

PCB Inverse Drill

D835 / D534 / D532

**PCB
FR4**

165°

APPLICATION

Drilling of high quality multilayer boards

ADVANTAGES

Efficient chip removal by optimized geometry
Excellent hole wall quality
High positional accuracy
Better vibration damping
Better heat dissipation

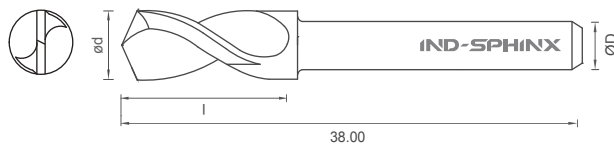
PACKING

10 tools per pack.
50 tools per pack.

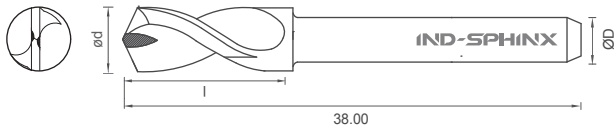
SCAN TO WEBSITE



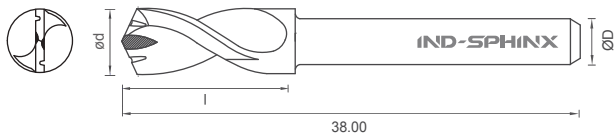
Standard Inverse Drill D835



High Performance Inverse Drill D534



High Performance C.B Inverse Drill D532



Ø d DIAMETER	I FLUTE LENGTH
3.20 - 3.50	12.00
3.55 - 4.00	12.00
4.05 - 4.50	12.00
4.55 - 5.00	12.00
5.05 - 5.50	12.00
5.55 - 6.00	12.00
6.05 - 6.50	12.00
6.55 - 7.00	12.00
7.05 - 7.50	12.00

All dimensions in mm

On request Inch / Special dimensions / Shank 3.00mm

RECOMMENDED PARAMETERS							
Ød	N	F		f		B	
mm	RPM	m/min	IPM	µm/rev	mil	m/min	IPM
3.20 - 3.95	20000	0.84	33	35	1.38	20	787
4.00 - 5.35	20000	0.84	33	35	1.38	20	787
5.50 - 6.00	20000	0.92	36	40	1.38	20	787
6.00 - 6.50	20000	0.92	36	40	1.57	20	787
6.55 - 7.50	20000	0.92	36	40	1.57	20	787
Ød Tool Diameter		N Spindle Speed		F Infeed	f Chip Load	B Retract Feed	
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.							

PCB Slot Drill

PCB
FR4

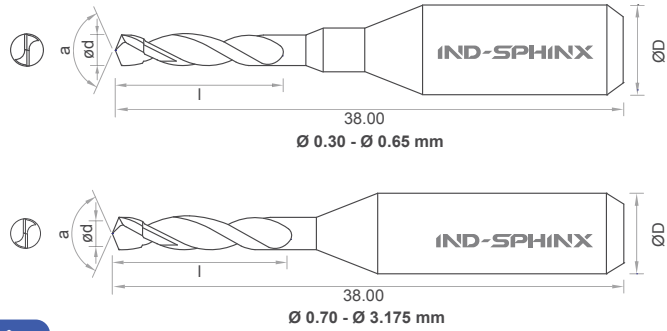
D546

150°

Point Angle α



Undercut



APPLICATION

For making slots in PCBs

ADVANTAGES

- Better dimensional control
- Reduced deviation
- Reduced breakages
- Improved slot finish

PACKING

- 10 tools per pack.
- 50 tools per pack.

