APPLICATION SPECIFICATION

MX64 ISO GRIP RECEPTACLE TERMINAL

1.0 SCOPE

This specification details the crimping information and common practices for general crimps for the MX64 ISO Grip Receptacle Terminal. Please refer to sales drawing, SD-33468-002, 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.

Terminal shown in this document are generic representations.

2.0 PRODUCT DESCRIPTION
DEFINITION OF TERMS:

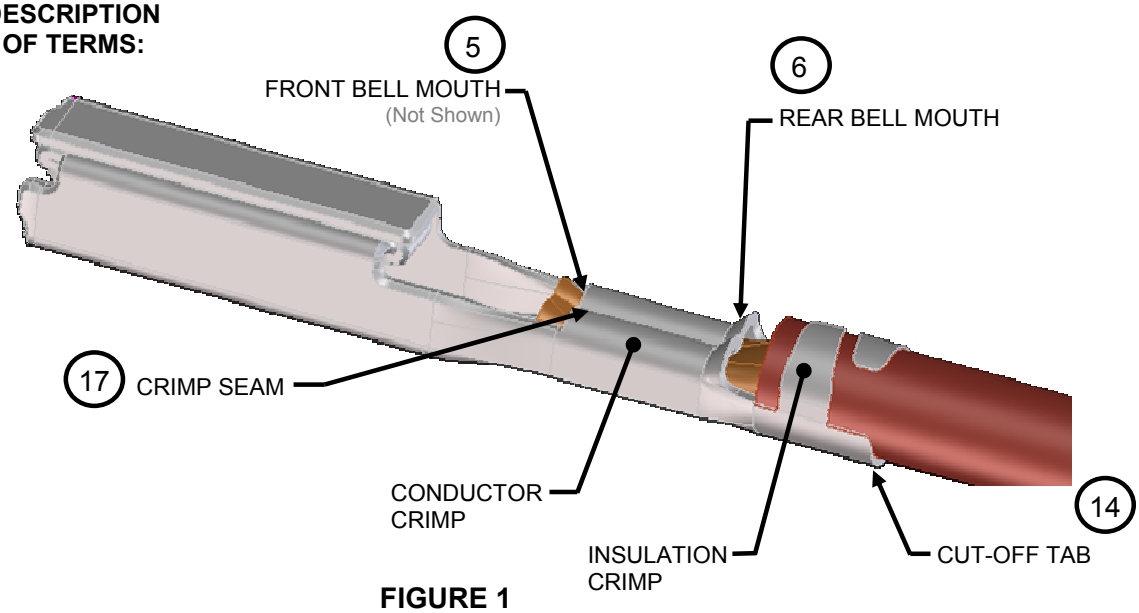


FIGURE 1

DEFINITIONS OF TERMS (CONT.):

