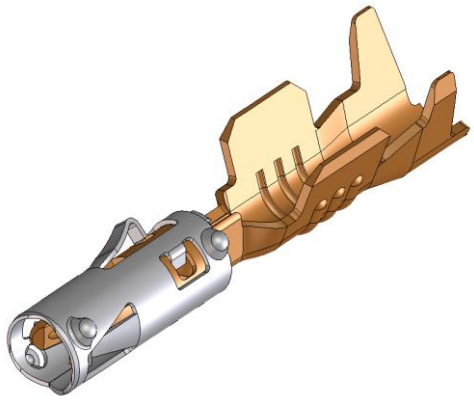
CP1.5 RECEPTACLE CRIMP TERMINAL

1.0 SCOPE

This specification details the crimping information and common practices for general crimps for the Molex CP1.5 receptacle terminal per sales drawing SD-64323-001 & SD-98915-001. Please refer to the sales drawing 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 noted in Millimeter and Newton unless otherwise specified.

2.0 PRODUCT DESCRIPTION



Material number	Plating	Crimping range (mm²)	TXL (AWG)
643231029 989151029	Tin	0.50 to 1.00	18
643231319 989151319	Gold		
643231039 989151039	Tin	1.50 to 2.00	16 & 14
643231219 989151219	Gold		

3.0 DEFINITION OF TERMS

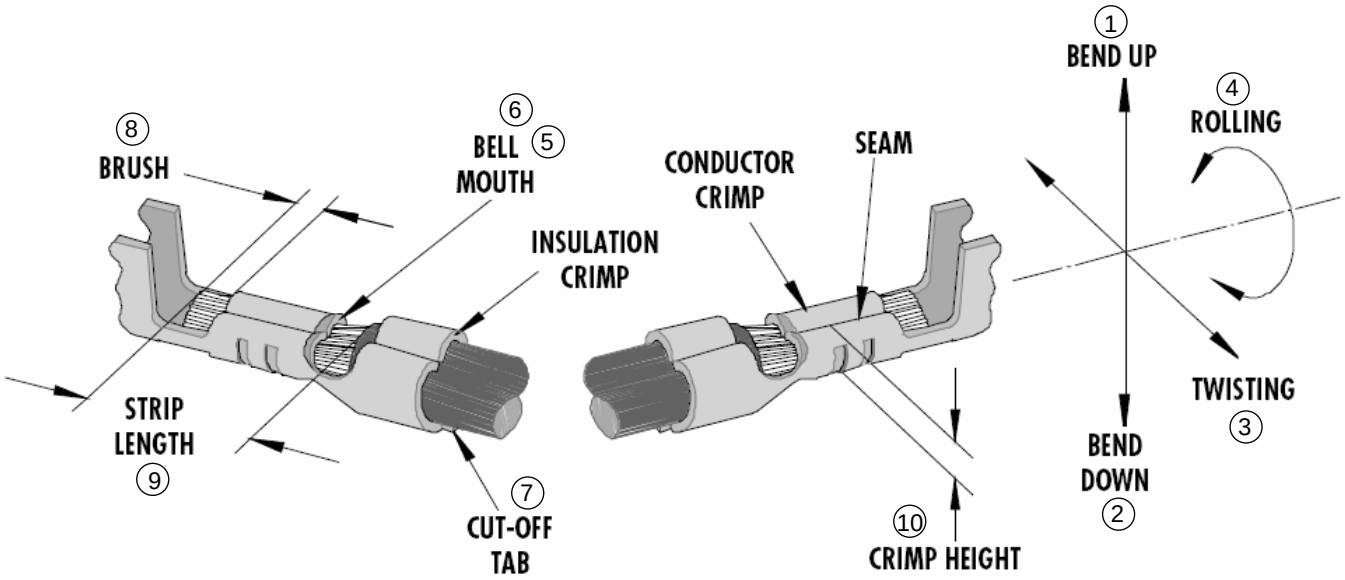
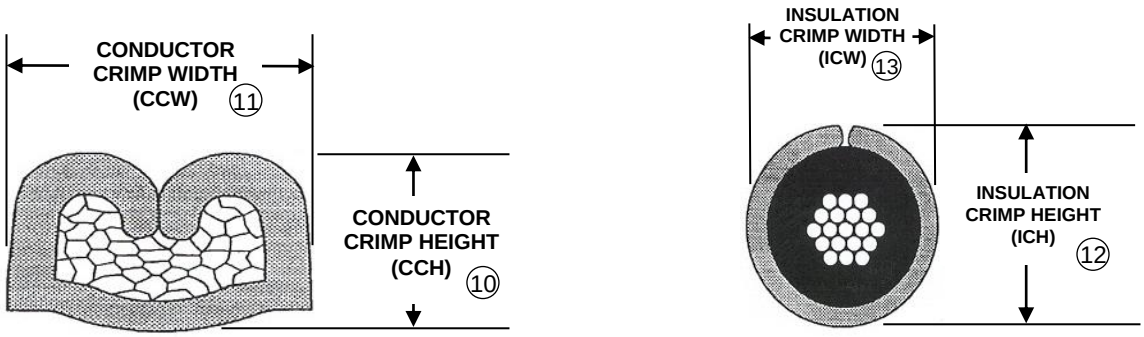


