



Designation: A 815/A 815M – 01a

## Standard Specification for Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings<sup>1</sup>

This standard is issued under the fixed designation A 815/A 815M; 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.

### 1. Scope

1.1 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 A 960. Fittings differing from these standards may be furnished in accordance with Supplementary Requirement S8.

1.1.1 Class WP fittings are subdivided into four subclasses: Classes WP-S, WP-W, WP-WX, and WP-WU. They are manufactured to the requirements of Specification A 960, and they shall have pressure ratings compatible with 12.2. Class WP-S fittings are those manufactured from seamless product by a seamless method of manufacture (marked with class symbol WP-S); Class WP-W fittings are those which contain welds where the fitting fabrication or construction welds have been radiographed (marked with class symbol WP-W); and Class WP-WX fittings are those which contain welds where all welds have been radiographed (marked with class symbol WP-WX); and Class WP-WU fittings are those which contain welds where all welds have been ultrasonically tested (marked with class symbol WP-WU).

1.1.2 Class CR fittings are those manufactured to the requirements of MSS SP-43, and they shall have pressure ratings compatible with 12.3.

1.2 This specification does not apply to cast fittings.

1.3 Optional supplementary requirements are provided. When desired, one or more of these may be specified in the order.

1.4 This specification is expressed in both inch-pound units and in SI units. However, unless the order specifies the applicable “M” specification designation [SI units], the material shall be furnished to inch-pound units.

1.5 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must

be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels<sup>2</sup>
- A 370 Test Methods and Definitions for Mechanical Testing of Steel Products<sup>2</sup>
- A 388/A 388M Practice for Ultrasonic Examination of Heavy Steel Forgings<sup>3</sup>
- A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products<sup>2</sup>
- A 763 Practices for Detecting Susceptibility to Intergranular Attack in Ferritic Stainless Steels<sup>2</sup>
- A 960 Specification for Common Requirements for Wrought Steel Piping Fittings<sup>4</sup>
- E 165 Test Method for Liquid Penetrant Examination<sup>5</sup>

#### 2.2 ASME Standards:<sup>6</sup>

- B16.9 Wrought Steel Butt-Welding Fittings
- B16.11 Forged Steel Fittings, Socket-Welding and Threaded
- B16.28 Wrought Steel Butt-Welding Short Radius Elbows and Returns

#### 2.3 MSS Standards:<sup>7</sup>

- SP-43 Standard Practice for Light Weight Stainless Steel Butt-Welding Fittings
- SP-79 Socket-Welding Reducer Inserts

#### 2.4 ASME Boiler and Pressure Vessel Codes:<sup>6</sup>

- Section VIII Division I, Pressure Vessels

#### 2.5 ASNT Standard:<sup>8</sup>

- SNT-TC-1A(1984) Recommended Practice for Nondestructive Testing Personnel Qualification and Certification

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.22 on Steel Forgings and Wrought Fittings for Piping Applications and Bolting Materials for Piping and Special Purpose Applications.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.03.

<sup>3</sup> Annual Book of ASTM Standards, Vol 01.05.

<sup>4</sup> Annual Book of ASTM Standards, Vol 01.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 03.03.

<sup>6</sup> Available from American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

<sup>7</sup> Available from Manufacturers' Standardization Society of the Valve and Fittings Industry, 127 Park St., N.E., Vienna, VA 22180.

<sup>8</sup> Available from American Society for Nondestructive Testing, 4153 Arlington Plaza, P.O. Box 28518, Columbus, OH 43228-0518.



### 3. Common Requirements and Ordering Information

3.1 Material furnished to this specification shall conform to the requirements of Specification A 960 including any supplementary requirements that are indicated in the purchase order. Failure to comply with the common requirements of Specification A 960 constitutes nonconformance with this specification. In case of conflict between this specification and Specification A 960, this specification shall prevail.

3.2 Specification A 960 identifies the ordering information that should be complied with when purchasing material to this specification.

### 4. Materials

4.1 The material for fittings shall consist of forgings, bars, plates, or seamless or welded tubular products that conform to the chemical requirements in Table 1.

