APPLICATION SPECIFICATION

MX64 SAE GRIP RECEPTACLE TERMINAL

1.0 SCOPE

This specification details the crimping information and common practices for general crimps for the MX64 SAE Grip Receptacle Terminal. Please refer to sales drawing, SD-33468-001, for additional part information. The information in this document is for reference and benchmark purposes only. The user is responsible for validating crimp performance based on tooling, equipment and wire that is being used.

All measurements are in millimeters unless otherwise specified.

Terminals shown in this document are generic representations.

2.0 PRODUCT DESCRIPTION
DEFINITION OF TERMS:

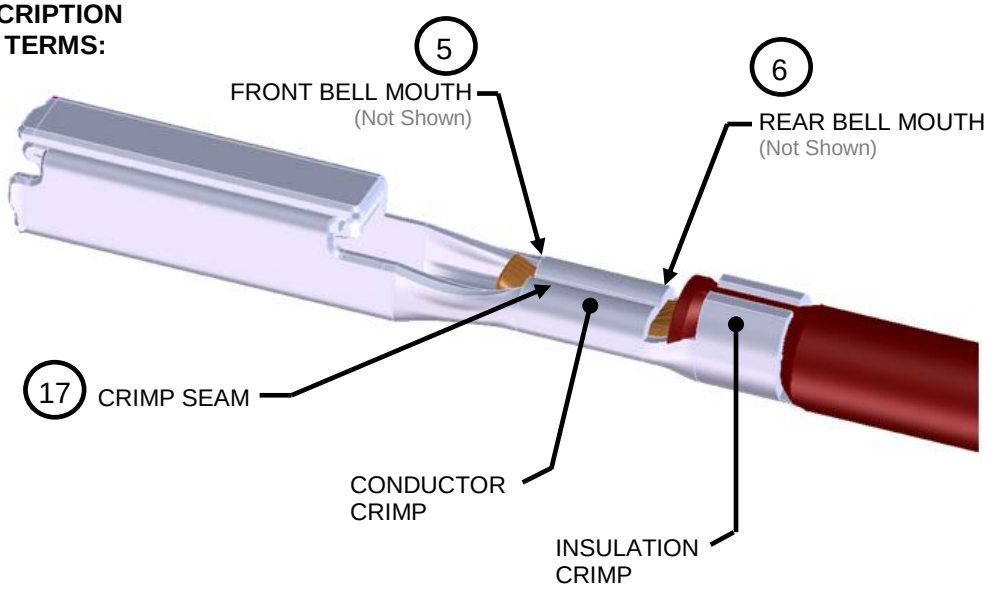


FIGURE 1

DEFINITIONS OF TERMS (CONT.):

