LAMINA TECHNOLOGIES

MULTI-FUNCTION MILLING LINE

For 90° Shoulder and
High Feed Milling

MAGIA

THREE INSERTS
TWO APPLICATIONS
ONE POCKET

Lamina Technologies introduces our new multi-function milling line.

The LT 752 range of milling bodies are designed for both 90° shoulder and high feed milling. Simply change the APKT 060204 PDTR insert to APKT 0602-HF or our reinforced APKW 0602-HF inserts to change application.

All three inserts are only available in our premium Multi-Mat™ LT 3000 milling grade.

MULTIFUNCTION MILLING LINE

- 1 milling body for 2 milling operations, 90° shoulder and high feed milling
- Helical cutting edge design for smooth cutting in both methods
- Smaller inventory and reduced costs
- Extremely high chip removal rates, also in weak or under powered machines
- Precise perpendicular 90° shoulder milling
- Differential pitch to reduce risk of vibration
- Highly suitable for small dimension slot milling in roughing and finishing

SMALL INSERTS
GREATER EFFICIENCY
INCREASED PRODUCTIVITY

⌀16 END MILL
APKT 0602-HF / 4 TEETH

⌀16 END MILL
APKT 1003 PDTR /2 TEETH

COMPARED WITH LARGER INSERTS

- More teeth per diameter increase the effective feed rate
- Lower feed per tooth for smoother cut with less cutting forces, an advantage for weak or under powered machines
- Minimum of 2 teeth, even in the smallest cutter diameter (10mm), provides greater stability

COMPARED WITH SOLID END MILLS

- Replaces solid end mills in roughing to semi-finishing with substantial cost savings
- No regrinding necessary. Simply exchange the insert cutting edge.
- Minimal carbide used per insert which means lower cost both financially and environmentally
- Steel cutter body improves resistance to shock and instability

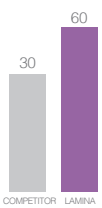
Test Reports

APKT 060204 PDTR

P 16MnCr5

PARAMETERS	
Vc (m/min)	200
fz (mm/z)	0.07
Ap/doc (mm)	0.50
Ae/woc (mm)	6
Coolant	no
Cutter diameter	12
Operation(s)	

Tool Life (parts)

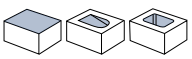


APKW 0602-HF

K GGG40

PARAMETERS	
Vc (m/min)	170
fz (mm/z)	0.50
Ap/doc (mm)	0.50
Ae/woc (mm)	6
Coolant	no
Cutter diameter	12
Operation(s)	

Tool Life (passes)

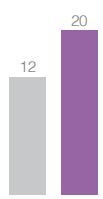


APKT 0602-HF

M X6CrNi18-10

PARAMETERS	
Vc (m/min)	220
fz (mm/z)	0.50
Ap/doc (mm)	0.50
Ae/woc (mm)	6
Coolant	no
Cutter diameter	12
Operation(s)	

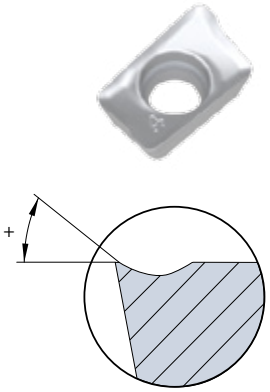
Tool Life (mins)



