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Milling Tools & Inserts *2nd edition*

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THE PERFORMANCE TEAM

The optimal choice of precision cutting tool offers the best opportunity for increased productivity. In today's modern manufacturing environment it is crucial to have an optimal match between tools, machines, materials, and experience.

LMT is a team of specialists offering technical expertise for designing and supplying Total Performance Solutions for the metal cutting industry.

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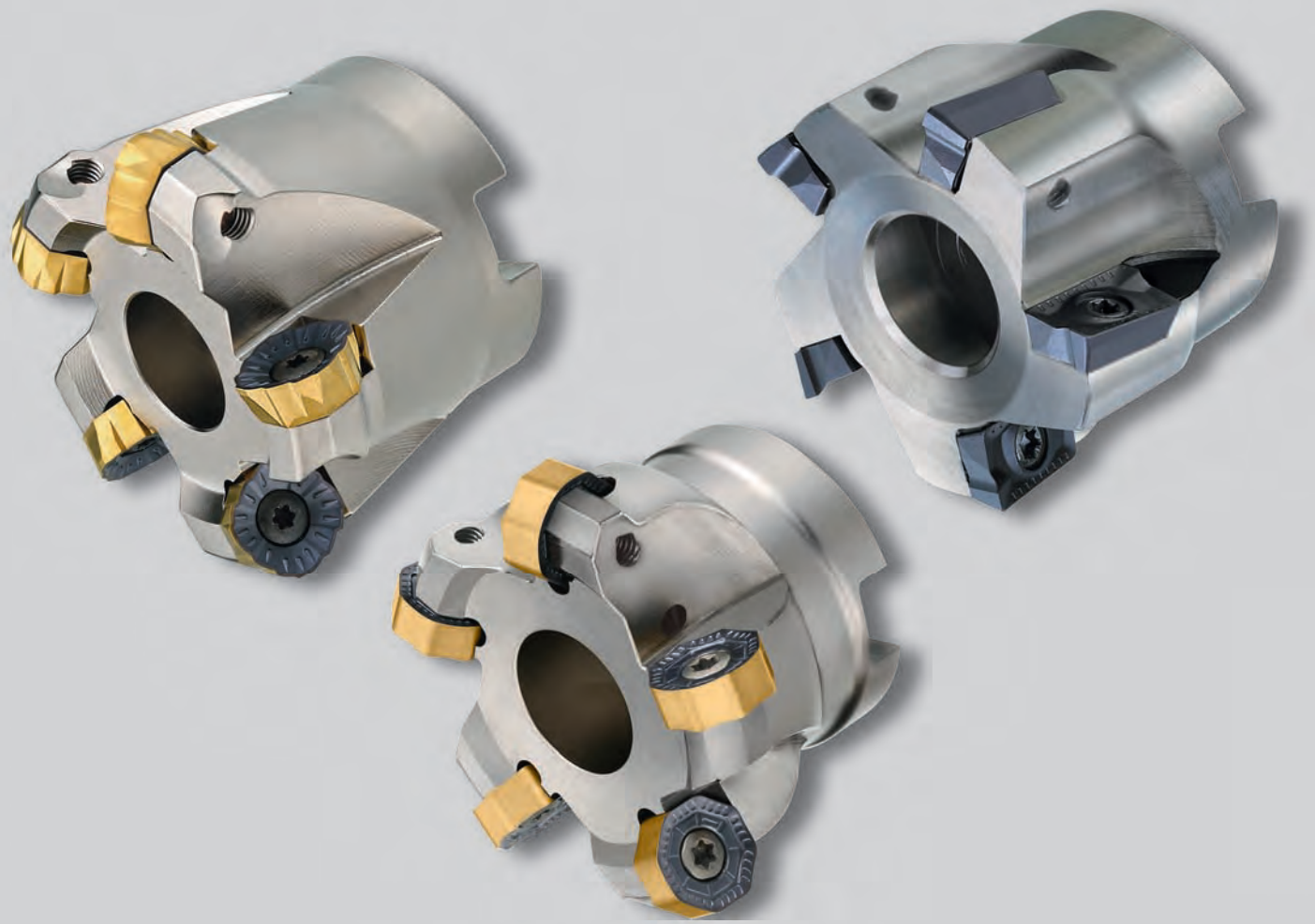
Solid Carbide End Mills



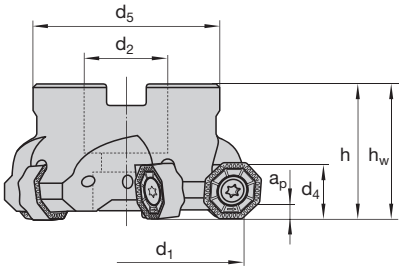
Face Milling Cutters

FMN45

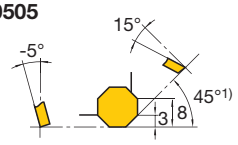
Application

- Indexable insert with 16 cutting edges (eight cutting edges on each side)
- Large feed rates are possible
- Carbide grades LC225T, LC240T, LC610T
- Cutter available in monobloc version from 2.00" to 6.00" (32mm to 160mm)
- Coolant Fed Body
- Wiper Insert available to achieve better flatness and surface finish

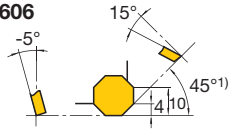
FMN45
Inch
IKZ



ONGU0505



ONGU0606



All bodies have internal coolant

d_1	Cutter Body No.	EDP No.	Ident No.	d_4	h	d_2	d_5	ap_{max} (DOC)	z ✡	Insert	Insert Screw	Torx Driver
2"	FMN45 O06.200AA-I	17001	1950420	.630	1.57	.750	1.57	.157	4	ONGU 0606	1045133	1048422
2"	FMN45 O06.200AA-IF	17002	1950421	.630	1.57	.750	1.57	.157	6			T20
2.5"	FMN45 O06.250AA-I	17005	1950422	.630	1.57	.750	1.97	.157	5			(Torx Plus)
2.5"	FMN45 O06.250AA-IF	17006	1950423	.630	1.97	.750	1.97	.157	8			
3"	FMN45 O06.300AB-I	17007	1950424	.630	1.97	1.00	2.36	.157	7			
3"	FMN45 O06.300AB-IF	17008	1950425	.630	1.97	1.00	2.36	.157	10			
4"	FMN45 O06.400AD-I	17009	1950426	.630	1.97	1.50	2.95	.157	9			
4"	FMN45 O06.400AD-IF	17010	1950427	.630	1.97	1.50	2.95	.157	12			
5"	FMN45 O06.500AD	17011	1950428	.630	2.48	1.50	3.54	.157	11			
5"	FMN45 O06.500AD-F	17012	1950429	.630	2.48	1.50	3.54	.157	15			
6"	FMN45 O06.600AD	17013	1950430	.630	2.48	1.50	5.12	.157	13			
6"	FMN45 O06.600AD-F	17014	1950431	.630	2.48	1.50	5.12	.157	19			

See page 11 for inserts
Cutting data recommendations starting page 174

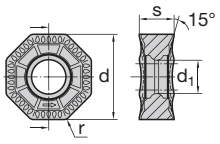
For Modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028081
Inch Cutters with ONGU 0505 Inserts quoted as Special
h_w dimension with wiper insert is h +0.002"

FMN45 Metric											
d_1	Cutter Body No.	Ident No.	d_4	h	d_2	d_5	ap_{max} (DOC)	z ✿	Insert	Insert Screw	Torx Driver
32	FMN45 005.032AN-I	1027400	12.7	40	16	32	3	3	ONGU 0505	1045131 M4	1048335 T15 (Torx Plus)
32	FMN45 005.032AN-IF	1027401	12.7	40	16	32	3	4			
40	FMN45 005.040AN-I	1027402	12.7	40	22	40	3	4			
40	FMN45 005.040AN-IF	1027403	12.7	40	22	40	3	5			
50	FMN45 005.050AN-I	1027404	12.7	40	22	40	3	5			
50	FMN45 005.050AN-IF	1027405	12.7	40	22	40	3	7			
63	FMN45 005.063AN-I	1027406	12.7	40	22	50	3	7			
63	FMN45 005.063AN-IF	1027407	12.7	40	22	50	3	9			
50	FMN45 006.050AN-I	1027420	16	40	22	40	4	4	ONGU 0606	1045133	1048422 T20 (Torx Plus)
50	FMN45 006.050AN-IF	1027421	16	40	22	40	4	6			
63	FMN45 006.063AN-I	1027422	16	40	22	50	4	5			
63	FMN45 006.063AN-IF	1027423	16	40	22	50	4	8			
80	FMN45 006.080AN-I	1027424	16	50	27	60	4	7			
80	FMN45 006.080AN-IF	1027425	16	50	27	60	4	10			
100	FMN45 006.100AN-I	1027426	16	50	32	75	4	9			
100	FMN45 006.100AN-IF	1027427	16	50	32	75	4	12			
125	FMN45 006.125AN	1027428	16	63	40	90	4	11			
125	FMN45 006.125AN-F	1027429	16	63	40	90	4	15			
160	FMN45 006.160AN	1027430	16	63	40	130	4	13			
160	FMN45 006.160AN-F	1027431	16	63	40	130	4	19			

Limited stock of metric products in U.S., please contact Customer Service for availability

Cutting data recommendations starting page 174

Indexable Inserts for MultiEdge Double 8 Face Milling Cutters

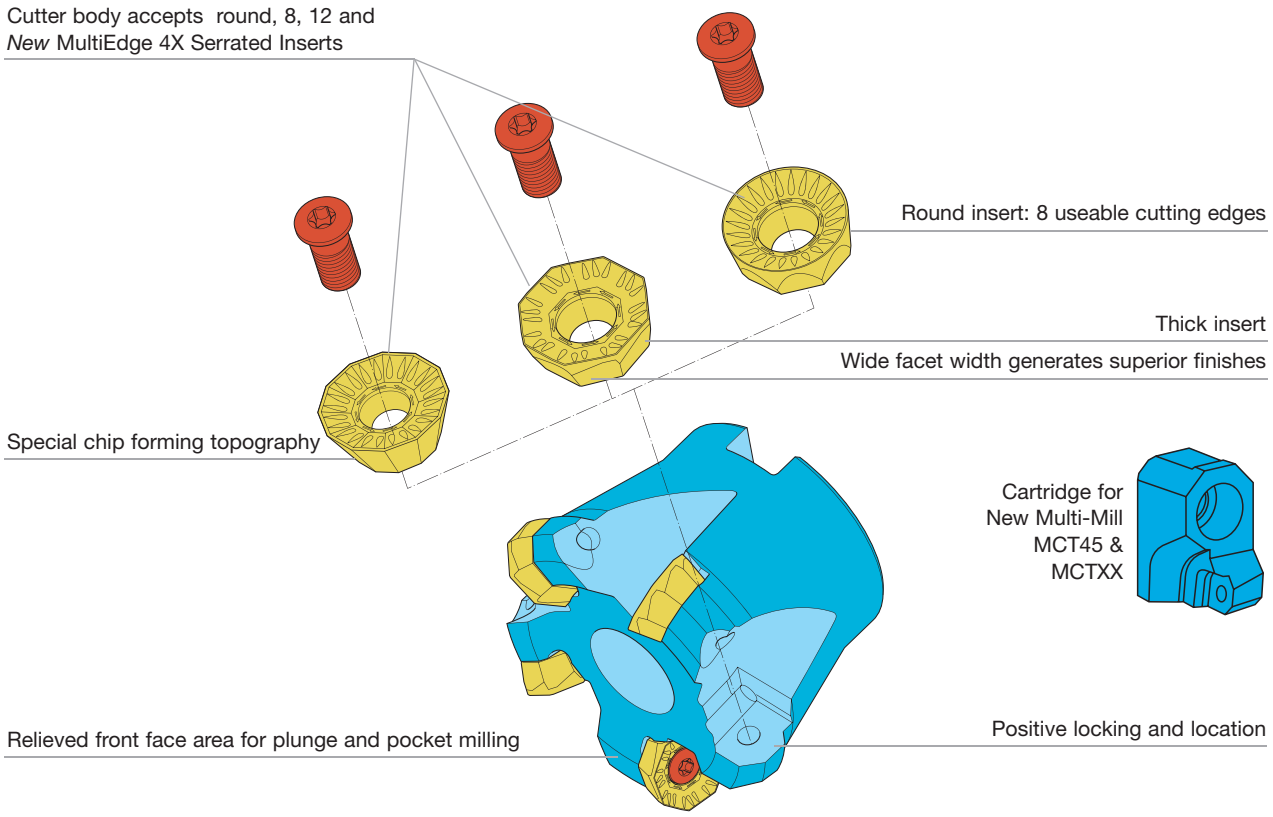
							Cutting materials Ident No.														For cutter
N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	LC280QN	LC280TT	LC610Q	LC240T	LC230F	LC225T	LC630T	LW240	LW225	LC610E	LC610T	LC610A	BN025	LC603Z	Cat-No.
 N = 16		5.56 (.219)	12.7 (.500)	4.4 (.173)	2 (.079)	ONGU 0505ANEN				1054009		1054017					1054014				FMN45
		5.56 (.219)	12.7 (.500)	4.4 (.173)	2 (.079)	ONGU 0506ANEN-SL WP Wiper											1054018[1)]				
		6.35 (.250)	16 (.630)	6.3 (.248)	2 (.079)	ONGU 0606ANEN				1054008		1054015					1054013				
		6.35 (.250)	16 (.630)	6.3 (.248)	2 (.079)	ONGU 0606ANEN-SL WP Wiper											1054016[1)]				

[1)] LC610T with additional TiN top layer

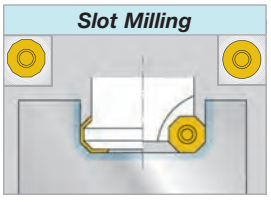
Note: Wiper Insert has 4 Cutting Edges Per Side

FCT 45 Features & Benefits

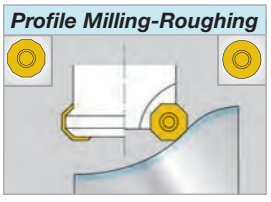
- Exclusive TWIN*CUT* geometry
- Large insert grade offering
- Direct pressed inserts in round, 8, 12 and New MultiEdge 4X Serrated Inserts
- Designed for roughing and finishing
- Deep, positive chip grooves



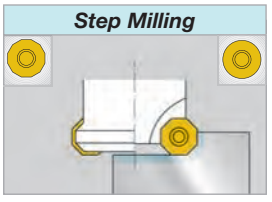
FCT45
Slot Milling



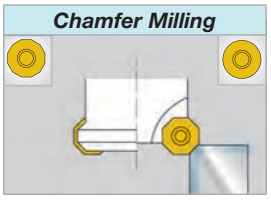
FCT45
Profile Milling-Roughing



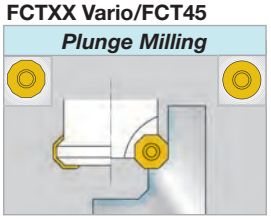
FCTXX Vario/FCT45
Step Milling



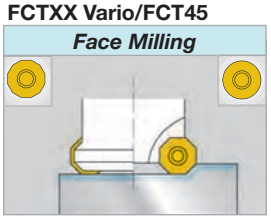
FCT45
Chamfer Milling



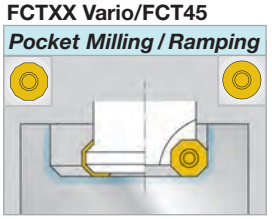
FCTXX Vario/FCT45
Plunge Milling



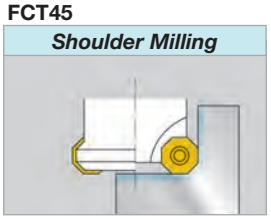
FCTXX Vario/FCT45
Face Milling



FCTXX Vario/FCT45
Pocket Milling / Ramping



FCT45
Shoulder Milling

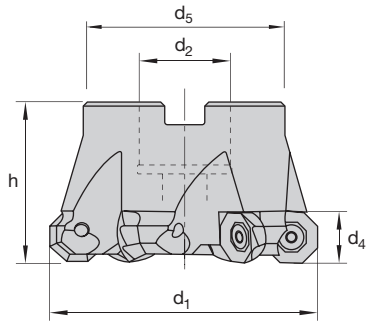


FCT45

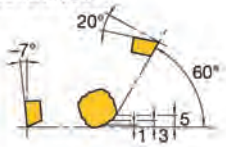
Application

- Universal milling cutter for face milling of steel, stainless steel and cast iron materials
- Exclusive TWIN*CUT* insert design offers round, 4 sided, and 8 sided for roughing applications

FCT45
Inch

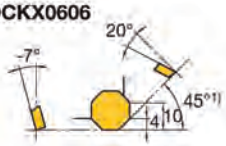


XOKX1606



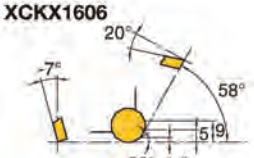
RCKX1606

OCKX0606



Max doc 0.157"

XCKX1606



Max doc 0.079"

d1	Cutter Body No.	EDP No.	Ident No.	max doc 8 edge	max doc 12 edge	d4	h	d2	z ⌬	Insert	Insert	Insert	Insert	Insert	Insert Screw	Torx Driver
2.00	FCT45 O06-200AA	50300	1950259	0.157	0.079	0.63	1.57	0.75	4	XOKX	RCKX	OCKX	XCKX	SAHT	50255	50258
2.50	FCT45 O06-250AA	50302	1950260	0.157	0.079	0.63	1.97	0.75	4	1606	1606	0606	1606	1306	M5	T20
3.00	FCT45 O06-300AB	50304	1950261	0.157	0.079	0.63	1.97	1.00	5							
4.00	FCT45 O06-400AD	50306	1950262	0.157	0.079	0.63	1.97	1.50	7							
5.00	FCT45 O06-500AD	50308	1950263	0.157	0.079	0.63	2.48	1.50	8							

See page 16 for Inserts
Cutting data recommendations starting page 175
For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028077

FCT45
Metric

d1	Cutter Body No.	Ident No.	d4	h	d2	d5	z ⌬	Insert	Insert	Insert	Insert	Insert	Insert Screw	Torx Driver
52	FCT45 006.052AN	1041011	16	40	22	40	4	XOKX	RCKX	OCKX	XCKX	SAHT	1045777	1048344
66	FCT45 006.066AN	1041012	16	50	27	48	5	1606	1606	0606	1606	1306	M5	T20
80	FCT45 006.080AN	1041013	16	50	27	60	6							
100	FCT45 006.100AN	1041014	16	50	32	65	7							
125	FCT45 006.125AN	1041015	16	63	40	90	8							
160	FCT45 006.160AN	4053555	16	63	40	95	9							

Limited stock of metric products in U.S., please contact Customer Service for availability

See Pages 17 & 18 for Multi Edge 4X XOKX Insert Advantages

TWIN*CUT* VARIO

The TWIN*CUT* VARIO is an excellent example of how cutting theory can be applied in practice. It successfully incorporates the principle of using two axially and radially offset edges to make the cut. The upper and lower rows of cutting edges each have different angles of approach and cutting depths.

This produces a technically superior chip cross-section with significantly reduced width to height relationship, sharply reducing the cutting forces. Power input can be reduced to between 75% and 85% of previous requirements. The improved dynamics of the VARIO's twin offset cutting edges make this possible and gives VARIO a competitive advantage.

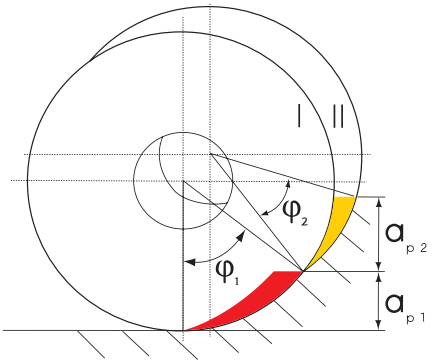
VARIO cutting tools are far superior to conventional button cutters, as they are quiet-running and reduce vibrations. This makes them especially suitable for machining under less stable conditions.

A major benefit of the Vario's innovative design is the versatility of the insert pocket. Vario's pockets will accept both the round and octagonal high-performance inserts.

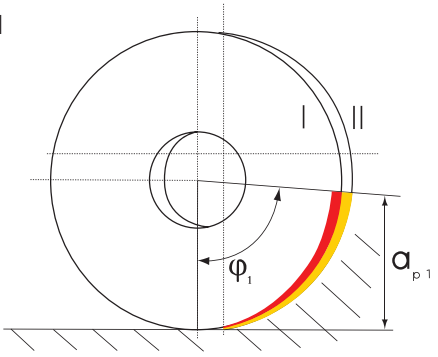
TWIN*CUT* VARIO Features & Benefits

- Broad application range for steel, castings and non-ferrous.
- Option of round or octagonal indexable inserts in same insert pocket. This flexible design helps reduce overall tooling costs.
- Increased insert thickness provides high feed rates and shorter machining times.
- Deep molded chip grooves and special design surface topography, lower horsepower requirements, reduce vibration, lower operating temperatures, yield superior surfaces, and extend tool life.
- Stable insert seating prevents insert rotation and allows precise indexing.
- Either z-axis plunging or ramping is possible making the Vario ideal for cavity milling and ramping.
- Precision sintered insert with eight effective cutting edges lower cost per cutting edge.

TWIN*CUT* VARIO
Geometry

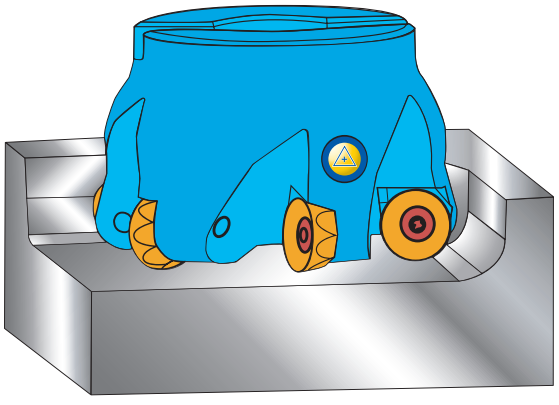


Conventional
Geometry

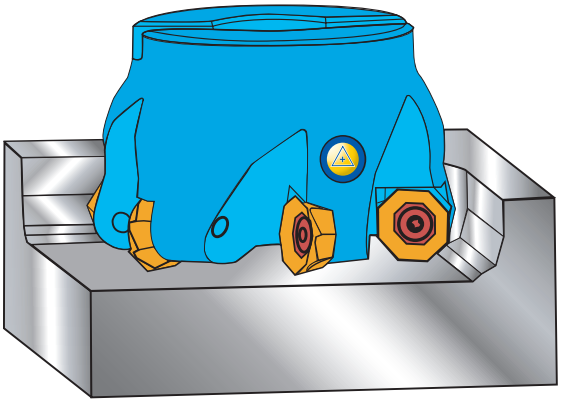


Milling profile with round inserts.

TWIN*CUT* VARIO with RCKX 1606 MO-TR



TWIN*CUT* VARIO with OCKX 0606 AD-TR

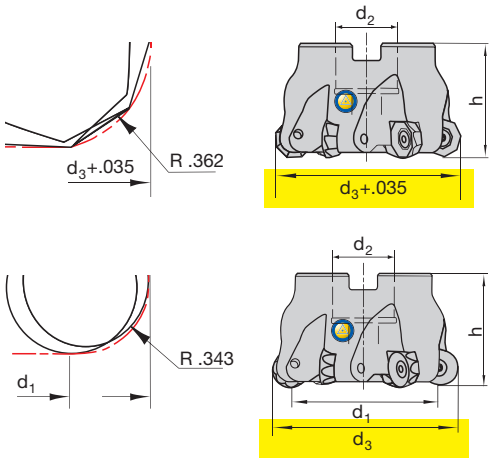


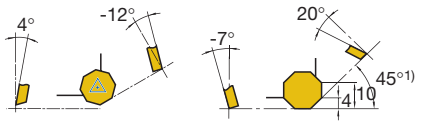
FCT XX TWINCUT – Vario

Application

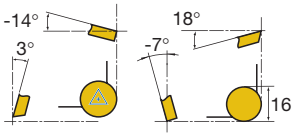
- Universal in application face milling of steel, castings, non-ferrous metals
- Exclusive TWINCUT insert design offers round, and 8 sided for roughing applications

FCT XX TWINCUT – Vario
Inch





8-Sided



Round

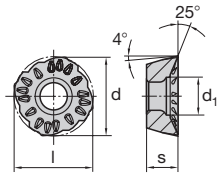
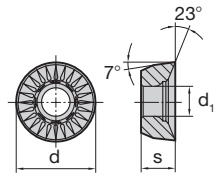
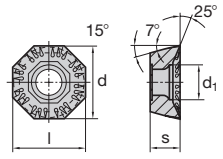
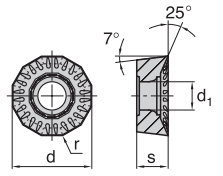
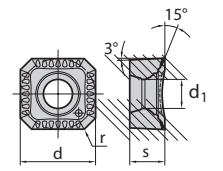
d1	Cutter Body No.	EDP No.	Ident No.	d3	h	d2	z ⌬	Insert	Insert	Insert Screw	Torx Driver
1.50	FCTXX R16-150AA	51486	1950270	2.23	1.57	0.75	4	RCKX 1606	OCKX 0606	50255	50258
2.00	FCTXX R16-200AA	51487	1950278	2.73	1.57	0.75	6			M5	T20
2.50	FCTXX R16-250AA	51488	1950279	3.23	1.97	0.75	6				
3.00	FCTXX R16-300AB	51489	1950273	3.73	1.97	1.00	8				
4.00	FCTXX R16-400AD	51490	1950274	4.73	1.97	1.50	10				

See page 16 for Inserts
Cutting data recommendations starting page 176
For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Vario Cartridge No. 1028079
Multi-Mill FCT45 Cartridge No. 1028077

FCT XX TWINCUT – Vario
Metric

d1	Cutter Body No.	Ident No.	d3	Insert Dia. d4	h	d2	z ⌬	Insert	Insert	Insert Screw	Torx Driver
36	FCTXX R16.036AN	1041016	54.6	16	40	22	4	RCKX 1606	OCKX 0606	1045777	1048344
48	FCTXX R16.066AN	1041026	66	16	50	27	6			M5	T20
50	FCTXX R16.050AN	1041017	68.6	16	50	27	6				
60	FCTXX R16.08AN	1041028	80	16	50	27	6				
63	FCTXX R16.063AN	1041018	81.6	16	50	27	6				
63	FCTXX R16.063AN-F	1041019	81.6	16	50	27	8				
80	FCTXX R16.080AN	1041020	98.6	16	50	32	8				
100	FCTXX R16.100AN	1041022	118.6	16	50	40	10				
125	FCTXX R16.125AN	1041024	143.6	16	63	40	10				

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No.												For cutter
							LC280QN[2]	LC280TT[1]	LC225S	LC225T	LC240T	LC610Q	LC630S	LC630T	LC440T	LC444W	LC610T	LC615E	Cat-No.
 N = 4	16 (.630)	6.35 (.250)	16 (.630)	5.8 (.228)	0.5 (.020)	XOKX 1606 ZD-TR	1054023			1054020	1054021	1054024					1054022		FCT45 FCTXX
 N = 8	16 (.630)	6.35 (.250)	16 (.630)	5.8 (.228)		RCKX 1606 MO-TR	7002762			7002763	1068433						1068435		FCT45 FCTXX
	16 (.630)	6.35 (.250)	16 (.630)	5.8 (.228)		RCKX 1606 MO-TRT wide land	7002767	1055730		7002768							1068464		
 N = 8	16 (.630)	6.35 (.250)	16 (.630)	5.8 (.228)		OCKX 0606 AD-TR	7002774		1054001		1054003						1054005	2414058	FCT45 FCTXX
	16 (.630)	6.35 (.250)	16 (.630)	5.8 (.228)	0.5 (.020)	OCKX 0606 AD-TRT wide land	7002782	1055731									1054011		
 N = 12	16 (.630)	6.35 (.250)	16 (.630)	5.8 (.228)	0.5 (.020)	XCKX 1606 ZDR-TR					1055677	7002783	1055708	1055709			1055678	1055689	FCT45 FCTXX
 N = 8		6.35 (.250)	13.5	5.5 (.217)	0.8 (.031)	SAHT 1306 AA ER									9206754	9206755			FCT45

[1] **LC280TT** Roughing geometry with double coating

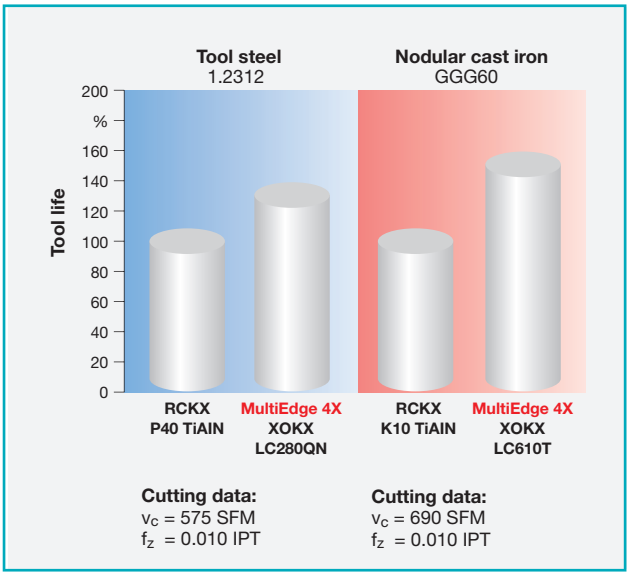
[2] **LC280QN** Two colored multi coating for high performance milling

MultiEdge 4X Features & Benefits

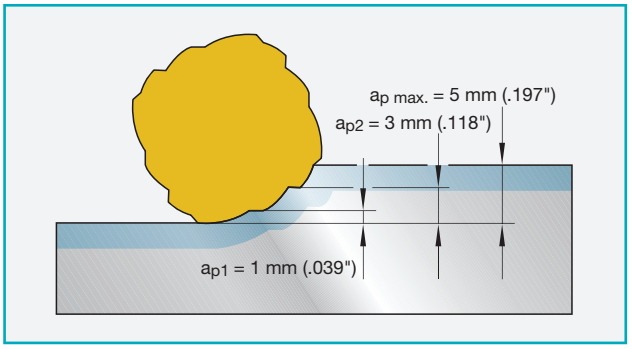
A characteristic attribute of the new MultiEdge 4X high-performance Milling Tools is the striking cutting edge design of the insert with a total of 12 steps. Thereby a favourable chip division will occur during milling which in combination with MultiC-coating will result in following advantages:

- Reduced cutting forces
- Reduced vibration during milling
- Excellent chip evacuation
- 10% less power requirements
- 20% higher depth of cut
- 30% more tool life
- 50% better surface
  (finish qualities also when roughing due to wiper-edge geometry)
- 100% higher depth of cut
  (at version with cut division)

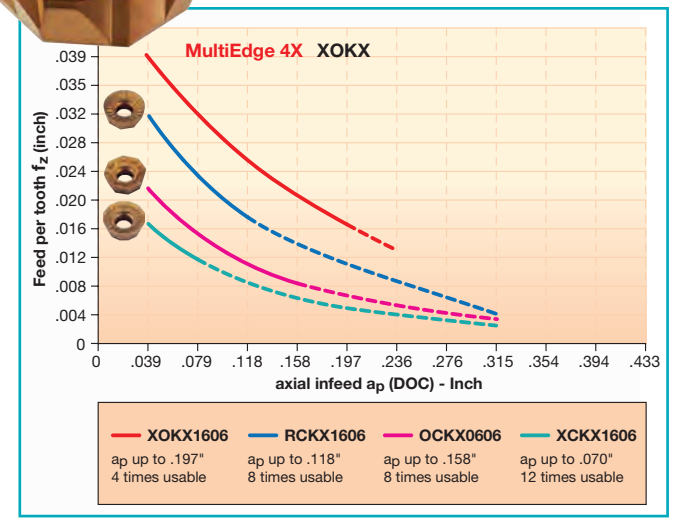
The Inserts are precision-sintered, indexable 4-times and usable in excisting and proven cutter bodies FCT45.



Tool life compansion



Cut-steps of MultiEdge 4X Insert



Feed per tooth of MultiEdge 4X compared with other inserts shape

MultiEdge 4X: Small chips because of chip division

Milling of Austempered Cast Iron Class 2

APPLICATION: Rough and Finish Face Milling in a single pass

CUSTOMER: General Machining Shop

MACHINE: CAT 40 Taper – 30 HP

STARTING SITUATION: Customer was unable to achieve tight surface finish requirements with existing competitors milling tools

PROBLEM: Operation requires both rough and finish face mills to achieve required RMS finish. Customer is also reporting reduced tool life with competitor's tooling.

SOLUTION: FCT45 Face Mill with XOKX 1606 inserts to rough and finish in one pass

CUSTOMER BENEFIT: Increase in productivity through reduced cycle times and fewer tool changes

TARGET MARKETS: Production shops looking to increase efficiency

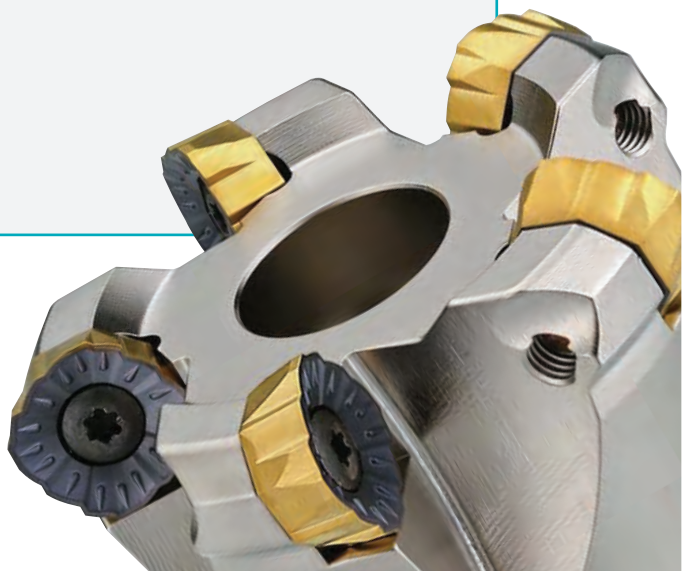
TOOL LIFE / EXPECTENCY:
Competitor (1-2 parts), LMT (18-20 parts)

CUTTING DATA:
- Face Mill: 4.00" FCT45 O06-400AD
- Insert: XOKX 1606 ZD TR LC610T
- Speed: 350 SFM (334 RPM)
- Feed: .012" FPT (28 IPM)
- DOC: .125"
- WOC: 3.00"
- Surface Finish Requirement: 42 RMS

Perthometer	M4P	**MultiEdge 4X**	v_c = 575 SFM
Dat.		**XOKX**	f_z = 0.010 IPT
Obj.			
#			
LT	15 mm		
RA	0.69 µm		
RZ	3.92 µm		
RMAX	4.32 µm		
VER	25 µm		
HOR LC	2.5 mm		

Perthometer	M4P	**RCKX**	v_c = 575 SFM
Dat.			f_z = 0.010 IPT
Obj.			
#			
LT	15 mm		
RA	5.67 µm		
RZ	19.68 µm		
RMAX	20.32 µm		
VER	25 µm		
HOR LC	2.5 mm		

Surface quality



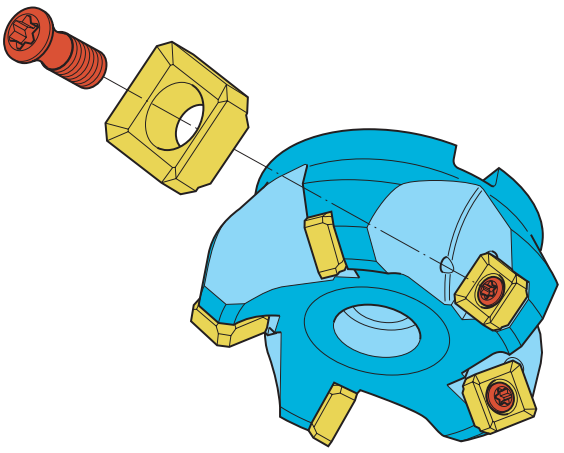
Features & Benefits

LMT-FETTE's exclusive TWIN*CUT* geometry lowers cutting forces and enables aggressive feed rates.

Double Negative Geometry:

The double negative insert position with high positive rake angles works well on a wide variety of materials, and on a wide variety of machines as well. The double negative design is exceptionally strong, offering unsurpassed smooth cutting action. TWIN*CUT* geometry directs downward pressure on the work piece, thus providing stability.

- Excellent on steels and cast iron
- Large insert seating surface
- Thick insert with rigid cross section

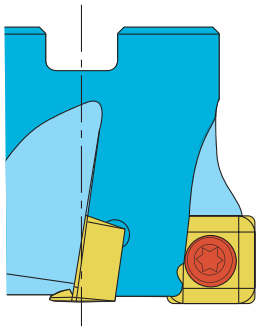


FMT45

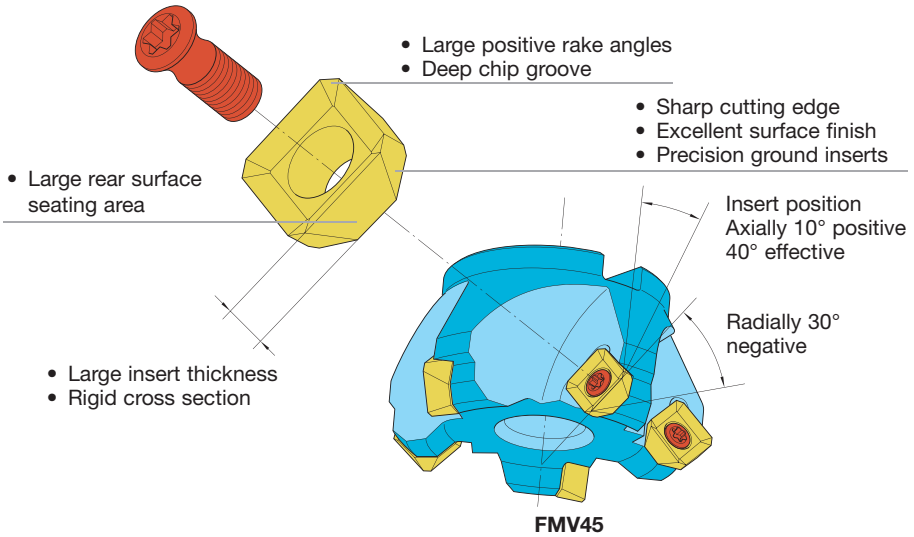
Positive Geometry:

The cutter is designed with a positive axial rake angle that allows the insert to cleanly and quietly shear the workpiece materials. This not only reduces horsepower requirements, but actually reduces wear on machine spindle bearings, ball screws and other components.

- Excellent on stainless steels, high temperature alloys and non-ferrous materials
- Extremely smooth cutting action



FMT90



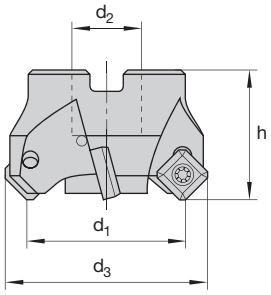
FMV45

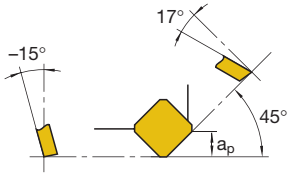
FMT45 (11250-12)

Application

- First choice milling cutter for face milling of steel and cast iron materials
- Used in rough and finish milling operations
- Features ramp milling capabilities

FMT45
Inch





d1	Cutter Body No.	EDP No.	Ident No.	ap (DOC)	d3	h	d2	z ✡	Insert	Insert Screw	Torx Driver
2.00	FMT45 S12-200AA	50310	1950044	0.28	2.56	1.57	0.75	4	SNKX 1205	50256	50258
2.50	FMT45 S12-250AA	50312	1950046	0.28	3.06	1.57	0.75	5	SNKQ 1205	M4.5	T20
3.00	FMT45 S12-300AB	50314	1950048	0.28	3.56	1.97	1.00	5	SNKU 1205		
3.00	FMT45 S12-300ABF*	50316	1950048I	0.28	3.56	1.97	1.00	6			
4.00	FMT45 S12-400AD	50318	1950050	0.28	4.56	1.97	1.50	7			

*Fine Pitch

Cutting data recommendations starting page 178

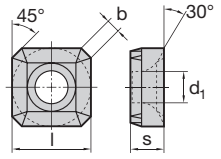
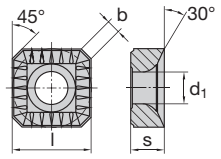
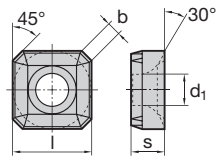
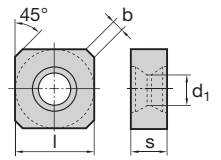
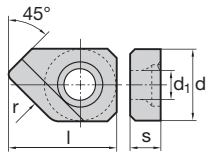
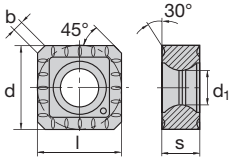
See page 21 for Inserts

For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028050

FMT45
Metric

d1	Cutter Body No.	11250 Ident No.	11250-IK Ident No.	ap (DOC)	d3	h	d2	z ✡	Insert	Insert Screw	Torx Driver
40	FMT45 S12.040AN-I	–	1027300	7	54	40	22	3	SNKX 1205 AN	1045123	1048344
50	FMT45 S12.050AN-I	–	1027302	7	64	40	22	4	SNKQ 1205 AN	M4.5	T20
63	FMT45 S12.063AN-I	–	1027304	7	77	40	22	5			
80	FMT45 S12.080AN(-I)	1027314	1027306	7	94	50	27	6			
100	FMT45 S12.100AN(-I)	1027316	1027308	7	114	50	32	7			
125	FMT45 S12.125AN(-I)	1027318	1027310	7	139	63	40	8			
160	FMT45 S12.160AN(-I)	1027320	1027312	7	174	63	40	9			

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No. LC280QN[2]	LC280TT[1]	LC240Q	LC610Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC612E	LC610T	LC615E	LW610	For cutter Cat-No.
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.078)	SNKX 1205 AN 1187-10					1052301			1052315					89365	1052339		1052236	MMT45
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.078)	SNKX 1205 AN-TR 1187-10 TR			1052260		1052248			1052239						1052251			FMT45
	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.078)	SNKX 1205 AN-TT wide land		1055742															
 N = 4	12.7 (.500)	5.44 (.214)		5.2 (.205)	2 (.078)	SNKX 1205 AN-T 1187-12 wide land					1052303			1052314						1052309	55955	1052254	FMT45
 N = 8	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.078)	SNKQ 1205 AN 1187-13					1052336									1052335	2414057	1052305	FMT45
 N = 1	19.05 (.750)	5.56 (.219)	12.7 (.500)	5.2 (.205)		1187-90 Wiper									2305343								FMT45
 N = 8	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.078)	SNKU 1205 AN-TR	1052327			1052328										1052329			FMT45

[1] LC280TT Roughing geometry with double coating

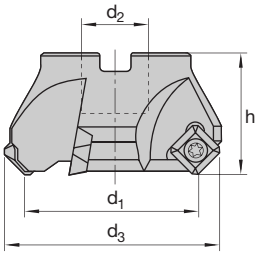
[2] LC280QN Two colored multi coating for high performance milling

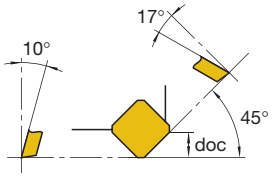
FMV45 (11280)

Application

- High performance *positive* milling cutter for face milling of stainless, high temperature alloys and non-ferrous materials
- Used in rough and finish milling operations
- Extremely smooth and quiet cutting action
- Designed to work well on low horsepower machines

FMV45
Inch





d_1	Cutter Body No.	EDP No.	Ident No.	doc	d_3	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
2.50	FMV45 S12-250AA	50356	1950223	0.197	2.93	1.57	0.75	5	SNHX 1205	50256	50258
3.00	FMV45 S12-300AB	50358	1950225	0.197	3.43	1.97	1.00	6		M4.5	T20
4.00	FMV45 S12-400AD	50360	1950227	0.197	4.43	1.97	1.50	7			
5.00	FMV45 S12-500AD	50362	1950229	0.197	5.43	2.48	1.50	8			
6.00	FMV45 S12-600AD	50364	1950231	0.197	6.43	2.48	1.50	9			

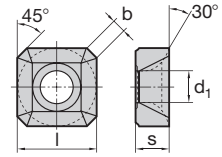
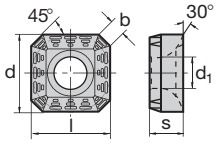
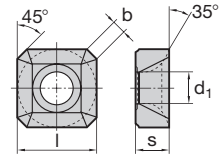
See page 23 for inserts

Cutting data recommendations starting page 178

FMV45
Metric

d_1	Cutter Body No.	Ident No.	d_3	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
50	FMV45 S12.050AN	1027331	61	40	22	4	SNHX 1205	1045123	1048344
63	FMV45 S12.063AN	1027330	74	40	22	5		M4.5	T20
80	FMV45 S12.080AN	1027332	91	50	27	6			
100	FMV45 S12.100AN	1027334	111	50	32	7			
125	FMV45 S12.125AN	1027336	136	63	40	8			

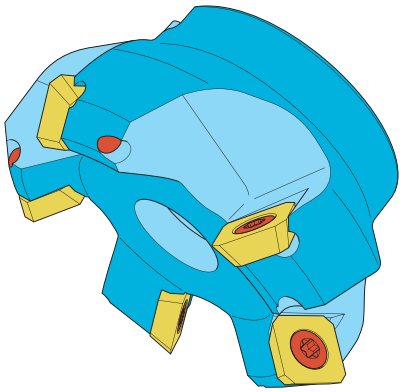
Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No.														For cutter
							LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC430T	LC444W	LC610E	LC610T	LC610A	LW610	LC603Z	Cat-No.
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNHX 1205 AE 1187-18					1052306				1067543							FMV45
	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNHX 1205 AESN-BM										1067537						FMV45
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNHX 1205 AE-ALC 1187-18 ALC												1052255	1052235			FMV45

Note: ALC LW610 High Polish for Aluminum Milling

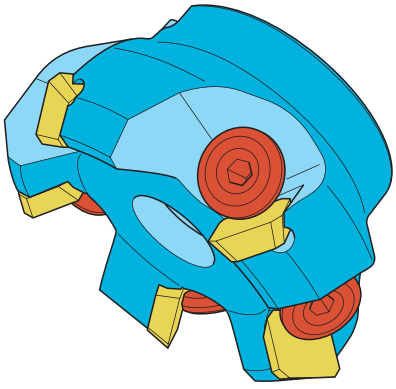
Features & Benefits

- High positive cutting geometry
- Quiet cutting action
- High cutting capacity with low horsepower machines or unstable conditions
- ISO indexable inserts



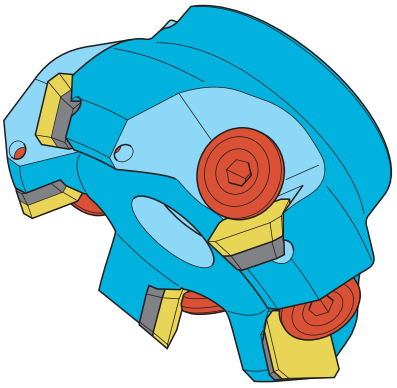
FMH45B

- Torx screw locking
- Thicker inserts for higher feed rates



FMH45A

- Locking screw (left-hand thread) for secure clamping
- Thicker inserts for higher feed rates



FMH45

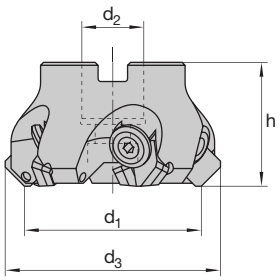
- Indexable inserts shims to protect the steel cutter body
- Locking screw (left-hand thread) for secure clamping

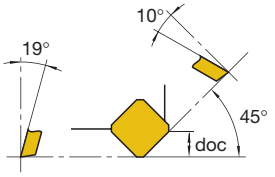
FMH45 (11172)

Application

- General purpose milling cutter for face milling of steel, stainless and non-ferrous materials
- Used in light-duty rough and finish milling operations
- Uses ISO style inserts
- High positive cutting geometry for low horsepower machines

FMH45
Inch





d_1	Cutter Body No.	EDP No.	Ident No.	a_p (DOC)	d_3	h	d_2	z ✿	Insert	Insert Locking Screw	Hex Key
2.00	FMH45 S12-200AA	50378	–	0.216	2.51	1.57	0.75	4	SEKN 1203	50652	50264
3.00	FMH45 S12-300AB	50380	–	0.216	3.51	1.97	1.00	5	SEKR 1203	50654	4mm
4.00	FMH45 S12-400AD	50382	–	0.216	4.51	1.97	1.50	6	SEAN 1203	50654	

See page 27 for inserts
For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028072

Insert Shim	Shim Screw	Torx Driver
50578	50580	50582

Cutting data recommendations starting page 178

FMH45
Metric

d_1	Cutter Body No.	Ident No.	d_3	h	d_2	z ✿	Insert	Insert Locking Screw	Hex Key
40	FMH45 S12.040AN	1027010	53	45	16	3	SEKN 1203	1050904	1048317
50	FMH45 S12.050AN	1027011	63	48	22	4	SEKR 1203		6K-SW4
63	FMH45 S12.063AN	1027012	76	40	22	5	SEAN 1203	1050901	
80	FMH45 S12.080AN	1027013	93	50	27	6			
100	FMH45 S12.100AN	1027014	113	50	32	6			

Limited stock of metric products in U.S., please contact Customer Service for availability

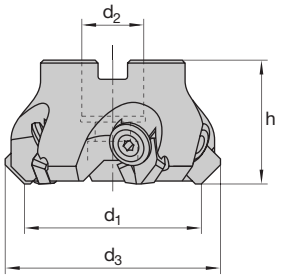
Insert Shim	Shim Screw	Torx Driver
1050902	1050903	2146539 6K-SWZ

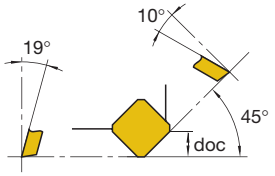
FMH45A (11173)

Application

- General purpose milling cutter for face milling of steel, stainless and non-ferrous materials
- Used in light-duty rough and finish milling operations
- Uses ISO style inserts
- High positive cutting geometry for low horsepower machines

FMH45A
Inch





d_1	Cutter Body No.	EDP No.	Ident No.	doc	d_3	h	d_2	z ✿	Insert	Insert Locking Screw	Hex Key
2.00	FMH45A S12-200AA	50384	–	0.216	2.51	1.57	0.75	4	SEKN 1204	50652	50264
3.00	FMH45A S12-300AB	50386	–	0.216	3.51	1.97	1.00	5	SEKR 1204	50654	4mm
4.00	FMH45A S12-400AD	50388	–	0.216	4.51	1.97	1.50	6		50654	

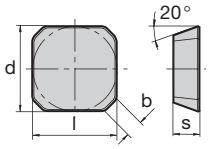
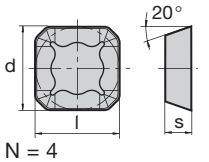
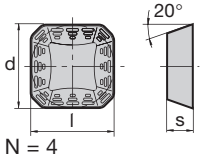
See page 27 for Inserts
For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028040

Cutting data recommendations starting page 178

FMH45A
Metric

d_1	Cutter Body No.	Ident No.	d_3	h	d_2	z ✿	Insert	Insert Locking Screw	Hex Key
40	FMH45A S12.040AN	1027020	53	45	16	3	SEKN 1204	1050904	1048317
50	FMH45A S12.050AN	1027021	63	48	22	4	SEKR 1204		6K-SW4
63	FMH45A S12.063AN	1027022	76	40	22	5		1050901	
80	FMH45A S12.080AN	1027023	93	50	27	6			
100	FMH45A S12.100AN	1027024	113	50	32	6			

Limited stock of metric products in U.S., please contact Customer Service for availability

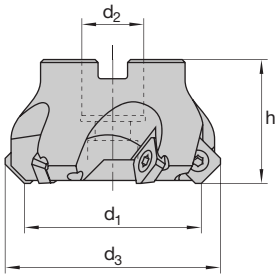
N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240Q	LC240T	LC230E	LC225T	LC225S	LW240	LW225	LC440T	LC444W	LC615E	LC610T	LC610A	LW610	For cutter Cat-No.
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKN 1203AFEN	1067514	1067487						1067508	1067526		1067474		1067468	FMH45
	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEAN 1203AFSN 1193-15		1055643												
	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKN 1203AFSN										6400580				
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKN 1204AFEN									1067527		1067475		1067486	FMH45A
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKN 1204AF	1067518	1067492						1067498						
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKN 1204AFSN				6406761						6400581				
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKR 1203AFSN		1055650		6406771				1067509						FMH45
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKR 1204AFSN		1055652		6406776										FMH45A
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKR 1203AFSN-BM									1067529					FMH45
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKR 1204AFSN-BM									1067531					FMH45A

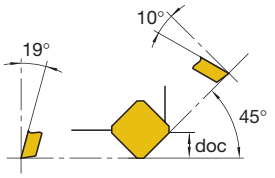
FMH45B (11171)

Application

- General purpose milling cutter for face milling of steel, stainless and non-ferrous materials
- Used in light-duty rough and finish milling operations
- Uses ISO style inserts
- Ideal for low horsepower machines

FMH45B
Inch





d_1	Cutter Body No.	EDP No.	Ident No.	doc	d_3	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
2.00	FMH45B S12-200AA	50372	–	0.216	2.51	1.57	0.75	4	SEHT 1204	50255	50258
3.00	FMH45B S12-300AB	50374	–	0.216	3.51	1.97	1.00	5	SEKW 1204	M5	T20
4.00	FMH45B S12-400AD	50376	–	0.216	4.51	1.97	1.50	6			

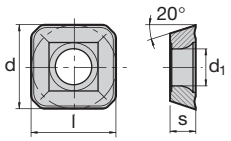
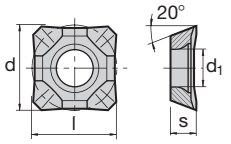
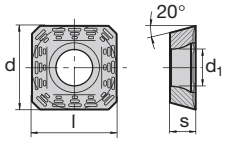
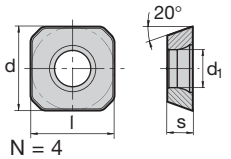
See page 29 for Inserts
For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028051

Cutting data recommendations starting page 178

FMH45B
Metric

d_1	Cutter Body No.	Ident No.	d_3	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
40	FMH45B S12.040AN	1027000	53	45	16	3	SEHT 1204	1045766	1048344
50	FMH45B S12.050AN	1027001	63	48	22	4	SEKW 1204	M5	T20
63	FMH45B S12.063AN	1027002	76	40	22	5			
80	FMH45B S12.080AN	1027003	93	50	27	6			
100	FMH45B S12.100AN	1027004	113	50	32	6			

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240T	LC230E	LC225T	LC225S	LW240	LW225	LC440T	LC430T	LC444W	LC615E	LC610T	LC610A	LW610	For cutter Cat-No.
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHT 1204AFSN	1067495							1067513	6406751					FMH45B
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHT 1204AFFN-ALC											6406749	6406748	1068537	FMH45B
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHT 1204AFSN-BM									1067533					FMH45B
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEKW 1204AFEN									6406780					FMH45B
	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEKW 1204AFSN			6406783							6400582				
	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHW 1204AF	1067497										1069339		1069344	

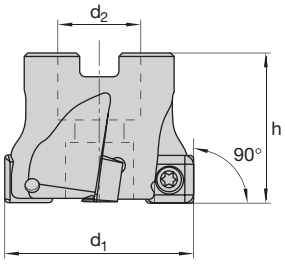
Note: ALC-LW610 High Polish for Aluminum Milling

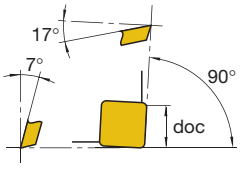
FMT90 (11260-12)

Application

- All purpose *positive* milling cutter for face and square shoulder milling of steel and non-ferrous materials
- Used in rough and finish milling operations

FMT90 Inch





d_1	Cutter Body No.	EDP No.	Ident No.	doc	h	d_2	z ⌬	Insert	Insert Screw	Torx Driver
2.00	FMT90 S12-200AA	50344	1950197	0.390	1.58	0.75	4	SPKX 120508	50256	50258
2.50	FMT90 S12-250AA	50346	1950198	0.390	1.58	0.75	5		M4.5	T20
3.00	FMT90 S12-300AB	50348	1950199	0.390	1.97	1.00	6			
4.00	FMT90 S12-400AD	50350	1950201	0.390	1.97	1.50	7			
5.00	FMT90 S12-500AD	50352	1950203	0.390	2.48	1.50	8			
6.00	FMT90 S12-600AD	50354	1950204	0.390	2.48	1.50	9			

For modular cutters diameter 6.00" to 12.00" see MultiMill section on pages 40-42
Multi-Mill Cartridge No. 1028055

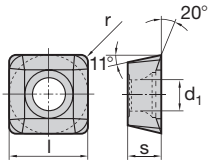
Cutting data recommendations starting page 178

FMT90 Metric

d_1	Cutter Body No.	Ident No.	a_p	h	d_2	z ⌬	Insert	Insert Screw	Torx Driver
50	FMT90 S12.050AN	1027380	10	40	22	4	SPKX 120508	1045123	1048344
63	FMT90 S12.063AN	1027382	10	40	22	5		M4.5	T20
80	FMT90 S12.080AN	1027384	10	50	27	6			
100	FMT90 S12.100AN	1027386	10	50	32	7			
125	FMT90 S12.125AN	1027388	10	63	40	8			
160	FMT90 S12.160AN	1027390	10	63	40	9			

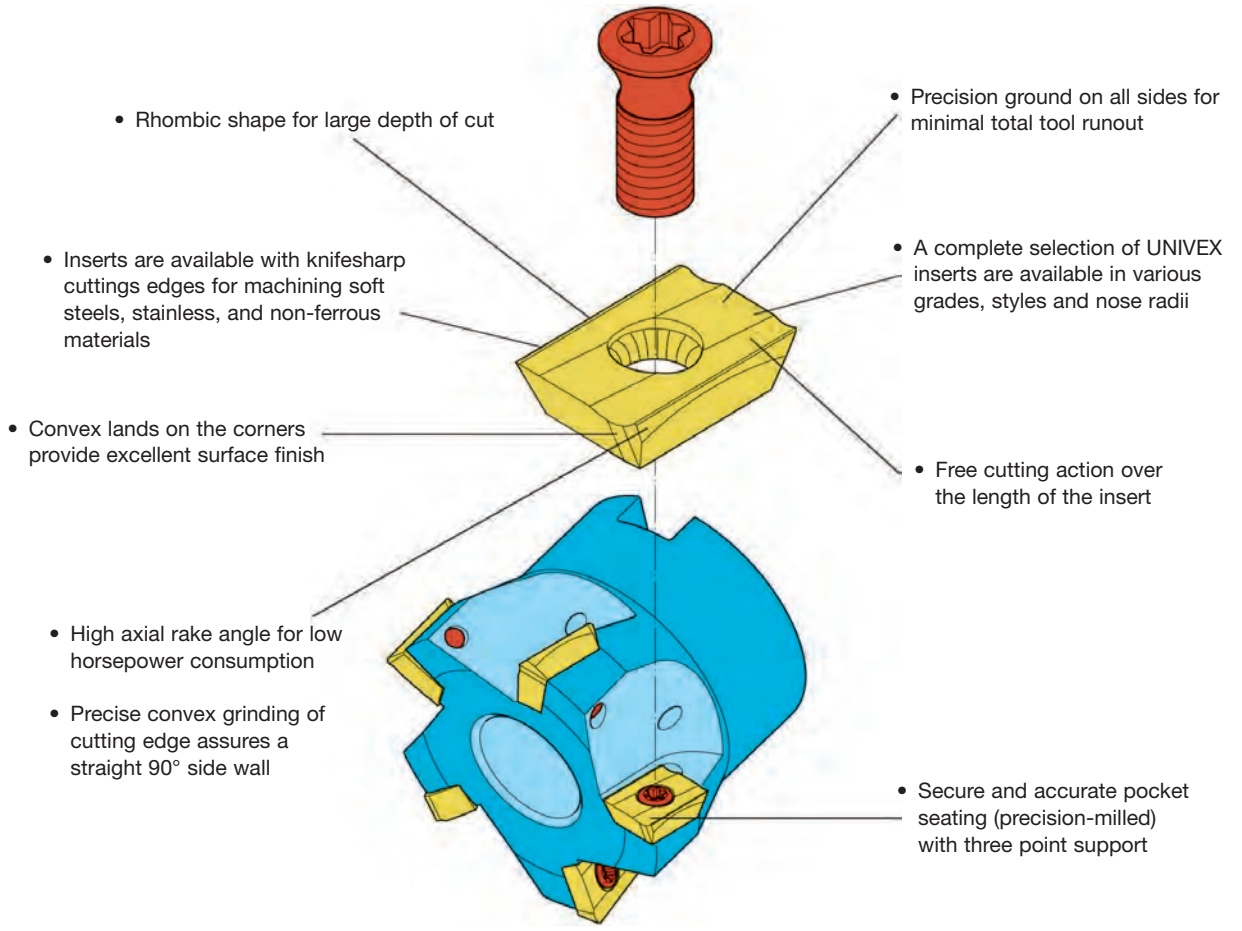
Limited stock of metric products in U.S., please contact Customer Service for availability

Indexable Inserts for 90° TWINCUT Face Mills

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No. LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC612E	LC610T	LC610A	LW610	LC603Z	For cutter Cat-No.
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	0.8 (.031)	SPKX 120508 1187-15	1052247	1052246									2346047	1052659		1052242		11260-12 FMT90 MMT90

Features & Benefits

LMT-FETTE's UNIVEX double-positive geometry provides smooth cutting action and low horsepower consumption. LMT-FETTE's UNIVEX line features double positive geometry with a high axial rake angle. UNIVEX is capable of cutting a true 90° wall, UNIVEX cutters perform well on steels, stainless and non-ferrous materials and are available in face mills, end mills, long edge helical mills and long edge shell mills. LMT-FETTE offers integral shank designs: CAT 40 and CAT 50.

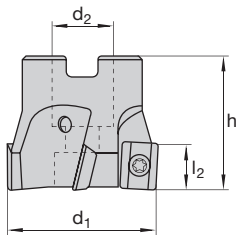


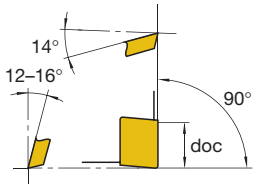
FMU90 (11475-IK)

Application

- High performance milling cutter for face, slot and square shoulder milling of steel, stainless and non-ferrous materials
- High positive axial rake angle provides quiet and smooth cutting action

FMU90
Inch
IK





All bodies have internal coolant

d_1	Cutter Body No.	EDP No.	Ident No.	l_2	h	d_2	z ✡	Insert	Insert Screw	Torx Driver
2.00	FMU90 A11-200AAI	54070	4052271	0.41	1.57	0.75	4	ADHX 1103	89979	89978
2.00	FMU90 A11-200AAFI	54071	4052274	0.41	1.57	0.75	5	ADKX 1103	M3	T08
2.50	FMU90 A11-250ABI	54072	4052272	0.41	1.57	1.00	5	ADMX 1103		
2.50	FMU90 A11-250ABFI	54073	4052275	0.41	1.57	1.00	6			
3.00	FMU90 A11-300ACI	54074	4052273	0.41	1.97	1.25	6			
3.00	FMU90 A11-300ACFI	54075	4052276	0.41	1.97	1.25	8			
1.58	FMU90 A12-158AA	50416	1950195	0.47	1.42	0.75	4	ADHX 12T3	89974	50259
2.00	FMU90 A12-200AA	50418	1950158	0.47	1.57	0.75	5	ADMX 12T3	M3.5	T15
2.50	FMU90 A12-250AA	50420	1950159	0.47	1.57	0.75	6	ADKX 12T3		

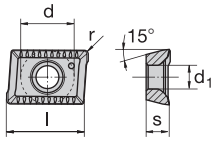
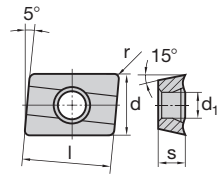
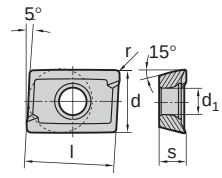
See pages 33-34 for Inserts

Cutting data recommendations starting page 186

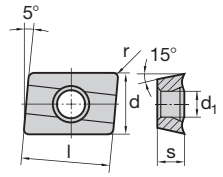
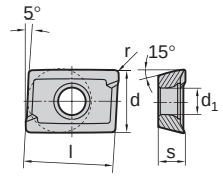
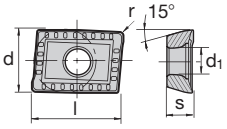
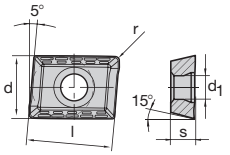
FMU90
Metric

d_1	Cutter Body No.	Ident No.	l_2	h	d_2	z ✡	Insert	Insert Screw	Torx Driver
40	FMU90 A12.040AN-I	1039804	12	36	16	4	ADHX 12T306	1045114	1048335
50	FMU90 A12.050AN-I	1039806	12	40	22	5		M3.5	T15
63	FMU90 A12.063AN-I	1039808	12	40	22	6			
80	FMU90 A12.080AN-I	1039810	12	50	27	7			

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC430T	LC444W	LC610E	LC610T	LW630	LW610	For cutter Cat-No.
 N = 2	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.5 (.020)	ADKX 110305 SR-TR		2413010					2413970						2414000			EMU90IK
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.031)	ADKX 110308 SR-TR		2413012					2413972						2414001			
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	1.2 (.047)	ADKX 110312 SR-TR		2413014					2413974						2414002			
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	1.6 (.063)	ADKX 110316 SR-TR		2413016					2413976						2414003			
 N = 2	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.5 (.020)	ADHX 110305 ER 1196-82	1068011	1069402	1069459				2410308			1067541			1069490		1069445	EMU90IK
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.031)	ADHX 110308 ER 1196-82 R03							1960108							1960070		
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	1.5 (.059)	ADHX 110315 ER 1196-82 R06							2410309							1960073		
 N = 2	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.5 (.020)	ADHX 110305 FR-ALC 1196-82 ALC													1069534		1069533	EMU90IK

Note: ALC LW610 High Polish for Aluminum Milling

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No. LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC430 T	LC444W	LC610E	LC610T	LW630	LW610	LC603Z	For cutter Cat-No.
 N = 2	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADHX 12T306 ER 1196-84	1068012	1069403	1069463		1069750					1067542	1067535		1069492	1069511	1069448		ERU90 FMU90 FRU90
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	1.5 (.059)	ADHX 12T315 ER 1196-84 R06							2413089							1960090			
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	2.3 (.091)	ADHX 12T323 ER 1196-84 R09							1960096							1960093			
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADMX 12T306 ER 1196-85		1069526	1069386										1069530		1069466		
 N = 2	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADHX 12T306 FR-ALC 1196-84 ALC													1069536		1069535		ERU90 FMU90 FRU90
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADKX 12T306 ER 1196-89		1055016											1055018				ERU90 FMU90 FRU90
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADHX 12T306SR-BM 1196-84 B11											1067535						ERU90 FMU90 FRU90

Note: ALC LW610 High Polish for Aluminum Milling

Insert Tolerance

ADHX & ADHT (Ground) 1196-80 1196-82 1196-84	ADMX (Direct Pressed) 1196-81 1196-83 1196-85	ADKX (Direct Pressed) 1196-96
s = +/– 0.001 l = +/– 0.0004 d = +/– 0.0004	s = +/– 0.001 l = +/– 0.002 d = +/– 0.002	s = +/– 0.001 l = +/– 0.002 d = +/– 0.002

Application:
Pocketing in a copper anode plate

Customer:
General machine construction

Initial situation:

Pockets (39 x 35 x 3.5 inches) are cavity machined in copper plates on a machining center.
There was an order for 270 parts.

The indexable inserts on a competitors tool were heavily flaked and often broken away.
This always happened whenever a chip was dragged through. Damage to the seating of the insert could not be avoided.

Solution:

Use of our UNIVEX square shoulder facemill 90°
FMU 90 11475 - IK d1 = 63 mm (2.48"); 6 teeth
with inserts
ADHX 12T306 FR-ALC, LC 610 T
1196 - 84 ALC, item no. 1069536

Cutting data:

Cutting speed:	1345 SFM
Rotary speed:	2072 RPM
Feed rate:	85 IPM
Width of cut:	1.38"
Depth of cut:	.345"

Customers benefit:

Higher feed rates and lower wear on the inserts allowed manufacture to be optimised and high production reliability to be achieved.

Costs (time saving):

On an order for 270 items it was possible to save $120,000.

The time saving was greater than 50%.

