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SCOPE

This document provides general guidelines and procedures for understanding and achieving reliable crimp terminations when using Fischer Connectors closed barrel crimp contacts.

Its contents may slightly differ from individual company guidelines and procedures, and is not intended to replace them. Given the broad variety of cable sizes, stranding and qualities, it is always recommended to perform trials to verify and if necessary adapt the procedure to the particular situation and application.

If a conflict occurs between this document and Fischer Connectors General Catalogue, this document will take precedence.

INTRODUCTION

The connection between the wire and the terminal is a critical element of any wire termination. A good termination is important because it ensures mechanical integrity and electrical performances required for the application.

Crimping is one common method of achieving this connection. It occurs inside the crimp barrel (terminal) of the contact. There are two types of barrels - open and closed. This specification only deals with closed barrels because all contacts referred in this document are screw-machined which is the usual process for producing this type of barrel.

Wire sections are expressed in AWG (American Wire Gauge), mm² or CMA (Circular Mil Area). See conversion table in **Appendix 1**. Because the wire stranding and insulation type or thickness can vary widely within a particular wire size, it is very important to carefully verify the compatibility between the selected wire and the crimp contact by checking the barrel hole dimensions in **Table 1**.

Wire types:

- Stranded conductors shall be used for crimping.
 - Solid round conductors may only be used when their suitability has been proven.



The end result of a properly crimped terminal is a reliable mechanical and electrical connection.

Parts of a machined Fischer Connector crimp contact

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CRIMP CONTACTS

Wire Size and Tool Chart



Crimp style connectors are supplied with the appropriate quantity of crimp contacts. However, replacement contacts may be ordered according to table below.

Crimp contacts can be removed from the contact block by means of extraction tools (see extraction tool section).

TABLE 1

Co	ntact				(Core \$	Series	;		Ulti	Mate	Positioner	Crimp Tool	Wire Size
Size [mm]	Polarity	Part Number	Replaces	102	103	1031	104	105	1051	13	18	Part Number	Part Number	AWG
	Male	200.2113	-	٠	•							TX00.300		
	Male	200.2172	-			•	•	•		•		TX00.301		
0.0	Female	200.2114	-	•	•							TX00.302]	1)
0.5	Female	200.2183	-			•	•					TX00.303	TX00.240	32-28
	Female	200.2412	-					•				TX00.324		
	Female	200.2898	-					•		•		TX00.373		
	Male	200.2884	200.1682 200.2698	•	•	•	•	•			•	TX00.304		
	Male	200.2887	200.2210						•			TX00.307		
Ø0.7	Male	200.2888	200.2384	•	•	•	•	•				TX00.304	TX00.240	28-24 ¹⁾
	Female	200.2885	200.1683 200.2760	•	•	•	•					TX00.305		
	Female	200.2886	200.2050					•	•			TX00.306		
	Male	200.2890	200.2248	•	•	•	•					TX00.307		
000	Male	200.2891	200.2350					•	•			TX00.308	TY00 240	ac aa ¹⁾
00.9	Female	200.2892	200.1856	•	•	•	•					TX00.309	1,00.240	20-22
	Female	200.2893	200.2143					•	•			TX00.310		
	Male	200.2402	-		•	•	•					TX00.311		
Ø1.3	Male	200.2403	-					•	•			TX00.338	TX00.240	24-20 ¹⁾
	Female	200.2214	-		•	•	•	•	•			TX00.312		
	Male	200.1653	-				•	•	•			TX00.313	TY00 040	
Ø1.6	Female	200.1654	-				•	•	•			TX00.314	1,00.242	18-14

Note 1: Exceptionally for a given AWG, the diameter of some stranded conductor designs could be larger than the hole diameter of the crimp barrel. Make sure that the conductor diameter fits into the hole. See barrel dimensions in **Table 2** on page 4.

Legend

Compatible

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CRIMP CONTACTS (Cont.)

Barrel Dimensions and Stripping Length





All contacts listed below are insulation support style machined crimp contacts except Ø1.6 contacts.

The wire insulation shall fit into D2.

