Aluminum, 355.0, permanent mold cast, T6

General information

Designation

355.0 (Aluminum Association)

Condition	T6 (Solution heat-treated and artificially
UNS number	A03550
EN number	EN AC-45300 / EN AC-Al

Typical uses

High strength alloy: engine cooling fans, clutch housings, high-speed rotating parts, structural aerospace components, compressor cases, machine parts

Composition overview

Compositional summary

Al90-94 / Si4.5-5.5 / Cu1-1.5 / Mg0.4-0.6 (impurities: Fe<0.6, Mn<0.5, Zn<0.35, Cr<0.25, Ti<0.25,

Material family	Metal
Base material	Al (Aluminum)

Composition detail (metals, ceramics and glasses)

Al (aluminum)	*	90.3	-	94.1	%
Cr (chromium)		0	-	0.25	%
Cu (copper)		1	-	1.5	%
Fe (iron)		0	-	0.6	%
Mg (magnesium)		0.4	-	0.6	%
Mn (manganese)		0	-	0.5	%
Si (silicon)		4.5	-	5.5	%
Ti (titanium)		0	-	0.25	%
Zn (zinc)		0	-	0.35	%
Other		0	-	0.15	%

Price

Price	*	1.73	-	1.85	EUR/kg
Price per unit volume	*	4.63e3	-	5.07e3	EUR/m^3

Physical properties

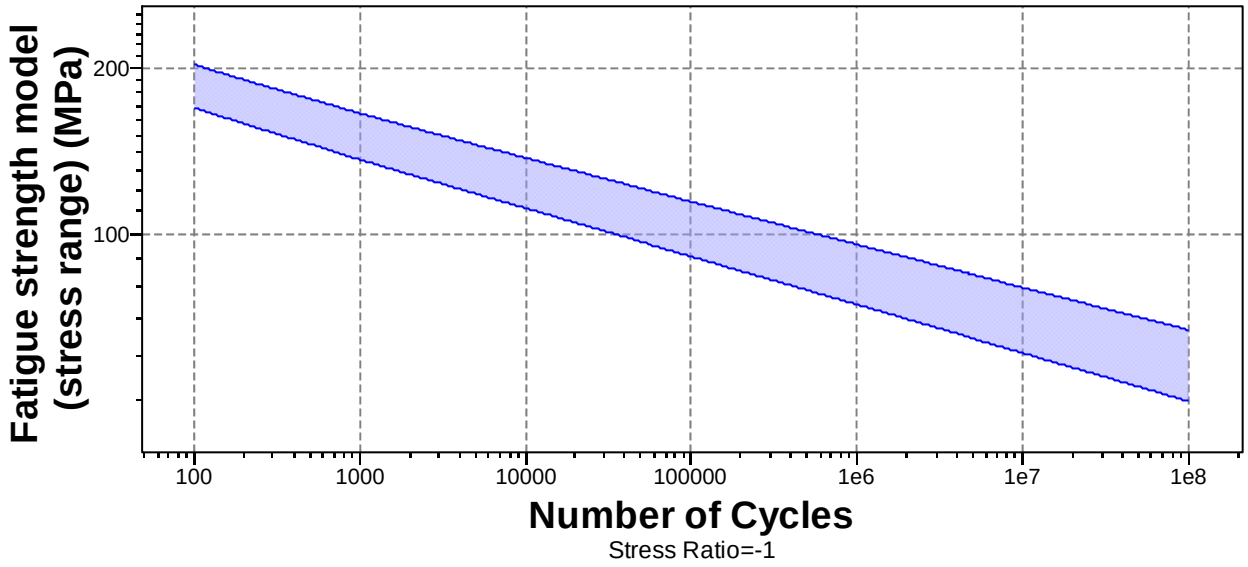
Density	2.68e3	-	2.74e3	kg/m^3

Mechanical properties

Young's modulus	68.6	-	71.4	GPa
Specific stiffness	25.3	-	26.4	MN.m/kg
Yield strength (elastic limit)	165	-	182	MPa
Tensile strength	259	-	286	MPa
Specific strength	60.9	-	67.3	kN.m/kg
Elongation	2.2	-	2.6	% strain
Compressive strength	109	-	121	MPa

Flexural modulus	* 68.6	-	71.4	GPa
Flexural strength (modulus of rupture)	* 165	-	182	MPa
Shear modulus	* 25.6	-	27	GPa
Bulk modulus	* 64.2	-	73.5	GPa
Poisson's ratio	0.322	-	0.338	
Shape factor	33			
Hardness - Vickers	100	-	110	HV
Elastic stored energy (springs)	195	-	237	kJ/m^3
Fatigue strength at 10^7 cycles	63	-	77	MPa
Fatigue strength model (stress range)	60.8	-	79.9	MPa

