

Aluminium and aluminium alloys — Cold drawn rod/bar and tube —

Part 2: Mechanical properties

ICS 77.150.10

National foreword

This British Standard is the UK implementation of EN 754-2:2008. It supersedes BS EN 754-2:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee NFE/35, Light metals and their alloys.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

This document (EN 754-2:2008) 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of an identical text or by endorsement, at the latest by September 2008, and conflicting national standards shall be withdrawn at the latest by September 2008.

This document supersedes EN 754-2:1997.

Within its programme of work, Technical committee CEN/TC 132 entrusted CEN/TC 132/WG 5 "*Extruded and drawn products*" to revise EN 754-2:1997

The following technical modifications have been introduced during the revision:

- General: Typical Brinell hardness values are introduced in the tables for mechanical properties for information only
The following new alloys are included; EN AW-5049, EN AW-6262A and EN AW-6065
- Subclause 3.1: Requirements for the use of condition F is described
- Subclause 3.2: A value should be used for elongation if not otherwise agreed, with exception of certain products
- Annex A: Informative Annex A added explaining temper designation used in all tables
- Former annexes A and B are deleted (content moved to Part 1)

EN 754 comprises the following parts under the general title "*Aluminium and aluminium alloys — Cold drawn rod/bar and tube*":

- *Part 1: Technical conditions for inspection and delivery*
- *Part 2: Mechanical properties*
- *Part 3: Round bars, tolerances on dimensions and form*
- *Part 4: Square bars, tolerances on dimensions and form*
- *Part 5: Rectangular bars, tolerances on dimensions and form*
- *Part 6: Hexagonal bars, tolerances on dimensions and form*
- *Part 7: Seamless tubes, tolerances on dimensions and form*
- *Part 8: Porthole tubes, tolerances on dimensions and form*

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1 Scope

This document specifies the mechanical property limits resulting from tensile testing applicable to aluminium and aluminium alloy cold drawn rod/bar and tube.

Technical conditions for inspection and delivery, including product and testing requirements, are specified in EN 754-1. Temper designations are defined in EN 515. The chemical composition limits for these materials are given in EN 573-3.

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.

EN 754-1:2008, *Aluminium and aluminium alloys — Cold drawn rod/bar and tube — Part 1: Technical conditions for inspection and delivery*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

3 Mechanical property limits

3.1 General

The mechanical properties shall be in conformity with those specified in Tables 1 to 35 or those agreed upon between supplier and purchaser and stated in the order document.

For all alloys the condition F (as fabricated) can be used, but without guaranteed mechanical properties.

Tables 1 to 35 contain limits of mechanical property values obtained by tensile testing according to EN 10002-1 after sampling and test piece preparation according to EN 754-1.

NOTE The mechanical properties refer to test pieces taken in the longitudinal direction. Mechanical properties of test pieces taken in other directions can differ from those for the longitudinal direction quoted in this standard.

Brinell hardness values given in Tables 1 to 35 expressed as HBW values are for information only.

3.2 Elongation

If not otherwise agreed, the A value shall be used.

The A value for elongation is the % elongation measured over a gauge length of $5,65\sqrt{S_0}$ (where S_0 is the initial cross-sectional area of the test-piece), and expressed in percent.

For certain products the supplier may choose (if not otherwise specified in the order documents) to use the elongation based on $A_{50\text{mm}}$. Consequently values for the $A_{50\text{mm}}$ are included in the following tables.

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

Test pieces and their location in the specimen are given in EN 754-1.

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3.4 Detailed tables of mechanical properties

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

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
	D^a	S^b	min.	max.	min.	max.			
O, H111	≤ 80	≤ 60	60	95	-	-	25	22	20
H14	≤ 40	≤ 10	100	135	70	-	6	5	30
H16	≤ 15	≤ 5	120	160	105	-	4	3	35
H18	≤ 10	≤ 3	145	-	125	-	3	3	43
Drawn tube									
Temper	Wall thickness t mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
			min.	max.	min.	max.			
O, H111	≤ 20		60	95	-	-	25	22	20
H14	≤ 10		100	135	70	-	6	5	30
H16	≤ 5		120	160	105	-	4	3	35
H18	≤ 3		145	-	125	-	3	3	43
^a D = Diameter for round bar									
^b S = Width across flats for square and hexagonal bar, thickness for rectangular bar									

Table 2 — Aluminium EN AW-1200 [Al 99,0]

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
	D^a	S^b	min.	max.	min.	max.			
O, H111	≤ 80	≤ 60	70	105	-	-	20	16	23
H14	≤ 40	≤ 10	110	145	80	-	5	4	37
H16	≤ 15	≤ 5	135	170	115	-	3	3	45
H18	≤ 10	≤ 3	150	-	130	-	3	3	50
Drawn tube									
Temper	Wall thickness t mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
			min.	max.	min.	max.			
O, H111	≤ 20		70	105	-	-	20	16	23
H14	≤ 10		110	145	80	-	5	4	37
H16	≤ 5		135	170	115	-	3	3	45
H18	≤ 3		150	-	130	-	3	3	50
^a D = Diameter for round bar									
^b S = Width across flats for square and hexagonal bar, thickness for rectangular bar									

Table 3 — Alloy EN AW-2007 [Al CuPbMgMn]