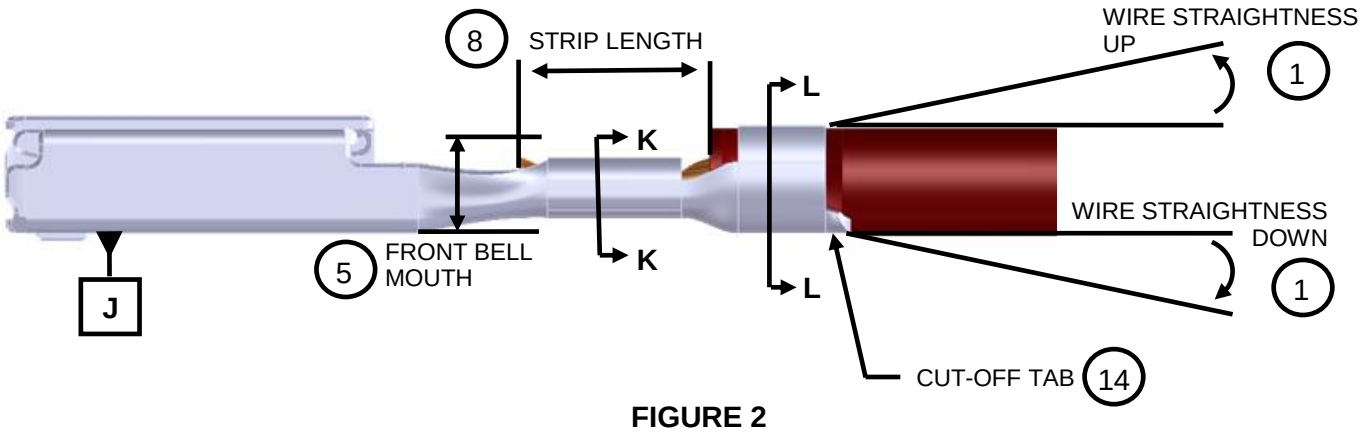


FIGURE 2

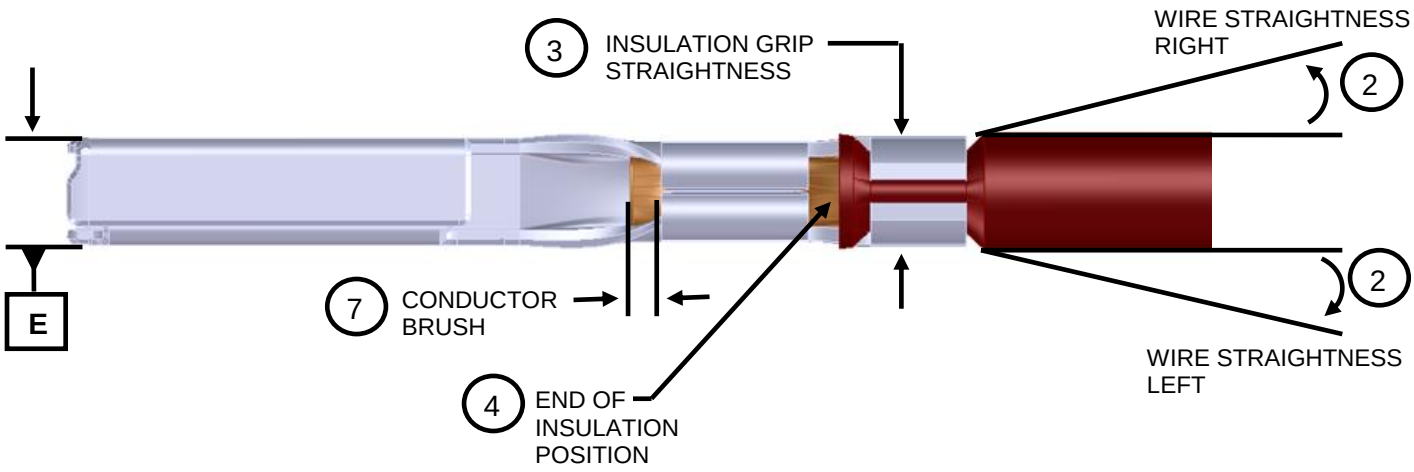


FIGURE 3

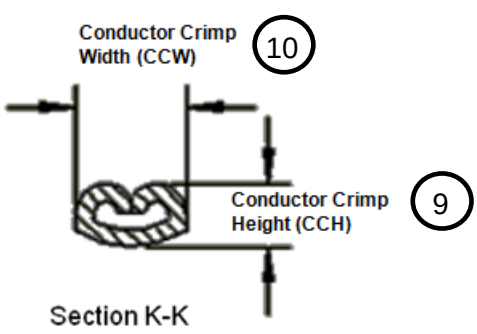


FIGURE 4

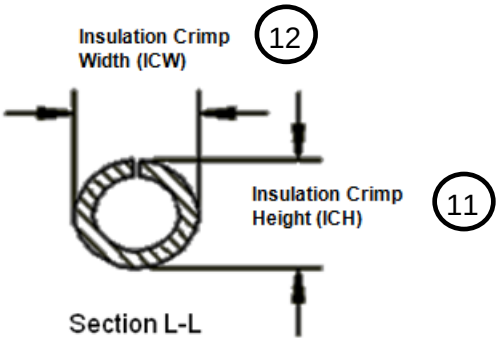


FIGURE 5

CONDUCTOR CRIMP

This is the metallurgical compression of a terminal around the wire's conductor. This connection creates a common electrical path with low resistance and high current carrying capabilities.

END OF INSULATION ④

This is the location where the wire insulation is in relation to the terminal transition area between the conductor and insulation crimps. The conductor strands and insulation jacket must be displaced evenly and visible in the transition area. This position ensures that the insulation is not crimped within the conductor grip. This position can be controlled by the wire stop and/or the wire strip length in bench applications. For automatic wire processing the insulation position is set by the in/out press on the applicator. See Figure 3.

BELLMOUTH (FLARE) ⑤⑥

The flare that is formed on the edge of the conductor crimp acts as a funnel for the wire strands. This flare reduces the possibility that a sharp edge on the conductor crimp will cut or nick the wire strands. For the MX64 SAE Grip terminal a rear bell mouth is required on the conductor crimp while a front bell mouth is optional. Caution: Excessively large bell mouths will reduce the crimp area which therefore reduces conductor pull forces.

Bell mouth too large
Reduced Crimp Area, Lower Pull Forces

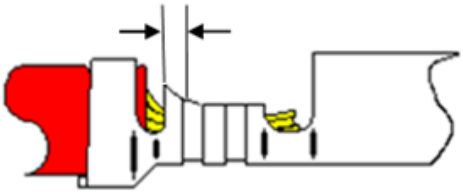


FIGURE 6 - Bad Crimp

Bell Mouth per specification

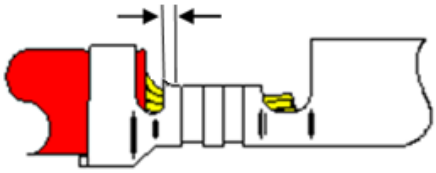


FIGURE 7- Good Crimp

CONDUCTOR BRUSH ⑦

The conductor brush is made up of the wire strands that extend past the conductor crimp into the transition area towards the terminal box. This helps ensure the mechanical compressions occur over the full length of the conductor crimp. The conductor brush should not extend past the transition area into the terminal box.

EXCESSIVE CONDUCTOR BRUSH

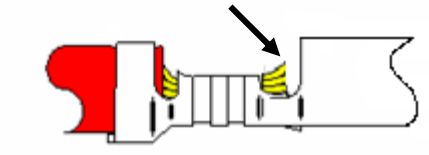


FIGURE 8 - Bad Crimp

CONDUCTOR BRUSH FLUSH OR BELOW CRIMP

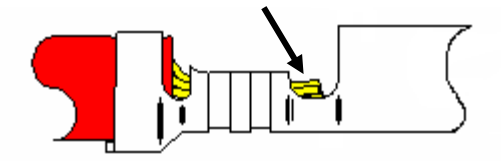


FIGURE 9 - Good Crimp

For the MX64 SAE Grip Receptacle Terminal, the conductor brush must be visible past the conductor crimp but must not exceed 0.55mm and, depending on where the brush ends, it must be below the conductor crimp height or below the transition wall (whichever is taller). See Figure 10 for an example of brush height boundary. [Caution: Excessive brush that extends above the crimp height/transition wall can cause terminal retention issues inside the plastic cavity and can potentially tear mat seals]. See Figure 3.

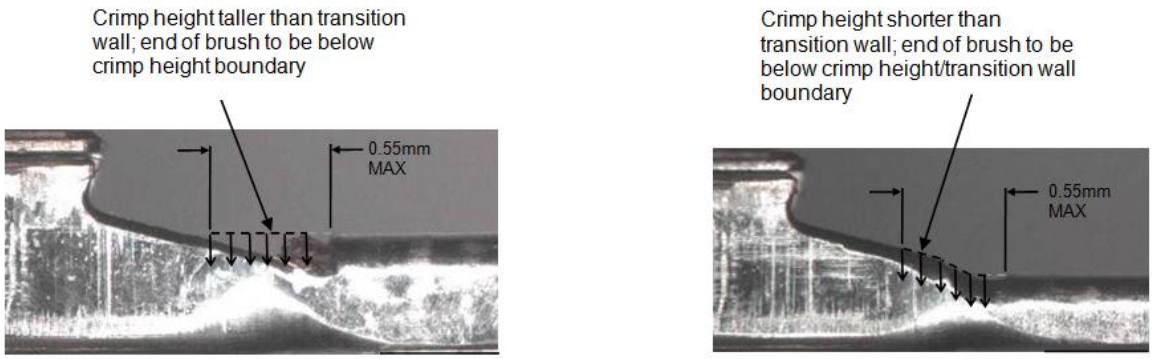


Figure 10

STRIP LENGTH (8)

The strip length is determined by measuring the exposed conductor strands after the insulation is removed. The strip length in conjunction with the end-of-insulation position will affect how much the brush length extends past the conductor crimp.

