ALUMINUM ALLOY DESIGNATIONS

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The aluminum industry uses a four-digit index system for the designation of its wrought aluminum alloys.

As outlined below, the first digit indicates the alloy group according to the major alloying elements.

1XXX SERIES

In this group. Minimum aluminum content is 99%. and there is no major alloying element.

The second digit indicates modifications in impurity limits. If the second digit is zero, there is no special control on individual impurities. Digits 1 through 9, which are assigned consecutively as needed, indicate special control of one or more individual impurities.

The last two digits indicate specific minimum aluminum content. Although the absolute minimum aluminum content in this group is 99% the minimum for certain grades is higher than 99%, and the last two digits represent the hundredths of a per cent over 99.

Thus, 1030 would indicate 99.30% minimum aluminum. Without special control on individual impurities. The designations 1130, 1230, 1330, etc. indicate the same purity with special control on one or more impurities. Likewise. 1100 indicates minimum aluminum content of 99.00% with individual impurity control.

2XXX THROUGH 9XXX SERIES

The major alloying elements are indicated by the first digit, as follows:

2xxx	Copper
3xxx	Manganese
4xxx	Silicon
5xxx	Magnesium
6xxx	Magnesium and silicon
7xxx	Zinc
8xxx	Other element
9xxx	Unused series

The second digit indicates alloy modification. If the second digit is zero, it indicates the original alloy: digits 1 through 9, which are assigned consecutively, indicate alloy modifications. The last two digits have no special significance, serving only to identify the different alloys in the group.

EXPERIMENTAL ALLOYS

Experimental alloys are designated according to the four digit system, but they are prefixed by the letter X. The prefix is dropped when the alloy becomes standard. During development, and before they are designated as experimental, new alloys are identified by serial numbers assigned by their originators. Use of the serial number is discontinued when the X number is assigned.

ALUMINUM TEMPER DESIGNATIONS

Temper designations of wrought aluminum alloys consist of suffixes to the numeric alloy designations. For example, in 3003-H14, 3003 denotes the alloy and “H14” denotes the temper, or degree of hardness. The temper designation also reveals the method by which the hardness was obtained. Temper designations differ between non heat-treatable alloys and heat-treatable alloys, and their meanings are given below:

NON HEAT-TREATABLE ALLOYS

The letter “H” is always followed by 2 or 3 digits. The first digit indicates the particular method used to obtain the temper, as follows:

— H1 means strain hardened only.

— H2 means strain hardened, then partially annealed.

— H3 means strain hardened, then stabilized.

The temper is indicated by the second digit as follows:

2	1/4 hard
4	1/2 hard
6	3/4 hard
8	full hard
9	extra hard

Added digits indicate modification of standard practice.

HEAT-TREATABLE ALLOYS

-F	As fabricated
-O	Annealed
-T	Heat treated

The letter “T” is always followed by one or more digits. These digits indicate the method used to produce the stable tempers, as follows:

-T3	Solution heat treated, then cold worked.
-T351	Solution heat treated, stress-relieved stretched, then cold worked.
-T36	Solution heat treated, then cold worked (controlled).
-T4	Solution heat treated, then naturally aged.
-T451	Solution heat treated, then stress relieved stretched.
-T5	Artificially aged only.
-T6	Solution heat treated, then artificially aged.
-T61	Solution heat treated (boiling water quench), then artificially aged.
-T651	Solution heat treated, stress-relieved stretched, then artificially aged (precipitation heat treatment).
-T652	Solution heat treated, stress relieved by compression. then artificially aged.
-T7	Solution heat treated, then stabilized.
-T8	Solution heat treated, cold worked, then artificially aged.
-T81	Solution heat treated, cold worked (controlled), then artificially aged.
-T851	Solution heat treated, cold worked, stress-relieved stretched, then artificially aged.
-T9	Solution heat treated, artificially aged, then cold worked.
-T10	Artificially aged, then cold worked.
	Added digits indicate modification of standard practice.

COMPARISON OF MODERN & OLD SYSTEMS OF ALUMINUM ALLOY DESIGNATION

Although the old system of aluminum identification has been obsolete for many years, stock with the old markings is still occasionally found. The following comparison is presented as an aid in identifying such materials in terms of the modern system.

In the old system, alloy composition was indicated by a one- or two-digit number followed by the letter “S” to indicate that it was a wrought alloy, i.e., an alloy that could be shaped by rolling, drawing or forging. Any variation in the basic composition was indicated by a letter preceding the numerical alloy designation. For example, A17S was a modification of the basic alloy 17S. In modern terminology these two alloys are designated 2117S and 2017S, respectively. Temper was designated by a second letter: “O” for soft (annealed), “H”for strain hardness of non heat-treatable alloys, and “T”for hardness of heat-treatable alloys. Degree of hardness of non heat-treatable alloys was indicated by a fraction preceding the letter “H”. For example, 3S1/4H would be quarter-hard 3S alloy.

The following Table gives examples of the old and modern designations of some common aluminum alloys.

Modern System	Old System
1100	2S
3003	3S
3003-0	3SO
2014	14S
2017	17S
2117	A17S
2018	18S
2218	B18S
2024T	24ST
5052	52S
7075T6	75ST6