



# Magnesium Elektron

SERVICE & INNOVATION IN MAGNESIUM

## Elektron ZE41

Datasheet : 452A

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# 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

Optimum properties are achieved in the T5 condition after 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/lb h °F
Specific heat	0.23 Btu/lb °F
Electrical resistivity	68 n $\Omega$ m (68°F)
Modulus of elasticity	6.4 x 10 <sup>3</sup> ksi
Poissons ratio	0.35
Melting range	990 - 1180°F
Damping index	1.0
Brinell hardness	55 - 70

## DESIGN DATA

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% Proof stress	17.5 ksi
Tensile strength	26.0 ksi
Elongation	2%

### Cut From Casting, Average

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

## OTHER PROPERTIES

### CASTABILITY

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

### PATTERN MAKERS SHRINKAGE FACTOR

1.3%

### WELDABILITY

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

### MACHINING

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

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

### CORROSION RESISTANCE

ASTM B117 Salt spray test

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

### LOW TEMPERATURE PROPERTIES

Mechanical properties at -320°F

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

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## AMBIENT TEMPERATURE MECHANICAL PROPERTIES

### TYPICAL TENSILE PROPERTIES

0.2% Proof stress	21.5 ksi
Tensile strength	31.6 ksi
Elongation	4.5%

### TYPICAL COMPRESSIVE PROPERTIES

0.2% Proof stress	18.8 - 21.8ksi
Ultimate strength	47.9 - 52.9 ksi

### TYPICAL SHEAR PROPERTIES

Ultimate stress	20.0 ksi
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### FRACTURE TOUGHNESS

$K_{IC}$	13.7 - 14.8 ksi in <sup>1/2</sup>
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### FATIGUE PROPERTIES

FIG. 1 Rotating bending fatigue tests on sand castings

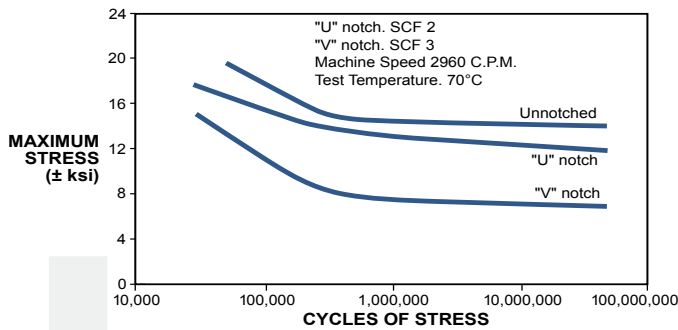
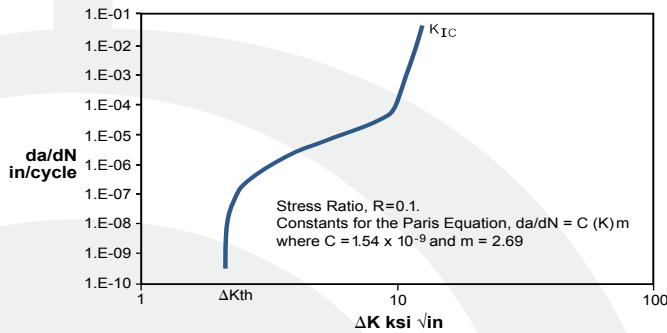


