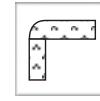


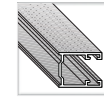
# Plastic



Plastic



Corian



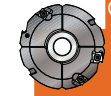
Aluminum



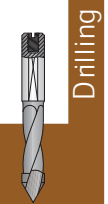
Sawing



CNC



Cutting



Drilling



Routing

Plastic, Corian, Aluminum



Custom Tooling

## Plastic is a general name for materials made of Polymer chains.

There are a large variety of plastics, different combinations of the polymer structures and sizes can create new mechanical properties.

These different materials are spread over the complete scale of each property, for example: very soft to very hard, clear to blank, heat sensitivity to heat resistant etc. That is the reason why it is so hard to define the exact cutting condition of rotation speed relating to the cutting feed.

Here are several guide lines in order to optimize the cutting process:

1) The bigger the chip size so the life time of the tool increases.

This condition can be created by increasing the feed or reducing the RPM. The wrong relation will create heat and the material will melt this phase in most of the plastic material is not recommended.

2) For "elastic/soft" material it is recommended to work with the minimal number of cutting edges - for example: It is preferable to work with 1 flute and not 2 flutes.

3) For "hard/breakable" material it is preferable to use more cutting edges - for example: to use a 300 diameter saw with 96 tip and not 60 tips.

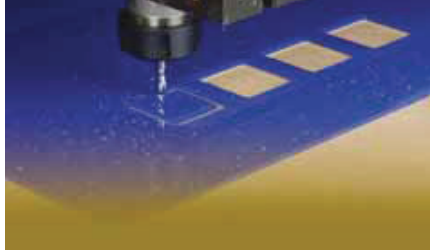
In order to define the material it is recommended to use the table below:

Polymer	Tensile Strength MPa	(%) Elongation	Tensile Modulus MPa
HDPE	21-35	15-100	700-1400
LDPE	7-21	50-800	100-250
PP	30-40	150-600	1150-1550
PS	33-35	1-4	2400-3350
PVC	35-63	2-30	2000-4200
ABS	35-48	15-80	1750-2500
PA 6/6	84	60-100	2070-3245
PA 6/12	62	150-340	2100
PC	63	110	2400
PMMA	55-75	5	2400-3100
POLYESTER	56	300	2400
Polysulfones	70.3	5-6	2482
PEEK	100	40	3900
PET	45-145		2300-10300
PVDC	19	350	345-552
Cellulosics	14-15	6-60	690-2100
PAI	125-185	5-12	710-4900
Polyacrylates	69	50	2400-16600
PPO	55	50	2484-2622
Polyimides	69	50	3588

The property of the Tensile Modulus and the Elongation can give a good idea where the material belongs - is it more breakable or is it considered to be soft.

As the tensile modulus gets bigger and the elongation gets smaller - the material becomes harder and more cutting edges can be used.

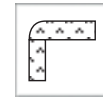
This table can also give a perspective of a new material regarding a material that is already known.



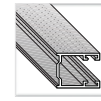
# Plastic



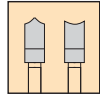
Plastic



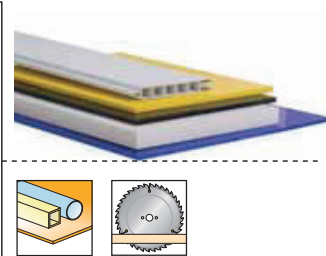
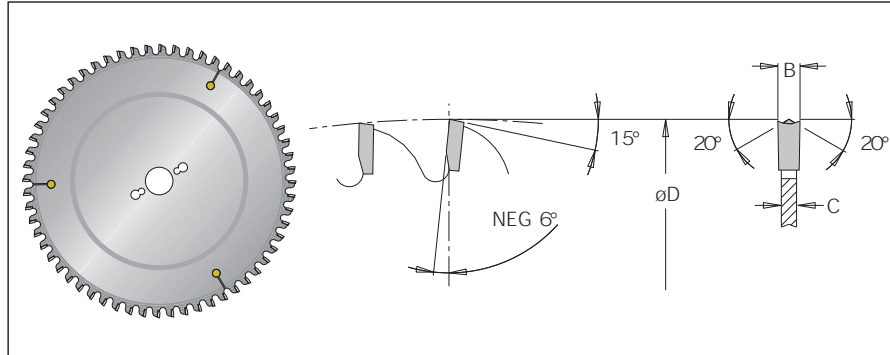
Corian