CONDUCTOR CRIMP HEIGHT (9)

The conductor crimp height is measured from the top surface of the formed crimp to the bottom most radial surface. Do not include the extrusion points in this measurement. Measuring the crimp height is a quick, non-destructive way to help ensure the metallurgical compression of the terminal around the wire's conductor is correct and it is an excellent attribute for process control. The crimp heights specified in this document are set specifically for an explicit type of wire to promote its electrical and mechanical performances.
See Table 2 for crimp height specifications.

INSULATION CRIMP HEIGHT (11)

Insulation crimp heights are specified in Section 3.0, Table 2. The MX64 SAE Grip Receptacle terminals are designed to accommodate multiple wire sizes. Even though the insulation grip may completely surround a smaller wire and only partially surround a larger wire, an acceptable insulation crimp is still provided.

The insulation crimp should be visually evaluated to confirm it provides an adequate compression on the wire. It should also be evaluated by sectioning through the center of the crimped insulation grip. The grip should compress the wire, but not damage the integrity of the insulation (some skiving is permissible). The grip should not contact the conductors under any circumstance.

Once the optimum setting for the application is determined it is important for the operator to check and document the insulation crimp height.

EXTRUSIONS (ANVIL FLASH) (13)

These are the burrs that form on the bottom of the conductor crimp resulting from the clearance between the punch and anvil tooling in the crimp applicator. Excessive extrusion will also occur when the anvil is worn or the terminal is over-crimped. An uneven extrusion may also result if the punch and anvil are misaligned, if the feed is misadjusted or if there is insufficient and excessive terminal drag. The cross section should be examined for any resulting cracks in the material. Cracks can undermine the integrity of the crimp and are not allowed under any circumstance. Caution: Anvil flash has the potential to cut mat-seals and should be maintained within specifications. See Section 3.0, Table 3 for anvil flash specifications.

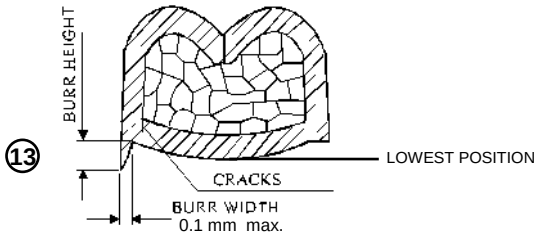


FIGURE 11

CUT-OFF TAB LENGTH (14)

This is the material that protrudes outside the insulation crimp after the terminal is separated from the carrier strip. A cut-off tab that is too long may expose a terminal outside the housing and it may fail the electrical spacing requirements. See Section 3.0, Table 3 for cut-off tab length specifications. Caution: Burrs on the cut-off tab are not allowed as they have the potential to cut mat-seals.

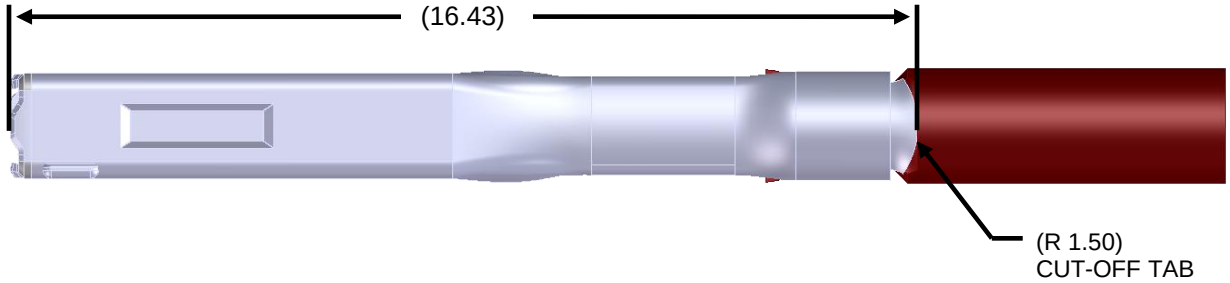


FIGURE 12

CRIMP BULGE (18)

Caution needs to be taken with the crimp tooling to prevent any bulging between the terminal box and the conductor crimp exceeding the box width at the maximum material condition (MMC). The transition from the conductor grip to the box should flow smoothly with no bulging. If any bulging shall occur between the conductor grip and the terminal box it must not exceed the MMC width of 1.95mm.

Any bulging between the conductor crimp and insulation must not exceed the insulations maximum allowable width of 2.05mm. See Figures 13 and 14 below.

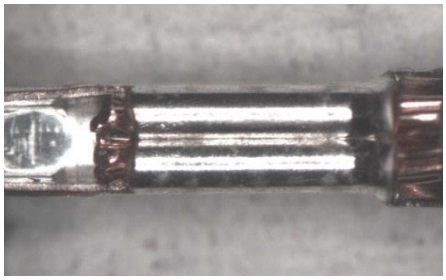


FIGURE 13 - NO BULGE

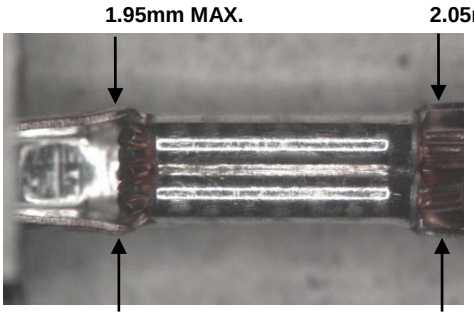


FIGURE 14 - WITH BULGE

GRIP STEP

This is the designed offset between the terminal box and the conductor or insulation grip. The grip step should not be altered during the crimping operation. See section 3.0, Table 3 for grip step specifications.

