

# FEEDS & SPEEDS CHART FOR DRILLS, REAMERS, MILLS & SAWS (CARBIDE TIPPED)

$$\text{RPM} = \text{SFPM} \times 3.82 / \text{CUTTER DIAM.}$$

$$\text{IPM} = \text{IPT} \times \text{RPM} \times \# \text{ TEETH}$$

Feeds & speeds are a starting recommendation only. Factors such as machine, fixture and tooling rigidity, horsepower available, coolant application and others will affect the performance significantly. Please read machine operators instructions and use all safety shields and glasses before performing these operations.  
(\*Half and full side mills & face mill cutters.) **Rev.030801**

| CLASS OF MATERIAL            | MATERIAL  | APPLICATION       |                        |                        | SPEED IN SFPM  |                    | FEED RATE (INCHES PER REVOLUTION) |      |      |      |      |      |      |      | HOLE DIAMETER IN INCHES |      |      |      |      |      |      |       |      |       |      |      |
|------------------------------|---|-------------------|------------------------|------------------------|----------------|--------------------|-----------------------------------|------|------|------|------|------|------|------|-------------------------|------|------|------|------|------|------|-------|------|-------|------|------|
|                              |   | BRINELL           | *MILLING<br>SFPM/IPT   | SAWS<br>SFPM/IPT       | HOLE<br>MAKING | GENERAL<br>PURPOSE | COOLANT<br>FED                    | 1/8  |      | 1/4  |      | 3/8  |      | 1/2  |                         | 5/8  |      | 3/4  |      | 1    |      | 1 1/4 |      | 1 1/2 |      |      |
|                              |   |                   |                        |                        |                | G.P.               | C.F.                              | G.P. | C.F. | G.P. | C.F. | G.P. | C.F. | G.P. | C.F.                    | G.P. | C.F. | G.P. | C.F. | G.P. | C.F. | G.P.  | C.F. | G.P.  | C.F. | G.P. |
| NON-FERROUS<br>(SOFT)        | ALUMINUM ALLOY - WROUGHT                              | 30-150<br>(500kg) | 3000-6000<br>.008-.020 | 2000-6000<br>.003-.006 | DRILL          | 250-350            | 375-550                           | .003 | -    | .005 | .004 | .007 | .005 | .008 | .006                    | .010 | .006 | .011 | .007 | .014 | .009 | .017  | -    | .019  | -    |      |
|                              |   |                   |                        |                        | REAM           | 150-250            | 200-300                           | .004 | -    | .006 | .008 | .008 | .010 | .013 | .012                    | .015 | .012 | .015 | .013 | .017 | .016 | .021  | .019 | .022  | .020 | .024 |
|                              | MAGNESIUM ALLOY                                       | 50-90             | 3000-5000<br>.006-.018 | 3000-5000<br>.003-.004 | DRILL          | 300-400            | 450-550                           | .003 | -    | .005 | .005 | .006 | .006 | .007 | .007                    | .008 | .008 | .009 | .009 | .013 | .013 | .015  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 130-190            | 150-250                           | .005 | -    | .010 | .012 | .012 | .015 | .015 | .018                    | .016 | .019 | .017 | .020 | .020 | .024 | .022  | .026 | .025  | .028 |      |
|                              | LEAD ALLOY  | 10-20             | 300-2700<br>.008-.012  | 300-2500<br>.003-.004  | DRILL          | 350-450            | 400-500                           | .003 | -    | .005 | .004 | .006 | .006 | .007 | .007                    | .008 | .008 | .009 | .009 | .013 | .013 | .015  | -    | .017  | -    |      |
|                              |   |                   |                        | REAM                   | 150-250        | 200-300            | .002                              | -    | .006 | .008 | .008 | .010 | .012 | .016 | .014                    | .017 | .015 | .018 | .018 | .022 | .021 | .024  | .022 | .026  |      |      |
|                              | NON-METAL AND PLASTIC                                 | -                 | 3500-6500<br>.008-.025 | 3000-6000<br>.003-.006 | DRILL          | 175-450            | -                                 | .002 | -    | .004 | -    | .005 | -    | .005 | -                       | .006 | -    | .008 | -    | .009 | -    | .010  | -    | .012  | -    |      |
|                              |   |                   |                        |                        | REAM           | 90-250             | 125-300                           | .004 | -    | .005 | .006 | .007 | .008 | .009 | .009                    | .010 | .012 | .014 | .014 | .016 | .016 | .018  | .018 | .020  |      |      |