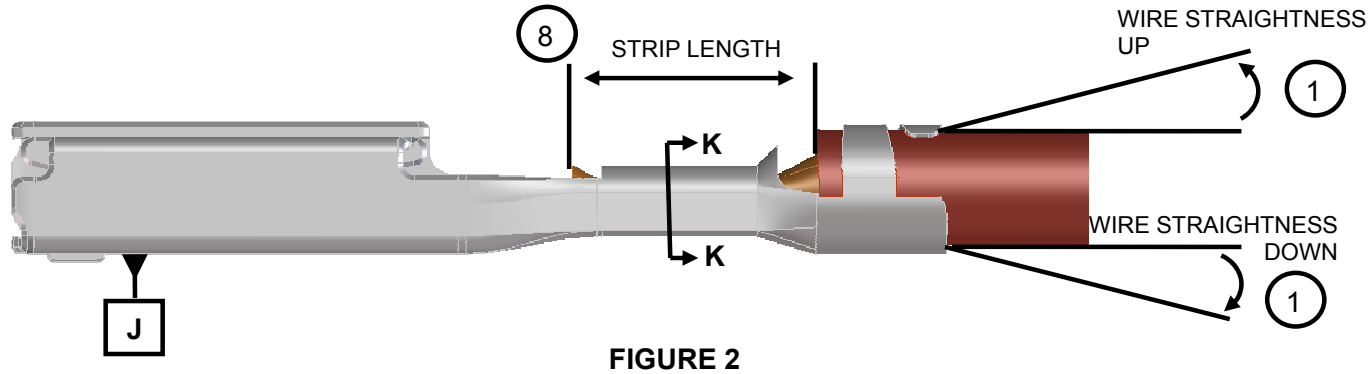


FIGURE 2

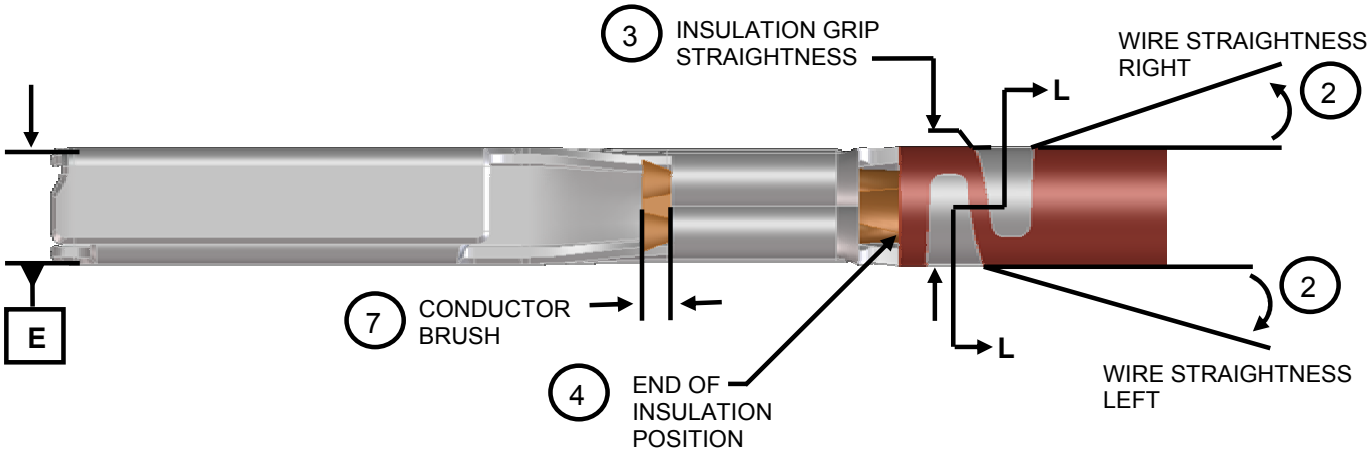


FIGURE 3

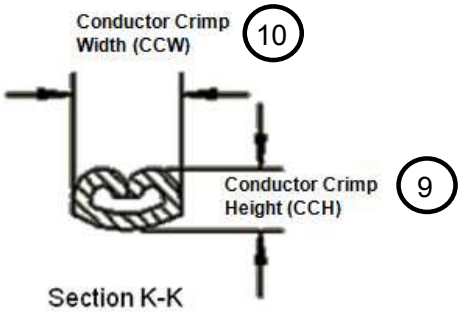


FIGURE 4

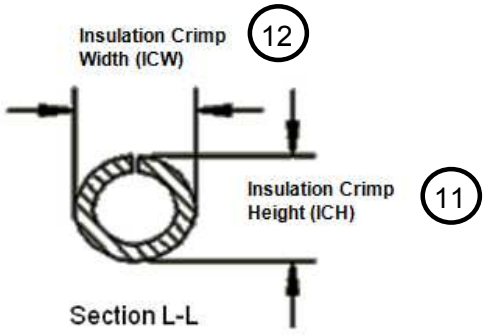


FIGURE 5

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 ISO 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. See Table 3 for bell mouth specifications.

Bell mouth too large
Reduced Crimp Area, Lower Pull Forces

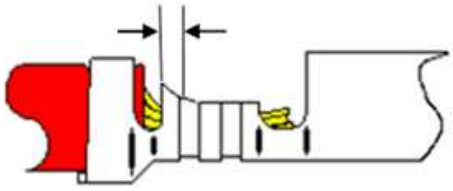


FIGURE 6 - Bad Crimp

Bell Mouth per specification

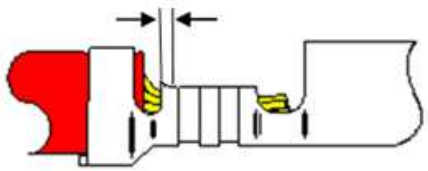


FIGURE 7- Good Crimp

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

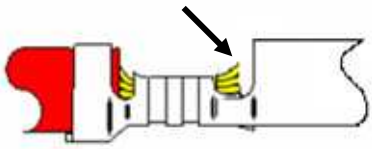


FIGURE 8 - Bad Crimp

CONDUCTOR BRUSH FLUSH OR BELOW CRIMP

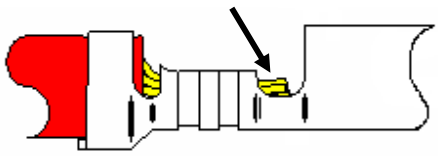


FIGURE 9 - Good Crimp

For the MX64 ISO 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.

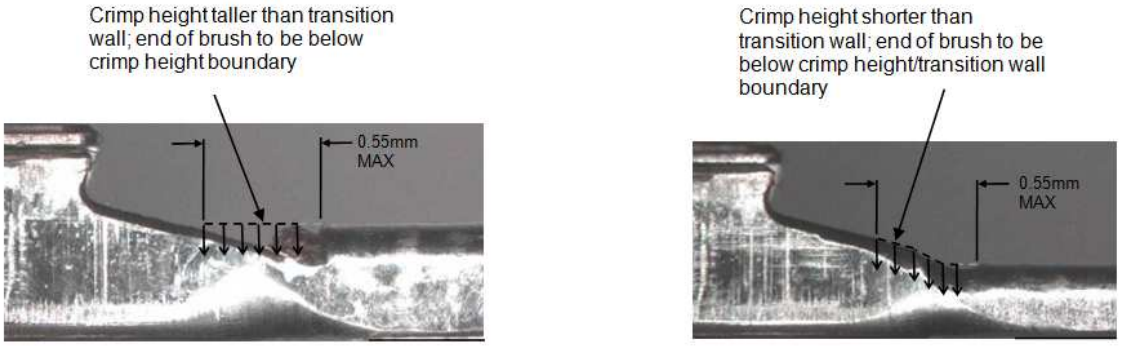


Figure 10

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 ISO 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 pierce it or otherwise damage the integrity of the insulation. 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 with specifications. See Section 3.0, Table 3 for anvil flash specifications.