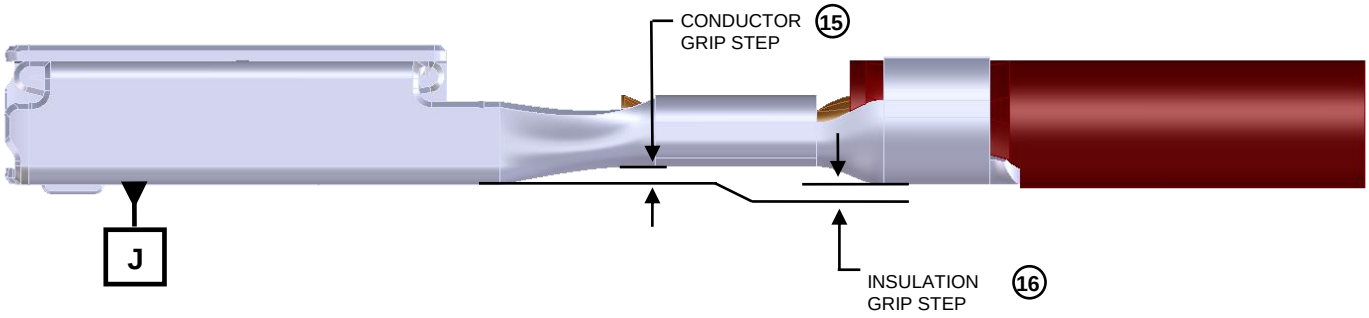


FIGURE 15

WIRE CONDITION AFTER CRIMP

The wire, after crimping, should not have any scratches, grooves or dents. Such imperfections act as a leak path at the junction between the wire and the mat-seal. At a minimum, check the condition of the wire on a sample length of 22mm as shown in Figure 16.

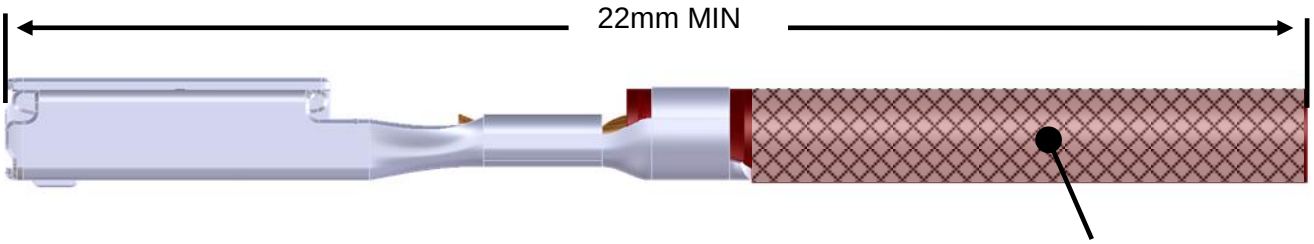


FIGURE 16

3.0 PRODUCT SPECIFICATIONS

Table 1

Terminal Order No.		Grip Size	Grip Code	Wire Size (SAE)	Insulation Diameter Range (mm)
Right Payoff "B" Wind	Left Payoff "D" Wind				
33468-0001 33467-0003 34736-2001	33468-0002 33467-0004 34736-1001	Small	A	22AWG	1.47 - 1.65
33468-0003 33467-0005 34736-2002	33468-0004 33467-0006 34736-1002	Large	B	18/20 AWG	1.70 – 2.06

Table 2

Terminal Order No.		Validated Wire				Conductor Barrel		Insulation Barrel		Pull out Force (N) MIN.
Right Payoff "B" Wind	Left Payoff "D" Wind	Size	Type	No. of Strands	Insulation Max OD (mm)	CCH ±0.05 (9)	CCW ±0.05 (10)	ICH† ±0.10 (11)	ICW† ±0.10 (12)	
33468-0001 33467-0003 34736-2001	33468-0002 33467-0004 34736-1001	22 AWG	TXL	7	1.65	0.95	1.45	1.60	1.80	50
33468-0003 33467-0005	33468-0004 33467-0006	20 AWG	TXL	7	1.85	1.10	1.80	1.95	1.95	75
		18 AWG	TXL	19	2.06	1.15	1.80	2.10	1.95	90
34736-2002	34736-1002	18 AWG	TXL	19	2.06	1.05	1.80	2.10	1.95	90

The above specifications are guidelines for an optimum crimp. Crimp heights/widths are applicable for punch/anvil tooling shown in Figures 19 – 22.

Customers are required to complete their own validation testing if tooling and/or wire is different than what is shown in this specification.

Terminal crimps were validated to following specifications:
USCAR-21

Wires are in accordance to the following:
ESB-MIL123-A
SAE J1128 · TXL type

†Values indicated below are the maximum size permitted for MX64 SAE terminals crimped to wires other than those shown in Table 2 above:
ICH Max = 2.20mm, ICW Max= 2.05mm

Mating (Blade/Pin) shall conform to EWCAP-001 Rev. B
Receptacle crimped lead must be used with matching plating type on male terminal.

Pull force should be measured with no influence from the insulation crimp.

For hand crimpers and application tooling see Supplier Applicator Tooling Table in Section 9.

Table 3

Specifications			
Balloon #	Description	Requirement	
1	Wire Straightness	Up	3° MAX
		Down	
2		Left	
		Right	
3	Insulation Grip Straightness	⌖ 0.10 Ⓜ J E	
5	Front Bell Mouth	Not required. If present, height from datum [-J-] must not exceed 1.75	
6	Rear Bell Mouth	0.3 – 0.5	
7	Conductor Brush	Visible to 0.55 MAX Not to extend above conductor crimp/transition height	
8	Wire Strip Length	(4.2)	
9	Conductor Crimp Height	See Table 2	
10	Conductor Crimp Width	See Table 2	
11	Insulation Crimp Height	See Table 2	
12	Insulation Crimp Width	See Table 2	
13	Conductor Anvil Flash	Burr Height	Not to extend below lowest point on conductor crimp
		Burr Width	0.1 MAX
14	Cut-off Tab Length	0.50 MAX No burrs allowed	
15	Conductor Grip Step	0.30 ± 0.10	
16	Insulation Grip Step		
17	Crimp Seam	Seam shall not be open and no wire is allowed out of the crimping area	
18	Crimp Bulge	In transition from terminal box to conductor grip	1.95 MAX
		In transition from conductor to insulation grip	2.05 MAX
19	Checking Aid	Crimped lead must be able to pass freely through checking aid Shown in Section 8.0, Figure 24	

