-3	Cable Seal
	1587827-3	Cable Seal Retainer
Supplier: LEONI Construction: 4 mm <sup>2</sup> Part Number: 76231175A (Orange)	1-968853-3	MCP 2.8-mm Receptacle Terminal
	1587828-3	Inner Ferrule
	1587829-3	Outer Ferrule
	1587826-3	Cable Seal
	1587827-3	Cable Seal Retainer
Supplier: Judd Wire Inc. Construction: 3 mm <sup>2</sup> Part Number: C09494 (Orange)	1-968853-3	MCP 2.8-mm Receptacle Terminal
	1587828-2	Inner Ferrule
	1587829-2	Outer Ferrule
	1587826-2	Cable Seal
	1587827-2	Cable Seal Retainer
Supplier: Aptiv Wire Construction: 3 mm <sup>2</sup> Part Number: M6488	1-968853-3	MCP 2.8-mm Receptacle Terminal
	1587828-1	Inner Ferrule
	1587829-1	Outer Ferrule
	2260703-1	Cable Seal
	2103181-1	Cable Seal Retainer

Figure 2

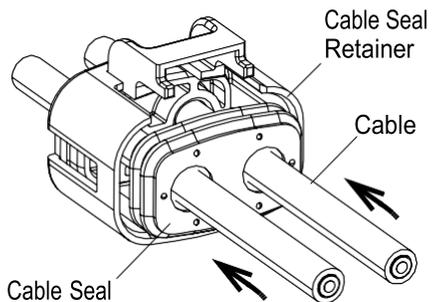
### 3.6. Preparation and Assembly

Steps for preparing the cable and assembling the plug connector components onto the cable are as follows:

1. Assemble the cable seal retainer and cable seal in the order and direction shown in Figure 3, Detail A.

Note that circuit numbers are shown on the cable seal retainer. Make sure that the correct cable is inserted into each cavity. See Figure 3, Detail B.

Detail A



Detail B

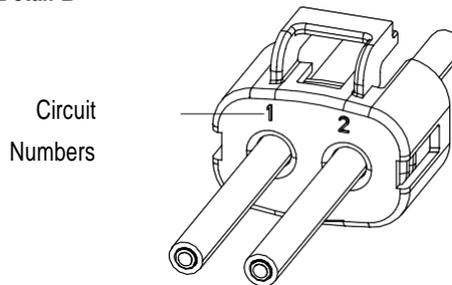


Figure 3

HUBER+SUHNER and LEONI are trademarks of their respective owners.

2. With the cable seal retainer and cable seal safely out of the way, strip the outer jacket and braided cable shield off of each cable. See Figure 4.



*Make sure that the stripping equipment has not nicked, scraped, or cut the conductor insulation during the stripping operation and that there are no remaining cable shield strands.*

Note: Not to Scale

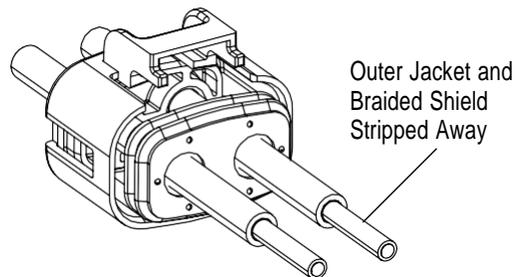
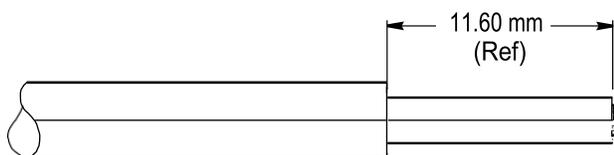


Figure 4

3. Strip the outer jacket further so that the combined exposed strip length of braided cable shield and conductor insulation. See Figure 5.



