Elektron® ZK60A Forgings

ZK60A
ZK60A is a wrought magnesium base alloy containing zinc and zirconium. Increased strength is obtained by artificial aging from the as-fabricated form. ZK60A-T5 has the best combination of strength and ductility at room-temperature of the wrought magnesium alloys.

Applications
Forgings in ZK60A find application in high strength parts for use primarily where the service temperature is below 150°C.

ZK60A forgings can be used where pressure tightness or machinability are required. That parts are dimensionally stable during and after machining is also an important design consideration.

Forgings in ZK60A find application in high strength parts for satellites, helicopter gearboxes and rotor hubs, bicycle frames, roadwheels, missile frames and interstage fairings, brake housings and landing gear struts.

Specifications
UNS No. M16600
AMS4362
ASTM B91
FEDERAL QQ-M-40

Chemical composition
Zinc 4.8-6.2%
Zirconium 0.45% min
Magnesium Balance

Heat treatment
As-fabricated (F) forgings can be converted to the precipitation treated temper (T5) by heating to 150°C for 24 hours, followed by air cooling.

Physical properties
Specific gravity 1.83
Coefficient of thermal expansion 27.1x10^-6 K^-1
Thermal conductivity 121 Wm^-1K^-1
Specific heat 1100 Jkg^-1K^-1
Electrical resistivity 57 nΩm
Modulus of elasticity 45GPa
Poissons ratio 0.35
Melting range 520-635°C

Design data
Specification minimum tensile properties.

ZK60A-T5 die forgings
0.2% proof stress 180 MPa
Tensile strength 290 MPa
Elongation in 5.65√A 6%

ZK60A-T6 die forgings
0.2% proof stress 220 MPa
Tensile strength 295 MPa
Elongation in 5.65√A 3%

Other properties
Typical hardness
ZK60A-T6 85 Rockwell E
ZK60A-T5 77 Rockwell E

Weldability
ZK60A is not considered to be weldable by conventional techniques due to hot-shortness cracking. However, resistance welding response is excellent. Friction stir welding can be used to join ZK60A to itself and other magnesium alloys.

Machining
ZK60A, like all magnesium alloy forgings, machines 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 centimeter of metal removed varies from 9 to 14 watts per minute depending on the operation.
Surface treatment
All the normal chromating, anodizing, plating, and finishing treatments are readily applicable.

Corrosion resistance
ASTM B117 salt spray test
Corrosion rate 0.6 mg/cm²/day
50 mpy

Ambient temperature mechanical properties for T5 temper
Typical tensile properties
0.2% proof stress 200 MPa
Tensile strength 310 MPa
Elongation in 5.65/A 13%

Typical compressive properties
0.2% proof stress 160 MPa

Typical shear properties
Ultimate stress 165 MPa

Typical bearing properties
0.2% proof stress 285 MPa
Ultimate stress 420 MPa

Fracture toughness
KIC 34 MPa√m

Fatigue properties

Elevated temperature mechanical properties for T5 temper

Typical tensile properties

Creep properties

Figure 1. Rotating bend fatigue test.

Figure 2. Effect of temperature on tensile properties.

Figure 3. Stress/time relationship for specified creep at 100 °C.

Figure 4. Stress/time relationship for specified creep at 150 °C.

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