Figure 1

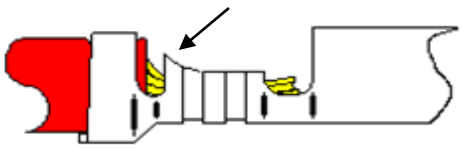


The above terminal drawing is a generic terminal representation. It is not an image of any terminal listed in the scope.

BELLMOUTH (FLARE) 5 6

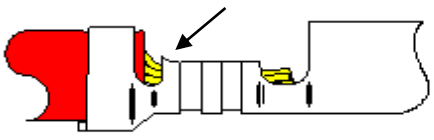
The flare that is formed on the edge of the conductor crimp acts as a funnel for the wire strands. This funnel reduces the possibility that a sharp edge on the conductor crimp will cut or nick the wire strands.

Reduced Crimp Area. Lower Pull Forces



Bad Crimp

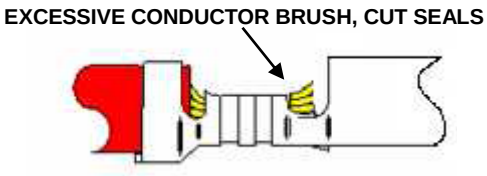
Bellmouth: see value in table 2



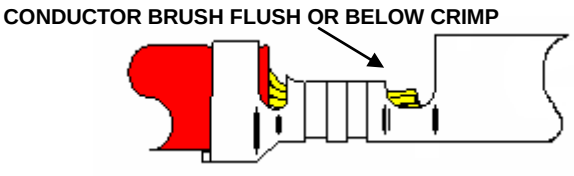
Good Crimp

CONDUCTOR BRUSH ⑧

The conductor brush is made up of the wire strands that extend past the conductor crimp on the contact side of the terminal. This helps ensure that mechanical compression occurs over the full length of the conductor crimp. The conductor brush should not extend into the contact area or above the conductor crimp height. CAUTION: Excessive conductor brush extended above the transition/crimp can cause connector water leak by compromising the glands of the matte seal.



Bad Crimp



Good Crimp

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.

CONDUCTOR CRIMP HEIGHT ⑩

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 crimp height is a quick, non-destructive way to help ensure the correct metallurgical compression of a terminal around the wire's conductor and is an excellent attribute for process control. The crimp height specification is typically set as a balance between electrical and mechanical performance over the complete range of wire stranding and coatings, and terminal materials and plating. Although it is possible to optimize a crimp height to individual wire strands and terminal plating, one crimp height specification is normally created.

CUT-OFF TAB LENGTH ⑦

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; it may fail electrical spacing requirements or could lead to excessive seal tears in matte sealed connectors. In most situations, a tool is setup to provide a cut-off tab that shall not exceed value indicated in **table 2**, no burrs. CAUTION: Excessive length or burrs can cause connector water leak by compromising the glands of the matte seal.

EXTRUSIONS (ANVIL FLASH)

These are the small flares that form on the bottom of the conductor crimp resulting from the clearance between the punch and anvil tooling. If the anvil is worn or the terminal is over-crimped, excessive extrusion can result. An uneven extrusion may also result if the punch and anvil alignment is not correct, if the feed adjustment is off, or if there is insufficient/excessive terminal drag. CAUTION: Excessive length or burrs can cause connector water leak by compromising the glands of the matte seal.

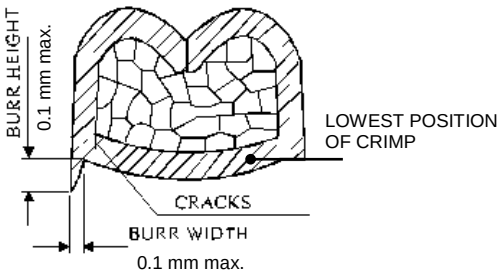


Figure 2

INSULATION CRIMP HEIGHT

Insulation crimp heights are specified in section 4.0, **table 1.A & B & C**. CP1.5 receptacle terminals are designed to accommodate multiple wire ranges and within the terminal range, an insulation grip may not completely surround the wire or fully surround the diameter of the wire, this condition will still provide an acceptable insulation crimp. To evaluate the insulation section cut the wire flush with the back of the terminal. Once the optimum setting for the application is determined it is important to document the insulation crimp height. Then, as part of the setup procedure the operator can check the crimp height.

