

# ASTM - A815/A815M

## SPECIFICATION FOR WROUGHT FERRITIC, FERRITIC/ AUSTENITIC, AND MARTENSITIC STAINLESS STEEL PIPING FITTINGS

This specification covers two general classes, WP and CR, of wrought ferritic, ferritic/austenitic, and martensitic stainless steel fittings of seamless and welded construction covered by the latest revision of Specification A960/A960M. Fittings differing from these standards may be furnished in accordance with Supplementary Requirement S58 of Specification A960/A960M.

Class WP fittings are subdivided into four subclasses: Classes WP-S, WP-W, WP-WX, and WP-WU.

Class WP-S fittings are those manufactured from seamless product by a seamless method of manufacture

Class WP-W fittings are those which contain welds where the fitting fabrication or construction welds have been radiographed; and Class WP-WX fittings are those which contain welds where all welds have been radiographed; and Class WP-WU fittings are those which contain welds where all welds have been ultrasonically tested. Class CR fittings are those manufactured to the requirements of MSS SP-43.

### ❖ Heat Treatment :-

1. Unless otherwise stated herein, heat treatment shall be performed after welding and in accordance with the requirements of Table 1.
2. No final heat treatment of welded fittings (HT-O) fabricated from ferritic/austenitic plate that has been heat treated as required by Table 1 for the particular grade, is required, provided material representative of the fittings, including base metal, weld metal, and heat affected zone, passes a Test Methods A923 Method B or C corrosion evaluation per heat.
3. For materials not listed in Table 3 of Test Methods A923, the HT-O provision does not apply.

**Table 1**

Stainless Steel	All WP and CR Grades	Temperature	Cooling	Tempering Temperature
Ferritic	All	≥ 1200 °F [650 °C]	As appropriate for grade	Not specified
Ferritic/Austenitic	S31803	1870–2010 °F [1020–1100 °C]	Water quench or rapidly cooled by other means	Not required
	S32101	1870 °F [1020 °C] min	Water quench or rapidly cooled by other means	Not required
	S32202	1870–1975 °F [1020–1080 °C]	Water quench or rapidly cooled by other means	Not required
	S32205	1870–2010 °F [1020–1100 °C]	Water quench	Not required
	S32750	1920–2060 °F [1025–1125 °C]	Water quench or rapidly cooled by other means	Not required
	S32760	2010–2085 °F [1100–1140 °C]	Water quench or rapidly cooled by other means	Not required

	S39274	1920–2060 °F [1025–1125 °C]	Water quench or rapidly cooled by other means	Not required
	S32550	1950–1975 °F [1065–1080 °C]	Water quench	Not required
	S32950	Not specified	Not specified	Not required
Martensitic	S41000	≥ 1200°F [650°C]	Not specified	Not specified
	S41008	>1200°F [650°C]	In still air as appropriate for grade	Not specified
	S41500	≥ 1750 °F [955 °C]	Air cool to ≤ 200 °F [95 °C] prior to any optional intermediate temper and prior to final temper.	1050–1150 °F [565–620 °C]

❖ **Chemical Composition :-**

The steel shall conform to the chemical composition in Table 2.

**Table 2**

Grade WP <sup>A</sup>	Grade CR <sup>A</sup>	UNS	C, max	Mn <sup>B</sup>	P, max	S, max	Si, max	Ni <sup>B</sup>	Cr	Mo	Cu <sup>B</sup>	N <sup>B</sup>	Ti	Other
Ferritic Steels														
WP27	CR27	S44627	0.01	0.75	0.02	0.02	0.4	0.5	25.0–27.5	0.75–1.50	0.2	0.015	...	Cb 0.05–0.20
WP33	CR33	S44626	0.06	0.75	0.04	0.02	0.75	0.5	25.0–27.0	0.75–1.50	0.2	0.04	0.20–1.00 (7×(C+N)) min	...
WP429	CR429	S42900	0.12	1	0.04	0.03	0.75	0.5	14.0–16.0	...	...	...	...	...
WP430	CR430	S43000	0.12	1	0.04	0.03	1	0.5	16.0–18.0	...	...	...	...	...
WP430Ti	CR430Ti	S43036	0.1	1	0.04	0.03	1	0.75	16.0–19.5	...	...	...	(5×C) min; 0.75max	...
WP446	CR446	S44600	0.2	1.5	0.04	0.03	0.75	0.5	23.0–27.0	...	...	0.25	...	...
Ferritic/Austenitic Steels														
WPS31803	CRS31803	S31803	0.03	2	0.03	0.02	1	4.5–6.5	21.0–23.0	2.5–3.5	...	0.08–0.20	...	...
WPS32101	CRS32101	S32101	0.04	4.0–6.0	0.04	0.03	1	1.35–1.70	21.0–22.0	0.10–0.80	0.1–0.8	0.20–0.25	...	...
WPS32202	CRS32202	S32202	0.03	2	0.04	0.01	1	1.00–2.80	21.5–24.0	0.45	...	0.18–0.26	...	...
WPS32750	CRS32750	S32750	0.03	1.2	0.035	0.02	0.8	6.0–8.0	24.0–26.0	3.0–5.0	0.5	0.24–0.32	...	...
WPS32950	CRS32950	S32950	0.03	2	0.035	0.01	0.6	3.5–5.2	26.0–29.0	1.00–2.50	...	0.15–0.35	...	...

