



Designation: **A473 – 13 A473 – 15**

Standard Specification for Stainless Steel Forgings¹

This standard is issued under the fixed designation A473; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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

1. Scope*

1.1 This specification covers austenitic, austenitic-ferritic, ferritic, and martensitic stainless steel forgings for general use, and for low- or high-temperature service.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 Supplementary requirements from Specification [A788/A788M](#) may be specified when additional testing, inspection, or processing is required.

2. Referenced Documents

2.1 *ASTM Standards:*²

~~A314 Specification for Stainless Steel Billets and Bars for Forging~~

~~A370 Test Methods and Definitions for Mechanical Testing of Steel Products~~

~~A484/A484M Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings~~

~~A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products~~

~~A788/A788M Specification for Steel Forgings, General Requirements~~

~~A1058 Test Methods for Mechanical Testing of Steel Products—Metric~~

~~E8/E8M Test Methods for Tension Testing of Metallic Materials~~

~~E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)~~

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 or number of pieces),

3.1.2 Dimensions, including prints or sketches,

3.1.3 Name of material (stainless steel forgings),

3.1.4 Type or UNS designation ([Table 1](#)),

3.1.5 Condition ([Table 2](#)), and

3.1.6 ASTM designation and date of issue.

3.1.7 Test for magnetic permeability if specified by customer purchase order when ordering Types 207 and 205.

3.1.8 Special requirements.

3.2 If possible the intended end use of the item should be given on the purchase order especially when the item is ordered for a specific end use or uses.

NOTE 1—A typical ordering description is as follows: 5 stainless steel forgings, Type 410, Designation A, ASTM Specification A473 dated _____, _____. End use: pump blocks for oil well equipment.

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 A01.06 on Steel Forgings and Billets.

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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.

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

TABLE 1 Chemical Requirements^A

UNS Designation ^B	Type Number	Carbon, %	Manganese, %	Phosphorus, %	Sulfur, %	Silicon, %	Chromium, %	Nickel, %	Molybdenum, %	Nitrogen, %	Other Elements, %
Austenitic Grades											
S20100	201	0.15	5.5–7.5	0.060	0.030	1.00	16.0–18.0	3.5–5.5	...	0.25	
S20200	202	0.15	7.5–10.0	0.060	0.030	1.00	17.0–19.0	4.0–6.0	...	0.25	
S20500	205	0.12–0.25	14.0–15.5	0.060	0.030	1.00	16.5–18.0	1.00–1.75	...	0.32–0.40	
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	
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	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	
S30215	302B	0.15	2.00	0.045	0.030	2.00–3.00	17.0–19.0	8.0–10.0	...	...
S30300	303	0.15	2.00	0.20	0.15 min	1.00	17.0–19.0	8.0–10.0	0.60 ^C	...	
S30323	303 Se	0.15	2.00	0.20	0.06	1.00	17.0–19.0	8.0–10.0	...	...	Se 0.15 min
S30400	304	0.08	2.00	0.045	0.030	1.00	18.0–20.0	8.0–10.5	...	0.10	
S30403	304L	0.030	2.00	0.045	0.030	1.00	18.0–20.0	8.0–12.0	...	0.10	
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	...	...
S30815	...	0.10	0.80	0.040	0.030	1.40–2.00	20.0–22.0	10.0–12.0	...	0.14–0.20	Ce 0.03–0.08
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	...	...
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	...	...
S31254	...	0.020	1.00	0.030	0.010	0.80	19.5–20.5	17.5–18.5	6.0–6.5	0.18–0.25	Cu 0.50–1.00
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	
S31603	316L	0.030	2.00	0.045	0.030	1.00	16.0–18.0	10.0–14.0	2.00–3.00	0.10	
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	
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 0.10 Co 0.20
Austenitic-Ferritic Grades											
S32550 ^D	...	0.04	1.50	0.040	0.030	1.00	24.0–27.0	4.5–6.5	2.9–3.9	0.10–0.25	Cu 1.50–2.50
S32760 ^D	...	0.030	1.00	0.030	0.010	1.00	24.0–26.0	6.0–8.0	3.0–4.0	0.20–0.30	Cu 0.50–1.00 W 0.50–1.00
S32950	...	0.03	2.00	0.035	0.010	0.60	26.0–29.0	3.5–5.2	1.00–2.50	0.15–0.35	
Ferritic Grades											
S40500	405	0.08	1.00	0.040	0.030	1.00	11.5–14.5	0.60	...	...	A1 0.10–0.30
S42900	429	0.12	1.00	0.040	0.030	1.00	14.0–16.0	0.75	...	...
S43000	430	0.12	1.00	0.040	0.030	1.00	16.0–18.0	0.75	...	...
S43020	430F	0.12	1.25	0.06	0.15 min	1.00	16.0–18.0	0.75	0.60 ^C	...	
S43023	430F Se	0.12	1.25	0.06	0.06	1.00	16.0–18.0	0.75	...	...	Se 0.15 min
S44600	446	0.20	1.50	0.040	0.030	1.00	23.0–27.0	0.75	...	0.25	
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	0.75	...	...
S41008	410S	0.08	1.00	0.040	0.030	1.00	11.5–13.5	0.75	...	...
S41400	414	0.15	1.00	0.040	0.030	1.00	11.5–13.5	1.25–2.50	...	...
S41425	...	0.05	0.50–1.00	0.020	0.005	0.50	12.0–15.0	4.0–7.0	1.50–2.00	0.06–0.12	Cu 0.30
S41500	^E	0.05	0.5–1.0	0.030	0.030	0.60	11.5–14.0	3.5–5.5	0.40–0.80	...	
S41600	416	0.15	1.25	0.06	0.15 min	1.00	12.0–14.0	...	0.60 ^C	...	
S41623	416 Se	0.15	1.25	0.06	0.06	1.00	12.0–14.0	...	...	...	Se 0.15 min
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	...	
S44003	440B	0.75–0.95	1.00	0.040	0.030	1.00	16.0–18.0	...	0.75	...	
S44004	440C	0.95–1.20	1.00	0.040	0.030	1.00	16.0–18.0	...	0.75	...	

