

**Bar, Medium Carbon Steel; Killed**

GE Material B4C1 identifies hot rolled and cold finished, medium carbon steel bar, similar to UNS G10450, made from silicon killed steel, as follows:

<u>GE designation</u>	<u>Description</u>
B4C1A	Hot rolled, chemical base, special quality
B4C1A2	Hot rolled, chemical base, stress relieved, special quality
B4C1A3	Hot rolled, chemical base, normalized, special quality
B4C1B	Hot rolled, physical base, special quality
B4C1B2	Hot rolled, physical base, normalized, special quality
B4C1B3	Hot rolled, physical base, special straightness, special quality
B4C1B4	Hot rolled, physical base, turned and polished, special quality
B4C1B5	Hot rolled, physical base, special straightness, stress relieved, pickled, oiled, special quality
B4C1B6	Hot rolled, physical base, normalized, hardness required, special quality
B4C1B7	Hot rolled or worked, physical base, stress relieved, lead free chemistry, special quality
B4C1B8	Hot rolled, physical base, special straightness, special quality
B4C1B9	Hot rolled, physical base, special quality
B4C1C3	Hot rolled, heat treated, special straightness, stress relieved, special quality
B4C1D2	Cold finished, chemical base, standard ISS fine grain size, standard quality
B4C1D3	Cold drawn, maximum hardness required, standard quality
B4C1D4	Cold finished, chemical base, standard ISS fine grain size, standard quality, plus restricted primary melt process, incidental element requirements and maximum hardness
B4C1D5	Cold finished, chemical base, standard ISS fine grain size, standard quality, turned, ground and polished to size and special tolerances
B4C1E	Hot rolled, physical base, additional restrictive requirements quality for nonmetallic inclusions

CHEMICAL COMPOSITION: % (Heat analysis)

Carbon (1)	0.43–0.50
Manganese	0.60–0.90
Phosphorus, max	0.040
Sulfur, max	0.050
Silicon	0.15–0.30
Lead (B4C1B7 only)	None

(1) Carbon range requirement applies only to B4C1A, A2, A3, D2, D3, D4 and D5.

For GE Material B4C1D4, the following restricted, incidental element requirements shall apply and analysis shall be reported:

Copper, max	0.35
Chromium, max	0.20
Nickel, max	0.25
Molybdenum, max	0.06

The heat analysis (formerly ladle analysis) made by the manufacturer to determine the percentages of the elements required under this specification shall be reported to the purchaser or his representative in a certificate of test when specified on purchase order or otherwise.

A product analysis (formerly check analysis) may be made by the purchaser from a sample representing each melt. The chemical composition thus determined shall conform to the requirements of this specification within the ISS (formerly AISI) permissible variation for product analysis.

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MECHANICAL PROPERTIES.

GE designation	Size, outside diameter or overall thickness, in	Tensile strength, ksi, min	Yield strength, 0.2% offset, ksi, min	Elongation in 2 inch, %, min	Reduction of area, %, min	Hardness, Brinell, HB
B4C1B, B3, B4, B5, E	Up to 2 incl	75 (2)	37.5	18	30	—
	Over 2 to 3 incl	75 (2)	37.5	17	28	—
	Over 3 to 4 incl	75 (2)	37.5	16	27	—
	Over 4	75 (2)	37.5	15	25	—
B4C1B2, B8	Up to 4 incl	75	40	18	40	—
	Over 4 to 7 incl	75	40	18	35	—
B4C1B6	All	—	—	—	—	156–223
B4C1B7	All	75–100	37.5	18	—	201 max
B4C1B9	Up to 3 3/8 incl	75	40	18	40	—
	Over 3 3/8 to 4 incl	75	40	18	35	—
	Over 4 to 5 1/2 incl	75	40	18	30	—
	Over 5 1/2	75	40	18	25	—
B4C1C3	Up to 4 incl	90	55 (3)	18	39	—
	Over 4 to 7 incl	85	50 (3)	18	39	—
	Over 7 to 10 incl	85	48	18	35	—
B4C1D3	All	—	—	—	—	223 max
B4C1D4	All	—	—	—	—	217 max

(2) Also 90 ksi, max required.

(3) Proportional limit, ksi, min.

ADDITIONAL REQUIREMENTS:

Process – Unless otherwise specified, material shall be made by the basic oxygen or electric furnace process.

Process, B4C1D4 (only) – Material shall be made by using a process which utilizes as a primary charge hot metal, normally molten pig iron, such as the basic oxygen furnace process. Material produced by the electric furnace process utilizing a 100 percent scrap charge is unacceptable for the application.

Quality – Killed steel is required for all material.