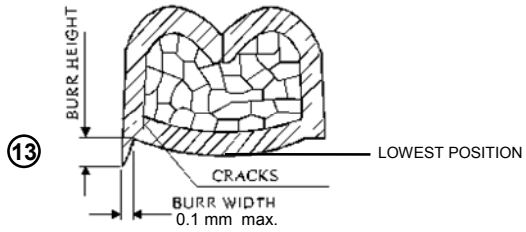


FIGURE 11

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.

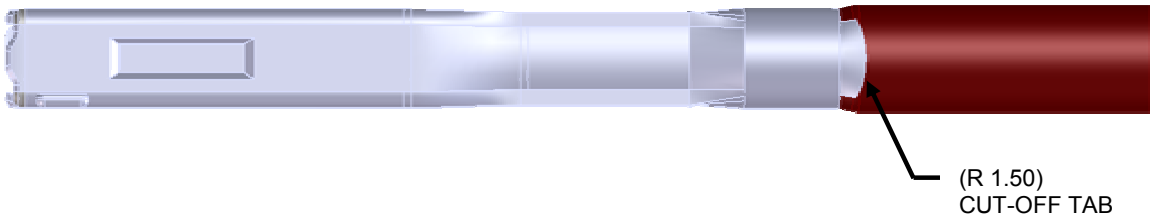


FIGURE 12

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.

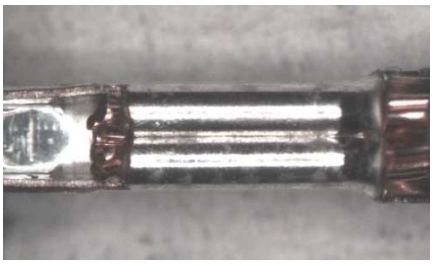


FIGURE 13 - NO BULGE

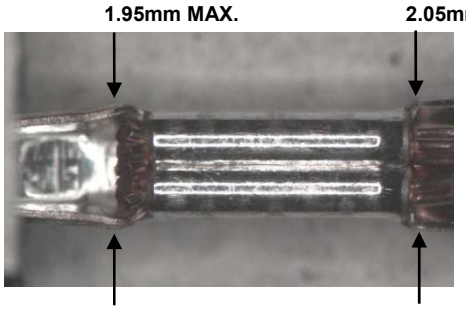


FIGURE 14 - WITH BULGE

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.

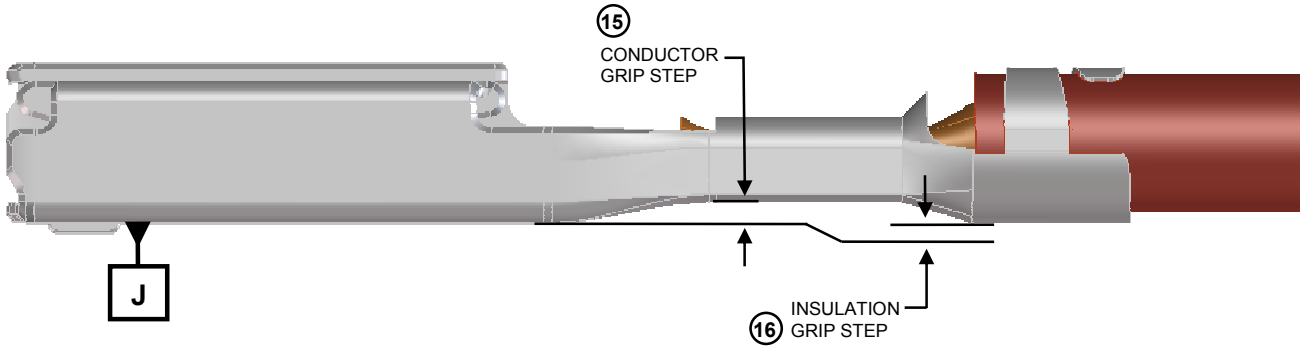


FIGURE 15

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.

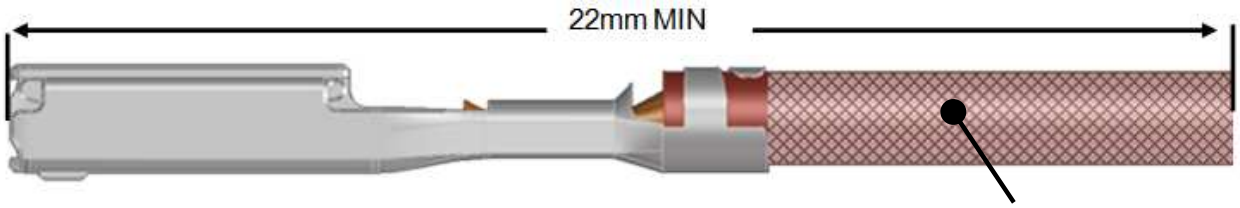


FIGURE 16

3.0 PRODUCT SPECIFICATIONS

Table 1

Terminal Order No.		Grip Size	Grip Code	Wire Range	Insulation Diameter Range (mm)
Left Payoff "D" Wind	Right Payoff "B" Wind				
33467-0021 33468-0021 34736-0025	33467-0022 33468-0022 34736-0026	Small	A	0.35 mm^2	1.20 – 1.65
33467-0023 33468-0023 34736-0027	33467-0024 33468-0024 34736-0028	Large	B	0.5 - 0.75 mm^2	1.40 – 2.06

