

INDUSTRIAL ROUTING

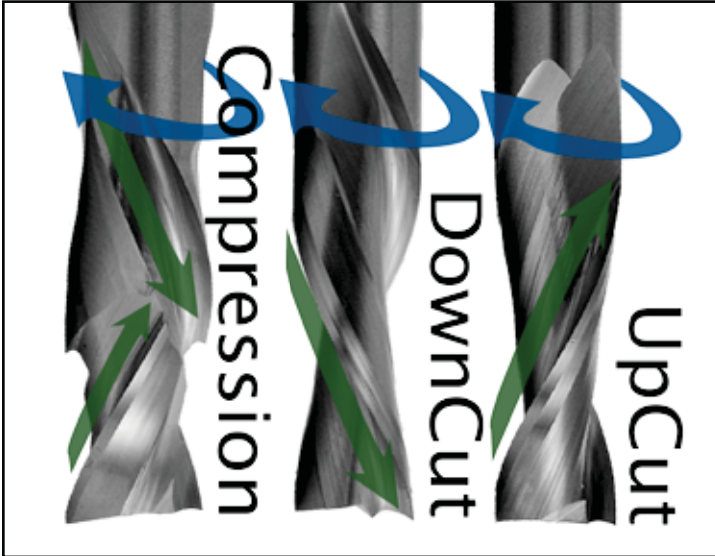


ROYCE//AYR
CUTTING TOOLS

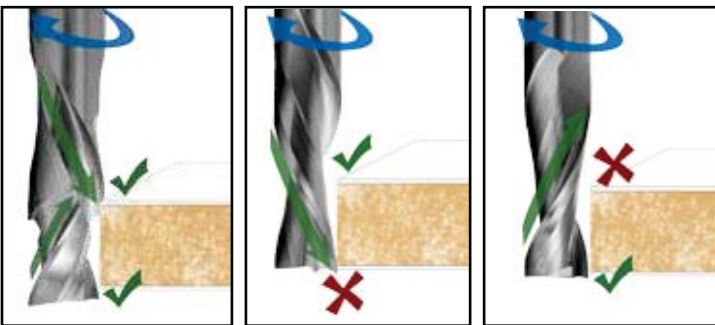
Technical Information

Chip-flow Explanation

UpCut, DownCut, Compression. What are the pros and cons of each of these chip flow styles? Below highlights some of the key considerations that should be taken into account.



When selecting what style tool is best two factors must be considered. First, is chipping on the edge of the material a concern. If you are machining brittle laminate that needs to have a chip free edge. Second, is parts moving an issue? Upcut tooling provides superior chip removal, which means longer life and faster feed rates, however it will have the tendency to pull the towards the spindle when cutting, this can be problematic for smaller inadequately held parts.



Material Selection

What tool works well on what material? We know that selecting tools can be a daunting task. Our material selection system is designed to make this task less daunting.

| | Best | Good | Acceptable | SFM |
|--------------------------------------|------|------|------------|-----------|
| Hardwoods | Hw | Hw | Hw | 1000-1800 |
| Softwoods | Sw | Sw | Sw | 1000-1800 |
| Particle Board With Laminate | Pb | Pb | Pb | 1000-1800 |
| Fiberboard With Laminate | Fb | Fb | Fb | 1000-1800 |
| Plywood | Pl | Pl | Pl | 1000-1800 |
| Hard Plastic | Hp | Hp | Hp | 1000-1800 |
| Soft Plastic | Sp | Sp | Sp | 1000-1800 |
| Fibre Re-enforced Plastic Composites | Rp | Rp | Rp | 1000-1800 |
| Aluminium | Al | Al | Al | 1000-1800 |

Calculations

$$RPM = (3.82 \times SFM) / \text{Diameter(in)}$$

$$SFM = 3.14 \times \text{Diameter(in)} \times (RPM/12)$$

$$F\text{-Rate (IPM)} = \text{Chip-load(in)} \times \# \text{ Wings} \times RPM$$

$$F\text{-Rate (mm/Min)} = \text{Chip-load(mm)} \times \# \text{ wings} \times RPM$$

$$\text{Chipload (in)} = F\text{-Rate (IPM)} / (RPM \times \# \text{ wings})$$

$$\text{Chipload (mm/min)} = F\text{-Rate(mm/m)} / (RPM \times \# \text{ wings})$$

2 Flute DownCut Spiral

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R57-22000 | 1/8 | 3/4 | 1/4 | 2-1/2 |
| R57-22201 | 1/8 | 1/2 | 1/4 | 2 |
| R57-22212 | 1/4 | 7/8 | 1/4 | 2-1/2 |
| R57-22214 | 1/4 | 1 | 1/4 | 2-1/2 |
| R57-22216 | 1/4 | 1-1/8 | 1/4 | 3 |
| R57-32222 | 3/8 | 1 | 3/8 | 3 |
| R57-32225 | 3/8 | 1-1/4 | 3/8 | 3 |
| R57-32226 | 3/8 | 1-1/4 | 3/8 | 3 |
| R57-32229 | 1/2 | 1-1/8 | 1/2 | 3 |
| R57-32231 | 1/2 | 1-1/4 | 1/2 | 3-1/2 |
| R57-32232 | 1/2 | 1-5/8 | 1/2 | 3-1/2 |
| R57-32235 | 1/2 | 2-1/8 | 1/2 | 4 |



General purpose router for solid wood, wood composites and some plastics. Downcut design gives a clean edge when cutting dados on laminated material.

