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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS H 0001 : 1988** is replaced with **JIS H 0001 : 1998**.

This revision is made for conformity with **ISO 2107 : 1983 Aluminium, magnesium and their alloys — Temper designation**.

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4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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Aluminium, magnesium and their alloys — Temper designation

Introduction This Japanese Industrial Standard has been prepared based on the first edition of International Standard **ISO 2107**, *Aluminium, magnesium and their alloys — Temper designations* published in 1983, and developed the scope from aluminium and aluminium alloys to aluminium, magnesium and their alloys and conformed the points of differences on the definition of HX8 to the corresponding International Standard. In order to use this Standard easily, for the definite explanation of subdesignation, which was not specified in the original International Standard, the descriptions specified in **JIS H 0001-1988** have remained without modification. And the matters specified in the following have been introduced: each Annex of **ISO 6361-2**, *Wrought aluminium and aluminium alloy sheets, strips and plates — Part 2: Mechanical properties*, **ISO 6362-2**, *Wrought aluminium and aluminium alloy extruded rods/bars, tubes and profiles — Part 2: Mechanical properties*, and **ISO 6363-2**, *Wrought aluminium and aluminium alloy cold-drawn rods/bars and tubes — Part 2: Mechanical properties*; and American National Standard (**ANSI**) **H35.1-1993**, *Alloy and Temper Designation Systems for Aluminum* and European Standard **EN 515 : 1993**, *Aluminium and aluminium alloys — Wrought products — Temper designation*, which are most utilized as the standard in the world.

1 Scope This Japanese Industrial Standard specifies the temper designation ⁽¹⁾ (hereafter referred to as “designation”) of the extension materials and castings of aluminium, magnesium and their alloys.

Note ⁽¹⁾ The term “temper” means the division of mechanical properties individually formed by various processing and heat treatment conditions in the manufacturing process.

Remarks: The corresponding International Standard to this Standard is as follows.

ISO 2107 *Aluminium, magnesium and their alloys — Temper designations*

2 Form of designation Temper designations shall follow a hyphen (-) after Alloy designation. The basic temper designation consists of one capital letter of Latin alphabet and the subdesignation of the basic tempers is indicated by one or more digits following the letter of the basic temper.

3 Basic temper designation The fundamental tempers are classified into five divisions and the basic temper designations are as specified in Table 1.

Table 1 Basic temper designations, definitions and meanings

Basic designations	Definition	Meaning
F ⁽²⁾	As fabricated	Applies to the products of shaping processes in which no special control over thermal conditions or strain-hardening is employed.
O	Annealed	Applies to extension material which is annealed to obtain the softest state of the metal, and to the castings which have been annealed for improvement of ductility or dimensional stability of the metal.
H ⁽³⁾	Strain-hardened	Applies to products subjected to the application of strain hardening to increase strength of the metal, whether the additional heat treatment to obtain the reasonable softness of the metal has been performed or not.
W	Solution heat-treated	An unstable temper. It applies only to alloys which are naturally aged at ordinary temperature after solution heat-treatment.
T	Thermally treated to produce stable tempers other than F, O or H.	Applies to products which are thermally treated, with or without supplementary strain-hardening, to produce stable temper.

Notes ⁽²⁾ For extension material, no mechanical properties are specified.

⁽³⁾ This designation applies only to extension material.

4 Subdesignation

4.1 Subdesignation of H The subdesignation for H shall always consist of two or more digits following the basic designation H.

- a) **HXY** The first digit X following the letter H indicates the basic treatment as defined in Table 2.

The next digit Y indicates the final degree of the tensile strength as graded in Table 3.

The tensile strength of temper HX8 may be determined, as a rule, from Table 4 on the basis of the degree of the tensile strength of O temper designation. These tensile strengths of tempers shall be rounded up to the whole number 0 or 5, which is nearer, when not ending in 0 or 5.

Table 2 Subdesignation HX and meaning

Subdesignation	Meaning
H1	Strain hardened only: Applies to products which are only strain-hardened to obtain the desired strength without supplementary thermal treatment.
H2	Strain-hardened and softened: Applies to products which are strain-hardened more than the desired final amount and then reduced in strength to the desired level by moderate softening. For alloys that age-soften at ordinary temperature, this tempers have the same minimum ultimate tensile strength as the corresponding H3 temper. For other alloys, this tempers have the same minimum ultimate tensile strength as the corresponding H1 tempers and slightly higher elongation.
H3	Strain-hardened and stabilized: Applies to strain-hardened products whose mechanical properties are stabilized by a low temperature thermal treatment and, as a result, their strength are slightly reduced, but improved ductility. This stabilizing treatment is applicable only to aluminium alloys containing magnesium, which gradually age-soften at ordinary temperature.
H4	Strain-hardened and lacquered or paint: Applies to strain-hardened products which are subjected to the partial annealing during the thermal curing which follows the painting or lacquering operation.

Table 3 Subdesignation HXY and meaning

Subdesignation	Meaning	Informative reference
HX1	Tempers whose ultimate tensile strength is intermediate between that of the O temper and that of the HX2 temper.	1/8 hard
HX2 (HXB)	Tempers whose ultimate tensile strength is approximately midway between that of the O tempers and that of the HX4 temper.	1/4 hard
HX3	Tempers whose ultimate tensile strength is intermediate between that of the HX2 temper and that of the HX4 temper.	3/8 hard
HX4 (HXD)	Tempers whose ultimate tensile strength is approximately midway between that of the O temper and that of the HX8 temper.	1/2 hard
HX 5	Tempers whose ultimate tensile strength is intermediate between that of the HX4 temper and that of the HX6 temper.	5/8 hard

Table 3 (concluded)

Subdesignation	Meaning	Informative reference
HX6 (HXF)	Temper whose ultimate tensile strength is approximately midway between that of the HX4 temper and that of the HX8 temper.	3/4 hard
HX7	Temper whose ultimate tensile strength is intermediate between that of the HX6 temper and that of the HX8 temper.	7/8 hard
HX8 (HXH)	HX8 has been assigned to the maximum tensile strength normally produced. The minimum tensile strength of HX8 temper may be determined according to Table 4 with reference based on the minimum tensile strength of the alloy in the annealed temper.	Hard
HX9 (HXJ)	Temper whose minimum ultimate tensile strength exceeds that of the HX8 temper by 10 N/mm ² or more.	Extra hard

Remarks: The temper designations in parentheses correspond to the alternative temper system in ISO and may be used as subdesignation.

Table 4 Standards for determining the minimum tensile strength of HX8Unit: N/mm²

Minimum tensile strength in annealed temper	Increase in tensile strength to HX8 temper
40 or less	55
45 or over up to and incl. 60	65
65 or over up to and incl. 80	75
85 or over up to and incl. 100	85
105 or over up to and incl. 120	90
125 or over up to and incl. 160	95
165 or over up to and incl. 200	100
205 or over up to and incl. 240	105
245 or over up to and incl. 280	110
285 or over up to and incl. 320	115
325 or more	120

b) **HXYZ** The digit Z following HXY indicates that a little modification has been made, on the basis of temper determined with HXY.

- 1) **HX11** Applies to products which have been less strain-hardened than that of HX1, after last annealing.
- 2) **H112** Applies to extension material which may acquire some temper from working at an elevated temperature or from a limited amount of cold work, and for which there are mechanical property limits. The alternative designation M may substitute for H112.