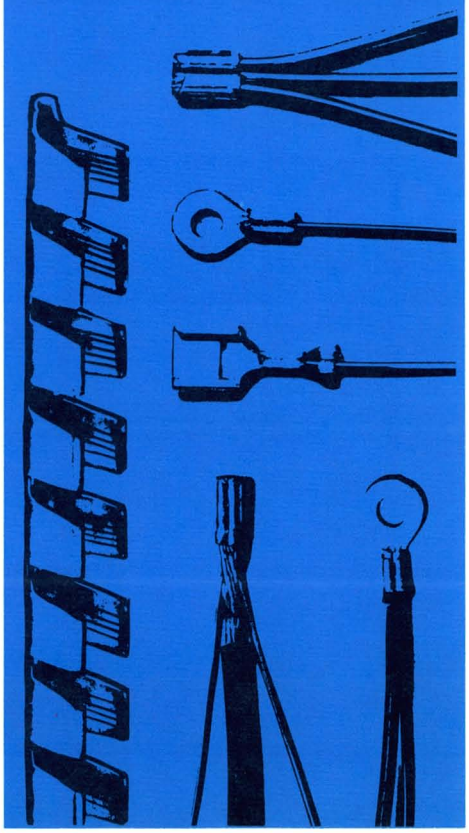
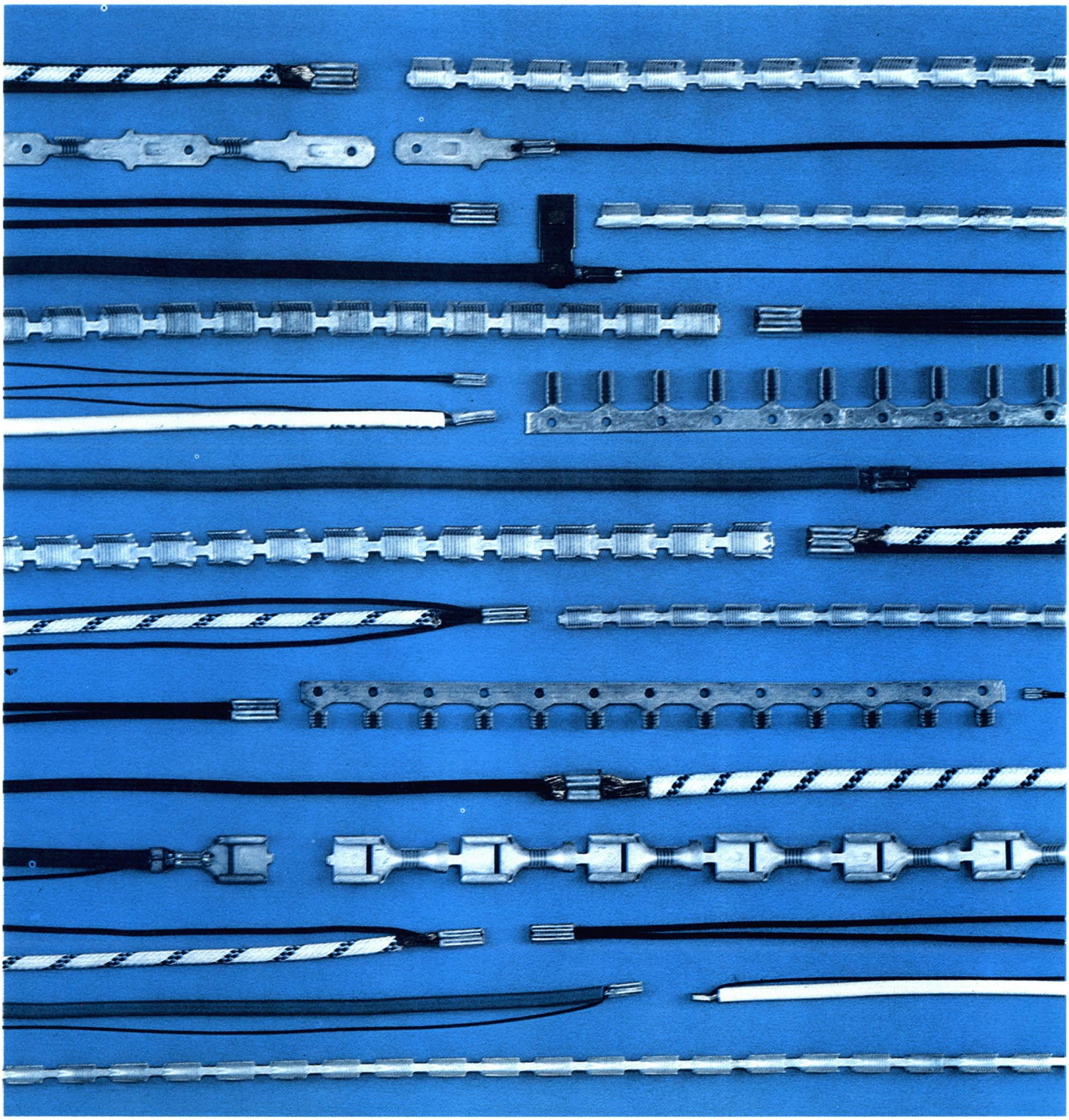
5

SPECIAL TERMINALS & SPLICES FOR AUTOMATIC MACHINE APPLICATION



AMPLIVAR Splices and Terminals (for Film Insulated/ Magnet Wire)



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AMPLIVAR Splices and Terminals

Introduction

AMPLIVAR Splices and Terminals are specifically designed to terminate magnet wire to itself or in combination with standard solid or stranded lead wire.

In a one-step operation the magnet wire is automatically multiple ring stripped of its insulation as it is forced into the serrations during the precisely controlled crimp. The resulting termination produces a high tensile strength, air sealed connection that is as resistant to corrosion as the insulated conductor.

As many as three magnet wires can be terminated, simultaneously in one splice. In addition, copper or aluminum magnet wire or a combination of both can be terminated. When required copper or aluminum magnet wire can be combined with standard, prestripped solid or stranded lead wires.

The AMPLIVAR line of splices has been recently expanded to accommodate a wire capacity range from 400 to 13,000 CMA.

Depending on your specific application AMPLIVAR Splices are available in 5, 7 and 9 serration versions and miniature and subminiature versions for 400 to 1600 CMA range

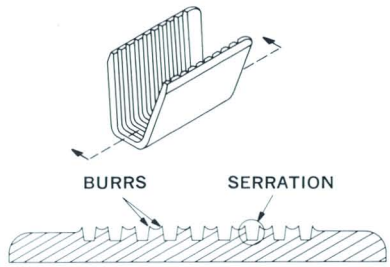
For detail specifications on crimping AMPLIVAR Splices request the appropriate AMP Specification Publication.

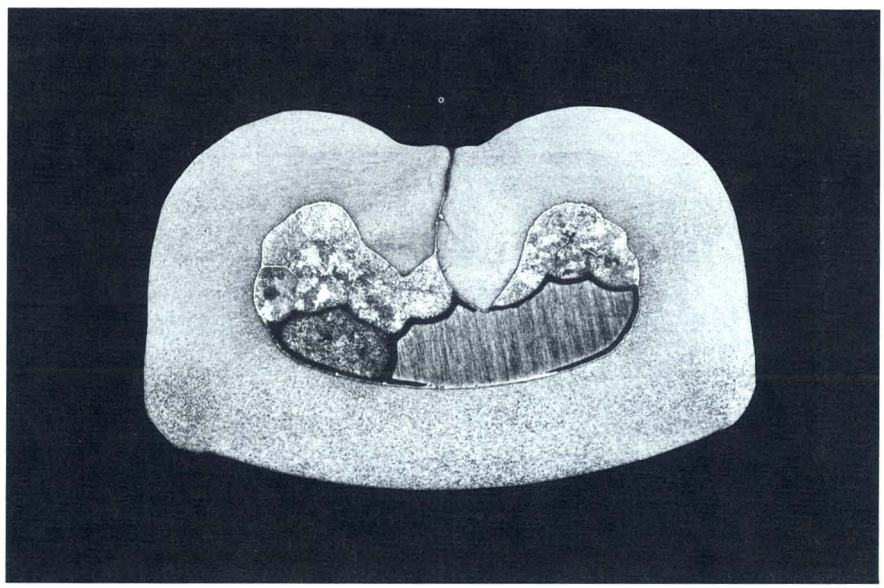
Specification No.	Type of Splice
114-2002	7 serration, pigtail
114-2003	9 serration, pigtail
114-2016	Miniature, pigtail
114-2005	Subminiature, thru
114-2006	Subminiature, pigtail
114-2008	5 serration, pigtail
114-2009	5 serration, thru

AMPLIVAR Splices and Terminals

General Information

The basic design of the AMPLIVAR Splice encompasses two main areas, the burrs at the top of the serrations and the serrations themselves. During the crimping operation the burrs pierce the insulation of the magnet wire and extrude the bare conductor into the serrations — creating intimate metal to metal contact.





