INTERNATIONAL STANDARD

ISO 6363-2

Second edition
2012-07-15

Wrought aluminium and aluminium alloys — Cold-drawn rods/bars and tubes and wires —

Part 2: Mechanical properties

Aluminium et alliages d'aluminium corroyés — Barres, tubes et fils étirés à froid —

Partie 2: Caractéristiques mécaniques

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6363-2 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 6, *Wrought aluminium and aluminium alloys*.

This second edition cancels and replaces the first edition (ISO 6363-2:1993) which has been technically revised.

ISO 6363 consists of the following parts, under the general title *Wrought aluminium and aluminium alloys — Cold-drawn rods/bars, tubes and wires*:

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

— *Part 2: Mechanical properties*

— *Part 3: Drawn round bars and wires — Tolerances on form and dimensions (symmetric plus and minus tolerances on diameter)*

— *Part 4: Drawn rectangular bars and wires — Tolerances on form and dimensions*

— *Part 5: Drawn square and hexagonal bars and wires — Tolerances on form and dimensions*

— *Part 6: Drawn round tubes — Tolerances on form and dimensions*

Wrought aluminium and aluminium alloys — Cold-drawn rods/bars and tubes and wires —

Part 2: Mechanical properties

1 Scope

This part of ISO 6363 specifies the mechanical properties of wrought aluminium and aluminium alloy rods/bars, tubes and wires for general engineering applications (except aeronautical rivets).

It applies to products which are extruded and then cold drawn.

It does not apply to:

— products which are rolled and then cold drawn, including seam-welded tubes;

— forging stock, wire for drawing stock;

— drawn wires for aeronautical application, electrical or welding purposes.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6363-1, *Wrought aluminium and aluminium alloys — Cold-drawn rods/bars, tubes and wires — Part 1: Technical conditions for inspection and delivery*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ASTM B557M, *Standard Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6363-1 apply.

4 Tensile testing

For the selection of the specimens and tensile testing, use ISO 6892-1 or ASTM B557M.

5 Mechanical properties

Values for mechanical properties of aluminium and aluminium alloys are given in Tables 1 and 2.

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

NOTE A is the percentage elongation on a gauge length of $5{,}65\sqrt{S_o}$. A_{50mm} is the percentage elongation on a gauge length of 50 mm.

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

Table 1 — Mechanical properties of rods/bars and wires

Alloy	Temper	Dimensions[a]	Tensile strength R_m MPa		0,2 % proof stress $R_{p0,2}$ MPa		Elongation min.	
			min.	max.	min.	max.	A %	A_{50mm} %
1050	O	D or $S \leq 3$	60	100	–	–	–	–
		$3 < D$ or $S \leq 100$	60	100	20	–	–	25
	H14	D or $S \leq 10$	95	–	–	–	–	–
	H18	D or $S \leq 10$	125	–	–	–	–	–
1050A	O	D or $S \leq 30$	60	–	20	–	25	–
	H14	D or $S \leq 30$	100	–	70	–	6	5
	H16	$D \leq 15$ or $S \leq 5$	120	160	105	–	4	3
	H18	D or $S \leq 10$	130	–	110	–	3	–
1070	O	D or $S \leq 3$	55	95	–	–	–	–
		$3 < D$ or $S \leq 100$	55	95	15	–	–	25
	H14	D or $S \leq 10$	85	–	–	–	–	–
	H18	D or $S \leq 10$	120	–	–	–	–	–
1080A	O	$D \leq 20$	–	80	–	–	–	–
	H14	$D \leq 18$	90	–	–	–	–	–
	H18	$D \leq 10$	120	–	–	–	–	–
1098	O	$D \leq 20$	–	70	–	–	–	–
	H14	$D \leq 18$	85	–	–	–	–	–
	H18	$D \leq 10$	115	–	–	–	–	–
1100	O	D or $S \leq 3$	75	110	–	–	–	–
		$3 < D$ or $S \leq 100$	75	110	20	–	22	25
	H14	D or $S \leq 30$	110	–	80[b]	–	5	–
	H18	D or $S \leq 10$	150	–	130[b]	–	3	–
1200	O	D or $S \leq 3$	75	110	–	–	–	–
		$3 < D$ or $S \leq 30$	75	110	30	–	20	25
		$30 < D$ or $S \leq 100$	75	110	20	–	–	25
	H14	D or $S \leq 30$	110	–	80	–	5	–
	H16	$D \leq 15$ or $S \leq 5$	135	170	115		3	3
2007	T3	D or $S \leq 30$	370	–	240	–	7	5
		$30 < D$ or $S \leq 80$	340	–	220	–	6	–
	T351	D or $S \leq 80$	370	–	240	–	5	3
2011	T3	$3 < D$ or $S \leq 38$	310	–	260	–	9	10
		$38 < D$ or $S \leq 50$	295	–	235	–	10	12
		$50 < D$ or $S \leq 80$	280	–	205	–	10	14
	T8	$3 \leq D$ or S ≤ 80	370	–	270	–	8	10
	H13	$D \leq 18$	155	225	–	–	–	–
	H18	$D \leq 10$	240	–	–	–	–	–