4.0 REFERENCE DOCUMENTS

Reference documentation for general practices are located on the website per the below links:

1. Molex Quality Crimping Handbook http://www.molex.com/images/products/apptool/qual_crimp.pdf
2. Molex-Recognizing Good Crimps http://www.molex.com, search for Application Tooling
   - Reference Tech Library for Good Crimps

5.0 PROCEDURE

5.1 GENERAL MEASUREMENT AND EVALUATION REQUIREMENTS

Crimp Height Measurement (Extrusion Evaluation)

1. Complete tool set-up procedure.
2. Crimp a minimum of 5 samples.
3. Place the flat blade of the crimp micrometer (Figure 17) across the center of the dual radii of the conductor crimp. Do not take the measurement near the conductor bell mouth.
4. Rotate the micrometer dial until the point contacts the bottom most radial surface. If using a caliper, be certain not to measure the extrusion points (anvil flash) of the crimp.
5. To check for extrusion (anvil flash) use the caliper (Figure 18) to measure the crimp height. If the caliper measurement is greater than the crimp micrometer measurement the extrusion is not acceptable.

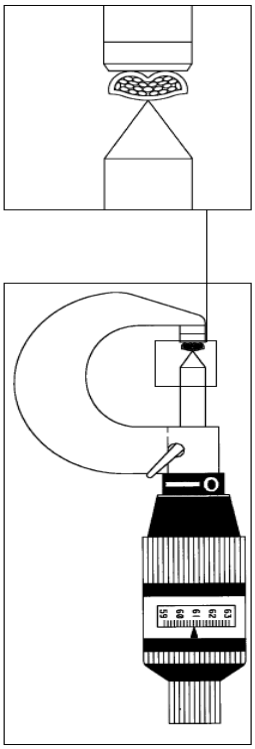


Figure 17

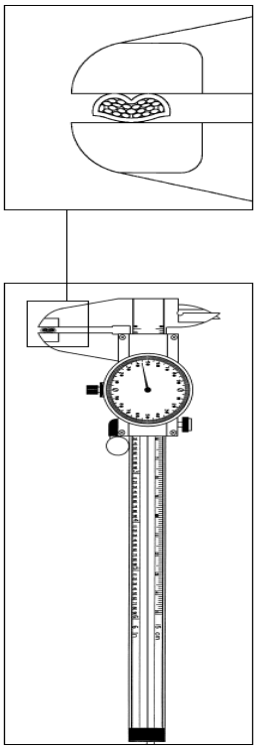
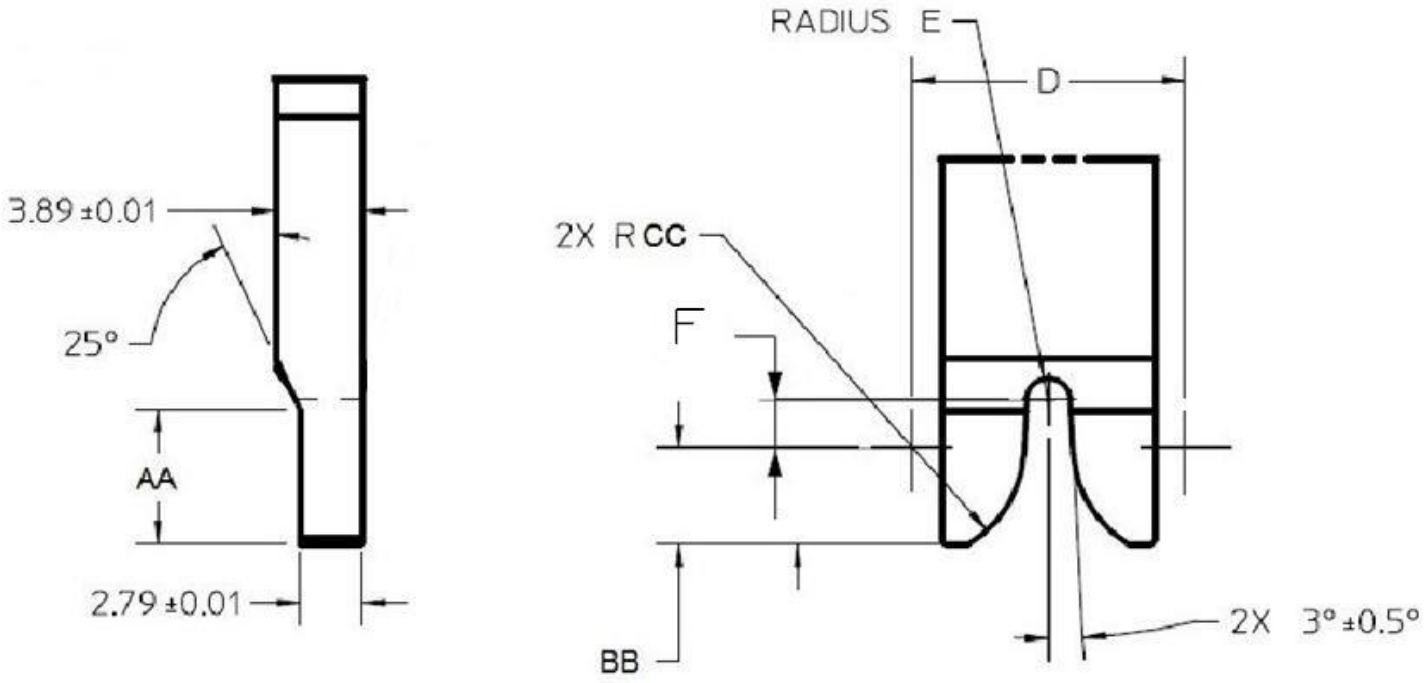


Figure 18

6.0 CRIMP TOOLING GEOMETRY

The crimp tooling information shown below is based on the tooling that Molex used to perform USCAR-21 (Crimp performance) and to establish recommended crimp height and widths. Based on the guidelines of USCAR-21 the user is responsible for validating crimp performance based on tooling, equipment and wire that is being used.

