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 COPALUM Lite sealed aluminum terminals and standard butt splices, which are especially suited for the aerospace industry. These terminals and splices are designed to be terminated to fine stranded aluminum (AL) wire sizes 8.6 to 110.9 mm² [8 to 4/0 AWG]. The terminals are available in a variety of tongue configurations having a single hole or dual hole used for mounting the terminal to a surface. Markings on the terminals and splices indicate the accepted wire sizes and wire material (AL for aluminum). The splices have a wire barrel and insulation barrel at each end and are used for joining aluminum-to-aluminum wires.

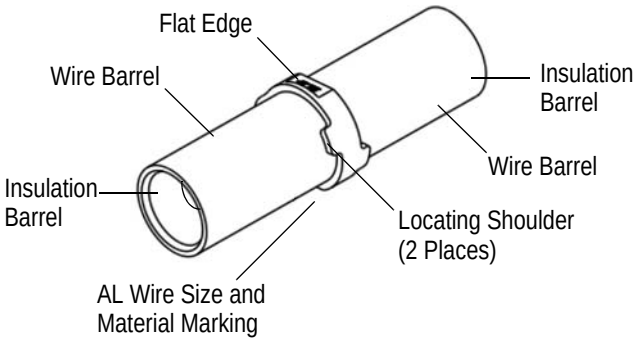
Each terminal and splice has a lead-in chamfer in the wire barrel that helps guide the wire. A perforated insert in the wire barrel creates a wiping action on the wire during crimping, removing oxides and forming a solid electrical bond between the wire and terminal or splice.

The terminal has one locating shoulder and the splice has two locating shoulders and a flat edge to denote which side of the barrel to crimp. The locating shoulders and flat edge are used to locate and align the terminal or splice in the crimp tooling.

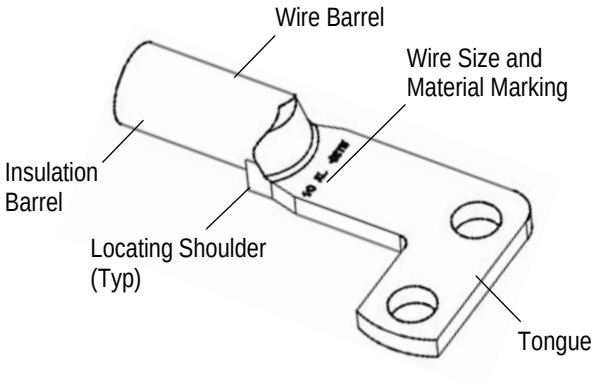
These terminals and splices are designed to be crimped with a precision die assembly and power-assisted unit, which perform a unique dry crimp that removes oxides to expose uncontaminated metal surfaces and seals the termination to prevent oxidation.

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.

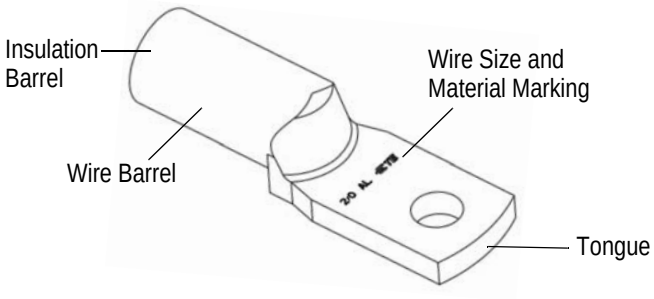
Standard Butt Splice



Dual-Hole Flag Terminal



Single-Hole Straight Terminal



Dual-Hole Straight Terminal

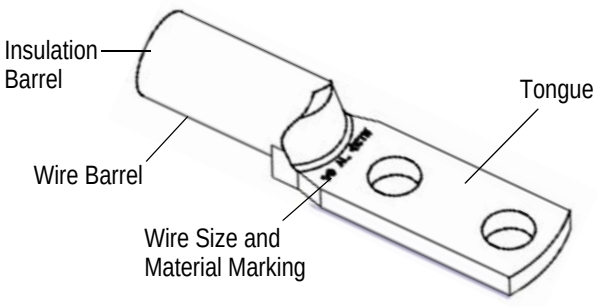


Figure 1 (Cont'd)