Features

- Compression crimp eliminates cold solder joints, weld burns and wire embrittlement usually connected with thermal type terminations.
- Excellent tensile strength — vibration resistant.
- Provides a superior electrical connection that is free of contaminants such as stripper residue and solder flux.
- Precision formed, strip-fed terminals and splices terminated in AMP Automatic Machines assure highest possible production rates.
- High termination rates, low wire consumption and the elimination of rejects caused by solder flux or heat damage results in the lowest applied costs.
- Precisely controlled crimp termination helps eliminate human error for maximum reliability.

AMPLIVAR Splices and Terminals

Proper Application Method

To assist you in obtaining the optimum AMPLIVAR splice termination, the following rules are recommended by AMP Incorporated:

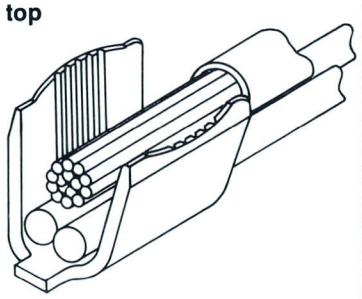
1. All magnet wires must be placed in the bottom of the splice before crimping. Any stranded wire should be placed on top of the magnet wires.

2. Splices are designed to accept a maximum of three insulated magnet wires plus stranded lead wires.

3. The ratio of magnet wire diameters crimped in any splice should not exceed 2:1. This ratio is approximately a range from the largest to the smallest magnet wire of six sizes.

4. The sum of the circular mil areas of the magnet wires and any stranded wire should not exceed the capacity of the splice.

5. The sum of the diameters of the individual magnet wires plus twice the terminal stock thickness must be equaled to or less than the crimp width.



6. Normally, magnet wires of #26 gauge or smaller should be used with splices having "shallow serrations". (Identified in tabular data with asterisk).

7. For combinations using aluminum magnet wire tin plated splices must be used.

8. Consult AMP Incorporated for splice selection and recommendations for all non-standard applications.

Test results

AMPLIVAR Products have been subjected to the following tests without significant millivolt increase:

Temperature Cycling — 25 cycles — each cycle consisting of 30 minutes at 125°C followed by 30 minutes at −65°C.

Heat Age — 96 hours at 150°C.

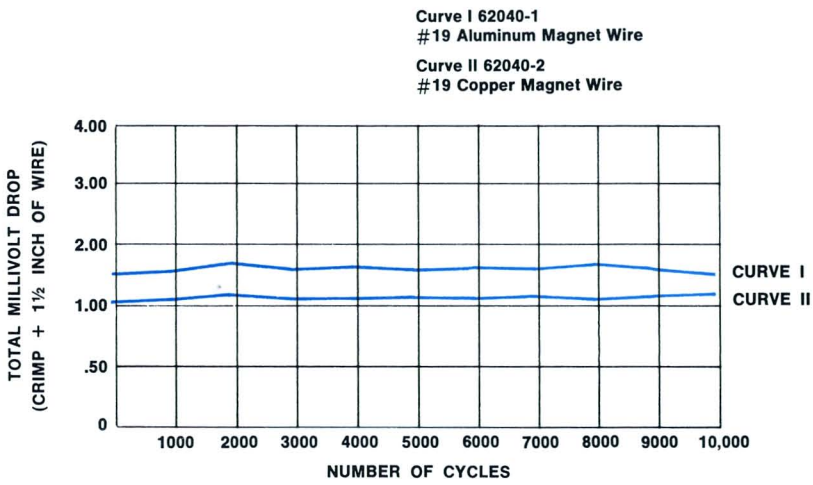
Thermal Shock — 25 cycles — each cycle consisting of 30 minutes at 150°C followed by 30 minutes at −65°C.

Salt Spray — 96 hours at 35°C with a 5% salt solution spray.

Humidity — 96 hours at 90-95% relative humidity and 40°C.

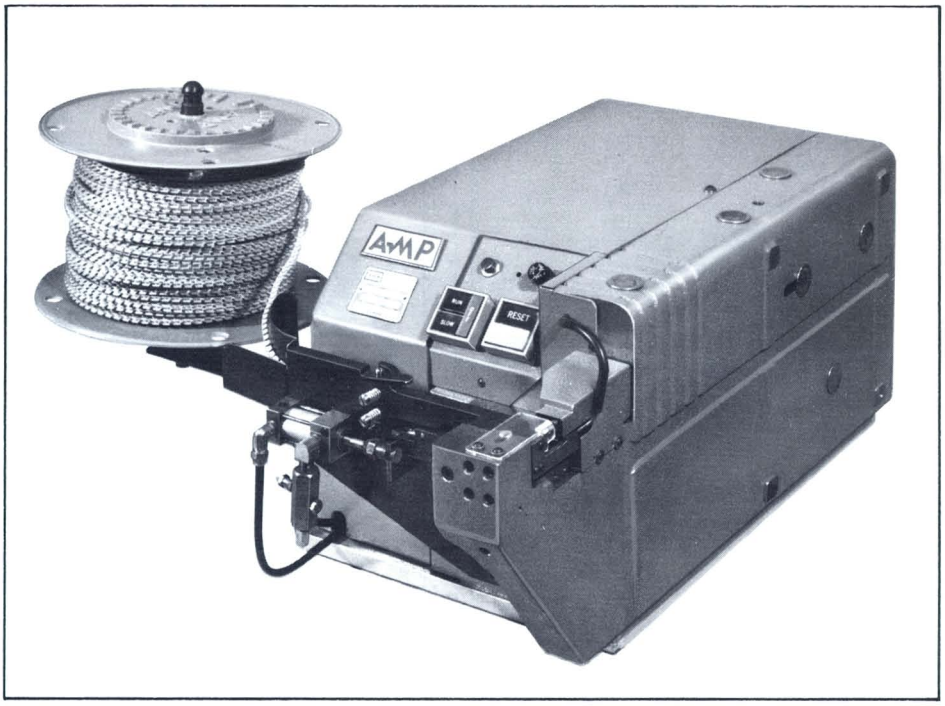
Current Cycling — 10,000 cycles — each consisting of 3 minutes on and 3 minutes off at a current which establishes a wire temperature of 150°C.

TYPICAL CURRENT CYCLING TEST RESULTS



Current Cycling: The splices were subjected to 10,000 cycles of current cycling at the current (24 amperes) which established a wire temperature of 150°C. Duration of the cycle was 3 minutes on and 3 minutes off.

Horizontal Terminating Machine



The Horizontal Terminating Machine is designed to apply strip form AMPLIVAR "Pigtail" type splices to magnet wire or to magnet and stranded wire combinations without a need for pre-stripping the magnet wire. This compact, bench mounted machine is foot operated, air and electrically powered, and is specifically designed so that electrical components can be held close to the crimping area during the crimping operation. This facilitates the splicing of very short leads down to ¾" in length. The terminating machine can also be supplied with a Wire Stuffer Assembly. The purpose of this mechanism is to eliminate the need for changing the crimp height when the combined CMA of the wires to be crimped varies from one operation to another. To increase the CMA, a stuffer wire is automatically inserted into the AMPLIVAR splice by actuating of a foot switch prior to the crimping operation.

The high production rates of the machine — limited only by operator dexterity — and its ability to handle unstripped magnet wire assure the lowest possible applied cost. During a crimping operation, the machine also automatically trims excess wire. The operator merely positions the wires in the machine and actuates a foot pedal. Minimum operator involvement plus the elimination of cold solder joints, weld burns and wire embrittlement which frequently occur with thermal methods provide assurance for consistently high quality terminations.

The machine is completely guarded as specified by OSHA regulations and at the same time is designed for maximum operator accessibility. Long tooling life of the crimpers, anvils, shears, etc., is assured by using self-aligning tooling. This results in reduced preventive maintenance.

