ALLUMINIUM ALLOYS

Aluminium alloys are alloys in which aluminium is the predominant metal. The typical alloying elements are copper, magnesium, manganese, silicon, tin and zinc. Aluminium is used in a huge variety of products including cans, foils, kitchen utensils, window frames, beer kegs and aeroplane parts. This is because of its particular properties. It has **low density**, is **non-toxic**, has a **high thermal conductivity**, has **excellent corrosion resistance** and can be **easily cast, machined and formed**. It is **also non-magnetic** and **non-sparking**. It is the second most **malleable** metal and the sixth most **ductile.** It is often used as an alloy because aluminium itself is not particularly strong. Alloys with copper, manganese, magnesium and silicon are lightweight but strong. They are very important in the construction of aeroplanes and other forms of transport. Aluminium is a good electrical conductor and is often used in electrical transmission lines. It is cheaper than copper and weight for weight is almost twice as good a conductor.

WROUGHT ALLOYS

- ***1xxx Series***: contains no alloying elements. The proportion of aluminium is 99.3 — 99.9% and the rest is formed by tiny impurities. The combination of material properties, especially superior conductivity makes these alloys suitable for applications mainly in electrical and heat-power industry. Materials of this series are considered non-hardenable alloys and have tensile strengths of 40 — 60 MPa.

- ***2xxx Series***: the alloying element is copper. Alloys of this series are high strength alloys. The strength is achieved by the heat treatment process. The tensile strength is about 400 MPa on completion of hardening. Alloys of this series are considered not suitable for surface treatments and poor for welding.

- ***3xxx Series***: the alloying element is manganese. Alloys of this series are moderate in strength, they have good formability and they are suitable for anodizing and welding.
- ***4xxx Series***: the alloying element is silicon.

- ***5xxx Series***: the alloying element is magnesium. Alloys of this series are moderate in strength (200 — 350 MPa). The strength is achieved by the heat treatment processing or forming. Alloys of this series have excellent resistance to corrosion in aggressive atmosphere and seawater.

- ***6xxx Series***: the alloying elements are magnesium and silicon. Alloys of this series are moderate in strength (200 — 350 MPa). The strength is achieved by the heat treatment processing or forming. Alloys of 6xxx series can be easily anodized.

- ***7xxx Series***: the alloying element is zinc. Alloys of this series have the highest strength among all series. The tensile strengths ranging between 450 — 500 MPa may exceed 600 MPa in some cases. These alloys prone to stress corrosion, especially when welded.

- ***8xxx Series***: the alloying element is other than for the other series (including lithium)

- ***9xxx Series***: no alloy groups assigned

TEMPER DESIGNATION

DESCRIPTION	
AS EXTRUDED	F
ANNEALED	O
DRAWN	H
COOLED AFTER HOT FORMING AND NATURALLY AGED	T1
SOLUTION HEAT TREATED AND QUENCHED, COLD WORKED AND NATURALLY AGED	T3
SOLUTION HEAT TREATED, QUENCHED AND NATURALLY AGED	T4
COOLED AFTER HOT FORMING AND ARTIFICIALLY AGED	T5
SOLUTION HEAT TREATED, QUENCHED AND ARTIFICIALLY AGED	T6
SOLUTION HEAT TREATED , QUENCHED AND STABILISED	T7
SOLUTION HEAT TREATED AND QUENCHED,COLD WORKED AND ARTIFICIALLY AGED	T8
SOLUTION HEAT TREATED , QUENCHED,ARTIFICIALLY AGED AND COLD WORKED	T9