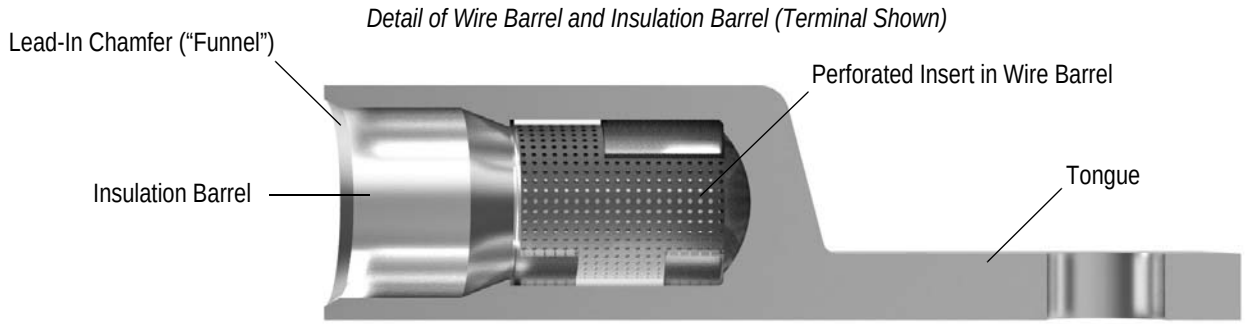


Figure 1 (End)

2. REFERENCE MATERIIAL

2.1. Revision Summary

Revisions to this application specification include:

- Updated document to corporate requirements
- Changed name of product in all instances from COPALUM to COPALUM Lite

2.2. Customer Assistance

Reference Product Base Part Numbers 2102581 and 2226015 and Product Code K879 are representative of COPALUM Lite sealed terminals and standard butt splices. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local representative or, after purchase, by calling PRODUCT INFORMATION at the number at the bottom of page 1.

2.3. Drawings

Customer Drawings for product part numbers are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any technical documentation supplied.

2.4. Publications

A publication developed by SAE International available for similar product is:

SAE AS70991, "Terminals: Lug and Splice, Crimp Style, Aluminum, For Aluminum Aircraft Wire"

2.5. 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. Documents available that pertain to this product are:

408-2453 Hydraulic Crimping Head 69066
408-7424 Checking Terminal Crimp Height or Gaging Die Closure
408-8909 Inspection and Servicing Hydraulic Crimping Heads 1752787-1 and 1752877-1
408-8914 Hydraulic Crimping Head 1752787-1
408-8956 Hydraulic Crimping Head 1752877-1
408-9535 Hydraulic Crimping Head 58422-1
408-32087 Crimping Die Assemblies and Supports for COPALUM Lite Sealed Terminals and Splices
409-1950 Heavy-Duty Electric Hydraulic Pumps 69120-1 and 69120-2
409-5860 Hydraulic Hand Pump 314979-1
409-10081 Electric Hydraulic Pumps 1804700-1 and -2

3. REQUIREMENTS

3.1. Storage

A. Ultraviolet Light

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

B. Shelf Life

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

3.2. Chemical Exposure

Do not store product near any chemical 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

3.3. Wire Selection and Preparation

A. Selection

DANGER
To avoid personal injury, DO NOT use larger or smaller aluminum wire sizes than those designated.

The terminal or splice selection must be determined by the wire size marking embossed on the terminal or splice. Those markings are also given in Figure 2.

For splices, use the same wire size (aluminum-to-aluminum) in both wire barrels.

TERMINAL OR SPLICE WIRE SIZE MARKING
4/0 AL
3/0 AL
2/0 AL
1/0 AL
2 AL
4 AL
6 AL
8 AL

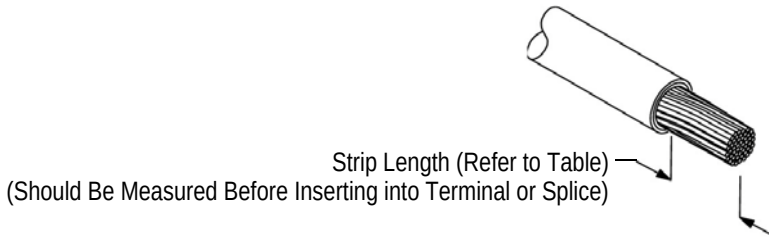
Figure 2

B. Preparation

The wire strip length depends on the wire size and type of insulation.Strip length for wire with tape-wrap insulation and extruded insulation is given in Figure 3.

