



## Extruded alloys- tempers & mechanical properties:

Standard alloys in production include:

EN-AW 6060 (Al MgSi0,5)	DIN 3.3206
EN-AW 6063 (Al Mg0,7Si)	DIN 3.2315
EN-AW 6005A (Al MgSi0,7)	DIN 3.3210
EN-AW 6082 (Al Si1MgMn)	DIN 3.2315
EN-AW 6061 (Al Mg1SiCu)	DIN 3.3211*

\* Only available with a prior notice of 5 weeks and a minimum ordered quantity of 22 tons dispatched in one go.

Alloy chemical composition as per EN 573-3:2-13											
Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Other		Al
									Each	Total	
<b>6060</b>	0,30-0,60	0,10-0,30	0,10	0,10	0,35-0,60	0,05	0,15	0,10	0,05	0,15	Rest
<b>6063</b>	0,20-0,60	0,35	0,10	0,10	0,45-0,90	0,10	0,10	0,10	0,05	0,15	Rest
<b>6005A</b>	0,50-0,90	0,35	0,30	0,50	0,40-0,70	0,30	0,20	0,10	0,05	0,15	Rest
<b>6082</b>	0,70-1,30	0,50	0,10	0,40-1,00	0,60-1,20	0,25	0,20	0,10	0,05	0,15	Rest
<b>6061*</b>	0,40-0,80	0,70	0,15-0,40	0,15	0,80-1,20	0,04-0,35	0,25	0,15	0,05	0,15	Rest

Available combinations of Alloys & Tempers				
6060	6063	6005A	6082	6061
O	O	O	O	O
T4	T4	T4	T4	T4
T5	T5	-	T5	-
T6	T6	T6	T6	T6
T66	T66	-	-	-

Temper designation EN 515:2017	
O	Annealed wrought alloys
T4	Solution heat treated & naturally aged.
T5	Cooled from an elevated temperature forming operation & artificially aged (precipitation hardened)
T6	Solution heat treated & artificially aged (precipitation hardened). Press quenching required.
T66	Cooled from an elevated temperature forming operation & artificially aged (precipitation hardened) to a higher level of mechanical properties through special control of manufacturing processes. Press quenching required.

Physical properties	Alloys EN-AW				
Alloys EN-AW	6060	6063	6005A	6082	6061
Melting range °C	585-650		585-650	585-650	580-640
Density g/cm <sup>3</sup>	2,70	2,70	2,70	2,70	2,70
Electrical Conductivity MS/m	34-38		26-32	24-32	22-30
Thermal Conductivity W/(m K)	200-220		180-220	170-220	170-200
Specific Heat J/(Kg K)	898			896	
Thermal Expansion Values					
-50 to 20 °C (10 <sup>-6</sup> /K)	21,8	23,4	23,4	23,4	23,0
20 to 100 °C (10 <sup>-6</sup> /K)	23,4				
20 to 200 °C (10 <sup>-6</sup> /K)	24,5				
20 to 300 °C (10 <sup>-6</sup> /K)	25,6				
Young's Modulus MPa	69500	69500	69500	70000	70000
Shear Modulus MPa	26100	26100	26200	26400	26300