TABLE 2

				Barro	el dimens	ions		Stripping lengt
Size [mm]	Polarity	Part Number	A min	В	с	D1 min	D2 min	
	Male	200.2113						
	Male	200.2172]					
~	Female	200.2114	3.0	0.5	25	0.43	0.83	25
Ø0.5	Female	200.2183	(0.118")	(0.020")	(0.098'')	(0.017")	(0.033'')	(0.098")
	Female	200.2412						
	Female	200.2898						
	Male	200.1682						
	Male	200.2210						
	Male	200.2384						
	Male	200.2698	3.4	0.8	3.1	0.60	1.11	2.6
	Female	200.1683	(0.134)	(0.031)	(0.122)	(0.024)	(0.044)	(0.102)
	Female	200.2050						
Ø0.7	Female	200.2760	1					
	Male	200.2884						
	Male	200.2887				0.62		
	Male	200.2888	3.4	0.6	3.1	(0.024)	1.11	2.8
	Female	200.2885	(0.134)	(0.024)	(0.122)	0.65	(0.044)	
	Female	200.2886	1			(0.026'')		
	Male	200.2248				0.82	1 56	
	Male	200.2350	3.3	0.7	3.1	(0.032'')	(0.061")	2.6
	Female	200.1856		(0.028'')	(0.122)	0.80	1 48	(0.102)
<i>a</i>	Female	200.2143	3.5 (0.138'')		3.3 (0.130'')	(0.031'')	(0.058'')	2.8 (0.110'')
<u>00.9</u>	Male	200.2890						
	Male	200.2891	33	0.5	31	0.83	1 56	28
	Female	200.2892	(0.130'')	(0.020'')	(0.122")	(0.033'')	(0.061")	(0.110")
	Female	200.2893						
	Male	200.2402	3.3		3.0			2.6
Ø1.3	Male	200.2403	(0.130'')	0.7	(0.118'')	1.18	1.76	(0.102'')
	Female	200.2214	3.6 (0.142'')	(0.028)	3.5 (0.138'')	(0.040)	(0.009)	2.9 (0.114'')
Ø1 6	Male	200.1653	5.0		4.7	1.78		6.0
0.19	Female	200.1654	(0.197'')	N/A	(0.185'')	(0.070'')	N/A	(0.236'')

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RECOMMENDED CRIMP TOOL SETTINGS

These setting and such	A second seco	
I nese settings are only	/ for use with the adequate	Crimp tool (see page b)
Those county are only	y 101 000 milit the doogudu	o on the tool (000 page 0)

TABLE 3		Contact			Crimp To	ol Setting
	Size [mm]	Polarity	Part Number	F	Wire Size AWG	
		Male	200.2113			
		Male	200.2172			
		Female	200.2114		32	2
	00.5	Female	200.2183		30	3
		Female	200.2412	-	28 '	4
		Female	200.2898			
		Male	200.1682			
		Male	200.2210			
		Male	200.2384	┍╼	28	6
		Male	200.2698		26	6
		Female	200.1683	L	24 ¹⁾	7
		Female	200.2050			
	Ø0.7	Female	200.2760			
		Male	200.2884			
		Male	200.2887	┍╺╸	28	5
		Male	200.2888	•	26	5
		Female	200.2885		24 ¹⁾	6
		Female	200.2886	L		
		Male	200.2248			
		Male	200.2350		26	6
		Female	200.1856		24	7
		Female	200.2143	L>	22 ¹⁾	8
	Ø0.9	Male	200 2800			
		Malo	200.2890	┍▶	26	5
		Female	200.2891		24	5
		Female	200.2893	┕	22 ¹⁾	6
			200.2000			
		Male	200.2402	┍╸	24	7
	Ø1.3	Male	200.2403		22	8
		Female	200.2214	L	20 ¹⁾	8
				-	10	5
	Ø16	Male	200.1653		16	
		Female	200.1654	Ļ	14 ¹⁾	6
				- L		v

Note 1: Exceptionally for a given AWG, the diameter of some stranded conductor designs could be larger than the hole diameter of the crimp barrel. Make sure that the conductor diameter fits into the hole. See barrel dimensions in **Table 2** on page 4.

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CRIMPING AND ASSEMBLY TOOLS

Crimp Tool ULTRA PRECISION for closed crimp termination



Contact Size [mm]	C Crimp Tool	Part Number
Ø0.5		
Ø0.7	BALMAR 18 - 000	TY00 240
Ø0.9	Or DANIELS MH - 800	1,00.240
Ø1.3		
Ø1.6	BUCHANAN 615 708	TX00.242

The best choice of precision crimp tools for highly reliable eight indenter crimping per US-MIL, IEC and DIN Specifications.

These hand tools have an integral mechanism to control the crimping operation to the extend that, once the crimping operation has been started, the crimping tool cannot be opened until the crimping cycle has been completed (full-cycle/ratcheting tool).

Positioners have to be ordered according to contact. See **Table 1** on page 3.

Contact Insertion Tool

MIL-C-22520, Class I, Type 1



Contact Size [mm]	Part Number
Ø0.5	TX00.214
Ø0.7	TX00.210
Ø0.9	TX00.211
Ø1.3	TX00.273

Tool for inserting male and female removable crimp contacts into the contact block.

Especially recommended for small gauge and fragile wires.

Contact Extraction Tool

POM (black Delrin®)

Tool Steel, chrome plated

Material

Material - Handle:

- Fork:

- Housing and Plunger:
- Sleeve: - Slide:
- r: POM (black Delrin®) Stainless Steel Tool Steel

Contact Size [mm]	Part Number
Ø0.5	TX00.213
Ø0.7	TX00.200
Ø0.9	TX00.205
Ø1.3	TX00.212
Ø1.6	TX00.201

Tool for extracting male and female removable crimp contacts from the contact block.