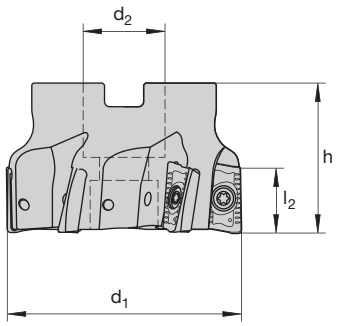
	FETTE	Competitor
cutting speed SFM	**1345**	985
RPM	**2072**	1447
chipload Inch	**.007**	.006
Average chipthickness Inch	**.006**	.005
feed rate IPM	**85**	34
width of cut [woc] Inch	**1.38**	.98
depth of cut [doc] Inch	**.345**	.472
No. of teeth	**6**	4
Chip removal volume in^3/min	**40**	16
Tool life in feet	**690**	217

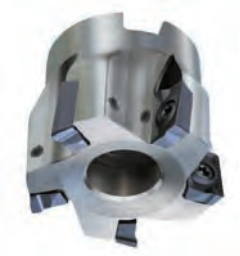
FMU90 (11415-IK)

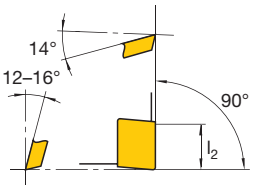
Application

- High performance milling cutter for face, slot and square shoulder milling of steel, stainless and non-ferrous materials
- High positive axial rake angle provides quiet and smooth cutting action

FMU90
Inch
IK







All bodies have internal coolant

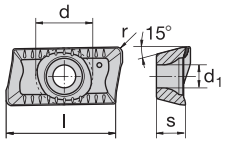
d_1	Cutter Body No.	EDP No.	Ident No.	l_2	h	d_2	z	Insert	Insert Screw	Torx Driver
2.00	FMU90 A17-200AAI	12903	1950280	0.650	1.575	0.750	4	ADKX	89974	50259
2.00	FMU90 A17-200AAIF	12904	1950281	0.650	1.575	0.750	5	1705_ _	M3.5	T15
2.50	FMU90 A17-250ABI	12905	1950282	0.650	1.575	1.000	5			
2.50	FMU90 A17-250ABIF	12906	1950283	0.650	1.575	1.000	6			
3.00	FMU90 A17-300ACI	12907	1950284	0.650	1.969	1.250	5			
3.00	FMU90 A17-300ACIF	12908	1950285	0.650	1.969	1.250	8			
4.00	FMU90 A17-400ADI	12909	1950286	0.650	1.960	1.500	6			
4.00	FMU90 A17-400ADIF	12910	1950287	0.650	1.990	1.500	9			
5.00	FMU90 A17-500ADIF	18801	9187004	0.670	1.970	1.500	9			
6.00	FMU90 A17-600AEIF	18804	9186523	0.670	1.970	2.000	10			

See page 37 for Inserts
Cutting data recommendations starting page 180
For modular cutter diameters 4.00"-12.00" see Multi-Mill section on pages 40-42
Multi-Mill Cartridge No.1028049

FMU90
Metric

d_1	Cutter Body No.	Ident No.	l_2	h	d_2	z	Insert	Insert Screw	Torx Driver
40	FMU90 A17.040AN-IF	1045035	16.5	36	16	4	ADKX	1045114	1048335
50	FMU90 A17.050AN-IF	1045036	16.5	40	22	5	1705_ _	M 3.5	T15
63	FMU90 A17.063AN-IF	1045037	16.5	40	22	6			
80	FMU90 A17.080AN-IF	1045038	16.5	50	27	8			
100	FMU90 A17.100AN-IF	1045039	16.5	50	32	9			

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC610E	LC610T	LC610A	LW610	LC603Z	For cutter Cat-No.
 N = 2	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	0.8 (.031)	ADKX 170508 SR-TR		2412980					2413978						2414004				FMU90
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.2 (.047)	ADKX 170512 SR-TR		2412982					2413980						2414005				
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.6 (.062)	ADKX 170516 SR-TR		2412984					2413982						2414006				
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	2 (.079)	ADKX 170520 SR-TR		2412986					2413984						2414007				
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	3.2 (.125)	ADKX 170532 SR-TR							2413228										
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	6.4 (.250)	ADKX 170564 SR-TR							2413230										
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	0.8 (.031)	ADHX 170508 FR-ALC													2414009		9206028		
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.2 (.047)	ADKX 170512 FR-ALC													7019835		7019836		
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.6 (.063)	ADHX 170516 FR-ALC													7019837		7019838		
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	2.0 (.078)	ADKX 170520 FR-ALC													7019839		7019840		
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	3.1 (.122)	ADHX 170531 FR-ALC													7019841		7019842		
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	4.0 (.157)	ADKX 170540 FR-ALC													7011958		7011957		

Note: ALC Geometry for Aluminum Milling
*When r > 2.0 (.078") Body must be modified for Clearance

Application Examples

Material: 4140 Pre-Hard
Hardness: 27-32 HRC

LMT-Fette UNIVEX PREMIUM Face Milling Cutter
FMU90 A17-200
Ø 2.00" 5 teeth
with inserts
Insert Grade LC630T

Cutting Data

sfm	=	825	ipm	=	40
rpm	=	1,600	woc	=	1.400"
ipt	=	.006"	doc	=	.400"

Material: 4140 Pre-Hard
Hardness: 27-32 HRC

LMT-Fette UNIVEX PREMIUM End Mill
Cat. Desc. EMU90
Ø 1.00" 2 teeth
with inserts
Insert Grade LC630T

Cutting Data

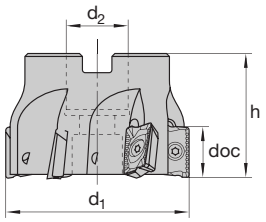
sfm	=	1,100	ipm	=	53
rpm	=	2,130	woc	=	.020"
ipt	=	.005"	doc	=	.500"

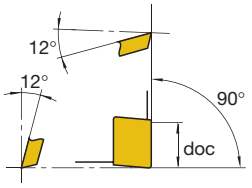
FMP/FMH90 (11145)

Application

- General purpose milling cutter for face, edge, slot and square shoulder milling of steel, stainless and non-ferrous materials
- Uses ISO style insert
- Positive cutting action for low horsepower machines

FMP/FMH90
Inch





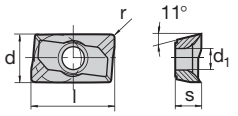
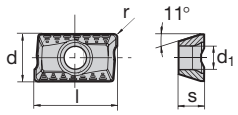
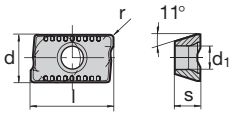
d_1	Cutter Body No.	EDP No.	Ident No.	a_p (DOC)	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
2.00	FMP90-A10-200AA	53870	–	0.330	1.50	0.75	7	APHT 1003 APKT 1003	53886 M2	89978 T8
2.00	FMP90 A16-200AA	50366	–	0.550	1.57	0.75	5	APHT 1604	50257	50259
2.50	FMP90-A16-250AB	53881	–	0.550	1.75	1.00	6	APKT 1604	M4	T15
3.00	FMP90 A16-300AB	50688	–	0.550	1.57	1.00	5			
3.00	FMP90 A16-300ABF	89239	–	0.550	1.97	1.00	7			
4.00	FMP90 A16-400AD	50370	–	0.550	1.97	1.50	8			
5.00	FMP90-A16-500AD	53884	–	0.550	2.00	1.50	9	APHT 1604	53887	50259
6.00	FMP90-A16-600AE	53885	–	0.550	2.50	2.00	10	APKT 1604	M4	T15

See page 39 for Inserts
Cutting data recommendations starting page 178
For modular cutter diameters 4.00"-12.00" see Multi-Mill section on pages 40-42
Multi-Mill Cartridge No. 1028054

FMP/FMH90
Metric

d_1	Cutter Body No.	Ident No.	a_p (DOC)	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
40	FMH90 A10.040AN	1028515	8	40	22	6	APHT 1003	1044972	1048326
50	FMH90 A10.050AN	1028516	8	40	22	7	APKT 1003	M2.5	T8
63	FMH90 A10.063AN	1028517	8	40	22	9			
80	FMH90 A10.080AN	1028518	8	50	27	11			
40	FMH90 A16.040AN	1028510	14	36	16	4	APHT 1604	1045131	1048335
50	FMH90 A16.050AN	1028511	14	40	22	5	APKT 1604	M4	T15
63	FMH90 A16.063AN	1028512	14	40	22	6			
80	FMH90 A16.080AN	1028513	14	50	27	7			
100	FMH90 A16.100AN	1028514	14	50	32	8			

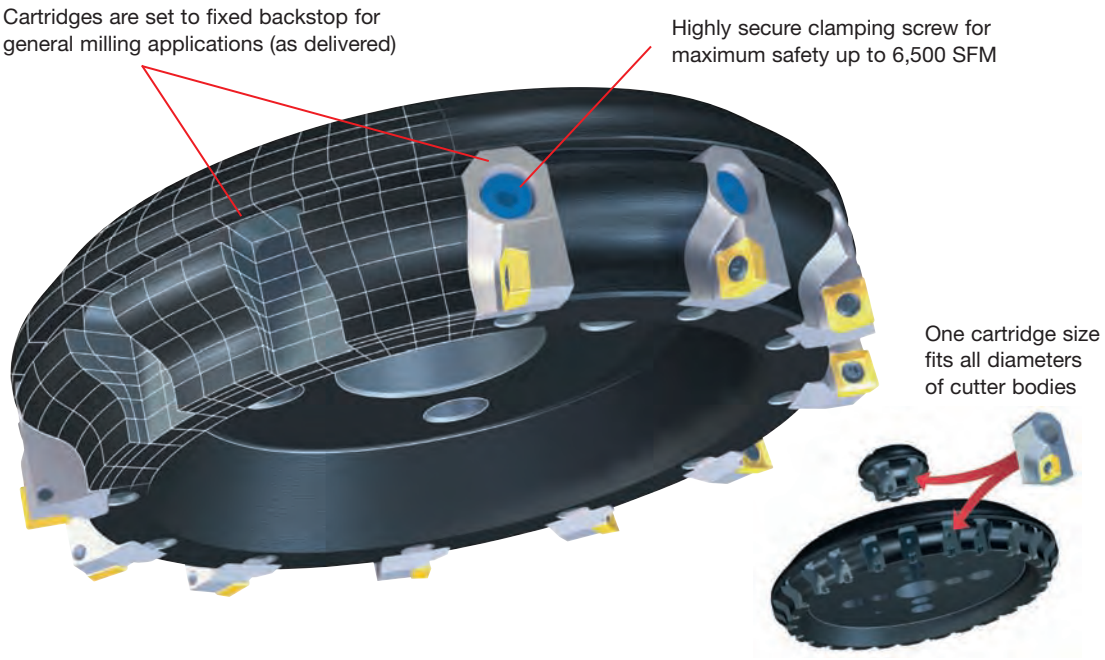
Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240Q	LC240T	LC230E	LC225T	LC240S	LC225S	LC630T	LW225	LC440T	LC444W	LC615E	LC610T	LC610A	LW610	LW630	For cutter Cat-No.
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.259)	2.8 (.110)	0.5 (.020)	APHT 100305 PDFR-ALC												6401070		6401071		FMH90 FMP90
	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APHT 160408 PDFR-ALC												6401073		6401074		FMH90 FMP90
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.259)	2.8 (.110)	0.5 (.020)	APKT 100305 PDSR-BM	1052345	1052343							1067504	1067520						FMH90 FMP90
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APKT 160408 PDSR-BM							6413391			1067522						FMH90 FMP90
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.259)	2.8 (.110)	0.5 (.020)	APKT 100305 PDSR-BP				6401076							6400573					FMH90 FMP90
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APKT 160408 PDSR-BP	1067517	1067507		6401085	1067506		6413391		1067503			1067512			1067515	FMH90 FMP90
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	1.6 (.062)	APKT 160416 SR-BP				6401089			6413393									
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	2.4 (.094)	APKT 160424 SR-BP				6401092			5015425									
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	3.2 (.125)	APKT 160432 SR-BP				6401095			5015426									

Note: ALC LW610 High Polish for Aluminum Milling

MULTI-MILL - Modular Mills

The distinctively robust design of the LMT-FETTE Multi-Mill allows for optimum performance. Two basic versions are available, course and fine pitch. For your convenience, Multi-Mill has standardized components for all diameters, and one cartridge size fits all diameters. The variable pitch design eliminates chatter and vibration.



Broad insert cartridge offering allows an extensive field of application

Comes ready to use . . . without adjustment. It is both a rougher and a finisher.

The LMT-FETTE Multi-Mill is the ideal milling cutter for a wide variety of applications. This unique milling cutter system can be used as a 45° face mill or as a square shoulder face mill on most standard milling machines. With button inserts, Multi-Mill can be used as a rougher and/or finisher for molds and dies, welded structures and frames. It can also be used to cut castings. Multi-Mill functions as two tools in one. Using the same cutter body, it can cut both clockwise and counterclockwise with a simple left hand / right hand cartridge change. Now that's a super-finisher!

Clamped indexable inserts also allow axial adjustability. One clamp for all versions.

Cartridge can be axially adjusted within ±.0002".

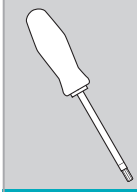
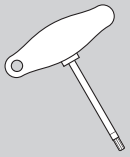
Differential pitch reduces vibration.

Available in coarse and fine pitch.

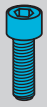
Photo Description	EDP No.	Ident No.	Catalog Description	Lead Angle	Insert Used	Clamping Style	Hand
	50237	1028072	MMH45S12	45 Deg.	SEKN 1203	LEVER TOP CLAMP	RIGHT HAND
	50238	1028041	MMH45S15	45 Deg.	SEKN 1504	LEVER TOP CLAMP	RIGHT HAND
	50239	1028040	MMH45A	45 Deg.	SE_N 1204	LEVER TOP CLAMP	RIGHT HAND
	50240	1028051	MMH45B	45 Deg.	SEKW 1204	CENTER SCREW	RIGHT HAND
	50241	1028050	MMT45B	45 Deg.	SNKX 1205	CENTER SCREW	RIGHT HAND
	50650	1028077	MCT45	45 Deg.	OCKX 0606 RCKX 1606 XCKX 1606 XOKX 1606	CENTER SCREW	RIGHT HAND
	56239	2345452	MCT45LF				LEFT HAND
	16176	1028081	FMN45	45 DEG.	ONGU 0606	CENTER SCREW	RIGHT HAND
	51979	1028079	MCTXX-VARIO	45 Deg.	OCKX 0606 RCKX 1606	CENTER SCREW	RIGHT HAND
	50243	1028042*	MMP75	75 Deg.	SP_N 1203	LEVER TOP CLAMP	RIGHT HAND
	50244	1028052	MMT87	87 Deg.	SNKX 1205	CENTER SCREW	RIGHT HAND
	50245	1028073*	MMH88A	88 Deg.	SEKN 1204	LEVER TOP CLAMP	RIGHT HAND
	50246	1028053*	MMH88B	88 Deg.	SEKW 1204	CENTER SCREW	RIGHT HAND
	50247	1028055*	MMT90	90 Deg.	SPKX 1205	CENTER SCREW	RIGHT HAND
	50248	1028046*	MMP90T16	90 Deg.	TPKN 1603	LEVER TOP CLAMP	RIGHT HAND
	50249	1028047*	MMP90T22	90 Deg.	TPKN 2204	LEVER TOP CLAMP	RIGHT HAND
	50250	1028054	MMP90	90 Deg.	APKT 1604	CENTER SCREW	RIGHT HAND
	50251	1028056	MMT R	90 Deg.	RCKT 1606	CENTER SCREW	RIGHT HAND
	15514	1028049	MCT90	90 Deg.	ADKX 1705	CENTER SCREW	RIGHT HAND
	16984	9164419	MMHF90	90 Deg.	XCNT 1205	CENTER SCREW	RIGHT HAND

*Non-Stock Items in USA
Multi-Mill Bodies on page 42

Torx Drivers & Hex Wrenches

	EDP No.	Size
	88600 89978 11171	T6 T8 T10
	50259 50258 88606	T15 T20 T30
	88712 88713	8mm Hex 6mm Hex

Cartridge & Adjustment Screws

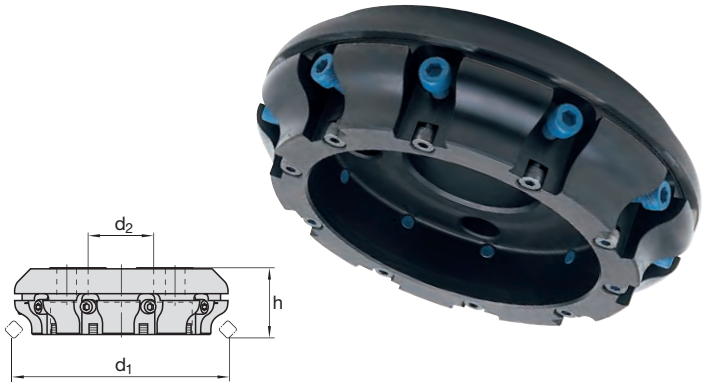
	EDP No.	Ident No.	Description
	50253	241985	Cartridge Fixation Screw
	50263	1045713	Axial Adjustment Screw

Anti-Seize Lubricant

EDP Number	Part Number
88610	SL1

Anti-Seize lubricates locking screw threads to prevent seizing caused by extreme temperatures and corrosion in machining operations. Screws should be coated frequently to prevent seizing.

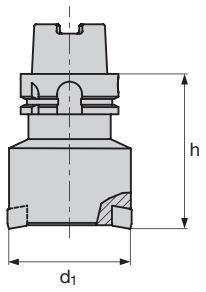
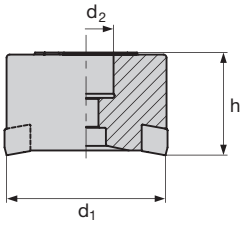
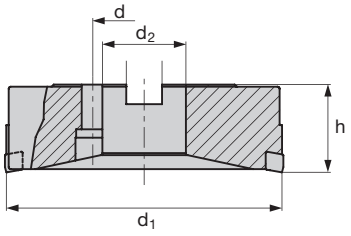
MM Body Sold Without Cartridges



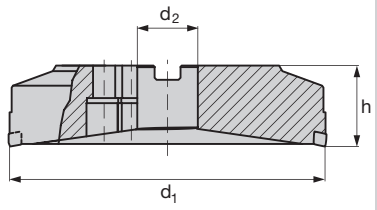
d_1	Cutter Body No.	EDP No.	Ident No.	h	d_2	z ✿
Coarse Pitch						
4.00	MM BODY 4.0 x 6	50226	1028901	2.48	1.50	6
5.00	MM BODY 5.0 x 6	50227	1028902	2.48	1.50	6
6.00	MM BODY 6.0 x 10	50228	1028903	2.48	1.50	10
8.00	MM BODY 8.0 x 12	50229	1028904	2.48	2.50	12
10.00	MM BODY 10.0 x 14	50230	1028905	2.48	2.50	14
12.00	MM BODY 12.0 x 18	50231	1028906	3.15	2.50	18
16.00	MM BODY 16.0 x 20	50265	1028907*	3.15	2.50	20
20.00	MM BODY 20.0 x 28	50266	1028908*	3.15	2.50	28
Fine Pitch						
5.00	MM BODY 5.0 x 8	50232	1028910	2.48	1.50	8
6.00	MM BODY 6.0 x 12	50233	1028911	2.48	1.50	12
8.00	MM BODY 8.0 x 16	50234	1028912	2.48	2.50	16
10.00	MM BODY 10.0 x 20	50235	1028913	2.48	2.50	20
12.00	MM BODY 12.0 x 24	50236	1028914	3.15	2.50	24
16.00	MM BODY 16.0 x 30	50267	1028915*	3.15	2.50	30
20.00	MM BODY 20.0 x 40	50268	1028916*	3.15	2.50	40

See Page 182 for Multi-Mill Assembly Instructions
*Quoted Upon Request

1D-Axial Insert Adjustment

	d_1	z	h	d_2	IKZ	LMT-Code	Ident. No.
Ø 63-80 	63	4	102	–	–	**1D-MK 063 04 R HSK-A63**	6200463
	63	4	102	–	x	**1D-MK 063 04 R HSK-A63 IK**	6200464
	80	6	102	–	–	**1D-MK 080 06 R HSK-A63**	6200460
	80	6	102	–	x	**1D-MK 080 06 R HSK-A63 IK**	6200459
Ø 80-125 	80	6	52	27	x	**1D-MK 080 06 R DIN 6358 IK**	6280824
	100	6	52	32	x	**1D-MK 100 06 R DIN 6358 IK**	6280825
	100	8	52	32	x	**1D-MK 100 08 R DIN 6358 IK**	6200465
	125	8	65	40	x	**1D-MK 125 08 R DIN 6358 IK**	6280803
	125	10	65	40	x	**1D-MK 125 10 R DIN 6358 IK**	6280823
Ø 160-250 	160	10	63	40	–	**1D-MK 160 10 R DIN 2079**	6280819
	160	10	63	40	x	**1D-MK 160 10 R DIN 2079 IK**	6280820
	160	12	63	40	–	**1D-MK 160 12 R DIN 2079**	6200461
	160	12	63	40	x	**1D-MK 160 12 R DIN 2079 IK**	6200462
	200	12	63	60	–	**1D-MK 200 12 R DIN 2079**	6280821
	200	12	63	60	x	**1D-MK 200 12 R DIN 2079 IK**	6280822
	200	16	63	60	–	**1D-MK 200 16 R DIN 2079**	6280810
	200	16	63	60	x	**1D-MK 200 16 R DIN 2079 IK**	6280811
	250	16	63	60	–	**1D-MK 250 16 R DIN 2079**	6280817
	250	16	63	60	x	**1D-MK 250 16 R DIN 2079 IK**	6280818
	250	20	63	60	–	**1D-MK 250 20 R DIN 2079**	6280812
	250	20	63	60	x	**1D-MK 250 20 R DIN 2079 IK**	6280813

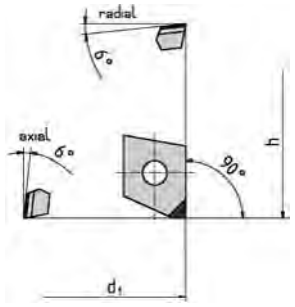
See pages 183-184 for Assembly Instructions
L/H version and additional tool arbors on request

	d_1	z	h	d_2	IKZ	LMT-Code	Ident No.
Ø 315-400 	315	20	80	60	–	**1D-MK 315 20 R DIN 2079**	6280815
	315	24	80	60	–	**1D-MK 315 24 R DIN 2079**	6280806
	400	24	80	60	–	**1D-MK 400 24 R DIN 2079**	6280809
	400	32	80	60	–	**1D-MK 400 32 R DIN 2079**	6280805

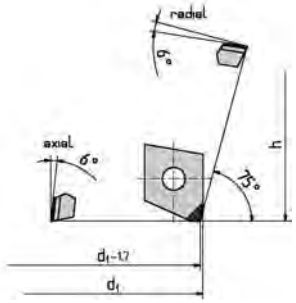
All images in face milling version

L/H version and additional tool arbors on request

Angle version

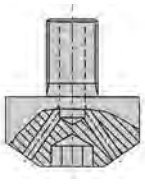


Face version



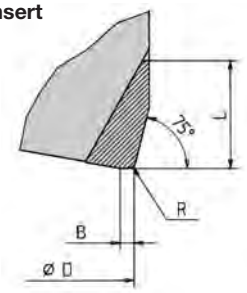
Either contour or face milling just by selecting the requested geometry

Coolant Supply (IKZ) – Body Material Aluminium

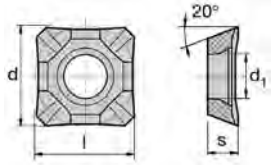
	MC diameter d [mm]		Internal coolant supply, IKZ	Ident No.
	80	●	FAS 080 27 A Shower Screw	6119384
	100	●	FAS 100 32 A Shower Screw	6119385
	125	●	FAS 125 40 A Shower Screw	6119386
	160	●	KVD 160 40 A Coolant Disk	6119398
	200 250	●	KVD 200 60 A Coolant Disk	6119381
	315	○	KVD 315 60 A Coolant Disk	6203857
	400	○	KVD 400 60 A Coolant Disk	6203858

● = included in delivery ○ = on request

Face-insert



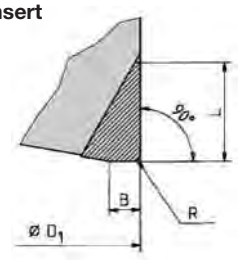
	B	t	y	r	LMT-Code	Ident No.
	1.0	3.0	6°	0.2	**IT 01 RP DP***	6126192
	1.0	6.0	6°	0.4	**IT 02 RP DP***	6126191
	0.7	–	6°	0.2	**IT 03 RP LW 610***	6126189
	1.0	6.0	6°	0.4	**IT 04 RP DP**	6126193
	0.7	–	6°	0.2	**IT 05 RP LW 610**	6280903
	1.0	3.0	6°	0.4	**IT 06 RP DP**	6281173



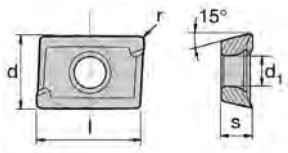
	l	d	d_1	s	LMT-Code	Ident No.
	12.7	12.7	5.5	4.76	**SEHT 1204 AFFN-ALC LW610**	1068537
	12.7	12.7	5.5	4.76	**SEHT 1204 AFFN-ALC LC610A**	6406748
	12.7	12.7	5.5	4.76	**SEHT 1204 AFFN-ALC LC610T**	1068538

ISO-insert in carbide, especially for face milling of aluminium.
Note: Additional Inserts on Page 29

Angle-insert



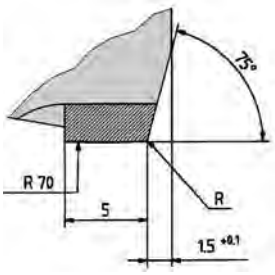
	B	t	y	r	LMT-Code	Ident No.
	1.6	3.0	6°	0.2	**IT 01 RE DP***	6126205
	1.6	6.0	6°	0.4	**IT 02 RE DP***	6126204
	1.6	–	6°	0.2	**IT 03 RE LW 610***	6126202
	1.6	6.0	6°	0.4	**IT 04 RE DP**	6126188
	1.6	–	6°	0.2	**IT 05 RE LW 610**	6260134
	1.6	3.0	6°	0.4	**IT 06 RE DP**	6281170



	l	d	d_1	s	LMT-Code	Ident No.
	12.7	9.52	4.0	3.97	**ADHT 12T306 FR-ALC LW610**	1069535
	12.7	9.52	4.0	3.97	**ADHT 12T306 FR-ALC LC610T**	1069536

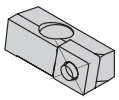
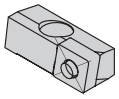
ISO-insert in carbide, especially for face milling of aluminium.
Note: Additional Inserts on Page 34

Wiper-insert



	B	t	y	r	LMT-Code	Ident No.
	–	5.0	6	0.2	**IT 01 RV DP***	6126201
	–	5.0	6	0.2	**IT 02 RV DP**	6201952

Insert-Holder/clamping piece/fixing screw/insert

Insert-Holder	Clamping piece	Fixing screw	Insert
6119392 MKH 1 NR 01 1D-Insert-Holder (short), radial 0° x axial 0° 	**6119407** MKL 1 R 01 clamping piece (short) 	**6119393** BS 5 R 02 fixing screw M 5  **6119319** 4 x 100 Hexagon service wrench with T-handle 	**Face insert:** IT 01 RP IT 02 RP IT 03 RP **Angle insert:** IT 01 RE IT 02 RE IT 03 RE **Wiper insert:** IT 01 RV
6119397 MKH 1 NR 02 1D-Insert-Holder (long), radial 0° x axial 0° 	**6280576** MKL 1 R 02 clamping piece (long) 	**6280711** BS 5 R 03 fixing screw M 5  **6119319** 4 x 100 Hexagon service wrench with T-handle 	**Face insert:** IT 04 RP IT 05 RP IT 06 RP **Angle insert:** IT 04 RE IT 05 RE IT 06 RE **Wiper insert:** IT 02 RV
6202578 MKH 1 PR 01 (45°) 1D-Insert-Holder, radial -3° x axial 15°  **Insert-Holder for ISO-inserts**	**6202587** MKL 1 R 03 clamping piece (ISO) 	**6119393** BS 5 R 03 fixing screw M 5  **6119319** 4 x 100 Hexagon service wrench with T-handle 	**Face insert:** SEHT 12 04 AFFN SEHT 12 04 AFFN
6202904 MKH 1 ER 01 (90°) 1D-Insert-Holder, radial -3° x axial 13°  **Insert-Holder for ISO-inserts**		**WSP fixing screw** SS2314 M 3.5 x 9 **6220131**	**Angle insert:** ADHT 12 T3 06 FR ADHT 12 T3 06 FR

Accessoires for 1D-Insert-Holder

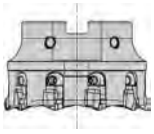
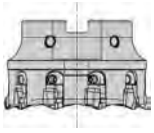
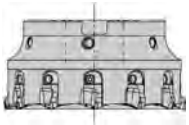
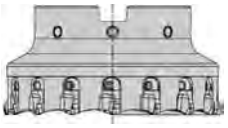
6119391
ST 5 R 01B
setting screw axial

6119394
BS 6 R 01
fixing screw M 6

*Phase-out product, short style cartridge will be replaced by the optimized long style.
See pages 183-184 for assembly instructions

Steel body

The FEED Jet multiple tooth milling cutter offers high precision fine adjustment for producing flat surfaces. The easy to adjust design with high quantity of teeth delivers higher surface quality and reduce burring. Cutter is suitable for roughing and finishing.

Dimensons $d_3 = d_1 + 2mm$	d_1	z	h	d_2	LMT Code	Ident-No.
Ø 63 	63	8	100	–	Feed Jet D063 Z8 L100 HSK-A 63	9124316
Ø 63 	63	8	40	ø 22 H6	Feed Jet D063 Z8 L40 DIN 8030-A	9124288
Ø 80 	80	10	100	–	Feed Jet D080 Z10 L100 HSK-A 63	9124325
Ø 80 	80	10	50	ø 27 H6	Feed Jet D080 Z10 L50 DIN 8030-A	9124323
Ø 100 	100	12	50	ø 32 H6	Feed Jet D100 Z12 L50 DIN 8030-B	9124328
Ø 125 	125	16	63	ø 40 H6	Feed Jet D125 Z16 L63 DIN 8030-C	9124329

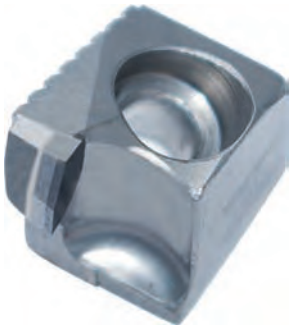
Note: Inch sizes quoted upon request

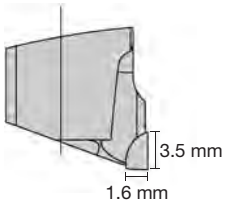
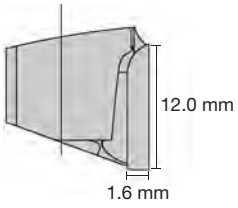
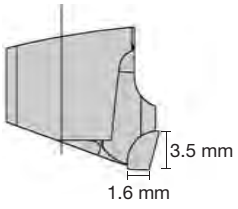
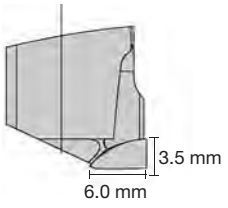
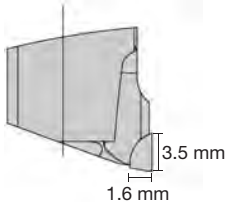
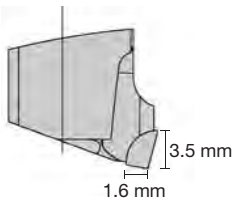
Application Limits FEED Jet

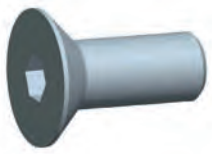
LMT Code	Diameter	z_{max} [1]	Weight [kg]	RPM n [1/min.]
Feed Jet D063 Z8 L100 HSK-A 63	63	8	1.91	18,000
Feed Jet D063 Z8 L40 DIN 8030-A	63	8	0.67	18,000
Feed Jet D080 Z10 L100 HSK-A 63	80	10	2.62	18,000
Feed Jet D080 Z10 L50 DIN 8030-A	80	10	1.23	18,000
Feed Jet D100 Z12 L50 DIN 8030-B	100	16	1.78	18,000
Feed Jet D125 Z16 L63 DIN 8030-C	125	18	3.08	14,000

See page 185 for assembly instructions

[1] On request



	Grade	LMT Code	Ident-No.
	DP012	L3.5 / PCD Cartridge PCD Width=1.6mm (.063") PCD Height=3.5mm (.138") Lead Angle 90 Deg.	9115413
	DP012	L12 / PCD Cartridge PCD Width=1.6mm (.063") PCD Height=12.0mm (.472") Lead Angle 90 Deg.	9115565
	DP012	L3.5 / PCD Cartridge PCD Width=1.6mm (.063") PCD Height=3.5mm (.138") Lead Angle 75 Deg.	9112580
	DP028	Wiper / PCD Cartridge PCD Width=6.0mm (.236") PCD Height=3.5mm (.138") Lead Angle 90 Deg.	9116145
	DP012	PCD Cartridge-Control PCD Width = 1.6mm (.063") PCD Height = 3.5mm (.138) Lead Angle 90 Deg. No Wiping Flat on Insert Surface Finish Controlled by Feed Rate of cutter	9115438
	DP012	PCD Cartridge-Control PCD Width = 1.6mm (.063") PCD Height = 3.5mm (.138) Lead Angle 75 Deg. No Wiping Flat on Insert Surface Finish Controlled by Feed Rate of cutter	9115014

	LMT Code	Ident-No.
	Axial-wedge	9112535
	Coolant screw M10x25 for ø 63	9114791
	Coolant screw M12x30 for ø 80	9116644
	Coolant disc for ø 100	9136417
	Coolant disc for ø 125	9113601
	Fixing screw DIN 912 M4x20 10.9	6104446
	Diff.-screw DS 05 LR 16	9137328
	Screw DIN 7991 M4x10 8.8	6103794

Feed Jet

APPLICATION: Pre-milling and finish milling. Valve housing and valve body

CUSTOMER: German Automobile Manufacturer

BRANCH: Automobile

COMPONENT: Valve housing and valve body

MATERIAL: GD-Al Si Cu3

MACHINE: CNC-Transferline

CARTRIDGES: Feed Jet Ø 200mm (7.874“) Z=24

CURRENT: Competitor: Mapal WWS

PROBLEM: Surface quality: WT < 4µ , Rz < 5µ

SOLUTION: LMT-Kieninger Feed Jet

CUTTING DATA:

- roughing/finishing
- Vc = 9840 sfm
- fpt = 0.002"
- doc = 0.02"
- woc = 6.299"

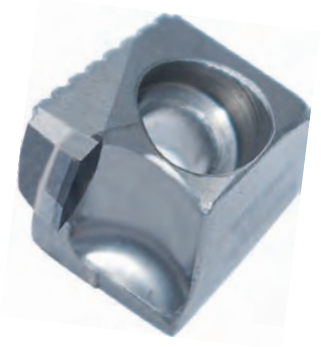
CUSTOMER BENEFIT:

High process safety in achieving the required surface < Rz 4µ
additional service life optimization
Result => highest efficiency

Summary:

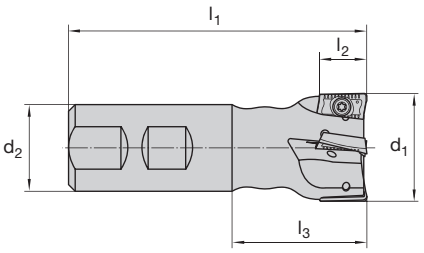
- LMT-Kieninger reached highest Tool Life
- Higher Feed Rates
- With the Benefit of easy adjustability => reduction of tool pre adjustment time

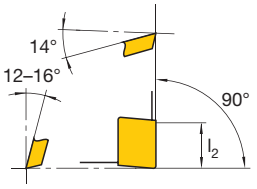
TARGET MARKETS: Aluminium components, automotive industry, automotive suppliers, aluminium foundries



End Mills, Long Edge End Mills, Specialty Mills

EMU90 IK
Inch





All bodies have Internal Coolant

d_1	Cutter Body No.	EDP No.	Ident No.	doc l_2	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
1.00	EMU90 A17-100WEI	12911	1950345	0.650	4.000	1.720	1.000	2	ADKX 1705	89973	50259
1.00	EMU90 A17-100SEI	12912	1950346	0.650	6.000	1.720	1.000	2		M3.5	T15
1.25	EMU90 A17-125WFI	12914	1950348	0.650	4.000	1.720	1.250	2		89974	
1.25	EMU90 A17-125SFI	12915	1950349	0.650	6.000	1.720	1.250	2		M3.5	
1.25	EMU90 A17-125WFI	12917	1950351	0.650	4.000	1.720	1.250	3			
1.25	EMU90 A17-125SCFI	12918	1950352	0.650	6.000	1.720	1.250	3			
1.50	EMU90 A17-150WGI	12919	1950353	0.650	4.500	1.720	1.500	3			
1.50	EMU90 A17-150SGI	12920	1950354	0.650	6.000	1.720	1.500	3			
1.50	EMU90 A17-150WGIF	12922	1950356	0.650	4.500	1.720	1.500	4			
1.50	EMU90 A17-150SGIF	12923	1950357	0.650	6.000	1.720	1.500	4			

See page 54 for Inserts

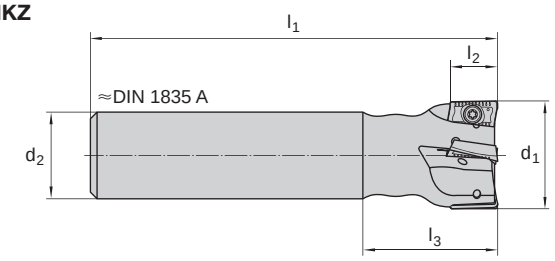
Cutting data recommendations starting page 180

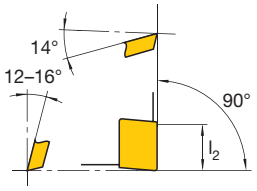
EMU90 IK
Metric

d_1	Cutter Body No.	Ident No.	l_2	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
20	EMU90 A11.020BN-IF	1045046	10.5	86	36	20	2	ADKX 1103	2237513	1048326
25	EMU90 A11.025BN-IF	1045047	10.5	96	40	25	3		M3.0	T8
32	EMU90 A11.032BN-IF	1045048	10.5	110	50	32	5			
40	EMU90 A11.040BF-IF	1045049	10.5	110	50	32	6			
25	EMU90 A17.025BN-IF	1045050	16.5	96	40	25	2	ADKX 1705	1045114	1048335
32	EMU90 A17.032BN-IF	1045053	16.5	110	50	32	3		M3.5	T15
40	EMU90 A17.040BF-IF	1045054	16.5	110	50	32	4			

Limited stock of metric products in U.S., please contact Customer Service for availability

EMU90
Inch
IKZ





All bodies have Internal Coolant

d_1	Cutter Body No.	EDP No.	Ident No.	doc l_2	l_1	l_3	d_2	z ⚙	Insert	Insert Screw	Torx Driver
1.00	EMU90 A17-100SEI	12913	1950347	0.650	10.00	1.720	1.000	2	ADKX 1705	89973 M3.5	50259 T15
1.25	EMU90 A17-125SFI	12916	1950350	0.650	10.00	1.720	1.000	2		89974	
1.50	EMU90 A17-150SGI	12921	1950355	0.650	10.00	1.720	1.250	3		M3.5	

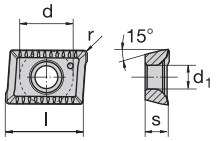
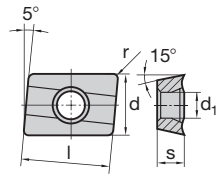
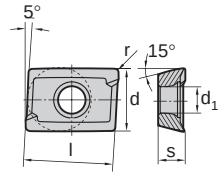
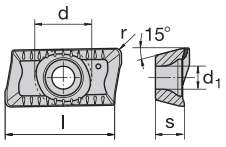
See page 54 for Inserts

Cutting data recommendations starting page 180

EMU90
Metric

d_1	Cutter Body No.	Ident No.	doc l_2	l_1	l_3	d_2	z ⚙	Insert	Insert Screw	Torx Driver
20	EMU90 A11.020AN-IF	1045040	10.5	200	36	20	2	ADKX 1103	2237513	1048326
25	EMU90 A11.025AN-IF	1045041	10.5	200	40	25	3	ADHX 1103	M3.5	T8
32	EMU90 A11.032AN-IF	1045042	10.5	250	50	32	5	ADMX 1103		
25	EMU90 A17.025AN-IF	1045043	16.5	200	40	25	2	ADKX 1705	1045114	1048335
32	EMU90 A17.032AN-IF	1045044	16.5	250	50	32	3		1045114	T15
40	EMU90 A17.040AF-IF	1045045	16.5	250	50	32	4		M3.5	

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC610E	LC610T	LC610A	LW610	For cutter Cat-No.
 N = 2	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.5 (.020)	ADKX 110305 SR-TR		2413010					2413970						2414000			EMU90IK
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.031)	ADKX 110308 SR-TR		2413012					2413972						2414001			
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	1.2 (.047)	ADKX 110312 SR-TR		2413014					2413974						2414002			
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	1.6 (.063)	ADKX 110316 SR-TR		2413016					2413976						2414003			
 N = 2	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.5 (.020)	ADHX 110305 ER 1196-82	1068011	1069402	1069459				2410308	1069457					1069490		1069445	EMU90IK
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.031)	ADHX 110308 ER 1196-82 R03							1960108								1960070	
	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	1.5 (.059)	ADHX 110315 ER 1196-82 R06							2410309	1960074						1960073		
 N = 2	11.1 (.437)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.5 (.020)	ADHX 110305 FR-ALC 1196-82 ALC													1069534		1069533	EMU90IK
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	0.8 (.031)	ADHX 170508 FR-ALC													2414009			FMU90
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.2 (.047)	ADHX 170512 FR-ALC															9206028	
 N = 2	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	0.8 (.031)	ADKX 170508 SR-TR		2412980					2413978						2414004			FMU90
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.2 (.047)	ADKX 170512 SR-TR		2412982					2413980						2414005			
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.6 (.062)	ADKX 170516 SR-TR		2412984					2413982						2414006			
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	2 (.079)	ADKX 170520 SR-TR		2412986					2413984						2414007			
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	3.2 (.125)	ADKX 170532 SR-TR							2413228									
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	6.4 (.250)	ADKX 170564 SR-TR							2413230									

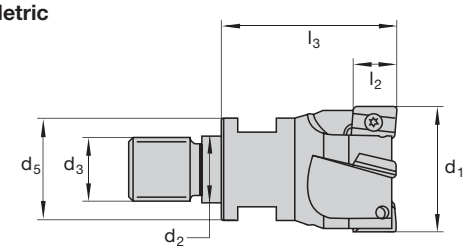
Note: Larger Radii ALC Inserts See Page 37

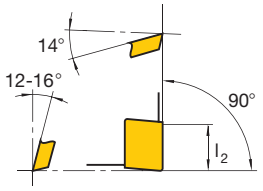
EMU90 11472

Special Features

- Rhombic shape for large depths of cut
- Convex flat land on the cutting edge corners gives high surface finish
- Accurate 90° angle milling, even with positive setting of the indexable insert. Convex grinding angle of the cutting edge produces accurate straight walls of the milled slot, in spite of high positive axial rake angle
- Precision ground on all sides, for excellent for round and face cutting operation
- Special chip groove grinding gives constant positive rake over the entire cutting edge length
- High axial rake angle
- Secure and accurate insert seat with three point support

EMU90 11472
Metric





d_1	Cutter Body No.	Ident No.	l_2	l_3	d_5	d_3	d_2h_6	z ✿	Insert	Insert Screw	Torx Driver
16	EMU90 A09.016TD	1039750	9.0	25	12	M 8	8.2	2	ADHX 0903	1044972	1048326
16	EMU90 A09.016TR	1039759	9.0	25	13	M 8	8.5	2	ADMX 0903	M2.5	T8
20	EMU90 A09.020TE	1039751	9.0	26	16	M10	10.2	3	ADKX 0903		
20	EMU90 A09.020TS	1039761	9.0	26	18	M10	10.5	3			
25	EMU90 A11.025TF	1039752	10.5	33	21	M12	12.5	3	ADHX 1103	2237513	1048326
32	EMU90 A11.032TH	1039753	10.5	43	26	M16	17	4	ADMX 1103	M3.0	T8
40	EMU90 A11.040TH	1039757	10.5	43	34	M16	17	5	ADKX 1103		

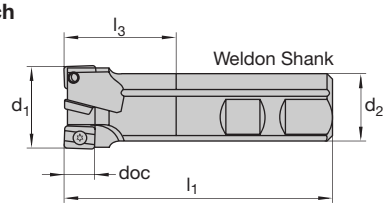
See pages 61-62 for Inserts
Cutting data recommendations starting page 186
See pages 136-139 for Screw On Shanks
Limited stock of metric products in U.S., please contact Customer Service for availability
Inch sizes quoted as specials

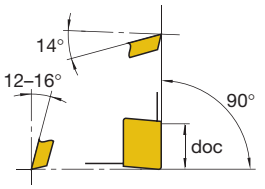
EMU90

Application

- High performance end milling cutter for square shoulder and slot milling of steel, stainless and non-ferrous materials
- High positive axial rake angle provides quiet and smooth cutting action
- Standard end mills furnished with external coolant slots

EMU90
Inch





d_1	Cutter Body No.	EDP No.	Ident No.	a_p (DOC)	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
0.500	EMU90 A09-050WBI	50390	2304513	0.354	2.50	0.70	0.50	1	ADHX 0903	89972	89978
0.500	EMU90 A09-050WCI	50392	2304515	0.354	2.50	0.70	0.63	1	ADMX 0903	M2.5	T8
0.625	EMU90 A09-0625WCI	50394	1950150	0.354	3.00	1.10	0.63	2	ADKX 0903		
0.750	EMU90 A09-075WDI	50396	1950151	0.354	3.25	1.42	0.75	2			
0.750	EMU90 A09-075WDIF	50398	1950165	0.354	3.25	1.42	0.75	3			
0.625	EMU90 A11-0625 WCI	54059	4052263	0.413	3.00	1.22	0.63	1	ADHX 1103	89979	89978
0.750	EMU90 A11-075 WDI	54060	4052264	0.413	3.25	1.22	0.75	2	ADMX 1103	M3.0	T8
1.000	EMU90 A11-100WDI	50400	1950200	0.413	3.25	1.22	0.75	3	ADKX 1103		
1.000	EMU90 A11-100WEI	50402	1950152	0.413	3.50	1.57	1.00	3			
1.000	EMU90 A11-100 WEI-060	54062	4052265	0.413	6.00	3.65	1.00	3			
1.000	EMU90 A11-100 WEI-080	54063	4052267	0.413	8.00	5.68	1.00	3			
1.250	EMU90 A11-125WDI	50404	1950202	0.413	3.25	1.22	0.75	4			
1.250	EMU90 A11-125 WFI-0325	54064	4052266	0.413	3.25	1.57	1.25	4			
1.250	EMU90 A11-125WEI	50406	1950153	0.413	3.50	1.57	1.00	4			
1.250	EMU90 A11-125 WFI-060	54065	4052277	0.413	6.00	3.65	1.25	4			
1.250	EMU90 A11-125 WFI-080	54066	4052269	0.413	8.00	5.62	1.25	4			
1.500	EMU90 A11-150WEI	50408	1950207	0.413	3.50	1.57	1.00	4			
1.500	EMU90 A11-150 WGI-035	54067	4052278	0.413	3.50	1.57	1.50	4			
1.500	EMU90 A11-150 WFI-060	54068	4052279	0.413	6.00	3.25	1.50	4			
1.500	EMU90 A11-150 WFI-080	54069	4052270	0.413	8.00	5.20	1.50	4			

See pages 61-62 for Inserts

Cutting data recommendations starting page 186

EMU90
Metric

d_1	Cutter Body No.	Ident No.	a_p (DOC)	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
12	EMU90 A09.012BR-I	1039754	9.0	76	28	16	1	ADHX 0903	1044972	1048326
14	EMU90 A09.014BP-I	1039755	9.0	76	28	16	1	ADMX 0903	M2.5	T8
16	EMU90 A09.016BN-I	1039756	9.0	76	28	16	2	ADKX 0903		
18	EMU90 A09.018BL-I	1039758	9.0	76	28	16	2			
20	EMU90 A09.020BN-IW	1039775	9.0	86	36	20	2			
20	EMU90 A09.020BN-I	1039760	9.0	86	36	20	3			
22	EMU90 A09.022BL-I	1039762	9.0	86	36	20	3			
25	EMU90 A11.025BI	1039765	10.5	86	36	20	3	ADHX 1103	2237513	10488326
25	EMU90 A11.030BN-I	1039764	10.5	96	40	25	3	ADMX 1103	M3.0	T8
30	EMU90 A11.030BD	1039769	10.5	86	36	20	4	ADKX 1103		
30	EMU90 A11.030BI-I	1039768	10.5	96	40	25	4			
32	EMU90 A11.032BB	1039771	10.5	86	36	20	4			
32	EMU90 A11.032BG-I	2275652	10.5	96	40	25	4			
32	EMU90 A11.032BN-I	1039770	10.5	110	50	32	4			
40	EMU90 A11.040BF-I	1039774	10.5	110	50	32	5			

Limited stock of metric products in U.S., please contact Customer Service for availability

Aluminum component guide column

Tool:
FMU90 IK, d_1 = 20, z = 5

Material:
3.2315 / EN AW-6082 (Al Si1MgMn)

Insert:
ADHX 170508SR-ALC, LW610

Cutting data:
v_c = 3288 SFM
n = 6350 RPM
f_z = 0.006"
v_f = 187 IPM
woc = 0.394"
doc = 0.197"

Injector

Tool:
EMU90 IK, d1 = 1/2", z = 2

Material:
4140

Insert:
ADKX 060204 SR, LC610T

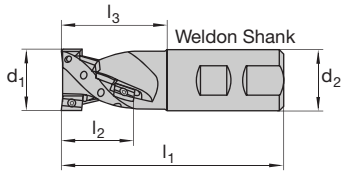
Cutting data:
v_c = 705 SFM
n = 5700 RPM
f_z = 0.002"
v_f = 22.5 IPM
woc = 0.472"
doc = 0.148"

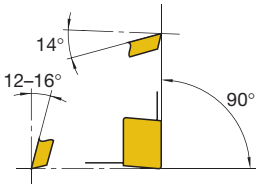
ERU90

Application

- High performance long edge end milling cutter for square shoulder and slot milling of steel, stainless and non-ferrous materials
- Full effective flute design
- High positive axial rake angle provides smooth cutting action and good chip removal

ERU90
Inch





d_1	Cutter Body No.	EDP	Ident No.	l_2	l_3	l_1	d_2	z ✿	No. Inserts	Insert	Insert Screw	Torx Driver
1.00	ERU90 A09-100WE	50422	1950100	0.95	1.75	4.03	1.00	2	6	ADHX 0903 ADMX 0903 ADKX 0903	89972 M2.5	89978 T8
1.25	ERU90 A11-125WF	50424	1950101	1.46	2.25	4.53	1.25	2	8	ADHX 1103	89979	89978
1.50	ERU90 A11-150WG	50426	1950104	1.77	2.75	5.44	1.50	3	15	ADMX 1103 ADKX 1103	M3.0	T8

See pages 61-62 for Inserts

Cutting data recommendations starting page 186

Note: End cutting inserts are offered in various nose radii. When using larger nose radii inserts, the outside corner of the steel body must be modified, or it will protrude beyond the cutting radius of the insert. Side cutting or periphery inserts must have .020 nose radius or smaller. This .020 radius is necessary for the inserts to overlap and not generate peaks.

ERU90
Metric

d_1	Cutter Body No.	Ident No.	l_2	l_3	l_1	d_2	z ✿	No. Inserts	Insert	Insert Screw	Torx Driver
25	ERU90 A09.025BI	1042662	16	36	86	20	2	4	ADHX 0903	1044972	1048326
25	ERU90 A09.025BN	1042659	25	44	100	25	2	6	ADMX 0903 ADKX 0903	M2.5	T8
32	ERU90 A11.032BN	1042660	37	55	115	32	2	8	ADHX 1103 ADMX 1103 ADKX 1103	2237513 M3.0	

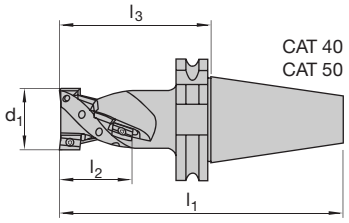
Limited stock of metric products in U.S., please contact Customer Service for availability

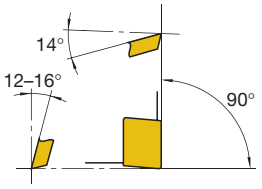
ERU90

Application

- High performance long edge end milling cutter for square shoulder and slot milling of steel, stainless and non-ferrous materials
- High positive axial rake angle provides smooth cutting action and excellent chip removal
- All-effective fluted design

ERU90
Inch





l_2 is the effective cutting length

d_1	Cutter Body No.	EDP	Ident No.	l_2	l_3	l_1	Shank Taper	z ✿	No. Inserts	Insert	Insert Screw	Torx Driver
CAT 40												
1.00	ERU90 A09-100CA	50428	1950070	0.95	2.75	5.44	40	2	6	ADHX 0903 ADMX 0903 ADKX 0903	89972 M2.5	89978 T8
1.25	ERU90 A11-125CA	50430	1950072	1.46	3.13	5.82	40	2	8	ADHX 1103	89979	89978
1.50	ERU90 A11-150CA	50432	1950090	1.77	3.50	6.19	40	3	15	ADMX 1103 ADKX 1103	M3.0	T8
CAT 50												
2.00	ERU90 A12-200CB	50434	1950096	2.40	4.50	8.50	50	3	18	ADHX 12T3	89974	50259
2.50	ERU90 A12-250CB	50436	1950098	2.95	5.00	9.00	50	4	28	ADMX 12T3 ADKX 12T3	M3.5	T15

See pages 61-62 for Inserts

Cutting data recommendations starting page 186

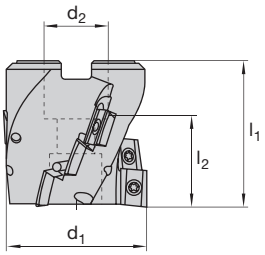
Note: End cutting inserts are offered in various nose radii. When using larger nose radii inserts, the outside corner of the steel body must be modified, or it will protrude beyond the cutting radius of the insert. Side cutting or periphery inserts must have .031 nose radius or smaller (for CAT 40) or .024 nose radius or smaller (for CAT 50). This radius is necessary for the inserts to overlap and not generate peaks.

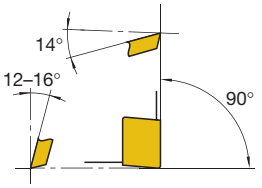
FRU90

Application

- High performance long edge milling cutter for square shoulder and slot milling of steel, stainless and non-ferrous materials
- High positive axial rake angle provides smooth cutting action and excellent chip removal
- Full effective flute design
- Offered in shell mill style

FRU90
Inch





d_1	Cutter Body No.	EDP	Ident No.	l_2	l_1	d_2	z ✿	No. Inserts	Insert	Insert Screw	Torx Driver
2.00	FRU90 A12-200AA200	50438	1950124	1.10	2.00	0.75	3	9	ADHX 12T3	89974	50259
2.00	FRU90 A12-200AA287	50440	1950126	2.00	2.88	0.75	3	15	ADMX 12T3	M3.5	T15
2.50	FRU90 A12-250AB200	50442	1950128	1.25	2.00	1.00	4	12	ADKX 12T3		
2.50	FRU90 A12-250AB287	50444	1950130	2.00	2.88	1.00	4	20			

See pages 61-62 for Inserts

Cutting data recommendations starting page 186

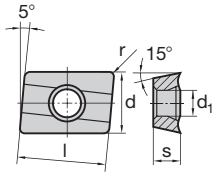
*Socket head cap screw NOT furnished with cutter

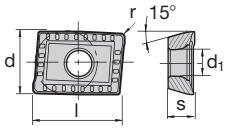
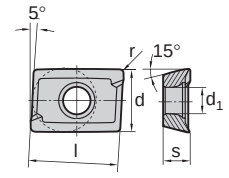
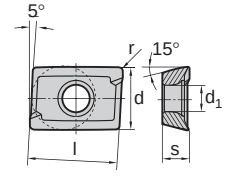
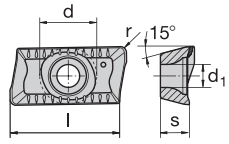
Note: End cutting inserts are offered in various nose radii. When using larger nose radii inserts, the outside steel body must be modified, or it will protrude beyond the cutting radius of the insert. Side cutting or periphery inserts must have .024 nose radius or smaller. This .024 radius is necessary for the inserts to overlap and not generate peaks.

FRU90
Metric

d_1	Cutter Body No.	Ident No.	l_2	l_1	d_2	Arbor Screw DIN912	z ✿	No. Inserts	Insert	Insert Screw	Torx Driver
50	FRU90 A12.050ANS	1035094	28	50	22	M10 x 25	3	9	ADMX 12T3	1045114	1048335
50	FRU90 A12.050AN	1035093	50	71	22	M10 x 40	3	15	ADHX 12T3	M3.5	T15
63	FRU90 A12.063ANS	1035096	32	50	27	M12 x 30	4	12	ADKX 12T3		
63	FRU90 A12.063AN	1035095	54	71	27	M12 x 45	4	20			

Limited stock of metric products in U.S., please contact Customer Service for availability

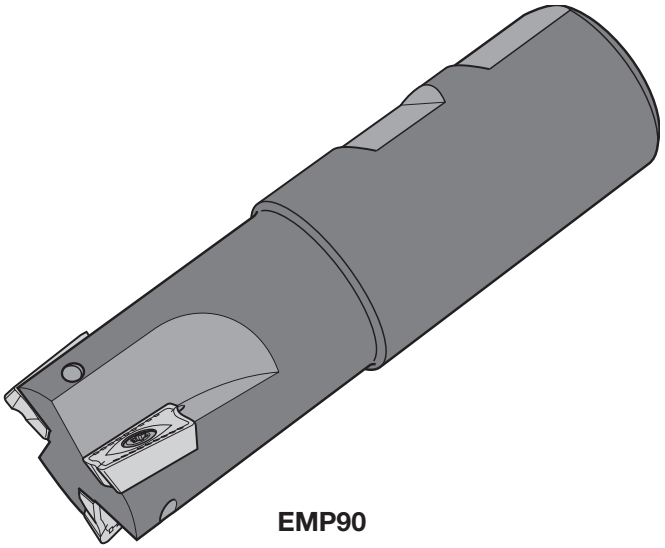
N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC430T	LC444W	LC610E	LC610T	LW630	LC610A	LW610	LC603Z	For cutter Cat-No.
 N = 2	9.52 (.375)	2.87 (.113)	6.35 (.250)	2.8 (.110)	0.4 (.016)	ADHX 090304 ER 1196-80	1068009	1069401	1069453							1067540			1069486	1069510		1069442		EMU90 ERU90
	9.52 (.375)	2.87 (.113)	6.35 (.250)	2.8 (.110)	0.8 (.031)	ADHX 090308 ER 1196-80 R03		60756					1960087							1960080				
	9.52 (.375)	2.87 (.113)	6.35 (.250)	2.8 (.110)	1.5 (.060)	ADHX 090315 ER 1196-80 R06							56234							1960083				
	9.52 (.375)	2.87 (.113)	6.35 (.250)	2.8 (.110)	0.4 (.016)	ADMX 090304 ER 1196-81		1069522	1069382										1069527			1069452		
	11.1 (.437)	3.18 (.125)	7.94 (.313)	3.4 (.134)	0.5 (.020)	ADHX 110305 ER 1196-82	1068011	1069402	1069459										1069490			1069445		EMU90 ERU90
	11.1 (.437)	3.18 (.125)	7.94 (.313)	3.4 (.134)	0.8 (.031)	ADHX 110308 ER 1196-82 R03							1960108									1960070		
	11.1 (.437)	3.18 (.125)	7.94 (.313)	3.4 (.134)	1.5 (.060)	ADHX 110315 ER 1196-82 R06																1960073		
	11.1 (.437)	3.18 (.125)	7.94 (.313)	3.4 (.134)	0.5 (.020)	ADMX 110305 ER 1196-83		1069528	1069384					1069383					1069529			1069485		
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADHX 12T306 ER 1196-84	1068012	1069403	1069463		1069750			1069461			1067535		1069492	1069511		1069448		ERU90 FRU90
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	1.5 (.060)	ADHX 12T315 ER 1196-84 R06							2413089									1960090		
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	2.3 (.090)	ADHX 12T323 ER 1196-84 R09							1960096							1960093				
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADMX 12T306 ER 1196-85		1069526	1069386										1069530			1069466		

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC610E	LC610T	LC610A	LW610	LC603Z	For cutter Cat-No.
	9.52 (.375)	2.87 (.113)	6.35 (.250)	2.8 (.110)	0.4 (.016)	ADKX 090304 PESR-BP 1196-87	1055004											1055006				EMU90 ERU90
	11.1 (.437)	3.18 (.125)	7.94 (.313)	3.4 (.134)	0.5 (.020)	ADKX 110305 PESR-BP 1196-88	1055010											1055012		1055011		
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADKX 12T306 PE 1196-89	1055016											1055018				ERU90 FRU90
	9.52 (.375)	2.87 (.113)	6.35 (.250)	2.8 (.110)	0.4 (.016)	ADHX 090304 FR-ALC 1196-80												1069532		1069531		EMU90 ERU90
	11.1 (.437)	3.18 (.125)	7.94 (.313)	3.4 (.134)	0.5 (.020)	ADHX 110305 FR-ALC 1196-82												1069534		1069533		
	12.7 (.500)	3.97 (.156)	9.52 (.375)	4 (.157)	0.6 (.024)	ADHX 12T306 FR-ALC 1196-84												1069536		1069535		ERU90 FRU90
 N = 2	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	0.8 (.031)	ADKX 170508 FR-ALC												2414009				FMU90
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.2 (.047)	ADKX 170512 FR-ALC														9206028		
 N = 2	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	0.8 (.031)	ADKX 170508 SR-TR	2412980					2413978						2414004				FMU90
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.2 (.047)	ADHX 170512 SR-TR	2412982					2413980						2414005				
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	1.6 (.062)	ADKX 170516 SR-TR	2412984					2413982						2414006				
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	2 (.079)	ADKX 170520 SR-TR	2412986					2413984						2414007				
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	3.2 (.125)	ADKX 170532 SR-TR						2413228										
	17.5 (.689)	5.6 (.221)	9.62 (.379)	3.8 (.150)	6.4 (.250)	ADKX 170564 SR-TR						2413230										

ALC LW610 has high polish for aluminum milling
Note: Larger Radii ALC Inserts See Page 37

Features & Benefits

- Universal applications
- Face milling, slotting, and shoulder milling
- For a wide range of materials
- Stable indexable inserts
- Large cutting length
- Positive cutting geometry
- High cutting edge stability



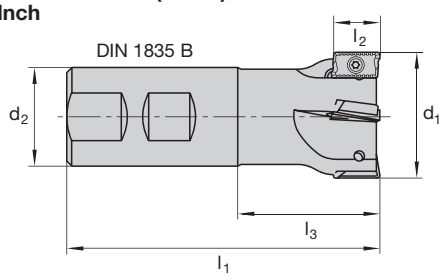
EMP90

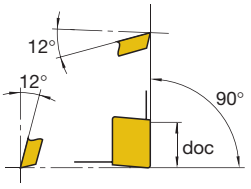
EMP90/EMH90 (11412)

Application

- General purpose milling cutter for face, edge, slot and square shoulder milling of steel, stainless and non-ferrous materials
- Uses ISO style insert
- Positive cutting action for low horsepower machines

EMP90/EMH90 (11412)
Inch





d_1	Cutter Body No.	EDP	Ident No.	a_p (DOC)	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
0.625	EMP90-A10-062WCI	53859	–	0.330	3.00	1.10	0.63	2	APKT 1003	53886	89978
0.625	EMP90-A10-062SCI-XL	53867	–	0.330	4.00	2.10	0.63	2	APHT 1003	M2.5	T8
0.750	EMP90-A10-075WDI	53860	–	0.330	3.50	1.47	0.75	2			
0.750	EMP90-A10-075WDFI	53861	–	0.330	3.50	1.47	0.75	3			
0.750	EMP90-A10-075SDI-XL	53868	–	0.330	5.00	2.97	0.75	2			
1.000	EMP90-A10-100WEI	53862	–	0.330	4.00	1.72	1.00	3			
1.000	EMP90-A10-100WEFI	53863	–	0.330	4.00	1.72	1.00	4			
1.000	EMP90-A10-100SEI-XL	53869	–	0.330	6.00	3.72	1.00	3			
1.250	EMP90-A10-125WFI	53864	–	0.330	4.00	1.72	1.25	5			
1.500	EMP90-A10-150WFI	53865	–	0.330	4.00	1.72	1.25	6			
0.750	EMP90-A16-075WDI	53871	–	0.550	3.50	1.47	0.75	1	APKT 1604	50257	50259
1.000	EMP90-A16-100WEI	53872	–	0.550	4.00	1.71	1.00	2		M4.0	T15
1.000	EMP90-A16-100SEI-XXL	53876	–	0.550	8.00	2.62	1.00	2			
1.250	EMP90-A16-125WFI	53873	–	0.550	4.00	1.71	1.25	3			
1.250	EMP90-A16-125SFI-XXL	53878	–	0.550	8.00	2.62	1.25	3			
1.500	EMP90-A16-150WFI	53874	–	0.550	4.00	–	1.25	3			
1.500	EMP90-A16-150WFFI	53875	–	0.550	4.00	–	1.25	4			
1.500	EMP90-A16-150SFI-XXL	53879	–	0.550	8.00	–	1.25	3			

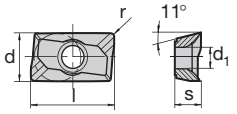
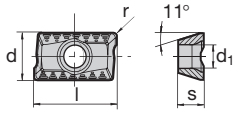
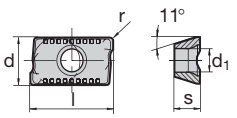
See page 65 for Inserts

Cutting data recommendations starting page 178

EMP90/EMH90 (11412)
Metric

d_1	Cutter Body No.	Ident No.	a_p (DOC)	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
16	EMH90 A10.016BN	1028506	8	76	28	16	2	APKT 1003	1044972	1048326
20	EMH90 A10.020BN	1028507	8	86	36	20	2	APHT 1003	M2.5	T8
25	EMH90 A10.025BI	1028508	8	86	36	20	3			
25	EMH90 A16.025BI	1028504	14	86	36	20	2	APKT 1604	1045131	1048335
25	EMH90 A16.025BN	1028501	14	96	40	25	2		M4.0	T15
32	EMH90 A16.032BB	1028505	14	86	36	20	3			
32	EMH90 A16.032BN	1028502	14	110	50	32	3			
40	EMH90 A16.040BF	1028503	14	110	50	32	4			

Limited stock of metric products in U.S., please contact Customer Service for availability

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240Q	LC240T	LC230E	LC225T	LC240S	LC225S	LC630T	LW225	LC440T	LC444W	LC615E	LC610T	LC610A	LW610	LW630	For cutter Cat-No.
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.259)	2.8 (.110)	0.5 (.020)	APHT 100305 PDFR-ALC												6401070		6401071		FMH90 FMP90
	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APHT 160408 PDFR-ALC												6401073		6401074		FMH90 FMP90
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.259)	2.8 (.110)	0.5 (.020)	APKT 100305 PDSR-BM	1052345	1052343							1067504	1067520						FMH90 FMP90
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APKT 160408 PDSR-BM										1067522						FMH90 FMP90
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.259)	2.8 (.110)	0.5 (.020)	APKT 100305 PDSR-BP				6401076							6400573					FMH90 FMP90
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APKT 160408 PDSR-BP	1067517	1067507		6401085	1067506		6413391		1067503			1067512			1067515	FMH90 FMP90
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	1.6 (.062)	APKT 160416 PDSR				6401089			6413393									
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	2.4 (.094)	APKT 160424 PDSR				6401092			5015425									
	16.3 (.642)	5.26 (.207)	9.52 (.375)	4.5 (.177)	3.2 (.125)	APKT 160432 PDSR				6401095			5015426									

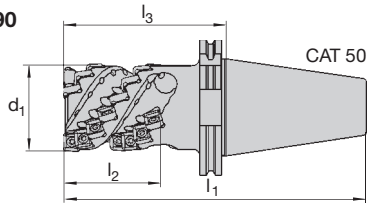
ALC LW610 is high polish for aluminum milling

ERT90

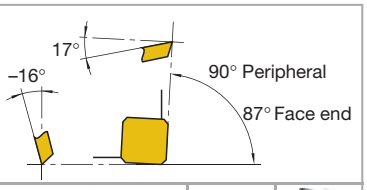
Application

- Heavy-duty long edge end milling cutter used *only* for edge milling of steel plate, and cast iron materials
- Left hand helix provides smooth cutting action
- Full-effective flute design
- Not recommended for face, step or slot milling
- Only offered in CAT 50

ERT90 Inch



l_2 is the effective cutting length





d_1	Cutter Body No.	EDP	Dimensions (inches) l_2	l_1	l_3	Shank Taper	No. Eff. Flutes	No. Inserts	Euro Ref. No.	Insert	Insert Screw	Torx Driver
2.00	ERT90 S12-200CB	50606	2.50	8.75	4.75	CAT 50	2	16	1950010	SNKX 1205	50256	50258
2.50	ERT90 S12-250CB	50608	3.00	9.75	5.75	CAT 50	3	27	1950012		M4.5	T20
3.00	ERT90 S12-300CB	50610	4.00	11.75	7.75	CAT 50	3	36	1950014			

