



# CUTTING TOOLS FOR SOFT MATERIALS

SPECIFICALLY FOR PLASTICS, ALUMINIUM,  
WOOD, COMPOSITES, ETC...



**DIAGER<sup>®</sup>**  
INDUSTRIE



**F**or almost 70 years, Diager Industrie has operated as a specialised French designer and manufacturer of rotary carbide cutting tools. Located in Poligny in the Jura region of eastern France, the company develops special and standard, single-piece cutting tools. Diager Industrie draws on all the synergies generated by a group structure to design high-quality tools for manufacturers. The company has fostered strong partnerships with leading players in the engineering, aeronautics, space and automotive industries and focuses its expertise on a range of high quality products.

## **RESEARCH & DEVELOPMENT: TAKING THE COMPANY TO THE NEXT LEVEL**

We invest heavily in research, development and innovation. Our ambition is to be able to resolve the machining problems you face. Our investments enable us to develop comprehensive and innovative solutions for these problems. For all your drilling, milling and boring operations, our experts develop not only cutting tools but also the optimal process for your application since we are, first and foremost, a supplier of solutions.

To facilitate this, we have set up: a team tasked with finding solutions that optimise your manufacturing strategy and industrial logistics; and testing platforms designed to be compatible with customers' equipment that enables us to

validate our machining processes in real-life conditions. These resources enable us to accurately measure the productivity achievable with our cutting tools and thus provide you with a complete picture of the costs associated with our solutions and the production times they allow. Consequently, we can meet, very precisely, the most demanding requirements specifications and guarantee the performance of our cutting tools.

Our pool of 135 machining tools, 45 of which are numerically controlled, gives us total control over our processes and tools, to make them even more efficient.



# A MOTIVATED AND COMMITTED COMPANY

Diager Industrie's ethos is founded on the excellent customer service and on ensuring the high quality of its products. Thanks to modern technologies and a significant investment from our staff, we do everything we can to reduce our impact on the environment. By adhering to a comprehensive environmental policy, we can guarantee that we control our activities and products. Caring for the environment is a constant priority, and informs all the activities performed by the company.



## PROCEDURES AND ACCREDITATIONS:



ISO 9001  
and 14001  
certified



Quality



Compliance  
with standards,  
respect for the  
environment

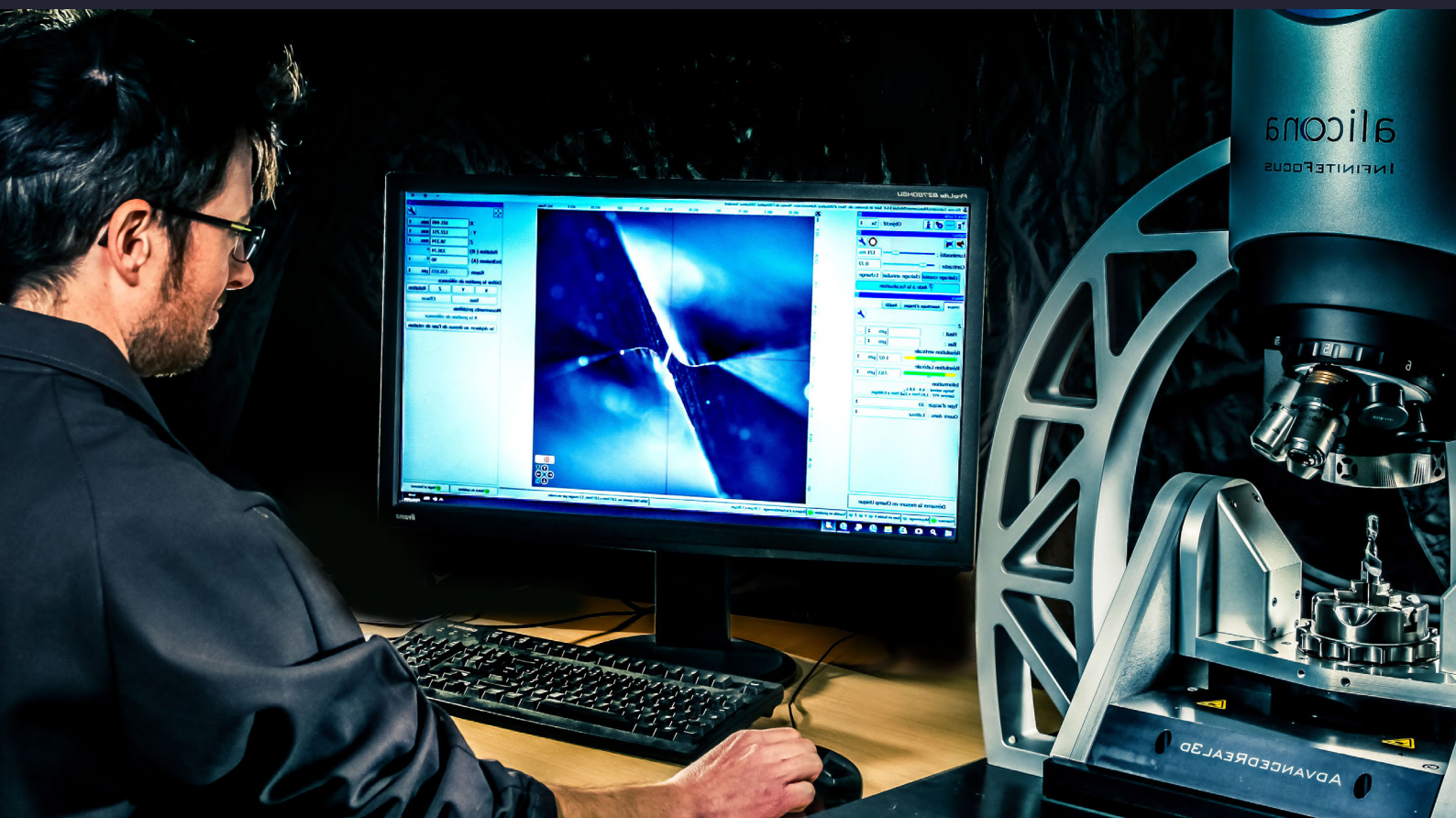


Awarded  
CRS (ISO) 26000  
by AFNOR and  
certified at the  
"CONFIRMED" level.

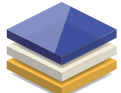


Our approach to CSR is a philosophy which drives our actions and guides our strategy. Our commitment to CSR indicates that our organisation takes responsibility for the impacts of its decisions and of its duties with regard to the sustainable development of its activities. We are proud of our certification which recognises our commitments to the well-being of our staff, our respect for the environment and product quality.

**Diager Industrie solutions come with the additional benefits  
of comprehensive support and optimal technical follow-up.  
Our teams are ready to work with you to ensure your success.**



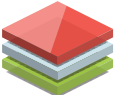
# MATERIALS



THERMOSETTING  
PLASTICS

## THERMOSETTING PLASTICS

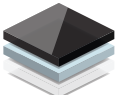
(PUR, Epoxy, DAP, PI, PF)



THERMO-  
PLASTICS

## THERMOPLASTICS

(PMMA, PE, PP, ABS, PC, POM, PET, PEEK, PS, PA)



SOFT  
PLASTICS

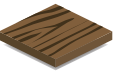
## SOFT PLASTICS

(PVC, PP, HDPE, Foamlite®, Nylon...)



EXPANDED  
PVC

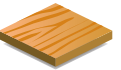
## EXPANDED PVC



HARD  
WOOD

## HARDWOODS

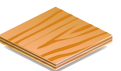
(Oak, beech, chestnut, elm, acacia, etc.)



SOFT  
WOOD

## SOFTWOODS

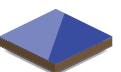
(Pine, birch, larch, spruce, etc.)



COMPOSITE  
WOODS

## COMPOSITE WOOD PRODUCTS

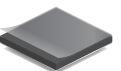
(MDF, melamine, plywood, etc.)



HIGH PRESSURE  
LAMINATES

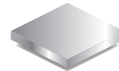
## COMPACT LAMINATES

(TRESPA®, FunderMAX®, ...)



PHENOLIC  
MATERIALS

## PHENOLIC MATERIALS



NON-FERROUS  
MATERIALS

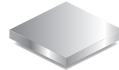
## NON-FERROUS METALS

(Aluminium, brass)



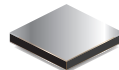
STEEL

## STEEL



STAINLESS  
STEEL

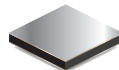
## STAINLESS STEEL



ALUMINUM LAYERS  
COMPOSITE PANELS

## ALUMINIUM-FACED COMPOSITE PANELS

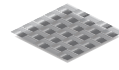
(Dibond®, Alucobond®)



STEEL LAYERS  
COMPOSITE PANELS

## STEEL-FACED COMPOSITE PANELS

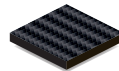
(Steelbond®)



GLASS FIBER  
REINFORCED PLASTICS

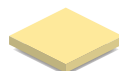
## GLASS-FILLED PLASTICS

(<40% glass fibres)



KEVLAR

## KEVLAR



FOAM

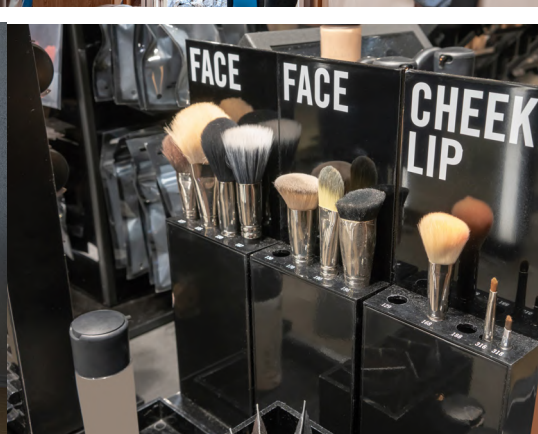
## FOAMED MATERIALS





# APPLICATIONS

**IN-STORE  
ADVERTISING  
SIGNAGE  
FACADES  
JOINERY ITEMS  
ACCESSORIES  
STANDS**

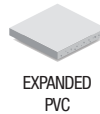
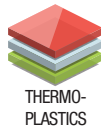




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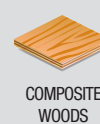
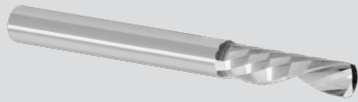
## 4013 ONE-FLUTE UPCUT CUTTERS

P. 8



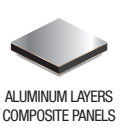
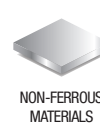
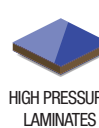
## 4012 ONE-FLUTE DOWNCUT CUTTERS

P. 9



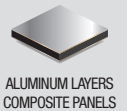
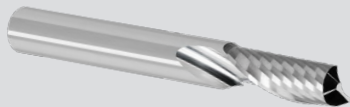
## 4053 ONE-FLUTE, HIGH-EFFICIENCY UPCUT CUTTERS

P. 11



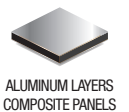
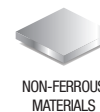
## 4023 ONE-FLUTE UPCUT CUTTERS FOR ALUMINIUM

P. 12



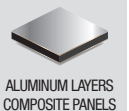
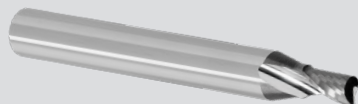
## 4022 ONE-FLUTE DOWNCUT CUTTERS FOR ALUMINIUM

P. 13



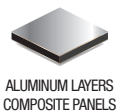
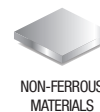
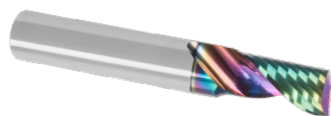
## 4001 SHORT ONE-FLUTE UPCUT CUTTER FOR ALUMINUM