Imperfections – All bars shall be machinable within the classifications specified above. The material shall be free from injurious external and internal imperfections of a nature which will interfere with the purpose for which it is intended according to ISS standards for killed steel.

Processing, B4C1B8 – Material shall be produced using a coarse grain practice. Bars shall be demagnetized prior to shipping.

Processing, B4C1B9 – Bars shall be demagnetized prior to shipping.

GE Material B4C1D5 shall be turned, ground and polished to size with special size tolerances required by drawing or specified on the purchase order.

IDENTIFICATION:

Unless otherwise specified on the purchase order, heat numbers shall be stamped on each bar where this does not incur an extra charge. Those sizes which incur an extra charge shall be tagged or bundled and tagged with the heat number.

REFEREE METHODS:

Chemical composition ASTM A751
Tension test (4) ASTM A370
Brinell hardness ASTM A370

- (4) Test specimens may be taken from any bar. The axis of the specimen shall be located at the center of bars not over 1 1/2 inch in diameter or width. From round, hexagon or square bars, more than 1 1/2 inch in diameter or width, the axis of the specimen shall be located midway between the center and the surface of the bar. From rectangular bars more than 1 1/2 inch wide, the axis of the specimen shall be located midway between the surface bounding the thickness of the bar and midway between the center and the edge of the bar.

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Bar, Medium Carbon Steel; Killed**DIMENSIONS AND TOLERANCES:**

Diameter, distance across flats (B4C1A, A2, A3, B, B2, B3, B5, B6, B7, B8, B9, C3, E)

ROUNDS AND SQUARES

Diameter or distance across flats, inch		Tolerance, inch			Diameter or distance across flats, inch		Tolerance, inch		
Over	To incl	Plus	Minus	Out of round or square section (5)	Over	To incl	Plus	Minus	Out of round or square section (5)
—	5/16	0.005	0.005	0.008	1 1/2	2	1/64	1/64	0.023
5/16	7/16	0.006	0.006	0.009	2	2 1/2	1/32	0	0.023
7/16	5/8	0.007	0.007	0.010	2 1/2	3 1/2	3/64	0	0.035
5/8	7/8	0.008	0.008	0.012	3 1/2	4 1/2	1/16	0	0.046
7/8	1	0.009	0.009	0.013	4 1/2	5 1/2	5/64	0	0.058
1	1 1/8	0.010	0.010	0.015	5 1/2	6 1/2	1/8	0	0.070
1 1/8	1 1/4	0.011	0.011	0.016	6 1/2	8 1/4	5/32	0	0.085
1 1/4	1 3/8	0.012	0.012	0.018	8 1/4	9 1/2	3/16	0	0.100
1 3/8	1 1/2	0.014	0.014	0.021	9 1/2	10	1/4	0	0.120

- (5) 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 is the difference in the two dimensions at the same cross section of a square bar between opposite faces.

HEXAGONS

Distance across flats, inch		Tolerance, inch			Distance across flats, inch		Tolerance, inch		
Over	To incl	Plus	Minus	Out of hexagon section (6)	Over	To incl	Plus	Minus	Out of hexagon section (6)
—	1/2	0.007	0.007	0.011	1 1/2	2	1/32	1/64	1/32
1/2	1	0.010	0.010	0.015	2	2 1/2	3/64	1/64	3/64
1	1 1/2	0.021	0.013	0.025	2 1/2	3 1/2	1/16	1/64	1/16

- (6) Out of hexagon section is the greatest difference between any two dimensions at the same cross section between opposite faces.

FLATS

Specified width, inch		Width tolerance, inch		Specified thickness, inch						
				0.203–0.230, excl	0.230–1/4, excl	1/4–1/2, incl	Over 1/2–1, incl	Over 1–2, incl	Over 2–3, incl	Over 3
Over	To incl	Plus	Minus	Thickness tolerance, inch, plus or minus						
—	1	1/64	1/64	0.007	0.007	0.008	0.010	—	—	—
1	2	1/32	1/32	0.007	0.007	0.012	0.015	1/32	—	—
2	4	1/16	1/32	0.008	0.008	0.015	0.020	1/32	3/64	3/64
4	6	3/32	1/16	0.009	0.009	0.015	0.020	1/32	3/64	3/64
6	8	1/8 (7)	3/32 (7)	—	0.015	0.016	0.025	1/32	3/64	1/16

- (7) Does not apply to flats 6 to 8 inch inclusive in width and over 3 inch in thickness.

