


| | |
|--|--|
|  <p>Steel</p> | <p>Steel unalloyed (Group 1 - 5) Steel low alloyed (Group 6 - 9) Steel high alloyed (Group 10 und 11) Ferritic (Group 12) Martensitic (Group 13)</p> |
|  <p>Stainless</p> | <p>Austenitic (Group 14.1) PH (Group 14.2) Duplex (Group 14.3) heat res. cast steel Ni>20% (Group 14.4)</p> |
|  <p>Cast iron</p> | <p>Grey cast iron (Group 15 und 16) Spheroidal graphite (Group 17 und 18)</p> |
|  <p>Non ferrous materials</p> | <p>Aluminum alloys (Group 21 – 22) Cast Aluminum (Group 23 – 25) Copper alloys (Group 26 – 28) Non ferrous(Group 29 – 30)</p> |
|  <p>Heat resistant alloys and Titanium alloys</p> | <p>Group(33 – 35) Group(36 – 37)</p> |
|  <p>Hardened materials</p> | <p>44 – 48 HRC Up to 57 HRC Up to 62 HRC</p> |



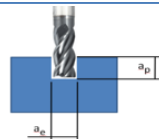
Steel

| Tool Type | roughing | semi-finishing | finishing | trochoidal HSC | Characteristics | Benefits |
|---------------------|----------|----------------|-----------|----------------|--|--|
| ECI-E4L | ① | ① | ③ | ③ | unequal pitch, Z=4, stable cutting edge, with honing | Smooth running, large flute space, Full slot, up to 2xD |
| ECI-E5L | ② | ① | ② | ② | unequal pitch, Z=5, stable cutting edge, with honing | Smooth running, Trimming with full cutting length |
| ECRI-B | ① | / | / | ④ | Roughing profile, Z=3-4, Cutting length 1-2xD | Reduce cutting forces, full slot up to 2xD, use on weak workpiece, |
| EFISI-E44-CF | ① | ① | ② | ④ | unequal pitch, bigger flute space, Cutting edge similar Finished EFISI-B44 | Troubleshooter on weak workpiece fixture, or thin walls |
| ECI-E/H7-CF | / | ④ | ① | ① | Z=7, Submicron IC902 unequal pitch, unequal helix | perfect also for hard machining up to 62 HRC, 1. choice for HSC-operations |
| EFISI-B44 | ② | ① | ② | ④ | 2 roughing and 2 finishing cutting edges Smooth cut | Roughing and finishing in one cut, perfect for Semi-Finishing |
| EFISI-B44-C | ① | ① | ② | ④ | Similar to EFISI-B44 but with coolant holes into flutes | Better cooling in cutting zone while full slot Better chip evacuation |
| ECI-H4M-E | ② | ① | ② | ③ | unequal pitch, unequal helix, Z=4, | For general use, both stainless and steel materials |
| ECI-H4S-E | ① | ① | ② | ③ | Similar as ECI-H4M-E, but cutting length 1xD | short, very stable type, |
| ECPI-H7-CF | ① | ① | ② | ③ | Chatterfree, Z=7 for general use, for rough and semi-finish operations | Chip-splitters cut the chips to small segments, Prevents chipp jamming in the machine conveyor |

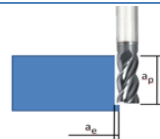
① = first choice, ② = second choice, aso.

„ / “ = not to be used

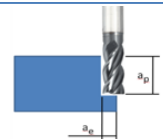
| | |
|--|-------|
| IC900/IC902 | IC608 |
| general steel machining | |
| IC300 | |
| wet machining, also difficult to cut materials | |



Roughing



Trochoidal / dyn. Milling



general machining

| | | | |
|----|---------------------|---------------------|---------------|
| ae | 40% up to full slot | 10% up to 20% | 20% up to 35% |
| ap | 1 x D | max. cutting length | 2 x D |

| ISO | Group | Cutting Speed Vc [sfm] | | | | | | | | | |
|-----|-------------------------|------------------------|-------|-------|-------------|-------|-------|-------|-------|-------|-----|
| | | IC900 | IC608 | IC300 | IC900/IC902 | IC608 | IC300 | IC900 | IC608 | IC300 | |
| P | unalloyed | 1 - 4 | 656 | 656 | 590 | 1181 | 1181 | 1066 | 853 | 853 | 771 |
| | 5 | 590 | 590 | 525 | 1066 | 1066 | 951 | 771 | 771 | 689 | |
| P | low alloyed | 6 - 7 | 459 | 459 | 459 | 853 | 853 | 787 | 623 | 623 | 574 |
| | 8 - 9 | 426 | 426 | 426 | 771 | 771 | 705 | 558 | 558 | 508 | |
| P | high alloyed, toolsteel | 10 | 361 | 361 | 361 | 656 | 656 | 590 | 492 | 492 | 426 |
| | 11 | 328 | 328 | 328 | 590 | 590 | 590 | 426 | 426 | 361 | |
| P | ferritic | 12 | 361 | 361 | 328 | 656 | 656 | 590 | 476 | 476 | 426 |
| | 13 | 230 | 230 | 197 | 410 | 410 | 361 | 344 | 344 | 262 | |

