Elektron 21

ELEKTRON 21 is a new high strength fully heat treatable magnesium based casting alloy for use at temperatures up to 200°C. This alloy has excellent corrosion resistance characteristics and castability.

APPLICATIONS

Magnesium Elektron has developed this lightweight, high performance alloy for motorsport and aerospace applications.
It is designed to provide superior mechanical properties and improved corrosion resistance together with good castability.

SPECIFICATIONS

AMS 4429
UNS M12310

CHEMICAL COMPOSITION

Zinc	0.2 – 0.5%
Neodymium	2.6 – 3.1%
Gadolinium	1.0 – 1.7%
Zirconium	Saturated
Magnesium	Balance

HEAT TREATMENT

Castings are given the following T6 heat treatment to obtain optimum mechanical properties.
Solution treat for 8 hours at 520°C (970°F),
Hot water quench using water at 60-80°C (140-175°F) or polymer quench,
Age for 16 hours at 200°C (400°F),
Air cool.

PHYSICAL PROPERTIES

Specific gravity	1.82
Coefficient of thermal expansion	$25.3 \times 10^{-6} K^{-1}$
Thermal conductivity	116 $Wm^{-1}K^{-1}$
Specific heat	1086 $Jkg^{-1}K^{-1}$
Electrical resistivity	94.6 nΩm
Modulus of elasticity	44×10^{3}MPa
Poissons ratio	0.27
Melting range	545°C-640°C
Brinell hardness	65-75

DESIGN DATA

Minimum specification tensile properties.

0.2% Proof stress	145 MPa
Tensile strength	248 MPa
Elongation	2%

OTHER PROPERTIES

CASTABILITY

Excellent castability as a consequence of low oxidation characteristics.
Fine-grained microstructure.
Pressure tight.

PATTERN MAKERS SHRINKAGE FACTOR

1.5%

WELDABILITY

Weldable by the tungsten arc inert gas process (TIG) with a filler rod of a similar composition.
Castings should be heat treated after welding to obtain optimum properties

MACHINING

ELEKTRON 21 castings, like all magnesium alloy castings, machine faster than any other metal. Providing the geometry of the part allows, the limiting factor is the power and speed of the machine rather than the quality of the tool material. The power required per cubic centimetre of metal removed varies from 9 to 14 watts per minute depending on the operation.

SURFACE TREATMENT

All the normal chromating, anodising and finishing treatments are applicable.

CORROSION RESISTANCE

ASTM B117 Salt spray test
Corrosion rate for base metal:
0.13-0.37mg/cm^2/day
10–30 mpy

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AMBIENT TEMPERATURE MECHANICAL PROPERTIES

TYPICAL TENSILE PROPERTIES

0.2% Proof stress	170 MPa
Tensile strength	280 MPa
Elongation	5%

TYPICAL COMPRESSIVE PROPERTIES

0.2% Proof stress	168 MPa
Ultimate strength	367 MPa

TYPICAL SHEAR PROPERTIES

Ultimate stress	172 MPa

FRACTURE TOUGHNESS

K_{Ic}	15 MPa $^{-3/2}$

FATIGUE PROPERTIES

Pull-pull fatigue: R = 0.1	5×10^7 cycles
	115 - 120 MPa

LOW TEMPERATURE MECHANICAL PROPERTIES

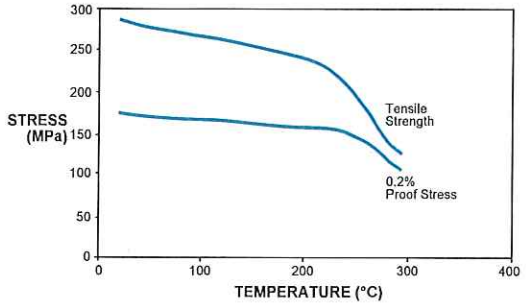
TYPICAL MECHANICAL PROPERTIES AT -35°C

Elongation:	7%
Ultimate tensile strength	270 MPa
Impact value(notched)	1.7J

ELEVATED TEMPERATURE MECHANICAL PROPERTIES

TYPICAL TENSILE PROPERTIES

FIG. 1 Effect of temperature on tensile properties



CREEP PROPERTIES

FIG. 2 Stress / time relationship at 200°C (0.1% creep strain)