General information

Designation

2017, wrought

Condition	T4 (Solution heat-treated and naturally aged to a substantially stable condition)
UNS number	A92017
EN name	EN AW-2017

Typical uses

general engineering purposes, structural applications in construction and transportation, screw machine products, and fittings.

Composition overview

Compositional summary

Al92-96 / Cu3.5-4.5 / Mn0.4-1 / Mg0.4-0.8 / Si0.2-0.8 (impurities: Fe<0.7, Zn<0.25, Ti<0.15, Cr<0.1, Other<0.15)

Material family	Metal (non-ferrous)
Base material	Al (Aluminum)

Composition detail (metals, ceramics and glasses)

Al (aluminum)	* 91,6	-	95,5	%
Cr (chromium)	0	-	0,1	%
Cu (copper)	3,5	-	4,5	%
Fe (iron)	0	-	0,7	%
Mg (magnesium)	0,4	-	0,8	%
Mn (manganese)	0,4	-	1	%
Si (silicon)	0,2	-	0,8	%
Ti (titanium)	0	-	0,15	%
Zn (zinc)	0	-	0,25	%
Other	0	-	0,15	%

Price

Price	* 2	-	2,35	EUR/kg
Price per unit volume	* 5,57e3	-	6,59e3	EUR/m^3

Physical properties

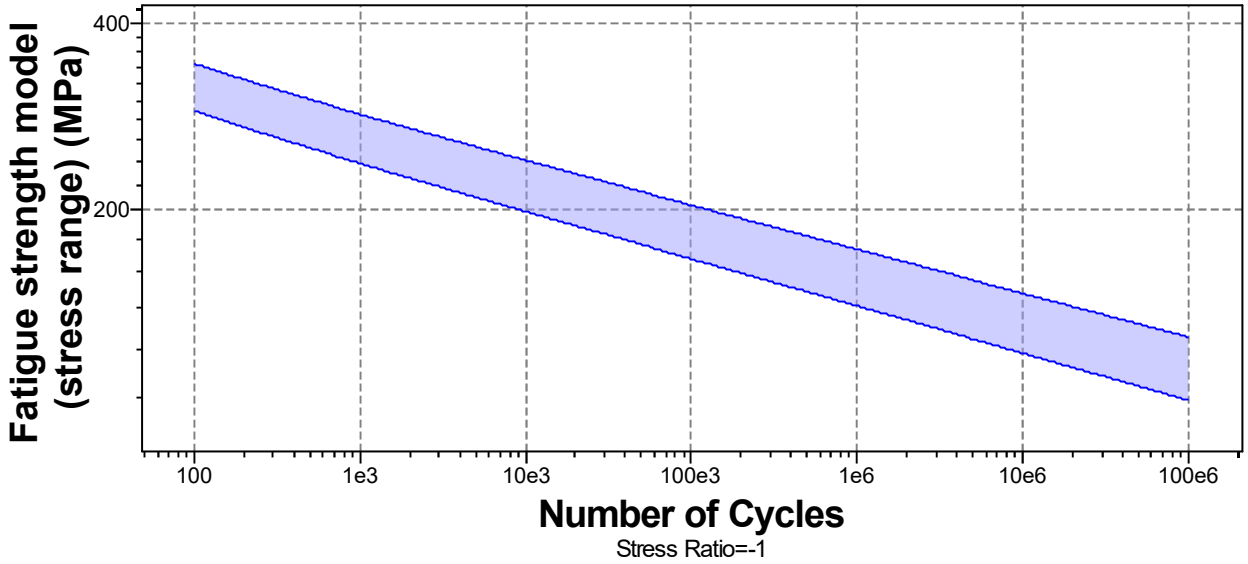
Density	2,78e3	-	2,81e3	kg/m^3

Mechanical properties

Young's modulus	72	-	75,7	GPa
Specific stiffness	25,7	-	27,1	MN.m/kg
Yield strength (elastic limit)	221	-	244	MPa
Tensile strength	379	-	419	MPa
Specific strength	79	-	87,4	kN.m/kg
Elongation	12	-	13,9	% strain
Compressive strength				

	* 221	-	244	MPa
Flexural modulus	* 72	-	75,7	GPa
Flexural strength (modulus of rupture)	221	-	244	MPa
Shear modulus	27	-	28,4	GPa
Bulk modulus	70,3	-	73,9	GPa
Poisson's ratio	0,33	-	0,343	
Shape factor	29			
Hardness - Vickers	* 100	-	120	HV
Elastic stored energy (springs)	331	-	404	kJ/m^3
Fatigue strength at 10^7 cycles	* 125	-	139	MPa
Fatigue strength model (stress range)	* 118	-	147	MPa