2 Flute UpCut Spiral

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R52-22800 | 1/8 | 3/4 | 1/4 | 2 |
| R52-22801 | 1/8 | 1/2 | 1/4 | 2 |
| R52-22810 | 1/4 | 7/8 | 1/4 | 2.5 |
| R52-22814 | 1/4 | 1-1/8 | 1/4 | 3 |
| R52-32820 | 3/8 | 1 | 3/8 | 3 |
| R52-32823 | 3/8 | 1-1/4 | 3/8 | 3 |
| R52-32829 | 1/2 | 1-1/4 | 1/2 | 3-1/2 |
| R52-32830 | 1/2 | 1-5/8 | 1/2 | 3-1/2 |
| R52-32832 | 1/2 | 2-1/2 | 1/2 | 5 |
| R52-32833 | 1/2 | 2-1/8 | 1/2 | 4 |



General purpose router for solid wood, wood composites and some plastics. Upcut spiral gives good chip evacuation.

3 Flute DownCut Low Helix Ripper

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-01401 | 3/8 | 1-1/8 | 3/8 | 3-1/2 |
| R60-01402 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R60-01404 | 1/2 | 1-5/8 | 1/2 | 4 |
| R60-01405 | 5/8 | 1-5/8 | 5/8 | 4 |
| R60-01406 | 5/8 | 2-1/8 | 5/8 | 5 |
| R60-01407 | 3/4 | 1-5/8 | 3/4 | 4 |
| R60-01408 | 3/4 | 2-1/8 | 3/4 | 5 |



Serrated tooth design to eliminate tear out in difficult wood grains. Tooth design greatly reduces horsepower required to cut. Downcut to assist material hold down.



Hw Sw PI Fb

See Material Guide p2

Serrated tooth design to eliminate tear out in difficult wood grains. Tooth design greatly reduces horsepower required to cut. Downcut to assist material hold down.



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Serrated tooth design to eliminate tear out in difficult wood grains. Tooth design greatly reduces horsepower required to cut. Upcut to assist with chip evacuation.



Hw Sw PI Fb

See Material Guide p2

Serrated tooth design to eliminate tear out in difficult wood grains. Tooth design greatly reduces horsepower required to cut. Upcut to assist with chip evacuation.

3 Flute DownCut High Helix Ripper

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-01501 | 3/8 | 1-1/8 | 3/8 | 3-1/2 |
| R60-01503 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R60-01504 | 1/2 | 1-5/8 | 1/2 | 4 |
| R60-01505 | 5/8 | 1-5/8 | 5/8 | 4 |
| R60-01506 | 5/8 | 2-1/8 | 5/8 | 5 |
| R60-01509 | 3/4 | 1-5/8 | 3/4 | 4 |
| R60-01510 | 3/4 | 2-1/8 | 3/4 | 5 |

3 Flute UpCut Low Helix Ripper

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-01601 | 3/8 | 1-1/8 | 3/8 | 3-1/2 |
| R60-01602 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R60-01603 | 1/2 | 1-5/8 | 1/2 | 4 |
| R60-01604 | 5/8 | 1-5/8 | 5/8 | 4 |
| R60-01605 | 5/8 | 2-1/8 | 5/8 | 5 |
| R60-01606 | 3/4 | 1-5/8 | 3/4 | 4 |
| R60-01607 | 3/4 | 2-1/8 | 3/4 | 5 |

3 Flute UpCut High Helix Ripper

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-01701 | 3/8 | 1-1/8 | 3/8 | 3-1/2 |
| R60-01703 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R60-01704 | 1/2 | 1-5/8 | 1/2 | 4 |
| R60-01711 | 1/2 | 2 | 1/2 | 4 |
| R60-01705 | 5/8 | 1-5/8 | 5/8 | 4 |
| R60-01706 | 5/8 | 2-1/2 | 5/8 | 5 |
| R60-01709 | 3/4 | 1-5/8 | 3/4 | 4 |
| R60-01710 | 3/4 | 2-1/8 | 3/4 | 5 |

2 Flute Compression Chipbreaker

| PART # | DIA | CEL | UPCUT | SHK | OAL |
|-----------|-----|-------|-------|-----|-------|
| R60-11001 | 3/8 | 7/8 | .385" | 3/8 | 3 |
| R60-11002 | 3/8 | 1-1/8 | .495" | 3/8 | 3 |
| R60-11014 | 1/2 | 7/8 | .400" | 1/2 | 3 |
| R60-11003 | 1/2 | 1-1/8 | .440" | 1/2 | 3 |
| R60-11004 | 1/2 | 1-1/8 | .495" | 1/2 | 3 |
| R60-11005 | 1/2 | 1-3/8 | .605" | 1/2 | 3-1/2 |
| R60-11006 | 1/2 | 1-5/8 | .715" | 1/2 | 4 |
| R60-11007 | 5/8 | 2-1/4 | .990" | 5/8 | 5 |
| R60-11008 | 3/4 | 1-7/8 | .825" | 3/4 | 4 |



PI Fb Pb Hw Sw

See Material Guide p2

Laminated or veneered wood and wood composites when top and bottom finish is critical. Upward and downward shearing action prevents chipping of laminates. Chipbreakers help with prevent furring of core on plywood.