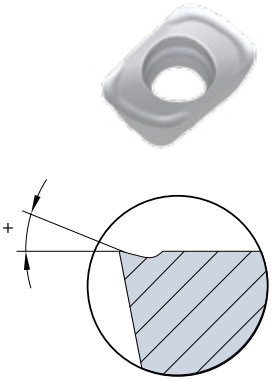
PRODUCTS

Inserts

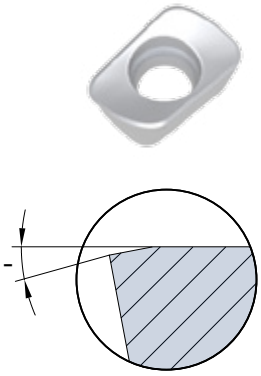
APKT 060204 PDTR



APKT 0602-HF



APKW 0602-HF

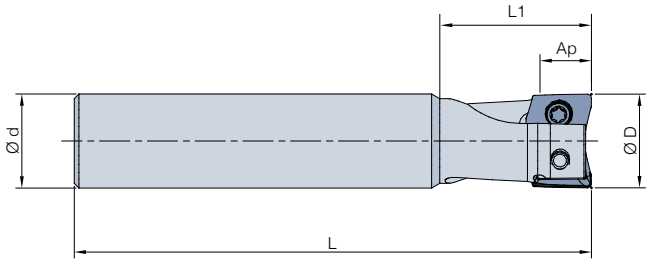


DESIGNATION	L	S	R	R_{PROG}	DIRECTION	RECOMMENDED	CATALOG #
APKT 060204 PDTR LT 3000	6.00	2.16	0.40	—	Right		M0004026
APKT 0602-HF LT 3000	6.00	2.38	—	1.20	Right		M0004296
APKW 0602-HF LT 3000	6.00	2.38	—	1.20	Right		M0004297

Cutters

Due to the small size of these inserts, using a pre-set torque screw driver (0.4Nm) at all times is recommended.

It is also recommended that during mounting, the insert should be held in place with a finger.



DESIGNATION	D	d	L1	L	Z	Ap max 90°	Ap max HF	CATALOG #
LT 752 C-W-D010/2	10	10	16	72	2	5.2	0.5	M2003098
LT 752 C-W-D012/3	12	12	26	80	3	5.2	0.5	M2003099
LT 752 C-W-D016/4	16	16	32	90	4	5.2	0.5	M2003100

90° = 90° Shoulder Milling
HF = High Feed MIlling

SPARE PARTS	CATALOG #
Screw	M2001640
Screwdriver Handle	M2002922
Preset Adapter 0.4NM	M2002923
Torx Plus Bit	M2003064

NEW MULTI PACK END MILL KIT

Lamina Technologies is pleased to introduce the multi-function milling kit.

Included in the kit are three of the most popular cutter diameters (ø10 mm, 12 mm, 16 mm) as well as a preset torque screw driver specifically indicated for use with these small inserts and screws.

Also included are ten pieces each APKT 060204 PDTR and our NEW APKT 0602-HF and APKW 0602-HF, only available in Lamina's premium LT 3000 Multi-Mat™ grade.

KIT# K0003696

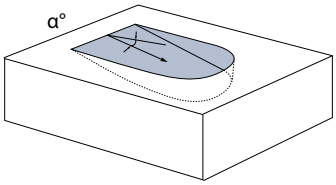
DESIGNATION	CATALOG #	QTY
APKT 060204 PDTR LT 3000	M0004026	10
APKT 0602-HF LT 3000	M0004296	10
APKW 0602-HF LT 3000	M0004297	10
LT 752 C-W-D010/2	M2003098	1
LT 752 C-W-D012/3	M2003099	1
LT 752 C-W-D016/4	M2003100	1
Screw Driver Handle	M2002922	1
Preset Adapter 0.4NM	M2002923	1
Torx Plus Bit	M2003064	1

PROGRAMMING INFORMATION

Application Parameters

SHOULDER MILLING - APKT 060204-PDTR

D	α° max. for linear ramping	Ap max. for linear ramping	Ae max. for linear plunging	Helical Milling			
				C min.	P max.	C max.	P max.
10	7	5.2	0.6	14	0.9	19	3.0
12	5	5.2	0.6	18	0.9	23	2.5
16	2.4	5.2	0.6	26	0.9	31	2.0

