

# Tooling and Consumables For CNC Routers



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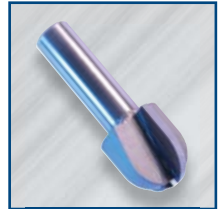
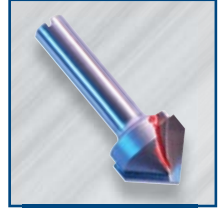
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**Selecting the right tooling for your CNC router system is just as important as choosing the right equipment in the first place. The quality of finished cut and appearance of your completed products are totally dependant on selecting the correct tool for the job.**

**We have been supplying the highest quality router bits, tooling and accessories into industry for the past ten years, and we pride ourselves on the quality of service we provide.**

**Selecting the right tool for the job is not always easy, but our sales team are always keen to help with your choice of tooling and can call upon an experienced team of engineers that can advise on a wide range of different cnc machining applications.**

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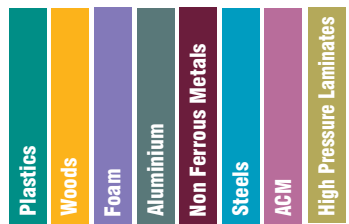
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# Belin Single Flute Upward Spiral

Plastics

Woods

Foam

Solid carbide tooling with a single upward spiral flute. These tools give a high quality cut finish on a range of materials including plastics, woods and foams. They are especially effective for machining acrylics where they should produce a smooth and consistent finish. The upward spiral flute geometry provides excellent swarf clearance.



## Metric Sizes

| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1011A-1-3    | 1mm         | 3mm            | 4mm            | 30mm               | £30.60 |
| 1011A-1.1-3  | 1.1mm       | 3mm            | 4mm            | 30mm               | £28.48 |
| 1011A-1.2-3  | 1.2mm       | 3mm            | 4mm            | 30mm               | £28.48 |
| 1011A-1.4-3  | 1.4mm       | 3mm            | 4mm            | 30mm               | £28.49 |
| 1011A-1.5-3  | 1.5mm       | 3mm            | 6mm            | 30mm               | £29.53 |
| 1011A-1.6-3  | 1.6mm       | 3mm            | 6mm            | 30mm               | £29.53 |
| 1011A-1.8-3  | 1.8mm       | 3mm            | 6mm            | 30mm               | £29.53 |
| 1011A-2      | 2mm         | 2mm            | 8mm            | 30mm               | £16.37 |
| 1013A-2      | 2mm         | 2mm            | 8mm            | 60mm               | £20.45 |
| 1011A-2-3    | 2mm         | 3mm            | 8mm            | 30mm               | £29.53 |
| 1011A-2-6    | 2mm         | 6mm            | 8mm            | 60mm               | £30.74 |
| 1011A-2.5    | 2.5mm       | 2.5mm          | 8mm            | 30mm               | £16.37 |
| 1013A-2.5    | 2.5mm       | 2.5mm          | 8mm            | 60mm               | £20.45 |
| 1011A-3      | 3mm         | 3mm            | 12mm           | 40mm               | £16.44 |
| 1013A-3      | 3mm         | 3mm            | 10mm           | 60mm               | £21.45 |
| 1011A-3-6    | 3mm         | 6mm            | 12mm           | 50mm               | £30.62 |
| 1014A-3      | 3mm         | 3mm            | 20mm           | 60mm               | £21.45 |
| 1014A-3-6    | 3mm         | 6mm            | 20mm           | 60mm               | £31.72 |
| 1012A-3      | 3mm         | 3mm            | 15mm           | 40mm               | £20.45 |
| 1017A-4      | 4mm         | 4mm            | 12mm           | 40mm               | £16.44 |
| 1011A-4      | 4mm         | 4mm            | 14mm           | 50mm               | £17.37 |
| 1014A-4      | 4mm         | 4mm            | 22mm           | 60mm               | £22.58 |
| 1016A-4      | 4mm         | 4mm            | 30mm           | 70mm               | £25.55 |
| 1011A-4-6    | 4mm         | 6mm            | 14mm           | 50mm               | £30.62 |
| 1012A-4-6    | 4mm         | 6mm            | 22mm           | 60mm               | £32.64 |

# Belin Single Flute Upward Spiral

| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1011A-5      | 5mm         | 5mm            | 16mm           | 60mm               | £20.45 |
| 1016A-5      | 5mm         | 5mm            | 22mm           | 60mm               | £20.45 |
| 1014A-5      | 5mm         | 5mm            | 30mm           | 70mm               | £28.71 |
| 1011A-5-6    | 5mm         | 6mm            | 16mm           | 60mm               | £30.74 |
| 1014A-5-6    | 5mm         | 6mm            | 22mm           | 60mm               | £30.62 |
| 1012A-6      | 6mm         | 6mm            | 14mm           | 50mm               | £21.07 |
| 1011A-6      | 6mm         | 6mm            | 22mm           | 60mm               | £23.45 |
| 1014A-6      | 6mm         | 6mm            | 32mm           | 70mm               | £30.62 |
| 1016A-6      | 6mm         | 6mm            | 38mm           | 80mm               | £36.82 |
| 1011A-8      | 8mm         | 8mm            | 22mm           | 60mm               | £40.06 |
| 1012A-8      | 8mm         | 8mm            | 32mm           | 70mm               | £46.20 |
| 1014A-8      | 8mm         | 8mm            | 38mm           | 80mm               | £52.33 |
| 1016A-8      | 8mm         | 8mm            | 42mm           | 80mm               | £52.33 |
| 1011A-10     | 10mm        | 10mm           | 30mm           | 75mm               | £47.81 |
| 1011A-12     | 12mm        | 12mm           | 30mm           | 75mm               | £58.93 |

## Imperial Sizes

| Product Code  | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|---------------|-------------|----------------|----------------|--------------------|--------|
| 1011A-013-025 | 1/8"        | 1/4"           | 1/2"           | 1 1/2"             | £26.64 |
| 1011A-013     | 1/8"        | 1/8"           | 1/2"           | 2"                 | £17.45 |
| 1011A-019-025 | 3/16"       | 1/4"           | 5/8"           | 2"                 | £26.64 |
| 1011A-019     | 3/16"       | 3/16"          | 5/8"           | 2"                 | £19.45 |
| 1014A-019-025 | 3/16"       | 1/4"           | 1 1/4"         | 3"                 | £38.90 |
| 1011A-025     | 1/4"        | 1/4"           | 3/4"           | 2"                 | £26.64 |
| 1014A-025     | 1/4"        | 1/4"           | 1 1/2"         | 3"                 | £46.07 |
| 1016A-025     | 1/4"        | 1/4"           | 2 1/4"         | 3 3/4"             | £49.90 |
| 1013A-025     | 1/4"        | 1/4"           | 1 1/8"         | 3"                 | £43.64 |
| 1011A-038     | 3/8"        | 3/8"           | 1 1/8"         | 3"                 | £47.81 |
| 1014A-038     | 3/8"        | 3/8"           | 3 3/16"        | 5"                 | £73.63 |
| 1011A-050     | 1/2"        | 1/2"           | 1 1/4"         | 3"                 | £66.44 |
| 1014A-050     | 1/2"        | 1/2"           | 2"             | 4"                 | £79.07 |

# Belin Single Flute Down Spiral

Plastics

Woods

Foam

Single flute solid carbide tool with down spiral geometry. Suitable for use on a wide range of plastics and wood. This bit is a popular choice when working with laminated materials, the down spiral geometry prevents de-lamination on the upper surface.



| Product Code  | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|---------------|-------------|----------------|----------------|--------------------|--------|
| 1021A-1-3     | 1mm         | 3mm            | 4mm            | 30mm               | £28.48 |
| 1021A-1.5-3   | 1.5mm       | 3mm            | 6mm            | 30mm               | £29.53 |
| 1021A-2       | 2mm         | 2mm            | 8mm            | 30mm               | £16.37 |
| 1023A-2       | 2mm         | 2mm            | 8mm            | 60mm               | £20.45 |
| 1021A-2-3     | 2mm         | 3mm            | 8mm            | 30mm               | £29.53 |
| 1021A-2.5     | 2.5mm       | 2.5mm          | 8mm            | 30mm               | £16.37 |
| 1023A-2.5     | 2.5mm       | 2.5mm          | 8mm            | 60mm               | £20.45 |
| 1021A-3       | 3mm         | 3mm            | 10mm           | 30mm               | £16.44 |
| 1023A-3       | 3mm         | 3mm            | 10mm           | 60mm               | £21.45 |
| 1021A-3-6     | 3mm         | 6mm            | 10mm           | 50mm               | £30.73 |
| 1021A-4       | 4mm         | 4mm            | 12mm           | 50mm               | £17.45 |
| 1023A-4       | 4mm         | 4mm            | 20mm           | 60mm               | £22.58 |
| 1026A-4       | 4mm         | 4mm            | 30mm           | 70mm               | £25.55 |
| 1021A-4-6     | 4mm         | 6mm            | 12mm           | 60mm               | £30.73 |
| 1021A-5       | 5mm         | 5mm            | 16mm           | 60mm               | £20.45 |
| 1024A-5       | 5mm         | 5mm            | 30mm           | 70mm               | £28.71 |
| 1021A-5-6     | 5mm         | 6mm            | 16mm           | 50mm               | £30.73 |
| 1021A-6       | 6mm         | 6mm            | 20mm           | 60mm               | £23.54 |
| 1024A-6       | 6mm         | 6mm            | 30mm           | 70mm               | £30.73 |
| 1026A-6       | 6mm         | 6mm            | 38mm           | 80mm               | £36.82 |
| 1021A-8       | 8mm         | 8mm            | 22mm           | 60mm               | £40.06 |
| 1024A-8       | 8mm         | 8mm            | 38mm           | 80mm               | £52.33 |
| 1021A-10      | 10mm        | 10mm           | 30mm           | 75mm               | £47.81 |
| 1021A-12      | 12mm        | 12mm           | 30mm           | 75mm               | £58.93 |
| 1021A-013-025 | 1/8"        | 1/4"           | 1/2"           | 1 1/2"             | £26.64 |
| 1021A-019-025 | 3/16"       | 1/4"           | 5/8"           | 2"                 | £26.64 |
| 1021A-025     | 1/4"        | 1/4"           | 3/4"           | 2"                 | £26.64 |

# CNCRouterShop Single Flute, Upward Spiral

Solid carbide tooling with a single upward spiral flute. These tools give a high quality cut finish on a range of materials including plastics, woods and foams. They are especially effective for machining acrylics where they should produce a smooth and consistent finish. The upward spiral flute geometry provides excellent swarf clearance.

