Designation: A 580/A 580M – 06

Standard Specification for Stainless Steel Wire[1]

This standard is issued under the fixed designation A 580/A 580M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers stainless steel wire, except the free-machining types. It includes round, square, octagon, hexagon, and shape wire in coils only for the more commonly used types of stainless steels for general corrosion resistance and high-temperature service. For bars in straightened and cut lengths, see Specifications A 276 or A 479/A 479M.

NOTE 1—For free-machining stainless wire, designed especially for optimum machinability, see Specification A 581/A 581M.

1.2 Unless the order specifies the applicable "M" specification designation, the material shall be furnished to the inch-pound units.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 276 Specification for Stainless Steel Bars and Shapes

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 479/A 479M Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels

A 555/A 555M Specification for General Requirements for Stainless Steel Wire and Wire Rods

A 581/A 581M Specification for Free-Machining Stainless Steel Wire and Wire Rods

E 527 Practice for Numbering Metals and Alloys (UNS)

2.2 *Society of Automotive Engineers Standard:*[3]

J 1086 Numbering Metals and Alloys

3. Ordering Information

3.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Such requirements may include, but are not limited to, the following:

3.1.1 Quantity (weight),

3.1.2 Name of material (stainless steel),

3.1.3 Type or UNS designation (Table 1),

3.1.4 Condition (4.1),

3.1.5 Finish (4.2),

3.1.6 Cross section (round, square, etc.),

3.1.7 Applicable dimensions including size, thickness, and width.

3.1.8 ASTM designation A 580/A 580M and date of issue.

3.1.9 Coil diameter (inside or outside diameter, or both) and coil weight.

3.1.10 Special requirements.

NOTE 2—A typical ordering description is as follows: 5000 lb [2000 kg] Type 304, wire, annealed and cold drawn, ½ in. [13 mm] round, ASTM Specification A 580/A 580M dated _____. End use: machined hydraulic coupling parts.

4. Manufacture

4.1 *Condition (Table 2)*:

4.1.1 *Condition A*—Annealed as a final heat treatment. Material in Condition A may be given a final cold drawing for size control or finish, or both, slightly raising tensile strength.

4.1.2 *Condition B*—Cold worked to higher strength.

4.1.3 *Condition T*—Heat treated to an intermediate temper generally by austenitizing, quenching, and tempering at a relatively low temperature.

4.1.4 *Condition H*—Heat treated to a hard temper generally by austenitizing, quenching, and tempering at a relatively low temperature.

4.2 *Finish*:

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.17 on Flat-Rolled and Wrought Stainless Steel.

Current edition approved March 1, 2006. Published March 2006. Originally approved in 1967. Last previous edition approved in 2004 as A 580/A 580M – 98 (2004).

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

***A Summary of Changes section appears at the end of this standard.**

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Copyright by ASTM Int'l (all rights reserved);
Reproduction authorized per License Agreement with Monique Tyree (ASTMIHS Account); Tue Mar 14 10:34:18 EST 2006
Not for Resale

