NOTE
All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.13 [±.005] and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of Val-U-Lok Plus Connectors with integrated Terminal Position Assurance (TPA). This product line consists of contacts which are installed in 2~6P (dual row) & 3~5P (single row) plug and receptacle connector housings. These housings may mate with each other for wire-to-wire applications. TPA-compatible contacts will accept 26-18 AWG (250-1900 CMA) stranded copper lead wire.

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.

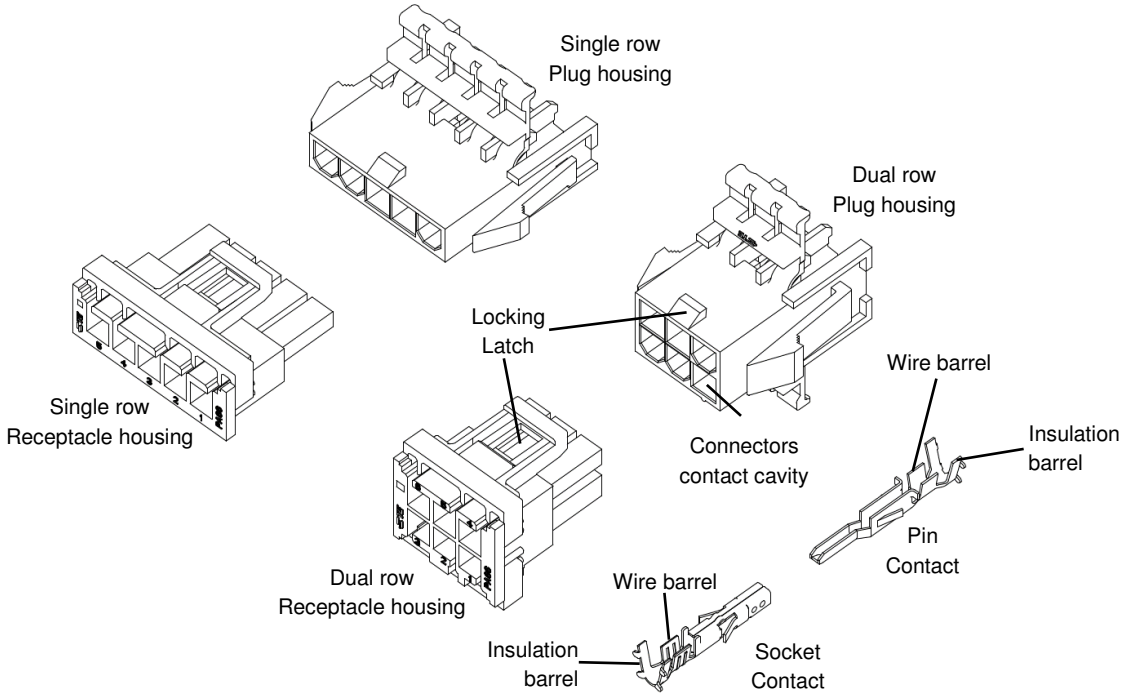

Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Initial release of application specification.

2.2. Customer Assistance

Reference Product Base Part Number (dual row: 2385532 & 2385533, single row: 2386011 & 2386014, socket contact:2238017 & 2238019, Pin contact: 2238016 & 2238018) and Product Code K924 are representative of Val-U-Lok connector. Use of these numbers will identify the product line and help you to obtain product and tooling information when visiting www.te.com or calling the number at the bottom of page 1.

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2.3. Drawings

Customer drawings for product part numbers are available from www.te.com. Information contained in the customer drawing takes priority.

2.4. Manuals

Manual 402-40 can be used as a guide to soldering. This manual provides information on various flux types and characteristics with the commercial designation, flux removal procedures, and a checklist for information on soldering problems.

2.5. Specifications

Product Specification 108-160744 provides product performance and test results.

2.6. Instructional Material

Instruction sheets (408-series) provide product assembly instructions or tooling setup and operation procedures and customer manuals (409-series) provide machine setup and operating procedures. Instructional material that pertains to this product are:

Document Number	Document Title
408-3295	Preparing Reel of Contacts for Applicator Tooling
408-8053	Conversion Guide for Miniature Quick Change Applicators
408-8917	PRO-CRIMPER* III Hand Tool Assembly 91387-1 with Die Assembly 91387-2
408-8918	PRO-CRIMPER III Hand Tool Assembly 91388-1 with Die Assembly 91388-2
408-9816	Handling of Reeled Products
408-10207	PRO-CRIMPER III Hand Tool Assembly 1976444-1 with Die Assembly 1976444-2
408-10389	Ocean Side-Feed Applicators
408-32113	VAL-U-LOK Connector System with Terminal Position Assurance
408-32114	Extraction Tool 1586343-1 for VAL-U-LOK Contacts
408-160090	Unlocking Tool 3-1579018-9 for VAL-U-LOK TPA
409-32035	AMP-O-LECTRIC* Model G II Terminator 2217000-[ ]

3. REQUIREMENTS

3.1. Safety

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

3.2. Material

The housings are made of flame-retardant rated nylon (UL94 V-0). The contacts are made of copper alloy.