Plastics

Woods

Foam



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1011J-2-6    | 2mm         | 6mm            | 6mm            | 58mm               | £14.12 |
| 1011J-3-6    | 3mm         | 6mm            | 10mm           | 58mm               | £12.88 |
| 1011J-4-6    | 4mm         | 6mm            | 12mm           | 58mm               | £13.18 |
| 1012J-4-6    | 4mm         | 6mm            | 20mm           | 60mm               | £14.32 |
| 1011J-5-6    | 5mm         | 6mm            | 16mm           | 58mm               | £13.50 |
| 1011J-6      | 6mm         | 6mm            | 20mm           | 58mm               | £10.35 |
| 1012J-6      | 6mm         | 6mm            | 30mm           | 70mm               | £14.30 |
| 1014J-6      | 6mm         | 6mm            | 40mm           | 80mm               | £16.52 |
| 1014J-8      | 8mm         | 8mm            | 31mm           | 64mm               | £15.58 |
| 1011J-10     | 10mm        | 10mm           | 35mm           | 73mm               | £32.18 |
| 1011J-12     | 12mm        | 12mm           | 30mm           | 73mm               | £37.20 |



1011J-3-6



1011J-6



1011J-10

# CNCRouterShop Single Flute, Down Spiral for Plastics

Plastics

Woods

Foam

Single flute solid carbide tool with down spiral geometry. Suitable for use on a wide range of plastics and wood. This bit is a popular choice when working with laminated materials, the down spiral geometry prevents de-lamination on the upper surface.



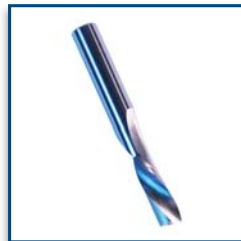
| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1021J-2-6    | 2mm         | 6mm            | 6mm            | 58mm               | £16.20 |
| 1021J-3-6    | 3mm         | 6mm            | 10mm           | 58mm               | £14.95 |
| 1021J-4-6    | 4mm         | 6mm            | 12mm           | 58mm               | £15.78 |
| 1021J-6      | 6mm         | 6mm            | 20mm           | 58mm               | £13.50 |
| 1021J-8      | 8mm         | 8mm            | 22mm           | 58mm               | £20.77 |
| 1021J-10     | 10mm        | 10mm           | 35mm           | 73mm               | £41.85 |



1021J-2-6



1021J-4-6



1021J-8



# CNCRouterShop Twin Flute, Upward Spiral for Plastics

Solid carbide, twin fluted spiral cutters designed for plastics. These cost effective tools are designed to give a high quality cut edge and will work well on most plastic materials.

Plastics

Woods

Foam



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price         |
|--------------|-------------|----------------|----------------|--------------------|---------------|
| 2011G-0.4-3  | 0.4mm       | 3mm            | 1.2mm          | 38mm               | <b>£15.80</b> |
| 2011G-0.5-3  | 0.5mm       | 3mm            | 1.5mm          | 38mm               | <b>£15.80</b> |
| 2011J-1-3    | 1mm         | 3mm            | 4.5mm          | 38mm               | <b>£12.97</b> |
| 2011J-1.5-3  | 1.5mm       | 3mm            | 4.5mm          | 38mm               | <b>£11.20</b> |
| 2011J-2-3    | 2mm         | 3mm            | 6mm            | 38mm               | <b>£5.72</b>  |
| 2011J-3      | 3mm         | 3mm            | 12mm           | 38mm               | <b>£5.72</b>  |
| 2014J-3      | 3mm         | 3mm            | 25mm           | 75mm               | <b>£11.42</b> |
| 2011J-4      | 4mm         | 4mm            | 14mm           | 51mm               | <b>£7.90</b>  |
| 2014J-4      | 4mm         | 4mm            | 25mm           | 75mm               | <b>£13.17</b> |
| 2011J-5      | 5mm         | 5mm            | 16mm           | 51mm               | <b>£9.67</b>  |
| 2011J-6      | 6mm         | 6mm            | 19mm           | 58mm               | <b>£10.10</b> |
| 2014J-6      | 6mm         | 6mm            | 25mm           | 75mm               | <b>£15.37</b> |
| 2016J-6      | 6mm         | 6mm            | 25mm           | 150mm              | <b>£27.50</b> |
| 2011J-8      | 8mm         | 8mm            | 20mm           | 64mm               | <b>£14.95</b> |
| 2014J-8      | 8mm         | 8mm            | 25mm           | 75mm               | <b>£22.67</b> |
| 2016J-8      | 8mm         | 8mm            | 25mm           | 150mm              | <b>£41.32</b> |
| 2011J-10     | 10mm        | 10mm           | 22mm           | 73mm               | <b>£21.95</b> |
| 2014J-10     | 10mm        | 10mm           | 38mm           | 100mm              | <b>£36.42</b> |
| 2016J-10     | 10mm        | 10mm           | 25mm           | 150mm              | <b>£53.28</b> |

# Belin Single Flute, Upward Spiral for Aluminium

Aluminium

Non Ferrous Metals

ACM

Single flute solid carbide tools designed for optimum surface finish on non-ferrous metals. Reduced cut length for maximum rigidity and minimum vibration.

Our most popular choice for machining aluminium.



## Metric Sizes

| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1111A-1.5-3  | 1.5mm       | 3mm            | 4mm            | 30mm               | £22.55 |
| 1111A-2-3    | 2mm         | 3mm            | 5mm            | 30mm               | £22.55 |
| 1111A-2.5-3  | 2.5mm       | 3mm            | 6mm            | 30mm               | £22.55 |
| 1111A-3      | 3mm         | 3mm            | 8mm            | 30mm               | £20.45 |
| 1111A-4      | 4mm         | 4mm            | 12mm           | 60mm               | £21.45 |
| 1111A-4-6    | 4mm         | 6mm            | 10mm           | 50mm               | £31.72 |
| 1114A-4      | 4mm         | 4mm            | 30mm           | 70mm               | £27.63 |
| 1111A-5      | 5mm         | 5mm            | 16mm           | 60mm               | £24.63 |
| 1111A-5-6    | 5mm         | 6mm            | 12mm           | 50mm               | £31.72 |
| 1114A-5      | 5mm         | 5mm            | 30mm           | 70mm               | £29.63 |
| 1111A-5-8    | 5mm         | 8mm            | 25mm           | 70mm               | £44.98 |
| 1114A-5-8    | 5mm         | 8mm            | 35mm           | 80mm               | £51.26 |
| 1111A-6      | 6mm         | 6mm            | 15mm           | 50mm               | £28.63 |
| 1113A-6      | 6mm         | 6mm            | 15mm           | 70mm               | £30.53 |
| 1114A-6      | 6mm         | 6mm            | 20mm           | 60mm               | £31.72 |
| 1112A-6      | 6mm         | 6mm            | 30mm           | 70mm               | £35.82 |
| 1116A-6      | 6mm         | 6mm            | 38mm           | 80mm               | £38.80 |
| 1111A-6-8    | 6mm         | 8mm            | 30mm           | 80mm               | £46.80 |
| 1111A-8      | 8mm         | 8mm            | 20mm           | 60mm               | £46.69 |
| 1112A-8      | 8mm         | 8mm            | 20mm           | 80mm               | £49.03 |
| 1114A-8      | 8mm         | 8mm            | 38mm           | 80mm               | £58.39 |
| 1111A-10     | 10mm        | 10mm           | 23mm           | 60mm               | £65.75 |
| 1115A-10     | 10mm        | 10mm           | 23mm           | 100mm              | £72.65 |
| 1114A-10     | 10mm        | 10mm           | 30mm           | 75mm               | £74.33 |

# Belin Single Flute, Upward Spiral for Aluminium

## Imperial Sizes

| Product Code  | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|---------------|-------------|----------------|----------------|--------------------|--------|
| 1111A-013-025 | 1/8"        | 1/4"           | 5/16"          | 1 1/2"             | £28.63 |
| 1111A-013     | 1/8"        | 1/8"           | 5/16"          | 1 1/2"             | £20.45 |
| 1111A-019-025 | 3/16"       | 1/4"           | 1/2"           | 2"                 | £28.63 |
| 1111A-019     | 3/16"       | 3/16"          | 1/2"           | 2"                 | £23.53 |
| 1111A-025     | 1/4"        | 1/4"           | 5/8"           | 2"                 | £28.63 |
| 1111A-038     | 3/8"        | 3/8"           | 1"             | 3"                 | £51.93 |
| 1111A-050     | 1/2"        | 1/2"           | 1 1/8"         | 3 1/2"             | £72.65 |

# CNCRouterShop Single Flute, Upward Spiral for Aluminium

Single flute solid carbide tools designed for optimum surface finish on non-ferrous metals.

This is one of our most popular tools as it can also be used very effectively on a range of other materials, notably plastics and woods, to give a clean and high quality cut finish.