|                              | ZINC ALLOY - DIE CAST                                 | 80-100            | 2500-6000<br>.008-.025 | 2500-6000<br>.003-.005 | DRILL          | 300-400            | 400-500                           | .003 | -    | .005 | .004 | .007 | .005 | .009 | .006                    | .011 | .008 | .012 | .009 | .014 | .010 | .016  | -    | .018  | -    |      |
|                              |   |                   |                        |                        | REAM           | 140-210            | 170-240                           | .005 | -    | .007 | .009 | .008 | .011 | .010 | .013                    | .011 | .014 | .012 | .016 | .015 | .020 | .018  | .022 | .020  | .025 |      |
| NON-FERROUS<br>(HARD)        | ALUMINUM BRONZE                                       | 40-175            | 300-2700<br>.008-.012  | 200-2500<br>.003-.004  | DRILL          | 125-190            | 200-300                           | .002 | -    | .005 | .004 | .007 | .005 | .008 | .006                    | .009 | .007 | .010 | .008 | .012 | .010 | .014  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 50-90              | 70-105                            | .004 | -    | .006 | .008 | .010 | .013 | .012 | .015                    | .014 | .016 | .016 | .018 | .018 | .021 | .020  | .024 | .022  | .028 |      |
|                              | BRASS ALLOY - LEADED AND<br>FREE CUTTING              | 10-100Rb          | 450-3000<br>.008-.012  | 500-3000<br>.003-.004  | DRILL          | 225-400            | 300-450                           | .003 | -    | .005 | .004 | .007 | .005 | .008 | .006                    | .009 | .007 | .010 | .008 | .012 | .010 | .014  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 100-250            | 125-300                           | .005 | -    | .008 | .010 | .011 | .014 | .015 | .020                    | .017 | .022 | .018 | .024 | .020 | .026 | .022  | .028 | .025  | .032 |      |
|                              | NICKEL SILVER   | 10-100Rb          | 350-1500<br>.006-.010  | 300-1200<br>.003-.004  | DRILL          | 125-190            | 225-300                           | .002 | -    | .005 | .004 | .007 | .005 | .008 | .006                    | .009 | .007 | .010 | .008 | .012 | .010 | .014  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 50-90              | 70-190                            | .004 | -    | .006 | .007 | .008 | .010 | .010 | .012                    | .011 | .013 | .012 | .014 | .014 | .017 | .015  | .018 | .016  | .018 |      |
|                              | COPPER ALLOY - TOUGH                                  | 40-200            | 300-1200<br>.006-.010  | 300-1000<br>.003-.004  | DRILL          | 125-190            | 225-300                           | .002 | -    | .005 | .004 | .007 | .005 | .008 | .006                    | .009 | .007 | .010 | .008 | .012 | .010 | .014  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 50-90              | 70-105                            | .005 | -    | .006 | .008 | .008 | .010 | .010 | .013                    | .011 | .014 | .012 | .016 | .014 | .018 | .016  | .019 | .017  | .020 |      |
| CAST IRON                    | DUCTILE CAST IRON -<br>AUSTENITIC                     | 120-275           | 275-1200<br>.008-.015  | 250-1100<br>.003-.004  | DRILL          | -                  | -                                 | -    | -    | -    | -    | -    | -    | -    | -                       | -    | -    | -    | -    | -    | -    | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 45-70              | 65-100                            | .004 | -    | .006 | .008 | .007 | .009 | .008 | .011                    | .010 | .014 | .013 | .016 | .015 | .018 | .018  | .020 | .020  | .025 |      |
|                              | DUCTILE CAST IRON - FERRITIC                          | 140-270           | 275-900<br>.006-.012   | 225-850<br>.003-.004   | DRILL          | 150-225            | 200-250                           | .002 | -    | .004 | .004 | .006 | .005 | .008 | .006                    | .010 | .007 | .012 | .008 | .014 | .010 | .016  | -    | .018  | -    |      |
|                              |   |                   |                        |                        | REAM           | 50-90              | 70-105                            | .004 | -    | .005 | .007 | .008 | .010 | .010 | .012                    | .012 | .015 | .014 | .017 | .017 | .022 | .020  | .024 | .023  | .027 |      |