3.3. Storage

A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the product material.

B. Shelf Life

The product should remain in the shipping containers until ready for use to prevent deformation to components. The product should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

C. Reeled Contacts

When using reeled contacts, store coil wound reels horizontally and traverse wound reels vertically.

D. Chemical Exposure

Do not store product near any chemical listed below as they may cause stress corrosion cracking in the material.

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

NOTE
Where the above environmental conditions exist, phosphor-bronze contacts are recommended instead of brass if available.

3.4. Special Characteristics

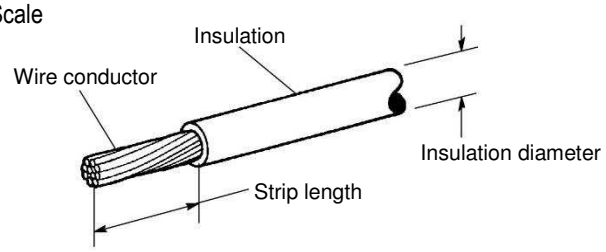
VAL-U-LOK Plus Connectors are available as a wire-to-wire connector system designed for power applications. The housings are designed on 4.2 x 4.2 mm centerlines. The housings are polarized to prevent mis-mating.

3.5. Wire Selection and Preparation

The contacts accept stranded copper wire having sizes and insulation diameter given in Figure 2. The wire must be stripped within the dimensions given in Figure 2.

CAUTION
When stripping the wire, care must be taken to avoid scraping, nicking, or cutting the conductor. Care must also be used when handling the wire during stripping and crimping to prevent cracking or breaking of the conductor and insulation.

NOTE: Not to Scale



WIRE	
SIZE (mm² [AWG])	INSUL DIA (mm)
0.30-0.82 [22-18]	1.50-3.10
0.13-0.30 [26-22]	1.20-1.75

Figure 2

3.6. Crimp Requirements

Contacts must be terminated according to the instructions packaged with the tooling.

A. Bellmouth

The rear bellmouth shall be evident and be within the dimensions given in Figure 3.

B. Cutoff Tab and Burr

The cutoff tab and burr shall not exceed the dimension given in Figure 3.

