

**MERITOR®**2135 West Maple Road  
Troy, MI 48084-7121

# Material Specification

**Specification:** B-81  
**Revision Date:** 04/13/2017  
**Revision Level:** K

## ALLOY STEEL - CARBURIZING GRADE

- 1.0 GENERAL SPECIFICATION: Material Specification B-1. All the requirements for the general specifications apply unless superseded by the requirements within this specification.
- 2.0 SCOPE: This specification covers a high grade alloy steel suitable for use in the manufacture of gearing and other carburized parts including restrictions for gears that are fabricated by electron beam welding.
- 3.0 APPLICATIONS: Spiral Bevel Gears, Hypoid Gears, Pinions, and other carburized parts.
- 4.0 CHEMISTRY:

Chemical Property	Range (wt.%)	
	8620H	4120H*
Carbon	0.17-0.23%	0.18-0.23%
Manganese	0.60-0.95%	0.90-1.20%
Silicon	0.15-0.35%	0.15-0.35%
Nickel	0.35-0.75%	-----
Chromium	0.35-0.65%	0.40-0.60%
Molybdenum	0.15-0.25%	0.13-0.20%
Sulfur <sup>1,2</sup>	0.025-0.040%	0.025-0.040%
Phosphorus <sup>3</sup>	0.035% max.	0.035% max.
Forging Code <sup>4</sup>	"I"	"P"

\* Cannot be used for transmission parts or electron beam welded parts

<sup>1</sup> The material must meet the inclusion ratings specified per B-1. For gearing applications, the aim sulfur is 0.028-0.040%; this is to aid in machinability. 0.025% maximum for electron beam welded parts.

<sup>2</sup> Sulfur content range for Meritor machining only, otherwise SAE J404 (2009) applies.

<sup>3</sup> 0.025% maximum for electron beam welded parts.

<sup>4</sup> Forging codes are required if specified on part drawing.

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## 5.0 HARDENABILITY:

Restricted hardenability band ranges are required for the following applications<sup>5</sup>:

### 5.1 Helical Gears: (Center 50% of the H band)

<b>Jominy Distance (1/16 inch)</b>				
	<b>J4</b>	<b>J8</b>	<b>J12</b>	<b>Requirement Level</b>
HRC min.	30	--	--	Aim
HRC max.	38	27	23	Aim

### 5.2 Side Gears and Differential Pinions: (Center 50% of the H band)

<b>Jominy Distance (1/16 inch)</b>				
	<b>J4</b>	<b>J8</b>	<b>J12</b>	<b>Requirement Level</b>
HRC min.	30	--	--	Aim
HRC max.	38	27	23	Aim

### 5.3 U-Joint Crosses: (Center 50% of the H band)

<b>Jominy Distance (1/16 inch)</b>				
	<b>J4</b>	<b>J8</b>	<b>J12</b>	<b>Requirement Level</b>
HRC min.	30	--	--	Aim
HRC max.	38	27	23	Aim

### 5.4 Differential Spiders: (Center 50% of the H band)

<b>Jominy Distance (1/16 inch)</b>				
	<b>J4</b>	<b>J8</b>	<b>J12</b>	<b>Requirement Level</b>
HRC min.	30	--	--	Mandatory
HRC max.	38	27	23	Mandatory

<sup>5</sup> Certain parts requiring upper or lower half band hardenability for performance or manufacturing reasons will be covered by a note on the print.

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## 6.0 INTERNATIONAL EQUIVALENTS:

The following steels, while not necessarily an exact equivalent of this base specification, can be used as an alternate provided it meets the remainder of the specification in its entirety. Suppliers cannot substitute cross referenced steels without prior approval of the using plant quality function.

Chemical Property	Range (wt.%)			
	ENGLAND <sup>9</sup> B.S. 970-3 805H20	GERMANY DIN EN 10277-4 21NiCrMo2 Werk No 1.6523	JAPAN JIS G4053 SNCM220H	CHINA GB/T 3077 20CrNiMo
Carbon	0.17-0.23	0.17-0.23	0.17-0.23	0.17-0.23
Manganese	0.60-0.95	0.60-0.90	0.60-0.95	0.60-0.95
Sulfur <sup>6</sup>	<0.050	<0.035	<0.030	0.040 Max
Phosphorus <sup>7</sup>	<0.040	<0.035	<0.030	0.035 Max
Silicon	0.10-0.35	0.15-0.40	0.15-0.35	0.17-0.37
Nickel	0.35-0.75	0.40-0.70	0.35-0.75	0.35-0.75
Chromium	0.35-0.65	0.35-0.65	0.35-0.65	0.40-0.70
Molybdenum	0.15-0.25	0.15-0.25	0.15-0.25	0.20-0.30
Grain Size	Fine	Fine	Fine	Fine
Forging code <sup>8</sup>	"U"	"L"	"X"	"Y"

<sup>6</sup> The material must still meet the inclusion ratings specified per B-1. For gearing applications the aim sulfur is 0.028-0.040%; this is to aid in machinability. 0.025% maximum for electron beam welded parts.

<sup>7</sup> 0.025% maximum for electron beam welded parts.

<sup>8</sup> Forging codes are required if specified on part drawing.

<sup>9</sup> 820H17 is also a satisfactory alternate

## 7.0 REFERENCE SPECIFICATIONS:

Industry Affiliation	Standard Number and revision Date	Title of Standard
Meritor	B-1	General Wrought Steel Standard
SAE	J404 (2009)	Chemical Composition of SAE Alloy Steels
BS	970-3 (1991)	Wrought Steels for Mechanical and Allied Engineering Purposes
DIN	EN 10277-4 (1999)	Bright Steel Products
GB/T	3077 (1999)	Alloy Structure Steel
JIS	G4053 (2008)	Low Alloy Steels for Machine Structural

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		Use
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Date	Change
04/13/2017 Level K PR-07063	Section 4: Added number 2 footnote about Sulfur range. Renumbered the subsequent footnotes. Added SAE J404 to Reference Specifications table.
2/14/2014 Level J Request 30272-176	Reformatted and updated the Header / Footer. Added clarifying sentence to General Specification section. Tabularized the Chemistry and Hardenability sections. Added Reference Specification section.
12/5/2006 Level H Request 26188-30	Sulfur aim was 0.028-0.032%
10/5/2006 Level G Request 26188-22	Added "for gearing applications" to the aim sulfur statements.
8/5/2006 Level F Request 26188-5	Added minimum on sulfur range; sulfur content was 0.040% max. Added sulfur minimum. Reiterated the requirement of inclusion ratings per B1. Made editorial changes.
5/15/2002 Level E Request 19466-10	Added forging codes as required per part drawing.
1/15/99 Level D	Added S & P at 0.025% maximum for electron beam welded parts, rearranged asterisks, added GB3077 20CrNiMo Chinese steel grade
6/15/98 Level C	Sulfur was 0.02 - 0.04% max.
3/15/95 Level B	4120 was PS-15
10/15/94 Level A	Sulphur was 0.04 % max.
8/15/91	Added "PS-15 can't be used for transmission parts."
12/15/90	Added hardenability requirement on Diff. spider. Restated 4120 by PS 15.
12/15/89	Replaced PS-15 by 4120 per SAE Spec. Revision.

Approved By: Kenneth Yu  
Chief Engineer - Materials Engineering

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