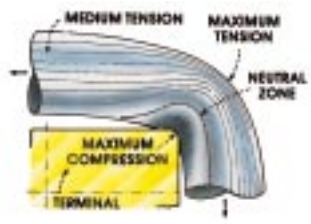
Wire Wrapping Overview

As the electronics industry has advanced in technology, the need for a faster, more reliable and inexpensive method of making electrical connections has become a necessity. In years past, it was sufficient to solder most connections since there was ample room between terminals and relatively few connections by today's standards. However, today's electronic equipment is far more complex, leading to many more terminals. The task is compounded by the reduction in equipment size. The end result is far more terminals - in much less space. To solve this problem, the industry has had to adapt to a completely different type of connection. The solderless connection by wire wrapping technique is now a standard method of making connections to terminals in high density electronic equipment.

The Technology of Wire Wrapping

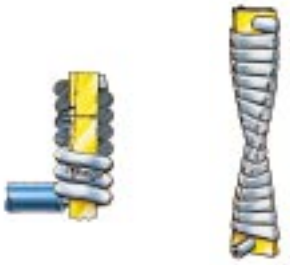
A wire wrapped connection is made by coiling the wire around the sharp corners of a terminal under mechanical tension. This method of connection was developed by Bell Telephone Laboratories, Western Electric Company.

Metal-To-Metal Contact



By bending the wire around the sharp corner of the terminal, the oxide layer on both wire and terminal is crushed or sheared, and a clean, oxide-free metal-to-metal contact is obtained.

High Pressure Contact



Terminals Suitable for Wire Wrapped Connections

Triple Connection

Types of Wrapping Tools

- Pneumatic tools are preferred for production work.
- Where compressor air is not available, electric tools are recommended.
- Battery or hand operated tools are used for service and repair work.

Easy Removal

- A distinct advantage of wire wrapping is the ease with which a wire may be removed from a terminal to correct errors or modify wiring. An unwrap tool is slipped over the terminal, engaging the first turn of the connection. Rotating the tool, the connection is removed in seconds, without damage to the terminal.

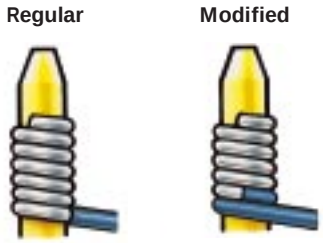
Wire

- Solid wire is used for wire wrapped connections. Copper is the most commonly used wire. Minimum elongation of 15% is required for 24 through 32 AWG; 20% for larger wire.

Quality Assurance

- Our bits are subjected to a series of "Qualification Tests". These consist of wrapping groups of wire on various types of test terminals. The wrapped wires are then subjected to a "Strip" test to determine adequate tightness. "Unwrap" tests are also performed to ensure against an "Overtight" wrap.

Types of Wrap



- A "Regular" bit wraps the bare wire around the terminal. A "Modified" bit wraps a portion of insulation around the terminal in addition to the bare wire. This greatly increases the ability to withstand vibration.

Strength of Connection

- The strength of a wire wrapped connection is considerably in excess of that of a soldered one. It is less easily stripped from the terminal and is less subject to breakage.

Gas Tight Contact Areas

- The contact areas of a wire wrapped connection remain gas tight when exposed to temperature changes, corrosive atmospheres, humidity and vibration.

"Strip" Force Chart*

Wire Size			Min. number of turns (Bare Wire)	Min. strip force	
AWG	Dia. inches	Dia. mm		lbs.	gms
16	.051	1.30	4	15	6800
18	.0403	1.00	4	15	6800
20	.032	0.80	5	8	3600
22	.0253	0.65	5	8	3600
24	.0201	0.50	6	7	3200
26	.0159	0.40	7	6	2700
28	.0126	0.32	7	5	2200
30	.0100	0.25	7	3.3	1500