Aluminum



MDN - Trimming & Sizing Saw Blade



øD	Teeth	Code No.	B	c	n	m/min	ød
220	42	901 10 65 6	3.2	2.2	6000-8600	13-18	30
253	48	901 10 13 6	3.2	2.2	5200-7500	12-18	30
303	60	901 10 85 6	3.2	2.2	4400-6300	13-19	30

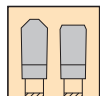
Manufacturing Technology:



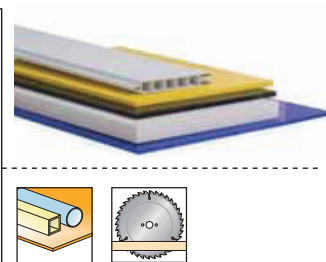
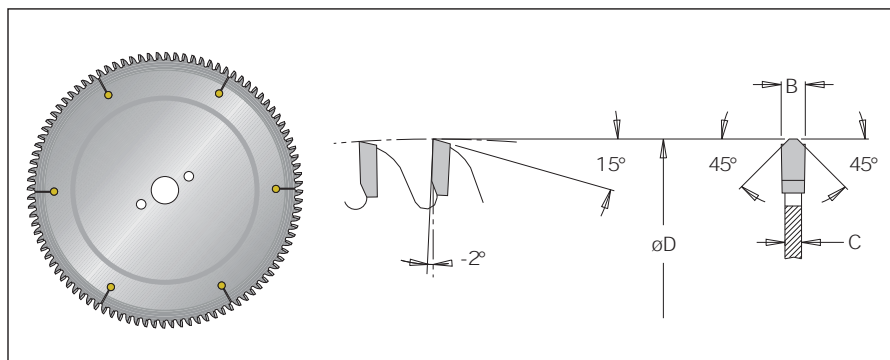
Dynamic Balancing



Dynamic Straightness



MUP - Plastic Trimming & Sizing Saw Blade



øD	Teeth	Code No.	B	c	ød
250	80	901 07 03 6	2.5	1.8	30
300	96	901 07 06 6	3.3	2.6	30
350	108	901 07 09 6	3.7	3	30

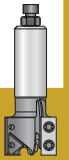
Manufacturing Technology:



Dynamic Straightness



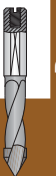
Sawing



CNC



Cutting

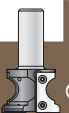


Drilling



Routing

Plastic, Corian, Aluminum



Custom Tooling



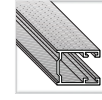
# Plastic



Plastic



Corian



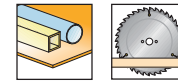
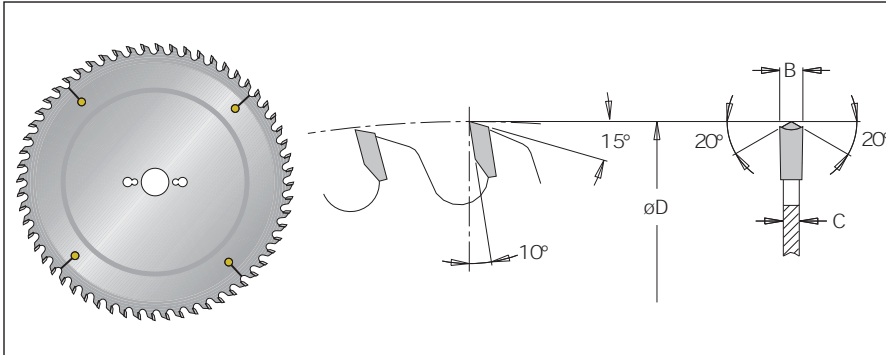
Aluminum