ALUMINIUM ALLOYS

CHEMICAL COMPOSITION BY WEIGHT %

DENOMINATION UNI EN 573 (CHEMICAL COMPOSITION GIVEN IN MAX VALUES UNLESS MIN-MAX RANGE QUOTED)													
MATERIAL	SI	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Zr	Pb	Bi	Al
EN AW-2011*	0.40	0.70	5.0÷6. 0	0.05	0.05	-	0.05	0.30	-	-	0.20÷0.40	0.20÷0.60	REM
EN AW -2030	0.80	0.70	3.3÷4.5	0.20÷1.0	0.50÷1.30	0.10	-	0.50	0.20	-	0.8÷1. 0	0.20	REM
EN AW -2007	0.80	0.80	3.3÷4.6	0.5÷1.0	0.40÷1.80	0.10	0.20	0.80	0.20	-	0.8÷1.0	0.20	REM
EN AW -2017A*	0.20÷0.80	0.70	3.5÷4.5	0.40÷1.0	0.40÷1.00	0.10	-	0.25	-	-	-	-	REM
EN AW -2024*	0.50	0.50	3.8÷4.9	0.30÷0.9	1.2÷1.8	0.10	-	0.25	0.15	-	-	-	REM
EN AW -6005*	0.60÷0.90	0.35	0.10	0.10	0.40÷0.60	0.10	-	-	-	-	-	-	REM
EN AW-6026*	0.60÷1.40	0.70	0.20÷0.50	0.20÷1.0	0.60÷1.20	0.30	-	0.30	0.20	-	0.40	0.50÷1.5	REM
EN AW-6060*	0.30÷0.60	0.10÷0.30	0.10	0.10	0.35÷0.60	0.05	-	0.15	0.10	-	-	-	REM
EN AW-6063*	0.20÷0.60	0.35	0.10	0.10	0.45÷0.90	0.10	-	0.10	0.10	-	-	-	REM
EN AW-6061*	0.40÷0.80	0.70	0.15÷0.40	0.15	0.80÷1.20	0.04÷0.35	-	0.25	0.15	-	-	-	REM
EN AW-6282*	0.70÷1.30	0.50	0.10	0.40÷1.0	0.60÷1.20	0.25	-	0.20	0.10	-	-	-	REM
EN AW-6064*	0.40÷0.80	0.70	0.15÷0.40	0.15	0.80÷1.20	0.04÷0.14	-	0.25	0.15	-	0.20÷0.40	0.4÷0.8	REM
EN AW-7003*	030	0.35	0.20	0.30	0.50÷1.0	0.20	-	5.0÷6.5	0.20	0.05÷0.25	-	-	REM
EN AW-7020*	0.35	0.40	0.20	0.05÷0.50	1.0÷1.4	0.10÷0.35	-	4.0÷5.0		0.08÷0.20	-	-	REM
EN AW-7075*	0.40	0.50	1.2÷2.0	0.30	2.1÷2.9	0.18÷0.28	-	5.1÷6.1	0.20	-	-	-	REM
* = ACCORDING TO DIRECTIVES : 2000/53/EC;2002/95/EC													

ALUMINIUM ALLOYS

MECHANICAL PROPERTIES

DENOMINATION UNI EN 573		MIN OR MAX VALUES ACC. TO EN STANDARD				
		TEMPER	Rm MPa	$Rp_{0.2}$ MPa	A%	HBW
EN AW-2011	EXTRUDED	T6	310	230	8	100
		T6	295	195	6	95
	DRAWN	T3	320	270	10	95
			300	250	10	95
			280	210	10	95
		T8	370	270	8	110
EN AW-2030	EXTRUDED	T4	370	250	8	100
			340	220	8	90
	DRAWN	T4	370	240	7	100
			340	220	6	90
EN AW-2007	EXTRUDED	T4	370	250	8	100
			340	220	8	90
	DRAWN	T4	370	240	7	100
			340	220	6	90
EN AW-2017A	EXTRUDED	0	≤250	≤135	12	≤65
		T4	380	260	12	110
			400	270	10	110
			390	260	9	110
			370	240	8	110
	DRAWN	0	≤240	≤125	12	≤65
		T4	400	250	10	110
EN AW2024	EXTRUDED	T3	450	310	8	120
			440	300	8	120
			420	280	8	120
	DRAWN	T3	425	290	9	120
EN AW-6005	EXTRUDED	T4	180	90	15	50
		T6	270	225	8	85
			260	215	8	85
			250	200	8	80
EN AW-6026	EXTRUDED	T6	310	260	8	95
			260	240	8	90
	DRAWN	T6	310	260	8	95
		T8	345	315	4	95
		T9	360	330	4	95