2 Flute Compression

| PART # | DIA | CEL | UPCUT | SHK | OAL |
|-----------|-----|-------|--------|-----|-------|
| R60-11409 | 1/4 | 7/8 | .500" | 1/4 | 2-1/2 |
| R60-11401 | 3/8 | 7/8 | .500" | 3/8 | 3 |
| R60-11402 | 1/2 | 7/8 | .500" | 1/2 | 3 |
| R60-11403 | 1/2 | 1-1/8 | .400" | 1/2 | 3 |
| R60-11404 | 1/2 | 1-3/8 | .625" | 1/2 | 3-1/2 |
| R60-11405 | 1/2 | 1-5/8 | .750" | 1/2 | 4 |
| R60-11410 | 1/2 | 2-1/2 | 1.125" | 1/2 | 5 |
| R60-11406 | 5/8 | 2-1/4 | 1.125" | 5/8 | 5 |
| R60-11407 | 3/4 | 1-7/8 | .750" | 3/4 | 4 |
| R60-11408 | 3/4 | 2-1/2 | 1.25" | 3/4 | 5 |



Pb Fb PI Hw Sw

See Material Guide p2

Laminated or veneered wood and wood composites when top and bottom finish is critical. Upward and downward shearing action prevents chipping of laminates.

2 Flute Mortise Compression

| PART # | DIA | CEL | UPCUT | SHK | OAL |
|---------------|-----|-------|-------|-----|-------|
| R60-12001 | 1/4 | 7/8 | .200" | 1/4 | 2-1/2 |
| R60-12002 | 3/8 | 7/8 | .210" | 3/8 | 3 |
| R60-12012 | 3/8 | 1-1/8 | .188" | 3/8 | 3 |
| R60-12003 | 1/2 | 7/8 | .230" | 1/2 | 3 |
| R60-12007 | 1/2 | 7/8 | .230" | 1/2 | 2-1/2 |
| R60-12004 | 1/2 | 1-1/8 | .230" | 1/2 | 3 |
| R60-12004-3.5 | 1/2 | 1-3/8 | .250" | 1/2 | 3-1/2 |



Pb Fb PI Hw Sw

See Material Guide p2

Laminated or veneered wood and wood composites when top and bottom finish is critical. Upward and downward shearing action prevents chipping of laminates. Short upcut allows chip free dados to be routed.



Pb Fb Pl Hw Sw

See Material Guide p2

Laminated or veneered wood and wood composites when top and bottom finish is critical. Short Upcut allows chip free dados to be routed.

3 Flute Mortise Compression

| PART# | DIA | CEL | UPCUT | SHK | OAL |
|-----------|-----|-------|-------|-----|-------|
| R60-12101 | 3/8 | 7/8 | .215" | 3/8 | 3 |
| R60-12102 | 1/2 | 7/8 | .230" | 1/2 | 3 |
| R60-11502 | 1/2 | 1-1/8 | .490" | 1/2 | 3 |
| R60-12103 | 1/2 | 1-3/8 | .290" | 1/2 | 3-1/2 |



Hw Hp Sw Sp Rp

See Material Guide p2

For routing plastics, composites, as well as finish passes on solid wood.

3 Flute DownCut Low Helix Finisher

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-22301 | 1/4 | 3/8 | 1/4 | 3 |
| R60-22302 | 1/4 | 7/8 | 1/4 | 3 |
| R60-22303 | 3/8 | 5/8 | 3/8 | 3 |
| R60-22310 | 3/8 | 1-1/8 | 3/8 | 3 |
| R60-22307 | 1/2 | 2-1/8 | 1/2 | 4-1/2 |
| R60-22311 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R60-22312 | 1/2 | 1-5/8 | 1/2 | 4 |
| R60-22309 | 3/4 | 2-1/8 | 3/4 | 5 |



Hw Hp Sw Sp Rp

See Material Guide p2

For routing plastics, composites, as well as finish passes on solid wood.

3 Flute UpCut Low Helix Finisher

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-22501 | 1/4 | 3/8 | 1/4 | 3 |
| R60-22502 | 1/4 | 7/8 | 1/4 | 3 |
| R60-22503 | 3/8 | 5/8 | 3/8 | 3 |
| R60-22504 | 3/8 | 1-1/8 | 3/8 | 3 |
| R60-22507 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R60-22509 | 1/2 | 1-5/8 | 1/2 | 4 |
| R60-22510 | 1/2 | 2-1/8 | 1/2 | 4-1/2 |
| R60-22512 | 3/4 | 2-1/8 | 3/4 | 5 |



Hw Sw Pl Pb Fb

See Material Guide p2

General purpose for solid wood, wood composites. Downcut design to give a clean edge when cutting dados on laminated material. Chip breakers help with furring and tear out.