Aluminium

Non Ferrous Metals



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1111V-2-6    | 2mm         | 6mm            | 6mm            | 50mm               | £21.40 |
| 1111V-3-6    | 3mm         | 6mm            | 6mm            | 50mm               | £21.40 |
| 1111V-4-6    | 4mm         | 6mm            | 14mm           | 50mm               | £21.40 |
| 1111V-5-6    | 5mm         | 6mm            | 16mm           | 50mm               | £21.40 |
| 1111V-6      | 6mm         | 6mm            | 22mm           | 50mm               | £21.40 |
| 1111V-8      | 8mm         | 8mm            | 32mm           | 64mm               | £35.00 |
| 1111V-10     | 10mm        | 10mm           | 32mm           | 76mm               | £40.20 |

# Belin Single Flute, Down Spiral for Aluminium

Aluminium

Non Ferrous Metals

Single flute solid carbide tools with downward spiral geometry. These are designed for optimum surface finish on non-ferrous metals. The downward spiral flute helps to hold the material down whilst cutting which makes these tools particularly suitable for thinner sheet materials.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1121A-1.5-3  | 1.5mm       | 3mm            | 4mm            | 30mm               | £22.55 |
| 1121A-2-3    | 2mm         | 3mm            | 5mm            | 30mm               | £22.55 |
| 1121A-2.5-3  | 2.5mm       | 3mm            | 6mm            | 30mm               | £22.55 |
| 1121A-3      | 3mm         | 3mm            | 8mm            | 30mm               | £20.45 |
| 1121A-4      | 4mm         | 4mm            | 12mm           | 60mm               | £21.45 |
| 1121A-4-6    | 4mm         | 6mm            | 10mm           | 50mm               | £31.72 |
| 1121A-5      | 5mm         | 5mm            | 16mm           | 60mm               | £24.63 |
| 1121A-5-6    | 5mm         | 6mm            | 12mm           | 50mm               | £31.72 |
| 1121A-6      | 6mm         | 6mm            | 15mm           | 50mm               | £28.63 |
| 1121A-8      | 8mm         | 8mm            | 20mm           | 60mm               | £46.69 |
| 1121A-10     | 10mm        | 10mm           | 23mm           | 60mm               | £65.75 |



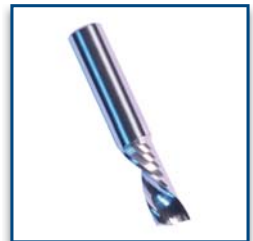
1121A-3



1121A-5



1121A-8



1121A-10

# HSS, Single Straight Flute for Aluminium

Aluminium

High speed steel straight fluted cutters designed for aluminium. The generous clearance and swarf removal capabilities of these tools make them suitable for machining all grades of aluminium to a fine, smooth cut edge.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1031S-3-6    | 3mm         | 6mm            | 6mm            | 47mm               | £13.76 |
| 1031S-6      | 6mm         | 6mm            | 6mm            | 47mm               | £14.96 |

# Twin Flute, High Helix for Aluminium

Aluminium

Non Ferrous Metals

Twin flute solid carbide tools recommended for cutting aluminium but can also be used on all non-ferrous metals.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price   |
|--------------|-------------|----------------|----------------|--------------------|---------|
| 2141H-3      | 3mm         | 3mm            | 12mm           | 38mm               | £17.40  |
| 2141H-4      | 4mm         | 4mm            | 14mm           | 50mm               | £20.00  |
| 2141H-5      | 5mm         | 5mm            | 19mm           | 50mm               | £21.47  |
| 2141H-6      | 6mm         | 6mm            | 19mm           | 63mm               | £23.95  |
| 2141H-8      | 8mm         | 8mm            | 19mm           | 63mm               | £30.25  |
| 2141H-10     | 10mm        | 10mm           | 22mm           | 70mm               | £39.30  |
| 2141H-12     | 12mm        | 12mm           | 25mm           | 83mm               | £53.50  |
| 2141H-16     | 16mm        | 16mm           | 32mm           | 88mm               | £93.25  |
| 2141H-20     | 20mm        | 20mm           | 38mm           | 100mm              | £165.10 |

# Spiral Fluted, TiALN Coated Tools for Metals

## Steels

Solid carbide end mills specially designed for cutting steels. These are all TiALN coated which gives excellent wear resistance and extended tool life. They are available in 2 flute, 3 flute and 4 flute versions and are suitable for both mild and stainless steels.



| Product Code | No. of Flutes | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|---------------|-------------|----------------|----------------|--------------------|--------|
| 2131H-2-3    | 2             | 2mm         | 3mm            | 6mm            | 38mm               | £15.00 |
| 3131H-2-3    | 3             | 2mm         | 3mm            | 6mm            | 38mm               | £15.00 |
| 4131H-2-3    | 4             | 2mm         | 3mm            | 6mm            | 38mm               | £15.00 |
| 2131H-3      | 2             | 3mm         | 3mm            | 12mm           | 38mm               | £17.50 |
| 3131H-3      | 3             | 3mm         | 3mm            | 12mm           | 38mm               | £17.50 |
| 4131H-3      | 4             | 3mm         | 3mm            | 12mm           | 38mm               | £17.50 |
| 2131H-4      | 2             | 4mm         | 4mm            | 14mm           | 50mm               | £17.50 |
| 3131H-4      | 3             | 4mm         | 4mm            | 14mm           | 50mm               | £17.50 |
| 4131H-4      | 4             | 4mm         | 4mm            | 14mm           | 50mm               | £17.50 |
| 2131H-5      | 2             | 5mm         | 5mm            | 16mm           | 50mm               | £17.50 |
| 3131H-5      | 3             | 5mm         | 5mm            | 16mm           | 50mm               | £17.50 |
| 4131H-5      | 4             | 5mm         | 5mm            | 16mm           | 50mm               | £17.50 |
| 2131H-6      | 2             | 6mm         | 6mm            | 19mm           | 63mm               | £17.50 |
| 3131H-6      | 3             | 6mm         | 6mm            | 19mm           | 63mm               | £17.50 |
| 4131H-6      | 4             | 6mm         | 6mm            | 19mm           | 63mm               | £17.50 |
| 2131H-8      | 2             | 8mm         | 8mm            | 19mm           | 63mm               | £22.50 |
| 3131H-8      | 3             | 8mm         | 8mm            | 19mm           | 63mm               | £22.50 |
| 4131H-8      | 4             | 8mm         | 8mm            | 19mm           | 63mm               | £22.50 |
| 2131H-10     | 2             | 10mm        | 10mm           | 22mm           | 70mm               | £32.50 |
| 3131H-10     | 3             | 10mm        | 10mm           | 22mm           | 70mm               | £32.50 |
| 4131H-10     | 4             | 10mm        | 10mm           | 22mm           | 70mm               | £32.50 |
| 2131H-12     | 2             | 12mm        | 12mm           | 25mm           | 75mm               | £42.50 |
| 3131H-12     | 3             | 12mm        | 12mm           | 25mm           | 75mm               | £42.50 |
| 4131H-12     | 4             | 12mm        | 12mm           | 25mm           | 75mm               | £42.50 |

# Carbide V Bits

A range of V carving bits which are ideal for 3D carving applications as well as chamfering and grooving. These tools are suitable for use on most materials including woods, plastics, aluminium and other non-ferrous metals.

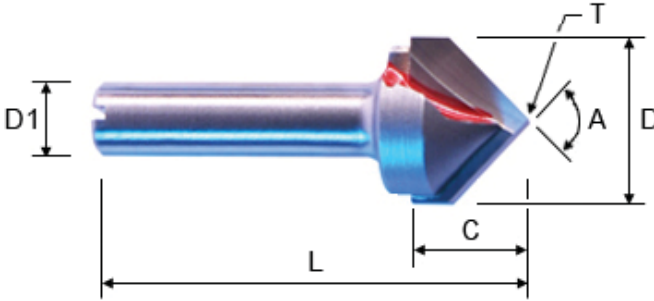
Aluminium

Plastics

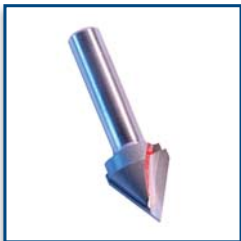
Woods

Non Ferrous Metals

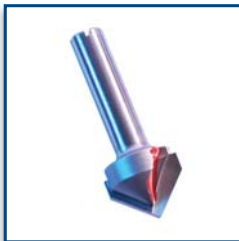
Foam



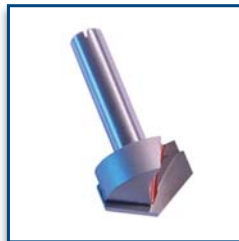
| Product Code | Tip (T) / Cut (D) Diameter | Shank Dia (D1) | Angle (A) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|----------------------------|----------------|-----------|----------------|--------------------|--------|
| 2051M-120-8  | 1mm / 21.5mm               | 8mm            | 120°      | 12mm           | 45mm               | £36.69 |
| 2051M-90-025 | 1mm / 18mm                 | 1/4"           | 90°       | 14mm           | 45mm               | £29.10 |
| 2051M-90-8   | 1mm / 18mm                 | 8mm            | 90°       | 14mm           | 45mm               | £29.10 |
| 2051M-90-050 | 1mm / 18mm                 | 1/2"           | 90°       | 14mm           | 45mm               | £29.10 |
| 2161M-90-12  | 0mm / 44mm                 | 12mm           | 90°       | 21mm           | 65mm               | £69.58 |
| 2051M-60-025 | 1mm / 15.75mm              | 1/4"           | 60°       | 16mm           | 45mm               | £29.10 |
| 2051M-60-8   | 1mm / 15.75mm              | 8mm            | 60°       | 16mm           | 45mm               | £29.10 |
| 2051M-60-050 | 1mm / 15.75mm              | 1/2"           | 60°       | 16mm           | 45mm               | £29.10 |
| 2161M-60-12  | 0mm / 26mm                 | 12mm           | 60°       | 21mm           | 65mm               | £69.58 |



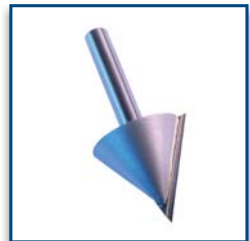
2051M-60-8



2051M-90-8



2051M-120-8



2161M-60-12

# Straight Twin Fluted Tools for Wood

Woods

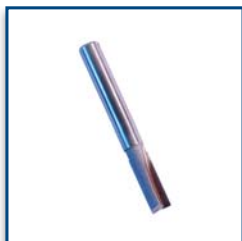
Foam

Plastics

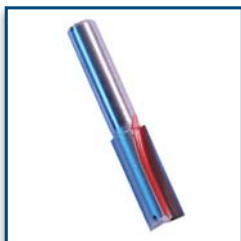
These twin straight fluted cutters are recommended for use on hardwoods, softwoods and MDF. The straight flutes cut a clean edge and do not leave any rough burrs on the top surface. They are also suitable for cutting foams which cut quickly and cleanly. All of these tools can be used for painting.



