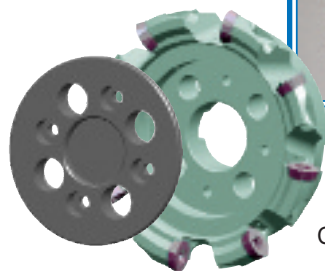
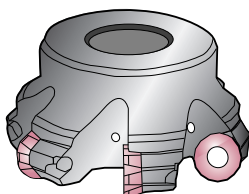


# High Performance 16 Corner Polygon Insert Cutter

"Wave Radius Mill" **WRCX** Type



- High feed rates
- Vibration free machining
- Excellent Surface finish
- Low cutting force



Coolant cap (CCAP-160) is available for cutter  $\phi 160$ .

# Wave Radius Mill WRCX Type

## High Durable Mill with Polygon Inserts

### Grades for Steels, Cast Iron and Aluminium



#### ■ Features

The "Wave Mill" WRXC type is a new multi purpose milling cutter for face milling, slotting, helical boring, plunging and profiling. Its unique design features 16 corner polygon inserts and a durable cutter body manufactured from high tensile alloyed steel protected by a hard surface treatment. Insert rigidity is maximised via close tolerance seat pockets and centre clamped using a torxscrew. Choose from a variety of insert grades such as our award winning Diamond like Carbon DL 1000 capable of high feed machining aluminium, our uncoated H1 grade suitable for non-ferrous metals or our new ACP/ACK grades for steels and irons.

#### ■ Advantages

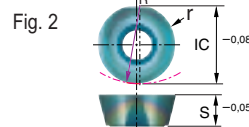
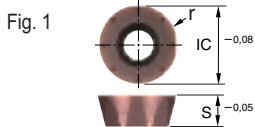
- Durable cutter body – Special alloyed steel with hard surface.
- High feed cutting – Optimised pitch and high number of cutting edges
- Excellent chip removal – Wide pocket and integral coolant hole
- Maximum rigidity – Rigid clamping of inserts with TORXPLUS screw
- Wide application range – Carbon steels, alloy steels, stainless steels, high temperature alloys, die mould steels, aluminums, non-ferrous metals etc

#### ■ Insert

- QPMT... : Standard 16 cornered polygon type
- QPMT...-H : Stronger cutting edge type



- QPET...-S : Polished round insert for non-ferrous material



Rake angle: 25°

4 corners use

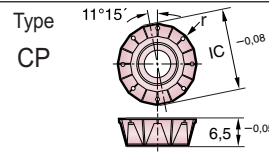
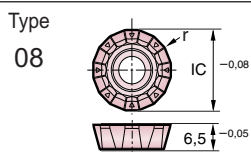
R : wiper radius

Cat. No.	Coated carbide					Diamond coated DL1000	Uncoated carbide H1	IC (mm)	r (mm)	s (mm)	Max. d <sub>oc</sub>		Fig.
	ACP100	ACP200	ACP300	ACK200	ACK300						4 corners application	8 corners application	
QPMT 080330 PPEN	●	●	●	●	●			8	3,0	3,18	3,8	1,0	1
QPMT 080330 PPEN-H	●	●	●	●	●								
QPMT 10T335 PPEN	●	●	●	●	●			10	3,5	3,97	4,7	1,2	1
QPMT 10T335 PPEN-H	●	●	●	●	●								
QPET 10T350 PPR-S						●	●		5,0				2
QPMT 120440 PPEN	●	●	●	●	●			12	4,0	4,76	5,6	1,5	1
QPMT 120440 PPEN-H	●	●	●	●	●								
QPET 120460 PPR-S						●	●		6,0				2
QPMT 160660 PPEN	●	●	●	●	●			16	6,0	6,5	7,6	2,1	1
QPMT 160660 PPEN-H	●	●	●	●	●								
QPET 160680 PPR-S						●	●		8,0				2
QPMT 200670 PPEN	●	●	●	●	●			20	7,0	6,5	9,4	2,5	1
QPMT 200670 PPEN-H	●	●	●	●	●								