See page 67 for Inserts

Cutting data recommendations starting page 186

ERT90 Metric



d_1	Cutter Body No.	Ident No.	l_2	l_1	l_3	SK	z ✿	No. Inserts	Insert	Insert Screw	Torx Driver
32	ERT90 S09.032HA	1027372	47	157.2	106	40	2	14	SNKX 0904 AN	1045114	1048335
40	ERT90 S09.040HA	2346622	54	162.2	118	40	3	24		M3.5	T15
40	ERT90 S09.040HB	1027373	54	207.2	106	50	3	24			
50	ERT90 S09.050HB	1027376	61	215.2	118	50	4	36	SNKX 1205 AN	1045123	10487344
50	ERT90 S12.050HB	1027370	62	208	106	50	2	14		M4.5	T20
63	ERT90 S12.063HB	1027371	70	220	118	50	3	24			

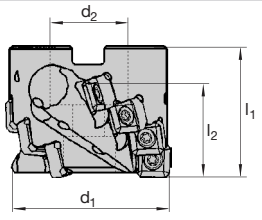
Limited stock of metric products in U.S., please contact Customer Service for availability

FRT90

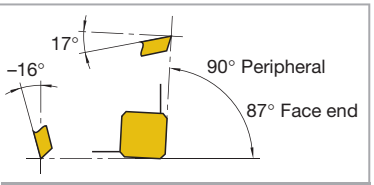
Application

- Heavy-duty long edge milling cutter used *only* for edge milling of steel plate, and cast iron materials
- Left hand helix provides smooth cutting action
- Full effective flute design
- Not recommended for face, step or slot milling

FRT90 Inch



l_2 is the effective cutting length

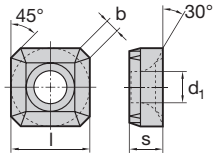
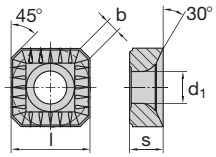
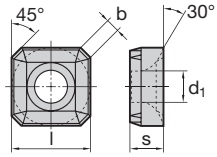
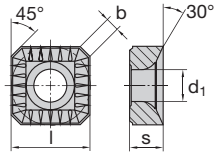




d_1	Cutter Body No.	EDP	Dimensions (inches) l_2	l_1	d_2	No. Eff. Flutes	No. Inserts	Euro Ref. No.	Insert	Insert Screw	Torx Driver
2.00	FRT90 S12-200AA	50612	1.10	2.00	0.75	2	6	1950024	SNKX 1205	50256	50258
2.50	FRT90 S12-250AB	50614	1.42	2.00	1.00	3	12	1950026		M4.5	T20
3.00	FRT90 S12-300AD	50616	1.77	2.50	1.50	3	15	1950028			

See page 67 for Inserts

Cutting data recommendations starting page 186

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No. LC280TT[1]	LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC612E	LC610T	LC615E	LW610	For cutter Cat-No.
 N = 4	9.52 (.375)	4.76 (.187)		4.4 (.173)	1.5 (.059)	SNKX 0904 AN 1187-00			1052316												1052317		1052236	ERT90
	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNKX 1205 AN 1187-10		1052301	1052230			1052228		1052238				1052234	89365	1052339			ERT90
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNKX 1205 AN-TR 1187-10 TR		1052260	1052248			1052239								1052251			ERT90
 N = 4	9.52 (.375)	4.76 (.187)		4.4 (.173)	1.5 (.059)	SNKX 0904 AN-TT wide land	1055743																ERT90
	12.7 (.500)	5.44 (.214)		5.2 (.205)	2 (.079)	SNKX 1205 AN-T 1187-12 wide land			1052303			1052314								1052309	55955	1052254	ERT90
 N = 4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNKX 1205 AN-TT wide land	1055742																ERT90

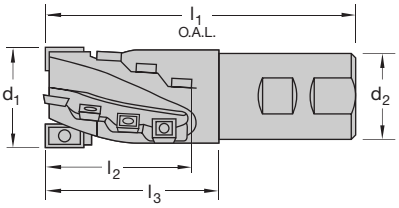
[1] LC280TT Roughing geometry with double coating

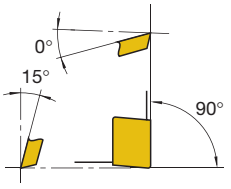
ERP90

Application

- Long edge end milling cutter for square shoulder and slot milling of steel and stainless materials
- Flute clearance provides maximum space for chip removal, *air blast always recommended*

ERP90
Inch



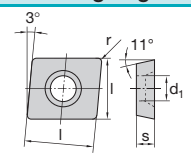
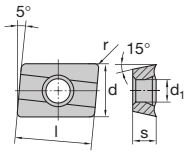
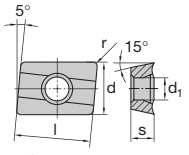
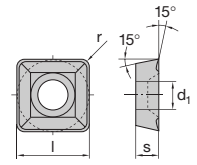
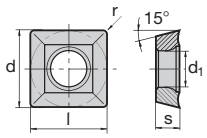
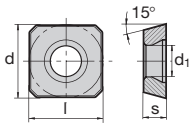
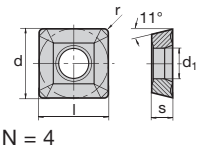
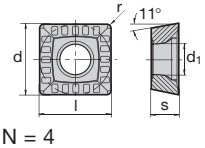
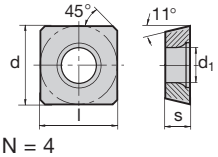


l_2 is the effective cutting length

d_1	Cutter Body No.	EDP	Ident No.	Dimensions (inches) l_2	l_1	l_3	d_2	No. Flutes	*No. Eff. Flutes	No. Per. Inserts	Periphery Insert	No. Face Inserts	Face End Insert	Insert Screw	Torx Driver
1.25	ERP90 S09 125WF	50446	1950102	1.58	4.53	2.25	1.25	3	1	8	SDMW 322	1	ADHW322	89974	50259
1.50	ERP90 S09 150WF	50448	1950106	1.97	5.51	3.32	1.25	4	2	12	SDMT 322	2	ADMT 322	M3.5	T15
2.00	ERP90 S12 200WH	50450	1950108	2.36	6.23	3.03	2.00	4	2	12	SPMW 432	2	SDHW533	89971	50258
											SPMT 432			M4.5	T20

See page 69 for Inserts

Cutting data recommendations starting page 186

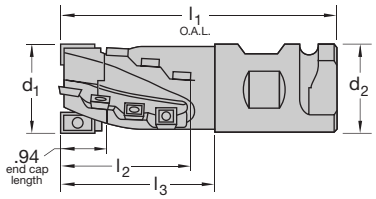
N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240T	LC230E	LC240S	LC225T	LC225S	LW240	LW225	LC440T	LC444W	LC615E	LC610T	LC610A	LW610	For cutter Cat-No.
 N = 2	12.7 (.500)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	ADHW 120308 R (ADHW 322) 1196-02	1069131		1069440										1069133	ERP 90 11453 ERP 90 11452
 N = 2	12.7 (.500)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	ADMW 120308 R (ADHW 322) 1196-06													1069641	ERP 90 11452
 N = 2	12.7 (.500)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	ADMT 120308 R (ADMT 322) 1196-04													1069188	ERP 90 11452
	16 (.630)	5 (.197)		5.2 (.205)	1 (.039)	SDMT 160510 (SDMT 533)			1069319	88520							1069749		1069311	ERP 90 11452
	16 (.630)	5 (.197)		5.2 (.205)	1 (.039)	SDHW 160510 SDHX 160510 (SDHX 533)	1069130		1069438										1069277	
 N = 4	9.52 (.375)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	SDMT 090308 (SDMT 322)													1069160	ERP 90 11452 ERP 90 11453
 N = 4	9.52 (.375)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	SDMW 090308 (SDMW 322)	1069127		1069439	6406733									1069106	
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.216)	0.8 (.031)	SPMT 120408SN (SPMT 432) 1196-12	2308343		1069299						6406965		1055660		1069295	ERP 90
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.216)	0.8 (.031)	SPMT 120408SN-BP (SPMT 432)				6406962										ERP 90
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.216)	0.8 (.031)	SPMW 120408 (SPMW 432) 1196-10	1069128		1069437	6406966						6400590	1069232		1069231	ERP 90

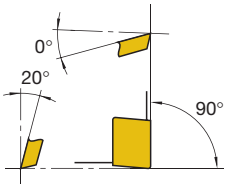
ERP90

Application

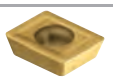
- General purpose long edge end milling cutter for square shoulder and slot milling of steel, stainless and non-ferrous materials
- Positive axial rake angle and generous chip gullets provide space for chip removal, *air blast always recommended*
- Sold as assembled tool with replaceable end cap

ERP90
Inch





l_2 is the effective cutting length

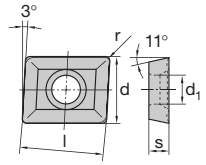
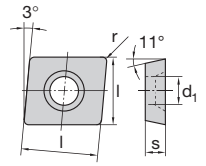
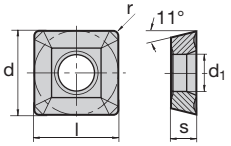
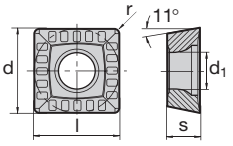
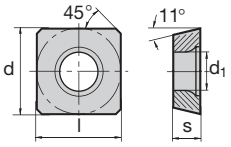

d_1	Cutter Body No.	EDP	Dimensions (inches) l_2	l_1	l_3	d_2	No. Flutes	*No. Eff. Flutes	No. Per. Inserts	Periphery Insert	No. Face Inserts	Face End Insert	Rep. Front End Cap	EC Soc. Hd. Screw	Insert Screw	Torx Driver
2.00	ERP90 S12 200PH 081	89251	4.30	8.10	4.85	2.00	4	2	20	SPMT 120408 SPMT 432 SPMW 432	2	XPMT 150408	89245 89246	89312 89313	89314 M5	50258 T15
2.00	ERP90 S12 200PH 101	89240	6.30	10.10	6.85	2.00	4	2	30		2					
2.50	ERP90 S12 250PI 083	89252	4.30	8.30	4.80	2.50	4	2	20		2					
2.50	ERP90 S12 250PI 103	89253	6.30	10.30	6.80	2.50	4	2	30		2					
2.50	ERP90 S12 250PI 123	89254	8.30	12.30	8.80	2.50	4	2	40		2					
2.50	ERP90 S12 250PI 143	89255	10.30	14.30	10.80	2.50	4	2	50		2					
3.00	ERP90 S12 300PI 113	89323	7.10	11.30	7.80	2.50	4	2	34		2		89268			

See page 71 for Inserts

Cutting data recommendations starting page 186

Note: End mills furnished with Combo Posi-lock shanks. Posi-lock shanks can also be used in standard weldon shank end mill holders. End mills shipped with insert locking screws, replaceable end cap screw & T20 torx wrench.

*Inserts are staggered in rows; two rows make one effective flute. Only one row cuts to the end. Each insert in that row is spaced so the next adjacent row of inserts cuts in the gap area (with some overlap) to complete the length of cut (and make an effective flute).

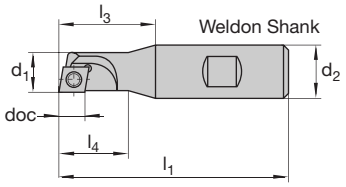
N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240T	LC230E	LC240S	LC225T	LC225S	LW240	LW225	LC630S	LC435I	LC444W	LC615E	LC610T	LC630E	LW610	For cutter Cat-No.
 N = 2	15.0 (.591)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	XPMT 150408 1196-79			1069146					54230	89140				10119		ERP 90 11453
 N = 2	15.0 (.591)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	XPMW 150408 1179-78	1069134		1069436		1069431							9172713		1069429	ERP 90 11453 ERP 90 11452
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMT 120408SN (SPMT 432) 1196-12	2308343		1069299							6406965		1055660		1069295	ERP 90
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMT 120408SN-BP (SPMT 432)				6406962											ERP 90
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMW 120408 (SPMW 432) 1196-10	1069128		1069437	6406966							6400590	1069232		1069231	ERP 90

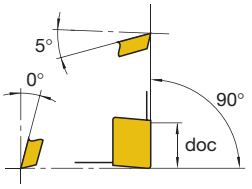
ESP90

Application

- Center cutting drill-mill cutter for use on steel, stainless and non-ferrous materials
- Used in milling operations requiring counter bores or slotting cutters
- Coolant through standard

ESP90
Inch

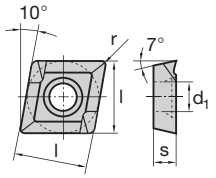
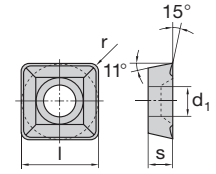
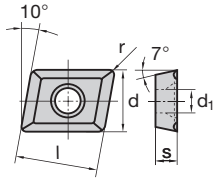




d_1	Cutter Body No.	EDP	Dimensions (inches) doc	l_1	l_3	l_4	d_2	No. Teeth	Euro Ref. No.	Face End Insert	Center Insert	Insert Screw	Torx Driver
0.488	ESP90 C08-0488WCI	50452	0.276	3.00	0.75	0.65	0.63	1	1950183	CCHX 080203	Not Required	50532	89978
0.613	ESP90 C09-0613WDI	50454	0.335	3.38	0.95	0.95	0.75	1	1950185	CCHX 090304		50546	50259
0.738	ESP90 C12-0738WEI	50456	0.433	3.75	1.10	0.99	1.00	1	1950167	CCHX 12T305		50534	
0.863	ESP90 C12-0863WEI	50458	0.512	3.38	1.10	0.99	1.00	1	1950169				
0.988	ESP90 X09 0988WFI	50460	0.512	4.00	1.42	1.34	1.25	1+1	1950171	1196-74	SPMT 3(2.5)2	89973	50259
1.238	ESP90 X09 1238WFI	50462	0.512	4.00	1.42	1.34	1.25	1+1	1950173				

See page 73 for Inserts

Cutting data recommendations starting page 186

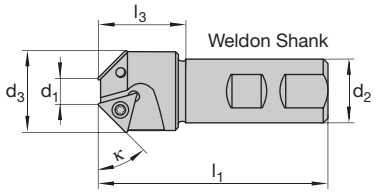
N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No. LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC610E	LC610T	LC610A	LW610	LC603Z	For cutter Cat-No.
 N = 2 s = ± 0,025 d = ± 0,01	7.94 (.313)	2.78 (.109)		3.4 (.134)	0.3 (.012)	CCHX 080203 1196-44					1069332									1069325		ESP90
	9.52 (.375)	3.18 (.125)		4.4 (.173)	0.4 (.016)	CCHX 090304 1196-54					1069338									1069390		
	12.7 (.500)	3.97 (.156)		5.5 (.217)	0.5 (.020)	CCHX 12T305 1196-64					1069334									1069399		
 N = 2	9.52 (.375)	3.97 (.156)		4.4 (.173)	0.8 (.031)	SPMT 09T308 1196-24					1069340											ESP90
 N = 2 s = ± 0,025 l = ± 0,01 d = ± 0,01	14.3 (.563)	3.97 (.156)	9.52 (.375)	4.4 (.173)	0.5 (.020)	1196-74					1069336									1069410		ESP90

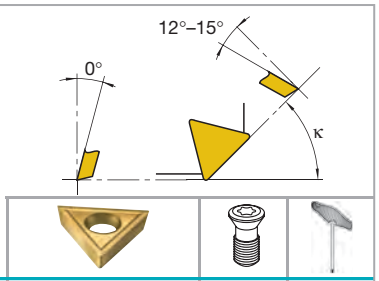
EFZ45/60

Application

- Chamfer-countersinking mills for both manual and CNC machines
- Positive cutting geometry provides free-cutting action on a wide variety of materials
- Available in 45° and 60° chamfer angles
- Uses industry standard inserts

ERT90
Inch





d1	Cutter Body No.	EDP	Dimensions (inches) K	d3	l1	l3	d2	No. Teeth	Euro Ref. No.	Insert	Insert Screw	Torx Driver
0.05	EFZ45 T11-047WB	50480	45°	0.63	2.16	0.79	0.50	1	1950224	TCMT 110202	89972	89978
0.24	EFZ45 T11-244WC	50482		0.83	3.15	1.26	0.63	2	1950226			
0.41	EFZ45 T16-409WE	50484		1.26	3.74	1.26	1.00	2	1950228	TCMT 16T304	89974	50259
0.21	EFZ60 T11-213WB	50486	60°	0.63	2.76	0.79	0.50	1	1950230	TCMT 110202	89972	89978
0.57	EFZ60 T11-567WC	50488		0.98	3.15	1.26	0.63	2	1950232			
0.63	EFZ60 T16-630WE	50490		1.26	3.74	1.42	1.00	2	1950233	TCMT 16T304	89974	50259

See page 75 for Inserts

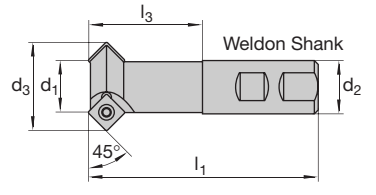
Cutting data recommendations starting page 186

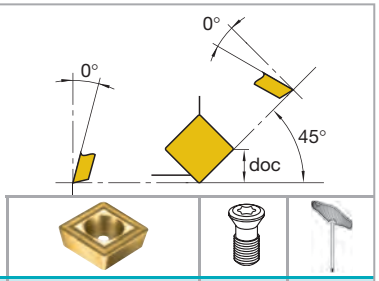
EFP45

Application

- Multiple application chamfer milling cutter for steel, stainless and non-ferrous materials
- Positive cutting action provides smooth and quiet cutting
- Unique design chamfers top and bottom bores; mill “V” grooves; chamfer T slots; and chamfer slots

EFP45
Inch

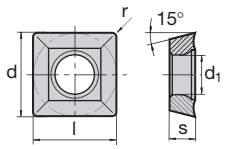
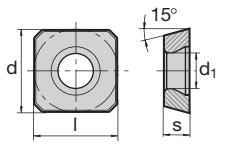
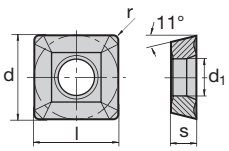
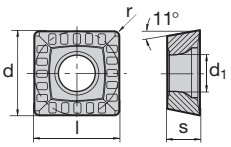
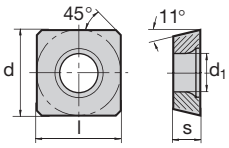
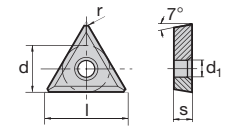




d1	Cutter Body No.	EDP	Dimensions (inches) d3	l1	l3	d2	No. Teeth	Euro Ref. No.	Insert	Insert Screw	Torx Driver
0.63	EFP45 S09-063WC	50476	1.13	3.35	1.46	0.63	2	1950135S	SDMT 090308	60712	50259
1.26	EFP45 S12-126WF	50478	1.94	4.92	2.56	1.25	3	1950136	SPMT 120408	89971	50258

See page 75 for Inserts

Cutting data recommendations starting page 186

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code	Cutting materials Ident No. LC240T	LC230E	LC240S	LC225T	LC225S	LW240	LW225	LC440T	LC444W	LC615E	LC610T	LC610A	LW610	For cutter Cat-No.
 N = 4	9.52 (.375)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	SDMT 090308 (SDMT 322)					6406726								1069160	EFZ45
 N = 4	9.52 (.375)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	SDMW 090308 (SDMW 322)	1069127		1069439	6406733	1069126								1069106	EFZ45
 N = 4	9.52 (.375)	3.18 (.125)	9.52 (.375)	4 (.157)	0.8 (.031)	SPMT 120408SN (SPMT 432)	2308343		1069299						6406965		1055660		1069295	EFZ45
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMT 120408SN-BP (SPMT 432)				6406962										EFZ45
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMW 120408 (SPMW 432)	1069128		1069437	6406966						6400590	1069232		1069231	EFZ45
 N = 3	11 (.433)	2.4 (.094)	6.35 (.250)	2.8 (.110)	0.2 (.008)	TCMT 110202 1166-00					1052102						1055661		1052107	EFZ45T11 EFZ60T11 EFZ30T16 EFZ45T16 EFZ60T16
	16.5 (.650)	3.97 (.156)	9.52 (.375)	4.3 (.169)	0.4 (.016)	TCMT 16T304 1166-10					1052103						1055662		1052109	

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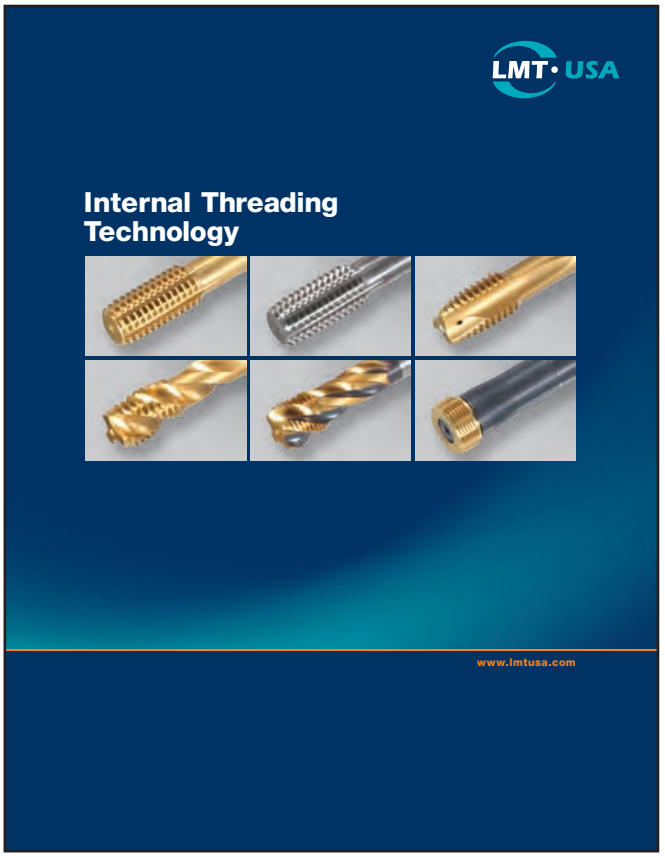
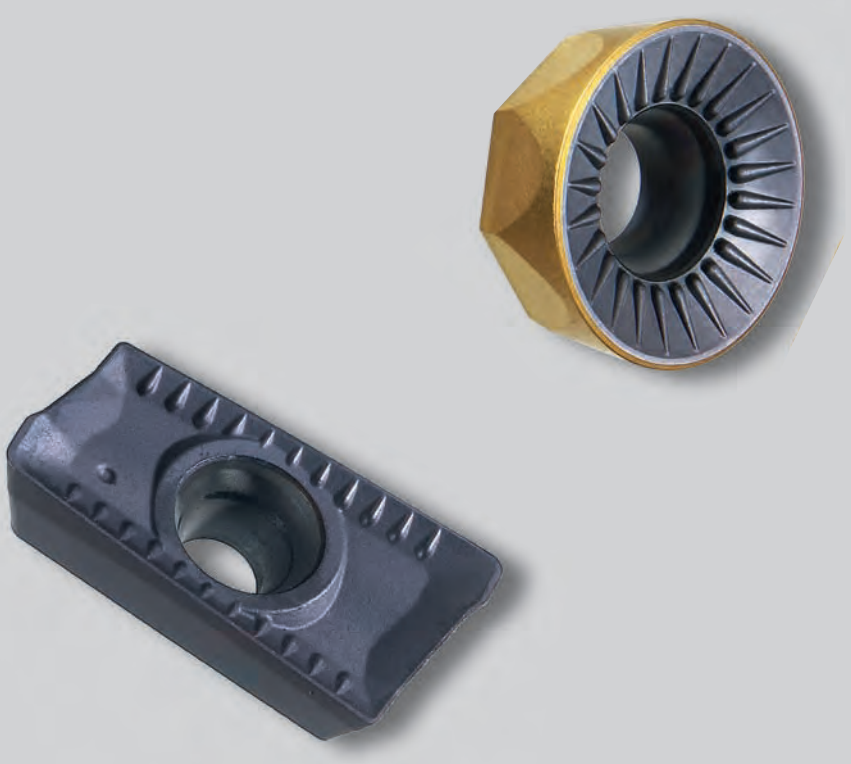
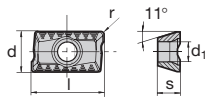
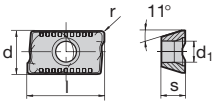
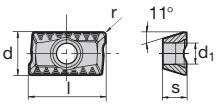
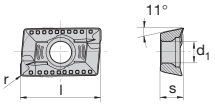
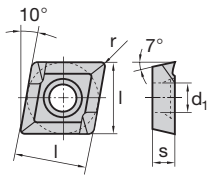
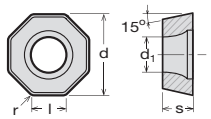
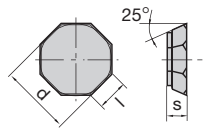
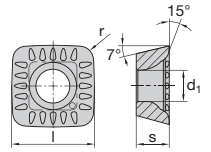
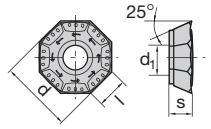
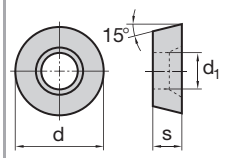
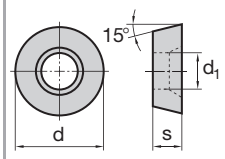




ISO Milling Inserts

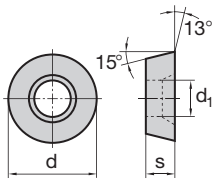
N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240Q	LC240T	LC230E	LC225T	LC240S	LC225S	LC630T	LW225	LC440T	LC430T	LC444W	LC615E	LC610T	LC610A	LW610	LW630	For cutter Cat-No.
 N = 2	10.96 (.431)	3.5 (.138)	6.6 (.260)	2.8 (.110)	0.5 (.020)	APKT 100305 PDSR-BM											1067520							EMH90 FMH90
	10.96 (.431)	3.5 (.138)	6.6 (.260)	2.8 (.110)	0.5 (.020)	APKT 100305 PDSR-BP	1052345	1052343		6401076					1067504								
 N = 2	16.33 (.643)	4.36 (.172)		4.5 (.177)	0.6 (.024)	APKT 15T306 PDTR-BP																	
						APKT 15T306 PDSR-BP												6400575					
 N = 2	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APKT 160408 PDSR-BM											1067522						EMH90 FMH90 MMH90
 N = 2	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	0.8 (.031)	APKT 160408 PDSR-BP	1067517	1067507		6401085	1067506		6413391		1067503				1067512			1067515	EMH90 FMH90 MMH90
	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	1.6 (.062)	APKT 160416 PDSR				6401089			6413393										EMH90 FMH90 MMH90
	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	2.4 (.094)	APKT 160424 PDSR				6401092			5015425										EMH90 FMH90 MMH90
	17.3 (.681)	5.26 (.207)	9.52 (.375)	4.5 (.177)	3.2 (.125)	APKT 160432 PDSR				6401095			5015426										EMH90 FMH90 MMH90
 N = 2 s = ± 0.025 d = ± 0.01	7.94 (.313)	2.78 (.109)		3.4 (.134)	0.3 (.012)	CCHX 080203 1196-44															1069325		ESP90
	9.52 (.375)	3.18 (.125)		4.4 (.173)	0.4 (.016)	CCHX 090304 1196-54															1069390		
	12.7 (.500)	3.97 (.156)		5.5 (.217)	0.5 (.020)	CCHX 12T305 1196-64														1069399			

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No.																For cutter
							LC240Q	LC240T	LC230E	LC225T	LC240S	LC225S	LW240	LW225	LC440T	LC430T	LC444W	LC615E	LC610T	LC610A	LW610	LW630	Cat-No.
 N = 8	6.58 (.259)	5.56 (.219)	15.88 (.625)	5.5 (.217)	0.8 (.031)	ODMW 060508 EN											6406180						
	6.58 (.259)	5.56 (.219)	15.88 (.625)	5.5 (.217)	0.8 (.031)	ODMW 060508 SN				6406181								6400577					
 N = 8	7.4 (.291)	4.76 (.187)	18.1 (.713)			OFEN 070405 SN				6406184								6400578					
 N = 8	7.4 (.291)	4.76 (.187)	18.1 (.713)			OFER 070405 SN-BP				6406187													
 N = 8	7.4 (.291)	3.97 (.156)	12.7 (.500)	4.6 (.181)		OFEX 05T305 SN-BP				6406190													

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No.																For cutter Cat-No.
							LC280TT[1]	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC610E	LC610T	LC603X	LW610	LC603Z[2]	
		2.38 (.094)	7.6 (.299)	2.8 (.110)		RDHX 0702 MO 1195-11		1068607	1070024														ECZ
		2.78 (.109)	9.6 (.378)	3.8 (.150)		RDHX 0902 MO 1195-21		1068609	1070025											1068660		
		3.97 (.156)	11.6 (.457)	5 (.197)		RDHX 11T3 MO 1195-31		1068610	1070026											1068704		
		4.76 (.187)	15.6 (.614)	5.2 (.205)		RDHX 1504 MO 1195-41		1068611	1070027											1068740		
		1.5 (.059)	5 (.197)	2 (.079)		RDHX 0501 MO 1195-01		1055505	1068369										1055639			1055756	ECZ
		2.38 (.094)	7 (.276)	2.7 (.106)		RDHX 0702 MO 1195-09		1055617											1055619			1055757	
		2.38 (.094)	8 (.315)	2.8 (.110)		RDHW 0802 MO 1195-15		1068612	1070129										1068621			1055758	ECZ
		3.18 (.125)	10 (.394)	3.8 (.150)		RDHW 1003 MO 1195-25		1068613	1070137										1068623		1070132	1055759	
		3.97 (.156)	12 (.472)	5 (.197)		RDHW 12T3 MO 1195-35 ECZ/FCZ Cutters		1068614	1070147										1068625		1070142	1055760	ECZ FCZ
		3.97 (.156)	12 (.472)	3.8 (.150)		RDHX 12T3 MO 1195-36 ACU-Jet		1070159	1070156										1070160			1055761	
		4.76 (.187)	16 (.630)	5.2 (.205)		RDHW 1604 MO 1195-45		1068616	1070167										1068627		1070162	1055762	
		4.76 (.187)	16 (.630)	5.2 (.205)		RDHW 1604 MO-T		2340525															

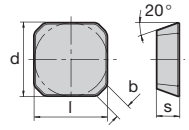
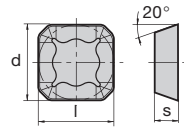
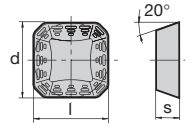
[1] LC280TT Roughing geometry with double coating

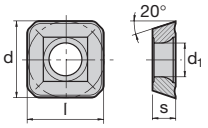
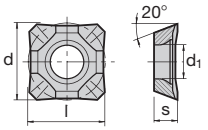
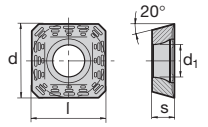
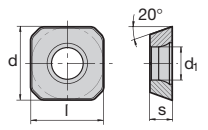
[2] Select LC603Z for Hardened Materials (52Rc-65Rc)

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No.															For cutter
							LC280TT[1]	LC240T	LC240S	LC230E	LC225T	LC225S	LC630T	LW240	LW225	LC440T	LC444W	LC610E	LC610T	LC610A	LW610	LC603Z[2]	Cat-No.
		2.38 (.094)	7 (.276)	2.7 (.106)		RDKT 0702 MO-TT	1055741															ECZ
		2.38 (.094)	8 (.315)	2.8 (.110)		RDKT 0802 MO-TT	1055740															
		3.18 (.125)	10 (.394)	3.8 (.150)		RDKT 1003 MO-TT	1055739															
		3.18 (.125)	10 (.394)	3.8 (.150)		RDKT 1003 MO												1070173		1070172		
		3.97 (.156)	12 (.472)	5 (.197)		RDKT 12T3 MO-TT	1055737															ECZ FCZ
		3.97 (.156)	12 (.472)	3.8 (.150)		RDKX 12T3 MO-TT	1055738															
		3.97 (.156)	12 (.472)	3.8 (.150)		RDKX 12T3 MO												1070179		1070178		
		4.76 (.187)	16 (.630)	5.2 (.205)		RDKT 1604 MO-TT	1055736															
		4.76 (.187)	16 (.630)	5.2 (.205)		RDKT 1604 MO												1070183		1070182		

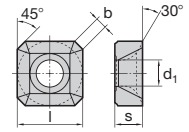
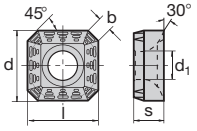
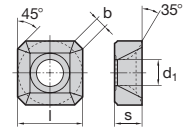
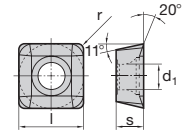
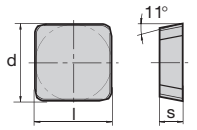
[1] LC280TT Roughing geometry with double coating

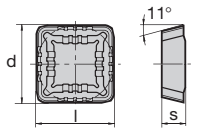
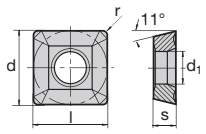
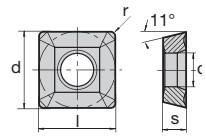
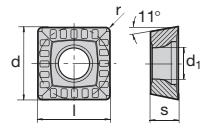
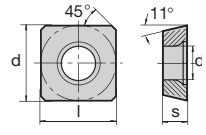
[2] Select LC603Z for Hardened Materials (52Rc-65Rc)

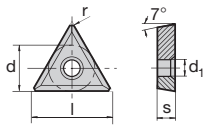
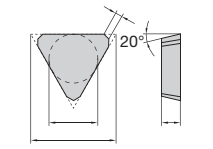
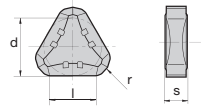
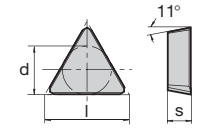
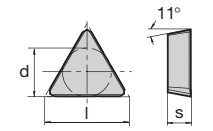
N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No.												For cutter
							LC240Q	LC240T	LC230E	LC225T	LC225S	LW240	LW225	LC440T	LC444W	LC615E	LC610T	LC610A	LW610	Cat-No.
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKN 1203AFEN	1067514	1067487							1067526		1067474		1067468	FMH45
	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEAN 1203AFSN 1193-15		1055643												
	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKN 1203AFSN								1067508		6400580				
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKN 1204AFEN									1067527		1067475		1067486	FMH45A
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKN 1204AF	1067518	1067492						1068498						
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKN 1204AFSN				6406761						6400581				
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKR 1203AFSN		1055650		6406771				1067509						FMH45
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKR 1204AFSN		1055652		6406776										FMH45A
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)		1.4 (.055)	SEKR 1203AFSN-BM									1067529					FMH45
	12.7 (.500)	4.76 (.187)	12.7 (.500)		1.4 (.055)	SEKR 1204AFSN-BM									1067531					FMH45A

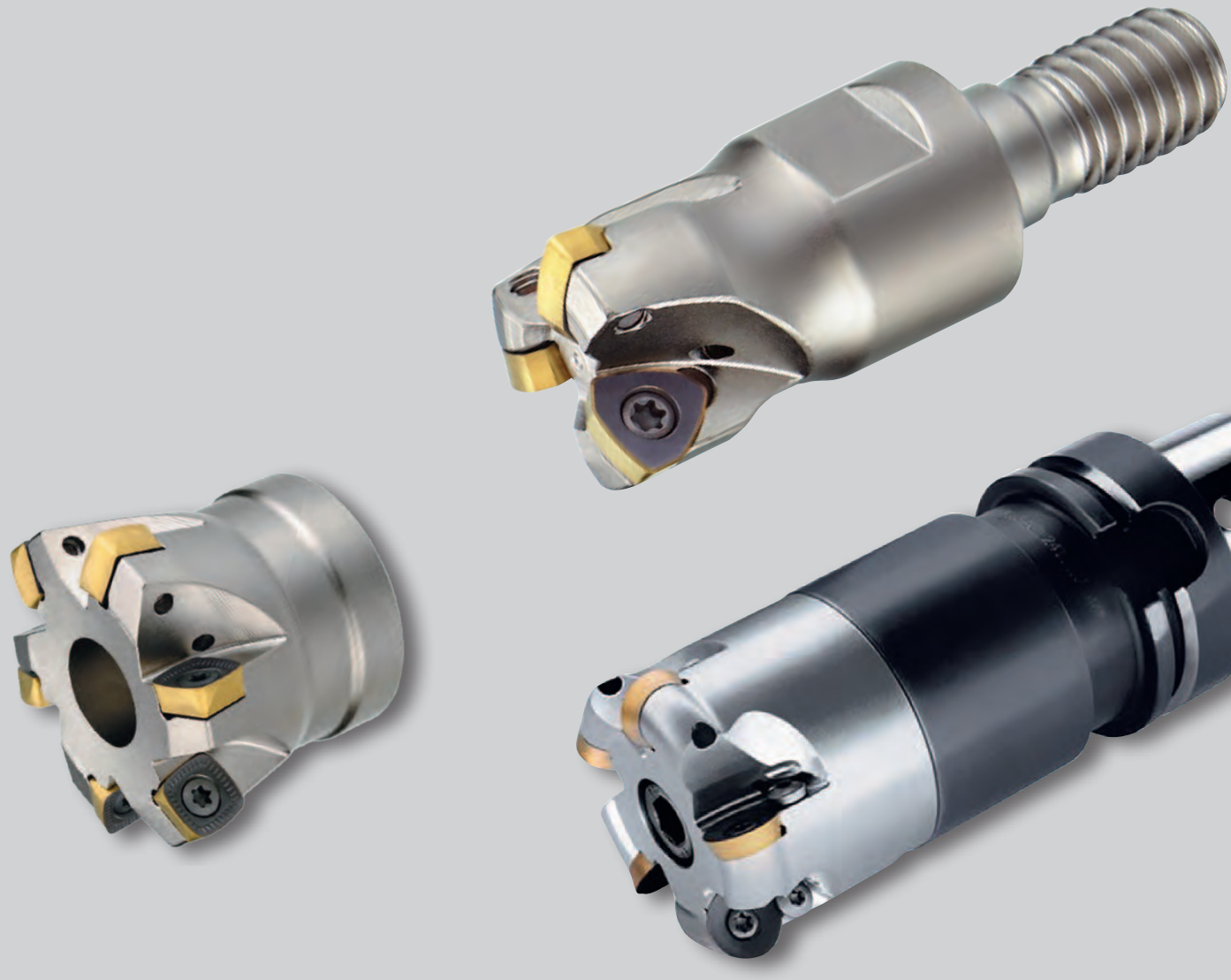
N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No.												For cutter
							LC240T	LC230E	LC225T	LC225S	LW240	LW225	LC440T	LC430T	LC444W	LC615E	LC610T	LC610A	LW610	Cat-No.
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHT 1204AFSN	1067495							1067513	6406751					FMH45B
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHT 1204AFFN-ALC											6406749	6406748	1068537	FMH45B
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEHT 1204AFSN-BM									1067533					FMH45B
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEKW 1204AFEN									6406780					FMH45B
	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.5 (.217)		SEKW 1204AFSN	1067497		6406783							6400582	1069339			

Note: ALC-LW610 High Polish for Aluminum Milling

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No.														For cutter Cat-No.
							LC240Q	LC240T	LC240S	LC230E	LC225T	LC225S	LW240	LW225	LC440T	LC430T	LC444W	LC612E	LC610T	LC610A	LW610	
	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNHX 1205 AE 1187-18										1067543						FMV45
	12.7 (.500)	3.18 (.125)		5.2 (.205)	2 (.079)	SNHX 1205 AESN-BM											1067537					FMV45
 N=4	12.7 (.500)	5.56 (.219)		5.2 (.205)	2 (.079)	SNHX 1205 AE-ALC 1187-18 ALC													1052255	1052235		FMV45
 N=4	9.52 (.375)	4.76 (.187)		4.4 (.173)	0.6 (.024)	SPKX 090406 1187-05		1055658											1069548			FMT90
	12.7 (.500)	5.56 (.219)		5.2 (.205)	0.8 (.031)	SPKX 120508 1187-15		1052247	1052246									2346047	1052659		1052242	11260-12 FMT90 MMT90
 N=4	12.7 (.500)	3.8 (.150)	12.7 (.500)			SPKN 1203 EDSR													1066620			MMP75
	12.7 (.500)	3.8 (.150)	12.7 (.500)			SPKN 1203 EDST					6406932							6400585				MMP75
	15.88 (.625)	4.76 (.187)	15.88 (.625)			SPKN 1504 EDSR					6406938							6400595				11260-12 FMT90 MMT90

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC240T	LC230E	LC240S	LC225T	LC225S	LW240	LW225	LC440T	LC444W	LC615E	LC610T	LW610	For cutter Cat-No.
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)			SPKR 1203 EDSR				6406941									MMP75
 N = 4	12.7 (.500)	3.18 (.125)	12.7 (.500)			SPKT 120508				6406945									
 N = 4	6.35 (.250)	3.18 (.125)	6.35 (.250)	3.4 (.134)	0.4 (.016)	SPMT 060304				6406958									EFZ45
	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMT 120408 SN 1196-12	2308343		1069299						6406965		1055660	1069295	
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMT 120408 SN-BP				6406962									EFZ45
 N = 4	12.7 (.500)	4.76 (.187)	12.7 (.500)	5.2 (.205)	0.8 (.031)	SPMW 120408	1069128		1069437	6406966						6400590	1069232	1069231	EFZ45

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No.												For cutter Cat-No.
							LC240T	LC230E	LC240S	LC225T	LC225S	LW240	LW225	LC440T	LC444W	LC615E	LC610T	LW610	
 N = 3	11 (.433)	2.4 (.094)	6.35 (.250)	2.8 (.110)	0.2 (.008)	TCMT 110202 1166-00											1056661	1052107	EFZ45T11 EFZ60T11 EFZ30T16 EFZ45T16 EFZ60T16
	16.5 (.650)	3.97 (.156)	9.52 (.375)	4.3 (.169)	0.4 (.016)	TCMT 16T304 1166-10											1055662	1052109	
 N = 3	22 (.866)	4.76 (.187)	12.7 (.500)		1.6 (.063)	TEAN 2204 ZZ 1172-25												1055403	
 N = 3	12 (.472)	4.76 (.187)	12.7 (.500)		2 (.079)	TNHF 1204ANSW BKL										6400587			
 N = 3	16.5 (.650)	3.18 (.125)	9.52 (.375)			TPAN 1603 PDR 1172-11												1055362	MMP90
	16.5 (.650)	3.18 (.125)	9.52 (.375)			TPKN 1603 PDR	1055326										1055320		
 N = 3	22 (.866)	4.76 (.187)	12.7 (.500)			TPKN 2204 PDER											1055323		MMP90
	22 (.866)	4.76 (.187)	12.7 (.500)			TPKN 2204 PDSR	1055328												

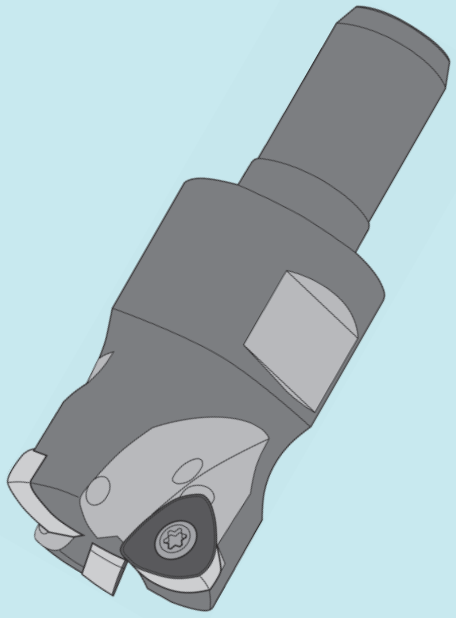


High Feed and Button Cutters

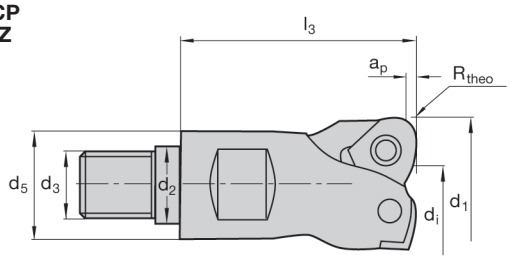
ECP 3 Feed

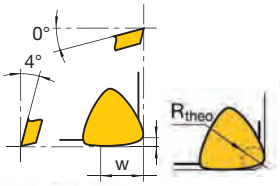
Special features

- Indexable inserts with 3 cutting edges and large inscribed circle
- Very high feed rates possible (up to 3 mm in steel)
- New generation of PVD-coating MultiC
- Available in different designs: as end mill and Screw-on type Cutter
- High number of teeth even at small diameter
- Indexable Inserts available in coated carbide grades and CBN
- Internal coolant supply



ECP
IKZ





$$w = \frac{d_1 - d_i}{2}$$

All bodies have internal coolant



d_1	d_i	l_3	d_3	d_2	d_5	ap_{max}	R_{theo}	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
16	4.8	28	M8	8.5	13	1	1.5	2	ECP X07.016TR028-I	1025001	1177-07T XPHW 070308 SR	1044972 M2.5	1048326 T08
20	9	30	M10	10.5	18	1	1.5	3	ECP X07.020TE030-I	1025005			
25	14	33	M12	12.5	21	1	1.5	3	ECP X07.025TF033	1025006			
25	14	33	M12	12.5	21	1	1.5	4	ECP X07.025TF033-IF	1025007			

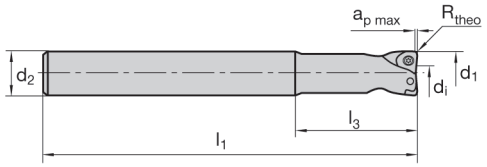
Limited stock of Metric products in U.S. please contact Customer Service for availability

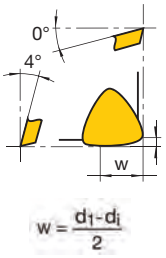
d_1	d_i	l_3	d_3	d_5	ap_{max}	R_{theo}	z ⚙	Cutter Body No. (inches)	Ident No.	Insert	Insert Screw	Torx Driver
.625	0.18	1.77	M8	.500	0.04	0.06	2	ECP X07-063TR 110	9089001	1177-07T XPHW 070308 SR	1044972 M2.5	1048326 T08
1.00	0.57	2.95	M12	.827	0.04	0.06	4	EXP X07-100TF 130IF	9089003			

See page 89 for Inserts
See pages 136-139 for Screw-On Shanks
Cutting data recommendations starting page 188

Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	10mm	2146606	16mm, .625"
	17mm	2146612	25mm, 1.00"

ECP
IKZ





All bodies have internal coolant

d_1	d_i	l_3	l_1	d_2	ap_{max}	R_{theo}	z ⯐	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
16	4.8	45	160	16	1.0	1.5	2	ECP X07.016AN160-I	1025025	1177-07T	1044972	1048326
20	9.0	60	175	20	1.0	1.5	3	ECP X07.020AN175-I	1025026	XPHW 070308 SR	M2.5	T08
25	14.0	75	190	25	1.0	1.5	3	ECP X07.025AN190-I	1025027			
25	14.0	75	190	25	1.0	1.5	4	ECP X07.025AN190-IF	1025028			

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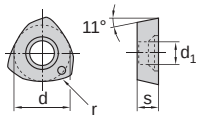
d_1	d_i	l_3	d_3	d_2	ap_{max}	R_{theo}	z ⯐	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
ECP V07												
.625	0.18	6.30	M8	0.625	0.04	0.06	2	ECP X07.063AC630-I	9089004	1177-07T	1044972	1048326
1.00	0.57	7.48	M12	1.00	0.04	0.06	4	ECP X07.100AE748-IF	9089006	XPHW 070308 SR	M2.5	T08

Cutting data recommendations starting page 188

MultiEdge 3 Feed – Indexable Inserts

N = Number of cutting edges	s	d	d_1	r	Cat-No.	Cutting materials Ident No. LC280QN[2]	LC280TT[1]	LC240T	LC230F	LC225T	LC225S	LC630T	LW240	LW225	LC610Q	LC610E	LC610T	LC610W	LC610A	BN025	LC603Z	For cutter Cat-No.
 N = 3 s = ± 0.02 d = ± 0.01	2.78 (.109)	9.52 (.375)	3.9 (.154)	6.0 (.236)	1177-07T XPHW 070308 SR	1058192									1058193							ECP

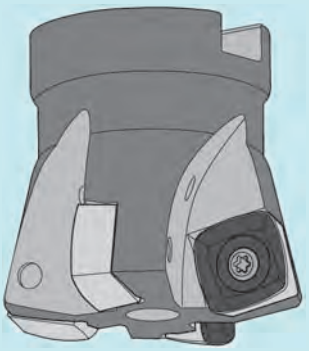
[1] LC280TT Roughing geometry with double coating

[2] LC280QN Two colored multi coating for high performance milling

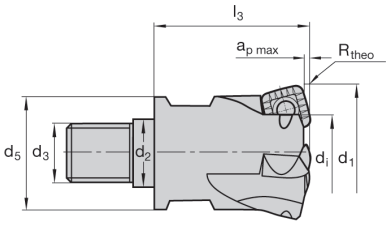
ECP 4 Feed

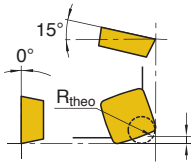
Special features

- Indexable Inserts with 4 cutting edges and large inscribed circle
- Deep chip-groove with topography at face
- New generation of PVD-coating MultiC
- Precision-sintered Indexable Inserts in various sizes
- Exceptionally thick inserts for high feed rates
- Internal coolant supply



ECP V07
ECP V09
IKZ





All bodies have internal coolant

d_1	d_i	l_3	d_3	d_2	d_5	ap_{max}	R_{theo}	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
ECP V07													
20	6.9	30	M10	10.5	18	1.0	1.5	2	ECP V07.020TS030-I	1025030	XCNT 070308	1045127	1048326
25	12	33	M12	12.5	21	1.0	1.5	3	ECP V07.025TF033-I	1025031	XCNW 070308	2237513	T 08
32	19	43	M16	17.0	29	1.0	1.5	3	ECP V07.032TH043-I	1025032		M3.0	
32	19	43	M16	17.0	29	1.0	1.5	4	ECP V07.032TH043-IF	1025033			
35	22	43	M16	17.0	29	1.0	1.5	5	ECP V07.035TH043-I	1025034			
ECP V09													
32	17	43	M16	17.0	29	1.2	2.5	3	ECP V09.032TH043-I	1025035	XCNT 09T312	1045105	1048335
32	17	43	M16	17.0	29	1.2	2.5	4	ECP V09.032TH043-IF	1025036	XCNW 09T312	M3.5	T 15
35	20	43	M16	17.0	29	1.2	2.5	4	ECP V09.035TH043-I	1025037			
42	27	43	M16	17.0	29	1.2	2.5	4	ECP V09.042TH043-IW	1025038		1045114	
42	27	43	M16	17.0	29	1.2	2.5	5	ECP V09.042TH043-I	1025039		M3.5	

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d_1	d_i	l_3	d_3	d_2	d_5	ap_{max}	R_{theo}	z ⚙	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
ECP V07													
0.75	0.24	1.18	M10	0.41	0.67	0.04	0.06	2	ECP V07-075TS118-I	9089007	XCNT 070308	1045127	1048326
1.00	0.49	1.30	M12	0.49	0.83	0.04	0.06	3	ECP V07-100TF130-I	9089008	XCNW 070308	2237513	T 08
												M3.0	
ECP V09													
1.25	0.66	1.69	M16	0.67	1.13	0.05	0.100	4	ECP V09-125TH169-IF	9089010	XCNT 09T312	1045105	1048335
1.50	0.67	1.69	M16	0.67	1.13	0.05	0.100	4	ECP V09-150TH169-I	9095431	XCNW 09T312	M3.5	T 15

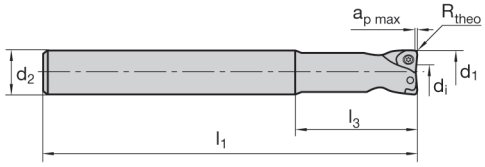
See page 93 for Inserts
See pages 136-139 for Screw-On Shanks

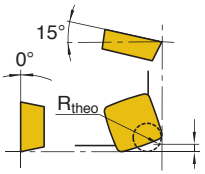
Cutting data recommendations starting page 189

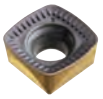
Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	15mm	2146611	20mm, .750"
	17mm	2146612	20mm, 1.00"

Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	24mm	2146615	32mm, 1.25"
	24mm	2146615	42mm, 1.50"

ECP
IKZ







All bodies have internal coolant

d_1	d_I	l_3	l_1	d_2	ap_{max}	R_{theo}	z ⯐	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
ECP V07												
20	6.9	60	175	20	1.0	1.5	2	ECP V07.020AN175-I	1025060	XCNT 070308	1045127	1048326
25	12.0	75	190	25	1.0	1.5	3	ECP V07.025AN190-I	1025061	XCNW 070308	2237513	T 08
32	19.0	80	210	32	1.0	1.5	3	ECP V07.032AN210-I	1025063		M3.0	
32	19.0	80	210	32	1.0	1.5	4	ECP V07.032AN210-IF-I	1025064			
ECP V09												
32	17.0	80	210	32	1.2	2.5	3	ECP V09.032AN210-I	1025065	XCNT 09T312	1045105	1048335
32	17.0	80	210	32	1.2	2.5	4	ECP V09.032AN210-IF	1025066	XCNW 09T312	M3.5	T 15

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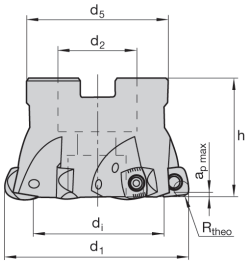
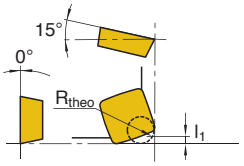
d_1	d_I	l_3	l_1	d_2	ap_{max}	R_{theo}	z ⯐	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
ECP V07												
0.75	0.24	2.36	6.89	0.75	0.04	0.06	2	ECP V07.075AD689-I	9089014	XCNT 070308	1045127	1048326
1.00	0.49	2.95	7.48	1.00	0.04	0.06	3	ECP V07.100AE748-I	9089015	XCNW 070308	2237513	T 08
											M3.0	
ECP V09												
1.25	0.66	3.15	8.27	1.25	0.05	0.10	4	ECP V09.125AF827-IF	9089017	XCNT 09T312	1045105	1048335
1.50	0.91	3.50	9.00	1.50	0.05	0.10	4	ECP V09.150AF900-IF	9095050	XCNW 09T312	M3.5	T 15

See page 93 for Inserts

Cutting data recommendations starting page 189

FCP V09
FCP V12
IKZ





All bodies have internal coolant

d_1	d_l	h	d_2	d_5	ap_{max}	R_{theo}	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
FCP V09												
42	27	40	16	29.6	1.2	2.5	4	FCP V09.042AN-IW	1025040	XCNT 09T312 XCNW 09T312	1045114 M3.5	1048335 T 15
42	27	40	16	29.6	1.2	2.5	5	FCP V09.042AN-I	1025041			
52	37	40	22	39.6	1.2	2.5	5	FCP V09.052AN-IW	1025042			
52	37	40	22	39.6	1.2	2.5	6	FCP V09.052AN-I	1025043			
FCP V12												
42	23	40	16	32	1.9	3.5	3	FCP V12.042AN-IW	1025045	XCNT 120520 XCNW 120520	1045123 M4.5	1048344 T 20
42	23	40	16	32	1.9	3.5	4	FCP V12.042AN-I	1025046			
52	33.1	40	22	39.6	1.9	3.5	4	FCP V12.052AN-IW	1025047			
52	33.1	40	22	39.6	1.9	3.5	5	FCP V12.052AN-I	1025048			
66	47.1	50	27	50	1.9	3.5	6	FCP V12.066AN-IW	1025049			
66	47.1	50	27	50	1.9	3.5	7	FCP V12.066AN-I	1025050			
80	61.2	50	27	60	1.9	3.5	8	FCP V12.080AN-I	1025051			
100	81.2	50	32	65	1.9	3.5	10	FCP V12.100AN-I	1025052			

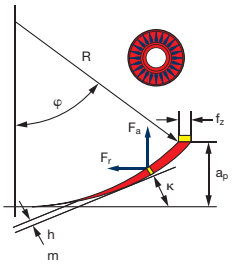
Limited stock of Metric products in U.S. please contact Customer Service for availability

d_1	d_l	h	d_2	d_5	ap_{max}	R_{theo}	z ⚙	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
ECP V09												
2.00	1.41	1.57	0.75	1.56	0.05	0.10	4	FCP V09.200AA158-IW	9089021	XCNT 09T312 XCNW 09T312	1045114 M3.5	1048335 T 15
2.00	1.41	1.57	0.75	1.56	0.05	0.10	5	FCP V09.200AA158-I	9089022			
2.00	1.41	1.57	0.75	1.56	0.05	0.10	6	FCP V09.200AA158-IF	9089023			
ECP V12												
2.00	1.26	1.57	0.75	1.56	0.07	0.14	4	FCP V12.200AA158-IW	9089026	XCNT 120520 XCNW 120520	1045123 M4.5	1048344 T 20
2.00	1.26	1.57	0.75	1.56	0.07	0.14	5	FCP V12.200AA158-I	9089027			
2.50	1.76	1.57	1.00	2.00	0.07	0.14	4	FCP V12.250AB158-IW	9089028			
2.50	1.76	1.57	1.00	2.00	0.07	0.14	6	FCP V12.250AB158-I	9089029			
2.50	1.76	1.57	1.00	2.00	0.07	0.14	7	FCP V12.250AB158-IF	9089030			
3.00	2.26	1.97	1.25	2.36	0.07	0.14	5	FCP V12.300AC197-IW	9095685			
3.00	2.26	1.97	1.25	2.36	0.07	0.14	8	FCP V12.300AC197-I	9095686			
4.00	3.24	1.97	1.50	3.15	0.07	0.14	7	FCP V12.400AD197-IW	9089033			
4.00	3.24	1.97	1.50	3.15	0.07	0.14	10	FCP V12.400AD197-I	9089034			

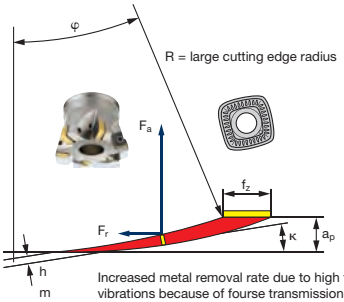
See page 93 for Inserts
For modular cutter diameters 4.00"-12.00" see Multi-Mill section on pages 40-42
Multi-Mill Cartridge No. 9164419

Cutting data recommendations starting page 189

Advantages of MultiEdge 4 Feed Geometry

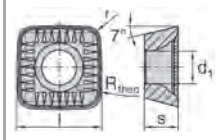
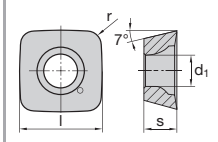
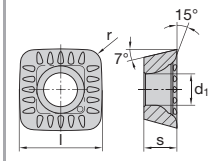


- Tangential Forces Act Around Radius on Button Inserts
- Radial Forces can create vibration resulting in premature damage to cutting edge.
- Reduced feed rates required to compensate for vibration
- Chip Thinning Effect not as great



Increased metal removal rate due to high feed rate, less disposition to vibrations because of fourse transmission towards spindle direction.

- Cutting forces of 4 Feed Geometry primarily Axial
- Greater chip thinning properties than round insert
- Increased feed rates for productivity

N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC280QN[1]	LC280TT	LC240T	LC230F	LC225T	LC225S	LC630T	LC630Q	LW240	LW225	LC610Q	LC610E	LC610T	LC610W	LC610A	BN025	LC603Z	For cutter Cat-No.
 N = 4 s = ± 0.02 d = ± 0.01 Chipbreaker	7.94 (.312)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.032)	XCNT 070308 SN-TR	1058100										1058101		1058106					ECP V07
	9.52 (.375)	3.97 (.156)	9.52 (.375)	3.8 (.150)	1.2 (.047)	XCNT 09T312 SN-TR	1058102										1058103							ECP/FCP V09
	12.7 (.500)	5.56 (.219)	12.7 (.500)	5.2 (.205)	2.0 (.079)	XCNT 120520 SN-TR	1058104										1058105		1058108					FCP V12
 N = 4 Flat Top NEW	7.94 (.312)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.032)	XCNW 070308 SN	9186492										9186493		9186494					ECP V07
	9.52 (.375)	3.97 (.156)	9.52 (.375)	3.8 (.150)	1.2 (.047)	XCNW 09T312 SN	9186440										9186441		9186442					ECP/FCP V09
	12.7 (.500)	5.56 (.219)	12.7 (.500)	5.2 (.205)	2.0 (.079)	XCNW 120520 SN	9186431										9186432		9186433					FCP V12
 N = 4 Sharp Edge for SS & Exotic Materials NEW	7.94 (.312)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.032)	XCNT 070308 EN-TR	9186375							7011714			9186376		9186377					ECP V07
	9.52 (.375)	3.97 (.156)	9.52 (.375)	3.8 (.150)	1.2 (.047)	XCNT 09T312 EN-TR	9186350							7011717			9186351		9186352					ECP/FCP V09
	12.7 (.500)	5.56 (.219)	12.7 (.500)	5.2 (.205)	2.0 (.079)	XCNT 120520 EN-TR	9186206							7011721			9186207		9186208					FCP V12

[1] LC280QN Two colored multi coating for high performance milling

Cutting material and selection				
P	●	●	●	●
M	●			
K	●	●	●	●
N		●	●	●
S		●	●	●
	LC280QN	LC610Q	LC610T	LC630Q

● = First choice
● = Alternative

ISO Code	XCNT/W 070308	XCNT/W 09T312	XCNT/W 120520
$a_{p\ max}$ to get use of all edges Number of cutting edges	.039"	.047"	.059"
Number of cutting edges	4	4	4

Feed correction

$$v_f = f_z \cdot z \cdot n \cdot f_2$$

a_p (DOC)	f_2 $l_{ges.}$ (Reach) < 4 x d_1	f_2 $l_{ges.}$ (Reach) > 4 x d_1
(50% Dia.) 0.5 x $a_{p\ max}$	.051"	.039"
(75% Dia.) 0.75 x $a_{p\ max}$	.039"	.030"
(Full Dia.) 1.0 x $a_{p\ max}$	.028"	.020"

Calculating formulas

Speed n (min⁻¹):

$$n = \frac{v_c \cdot 1000}{\pi \cdot d_1}$$

Cutting speed

$$v_c = \frac{n \cdot \pi \cdot d_1}{1000}$$

Feed rate v_f (inch/min):

$$v_f = f_z \cdot z_{eff} \cdot n \cdot f_2$$

Feed per tooth

$$f_z = \frac{v_f}{z_{eff} \cdot n \cdot f_2}$$

Chip volume-Q (min):

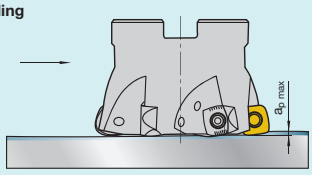
$$Q = \frac{a_e \cdot a_p \cdot v_f}{1000}$$

Drive power

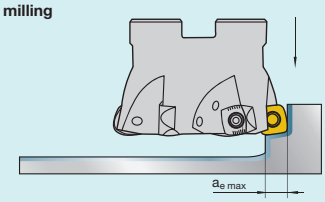
$$P_e = \frac{Q}{LF}$$

v_c = Cutting speed (sfm)
n = Speed (min⁻¹)
d_1 = Cutter dia. (rpm)
v_f = Feed rate (ipm)
f_z = Feed per tooth (kW)
P_e = Drive power (kW)
z_{eff} = Effective number of teeth
f_2 = Correction factor
Q = Chip volume
a_e = Width of cut (inch)
a_p = Depth of cut (inch)
LF = Efficiency factor

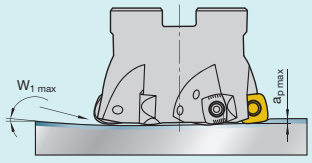
Face milling



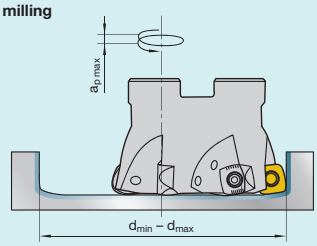
Plunge milling



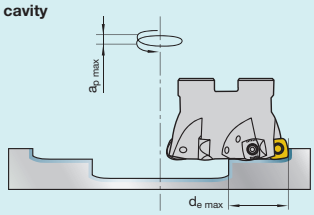
Ramping



Circular milling



Opening cavity



Tool		ECP X07.	ECP V07.	E(F)CP V09.	E(F)CP V12.
$a_{p\ max}$ (inch)		.040"	.040"	.047"	.060"
$a_{e\ max}$ (inch)		.236"	.250"	.315"	.375"
T_{max} (inch)		.020"	.020"	.024"	.032"
Ramping Angle W1					
d_1 (mm)	d_1 (inch)	$W_{1\ max}$ (°)			
16	.625"	3.5			
20	.750"	1.8	4.3		
25	1.00"	1.2	2.4		
32	1.25"		1.5	2.2	
35	1.50"		1.3	1.8	
42	–			1.3	2
52	2.00"			1	1.5
66	2.50"				1
80	3.00"				0.8
100	4.00"				0.6
Circular Milling					
d_1 (mm)	d_1 (inch)	d_{min} – d_{max} (inch)			
16	.625"	.750"–1.22"			
20	.750"	1.102"–1.54"	1.02"–1.54"		
25	1.00"	1.50"–1.93"	1.42"–1.93"		
32	1.25"		1.97"–2.44"	1.89"–2.44"	
35	1.50"		2.20"–2.68"	2.13"–2.68"	
42	–			3.46"–4.02"	2.52"–3.23"
52	2.00"				3.31"–4.02"
66	2.50"				4.41"–5.12"
80	3.00"				5.51"–6.22"
100	4.00"				7.09"–7.80"
Open Cavity Milling					
d_1 (mm)	d_1 (inch)	$d_{e\ max}$ (inch)			
16	.625"	.395"			
20	.750"	.551"	.512"		
25	1.00"	.748"	.709"		
32	1.25"		.984"	.945"	
35	1.50"		1.10"	1.06"	
42	–			1.34"	1.26"
52	2.00"			1.73"	1.65"
66	2.50"				2.20"
80	3.00"				3.54"
100	4.00"				

T_{max}: axial drilling depth

WORK PIECE: Automotive Mold

MATERIAL: P20 (32-38 HRC)

MACHINE: Makino MCC2013 using Tebis Cad/Cam HSK100A 30HP SPINDLE

SITUATION: Customer was in search for a High Feed insert with increase tool life
Result +20%

TOOL: XCNW 120520 SN LC280QN -9186431 -NEW
FCP V12.300 AC197-IW -5 TOOTH

COMPTETITOR TOOL: WDMW 10X610ZRT JC8015
SKS-5300-125R-10

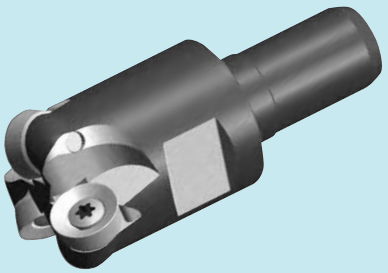
CUTTING DATA:

LMT Fette MultiEdge 4 Feed	**Competitor**
N = 825 RPM	N = 700 RPM
V_c = 650 SFM (198 m/min)	V_c = 550 SFM (168 m/min)
A_p = .040 (1 mm)	A_p = .045 (1.143 mm)
A_e = 2.100 (53 mm)	A_e = 2.100 (53 mm)
F_z = .068 (1.8 mm) per Tooth	F_z = .065 (1.65 mm) per tooth
V_f = 280 in/min (7112 mm/min)	V_f = 228 in/min (5791 mm/min)
Tool Life: 500 meters	Tool Life: 400 meter

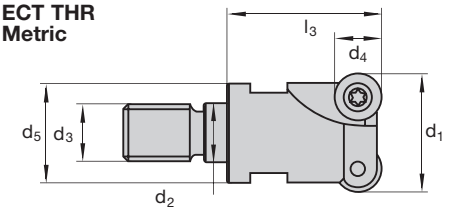
ECT

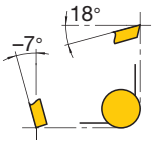
Special features

- Large insert thickness, stable cross section, precision ground all-over on the circumference
- Axially, negative
- Double negative insert position with high positive rake angles, smooth start of cutting action and low vibration level operation
- Deep chip groove
- Radially, negative
- Relieved front face for plunge milling and heavy die sinking operations



ECT THR
Metric





d_1	d_4	l_3	d_5	d_3	d_2	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
10	5	28	13	M8	8.5	2	ECT R05.010TR028	1040995	RCHX05T1MO	1045604 M1.8	1048434 T06
12	5	28	13	M8	8.5	2	ECT R05.012TR028	1040996			
16	5	25	13	M8	8.5	4	ECT R05.016TR025	1041091			
20	5	26	18	M10	10.5	5	ECT R05.020TS026	1041092			
25	5	33	18	M10	10.5	6	ECT R05.025TS033	1041093			
32	5	43	29	M16	17.0	7	ECT R05.032TH043	1041094			
15	7	23	13	M8	8.5	2	ECT R07.015TR023	1041101	RCHX0702MO	1044972 M2.5	1048326 T08
20	7	30	18	M10	10.5	4	ECT R07.020TS030	1041103			
16	8	25	13	M8	8.5	2	ECT R08.016TR025	1041042	RCHX0803MO	2237513 M3	1048326 T08
20	8	26	18	M10	10.5	3	ECT R08.020TS026	1041095			
25	8	33	18	M10	10.5	4	ECT R08.025TS033	1041096			
20	10	26	18	M10	10.5	2	ECT R10.020TS026	1041045	RCHX10T3MO	1045132 M4	1048335 T15
25	10	33	18	M10	10.5	3	ECT R10.025TS033	1041046			
25	10	33	21	M12	12.5	3	ECT R10.025TF033	1041100			
30	10	43	29	M16	17.0	4	ECT R10.030TH043	1041097			
35	10	43	29	M16	17.0	4	ECT R10.035TH043	1041098	RCHX1205MO	1045123 M4.5	1048344 T20
25	12	33	21	M12	12.5	2	ECT R12.025TF033	1041074			
32	12	43	29	M16	17.0	3	ECT R12.032TH043	1041062			
40	12	43	29	M16	17.0	4	ECT R12.040TH043	1041064			
32	16	43	29	M16	17.0	2	ECT R16.032TH043	1041105	RCHX1606MO	1045777 M5	1048344 T20

