



# Magnesium Elektron

SERVICE & INNOVATION IN MAGNESIUM

## Elektron ZRE1

Datasheet : 450

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# Elektron ZRE1

ELEKTRON ZRE1 is a magnesium based alloy containing zinc, rare earths and zirconium.

The alloy exhibits excellent casting characteristics with components being both pressure tight and weldable. It is creep resistant to 250°C.

## APPLICATIONS

The alloy is suitable for components operating at temperatures where creep resistance is required for low stressed complicated castings.

## SPECIFICATIONS

ASTM B80 EZ33A-T5

AMS 4442

UNS 12330

BS 2L.126

BS2970 MAG6-TE

AIR 3380 ZRE1

AFNOR G-TR3Z2

DIN 1729 3.5103

Aircraft Number 3.6204

AECMA MG-C-91

ISO 2119 and 3115

## CHEMICAL COMPOSITION

Zinc	2.0–3.0%
Rare Earths	2.5–4.0%
Zirconium	0.4–1.0%
Magnesium	Balance

## HEAT TREATMENT

ELEKTRON ZRE1 is normally used in the T5 condition ie: 10–16 hours at 170–200°C and air cooled.

## PHYSICAL PROPERTIES

Specific gravity	1.80
Coefficient of thermal expansion	$26.8 \times 10^{-6} \text{K}^{-1}$
Thermal conductivity	$100 \text{ Wm}^{-1} \text{K}^{-1}$
Specific heat	$1040 \text{ Jkg}^{-1} \text{K}^{-1}$
Electrical resistivity	73 nΩm
Modulus of elasticity	44 GPa
Poissons ratio	0.33
Melting range	545–640°C
Damping index	1.89
Brinell hardness	50–60

## DESIGN DATA

Minimum specification tensile properties  
BS 2L.126

0.2% Proof stress	95 MPa
Tensile strength	140 MPa
Elongation	3%

## OTHER PROPERTIES

### CASTABILITY

Excellent. Castings are free from microporosity and the tendency to hot cracking in difficult castings is low. Castings are pressure tight and may be welded.

### 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. ie 2 hours at 345°C and 5 hours at 215°C.

### MACHINING

ELEKTRON ZRE1 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 3.5 mg/cm<sup>2</sup>/day  
270 mpy

### LOW TEMPERATURE PROPERTIES

Mechanical properties at -196°C  
Elongation 0.5%  
Ultimate tensile strength 154 MPa  
Impact value (unnotched) 0.5J

**AMBIENT TEMPERATURE MECHANICAL PROPERTIES**

**TYPICAL TENSILE PROPERTIES**

0.2% Proof stress	110 MPa
Tensile strength	160 MPa
Elongation	3%

**TYPICAL COMPRESSIVE PROPERTIES**

0.2% Proof stress	85–120 MPa
Ultimate strength	275–340 MPa

**TYPICAL SHEAR PROPERTIES**

Ultimate stress	138 MPa
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**TYPICAL BEARING PROPERTIES**

Yield	275 MPa
Ultimate	395 MPa

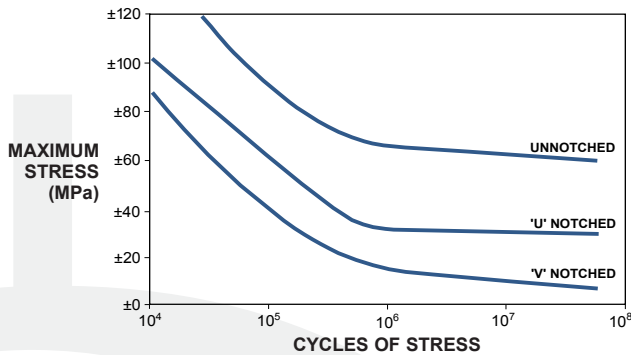
**IMPACT VALUES**

**HOUNSFIELD**

Unnotched	6.1–7.4 J
Notched	0.7–2.0 J

**FATIGUE PROPERTIES**

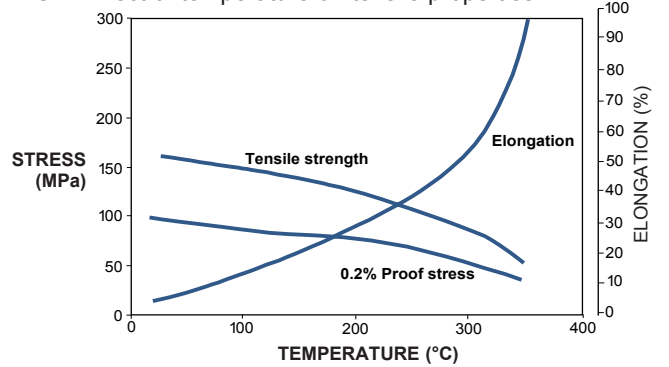
**FIG. 1** Rotating bend fatigue tests



**ELEVATED TEMPERATURE MECHANICAL PROPERTIES**

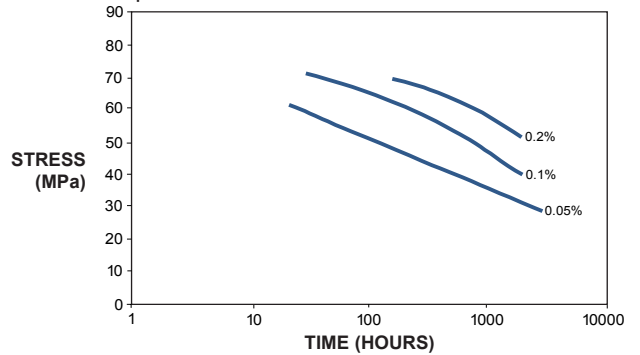
**TYPICAL TENSILE PROPERTIES**

**FIG. 2** Effect of temperature on tensile properties

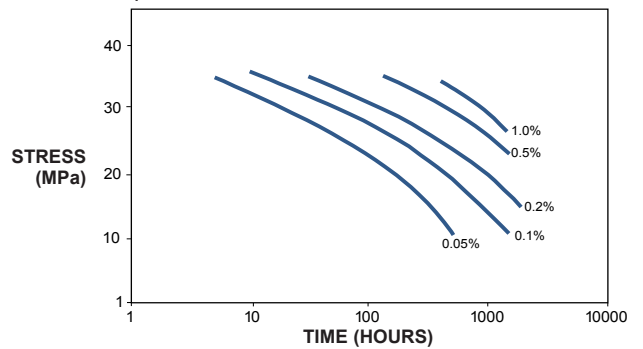


**CREEP PROPERTIES**

**FIG. 3** Stress / time relationships for specified creep strains 200°C

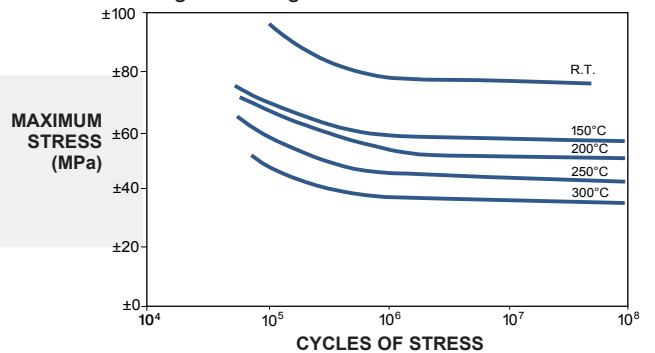


**FIG. 4** Stress / time relationships for specified creep strains 250°C



**FATIGUE PROPERTIES**

**FIG. 5** Rotating bend fatigue curves





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