INSULATION POSITION

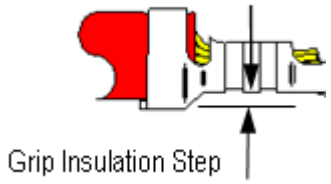
This is the location of the insulation in relation to the transition area between the conductor and insulation crimps. Equal amounts of the conductor strands and insulation needs to be visible in the transition area. The insulation position ensures that the insulation is crimped along the full length of the insulation crimp, and that no insulation gets crimped under the conductor crimp. The insulation position is set by the wire stop and strip length for bench applications. For automatic wire processing applications the insulation position is set by the in/out press adjustment.

STRIP LENGTH (9)

The strip length is determined by measuring the exposed conductor strands after the insulation is removed. The strip length determines the conductor brush length when the insulation position is centered between conductor and insulation crimps. CAUTION: Care must be taken not to leave indentations on the wire surface during the strip and cut operation as this can affect the integrity of grommet to wire seal performance and can cause wire leaks.

GRIP INSULATION STEP (14)

The designed offset between the conductor grip and the insulation grip. Not to be altered by crimp process.



4.0 PRODUCT SPECIFICATIONS

Terminal crimps were validated per the following standards and specifications:
- International wire standard ISO 6722
- PSA wire specification B251110
- PSA crimping specification STE 9634115099

Table 1.A ISO WIRE

TERMINAL	ISO WIRES			CONDUCTOR BARREL		INSULATION BARREL		WIRE / TERMINAL	
Material number	Nominal cross section (mm²)	Effective cross section (mm²)	Insulation diameter	CCH (±0.05) (10)	CCW (11)	ICH (+0.1/-0.05) (12)	ICW (13)	Reduction ratio	Minimum pull-out force (N)
643231029 643231319 989151029 989151319	0.50	0.461 mini 0.501 maxi	1.40 mini 1.70 maxi	1.15	(2.06)	2	(2.57)	15 % mini 25 % maxi	70
	0.75	0.692 mini 0.752 maxi	1.60 mini 1.90 maxi	1.25	(2.08)	2.2	(2.59)	15 % mini 25 % maxi	90
	1.00	0.924 mini 1.004 maxi	1.75 mini 2.15 maxi	1.32	(2.09)	2.4	(2.62)	15 % mini 25 % maxi	115
643231039 643231219 989151039 989151219	1.50	1.346 mini 1.459 maxi	2.10 mini 2.40 maxi	1.55	(2.25)	2.65	(2.85)	15 % mini 25 % maxi	155
	2.00	1.812 mini 1.971 maxi	2.50 mini 2.80 maxi	1.75	(2.27)	2.8	(2.88)	15 % mini 25 % maxi	195

Notes:

The above specifications are guidelines to an optimum crimp. In case of non-compliance of these parameters, performances of the product can be affected.
Crimp heights/widths are applicable for the punch and anvil tooling shown in this document.

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.
Molex cannot be responsible for the performances of the products in case of non-compliance with this procedure.

Terminal crimps were validated per the following standards and specifications:
- SAE International SAE/USCAR-21 Rev. 2
- SAE J1128 Low Voltage Primary Cable Rev. Jan 2011

Table 1.B SAE (TXL)

TERMINAL	TXL WIRES			CONDUCTOR BARREL		INSULATION BARREL		WIRE / TERMINAL	
Material number	AWG	Effective cross section (mm²)	Max. outside cable dia.	CCH (±0.05) (10)	CCW (11)	ICH (+0.1/-0.05) (12)	ICW (13)	Reduction ratio	Avg. minus 3 standard deviation (N)
643231029 643231319 989151029 989151319	18	0.8	2.20	1.37	(2.03)	2.43	(2.50)	15 % mini 35 % maxi	90
643231039 643231219 989151039 989151219	16	1	2.40	1.39	(2.24)	2.74	(2.82)	15 % mini 35 % maxi	120
	14	2	2.70	1.74	(2.27)	2.80	(2.80)	15 % mini 35 % maxi	180

Notes:

The above specifications are guidelines to an optimum crimp. In case of non-compliance of these parameters, performances of the product can be affected.
Crimp heights/widths are applicable for the punch and anvil tooling shown in this document.