^A Maximum, unless range or minimum is indicated.

^B New designation established in accordance with Practice E527 and SAE J 1086.

^C At manufacturer's option; reported only when intentionally added.

^D %Cr + 3.3 × %Mo + 16 × %N ≥ 40.

^E Wrought version of CA6NM.

4. General Requirements

4.1 Material supplied to this specification shall conform to the requirements of Specification A788/A788M, which outlines additional ordering information, manufacturing requirements, testing and retesting methods and procedures, marking, certification, product analysis variations, and additional supplementary requirements.

TABLE 2 Mechanical Property Requirements

Type	Condition	Yield Strength, min, ksi (MPa) ^A	Tensile Strength, min, ksi (MPa)	Elongation in 2 in. (50 mm) or 4D, min %	Reduction of Area, min, %	Brinell Hardness Number, max
Austenitic Grades						
201, 302, 302B, 303, 303SE, 305, 308, 309, 309S, 310, 310S, 314, 317, 321, 347, 348	A	30 (205)	75 (515)	40	50	...
202	A	45 (310)	90 (620)	40	50	...
205	A	50 (345)	90 (620)	40	50	...
304 and 316, Sections 5 in. (127 mm) and Under	A	30 (205)	75 (515)	40	50	...
304 and 316, Sections Over 5 in. (127 mm)	A	30 (205)	70 (485)	40	50	...
304L and 316L	A	25 (170)	65 (450)	40	50	...
XM-10 and XM-11	A	50 (345)	90 (620)	45	60	...
S28200	A	60 (415)	110 (760)	40	55	...
S30815	A	45 (310)	87 (600)	40	50	...
S31254	A	44 (300)	95 (650)	35	50	...
Austenitic-Ferritic Grades						
S32550	A	80 (550)	109 (750)	25.0	...	290
S32950	A	70 (480)	100 (690)	15	...	293
S32760	A	80 (550)	109 (750)	25	...	290
Ferritic Grades						
430F, 430FSE, 446	A	40 (275)	70 (485)	20	45	223
405	A	30 (205)	60 (415)	20	45	207
429	A	35 (240)	65 (450)	23	45	207
430	A	35 (240)	70 (485)	20	45	217
Martensitic Grades						
403, 410, 416, 416SE	A	40 (275)	70 (485)	20	45	223
410S	A	35 (240)	65 (450)	22	45	217
414	A	...	...	...	...	298
	T	90 (620)	115 (795)	15	45	321
	H	100 (690)	125 (860)	15	45	321
S41425	T	120 (825)	95 (655)	15	45	321
S41500	normalized and tempered	90 (620)	115 (795)	15	45	295
420	A	...	...	...	...	223
431	A	...	...	...	...	277 ^B
	T	90 (620)	115 (795)	15	...	321
	H	135 (930)	175 (1210)	13	...	440
440A, 440B, 440C	A	...	...	...	...	269

^A Yield strength shall be determined by the 0.2 % offset method in accordance with Test Methods and Definitions A370. An alternative method of determining yield strength may be used based on a total extension under load of 0.5 %.

^B Type 431 forgings of designation A, when specified, shall be capable of meeting the above mechanical property requirements of designation T after oil quenching from 1800 to 1900°F (980 to 1038°C) and tempering at not less than 1100°F (595°C), or designation H when oil quenched from 1850 to 1950°F (1010 to 1065°C) and tempered at not more than 700°F (370°C).

~~4.2 In addition to~~ If the requirements of this specification, all requirements of the current edition of Specification ~~specification are in conflict A484/A484M shall apply. Failure to comply with the general requirements of Specification A484/A484M A788/A788M constitutes nonconformance with this specification.~~, the requirements of this specification shall prevail.

5. Manufacture

5.1 Material for forgings shall consist of ingots or blooms, billets, slabs, or bars, either forged or rolled from an ingot, and cut to the required length by a suitable process. ~~This material, except for ingots, may be specified to Specification A314.~~

5.2 The material shall be forged by hammering, pressing, rolling, extruding, or upsetting. It shall be brought as nearly as possible to the finished shape and size by hot-working; and shall be processed, if practicable, so as to cause metal-flow during the hot-working operation in the direction most favorable for resisting the stresses encountered in service as may be indicated to the manufacturer by the purchaser.