P. 14



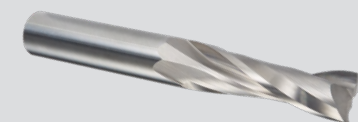
## 4001 NHC SHORT, COATED ONE-FLUTE UPCUT CUTTER FOR ALUMINUM

P. 15



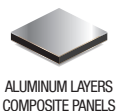
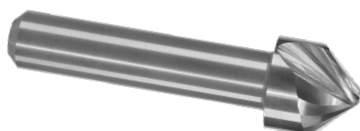
## 4052 TWO-FLUTES CUTTERS SPECIFIC FOR SOFT PLASTICS

P. 16



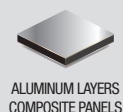
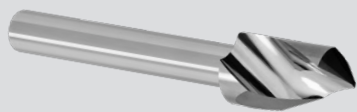
## 4045 HIGH-SPEED CONICAL TWO-TOOTH CUTTERS FOR SLOT CUTTING - FOLDING

P. 17



## 4041 CONICAL, ONE-FLUTE CUTTERS FOR CUTTING SLOTS - FOLDING

P. 18



ALUMINUM LAYERS  
COMPOSITE PANELS

## 4044 CUTTERS FOR SLOT CUTTING - FOLDING - CHAMFERING

P. 19



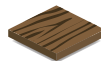
THERMOSETTING  
PLASTICS



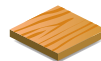
THERMO-  
PLASTICS



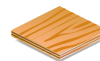
EXPANDED  
PVC



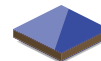
HARD  
WOOD



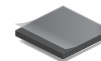
SOFT  
WOOD



COMPOSITE  
WOODS



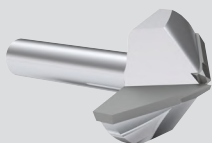
HIGH PRESSURE  
LAMINATES



PHENOLIC  
MATERIALS

## 4042 CUTTERS FOR SLOT CUTTING - CHAMFERING

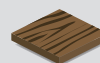
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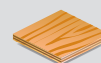
THERMOSETTING  
PLASTICS



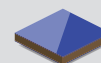
EXPANDED  
PVC



HARD  
WOOD



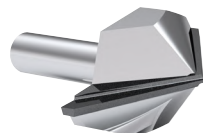
COMPOSITE  
WOODS



HIGH PRESSURE  
LAMINATES

## 4043 CUTTERS FOR SLOT CUTTING - CHAMFERING

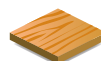
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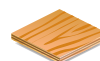
THERMO-  
PLASTICS



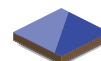
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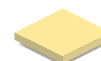
SOFT  
WOOD



COMPOSITE  
WOODS



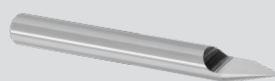
HIGH PRESSURE  
LAMINATES



FOAM

## 4070 CONICAL ENGRAVING CUTTERS

P. 22



THERMOSETTING  
PLASTICS



THERMO-  
PLASTICS



EXPANDED  
PVC



HARD  
WOOD



SOFT  
WOOD



COMPOSITE  
WOODS



HIGH PRESSURE  
LAMINATES



NON-FERROUS  
MATERIALS



ALUMINUM LAYERS  
COMPOSITE PANELS



STEEL LAYERS  
COMPOSITE PANELS

## 4080 FACE MILLING CUTTERS

P. 23



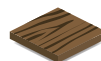
THERMOSETTING  
PLASTICS



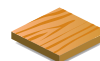
THERMO-  
PLASTICS



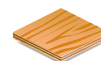
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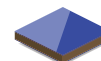
HARD  
WOOD



SOFT  
WOOD



COMPOSITE  
WOODS



HIGH PRESSURE  
LAMINATES

## CUTTING CONDITIONS

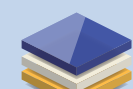
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IMPACT OF COLLETS ON CUTTING QUALITY  
ADVICE ABOUT MACHINING.  
DEPTH OF CUT AND MACHINING DIRECTION

P. 25



## MATERIALS:



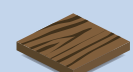
THERMOSETTING  
PLASTICS



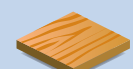
THERMO-  
PLASTICS



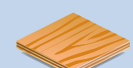
EXPANDED  
PVC



HARD  
WOOD



SOFT  
WOOD

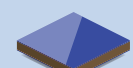


COMPOSITE  
WOODS

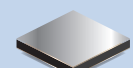


FOAM

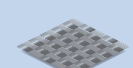
## Possible uses:



HIGH PRESSURE  
LAMINATES



ALUMINUM LAYERS  
COMPOSITE PANELS



GLASS FIBER  
REINFORCED PLASTICS

\*Strengthened shank

## THE MOST VERSATILE RANGE

SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS

UPCUT TOOL, UPWARDS CHIP REMOVAL:

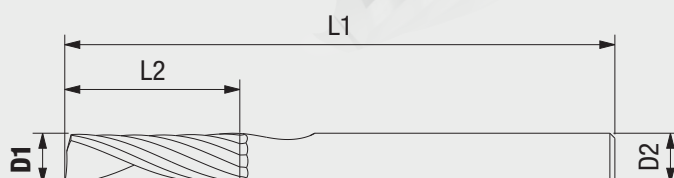
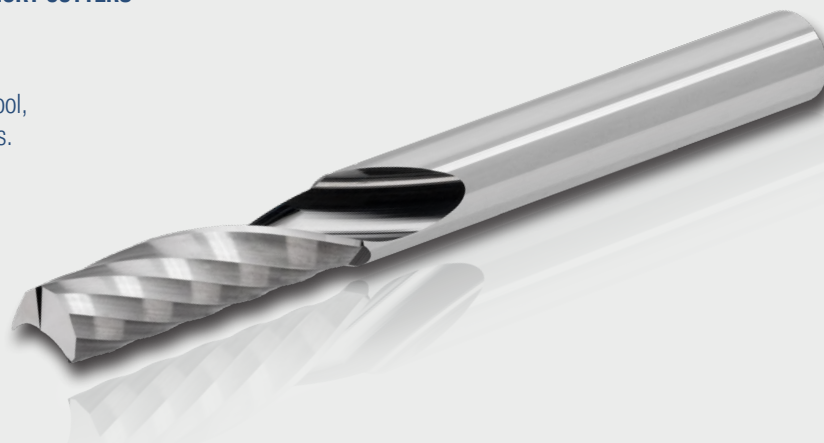
Chips evacuated efficiently.

The most commonly used.

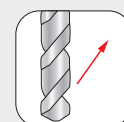
## WHEN POSSIBLE, SELECT SHORT CUTTERS

(CUTTING LENGTH = 2 X Ø):

- Improves surface finishes,
- Longer service life of the tool,
- Improves cutting conditions.



SOLID  
CARBIDE



UPCUT  
TOOL



MILLING /  
SLOTING

| Ø D1 |      | Ø D2        |              | LoC - L2 |       | OAL - L1 |       | z | Part Ref.   |
|------|------|-------------|--------------|----------|-------|----------|-------|---|-------------|
| Inch | mm   | Inch        | mm           | Inch     | mm    | Inch     | mm    |   |             |
| 1/16 | 1,59 | <b>1/8*</b> | <b>3,17*</b> | 1/8      | 3,17  | 1 1/2    | 38,1  | 1 | 4013--0159  |
| 1/16 | 1,59 | <b>1/8*</b> | <b>3,17*</b> | 1/4      | 6,35  | 1 1/2    | 38,1  | 1 | 4013--0159A |
| 1/8  | 3,17 | 1/8         | 3,17         | 1/4      | 6,35  | 1 1/2    | 38,1  | 1 | 4013--0317B |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 1/4      | 6,35  | 2        | 50,8  | 1 | 4013--0317C |
| 1/8  | 3,17 | 1/8         | 3,17         | 1/2      | 12,7  | 2        | 50,8  | 1 | 4013--0317  |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 1/2      | 12,7  | 2        | 50,8  | 1 | 4013--0317A |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 5/8      | 15,87 | 2        | 50,8  | 1 | 4013--0317D |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 3/4      | 19,05 | 2        | 50,8  | 1 | 4013--0317E |
| 3/16 | 4,76 | 3/16        | 4,76         | 3/8      | 9,52  | 2        | 50,8  | 1 | 4013--0476C |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 3/8      | 9,52  | 2        | 50,8  | 1 | 4013--0476D |
| 3/16 | 4,76 | 3/16        | 4,76         | 5/8      | 15,87 | 2        | 50,8  | 1 | 4013--0476  |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 5/8      | 15,87 | 2        | 50,8  | 1 | 4013--0476A |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 1 1/4    | 31,75 | 3        | 76,2  | 1 | 4013--0476B |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/8      | 9,52  | 2        | 50,8  | 1 | 4013--0635C |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/4      | 19,05 | 2        | 50,8  | 1 | 4013--0635  |
| 1/4  | 6,35 | 1/4         | 6,35         | 1 1/8    | 28,57 | 3        | 76,2  | 1 | 4013--0635A |
| 1/4  | 6,35 | 1/4         | 6,35         | 1 1/2    | 38,1  | 3        | 76,2  | 1 | 4013--0635B |
| 1/4  | 6,35 | 1/4         | 6,35         | 2 1/4    | 57,2  | 3 3/4    | 95,25 | 1 | 4013--0635D |
| 5/16 | 7,93 | 5/16        | 7,93         | 1/2      | 12,7  | 2        | 50,8  | 1 | 4013--0793  |
| 5/16 | 7,93 | 5/16        | 7,93         | 3/4      | 19,05 | 2 1/2    | 63,5  | 1 | 4013--0793A |
| 5/16 | 7,93 | 5/16        | 7,93         | 1        | 25,4  | 3        | 76,2  | 1 | 4013--0793B |
| 5/16 | 7,93 | 5/16        | 7,93         | 1 1/2    | 38,10 | 3 1/2    | 88,9  | 1 | 4013--0793C |
| 3/8  | 9,52 | 3/8         | 9,52         | 3/8      | 9,52  | 3        | 76,2  | 1 | 4013--0952  |
| 3/8  | 9,52 | 3/8         | 9,52         | 1 1/8    | 28,58 | 3        | 76,2  | 1 | 4013--0952A |
| 3/8  | 9,52 | 3/8         | 9,52         | 1 5/8    | 41,3  | 3 1/2    | 88,9  | 1 | 4013--0952B |
| 3/8  | 9,52 | 3/8         | 9,52         | 3 3/16   | 80,96 | 5        | 127   | 1 | 4013--0952C |
| 1/2  | 12,7 | 1/2         | 12,7         | 1 1/4    | 31,8  | 3        | 76,2  | 1 | 4013--1270  |
| 1/2  | 12,7 | 1/2         | 12,7         | 2        | 50,8  | 4        | 101,6 | 1 | 4013--1270A |

## VERSATILE RANGE

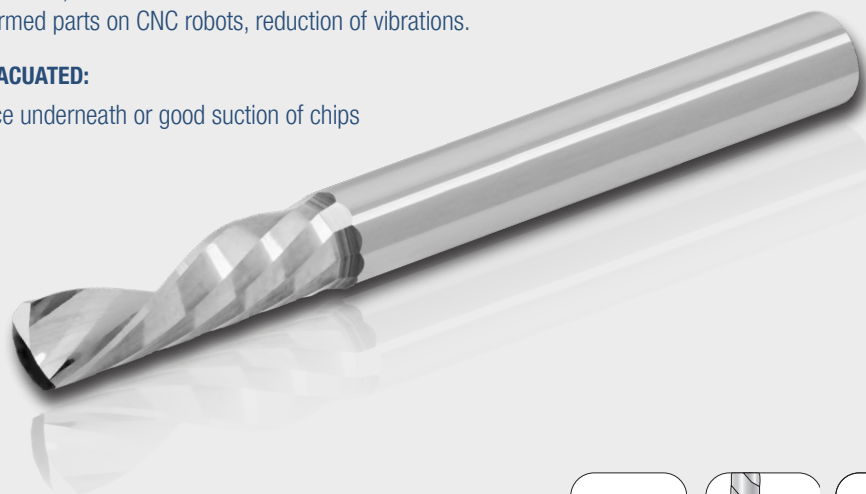
SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS

DOWNCUT TOOL, DOWNWARDS REMOVAL OF CHIPS

- Workpieces held better due to the downwards force.
- Limits the delamination of the upper face,
- Suited to thin materials,
- Milling thermoformed parts on CNC robots, reduction of vibrations.