Ø d DIAMETER	I FLUTE LENGTH	
0.30	4.00	-
0.35*	4.00	-
0.40	4.00	-
0.45	4.00	-
0.50 - 0.65	5.50	7.00
0.70 - 1.25	7.00	8.50
1.30 - 3.175	8.50	-

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

* : Non stock items / Articles

RECOMMENDED PARAMETERS									
Material : FR4 MLB 6-20 layers				Spindle Type : Air Bearing		Cutting Speed : 150 m/min			
Ød	125,000 Max.			B	Ød	125,000 Max.			B
	f	N	F			f	N	F	
mm	µm/rev	RPM	m/min	m/min	mm	µm/rev	RPM	m/min	m/min
0.30	5	125000	0.6	5	1.15	55	42000	2.3	25
0.35	7	125000	0.9	5	1.20	56	40000	2.2	25
0.40	8	125000	1.0	7	1.25	58	38000	2.2	25
0.45	9	125000	1.1	7	1.30	59	37000	2.2	25
0.50	10	115000	1.2	10	1.35	61	35000	2.1	25
0.55	17	104000	1.8	10	1.40	62	34000	2.1	25
0.60	20	88000	1.8	15	1.45	63	33000	2.1	25
0.65	27	80000	2.2	25	1.50	64	32000	2.0	25
0.70	33	75000	2.5	25	1.55	66	31000	2.0	25
0.75	35	70000	2.5	25	1.60	67	30000	2.0	25
0.80	38	66000	2.5	25	1.80	72	27000	1.9	25
0.85	40	62000	2.5	25	2.00	80	24000	1.9	25
0.90	43	58000	2.5	25	2.40	80	20000	1.6	25
0.95	47	55000	2.6	25	2.50	80	20000	1.6	25
1.00	50	52000	2.6	25	2.80	70	20000	1.4	25
1.05	52	45000	2.3	25	3.00	60	20000	1.2	25
1.10	53	43000	2.3	25	3.175	60	20000	1.2	25
Ød Tool Diameter		f Chip Load		N Spindle Speed		F Infeed		B Retract Feed	
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.									

SCAN TO WEBSITE



QUALITY • PRECISION • CONSISTENCY

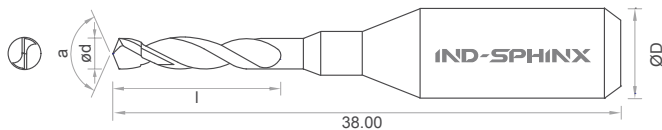


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PCB Multilayer Undercut Drill

D620

**PCB
FR4**



Point Angle a
Ø0.15 - Ø0.20



Point Angle a
Ø0.25 - Ø0.65



Undercut

APPLICATION

Drilling of high layer boards /
thick panels

ADVANTAGES

Efficient chip removal by
optimized geometry

Excellent hole wall quality

High positional accuracy

Better vibration damping

Better heat dissipation

PACKING

10 tools per pack.
50 tools per pack.

Ø d DIAMETER		l FLUTE LENGTH	
0.15		2.00	2.50*
0.20		3.50	4.00*
0.25		3.50	4.00*
0.30		5.50	7.00*
0.35		5.50	7.00*
0.40		5.50	7.00*
0.45		7.00	8.50*
0.50 - 0.65		7.00	8.50

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

* : Non stock items / Articles

RECOMMENDED PARAMETERS								
Material : FR4 MLB 8-20 layers Spindle Type : Air Bearing								
Ød	f	110,000 Max.		125,000 Max.		150,000 Max.		B
		N	F	N	F	N	F	
mm	µm/rev	RPM	m/min	RPM	m/min	RPM	m/min	m/min
0.15	6	110000	0.7	125000	0.8	150000	0.9	2.3
0.20	9	110000	1.0	125000	1.1	150000	1.4	3.0
0.25	13	110000	1.4	125000	1.6	150000	2.0	3.8
0.30	16	110000	1.8	125000	2.0	150000	2.4	4.5
0.35	18	110000	2.0	125000	2.3	136000	2.4	5.3
0.40	20	110000	2.2	119000	2.4	119000	2.4	6.0
0.45	23	106000	2.4	106000	2.4	106000	2.4	6.8
0.50	26	95000	2.5	95000	2.5	95000	2.5	7.5
0.55	32	87000	2.8	87000	2.8	87000	2.8	11.3
0.60	35	80000	2.8	80000	2.8	80000	2.8	15.0
0.65	38	73000	2.8	73000	2.8	73000	2.8	18.8
Ød Tool Diameter f Chip Load N Spindle Speed F Infeed B Retract Feed								
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.								

