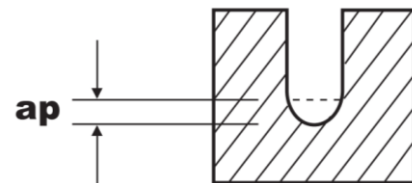
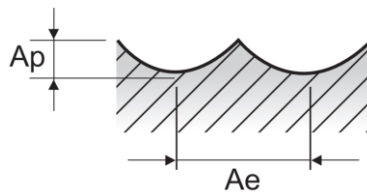
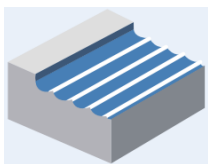


# Speeds and Feeds



End Mill Series - HTPM

| Material |          |                      | Recommended Cutting Values - 4 Flutes / Ball / Plane Cutting |                  |                |                    |       |       |       |       |       |       |       |       |       |       |     |     |
|----------|----------|----------------------|--|------------------|----------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|-----|
| Group    |          | Material Description | Width of Cut, ae   | Depth of Cut, ap | Parameter      | Tool Diameter (mm) |       |       |       |       |       |       |       |       |       |       |     |     |
| ISO      | VDI 3323 |                      |  |                  |                | 3                  | 4     | 5     | 6     | 8     | 10    | 12    | 16    | 18    | 20    | 25    |     |     |
| P        | 1        | Non-alloy steel      | 0.5D   | 1.0D             | Vc, m/min.     | 162                | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162 | 162 |
|          |          |                      |  |                  | fz, mm/tooth   | 0.025              | 0.027 | 0.030 | 0.040 | 0.060 | 0.065 | 0.070 | 0.075 | 0.080 | 0.090 | 0.099 |     |     |
|          |          |                      |  |                  | RPM, rev./min. | 17189              | 12892 | 10313 | 8594  | 6446  | 5157  | 4297  | 3223  | 2865  | 2578  | 2063  |     |     |
|          |          |                      |  |                  | FEED, mm/min   | 1719               | 1392  | 1238  | 1375  | 1547  | 1341  | 1203  | 967   | 917   | 928   | 817   |     |     |
|          | 2        |                      | 0.5D   | 1.0D             | Vc, m/min.     | 162                | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162 | 162 |
|          |          |                      |  |                  | fz, mm/tooth   | 0.025              | 0.027 | 0.030 | 0.040 | 0.060 | 0.065 | 0.070 | 0.075 | 0.080 | 0.090 | 0.099 |     |     |
|          |          |                      |  |                  | RPM, rev./min. | 17189              | 12892 | 10313 | 8594  | 6446  | 5157  | 4297  | 3223  | 2865  | 2578  | 2063  |     |     |
|          |          |                      |  |                  | FEED, mm/min   | 1719               | 1392  | 1238  | 1375  | 1547  | 1341  | 1203  | 967   | 917   | 928   | 817   |     |     |
|          | 3        |                      | 0.5D   | 1.0D             | Vc, m/min.     | 162                | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162 |     |
|          |          |                      |  |                  | fz, mm/tooth   | 0.025              | 0.027 | 0.030 | 0.040 | 0.060 | 0.065 | 0.070 | 0.075 | 0.080 | 0.090 | 0.099 |     |     |
|          |          |                      |  |                  | RPM, rev./min. | 17189              | 12892 | 10313 | 8594  | 6446  | 5157  | 4297  | 3223  | 2865  | 2578  | 2063  |     |     |
|          |          |                      |  |                  | FEED, mm/min   | 1719               | 1392  | 1238  | 1375  | 1547  | 1341  | 1203  | 967   | 917   | 928   | 817   |     |     |
|          | 4        |                      | 0.5D   | 1.0D             | Vc, m/min.     | 162                | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162 |     |
|          |          |                      |  |                  | fz, mm/tooth   | 0.025              | 0.027 | 0.030 | 0.040 | 0.060 | 0.065 | 0.070 | 0.075 | 0.080 | 0.090 | 0.099 |     |     |
|          |          |                      |  |                  | RPM, rev./min. | 17189              | 12892 | 10313 | 8594  | 6446  | 5157  | 4297  | 3223  | 2865  | 2578  | 2063  |     |     |
|          |          |                      |  |                  | FEED, mm/min   | 1719               | 1392  | 1238  | 1375  | 1547  | 1341  | 1203  | 967   | 917   | 928   | 817   |     |     |
|          | 5        |                      | 0.5D   | 1.0D             | Vc, m/min.     | 113                | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113 |     |
|          |          |                      |  |                  | fz, mm/tooth   | 0.025              | 0.027 | 0.030 | 0.040 | 0.060 | 0.065 | 0.070 | 0.074 | 0.079 | 0.090 | 0.099 |     |     |
|          |          |                      |  |                  | RPM, rev./min. | 11990              | 8992  | 7194  | 5995  | 4496  | 3597  | 2997  | 2248  | 1998  | 1798  | 1439  |     |     |
|          |          |                      |  |                  | FEED, mm/min   | 1199               | 971   | 863   | 959   | 1079  | 935   | 839   | 665   | 631   | 647   | 570   |     |     |
