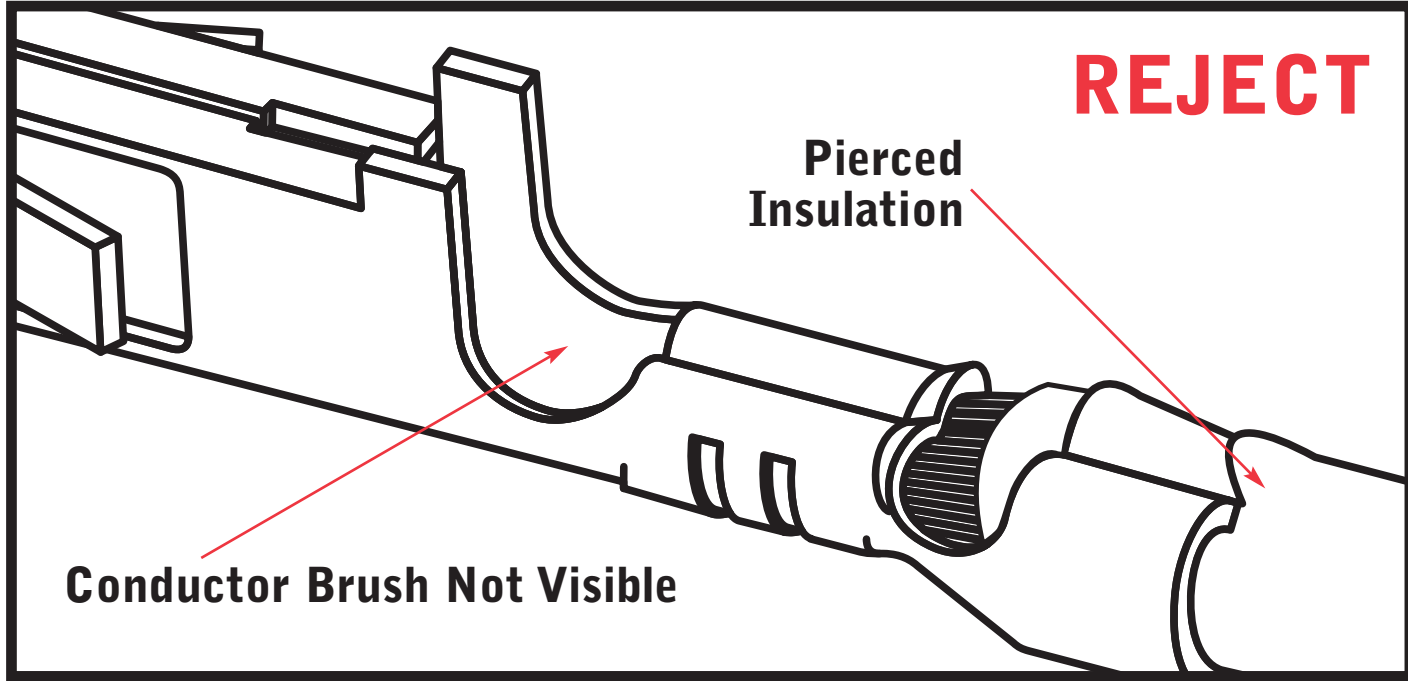
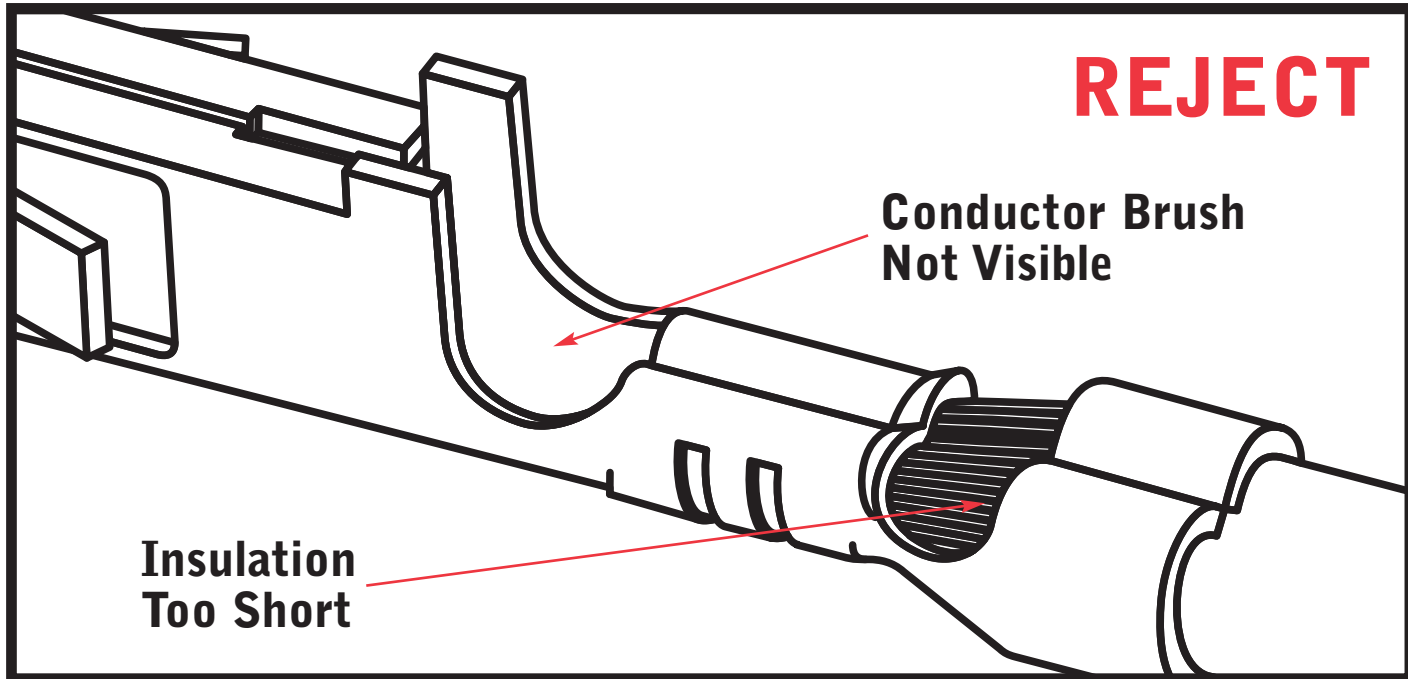
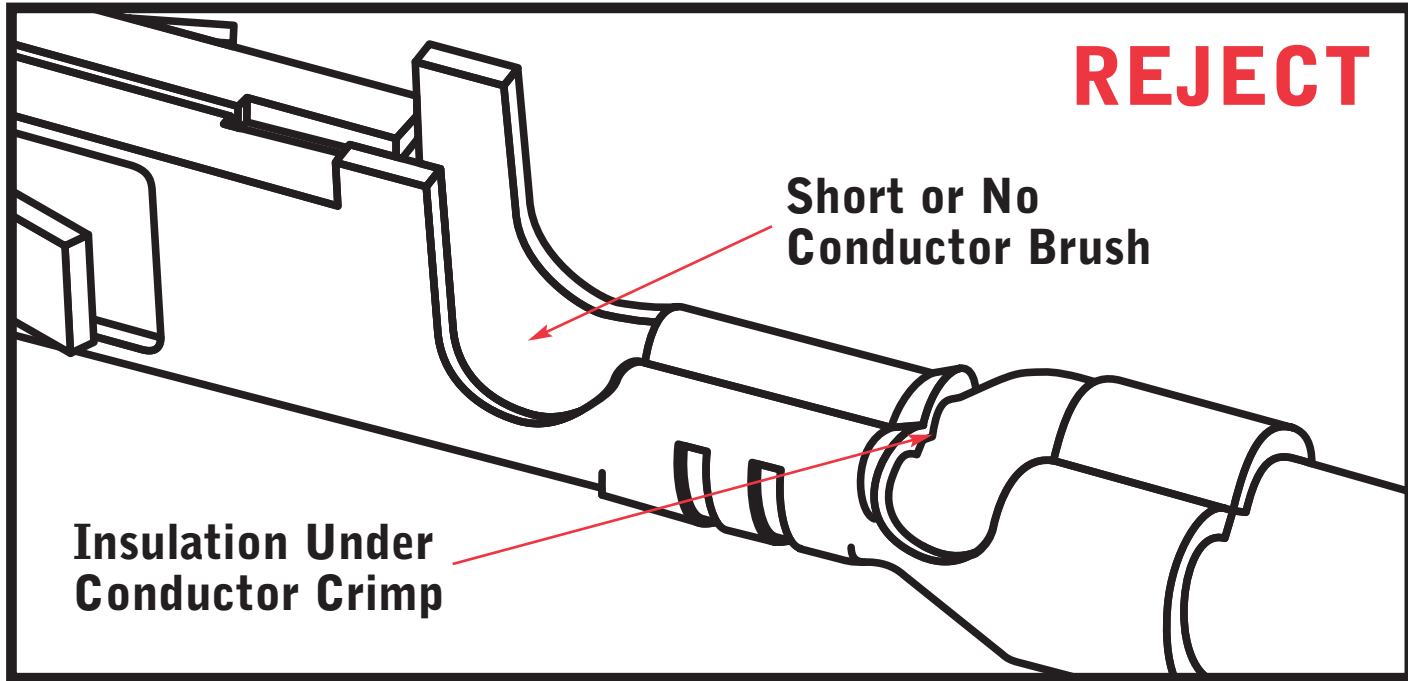
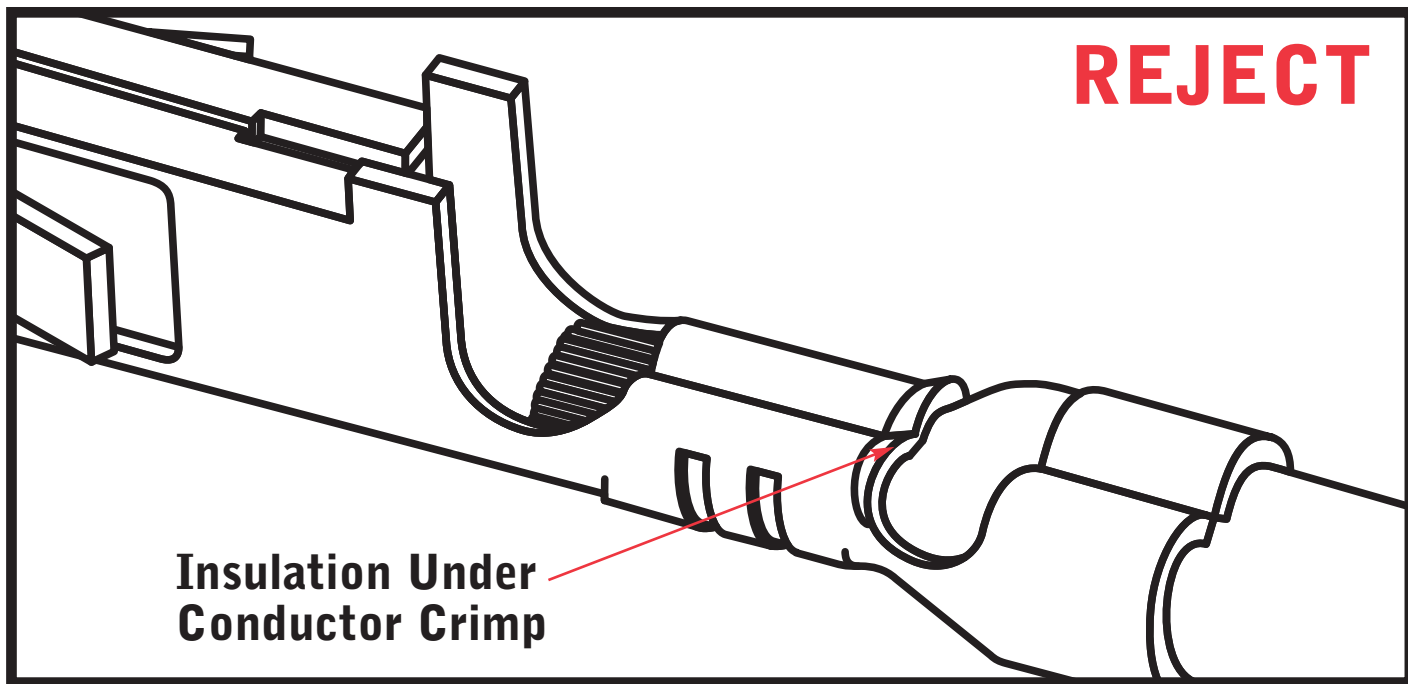
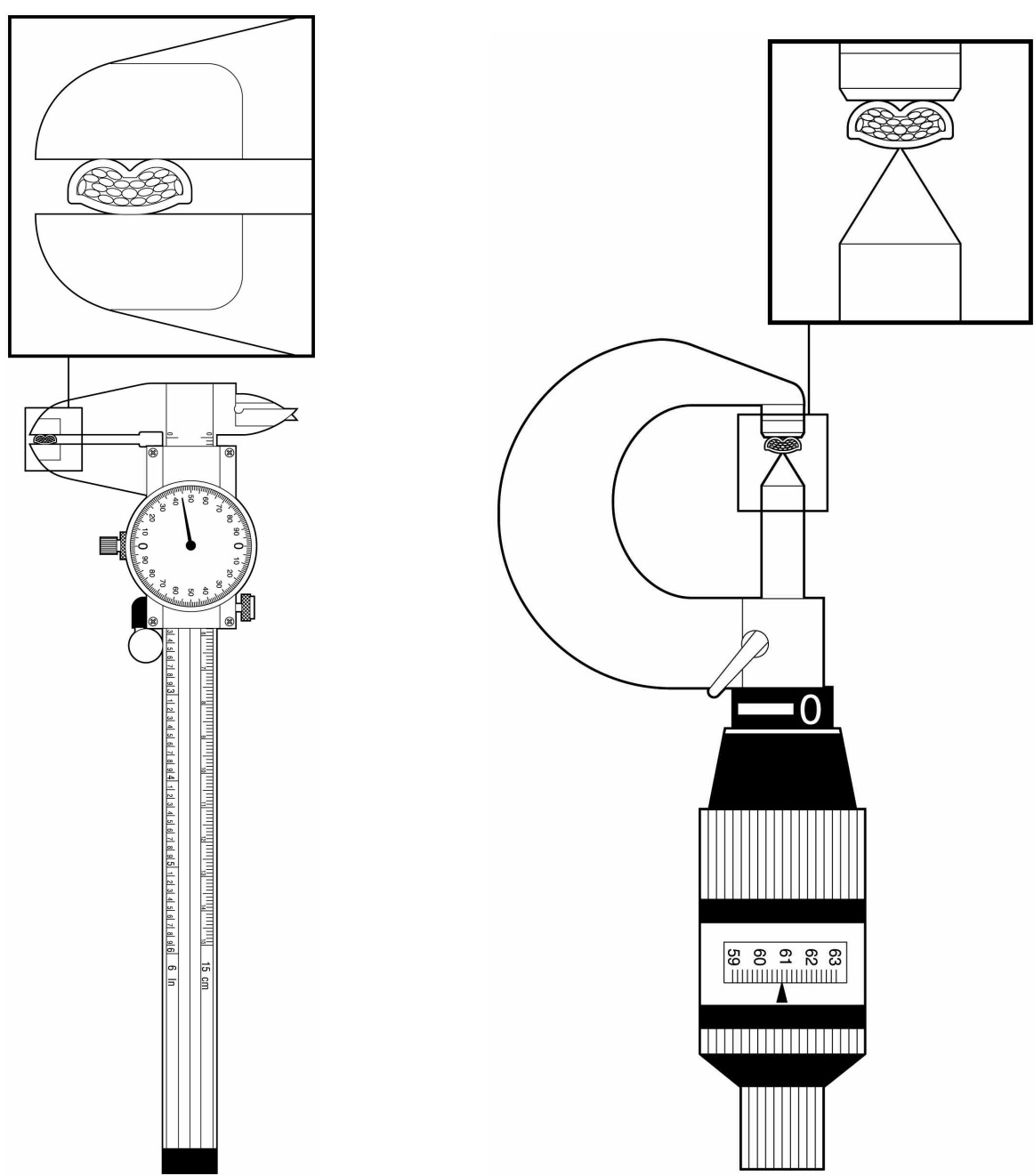