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PCB Undercut Drill

PCB
FR4

D635



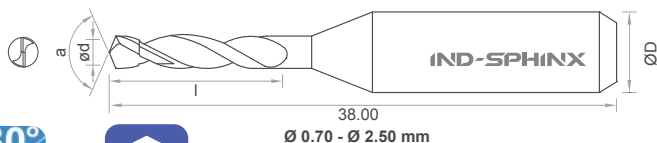
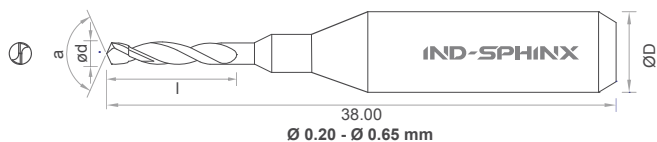
Point Angle α
 $d \leq \varnothing 0.25\text{mm}$



Point Angle α
 $d \geq \varnothing 0.30\text{mm}$



Undercut



APPLICATION

Drilling of high quality multilayer boards

ADVANTAGES

Efficient chip removal by optimized geometry

Excellent hole wall quality

High positional accuracy

Better vibration damping

Better heat dissipation

PACKING

10 tools per pack.

50 tools per pack.

Ø d DIAMETER	I FLUTE LENGTH		
0.20	3.50	-	-
0.25	3.50	-	-
0.30	5.00*	5.50	7.00*
0.35 - 0.45	5.50	7.00	-
0.50 - 0.65	7.00	8.50	-
0.70 - 2.50	10.00	-	-

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

* : Non stock items / Articles

RECOMMENDED PARAMETERS								
Material : FR4 MLB 6-20 layers Spindle Type : Air Bearing								
Ød	f	110,000 Max.		125,000 Max.		150,000 Max.		B
		N	F	N	F	N	F	
mm	µm/rev	RPM	m/min	RPM	m/min	RPM	m/min	m/min
0.20	9	110000	1.0	125000	1.1	150000	1.4	3.0
0.25	13	110000	1.4	125000	1.6	150000	2.0	3.8
0.30	16	110000	1.8	125000	2.0	150000	2.4	4.5
0.35	18	110000	2.0	125000	2.3	136000	2.4	5.3
0.40	20	110000	2.2	119000	2.4	119000	2.4	6.0
0.45	23	106000	2.4	106000	2.4	106000	2.4	6.8
0.50	26	95000	2.5	95000	2.5	95000	2.5	7.5
0.55	32	87000	2.8	87000	2.8	87000	2.8	11.3
0.60	35	80000	2.8	80000	2.8	80000	2.8	15.0
0.65	38	73000	2.8	73000	2.8	73000	2.8	18.8
0.70	41	68000	2.8	68000	2.8	68000	2.8	18.8
1.00	64	48000	3.1	48000	3.1	48000	3.1	18.8
1.30 - 1.40	68	37000	2.5	37000	2.5	37000	2.5	18.8
1.45 - 1.60	68	33000	2.2	33000	2.2	33000	2.2	18.8
1.65 - 1.80	68	28000	1.9	28000	1.9	28000	1.9	18.8
1.80 - 2.20	68	25000	1.7	25000	1.7	25000	1.7	18.8
2.25 - 3.175	68	20000	1.4	20000	1.4	20000	1.4	18.8
Ød Tool Diameter		f Chip Load		N Spindle Speed		F Infeed		B Retract Feed
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.								

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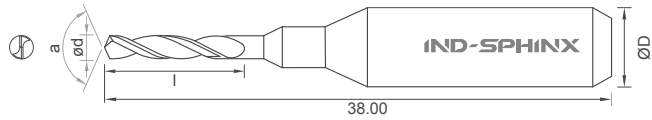
PEOPLE

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PCB Micro Drill

D835

**PCB
FR4**



Point Angle α
 $d \leq \text{Ø}0.25\text{mm}$



Point Angle α
 $d \geq \text{Ø}0.30\text{mm}$

APPLICATION

Drilling of small holes with high positional accuracy

Drilling of small through holes and via holes

ADVANTAGES

Excellent hole wall quality

High positional accuracy

Efficient chip removal

PACKING

10 tools per pack.

50 tools per pack.