4.2 The steel shall be melted by one of the following processes:

4.2.1 Electric furnace (with separate degassing and refining optional),

4.2.2 Vacuum furnace, or

4.2.3 Electric furnace followed by vacuum or electroslag-consumable remelting.

4.3 If secondary melting is employed, the heat shall be defined as all ingots remelted from a primary heat.

### 5. Manufacture

5.1 *Forming*—Forging or shaping operations may be performed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, fusion welding, machining or by combination of two or more of these operations. The forming procedure shall be so applied that it will not produce surface discontinuities deeper than 5 % of the specified nominal thickness of the fitting.

5.2 All classes of fittings shall be heat treated in accordance with Section 6.

TABLE 1 Chemical Requirements

NOTE 1—Where an ellipsis ( . . . ) appears in this table, there is no requirement.

Grade	UNS	Composition, %											
		C, max	Mn, max	P, max	S, max	Si, max	Ni <sup>A</sup>	Cr	Mo	Cu, max	N	Ti	Other
Ferritic Steels													
WP27	S44627	0.010	0.75	0.020	0.020	0.40	0.50	25.0–27.5	0.75–1.50	0.20	0.015 max	...	Cb 0.05–0.20
WP33	S44626	0.06	0.75	0.040	0.020	0.75	0.50	25.0–27.0	0.75–1.50	0.20	0.040 max	0.20–1.00 (7×(C+N)) min	...
WP429	S42900	0.12	1.0	0.040	0.030	0.75	0.50	14.0–16.0	...	...	...	...	...
WP430	S43000	0.12	1.00	0.040	0.030	1.00	0.50	16.0–18.0	...	...	...	...	...
WP430TI	S43036	0.10	1.00	0.040	0.030	1.00	0.75	16.0–19.5	...	...	...	(5×C) min 0.75 max	...
WP446	S44600	0.20	1.50	0.040	0.030	0.75	0.50	23.0–27.0	...	...	0.25	...	...
Ferritic/Austenitic Steels													
S31803	S31803	0.030	2.00	0.030	0.020	1.0	4.5–6.5	21.0–23.0	2.5–3.5	...	0.08–0.20	...	...
S32750	S32750	0.030	1.20	0.035	0.020	0.8	6.0–8.0	24.0–26.0	3.0–5.0	0.5	0.24–0.32	...	...
S32950	S32950	0.030	2.00	0.035	0.010	0.60	3.5–5.2	26.0–29.0	1.00–2.50	...	0.15–0.35	...	...
S32760	S32760	0.030	1.00	0.030	0.010	1.00	6.0–8.0	24.0–26.0 <sup>B</sup>	3.0–4.0 <sup>B</sup>	0.50–1.00	0.20–0.30 <sup>B</sup>	...	W 0.50–1.00
S39274	S32974	0.030	1.00	0.030	0.020	0.80	6.0–8.0	24.0–26.0	2.50–3.50 <sup>B</sup>	0.20–0.80	0.24–0.32	...	W 1.50–2.50
S32550	S32550	0.04	1.50	0.040	0.030	1.00	4.5–6.5	24.0–27.0	2.9–3.9	1.50–2.50	0.10–0.25	...	...
S32205	S32205	0.030	2.00	0.030	0.020	1.00	4.5–6.5	22.0–23.0	3.0–3.5	...	0.14–0.20	...	...
Martensitic Steels													
WP410	S41000	0.15	1.00	0.040	0.030	1.00	0.50 max	11.5–13.5	...	...	...	...	...
	S41008	0.08	1.00	0.040	0.030	1.00	0.60	11.5–13.5	...	...	...	...	...
UNS	S41500	0.05	0.50–1.00	0.030	0.030	0.60	3.5–5.5	11.5–14.0	0.50–1.00	...	...	...	W 0.50–1.00

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

<sup>B</sup> % Cr + 3.3 × % Mo + 16 × % N = 40 min.



5.3 Fittings ordered as Class WP-S shall be of seamless construction and shall meet all requirements of Specification A 960.

5.4 Fittings ordered as Class WP-W shall meet the requirements of Specification A 960 and (1) shall have all welds made by the fitting manufacturer and all pipe welds made with the addition of filler metal radiographically examined throughout the entire length in accordance with Paragraph UW-51 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code; and (2) shall not require radiography of the starting pipe weld if the pipe was welded without the addition of filler metal. In place of radiographic examination, welds made by the fitting manufacturer may be ultrasonically examined in accordance with the code requirements stated in 5.6.