2 Flute DownCut Chipbreaker Finisher

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-31001 | 3/8 | 1-1/8 | 3/8 | 3 |
| R60-31002 | 1/2 | 1-1/8 | 1/2 | 3 |
| R60-31003 | 1/2 | 1-5/8 | 1/2 | 3-1/2 |
| R60-31004 | 1/2 | 1-7/8 | 1/2 | 4 |
| R60-31005 | 1/2 | 2-1/8 | 1/2 | 4 |
| R60-31006 | 5/8 | 2-1/8 | 5/8 | 4 |
| R60-31007 | 3/4 | 2-1/8 | 3/4 | 4 |

2 Flute UpCut Chipbreaker Finisher

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R60-31201 | 3/8 | 1-1/8 | 3/8 | 3 |
| R60-31202 | 1/2 | 1-1/8 | 1/2 | 3 |
| R60-31203 | 1/2 | 1-5/8 | 1/2 | 3-1/2 |
| R60-31205 | 1/2 | 1-7/8 | 1/2 | 3-1/2 |
| R60-31204 | 1/2 | 2 | 1/2 | 4 |
| R60-31206 | 5/8 | 2-1/8 | 5/8 | 4-1/2 |
| R60-31207 | 3/4 | 2-1/8 | 3/4 | 4-1/2 |



Hw Sw Pl Pb Fb

See Material Guide p2

General purpose for solid wood and wood composites. Upcut spiral gives good chip evacuation. Chip breakers help with furring and tear out.

2 Flute UpCut Ballnose

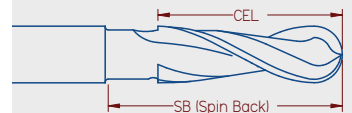
| PART # | DIA | CEL | SHK | SB | OAL |
|-----------|------|-------|-----|--------|-------|
| R52-23401 | 1/8 | 3/4 | 1/4 | N/A | 2-1/2 |
| R52-23402 | 1/8 | 1/2 | 1/4 | N/A | 2-1/2 |
| R52-23403 | 3/16 | 3/4 | 1/4 | N/A | 2 |
| R52-23404 | 3/16 | 3/4 | 1/4 | N/A | 3 |
| R52-23405 | 1/4 | 7/8 | 1/4 | N/A | 2-1/2 |
| R52-23406 | 1/4 | 1 | 1/4 | N/A | 4 |
| R52-33407 | 3/8 | 1-1/8 | 3/8 | N/A | 3 |
| R52-33408 | 3/8 | 1-1/4 | 3/8 | N/A | 4 |
| R52-33409 | 1/2 | 1-1/8 | 1/2 | N/A | 4 |
| R52-33411 | 1/2 | 1-1/2 | 1/2 | N/A | 5 |
| R52-33413 | 5/8 | 2-1/2 | 5/8 | N/A | 5 |
| R52-33417 | 3/4 | 3-1/2 | 3/4 | 4-1/4" | 6 |



Sw Hw Fb Pl Al Hp Sp

See Material Guide p2

General purpose for solid wood and wood composites. Upcut spiral gives good chip evacuation. Ball nose design for carving applications.



1 Flute UpCut "O" Style Aluminum

| PART # | DIA | CEL | SHK | OAL |
|-----------|------|-------|-----|-------|
| R63-60002 | 1/16 | 1/4 | 1/8 | 1-1/2 |
| R63-60006 | 1/8 | 1/4 | 1/4 | 2 |
| R63-60010 | 1/8 | 1/2 | 1/4 | 2 |
| R63-60014 | 3/16 | 3/8 | 1/4 | 2 |
| R63-60018 | 3/16 | 5/8 | 1/4 | 2 |
| R63-60020 | 1/4 | 3/8 | 1/4 | 2 |
| R63-60022 | 1/4 | 3/4 | 1/4 | 2-1/2 |
| R63-60024 | 1/4 | 1-1/4 | 1/4 | 3 |
| R63-60025 | 3/8 | 3/4 | 3/8 | 3 |
| R63-60026 | 3/8 | 1-1/8 | 3/8 | 3 |
| R63-60031 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |
| R63-60032 | 1/2 | 1-3/8 | 1/2 | 3-1/2 |



Al Hp

See Material Guide p2

Designed for routing aluminum sheet and solid material on CNC machines. Upcut design for good chip removal.