## CHIPS POORLY EVACUATED:

Provide clear space underneath or good suction of chips



Carbide

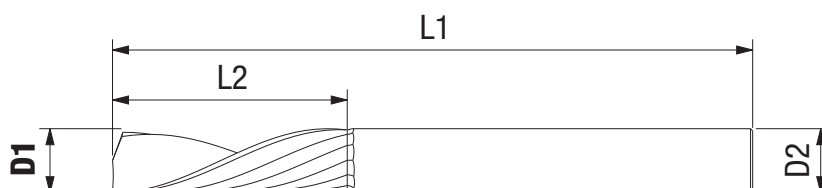
SOLID  
CARBIDE



DOWNCUT  
TOOL



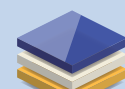
MILLING /  
SLOTING



| Ø D1 |      | Ø D2        |              | LoC - L2 |       | OAL - L1 |      | z | Part Ref.   |
|------|------|-------------|--------------|----------|-------|----------|------|---|-------------|
| Inch | mm   | Inch        | mm           | Inch     | mm    | Inch     | mm   |   |             |
| 1/16 | 1,59 | <b>1/8*</b> | <b>3,17*</b> | 1/8      | 3,17  | 1 1/2    | 38,1 | 1 | 4012--0159  |
| 1/16 | 1,59 | <b>1/8*</b> | <b>3,17*</b> | 1/4      | 6,35  | 1 1/2    | 38,1 | 1 | 4012--0159A |
| 1/8  | 3,17 | 1/8         | 3,17         | 1/4      | 6,35  | 1 1/2    | 38,1 | 1 | 4012--0317A |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 1/4      | 6,35  | 2        | 50,8 | 1 | 4012--0317B |
| 1/8  | 3,17 | 1/8         | 3,17         | 1/2      | 12,7  | 1 1/2    | 38,1 | 1 | 4012--0317C |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 1/2      | 12,7  | 2        | 50,8 | 1 | 4012--0317  |
| 3/16 | 4,76 | 3/16        | 4,76         | 5/8      | 15,87 | 2        | 50,8 | 1 | 4012--0476A |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 5/8      | 15,87 | 2        | 50,8 | 1 | 4012--0476  |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/4      | 19,05 | 2        | 50,8 | 1 | 4012--0635  |
| 1/4  | 6,35 | 1/4         | 6,35         | 1 1/4    | 31,75 | 3        | 76,2 | 1 | 4012--0635A |
| 1/4  | 6,35 | 1/4         | 6,35         | 1 1/2    | 38,1  | 3        | 76,2 | 1 | 4012--0635B |
| 5/16 | 7,93 | 5/16        | 7,93         | 3/4      | 19,1  | 2 1/2    | 63,5 | 1 | 4012--0793  |
| 5/16 | 7,93 | 5/16        | 7,93         | 1 1/2    | 38,1  | 3        | 76,2 | 1 | 4012--0793A |

\* Strengthened shank

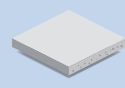
## MATERIALS:



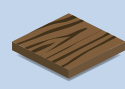
THERMOSETTING  
PLASTICS



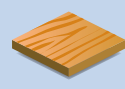
THERMO-  
PLASTICS



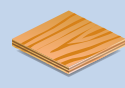
EXPANDED  
PVC



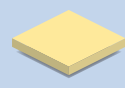
HARD  
WOOD



SOFT  
WOOD

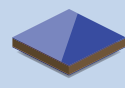


COMPOSITE  
WOODS

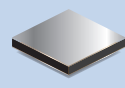


FOAM

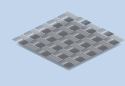
## Possible uses:



HIGH PRESSURE  
LAMINATES



ALUMINUM LAYERS  
COMPOSITE PANELS



GLASS FIBER  
REINFORCED PLASTICS







**THIS RANGE'S GEOMETRY HAS BEEN SPECIALLY DEVELOPED TO PRODUCE A BETTER SURFACE FINISH IN PMMA, POLYCARBONATE, PA6, CORIAN AND COMPACT LAMINATES.**  
SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS.  
UPCUT TOOL, UPWARDS REMOVAL OF CHIPS  
MORE RESISTANT TO ABRASION.

**WHEN POSSIBLE, SELECT SHORT CUTTERS**

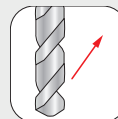
**(CUTTING LENGTH = 2 X Ø):**

- Improves surface finishes,
- Longer service life of the tool,
- Improves cutting conditions.



**Carbide**

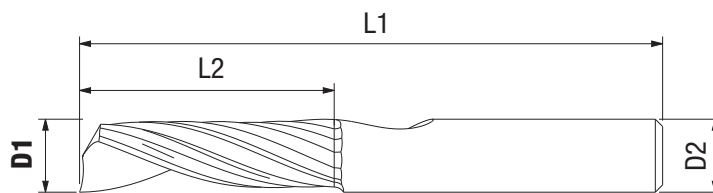
SOLID  
CARBIDE



UPCUT  
TOOL



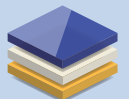
MILLING /  
SLOTTING



| Ø D1 |      | Ø D2        |              | LoC - L2 |       | OAL - L1 |      | z | Part Ref.   |
|------|------|-------------|--------------|----------|-------|----------|------|---|-------------|
| Inch | mm   | Inch        | mm           | Inch     | mm    | Inch     | mm   |   |             |
| 1/8  | 3,17 | 1/8         | 3,17         | 3/8      | 9,52  | 1 1/2    | 38,1 | 1 | 4053--0317  |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 3/8      | 9,52  | 2        | 50,8 | 1 | 4053--0317A |
| 3/16 | 4,76 | 3/16        | 4,76         | 1/2      | 12,7  | 2        | 50,8 | 1 | 4053--0476  |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 1/2      | 12,7  | 2        | 50,8 | 1 | 4053--0476A |
| 1/4  | 6,35 | 1/4         | 6,35         | 5/8      | 15,87 | 2        | 50,8 | 1 | 4053--0635  |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/4      | 19,05 | 2        | 50,8 | 1 | 4053--0635A |
| 5/16 | 7,93 | 5/16        | 7,93         | 3/4      | 19,05 | 2 1/2    | 63,5 | 1 | 4053--0793  |
| 5/16 | 7,93 | 5/16        | 7,93         | 1        | 25,4  | 2 1/2    | 63,5 | 1 | 4053--0793A |
| 5/16 | 7,93 | 5/16        | 7,93         | 1 1/2    | 38,1  | 3        | 76,2 | 1 | 4053--0793B |
| 3/8  | 9,52 | 3/8         | 9,52         | 1        | 25,4  | 2 1/2    | 63,5 | 1 | 4053--0952  |
| 3/8  | 9,52 | 3/8         | 9,52         | 1 1/2    | 38,1  | 3        | 76,2 | 1 | 4053--0952A |

**\* Strengthened shank**

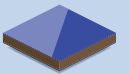
## MATERIALS:



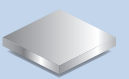
THERMOSETTING  
PLASTICS



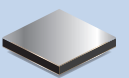
THERMO-  
PLASTICS



HIGH PRESSURE  
LAMINATES

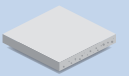


NON-FERROUS  
MATERIALS

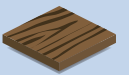


ALUMINUM LAYERS  
COMPOSITE PANELS

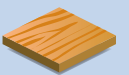
## Possible uses:



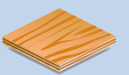
EXPANDED  
PVC



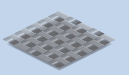
HARD  
WOOD



SOFT  
WOOD

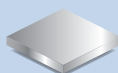


COMPOSITE  
WOODS

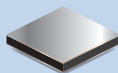


GLASS FIBER  
REINFORCED PLASTICS

## MATERIALS:

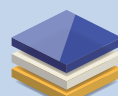


NON-FERROUS  
MATERIALS



ALUMINIUM LAYERS  
COMPOSITE PANELS

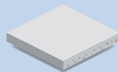
## Possible uses:



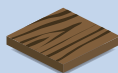
THERMOSETTING  
PLASTICS



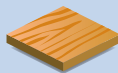
THERMO-  
PLASTICS



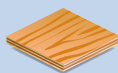
EXPANDED  
PVC



HARD  
WOOD



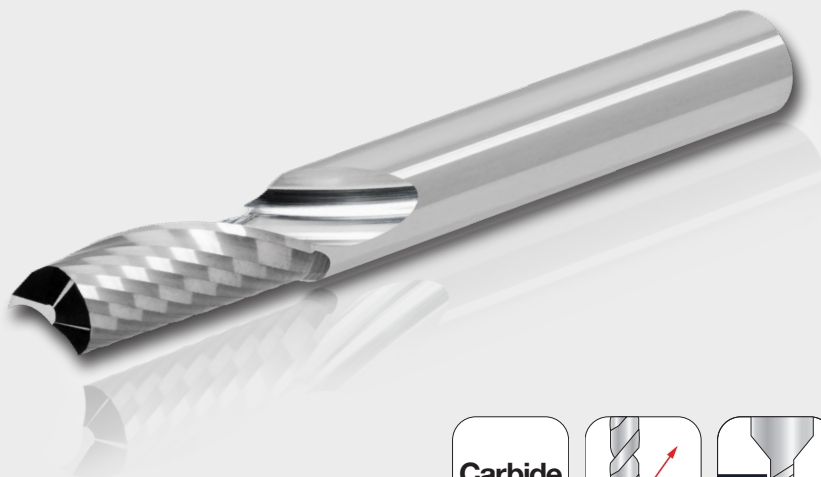
SOFT  
WOOD



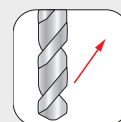
COMPOSITE  
WOODS

**RANGE SPECIFICALLY FOR NON-FERROUS METALS (ALUMINIUM, BRASS, COPPER, ETC.)**  
SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS  
UPCUT TOOL, UPWARDS REMOVAL OF CHIPS.

Uncoated cutter, lubrication recommended.  
Use NHC coated version for lubrication-free machining.



