INTERNATIONAL STANDARD

ISO 6361-2

Fourth edition
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Wrought aluminium and aluminium alloys — Sheets, strips and plates —

Part 2: Mechanical properties

Aluminium et alliages d'aluminium corroyés — Tôles, bandes et tôles épaisses —

Partie 2: Propriétés mécaniques

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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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 6, *Wrought aluminium and aluminium alloys*.

This fourth edition cancels and replaces the third edition (ISO 6361-2:2011), which has been technically revised.

ISO 6361 consists of the following parts, under the general title *Wrought aluminium and aluminium alloys — Sheets, strips and plates*:

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

— *Part 2: Mechanical properties*

— *Part 3: Strips: Tolerances on shape and dimensions*

— *Part 4: Sheets and plates: Tolerances on shape and dimensions*

— *Part 5: Chemical composition*

Wrought aluminium and aluminium alloys — Sheets, strips and plates —

Part 2: Mechanical properties

1 Scope

In conjunction with ISO 6361-1, this part of ISO 6361 specifies the mechanical properties of wrought aluminium and aluminium alloy sheets, strips, and plates for general engineering applications.

It applies to flat-rolled products.

The chemical composition of these materials is given in ISO 6361-5.

The designations of aluminium and aluminium alloys and the temper designations used in this part of ISO 6361 are in accordance with ISO 2107.

NOTE In certain countries, for purposes of mechanical properties, the thickness limit can be lowered to 0,15 mm by agreement between the purchaser and the supplier, in the case of sheets and strips.

2 Normative references

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

ISO 6361-1, *Wrought aluminium and aluminium alloys — Sheets, strips and plates — Part 1: Technical conditions for inspection and delivery*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6361-1 apply.

4 Tensile testing

For the selection of the specimens and tensile testing, see ISO 6361-1.

5 Bend testing

For the selection of the specimens and bend testing, see ISO 6361-1.

6 Mechanical properties

6.1 Tensile test

Values for mechanical properties of aluminium and aluminium alloys are given in Tables 1 to 63. 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.

6.2 Bend test

Sheet, strip, and plate shall be capable of being bent cold through an angle of 180°, as applicable, around a pin having a radius equal to k times the thickness, t, of the sheet, strip, or plate (for example 0,5t) without cracking. The values of the minimum bend radii for different alloys, tempers, and thicknesses are given in Tables 1 to 63.

NOTE The explanations of the numbered notes in Tables 1 to 63 are given after Table 63.

Table 1 — Aluminium 1050

Temper	Tensile test								Bend test[2]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
H112	≥4,0	6,5	85		45		10				
	6,5	13,0	80		45		10				
	13,0	25,0	70		35		16				
	25,0	50,0	65		30		22				
	50,0	75,0	65		20		22				
O	≥0,2	0,5	60	100			15		≥0,2	6,0	0t
	0,5	0,8	60	100			20				
	0,8	1,3	60	100	20		25				
	1,3	6,5	60	100	20		30				
	6,5	50,0	60	100	20		28				
H12 or H22[3]	≥0,2	0,3	80	120			2		≥0,2	0,8	0t
	0,3	0,5	80	120			3		0,8	6,0	0,5t
	0,5	0,8	80	120			4				
	0,8	1,3	80	120	65		6				
	1,3	2,9	80	120	65		8				
	2,9	12,0	80	120	65		9				
H14 or H24[3]	≥0,2	0,3	95	125			1		≥0,2	0,8	0,5t
	0,3	0,5	95	125			2		0,8	6,0	1t
	0,5	0,8	95	125			3				
	0,8	1,3	95	125	75		4				
	1,3	2,9	95	125	75		5				
	2,9	12,0	95	125	75		6				

