
**Aluminium and aluminium alloys —
Wrought products — Temper
designations**

*Aluminium et alliages d'aluminium — Produits corroyés —
Désignation des états métallurgiques*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 9, *Symbolization*.

This fourth edition cancels and replaces the third edition (ISO 2107:2007), of which it constitutes a minor revision. The changes are as follows:

- [Clause 2](#) has been added;
- some terms and definitions have been updated and some new terms have been added in [Clause 3](#);
- [Clause 4](#) has been modified to "Basic temper" with some definitions updated and subdivisions added;
- [Annex A](#) has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Aluminium and aluminium alloys — Wrought products — Temper designations

1 Scope

This document establishes temper designations as required for identification for all product forms of wrought aluminium and aluminium alloys.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

temper

condition of the metal produced by mechanical and/or thermal processing, or both, typically characterized by a certain structure and specified properties

3.2

working

forming of solid metal

3.3

hot working

forming of solid metal after pre-heating

Note 1 to entry: Strain hardening will or will not occur during hot working.

3.4

cold working

forming of solid metal without preheating

Note 1 to entry: Plastic deformation of metal at such temperature and strain-rate that strain hardening occurs.

3.5

strain-hardening

modification of a metal structure, by cold working, resulting in an increase in strength and hardness, generally with loss of ductility

3.6

solution heat-treating

heating of an alloy at a suitable temperature for a sufficient time to allow one or more soluble constituents to enter into solid solution, where they are retained in a supersaturated state after quenching (rapid cooling)

**3.7
ageing**

treatment of a metal aiming at a change in its properties by precipitation of intermetallic phases from supersaturated solid solution

Note 1 to entry: Ageing can be a treatment at room temperature (natural ageing) or a thermal treatment (artificial ageing).

**3.8
annealing**

thermal treatment to soften metal by reduction or removal of strain hardening resulting from cold working and/or by coalescing precipitates from solid solution

**3.9
heat treatable alloy**

alloy which can be strengthened by a suitable thermal treatment

**3.10
non-heat-treatable alloy**

alloy which is strengthened by working and not by thermal treatment

**3.11
stress-relieving**

reduction of internal residual stresses by thermal or mechanical means

4 Basic temper designations

The temper designations are based on the sequences of basic treatments used to produce the various tempers. Property limits (mechanical or physical) apply to individual alloy-temper-product combinations.

Regional temper designations are provided in [Annex A](#).

The temper designation follows the alloy designation; these are separated by a hyphen.

Basic temper designations consist of letters. If subdivisions of the basic tempers are required, these are indicated by one or more digits following the letter of the basic temper. These digits relate to a specific sequence of basic treatments, but only those treatments or operations recognized as significantly influencing the product characteristics are indicated.

Should some other variation of the same sequence of basic operations be applied to the same alloy, resulting in different characteristics, then additional digits are added to the designation.

Throughout this document, generalized examples of tempers are shown, as follows:

- “X” denotes an unspecified digit (e.g. H2X is generalized to indicate appropriate temper designations in the series H21 to H29);
- “XX” denotes two unspecified digits (e.g. HXX4 is generalized to indicate appropriate temper designations in the H114 to H194 series, the H224 to H294 series, and the H324 to H394 series);
- “_” denotes one or multiple unspecified digits (e.g. T_51 is generalized to indicate appropriate temper designations such as T351, T651, T6151, T7351, T7651, etc.).

4.1 F — as fabricated

This designation applies to the products of shaping processes in which no special control over thermal conditions or strain-hardening is employed. For wrought products, there are no mechanical property limits specified.

4.2 O — annealed

This designation applies to wrought products that are annealed to obtain the lowest strength temper, and to cast products that are annealed to improve ductility and dimensional stability. The O may be followed by a digit other than zero to indicate a product in the annealed condition having special characteristics.

NOTE Products achieving the required annealed properties after hot forming processes can be designated as O temper.

4.3 H — strain-hardened

This designation applies to products that have their strength increased by strain-hardening with or without supplementary thermal treatments to produce some reduction in strength. The letter H is always followed by at least two digits, the first indicating the specific combination of basic operations and the second indicating the degree of strain hardening. A third digit indicates a variation of a two-digit temper and is used when the mechanical properties, or other characteristics, differ from those of the two-digit H temper to which it is added.

4.4 W — solution heat-treated

This designation describes an unstable temper applicable only to alloys that spontaneously age at room temperature after solution heat-treatment. This designation is specific only when the period of natural ageing is indicated, e.g. W 1/2 hr.

4.5 T — precipitation hardened to produce stable tempers other than F, O or H

This designation applies to products that are precipitation hardened, with or without supplementary strain hardening, to produce stable tempers. The T is always followed by one or more digits indicating the specific sequence of treatments.

5 Subdivisions of O temper designations

A digit following the O, when used, indicates a product in the annealed condition having special characteristics. 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 properties or other characteristics.

5.1 O1 — high-temperature annealed to accentuate ultrasonic response and provide dimensional stability

This designation applies to wrought products that are thermally treated at approximately the same time and temperature required for solution heat-treatment and slow cooled to room temperature in order to accentuate ultrasonic response and/or to provide dimensional stability. It is applicable to products that are to be machined prior to solution heat-treatment by the user. Mechanical property limits are not specified.

5.2 O3 — homogenized

This designation applies to continuously cast drawing stock or strip, which are subjected to a high temperature soaking treatment to eliminate or reduce segregations, thus improving subsequent formability and/or response to solution heat-treatment.