The sleeve of this tool is pushed over the contact, thereby releasing the contact retaining mechanism. The tool plunger is then pushed to eject the contact.



Crimping Instructions

Assembly Instructions

CRIMP PROCESS

Stranded conductors shall not be soldered/tin dipped in that part which is intended to be crimped. After crimping, no additional soldering should take place.

Some reasons for failure of crimped joints to meet minimum tensile requirements include nicked wires, nicked or ruptured strands, strand turn back at crimp joint, and ruptured wires outside of the crimped terminal. To avoid these problems, use the correct size wire for the barrel, prepare your wire carefully, and use the proper crimping tool.

PREPARATION

Stripping:

Wire insulation may be removed using chemical, thermal or mechanical strippers. Chemical insulation stripping agent shall be used only for solid wires.

In order to obtain a good and stable crimped connection, it is necessary to strip the wire correctly, i.e. the required stripping length depends on the type and size of the crimp barrel used as described below.

See Table 2 on page 4 for barrel dimensions A and B, position of inspection hole C, and stripping length.





Crimping Instructions

Assembly Instructions

Strand damage and end cuts:

The strands stripped part of the conductor shall not be damaged, for example partly or totally broken, as it can lead to degraded performance. Tools utilized to accomplish wire cut shall be selected and used to provide repetitive and consistent wire cut terminations. The process of wire cutting shall be performed such that the cut ends are uniform and all strands are the same length.





Do NOT tin the wire with solder before crimping

Wire insulation damage:

Indents on the wire insulation caused by the stripping tool which do not damage the insulation are permitted if there are no cuts, breaks, cracks or splits in insulation. Coatings added over insulation base material such as resin coatings over polyimide are not considered to be part of the insulation.

Cleanliness:

The stripped part of the conductor shall be clean and free of heavy, non-conductive films such as oxides, sulfides, and similar substances., and free from particles of insulation.

Conductor deformation/birdcaging:

The strands shall not be flattened, untwisted, buckled, kinked or otherwise deformed. The lay of the strands shall be correct. If the lay has been disturbed, it may be restored by a light twist to approximate the original spiral lay of the wire. Care should be taken not to over-twist the strands.



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Assembly Instructions

CRIMP PROCESS (Cont.)





CRIMP PROCESS (Cont.)

CRIMPING

Conductor location:

The conductor shall be correctly located in the barrel, i.e. to the correct depth. It must be visible inside the inspection window. All conductor strands shall be within the barrel. There shall be no damaged strands.



Deformation of the crimp barrel:

The figures below show the crimping of the same contact but with two different wire sizes. The smaller wire requires a deeper deformation of the crimp barrel which is achieved by selecting the recommended crimp tool setting in **Table 3** on page 5.





CRIMP PROCESS (Cont.)

Mechanical Properties of the Crimped Connection

For each contact and compatible wire combination, a proper crimp requires a crimp dimension (or height) that offers the highest performance.

The tensile test or pull test is the most widely used field test for evaluating the mechanical properties of the crimped connection. The chart on the existing page shows the requirements of the IEC 60352-2 for various wire sizes. The force indicates the minimum acceptable force to break or separate terminal from the conductor.

- If the crimp dimension is too small, then the conductor is overcrimped and the wire strands could be damaged. This could also create a heat rise across the termination because of increased resistance.

- If this dimension is too large, then the conductor is undercrimped and the wire strands will not be deformed enough.

In both cases the result will be a lower pull out force.

Pull out force of crimped connections ¹⁾

Conductor cr	oss-section	Pull out force
[mm ²]	AWG ²⁾	[N]
0.05	30	6
0.08	28	11
0.12	26	15
0.14	-	18
0.22	24	28
0.25	-	32
0.32	22	40
0.5	20	60
0.75	-	85
0.82	18	90

Note 1: Source: IEC 60352-2, § 5.2.2.1 Note 2: For information only

Methods for Building up Conductor Cross-Section

In some industries, the use of the methods described below is not recommended.

Normally, crimped connections are made with one wire in a crimp barrel. However under certain circumstances, when the wire size is smaller than the acceptable range of the crimp barrel, one of the following methods or a combination of both can be used to buildup the correct cross-section :

• The conductor is folded or bent back:



 The conductor area is increased by the use of bare (non-insulated) filler conductors as needed:



- The following items:
- The filler shall be visible at the wire entry end of the barrel.
- The filler conductors and/or the wire conductor are visible in the inspection window of the contact.
- The filler conductor is of the same type conductor as the wire being crimped into the contact. (Gauge can be different as needed but the base metal and the plating, if any, need to be the same).