Table 2

Terminal Order No.		Validated Wire				Conductor Crimp		Insulation Crimp		Pull Force Minimum (N)
Left Payoff "D" Wind	Right Payoff "B" Wind	Size	Type	No. of Strands	Insulation Max OD (mm)	CCH (mm) ⑨	CCW (mm) ± 0.05 ⑩	ICH† (mm) ± 0.10 ⑪	ICW† (mm) ±0.10 ⑫	
33467-0021 33468-0021 34736-0025	33467-0022 33468-0022 34736-0026	0.35 mm^2	FLR2X-A[1,a]	7	1.30	0.96±0.03	1.40	1.55	1.74	50
33467-0023 33468-0023 34736-0027	33467-0024 33468-0024 34736-0028	0.5 mm^2	T3ZHID [1,c]	7	1.60	0.99±0.04	1.80	1.90	1.89	75
			FLR2X-A[1,a]	19						
		0.75 mm^2	FLR2X-A[1,a]	19	1.80	1.08±0.05		2.10	1.93	90

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

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

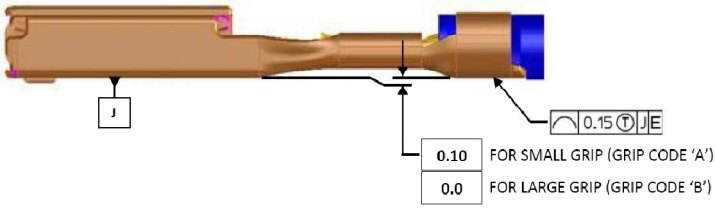
Customers are required to complete their own validation testing if tooling and/or wire is different than what is shown in this specification.

†Values indicated below are the maximum size permitted for MX64 ISO terminals crimped to wires other than those shown in Table 2 above:
Small Grip (Grip Code A) terminals: ICH Max = 2.10mm, ICW Max = 2.05mm
Large Grip (Grip Code B) terminals: ICH Max = 2.20mm, ICW Max= 2.05mm

Terminal crimps were validated to following specifications:
[1]USCAR-21

Wires are in accordance with following specifications:
[a]ISO 6722, GMW15626 (FLR2X-A/T125) and Ford ES-AU5T-1A348-AA (3TAD)
[c]PSA B25 1110:NTS – Conventional Electrical Conductor

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 1.60mm.	
6	Rear Bell Mouth	0.25 – 0.45	
7	Conductor Brush	Visible to 0.55 MAX Not to extend above conductor crimp/transition height	
8	Wire Strip Length	(4.1)	
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.

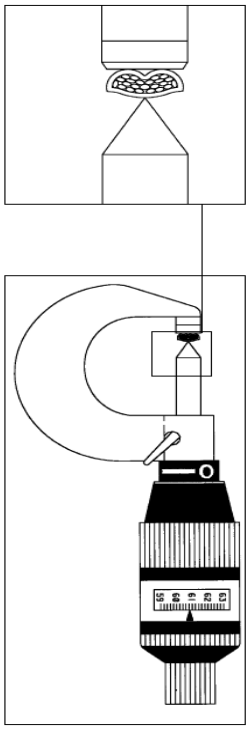


Figure 17

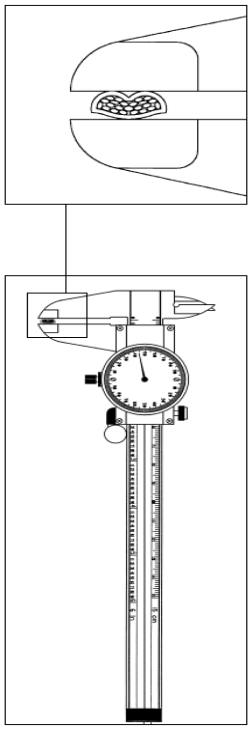
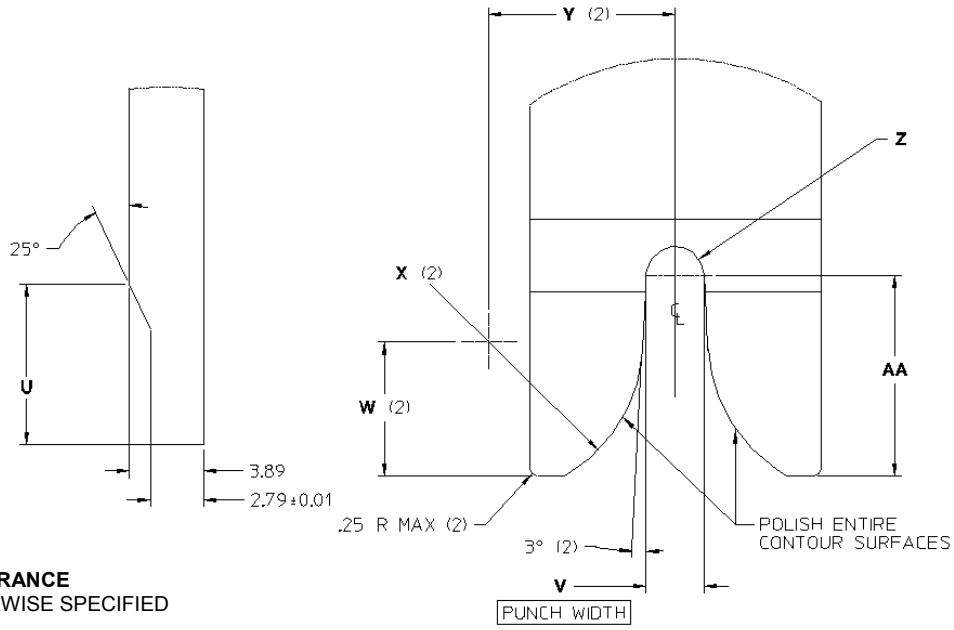


