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Aluminij in aluminijeve zlitine - Pločevine, trakovi in plošče - 2. del: Mehanske lastnosti

Aluminium and aluminium alloys - Sheet, strip and plate - Part 2: Mechanical properties

Aluminium und Aluminiumlegierungen - Bänder, Bleche und Platten - Teil 2: Mechanische Eigenschaften

Aluminium et alliages d'aluminium - Tôles, bandes et tôles épaisses - Partie 2: Caractéristiques mécaniques

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Aluminium and aluminium alloys - Sheet, strip and plate - Part 2: Mechanical properties

Aluminium et alliages d'aluminium - Tôles, bandes et tôles épaisses - Partie 2: Caractéristiques mécaniques

Aluminium und Aluminiumlegierungen - Bänder, Bleche und Platten - Teil 2: Mechanische Eigenschaften

This European Standard was approved by CEN on 22 August 2013.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 485-2:2013) has been prepared by Technical Committee CEN/TC 132 “Aluminium and aluminium alloys”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

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CEN/TC 132 affirms its policy that if a patentee refuses to grant licences on standardized products under reasonable and not discriminatory conditions, this product will be removed from the corresponding document.

This document supersedes EN 485-2:2008.

CEN/TC 132 decided to revise EN 485-2:2008 as follows:

— addition of the alloy EN AW-1350 in a new Table 18;

— addition of the alloy EN AW-4115 in a new Table 18;

— addition of the alloy EN AW-5449A in a new Table 36;

— addition of the alloy EN AW-5456 in a new Table 38;

— EN 10002-1 was replaced by EN ISO 6892-1.

EN 485 comprises the following parts under the general title, "*Aluminium and aluminium alloys — Sheet, strip and plate*":

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

— *Part 2: Mechanical properties*

— *Part 3: Tolerances on dimensions and form for hot-rolled products*

— *Part 4: Tolerances on shape and dimensions for cold-rolled products*

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1 Scope

This European Standard specifies the mechanical properties of wrought aluminium and wrought aluminium alloy sheet, strip and plate for general engineering applications.

It does not apply to semi-finished rolled products in coiled form to be subjected to further rolling (reroll stock) or to special products such as corrugated, embossed, painted, sheets and strips or to special applications such as aerospace, can stock, finstock, for which mechanical properties are specified in separate European Standards.

The chemical composition limits of the alloys are specified in EN 573-3.

Temper designations are defined in Annex B, in compliance with the provisions of EN 515.

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.

EN 485-1, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 1: Technical conditions for inspection and delivery*

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

ASTM G66, *Standard Test Method for Visual Assessment of Exfoliation Corrosion Susceptibility of 5xxx Series Aluminium Alloys (ASSET Test)*

ASTM G67, *Standard Test Method for Determining the Susceptibility to Intergranular Corrosion of 5xxx Series Aluminium Alloys by Mass Loss After Exposure to Nitric Acid (NAMLT Test)*

3 Requirements

The mechanical properties shall be in conformity with those specified in Clause 4 or those agreed upon between purchaser and manufacturer and stated on the order document.

4 List of alloys with mechanical property limits

4.1 General

Table 1 to Table 50 contain mechanical property limits values obtained by tensile testing according to EN ISO 6892-1 after sampling and after sample preparation according to EN 485-1.

They also contain values of bend radius and hardness following sampling and test methods as described in EN 485-1. These values are for information only.

For some alloys they contain provisions related to intergranular corrosion, exfoliation corrosion or stress corrosion testing, see also EN 485-1.

4.2 Elongation

The A_{50mm} value is the elongation measured over a gauge length of 50 mm and expressed in percent.

The A value for elongation is the elongation measured over a gauge length of 5,65 $\sqrt{S_o}$ (where S_o is the initial cross-sectional area of the test-piece), and expressed in percent.