Assembly Instructions

ASSEMBLY IN CONNECTOR

A certain play in the bloc is necessary for the crimp contacts. Never twist the cable and wires during the cable assembly.







Assembly Instructions

APPENDIX 1 - WIRE SIZE

This chart is intended for reference only.

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	44988888888888888888888888888888888888	Solid Solid Solid Solid Solid Solid 1740 5016 7740 5016 7740 7740 5016 7738	Inches 0.0020 0.0025 0.0031 0.0046 0.0046 0.0066 0.0063 0.0063 0.0063 0.0063 0.0080 0.0080 0.0080 0.0080	m 0.050 0.060 0.11 0.13 0.13 0.13 0.13 0.13 0.13 0.1	CMA 1) 3.9 6.2 12.5 15.7 19.8 19.8	0.002	33	Solid	Inches	mm U 57	CMA 1)	mm ²
1 5000 00000 00000 0000 0000	4 4 9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Solid Solid Solid Solid Solid Solid 7/40 7/40 7/40 5/14 7/20 8/21 8/21 8/21 8/21 8/21 8/21 8/21 8/21	0.0020 0.0025 0.0035 0.0046 0.0065 0.0063 0.0063 0.0063 0.0080 0.0080 0.0080 0.0080	0.050 0.063 0.080 0.10 0.11 0.11 0.11 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23	3.9 6.2 12.5 15.7 19.8	0.002	23	Solid	0.073	U 57	2002	
40 500 0005 00	4 9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Solid Solid Solid Solid Solid Solid 19/42 17/30 Solid 17/38 17/40 17/38 17/40 17/38 17/40 17/38	0.0025 0.0031 0.0045 0.0066 0.0063 0.0063 0.0063 0.0080 0.0080 0.0080 0.0080	0.063 0.080 0.10 0.11 0.13 0.13 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.2	6.2 9.9 15.7 19.8	0.003			040.0	;;;	and	0.258
0 501d 00031 0003 0103	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Solid Solid Solid Solid Solid Solid 19/42 Solid 7/40 Solid 7/40 Solid 7/38	0.0031 0.0035 0.0040 0.0060 0.0063 0.0080 0.0080 0.0080 0.0080 0.0080	0.080 0.00 0.11 0.13 0.13 0.13 0.13 0.13 0.1	9.9 12.5 15.7 19.8		22	Solid	0.025	0.64	642	0.326
3 5/4 0005 0.006 0.11 5/5 0.002 0.013 0.014 0.117 0.012 0.014 0.117 0.014 0.117 0.014 0.112 0.012 0.014 0.012 0.014 0.012 0.014 0.012 0.014 0.012 0.014 0.012 0.014 <td>8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8</td> <td>Solid Solid Solid Solid Solid 19/44 Solid Solid 7/40 Solid 7/38</td> <td>0.0035 0.0040 0.0060 0.0066 0.0080 0.0080 0.0080 0.0080 0.010</td> <td>0.090 0.11 0.13 0.13 0.13 0.13 0.13 0.13 0.1</td> <td>12.5 1<mark>5.7</mark> 19.8</td> <td>900.0</td> <td>22</td> <td>1/30</td> <td>0:030</td> <td>0.76</td> <td>704</td> <td>0.356</td>	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Solid Solid Solid Solid Solid 19/44 Solid Solid 7/40 Solid 7/38	0.0035 0.0040 0.0060 0.0066 0.0080 0.0080 0.0080 0.0080 0.010	0.090 0.11 0.13 0.13 0.13 0.13 0.13 0.13 0.1	12.5 1 <mark>5.7</mark> 19.8	900.0	22	1/30	0:030	0.76	704	0.356
8 Side 0006 01 65 0008 01 66 0008 01 60 0008 01 60 0008 01 60 0008 01 60 0008 01 60 0008 01 0008 01 0008 01 0008 01 0008 01 0008 01 0008 01 0008 01 0008 01 0008 01 01 0008 01 <td>8 3 3 3 3 3 3 3 3 8 3 8 3 8 3 8 3 8</td> <td>Solid Solid Solid Solid Solid 1/40 Solid 1/38 1/38 1/38</td> <td>0.0040 0.0045 0.0056 0.0063 0.0080 0.0080 0.0080 0.0080</td> <td>0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>15.7 19.8</td> <td>0.006</td> <td>22</td> <td>19/34</td> <td>0.032</td> <td>0.81</td> <td>755</td> <td>0.383</td>	8 3 3 3 3 3 3 3 3 8 3 8 3 8 3 8 3 8	Solid Solid Solid Solid Solid 1/40 Solid 1/38 1/38 1/38	0.0040 0.0045 0.0056 0.0063 0.0080 0.0080 0.0080 0.0080	0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0 0 0 0 0	15.7 19.8	0.006	22	19/34	0.032	0.81	755	0.383