*Make sure that the stripping equipment has not nicked, scraped, or cut the braided cable shield strands during the stripping operation.*

Note: Note to Scale

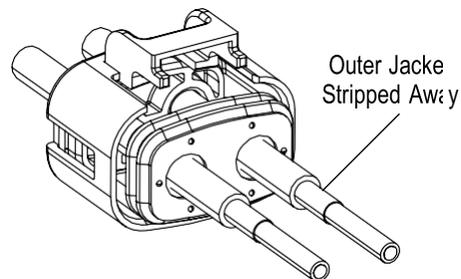
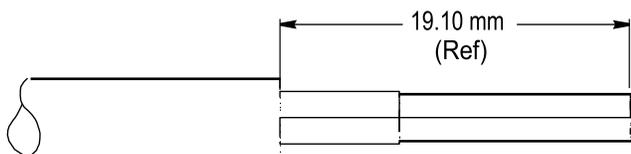


Figure 5

4. Insert an inner ferrule onto each cable and over the outer jacket as shown in Figure 6.

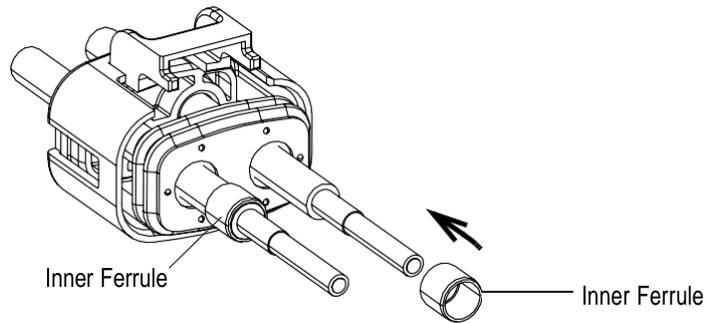


Figure 6

5. Fold the braided cable shield back over the inner ferrule, taking care to try to keep inner ferrule positioned such that its edge is flush with the stripped edge of the outer jacket as shown in Figure 7.

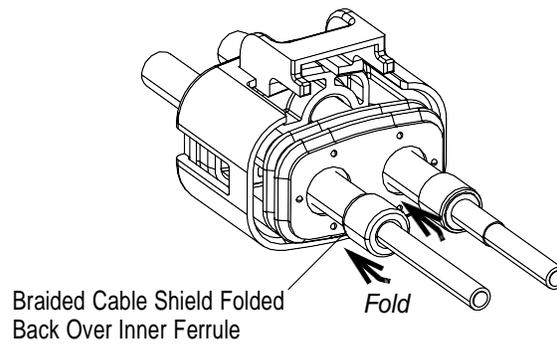


Figure 7

6. Strip the conductor insulation off of each cable to the dimension defined in Application Specification 114-18148. See Figure 8.

**Note:** Not to Scale

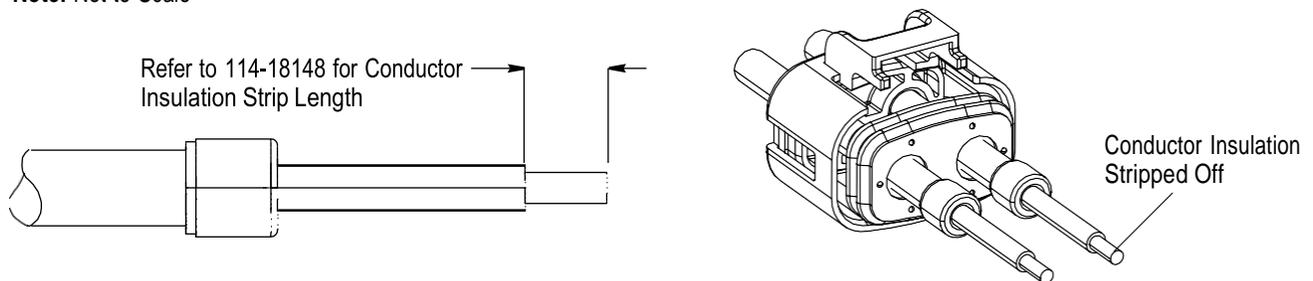


Figure 8

7. Apply a receptacle terminal to each cable using the tooling, method, dimensions, and inspections detailed in Application Specification 114-18148. The trailing edge of the receptacle terminal box should be located from the stripped edge of the outer jacket to the dimension (approximately) given in Figure 9.