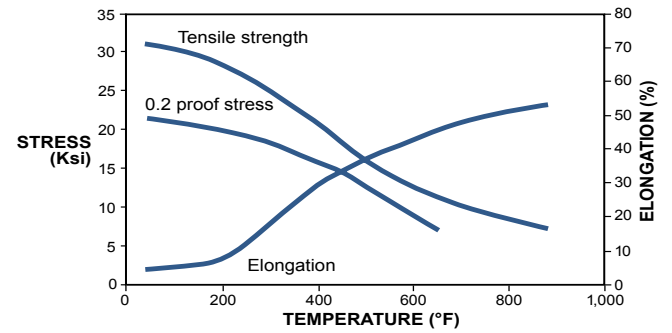
FIG. 2 Fatigue crack growth



## ELEVATED TEMPERATURE MECHANICAL PROPERTIES

### TYPICAL TENSILE PROPERTIES

FIG. 3 Effect of temperature on tensile properties



### CREEP PROPERTIES

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

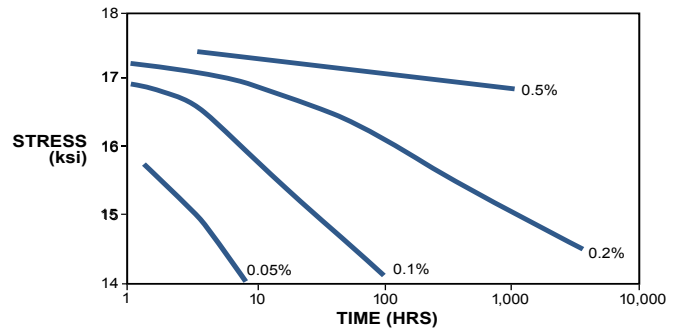
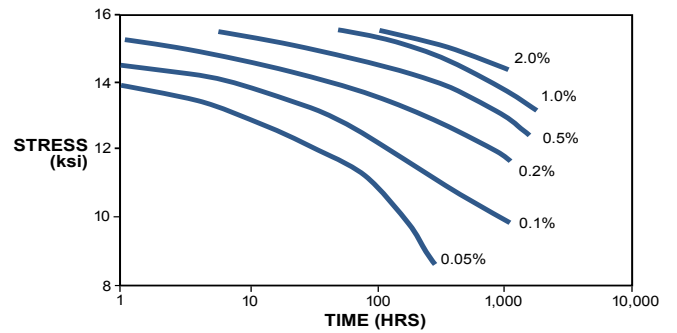
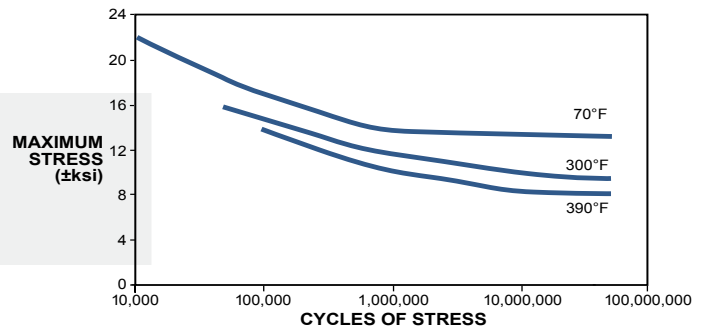


FIG. 5 Stress/time relationship for specified creep strains at 300°F



### FATIGUE PROPERTIES

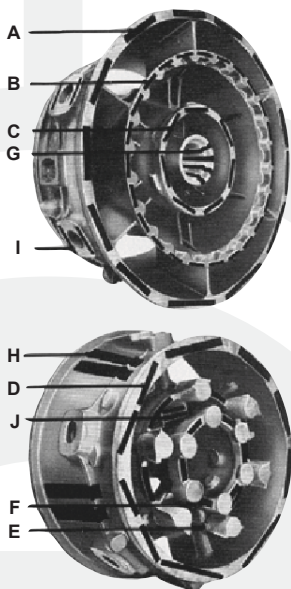
FIG. 6 Rotating bending fatigue tests



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## 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	20.2	31.0	4
			Average	21.3	32.2	4.5
			Maximum	22.2	34.4	7
G, B, J	0.4	25	Minimum	21.2	29.6	2
			Average	22.9	33.6	6.25
			Maximum	27.3	36.4	9.5
C, E	0.6	17	Minimum	19.3	29.6	3.5
			Average	21.9	33.6	6.5
			Maximum	23.9	36.3	9
A, F	0.75	26	Minimum	20.2	31.3	4
			Average	21.5	34.1	7.25
			Maximum	23.5	36.7	11
D	0.75 - 1.28	7	Minimum	-	30.2	7
			Average	20.6	31.3	7.5
			Maximum	-	33.9	9
I	1.25 - 1.76	13	Minimum	20.2	30.0	3
			Average	20.6	32.9	6
			Maximum	21.2	34.7	8



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



Certificate No. FM12677