

Aluminum, 2017, wrought, T4

General properties

Designation

2017

Density 2800 kg/m³

Price 3.2 to 3.5 USD/kg (estimate)

Composition (summary)

Al/3.5-4.5Cu/.40-1.0Mn/.40-.80Mg/.1Cr/.25Zn/.15Ti

Primary material production: energy, CO2 and water

Embodied energy, primary production 190 to 210 MJ/kg (estimate)

CO2 footprint, primary production 12 to 13 kg/kg (estimate)

Water usage 1100 to 1200 l/kg (estimate)

Material processing: energy

Rough rolling, forging energy 5.5 to 6.1 MJ/kg (estimate)

Metal powder forming energy 22 to 24 MJ/kg (estimate)

Vaporization energy 16000 to 17000 MJ/kg (estimate)

Electro-plating energy 80 to 100 MJ/m²

Painting energy 11 to 14 MJ/m²

Powder coating energy 67 to 86 MJ/m²

Material processing: CO2 footprint

Rough rolling, forging CO2 0.42 to 0.46 kg/kg (estimate)

Metal powder forming CO2 1.8 to 2.0 kg/kg (estimate)

Vaporization CO2 1200 to 1300 kg/kg (estimate)

Electro-plating CO2 4.4 to 5.3 kg/m²

Painting CO2 0.80 to 1.2 kg/m²

Powder coating CO2 3.7 to 4.6 kg/m²

Material recycling: energy, CO2 and recycle fraction

Embodied energy, recycling 33 to 36 MJ/kg (estimate)

CO2 footprint, recycling 2.6 to 2.8 kg/kg (estimate)

Recycle fraction in current supply 41 to 45 %

<u>A renewable resource?</u>	No
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Bio-data

<u>Food contact</u>	Yes
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<u>RoHS (EU) compliant grades?</u>	Yes
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Geo-economic data for principal component

<u>Principal component</u>	Aluminum
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<u>Typical exploited ore grade</u>	30 to 34 %
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<u>Minimum economic ore grade</u>	25 to 39 %
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<u>Abundance in Earth's crust</u>	82000 ppm
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<u>Abundance in seawater</u>	0.00050 to 0.0050 ppm
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<u>Annual world production</u>	3.7e7 tonne/yr
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<u>Reserves</u>	4.7e10 to 5.2e10 tonne
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Main mining areas

(Smelter production and capacity) United States, Australia, Bahrain, Brazil, Canada, China, Germany, Iceland, India, Mozambique, Norway, Russia, South Africa, United Arab Emirates, Venezuela

Mechanical properties

<u>Young's modulus</u>	72 to 76 GPa
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<u>Poisson's ratio</u>	0.33 to 0.34
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<u>Yield strength (elastic limit)</u>	220 to 240 MPa
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<u>Tensile strength</u>	380 to 420 MPa
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<u>Compressive strength</u>	220 to 240 MPa (estimate)
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<u>Elongation</u>	12 to 14 % strain
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Thermal properties

<u>Maximum service temperature</u>	110 to 170 °C
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<u>Minimum service temperature</u>	-270 °C
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<u>Thermal conductivity</u>	140 to 150 W/m.°C
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<u>Specific heat capacity</u>	960 to 1000 J/kg.°C
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<u>Thermal expansion coefficient</u>	23 to 24 µstrain/°C
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Electrical & optical properties

<u>Electrical resistivity</u>	4.9 to 5.3 µohm.cm
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Transparency

Opaque

Durability

Flammability

Non-flammable

Organic solvents

Excellent

UV radiation (sunlight)

Excellent

Water (fresh)

Excellent

Water (salt)

Acceptable

Notes

Typical uses

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