VISUAL INSPECTION OF CRIMPED TERMINALS

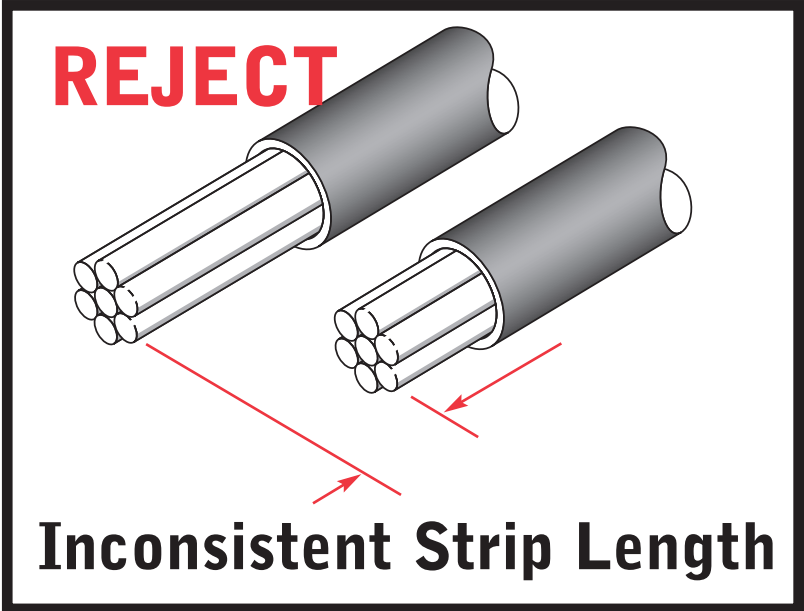
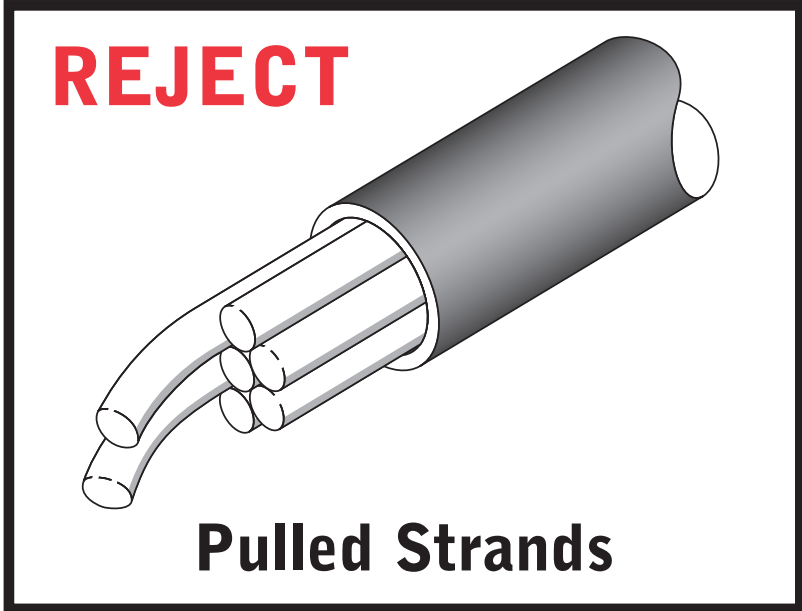
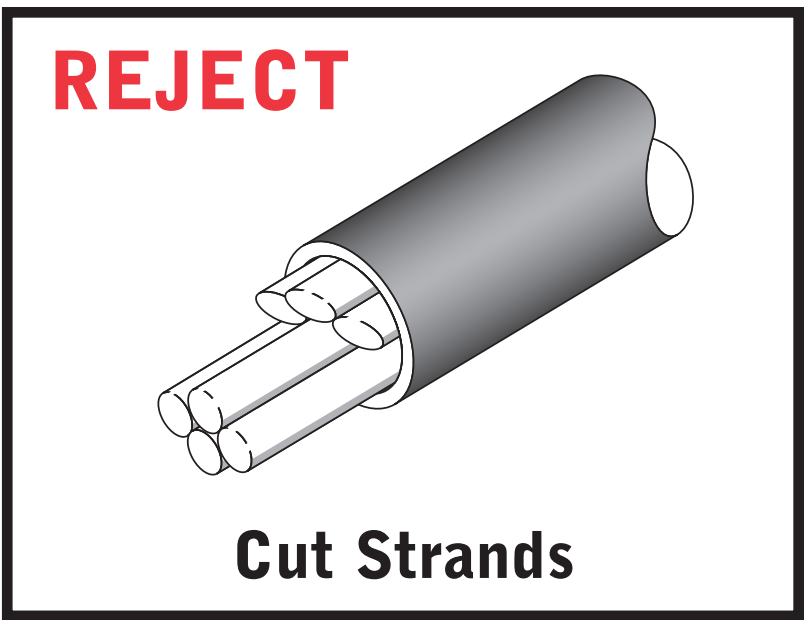
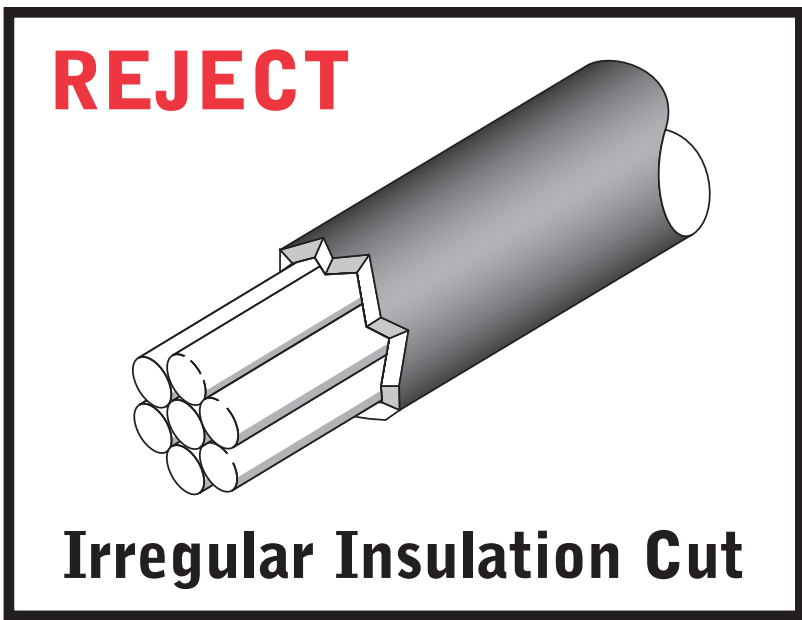
Examples