Ø d DIAMETER		l FLUTE LENGTH		
	0.20	3.50	-	-
	0.25	3.50	-	-
	0.30	3.50	5.50	7.00
	0.35	3.50	5.50	7.00
	0.40	5.50	7.00	8.50
	0.45	5.50	7.00	8.50
	0.50	7.00	8.50	-
	0.55	7.00	8.50	-
	0.60	7.00	8.50	-
	0.65	7.00	8.50	-

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

RECOMMENDED PARAMETERS								
Ød mm	f µm/rev	125,000 Max.		150,000 Max.		180,000 Max.		B m/min
		N RPM	F m/min	N RPM	F m/min	N RPM	F m/min	
0.20	11	125000	1.4	150000	1.7	180000	2.0	4
0.25	15	125000	1.9	150000	2.3	180000	2.7	5
0.30	18	125000	2.3	150000	2.7	160000	2.9	6
0.35	21	125000	2.6	137000	2.9	137000	2.9	7
0.40	23	120000	2.8	120000	2.8	120000	2.8	8
0.45	26	107000	2.8	107000	2.8	107000	2.8	9
0.50	30	96000	2.9	96000	2.9	96000	2.9	10
0.55	42	87000	3.7	87000	3.7	87000	3.7	15
0.60	46	80000	3.7	80000	3.7	80000	3.7	20
0.65	50	73000	3.7	73000	3.7	73000	3.7	25
Ød Tool Diameter		f Chip Load		N Spindle Speed		F Feed Rate		B Retract Feed
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.								

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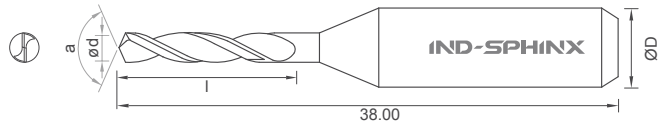
PCB Standard Drill

PCB
FR4

D835

130°
2

Point Angle α



APPLICATION

For all standard PCBs

ADVANTAGES

Excellent hole wall quality

High positional accuracy

Efficient chip removal

PACKING

10 tools per pack.

50 tools per pack.

Ø d DIAMETER	l FLUTE LENGTH
0.70	10.50
0.75	10.50
0.80	10.50
0.85	10.50
0.90	10.50
0.95	10.50
1.00	10.50
1.05	10.50
1.10	10.50
1.15	10.50
1.20	10.50
1.25	10.50
1.30	10.50
1.35	10.50
1.40	10.50
1.45 - 2.30	10.50
2.35 - 3.175	10.50

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

RECOMMENDED PARAMETERS				
Material : FR4 MLB 8-20 layers Spindle Type : Air Bearing				
Ød	N	F	f	B
mm	RPM	m/min	µm/rev	m/min
0.70	68000	3.40	50	20
0.75	64000	3.50	54	20
0.80	60000	3.50	59	20
0.85	56000	3.50	63	20
0.90	53000	3.60	68	20
0.95	50000	3.60	72	20
1.00	48000	3.70	77	20
1.10	43000	3.50	81	20
1.20	40000	3.20	81	20
1.30	37000	3.00	81	20
1.40	34000	2.80	81	20
1.45 - 1.80	33000	2.70	81	20
1.85 - 1.90	25000	2.10	81	20
1.95 - 2.00	24000	1.90	81	20
2.05 - 2.10	23000	1.90	81	20
2.15 - 2.20	22000	1.80	81	20
2.25 - 3.175	21000	1.70	81	20
Ød Tool Diameter	N Spindle Speed	F Feed Rate	f Chip Load	B Retraction

Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.

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PCB Multilayer Ultra Micro Drill

D840

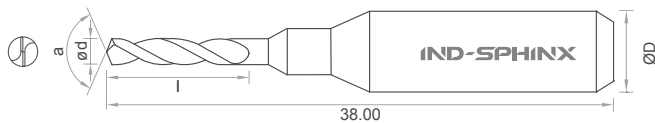
PCB
FR4

PTFE

POLYIMIDE
FLEXIBLE
PCB

IND-SPHINX®

PCB DRILLS | PCB ROUTERS



Point Angle a

APPLICATION

Drilling of small through holes in multilayer boards

ADVANTAGES

Efficient chip removal by optimized geometry

Excellent hole wall quality

High positional accuracy

PACKING

10 tools per pack.

