



Designation: **A958/A958M—17** **A958/A958M – 24**

## Standard Specification for Steel Castings, Carbon and Alloy, with Tensile Requirements, Chemical Requirements Similar to Standard Wrought Grades<sup>1</sup>

This standard is issued under the fixed designation A958/A958M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This specification covers carbon and low-alloy steel castings having chemical analyses similar to ~~that~~those of the standard wrought grades.

1.2 Several classes are covered and are designated by chemical composition as shown in **Table 1**.

1.3 Options for tensile properties are shown in **Tables 2 and 3**.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.4.1 Within the text, the SI units are shown in brackets.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**A488/A488M Practice for Steel Castings, Welding, Qualifications of Procedures and Personnel**

**A781/A781M Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use**

**A957/A957M Specification for Investment Castings, Steel and Alloy, Common Requirements, for General Industrial Use**

### 3. General Conditions for Delivery

3.1 Material furnished to this specification shall conform to the requirements of Specification **A781/A781M**, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of

<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 **A01.18** on Castings.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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 Composition, Weight Percent

NOTE 1—Values are maximum unless a range is given.

Grade	E								Mn	P	Si	Ni	Cr	Mo
	SC 1020	0.18/0.23	0.40/0.80	0.040	0.040	0.30/0.60	—	—						
SC 1025	0.22/0.28	0.40/0.80	0.040	0.040	0.30/0.60	—	—	—	—	—	—	—	—	—
SC 1030	0.28/0.34	0.50/0.90	0.040	0.040	0.30/0.60	—	—	—	—	—	—	—	—	—
SC 1040	0.37/0.44	0.50/0.90	0.040	0.040	0.30/0.60	—	—	—	—	—	—	—	—	—
SC 1045	0.43/0.50	0.50/0.90	0.040	0.040	0.30/0.60	—	—	—	—	—	—	—	—	—
SC 4130	0.28/0.33	0.40/0.80	0.035	0.040	0.30/0.60	—	0.80/1.10	0.15/0.25	—	—	—	—	—	—
SC 4140	0.38/0.43	0.70/1.10	0.035	0.040	0.30/0.60	—	0.80/1.10	0.15/0.25	—	—	—	—	—	—
SC 4330	0.28/0.33	0.60/0.90	0.035	0.040	0.30/0.60	1.65/2.00	0.70/0.90	0.20/0.30	—	—	—	—	—	—
SC 4340	0.38/0.43	0.60/0.90	0.035	0.040	0.30/0.60	1.65/2.00	0.70/0.90	0.20/0.30	—	—	—	—	—	—
SC 8620	0.18/0.23	0.60/1.00	0.035	0.040	0.30/0.60	0.40/0.70	0.40/0.60	0.15/0.25	—	—	—	—	—	—
SC 8625	0.23/0.28	0.60/1.00	0.035	0.040	0.30/0.60	0.40/0.70	0.40/0.60	0.15/0.25	—	—	—	—	—	—
SC 8630	0.28/0.33	0.60/1.00	0.035	0.040	0.30/0.60	0.40/0.70	0.40/0.60	0.15/0.25	—	—	—	—	—	—

TABLE 1 Chemical Requirements<sup>A,B</sup>

Grade	Composition, Weight %							
	Carbon	Manganese	Phosphorus	Sulfur	Silicon	Nickel	Chromium	Molybdenum
SC 1020	0.18–0.23	0.40–0.80	0.040	0.040	0.30–0.60	...	...	...
SC 1025	0.22–0.28	0.40–0.80	0.040	0.040	0.30–0.60	...	...	...
SC 1030	0.28–0.34	0.50–0.90	0.040	0.040	0.30–0.60	...	...	...
SC 1040	0.37–0.44	0.50–0.90	0.040	0.040	0.30–0.60	...	...	...
SC 1045	0.43–0.50	0.50–0.90	0.040	0.040	0.30–0.60	...	...	...
SC 4130	0.28–0.33	0.40–0.80	0.035	0.040	0.30–0.60	...	0.80–1.10	0.15–0.25
SC 4140	0.38–0.43	0.70–1.10	0.035	0.040	0.30–0.60	...	0.80–1.10	0.15–0.25
SC 4330	0.28–0.33	0.60–0.90	0.035	0.040	0.30–0.60	1.65–2.00	0.70–0.90	0.20–0.30
SC 4340	0.38–0.43	0.60–0.90	0.035	0.040	0.30–0.60	1.65–2.00	0.70–0.90	0.20–0.30
SC 8620	0.18–0.23	0.60–1.00	0.035	0.040	0.30–0.60	0.40–0.70	0.40–0.60	0.15–0.25
SC 8625	0.23–0.28	0.60–1.00	0.035	0.040	0.30–0.60	0.40–0.70	0.40–0.60	0.15–0.25
SC 8630	0.28–0.33	0.60–1.00	0.035	0.040	0.30–0.60	0.40–0.70	0.40–0.60	0.15–0.25