Figure 18

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



GENERAL TOLERANCE
UNLESS OTHERWISE SPECIFIED

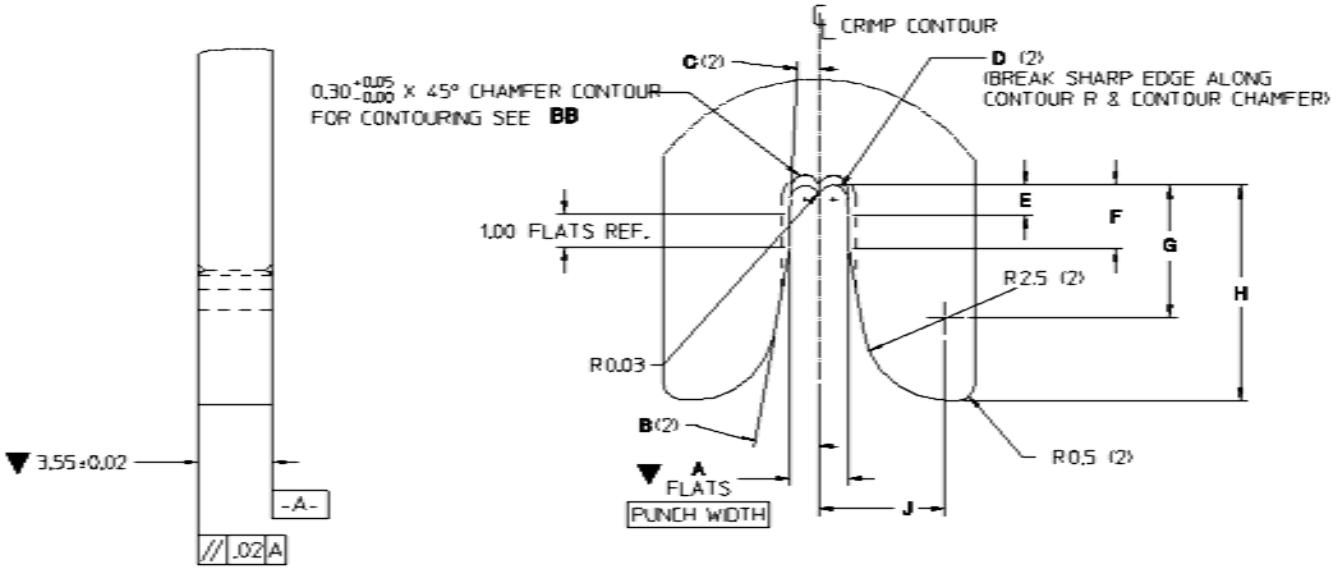
3 PLACES ± 0.01
2 PLACES ± 0.13
1 PLACE ±0.25
ANGULAR ± ½°

FIGURE 19

TABLE 4

Part No.	U	V	W	X	Y	Z	AA
33467-0021 33468-0021 33467-0022 33468-0022 34736-0025 34736-0026	7.43	1.75 ± 0.01	4.02	R 5.08	6.07	0.876 ± 0.01	6.01
33467-0023 33468-0023 33467-0024 33468-0024 34736-0027 34736-0028	8.33	1.88 ± 0.01	4.35	R 5.00	6.06	0.94 ± 0.01	6.50

6.2 CONDUCTOR PUNCH



GENERAL TOLERANCE
UNLESS OTHERWISE SPECIFIED

3 PLACES ± 0.01
2 PLACES ± 0.13
1 PLACE ±0.25
ANGULAR ± ½°

NOTE:
CONTOUR GROUND, POLISHED, AND BUFFED TO A 0.5-2.0 MICRO/IN. FINISH

FIGURE 20

TABLE 5

Part No.	A	B	C	D	E	F	G	H	J	BB
33467-0021 33468-0021 33467-0022 33468-0022 34736-0025 34736-0026	1.396 +0.01/-0	6.56°	2°	R0.35 ± 0.01	0.80 ± 0.03	1.80	3.94	6.43	3.46	CHAMFER ENTIRE CONTOUR ON REAR, TOP RADIUS ONLY ON FRONT
33467-0023 33468-0023 33467-0024 33468-0024 34736-0027 34736-0028	1.786 +0.01/-0	10.14°	3°	R0.45 ± 0.01	0.91 ± 0.03	1.91	4.04	6.53	3.81	CHAMFER TOP RADIUS ONLY (FRONT & REAR)