While the press is basically designed for horizontal mounting it can be mounted at angles up to 60° for more efficient operation depending on the lead being terminated. Applications requiring short wire termination down to ¾" in length can be accomplished on the AMP horizontal terminating machine.

AMPLIVAR Splices and Terminals

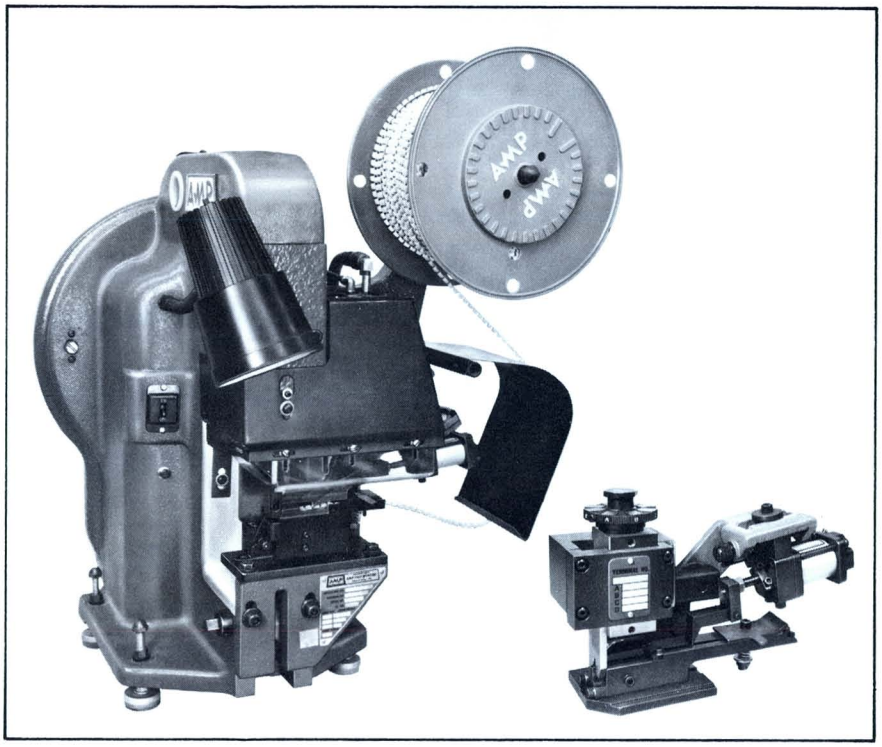
Application Tooling

AMPLIVAR Pneumatic Hand Tool

Compact and lightweight the AMPLIVAR pneumatic hand tool provides maximum "on the job" termination versatility. This tool will accept strips of approximately 25 to 30 AMPLIVAR Pigtail Splices, depending on wire size. These strips are cut from the large reels and fed into the tool by turning the hand feed knob to the exact crimp location. The tool is actuated by a foot pedal which frees both hands of the operator to position the tool and the wires being crimped.

The AMPLIVAR pneumatic hand tool provides the same positive termination as the AMPLIVAR bench mounted equipment. Complete AMPLIVAR terminal CMA range can be accommodated with one set of tooling by properly adjusting the crimp heights.

Since the tool is portable it is ideally suited for limited production requirements. In addition, in many applications it is necessary to terminate the wires on location, particularly in maintenance and repair.



AMP-O-LECTRIC Terminating Machine with Standard or Miniature Applicators

This AMP-O-LECTRIC Terminating Machine is an electrically powered machine specifically designed to apply precision formed AMPLIVAR terminals and splices to magnet wire or to magnet and stranded wire combinations without a need for pre-stripping the magnet wires. During each machine cycle, the operator simply positions the wires and actuates a foot pedal. The machine is completely guarded as specified by OSHA regulations and is designed for maximum operation production.

Maximum versatility is achieved through the machine's ability to handle copper or aluminum magnet wire combinations and magnet and stranded wire combinations. Additional capabilities include the making of "Thru" and Pigtail type splices as well as the trimming of excess wire of the Pigtail splices. Also, since the machine automatically multiple-ring strips magnet wire of its coating during the crimping process, pre-stripping the magnet wire insulation is not required. The reduction of human error through minimum operator involvement and the elimination of heat damage caused by welding or soldering techniques also contribute to the efficient and economical production of magnet wire terminations. Production rates can be measured by the speed and dexterity of the operator.

The AMP-O-LECTRIC Machine is available with a standard applicator for long production runs where the wire sizes remain the same. For savings in downtime due to frequent terminal and wire size changes, a miniature applicator is recommended. These applicators provide complete crimp height adjustment within the CMA range of the AMPLIVAR splice thru a simple dial setting.

Suggested Splice Selection Procedure

As a guide to enable you to determine the proper splice or terminal for your application the following general rules may be of assistance:

1. Use 7 or 9 serration splices, tin plated, when terminating aluminum magnet wire or combinations with aluminum magnet wire.

2. Use 9 serration splices for hermetic and severe environment applications.

3. Use splices identified with an asterisk (*) when terminating #26 AWG and smaller wires.

4. Calculate the total CMA of the magnet wires. Use the coated CMA for magnet wire. (When used in combination with standard lead wire include in total CMA). (See Table I & II, pages 14 & 15).

5. Calculate the total of magnet wire diameters (See Table I, page 14).

6. Select a splice for trial calculations. The splice should have the proper CMA range. Wire size #26 AWG and smaller should use splices identified with an asterisk. Plating finish should also be considered at this time.

7. Calculate the sum of the magnet wire diameters plus two splice stock thicknesses. If this total is less than the crimp width of the splice selected it may be used. If the total is greater than the crimp width, a splice with a greater crimp width must be selected. Consult AMP for special wide tooling recommendations.

Example of splice selection procedure:

Selection of a Pigtail Splice to terminate the following wires.

One #26 AWG copper magnet wire

One #20 AWG aluminum magnet wire

One #18 AWG 19 strand copper lead wire

Calculate the total CMA (Procedure 4).

#26 AWG coated magnet wire	289 CMA
#20 AWG coated magnet wire	1116 CMA
#18 AWG 19 strand lead wire	1608 CMA
	3013 CMA

Calculate the sum of the magnet wire diameters (Procedure 5).

#26 AWG coated magnet wire	.0170
#20 AWG coated magnet wire	.0334
	.0504

Select a terminal for trial calculations. Splice Part No. 62158-2, Page 6. (Procedure 6).

CMA range	1500-5000
Stock thickness	.020
Crimp width	.110

7 serration, tin plated for aluminum magnet wire (Procedure 1). Splice identified with asterisk (*) for #26 AWG. (Procedure 3).

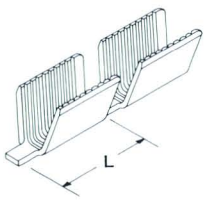
Calculate the sum of the magnet wire diameters plus two splice stock thicknesses. (Procedure 7).

$.0504 + (.020 \times 2) = .0904$

.0904 is less than the splice crimp width of .110, therefore, part no. 62158-2 may be used.

AMPLIVAR
Splices

9 Serrations
Pigtail Type



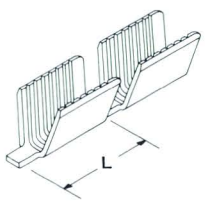
Features (plus all 7 Serration features)

1. Splice length is increased on larger CMA splices for improved performance.
2. Splice CMA ranges are overlapped so that 2 splices are available for any given CMA.
3. Serration depths are varied within the splice to give optimum electrical/mechanical performance on all size wires.
4. Serration sidewall angles are varied to allow better wire stripping and serration fill.
5. Flat bottom of splice helps keep magnet wires on bottom as required during crimping.

WIRE RANGE CMA	STOCK THICKNESS	CRIMP WIDTH	L	MATERIAL	PART NUMBER
400-1500	.016	.080	.225	Tin Plated Brass	62303-2
1000-3000	.020	.110	.225	Tin Plated Brass	62304-2
1000-3000	.016	.110	.225	Tin Plated Brass	62305-2*
1500-5000	.020	.110	.225	Tin Plated Brass	62306-2
1500-5000	.016	.110	.225	Tin Plated Brass	62307-2*
3000-7000	.020	.140	.265	Tin Plated Brass	62308-2
5000-10,000	.025	.180	.265	Tin Plated Brass	62309-2
7000-13,000	.025	.180	.265	Tin Plated Brass	62310-2

*These splices are recommended for applications using #26 AWG wire size or smaller.