5.5 Fittings ordered as Class WP-WX shall meet the requirements of Specification A 960 and shall have all welds, whether made by the fitting manufacturer or the starting material manufacturer, radiographically examined throughout their entire length in accordance with Paragraph UW-51 of Section VIII, Division I of the ASME Boiler and Pressure Vessel Code. The radiography of welds for this class of fittings can be done either prior to or after forming at the option of the manufacturer.

5.6 Fittings ordered as Class WP-WU shall meet the requirements of Specification A 960 and shall have all welds, whether made by the fitting manufacturer or the starting material manufacturer, ultrasonically examined throughout their entire length in accordance with Appendix 12 of Section VIII, Division 1 of ASME Boiler and Pressure Vessel Code.

5.7 The radiography or ultrasonic examination for this class of fittings may be done at the option of the manufacturer, either prior to or after forming.

5.8 Personnel performing NDE examinations shall be qualified in accordance with SNT-TC-1A.

5.9 Fittings covered in Specification A 960 and ordered as CR shall meet the requirements of Specification A 960 and do not require nondestructive examination.

5.10 All classes of fittings shall have the welders, welding operators, and welded procedures qualified under the provisions of Specification A 960 except that starting pipe welds made without the addition of filler metal do not require such qualification.

5.11 All joints welded with filler metal shall be finished in accordance with the requirements of Paragraph UW-35 (a) of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code.

5.12 Fittings machined from bar shall be restricted to NPS 4 or smaller.

5.12.1 All caps machined from bar shall be examined by liquid penetrant in accordance with Practice E 165.

5.13 Weld buildup is permitted to dimensionally correct unfilled areas produced during cold forming of stub ends. Radiographic examination of the weld buildup shall not be required provided that all of the following steps are adhered to:

5.13.1 The weld procedure and welders or welding operators meet the requirements of 5.10,

5.13.2 Heat-treatment is performed after welding and prior to machining,

5.13.3 All weld surfaces are liquid penetrant examined in accordance with Appendix 8 of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, and

5.13.4 Repair of areas in the weld is permitted, but 5.13.1, 5.13.2, and 5.13.3 must be repeated.

5.14 Stub ends may be produced with the entire lap added as weld metal to a straight pipe section provided the welding satisfies the requirements of 5.10 for qualifications and 6.2 for post weld heat treatment.

5.14.1 *Class WP-W*—Radiographic inspection of the weld is required (see 5.4).

5.14.2 *Class WP-WX*—Radiographic inspection of all welds is required (see 5.5).

5.14.3 *Class WP-WU*—Ultrasonic inspection of all welds is required (see 5.6).

5.14.4 *Class CR*—Nondestructive examination is not required (see 5.9).

5.15 Stub ends may be produced with the entire lap added by the welding of a ring, made from plate or bar of the same alloy grade and composition, to the outside of a straight section of pipe, provided the weld is double welded, is a full penetration joint, satisfies the requirements of 5.10 for qualifications and 6.2 for post weld heat treatment.

5.15.1 *Class WP-W*—Radiographic inspection of all welds, made with the addition of filler metal is required (see 5.4).

5.15.2 *Class WP-WX*—Radiographic inspection of all welds, made with or without the addition of filler metal, is required (see 5.5).

5.15.3 *Class WP-WU*—Ultrasonic inspection of all welds, made with or without the addition of filler metal, is required (see 5.6).

5.15.4 *Class CR*—Nondestructive examination is not required (see 5.9).

## 6. Heat Treatment

6.1 All fittings shall be heat treated in accordance with the requirements specified in Table 2.

6.2 All welding shall be done prior to the heat treatment specified in Table 2.

6.3 All fittings machined directly from forgings or bars (see 5.12), previously heat treated in accordance with the requirements specified in Table 2, need not be reheat treated.

## 7. Chemical Composition

7.1 The chemical composition of each cast or heat shall be determined and shall conform to the requirements of the chemical composition for the respective grades of materials listed in Table 1. Methods and practices relating to chemical analyses required by this specification shall be in accordance with Methods, Practices, and Definitions A 751. Product analysis tolerances in accordance with Table 3 are applicable.

7.2 Except as listed below, in fittings of welded construction, the composition of the deposited weld shall conform to the same requirements as the base metal.

7.2.1 Welds on S32950 base metal shall be made with nominal 26 % Cr, 8 % Ni, 2 % Mo weld metal.

7.2.2 Welds on S31803 base metal shall conform to the same requirements as the base metal or shall be made with nominal 22 % Cr, 8 to 10 % Ni, 3 % Mo weld metal.