

MIL-N-46026A(MR)  
13 July 1965  
SUPERSEDING  
MIL-N-46026(0rd)  
30 March 1959

**MILITARY SPECIFICATION**  
**NICKEL ROD AND WIRE (ROUND) (FOR ELECTRONIC USE)**

**1. SCOPE**

1.1 Scope. This specification covers one grade of nickel rod and wire (round) for electronic use (see 6.1).

1.2 Classification.

1.2.1 Composition and tempers. The material covered by this specification shall be furnished in the composition hereinafter specified (see 3.1), and in the following tempers, as specified (see 6.2).

Annealed  
As drawn

1.2.2 Finish. Unless otherwise specified in the contract or order, nickel rod and wire (round) shall be furnished in bright or a dull matte finish.

**2. APPLICABLE DOCUMENTS**

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

FSC 9525, 9530

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## STANDARDS

## FEDERAL

Fed. Test Method Std. No. 151 - Metals; Test Methods

## MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 - Marking for Shipment and Storage

(Copies of specifications, standards, drawings, and publication required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

## 3. REQUIREMENTS

3.1 Chemical requirements. The material shall conform to the chemical requirements shown in table I.

Table I - Chemical composition

Element	Percent <sup>1/</sup>
Nickel <sup>2/</sup>	99.0 min.
Iron	.030
Copper	.20
Manganese	.35
Carbon	.15
Silicon	.20
Sulfur	.008

1/ Maximum unless otherwise indicated.

2/ Cobalt counting as nickel.

3.1.1 Analysis shall be made regularly only for the elements specifically mentioned in table I. If, however, the presence of other elements is suspected, or indicated in the course of routine analysis, further analysis shall be made to determine that the total of other elements is not in excess of the limits specified.

3.1.2 The contractor shall furnish analysis of each melt showing the percentage of each of the elements designated in table I.

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3.1.3 Chemical analysis by the contractor of the individual melts may be waived at the discretion of the inspector provided that the producer's method of composition control is acceptable or that all material in the lot can be identified as being from melts previously analyzed and found to be in conformance with the chemical composition requirements.

3.2 Mechanical properties. The mechanical properties of nickel rod and wire (round) shall be as specified in tables II and III.

Table II - Mechanical properties

Size	Temper	Tensile strength, psi
All	Annealed	75,000 maximum
	As drawn	59,000 minimum

Table III - Permissible elongation limits of annealed wire (round)

Diameter, inch	Minimum elongation in 10 inch gage length, percent.
Up to 0.0015, incl	8
Over 0.0015 to 0.0035, incl	10
Over 0.0035 to 0.010, incl	15
Over 0.010 to 0.015, incl	20
Over 0.015 to 0.080, incl	25
Over 0.080	40

### 3.3 Dimensional tolerances, rod.

3.3.1 Diameter. Rod, measured on the diameter, shall not vary at any point from the specified dimensions by more than the amounts shown in table IV.

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Table IV - Tolerances on diameter of rod

Ordered diameter, inches	Tolerances, inch (minus only)
1/16 to 3/16, incl.	.0002
Over 3/16 to 1-15/16, incl.	.003
Over 1-15/16 to 2-1/2, incl.	.004
Over 2-1/2 to 3, incl.	.005
Over 3 to 3-1/2, incl.	.006
Over 3-1/2 to 4, incl.	.007

3.3.2 Length.

3.3.2.1 Nominal lengths. Nominal lengths between 6 and 14 feet may be specified. The minimum acceptable length shall be the specified length. The maximum length shall be the specified length plus 2 feet, 1/2 inch.

3.3.2.2 Random mill lengths. All random mill lengths shall be between 4 and 16 feet, with not more than 25 percent by weight under 9 feet.

3.3.2.3 Cut straight lengths. If cut straight lengths are specified, the lengths shall be within the limits specified in table V.