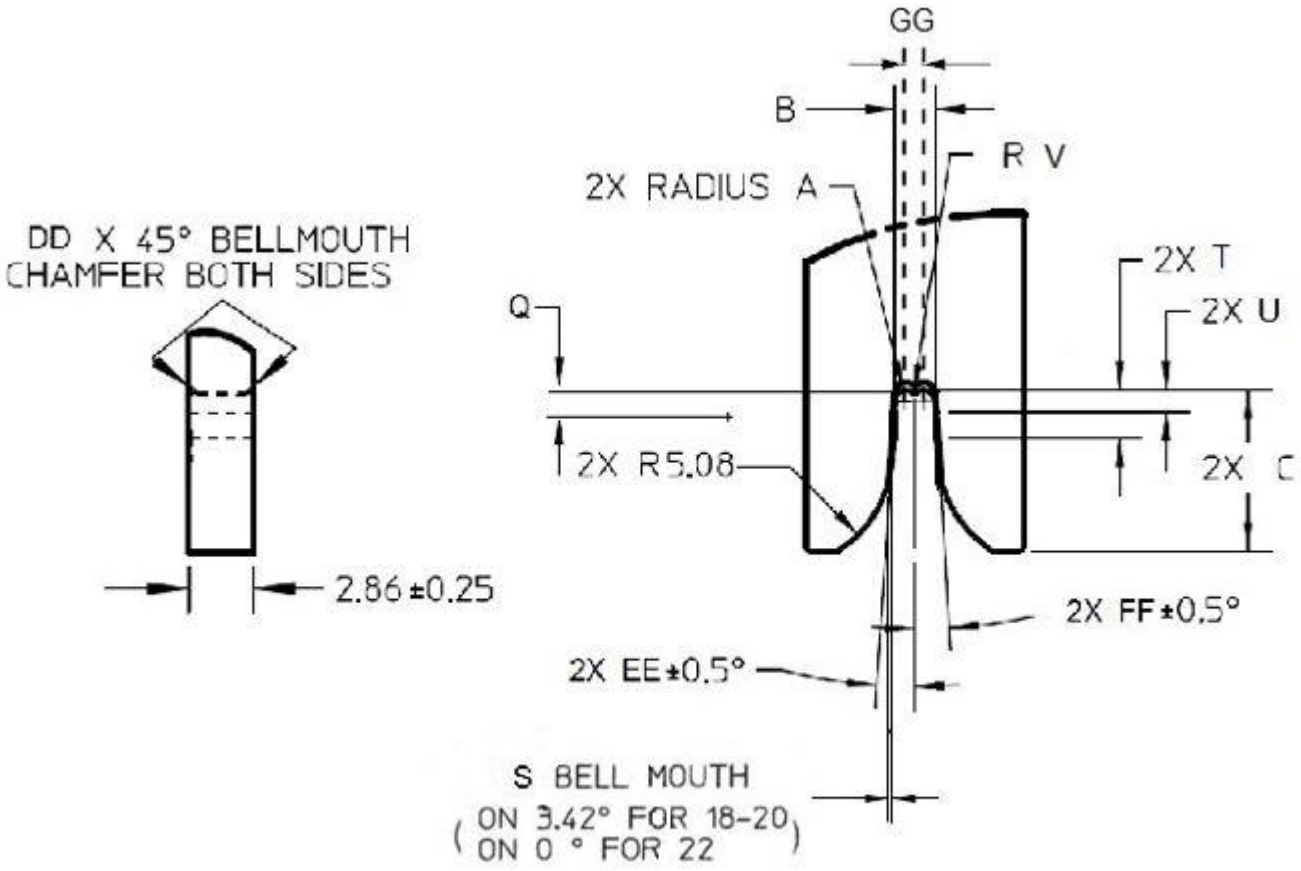
6.1 INSULATION PUNCH



Wire Size	AA	BB	CC
18/20	5.97	4.35	5.0
22	5.07	4.02	5.08

FIGURE 19

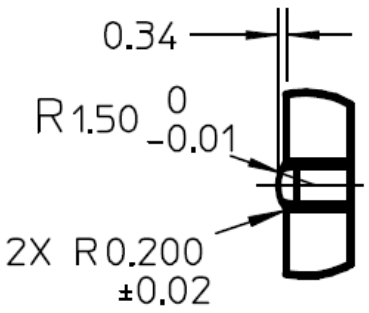
6.2 CONDUCTOR PUNCH

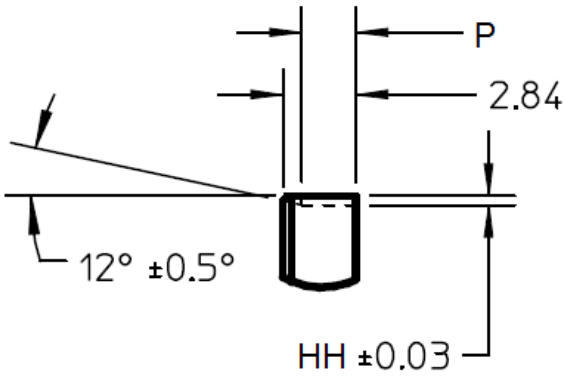


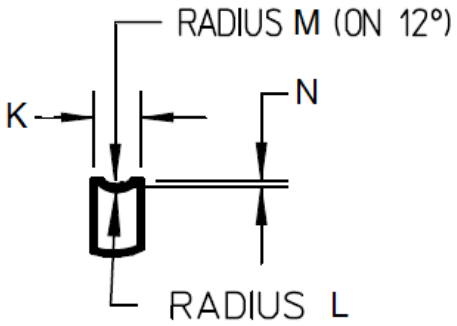
Wire Size	DD	EE	FF	GG
18/20	0.34	3.42°	4°	0.80
22	0.30	3°	5°	0.71

