Designation: F 85 – 76 (Reapproved 1997)ε1

AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Practice for Nomenclature for Wire Leads Used as Conductors in Electron Tubes [1]

This standard is issued under the fixed designation F 85; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Keywords were added editorially in November 1997.

1. Scope

1.1 This practice covers rules for designating one, two, or three-piece round wire leads used as conductors through glass seals in electron tubes. Stranded leads and leads for semiconductors are excluded.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

B 127 Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip[2]

B 160 Specification for Nickel Rod and Bar[2]

F 15 Specification for Iron-Nickel-Cobalt Sealing Alloy[3]

F 29 Specification for Dumet Wire for Glass–to–Metal Seal Applications[3]

F 30 Specification for Iron-Nickel Sealing Alloys[3]

F 290 Specification for Round Wire for Winding Electron Tube Grid Laterals[3]

3. Dimensioning

3.1 *Diameter*—The diameter shall be expressed in millimetres. Three digits shall be used for all diameters under 1 mm and four or more digits shall be used for all diameters 1 mm and larger. A decimal point is understood to be present three places from the right.

3.2 *Length*—The length shall be expressed in millimetres using any number of digits.

NOTE 1—All fractions shall be expressed in millimetres as decimals.

3.3 *Conventions*—The diameter shall always precede and be separated from the length by the letter“ x”. For example, a wire 13 mm long and 0.508 mm in diameter will be referred to as 508x13.

4. Nomenclature

4.1 The nomenclature for designating a lead shall consist of one, two, or three parts; for one-, two-, or three-piece leads, respectively. Each of these parts shall specify for its piece the diameter in millimetres, the length in millimetres, and the material (see Section 4). The order for designating the component pieces shall be: (*1*) the inner lead section, (*2*) the press of seal section, and (*3*) the outer lead section.

4.1.1 Each portion of the designation shall be separated by a dash (—), for example,

508x13FeCuC40—406x2D—1016x8NiPtd,

corresponding to Inner Lead—Press Lead—Outer Lead, respectively.

4.1.2 One-, two-, or three-piece leads shall be designated according to the typical examples listed in Table 1.

5. Materials

5.1 The material for a component lead section is generally designated by use of its chemical symbol. A numerical suffix at the end of the material designation preceded by “C” (coating) indicates percent of cladding or plating. For unspecified alloys, a numerical value between chemical symbols indicates the percent content of the material preceding the value.

5.2 Additional descriptive suffixes are given in Table 2.

5.3 *Materials List*—Commonly used lead wire materials and their respective designations are listed in Table 3. Where trade names are indicated, equivalent materials may be used.

5.4 *Annealing Treatments*—For special applications it is sometimes desirable to have the entire lead, or certain parts, with an extremely soft temper. To satisfy these conditions, standard treatments are available as follows:

5.4.1 *Anneal Types*:

5.4.1.1 *Entire Lead Anneal (No. 1)*—Entire leads involving nickel and copper are annealed at a temperature suitable for annealing copper but below the annealing point for nickel. After annealing, the leads are put through a straightening process to recondition any leads which become distorted during the anneal.

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[1] This practice is under the jurisdiction of ASTM Committee F-1 on Electronics, and is the direct responsibility of Subcommittee F01.03 on Metallic Materials.

Current edition approved Aug. 27, 1976. Published January 1977. Originally published as F 85-67T. Last previous edition F 85-69 (1974).

[2] *Annual Book of ASTM Standards*, Vol 02.04.

[3] *Annual Book of ASTM Standards*, Vol 10.04.

TABLE 1 Designation for One, Two, or Three-Piece Leads

No. of Sections	Lead Wire Designation	Component Sections								
		Inner lead			Press of Seal Lead			Outer Lead		
		Dia	Length	Material [A]	Dia	Length	Material [A]	Dia	Length	Material [A]
		mm	mm		mm	mm		mm	mm	
1	1524x21D	...	...	...	1.524	21	D	...	...	...
2	1016x25Ni–1524 x14D	1.016	25	Ni	1.524	14	D	...	...	...
3	508x13FeCuC40–406x2D–1016x8NiPtd	0.508	13	FeCuC40	0.406	2	D	1.016	8	NiPtd

[A] See 5.3 and Table 3 for interpretation of designations.

TABLE 2 Descriptive Suffixes for Designations

Suffix	Description
A	anneal condition (see 5.4)
S	degassed
Hd	hard (no symbol if material is soft)
Ptd	pointed tip
Flk	flick off lead
C	coating applied by plating or cladding
HK	hook lead
HKCORR	corrugated hook lead

Examples:
CuHd—Cooper hard
NiCuC20—Nickel, coated 20 % with copper
FeCuC40—Steel, coated 40 % with copper

TABLE 3 Commonly Used Lead Wire Materials

Material	Designation
Aluminum	Al
Copper	Cu
Copper, nickel-coated	CuNiC—
Dumet, medium borate, Specification F 29	D
Dumet, dark borate, Specification F 29	DD
Dumet, light borate, Specification F 29	DL
Dumet, unborated, Specification F 29	DU
Molybdenum	Mo
Monel 440, Specification B 127	Ml
Nickel 200, Specification B 160	Ni
Nickel 200, degassified, Specification B 160	NiS
Nickel 211, Specification F 290	NiD
Nickel 211, degassified, Specification F 290	NiDS
Nickel-silver, coated	NiAgC—
Nickel, copper-coated	NiCuC—
Iron nickel, 52 Alloy, Specification F 30	NiFe
Nickel-silver Alloy	CuNiZn
Iron-nickel-cobalt Alloy, Specification F 15	NiFeCo
Silver	Ag
Steel, low carbon	Fe
Steel, nickel-coated	FeNiC–
Steel, copper-coated	FeCuC–
Platinum	Pt
Tungsten	W
Silicon bronze alloy	CuSi

5.4.1.2 *Entire Lead Anneal (No. 1A)*—This is the same process as No. 1 anneal except the final straightening operation is omitted.

5.4.1.3 *Hook Anneal (No. 2)*—This process anneals only the hook on finished leads.

5.4.1.4 *Outer Lead Anneal (No. 3)*—The outer and press leads are annealed as a unit before welding to the inner lead. This applies only to handmade leads.

5.4.1.5 *Inner Lead Anneal (No. 4)*—The inner lead is given a special anneal before welding to the press and outer lead parts. This applies only to handmade leads.

5.4.1.6 *Outer Lead (Wire Anneal) (No. 5)*—The outer wire is given a special anneal while in wire form, prior to cutting into lead components. This most generally applies to 1.016 and 1.270-mm nickel-plated copper being used on machine-made leads.

5.4.1.7 *Special Anneal (No. 6)*—Any annealing treatment desired, which is not covered by any of the foregoing, should be accompanied by a detailed explanation on the order.

5.4.1.8 *Entire Lead Anneal (No. 7)*—The entire lead is annealed similar to the No. 1 anneal, except at a higher temperature suitable for annealing nickel. This temperature is above the melting point for copper. Therefore, this anneal is unsuitable for a complete lead having copper parts.

5.4.2 When annealed lead wires are required, they should be designated by the symbol number for the annealing treatment desired, preceded by“ A” and enclosed in parentheses and placed last in the designation, for example,

889x11NiSCorr—406x4D—635x84Cu(A2).

5.4.3 For a three-part lead, when the inner and outer leads require different anneals the inner lead anneal is listed first, followed by the outer lead anneal, for example,

2032x90NiS—813x7 D—1270x85NiC10 (A4, A5).

6. Keywords

6.1 annealing conditions; electron tubes; wire leads—glass seals