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Table 1 — Aluminium EN AW-1050A [Al 99,5]

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
	over	up to	min.	max.	min.	max.	$A_{50\ mm}$	A	180°	90°	
F[a]	≥ 2,5	150,0	60								
O	0,2	0,5	65	95	20		20		0 t	0 t	20
	0,5	1,5	65	95	20		22		0 t	0 t	20
	1,5	3,0	65	95	20		26		0 t	0 t	20
	3,0	6,0	65	95	20		29		0,5 t	0,5 t	20
	6,0	12,5	65	95	20		35		1,0 t	1,0 t	20
	12,5	80,0	65	95	20			32			20
H111	0,2	0,5	65	95	20		20		0 t	0 t	20
	0,5	1,5	65	95	20		22		0 t	0 t	20
	1,5	3,0	65	95	20		26		0 t	0 t	20
	3,0	6,0	65	95	20		29		0,5 t	0,5 t	20
	6,0	12,5	65	95	20		35		1,0 t	1,0 t	20
	12,5	80,0	65	95	20			32			20
H112	≥ 6,0	12,5	75		30		20				23
	12,5	80,0	70		25			20			22
H12	0,2	0,5	85	125	65		2		0,5 t	0 t	28
	0,5	1,5	85	125	65		4		0,5 t	0 t	28
	1,5	3,0	85	125	65		5		0,5 t	0,5 t	28
	3,0	6,0	85	125	65		7		1,0 t	1,0 t	28
	6,0	12,5	85	125	65		9			2,0 t	28
	12,5	40,0	85	125	65			9			28
H14	0,2	0,5	105	145	85		2		1,0 t	0 t	34
	0,5	1,5	105	145	85		2		1,0 t	0,5 t	34
	1,5	3,0	105	145	85		4		1,0 t	1,0 t	34
	3,0	6,0	105	145	85		5			1,5 t	34
	6,0	12,5	105	145	85		6			2,5 t	34
	12,5	25,0	105	145	85			6			34
H16	0,2	0,5	120	160	100		1			0,5 t	39
	0,5	1,5	120	160	100		2			1,0 t	39
	1,5	4,0	120	160	100		3			1,5 t	39
H18	0,2	0,5	135		120		1			1,0 t	42
	0,5	1,5	140		120		2			2,0 t	42
	1,5	3,0	140		120		2			3,0 t	42
H19	0,2	0,5	155		140		1				45
	0,5	1,5	150		130		1				45
	1,5	3,0	150		130		1				45

Table 1 *(continued)*

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
	over	up to	min.	max.	min.	max.	$A_{50\ mm}$	A	180°	90°	
H22	0,2	0,5	85	125	55		4		0,5 t	0 t	27
	0,5	1,5	85	125	55		5		0,5 t	0 t	27
	1,5	3,0	85	125	55		6		0,5 t	0,5 t	27
	3,0	6,0	85	125	55		11		1,0 t	1,0 t	27
	6,0	12,5	85	125	55		12			2,0 t	27
H24	0,2	0,5	105	145	75		3		1,0 t	0 t	33
	0,5	1,5	105	145	75		4		1,0 t	0,5 t	33
	1,5	3,0	105	145	75		5		1,0 t	1,0 t	33
	3,0	6,0	105	145	75		8		1,5 t	1,5 t	33
	6,0	12,5	105	145	75		8			2,5 t	33
H26	0,2	0,5	120	160	90		2			0,5 t	38
	0,5	1,5	120	160	90		3			1,0 t	38
	1,5	4,0	120	160	90		4			1,5 t	38
H28	0,2	0,5	140		110		2			1,0 t	41
	0,5	1,5	140		110		2			2,0 t	41
	1,5	3,0	140		110		3			3,0 t	41

[a] For information only.

Table 2 — Aluminium EN AW-1070A [Al 99,7]