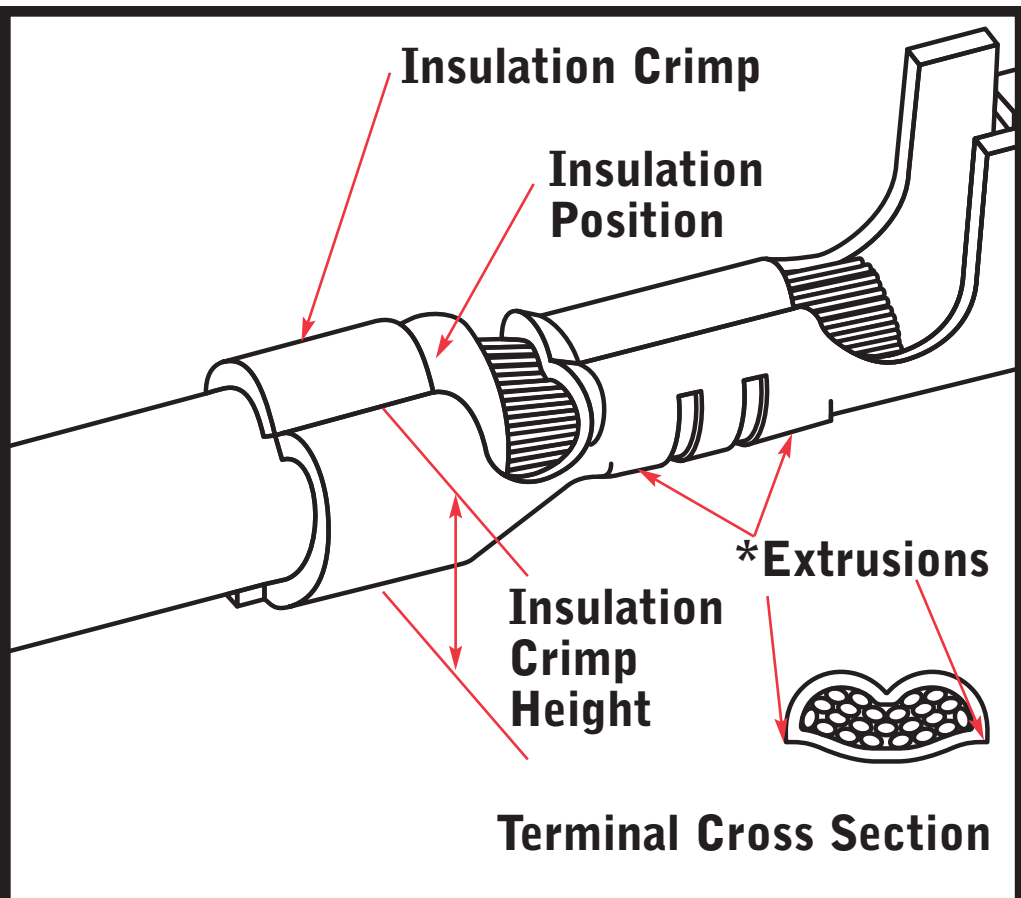
Measurement of Crimp Height



Improper Wire Preparation

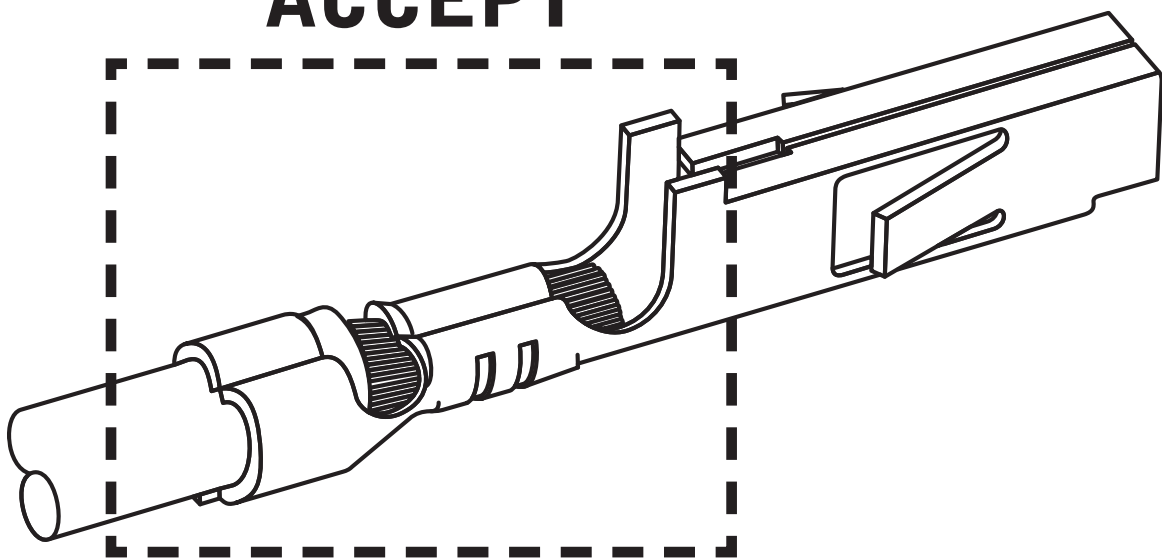


Optimal Crimp



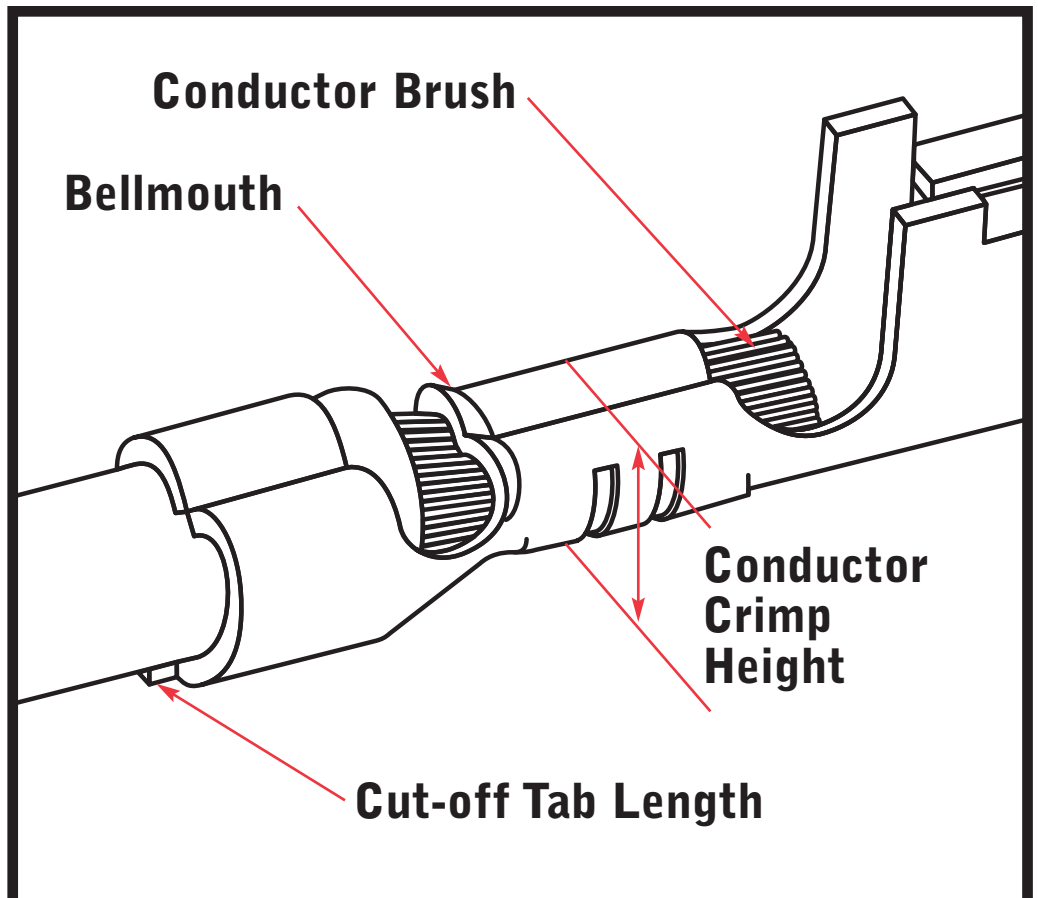
* Extrusions should be minimal or non-existent. When a minimal extrusion exists, it should not exceed below the bottom of the terminal.

ACCEPT

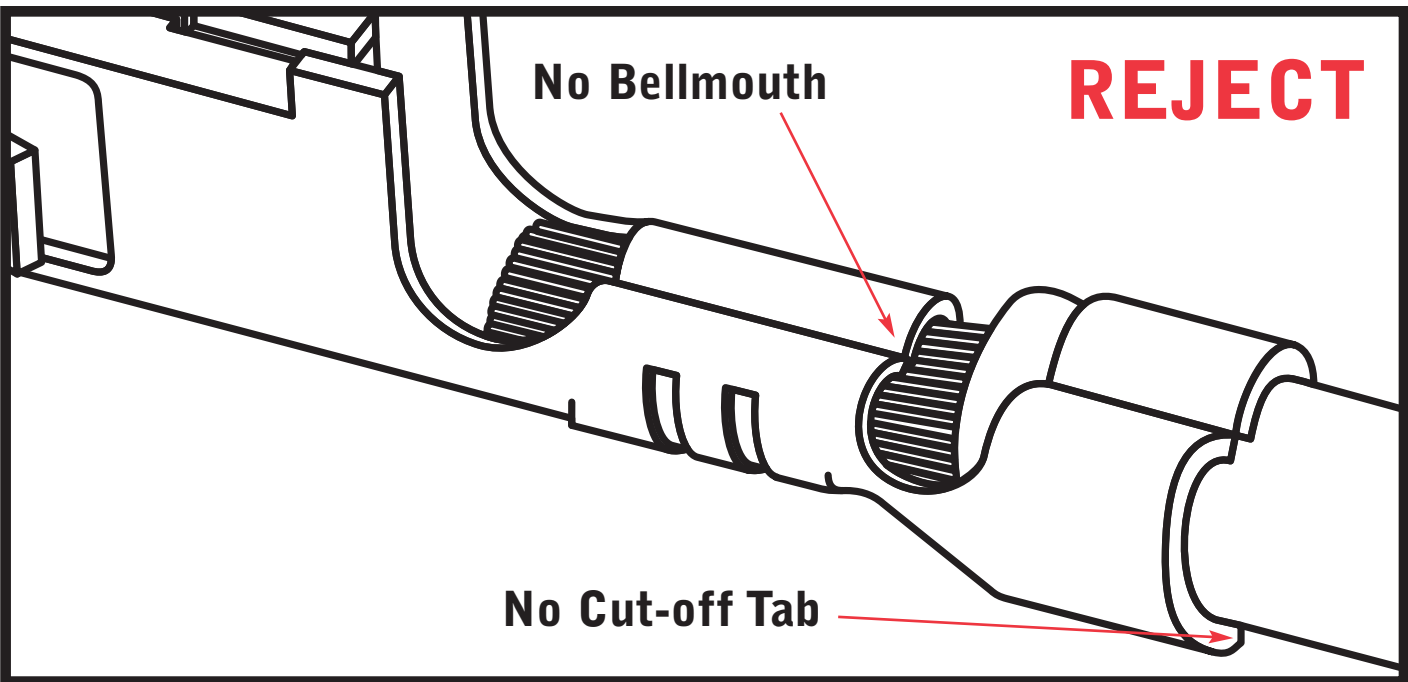
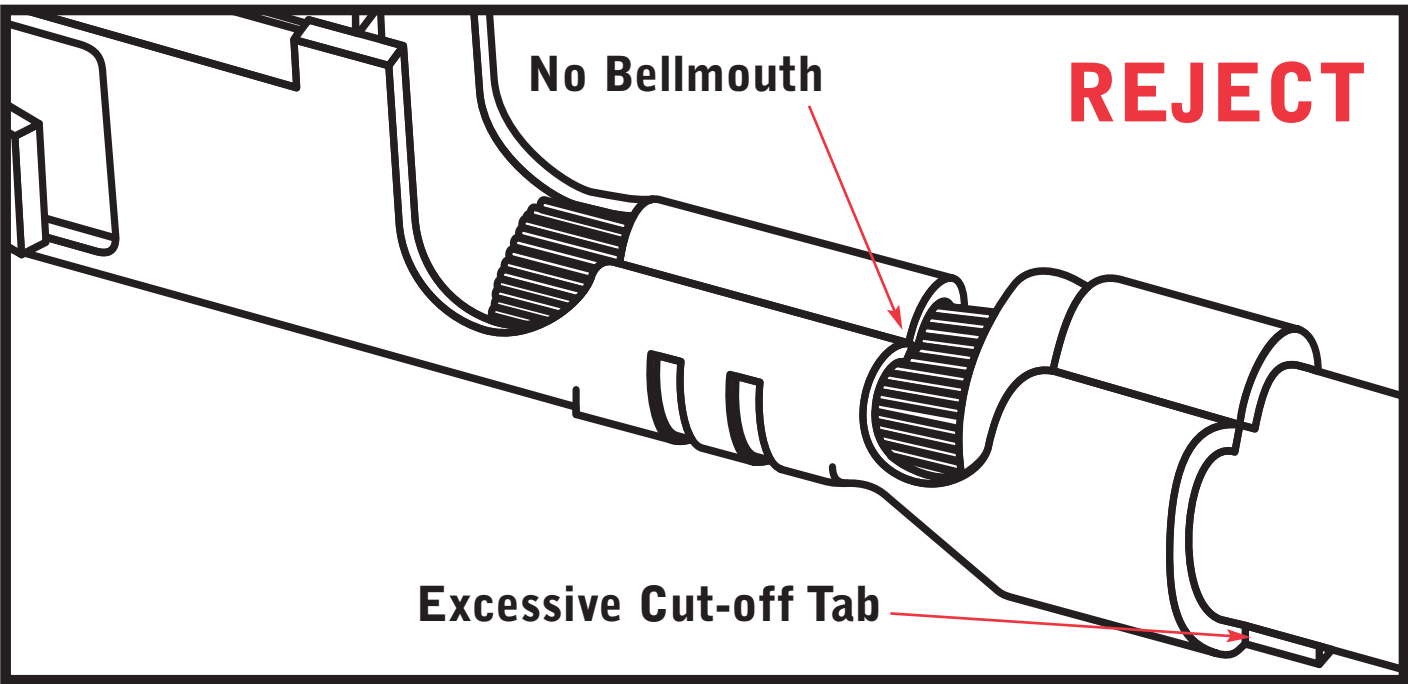
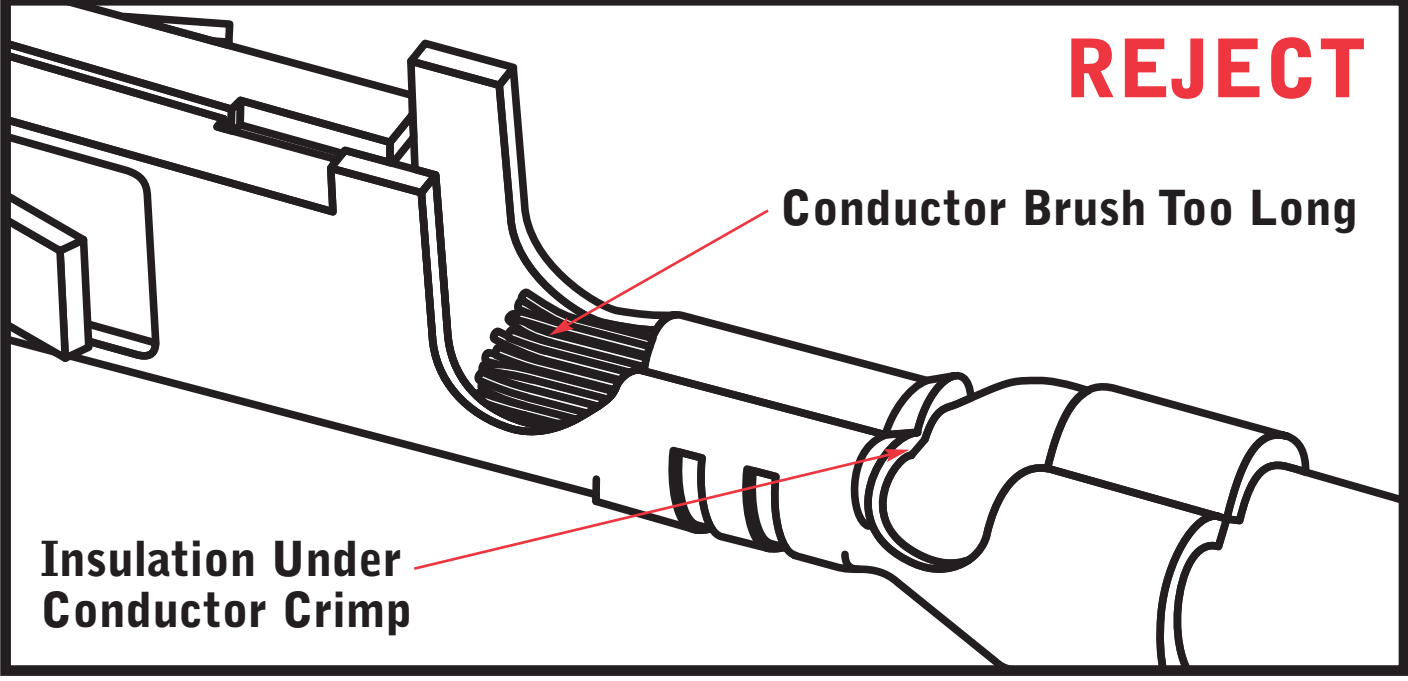
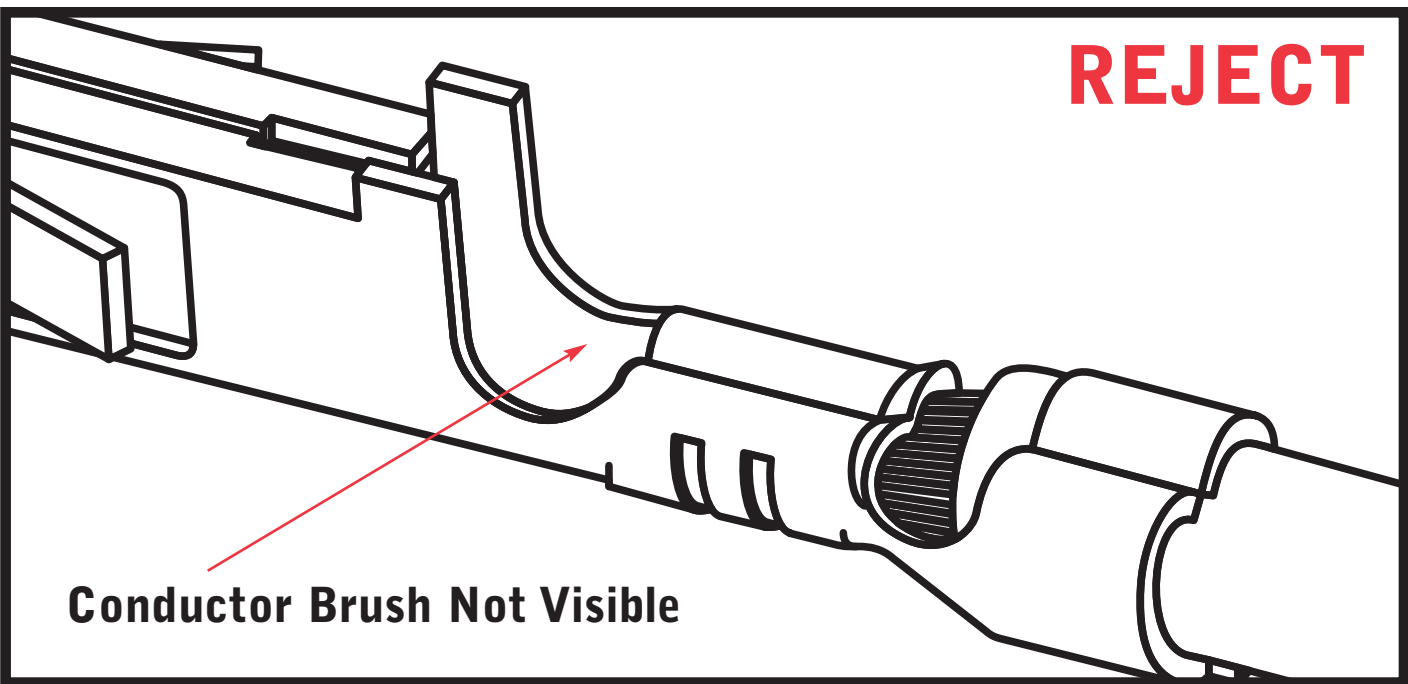


