



umicore

Zinc Alloys

Legend :
HCDC : hot chamber die casting
CCDC : cold chamber die casting
ConCast : continuous cast
IM : injection molding
SC : spin casting
EX : extrusion
Pr : pressing

Warmkammerverfahren
 Kalkkammerverfahren
 Strangguss
 Spritzguss
 Schleuderguss
 Extrusion
 Stanzen

for additional information :
www.zincdiecasting.umicore.com
www.zamak.info
www.overcor.com
www.umicore.com

EN12844 : standard for zinc die casting parts
 EN1706 : standard for aluminium die casting parts
 EN1753 : standard for magnesium die casting parts
 IZA : International Zinc Association
 IMA : International Magnesium Association
 ECI : European Copper Institute
 IAA : International Aluminium Association
 EMS : plastic producer data
 MatWeb : website for material properties www.matweb.com

close tolerances difficult for plastics

** -Production Speeds governed largely by product size, material used and rate of cooling, which, size for size, tends to be far slower than metals.

All properties and data for guidance only
 * Properties on 1,5mm specimen after 8 weeks of ageing @ 20°C

Alle Angaben rein informativ

| Property | Units | Zinc alloys | | | | | | | | | Aluminium alloys | | Magnesium | Brass | | Steel | Plastics | | | | | Eigenschaften | |
|---|--|---|-------------------------------|-------------------------------|----------------------------|------------------|---------|------------------------------|------------------------------|---------------|------------------|-------------|------------|------------------------------|--------------------------------------|---|-------------------------|----------------------------|---------------------------------|--------------------------------|--------------------------------------|---|----------------------|
| | | HP3 | HP5 | HP2 | HP8 | Superloy | KS | HP12 | HP27 | HP27 | AISI9Cu3 | AISI12 | AZ91 | CuZn37 | CuZn35Pb1 | DIN 1.0402 | ABS | PA 66 | PA66+PA | 50% GF | 30% GF Nylon | | Produktionsverfahren |
| Process technology | | HCDC | HCDC | HCDC | HCDC | HCDC | SC | CCDC | CCDC | CCDC | CCDC | CCDC | CCDC | CCDC | EX | Pr | IM | IM | IM | IM | IM | Mechanische Eigenschaften | |
| Mechanical Properties | | * | * | * | * | * | | | | | | | | | | | | | | | | Mechanische Eigenschaften | |
| Yield strength | MPa | 268 | 295 | 361 | 319 | 300 | <200 | 320 | 371 | 159 | 165 | 111-170 | 120 | 330 | 345 | 25-65 | 55-90 | 40-70 | | | | R _{0,2} -Grenze/Streckgrenze | |
| Ultimate tensile strength (UTS) | MPa | 308 | 331 | 397 | 387 | 333 | <200 | 404 | 426 | 317 | 330 | 200-260 | 280 | 435 | 440 | 25 - 65 | 80 | 45 | 240-250 | 155-210 | | Zugfestigkeit | |
| Young's modulus | GPa | 96 | 96 | 96 | 96 | 96 | | 86 | 78 | 71 | 71 | 44 | 110 | 105 | 200 | 1,79-3,2 | 0,7-1,8 | 7,5-27 | 17,5-18 | 3,2 - 12,7 | | E- Modul/Elastizitätsmodul | |
| Torsional modulus | GPa | >33 | >33 | >33 | >33 | >33 | | | | 26,9 | 26,9 | 16,5 | | | | 1,6-5,9 | | | | n/a | | Torsionsmodul | |
| Elongation at F _{max} | % | 3 | 2 | 3 | 4 | 3 | <2 | | 2,5 | | | | | | | 1,7-6 | | 4-15 | | | | Dehnung bei F _{max} | |
| Elongation at fracture | % | 6,3 | 3,6 | 6 | 8 | 10 | <2 | 5 | | 1-3 | 0,5-3 | 7 | 4 | 30 | 35,8 | 2 - 110 | 9-50 | 25-50 | 2 | 3-5 | | Bruchdehnung | |