**NOTE**



While these steps provide a logical procedural flow to complete this assembly, the order of operations maybe changed as needed as long as the dimensional specification between the terminal and the ferrule shown in Figure 11 ( $18.10 \pm 1$  mm) is not violated and ferrule retention meets all the USCAR 37 acceptance criteria.

The ferrules (inner and outer) maybe crimped before the conductor insulation is stripped and the receptacle terminal is crimped.

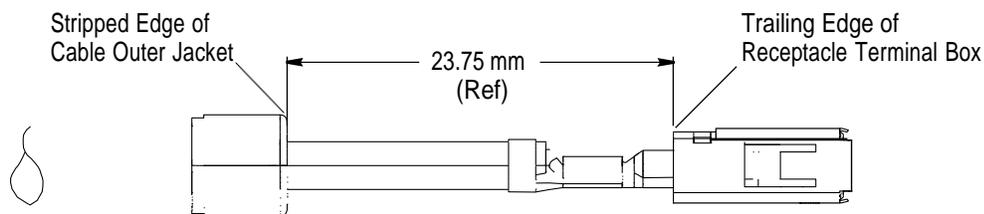


Figure 9

8. Insert an outer ferrule onto each cable in the orientation shown and over the inner ferrule and folded back braided cable shield. See Figure 10.

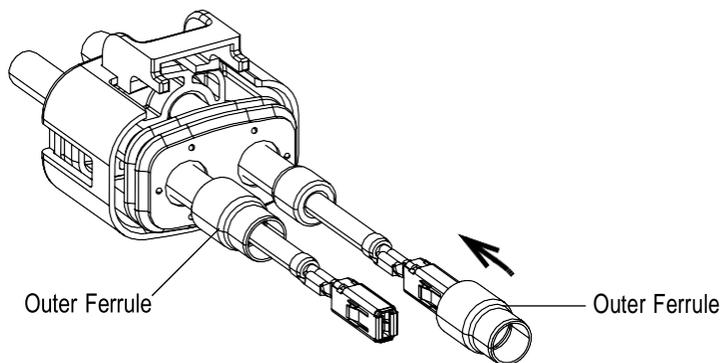


Figure 10

9. Crimp each outer ferrule using the tooling specified in Section 5. Using a blade micrometer, measure each outer ferrule crimp at 3 places: one on top and one on each opposing side. The crimp height must meet the dimension given. Use the lowest measurement as the passing criteria. The crimp height is shown in Figure 11. An optional way is to do one measurement in vertical or operating direction of the crimp tool as the other representation of Figure 11.

The distance between the leading edge of the outer ferrule and trailing edge of the receptacle terminal box must be maintained at the dimension given in Figure 11.

**CAUTION**



Any loose strands of the braided cable shield seen protruding from below the outer ferrule should be trimmed, taking special care not to cut any insulation or leave any detached strands attached to the assembly. A dielectric test between the shield and the conductor is recommended to ensure intended electrical function of the harness

