

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  
Kaltkammerverfahren  
Strangguss  
Spritzguss  
Schleuderguss  
Extrusion  
Stanzen

EN12844

EN1706

EN1753

IZA

IMA

ECI

IAA

EMS

MatWeb


standard for zinc die casting parts  
standard for aluminum die casting parts  
standard for magnesium die casting parts  
International Zinc Association  
International Magnesium Association  
European Copper Institute  
International Aluminum Association  
plastic producer data  
website for material properties www.matweb.com



All properties and data for guidance only

\* Properties on 1.5mm specimen after 8 weeks of ageing @ 20°C

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|  |  |  |   |                               |                               |                            |                  |          |                              |                              |                                      |                |                                |                         |                              |                                      |   |                  |                  |                          |                                      |                     |                  |  |                                      |                                   |
|--|--|--|---|-------------------------------|-------------------------------|----------------------------|------------------|----------|------------------------------|------------------------------|--------------------------------------|----------------|--------------------------------|-------------------------|------------------------------|--------------------------------------|---|------------------|------------------|--------------------------|--------------------------------------|---------------------|------------------|--|--------------------------------------|-----------------------------------|
| Properties on 1.5mm specimen after 8 weeks of ageing @ 20°C                        |  |  |   |                               |                               |                            |                  |          |                              |                              |                                      |                |                                |                         |                              |                                      |   |                  |                  | Eigenschaften            |                                      |                     |                  |  |                                      |                                   |
| Process technology   |  | Units  | ZP3<br>HCDC                                   | ZP5<br>HCDC                   | ZP2<br>HCDC                   | ZP8<br>HCDC                | Superloy<br>HCDC | KS<br>SC | ZP12<br>CCDC                 | ZP27<br>CCDC                 | Aluminium alloys<br>AlSi9Cu3<br>CCDC | AlSi12<br>CCDC | Magnesium<br>AZ91<br>HCDC/CCDC | Brass<br>CuZn37<br>CCDC | CuZn35Pb1<br>EX              | Steel<br>DIN 1.0402<br>PR            | ABS<br>IM   | PA 66<br>IM      | PA66/PA6<br>IM   | Plastics<br>50% GF<br>IM | 30% GF Nylon<br>IM                   | Polycarbonate<br>IM | Acetal<br>IM     | Produktionsverfahren                             |                                      |                                   |
| 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            | n/a                      | n/a                                  | n/a                 | -                | R <sub>0,2</sub> -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                              | 54-72               | 37-70            | 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                           | 1,6-5,5             | 1,4 - 3,6        | E- Modul/Elastizitätsmodul                       |                                      |                                   |
| Torsional modulus  |  | GPa  | >33   | >33                           | >33                           | >33                        | >33              |          |                              |                              | 26,9                                 | 26,9           | 16,5                           |                         |                              |                                      | 1,6-5,9   |                  |                  |                          | n/a                                  | n/a                 | n/a              | Torsionsmodul                                    |                                      |                                   |
| Elongation at F <sub>max</sub>   |  | %  | 3   | 2                             | 3                             | 4                          | 3                | <2       |                              | 2,5                          |                                      |                |                                |                         |                              |                                      | 1,7-6   | 15-300           | 14-15            |                          |                                      | 8 - 135             | 3 - 250          | Dehnung bei F <sub>max</sub>                     |                                      |                                   |
| 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                                  | 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                                    | 8                   | 5                | Schlagarbeit                                     |                                      |                                   |
| Fatigue resistance (5x10 <sup>7</sup> )  |  | MPa  | 48  | 57                            | 59                            |                            | 89               |          |                              |                              | 70-100                               | 60-90          | 50-70                          | 110                     |                              |                                      | 7   |                  |                  |                          | 15                                   |                     | 15               | Zeitfestigkeit (5 x 10 <sup>8</sup> 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                             | too soft            | too soft         | too soft   | Härte Brinell HBN                    |                                   |