| Shear strength | MPa | 214 | 262 | 317 | 275 | 245 | | | 325 | 195 | 186 | 138 | | 295 | | | | | | | | Scherfestigkeit | |
| Compressive yield stress | MPa | 414 | 600 | 641 | -600 | 590 | | | 385 | | | 108-159 | | | | 53-86 | | | | | | Druckfestigkeit | |
| Impact strength | Joules | 46 | 52 | 38 | 42 | 65 | | 28 | 12,7 | 3,4 | 4 | 3,7 - 6 | | | 16,9 | 0,4-6,4 | no break | no break | 8 | 5 | | Schlagarbeit | |
| Fatigue resistance (5x10 ⁸) | MPa | 48 | 57 | 59 | | 89 | | | | 70-100 | 60-90 | 50-70 | 110 | | | 7 | | | | | | Zeitfestigkeit (5 x10 ⁸ Lastwechsel) | |
| Hardness Brinell HBN | Brinell | 97 | 114 | 130 | 110 | 131 | 150 | 100 | 119 | 75 | 85 | 63-85 | 75 | 135 | 131 | too soft | too soft | too soft | too soft | too soft | | Härte Brinell HBN | |
| Fracture toughness K _{IC} | x10 ³ N.m ^{-3/2} | 2,25 | 2,1 | | 1,95 | | | | | 3,6 (?) | 3,6 (?) | | | | | | | | | | | Bruchzähigkeit K _{IC} | |
| Specific damping capacity @ 35 MPa | % | 18 | 19 | 19 | 20 | 21 | | | | 1 | 1 | 25 | | | | | | | | | | Spez. Dämpfungskapazität @ 35 MPa | |
| Specific damping capacity @ 100 MPa | % | 40 | 41 | 42 | 44 | 45 | | | | 4 | 4 | 53 | | | | | | | | | | Spez. Dämpfungskapazität @ 100 MPa | |
| Physical properties @ 20°C | | | | | | | | | | | | | | | | | | | | | | Physikalische Eigenschaften bei 20°C | |
| Density | g cm ⁻³ | 6,7 | 6,7 | 6,8 | 6,3 | 6,5 | 6,8 | 6,3 | 5 | 2,79 | 2,65 | 1,82 | 8,5 | 8,47 | 7,87 | 1,02-1,21 | 1,07 | 1,14 | 1,65 | 1,11-1,68 | | Dichte | |
| Coefficient of thermal expansion | x10 ⁻⁶ °C ⁻¹ | 27,4 | 27,4 | 27,8 | 23,3 | 27 | 27,8 | 24,1 | 26 | 21 | 21,1 | 25,2-26,0 | 20,3 | 20,3 | 16 | 50 - 150 | 60-90 | 80-120 | 40-15 | 17 - 104 | | thermischer Ausdehnungskoeffizient | |
| Thermal conductivity | W m ⁻¹ hr ⁻¹ m ⁻² | 113 | 109 | 105 | 112 | 112 | 105 | 116 | 125 | 109 | 96 | 51 - 72,7 | 30-100 | 115 | 52 | 0,13-0,19 | | | | <1 (?) | | thermische Leitfähigkeit | |
| Electrical conductivity | % IACS | 27 | 26 | 25 | 27,7 | 26 | 25 | 28,3 | 29,7 | 24 | 27 | 11,5 - 12,1 | | | 12,1 | n/a | | | | | n/a | elektrische Leitfähigkeit | |
| Electrical conductivity | Sm mm ⁻² | 15-16 | 15-16 | 15-16 | 15-16 | 15-16 | 15-16 | | | 12-28 | 12-28 | 6-10 | 14-15 | 14-15 | | | | | | | | elektrische Leitfähigkeit | |
| Electrical resistivity | μohm cm | 6,37 | 6,54 | 6,85 | 6,2 | 6,9 | 6,85 | 6,1 | 5,8 | 6,4 | 7,5 | | 6,6 | 6,6 | 15,9 | 10 ¹⁵ | 10 ¹² | 10 ¹⁰ | 10 ¹¹ | 10 ¹² | | elektrischer Widerstand | |
| Melting temperature range | °C | 381-387 | 380-386 | 379-390 | 375-404 | 375-377 | 379-390 | 377-432 | 377-484 | 538-593 | 516-582 | 468-598 | 885-925 | 885-925 | | | 260 | 260 | 325 | 260 | | Erstarrungsintervall | |
| Specific heat capacity | J kg ⁻¹ °C ⁻¹ | 419 | 419 | 419 | 435 | 429 | 419 | 450 | 525 | 963 | 960 | 1020 | 380 | 380 | 486 | 1960 - 2130 | | | | | 1200 - 2350 | spezifische Wärme | |
| Coefficient of friction | - | 0,07 | 0,08 | 0,08 | 0,11 | 0,07 | 0,08 | | | | | | | | | 0,45 | | | | | | Reibungskoeffizient | |
| Production specific parameters | | | | | | | | | | | | | | | | | | | | | | Produktionsspezifische Kenndaten | |
| Typical precision | % | 0,1 | 0,1 | 0,1 | 0,1 | 0,1 | 0,5 | 0,25 | 0,3 | 0,25-0,3 | 0,25-0,3 | 0,175 | 1 | 1 | | High shrinkage and humidity make close tolerances difficult for plastics | | | | | Toleranz | | |