SOLID  
CARBIDE



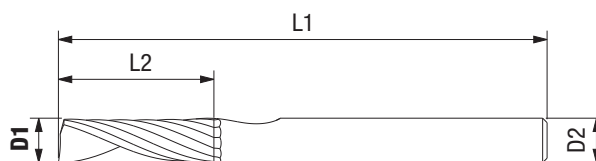
UPCUT  
TOOL



MILLING /  
SLOTTING



USE  
COOLANT



| Ø D1 |      | Ø D2        |              | LoC -L2 |       | OAL - L1 |      | z | Part Ref.   | Standard coating |
|------|------|-------------|--------------|---------|-------|----------|------|---|-------------|------------------|
| Inch | mm   | Inch        | mm           | Inch    | mm    | Inch     | mm   |   |             |                  |
| 1/16 | 1,59 | <b>1/8*</b> | <b>3,17*</b> | 3/16    | 4,76  | 1 1/2    | 38,1 | 1 | 4023--0159  | 4023-NHC0159     |
| 3/32 | 2,38 | <b>1/8*</b> | <b>3,17*</b> | 1/4     | 6,35  | 1 1/2    | 38,1 | 1 | 4023--0238  | 4023-NHC0238     |
| 1/8  | 3,17 | 1/8         | 3,17         | 5/16    | 7,93  | 1 1/2    | 38,1 | 1 | 4023--0317  | 4023-NHC0317     |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 5/16    | 7,93  | 2        | 50,8 | 1 | 4023--0317A | 4023-NHC0317A    |
| 3/16 | 4,76 | 3/16        | 4,76         | 3/8     | 9,52  | 2        | 50,8 | 1 | 4023--0476B | 4023-NHC0476B    |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 3/8     | 9,52  | 2        | 50,8 | 1 | 4023--0476C | 4023-NHC0476C    |
| 3/16 | 4,76 | 3/16        | 4,76         | 1/2     | 12,7  | 2        | 50,8 | 1 | 4023--0476  | 4023-NHC0476     |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 1/2     | 12,7  | 2        | 50,8 | 1 | 4023--0476A | 4023-NHC0476A    |
| 3/16 | 4,76 | 3/16        | 4,76         | 5/8     | 15,87 | 2        | 50,8 | 1 | 4023--0476D | 4023-NHC0476D    |
| 1/4  | 6,35 | 1/4         | 6,35         | 5/8     | 15,87 | 2        | 50,8 | 1 | 4023--0635  | 4023-NHC0635     |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/4     | 19,05 | 2 1/2    | 63,5 | 1 | 4023--0635A | 4023-NHC0635A    |
| 5/16 | 7,93 | 5/16        | 7,93         | 3/4     | 19,05 | 2 1/2    | 63,5 | 1 | 4023--0793  | 4023-NHC0793     |
| 5/16 | 7,93 | 5/16        | 7,93         | 1       | 25,4  | 3        | 76,2 | 1 | 4023--0793A | 4023-NHC0793A    |
| 3/8  | 9,52 | 3/8         | 9,52         | 3/8     | 9,52  | 3        | 76,2 | 1 | 4023--0952  | 4023-NHC0952     |
| 3/8  | 9,52 | 3/8         | 9,52         | 1       | 25,4  | 3        | 76,2 | 1 | 4023--0952A | 4023-NHC0952A    |
| 3/8  | 9,52 | 3/8         | 9,52         | 1 3/8   | 34,9  | 3 1/2    | 88,9 | 1 | 4023--0952B | 4023-NHC0952B    |
| 1/2  | 12,7 | 1/2         | 12,7         | 1 1/8   | 28,58 | 3 1/2    | 88,9 | 1 | 4023-1270   | 4023-NHC1270     |
| 1/2  | 12,7 | 1/2         | 12,7         | 1 3/8   | 34,9  | 3 1/2    | 88,9 | 1 | 4023-1270A  | 4023-NHC1270A    |

\* Strengthened shank



## RANGE SPECIFICALLY FOR NON-FERROUS METALS (ALUMINIUM, BRASS, COPPER, ETC.)

SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS

DOWNCUT TOOL, DOWNWARDS REMOVAL OF CHIPS

- Workpieces held better due to the downwards force.
- Limits the delamination of the upper face.
- Suited to thin materials.
- Milling thermoformed parts on CNC robots, reduction of vibrations.

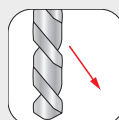
Uncoated cutter, lubrication recommended.

Use NHC coated version for lubrication-free machining



Carbide

SOLID  
CARBIDE



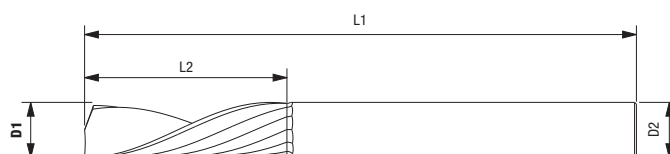
DOWNCUT  
TOOL



MILLING /  
SLOTTING



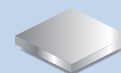
USE  
COOLANT



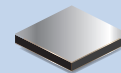
| Ø D1 |      | Ø D2        |              | LoC - L2 |       | OAL - L1 |      | z | Part Ref.   | Standard coating |
|------|------|-------------|--------------|----------|-------|----------|------|---|-------------|------------------|
| Inch | mm   | Inch        | mm           | Inch     | mm    | Inch     | mm   |   |             |                  |
| 1/8  | 3,17 | 1/8         | 3,17         | 5/16     | 7,93  | 1 1/2    | 38,1 | 1 | 4022--0317A | 4022-NHC0317A    |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 5/16     | 7,93  | 2        | 50,8 | 1 | 4022--0317  | 4022-NHC0317     |
| 3/16 | 4,76 | 3/16        | 4,76         | 1/2      | 12,7  | 2        | 50,8 | 1 | 4022--0476  | 4022-NHC0476     |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 1/2      | 12,7  | 2        | 50,8 | 1 | 4022--0476A | 4022-NHC0476A    |
| 1/4  | 6,35 | 1/4         | 6,35         | 5/8      | 15,87 | 2        | 50,8 | 1 | 4022--0635  | 4022-NHC0635     |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/4      | 19,05 | 2 1/2    | 63,5 | 1 | 4022--0635A | 4022-NHC0635A    |
| 5/16 | 7,93 | 5/16        | 7,93         | 3/4      | 19,05 | 2 1/2    | 63,5 | 1 | 4022--0793  | 4022-NHC0793     |

\*Strengthened shank

## MATERIALS:

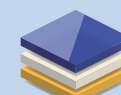


NON-FERROUS  
MATERIALS



ALUMINUM LAYERS  
COMPOSITE PANELS

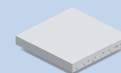
## Possible uses:



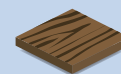
THERMOSETTING  
PLASTICS



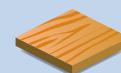
THERMO-  
PLASTICS



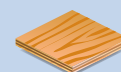
EXPANDED  
PVC



HARD  
WOOD



SOFT  
WOOD

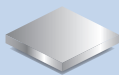


COMPOSITE  
WOODS

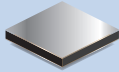


FOR THE 4022 AND 4023 CUTTERS, THE NHC COATING ALLOWS MACHINING WITHOUT LUBRICATION

## MATERIALS:

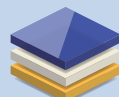


NON-FERROUS  
MATERIALS

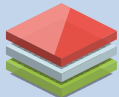


ALUMINUM LAYERS  
COMPOSITE PANELS

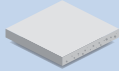
## Possible uses:



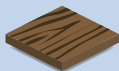
THERMOSETTING  
PLASTICS



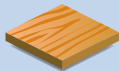
THERMO-  
PLASTICS



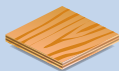
EXPANDED  
PVC



HARD  
WOOD



SOFT  
WOOD



COMPOSITE  
WOODS

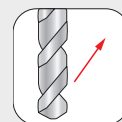
**RANGE SPECIFICALLY FOR NON-FERROUS METALS (ALUMINIUM, BRASS, COPPER, ETC.)**  
**PARTICULARLY RECOMMENDED FOR DIBOND® TYPE TAC AND ACM**  
**SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS**  
**UPCUT TOOL, UPWARDS REMOVAL OF CHIPS. STUB CUTTER SERIES, HIGH RIGIDITY**

- Improves surface finishes,
- Longer service life of the tool,
- Improves cutting conditions.

Uncoated cutter, lubrication recommended



SOLID  
CARBIDE



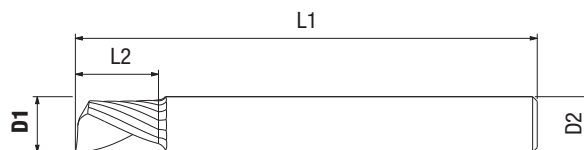
UPCUT  
TOOL



MILLING /  
SLOTING



USE  
COOLANT



| Ø D1 |      | Ø D2        |              | LoC - L2 |       | OAL - L1 |      | z | Part Ref.   |
|------|------|-------------|--------------|----------|-------|----------|------|---|-------------|
| Inch | mm   | Inch        | mm           | Inch     | mm    | Inch     | mm   |   |             |
| 1/8  | 3,17 | 1/8         | 3,17         | 3/16     | 4,76  | 1 1/2    | 38,1 | 1 | 4001--0317  |
| 1/8  | 3,17 | <b>1/4*</b> | <b>6,35*</b> | 3/16     | 4,76  | 2        | 50,8 | 1 | 4001--0317A |
| 3/16 | 4,76 | 3/16        | 4,76         | 9/32     | 7,1   | 2        | 50,8 | 1 | 4001--0476  |
| 3/16 | 4,76 | <b>1/4*</b> | <b>6,35*</b> | 9/32     | 7,1   | 2        | 50,8 | 1 | 4001--0476A |
| 1/4  | 6,35 | 1/4         | 6,35         | 3/8      | 9,52  | 2        | 50,8 | 1 | 4001--0635  |
| 5/16 | 7,93 | 5/16        | 7,93         | 15/32    | 11,9  | 2 1/2    | 63,5 | 1 | 4001--0793  |
| 3/8  | 9,52 | 3/8         | 9,52         | 9/16     | 14,3  | 2 1/2    | 63,5 | 1 | 4001--0952  |
| 1/2  | 12,7 | 1/2         | 12,7         | 3/4      | 19,05 | 2 1/2    | 63,5 | 1 | 4001--1270  |

\*Strengthened shank



## RANGE SPECIFICALLY FOR NON-FERROUS METALS (ALUMINIUM, BRASS, COPPER, ETC.)

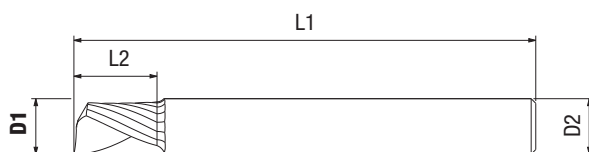
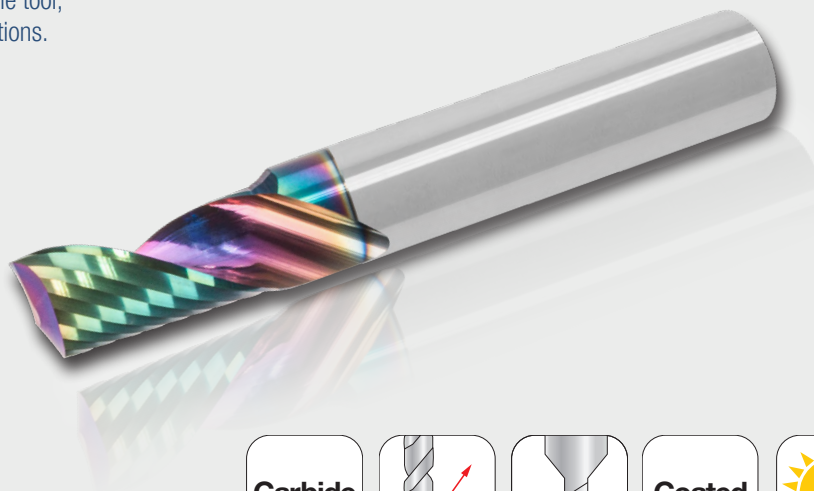
PARTICULARLY RECOMMENDED FOR DIBOND® TYPE ACM AND TAC

SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS

UPCUT TOOL, UPWARDS REMOVAL OF CHIPS.

### STUB CUTTER SERIES, HIGH RIGIDITY

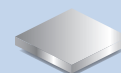
- Improves surface finishes,
- Longer service life of the tool,
- Improves cutting conditions.