Sawing



## MD - Trimming & Sizing Saw Blade



CNC

øD	Teeth	Code No.	B	c	n	m/min	ød
220	42	901 10 60 6	3.2	2.2	6000-8600	13-18	30
230	42	901 10 70 6	3.2	2.2	5800-8300	12-17	30
253	48	901 10 10 6	3.2	2.2	5200-7500	12-18	30
303	60	901 10 25 6	3.3	2.4	4400-6300	13-19	30
350	72	901 10 30 6	3.2	2.2	3800-5400	14-19	30

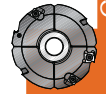
Manufacturing Technology:



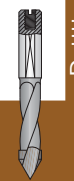
Dynamic Balancing



Dynamic Straightness Above 250 Diameter



Cutting

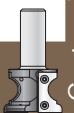


Drilling

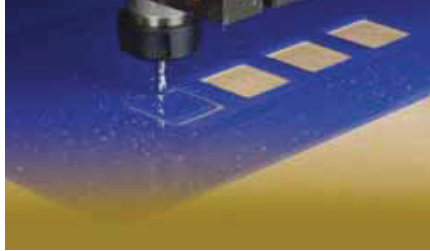


Routing

Plastic, Corian, Aluminum



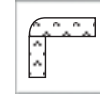
Custom Tooling



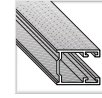
# Plastic



Plastic



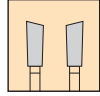
Corian



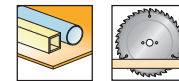
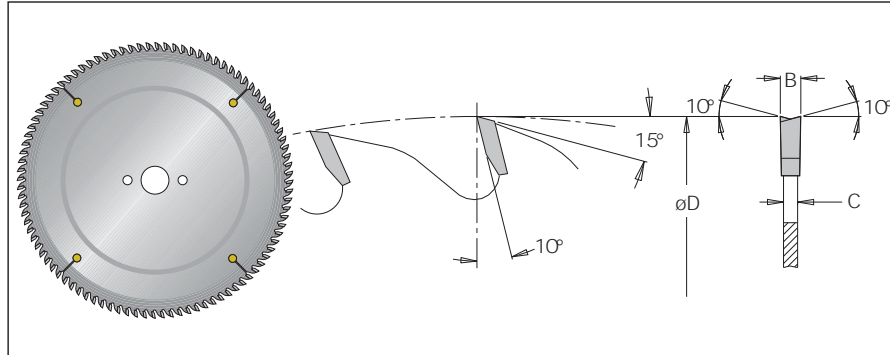
Aluminum



Sawing

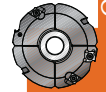


## MW - Trimming & Sizing Saw Blade



CNC

Cutting



øD	Teeth	Code No.	B	c	ød	n	m/min
150	30	901 03 50 6	3.0	2.0	30	6300-10100	32-52
	36	901 03 60 6	3.0	2.0	30	6300-10100	39-62
	48	901 05 30 6	3.0	2.0	30	6300-10100	51-82
180	42	901 03 80 6	3.0	2.0	30	5300-8400	38-60
	58	901 05 40 6	3.0	2.0	30	5300-8400	52-83
200	48	901 04 00 6	3.0	2.0	30	4700-7600	38-62
	64	901 05 50 6	3.0	2.0	30	4700-7600	51-83
220	48	901 04 03 6	3.0	2.0	30	4300-6900	35-56
	64	901 05 59 6	3.0	2.0	30	4300-6900	47-75
250	60	901 04 10 6	3.2	2.2	30	3800-6100	39-62
	80	901 05 70 6	3.2	2.2	30	3800-6100	52-83
300	60	901 04 20 6	3.2	2.2	30	3100-5000	32-51
	72	901 04 30 6	3.2	2.2	30	3100-5000	38-61
	96	901 05 80 6	3.2	2.2	30	3100-5000	51-82
350	72	901 04 40 6	3.5	2.5	30	2700-4300	33-53
	84	901 04 50 6	3.5	2.5	30	2700-4300	39-61
400	108	901 05 90 6	3.5	2.5	30	2700-4300	50-79
	96	901 04 60 6	3.5	2.5	30	2300-3800	38-62
450	120	901 06 00 6	3.5	2.5	30	2300-3800	47-78
	108	901 04 62 6	4.0	2.8	30	2100-3300	39-61
500	132	901 06 03 6	4.0	2.8	30	2100-3300	47-74
	120	901 04 63 6	4.4	3.0	30	1900-3000	39-61

