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SAE J230 DEC88

Stainless Steel, SAE 30302, Spring Wire and Springs

SAE Recommended Practice
Reaffirmed December 1988

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The Engineering Society For Advancing Mobility Land Sea Air and Space®

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

Submitted for recognition as an American National Standard

MATERIALS PRACTICE

SAE J230

Issued February 1971
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Reaffirming J230 FEB71

STAINLESS STEEL, SAE 30302, SPRING WIRE AND SPRINGS

1. SCOPE:

This recommended practice covers a high-strength corrosion-resisting steel wire, uniform in mechanical properties, intended for the manufacture of springs and wire forms. It covers basic materials and processing requirements of springs and forms fabricated therefrom.

2. MANUFACTURE AND WORKMANSHIP:

The steel shall be made by the electric arc, electric induction, or other suitable commercial processes, using proper controls to prevent injurious segregation or inclusions. The wire shall be properly annealed and cold drawn to produce the specified mechanical properties. The wire shall be uniform in quality and shall not be kinked or improperly cast. To test for cast, a few convolutions of wire shall be cut from the bundle and placed on a flat surface. The wire shall lie substantially flat on itself and not show a wavy condition. Each unit shall be a continuous length with welds being permitted before final drawing. Welds are not permitted at finished size except by negotiation between manufacturer and user.

3. FINISH:

This wire is usually supplied with a thin surface film that will prevent galling or seizure of the wire by the coiling or forming tools. This wire is available with the following finishes: lead, oxide, bright, copper, and other.

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4. CHEMICAL COMPOSITION:

This wire shall conform to the chemical composition (percent by weight) as follows:

Carbon	0.15 max
Manganese	2.00 max
Silicon	1.00 max
Phosphorus	0.045 max
Sulfur	0.030 max
Chromium	17.00 - 19.00
Nickel	8.00 - 10.00

5. MECHANICAL PROPERTIES:

The tensile properties of the wire shall conform to the requirements in Table 1 for the various sizes. Both lower and higher tensile strengths are available upon mutual agreement between supplier and purchaser.

6. PERMISSIBLE VARIATIONS IN DIAMETER:

Permissible variations in the wire diameter shall be as specified in Table 2.

7. WRAP TEST REQUIREMENT:

For sizes 0.162 in diameter and smaller, the wire shall wind on itself as an arbor without fracture. For sizes over 0.162 in, the wire shall wind without cracking on an arbor equal to twice its diameter. This test shall be conducted prior to any stress relieving or passivation.

8. COILING TEST:

The as-cold-drawn wire shall show a uniform pitch with no splits, cracks, or fractures when wound in a tightly closed coil on an arbor three to four times the wire diameter and the resultant coil stretched to a permanent set of four times its as-wound length. This requirement shall apply only to wire sizes 0.105 in diameter and smaller.

9. SURFACE CONDITION:

Surface of the wire shall be free from injurious imperfections, such as seams, pits, die scratches, and other defects which will impair the serviceability of the part. (Visually examine at 10X magnification.)

10. FINISHED PARTS:

10.1 The surface condition of the finished parts shall be as described for the wire, except in certain instances where shot peening might be used. In addition, there shall be no excessive coiling marks, nicks, or gouges which would impair the serviceability of the part. When the springs are shot peened, the surface appearance will be altered. Because of a resulting decrease in the spring resistance to relaxation, shot peening is permitted only when agreed upon by the purchaser. After shot peening, the springs shall be stress relieved at 450-500°F for a minimum of 30 min at heat.

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TABLE 1

Wire Diameter, in	Tensile Strength, min, ksi	Tensile Strength, max, ksi
0.009 and smaller	325	355
0.010	320	350
0.011	318	348
0.012	316	346
0.013	314	344
0.014	312	342
0.015	310	340
0.016	308	338
0.017	306	336
0.018	304	334
0.019 to 0.020 incl	300	330
Over 0.020 to 0.022 incl	296	326
Over 0.022 to 0.024 incl	292	322
Over 0.024 to 0.026 incl	289	319
Over 0.026 to 0.028 incl	286	316
Over 0.028 to 0.032 incl	277	307
Over 0.032 to 0.036 incl	273	303
Over 0.036 to 0.041 incl	269	299
Over 0.041 to 0.047 incl	262	292
Over 0.047 to 0.054 incl	260	290
Over 0.054 to 0.062 incl	255	285
Over 0.062 to 0.072 incl	250	280
Over 0.072 to 0.080 incl	245	275
Over 0.080 to 0.092 incl	240	270
Over 0.092 to 0.105 incl	232	262
Over 0.105 to 0.120 incl	225	255
Over 0.120 to 0.148 incl	210	240
Over 0.148 to 0.162 incl	205	235
Over 0.162 to 0.177 incl	195	225
Over 0.177 to 0.207 incl	185	215
Over 0.207 to 0.225 incl	180	210
Over 0.225 to 0.250 incl	175	205
Over 0.250 to 0.312 incl	160	190
Over 0.312 to 0.375 incl	140	170

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Table 2

Diameter, in	Permissible Variations, ±in	Permissible Out of Round, in
0.003 to 0.0046 incl	0.0001	0.0001
Over 0.0046 to 0.007 incl	0.00015	0.00015
Over 0.007 to 0.008 incl	0.0002	0.0002
Over 0.008 to 0.012 incl	0.00025	0.00025
Over 0.012 to 0.024 incl	0.0004	0.0004
Over 0.024 to 0.033 incl	0.0005	0.0005
Over 0.033 to 0.044 incl	0.00075	0.00075
Over 0.044 to 0.312 incl	0.0010	0.0010
Over 0.312 to 0.375 incl	0.0015	0.0015

10.2 Lead coatings shall be removed from spings prior to stress relieving when a temperature of 550°F or above is required.

10.3 Springs made from this wire are normally stress relieved for a minimum of 30 min. Typical temperatures are 550-600°F. It should be recognized that other than typical stress relieving temperatures may be used or omitted completely, depending upon the spring design and application.

10.4 Springs made from this wire must be cleaned and passivated after coiling to insure maximum corrosion resistance of the stainless steel. All metallic coatings must be removed prior to heat treatment. One procedure is as follows:

(a) Remove drawing compounds from the wire surface by a 5 min dip in alkaline cleaner at approximately 190°F followed by a water rinse.

(b) Remove metallic and most nonmetallic coatings from the wire surface and passivate the surface by immersing parts in a nitric acid solution of 15-25% at 140-160°F for 5 min or until clean. Follow with a water rinse.

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RATIONALE:

Not applicable.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

Not applicable.

APPLICATION:

This recommended practice covers a high-strength corrosion-resisting steel wire, uniform in mechanical properties, intended for the manufacture of springs and wire forms. It covers basic materials and processing requirements of springs and forms fabricated therefrom.

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