| 6        | 0.5D     | 1.0D                 | Vc, m/min.   | 162              | 162            | 162                | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   |       |     |     |
|          |          |                      | fz, mm/tooth   | 0.025            | 0.027          | 0.030              | 0.040 | 0.060 | 0.065 | 0.070 | 0.075 | 0.080 | 0.090 | 0.099 |       |       |     |     |
|          |          |                      | RPM, rev./min.   | 17189            | 12892          | 10313              | 8594  | 6446  | 5157  | 4297  | 3223  | 2865  | 2578  | 2063  |       |       |     |     |
|          |          |                      | FEED, mm/min   | 1719             | 1392           | 1238               | 1375  | 1547  | 1341  | 1203  | 967   | 917   | 928   | 817   |       |       |     |     |
| 7        | 0.5D     | 1.0D                 | Vc, m/min.   | 162              | 162            | 162                | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   | 162   |       |     |     |
|          |          |                      | fz, mm/tooth   | 0.025            | 0.027          | 0.030              | 0.040 | 0.060 | 0.065 | 0.070 | 0.075 | 0.080 | 0.090 | 0.099 |       |       |     |     |
|          |          |                      | RPM, rev./min.   | 17189            | 12892          | 10313              | 8594  | 6446  | 5157  | 4297  | 3223  | 2865  | 2578  | 2063  |       |       |     |     |
|          |          |                      | FEED, mm/min   | 1719             | 1392           | 1238               | 1375  | 1547  | 1341  | 1203  | 967   | 917   | 928   | 817   |       |       |     |     |
| 8        | 0.5D     | 1.0D                 | Vc, m/min.   | 113              | 113            | 113                | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   |       |     |     |
|          |          |                      | fz, mm/tooth   | 0.025            | 0.027          | 0.030              | 0.040 | 0.060 | 0.065 | 0.070 | 0.074 | 0.079 | 0.090 | 0.099 |       |       |     |     |
|          |          |                      | RPM, rev./min.   | 11990            | 8992           | 7194               | 5995  | 4496  | 3597  | 2997  | 2248  | 1998  | 1798  | 1439  |       |       |     |     |
|          |          |                      | FEED, mm/min   | 1199             | 971            | 863                | 959   | 1079  | 935   | 839   | 665   | 631   | 647   | 570   |       |       |     |     |
| 9        | 0.5D     | 1.0D                 | Vc, m/min.   | 113              | 113            | 113                | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   | 113   |       |     |     |
|          |          |                      | fz, mm/tooth   | 0.025            | 0.027          | 0.030              | 0.040 | 0.060 | 0.065 | 0.070 | 0.074 | 0.079 | 0.090 | 0.099 |       |       |     |     |
|          |          |                      | RPM, rev./min.   | 11990            | 8992           | 7194               | 5995  | 4496  | 3597  | 2997  | 2248  | 1998  | 1798  | 1439  |       |       |     |     |
|          |          |                      | FEED, mm/min   | 1199             | 971            | 863                | 959   | 1079  | 935   | 839   | 665   | 631   | 647   | 570   |       |       |     |     |
| 10       | 0.5D     | 1.0D                 | Vc, m/min.   | 68               | 68             | 68                 | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    |       |     |     |
|          |          |                      | fz, mm/tooth   | 0.017            | 0.019          | 0.021              | 0.028 | 0.042 | 0.045 | 0.049 | 0.052 | 0.056 | 0.063 | 0.070 |       |       |     |     |
|          |          |                      | RPM, rev./min.   | 7215             | 5411           | 4329               | 3608  | 2706  | 2165  | 1804  | 1353  | 1203  | 1082  | 866   |       |       |     |     |
|          |          |                      | FEED, mm/min   | 491              | 411            | 364                | 404   | 455   | 390   | 354   | 281   | 269   | 273   | 242   |       |       |     |     |
| 11.1     | 0.5D     | 1.0D                 | Vc, m/min.   | 68               | 68             | 68                 | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    |       |     |     |
|          |          |                      | fz, mm/tooth   | 0.017            | 0.019          | 0.021              | 0.028 | 0.042 | 0.045 | 0.049 | 0.052 | 0.056 | 0.063 | 0.070 |       |       |     |     |
|          |          |                      | RPM, rev./min.   | 7215             | 5411           | 4329               | 3608  | 2706  | 2165  | 1804  | 1353  | 1203  | 1082  | 866   |       |       |     |     |
|          |          |                      | FEED, mm/min   | 491              | 411            | 364                | 404   | 455   | 390   | 354   | 281   | 269   | 273   | 242   |       |       |     |     |