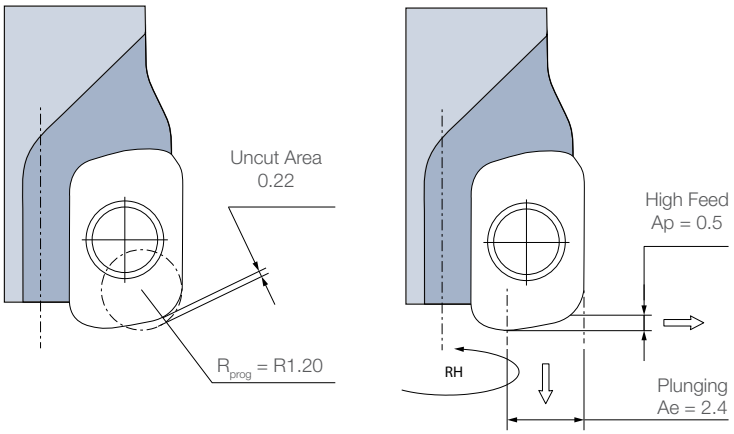


HIGH FEED MILLING - APKT & APKW 0602-HF

D	D1	α° max. for linear ramping	Ap max. for linear ramping	Ae max. for linear plunging	Helical Milling			
					C min.	P max.	C max.	P max.
10	4.7	7	0.5	2.2	14.7	0.5	18	0.5
12	6.7	5	0.5	2.2	18.7	0.5	22	0.5
16	10.7	2.4	0.5	2.2	26.7	0.5	30	0.5

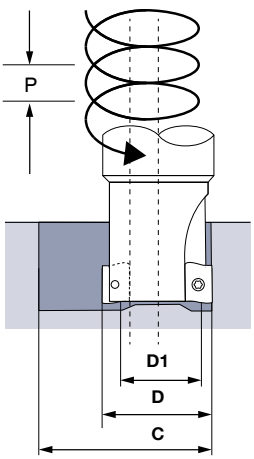
Programming Radius

Uncut Area = Uncut thickness, maximum mismatch between programmed corner radii (Rprog) and generated machined profile.

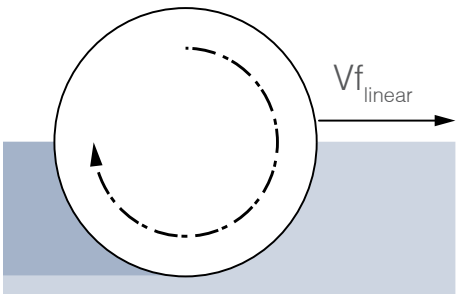


Helical Milling

For circular movements like helical milling, the table feed must be slower and can be compensated by the factor like shown.