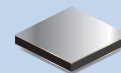
| Ø D1 |      | Ø D2 |       | LoC - L2 |       | OAL - L1 |      | z | Part Ref.     |
|------|------|------|-------|----------|-------|----------|------|---|---------------|
| Inch | mm   | Inch | mm    | Inch     | mm    | Inch     | mm   |   |               |
| 1/8  | 3,17 | 1/8  | 3,17  | 3/16     | 4,76  | 1 1/2    | 38,1 | 1 | 4001-NHC0317  |
| 1/8  | 3,17 | 1/4* | 6,35* | 3/16     | 4,76  | 2        | 50,8 | 1 | 4001-NHC0317A |
| 3/16 | 4,76 | 3/16 | 4,76  | 9/32     | 7,1   | 2        | 50,8 | 1 | 4001-NHC0476  |
| 3/16 | 4,76 | 1/4* | 6,35* | 9/32     | 7,1   | 2        | 50,8 | 1 | 4001-NHC0476A |
| 1/4  | 6,35 | 1/4  | 6,35  | 3/8      | 9,52  | 2        | 50,8 | 1 | 4001-NHC0635  |
| 5/16 | 7,93 | 5/16 | 7,93  | 15/32    | 11,9  | 2 1/2    | 63,5 | 1 | 4001-NHC0793  |
| 3/8  | 9,52 | 3/8  | 9,52  | 9/16     | 14,3  | 2 1/2    | 63,5 | 1 | 4001-NHC0952  |
| 1/2  | 12,7 | 1/2  | 12,7  | 3/4      | 19,05 | 2 1/2    | 63,5 | 1 | 4001-NHC1270  |

\*Strengthened shank

### MATERIALS:

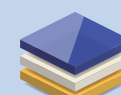


NON-FERROUS  
MATERIALS



ALUMINUM LAYERS  
COMPOSITE PANELS

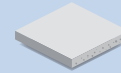
### Possible uses:



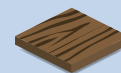
THERMOSETTING  
PLASTICS



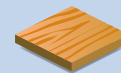
THERMO-  
PLASTICS



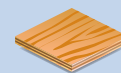
EXPANDED  
PVC



HARD  
WOOD



SOFT  
WOOD



COMPOSITE  
WOODS



OUR NHC COATING ALLOWS MACHINING WITHOUT LUBRICATION

## MATERIALS:



## TWO-FLUTES CUTTERS SPECIFIC FOR SOFT PLASTICS: PVC, PP, HDPE, FOAMLITE®, NYLON...

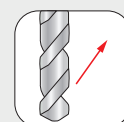
Smooth and polished flute, limited built-up edge effects  
Upcut tool, upwards removal of chips

### HIGH CUTTING SPEED.

QUALITY OF SURFACE CONDITIONS ON THE EDGES AND THE BOTTOM OF THE POCKET.



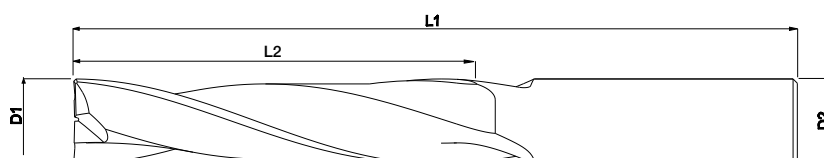
SOLID  
CARBIDE



UPCUT  
TOOL



MILLING /  
SLOTING



| Ø D1 |       | Ø D2 |       | Loc - L2 |       | OAL - L1 |       | Z | Part Ref.   |
|------|-------|------|-------|----------|-------|----------|-------|---|-------------|
| Inch | mm    | Inch | mm    | Inch     | mm    | Inch     | mm    |   |             |
| 1/8  | 3,17  | 1/4* | 6,35* | 1/2      | 12,70 | 2        | 50,8  | 2 | 4052--0317A |
| 3/16 | 4,76  | 1/4* | 6,35* | 5/8      | 15,9  | 2 1/2    | 63,5  | 2 | 4052--0476  |
| 1/4  | 6,35  | 1/4  | 6,35  | 7/8      | 22,50 | 3        | 76,2  | 2 | 4052--0635  |
| 1/4  | 6,35  | 1/4  | 6,35  | 1 1/4    | 31,8  | 3        | 76,2  | 2 | 4052--0635A |
| 3/8  | 9,52  | 3/8  | 9,52  | 1        | 25,4  | 3        | 76,2  | 2 | 4052--0952  |
| 3/8  | 9,52  | 3/8  | 9,52  | 1 1/2    | 38,1  | 4        | 101,6 | 2 | 4052--0952A |
| 1/2  | 12,70 | 1/2  | 12,70 | 1 3/4    | 44,45 | 4        | 101,6 | 2 | 4052--1270  |
| 1/2  | 12,70 | 1/2  | 12,70 | 2 1/8    | 54,0  | 4        | 101,6 | 2 | 4052--1270A |
| 5/8  | 15,87 | 5/8  | 15,87 | 2 1/4    | 57,15 | 5        | 127,0 | 2 | 4052--1587  |

\*Strengthened shank

# HIGH-SPEED CONICAL TWO-TOOTH CUTTERS FOR SLOT CUTTING - FOLDING

**FAMILY  
4045**

## HIGH-SPEED CUTTER FOR SLOT CUTTING - FOLDING SPECIALLY DESIGNED FOR ACM AND TAC (DIBOND®, ALUCOBOND®)

Very good surface finish  
Improves the evacuation of chips.  
High working speed

### UPCUT TOOL, UPWARDS REMOVAL OF CHIPS

Coating on demand.

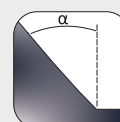


**Carbide**

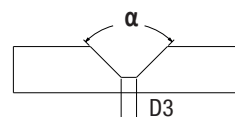
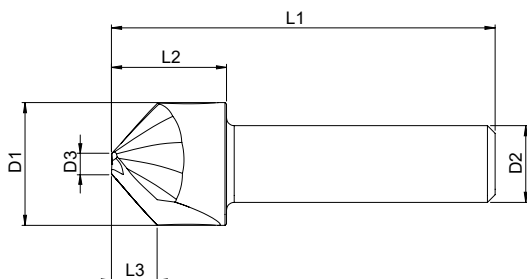
SOLID  
CARBIDE



MILLING /  
SLOTTING



MILLING WITH  
CHAMFER



| Ø D1 |       | Ø D2 |      | D3    |    | LoC - L3 |     | L2    |      | OAL - L1 |      | α°   | z | Part Ref.       |
|------|-------|------|------|-------|----|----------|-----|-------|------|----------|------|------|---|-----------------|
| Inch | mm    | Inch | mm   | Inch  | mm | Inch     | mm  | Inch  | mm   | Inch     | mm   |      |   |                 |
| 3/4  | 19,05 | 3/8  | 9,52 | 0,118 | 3  | 0,287    | 7,3 | 0,750 | 19,1 | 2        | 50,8 | 95°  | 2 | 4045--1905-095° |
| 3/4  | 19,05 | 3/8  | 9,52 | 0,078 | 2  | 0,244    | 6,2 | 0,750 | 19,1 | 2        | 50,8 | 108° | 2 | 4045--1905-108° |
| 3/4  | 19,05 | 3/8  | 9,52 | 0,078 | 2  | 0,138    | 3,5 | 0,750 | 19,1 | 2        | 50,8 | 135° | 2 | 4045--1905-135° |

## MATERIALS:



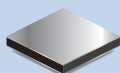
ALUMINIUM-FACED  
COMPOSITE PANELS



# FAMILY 4041

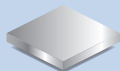
# CONICAL, ONE-FLUTE CUTTERS FOR SLOT CUTTING - FOLDING

## MATERIALS:

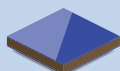


ALUMINUM LAYERS  
COMPOSITE PANELS

## Possible uses:



NON-FERROUS  
MATERIALS



HIGH PRESSURE  
LAMINATES

## CUTTERS FOR SLOT CUTTING - FOLDING

SPECIALLY DESIGNED FOR ACM AND TAC ( DIBOND®, ALUCOBOND® )

Very good surface finish.

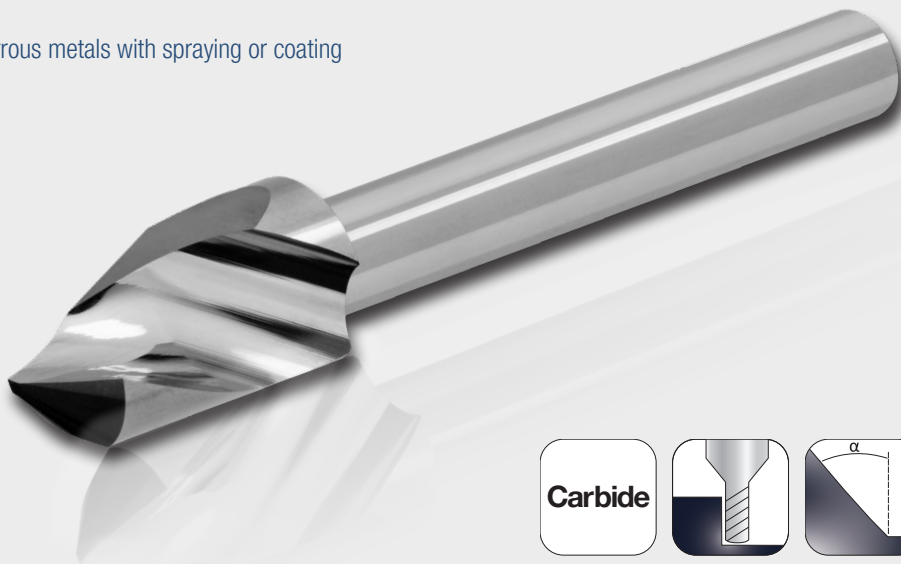
Improves the evacuation of chips.

SMOOTH AND POLISHED FLUTE, LIMITED BUILT-UP EDGE EFFECTS

UPCUT TOOL, UPWARDS REMOVAL OF CHIPS.

Coating on demand.

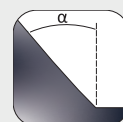
Machining of non-ferrous metals with spraying or coating



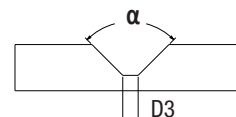
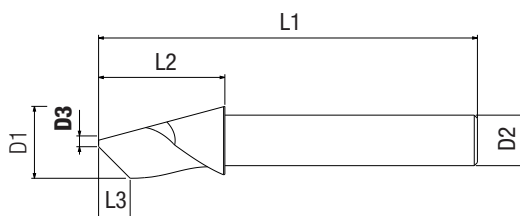
SOLID  
CARBIDE



MILLING /  
SLOTTING



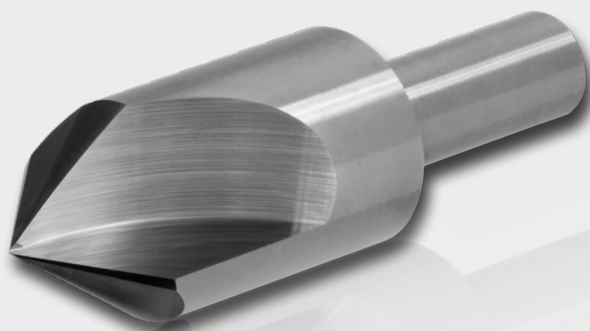
MILLING WITH  
CHAMFER



| Ø D1 |       | Ø D2 |       | D3   |      | LoC - L3 |     | L2   |       | OAL - L1 |      | α°   | z | Part Ref.         |
|------|-------|------|-------|------|------|----------|-----|------|-------|----------|------|------|---|-------------------|
| Inch | mm    | Inch | mm    | Inch | mm   | Inch     | mm  | Inch | mm    | Inch     | mm   |      |   |                   |
| 1/2  | 12,70 | 1/4  | 6,35* | 3/32 | 2,38 | 0,185    | 4,7 | 3/4  | 19,05 | 2 1/2    | 63,5 | 95°  | 1 | 4041--1270-095°   |
| 1/2  | 12,70 | 1/4  | 6,35* | 3/32 | 2,38 | 0,145    | 3,7 | 3/4  | 19,05 | 2 1/2    | 63,5 | 108° | 1 | 4041--1270-108°   |
| 1/2  | 12,70 | 1/2  | 12,70 | 3/32 | 2,38 | 0,185    | 4,7 | 3/4  | 19,05 | 2 1/2    | 63,5 | 95°  | 1 | 4041--1270-095°-A |
| 1/2  | 12,70 | 1/2  | 12,70 | 3/32 | 2,38 | 0,145    | 3,7 | 3/4  | 19,05 | 2 1/2    | 63,5 | 108° | 1 | 4041--1270-108°-A |