1 Flute DownCut "O" Style Aluminum



Al Hp

See Material Guide p2

Designed for routing aluminium sheet and solid material on CNC machines. Downcut design to assist material hold down.

| PART # | DIA | CEL | SHK | OAL |
|-----------|------|-------|-----|-------|
| R62-60002 | 1/16 | 1/4 | 1/8 | 1-1/2 |
| R62-60006 | 1/8 | 1/4 | 1/4 | 2 |
| R62-60010 | 1/8 | 1/2 | 1/4 | 2 |
| R62-60014 | 3/16 | 3/8 | 1/4 | 2 |
| R62-60020 | 1/4 | 1-1/8 | 1/4 | 2-1/2 |
| R62-60022 | 1/4 | 3/4 | 1/4 | 2-1/2 |
| R62-60024 | 1/4 | 1-1/4 | 1/4 | 3 |
| R62-60025 | 3/8 | 3/4 | 3/8 | 3 |
| R62-60031 | 1/2 | 1-1/8 | 1/2 | 3-1/2 |

1 Flute UpCut "O" Style Soft Plastic



Sp Hp Hw Sw Al

See Material Guide p2

Designed for routing soft plastics. Upcut design gives good chip removal.

| PART # | DIA | CEL | SHK | OAL |
|-----------|------|-------|------|-------|
| R63-71701 | 1/16 | 1/4 | 1/8 | 2 |
| R63-71702 | 1/16 | 1/4 | 1/4 | 2 |
| R63-71703 | 1/8 | 1/4 | 1/8 | 2 |
| R63-71704 | 1/8 | 1/4 | 1/4 | 2 |
| R63-71705 | 1/8 | 1/2 | 1/8 | 2 |
| R63-71706 | 1/8 | 1/2 | 1/4 | 2 |
| R63-71708 | 3/16 | 3/8 | 3/16 | 2 |
| R63-71709 | 3/16 | 3/8 | 1/4 | 2 |
| R63-71710 | 3/16 | 5/8 | 1/4 | 2 |
| R63-71715 | 1/4 | 3/8 | 1/4 | 2 |
| R63-71712 | 1/4 | 3/4 | 1/4 | 2-1/2 |
| R63-71713 | 1/4 | 1-1/4 | 1/4 | 3 |
| R63-71714 | 3/8 | 1-1/8 | 3/8 | 3 |

1 Flute UpCut "O" Style Hard Plastic



Hp Al Hw Sw

See Material Guide p2

Designed for routing hard plastics. Upcut design gives good chip removal.

| PART # | DIA | CEL | SHK | OAL |
|-----------|------|-------|-----|-------|
| R63-71609 | 1/16 | 1/4 | 1/8 | 2 |
| R63-71601 | 1/16 | 1/4 | 1/4 | 2 |
| R63-71610 | 1/8 | 1/4 | 1/8 | 2 |
| R63-71602 | 1/8 | 1/4 | 1/4 | 2 |
| R63-71603 | 1/8 | 1/2 | 1/4 | 2 |
| R63-71604 | 3/16 | 3/8 | 1/4 | 2 |
| R63-71605 | 3/16 | 5/8 | 1/4 | 2 |
| R63-71614 | 1/4 | 3/8 | 1/4 | 2 |
| R63-71606 | 1/4 | 3/4 | 1/4 | 2-1/2 |
| R63-71607 | 1/4 | 1-1/4 | 1/4 | 3 |
| R63-71608 | 3/8 | 1-1/8 | 3/8 | 3 |

1 Flute DownCut "O" Style Soft Plastic

| PART # | DIA | CEL | SHK | OAL |
|-----------|------|-------|------|-------|
| R62-71501 | 1/8 | 1/2 | 1/8 | 2 |
| R62-71502 | 1/8 | 1/2 | 1/4 | 2 |
| R62-71503 | 3/16 | 5/8 | 3/16 | 2 |
| R62-71504 | 3/16 | 5/8 | 1/4 | 2 |
| R62-71505 | 1/4 | 3/4 | 1/4 | 2-1/2 |
| R62-71506 | 1/4 | 1-1/4 | 1/4 | 3 |
| R62-71507 | 3/8 | 1-1/8 | 3/8 | 3 |



Sp Hp Hw Sw Al

See Material Guide p2

Designed for routing soft plastics. Downcut design to assist material hold down.

1 Flute DownCut "O" Style Hard Plastic

| PART # | DIA | CEL | SHK | OAL |
|-----------|------|-------|------|-------|
| R62-71408 | 1/8 | 1/2 | 1/8 | 2 |
| R62-71401 | 1/8 | 1/2 | 1/4 | 2 |
| R62-71409 | 3/16 | 5/8 | 3/16 | 2 |
| R62-71403 | 3/16 | 5/8 | 1/4 | 2 |
| R62-71405 | 1/4 | 3/4 | 1/4 | 2-1/2 |
| R62-71406 | 1/4 | 1-1/4 | 1/4 | 3 |
| R62-71407 | 3/8 | 1-1/8 | 3/8 | 3 |



Hp Al Hw Sw

See Material Guide p2

Designed for routing hard plastics. Downcut design to assist material hold down.

2 Flute Beading Tools

| PART # | DIA | r | b | SHK | OAL |
|-----------|-----|------|---------------|-----|-------|
| R68-02001 | 3/8 | 1/16 | 1mm (.039") | 3/8 | 2-1/2 |
| R68-02002 | 3/8 | 1/8 | 1mm (.039") | 3/8 | 2-1/2 |
| R68-02003 | 1/2 | 3/16 | 1.5mm (.059") | 1/2 | 3 |
| R68-02004 | 1/2 | 1/4 | 1.5mm (.059") | 1/2 | 3 |



Fb Hp Sp Hw Sw

See Material Guide p2



For beading profiles in MDF, Solid Wood, and plastics. 10° flares provide line free overlaps in MDF doors.