FIGURE 20

6.3 INSULATION ANVIL



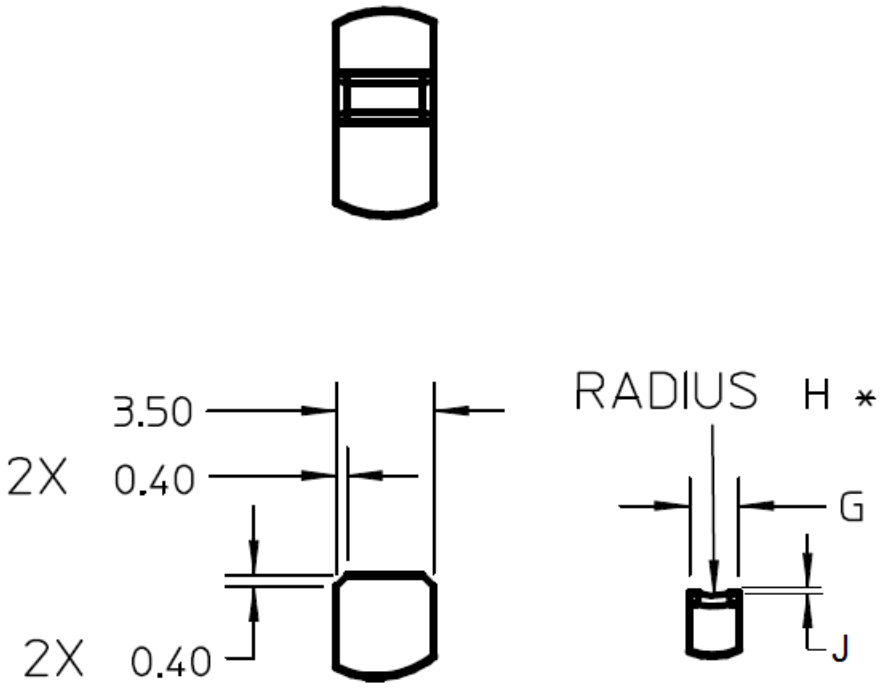




Wire Size	HH
18/20	0.35
22	0.30

FIGURE 21

6.4 CONDUCTOR ANVIL



* E.D.M. FINISH REQUIRED ON WORKING SURFACE
NO EXTRA PROCESS REQUIRED
ROUGH TEXTURED SURFACE REQUIRED
SURFACE GRINDING OR POLISHING PROCESS WILL NOT BE ACCEPTED

FIGURE 22

7.0 CRIMP STRAIGHTNESS

A method for maintaining crimp straightness is shown in figure 23 below.

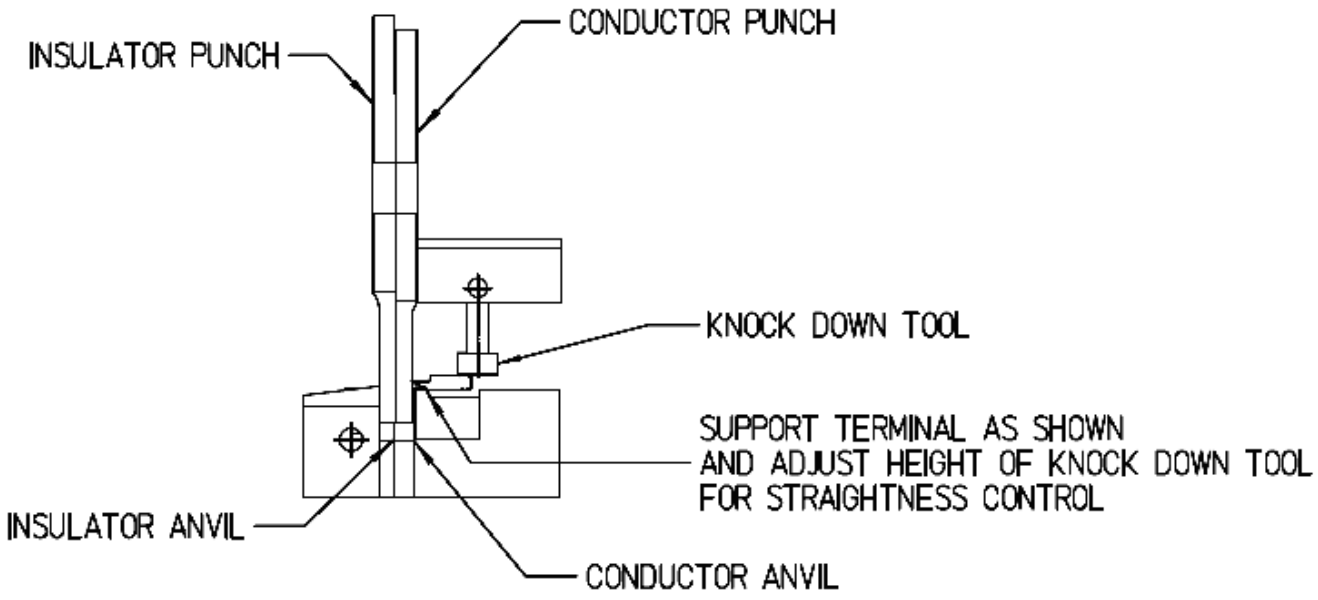


FIGURE 23

Table 4

Applicator Tooling Information Table

SAE AWG	A	B +0.01 -0	C	D	E	F	G +0 -0.01	H	J ±0.03	K +0 -0.01	L ±0.03	M	N	P ±0.03	Q	S	T	U	V
18/20	0.470	1.798	7.05	12.12	0.94	6.5	1.79	1.83	0.08	1.89	0.98	0.98	0.20	2.13	2.74	0.05	2.10	0.98	0.05
22	0.35	1.452	7.44	12.14	0.88	6.01	1.44	2.29	0.06	1.70	1.02	1.02	0.12	1.97	2.84	0.13	1.26	0.68	0.13

APPLICATOR TOOLING TOLERANCE TABLE	
3 PLACE	±0.005
2 PLACE	±0.025
1 PLACE	±0.13
ANGULAR	±0.5°

8.0 CHECKING AID

Crimped terminal lead must be able to pass freely through checking aid shown.