Table 1 *(continued)*

Alloy	Temper	Dimensions[a]	Tensile strength R_m MPa		0,2 % proof stress $R_{p0,2}$ MPa		Elongation min.	
			min.	max.	min.	max.	A %	A_{50mm} %
2011A	T3	D or $S \leq 40$	320	–	270	–	10	8
		$40 < D$ or $S \leq 50$	300	–	250	–	10	–
		$50 < D$ or $S \leq 80$	280	–	210	–	10	–
	T8	D or $S \leq 80$	370	–	270	–	8	6
2014	O	$3 \leq D$ or $S \leq 100$	–	245	–	–	–	12
	T3	D or $S \leq 80$	380	–	290	–	8	6
	T351	D or $S \leq 80$	380	–	290	–	6	4
	T4 T42[c] T451	$3 \leq D$ or $S \leq 100$	380	–	220	–	10	16
	T6 T62[d] T651	$3 \leq D$ or $S \leq 100$	450	–	380	–	7	8
2014A	O H111	D or $S \leq 80$	–	240	–	125	12	10
	H13[e]	$D \leq 18$	210	280	–	–	–	–
	H18	$D \leq 10$	295	–	–	–	–	–
	T3	D or $S \leq 80$	380	–	290	–	8	6
	T351	D or $S \leq 80$	380	–	290	–	6	4
	T4 T451	D or $S \leq 100$	380	–	220	–	10	10
	T6	D or $S \leq 50$	440	–	360	–	7	8
	T651	D or $S \leq 100$	450	–	380	–	7	8
2017	O	D or $S \leq 3$	–	245	–	–	–	–
		$3 < D$ or $S \leq 100$	–	245	–	–	–	16
	H13	$3 \leq D$ or $S \leq 10$	205	275	–	–	–	–
	T4	D or $S \leq 3$	380	–	–	–	–	–
	T42[c]	$3 < D$ or $S \leq 100$	380	–	225	–	–	12
2017A	O H111	D or $S \leq 80$	–	240	–	125	12	10
	H13[e]	$D \leq 18$	210	300	–	–	–	–
	H18	$D \leq 10$	315	–	–	–	–	–
	T3	D or $S \leq 80$	400	–	250	–	10	8
	T351	D or $S \leq 80$	400	–	250	–	8	6
	T4 T451	D or $S \leq 50$	380	–	220	–	10	–
		$50 < D$ or $S \leq 100$	390	–	235	–	10	–

Table 1 *(continued)*

Alloy	Temper	Dimensions[a]	Tensile strength R_m MPa		0,2 % proof stress $R_{p0,2}$ MPa		Elongation min.	
			min.	max.	min.	max.	A %	A_{50mm} %
2117	H13[e]	D or $S \leq 18$	170	240	–	–	–	–
	H15	$3 < D$ or S ≤ 10	195	245	–	–	–	–
	H18	$D \leq 18$	260	–	–	–	–	–
	T4	$3 < D$ or S ≤ 10	265	–	125	–	–	18
2024	O[f]	D or $S \leq 3$	–	245	–	–	–	–
	H111	$3 < D$ or S ≤ 100	–	245	–	–	–	16
	H13[e]	$D \leq 18$	230	300	–	–	–	–
	H18	$D \leq 10$	320	–	–	–	–	–
	T3	D or $S \leq 10$	425	–	310	–	10	8
		$10 < D$ or S ≤ 80	425	–	290	–	9	7
	T351	$12,5 < D$ or S ≤ 100	425	–	310	–	9	–
	T4	D or $S \leq 3$	425	–	–	–	–	–
	T451	$3 < D$ or S ≤ 12	425	–	310	–	10	10
		$12 < D$ or S ≤ 100	425	–	290	–	9	10
	T42[c]	D or $S \leq 3$	430	–	–	–	–	–
		$3 < D$ or S ≤ 100	430	–	275	–	–	10
	T6	D or $S \leq 80$	425	–	315	–	5	4
	T651	D or $S \leq 80$	425	–	315	–	4	3
	T62[d]	D or $S \leq 3$	410	–	–	–	–	–
		$3 < D$ or S ≤ 100	410	–	315	–	–	5
	T8	D or $S \leq 80$	455	–	400	–	4	3
	T851	D or $S \leq 80$	455	–	400	–	3	2
2030	T3	D or $S \leq 50$	370	–	250	–	7	–
		$50 < D$ or S ≤ 100	340	–	210	–	7	–
	T351	D or $S \leq 80$	370	–	240	–	5	3
2219	T851	$10 < D$ or S ≤ 50	400	–	275	–	3	–
		$50 < D$ or S ≤ 100	395	–	270	–	3	–
3003	O	D or $S \leq 3$	95	125	–	–	–	–
		$3 < D$ or S ≤ 100	95	125	35	–	22	25
	H12	D or $S \leq 10$	115	–	80[b]	–	7[b]	–
	H14	D or $S \leq 10$	135	–	110 [b]	–	6[b]	–
	H16	$D \leq 15$ or $S \leq 5$	160	–	130 [b]	–	3[b]	–
	H18	D or $S \leq 10$	180	–	145 [b]	–	2[b]	–
3103	O	D or $S \leq 50$	95	–	35	–	22	19
	H14	D or $S \leq 30$	130	–	90	–	6	4
	H16	$D \leq 15$ or $S \leq 5$	160	195	130	–	4	3
	H18	D or $S \leq 10$	160	–	130	–	4	3