MECHANICAL PROPERTIES

DENOMINATION UNI EN 573		MIN OR MAX VALUES ACC. TO EN STANDARD				
		TEMPER	Rm MPa	$Rp_{0.2}$ MPa	A%	HBW
EN AW-6060	EXTRUDED	T1	120	60	16	45
		T5	190	150	8	55
		T5	170	140	8	55
		T6	215	160	8	70
		T6	195	150	8	60
		T5/1	165÷205	90÷130	15÷23	40÷55
		T5/2	165÷205	100÷135	18÷26	45÷60
		T5/3	190÷205	150÷205	12÷20	55÷70
EN AW-6063	EXTRUDED	T1	130	65	14	50
		T5	175	130	8	60
		T5	160	110	7	60
		T6	245	200	8	80
		T6	225	180	8	80
EN AW-6061	EXTRUDED	0	≤150	≤110	16	≤45
		T6	260	240	8	95
	DRAWN	0	≤150	≤110	16	≤45
		T6	290	240	10	95
EN AW-6082	EXTRUDED	O	≤160	≤110	14	≤45
		T6	295	250	8	95
			310	260	8	95
			280	240	6	95
	DRAWN	O	≤160	≤110	15	≤45
		T6	310	255	10	95
EN AW6064A	EXTRUDED	T6	260	240	10	90
	DRAWN	T6	290	240	10	90
		T8	345	315	4	95
		T9	360	330	4	95
EN AW-7003	EXTRUDED	T1	320	210	12	90
		T5	350	290	10	105
		T5	340	280	10	105
EN AW-7020	EXTRUDED	T6	350	290	10	110
			340	275	10	110
	DRAWN	T6	350	280	10	110
EN AW-7075	EXTRUDED	T6	560	500	7	150
		T6	530	470	6	150
		T6	470	400	5	150
	DRAWN	T6	540	485	7	150

CRITERIA USED IN THE CHOICE OF ALUMINIUM ALLOYS

DENOMINATION UNI EN573	TEMPER	TYPICAL APPLICATIONS	MACHIBABILITY				ANODIZING												RESISTANCE CORROSION							
							PROTECTIVE					DECORATIVE					HARD					ATMOSPHERIC					MARINE			
			A	B	C	D	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D
EN AW-2011	T3	SUITABLE FOR FREE CUTTING																											
	T8																												
EN AW-2030	T4	SUITABLE FOR FREE CUTTING																											
EN AW-2007	T4	SUITABLE FOR FREE CUTTING																											
EN AW-2017A	T4	MECHANICAL INDUSTRY																											
EN AW-2024	T3	MECHANICAL AND AEREONAUTICHAL PARTS																											
EN AW-6005	T6	TRANSPORT																											
EN AW-6026	T6	SUITABLE FOR FREE CUTTING AND FORGING																											
	T9																												
EN AW-6060	T1	BULDING AND TRANSPORT																											
	T5																												
	T6																												
EN AW-6063	T6	ELECTRONICS AND PNEUMATICS																											
EN AW-6061	T6	MECHANICAL INDUSTRY																											
EN AW-6082	T6	TRANSPORT AND SUITABLE FOR FORGING																											
EN AW-6064A	T9	SUITABLE FOR FREE CUTTING																											
EN AW-7003	T5	HIGH STRENGTH STRUCTURAL PARTS																											
EN AW-7020	T6	HIGH STRENGTH STRUCTURAL PARTS																											
EN AW-7075	T6	HIGH STRENGTH STRUCTURAL PARTS																											