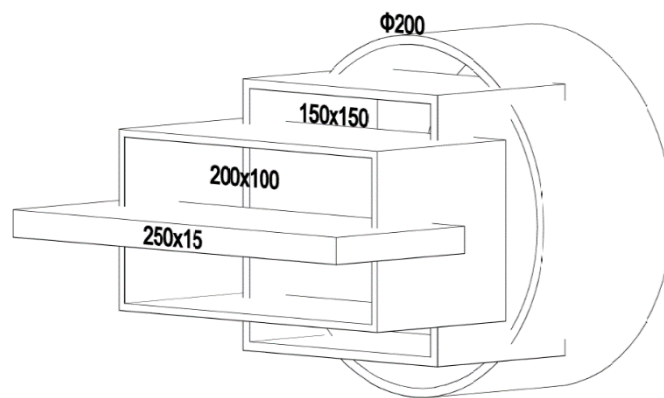
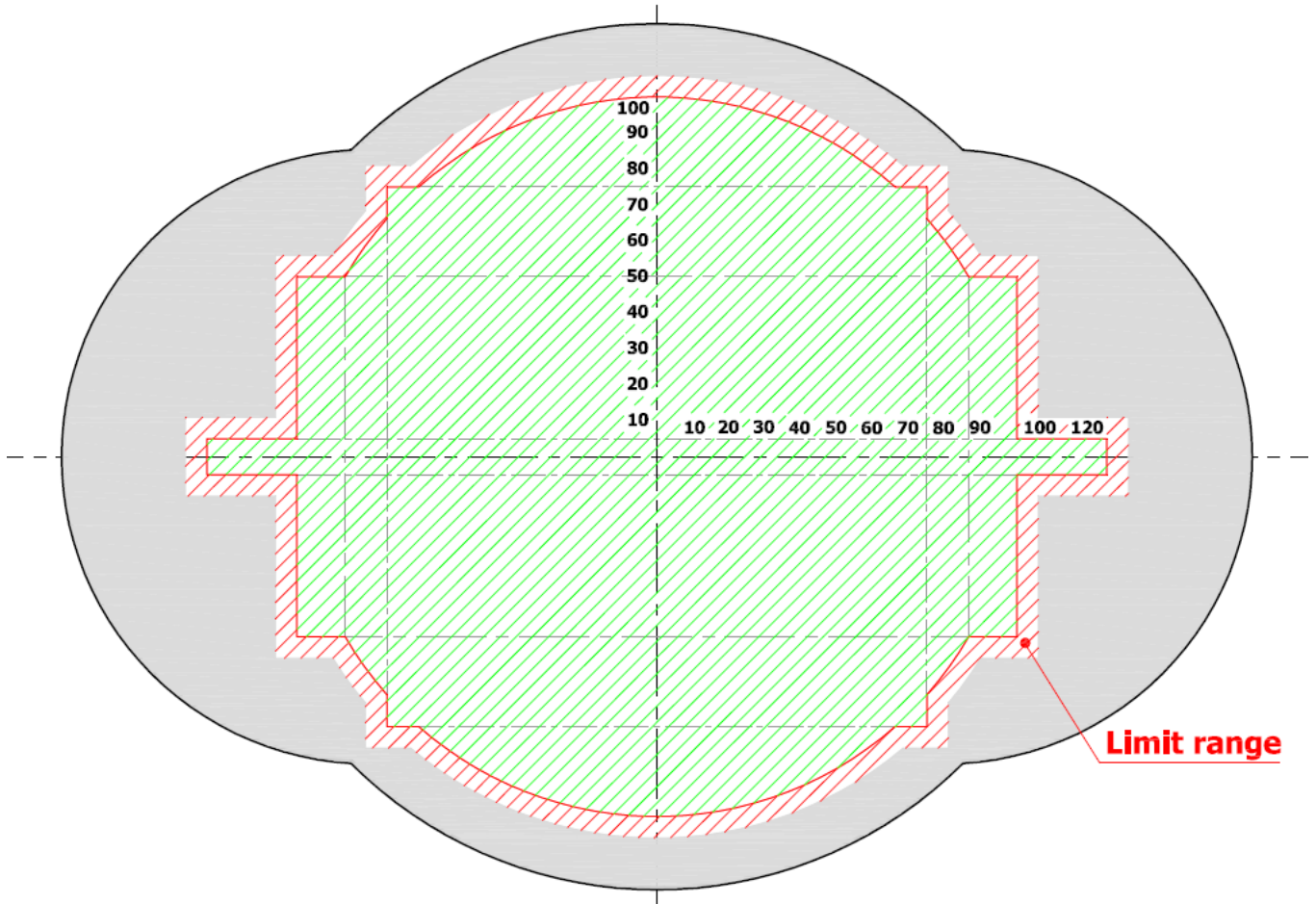


Mechanical properties as per EN 755-2:2016 (EXTRUDED PROFILES)							
Alloy	Temper	Wall Thickness e mm*	Tensile strength R <sub>m</sub> MPa min	Yield strength R <sub>p0,2</sub> MPa min	Elongation		Brinell Hardness HB**
					A % min	A <sub>50mm</sub> % min	
EN-AW 6060	T4	e ≤ 25	120	60	16	14	50
	T5	e ≤ 5	160	120	8	6	60
		5 < e ≤ 25	140	100	8	6	60
	T6	e ≤ 5	190	150	8	6	60
		5 < e ≤ 25	170	140	8	6	60
	T66	e ≤ 5	215	160	8	6	75
		5 < e ≤ 25	195	150	8	6	75
EN-AW 6063	T4	e ≤ 25	130	65	14	12	50
	T5	e ≤ 10	175	130	8	6	65
		10 < e ≤ 25	160	110	7	5	65
	T6	e ≤ 10	215	170	8	6	75
		10 < e ≤ 25	195	160	8	6	75
	T66	e ≤ 10	245	200	8	6	80
10 < e ≤ 25		225	180	8	6	80	
EN-AW 6005A	T4 open	e ≤ 25	180	90	15	13	50
	T4 hollow	e ≤ 10	180	90	15	13	50
	T6 open	e ≤ 5	270	225	8	6	90
		5 < e ≤ 10	260	215	8	6	85
		10 < e ≤ 25	250	200	8	6	85
	T6 hollow	e ≤ 5	255	215	8	6	85
5 < e ≤ 15		250	200	8	6	85	
EN-AW 6082	T4	e ≤ 25	205	110	14	12	35
	T5 open	e ≤ 5	270	230	8	6	90
	T5 hollow	e ≤ 5	270	230	8	6	95
	T6 open	e ≤ 5	290	250	8	6	95
		5 < e ≤ 25	310	260	10	8	95
	T6 hollow	e ≤ 5	290	250	8	6	95
5 < e ≤ 15		310	260	10	8	95	
EN-AW 6061	T4	e ≤ 25	180	110	15	13	65
	T6	e ≤ 5	260	240	9	7	95
		5 < e ≤ 25	260	240	10	8	95