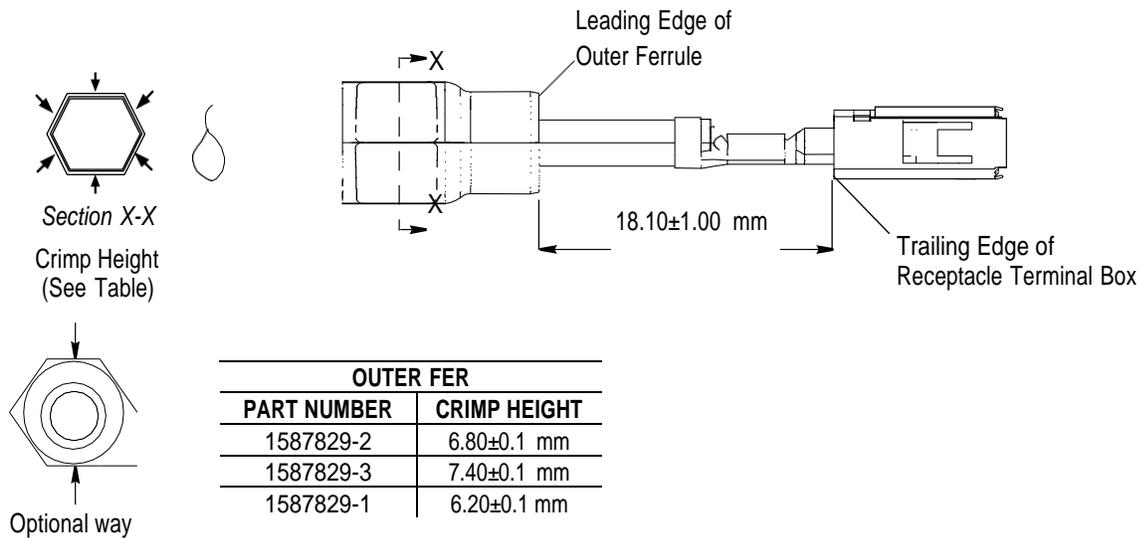


Figure 11

### 3.7. Cable Assembly Inspection Summary

Refer to Figure 12.

- samples match examples shown in the figures in this document
- cables are inserted in correct cavity openings in seal retainer
- seal is not rolled or damaged
- outer jacket or conductor is not damaged
- no loose or protruding strands from braided cable shield and ferrule crimp
- terminal crimp meets requirements outlined in Application Specification 114-18148
- outer ferrule hex crimp height is correct and outer ferrule is not distorted and is straight relative to the cable

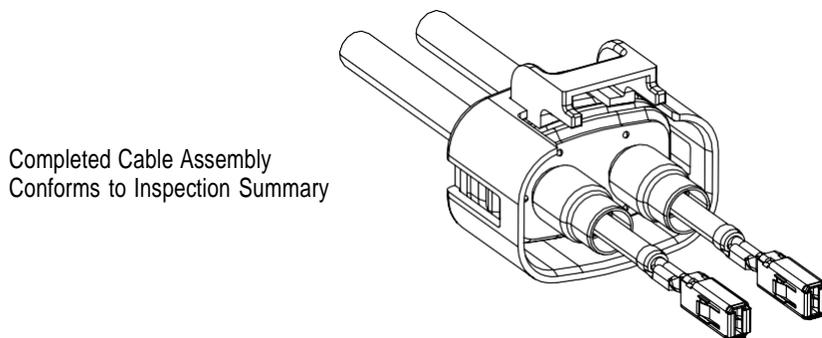


Figure 12

### 3.8. Receptacle Terminal Installation

Steps for installing the receptacle terminals into the plug connector are as follows:

1. Orient the cable assembly so that the bridge feature on the cable seal retainer is aligned with the plug connector latch as shown in Figure 13.