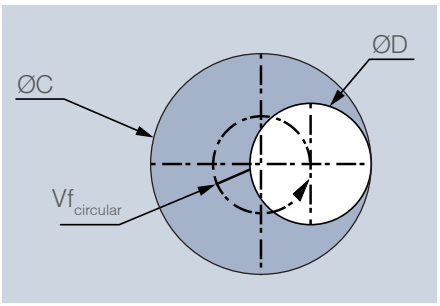


LINEAR MILLING



$Vf_{linear} = fz \times RPM \times Z$

CIRCULAR MILLING



$Vf_{circular} = ((C-D)/C) \times Vf_{linear}$

MACHINING CONDITIONS

APKT 060204 PDTR – LT 3000 | 90° Shoulder Milling

	Material Group	Gr. N°	VDI Group	Material Examples	Hardness	DOC [mm]		Feed [mm/z]		V_c [m/min]		Suggested Starting Parameters		
						min	max	min	max	min	max	DOC	Feed	V_c
P	Non Alloyed	1	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.30	5.50	0.04	0.13	190	330	1.30	0.07	250
			2		190 HB	0.30	5.50	0.04	0.13	190	300	1.30	0.07	220
			3		250 HB	0.30	5.50	0.04	0.13	190	250	1.30	0.07	200
	Low Alloyed	2	4, 6	42CrMo4, St50, Ck60, 4140, 4340, 100Cr06	180 HB	0.30	5.50	0.03	0.10	150	240	1.30	0.06	200
			5, 7		230 HB	0.30	5.50	0.03	0.10	150	210	1.30	0.06	180
			6		280 HB	0.30	5.50	0.03	0.09	130	190	1.30	0.05	150
			8		350 HB	0.30	5.50	0.03	0.09	130	170	1.30	0.05	140
	High Alloyed	3	10	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.30	3.90	0.03	0.09	90	150	1.00	0.05	130
			10		280 HB	0.30	3.90	0.03	0.09	90	130	1.00	0.05	120
			11		320 HB	0.30	3.90	0.03	0.07	60	110	1.00	0.05	100
			11		350 HB	0.30	3.90	0.03	0.07	60	90	1.00	0.05	80
M	Austenitic	4	14	304, 316, X5CrNi18-9	180 HB	0.30	5.50	0.03	0.10	190	250	1.30	0.06	220
			14		240 HB	0.30	5.50	0.03	0.09	160	210	1.30	0.06	190
	Duplex	5	14	X2CrNiN23-4, S31500	290 HB	0.30	3.90	0.03	0.07	70	130	1.00	0.05	100
			14		310 HB	0.30	3.90	0.03	0.07	70	120	1.00	0.05	90
	Ferritic & Martensitic	6	12	410, X6Cr17, 17-4PH, 430	200 HB	0.30	5.50	0.03	0.10	150	210	1.30	0.06	190
			13		42 HRc	0.30	3.90	0.03	0.08	90	150	1.00	0.05	130
K	Grey	7	15	GG20, GG40, EN-GJL-250, N030B	150 HB	0.30	5.50	0.04	0.13	150	240	1.30	0.07	200
			15		200 HB	0.30	5.50	0.04	0.13	150	220	1.30	0.07	180
			16		250 HB	0.30	5.50	0.04	0.13	150	190	1.30	0.07	160
	Malleable & Nodular	8	17, 19	GGG40, GGG70, 50005	150 HB	0.30	5.50	0.03	0.11	100	200	1.30	0.06	180
			17, 19		200 HB	0.30	5.50	0.03	0.11	100	180	1.30	0.06	150
			18, 20		250 HB	0.30	5.50	0.03	0.11	100	150	1.30	0.06	130
S	Fe, Ni & Co based	9	31, 32	Incoloy 800	240 HB	0.30	3.90	0.03	0.07	30	50	1.00	0.05	32
			33	Inconel 700	250 HB	0.30	3.90	0.03	0.07	30	50	1.00	0.05	30
			34	Stellite 21	350 HB	0.30	3.90	0.03	0.07	30	50	1.00	0.05	30
	Ti based	10	36	TiAl6V4	-	0.30	3.90	0.03	0.08	40	70	1.00	0.05	55
			37	T40	-	0.30	3.90	0.03	0.07	30	60	1.00	0.05	40
H	Steel	11	38	X100 CrMo13, 440C, G-X260NiCr42	45 HRc	0.30	2.00	0.02	0.07	40	80	0.70	0.04	60
			38		50 HRc	0.30	1.20	0.02	0.06	40	70	0.50	0.04	55
			38		55 HRc	0.30	0.60	0.02	0.06	40	60	0.30	0.04	50
	Chilled Cast Iron	12	40	Ni-Hard 2	400 HB	0.30	1.60	0.02	0.07	40	80	0.50	0.04	50
	White Cast Iron	13	41	G-X300CrMo15	55 HRc	0.30	0.60	0.02	0.06	30	60	0.30	0.04	40
NF	Aluminium	14	25	AlSi12	130 HB	0.30	5.50	0.04	0.13	200	400	1.30	0.08	280