KEY	A —NOT RECOMMENDED	B- ACCEPTABLE	C- GOOD	D- EXCELLENT

CRITERIA USED IN THE CHOICE OF ALUMINIUM ALLOYS

DENOMINATION UNI EN573	TEMPER	TYPICAL APPLICATION	WELDABILITY														PLASTIC FORMABILITY WHEN COLD					PLASTIC FORMABILITY WHEN HOT				
			MIG-TIG					AT RESISTANCE					BRAZING														
			A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D	
EN AW-2011	T3	SUITABLE FOR FREE CUTTING																									
	T8																										
EN AW-2030	T4	SUITABLE FOR FREE CUTTING																									
EN AW-2007	T4	SUITABLE FOR FREE CUTTING																									
EN AW-2017A	T4	MECHANICAL INDUSTRY																									
EN AW-2024	T3	MECHANICAL AND AEREONAUTICHAL PARTS																									
EN AW-6005	T6	TRANSPORT																									
EN AW-6026	T6	SUITABLE FOR FREE CUTTING AND FORGING																									
	T9																										
EN AW-6060	T1	BULDING AND TRANSPORT																									
	T5																										
	T6																										
EN AW-6063	T6	ELECTRONICS AND PNEUMATICS																									
EN AW-6061	T6	MECHANICAL INDUSTRY																									
EN AW-6082	T6	TRANSPORT AND SUITABLE FOR FORGING																									
EN AW-6064A	T9	SUITABLE FOR FREE CUTTING																									
EN AW-7003	T5	HIGH STRENGTH STRUCTURAL PARTS																									
EN AW-7020	T6	HIGH STRENGTH STRUCTURAL PARTS																									
EN AW-7075	T6	HIGH STRENGTH STRUCTURAL PARTS																									
KEY	A —NOT RECOMMENDED		B-ACCEPTABLE					C- GOOD					D- EXCELLENT														

