AMP

HD–20 Precision Formed Contacts

NOTE

All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.13 [.005] and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for the application of AMP* HD–20 Precision Formed Contacts. These contacts are available in three snap–in types: crimp, posted, and solder cup. The crimp snap–in contacts are available with or without an insulation support barrel for strain relief. The contacts accept a wire size range of 32 to 18 AWG and may be terminated to either stranded or solid wire.

After termination, these contacts are inserted into the cavities in the BACK of the connector housing and snap into place. Assembled connectors containing these contacts are available and designed to meet requirements of Military Specification MIL–C–24308. For specific information on these and other connectors, contact the Product Information number at the bottom of page 1.

When corresponding with AMP personnel, use the terminology provided on this specification to help facilitate your inquiry for information. Basic terms and features of components are provided in Figure 1.

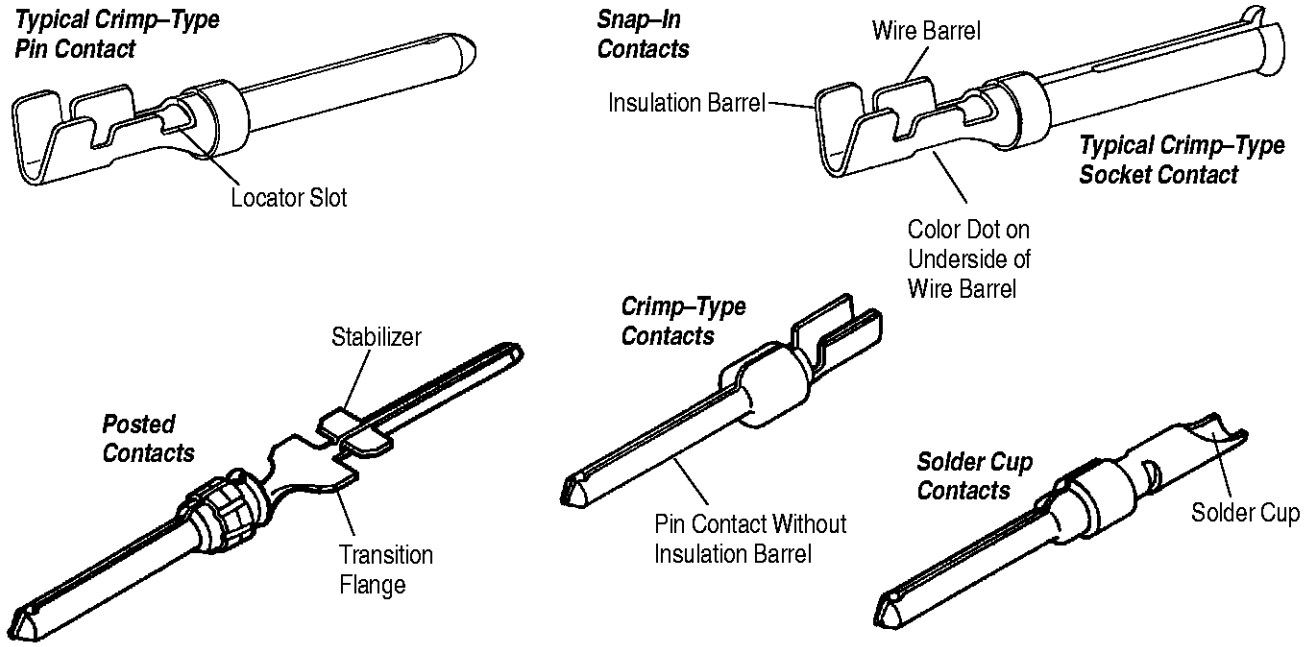


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

This paragraph is reserved for a revision summary covering the most recent additions and changes made to this specification which include the following:

Per EC 0990–0346–99

- Updated document to corporate requirements
- Changed wire size range from “28 to 18” to “32 to 18” in Section 1 and Paragraph 3.2
- Changed “Bulletin 401–52” to “Manual 402–40” in Paragraph 2.4 and 3.5.D
- Deleted document 409–5866 from Paragraph 2.5 and added new documents
- Added wire size range “32 to 28” to tables in Figures 2, 4, and 8
- Changed rear bellmouth dimensions in Figure 3
- Added new tooling and art in Figure 8

2.2. Customer Assistance

Reference Part Number 66504 and Product Code 5899 are representative numbers of AMP HD–20 Contacts. Use of these numbers will identify the product line and expedite your inquiries through an AMP service network established to help you obtain product and tooling information. Such information can be obtained through a local AMP Representative (Field Sales Engineer, Field Applications Engineer, etc) or, after purchase, by calling the Tooling Assistance Center or the AMP FAX/Product Information number at the bottom of page 1.