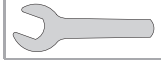
Limited stock of Metric products in U.S. please contact Customer Service for availability

ECT THR
Inch

d_1	d_4	l_3	d_5	d_3	d_2	z ⚙	Cutter Body No.	EDP No.	Ident No.	Insert	Insert Screw	Torx Driver
1.25	.472	1.65	1.02	M16	.670	3	ECT R12-125TH	12734	1950184	RCHX 1205	1045123 M4.5	1048344 T20
1.50	.472	1.65	1.14	M16	.670	3	FCT R12-150TH	52019		RCKT 1205		
1.50	.472	1.65	1.14	M16	.670	4	ECT R12-150TH	12736	1950186			

See page 99 for Inserts
See pages 136-139 for Screw-On Shanks

Cutting data recommendations starting page 192

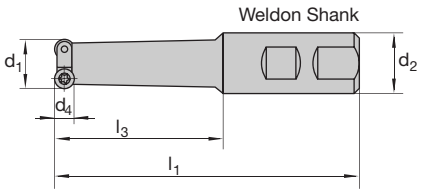
Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	24mm	2146615	1.25", 1.50"

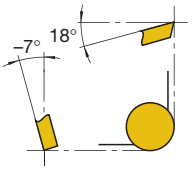
ECT R

Application

- Milling cutter for copy, face, and contour milling of steel, stainless, and cast iron materials
- Features ramping capabilities
- Straight front end (no taper)

ECT R
Inch



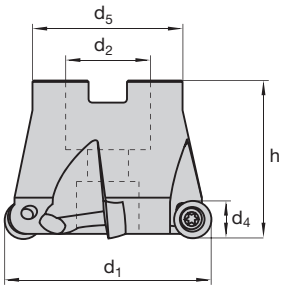


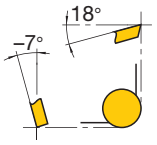
d_1	Cutter Body No.	EDP No.	Weldon Shank/ Cyl Shank	d_4	l_1	l_3	d_2	z ✿	Insert	Insert Screw	Torx Driver
.500	ECT R05 050AB033	51012	Cylindrical	0.197	3.30	1.50	0.500	2	RCHX 05T1 MO	50995	88600
.500	ECT R05 050WB033	51013	Weldon	0.197	3.30	1.50	0.500	2		M1.8	T06
.500	ECT R05 050AB040	51014	Cylindrical	0.197	4.00	2.23	0.500	2			
.500	ECT R05 050WB040	51015	Weldon	0.197	4.00	2.23	0.500	2			
.625	ECT R05 063AC038	51016	Cylindrical	0.197	3.75	1.85	0.625	3			
.625	ECT R05 063WC038	51017	Weldon	0.197	3.75	1.85	0.625	3			
.625	ECT R05 063AC045	51018	Cylindrical	0.197	4.50	2.56	0.625	3			
.625	ECT R05 063WC045	51019	Weldon	0.197	4.50	2.56	0.625	3			
.750	ECT R05 075AD053	51020	Cylindrical	0.197	5.31	2.00	0.750	4			
.750	ECT R05 075WD053	51021	Weldon	0.197	5.31	2.00	0.750	4			
.750	ECT R05 075AD063	51022	Cylindrical	0.197	6.30	3.00	0.750	4			
.750	ECT R05 075WD063	51023	Weldon	0.197	6.30	3.00	0.750	4			
1.00	ECT R12 100WE 040	89352	Weldon	0.47	4.00	1.72	1.00	2	RCHX 1205	50256	50258
1.00	ECT R12 100WE 060	50584	Weldon	0.47	6.00	3.72	1.00	2	RCKT 1205	M4.5	T20
1.00	ECT R12 100WE 080	10603	Weldon	0.47	8.00	5.77	1.00	2			
1.25	ECT R12 125WF 040	50586	Weldon	0.47	4.00	1.72	1.25	3			
1.25	ECT R12 125WF 060	10345	Weldon	0.47	6.00	3.72	1.25	2			
1.25	ECT R12 125WFF 060	89244	Weldon	0.47	6.00	3.72	1.25	3			
1.25	ECT R12 125WF 080	10347	Weldon	0.47	8.00	5.77	1.25	2			
1.25	ECT R12 125WFF 080	50588	Weldon	0.47	8.00	5.77	1.25	3			
1.50	ECT R12 150WG 060	50590	Weldon	0.47	6.00	3.31	1.50	3			
1.50	ECT R12 150WG 080	50592	Weldon	0.47	8.00	5.31	1.50	3			
1.50	ECT R12 150WG 100	50594	Weldon	0.47	10.00	7.31	1.50	3			
1.50	ECT R16 150WE040	50741	Weldon	0.630	4.00	1.75	1.25	2	RCKT 1606	1045777	
1.50	ECT R16 150WF040	50742	Weldon	0.630	4.00	1.75	1.50	2	RCHX 1606	M5	T20
1.50	ECT R16 150WF063	52460	Weldon	0.630	6.30	3.30	1.25	2			

See page 99 for Inserts

Cutting data recommendations starting page 192

FCT
Metric





d_1	Cutter Body No.	Ident No.	d_4	h	d_2	d_5	z ✿	Insert	Insert Screw	Torx Driver
42	FCT R10.042AN	1041087	10	40	16	32.0	5	RCHX10T3MO	1045132	1048335
52	FCT R12.052AN	1041051	12	40	22	39.6	5	RCHX1205MO	1045123	1045344
66	FCT R12.066AN	1041055	12	50	27	48.0	6		M4.5	T20
66	FCT R16.066AN	1041058	16	50	27	48.0	5	RCHX1606MO	1045777	1045344
80	FCT R16.080AN	1041060	16	50	27	50.0	6	RCKT 1606	M5	T20
100	FCT R16.100AN	1041073	16	50	32	65.0	6			
125	FCT R16.125AN	1041075	16	63	40	90.0	8			

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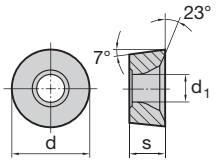
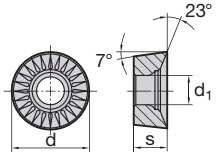
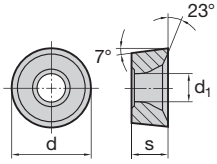
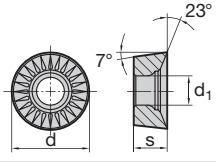
FCT
Inch

d_1	Cutter Body No.	EDP No.	Ident No.	d_4	h	d_2	z ✿	Insert	Insert Screw	Torx Driver
2.00	FCT R12.200AA	89803	1950040	0.47	1.57	0.75	5	RCHX 1205	1045123	1048344
2.50	FCT R12.250AB	89804	1950042	0.47	1.98	1.00	6	RCKT 1205	M4.5	T20
3.00	FCT R12.300AB	50743	–	0.47	1.98	1.00	6			
2.00	FCT R16.200AA	51011	–	0.63	1.57	0.75	3	RCHX 1606	1045777	1048344
3.00	FCT R16.300AB	89813	1950182	0.63	1.98	1.00	6	RCKT 1606	M5	T20
3.00	FCT R16.300ABF	53523	–	0.63	1.98	1.00	7			
3.00	FCT R16.300AC	56257	–	0.63	1.98	1.25	6			
4.00	FCT R16.400AD	89800	2346679	0.63	1.98	1.50	7			

See page 99 for Inserts
Cutting data recommendations starting page 192
For modular cutter diameters 4.00"-12.00" see Multi-Mill section pages 40-42
Multi-Mill Cartridge No. 1028056 for RCKT 1606/RCHX 1606 inserts

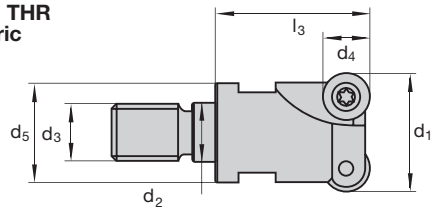
N = Number of cutting edges	d	s	d_1	ISO-Code Cat-No.	Cutting materials Ident No.									For cutter Cat-No.
					LC280TT[1]	LC240T	LC240S	LC225T	LC225S	LW240	LW225	LC610T	LW610	LC6032[2]	
	5 (.197)	1.98 (.079)	2.1 (.083)	RCHX 05T1 MO		1055635						1055639	1055625	1055750	ECT
	7 (.275)	2.78 (.109)	2.8 (.110)	RCHX 0702 MO		1068443						1068445	1068444	1055751	
	8 (.315)	3.18 (.125)	3.4 (.134)	RCHX 0803 MO		1068387	1068378					1068391	1068374	1055752	
	10 (.394)	3.97 (.156)	4.4 (.173)	RCHX 10T3 MO		1068393	1068388					1068395	1068384	1055753	ECT FCT
	12 (.472)	5.56 (.219)	5.2 (.205)	RCHX 1205 MO		1068375	1068406					1068377	1068404	1055754	
	16 (.630)	6.35 (.250)	5.8 (.228)	RCHX 1606 MO		1068379	1068415					1068383	1068413	1055755	ECT FCT MCT
	12 (.472)	5.56 (.219)	5.2 (.205)	RCHX 1205 MO-TR		1069519	1069517					1069520			ECT FCT
	16 (.630)	6.35 (.250)	5.2 (.205)	RCHX 1606 MO-TR		1069506		1069501				1069509			ECT FCT MCT
 wide land	8 (.315)	3.18 (.125)	3.4 (.134)	RCHX 0803 MO-T								1068397			ECT
	10 (.394)	3.97 (.156)	4.4 (.173)	RCHX 10T3 MO-T								1068398			ECT FCT
	12 (.472)	5.56 (.219)	5.2 (.205)	RCHX 1205 MO-T								1068399			
	12 (.472)	5.56 (.219)	5.8 (.228)	RCHX 1205 MO-T		1068385	1068409								
	16 (.630)	6.35 (.250)	5.8 (.228)	RCHX 1606 MO-T		1068389						2345947			ECT FCT MCT
	12 (.472)	5.56 (.219)	5.2 (.205)	RCMX 1205 MO-T		1068425									ECT FCT
	8 (.315)	3.18 (.125)	3.4 (.134)	RCKT 0803 MO-TT	1055735										ECT
	10 (.394)	3.97 (.156)	4.4 (.173)	RCKT 10T3 MO-TT	1055734										ECT FCT ECT
	12 (.472)	5.56 (.219)	5.2 (.205)	RCKT 1205 MO-TT	1055733										FCT
	16 (.630)	6.35 (.250)	5.8 (.228)	RCKT 1606 MO-TT	1055732										ECT FCT MCT

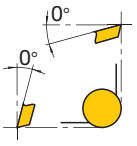
[1] LC280TT Roughing geometry with double coating

[2] Select LC603Z for Hardened Materials (52Rc-65Rc)

Cutter suitable for cutting hardened material with LC603Z inserts

ECZ THR
Metric





d_1	d_4	l_3	d_5	d_3	d_2	z ✡	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
8	5	28	9.7	M6	6.5	1	ECZ R05.008TC028	2309120	RDHX0501MO 1195-01	1045604 M1.8	1048434 T06
10	5	18	9.7	M6	6.5	2	ECZ R05.010TC018	1043211			
12	5	28	13	M8	8.5	3	ECZ R05.012TR028	1041109			
16	5	28	13	M8	8.5	4	ECZ R05.016TR028	2309126			
20	5	30	18	M10	10.5	5	ECZ R05.020TS030	1043201			
12	7	18	9.7	M6	6.5	2	ECZ R07.012TC018	1043212	RDHX0702MO 1195-09	1044972 M2.5	1048326 T08
12	7	28	13	M8	8.5	2	ECZ R07.012TR028	1043219			
15	7	28	13	M8	8.5	2	ECZ R07.015TR028	1040997			
15	7	23	13	M8	8.5	3	ECZ R07.015TR023-F	1043194			
20	7	30	18	M10	10.5	4	ECZ R07.020TS030	1043200			
25	7	35	21	M12	12.5	5	ECZ R07.025TF035	1043207			
30	7	43	26	M16	17	5	ECZ R07.030TH043	1043213			
35	7	43	26	M16	17	6	ECZ R07.035TH043	1043215			
16	8	28	13	M8	8.5	2	ECZ R08.016TR028	1043220	RDHW0802MO 1195-15	1044972 M2.5	1048326 T08
20	8	29	16	M10	10.5	2	ECZ R08.020TS029	1043221			
20	10	30	18	M10	10.5	2	ECZ R10.020TS030	1043202	RDHW1003MO 1195-25	1044981 M3.5	1048335 T15
25	10	35	21	M12	12.5	2	ECZ R10.025TF035	1043193			
25	10	35	21	M12	12.5	3	ECZ R10.025TF035	1043206			
30	10	43	29	M16	17	4	ECZ R10.030TH043	1043208			
35	10	43	29	M16	17	4	ECZ R10.035TH043	1043209			
42	10	43	29	M16	17	5	ECZ R10.042TH043	1043222			
24	12	35	21	M12	12.5	2	ECZ R12.024TF035	1043204	RDHW12T3MO 1195-35	1045123 M4.5	1048344 T20
32	12	43	29	M16	17	3	ECZ R12.032TH043	1043195			
35	12	43	29	M16	17	3	ECZ R12.035TH043	1043216			
40	12	43	29	M16	17	4	ECZ R12.040TH043	1043197			
24	12	35	21	M12	12.5	2	ECZ R12.024TF035-B	1043224	RDHX12T3MO 1195-36	1045105 M3.5	1048335 T15
35	12	43	29	M16	17	3	ECZ R12.035TH043-B	1043225			
42	12	43	29	M16	17	4	ECZ R12.042TH043-B	1043226			
32	16	43	29	M16	17	2	ECZ R16.032TH043	1043210	RDHW1604MO 1195-45	1044990 M4.5	1048344 T20

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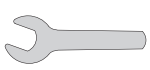
ECZ THR
Inch

d_1	d_4	l_3	d_5	d_3	d_2	z ✡	Cutter Body No.	EDP No.	Ident No.	Insert	Insert Screw	Torx Driver
1.00	.394	1.30	0.83	M12	0.490	2	ECZ R10-100TF	12574	1940038	RDHW1003 1195-25	60712 M3.5	50259 T15
1.25	.472	1.70	1.02	M16	0.670	3	ECZ R12-125TH	12575	1940039	RDHW12T3 1195-35	50256 M4.5	50258 T20
1.50	.472	1.70	1.34	M16	0.670	4	ECZ R12-150TH	12576	1940040			

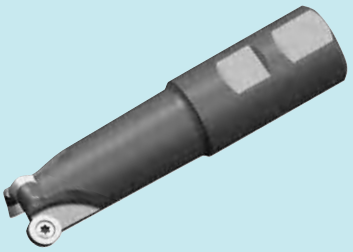
See page 104 for Inserts
See pages 136-139 for Screw-On Shanks
Cutting data recommendations starting page 192

Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	17mm	2146612	25mm, 1.00"
	19mm	2146613	32mm, 1.25"
	24mm	2146615	42mm, 1.50"

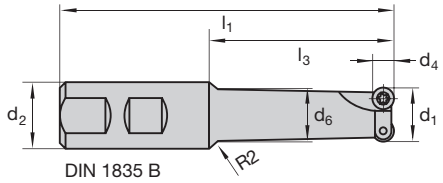
ECZ

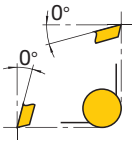
Special features:

- For copy milling, radius milling, contour milling of moulds and dies
- Radial and axial clearances enables this milling system to plunge and ramp
- Cat.-No. ECZ also available in extra long length as special designs
- Cutter suitable for cutting hardened material with LC603Z inserts



ECZ
Metric





d_1	d_4	l_1	l_3	d_2	d_6	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
20	8	125	69	25	19	2	ECZ R08.020BS125	1043032	RDHW0802MO 1195-15	1044972	1048326 T8
25	10	86	36	20	19.2	2	ECZ R10.025BI086	1043039	RDHW1003MO 1195-25	1044981 M3.5	1048335 T15
25	10	125	69	25	23.2	2	ECZ R10.025BN125	1043038			
25	10	200	144	25	23.4	2	ECZ R10.025BN200	1043040	RDHW12T3MO 1195-35	1045123 M4.5	1048344 T20
32	12	86	36	20	18.5	3	ECZ R12.032BB086	1043043			
32	12	135	75	32	28.3	3	ECZ R12.032BN135	1043042			
32	12	160	100	32	29.1	3	ECZ R12.032BN160	1043044			
40	12	135	75	32	30	4	ECZ R12.040BF135	1043048			
40	12	180	120	32	30	4	ECZ R12.040BF180	1043050			

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ECZ
Inch

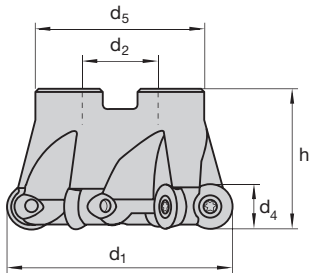
d_1	d_4	l_3	l_1	d_6	d_2	z ⚙	Cutter Body No.	EDP No.	Ident No.	Insert	Insert Screw	Torx Driver
1.00	.394	1.70	4.00	0.85	1.00	2	ECZ R10-100WE040	60882	–	RDHW1003 1195-25	60712 M3.5	50259 T15
1.00	.394	3.75	6.00	0.97	1.00	2	ECZ R10-100WE060	60883	–			
1.25	.472	1.70	4.00	1.08	1.25	3	ECZ R12-125WF040	60884	–	RDHW12T3 1195-35	50256 M4.5	50258 T20
1.25	.472	3.66	6.00	1.22	1.25	3	ECZ R12-125WF060	60885	–			
1.25	.472	5.70	8.00	1.22	1.25	3	ECZ R12-125WF080	60886	–			

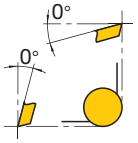
See page 104 for Inserts

Cutting data recommendations starting page 192

Cutter suitable for cutting hardened material with LC603Z inserts

FCZ





d_1	d_4	h	d_2	d_5	z	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
42	10	40	16	32	5	FCZ R10.042AN	1043227	RDHW1003MO	1044981	1048335
52	10	40	22	40	6	FCZ R10.052AN	1043228	1195-25	M3.5	T15
52	12	40	22	39.6	5	FCZ R12.052AN-B	1043229	RDHX12T3MO	1045105	1048335
66	12	50	27	48	6	FCZ R12.066AN-B	1043230	1195-36	M3.5	T15
52	12	40	22	39.6	5	FCZ R12.052AN	1037402	RDHW12T3MO	1045123	1048344
66	12	50	27	48	6	FCZ R12.066AN	1037404	1195-35	M4.5	T20
52	16	40	22	39.6	4	FCZ R16.052AN	1037414	RDHW1604MO	1044990	
66	16	50	27	48	5	FCZ R16.066AN	1037406	1195-45	M4.5	
80	16	50	27	78	6	FCZ R16.080AN	1037408			
100	16	50	32	99.6	7	FCZ R16.100AN	1037412			

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d_1	d_4	h	d_2	d_5	z	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
2.00	0.47	1.77	0.75	n/a	5	FCZ R12.200AA	1940031	RDHW12T3..	1045123	1048344
3.00	0.47	1.97	1.00	n/a	6	FCZ R12.300AB	1940033	1195-35	M4.5	T20
4.00	0.63	1.97	1.50	n/a	6	FCZ R16.400AD	1940035	RDHW1604	1044990	
5.00	0.63	2.48	1.15	n/a	8	FCZ R16.500AD	1940037	1195-45	M4.5	

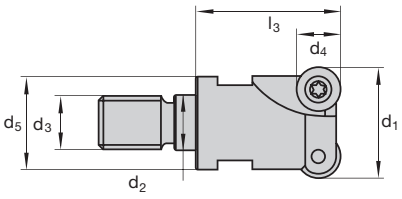
See page 104 for Inserts

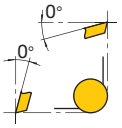
Cutting data recommendations starting page 192

ECC / FCC

- All-around cutter for roughing and finishing
- High Runout accuracy (+/– 10 Microns (+/– .0004")
- Maximum no. of teeth
- Smooth and reduced vibration during cutting
- Additional screw for insert fixation from ∅ 32
- Internal coolant directed to the cutting edge

ECC



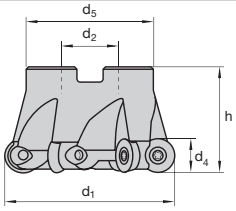


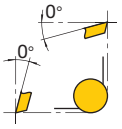
d_1	d_4	l_3	d_5	d_3	d_2	z ✿	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
20	10	30	18	M10	10.5	2	ECC R10.020TH 30-02-I	9082898	RD.. 10	1044981	1048335
20	7	30	18	M10	10.5	4	ECC R07.020TH 30-03-I	9082897	RD.. 07	1045977	1048326
24	12	35	21	M12	12.5	2	ECC R12.024TH 35-02-I	9082896	RDHX 12 RDKX 12	1045105	1048335
25	7	35	21	M12	12.5	5	ECC R07.025TH 35-05-I	9082895	RD.. 07	1045977	1048326
25	10	35	21	M12	12.5	3	ECC R10.025TH 35-03-I	9082894	RD.. 10	1044981	1048335
32	12	40	29	M16	17	4	ECC R12.032TH 40-04-I	9091058	RDHX 12 RDKX 12	1045105	
32	16	40	29	M16	17	2	ECC R16.032TH 40-02-I	9082893	RD.. 16	1044990	1048344
35	12	40	29	M16	17	4	ECC R12.035TH 40-04-I	9082892	RD.. 12	1045105	1048335
42	12	40	29	M16	17	5	ECC R12.042TH 40-05-I	9082891			

d_1	d_4	l_3	d_5	d_3	d_2	z ✿	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
1.00	0.39	1.37	0.82	0.49	M12	3	ECC R10.1000TH 35-03-I	9111904	RD.. 10	1044981	1048335
1.00	0.47	1.37	0.82	0.49	M12	2	ECC R12.1000TH 35-02-I	9111905	RDHX 12 RDKX 12	1045105	T15

See page 104 for Inserts
See pages 136-139 for Screw-On Shanks
Cutting data recommendations starting page 192

FCC

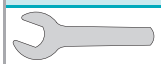


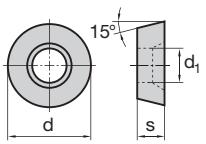
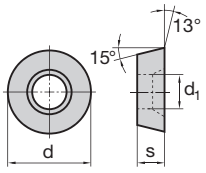


d_1	d_4	h	d_2	d_5	z ✿	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
42	12	40	16	32	5	FCC R12.042AN 40-05-I	9082890	RDHX 12 RDKX 12	1045105 M3.5	1048344 T20
52	12	40	22	40	6	FCC R12.052AN 40-06-I	9082887			
52	16	40	22	48	5	FCC R16.052AN 40-05-I	9082886	RD.. 16	1044990 M4.5	
66	16	50	27	60	5	FCC R16.066AN 50-05-I	9091049			
66	16	50	27	48	6	FCC R16.066AN 50-06-I	9082878			

d_1	d_4	h	d_2	d_5	z ✿	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
2.00	0.47	1.57	0.75	1.57	6	FCC R12.2000AN 40-06-I	9111906	RDHX 12 RDKX 12	1045105	1048335 T15
2.00	0.63	1.57	0.75	1.89	5	FCC R16.2000AN 40-05-I	9111907	RD.. 16	1044990	

See page 104 for Inserts
Cutting data recommendations starting page 192

Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	17mm	2146612	25mm, 1.00"

N = Number of cutting edges	d	s	d_1	ISO-Code Cat-No.	Cutting Materials Ident No. LC280TT[1]	LC240T	LC240S	LC225S		LW225	LC610T	LW610	LC603Z[2]	For Cutter Cat-No.
	5 (.197)	1.50 (.059)	2.0 (.079)	RDHX 0501 MO		1055505	1068369				1055639		1055756	ECZ ECC
	7 (.276)	2.38 (.094)	2.7 (.106)	RDHX 0702 MO		1055617					1055619		1055757	
	8 (.315)	2.38 (.094)	2.8 (.110)	RDHW 0802 MO		1068612	1070129				1068621		1055758	ECZ ECC
	10 (.394)	3.18 (.125)	3.8 (.150)	RDHW 1003 MO		1068613	1070137				1068623	1070132	1055759	
	12 (.472)	3.97 (.156)	5.0 (.197)	RDHW 12T3 MO ECZ/FCZ Cutters		1068614	1070147				1068625	1070142	1055760	ECZ FCZ ECC FCC
	12 (.472)	3.97 (.156)	3.8 (.150)	RDHX 12T3 MO ECC/FCC Acu-Jet Cutters		1070156	1070156				1070160		1055761	
	16 (.630)	4.76 (.187)	5.2 (.205)	RDHW 1604 MO		1068616	1070167				1068627	1070162	1055762	
	16 (.630)	4.76 (.187)	5.2 (.205)	RDHW 1604 MO-T		2340525								
	7 (.276)	2.38 (.094)	2.7 (.106)	RDKT 0702 MO-TT	1055741									ECZ ECC
	8 (.315)	2.38 (.094)	2.8 (.110)	RDKT 0802 MO-TT	1055740									
	10 (.394)	3.18 (.125)	3.8 (.150)	RDKT 1003 MO-TT	1055739									
	10 (.394)	3.18 (.125)	3.8 (.150)	RDKT 1003 MO							1070173	1070172		
	12 (.472)	3.97 (.156)	5.0 (.197)	RDKT 12T3 MO-TT ECZ/FCZ Cutters	1055737									FCZ ECC FCC
	12 (.472)	3.97 (.156)	3.8 (.150)	RDKX 12T3 MO-TT ECC/FCC Acu-Jet Cutters	1055738									
	12 (.472)	3.97 (.156)	3.8 (.150)	RDKX 12T3 MO ECC/FCC Acu-Jet Cutters							1070179	1070178		
	16 (.630)	4.76 (.187)	5.2 (.205)	RDKT 1604 MO-TT	1055736									
	16 (.630)	4.76 (.187)	5.2 (.205)	RDKT 1604 MO							1070183	1070182		

[1] LC280TT Roughing geometry with double coating

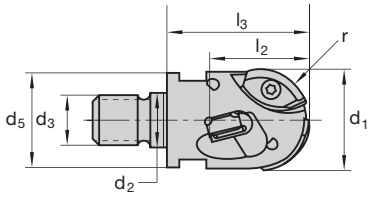
[2] Select LC603Z for Hardened Materials (52Rc-65Rc)

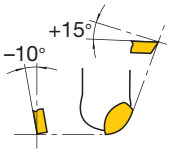
EBT

Special features:

- Effective z = 2 in ball range 0.4 · d
- Rigid cross cutting edge at center
- Negative axial angle with positive chipbreaker (skiving cut)
- Peripheral inserts, 4 cutting edges
- L. H. helix
- 2 Form shaping indexable inserts, ground, to be used on both sides

EBT THR (11497)
Metric



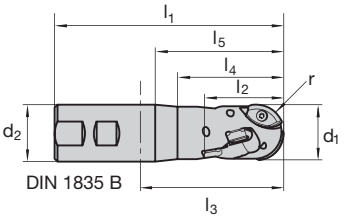


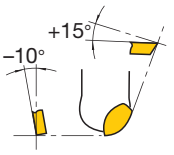
d_1	r	l_2	l_3	d_2	d_3	d_5	Cutter Body No.	Ident No.	Insert	Insert Screw	Insert	Insert Screw	Torx Driver
20	10	20	32	10.5	M10	18	EBT X12.020TS032	1041090	CCMT060204	1044972	1179-25	2237513	1048326
25	12.5	24	36	12.5	M12	21	EBT X16.025TF036	1041076	CCMT080308	2237513	1179-35	1045114	1048335
32	16	29	45	17	M16	29	EBT X20.032TH045	1041077	SNKX0904AN	1045114	1179-45	1045126	1048335
40	20	37	56	21	M20	36	EBT X25.040TI056	1041078	SNKX1205AN	1045123	1179-55	1045777	1048344
50	25	43	56	25	M24	46	EBT X21.050TJ056	1041079	SNKX1205AN	1045123	1179-65	1045777	1048344

Limited stock of Metric products in U.S. please contact Customer Service for availability

EBT Twincut Ball Nose Copy Mill

EBT
Metric





d_1	r	l_1	l_2	l_4	l_5	l_3	d_2	Cutter Body No.	Ident No.	Insert	Insert Screw	Insert	Insert Screw	Torx Driver
20	10	135	30	40	60	79	25	EBT X12.020BS135	1041048	CCMT060204	1044972	1179-25	2237513	1048326
20	10	160	30	40	85	104	25	EBT X12.020BS160	1041049		M2.5		M3	T08
25	12.5	120	35	54	54	54	25	EBT X16.025BN120	1041067	CCMT080308	2237513	1179-35	1045114	1048335
25	12.5	170	35	50	90	110	32	EBT X16.025BV170	1041068		M3		M3.5	T15
32	16	150	40	70	70	90	32	EBT X20.032BN150	1041069	SNKX0904AN	1045114	1179-45	1045126	1048335
32	16	200	40	60	115	130	40	EBT X20.032BW200	1041070		M3.5		M4	T15
40	20	145	55	80	80	85	32	EBT X25.040BF145	1041071	SNKX1205AN	1045123	1179-55	1045777	1048344
40	20	200	55	115	115	130	40	EBT X25.040BN200	1041072		M4.5		M5	T20

See page 107 for Inserts

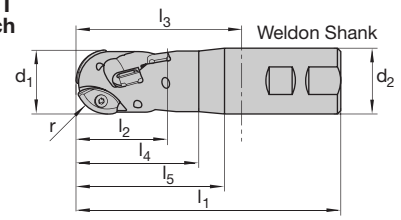
Cutting data recommendations starting page 192

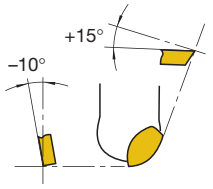
EBT

Application

- Heavy duty rough copy milling cutter for use on steel, stainless, and non-ferrous molds and dies
- Features periphery inserts for deep cavity molds
- Ball end inserts are two effective and offer 2 indexes
- Periphery inserts offer 2 and 4 indexes for deep cavity work

EBT
Inch





l_2 is the effective cutting length

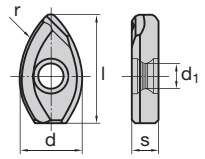
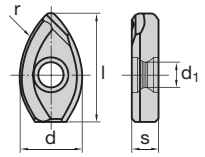
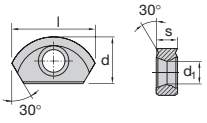
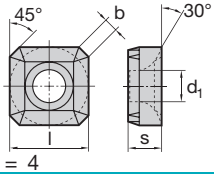
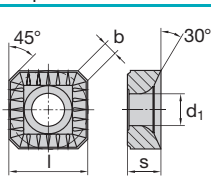
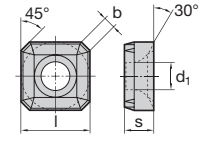
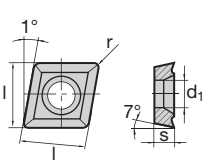
d_1	Cutter Body No.	EDP	Ident No.	Dimensions (inches) r	l_1	l_2	l_4	l_5	l_3	d_2	Ball End Insert	Periphery Insert
0.750	EBT T0750W1000 532	89821	1950210	0.38	5.32	1.18	1.58	2.36	3.11	1.00	1179-24	CCMT 060204
0.750	EBT T0750W1000 630	89822	1950211	0.38	6.30	1.18	1.58	3.35	4.09	1.00		
0.787	EBT T0787W1000 532	89836	1950248	0.39	5.32	1.18	1.58	2.36	3.11	1.00	1179-25	
0.787	EBT T0787W1000 630	89837	1950249	0.39	6.30	1.18	1.58	3.35	4.09	1.00		
1.000	EBT T1000W1000 472	89823	1950212	0.50	4.72	1.38	2.13	2.13	2.13	1.00	1179-35	CCMT 080308
1.000	EBT T1000W1250 669	89824	1950213	0.50	6.69	1.38	1.97	3.54	4.33	1.25		
1.250	EBT T1250W1250 591	89825	1950215	0.63	5.91	1.58	2.76	2.76	3.54	1.25	1179-45	SNKX 0904
1.250	EBT T1250W1500 787	89826	1950217	0.63	7.87	1.58	2.36	4.53	5.12	1.50		
1.500	EBT T1500W1500 571	89827	1950219	0.75	5.71	2.17	3.15	3.15	3.35	1.25	1179-55	SNKX 1205
1.500	EBT T1500W1500 787	89828	1950220	0.75	7.87	2.17	4.53	4.53	5.12	1.50		
2.000	EBT T2000W2000 700	89840	2340261	1.00	7.00	3.00	3.75	3.75	3.75	2.00	1179-66	
2.000	EBT T2000W2000 900	89838	2340257	1.00	9.00	4.00	5.00	5.75	5.75	2.00		
2.000	EBT T2000W2000 110	89839	2340259	1.00	11.00	4.00	7.00	7.75	7.75	2.00		

See page 107 for Inserts

Cutting data recommendations starting page 192

Parts and Accessories

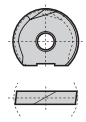
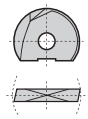
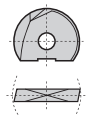
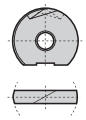
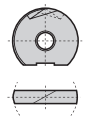
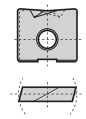
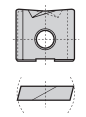
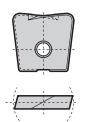
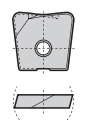
Spare Parts for Cutter Body Number	EDP	No. of Inserts	Ball End Insert	Insert Screw EDP Ident No.	No. of Inserts	Periphery Insert	Insert Screw	Torx Driver
EBT T0750W1000 532	89821	2	1179-24	89979 M3	4	*CCMT 060204	89972 M2.5	89978 T08
EBT T0750W1000 630	89822							
EBT T0787W1000 532	89836	2	1179-25					
EBT T0787W1000 630	89837							
EBT T1000W1000 472	89823	2	1179-35	89974 M3.5	4	*CCMT 080308	89979 M3	50259 T15
EBT T1000W1250 669	89824							
EBT T1250W1250 591	89825	2	1179-45	89976 M4	4	SNKX 0904	89974 M3.5	
EBT T1250W1500 787	89826							
EBT T1500W1500 571	89827	2	1179-55	50255 M5	4	SNKX 1205	50256 M4.5	50258 T20
EBT T1500W1500 787	89828							
EBT T2000W2000 700	89840	2	1179-66		6			
EBT T2000W2000 900	89838				9			
EBT T2000W2000 110	89839							

N = Number of cutting edges	l	s	d	d_1	b/r	ISO-Code Cat-No.	Cutting materials Ident No. LC280TT[1]	LC240T	LC240S	LC225T	LC225S	LW240	LW225	LC610T	LW610	For cutter Cat-No.
 N = 2	12.79 (.504)	3.18 (.125)	7.15 (.281)	3.5 (.138)	9.52 (.375)	1179-24		1960069			1960066					
 N = 2 s = ± 0.025 d = ± 0.01	12.79 (.504)	3.18 (.125)	7.15 (.281)	3.5 (.138)	10 (.394)	1179-25		1069560	1069599		1069598			1069562		EBT X
	15.99 (.630)	3.97 (.156)	8.94 (.352)	4.1 (.161)	12.5 (.492)	1179-35		1069563	1069594		1069593			1069564		
	20.47 (.806)	5.08 (.200)	11.44 (.450)	4.5 (.177)	16 (.630)	1179-45		1069565	1069604		1069603			1069566		
	25.58 (1.00)	6.35 (.250)	14.30 (.563)	5.5 (.217)	20 (.787)	1179-55		1069567	1069610		1069609			1069568		
	21.55 (.848)	6.35 (.250)	14.30 (.563)	5.5 (.217)	25 (.984)	1179-65		1069569	1069615		1069614			1069685		
	36.17 (1.424)	6.35 (.250)	14.30 (.563)	5.5 (.217)	24.20 (.953)	1179-66		1069546		1069549						
 N = 4	9.52 (.375)	4.76 (.187)		4.4 (.173)	1.5 (.059)	SNKX 0904 AN		1052316	1052294		1052292			1052317	1052286	EBT X
	12.70 (.500)	5.56 (.219)		5.2 (.205)	2.0 (.079)	SNKX 1205 AN		1052301	1052230	1052315	1052228			1052339	1052236	
 N = 4	12.70 (.500)	5.56 (.219)		5.2 (.205)	2.0 (.079)	SNKX 1205 AN-TR		1052248	1052245	1052239	1052237			1052251	1052249	EBT X
	12.70 (.500)	5.56 (.219)		5.2 (.205)	2.0 (.079)	SNKX 1205 AN-TT wide land	1055742									
 N = 4	12.70 (.500)	5.44 (.219)		5.2 (.205)	2.0 (.079)	SNKX 1205 AN-T wide land		1052303	1052258	1052314	1052256			1052309	1052254	EBT X
	9.52 (.375)	4.76 (.187)		4.4 (.173)	1.5 (.059)	SNKX 0904 AN-TT	1055743									
 N = 2	6.35 (.250)	2.38 (.094)	6.35 (.250)	2.8 (.110)	0.4 (.016)	CCMT 060204		1069497			1069412			1069498		EBT X
	7.94 (.312)	3.18 (.125)	7.94 (.312)	3.4 (.134)	0.8 (.031)	CCMT 080308		1069499			1069416			1069500		

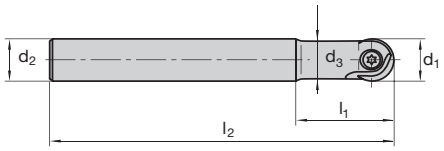
[1] LC280TT Roughing geometry with double coating

Ball Nose & Backdraft Cutters & Inserts

Available Cutting Geometries with Applications for Ball Nose & Back Draft Cutters

LMT Code	Geometry	Page #	Finishing	Semi-finishing	Roughing	Application
WPR .. -AR		114		▲▲	▲	steel, cast steel, high temperature alloys
WPR ..-CF		115		▲▲	▲	with chip control for long-chipping ferrous metals
WPR ..-D		116-117	▲▲▲	▲▲		steel, cast steel, high temperature alloys
WPR ..-DN		116-117	▲▲▲	▲▲	▲	non-ferrous materials, plastics and graphite, Titanium, Inconel
WPR .. -N		118	▲▲▲	▲▲		cast steel, steel (up to 54 HRc), cast iron, 7° clearance angle
WPR .. -NP		119	▲▲▲	▲▲		cast steel, steel (up to 65 HRc), high temperature alloys, cast iron, 12° clearance angle
WPB ..-FB		120	▲▲▲	▲▲		steel, cast steel, high temperature alloys and hardened steel up to 62 HRc
WPV ..-N		124	▲▲▲	▲▲		steel, cast steel, high temperature alloys and hardened steel up to 60 HRC
WPV ..-CF		125		▲▲	▲	with chip control for long-chipping ferrous metals
WPB ..-N		126–127	▲▲▲	▲▲		steel, cast steel, high temperature alloys and hardened steel up to 60 HRC
WPB ..-CF		128–129		▲▲	▲	with chip control for long-chipping ferrous metals
WPB ..-HF		130		▲▲	▲	high feed cutting of steel, cast steel and high temperature alloys

EBG R
Metric



d_1	Cutter Body No.	Ident No.	l_1	l_2	d_2	d_3	z ✿	Insert	Insert Screw	Torx Driver
12	EBG R12.012AN090	6130568	32	90	12	10.5	2	WPR 12	GWS 12	T20
12	EBG R12.012AN130	6121395	32	130	12	10.5	2			
12	EBG R12.012AN150	6121397	46	150	12	10.5	2			
16	EBG R16.016AN100	6130569	36	100	16	14	2	WPR 16	GWS 16	
16	EBG R16.016AN140	6121385	36	140	16	14	2			
16	EBG R16.016AN160	6121387	53	160	16	14	2			
20	EBG R20.020AN160	6121382	45	160	20	18	2	WPR 20	GWS 20	
20	EBG R20.020AN175	6121375	61	175	20	18	2			
25	EBG R25.025AN160	6121367	45	160	25	22.4	2	WPR 25	GWS 25	T30
25	EBG R25.025AN190	6121369	70	190	25	22.4	2			
30	EBG R30.030AP175	6200387	56	175	32	27	2	WPR 30	GWS 32	
30	EBG R30.030AP210	6121350	80	210	32	27	2			
32	EBG R32.032AN175	6121359	56	175	32	28.6	2	WPR 32	GWS 50	
32	EBG R32.032AN210	6121361	80	210	32	28.6	2			

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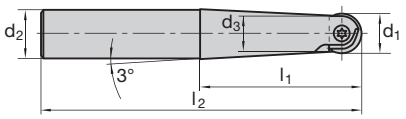
EBG R
Inch

d_1	Cutter Body No.	EDP	Ident No.	l_1	l_2	d_2	d_3	z ✿	Insert	Insert Screw	Torx Driver
0.375	EBG R0375A0500 090N	88114	6121394	1.34	3.54	0.500	0.34	2	WPR 0375	GWS 10	T15
0.375	EBG R0375A0375 150N	10974	6129378		5.91	0.375	0.34	2			
0.500	EBG R0500A0500 130N	88115	6121396	1.26	5.12	0.500	0.41	2	WPR 0500	GWS 12	T20
0.500	EBG R0500A0500 150N	88116	6121398	1.81	5.91	0.500	0.41	2			
0.625	EBG R0625A0625 140N	88117	6121386	1.42	5.51	0.625	0.55	2	WPR 0625	GWS 16	T20
0.625	EBG R0625A0625 160N	88118	6121388	2.09	6.30	0.625	0.55	2			
0.750	EBG R0750A0750 160N	88119	6121374	1.77	6.30	0.750	0.71	2	WPR 0750	GWS 20	T20
0.750	EBG R0750A0750 175N	88120	6121376	2.40	6.89	0.750	0.71	2			
0.750	EBG R0750A0750 210N	88913	6121366	2.36	8.27	0.750	0.71	2			
0.750	EBG R0750A0750 254N	10682	6129152		10.00	0.750	0.71	2			
1.000	EBG R1000A1000 160N	88121	6121368	1.77	6.30	1.000	0.88	2	WPR 1000	GWS 25	T30
1.000	EBG R1000A1000 190N	88122	6121370	2.76	7.48	1.000	0.88	2			
1.000	EBG R1000A1000 230N	88898	6121357	3.14	9.06	1.000	0.88	2			
1.000	EBG R1000A1000 254N	10683	6129583		10.00	1.000	0.88	2			
1.250	EBG R1250A1250 175N	88125	6121360	2.20	6.89	1.250	1.13	2	WPR 1250	GWS 32	
1.250	EBG R1250A1250 210N	88126	6121362	3.15	8.27	1.250	1.13	2			
2.000	EBG R2000A2000 330N	88906	6121393	4.92	12.99	2.000	1.77	2	WPR 2000	GWS 50	2146556

See pages 115-120 for Inserts
See page 114 for Insert Screw Specifications
Cutting data recommendations starting page 195

EBG R
Metric



d1	Cutter Body No.	Ident No.	l1	l2	d2	d3	z ✿	Insert	Insert	Insert	Insert Screw	Torx Driver
6	EBG R06.006AR090	6128481	16	90	10	5.3	2	WPR 06	WPV 06	WPB 06	GWS 06	T6
8	EBG R08.008AR085	6130570	50	85	12	7.5	2	WPR 08	WPV 08	WPB 08	GWS 08	T8
8	EBG R08.008AR140	6121409	50	140	12	7.5	2					
10	EBG R10.010AP085	6130571	35	85	12	9	2	WPR 10	WPV 10	WPB 10	GWS 10	T15
10	EBG R10.010AP150	6121401	35	150	12	9	2					
12	EBG R12.012AR110	6130572	60	110	16	10.5	2	WPR 12			GWS 12	T20
12	EBG R12.012AR160	6121402	60	160	16	10.5	2					
16	EBG R16.016AR120	6130573	67	120	20	14	2	WPR 16			GWS 16	
16	EBG R16.016AR175	6121403	67	175	20	14	2					
20	EBG R20.020AS190	6121404	80	190	25	18	2	WPR 20			GWS 20	
25	EBG R25.025AV210	6121405	100	210	32	22.4	2	WPR 25			GWS 25	T30
32	EBG R32.032AW240	6121392	123	240	40	28.6	2	WPR 32			GWS 32	

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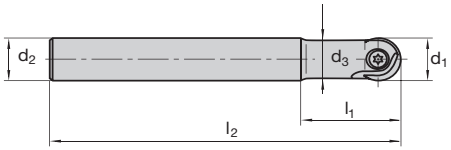
EBG R
Inch

d1	Cutter Body No.	EDP	Ident No.	l1	l2	d2	d3	z ✿	Insert	Insert	Insert	Insert Screw	Torx Driver
0.250	EBG R0250A0375 090T	10525	6128482	1.57	3.54	0.375	0.22	2	WPR 0250	WPV 0250	WPB 0250	GWS 06	T 6
0.312	EBG R0312A0500 140T	88100	6121294	1.97	5.51	0.500	0.30	2	WPR 0312	WPV 0312	WPB 0312	GWS 08	T 8
0.375	EBG R0375A0500 150T	88101	6121295	1.38	5.10	0.500	0.35	2	WPR 0375	WPV 0375	WPB 0375	GWS 10	T 10
0.500	EBG R0500A0625 160T	88102	6121296	2.36	6.30	0.625	0.41	2	WPR 0500			GWS 12	T 20
0.500	EBG R0500A0625 254T	10680	6129150		10.00	0.625	0.41	2	WPR 0500			GWS 12	T 15
0.625	EBG R0625A0750 175T	88103	6121297	2.64	6.89	0.750	0.55	2	WPR 0625			GWS 16	T 20
0.750	EBG R0625A0750 254N	10681	6129151		10.00	0.750	0.55	2	WPR 0625			GWS 20	T 20
0.750	EBG R0750A1000 190T	88104	6121298	3.15	7.48	1.000	0.71	2	WPR 0750			GWS 20	T 20
1.000	EBG R1000A1250 210T	88105	6121299	3.94	8.27	1.250	0.88	2	WPR 1000			GWS 25	T 30
1.250	EBG R1250A1500 240T	88106	6121300	4.84	9.45	1.500	1.17	2	WPR 1250			GWS 32	T 30

See pages 115-120 for Inserts
See page 114 for Insert Screw Specifications
Cutting data recommendations starting page 195

EBG R Metric



d_1	Cutter Body No.	Ident No.	(IKZ)* Ident No.	l_1	l_2	d_2	d_3	z ✡	Insert	Insert	Insert Screw	Torx Driver
6	EBG R06.006AN100-C	6130088	–	20	100	6	5.8	2	WPR 06	WPB 06	GWS 06	T6
6	EBG R06.006AN150-C	6130086	–	70	150	6	5.8	2	WPR 06	WPB 06	GWS 06	
6	EBG R06.006AN200-C	6130084	–	100	200	6	5.8	2	WPR 06	WPB 06	GWS 06	
6	EBG R06.006AP100-C	6128437	–	16	100	8	5.3	2	WPR 06	WPB 06	GWS 06	
8	EBG R08.008AN080-C	6131495	–	25	80	8	7.0	2	WPR 08		GWS 08	T8
8	EBG R08.008AN100-C	6121301	–	25	100	8	7.0	2				
8	EBG R08.008AN150-C	6121284	–	40	150	8	7.0	2				
10	EBG R10.010AN080-C-I	9074942	6131499	35	80	10	8.8	2	WPR 10		GWS 10	T15
10	EBG R10.010AN120-C-I	6121285	6130392	35	120	10	8.8	2				
10	EBG R10.010AN150-C-I	6121286	6130393	50	150	10	8.8	2				
12	EBG R12.012AN080-C-I	9074945	6131500	35	80	12	10.5	2	WPR 12		GWS 12	T20
12	EBG R12.012AN120-C-I	6121287	6130394	35	120	12	10.5	2				
12	EBG R12.012AN160-C-I	6121288	6130395	50	160	12	10.5	2				
16	EBG R16.016AN100-C-I	–	6131501	40	100	16	14.0	2	WPR 16		GWS 16	
16	EBG R16.016AN140-C-I	–	6130396	40	140	16	14.0	2				
16	EBG R16.016AN175-C-I	–	6130397	55	175	16	14.0	2				
20	EBG R20.020AN100-C-I	–	6131503	50	100	20	18.0	2	WPR 20		GWS 20	
20	EBG R20.020AN140-C-I	–	6130398	50	140	20	18.0	2				
20	EBG R20.020AN190-C-I	–	6130399	75	190	20	18.0	2				
25	EBG R25.025AN160-C-I	–	6130400	60	160	25	22.4	2	WPR 25		GWS 25	
25	EBG R25.025AN210-C-I	–	6130401	90	210	25	22.4	2				
32	EBG R32.032AN190-C	6121277	–	65	190	32	28.6	2	WPR 32		GWS 32	T30
32	EBG R32.032AN240-C	6121278	–	105	240	32	28.6	2				

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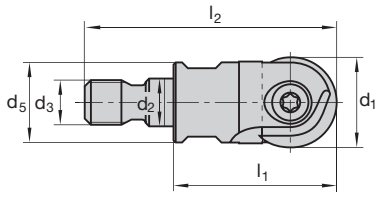
*IKZ=Internal Coolant Supply

EBG R Inch

d_1	Cutter Body No.	Ident No.	(IKZ)* Ident No.	l_1	l_2	d_2	d_3	z ✡	Insert	Insert	Insert Screw	Torx Driver
0.250	EBG R0250A0375 100NC	6128439		1.57	3.94	0.375	0.22	2	WPR 0250	WPB 0250	GWS 06	T6
0.250	EBG R0250A0250 100NC-40	6131238		1.57	3.94	0.250	0.22	2				
0.250	EBG R0250A0250 150NC-70	6131239		2.76	5.91	0.250	0.22	2				
0.250	EBG R0250A0250 200NC-100	6131240		3.94	7.88	0.250	0.22	2				
0.250	EBG R0250A0250 200NC-140	6131234		5.51	7.88	0.250	0.22	2				
0.312	EBG R0312A0375 100NC	6128633		0.99	3.94	0.375	0.28	2	WPR 0312	WPB 0312	GWS 08	T8
0.312	EBG R0312A0375 150NC	6128635		1.57	5.91	0.375	0.28	2				
0.312	EBG R0312A0312 200NC-100	6131232		3.94	7.88	0.312	0.28	2				
0.375	EBG R0375A0375 120NC	6128636		1.38	4.73	0.375	0.35	2	WPR 0375	WPB 0375	GWS 10	T15
0.375	EBG R0375A0375 150NC	6128638		1.97	5.91	0.375	0.35	2				
0.375	EBG R0375A0375 200NC-100	6131236		3.94	7.88	0.375	0.35	2				
0.500	EBG R0500A0500 120NC	6128639	7022522	1.38	4.73	0.500	0.42	2	WPR 0500	WPB 0500	GWS 12	T20
0.500	EBG R0500A0500 160NC	6128641	7022523	1.97	6.30	0.500	0.42	2				
0.625	EBG R0625A0625 140NC	6128642	7022524	1.58	5.52	0.625	0.63	2	WPR 0625	WPB 0625	GWS 16	
0.625	EBG R0625A0625 175NC	6128644	7022525	2.17	6.89	0.625	0.63	2				
0.750	EBG R0750A0750 140NC	6128645	7022526	1.58	5.52	0.750	0.71	2	WPR 0750	WPB 0750	GWS 20	
0.750	EBG R0750A0750 190NC	6128647	7022527	2.96	7.48	0.750	0.71	2				
1.000	EBG R1000A1000 160NC	6128648	7022528	2.37	6.30	1.000	0.89	2	WPR 1000	WPB 1000	GWS 25	T30
1.000	EBG R1000A1000 210NC	6128650	7022529	3.55	8.27	1.000	0.89	2				
1.250	EBG R1250A1250 190NC	6128651	7022530	2.56	7.48	1.250	1.13	2	WPR 1250	WPB 1250	GWS 32	
1.250	EBG R1250A1250 240NC	6128653	7022531	4.14	9.45	1.250	1.13	2				

See Pages 115-120 for Inserts
See page 114 for Insert Screw Specifications
Cutting data recommendations starting page 195

EBG R Metric



Product optimization by shortened, compact version

d_1	Cutter Body No.	Ident No.	l_1	l_2	d_2	d_3	d_5	z ✿	IKZ	Insert	Insert	Insert	Insert Screw	Torx Driver
8	EBG R08.008TC025	6131455	25	39.5	6.5	M6	10	2		WPR 08	WPV 08	WPB 08	GWS 08	T 8
10	EBG R10.010TC025	6131457	25	39.5	6.5	M6	9.35	2		WPR 10	WPV 10	WPB 10	GWS 10	T15
12	EBG R12.012TR025	6131451	25	39.5	6.5	M6	10	2		WPR 12			GWS 12	T20
12	EBG R12.012TR026-I	6131459	26	43.5	8.5	M8	13	2	x	WPR 12			GWS 12	
16	EBG R16.016TR026-I	6131461	26	43.5	8.5	M8	13	2	x	WPR 16			GWS 16	
20	EBG R20.020TS030-I	6131463	30	49.5	10.5	M10	18	2	x	WPR 20			GWS 20	
25	EBG R25.025TF040-I	6131465	40	62.0	12.5	M12	21	2	x	WPR 25			GWS 25	T30
32	EBG R32.032TH045-I	6131470	45	69.0	17.0	M16	30	2	x	WPR 32			GWS 32	

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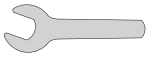
EBG R Inch

d_1	Cutter Body No.	EDP	Ident No.	l_1	l_2	d_2	d_3	d_5	z ✿	IKZ	Insert	Insert Screw	Torx Driver
0.375	EBG R 0375 T0375	13727	9101920	0.984	1.555	0.255	M6	0.368	2		WPR 0375	GWS 10	T15
0.500	EBG R 0500 T0500-I	13728	9101921	0.984	1.555	0.255	M6	0.393	2	x	WPR 0500	GWS 12	T20
0.625	EBG R 0625 T0625-I	13729	9101922	1.023	1.712	0.334	M8	0.511	2	x	WPR 0625	GWS 16	T20
0.750	EBG R 0750 T0750-I	13730	9101924	1.181	1.948	0.413	M10	0.708	2	x	WPR 0750	GWS 20	T20
1.000	EBG R 1000 T1000-I	13731	9101925	1.574	2.440	0.492	M12	0.826	2	x	WPR 1000	GWS 25	T30

See pages 115-120 for Inserts
See pages 136-139 for Screw-On Shanks
*IKZ=Internal Coolant Supply

Cutting data recommendations starting page 195

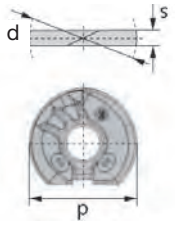
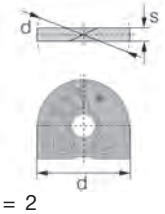
Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	8mm	2146604	8mm, 10mm, 10mm 12mm, .375", .500"
	10mm	2146606	12mm, 16mm, .625"
	15mm	2146611	20mm, .750"
	17mm	2146612	25mm, 1.00"

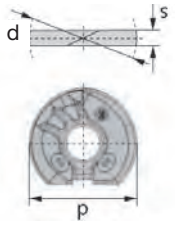
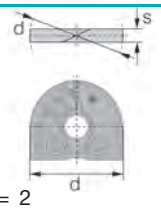
Torque in Nm

EBG R.../ EBG V... Torque Requirements

		Tool type		
Screw Ident. No.	Screw	GRT	GWR	GWV
	SA 40115	manual	---	---
6260409	GWS 06	---	1	1
6119572	GWS 08	---	2	2
6119571	GWS 10	---	3	3
6119559	GWS 12	---	4	4
6119560	GWS 16	---	5	5
6119561	GWS 20	---	6	6
6119562	GWS 25	6.5	6.5	6.5
6119563	GWS 32	6.5	6.5	6.5
		Torque in Nm		

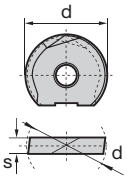
AR Geometry has a helical cutting edge used for roughing and semi-finishing in steel (Up to 54 HRC), cast steel and high temp alloys at extreme metal removal rates

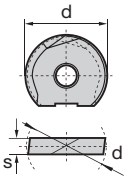
				Cutting materials Ident No.	For cutter
Metric **N = Number of cutting edges**	**d**	**s**	**LMT-Code**	**LC630Q**	**LMT-Code**
 N = 2	12	2.5	WPR 12-AR	9076995	EBG R 12
	16	3	WPR 16-AR	6183222	EBG R 16
	20	3	WPR 20-AR	6183220	EBG R 20
 N = 2	25	4	WPR 25-AR	6183218	EBG R 25
	32	5	WPR 32-AR	9074078	EBG R 32

Inch **N = Number of cutting edges**	**d**	**s**	**LMT-Code**	**LC630Q**	**For cutter** **LMT-Code**
 N = 2	.500	.098	WPR 0500-AR	9077903	EBG R 0500
	.625	.118	WPR 0625-AR [1]	9073899	EBG R 0625
	.750	.118	WPR 0750-AR [1]	9073919	EBG R 0750
 N = 2	1.000	.157	WPR 1000-AR	9077910	EBG R 1000
	1.250	.196	WPR 1250-AR	7021657	EBG R 1250

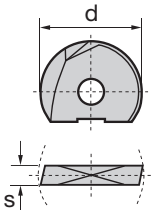
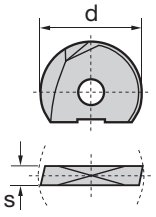
1) Do Not Have Coolant Channels to Cutting Edge
Note: Use holders with IKZ designation to take advantage of inserts with Coolant Channels
Note: Cutting data found on page 200

CF Geometry has chip control geometry for roughing and semi-finishing long-chipping ferrous materials

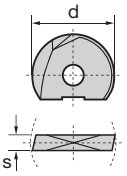
Metric N = Number of cutting edges	d	s	LMT-Code	Cutting materials Ident No. LC240T	LC610T	For cutter LMT-Code
 N = 2	8	2	WPR 08-CF	6282698	6122964	EBG R 08
	10	2.5	WPR 10-CF	6282700	6123044	EBG R 10
	12	2.5	WPR 12-CF	6282703	6123025	EBG R 12
	16	3	WPR 16-CF	6282705	6123007	EBG R 16
	20	3	WPR 20-CF	6282709	6123005	EBG R 20
	25	4	WPR 25-CF	6128868	6122985	EBG R 25
	30	5	WPR 30-CF	6282712	6200286	EBG R 30
	32	5	WPR 32-CF	6282714	6122980	EBG R 32

Inch N = Number of cutting edges	d	s	LMT-Code	LC240T	LC610T	For cutter LMT-Code
 N = 2	0.312	0.06	WPR 0312-CF	6130279	6122842	EBG R 0312
	0.375	0.08	WPR 0375-CF	6130280	6122830	EBG R 0375
	0.500	0.10	WPR 0500-CF	6130281	6122825	EBG R 0500
	0.625	0.12	WPR 0625-CF	6130282	6122817	EBG R 0625
	0.750	0.12	WPR 0750-CF	6130283	6122808	EBG R 0750
	1.000	0.16	WPR 1000-CF	6130284	6122783	EBG R 1000
	1.250	0.20	WPR 1250-CF	6130045	6122774	EBG R 1250
	2.000	0.24	WPR 2000-CF		9132483	EBG R 2500

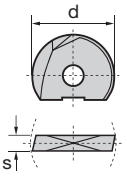
D – Helical Geometry suitable for semi-finishing and finishing in soft materials (Up to 54 Rc)
DN – Helical Geometry suitable for semi-finishing and finishing in non-ferrous materials and also in Exotic materials (LW610)

				Cutting materials Ident No.				For cutter
Metric **N = Number of cutting edges**	**d**	**s**	**LMT-Code**	**LW610**	**LC610Z**	**LC730Z**	**LC610A**	**LMT-Code**
 N = 2 **New helical cutting geometry** WPR…D for semi-finishing and finishing of steel, cast steel and high temperature alloy up to 54 HRC	6	1.6	WPR 06-D		9194125			EBG R 06
	8	2	WPR 08-D		9078537	9077969		EBG R 08
	10	2.5	WPR 10-D		7014309	9174494		EBG R 10
	12	2.5	WPR 12-D		9189228	9151046		EBG R 12
	16	3	WPR 16-D		9072851	9080641		EBG R 16
	20	3	WPR 20-D		9080866	9079709		EBG R 20
	25	4	WPR 25-D		7014310	9174495		EBG R 25
	32	5	WPR 32-D		7004421	9174496		EBG R 32
 N = 2 **New helical cutting geometry** WPR…DN for semi-finishing and finishing of non-ferrous metals, plastics, graphite and titanium	6	1.6	WPR 06-DN	6132363			9079232	EBG R 06
	8	2	WPR 08-DN	6131629			9074406	EBG R 08
	10	2.5	WPR 10-DN	6131302			6132330	EBG R 10
	12	2.5	WPR 12-DN	6131303			6132329	EBG R 12
	16	3	WPR 16-DN	6131304			9074409	EBG R 16
	20	3	WPR 20-DN	6131305			6132089	EBG R 20
	25	4	WPR 25-DN	6131306			9074410	EBG R 25
	32	5	WPR 32-DN	6131307			9074411	EBG R 32

D – Helical Geometry suitable for semi-finishing and finishing in soft materials (Up to 54 Rc)
DN – Helical Geometry suitable for semi-finishing and finishing in non-ferrous materials and also in Exotic materials (LW610)

Inch N = Number of cutting edges	d	s	LMT-Code	Cutting materials Ident No. LW610	LC610Z	LC730Z	LC610A	For cutter LMT-Code
 N = 2 **New helical cutting geometry** WPR…D for semi-finishing and finishing of steel, cast steel and high temperature alloy up to 54 HRC	0.250	0.063	WPR 0250-D		7036962			EBG R 0250
	0.312	0.08	WPR 0312-D		7036963	7036964		EBG R 0312
	0.375	0.10	WPR 0375-D		7025008	7036965		EBG R 0375
	0.500	0.10	WPR 0500-D		7022864	7036966		EBG R 0500
	0.625	0.12	WPR 0625-D		7025009	7036967		EBG R 0625
	0.750	0.12	WPR 0750-D		7025110	7036968		EBG R 0750
	1.000	0.16	WPR 1000-D		7019454	7036969		EBG R 1000

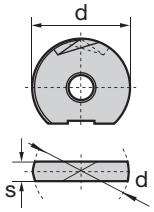
Cutting data recommendations starting page 199

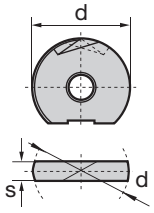
Inch N = Number of cutting edges	d	s	LMT-Code	Cutting materials Ident No. LW610	LC610Z	LC730Z	LC610A	For cutter LMT-Code
 N = 2 **New helical cutting geometry** WPR…DN for semi-finishing and finishing of non-ferrous metals, plastics, graphite and titanium	0.250	0.063	WPR 0250-DN	9186899				EBG R 0250
	0.312	0.08	WPR 0312-DN	9186031				EBG R 0312
	0.375	0.10	WPR 0375-DN	9186035				EBG R 0375
	0.500	0.10	WPR 0500-DN	6131308				EBG R 0500
	0.625	0.12	WPR 0625-DN	9186037				EBG R 0625
	0.750	0.12	WPR 0750-DN	9186038				EBG R 0750
	1.000	0.16	WPR 1000-DN	6131309				EBG R 1000

Begin 2011 Q coated inserts upgraded to Z Coating for improved performance

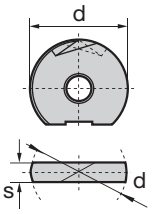
Cutting data recommendations starting page 199

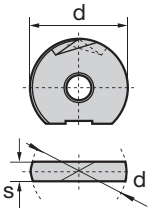
N Geometry is for semi-finishing and finishing of steel, cast steel, steel (up to 54 HRc), cast iron, 7° clearance angle

Metric N = Number of cutting edges	d	s	LMT-Code	Cutting materials Ident No. LC610T	For cutter LMT-Code
 N = 2 7° Clearance Angle	6	1.6	WPR 06-N		EBG R 06
	8	2	WPR 08-N	9155009	EBG R 08
	10	2.5	WPR 10-N	9155011	EBG R 10
	12	2.5	WPR 12-N	9155014	EBG R 12
	16	3	WPR 16-N	9155016	EBG R 16
	20	3	WPR 20-N	9155020	EBG R 20
	25	4	WPR 25-N	9155022	EBG R 25
	30	5	WPR 30-N	9155024	EBG R 30
	32	5	WPR 32-N	9155026	EBG R 32

Inch N = Number of cutting edges	d	s	LMT-Code	LC610T	For cutter LMT-Code
 N = 2 7° Clearance Angle	0.312	0.06	WPR 0312-N	6122907	EBG R 0312
	0.375	0.08	WPR 0375-N	6122896	EBG R 0375
	0.500	0.10	WPR 0500-N	6122887	EBG R 0500
	0.625	0.12	WPR 0625-N	6122873	EBG R 0625
	0.750	0.12	WPR 0750-N	6122869	EBG R 0750
	1.000	0.16	WPR 1000-N	6122860	EBG R 1000
	1.250	0.20	WPR 1250-N	6122851	EBG R 1250
	2.000	0.24	WPR 2000-N	6127904	EBG R 2500

NP Geometry is a High Performance Geometry for finishing of hardened steel, Cast Steel and High Temperature Alloys up to 60HRC-"Z" Coating provides extended tool life

Metric N = Number of cutting edges	d	s	LMT-Code	Cutting materials Ident No. LC610Z	Cutting materials Ident No. LC730Z	For cutter LMT-Code
 N = 2 12° Clearance Angle	6	1.6	WPR 06-NP	9089461		EBG R 06
	8	2	WPR 08-NP	6132308	9074564	EBG R 08
	10	2.5	WPR 10-NP	6132309	9074565	EBG R 10
	12	2.5	WPR 12-NP	6131467	9074566	EBG R 12
	16	3	WPR 16-NP	6130735	9074567	EBG R 16
	20	3	WPR 20-NP	6131468	9074568	EBG R 20
	25	4	WPR 25-NP	6131469	9074569	EBG R 25
	30	5	WPR 30-NP	9091928		EBG R 30
	32	5	WPR 32-NP	6132054	9074570	EBG R 32

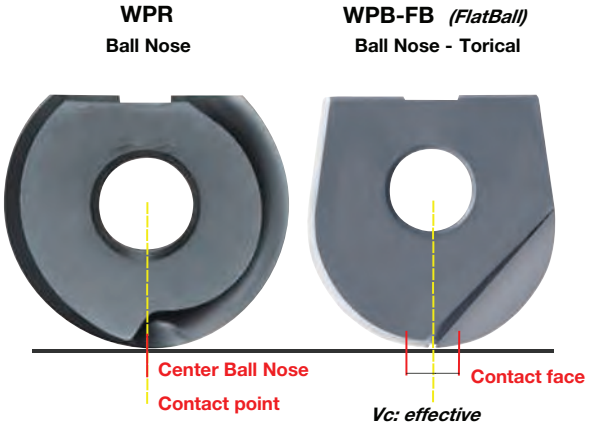
Inch N = Number of cutting edges	d	s	LMT-Code	LC610Z	LC730Z	For cutter LMT-Code
 N = 2 12° Clearance Angle	0.312	0.06	WPR 0312-NP	6122907		EBG R 0312
	0.375	0.08	WPR 0375-NP	7024924		EBG R 0375
	0.500	0.10	WPR 0500-NP	7024925	7015446	EBG R 0500
	0.625	0.12	WPR 0625-NP	7024926	9086604	EBG R 0625
	0.750	0.12	WPR 0750-NP	7024927	9086606	EBG R 0750
	1.000	0.16	WPR 1000-NP	7024928	9086599	EBG R 1000
	1.250	0.20	WPR 1250-NP			EBG R 1250

WPB-FB Flatball geometry reduces semi-finishing and finishing time with increased step overs in steel, cast steel, high temperature alloys and hardened steel up to 62Rc

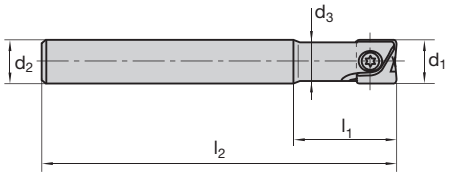
Metric N = Number of cutting edges	d	l	s	R	LMT-Code	Cutting materials Ident No. LC610Z	BN081	For cutter LMT-Code
	6		1.6	2	WPB 06-FB-20	9112332		EBG R 10
	8		2	3	WPB 08-FB-30	9112328		EBG R 12
	10	11.5	2.5	4	WPB 10-FB-40	9097607		EBG R 16
	12	14	2.5	5	WPB 12-FB-50	9097606	9078092	EBG R 20
	16	16	3	7	WPB 16-FB-70	9095870	9078091	
	32	18	3	15	WPB 20-FB-90	9097608	9080149	

