NEW!

IMPELLER SOLUTION

SILMAX

QUALITY AS STANDARD

MADE IN ITALY

MACHINING INOX, TITANIUM, ALUMINIUM & ALLOYS

MATERIAL	GROUP	WRKNR	STD	DIN	★ GOOD ★★ OPTIMUM
INOX	FERRITIC / MARTENSITIC	1.4301 1.4002 1.4021 1.4112 1.4113	AISI 304 AISI 405 AISI 420 AISI 440B AISI 434	X5CrNi18 9 X6CrAl13 X20Cr13 X90CrMoV18 X6CrMo17	 013EV ★★  197 ★★  198 ★  747 ★★  91 ★★  92 ★★
	AUSTENITIC	1.4401 1.4404 1.4571 1.4541	AISI 316 AISI 316 L AISI 316 Ti AISI 321	ZX5CrNiMo18 10 X2CrNiMo17 13 2 X6CrNiMoTi17 12 2 X6CrNiTi18 10	
	PH	1.4545 1.4564 1.4542	15-5 PH 17-7 PH 17-4 PH	X5CrNiCuNb17 4	
	DUPLEX	1.4410 1.4462			
TITANIUM	TITANIUM ALLOYS 340-450 HB	3.7124 3.7144 3.7154 3.7165 3.7174 3.7184		TiCu2 TiAl6Sn2Zr4Mo2 TiAl6Zr5 TiAl6V4 TiAl6V6Sn2 TiAl4Mo4Sn2	 013EV ★  017 ★★  197 ★  198 ★★  747 ★★  91 ★★  92 ★★
ALUMINIUM & ALLOYS	MALLEABLE NON HARDENED ALLOYS (30-80 HB)	3.1325 3.3206 3.3318		AlMn1 AlMg1 AlMg3	 015S ★★  765S ★★  93 ★★  94 ★★
	MALLEABLE HARDENED ALLOYS (70-150 HB)	3.3537 3.4345 3.615		AlCuSiMn AlMgSi1 AlZnMgCu1.5	
	ALUMINIUM CASTING 6-12% Si	3.2151 3.2381		G-AlSi6Cu4 G-AlSi10Mg	

IMPELLER SOLUTION

INDEX

SILMAX IMPELLER SOLUTION

The brand-new Silmax proposal for impeller machining consists in a complete and customized milling solution, including high performing standard tools available in stock and special tools, upon customer's request.
The new Silmax products specific for impeller machining allow:

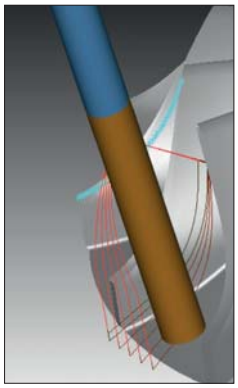
- Performance increase and efficient milling strategy
- Cycle time reduction and cost saving
- Longer tool life thanks to high surface finishing quality

Silmax specialists can support you with a professional 5-Axis milling solution service (CAM, proper tool selection, coolant suggestion, cutting parameters).
The product line is suitable for Aluminium, Inox and Titanium impeller machining and includes cylindrical end mills for roughing and semi-finishing and conical end mills for semi-finishing and finishing of all the impeller components (hub and blade).

EXAMPLES OF APPLICATION

ROUGHING (Traditional Strategy)