| Product Code  | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|---------------|-------------|----------------|----------------|--------------------|--------|
| 2031M-6       | 6mm         | 6mm            | 16mm           | 57mm               | £25.30 |
| 2031B-6-050   | 6mm         | 1/2"           | 18mm           | 70mm               | £22.00 |
| 2031M-8       | 8mm         | 8mm            | 20mm           | 57mm               | £26.57 |
| 2031M-10      | 10mm        | 8mm            | 25mm           | 70mm               | £32.89 |
| 2031M-12      | 12mm        | 12mm           | 30mm           | 70mm               | £35.42 |
| 2031M-20-8    | 20mm        | 8mm            | 25mm           | 53mm               | £41.75 |
| 2031M-22-12   | 22mm        | 12mm           | 40mm           | 82mm               | £61.99 |
| 2031M-25-12   | 25mm        | 12mm           | 25mm           | 53mm               | £43.01 |
| 2031M-013-025 | 1/8"        | 1/4"           | 3/8"           | 42mm               | £23.28 |
| 2031M-075-025 | 3/4"        | 1/4"           | 1"             | 2"                 | £36.69 |
| 2031M-075-038 | 3/4"        | 3/8"           | 1"             | 2"                 | £36.69 |
| 2031M-100-038 | 1"          | 3/8"           | 3/4"           | 2"                 | £40.48 |



203M-6



2031M-10



2051M-013-025



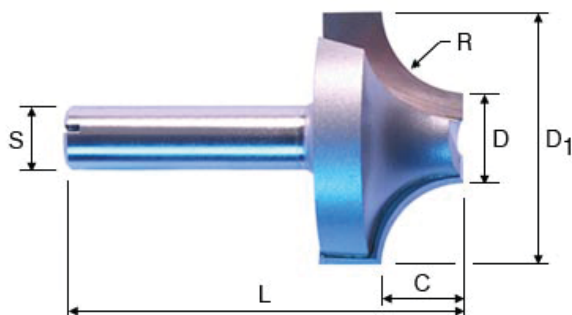
2031M-100-038



# Ovolo Profiling Tools for Wood

A selection of solid carbide cutters for creating a decorative profiled cut edge.

Woods



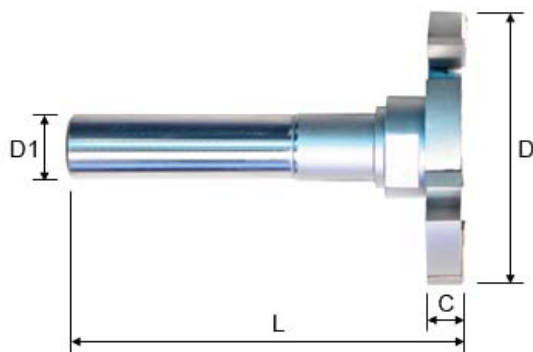
| Product Code | Radius (R) | Inner Dia (D) | Outer Dia (D1) | Shank Dia (S) | Cut Length (C) | Price  |
|--------------|------------|---------------|----------------|---------------|----------------|--------|
| 2081M-17-8   | 3mm        | 11mm          | 17mm           | 8mm           | 3mm            | £40.48 |
| 2081M-23-8   | 6.3mm      | 11mm          | 23mm           | 8mm           | 6.3mm          | £55.66 |
| 2081M-31-8   | 10mm       | 11mm          | 31mm           | 8mm           | 10mm           | £56.93 |

# Skimming & Rebating Tools for Wood

These tools are ideal for skimming MDF sacrificial sheet. Thanks to the large diameter they can surface large areas very quickly.

Woods

Plastics



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 6037M-52-12  | 52          | 12             | 7.3            | 74.5               | £99.94 |

# Ball Nose TiALN Coated

Woods

Plastics

Non Ferrous Metals

Aluminium

Steels

Solid carbide tooling with TiALN coating and ball nose geometry, commonly used for 3D machining applications.

Suitable for cutting most woods, plastics and non ferrous metals.



| Product Code | No. of Flutes | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|---------------|-------------|----------------|----------------|--------------------|--------|
| 2181H-2-3    | 2             | 2mm         | 3mm            | 12mm           | 38mm               | £19.90 |
| 2181H-3      | 2             | 3mm         | 3mm            | 12mm           | 38mm               | £12.15 |
| 2181H-4      | 2             | 4mm         | 4mm            | 14mm           | 50mm               | £12.75 |
| 2181H-5      | 2             | 5mm         | 5mm            | 16mm           | 50mm               | £15.50 |
| 2181H-6      | 2             | 6mm         | 6mm            | 19mm           | 63mm               | £19.50 |
| 2181H-8      | 2             | 8mm         | 8mm            | 19mm           | 63mm               | £29.75 |
| 2181H-10     | 2             | 10mm        | 10mm           | 22mm           | 70mm               | £39.90 |
| 2181H-12     | 2             | 12mm        | 12mm           | 25mm           | 75mm               | £59.75 |
| 3181H-2-3    | 3             | 2mm         | 3mm            | 12mm           | 38mm               | £19.90 |
| 3181H-3      | 3             | 3mm         | 3mm            | 12mm           | 38mm               | £12.15 |
| 3181H-4      | 3             | 4mm         | 4mm            | 14mm           | 50mm               | £30.30 |
| 3181H-5      | 3             | 5mm         | 5mm            | 16mm           | 50mm               | £15.50 |
| 3181H-6      | 3             | 6mm         | 6mm            | 19mm           | 63mm               | £19.50 |
| 3181H-8      | 3             | 8mm         | 8mm            | 19mm           | 63mm               | £29.75 |
| 3181H-10     | 3             | 10mm        | 10mm           | 22mm           | 70mm               | £39.90 |
| 3181H-12     | 3             | 12mm        | 12mm           | 25mm           | 75mm               | £59.75 |
| 4181H-2-3    | 4             | 2mm         | 3mm            | 12mm           | 38mm               | £19.90 |
| 4181H-3      | 4             | 3mm         | 3mm            | 12mm           | 38mm               | £12.15 |
| 4181H-4      | 4             | 4mm         | 4mm            | 14mm           | 50mm               | £13.28 |
| 4181H-5      | 4             | 5mm         | 5mm            | 16mm           | 50mm               | £15.50 |
| 4181H-6      | 4             | 6mm         | 6mm            | 19mm           | 63mm               | £19.50 |
| 4181H-8      | 4             | 8mm         | 8mm            | 19mm           | 63mm               | £29.75 |
| 4181H-10     | 4             | 10mm        | 10mm           | 22mm           | 70mm               | £39.90 |
| 4181H-12     | 4             | 12mm        | 12mm           | 25mm           | 75mm               | £59.75 |

# Ball Nose, Long Series

Long Series solid carbide tooling with ball nose geometry. These are commonly used for 3D machining applications and are suitable for cutting most woods, plastics and non ferrous metals. The extra length of these tools make them ideal for those larger 3D machining jobs such as moulds, models and rapid prototyping.

Woods

Plastics

Non Ferrous Metals

Aluminium



| Product Code | No. of Flutes | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|---------------|-------------|----------------|----------------|--------------------|--------|
| 2044H-3      | 2             | 3mm         | 3mm            | 25mm           | 65mm               | £19.75 |
| 2044H-4      | 2             | 4mm         | 4mm            | 25mm           | 65mm               | £29.75 |
| 2044H-5      | 2             | 5mm         | 5mm            | 25mm           | 75mm               | £34.75 |
| 2044H-6      | 2             | 6mm         | 6mm            | 38mm           | 100mm              | £34.95 |
| 2044H-8      | 2             | 8mm         | 8mm            | 38mm           | 100mm              | £39.25 |
| 2044H-10     | 2             | 10mm        | 10mm           | 38mm           | 100mm              | £49.75 |
| 2044H-12     | 2             | 12mm        | 12mm           | 75mm           | 150mm              | £95.00 |
| 3044H-3      | 3             | 3mm         | 3mm            | 25mm           | 65mm               | £19.75 |
| 3044H-4      | 3             | 4mm         | 4mm            | 25mm           | 65mm               | £29.75 |
| 3044H-5      | 3             | 5mm         | 5mm            | 25mm           | 75mm               | £34.75 |
| 3044H-8      | 3             | 8mm         | 8mm            | 38mm           | 100mm              | £39.25 |
| 3044H-10     | 3             | 10mm        | 10mm           | 38mm           | 100mm              | £49.75 |
| 3044H-12     | 3             | 12mm        | 12mm           | 75mm           | 150mm              | £95.00 |
| 4044H-3      | 4             | 3mm         | 3mm            | 25mm           | 65mm               | £19.75 |
| 4044H-4      | 4             | 4mm         | 4mm            | 25mm           | 65mm               | £29.75 |
| 4044H-5      | 4             | 5mm         | 5mm            | 25mm           | 75mm               | £34.75 |
| 4044H-6      | 4             | 6mm         | 6mm            | 38mm           | 100mm              | £34.95 |
| 4044H-8      | 4             | 8mm         | 8mm            | 38mm           | 100mm              | £39.25 |
| 4044H-10     | 4             | 10mm        | 10mm           | 38mm           | 100mm              | £49.75 |
| 4044H-12     | 4             | 12mm        | 12mm           | 75mm           | 150mm              | £95.00 |

# Carbide Engraving Tools, TiALN Coated

Plastics

Woods

Non Ferrous Metals

Steels

Aluminium

Solid carbide engraving tools with TiALN coating for extended life and improved cut quality. All these tools have specially designed geometry to provide clean, burr free engraving in a variety of materials including plastics, woods, non-ferrous metals and also steels.



| Product Code | Tip Geometry  | Tip Dia (T) | Shank Dia (D1) | Overall Length (L) | Price  |
|--------------|---------------|-------------|----------------|--------------------|--------|
| 6171Q-0.2    | Quarter round | 0.2mm       | 4mm            | 62mm               | £30.90 |
| 6171Q-0.4    | Quarter round | 0.4mm       | 4mm            | 62mm               | £30.90 |
| 7171Q-0.4    | Half round    | 0.4mm       | 4mm            | 62mm               | £27.00 |
| 6171Q-0.6    | Quarter round | 0.6mm       | 4mm            | 62mm               | £27.00 |
| 6171Q-0.8    | Quarter round | 0.8mm       | 4mm            | 62mm               | £27.00 |



6171Q-0.2



7171Q-0.4



6171Q-0.8

# Solid Carbide Engraving Tools

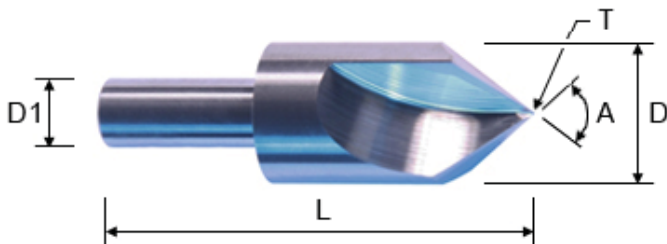
Solid carbide engraving tools suitable for engraving all plastics and woods.