Parameters: Stress Ratio = -1, Number of Cycles = 1e7cycles



Impact & fracture properties

Fracture toughness	* 21.2	-	24.4	MPa.m^0.5
Toughness (G)	6.44	-	8.48	kJ/m^2

Thermal properties

Melting point	587	-	653	°C
Maximum service temperature	150	-	170	°C
Minimum service temperature	-273			°C
Thermal conductivity	146	-	164	W/m.°C
Specific heat capacity	944	-	982	J/kg.°C
Thermal expansion coefficient	21.9	-	22.9	µstrain/°C
Thermal shock resistance	104	-	117	°C
Thermal distortion resistance	* 6.49	-	7.36	MW/m
Latent heat of fusion	* 384	-	393	kJ/kg

Electrical properties

Electrical resistivity	4.2	-	4.9	µohm.cm

Electrical conductivity		35.2	-	41.1	%IACS
Galvanic potential	*	-0.76	-	-0.68	V

Magnetic properties

Magnetic type		Non-magnetic			

Optical, aesthetic and acoustic properties

Transparency		Opaque			
Acoustic velocity		5.03e3	-	5.14e3	m/s
Mechanical loss coefficient (tan delta)	*	0.0246	-	0.0394	

Critical materials risk

Contains >5wt% critical elements?		Yes			

Processing properties

Metal casting		Excellent			
Metal cold forming		Unsuitable			
Metal hot forming		Unsuitable			
Metal press forming		Unsuitable			
Metal deep drawing		Unsuitable			
Machining speed		101			m/min
Weldability		Excellent			
Notes		Preheating is not required, post weld heat treatment is required			

Durability

Water (fresh)		Excellent			
Water (salt)		Acceptable			
Weak acids		Excellent			
Strong acids		Excellent			
Weak alkalis		Acceptable			
Strong alkalis		Unacceptable			
Organic solvents		Excellent			
Oxidation at 500C		Unacceptable			
UV radiation (sunlight)		Excellent			
Galling resistance (adhesive wear)		Limited use			

Notes

Aluminum alloys perform poorly when self-mated but can be processed without galling when mated with steels.

Flammability		Non-flammable			

Corrosion resistance of metals

Stress corrosion cracking		Slightly susceptible			
Note		Rated in chloride; Other susceptible environments: Halide, water			

Primary production energy, CO2 and water

Embodied energy, primary production	*	184	-	203	MJ/kg

CO2 footprint, primary production	* 11.9	-	13.1	kg/kg
Water usage	* 1.06e3	-	1.17e3	l/kg

Processing energy, CO2 footprint & water

Casting energy	* 10.9	-	12	MJ/kg
Casting CO2	* 0.652	-	0.721	kg/kg
Casting water	* 20.6	-	30.9	l/kg
Vaporization energy	* 1.55e4	-	1.71e4	MJ/kg
Vaporization CO2	* 930	-	1.03e3	kg/kg
Vaporization water	* 6.45e3	-	9.68e3	l/kg
Coarse machining energy (per unit wt removed)	* 0.878	-	0.97	MJ/kg
Coarse machining CO2 (per unit wt removed)	* 0.0527	-	0.0582	kg/kg
Fine machining energy (per unit wt removed)	* 4.5	-	4.97	MJ/kg
Fine machining CO2 (per unit wt removed)	* 0.27	-	0.298	kg/kg
Grinding energy (per unit wt removed)	* 8.53	-	9.42	MJ/kg
Grinding CO2 (per unit wt removed)	* 0.512	-	0.565	kg/kg
Non-conventional machining energy (per unit wt removed)	* 155	-	171	MJ/kg
Non-conventional machining CO2 (per unit wt removed)	* 9.3	-	10.3	kg/kg

Recycling and end of life

Recycle	✓			
Embodied energy, recycling	* 31.6	-	34.9	MJ/kg
CO2 footprint, recycling	* 2.48	-	2.74	kg/kg
Recycle fraction in current supply	40.5	-	44.7	%
Downcycle	✓			
Combust for energy recovery	✗			
Landfill	✓			
Biodegrade	✗			

Notes

Standards with similar compositions

• Canada:
SC51N to CSA HA.10, SG51N to CSA HA.9
• Europe:
EN AB-45300 to CEN EN 1676, EN AC-45300 to CEN EN 1706
• International:
AlSi5Cu1Mg to ISO 3522
• Japan:
AC4D to JIS H5202, AC4D.1 to JIS H2211
• Spain:
L-2571 to UNE 38-203, L-2571 to UNE 38-266
• UK:
LM16 to BS 1490
• USA:
355, 355 to ASTM B108, 355 to ASTM B26/B26M, 355 to ASTM B618, 355.1, 355.1 to ASTM B179, A03550 to SAE J452, UNS A03550, UNS A03551
• Tradenames:
USCO 5-W

Links

ProcessUniverse

Producers

Reference

Shape