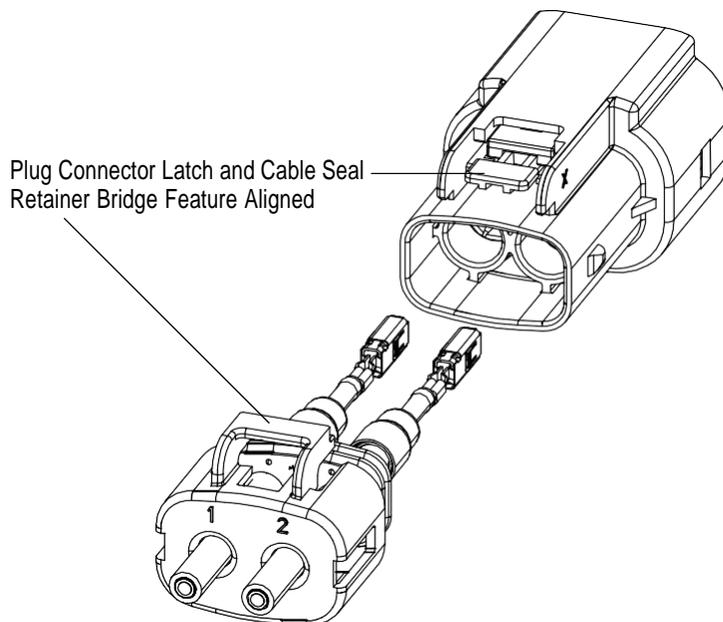


Figure 13

2. Insert the receptacle terminals into their respective plug connector circuit cavities until they are fully locked, and an audible and tactile “click” is detected. See Figure 14.

The installation of the ferrule into the contact springs of the connector shield will cause some resistance, so it is important to verify that the receptacle terminals are fully inserted by pulling back lightly on the cables.

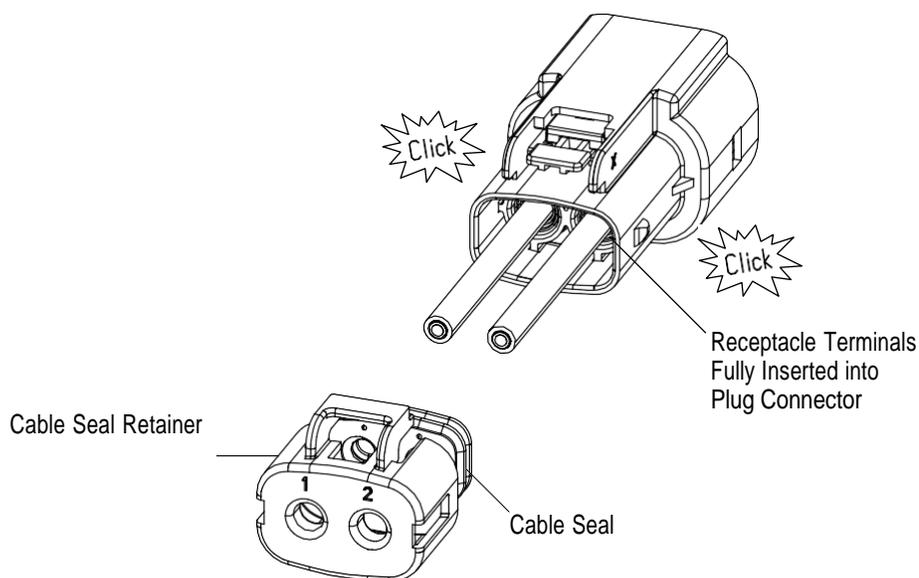


Figure 14

3. Fully insert the cable seal until it stops inside the back of the plug connector. See Figure 15, Detail A.
  4. Fully install the cable seal retainer over the back of the plug connector, making sure that the bridge feature is correctly aligned with the plug connector latch feature. See Figure 15, Detail B.
- Verify that both locking features are fully engaged.

