

Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles

Part 2. Mechanical properties

The European Standard EN 755-2 : 1997 has the status of a
British Standard

ICS 77.150.10

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee NFE/35, Light metals and their alloys, to Subcommittee NFE/35/5, Wrought aluminium and aluminium alloys, upon which the following bodies were represented:

- Aluminium Federation
- Aluminium Stockholders' Association
- Association of Light Alloy Refiners Limited
- Magnesium Industry Council
- Ministry of Defence

The following bodies were also represented in the drafting of the standard, through sub-committees and panels:

- Association of British Welded Aluminium Tube Makers
- Institution of Structural Engineers
- Metal Packaging Manufacturers' Association

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1997

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Amendments issued since publication

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National foreword

This Part of BS EN 755 has been prepared by Subcommittee NFE/35/5 and is the English language version of EN 755 *Aluminium and aluminium alloys — Extruded rod/bar tube and profiles — Part 2 : 1997 Mechanical properties*, published by the European Committee for Standardization (CEN).

This British Standard is published under the direction of the Engineering Sector Board whose Technical Committee NFE/35 has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international committee any enquiries on interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

This Part of BS EN 755 is published together with:

BS EN 754 *Aluminium and aluminium alloys — Cold drawn rod/bar and tube*
 Part 1 *Technical conditions for inspection and delivery*
 Part 2 *Mechanical properties*
 BS EN 755 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles*
 Part 1 *Technical conditions for inspection and delivery*

As a result of the publication of the above standards, BS 4300 : Part 5 : 1973 is withdrawn and the following British Standards listed in the table are partially superseded.

NOTE. The table gives the full list of European Standards which partially supersede the British Standards.

British Standards partially superseded by this standard and other European Standards				
BS 1471 : 1972	BS 1474 : 1987	BS 4300 : Part 4 : 1973	BS 4300 : Part 12 : 1969	BS 4300 : Part 15 : 1973
EN 515	EN 515	EN 515	EN 515	EN 515
EN 573-3	EN 573-3	EN 573-3	EN 573-3	EN 573-3
EN 573-4	EN 573-4	EN 573-4	EN 573-4	EN 574-4
EN 754-1	EN 755-1	EN 755-1	EN 755-1	EN 755-1
EN 754-2	EN 755-2	EN 755-2	EN 755-2	EN 755-2
	EN 755-3	EN 755-3	EN 755-3	EN 755-3
	EN 755-4	EN 755-4	EN 755-4	EN 755-4
	EN 755-5	EN 755-5	EN 755-5	EN 755-5
	EN 755-6	EN 755-6	EN 755-6	EN 755-6

In addition, the British Standards in the table will be withdrawn when the following European Standards are published:

EN 754	<i>Aluminium and aluminium alloys — Cold drawn rod/bar and tube</i>
Part 7	<i>Seamless tubes, tolerances on dimensions and form</i>
Part 8	<i>Porthole tubes, tolerances on dimensions and form</i>
EN 755	<i>Aluminium and aluminium alloys — Extruded rod/bar and profiles</i>
Part 7	<i>Seamless tubes, tolerances on dimensions and form</i>
Part 8	<i>Porthole tubes, tolerances on dimensions and form</i>
Part 9	<i>Profile, tolerances on dimensions and form</i>
EN 12020	<i>Aluminium and aluminium alloys — Extruded precision profiles in alloys EN AW 6060/EN AW 6063</i>
Part 1	<i>Technical conditions for inspection and delivery</i>
Part 2	<i>Tolerances on dimensions and form</i>

NOTE. International and European Standards, as well as overseas standards, are available from Customer Services, BSI, 389 Chiswick High Road, London W4 4AL.

