

AS&D Erratum #2

temper designation/general information

- T3 solution heat-treated^⑨, cold worked, and naturally aged to a substantially stable condition.** Applies to products that are cold worked to improve strength after solution heat-treatment, or in which the effect of cold work in flattening or straightening is recognized in mechanical property limits.
- T4 solution heat-treated^⑨ and naturally aged to a substantially stable condition.** Applies to products that are not cold worked after solution heat-treatment, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical property limits.
- T5 cooled from an elevated temperature shaping process and then artificially aged.** Applies to products that are not cold worked after cooling from an elevated temperature shaping process, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical property limits.
- T6 solution heat-treated^⑨ and then artificially aged.** Applies to products that are not cold worked after solution heat-treatment, or in which the effect of cold work in flattening or straightening may not be recognized in mechanical property limits.
- T7 solution heat-treated^⑨ and overaged/stabilized.** Applies to wrought products that are artificially aged after solution heat-treatment to carry them beyond a point of maximum strength to provide control of some significant characteristic^⑩. Applies to cast products that are artificially aged after solution heat-treatment to provide dimensional and strength stability.
- T8 solution heat-treated^⑨, cold worked, and then artificially aged.** Applies to products that are cold worked to improve strength, or in which the effect of cold work in flattening or straightening is recognized in mechanical property limits.
- T9 solution heat-treated^⑨, artificially aged, and then cold worked.** Applies to products that are cold worked to improve strength.
- T10 cooled from an elevated temperature shaping process, cold worked, and then artificially aged.** Applies to products that are cold worked to improve strength, or in which the effect of cold work in flattening or straightening is recognized in mechanical property limits.

(b) Additional digits^⑪, the first of which shall not be zero, may be added to designations T1 through T10 to indicate a variation in treatment that significantly alters the product characteristics that are or would be obtained using the basic treatment. (See Appendix for specific additional digits for T tempers.)

4.3 Variations of O Temper: Annealed

4.3.1 A digit following the O, when used, indicates a product in the annealed condition having special characteristics. NOTE: As the O temper is not part of the strain-hardened (H) series, variations of O temper shall not apply to products that are strain-hardened after annealing and in which the effect of strain-hardening is recognized in the mechanical

^⑨ Solution heat treatment is achieved by heating cast or wrought products to a suitable temperature, holding at that temperature long enough to allow constituents to enter into solid solution and cooling rapidly enough to hold the constituents in solution. Some 6xxx series and some 7xxx series alloys attain the same specified mechanical properties whether furnace solution heat treated or cooled from an elevated temperature shaping process at a rate rapid enough to hold constituents in solution. In such cases the temper designations T3, T4, T6, T7, T8, and T9 are used to apply to either process and are appropriate designations.

^⑩ For this purpose, *characteristic* is something other than mechanical properties. The test method and limit used to evaluate material for this characteristic are specified at the time of the temper registration.

^⑪ Additional digits may be arbitrarily assigned and registered with The Aluminum Association for an alloy and product to indicate a variation of tempers T1 through T10 even though the temper representing the basic treatment has not been registered (see note ^⑥). Variations in treatment that do not alter the characteristics of the product are considered alternate treatments for which additional digits are not assigned.

properties or other characteristics. (See Appendix for specific additional digits for O tempers.)

5. Powder Aluminum and Aluminum Alloy Designation System ^{①②③④⑤}

A system of six alphanumeric characters for designating aluminum and aluminum alloy powders.

The alloy designation system has the following structure:

wZab.yv where:

w = Alloy Group (1-8), determined by major alloying element.

Z = Alloy modification. The letter 'A' denotes the original alloy in an alloy family, and alloy modifications are denoted by letters 'B' through 'Z'. The Reserve Numeral "v" may also be used to denote modification when there are more modification in an alloy family than the Alloy Modification letter 'Z' allows for.

ab = Alloy Family, with numerals 00 through 99 (minimum Al content for Alloy Group 1, and arbitrary for Groups 2-8).

y = Alloy Form. The numeral 5 designates a powder alloy.

v = Reserve numeral maintained as '0' by default. Values 1 through 9 may be used in combination with Alloy Modification letter to increase the total number of modifications available for each Alloy Family. May also be used as a unique identifier.