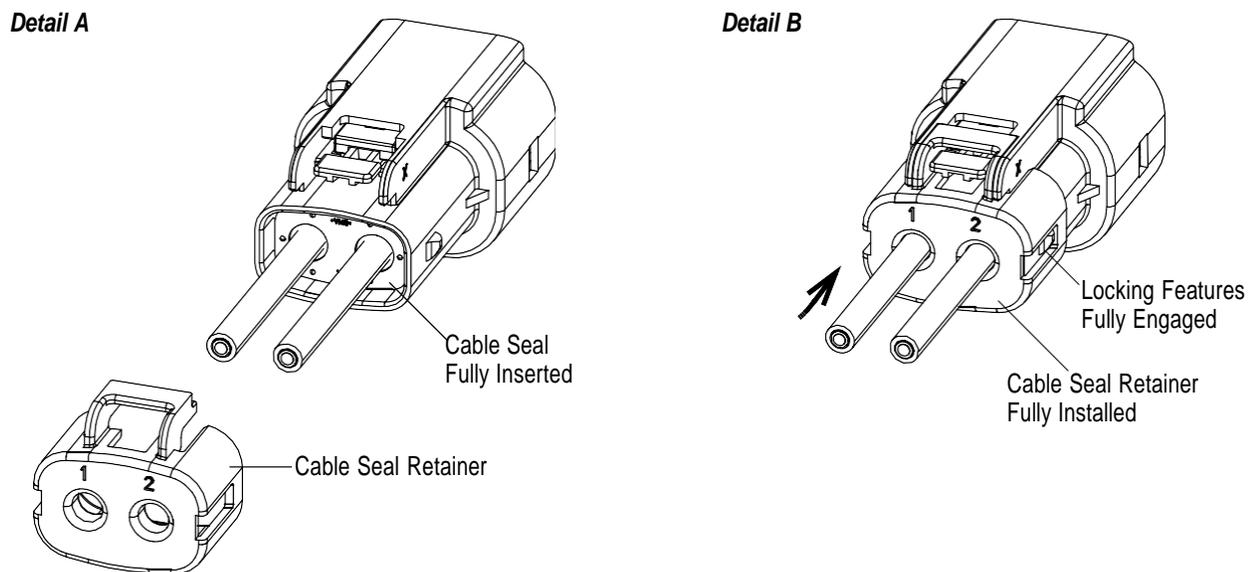


Figure 15

### 3.9. Connector Mating and Unmating

#### A. Mating

1. Align the plug connector and header assembly as shown in Figure 16.

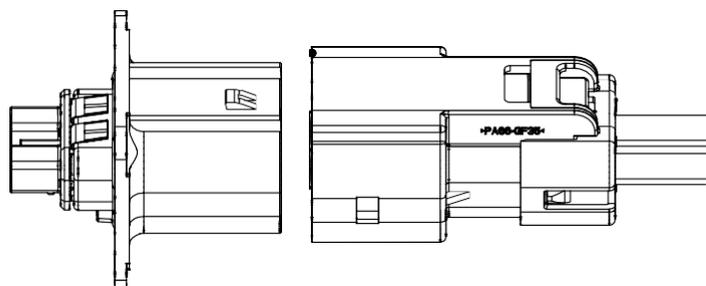


Figure 16

2. Push the plug connector and header assembly together fully until they stop (two clicks will be heard). Verify that the plug connector and header assembly are fully locked with a light tug and by visually verifying the location of the indicator slot on the floating latch as shown in Figure 17.

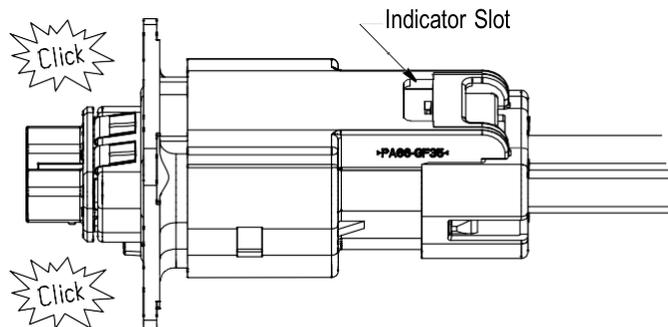


Figure 17

### B. Unmating

1. Fully depress the thumb actuation pad on the plug connector flexible latch (orange). See Figure 18.
2. Pull the plug connector back (approximately 4.5 mm) into the intermediate position. At this point, the HVIL circuit has been opened, but the HV terminals are still making contact.