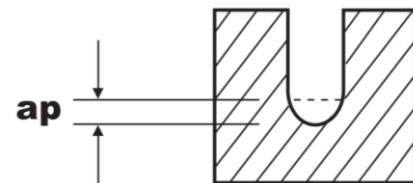
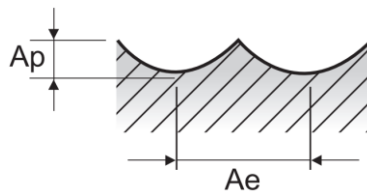
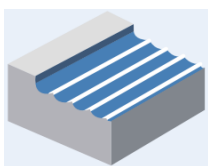


# Speeds and Feeds



End Mill Series - HTPM

| Material |          |                      | Recommended Cutting Values - 4 Flutes / Ball / Plane Cutting |                  |                |                    |       |       |       |       |       |       |       |       |       |       |    |
|----------|----------|----------------------|--|------------------|----------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| Group    |          | Material Description | Width of Cut, ae   | Depth of Cut, ap | Parameter      | Tool Diameter (mm) |       |       |       |       |       |       |       |       |       |       |    |
| ISO      | VDI 3323 |                      |  |                  |                | 3                  | 4     | 5     | 6     | 8     | 10    | 12    | 16    | 18    | 20    | 25    |    |
| M        | 12       | Stainless steel      | 0.5D   | 1.0D             | Vc, m/min.     | 77                 | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77 |
|          |          |                      |  |                  | fz, mm/tooth   | 0.015              | 0.015 | 0.025 | 0.030 | 0.040 | 0.045 | 0.050 | 0.054 | 0.059 | 0.058 | 0.059 |    |
|          |          |                      |  |                  | RPM, rev./min. | 8170               | 6127  | 4902  | 4085  | 3064  | 2451  | 2042  | 1532  | 1362  | 1225  | 980   |    |
|          |          |                      |  |                  | FEED, mm/min   | 490                | 368   | 490   | 490   | 490   | 441   | 408   | 331   | 321   | 284   | 231   |    |
|          | 13       |                      | 0.5D   | 1.0D             | Vc, m/min.     | 77                 | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77 |
|          |          |                      |  |                  | fz, mm/tooth   | 0.015              | 0.015 | 0.025 | 0.030 | 0.040 | 0.045 | 0.050 | 0.054 | 0.059 | 0.058 | 0.059 |    |
|          |          |                      |  |                  | RPM, rev./min. | 8170               | 6127  | 4902  | 4085  | 3064  | 2451  | 2042  | 1532  | 1362  | 1225  | 980   |    |
|          |          |                      |  |                  | FEED, mm/min   | 490                | 368   | 490   | 490   | 490   | 441   | 408   | 331   | 321   | 284   | 231   |    |
|          | 14.1     |                      | 0.5D   | 1.0D             | Vc, m/min.     | 85                 | 85    | 85    | 85    | 85    | 85    | 85    | 85    | 85    | 85    | 85    | 85 |
|          |          |                      |  |                  | fz, mm/tooth   | 0.020              | 0.020 | 0.025 | 0.041 | 0.045 | 0.050 | 0.055 | 0.060 | 0.064 | 0.065 | 0.068 |    |
|          |          |                      |  |                  | RPM, rev./min. | 9019               | 6764  | 5411  | 4509  | 3382  | 2706  | 2255  | 1691  | 1503  | 1353  | 1082  |    |
|          |          |                      |  |                  | FEED, mm/min   | 722                | 541   | 541   | 740   | 609   | 541   | 496   | 406   | 385   | 352   | 294   |    |
| 14.2     | 0.5D     | 1.0D                 | Vc, m/min.   | 77               | 77             | 77                 | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    | 77    |       |    |
|          |          |                      | fz, mm/tooth   | 0.020            | 0.020          | 0.025              | 0.041 | 0.045 | 0.050 | 0.055 | 0.060 | 0.064 | 0.065 | 0.068 |       |       |    |
|          |          |                      | RPM, rev./min.   | 8170             | 6127           | 4902               | 4085  | 3064  | 2451  | 2042  | 1532  | 1362  | 1225  | 980   |       |       |    |
|          |          |                      | FEED, mm/min   | 654              | 490            | 490                | 670   | 551   | 490   | 449   | 368   | 349   | 319   | 267   |       |       |    |
| K        | 15       | Grey cast iron       | 0.5D   | 1.0D             | Vc, m/min.     | 119                | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   |    |
|          |          |                      |  |                  | fz, mm/tooth   | 0.031              | 0.033 | 0.037 | 0.050 | 0.074 | 0.081 | 0.087 | 0.093 | 0.099 | 0.112 | 0.124 |    |