NOTE
After cutting, the wire may no longer be circular in shape and/or have a burr or raised edge. With the insulation still in place, the wire end can be formed into a circular shape and slightly chamfered using an external countersink deburr tool. TE recommends NOGA NG3500 (OD range of 8 to 28 mm) and NG1700 (OD range of 4 to 18 mm) for the range of wire sizes. After stripping, the brush end of the wire may require that the conductor strands be put back in place depending on the stripping tool used.

CAUTION
Nicked or missing aluminum conductor strands must not be allowed when the insulation is stripped from the wire. TE recommends that a laser stripper be used to guarantee no nicked conductor strands.



WIRE SIZE			WIRE STRIP LENGTH (±1.57 mm [.062 in.])	
mm^2	AWG	CMA	TAPE-WRAP INSULATION (Less Than 20 Mils Thick)	EXTRUDED INSULATION (Greater Than 30 Mils Thick)
8.60	8	15526-16564	12.70 [.500]	12.70 [.500]
14.60	6	26818-28281		
21.90	4	42143-43229	16.51 [.650]	16.51 [.650]
35.00	2	65130-67874	20.32 [.800]	20.32 [.800]
55.50	1/0	104450-107464		
71.30	2/0	134292-138168		
87.20	3/0	168872-172512		
110.94	4/0	201438-214928		

Figure 3

C. Sealing (Inner Moisture Sleeve)

Wire with tape-wrap insulation and/or insulation thickness less than 20 mils require an insulation build-up sleeve (inner moisture sleeve) in order to meet specific test requirements for hydrostatic pressure and/or air pressure. Applying a heat shrink sleeve to the wire will accomplish this seal.

CAUTION
TE engineering should be contacted prior to use to validate the chosen wire type and construction for sealing depending on the chosen performance requirements.

Recommended heat shrink sleeves are: AMS-DTL-23053/4 and /12 (Class 2), and /8 and /18 (Class 1).

NOTE
Manufacturer's suggested guidelines must be followed when applying a specific heat shrink sleeve prior to crimping.

The heat shrink sleeve must be cut to length according to the wire size being used. Recommended sizes and cut lengths are given in Figure 4. The applied heat shrink sleeve must have the following requirements:

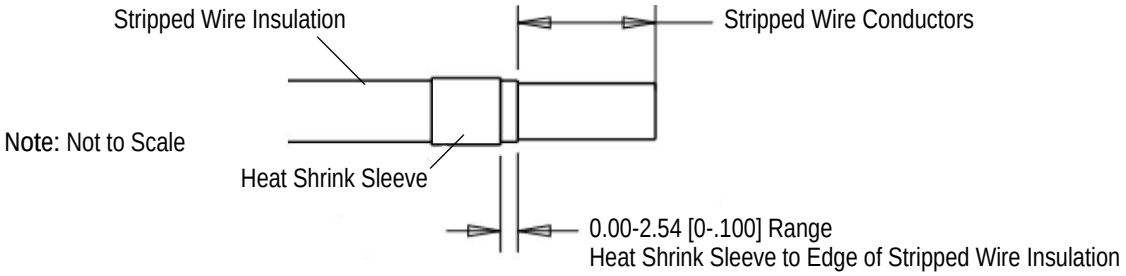
— must be located from the edge of the stripped wire insulation within the dimensions given in Figure 4

— can protrude out from the end of the crimped terminal or splice by a maximum of 6.4 [.25]

— is allowed to bulge at the end of the crimped terminal or splice; however, it must not be pushed back or bunched to a point where it is no longer inside of the crimped terminal or exceeds the maximum protrusion

— the wire insulation may buckle or bulge beyond the applied sleeve (this will depend on the wire insulation type and thickness of heat shrink sleeving)

CAUTION
This is acceptable only if the wire insulation and the applied sleeve are not cracked, split, or damaged.