Table 1 *(continued)*

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
H16 or H26[3)]	≥0,2	0,5	120	145			1		≥0,2	4,0	2t
	0,5	0,8	120	145			2				
	0,8	1,3	120	145	85		3				
	1,3	4,0	120	145	85		4				
H18	≥0,2	0,5	125				1				
	0,5	0,8	125				2				
	0,8	1,3	125				3				
	1,3	3,0	125				4				

Table 2 — Aluminium 1050A

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O	≥0,2	0,5	65	95	20		20				
	0,5	1,5	65	95	20		22				
	1,5	3,0	65	95	20		26				
	3,0	6,0	65	95	20		29				
	6,0	12,5	65	95	20		35				
	12,5	25,0	65	95	20		32	32			
H14	≥0,2	0,5	105	145	85		2				
	0,5	1,5	105	145	85		3				
	1,5	3,0	105	145	85		4				
	3,0	6,0	105	145	85		5				
H24	≥0,2	0,5	105	145	75		3				
	0,5	1,5	105	145	75		4				
	1,5	3,0	105	145	75		5				
	3,0	6,0	105	145	75		8				
H18	≥0,2	0,5	140	120	120		1				
	0,5	1,5	140	120	120		2				
	1,5	3,0	140	120	120		2				

Table 3 — Aluminium 1070, 1080, and 1085

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
H112	≥4,0	6,5	75		35		13				
	6,5	13,0	70		35		15				
	13,0	25,0	60		25		20				
	25,0	50,0	55		20		25				
	50,0	75,0	55		15		25				
O	≥0,2	0,3	55	95			15		≥0,2	6,0	0t
	0,3	0,5	55	95			20				
	0,5	0,8	55	95			25				
	0,8	1,3	55	95	15		30				
	1,3	13,0	55	95	15		35				
	13,0	50,0	55	95	15		30				
H12 or H22[3)]	≥0,2	0,3	70	110			2		≥0,2	6,0	0t
	0,3	0,5	70	110			3				
	0,5	0,8	70	110			4				
	0,8	1,3	70	110	55		6				
	1,3	2,9	70	110	55		8				
	2,9	12,0	70	110	55		9				
H14 or H24[3)]	≥0,2	0,3	85	120			1		≥0,2	0,8	0,5t
	0,3	0,5	85	120			2		0,8	6,0	1t
	0,5	0,8	85	120			3				
	0,8	1,3	85	120	65		4				
	1,3	2,9	85	120	65		5				
	2,9	12,0	85	120	65		6				
H16 or H26[3)]	≥0,2	0,5	100	135			1		≥0,2	0,8	1t
	0,5	0,8	100	135			2		0,8	6,0	1,5t
	0,8	1,3	100	135	75		3				
	1,3	4,0	100	135	75		4				
H18	≥0,2	0,5	120				1				
	0,5	0,8	120				2				
	0,8	1,3	120				3				
	1,3	3,0	120				4				