Crimp Height Testing

1. Complete tool set-up procedure.
2. Crimp a minimum of 5 samples.
3. Place the flat blade of the crimp micrometer across the center of the dual radii of the conductor crimp.
Do not take 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 of the crimp.
5. Record crimp height readings. A minimum of 5 crimp height readings are necessary to confirm each set-up. A minimum of 30 readings are necessary to determine capability.
6. Check crimp height every 250 to 500 parts throughout the run.



Examples



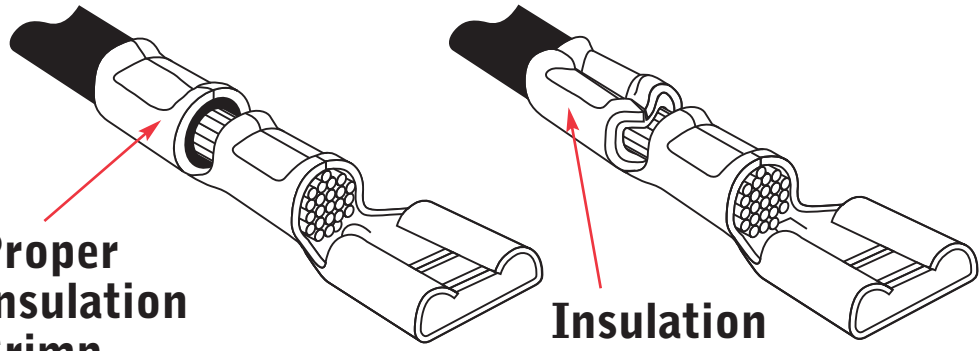
Visual Inspection of Crimped Terminals

INDUSTRIAL

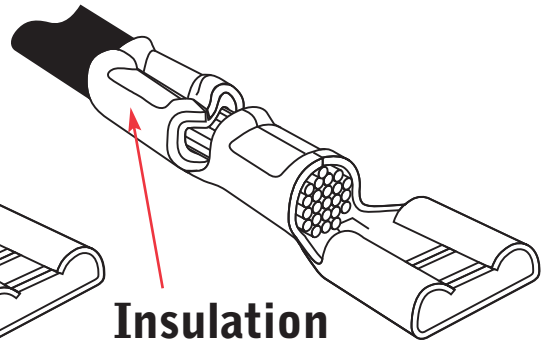
Open Barrel Terminals

ACCEPT

REJECT



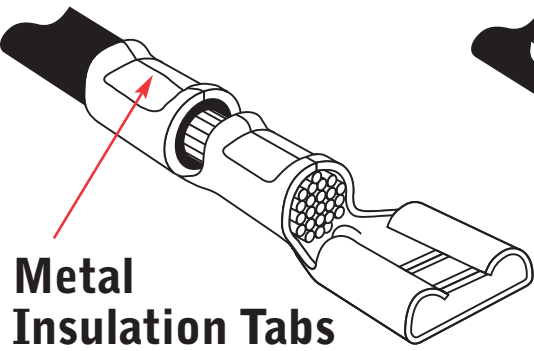
Proper Insulation Crimp



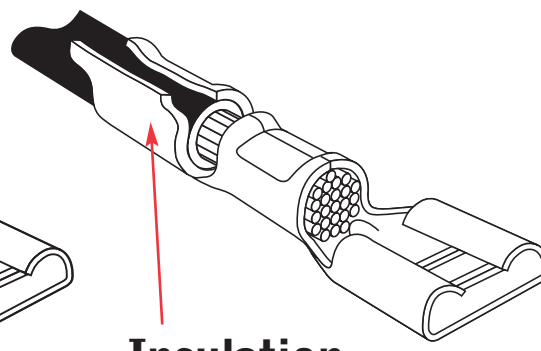
Insulation Pierced or Crushed

ACCEPT

REJECT



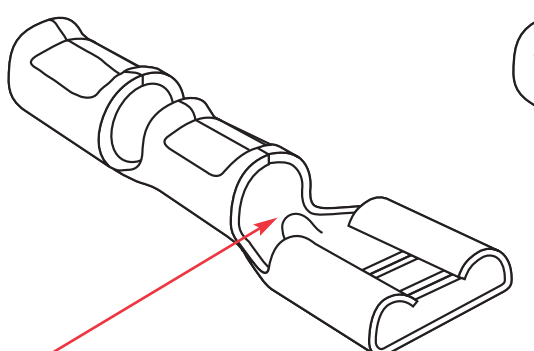
Metal Insulation Tabs Formed and Wire is Held Snugly



