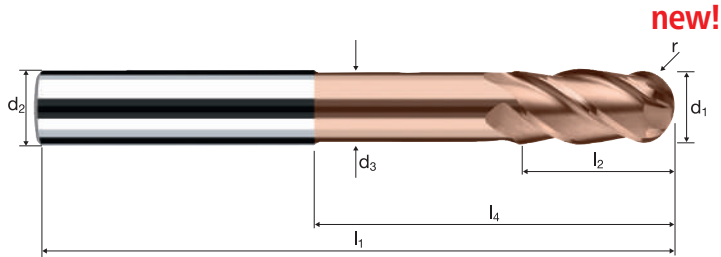


Ball nose end mills SpheroX

Tolerance $r \pm 0.005$, 4.5xd



| | |
|----------|------------------------------|
| HM XA | λ 40° γ 0° |
| | |
| Vario | |
| | |

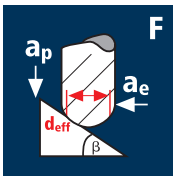


| | | | | | | | |
|--|-----------------|-----------------|--------------|--------------|-------------|----------------|-----|
| | Rm 1100-1300 | Rm 1300-1500 | HRC 48-56 | HRC 56-60 | HRC > 60 | Ti Titanium | HSS |
|--|-----------------|-----------------|--------------|--------------|-------------|----------------|-----|

| Ø Code | d ₁ | d ₂ h4 | d ₃ | l ₁ | l ₂ | l ₃ | l ₄ | r ±0.005 | α | z | DURO-Si | |
|-----------------------|---------------------|----------------------|---------------------------|----------------|----------------------|----------------|----------------|-------------|-------|---|---------|--|
| | | | | | | | | | | | H7492 | |
| Example: Order-N°. | Coating H | | Article-N° 7492 | | ø-Code 100 | | | | | | | |
| 100 | 1.00 | 6.00 | 0.95 | 61 | 2.00 | 4.50 | 14.58 | 0.500 | 10.0° | 4 | ● | |
| 140 | 2.00 | 6.00 | 1.90 | 61 | 4.00 | 9.00 | 17.31 | 1.000 | 6.8° | 4 | ● | |
| 180 | 3.00 | 6.00 | 2.80 | 61 | 6.00 | 13.50 | 20.13 | 1.500 | 4.5° | 4 | ● | |
| 220 | 4.00 | 6.00 | 3.70 | 66 | 8.00 | 18.00 | 22.95 | 2.000 | 2.7° | 4 | ● | |
| 260 | 5.00 | 6.00 | 4.60 | 66 | 10.00 | 22.50 | 25.77 | 2.500 | 1.4° | 4 | ● | |
| 300 | 6.00 | 6.00 | 5.50 | 69 | 12.00 | 30.34 | 31.00 | 3.000 | 0.0° | 4 | ● | |
| 391 | 8.00 | 8.00 | 7.40 | 80 | 16.00 | 39.29 | 40.00 | 4.000 | 0.0° | 4 | ● | |
| 450 | 10.00 | 10.00 | 9.20 | 90 | 20.00 | 47.20 | 48.00 | 5.000 | 0.0° | 4 | ● | |
| 501 | 12.00 | 12.00 | 11.00 | 105 | 24.00 | 54.13 | 55.00 | 6.000 | 0.0° | 4 | ● | |
| 610 | 16.00 | 16.00 | 15.00 | 125 | 32.00 | 74.13 | 75.00 | 8.000 | 0.0° | 4 | ● | |

Application

Material



Hardened tool steel
52 - 56 HRC



| d1 [mm] | z | v _c [m/min] | f _s [mm] | a _p [mm] | a _s [mm] | d _{eff} [mm] | n [min ⁻¹] | v _c [mm/min] | β [°] |
|---------|---|------------------------|---------------------|---------------------|---------------------|-----------------------|------------------------|-------------------------|-------|
| 1.00 | 4 | 120 | 0.014 | 0.030 | 0.090 | 0.91 | 41975 | 2350 | 45° |
| 2.00 | 4 | 140 | 0.022 | 0.030 | 0.120 | 1.72 | 25910 | 2280 | 45° |
| 3.00 | 4 | 180 | 0.034 | 0.050 | 0.150 | 2.59 | 22120 | 3010 | 45° |
| 4.00 | 4 | 180 | 0.042 | 0.050 | 0.180 | 3.39 | 16900 | 2840 | 45° |
| 5.00 | 4 | 180 | 0.048 | 0.050 | 0.210 | 4.17 | 13740 | 2640 | 45° |
| 6.00 | 4 | 180 | 0.052 | 0.050 | 0.230 | 4.94 | 11600 | 2410 | 45° |
| 8.00 | 4 | 180 | 0.056 | 0.080 | 0.280 | 6.67 | 8590 | 1925 | 45° |
| 10.00 | 4 | 180 | 0.060 | 0.080 | 0.310 | 8.22 | 6970 | 1675 | 45° |
| 12.00 | 4 | 180 | 0.066 | 0.100 | 0.340 | 9.89 | 5795 | 1530 | 45° |