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.
Molex cannot be responsible for the performances of the products in case of non-compliance with this procedure.

Terminal crimps were validated per the following standards and specifications:
- International wire standard ISO 6722
- SAE International SAE/USCAR-21 Rev. 4

Table 1.C FLRY-A WIRES

TERMINAL	FLRY-A WIRES			CONDUCTOR BARREL		INSULATION BARREL		WIRE / TERMINAL	
Material number	Nominal cross section (mm²)	Effective cross section (mm²)	Max. outside cable dia.	CCH (±0.05) (10)	CCW (11)	ICH (+0.1/-0.05) (12)	ICW (13)	Reduction ratio	Avg. minus 3 standard deviation (N)
643231029 643231319 989151029 989151319	0.75	0.689	1.9	1.25	(2.05)	2.3	(2.4)	20 % mini 35 % maxi	70 (90)
	1.00	0.888	2.1	1.32	(2.03)	2.4	(2.4)	20 % mini 35 % maxi	90 (120)
643231039 643231219 989151039 989151219	2.00	1.821	2.8	1.65	(2.30)	2.9	(2.85)	20 % mini 35 % maxi	180

Notes:

The above specifications are guidelines to an optimum crimp. In case of non-compliance of these parameters, performances of the product can be affected.
Crimp heights/widths are applicable for the punch and anvil tooling shown in this document.

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.
Molex cannot be responsible for the performances of the products in case of non-compliance with this procedure.

Deviation for conductor pull-out force test (USCAR-21 Rev 4 Seq. 4.4) for wires FLRY-A 0.75mm² and 1.00mm².

Table 2

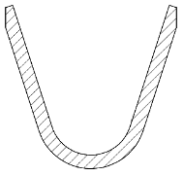
TERM.		Material number →	643231029 643231319 989151029 989151319	643231039 643231219 989151039 989151219
WIRE		Nominal cross section (mm^2) →	0.5 0.75 1	1.5 2
SAE Wire		Nominal cross section (awg) →	18	16 & 14
BALLON #	1	Bend Up	2° MAX	1° MAX
	2	Bend Down	2° MAX	1° MAX
	3	Twisting	2° MAX	1° MAX
	4	Rolling	2° MAX	
	5	Rear Bell Mouth	0.3 ± 0.1	
	6	Front Bell Mouth	Not required	
	7	Cut-off tab length	0.3 MAX	
	8	Conductor length / Wire brush	0.2 to 0.8 Not to exceed above conductor crimp height	
	9	Wire strip length	4.5 ± 0.1	
	10	Conductor Crimp Height	See Table 1.A & B & C	
	11	Conductor Crimp Width	See Table 1.A & B & C	
	12	Insulation Crimp Height	See Table 1.A & B & C	
	13	Insulation Crimp Width	See Table 1.A & B & C	
	14	Insulation Grip Step	0.15 ± 0.1	0.3 ± 0.1
		Crimp Elongation	0.9 MAX	0.8 MAX

REDUCTION RATIO

The reduction ratio is obtained by formula:

$$\text{REDUCTION RATIO} = \left(1 - \left(\frac{\text{CRIMP SECTION AREA AFTER CRIMPING}}{\text{WIRE CROSS SECTION AREA BEFORE CRIMPING} + \text{WING SECTION AREA BEFORE CRIMPING (See table 3)}}\right)\right) \times 100$$

Table 3

TERMINAL MATERIAL NUMBER →	643231029 643231319 989151029 989151319	643231039 643231219 989151039 989151219
WING SECTION AREA BEFORE CRIMPING (mm²) → 	1.82	2.20

5.0 REFERENCE DOCUMENTS

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

i. Molex Quality Crimping Handbook
http://www.molex.com/images/products/apptool/qual_crimp.pdf

ii. Molex-Recognizing Good Crimps
http://www.molex.com, search for Application Tooling

6.0 PROCEDURE

6.1 GENERAL MEASUREMENT AND EVALUATION REQUIREMENTS

Crimp Height Measurement (Extrusion Evaluation)

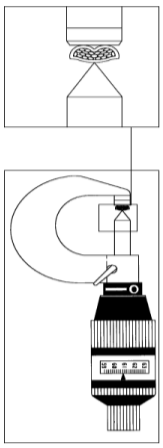


Figure 3

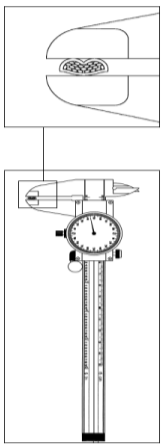


Figure 4

1. Complete tool set-up procedure.
2. Crimp a minimum of 5 samples.
3. Place the flat blade of the crimp micrometer (Figure 3) across the center of the dual radii of the conductor crimp. Do not take the measurement near the conductor bellmouth.
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 4) to measure the crimp height. If the caliper measurement is greater than the crimp micrometer measurement the extrusion is not acceptable. CAUTION: Excessive extrusion can cause connector water leak.