Length: (Mill cutting) (B4C1A, A2, A3, B, B2, B3, B5, B6, B7, B8, B9, C3, E)

Size of rounds, squares, hexagons, inch		Size of flats, inch		Length, foot				
				5–10 excl	10–20 excl	20–30 excl	30–40 excl	40–60 incl
Over	To incl	Width	Thickness	Tolerance, inch, plus only				
—	1	Up to 3 incl	Up to 1 incl	1/2	3/4	1 1/4	1 3/4	2 1/4
1	2	Up to 3 incl	Over 1	5/8	1	1 1/2	2	2 1/2
1	2	Over 3–6 incl	Up to 1 incl	5/8	1	1 1/2	2	2 1/2
2	5	Over 3–6 incl	Over 1	1	1 1/2	1 3/4	2 1/4	2 3/4
5	10	—	—	2	2 1/2	2 3/4	3	3 1/4
—	—	Over 6–8 incl	0.230 to 1 incl	3/4	1 1/4	1 3/4	3 1/2	4
—	—	Over 6–8 incl	Over 1 to 3 incl	1 1/4	1 3/4	2	3 1/2	4
Bar size sections		—	—	5/8	1	1 1/2	2	2 1/2

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Bar, Medium Carbon Steel; Killed

DIMENSIONS AND TOLERANCES: (Continued)

Straightness:

B4C1A, B, B9, E 1/4 inch in any 5 feet, but may not exceed
total length (feet)
1/4 inch x 5

B4C1B3, B4, B5, B8, C3, D2, D3, D4, D5 1/8 inch in any 5 feet, but may not exceed
total length (feet)
1/8 inch x 5

Diameter (B4C1B4)

Diameter, inch		Tolerance, inch, minus only
Over	To incl	
1 1/8	2	0.004
2	4	0.005
4	6	0.006
6	7 3/4	0.008

Diameter, thickness and width: (B4C1D2, D4)

ROUNDS

Diameter, inch		Tolerance, inch, minus only
Over	To incl	
—	1 1/2	0.003
1 1/2	2 1/2	0.004
2 1/2	4	0.005

HEXAGONS AND SQUARES

Distance across flats, inch		Tolerance, inch, minus only	
Over	To incl	Hexagons	Squares
—	3/4	0.003	0.004
3/4	1 1/2	0.004	0.005
1 1/2	2 1/2	0.005	0.006
2 1/2	3 1/8	0.006	—
2 1/2	4	—	0.008

FLATS

Width, inch		Tolerance, inch, minus only (8)
Over	To incl	
—	3/4	0.004
3/4	1 1/2	0.005
1 1/2	3	0.006
3	4	0.008
4	6	0.010
6	—	0.015

(8) Applies to thickness as well as width.

Diameter, thickness and width: (B4C1D3)

ROUNDS

Diameter, inch		Tolerance, inch, minus only
Over	To incl	
—	1 1/2	0.005
1 1/2	2 1/2	0.006
2 1/2	4	0.007

HEXAGONS AND SQUARES

Distance between parallel surfaces, inch		Tolerance, inch, minus only	
Over	To incl	Hexagons	Squares
—	3/4	0.006	0.007
3/4	1 1/2	0.007	0.008
1 1/2	2 1/2	0.008	0.009
2 1/2	3 1/8	0.009	—
2 1/2	4	—	0.011

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*Bar, Medium Carbon Steel; Killed***DIMENSIONS AND TOLERANCES (Continued)**

Diameter, thickness and width: (B4C1D3) (Continued)

FLATS

Width, inch		Tolerance, inch, minus only (9)
Over	To incl	
—	3/4	0.008
3/4	1 1/2	0.010
1 1/2	3	0.012
3	4	0.016
4	6	0.020

(9) Applies to thickness as well as width.

Squareness – Squares and flats: (B4C1D3)

Bars shall be square within 0.002 inch per inch of thickness.

Twist – Squares and flats: (B4C1D3)

Twist in any bar shall not exceed 10 degrees in any 12 feet of length.

Length: (B4C1B4, D2, D3, D4, D5)

Random:

Length, foot	Length range, total tolerance, inch
5 to 20 incl	24
Over 20 to 30 incl	36
Over 30 to 40 incl	48

CERTIFICATE OF TEST:

When requested, the supplier shall submit promptly to the purchaser at the point of delivery a certificate of test showing the results of tests for chemical analysis and properties required by this specification. This certificate shall be addressed to the section, unit, or person specified on the purchase order, and shall contain the GE designation, the purchase order number, and the quantity shipped so that the certificate may be identified with the shipment.

PACKING AND MARKING:

All material shall be separated by size for shipment, and carefully packed to avoid damage to surface or loss during shipment.

When lift size is not specified on the purchase order, standard ISS lift will be acceptable.

Each shipment shall be legibly marked with the purchase order number, the supplier's name or trade name, and the GE designation.