| ISO | Group | Feed per Tooth fz [in] | | | | | | | | | | | | | | | | | | |
|-----|-------------------------|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | Ø 1/4 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | Ø 1/4 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | Ø 1/4 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | |
| P | unalloyed | 1 - 4 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 | 0.0039 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 |
| | 5 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 | 0.0039 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | |
| P | low alloyed | 6 - 7 | 0.0011 | 0.0015 | 0.0019 | 0.0022 | 0.0029 | 0.0037 | 0.0017 | 0.0023 | 0.0029 | 0.0034 | 0.0046 | 0.0057 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 | 0.0045 |
| | 8 - 9 | 0.0011 | 0.0015 | 0.0019 | 0.0022 | 0.0029 | 0.0037 | 0.0017 | 0.0023 | 0.0029 | 0.0034 | 0.0046 | 0.0057 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 | 0.0045 | |
| P | high alloyed, toolsteel | 10 | 0.0010 | 0.0013 | 0.0016 | 0.0019 | 0.0026 | 0.0032 | 0.0016 | 0.0021 | 0.0026 | 0.0031 | 0.0042 | 0.0053 | 0.0012 | 0.0017 | 0.0020 | 0.0024 | 0.0033 | 0.0041 |
| | 11 | 0.0010 | 0.0013 | 0.0016 | 0.0019 | 0.0026 | 0.0032 | 0.0016 | 0.0021 | 0.0026 | 0.0031 | 0.0042 | 0.0053 | 0.0012 | 0.0017 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | |
| P | ferritic | 12 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 | 0.0035 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0057 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 |
| | 13 | 0.0010 | 0.0013 | 0.0017 | 0.0020 | 0.0026 | 0.0033 | 0.0016 | 0.0021 | 0.0026 | 0.0031 | 0.0042 | 0.0052 | 0.0012 | 0.0017 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | |

M Stainless Steel

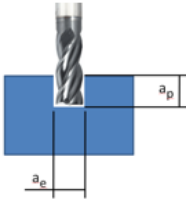
| Tool Type | roughing | semi-finishing | finishing | trochoidal HSC | Characteristics | Benefits |
|------------------------------|----------|----------------|-----------|----------------|--|--|
| ECI-H4M/S | ① | ① | ③ | ③ | unequal pitch/ helix, Z=4, sharp cutting edge, smooth cut | smooth running, large flute space, Full slot, up to 1.5xD |
| ECI-H5 | ② | ① | ② | ② | unequal pitch/ helix, Z=5, stable cutting edge, smooth cut | smooth running, trimming with full depth of cut |
| ECPI-E3L ECPI-E4L | ① | ② | / | ③ | chip splitter, Z=3 and Z=4, sharp cutting edge | reduce cutting forces, large flute space, also for weak workpieces |
| ECI-H7-CF | / | ④ | ① | ① | Z=7, Submicron IC902 unequal pitch, unequal helix | perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7 |
| EFSI-B44 | ② | ① | ② | ④ | 2 roughing and 2 finishing cutting edges Smooth cut | Roughing and finishing in one cut, perfect for Semi-Finishing |
| EFSI-B44-C | ① | ① | ② | ④ | Similar to EFSI-B44 but with coolant holes into flutes | Better cooling in cutting zone while full slot Better chip evacuation |
| EFSI-E44-CF | ① | ① | ② | ④ | unequal pitch, bigger flute space, Cutting edge similar Finished EFSI-B44 | Troubleshooter on weak workpiece fixture, or thin walls |
| ECKI-H4R-CFR (C) | ① | ① | ② | ③ | Different cutting edge geometry, Z=4 stable cutting edge, C = coolant into flute space | 1. Choice for machining Titanium, coolant into cutting zone and better chip evacuation |
| ECYI-S5-CFR | ① | ① | ② | ③ | Z=5, Sub-flute with variable helix for stable machining | Dedicated gemetry for stianless steel and PH |

① = first choice, ②= second choice, aso.