**Note:** Do NOT pull on the cables.

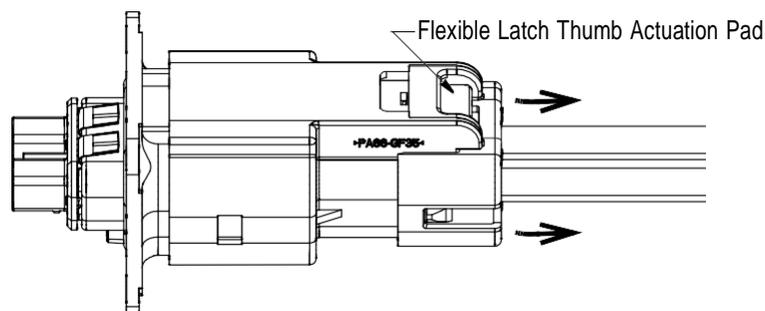
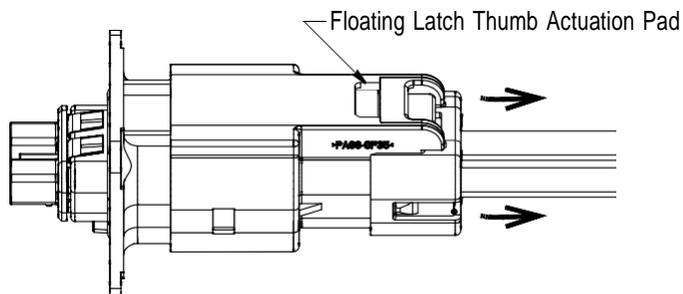


Figure 18

3. Fully depress the thumb actuation pad on the floating latch (red). See Figure 19, Detail A.
4. Pull the plug connector until it is fully separated from the header assembly. See Figure 19, Detail B.

**Note:** Do NOT pull on the cables.

Detail A



Detail B

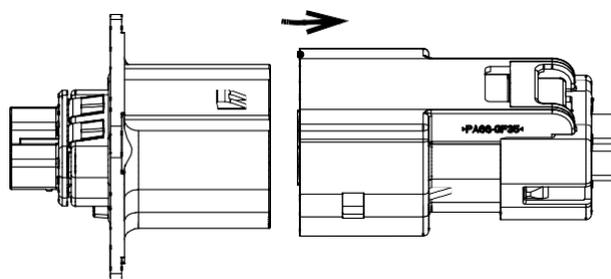


Figure 19

**4. QUALIFICATIONS**

No outside agency approval was defined for the HVA280-2phi high-voltage plug connector at the time of publication of this document.

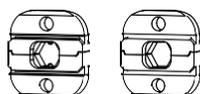
**5. TOOLING**

Tooling recommendations covering the full cable size range for crimping the receptacle terminals is provided in Application Specification 114-18148.

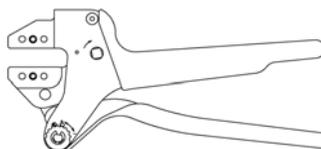
A hand crimping tool frame and electric bench terminator are available to crimp the outer ferrule. The tool frame and terminator each accept a die assembly designed to crimp the specific outer ferrule. Tooling part numbers for crimping the outer ferrule, and instructional material packaged with the tooling, are shown in Figure 20.



*Modified designs and additional tooling concepts may be available to meet other application requirements. For additional information, contact TOOLING ASSISTANCE CENTER or PRODUCT INFORMATION at the numbers at the bottom of page 1.*



OUTER FERRULE	DIE ASSEMBLY (No Document)
1587829-2	2063013-3 (Type 1) 6.80-mm Hex
1587829-3	2063013-6 (Type 2) 7.40-mm Hex
1587829-1	2063013-4 (Type 3) 6.20-mm Hex



SDE-SA Hand Crimping Tool Frame Assembly 9-1478240-0 (408-8851)



SDE Electric Bench Terminator 1490076-2 (409-10052)

Figure 20

VISUAL AID

The illustration below shows a typical application of HVA280-2phi high-voltage plug connector. 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.



Refer to 114-18148 for application requirements for terminated terminals.