7 5id 0.005 0.11 19.8 0.001 21 5id 0.023 0.27 10 8 5id 0.0065 0.11 31.5 0.003 0.03	8 3 3 3 3 3 3 8 3 8 8 8 8 8 8 8 8 8 8 8 8	Solid Solid Solid Solid 9/44 50lid Solid 7/38 50lid 7/38	0.0045 0.0050 0.0065 0.0080 0.0080 0.0080 0.0080 0.010	0.13 0.13 0.13 0.13 0.13 0.14 0.14 0.14 0.14 0.14 0.14 0.14 0.14	19.8	0.008	22	26/36	0.029	0.74	650	0.329
3 5 1000 013 350 0003 013 350 0003 013 315 0003 013 110 3 5 0005 014 315 0003 013 110 013 103 013 103 013 103 3 5 0005 014 300 0003 013 103 013 103 013 103 3 5 0000 0.23 592 0003 013 103 013 103 3 5 0000 0.23 593 0003 023 733 0003 013 103 3 5 0000 0.23 733 0003 013 733 013 733 3 0010 0.23 023 0033 023 0033 023 023 023 023 023 023 3 0033 013 023 033 113	8 3 3 3 3 3 8 8 3 3 3 3 3 3 8 8 3 3 3 3 3 8 8	Solid Solid Solid Solid 19/44 Solid Solid 7/38 7/38	0.0050 0.0055 0.0063 0.0080 0.0080 0.0080 0.0089 0.010	0.13 0.15 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23	1.2	0.010	21	Solid	0.028	0.72	810	0.410
5 50id 00056 0.14 315 0.006 0.24 315 0.005 0.03 0	8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Solid Solid Solid 99/44 Solid Solid 7/38 7/38	0.0056 0.0080 0.0080 0.0080 0.0080 0.0089 0.0089	0.16 0.18 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23	25.0	0.013	20	Solid	0.032	0.81	1022	0.518
3 5 01003<	8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Solid Solid 1/40 1/40 Solid Solid 1/38 1/38	0.0063 0.0080 0.0080 0.0080 0.0089 0.0089	0.16 0.20 0.23 0.23 0.23 0.23 0.23 0.23 0.23	31.5	0.016	20	7/28	0.038	0.97	1119	0.567
33 Solid 0.0071 0.16 50.1 0.0025 20 145.2 0.0036 0.97 102	8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Solid Solid 1/40 19/44 Solid 5/13 1/38 1/38	0.0071 0.0080 0.0080 0.0089 0.0089 0.010	0.18 0.23 0.23 0.23 0.20 0.20 0.20 0.20 0.20	39.8	0.020	20	10/30	0.036	0.91	1005	0.509
2 5 6 0.000 0.20 6.3 0.006 102 103	33 33 33 33 33 30 33 30 30 30 30 30 30 3	Solid 1/40 19/44 Solid Solid 19/42 1/38	0.0080 0.0080 0.0080 0.0080 0.000	8 <mark>888888888888888888888888888888888888</mark>	50.1	0.025	20	19/32	0.038	0.97	1201	0.609
2 740 00000 0.23 952 00036 13 136 00036 107 1268 3 5014 00090 0.23 737 00036 19 5304 00036 117 773 3 5016 0010 0.23 737 00036 19 756 0006 117 773 3 601 0.033 110 0056 16 756 0066 117 653 3 601 0.33 116 0066 16 636 006 117 653 3 19 0.011 0.23 175 0064 126 734 0066 127 653 3 19 0.016 0.33 176 0.006 122 653 653 653 653 653 653 653 653 653 653 653 653 653 653 653 653 653 653 653 6	33 33 33 33 30 30 30 30 30 30 30 30 30 3	7/40 19/44 Solid Solid 7/38 19/42	0.0000 0.0080 0.0080 0.010 0.010	5 <mark>5</mark> 5	63.2	0.032	20	26/34	0.040	1.02	1034	0.524