2.3. Drawings

AMP Customer Drawings for each product part number are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any technical documentation supplied by AMP Incorporated.

2.4. Manuals

AMP Manual 402–40 is available from the service network. This manual provides information on various flux types and characteristics along with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

2.5. Instructional Material

The following list includes available AMP instruction sheets (408–series) that provide assembly procedures for product, operation, maintenance and repair of tooling, as well as setup and operation procedures of applicators; and customer manuals (409–series) that provides setup, operation, and maintenance of AMP machines.

Document Number	Document Title
408–3295	Preparing Reel of Contacts for Application Tooling
408–6695	AMP Hand Crimping Tool 90405–1
408–6709	AMP Hand Crimping Tool 90406–1
408–7424	Checking Terminal Crimp Height Gaging Die Closure
408–7521	AMP Hand Crimping Tool 90265–1
408–7634	AMP Hand Crimping Tool 90302–1
408–7799	AMPLIMITE* Solder Pot Contacts (66569–3 and 66570–3)
408–7954	AMP Hand Crimping Tool 90374–1
408–8040	AMP HD Quick–Change Applicators (Side–Feed Type) with Mechanical Feed System
408–9404	AMP Insertion/Extraction Tool 91285–1 and Replacement Tip Kits 543382
408–9816	Handling of Reeled AMP Products
408–9866	AMP Terminal Reel Flange Removal Tool 354030–1
409–5128	AMP Basic AMP–O–LECTRIC* Model “K” Terminating Machines, and Accessories
409–5842	AMP AMP–O–LECTRIC Model “G” Terminating Machine 354500–[ ]
409–5852	Model III–G AMPOMATOR* CLS Lead–Making Machine 122500–[ ]
409–5855	AMP–O–MATIC* Side Feed Stripper–Crimper Model II Machine No. 854040–3 and –4
409–5878	AMPOMATOR CLS IV+ Lead–Making Machine
409–5884	ADUZI* Lead–Making Machine 662700–[ ]
409–5885	Model “M” Terminator 904000–[ ]

3. REQUIREMENTS

3.1. Storage

A. Reeled Contacts

When using reeled contacts, store coil wound reels horizontally and traverse wound reels vertically.

B. Shelf Life

The contacts should remain in the shipping containers until ready for use to prevent deformation to the contacts and/or damage to the housings. The products should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

C. Chemical Exposure

Do not store contacts near any chemicals listed below, as they may cause stress corrosion cracking in the components.

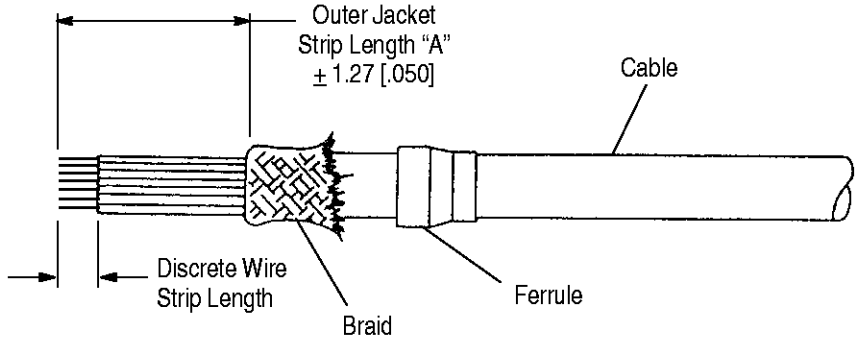
Alkalies	Ammonia	Citrates	Phosphates Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites	Tartrates

3.2. Wire Size and Preparation

The contacts will accept a wire size range of 32 to 18 AWG and may be terminated to either stranded or solid wire.

Figure 2 lists insulation stripping lengths as determined by the contact wire size range used. Also listed are acceptable wire insulation outside diameters for the contacts, and color codes used to easily identify loose–piece contacts.