Table V - Tolerances of cut straight lengths

Length, feet	Tolerances, inch (plus only)
Up to 6, incl.	.125
Over 6	.250

3.3.3 Straightness. The deviation from straightness shall not be greater than the amounts shown in table VI.

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Table VI - Straightness tolerances of rod

Ordered diameter, inches	Permissible deviation (throw in one revolution in 42 inch length), inch
15/16 and under	0.020
Over 15/16 to 4, incl.	.015

3.3.4 Out of round. Rod shall not be out-of-round by more than one-half the total variations shown in table IV.

#### 3.4 Dimensional tolerances, wire (round)

3.4.1 Diameter. The diameter of wire shall not vary at any point by more than the amounts shown in table VII.

Table VII - Dimensional tolerances for wire (round)

Diameter, inch	Tolerance, inch	
	Plus	Minus
Under 0.004	0.0002	0.0002
0.004 to 0.0079, incl.	.00025	.00025
Over 0.0079 to 0.0149, incl.	.0003	.0003
Over 0.0149 to 0.0199, incl.	.0004	.0004
Over 0.0199 to 0.031, incl.	.0005	.0005
Over 0.031 to 0.045, incl.	.0006	.0006
Over 0.045 to 0.079, incl.	.0007	.0007
Over 0.079 to 0.1075, incl.	.001	.001
Over 0.1075 to 0.406, incl.	.001	.002
Over 0.406	.002	.002

3.4.2 Out of round. Wire shall not be out-of-round by more than one-half the total variations shown in table VII.

3.5 Workmanship. Material shall be commercially free from dirt, oxide, scale, streaks, stains, grease, oil lubricants, scratches, pits, die marks, burns, chattermarks, dents, blisters, laps, grooves, slivers, seams, cracks, inclusions, and other injurious imperfections.

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#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Lot. Unless otherwise specified in the contract or order, a lot shall consist of material of the same temper, finish, heat or melt, or thickness made by the same manufacturing process, submitted for inspection at one time.

4.3 Sampling. Samples taken for the purpose of tests prescribed in this specification shall be selected in a manner as to represent correctly the material furnished and avoid needless destruction of finished material when samples representative of the material are available from other sources.

4.3.1 For chemical analysis. A sample for chemical analysis shall be obtained from each 500 pounds of material that can be identified by heat. Where material cannot be identified by heat, 2 samples shall be obtained. The sampler shall be selected in a manner calculated to disclose any nonuniformity of material within the lot. From each sample, not less than 4 ounces of clean millings, drillings, or clippings shall be obtained.

##### 4.3.2 For mechanical properties.

4.3.2.1 Tension tests. Unless otherwise specified in the contract or order, one tension test specimen shall be taken from each 500 pounds of material in the lot.

4.3.3 For visual and dimensional examination. A representative sample shall be selected in accordance with table VII. Pieces selected for dimensional examination may be the same as those selected for visual examination, but each criteria shall be evaluated separately.

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**Table VIII - Sampling for visual and dimensional examination,  
AQL = 1.5 percent defective**

Number of pieces in lot	Number of sample units required of
Up to 110	Inspection Level III - MIL-STD-105
110 and over	Inspection Level II - MIL-STD-105

4.3.3.1 When wire (round) is furnished in coils or on spools, the sample for examination shall be taken from within 10 feet of the outer end. If the sample selected is rejected due to handling marks, an additional 20 feet shall be used for reexamination.

#### 4.4 Examination.

4.4.1 Visual and dimensional. Pieces selected in accordance with 4.3.3 shall be visually examined to determine compliance with the requirements for workmanship (see 3.5) and shall be measured for compliance with the dimensional requirements (see 3.3 and 3.4) of this specification.

4.4.2 Straightness. The rod shall be placed on a precision table equipped with ball-bearing roller supports 42 inches apart and a micrometer or dial indicator. The rod shall be rotated slowly against the indicator at the point of apparent maximum deviation. The maximum and minimum readings of the indicator during one complete rotation of the rod shall be reported as the deviation from straightness (throw).

4.4.2 Preparation for shipment. Examination of the packaging and packing, and marking for shipment shall be made for conformance with the requirements of section 5.

#### 4.5 Tests.

##### 4.5.1 Tension test specimens.

4.5.1.1 Rod 1/2 inch or less in diameter. Rod 1/2 inch or less in diameter shall be in full size as received, using a free length between the jaws of the testing machine.

4.5.1.2 Rod over 1/2 inch in diameter. Test specimens shall be in accordance with method 211 of Fed. Test Method Std. No. 151.

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4.5.1.3 Wire, (round). A 10 inch gage length specimen shall be used.