APKT 0602-HF – LT 3000 | High Feed Milling

	Material Group	Gr. N°	VDI Group	Material Examples	Hardness	DOC [mm]		Feed [mm/z]		V_c [m/min]		Suggested Starting Parameters		
						min	max	min	max	min	max	DOC	Feed	V_c
P	Non Alloyed	1	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.20	0.50	0.20	1.40	190	330	0.50	1.00	250
			2		190 HB	0.20	0.50	0.20	1.40	190	300	0.50	1.00	220
			3		250 HB	0.20	0.50	0.20	1.40	190	250	0.50	1.00	200
	Low Alloyed	2	4, 6	42CrMo4, St50, Ck60, 4140, 4340, 100Cr06	180 HB	0.20	0.50	0.20	1.30	150	240	0.40	0.80	200
			5, 7		230 HB	0.20	0.50	0.20	1.30	150	210	0.40	0.80	180
			6		280 HB	0.20	0.50	0.20	1.30	130	190	0.40	0.70	150
			8		350 HB	0.20	0.50	0.20	1.30	130	170	0.40	0.70	140
	High Alloyed	3	10	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.20	0.40	0.20	1.10	90	150	0.40	0.70	130
			10		280 HB	0.20	0.40	0.20	1.10	90	130	0.40	0.70	120
			11		320 HB	0.20	0.40	0.20	1.10	60	110	0.40	0.60	100
			11		350 HB	0.20	0.40	0.20	1.10	60	90	0.40	0.60	80
M	Austenitic	4	14	304, 316, X5CrNi18-9	180 HB	0.20	0.40	0.20	0.70	190	250	0.40	0.50	220
			14		240 HB	0.20	0.40	0.20	0.70	160	210	0.40	0.50	190
	Duplex	5	14	X2CrNiN23-4, S31500	290 HB	0.20	0.40	0.20	0.50	70	130	0.40	0.35	100
			14		310 HB	0.20	0.40	0.20	0.50	70	120	0.40	0.35	90
	Ferritic & Martensitic	6	12	410, X6Cr17, 17-4PH, 430	200 HB	0.20	0.40	0.20	0.50	150	210	0.40	0.40	190
			13		42 HRc	0.20	0.40	0.20	0.50	90	150	0.40	0.30	130
K	Grey	7	15	GG20, GG40, EN-GJL-250, N030B	150 HB	0.20	0.50	0.20	1.40	150	240	0.50	1.00	200
			15		200 HB	0.20	0.50	0.20	1.40	150	220	0.50	1.00	180
			16		250 HB	0.20	0.50	0.20	1.40	150	190	0.50	1.00	160
	Malleable & Nodular	8	17, 19	GGG40, GGG70, 50005	150 HB	0.20	0.50	0.20	1.20	100	200	0.50	0.90	180
			17, 19		200 HB	0.20	0.50	0.20	1.20	100	180	0.50	0.90	150
			18, 20		250 HB	0.20	0.50	0.20	1.20	100	150	0.40	0.90	130
S	Fe, Ni & Co based	9	31, 32	Incoloy 800	240 HB	0.20	0.40	0.20	0.50	30	50	0.30	0.30	32
			33	Inconel 700	250 HB	0.20	0.40	0.20	0.50	30	50	0.30	0.30	30
			34	Stellite 21	350 HB	0.20	0.40	0.20	0.50	30	50	0.30	0.30	30
	Ti based	10	36	TiAl6V4	-	0.20	0.40	0.20	0.40	40	70	0.30	0.30	55
			37	T40	-	0.20	0.40	0.20	0.40	30	60	0.30	0.30	40
H	Steel	11	38	X100 CrMo13, 440C, G-X260NiCr42	45 HRc	0.20	0.40	0.20	0.70	40	80	0.40	0.40	60
			38		50 HRc	0.20	0.30	0.20	0.60	40	70	0.20	0.30	55
			38		55 HRc	0.20	0.30	0.20	0.50	40	60	0.20	0.30	50
	Chilled Cast Iron	12	40	Ni-Hard 2	400 HB	0.20	0.30	0.20	0.50	40	80	0.20	0.30	50
	White Cast Iron	13	41	G-X300CrMo15	55 HRc	0.20	0.30	0.20	0.50	30	60	0.20	0.30	40
NF	Aluminium	14	25	AlSi12	130 HB	0.20	0.50	0.20	0.70	200	400	0.50	0.60	280