Manufacturing Technology:



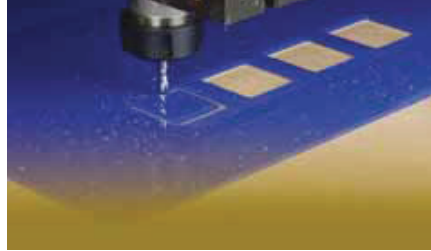
Dynamic  
Straightness  
Above 250  
Diameter

Drilling

Routing

Plastic, Corian, Aluminum

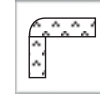
Custom Tooling



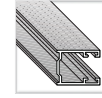
# Plastic



Plastic



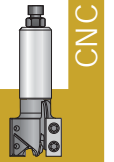
Corian



Aluminum



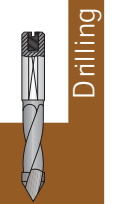
Sawing



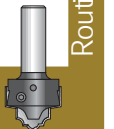
CNC



Cutting



Drilling



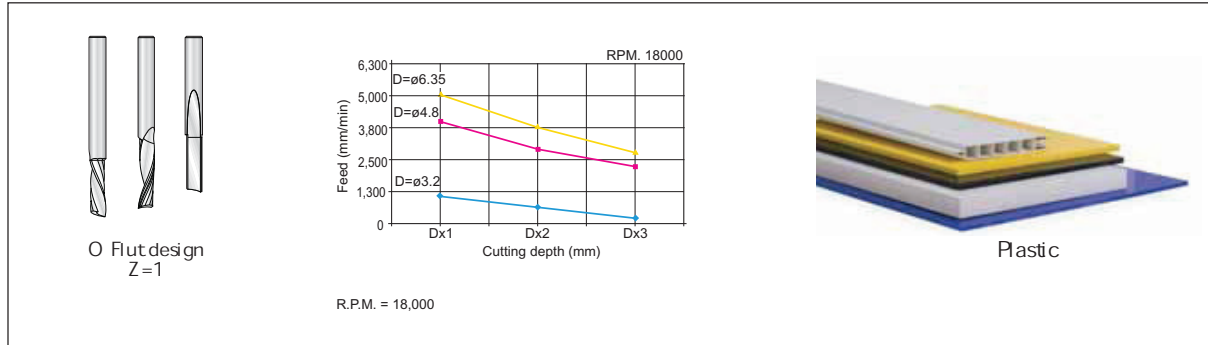
Routing



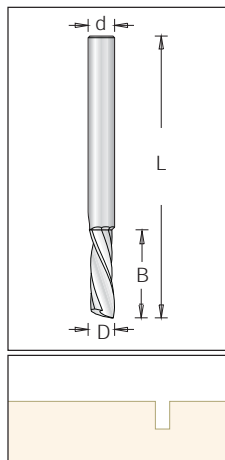
Plastic, Corian, Aluminum



Custom Tooling



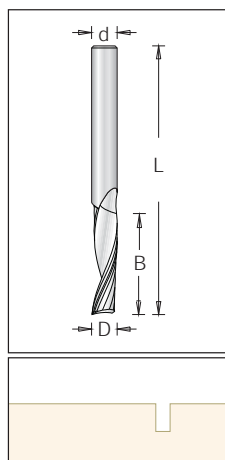
## Single spiral "O" flute, down shear angle, mirror finish



D	B	Code No.	L	ød
3.0	11.0	185 411 z	50	3.0
3.2	12.7	185 411 0	50	3.2
4.0	13.0	185 412 z	50	4.0
4.75	16.0	185 423 0	50	4.75
5.0	18.0	185 413 z	60	5.0
6.0	20.0	185 414 3	60	6.0
6.35	19.0	185 431 4	63	6.35