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Descriptors: Aluminium, aluminium alloys, wrought products, extruded products, metal bars, metal tubes, metal sections, mechanical properties, tables (data)

English version

Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 2: Mechanical properties

Aluminium et alliages d'aluminium — Barres, tubes et profilés filés — Partie 2: Caractéristiques mécaniques

Aluminium und Aluminiumlegierungen — Stanggepreßte Stangen, Rohre und Profile — Teil 2: Mechanische Eigenschaften

This European Standard was approved by CEN on 1997-03-10. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard has been drawn up by 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 October 1997, and conflicting national standards shall be withdrawn at the latest by October 1997.
Within its programme of work, Technical Committee CEN/TC 132 entrusted CEN/TC 132/WG 5, Extruded and drawn products, to prepare the following standard:

EN 755-2 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 2: Mechanical properties*

This standard is part of a set of nine standards. The other standards deal with:

EN 755-1 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 1: Technical conditions for inspection and delivery*

EN 755-3 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 3: Round bars, tolerances on dimensions and form*

EN 755-4 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 4: Square bars, tolerances on dimensions and form*

EN 755-5 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 5: Rectangular bars, tolerances on dimensions and form*

EN 755-6 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 6: Hexagonal bars, tolerances on dimensions and form*

prEN 755-7 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 7: Seamless tubes, tolerances on dimensions and form*

prEN 755-8 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 8: Porthole tubes, tolerances on dimensions and form*

prEN 755-9 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 9: Profiles, tolerances on dimensions and form*

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This Part of EN 755 specifies the mechanical property limits applicable to aluminium and aluminium alloy extruded rod/bar, tube and profile.

Temper designations are defined in EN 515. The numerical designation system of alloys is specified in EN 573-1. The chemical symbol based designation system is specified in EN 573-2. The chemical composition limits for these materials are given in EN 573-3. Mechanical property limits are specified for all Class 'A' alloys as defined in EN 573-4.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 515	<i>Aluminium and aluminium alloys — Wrought products — Temper designations</i>
EN 573-1	<i>Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 1: Numerical designation system</i>
EN 573-2	<i>Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 2: Chemical symbol based designation system</i>
EN 573-3	<i>Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition</i>
EN 573-4	<i>Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 4: Forms of products</i>
EN 755-1	<i>Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Part 1: Technical conditions for inspection and delivery</i>
EN 2004-1	<i>Aerospace series — Test methods for aluminium and aluminium alloys products — Part 1: Determination of electrical conductivity of wrought aluminium alloys</i>
EN 10002-1	<i>Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature)</i>
ISO 9591	<i>Corrosion of aluminium alloys — Determination of resistance to stress-corrosion cracking</i>
ASTM G 47	<i>Standard test method for determining susceptibility to stress-corrosion cracking of high-strength aluminium alloy products</i>

3 Requirements

The mechanical properties shall be in conformity with those specified in clause 5 or those agreed upon between supplier and purchaser and stated in the order.

4 Tensile test

The selection, preparation and number of specimens and test-pieces are specified in EN 755-1.

Tensile testing shall be carried out as specified in EN 10002-1.

4.1 Test direction

All products shall be tested in the longitudinal direction in order to provide guaranteed mechanical properties.

Test in other directions may be carried out. However these and mechanical properties shall be agreed between supplier and purchaser and shall be stated on the order. It should be noted that the mechanical properties obtained can differ from those for the longitudinal direction quoted in this standard.

4.2 Elongation values

The $A_{50\text{ mm}}$ 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 $5,65\sqrt{S_0}$ (where S_0 is the initial cross sectional area of the test piece), and expressed in percent.

a) Extruded rod/bar:

the $A_{50\text{ mm}}$ value shall be used for rectangular rod/bar tested in the full thickness up to 12,5 mm thickness.

The A value shall be used for all other test pieces.

b) Extruded tube:

the $A_{50\text{ mm}}$ value shall be used for tube tested in the full section and the sheet type specimens taken from tube having either a flat or a curved wall up to and including 12,5 mm thick.

The A value shall be used for round test pieces machined from wall thicknesses over 12,5 mm.

c) Extruded profile:

the $A_{50\text{ mm}}$ value shall be used for shapes tested in full section and for sheet type specimens machined from material up to and including 12,5 mm in thickness having parallel surfaces.

The A value shall be used for round test specimens machined from material thicknesses over 12,5 mm.

5 List of alloys and their mechanical properties

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NOTE. EN AW-5019 is the new designation for EN AW-5056A.

Table 1. Alloy EN AW-1050A [Al 99,5]								
Extruded rod/bar								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all	all	60	—	20	—	25	23
O, H111	all	all	60	95	20	—	25	23
Extruded tube								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all		60	—	20	—	25	23
O, H111	all		60	95	20	—	25	23
Extruded profile								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all		60	—	20	—	25	23

¹⁾ D = Diameter for round bar.