Parameters: Stress Ratio = -1, Number of Cycles = 10e6cycles



Impact & fracture properties

Fracture toughness	* 27	-	37	MPa.m^0.5
Toughness (G)	10,1	-	18,2	kJ/m^2

Thermal properties

Melting point	513	-	640	°C
Maximum service temperature	170	-	200	°C
Minimum service temperature	-273			°C
Thermal conductivity	135	-	146	W/m.°C
Specific heat capacity	963	-	1e3	J/kg.°C
Thermal expansion coefficient	22,9	-	24	µstrain/°C
Thermal shock resistance	126	-	143	°C
Thermal distortion resistance	* 5,72	-	6,28	MW/m
Latent heat of fusion	384	-	393	kJ/kg

Electrical properties

Electrical resistivity		4,95	-	5,3	µohm.cm
Electrical conductivity		32,5	-	34,8	%IACS
Galvanic potential	*	-0,77	-	-0,69	V

Magnetic properties

Magnetic type	Non-magnetic

Optical, aesthetic and acoustic properties

Transparency		Opaque			
Acoustic velocity		5,07e3	-	5,21e3	m/s
Mechanical loss coefficient (tan delta)	*	100e-6	-	2e-3	

Critical materials risk

Contains >5wt% critical elements?	Yes
Notes	Al (aluminum) added to the 2018 US critical minerals list

Processing properties

Metal casting	Unsuitable	
Metal cold forming	Acceptable	
Metal hot forming	Limited use	
Metal press forming	Acceptable	
Metal deep drawing	Limited use	
Machining speed	57,9	m/min
Weldability	Poor	
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	Highly susceptible
Notes	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	* 12	-	13,2	kg/kg
Water usage	* 1,09e3	-	1,21e3	l/kg

Processing energy, CO2 footprint & water

Roll forming, forging energy	* 5,55	-	6,13	MJ/kg
Roll forming, forging CO2	* 0,416	-	0,46	kg/kg
Roll forming, forging water	* 3,92	-	5,88	l/kg
Extrusion, foil rolling energy	* 10,8	-	11,9	MJ/kg
Extrusion, foil rolling CO2	* 0,811	-	0,896	kg/kg
Extrusion, foil rolling water	* 6,17	-	9,26	l/kg
Wire drawing energy	* 39,7	-	43,9	MJ/kg
Wire drawing CO2	* 2,98	-	3,3	kg/kg
Wire drawing water	* 15	-	22,5	l/kg
Metal powder forming energy	* 22,1	-	24,4	MJ/kg
Metal powder forming CO2	* 1,77	-	1,95	kg/kg
Metal powder forming water	* 24,1	-	36,1	l/kg
Vaporization energy	* 15,5e3	-	17,1e3	MJ/kg
Vaporization CO2	* 1,16e3	-	1,28e3	kg/kg
Vaporization water	* 6,46e3	-	9,69e3	l/kg
Coarse machining energy (per unit wt removed)	* 1,26	-	1,4	MJ/kg
Coarse machining CO2 (per unit wt removed)	* 94,8e-3	-	0,105	kg/kg
Fine machining energy (per unit wt removed)	* 8,37	-	9,25	MJ/kg
Fine machining CO2 (per unit wt removed)	* 0,628	-	0,694	kg/kg
Grinding energy (per unit wt removed)	* 16,3	-	18	MJ/kg
Grinding CO2 (per unit wt removed)	* 1,22	-	1,35	kg/kg
Non-conventional machining energy (per unit wt removed)	* 155	-	171	MJ/kg
Non-conventional machining CO2 (per unit wt removed)	* 11,6	-	12,8	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

• Austria:
AlCuMg1 to ONORM M3430
• Belgium:
2017 to NBN P21-001
• Europe:
EN AW-2017A to CEN EN 573-3
• France:
2017.S to NF A50-506, 2017A to NF A50-411, 2017A to NF A50-451, A-G4MC(5086) to AIR 9051-A, A-U4G to AIR 9150-B, A-U4G(2017-F) to AIR 9051-A
• Germany:
3.1325/AlCuMg1 to DIN 1725-1
• India:
24534 to IS
• International:
AlCu4MgSi to ISO 209-1, AlCu4MgSi(A) to ISO 209-1
• Japan:
A2017BD/W to JIS H4040, A2017BE to JIS H4040, A2017FD to JIS H4140, A2017P to JIS H4000, A2017S to JIS H4100, A2017TD to JIS H4080, A2017TE to JIS H4080
• Norway:
17103 to NS 17103
• South Africa:
20171(Al-Cu4MgSi) to SABS 712
• USA:
2017, 2017 to ASTM B316/B316M, 2017A, UNS A92017
• Venezuela:
2017 to COPANT 862
• Tradenames:
ALCAN 2017A, AVIONAL-102, BAW 2017, KAISER ALUMINUM 2017

Links

ProcessUniverse

Producers

Reference

Shape