OUTER JACKET STRIP LENGTH	
CONTACT POSITIONS	"A" LENGTH
9	33.02 [1.300]
15	
25	
37	43.18 [1.700]
50	40.64 [1.600]



DISCRETE WIRE					
CONTACT WIRE SIZE RANGE (AWG)	COLOR CODE (ON WIRE BARREL OF LOOSE PIECE CONTACTS ONLY)	INSULATION DIAMETER ACCEPTED	STRIP LENGTH ± 0.25 [.010]		
			MILLIMETERS	DECIMAL INCHES	FRACTIONAL INCHES
OPEN BARREL CONTACTS (W/ or W/O Insulation Support)					
32–28	—	0.76–1.02 [.030–.040]	2.39	0.94	3/32
28–24	BLUE	1.73 [.068] Max	2.77	.109	7/64
	BLACK	1.27–1.52 [.050–.060]	2.39	.094	3/32
	BLUE	0.76–1.02 [.030–.040]			
26–22	YELLOW	1.27 [.050] Max			
24–20	RED	1.73 [.068] Max	2.77	.109	7/64
		1.27–1.52 [.050–.060]	2.39	.094	3/32
22–18	GREEN	1.73 [.068] Max	2.77	.109	7/64
SOLDER–CUP CONTACTS					
18 and Smaller	None	None Specified	3.96	.156	9/64

Figure 2

NOTE *DO NOT nick, scrape, or cut the wire conductor during the stripping operation.*

3.3. Crimped Contact Requirements

Contact shall be located in desired tooling and crimped according to the instructions packaged with that tooling. See Section 5, TOOLING, of this document for details on tooling options and instructional materials.

NOTE *Wire insulation shall NOT be cut or broken during the crimping operation, nor shall the insulation be crimped into the contact wire barrel. Reasonable care should be taken by tooling operators to provide undamaged wire terminations.*

A. Contact Crimp Barrel Configurations

The contact wire barrel shall be crimped to an F–Crimp configuration as shown in Section X–X of Figure 3. The insulation barrel (when present) shall be crimped to an O–Crimp configuration. Refer to the table in Figure 4 for crimp dimensions.

B. Contact Crimp Features

Figure 3 shows a typical contact as it should appear after crimping. Although a pin contact with insulation barrel is shown, the requirements apply equally to socket contacts, and to contacts not having an insulation barrel.

1. *Crimp Location*

For optimum crimp effectiveness, the crimp must be within the area shown and must meet the crimp requirements provided in Figure 4. Effective crimp length shall be 1.47 [.058] minimum, and is defined as that portion of the wire barrel, excluding bellmouth(s), fully formed by the crimping tool. Instructions for adjusting, repairing, and inspecting tools are packaged with the tools. See Figure 8.

2. *Conductor Extension*

The conductor may extend beyond the wire barrel to the maximum shown.

3. *Wire Barrel Seam*

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam.

4. *Conductor/Insulation*

The conductor and insulation must both be visible in the area between the insulation barrel and the wire barrel.

5. *Bellmouth*

Front and rear bellmouths shall be formed and adhere to the dimensions given.