## single spiral O flut up shear angle Mirror finish



D	B	Code No.	L	ød
3.0	11.0	185 511 z	50	3.0
3.2	12.7	185 511 0	50	3.2
4.0	13.0	185 512 z	50	4
4.75	16.0	185 523 0	50	4.75
5.0	18.0	185 513 z	60	5.0
6.0	20.0	185 514 3	60	6.0
6.35	25.4	185 532 4	63	6.35

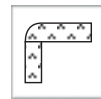




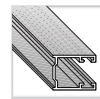
# Plastic



Plastic



Corian

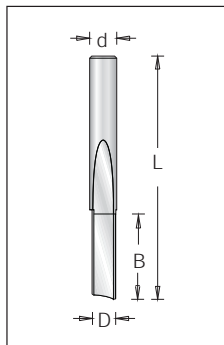


Aluminum



Index

## single straight O flut



D	B	Code No.	L	ød
3.18	12.75	185 022 4	50	6.35
4.76	16.0	185 010 4	50	6.35
6.35	19.05	185 030 4	50	6.35
6.35	25.4	185 032 4	65	6.35
6.35	25.4	L185 032 4	90	6.35

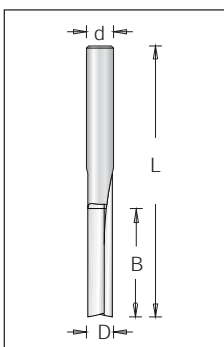


Sawing

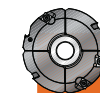


CNC

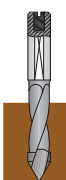
## double straight flut



D	B	Code No.	L	ød
3.15	12.7	187 010 4	50	6.35
4.75	16.0	187 022 4	50	6.35
6.35	25.4	187 032 4	64	6.35
9.5	25.4	187 040 6	64	9.5
12.7	25.4	187 050 8	77	12.7



Cutting

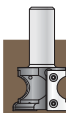


Drilling

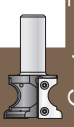
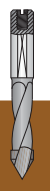
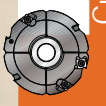
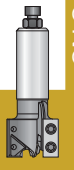


Routing

Plastic, Corian, Aluminum



Custom Tooling



## Engraving system

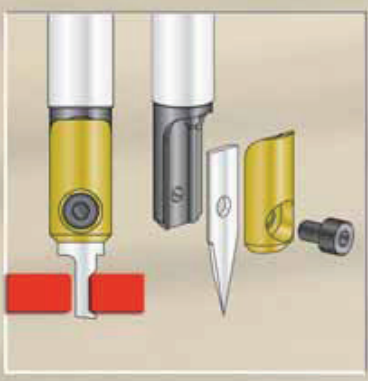
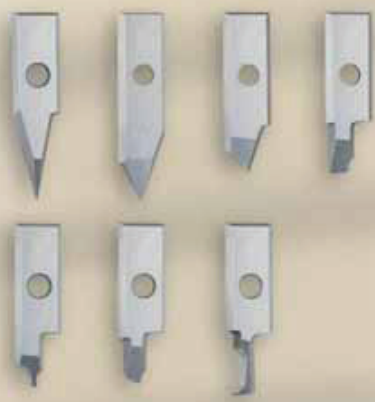
The Engraving Insert System features one tool body with 40 unique insert knives designed for a variety of applications: Straight cut, core box, round corner, V grooves and cutting + chamfering.

Industrial quality insert knives ensure clean cuts and a longer life time than the standard solid router bits.

This engraving system was engineered to quickly interchange inserts while mounted in CNC machines to eliminate setup-time and to maintain consistent cutting accuracy.

Balanced design to minimize vibration and to provide superior cutting results.

Ideal for cutting laminated materials, veneers, MDF, plastics, wood and solid surfaces.