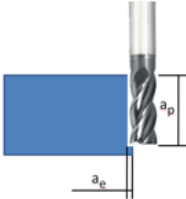
„ / “ = not to be used

IC900
general steel machining

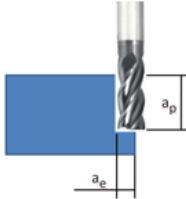
IC300
wet machining, also difficult to cut materials



Roughing



Trochoidal / dyn. Milling



general machining

| | | | |
|----|---------------------|---------------------|---------------|
| ae | 40% up to full slot | 10% up to 20% | 20% up to 35% |
| ap | 1 x D | max. cutting length | 2 x D |

| Gruppe | IC900 | IC300 | IC900 | IC902 / IC903 | IC300 | IC900 | IC902 / IC903 | IC300 | | |
|-------------------------------|-----------------------------|-------|-------|---------------|-------|-------|---------------|-------|-----|-----|
| Cutting Speed Vc [sfm] | | | | | | | | | | |
| ISO | | | | | | | | | | |
| M | austenitic | 14.1 | 262 | 262 | 492 | 623 | 492 | 361 | 426 | 361 |
| | PH | 14.2 | 230 | 230 | 394 | 525 | 394 | 295 | 344 | 295 |
| | Duplex | 14.3 | 197 | 164 | 328 | 394 | 279 | 213 | 230 | 180 |
| | heat res. cast steel Ni>20% | 14.4 | 246 | 246 | 426 | 558 | 426 | 295 | 361 | 295 |

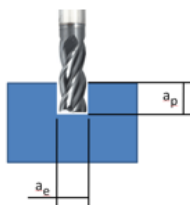
| Feed per Tooth fz [in] | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Ø 1/2 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | Ø 1/2 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | | | | | | | | |
| M | austenitic | 14.1 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0026 | 0.0032 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0039 | 0.0049 | 0.0012 | 0.0016 | 0.0020 | 0.0026 | 0.0035 | 0.0047 |
| | PH | 14.2 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0026 | 0.0032 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0039 | 0.0049 | 0.0012 | 0.0016 | 0.0020 | 0.0026 | 0.0033 | 0.0047 |
| | Duplex | 14.3 | 0.0008 | 0.0011 | 0.0015 | 0.0017 | 0.0024 | 0.0030 | 0.0014 | 0.0019 | 0.0024 | 0.0029 | 0.0037 | 0.0040 | 0.0010 | 0.0014 | 0.0019 | 0.0022 | 0.0030 | 0.0037 |
| | heat res. cast steel Ni>20% | 14.4 | 0.0009 | 0.0012 | 0.0014 | 0.0017 | 0.0026 | 0.0031 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0039 | 0.0049 | 0.0011 | 0.0015 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |

N Non ferrous materials

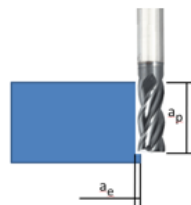
| Tool Type | roughing | Semi-finishing | finishing | Trochoidal HSC | Characteristics | Benefits |
|-------------------|----------|----------------|-----------|----------------|--|---|
| ECAI-H3-CF | ① | ② | ② | ② | unequal pitch/ helix, Z=3, assorted corner radii | smooth running, roughing and finishing, full slot up to 1,5xD |
| ECAI-H4-CF | ② | ① | ① | ① | Dynamically balanced, Z = 4 Depth of cut up to 2xD | Perfect for trimming with large ae Full slot up to 1xD |
| EPXI (CFK) | ① | ② | ③ | ③ | Left/right helix, Compression cutter | Roughing and finishing, avoid delamination |
| EPNI (CFK) | ③ | ① | ① | ③ | Boring and milling (Type D) trimming and circular milling (Type C) Trimming (Type F) | Roughing and finishing, |

① = first choice, ② = second choice, aso.

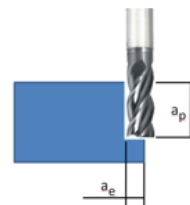
„ / “ = not to be used



roughing and finishing



Trochoidal / dyn. milling



general machining

| | | | |
|----|---------------------|---------------------|---------------|
| ae | 40% up to full slot | 10% up to 20% | 20% up to 35% |
| ap | 1 x D | max. cutting length | 2 x D |

