1 Scope at a Glance

Product	Wrought austenitic stainless steel **piping fittings** for pressure service — elbows, tees, reducers, caps, stub ends. Cast fittings are excluded.
Grade Prefix	**WP** — dimensions and ratings per ASME; **CR** — per MSS SP-43.
Classes	**S** seamless · **W** welded, RT or UT of welds · **WX** welded, RT of all welds · **WU** welded, UT of all welds. CR grades have no classes.
Starting Material	Forgings, bar, plate, or seamless / welded tubular products; electric furnace, vacuum furnace or remelted steel.
Product Forms	Butt-welding fittings (ASME B16.9 / B16.28) · socket-weld & threaded fittings, classes 3000 / 6000 / 9000 (ASME B16.11) · lightweight CR fittings & stub ends (MSS SP-43) · reducer inserts (MSS SP-79).
Base Standards	ASTM A 960 (common requirements); ASME B16.9 / B16.11 / B16.28; MSS SP-43 / SP-79.

2 Chemical Requirements — Common Grades (Table 2, excerpt, %)

UNS	Type	C	Mn	P	S	Si	Ni	Cr	Mo
S30400	304	0.08 max	2.00	0.045	0.030	1.00	8.0–11.0	18.0–20.0	—
S30403	304L	0.030 max	2.00	0.045	0.030	1.00	8.0–12.0	18.0–20.0	—
S30409	304H	0.04–0.10	2.00	0.045	0.030	1.00	8.0–11.0	18.0–20.0	—
S30900	309	0.20 max	2.00	0.045	0.030	1.00	12.0–15.0	22.0–24.0	—
S31008	310S	0.08 max	2.00	0.045	0.030	1.00	19.0–22.0	24.0–26.0	—
S31600	316	0.08 max	2.00	0.045	0.030	1.00	10.0–14.0	16.0–18.0	2.00–3.00
S31603	316L	0.030 max	2.00	0.045	0.030	1.00	10.0–14.0	16.0–18.0	2.00–3.00
S31609	316H	0.04–0.10	2.00	0.045	0.030	1.00	10.0–14.0	16.0–18.0	2.00–3.00
S31700	317	0.08 max	2.00	0.045	0.030	1.00	11.0–15.0	18.0–20.0	3.00–4.00
S31703	317L	0.030 max	2.00	0.045	0.030	1.00	11.0–15.0	18.0–20.0	3.00–4.00
S32100	321	0.08 max	2.00	0.045	0.030	1.00	9.0–12.0	17.0–19.0	—
S32109	321H	0.04–0.10	2.00	0.045	0.030	1.00	9.0–12.0	17.0–19.0	—
S34700	347	0.08 max	2.00	0.045	0.030	1.00	9.0–12.0	17.0–19.0	—
S34709	347H	0.04–0.10	2.00	0.045	0.030	1.00	9.0–12.0	17.0–19.0	—

The specification also covers N / LN grades (304N, 316LN), XM-19 (S20910), super-austenitics S31254, S31725/26, S34565 and S33228, plus 348 / 348H. All values in mass %.

3 Heat Treatment

- **Solution anneal at ≥ 1900°F (1040°C)** followed by cooling fast enough to prevent carbide reprecipitation — all fittings furnished heat treated.
- **H grades** require a separate solution anneal (in-process treatment is not a substitute) and a grain size of 7 or coarser per ASTM E 112.
- For 321 / 321H / 347 / 347H, annealing above 1950°F (1065°C) may impair intergranular corrosion resistance — optional stabilization anneal per S2.
- All welding is completed before heat treatment. Fittings machined from already solution-annealed stock need not be re-annealed.

4 Tensile Requirements (Table 4)

Grades	Yield, min ksi (MPa)	Tensile, min ksi (MPa)
304 / 304H / 304LN, 309, 310, 316 / 316H / 316LN, 317 / 317L, 321 / 321H, 347 / 347H, 348 / 348H	30 (205)	75 (515)
304L, 316L	25 (170)	70 (485)
304N, 316N, S31726	35 (240)	80 (550)
S31725	42 (290)	92 (635)
XM-19 (S20910)	55 (380)	100 (690)
S31254	44 (300)	94 (650) – 119 (820)
S33228	27 (185)	73 (500)
S34565	60 (415)	115 (795)

Elongation, min: 28 % longitudinal / 20 % transverse. A tension test on the starting material may serve as certification when the heat treatment is identical.

5 Testing, Surface Quality & Marking

- **Welded classes** — W: RT or UT of manufacturer welds; WX: RT of all welds (ASME UW-51); WU: UT of all welds (Appendix 12). NDE personnel qualified to SNT-TC-1A.
- **Hydrostatic** — not required, but every fitting must withstand the test pressure of the matching pipe (CR tees: 70 % of MSS SP-43 rating).
- **Surface** — discontinuities deeper than 5 % of nominal wall removed; remaining wall ≥ 87.5 %. Fish scale > 1/64 in. (0.4 mm) and mechanical marks > 1/16 in. (1.6 mm) removed. Scale-free and passivated.
- **Test report** — chemistry, mechanical properties, heat-treatment type, NDE results, weld process and heat numbers (Section 13).
- **Marking** — per MSS SP-25: manufacturer, size, schedule / wall, grade and class, e.g. **WP304-S**, **WP304-WX**, **WP304/304L**. No metal stamps below 0.083 in. (2.1 mm) wall.

6 Ordering Information

To describe the material adequately, an order should state: quantity (number of pieces) · product description (elbow, tee, reducer, cap, stub end…) · designation **WP** or **CR** · grade and class (e.g. WP316/316L-WX) · size and schedule / pressure class · reference dimensional standard (B16.9, B16.11, MSS SP-43…) · heat treatment (solution annealed) · test report required (EN 10204 3.1 / 3.2) · specification designation and year-date.

7 Common Grades & Typical Service

Grade	Typical service
304 / 304L	General corrosive service, water, food and dairy; 304L for welded assemblies.
316 / 316L	Marine and chloride-bearing environments, pulp and paper, chemical processing.
321 / 347	High-temperature service with intermittent heating — Ti- and Cb-stabilized.
310S / XM-19 / S31254	Oxidizing high-temperature service; high-strength and high-molybdenum grades for severe chloride duty.

All ASTM A403 fittings are supplied with EN 10204 3.1 Mill Test Certificates, including chemical analysis, mechanical properties, class (S / W / WX / WU) and heat-number traceability.