



ASTM A182 Flange Specification

Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

This standard is issued under the fixed designation A182/A182M; 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 revision.

A number in parentheses indicates the year of last reapproval. A superscript epsilon indicates an editorial change since the last revision or reapproval.

For more info please visit <https://www.octalflange.com/astm-a182/>

Table 1 - Chemical Requirements of ASTM A182

Grade/Identification Symbol	UNS Designation	Chemical Composition (%)										
		carbon	Manganese	Phosphorus	Sulfur	Silicon	Nickel	Chromium	Molybdenum	Columblum	Titanium	Other Elements
<i>Low Alloy Steels</i>												
F5 ^C	K41545	0.15	0.30-0.60	0.030	0.030	0.50	0.50	4.0-6.0	0.44-0.65	...	...	...
F9	K90941	0.15	0.30-0.60	0.030	0.030	0.50-1.00	...	8.0-10.0	0.90-1.10	...	...	...
F91	K90941	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	0.40	8.0-9.5	0.85-1.05	0.06-0.10		N 0.03-0.07 Al 0.02 ^D Ti 0.01 ^D Zr 0.01 ^D
F92	K92460	0.07-0.13	0.30-0.60	0.020	0.010	0.50	0.40	8.50-9.50	0.30-0.60	0.04-0.09		V 0.15-0.25 N 0.030-0.070 Al 0.02 ^D W 1.50-2.00 B 0.007-0.015 Ti 0.01 ^D Zr 0.01 ^D
F11, Class 1	K11597	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	...	1.00-1.50	0.44-0.65	...	...	...
F11, Class 2	K11572	0.10-0.20	0.30-0.80	0.040	0.040	0.50-1.00	...	1.00-1.50	0.44-0.65	...	...	...
F11, Class 3	K11572	0.10-0.20	0.30-0.80	0.040	0.040	0.50-1.00	...	1.00-1.50	0.44-0.65	...	...	...
F12, Class 1	K11562	0.05-0.15	0.30-0.60	0.045	0.045	0.50 max	...	0.80-1.25	0.44-0.65	...	...	...
F12, Class 2	K11564	0.10-0.20	0.30-0.80	0.040	0.040	0.10-0.60	...	0.80-1.25	0.44-0.65	...	...	...
F21	K31545	0.05-0.15	0.30-0.60	0.040	0.040	0.50 max	...	2.7-3.3	0.80-1.06	...	...	...
F22, Class 1	K21590	0.05-0.15	0.30-0.60	0.040	0.040	0.50		2.00-2.50	0.87-1.13	...	...	...
F22, Class 3	K21590	0.05-0.15	0.30-0.60	0.040	0.040	0.50		2.00-2.50	0.87-1.13	...	...	...
<i>Austenitic Stainless Steels</i>												
F304	S30400	0.080	2.00	0.045	0.030	1.00	8.0-11.0	18.0-20.0	...	...	...	N 0.10
F304L	S30403	0.030	2.00	0.045	0.030	1.00	8.0-13.0	18.0-20.0	...	...	...	N 0.10
F316	S31600	0.080	2.00	0.045	0.030	1.00	10.0-14.0	16.0-18.0	2.00-3.00	...	...	N 0.10
F316L	S31603	0.030	2.00	0.045	0.030	1.00	10.0-15.0	16.0-18.0	2.00-3.00	...	...	N 0.10
F321	S32100	0.080	2.00	0.045	0.030	1.00	9.0-12.0	17.0-19.0	...	...	I	...

C. The present grade F 5a (0.25 max carbon) previous to 1995 was assigned the identification symbol F 5. Identification symbol F 5 in 1955 was assigned to the 0.15 max carbon grade to be consistent with ASTM specification for other products such as pipe, tubing, bolting, welding fittings, and the like.