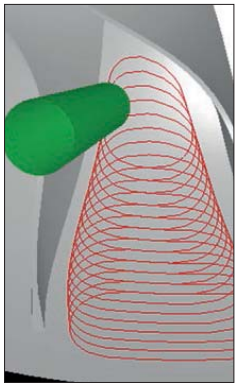
Rough profile End mill for Slotting



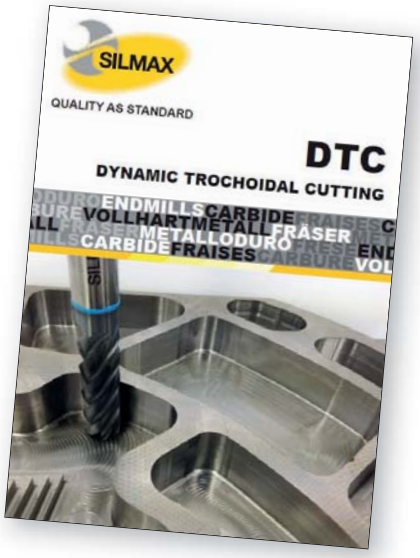
17-4PH	TITANIUM	TITANIUM	ALUMINIUM
			
013EV	**017**	**013EV**	**015S**
Vc : 70 m/min	Vc : 50-70 m/min	Vc : 50-60 m/min	Vc : 300-700 m/min
fz : 0.07 mm	fz : 0.06 mm	fz : 0.02-0.03 mm	fz : 0.1-0.17 mm
ap : 0.5 D-D	ap : 0.6 D-1.5 D	ap : 0.5 D-D	ap : 0.5 D-D
ae : 0.7 D-D	ae : 0.1 D-D	ae : 0.5 D-D	ae : 0.7 D-D

ROUGHING (Trochoidal Strategy)

DTC (Dynamic Trochoidal Cutting) end mill



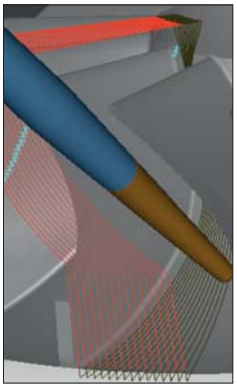
17-4PH	TITANIUM
	
197	**198**
Vc : 120-230 m/min	Vc : 100-190 m/min
fz : 0.1 mm	fz : 0.1-0.15 mm
ap : D-4 D	ap : D-4 D
ae : 0.1 D-0.3 D	ae : 0.1 D-0.3 D



EXAMPLES OF APPLICATION

SEMI-FINISHING AND FINISHING (HUB)

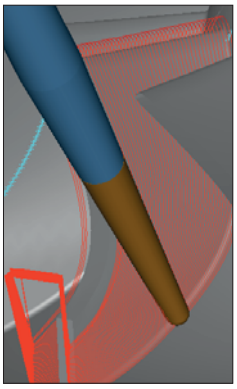
High Feedrate Point milling



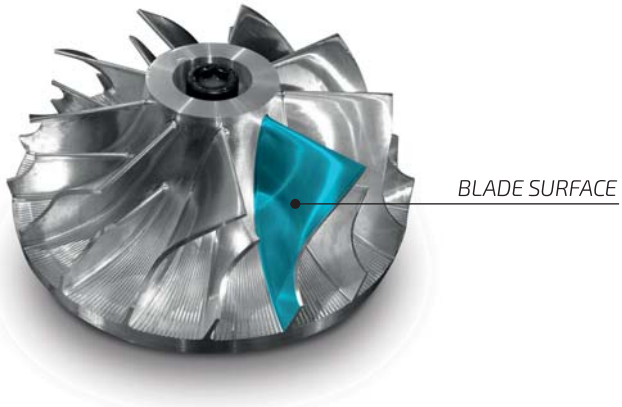
17-4PH	17-4PH
	
747	**92**
Vc : 90-110 m/min	Vc : 70-100 m/min
fz : 0.1-0.4 mm	fz : 0.1-0.4 mm
ap :0.1-0.2 mm	ap : 0.1-0.2 mm
ae : refer surface finishing	ae : refer surface finishing

SEMI-FINISHING AND FINISHING (BLADE)

High Feedrate Point milling

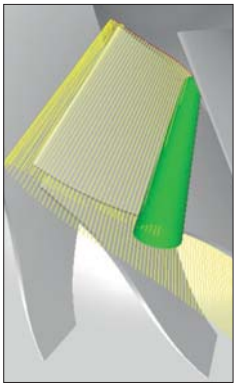


17-4PH	ALUMINIUM
	
92	**765S**
Vc : 70-100 m/min	Vc : 300-900 m/min
fz : 0.05-0.15 mm	fz : 0.05-0.1 mm
ap : 0.1-0.3 mm	ap : 0.1-0.3 mm
ae : refer surface finishing	ae : refer surface finishing



SEMI-FINISHING AND FINISHING (BLADE)

