Magnesium Alloys for Automotive Applications

DIECASTING ALLOYS

- AZ91D — most widely used alloy
- AM60
- AM50
- AM20

  — higher ductility alloys
- AE42
- AS41
- AS21

  — higher temperature alloys

Automotive Applications

AZ91D ALLOY (Mg-9Al-1Zn)

Good room temperature strength, excellent die-castability, good corrosion resistance

Drive brackets, oil pan, steering column brackets, 4-wheel drive transfer case, manual transmission case, induction cover, clutch pedal, brake pedal, steering column brackets, crankcase, chain housing, steering box, rear-link arms, subframe.

Automotive Applications

AM60, AM50, AM20 ALLOYS

High ductility, good impact strength, good diecastability, good corrosion resistance

- Seat frames (8kg)

  Daimler Benz 500/600SL AM50 /AM20

- Wheels (50 kg)

  Porche AM60

- Instrument Panels

  Audi AM20

Automotive Applications

AE42, AS41, AS21 ALLOYS

Good Strength and creep resistance at temperatures above 120°C

AE42 has also good ductility and corrosion resistance but poor castability and low fatigue strength. Cost is a problem.

AS41, AS21 have borderline strength and exhibit poor castability

Automatic Transmission Case

Magnesium Alloys for Automotive Applications

LOW-PRESSURE DIECASTING,
GRAVITY CASTING

ALLOYS & APPLICATIONS

- WHEELS AM50, AM60, AZ91E
- ENGINE BLOCKS ZE41, AC63

Magnesium Alloys for Automotive Applications

PROTOTYPING OF DIECAST PARTS

- AZ91D, AM50, AM60
  - PLASTER-CAST AZ91E
  - PROPERTIES ARE 70% OF DIECAST PARTS
- AE42, AS41, AS21
  - DIFFICULT TO PROTOTYPE
  - PROPERTIES NOT REPRESENTATIVE.
  - ALLOY MODIFICATION NEEDED FOR PROTOTYPING

PROPERTIES OF MAGNESIUM ALLOYS

MECHANICAL PROPERTIES AND CORROSION PERFORMANCE

ALLOY	T.S. (MPa)	Y.S. (MPa)	E (%)	CREEP (%) (150ºC, 35MPa, 200hr)	CORROSION (mg/cm²/day)
A380	325	160	3	0.19	–
AZ91D	240	165	3	2.54	0.11
AM60	220	130	6	2.15	0.13
AM50	200	125	6-10	2.15	0.22
AM20	135	105	10	–	–
AS41	225	135	4.5	–	0.25
AS21	170	110	4	–	–
AE42	225	140	8-10	0.33	0.21
ZC63*	240	145	5	–	–
ZE41*	180	135	2	–	–