D. Applies to both heat and product analyses.

I. Grade F 321 shall have a titanium content of not less than five times the carbon content and not more than 0.70%.

Table 2 - Mechanical Properties of ASTM A182

Grade Symbol	Tensile Strength, min, ksi [MPa]	Yield Strength, min, ksi [MPa] ^B	Elongation in 2 in. [50 mm] or 4D, min, %	Reduction of Area, min, %	Brienell Hardness Number, HBW, unless otherwise indicated
Low Alloy Steels					
F5	70 [485]	40 [275]	20	35	143-217
F9	85 [585]	55 [380]	20	40	179-217
F91	90 [620]	60 [415]	20	40	190-248
F92	90 [620]	64 [440]	20	45	269 max
F11, Class 1	60 [415]	30 [205]	20	45	121-174
F11, Class 2	70 [485]	40 [275]	20	30	143-207
F11, Class 3	75 [515]	45 [310]	20	30	156-207
F12, Class 1	60 [415]	32 [220]	20	45	121-174
F12, Class 2	70 [485]	40 [275]	20	30	143-207
F21	75 [515]	45 [310]	20	30	156-207
F22, Class 1	60 [415]	30 [205]	20	35	170 max
F22, Class 3	75 [515]	45 [310]	20	30	156-207
Austenitic Stainless Steels					
F304	75 [515] ^C	30 [205]	30	50	...
F304L	70 [485] ^D	25 [170]	30	50	...
F316	75 [515] ^C	30 [205]	30	50	...
F316L	70 [485] ^D	25 [170]	30	50	...
F321	75 [515]	30 [205]	30	50	...

C. For sections over 5 in. [130 mm] in thickness, the minimum tensile strength shall be 70 ksi [485 MPa].

D. For sections over 5 in. [130 mm] in thickness, the minimum tensile strength shall be 65 ksi [450 MPa].

Table 3 -Heat Treatment Requirements of ASTM A182

Grade	Heat Treat Type	Austenitizing/ Solutioning Temperature, Minimum or Range, °F [°C] ^A	cooling Media	Quenching Cool Below °F [°C]	Tempering, Temperature, Minimum or Range, °F [°C]
Low Alloy Steels					
F5	anneal	1750 [955]	furnace cool	B	^B
	normalize and temper	1750 [955]	air cool	B	1250 [675]
F9	anneal	1750 [955]	furnace cool	B	^B
	normalize and temper	1750 [955]	cool or liquid	B	1250 [675]
F91	normalize and temper or quench and temper	1900-1975 [1040-1080]	air cool accelerated air	B	1350-1470 [730-800]
			cool or liquid	B	
F92	normalize and temper	1900-1975 [1040-1080]	air cool	B	1350-1470 [730-800]
F11, Class 1, 2, 3	anneal	1650 [900]	furnace cool	B	^B
	normalize and temper	1650 [900]	air cool	B	1150 [620]
F12, Class 1, 2	anneal	1650 [900]	furnace cool	B	^B
	normalize and temper	1650 [900]	air cool	B	1150 [620]
F21	anneal	1750 [955]	furnace cool	B	^B
	normalize and temper	1750 [955]	air cool	B	1250 [675]
F22, Class 1, 3	anneal	1650 [900]	furnace cool	B	B
	normalize and temper	1650 [900]	air cool	B	1250 [675]
Austenitic Stainless Steels					
F304	solution treat and quench	1900 [1040]	liquid ^E	500 [260]	^B
F304L	solution treat and quench	1900 [1040]	liquid ^E	500 [260]	^B
F316	solution treat and quench	1900 [1040]	liquid ^E	500 [260]	^B
F316L	solution treat and quench	1900 [1040]	liquid ^E	500 [260]	^B
F321	solution treat and quench	1900 [1040]	liquid ^E	500 [260]	^B

A. Minimum unless temperature range is listed

B. Not applicable

E. Forged or rolled bar meeting the requirements of 7.5 shall be liquid quenched or rapid-cooled by other means in accordance with Specification A484/ A484M