ALUMINIUM ALLOYS

INTERNATIONAL DESIGNATIONS

EUROPE UNI EN 573 (IN FORCE)	FRANCE AFNOR	GERMANY DIN	U. K	ITALY UNI		USA ASTM	JAPAN JIS
				RETREAT	RETREAT		
EN AW-1080A (Al99,8(A))	1080A	AI99.8	1080A	4509	9001/4	1080A	A1080
EN AW-1070A (Al99,7)	1070A	AI99.7	-	4508	9001/3	1070A	A1070
EN AW-1050A (AI99,5)	1050A	AI99.5	1050A	4507	9001/2	1050A	A1050
EN AW-1200(Al99,0)	1200	AI99	1200	3567	9001/1	1200	A1200
EN AW-1100 (Al99,0 Cu)	1100	-	-	-	-	1100	A1100
EN AW-2011 (Al Cu6 Bi Pb)	2011	Al Cu Bi Pb	2011	6362	9002/5	2011	A2011
EN AW-2014 (Al Cu4 Si Mg)	2014	Al Cu Si Mg	2014A	3581	9002/3	2014	A2014
EN AW-2017 (Al Cu4 Si Mg(A))	2017A	Al Cu Mg1	2017A	3579	9002/2	2017A	A2017
EN AW-2618A (Al Cu2 Mg1.5Ni)	2618A	-	2618A	7250	-	2618A	-
EN AW-2024 (Al Cu4 Mg1)	2024	Al Cu Mg2	2024	3583	9002/4	2024	A2024
EN AW-2030/2007 (Al Cu4 Pb Mg)	2030/2007	Al Cu Pb Mg	-	-	9002/8	2030	-
EN AW-3003 (Al Mn1 Cu)	3003	Al Mn Cu	3103	7788	9003/1	3003	A3003
EN AW-3004 (Al Mn1 Mg1)	3004	Al Mn1 Mg1	-	6361	9003/2	3004	A3004
EN AW-3005 (Al Mn 1 Mg0.5)	3005	Al Mn 1 Mg0.5	-	-	9003/4	3005	A3005
EN AW-3105 (Al Mn0.5 Mg0.5)	3105	Al Mn0.5 Mg0.5	3105	3103	-	-	-
EN AW-5005 (Al Mg1(B))	5005	Al Mg1	5005	5764	9005/1	5005	A5005
EN AW-5049(Al Mg2.5Mn0.8)	5049	Al Mg2.5Mn0.8	-	-	-	5049	-
EN AW-5251 (Al Mg2)	5251	Al Mg2Mn0.3	5251	4511	-	5251	-
EN AW-5052 (Al Mg2.5)	5052	Al Mg2.5	-	3574	9005/2	5052	A5052
EN AW-5454 (Al Mg3 Mn)	5454	Al Mg2.7 Mn	5454	7789	9005/3	5454	A5454
EN AW-5754(Al Mg3)	5754	Al Mg3	-	-	-	5754	-
EN AW-5356 (Al Mg5 Cr(A))	5356	Al Mg5	3576	-	-	5356	-
EN AW-5182 (Al Mg4.5 Mn0.4)	5182	Al Mg5 Mn	-	-	-	5182	-
EN AW-5083 (Al Mg4.5 Mn0.7)	5083	Al Mg4.5 Mn	5083	7790	9005/5	5083	A5083
EN AW-5086(Al Mg4)	5086	Al Mg4 Mn	-	5452	9005/4	5086	A5086
EN AW-6005A(Al Mg Si(A))	6005A	Al Mg Si	-	-	9006/6	6005A	-
EN AW-6026 (Al Mg Si Bi)	6026	Al Mg Si Bi	-	-	-	-	-
EN AW-6060 (Al Mg Si)	6060	Al Mg Si0.5	6063	3569	9006/1	6060	-
EN AW-6061(Al Mg1 Si Cu)	6061	Al Mg1 Si Cu	6061	6170	9006/2	6061	A6061
EN AW-6012(Al Mg Si Pb)	6012	Al Mg Si Pb	6012	-	-	-	-
EN AW-6082 (Al Si1 Mg Mn)	6082	Al Mg Si1	6082	3571	9006/4	6082	-
EN AW-7020 (Al Zn4.5 Mg1)	7020	Al Zn4.5 Mg1	7020	7791	9007/1	7020	7020
EN AW-7049A (Al Zn)	7049A	-	-	-	-	7049A	-
EN AW-7075(Al Zn5.5 Mg Cu)	7075	Al Zn Mg Cu1.5	7075	3735	9007/2	7075	A7075
EN AW-8011A(Al Fe Si)	8011	-	-	-	8011	-	-

ALUMINIUM ALLOYS

EN AW-6005A

EN AW-6005A alloy possesses optimum mechanical properties combined with good corrosion resistance.
Response to surface treatments is good, and machinability likewise is good.

CHEMICAL COMPOSITION — EN 573-3										
								IMPURITIES		
Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	EACH	TOTAL	ALLUMINIUM
0.50-0.90	0.35	0.30	0.5	0.40-0.70	0.30	0.20	0.10	0.05	0.15	REMAINDER
The values indicated express the content of the element as percentage by mass. Single values indicate the maximum permissible.										

PHYSICAL PROPERITIES	
Density 2700 Kg/m3	Coeffi cient of thermal expansion 23 x 10-6 1 / ° K (20 — 100 ° C)
Melting range 590 - 645 ° C	**Thermal conductivity at 20 °C 180 W/(m*K) (temper T6)**
Specifi c heat 950 J/Kg ° K (0 — 100 ° C)	Thermal conductivity at 20 ° C 180 W/(m*K) (temper T6)
Modulus of Elasticity 69000 MPa	

TEMPER DESIGNATIONS – EN 515	
F	As fabricated (limits of mechanical properties not specified)
T4	Solution heat-treated and naturally aged
T6	Solution heat-treated and then artificially aged