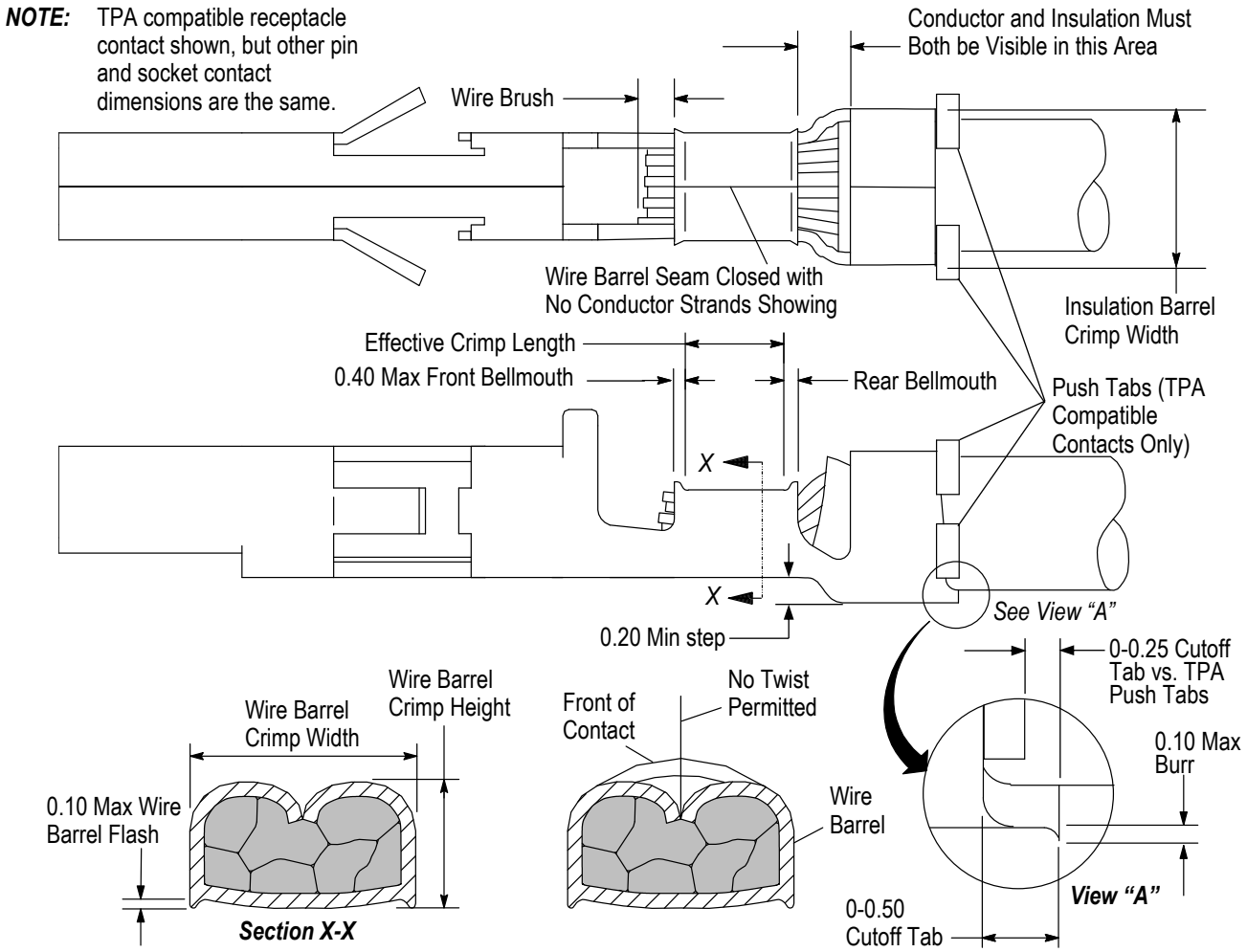
C. Wire Barrel Flash

The wire barrel flash shall not exceed the dimension given in Figure 3.

D. Crimp Height

The crimp applied to the wire portion of the contact is the most compressed area and is most critical in ensuring optimum electrical and mechanical performance of the crimped contact. The wire barrel crimp height and width and insulation barrel crimp width must be within the dimensions provided in Figure 3.

NOTE
The effective crimp length depends on the crimping dies used and should not be measured for inspection purposes.



WIRE SIZE		CONTACT							
		WIRE BARREL CRIMP		INSULATION BARREL CRIMP		WIRE BRUSH		REAR BELLMOUTH	
mm²	AWG	HEIGHT (mm)	WIDTH (mm)	WIDTH (mm)	CRIMP CONFIGURATION	HAND TOOL (mm)	APPLICATOR (mm)	HAND TOOL (mm)	APPLICATOR (mm)
0.13-0.30	26	0.67±0.05	1.16	1.9	F-crimp	0.90 Max	0.1~0.6	0.3~0.65	0.3~0.5
	24	0.75±0.05							
	22	0.82±0.05							
0.30-0.82	22	0.78±0.05	1.57	2.9					
	20	0.94±0.05							
	18	1.08±0.05							

Figure 3

CAUTION
TPA-compatible contacts are equipped with four small push tabs on the insulation crimp barrel to facilitate function of the TPA accessory. Damage or distortion of these push tabs during the termination process is not permissible.

E. Effective Crimp Length

Effective crimp length shall be defined as that portion of the wire barrel, excluding the rear bellmouth, fully formed by the crimping tool. Refer to Figure 3.

F. Wire Location

The wire insulation and conductors must be visible in the transition area between the wire barrel and insulation barrel. See Figure 3.

G. Wire Brush

The conductors may extend beyond the wire barrel within the dimensions given in Figure 3.

H. Wire Barrel Seam

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam.

I. Stabilizer Barrel

The stabilizer barrel must not be deformed.

J. Locking Latch

The locking latch must not be deformed.

K. Twist and Roll

There shall be no twist, roll, deformation, or other damage to the mating portion of the crimped contact that will prevent proper mating.

L. Straightness

The force applied during crimping may cause some bending between the crimped wire barrel and the mating portion of the contact. Such deformation is acceptable within the following limits:

- The side-to-side bending of the contact may not exceed the limits provided in Figure 4.
- The crimped contact, including cutoff tab and burr, shall not be bent above or below the datum line more than the amount given in Figure 4.