7 Serrations
Pigtail Type



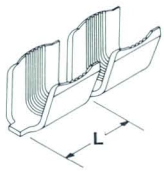
Features

1. 6° taper on both crimper and anvil improves flex life of termination.
2. Longer "Flat" on tooling improves electrical performance (.125 VS .080).
3. Radius on wire entry end of splice prevents nicking wires, improves mechanical performance.
4. Additional serrations enhance stability of crimp.
5. Serrations are offset to sheared end to place additional serrations in "Electrical" portion of the crimped splice.

WIRE RANGE CMA	STOCK THICKNESS	CRIMP WIDTH	L	MATERIAL	PART NUMBER
600-3000	.020	.110	.225	Brass	62000-1
600-3000	.020	.110	.225	Brass	62157-1*
600-3000	.020	.110	.225	Tin Plated Brass	62000-2
600-3000	.020	.110	.225	Tin Plated Brass	62157-2*
1500-5000	.020	.110	.225	Brass	62040-2
1500-5000	.020	.110	.225	Brass	62158-1*
1500-5000	.020	.110	.225	Tin Plated Brass	62040-1
1500-5000	.020	.110	.225	Tin Plated Brass	62158-2*
3000-7000	.020	.140	.225	Brass	62001-1
3000-7000	.020	.140	.225	Tin Plated Brass	62001-2
7000-12,000	.025	.220	.225	Brass	62335-1
7000-12,000	.025	.220	.225	Tin Plated Brass	62335-2
7000-12,000	.025	.250	.225	Tin Plated Brass	62295-1
7000-12,000	.025	.265	.225	Brass	62295-2
7000-13,000	.025	.180	.225	Brass	62002-1
7000-13,000	.025	.180	.225	Tin Plated Brass	62002-2

*These splices are recommended for applications using #26 AWG wire size or smaller.

5 Serrations Thru Type



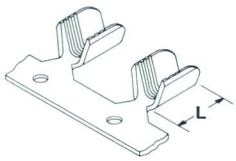
Features

1. Wide range of thru splices.
2. Serrations centered in splice to achieve optimum electrical and mechanical performance in a thru splice.
3. CMA range accepts a wide variety of wire sizes and combinations.

WIRE RANGE CMA	STOCK THICKNESS	CRIMP WIDTH	L	MATERIAL	PART NUMBER
600-3000	.020	.110	.225	Brass	42076-0
600-3000	.020	.110	.225	Brass	42192-1*
600-3000	.020	.110	.225	Tin Plated Brass	42076-1
600-3000	.020	.110	.225	Tin Plated Brass	42192-2*
600-3000	.020	.110	.225	Brass—Nickel Flash	42192-5*
1500-5000	.020	.110	.225	Brass	41765
1500-5000	.020	.110	.225	Brass	42119-1*
1500-5000	.020	.110	.225	Tin Plated Brass	41899
1500-5000	.020	.110	.225	Tin Plated Brass	42119-2*
3000-7000	.020	.140	.225	Brass	41766
3000-7000	.020	.140	.225	Brass	60667-1*
3000-7000	.020	.140	.225	Tin Plated Brass	41900
3000-7000	.020	.140	.225	Tin Plated Brass	60667-2*
7000-13,000	.025	.180	.225	Brass	41770
7000-13,000	.025	.180	.225	Tin Plated Brass	41904

*These splices are recommended for applications using #26 AWG wire size or smaller.

Miniature Splice Pigtail Type

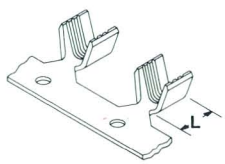


Features

1. The compactness of these splices make them ideal for use in small subfractional motors, transformers, relays, solenoids, indicator lamp and small appliance terminations.
2. These splices provide the same reliability as the larger AMPLIVAR splices.

WIRE RANGE CMA	STOCK THICKNESS	CRIMP WIDTH	L	MATERIAL	PART NUMBER
480-1700	.014	.080	.195	Tin Plated Brass	62341-1

Subminiature Splice Thru or Pigtail Type

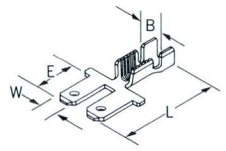


WIRE RANGE CMA	STOCK THICKNESS	CRIMP WIDTH	L	MATERIAL	PART NUMBER
400-1600	.016	.070	.100	Tin Plated Brass	62194-2

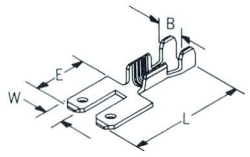
AMPLIVAR
Bobbin Terminals

Bobbin Tabs

A



B



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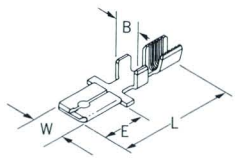
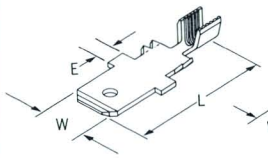


TYPE	MAGNET WIRE RANGE	STOCK THICK-NESS	MATERIAL	W	L	E	B	PART NUMBER
A	24-18	.025	Tin Plated Brass	.110	.795	.280	.134	61266-1
B	24-18	.025	Tin Plated Brass	.110	.795	.340	.134	62285-1
C	21-16	.016	Tin Plated Brass	.250	.830	.310	.177	61502-1
D	32-28	.032	Brass	.250	.750	.125	—	61598-1
D	32-28	.032	Tin Plated Brass	.250	.750	.125	—	61598-2
E	21-16	.016	Tin Plated Brass	.200	.490	.200	—	61600-1
F	32-28	.032	Tin Plated Brass	.250	.750	.310	—	61707-1
G	32-28	.032	Tin Plated Brass	.250	.750	.310	—	61708-1
D	32-28	.032	Tin Plated Brass	.250	.750	.075	—	62017-1



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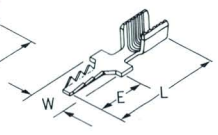
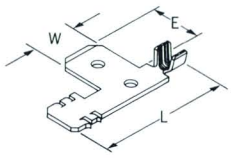


E



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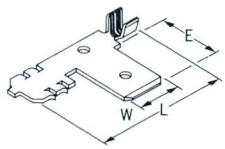
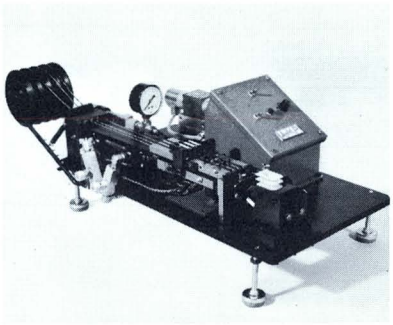
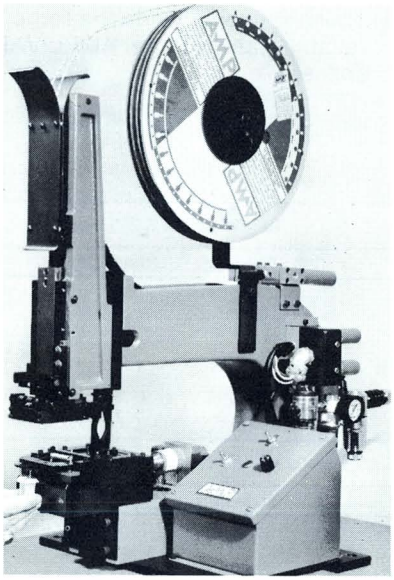


G

Application Tooling



Horizontal Single Module Machine



Vertical Single Module Machine

Horizontal Single Module Machine

This equipment is an economical "general purpose" type machine that will accept most bobbins and bobbin tab styles requiring straight insertion of one or more tabs. It is a pneumatically powered bench model consisting of a Standard Insertion Module and bobbin holding fixture mounted on a common base. When the operator places a bobbin in the holding fixture, the machine automatically inserts the required number of tabs and ejects the completed bobbin. The production rate of this machine is usually in excess of 1500 bobbins per hour.

The Single Module Machine also can be provided with the following optional equipment to extend its versatility.

A. Two Position Bobbin Holder

This feature permits the processing of bobbins that require a row of tabs in two different flanges, without double processing. When the operator places a bobbin in the holding fixture, the machine automatically inserts a row of tabs into one flange, vertically repositions the bobbin, then inserts the second row of tabs.