Plastics

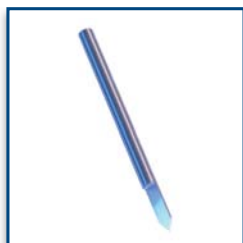
Woods

Non Ferrous Metals

Aluminium



| Product Code | Tip (T) / Cut (D) Diameter | Shank Dia (D1) | Angle (A) | Overall Length (L) | Price   |
|--------------|----------------------------|----------------|-----------|--------------------|---------|
| 7061R-0-4    | 0mm / 4mm                  | 4mm            | 60°       | 60mm               | £22.05  |
| 7061R-0.5-4  | 0.5mm / 4mm                | 4mm            | 60°       | 60mm               | £22.05  |
| 7061R-1-4    | 1mm / 4mm                  | 4mm            | 60°       | 60mm               | £22.05  |
| 7061R-2-4    | 2mm / 4mm                  | 4mm            | 60°       | 60mm               | £22.05  |
| 2051A-0-12   | 0mm / 12mm                 | 12mm           | 90°       | 50mm               | £117.70 |
| 2051A-0-8    | 0mm / 8mm                  | 8mm            | 90°       | 50mm               | £102.60 |
| 2051A-0.2-8  | 0.2mm / 16mm               | 8mm            | 90°       | 50mm               | £140.67 |
| 2051A-0.5-8  | 0.5mm / 16mm               | 8mm            | 90°       | 50mm               | £140.67 |
| 2051A-1-8    | 1mm / 16mm                 | 8mm            | 90°       | 50mm               | £140.67 |



7061R-0.4



7061R-2.4



2051A-0.8



2051A-0.2-8

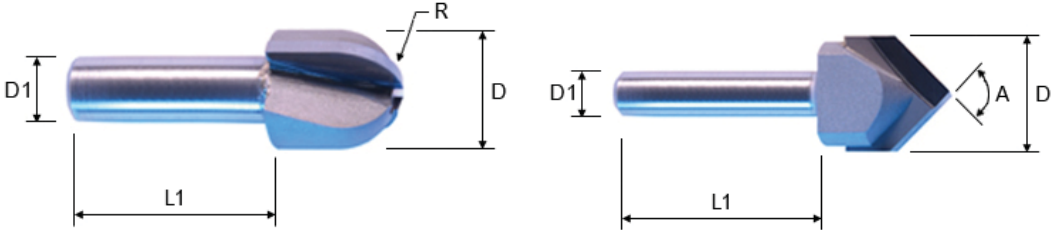
# Tooling For ACM Manufacturers (PanelBuilder)

## Aluminium Composite Spherical & V Cutters

ACM

Aluminium

Solid carbide spherical form and V grooving cutters for machining aluminium composite materials (ACM). The V cutters have a 3mm flat at the tip to allow the correct bend clearance.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Angle (A)/Radius (R) | Shank Length (L1) | Price  |
|--------------|-------------|----------------|----------------------|-------------------|--------|
| 2091A-90-8   | 20mm        | 8mm            | 90°                  | 38mm              | £91.12 |
| 2091A-135-8  | 20mm        | 8mm            | 135°                 | 38mm              | £91.12 |
| 2101A-10-8   | 10mm        | 6mm            | 5mm                  | 30mm              | £86.50 |
| 2101A-15-8   | 15mm        | 8mm            | 7.5mm                | 25mm              | £95.75 |

## Profile Cutters for ACM

ACM

Aluminium

Single flute solid carbide tools designed for optimum surface finish when profile cutting ACM. Reduced cut length for maximum rigidity and minimum vibration.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1111A-4-6    | 4mm         | 6mm            | 10mm           | 50mm               | £31.31 |
| 1111A-5-6    | 5mm         | 6mm            | 12mm           | 50mm               | £31.31 |
| 1111A-6      | 6mm         | 6mm            | 15mm           | 50mm               | £28.08 |

# Tooling For SCM Manufacturers (PanelBuilder)

## SCM Composite Spherical Cutters

Solid carbide, TiAlN coated spherical form cutter for machining steel composite materials (SCM).

ACM

Steels



| Product Code | Cut Dia (D) | Shank Dia (D1) | Radius (R) | Cut Length (C) | Overall Length (L) | Price   |
|--------------|-------------|----------------|------------|----------------|--------------------|---------|
| 2181T-12     | 12mm        | 12mm           | 6mm        | 22mm           | 83mm               | £221.33 |

## Spiral Fluted TiAlN Coated for SCM

This tool is specially designed for machining steel composite materials. The specially formulated super G coating reduces wear and extends tool life.

ACM

Steels

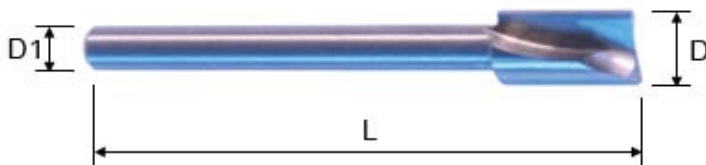


| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length(C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|---------------|--------------------|--------|
| 2131T-6      | 6mm         | 6mm            | 19mm          | 57mm               | £41.31 |

# Tooling For Diemaking Applications

## Positioning Hole Drills for Pertinax Counters

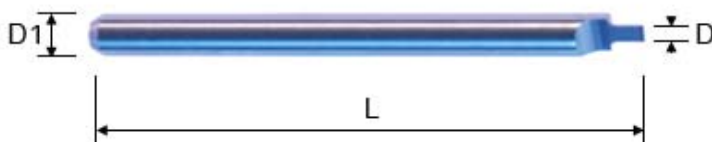
Specially designed tools for drilling positioning holes in pertinax counters.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Overall Length (L) | Price   |
|--------------|-------------|----------------|--------------------|---------|
| 2151N-5-3    | 5mm         | 3mm            | 38mm               | £104.70 |
| 2151N-5.5-3  | 5.5mm       | 3mm            | 38mm               | £115.80 |

## Slot Cutters for Pertinax Counters

Cutters for machining slots in pertinax. These are solid carbide tools that are machined to precise diameters for cutting accurate and clean slots in pertinax counter material.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Overall Length (L) | Price  |
|--------------|-------------|----------------|--------------------|--------|
| 1031N-1-3    | 1mm         | 3mm            | 40mm               | £19.00 |
| 1031N-1.1-3  | 1.1mm       | 3mm            | 40mm               | £19.00 |
| 1031N-1.2-3  | 1.2mm       | 3mm            | 40mm               | £19.00 |
| 1031N-1.3-3  | 1.3mm       | 3mm            | 40mm               | £19.00 |
| 1031N-1.4-3  | 1.4mm       | 3mm            | 40mm               | £19.00 |
| 1031N-1.5-3  | 1.5mm       | 3mm            | 40mm               | £19.00 |
| 1031N-1.6-3  | 1.6mm       | 3mm            | 40mm               | £19.00 |
| 1031N-1.7-3  | 1.7mm       | 3mm            | 40mm               | £19.00 |



# Tooling For Diemaking Applications

## Chamfering Tools for Pertinax Counters

A selection of precision ground chamfering tools designed for putting smooth chamfers on the edges of pertinax counters.



| Product Code | Angle (A) | Shank Dia (D1) | Price   |
|--------------|-----------|----------------|---------|
| 2161N-130-3  | 130°      | 3mm            | £106.28 |
| 2161N-160-3  | 160°      | 3mm            | £141.28 |
| 2161N-170-3  | 170°      | 3mm            | £141.28 |

## Die Board Tools

These are specially designed to cut a narrow constant width slot in plywood.

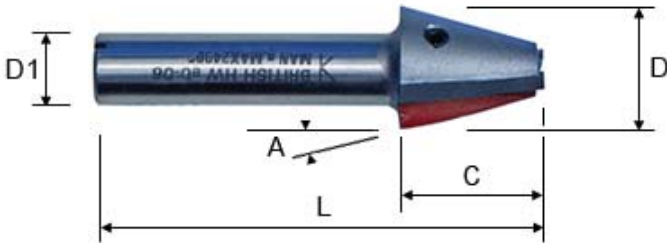


| Product Code   | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|----------------|-------------|----------------|----------------|--------------------|--------|
| 5151P-0.69-013 | 0.69mm      | 1/8"           | 11.7mm         | 38mm               | £41.04 |
| 5151P-0.70-013 | 0.70mm      | 1/8"           | 11.7mm         | 38mm               | £41.04 |
| 5151P-0.71-013 | 0.71mm      | 1/8"           | 11.7mm         | 38mm               | £41.04 |
| 5151P-1.04-013 | 1.04mm      | 1/8"           | 12.7mm         | 38mm               | £41.04 |
| 5151P-1.05-013 | 1.05mm      | 1/8"           | 12.7mm         | 38mm               | £41.04 |
| 5151P-1.07-013 | 1.07mm      | 1/8"           | 12.7mm         | 38mm               | £41.04 |
| 5151P-1.42-013 | 1.42mm      | 1/8"           | 12.7mm         | 38mm               | £41.04 |

# Tooling For Diemaking Applications

## V Groove and Slotting Tool

Special Combination Tool used in conjunction with dieboard tools to machine female strippers.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Angle (A) | Cut Length (C) | Overall Length (L) | Price   |
|--------------|-------------|----------------|-----------|----------------|--------------------|---------|
| 2151M-30-10  | 14mm        | 10mm           | 15°       | 23mm           | 65mm               | £130.00 |

# Tooling For High Pressure Laminates

## Belin Cristal Single Flute, Upward Spiral

### High Pressure Laminates

These solid carbide tools are especially effective for machining hard materials such as High Pressure Laminates (eg: Trespa) where they produce a smooth and consistent finish with excellent swarf clearance.