6. *Cutoff Tab*

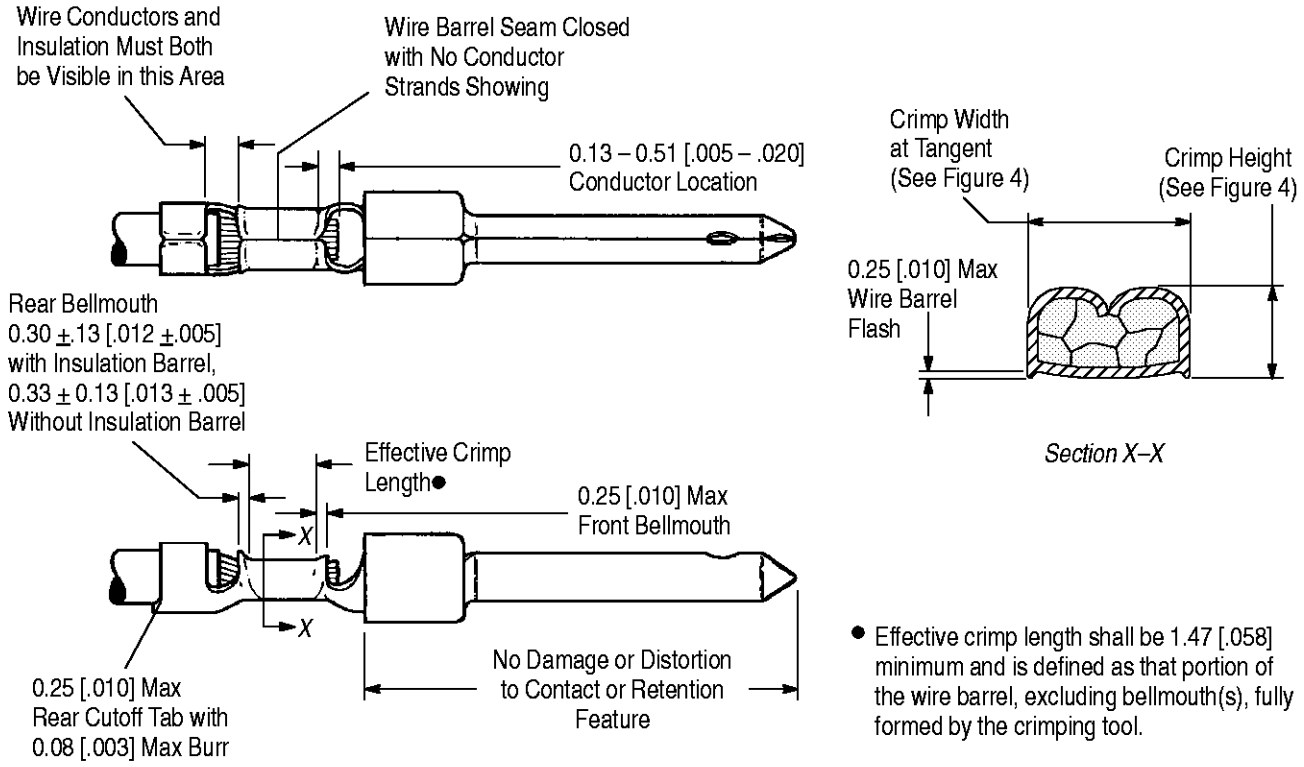
The cutoff tab shall be cut to the dimensions shown.

7. *Burrs*

The cutoff burr shall not exceed the dimensions shown.

8. *Flash*

The wire barrel flash shall not exceed the dimensions shown in Section X–X.



● Effective crimp length shall be 1.47 [.058] minimum and is defined as that portion of the wire barrel, excluding bellmouth(s), fully formed by the crimping tool.

Figure 3

WIRE SIZE RANGE, AWG	INSULATION DIAMETER ACCEPTED	SIZE OF WIRE APPLIED	WIRE BARREL CRIMP			INSULATION BARREL CRIMP	
			HEIGHT (Range)	TENSILE STRENGTH N [LB] Min	WIDTH	WIDTH (Ref)	HEIGHT (Ref)
32–28	0.76–1.02 [.030–.040]	32	0.58–0.46 [.023–.018]	8.01 [1.8]	0.84 [.033]	1.35–1.57 [.053–.062]	0.64–1.93 [.025–.076]
		30	0.61–0.46 [.024–.018]	10.01 [2.2]			
		28	0.63–0.51 [.025–.020]	11.12 [2.8]			
28–24	1.73 [.068] Max	28	0.46–0.76 [.018–.030]	12.01 [2.7]	0.94–1.52 [.037–.060]	—	—
		26	0.46–0.81 [.018–.032]	20.02 [4.5]			
		24	0.46–0.86 [.018–.034]	35.91 [8.0]			
	1.27–1.52 [.050–.060]	28	0.61–0.76 [.024–.030]	12.01 [2.7]	1.07 [.042]	1.35–1.57 [.053–.062]	1.14–1.93 [.045–.076]
		26	0.66–0.79 [.026–.031]	20.02 [4.5]			
		24	0.66–0.86 [.026–.034]	35.91 [8.0]			
	0.76–1.02 [.030–.040]	28	0.61–0.76 [.024–.030]	12.01 [2.7]	0.91–1.19 [.036–.047]	1.35–1.57 [.053–.062]	0.64–1.93 [.025–.076]
		26	0.66–0.81 [.026–.032]	20.02 [4.5]			
		24	0.66–0.853 [.026–.0336]	35.91 [8.0]			
26–22	1.27 [.050] Max	26	0.71–0.81 [.028–.032]	20.02 [4.5]	1.07 [.042]	1.35–1.57 [.053–.062]	0.64–1.93 [.025–.076]
		24	0.71–0.86 [.028–.034]	35.91 [8.0]			
		22	0.81–0.96 [.032–.038]	53.38 [12.0]			
24–20	1.73 [.068] Max	24	0.68–0.86 [.027–.034]	35.91 [8.0]	1.40 [.055]	—	—
		22	0.68–0.86 [.027–.034]	53.38 [12.0]			
		20	0.68–0.86 [.027–.034]	88.96 [20.0]			
	1.27–1.52 [.050–.060]	24	0.68–0.86 [.027–.034]	35.91 [8.0]		1.35–1.57 [.053–.062]	1.14–1.93 [.045–.076]
		22	0.68–0.86 [.027–.034]	53.38 [12.0]			
		20	0.68–0.86 [.027–.034]	88.96 [20.0]			
22–18	1.73 [.068] Max	22	0.84–0.94 [.033–.037]	53.38 [12.0]	1.57 [.062]	—	—
		20	0.84–0.99 [.033–.039]	88.96 [20.0]			
		18	1.07–1.17 [.042–.046]				