6.2 CRIMP TOOLING GEOMETRY

The crimp tooling shown below is used by Molex to perform validations and to establish recommended crimp height and widths. The user is responsible for validating crimp performance based on tooling, equipment and wire that is being used.

TERMINAL MATERIAL NUMBER →	**643231029 643231319 989151029 989151319**	
WIRE NOMINAL CROSS SECTION (mm²) →	**0.50 - 0.75 - 1.00**	
SAE (awg) →	**18**	

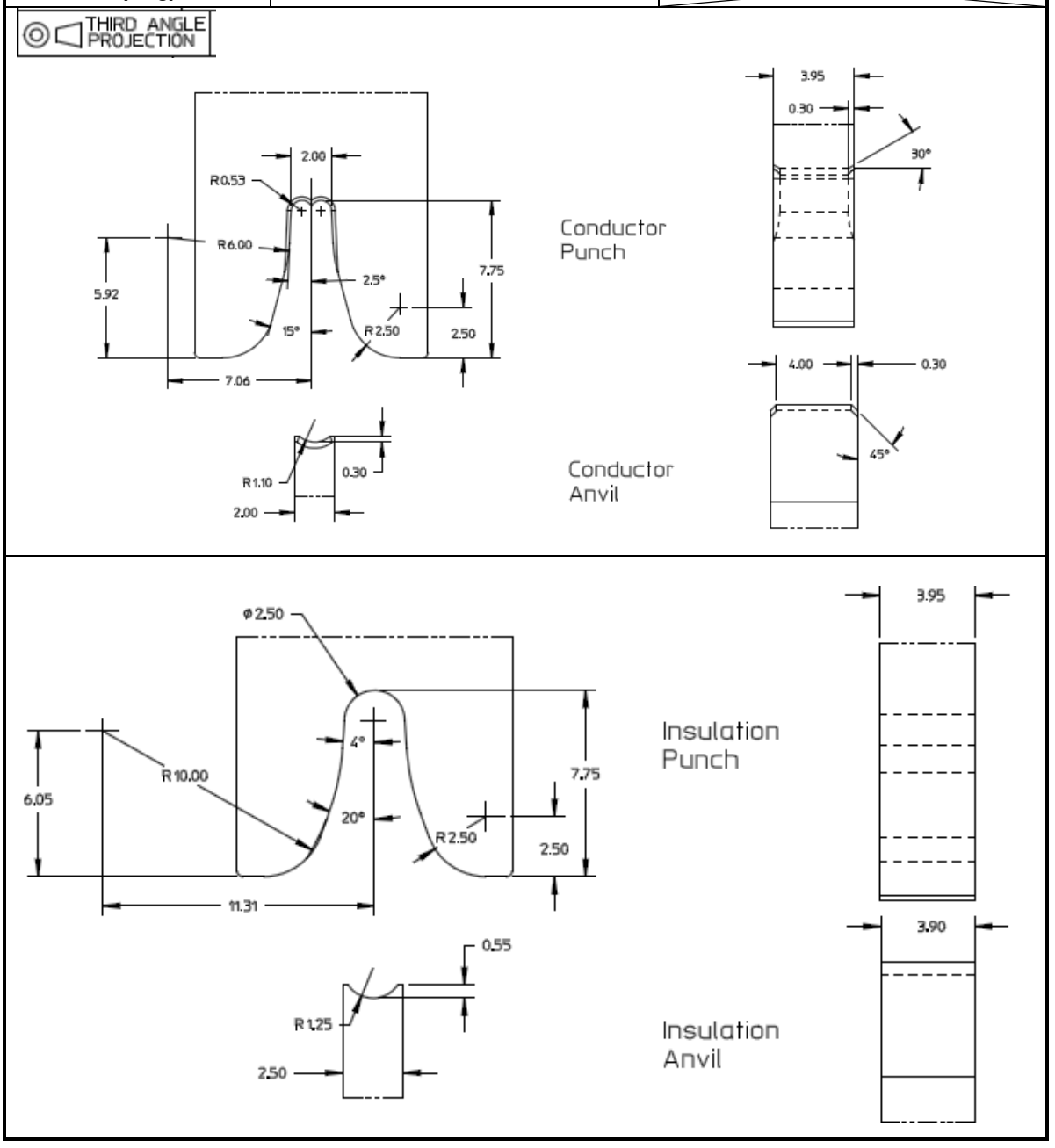


Figure 5a

TERMINAL MATERIAL NUMBER →		643231039 643231219 989151039 989151219
WIRE NOMINAL CROSS SECTION (mm²) →		1.50 - 2.00
SAE (awg) →		14 & 16