\*Smaller shank diameter

**VERY GOOD SURFACE FINISH**  
SOLID CARBIDE, HIGH RIGIDITY

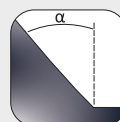


**Carbide**

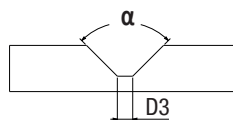
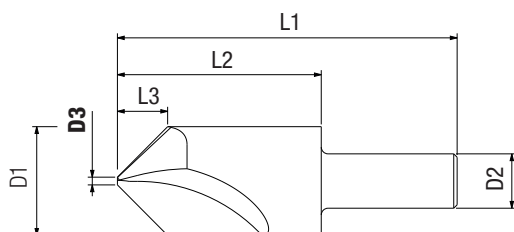
SOLID  
CARBIDE



MILLING /  
SLOTTING



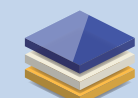
MILLING WITH  
CHAMFER



| Ø D1 |      | Ø D2 |              | D3    |     | LoC - L3 |      | L2   |      | OAL - L1 |      | α°  | z | Part Ref.         |
|------|------|------|--------------|-------|-----|----------|------|------|------|----------|------|-----|---|-------------------|
| Inch | mm   | Inch | mm           | Inch  | mm  | Inch     | mm   | Inch | mm   | Inch     | mm   |     |   |                   |
| 3/8  | 9,52 | 1/4  | <b>6,35*</b> | 0,008 | 0,2 | 0,181    | 4,6  | 1    | 25,4 | 2        | 50,8 | 90° | 2 | 4044--0952-090°   |
| 3/8  | 9,52 | 3/8  | 9,52         | 0,008 | 0,2 | 0,181    | 4,6  |      |      | 2        | 50,8 | 90° | 2 | 4044--0952-090°-A |
| 1/2  | 12,7 | 1/2  | 12,7         | 0,008 | 0,2 | 0,244    | 6,2  |      |      | 2        | 50,8 | 90° | 2 | 4044--1270-090°   |
| 1    | 25,4 | 1/2  | <b>12,7*</b> | 0,008 | 0,2 | 0,496    | 12,6 | 1    | 25,4 | 2 1/2    | 63,5 | 90° | 2 | 4044--2540-090°   |

\*Smaller shank diameter

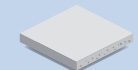
## MATERIALS:



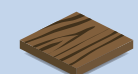
THERMOSETTING  
PLASTICS



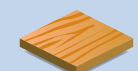
THERMO-  
PLASTICS



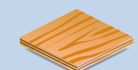
EXPANDED  
PVC



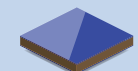
HARD  
WOOD



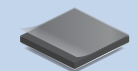
SOFT  
WOOD



COMPOSITE  
WOODS

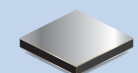


HIGH PRESSURE  
LAMINATES



PHENOLIC  
MATERIALS

## Possible uses:



ALUMINUM LAYERS  
COMPOSITE PANELS

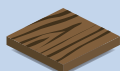
## MATERIALS:



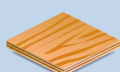
THERMOSETTING  
PLASTICS



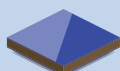
EXPANDED  
PVC



HARD  
WOOD



COMPOSITE  
WOODS

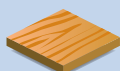


HIGH PRESSURE  
LAMINATES

## Possible uses:



THERMO-  
PLASTICS



SOFT  
WOOD

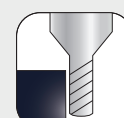


FOAM

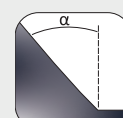
SPECIFICALLY DESIGNED FOR HARDER MATERIALS (PMMA, CORIAN, POLYCARBONATES, HARDWOODS, ETC.)



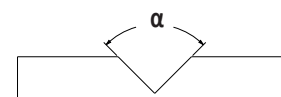
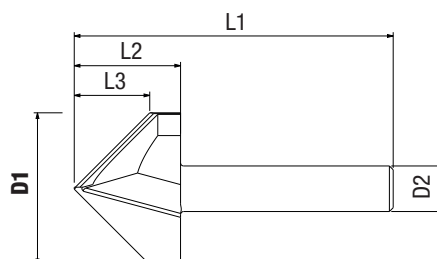
**Carbide  
Steel**  
CARBIDE  
TIPPED  
STEEL BODY



MILLING /  
SLOTTING



MILLING WITH  
CHAMFER



| Ø D1 |      | Ø D2 |      | D3    |     | LoC - L3 |      | L2    |      | OAL - L1 |      | α°  | z | Part Ref.       |
|------|------|------|------|-------|-----|----------|------|-------|------|----------|------|-----|---|-----------------|
| Inch | mm   | Inch | mm   | Inch  | mm  | Inch     | mm   | Inch  | mm   | Inch     | mm   |     |   |                 |
| 1    | 25,4 | 1/2  | 12,7 | 0,008 | 0,2 | 7/8      | 22,0 | 1     | 25,4 | 2 1/2    | 63,5 | 60° | 2 | 4042--2540-060° |
| 1    | 25,4 | 1/2  | 12,7 | 0,008 | 0,2 | 1/2      | 12,7 | 17/24 | 18   | 2        | 50,8 | 90° | 2 | 4042--2540-090° |



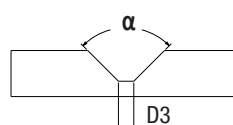
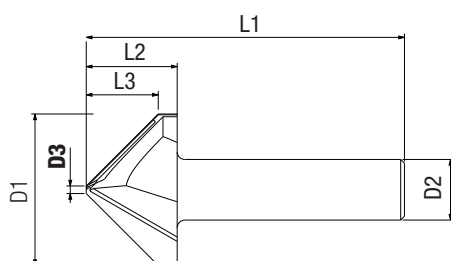
SPECIFICALLY DESIGNED FOR SOFT MATERIALS (SOFTWOODS, COMPOSITE WOOD PRODUCTS, FOAMED MATERIALS, ETC.)



**Carbide Steel**  
CARBIDE  
TIPPED  
STEEL BODY

MILLING /  
SLOTTING

MILLING WITH  
CHAMFER

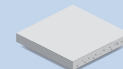


| Ø D1  |       | Ø D2 |      | D3   |     | LoC - L3 |      | L2    |       | OAL - L1 |      | α°  | z | Part Ref.       |
|-------|-------|------|------|------|-----|----------|------|-------|-------|----------|------|-----|---|-----------------|
| Inch  | mm    | Inch | mm   | Inch | mm  | Inch     | mm   | Inch  | mm    | Inch     | mm   |     |   |                 |
| 1 1/4 | 31,75 | 1/2  | 12,7 | 0,02 | 0,5 | 1,06     | 27   | 1 1/4 | 31,75 | 2 1/2    | 63,5 | 60° | 2 | 4043--3175-060° |
| 1 1/4 | 31,75 | 1/2  | 12,7 | 0,02 | 0,5 | 0,614    | 15,6 | 3/4   | 19,05 | 2        | 50,8 | 90° | 2 | 4043--3175-090° |

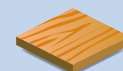
## MATERIALS:



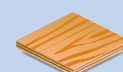
THERMOSETTING  
PLASTICS



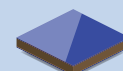
EXPANDED  
PVC



SOFT  
WOOD



COMPOSITE  
WOODS



HIGH PRESSURE  
LAMINATES

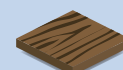


FOAM

## Possible uses:



THERMO-  
PLASTICS

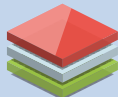


HARD  
WOOD

## MATERIALS:



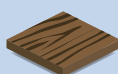
THERMOSETTING  
PLASTICS



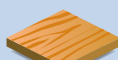
THERMO-  
PLASTICS



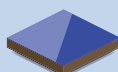
EXPANDED  
PVC



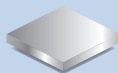
HARD  
WOOD



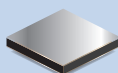
SOFT  
WOOD



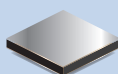
HIGH PRESSURE  
LAMINATES



NON-FERROUS  
MATERIALS

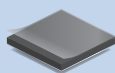


ALUMINUM LAYERS  
COMPOSITE PANELS

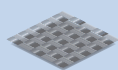


STEEL LAYERS  
COMPOSITE PANELS

## Possible uses:



PHENOLIC  
MATERIALS



GLASS FIBER  
REINFORCED PLASTICS

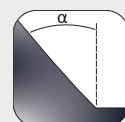
## CONICAL, MULTI-MATERIAL ENGRAVING CUTTERS



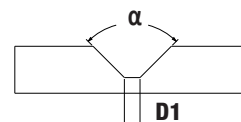
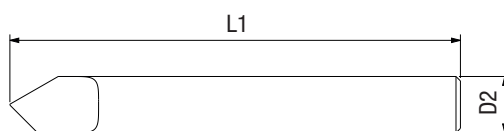
SOLID  
CARBIDE



ENGRAVING



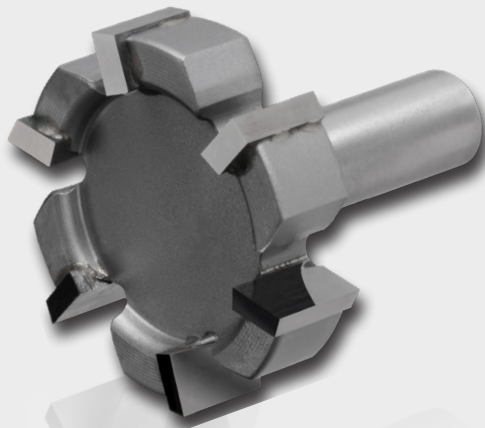
MILLING WITH  
CHAMFER



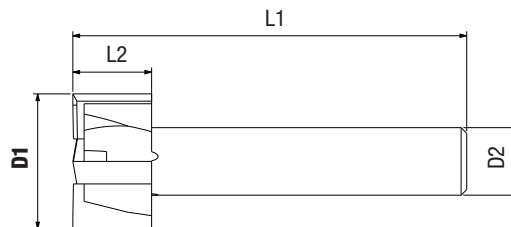
| Ø D1  |     | Ø D2 |      | LoC - L1 |      | α°  | z | Part Ref.        |
|-------|-----|------|------|----------|------|-----|---|------------------|
| Inch  | mm  | Inch | mm   | Inch     | mm   |     |   |                  |
| 0,012 | 0,3 | 1/8  | 3,17 | 1 1/2    | 38,1 | 30° | 1 | 4070--317-030°   |
| 0,012 | 0,3 | 1/8  | 3,17 | 1 1/2    | 38,1 | 40° | 1 | 4070--317-040°-A |
| 0,008 | 0,2 | 1/8  | 3,17 | 1 1/2    | 38,1 | 40° | 1 | 4070--317-040°-B |
| 0,004 | 0,1 | 1/8  | 3,17 | 1 1/2    | 38,1 | 60° | 1 | 4070--317-060°   |
| 0,012 | 0,3 | 3/16 | 4,76 | 2        | 50,8 | 30° | 1 | 4070--476-030°   |
| 0,012 | 0,3 | 3/16 | 4,76 | 2        | 50,8 | 40° | 1 | 4070--476-040°-A |
| 0,008 | 0,2 | 3/16 | 4,76 | 2        | 50,8 | 40° | 1 | 4070--476-040°-B |
| 0,008 | 0,2 | 3/16 | 4,76 | 2        | 50,8 | 60° | 1 | 4070--476-060°   |
| 0,020 | 0,5 | 1/4  | 6,35 | 2        | 50,8 | 30° | 1 | 4070--635-030°   |
| 0,016 | 0,4 | 1/4  | 6,35 | 2        | 50,8 | 40° | 1 | 4070--635-040°   |
| 0,012 | 0,3 | 1/4  | 6,35 | 2        | 50,8 | 60° | 1 | 4070--635-060°   |
| 0,004 | 0,1 | 1/4  | 6,35 | 2        | 50,8 | 90° | 1 | 4070--635-090°   |

# FACE MILLING CUTTERS

(FACE MILLING ON MARTYR PLATES, ETC.)