3 Flute UpCut Phenolic Spiral

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R72-10004 | 3/8 | 7/8 | 3/8 | 3 |
| R72-10007 | 1/2 | 1-1/4 | 1/2 | 3-1/2 |
| R72-10010 | 1/2 | 2-1/8 | 1/2 | 4 |



Rp Hp

See Material Guide p2

Designed for routing phenolic and other fiber re-reinforced plastics, unique style chip-breakers help eliminate harmonics in routing.

3 Flute DownCut Phenolic Spiral



Rp Hp

See Material Guide p2

Designed for routing phenolic and other fiber re-enforced plastics, unique style chip-breakers help eliminate harmonics in routing.



Rp Fb Hw

See Material Guide p2

PCD cutting tool provides excellent wear resistance in abrasive materials.



Rp Hw Fb

See Material Guide p2

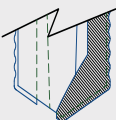
PCD cutting tool provides excellent wear resistance in abrasive materials. Serrated cutting edge cuts more freely and reduces delamination.



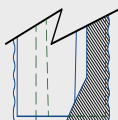
Rp Hp Hw

See Material Guide p2

Serrated tooth design helps cleanly shear glass or carbon fibers in composites.



Drill Point



End Mill

| PART # | DIA | CEL | SHK | OAL |
|-----------|-----|-------|-----|-------|
| R72-20004 | 3/8 | 7/8 | 3/8 | 3 |
| R72-20007 | 1/2 | 1-1/4 | 1/2 | 3-1/2 |
| R72-20010 | 1/2 | 2-1/8 | 1/2 | 4 |

2 Flute PCD Straight

| PART # | DIA | CEL | SHK | OAL |
|------------|-----|-------|-----|-------|
| R100-004 | 1/4 | 3/4 | 1/2 | 3 |
| R100-007 | 3/8 | 1-1/8 | 3/8 | 3 |
| R100-010 | 1/2 | 1-3/8 | 1/2 | 3-1/2 |
| R100-013 • | 5/8 | 1-5/8 | 5/8 | 4 |

• Steel Body

2 Flute PCD Serrated Tooth

| PART # | DIA | CEL | SHK | OAL |
|------------|-----|-------|-----|-------|
| R101-004 | 1/4 | 3/4 | 1/2 | 3 |
| R101-007 | 3/8 | 1-1/8 | 3/8 | 3 |
| R101-010 | 1/2 | 1-3/8 | 1/2 | 3-1/2 |
| R101-013 • | 5/8 | 1-5/8 | 5/8 | 4 |

• Steel Body

PCD Fiber Reinforced Plastic Tool

| PART # | DIA | CEL | SHK | OAL | END |
|--------------|-----|-------|-----|-------|----------|
| R103-004 | 3/8 | 1-1/8 | 3/8 | 3-1/2 | Drill |
| R103-007 | 1/2 | 1-1/8 | 1/2 | 2 | Drill |
| R103-008 | 1/2 | 1-3/8 | 1/2 | 4 | Drill |
| R103-010 | 1/2 | 1-5/8 | 1/2 | 3-1/2 | Drill |
| R103-013 • | 5/8 | 1-7/8 | 5/8 | 4 | Drill |
| R103-004EM | 3/8 | 1-1/8 | 3/8 | 3-1/2 | End Mill |
| R103-007EM | 1/2 | 1-1/8 | 1/2 | 2 | End Mill |
| R103-008EM | 1/2 | 1-3/8 | 1/2 | 3-7/8 | End Mill |
| R103-010EM | 1/2 | 1-5/8 | 1/2 | 3-1/2 | End Mill |
| R103-013EM • | 5/8 | 1-7/8 | 5/8 | 4 | End Mill |

•Steel Body

3 Flute PCD Rougher Finisher Tool

| PART # | DIA | CEL | SHK | OAL |
|------------|-----|-------|-----|-------|
| R104-004 | 3/8 | 5/8 | 3/8 | 3 |
| R104-007 | 3/8 | 7/8 | 3/8 | 3 |
| R104-010 | 1/2 | 5/8 | 1/2 | 3 |
| R104-011 | 1/2 | 7/8 | 1/2 | 3 |
| R104-013 | 1/2 | 1-1/4 | 1/2 | 3-1/2 |
| R104-016 • | 3/4 | 1-3/8 | 3/4 | 4 |

•Steel Body

3 Flute PCD UpCut Phenolic Tool

| PART # | DIA | CEL | SHK | OAL |
|----------|-----|-------|-----|-------|
| R107-004 | 3/8 | 1/2 | 3/8 | 3 |
| R107-007 | 1/2 | 5/8 | 1/2 | 3 |
| R107-010 | 1/2 | 1-1/4 | 1/2 | 3-1/2 |