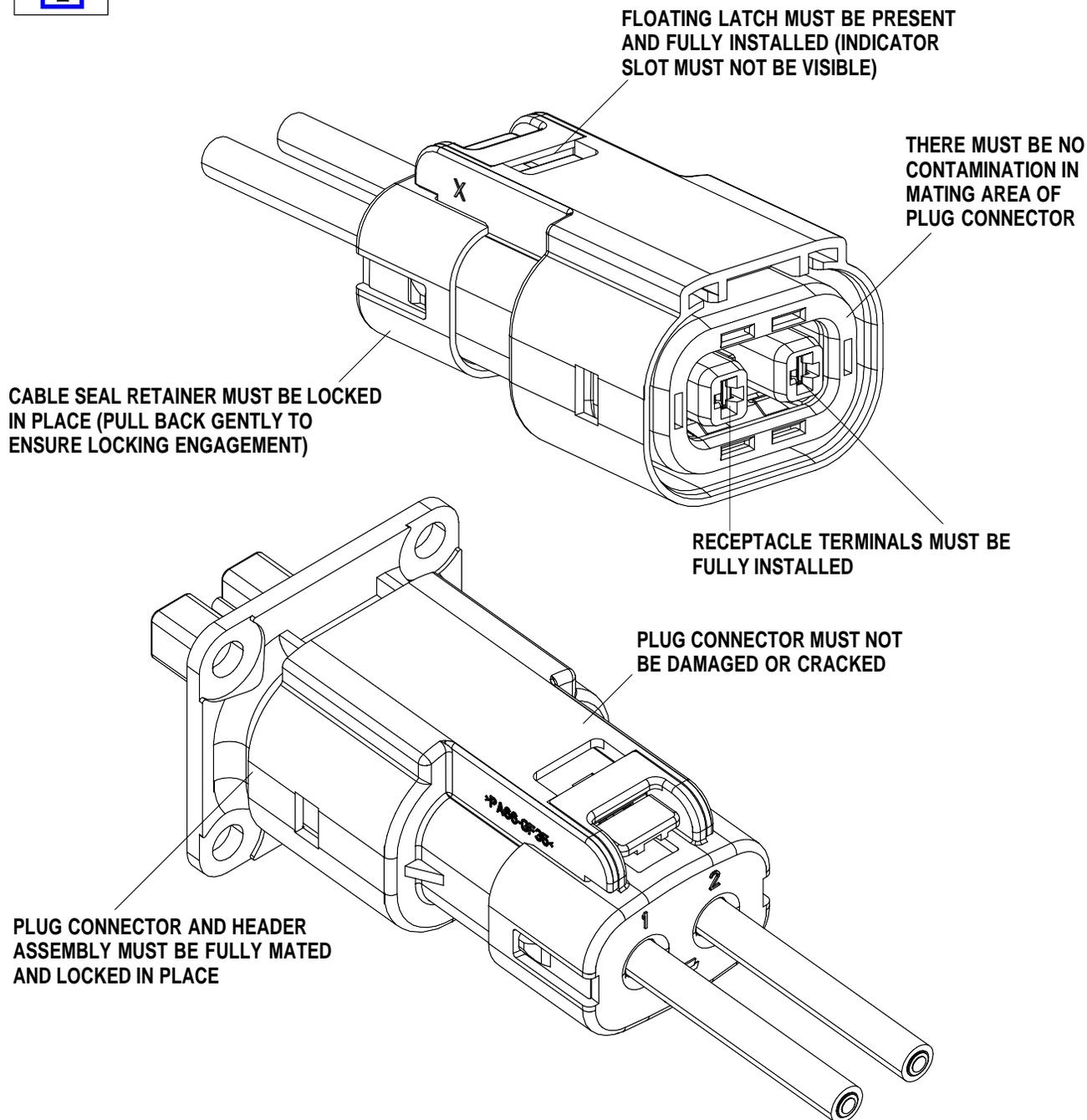


FIGURE 21. VISUAL AID