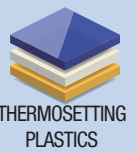


**Carbide Steel**  
CARBIDE  
TIPPED  
STEEL BODY

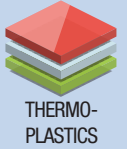


| Ø D1 |       | Ø D2 |      | LoC - L2 |      | LoC - L1 |      | z | Part Ref.  |
|------|-------|------|------|----------|------|----------|------|---|------------|
| Inch | mm    | Inch | mm   | Inch     | mm   | Inch     | mm   |   |            |
| 1    | 25,40 | 3/8  | 9,52 | 3/8      | 9,52 | 2        | 50,8 | 5 | 4080--2540 |
| 2    | 50,80 | 1/2  | 12,7 | 1/2      | 12,7 | 2 1/2    | 63,5 | 8 | 4080--5080 |

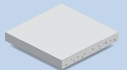
## MATERIALS:



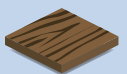
THERMOSETTING  
PLASTICS



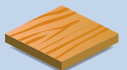
THERMO-  
PLASTICS



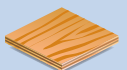
EXPANDED  
PVC



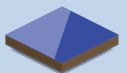
HARD  
WOOD



SOFT  
WOOD

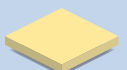


COMPOSITE  
WOODS

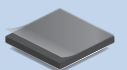


HIGH PRESSURE  
LAMINATES

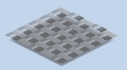
## Possible uses:



FOAM



PHENOLIC  
MATERIALS



GLASS FIBER  
REINFORCED PLASTICS



## CUTTING CONDITIONS (GUIDELINE DATA)

Calculation of the rotational speed of the spindle

$$n = (1000 \times V_c) / (\pi \times D)$$

Calculation of the feed speed:

$$V_f = F_z \times Z \times N$$

Calculation of the cutting speed

$$V_c = (n \times \pi \times D) / 1000$$

Calculation of the feed per tooth

$$F_z = V_f / (Z \times n)$$

$$\pi = 3.1416$$

|                  |                |        |
|------------------|----------------|--------|
| Tool diameter    | D              | mm     |
| Number of teeth  | Z              |        |
| Cutting speed    | V <sub>c</sub> | m/min  |
| Rotational speed | N              | rpm    |
| Feed per tooth   | F <sub>z</sub> | mm/z   |
| Feed speed       | V <sub>f</sub> | mm/min |

### FOR EXAMPLE:

Single-flute, Ø6 cutter

Material: PMMA

V<sub>c</sub> = 450

F<sub>z</sub> = 0.07

Rotational speed:

$$n = (1,000 \times 450) / (\pi \times 6) = 23,873 \text{ (24,000 rpm)}$$

Feed:

$$V_f = 0.07 \times 1 \times 24,000 = 1,680 \text{ mm/min}$$

| MATERIALS                                    |            | Feed per tooth F <sub>z</sub> |              |              |             |
|----------------------------------------------|------------|-------------------------------|--------------|--------------|-------------|
|                                              |            | <Ø3                           | Ø3 to Ø5     | Ø5 to Ø8     | Ø8 to Ø14   |
| Aluminium alloy                              | 200 to 400 | 0.01 - 0.03                   | 0.025 - 0.05 | 0.04 - 0.09  | 0.07 - 0.17 |
| Unalloyed aluminium (1,000)                  | 200 to 400 | 0.04 - 0.06                   | 0.05 - 0.10  | 0.08 - 0.17  | 0.12 - 0.25 |
| Brass                                        | 200 to 400 | 0.01 - 0.03                   | 0.03 - 0.06  | 0.06 - 0.09  | 0.08 - 0.12 |
| Bronze                                       | 100 to 150 | 0.008 - 0.02                  | 0.02 - 0.04  | 0.035 - 0.05 | 0.05 - 0.08 |
| Copper                                       | 150 to 300 | 0.01 - 0.03                   | 0.015 - 0.04 | 0.03 - 0.07  | 0.06 - 0.14 |
| Thermoplastics, Plexiglass, ABS,             | 300 to 500 | 0.02 - 0.05                   | 0.05 - 0.08  | 0.07 - 0.14  | 0.12 - 0.25 |
| Nylon, polyethylene, Acetate, High-impact PS | 150 to 350 | 0.07 - 0.10                   | 0.1 - 0.2    | 0.2 - 0.3    | 0.3 - 0.4   |
| Plastics - PVC - PE - PP                     | 100 to 300 | 0.045 - 0.11                  | 0.10 - 0.20  | 0.18 - 0.35  | 0.20 - 0.45 |
| Expanded PVC                                 | 250 to 500 | 0.08 - 0.15                   | 0.15 - 0.25  | 0.25 - 0.35  | 0.20 - 0.45 |
| POM-C, PA6                                   | 200 to 400 | 0.02 - 0.05                   | 0.05 - 0.08  | 0.07 - 0.14  | 0.12 - 0.25 |
| PEHD (500 - 1000)                            | 300 to 450 | 0.04 - 0.08                   | 0.08 - 0.12  | 0.12 - 0.25  | 0.25 - 0.35 |
| High-impact PS                               | 150 to 250 | 0.04 - 0.1                    | 0.1 - 0.15   | 0.1 - 0.3    | 0.2 - 0.5   |
| Corian                                       | 400 to 500 | 0.03 - 0.045                  | 0.045 - 0.06 | 0.06 - 0.09  | 0.09 - 0.14 |
| Polyester, PC, PET                           | 250 to 400 | 0.015 - 0.025                 | 0.025 - 0.04 | 0.04 - 0.08  | 0.08 - 0.12 |
| PETG                                         | 400 to 500 | 0.02 - 0.04                   | 0.045 - 0.07 | 0.06 - 0.10  | 0.09 - 0.15 |
| Bakelite                                     | 100 to 250 | 0.04 - 0.06                   | 0.05 - 0.10  | 0.08 - 0.17  | 0.12 - 0.25 |
| Foamed materials                             | 300 to 350 | 0.07 - 0.10                   | 0.1 - 0.2    | 0.2 - 0.3    | 0.3 - 0.4   |
| Horn                                         | 150 to 350 | 0.03 - 0.045                  | 0.045 - 0.06 | 0.06 - 0.09  | 0.09 - 0.14 |
| LAB                                          | 250 to 400 | 0.04 - 0.07                   | 0.06 - 0.1   | 0.1 - 0.2    | 0.2 - 0.3   |
| Natural PEEK                                 | 250 to 450 | 0.01 - 0.025                  | 0.02 - 0.04  | 0.035 - 0.07 | 0.07 - 0.11 |
| Wood                                         | 300 to 450 | 0.015 - 0.07                  | 0.05 - 0.1   | 0.07 - 0.15  | 0.12 - 0.25 |
| MDF with Z1                                  | 250 to 400 | 0.04 - 0.08                   | 0.08 - 0.12  | 0.1 - 0.15   | 0.15 - 0.2  |
| MDF with 4030                                | 300 to 700 |                               |              | 0.15 - 0.20  | 0.15 - 0.3  |
| Trespa                                       | 300 to 500 | 0.04 - 0.08                   | 0.08 - 0.12  | 0.1 - 0.15   | 0.15 - 0.2  |
| Stainless steel                              | 40 to 90   | 0.008 - 0.015                 | 0.01 - 0.02  | 0.015 - 0.04 | 0.03 - 0.06 |
| Galvanised steel                             | 100 - 150  | 0.008 - 0.015                 | 0.02 - 0.03  | 0.03 - 0.05  | 0.04 - 0.08 |

## IMPACT OF COLLETS ON CUTTING QUALITY

Poor collet condition accounts for the majority of the problems encountered: poor surface finishes, shorter tool life, abnormal machining noises, etc.

Perfect machining is only possible when every element in the clamping chain (spindle, chuck, collet) is in perfect condition.

### MAINTAINING SPRING COLLETS

During machining, chips and dust particles lodge inside collets.

For this reason, collets must be well maintained.

We recommend that you systematically clean the collet and the tool holder carefully at every tool changeover.

Apply a rust inhibiting product to collets before putting them in storage. (remember to remove this product before reusing the collet).

### SERVICE LIFE OF COLLETS

Collets are wear parts and as such must be replaced regularly. They lose their elasticity and are marked by the various tools they come into contact with.

As a preventive measure, we recommend replacing them approximately every 500 hours.

Well-serviced collets may last much longer.

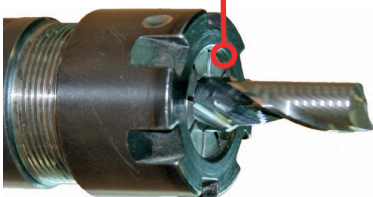
A collet must be replaced if the tool it was holding broke, since this would mark the collet and make the runout incompatible with high quality machining.

### GOOD CLAMPING PRACTICES

The tool must be held by as much of the collet's gripping surface as possible; at least 80 % of the length of the collet. This lets the tool rotate concentrically and limits vibrations that have an adverse effect on cutting quality.

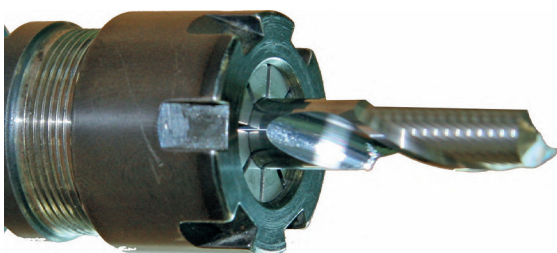
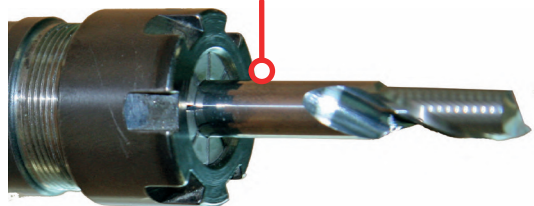
#### TOOL INSERTED TOO FAR INTO THE COLLET.

Bad runout is possible.  
Chips can get inside the collet.



#### TOOL INSUFFICIENTLY INSERTED.

Bad runout  
Vibration, poor surface finishes.  
Breakage possible  
Reduced service life  
Worsening cutting conditions



#### TOOL CORRECTLY INSERTED

2 to 3 mm of shank visible after the end of the flute.

## ADVICE ABOUT MACHINING

### PREAMBLE:

The key principles and recommendations are covered below.

Machining quality is dependent on many criteria. The five criteria for success are:

**1 ) Production equipment:** condition and choice of equipment (machine, spindle, suction, workpiece clamping, choice of cutting tool, etc.)

**2) Machining method** and strategy: machining direction (conventional (up) or down), number of cuts, type of entrance into the cut (angular, tangential), use or not of sprayed lubricant, etc.

**3) Human resources:** training, level of experience of the technicians in using the production resources.

**4) Material:** type and quality of the material.

**5) Environment:** dust, vibration, temperature (workshop and material), etc.

**And also,** required surface finish and target machining time.

### IMPACT OF SPINDLE POWER:

In general, low-power spindles (0.5 to 1.5 kW) can reach high rotational speeds, but deliver very low torque at low speeds. They should not, therefore, be fitted with tools whose diameter is more than 6 mm.