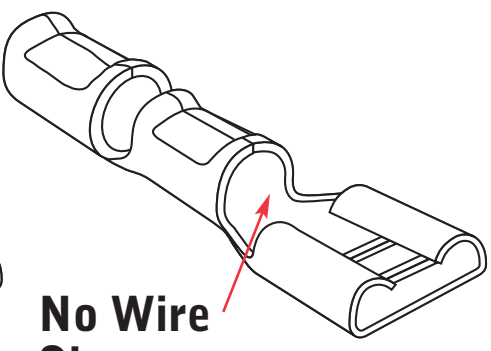
Insulation Tab Bent

ACCEPT

REJECT



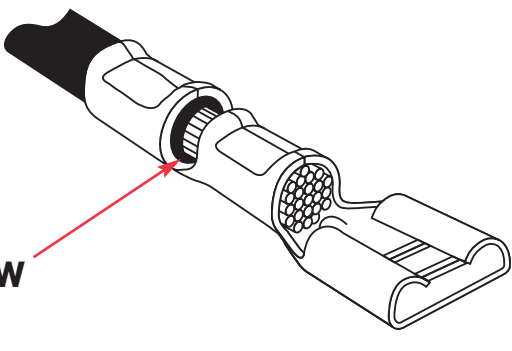
Wire Stop



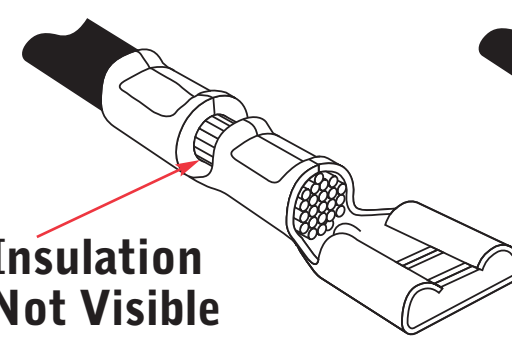
No Wire Stop Do Not Use

ACCEPT

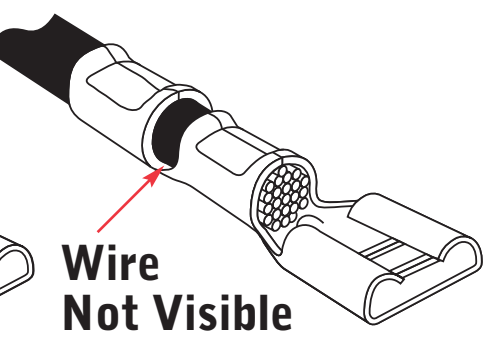
REJECT



Window



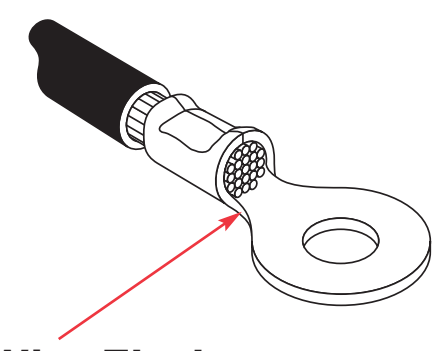
Insulation Not Visible



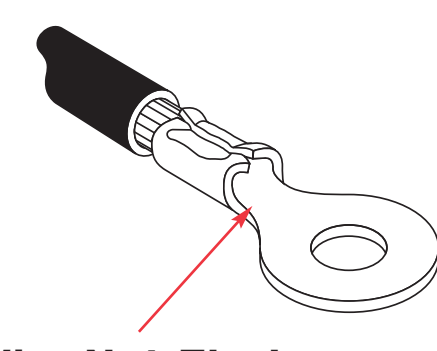
Wire Not Visible

ACCEPT

REJECT



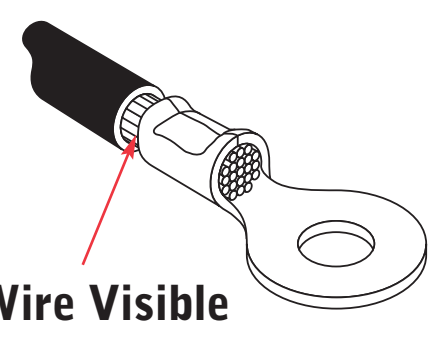
Wire Flush



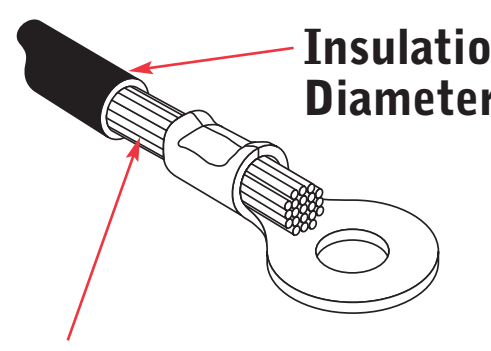
Wire Not Flush

ACCEPT

REJECT



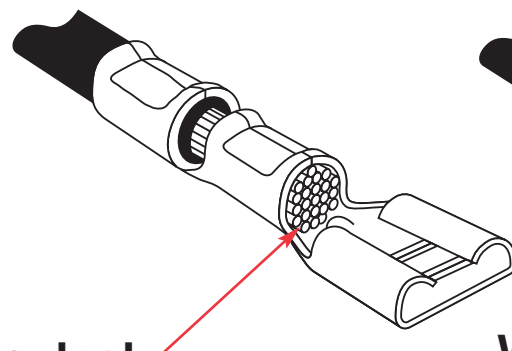
Wire Visible



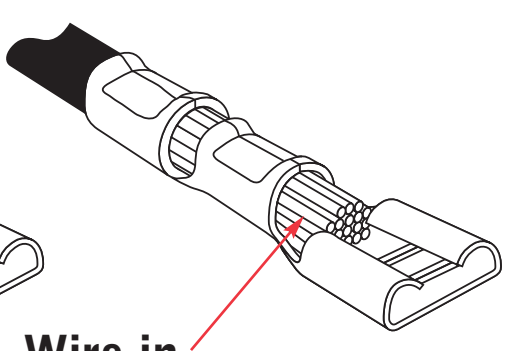
Exceeds Insulation Diameter

ACCEPT

REJECT



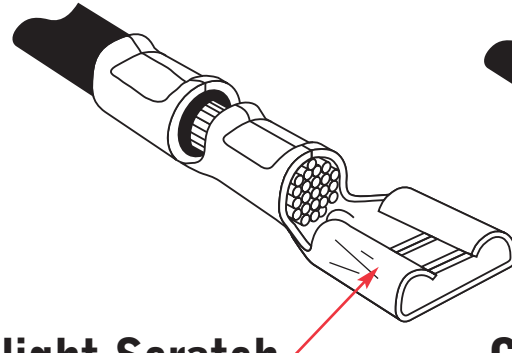
Contact Area



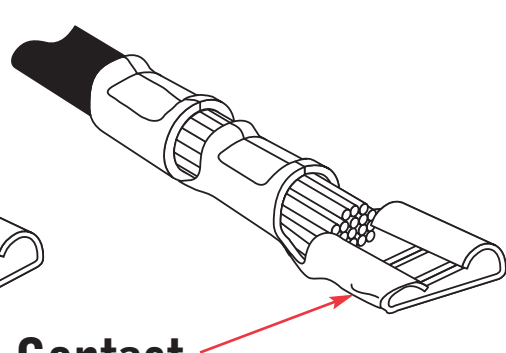
Wire in Contact Area

ACCEPT

REJECT



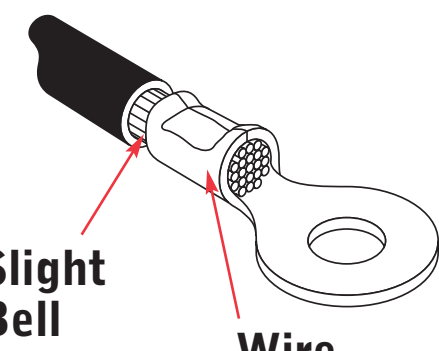
Slight Scratch or Scrape but No Visual Dents



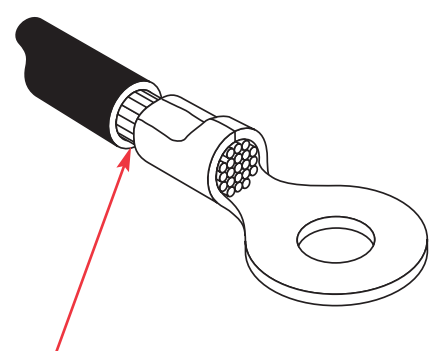
Contact Area Damaged

ACCEPT

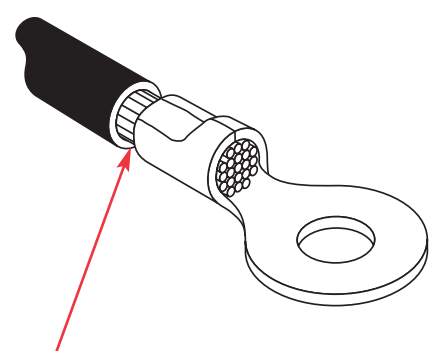
REJECT



Slight Bell Mouth



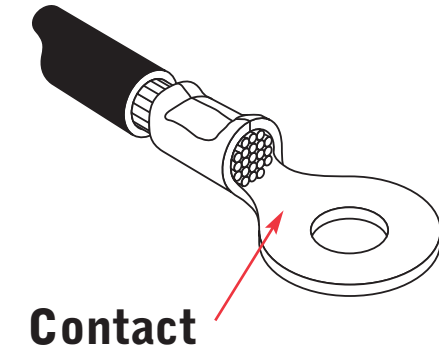
Wire Crimp



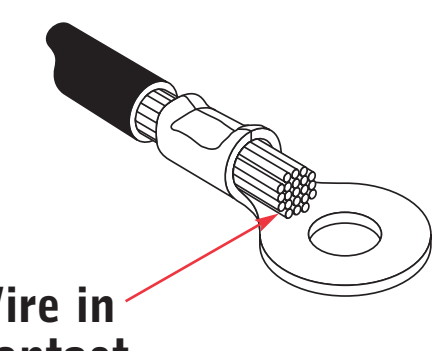
No Bell Mouth

ACCEPT

REJECT

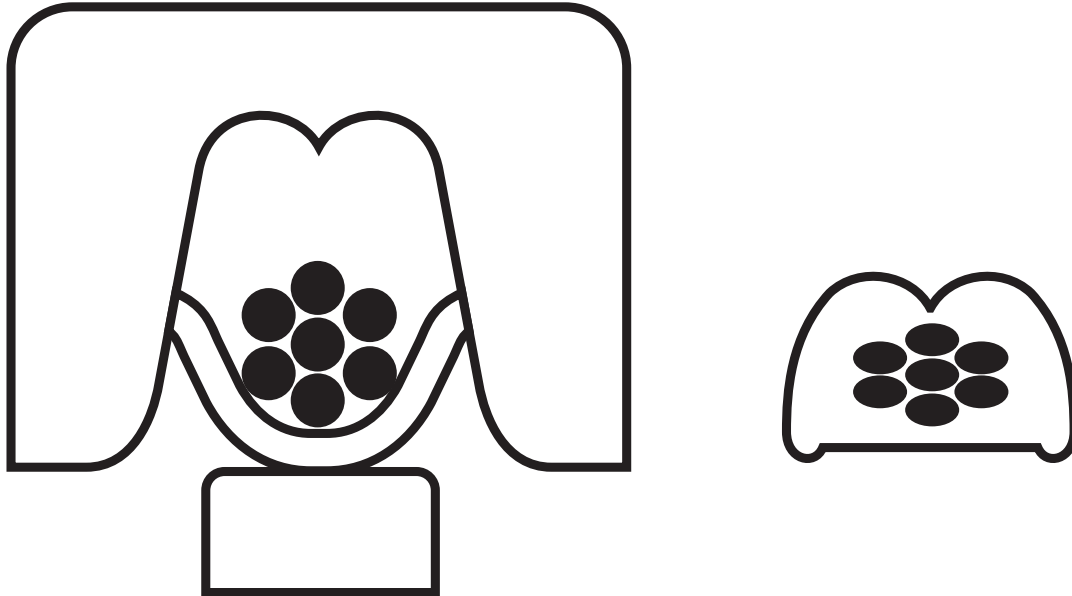


Contact Area

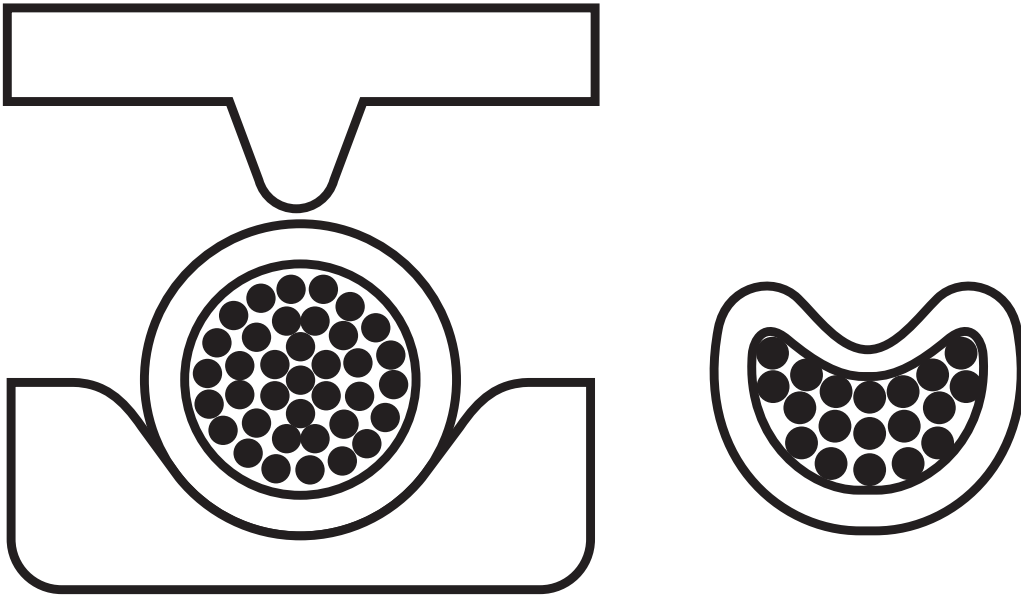


Wire in Contact Area

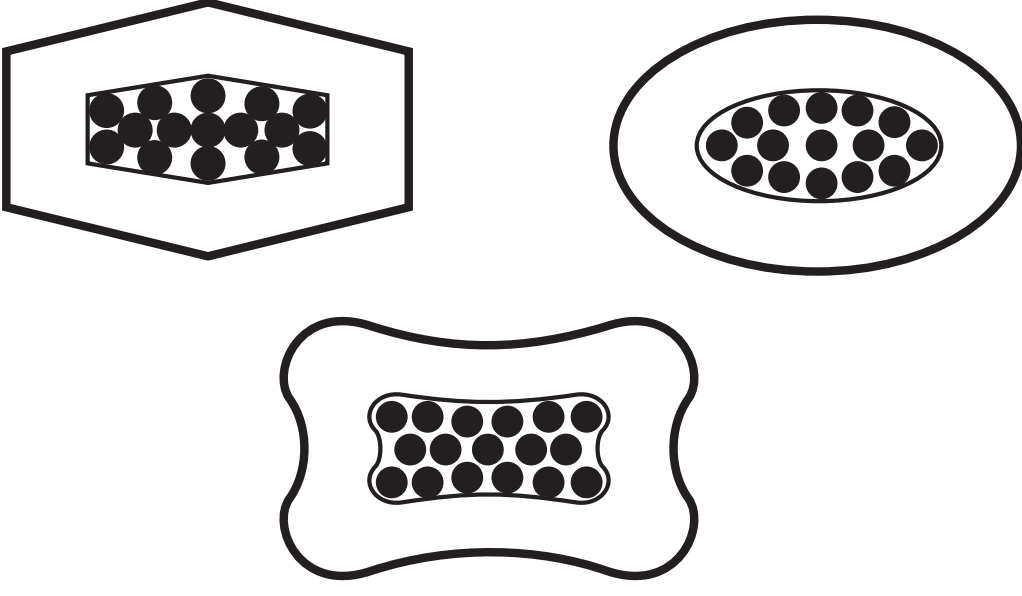
Crimp Types



F CRIMP FOR OPEN BARREL TERMINALS



INDENTOR CRIMP FOR CLOSED BARREL TERMINALS



CONFINED CRIMP FOR CLOSED BARREL TERMINALS

Tensile Strength in Pounds

Wire Size	*UL-486A	*UL-486-C	*UL-310	*Military Class 2
26	3	N/A	N/A	7
24	5	N/A	N/A	10
22	8	8	8	15
20	13	10	13	19
18	20	10	20	38
16	30	15	30	50
14	50	25	50	70
12	70	35	70	110
10	80	40	80	150
8	90	45	N/A	225
6	100	50	N/A	300
4	140	N/A	N/A	400
2	180	N/A	N/A	550
1	200	N/A	N/A	650
1/0	250	N/A	N/A	700
2/0	300	N/A	N/A	750
3/0	350	N/A	N/A	825
4/0	450	N/A	N/A	875
250 MCM	500	N/A	N/A	1000
300 MCM	550	N/A	N/A	1120
350 MCM	600	N/A	N/A	1125

AWG-CMA Table

Terminal Size	CMA Range
26-22	202 - 810
24-20	320 - 1,020
22-18	509 - 2,600
22-16	509 - 3,260
16-14	2,050 - 5,180
14-12	3,260 - 8,213
12-10	5,180 - 13,100
8	13,100 - 20,800
6	20,800 - 33,100
4	33,100 - 52,600
2	52,600 - 83,700
1/0	83,700 - 119,500
2/0	119,500 - 150,500
3/0	150,500 - 190,000
4/0	190,000 - 231,000

Technical Wire Information

CMA - Circular Mil Area is a unit of area equal to that of a circle whose diameter in one Mil.

