

[INCH-POUND]  
A-A-59167  
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SUPERSEDING  
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## COMMERCIAL ITEM DESCRIPTION

### MAGNET MATERIALS, PERMANENT

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

#### 1. SCOPE

1.1 Scope. This CID covers permanent magnet materials in the forms of bars, rods, strips, wire, castings, and sintered shapes.

#### 2. CLASSIFICATION

2.1 Classification. The permanent magnet materials shall be of the classes and forms specified in table I.

#### 3. SALIENT CHARACTERISTICS

3.1 Material. The quality of raw materials used shall produce permanent magnetic materials meeting all requirements of this commercial item description.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RD-SE-TD-ST, Redstone Arsenal, AL 35898-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
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AMSC N/A

FSC 9535

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TABLE I. Classes and forms.

Classes <u>1/</u>	Forms
A1	Wrought bars and rods
A2	Wrought bars, rods, and strips
A3	Wrought bars and rods; castings
B1, B2, B3, B4, B7, B8, B10	Castings
B5, B6, B9, B11	Sintered shapes
C1	Wrought bars, rods, strips, and wire; castings
C2	Wrought bars, rods, strips, and wire
C3	Sintered shapes
C4	Wrought bars, rods, strips, and wire

1/ Nominal chemical compositions for the various classes are given in table II.

TABLE II. Nominal chemical composition, in percent.

Class	Commercial Designation	C	Mn*	Si	Al*	Co*	Cr*	Cu*	Ni*	W	Ti	Fe
A1	Mn Steel	0.85	0.70	0.15								Remainder
A2	Cr Steel	0.90	0.45	0.15			3.5					Remainder
A3	Fe-Co Alloy	0.75	0.50	0.15		36	3.5		4			Remainder
B1	Alnico 3, cast	0.10	0.15	0.15	12				25			Remainder
B2	Alnico 2, cast	0.10	0.15	0.15	10	12.5		6	17			Remainder
B3	Alnico 4, cast	0.10	0.15	0.15	12	5			28			Remainder
B4	Alnico 5, cast	0.10	0.15	0.15	8	24		3.25	14			Remainder
B5	Alnico 2, sintered	0.10	0.15	0.15	11	12.5		6	16			Remainder
B6	Alnico 4, sintered	0.10	0.15	0.15	12	5			28			Remainder
B7	Alnico 6, cast	0.10	0.15	0.15	8	24		3	15		1.25	Remainder
B8	Alnico 12, cast	0.10	0.15	0.15	6	35			18		8	Remainder
	* Potentially hazardous											

TABLE II. Nominal chemical composition, in percent - Continued.

Class	Commercial Designation	C	Mn*	Si	Al*	Co*	Cr*	Cu*	Ni*	W	Ti	Fe
B9	Alnico 5, sintered	0.10	0.15	0.15	8	24		3.25	14			Remainder
B10	Alnico 8, cast				7	35		4	15		5	Remainder
B11	Alnico 8, sintered				7.5	34		3.5	14		5	Remainder
C1	Cunico					29		50	21			
C2	Cunife							60	20			20
C3	Vectolite	30 Fe <sub>2</sub> O <sub>3</sub> , 26 CO <sub>2</sub> O <sub>3</sub> , 44 Fe <sub>3</sub> O <sub>4</sub>										
C4	Silmanal	86.75 Ag, 8.8 Mn, 4.45 Al.										

\* Potentially hazardous

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### 3.2 Condition.

3.2.1 Class A. Unless otherwise specified in the contract or order, Class A wrought material shall be furnished in the as-rolled, as-forged, or as-drawn condition, as applicable, and Class A3 cast material in the as-cast condition.

3.2.2 Class B and Class C. Unless otherwise specified in the contract or order, Class B and Class C wrought, cast, or sintered material shall be furnished in the fully heat-treated condition and shall be completely demagnetized.

3.3 Heat-treatment. The material shall be given such uniform treatment as the manufacturer desires to produce material which will conform to the requirements specified, applied in a manner that will produce the utmost uniformity. Heat-treating operations shall be performed on the whole of a piece, never on a part only.

3.4 Stabilization. Where stabilization treatment is required, material shall be stabilized in accordance with the requirements specified in the contract or purchase order.