WIRE SIZE (AWG)	HEAT SHRINK SLEEVE	
	RECOMMENDED SIZE (Supplied Diameter) mm [in.]	CUT LENGTH ±1.6 mm [.063 in.]
8	6.35 [.25]	9.52 [.375]
6	9.52 [.375]	
4	12.7 [.50]	
2	12.7 [.50]	12.7 [.500]
1/0	19.05 [.75]	
2/0	19.05 [.75]	15.88 [.625]
3/0	25.4 [1.00]	19.05 [.750]
4/0	25.4 [1.00]	

Figure 4

3.4. Crimp Criteria

The properly stripped wire should be fully inserted into the terminal or splice until the wire brush end bottoms. The integrated lead-in chamfer (funnel) inside the wire entry area of the terminal or splice will help guide the conductor into the wire barrel, thus eliminating stubbing of wire (refer to Figure 1).

CAUTION
The wire must avoid being moved after it is inserted. The wire should not be rotated or pulled out after it is fully inserted. This could lead to an improperly terminated wire.

The terminal or splice must be properly placed in the die assembly to achieve a quality crimp. Placement is described in the appropriate die assembly instruction sheet. The crimp applied to the terminal or splice is accomplished in three stages in a single-crimp cycle/operation. The three stages are (1) primary, (2) transition, and (3) seal, as shown in Figure 5.

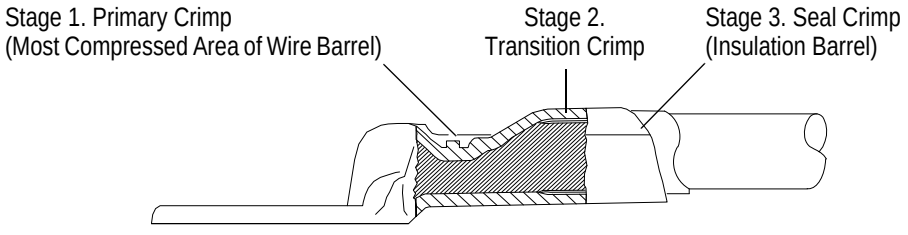


Figure 5

A. Inner Moisture Sleeve (If Used)

If used, the applied inner moisture sleeve should not protrude beyond 6.4 [.25] from the end of the crimped terminal or splice as shown in Figure 6.

The wire insulation should be inside the crimped insulation barrel. No exposed conductor should be visible after the terminal or splice is applied to the wire.

B. Crimp Inspection Mark

The crimp inspection mark (created by the die assembly) on the terminal or splice can be used as a visual indicator of an acceptable termination, but it does not indicate that the crimp is not acceptable. If the crimp inspection mark is centered in the crimp area and is evenly and distinctly formed, the crimp is considered properly applied; however, if it is not, and the following requirements are met, the crimp can be considered acceptable. Refer to Figure 6.

— the proper terminal or splice and die assembly combination according to the wire size was used

— the die assembly conforms to a gage inspection

— the dies fully bottom during the crimping cycle

— the wire is bottom in the terminal or splice wire barrel

— the crimped terminal or splice meets the crimp height, location, straightness, and appearance requirements given in this specification

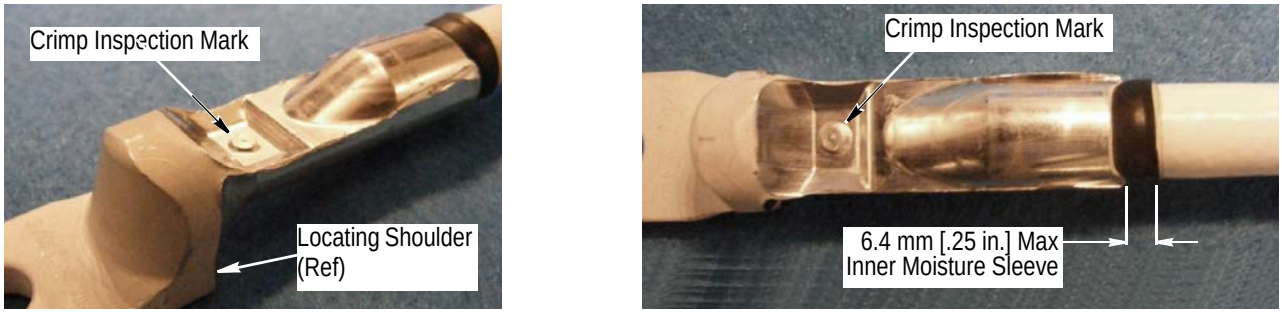


Figure 6

NOTE
Gage inspection and proper die assembly with support tooling setup per terminal or splice part number is described in the instruction sheet for the die assembly.