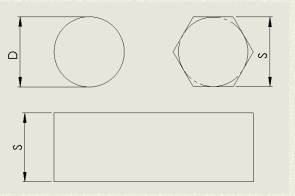
TECHNOLOGICAL CHARACTERISTICS			MAIN SECTORS OF USE
Cold plastic workability	TEMPER T4	Average-Good	Profiles extruded from 6005 alloy fi nd application in sectors where the requirement is for average mechanical strength coupled with good corrosion resistance. Building (structural profi les)/ Nautical and railway/ Fabrication and industrial automation
	TEMPER T6	Low	
Weldability		Good	
Machinability	TEMPER T4	Average	
	TEMPER T6	Good	
Polishability	TEMPER T4	Average	
	TEMPER T6	Good	

ALUMINIUM ALLOYS

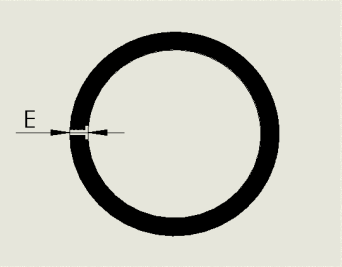
MECHANICAL PROPERTIES — EN 755-2

EN AW-6005A

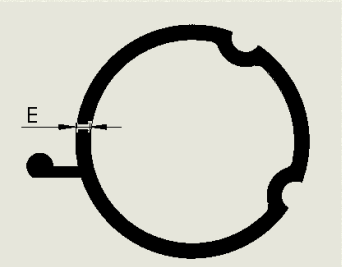
	TEMPER	DIMENSIONS (mm)		ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
		D	S	MIN	MAX	MIN	MAX	MIN	MIN	
EXTRUDED BAR	T6	≤25 25<D ≤50 50<D ≤100	≤25 25<S ≤50 50<S ≤100	270 270 260	- - -	225 225 215	- - -	10 8 8	8 - -	90 90 85



	TEMPER	DIMENSIONS (mm)		ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
		E		MIN	MAX	MIN	MAX	MIN	MIN	
EXTRUDED TUBE	T6	≤5 5<e ≤10		270 260	- -	225 215	- -	8 8	6 6 -	90 85



	TEMPER	DIMENSIONS (mm)	ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
		E	MIN	MAX	MIN	MAX	MIN	MIN	
EXTRUDED PROFILE	OPEN PROFILE								
	T4	≤25	180	-	90	-	15	13	50
	T6	≤5 5<e ≤10 10<e ≤25	270 260 250	- - -	225 215 200	- - -	8 8 8	6 6 6	90 85 85
	HALLOW PROFILE								
	T4	≤10	180	-	90	-	15	13	50
	T6	≤5 5<e ≤15	255 250	- -	215 200	- -	8 8	6 6	85 85



ALUMINIUM ALLOYS

EN AW-6060

EN AW-6060, commonly known as “6060” is the extrusion alloy most widely used in the European market, accounting for about 85% of production. This is a re flection of the fact that it guarantees high extrudability, allowing the production even of notably complex shapes utilizing thin gauges, combined with an optimum response to surface treatments such as anodizing and painting. Another advantageous property of the EN AW-6060 alloy is its good machinability.

CHEMICAL COMPOSITION — EN 573-3										
								IMPURITIES		
Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	EACH	TOTAL	ALLUMINIUM
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	REM.
The values indicated express the content of the element as percentage by mass. Single values indicate the maximum permissible.										

PHYSICAL PROPERITIES	
Density 2700 Kg/ m 3	Coefficient of thermal expansion 23 x 10-6 1 / ° K (20 — 100 ° C)
Melting range 615 - 655 ° C	Thermal conductivity at 20 ° C 175 W/(m*K) (temper T6)
Specifi c heat 890 J/Kg ° K (0 — 100 ° C)	Electrical Resistivity at 20 ° C 33 n Ω m
Modulus of Elasticity 69000 MPa	

TEMPER DESIGNATIONS – EN 515	
F	As fabricated (limits of mechanical properties not specified)
T4	Solution heat-treated and naturally aged
T5	Cooled from an elevated temperature shaping process and then artificially aged
T64	Solution heat-treated and then artificially aged in under aging conditons to improve formability
T6	Solution heat-treated and then artificially aged
T66	Solution heat-treated and then artificially aged. Mechanical property level higher than T6 achieved through special control of the process (6000 series alloys)