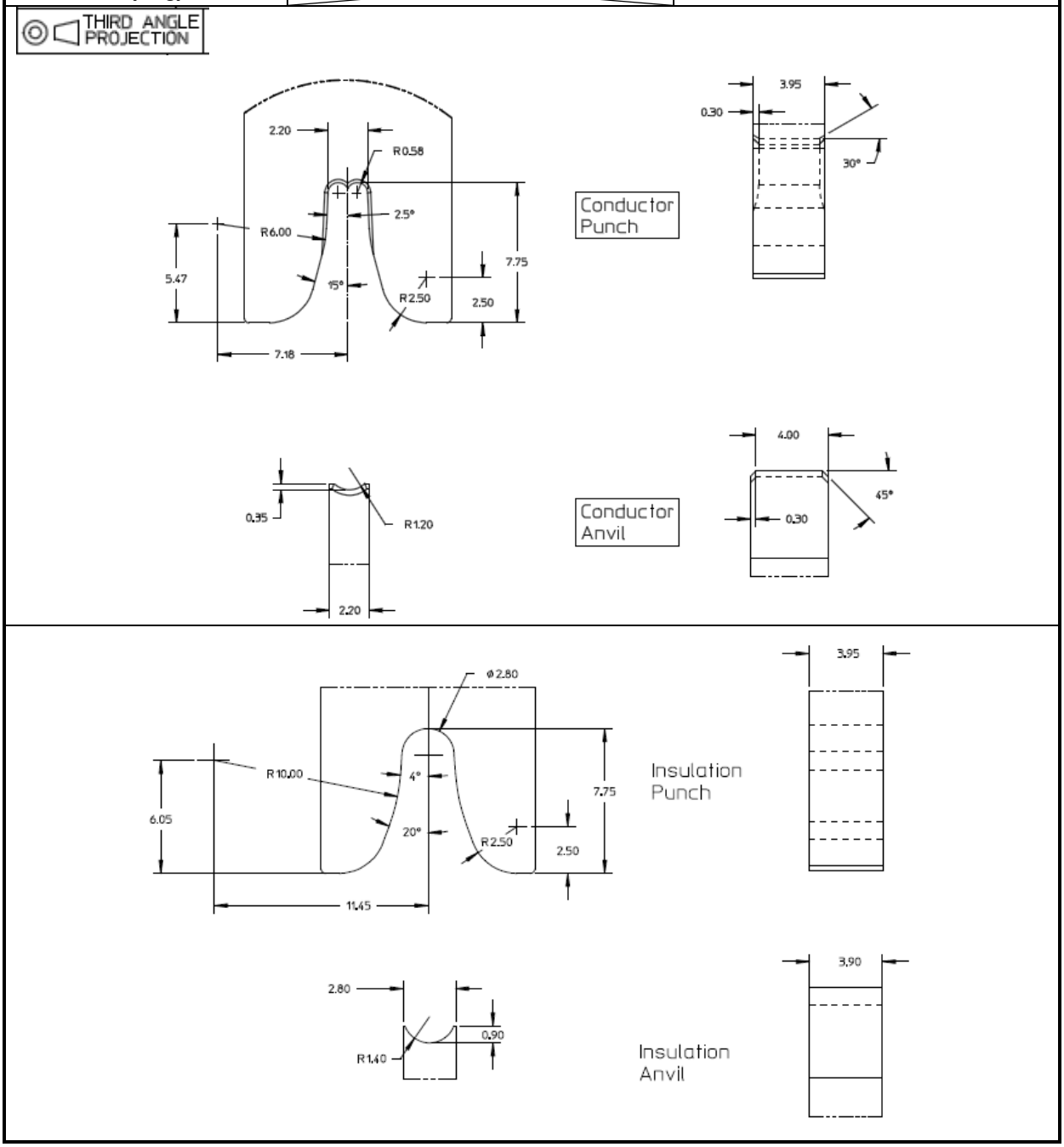


Figure 5b

CRIMP STRAIGHTNESS

A method to maintain crimp straightness is shown in figure 6a below.