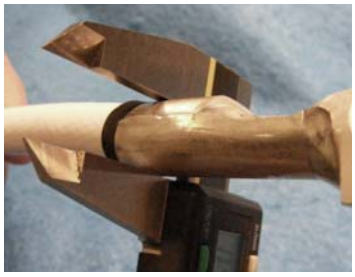
C. Crimp Height

The wire barrel crimp height and insulation barrel crimp height must meet the dimensions given in Figure 7.

NOTE
The crimp heights must be measured in the locations shown in Figure 7 using a drop gage or micrometer (shown) with the appropriate anvil tips (flat and point used together) or dial calipers (shown). The terminal or splice must be kept from rotating while taking measurements, and only light pressure should be applied to avoid scratching or gouging the wire barrel.

Wire Barrel Crimp Height Measurement

Insulation Barrel Crimp Height Measurement



WIRE SIZE (AWG)	CRIMP HEIGHT (mm [in.])	
	WIRE BARREL +0.03/-0.10 [+.001/-.004]	INSULATION BARREL ±0.20 [±.008]
8	3.00 [.118]	6.45 [.254]
6	3.33 [.131]	7.72 [.304]
4	4.06 [.160]	9.40 [.370]
2	5.13 [.202]	11.58 [.456]

WIRE SIZE (AWG)	CRIMP HEIGHT (mm [in.])	
	WIRE BARREL +0.03/-0.10 [+.001/-.004]	INSULATION BARREL ±0.20 [±.008]
1/0	6.32 [.249]	14.02 [.552]
2/0	8.05 [.317]	15.24 [.600]
3/0	7.65 [.301]	16.41 [.646]
4/0	9.68 [.381]	16.41 [.646]

Figure 7

D. Crimp Location

The distance between the locating shoulder of the terminal or splice and the crimp formation must be no more than the dimension given in Figure 8.

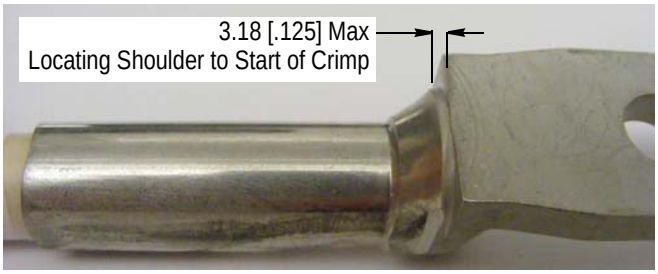


Figure 8

NOTE
If the crimp location is not correct, make sure that the terminal or splice was properly placed in the die assembly—the terminal or locating shoulder must align with and rests on the nest.

E. Straightness (For Terminals and Splices Having Wire Sizes 2 through 4/0 AWG Only)

When the support tooling is in place as described in the die assembly instruction sheet, the crimped terminal or splice must be within ±5 degrees of straightness measured in two places: (1) at the wire barrel and (2) at the wire exiting the terminal or splice. Both measurements must use the tongue as the datum for the terminal (shown in Figure 9) and the center portion (flat edge, indicated in Figure 1) as the datum for the splice.

NOTE
If straightness is not correct, make sure that the support tooling is not damaged or worn, and that the support tooling is attached to the die assembly as described in the specific die assembly instruction sheet.

Note: Not to Scale

Straightness (Terminal Shown)

Figure 9

F. Flash

Flash may be evident along the edges of the crimped terminal or splice. Flash edges should be removed.

DANGER
Avoid personal injury; flash edges may be sharp.

CAUTION
When removing flash edges, it is important that no more material than intended be removed and to avoid imparting damage to the terminal or splice.

G. Crimp Appearance

There should be no cracks, gouges, or peeling finish after the terminal or splice is applied to wire. If a defect is evident, the crimped terminals and splices should be inspected under 5X or 10X magnification.

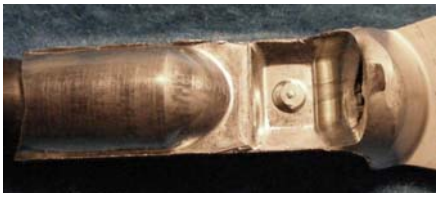
NOTE
Due to the nature of the finish, burnish marks could be mistaken for scratches. Burnish marks or scratches without a raised edge or noticeable depth that can be felt with the finger tip or finger nail are acceptable.