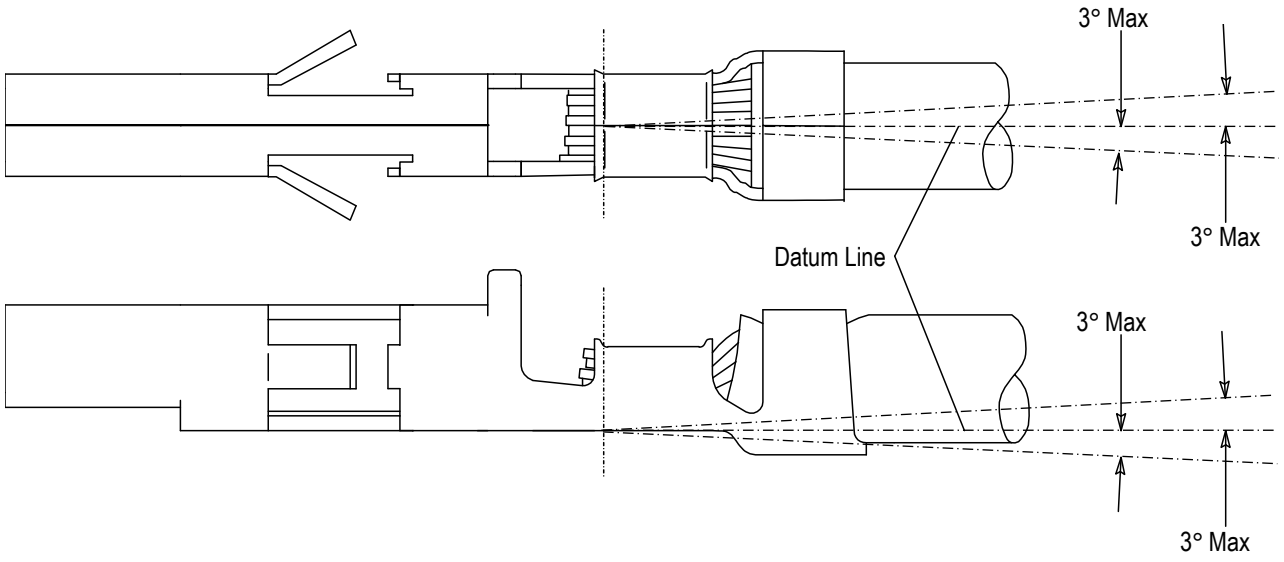


Figure 4

3.7. Assembly

A. Crimped Contact Insertion into Housing

The crimped contacts must be inserted in the back of the housing and snapped into place. Install the contact so the wire barrel is facing the housing latch. When fully inserted, the locking lances will engage the housing and prevent backing out during mating of the connector. After inserting contact into housing, pull back lightly on the wire to ensure contact is fully seated. See Figure 5.