6.3 INSULATION ANVIL

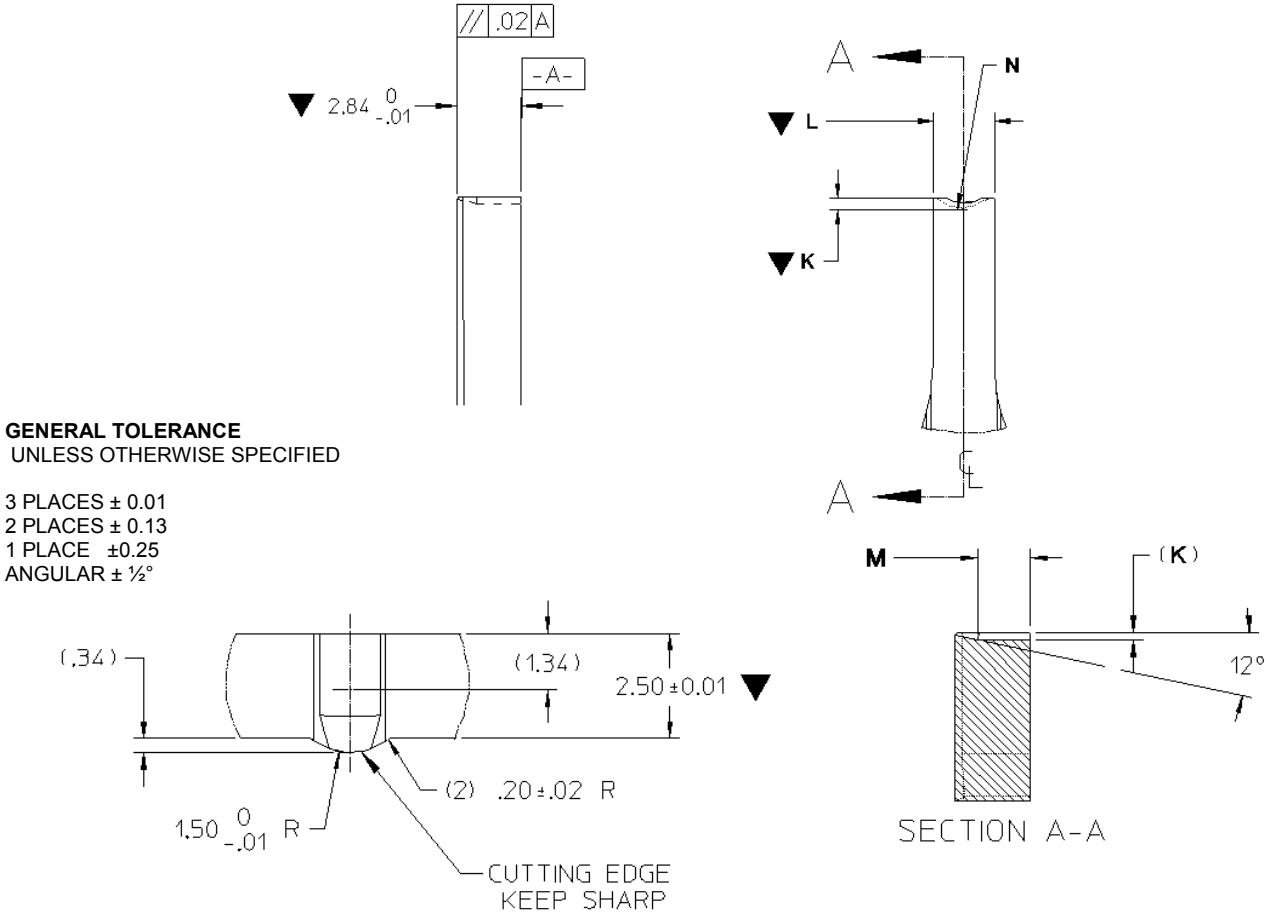
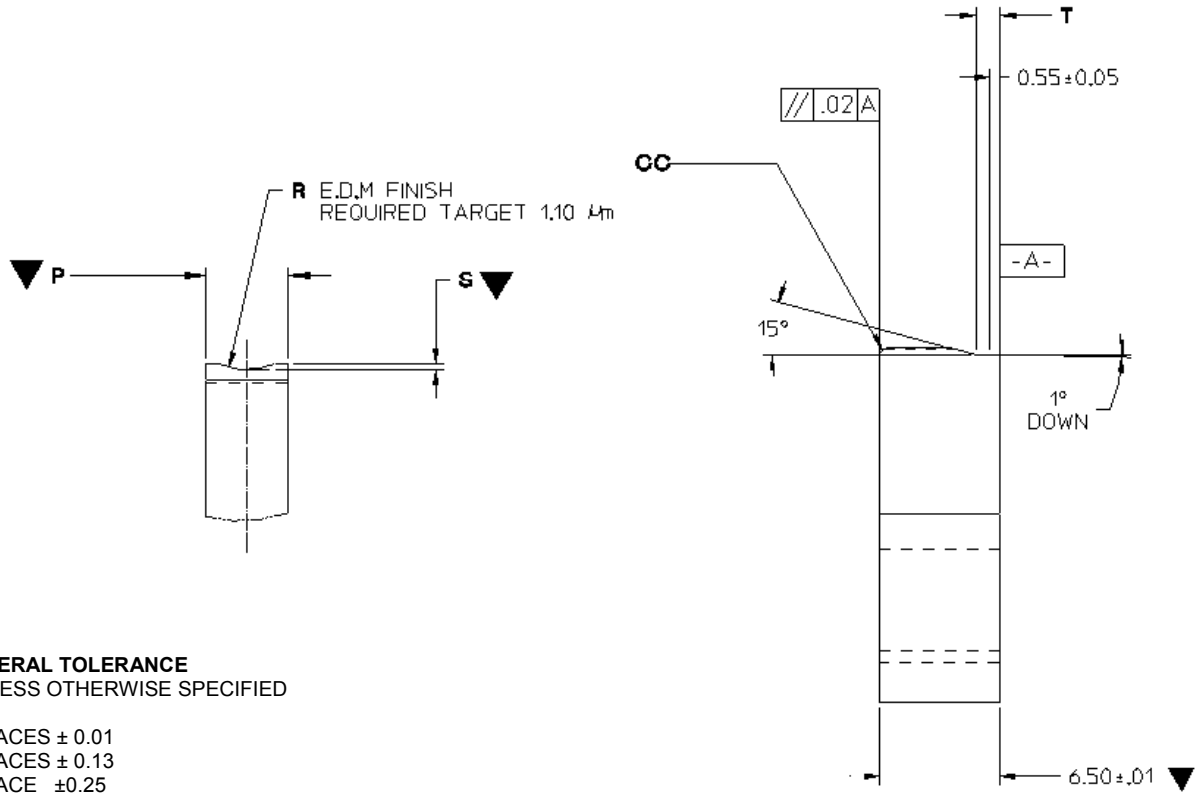