Inch N = Number of cutting edges	d	l	s	R	LMT-Code	LC610Z	BN081	For cutter LMT-Code
	0.500	0.551	0.10	0.187	WPB 0500 FB 0187	9142857		EBG R 0500
	0.750	0.709	0.12	0.312	WPB 0750 FB 0312	9142858		EBG R 0750
	1.000	0.905	0.16	0.437	WPB 1000 FB 0437	9142879		EBG R 1000

Cutting data recommendations see page 201



EBG V Metric



d_1	Cutter Body No.	Ident No.	l_1	l_2	d_2	d_3	z ✿	Insert	Insert	Insert Screw	Torx Driver
12	EBG V12.012AN090	6130574	34	92	12	10.5	2	WPB 12	WPV 12	GWS 12	T20
12	EBG V12.012AN130	6121399	34	132	12	10.5	2				
12	EBG V12.012AN150	6121383	48	152	12	10.5	2				
16	EBG V16.016AN100	6130575	38	102	16	14	2	WPB 16	WPV 16	GWS 16	
16	EBG V16.016AN140	6121389	38	142	16	14	2				
16	EBGV16.016AN160	6121391	55	162	16	14	2				
20	EBG V20.020AN160	6121377	47	162	20	18	2	WPB 20	WPV 20	GWS 20	
20	EBG V20.020AN175	6121379	63	177	20	18	2				
25	EBG V25.024AN160	6121371	47	162	25	22.4	2	WPB 25	WPV 25	GWS 25	T30
25	EBG V25.025AN190	6121373	72	192	25	22.4	2				
32	EBG V32.032AN175	6121363	58	177	32	28.6	2		WPV 32	GWS 32	
32	EBG V32.032AN210	6121364	82	212	32	28.6	2				

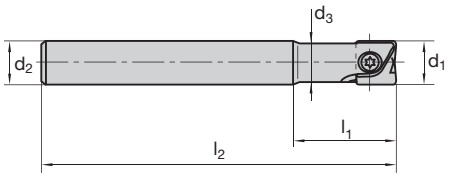
Limited stock of metric products in U.S., please contact Customer Service for availability

EBG V Inch

d_1	Cutter Body No.	EDP	Ident No.	l_1	l_2	d_2	d_3	z ✿	Insert	Insert	Insert Screw	Torx Driver
0.500	EBG V0500A0500 130N	88139	6121400	1.34	5.20	0.500	0.41	2	WPB 0500	WPV 0500	GWS 12	T20
0.500	EBG V0500A0500 150N	88140	6121384	1.89	5.98	0.500	0.41	2				
0.625	EBG V0625A0625 140N	88141	6121390	1.50	5.51	0.625	0.55	2	WPB 0625	WPV 0625	GWS 16	
0.625	EBG V0625A0625 160N	88142	6121381	2.16	6.30	0.625	0.55	2				
0.750	EBG V0750A0750 160N	88143	6121378	1.85	6.30	0.750	0.71	2	WPB 0750	WPV 0750	GWS 20	
0.750	EBG V0750A0750 175N	88144	6121380	2.48	6.89	0.750	0.71	2				
0.750	EBG V0750A0750 210N	88914	6121365	2.36	8.27	0.750	0.71	2				
1.000	EBG V1000A1000 160N	88145	6121372	1.85	6.30	1.000	0.88	2	WPB 1000	WPV 1000	GWS 25	T30
1.000	EBG V1000A1000 190N	88146	6121356	2.83	7.48	1.000	0.88	2				
1.000	EBG V1000A1000 230N	88902	6121358	3.14	9.06	1.000	0.88	2				

See pages 124-131 for Inserts
See page 123 for Insert Screw Specifications
Cutting data recommendations starting page 195

EBG V
Metric



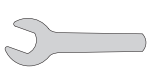
d_1	Cutter Body No.	Ident No.	IKZ Ident No.	l_1	l_2	d_2	d_3	z ✪	Insert	Insert	Insert Screw	Torx Driver
8	EBG V08.008AN080-C	6131510	–	27	82	8	7	2	WPB 08	WPV 08	GWS 08	T8
8	EBG V08.008AN100-C	6130576	–	27	102	8	7	2				
8	EBG V08.008AN150-C	6130577	–	42	152	8	7	2				
10	EBG V10.010AN080-C-I	9074948	6131512	37	82	10	8.8	2	WPB 10	WPV 10	GWS 10	T15
10	EBG V10.010AN120-C-I	6130578	6131511	37	122	10	8.8	2				
10	EBG V10.010AN150-C-I	6130579	6131513	52	152	10	8.8	2				
12	EBG V12.012AN080-C-I	9074949	6131514	37	82	12	10.5	2	WPB 12	WPV 12	GWS 12	T20
12	EBG V12.012AN120-C-I	6128023	6130402	37	122	12	10.5	2				
12	EBG V12.012AN160-C-I	6128030	6130403	52	162	12	10.5	2				
16	EBG V16.016AN100-C-I	–	6131515	42	102	16	14	2	WPB 16	WPV 16	GWS 16	
16	EBG V16.016AN140-C-I	–	6130404	42	142	16	14	2				
16	EBG V16.016AN175-C-I	–	6130405	57	177	16	14	2				
20	EBG V20.020AN100-C-I	–	6131516	52	102	20	18	2	WPB 20	WPV 20	GWS 20	
20	EBG V20.020AN140-C-I	–	6130406	52	142	20	18	2				
20	EBG V20.020AN190-C-I	–	6130407	77	192	20	18	2				
25	EBG V25.025AN160-C-I	–	6130408	62	162	25	22.4	2	WPB 25	WPV 25	GWS 25	T30
25	EBG V25.025AN210-C-I	–	6130409	92	212	25	22.4	2				
32	EBG V32.032AN190-C	6128040	–	67	192	32	28.6	2	WPB 32	WPV 32	GWS 32	
32	EBG V32.032AN240-C	6128041	–	107	242	32	28.6	2				

Limited stock of metric products in U.S., please contact Customer Service for availability
IKZ=Internal Coolant Supply

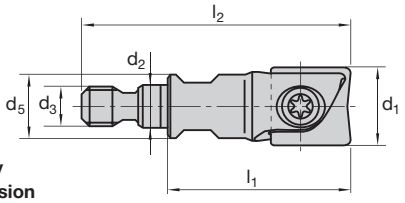
EBG V
Inch

d_1	Cutter Body No.	Ident No.	IKZ Ident No.	l_1	l_2	d_2	d_3	z ✪	Insert	Insert	Insert Screw	Torx Driver
0.500	EBG V0500A0500 120NC	6128661	7022532	1.38	4.73	0.500	0.42	2	WPB 0500	WPV 0500	GWS 12	T20
0.500	EBG V0500A0500 160NC	6128663	7022533	1.97	6.30	0.500	0.42	2				
0.625	EBG V0625A0625 140NC	6128664	7022534	1.58	5.52	0.625	0.56	2	WPB 0625	WPV 0625	GWS 16	
0.625	EBG V0625A0625 175NC	6128666	7022535	2.17	6.89	0.625	0.56	2				
0.750	EBG V0750A0750 140NC	6128667	7022536	1.58	5.52	0.750	0.70	2	WPB 0750	WPV 0750	GWS 20	
0.750	EBG V0750A0750 190NC	6128690	7022537	2.96	6.30	1.000	0.89	2				
1.000	EBG V1000A1000 160NC	6128691	7022538	2.37	6.30	1.000	0.89	2	WPB 1000	WPV 1000	GWS 25	T30
1.000	EBG V1000A1000 210NC	6128693	7022539	3.55	8.27	1.000	0.89	2				
1.250	EBG V1250A1250 190NC	50294	6128694		10.00	1.250	1.13	2	WPB 1250		GWS 25	T20
1.250	EBG V1250A1250 240NC	50295	6128696		10.00	1.250	1.13	2				T30

See pages 124-131 for Inserts
See page 123 for Insert Screw Specifications
Cutting data recommendations starting page 195

Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	8mm	2146604	8mm, 10mm, 12mm, .375", .500"
	10mm	2146606	16mm, .625"
	15mm	21446611	20mm, .750"
	17mm	2146612	25mm, 1.00"

EBG V Metric



Product optimization by shortened compact version

d_1	Cutter Body No.	Ident No.	l_1	l_2	d_2	d_3	d_5	z ✿	IKZ	Insert	Insert	Insert Screw	Torx Driver
8	EBG V08.008TC025	6131472	25	39.5	6.5	M6	10	2		WPV 08	WPB 08	GWS 08	T 8
10	EBG V10.010TC025	6131474	25	39.5	6.5	M6	9.35	2		WPV 10	WPB 10	GWS 10	T15
12	EBG V12.012TC025	6131476	25	39.5	6.5	M6	10	2		WPV 12	WPB 12	GWS 12	T20
12	EBG V12.012TR028-I	6131478	28	45.5	8.5	M8	13	2	x	WPV 12	WPB 12	GWS 12	
16	EBG V16.016TR028-I	6131480	28	45.5	8.5	M8	13	2	x	WPV 16	WPB 16	GWS 16	
20	EBG V20.020TS032-I	6131482	32	51.5	10.5	M10	18	2	x	WPV 20	WPB 20	GWS 20	
25	EBG V25.025TF042-I	6131484	42	64	12.5	M12	21	2	x	WPV 25	WPB 25	GWS 25	T30
32	EBG V32.032TH047-I	6131486	47	71	17.0	M16	30	2	x	WPV 32	WPB 32	GWS 32	

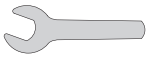
Limited stock of metric products in U.S., please contact Customer Service for availability

EBG V Inch

d_1	Cutter Body No.	EDP	Ident No.	l_1	l_2	d_2	d_3	d_5	z ✿	IKZ	Insert	Insert	Insert Screw	Torx Driver
0.375	EBG V 0375 T0375	13732	9101926	0.98	1.555	0.25	M6	0.39	2		WPV 0375	WPB 0375	GWS 10	T15
0.500	EBG V 0500 T0500-I	13733	9101927	0.98	1.555	0.25	M6	0.368	2		WPV 0500	WPB 0500	GWS 12	T20
0.625	EBG V 0625 T0625-I	13734	9101928	1.10	1.791	0.33	M8	0.51	2	x	WPV 0625	WPB 0625	GWS 16	T20
0.750	EBG V 0750 T0750-I	13735	9101929	1.26	2.027	0.41	M10	0.71	2	x	WPV 0750	WPB 0750	GWS 20	T20
1.000	EBG V 1000 T1000-I	13736	9101930	1.65	2.519	0.49	M12	0.83	2	x	WPV 1000	WPB 1000	GWS 25	T30

See pages 124-131 for Inserts
See pages 136-139 for Screw-On Shanks
IKZ=Internal Coolant Supply

Cutting data recommendations starting page 195

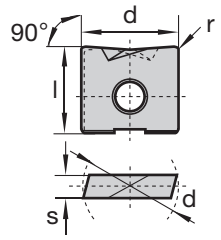
Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	8mm	2146604	8mm, 10mm, 12mm, .375", .500"
	10mm	2146606	16mm, .625"
	15mm	2146611	20mm, .750"
	17mm	2146612	25mm, 1.00"

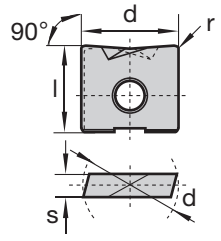
Torque in Nm

EBG R.../ EBG V... Torque Requirements

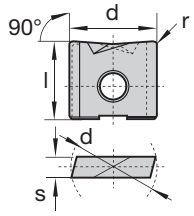
		Tool type		
Ident No.	Screw	GRT	GWR	GWV
	SA 40115	manual	---	---
6260409	GWS 06	---	1	1
6119572	GWS 08	---	2	2
6119571	GWS 10	---	3	3
6119559	GWS 12	---	4	4
6119560	GWS 16	---	5	5
6119561	GWS 20	---	6	6
6119562	GWS 25	6.5	6.5	6.5
6119563	GWS 32	6.5	6.5	6.5
		Torque in Nm		

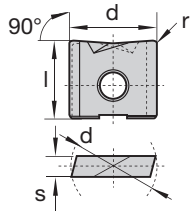
N Geometry for semi-finishing and finishing steel, for steel, cast steel, high temperature alloys and hardened steel up to 60 HRC

Metric N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC610T	LW610	LDP05B-PCD	For cutter LMT-Code
 N = 2	8	9.5	2	0.6	WPV 08-N	6122595	6122594		EBG V 08
	10	11.5	2.5	0.8	WPV 10-N	6122669	6122668		EBG V 10
	12	14	2.5	1.0	WPV 12-N	6122665	6122664		EBG V 12
	16	16	3	1.3	WPV 16-N	6122641	6122640		EBG V 16
	20	18	3	1.6	WPV 20-N	6122635	6122634		EBG V 20
	25	23.5	4	2.0	WPV 25-N	6122629	6122628		EBG V 25
	32	28	5	2.5	WPV 32-N	6122605	6122620		EBG V 32

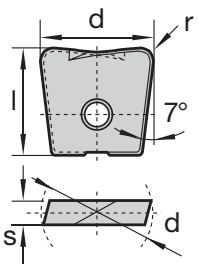
Inch N = Number of cutting edges	d	l	s	r	LMT-Code	LC610T	LW610	LDP05B-PCD	For cutter LMT-Code
 N = 2	0.375	0.45	0.08	0.031	WPV 0375-N-2	6127876		50890	EBG V 0375
	0.375	0.45	0.08	0.062	WPV 0375-N-4	6127947		50891	
	0.500	0.55	0.10	0.031	WPV 0500-N-2	6127785		50895	EBG V 0500
	0.500	0.55	0.10	0.062	WPV 0500-N-4	6122509		50896	
	0.625	0.62	0.12	0.031	WPV 0625-N-2	6122525		50902	EBG V 0625
	0.625	0.62	0.12	0.062	WPV 0625-N-4	6127786		50903	
	0.750	0.70	0.12	0.031	WPV 0750-N-2	6128965		50904	EBG V 0750
	0.750	0.70	0.12	0.062	WPV 0750-N-4	6127787		50905	
	1.000	0.92	0.16	0.031	WPV 1000-N-2	6127789		50906	EBG V 1000
	1.000	0.92	0.16	0.062	WPV 1000-N-4	6127788		50798	
	1.000	0.92	0.16	0.125	WPV 1000-N-8	6127790		55084	

CF Geometry with chip control geometry for roughing and semi-finishing long chipping ferrous materials

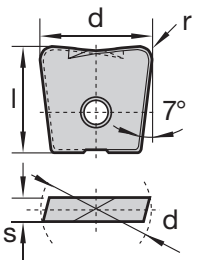
Metric N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC240T	For cutter LMT-Code
	8	9.5	2	0.6	WPV 08-N-CF	6282725	EBG V 08
	10	11.5	2.5	0.8	WPV 10-N-CF	6282727	EBG V 10
	12	14	2.5	1.0	WPV 12-N-CF	6282729	EBG V 12
N = 2	16	16	3	1.3	WPV 16-N-CF	6282731	EBG V 16
	20	18	3	1.6	WPV 20-N-CF	6282733	EBG V 20
	25	23.5	4	2.0	WPV 25-N-CF	6282735	EBG V 25
	32	28	5	2.5	WPV 32-N-CF	6282737	EBG V 32

Inch N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC240T	For cutter LMT-Code
	0.500	0.55	0.10	0.032	WPV 0500-CF-2	6130285	EBG V 0500
	0.500	0.55	0.10	0.063	WPV 0500-CF-4	6130286	
	0.625	0.62	0.12	0.032	WPV 0625-CF-2	6130287	EBG V 0625
	0.625	0.62	0.12	0.063	WPV 0625-CF-4	6130288	
N = 2	0.750	0.70	0.12	0.032	WPV 0750-CF-2	6130289	EBG V 0750
	0.750	0.70	0.12	0.063	WPV 0750-CF-4	6130290	
	1.000	0.92	0.12	0.032	WPV 1000-CF-2	6130291	EBG V 1000
	1.000	0.92	0.16	0.063	WPV 1000-CF-4	6130292	
	1.000	0.92	0.16	0.125	WPV 1000-CF-8	6130293	

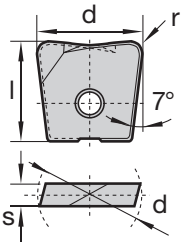
N Geometry for semi-finishing and finishing of steel, cast steel and high temperature alloys up to 54 HRC

Metric N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC610T	For cutter LMT-Code
 N = 2	8	9.5	2	0.6	WPB 08-N-06	6282927	EBG V 08
	8	9.5	2	1.0	WPB 08-N-10	6282919	
	10	11.5	2.5	0.8	WPB 10-N-08	6282928	EBG V 10
	10	11.5	2.5	1.0	WPB 10-N-10	6282918	
	12	14	2.5	1.0	WPB 12-N-10	6129227	EBG V 12
	12	14	2.5	2.0	WPB 12-N-20	6128106	
	16	16	3	1.0	WPB 16-N-10	6129229	EBG V 16
	16	16	3	1.3	WPB 16-N-13	6282931	
	16	16	3	3.0	WPB 16-N-30	6128110	
	20	18	3	1.0	WPB 20-N-10	6129231	EBG V 20
	20	18	3	1.6	WPB 20-N-16	6282930	
	20	18	3	4.0	WPB 20-N-40	6128114	
	25	23.5	4	1.0	WPB 25-N-10	6129233	EBG V 25
	25	23.5	4	2.0	WPB 25-N-20	6282929	
	25	23.5	4	5.0	WPB 25-N-50	6128118	

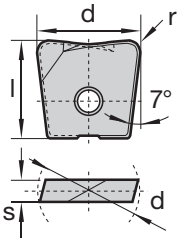
N Geometry for semi-finishing and finishing of steel, cast steel and high temperature alloys up to 54 HRC

Inch N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC610T	Cutting materials Ident No. LDP05B-PCD	For cutter LMT-Code
 N = 2	0.250		0.063	0.032	WPB 0250-N-2		50696	EBG R 0250
	0.375		0.063	0.010	WPB 0375-N	6129886		EBG R 0375
	0.375	0.450	0.08	0.032	WPB 0375-N-2	7031925	54262	EBG R 0375
	0.375	0.450	0.08	0.063	WPB 0375-N-4	7031927	54263	EBG R 0375
	0.500	0.550	0.10	0.032	WPB 0500-N-2	6122370	54264	EBG V 0500
	0.500	0.550	0.10	0.063	WPB 0500-N-4	6122376	54265	
	0.625	0.625	0.12	0.032	WPB 0625-N-2	6127791	54757	EBG V 0625
	0.625	0.625	0.12	0.063	WPB 0625-N-4	6127792	54758	
	0.750	0.700	0.12	0.032	WPB 0750-N-2	6127793	54266	EBG V 0750
	0.750	0.700	0.12	0.063	WPB 0750-N-4	6127794	51150	
	1.000	0.925	0.16	0.032	WPB 1000-N-2	6122374	54267	EBG V 1000
	1.000	0.925	0.16	0.063	WPB 1000-N-4	6122362	54268	
	1.000	0.925	0.16	0.125	WPB 1000-N-8	6127795	54759	

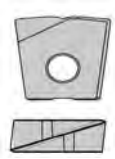
CF Geometry with chip control geometry for roughing and semi-finishing long chipping ferrous materials

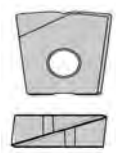
Inch N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC610T	For cutter LMT-Code
 N = 2	6	8	1.6	0.5	WPB 06-N-05-CF	6129235	EBG R 06
	8	9.5	2	1.0	WPB 08-N-10-CF	6129237	EBG V 08
	10	11.5	2.5	1.0	WPB 10-N-10-CF	6129239	EBG V 10
	12	14	2.5	1.0	WPB 12-N-10-CF	6282913	EBG V 12
	12	14	2.5	2.0	WPB 12-N-20-CF	6128108	
	16	16	3	1.0	WPB 16-N-10-CF	6282914	EBG V 16
	16	16	3	3.0	WPB 16-N-30-CF	6128112	
	20	18	3	1.0	WPB 20-N-10-CF	6129258	EBG V 20
	20	18	3	4.0	WPB 20-N-40-CF	6128116	
	25	23.5	4	1.0	WPB 25-N-10-CF	6282915	EBG V 25
	25	23.5	4	5.0	WPB 25-N-50-CF	6128120	

CF Geometry with chip control geometry for roughing and semi-finishing long chipping ferrous materials

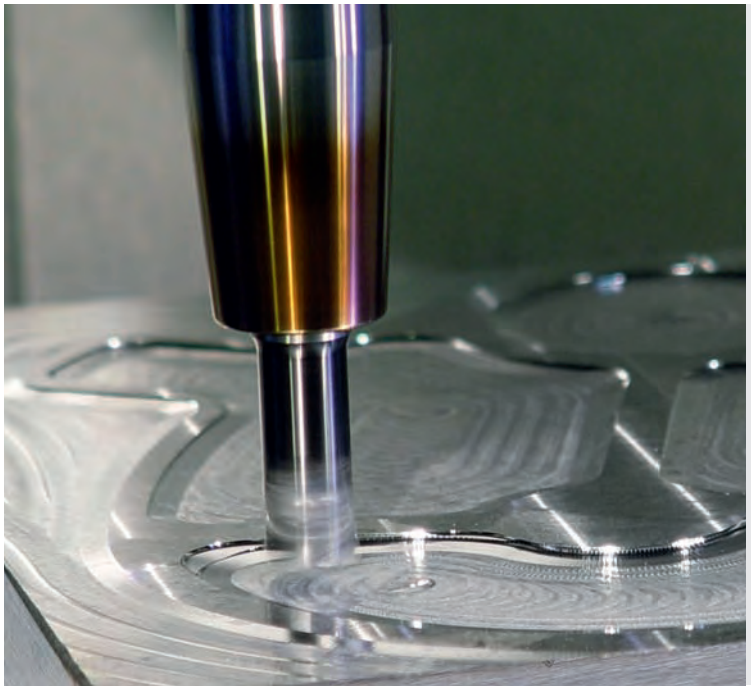
Inch N = Number of cutting edges	d	l	s	r	LMT-Code	Cutting materials Ident No. LC240T	Cutting materials Ident No. LC610T	For cutter LMT-Code
	.250		0.063	0.032	WPB 0250-CF-2		6130879	EBG R 0250
	.375	0.450	0.080	0.032	WPB 0375-CF-2		6130878	EBG R 0375
	.375	0.450	0.080	0.063	WPB 0375-CF-4		6130877	EBG R 0375
	0.500	0.550	0.10	0.032	WPB 0500-CF-2	6130294	6130870	EBG V 0500
N = 2	0.500	0.550	0.10	0.063	WPB 0500-CF-4	6130295	6128916	
	0.625	0.625	0.12	0.032	WPB 0625-CF-2	6130296	6130869	EBG V 0625
	0.625	0.625	0.12	0.063	WPB 0625-CF-4	6130297	6130871	
	0.750	0.700	0.12	0.032	WPB 0750-CF-2	6130298	6130872	EBG V 0750
	0.750	0.700	0.12	0.063	WPB 0750-CF-4	6130299	6130873	
	1.000	0.925	0.16	0.032	WPB 1000-CF-2	6130300	6130874	EBG V 1000
	1.000	0.925	0.16	0.063	WPB 1000-CF-4	6130301	6130875	
	1.000	0.925	0.16	0.125	WPB 1000-CF-8	6130302	6130876	

WPB-HF High Feed geometry excellent for high feed roughing of steel, cast steel and high temperature alloys.

Metric N = Number of cutting edges	d	l	s	ap_{max}	R_{Theo}	LMT-Code	Cutting materials Ident No. LC630Q	LC610Q	LW610	For cutter LMT-Code
 N = 2	10	11.5	2.5	0.5	0.8	WPB 10-HF		9103211		EBG V 10
	12	14	2.5	0.6	1	WPB 12-HF	6132176			EBG V 12
	16	16	3	0.8	1.5	WPB 16-HF	6132180			EBG V 16
	20	18	3	1	2	WPB 20-HF	6132182			EBG V 20
	25	23.5	4	1.25	2.5	WPB 25-HF		6183263		EBG V 25
	32	26.5	5	1.6	3.2	WPB 32-HF		6183264		EBG V 32

Inch N = Number of cutting edges	d	l	s	ap_{max}	R_{Theo}	LMT-Code	LC630Q	LC610Q	LW610	For cutter LMT-Code
 N = 2	0.500	0.55	0.10	0.025	0.045	WPB 0500-HF	6132184	9186039		EBG V 0500
	0.625	0.63	0.12	0.030	0.050	WPB 0625-HF	6132186	9186042		EBG V 0625
	0.750	0.70	0.12	0.040	0.080	WPB 0750-HF	6132188	9186043		EBG V 0750

Cutting data recommendations see page 206



Tool:
EBG V12.012AN080-C-I , $d_1 = 2$

Material:
Toolox 44

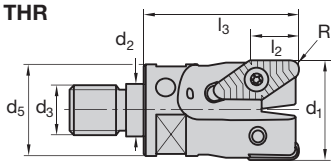
Insert:
WPB 12-HF, LC630Q

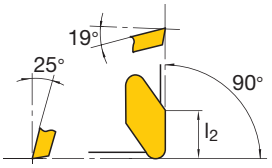
Tensile strength:
44 HRC

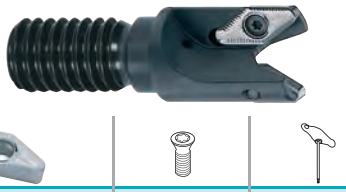
Machine:
Machining center
DMU70 eVo/HSK-A63/25 kW
$n_{max.}$ = 18000 max RPM

Cutting data:
v_c = 525 SFM
n = 4240 RPM
f_z = .031 IPT
v_f = 268 IPM
a_e = .315
a_p = .016

EMZ 90 THR IKZ







d_1	R	l_3	l_2	d_5	d_3	d_2h6	z ✪	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
20	0.4	30	10	18	M10	10.5	2	EMZ90 V11.020TS030-I	1043246	VPGT 110304-ALM	1044972	1048326 T8
25	1.2	40	13.5	21	M12	12.5	2	EMZ90 V16.025TF040-I	1043247	VPGT 160412-ALM	1051312	1048335
32	3	50	15	29	M16	17	2	EMZ90 V22.032TH050-I	1043248	VCGT 220530-ALM	1045766	T15
35	3	50	15	29	M16	17	2	EMZ90 V22.035TH050-I	1043250			
42	3	50	15	29	M16	17	3	EMZ90 V22.042TH050-I	1043249			

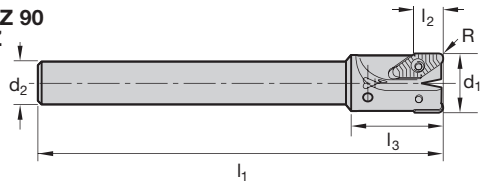
d_1	R	l_3	l_2	d_5	d_3	d_2h6	z ✪	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
1.00	0.05	1.57	0.53	0.83	M12	0.49	2	EMZ90 V16.100TF-I	1950301	VPGT 160412-ALM	1051312	1048335
1.25	0.12	1.97	0.59	1.02	M16	0.67	2	EMZ90 V22.125TH-I	1950302	VCGT 220530-ALM	1045766	
1.50	0.12	1.97	0.59	1.02	M16	0.67	2	EMZ90 V22.150TH-I	1950303			

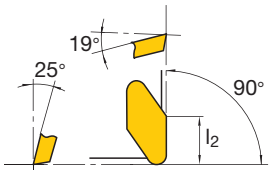
See Page 133 for Inserts

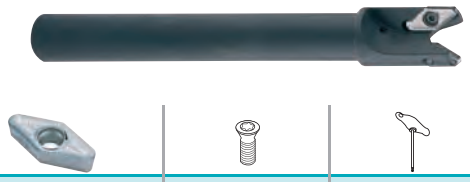
Cutting data recommendations starting page 202

See pages 136-139 for Screw-On Shanks

EMZ 90 IKZ







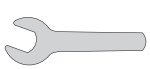
Overhang and infeed parameters to be choosen in accordance to application.

d_1	R	l_3	l_2	l_1	d_2	z ✪	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
20	0.4	30	10	175	16	2	EMZ90 V11.020AJ-I	1043242	VPGT 110304-ALM	1044972	1048326 T8
25	1.2	40	13.5	200	20	2	EMZ90 V16.025AI-I	1043243	VPGT 160412-ALM	1051312	1048335
32	3.0	50	15	220	25	2	EMZ90 V22.032AG-I	1043244	VCGT 220530-ALM	1045766	T15
35	3.0	50	15	220	25	2	EMZ90 V22.035AG-I	1043251			

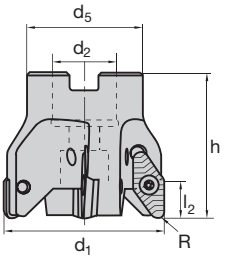
d_1	R	l_3	l_2	l_1	d_2	z ✪	Cutter Body No. (inches)*	Ident No.	Insert	Insert Screw	Torx Driver
0.75	0.02	1.18	0.40	6.75	0.75	2	EMZ90 V11-075SA-I	1950290	VPGT 110304-ALM	1044972	1048326
1.00	0.05	2.00	0.53	8.00	0.75	2	EMZ90 V16-100SA-I	0054651	VPGT 160412-ALM	1051312	1048335
1.00	0.05	1.58	0.53	7.88	1.00	2	EMZ90 V16-100SB-I	1950291	VPGT 160412-ALM		
1.00	0.05	2.00	0.53	4.28	1.00	2	EMZ90 V16-100WB-I	0054286	VPGT 160412-ALM		
1.25	0.05	2.00	0.53	8.00	1.00	2	EMZ90 V16-125SB-I	0054294	VPGT 160412-ALM		
1.25	0.05	2.00	0.53	4.28	1.25	2	EMZ90 V16-125WC-I	0054287	VPGT 160412-ALM		
1.50	0.05	2.00	0.53	8.00	1.00	2	EMZ90 V16-150SC-I	0054295	VPGT 160412-ALM		
1.50	0.05	2.00	0.53	4.88	1.25	2	EMZ90 V16-150WC-I	0054288	VPGT 160412-ALM		
1.25	0.12	2.00	0.59	8.62	1.00	2	EMZ90 V22-125SB-I	1950292	VCGT 220530-ALM	1045766	
1.50	0.12	2.00	0.59	8.62	1.00	2	EMZ90 V22-150SB-I	1950293	VCGT 220530-ALM		

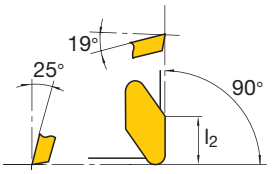
See page 133 for Inserts

Cutting data recommendations starting page 202

Open End Wrench	Wrench Size	Ident No.	For Head Sizes
	15mm		20mm, .750"
	17mm	2146612	25mm, 1.00"
	19mm	2146613	32mm, 1.25"
	19mm	2146613	42mm, 1.50"

FMZ 90 IKZ



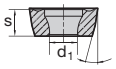
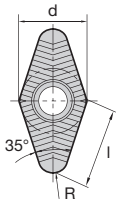


d_1	R	l_2	h	d_2	d_5	z	Cutter Body No.	Ident No.	Insert	Insert Screw	Torx Driver
42	3	15	55	16	32.0	3	FMZ90 V22.042AN-I	1043253	VCGT 220530-ALM	1045766	1048335
52	3	15	55	22	40.0	3	FMZ90 V22.052AN-I	1043254		M5	T15
66	3	15	60	27	48.0	4	FMZ90 V22.066AN-I	1043255			
80	3	15	60	27	60.0	4	FMZ90 V22.080AN-I	1043256			
100	3	15	65	32	80.0	5	FMZ90 V22.100AN-I	1043257			
125	3	15	70	40	100.0	6	FMZ90 V22.125AN-I	1043258			

d_1	R	l_2	h	d_2	d_5	z	Cutter Body No. (inches)*	Ident No.	Insert	Ident No.	Ident No.
1.50	0.05	0.53	2.12	0.75	1.26	3	FMZ90 V16.150AA-I	1950294	VPGT 160412-ALM	1051312	1048335
2.00	0.05	0.53	2.12	0.75	1.75	4	FMZ90 V16.200AA-I	0053521		M4	T15
2.00	0.12	0.59	2.12	0.75	1.57	3	FMZ90 V22.200AA-I	1950295	VCGT 220530-ALM	1045766	
2.50	0.12	0.59	2.12	0.75	1.750	4	FMZ90 V22.250AA-I	1950296		M5	
2.50	0.12	0.59	2.12	1.00	2.200	4	FMZ90 V22.250	0018680			
3.00	0.12	0.59	2.12	1.00	–	3	FMZ90 V22.300AB-I	0054794			
3.00	0.12	0.59	2.12	1.00	2.36	4	FMZ90 V22.300ABE-I	1950297			
3.00	0.12	0.59	2.12	1.00	2.29	5	FMZ90 V22.300ABF-I	0054781			
4.00	0.12	0.59	2.12	1.50	3.15	5	FMZ90 V22.400AD-I	1950298			

Cutting data recommendations starting page 202

Cutters for Non-Ferrous Metals and Plastics – Indexable Inserts

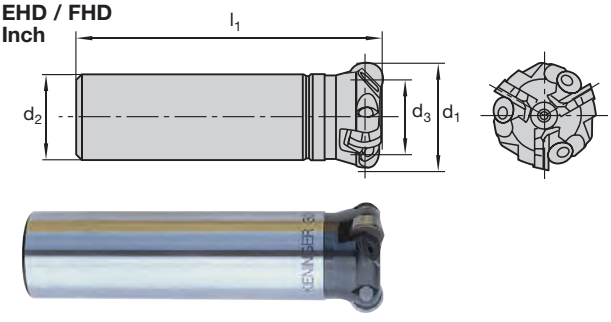
N = Number of cutting edges	l	s	d	d_1	r	ISO-Code Cat-No.	Cutting materials Ident No. LC610T	Cutting materials Ident No. LW610	For cutter Cat-No.
	11.61 (.457)	3.18 (.125)	6.35 (.250)	2.8 (.110)	0.4 (.016)	VPGT110304-ALM (11° Clearance Angle)	1069756	1069755	EMZ90 FMZ90
	16.60 (.654)	4.76 (.187)	9.52 (.375)	4.4 (.173)	1.2 (.047)	VPGT160412-ALM (11° Clearance Angle)	1069758	1069757	
	22.10 (.866)	5.56 (.219)	12.70 (.500)	5.5 (.217)	3.0 (.118)	VCGT220530-ALM (7° Clearance Angle)	1069760	1069759	

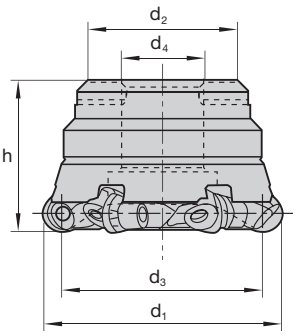
EHD / FHD

Application

- Cutter specifically designed for high-speed contouring and face milling of hardened steels, plastic composites, high silicon aluminum and graphite
- Cutter pocket provides secure insert locking and allows 4 indexes (10mm diameter insert)
- Cutters manufactured with a run-out accuracy of ± .001"
- Inserts are regrindable

EHD / FHD
Inch

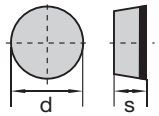




d_1	Cutter Body No.	Indent No.	EDP	Dimensions (inches) d_2	Dimensions (inches) d_4	Dimensions (inches) l_1 / h	No. Teeth	Insert	Insert Screw	Torx Driver
1.00	EHD R10 100 SA	6282262	50296	0.75		3.94	2	R10 10 42 S	18574	89978
1.25	EHD R10 125 SB	6282263	50297	1.00		4.73	3			
1.50	EHD R10 150 SB	6282264	50298	1.00		4.73	4			
2.00	FHD R10 200 AA	6282265	50299		0.75	1.57	5		18575	11171
2.50	FHD R10 250 AA	6282266	50301		0.75	1.57	6			

Cutting data recommendations starting page 204

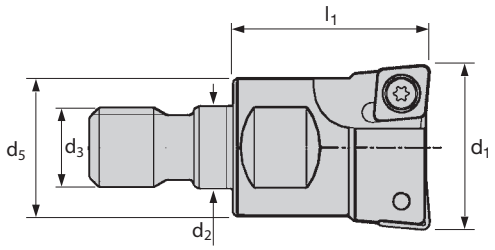
PCD/CBN Copy Face Mills – Inserts

		PCD/CBN	LMT-Code	Ident No.	d [mm]	s [mm]	a [°]
	sharp	PCD	R 10 42 S DP 012	6200038	10.0 (.394)	4.2 (.165)	11
	honed	CBN	R 10 42 SV BN 081	6203893	10.0 (.394)	4.2 (.165)	11
	T-land	CBN	R 10 42 SN BN 081	6203894	10.0 (.394)	4.2 (.165)	11
	T-land and honed	CBN	R 10 42 SN/SV BN 081	6143598	10.0 (.394)	4.2 (.165)	11

PCD/CBN Copy Face Mills – Accessories and Spare Parts

	LMT-Code	EDP	Ident No.	LMT-Code	Ident No.
	MKL 0 02 B	18574	6280026	DS 04 LR 12C Differential setting screw	K200527
	MKL 0 03 B	18575	6200041	DS 05 LR 12 C Differential setting screw	K200528
	T 8, TORX-Screwdriver		6119528		
	T 10, TORX-Screwdriver		6200042		

Screw-in Copy Cutter
Metric



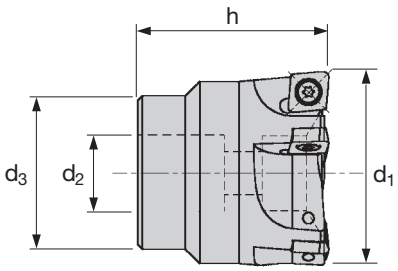


d_1	d_2	d_3	d_5	l_1	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw	Screw-in extension
20	10.5	M10	18	25	2	ECG V08.020TE025-I	6204339	CPHX 080310	SA3075	ADT 10 …
25	12.5	M12	21	25	3	ECG V08.025TF025-I	6204100	CPHX 080310	SA3075	ADT 12 …
32	17.0	M16	29	30	4	ECG V08.032TH030-I	6204101	CPHX 080310	S30L62	ADT 16 …
35	17.0	M16	29	30	4	ECG V08.035TH030-I	6204102	CPHX 080310	SA3075	ADT 16 …
40	17.0	M16	29	30	5	ECG V08.040TH030-I	6204340	CPHX 080310	SA3075	ADT 16 …

See pages 136-139 for Screw-On Shanks

Cutting data recommendations starting page 205

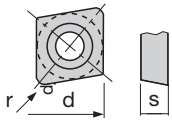
Shell Copy Cutter
Metric



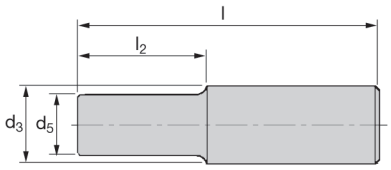

d_1	d_2	d_3	h	z ⚙	Cutter Body No.	Ident No.	Insert	Insert Screw
42	16	32	40	5	FCG V08.42FN040-I	6204341	CPHX 080310	S30L62
52	22	41	40	6	FCG V08.52FN040-I	6204342	CPHX 080310	SA3075
66	27	50	50	7	FCG V08.66FN050-I	6204343	CPHX 080310	S30L62

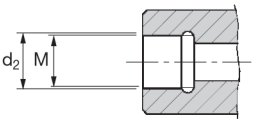
Cutting data recommendations starting page 205

Finish Line Universal Cutter – Inserts

	s	d	r	ISO-Code Cat-No.	Cutting materials Ident No. BN025	LC610Z	LC610Q	Insert LMT-Code	Insert LMT-Code
	3.18 (.125)	7.938 (.312)	1.0 (.039)	CPHX 080310		6204334	6204103	SA 3075	S30L62
	3.18 (.125)	7.938 (.312)	2.0 (.079)	CPHX 080310	6204344				

ADT – Carbide





1)

Thread M	d_2	Shank d_3	d_5	l	l_2	Cutter Body No.	Ident No.
6	6.5	10	9.7	140	53	ADT T06 140 RZ-C	6129285
6	6.5	10	9.7	110	38	ADT T06 110 RZ-C	6129286
6	6.5	12	9.7	162	52	ADT T06 162 RZ-C	6129287
6	6.5	12	9.7	122	37	ADT T06 122 RZ-C	6129288
8	8.5	16	13	177	57	ADT T08 177 RZ-C	6129289
8	8.5	16	13	142	42	ADT T08 142 RZ-C	6129290
10	10.5	20	18	194	78	ADT T10 194 RZ-C	6129291
10	10.5	20	18	144	54	ADT T10 144 RZ-C	6129292
12	12.5	25	21	210	90	ADT T12 210 RZ-C	6129293
12	12.5	25	21	160	60	ADT T12 160 RZ-C	6129294
16	17	32	28	232	99	ADT T16 232 RZ-C	6129295
16	17	32	28	182	59	ADT T16 182 RZ-C	6129296

ADT-THR Straight – Inch Shank

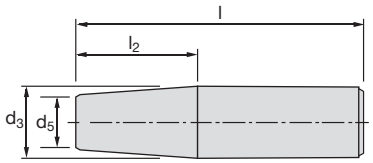
Thread M	d_2	Shank d_3	d_5	l	l_2	Cutter Body No.	Ident No.
6	0.2677	0.3750	0.3740	4.3307	1.4961	ADT T06 110 0375 RZ-C	9111916
6	0.2677	0.3750	0.3740	5.5118	2.0866	ADT T06 140 0375 RZ-C	9111917
6	0.2677	0.5000	0.4331	4.8031	1.4567	ADT T06 122 0500 RZ-C	9111914
6	0.2677	0.5000	0.4331	6.3780	2.0472	ADT T06 162 0500 RZ-C	9111915
8	0.3504	0.6250	0.5433	5.5906	1.6535	ADT T08 142 0625 RZ-C	9111912
8	0.3504	0.6250	0.5433	6.9685	2.2441	ADT T08 177 0625 RZ-C	9111913
10	0.4370	0.7500	0.7087	5.6693	2.1260	ADT T10 144 0750 RZ-C	9111910
10	0.4370	0.7500	0.7087	7.6378	3.0709	ADT T10 194 0750 RZ-C	9111911
12	0.5157	1.0000	0.8898	6.2992	2.3622	ADT T12 160 1000 RZ-C	9111908
12	0.5157	1.0000	0.8898	8.2677	3.5433	ADT T12 210 1000 RZ-C	9111909

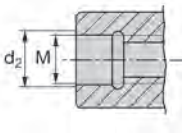
ADT-THR Tapered – Inch Shank

Thread M	d_2	Shank d_3	d_5	l_2	Cutter Body No.	Ident No.
6	0.2677	0.5000	0.3740	3.0315	ADT T06 125 0500 T-C S.C.	9111918
6	0.2677	0.5000	0.3740	5.0000	ADT T06 175 0500 T-C S.C.	9111919
8	0.3504	0.6250	0.4921	3.9370	ADT T08 150 0625 T-C S.C.	9111920
8	0.3504	0.6250	0.4921	4.9213	ADT T08 175 0625 T-C S.C.	9111921
10	0.4370	0.7500	0.6693	3.7008	ADT T10 150 0750 T-C S.C.	9111922
10	0.4370	0.7500	0.6693	5.6693	ADT T10 200 0750 T-C S.C.	9111923
12	0.5157	1.0000	0.7874	4.0945	ADT T12 160 1000 T-C S.C.	9111924
12	0.5157	1.0000	0.7874	6.0630	ADT T12 210 1000 T-C S.C.	9111925

Note: All shanks are h6 tolerance suitable for heat shrinking

ADT – Metric Shank – Heavy Metal





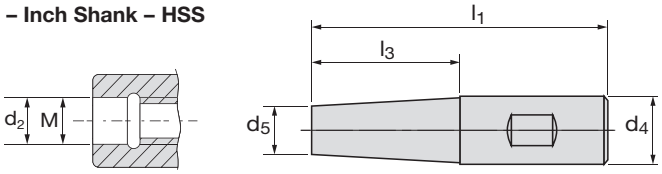
Thread M	d_2	Shank d_3	d_5	l_2	l	LMT-Code	Ident No.
6	6.5	12	10	70	115	ADT T06 070 RZ-H	1460928
6	6.5	12	10	90	135	ADT T06 090 RZ-H	1460967
8	8.5	16	13	110	158	ADT T08 110 RZ-H	1460971
8	8.5	16	13	130	178	ADT T08 130 RZ-H	1460981
10	10.5	20	18	130	180	ADT T10 130 RZ-H	1460984
10	10.5	20	18	150	200	ADT T10 150 RZ-H	1460985

Arbors

Application

- HSS Screw-On Extended Length Arbors

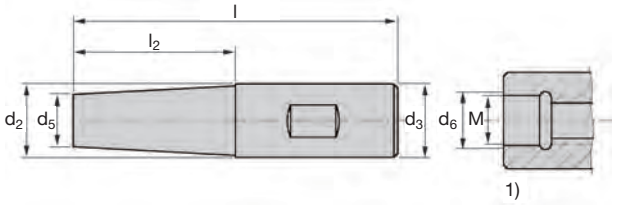
ADT – Inch Shank – HSS



Arbor Description	EDP	Dimensions (inches)						Arbor Description	EDP	Dimensions (inches)					
		M	d_2	d_5	l_3	l_1	d_4			M	d_2	d_5	l_3	l_1	d_4
ADT T08 W1000 6280T	12798	M8	0.32	0.48	4.00	6.28	1.00	ADT T16 W1250 5280T	12806	M16	0.67	1.02	3.00	5.28	1.25
ADT T08 W1250 8280T	12799	M8	0.32	0.48	6.00	8.28	1.25	ADT T16 W1250 7280T	12807	M16	0.67	1.02	5.00	7.28	1.25
ADT T10 W0750 4030T	12800	M10	0.41	0.63	2.00	4.03	0.75	ADT T16 W1250 9280T	12808	M16	0.67	1.02	7.00	9.28	1.25
ADT T10 W1000 6280T	12801	M10	0.41	0.63	4.00	6.28	1.00	ADT T16 W1500 5680T	12809	M16	0.67	1.34	3.00	5.68	1.50
ADT T10 W1250 8280T	12802	M10	0.41	0.63	6.00	8.28	1.25	ADT T16 W1500 7680T	12810	M16	0.67	1.34	5.00	7.68	1.50
ADT T12 W1000 5280T	12803	M12	0.49	0.83	3.00	5.28	1.00	ADT T16 W1500 9680T	12811	M16	0.67	1.34	7.00	9.68	1.50
ADT T12 W1250 7280T	12804	M12	0.49	0.83	5.00	7.28	1.25	ADT T16 W1250 3270T	12812	M16	0.67	1.34	1.00	3.27	1.25
ADT T12 W1250 9280T	12805	M12	0.49	0.83	7.00	9.28	1.25								

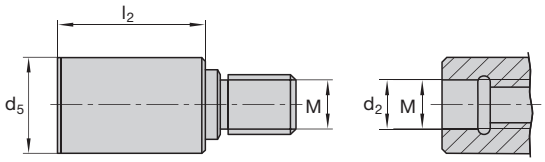
All Inch Arbors are Coolant Thru

ADT – Metric Shank



Thread M	d_6	d_2	d_5	Shank d_3	l_2	l	Cutter Body No.	Ident No.
6	6.5	14	10	16	20	68	ADT T06 068 RZ	1460789
6	6.5	14	10	16	50	98	ADT T06 098 RZ	1460920
6	6.5	18	10	20	75	125	ADT T06 125 RZ	1460922
6	6.5	23	10	25	100	156	ADT T06 156 RZ	1460926
8	8.5	18	13	20	20	70	ADT T08 070 RZ	1460790
8	8.5	18	13	20	50	100	ADT T08 100 RZ	1460929
8	8.5	23	13	25	100	156	ADT T08 156 RZ	1460931
8	8.5	30	13	32	150	210	ADT T08 210 RZ	1460935
10	10.5	18	18	20	20	70	ADT T10 070 RZ	1460791
10	10.5	18	18	20	50	100	ADT T10 100 RZ	1460939
10	10.5	23	18	25	100	156	ADT T10 156 RZ	1460943
10	10.5	30	18	32	150	210	ADT T10 210 RZ	1460945
12	12.5	23	21	25	30	86	ADT T12 086 RZ	1460792
12	12.5	23	21	25	75	135	ADT T12 135 RZ	1460915
12	12.5	30	21	32	125	185	ADT T12 185 RZ	1460917
12	12.5	30	21	32	180	240	ADT T12 240 RZ	1460919
16	17	30	26	32	30	90	ADT T16 090 RZ	1460793
16	17	30	26	32	75	135	ADT T16 135 RZ	1460921
16	17	30	26	32	125	185	ADT T16 185 RZ	1460923
16	17	30	26	32	180	240	ADT T16 240 RZ	1460925

ADT-THR

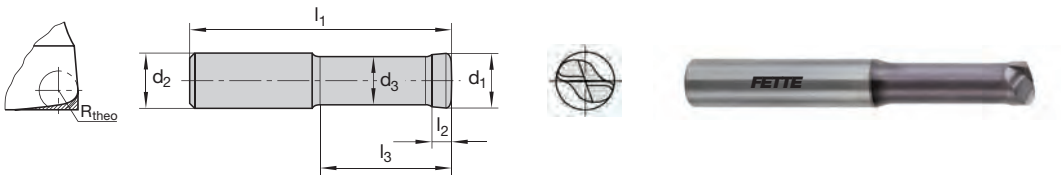


Thread M	d_2	d_5	l_2	Cutter Body No.	Ident No.
6	6.5	9.7	25	ADT T06 025 M06	2412415
8	8.5	13	30	ADT T08 030 M08	2412416
10	10.5	18	35	ADT T10 035 M10	1460983
12	12.5	21	40	ADT T12 040 M12	1460975
16	17	29	40	ADT T16 040 M16	1460977


BILZ
ISG 2200 WK
cool
down
ThermoGrip®
LMT
BILZ
BILZ
3200 ISG
BILZ

Solid Carbide Endmills

Solid Carbide, center cutting
Inch



Cat.-No.	**1430 C**
Type	2Feed HSC
Helix angle	λ = 0°
Straight shank	DIN 6535 HA
Coating	AL2 PLUS
Cutting materials	LC620T

d_1	R_{theo}	l_2	l_1	l_3	d_3	z	d_2 (h6)	$ap_{max.}$	Length	Ident No.
short										
0.187	0.019	0.075	2.00	0.66	0.16	2	0.250	0.009	Short	10388
0.250	0.025	0.104	2.50	0.77	0.21	2	0.250	0.013	Short	10390
0.312	0.031	0.120	2.50	0.94	0.26	2	0.312	0.016	Short	10392
0.375	0.038	0.136	2.50	1.06	0.31	2	0.375	0.019	Short	10394
0.500	0.050	0.167	3.50	1.42	0.42	2	0.500	0.025	Short	10396
extra long										
0.187	0.019	0.075	3.00	1.50	0.16	2	0.250	0.009	Extra Long	10389
0.250	0.025	0.104	3.25	1.75	0.21	2	0.250	0.013	Extra Long	10391
0.312	0.031	0.120	3.50	2.10	0.26	2	0.312	0.016	Extra Long	10393
0.375	0.038	0.136	4.00	2.25	0.31	2	0.375	0.019	Extra Long	10395
0.500	0.050	0.167	4.50	2.50	0.42	2	0.500	0.025	Extra Long	10397

Cutting data recommendations starting on page 206

Application Examples

Material: 4140 Pre-Hard
Hardness: 27-32 HRC

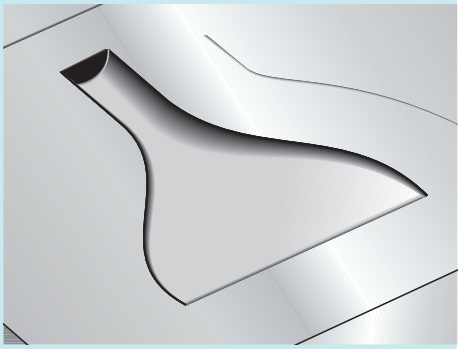
LMT-Fette HSC FEED™ Mill
Cat. Desc. 1430 HSC FEED™ Mill
Ø 1/2" 2 flute
Cutting Material LC620T

Cutting Data
sfm = 1,100
rpm = 9,000
ipt = .030"
ipm = 540
woc = .200"
doc = .024"

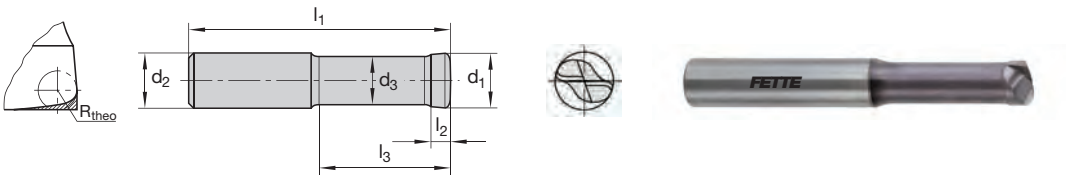
HSC FEED was used instead of a radius end mill for Z-level-roughing of a chissel die.

Feed rate could be doubled to v_f (IPM) = 365, without changing speed of

v_c (SFM) = 492 and tool life was 4 times higher.



Solid Carbide, center cutting
Metric

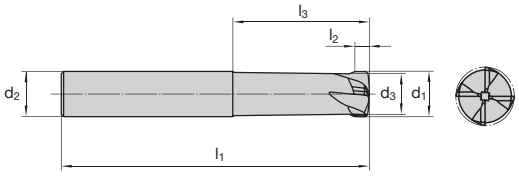


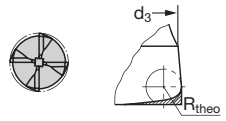
Cat.-No.	**1430 C**
Type	2Feed HSC
Helix angle	λ = 0°
Straight shank	DIN 6535 HA
Coating	AL2 Plus
Cutting materials	LC620T

d_1	R_{theo}	l_2	l_1	l_3	d_3	d_2 (h6)	z	$a_{p\ max.}$	Ident No.
extra short									
1	0.1	0.35	40	2	0.8	3	2	0.05	1300994
2	0.2	0.7	40	4	1.6	4	2	0.1	1300995
3	0.3	1	50	6	2.5	6	2	0.15	1300996
4	0.4	1.5	57	8	3.4	6	2	0.2	1301100
5	0.5	2	57	10	4.2	6	2	0.25	1301101
6	0.6	2.5	57	12	5	6	2	0.3	1301102
8	0.8	3	63	16	6.7	8	2	0.4	1301103
10	1	3.5	72	20	8.5	10	2	0.5	1301104
12	1.2	4	83	24	10	12	2	0.6	1301105
14	1.4	4.5	83	28	11.8	14	2	0.7	1301106
short									
1	0.1	0.35	40	4	0.8	3	2	0.05	1300997
2	0.2	0.7	40	8	1.6	4	2	0.1	1300998
3	0.3	1	57	12	2.5	6	2	0.15	1300999
4	0.4	1.5	57	15	3.4	6	2	0.2	1110170
5	0.5	2	57	17.5	4.2	6	2	0.25	1110171
6	0.6	2.5	57	19	5	6	2	0.3	1110172
8	0.8	3	63	24	6.7	8	2	0.4	1110173
10	1	3.5	72	28.5	8.5	10	2	0.5	1110174
12	1.2	4	83	34	10	12	2	0.6	1110175
16	1.6	5.5	92	39	13.5	16	2	0.8	1110176
20	2	7	104	48	17	20	2	1.0	1110177
long									
4	0.4	1.5	70	24	3.4	6	2	0.2	1300988
5	0.5	2	70	30	4.2	6	2	0.25	1300989
6	0.6	2.5	80	35	5	6	2	0.3	1300990
8	0.8	3	80	40	6.7	8	2	0.4	1300991
10	1	3.5	90	45	8.5	10	2	0.5	1300992
12	1.2	4	100	50	10	12	2	0.6	1300993
extra long									
4	0.4	1.5	80	34	3.4	6	2	0.2	1110180
5	0.5	2	80	37	4.2	6	2	0.25	1110181
6	0.6	2.5	80	42	5	6	2	0.3	1110182
8	0.8	3	90	51	6.7	8	2	0.4	1110183
10	1	3.5	100	56.5	8.5	10	2	0.5	1110184
12	1.2	4	110	61	10	12	2	0.6	1110185
16	1.6	5.5	130	77	13.5	16	2	0.8	1110186
20	2	7	150	94	17	20	2	1.0	1110187

Cutting data recommendations starting on page 206

Solid carbide
center cutting
suitable for NC



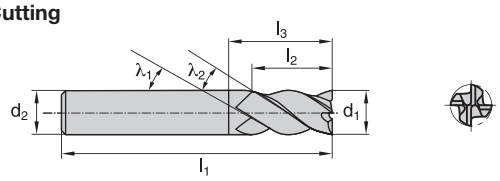


Cat.-No.	**1431 C**
Type	4Feed HSC
Standard	FETTE Standard
Helix angle	λ = 0°
Shank design	DIN 6535 HA
Coating	Nanosphere Red
Cutting material	LC620ZM

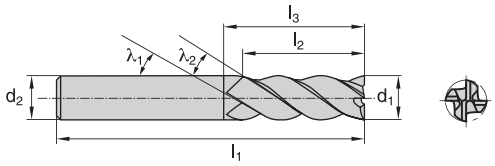
d_1h10	R_{theo}	l_2	l_1	l_3	d_3	d_2 h6	z	$a_{p\ max}$	Ident No.
extra short									
4	0.4	1.5	57	8	3.55	6	4	0.2	9207993
5	0.5	2	57	10	4.4	6	4	0.25	9207994
6	0.6	2.5	57	12	5.3	6	4	0.3	9207995
8	0.8	3	63	16	7.1	8	4	0.4	9207996
10	1	3.5	72	20	8.9	10	4	0.5	9207997
12	1.2	4	83	24	10.7	12	4	0.6	9207998
short									
4	0.4	1.5	57	15	3.55	6	4	0.2	9207999
5	0.5	2	57	17.5	4.4	6	4	0.25	9208000
6	0.6	2.5	57	19	5.3	6	4	0.3	9208002
8	0.8	3	63	24	7.1	8	4	0.4	9208003
10	1	3.5	72	28.5	8.9	10	4	0.5	9208004
12	1.2	4	83	34	10.7	12	4	0.6	9208005
long									
6	0.6	2.5	80	35	5.3	6	4	0.3	9208006
8	0.8	3	80	40	7.1	8	4	0.4	9208007
10	1	3.5	90	45	8.9	10	4	0.5	9208008
12	1.2	4	100	50	10.7	12	4	0.6	9208009

Cutting data recommendations starting on page 206

Solid Carbide
Center Cutting



z = 4 teeth



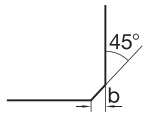
z = 4 teeth

Cat.-No.	**1521C**
Type	DHC
Standard	DIN 6527 A / DIN 6528
Helix angle	λ_1 / λ_2 = 35° / 38°
Straight shank	DIN 6535 HA (Cylindrical)
Coating	AL2 Plus (TiAlN)
Cutting materials	LC630T
Special features	Edge protection chamfer or corner radius

d_1	Std Cutter EDP #	.015" Radius EDP #	.030" Radius EDP #	.060" Radius EDP #	d2 (h6)	l_1	l_2	l_3
short								
0.187 (3/16)	**9166725**	7000709*	7000710*	–	0.187 (3/16)	2.00	0.375	0.630
0.250 (1/4)	**9166814**	7000713*	7000714*	–	0.250 (1/4)	2.00	0.500	0.709
0.375 (3/8)	**9166816**	7000714*	7000718*	–	0.375 (3/8)	2.00	0.625	0.906
0.500 (1/2)	**9166818**	7000721*	7000722*	7016081*	0.500 (1/2)	2.50	0.625	1.000
0.625 (5/8)	**9166819**	7016083*	7000725*	7000726*	0.625 (5/8)	3.00	0.750	1.181
0.750 (3/4)	**9166820**	7016085*	7000729*	7000730*	0.750 (3/4)	3.00	1.000	1.260
long								
0.187 (3/16)	**9166824**	7000711*	7000712*	–	0.187 (3/16)	2.00	0.500	0.787
0.250 (1/4)	**9166828**	7000715*	7000716*	–	0.250 (1/4)	2.50	0.625	1.024
0.375 (3/8)	**9166831**	**7000719**	**7000720**	–	0.375 (3/8)	2.50	1.000	1.181
0.500 (1/2)	**9166832**	7000723*	**7000724**	**7012673**	0.500 (1/2)	3.00	1.000	1.378
0.625 (5/8)	**9166833**	7016087*	7000727*	7000728*	0.625 (5/8)	3.50	1.250	1.732
0.750 (3/4)	**9166835**	7016088*	**7000731**	**7000732**	0.750 (3/4)	4.00	1.500	2.126

*Note: Check for availability

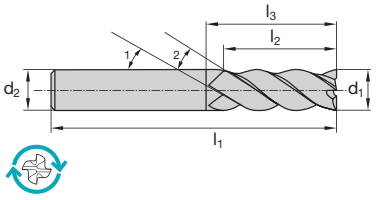
Edge protection chamfer (Standard Cutters)



d_1	b
0.187	0.004
0.250–0.500	0.008
0.625–0.750	0.012

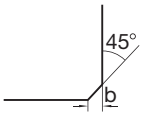
For DHC Endmills See pages 146-147

Solid carbide, center cutting
Metric



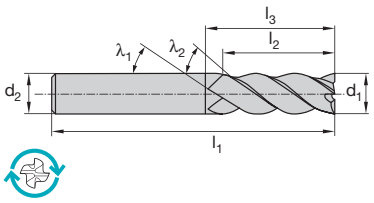
Cat.-No.					1521 C	1522 C
Type					DHC	
Standard					DIN 6527 A / DIN 6528	DIN 6527 B
Helix angle					λ_1 / λ_2 = 35° / 38°	
Shank design					DIN 6535 HA	DIN 6535 HB
Coating					AL2 Plus	
Cutting material					LC630T	
Special features					Edge protection chamfer	
d_1 h10	**l_2**	**l_1**	**l_3**	**d_2 (h6)**	**Ident No.**	**Ident No.**
short						
4	5	54	8	6	1190000	1190010
5	6	54	10	6	1190001	1190011
6	7	54	16	6	1190002	1190012
8	9	58	20	8	1190003	1190013
10	11	66	24	10	1190004	1190014
12	12	73	26	12	1190005	1190015
14	14	75	28	14	1190006	1190016
16	16	82	32	16	1190007	1190017
18	18	84	34	18	1190008	1190018
20	20	92	40	20	1190009	1190019
long						
4	8	54	12	6	1110700	1110705
5	10	54	15	6	1110701	1110706
6	13	57	21	6	1110223	1110231
8	19	63	27	8	1110224	1110232
10	22	72	32	10	1110225	1110233
12	26	83	38	12	1110226	1110234
14	26	83	38	14	1110227	1110235
16	32	92	44	16	1110228	1110236
18	34	92	44	18	1110229	1110237
20	38	104	54	20	1110230	1110238

Cutting data recommendations starting page 208

Edge protection chamfer		
	d_1	**b**
	4 5 6 - 12 14 - 20	0.1 0.15 0.2 0.3

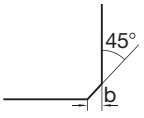
INOX design suited for Stainless Steel and Titanium

Solid carbide, center cutting
Metric

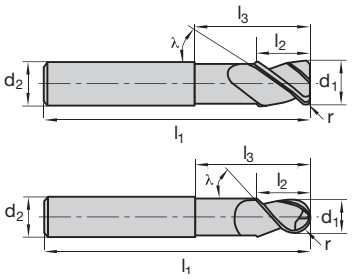


Cat.-No.					1525 C	1565 C
Type					DHC INOX	
Standard					DIN 6527 A / DIN 6528	DIN 6527 B
Helix angle					λ_1 / λ_2 = 41° / 44°	
Shank design					DIN 6535 HA	DIN 6535 HB
Coating					AL2 Plus	
Cutting material					LC630T	
Special features					Edge protection chamfer	
d_1 h10	**l_2**	**l_1**	**l_3**	**d_2** (h6)	**Ident No.**	**Ident No.**
short						
4	5	54	8	6	9097019	9097052
5	6	54	10	6	9097020	9097053
6	7	54	12	6	9097021	9097054
8	9	58	16	8	9097022	9097055
10	11	66	20	10	9097023	9097056
12	12	73	24	12	9097024	9097057
14	14	75	28	14	9097025	9097058
16	16	82	32	16	9097026	9097059
18	18	84	36	18	9097027	9097060
20	20	92	40	20	9097028	9097061
long						
4	8	54	12	6	9096396	9096407
5	10	54	15	6	9096397	9096408
6	13	57	21	6	9096398	9096409
8	19	63	27	8	9096399	9096410
10	22	72	32	10	9096401	9096412
12	26	83	38	12	9096402	9096413
14	26	83	38	14	9096403	9096414
16	32	92	44	16	9096404	9096415
18	32	92	44	18	9096405	9096416
20	38	104	54	20	9096406	9096417

Cutting data recommendations starting page 208

Edge protection chamfer		
	d_1	**b**
	4 5 6 - 12 14 - 20	0.1 0.15 0.2 0.3

Solid Carbide, center cutting
Metric



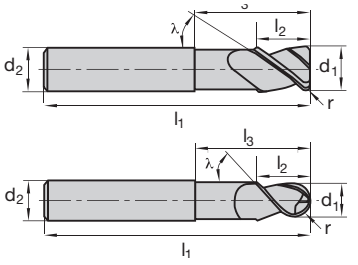
1410 C

1412 C

LMT-Code						**1410 C**			**1412 C**		
Helix angle						λ= 20°			λ= 20°		
Straight shank						DIN 6535 HA			DIN 6535 HA		
Cutting material						LC620T			LC620T		
d_1	**l_2**	**l_1**	**l_3**	**d_2 (h6)**	**z**	**r**	**Cat. No.**	**Ident No.**	**r**	**Cat. No.**	**Ident No.**
1	1.5	38	2.7	3	2	0.2	1410 C	1122314	0.5	1412 C	1122452
2	2	50	3.6	6	2	0.3	1410 C	1122326	1	1412 C	1122464
3	3	50	5.5	6	2	0.4	1410 C	1122338	1.5	1412 C	1122477
4	4	57	14.5	6	2	0.5	1410 C	1122350	2	1412 C	1122490
4	4	57	14.5	6	2	1	1410 C	1110039	-	-	-
5	5	57	21	6	2	0.5	1410 C	1110040	2.5	1412 C	1122502
5	5	57	21	6	2	0.6	1410 C	1122362	-	-	-
5	5	57	21	6	2	1	1410 C	1110041	-	-	-
6	6	57	21	6	2	0.3	1410 C	1110188	3	1412 C	1122526
6	6	57	21	6	2	0.5	1410 C	1110042	-	-	-
6	6	57	21	6	2	0.8	1410 C	1122374	-	-	-
6	6	57	21	6	2	1	1410 C	1110044	-	-	-
8	8	63	27	8	2	-	-	-	4	1412 C	1122538
8	8	63	27	8	3	0.3	1410 C	1110190	-	-	-
8	8	63	27	8	3	1	1410 C	1122386	-	-	-
8	8	63	27	8	3	1.5	1410 C	1110045	-	-	-
8	8	63	27	8	3	2	1410 C	1110046	-	-	-
10	10	72	32	10	2	-	-	-	5	1412 C	1122550
10	10	72	32	10	3	0.5	1410 C	1110192	-	-	-
10	10	72	32	10	3	1	1410 C	1110047	-	-	-
10	10	72	32	10	3	1.3	1410 C	1122398	-	-	-
10	10	72	32	10	3	1.5	1410 C	1110048	-	-	-
10	10	72	32	10	3	2	1410 C	1110049	-	-	-
12	12	83	38	12	2	-	-	-	6	1412 C	1122562
12	12	83	38	12	3	0.5	1410 C	1110194	-	-	-
12	12	83	38	12	3	1	1410 C	1110050	-	-	-
12	12	83	38	12	3	1.5	1410 C	1110051	-	-	-
12	12	83	38	12	3	1.6	1410 C	1122411	-	-	-
12	12	83	38	12	3	2	1410 C	1110053	-	-	-
16	16	92	44	16	4	2	1410 C	1122425	8	1412 C	1122574
20	20	104	54	20	4	2	1410 C	1110197	-	-	-
20	20	104	54	20	4	2.5	1410 C	1122438	10	1412 C	1122587

Cutting data recommendations starting on page 210

Solid Carbide, center cutting
Metric



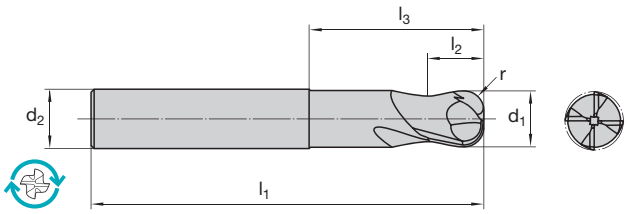
1450 C

1451 C

LMT-Code						**1450 C**			**1451 C**		
Helix angle						λ= 20°			λ= 20°		
Straight shank						DIN 6535 HA			DIN 6535 HA		
Cutting material						LC620T			LC620T		
d_1	**l_2**	**l_1**	**l_3**	**d_2 (h6)**	**z**	**r**	**Cat. No.**	**Ident No.**	**r**	**Cat. No.**	**Ident No.**
4	4	80	19	6	4	0.5	1450 C	1301235	2	1451 C	1301253
4	4	80	19	6	4	1	1450 C	1301236	-	-	-
4	4	80	19	6	2	-	-	-	2	1451 C	1301254
5	5	80	44	6	4	0.5	1450 C	1301237	2.5	1451 C	1301255
5	5	80	44	6	4	1	-	1301238	-	-	-
5	5	80	44	6	2	-	-	-	2.5	1451 C	1301256
6	6	80	44	6	4	0.5	1450 C	1301239	3	1451 C	1301257
6	6	80	44	6	4	1	1450 C	1301240	-	-	-
6	6	80	44	6	2	-	-	-	3	1451 C	1301258
8	8	90	54	8	4	0.5	1450 C	1301241	4	1451 C	1301259
8	8	90	54	8	4	1	1450 C	1301242	-	-	-
8	8	90	54	8	4	1.5	1450 C	1301243	-	-	-
8	8	90	54	8	4	2	1450 C	1301244	-	-	-
8	8	90	54	8	2	-	-	-	4	1451 C	1301260
10	10	100	60	10	4	0.5	1450 C	1301245	5	1451 C	1301261
10	10	100	60	10	4	1	1450 C	1301246	-	-	-
10	10	100	60	10	4	1.5	1450 C	1301247	-	-	-
10	10	100	60	10	4	2	1450 C	1301248	-	-	-
10	10	100	60	10	2	-	-	-	5	1451 C	1301262
12	12	110	65	12	4	0.5	1450 C	1301249	-	-	-
12	12	110	65	12	4	1	1450 C	1301250	-	-	-
12	12	110	65	12	4	1.5	1450 C	1301251	-	-	-
12	12	110	65	12	4	2	1450 C	1301252	-	-	-
12	12	110	65	12	2	-	-	-	6	1451 C	1301263

Cutting data recommendations starting on page 210

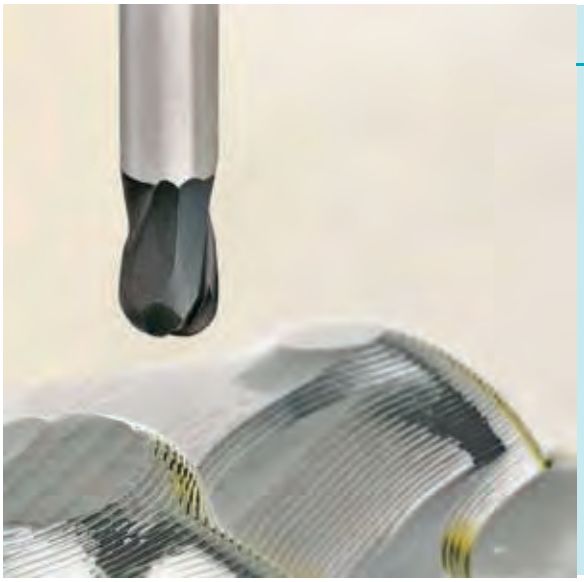
Solid carbide, center cutting
Metric



Cat.-No.	**1400 C**
Type	N
Standard	Werknorm FETTE Standard
Helix angle	20°
Shank design	DIN 6535 HA
Coating	AL6
Cutting material[1)]	LC620Q
Special features	–

d_1 h7	d_1 h10	r ±0.01	l_2	l_1	l_3	d_2 (h5)	z ☼	Ident No.
short								
	4	1.5	4	57	14	6	2	9123725
	5	2	5	57	17	6	2	9123726
	6	2	6	57	21	6	2	9123727
	8	3	8	63	27	8	2	9123728
	10	4	10	72	32	10	2	9123729
	12	5	12	83	38	12	2	9123730
long								
	6	2	6	80	44	6	2	9123785
	8	3	8	90	54	8	2	9123787
	10	4	10	100	60	10	2	9123788
	12	5	12	110	65	12	2	9123790
long reinforced								
6		2	6	90	27	8	2	9123794
8		3	8	100	32	10	2	9123795
10		4	10	110	35	12	2	9123796
12		5	12	130	37	16	2	9123797

Cutting data recommendations starting on page 214



Form for wheels

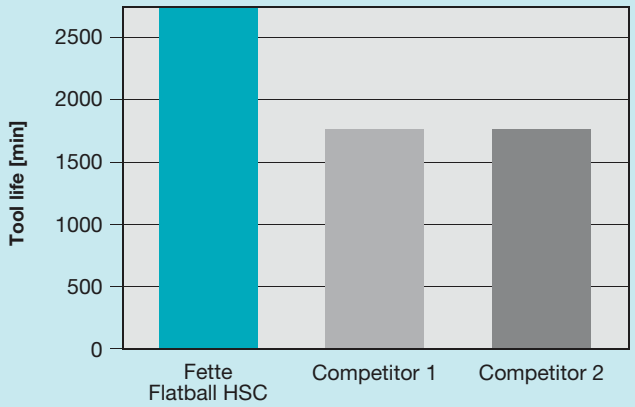
Material:
St52

Tool:
Cat.-No. 1400 C (Flatball HSC)
d_1 = 12 mm (.472" Dia.)