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
	over	up to	min.	max.	min.	max.	$A_{50\ mm}$	A	180°	90°	
F[a]	≥ 2,5	25,0	60								
O	0,2	0,5	60	90	15		23		0 t	0 t	18
	0,5	1,5	60	90	15		25		0 t	0 t	18
	1,5	3,0	60	90	15		29		0 t	0 t	18
	3,0	6,0	60	90	15		32		0,5 t	0,5 t	18
	6,0	12,5	60	90	15		35		0,5 t	0,5 t	18
	12,5	25,0	60	90	15			32			18
H111	0,2	0,5	60	90	15		23		0 t	0 t	18
	0,5	1,5	60	90	15		25		0 t	0 t	18
	1,5	3,0	60	90	15		29		0 t	0 t	18
	3,0	6,0	60	90	15		32		0,5 t	0,5 t	18
	6,0	12,5	60	90	15		35		0,5 t	0,5 t	18
	12,5	25,0	60	90	15			32			18
H112	≥ 6,0	12,5	70		20		20				
	12,5	25,0	70					20			
H12	0,2	0,5	80	120	55		5		0,5 t	0 t	26
	0,5	1,5	80	120	55		6		0,5 t	0 t	26
	1,5	3,0	80	120	55		7		0,5 t	0,5 t	26
	3,0	6,0	80	120	55		9			1,0 t	26
	6,0	12,5	80	120	55		12			2,0 t	26
H14	0,2	0,5	100	140	70		4		0,5 t	0 t	32
	0,5	1,5	100	140	70		4		0,5 t	0,5 t	32
	1,5	3,0	100	140	70		5		1,0 t	1,0 t	32
	3,0	6,0	100	140	70		6			1,5 t	32
	6,0	12,5	100	140	70		7			2,5 t	32
H16	0,2	0,5	110	150	90		2		1,0 t	0,5 t	36
	0,5	1,5	110	150	90		2		1,0 t	1,0 t	36
	1,5	4,0	110	150	90		3		1,0 t	1,0 t	36
H18	0,2	0,5	125		105		2			1,0 t	40
	0,5	1,5	125		105		2			2,0 t	40
	1,5	3,0	125		105		2			2,5 t	40
H22	0,2	0,5	80	120	50		7		0,5 t	0 t	26
	0,5	1,5	80	120	50		8		0,5 t	0 t	26
	1,5	3,0	80	120	50		10		0,5 t	0,5 t	26
	3,0	6,0	80	120	50		12			1,0 t	26
	6,0	12,5	80	120	50		15			2,0 t	26

Table 2 *(continued)*

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
H24	0,2	0,5	100	140	60		5		0,5 *t*	0 *t*	31
	0,5	1,5	100	140	60		6		0,5 *t*	0,5 *t*	31
	1,5	3,0	100	140	60		7		1,0 *t*	1,0 *t*	31
	3,0	6,0	100	140	60		9			1,5 *t*	31
	6,0	12,5	100	140	60		11			2,5 *t*	31
H26	0,2	0,5	110	150	80		3			0,5 *t*	35
	0,5	1,5	110	150	80		3			1,0 *t*	35
	1,5	4,0	110	150	80		4			1,0 *t*	35

[a] For information only.

Table 3 — Aluminium EN AW-1080A [Al 99,8(A)]

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
	over	up to	min.	max.	min.	max.	$A_{50\ mm}$	A	180°	90°	
F[a]	≥ 2,5	25,0	60								
O	0,2	0,5	60	90	15		26		0 t	0 t	18
	0,5	1,5	60	90	15		28		0 t	0 t	18
	1,5	3,0	60	90	15		31		0 t	0 t	18
	3,0	6,0	60	90	15		35		0,5 t	0,5 t	18
	6,0	12,5	60	90	15		35		0,5 t	0,5 t	18
H111	0,2	0,5	60	90	15		26		0 t	0 t	18
	0,5	1,5	60	90	15		28		0 t	0 t	18
	1,5	3,0	60	90	15		31		0 t	0 t	18
	3,0	6,0	60	90	15		35		0,5 t	0,5 t	18
	6,0	12,5	60	90	15		35		0,5 t	0,5 t	18
H112	≥ 6,0	12,5	70				20				
	12,5	25,0	70					20			
H12	0,2	0,5	80	120	55		5		0,5 t	0 t	26
	0,5	1,5	80	120	55		6		0,5 t	0 t	26
	1,5	3,0	80	120	55		7		0,5 t	0,5 t	26
	3,0	6,0	80	120	55		9			1,0 t	26
	6,0	12,5	80	120	55		12			2,0 t	26
H14	0,2	0,5	100	140	70		4		0,5 t	0 t	32
	0,5	1,5	100	140	70		4		0,5 t	0,5 t	32
	1,5	3,0	100	140	70		5		1,0 t	1,0 t	32
	3,0	6,0	100	140	70		6			1,5 t	32
	6,0	12,5	100	140	70		7			2,5 t	32
H16	0,2	0,5	110	150	90		2		1,0 t	0,5 t	36
	0,5	1,5	110	150	90		2		1,0 t	1,0 t	36
	1,5	4,0	110	150	90		3		1,0 t	1,0 t	36
H18	0,2	0,5	125		105		2			1,0 t	40
	0,5	1,5	125		105		2			2,0 t	40
	1,5	3,0	125		105		2			2,5 t	40
H22	0,2	0,5	80	120	50		8		0,5 t	0 t	26
	0,5	1,5	80	120	50		9		0,5 t	0 t	26
	1,5	3,0	80	120	50		11		0,5 t	0,5 t	26
	3,0	6,0	80	120	50		13			1,0 t	26
	6,0	12,5	80	120	50		15			2,0 t	26