When machining thick materials, the number of cuts must be increased.

For cutters with a diameter of less than 4 mm, the axial depth of cut ( $A_p$ ) should be equal to the  $\varnothing$  and be about 3 mm for cutters with a diameter of 5 to 6 mm.

### ROTATIONAL SPEED OF SPINDLE: (REFER TO PAGE 24 "CUTTING CONDITIONS")

The calculations (given in page 24 of this catalogue) used to determine the rotational speed of the spindle clearly show that when the  $\varnothing$  of the tool is larger, the rotational speed of the spindle needs to be reduced, irrespective of the material. The rotational speed should also be adjusted to suit the properties of the material.

For example: when machining soft materials, the rotational speed should be lower so as not to heat the material.

The rotational speed should also be reduced if the tool is long (since the potential out-of-balance is greater as is the risk of breakage and vibration).

### FEED: (REFER TO PAGE 24 "CUTTING CONDITIONS")

A small-diameter tool is more susceptible to bending. The feed speed should therefore be set lower than that possible with a larger diameter.

The same principle applies for tools that have a long cutting length - the feed should be reduced since this type of tool generates a lot of bending.

When machining soft materials, the feed speed can be increased so as not to heat up the material.

Take care when calculating the feed speed: when you increase the number of teeth, you need to reduce the  $F_z$  value due to the impact of less effective chip evacuation (you cannot go three times quicker with three teeth than you can with one tooth).

The in-feed (or plunge) speed is normally half, or even a third, of the feed speed.

The impact on the machining time is not too significant, but this lower speed increases the service life of the tool (by protecting the tip) and the spindle.

(It can even be lower. For example:  $\varnothing$  20 face cutter fed directly onto the material:

in-feed (plunge) speed of about 50 mm/min)

There is no benefit in setting a very high feed for very small workpieces. The reason is that the machine only vary rarely reaches this speed; the gain in time and in surface finish is very small. However, the geometry of the workpieces and the service life of the cutters is degraded.

#### **“RUNNING-IN” PERIOD FOR NEW TOOLS:**

New tools being used for the first time will not produce their best surface finish until the tool has machined a few metres of material, due to the extremely sharp edges on new tools.

This is particularly true for one-flute tools used to machine plastics.

The 4053 series cuts less aggressively and does not need to be “run in”.

#### **CHOICE OF USEFUL LENGTH OF TOOL:**

The useful length must be greater than the thickness to be cut, without being too long, since this leads to:

- A longer unsupported length,
- A less rigid and more breakable tool,
- An impaired surface finish and shorter tool life.

#### **HELIX DIRECTION:**

Upcut cutters with a right-handed cut tend to pull the machined workpiece towards the tool: the chips are very well evacuated, but the workpiece must be clamped securely to avoid any vibration problems.

Downcut cutters with a right-handed cut tend to push the machined workpiece against the table of the machine, which reduces clamping-related issues. There will be no delamination of the material near the surface of the workpiece, but the chips will be poorly evacuated (with a risk of chip jamming).

Excellent chip suction or providing clear space under the workpiece are recommended.

#### **SURFACE FINISH:**

A number of criteria need to be satisfied to obtain a good surface finish, with feed speed far from being the only one.

- Securely holding the workpiece (extremely important).
- The right tool for the type and thickness of the material.
- Good condition of the machine (shafts, spindles, tapers, collets, etc.) and tool.
- Good chip suction.
- Good cutting conditions.
- Good machining strategies.

#### **FINISHING CUT:**

Removing 0.3 to 0.5 mm of material with a finishing cut is a good way to obtain a better surface finish for many materials. This eliminates any built-up edge-related issues and smooths out the effects of vibration. However, this is not true for all materials.

#### **MACHINING THE BOTTOM OF POCKETS:**

One-flute cutters, due to their geometry, do not produce the best surface finish in the bottom of pockets. Two-flute cutters have flatter tips and produce a better surface finish.

Smaller overlaps and lower speeds also greatly improve the surface finish.



## ADVICE ABOUT DEPTHS OF CUT.

### RADIAL DEPTH OF CUT, AE:

When contouring (or profiling) a workpiece, it is advisable to reduce the radial depth of cut (Ae) when machining hard materials and when using small-diameter tools.

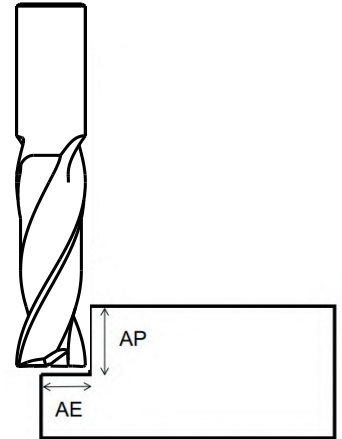
### AXIAL DEPTH OF CUT, AP:

For most plastics, the Ap should be 1 to 2 times the tool diameter.

For non-ferrous metals (aluminium, etc.) 0.5 to 1 times the diameter of the tool.

### THESE ARE GUIDELINE VALUES.

For example: for expanded PVC, the Ap can be 3 to 4 times the tool Ø (for tools with a Ø of 6 mm and above)



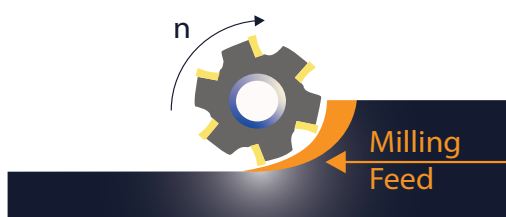
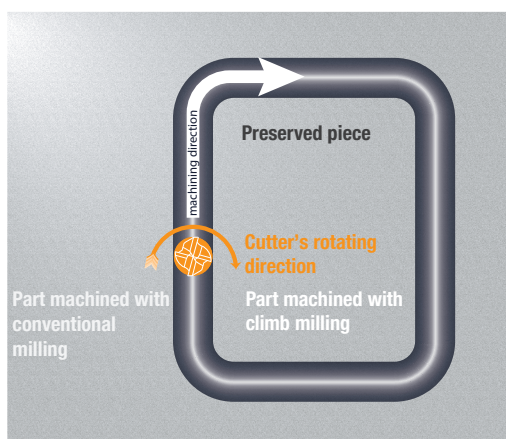
## MACHINING DIRECTION

THE CHOICE OF MACHINING DIRECTION IS PRIMARILY DETERMINED BY THE DESIRED QUALITY OF THE SURFACE FINISH. THE PROPERTIES OF THE MATERIAL ALSO HAS TO BE CONSIDERED.

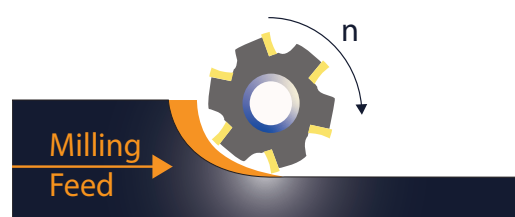
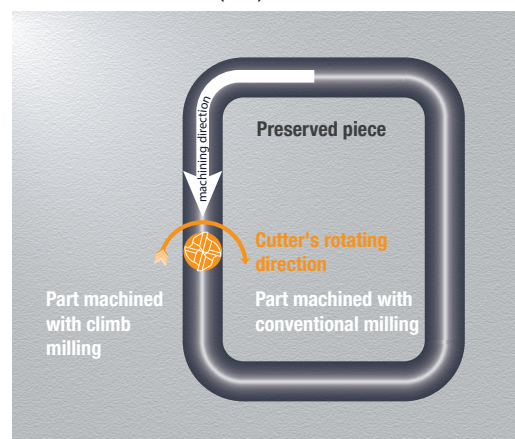
Down (or climb) milling is used for most plastics.  
The cuts are more “gentle”.

Conventional (up) milling tends to be used for soft or fibrous materials.  
The cut is more “aggressive”.

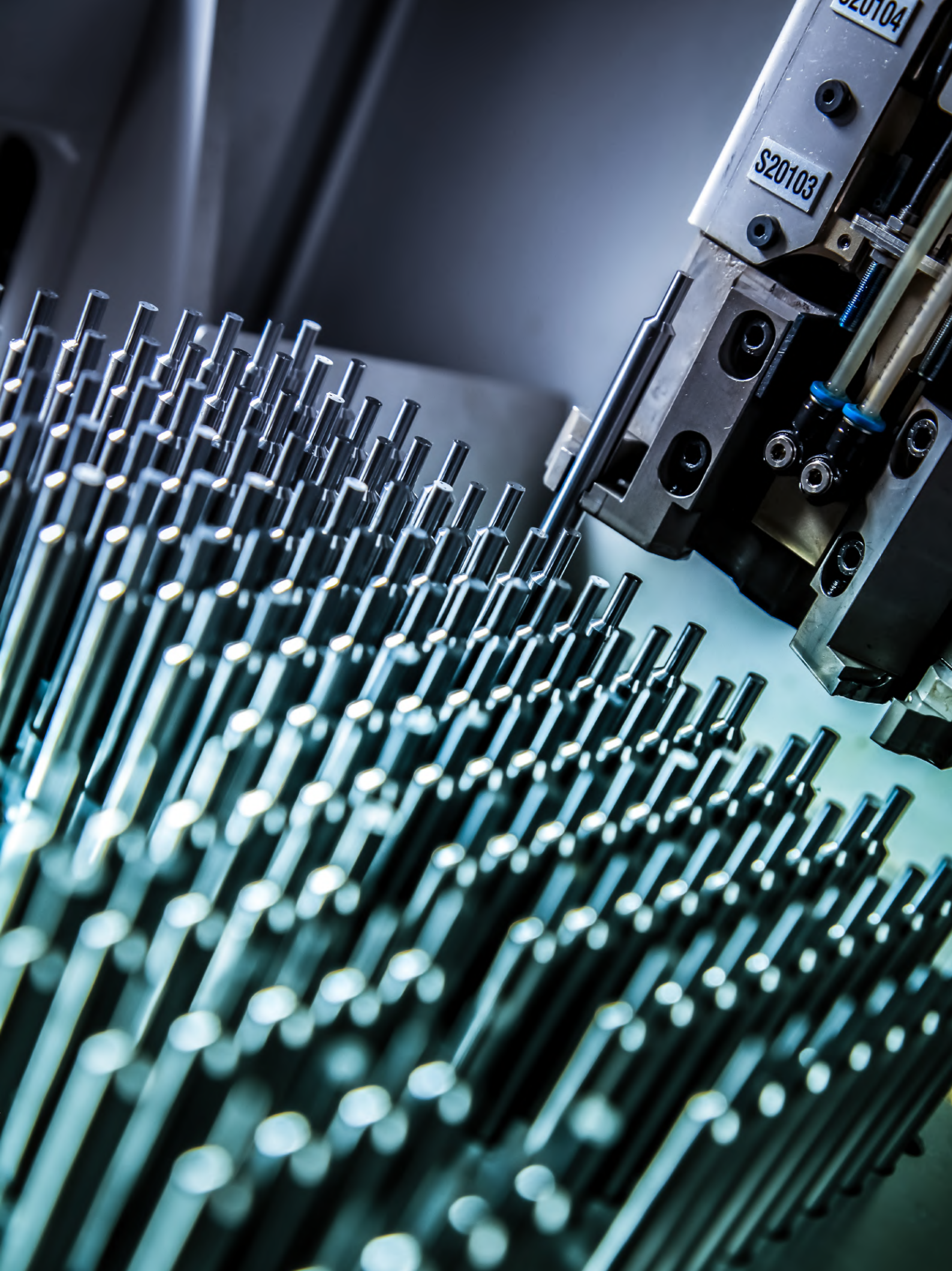
### DOWN MILLING / CLOCKWISE



### CONVENTIONAL (UP) MILLING / ANTICLOCKWISE













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