4.5.2 Test procedures

4.5.2.1 Chemical analysis. The samples selected in accordance with 4.3.1 shall be analyzed by the wet chemical method in accordance with method 111 of Fed. Test Method Std. No. 151 or the spectrochemical method in accordance with method 112 of Fed. Test Method Std. No. 151 to determine conformance with 3.1. A single analysis of a composite sample may be made. In case of dispute, analysis by the wet method (method 111) shall be the basis for acceptance.

4.5.2.2 Tension tests. Specimens from samples selected in accordance with 4.3.2 shall be tested in accordance with method 211 of Fed. Test Method Std. No. 151.

4.6 Rejection.

4.6.1 Examination defects. Any sample unit having one or more defects shall be rejected. If the number of nonconforming sample units in the sample exceeds the acceptance number specified in table VIII for that sample size, the entire lot shall be rejected subject to the provisions of the section on "Acceptance and Rejection" of MIL-STD-105.

4.6.2 Test failures. A lot shall be rejected for failure to meet any of the test requirements when tested in accordance with 4.5 subject to the provisions of the section on "Rejection and Retests" of Fed. Test Method Std. No. 151.

5. PREPARATION FOR DELIVERY

5.1 Packaging, level C.

5.1.1 Wire. Unless otherwise specified in the contract or order, wire shall be packaged in coils or on spools of the sizes shown in table IX.

Table IX - Spool dimensions

Spool design- nation	Nominal capacity pounds	Flange diameter, inches	Drum diameter, inches	Traverse, inches	Hole diameter inches
A	1	2-1/2	1-3/4	3	5/8
B	2	3	1-3/4	3	5/8
C	5	4-1/2	2	3	5/8
D	10	6 to 7	2-1/4 to 3-1/4	3	5/8
E	25	9 to 10	3-3/4 to 6	4	1 to 1-1/4

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- 5.1.1.1 Each spool or coil shall be one continuous length of wire, evenly wound so that it may be unwound under a reasonable degree of tension without binding or distortion.
- 5.1.1.2 The inner and outer ends of the wire shall be attached securely to the spool to prevent accidental unwinding of the wire.
- 5.1.1.3 The spools shall be wound tightly with windings free from any loose turns or layers. They shall be clean and smooth, of metal, plastic, bound wood, or equivalent construction and free from distortion and sulfur or other ingredients which would in any way be injurious to the wire.
- 5.1.1.4 Annealed wire 0.050 inch or less in diameter shall be furnished on type C spools with maximum weights of wire as shown in table X.

Table X - Maximum weights of annealed wire per spool

Wire diameter, inch	Maximum weight of wire per spool, pounds
Up to 0.020, incl.	3.0
Over 0.020 to 0.050, incl.	4.0

- 5.1.1.5 Unless a definite spool size is specified in the order, annealed wire over 0.050 inch in diameter and wire of all diameters in other tempers shall be packed in spool sizes as shown in table XI.

Table XI - Spool sizes for various diameter wire

Wire diameter, inch	Spool designation
Up to 0.004, incl.	A
Over 0.004 to 0.010, incl.	A, B, C
Over 0.010 to 0.013, incl.	B, C
Over 0.013 to 0.025, incl.	C, D, E
Over 0.025 to 0.040, incl.	D, E
Over 0.040 to 0.080, incl.	E or 15-50 pound coils 15-50 pound coils
Over 0.080	

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5.2 Packing, level C. The subject material shall be separated by size, composition and packed in accordance with the manufacturer's standard practice into containers of a type and size commonly used for the purpose, in such a manner as to insure acceptance by carrier for transportation at the lowest rate applicable and to afford maximum protection from normal hazards of transportation.

5.2.1 Cut straight lengths shall be packed in boxes or crates.

5.3 Marking. In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Rod and wire (round) are intended for use as components of magnetrons.

6.1.1 Conservation. Due to the high nickel content of this alloy, its use should be limited to those applications where the use of less critical materials would seriously impair military characteristics.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Form, size, temper, and surface finish of material required (see 1.2).

(c) The lengths required, and whether "cut-to-lengths," "random mill lengths," "nominal" (stock) lengths, or multiples are required (see 3.3.2).

(d) When tolerances other than those shown are required (see 3.3).

6.3 Definition. Out-of-round is defined as the percentage of deviation from the maximum diameter.

Custodian                              Preparing activity:  
Army - MR                              Army - MR

Review interest                      Project No. 9525-1006  
Army - MR, MU

User interest:  
Army - MO

Review/User information is current as of the date of this document; draft circulation should be based on the information in the current DODISS.