\* For a profile having different wall thicknesses, the lowest specified values of properties shall be considered as valid for the whole profile cross section. \*\* The values for the HB hardness are indicative only.

Bendability classes to standardised tempers (EN 15088:2005)							
Alloy	T4	T5	T6	T6510	T64	T66	
EN-AW 6060	-	B3	B3	B3	B2	B3	
EN-AW 6063	-	B3	B3	B3	-	B3	
EN-AW 6005A	-	-	-	B3	B3	-	
EN-AW 6082	B2	B3	B3	-	-	-	
EN-AW 6061	B2	-	B3	B3	-	-	
<b>B2</b>	Material is in mid strained hardened/naturally aged/partially aged hardened. Bendability for simple symmetrical sections with medium radii is possible. Thin walled or complicated sections may require special devices or bending machines.						
<b>B3</b>	Material is in hard/fully age hardened. For simple symmetrical sections bendability is possible only with relatively large radii. Thin walled or complicated sections may require special devices or bending machines.						

## Profile size production range



Maximum extrusion dimensions per standard profile (shape) category.

01 Square	02 Rect	03 Round	04 Angle	05 Angle	06 T-section	07 U-Section	09/12 Square	10/13 Rect.	11 Round
61x61	250x15	70	150x150x13	240x40x14	150x150x13	40x240x40x12	150x150x6	200x100x6	200x5