Table 4 — Aluminium 1070A

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O/H111	0,2	0,5	60	90	15		23		0,2	0,5	0t
	0,5	1,5	60	90	15		25		0,5	1,5	0t
	1,5	3,0	60	90	15		29		1,5	3,0	0t
	3,0	6,0	60	90	15		32		3,0	6,0	0,5t
	6,0	12,5	60	90	15		35		6,0	12,5	0,5t
	12,5	25,0	60	90	15			32			
H112	≥6,0	12,5	70		20		20				
	12,5	25,0	70					20			
H12	0,2	0,5	80	120	55		5		0,2	0,5	0,5t
	0,5	1,5	80	120	55		6		0,5	1,5	0,5t
	1,5	3,0	80	120	55		7		1,5	3,0	0,5t
	3,0	6,0	80	120	55		9				
	6,0	12,5	80	120	55		12				
H14	0,2	0,5	100	140	70		4		0,2	0,5	0,5t
	0,5	1,5	100	140	70		4		0,5	1,5	0,5t
	1,5	3,0	100	140	70		5		1,5	3,0	1t
	3,0	6,0	100	140	70		6				
	6,0	12,5	100	140	70		7				
H16	0,2	0,5	110	150	90		2		0,2	0,5	1t
	0,5	1,5	110	150	90		2		0,5	1,5	1t
	1,5	4,0	110	150	90		3		1,5	4,0	1t
H18	0,2	0,5	125		105		2				
	0,5	1,5	125		105		2				
	1,5	3,0	125		105		2				
H22	0,2	0,5	80	120	50		7		0,2	0,5	0,5t
	0,5	1,5	80	120	50		8		0,5	1,5	0,5t
	1,5	3,0	80	120	50		10		1,5	3,0	0,5t
	3,0	6,0	80	120	50		12				
	6,0	12,5	80	120	50		15				
H24	0,2	0,5	100	140	60		5		0,2	0,5	0,5t
	0,5	1,5	100	140	60		6		0,5	1,5	0,5t
	1,5	3,0	100	140	60		7		1,5	3,0	1t
	3,0	6,0	100	140	60		9				
	6,0	12,5	100	140	60		11				
H26	0,2	0,5	110	150	80		3				
	0,5	1,5	110	150	80		3				
	1,5	4,0	110	150	80		4				

Table 5 — Aluminium 1080A

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O/H111	0,2	0,5	60	90	15		26		0,2	0,5	0t
	0,5	1,5	60	90	15		28		0,5	1,5	0t
	1,5	3,0	60	90	15		31		1,5	3,0	0t
	3,0	6,0	60	90	15		35		3,0	6,0	0,5t
	6,0	12,5	60	90	15		35		6,0	12,5	0,5t
H112	≥6,0	12,5	70				20				
	12,5	25,0	70					20			
H12	0,2	0,5	80	120	55		5		0,2	0,5	0,5t
	0,5	1,5	80	120	55		6		0,5	1,5	0,5t
	1,5	3,0	80	120	55		7		1,5	3,0	0,5t
	3,0	6,0	80	120	55		9				
	6,0	12,5	80	120	55		12				
H14	0,2	0,5	100	140	70		4		0,2	0,5	0,5t
	0,5	1,5	100	140	70		4		0,5	1,5	0,5t
	1,5	3,0	100	140	70		5		1,5	3,0	1t
	3,0	6,0	100	140	70		6				
	6,0	12,5	100	140	70		7				
H16	0,2	0,5	110	150	90		2		0,2	0,5	1t
	0,5	1,5	110	150	90		2		0,5	1,5	1t
	1,5	4,0	110	150	90		3		1,5	4,0	1t
H18	0,2	0,5	125		105		2				
	0,5	1,5	125		105		2				
	1,5	3,0	125		105		2				
H22	0,2	0,5	80	120	50		8		0,2	0,5	0,5t
	0,5	1,5	80	120	50		9		0,5	1,5	0,5t
	1,5	3,0	80	120	50		11		1,5	3,0	0,5t
	3,0	6,0	80	120	50		13				
	6,0	12,5	80	120	50		15				
H24	0,2	0,5	100	140	60		5		0,2	0,5	0,5t
	0,5	1,5	100	140	60		6		0,5	1,5	0,5t
	1,5	3,0	100	140	60		7		1,5	3,0	1t
	3,0	6,0	100	140	60		9				
	6,0	12,5	100	140	60		11				
H26	0,2	0,5	110	150	80		3				
	0,5	1,5	110	150	80		3				
	1,5	4,0	110	150	80		4				