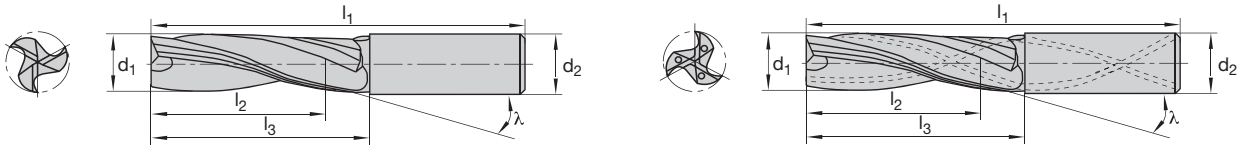
Cutting material:
LC620T

Surface:
Finishing

Cutting data	Fette Flatball HSC	Competitor 1	Competitor 2
Number of teeth	2	3	4
v_c	252 m/min (827 SFM)	252 m/min (827 SFM)	252 m/min (827 SFM)
n	9500 1/min (6687 RPM)	9500 1/min (6687 RPM)	9500 1/min (6687 RPM)
f_z	0.26 mm (.010" FPT)	0.17 mm (.007" FPT)	0.13 mm (.005" FPT)
v_f	5000 mm/min (196 IPM)	5000 mm/min (196 IPM)	5000 mm/min (196 IPM)
a_e	0.3–0.6 mm (.012"-.024" WOC)	0.3–0.6 mm (.012"-.024" WOC)	0.3–0.6 mm (.012"-.024" WOC)
a_p	0.3 mm (.012" DOC)	0.3 mm (.012" DOC)	0.3 mm (.012" DOC)
Cutting time	2100 min	2100 min	2100 min
Tool life [min]	2800	1800	1800
Surface quality	good	bad	bad; tool starts to generale vibrations after machining ¾ of part only



Solid carbide, center cutting,
Super-fine grain type
Inch

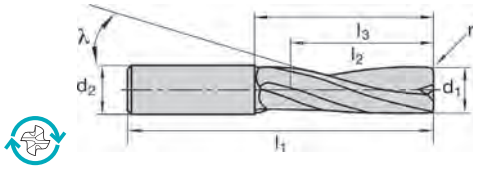


Cat. No.	1571
Primary Application	Aluminum/Thermoplastics
Type	SH
Standard	DIN 6527 A
Helix Angle	λ = 30°
Straight Shank	Yes
Coating	–
Cutting Materials	LW630

d_1h10	r ± 0.01	l_2	l_1	l_3	d_2h6	z ☼	Ident No.	Ident No. internal coolant
LW630								
0.250	0.004	0.625	2.500	0.812	0.250	2	–	0053756
0.375	0.004	0.857	3.000	1.250	0.375	2	–	0053720
0.500	0.004	1.125	3.500	1.500	0.500	3	–	0053721
0.625	0.004	1.250	4.000	1.750	0.625	3	–	0053722
0.750	0.004	1.500	4.000	2.125	0.750	3	–	0053723
1.000	0.004	2.000	4.000	2.750	1.000	3	–	0053734
0.250	0.004	0.625	2.500	0.812	0.250	2	0053725	–
0.375	0.004	0.857	3.000	1.250	0.375	2	0053726	–
0.500	0.004	1.125	3.500	1.500	0.500	3	0053727	–
0.625	0.004	1.250	4.000	1.750	0.625	3	0053728	–
0.750	0.004	1.500	4.000	2.125	0.750	3	0053729	–
1.000	0.004	2.000	4.000	2.750	1.000	3	0053730	–
LC630T								
0.250	0.004	0.625	2.500	0.812	0.250	2	–	0053731
0.375	0.004	0.857	3.000	1.250	0.375	2	–	0053732
0.500	0.004	1.125	3.500	1.500	0.500	3	–	0053733
0.625	0.004	1.250	4.000	1.750	0.625	3	–	0053734
0.750	0.004	1.500	4.000	2.125	0.750	3	–	0053735
1.000	0.004	2.000	4.000	2.750	1.000	3	–	0053736
0.250	0.004	0.625	2.500	0.812	0.250	2	0053737	–
0.375	0.004	0.857	3.000	1.250	0.375	2	0053738	–
0.500	0.004	1.125	3.500	1.500	0.500	3	0053739	–
0.625	0.004	1.250	4.000	1.750	0.625	3	0053740	–
0.750	0.004	1.500	4.000	2.125	0.750	3	0053741	–
1.000	0.004	2.000	4.000	2.750	1.000	3	0053742	–

Cutting data recommendations starting on page 215

Solid carbide, center cutting,
Super-fine grain type
Metric

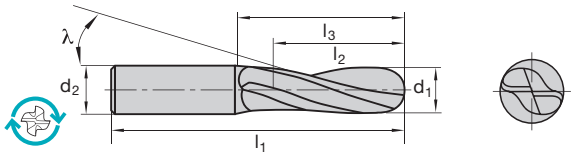


Cat.-No.	1436	1437
Type	SH	
Standard	DIN 6527 A/B	
Helix angle	λ = 20° R. H. Spiral	
Shank design	DIN 6535 HA	DIN 6535 HB
Coating	–	
Cutting material[1)]	LW630	
Special features	for Aluminium/Thermoplastics machining	

d_1 h10	r ±0.01	l_2	l_1	l_3	d_2 h6	z ☼	Ident No.	Ident No.
4	0.5	11	57	21	6	2	1110900	1110930
4	1	11	57	21	6	2	1110901	1110931
5	0.5	13	57	21	6	2	1110902	1110932
5	1	13	57	21	6	2	1110903	1110933
6	0.5	13	57	21	6	2	1110904	1110934
6	1	13	57	21	6	2	1110905	1110935
8	0.5	19	63	27	8	2	1110906	1110936
8	1	19	63	27	8	2	1110907	1110937
8	1.5	19	63	27	8	2	1110908	1110938
10	1	22	72	32	10	2	1110909	1110939
10	1.5	22	72	32	10	2	1110910	1110940
10	2	22	72	32	10	2	1110911	1110941
12	1	26	83	38	12	3	1110912	1110942
12	1.5	26	83	38	12	3	1110913	1110943
12	2	26	83	38	12	3	1110914	1110944
14	1	26	83	38	14	3	1110915	1110945
14	2	26	83	38	14	3	1110916	1110946
14	4	26	83	38	14	3	1110917	1110947
16	1	32	82	44	16	3	1110918	1110948
16	2	32	82	44	16	3	1110919	1110949
16	4	32	82	44	16	3	1110920	1110950
18	1	32	92	44	18	3	1110921	1110951
18	2	32	92	44	18	3	1110922	1110952
18	4	32	92	44	18	3	1110923	1110953
20	1	38	104	54	20	3	1110924	1110954
20	2	38	104	54	20	3	1110925	1110955
20	4	38	104	54	20	3	1110926	1110956
25	1	45	121	65	25	3	1110927	1110957
25	2	45	121	65	25	3	1110928	1110958
25	4	45	121	65	25	3	1110929	1110959

Cutting data recommendations starting on page 215

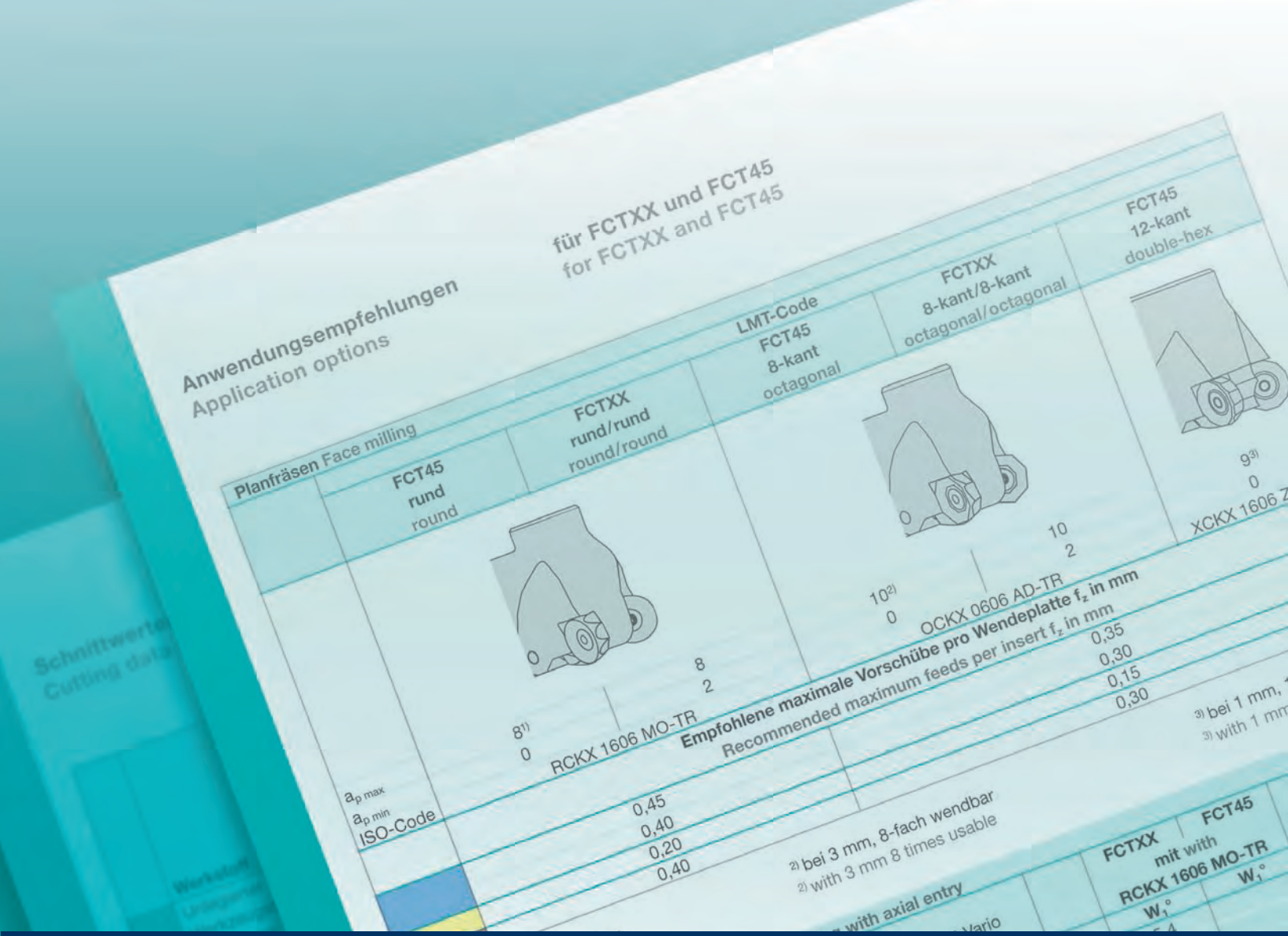
Solid carbide, center cutting,
Super-fine grain type
Metric



Cat.-No.	1434	1435
Type	SH	
Standard	DIN 6527 A/B	
Helix angle	λ = 30° R. H. Spiral	
Shank design	DIN 6535 HA	DIN 6535 HB
Coating	–	
Cutting material[1)]	LW630	
Special features	for Aluminium/Thermoplastics machining	

d_1 e8	l_2	l_1	l_3	d_2 h6	z ✿	Ident No.	Ident No.
long							
4	4	57	17	6	2	1110559	1110579
5	5	57	18	6	2	1110560	1110580
6	6	57	19	6	2	1110561	1110581
8	8	63	25	8	2	1110562	1110582
10	10	72	30	10	2	1110563	1110583
12	12	83	36	12	2	1110564	1110584
14	14	83	36	14	2	1110565	1110585
16	16	82	42	16	2	1110566	1110586
18	18	92	42	18	2	1110567	1110587
20	20	104	54	20	2	1110568	1110588
extra long							
4	4	80	28	6	2	1110569	1110589
5	5	80	29	6	2	1110570	1110590
6	6	80	30	6	2	1110571	1110591
8	8	90	44	8	2	1110572	1110592
10	10	100	53	10	2	1110573	1110593
12	12	110	63	12	2	1110574	1110594
14	14	110	63	14	2	1110575	1110595
16	16	130	73	16	2	1110576	1110596
18	18	130	73	18	2	1110577	1110597
20	20	150	89	20	2	1110578	1110598

Cutting data recommendations starting on page 215



Technical Data

ISO Example

S E K N

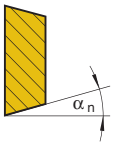
1 2 3 4

1 Insert Shape

A	85°
B	82°
C	80°
D	55°
E	75°
H	120°
K	55°
L	90°
M	86°
O	135°
P	108°
R	
S	90°
T	60°
V	35°
W	80°

Note 1: In case of more than one angle, always use smallest angle.

2 Clearance Angle

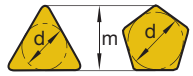


	α_n
A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
O	Normal clearance angles, which require a special description.

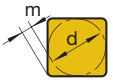
3

Tolerances (inches)

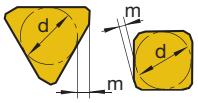
	m	s	d
A	±0.0002	±0.001	±0.001
C	±0.0005		
E	±0.001		
F	±0.0002		±0.0005
G	±0.001	±0.005	±0.001
H	±0.0005	±0.001	±0.0005
J	±0.0002		See Table 5
K	±0.0005		
L	±0.001		
M	See Table 4	±0.005	
N		±0.001	
U		±0.005	



Corner rounding, uneven number of sides



Corner rounding, even number of sides



Chamfered inserts

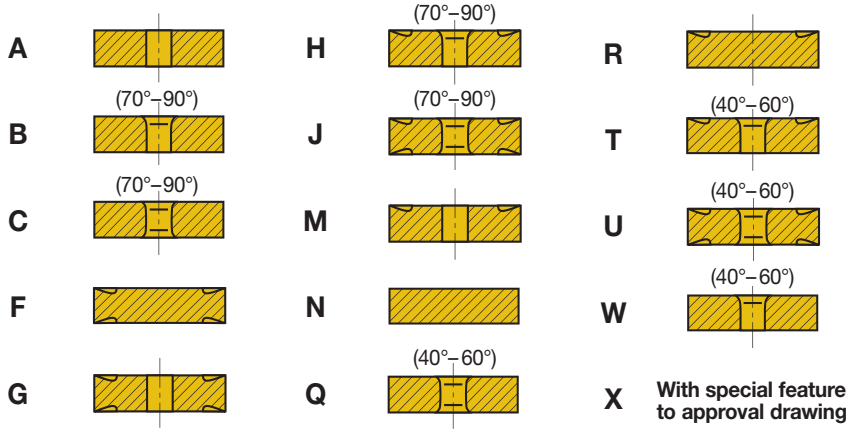
Table 4-m

d		M, N	U
Over .154	**Up to .394**	±0.003	±0.005
.394	.590	±0.005	±0.008
.590	.787	±0.006	±0.011
.787	1.024	±0.007	±0.015
1.024	1.260	±0.008	±0.015

Table 5-d

d		J, K, L, M	U
Over .154	**Up to .394**	±0.002	±0.003
.394	.590	±0.003	±0.005
.590	.787	±0.004	±0.007
.787	1.024	±0.005	±0.001
1.024	1.260	±0.006	±0.001

4 Cutting Face, Clamp Style



With special feature to approval drawing

( ) Cone angle for screw

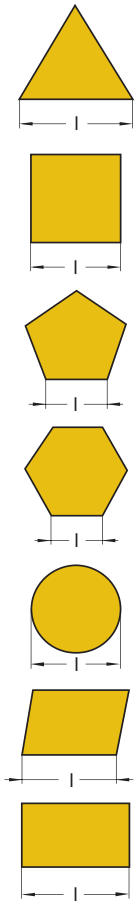
12 03 AF S N

5 6 7 8 9

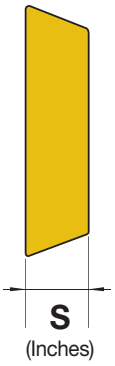
5 Cutting Edge Length

l = Length

	l
06	.250
07	.312
09	.375
11	.433
12	.500
15	.625
16	.649
19	.750
22	.866
25	1.00
31	1.25
38	1.50



6 Thickness

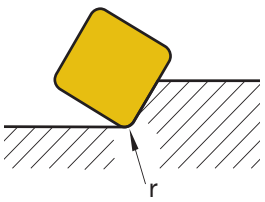


S (Inches)

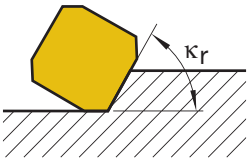
02	.094
03	.125
T3	.156
04	.187
05	.219
06	.250
07	.312
08	.315
09	.375

7 A Cutting Edge Corner

Radius inserts



For chamfer face milling inserts



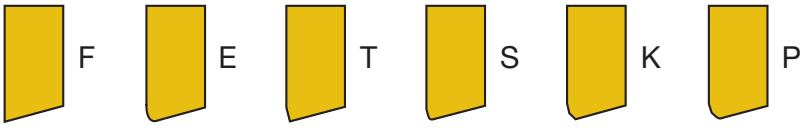
	Corner radius-r (Inches)
00	sharp-edged
02	0.007
04	0.015
08	0.031
12	0.047
16	0.062
20	0.078

	Approach angle κ_r
A	45°
D	60°
E	75°
F	85°
P	90°
Z	Special

7 B

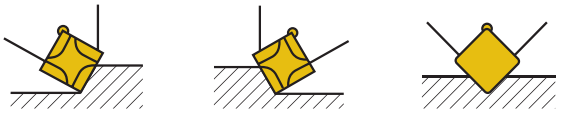
A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
O	Clearance of face milling edge

8 Cutting Edge Corner*



F	E	T	S	K	P
Sharp-edged	Rounded	Chamfered	Chamfered and Rounded	Doubled Chamfered	Double Chamfered and Rounded

9 Direction of Cut*



R RH cut only

L LH cut only

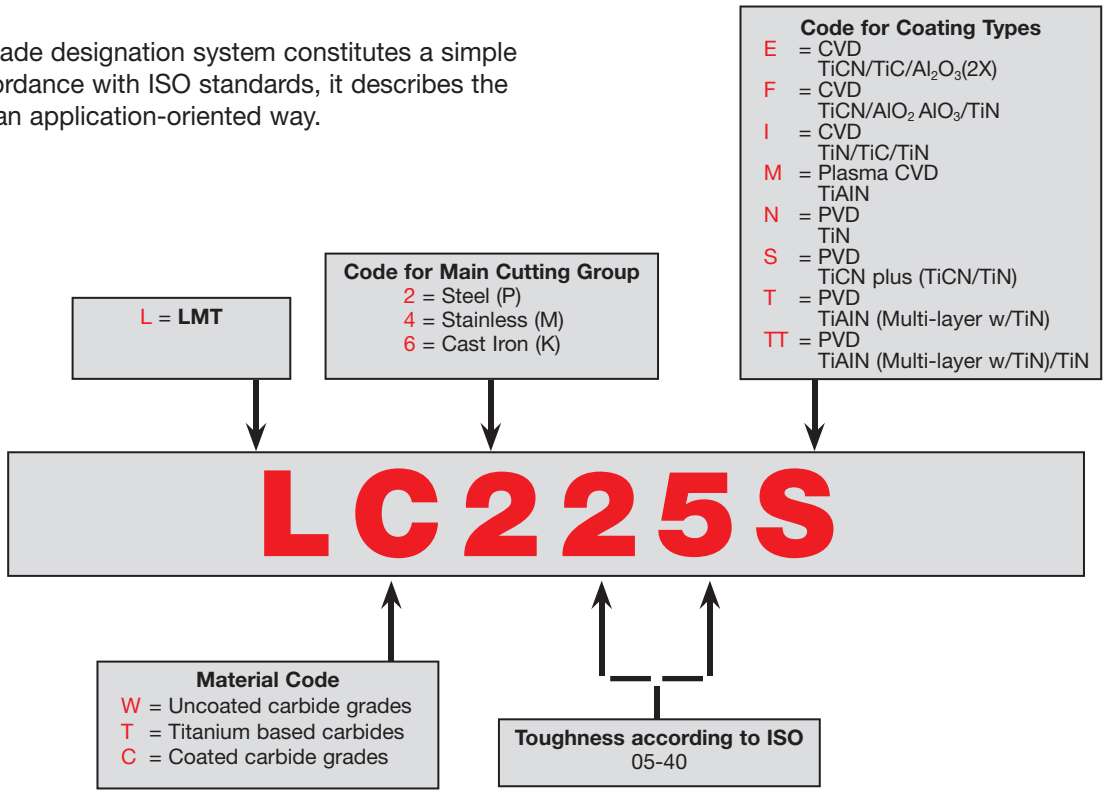
N RH and LH cut

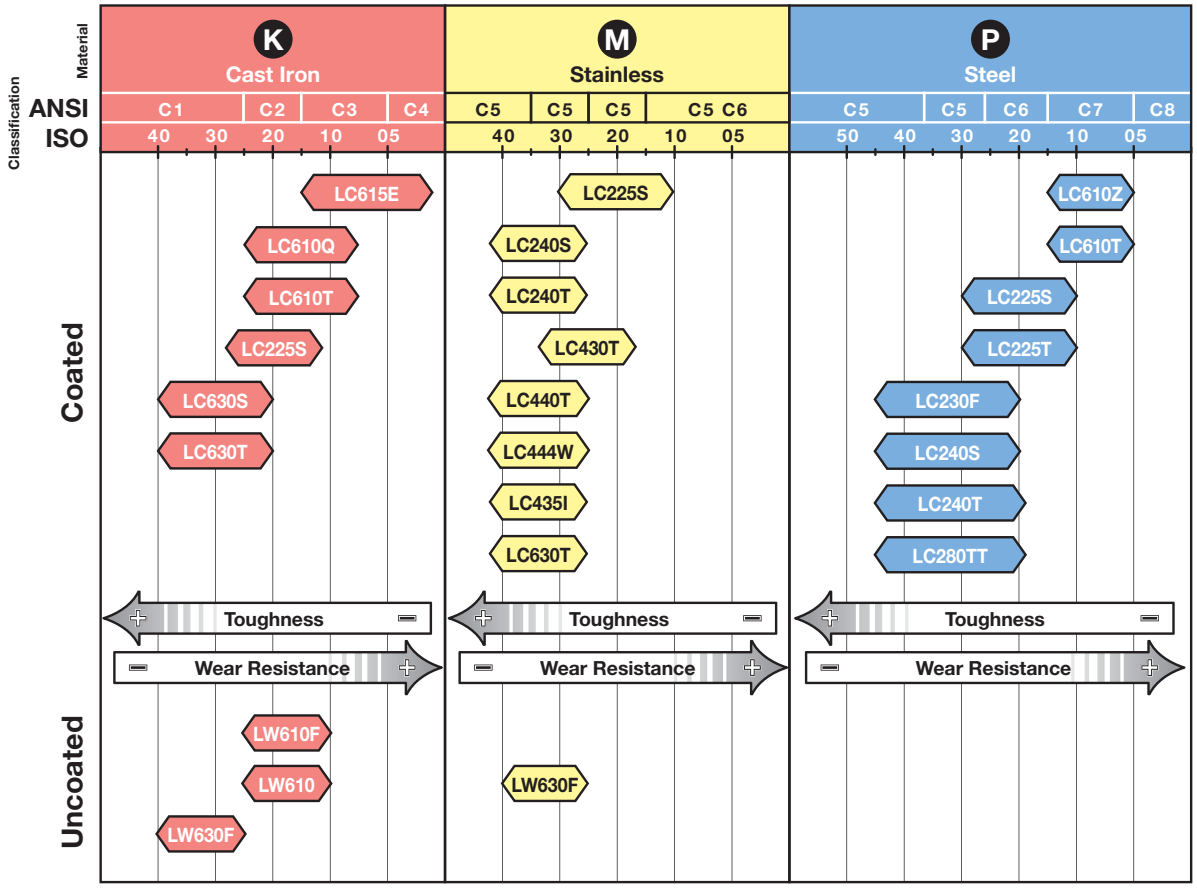
*This reference letter is not always used

Cutting material grades	Description of cutting materials for mold and die industry
LC225S	HC-P25 PVD-TiCN Plus coated Highly wear-resistant multiple-application grade with high toughness For wet and dry milling of steel, stainless cast steel and cast iron High cutting speeds Low to medium cut depths Low to medium chip load
LC225T	HC-P25 PVD TiAlN Al2Plus coated Highly wear-resistant multiple-application grade with high toughness For wet and dry milling of steel, cast steel and cast iron High cutting speeds Low to medium depths of cut Low to medium chip load
LC230F	The very tough carbide substrate guarantees this universal steel milling grade's high machining security for a from soft gummy carbon steels to alloy tool steels and alternative for Austenitic Stainless. A modern MT-CVD multilayer Al_2O_3 – coating ensures dry machining. An outer TiN layer makes wet machining also possible.
LC240S	HC-P40 PVD TiCN Plus coated Wear-resistant grade with high toughness for wet and dry milling of steel, stainless steel, cast steel and cast iron Medium cutting speeds Medium to high chip load
LC240T	HC-P40 PVD TiAlN Al2Plus coated Wear-resistant grade with high toughness, for wet and in particular dry milling of steel, cast steel and cast iron Medium to high cutting speeds Medium to high load
LC280QN	HC-P40 PVD TiAlN Al2Plus/TiN double coated Wear-resistant grade with high toughness and particularly stable micro-geometry, for wet and particular dry milling of steel and cast steel, unstable conditions Medium to high cutting speeds Highest chip load High chip load
LC603Z	HC-K03 PVD-TiAlN AlX coated Extremely wear-resistant grade, particularly suitable for finishing of cold and hot forming tool steel. Suitable for hard machining. Also suitable for cast iron and non-ferrous metals High cutting speeds. Low chip-forming cross-sections Low to medium chip load
LC610A	HC-K10 CVD diamond coated Diamond-coated carbide for graphite machining suitable for roughing and finishing, can be used for 3- and 5-axis as well as for high speed cutting
LC610Q	HC-K 10 PVD- AL Cr N coated Highly wear-resistant coated milling grad with high cutting edge stability for fine machining alloyed and unalloyed tool steels. High stability and wear-resistance specifically by high temperatures. Suitable for dry machining and high speed cutting up to 54 HRC. Low to medium depths of cut Low to medium chip load
LC610Z	HC-K 10 fine-grain PVD TiAlN AlX coated Highly wear-resistant grade with high toughness for wet and dry machining of steel, cast steel, cast iron and non-ferrous metals. Especially suitable for hard machining of materials > 56 HRC
LC610W	HC-K 10 PVD TiCN coated Highly wear-resistant coated milling grade with high cutting edge stability for fine machining of alloyed and unalloyed tool steels, high-strength materials and cast iron at medium cutting speeds. Low to medium depths of cut Low to medium chip load
LC610T	HC-K 10 PVD TiAlN Al2Plus coated Highly wear-resistant coated milling grade with high cutting edge stability for fine machining of alloyed and unalloyed tool steels, high-strength materials, non-ferrous metals and cast iron at high cutting speeds. Low to medium depths of cut Low to medium chip load

Cutting material grades	Description of cutting materials for mold and die industry
LC620T	HC-K20 fine-grain PVD TiAlN Al2Plus coated Highly wear-resistant grade with high toughness for wet and dry machining of steel, cast steel, cast iron and non-ferrous metals. Suitable also for hard machining Medium to high cutting speeds Medium depths of cut, Medium tooth feeds
LC620Z	HC-K20 fine-grain PVD TiAlN AlX coated Highly wear-resistant grade with high toughness for wet and dry machining of steel, cast steel, cast iron and non-ferrous metals. Suitable also for hard machining Medium to high cutting speeds Medium depths of cut, Medium chip load
LC630T	HC-K30 TiAlN AL2Plus coated Highly wear-resistant milling grade with high cutting edge stability for machining of alloyed and unalloyed tool steels, high-strength materials, stainless steels and cast iron at medium cutting speeds Medium depths of cut Medium chip loads
LC630Q	HC-K30 PVD-AL Cr N coated Highly wear-resistant milling grade with high toughness for dry machining alloyed and unalloyed steels up to 54 Rc and cast iron at medium cutting speeds Medium Depths of Cut Medium to Heavy Chip loads
LC730Z	HC-K20 fine-grain PVD TiAlN AlX coated Highly wear-resistant ultra fine grain grade with high toughness for wet and dry machining of steel, cast steel, cast iron and non-ferrous metals. Suitable also for hard machining Medium to high cutting speeds Medium depths of cut, Medium chip load
LW225	HW-P25 uncoated Wear-resistant, uncoated multiple-application material with high strength, for wet and dry milling of alloyed materials (cast iron, in some cases also nodular cast iron) Moderate cutting speeds Low to medium depths of cut Low to medium chip load
LW240	HW-P40 uncoated Extra-tough uncoated carbide grade for medium to heavy milling of steel and cast steel Low to medium cutting speeds Medium to high chip For wet and dry milling
LW610	HW-K 10 micro-grain uncoated Milling grade with high wear resistance for machining of grey cast iron, aluminium alloys, and non-ferrous metals at medium to higher cutting speeds, even under unfavourable machining conditions
DP	Polycrystalline diamond (PCD) Highly wear-resistant uncoated milling grade for machining of aluminium, bronze, non-ferrous metals, fibre-reinforced composite materials, plastics, certain ceramics and carbides (soft, prior to sintering) at high cutting speeds Low to medium depths of cut Low to medium chip load
BN	Cubical boron nitride (CBN) Very highly wear-resistant uncoated milling grade for machining of hardened materials with HRC >45, cast iron at high cutting speeds Low to medium depths of cut Low to medium chip load

The LMT grade designation system constitutes a simple key. In accordance with ISO standards, it describes the material in an application-oriented way.





Grade	ISO	Range of Applications (01 05 10 15 20 25 30 35 40 45 50)	Group of Materials: P Steel	M Stainless	K Grey cast iron	N Nonferrous materials	S High temperature materials	H Hard materials
LC280TT **LC280QN**	HC-P40		■					
	HC-M40			□				
LC240T	HC-P40		■					
	HC-M40			□				
LC240S	HC-P40		■					
LC230F	HC-P30		■					
	HC-M30			□				
LC225T	HC-P25		■					
	HC-M25			□				
	HC-K25				□			
LC225S[1]	HC-P25		■					
	HC-K25				□			
LC630T	HC-P20		■					
	HC-K15				□			
LC440T[2]	HC-M40			■			□	
LC444W	HC-M40			■			□	
LC610E	HC-K10				■			
LC610Q	HC-K10		■	□		□		
LC610T	HC-K10				■			
	HC-K10					■		
	HC-P10		□					
	HC-M10			□				
LC615E	HC-K10				■			
LC610A	HC-K01					■ graphite		
LC603Z	HC-K03				□			■

[1] Also usable for threading

[2] Preferably for dry machining with high cutting speeds

■ Main application □ Further application

"K" Factors

Work Material	Hardness BHN	"K" factor
steel, wrought and cast (plain carbon, alloy steels, and tool steels)	85-200 201-253 254-288 287-327 328-371 372-481 492-550 561-515	1.64 1.58 1.28 1.10 .88 .69 .59 .54
precipitation, hardening stainless steels	150-450	1.27-.42
cast irons (grey, ductile and malleable)	150-175 110-190 176-200 201-250 251-300 301-320	2.27 2.00 1.89 1.52 1.27 1.19
stainless steels, wrought and cast (ferritic, austenitic, & martensitic)	135-275 288-421	1.54-.76 .74-.50
titanium	250-375	1.33-.87
high-temperature alloys nickel, and cobalt based	200-380	.83-.48
iron base	180-320	.91-.53
nickel alloys	80-360	.91-.53
aluminum alloys	30-150 (500kg)	6.25-3.33
magnesium alloys	40-90 (500kg)	10.0-6.67
copper	150	3.33
copper alloys	100-150 151-240	3.33 2.0

Conversion millimeter – inches

Diameters

mm	inch
1	0.039
2	0.079
3	0.118
4	0.157
5	0.197
6	0.236
8	0.315
10	0.394
12	0.472
14	0.551
16	0.630
18	0.709
20	0.787
25	0.984
32	1.260
40	1.575
50	1.969
52	2.047
63	2.480
66	2.598
80	3.150
100	3.937
125	4.921
160	6.299
200	7.874
250	9.843
315	12.402
400	15.748
500	19.685

Conversion Charts

doc		Speed	
mm	inch	sfm	m/min
0.254	.010	300	91
0.381	.015	400	122
0.762	.030	500	152
1.270	.050	600	183
2.540	.100	800	244
3.175	.125	1000	305
3.810	.150	1200	366
6.350	.250	2000	610
9.525	.375	4000	1219
12.700	.500	10000	3048

Chipload IPT		Surface Finish (RA)	
mm/T	Inch/T	um	uinch
0.076	.003	12.5	500
0.102	.004	6.3	250
0.127	.005	3.2	125
0.152	.006	1.6	63
0.178	.007	0.8	32
0.203	.008	0.4	16
0.229	.009		
0.254	.010		
0.279	.011		
0.305	.012		

Multiply	By	To Obtain
meters/seconds	3.281	SFM (feet/minute)
inches	25.4	millimeters
millimeters	.03937	inches

Formulas

Surface feet per minute	**sfm=** .262 x rpm x D
revolutions per minute	**rpm=** 3.82 x sfm ÷ D
inch per revolution	**ipr=** ipm ÷ rpm
(feed rate) inch per minute	**ipm=** lpt x nt x rpm
inch per tooth (chip load)	**ipt=** ipm ÷ (nt x rpm)
metal removal rate	**mrr=** doc x woc x ipm **=** cu. inches/min.
horse power at cutter	**HPc=** mrr÷ k
horse power at motor	**HPm=** hpc ÷ e

Legend

doc = axial depth of cut **woc =** radial width of cut
e = spindle efficiency (varies 75% to 90%)
k = a power factor that represents the number of cubic inches of metal per minutes that can be removed by one horsepower.
nt = number of effective teeth or inserts in a cutter body
D = cutter diameter

Example

5" cutter diameter	
8 teeth in cutter	rpm = 3.82 x 550 ÷ 5 = 420
550 sfm	ipm = .008 x 8 x 420 = 26.9
.008 ipt	ipr = 26.9 ÷ 420 = .064

Hardness Comparison Chart

Tensible strength Rm N/mm²	Vickers hardness HV	Brinell hardness HB	Rockwell hardness HRC
255	80	76	
270	85	80.7	
285	90	85.5	
305	95	90.2	
320	100	95	
335	105	99.8	
350	110	105	
370	115	109	
385	120	114	
400	125	119	
415	130	124	
430	135	128	
450	140	133	
465	145	138	
480	150	143	
495	155	147	
510	160	152	
530	165	156	
545	170	162	
560	175	166	
575	180	171	
595	185	176	
610	190	181	
625	195	185	
640	200	190	
660	205	195	
675	210	199	
690	215	204	
705	220	209	
720	225	214	
740	230	219	
755	235	223	
770	240	228	20.3
785	245	233	21.3
800	250	238	22.2
820	255	242	23.1
835	260	247	24
850	265	252	24.8
865	270	257	25.6
880	275	261	26.4
900	280	266	27.1
915	285	271	27.8
930	290	276	28.5
950	295	280	29.2
965	300	285	29.8
995	310	295	31
1030	320	304	32.2
1060	330	314	33.3
1095	340	323	34.4

Tensible strength Rm N/mm²	Vickers hardness HV	Brinell hardness HB	Rockwell hardness HRC
1125	350	333	35.5
1155	360	342	36.6
1190	370	352	37.7
1220	380	361	38.8
1155	390	371	39.8
1290	400	380	40.8
1320	410	390	41.8
1350	420	399	42.7
1385	430	409	43.6
1420	440	418	44.5
1455	450	428	45.3
1485	460	437	46.1
1520	470	447	46.9
1555	480	(456)	47.7
1595	490	(466)	48.4
1630	500	(475)	49.1
1665	510	(485)	49.8
1700	520	(494)	50.5
1740	530	(504)	51.1
1775	540	(513)	51.7
1810	550	(523)	52.3
1845	560	(532)	53.0
1880	570	(542)	53.6
1920	580	(551)	54.1
1955	590	(561)	54.7
1995	600	(570)	55.2
2030	610	(580)	55.7
2070	620	(589)	56.3
2105	630	(599)	56.8
2145	640	(608)	57.3
2180	650	(618)	57.8
	660		58.3
	670		58.8
	680		59.2
	690		59.7
	700		60.1
	720		61
	740		61.8
	760		62.5
	780		63.3
	800		64
	820		64.7
	840		65.3
	860		65.9
	880		66.4
	900		67
	920		67.5
	940		68

Tensible strength	Rm	N/mm²
Vickers hardness	HV	Diamond pyramid 136°, Test force F = 98 N
Brinell hardness Calculated from: HB = 0.95 x HV	HB	0.102 x F/D2 = 30 N/mm² F = Test force in N, D = Ball diameter in mm
Hardness Rockwell C	HRC	Diamond cone 120°, Total test force 1471 ± 9 N

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM					
				0.003 - 0.006		0.006 - 0.014		0.014 - 0.020	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain Carbon steel	1018, 1025,	< 20	520	790	490	720	390	520
	Free Machining steel	1212, 12L13	< 20	520	790	490	720	390	520
	Structural alloy steel	1040, 4130	< 30	520	790	490	720	390	520
	Heat-treatment steel,	4140, 6150	< 30	490	620	430	520	360	460
	medium strength	4340, 8740		490	620	430	520	360	460
	Cast Steel	52100, 8620	< 30	490	620	430	520	360	460
	Caste hardening steel	410, 430F, 440	< 30	-	-	-	-	-	-
	Stainless steel,	4140, 8740	< 30	520	720	430	590	330	460
	ferritic			430	590	330	460	260	360
	martensitic			390	520	300	430	230	330
	Heat treatment steel, High strength	A355	28 - 44	-	-	-	-	-	-
	Nitriding Steel	H13, D2	28 - 44	390	520	300	430	230	330
	Tool Steel	1018, 1025,	28 - 44	390	520	300	430	230	330
M	Stainless steel, austenitic Maraging steel	304, 316	< 30	390	590	-	-	-	-
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	-	-	-	-	-	-
	Alloyed grey cast iron	A434, A436-72	< 22	-	-	-	-	-	-
	Nodular cast iron	A536 (80-55-06), J434	< 34	490	620	410	540	340	460
	Malleable cast iron	A220, 50005 A47,32510	< 29	-	-	-	-	-	-
N	Pure metals, soft	Pure Iron, Lead	< 20	-	-	-	-	-	-
	Aluminum alloys, long chipping	6061, 7050	< 20	-	-	-	-	-	-
	Aluminum alloys, short chipping	A356, 4218	< 20	-	-	-	-	-	-
	Copper alloys, long chipping	C27200, B-148-52	< 20	-	-	-	-	-	-
	Copper alloy, short chipping		< 20	-	-	-	-	-	-
	Magnesium alloys	B94, M11910		-	-	-	-	-	-
	Thermoplastics	PVC, Acrylic glass		-	-	-	-	-	-
	Duroplastics	Durolite, Ampal		-	-	-	-	-	-
	Graphite			-	-	-	-	-	-
S	Titanium alloys, medium strength	F67, B265	< 29	-	-	-	-	-	-
	Titanium alloys, high strength Alloy	Ti-6Al-4V	27 - 44	-	-	-	-	-	-
	Nickel based alloys medium strength	20Cb3	< 29	-	-	-	-	-	-
	Heat resistant nickel based alloys high strength	Inconel 718	27 - 44	-	-	-	-	-	-
H	Chilled cast iron	Ampco 25	< 20	-	-	-	-	-	-
	Hardened steel		45 - 52	-	-	-	-	-	-
			53 - 59						
			60 - 65						

💧💧 Wet machining ☀ Dry machining

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM					
				0.003 - 0.006		0.006 - 0.014		0.014 - 0.020	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain Carbon steel	1018, 1025,	< 20	460	750	360	520	390	660
	Free Machining steel	1212, 12L13	< 20	460	750	360	520	390	660
	Structural alloy steel	1040, 4130	< 30	460	750	360	520	390	660
	Heat-treatment steel, medium strength	4140, 6150	< 30	390	560	300	390	390	490
	Cast Steel	4340, 8740	< 30	390	560	300	390	390	490
	Case hardening steel	52100, 8620	< 30	390	560	300	390	390	490
	Stainless steel,	410, 430F, 440	< 30						
	ferritic,			490	520	330	460	430	560
	martensitic			360	520	260	360	330	460
	Heat treatment steel, High strength	4140, 8740	28 - 44	390	520	260	360	330	460
	Nitriding Steel	A355	28 - 44	390	520	260	360	330	460
	Tool Steel	H13, D2	28 - 44	390	520	260	360	330	460
M	Stainless steel austenitic	304, 316	< 30	260	520	-	-	-	-
	Maraging steel								
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	-	-	-	-	-	-
	Alloyed grey cast iron	A434, A436-72	< 22	-	-	-	-	-	-
	Nodular cast iron	A536 (80-55-06), J434	< 34	490	590	310	430	430	520
	Malleable cast iron	A220, 50005 A47,32510	< 29	-	-	-	-	-	-
N	Pure metals, soft	Pure Iron, Lead	< 20	-	-	-	-	-	-
	Aluminum alloys, long chipping	6061, 7050	< 20	-	-	-	-	-	-
	Aluminum alloys, short chipping	A356, 4218	< 20	-	-	-	-	-	-
	Copper alloys, long chipping	C27200, B-148-52	< 20	-	-	-	-	-	-
	Copper alloy, short chipping		< 20	-	-	-	-	-	-
	Magnesium alloys	B94, M11910		-	-	-	-	-	-
	Thermoplastics	PVC, Acrylic glass		-	-	-	-	-	-
	Duroplastics	Durolite, Ampal		-	-	-	-	-	-
	Graphite			-	-	-	-	-	-
S	Titanium alloys, medium strength	F67, B265	< 29	-	-	-	-	-	-
	Titanium alloys, high strength Alloy	Ti-6Al-4V	27 - 44	-	-	-	-	-	-
	Nickel based alloys medium strength	20Cb3	< 29	-	-	-	-	-	-
	Heat resistant nickel based alloys high strength	Inconel 718	27 - 44	-	-	-	-	-	-
H	Chilled cast iron	Ampco 25	< 20						
	Hardened steel		45 - 52	-	-	-	-	-	-
			53 - 59						
			60 - 65	-	-	-	-	-	-

💧💧 Wet machining ☀ Dry machining

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM					
				0.003 - 0.006		0.006 - 0.014		0.014 - 0.020	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain Carbon steel	1018, 1025,	< 20	690	870	540	720	430	570
	Free Machining steel	1212, 12L13	< 20	690	870	540	720	430	570
	Structural alloy steel	1040, 4130	< 30	690	870	540	720	430	570
	Heat-treatment steel, medium strength	4140, 6150	< 30	560	710	440	590	360	480
	Cast Steel	4340, 8740	< 30	560	710	440	590	360	480
	Caste hardening steel	52100, 8620	< 30	560	710	440	590	360	480
	Stainless steel, ferritic martensitic	410, 430F, 440	< 30	560	710	440	590	360	480
	Heat treatment steel, High strength	4140, 8740	28 - 44	490	620	390	520	310	430
	Nitriding Steel	A355	28 - 44	490	620	390	520	310	430
	Tool Steel	H13, D2	28 - 44	490	620	390	520	310	430
M	Stainless steel austentic	304, 316	< 30	750	950	590	790	480	620
	Maraging steel			750	950	590	790	480	620
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	690	870	540	720	430	570
	Alloyed grey cast iron	A434, A436-72	< 22	560	710	440	590	360	480
	Nodular cast iron	A536 (80-55-06), J434	< 34	490	620	390	520	310	430
	Malleable cast iron	A220, 50005 A47,32510	< 29	490	620	390	520	310	430
N	Pure metals, soft	Pure Iron, Lead	< 20						
	Aluminum alloys, long chipping	6061, 7050	< 20						
	Aluminum alloys, short chipping	A356, 4218	< 20						
	Copper alloys, long chipping	C27200, B-148-52	< 20						
	Copper alloy, Short chipping		< 20						
	Magnesium alloys	B94, M11910							
	Thermoplastics	PVC, Acrylic glass							
	Duroplastics	Durolite, Ampal							
	Graphite								
S	Titanium alloys, medium strength	F67, B265	< 29						
	Titanium alloys high strength Alloy	Ti-6Al-4V	27 - 44						
	Nickel based alloys medium strength	20Cb3	< 29				230		
	Heat resistant nickel based alloys high strength	Inconel 718	27 - 44				160		
H	Chilled cast iron	Ampco 25	< 20				160		
	Hardened steel		45 - 52				160		
			53 - 59						
			60 - 65						

💧💧 Wet machining ☀ Dry machining

Recommended *maximum* feed per tooth (f_z) for inserts

Cutter Type	FCZ FCZ R10 FCZ R12 FCZ R16			FCT FCT45 FCT45XX			ECZ ECZR07 ECZ R08 ECZ R10 ECZ R12				FMT45 FMT45 S09 FMT45 S12	
												
Ø inch cutter	1.625-3.00			1.625-5.00			.500-1.50				1.00-6.00	
Insert ISO-Code	RDKT RDHW RDHX			RCKX RCKT OCKX			RDKT RDHW				SNKT SNKX RDHX	
Insert Size mm	10	12	16	10	12	16	7	8	10	12	9.52	12.7
Insert Size inch	.394	.472	.630	.394	.472	.630	.276	.315	.394	.472	.375	.500
Max a_p	.098	.118	.197	.098	.118	.197	.059	.098	.098	.118	.197	.276
P	.010	.016	.018	.010	.016	.018	.012	.010	.010	.016	.016	.020
M	.005	.006	.008	.005	.006	.008	.004	.004	.005	.006	.006	.006
K	.016	.016	.016	.012	.016	.016	.010	.012	.014	.016	.020	.024
H	.012	.012	.012	.010	.012	.012	.006	.008	.010	.012	.010	.012

Cutting Data Recommendations for Copying-Cutters for Roughing with LC280TT

	Material	Examples	SFM
P	Unalloyed tool steel	1045, W1	900
	Heat – treatable die steels	1212, 12L13	820
	Case hardening steels	1040, 4130	900
	Full hardening tool steels	O2, D2, D3, H13, H11	650
	Nitriding steels	H13, 6150, A355 Cl C	575
M	Stainless steel, austenitic	316L 304	820
	Maraging steel		
K	Grey cast iron and Alloyed grey cast iron	No. 35B	750
	Nodular cast iron and Alloyed nodular cast iron	60-40-18	650
H	Chilled cast iron		590
	Hardened steel	45-52 Rc	450

LC430T, LC440T
Cutting Data Recommendations

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM	
				0.003 - 0.006	0.006 - 0.014
M	Austenitic	303, 304, 304L, 316, 316L, 321, 347	< 20	820 - 1050	660 - 920
	Austenitic hardened	309, 310S, 630, J775(SAE)	< 20	660 - 920	-
	Duplex (Austentic / ferritic)	329	< 20	660 - 920	-

Dry machining

For ferritic and martensitic stainless steels we recommend grade LC230F (preferably dry machining)

LC444W
Cutting Data Recommendations

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM	
				0.003 - 0.008	0.009 - 0.016
M	Austenitic	303, 304, 304L, 316, 316L	< 20	260 - 525	229 - 460
		316Ti, 318, 321, 347, 348	< 20	230 - 410	165 - 395
	Austenitic hardened	309, 310S, 630, J775 (SAE)		230 - 330	
	Duplex (austenitic/ferritic)	329		230 - 395	
S	Heat resistant alloys				
	Ni- or Co-basis	Inconel 718, Incoloy 925	32 - 38	130 - 230	95 - 195
	Titanium alloys:				
	Alpha- + Beta-alloys	Ti -6Al-4V	< 32	150 - 195	130 - 180

Wet machining

For ferritic and martensitic stainless steels we recommend grade LC230F (preferably dry machining)

	Material	Examples	Hardness Material No.	Feed per tooth (f_z) Cutting speed (v_c)							
				Roughing				Finishing			
				v_c	d_4 = .188" to .3125"	d_4 = .375" to .500"	d_4 = > .625"		d_4 = .188" to .3125"	d_4 = .375" to .500"	d_4 = > .625"
					f_z				f_z		
P	Plain carbon steel	1018, 1025									
	Heat-treatable die steels	4140, 6150									
	Case hardening steels	5115, 8620									
	Full hardening tools steels	4140, 8740, 4340									
	Nitriding steels	A355, H13, D2									
M	Stainless steel, austenitic	304, 316									
K	Grey cast iron and alloyed grey cast iron	A159, J431, G3500, A436-725									
	Nodular cast iron and alloyed nodular cast iron	A220, F2000, 5005									
H	Hardened steel		45-52HRC	525	.0059	.0078	.0098	787	.004	.0078	.0098
			53-59HRC	394	.004	.0059	.0078	689	.004	.0078	.0098
			60-65HRC	–				590	.004	.0078	.0098

	Material		R_m/UTS (N/mm²)	Cutting speed v_c SFM for feed/tooth					
				.003 - .006		.014 - .020		.006 - .014	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain carbon steel		- 700						
	Free cutting steel		- 700						
	Structural alloy steel		500 - 950						
	Heat-treatment steel, medium strength		500 - 950						
	Cast steel		- 950						
	Case hardening steel		- 950						
	Stainless steel, ferritic, martensitic		500 - 950						
	Heat-treatment steel, high strength		950 - 1400						
	Nitriding steel		950 - 1400						
	Tool steel		950 - 1400						
M	Stainless steel, austenitic		500 - 950						
	Maraging steel		–						
K	Grey cast iron		100 - 400 (120 - 260 HB)						
	Alloyed grey cast iron		150 - 250 (160 - 230 HB)						
	Nodular cast iron		400 - 800 (120 - 310 HB)						
	Malleable cast iron		350 - 700 (150 - 280 HB)						
N	Pure metals, soft		- 500						
	Aluminium alloys, long chipping		- 550						
	Aluminium alloys, short chipping		- 400						
	Copper alloys, long chipping		300 - 700						
	Copper alloys, short chipping		- 500						
	Magnesium alloys		160 - 300						
	Thermoplastics	PVC, Acrylic Glass	400 - 600	–	1804	–	1640	–	–
	Duroplastics	Durolite, Ampal	400 - 600	–	1804	–	1640	–	–
	Graphite		400 - 600	–	1968	–	1640	–	1476
S	Titanium alloys, medium strength		- 950						
	Titanium alloys, hight strength		900 - 1400						
	Nickel based alloys, medium strength		- 950						
	Heat resistant nickel based alloys, high strength		900 - 1400						
H	Chilled cast iron		300 - 600 HB						
	Hardened steel		45 - 52 HRC 53 - 59 HRC 60 - 65 HRC						

💧💧 Wet machining ☀ Dry machining

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM					
				0.003 - 0.006		0.006 - 0.014		0.014 - 0.020	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain Carbon steel	1018, 1025,	< 20	940	1180	740	980	590	790
	Free Machining steel	1212, 12L13	< 20	940	1180	740	980	590	790
	Structural alloy steel	1040, 4130	< 30	940	1180	740	980	590	790
	Heat-treatment steel, medium strength	4140, 6150	< 30	940	1180	740	980	590	790
	Cast Steel	4340, 8740	< 30	770	980	740	820	490	660
	Caste hardening steel	52100, 8620	< 30	770	980	740	820	490	660
	Stainless steel, ferritic martensitic	410, 430F, 440	< 30	770	980	740	820	490	660
	Heat treatment steel, High strength	4140, 8740	28 -44	620	790	490	660	390	520
	Nitriding Steel	A355	28 - 44	620	790	490	660	390	520
	Tool Steel	H13, D2	28 -44	620	790	490	660	390	520
M	Stainless steel, austenitic	304, 316	< 30	-	-	-	-	-	-
	Maraging steel			-	-	-	-	-	-
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	940	1180	740	980	590	790
	Alloyed grey cast iron	A434, A436-72	< 22	720	910	560	750	460	610
	Nodular cast iron	A536 (80-55-06), J434	< 34	660	820	520	690	410	560
	Malleable cast iron	A220, 50005 A47,32510	< 29	660	820	520	690	410	560
N	Pure metals, soft	Pure Iron, Lead	< 20	2180	2760	1720	2300	1380	1840
	Aluminum alloys, long chipping	6061, 7050	< 20	3120	3280	2460	3280	1970	2620
	Aluminum alloys, short chipping	A356, 4218	< 20	1250	1570	980	1310	790	1050
	Copper alloys, long chipping	C27200, B-148-52	< 20	3120	3280	2460	3280	1970	2620
	Copper alloy, short chipping		< 20	1250	1570	980	1310	790	1050
	Magnesium alloys	B94, M11910		-	1970	-	1640	-	1310
	Thermoplastics	PVC, Acrylic glass		-	1970	-	1640	-	1310
	Duroplastics	Durolite, Ampal		-	1970	-	1640	-	1310
	Graphite			-	1970	-	1640	-	1310
S	Titanium alloys, medium strength	F67, B265	< 29						
	Titanium alloys, high strength Alloy	Ti-6Al-4V	27 - 44						
	Nickel based alloys medium strength	20Cb3	< 29	260	300				
	Heat resistant nickel based alloys high strength	Inconel 718	27 - 44	200	230				
H	Chilled cast iron	Ampco 25	< 20	200	230				
	Hardened steel		45 - 52	260	300				
			53 - 59	200	230				
			60 - 65	130	160				

💧💧 Wet machining ☀ Dry machining

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM					
				0.003 - 0.006		0.006 - 0.014		0.014 - 0.020	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain Carbon steel	1018, 1025,	< 20						
	Free Machining steel	1212, 12L13	< 20						
	Structural alloy steel	1040, 4130	< 30						
	Heat-treatment steel, medium strength	4140, 6150	< 30						
	Cast Steel	4340, 8740	< 30						
	Caste hardening steel	52100, 8620	< 30						
	Stainless steel, ferritic martensitic	410, 430F, 440	< 30						
	Heat treatment steel, High strength	4140, 8740	28 - 44						
	Nitriding Steel	A355	28 - 44						
	Tool Steel	H13, D2	28 -44						
M	Stainless steel, austenitic	304, 316	< 30						
	Maraging steel								
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	520	1050	430	790	300	590
	Alloyed grey cast iron	A434, A436-72	< 22	430	820	330	660	260	490
	Nodular cast iron	A536 (80-55-06), J434	< 34	490	590	390	490	300	430
	Malleable cast iron	A220, 50005 A47,32510	< 29	490	920	390	690	300	490
N	Pure metals, soft	Pure Iron, Lead	< 20						
	Aluminum alloys, long chipping	6061, 7050	< 20						
	Aluminum alloys, short chipping	A356, 4218	< 20						
	Copper alloys, long chipping	C27200, B-148-52	< 20						
	Copper alloy, short chipping		< 20						
	Magnesium alloys	B94, M11910							
	Thermoplastics	PVC, Acrylic glass							
	Duroplastics	Durolite, Ampal							
	Graphite								
S	Titanium alloys, medium strength	F67, B265	< 29						
	Titanium alloys, high strength Alloy	Ti-6Al-4V	27 - 44						
	Nickel based alloys medium strength	20Cb3	< 29						
	Heat resistant nickel based alloys high strength	Inconel 718	27 - 44						
H	Chilled cast iron	Ampco 25	< 20						
	Hardened steel		45 - 52						
			53 - 59						
			60 - 65						

💧💧 Wet machining ☀ Dry machining

LC630T
Cutting Data Recommendations

	Material	Examples	Rockwell C	Feed per Tooth (f_z) / SFM					
				0.003 - 0.006		0.006 - 0.014		0.014 - 0.020	
				💧💧	☀	💧💧	☀	💧💧	☀
P	Plain Carbon steel	1018, 1025,	< 20	940	1180	740	980	590	790
	Free Machining steel	1212, 12L13	< 20	940	1180	740	980	590	790
	Structural alloy steel	1040, 4130	< 30	940	1180	740	980	590	790
	Heat-treatment steel, medium strength	4140, 6150	< 30	940	1180	740	980	590	790
	Cast Steel	4340, 8740	< 30	770	980	740	820	490	660
	Caste hardening steel	52100, 8620	< 30	770	980	740	820	490	660
	Stainless steel, ferritic martensitic	410, 430F, 440	< 30	770	980	740	820	490	660
	Heat treatment steel, High strength	4140, 8740	28 -44	620	790	490	660	390	520
	Nitriding Steel	A355	28 - 44	620	790	490	660	390	520
	Tool Steel	H13, D2	28 -44	620	790	490	660	390	520
M	Stainless steel, austenitic	304, 316	< 30	-	-	-	-	-	-
	Maraging steel			-	-	-	-	-	-
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	940	1180	740	980	590	790
	Alloyed grey cast iron	A434, A436-72	< 22	720	910	560	750	460	610
	Nodular cast iron	A536 (80-55-06), J434	< 34	660	820	520	690	410	560
	Malleable cast iron	A220, 50005 A47,32510	< 29	660	820	520	690	410	560
N	Pure metals, soft	Pure Iron, Lead	< 20	2180	2760	1720	2300	1380	1840
	Aluminum alloys, long chipping	6061, 7050	< 20	3120	3280	2460	3280	1970	2620
	Aluminum alloys, short chipping	A356, 4218	< 20	1250	1570	980	1310	790	1050
	Copper alloys, long chipping	C27200, B-148-52	< 20	3120	3280	2460	3280	1970	2620
	Copper alloy, short chipping		< 20	1250	1570	980	1310	790	1050
	Magnesium alloys	B94, M11910		-	1970	-	1640	-	1310
	Thermoplastics	PVC, Acrylic glass		-	1970	-	1640	-	1310
	Duroplastics	Durolite, Ampal		-	1970	-	1640	-	1310
	Graphite			-	1970	-	1640	-	1310
S	Titanium alloys, medium strength	F67, B265	< 29						
	Titanium alloys, high strength Alloy	Ti-6Al-4V	27 - 44						
	Nickel based alloys medium strength	20Cb3	< 29	260	300				
	Heat resistant nickel based alloys high strength	Inconel 718	27 - 44	200	230				
H	Chilled cast iron	Ampco 25	< 20	200	230				
	Hardened steel		45 - 52	260	300				
			53 - 59	200	230				
			60 - 65	130	160				

💧💧 Wet machining ☀ Dry machining

MultiEdge Double 8
Cutting Data Recommendations

	Material	(N/mm²)	DIN Des.	Materials	Carbide Grade	Cutting Speed V_c (sfm)	Recommended max. feed per tooth f_z [in] with woc = 0.75 x d_1	
							ONGU0505	ONGU0606
							doc_{max} = 0.12 inch	doc_{max} = 0.16 inch
							inch	inch
P	Plain carbon steel	300-500	St 37, St 44	A36, 1005–1029	LC 225 T LC 240 T	650–800	0.018	0.020
		500-700	St 52, St 70	A570				
		350-500	U- und and R St 37-2	1.0036, 1.0038				
	Free cutting steel	360-550	9 S 20, 9 SMn 28	1213			0.018	0.020
		600-800	45 S 20, 60 S 20	1.0727, 1.0728				
	Structural alloy steel	500-950	Ck 45	1045			0.016	0.018
			26 CrMo 4	4130				
	Heat-treatable steel, medium strength	500-950	42 CrMo 4	4140		590–660	0.014	0.016
			50 CrV 4	1.2241				
	Cast steel	-950	GS 40	1.0416		460–530	0.012	0.014
	Case hardening steel	-950	16 MnCr 5	5115, 8620		460–590	0.012	0.014
	Heat-treatable steel, high strength	950-1400	42 CrMo 4	4140		390–530	0.010	0.012
			30 CrNiMo 8	~8740				
	Nitriding steel	950-1400	34 CrAl 6	~6150		390–460	0.010	0.012
	Tool steel	950-1400	X 38 CrMoV 5 1	H11		390–460	0.008	0.010
			X 155 CrVMo 12 1	D2				
K	Cast iron with flake graphite	100-400 (120-260 HB)	EN-GJL 250 (GG 25)	EN-JL-1040 A159, J431	LC 610 T	660–850	0.018	0.020
	Alloyed cast iron	150-250 (160-230 HB)	EN-GJLA-XNiCr35-2 (GGL-NiCr 35-2)	A436		530–660	0.012	0.014
	Cast iron with nodular graphite	400-800 (120-310 HB)	EN-GJS-600 (GGG60)	EN-JS-1060 (0.7060)		460–590	0.014	0.016
	Malleable cast iron	350-700 (150-280 HB)	EN-GJMB-550-4 (GTS55)	EN-JL-1160 A220		530–660	0.014	0.016

The cutting data indicated are starting values and must be adjusted to the prevailing conditions

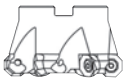
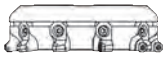
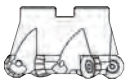
The MultiEdge Double 8 was used in replacement of a 45° face milling cutter with inserts having 8 cutting edges, for face milling a guide joint made out of GJS-600. At a speed rate of 590 sfm, tool life could be inreased by 25%. Because of 16-times indexable inserts ONGU0606, the total number of inserts needed was reduced by 50%.

Tool:
FMN45 | Dia. = 3 inches, z = 7 Teeth
MultiEdge Double 8 (ONGU0606) | LC610T

Material:
GGG NiSiCr 3552 GGG60-Nodular Iron

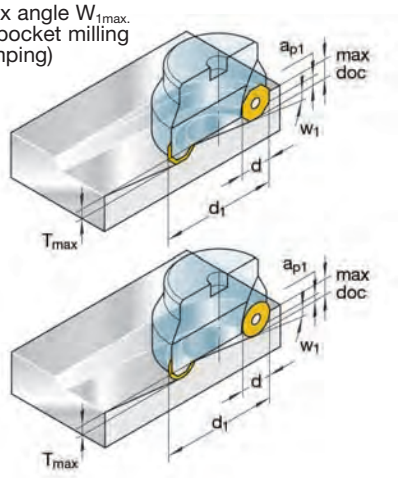
Cutting data:
v_c = 590 sfm
n = 720 rpm
v_f = 71 ipm
woc = 2.4 inch
doc = 0.16 inch

Recommended *maximum* feed per tooth (f_z) when woc = 3:2 (.67 x d_1) d_1 = Cutter dia.

Catalog No.	FCT45	MCT45	FCT 45	MCT45	FCT 45	MCT45
						
ap_1 (doc)	.118 with 8 indexed edges max.		.060 with 12 indexed edges max.		.078 with 8 indexed edges max.	
max.doc.	.394		.380		.315	
ISO-Code	OCKX 0606 AD-TR		XCKX 1606 DD-TR		RCKX 1606 MO-TR	
Recommended Maximum Feed per Tooth (f_z)						
P	.017		.017		.017	
	.015		.015		.015	
M	.008		.008		.008	
N	.015		.015		.015	
K	.014		.014		.014	
S	.012		.012		.012	

Pocket Milling and Ramp Milling

Helix angle $W_{1max.}$ for pocket milling (ramping)



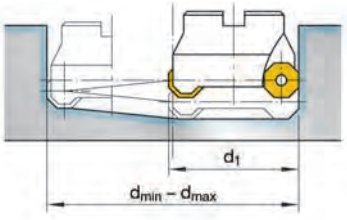
	FCT45 with OCKX 0606 AD-TR	FCT45 with XCKX 0606 AD-TR	FCT45 with RCKX 1606 MO-TR
Insert Dia.	16mm (.630")	16mm (.630")	16mm (.630")
max.doc.	.394	.380	.315
d_1 cutter dia.	**W_{1max} in deg.**		
2.00	8	7	7
2.50	5.4	4.8	4.8
3.00	4	3.6	3.6
4.00	3	2.7	2.7
5.00	2	2	2

Internal cutting depth T_{max} = .158"

Ramping

Ramping is always recommended over plunging when entering the workpiece. Ramp milling minimizes the likelihood of the workpiece material work hardening and improves tool life. Climb milling is recommended with workpiece materials that work harden. This method reduces the heat in the workpiece by dissipating it into the chip.

Circular Milling



Diameter Range for Helical Interpolation in a Recess		
d_1	d_{min}	d_{max}
2.00	2.799	4.00
2.50	3.799	5.00
3.00	4.799	6.00
4.00	6.799	8.00
5.00	8.799	10.00

Helical Interpolation

When possible Helical Interpolation is another preferred method of entry into the workpiece when roughing with button style cutters to full cavity depth. (See chart)

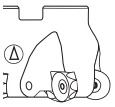
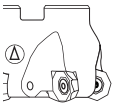
A consistent depth of cut and chip load is maintained without the need to dwell on the Z-axis. Once there is a cavity in the workpiece, the cutter can be used as a conventional facemill and rough the part with normal X and Y axis tool paths.