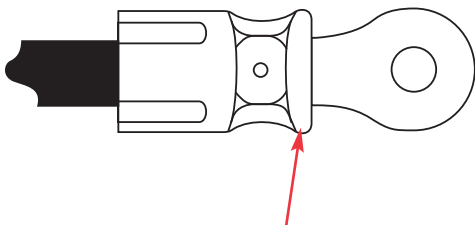
MIL - One mil equals .001 inches.
.001 = 1 mil
.030 = 30 mils
.125 = 125 mils

* **UL - 486 A** - Terminals (Copper conductors only)
* **UL - 486 C** - Butt Splices, Parallel Splices, Closed End Connectors and Wire Nuts
* **UL - 310** - Quick Disconnects, Flag and Couplers
* **Military Class 2** - Military Approved Terminals only as listed

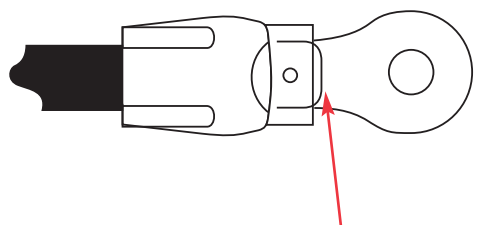
Closed Barrel Terminals

ACCEPT

REJECT



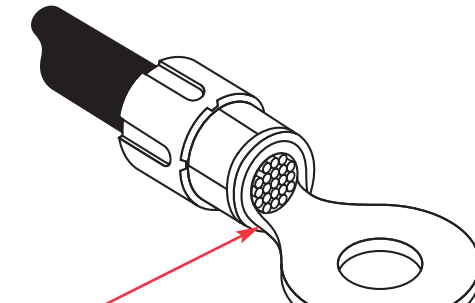
Bell Mouth



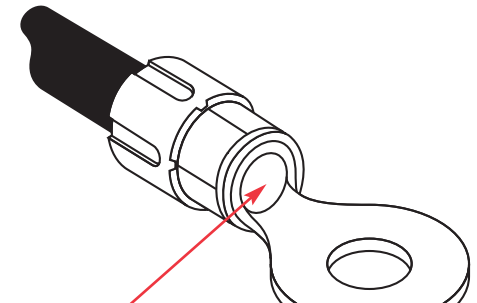
No Bell Mouth

ACCEPT

REJECT

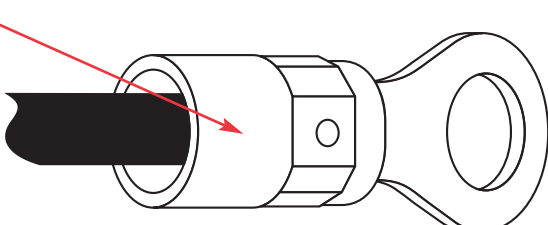


Wire Flush or Greater (Brush)



Wire Not Visible

ACCEPT



No Insulation Crimp

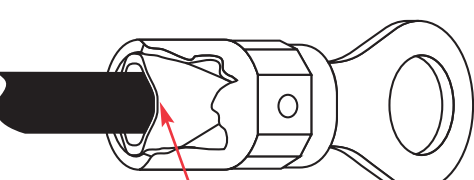
Wire Flush or Greater (Brush) Wire Not Visible

Wire sizes of 8 AWG and larger do not require an insulation crimp.

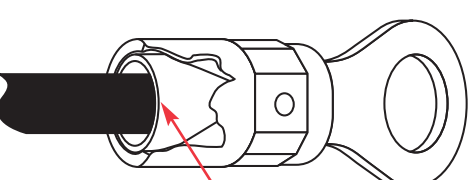
Wire sizes of 18 through 10 AWG require an insulation crimp and the wire can be held securely in the insulation crimp.

ACCEPT

REJECT



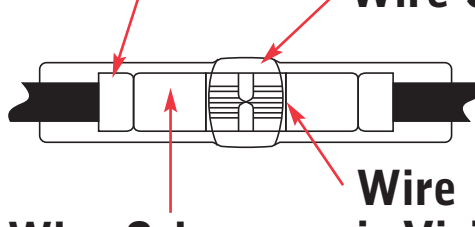
Insulation Indent Formed-Wire Secure In Insulation Crimp



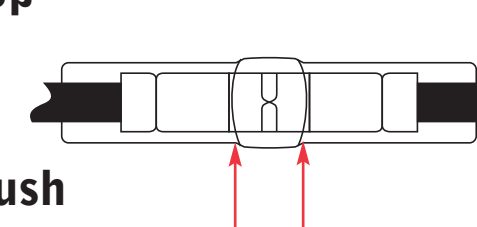
Insulation Indent Not Formed-Wire Moves In Insulation Crimp

ACCEPT

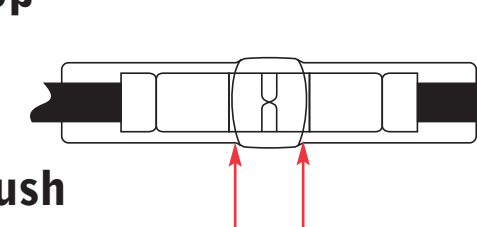
REJECT



Wire Crimp



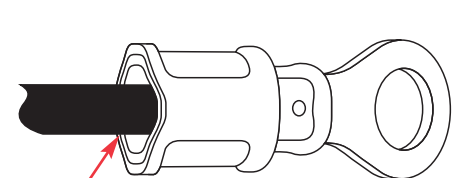
Wire Brush is Visible



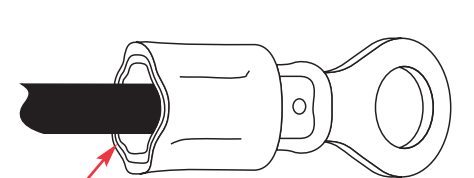
Wire Brush Not Visible

ACCEPT

REJECT



Metal Sleeve Snug



Metal Sleeve Not Snug

Changing Inches to Mils

■ Multiply inches by 1000 or:
■ Move decimal point 3 places to right or:
■ Change terminology, i.e. .032 in. = 32 thousandths or 32 mils.

Computation of CMA

D = Diameter in mils
Round Solid Conductor: Change diameter from inches to mils, then multiply the diameter in mils by itself.
CMA = D mils x D mils
Stranded Conductor: Find CMA of a single strand and multiply the result by the total number of strands.
CMA = (D of one strand x D of one strand) x Number of Strands

INSPECCIÓN VISUAL DE TERMINALES ENGARZADOS INDUSTRIAL

Terminales de cilindro abierto

ACEPTAR

RECHAZAR

Engarzado correcto del aislamiento

Aislamiento perforado o aplastado

ACEPTAR

RECHAZAR

Área de contacto

Alambre en el área de contacto

ACEPTAR

RECHAZAR

Abolladuras o rayas leves pero sin melladuras visibles

Área de contacto dañada

ACEPTAR

RECHAZAR

Leve abocinamiento

Engarzado del alambre

Sin abocinamiento

ACEPTAR

RECHAZAR

Área de contacto

Alambre en el área de contacto

ACEPTAR

RECHAZAR

Se forman lengüetas metálicas de aislamiento y el alambre se sujeta firmemente

Lengüeta doblada de aislamiento

ACEPTAR

RECHAZAR

Tope de alambre

No hay tope de alambre No lo use

ACEPTAR

RECHAZAR

Ventana

RECHAZAR

RECHAZAR

Aislamiento no visible

El alambre no es visible

ACEPTAR

RECHAZAR

Alambre a ras

Alambre no está a ras

ACEPTAR

RECHAZAR

Alambre visible

Excede el diámetro del aislamiento

Tipos de engarzado

ENGARZADO F PARA TERMINALES DE CILINDRO ABIERTO

ENGARZADO HENDEDOR PARA TERMINALES DE CILINDRO CERRADO

ENGARZADO CONFINADO PARA TERMINALES DE CILINDRO CERRADO

Resistencia a la tensión en libras

Calibre del alambre	*UL-486A	*UL-486-C	*UL-310	*Uso Militar Clase 2
26	3	N/A	N/A	7
24	5	N/A	N/A	10
22	8	8	8	15
20	13	10	13	19
18	20	10	20	38
16	30	15	30	50
14	50	25	50	70
12	70	35	70	110
10	80	40	80	150
8	90	45	N/A	225
6	100	50	N/A	300
4	140	N/A	N/A	400
2	180	N/A	N/A	550
1	200	N/A	N/A	650
1/0	250	N/A	N/A	700
2/0	300	N/A	N/A	750
3/0	350	N/A	N/A	825
4/0	450	N/A	N/A	875
250 MCM	500	N/A	N/A	1000
300 MCM	550	N/A	N/A	1120
350 MCM	600	N/A	N/A	1125

* UL - 486 A - Terminales (sólo para conductores de cobre)

* UL - 486 C - Empalmes a tope, empalmes paralelos, conectores de extremo cerrado y conectores manuales para alambres

* UL - 310 - Conectores rápidos, barra y acoples

* Uso militar Clase 2 - Terminales con aprobación militar sólo de acuerdo con la lista

Tabla AWG-CMA

Tamaño de terminal	Límites CMA
26-22	202 - 810
24-20	320 - 1,020
22-18	509 - 2,600
22-16	509 - 3,260
16-14	2,050 - 5,180
14-12	3,260 - 8,213
12-10	5,180 - 13,100
8	13,100 - 20,800
6	20,800 - 33,100
4	33,100 - 52,600
2	52,600 - 83,700
1/0	83,700 - 119,500
2/0	119,500 - 150,500
3/0	150,500 - 190,000
4/0	190,000 - 231,000

Información técnica del alambre

CMA - Área milésima circular, es una unidad de área equivalente al área de un círculo cuyo diámetro es una milésima.

MIL - Una milésima equivale a 0.001 pulgadas.

0.001 = 1 mil

0.030 = 30 mil

0.125 = 125 mil

Terminales de cilindro cerrado

ACEPTAR

RECHAZAR

Diámetro de abocinamiento

Sin abocinamiento

ACEPTAR

RECHAZAR

Centrado

Descentrado Demasiado adelantado

ACEPTAR

RECHAZAR

Alambres a ras o con mayor extensión (escobilla)

El alambre no es visible

ACEPTAR

RECHAZAR

Área de contacto

Alambre en el área de contacto

ENGARZADO DE AISLAMIENTO METÁLICO

ACEPTAR

RECHAZAR

Se deforma el aislamiento - El alambre está fijo en el engarzado del aislamiento

No se deforma el aislamiento - El alambre se mueve en el engarzado del aislamiento

EMPALMES A TOPE

10 a 18 AWG

ACEPTAR

RECHAZAR

Engarzado del aislamiento

Tope de alambre

La escobilla de alambre es visible

La escobilla de alambre no es visible

ACEPTAR

RECHAZAR

Camisa metálica ajustada

Camisa metálica no está ajustada

Conversión de pulgadas a milésimas

■ Multiplicar las pulgadas por 1000 o:

■ Mover el punto decimal 3 posiciones a la derecha o:

■ Cambiar terminología, es decir 0.032 pulg. = 32 milésimas o 32 mils.

Cálculo de CMA

D = diámetro en mils

Conductor sólido circular: Cambiar el diámetro de pulgadas a milésimas, después multiplicar el diámetro en milésimas por sí mismo.