Table 6 — Aluminium 1100, 1100A, 1200, and 1230A

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
H112	≥4,0	6,5	95		50		9				
	6,5	13,0	90		50		9				
	13,0	50,0	85		35		14				
	50,0	75,0	80		25		20				
O	≥0,2	0,5	75	105	25		17		≥0,2	6,0	0*t*
	0,5	0,8	75	105	25		22				
	0,8	1,3	75	105	25		22				
	1,3	6,5	75	105	25		30				
	6,5	75,0	75	105	25		28	25			
H12 or H22[3)]	≥0,2	0,3	95	125	75		2		≥0,2	6,0	0,5*t*
	0,3	0,5	95	125	75		3				
	0,5	0,8	95	125	75		4				
	0,8	1,3	95	125	75		6				
	1,3	2,9	95	125	75		8				
	2,9	12,0	95	125	75		9				
H14 or H24[3)]	≥0,2	0,3	120	145	95		1		≥0,2	6,0	1*t*
	0,3	0,5	120	145	95		2				
	0,5	0,8	120	145	95		3				
	0,8	1,3	120	145	95		4				
	1,3	2,9	120	145	95		5				
	2,9	12,0	120	145	95		6				
H16 or H26[3)]	≥0,2	0,5	135	165	115		1		≥0,2	4,0	2*t*
	0,5	0,8	135	165	115		2				
	0,8	1,3	135	165	115		3				
	1,3	4,0	135	165	115		4				
H18	≥0,2	0,5	150		130		1				
	0,5	0,8	150		130		2				
	0,8	1,3	150		130		3				
	1,3	3,0	150		130		4				

Table 7 — Alloy 2014

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O[4)]	≥0,4	0,5		220		140	16		≥0,4	1,6	0,5*t*
	0,5	13,0		220		140	16		1,6	2,9	1*t*
	13,0	25,0		220		140	10	9	2,9	6,0	1,5*t*

Table 7 *(continued)*

Temper	Tensile test								Bend test[2]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
T3	≥0,4	0,5	395		245		14		≥0,4	0,5	1,5t
	0,5	6,0	395		245		14		0,5	1,6	2,5t
	6,0	6,3	395		240		14		1,6	2,9	3t
	6,3	12,0	395		235		13		2,9	6,0	3,5t
T4	≥0,4	0,5	395		240		14		≥0,4	0,5	1,5t
	0,5	6,0	395		240		14		0,5	1,6	2,5t
	6,0	6,3	400		250		14		1,6	2,9	3t
	6,3	12,0	400		250		14		2,9	6,0	3,5t
T451[5]	≥6,0	13,0	400		250		14				
	13,0	25,0	400		250		14				
	25,0	50,0	400		250		12	10			
	50,0	80,0	395		250		8	7			
T42[6]	≥0,4	0,5	400				14				
	0,5	25,0	400		235		14				
T6	≥0,4	0,5	440		390		6		≥0,4	0,5	3t
	0,5	1,0	440		390		6		0,5	1,6	3,5t
	1,0	6,0	440		390		7		1,6	2,9	4,5t
	6,0	6,3	450		395		7		2,9	6,0	5t
	6,3	12,0	450		395		7				
T62[7]	≥0,4	0,5	440				6				
	0,5	1,0	440		390		6				
	1,0	6,5	460		400		7				
	6,5	13,0	460		410		7				
	13,0	25,0	460		410		6				
T651	≥6,0	13,0	460		405		7				
	13,0	25,0	460		405		7	6			
	25,0	50,0	460		405		4	5			
	50,0	60,0	450		390		2	3			
	60,0	80,0	435		380		2	1			
	80,0	100,0	405		380			1			