# Plastic



Plastic



Corian



Aluminum

Index

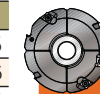
Sawing



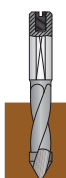
CNC



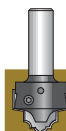
Cutting



Drilling



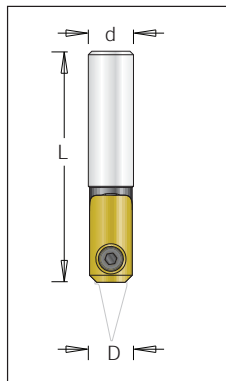
Routing



Plastic, Corian, Aluminum

Custom Tooling

## Engraving system



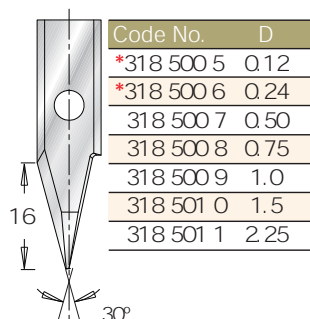
Code No.	D	L	ød
G185 3x0 5	12	65	8
G185 3x0 9	12	65	12



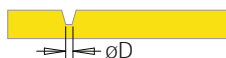
Allen screw  
#193 807 0  
M4x6



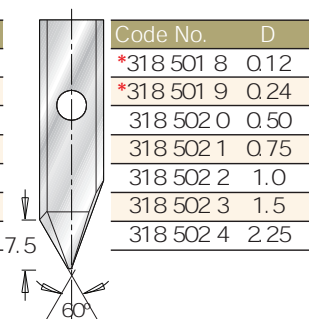
### V-Groove 30° Engraving Insert Knives



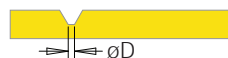
Code No.	D
*318 500 5	0.12
*318 500 6	0.24
318 500 7	0.50
318 500 8	0.75
318 500 9	1.0
318 501 0	1.5
318 501 1	2.25



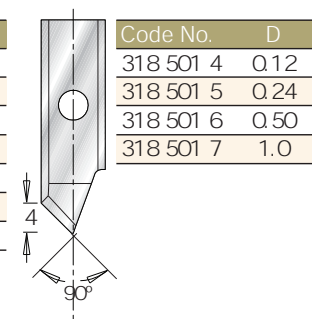
### V-Groove 60° Engraving Insert Knives



Code No.	D
*318 501 8	0.12
*318 501 9	0.24
318 502 0	0.50
318 502 1	0.75
318 502 2	1.0
318 502 3	1.5
318 502 4	2.25



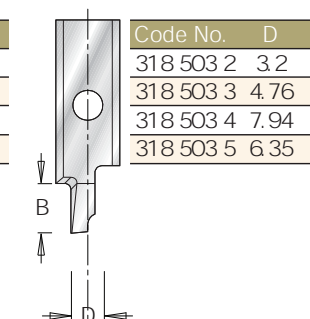
### V-Groove 90° Engraving Insert Knives



Code No.	D
318 501 4	0.12
318 501 5	0.24
318 501 6	0.50
318 501 7	1.0



### Straight Engraving Insert Knives

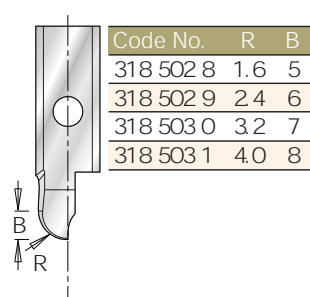


Code No.	D	B
318 503 2	3.2	5
318 503 3	4.76	6
318 503 4	7.94	7
318 503 5	6.35	8



\* Only for use with controllable feed rate machines.

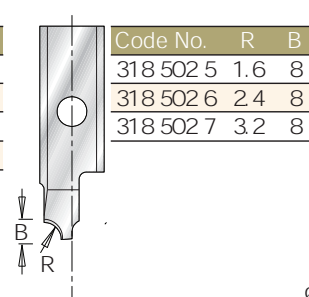
### Core box Engraving Insert Knives



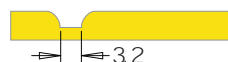
Code No.	R	B
318 502 8	1.6	5
318 502 9	2.4	6
318 503 0	3.2	7
318 503 1	4.0	8