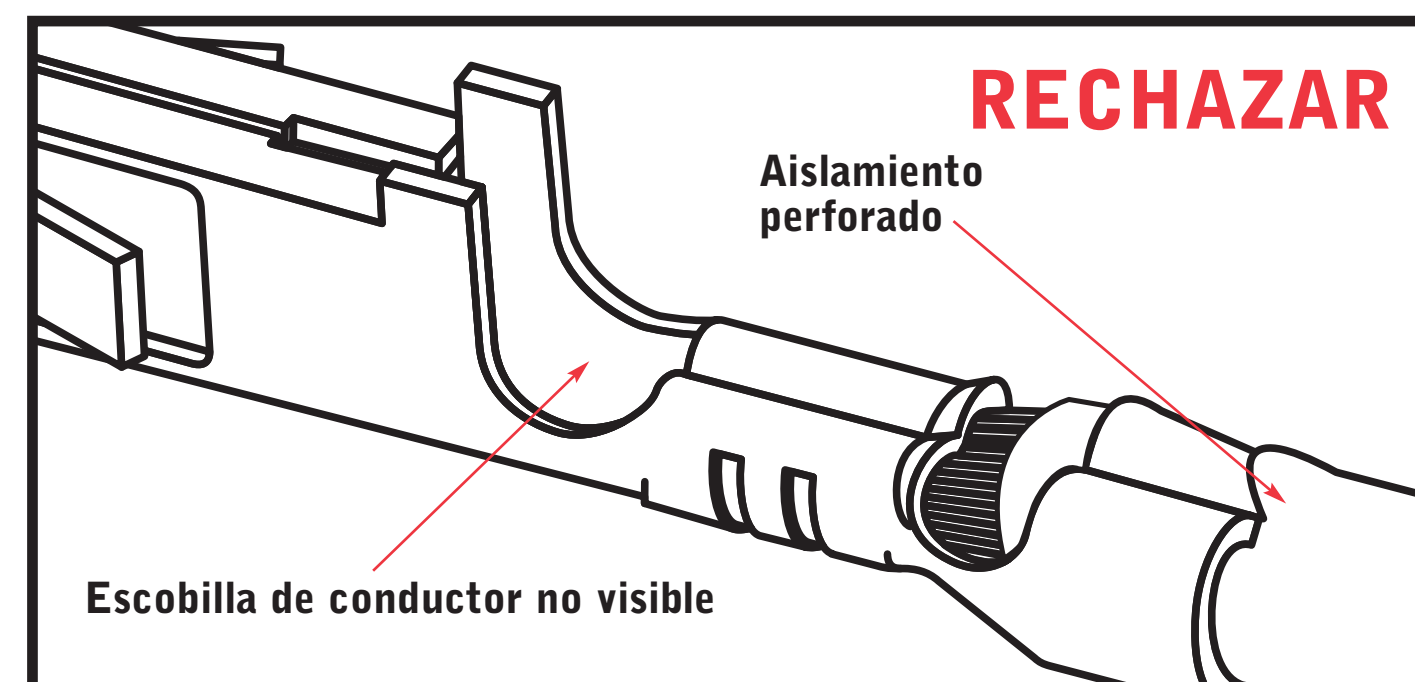
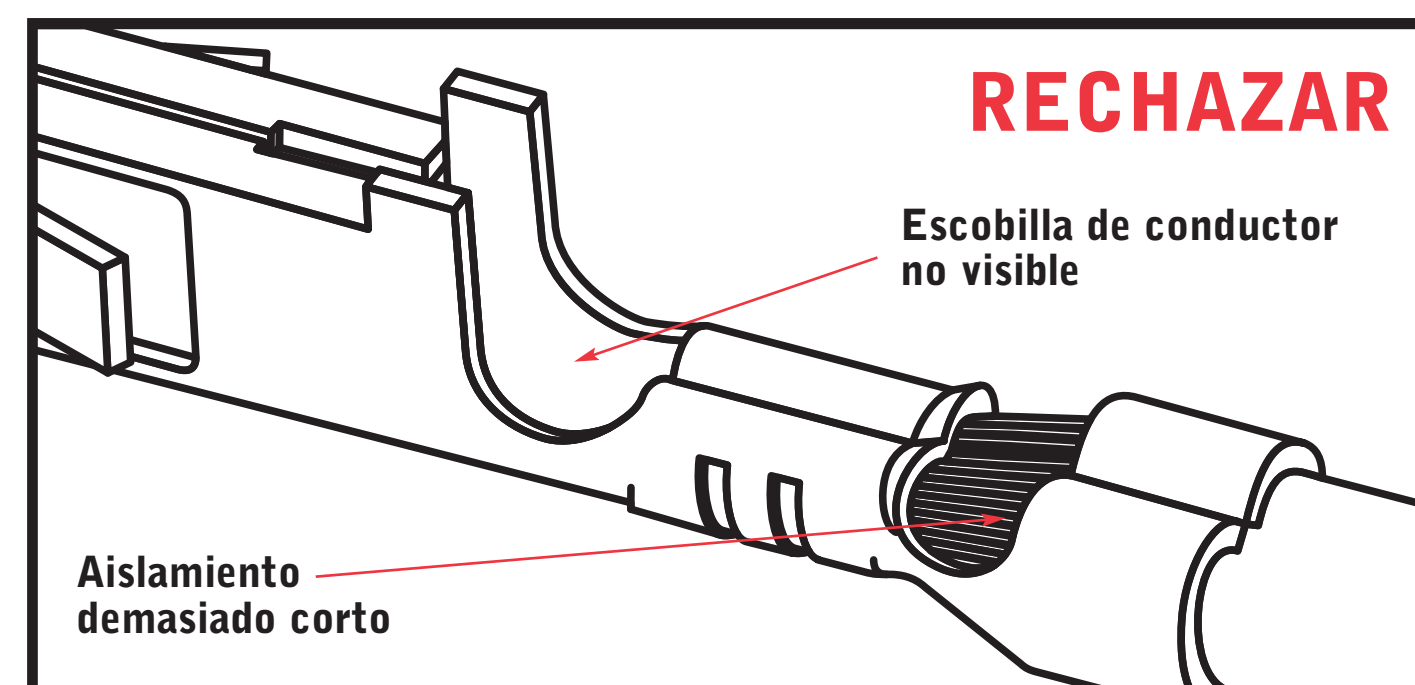
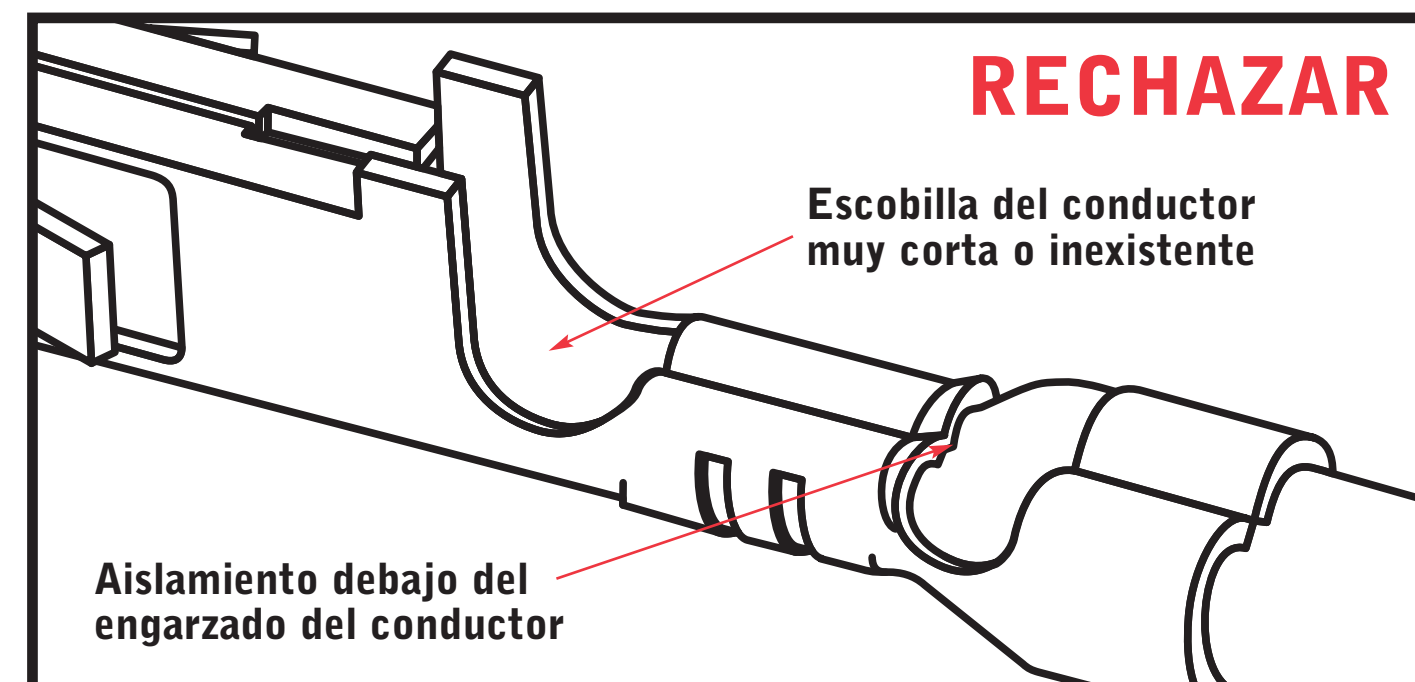
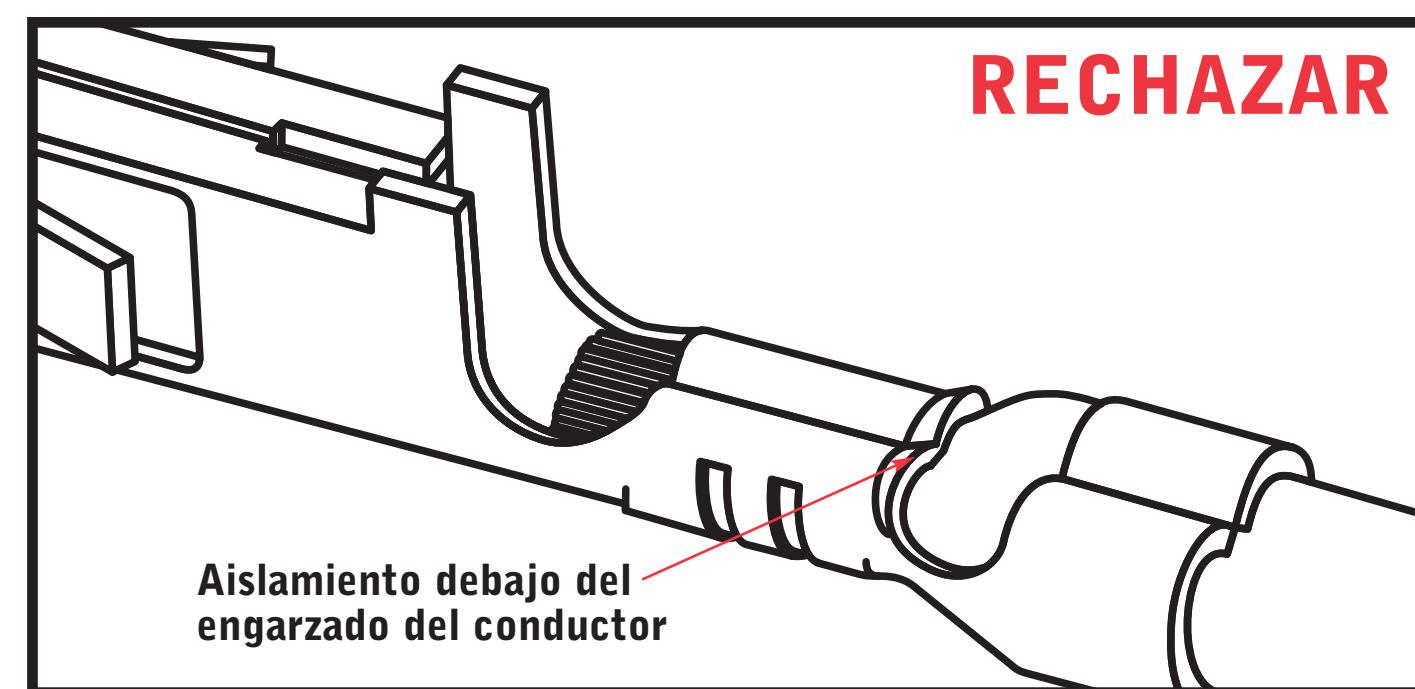
CMA = D mils x D mils

Conductor trenzado: Determinar CMA de una sola hebra y multiplicar el resultado por el número total de hebras.