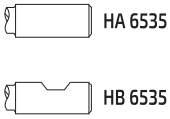
Side milling rule surface



17-4PH	TITANIUM	TITANIUM	ALUMINIUM	ALUMINIUM
SEMI-FINISHING FINISHING	SEMI-FINISHING	FINISHING	SEMI-FINISHING	FINISHING
				
91	**91**	**92**	**93**	**94**
Vc : 70-100 m/min	Vc : 90 m/min	Vc : 60 m/min	Vc : 300-800 m/min	Vc : 250-300 m/min
fz : 0.03-0.07 mm	fz : 0.07-0.1 mm	fz : 0.03 mm	fz : 0.05-0.1 mm	fz : 0.02-0.05 mm
ap : blade height	ap : blade height	ap : blade height	ap : blade height	ap : blade height
ae : 0.07-0.1 mm	ae : 0.5-1 mm	ae : 0.15-0.2 mm	ae : 0.2-1 mm	ae : 0.05-0.2 mm

013EV

Roughing end mills with variable helix and unequal flute spacing



INOX

013EV	D h 10	d h 6	L	l ap	45°	6535	Z			HMG
013F03EV	3	6	57	6	0,15	HA	3			■
013F04EV	4	6	57	8	0,15	HA	3			■
013F05EV	5	6	57	10	0,15	HA	3			■
013F06EV	6	6	57	15	0,15	HA	4			■
013F08EV	8	8	63	20	0,20	HA	4			■
013F10EV	10	10	72	25	0,30	HA	4			■
013F12EV	12	12	83	30	0,40	HB	4			■
013F14EV	14	14	92	35	0,45	HB	4			■
013F16EV	16	16	104	40	0,50	HB	4			■
013F20EV	20	20	104	40	0,60	HB	4			■
013F16EVZ6	16	16	104	48	0,50	HA	6			■
013F20EVZ6	20	20	134	60	0,60	HA	6			■

017

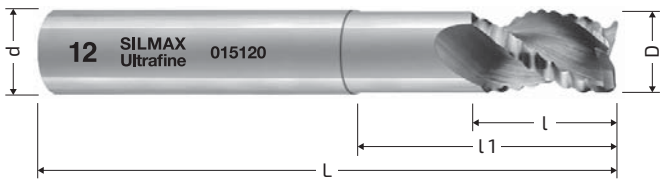
Roughing end mills with chip breaker

TITANIUM

017	D h 10	d h 6	L	l ap	l1	a	Cr	Z		HMC
017080Cr10	8	8	63	12	27	0,15	1,0	4		■
017100Cr10	10	10	72	15	30	0,15	1,0	4		■
017100Cr30	10	10	72	15	30	0,15	3,0	4		■
017120Cr10	12	12	83	18	36	0,20	1,0	4		■
017120Cr20	12	12	83	18	36	0,20	2,0	4		■
017120Cr30	12	12	83	18	36	0,20	3,0	4		■
017160Cr10	16	16	92	24	42	0,20	1,0	4		■
017160Cr30	16	16	92	24	42	0,20	3,0	4		■
017200Cr10	20	20	104	30	52	0,20	1,0	4		■
017200Cr30	20	20	104	30	52	0,20	3,0	4		■

015S

Roughing end mills with chip breaker

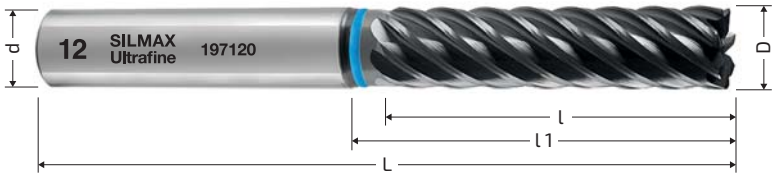


ALUMINIUM

015S	D h 10	d h 6	L	l ap	l1	a	Cr	Z	HM0 uncoated	HMW
015100	10	10	72	15	30	0,15	1,0	3	■	■
015120	12	12	81	18	36	0,20	1,0	3	■	■
015160	16	16	92	24	42	0,20	1,0	3	■	■
015200	20	20	104	30	52	0,20	1,0	3	■	■

