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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Wrought aluminium and aluminium alloys extruded rods/bars, tubes and profiles —

Part 2:
Mechanical properties

Barres, tubes et profilés filés en aluminium et alliages d'aluminium corroyés —

Partie 2: Caractéristiques mécaniques

Reference number
ISO 6362-2 : 1987 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6362-2 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys.*

It constitutes a partial technical revision of International Standards ISO 2779 : 1973 and ISO 3335 : 1977, which will be cancelled when the revision of ISO Recommendation R 209 : 1971 is published (see clause 2).

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Wrought aluminium and aluminium alloys extruded rods/bars, tubes and profiles —

Part 2: Mechanical properties

1 Scope and field of application

In conjunction with ISO 6362-1, this part of ISO 6362 specifies the mechanical properties of wrought aluminium and aluminium alloys rods/bars, tubes and profiles for general engineering applications.

It applies to extruded products.

The chemical composition of these materials is given in ISO 209-1.

The designations of aluminium and aluminium alloys and the temper designations used in this International Standard are in accordance with ISO 2092 and ISO 2107, respectively.

2 References

ISO 209-1, *Wrought aluminium and aluminium alloys — Chemical composition and form of products — Part 1: Chemical composition.* [1)]

ISO 2092, *Light metals and their alloys — Code of designation based on chemical symbols.* [2)]

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

ISO 3134-3, *Light metals and their alloys — Terms and definitions — Part 3: Wrought products.*

ISO 6362-1, *Wrought aluminium and aluminium alloys extruded rods/bars, tubes and profiles — Part 1: Technical conditions for inspection and delivery.*

3 Definitions

For definitions of the terms *rod/bar*, *tube* and *profile*, see ISO 3134-3.

4 Tensile testing

For the selection of specimens and tensile testing, see ISO 6362-1.

5 Mechanical properties

Values for mechanical properties of aluminium and aluminium alloys are given in tables 1 to 15. For elongation two different gauge lengths are used. The choice of the gauge length for elongation measurements A or A_{50mm} shall be at the discretion of the producer, unless otherwise agreed [3)].

Test results shall be rounded in accordance with the rules given in the annex.

1) At present at the stage of draft. (Partial revision of ISO 2779 : 1973 and ISO 3335 : 1977.)

2) Under revision.

3) A : Percentage elongation on a gauge length of $5{,}65\sqrt{S_o}$.

A_{50mm}: Percentage elongation on a gauge length of 50 mm.

5.1 Table 1 — Al 99,5 (1050 A)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min.[2] N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	$e \geqslant 2,5$	65	20	25	23
Rod/bar	M	$D < 35$ (30)[1]	65	20	25	23

5.2 Table 2 — Al 99,0 (1200)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min.[2] N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	$e \geqslant 2,5$	75	25	18	18
Rod/bar	M	$D < 35$ (30)[1]	75	25	18	18

5.3 Table 3 — Al 99,0Cu (1100)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min.[2] N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Rod/bar	M	$D < 35$ (30)[1]	75	20	18	18

1) Values in brackets refer to the thickness of rectangular bars.

2) Minimum values guaranteed only on special agreement.

5.4 Table 4 — Al Cu4PbMg (2030) [1)]

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Rod/bar	TB	$3 \leqslant D \leqslant 75$	370	245	8	10

5.5 Table 5 — Al Cu6BiPb (2011) [1)]

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Rod/bar	TB	$3 \leqslant D \leqslant 200$	275	125	14	16
	TD	$3 \leqslant D \leqslant 40$	310	260	10	10
		$40 < D \leqslant 50$	295	235	10	12
		$50 < D \leqslant 75$	290	205	10	14
	TH	$3 \leqslant D \leqslant 75$	370	275	10	10
	TF	$3 \leqslant D \leqslant 75$	310	230	8	10
		$75 < D \leqslant 160$	295	195	6	8

5.6 Table 6 — Al Mn1 (3103)

Product	Temper	Wall thickness e, mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min.[2)] N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	$e \geqslant 2,5$	95	35	17	—

1) The introduction of this alloy cancels ISO 2779 : 1973.

2) Minimum values guaranteed only on special agreement.

5.7 Table 7 — Al Mn1Cu (3003)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min.[1] N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	All	95	35	17	22
Profile	M	All	95	35	17	22

5.8 Table 8 — Al Mg3 (5754)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	$e \geqslant 3$	180	80	14	—

5.9 Table 9 — Al Mg3Mn (5454)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	$e \geqslant 3$	215	100	16	14
Rod/bar	M	All	215	100	16	14

1) Minimum values guaranteed only on special agreement.