Hardened tool steel
56 - 60 HRC



| | | | | | | | | | |
|-------|---|-----|-------|-------|-------|------|-------|------|-----|
| 1.00 | 4 | 110 | 0.014 | 0.030 | 0.090 | 0.91 | 38475 | 2155 | 45° |
| 2.00 | 4 | 110 | 0.022 | 0.030 | 0.120 | 1.72 | 20355 | 1790 | 45° |
| 3.00 | 4 | 140 | 0.034 | 0.050 | 0.150 | 2.59 | 17205 | 2340 | 45° |
| 4.00 | 4 | 140 | 0.042 | 0.050 | 0.180 | 3.39 | 13145 | 2210 | 45° |
| 5.00 | 4 | 140 | 0.048 | 0.050 | 0.210 | 4.17 | 10685 | 2050 | 45° |
| 6.00 | 4 | 140 | 0.052 | 0.050 | 0.230 | 4.94 | 9020 | 1875 | 45° |
| 8.00 | 4 | 140 | 0.056 | 0.080 | 0.280 | 6.67 | 6680 | 1495 | 45° |
| 10.00 | 4 | 140 | 0.060 | 0.080 | 0.310 | 8.22 | 5420 | 1300 | 45° |
| 12.00 | 4 | 140 | 0.066 | 0.100 | 0.340 | 9.89 | 4505 | 1190 | 45° |

Hardened tool steel
> 60 HRC

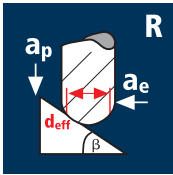


| | | | | | | | | | |
|-------|---|----|-------|-------|-------|------|-------|------|-----|
| 1.00 | 4 | 70 | 0.014 | 0.030 | 0.090 | 0.91 | 24485 | 1370 | 45° |
| 2.00 | 4 | 70 | 0.022 | 0.030 | 0.120 | 1.72 | 12955 | 1140 | 45° |
| 3.00 | 4 | 90 | 0.034 | 0.050 | 0.150 | 2.59 | 11060 | 1505 | 45° |
| 4.00 | 4 | 90 | 0.042 | 0.050 | 0.180 | 3.39 | 8450 | 1420 | 45° |
| 5.00 | 4 | 90 | 0.048 | 0.050 | 0.210 | 4.17 | 6870 | 1320 | 45° |
| 6.00 | 4 | 90 | 0.052 | 0.050 | 0.230 | 4.94 | 5800 | 1205 | 45° |
| 8.00 | 4 | 90 | 0.056 | 0.080 | 0.280 | 6.67 | 4295 | 960 | 45° |
| 10.00 | 4 | 90 | 0.060 | 0.080 | 0.310 | 8.22 | 3485 | 835 | 45° |
| 12.00 | 4 | 90 | 0.066 | 0.100 | 0.340 | 9.89 | 2895 | 765 | 45° |

High speed steel,
hardened
64 - 70 HRC



| | | | | | | | | | |
|-------|---|----|-------|-------|-------|------|-------|-----|-----|
| 1.00 | 4 | 40 | 0.014 | 0.030 | 0.090 | 0.91 | 13990 | 785 | 45° |
| 2.00 | 4 | 40 | 0.022 | 0.030 | 0.120 | 1.72 | 7405 | 650 | 45° |
| 3.00 | 4 | 50 | 0.034 | 0.050 | 0.150 | 2.59 | 6145 | 835 | 45° |
| 4.00 | 4 | 50 | 0.042 | 0.050 | 0.180 | 3.39 | 4695 | 790 | 45° |
| 5.00 | 4 | 50 | 0.048 | 0.050 | 0.210 | 4.17 | 3815 | 735 | 45° |
| 6.00 | 4 | 50 | 0.052 | 0.050 | 0.230 | 4.94 | 3220 | 670 | 45° |
| 8.00 | 4 | 50 | 0.056 | 0.080 | 0.280 | 6.67 | 2385 | 535 | 45° |
| 10.00 | 4 | 50 | 0.060 | 0.080 | 0.310 | 8.22 | 1935 | 465 | 45° |
| 12.00 | 4 | 50 | 0.066 | 0.100 | 0.340 | 9.89 | 1610 | 425 | 45° |