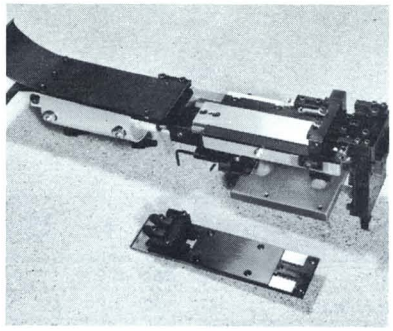
B. Dual Pocket Bobbin Holder

This feature allows the operator to load two bobbins for each machine cycle. The bobbin configuration must be small and have prominent orientation features to make two-hand loading practical.

Vertical Single Module Machine

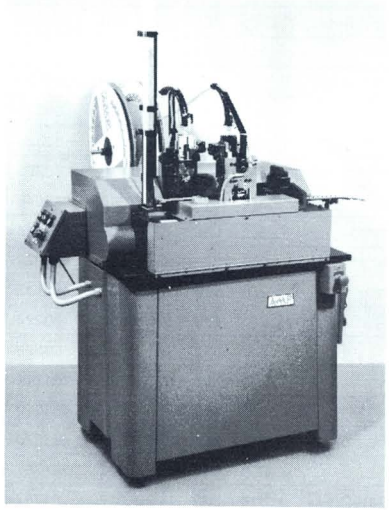
The vertically mounted module with a special bobbin holder, permits tabs to be inserted into the "end" of the bobbin flange. Operation of this machine is identical to the horizontal unit, and its production rate is usually in excess of 1500 bobbins per hour.

AMPLIVAR
Bobbin Terminals

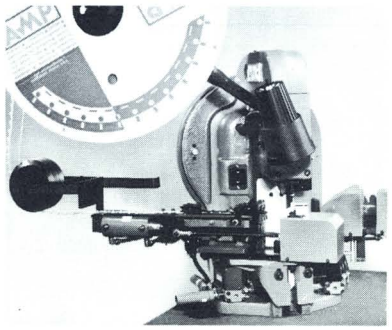


Standard Bobbin Tab Insertion Module

Rotary Multiple Module Machine



In Line Multiple Module Machine



Tab Insert and Crimp Machine

Standard Bobbin Tab Insertion Module

The insertion module is used in all Bobbin Tab Insertion equipment. It will take single, multiple or "ladder" type bobbin tabs from reels, remove the tabs from the strip and precisely insert them into a bobbin flange. The module can be provided with conversion tooling that permits the unit to be quickly converted to insert additional tab styles and combinations. The module also can be provided with a pneumatic, hydraulic or mechanical power source.

Rotary Multiple Module Machine

This multiple-station floor model is ideal where one universal machine is needed to process various styles of bobbins and tabs. Production rates of this machine are in excess of 2000 assemblies per hour for manual loading and 3500 assemblies per hour for automatic loading. The rotary table equipment consists of an operator loading station, an eject station, and the required number of working stations. Each working station can be tooled with a Standard Insertion Module mounted on an adjustable base. This feature allows the unit to be vertically and horizontally aligned to the required tab cavity position on the bobbin flange. These working stations can also be tooled with special forming functions — staking, bending, shearing, etc. — to suit the customer's specific requirements. With such tooling flexibility, several bobbin applications can be tooled on the machine at one time and the work functions made operative, as required, on the control panel.

In Line Multiple Module Machine

This equipment is applicable where multiple tab insertion and forming operations are required. Its production rates are in excess of 2000 assemblies per hour for manual loading and 6000 assemblies per hour for automatic loading. A bobbin, phenolic board, or similar product requiring a bobbin style terminal is fed through a series of in-line work stations. The number of work stations depends on the operations required, but will normally consist of a loading station, one or more insertion stations using the Standard Insertion Module, a tab staking or clinching station, a bending station and an eject station.

The main drive is electromechanical, and all working stations are cam controlled to provide maximum reliability.

The equipment also can be tooled for manual operator loading, magazine loading, vibrator bowl-feed loading or fully automatic loading by direct acceptance of products from another manufacturing process.

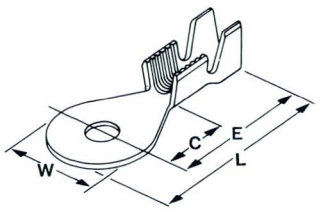
Tab Insert and Crimp Machine

This equipment is suitable where it is desirable to crimp the start and stop leads of a wound bobbin to a flange mounted tab. The machine consists of a pneumatically powered Standard Insertion Module and bobbin holder mounted in an AMP-O-LECTRIC Press. The operator simply installs a wound bobbin on the holder and places the lead wires into a pair of wire position arms. The machine then will automatically insert two tabs, position the leads over the tab barrels, crimp the leads in the barrels and eject the finished bobbin. This unit is capable of producing up to 800 assemblies per hour.

AMPLIVAR
Terminals

Ring Tongue Terminals

A



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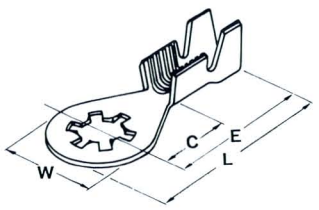

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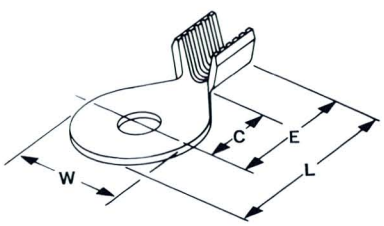

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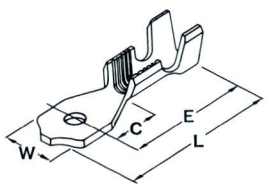

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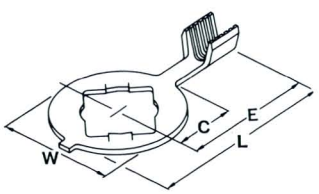

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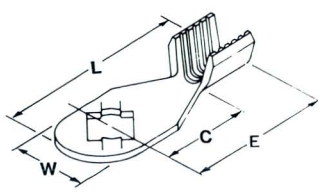


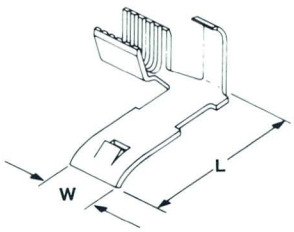
TYPE	MAGNET WIRE RANGE	INSULATION DIA. RANGE	HOLE DIA.	STUD SIZE	STOCK THICK-NESS	MATERIAL	W	L	E	C	PART NUMBER
A	11-13	.085-.150	.180	8	.025	Brass	.342	.833	.657	.312	61710-1
A	12-10	.150-.190	.265	¼	.025	Tin Plated Brass	.420	.872	.682	.312	61756-1
A	15-12	.150-.190	.094	2	.025	Tin Plated Brass	.420	.870	.660	.312	485007-2
A	15-12	.150-.190	.265	¼	.025	Brass	.420	.870	.660	.312	61185-1
A	15-12	.150-.190	.265	¼	.025	Tin Plated Brass	.420	.870	.660	.312	61185-2
A	(2) #17 or (2) #15	.150-.190 or (2) .115	.197	10	.025	Tin Plated Brass	.342	.827	.656	.312	61151-1
A	(2) #17 or (2) #15	.150-.190 or (2).115	.171	8	.025	Brass	.342	.827	.656	.312	60752-1
A	(2) #17 or (2) #15	.150-.190 or (2) .115	.171	8	.025	Tin Plated Brass	.342	.827	.656	.312	60752-2
A	18-14	.100-.140	.197	10	.020	Brass	.342	.833	.662	.312	60318-1
A	18-14	.100-.140	.197	10	.020	Tin Plated Brass	.342	.833	.662	.312	60318-2
A	18-14	.100-.140	.171	8	.020	Brass	.342	.833	.662	.312	60320-1
A	18-14	.100-.140	.171	8	.020	Tin Plated Brass	.342	.833	.662	.312	60320-2
A	20-16	.125-.165	.197	10	.020	Brass	.300	.700	.550	.230	60324-1
A	20-16	.125-.165	.197	10	.020	Tin Plated Brass	.300	.700	.550	.230	60324-2
A	20-16	.125-.165	.171	8	.020	Brass	.300	.700	.550	.230	60322-1
A	20-16	.125-.165	.171	8	.020	Tin Plated Brass	.300	.700	.550	.230	60322-2
A	23-19	.100-.140	.197	10	.020	Brass	.342	.833	.662	.312	60319-1
A	23-19	.100-.140	.197	10	.020	Tin Plated Brass	.342	.833	.662	.312	60319-2
A	23-19	.125-.165	.197	10	.020	Brass	.300	.700	.550	.230	60325-1
A	23-19	.125-.165	.197	10	.020	Tin Plated Brass	.300	.700	.550	.230	60325-2
A	23-19	.100-.140	.171	8	.020	Brass	.342	.833	.662	.312	60321-1
A	23-19	.100-.140	.171	8	.020	Tin Plated Brass	.342	.833	.662	.312	60321-2
A	23-19	.100-.140	.145	6	.020	Brass	.342	.833	.662	.312	60321-3
A	23-19	.125-.165	.171	8	.020	Brass	.300	.700	.550	.230	60323-1
A	23-19	.125-.165	.171	8	.020	Tin Plated Brass	.300	.700	.550	.230	60323-2
B	18-14	.080-.120	.204	10	.028	Lu-Bronze*	.370	.915	.730	.380	485046-1
B	18-14	.080-.120	.185	8	.028	Lu-Bronze*	.365	.882	.700	.380	485044-1
B	18-14	.080-.120	.173	8	.028	Lu-Bronze*	.370	.915	.730	.380	485079-1
B	18-14	.080-.120	.147	6	.028	Lu-Bronze*	.370	.915	.730	.380	485045-1
C	22-18	—	.132	—	.030	Brass	.290	.500	.355	.195	60224-1
C	22-18	—	.150/.145	—	.030	Brass	.290	.500	.355	.195	60536-1
C	22-18	—	.171	8	.030	Brass	.290	.500	.355	.195	61719-1
C	22-18	—	.090	2	.030	Brass	.290	.500	.355	.195	485019-1
D	23-19	.100-.140	.145	6	.020	Tin Plated Brass	.240	.833	.657	.312	485070-1
D	18-14	.055-.100	.180	8	.020	Brass	.310	.833	.662	.312	61787-1
D	18-14	.055-.100	.180	8	.020	Tin Plated Brass	.310	.833	.662	.312	61787-2
E	20-16	—	—	—	.020	Brass	.625	.940	.627	.467	505017-1
F	20-16	—	—	—	.020	Brass	.340	.830	.660	.500	505018-1

