

Article

Achieving High-Strength and Toughness in a Mg-Gd-Y Alloy Using Multidirectional Impact Forging

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Elektron Wrought Alloys

Typical chemical composition – major alloying elements %	Elektron alloy	Tensile properties ^a			Compressive properties		Fatigue properties ^b		Hardness	Description
		0.2% proof stress (MPa)	Tensile strength (MPa)	Elongation ^c (%)	0.2% proof stress (MPa)	Compressive strength (MPa)	Unnotched (MPa)	Notched (MPa)	v.p.n.	
Y 5.25 Nd 3.5 ^a Zr 0.5	WE54 Extruded bars and sections									
	Precipitation treated	(180)	(280)	(6)	–	–	–	–	75–95	High strength at elevated temperatures particularly in the fully heat treated condition.
	Fully heat treated	(160)	(250)	(6)	–	–	–	–	75–95	
	Forgings ^d									
	Precipitation treated	(165)	(310)	(4)	–	–	–	–	–	
Y 4.0 Nd 3.0 ^a Zr 0.5	WE43 Extruded bars									
	Precipitation treated	(160)	(245)	(6)	–	–	–	–	75–95	High strength aerospace alloy at elevated temperatures particularly in the fully heat treated condition.
	Fully heat treated	(130)	(230)	(7)	–	–	–	–	75–95	
	Forgings ^d									
	Precipitation treated	(155)	(285)	(6)	–	–	–	–	–	
	Fully heat treated	(165)	(265)	(6)	–	–	–	–	–	

Figure S1. Room temperature tensile properties of extruded bars and forged billets of commercial WE43 and WE54 alloys produced by Elektron Ltd (London, UK).

Magnesium Elektron Elektron® 43 Magnesium Wrought Alloy

Categories: [Metal](#); [Nonferrous Metal](#); [Magnesium Alloy](#)

Material Notes: High strength wrought Mg alloy available as rolled plate, forging feedstock, and extrusions. It is a wrought evolution of the casting alloy Elektron WE43. Elektron 43 uses zirconium grain refining and has successfully undergone flammability tests by the FAA for use in aircraft seat frames. It develops maximum strength in the T5 condition.

Vendors: Magnesium Elektron is the world leader in high strength magnesium alloys in rolled, extruded and cast forms. Phone (303) 589-3189 or visit www.magnesium-elektron.com.

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Physical Properties	Metric	English	Comments
Density	1.84 g/cc	0.0665 lb/in ³	
Mechanical Properties	Metric	English	Comments
Hardness, Brinell	70 - 90	70 - 90	
Tensile Strength	296 MPa	43000 psi	Extruded Bar - Transverse
	331 MPa	48000 psi	Extruded Bar - Longitudinal
	345 MPa	50000 psi	Rolled Plate
	@Thickness 1.02 - 38.1 mm @Thickness 0.0400 - 1.50 in		
	345 MPa	50000 psi	Rolled Plate
	@Thickness 38.13 - 76.2 mm @Thickness 1.501 - 3.00 in		
Tensile Strength, Yield	179 MPa	26000 psi	Extruded Bar - Transverse
	@Strain 0.200 %	@Strain 0.200 %	
	214 MPa	31000 psi	Extruded Bar - Longitudinal
	@Strain 0.200 %	@Strain 0.200 %	
	255 MPa	37000 psi	Rolled Plate
	@Strain 0.200 %, Thickness 38.13 - 76.2 mm @Thickness 1.501 - 3.00 in	@Strain 0.200 %, Thickness 1.501 - 3.00 in	
	276 MPa	40000 psi	Rolled Plate
	@Strain 0.200 %, Thickness 1.02 - 38.1 mm @Thickness 0.0400 - 1.50 in	@Strain 0.200 %, Thickness 0.0400 - 1.50 in	
Elongation at Break	11 %	11 %	Extruded Bar - Transverse
	14 %	14 %	Extruded Bar - Longitudinal
	12 %	12 %	Rolled Plate
	@Thickness 1.02 - 38.1 mm @Thickness 0.0400 - 1.50 in		
	14 %	14 %	Rolled Plate
	@Thickness 38.13 - 76.2 mm @Thickness 1.501 - 3.00 in		

Figure S2. Room temperature tensile properties of rolled plate and extruded bar of commercial WE43 alloys produced by Elektron Ltd (London, UK).