50 tools per pack.

Ø d DIAMETER	l FLUTE LENGTH
0.050	0.60
0.060	0.70
0.075	1.00
0.080	1.00
0.090	1.00

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

RECOMMENDED PARAMETERS										
Material : FR4 MLB 8-20 layers Spindle Type : Air Bearing										
Ød	f	110,000 Max.		125,000 Max.		150,000 Max.		180,000 Max.		B
		N	F	N	F	N	F	N	F	
mm	µm/rev	RPM	m/min	RPM	m/min	RPM	m/min	RPM	m/min	m/min
0.050	3	110000	0.3	125000	0.4	150000	0.5	180000	0.5	2.0
0.060	3	110000	0.3	125000	0.4	150000	0.5	180000	0.5	2.0
0.075	3	110000	0.3	125000	0.4	150000	0.5	180000	0.5	2.0
0.080	4	110000	0.4	125000	0.5	150000	0.6	180000	0.7	2.0
0.090	4	110000	0.4	125000	0.5	150000	0.6	180000	0.7	2.0
Ød Tool Diameter		f Chip Load		N Spindle Speed		F Infeed		B Retract Feed		
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.										

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PEOPLE

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PCB Multilayer Super Micro Drill

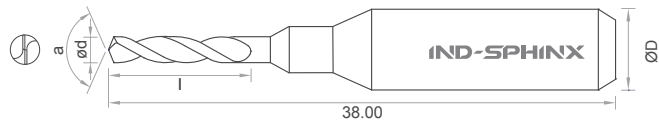
D840

PCB
FR4

PTFE

POLYIMIDE
FLEXIBLE
PCB

IND-SPHINX®
PCB DRILLS | PCB ROUTERS



Point Angle α

APPLICATION

Drilling of small through holes in multilayer boards

ADVANTAGES

Efficient chip removal by optimized geometry

Excellent hole wall quality

High positional accuracy

PACKING

10 tools per pack.

50 tools per pack.

Ø d DIAMETER	l FLUTE LENGTH
0.100	1.50
0.110	1.50
0.120	1.50
0.130	1.50
0.140	2.00
0.150	2.00
0.160	2.00
0.170	2.00
0.175	2.00
0.180	2.00
0.190	2.00

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

RECOMMENDED PARAMETERS										
Material : FR4 MLB 8-20 layers Spindle Type : Air Bearing										
Ød	f	110,000 Max.		125,000 Max.		150,000 Max.		180,000 Max.		B
		N	F	N	F	N	F	N	F	
mm	µm/rev	RPM	m/min	RPM	m/min	RPM	m/min	RPM	m/min	m/min
0.100	4	110000	0.4	125000	0.5	150000	0.7	180000	0.7	2.0
0.110	5	110000	0.6	125000	0.6	150000	0.8	180000	0.9	2.0
0.120	6	110000	0.7	125000	0.8	150000	0.9	180000	1.1	2.3
0.125	6	110000	0.7	125000	0.8	150000	0.9	180000	1.1	2.5
0.130	7	110000	0.8	125000	0.9	150000	1.1	180000	1.3	2.8
0.140	7	110000	0.8	125000	1.0	150000	1.2	180000	1.3	2.8
0.150	7	110000	0.8	125000	1.0	150000	1.2	180000	1.3	3.0
0.160	8	110000	0.9	125000	1.0	150000	1.2	180000	1.4	3.2
0.170	8	110000	0.9	125000	1.0	150000	1.2	180000	1.4	3.5
0.175	9	110000	1.0	125000	1.1	150000	1.4	180000	1.6	3.5
0.180	9	110000	1.0	125000	1.1	150000	1.4	180000	1.6	3.8
0.190	10	110000	1.1	125000	1.3	150000	1.5	180000	1.8	4.0
Ød Tool Diameter		f Chip Load		N Spindle Speed		F Infeed		B Retract Feed		
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.										