2 19/44 0.0000 0.23 737 0.000 173 0.006 177 173 3 50id 0.0009 0.23 170 0.006 117 173 173 3 60 0.0009 0.23 170 0.006 117 173 3 0012 0.30 110 0.005 18 1734 0.046 117 173 3 0013 0.33 113 0.036 0.046 117 173 3 1010 0.036 175 0.066 175 0.046 117 173 3 1010 0.033 175 0.066 175 0.046 177 173 3 1017 0.33 175 0.066 177 150 0.046 177 173 3 1027 0.014 0.15 0.046 177 173 0.046 177 173 3 1027 0.013 0	33 33 33 33 30 32	.9/44 Solid Solid 7/38 19/42	0.0080 0.0089 0.010	0.20	69.2	0.035	20	41/36	0.038	0.97	1025	0.519
31 Solid 0.0039 0.23 737 0.040 117 1779 30 738 0.000 0.25 101 0.051 18 7.56 0.046 117 1779 30 738 0.013 0.33 118 0.066 18 1736 0.046 117 1779 30 101 0.22 103 0.33 118 0.066 18 1736 0.046 117 1779 30 101 0.22 103 0.33 118 0.066 17 501 127 150 20 103 0.33 175 0.064 177 501 0.046 127 150 21 173 0.016 0.41 166 726 0.046 127 150 238 21 173 0.016 0.12 166 724 0.046 127 238 21 13 13 14 12 236 <td>8 8 8 0</td> <td>Solid Solid 7/38 19/42</td> <td>0.0089 0.010</td> <td></td> <td>74.3</td> <td>0.038</td> <td>6</td> <td>Solid</td> <td>0.036</td> <td>0.91</td> <td>1288</td> <td>0.653</td>	8 8 8 0	Solid Solid 7/38 19/42	0.0089 0.010		74.3	0.038	6	Solid	0.036	0.91	1288	0.653
000 0000 0.25 001 0005 117 00046 117 177 000 1940 0001 0.23 116 0006 117 00046 117 177 0001 0.23 116 0001 0.23 116 00046 117 120 0001 0.23 176 00061 128 10046 117 1600 0001 0.23 170 00061 128 0006 117 1600 177 0001 0.23 1001 0021 1001 1025 2006 177 0016 0117 108 00061 127 120 2006 177 0016 0117 0016 0117 120 2006 1177 120 177 0016 0117 112 120 1204 120 2006 1204 120	8	Solid 7/38 19/42	0.010	C7.U	7.67	0.040	18	Solid	0.040	1.02	1624	0.823
30 738 0012 0.33 110 0.066 18 16.30 0.046 1.17 1900 30 9442 0013 0.33 176 0006 18 419.30 0.066 1.22 1910 36 0013 0.33 176 0006 18 419.30 0.066 1.22 1910 38 736 0013 0.33 175 0006 18 413.4 1006 1.22 1910 28 736 0016 0.41 188 0006 1.66 7.24 0.066 1.27 160 7 755 0014 0.36 221 0112 16 7.24 0.066 1.27 2408 7 755 0016 0.46 254 0.12 16 7.24 0.066 1.47 2.63 2408 7 734 0016 0.46 256 0.14 1.47 2.408 7.24 1.67 2.68 <td></td> <td>1/38 <mark>19/42</mark> Settu</td> <td></td> <td>0.25</td> <td>101</td> <td>0.051</td> <td>18</td> <td>7/26</td> <td>0.046</td> <td>1.17</td> <td>1779</td> <td>0.901</td>		1/38 <mark>19/42</mark> Settu		0.25	101	0.051	18	7/26	0.046	1.17	1779	0.901
0 1942 0013 0.33 118 0.0064 18 1950 0.046 117 1630 28 Solid 0011 0.23 175 00064 18 14734 0.046 117 1650 28 736 0015 0.33 175 00064 16 5616 0.046 117 1650 28 736 0016 0.41 188 00064 16 5616 0.046 177 1650 27 172 0104 0.36 221 0112 16 5614 0.061 122 208 27 6544 0016 0.46 254 0129 16 724 0.064 177 208 26 1936 017 036 254 0129 16 5634 0.064 176 263 26 1936 017 16 724 0069 147 263 208 26 1936 </td <td>30 7</td> <td>1<mark>9/42</mark></td> <td>0.012</td> <td>0::0</td> <td>110</td> <td>0.056</td> <td>18</td> <td>16/30</td> <td>0.046</td> <td>1.17</td> <td>1608</td> <td>0.815</td>	30 7	1 <mark>9/42</mark>	0.012	0::0	110	0.056	18	16/30	0.046	1.17	1608	0.815
28 Solid 0011 0.23 127 0.064 117 1530 28 736 0013 0.32 160 0.081 17 8/66 0.046 1.22 165 28 736 0016 0.41 186 0.006 17 8010 0.051 1.22 165 28 19/40 0016 0.41 186 0.006 16 7.24 0.061 1.22 283 27 127 0112 0.12 0.12 0.12 1.47 2.63 0.06 1.47 2.63 2.63 27 0116 0.12 0.12 0.12 0.12 1.47 2.63 2.66 1.47 2.61 2.63 2.66	# @	D-IG	0.013	0.33	118	0.060	18	19/30	0.048	1.22	1910	0.968