²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar.

³⁾ e = Wall thickness.

⁴⁾ F Temper: property values are for information only.

Table 2. Alloy EN AW-1070A [Al 99,7]								
Extruded rod/bar								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
	mm		MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all	all	60	—	20	—	25	23
Extruded tube								
Not specified.								
Extruded profile								
Not specified.								
¹⁾ D = Diameter for round bar.								
²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar.								
⁴⁾ F Temper: property values are for information only.								

Table 3. Alloy EN AW-1200 [Al 99,0]								
Extruded rod/bar								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
			MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all	all	75	—	25	—	20	18
Extruded tube								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
			MPa		MPa		%	%
	$e^3)$		min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all		75	—	25	—	20	18
Extruded profile								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
			MPa		MPa		%	%
	$e^3)$		min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all		75	—	25	—	20	18
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ⁴⁾ F Temper: property values are for information only.								

Table 4. Alloy EN AW-1350 [EA1 99,5]								
Extruded rod/bar ¹¹⁾								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all	all	60	—	—	—	25	23
Extruded tube ¹¹⁾								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all		60	—	—	—	25	23
Extruded profile ¹¹⁾								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
F ⁴⁾ , H112	all		60	—	—	—	25	23
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ⁴⁾ F Temper: property values are for information only. ¹¹⁾ Electrical conductivity $\gamma \geq 35,4 \text{ MS/m}$.								

Table 5. Alloy EN AW-2007 [Al Cu4PbMgMn]								
Extruded rod/bar								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
T4, T4510, T4511 ⁵⁾	≤ 80	≤ 80	370	—	250	—	8	6
	$80 < D \leq 200$	$80 < S \leq 200$	340	—	220	—	8	—
	$200 < D \leq 250$	$200 < S \leq 250$	330	—	210	—	7	—
Extruded tube								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
T4, T4510, T4511 ⁵⁾	≤ 25		370	—	250	—	8	6
Extruded profile								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
T4, T4510, T4511 ⁵⁾	≤ 30		370	—	250	—	8	6
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ⁵⁾ Properties may be obtained by press quenching.								

Table 6. Alloy EN AW-2011 [Al Cu6BiPb]								
Extruded rod/bar								
Temper	Dimensions		R_m MPa		$R_{P0,2}$ MPa		A %	$A_{50\text{ mm}}$ %
	mm $D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
T4 ⁵⁾	≤ 200	≤ 60	275	—	125	—	14	12
T6 ⁵⁾	≤ 75	≤ 60	310	—	230	—	8	6
	$75 < D \leq 200$	—	295	—	195	—	6	—
Extruded tube								
Temper	Dimensions		R_m MPa		$R_{P0,2}$ MPa		A %	$A_{50\text{ mm}}$ %
	mm $e^{3)}$		min.	max.	min.	max.	min.	min.
T6 ⁵⁾	≤ 25		310	—	230	—	6	4
Extruded profile								
Not specified.								
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ⁵⁾ Properties may be obtained by press quenching.								

Table 7. Alloy EN AW-2011A [Al Cu6BiPb(A)]								
Extruded rod/bar								
Temper	Dimensions		R_m MPa		$R_{P0,2}$ MPa		A %	$A_{50\text{ mm}}$ %
	mm $D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
T4 ⁵⁾	≤ 200	≤ 60	275	—	125	—	14	12
T6 ⁵⁾	≤ 75	≤ 60	310	—	230	—	8	6
	$75 < D \leq 200$	—	295	—	195	—	6	—
Extruded tube								
Temper	Dimensions		R_m MPa		$R_{P0,2}$ MPa		A %	$A_{50\text{ mm}}$ %
	mm $e^{3)}$		min.	max.	min.	max.	min.	min.
T6 ⁵⁾	≤ 25		310	—	230	—	6	4
Extruded profile								
Not specified.								
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ⁵⁾ Properties may be obtained by press quenching.								