197

Corner radius end mills for trochoidal machining



INOX

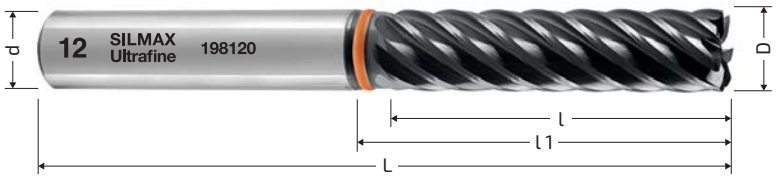
a = 0,25 mm

Ultra Fine | SILMAX Norm | λ 40° | Cr | 4xD

197	D h 10	d h 6	L	l ap	l 1	Cr	λ°	Z		HMY
197040	4	6	57	16	20	0,2	40	4		■
197060	6	6	68	24	30	0,3	40	5		■
197080	8	8	80	32	40	0,5	40	5		■
197080Z7	8	8	80	32	40	0,5	40	7		■
197100	10	10	87	40	46	0,5	40	5		■
197100Z7	10	10	87	40	46	0,5	40	7		■
197120Z7	12	12	108	48	58	0,5	40	7		■
197160Z7	16	16	120	64	68	0,5	40	7		■

198

Corner radius end mills for trochoidal machining



TITANIUM

a = 0,25 mm

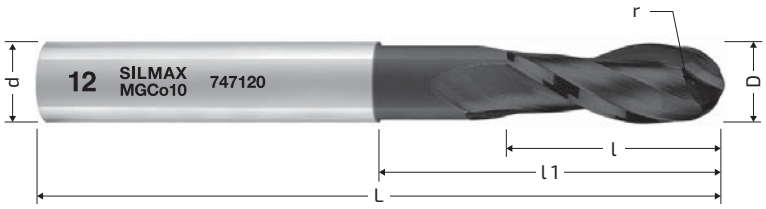
Ultra Fine | SILMAX Norm | λ 40° | Cr | 4xD

198	D h 10	d h 6	L	l ap	l 1	Cr	λ°	Z		HMC
198040	4	6	57	16	20	0,2	40	4		■
198060	6	6	68	24	30	0,3	40	5		■
198080	8	8	80	32	40	0,5	40	5		■
198080Z7	8	8	80	32	40	0,5	40	7		■
198100	10	10	87	40	46	0,5	40	5		■
198100Z7	10	10	87	40	46	0,5	40	7		■
198120Z7	12	12	108	48	58	0,5	40	7		■
198160Z7	16	16	120	64	68	0,5	40	7		■

Diameter 20 mm on request

747

Ball nose end mills



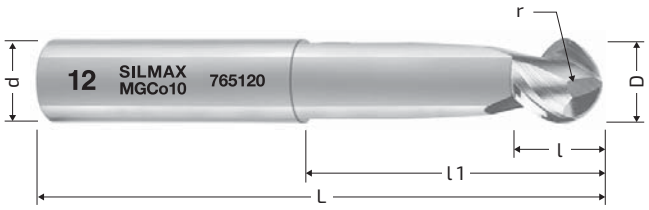
INOX TITANIUM

MG Co10 | SILMAX Norm | λ 30°

747	D	d h 6	L	l ap	l1	a	r f 8	Z			HMG
747040	4	4	62	16	-	-	2,0	2			■
747060	5	5	62	20	-	-	2,5	2			■
747060	6	6	78	20	30	0,15	3,0	2			■
747080	8	8	78	25	35	0,15	4,0	2			■
747100	10	10	105	28	48	0,15	5,0	2			■
747120	12	12	105	32	52	0,20	6,0	2			■
747160	16	16	130	40	60	0,20	8,0	2			■

765S

Ball nose end mills



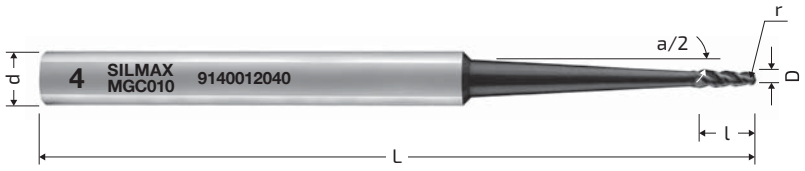
ALUMINIUM

MG Co10 | SILMAX Norm | λ 50°

765S	D	d h 6	L	l ap	l1	a	r f 8	Z	HM0 uncoated	HMW
765030	3	3	50	3	22	0,15	1,5	2	■	■
765040	4	4	50	4	22	0,20	2,0	2	■	■
765050	5	5	50	5	22	0,20	2,5	2	■	■
765060	6	6	57	6	21	0,25	3,0	2	■	■
765080	8	8	63	8	27	0,35	4,0	2	■	■
765100	10	10	72	10	32	0,50	5,0	2	■	■
765120	12	12	83	12	38	0,50	6,0	2	■	■
765160	16	16	92	16	44	0,80	8,0	2	■	■
765200	20	20	104	20	54	0,90	10,0	2	■	■