28 Solid 0.013 0.22 160 0.081 18 65.96 0.048 1.22 1626 28 7/36 0.015 0.33 175 0.009 17 Solid 0.045 1.15 263 27 1/27 0.014 0.34 221 0.112 166 7/24 0.090 172 263 27 7/35 0.017 0.43 221 0.112 16 7/24 0.090 172 263 27 7/36 0.016 0.46 254 0.129 16 7/24 0.090 172 2408 26 7/34 0.019 0.46 254 0.129 16 7/24 0.090 147 2613 26 7/34 0.019 0.46 254 0.129 16 7/24 0.090 177 2613 26 7/34 0.019 0.46 7/24 0.066 174 2613 2408 <t< td=""><td>8 8</td><td>DIIDC</td><td>0.011</td><td>0.29</td><td>127</td><td>0.064</td><td>18</td><td>41/34</td><td>0.046</td><td>1.17</td><td>1630</td><td>0.826</td></t<>	8 8	DIIDC	0.011	0.29	127	0.064	18	41/34	0.046	1.17	1630	0.826
28 7/36 0015 0.38 175 0.006 17 Solid 0.045 1.15 2048 27 7/35 0.016 0.41 188 0.096 16 7/24 0.061 1.29 2883 27 7/35 0.017 0.35 2/1 0.112 16 7/24 0.066 1.47 2403 26 5/34 0.016 0.46 2/54 0.129 16 7/24 0.069 1.47 2403 26 7/36 0.016 0.46 2/54 0.129 1/6 7/24 0.069 1.47 2403 26 7/34 0.019 0.46 2/54 0.129 1/6 7/93 0.069 1.47 2/16 2/28 26 7/34 0.016 0.46 2/24 0.129 1/6 7/93 1/6 1/47 2/16 2/16 2/16 2/16 2/16 2/16 2/16 2/16 2/16 1/16 1/16	28 S	Solid	0.013	0.32	160	0.081	18	65/36	0.048	1.22	1625	0.823
28 1940 0016 041 188 0096 16 Solid 0.061 1.29 283 77 172 0014 0.36 221 0.112 16 724 0.060 152 283 7 6544 0017 0.43 221 0.112 16 724 0.060 152 283 7 6544 0019 0.46 254 0.129 16 56.34 0.060 147 213 26 7/34 0019 0.46 254 0.129 16 65.34 0.093 1.47 231 26 7/34 0019 0.48 278 0.141 177 219 1.47 231 26 7/34 0.091 0.46 254 0.129 16 65/34 0.059 1.47 251 243 27 0.136 0.14 0.201 16 65/34 0.059 1.47 251 2417	28 7	7/36	0.015	0.38	175	0.089	17	Solid	0.045	1.15	2048	1.038
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	28	19/40	0.016	0.41	188	0.095	16	Solid	0.051	1.29	2583	1.309
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	27 1	1/27	0.014	0.36	202	0.102	16	7/24	0.060	1.52	2828	1.433
27 65/4 0018 0.46 254 0.129 16 26/30 0.068 1.47 2613 26 7/34 0016 0.40 254 0.129 16 65/34 0.069 1.50 2584 26 7/34 0019 0.48 278 0.141 16 65/34 0.069 1.50 2584 26 10/36 0.020 051 299 0.151 14 702 0.067 1.46 2525 26 10/36 0.020 051 299 0.151 14 702 0.067 1.46 2584 26 501d 0.020 051 299 0.151 14 702 0.067 1.46 2584 27 501d 0.020 0.51 240 0.056 1.46 7.35 218 417 27 10/34 0.026 0.61 475 0.076 1.46 7.73 218 21 1	27 7	7/35	0.017	0.43	221	0.112	16	19/29	0.054	1.37	2408	1.220
26 Solid 0.016 0.40 254 0.129 16 65/34 0.069 150 264 26 7/34 0.019 0.48 276 0.141 16 105/36 0.069 150 2654 26 10/36 0.020 0.51 250 0.127 15 2656 3257 26 19/38 0.020 0.51 239 0.151 14 201d 1.65 3257 25 501d 0.018 0.45 320 0.162 14 16 772 0.073 1.66 3407 25 501d 0.018 0.45 320 0.162 14 163 4107 26 501d 0.020 0.51 402 0.162 14 163 417 21 1/32 0.023 0.616 475 0.073 1.66 1.73 329 21 1/32 0.023 0.56 0.201 14 19/	27 6.	5/44	0.018	0.46	254	0.129	16	26/30	0.058	1.47	2613	1.324
26 734 0019 0.48 278 0.141 16 105/36 0.059 150 225 26 10/36 0.020 051 250 0.127 15 260 0.267 327 26 19/38 0.020 0.51 290 0.151 14 260 145 327 25 Solid 0.018 0.45 320 0.162 14 2014 165 440 26 Solid 0.018 0.45 320 0.162 14 772 0.033 186 440 21 10/34 0.020 0.51 404 0.205 14 1927 0.033 123 24 10/34 0.026 0.264 0.206 0.206 1.73 3829 24 10/34 0.026 0.206 142 1927 0.036 1.73 3829 24 10/34 0.026 0.206 0.206 124 14 <td< td=""><td>S 26</td><td>Solid</td><td>0.016</td><td>0.40</td><td>254</td><td>0.129</td><td>16</td><td>65/34</td><td>0.059</td><td>1.50</td><td>2584</td><td>1.309</td></td<>	S 26	Solid	0.016	0.40	254	0.129	16	65/34	0.059	1.50	2584	1.309