Table 1 *(continued)*

Alloy	Temper	Dimensions[a]	Tensile strength R_m MPa		0,2 % proof stress $R_{p0,2}$ MPa		Elongation min.	
			min.	max.	min.	max.	A %	A_{50mm} %
5005	O H111	$D \leq 80$ or $S \leq 60$	100	145	40	–	18	16
	H14	$D \leq 40$ or $S \leq 10$	140	–	110	–	6	4
	H18	$D \leq 15$ or $S \leq 2$	185	–	155	–	4	2
5005A	O H111	$D \leq 80$ or $S \leq 60$	100	145	40	–	18	16
	H14	$D \leq 40$ or $S \leq 10$	140	–	110	–	6	4
	H18	$D \leq 15$ or $S \leq 2$	185	–	155	–	4	2
5019	O H111	$D \leq 80$ or $S \leq 60$	250	320	110	–	16	14
	H12 H22 H32	$D \leq 40$ or $S \leq 25$	270	350	180	–	8	7
	H14 H24 H34	$D \leq 25$ or $S \leq 10$	300	–	210	–	4	3
5041	O	D or $S \leq 25$	225	–	–	–	–	20
5050	O	D or $S \leq 10$	125	180	–	–	25	22
	H32	D or $S \leq 10$	150	–	–	–	–	–
	H34	D or $S \leq 10$	170	–	–	–	–	–
	H36	D or $S \leq 10$	185	–	–	–	–	–
	H38	D or $S \leq 10$	200	–	–	–	–	–
5051A	O	$D \leq 20$	–	195	–	–	–	–
	H12	$D \leq 18$	170	220	–	–	–	–
	H14	$D \leq 18$	195	245	–	–	–	–
	H18	$D \leq 10$	245	–	–	–	–	–
5052	O	D or $S \leq 3$	170	220	–	–	–	–
	H111	$3 < D$ or $S \leq 100$	170	220	65	–	22	25
	H32	$3 < D$ or $S \leq 10$	215	255	–	–	–	–
	H14	D or $S \leq 3$	235	–	–	–	–	–
		$3 < D$ or $S \leq 30$	235	–	180	–	5	–
	H34	D or $S \leq 3$	235	–	–	–	–	–
		$3 < D$ or $S \leq 30$	235	–	180	–	6[b]	–
	H16 H26 H36	D or $S \leq 15$	250	290	200	–	3	3
	H18	D or $S \leq 10$	270	–	220	–	2	–
	H38	D or $S \leq 10$	270	–	220[b]	–	2[b]	–