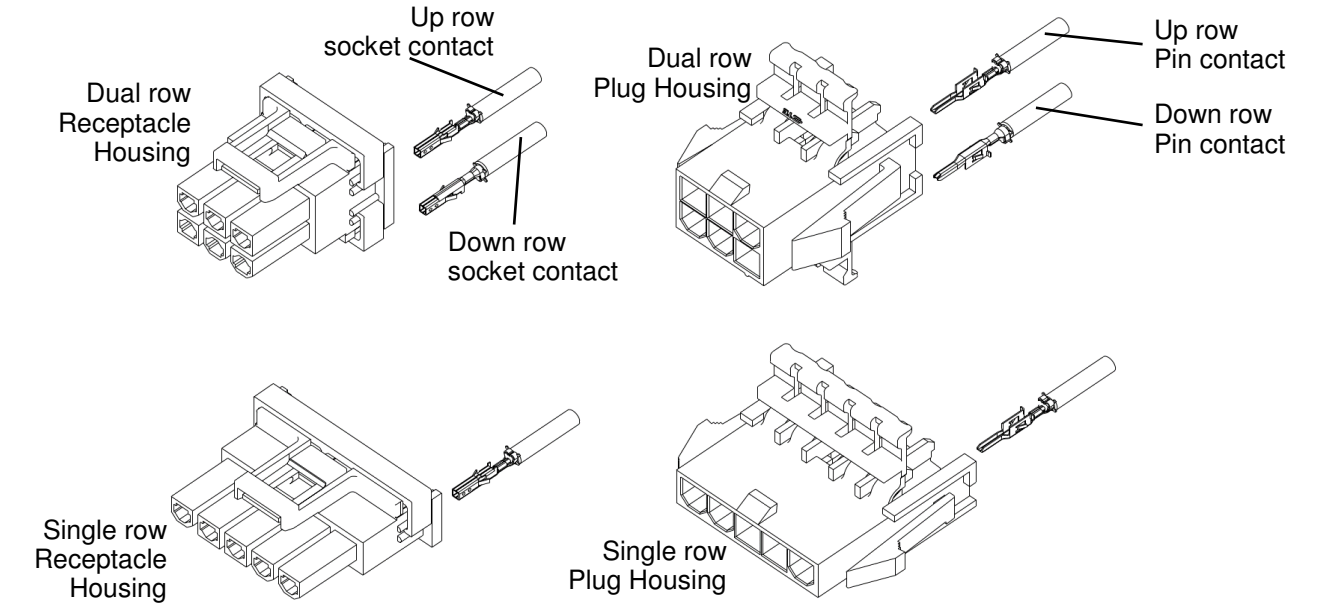


Figure 5

B. TPA Assembly

For applications requiring the use of a TPA device, TPA-compatible contacts must be employed. The TPA device will not work with standard contacts. Once all the TPA-compatible contacts have been inserted, the integrated TPA device may now be locked. There should be an audible and tactile “click” as each locking feature is individually engaged. See Figure 6.

3.8. Connector Assembly

The plug and receptacle connectors will mate according to the polarization designed in the housings. Once the connectors have been mated, the latch will secure them from becoming unmated. See Figure 7.

3.9. Wire Bend Radius

TE Engineering recommends that individual cables should be dressed to a bend radius of at least ten times the cable outside diameter. Likewise, cable bundles should be dressed to a bend radius of at least ten times the diameter of the bundle.

