

1.0 DESCRIPTION

Steel - Alloy

2.0 APPLICATION

Carburized parts requiring extra cleanliness.

3.0 QUALIFYING SPECIFICATIONS

1E0024A Wrought Steel - Sampling And Testing
 1E1861 Wrought Steel - Approved Suppliers
 1E2661A Steel Cleanliness - Ladle Refining
 1E2177 Mill Tolerances - Steel Products
 1E2349 Materials Application - Substitute
 1E2700C Strand Cast Steel - Class 1B Caster

4.0 FORM AND QUALITY

Semifinished for Forging
 Hot Rolled Bars
 Cold Finished Bars

5.0 COMPOSITION (%) (HEAT ANALYSIS)

Carbon 0.19 - 0.23
 Manganese 0.80 - 1.10
 Phosphorus 0.020 MAX
 Sulfur 0.015 - 0.025
 Silicon 0.18 MAX
 Chromium 0.65 - 1.00
 Molybdenum 0.15 - 0.30
 Aluminum 0.020 MIN (Ladle and Product)

Note: If DI (calculated by 1E0024 multiplying factors) is 62.2 mm to 77.5 mm, based on ladle chemistry or 59.7 mm to 80.0 mm, based on product chemistry, then the heat can be exempted from the 1E0024 requirement for Jominy hardness testing.

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 (4122 MODIFIED – SPECIAL CLEANLINESS)

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6.0 STEEL CLEANLINESS

Ladle refining per 1E2661A is required for 1E0778. ASTM A534 bearing quality or national standard cleanliness levels equivalent to 1E2661A are applicable only to substitute materials used for 1) gear and parts requiring, 1E0392, 1E2057, or 1E4157 or; 2) parts with bearing surfaces (any part with areas of 0.4 μm surface finish). All other applications will conform to 1E0024 steel cleanliness requirements.

7.0 AUSTENITIC GRAIN SIZE

5 or finer.

8.0 HARDENABILITY

Normalizing Temperature 925°C

Austenitizing Temperature 925°C

Jominy Distance (mm)	1.5	7	13
MAX	48	--	32
RKW C			
MIN	43	34	--
Jominy Distance (Inch)	1/16	4/16	8/16
MAX	48	--	33
RKW C			
MIN	43	35	--

9.0 SUBSTITUTE MATERIALS

9.1 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, DI, grain size, etc.**

9.2 All substitute materials used for gears and parts with bearing surfaces shall conform to ASTM A534 bearing quality, 1E2661A ladle refining requirements or the appropriate national standard for bearing quality requirements.

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9.3 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.

9.4 1E2349 governs approval requirements and procedures. This specification **shall** be read and understood before using any of the substitute materials listed below.

Specification		Approval Type
Caterpillar	1E1054, 1E2766	1E2349B
ASTM A304	Grade 8822H	1E2349B
	Grades 8620H* and 8720H*	1E2349B
SAE J1868	Grades 4120RH*, 8620RH*, and 8720RH*	1E2349B
BS 970	Grades 805H20* and 805H22*	1E2349B
EN 10084	Grades 20MoCr4 and 20MnCr5*	1E2349B
AFNOR A35-551	Grades 18CD4* and 20NCD2*	1E2349B
JIS G4052	Grades SCM420H* and SNCM220H*	1E2349B
GB/T 5216	Grade 20CrMnTiH**	1E2349B

Note*: Material may only be used if it can be determined that the material meets the DI requirements per Article 5.0 or the hardenability requirements in Article 8.0.

Note:** Not allowed for gears and planet shafts.

Note: Use of these substitute materials may require manufacturing process changes due to differences in machinability.

10.0 SUBSIDIARY SPECIFICATIONS (FOR CATERPILLAR REFERENCE ONLY)

10.1 At the time of release of 1E0778, Change **16**, the following subsidiary versions of 1E0778 were in use by Caterpillar Facilities outside of the United States.

Caterpillar Brazil Ltda (Piracicaba)	"G" Version
Caterpillar Japan Ltd. (Sagami)	"X" Version
Caterpillar Japan Ltd. (Akashi)	"X" Version

Figure 1

10.2 Subsidiary versions may be changed, released, or cancelled without a change to this version of 1E0778. The Engineering Data System (EDS) provides information on the status of subsidiary version specifications and should be referenced for current information.

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11.0 REFERENCES

Caterpillar	1E0024, 1E0392, 1E1054, 1E2057, 1E2349B, 1E2766, 1E4157
ASTM	A304, A534
SAE	J1868
BS	970
EN	10084
AFNOR	A35-551
JIS	G4052
GB/T	5216

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