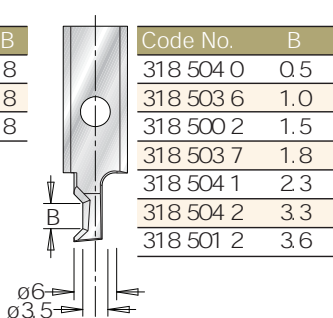
### Comerround Engraving Insert Knives



Code No.	R	B
318 502 5	1.6	8
318 502 6	2.4	8
318 502 7	3.2	8



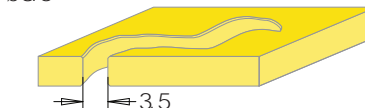
### Cutting and chamfering Engraving Insert Knives

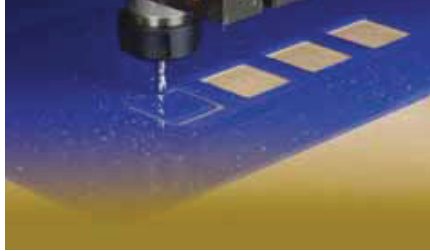


Code No.	B
318 504 0	0.5
318 503 6	1.0
318 500 2	1.5
318 503 7	1.8
318 504 1	2.3
318 504 2	3.3
318 501 2	3.6

Code No.	B
318 504 3	4.3
318 501 3	4.6
*318 500 3	5.0
*318 504 4	5.5
*318 503 8	6.3
*318 503 9	8.3

\* Only for Chamfer operation.

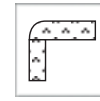




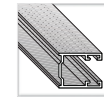
# Plastic



Plastic



Corian



Aluminum



Sawing



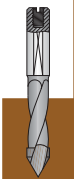
CNC



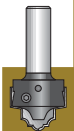
Cutting



Drilling

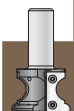


Routing



Plastic, Corian, Aluminum

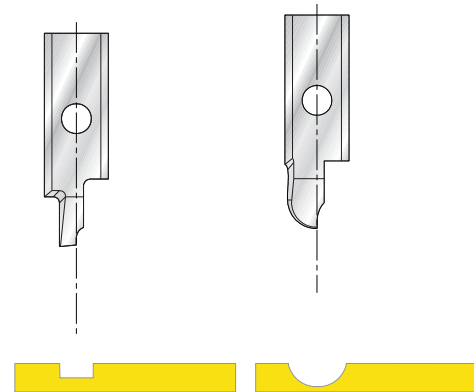
Custom Tooling



## Engraving system feed rates.

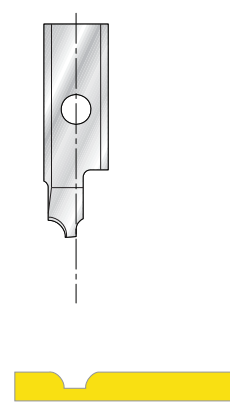
Straight and core box max feed Vars. RPM (cutting depth 1D) mm/min

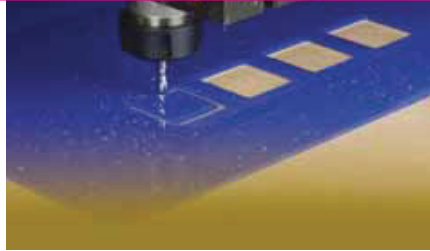
head diameter (mm)	3.2	4.76	6.35	7.93
rotation speed (RPM)	Recomended free rate (mm/min)			
6000	600	780	900	1080
7000	700	910	1050	1260
8000	800	1040	1200	1440
9000	900	1170	1350	1620
10000	1000	1300	1500	1800
11000	1100	1430	1650	1980
12000	1200	1560	1800	2160
13000	1300	1690	1950	2340
14000	1400	1820	2100	2520
15000	1500	1950	2250	2700
16000	1600	2080	2400	2880
17000	1700	2210	2550	3060
18000	1800	2340	2700	3240
19000	1900	2470	2850	3420
20000	2000	2600	3000	3600
21000	2100	2730	3150	3780
22000	2200	2860	3300	3960
23000	2300	2990	3450	4140
24000	2400	3120	3600	4320
25000	2500	3250	3750	4500
26000	2600	3380	3900	4680
27000	2700	3510	4050	4860
28000	2800	3640	4200	5040