Table 3 *(continued)*

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
H24	0,2	0,5	100	140	60		5		0,5 *t*	0 *t*	31
	0,5	1,5	100	140	60		6		0,5 *t*	0,5 *t*	31
	1,5	3,0	100	140	60		7		1,0 *t*	1,0 *t*	31
	3,0	6,0	100	140	60		9			1,5 *t*	31
	6,0	12,5	100	140	60		11			2,5 *t*	31
H26	0,2	0,5	110	150	80		3			0,5 *t*	35
	0,5	1,5	110	150	80		3			1,0 *t*	35
	1,5	4,0	110	150	80		4			1,0 *t*	35

[a] For information only.

Table 4 — Aluminium EN AW-1200 [Al 99,0]

Temper	Specified thickness mm		Tensile strength R_m MPa		Yield strength $R_{p0,2}$ MPa		Elongation min. %		Bend radius[a]		Hardness HBW[a]
	over	up to	min.	max.	min.	max.	$A_{50\ mm}$	A	180°	90°	
F[a]	≥ 2,5	150,0	75								
O	0,2	0,5	75	105	25		19		0 t	0 t	23
	0,5	1,5	75	105	25		21		0 t	0 t	23
	1,5	3,0	75	105	25		24		0 t	0 t	23
	3,0	6,0	75	105	25		28		0,5 t	0,5 t	23
	6,0	12,5	75	105	25		33		1,0 t	1,0 t	23
	12,5	80,0	75	105	25			30			23
H111	0,2	0,5	75	105	25		19		0 t	0 t	23
	0,5	1,5	75	105	25		21		0 t	0 t	23
	1,5	3,0	75	105	25		24		0 t	0 t	23
	3,0	6,0	75	105	25		28		0,5 t	0,5 t	23
	6,0	12,5	75	105	25		33		1,0 t	1,0 t	23
	12,5	80,0	75	105	25			30			23
H112	≥ 6,0	12,5	85		35		16				26
	12,5	80,0	80		30			16			24
H12	0,2	0,5	95	135	75		2		0,5 t	0 t	31
	0,5	1,5	95	135	75		4		0,5 t	0 t	31
	1,5	3,0	95	135	75		5		0,5 t	0,5 t	31
	3,0	6,0	95	135	75		6		1,0 t	1,0 t	31
	6,0	12,5	95	135	75		8			2,0 t	31
	12,5	40,0	95	135	75			8			31
H14	0,2	0,5	105	155	95		1		1,0 t	0 t	37
	0,5	1,5	115	155	95		3		1,0 t	0,5 t	37
	1,5	3,0	115	155	95		4		1,0 t	1,0 t	37
	3,0	6,0	115	155	95		5		1,5 t	1,5 t	37
	6,0	12,5	115	155	90		6			2,5 t	37
	12,5	25,0	115	155	90			6			37
H16	0,2	0,5	120	170	110		1			0,5 t	42
	0,5	1,5	130	170	115		2			1,0 t	42
	1,5	4,0	130	170	115		3			1,5 t	42
H18	0,2	0,5	150		130		1			1,0 t	45
	0,5	1,5	150		130		2			2,0 t	45
	1,5	3,0	150		130		2			3,0 t	45