TABLE 1 Chemical Requirements

UNS Designation[A]	Type	Composition, %									
		Carbon, max[B]	Manganese, max[B]	Phosphorus, max	Sulfur, max	Silicon, max[B]	Chromium	Nickel	Molybdenum	Nitrogen	Other Elements
Austenitic Grades											
S20161	. . .	0.15	4.0–6.0	0.040	0.040	3.0–4.0	15.0–18.0	4.0–6.0		0.08–0.20	
S20910	XM-19	0.06	4.0–6.0	0.040	0.030	1.00	20.5–23.5	11.5–13.5	1.50–3.00	0.20–0.40	Cb 0.10–0.30 V 0.10–0.30
S21400	XM-31	0.12	14.0–16.0	0.045	0.030	0.30–1.00	17.0–18.5	1.00 max		0.35 max	
S21800	...	0.10	7.0–9.0	0.060	0.030	3.5–4.5	16.0–18.0	8.0–9.0		0.08–0.18	
S21900	XM-10	0.08	8.0–10.0	0.060	0.030	1.00	19.0–21.5	5.5–7.5		0.15–0.40	
S21904	XM-11	0.04	8.0–10.0	0.060	0.030	1.00	19.0–21.5	5.5–7.5		0.15–0.40	
S24000	XM-29	0.08	11.5–14.5	0.060	0.030	1.00	17.0–19.0	2.3–3.7		0.20–0.40	
S24100	XM-28	0.15	11.0–14.0	0.040	0.030	1.00	16.5–19.0	0.5–2.50		0.20–0.45	
S28200	...	0.15	17.0–19.0	0.045	0.030	1.00	17.0–19.0	...	0.75–1.25	0.40–0.60 0.10 max	Cu 0.75–1.25
S30200	302	0.15	2.00	0.045	0.030	1.00	17.0–19.0	8.0–10.0		0.10 max	
S30215	302B	0.15	2.00	0.045	0.030	2.00–3.00	17.0–19.0	8.0–10.0			
S30400	304	0.08	2.00	0.045	0.030	1.00	18.0–20.0	8.0–10.5		0.10 max	
S30403	304L[C]	0.030	2.00	0.045	0.030	1.00	18.0–20.0	8.0–12.0		0.10 max	
S30500	305	0.12	2.00	0.045	0.030	1.00	17.0–19.0	10.5–13.0			
S30800	308	0.08	2.00	0.045	0.030	1.00	19.0–21.0	10.0–12.0			
S30900	309	0.20	2.00	0.045	0.030	1.00	22.0–24.0	12.0–15.0			
S30908	309S	0.08	2.00	0.045	0.030	1.00	22.0–24.0	12.0–15.0			
S30940	309Cb	0.08	2.00	0.045	0.030	1.00	22.0–24.0	12.0–16.0		0.10 max	Cb+Ta 10×C min, 1.10 max
S31000	310	0.25	2.00	0.045	0.030	1.50	24.0–26.0	19.0–22.0			
S31008	310S	0.08	2.00	0.045	0.030	1.50	24.0–26.0	19.0–22.0			
S31400	314	0.25	2.00	0.045	0.030	1.50–3.00	23.0–26.0	19.0–22.0			
S31600	316	0.08	2.00	0.045	0.030	1.00	16.0–18.0	10.0–14.0	2.00–3.00	0.10 max	
S31603	316L[C]	0.030	2.00	0.045	0.030	1.00	16.0–18.0	10.0–14.0	2.00–3.00	0.10 max	
S31700	317	0.08	2.00	0.045	0.030	1.00	18.0–20.0	11.0–15.0	3.0–4.0	0.10 max	
S32100	321	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–12.0			Ti 5×C min
S34700	347	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–13.0			Cb+Ta 10×C min
S34800	348	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–13.0			Cb+Ta 10×C min Ta 1.10 max Co 0.20 max
Ferritic Grades											
S40500	405	0.08	1.00	0.040	0.030	1.00	11.5–14.5	...			Al 0.10–0.30
S40976	. . .	0.030	1.00	0.040	0.030	1.00	10.5–11.7	0.75–1.00		0.040	Cb 10×(C+N) –0.80
S43000	430	0.12	1.00	0.040	0.030	1.00	16.0–18.0	...			
S44400	...	0.025	1.00	0.040	0.030	1.00	17.5–19.5	1.00	1.75–2.50	0.035 max	[Ti+Cb] 0.20+4(C+N)–0.80
S44600	446	0.20	1.50	0.040	0.030	1.00	23.0–27.0	...		0.25 max	
S44700	...	0.010	0.30	0.025	0.020	0.20	28.0–30.0	0.15 max	3.5–4.2	0.020 max	C+N 0.025 max Cu 0.15 max
S44800	...	0.010	0.30	0.025	0.020	0.20	28.0–30.0	2.00–2.50	3.5–4.2	0.020 max	C+N 0.025 max Cu 0.15 max
S44535	...	0.030	0.30–0.80	0.050	0.020	0.50	20.0–24.0	...	...	...	Cu 0.50, Al 0.50 La 0.04–0.20 Ti 0.03–0.20
Martensitic Grades											
S40300	403	0.15	1.00	0.040	0.030	0.50	11.5–13.0	...			
S41000	410	0.15	1.00	0.040	0.030	1.00	11.5–13.5	...			
S41400	414	0.15	1.00	0.040	0.030	1.00	11.5–13.5	1.25–2.50			
S42000	420	over 0.15	1.00	0.040	0.030	1.00	12.0–14.0	...			
S43100	431	0.20	1.00	0.040	0.030	1.00	15.0–17.0	1.25–2.50			
S44002	440A	0.60–0.75	1.00	0.040	0.030	1.00	16.0–18.0	...	0.75 max		
S44003	440B	0.75–0.95	1.00	0.040	0.030	1.00	16.0–18.0	...	0.75 max		
S44004	440C	0.95–1.20	1.00	0.040	0.030	1.00	16.0–18.0	...	0.75 max		

[A] New designation established in accordance with Practice E 527 and SAE J 1086.

[B] Maximum, unless otherwise indicated.

[C] For some applications, the substitution of Type 304L for Type 304, or Type 316L for Type 316 may be undesirable because of design, fabrication, or service requirements. In such cases, the purchaser should so indicate on the order.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale
Reproduction authorized per License Agreement with Monique Tyler (ASTMIHS Account); Tue Mar 14 10:34:18 EST 2006