|          |          |                      |  |                  | RPM, rev./min. | 12626              | 9470  | 7576  | 6313  | 4735  | 3788  | 3157  | 2367  | 2104  | 1894  | 1515  |    |
|          |          |                      |  |                  | FEED, mm/min   | 1566               | 1250  | 1121  | 1263  | 1402  | 1227  | 1098  | 881   | 833   | 848   | 752   |    |
|          | 16       |                      | 0.5D   | 1.0D             | Vc, m/min.     | 119                | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   |    |
|          |          |                      |  |                  | fz, mm/tooth   | 0.031              | 0.033 | 0.037 | 0.050 | 0.074 | 0.081 | 0.087 | 0.093 | 0.099 | 0.112 | 0.124 |    |
|          |          |                      |  |                  | RPM, rev./min. | 12626              | 9470  | 7576  | 6313  | 4735  | 3788  | 3157  | 2367  | 2104  | 1894  | 1515  |    |
|          |          |                      |  |                  | FEED, mm/min   | 1566               | 1250  | 1121  | 1263  | 1402  | 1227  | 1098  | 881   | 833   | 848   | 752   |    |
|          | 17       |                      | 0.5D   | 1.0D             | Vc, m/min.     | 119                | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   |    |
|          |          |                      |  |                  | fz, mm/tooth   | 0.031              | 0.033 | 0.037 | 0.050 | 0.074 | 0.081 | 0.087 | 0.093 | 0.099 | 0.112 | 0.124 |    |
|          |          |                      |  |                  | RPM, rev./min. | 12626              | 9470  | 7576  | 6313  | 4735  | 3788  | 3157  | 2367  | 2104  | 1894  | 1515  |    |
|          |          |                      |  |                  | FEED, mm/min   | 1566               | 1250  | 1121  | 1263  | 1402  | 1227  | 1098  | 881   | 833   | 848   | 752   |    |
| 18       | 0.5D     | 1.0D                 | Vc, m/min.   | 119              | 119            | 119                | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   |       |       |    |
|          |          |                      | fz, mm/tooth   | 0.031            | 0.033          | 0.037              | 0.050 | 0.074 | 0.081 | 0.087 | 0.093 | 0.099 | 0.112 | 0.124 |       |       |    |
|          |          |                      | RPM, rev./min.   | 12626            | 9470           | 7576               | 6313  | 4735  | 3788  | 3157  | 2367  | 2104  | 1894  | 1515  |       |       |    |
|          |          |                      | FEED, mm/min   | 1566             | 1250           | 1121               | 1263  | 1402  | 1227  | 1098  | 881   | 833   | 848   | 752   |       |       |    |
| 19       | 0.5D     | 1.0D                 | Vc, m/min.   | 119              | 119            | 119                | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   |       |       |    |
|          |          |                      | fz, mm/tooth   | 0.031            | 0.033          | 0.037              | 0.050 | 0.074 | 0.081 | 0.087 | 0.093 | 0.099 | 0.112 | 0.124 |       |       |    |
|          |          |                      | RPM, rev./min.   | 12626            | 9470           | 7576               | 6313  | 4735  | 3788  | 3157  | 2367  | 2104  | 1894  | 1515  |       |       |    |
|          |          |                      | FEED, mm/min   | 1566             | 1250           | 1121               | 1263  | 1402  | 1227  | 1098  | 881   | 833   | 848   | 752   |       |       |    |
| 20       | 0.5D     | 1.0D                 | Vc, m/min.   | 119              | 119            | 119                | 119   | 119   | 119   | 119   | 119   | 119   | 119   | 119   |       |       |    |
|          |          |                      | fz, mm/tooth   | 0.031            | 0.033          | 0.037              | 0.050 | 0.074 | 0.081 | 0.087 | 0.093 | 0.099 | 0.112 | 0.124 |       |       |    |
|          |          |                      | RPM, rev./min.   | 12626            | 9470           | 7576               | 6313  | 4735  | 3788  | 3157  | 2367  | 2104  | 1894  | 1515  |       |       |    |
|          |          |                      | FEED, mm/min   | 1566             | 1250           | 1121               | 1263  | 1402  | 1227  | 1098  | 881   | 833   | 848   | 752   |       |       |    |