SCAN TO WEBSITE



QUALITY • PRECISION • CONSISTENCY

PEOPLE

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PCB Multilayer Drill

D840

**PCB
FR4**

PTFE

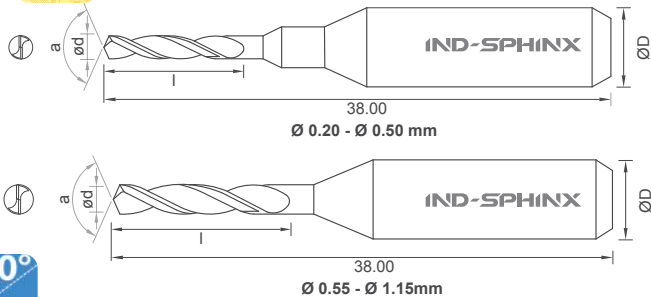
**POLYIMIDE
FLEXIBLE
PCB**

**118°
2**

Point Angle α
 $d \leq \varnothing 0.25\text{mm}$

**130°
2**

Point Angle α
 $d \geq \varnothing 0.30\text{mm}$



APPLICATION

Drilling of small through holes in multilayer boards

ADVANTAGES

Efficient chip removal by optimized geometry

Excellent hole wall quality

High positional accuracy

PACKING

10 tools per pack.

50 tools per pack.

$\varnothing d$ DIAMETER		FLUTE LENGTH	
0.20		2.50	3.50
0.25		3.50	4.00
0.30		5.50	6.50
0.35		5.50	7.00
0.40		5.50	7.00
0.45		7.00	-
0.50		7.00	-
0.55		8.50	-
0.60		8.50	-
0.65		8.50	-
0.70		9.50	-
0.75		9.50	-
0.80		9.50	-
0.85		9.50	-
0.90		10.50	-
0.95		10.50	-
1.00 - 1.15		10.50	-

All dimensions in mm

On request : Inch / Special dimensions / Shank 3.00mm

RECOMMENDED PARAMETERS										
Material : FR4 MLB 8-20 layers Spindle Type : Air Bearing										
Ød	f	110,000 Max.		125,000 Max.		150,000 Max.		180,000 Max.		B
		N	F	N	F	N	F	N	F	
mm	µm/rev	RPM	m/min	RPM	m/min	RPM	m/min	RPM	m/min	m/min
0.200	11	110000	1.2	125000	1.3	150000	1.6	180000	2.0	3.0
0.250	13	110000	1.4	125000	1.6	150000	1.9	180000	2.3	3.8
0.300	16	110000	1.8	125000	2.0	150000	2.4	159000	2.5	4.5
0.350	18	110000	2.0	125000	2.2	136000	2.4	136000	2.4	5.3
0.400	20	110000	2.2	119000	2.3	119000	2.3	119000	2.4	6.0
0.450	23	106000	2.4	106000	2.4	106000	2.4	106000	2.4	6.8
0.500	26	95000	2.5	95000	2.4	95000	2.4	95000	2.5	7.5
0.550	32	87000	2.8	87000	2.7	87000	2.7	87000	2.8	11.3
0.600	35	80000	2.8	80000	2.8	80000	2.8	80000	2.8	18.8
0.650	38	73000	2.8	73000	2.7	73000	2.7	73000	2.8	18.8
0.700	41	68000	2.8	68000	2.7	68000	2.7	68000	2.8	18.8
0.750	45	64000	2.9	64000	2.8	64000	2.8	64000	2.9	18.8
0.800	49	60000	2.9	60000	2.9	60000	2.9	60000	2.9	18.8
0.850	53	56000	3.0	56000	2.9	56000	2.9	56000	3.0	18.8
0.900	56	53000	3.0	53000	2.9	53000	2.9	53000	3.0	18.8
1.000	64	48000	3.1	48000	3.0	48000	3.0	48000	3.1	18.8
1.150	68	42000	2.9	42000	2.8	42000	2.8	42000	2.9	18.8
Ød Tool Diameter		f Chip Load		N Spindle Speed		F Infeed		B Retract Feed		
Tabulated parameters provide guidelines which acts as starting points for optimising speeds and feeds at the user's end.										

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