5.1 Alloy Group

The first of the six alphanumeric characters in the designation, denoted by "w" in "wZab.yv" is a numerical digit that indicates the alloy group as follows:

Aluminum, 99.00% and greater 1Zab.yv
Aluminum alloys grouped by major alloying elements:

Copper 2Zab.yv
Silicon, with added Copper and/or Magnesium 3Zab.yv
Silicon 4Zab.yv
Magnesium 5Zab.yv
Magnesium and Silicon 6Zab.yv
Zinc 7Zab.yv
Other Element 8Zab.yv

5.1.1 Aluminum Powders

The designation assigned shall be in the 1Zab.yv group whenever the minimum aluminum content is specified as 99.00% and greater. In the 1Zab.yv group, the numerical digits in the third and fourth positions in the designation, denoted by "ab" in "1Zab.yv", indicate the minimum aluminum percentage.

TABLE 11.1 Mechanical Property Limits—Extruded Wire, Rod, Bar and Profiles ⑥ (continued)

ALLOY AND TEMPER	SPECIFIED DIAMETER OR THICKNESS ① OR MINIMUM DISTANCE ACROSS FLATS in.	AREA sq. in.	TENSILE STRENGTH ksi				ELONGATION ② percent min. in 2 in. or 4D ③
			ULTIMATE		YIELD		
			min.	max.	min.	max.	
6005A							
6005A-T1	Up thru 0.249	All	25.0	..	14.5	..	15
6005A-T5	Up thru 0.249	All	38.0	..	31.0	..	7
	0.250-0.999	All	38.0	..	31.0	..	9
6005A-T61	Up thru 0.249	All	38.0	..	35.0	..	8
	0.250-1.000	All	38.0	..	35.0	..	10
6060							
6060-T51	Up thru 0.125	All	22.0	xx	16.0	xx	8
6060-T61	Up thru 0.124	All	30.0	xx	25.0	xx	8
	0.125-1.000	All	30.0	xx	25.0	xx	10
6061							
6061-O	All	All	..	22.0	..	16.0	8 16
6061-T1	Up thru 0.625	All	26.0	..	14.0	..	16
6061-T4, T4510 ⑤ ⑦ and T4511 ⑤ ⑦	All	All	26.0	..	16.0	..	16
6061-T42 ④ ⑧	All	All	26.0	..	12.0	..	16
6061-T51	Up thru 0.625	All	35.0	..	30.0	..	8
6061-T6, T62 ④ ⑧, T6510 ⑤	Up thru 0.249	All	38.0	..	35.0	..	8
and T6511 ⑤	0.250 and over	All	38.0	..	35.0	..	10
6063							
6063-O	All	..	..	19.0	..		18
6063-T1	Up thru 0.500	All	17.0	..	9.0	..	12
	0.501–1.000	All	16.0	..	8.0	..	12
6063-T4 and T42 ④ ⑧	Up thru 0.500	All	19.0	..	10.0	..	14
	0.501–1.000	All	18.0	..	9.0	..	14
6063-T5	Up thru 0.500	All	22.0	..	16.0	..	8
	0.501–1.000	All	21.0	..	15.0	..	8
6063-T52 ⑭	Up thru 1.000	All	22.0	30.0	16.0	25.0	8
6063-T6 and T62 ④ ⑧	Up thru 0.124	All	30.0	..	25.0	..	8
	0.125–1.000	All	30.0	..	25.0	..	10
6066							
6066-O	All	All	..	29.0	..	18.0	16
6066-T4, T4510 ⑤ ⑦ and T4511 ⑤ ⑦	All	All	40.0	..	25.0	..	14
6066-T42 ④ ⑧	All	All	40.0	..	24.0	..	14
6066-T6, T6510 ⑤ and T6511 ⑤	All	All	50.0	..	45.0	..	8
6066-T62 ④ ⑧	All	All	50.0	..	42.0	..	8
6070							
6070-T6 and T62 ④ ⑧	Up thru 2.999	Up thru 32	48.0	..	45.0	..	6
6082							
6082-T6, T6511 ⑮	0.200-0.750	All	45.0	..	38.0	..	6
	0.751-6.000	All	45.0	..	38.0	..	8
	6.001-8.000	All	41.0	..	35.0	..	6
6105							
6105-T1	Up thru 0.500	All	25.0	..	15.0	..	16
6105-T5	Up thru 0.500	All	38.0	..	35.0	..	8
6162							
6162-T5, T5510 ⑤ and T5511 ⑤	Up thru 1.000	All	37.0	..	34.0	..	7
6162-T6, T6510 ⑤	Up thru 0.249	All	38.0	..	35.0	..	8
and T6511 ⑤	0.250–0.499	All	38.0	..	35.0	..	10
6262							
6262-T6, T62 ④ ⑧, T6510 ⑤ and T6511 ⑤	All	All	38.0	..	35.0	..	10

For all numbered footnotes, see page 11-5.