



AEROSPACE MATERIAL SPECIFICATION

AMS6450™**REV. L**

Issued 1941-11
Reaffirmed 2013-04
Revised 2022-11

Superseding AMS6450K

Steel, Spring Wire
0.95Cr - 0.22V (0.48 - 0.53C) (SAE 6150)
Annealed and Cold Drawn
(Composition similar to UNS G61500)

RATIONALE

AMS6450L is the result of a Five-Year Review and update of the specification. The revision includes updates to chemistry and reporting (3.1, 3.1.1), prohibits unauthorized exceptions (3.6, 4.4.2, 8.8), addresses changes to AMS2301 (4.2.1, 4.4.3), provides grain size exceptions (4.4.1, 4.2.1, 4.2.2, 8.6), adds pyrometry controls (3.3.4), and allows prior revisions (8.7).

1. SCOPE

1.1 Form

This specification covers a low-alloy steel in the form of wire supplied as coils, spools, and straight lengths.

1.2 Application

This wire has been used typically for valve springs and other springs requiring high-fatigue properties when used at moderately elevated temperatures, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS2301	Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure
AMS2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS2430	Shot Peening

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<https://www.sae.org/standards/content/AMS6450L/>

Documents
Document Sharing Hub

AMS2750 Pyrometry

AS7766 Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A370 Mechanical Testing of Steel Products

ASTM A751 Chemical Analysis of Steel Products

ASTM E112 Determining Average Grain Size

ASTM E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

ASTM E290 Bend Testing Material for Ductility

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751 or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.48	0.53
Manganese	0.70	0.90
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.80	1.10
Vanadium	0.15	0.30
Nickel	--	0.25
Molybdenum	--	0.06
Copper	--	0.35

3.1.1 Producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection, unless limits of acceptability are specified by the purchaser.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Condition

Wire shall be uniformly annealed and cold drawn. Carbides shall be finely spheroidized and uniformly distributed.

3.3 Properties

Product shall conform to the following requirements:

3.3.1 Average Grain Size

Shall be ASTM No. 5 or finer, determined in accordance with ASTM E112.

3.3.2 Carburization and Decarburization

Wire shall not be carburized or decarburized to such an extent as will prevent finished springs from having a microstructure free from ferrite or massive carbide adjacent to the surface when metallographically examined at 500X after heat treatment in accordance with 3.3.4.

3.3.3 Bending

Wire shall withstand, without cracking, bending in accordance with ASTM E290 through an angle of 180 degrees around a diameter equal to the nominal diameter or thickness of the wire.

3.3.4 Response to Heat Treatment

Wire shall have the following properties after being hardened by quenching in oil from 1575 °F ± 25 °F (857 °C ± 14 °C) and tempering at not lower than 700 °F (371 °C) for approximately 2 hours at heat; hardness and tensile testing shall be performed in accordance with ASTM A370. Pyrometry shall be in accordance with AMS2750.

3.3.4.1 Tensile Properties

Shall be as shown in Table 2.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	220 ksi (1517 MPa)
Reduction of Area	40%

3.3.4.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (±0.002 mm/mm/min) through 0.2% offset yield strain. After the yield strain, the speed of the testing machine shall be set between 0.05 in/in and 0.5 in/in (0.05 mm/mm and 0.5 mm/mm) of the length of the reduced section (or distance between the grips for specimens not having a reduced section) per minute. Alternatively, an extensometer and strain rate indicator may be used to set the strain rate between 0.05 in/in/min and 0.5 in/in/min (0.05 mm/mm/min and 0.5 mm/mm/min).

3.3.4.2 Hardness

Shall be not lower than 46 HRC, or equivalent (see 8.2).

3.3.4.3 Twisting (Round Wire)

A straight specimen of suitable length shall be held between two clamps, one of which can be rotated, separated by a distance equal to 100 times the nominal wire diameter and twisted forward two complete 360 degree turns, reversed four turns, and then reversed repeatedly after each succeeding four turns until failure. Twisting shall be done at a uniform rate and slowly enough so that the temperature of the wire while twisting shall not exceed 212 °F (100 °C). If it is impracticable to twist a specimen as long as 100 times the wire diameter because of limitations of the twisting machine, a specimen 50 times the diameter may be used, but the initial forward twist shall be just one turn and each succeeding reversal two turns. Specimens 100 times the diameter shall withstand not less than 24 turns, and specimens 50 times the diameter shall withstand not less than 12 turns.