*High conductivity copper-tin-zinc alloy.

AMPLIVAR
Terminals

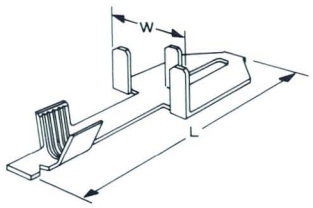
Brush Terminal

A



Staking Terminal

B



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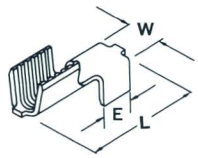

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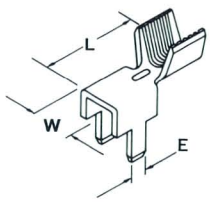


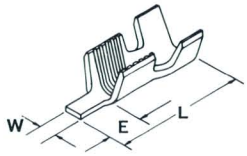
TYPE	MAGNET WIRE RANGE	INSULATION DIA. RANGE	STOCK THICK-NESS	MATERIAL	W	L	E	PART NUMBER
A	22-17	.095 to .115	.020	Phosphor Bronze	.214	.550	—	61148-1
A	22-17	.095 to .115	.020	Tin Plated Phosphor Bronze	.214	.550	—	61148-2
B	20-16	—	.018	Brass	.260	.545	—	61542-1‡
B	20-16	—	.018	Brass	.260	.545	—	61643-1
C	20-16	—	.020	Brass	.200	.355	.090	61069-1
D	10-14	—	.022	Brass	.200	.500	.075	61757-1
D	10-14	—	.022	Tin Plated Brass	.200	.500	.075	61757-2
E	23-19	.125-.165	.020	Brass	.055	.486	.130	42918-1
E	23-19	.125-.165	.020	Tin Plated Brass	.055	.486	.130	42918-2
E	20-16	.125-.165	.020	Brass	.055	.486	.130	42917-1
E	20-16	.125-.165	.020	Tin Plated Brass	.055	.486	.130	42917-2
F	23-19	—	.020	Tin Plated Brass	.050	.315	—	61089-1
G	34-30 Lead 24-20	.048-.071	.020	Brass	.125	.595	.100	60978-1†
								60978-3†
G	34-30 Lead 24-20	.048-.071	.020	Tin Plated Brass	.125	.595	.100	60978-2†
								60978-4†
H	34-30 Lead 24-20	—	.020	Brass	.125	.495	.100	62018-1

†Dash number designates direction terminal comes off the reel depending on terminating equipment used. Consult AMP Engineering for correct number.

‡4 serrations.

Welding Tabs

E



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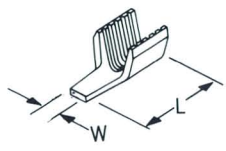
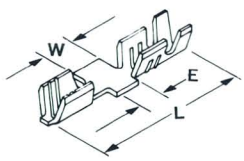
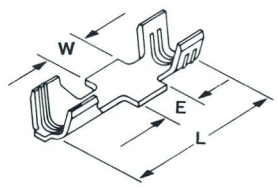


Fuse Terminals

G



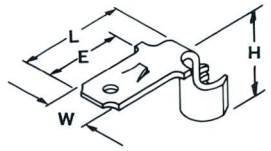
H



AMPLIVAR Terminals

FASTON Tabs with Locking Lance

A



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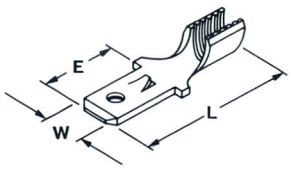
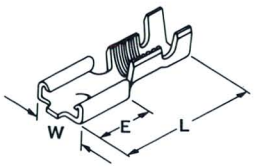


TYPE	MAGNET WIRE RANGE	STOCK THICK-NESS	MATERIAL	BOARD THICK-NESS	W	H	L	E	PART NUMBER
A	24-21	.020	Tin Plated Brass	.062-.072	.187	.400	.525	.458	61136-1*
A	21-16	.020	Brass	.062-.072	.187	.400	.525	.458	60289-1*
A	21-16	.020	Tin Plated Brass	.062-.072	.187	.400	.525	.458	60289-2*
A	15-13	.020	Tin Plated Brass	.062-.072	.187	.400	.525	.458	60571-1*
B	24-21	.020	Pre Tin Plated Brass	.062-.072	.187	—	.935	.458	61440-1
B	24-21	.020	Tin Plated Brass	.062-.072	.187	—	.935	.458	61440-2†
B	24-21	.020	Tin Plated Brass	.062-.072	.187	—	.935	.458	61440-3
B	21-16	.020	Pre Tin Plated Brass	.062-.072	.187	—	.935	.458	61441-1
B	21-16	.020	Tin Plated Brass	.062-.072	.187	—	.935	.458	61441-2†
B	21-16	.020	Tin Plated Brass	.062-.072	.187	—	.935	.458	61441-3
B	15-13	.020	Pre Tin Plated Brass	.062-.072	.187	—	.935	.458	61442-1
B	15-13	.020	Tin Plated Brass	.062-.072	.187	—	.935	.458	61442-2†
B	15-13	.020	Tin Plated Brass	.062-.072	.187	—	.935	.458	61442-3

*Available in loose piece only.
†Reeled for Miniature Applicator.