Figure 4

3.4. Crimped Contact Straightness

A. Twist or Roll

The crimped wire and insulation barrels must be aligned with the un–crimped portion of the contact to within the limit shown in Figure 5.

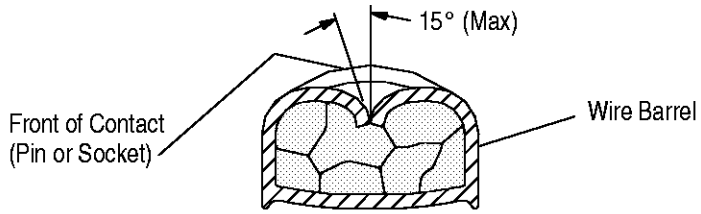
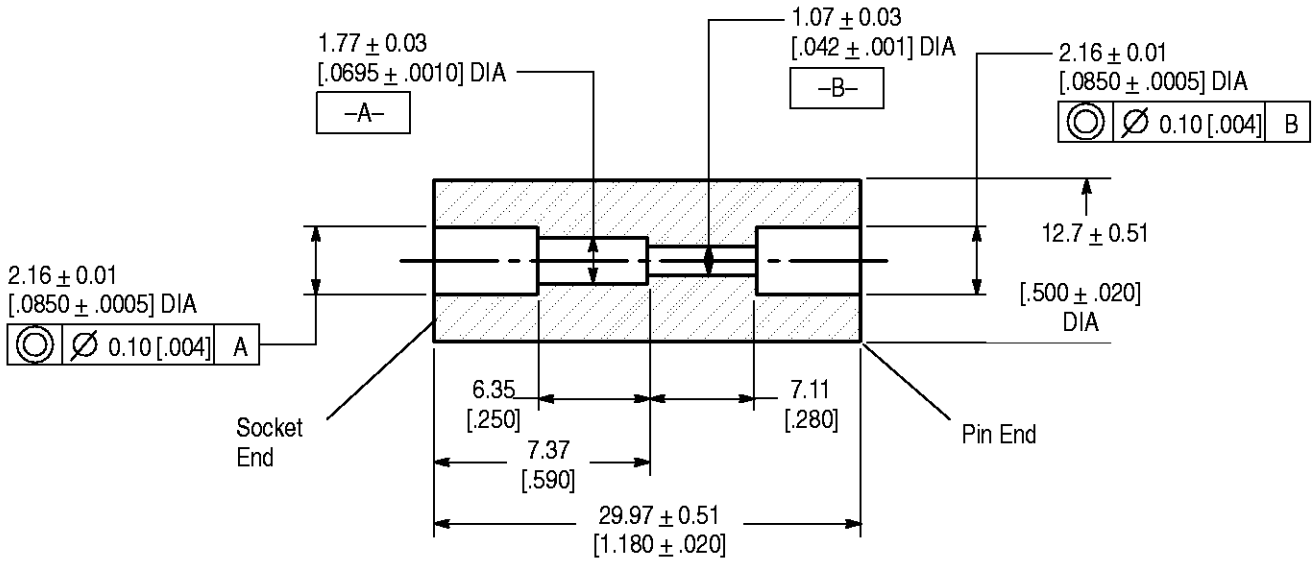


Figure 5

B. Straightness

Test questionable contacts using a straightness gage manufactured to the specifications of Figure 6. To be considered acceptable for use, a contact must fully enter the gage without binding.



NOTES:
Material . . . . . Tool Steel, AISI Type 01 or 02
Hardness . . . . . Rockwell B99 Maximum
Finish . . . . . Black Oxide

Figure 6

3.5. Solder Cup Contacts

Observe the guidelines and procedures described in AMP Instruction Sheet 408–7799 when solder cup contacts are required. Solder, clean, and dry all wire leads to contacts according to the following:

A. Flux Selection

Wire lead and contact wire barrel interior shall be fluxed prior to soldering using a mildly active rosin. Flux must be compatible with manufacturing, safety, and health guidelines.