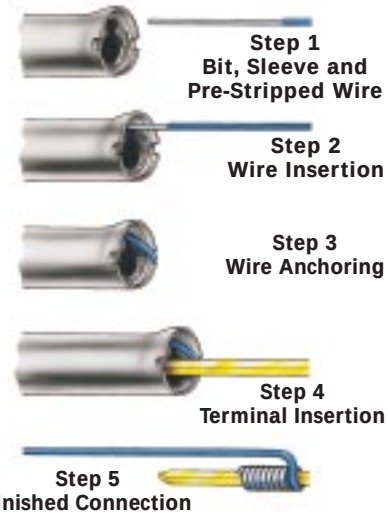
*Conforms to MIL-STD-1130B

How to Select Wire

1. Determine Wire Gauge
2. Select Regular wrap (bare wire only around terminal) or Modified wrap (first 1½ turns of insulation around terminal, balance of turns - bare wire)
3. Determine terminal diagonal using terminal diagonal chart below
4. Select Bit (and corresponding sleeve) using charts on page 8 by using wire gauge, regular/modified wrap then terminal hole diameter
5. Insure the terminal diagonal fits between minimum and maximum terminal diagonal on bit and sleeve chart

Notes:
A. Once bit is selected, the corresponding sleeve part number is printed along side
B. Bits marked with an asterisk (*) are for use on .025" (.63mm) square terminals
C. Modified wraps are recommended for wire diameters 26, 28, 30 AWG (.40, .32, .25mm) when used on .025" (.63mm) square terminals

How to Make Wire Wrapped Connections with OK Tools



Wire Size Chart

Bare Wire Dia.		AWG	SWG
Inches	mm	(USA)	(GB)
.0403	1.022	18	
.040	1.016		19
.036	0.914	19	20
.032	0.813	20	21
.028	0.711	21	22
.0253	0.643	22	
.024	0.61		23
.0226	0.574	23	
.022	0.559		24
.0201	0.51	24	
.020	0.508		25
.018	0.457		26
.0179	0.455	25	
.0164	0.417		27
.0159	0.404	26	
.0148	0.376		28
.0142	0.361	27	
.0136	0.345		29
.0126	0.320	28	
.0124	0.315		30
.0116	0.295		31
.0113	0.287	29	
.0108	0.274		32
.0100	0.254	30	33
.0092	0.234		34
.0089	0.226	31	
.0084	0.213		35
.008	0.203	32	

Some Hints on Making Wrapped Connections

Overwrap

Open Wrap

Spiral Wrap

Easy Does It!

Do not press too hard. Let the OK tools do the work. Excessive pressure can lead to overwrapping. Backforce "BF" to prevent overwrapping is available on most power tools and is recommended for use with 26 through 30 AWG wire.

Insufficient Turns

Feed Wire Correctly!

It's easy to feed wire into the slot in the OK bit correctly. Be sure the stripped end of the wire is "pushed-in" all the way.

Stay With It!

Just keep the OK tool on the terminal until the wrap is complete. Early removal can result in spiral and open wraps.

Pigtail

Use the Correct Bit and Sleeve!

Wire wrapping is a precision technique and the wrong bit and sleeve just cannot do the job. Improper selection can cause problems ranging from "Pigtails" to loose wraps.

Terminal Diagonal Chart

Dimension "F"