| Product Code | Flutes | Cut Dia (D) | Shank Dia (D1) | Cut (C) | Length (L) | Price  |
|--------------|--------|-------------|----------------|---------|------------|--------|
| 1191A-3      | 1      | 3mm         | 3mm            | 9mm     | 30mm       | £23.53 |
| 1191A-4      | 1      | 4mm         | 4mm            | 13mm    | 50mm       | £25.55 |
| 1191A-4-6    | 1      | 4mm         | 6mm            | 13mm    | 50mm       | £37.82 |
| 1191A-6      | 1      | 6mm         | 6mm            | 16mm    | 50mm       | £28.64 |
| 1191A-8      | 1      | 8mm         | 8mm            | 20mm    | 60mm       | £41.90 |
| 1191A-10     | 1      | 10mm        | 10mm           | 23mm    | 60mm       | £50.08 |

# Tooling For Ductmaking Applications

## CNCRouterShop Single Flute, Upward Spiral

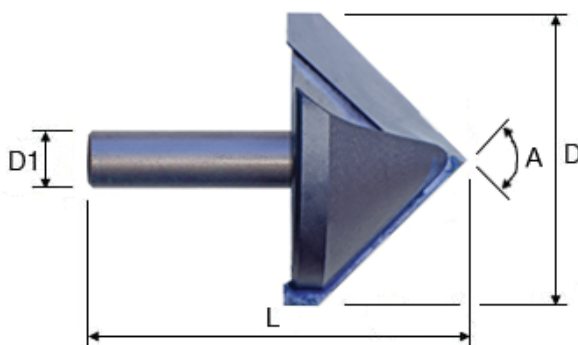
Solid carbide tooling with a single upward spiral flute. These tools give a high quality cut finish on duct insulation board and are suitable for use on materials up to 40mm thick. The upward spiral flute geometry provides excellent swarf clearance.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Cut Length (C) | Overall Length (L) | Price  |
|--------------|-------------|----------------|----------------|--------------------|--------|
| 1012J-6      | 6mm         | 6mm            | 30mm           | 70mm               | £14.30 |
| 1014J-6      | 6mm         | 6mm            | 40mm           | 80mm               | £16.52 |

## Duct Board V Cutters

These routing tools are designed for V grooving Duct insulation board in thicknesses of 22mm, 30mm and 40mm. The V tools have a 1mm flat at the tip to allow clearance for folding.



| Product Code | Cut Dia (D) | Shank Dia (D1) | Angle (A) | Cut Length (C) | Overall Length (L) | Price   |
|--------------|-------------|----------------|-----------|----------------|--------------------|---------|
| 2091C-65-12  | 65mm        | 12mm           | 90°       | 32mm           | 79mm               | £225.00 |
| 2091C-80-12  | 80mm        | 12mm           | 90°       | 39.5mm         | 86.5mm             | £335.00 |

# Knife Blades

## Blades for Tangential Knife

Knife blades to fit the XYZ Tangential knife tool. These are available in different sizes and geometries to handle various materials and thicknesses



| Product Code | Description   | Cut Length | Tip Geometry | Knife Device                    | Price  |
|--------------|---|------------|--------------|---------------------------------|--------|
| BT1051L-7    | Saber blade, 7mm, 2 sided, 60degree                     | 7mm        | Point        | Tang, Saber                     | £23.14 |
| BT1051X-20   | Blade for box cutter & 45degree cartridges (10 pack)    | 20mm       | Point        | Tang, Box, 45deg                | £23.00 |
| BT1041X-2    | Blade for pizza wheel cartridge                         | 2mm        | Wheel        | Tang, Pizza                     | £37.50 |
| BT1033D-29   | Blade for barrel rigid and self-align holders (10 pack) | 6mm        | Flat         | Tang, Barrel Rigid & Self Align | £12.00 |

## Blades for Oscillating Knife

Knife blades are designed to fit the XYZ Oscillating knife tool. These versatile tools have the ability to cut a wide range of materials and also possess the dextrorotatory to cut small detail and curves. These knife blades are available in different sizes and geometries to handle various materials and thicknesses.



| Product Code | Description                  | Cut Length | Tip Geometry | Knife Device | Price  |
|--------------|------------------------------|------------|--------------|--------------|--------|
| B1051L-5     | 5mm, 2 sided 60degree, point | 5mm        | Point        | Osc          | £21.21 |
| B1031L-10    | 10mm, flat tip               | 10mm       | Flat         | Osc          | £21.21 |
| B1031L-15    | 15mm, flat tip               | 15mm       | Flat         | Osc          | £27.27 |
| B1051L-15    | 15mm, 2 sided 69degree, flat | 15mm       | Flat         | Osc          | £31.40 |
| B1031L-20    | 20mm, flat tip               | 20mm       | Flat         | Osc          | £42.42 |
| B1041L-10    | 10mm, round tip              | 10mm       | Round        | Osc          | £22.73 |
| B1041L-15    | 15mm, round tip              | 15mm       | Round        | Osc          | £27.27 |

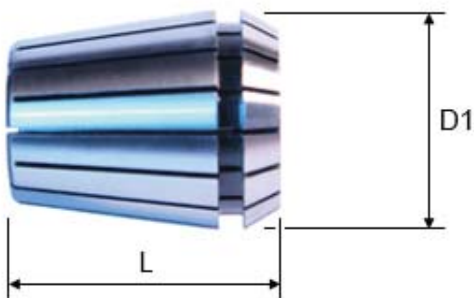
# Collets and Cones

## ER Type Collets

A wide selection of metric and imperial ER type standard collets. These can be used with a wide range of spindle types including Perske, Elte, Colombo and HSD.

**It is essential to use the correct size collet for the tool shank diameter.** First make sure you are looking at the right type of collet to fit the spindle on your machine and then select the required size from either the metric or imperial range.

Use the table below to select the right size of ER collet. The example spindles shown are just a small selection of where these collets can be used. Even if your spindle is listed the best way to check compatibility is to compare the dimensions in the table with one of your existing collets.



| Collet Type | D1 (mm) | L (mm) | Example Spindle Types   |
|-------------|---------|--------|---|
| ER16        | 17      | 27.5   | Colombo RC73, 1.5kw (2HP)   |
| ER20        | 21      | 31.5   | Perske KRS35 (1/2" capacity), 1.2kw, 1.7kw  |
| ER25        | 26      | 34     | Elte TMPE3 & TMPE4, 2.2kw (3HP), 3.7kw (5HP)<br>Colombo RC90, 4.1kw (5.5HP)             |
| ER32        | 33      | 40     | Elte TMPE5, 4.5kw (6HP), 7kw (10HP)<br>HSD 4kw (5HP), 7kw (10HP)<br>Colombo RC110, 10kw |

Collets should be replaced every 3-6 months. This will avoid problems associated with worn collets including:

- poor cut quality
- reduced tool life
- premature tool breakage
- tools working loose whilst cutting

| Product Code | Type | Shank Dia (D1)     | Price  |
|--------------|------|--------------------|--------|
| C1603        | ER16 | 3mm                | £11.90 |
| C1604        | ER16 | 4mm                | £11.90 |
| C1605        | ER16 | 5mm                | £11.90 |
| C1606        | ER16 | 6mm                | £11.90 |
| C1608        | ER16 | 8mm                | £11.90 |
| C1610        | ER16 | 10mm               | £11.90 |
| C16013       | ER16 | 1/8"               | £25.00 |
| C16025       | ER16 | 1/4"               | £25.00 |
| C2002        | ER20 | 2mm - 1mm          | £13.80 |
| C2003        | ER20 | 3mm - 2mm          | £13.80 |
| C2004        | ER20 | 4mm - 3mm          | £13.80 |
| C2005        | ER20 | 5mm - 4mm          | £13.80 |
| C2006        | ER20 | 6mm - 5mm          | £13.80 |
| C2008        | ER20 | 8mm - 7mm          | £13.80 |
| C2010        | ER20 | 10mm - 9mm         | £13.80 |
| C2012        | ER20 | 12mm - 11mm        | £13.80 |
| C20025       | ER20 | 7mm - 6mm (1/4")   | £27.00 |
| C20050       | ER20 | 13mm - 12mm (1/2") | £27.00 |
| C2502        | ER25 | 2mm - 1mm          | £28.00 |
| C2503        | ER25 | 3mm - 2mm          | £28.00 |
| C2504        | ER25 | 4mm - 3mm          | £28.00 |
| C2505        | ER25 | 5mm - 4mm          | £28.00 |
| C2506        | ER25 | 6mm - 5mm          | £28.00 |
| C2508        | ER25 | 8mm - 7mm          | £28.00 |
| C2509        | ER25 | 9mm - 8mm          | £28.00 |
| C2510        | ER25 | 10mm - 9mm         | £28.00 |
| C2511        | ER25 | 11mm - 10mm        | £28.00 |
| C2512        | ER25 | 12mm - 11mm        | £28.00 |
| C25025       | ER25 | 7mm - 6mm (1/4")   | £28.00 |
| C25050       | ER25 | 13mm - 12mm (1/2") | £28.00 |
| C3202        | ER32 | 2mm - 1mm          | £28.00 |
| C3203        | ER32 | 3mm - 2mm          | £28.00 |
| C3204        | ER32 | 4mm - 3mm          | £28.00 |
| C3205        | ER32 | 5mm - 4mm          | £28.00 |
| C3206        | ER32 | 6mm - 5mm          | £28.00 |
| C3208        | ER32 | 8mm - 7mm          | £28.00 |
| C3209        | ER32 | 9mm - 8mm          | £28.00 |
| C3210        | ER32 | 10mm - 9mm         | £28.00 |
| C3211        | ER32 | 11mm - 10mm        | £28.00 |
| C3212        | ER32 | 12mm - 11mm        | £28.00 |
| C3215        | ER32 | 15mm - 14mm        | £28.00 |
| C3216        | ER32 | 16mm - 15mm        | £28.00 |
| C3220        | ER32 | 20mm - 19mm        | £28.00 |
| C32013       | ER32 | 1/8"               | £28.00 |
| C32025       | ER32 | 7mm - 6mm (1/4")   | £28.00 |
| C32038       | ER32 | 3/8"               | £28.00 |
| C32050       | ER32 | 13mm - 12mm (1/2") | £28.00 |

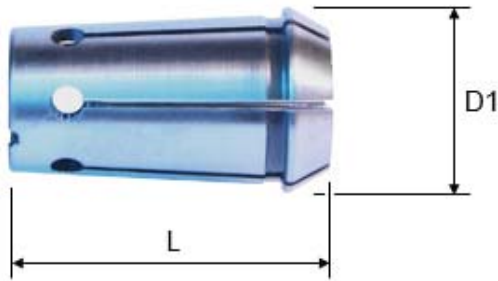
# Collets and Cones

## OZ Type Collets

A full range of metric and imperial size OZ 1831 and OZ 1833 type collets for use with Perske spindles. These differ to the ER collets in that they are made to take an exact size cutter shank.