H. Unacceptable Crimp

Unacceptable crimp forms with a possible root cause are provided in Figure 10.

Unacceptable Crimp Forms

Upside-Down Crimp
Difficulty producing with support tooling in place.
Terminal or splice was placed upside-down in die assembly.
The locating shoulder was not aligned with scribe mark on nest.
Could result in damaged tooling.



Over Inserted Crimp
Terminal or splice locating shoulder was not resting on face of die assembly nest, but was inserted into crimp tooling.
Could result in damaged tooling.

Under Inserted Terminal (Side View)
Terminal or splice locating shoulder not resting against face of die assembly nest.

Rotated Crimp
Terminal or splice rotated during crimping and locating shoulder was not aligned with scribe mark on die assembly nest.

Under Inserted Terminal (Top View)
Terminal or splice locating shoulder was not resting against face of die assembly nest.

Wire Not Bottomed in Terminal or Splice Wire Barrel
Crimp Inspection mark is deformed and inner moisture sleeve length is more than 6.35 [.250]

Backwards Crimp
Terminal or splice locating shoulder was aligned with opposing face of die assembly nest and opposite side of die assembly anvil.
Could result in damaged tooling.

Figure 10

3.5. Strain Relief

A properly inserted wire will have a portion of the insulation inside the insulation barrel of the terminal or splice. When the terminal or splice is crimped, the end of the insulation barrel will form around the insulation to seal and provide strain relief for the terminated wire.

3.6. Mounting Hardware

The fasteners used to secure the terminals to a surface must be in accordance with the user's specification.

3.7. Mating and Alignment

Terminals and splices must not be mated to incompatible, dissimilar metals without appropriate interface treatment.

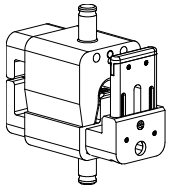
4. QUALIFICATIONS

No outside agency qualifying support was defined at the time of publication of this specification.

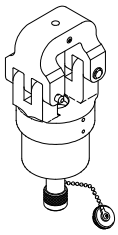
5. TOOLING

These terminals and splices are designed to be terminated using die assembly crimping heads, and hydraulic power units indicated in Figure 11.

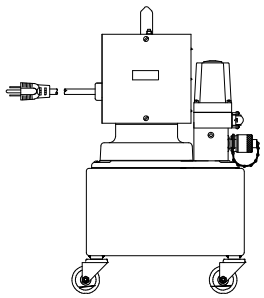
The die assembly and crimping head must be chosen by the wire size and product type. Hydraulic power can be provided by either an electric hydraulic pump or hydraulic pump.



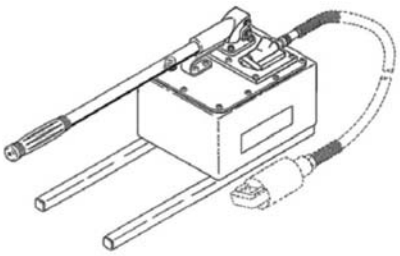
Crimping Die Assemblies and Supports for COPALUM Lite Sealed Terminals and Splices (See Table) (408-32087)



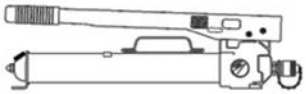
Hydraulic Crimping Heads 69066 (408-2453), 1752787-1 (408-8914), 1752877-1 (408-8956), or 58422-1 (408-9535)



Heavy-Duty Electric Hydraulic Pumps 69120-1 and 69120-2 (409-1950), 1804700-1 and -2 (409-10081)



Hydraulic Hand Pump 314979-1 (409-5860)



Hydraulic Hand Pump 1583661-1 (No Document Available)

Hydraulic Foot Pump 1583659-1 (No Document Available)

WIRE SIZE			TOOLING		
mm^2	AWG	CMA	DIE ASSEMBLY	CRIMPING HEAD	POWER UNIT
8.60	8	15526-16564	68006-3	58422-1 69066 1752787-1 1752877-1	1804700-1, -2
14.60	6	26818-28281	68007-3		
21.90	4	42143-43229	68008-3		
35.00	2	65130-67874	68009-3		
55.50	1/0	104450-107464	68010-3		
71.30	2/0	134292-138168	68011-3		69120-1, -2 314979-1 1583661-1 1583659-1
87.20	3/0	168872-172512	59877-3		
110.94	4/0	201438-214928	314948-3		

Figure 11

6. VISUAL AID

The illustration below shows a typical application of COPALUM Lite sealed terminals and splices. 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.