| Group | IC08 | IC08 coated | IC02 | IC2018 | IC08 | IC08 coated | IC02 | IC2018 | IC08 | IC08 coated | IC02 | IC2018 |
|-------------------------------|------|-------------|------|--------|------|-------------|------|--------|------|-------------|------|--------|
| Cutting Speed Vc [sfm] | | | | | | | | | | | | |
| Al-forging alloy 21-22 | 1312 | - | - | - | 2362 | - | - | - | 1706 | - | - | - |
| cast-Al (Si>10%) 23-25 | 590 | 820 | - | - | 1063 | 1476 | - | - | 768 | 1066 | - | - |
| 26-27 | 984 | - | - | - | 1771 | - | - | - | 1279 | - | - | - |
| copper alloys | | | | | | | | | | | | |
| 28 E-CuZn | 492 | - | - | - | 886 | - | - | - | 640 | - | - | - |
| non ferrous 29-30 | - | - | 492 | 656 | - | - | 886 | 1181 | - | - | 640 | 853 |

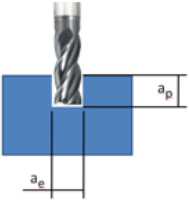
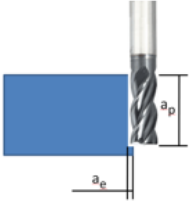
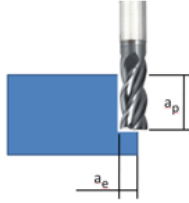
| Feed per Tooth fz [in] | | | | | | | | | | | | |
|-------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Ø 1/4 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | Ø 1/4 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 |
| Al-forging alloy 21-22 | 0.0017 | 0.0022 | 0.0028 | 0.0033 | 0.0044 | 0.0055 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 | 0.0088 |
| cast-Al (Si>10%) 23-25 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 | 0.0045 | 0.0022 | 0.0029 | 0.0037 | 0.0044 | 0.0058 | 0.0073 |
| 26-27 | 0.0018 | 0.0024 | 0.0030 | 0.0035 | 0.0047 | 0.0059 | 0.0028 | 0.0038 | 0.0047 | 0.0057 | 0.0076 | 0.0094 |
| copper alloys | | | | | | | | | | | | |
| 28 E-CuZn | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 | 0.0045 | 0.0022 | 0.0029 | 0.0037 | 0.0044 | 0.0058 | 0.0073 |
| non ferrous 29-30 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | - | - | 0.0013 | 0.0017 | 0.0021 | 0.0025 | - | - |

S

Superalloys and Ti-alloys

| Tool Type | roughing | Semi-finishing | finishing | Trochoidal HSC | Characteristics | Benefits |
|----------------------------------|----------|----------------|-----------|---------------------------|---|--|
| ECI-H4M ECI-H4S | ① | ① | ③ | ③ | unequal pitch/ helix, Z=4, Sharp cutting edge, smooth cut | Smooth running, large flute space, Full slot up to 1,5xD |
| ECI-H5R-CFR | ② | ① | ② | ② | unequal pitch/ helix, Z=5, Stable cutting edge, smooth cut | Smooth running, Trimming with full depth of cut |
| ECKI-H4M-CFR (C) | ① | ① | ② | ③ | Different cutting edge geometry, Z=4 Stable cutting edge, C = coolant into flute space | 1. Choice for Ti machining, C = coolant into cutting zone and better chip evacuation |
| ECI-H7-CF | / | ④ | ① | ① | unequal pitch/ helix, Z=7, Submicron IC902 | perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7 |
| ECHI-B-6 | / | ② | ② | ① | Z = 6, smooth cut | Smooth running, Finishing and Semi-Finish |
| ECI-H Multiflute | / | / | ① | ③ Take care of Dynamic | per every mm diameter one cutting edge, unequal pitch/ helix, smooth cut, Max. ae = 6% of tool diameter | Perfect for finishing, hard machining with IC902 Smooth running, long tool life due to high number of teeth |