TECHNOLOGICAL CHARACTERISTICS			SETTORI DI UTILIZZO PRINCIPALI
Cold plastic workability	TEMPER T4	Good	6060 alloy profiles find application in environments requiring optimum resistance to corrosion and good mechanical strength. Building/ Furnishing/ Air conditioning/ Electronics
	TEMPER T64	Average	
	TEMPER T6;T66	Low	
Weldability		Good	
Machinability	TEMPER T4	Average	
	TEMPER T6;T66	Good	
Polishability	TEMPER T4	Average	
	TEMPER T6;T66	Good	

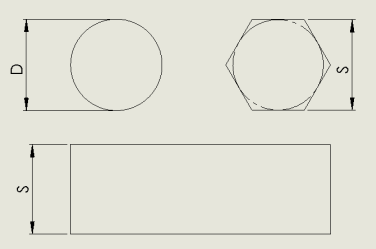
ALUMINIUM ALLOYS

MECHANICAL PROPERTIES — EN 755-2

EN AW-6060

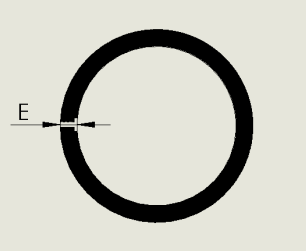
EXTRUDED BAR

TEMPER	DIMENSIONS (mm)		ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
	D	S	MIN	MAX	MIN	MAX	MIN	MIN	
T4	≤150	≤150	120	-	60	-	16	14	50
T5	≤150	≤150	160	-	120	-	8	6	60
T6	≤150	≤150	190	-	150	-	8	6	70
T64	≤50	≤50	180	-	120	-	12	10	60
T66	≤150	≤150	215	-	160	-	8	6	75



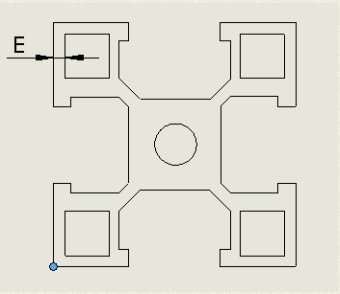
EXTRUDED TUBE

TEMPER	DIMENSIONS (mm)	ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
	E	MIN	MAX	MIN	MAX	MIN	MIN	
T4	≤15	120	-	60	-	16	14	50
T5	≤15	160	-	120	-	8	6	60
T6	≤15	190	-	150	-	8	6	70
T64	≤15	180	-	120	-	12	10	60
T66	≤15	215	-	160	-	8	6	75



EXTRUDED PROFILE

TEMPER	DIMENSIONS (mm)	ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
	E	MIN	MAX	MIN	MAX	MIN	MIN	
T4	≤25	120	-	60	-	16	14	50
T5	≤5	160	-	120	-	8	6	60
	5<e ≤25	140	-	100	-	8	6	60
T6	≤3	190	-	150	-	8	6	70
	3<e ≤ 25	170	-	140	-	8	6	70
T64	≤ 15	180	-	120	-	12	10	60
T66	≤3	215	-	160	-	8	6	75
	3<e ≤ 25	195	-	150	-	8	6	75



ALUMINIUM ALLOYS

EN AW-6082

EN AW-6082 alloy is characterized by high mechanical strength. It offers good extrudability and can be used to produce shapes of average complexity, whilst the response to surface treatments is acceptable.

CHEMICAL COMPOSITION — EN 573-3										
								IMPURITIES		
Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	EACH	TOTAL	ALUMINIUM
0.70-1.30	0.50	0.10	0.40-1.00	0.6-1.20	0.25	0.20	0.10	0.05	0.15	Resto
The values indicated express the content of the element as percentage by mass. Single values indicate the maximum permissible.										