Table 8 — Alloy 2014A

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O	≥0,35	3,2		220		140	16	13			
	3,2	6,0		220		140	16	12			
	6,0	12,0		220		140	16	12			
	12,0	12,5		220		140	16	12			
	12,5	25,0		220		140	12	9			
T3 or T4	≥0,35	0,5	395		240		14				
	0,5	1,0	395		240		14				
	1,0	1,6	395		240		14				
	1,6	6,0	395		240		14				
	6,0	6,3	395		240		14				
	6,3	12,0	395		235		13				
T6	≥0,35	0,5	440		380		6				
	0,5	1,0	440		380		6				
	1,0	1,6	440		380		7				
	1,6	6,0	440		390		7				
	6,0	6,3	440		390		7				
	6,3	12,0	440		390		7				
T451	≥6,0	6,3	395		240		14				
	6,3	12,0	395		240		14				
	12,0	12,5	400		250		14				
	12,5	25,0	400		250		14	12			
	25,0	40,0	400		250			10			
	40,0	50,0	400		250			8			
	50,0	60,0	395		250			7			
	60,0	80,0	390		240			7			
T651	≥6,0	6,3	450		395		7				
	6,3	12,0	450		395		7				
	12,0	12,5	450		395		7				
	12,5	25,0	460		405		7	6			
	25,0	40,0	460		405			5			
	40,0	50,0	450		390			3			
	50,0	60,0	450		390			3			
	60,0	80,0	435		380			1			
	80,0	100,0	405		350			1			

Table 9 — Alloy 2017

Temper	Tensile test								Bend test[2]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O[4]	≥0,4	0,5		215			12		≥0,4	1,6	0,5t
	0,5	25,0		215		110	12		1,6	2,9	1t
									2,9	6,0	1,5t
T3	≥0,4	0,5	375				12		≥0,4	0,5	1,5t
	0,5	1,6	375		215		15		0,5	1,6	2,5t
	1,6	2,9	375		215		17		1,6	2,9	3t
	2,9	6,0	375		215		15		2,9	6,0	3,5t
T351	≥6,0	25,0	375		215		12				
	25,0	50,0	375		215		12				
	50,0	80,0	355		195		11				
	80,0	100,0	355		195		10				
T4	≥0,4	0,5	355				12		≥0,4	0,5	1,5t
	0,5	1,6	355		195		15		0,5	1,6	2,5t
	1,6	2,9	355		195		17		1,6	2,9	3t
	2,9	6,0	355		195		15		2,9	6,0	3,5t
T451	≥6,0	25,0	355		195		12				
	25,0	50,0	355		195		12				
	50,0	80,0	355		195		11				
	80,0	100,0	355		195		10				
T42[6]	≥0,4	0,5	355				12				
	0,5	1,6	355		195		15				
	1,6	2,9	355		195		17				
	2,9	6,5	355		195		15				
	6,5	25,0	335		195		12				

Table 10 — Alloy 2017A

Temper	Tensile test								Bend test[2]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O	≥0,35	3,2		225		145	12				
	3,2	6,0		225		145	13				
	6,0	12,0		225		145	13				

Table 10 *(continued)*

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
T4	0,35	6,0	390		245		14				
	6,0	12,0	390		260		13				
T451	6,0	12,0	390		260		13				
	12,0	25,0	390		250		13	12			
	25,0	40,0	390		250			12			
	40,0	60,0	385		240			10			
	60,0	80,0	385		240			10			
	80,0	120,0	370		240			8			
	120,0	150,0	350		240			4			

Table 11 — Alloy 2618A

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
T851	≥6,0	12,5	420		375		5				
	12,5	40,0	420		375			5			
	40,0	80,0	410		370			5			
	80,0	100,0	405		365			4			
	100,0	140,0	395		360			4			

Table 12 — Alloy 2219

Temper	Tensile test								Bend test[2)]		
	Specified thickness mm		Tensile strength MPa		0,2 % proof stress MPa		Elongation[1)] min. %		Specified thickness mm		Radius
	over	up to	min.	max.	min.	max.	A_{50mm}	A	over	up to	
O[4)]	≥0,5	13,0		220		110	12		≥0,5	6,5	$2t$
	13,0	50,0		220		110	11	10	6,5	13,0	$3t$
									13,0	25,0	$4t$
T31[9)]	≥0,5	1,0	315		200		8				
	1,0	6,5	315		195		10				
T351[8)]	≥6,5	12,5	315		195		10				
	12,5	50,0	315		195		10				
	50,0	80,0	305		195		10				
	80,0	100,0	290		195		9				