Table 8. Alloy EN AW-2014 [Al Cu4SiMg]								
Extruded rod/bar								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
O, H111	≤ 200	≤ 200	—	250	—	135	12	10
T4, T4510, T4511	≤ 25	≤ 25	370	—	230	—	13	11
	$25 < D \leq 75$	$25 < S \leq 75$	410	—	270	—	12	—
	$75 < D \leq 150$	$75 < S \leq 150$	390	—	250	—	10	—
	$150 < D \leq 200$	$150 < S \leq 200$	350	—	230	—	8	—
T6, T6510, T6511	≤ 25	≤ 25	415	—	370	—	6	5
	$25 < D \leq 75$	$25 < S \leq 75$	460	—	415	—	7	—
	$75 < D \leq 150$	$75 < S \leq 150$	465	—	420	—	7	—
	$150 < D \leq 200$	$150 < S \leq 200$	430	—	350	—	6	—
	$200 < D \leq 250$	$200 < S \leq 250$	420	—	320	—	5	—
Extruded tube								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
O, H111	≤ 20		—	250	—	135	12	10
T4, T4510, T4511	≤ 20		370	—	230	—	11	10
T6, T6510, T6511	≤ 10		415	—	370	—	7	5
	$10 < e \leq 40$		450	—	400	—	6	4
Extruded profile¹⁰⁾								
Temper	Dimensions		R_m		$R_{p0,2}$		A	$A_{50 \text{ mm}}$
	mm		MPa		MPa		%	%
	$e^{3)}$		min.	max.	min.	max.	min.	min.
O, H111	all		—	250	—	135	12	10
T4, T4510, T4511	≤ 25		370	—	230	—	11	10
	$25 < e \leq 75$		410	—	270	—	10	—
T6, T6510, T6511	≤ 25		415	—	370	—	7	5
	$25 < e \leq 75$		460	—	415	—	7	—
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ¹⁰⁾ If a profile cross section is comprised of different thicknesses which fall in more than one set of specified mechanical property values, the lowest specified value shall be considered as valid for the whole profile cross section.								

Table 9. Alloy EN AW-2014A [Al Cu4SiMg(A)]								
Extruded rod/bar								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
	mm		MPa		MPa		%	%
	$D^{1)}$	$S^{2)}$	min.	max.	min.	max.	min.	min.
O, H111	≤ 200	≤ 200	—	250	—	135	12	10
T4, T4510, T4511	≤ 25	≤ 25	370	—	230	—	13	11
	$25 < D \leq 75$	$25 < S \leq 75$	410	—	270	—	12	—
	$75 < D \leq 150$	$75 < S \leq 150$	390	—	250	—	10	—
	$150 < D \leq 200$	$150 < S \leq 200$	350	—	230	—	8	—
T6, T6510, T6511	≤ 25	≤ 25	415	—	370	—	6	5
	$25 < D \leq 75$	$25 < S \leq 75$	460	—	415	—	7	—
	$75 < D \leq 150$	$75 < S \leq 150$	465	—	420	—	7	—
	$150 < D \leq 200$	$150 < S \leq 200$	430	—	350	—	6	—
	$200 < D \leq 250$	$200 < S \leq 250$	420	—	320	—	5	—
Extruded tube								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
	mm		MPa		MPa		%	%
	$e^3)$		min.	max.	min.	max.	min.	min.
O, H111	≤ 20		—	250	—	135	12	10
T4, T4510, T4511	≤ 20		370	—	230	—	11	10
T6, T6510, T6511	≤ 10		415	—	370	—	7	5
	$10 < e \leq 40$		450	—	400	—	6	4
Extruded profile ¹⁰⁾								
Temper	Dimensions		R_m		$R_{P0,2}$		A	$A_{50\text{ mm}}$
	mm		MPa		MPa		%	%
	$e^3)$		min.	max.	min.	max.	min.	min.
O, H111	all		—	250	—	135	12	10
T4, T4510, T4511	≤ 25		370	—	230	—	11	10
	$25 < e \leq 75$		410	—	270	—	10	—
T6, T6510, T6511	≤ 25		415	—	370	—	7	5
	$25 < e \leq 75$		460	—	415	—	7	—
¹⁾ D = Diameter for round bar. ²⁾ S = Width across flats for square and hexagonal bar, thickness for rectangular bar. ³⁾ e = Wall thickness. ¹⁰⁾ If a profile cross section is comprised of different thicknesses which fall in more than one set of specified mechanical property values, the lowest specified value shall be considered as valid for the whole profile cross section.								