5.10 Table 10 — Al Mg4,5Mn0,7 (5083)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	M	$e \geqslant 3,5$	270	140	12	—
Rod/bar	M	All	270	140	12	—
Profile	M	All	270	140	12	—

5.11 Table 11 — Al MgSi (6060)

Product	Temper[1)]	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	TF	$e \leqslant 15$	190	150	10	8
Rod/bar	TF	$D \leqslant 100$	190	150	10	8
Profile	TF	$e \leqslant 25$	190	150	10	8

5.12 Table 12 — Al Mg0,7Si (6063)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	TE	$e \leqslant 12,5$	150	110	7	8
	TE	$12,5 < e \leqslant 25$	145	105	7	—
	TF[1)]	$e \leqslant 3,2$	205	170	—	8
	TF[1)]	$3,2 < e \leqslant 25$	205	170	9	10
Rod/bar	TE	$D \leqslant 12,5$	150	110	7	8
	TE	$12,5 < D \leqslant 25$	145	105	7	—
	TF[1)]	$D \leqslant 3,2$	205	170	—	8
	TF[1)]	$3,2 < D \leqslant 25$	205	170	9	10
Profile	TE	$e \leqslant 12,5$	150	110	7	8
	TE	$12,5 < e \leqslant 25$	145	105	7	—
	TF[1)]	$e \leqslant 3,2$	205	170	—	8
	TF[1)]	$3,2 < e \leqslant 25$	205	170	9	10

1) Controlled cooling after extrusion is permitted.

5.13 Table 13 — Al SiMg(A) (6005A)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	TF[1]	$e \leqslant 6$	270	225	8	—
	TF[1]	$e > 6$	260	215	8	—
Rod/bar	TF[1]	$D \leqslant 50$	270	225	8	—
	TF[1]	$50 < D \leqslant 100$	260	215	8	—
Profile	TF[1]	$e \leqslant 6$	270	225	8	—
	TF[1]	$6 < e \leqslant 10$	260	215	8	—
	TE	$e \leqslant 8$	250	200	8	—

5.14 Table 14 — Al Mg1SiCu (6061)

Product	Temper[1]	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	TB	$e \leqslant 25$	180	110	14	16
	TF	$e \leqslant 6,3$	260	240	7	8
	TF	$6,3 < e \leqslant 25$	260	240	9	10
Rod/bar	TB	$D \leqslant 100$	180	110	14	16
	TF	$D \leqslant 6,3$	260	240	7	8
	TF	$6,3 < D \leqslant 100$	260	240	9	10
Profile	TB	$e \leqslant 25$	180	110	14	16
	TF	$e \leqslant 6,3$	260	240	7	8
	TF	$6,3 < e \leqslant 25$	260	240	9	10

5.15 Table 15 — Al Si1MgMn (6082)

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Tube	TF[1]	$e \leqslant 10$	310	260	8	7
Rod/bar	TB[1]	$10 \leqslant D \leqslant 80$	205	110	14	14
	TF[1]	$10 \leqslant D \leqslant 60$ (50)[2]	310	260	8	7
	TF[1]	(50) $60 \leqslant D \leqslant 150$	300	240	8	—
Profile	TB[1]	$e \leqslant 15$	205	110	14	14
	TF[1]	$e \leqslant 15$	310	260	8	7
	TE	$e \leqslant 15$	290	250	8	8

1) Controlled cooling after extrusion is permitted.

2) Values between brackets are for bars other than round (for example, square, hexagonal, rectangular).

5.16 Table 16 — Al Zn4,5Mg1 (7020) [1)]

Product	Temper	Wall thickness e, or diameter D mm	Tensile strength R_m min. N/mm²	0,2 % proof stress $R_{p0,2}$ min. N/mm²	Elongation min. A %	Elongation min. A_{50mm} %
Solid profiles	TF, TE	$3,0 \leqslant e \leqslant 30$	350	290	10	8

1) The introduction of this alloy cancels ISO 3335 : 1977.

Annex

Rules for rounding

(This annex forms an integral part of Standard.)

A.1 Rounding of results obtained by inspection and testing

A.1.1 Mechanical and chemical properties

The results of mechanical and chemical tests shall be rounded using either the rules specified in the International Standard specifying the method of test or, if the value obtained contains a larger number of significant figures than the guaranteed value, the generally accepted rules for rounding.

A.1.2 Dimensional characteristics

The results of determinations of dimensions (length, width, thickness, rounding, etc.) and shape (squaring, cambering, straightness, flatness, kinking, circularity, etc.) are not rounded. These shall comply with the specification in the relevant International Standard, taking into account permissible tolerances also given in that International Standard.

A.2 Rounding for determination of compliance

In recording test results, the number representing the result of a test to determine a given property or to determine chemical composition should be expressed to the same number of decimal places as the corresponding number in the relevant International Standard.

The following rules should be used for rounding:

a) When the figure immediately after the last figure to be retained is less than 5, the last figure to be retained remains unchanged.

b) When the figure immediately after the last figure to be retained is greater than 5, or equal to 5 and followed by at least one figure other than zero, the last figure to be retained is increased by one.

c) When the figure immediately after the last figure to be retained is equal to 5 and followed by zeros only, the last figure to be retained remains unchanged if even and is increased by one if odd.