FIGURE 21

TABLE 6

Part No.	K	L	M	N
33467-0021 33468-0021 33467-0022 33468-0022 34736-0025 34736-0026	0.30 ± 0.03	1.70 +0/-0.01	1.97 ± 0.03	R1.02 ± 0.03
33467-0023 33468-0023 33467-0024 33468-0024 34736-0027 34736-0028	0.35 ± 0.03	1.89 +0/-0.01	2.10 ± 0.03	R0.98 ± 0.03

6.4 CONDUCTOR ANVIL



GENERAL TOLERANCE
UNLESS OTHERWISE SPECIFIED

3 PLACES ± 0.01
2 PLACES ± 0.13
1 PLACE ±0.25
ANGULAR ± ½°

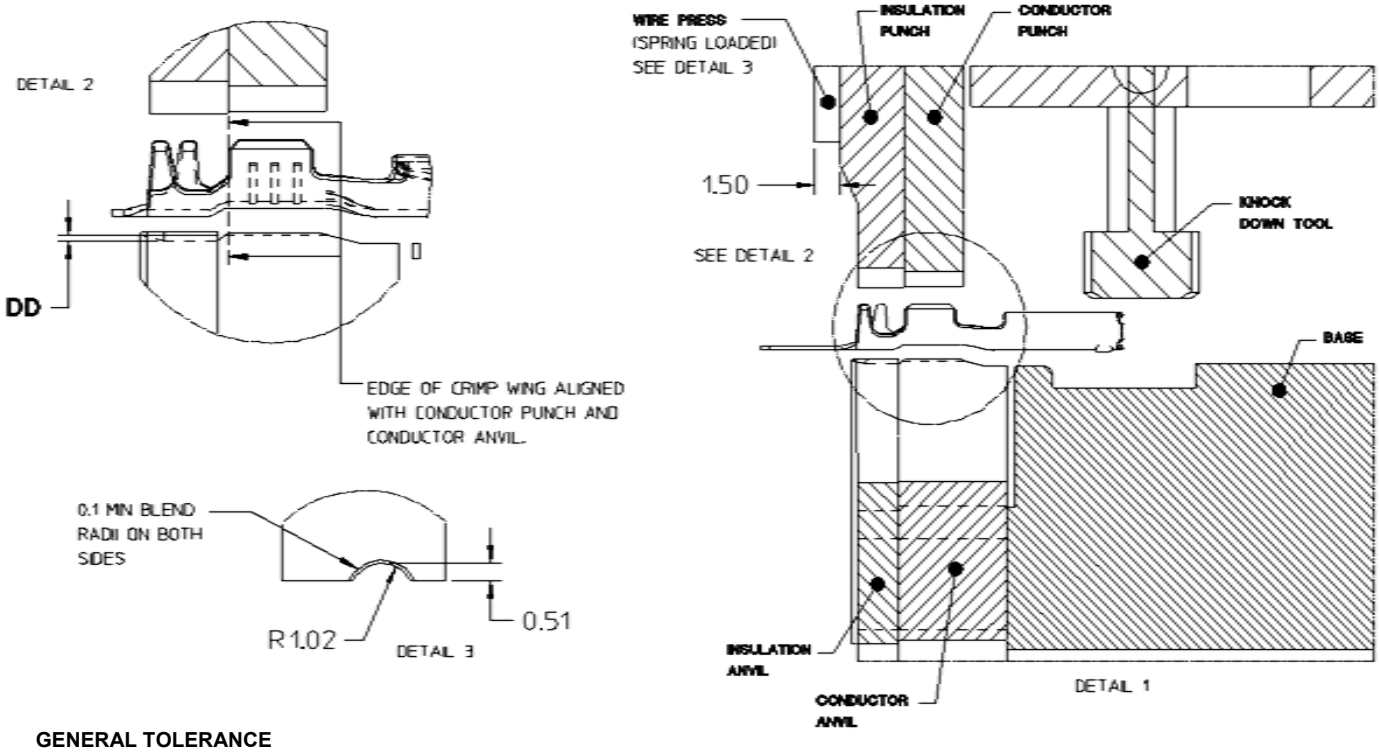
FIGURE 22

TABLE 7

Part No.	P	R	S	T	CC
33467-0021 33468-0021 33467-0022 33468-0022 34736-0025 34736-0026	1.38 +0/-0.01	R1.30 ± 0.01	0.09 ± 0.03	1.38 ± 0.05	0.30 ± 0.03 x 45°
33467-0023 33468-0023 33467-0024 33468-0024 34736-0027 34736-0028	1.77 +0/-0.01	R1.71 ± 0.01	0.11 ± 0.03	1.29 ± 0.05	0.35 ± 0.03 x 45°

7.0 CRIMP STRAIGHTNESS, WIRE PRESS AND OFFSET

See Detail 1 for a method for maintaining crimp straightness.
See Detail 2 for offset required between the radii on anvils.
See Detail 3 for Molex recommended wire press design.