It is essential to use the correct size collet for the tool shank diameter. First make sure you are looking at the right type of collet to fit the spindle on your machine and then select the required size from either the metric or imperial range.

Use the table below to select the right type of OZ collet. The example spindles shown are just a selection of where these collets can be used. Even if your spindle is listed the best way to check compatibility is to compare the dimensions in the table with one of your existing collets.



| Collet Type | D1 (mm) | L (mm) | Example Spindle Types                               |
|-------------|---------|--------|---|
| OZ 1831     | 14.4    | 26     | Perske KRS35 1.2kw & 1.7kw                          |
| OZ 1833     | 19.7    | 34     | Perske KNS50 2.2kw (3HP)<br>Perske VS60 5kw (6.7HP) |

Collets should be replaced every 3-6 months. This will avoid problems associated with worn collets including:

- poor cut quality
- reduced tool life
- premature tool breakage
- tools working loose whilst cutting



C3103

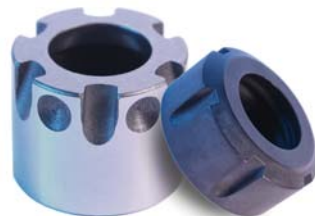


C33375

| Product Code | Type   | Shank Dia (D1) | Price  |
|--------------|--------|----------------|--------|
| C3102        | OZ1831 | 2mm            | £19.20 |
| C3103        | OZ1831 | 3mm            | £19.20 |
| C3104        | OZ1831 | 4mm            | £19.20 |
| C3105        | OZ1831 | 5mm            | £19.20 |
| C3106        | OZ1831 | 6mm            | £19.20 |
| C3108        | OZ1831 | 8mm            | £19.20 |
| C31013       | OZ1831 | 1/8"           | £19.20 |
| C31019       | OZ1831 | 3/16"          | £19.20 |
| C31025       | OZ1831 | 1/4"           | £19.20 |
| C3302        | OZ1833 | 2mm            | £21.90 |
| C3303        | OZ1833 | 3mm            | £21.90 |
| C3304        | OZ1833 | 4mm            | £21.90 |
| C3305        | OZ1833 | 5mm            | £21.90 |
| C3306        | OZ1833 | 6mm            | £21.90 |
| C3308        | OZ1833 | 8mm            | £21.90 |
| C3310        | OZ1833 | 10mm           | £21.90 |
| C3312        | OZ1833 | 12mm           | £21.90 |
| C33013       | OZ1833 | 1/8"           | £21.90 |
| C33025       | OZ1833 | 1/4"           | £21.90 |
| C33038       | OZ1833 | 3/8"           | £21.90 |
| C33050       | OZ1833 | 1/2"           | £21.90 |

## Collet Locknuts

Locknuts for use with a wide range of spindles, collets and toolholder cones. Locknuts are designed to be used with a specific type of collet but also need to have the correct thread for the spindle or toolholder cone.



| Product Code | Description   | Price  |
|--------------|---|--------|
| LN0031       | Locknut for OZ1831 collets, eg: Perske KRS35 spindle  | £26.00 |
| LN0033       | Locknut for OZ1833 collets, eg: Perske KNS50, VS50, VS60 spindles                           | £34.00 |
| LN135        | Locknut for Kress 600W spindle  | £15.00 |
| LN169        | Locknut for Kress 900W spindle  | £15.00 |
| LN0020       | Locknut for ER20 collets. 'Mini' style locknut, eg: Perske KRS35 with large (1/2") capacity | £25.00 |
| LN0025       | Locknut for ER25 collets, eg: Elte TMPE3/4 and Colombo RC/RV90 spindles                     | £43.00 |
| LN0016       | Locknut for ER16 collets. 'Mini' style locknut, eg: Colombo RC73 spindles                   | £25.00 |
| LN0032       | Locknut for ER32 collets, eg: Elte TMPE5, HSD, Colombo RC110 spindles                       | £69.00 |



# AutoToolchange & Quick Release Accessories

A wide selection of toolholder cones, pull studs and clips suitable for HSD and Colombo spindles.

All cones are supplied complete with locknut.



| Product Code | Description  | Price   |
|--------------|--|---------|
| CN2016       | ISO20 Cone for use with ER16 collets. Fits Colombo RC73 spindles                               | £190.00 |
| CN2525       | ISO25 Cone for use with ER25 collets. Fits Colombo RC/RV90 spindles                            | £119.00 |
| CN3032       | ISO30 Cone for use with ER32 collets. Fits HSD and Colombo RC110 spindles                      | £135.00 |
| CN3032A      | ISO30 Cone for use with ER32 collets. Use on Pacer machines with Colombo RC110 or HSD spindles | £135.00 |
| PS020        | Replacement Pull Stud for ISO20 Cone   | £19.00  |
| PS025        | Replacement Pull Stud for ISO25 Cone   | £19.00  |
| PS030        | Replacement Pull Stud for ISO30 Cone   | £25.00  |
| TC020        | Replacement toolclip for Pacer machine autotoolchange toolrack using ISO20 cones               | £23.00  |
| TC025        | Replacement toolclip for Pacer machine autotoolchange toolrack using ISO25 cones               | £25.00  |
| TC030        | Replacement toolclip for Pacer machine autotoolchange toolrack using ISO30 cones               | £33.00  |



CN2016



CN3032



PS020



TC020

# Spanners

A range of spanners to suit all spindles and locknuts.



| Product Code | Description   | Price  |
|--------------|---|--------|
| SA3002-1     | 17mm combination spanner for Perske KRS35 spindle and ISO20 toolholder cones          | £9.60  |
| SA3003-1     | 24mm combination spanner for Perske KNS50 spindle                                     | £17.00 |
| SA2004-1     | 24mm / 27mm open-end spanner for ISO25 toolholder cones                               | £17.00 |
| SA4008-1     | 32mm / 36mm open-end spanner for ISO30 toolholder cones                               | £34.00 |
| SA4001-1     | Hook spanner 25-28 for LN0031 locknut (OZ1831 collets)                                | £15.60 |
| SA4002-1     | Hook spanner 34-36 for LN0033 locknut (OZ1833 collets)                                | £15.60 |
| SA4004-1     | Hook spanner 40-42 for LN0025 locknut (ISO25 cone, Elite spindles using ER25 collets) | £15.60 |
| SA4007-1     | Hook spanner 45-50 for LN0032 locknut (ISO30 cone, Elite spindles using ER32 collets) | £16.60 |
| SA4005-1     | Locknut spanner for 'Mini' LN0016 locknut used with ER16 collets                      | £49.00 |
| SA4003-1     | Locknut spanner for 'Mini' LN0020 locknut used with ER20 collets                      | £49.00 |

## Consumables

### Texon

Texon sacrificial diffuser sheet. This is designed for use primarily on Pacer machine beds as a porous, sacrificial surface. It enhances vacuum hold down and will not cause damage or wear to tools if it is cut into.



| Product Code | Description                         | Price  |
|--------------|-------------------------------------|--------|
| KA2701       | Pack of 5 sheets, 1.5m x 1.22m x3mm | £85.00 |

# Consumables

## Cutting Oil/Lubricant

This specially formulated cutting oil is designed to provide superior cutting performance for all metal cutting applications. It can be used in spray mister systems and is only required in very small quantities to maintain cutter lubrication and therefore quality of cut edge and prolonged tool life.



| Product Code | Description                               | Price  |
|--------------|---|--------|
| LUB2001      | 1 litre, minimal amount cutting lubricant | £22.00 |

## Machine Maintenance

A selection of grease and lubricating sprays for routine maintenance of CNC routers.

These should be used according to the machine manufacturers maintenance schedule to ensure optimum machine performance, reduce the risk of breakdowns and to prolong the life of the all important bearings, sideways and drive systems.



| Product Code | Description                           | Price  |
|--------------|---------------------------------------|--------|
| GRE0400      | Grease cartridge                      | £3.40  |
| NA1001       | Penetrating spray with PTFE (400ml)   | £13.25 |
| NA1010       | General purpose service spray (500ml) | £6.46  |

# Swarf Cone Brushes

These are replaceable brush rings which clip into place on the swarf cones used on various manual and quick release (ATC) spindles on Pacer CNC routers. Used correctly, they will eliminate the scattering of swarf and dust by the cutter and they enhance the performance of the cyclonic extraction system to maintain a clean and tidy workplace.



| Product Code | Description  | Price  |
|--------------|--|--------|
| BRH2015E     | 15mm brush for Elte spindle on Pacer                 | £16.00 |
| BRH2020E     | 20mm brush for Elte spindle on Pacer                 | £16.00 |
| BRH2030E     | 30mm brush for Elte spindle on Pacer                 | £16.00 |
| BRH2040E     | 40mm brush for Elte spindle on Pacer                 | £16.00 |
| BRH2050E     | 50mm brush for Elte spindle on Pacer                 | £19.50 |
| BRH2015P     | 15mm brush for Perske spindle on Pacer               | £15.25 |
| BRH2020P     | 20mm brush for Perske spindle on Pacer               | £15.25 |
| BRH2030P     | 30mm brush for Perske spindle on Pacer               | £21.50 |
| BRH2040P     | 40mm brush for Perske spindle on Pacer               | £14.95 |
| BRH2050P     | 50mm brush for Perske spindle on Pacer               | £15.50 |
| BRH2025C1.5  | 25mm, 2 piece set for Colombo 1.5kw spindle on Pacer | £10.85 |
| BRH2045C1.5  | 45mm, 2 piece set for Colombo 1.5kw spindle on Pacer | £10.85 |
| BRH2025C4.1  | 25mm, 2 piece set for Colombo 4.1kw spindle on Pacer | £17.50 |
| BRH2045C4.1  | 45mm, 2 piece set for Colombo 4.1kw spindle on Pacer | £17.50 |
| BRH2025H10.0 | 25mm, 2 piece set for HSD 10hp spindle on Pacer      | £13.85 |
| BRH2045H10.0 | 45mm, 2 piece set for HSD 10hp spindle on Pacer      | £13.85 |

## Some General Tooling Recommendations

- Use single edge router bits when speed is the primary consideration and finish is less important.
- Use double edge router bits when finish is the primary consideration.
- Use upcut spiral router bits for grooving, slotting or when fast chip removal is required.
- Use spiral, straight or shear tools for natural woods depending on type of cut required.
- Use spiral, straight or shear carbide tools for composites, particleboard, plywood or MDF.
- Use spiral tools when finish and/or available horsepower are problems.
- The cutting length of the tool is very important to the finish. Use the shortest cutting length allowable, based on the material thickness. Using a tool with a cutting length that is longer than required can cause vibration, deflection and an inferior finish.
- In general, the cutting length should not be more than four times the cutting diameter. Bits with a cutting length over four times their diameter will be subject to increased breakage.
- Use the largest tool diameter allowable for increased rigidity, finish and tool life.