**For plunging, use the cutting speeds and feed rates recommended for shoulder milling.

LAMINA TECHNOLOGIES

APKW 0602-HF – LT 3000 | **High Feed Milling**

Material Group		Gr. N°	VDI Group	Material Examples	Hardness	DOC [mm]		Feed [mm/z]		V_c [m/min]		Suggested Starting Parameters		
						min	max	min	max	min	max	DOC	Feed	V_c
P	Non Alloyed	1	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.20	0.50	0.20	1.40	190	330	0.50	1.00	250
			2		190 HB	0.20	0.50	0.20	1.40	190	300	0.50	1.00	220
			3		250 HB	0.20	0.50	0.20	1.40	190	250	0.50	1.00	200
	Low Alloyed	2	4, 6	42CrMo4, St50, Ck60, 4140, 4340, 100Cr06	180 HB	0.20	0.50	0.20	1.30	150	240	0.40	0.80	200
			5, 7		230 HB	0.20	0.50	0.20	1.30	150	210	0.40	0.80	180
			6		280 HB	0.20	0.50	0.20	1.30	130	190	0.40	0.70	150
			8		350 HB	0.20	0.50	0.20	1.30	130	170	0.40	0.70	140
	High Alloyed	3	10	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.20	0.40	0.20	1.10	90	150	0.40	0.70	130
			10		280 HB	0.20	0.40	0.20	1.10	90	130	0.40	0.70	120
			11		320 HB	0.20	0.40	0.20	1.10	60	110	0.40	0.60	100
			11		350 HB	0.20	0.40	0.20	1.10	60	90	0.40	0.60	80
M	Austenitic	4	14	304, 316, X5CrNi18-9	180 HB	0.20	0.40	0.20	0.70	190	250	0.40	0.50	220
			14		240 HB	0.20	0.40	0.20	0.70	160	210	0.40	0.50	190
	Duplex	5	14	X2CrNiN23-4, S31500	290 HB	0.20	0.40	0.20	0.50	70	130	0.40	0.35	100
			14		310 HB	0.20	0.40	0.20	0.50	70	120	0.40	0.35	90
	Ferritic & Martensitic	6	12	410, X6Cr17, 17-4PH, 430	200 HB	0.20	0.40	0.20	0.50	150	210	0.40	0.40	190
			13		42 HRc	0.20	0.40	0.20	0.60	90	150	0.40	0.40	130
K	Grey	7	15	GG20, GG40, EN-GJL-250, N030B	150 HB	0.20	0.50	0.20	1.40	150	240	0.50	1.00	200
			15		200 HB	0.20	0.50	0.20	1.40	150	220	0.50	1.00	180
			16		250 HB	0.20	0.50	0.20	1.40	150	190	0.50	1.00	160
	Malleable & Nodular	8	17, 19	GGG40, GGG70, 50005	150 HB	0.20	0.50	0.20	1.20	100	200	0.50	0.90	180
			17, 19		200 HB	0.20	0.50	0.20	1.20	100	180	0.50	0.90	150
			18, 20		250 HB	0.20	0.50	0.20	1.20	100	150	0.40	0.90	130
H	Steel	11	38	X100 CrMo13, 440C, G-X260NiCr42	45 HRc	0.20	0.40	0.20	0.80	40	80	0.40	0.50	60
			38		50 HRc	0.20	0.30	0.20	0.70	40	70	0.30	0.40	55
			38		55 HRc	0.20	0.30	0.20	0.50	40	60	0.30	0.30	50
	Chilled Cast Iron	12	40	Ni-Hard 2	400 HB	0.20	0.30	0.20	0.50	40	80	0.30	0.40	50
	White Cast Iron	13	41	G-X300CrMo15	55 HRc	0.20	0.30	0.20	0.50	30	60	0.30	0.30	40

**For plunging, use the cutting speeds and feed rates recommended for shoulder milling.

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