<sup>A</sup> All values are maximums unless specified as a minimum or a range is provided.<sup>B</sup> Where "..." appears in this table, there is no requirement and the element need not be analyzed for or reported.

Specification A781/A781M constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A781/A781M, this specification shall prevail.

3.2 Steel investment castings furnished to this specification shall conform to the requirements of Specification A957/A957M, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A957/A957M constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A957/A957M, Specification A957/A957M shall prevail.

#### 4. Ordering Information

4.1 Orders for material under this specification should include the following information:

4.1.1 Quantity,

4.1.2 Specification, including year and date of issue,

4.1.3 Grade and class of steel,

4.1.4 Description of the casting by pattern number or drawing (Dimensional tolerances should be included on the casting drawing),

4.1.5 Options in the specification, and

4.1.6 Supplementary requirements desired, including standards of acceptance.

#### 5. Heat Treatment

5.1 All castings shall receive a heat treatment indicated in Table 4. Preliminary heat treatment prior to final heat treatment as well as multiple tempering is permitted.



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### TABLE 2 Tensile Requirements

Class	65/35	70/36	80/40	80/50	90/60	105/85	115/95	130/115	135/125	150/135	160/145	165/150
Tensile, ksi	65	70	80	80	90	105	115	130	135	150	160	165
Tensile, min. (MPa)	[450]	[485]	[550]	[550]	[620]	[725]	[795]	[895]	[930]	[1035]	[1105]	[1140]
Yield, ksi	35	36	40	50	60	85	95	115	125	135	145	150
Yield, min. (MPa)	[240]	[250]	[275]	[345]	[415]	[585]	[655]	[795]	[860]	[930]	[1000]	[1035]
Elongation in 2 in. or 50 mm, min. %	24	22	18	22	18	17	14	11	9	7	6	5
Reduction of Area, min. %	35	30	30	35	35	35	30	25	22	18	12	10

### TABLE 2 Tensile Requirements

Class	Tensile strength, min, ksi [MPa]	Yield strength, <sup>A</sup> min, ksi [MPa]	Elongation in 2 in. or 50 mm, min. % <sup>B</sup>	Reduction of Area, min. %
65/35	65 [450]	35 [240]	24	35
70/36	70 [485]	36 [250]	22	30
80/40	80 [550]	40 [275]	18	30
80/50	80 [550]	50 [345]	22	35
90/60	90 [620]	60 [415]	18	35
105/85	105 [725]	85 [585]	17	35
115/95	115 [795]	95 [655]	14	30
130/115	130 [895]	115 [795]	11	25
135/125	135 [930]	125 [860]	9	22
150/135	150 [1035]	135 [930]	7	18
160/145	160 [1105]	145 [1000]	6	12
165/150	165 [1140]	150 [1035]	5	10
210/180	210 [1450]	180 [1240]	4	8

<sup>A</sup> Determine by the 0.2 % offset method.

<sup>B</sup> When ICI test bars are used in tensile testing as provided for in Specification A957/A957M, the gauge length to reduced section diameter ratio shall be 4 to 1.

### TABLE 3 Tensile Requirements/Grade Suitability

Grade	Class													
	Class	65/35	70/36	80/40	80/50	90/60	105/85	115/95	130/115	135/125	150/135	160/145	165/150	210/180
65/35	70/36	80/40	80/50	90/60	105/85	115/95	130/115	135/125	150/135	160/145	165/150	210/180		
Grade														
SC 1020	X <sup>A</sup>	X												
SC 1025	X	X												
SC 1030	X	X	X	X										
SC 1040	X <sup>B</sup>	X	X	X	X									
SC 1045	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X							
SC 4130	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X	X				
SC 4140	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X			
SC 4330	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X	X		
SC 4340	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X	X	
SC 8620	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X	X	X	X	X	
SC 8625	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X	X	X	X	X	
SC 8630	X <sup>B</sup>	X <sup>B</sup>	X	X	X	X	X	X	X	X	X	X	X	

<sup>A</sup> "X" denotes that the properties may be achieved by at least one of the heat treatments referenced in 5-Section 5. The effect of section thickness should be considered in making grade selections. The heat treatment requirements do not imply that all section thicknesses will be through hardened.