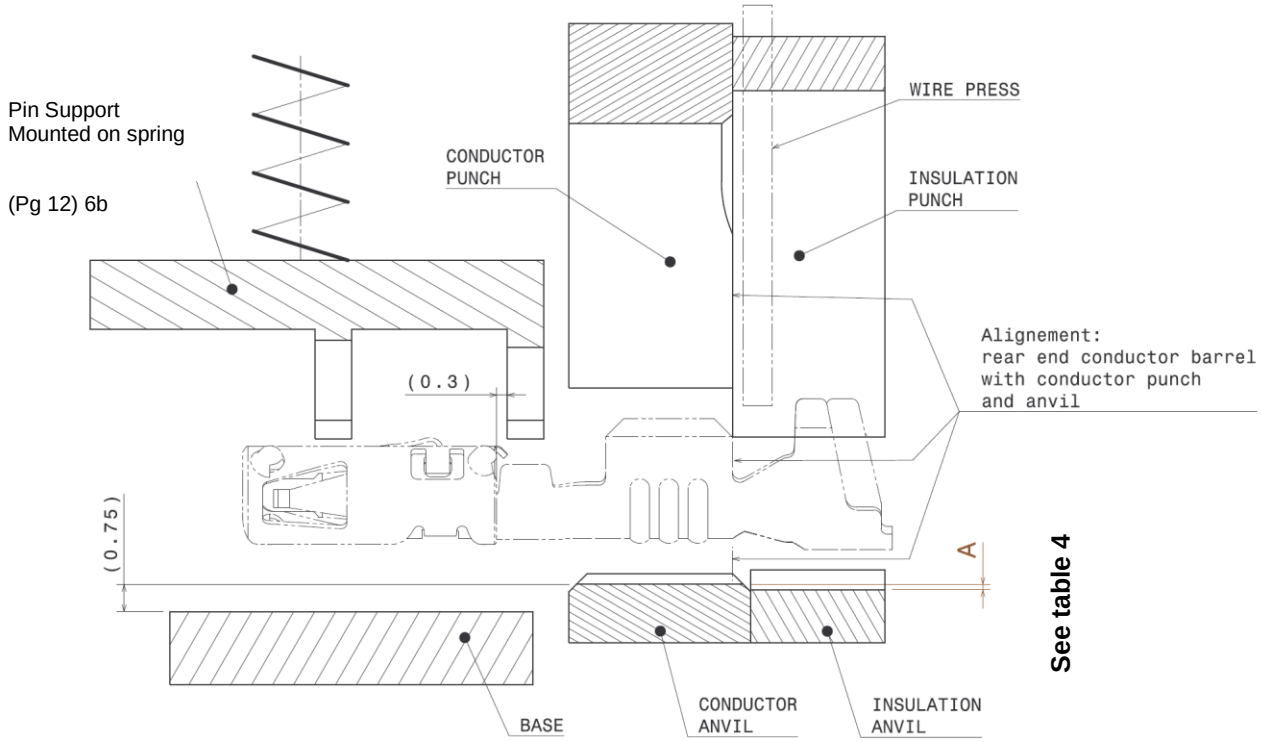


Figure 6a – TERMINAL POSITION IN TOOL

Table 4

TERMINAL MATERIAL NUMBER →	643231029 643231319 989151029 989151319	643231039 643231219 989151039 989151219
WIRE NOMINAL CROSS SECTION (mm²) →	0.50 - 0.75 - 1.00	1.50 - 2.00
NOMINAL CROSS SECTION (AWG) →	18	16 & 14
A (mm)	(0.15)	(0.30)