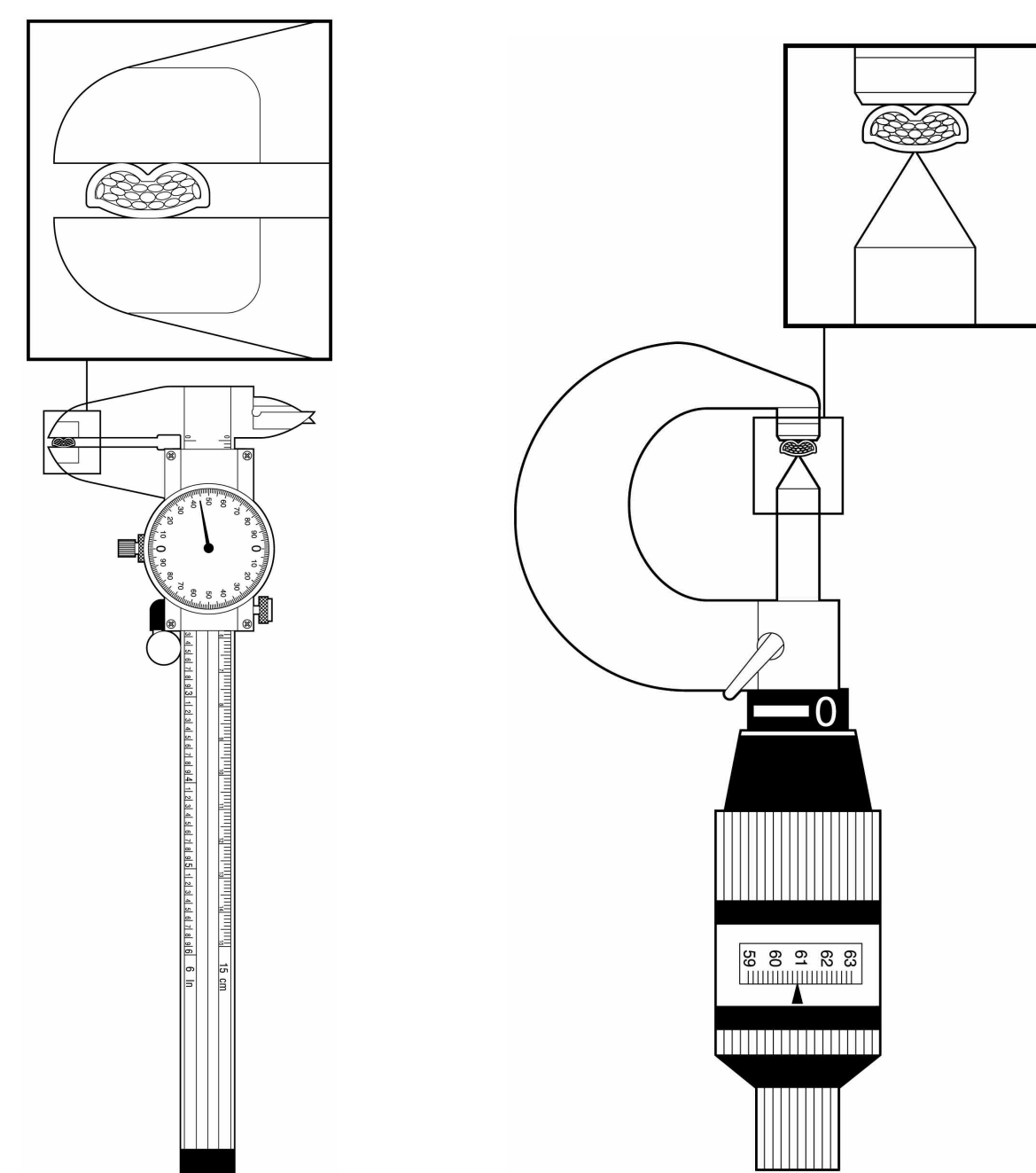
CMA = (D de una hebra x D de una hebra) x Número de hebras

INSPECCIÓN VISUAL DE TERMINALES ENGARZADOS

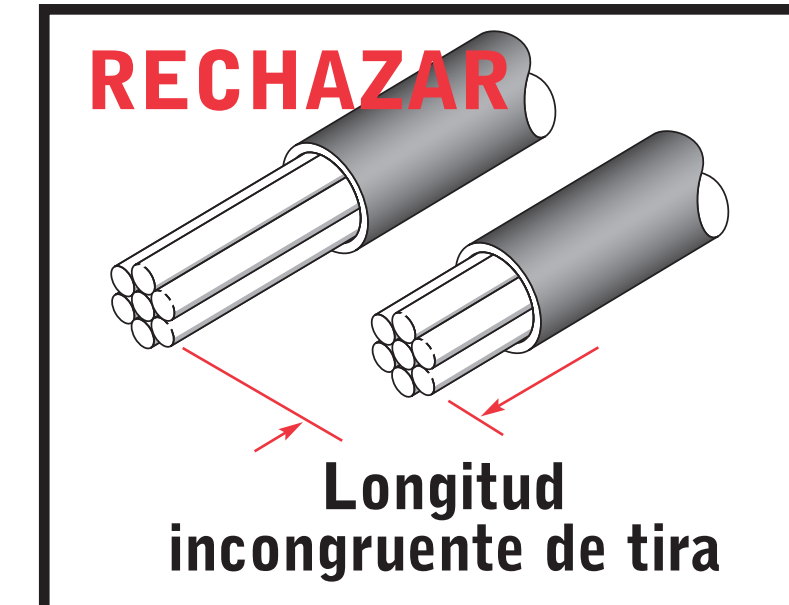
Ejemplos



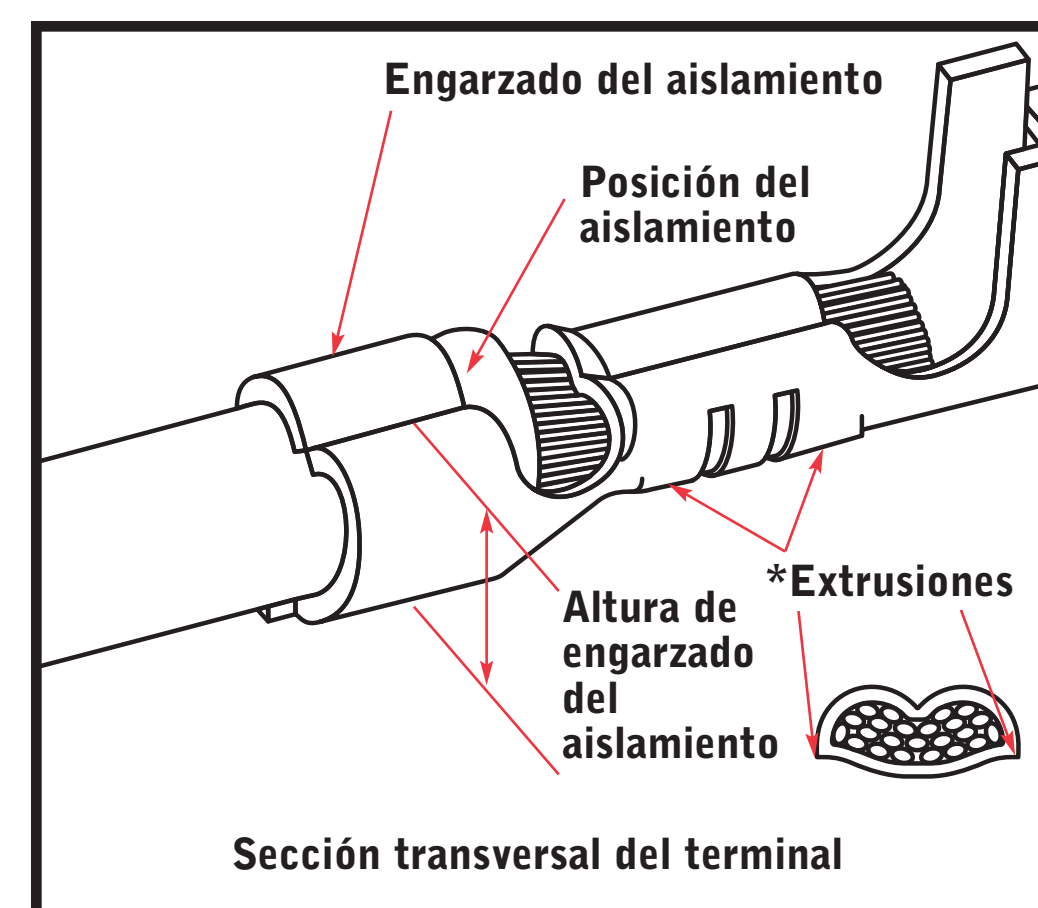
Medición de la altura del engarzado



Preparación errónea del alambre

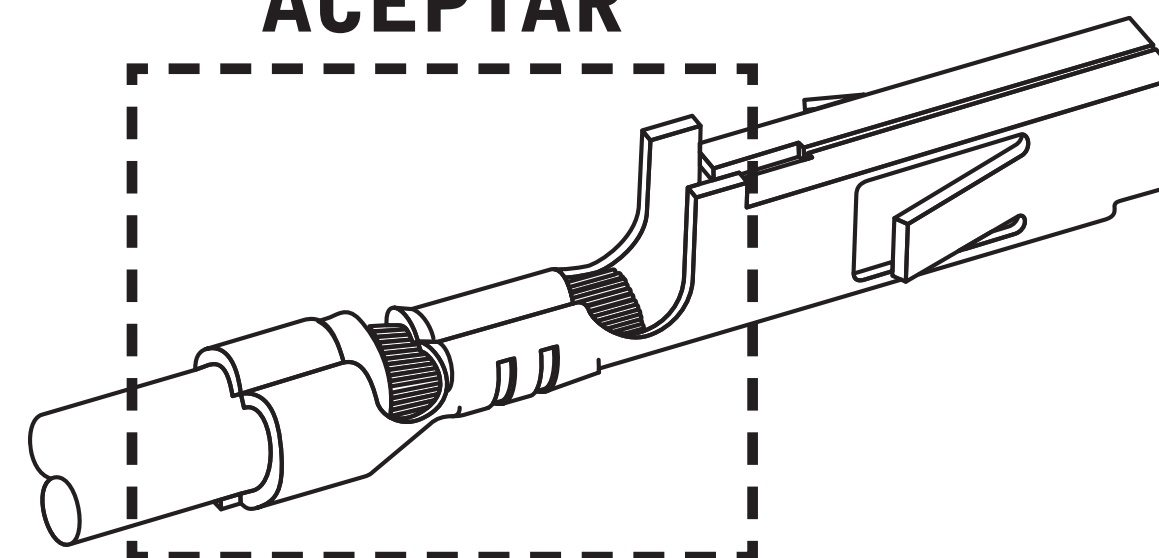


Engarzado óptimo



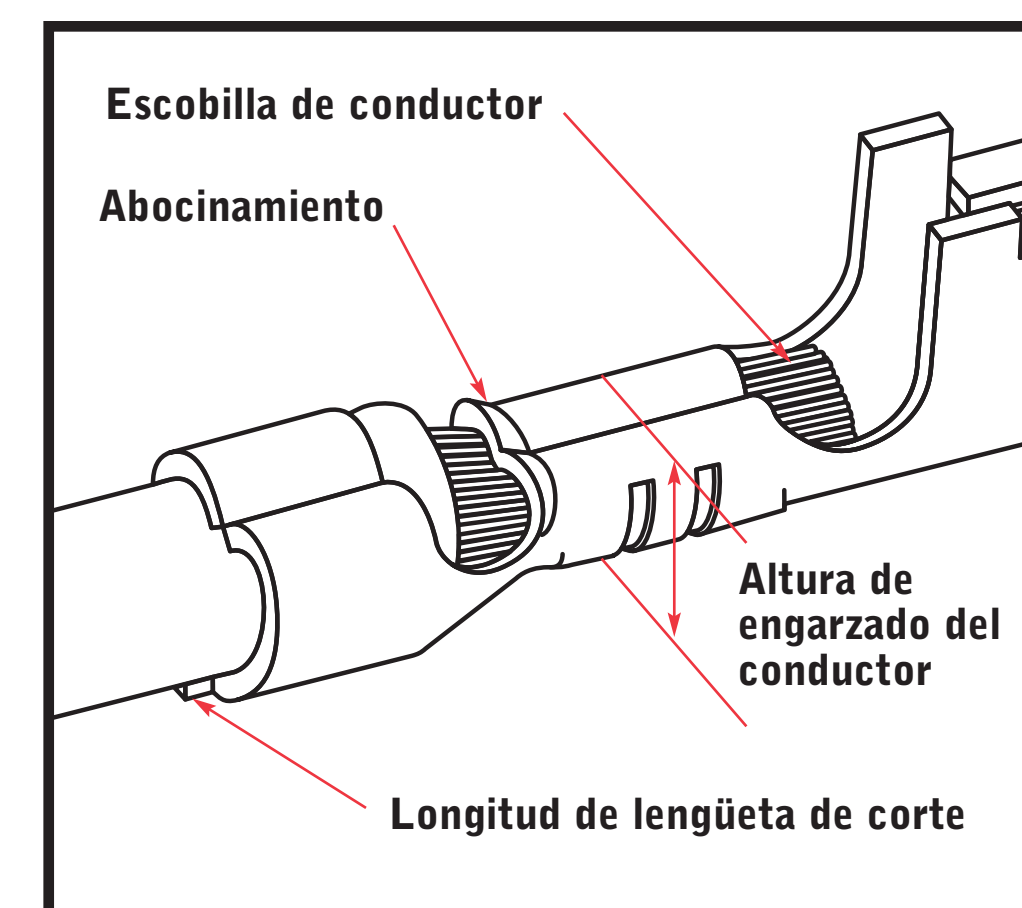
* Las extrusiones deben ser mínimas o inexistentes. Cuando exista una extrusión mínima, ésta no deberá sobresalir de la parte inferior del terminal.

ACEPTAR



Prueba de altura del engarzado

1. Procedimiento completo de instalación de la herramienta.
2. Realice el engarzado de un mínimo de cinco (5) muestras.
3. Coloque la hoja plana del micrómetro de engarzado a través del centro del radio doble del engarzado del conductor. No tome la medición cerca del abocinado del conductor.
4. Gire el cuadrante del micrómetro hasta que la punta haga contacto con la superficie radial inferior.
Si usa un calibrador, cerciórese de no realizar la medición en los puntos de extrusión del engarzado.
5. Registre las lecturas de altura de engarzado. Es necesario tomar un mínimo de cinco (5) lecturas de altura de engarzado para conformar cada instalación. Es necesario tomar un mínimo de treinta (30) lecturas para determinar la capacidad.
6. Verifique la altura de engarzado cada 250 a 500 partes durante la producción del lote.



Ejemplos