|                              | DUCTILE CAST IRON -<br>MARTENSITIC                    | 270-400           | 225-600<br>.005-.010   | 175-450<br>.002-.004   | DRILL          | -                  | 200-250                           | -    | -    | -    | .004 | -    | .005 | -    | .006                    | -    | .007 | -    | .008 | -    | .010 | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 35-60              | 50-85                             | .004 | -    | .006 | .008 | .007 | .009 | .008 | .010                    | .009 | .011 | .010 | .013 | .012 | .014 | .014  | .017 | .016  | .019 |      |
|                              | GRAY - PEARLITIC                                      | 220-320           | 225-750<br>.004-.010   | 225-450<br>.003-.004   | DRILL          | 130-225            | 225-325                           | .002 | -    | .004 | .004 | .006 | .006 | .007 | .008                    | .009 | .010 | .010 | .012 | .013 | .015 | .016  | -    | .018  | -    |      |
|                              |   |                   |                        |                        | REAM           | 45-70              | 55-100                            | .004 | -    | .006 | .008 | .008 | .010 | .009 | .012                    | .010 | .014 | .012 | .015 | .014 | .018 | .018  | .020 | .020  | .026 |      |
|                              | GRAY - FERRITIC                                       | 110-240           | 250-750<br>.005-.012   | 200-600<br>.002-.004   | DRILL          | 125-190            | 200-250                           | .002 | -    | .005 | .004 | .008 | .006 | .009 | .008                    | .010 | .008 | .011 | .008 | .012 | .010 | .014  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 60-120             | 70-105                            | .004 | -    | .006 | .007 | .010 | .012 | .011 | .014                    | .012 | .014 | .013 | .014 | .014 | .017 | .016  | .020 | .018  | .022 |      |
|                              | MALLEABLE CAST IRON -<br>MARTENSITIC                  | 200-320           | 225-850<br>.005-.012   | 175-375<br>.002-.003   | DRILL          | 100-150            | 200-250                           | .002 | -    | .004 | .004 | .006 | .005 | .007 | .006                    | .008 | .007 | .010 | .008 | .012 | .010 | .014  | -    | .016  | -    |      |
|                              |   |                   |                        |                        | REAM           | 45-70              | 65-100                            | .004 | -    | .006 | .008 | .008 | .010 | .010 | .012                    | .012 | .014 | .013 | .015 | .015 | .020 | .018  | .023 | .025  | .030 |      |
| LOW CARBON<br>STEELS         | LOW AND MEDIUM CARBON<br>STEEL - FREE MACHINING       | 100-250           | 350-1500<br>.008-.012  | 200-650<br>.002-.004   | DRILL          | 125-175            | 150-250                           | .003 | -    | .004 | .005 | .008 | .006 | .010 | .008                    | .012 | .009 | .014 | .010 | .017 | .012 | .018  | -    | .019  | -    |      |
|                              |   |                   |                        |                        | REAM           | 70-100             | 100-150                           | .005 | -    | .008 | .012 | .010 | .014 | .012 | .016                    | .014 | .018 | .015 | .020 | .020 | .025 | .025  | .030 | .030  | .035 |      |
|                              | LOW AND MEDIUM CARBON<br>STEEL - WROUGHT              | 100-375           | 400-1750<br>.008-.012  | 200-550<br>.002-.004   | DRILL          | -                  | -                                 | -    | -    | -    | -    | -    | -    | -    | -                       | -    | -    | -    | -    | -    | -    | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 30-85              | 40-110                            | .004 | -    | .008 | .009 | .009 | .011 | .013 | .013                    | .015 | .015 | .017 | .018 | .022 | .020 | .024  | .022 | .026  |      |      |
| MEDIUM<br>STRENGTH<br>STEELS | LOW AND MEDIUM CARBON<br>ALLOY STEEL - FREE MACHINING | 100-275           | 450-1800<br>.008-.012  | 350-1200<br>.003-.006  | DRILL          | -                  | 100-220                           | -    | -    | -    | .005 | -    | .006 | -    | .007                    | -    | .008 | -    | .010 | -    | .012 | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 65-100             | 90-135                            | .005 | -    | .008 | .010 | .010 | .012 | .015 | .018                    | .017 | .020 | .018 | .022 | .022 | .025 | .025  | .027 | .027  | .030 |      |