FASTON Receptacles .250 x .032 Tab Fit

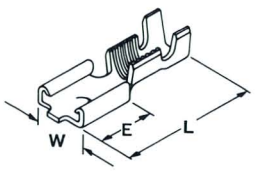
C



TYPE	MAGNET WIRE RANGE	INSULATION DIA. RANGE	STOCK THICK-NESS	MATERIAL	TAB THICK-NESS	W	L	E	PART NUMBER
C	23-19 or 24-26 doubled	.050/.080 or (2) .050 side by side	.016	Brass	.032	.290	.755	.280	60863-1
			.016	Tin Plated Brass					60863-2
C	20-16 or (2) 23 or (2) 20	.100/.140 or (2) .060 max.	.016	Brass	.032	.290	.690	.280	60384-1
C	20-16 or (2) 23 or (2) 20	.100/.140 or (2) .060 max.	.016	Tin Plated Brass	.032	.290	.690	.280	60384-2
C	18-14 or (2) 17	.120/.170 or (2) .080 max.	.016	Brass	.032	.290	.690	.280	60385-1
C	18-14 or (2) 17	.120/.170 or (2) .080 max.	.016	Tin Plated Brass	.032	.290	.690	.280	60385-2
D	23-19 or (2) 24-26 doubled	.050/.080 or (2) .050 side by side	.016	Brass	.020	.290	.755	.280	61667-1

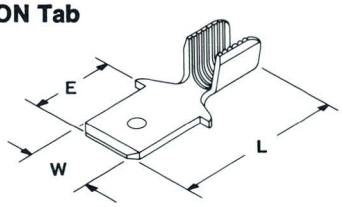
FASTON Receptacles .250 x .020 Tab Fit

D



FASTON Tab

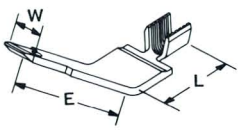
E



TYPE	MAGNET WIRE RANGE	STOCK THICK-NESS	MATERIAL	TAB THICK-NESS	W	L	E	PART NUMBER
E	14-12	.032	Tin Plated Brass	.032	.250	.630	.312	62413-1

FASTON Tab Bent 65°

F



TYPE	MAGNET WIRE RANGE	STOCK THICK-NESS	MATERIAL	W	L	E	PART NUMBER
F	21-18	.032 Tab .020 Barrel	Tin Plated Brass	.250	.400	.568	62247-1

Tensile Strength and Temperature Conversions

Tensile Strength

Note: Copper Magnet wire calculated at 33,000 PSI, Aluminum Magnet wire calculated at 11,000 PSI (EC Grade). Magnet wire should be tensiled on each coil. After termination of the AMPLIVAR splice the tensile strength will be 70% (min.) of the original magnet wire tensile values.

TENSILE OF MAGNET WIRE		
WIRE SIZE	NOMINAL DIA. COPPER (POUNDS)	NOMINAL DIA. ALUMINUM (POUNDS)
8	428	142
9	340	113
10	269	89
11	213	71
12	169	56
13	134	44
14	106	35
15	84	28
16	66	22
17	53	17
18	42	14
19	33	11
20	26	8
21	21	7
22	16	5
23	13	4
24	10	3
25	8	2.7
26	6	2.1
27	5	1.7
28	4	1.3
29	3	1.1
30	2	.86
31	2	.68
32	1	.55
33	1	.43
34	1	.34
35	.81	.27
36	.65	.21
37	.53	.17
38	.42	.13
39	.32	.10
40	.25	.083
41	.20	.067
42	.16	.054

Magnet wire tensile will change as the PSI of magnet wire changes.

Temperature Conversions

C.	F.	C.	F.	C.	F.	C.	F.
−80	−112.	9	48.2	47	116.6	85	185.0
−70	− 94.	10	50.0	48	118.4	86	186.8
−60	− 76.	11	51.8	49	120.2	87	188.6
−50	− 58.0	12	53.6	50	122.0	88	190.4
−45	− 49.1	13	55.4	51	123.8	89	192.2
−40	− 40.0	14	57.2	52	125.6	90	194.0
−35	− 31.0	15	59.0	53	127.4	91	195.8
−30	− 22.0	16	60.8	54	129.2	92	197.6
−25	− 13.0	17	62.6	55	131.0	93	199.4
−20	− 4.0	18	64.4	56	132.8	94	201.2
−19	− 2.2	19	66.2	57	134.6	95	203.0
−18	− .4	20	68.0	58	136.4	96	204.8
−17	1.4	21	69.8	59	138.2	97	206.6
−16	3.2	22	71.6	60	140.0	98	208.4
−15	5.0	23	73.4	61	141.8	99	210.2
−14	6.8	24	75.2	62	143.6	100	212.0
−13	8.6	25	77.0	63	145.4	110	230.
−12	10.4	26	78.8	64	147.2	120	248.
−11	12.2	27	80.6	65	149.0	130	266.
−10	14.0	28	82.4	66	150.8	140	284.
− 9	15.8	29	84.2	67	152.6	150	302.
− 8	17.6	30	86.0	68	154.4	160	320.
− 7	19.4	31	87.8	69	156.2	170	338.
− 6	21.2	32	89.6	70	158.0	180	356.
− 5	23.0	33	91.4	71	159.8	190	374.
− 4	24.8	34	93.2	72	161.6	200	392.
− 3	26.6	35	95.0	73	163.4	220	428.
− 2	28.4	36	96.8	74	165.2	240	464.
− 1	30.2	37	98.6	75	167.0	260	500.
0	32.0	38	100.4	76	168.8	280	536.
1	33.8	39	102.2	77	170.6	300	572.
2	35.6	40	104.0	78	172.4	400	752.
3	37.4	41	105.8	79	174.2	500	932.
4	39.2	42	107.6	80	176.0	600	1112.
5	41.0	43	109.4	81	177.8	700	1292.
6	42.8	44	111.2	82	179.6	800	1472.
7	44.6	45	113.0	83	181.4	900	1652.
8	46.4	46	114.8	84	183.2	1000	1832.

C = 5/9 (F. − 32). F = 9/5 C. + 32.

Table I
Circular Mil Area and Diameter for Magnet Wires

Wire Sizes from #42 to 8

WIRE SIZE	BARE WIRE DIA.	BARE CMA	WIRE SINGLE FILM COATED DIA.	CIRCULAR MIL AREA SINGLE FILM COATED	HEAVY FILM COATED DIA.	CMA HEAVY FILM COATED
42	.0025	6	.0028	8	.0030	9
41	.0028	8	.0031	10	.0034	12
40	.0031	10	.0035	12	.0038	14
39	.0035	12	.0039	15	.0043	18
38	.0040	16	.0045	20	.0049	24
37	.0045	20	.0050	25	.0055	30
36	.0050	25	.0056	31	.0060	36
35	.0056	31	.0062	38	.0067	45
34	.0063	40	.0069	48	.0075	56
33	.0071	50	.0077	59	.0085	72
32	.0080	64	.0084	71	.0095	90
31	.0089	79	.0092	85	.0105	110
30½	.0095	90	.0099	98	.0111	123
30	.0100	100	.0106	112	.0116	135
29½	.0107	115	.0114	130	.0123	151
29	.0113	128	.0120	144	.0130	169
28½	.0120	144	.0126	159	.0137	187
28	.0126	159	.0136	185	.0144	207
27½	.0134	180	.0144	207	.0153	234
27	.0142	202	.0152	231	.0161	259
26½	.0150	225	.0160	256	.0170	289
26	.0159	253	.0170	289	.0179	320
25½	.0169	286	.0180	324	.0190	361
25	.0179	320	.0190	361	.0200	400
24½	.0190	361	.0200	400	.0212	449
24	.0201	404	.0213	455	.0223	497
23½	.0214	458	.0226	511	.0236	557
23	.0226	511	.0238	566	.0249	620
22½	.0240	576	.0252	635	.0263	692
22	.0253	640	.0266	708	.0277	767
21½	.0269	724	.0282	795	.0293	858
21	.0285	812	.0298	888	.0310	961
20½	.0303	918	.0315	992	.0328	1,076
20	.0320	1,024	.0334	1,116	.0346	1,197
19½	.0340	1,156	.0353	1,246	.0365	1,340
19	.0359	1,289	.0373	1,391	.0386	1,490
18½	.0381	1,452	.0395	1,560	.0409	1,673
18	.0403	1,624	.0418	1,747	.0431	1,858
17½	.0428	1,832	.0443	1,962	.0456	2,079
17	.0453	2,052	.0468	2,190	.0482	2,323
16½	.0481	2,314	.0496	2,460	.0510	2,601
16	.0508	2,581	.0524	2,746	.0538	2,894
15½	.0540	2,916	.0560	3,136	.0570	3,249
15	.0571	3,260	.0587	3,446	.0602	3,624
14½	.0606	3,672	.0622	3,869	.0639	4,082
14	.0641	4,109	.0658	4,330	0675	4,556
13½	.0681	4,638	.0698	4,872	.0711	5,055
13	.0720	5,184	.0738	5,446	.0749	5,670
12½	.0764	5,837	.0783	6,131	.0793	6,188
12	.0808	6,529	.0827	6,839	.0838	7,090
11½	.0858	7,362	.0877	7,691	.0888	7,885
11	.0907	8,226	.0927	8,593	.0938	8,892
10½	.0963	9,274	.0983	9,663	.0994	9,880
10	.1019	10,384	.1040	10,820	.1050	11,151
9	.1144	13,087	.1166	13,600	.1177	13,971
8	.1285	16,512	.1307	17,080	.1318	17,530