3.5 Magnetic properties. Material covered by the specification, after suitable heat-treatment, shall have the coercive forces and residual indications specified in table III when determined from the corresponding indicated values of peak magnetizing force specified.

### 3.6 Dimensions and tolerances.

#### 3.6.1 Bars and rods.

3.6.1.1 Diameter, thickness, and width. The diameter, thickness, and width of bars and rods shall not vary from that ordered by greater than the amount specified in table IV.

3.6.1.2 Length. Unless otherwise specified in the contract or order, bars and rods shall be furnished in random lengths of not less than 6 feet.

3.6.2 Strips. The thickness and width of strips shall not vary from that ordered by greater than the amounts specified in table V.

3.6.3 Wire. Diameter or thickness of wire, both round and rectangular, shall not vary from that ordered by greater than the permissible variation specified in table VI.

3.6.4 Castings and sintered shapes. The dimensions of castings and sintered shapes shall be as specified in the drawings, within the tolerances given thereon. Sufficient stock shall be allowed for finishing where indicated by the drawings.

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TABLE III. Magnetic properties.

Class	Coercive force ( $H_C$ ) minimum Oersteds	Residual induction ( $B_r$ ) minimum Gausses	Peak magnetizing force ( $H_{max}$ ) Oersteds
A1	40	8700	300
A2	62	9000	300
A3	210	9000	1000
B1 <u>1/</u>	450	6700	2000
B1 <u>2/</u>	400	7100	2000
B2	540	7200	2000
B3	700	5200	3000
B4	575	12000	3000
B5	520	6900	2000
B6	700	5200	3000
B7	750	10000	3000
B8	950	5800	3000
B9	575	10000	3000
B10	1470	8625	5000
B11	1400	7500	5000
C1	660	3400	3000
C2 <u>3/</u>	550	5400	2000
C2 <u>4/</u>	440	4800	2000
C3	1000	1600	3500
C4	500 <u>5/</u>	550	20000

## NOTES:

1/ Up to 0.625 by 0.625-inch cross-sectional dimension, inclusive.

2/ Over 0.625 by 0.625-inch cross-sectional dimension.

3/ Up to 0.155 inch diameter, inclusive.

4/ Over 0.155 inch diameter.

5/ Required intrinsic coercive force shall be not less than 6000 oersteds.

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TABLE IV. Permissible variations in diameter, thickness, and width of bars and rods.

ROUNDS, SQUARES, AND ROUND-CORNERED SQUARES				
Ordered diameter or distance between parallel faces			Permissible variation	
Over	To and including	Plus	Minus	Out-of-section /1
Inches	Inches	Inch	Inch	Inch
	0.3125	0.005	0.005	0.008
0.3125	0.4375	0.006	0.006	0.009
0.4375	0.625	0.007	0.007	0.010
0.625	0.875	0.008	0.008	0.012
0.875	1	0.009	0.009	0.013
1	1.125	0.010	0.010	0.015
1.125	1.250	0.011	0.011	0.016
1.250	1.375	0.012	0.012	0.018
1.375	1.50	0.014	0.014	0.021
1.50	2	0.0157	0.0157	0.023
2	2.50	0.03125	0	0.023
2.50	3.50	0.047	0	0.035
3.50	4.50	0.0625	0	0.046
4.50	5.50	0.078	0	0.058
5.50	6.50	0.125	0	0.070
6.50	8	0.157	0	0.085

HEXAGONS AND OCTAGONS				
Ordered distance between parallel faces			Permissible variation	
Over	To and including	Plus	Minus	Out-of-section /1
Inches	Inches	Inch	Inch	Inch
	0.50	0.007	0.007	0.011
0.50	1	0.010	0.010	0.015
1	1.50	0.021	0.013	0.025
1.50	2	0.031	0.0157	0.031
2	2.50	0.047	0.0157	0.047
2.50	3.50	0.0625	0.0157	0.0625

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TABLE IV. Permissible variations in diameter, thickness, and width of bars and rods - Continued.