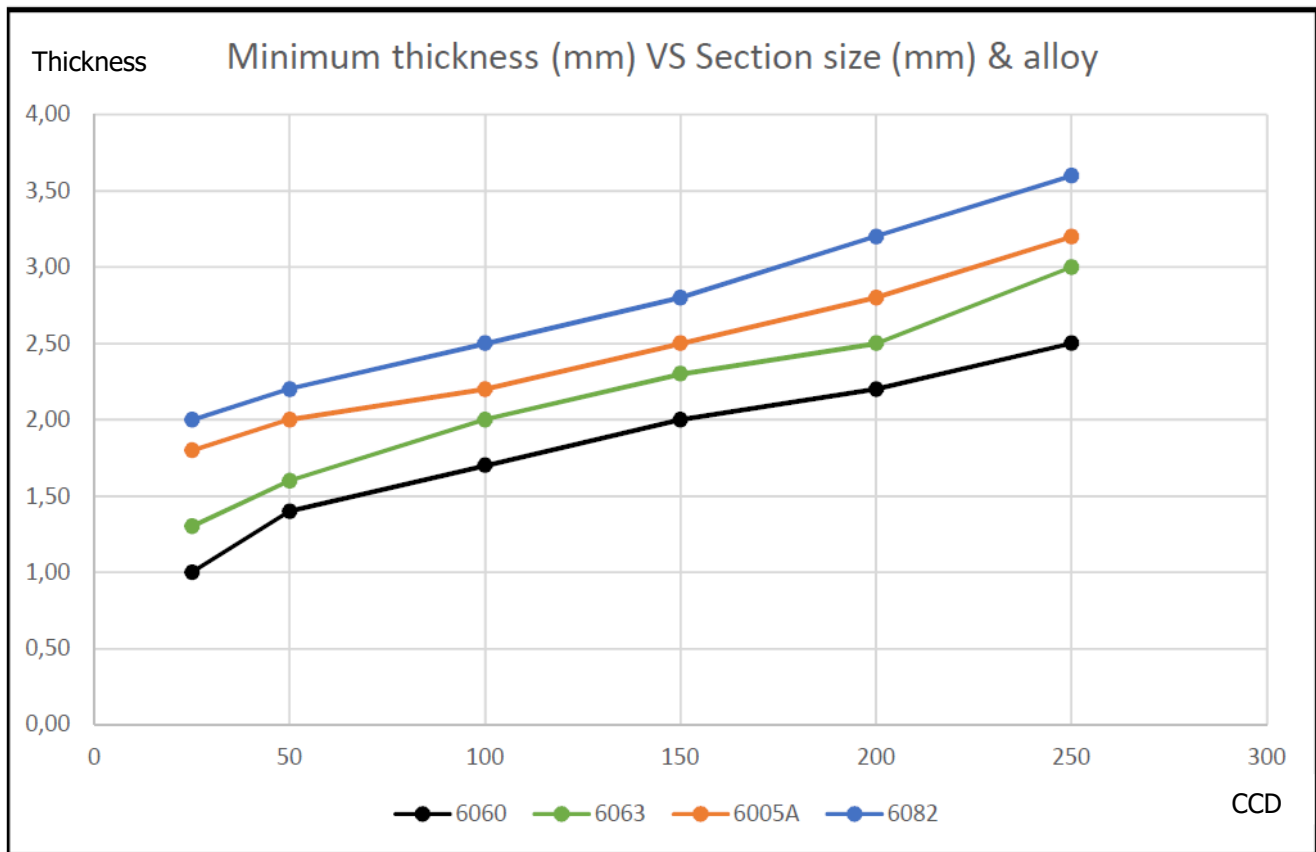


## Profile weight production range

<b>Minimum</b> <b>0,100 Kg/m</b>	<b>Maximum</b> <b>10,00 Kg/m</b>
-------------------------------------	-------------------------------------

## Thickness vs Alloy

Depending on the size of the section (Circumscribed Circle Diameter, horizontal axis) and the alloy to extrude, the minimum thickness should follow the trend indicated by the chart below (vertical axis):



## Product forms & Applications

Alloys	Forms	Characteristic properties	Applications
EN-AW 6060	Extruded bars Extruded tubes	V.good corrosion resistance, weldability, Medium strength, Complex sections, Anodising quality.	Architectural sections, windows, doors, curtain walls, lightings, railing, ladders, furniture, fences, truck flooring, heat sinks, irrigation, cooling pipes, electronic modules.
EN-AW 6063	Extruded profiles	V.good corrosion resistance, weldability, Medium strength, Complex sections, Anodising quality.	Architectural sections, windows, doors, curtain walls, lightings, railing, ladders, furniture, fences, truck flooring, heat sinks, irrigation, cooling pipes, electronic modules, electric motor housings, office equipment, special machine elements.



## EXPERTS IN ALUMINIUM™

EN-AW 6005A	V.good corrosion resistance, V.good weldability, ,Medium-high strength, Complex sections, Anodising quality.	Bus and railway profile structures, structural engineering, pylons, platforms, pipeline,...
EN-AW 6082	V.good corrosion resistance, V.good weldability, Medium-high strength, good machinability, formability in T4,Medium-high strength, Simple sections	Heavy duty structures in rail coaches, truck frames, ship building, offshore, bridges, boiler making, mast and beams for ship building, scaffolding, motorboats.
EN-AW 6061	V.good corrosion resistance, V.good weldability, Medium-high strength, good machinability, formability in T4,Medium-high strength, Simple sections	Heavy duty structures in rail coaches, truck frames, ship building, offshore, bridges, boiler making, mast and beams for ship building, scaffolding, motorboats

## Quality control

Cosmos follow the inspection rules and control the shape quality characteristics and mechanical properties of the extruded sections under the following European norms:

EN Standard	Description
<b>Aluminium &amp; aluminium alloys- Extruded rod/bar, tubes and profiles</b>	
EN 755-1	Technical conditions for inspection & delivery
EN 755-2	Mechanical properties
EN 515	Temper designation
EN 573-3	Chemical composition and form of products
EN 755-3	Round bars, tolerances on dimension & form
EN 755-4	Square bars, tolerances on dimension & form
EN 755-5	Rectangular bars, tolerances on dimension & form
EN 755-6	Hexagonal bars, tolerances on dimension & form
EN 755-8	Porthole square, rect, hex, Oct, & round tubes, tolerances on dimension & form
EN 755-9	Profiles, tolerances on dimension & form
EN- 12020-1	Technical conditions for inspection & delivery (for precision profiles only)
EN- 12020-2	Tolerances on dimension & form (for precision profiles only)
<b>Metallic products- materials</b>	
EN ISO 6892-1	Tensile testing- part 1: Method of test at room temperature
EN- 10204	Inspection certificates 2.3, 3.1, 3.2
<b>On special request</b>	
ASTM B 221M-07 (Metric)	Standard specification for Aluminium and Aluminium alloy Extruded Bars, Rods, Wire, Profiles and Tubes
ASTM B 429M-06	Standard specification for Aluminium alloy Extruded Structural Pipe or Tube.
BS EN ISO 8493:2004	Tube- Drift- expanding test

## Certifications

Cosmos aluminium is holding the following certificates:

Cosmos Certificates
ISO 9001
ISO 14001
ISO 50001
OSHAS 18001
Certificate of Conformity of Factory Production Control- No 0038/CPR/PIR1007756/A- Lloyds
LR Approved- No MD00/4306/0004/6a- Lloyds
REACH
RoHS