In. / mm	.010 / 0.25	.015 / 0.38	.020 / 0.51	.025 / 0.64	.030 / 0.76	.035 / 0.89	.040 / 1.02	.045 / 1.14	.050 / 1.27	.055 / 1.40	.060 / 1.52	.065 / 1.65	.070 / 1.78	.075 / 1.91	.080 / 2.03	.085 / 2.16	.090 / 2.29	.095 / 2.41	.100 / 2.54
.010 / 0.25	.014 / 0.36	.018 / 0.46	.022 / 0.56	.027 / 0.69	.032 / 0.81	.036 / 0.91	.041 / 1.04	.046 / 1.17	.051 / 1.30	.056 / 1.42	.061 / 1.55	.066 / 1.68	.071 / 1.80	.076 / 1.93	.081 / 2.06	.086 / 2.18	.091 / 2.31	.096 / 2.44	.101 / 2.57
.015 / 0.38	.018 / 0.46	.021 / 0.53	.025 / 0.64	.029 / 0.74	.033 / 0.84	.038 / 0.97	.043 / 1.09	.047 / 1.19	.052 / 1.32	.057 / 1.45	.062 / 1.58	.067 / 1.70	.072 / 1.83	.077 / 1.96	.082 / 2.08	.087 / 2.21	.092 / 2.34	.097 / 2.46	.102 / 2.59
.020 / 0.51	.022 / 0.56	.025 / 0.64	.028 / 0.71	.032 / 0.81	.036 / 0.91	.040 / 1.02	.045 / 1.14	.049 / 1.25	.053 / 1.35	.058 / 1.47	.063 / 1.60	.068 / 1.73	.073 / 1.85	.078 / 1.98	.083 / 2.11	.088 / 2.24	.093 / 2.36	.098 / 2.49	.103 / 2.62
.025 / 0.64	.027 / 0.69	.029 / 0.74	.032 / 0.81	.035 / 0.89	.039 / 0.99	.043 / 1.09	.047 / 1.19	.050 / 1.27	.056 / 1.42	.060 / 1.52	.065 / 1.65	.069 / 1.75	.074 / 1.88	.079 / 2.01	.084 / 2.13	.089 / 2.26	.094 / 2.39	.099 / 2.52	.104 / 2.64
.030 / 0.76	.032 / 0.81	.033 / 0.84	.036 / 0.91	.039 / 0.99	.042 / 1.07	.046 / 1.17	.050 / 1.27	.054 / 1.37	.058 / 1.47	.062 / 1.58	.067 / 1.70	.071 / 1.80	.076 / 1.93	.080 / 2.03	.085 / 2.16	.090 / 2.29	.095 / 2.41	.100 / 2.54	.105 / 2.67
.035 / 0.89	.036 / 0.91	.038 / 0.97	.040 / 1.02	.043 / 1.09	.046 / 1.17	.049 / 1.25	.052 / 1.32	.056 / 1.42	.060 / 1.52	.064 / 1.63	.069 / 1.75	.073 / 1.85	.078 / 1.98	.082 / 2.08	.087 / 2.21	.091 / 2.31	.096 / 2.44	.101 / 2.57	.106 / 2.69
.040 / 1.02	.041 / 1.04	.043 / 1.09	.045 / 1.14	.047 / 1.19	.050 / 1.27	.052 / 1.32	.056 / 1.42	.060 / 1.52	.064 / 1.63	.068 / 1.73	.072 / 1.83	.076 / 1.93	.080 / 2.03	.084 / 2.13	.089 / 2.26	.092 / 2.34	.097 / 2.46	.102 / 2.59	.107 / 2.72
.045 / 1.14	.046 / 1.17	.047 / 1.19	.049 / 1.25	.050 / 1.27	.054 / 1.37	.056 / 1.42	.060 / 1.52	.063 / 1.60	.067 / 1.70	.071 / 1.80	.074 / 1.88	.078 / 1.98	.083 / 2.11	.087 / 2.21	.091 / 2.31	.096 / 2.44	.101 / 2.57	.105 / 2.67	.109 / 2.77
.050 / 1.27	.051 / 1.30	.052 / 1.32	.053 / 1.35	.056 / 1.42	.058 / 1.47	.060 / 1.52	.064 / 1.63	.067 / 1.70	.071 / 1.80	.074 / 1.88	.078 / 1.98	.082 / 2.08	.086 / 2.18	.090 / 2.29	.094 / 2.39	.098 / 2.49	.103 / 2.62	.107 / 2.72	.111 / 2.82

Dimension "E"

Example: If "E"=.020". "F"=.060". The terminal diagonal is .063" as shown on chart.