91

Tapered end mill for semi-finishing



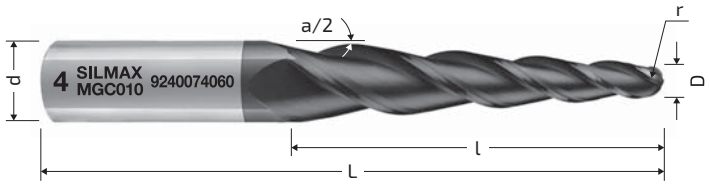
INOX TITANIUM

MG Co10 | SILMAX Norm | λ 40°

91	D	d h 6	L	l ap	a/2	r	Z			HMC
9140012040	4	12	120	12	4°	2	3			■
9140018060	6	16	140	18	4°	3	3			■

92

Tapered end mill for finishing



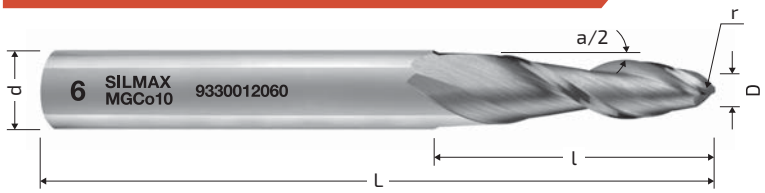
INOX TITANIUM

MG Co10 | SILMAX Norm | λ 35°

92	D	d h 6	L	l ap	a/2	r	Z			HMC
9240059040	4	12	120	57	4°	2	3			■
9240074060	6	16	140	71	4°	3	3			■
9240089080	8	20	155	85	4°	4	3			■

93

Tapered end mill for semi-finishing



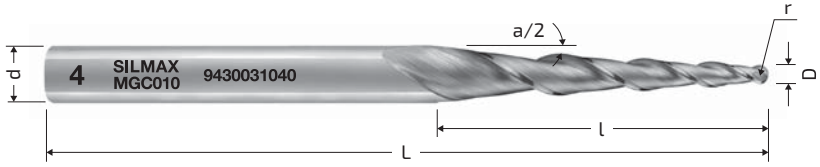
ALUMINIUM

MG Co10 | SILMAX Norm | λ 35°

93	D	d h 6	L	l ap	a/2	r	Z		HMO uncoated	HMW
9330006030	3	8	63	6	3°	1,5	2			■
9330012060	6	10	80	12	3°	3,0	2			■
9340006030	3	8	63	6	4°	1,5	2			■
9340012060	6	10	80	12	4°	3,0	2			■
9350005020	2	8	63	5	5°	1,0	2			■

94

Tapered end mill for finishing



ALUMINIUM

MG Co10 | SILMAX Norm | λ 35°

94	D	d h 6	L	l ap	a/2	r	Z		HMO uncoated	HMW
9430020030	3	6	63	28	3°	1,5	2			■
9430031040	4	8	80	38	3°	2,0	2			■
9440020020	2	6	63	28	4°	1,0	2			■
9440030040	4	8	80	28	4°	2,0	2			■
9450026020	2	8	63	34	5°	1,0	2			■

WORKING PARAMETERS

ROUGHING

INOX

013EV

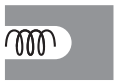
1,0 D

0,5 D

	Vc = 50 m/min			Vc = 60 m/min		
D	fz	F	n	fz	F	n
mm	mm/z	mm/min	rpm	mm/z	mm/min	rpm
6	0,014	150	2.700	0,020	260	3.200
8	0,018	140	2.000	0,026	250	2.400
10	0,020	130	1.600	0,030	230	1.900
12	0,025	130	1.300	0,036	230	1.600
16	0,029	120	1.000	0,043	210	1.200
20	0,033	110	800	0,049	200	1.000

