Designation: B918/B918M – 20a

Standard Practice for Heat Treatment of Wrought Aluminum Alloys[1]

This standard is issued under the fixed designation B918/B918M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This practice is intended for use in the heat treatment of wrought aluminum alloys for general purpose applications.

1.1.1 The heat treatment of wrought aluminum alloys used in specific aerospace applications is covered in AMS2772.

1.1.2 Heat treatment of aluminum alloy castings for general purpose applications is covered in Practice B917/B917M.

1.2 Times and temperatures appearing in the heat-treatment tables are typical for various forms, sizes, and manufacturing methods and may not provide the optimum heat treatment for a specific item.

1.3 Some alloys in the 6xxx series may achieve the T4 temper by quenching from within the solution temperature range during or immediately following a hot working process, such as upon emerging from an extrusion die. Such alternatives to furnace heating and immersion quenching are indicated in Table 1, by footnote *L*, for heat treatment of wrought aluminum alloys. However, this practice does not cover the requirements for a controlled extrusion press or hot rolling mill solution heat treatment; it only covers the requirements of artificial aging, annealing and associated pyrometry of those processes for products solution heat treated in accordance with Practices B807/B807M and B947. (Refer to Practice B807/B807M for extrusion press solution heat treatment of aluminum alloys and to Practice B947 for hot rolling mill solution heat treatment of aluminum alloys and associated pyrometry.)

1.4 *Units*—The values stated in either Metric or US Customary 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.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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 The following documents, of the issue in effect on the date of material purchase, form a part of this practice to the extent referenced herein:

2.2 *ASTM Standards:*[2]

B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)

B807/B807M Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys

B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products

B917/B917M Practice for Heat Treatment of Aluminum-Alloy Castings From All Processes

B947 Practice for Hot Rolling Mill Solution Heat Treatment for Aluminum Alloy Plate

G69 Test Method for Measurement of Corrosion Potentials of Aluminum Alloys

2.3 *ANSI Standard:*[3]

H35.1/H35.1M Alloy and Temper Designation Systems for Aluminum

2.4 *SAE Standard:*[4]

AMS2750 Pyrometry

[1] This practice is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Aluminum Association, 1400 Crystal Dr., Suite 430, Arlington, VA 22202, http://www.aluminum.org.

[4] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://www.sae.org.

***A Summary of Changes section appears at the end of this standard**

TABLE 1 Recommended Heat Treatment for Wrought Aluminum Alloys[A,W]

Product	Solution Heat Treatment		Precipitation Heat Treatment[B]			
	Metal Temperature, ±10 °F [±6 °C][C,D,V]	Quench Temperature, °F [°C][E]	Temper	Metal Temperature, ±10 °F [±6 °C][V]	Time at Temperature, h	Temper
			2011 Alloy[A]			
Cold-finished wire, rod, and bar	945–995 [507–535]	110 [43] max	T3	320 [160]	14	T8
			T4	. . .	. . .	. . .
			T451	. . .	. . .	. . .
Drawn tube and pipe	975 [524]	110 [43] max	T3	320 [160]	14	T8
			T4511	. . .	. . .	. . .
			2014 Alloy[A]			
Flat sheet, bare or Alclad	925–945 [496–507]	110 [43] max	T3	. . .	. . .	. . .
	935 [502][U]		T42	320 [160][U]	18–20[U]	T62[U]
Coiled sheet, bare or Alclad	925–945 [496–507]	110 [43] max	T4	320 [160]	18	T6
	935 [502][U]		T42	320 [160][U]	18–20[U]	T62[U]
Plate, bare or Alclad	925–945 [496–507]	110 [43] max	T451	320 [160]	18	T651
	935 [502][U]		T42	350 [177][U]	8–9[U]	T62[U]
Cold-finished wire, rod, and bar	925–945 [496–507]	110 [43] max	T4	350 [177]	9	T6
			T451	350 [177]	9	T651
	935 [502][U]		T42	350 [177][U]	8–9[U]	T62[U]
Extruded wire, rod, bar, profiles, tube, and pipe	925–945 [496–507]	110 [43] max	T4	350 [177]	9	T6
			T4510	350 [177]	9	T6510
			T4511	350 [177]	9	T6511
	935 [502][U]		T42	350 [177][U]	8–9[U]	T62[U]
Drawn tube and pipe	925–945 [496–507]	110 [43] max	T4	350 [177]	9	T6
	935 [502][U]		T42	350 [177][U]	8–9[U]	T62[U]
Die forgings	925–945 [496–507]	140–180 [60–82]	T4	350 [177]	9	T6
Hand forgings and rolled rings	925–945 [496–507]	140–180 [60–82]	T4	350 [177]	9	T6
	935 [502][U]		T452	350 [177][U]	10[U]	T652[U]
			2017 Alloy[A]			
Cold-finished wire, rod, and bar	925–950 [496–510]	110 [43] max	T4	. . .	. . .	. . .
			T451	. . .	. . .	. . .
			T42	. . .	. . .	. . .
			2018 Alloy[A]			
Die forgings	940–970 [504–521]	Boiling Water[T]	T4	340 [171]	10	T61
			2024 Alloy[A]			
Flat sheet, bare or Alclad	910–930 [488–499]	110 [43] max	T3	375 [191]	12	T81
	920 [493][U]		T361	375 [191[U]	8[U]	T861[U]
			T42	375 [191][U]	9–10[U]	T62[U]
			T42	375 [191][U]	16–18[U]	T72[U]
Coiled sheet, bare or Alclad	910–930 [488–499]	110 [43] max	T4	375 [191]	9–10	T6
	920 [493][U]		T42	375 [191][U]	9[U]	T62[U]
			T42	375 [191][U]	16–18[U]	T72[U]
Plate, bare or Alclad	910–930 [488–499]	110 [43] max	T351	375 [191]	12	T851
	920 [493][U]		T361	375 [191][U]	8[U]	T861[U]
			T42	375 [191][U]	9–10[U]	T62[U]
Cold-finished wire, rod, and bar	910–930 [488–499]	110 [43] max	T351	375 [191]	12	T851
			T36	. . .	. . .	. . .
			T4	375 [191]	12	T6
	920 [493][U]		T42	375 [191][U]	12–13[U]	T62[U]
Extruded wire, rod, bar, profiles, tube, and pipe	910–930 [488–499]	110 [43] max	T3	375 [191]	12	T81
			T3510	375 [191]	12	T8510
			T3511	375 [191]	12	T8511
	920 [493][U]		T42	375 [191][U]	12–13[U]	T62[U]
Drawn tube and pipe	910–930 [488–499]	110 [43] max	T3	375 [191]	12	T8
	920 [493][U]		T42	375 [191][U]	9–10[U]	T62[U]
			2025 Alloy[A]			
Die forgings	950–970 [510–521]	140–160 [60–71]	T4	350 [177]	9	T6
			2117 Alloy[A]			
Cold-finished, wire or rod	925–950 [496–510]	110 [43] max	T4	. . .	. . .	. . .