B. Cleaning

After cleaning, removal of fluxes, residues, and activators is mandatory. Cleaning procedures and solvents depend on the type of flux used. See Figure 7.

DANGER *Consideration must be given to toxicity and other safety and health requirements as recommended in the Material Safety Data Sheet supplied by the solder cleaning solvent manufacturer.*

CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110■	Aqueous	1	132	270
Bioact EC–7◆	Solvent	5	100	212
Butyl Carbitol●	Solvent	1	Room Ambience	
Isopropyl Alcohol	Solvent	5	100	212
Kester 5778❖	Aqueous	5	100	212
Kester 5779❖	Aqueous	5	100	212
Loncoterge 520●	Aqueous	5	100	212
Loncoterge 530●	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

■ Product of Fry's Metals, Inc. ◆ Product of Petroferm, Inc. ● Product of Union Carbide Corp. ❖ Product of Litton Systems, Inc.

Figure 7

C. Drying

When drying cleaned assemblies, DO NOT exceed recommended temperature limitations. Excessive temperatures may cause degradation of the connector used as a stabilizer during the soldering process.

D. Soldering Guideline

AMP Manual 402–40 is available upon request and can be used as a guide in soldering. This manual gives various flux types and characteristics, commercial designation, and flux removal procedures. A checklist is included in the manual to aid in obtaining information pertaining to soldering problems.

3.6. Posted Contacts

Pin and socket contacts having 0.64 [.025]–square technology posted aft ends are available to fit HD–20 Connectors. Posts 3.18 [.125], 4.78 [.188], 10.80 [.425], and 16.54 [.651] in length are offered, allowing a variety of mating or grounding options. When inserting posted contacts into housings, be careful to hold the contact by the transition flange area. See Figure 1.

3.7. Repair/Replace

Use AMP Insertion/Extraction Tool 91285–1 (408–9404) to remove individual contacts from housings for replacement or for relocation to another housing cavity. Damaged or worn contacts may be replaced provided there is sufficient slack, after restripping the wire, to insert the new contact.

NOTE *DO NOT re–use damaged or worn contacts. Instead, replace them with new contacts and discard the old ones.*

4. QUALIFICATION

No qualifications or approvals are required for HD–20 Contacts.

5. TOOLING

HD–20 Contacts can be terminated to wire using hand, semi–automatic, or automatic crimping tools. Recommended tooling, and instructional material, is provided in Figure 8.

All hand tools and applicators include integral dies. The automatic machines that hold applicators are also listed in the table along with related documentation.

NOTE *The Model "K" AMP–O–LECTRIC Terminating Machine PN 565435–5 has been superseded by the Model "G" Terminating Machine PN 354500–1 for new applications. For existing applications, the Model "K" is still recommended because of the large number of installed machines.*

CONTACT WIRE SIZE RANGE (AWG)	INSULATION DIAMETER ACCEPTED	HAND TOOL (DOCUMENT)	APPLICATOR■■ (408–8040)	AUTOMATIC MACHINE	MACHINE DOCUMENT
32–28	0.76–1.02 [.030–.040]	90719–1 (408–4514)	680659–2	354500–1	409–5842
				565435–5	409–5128
			680659–3	354500–[ ]	409–5842
				904000–[ ]	409–5885
28–24	1.73 [.068] Max	90265–1 (408–7521)	466506–1	122500–2, –3	409–5852
				356500–1, –2	409–5878
				662700–[ ]	409–5884
				1213400–1, –2	409–5878
			466506–2	354500–1	409–5842
				565435–5	409–5128
			466903–1	854040–3	409–5855
	1.27–1.52 [.050–.060]	90374–1 (408–7954)	466758–2	354500–1	409–5842
				565435–5	409–5128
			466963–1	854040–3	409–5855
	0.76–1.02 [.030–.040]	90302–1 (408–7634)	466423–1	122500–2, –3	409–5852
				356500–1, –2	409–5878
				662700–[ ]	409–5884
				1213400–1, –2	409–5878
			466423–2	354500–1	409–5842
				565435–5	409–5128
			466901–1	854040–3	409–5855
26–22	1.27 [.050] Max	90406–1 (408–6709)	567036–1	122500–2, –3	409–5852
				356500–1, –2	409–5878
				662700–[ ]	409–5884
				1213400–1, –2	409–5878
			567036–2	354500–1	409–5842
				565435–5	409–5128
24–20	1.73 [.068] Max	90265–1 (408–7521)	466505–1	122500–2, –3	409–5852
				356500–1, –2	409–5878
				662700–[ ]	409–5884
				1213400–1, –2	409–5878
			466505–2	354500–1	409–5842
				565435–5	409–5128
			466902–1	854040–3	409–5855
	1.27–1.52 [.050–.060]	90302–1 (408–7634)	466422–1	122500–2, –3	409–5852
				356500–1, –2	409–5878
				662700–[ ]	409–5884
				1213400–1, –2	409–5878
			466422–2	354500–1	409–5842
				565435–5	409–5128
			466900–1	854040–3	409–5855