Round corner reccomended feed Vars. RPM mm/min

Knife radius (mm)	1.6	2.4	3.2
rotation speed (RPM)	Recomended free rate (mm/min)		
6000	1500	1320	1200
7000	1750	1540	1400
8000	2000	1760	1600
9000	2250	1980	1800
10000	2500	2200	2000
11000	2750	2420	2200
12000	3000	2640	2400
13000	3250	2860	2600
14000	3500	3080	2800
15000	3750	3300	3000
16000	4000	3520	3200
17000	4250	3740	3400
18000	4500	3960	3600
19000	4750	4180	3800
20000	5000	4400	4000
21000	5250	4620	4200
22000	5500	4840	4400
23000	5750	5060	4600
24000	6000	5280	4800
25000	6250	5500	5000
26000	6500	5720	5200
27000	6750	5940	5400
28000	7000	6160	5600

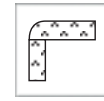




# Plastic



Plastic



Corian



Aluminum



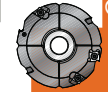
Sawing



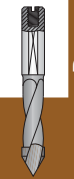
CNC



Cutting



Drilling

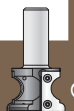


Routing



Plastic, Corian, Aluminum

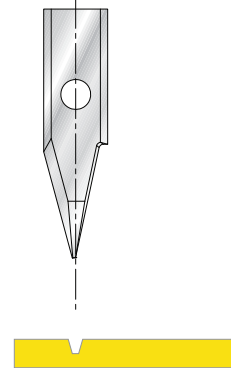
Custom Tooling



V-groove Routing recommended max feed vars. RPM (inch/min)

head diameter (D) mm	0.1	0.25	0.5	0.75	1	1.5	2.25
rotation speed (RPM)	Max. feed rate mm/min						
6000	480	1200	2400	3600			
7000	560	1400	2800				
8000	640	1600	3200				
9000	720	1800	3600				
10000	800	2000	4000				
11000	880	2200					
12000	960	2400					
13000	1040	2600					
14000	1120	2800					
15000	1200	3000					
16000	1280	3200					
17000	1360	3400					
18000	1440	3600					
19000	1520	3800					
20000	1600						
21000	1680						
22000	1760						
23000	1840						
24000	1920						
25000	2000						
26000	2080						
27000	2160						
28000	2240						

NO LIMIT



sizing and chamfering recommended feed Vars. RPM mm/min

Sizing and chamfering

Material thickness (mm)	2	3	4.6	5.6
rotation speed (RPM)	Recommended feed rate (mm/min)			
6000	1500	1320	1200	1080
7000	1750	1540	1400	1260
8000	2000	1760	1600	1440
9000	2250	1980	1800	1620
10000	2500	2200	2000	1800
11000	2750	2420	2200	1980
12000	3000	2640	2400	2160
13000	3250	2860	2600	2340
14000	3500	3080	2800	2520
15000	3750	3300	3000	2700
16000	4000	3520	3200	2880
17000	4250	3740	3400	3060
18000	4500	3960	3600	3240
19000	4750	4180	3800	3420
20000	5000	4400	4000	3600
21000	5250	4620	4200	3780
22000	5500	4840	4400	3960
23000	5750	5060	4600	4140
24000	6000	5280	4800	4320
25000	6250	5500	5000	4500
26000	6500	5720	5200	4680
27000	6750	5940	5400	4860
28000	7000	6160	5600	5040

Chamfering only

	6	7.2	8
6000	1500	1320	1200
7000	1750	1540	1400
8000	2000	1760	1600
9000	2250	1980	1800
10000	2500	2200	2000
11000	2750	2420	2200
12000	3000	2640	2400
13000	3250	2860	2600
14000	3500	3080	2800
15000	3750	3300	3000
16000	4000	3520	3200
17000	4250	3740	3400
18000	4500	3960	3600
19000	4750	4180	3800
20000	5000	4400	4000
21000	5250	4620	4200
22000	5500	4840	4400
23000	5750	5060	4600
24000	6000	5280	4800
25000	6250	5500	5000
26000	6500	5720	5200
27000	6750	5940	5400
28000	7000	6160	5600