Table 1 *(continued)*

Alloy	Temper	Dimensions[a]	Tensile strength R_m MPa		0,2 % proof stress $R_{p0,2}$ MPa		Elongation min.	
			min.	max.	min.	max.	A %	A_{50mm} %
5056	O	D or $S \leq 3$	–	315	–	–	–	–
		$3 < D$ or $S \leq 100$	250	320	110	–	16	20
	H12 H32	D or $S \leq 10$	300	–	–	–	–	–
	H34	D or $S \leq 10$	345	–	–	–	–	–
	H38	D or $S \leq 10$	380	–	–	–	–	–
5083	O	D or $S \leq 3$	275	355	–	–	–	–
		$3 < D$ or $S \leq 100$	275	355	110	–	14	14
	H111	D or $S \leq 50$	270	–	140	–	12	–
	H12	D or $S \leq 30$	300	–	200	–	4	–
5086	O	D or $S \leq 50$	240	–	95	–	16	–
	H12	D or $S \leq 25$	270	–	190	–	4	–
	H32	D or $S \leq 25$	270	–	190	–	5	–
5154	O	D or $S \leq 10$	205	285	75	–	20	16
	H32	D or $S \leq 10$	250	–	–	–	–	–
	H34	D or $S \leq 10$	270	–	–	–	–	–
	H36	D or $S \leq 10$	290	–	–	–	–	–
	H38	D or $S \leq 10$	310	–	–	–	–	–
5251	O H111	$D \leq 80$ or $S \leq 60$	150	200	60	–	17	15
	H14 H24 H34	$D \leq 30$ or $S \leq 5$	200	240	160	–	5	4
	H18 H28 H38	$D \leq 20$ or $S \leq 3$	240	–	200		2	2
5754	O	D or $S \leq 50$	180	–	80	–	16	–
	H14	D or $S \leq 30$	250	–	180	–	4	–
	H34	D or $S \leq 30$	250	–	180	–	5	–
	H18	D or $S \leq 10$	280	–	240	–	2	–
	H38	D or $S \leq 10$	280	–	240	–	3	–
6012	T4[g]	D or $S \leq 80$	200	–	100	–	10	8
	T6[g]	D or $S \leq 80$	310	–	260	–	8	6
6056	H13[d]	$D \leq 18$	160	240	–	–	–	–
	H18	$D \leq 10$	240	–	–	–	–	–
	T39[i]	$D < 6$	400	–	–	–	–	–
	T39[i]	$D \geq 6$	360	–	–	–	–	–
	T4	$D \leq 20$	300	380	–	–	–	–
	T6	$D \leq 20$	400	–	–	–	–	–
	T89[i]	$D < 6$	420	–	–	–	–	–

Table 1 *(continued)*

Alloy	Temper	Dimensions[a]	Tensile strength R_m MPa		0,2 % proof stress $R_{p0,2}$ MPa		Elongation min.	
			min.	max.	min.	max.	A %	A_{50mm} %
6060	T39[i]	$D \geq 6$	220	–	–	–	–	–
	T39[i]	$D < 6$	270	–	–	–	–	–
	T4[g]	D or $S \leq 80$	130	–	65	–	15	13
	T6[g]	D or $S \leq 80$	215	–	160	–	12	10
	T89[i]	$D < 6$	260	–	–	–	–	–
6061	O[f]	D or $S \leq 3$	145	–	–	–	–	–
		$3 < D$ or $S \leq 100$	145	–	–	–	–	18
	H13[h]	$3 \leq D$ or $S \leq 10$	155	205	–	–	–	–
	H18	$D \leq 10$	210	–	–	–	–	–
	T39	$D < 6$	310	–	–	–	–	–
		$6 \leq D$	260	–	–	–	–	–
	T4	D or $S \leq 3$	205	–	–	–	–	–
		$3 < D$ or $S \leq 100$	205	–	110	–	16	18
	T42[c]	D or $S \leq 3$	205	–	–	–	–	–
		$3 < D$ or $S \leq 100$	205	–	95	–	–	18
	T6	D or $S \leq 3$	290	–	–	–	–	–
	T62[d]	$3 < D$ or $S \leq 100$	290	–	240	–	9	10
	T89[i]	$D < 6$	300	–	–	–	–	–
6063	T39[i]	$D \geq 6$	230	–	–	–	–	–
	T39[i]	$D < 6$	280	–	–	–	–	–
	T4[g]	D or $S \leq 80$	150	–	75	–	15	13
	T6[g]	D or $S \leq 80$	220	–	190	–	10	8
	T66[g]	D or $S \leq 80$	230	–	195	–	10	8
	T89[i]	$D < 6$	270	–	–	–	–	–
6063A	O H111	D or $S \leq 80$	–	140	–	–	15	13
	T4[g]	D or $S \leq 80$	150	–	90	–	16	14
	T6[g]	D or $S \leq 80$	230	–	190	–	9	7
6065	T6[g]	$D \leq 120$ or $S \leq 85$	290	–	240	–	10	8
	T8[g]	$D \leq 120$ or $S \leq 85$	345	–	315	–	4	3
	T9[g]	$D \leq 120$ or $S \leq 85$	360	–	330	–	4	3
6082	O	D or $S \leq 80$	–	160	–	110	15	–
	H13[h]	$D \leq 18$	165	225	–	–	–	–
	H18	$D \leq 10$	220	–	–	–	–	–
	T39[i]	$D < 6$	360	–	–	–	–	–
	T39[i]	$6 \leq D$	310	–	–	–	–	–
	T4	D or $S \leq 80$	205	–	110	–	14	–
	T6	D or $S \leq 80$	310	–	255	–	10	–
	T8	D or $S \leq 80$	310	–	260	–	8	–
	T89[i]	$D < 6$	340	–	–	–	–	–