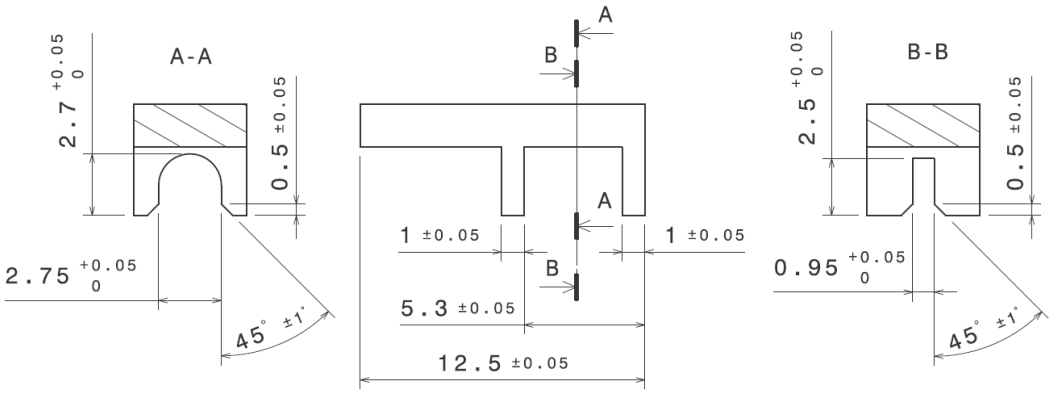


Figure 6b – DETAIL OF PIN SUPPORT

Optional Construction

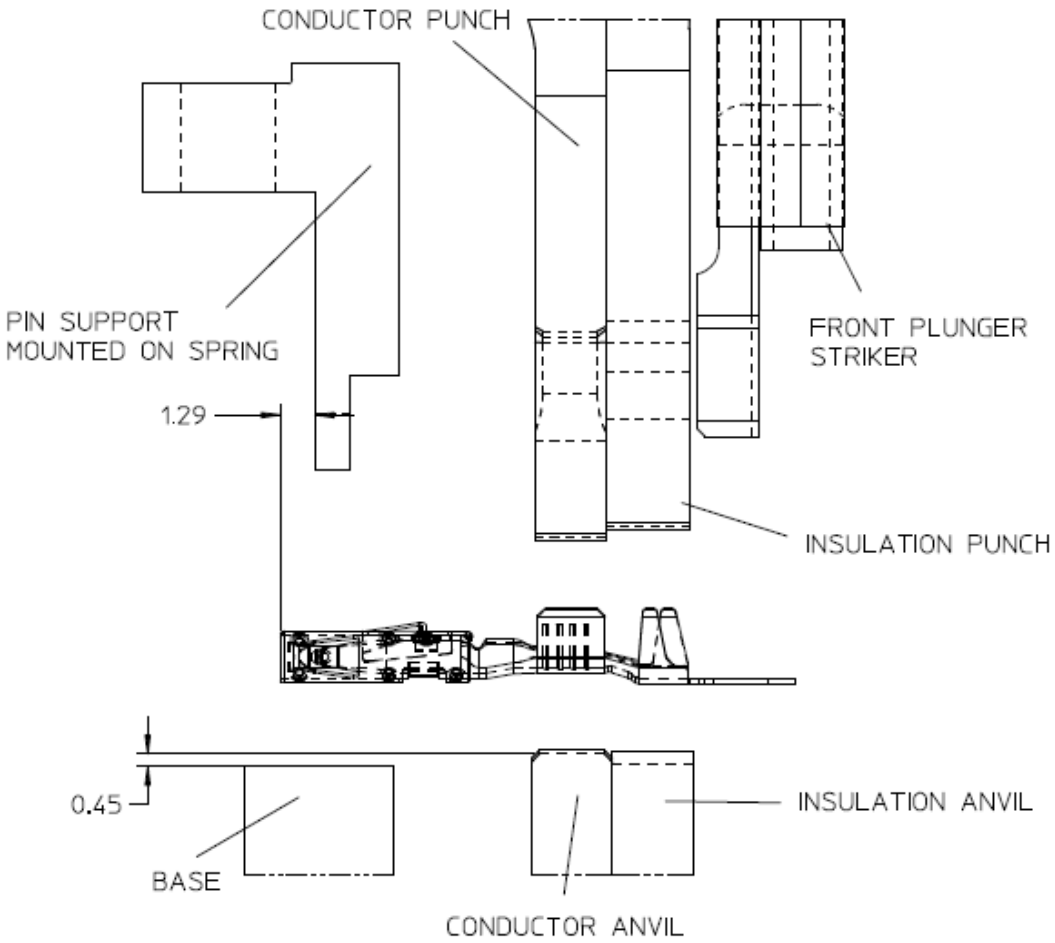


Figure 7a – TERMINAL POSITION IN TOOL

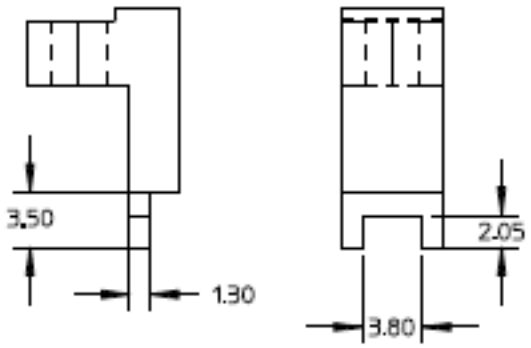


Figure 7b – DETAIL OF PIN SUPPORT

Application Spec Revision Log

Change	By	Date	Revision Number
New document templated applied Tables 1.A and 1.B: Notes added Table 1.C with FLRY-A and the associated notes added Revision Log created	G.Simon	7/7/2021	B