Table II
Area in Circular Mils
For Lead Wires

Wire Sizes from #30 to #8

WIRE SIZE	STRANDS		WIRE AREA IN CIRC. MILS	WIRE SIZE	STRANDS		WIRE AREA IN CIRC. MILS
	NO.	DIA. (MILS)			NO.	DIA. (MILS)	
30	7	4.0	112	16	1	50.8	2,581
30	1	10.0	100	16	65	6.3	2,580
28	7	5.0	175	16	19	11.7	2,601
28	19	3.1	181	16	105	5.0	2,625
28	1	12.6	159	—	26	10.0	2,600
27	7	5.6	219	16	7	20.0	2,800
27	1	14.2	202	14 AN	19	14.2	3,831
26	6	6.3	238	14	37	10.5	4,079
26	10	5.0	250	14	7	24.2	4,099
26	16	4.0	256	14	19	14.7	4,106
26	8	5.6	251	14	1	64.1	4,109
26	1	15.9	253	—	41	10.0	4,100
26	26	3.1	250	14	105	6.3	4,167
26	7	6.3	278	14	168	5.0	4,200
26	3	10.0	300	14	84	7.1	4,234
26 AN	12	5.0	300	—	7	25.3	4,481
25	10	5.6	314	12	19	17.9	6,088
25	8	6.3	318	12 AN	19	17.9	6,088
25	1	17.9	320	12	259	5.0	6,475
24	10	6 3	397	12	19	18.5	6,503
24	8	7.1	403	12	7	30.5	6,512
24	16	5.0	400	12	37	13.3	6,545
24	4	10.0	400	12	1	80.8	6,529
24	1	20.1	404	12	165	6.3	6,549
24	26	4.0	416	12	84	8.9	6,654
24	13	5.6	408	10	7	36.0	9,072
24	7	8.0	448	—	37	16.0	9,472
24	56	2.8	439	10	414	5.0	10,350
24 AN	19	5.0	475	10	37	16.7	10,319
23	10	7.1	504	10	1	101.9	10,384
23	8	8.0	512	10	7	38.5	10.376
23	1	22.6	511	10	19	23.4	10,404
—	21	5.0	525	—	41	15.9	10,365
22	6	10.0	600	10	105	10.0	10,500
22	8	8.9	634	9	7	43.0	12,943
22	16	6.3	635	9	1	114.4	13.087
22	10	8.0	640	9	525	5.0	13,125
22	1	25.3	640	8	7	45.0	14,175
22	7	10.0	700	8	133	11.1	16,386
22 AN	19	6.3	754	8	37	21.1	16,472
20	10	10.0	1,000	8	1	128.5	16,512
20	1	32.0	1,024	8	7	48.6	16,533
20	26	6.3	1,032	8	19	29.5	16,534
20	7	12.6	1,111	8	49	18.4	16,589
20 AN	19	7.9	1,186	8 AN	133	11.3	16,982
18	19	9.2	1,608				
—	16	10.0	1,600				
18	1	40.3	1,624				
18	7	15.2	1,617				
18	65	5.0	1,625				
18	7	15.3	1,639				
—	41	6.3	1,627				
—	7	16.0	1,792				
18 AN	19	10.0	1,900				
16 AN	19	11.3	2,426				
16	7	19.2	2,580				

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Resistance Correction Factors and Weight and Resistance Table

Resistance Correction Factors

TEMPERATURE CENTIGRADE	TO CORRECT RESISTANCE TO 20 C. MULTIPLY BY COLUMN 1	TO CONVERT RESISTANCE AT 20 C. KNOWN TEMPERATURE MULTIPLY BY COLUMN 2	TEMPERATURE CENTIGRADE	TO CORRECT RESISTANCE TO 20 C. MULTIPLY BY COLUMN 1	TO CONVERT RESISTANCE AT 20 C. KNOWN TEMPERATURE MULTIPLY BY COLUMN 2
15	1.0197	.9804	28	.9686	1.0314
16	1.0157	.9843	29	.9646	1.0354
17	1.0118	.9882	30	.9607	1.0393
18	1.0079	.9921	31	.9568	1.0432
19	1.0039	.9961	32	.9528	1.0472
20	1.0000	1.0000	33	.9489	1.0511
21	.9961	1.0039	34	.9450	1.0550
22	.9921	1.0079	35	.9411	1.0590
23	.9882	1.0118	36	.9371	1.0629
24	.9843	1.0157	37	.9332	1.0668
25	.9804	1.0197	38	.9293	1.0707
26	.9764	1.0236	39	.9253	1.0747
27	.9725	1.0275	40	.9214	1.0786

Based on temperature coefficient of .00393 adopted as standard by the International Electrochemical Commission in 1913.

Round Wire Film Coated Standards — Weight and Resistance

	LBS. PER 1000 FT.				FT. PER LB.				OHMS PER 1000 FT.				OHMS PER LB.			
	SINGLE		HEAVY		SINGLE		HEAVY		SINGLE		HEAVY		SINGLE		HEAVY	
AWG	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
10			9.8	31.72			102.04	31.53			1.616	.9987			.1649	.0315
11			7.85	25.18			127.39	39.71			2.040	1.261			.2599	.0501
12			6.23	20.03			160.51	49.93			2.570	1.588			.4125	.0793
13			4.98	15.90			200.80	62.89			3.240	2.001			.6506	.1258
14	3.83	12.50	3.90	12.57	261.10	80.0	256.41	79.55	4.079	2.524	4.079	2.524	1.065	.2019	1.046	.2008
15	3.08	9.95	3.14	10.01	324.68	100.5	318.47	99.9	5.149	3.181	5.149	3.181	1.672	.3197	1.640	.3178
16	2.45	7.89	2.51	7.95	408.16	126.7	398.41	125.79	6.501	4.018	6.501	4.018	2.653	.5093	2.590	.5054
17	1.94	6.25	2.00	6.32	515.46	159.7	500.00	158.23	8.180	5.054	8.180	5.054	4.216	.8073	4.090	.7997
18	1.56	4.97	1.61	5.02	641.03	201.2	621.11	199.2	10.301	6.386	10.300	6.386	6.603	1.2849	6.398	1.2721
19	1.24	3.95	1.28	3.99	806.45	253.2	781.13	250.6	13.000	8.046	13.000	8.046	10.484	2.0370	10.156	2.0165
20	.973	3.13	1.003	3.16	1027.75	319.5	997.0	316.5	16.400	10.13	16.400	10.13	16.855	3.2364	16.351	3.2057
21	.771	2.483	.798	2.51	1297.0	402.7	1253.1	398.4	20.701	12.77	20.700	12.77	26.85	5.143	25.94	5.088
22	.617	1.970	.640	1.99	1620.7	507.6	1562.5	502.5	26.201	16.20	26.201	16.20	42.46	8.223	40.94	8.141
23	.490	1.565	.515	1.59	2040.8	639.0	1941.7	628.9	32.895	20.30	32.898	20.30	67.14	12.971	63.88	12.767
24	.389	1.240	.408	1.26	2570.7	806.5	2450.9	793.7	41.506	25.67	41.494	25.67	106.7	20.702	101.7	20.373
25	.303	.966	.990	1.005	3300.0	1012.1	3030.3	995.0	52.404	32.37	52.404	32.37	171.7	32.763	158.8	32.209
26	.209	.784	.267	.799	4016.0	1276.0	3745.3	1252.0	66.403	41.02	66.403	41.02	266.7	52.32	248.7	51.34
27	.200	.623	.209	.634	5000.0	1605.0	4784.6	1577.0	83.203	51.44	83.203	51.44	416.0	82.57	398.1	81.14
28	.160	.495	.169	.504	6250.0	2020.0	5917.2	1984.0	105.99	65.31	105.99	65.31	662.5	131.94	627.2	129.53
29	.130	.399	.133	.401	7692.1	2538.0	7518.7	2494.0	131.00	81.21	131.00	81.21	1008.0	206.12	985.0	202.52
30	.101	.312	.108	.318	9900.9	3205.0	9259.0	3145.0	168.00	103.70	168.00	103.70	1663.0	332.37	1556.0	326.10

Weights, resistance and wires per square inch are based on nominal diameters at 20°C. Variations from these values can be expected in actual practice.