

**CATERPILLAR: CONFIDENTIAL YELLOW TECHNICAL INFORMATION - YOU SHALL OBTAIN PERMISSION FROM THE CONTENT OWNER AND ESTABLISH THAT THE PERSON RECEIVING THE INFORMATION HAS THE NEED TO KNOW PRIOR TO SHARING THIS INFORMATION WITH ANYONE INSIDE OR OUTSIDE OF CATERPILLAR.**

### 1.0 DESCRIPTION

Steel – Alloy

**Note:** This is a multiple variation specification with different restrictions on material substitution.  
(See Article 4.0)

### 2.0 APPLICATION

Nitrided Parts

### 3.0 QUALIFYING SPECIFICATIONS

- 1E0024A Wrought Steel - General Requirements
- 1E1801 Hydrogen Control - Steel
- 1E1861 Wrought Steel - Approved Suppliers
- 1E2177 Mill Tolerances - Steel Products
- 1E2349 Material Application Substitute
- 1E2661A Steel Cleanliness - Vacuum Degassing, Ladle Refining
- 1E2700C Wrought Steel - Caster Class 1B \*

**Note\*:** Caster Class 3 is permitted for parts not covered by Special Cleanliness requirements found in Article 7.0

### 4.0 DRAWING DESIGNATIONS

**Note:** Materials specified as 1E1286 (without letter suffix) shall be fulfilled by 1E1286A.

- 1E1286A Permits Material Substitution Per Article 10.0
- 1E1286B No Material Substitution is Permitted

### 5.0 FORM AND QUALITY

Semifinished For Forging  
Cold Finished Bars  
Hot Rolled Bars

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STEEL – ALLOY (5130 MODIFIED)

DATE  
17 SEP 2015

CHG NO  
13

NUMBER  
1E1286

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## 6.0 COMPOSITION (%) (HEAT ANALYSIS)

**6.1** Additional composition limits are established in the 1E0024, 1E2661, and 1E1801 qualifying specifications. The composition limits listed below supersede the composition limits in the qualifying specifications. The limits in the qualifying specifications are only modified by explicit minimum and/or maximum limits in this material specification.

Carbon	0.28 - 0.33
Manganese	0.90 - 1.20
Phosphorus	0.035 MAX
Sulfur	0.050 - 0.080
Silicon	0.15 - 0.35
Chromium	0.90 - 1.20
Vanadium	0.05 - 0.10
Aluminum	0.08 - 0.13

**Note:** If DI (calculated by 1E0024 multiplying factors) is 96.5-119.4 mm based on ladle chemistry, or 92-122 mm based on product chemistry, then the heat can be exempted from the 1E0024 requirement for Jominy hardness testing.

## 7.0 STEEL CLEANLINESS

Ladle refining per 1E2661A is required for 1E1286. 1E2661A requirements for Type A sulfide inclusions are waived due to the sulfur content of this steel. ASTM A534 bearing quality or national standard cleanliness levels equivalent to 1E2661A are also applicable to substitute materials used for 1) gears or other parts requiring 1E4157 or 1E2057, or 2) parts with bearing surfaces (typically any part with 0.4 µm surface finish or finer). All other applications shall conform to 1E0024 steel cleanliness requirements.

## 8.0 AUSTENITIC GRAIN SIZE

5 or Finer

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### 9.0 HARDENABILITY

Normalizing Temperature 900 °C  
Austenitizing Temperature 870 °C

<b>Jominy Distance (mm)</b>	<b>1.5</b>	<b>20</b>	<b>25</b>
MAX	55	--	48
RKW C			
MIN	50	37	--
<b>Jominy Distance (Inch)</b>	<b>1/16</b>	<b>14/16</b>	<b>16/16</b>
MAX	55	--	48
RKW C			
MIN	50	37	--

### 10.0 SUBSTITUTE MATERIALS

**10.1** Substitute materials allow the chemical compositions of certain National Standard grade steels to be used in place of 1E Specification chemistries, per the guidelines of 1E0024 and 1E2349 - Substitute Materials Application. **When procuring any of the following substitute grades, all other quality requirements of the original 1E Specification shall be met, such as approved mill, reduction ratio, caster class, cleanliness, grain size, etc. The DI of the substitute materials are not required to meet 1E1286 requirement but shall be reported.**

**10.2** If steel purchasers do not understand these issues, they shall buy materials to the 1E Material Specification or employ the services of Caterpillar® Global Purchasing to assist in material acquisition.

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**10.3** 1E2349 governs approval requirements and procedures. This specification shall be read and understood before using any of the substitute materials listed below.

SPECIFICATIONS		APPROVAL TYPE
Caterpillar	1E0509	1E2349B
ASTM A304	Grade 4140H, 4142H	1E2349B
ASTM A322	Grades 4140, 4142	1E2349B
SAE J1868	Grade 4140RH	1E2349B
JIS G4052	Grade SCM440H	1E2349B
JIS G4052	Grade SCr430VS1	1E2349B
JIS G4053	Grade SCM440	1E2349B
BS 970	Grade 708M40	1E2349B
DIN EN 10083	Grade 42CrMo4	1E2349B
DIN EN 10083	Grade 42CD4	1E2349B

Figure 1

**Note:** Use of these substitute materials may require manufacturing process changes due to differences in heat treat response.

## 11.0 REFERENCES

### Abbreviations

Caterpillar Specifications

ASTM

BS

DIN EN

JIS

SAE

1E0011

1E0024, 1E0509, 1E2057, 1E2349B, 1E4157

A304, A322, A534

970

10083

G4052, G4053

J1868

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