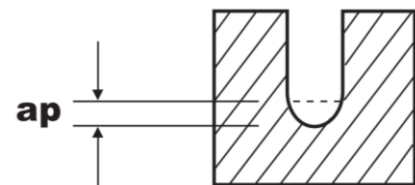
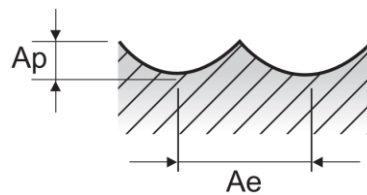
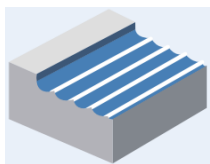


# Speeds and Feeds



End Mill Series - HTPM

| Material       |                | Recommended Cutting Values - 4 Flutes / Ball / Plane Cutting |                  |                  |                |                    |       |       |       |       |       |       |       |       |       |       |    |
|----------------|----------------|--|------------------|------------------|----------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| Group          |                | Material Description   | Width of Cut, ae | Depth of Cut, ap | Parameter      | Tool Diameter (mm) |       |       |       |       |       |       |       |       |       |       |    |
| ISO            | VDI 3323       |  |                  |                  |                | 3                  | 4     | 5     | 6     | 8     | 10    | 12    | 16    | 18    | 20    | 25    |    |
| S              | 31             | Heat Resistant Super Alloys                                  | 0.2D             | 0.3D             | Vc, m/min.     | 21                 | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21 |
|                |                |  |                  |                  | fz, mm/tooth   | 0.014              | 0.014 | 0.017 | 0.028 | 0.031 | 0.035 | 0.038 | 0.042 | 0.045 | 0.045 | 0.048 |    |
|                |                |  |                  |                  | RPM, rev./min. | 2228               | 1671  | 1337  | 1114  | 836   | 668   | 557   | 418   | 371   | 334   | 267   |    |
|                |                |  |                  |                  | FEED, mm/min   | 125                | 94    | 91    | 125   | 104   | 94    | 85    | 70    | 67    | 60    | 51    |    |
|                |                |  |                  |                  | Vc, m/min.     | 21                 | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21 |
|                |                |  |                  |                  | fz, mm/tooth   | 0.014              | 0.014 | 0.017 | 0.028 | 0.031 | 0.035 | 0.038 | 0.042 | 0.045 | 0.045 | 0.048 |    |
|                | RPM, rev./min. |  | 2228             | 1671             | 1337           | 1114               | 836   | 668   | 557   | 418   | 371   | 334   | 267   |       |       |       |    |
|                | FEED, mm/min   |  | 125              | 94               | 91             | 125                | 104   | 94    | 85    | 70    | 67    | 60    | 51    |       |       |       |    |
|                | Vc, m/min.     |  | 21               | 21               | 21             | 21                 | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    |       |       |    |
|                | fz, mm/tooth   |  | 0.014            | 0.014            | 0.017          | 0.028              | 0.031 | 0.035 | 0.038 | 0.042 | 0.045 | 0.045 | 0.048 |       |       |       |    |
|                | RPM, rev./min. |  | 2228             | 1671             | 1337           | 1114               | 836   | 668   | 557   | 418   | 371   | 334   | 267   |       |       |       |    |
|                | FEED, mm/min   |  | 125              | 94               | 91             | 125                | 104   | 94    | 85    | 70    | 67    | 60    | 51    |       |       |       |    |
|                | Vc, m/min.     |  | 21               | 21               | 21             | 21                 | 21    | 21    | 21    | 21    | 21    | 21    | 21    | 21    |       |       |    |