GENERAL TOLERANCE
UNLESS OTHERWISE SPECIFIED

3 PLACES ± 0.01
2 PLACES ± 0.13
1 PLACE ±0.25
ANGULAR ± ½°

FIGURE 23

TABLE 8	
Part No.	**DD**
33467-0021 33468-0021 33467-0022 33468-0022 34736-0025 34736-0026	0.2 ± 0.04
33467-0023 33468-0023 33467-0024 33468-0024 34736-0027 34736-0028	0.3 ± 0.04

8.0 CHECKING AID

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

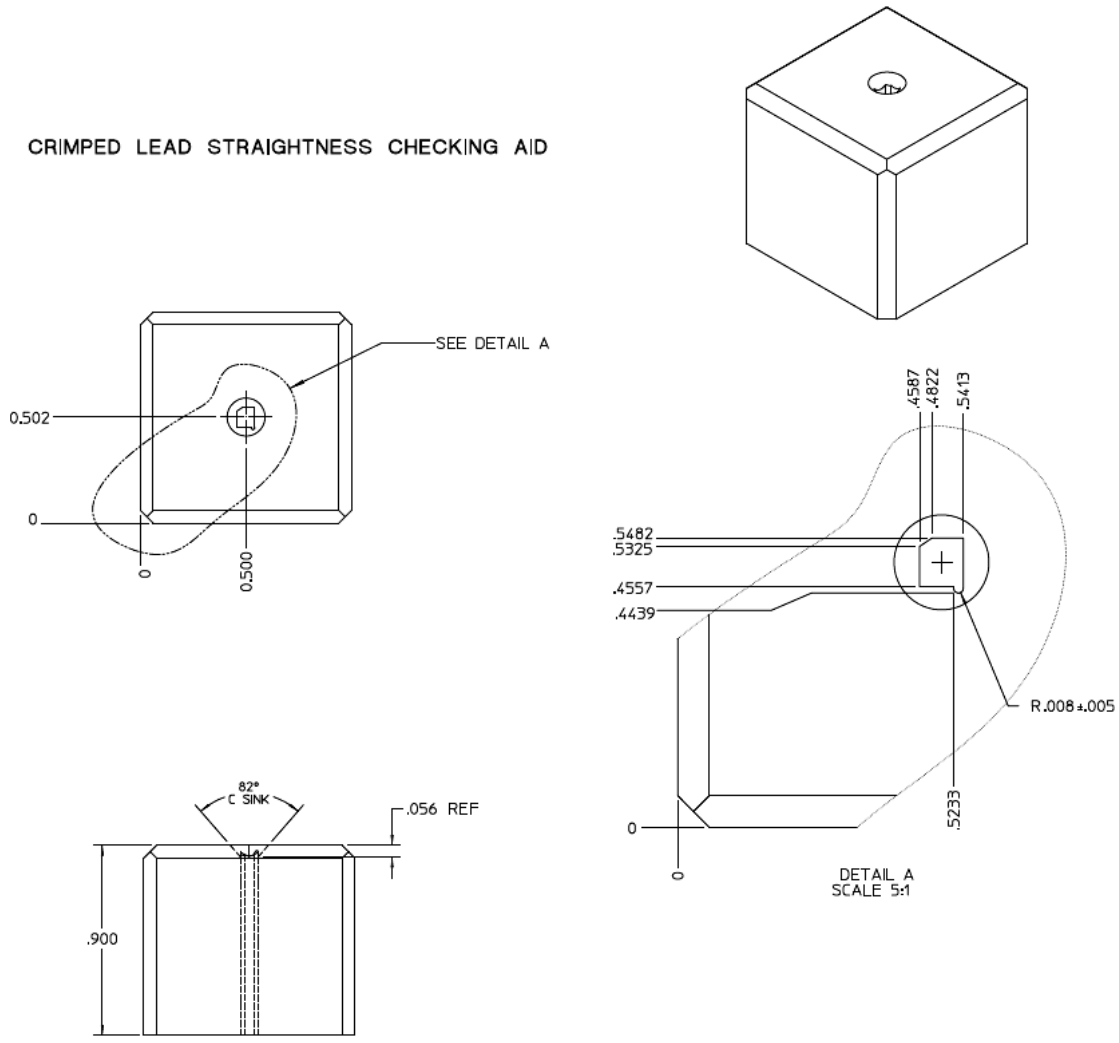


Figure 24

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

Applicator tooling for the MX64 ISO Grip Receptacle Terminal can be obtained directly from Molex. See table below for description and product numbers. Molex FineAdjust™ Applicator tooling requires the use of left payoff ("D" Wind) parts.

SUPPLIER APPLICATOR TOOLING TABLE	
Description	**Molex Product No.**
Hand Crimp Tool for MX64 ISO Receptacle Terminal, 0.35mm^2	TBD
FineAdjust™ Applicator for MX64 ISO Receptacle Terminal, 0.35mm^2	63902-5100
Hand Crimp Tool for MX64 ISO Receptacle Terminal, 0.50, 0.75 mm^2	TBD
FineAdjust™ Applicator for MX64 ISO Receptacle Terminal, 0.50, 0.75 mm^2	63902-5300

Note: Applicator 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.