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A %	$A_{50\text{ mm}}$ %	HBW Typical value
	D^a	S^b	min.	max.	min.	max.	min.	min.	
T3 ^c	≤ 30	≤ 30	370	-	240	-	7	5	95
	$30 < D \leq 80$	$30 < S \leq 80$	340	-	220	-	6	-	95
T351 ^c	≤ 80	≤ 80	370	-	240	-	5	3	95
Drawn tube									
Temper	Wall thickness t mm		R_m MPa		$R_{p0,2}$ MPa		A %	$A_{50\text{ mm}}$ %	HBW Typical value
			min.	max.	min.	max.	min.	min.	
T3 ^c	≤ 20		370	-	250	-	7	5	95
T3510 T3511 ^c	≤ 20		370	-	240	-	5	3	95
^a D = Diameter for round bar									
^b S = Width across flats for square and hexagonal bar, thickness for rectangular bar									
^c Properties may be obtained by press quenching									

Table 4 — Alloy EN AW-2011 [Al Cu6BiPb]

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A %	$A_{50\text{ mm}}$ %	HBW Typical value
	D^a	S^b	min.	max.	min.	max.	min.	min.	
T3	≤ 40	≤ 40	320	-	270	-	10	8	90
	$40 < D \leq 50$	$40 < S \leq 50$	300	-	250	-	10	-	90
	$50 < D \leq 80$	$50 < S \leq 80$	280	-	210	-	10	-	90
T8	≤ 80	≤ 80	370	-	270	-	8	6	115
Drawn tube									
Temper	Wall thickness t mm		R_m MPa		$R_{p0,2}$ MPa		A %	$A_{50\text{ mm}}$ %	HBW Typical value
			min.	max.	min.	max.	min.	min.	
T3 ^c	≤ 5		310	-	260	-	10	8	90
	$5 < t \leq 20$		290	-	240	-	8	6	90
T8	≤ 20		370	-	275	-	8	6	115
^a D = Diameter for round bar									
^b S = Width across flats for square and hexagonal bar, thickness for rectangular bar									
^c Properties may be obtained by press quenching									

Table 5 — Alloy EN AW-2011A [Al Cu6BiPb(A)]

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
	D^a	S^b	min.	max.	min.	max.			
T3	≤ 40	≤ 40	320	-	270	-	10	8	90
	$40 < D \leq 50$	$40 < S \leq 50$	300	-	250	-	10	-	90
	$50 < D \leq 80$	$50 < S \leq 80$	280	-	210	-	10	-	90
T8	≤ 80	≤ 80	370	-	270	-	8	6	115
Drawn tube									
Temper	Wall thickness t mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
			min.	max.	min.	max.			
T3 ^c	≤ 5		310	-	260	-	10	8	90
	$5 < t \leq 20$		290	-	240	-	8	6	90
T8	≤ 20		370	-	275	-	8	6	115
^a D = Diameter for round bar									
^c S = Width across flats for square and hexagonal bar, thickness for rectangular bar									
^c Properties may be obtained by press quenching									

Table 6 — Alloy EN AW-2014 [Al Cu4SiMg]

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
	D^a	S^b	min.	max.	min.	max.			
O, H111	≤ 80	≤ 80	-	240	-	125	12	10	45
T3	≤ 80	≤ 80	380	-	290	-	8	6	110
T351	≤ 80	≤ 80	380	-	290	-	6	4	110
T4	≤ 80	≤ 80	380	-	220	-	12	10	110
T451	≤ 80	≤ 80	380	-	220	-	10	8	110
T6	≤ 80	≤ 80	450	-	380	-	8	6	140
T651	≤ 80	≤ 80	450	-	380	-	6	4	140
Drawn tube									
Temper	Wall thickness t mm	R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value	
		min.	max.	min.	max.				
O, H111	≤ 20	-	240	-	125	12	10	45	
T3	≤ 20	380	-	290	-	8	6	110	
T3510, T3511	≤ 20	380	-	290	-	6	4	110	
T4	≤ 20	380	-	240	-	12	10	110	
T4510, T4511	≤ 20	380	-	240	-	10	8	110	
T6	≤ 20	450	-	380	-	8	6	140	
T6510, T6511	≤ 20	450	-	380	-	6	4	140	
^a D = Diameter for round bar									
^b S = Width across flats for square and hexagonal bar, thickness for rectangular bar									

Table 7 — Alloy EN AW-2014A [Al Cu4SiMg(A)]

Drawn rod/bar									
Temper	Dimensions mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
	D^a	S^b	min.	max.	min.	max.			
O, H111	≤ 80	≤ 80	-	240	-	125	12	10	45
T3	≤ 80	≤ 80	380	-	290	-	8	6	110
T351	≤ 80	≤ 80	380	-	290	-	6	4	110
T4	≤ 80	≤ 80	380	-	220	-	12	10	110
T451	≤ 80	≤ 80	380	-	220	-	10	8	110
T6	≤ 80	≤ 80	450	-	380	-	8	6	140
T651	≤ 80	≤ 80	450	-	380	-	6	4	140
Drawn tube									
Temper	Wall thickness t mm		R_m MPa		$R_{p0,2}$ MPa		A % min.	$A_{50\text{ mm}}$ % min.	HBW Typical value
			min.	max.	min.	max.			
O, H111	≤ 20		-	240	-	125	12	10	45
T3	≤ 20		380	-	290	-	8	6	110
T3510, T3511	≤ 20		380	-	290	-	6	4	110
T4	≤ 20		380	-	240	-	12	10	110
T4510, T4511	≤ 20		380	-	240	-	10	8	110
T6	≤ 20		450	-	380	-	8	6	140
T6510, T6511	≤ 20		450	-	380	-	6	4	140
^a D = Diameter for round bar									
^b S = Width across flats for square and hexagonal bar, thickness for rectangular bar									