PHYSICAL PROPERITIES	
Density 2710 Kg/m3	Coeffi cient of thermal expansion 23,0 x 10-6 1 / ° K (20 — 100 ° C)
Melting range 580 - 645 ° C	Thermal conductivity at 20 ° C 170 W/(m*K) (temper T6)
Specifi c heat 900 J/Kg ° K (0 — 100 ° C)	Electrical Resistivity at 20 ° C 38 n Ω m
Modulus of Elasticity 69000 MPa	

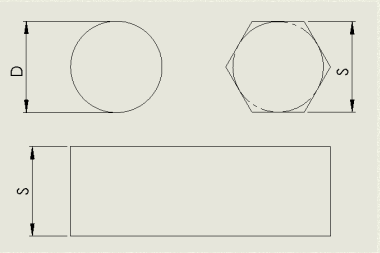
TEMPER DESIGNATIONS — EN 515	
F	As fabricated (limits of mechanical properties not specified
O	Annealed
H111	Annealed and slightly strain-hardened during subsequent operations such as stretching or levelling
T4	Solution heat-treated and naturally aged
T5	Cooled from an elevated temperature shaping process and then artificially aged
T6	Solution heat-treated and then artificially aged

TECHNOLOGICAL CHARACTERISTICS			SETTORI DI UTILIZZO PRINCIPALI
Cold plastic workability	TEMPER T4	Good	Profi les extruded from 6082 alloy fi nd application in sectors requiring high mechanical strength for static and dynamic structural functions, coupled with acceptable corrosion resistance. Mechanical engineering/ Public Transport/ Fabrication/ Automation/ Nautica
	TEMPER T6	Low	
Weldability		Good	
Machinability	TEMPER T4	Average	
	TEMPER T6	Good	
Polishability	TEMPER T4	Average	
	TEMPER T6	Good	

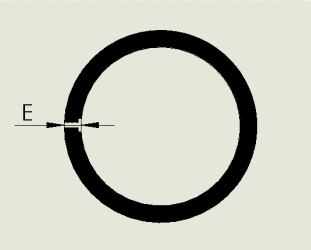
CARATTERISTICHE MECCANICHE — EN755-2

EN AW-6082

	TEMPER	DIMENSIONS (mm)		ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
		D	S	MIN	MAX	MIN	MAX	MIN	MIN	
EXTRUDED BAR	O,H111	≤200	≤200	-	160	-	110	14	12	35
	T4	≤200	≤200	205	-	110	-	14	12	70
	T6	≤20	≤20	295	-	250	-	8	6	95
		20≤D≤150	20≤S≤150	310	-	260	-	8	-	95
		150≤D≤200	150≤S≤200	280	-	240	-	6	-	95
		200≤D≤250	200≤S≤250	270	-	200	-	6	-	95



	TEMPER	DIMENSIONS (mm)	ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
		E	MIN	MAX	MIN	MAX	MIN	MIN	
EXTRUDED TUBE	O.H111	≤25	-	160	-	110	14	12	35
	T4	≤25	205	-	110	-	14	12	70
	T6	≤5	290	-	250	-	8	6	95
		5<e<25	310	-	260	-	10	8	95



	TEMPER	DIMENSIONS (mm)	ULTIMATE TENSILE STRENGHT R_m (MPa)		YIELD STRENGHT $R_{p0,2}$ (MPa)		ELONGATION A%	ELONGATION A50mm%	HARDNESS TYPICAL VALUE
		E	MIN	MAX	MIN	MAX	MIN	MIN	
EXTRUDED PROFILE	O.H111	ALL	-	160	-	110	14	12	35
	T4	≤25	205	-	110	-	14	12	70
	OPEN PROFILE								
	T5	≤5	270	-	230	-	8	6	90
	T6	≤5	290	-	250	-	8	6	95
		5<e ≤25	310	-	260	-	10	8	95
	HALLOW PROFILE								
	T5	≤5	270	-	230	-	8	6	90
	T6	≤5	290	-	250	-	8	6	95
		5<e ≤25	310	-	260	-	10	8	95