2 Flute PCD Ballnose

| PART # | DIA | CEL | SHK | OAL |
|------------|-----|-----|-----|-----|
| R109-004 | 1/4 | 3/8 | 1/4 | 3 |
| R109-007 | 3/8 | 1/2 | 3/8 | 3 |
| R109-010 | 1/2 | 5/8 | 1/2 | 3 |
| R109-013 • | 5/8 | 7/8 | 5/8 | 3 |
| R109-017 | 3/4 | 1 | 3/4 | 4 |

•Steel Body

3 Flute PCD Lock Mortise Tool

| PART # | DIA | CEL | LOF | SHK | OAL |
|----------|------|------|-------|------|-------|
| R230-004 | 5/8 | 7/8 | 4-7/8 | 5/8 | 7 |
| R230-007 | 3/4 | 7/8 | 4-7/8 | 3/4 | 7 |
| R230-104 | 16mm | 20mm | 120mm | 16mm | 175mm |



Rp Fb Hw

See Material Guide p2

Serrated tooth design helps cleanly shear glass or carbon fibers in composites. Finishing wing provides smooth finish.



Rp

See Material Guide p2

Designed for routing phenolic and other fiber re-enforced plastics, unique style chip-breakers help eliminate harmonics in routing. PCD for extended life in abrasive materials.



Rp Fb Hw

See Material Guide p2

For adding structural rads in pocketing applications. PCD edge provides excellent wear resistance in abrasive material.



Fb Sw Pl

See Material Guide p2

Designed for mortising side of doors to hold locksets. PCD cutting edge to for long life in engineered materials.



Fb PI Pb Rp Hw

See Material Guide p2

PCD cutting tool provides excellent wear resistance in abrasive materials. Compression style wings help eliminate chipping and delamination.

1 + 1 Wing PCD "ECODIA" Style

| PART # | DIA | CEL | UPCUT | SHK | OAL |
|-------------|-----|--------|-------|-----|-------|
| ECODIA-00* | 3/8 | 7/8 | .250" | 3/8 | 2-3/4 |
| ECODIA-01 | 1/2 | 1-1/16 | .433" | 1/2 | 2-3/4 |
| ECODIA-01.S | 1/2 | 1 | .433" | 1/2 | 2-3/4 |
| ECODIA-01L | 1/2 | 1-1/16 | .433" | 1/2 | 2-3/4 |
| ECODIA-02 | 1/2 | 1-3/8 | .433" | 1/2 | 3-3/4 |
| ECODIA-02L | 1/2 | 1-3/8 | .433" | 1/2 | 3-3/4 |
| ECODIA-03 | 5/8 | 1-1/16 | .433" | 5/8 | 2-3/4 |
| ECODIA-04 | 5/8 | 1-3/8 | .433" | 3/4 | 4 |
| ECODIA-05 | 3/4 | 1-1/16 | .433" | 3/4 | 3-5/8 |
| ECODIA-06 | 3/4 | 1-3/8 | .433" | 3/4 | 4 |
| ECODIA-07 | 3/4 | 1-3/4 | .433" | 3/4 | 4-3/8 |
| ECODIA-08 | 3/4 | 1-7/8 | .433" | 3/4 | 4-1/2 |

*Not Guaranteed due to fragility

"L" signifies left hand rotation



Fb PI Pb Rp Hw

See Material Guide p2

PCD cutting tool provides excellent wear resistance in abrasive materials. Compression style wings help eliminate chipping and delamination.

2 + 2 PCD "ECO-SPARK" Style

| PART # | DIA | CEL | UPCUT | SHK | OAL |
|--------------|-----|-------|-------|-----|-------|
| ECO-SPARK-03 | 5/8 | 1-1/8 | .290" | 5/8 | 3-3/4 |
| ECO-SPARK-04 | 5/8 | 1-3/8 | .290" | 5/8 | 4 |
| ECO-SPARK-05 | 3/4 | 1 | .290" | 3/4 | 3-1/2 |
| ECO-SPARK-06 | 3/4 | 1-3/8 | .290" | 3/4 | 4 |
| ECO-SPARK-07 | 3/4 | 1-3/4 | .290" | 3/4 | 4-3/8 |

3 Flute PCD “HIFEED” Style



Rp Fb Hw

See Material Guide p2

PCD cutting tool provides excellent wear resistance in abrasive materials. Compression style wings help eliminate chipping and delamination. Complex geometry closely matches 3 wings spiral tools.

| PART # | DIA | CEL | UPCUT | SHK | OAL |
|---------------|-----|-------|-------|-----|-------|
| DIA-HIFEED.01 | 1/2 | 1 | .290" | 1/2 | 3 |
| DIA-HIFEED.03 | 5/8 | 1 | .290" | 3/4 | 4 |
| DIA-HIFEED.05 | 3/4 | 1-1/8 | .290" | 3/4 | 3-3/4 |
| DIA-HIFEED.06 | 3/4 | 1-1/4 | .290" | 3/4 | 4-3/8 |
| DIA-HIFEED.07 | 3/4 | 1-7/8 | .290" | 3/4 | 4-3/8 |
| DIA-HIFEED.08 | 3/4 | 1-7/8 | .290" | 3/4 | 4-1/2 |
| DIA-HIFEED.09 | 1 | 1 | .290" | 1 | 3-3/4 |
| DIA-HIFEED.10 | 1 | 1-1/4 | .290" | 1 | 4-3/4 |
| DIA-HIFEED.11 | 1 | 1-7/8 | .290" | 1 | 4-3/8 |