① = first choice ② = second choice, aso. „ / “ = not to be used

| | | | | | | | | | | | | | | | | | | | |
|---------------|------------------------|---|---|---|---------------|--------|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| IC900 | general machining |  |  |  | | | | | | | | | | | | | | | |
| IC902 / IC903 | trimming | | | | | | | | | | | | | | | | | | |
| | | Roughing | Trochoidal / dyn. Milling | general machining | | | | | | | | | | | | | | | |
| | | ae 40% up to full slot | ae 10% up to 20% | ae 20% up to 35% | | | | | | | | | | | | | | | |
| | | ap 1 x D | ap max. cutting length | ap 2 x D | | | | | | | | | | | | | | | |
| ISO | Group | IC900 | IC902 / IC903 | IC900 | IC902 / IC903 | IC900 | IC902 / IC903 | | | | | | | | | | | | |
| S | | Cutting Speed Vc [sfm] | | | | | | | | | | | | | | | | | |
| | Ni-Base alloys 33-35 | 89 | - | 161 | 207 | 115 | 151 | | | | | | | | | | | | |
| | Ti and Ti-alloys 36-37 | 148 | - | 266 | 328 | 194 | 236 | | | | | | | | | | | | |
| S | | Feed per Tooth fz [in] | | | | | | | | | | | | | | | | | |
| | Ni-Base alloys 33-35 | 0.0008 | 0.0011 | 0.0013 | 0.0016 | 0.0021 | 0.0027 | 0.0013 | 0.0017 | 0.0021 | 0.0025 | 0.0033 | 0.0041 | 0.0010 | 0.0013 | 0.0017 | 0.0020 | 0.0026 | 0.0033 |
| | Ti and Ti-alloys 36-37 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0026 | 0.0032 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0039 | 0.0049 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0032 | 0.0040 |

H

Hardened materials

| Tool Type | roughing | Semi-finishing | finishin | Trochoidal HSC | Characteristics | Benefits |
|-------------------------|----------|--------------------|----------|---------------------------|---|---|
| ECRI-B | ④ | / | / | ④ | Roughing profile, Z=4-6, Depth of cut von 1-2xD | reduce cutting force due to roughing profile, full slot up to 1,5xD , also for weak workpieces |
| ECI-H7-CF | / | ② max 15% ae | ① | ① | unequal pitch/ helix, Z=7, Submicron IC902 | perfect also for hard machining up to 62 HRC, 1. choice for HSC-machining, Long tool life due to Z=7 |
| ECHI-B-6 | / | ② max 15% ae | ② | ① | Z = 6, Smooth cut | Smooth running Finishing and Semi-Finish |
| ECI-H Multiflute | / | / | ① | ② Take care of Dynamic | per every mm diameter one cutting edge, unequal pitch/ helix, smooth cut, Max. ae = 6% of tool diameter | Perfect for finishing, hard machining with IC902 Smooth running, long tool life due to high number of teeth |

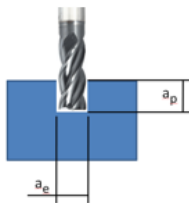
① = first choice, ② = second choice, aso.

„ / “ = not to be used

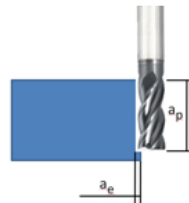
full slot operation in hardened material from 55 HRC is basically NOT recommended!

Please prefer roughing strategy "trochoid/dynamic"

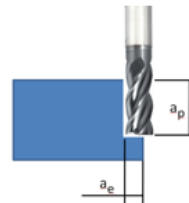
only DRY operation for hard machining



Roughing



Trochoidal / dyn. Milling



general machining

| ae | 40% up to full slot | 10% up to 20% | 20% up to 35% |
|----|---------------------|---------------------|---------------|
| ap | 1 x D | max. cutting length | 2 x D |

| Group | IC900 | IC902 / IC903 | IC702 | IC900 | IC902 / IC903 | IC702 | IC900 | IC902 / IC903 | IC702 | |
|-------------------------------|--------------|---------------|-------|-------|---------------|-------|-------|---------------|-------|-----|
| Cutting Speed Vc [sfm] | | | | | | | | | | |
| ISO | | | | | | | | | | |
| H | 44-48 HRC | 262 | 262 | 262 | 472 | 472 | 472 | 341 | 341 | 341 |
| | up to 57 HRC | - | 197 | 197 | - | 354 | 354 | - | 256 | 256 |
| | up to 62 HRC | - | - | 131 | - | 236 | 236 | - | 171 | 171 |

| Feed per Thoot fz [in] | | | | | | | | | | | | | | | | | | |
|-------------------------------|--------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | Ø 1/2 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | Ø 1/2 | Ø 5/16 | Ø 3/8 | Ø 1/2 | Ø 5/8 | Ø 3/4 | | | | |
| H | 44-48 HRC | 38-41 | 0.0010 | 0.0013 | 0.0017 | 0.0020 | 0.0026 | 0.0033 | 0.0016 | 0.0021 | 0.0026 | 0.0031 | 0.0042 | 0.0053 | | | | |
| | up to 57 HRC | | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0026 | 0.0013 | 0.0017 | 0.0021 | 0.0025 | 0.0033 | 0.0041 | | | | |
| | up to 62 HRC | | - | - | - | - | - | - | 0.0010 | 0.0013 | 0.0017 | 0.0020 | 0.0027 | 0.0033 | 0.0008 | 0.0011 | 0.0014 | 0.0016 |