## Solid Tungsten Carbide Router Bits

Tungsten carbide cutters are made up of very hard particles of tungsten carbide bound together with metallic cobalt. Bits produced with this material are very strong and durable and tend to stay sharper longer than HSS tools.

## Carbide-Tipped Router Bits

Carbide-tipped tooling provides some of the edge longevity of carbide with the lower cost of a steel base. Carbide tipped bits are only available with straight flutes.

## High-Speed Steel (HSS) Router Bits

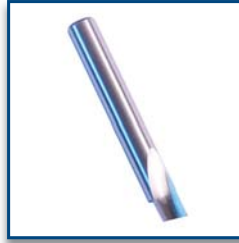
HSS is a poured material, chemically and metallurgically bonded together. The steel is processed from raw ore and heated to a liquid stage where several minerals and elements are added to improve the internal structure. Typically, HSS tool life is not as long as carbide.

## Ceramic and Diamond Coated Router Bits

This tooling is worth considering when carbide's life is not acceptable. The major consideration with these tools is the cost of the coating materials.

# Tool Geometry and Material Types

## Straight Flute



Use for wood and plastic operations. The straight flute design, in single or multiple cutting edges, produces a clean finish. The harder the material, the more cutting edges are recommended. The straight flute does not allow for the lifting of material out of the cut.

## Spiral Flute



Use for aluminium, wood and plastic operations. The up-spiral flute is especially good for chip removal. When cutting aluminium and plastic, re-melting of the chips is the primary source of poor cut quality.

Use **single spiral flute** tools for faster feed rates in softer materials. The single-flute cutter typically has lots of room for chips, but the single cutting edge limits either the feed rate or the hardness of the material to be cut. These types of cutters are especially recommended for plastics.

Use **double or triple spiral flutes** for a better finish in harder materials. Double-flute bits provide a smoother cutting action because the chip load is smaller than a single-flute cutter for a given feed. This allows harder materials to be handled.

**Upcut spirals** are the most popular type of spiral fluted tool. Use these for grooving or slotting, for upward chip evacuation and best finish on the bottom side of the part. These bits allow for rapid cuts since the tool clears the chips away from the material. This type of tool is not recommended for softer materials because of the ragged finish that can result on the top surface. This type of geometry is used whenever the best finish is needed on the bottom side of a part.

**Downcut spiral tools** are best used for thinner materials which will be pushed down into the machine bed rather than being lifted with an upcut spiral. They are also best for leaving a good cut finish on the top surface of cut parts. Note that the cutting speeds usually have to be reduced because the chips are pushed back into the material. Chip extraction is generally less effective with this type of tool than it is with upcut spiral tools.

## Chipbreaker

Use for wood roughing or hogging operations. The chipbreaker is designed to break up chips for fast, clean and efficient removal whilst reducing overall chipload.

## Compression Spiral

Compression spirals are used extensively for cutting double sided laminates. These tools can also be used on natural woods where edge finishing is a problem with standard spiral tools. This tool will leave a clean edge cut.

## General Recommendations



Tools should be changed at the first sign of edge deterioration causing finish degradation or increase in operator effort to maintain feed rates.



Never allow the tools to dwell in a cut.



The router bit should be fed in such a manner so that in moving through the work, it has a chance to bite or cut its way freely. If the feedrate is too fast, strain and deflection will occur. If fed too slowly, friction and burning will occur. Both decrease the life of the router bit and are common causes of breakage.



The router spindle must be well maintained for any cutting tool to perform properly. Routinely check the collet for wear. Inspect tools for collet marks, indicating slippage due to wear or dust build up. Check spindle on a dial indicator for run-out. Collet and run-out problems cause premature tool failure and associated production difficulties.



Do not use adaptor bushings to reduce size of the collet on a routing or production basis. Tools will not perform properly in bushings over an extended period of time. Bushings are for prototype, experimentation, test and evaluation and not for production.



Wherever possible, use a coolant when routing. Heat buildup caused by action between the tool and workpiece will lead to premature tool failure.



Heat is a function of surface area per unit of time, thus, the more dense the material, the faster the feed rate to minimise heat. However a compromise must be reached between finish and heat.



Tool life is affected dramatically by tool geometry. Rake and clearance angles, as well as cutting edge length should be examined.



Router bit breakage is most often caused by a misapplication of the router bit. Do not assume the proper router bit is being used.

# Fitting Tools into Collets and Spindles

1. Make sure you have the right size collet for the tool to be used. Push the collet into the nut until it clicks into position. Insert collet at slight angle to engage collet groove in locking ring of nut.



2. Screw the nut loosely onto the spindle or toolholder cone.



3. Insert the tool into the collet. The tool should fill at least 80% of the collet bore but do not allow any of the flute run out to enter the collet.



Note: To ensure trouble free operation, always insert the collet into the collet nut until it clicks in and thread it loosely onto the spindle prior to inserting router bit.

## Collet Maintenance

Collet maintenance is one of the most common causes of inadequate tool life or breakage. There are many factors, that can affect this critical tool holding system called a collet. As a chain is only as strong as the weakest link, a router bit can only be as good as the system that holds it properly. The small amount of time spent to regularly inspect and clean the collet system, will be more than offset by increased productivity and a reduction in overall costs.





## 1. Internal Collet Clamping Surfaces

The most important link in the tool holder chain is the inside of the collet. Resin migrates up through the slits in the collet and then deposits itself on the inside of the collet. This resin build up, if not removed, causes the collet to grip inconsistently on the tool shank. By not applying equal pressure throughout the entire gripping range of the collet, the tool holder allows the tool to resonate inside, causing slippage inside the collet.

Slippage can cause “fretting”, a condition in which resins are deposited on the shank of the tool. Any resin buildup should always be removed from the inside of the collet.

## 2. Internal Spindle & Collet Taper

The inside taper of the spindle and tool holder is a critical surface which accumulates resin build up and should be cleaned at each tool change to maintain best concentricity. Felt brushes are available to fit most taper sizes and provide a quick means of removing short-term buildup.

## 3. External Collet & Tool Holder Taper

The outside taper of the collet and tool holder require regular inspection and should be cleaned of all deposits each time the tool is changed. Brass brushes work well for this application, but felt cloths can also be used if the tapers are regularly maintained and the buildup is minor.

## 4. Clamping Nut Surfaces

The inside of the nut should be clean and free of burrs on the surface. Any surface burrs or contamination will not only skew a collet but can also permanently ruin a new collet. The clamping nut should be cleaned with a brass brush during every tool change. Special care should be taken to examine the clamping nut threads on a regular basis.

## 5. Tool Holders

Tool holders such as the ISO 30 have additional matching and mating tolerances beyond those of the older tapers. Because of their unique design, these tool-holding systems can be more prone to runout caused by resin buildup. “Fretting” or “Bronzing” will cause inconsistent gripping in the taper and / or the flat mating surface and reduce consistency of tool life. If ignored, these conditions can eventually produce premature spindle failure. The mating surfaces should be cleaned regularly.

All of these components are critical and should be regularly maintained. One more item not to be overlooked is that collets should be replaced on a regular basis, approximately every 400 to 600 run time hours. This means inspection for metallic damage such as bell mousing or burrs with every tool change. If damage is visible, the collet should be discarded and replaced.

Also consider that even if there is no damage present the collet can be worn out through metal fatigue. Heat is directly transferred from the tool to the collet. These heating / cooling cycles remove the original tempering of the steel. Collets are made from spring steel allowing them to have a certain amount of elasticity to grip the tool. As the heat cycle is repeated this elasticity diminishes. Over time, a collet requires increased tightening to maintain the tool in proper position. As over tightening increases, the collet is distorted, creating eccentricities in the tool holder. Therefore, instead of over tightening older collets and creating a number of other problems, the collet should be replaced. Often the cost of a new collet can be offset by the cost of needlessly broken tools in one shift alone.

# Troubleshooting Cutting Problems

For every problem there is a possible cause and a solution. Here are some typical problems that you may encounter and possible solution for each problem.

| Problem   | Cause  | Solution  |
|---|--|---|
| Tool Breakage                                     | Heat buildup due to incorrect tool selection | Use correct tool for material being cut                                 |
|   | Heat due to inadequate chip removal          | Use up spiral tool to help in chip removal                              |
|   | Too high a plunge rate                       | Reduce plunge rate  |
|   | Blunt tool                                   | Replace tool  |
|   | Tool runout                                  | Tighten tool in collet or if necessary change collet                    |
|   | Worn collet                                  | Replace collet  |
|   | Too high a feed rate                         | Reduce feed rate  |
|   | Too high a chip load                         | Reduce feed rate or increase RPM or change tool to one with more flutes |
|   | Vibration                                    | Improve workpiece hold down to machine bed                              |
|   | Tool not fitted correctly in collet          | Re-fit tool in collet ensuring at least 80% of collet length is used    |
| Poor cut finish due to chip rewelding to cut edge | Tool deflection                              | Reduce feed rate but if possible use larger diameter tool               |
|   | No coolant                                   | Use mist coolant or cold air gun  |
|   | Blunt tool                                   | Replace tool  |
|   | Too slow a feed rate                         | Increase feed rate  |
|   | Incorrect tool selection for material        | Choose correct tool for material being machined                         |
| Heat due to inadequate chip removal               | Use up spiral tool                           |   |



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