TABLE 2 Mechanical Test Requirements

UNS Designation	Type	Condition (see 4.1)	Final Operation	Tensile Strength,[A] min		Yield Strength,[B] min		Elongation in Length 4 × Gage Diameter of Test Specimens,[C] min, %	Reduction of Area, min, %
				ksi	[MPa]	ksi	[MPa]		
Austenitic Grades									
S20161	. . .	A	cold finished annealed	125	[860]	50	[345]	40	40
S20910	XM-19	A	cold finished annealed	100	[690]	55	[380]	35	55
S21400	XM-31	A	cold finished	130	[900]	85	[585]	24	60
			annealed	100	[690]	50	[345]	40	65
		B	cold finished	220	[1520]	190	[1310]	5	50
S21800	. . .	A	cold finished annealed	95	[655]	50	[345]	35	55
S21900 and S21904	XM-10 and XM-11	A	cold finished annealed	90	[620]	50	[345]	45	60
S24000 and S24100	XM-29 and XM-28	A	cold finished annealed	100	[690]	55	[380]	30	50
S28200	. . .	A	cold finished annealed	110	[760]	60	[415]	35	55
		B	cold finished	175	[1210]	150	[1035]	15	50
S30200, S30215, S30400, S30500, S30800, S30900, S30908, S30940, S31000, S31008, S31400, S31600, S31700, S32100, S34700,S34800	302, 302B, 304, 305, 308, 309, 309S, 309Cb, 310, 310S, 314, 316, 317, 321, 347, 348	A	cold finished	90	[620]	45	[310]	30[D]	40[D]
			annealed	75	[520]	30	[210]	35[D]	50[D]
S30403 and S31603	304L and 316L	A	cold finished	90	[620]	45	[310]	30[D]	40[D]
			annealed	70	[485]	25	[170]	35[D]	50[D]
Ferritic Grades									
S40976	. . .	A	annealed	60	[415]	20	[140]	20	45
S40500,[E] S43000,	405, 430,	A	cold finished	70	[485]	40	[275]	16	45
S44401, S44600	. . ., 446		annealed	70	[485]	40	[275]	20	45
S44700 and S44800	. . ., . . .	A	cold finished	75	[520]	60	[415]	15	30
			annealed	70	[485]	55	[380]	20	40
S44535	. . .	A	cold finished annealed	58	[400]	36	[250]	20[F]	. . .
Martensitic Grades									
S40300 and S41000	403 and 410	A	cold finished	70	[485]	40	[275]	16	45
			annealed	70	[485]	40	[275]	20	45
		T	cold finished	100	[690]	80	[550]	12	40
		H	cold finished	120	[830]	90	[620]	12	40
S41400	414	A	cold finished	150 max	[1035] max	. . .	. . .	. . .	. . .
S42000	420	A	cold finished	125 max	[860] max	. . .	. . .	. . .	. . .
S43100, S44002, S44003, S44004	431, 440A, 440B, 440C	A	cold finished	140 max	[965] max	. . .	. . .	. . .	. . .

[A] Minimum unless otherwise noted.

[B] Yield strength shall be determined by the 0.2 % offset method in accordance with Test Methods and Definitions A 370. An alternative method of determining yield strength, based on a total extension under load of 0.5 %, may be used.

[C] For wire products, it is generally necessary to use sub-size test specimens in accordance with Test Methods and Definitions A 370.

[D] For material 5⁄32 in. [3.96 mm] and under in size, the elongation and reduction in area shall be 25 % and 40 %, respectively.

[E] Material shall be capable of being heat treated to a maximum hardness of HRC 25 when oil quenched from 1750°F [955°C].

[F] Elongation requirement for S44535 applies only to diameters greater or equal to 0.003 in. [0.08 mm].

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale
Reproduction authorized per License Agreement with Monique Tyler (ASTMIHS Account); Tue Mar 14 10:34:18 EST 2006

4.2.1 *Cold Drawn*—A finish resulting from a final cold drawing pass, generally with cold drawing lubricant left on. Special bright finishes, lubricant removal, etc., for special end uses must be negotiated with the producer.

4.2.2 *Annealed and Pickled*—A dull matte appearance necessarily associated with the dead-soft condition when no final cold drawing is permitted.

5. Chemical Composition

5.1 The steel shall conform to the requirements as to chemical composition specified in Table 1.

6. Mechanical Requirements

6.1 The material shall conform to the mechanical test requirements specified in Table 2.

6.2 The martensitic grades shall be capable of meeting the hardness requirements, after heat treating, as specified in Table 3.

7. General Requirements for Delivery

7.1 In addition to the requirements of this specification, all requirements of the current edition of Specification A 555/A 555M shall apply. Failure to comply with the general requirements of Specification A 555/A 555M constitutes nonconformance with this specification.

8. Keywords

8.1 stainless steel; wire

TABLE 3 Response to Heat Treatment

Type[A]	Heat Treatment[B] Temperature °F [°C]	Quenchant	Hardness HRC, min
403	1750 [955]	Air	35
410	1750 [955]	Air	35
414	1750 [955]	Oil	42
420	1825 [1000]	Air	50
431	1875 [1025]	Oil	40
440A	1875 [1025]	Air	55
440B	1875 [1025]	Oil	56
440C	1875 [1025]	Air	58

[A] Samples for testing shall be in the form of a section not exceeding ⅜ in. (9.50 mm) in thickness.
[B] Temperature tolerance is ±25°F [±15°C].

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue, A 580/A 580 – 98 (2004), that may impact the use of this standard. (Approved March 1, 2006.)

(*1*) Added new grade S44535 to Tables 1 and 2.

(*2*) Added Footnote F to Table 2.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Copyright by ASTM Int'l (all rights reserved);
Reproduction authorized per License Agreement with Monique Tyree (ASTMIHS Account); Tue Mar 14 10:34:18 EST 2006
Not for Resale