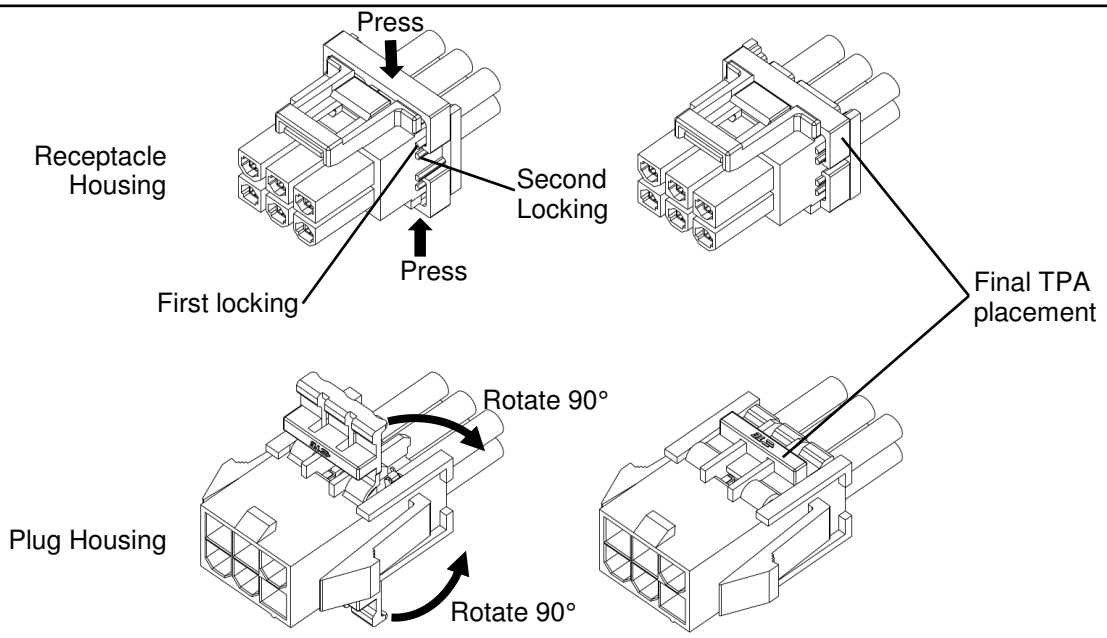


Figure 6

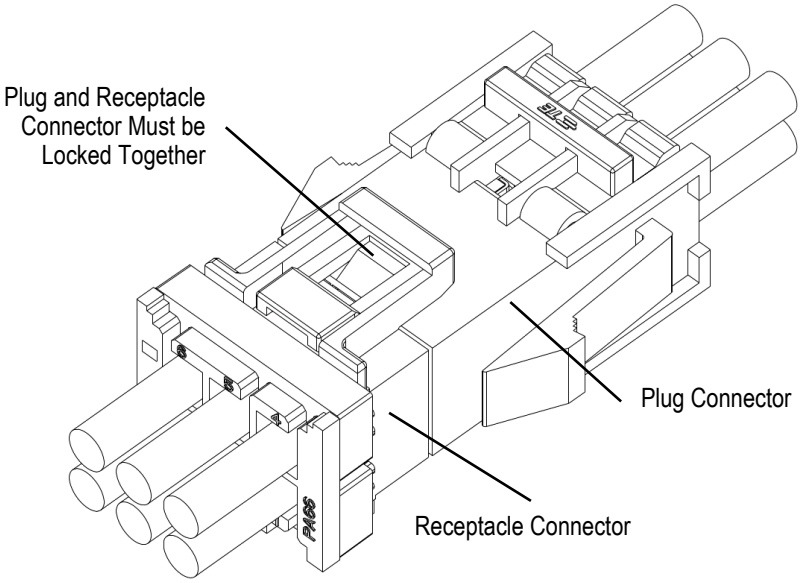
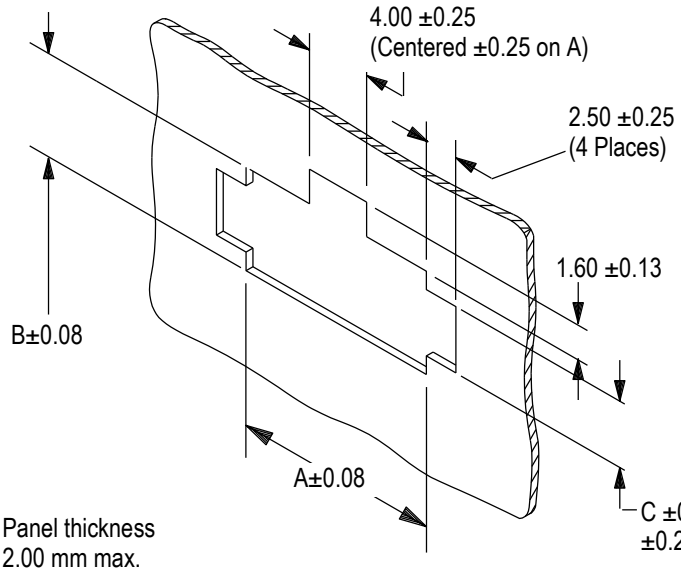


Figure 7

3.10. Panel Cutout

VAL-U-LOK Series Connector panel cutouts shall be as indicated in Figure 8. No mounting hardware is required. The plug housing features flexible mounting tabs for insertion into the panel. Push the plug connector through the panel - in the same direction as the cutout was made - until it snaps in place.



DUAL ROW

POSITIONS	A	B	C
2	9.30	10.00	5.60
4	10.00	10.00	5.60
6	14.20	10.00	5.60

SINGLE ROW

POSITIONS	A	B	C
3	14.20	5.80	3.30
4	18.40	5.80	3.30
5	22.60	5.80	3.30

NOTE: Panel thickness 2.00 mm max.

Figure 8

3.11. Polarization

The configuration of the VAL-U-LOK Series Connector mating cavities prevents accidental inversion when mating the two components.

3.12. Repair/Removal

A. Repair/Removal TPA process

Use an unlocking tool to unlock Terminal Position Assurance (TPA) from connectors, then remove individual contacts. Unlocking Tool 3-1579018-9 is used to unlock TPA (**less than two cycles**), ensure that the TPA lock feature haven't any destroy at the same time. Damaged or worn housing should be replaced provided there is sufficient slack, insert the contact into the new connector, then Lock TPA. Refer to Section 5, TOOLING.

B. Repair/Removal Contact process

Use an extraction tool to remove individual contacts from connectors for replacement or for relocation to another housing cavity. Extraction Tool 1586343-1 is used to extract contacts. Reset the locking lances to the original spread before reusing contacts. Damaged or worn contacts may be replaced provided there is sufficient slack, after rest ripping the wire, to insert the new contact into the connector. Refer to Section 5, TOOLING.

4. QUALIFICATION

4.1. Underwriters Laboratories Inc. (UL)

The VAL-U-LOK Series Connectors are Recognized by Underwriters Laboratories Inc. (UL) in File E28476.

4.2. Verband der Elektrotechnik (VDE)

The VAL-U-LOK Series Connectors are certified by VDE per IEC61984 in Certificate 40045448.

5. TOOLING

A listing of tooling recommendations covering the full wire size range is provided in Figure 16. The listing includes hand tools for manual application of loose piece contacts, and semi-automatic and automatic machines for power assisted application of strip form contacts. Modified designs and additional tooling concepts may be available to meet other application requirements. For additional information, contact one of the service groups at the bottom of page 1.

