



## ELEKTRON ZE41

ELEKTRON ZE41 is a well proven magnesium casting alloy containing zinc, rare earths and zirconium. Used in the T5 condition, this medium strength magnesium alloy is ideal for high integrity castings operating at ambient temperatures or up to 300 °F. In addition to displaying excellent casting characteristics, the alloy is both pressure tight and weldable.

### APPLICATIONS

The proven versatility of this alloy makes it of interest to a wide range of designers dealing with aerospace, automotive, military and electronic applications.

Castings in ELEKTRON ZE41 are found in a wide range of applications including:

- Helicopter gearboxes
- Performance car components
- Video cameras
- Military equipment
- Computer parts
- Aircraft engines
- Power tools
- Vibration testing equipment
- Aircraft components
- Motorcycle wheels

### SPECIFICATIONS

ASTM B80 ZE41A-T5  
AMS 4439  
MIL-M-46062  
UNS M16410  
MIL-HDBK-5

BS 2L.128  
BS2970 MAG5-TE

AIR 3380 RZ5  
AFNOR G-Z4TR

DIN 1729 3.5101  
Aircraft Number 3.6104

UNAVIA 816-02

EN 1753  
EN MB 35110

### CHEMICAL COMPOSITION

Zinc	3.5 - 5.0%
Rare Earths	0.8 - 1.7%
Zirconium	0.4 - 1.0%
Magnesium	Balance

### HEAT TREATMENT

2 hours at 625 °F followed by 10 - 16 hours at 350 °F. Water quenching is not required.

Satisfactory properties may be obtained from 2 hours at 625 °F. Water quenching is not required.

### PHYSICAL PROPERTIES

Specific gravity	1.84
Coefficient of Thermal expansion	15.1 $\mu$ in/in °F
Thermal conductivity	63.0 Btu/ft-h °F
Specific heat	0.23 Btu/lb °F
Electrical resistivity	68 n $\Omega$ m (68 °F)
Modulus of elasticity	6.4 $\times 10^3$ ksi
Poisson's ratio	0.35
Melting range	990 - 1180 °F
Damping index	1.0
Brinell hardness	55 - 70

## DESIGN DATA

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Tensile properties  
AMS 4439 specification

### Separately-Cast Minimum

0.2% Yield stress	19.5 ksi
Tensile strength	29.0 ksi
Elongation	2.5%

### Cut From Casting, Minimum

0.2% Yield stress	17.5 ksi
Tensile strength	26.0 ksi
Elongation	2%

### Cut From Casting, Average

0.2% Yield stress	19.5 ksi
Tensile strength	28.0 ksi
Elongation	2.5%

## OTHER PROPERTIES

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### CASTABILITY

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Excellent. Castings will contain minimal microporosity and the tendency to hot cracking is low. Castings are pressure tight and weldable.

### PATTERN MAKERS SHRINKAGE FACTOR

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1.3%

### WELDABILITY

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Weldable by the TIG process with filler rod of similar composition. Castings should be heat treated after welding.

### MACHINING

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ELEKTRON ZE41 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 type of the tool material. The power required per cubic centimeter of metal removed varies from 9 to 14 watts per minute depending on the operation.

## SURFACE TREATMENT

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

## CORROSION RESISTANCE

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ASTM B117 Salt spray test

Corrosion rate	4 - 6 mg/cm <sup>2</sup> /day 320 - 480 mpy
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## LOW TEMPERATURE PROPERTIES

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Mechanical properties at -320 °F

Elongation	0.5%
Ultimate tensile strength	36 ksi
Impact value (unnotched)	0.5 ft lb

## AMBIENT TEMPERATURE

### MECHANICAL PROPERTIES

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### TYPICAL TENSILE PROPERTIES

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0.2% Yield strength	21.5 ksi
Tensile strength	31.6 ksi
Elongation	4.5%

### TYPICAL COMPRESSIVE PROPERTIES

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0.2% Yield strength	18.8 - 21.8 ksi
Ultimate strength	47.9 - 52.9 ksi

### TYPICAL SHEAR PROPERTIES

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Ultimate stress	20.0 ksi
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### FRACTURE TOUGHNESS

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K <sub>IC</sub>	13.7 - 14.8 ksi in <sup>1</sup> / <sub>2</sub>
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## FATIGUE PROPERTIES

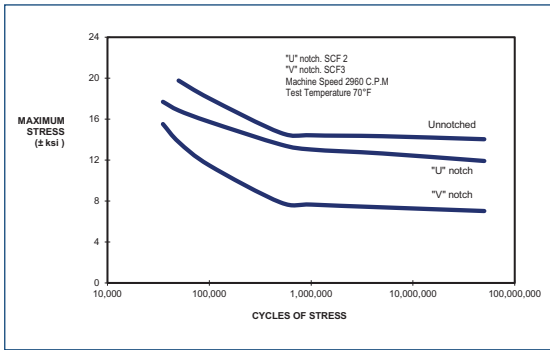


Figure 1. Rotating bending fatigue tests on sand castings.

