INTERNATIONAL STANDARD

ISO 6362-2

Second edition
1990-04-01

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

Part 2: Mechanical properties

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

Partie 2: Caractéristiques mécaniques

Reference number
ISO 6362-2 : 1990 (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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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*.

This second edition cancels and replaces the first edition (ISO 6362-2 : 1987), of which it constitutes a technical revision; in addition it constitutes a partial technical revision of International Standard 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).

ISO 6362 consists of the following parts, under the general title *Wrought aluminium and aluminium alloy extruded rods/bars, tubes and profiles*:

— *Part 1: Technical conditions for inspection and delivery*

— *Part 2: Mechanical properties*

— *Part 3: Extruded rectangular bars — Tolerances on shape and dimensions*

— *Part 4: Extruded profiles — Tolerances on shape and dimensions*

— *Part 5: Extruded round square and hexagonal bars — Tolerances on shape and dimensions* (At present ISO 7273 : 1981)

Annexes A and B form an integral part of this part of ISO 6362.

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

Part 2: Mechanical properties

1 Scope

In conjunction with ISO 6362-1, this part of ISO 6362 specifies the mechanical properties of wrought aluminium and aluminium alloy 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 part of ISO 6362 are in accordance with ISO 2092, ISO 2107 and annex B respectively.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6362. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6362 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 209-1 : 1989, *Wrought aluminium and aluminium alloys — Chemical composition and forms of products — Part 1: Chemical composition.*

ISO 2092 : 1981, *Light metals and their alloys — Code of designation based on chemical symbols.*

ISO 2107 : 1983, *Aluminium, magnesium and their alloys — Temper designations.*

ISO 3134-3 : 1985, *Light metals and their alloys — Terms and definitions — Part 3: Wrought products.*

ISO 6362-1 : 1986, *Wrought aluminium and aluminium alloy extruded rods/bars, tubes and profiles — Part 1: Technical conditions for inspection and delivery.*

ISO 6362-4 : 1988, *Wrought aluminium and aluminium alloy extruded rods/bars, tubes and profiles — Part 4: Extruded profiles — Tolerances on shape and dimensions.*

ISO 7273 : 1981, *Wrought aluminium and aluminium alloys — Extruded round bars — Tolerances on shape and dimensions.*

3 Definitions

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

4 Tensile testing

For the selection of the 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 24. For elongation two different gauge lengths are used. The choice of the gauge length for elongation measurements (A or $A_{50\ mm}$) is at the discretion of the producer, unless otherwise agreed[1].

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

1) A: percentage elongation on a gauge length of $5{,}65\sqrt{S_o}$

$A_{50\ mm}$: percentage elongation on a gauge length of 50 mm

5.1 Table 1 — Aluminium Al 99,5 (1050A)

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

5.2 Table 2 — Aluminium Al 99,0 (1200)

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

5.3 Table 3 — Alloy Al 99,0Cu (1100)

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

5.4 Table 4 — Alloy Al Cu4PbMg (2030)[1]

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

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

2) Minimum values guaranteed only on special agreement between the supplier and the purchaser.

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

5.5 Table 5 — Alloy Al Cu4SiMg (2014) and alloy Al Cu4SiMg(A) (2014A)

Product	Temper		Wall thickness a or diameter D mm	Tensile strength R_m min.[2] MPa	0,2 % proof stress $R_{p0,2}$ min.[2] MPa	Elongation min. A %	Elongation min. $A_{50\ mm}$ %
	ISO	Alternative designation[1]					
Bar	O	O	[3] 10 < a or D ⩽ 200	250 max.	135 max.	10	12
	TB TB51	T4 T4510 T4511	[3] 10 < a or D ⩽ 200	345	240	10	12
	TF	T6	[3] 12,5 < a or D ⩽ 100 [3] 100 < a or D ⩽ 120	440 430	400 350	6 6	
	TF51	T6510 T6511	[3] 120 < a or D ⩽ 200	430	350	6	
Tube	TF	T6	a ⩽ 15 D ⩽ 150	415	365	6	
Profile	TF	T6	[4] a ⩽ 15 [4] 15 < a ⩽ 30 [4] 30 < a ⩽ 60	415 435 470	365 370 400	6 6 5	

5.6 Table 6 — Alloy Al Cu4MgSi(A) (2017A)

Product	Temper		Wall thickness a or diameter D mm	Tensile strength R_m min.[2] MPa	0,2 % proof stress $R_{p0,2}$ min.[2] MPa	Elongation min. A %	Elongation min. $A_{50\ mm}$ %
	ISO	Alternative designation[1]					
Bar	O	O	[3] 10 < a or D ⩽ 100	250 max.	150 max.	10	
	TB	T4 T4510 T4511	[3] 10 < a ou D ⩽ 80 [3] 80 < a ou D ⩽ 200	390 360	265 220	10 7	
Tube	O	O	a ⩽ 5 D ⩽ 150	240 max.	150 max.	10	
	TB	T4	a ⩽ 5 D ⩽ 150	390	255	14	
			5 < a ⩽ 20 D ⩽ 100	370	230	10	
Profilé	TB	T4	[4] a ⩽ 15 [4] 15 < a ⩽ 30	380 380	230 230	10 10	

1) The alternative designation is applicable to the considered alloy and stated form of product only.