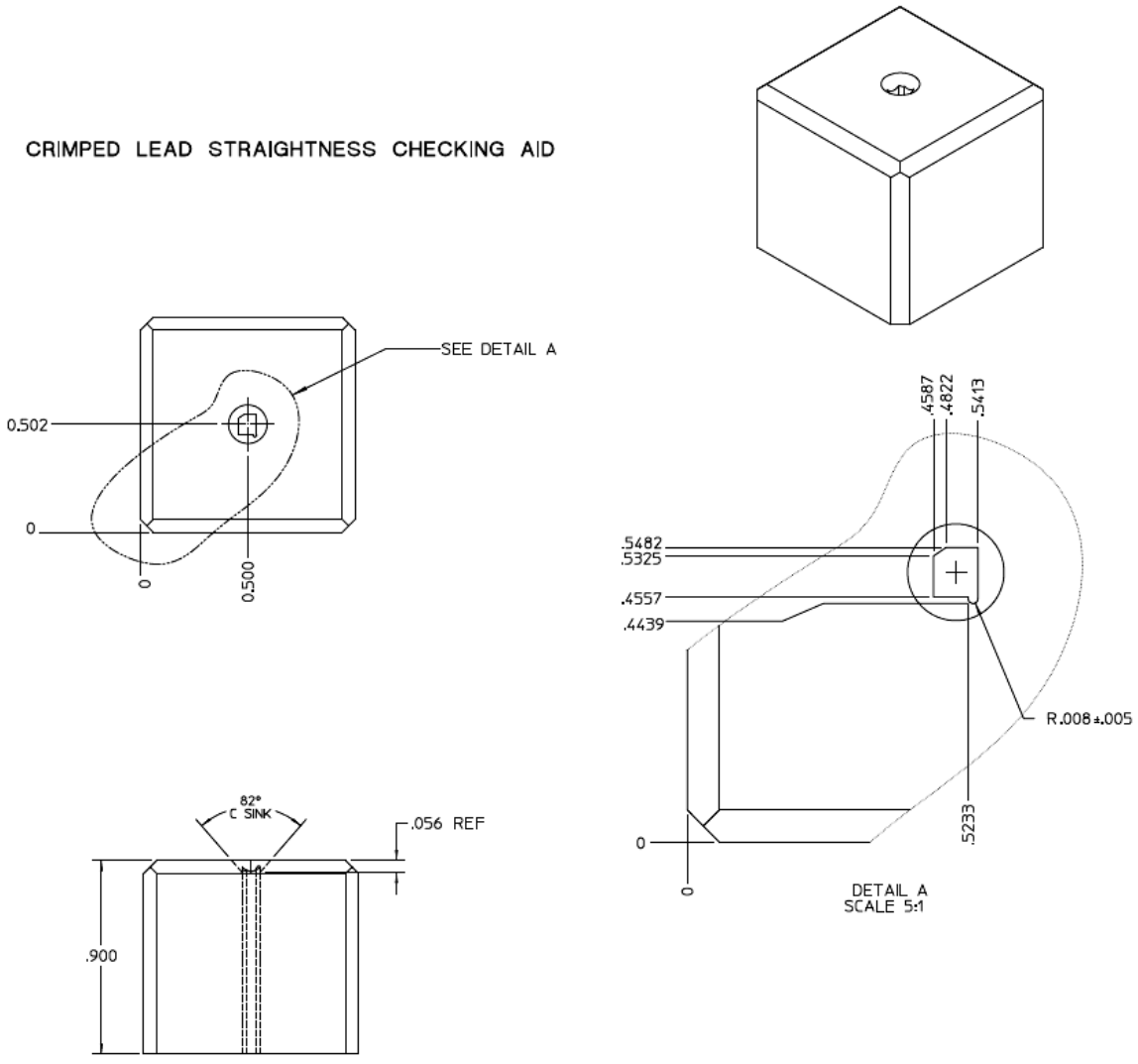


Figure 24

Checking Aid Notes: (Unless otherwise specified)

1) Material : Steel 4140 Pre-hardened
2) Finish:
   a) Surface: Block Oxide
   b) Inside Profile: Polish
3) All Dimensions are in inches
4) Tolerances are in inches
   2 Places ± 0.01
   3 Places ± 0.005
   4 Places ± 0.0002

SUPPLIER CHECKING AID TOOLING	
PART NUMBER	DESCRIPTION
63867-3008	MX64 CRIMPED LEAD STRAIGHTNESS CHECKING AID

9.0 APPLICATOR TOOLING

Application Tooling for the MX64 SAE Grip Receptacle Terminal can be obtained directly from Molex.

To find the proper and latest Molex Application Tooling

1. Go to http://www.molex.com
2. Enter the terminal / connector part number into the search box and select the “Go” button.
    a. Molex part numbers can also be found by searching on the product description.
3. Review the Application Tooling available on the right side of the product window.
    a. It may be necessary to scroll down on the right side of the terminal / connector product page to view all the tooling options.
    b. Hand tools and manual type tools require the loose terminal / connector part number to be used in the search.
    c. Applicator or semi-automatic type tools require the reeled terminal / connector part number to be used in the search.
4. Select the tool part number link
5. Review the tooling page for general tool information
6. Open the link for the Application Tooling Specification (ATS) (located on the left under *Specifications & Other Documents*) for additional details such as:
    a. Termination specifications: crimp height, pull force, wire strip length, insulation diameter, etc.
    b. Tool information: tool diagram, tool parts list, repair parts, perishable parts list.
7. Order Molex Application Tooling through your preferred distributor

Notes:

1. Hand crimp tooling can only be used with certain wires and terminal part numbers. Check the Application Tooling Specification Sheet on the Molex website for details.
2. Application Tooling product numbers are subject to change without prior notice. Customers are advised to check the Molex website for the most up-to-date information.
3. Molex FineAdjust™ and MiniMac™ Application Tooling requires the use of left payoff (“D” Wind) parts.

APPLICATION SPECIFICATION

Application Spec Revision Log

Change	By	Date	Revision Number
Applicator tooling dimensions updated to current tooling revision. Balloons 5 and 6 added to table 3. Front bell mouth callout included on Figure 2. Note on permissible skiving included on Sheet 4 – Insulation Crimp Height. Recommend lower CCH range per table 2 for part numbers 34736-2002 & 34736-1002 to overcome poor quality of wire (Surface contaminants, insulation entrapment, etc.)	Nvenkateshsh	10/23/2017	B