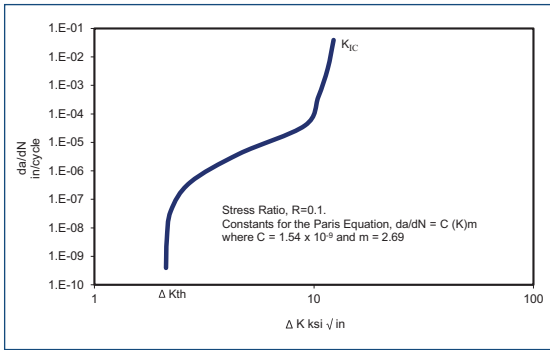


Figure 2. Fatigue crack growth.

## ELEVATED TEMPERATURE MECHANICAL PROPERTIES

### TYPICAL TENSILE PROPERTIES

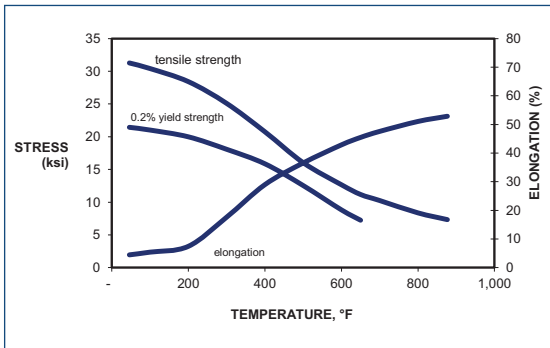


Figure 3. Effect of temperature on tensile properties.

## CREEP PROPERTIES

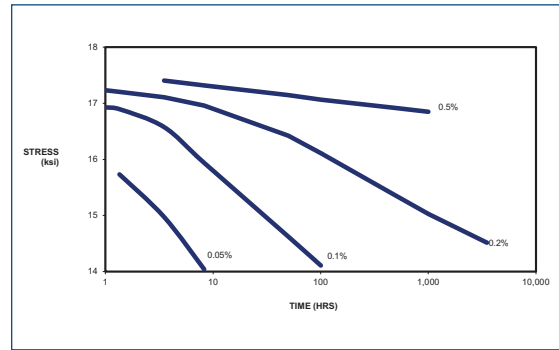


Figure 4. Stress/time relationship for specified creep strains at 212 °F.

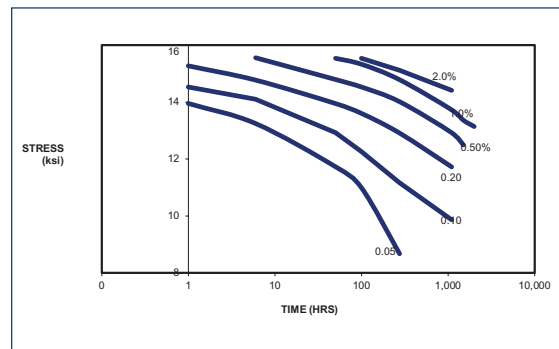


Figure 5. Stress/time relationship for specified creep strains at 300 °F.

## FATIGUE PROPERTIES

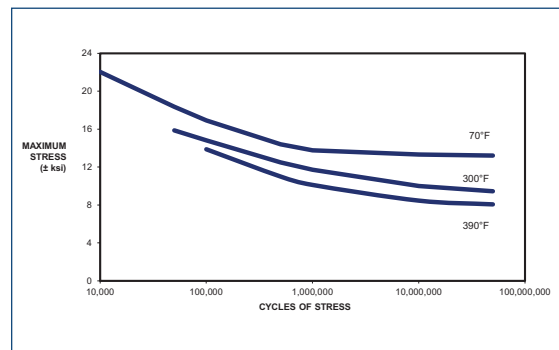
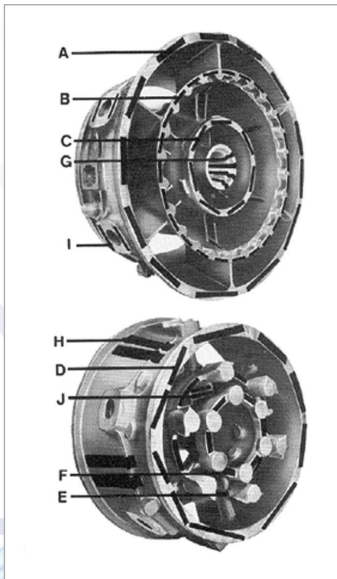


Figure 6. Rotating bending fatigue tests.

**CUT UP PROPERTIES ON SAMPLES TAKEN FROM ACTUAL CASTINGS**

Position	Section Thickness (inches)	Number of Tests		0.2% Yield Strength (ksi)	Tensile Strength (ksi)	Elongation (%)
H	0.2	8	Minimum Average Maximum	20.2 21.3 22.2	31.0 32.2 34.4	4 4.5 7
G, B, J	0.4	25	Minimum Average Maximum	21.2 22.9 27.3	29.6 33.6 36.4	2 6.35 9.5
C, E	0.6	17	Minimum Average Maximum	19.3 21.9 23.9	29.6 33.6 36.3	3.5 6.5 9
A, F	0.75	26	Minimum Average Maximum	20.2 21.5 23.5	31.3 34.1 36.7	4 7.25 11
D	0.75-1.26	7	Minimum Average Maximum	- 20.6 -	30.2 31.3 33.9	7 7.5 9
I	1.25-1.76	13	Minimum Average Maximum	20.2 20.6 21.2	30.0 32.9 34.7	3 6 8



Intake and intermediate casting for Pratt & Whitney's JT15-D. Casting weight 66 lbs. Outside diameter approx. 24 in.

†The information contained within is meant as a guideline only

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