26 1036 0020 0.51 260 0.177 15 Solid 0.057 1.45 3257 26 1938 0.020 0.51 299 0.151 14 3257 3257 26 Solid 0.064 0.261 299 0.162 14 7722 0.064 1.63 4407 21 Solid 0.020 0.51 404 0.051 14 7722 0.064 1.63 4407 21 Solid 0.020 0.51 404 0.026 0.51 14 7722 0.064 1.73 3829 21 7/32 0.024 0.61 442 0.205 14 1130 0.070 1.78 4471 21 19/36 0.026 0.61 475 0.066 1.73 3829 21 19/36 0.026 0.64 475 0.026 1.45 4174 21 19/36 0.020 0.021 14	26 7	7/34	0.019	0.48	278	0.141	16	105/36	0.059	1.50	2625	1.330
26 19/36 0.020 0.51 290 0.151 14 Solid 0.064 1.63 4107 26 Solid 0.016 0.45 320 0.162 14 7/22 0.073 1.85 4497 24 7/32 0.020 0.51 444 0.205 14 1/30 0.073 1.85 4497 24 7/32 0.024 0.61 442 0.204 1.73 3829 173 3829 24 10/34 0.023 0.66 475 0.204 1.73 0.066 1.73 3829 24 19/36 0.025 0.64 475 0.204 1.66 1.73 3829 24 19/36 0.026 0.21 14 1.130 0.070 1.78 4114 21 19/36 0.026 0.266 475 0.205 1.40 1.45 1.414 21 11/40 0.026 0.266 2.41 1	26	10/36	0.020	0.51	250	0.127	15	Solid	0.057	1.45	3257	1.650
25 Solid 0.018 0.45 320 0.162 14 7/22 0.073 1.86 4437 24 7/32 0.020 0.51 404 0.205 14 19/27 0.068 1.73 3829 24 7/32 0.023 0.56 442 0.205 14 19/27 0.068 1.73 3829 24 7/32 0.023 0.58 398 0.201 14 19/27 0.066 1.73 3829 24 10/34 0.025 0.64 475 0.204 16 4730 1736 1733 3829 24 19/36 0.025 0.64 475 0.204 16 474 24 41/40 0.026 0.205 0.204 16 473 24 41/40 0.026 0.205 0.205 14 105/34 173 24 41/40 0.026 0.205 0.205 0.206 174 16	26	19/38	0.020	0.51	299	0.151	14	Solid	0.064	1.63	4107	2.081
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	22	Solid	0.018	0.45	320	0.162	14	7722	0.073	1.85	4497	2.279
24 732 0.024 0.61 442 0.224 14 41/30 0.070 1.78 4121 24 10/34 0.025 0.58 396 0.201 14 10534 0.086 2.18 4174 24 19/36 0.025 0.64 475 0.201 14 10534 0.086 2.18 4174 24 19/36 0.026 0.61 405 0.201 14 105/34 0.086 2.18 4174 24 41/40 0.024 0.61 405 0.205 0.205 0.086 2.18 4174 24 41/40 0.024 0.61 405 0.205 0.086 2.18 4174 20 0.024 0.025 0.205 0.205 0.208 2.18 4174 20 0.024 0.026 0.216 0.206 2.18 4174 20 0.024 0.025 0.205 0.205 2.18 4174	24 S	Solid	0.020	0.51	404	0.205	14	19/27	0.068	1.73	3829	1.940
24 10/34 0.033 0.58 396 0.201 14 105/34 0.086 2.18 4174 24 19/36 0.025 0.64 475 0.241 9 9 9 9 9 24 41/40 0.024 0.61 405 0.205 0.205 Number of strands $11/4$ $11/40$ <	24 7	7/32	0.024	0.61	442	0.224	14	41/30	0/0/0	1.78	4121	2.088
24 19/36 0.025 0.64 475 0.241 24 41/40 0.024 0.61 405 0.205 Number of strands 0.0024 0.61 405 0.205	24 1	10/34	0.023	0.58	869 930	0.201	14	105/34	0.086	2.18	4174	2.115
24 41/40 0.024 0.61 405 0.205 Number of strands — Size of each strand in AWG	24	96/61	0.025	0.64	475	0.241		4				
Number of strands — Size of each strand in AWG	24 4	11/40	0.024	0.61	405	0.205						
							Number of st	trands	of each strand ir	AWG N		
Note 1: Circular Mil Area (CMA):	Note 1: Circular Mil Area	(CMA):										