197


ae = 0,10x D


ae = 0,05xD

	Vc = 150-190 m/min				Vc = 190-230 m/min			
D	ae	ap max	fz min	fz max	ae	ap max	fz min	fz max
mm	mm	mm	mm	mm	mm	mm	mm	mm
6	0,60	18	0,06	0,10	0,30	18	0,08	0,13
8	0,80	24	0,10	0,13	0,40	24	0,13	0,16
10	1,00	30	0,13	0,15	0,50	30	0,16	0,19
12	1,20	36	0,15	0,18	0,60	36	0,19	0,22
16	1,60	48	0,18	0,21	0,80	48	0,22	0,25
-	-	-	-	-	-	-	-	-

TITANIUM

017

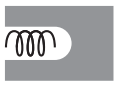
1,0 D

0,5 D

	Vc = 40 m/min			Vc = 50 m/min		
D	fz	F	n	fz	F	n
mm	mm/z	mm/min	rpm	mm/z	mm/min	rpm
-	-	-	-	-	-	-
-	-	-	-	-	-	-
10	0,030	155	1.270	0,035	225	1.590
12	0,040	170	1.060	0,045	240	1.330
16	0,050	160	800	0,060	240	990
20	0,065	165	640	0,075	240	800

198


ae = 0,10x D


ae = 0,05xD

	Vc = 120-150 m/min				Vc = 150-180 m/min			
D	ae	ap max	fz min	fz max	ae	ap max	fz min	fz max
mm	mm	mm	mm	mm	mm	mm	mm	mm
6	0,60	18	0,08	0,13	0,30	18	0,11	0,18
8	0,80	24	0,13	0,16	0,40	24	0,18	0,22
10	1,00	30	0,16	0,19	0,50	30	0,22	0,27
12	1,20	36	0,19	0,22	0,60	36	0,27	0,31
16	1,60	48	0,22	0,25	0,80	48	0,31	0,36
-	-	-	-	-	-	-	-	-

ALUMINIUM < 6% Si

015S

1,0 D

0,5 D

	Vc = 600 m/min			Vc = 880 m/min		
d1	fz	F	n	fz	F	n
mm	mm/z	mm/min	rpm	mm/z	mm/min	rpm
10	0,151	8.667	19.108	0,141	11.871	28.028
12	0,171	8.181	15.924	0,161	11.298	23.355
16	0,203	7.269	11.943	0,193	10.136	17.516
20	0,227	6.519	9.554	0,217	9.141	14.013
-	-	-	-	-	-	-
-	-	-	-	-	-	-

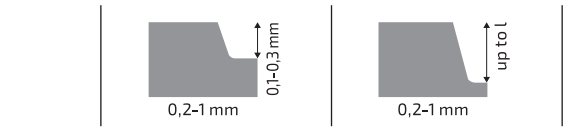
WORKING PARAMETERS

SEMIFINISHING

747

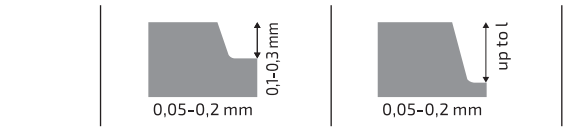
	Vc = 90 m/min		
D	fz	F	n
mm	mm/z	mm/min	rpm
6	0,23	2.150	4.777
8	0,28	1.971	3.582
10	0,32	1.806	2.866
12	0,36	1.744	2.388
16	0,42	1.487	1.791
20	0,47	1.333	1.433

91



		Vc = 100 m/min			Vc = 100 m/min		
d1	a/2	fz	F	n	fz	F	n
mm	°	mm/z	mm/min	rpm	mm/z	mm/min	rpm
4	4	0,015	287	6.582	0,015	287	6.582
6	4	0,022	287	4.388	0,022	287	4.388
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

92



		Vc = 70 m/min			Vc = 70 m/min		
d1	a/2	fz	F	n	fz	F	n
mm	°	mm/z	mm/min	rpm	mm/z	mm/min	rpm
4	4	0,012	100	2.744	0,012	100	2.744
6	4	0,017	100	1.995	0,017	100	1.995
8	4	0,021	100	1.568	0,021	100	1.568
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