	Material	Brinell (BHN)	Recommended Grade	Cutting Speed	
				Face Milling sfm	Copy Milling sfm
P	Low Carbon Steel (1018, 1025)	< 206	LC280TT LC240T LC225S	525-720	820-980
	Plain Carbon Steel (1212, 12L13)	147-280		525-655	600-850
	Alloy Steel (1040, 4130)	147-280		460-590	600-850
	Cast steel (4340, 8740)	< 280		460-590	600-850
	Carburizing steel (52100, 8620)	< 950		460-590	600-850
	Stainless, ferritic, martensitic 400-500 series (410, 430F, 440)	147-280		460-560	500-850
	Heat-treatable steel, high-strength (4140)	280-1400	LC280TT LC240T LC610T	394-492	500-720
	Nitralloy steel, heat-treated (A355)	950-1400		394-492	500-720
	Tool steel (H13, D2)	280-412		394-492	500-720
M	Stainless, austenitic 200-300 series (303, 304, 316, 316L)	147-280	LC240T	400-630	400-575
K	Gray cast iron (A319, J431, No.25B, No.50B)	< 120	LC610T	425-690	650-984
	Alloyed gray cast iron (No.30B, A436-725)	< 75	LC610T	325-525	500-820
	Spheroidal graphite iron	120-238	LC610T	325-525	524-984
	Malleable cast iron (5005)		LC610T	390-690	524-820
N	Aluminum alloys, short chipping (6061-T6, 7050)	350-700	LW610*	650-980	524-984
	Copper alloys, short chipping (C27200, B-148-52)		LC225S	650-980	524-984
	Magnesium alloys (B94, M11910)	< 119	LW610*	650-1300	524-1300
	Thermosetting plastics (PVC, Acrylic Glass)	< 147			
S	Titanium alloys, medium-strength (F67, B265)	110-275	LW610*	120-250	120-250
	Titanium alloys, high-strength (Ti-6Al-4V)	300-350	LW610*	80-170	80-170
	Nickel-based alloys, medium-strength	< 280	LC225S	90-200	80-200
	Highly refractory Nickel-based alloys (Inconel 718)	266-912	LC225S**	98-165	80-220
K	Chilled cast iron (Ampco 25)	266-412	LC225S*	98-130	80-220

*Uncoated LW610 grade, the sfm specified in the table is for this material.
**Substitute LC280TT grade in cases where there is a risk of the tool breaking.

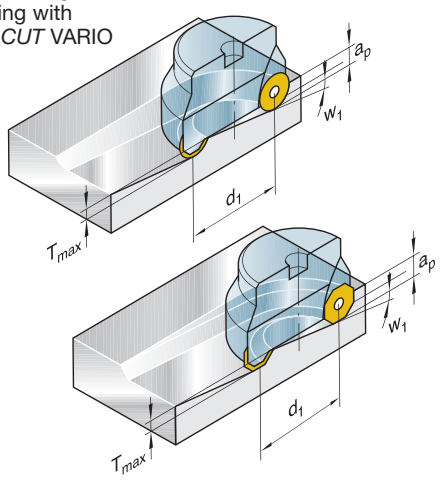
Vario

Face Milling

Catalog No.	Round	Octagonal
		
max.doc.	0.315	0.394
min.doc.	0.079	0.079
ISO-Code	RCKX 1606 MO-TR	OCKX 0606 AD-TR
Recommended Maximum Feed per Tooth (f_z)		
P	0.018	0.014
	0.016	0.012
M	0.008	0.006
K	0.016	0.012
	0.014	0.012
	0.012	0.010

Pocket Milling and Ramp Milling

Max. W_1 angle when ramping with TWIN*CUT* VARIO



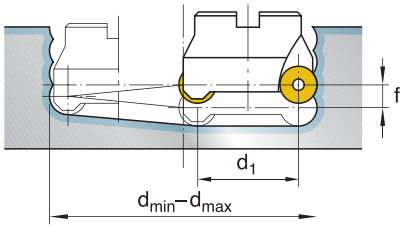
	TWIN*CUT* VARIO with RCKX 1606 MO-TR	TWIN*CUT* VARIO with OCKX 0606 AD-TR
d_1 inch	W_1°	W_1°
1.50	1.3°	1.1°
2.00	1.8°	1.6°
2.50	2.3°	2.1°
3.00	2.8°	2.6°
4.00	3.8°	3.6°

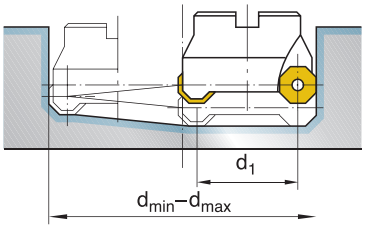
Internal cut depth T_{max} = 0.157"

Ramping

Ramping is always recommended over plunging when entering the workpiece. Ramp milling minimizes the likelihood of the workpiece material work hardening and improves tool life. Climb milling is recommended with workpiece materials that work harden. This method reduces the hear in the workpiece by dissipating it into the chip.

Circular Milling





Diameter Range for Helical Interpolation in One Operation		
d_1	d_{min}	d_{max}
1.50	3.06	4.54
2.00	4.06	5.54
2.50	5.06	6.54
3.00	6.06	7.54
4.00	8.06	9.54

Face Mills – TWIN*CUT* / ISO
Cutting Data Recommendations

	Material	Hardness		Cutting Speed (SFM) Range			Recommended Grade	Feed Per Tooth (f_z) Range	Starting Speed (SFM)	Starting Feed Per Tooth (f_z)	Wet or Dry
		Brinell (BHN)	Rockwell (HRC)	Uncoated Carbide	Coated Carbide	CBN/PCD					
P	Low Carbon Steels AISI: 1008, 1010, 1018, 1117, 1141	< 220	< 19		350-900 400-1100		LC240T LC225S/T	.004-.020 .004-.014	500 650	.012 .010	D D
P	Plain Carbon, Alloy and Tool Steels AISI: 1045, 4140, 4320, 4340,5120, 8620, P-20	200-300 300-425 425-570	19-32 32-45 45-54		300-700 300-900 175-400 250-650 300-500	 300-800	LC240T LC225S/T LC240T LC225S/T LC610T CBN	.003-.018 .003-.012 .003-.014 .003-.008 .003-.006 .003-.006	400 500 300 450 350 550	.012 .009 .008 .006 .004 .004	D D D D D D
M	Stainless Steels Ferritic-Martensitic 400 to 500 Series PH Stainless Steels Austenitic 200 to 300 Series	< 330 330-450 135-275	< 35 35-45 < 28		200-600 250-650 150-500 150-425 250-550 300-600 300-700		LC240T LC225S/T LC225S LC240T LC240T LC225S/T LC610T	.003-.012 .003-.009 .003-.006 .004-.011 .004-.012 .004-.009 .003-.008	400 .450 425 350 425 450 500	.007 .005 .005 .007 .007 .006 .005	W/D D D W/D D D
N	Aluminum and other Free-Machining Non-Ferrous Materials Aluminum/High-Silicon (12% or higher)	50-150		700-2000 700-1500		 1000-12,000 1000-6000	LW610 PCD LW610 PCD	.004-.015 .004-.012 .003-.014 .003-.012	1000 4000 1000 2000	.008 .006 .009 .007	W/D W/D D D
K	Gray Cast Iron	120-320	< 34		300-900 300-1100		LC610T LC615E	.003-.009 003-.010	700 850	.007 .007	D D
K	Cast Iron Ductile and Malleable	120-320	< 34		300-800 300-1000 250-550		LC610T LC615E LC240T	.003-.008 .003-.009 003-.009	500 575 450	.006 .007 .008	D D D
K	Cast Iron Hardened or Chilled	400-560	43-55		150-600 150-675	 200-900	LC610T LC615E CBN	.004-.008 .004-.008 .003-.008	400 475 600	.006 .006 .006	D D D
S	Nickel-Base Alloys Annealed 600 series Inconel, Hastelloy, & Waspaloy	140-300	< 32		50-220 50-220		LC630T/S LC240T	.002-.006 .002-.008	120 110	.004 .005	D D
S	Nickel-Base, Heat Resistant Alloys Annealed Inconel 700 Series	300-475	31-49		60-200 60-200 60-200		LC630S/T LC225S/T LC240T	.002-.006 .002-.007 .002-.008	95 90 80	004 .004 .005	D D D
S	Iron-Base, Heat Resistant Alloys Wrought: A-286, Incoloy 801, ASTM351 grade HK-30, 40, HT-30	135-320	< 34		80-450 80-350 80-300		LC630S/T LC225S/T LC240T	.003-.007 .003-.008 .003-.009	280 240 210	004 .005 .006	D D D
S	Cobalt Heat Resistant alloys	150-425	< 45		75-400 75-400 75-400		LC630S/T LC225S/T LC240T	.002-.007 .002-.008 .003-.009	120 110 100	.004 .005 .006	D D D
S	Titanium-Alloy Annealed Ti6Al-4V, Ti6Al, Ti98.8, Ti99.9	110-300 300-350 350-440	< 32 32-36 36-46	60-300 60-220 60-180	90-400 90-300 90-200		LC240T/LW610 LC240T/LW610 LC240T/LW610	.003-.008 .003-.007 .003-.006	220 150 130	.004 .004 .004	W W W

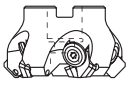
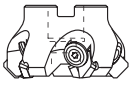
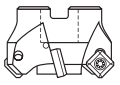
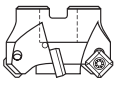
When setting initial cutting conditions, consider the following:
Suggested starting conditions are based on a .100" axial depth of cut. Cutting speed should be adjusted for a greater or lesser depth. Using a cutter with the recommended 3:2 cutter diameter-to-workpiece width ratio will provide a negative angle of entry, allowing the insert to make contact with the workpiece at its strongest point on the cutting edge.

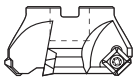
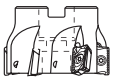
Climb Milling is normally recommended in order to allow the insert to enter with a heavier chip load. This reduces edge build up and dissipates the heat in the chip minimizing workhardening.

Use LC280TT in case of tool breakage, or heavy rough milling operations.

For 87° **TWIN*CUT***, reduce roughing and semifinishing chiploads by 40%
For 90° **TWIN*CUT***, and ISO 90° APKT style cutters reduce roughing and semifinishing chiploads by 45%
For Face Milling using ISO 45° insert styles SEAN and SEKN, reduce roughing and finishing chiploads by 30%
For **UNIVEX** data, see pages 171 and 172

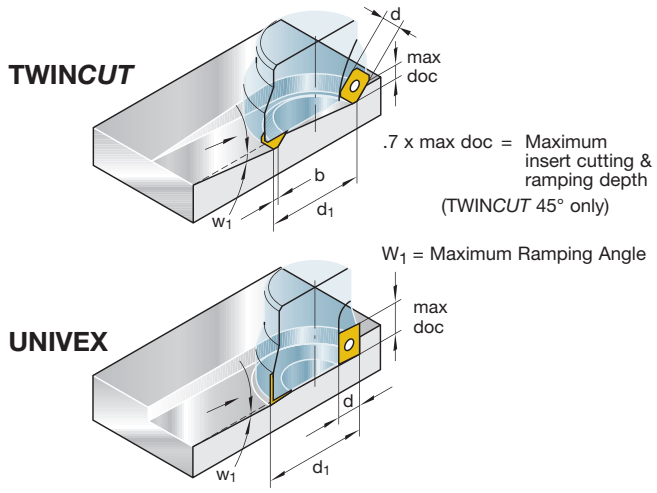
Recommended *maximum* feed per tooth (f_z) when woc = 3:2 (.67 x d_1) d_1 = Cutter dia.

Catalog No.	FMH45B 11171 MMH45B S12	FMH45 11172 MMH45 S12	FMH45 11173 MMH45A S12	FMT45 11250-12	FMT45 11250-19 MMT45 S12
					
a_p = max doc	.216	.216	.216	.275	.394
lead angle	45°	45°	45°	45°	45°
ISO-Code	SEHW 1204 AF	SEKN 1203 AF	SEKN 1204 AF	SNKX 1205 AN	SNKX 1907 AN
P	.015	.012	.015	.020	.024
	.012	.010	.012	.015	.020
M	.009	.007	.009	.012	.014
N	.020	.015	.020	.024	.024
K	.015	.012	.015	.020	.020
S	.010	.008	.010	.012	.012

Catalog No.	FMV45 11280	FMT87 11230	FMT90 11260 MMT90 S12	FMP90 11415 MMP90 A16	FMU90 11475
					
a_p = max doc	.197	.394	.394	.551	.472
lead angle	45°	87°	90°	90°	90°
P	SNHX 1205 AE	SNKX 1205 AN	SPKX 120508	APKT 1604 PDR	ADHX 12T306
M	.012	.013	.015	.010	.010
N	–	.012	.012	.008	.008
K	.007	.010	.009	.006	.006
S	.020	.016	.0013	.015	.015

Ramping with TWIN*CUT* 45° and UNIVEX

Ramping is always recommended over plunging when entering the workpiece. Ramp milling minimizes the likelihood of the workpiece material work hardening and improves tool life. Climb milling is recommended with workpiece materials that work harden. This method reduces the heat in the workpiece by dissipating it into the chip.



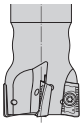
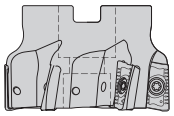
	TWIN*CUT* 45°		UNIVEX 90°	
d (insert ic)	.500	.750	.500	
b (facet width)	.078	.118	-	
a_p = max doc	.276	.394	.425	
d_1 inch	d_1 mm	W_1 max Degree	d_1 inch	W_1 max Degree
1.00	25	17.0		
1.25	32	12.0		
1.50	40	9.0	1.57	1.2
2.00	50	7.0	2.00	0.9
2.50	63	5.0	2.50	0.7
3.00	80	4.0		
4.00	100	3.0		
5.00	125	2.5		
6.00	160	2.0		
8.00	200	1.5	2.11	
10.00	250	1.2	1.66	

See page 80 for milling formulas.

Univex Premium – 17mm End Mills and Face Mills 90°
Cutting Data Recommendations

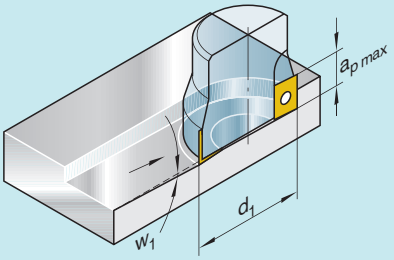
	Material	Material Examples	Rockwell C	Starting Cutting Speed (SFM)		
				LC630T	LC610T	LC240T
P	Plain Carbon Steel	1018, 1025	< 20	660	870	640
	Free Machining Steel	1212, 12L13	< 20	660	870	640
	Structural Alloy Steel	1040, 4130	< 30	590	870	640
	Heat Treatment Steel, medium strength	4140, 6150	< 30	520	870	525
	Cast Steel	4340, 8740	< 30	520	750	525
	Caste Hardening Steel	52100, 8620	< 30	520	750	525
	Stainless Steel, ferritic martensitic	410, 430F, 440	< 30	520	750	525
	Heat Treatment Steel, high strength	4140, 8740	28 - 44	390	575	460
	Nitriding Steel	A355	28 - 44	390	575	460
	Tool Steel	H13, D2	28 - 44	390	575	460
M	Stainless Steel, austenitic	304, 316	< 30	790	–	700
	Maraging Steel			200	–	700
K	Grey Cast Iron	A319, J431, No. 25B, No. 50B	< 27	660	870	640
	Alloyed Grey Cast Iron	A434, A436-72	< 22	490	675	525
	Nodular Cast Iron	A536 (80-55-06), J434	< 34	490	610	460
	Malleable Cast Iron	A220, 50005, A47, 32510	< 29	520	610	460
N	Pure Metals, soft	Pure Iron, Lead	< 20	980	2030	–
	Aluminum Alloys, long chipping	6061, 7050	< 20	3280	2750	–
	Aluminum Alloys, short chipping	A356, 4218	< 20	980	1150	–
	Copper Alloys, long chipping	C27200, B-148-52	< 20	820	2750	–
	Copper Alloys, short chipping		< 20	820	1150	–
	Magnesium Alloys	B94, M11910		1310	1640	–
	Thermoplastics	PVC, Acrylic glass		820	1640	–
	Duroplastics	Durolite, Ampal		660	1640	–
	Graphite			660	1640	–
S	Titanium Alloys, medium strength	F67, B265	< 29	260	–	–
	Titanium Alloys, high strength	Ti-6Al-4V	27 - 44	130	–	–
	Nickel Based Alloys medium strength	20Cb3	< 29	200	280	230
	Heat Resistant Nickel Based Alloys, high strength	Inconel 718	27 - 44	100	215	160
H	Chilled Cast Iron	Ampco 25	< 20	130	215	160
	Hardened Steel		45 - 52	–	280	160
			53 - 59	–	215	–
			60 - 65	–	145	–

Recommended feed per tooth (f_z) when width of cut (a_e) = 0.50 x d_1 (d_1 = Cutter Diameter)

LMT-Code	EMU90		FMU90
			
Ø	.787 - 1.574	.9842 - 1.574	1.574 - 3.937
ISO-Code	ADKX 1103 …	ADKX 1705 …	ADKX 1705 …
P	.0047 - .0059	.0059 - .0098	.0078 - .0118
M	.0047	.0059	.0066
K	.0078	.0118	.0137
N	.0098	.0137	.0157
S	.0039	.0059	.0059

Plunge milling using Univex EMU90, FMU90

Bevel angle $W_{1\ max}$ for plunge milling "ramping"

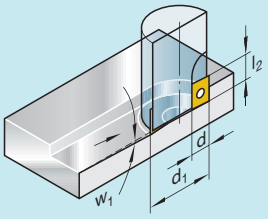


Type	d_1 (mm)	d_1 (inch)	ISO-Code	$a_{p\ max}$	$W_{1\ max}$ Degree
EMU90	20	.750	ADKX 1103 …	.413	3.3
	25	1.000			2.3
	32	1.250			1.6
	40	1.500			1.2
	25	1.000	ADKX 1705 …	.649	4
	32	1.500			2.7
	40	1.500			2
FMU90	40	1.500	ADKX 1705 …	.649	2
	50	2.000			1.5
	63	2.500			1.1
	80	3.000			0.8
	100	4.000			0.6

Feed Rates for Univex/Univex Premium Milling Cutters with Inserts

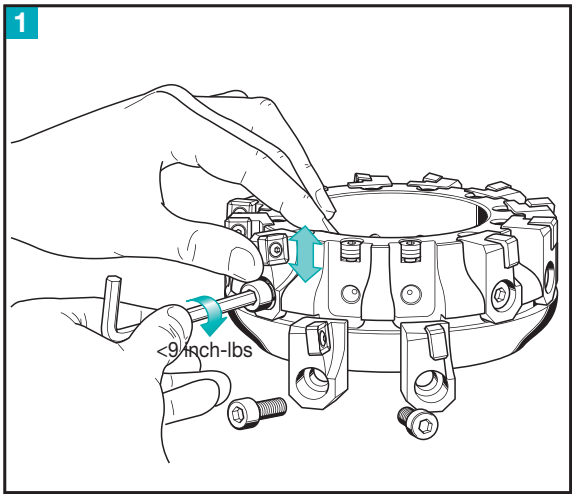
Plunge milling using Univex EMU90, FMU90, ERU90, FRU90

Bevel angle $W_{1\ max}$ for plunge milling "ramping"



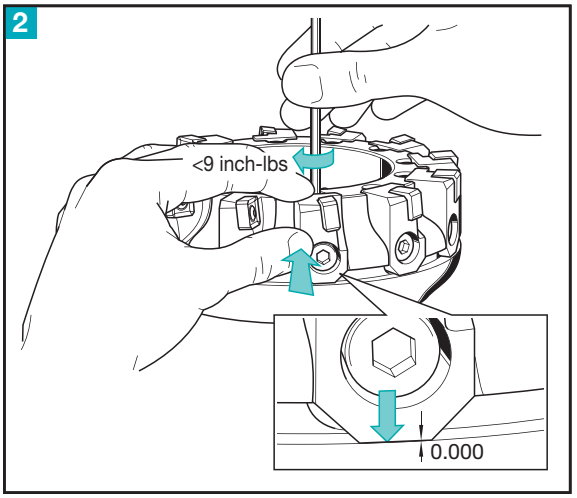
d_1 (mm)	d_1 (inch)	l_2 (Axial DOC)	d (Insert WOC)	$W_{1\ max}$ Degree
12	.472	9 (.354)	6.35 (.250)	4.5
14	.500			3.3
16	.625			2.6
18	.709			2.2
20	.750			1.9
22	.866			1.6
25	1.000	10.5 (.413)	7.92 (.312)	1.9
28	1.102			1.6
30	1.181			1.4
32	1.250			1.3
36	1.417			1.1
40	1.500			1.0

1



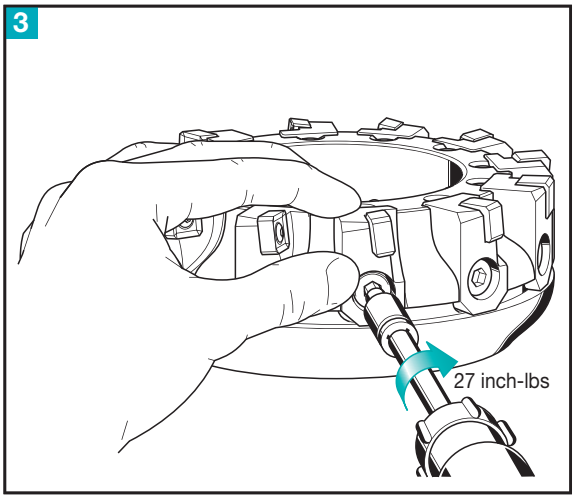
Load cartridges and pre-torque to 9 inch-lbs.

2



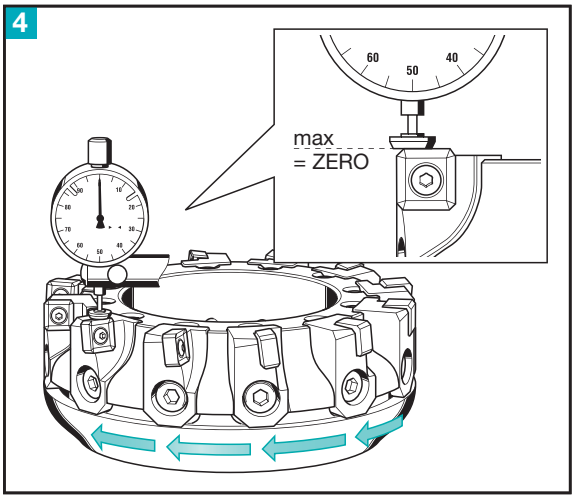
Push cartridges in and adjust down to fixed ground undercut surface with allen wrench as shown.

3



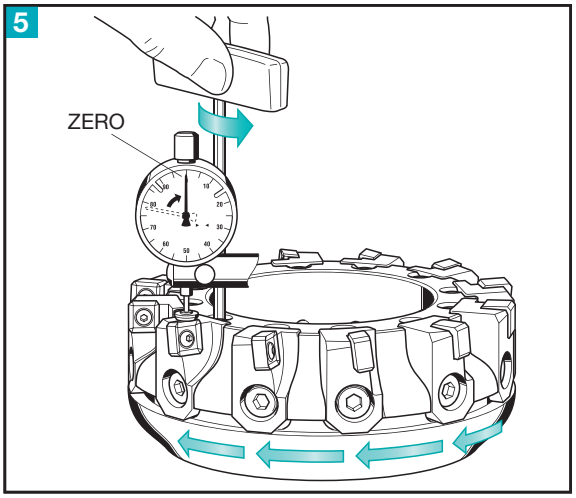
Pre-load all cartridges to 27 inch-lbs.

4



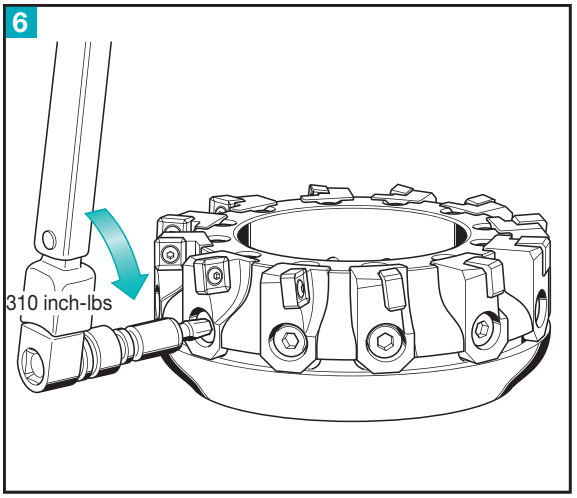
Measure height of all inserts and select highest insert as the established zero point on indicator.

5



Adjust all cartridges up to the established zero point on the indicator that was predetermined by the highest insert

6



Finish torque all cartridges to 310 inch-lbs.

1D-HSC-Milling Cutter
Assembly and Adjustment Instructions

The 1D (1-dimensional) adjustability on milling cutters for HSC-operations (HSC-High Speed Cutting) means, that the inserts' axial run-out can be individually adjusted and set. The radial insert run-out and the wiper-edge are preset and cannot be adjusted. When adjusting the milling cutter, the basic cutter materials have to be taken into consideration (aluminium–or steel type). KIENINGER supplies the milling cutters balanced, preadjusted and set in both axial and radial directions.

Basic setting:

1. The cartridge (2) together with the previously installed insert (1) has to be screwed into the cutter body. Tighten the cartridge locking screw (3) with a tourque of 4Nm (35 in. Lb), (picture 1).
2. Screw in the insert wedge (5) and tighten it with with 4 Nm tourque (picture 2).
3. Screw in the axial adjusting screw (4) into the cutter body, until it touches the insert cartridge (2), (picture 3)
4. Continue the previously mentioned process steps, until the cutter body is completely loaded with inserts.

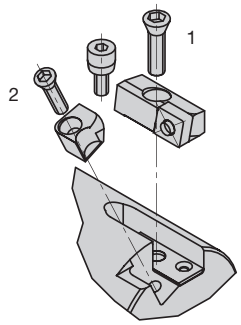
Fine tuning:

1. Tuning the axial adjusting screw (4) until all inserts have to been adjusted to approximately 0.02 mm (.0008") below the nominal required setting height (picture 3). This provides for additional axial adjusting travel heigh if required.
2. The locking screw (4) for the insert cartridge has to be tightened with a 10 Nm (88 in. Lb.) tourque (picture 1).
3. For fine tuning, use axial adjusting screw (4), (see picture 3).
   Important: Do not loosen screws again
4. Check the settings once again.

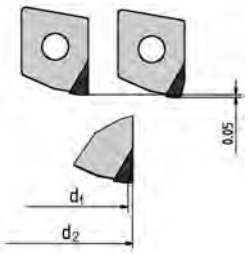
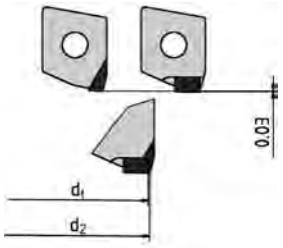
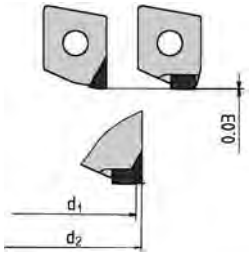
Please note, inserts cannot be changed individually without adjustment. Should this still be necessary, the hardware hast to be dismantled, cleaned and readjusted.

Use torque wrench when loosening the cartridge locking screws (4 + 7).

4 Nm = 35 in. lb.
10 Nm = 88 in. Lb.

Recommended torque [Nm]	Screw	Screwdriver	Tourques setting
	1	SW 4	pre-adjustment 4.0 Nm
			fine-tuning 10.0 Nm
	2	SW 4	4.0 Nm

Optimization of the surface through roughing/finishing adjustment with standard inserts

exchangeable inserts angle-face	exchangeable inserts angle-wiper blade	exchangeable inserts face-wiper blade
		

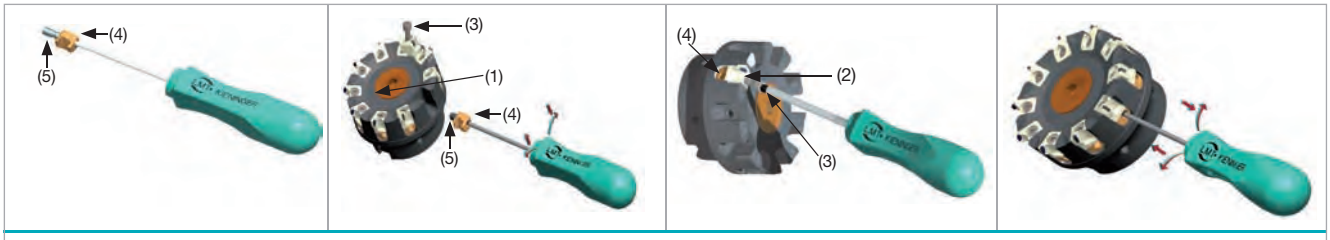
Adjustable in axial direction only

Axial adjustable to nom. measure. Regrinding cannot be compensated.
Runout = 0.05 mm.
Tools are shipped adjusted and balanced.

MC diameter d [mm]	Body	No. of teeth z	Weight [kg]	cutting speed v_c [SFM]	speed n [1/min]
63	steel	4	2.1	6283	20000
80	steel	6	2.7	6283	20000
80	aluminium	6	0.7	6283	20000
100	aluminium	6	1.0	6283	20000
100	aluminium	8	1.1	6283	20000
125	aluminium	8	1.8	6283	16000
125	aluminium	10	1.9	6283	16000
160*	aluminium	10	2.9	6283	12500
160*	aluminium	12	3.0	6283	12500
200*	aluminium	12	4.4	6283	10000
200*	aluminium	16	4.6	6283	10000
250*	aluminium	16	6.9	6283	8000
250*	aluminium	20	7.1	6283	8000
315*	aluminium	20	13.0	6283	6350
315*	aluminium	24	13.2	6283	6350
400*	aluminium	24	21.5	6283	5000
400*	aluminium	32	21.9	6283	5000

* Weight without coolant disc

Feed-Jet Milling Cutter
Adjustment Instructions



General

– Make sure that all parts are clean and can be moved easily. Please verify that no damaged or worn parts are assembled.
– Only original KIENINGER components to be used.
– Adjustment should only be done with inserts facing up. If the cutter can not be changed in upright position, go back to the starting point. This always ensures there is a pretension.

Pre-adjustment

– Screw in the thread pin (5) into the wedge (4) ; 1 - 1.5 revolutions. Caution: left hand thread!
– Screw in the wedge (4) into the the cutter (1) body as deep as possible.
– Put the cartridge (2) into the cutter (1) body. Tighten the screw slightly.
– Setting the cartridges by turning the threaded pin (5) counter clockwise.
Pre-adjust the cartridges to approx 0.01 - max 0.02 mm below the nominal height.

Note:

During height adjustment, screw will become tight (3). In case the screw might become too tight and only excessive torque is needed to move the cartridge, please loosen the clamping screw and re-adjust.

– After pre-adjustment the xing screw (3) have to be tightened with a torque wrench to 3 Nm. An actual moment above 3 Nm can lead to difficulties in the fine adjustement. In this case the xing screw has to be loosen to 3 Nm.

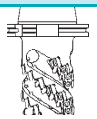
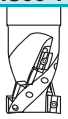
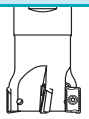
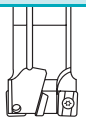
Fine adjustment

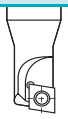
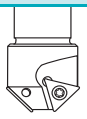
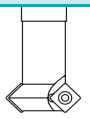
– Adjusting to nomial height by turning the thread pin (5) counter clockwise.
– Verify the adjustment. Available adjustment accuracy: 4 µ m
– Verify the tightening torque of the cartridge xing screw (3). This torque must at least 5 Nm. (Higher values are possible see note and do not have to be connected)

	Material	Hardness		Cutting Speed (SFM) Range		Recommended Grade	Feed Per Tooth (f_z) Range	Starting Speed (SFM)	Starting Feed Per Tooth (f_z)	Starting Chamfering (IPT)	Wet or Dry
		Brinell (BHN)	Rockwell (HRC)	Uncoated Carbide	Coated Carbide						
P	Low Carbon Steels	< 220	< 19		350-800	LC240T	.003-.009	500	.006	.013	D
	AISI: 1008, 1010,				400-1000	LC225T	.003-.008	650	.005	.011	D
	1018, 1117, 1141				300-650	LC630T	.003-.009	450	.006	.012	D
	Plain Carbon, Alloy and Tool Steels	200-300	19-32		300-700	LC240T	.003-.009	450	.006	.013	D
	AISI: 1045, 4140, 4320,				300-900	LC225T	.003-.008	550	.005	.013	D
	4340,5120, 8620, P-20				300-600	LC630T	.003-.009	400	.006		
	Alloy and Tool Steels	300-381	32-41		175-400	LC240T	.003-.008	300	.005	.009	D
	AISI Tool steels: H10, H11,				250-650	LC225S/T	.003-.007	450	.005	.008	D
	H13, alloy steels: 4140, 4150,				200-400	LC630S/T	.003-.008	300	.005	.009	D
	4320, 4340, 5120, 8620, 8640										
M	Stainless Steels										
	Ferritic-Martensitic	< 330	< 35		200-600	LC240T	.003-.008	450	.005	.008	D
	400 to 500 Series				250-650	LC225T	.003-.007	500	.004	.008	D
		330-371	35-40		150-500	LC240T	.003-.007	350	.005	.008	D
					175-550	LC225T	.003-.006	425	.004	.008	D
	PH Stainless Steels 15-5PH, 17-4PH, 17-7PH	150-371	< 40		175-500	LC240T	.003-.007	400	.005	.008	W/D
	Stainless Steels										
	Austenitic 200 to 300 Series	135-275	< 29		250-600	LC240T	.003-.007	400	.005	.008	D
	303, 304, 306, 316, 347				300-800	LC225T	.003-.007	450	.005	.008	D
N	Aluminum and other										
	Free-Machining	50-150			700-2000	LC610T•	.003-.012	1000	.008	.012	W/D
	Nonfererrous Materials				1000-12000	PCD	.003-.010	4000	.006	.010	W/D
	(copper, brass, zinc				900-4000	LC610T•	.003-.010	1500	.008	.012	W/D
	and magnesium)										
	Aluminum/High-Silicon				1000-6000	PCD	.003-.010	4000	.007	.010	W/D
	(12% or Higher)				700-1500	LC610T•	.003-.010	1000	.007	.010	W/D
K	Grey Cast Iron										
	Class: 20, 25, 30, 35, 40, 45, 50	120-320	< 34		300-900	LC610T	.003-.008	700	.006	.012	D
	SAE: grade G1800, G3000,				300-1100	LC615E	.003-.008	850	.006	.012	D
	G3500, G4000										
	Cast Iron										
	Ductile and Malleable	120-320	< 34		275-500	LC240T	.003-.006	325	.004	.008	D
	ASTM A536: 60-40-18,				300-600	LC610T	.003-.006	475	.004	.008	D
	65-45-12, 100-70-06				300-800	LC612E	.003-.006	525	.004	.008	D
	ASTM A47 grades 3000,										
	4000, 5000, 6000										
S	Nickel-Base Alloys										
	Annealed 600 series Inconel	140-300	< 32		50-300	LC610M	.003-.006	130	.004	.008	D
	Hastelloy & Waspaloy-Hastelloy B,				50-250	LC240T	.003-.007	110	.004	.008	D
	C-27, Inconel 601, 617, 625, 718										
	Nickel-Base,										
	Heat Resistant Alloys	300-475	31-49		60-200	LC240T	.002-.005	90	.003	.008	D
	Annealed Inconel 700 Series				60-200	LC225T	.002-.005	95	.003	.008	D
	Inconel 718, Rena 95,										
	MA6000, Hastelloy C										
	Titanium-Alloy	110-300	< 32	60-300	90-400	LC610T LW610	.003-.006	220	.003	.005	W
	Annealed Ti6Al-4V	300-350	32-36	60-220	90-300	LC610T LW610	.002-.006	150	.003	.005	W
	Ti6Al, Ti98.8, Ti99.9	350-440	36-46	60-180	90-200	LC610T LW610	.003-.006	130	.003	.005	W

When using uncoated grades reduce cutting speeds by 25%.
Use grade LC240S/T if tool breakage occurs.

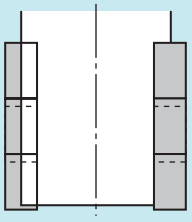
Recommended *maximum* feed per tooth (f_z) when woc = .5 x d_1 (d_1 = Cutter dia.)

Catalog No.	ERT90 11257 FRT90 11259	ERU90 11552 ERU90 11555 ERU90 11335	EMP90 11415 FMP90 11415	EMU90 11473 EMU90 11474
				
Cutter Dia.	2.00-3.00	1.00-2.50	1.00-4.00	0.50-1.50
ISO Code	SNKX	ADMX	APKT	ADHX
Recommended Maximum Feed per Tooth (f_z)				
P	.010	.006	.010	.006*
	.008	.005	.008	.005*
M	–	.004	–	.004*
K	.012	.010	.010	.010*
	.010	.008	.008	.008*
S	–	.004	–	.004*

Catalog No.	EMT45 11253	ESP90 11470	EFZ45/60 1148	EFP45 11483
				
Cutter Dia.	1.56-2.06	.488-1.238	.630-1.26	1.134-1.941
ISO Code	SNKX	CCHX	TCMT	SDM_ and SP__
Recommended Maximum Feed per Tooth (f_z)				
P	.010	.006	.008	.008
	.008	.004	.006	.006
M	.006	–	.004	.004
K	.012	.008	.010	.010
	.010	.006	.008	.008
S	.004	–	.003	.003

*These recommendations represent the average of the size range offered. These figures are not appropriate for smaller cutter diameters.

Calculation of Feed (IPM) When Applying Long Edge Helical Cutters

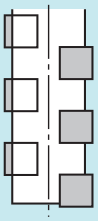


Inserts overlap
(all effective)
$nt_{eff.}$ = number of flutes

rpm = 3.82 x sfm ÷ d

IPM = rpm x $nt_{eff.}$ x f_z x M_f

rpm = spindle speed
f_z = feed per tooth
$nt_{eff.}$ = effective teeth
M_f = multiplication factor



Inserts do not overlap
(half effective)
$nt_{eff.}$* ÷ 2 = number of flutes

*Inserts are staggered in rows; two rows make one effective flute. Only one row cuts to the end. Each insert in that row is spaced so the next adjacent row of inserts cuts in the gap area with some insert overlap to complete the length of cut and make an effective flute.

MultiEdge 3 Feed – Indexable
Cutting Data Recommendations

	Material	AISI/SAE (USA Spec)	Material No.	DIN Des.	Feed per tooth f_z (inches) Cutting speed v_c = SFM			
					LC280QN		LC610Q	
					v_c	f_z	v_c	f_z
P	Plain carbon steel	1018, 1025	1.1730	C45W	984	.079	1082	.071
			1.1545	C105W	984	.079	1082	.071
	Heat-treatable die steels	4140, 6150	1.2311	40CrMMo7	787	.063	984	.055
			1.2312	40CrMnNiMoS8.6	787	.071	984	.063
			1.2738	45CrMnNiMo8.6.4	787	.071	984	.063
			1.2711	54NiCrMoV6	721	.063	869	.055
	Case hardening steels	52100, 8620	1.2162	21MnCr5	984	.063	1082	.055
			1.2764	X19NiCrMo4	787	.063	1993	.055
	Full hardening tools steels	H13, D2	1.2343	X38CrMoV5.1	721	.063	869	.055
			1.2344	X40CrMoV5.1	721	.063	869	.055
			1.2367	X38CrMoV5.3	721	.063	869	.055
			1.2080	X210Cr12	656	.047	820	.039
			1.2379	X155CrVMo12.1	656	.047	820	.039
			1.2767	X45NiCrMo4	590	.055	721	.047
			1.2842	90MnCrV8	721	.055	869	.047
	Nitriding steels	A355	1.8550	34CrAiNi7	590	.055	721	.047
			1.8519	31CrMoV9	590	.047	721	.039
			1.7735	14CrMoV6.9	590	.047	721	.039
			1.2344	X40CrMoV5.1	492	.055	656	.047
M	Stainless steel, austenitic	303, 304, 316	1.2083	X42CrMo13	820 [1)]			
			1.2316	X36CrMo17	820 [1)]			
K	Grey cast iron and alloyed grey cast iron	A319, J431, No. 25B, No. 50B	0.6025	GG25			984	.079
				GG25CrMoV			984	.063
	Nodular cast iron and alloyed nodular cast iron	A536 (80-55-06), J434	0.7040	GGG40			820	.055
			0.7070	GGG70			820	.047
				GGG70 alloyed			820	.039
H	Hardened steel	Ampco 25	45-52HRC				393	
			53-59HRC				328	
			60-65HRC				295	

[1)] Dry cutting with inserts 1177-65 LC240T (Ident No. 1058174)

The cutting data indicated are starting values and must be adjusted to the prevailing conditions

MultiEdge 4 Feed – Indexable
Cutting Data Recommendations

	Material	Material No.	DIN Designation	Material values	Recommended max. feed per tooth f_z with $a_e = 0.75 \times d_1$ (d_1 = Cutter diameter)													
					Cutting speed / v_c (m/min)													
					LC280QN							LC610T / LC610Q / LC 630Q						
					v_c	XCNT07 SN-TR XCNW07 SN	XCNT09 SN-TR XCNW09 SN	XCNT12 SN-TR XCNW12 SN	XCNT07 EN-TR	XCNT09 EN-TR	XCNT12 EN-TR	v_c	XCNT07 SN-TR XCNW07 SN	XCNT09 SN-TR XCNW09 SN	XCNT12 SN-TR XCNW12 SN	XCNT07 EN-TR	XCNT09 EN-TR	XCNT12 EN-TR
P	Plain carbon steel	1.1730	C45W	190 – 200 HB	650 – 850	.078	.098	.118	.055	.067	.078	800 – 980	.063	.078	.094	.043	.055	.063
		1.1545	C105W	190 – 240 HB														
	Heat-treatable die steels	1.2311	40CrMnMo7	280 – 325 HB	450 – 600	.047	.060	.071	.030	.043	.052	600 – 720	.040	.047	.055	.027	.030	.040
		1.2312	40CrMnMoS8.6	280 – 325 HB		.060	.078	.098	.043	.055	.071		.047	.063	.078	.030	.043	.055
		1.2738	40CrMnNiMoS8.6.4	280 – 325 HB														
		1.2711	54NiCrMoV6	280 – 415 HB		.078	.098	.118	.055	.067	.078		.063	.078	.094	.043	.055	.063
	Case hardening steels	1.2162	21MnCr5	215 HB	450 – 720	.078	.098	.118	.055	.067	.078	720 – 920	.063	.078	.094	.043	.055	.063
		1.2764	X19NiCrMo4	255 HB		.071	.087	.098	.052	.060	.071		.055	.071	.078	.040	.047	.055
	Full hardening tools steels	1.2343	X 38 CrMoV 5 1	230 HB	450 – 600	.078	.098	.118	.055	.067	.078	600 – 800	.063	.078	.094	.043	.055	.063
		1.2080	X210Cr12	250 HB		.055	.071	.078	.040	.052	.055		.043	.055	.063	.030	.040	.043
		1.2379	X 155 CrVMo 12 1	250 HB		.078	.098	.118	.055	.067	.078		.063	.078	.094	.043	.055	.063
		1.2767	X 45NiCrMo4	260 HB		.063	.078	.087	.043	.055	.060		.052	.063	.071	.035	.043	.047
	Nitriding steels	1.8550	34CrAlNi7	240 – 300 HB	400 – 450	.055	.063	.071	.040	.043	.052	520 – 650	.043	.052	.055	.030	.035	.040
		1.8519	31CrMoV9	265 – 310 HB														
		1.7735	14CrMoV6.9	265 – 310 HB		.043	.052	.060	.027	.035	.040		.035	.040	.047	0.24	.027	.030
		1.2344	X40CrMoV5.1	280 – 325 HB		.063	.078	.087	.043	.055	.060		.052	.063	.071	.035	.043	.047
M	Stainless steel (dry processing)	1.2083	X42CrMo13	500 – 900 N/mm²	720 – 850	.040	.060	.071	.040	.060	.071							
		1.2316	X36CrMo17															
		1.4301	X5CrNi1810	– 950 N/mm²		.030	.047	.060	.030	.047	.060							
		1.4572	X5CrNiMoTi17-12-3															
K	Cast iron with flake graphite	EN-JL-1040 (0.6025)	EN-GJL 250 (GG 25)	120 – 260 HB	650 – 850	.060	.078	.098	.047	.063	.078	650 – 850	.060	.078	.098	.047	.063	.078
	Cast iron. alloyed	(0.6678)	EN-GJLA-XNiCr35-2 (GGL-NiCr 35-2)	150 – 250 HB	520 – 650							520 – 650						
	Graphite cast iron	EN-JS-1030 (0.7040)	EN-GJS-400 (GGG40)	135 – 180 HB	650 – 800	.060	.078	.098	.040	.055	1.7	650 – 800	.060	.078	.098	.040	.055	.067
		EN-JS-1060 (0.7060)	EN-GJS-600 (GGG60)	190 – 270 HB														
	Malleable cast iron	EN-JL-1160 (0.8155)	EN-GJMB-550-4 (GTS55)	150 – 280 HB	520 – 650	.052	.052	.060	.027	.035	.040	520 – 650	.052	.052	.060	.027	.035	.040
N	Aluminum alloys, long chipping			– 550 N/mm²								1300 – 2600				.071	.078	.087
	Aluminum alloys, short chipping			350 – 700 N/mm²								980 – 1300						
	Copper alloys, long chipping			300 – 750 N/mm²								820 – 1300				.055	.063	.071
	Copper alloys, short chipping			– 750 N/mm²														
S	Titanium alloys, medium strength			– 900 N/mm²								260 – 400				.020	.030	.040
	Titanium alloys, high strength			900 – 1400- N/mm²								130 – 260				.012	.020	.030
	Nickel alloys, medium strength			– 900 N/mm²								260 – 400				.020	.030	.040
	Nickel alloys, high strength			900 – 1400 N/mm²								130 – 260				.012	.020	.030

Feed Correction

$$v_f = n \cdot z \cdot f_z \cdot f_2$$

f_2

a_p	l_{ges} = max. 4 x d_1	l_{ges} = > 4 x d_1
.0197	1.3	1.0
.0394	1.0	0.75
.059	0.7	0.5

v_f = Feed rate (SFM)
n = RPM
z = No. of teeth
f_z = Feed per tooth (in)
l_{ges} = Reach in (in)
a_p = Depth of cut in (in)
f_2 = Correction factor

Feed correction

$v_f = f_z \cdot z \cdot n \cdot f_2$

a_p	f_2 $l_{ges.} < 4 \times d_1$	f_2 $l_{ges.} > 4 \times d_1$
0.5 x $a_{p\,max}$	1.3	1.0
0.75 x $a_{p\,max}$	1.0	0.75
1.0 x $a_{p\,max}$	0.7	0.5

Calculating formulas

Speed n (min⁻¹):
$n = \frac{v_c \cdot 1000}{\pi \cdot d_1}$

Cutting speed
$v_c = \frac{n \cdot \pi \cdot d_1}{1000}$

Feed rate
v_f (inch/min):
$v_f = f_z \cdot z_{eff} \cdot n \cdot f_2$

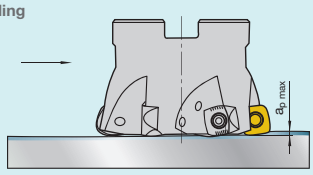
Feed per tooth
$f_z = \frac{v_f}{z_{eff} \cdot n \cdot f_2}$

Chip volume-Q (min):
$Q = \frac{a_e \cdot a_p \cdot v_f}{1000}$

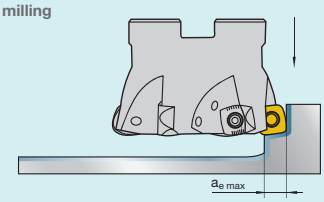
Drive power
$P_e = \frac{Q}{LF}$

v_c = Cutting speed (sfm)
n = Speed (min⁻¹)
d_1 = Cutter dia. (rpm)
v_f = Feed rate (ipm)
f_z = Feed per tooth (kW)
P_e = Drive power (kW)
z_{eff} = Effective number of teeth
f_2 = Correction factor
Q = Chip volume
a_e = Width of cut (inch)
a_p = Depth of cut (inch)
LF = Efficiency factor

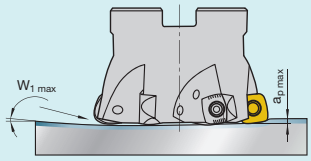
Face milling



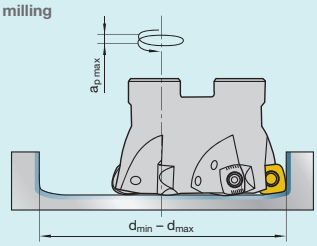
Plunge milling



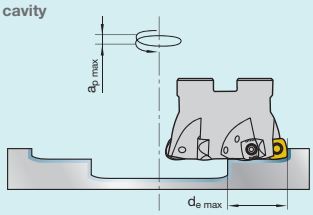
Ramping



Circular milling

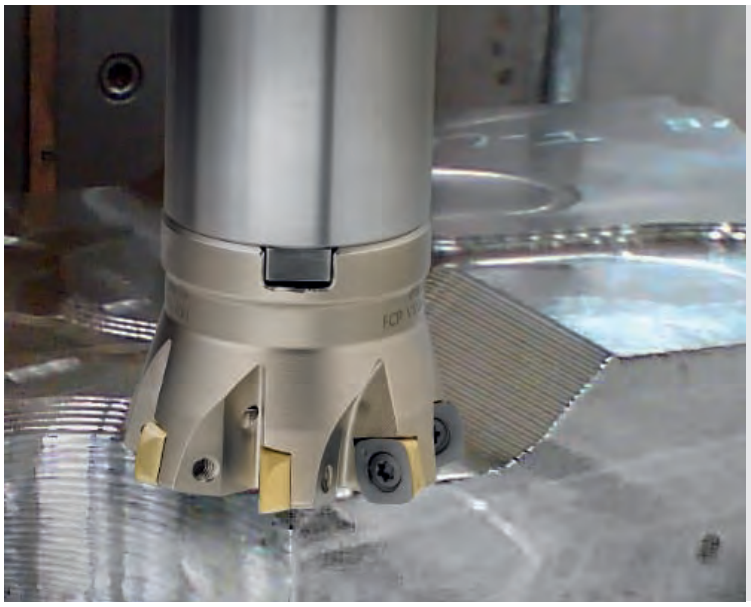


Opening cavity



Tool		ECP X07.	ECP V07.	E(F)CP V09.	E(F)CP V12.
$a_{p\,max}$ (inch)		.040"	.040"	.047"	.060"
$a_{e\,max}$ (inch)		.236"	.250"	.315"	.375"
T_{max} (inch)		.020"	.020"	.024"	.032"
Ramping Angle W1					
d_1 (mm)	d_1 (inch)	$W_{1\,max}$ (°)			
16	.625"	3.5			
20	.750"	1.8	4.3		
25	1.00"	1.2	2.4		
32	1.25"		1.5	2.2	
35	1.50"		1.3	1.8	
42	–			1.3	2
52	2.00"			1	1.5
66	2.50"				1
80	3.00"				0.8
100	4.00"				0.6
Circular Milling					
d_1 (mm)	d_1 (inch)	$d_{min} – d_{max}$ (inch)			
16	.625"	.750"–1.22"			
20	.750"	1.102"–1.54"	1.02"–1.54"		
25	1.00"	1.50"–1.93"	1.42"–1.93"		
32	1.25"		1.97"–2.44"	1.89"–2.44"	
35	1.50"		2.20"–2.68"	2.13"–2.68"	
42	–			3.46"–4.02"	2.52"–3.23"
52	2.00"				3.31"–4.02"
66	2.50"				4.41"–5.12"
80	3.00"				5.51"–6.22"
100	4.00"				7.09"–7.80"
Open Cavity Milling					
d_1 (mm)	d_1 (inch)	$d_{e\,max}$ (inch)			
16	.625"	.395"			
20	.750"	.551"	.512"		
25	1.00"	.748"	.709"		
32	1.25"		.984"	.945"	
35	1.50"		1.10"	1.06"	
42	–			1.34"	1.26"
52	2.00"			1.73"	1.65"
66	2.50"				2.20"
80	3.00"				3.54"
100	4.00"				

T_{max}: axial drilling depth



Copy end mills, pump casing pressure die casting mold

Tool:
FCP V12.066 AN-I, d_1 = 66 mm, z = 7

Material:
Tool steel 1.2842
S7
32 HRC

Insert:
XCNW 120520 SN, LC280QN

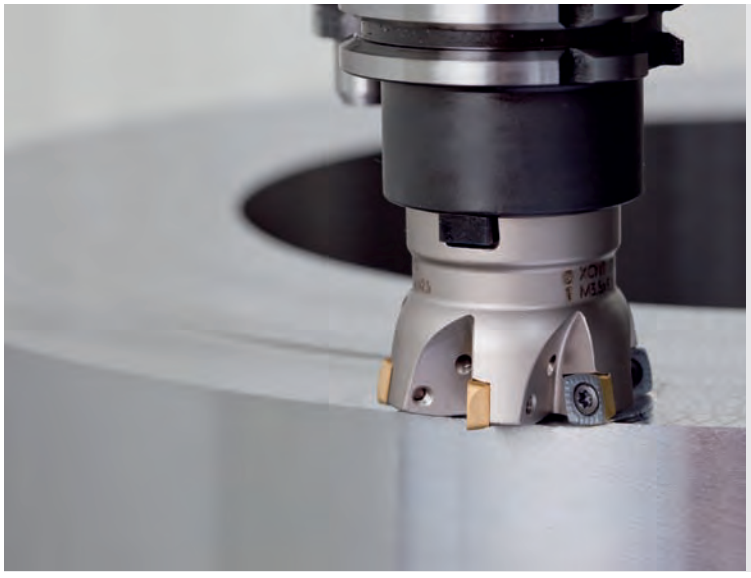
Cutting data:
v_c = 720 SFM
n = 100 RPM
f_z = .070 IPT
v_f = 521 IPM
a_e = 1.770
a_p = .040

Roughing z-surfaces, wheel-die

Tool:
1431 C, d_1= 8 mm, z = 4
LC620ZM

Material:
Tool steel
P20

Cutting data:
v_c = 500 SFM
n = 6060 RPM
f_z = .008 IPT
v_f = 195 IPM
a_p = .008



Face milling, machine component, flange

Tool:
FCP V09.052 AN-I, d_1 = 52 mm, z = 6

Material:
316 Stainless Steel, Austenitic

Insert:
XCNT 09T312 EN-TR, LC280QN

Cutting data:
v_c = 800 SFM
n = 1500 RPM
f_z = .047 IPT
v_f = 423 IPM
a_e = 1.380
a_p = .040

Copy Milling Cutters and Ball Nose Copying Cutters – Indexable
Cutting Data Recommendations

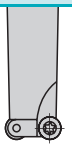
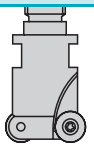
	Material	AISI/SAE (USA Spec) Material Examples	R_m/UTS (N/mm²)	Carbide grade	Cutting speed v_c = SFM			
					Roughing		Finishing	
					with round inserts	with roughing end mills or ball nose cutters		with cermet
P	Plain carbon steel	1018, 1025	- 700	LC240T	984 - 820	721 - 524	984 - 820	1148 - 984
	Free cutting steel	1212, 12L13	- 700	LC610T	984 - 820	721 - 524	984 - 820	1148 - 984
	Structural alloy steel	1040, 4130	500 - 950	(Finishing)	984 - 820	721 - 524	984 - 820	1148 - 984
	Heat-treatable steel, medium strength	4140, 6150	500 - 950		984 - 820	721 - 524	984 - 820	1148 - 984
	Cast steel	4340, 8740	- 950		984 - 820	721 - 524	984 - 820	1148 - 984
	Case hardening steel	52100, 8620	- 950		984 - 820	721 - 524	984 - 820	1148 - 984
	Stainless steel, ferritic, martensitic	410, 430F, 440	500 - 950		984 - 820	721 - 524	984 - 820	1148 - 984
	Heat-treatable steel, high strength	4140, 8740	950 - 1400	LC240T LC610T	721 - 590	492 - 393	721 - 590	820 - 656
	Nitriding steel	A355	950 - 1400	(Finishing)	721 - 590	492 - 393	721 - 590	820 - 656
	Tool steel	H13, D2	950 - 1400		721 - 590	492 - 393	721 - 590	820 - 656
M	Stainless steel, austenitic	303, 304, 316		500 - 950	LC240T (-262)[3]	820 - 1148	820 - 1148 (-262)[3]	820
	Maraging steel				820 - 984 (-262)[3]		820 - 1148 (-262)[3]	
K	Grey cast iron	A319, J431, No. 25B, No. 50B	100 - 400 (120 - 260 HB)	LC610T	984 - 721	984 - 656	1148 - 820	984 - 820
	Alloyed grey cast iron	A434, A436-72	150 - 250 (100 - 230 HB)	LC610T	984 - 721	984 - 656	1148 - 820	984 - 820
	Nodular cast iron	A536, (80-55-06), J434	400 - 800 (120 -310 HB)	LC610T	984 - 721	984 - 656	1148 - 820	984 - 820
	Malleable cast iron	A220, 50005, A47, 32510	350 - 700 (150 - 280 HB)	LC610T	984 - 721	984 - 656	1148 - 820	984 - 820
N	Pure metals, soft	Pure Iron, Lead	- 500	LC225S	984 - 3281	984 - 3281	1640 - 4921	
	Aluminium alloys, long chipping	6061-T6, 7050	- 550	LW610[1]	984 - 3281	984 - 3281	1640 - 4921	
	Aluminium alloys, short chipping	A356, 4218	- 400	LW610[1]	984 - 721	984 - 721	1148 - 820	984 - 820
	Copper alloys, long chipping	C27200	300 - 700	LC225S	984 - 3281	984 - 3281	1640 - 4921	
	Copper alloys, short chipping		- 500	LC225S	984 - 721	984 - 721	1148 - 820	984 - 820
	Magnesium alloys	B94, M11910	150 - 300	LW610[1]	984 - 3281	984 - 3281	1640 - 4921	
	Thermoplastics	PVC, Acrylic Glass	40 - 70	LW610[1]	984 - 3281	984 - 3281	1640 - 4921	
	Duroplastics	Durolite, Ampal	20 - 40	LW610[1]	984 - 721	984 - 721	1148 - 820	984 - 820
	Graphite		40 - 60	LC610[1]	131 - 262	1312 - 2625	1312 - 2625	
S	Titanium alloys, medium strength	F67, B265	- 950	LW610[1]	131 - 262	131 - 262	131 - 262	
	Titanium alloys, high strength	Ti-6Al-4V	900 - 1400	LW610[1]	131 - 262	131 - 262	131 - 262	
	Nickel based alloys, medium strength	20Cb3	- 950	LC225S	131 - 262	131 - 262	131 - 262	
	Heat resistant nickel based alloys, high strength	Inconel 718	900 - 1400	LC225S	131 - 262	131 - 262	131 - 262	
H	Chilled cast iron	Ampco 25	300 - 600 HB	LC240T	131 - 262	131 - 262	131 - 262	

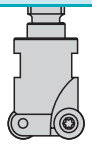
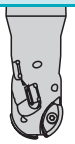
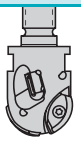
[1] Uncoated grade, value of v_c is valid for this grade
[3] When using liquid coolants.

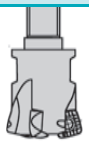
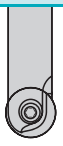
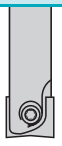
When using uncoated grades reduce cutting speed by 30%.

Copy Milling Cutters
Recommended Maximum Feed per Tooth f_z

Feed per tooth and depth of cut tool-dia., indexable insert dia. and unclamped length

Cat.-No.	FCZ			FCT/FCC			ECZ/ECC				
											
Cutter Dia.	42 - 80mm / 1.50 - 3.00 in			42 - 125mm / 1.50 - 5.00 in			8 - 40mm / .312 - 1.50 in				
ISO-Code	RDHW RDHX			RCHX RCKT/RCMX			RDHW RDHX				
Insert Dia.	0.394	0.472	0.630	0.394	0.472	0.630	0.197	0.276	0.315	0.394	0.472
max. ap (DOC)	0.098	0.118	0.197	0.098	0.118	0.197	0.031	0.059	0.079	0.118	0.138
P	0.010	.0118-.0157	.0157-.0177	0.010	.0118-.0157	.0157-.0177	.0098-.0118	.03947-.0118	.0118-.0138	.0087-.0146	.0118-.0157
M	0.005	0.006	0.008	0.005	0.006	0.008	0.003	0.004	0.005	0.005	0.006
K	0.010	0.014	0.014	0.010	0.014	0.014	0.008	0.008	0.010	0.012	0.014
N	0.012	0.016	0.016	0.012	0.016	0.016	0.010	0.010	0.012	0.014	0.016
S	0.010	0.012	0.012	0.010	0.012	0.012	0.006	0.006	0.008	0.010	0.012

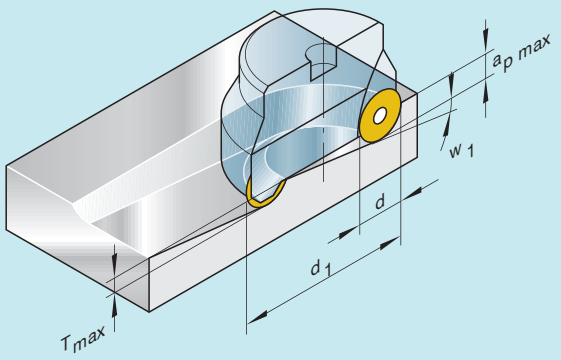
Cat.-No.	ECT				EBG T GRT	EBT			
									
Cutter Dia.	10 - 40mm / .375 - 1.50 in				25 - 32mm	20 - 50mm / .750 - 2.0 in			
ISO-Code	RCHX					CCMT SNKX			
Insert Dia.	0.197	0.315	0.394	0.472		0.250	0.313	0.375	0.500
max. ap (DOC)	0.031	0.079	0.118	0.138					
P	.0098-.0138	.0118-.0138	.0087-.0098	0.012	.0079-.0098	0.008	0.010	0.012	0.014
M	0.004	0.005	0.005	0.006					
K	0.012	0.010	0.012	0.014	0.012	0.008	0.010	0.012	0.014
N	0.014	0.012	0.014	0.016	0.016	0.010	0.012	0.014	0.016
S	0.010	0.008	0.010	0.012	0.010	0.006	0.008	0.010	0.012

Cat.-No.	EBT		ECP	FCP ECP	EBG R GWR		EBG R THR		EBG V GWV		
											
Cutter Dia.	16 - 32mm / .625 - 1.25 in		16 - 25mm	20 - 100mm	6 - 32mm / .250 - 1.25 in				12 - 32mm / .500 - 1.25 in		
ISO-Code	Half Moon Insert		1177	XCNT	WPR Ball Nose Inserts				WPV/WPB Inserts		
Cut Dia.	0.630	0.787	0.984	1.260	0.315	0.394	0.472	0.630	0.787	0.984	1.260
max. ap (DOC)	0.059	.079	.040	.070	.039	.039	.039	.059	.079	.0985	.118
P	0.006	0.008	0.008	0.010	0.006	0.006	0.006	0.006	0.008	0.008	.0079-.0098
M	0.003	0.004	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.005
K	0.005	0.006	0.008	0.010	0.004	0.004	0.004	0.005	0.006	0.008	0.010
N	0.006	0.008	0.010	0.012	0.004	0.004	0.004	0.006	0.008	0.010	0.012
S	0.005	0.006	0.007	0.008	0.004	0.004	0.004	0.005	0.006	0.007	0.008

Maximum depth of cut for facemilling

	Insert Dia.	5 (.197")	7 (.276")	8 (.315")	10 (.394")	12 (.472")	16 (.630")
$a_{p\ max}$ (DOC)	**Roughing**	.031	.059	.078	.118	.118	.1969
	Finishing	.012	.020	.030	.039	.039	.039

Maximum angle W, for ramping



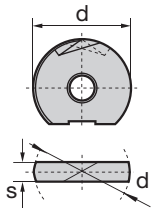
	Copy Insert Diameter					
d_1	5 (.197")	7 (.276")	8 (.315")	10 (.394")	12 (.472")	16 (.630")
0.315	8.9°					
0.394	6.3°					
0.472	4.8°	8.0°				
0.591		5.7°				
0.630	3.3°		6.3°			
0.787	2.5°	3.8°	4.6°	6.3°		
0.945					6.3°	
0.984	2.9°	2.9°	3.4°	4.6°	5.9°	
1.181		2.3°		3.6°		
1.260	2.1°				4.2°	6.3°
1.378		1.9°		3.0°	3.7	
1.575					3.1°	
1.654				2.4°		
1.969					2.3°	3.3°
2.047					2.3°	
2.480					1.7°	2.5°
2.598					1.7°	2.4°
3.150					1.3°	1.9°
3.937						1.5°
4.921						1.1°
T_{max}	.0196	.0295	.0393	.0492	.059	.0787

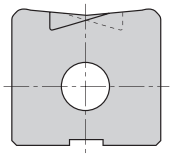
ECT THR

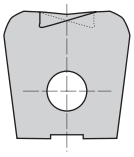
FCC

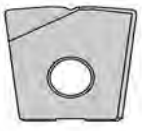
ECZ

GWR and GWV Copying Cutters
Maximum Machining Data

GWR Copying Cutters	Maximum depth of cut a_p max [in]			
	Diameter			
	mm	Inch	Roughing	Finishing
	–	0.250	0.125	0.050
	0.315	0.312	0.157	0.063
	0.394	0.375	0.197	0.079
	0.472	0.500	0.236	0.094
	0.630	0.625	0.315	0.126
	0.787	0.750	0.394	0.157
	0.984	1.000	0.492	0.197
	1.260	1.250	0.630	0.252

GWV Flat Bottom Cutters	Maximum depth of cut a_p max [in]			
	Diameter			
	mm	Inch	Roughing	Finishing
	0.315	0.312	0.079	0.024
	0.394	0.375	0.118	0.079
	0.472	0.500	0.118	0.094
	0.630	0.625	0.157	0.126
	0.787	0.750	0.197	0.157
	0.984	1.000	0.236	0.197
	1.260	1.250	0.315	0.252

GWV Backdraft Cutters	Maximum depth of cut a_p max [in]			
	Diameter			
	mm	Inch	Roughing	Finishing
	0.472	0.500	0.079	0.031
	0.630	0.625	0.118	0.039
	0.787	0.750	0.157	0.039
	0.984	1.000	0.197	0.059

WPB-HF, High feed insert [1]	Maximum depth of cut			
	Diameter			
	mm	Inch	a_p max [in]	R_{theo} [in]
	0.394	0.375	0.020	0.039
	0.472	0.500	0.024	0.039
	0.630	0.625	0.031	0.059
	0.787	0.750	0.039	0.079
	0.984	1.000	0.049	0.098
	1.250	1.250	0.063	0.118

	Material	Material No.	DIN Des.	Feed per tooth f_z (inches)			
				Finishing		Roughing	
				(.312"-.625") Ø 8-16	(.750"-1.25") Ø 20-32	(.312"-.625") Ø 8-16	(.750"-1.25") Ø 20-32
P	Unalloyed tool steel (1045, 4130)	1.1730	C45W	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
		1.1545	C105W	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
	Heat-treatable die steels (4140, 6150)	1.2311	40CrMnMo7	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
		1.2312	40CrMnMoS8.6	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
		1.2738	40CrMnNiMo8.6.4	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
		1.2711	54NiCrMoV6	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
	Case hardening steels (52100, 8620)	1.2162	21MnCr5	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
		1.2764	X19NiCrMo4	0.0059	0.0078-.0098	0.0059-0.0078	0.0078-0.0118
	Full hardening tool steels (H13, D2)	1.2343	X38CrMoV5.1	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2344	X40CrMoV5.1	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2367	X38CrMoV5.3	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2080	X210Cr12	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2379	X155CrVMo12.1	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2767	X45NiCrMo4	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2842	90MnCrV8	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
	Nitriding steels (A355)	1.8550	34CrAlNi7	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.8519	31CrMoV9	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.7735	14CrMoV6.9	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
		1.2344	X40CrMoV5.1	0.0039	0.0078-.0098	0.0039-0.0059	0.0059-0.0098
M	Stainless steels (303, 304, 316, 316L)	1.2083	X42CrMo13	0.0031	0.0039	0.0039	0.0059
		1.2316	X36CrMo17	0.0031	0.0039	0.0039	0.0059
		1.4541	X6CrNiTi18.10	0.0031	0.0039	0.0039	0.0059
		1.4571	X8CrNiMoTi17.12.2	0.0031	0.0039	0.0039	0.0059
		1.4401	X5CrNiMo17.12.2	0.0031	0.0039	0.0039	0.0059
		1.4521	X1CrMoTi18.2	0.0031	0.0039	0.0039	0.0059
		1.4893	X8CrNiNb11	0.0031	0.0039	0.0039	0.0059
		1.4313	(G-)X4CrNi13.4	0.0031	0.0039	0.0039	0.0059
	Maraging steel	1.2709	X3NiCrMoTi18.9.5	0.0031	0.0039	0.0039	0.0059
K	Grey cast iron and alloyed cast iron (A319, J431, No.25B)	0.6025	GG25	0.0039	0.0059	0.0059	0.0118
			GG25CrMoV	0.0039	0.0059	0.0059	0.0118
	Nodular cast iron and alloyed nodular cast iron (A536 (80-55-06), J434)	0.7040	GGG 40	0.0039	0.0059		
		0.7070	GGG70	0.0031	0.0039	0.0078	0.0098
			GGG70 legiert alloyed	0.0031	0.0039	0.0078	0.0098
N	Aluminium and aluminium alloys (6061-T6), 7050		AlZnMgCu2	0.0059	0.0059	0.0078	0.0098
		32.581	AlSi12	0.0059	0.0059	0.0078	0.0098
	Copper and copper alloys (C27200, B-148-52)		Elektrolyt-Cu Electrolyte copper	0.0039	0.0047	0.0078	0.0098
	Non-metallic materials		Bronze	0.0039	0.0047	0.0078	0.0118
	Duroplastics	PUR	Kunststoff Plastics	0.0059	0.0078	0.0118	0.0157
		Epoxy resin	Plastics	0.0059	0.0078	0.0118	0.0157
			Graphite	0.0039	0.0059	0.0078	0.0018
S	Titanium alpha beta alloys		TiAl6V4	0.0031	0.0039	0.0039	0.0039
	Titanium beta alloys (Inconel 718)		Ti10V2Fe3Al	0.0031	0.0039	0.0039	0.0039
H	Hardened steel	45–52 HRC		0.0031	0.0039	0.0039	0.0078
		53–59 HRC		0.0031	0.0031	0.0039	0.0078
		60–65 HRC		0.0019	0.0031	0.0031	0.0039

The cutting data indicated are starting values and must be adjusted to the prevailing conditions.