NOTE
TE Tool Engineers have designed machines for a variety of application requirements. For assistance in setting up prototype and production line equipment, contact Tool Engineering through your local TE Representative or call the Tooling Assistance Center number at the bottom of page 1.

5.1. Hand Crimping Tools

Hand crimping tools that accommodate the full wire size range are designed for prototype and low-volume applications such as repair of damaged contacts.

5.2. Applicators

Applicators are designed for the full wire size range of strip-fed, precision formed contacts, and provide for high volume, heavy duty production requirements. The applicators can be used in bench or floor model power units.

NOTE
Each applicator is shipped with a metal identification tag attached. DO NOT remove this tag or disregard the information on it. Also, a packet of associated paperwork is included in each applicator shipment. This information should be read before using the applicator; then it should be stored in a clean, dry area near the applicator for future reference. Some changes may have to be made to the applicators to run in all related power units. Contact the Tooling Assistance Center number at the bottom of page 1 for specific changes.

5.3. Power Units

A power unit is an automatic or semi-automatic device used to assist in the application of a product. Power unit includes the power source used to supply the force or power to an applicator.

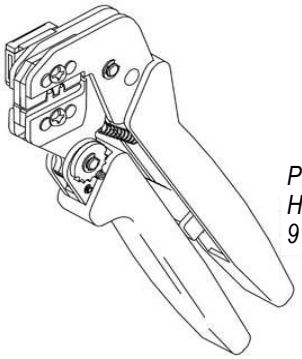
5.4. Robotic Equipment

Robotic equipment for placement of the header assemblies on a pc board must have a true position accuracy of 0.25 mm to ensure proper location and insertion of the solder tines. This includes gripper and fixture tolerances as well as equipment repeatability. It must use the assembly datum surface to ensure reliable header placement.

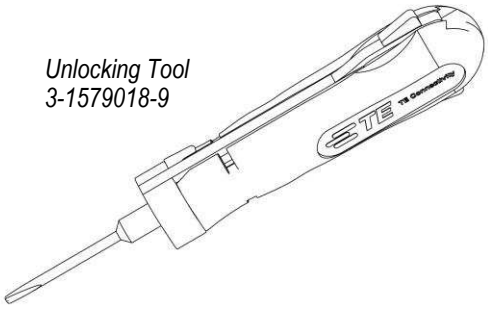
5.5. Unlocking/Extraction Tools

Unlocking Tools are designed to release TPA from the receptacle and plug connector without damaging the housing & contacts. Extraction Tools are designed to release the contacts inside the receptacle connector without damaging the housing or contacts. Refer to Paragraph 3.12 and 408-32114 & 408-160090.

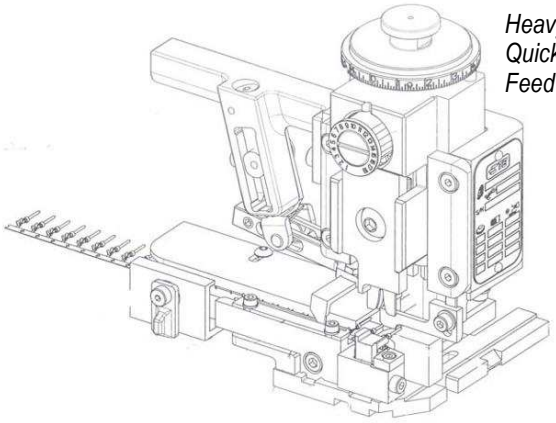
AMP-O-LECTRIC Model
"G" II Terminator
2217000-[ ]



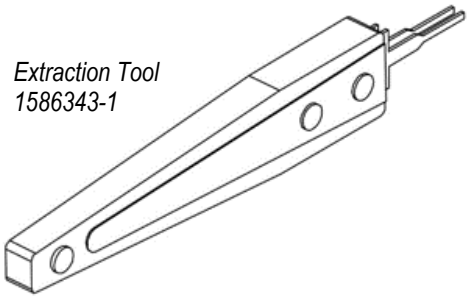
PRO-CRIMPER III
Hand Tool 91387-1,
91388-1,



Unlocking Tool
3-1579018-9



Heavy Duty Miniature
Quick-change Side-
Feed Applicator (Typ)



Extraction Tool
1586343-1

WIRE SIZE mm² (AWG)	INSULATION DIA RANGE		APPLICATION TOOLING (DOCUMENT)			
		APPLICATOR	POWER UNIT	HAND TOOL	UNLOCKING TOOL	EXTRACTION TOOL
0.13-0.30 [26-22]	1.20-1.75	2381271-[ ] (408-10389)	2217000-[ ] (409-32035)	91387-1 (408-8917)	3-1579018-9	1586343-1 (408-32114)
0.30-0.82 [22-18]	1.50-3.10	2381270-[ ] (408-10389)		91388-1 (408-8918)		

Figure 9

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.

