



Magnesium Casting Alloys

Typical chemical composition – major alloying elements %	Elektron alloy	Tensile properties ¹			Compressive properties		Fatigue properties ³		Hardness	Description
		0.2% proof stress (MPa)	Tensile strength (MPa)	Elongation ² (%)	0.2% proof stress (MPa)	Ultimate strength (MPa)	Unnotched (MPa)	Notched (MPa)	v.p.n.	
Y 5.25 Nd and other heavy rare earth metals 3.5 Zr 0.5	Elektron WE54 Solution and precipitation treated – Sand cast – Chill cast	185 185	255 255	2 2	167–175 –	410 –	95–100 –	– –	90–105 –	High strength at elevated temperatures
Y 4.0 Nd and other heavy rare earth metals 3.0 Zr 0.5	Elektron WE43 Solution and precipitation treated – Sand cast – Chill cast	172 172	220 220	2 2	187 –	323 –	85 –	– –	85–105	Excellent retention of strength after long exposure at 250 °C. Good castability, weldable.
Nd 2.7 Gd 1.3 Zn 0.3 Zr 0.6	Elektron Z1 Solution and precipitation treated – Sand cast	145	248	2	(156)	(348)	(115–120)	–	(70–80)	High strength alloy. Good corrosion resistance, good castability.
Rare earth metals 3.0 Zn 2.5 Zr 0.6	Elektron ZRE1 Solution and precipitation treated – Sand cast – Chill cast	95 100	140 155	3 3	85–120 –	275–340 –	66–75 –	55–70 –	55–70 –	Creep-resistant up to 250 °C. Excellent castability. Pressure tight and weldable.
Zn 4.2 Rare earth metals 1.3 Zr 0.7	Elektron RZ5 Solution and precipitation treated – Sand cast – Chill cast	135 135	200 215	3 4	130–150 –	330–365 –	90–105 –	75–90 –	60–80 –	Easily cast, weldable, pressure tight, with useful strength.
Ag 1.5 Nd rich rare earth metals 2.0 Zr 0.6 Cu 0.07	Elektron EQ21 Solution and precipitation treated – Sand cast – Chill cast	175 185	240 240	2 2	165–200 –	310–385 –	100–110 –	60–70 –	80–105 –	Heat-treated alloys with high yield strength up to 200 °C. Pressure tight and weldable.
Ag 2.5 Nd rich rare earth metals 2.5 Zr 0.6	Elektron MSR-B Solution and precipitation treated – Sand cast – Chill cast	175 175	240 240	2 2	165–200 –	310–385 –	100–110 –	60–70 –	80–105 –	
Ag 2.5 Nd rich rare earth metals 2.0 Zr 0.6	Elektron QE22 Solution and precipitation treated – Sand cast – Chill cast	175 175	240 240	2 2	165–200 –	310–385 –	100–110 –	60–70 –	80–105 –	
Al 8.0 Zn 0.5 Mn 0.3	Elektron A8 As cast – Sand cast – Chill cast Solution treated – Sand cast – Chill cast	(85) (85) 80 80	140 185 200 230	2 4 7 10	75–90 – 75–90 –	280–340 – 325–415 –	75–85 – 75–90 –	58–65 – 60–70 –	55–70 – 55–70 –	General purpose alloy. Good founding properties. Good ductility, strength and shock resistance. Also available as a high purity grade.
Al 9.5 Zn 0.5 Mn 0.3	Elektron AZ91 As cast – Sand cast – Chill cast Solution treated – Sand cast – Chill cast Solution and precipitation treated – Sand cast – Chill cast	(95) (100) 80 80 120 120	125 170 200 215 200 215	– 2 4 5 – 2	85–110 – 75–110 – 110–140 –	280–340 – 185–432 – 385–465 –	75–85 – 77–92 – 70–77 –	58–65 – 65–77 – 58–62 –	60–75 – 60–75 – 85–100 –	General purpose alloy. Good founding properties. Suitable for pressure die castings.
Al 9.0 Zn 0.5 Mn 0.3	AZ91D Die cast	120	120	3	160	–	100	–	–	
Al 5.0 Mn 0.5	AM50A Die cast	110	200	10	–	–	–	–	–	
Al 6.0	AM60B Die cast	130	220	8	–	–	–	–	–	

Approximate conversion factors 1 MPa=0.065 T.S.I.=0.145 K.S.I.
The tensile properties quoted are the specification minima for the first specification listed for that alloy and condition.
The ranges given are the specified minima; bracketed values are for information only.