Hardened tool steel
52 - 56 HRC



| | | | | | | | | | |
|-------|---|-----|-------|-------|-------|-------|-------|------|-----|
| 1.00 | 4 | 104 | 0.023 | 0.180 | 0.180 | 0.99 | 33440 | 3075 | 30° |
| 2.00 | 4 | 104 | 0.039 | 0.280 | 0.280 | 1.92 | 17240 | 2690 | 30° |
| 3.00 | 4 | 104 | 0.049 | 0.360 | 0.360 | 2.83 | 11700 | 2295 | 30° |
| 4.00 | 4 | 104 | 0.058 | 0.480 | 0.480 | 3.77 | 8780 | 2035 | 30° |
| 5.00 | 4 | 104 | 0.065 | 0.600 | 0.600 | 4.71 | 7030 | 1825 | 30° |
| 6.00 | 4 | 104 | 0.070 | 0.720 | 0.720 | 5.66 | 5850 | 1640 | 30° |
| 8.00 | 4 | 104 | 0.086 | 0.960 | 0.960 | 7.54 | 4390 | 1510 | 30° |
| 10.00 | 4 | 104 | 0.098 | 1.200 | 1.200 | 9.43 | 3510 | 1375 | 30° |
| 12.00 | 4 | 104 | 0.101 | 1.440 | 1.440 | 11.31 | 2925 | 1185 | 30° |

Hardened tool steel
56 - 60 HRC



| | | | | | | | | | |
|-------|---|----|-------|-------|-------|-------|-------|------|-----|
| 1.00 | 4 | 64 | 0.014 | 0.160 | 0.160 | 0.97 | 21000 | 1175 | 30° |
| 2.00 | 4 | 64 | 0.023 | 0.250 | 0.250 | 1.90 | 10720 | 985 | 30° |
| 3.00 | 4 | 64 | 0.029 | 0.320 | 0.320 | 2.78 | 7330 | 850 | 30° |
| 4.00 | 4 | 64 | 0.035 | 0.430 | 0.430 | 3.72 | 5475 | 765 | 30° |
| 5.00 | 4 | 64 | 0.039 | 0.540 | 0.540 | 4.65 | 4380 | 685 | 30° |
| 6.00 | 4 | 64 | 0.042 | 0.650 | 0.650 | 5.58 | 3650 | 615 | 30° |
| 8.00 | 4 | 64 | 0.051 | 0.860 | 0.860 | 7.43 | 2740 | 560 | 30° |
| 10.00 | 4 | 64 | 0.058 | 1.080 | 1.080 | 9.30 | 2190 | 510 | 30° |
| 12.00 | 4 | 64 | 0.061 | 1.300 | 1.300 | 11.16 | 1825 | 445 | 30° |

Hardened tool steel
> 60 HRC



| | | | | | | | | | |
|-------|---|----|-------|-------|-------|-------|-------|-----|-----|
| 1.00 | 4 | 48 | 0.011 | 0.130 | 0.130 | 0.95 | 16085 | 710 | 30° |
| 2.00 | 4 | 48 | 0.019 | 0.200 | 0.200 | 1.84 | 8305 | 630 | 30° |
| 3.00 | 4 | 48 | 0.023 | 0.250 | 0.250 | 2.69 | 5680 | 525 | 30° |
| 4.00 | 4 | 48 | 0.028 | 0.340 | 0.340 | 3.59 | 4255 | 475 | 30° |
| 5.00 | 4 | 48 | 0.031 | 0.420 | 0.420 | 4.48 | 3410 | 425 | 30° |
| 6.00 | 4 | 48 | 0.034 | 0.500 | 0.500 | 5.37 | 2845 | 385 | 30° |
| 8.00 | 4 | 48 | 0.041 | 0.670 | 0.670 | 7.17 | 2130 | 350 | 30° |
| 10.00 | 4 | 48 | 0.047 | 0.840 | 0.840 | 8.96 | 1705 | 320 | 30° |
| 12.00 | 4 | 48 | 0.049 | 1.010 | 1.010 | 10.76 | 1420 | 280 | 30° |

High speed steel,
hardened
64 - 70 HRC



| | | | | | | | | | |
|-------|---|----|-------|-------|-------|-------|------|-----|-----|
| 1.00 | 4 | 24 | 0.007 | 0.130 | 0.130 | 0.95 | 8040 | 225 | 30° |
| 2.00 | 4 | 24 | 0.012 | 0.200 | 0.200 | 1.84 | 4150 | 200 | 30° |
| 3.00 | 4 | 24 | 0.015 | 0.250 | 0.250 | 2.69 | 2840 | 170 | 30° |
| 4.00 | 4 | 24 | 0.018 | 0.340 | 0.340 | 3.59 | 2130 | 155 | 30° |
| 5.00 | 4 | 24 | 0.020 | 0.420 | 0.420 | 4.48 | 1705 | 135 | 30° |
| 6.00 | 4 | 24 | 0.022 | 0.500 | 0.500 | 5.37 | 1425 | 125 | 30° |
| 8.00 | 4 | 24 | 0.026 | 0.670 | 0.670 | 7.17 | 1065 | 110 | 30° |
| 10.00 | 4 | 24 | 0.030 | 0.840 | 0.840 | 8.96 | 855 | 100 | 30° |
| 12.00 | 4 | 24 | 0.031 | 1.010 | 1.010 | 10.76 | 710 | 90 | 30° |