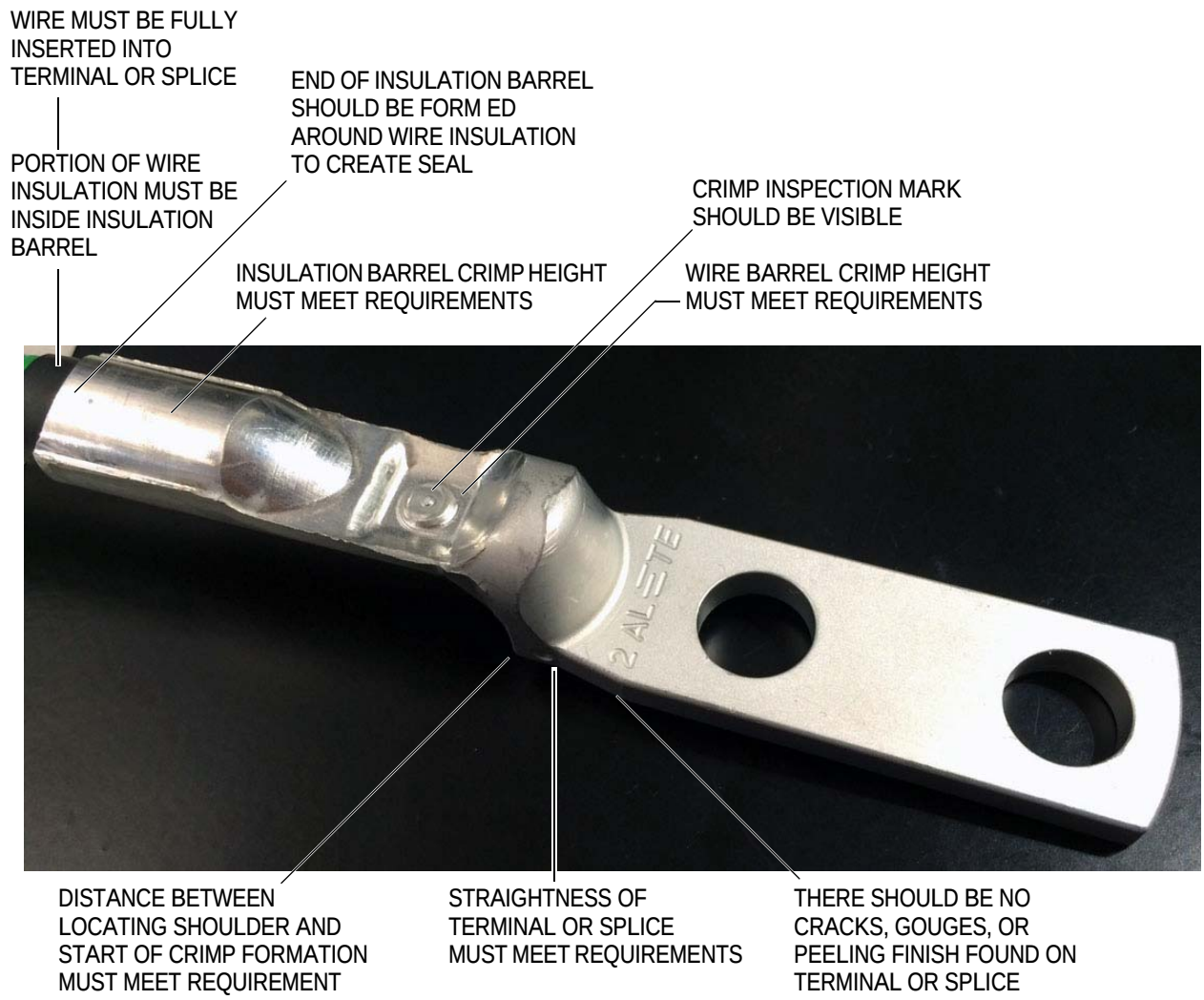


FIGURE 12. VISUAL AID