<sup>B</sup> These grades significantly exceed the minimum strength levels, therefore, they may be unsuitable for use due to weldability and machinability issues.



TABLE 4 Heat Treatment

NOTE 1—The effect of section thickness should be considered in making grade selections. The heat treatment requirements do not imply that all section thicknesses will be through hardened.

NOTE 2—Post-weld heat treatment must be at or below the final tempering temperature.

NOTE 3—Following quenching the castings must be cooled below 500 °F [260 °C] prior to tempering.

Grade	Class	Austenitizing Temperature, min, °F [°C]	Media	Tempering Temperature, min, ° F [°C]
SC1020	65/35	1700 [925]	A <sup>A</sup>	—
	70/36	1700 [925]	A	—
SC1025	65/35	1700 [925]	A	—
	70/36	1700 [925]	A	—
SC1030	65/35	1650 [900]	A	—
	70/36	1650 [900]	A	1100 [595]
	80/40	1650 [900]	L <sup>A</sup>	1100 [595]
	80/50	1650 [900]	L	1100 [595]
SC1040	65/35 <sup>B</sup>	1650 [900]	A	1150 [621]
	70/36	1650 [900]	A	1150 [621]
	80/40	1650 [900]	A	1150 [621]
	80/50	1650 [900]	A	1100 [595]
	90/60	1650 [900]	A	1100 [595]
SC1045	65/35 <sup>B</sup>	1600 [870]	A	1150 [621]
	70/36 <sup>B</sup>	1600 [870]	A	1150 [621]
	80/40	1600 [870]	A	1150 [621]
	80/50	1600 [870]	A	1150 [621]
	90/60	1600 [870]	A	1100 [595]
	105/85	1600 [870]	A	1100 [595]
	115/95	1600 [870]	A	1050 [565]
SC4130	65/35 <sup>B</sup>	1650 [900]	A	1200 [650]
	70/36 <sup>B</sup>	1650 [900]	A	1200 [650]
	80/40	1650 [900]	A	1200 [650]
	80/50	1650 [900]	A	1200 [650]
	90/60	1650 [900]	A or L	1150 [621]
	105/85	1650 [900]	L	1100 [595]
	115/95	1650 [900]	L	1100 [595]
	130/115	1650 [900]	L	1000 [538]
	135/125	1650 [900]	L	1000 [538]
	150/135	1650 [900]	L	1000 [538]
SC4140	65/35 <sup>B</sup>	1600 [870]	A	1200 [650]
	70/36 <sup>B</sup>	1600 [870]	A	1200 [650]
	80/40 <sup>B</sup>	1600 [870]	A	1200 [650]
	80/50 <sup>B</sup>	1600 [870]	A	1150 [621]
	90/60	1600 [870]	A	1150 [621]
	105/85	1600 [870]	A or L	1150 [621]
	115/95	1600 [870]	L	1050 [566]
	130/115	1600 [870]	L	1000 [538]
	135/125	1600 [870]	L	1000 [535]
	150/135	1600 [870]	L	950 [510]
	160/145	1600 [870]	L	950 [510]
	165/150	1600 [870]	L	950 [510]
	SC4330	65/35 <sup>B</sup>	1650 [870]	A
70/36 <sup>B</sup>		1650 [870]	A	1200 [650]
80/40 <sup>B</sup>		1650 [870]	A	1200 [650]
80/50 <sup>B</sup>		1650 [870]	A	1200 [650]
90/60		1650 [870]	A or L	1150 [620]
105/85		1650 [870]	L	1100 [595]
115/95		1650 [870]	L	1100 [595]
130/115		1650 [870]	L	1000 [535]
135/125		1650 [870]	L	1000 [535]
150/135		1650 [870]	L	1000 [535]
160/145		1650 [870]	L	950 [510]
165/150		1650 [870]	L	950 [510]
210/180		1650 [870]	L	900 [482]
SC4340		65/35 <sup>B</sup>	1600 [870]	A
	70/36 <sup>B</sup>	1600 [870]	A	1200 [650]
	80/40 <sup>B</sup>	1600 [870]	A	1200 [650]
	80/50 <sup>B</sup>	1600 [870]	A	1150 [620]