SEMIFINISHING

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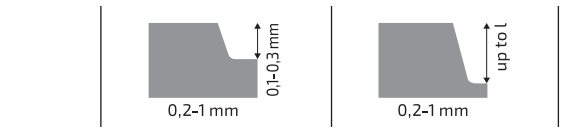
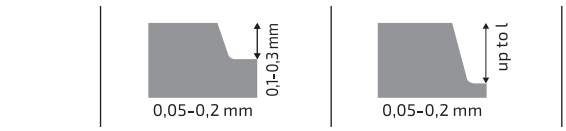
	Vc = 55 m/min		
D	fz	F	n
mm	mm/z	mm/min	rpm
6	0,15	892	2.919
8	0,19	820	2.189
10	0,21	751	1.752
12	0,24	724	1.460
16	0,29	627	1.095
20	0,32	561	876

91



		Vc = 90 m/min			Vc = 90 m/min		
d1	a/2	fz	F	n	fz	F	n
mm	°	mm/z	mm/min	rpm	mm/z	mm/min	rpm
4	4	0,070	1.244	5.924	0,070	1.244	5.924
6	4	0,070	829	3.949	0,070	829	3.949
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

92



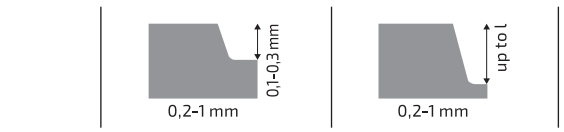
		Vc = 60 m/min			Vc = 60 m/min		
d1	a/2	fz	F	n	fz	F	n
mm	°	mm/z	mm/min	rpm	mm/z	mm/min	rpm
4	4	0,030	212	2.352	0,030	212	2.352
6	4	0,030	154	1.710	0,030	154	1.710
8	4	0,030	121	1.344	0,030	121	1.344
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

SEMIFINISHING

765S

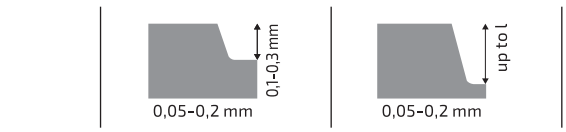
	Vc = 594 m/min		
D	fz	F	n
mm	mm/z	mm/min	rpm
4	0,019	1.825	47.293
6	0,055	3.468	31.529
8	0,081	3.826	23.646
10	0,101	3.820	18.917
12	0,117	3.701	15.764
16	0,143	3.388	11.823

93



		Vc = 490 m/min			Vc = 490 m/min		
d1	a/2	fz	F	n	fz	F	n
mm	°	mm/z	mm/min	rpm	mm/z	mm/min	rpm
3	3	0,023	2.185	47.084	0,023	2.185	47.084
6	4	0,046	2.185	23.542	0,046	2.185	23.542
3	4	0,024	2.185	45.638	0,024	2.185	45.638
6	4	0,048	2.185	22.819	0,048	2.185	22.819
2	5	0,017	2.185	64.028	0,017	2.185	64.028
-	-	-	-	-	-	-	-

94



		Vc = 280 m/min			Vc = 280 m/min		
d1	a/2	fz	F	n	fz	F	n
mm	°	mm/z	mm/min	rpm	mm/z	mm/min	rpm
3	3	0,026	1.159	22.031	0,026	1.159	22.031
4	3	0,037	1.159	15.856	0,037	1.159	15.856
2	4	0,022	1.159	26.244	0,022	1.159	26.244
4	4	0,040	1.159	14.626	0,040	1.159	14.626
2	5	0,028	1.159	20.866	0,028	1.159	20.866
-	-	-	-	-	-	-	-

SILMAX SpA
Via Fucine, 9
10074 Lanzo Torinese (TO) Italy
+39 0123 940301
+39 0123 940399
silmax@silmax.it
www.silmax.it

SILMAX GmbH
Mergenthalerallee 10-12
D-65760 Eschborn - Germany
+49 6196400840
+49 6196400910
vertrieb@silmax.it
www.silmax.com

SILMAX China Representative Office
Room 2722, Tianshan Road No. 6
Xinwu District, Wuxi City
Jiangsu Prov, 214028, China
+86 510 8190 5986
+86 510 8190 5987
sales@silmax.it
www.silmax.com

SILMAX Tools India Pvt. Ltd.
#3160, HAL 2nd Stage
Bangalore - 560 008
Karnataka - India
+91 8025252555
sales@silmax.in
www.silmax.in

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