- The values quoted are for separately cast test bars and may not be realised in certain portions of castings.
- Elongation values are based on a gauge length of $5.65\sqrt{A}$, except in the case of thin material where a gauge length of 50 mm may be used (see B.S. 2 L.500, 3370 and 3373).
With the latter gauge length, elongation requirements for sheet and plate depend on thickness and a range of minima is quoted.
- Endurance values for 50×10^6 reversals in rotating bending-type tests; semi-circular notch, radius 1.2 mm, S.C.F. approx. 2.

Magnesium alloy Designation and condition	British		American				German		French			European
	B.S. Series		ASTM alloy designation and temper	ASTM	Federal	AMS	Aircraft number	DIN 1729 number	Commercial designation	Air 3380	AFNOR	General engineering aircraft ISO 16220
	Aircraft	General engineering										
Elektron WE54 Solution and precipitation treated	-	2970 MAG14-TF	WE54A-T6	B80	-	4426	-	-	-	-	-	MC95310
Elektron WE43 Solution and precipitation treated	-	-	WE43A-T6	B80	-	4427	-	-	-	-	-	MC95320
Elektron 21 Solution and precipitation treated	-	-	EV31A-T6	B80	-	4429	-	-	-	-	-	MC65410
Elektron ZRE1 Precipitation treated	2 L. 126	2970 MAG6-TE	EZ33A-T5	B80	QQ-M-56B	4442	3.6204	3.5103	ZRE1	ZRE1	G-TR372	MC65120
Elektron RZ5 Precipitation treated	2 L. 128	2970 MAG5-TE	ZE41A-T5	B80	-	4439	3.6104	3.5101	RZ5	RZ5	G-Z4TR	MC35110
Elektron EQ21 Solution and precipitation treated	-	2970 MAG13-TF	EQ21A-T6	B80	-	4417	-	-	-	-	-	MC65220
Elektron MSR-B Solution and precipitation treated	-	2970 MAG12-TF	-	-	-	-	-	-	MSR-B	-	G-Ag2.5 TR	MC65210
Elektron QE22 Solution and precipitation treated	-	-	QE22A-T6	B80	QQ-M-56B	4418	3.5164	3.5106	-	-	-	-
Elektron A8 As cast Solution treated	- 3 L. 122	2970 MAG1-M 2970 MAG1-TB	AZ81A-F AZ81A-T4	B80 B80	QQ-M-56B QQ-M-56B	- -	- -	3.5812 3.5812	FT FT	G-A9 G-A9	G-A9 G-A9	MC21110
Elektron AZ91 As cast Solution treated Solution and precipitation treated	- 3 L. 124 3 L. 125	2970 MAG3-M 2970 MAG3-TB 2970 MAG3-TF	AZ91E-F AZ91E-T4 AZ91E-T6	B80 B80 B80	QQ-M-56B QQ-M-56B QQ-M-56B	- - 4437	- 3.5194 3.5194	- - -	F10 F10 F10	G-A9Z1 G-A9Z1 G-A9Z1	G-A9Z1 G-A9Z1 G-A9Z1	MC21120
Elektron AZ91 Die cast	-	-	AZ91D	B94	-	-	-	-	-	-	-	MC21120
Elektron AM60 Die cast	-	-	AM60B	B94	-	-	-	-	-	-	-	MC21220
Elektron AM50 Die cast	-	-	AM50A	B94	-	-	-	-	-	-	-	MC21230

Magnesium alloy	Specific gravity (20°C)	Coefficient of thermal expansion 10 ⁻⁶ K ⁻¹ (20–200°C)	Thermal conductivity Wm ⁻¹ K ⁻¹ (20°C)	Electrical resistivity nΩm (20°C)	Specific heat Jkg ⁻¹ K ⁻¹ (20–100°C)
Elektron WE54	1.85	24.6	52	173	960
Elektron WE43	1.84	26.7	51	148	966
Elektron 21	1.82	26.3	116	94.6	1086
Elektron ZRE1	1.80	26.8	100	73	1050
Elektron RZ5	1.84	27.1	109	68	960
Elektron MSR-B	1.82	26.7	113	68	1000
Elektron QE22	1.82	26.7	113	68	1000
Elektron A8	1.81	27.2	84	134	1000
Elektron AZ91	1.83	27.0	84	141	1000
Elektron C	1.81	27.2	84	134	1000

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