“ER” Precision Collets

IMPERIAL

| SIZE | ER11 | ER16 | ER20 | ER25 | ER32 | ER40 |
|-------|--------------|--------------|--------------|--------------|--------------|--------------|
| 1/32" | PRC-310.0031 | | | | | |
| 1/16" | PRC-310.0063 | PRC-320.0063 | PRC-330.0063 | PRC-340.0063 | PRC-350.0063 | |
| 1/8" | PRC-310.0125 | PRC-320.0125 | PRC-330.0125 | PRC-340.0125 | PRC-350.0125 | PRC-375.0125 |
| 3/16" | PRC-310.0188 | PRC-320.0188 | PRC-330.0188 | PRC-340.0188 | PRC-350.0188 | PRC-375.0188 |
| 1/4" | | PRC-320.0250 | PRC-330.0250 | PRC-340.0250 | PRC-350.0250 | PRC-375.0250 |
| 5/16" | | PRC-320.0313 | PRC-330.0313 | PRC-340.0313 | PRC-350.0313 | PRC-375.0313 |
| 3/8" | | PRC-320.0375 | PRC-330.0375 | PRC-340.0375 | PRC-350.0375 | PRC-375.0375 |
| 7/16" | | | PRC-330.0438 | PRC-340.0438 | PRC-350.0438 | PRC-375.0438 |
| 1/2" | | | PRC-330.0500 | PRC-340.0500 | PRC-350.0500 | PRC-375.0500 |
| 9/16" | | | | PRC-340.0563 | PRC-350.0563 | PRC-375.0563 |
| 5/8" | | | | PRC-340.0625 | PRC-350.0625 | PRC-375.0625 |
| 3/4" | | | | PRC-340.0750 | PRC-350.0750 | PRC-375.0750 |
| 7/8" | | | | | | PRC-375.0875 |
| 1" | | | | | | PRC-375.1000 |

METRIC

| SIZE | ER11 | ER16 | ER20 | ER25 | ER32 | ER40 |
|------|--------------|--------------|--------------|--------------|--------------|--------------|
| 3mm | PRC-310.M030 | PRC-320.M030 | PRC-330.M030 | PRC-340.M030 | PRC-350.M030 | |
| 4mm | PRC-310.M040 | PRC-320.M040 | PRC-330.M040 | PRC-340.M040 | PRC-350.M040 | PRC-375.M040 |
| 6mm | PRC-310.M060 | PRC-320.M060 | PRC-330.M060 | PRC-340.M060 | PRC-350.M060 | PRC-375.M060 |
| 8mm | | PRC-320.M080 | PRC-330.M080 | PRC-340.M080 | PRC-350.M080 | PRC-375.M080 |
| 9mm | | PRC-320.M090 | PRC-330.M090 | PRC-340.M090 | PRC-350.M090 | PRC-375.M090 |
| 10mm | | PRC-320.M100 | PRC-330.M100 | PRC-340.M100 | PRC-350.M100 | PRC-375.M100 |
| 12mm | | | PRC-330.M120 | PRC-340.M120 | PRC-350.M120 | PRC-375.M120 |
| 13mm | | | | PRC-340.M130 | PRC-350.M130 | PRC-375.M130 |
| 14mm | | | | PRC-340.M140 | PRC-350.M140 | PRC-375.M140 |
| 16mm | | | | | PRC-350.M160 | PRC-375.M160 |
| 19mm | | | | | PRC-350.M190 | PRC-375.M190 |
| 20mm | | | | | PRC-350.M200 | PRC-375.M200 |
| 25mm | | | | | | PRC-375.M250 |

“SYOZ 25” Precision Collets

IMPERIAL

| SIZE | PART# |
|-------|--------------|
| 1/8" | PRC-400.0125 |
| 3/16" | PRC-400.0188 |
| 1/4" | PRC-400.0250 |
| 5/16" | PRC-400.0313 |
| 3/8" | PRC-400.0375 |
| 7/16" | PRC-400.0438 |
| 1/2" | PRC-400.0500 |
| 9/16" | PRC-400.0563 |
| 5/8" | PRC-400.0625 |
| 3/4" | PRC-400.0750 |
| 7/8" | PRC-400.0875 |
| 1" | PRC-400.1000 |

METRIC

| SIZE | PART# |
|------|--------------|
| 3mm | PRC-400.M030 |
| 4mm | PRC-400.M040 |
| 6mm | PRC-400.M060 |
| 8mm | PRC-400.M080 |
| 9mm | PRC-400.M090 |
| 10mm | PRC-400.M100 |
| 12mm | PRC-400.M120 |
| 13mm | PRC-400.M130 |
| 14mm | PRC-400.M140 |
| 16mm | PRC-400.M160 |
| 19mm | PRC-400.M190 |
| 20mm | PRC-400.M200 |
| 25mm | PRC-400.M250 |



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