| Min. wall thickness | mm | 0,4 | 0,4 | 0,5 | 0,6 | 0,3 | 1,2 | 0,9 | 1,2 | 1,3 | 1,3 | 1,2 | | | | - | | | | | min. Wanddicke | | |
| Typical production speed | shots/hour | large 200-500; small 400-1000; tiny 2000-3000 | | | | | | 20 | 200-300 | 100-300 | 50-250 | | 20-275 | 125 | | Production speeds governed largely by product size, material used and rate of cooling, which, size for size, tends to be far slower than metals | | | | | durchschnittliche Produktionsrate | | |
| Broad production speed range | shots/hour | 200-3600 | | | | | | 10-30 | 250 | 175 | 30-350 | | 40-2400 | 30-200 | 300-720 | 180-1800 | | 100-400 | | | durchschnittliche Produktionsrate | | |
| Typical tool life | shots x 10 ³ | 750-2000 | | | | | | 0,2 | 700 | 500 | 100-225 | | 300-500 | | | Function of composition and reinforcement | | | | | durchschnittliche Standzeit Werkzeug | | |
| Chemical composition | | | | | | | | | | | | | | | | | | | | | | Chemische Zusammensetzung | |
| standard | | EN12844 | EN12844 | EN12844 | EN12844 | Umicore | Umicore | EN12844 | EN12844 | EN1706 | EN1706 | EN1753 | | | | ISO 1874 | ISO 1874 | ISO 1874 | ISO 1874 | ISO 1874 | | | |
| % Al | | 3,7-4,3 | 3,7-4,3 | 3,7-4,3 | 8,0-8,8 | 6,4-7,0 | 3,8-4,2 | 10,5-11,5 | 24-27 | balance | balance | 8,3-9,7 | | | | | | | | | | | |
| % Cu | | <0,05 | 0,7-1,25 | 2,7-3,3 | 0,9-1,1 | 3,0-3,5 | 2,5-3,5 | 0,9-1,5 | 2,0-2,5 | 3,0-4,0 | 3,0-4,0 | <0,030 | 60-65 | 60-65 | 0,17-0,23 | | | | | | | | |
| % Mg | | 0,02-0,06 | 0,02-0,06 | 0,02-0,06 | 0,015-0,03 | <0,05 | 0,4-0,6 | 0,015-0,03 | 0,01-0,02 | <0,30 | <0,1 | balance | | | | | | | | | | | |
| % Zn | | balance | balance | balance | balance | balance | balance | balance | balance | <3,0 | <1,0 | 0,35-1,0 | 30-37 | 30-37 | | | | | | | | | |
| % Mn | | - | - | - | - | - | - | - | - | <0,5 | <0,1 | 0,15-0,50 | | | 0,3-0,6 | | | | | | | | |
| % Fe | | <0,05 | <0,05 | <0,05 | <0,05 | <0,05 | <0,05 | <0,07 | <0,1 | <1,3 | <0,6 | <0,005 | | <0,1 | | | | | | | | | |
| % Si | | <0,03 | <0,03 | <0,03 | <0,045 | <0,03 | <0,03 | <0,06 | <0,08 | 7,5-9,5 | 10,5-12 | <0,10 | | | | | | | | | | | |
| % Ni | | <0,02 | <0,02 | <0,02 | <0,02 | <0,02 | <0,02 | <0,02 | <0,02 | <0,5 | <0,5 | <0,002 | | | | | | | | | | | |
| % Sn | | <0,002 | <0,002 | <0,002 | <0,003 | <0,002 | <0,002 | <0,003 | <0,003 | | | | | | | | | | | | | | |
| % Cd | | <0,005 | <0,005 | <0,005 | <0,006 | <0,005 | <0,005 | <0,006 | <0,006 | | | | | | | | | | | | | | |
| % Pb | | <0,005 | <0,005 | <0,005 | <0,006 | <0,005 | <0,005 | <0,006 | <0,006 | | | | <1 | 0,8-1,4 | | | | | | | | | |
| color code | | white/yellow | white/black | white/green | white/blue | - | - | white/orange | white/violet | | | | | | | | | | | | | | |
| Other designations | | Zamak 3 ZP0400 ZnAl4 | Zamak 5 ZP0410 ZnAl4Cu1 | Zamak 2 ZP0430 ZnAl4Cu3 | ZA 8 ZP0810 ZnAl8Cu1 | Superloy GDSL | KS | ZA 12 ZP1110 ZnAl11Cu1 | ZA 27 ZP2720 ZnAl27Cu2 | LM 24 A380 | LM 25 A384 | | ISO CuZn37 | ISO CuZn35Pb1 65/35 brass | AISI1020 UNS G10200 DIN 1.0402 | | PA 66 MFHR 14-140 | PA66/PA6 MHR 14-030N | PA6T/6I MH 12-190 GF50 | PA 66 MHR 14-120 GF35 | | | Andere Bezeichnungen |
| Source | | IZA | IZA | IZA | IZA | Umicore | Umicore | IZA | IZA | IAA | IAA | IMA | ECI | ECI | | EMS | EMS | EMS | EMS | | | Quelle | |

