Designation: F 4 – 66 (Reapproved 2005)

Standard Specification for Carbonized Nickel Strip and Carbonized Nickel-Plated and Nickel-Clad Steel Strip for Electron Tubes[1]

This standard is issued under the fixed designation F 4; 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.

1. Scope

1.1 This specification covers carbonized nickel strip and carbonized nickel-plated and nickel-clad steel strip for use in electron tubes.

1.2 The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units may be approximate.

2. Referenced Documents

2.1 *ASTM Standards:*

F 1 Specification for Nickel-Clad and Nickel-Plated Steel Strip for Electron Tubes[2]

F 3 Specification for Nickel Strip for Electron Tubes[2]

F 155 Test Method for Temper of Strip and Sheet Metals for Electronic Devices (Spring-Back Method)[3]

3. Temper

3.1 The temper of the strip shall conform to limits agreed upon by the producer and the consumer, and shall be determined in accordance with Test Method F 155.

4. Dimensions, Mass and Permissible Variations

4.1 *Thickness*—The thickness of the material shall conform to the following tolerances:

Thickness, in. (mm)	Thickness, Tolerance, in. (mm)
Under 0.010 (0.25)	±0.0005 (0.013)
0.010 to 0.020 (0.25 to 0.5), incl	±0.0008 (0.020)

The thickness shall be measured 0.375 in. (9.5 mm) from the edge on 1-in. (25.4-mm) or wider strip, or at any point on narrower strip.

4.2 *Width*—For strip less than 3.0 in. (76 mm) wide and less than 0.020 in. (0.51 mm) thick, the width tolerance shall be ±0.005 in. (0.13 mm).

4.3 *Edgewise Bow* shall be a maximum of 0.5 in. (13 mm) in 8 ft (2.4 m).

4.4 *Edge*—The edge shall be such as would result from a standard slitting operation.

4.5 *Burr*—The burr shall not exceed one half the strip thickness or 0.0025 in. (0.064 mm) whichever is smaller, as measured in accordance with the procedure described in the Appendix of Specification F 1.

5. Workmanship, Finish, and Appearance

5.1 The surface shall be free of any lubricant used in processing. The appearance of the carbonized strip shall be uniform.

5.2 Other appearance characteristics shall be defined as agreed upon by the producer and the consumer.

6. Test for Carbon Loss

6.1 Testing for carbon loss by firing of carbonized materials covered by this specification shall be conducted in such a manner as to ensure an acceptable standard of quality for operation in electron-tube applications.

6.2 The materials being tested shall be protected by the use of a suitable covered boat, so as to prevent direct radiation from the furnace heating elements or direct impingement of gas.

6.3 The cooling section of the furnace shall contain the same atmosphere as that in the hot zone.

6.4 The furnace atmosphere shall consist of pure hydrogen or 25 % nitrogen and 75 % hydrogen, and shall have a moisture content no greater than saturation at – 45°C. The maximum oxygen content of the furnace atmosphere shall be 0.001 % by volume.

6.5 The firing temperature shall be 850 ± 10°C. The firing time shall be 9 ± 1 min at temperature for carbonized nickel, for both classes of carbonized nickel-clad steel, and for carbonized nickel-plated steel, Type II; and 4 ± 1 min for carbonized nickel-plated steel, Type I.

6.6 Samples after firing shall show no visual loss of carbon and shall be free from uncarbonized bare metal exposure.

7. Coiling and Spooling

7.1 Each coil or spool shall have only one continuous length of strip, free from joints of any kind, unless otherwise agreed.

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

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Discontinued 1985, see *1983 Annual Book of ASTM Standards*, Vol 10.04.

7.2 The strip shall be so coiled that the normal curvature is not reversed.

8. Chemical Requirements

8.1 The base metal to be carbonized shall conform to Specification F 1, in which Type I and Type II nickel cladding and nickel plating are described, or Specification F 3.

9. Rejection

9.1 Any spools or coils not conforming to the specified requirements may be rejected. If 15 % of the spools or coils in any shipment do not conform to the specified requirements, the entire shipment may be rejected.

10. Packaging

10.1 The packing shall be adequate to protect the spools or coils from contamination and damage during shipment. If a protective coating is used, it shall be completely removable by trichloroethylene degreasing.

11. Package Marking

11.1 Each coil or spool shall be marked plainly as follows:
11.1.1 Name of material,
11.1.2 Name of manufacturer,
11.1.3 Lot or manufacturer's identification number,
11.1.4 Gross, tare, and net weight,
11.1.5 Thickness and width of strip,
11.1.6 Shipping date, and
11.1.7 Inspector's number or designation.

12. Keywords

12.1 carbonized nickel-plated steel strip; carbonized nickel strip; electron tubes; nickel-clad steel strip