|                | fz, mm/tooth   |  | 0.014            | 0.014            | 0.017          | 0.028              | 0.031 | 0.035 | 0.038 | 0.042 | 0.045 | 0.045 | 0.048 |       |       |       |    |
| RPM, rev./min. | 2228           | 1671   | 1337             | 1114             | 836            | 668                | 557   | 418   | 371   | 334   | 267   |       |       |       |       |       |    |
| FEED, mm/min   | 125            | 94   | 91               | 125              | 104            | 94                 | 85    | 70    | 67    | 60    | 51    |       |       |       |       |       |    |
| Vc, m/min.     | 47             | 47   | 47               | 47               | 47             | 47                 | 47    | 47    | 47    | 47    | 47    | 47    |       |       |       |       |    |
| fz, mm/tooth   | 0.018          | 0.018  | 0.022            | 0.037            | 0.040          | 0.045              | 0.049 | 0.054 | 0.058 | 0.058 | 0.061 |       |       |       |       |       |    |
| RPM, rev./min. | 4987           | 3740   | 2992             | 2493             | 1870           | 1496               | 1247  | 935   | 831   | 748   | 598   |       |       |       |       |       |    |
| FEED, mm/min   | 359            | 269  | 263              | 369              | 299            | 269                | 244   | 202   | 193   | 174   | 146   |       |       |       |       |       |    |
| Vc, m/min.     | 47             | 47   | 47               | 47               | 47             | 47                 | 47    | 47    | 47    | 47    | 47    |       |       |       |       |       |    |
| fz, mm/tooth   | 0.018          | 0.018  | 0.022            | 0.037            | 0.040          | 0.045              | 0.049 | 0.054 | 0.058 | 0.058 | 0.061 |       |       |       |       |       |    |
| RPM, rev./min. | 4987           | 3740   | 2992             | 2493             | 1870           | 1496               | 1247  | 935   | 831   | 748   | 598   |       |       |       |       |       |    |
| FEED, mm/min   | 359            | 269  | 263              | 369              | 299            | 269                | 244   | 202   | 193   | 174   | 146   |       |       |       |       |       |    |



# Speeds and Feeds



**Feed Rate, Per Revolution (mm/min)**

$$v_f = f_n \cdot n$$

**Feed Rate, Per Tooth (mm/min)**

$$v_f = f_z \cdot n \cdot Z$$

**Feed Per Revolution (mm/rev)**

$$f_n = \frac{v_f}{n}$$

**Feed Per Tooth (mm)**

$$f_z = \frac{v_f}{n \cdot Z}$$

**Cutting Speed (m/min)**

$$v_c = \frac{\pi \cdot D_{tool} \cdot n}{1000}$$

**Spindle Speed (rev/min)**

$$n = \frac{v_c \cdot 1000}{\pi \cdot D_{tool}}$$

**Material Removal Rate (mm<sup>3</sup>/min)**

$$MMR = \frac{a_p \cdot a_e \cdot v_f}{1000}$$

## Metric

| Symbol     | Definition             | Unit                   |
|------------|------------------------|------------------------|
| $v_f$      | Feed rate              | mm/min                 |
| $f_n$      | Feed per revolution    | mm/rev                 |
| $f_z$      | Feed per tooth         | mm                     |
| $v_c$      | Cutting speed          | m/min (SMM)            |
| $n$        | Spindle speed          | rev/min (RPM)          |
| $D_{tool}$ | Tool cutting diameter  | mm                     |
| $MMR$      | Material removal rate  | (mm <sup>3</sup> /min) |
| $a_e$      | Radial depth of cut    | mm                     |
| $a_p$      | Axial depth of cut     | mm                     |
| $Z$        | Number of teeth/flutes |                        |