	Cutting speed v_c [SFM]											
	Finishing					Roughing						
	LC610Z (Soft)	LC610T	LC610Q	LC630Q	LC730T	LC610T	LC610Z (Hard)	LC240T	LC630Q	LC730T	LW240	LW225
	886	755	656	656	886	787	738	656	525	787	459	427
	853	722	623	623	853	755	705	656	492	755	427	394
	820	689	591	591	820	722	673	591	459	722	394	361
	820	689	591	591	820	722	673	591	459	722	394	361
	787	656	558	558	787	689	640	558	427	689	361	328
	820	689	591	591	820	722	673	591	459	722	394	361
	755	623	525	525	755	656	607	558	394	656	328	295
	755	623	525	525	755	656	607	492	394	656	328	295
	755	623	525	525	755	656	607	492	394	656	328	295
	755	623	525	525	755	656	607	492	394	656	328	295
	689	558	459	459	689	591	541	492	328	591	262	230
	689	558	459	459	689	591	541	394	328	591	262	230
	755	623	525	525	755	656	607	394	394	656	328	295
	755	623	525	525	755	656	607	394	394	656	328	295
	689	558	459	427	689	591	541	394	295	591	230	230
	689	558	459	427	689	591	541	394	295	591	230	230
	689	558	459	427	689	591	541	394	295	591	230	230
	656	525	427	361	656	558	509	394	262	558	197	230
	787	656	558		787			394	410		295	
	787	656	558		787			394	410		295	
	787	656	558		787			361	410		262	
	722	591	592		722			361	345		262	
	722	591	592		722			361	345		262	
	787	656	558		787			361	410		262	
	787	656	558		787			361	410		262	
	722	591	492		722			361	345		262	
	722	591	492		722			361	345		262	
	1247	689	820	787	1247	1148	1099		525	1148		427
	1247	689	820	787	1247	1148	1099		525	1148		427
	1116	591	722	656	1116	1017	968		459	1017		361
	1116	591	722	656	1116	1017	968		459	1017		361
	1116	591	722	656	1116	1017	968		459	1017		361
	2953	2297		1476	2953	1969	1969			1969		
	1312	1148		820	1312	984	984			984		
	1312	1148		656	1312	984	984			984		
	1148	984		591	1148	820	820			820		
	1969			1312	1969	1969				1969		
	1641			984	1641	1641				1641		
	1969				1969	1641	1641			1641		
	295				295	230	230			230		
	295				295	230	230			230		
	591			276	591	459	459			459		
	492			236	492	361	361			361		
	295				295	197	197			197		

1. Selected diameter of tool to be used.
2. Determine Depth of Cut (DOC) to be used.
3. Refer to Figure and Table to find the Effective Cutting Diameter (ECD).
4. Refer to Feed and Speed chart on pages 196 & 197 to select the surface footage to be used (SFM).
5. Calculate RPM using the ECD and SFM. (SFM x 3.82 / ECD = RPM)
6. Refer to Table to determine Feed Rate Adjustment (FRA).
7. Refer to chart on pages 196 & 197 and select Inches per Teeth (IPT). Calculate Inches per Minute (IPM). (No Teeth x IPT x RPM x FRA = IPM)

Formulas

SFM = .262 x RPM x Diameter of Cutter
RPM = 3.82 x SFM ÷ Diameter of Cutter
IPR = IPM ÷ RPM
IPM = IPT x Number Of Teeth x RPM
IPT = IPM ÷ (Number Of Teeth x RPM)
MRR = Axial DOC x Radial WOC x IPM = in^3/min
HP (Cutter) = MRR ÷ Power Factor (K)
HIFB = (2 x d) – IC

Legend

RPM = Revolutions Per Minute
SFM = Surface Feet Per Minute
IPR = Inches Per Revolution
IPM = Inch Per Minute
IPT = Inches Per Tooth (Chip load)
DOC = Depth Of Cut
MRR = Metal Removal Rate
HP = Horse Power
HIFB = Helical Interpolation to Flat Bottom
ECD = Effective Cutting Data
FRA = Feed Rate Adjustment

Calculated Effective Cutting Diameter for Ball Nose Tooling

Inch	Insert Diameter									
DOC	**0.250**	**0.312**	**0.375**	**0.500**	**0.625**	**0.750**	**1.000**	**1.250**	**1.500**	**2.000**
0.005	0.070	0.078	0.086	0.099	0.111	0.122	0.141	0.158	0.173	0.200
0.010	0.098	0.110	0.121	0.140	0.157	0.172	0.199	0.223	0.244	0.282
0.020	0.136	0.153	0.169	0.196	0.220	0.242	0.280	0.314	0.344	0.398
0.050	0.200	0.229	0.255	0.300	0.339	0.374	0.436	0.490	0.539	0.624
0.075	0.229	0.267	0.300	0.357	0.406	0.450	0.527	0.594	0.654	0.760
0.100	0.245	0.291	0.332	0.400	0.458	0.510	0.600	0.678	0.748	0.872
0.125	0.250	0.306	0.354	0.433	0.500	0.559	0.661	0.750	0.829	0.968
0.156		0.312	0.370	0.463	0.541	0.609	0.726	0.826	0.916	1.073
0.188			0.375	0.484	0.573	0.650	0.781	0.894	0.993	1.167
0.250				0.500	0.612	0.707	0.866	1.000	1.118	1.323
0.312					0.625	0.739	0.927	1.082	1.218	1.451
0.375						0.750	0.968	1.146	1.299	1.561
0.600							1.000	1.225	1.414	1.732
0.625								1.250	1.479	1.854
0.750									1.500	1.936
1.000										2.000

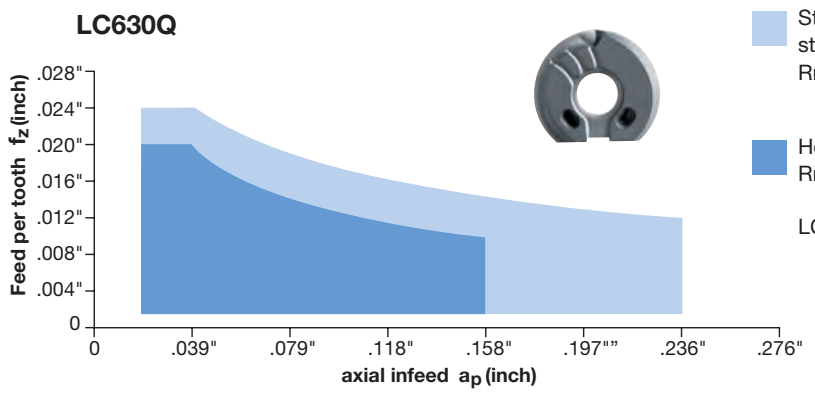
Feed Rate Adjustment (FRA)

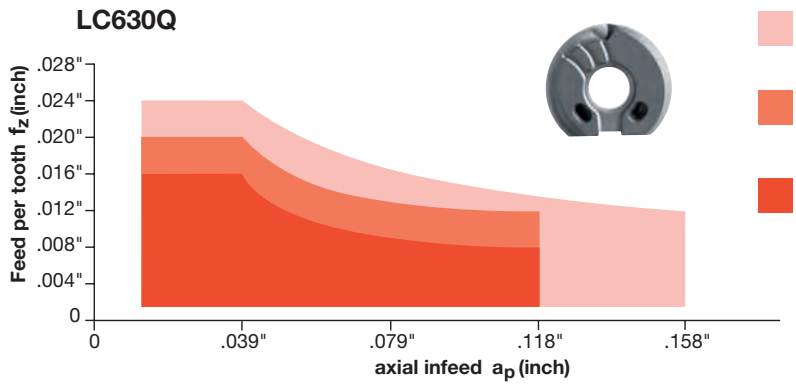
Inch	Insert Diameter							
DOC	**0.250**	**0.312**	**0.375**	**0.500**	**0.625**	**0.750**	**1.000**	**1.250**
0.005	3.6	4.0	4.4	5.0	5.6	6.1	7.1	7.9
0.010	2.6	2.8	3.1	3.6	4.0	4.4	5.0	5.6
0.015	2.1	2.3	2.6	2.9	3.3	3.6	4.1	4.6
0.020	1.8	2.0	2.2	2.6	2.8	3.1	3.6	4.0
0.025	1.7	1.8	2.0	2.3	2.6	2.8	3.2	3.6
0.050	1.2	1.4	1.5	1.7	1.8	2.0	2.3	2.6
0.075	1.1	1.2	1.2	1.4	1.5	1.7	1.9	2.1
0.100		1.1	1.1	1.2	1.4	1.5	1.7	1.8
0.125			1.1	1.2	1.3	1.3	1.4	1.5
0.150				1.1	1.2	1.3	1.4	1.5
0.175					1.1	1.2	1.3	1.4
0.200						1.1	1.3	1.4
0.250							1.2	1.2
0.300							1.1	1.2
0.400								1.1

WPR-D – Helical Ball Nose Insert LC610Z
Cutting Data Recommendations

	Material	Material Examples	Rockwell C	Feed IPT / SFM .002" - .012" IPT	
P	Plain Carbon steel	1018, 1025,	< 20	1050	1300
	Free Machining steel	1212, 12L13	< 20	1050	1300
	Structural alloy steel	1040, 4130	< 30	1050	1300
	Heat-treatment steel, medium strength	4140, 6150	< 30	1050	1300
	Cast Steel	4340, 8740	< 30	850	980
	Caste hardening steel	52100, 8680	< 30	850	980
	Stainless steel, ferritic martensitic	410, 430F, 440	< 30	850	980
	Heat treatment steel, high strength	4140, 8740	28 - 44	680	790
	Nitriding Steel	A355	28 - 44	680	790
	Tool Steel	H13, D2	28 - 44	680	790
M	Stainless steel, austenitic	304, 316	< 30	–	–
	Maraging steel			–	–
K	Grey cast iron	A319, J431 No. 25B, No. 50B	< 27	1050	1300
	Alloyed grey cast iron	A434, A436-72	< 22	800	910
	Nodular cast iron	A536 (80-55-06), J434	< 34	725	820
	Malleable cast iron	A220, 50005 A47,32510	< 29	725	820
N	Pure metals, soft	Pure Iron, Lead	< 20	2400	2760
	Aluminum alloys, long chipping	6061, 7050	< 20	3120	3280
	Aluminum alloys, short chipping	A356, 4218	< 20	1250	1570
	Copper alloys, long chipping	C28000, B-148-52	< 20	3120	3280
	Copper alloy, short chipping		< 20	1250	1570
	Magnesium alloys	B94, M11910		–	1570
	Thermoplastics	PVC, Acrylic glass		–	1970
	Duroplastics	Durolite, Ampal		–	1970
	Graphite			–	1970
S	Titanium alloys, medium strength	F67, B265	< 29	–	–
	Titanium alloys, high strength alloy	Ti-6Al-4V	27 - 44	–	–
	Nickel based alloys, medium strength	20Cb3	< 29	260	300
	Heat resistant nickel based alloys, high strength	Inconel 718	27 - 44	200	230
H	Chilled cast iron	Ampco 25	< 20	200	230
	Hardened steel		45 - 52	260	300
			53 - 59	200	230
			60 - 65	130	160

Recommended max. feed per tooth in relation to workpiece material and depth of cut





For best performance it is recommended to use a HSS shank not carbide

AR – Cutting Data Recommendations

	Material	AISI/SAE (USA Spec) Material Example:	R_m (N/mm²)	Carbide Grade	Cutting Speed V_c (SFM) LC630Q V_c (SFM)
P	Plain carbon steel	1018, 1025	-700		590-650
	Free cutting steel	1212, 12L13, 12L14	-700		590-650
	Structural alloy steel	1040, 4130	500-950		650-780
	Heat-treatable steel, medium strength	4140, 6150	500-950		650-780
	Cast steel	4340, 8740	-950		650-780
	Case hardening steel	52100, 8620	-950		650-780
	Stainless steel, ferritic, martensitic	410, 430F, 440	500-950		650-780
	Heat-treatable steel, high strength	4140, 8740	950-1400		525-590
	Nitriding steel	A355	950-1400		525-590
	Tool steel	H13, D2	950-1400		525-590
K	Grey cast iron	No.20B, No.25B, No.30B, No.35B, No.40B	100-400		525-590
	Alloyed grey cast iron	A434, A436-72	150-250		525-590
	Nodular cast iron	A536 (80-55-06), J434	400-800		525-590
	Malleable cast iron	A220, 50005, A47, 32510			590-650

	Material	Carbide: LC610Z		CBN: BN081	
		Cutting Speed (sfm)	Feed Per Tooth (f_z)	Cutting Speed (sfm)	Feed Per Tooth (f_z)
P	Steel, cast steel, stainless steel, ferritic and martensitic	1150-1312	.012"-.016"	–	–
M	Stainless steel and cast steel Austenitic and austenitic/ferritic	1000-1150	.008"-.016"	–	–
K	Grey cast iron Nodular cast iron, Malleable cast iron	920-1050	.008"-.016"	1640-2300	.008"-.016"
H	Chilled cast iron Hardened steel > 60 HRC	–	–	820-1000	.008"

For best results run Flatball in Carbide Shank holder
Increase step over of 50% more than N Geometry possible
Must be programmed using 3D copy milling techniques with a X, Y, X moves simultaneously (45 Degrees on the workpiece)

Application Examples

WPB 16-FB-70 in LC610Z

Cutting Speed:
v_c = 1300 SFM

Feed:
f_z = .015"

Depth of Cut:
a_p = .003"

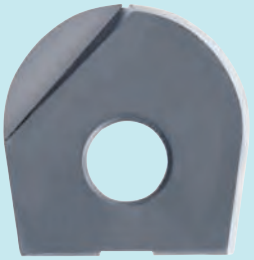
Step Over:
a_e = .016"

Workpiece:
Clipping tool

Material:
1.2320 / P20

Cutter:
WPB 16-70 in LC610Z
EBG R 16.016 AN140-C-I

Tool Life: 660 Minutes



WPB 16-FB-70 in BN081

Cutting Speed:
v_c = 2000 SFM

Feed:
f_z = .024"

Depth of Cut:
a_p = .010"

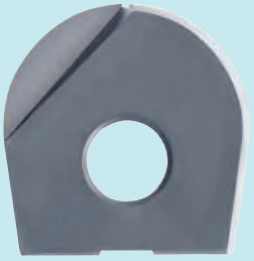
Step Over:
a_e = .008"

Workpiece:
Forming die

Material:
Cast steel,
partially hardened to 60 HRC

Cutter:
WPB 16-70 in BN081, CBN
EBG R 16.016 AN140-C-I

Tool Life: 70 Hours



	Material	Brinell Hardness (BHN)	Cutting Speed (SFM)	
			LW610 SFM	LC610T* SFM
N	Aluminum Free Machining	HB < 80	3280	4920
		HB > 80	2620	3280
	Copper alloys	long chipping	820	985
	Thermoplastics		985	–
	Aluminum alloys	Si < 12%	2620	328
		Si ≥ 12%**	–	650
	Copper alloys	short chipping	1320	1640
	Magnesium alloys	1320	–	
	Duroplastics		490	650

*LC610T CVD Coated TiAlN

**PCD-tipped inserts upon request.

Recommended Maximum Feed per Tooth (f_z) for V_GT Inserts

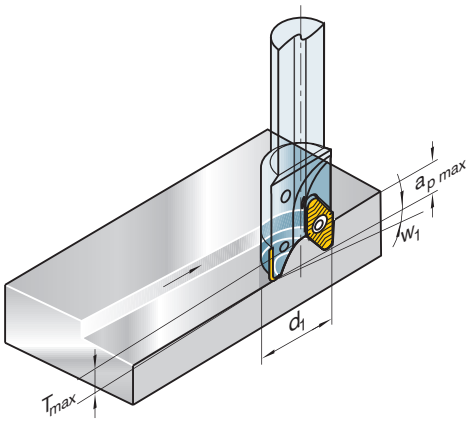
	Maximum Feed Per Tooth (f_z)	
	VPGT1604 . . .	VCGT2205 . . .
	.014	.020
	.012	.016

EMZ90

EMZ90-THR

FMZ90

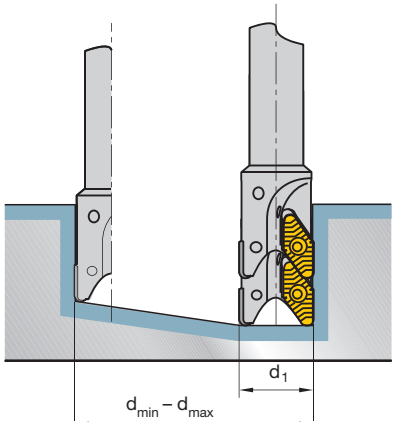
Pocket Milling and Axial Plunging



	VPGT 160412-ALM	VCGT 220530-ALM
$a_{p\ max}$	.531	.590
T_{max}	.31	.350
$W_{1\ max}$ Degree (Ramp Angle)		
1.00	12	
1.25		11
1.50		7.5
2.00		6
2.50		4.5
3.00		3.5
4.00		2.5

Helix angle $W_{1\ max}$ and internal depth of cut T_{max}

Circular Milling

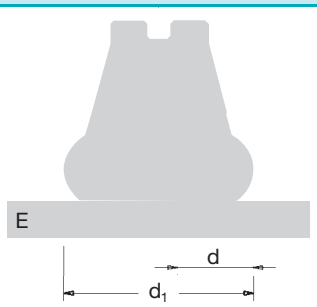


d_1	d_{min}	d_{max}
1.00	1.40	1.91
1.25	1.64	2.26
1.50	2.34	2.75
2.00	3.18	3.76
2.50	4.23	4.76
3.00	5.28	5.76
4.00	7.07	7.75

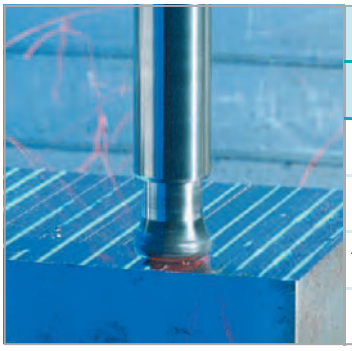
EMZ90

UFC Milling Cutters
Maximum Machining Data

Maximum depth of cut for face milling	Maximum depth of cut a_p [in]
	R 10 42 S/SV/SN
	Hardened steel: .020 - .031
	Cast iron: .039 - .059
	Aluminium: .197
	Plastic: .197

Maximum ramp angle	Max. ramp angle E [°]	
	Diameter	R 10 42 S/SV/SN
	0.984	14.0°
	1.260	8.0°
	1.575	5.5°
	1.969	4.0°
	2.480	2.7°
	3.150	2.0°
	3.937	1.5°
	4.921	1.2°

UFC Universal Face Milling Cutters
Application Options



Maximum depth of cut for face milling		Maximum angle for ramping	
material	a_p [inch]	diameter [inch]	∢
Hardened steel	.020 - .031	0.984	14
		1.378	8
Cast iron	.039 - .059	1.574	5.5
		1.968	4
Aluminium	.197	2.480	2.7
		3.150	2
Plastic	.197	3.937	1.5
		4.921	2

Cutting data recommendations				feed per tooth v_f [SFM]	
diameter [inch]	tooth [z]	Maximum RPM n [1/min]	cutting speed v_c [SFM]	f_z = 0.0007	f_z = 0.0019
0.984	2	40000	3142	5250	13124
1.260	3	40000	4021	7874	19686
1.575	4	40000	5027	10499	26248
1.969	5	36000	5655	11812	29529
2.480	6	30000	5938	11812	29529

	Material	Cutting Speed		Coated		CBN	fz (mm)	fz (in)
		v_c (SFM)	v_c (m/min)	LC610Q	LC610Z	BN025	d_1 = ∅20-∅66 a_p = 1.5	d_1 = ∅.750-∅2.60 a_p = .059
P	Steel, cast steel, stainless steel, ferritic and martensitic	500 - 1835	150 - 560	▲/▲▲/▲▲▲	▲▲/▲▲▲		0.15-0.5	.006"-.020"
M	Stainless steel and cast steel, austenitic and austenitic/ferritic	400 - 1000	120 - 300	▲/▲▲/▲▲▲	▲▲/▲▲▲		0.1-0.35	.004"-.014"
K	Grey cast, iron cast with spheriodal graphite, malleable cast iron	500 - 1640	150 - 500		▲▲/▲▲▲		0.15-0.5	.006"-.020"
S	High temperature alloys, super and titanium alloys	400 - 650	120 - 200	▲/▲▲			0.1-0.35	.004"-.014"
H	Hardened steel and cast steel		130 - 280 (LC610Z) 100 - 450 (BN025)		▲▲/▲▲▲	▲▲/▲▲▲	0.1-0.2	.004"-.008"

▲ roughing
▲▲ semi-finishing
▲▲▲ finishing

ECG-THR

2 Feed HSC MultiEdge and WPB-HF
Cutting Data Recommendations

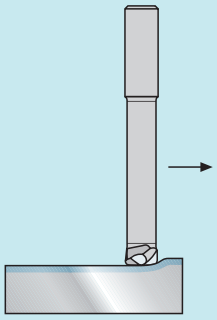
	Material	Material Examples	HRC	LC620ZM	
				Cutting Speed (sfm)	Feed Per Tooth (f_z)
P	Unalloyed Carbon Steel	A36, 1005-1029, 1213, 12L14	16 - 30	800 - 1000	.040
P	Alloyed Steel, medium strength	4140, 6150, 5115, 8620	< 30	800 - 990	.030
P	Heat Treatable Steel, high strength	4340	30 - 44	720 - 790	.030
P	Nitriding Steel	H13	30 - 44	490 - 590	.030
P	Tool Steel	A2, D2, P20	30 - 44	590 - 720	.030
M	Stainless Steel, austenitic	303, 304, 316, Nitronic	< 30	700 - 800	.030
K	Grey Cast Iron Alloyed Grey Cast Iron	No. 30B A436-725	< 30	750 - 820	.050
K	Nodular Cast Iron	5005	< 23	550 - 590	.040
K	Alloyed Nodular Cast Iron	5005	< 16	450 - 590	.030
H	Hardened Steel		45 - 52	754	.0195
				656	.016

The cutting data indicated are starting values and must be adjusted to current machining conditions
*We recommend reducing the feed per tooth value with the long length version by 30%.

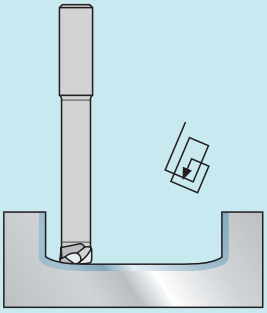
4 Feed HSC
Cutting Data Recommendations

	Material	Material No.	DIN Des.	Cutting speed v_c = SFM	Feed per tooth f_z = inches Cutter diameter mm						Cutting depth a_p (inch)
					4	5	6	8	10	12	
P	Heat-treatable die steels (4140, 8740)	1.2311	40CrMnMo7	787	0.0118	0.0150	0.0177	0.0236	0.0295	0.0354	0.0020 x d_1 (= a_p max.)
P		1.2312	40CrMnMoS8.6								
P		1.2738	40CrMnNiMoS8.6.4	722	0.0118	0.0150	0.0177	0.0236	0.0295	0.0354	
P		1.2711	54NiCrMoV6	656	0.0094	0.0118	0.0142	0.0189	0.0236	0.0276	
P	Full hardening tools steels (H13, D2)	1.2343	X 38 CrMoV 5 1	656	0.0110	0.0138	0.0165	0.0220	0.0276	0.0335	0.0016 x d_1
P		1.2080	X210Cr12	591	0.0102	0.0130	0.0154	0.0205	0.0256	0.0315	
P		1.2379	X 155 CrVMo 12 1								
P		1.2767	X 45NiCrMo4	525	0.0094	0.0118	0.0142	0.0189	0.0236	0.0276	
P	Nitriding steels (A355)	1.8550	34CrAlNi7	656	0.0110	0.0138	0.0165	0.0220	0.0276	0.0335	0.0016 x d_1
P		1.8519	31CrMoV9	591	0.0102	0.0130	0.0154	0.0205	0.0256	0.0315	
P		1.7735	14CrMoV6.9								
P		1.2344	X40CrMoV5.1	525	0.0094	0.0118	0.0142	0.0189	0.0236	0.0276	
H	Hardened steel	45–52 HRC		656	0.0063	0.0079	0.0094	0.0126	0.0157	0.0189	0.0016 x d_1
H		53–56 HRC		591	0.0047	0.0059	0.0071	0.0094	0.0118	0.0142	0.0012 x d_1
H		57–62 HRC		459	0.0031	0.0039	0.0047	0.0063	0.0079	0.0094	0.0008 x d_1
H		63–67 HRC		328	0.0024	0.0031	0.0035	0.0047	0.0059	0.0071	0.0004 x d_1

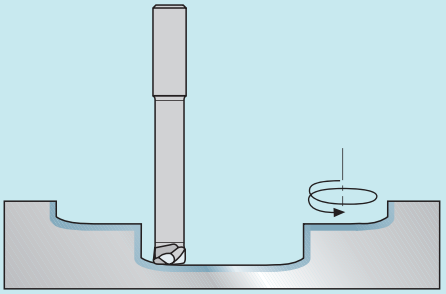
Face Milling



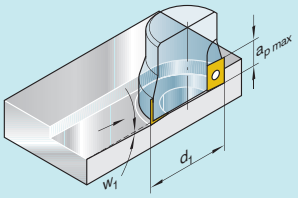
Pocketing



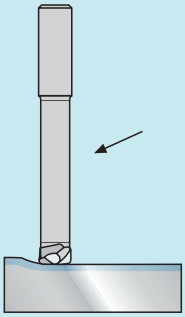
Opening cavity



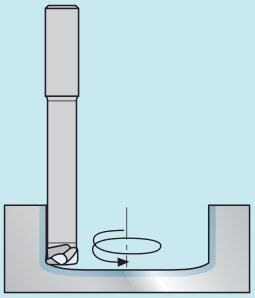
Plunge Milling



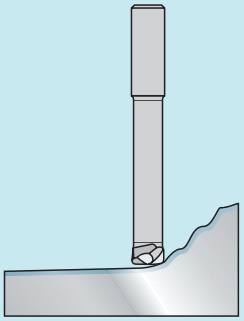
Ramping
Ramp Angle = 1-2°



Circular interpolation



3D rough copy milling



Roughing-Finishing End Mills Type DHC and DHC SLOT
Cutting Data Recommendations

	Material	Rm/UTS (N/mm²)	Example	Material No.	Cutting speed v_c [SFM]	Coolant	Feed per tooth f_z = (inches) Cutter diameter (mm) 4	5	6	8	10	12	14 -16	18 -20
P	Plain carbon steel (1018, 1025)	300-500 500-700 350-500	St 37. St 44 St 52. St 70 U- and R St 37-2	1.0037. 1.0044 1.0052. 1.0070 1.0036. 1.0038	755	☼ 💧	.0016	.0024	.0028	.0035	.0043	.0051	.0071	.0087
	Free cutting steel (1212, 12L13, 12L14)	360-550 600-800	9 S 20. 9 SMn 28 45 S 20. 60 S 20	1.0711. 1.0715 1.0727. 1.0728	755	☼ 💧	.0016	.0024	.0028	.0087	.0043	.0051	.0071	.0087
	Structural alloy steel (1040, 4130)	500-950	Ck 45. 26CrMo4	1.1191 1.7219	656	☼ 💧	.0016	.0020	.0024	.0079	.0039	.0047	.0063	.0079
	Heat-treatable steel, medium strength (4140, 6150)	500-950	42CrMo4. 50CrV4.	1.7225 1.2241	525	☼ 💧	.0016	.0020	.0024	.0079	.0039	.0047	.0063	.0079
	Cast steel (4340, 8740)	-950	GS40	1.0416	427	☼ 💧	.0012	.0016	.0020	.0067	.0035	.0039	.0055	.0067
	Case hardening steel (52100, 8620)	-950	16MnCr5	1.7131	525	☼ 💧	.0016	.0020	.0024	.0079	.0039	.0047	.0063	.0079
	Heat-treatable steel, high strength (4140, 8740)	950-1400	42CrMo4 30CrNiMo8	1.7225 1.6580	394	☼ 💧	.0012	.0016	.0020	.0059	.0031	.0035	.0047	.0059
	Nitriding steel (A355)	950-1400	34CrAl6	1.8504	361	☼ 💧	.0012	.0016	.0020	.0059	.0031	.0035	.0047	.0059
	Tool steel (H13,D2)	950-1400	X38CrMoV5-1 X155 CrVMo12-1	1.2343 1.2379	328	☼ 💧	.0012	.0016	.0016	.0055	.0028	.0031	.0043	.0055
M[1)]	Stainless steel, austenitic (303, 304, 316, 316L)	500-950	X5CrNi18-10 X2CrNiMo17-12-2 X6CrNiMoTi17-12	1.4301 1.4404 1.4571	328	💧	.0008	.0012	.0012	.0039	.0020	.0024	.0031	.0039
	Stainless steel, ferritic, martensitic (431)	500-950	X15Cr13 X17CrNi16-2 X35CrMo17	1.4024 1.4057 1.4122	328	💧	.0012	.0016	.0020	.0059	.0031	.0035	.0047	.0059
	Stainless steel, martensitic steel (403, 420, 430)	800-1000	X3NiCoMoTi18-9-5 X5CrNrCuNb16-4 X7CrNiAl17-7	1.2709 1.4542 1.4568	394	💧	.0012	.0012	.0016	.0051	.0028	.0031	.0039	.0051
K	Grey cast iron (No.20B, No.25B, No.30B, No.35B,No.40B, No.45B)	100-400 (120-260 HB)	EN-GJL-250 (GG25)	EN-JL-1040 (0.6025)	591	☼ 💧	.0024	.0028	.0031	.0110	.0055	.0067	.0087	.0110
	Alloyed grey cast iron	150-250 (160-230 HB)	EN-GJLA-XNiCr35-2 (GGL-NiCr35-2)	(0.6678)	525	☼ 💧	.0020	.0024	.0028	.0094	.0047	.0055	.0075	.0094
	Nodular cast iron (60-40-18, 80-55-06)	400-800 (120-310 HB)	EN-GJS-600 (GGG60)	EN-JS-1060 (0.7060)	492	☼ 💧	.0016	.0024	.0028	.0087	.0043	.0051	.0071	.0087
	Malleable cast iron (32510, 40010, 50005)	350-700 (150-280 HB)	EN-GJMB-550-4 (GTS55)	EN-JM-1160 (0.8155)	394	☼ 💧	.0016	.0024	.0028	.0087	.0043	.0051	.0071	.0087
N	Aluminium alloys, short chipping (6061-T6, 7050)	-400	G-AlSi12	3.2581	984	💧	.0020	.0024	.0031	.0098	.0051	.0059	.0079	.0098
	Aluminium alloys, short chipping	-500	MS58	2.0402	820	💧	.0016	.0020	.0024	.0079	.0039	.0047	.0063	.0079
S[1)]	Titanium alloys, medium strength (Ti6Al V4)	-950	TiAl5Sn2-5 TiAl6V4	3.7115 3.7165	262	💧	.0012	.0012	.0016	.0051	.0028	.0031	.0039	.0051
	Titanium alloys, hight strength	900-1400	TiAl6Sn2	3.7174	197	💧	.0008	.0012	.0012	.0039	.0020	.0024	.0031	.0039
	Nickel based alloys, medium strength (Inconel 718, Hastelloy C, Monel 400)	-950	NiCr12Al6MoNb	2.4670	131	💧	.0012	.0012	.0016	.0051	.0028	.0031	.0039	.0051
	Heat resis. nickel based all., high stren.	900-1400	NiCr19Fe19NbMo	Inconel 718	98	💧	.0008	.0012	.0118	.0039	.0020	.0024	.0031	.0039

☼ Dry machining, air-blast cooling is advantageous

💧 Wet machining, sufficient emulsion volume required

Feed correction factor f_1

$v_f = n \cdot z \cdot f_z \cdot f_1$

WOC a_e	DOC a_p	DHC long f_1	DHC short f_1	
.0039 · d_1	.039 x d_1	.071	.079	The cutting speed v_c must be increased by 30%
	.059 x d_1	.067	–	
	.079 x d_1*)	.063	–	
.0098 · d_1	.039 x d_1	.055	.079	
	.059 x d_1	.051	–	
	.079 x d_1*)	.047	–	
.020 · d_1	.039 x d_1	.043	.051	
	.059 x d_1	.039	–	
	.079 x d_1*)	.0314	–	
.0295 · d_1	.039 x d_1	.0314	.039	
	.059 x d_1	.0275	–	
	.079 x d_1*)	.0236	–	
.039 · d_1	.0196 x d_1	.0314	.0354	Reduce the cutting speed v_c by 20%
	.039 x d_1	.0275	.0314	
	.059 x d_1	.0236	–	

*) .071 x d_1 for diameter 14, 18, 20

a_e = Width of cut in (in)
a_p = Depth of cut in (in)
d_1 = Cutter diameter in (in)
f_1 = Correction factor for v_f
f_z = Feed per tooth in (in)
n = Speed in min^{-1}
Q = Chip volume in cm^3/min
v_c = Cutting speed in (RPM)
v_f = Feed rate in (in/min)
z = No. of teeth

[1)] For that materials do not use DHC, please take the DHC INOX

Roughing-Finishing End Mills Type DHC INOX
Cutting Data Recommendations

	Material	Rm/UTS (N/mm²)	Example	Material No.	Cutting speed v_c [SFM]	Coolant	Feed per tooth f_z = (inches) Cutter diameter (mm) 4	5	6	8	10	12	14 -16	18 -20
M	Stainless steel, austenitic (303, 304, 316Ti, 316L)	500-950	X5CrNi18-10 X2CrNiMo17-12-2 X6CrNiMoTi17-12-2	1.4301 1.4404 1.4571	328	💧💧	.0008	.0012	.0012	.0016	.0020	.0024	.0031	.0039
	Stainless steel, ferritic, martensitic (431)	500-950	X15Cr13 X17CrNi16-2 X35CrMo17	1.4024 1.4057 1.4122	328	💧💧	.0012	.0016	.0020	.0059	.0031	.0035	.0047	.0059
	Stainless steel, martensitic steel (403, 420, 430)	800-1000	X3NiCoMoTi18-9-5 X5CrNrCuNb16-4 X7CrNiAl17-7	1.2709 1.4542 1.4568	394	💧💧	.0012	.0012	.0016	.0051	.0028	.0031	.0039	.0051
N	Aluminium alloys, short chipping (6061-T6, 7050, A413.1)	-400	G-AlSi12	3.2581	984	💧💧	.0020	.0024	.0031	.0098	.0051	.0059	.0079	.0098
	Aluminium alloys, short chipping	-500	MS58	2.0402	820	💧💧	.0016	.0020	.0024	.0079	.0039	.0047	.0063	.0079
S	Titanium alloys, medium strength (Ti6Al V4)	-950	TiAl5Sn2-5 TiAl6V4	3.7115 3.7165	262	💧💧	.0012	.0012	.0016	.0051	.0028	.0031	.0039	.0051
	Titanium alloys, hight strength	900-1400	TiAl6Sn2	3.7174	197	💧💧	.0008	.0012	.0012	.0039	.0020	.0024	.0031	.0039
	Nickel based alloys, medium strength	-950	NiCr12Al6MoNb	2.4670	131	💧💧	.0012	.0016	.0016	.0051	.0028	.0031	.0039	.0051
	Heat resistant nickel based alloys, high strength (Inconel 718, Hastelloy C, Monel 400)	900-1400	NiCr19Fe19NbMo	Inconel 718	98	💧💧	.0008	.0012	.0012	.0039	.0020	.0024	.0031	.0039

☼ Dry machining, air-blast cooling is advantageous

💧💧 Wet machining, sufficient emulsion volume required

Feed correction factor f_1

$v_f = n \cdot z \cdot f_z \cdot f_1$

WOC a_e	DOC a_p	DHC long f_1	DHC short f_1	
.0039 · d_1	.039 x d_1	.071	.079	The cutting speed v_c must be increased by 30%
	.059 x d_1	.067	–	
	.079 x d_1*)	.063	–	
.0098 · d_1	.039 x d_1	.055	.079	
	.059 x d_1	.051	–	
	.079 x d_1*)	.047	–	
.020 · d_1	.039 x d_1	.043	.051	
	.059 x d_1	.039	–	
	.079 x d_1*)	.0314	–	
.0295 · d_1	.039 x d_1	.0314	.039	
	.059 x d_1	.0275	–	
	.079 x d_1*)	.0236	–	
.039 · d_1	.0196 x d_1	.0314	.0354	Reduce the cutting speed v_c by 20%
	.039 x d_1	.0275	.0314	
	.059 x d_1	.0236	–	

*) .071 x d_1 for diameter 14, 18, 20

1) For that materials do not use DHC, please take the DHC INOX

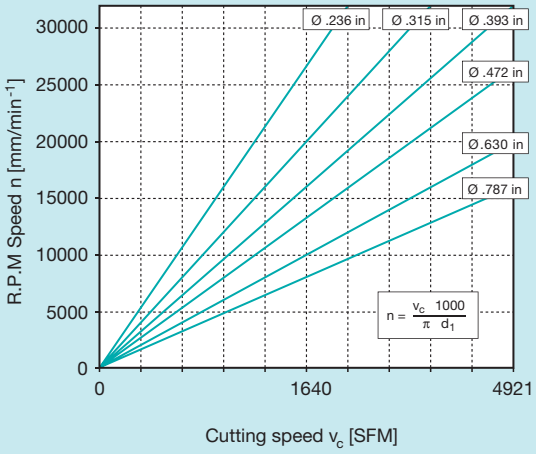
a_e = Width of cut in (in)
a_p = Depth of cut in (in)
d_1 = Cutter diameter in (in)
f_1 = Correction factor for v_f
f_z = Feed per tooth in (in)
n = Speed in min^{-1}
Q = Chip volume in cm^3/min
v_c = Cutting speed in (RPM)
v_f = Feed rate in (in/min)
z = No. of teeth

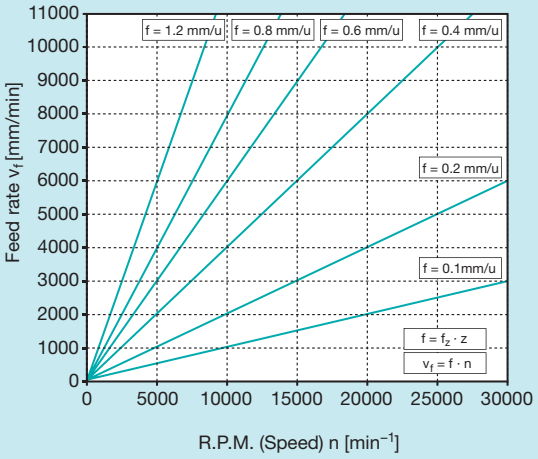
	Material	AIS/SAE (USA Spec) Material Examples	R_m/UTS (N/mm²)	Example	DIN-No.	
P	Plain carbon steel	1018, 1025	-700	St 52	1.0052	
	Free cutting steel	1212, 12L13, 12L14	-700	9 SMn 28	1.0715	
	Structural alloy steel	1040, 4130	500-950	Ck 45 26 CrMo 4	1.1191 1.7219	
	Heat-treatable steel, medium strength	4140, 6150	500-950	42 CrMo 4 50 CrV 4	1.7225 1.2241	
	Cast steel	4340, 8740	-950	GS 40	1.0416	
	Case hardening steel	52100, 8620	-950	16 MnCr 5	1.7131	
	Stainless steel, ferritic, martensitic	410, 430F, 440	500-950	X 10 Cr 13 X 12 CrMoS 17 X 35 CrMo 17	1.4006 1.4104 1.4122	
	Heat-treatable steel, high strength	4140, 8740	950-1400	42 CrMo 4 30 CrNiMo 8	1.7225 1.6580	
	Nitriding steel	A355	950-1400	34 CrAl 6	1.8504	
	Tool steel	H13, D2	950-1400	X 38 CrMoV 5 1 X 155 CrVMo 12 1	1.2343 1.2379	
M	Stainless steel, austenitic	303, 304, 316Ti, 316L	500-950	X 5 CrNi 18 10 X10 CrNiMo 18 10	1.4301 1.4571	
	Maraging steel				1.2709	
K	Grey cast iron	No.20B, No.25B, No.30B, No.35B, No.40B, No.45B	-550	GG25	0.6025	
	Alloyed grey cast iron		300-700	GGL-NiCr 35 2	0.6678	
	Nodular cast iron	A536, (80-55-06), J434	-500	GGG60	0.7060	
	Malleable cast iron	32510, 50005	40-70	GTS55	0.8155	
N	Pure metals, soft		400-800 (120-310 HB)	Reineisen, Blei pure iron, lead		
	Aluminium alloys, long chipping	6061-T6, 7050	100-400 (120-260 HB)	AlMg 3 AlZnMgCu 1,5	3.3535 3.4365	
	Aluminium alloys, short chipping	A431.1	-400	G-AlSi 12	3.2581	
	Copper alloys, long chipping	C27200, B-148-52	150-250 (160-230 Hb)	MS63 CuAl10Ni	2.0320 2.0975	
	Copper alloys, short chipping		-500	MS58	2.0402	
	Magnesium alloys	B94, M11910	160-300	G-MgAl9Zn1	3.5912	
	Thermoplastics	PVC, Acrylic Glass	350-700 (150-280 HB)	PVC, Acrylglas PVC, acrylic glass		
	Duroplastics	Durolite, Ampal	20-40	Bakelit, Melamin		
	Graphite			Graphite	R8510	
S	Titanium alloys, medium strength	F67, B265	-950	TiAl5Sn2,5 TiAl6V4	3.7115 3.7165	
	Titanium alloys, high strength	Ti-6Al-4V	900-140	TiAl6Sn2	3.7174	
	Nickel based alloys, medium strength	20Cb3	-950	NiCr12Al6MoNb	2.4670	
	Heat resistant nickel based alloys, high strength	Inconel 718	900-1400	NiCr19Fe19NbMo Inconel 718		
H	Chilled cast iron		300-600	Ni-hard, Ampco		
	Hardened steel		45-52 HRC 53-59 HRC 60-65 HRC			

The cutting data quoted includes standard values, and must be adjusted to the actual conditions.

Cutting speed v_c = SFM			Solid carbide						
coated	coated	uncoated	Feed per tooth (inch) at cutter dia. Ø d_1 f_z [mm]						
HSCline SN50	N	N	1	1-2	2-4	4-6	6-10	12-16	> 16
1969	689	984	0.0008	0.0012	0.0016	0.0031	0.0039	0.0051	0.0063
1969	689	984	0.0008	0.0012	0.0016	0.0031	0.0039	0.0051	0.0063
1641	689	984	0.0008	0.0012	0.0016	0.0003	0.0039	0.0051	0.0063
1476	574	820	0.0004	0.0005	0.0079	0.0020	0.0031	0.0039	0.0059
1476	367	525	0.0003	0.0006	0.0006	0.0020	0.0031	0.0039	0.0047
1312	367	525	0.0003	0.0004	0.0006	0.0016	0.0031	0.0039	0.0047
984	131	197	0.0003	0.0004	0.0006	0.0016	0.0031	0.0039	0.0047
1148	574	820	0.0004	0.0005	0.0016	0.0024	0.0031	0.0043	0.0055
984	574	820	0.0004	0.0008	0.0016	0.0024	0.0031	0.0043	0.0055
820	574	820	0.0004	0.0008	0.0016	0.0024	0.0031	0.0043	0.0055
787-1312	131	197	0.0004	0.0008	0.0020	0.0028	0.0035	0.0043	0.0051
787-1312	131	197	0.0004	0.0012	0.0020	0.0028	0.0035	0.0043	0.0051
1969	505	722	0.0006	0.0012	0.0028	0.0004	0.0005	0.0059	0.0071
1641	367	525	0.0006	0.0010	0.0022	0.0030	0.0037	0.0047	0.0063
1148	367	525	0.0006	0.0010	0.0022	0.0030	0.0037	0.0047	0.0063
1148	295	427	0.0018	0.0012	0.0028	0.0004	0.0005	0.0059	0.0071
3281	459	656	0.0006	0.0012	0.0024	0.0031	0.0039	0.0047	0.0059
3281	2953		0.0006	0.0016	0.0022	0.0030	0.0039	0.0055	0.0079
2625	820		0.0004	0.0012	0.0018	0.0026	0.0035	0.0047	0.0063
3281	656	919	0.0004	0.0012	0.0018	0.0026	0.0035	0.0047	0.0063
2297	574	820	0.0004	0.0010	0.0016	0.0024	0.0031	0.0043	0.0059
	1312		0.0008	0.0016	0.0024	0.0031	0.0039	0.0047	0.0063
	820		0.0012	0.0020	0.0028	0.0035	0.0043	0.0051	0.0063
	984		0.0008	0.0016	0.0024	0.0031	0.0039	0.0047	0.0059
3937			0.0006	0.0007	0.0020	0.0035	0.0043	0.0055	0.0071
591	197		0.0004	0.0008	0.0016	0.0028	0.0035	0.0043	0.0051
394	131		0.0004	0.0006	0.0014	0.0026	0.0033	0.0039	0.0047
492	262	98	0.0004	0.0008	0.0016	0.0028	0.0035	0.0043	0.0051
328	197	66	0.0004	0.0006	0.0014	0.0026	0.0033	0.0039	0.0047
656	262	131	0.0004	0.0006	0.0008	0.0016	0.0026	0.0031	0.0039
1148			0.0008	0.0013	0.0013	0.0014	0.0023	0.0027	0.0043
984			0.0006	0.0011	0.0011	0.0020	0.0025	0.0034	0.0037
820			0.0004	0.0008	0.0009	0.0018	0.0023	0.0032	0.0035

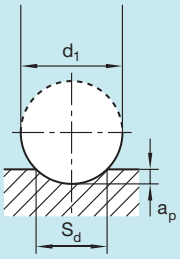
Diagram
for ap ≥ 0,5 · d_4 respectively
otherwise
see formula below





d_1 = Milling Cutter diameter Ø [in]
d_4 = 2 · Corner radius [in]

Ball Nose Copying Milling Cutter



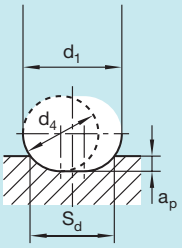
Ball nose copying milling cutter with depth of cut
$a_p < 0.5 \cdot d_1$

$$n = \frac{v_c \cdot 1000}{2 \cdot \pi \sqrt{d_1 \cdot ap - ap^2}} \quad [min^{-1}]$$

a_p = Depth of cut [in]
S_d = Cutting circle dia. [in]
d_1 = Milling Cutter diameter [in]

$$S_d = 2 \cdot \sqrt{d_1 \cdot a_p - a_p^2}$$

Milling Cutter with corner radius



Cutter with depth of cut
$a_p < 0.5 \cdot d_4$

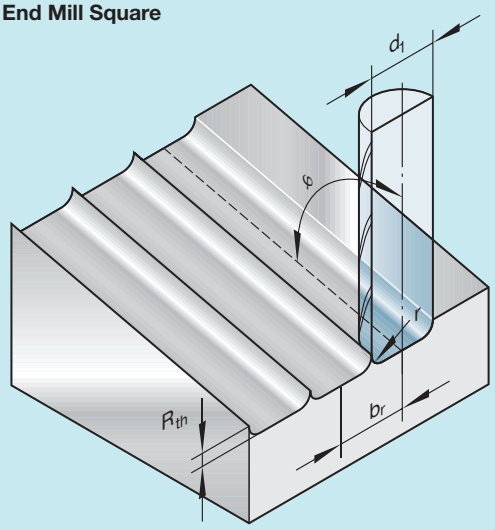
$$n = \frac{v_c \cdot 1000}{(d_1 - d_4 + 2 \cdot \sqrt{d_4 \cdot a_p - a_p^2}) \cdot \pi} \quad [min^{-1}]$$

d_4 = 2 · Corner radius [in]

$$Sd = d_1 - d_4 + 2 \cdot \sqrt{d_4 \cdot a_p - a_p^2}$$

z = No. of teeth
f_z = Feed/Tooth [in]
f = Feed/Revolution [in/u]

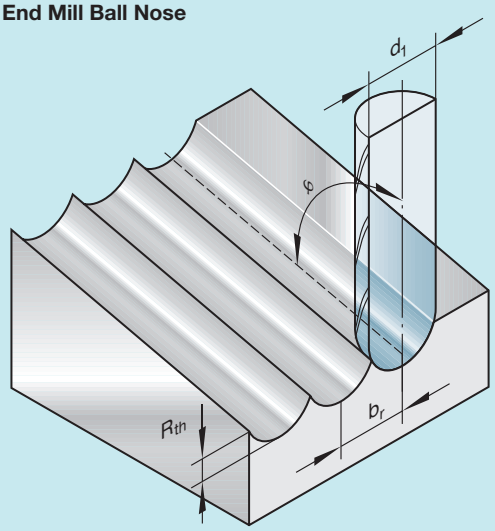
HSC End Mill Square



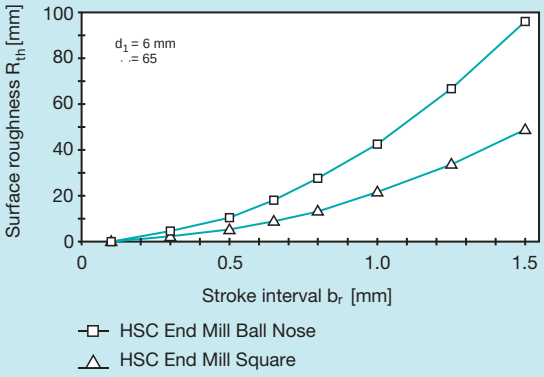
$$R_{th} = a \cdot \sin\varphi \cdot \left(1 - \sqrt{1 - \frac{b_r^2}{4 \cdot a^2}}\right)$$

$$a = \frac{1}{2} d_1 - r + r \cdot \sin\varphi$$

HSC End Mill Ball Nose



$$R_{th} = \frac{d_1}{2} - \sqrt{\frac{d_1^2 - b_r^2}{4}}$$



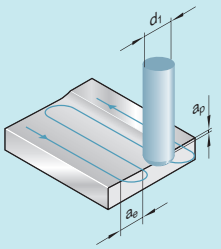
r = Corner radius
d_1 = Milling Cutter diameter
φ = Milling Cutter setting angle

	Material	Material No.	DIN Des.	Feed per tooth f_z (Inch)		Cutting speed v_c (SFM)
				Ø 4-8mm	Ø 10–12mm	1400 C
P	Plain carbon steel (1018, 1025)	1.1730	C45W	0.12	0.18	984
		1.1545	C105W	0.12	0.18	984
	Heat-treatable die steels 4140, 6150)	1.2311	40CrMnMo7	0.10	0.16	820
		1.2312	40CrMnMoS8.6	0.10	0.16	820
		1.2738	40CrMnNiMo8.6.4	0.08	0.14	656
		1.2711	54NiCrMoV6	0.08	0.14	656
	Case hardening steels (52100, 8620)	1.2162	21MnCr5	0.10	0.16	591
		1.2764	X19NiCrMo4	0.10	0.16	591
	Full hardening tool steels (H13, D2)	1.2343	X38CrMoV5.1	0.08	0.13	722
		1.2344	X40CrMoV5.1	0.08	0.13	722
		1.2367	X38CrMoV5.3	0.09	0.14	722
		1.2080	X210Cr12	0.1	0.15	656
		1.2379	X155CrVMo12.1	0.1	0.15	656
		1.2767	X45NiCrMo4	0.12	0.17	656
		1.2842	90MnCrV8	0.12	0.17	722
	Nitriding steels (A355)	1.8550	34CrAlNi7	0.08	0.15	656
		1.8519	31CrMoV9	0.08	0.15	656
		1.7735	14CrMoV6.9	0.07	0.12	656
		1.2344	X40CrMoV5.1	0.07	0.12	656
M	Stainless steels, austenitic (303, 304, 316Ti, 316L)	1.2083	X42CrMo13	0.06	0.12	656
		1.2316	X36CrMo17	0.05	0.10	656
		1.4571	X8CrNiMoTi17.12.2			656
		1.4401	X5CrNiMo17.12.2			656
		1.4521	X1CrMoTi18.2			656
K	Grey cast iron and alloyed cast iron (No.20B, No.25B, No.25B, No.30B, No.35B, No.40B)	EN-JL-1040 (0.6025)	EN-GJL-250 (GG25)	0.1	0.17	
		(0.6678)	EN-GJLA-XNiCr35-2 (GGL-NiCr35-2)	0.08	0.15	
	Nodular cast iron and alloyed nodular cast (A536, 80-55-06, J434)	0.7040	GGG 40	0.08	0.15	
		0.7070	GGG70	0.06	0.12	
			GGG70 alloyed	0.05	0.10	
N	Copper and copper alloys C27200, B-148-52		Elektrolyt-Cu Electrolyte copper	0.08	0.14	
			Bronze	0.06	0.12	1148
	Non-metallic materials	PUR	Plastics	0.15	0.25	1969
S	Titanium alpha beta alloys (Ti-6Al-4V)		TiAl6V4	0.04	0.09	
	Titanium beta alloys		Ti10V2Fe3Al	0.03	0.07	
H	Hardened steel	45–52 HRC		0.05	0.1	722

The cutting data indicated are starting values based and must be adjusted to the prevailing conditions.

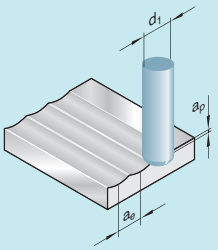
Face milling

$a_e = d_1 - 2 \cdot r$
$a_p < 0{,}025 \cdot d_1$



Profile finishing

$a_e = 0.5 \cdot (d_1 - 2 \cdot r)$
$a_p = 0.02 \cdot d_1$



	Material	sfm Cutting Speed v_c	Feed per Tooth f_z at Cutter Diameter d_1		
			.250 - .394	.472 - .630	> .630
N	Aluminum Malleable Alloys	2950	.004	.010	.010
	Aluminum Casting Alloys with < 12%	2000	.004	.006	.010
	Aluminum Casting Alloys with > 12%	820	.004	.006	.010
	Soft Plastic	1500	.006	.008	.012
	Hard Plastic	1000	.005	.007	.010
	Composites	1000	.002	.002	.003

Calculation Formulas

Speed

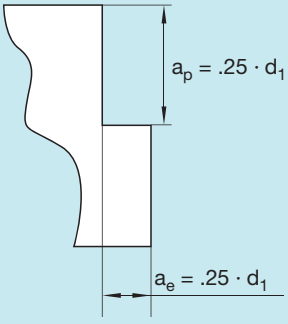
$$n = \frac{v_c \cdot 1000}{\omega \cdot d_1}$$

Feed Rate

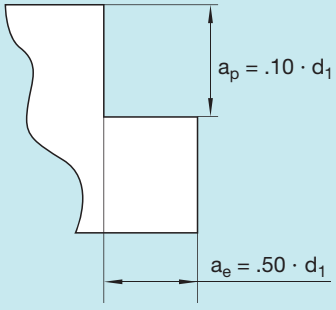
$$v_f = f_z \cdot z \cdot n \cdot f_1$$

a_e = Width of cut in inch
a_p = Depth of cut in inch
d_1 = Cutter diameter in inch
f_1 = Correction factor v_f
f_z = Feed per tooth in inch
n = rpm^{-1}
v_c = Cutting speed in sfm
v_f = Feed rate in ipm
z = No. of flutes

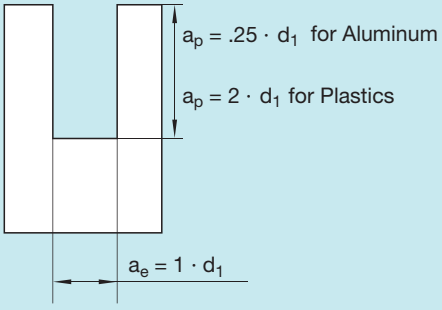
Feed Rate Correction Factor f_1



$f_1 = 1.0$

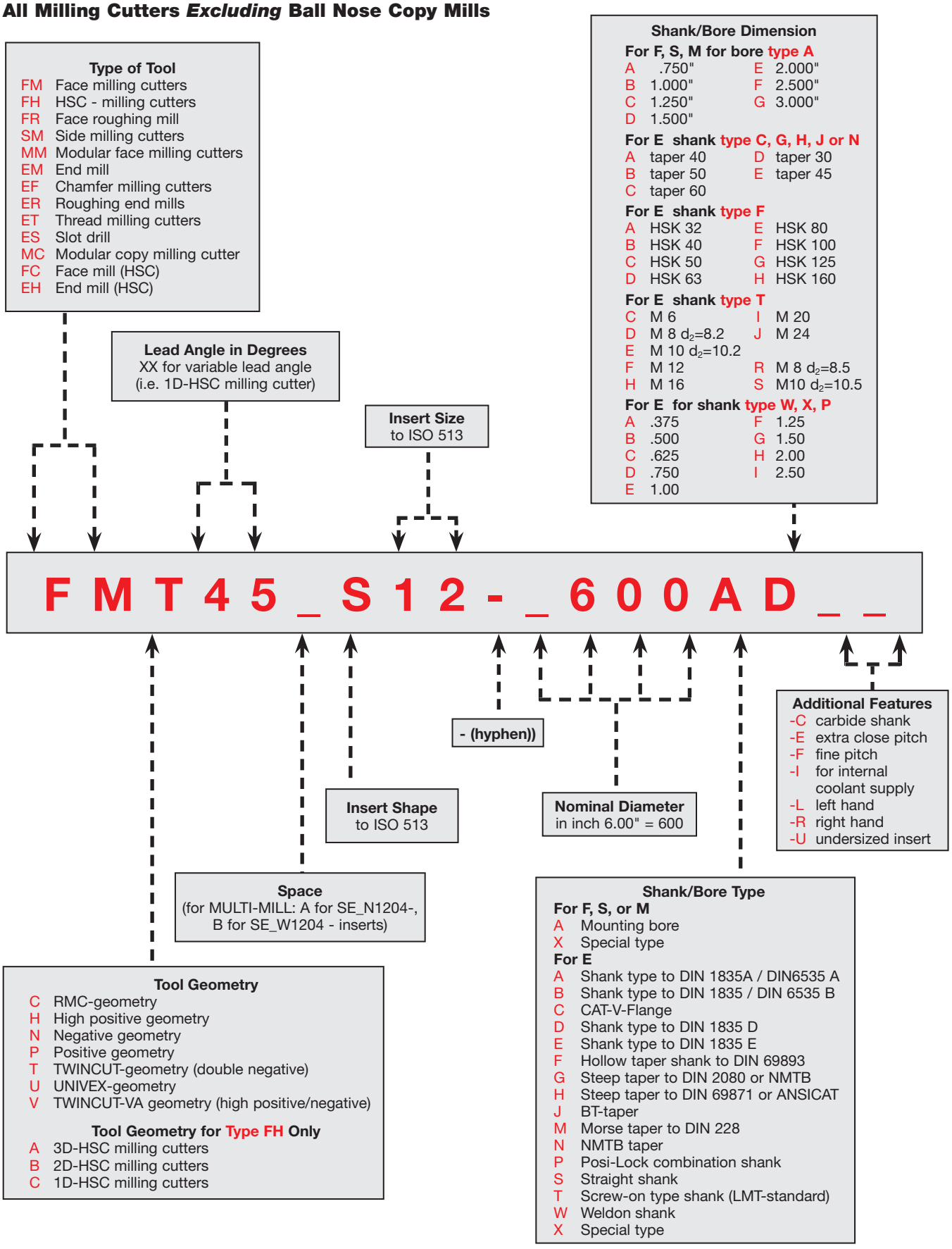


$f_1 = 0.9$

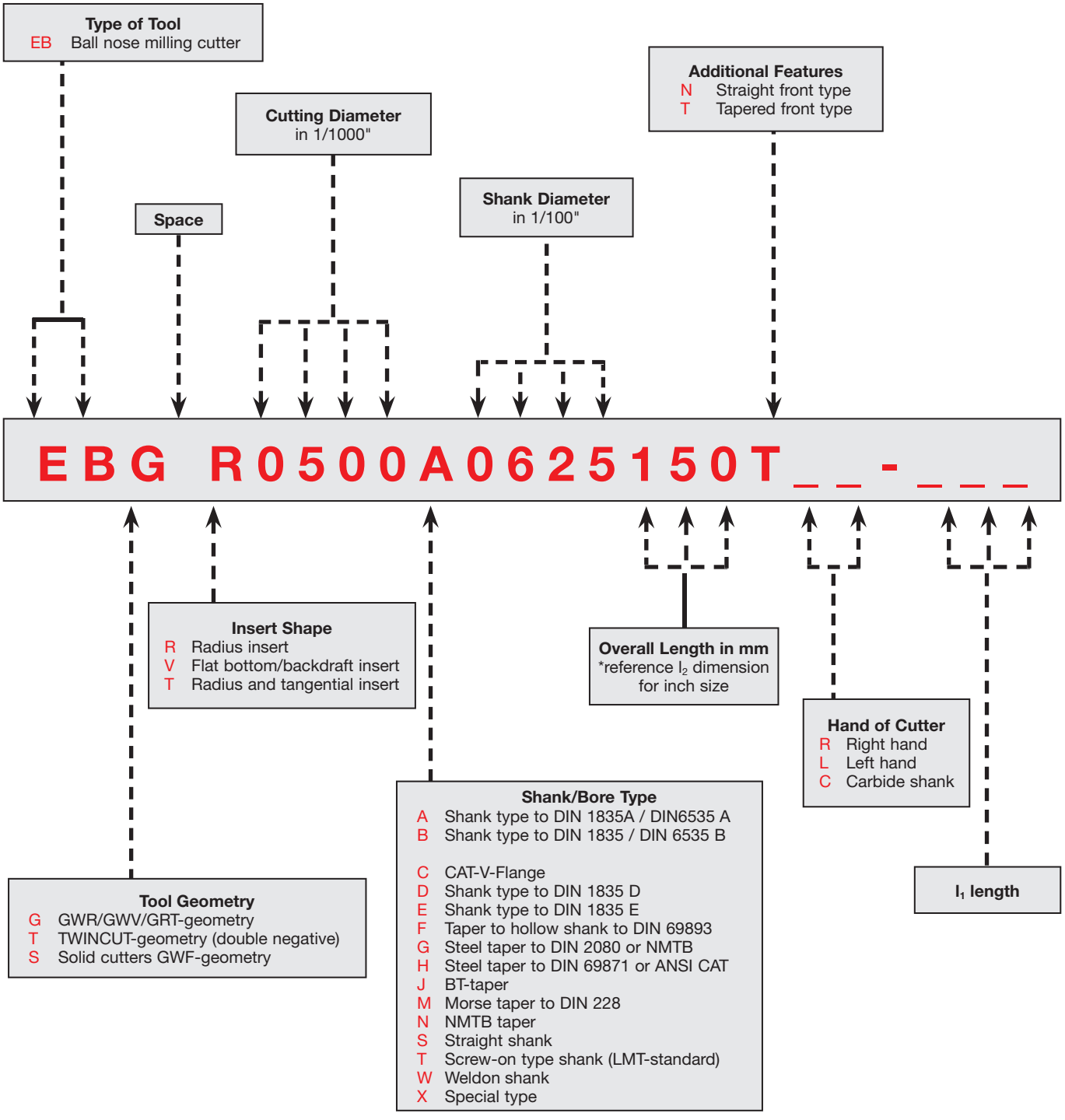


$f_1 = 0.75$

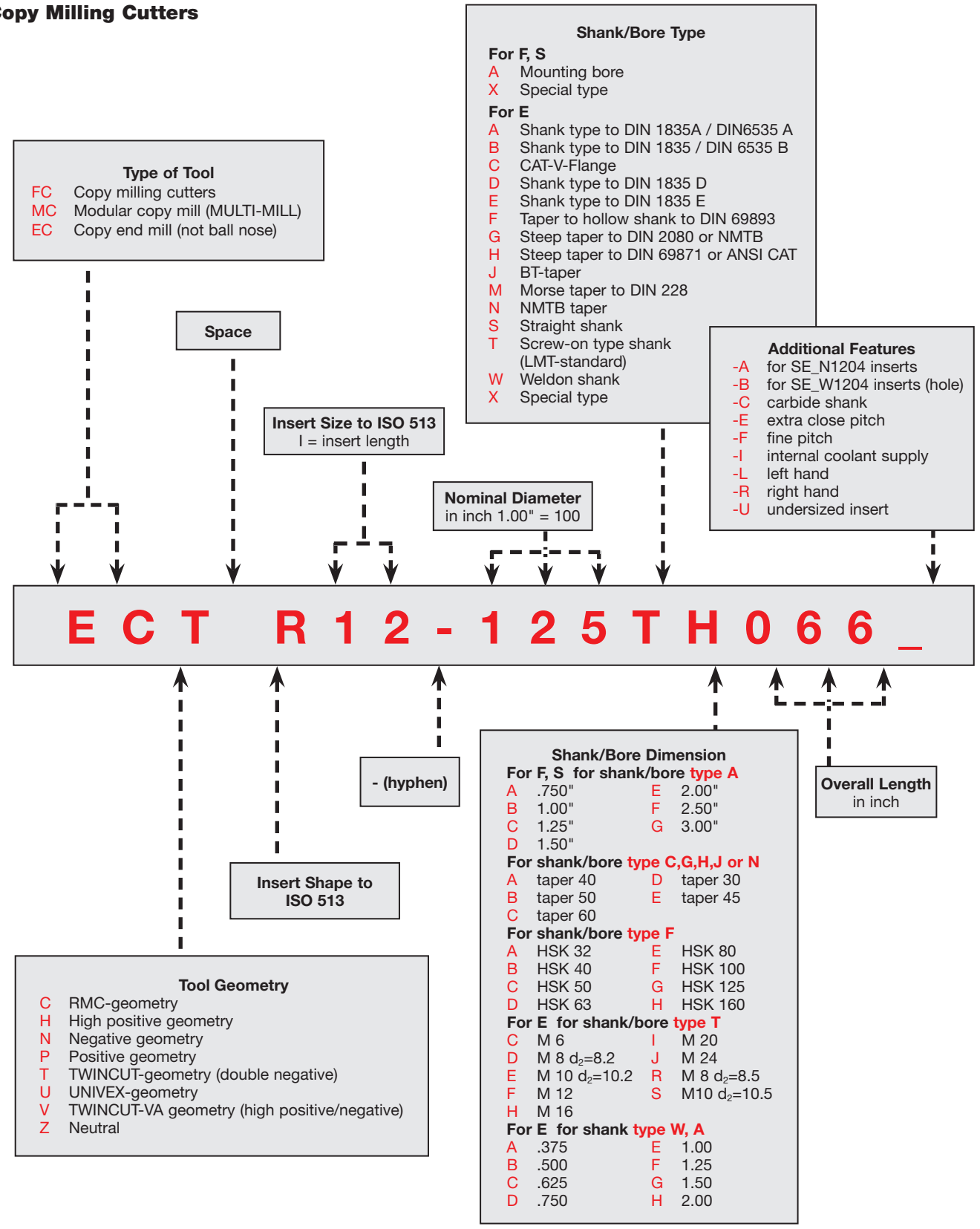
All Milling Cutters *Excluding* Ball Nose Copy Mills



Ball Nose Milling Cutters



Copy Milling Cutters



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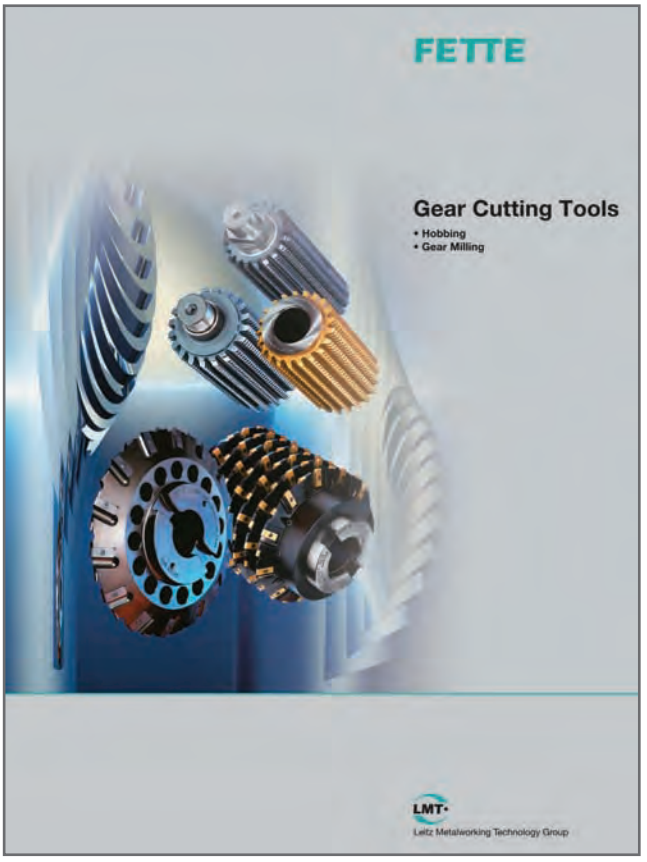

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