WPS32760	CRS32760	S32760	0.03	1	0.03	0.01	1	6.0–8.0	24.0–26.0C	3.0–4.0 <sup>C</sup>	0.5–1.0	0.20–0.30 <sup>C</sup>	...	W 0.50–1.00
WPS39274	CRS39274	S32974	0.03	1	0.03	0.02	0.8	6.0–8.0	24.0–26.0	2.503.50 <sup>C</sup>	0.2–0.8	0.24–0.32	...	W 1.50–2.50
WPS32550	CRS32550	S32550	0.04	1.5	0.04	0.03	1	4.5–6.5	24.0–27.0	2.9–3.9	1.5–2.5	0.10–0.25	...	...
WPS32205	CRS32205	S32205	0.03	2	0.03	0.02	1	4.5–6.5	22.0–23.0	3.0–3.5	...	0.14–0.20	...	...
Martensitic Steels														
WP410	CR410	S41000	0.15	1.00	0.040	0.030	1.00	0.50 max	11.5–13.5	...	...	...	...	...
WPS41008	CRS41008	S41008	0.08	1.00	0.040	0.030	1.00	0.60	11.5–13.5	...	...	...	...	...
WPS41500	CRS41500	S41500	0.05	0.5–1.0	0.03	0.030	0.6	3.5–5.5	11.5–14.0	0.5–1.0	...	...	...	W 0.50–1.00

<sup>A</sup> Naming system developed and applied by ASTM International.

<sup>B</sup> Maximum unless otherwise indicated.

<sup>C</sup>  $\%Cr + 3.3 \times \%Mo + 16 \times \%N = 40 \text{ min.}$

❖ **Tensile Requirements :-**

1. The tensile properties of the fitting material shall conform to the requirements of Table 3. The testing and reporting shall be performed in accordance with Specification A960/ A960M.

❖ **Hardness Requirements :-**

Fittings shall not exceed the maximum hardness shown in Table 3.

**Table 3**

All WP and CR Grades	Yield Strength, min, ksi [MPa]	Tensile Strength, <sup>A</sup> ksi [MPa]	Elongation in 2 in.[50 mm] or 4D, min, %	HBW max
Ferritic Steels:				
S44627	40[275]	65[450]–90[620]	20	190
S44626	45[310]	68[470]–93[640]	20	241
S42900	35[240]	60[415]–85[585]	20	190
S43000	35[240]	65[450]–90[620]	20	190
S43036	35[240]	60[415]–85[585]	20	190
S44600	40[275]	70[485]–95[655]	18	207
Ferritic/Austenitic Steels:				

S31803	65[450]	90[620]	20	290
S32101	65[450]	94[650]	30	290
S32202	65[450]	94[650]	30	290
S32205	65[450]	95[655]	20	290
S32750	80[550]	116[800]–140[965]	15	310
S32760	80[550]	109[750]–130[895]	25	270
S32950	70[485]	100[690]	15	290
S39274	80[550]	116[800]	15	310
S32550	80[550]	110[760]	15	302
Martensitic Steels:				
S41000	30[205]	70[485]–95[655]	20	207
S41008	30[205]	60[415]	22	183
S41500	90[620]	110[760]–135[930]	15	295

<sup>A</sup> Minimum unless otherwise indicated.

❖ **Hydrostatic Tests :-**

1. Hydrostatic testing is not required by this specification.

❖ **Supplementary Test :-** 1. Tension Test.

2. Intergranular Corrosion Bend Test.
3. Ultrasonic Test.
4. Liquid Penetrant Test.

**Keyword**

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