| Fracture toughness K <sub>IC</sub>   |  | x10 <sup>3</sup> N.m <sup>3/2</sup>                | 2,25  | 2,1                           |                               | 1,95                       |                  |          |                              |                              | 3,6                                  | 3,6            |                                |                         |                              |                                      |   | 0,07             |                  | 0,22                     | 0,09                                 | -                   | -                | Bruchzähigkeit K <sub>IC</sub>                   |                                      |                                   |
| 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 <sup>-3</sup>                                 | 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                            | 1,17-1,45           | 1,29-1,43        | Dichte   |                                      |                                   |
| Coefficient of thermal expansion   |  | x10 <sup>-6</sup> °C <sup>-1</sup>                 | 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                             | 40-15               | 17 - 104         | thermischer Ausdehnungskoeffizient               |                                      |                                   |
| Thermal conductivity   |  | W m <sup>-1</sup> hr <sup>-1</sup> m <sup>-2</sup> | 113   | 109                           | 105                           | 112                        | 112              | 105      | 116                          | 125                          | 109                                  | 96             | 51 - 72,7                      | 30-100                  | 115                          | 52                                   | 0,13-0,19   | 0,24             | n/a              | n/a                      | < 1                                  | < 1                 | 0,13-0,3         | 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              | n/a              | n/a                      | n/a                                  | n/a                 | n/a              | elektrische Leitfähigkeit                        |                                      |                                   |
| Electrical conductivity  |  | Sm mm <sup>-2</sup>                                | 15-16   | 15-16                         | 15-16                         | 15-16                      | 15-16            | 15-16    |                              |                              | 12-28                                | 12-28          | 6-10                           | 14-15                   | 14-15                        |                                      | n/a   | n/a              | n/a              | n/a                      | n/a                                  | n/a                 | n/a              | 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 <sup>15</sup>  | 10 <sup>12</sup> | 10 <sup>10</sup> | 10 <sup>11</sup>         | 10 <sup>12</sup>                     | 10 <sup>11</sup>    | 10 <sup>12</sup> | 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                      |                                      | -   | -                | -                | -                        | -                                    | -                   | -                | Erstarrungsintervall                             |                                      |                                   |
| Specific heat capacity   |  | J kg <sup>-1</sup> °C <sup>-1</sup>                | 419   | 419                           | 419                           | 435                        | 429              | 419      | 450                          | 525                          | 963                                  | 960            | 1020                           | 380                     | 380                          | 486                                  | 1960 - 2130   | 1600-2750        |                  |                          | 1200 - 2350                          | 1000-1200           | -                | -  | spezifische Wärme                    |                                   |
| Coefficient of friction  |  | -  | 0,07  | 0,08                          | 0,08                          | 0,11                       | 0,07             | 0,08     |                              |                              |                                      |                |                                |                         |                              |                                      | 0,45  | 0,28-0,46        |                  |                          | 0,28                                 | 0,38                | 0,21             | 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 metal. |                  |                  |                          |                                      |                     |                  |  | 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 <sup>4</sup>                            | 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                             | 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        | <0,30                          | <0,1                    | balance                      |                                      | 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<br>ZP0400<br>ZnAl4                    | Zamak 5<br>ZP0410<br>ZnAl4Cu1 | Zamak 2<br>ZP0430<br>ZnAl4Cu3 | ZA 8<br>ZP0810<br>ZnAl8Cu1 | Superloy<br>GDSL | KS       | ZA 12<br>ZP1110<br>ZnAl11Cu1 | ZA 27<br>ZP2720<br>ZnAl27Cu2 | LM 24<br>A380                        | LM 25<br>A384  |                                | ISO CuZn37              | ISO CuZn35Pb1<br>65/35 brass | AlSi1020<br>UNS G10200<br>DIN 1.0402 |   | PA 66<br>MHR     | PA66/PA6<br>MHR  | PA6T/6I<br>MH            | PA 66<br>MHR                         | PA6T/6I<br>MH       | PA 66<br>MHR     | Andere Bezeichnungen                             |                                      |                                   |