FLATS (SQUARE-EDGE AND ROUND-EDGE)									
Width ordered		Permissible variations in width				Permissible variation in thickness, plus or minus			
Over	To and including	Plus	Minus	Thickness Under 0.25 inch	Thickness 0.25 to 0.50 inch, inclusive	Thickness Over 0.50 5 to 1 inch, inclusive	Thickness Over 1 to 2 inches, inclusive	Thickness Over 2 to 4 inches, inclusive	Thickness
Inches	Inches	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch
1	1	0.0157	0.0157	0.007	0.008	0.010	0.031	0.047	
2	2	0.031	0.031	0.007	0.012	0.015	0.031	0.0625	
4	4	0.0625	0.031	0.008	0.015	0.020	0.031	0.0625	
	6	0.094	0.0625	0.009	0.015	0.020	0.031	0.0625	

NOTE:

1/ Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same cross-section. Out-of-square section, out-of-hexagonal-section, and out-of-octagonal- section are the differences in the two, three, or four dimensions at the same cross-section of the bar, each dimension being the distance between parallel faces.



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TABLE V. Permissible variation in strip dimensions.

Thickness ordered		Permissible variation in thickness, plus or minus <u>1/</u>			
Over	To and including	Width to 3.50 inches, inclusive	Width over 3.50 in. to 6 in., inclusive	Width over 6 in. to 12 in., inclusive	Width over 12 in. to 15 in., inclusive
<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>
0.0636	0.1120	0.004	0.005	0.005	0.006
0.1120	0.1718	0.005	0.005	0.006	0.007
0.1719	0.2030	0.006	0.006	0.006	0.007
0.2031	0.2499	0.006	0.006	0.007	0.008
Width Ordered		Permissible variation in width, plus or minus			
Over	To and including				
<b>Inches</b>	<b>Inches</b>	<b>Inch</b>			
	2	0.031			
2	6	0.047			
6	12	0.0625			
12	15	0.094			

NOTE:

1/ For thickness measurements taken 0.375 inch from edge of strip. Measurements taken at center of strip may be larger than those taken 0.375 inch from edge by the following amounts:

- a. For widths up to 2 inches, inclusive: 0.002 inch
- b. For widths over 2 inches to 5 inches, inclusive: 0.003 inch
- c. For widths over 5 inches to 10 inches, inclusive: 0.004 inch
- d. For widths over 10 inches to 15 inches, inclusive: 0.005 inch

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TABLE VI. Permissible variations in wire dimensions.

ROUND WIRE	
Diameter ordered	Permissible variation in diameter, plus or minus
<b>Inches</b>	<b>Inch</b>
To 0.150, inclusive	0.002
Over 0.150 to 0.250, inclusive	0.004
RECTANGULAR WIRE	
Width ordered	Permissible variation in width, plus or minus
To 1.250, inclusive	0.005
Thickness ordered	Permissible variation in thickness, plus or minus
To 0.150, inclusive	0.002
Over 0.150 to 0.250, inclusive	0.004

#### 4. QUALITY RESEARCH PROVISIONS

4.1 Product Conformance. The products provided shall meet the salient characteristics of this commercial item description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial market. The government reserves the right to require proof of such conformance.

4.2 Marketing Acceptability. The following market acceptability criteria are necessary to document the quality of the product to be provided under this CID.

4.2.1 The company producing the item must have been producing meeting the requirements of this CID for at least two years.

4.2.2 The company must have sold 1000 units meeting this CID in the commercial marketplace over the past two years.

#### 5. PACKAGING

5.1 Preservation, packing and marking shall be as specified in the contract or order.

#### 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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6.1 Product availability. Permanent magnet materials are available commercially through Magnet Sales & Manufacturing, 11248 Playa Court, Culver City, CA 90230; Thomas & Skinner, Inc., 1120 East 23rd Street, P.O. Box 150-B, Indianapolis, IN 46206; and Dexter Magnetic Materials Division, 855 East Collins Blvd., Richardson, TX 75081.

6.2 Subject term (keyword) listing.

Attractor, metallic  
Electromagnet  
Hysteresis  
Magnetic fields  
Magnetism  
Residual magnetism

Custodian:  
Army - MI

Preparing activity:  
Army - MI

(Project 9535 – 0621)

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### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
A-A-59167

2. DOCUMENT DATE (YYMMDD)  
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3. DOCUMENT TITLE **MAGNET MATERIALS, PERMANENT**

4. NATURE OF CHANGE *Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

d. TELEPHONE *(Include Area Code)*  
(1) Commercial  
(2) AUTOVON  
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7. DATE SUBMITTED  
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