2) Minimum values guaranteed only on special agreement between the supplier and the purchaser.

3) According to thickness limits of ISO 7273.

4) According to thickness limits of ISO 6362-4.

5.7 Table 7 — Alloy Al Cu4Mg1 (2024)

Product	Temper		Wall thickness a or diameter D mm	Tensile strength R_m min.[2] MPa	0,2 % proof stress $R_{p0,2}$ min.[2] MPa	Elongation min. A %	Elongation min. $A_{50\ mm}$ %
	ISO	Alternative designation[1]					
Bar	O	O	[3] $10 < a$ or $D \leqslant 200$	250 max.	150 max.	10	
	TB	T4	[3] $10 < a$ or $D \leqslant 18$	410	300	10	
	TD	T3	[3] $18 < a$ or $D \leqslant 35$	450	310	8	
			[3] $35 < a$ or $D \leqslant 100$	440	300	8	
			[3] $100 < a$ or $D \leqslant 200$	400	260	6	
	TD51	T3510	[3] $10 < a$ or $D \leqslant 18$	410	300	10	12
		T3511	[3] $18 > a$ or $D \leqslant 35$	450	310	8	
			[3] $35 > a$ or $D \leqslant 150$	460	320	7	
	TH51	T8510					
	TH1	T8511	[3] $10 < a$ or $D \leqslant 150$	455	400	4	
		T81					
Tube	O	O	$a \leqslant 5$ $D \leqslant 150$	240 max.	150 max.		10
	TB	T4	$a \leqslant 15$ $D \leqslant 150$	395	290		10
	TD	T3					
	TH1	T81	$a \leqslant 5$ $D \leqslant 150$	440	385		4
Profile	TD	T3	[4] $a \leqslant 5$	395	290		12
			[4] $5 < a \leqslant 15$	395	290		12
			[4] $15 < a \leqslant 30$	415	305	9	
	TH1	T81	[4] $a \leqslant 5$	440	385		4
			[4] $5 < a \leqslant 15$	440	385		4
			[4] $15 < a \leqslant 30$	450	400	4	

5.8 Table 8 — Alloy Al Cu6BiPb (2011)[5]

Product	Temper	Wall thickness a or diameter D mm	Tensile strength R_m min. MPa	0,2 % proof stress $R_{p0,2}$ min. MPa	Elongation min. A %	Elongation min. $A_{50\ mm}$ %
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

1) The alternative designation is applicable to the considered alloy and stated form of product only.

2) Minimum values guaranteed only on special agreement between the supplier and the purchaser.

3) According to thickness limits of ISO 7273.

4) According to thickness limits of ISO 6362-4.

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

5.9 Table 9 — Alloy Al Mn1 (3103)

Product	Temper	Wall thickness a mm	Tensile strength R_m min. MPa	0,2 % proof stress $R_{p0,2}$ min.[1] MPa	Elongation min. A %	Elongation min. $A_{50\ mm}$ %
Tube	M	$a \geqslant 2,5$	95	35	17	—

5.10 Table 10 — Alloy Al Mn1Cu (3003)

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

5.11 Table 11 — Alloy Al Mg3 (5754)

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

5.12 Table 12 — Alloy Al Mg3Mn (5454)

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

1) Minimum values guaranteed only on special agreement between the supplier and the purchaser.

5.13 Table 13 — Alloy Al Mg4,5Mn0,7 (5083)

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

5.14 Table 14 — Alloy Al MgSi (6060)

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

5.15 Table 15 — Alloy Al Mg0,7Si (6063)

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

1) Controlled cooling after extrusion is permitted.

5.16 Table 16 — Alloy Al SiMg(A) (6005A)

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

5.17 Table 17 — Alloy Al Mg1SiCu (6061)

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

5.18 Table 18 — Alloy Al Si1MgMn (6082)

Product	Temper	Wall thickness a or diameter D mm	Tensile strength R_m min. MPa	0,2 % proof stress $R_{p0,2}$ min. MPa	Elongation min.	
					A %	$A_{50\ mm}$ %
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	—
Tube	TF[1]	$a \leqslant 10$	310	260	8	7
Profile	TB[1]	$a \leqslant 15$	205	110	14	14
	TF[1]	$a \leqslant 15$	310	260	8	7
	TE	$a \leqslant 15$	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).