SOCKET CONTACT SHOWN, PIN CONTACT HAS SAME REQUIREMENTS.
DUAL RECEPTACLE AND PLUG HOUSING SHOWN, SINGLE RECEPTACLE AND PLUG HOUSING HAVE SAME REQUIREMENTS.

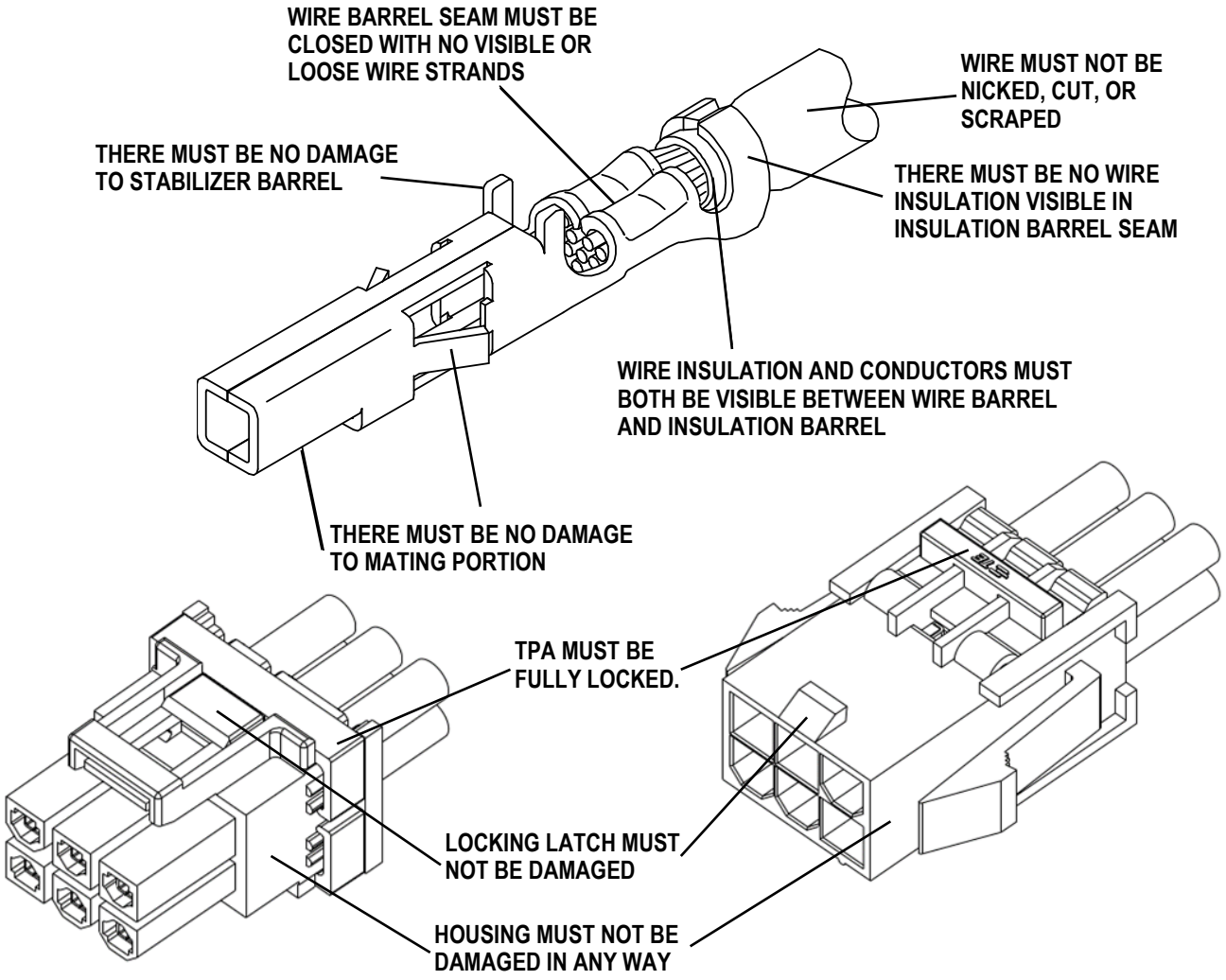


Figure 10 VISUAL AID