■■ In order to use the same applicator in the AMPOMATOR CLS IV Lead–Making Machine and the AMP–O–LECTRIC Terminating Machine, the feed cam and wire stripper must be changed. See the Customer Manuals supplied with these machines for instructions on these procedures or contact the Tooling Assistance Center number at the bottom of page 1.

Figure 8 (cont'd)

CONTACT WIRE SIZE RANGE (AWG)	INSULATION DIAMETER ACCEPTED	HAND TOOL (DOCUMENT)	APPLICATOR■■ (408–8040)	AUTOMATIC MACHINE	MACHINE DOCUMENT
22–18	1.73 [.068] Max	90405–1 (408–6695)	567033–1	122500–2, –3	409–5852
				356500–1, –2	409–5878
				662700–[ ]	409–5884
				1213400–1, –2	409–5878
			567033–2	354500–1	409–5842
				565435–5	409–5128

■■ In order to use the same applicator in the AMPOMATOR CLS IV Lead–Making Machine and the AMP–O–LECTRIC Terminating Machine, the feed cam and wire stripper must be changed. See the Customer Manuals supplied with these machines for instructions on these procedures or contact the Tooling Assistance Center number at the bottom of page 1.

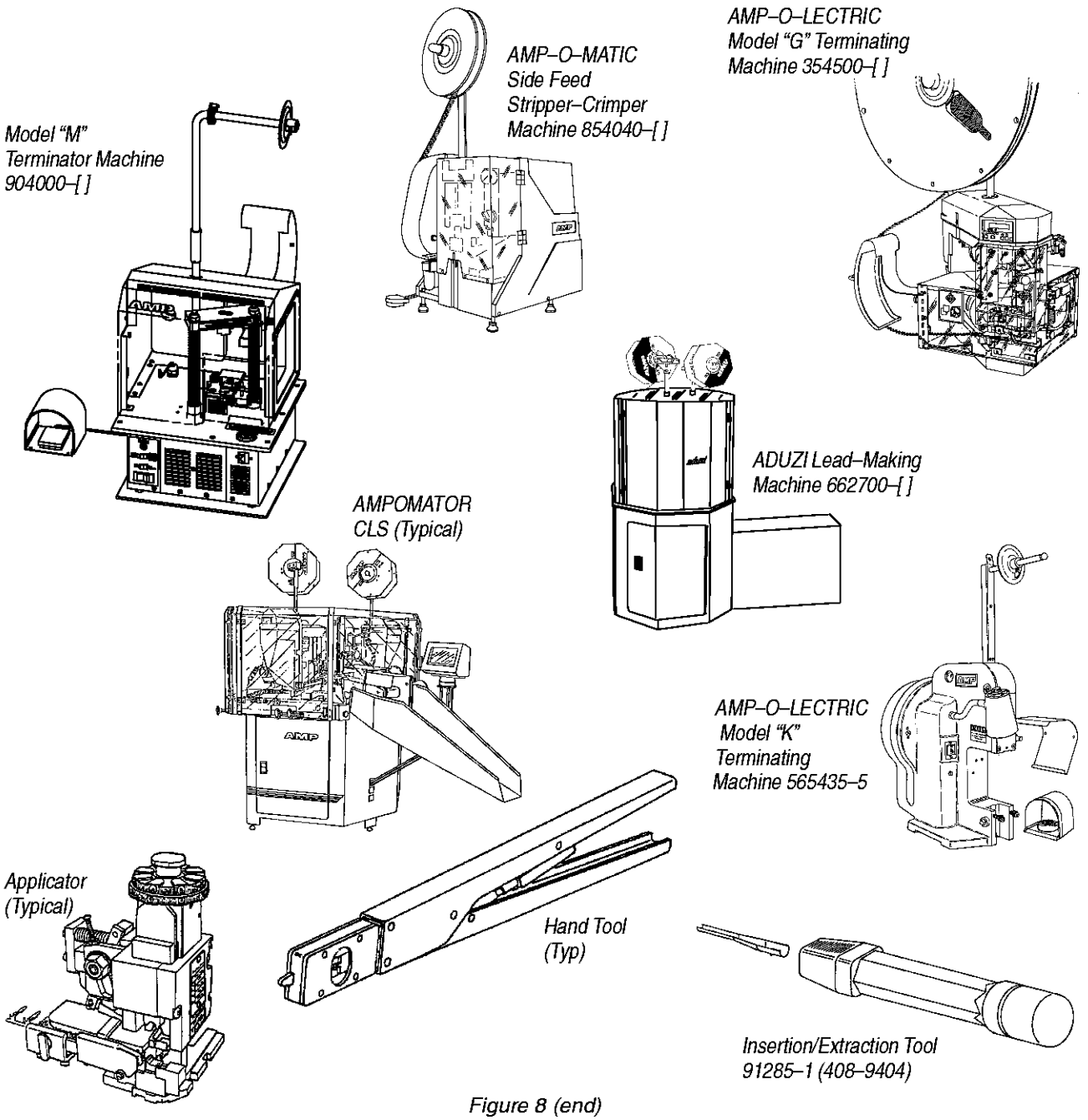


Figure 8 (end)

6. VISUAL AID

Figure 9 shows a typical application of an HD–20 Contact. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

NOTE: CRIMPED CONTACT (SHOWN WITH INSULATION BARREL; APPLIES ALSO TO CONTACTS WITH OUT INSULATION BARREL)

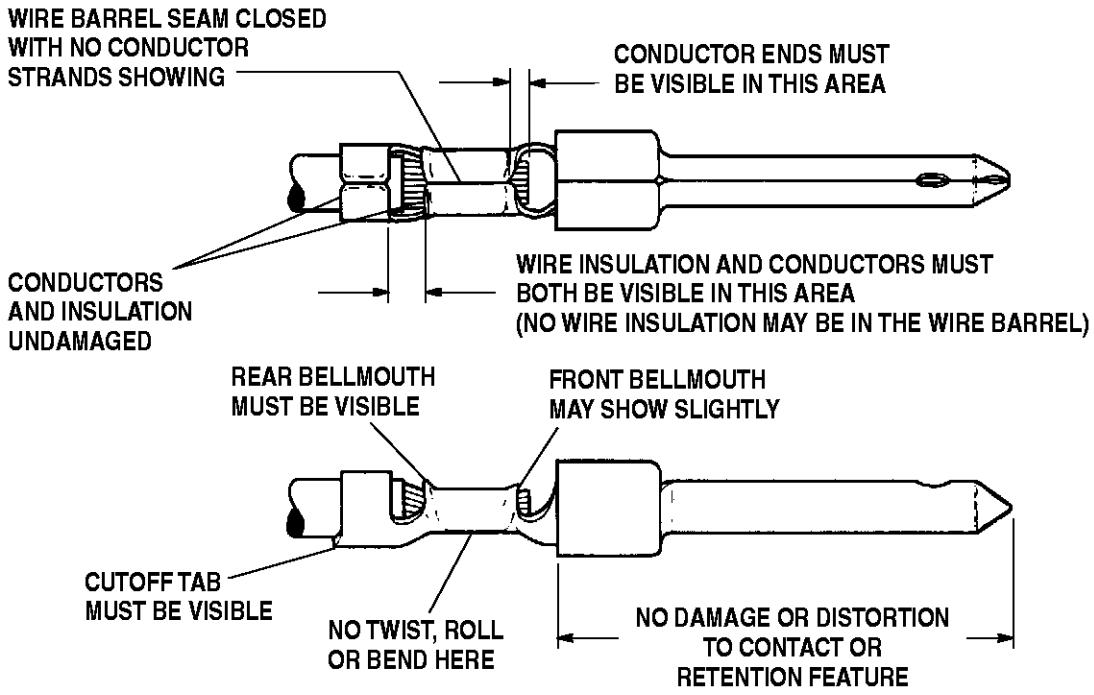


FIGURE 9. VISUAL AID