|                              | LOW AND MEDIUM CARBON<br>ALLOY STEEL                  | 85-375            | 325-1200<br>.004-.010  | 300-650<br>.002-.004   | DRILL          | -                  | 100-150                           | -    | -    | -    | .005 | -    | .006 | -    | .007                    | -    | .008 | -    | .010 | -    | .012 | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 40-85              | 65-100                            | .005 | -    | .010 | .012 | .012 | .015 | .015 | .018                    | .018 | .022 | .020 | .024 | .025 | .028 | .027  | .030 | .030  | .033 |      |
|                              | STAINLESS STEEL - 400 SERIES                          | 135-325           | 300-1200<br>.004-.009  | 275-800<br>.002-.005   | DRILL          | -                  | 110-150                           | -    | -    | -    | .004 | -    | .005 | -    | .006                    | -    | .007 | -    | .008 | -    | .010 | -     | .012 | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 40-90              | 50-100                            | .003 | -    | .005 | .007 | .006 | .007 | .007 | .008                    | .008 | .009 | .008 | .009 | .010 | .012 | .011  | .014 | .012  | .015 |      |
|                              | STAINLESS STEEL - 400 SERIES<br>FREE MACHINING        | 135-275           | 350-1500<br>.005-.010  | 300-825<br>.003-.006   | DRILL          | 100-150            | 125-190                           | .002 | -    | .004 | .004 | .005 | .005 | .006 | .006                    | .007 | .007 | .008 | .007 | .010 | .008 | .012  | -    | .014  | -    |      |
|                              |   |                   |                        |                        | REAM           | 65-100             | 90-135                            | .004 | -    | .006 | .008 | .007 | .009 | .008 | .010                    | .009 | .011 | .009 | .012 | .010 | .013 | .011  | .013 | .012  | .014 |      |
| HIGH STRENGTH<br>STEELS      | HIGH STRENGTH STEEL -<br>WROUGHT & TOOL STEEL         | 175-400           | 180-600<br>.005-.012   | 125-275<br>.002-.003   | DRILL          | -                  | 100-150                           | -    | -    | -    | .004 | -    | .006 | -    | .007                    | -    | .008 | -    | .010 | -    | .012 | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 35-70              | 50-100                            | .004 | -    | .006 | .007 | .008 | .008 | .009 | .009                    | .011 | .010 | .012 | .011 | .014 | .012 | .015  | .013 | .016  |      |      |
| HIGH TEMP.<br>ALLOYS         | HIGH TEMP ALLOYS<br>NICKEL & IRON BASE ALLOY          | 140-300           | 100-300<br>.003-.007   | 150-500<br>.001-.003   | DRILL          | -                  | 60-115                            | -    | -    | -    | .002 | -    | .003 | -    | .004                    | -    | .005 | -    | .006 | -    | .007 | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 15-85              | 20-115                            | .003 | -    | .005 | .006 | .005 | .007 | .005 | .007                    | .006 | .008 | .007 | .008 | .008 | .010 | .010  | .012 | .012  | .015 |      |
|                              | STAINLESS STEEL - 300 SERIES                          | 135-375           | 450-1200<br>.004-.010  | 400-850<br>.003-.006   | DRILL          | -                  | 70-105                            | -    | -    | -    | .003 | -    | .004 | -    | .005                    | -    | .006 | -    | .007 | -    | .008 | -     | -    | -     | -    |      |
|                              |   |                   |                        |                        | REAM           | 40-75              | 60-90                             | .003 | -    | .004 | .006 | .005 | .007 | .006 | .008                    | .006 | .008 | .007 | .009 | .008 | .010 | .009  | .011 | .010  | .012 |      |
|                              | STAINLESS STEEL - PH SERIES                           | 150-440           | 375-750<br>.004        |                        |                |                    |                                   |      |      |      |      |      |      |      |                         |      |      |      |      |      |      |       |      |       |      |      |