● = Euro stock

○ = Delivery on request

#### ● Anti-Vibration Type (Paired Sets for Vibration Free Machining)



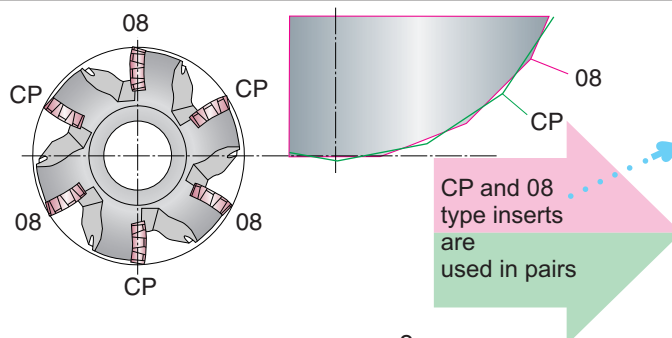
Cat. No.	Coated carbide					Diamond coated DL1000	Uncoated carbide H1	IC (mm)	r (mm)	s (mm)	Max. d <sub>oc</sub>		Insert type
	ACP100	ACP200	ACP300	ACK200	ACK300						4 corners application	8 corners application	
QPMT 160608 PPEN	●	●	●	●	●			16	0,8	6,5	7,6	1,2	08
QPMT 200608 PPEN	●	●	●	●	●			20			9,4	1,6	
QPMT 160608 PPEN-CP	●	●	●	●	●			16	0,8	6,5	7,6	2,3	CP
QPMT 200608 PPEN-CP	●	●	●	●	●			20			9,4	2,9	

The combination of different inserts in a staggered formation varies the cut depth and eliminates vibration when feed rate is

$$f_t < 0,15 \quad (IC=16 \text{ mm})$$

or

$$f_t < 0,2 \quad (IC=20 \text{ mm}).$$



#### ● Chip Formation

Anti-vibration Type	Standard Type
Work material: 50C	
Cutting data: f <sub>t</sub> = 0,1mm/tooth, d <sub>oc</sub> = 7 mm	
Insert size: IC = 20 mm	

# Wave Radius Mill WRCX Type



Fig. 1

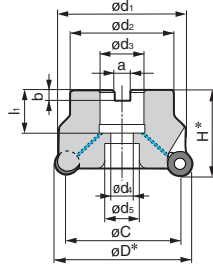


Fig. 2

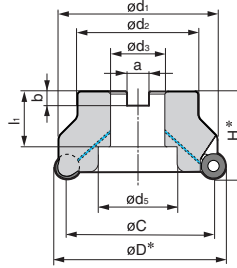
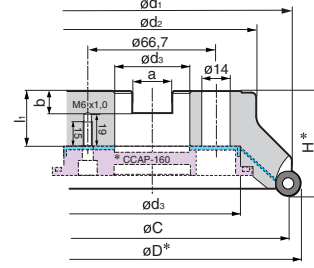


Fig. 3



Axial rake angle:  $-3^\circ$   
Radial rake angle:  $0^\circ$

## Body

### Standard WRCX Type

\* Note Fig.3 for  $\phi D=160$  : Coolant cap (CCAP-160) with 4 screws (BX0620) and wrench (TH050) is available separately.

Insert IC (mm)	Cat. No.	Stock	Dimensions (mm)					Mounting						No. of teeth	Helical boring $\phi B$ Standard	Plunging $\alpha$ max.	Weight (Kg)	Fig.
			$\phi D^*$	$\phi C$	$\phi d_1$	$\phi d_2$	$H^*$	a	b	$\phi d_3$	$\phi d_4$	$\phi d_5$	$l_1$					
12	WRCX 12040 RS	●	40	28	36	36	40	8,4	5,6	16	9	14	18	4	$68 \pm 11$	$10^\circ$	0,2	1
	WRCX 12050 RS	●	50	38	46	40	40	10,4	6,3	22	11	18	20	4	$88 \pm 11$	$7^\circ$	0,3	
	WRCX 12052 RS	●	52	40	48	40	40	10,4	6,3	22	11	18	20	5	$92 \pm 11$	$6^\circ 30'$	0,3	
	WRCX 12063 RS	●	63	51	59	40	40	10,4	6,3	22	11	18	20	5	$114 \pm 11$	$5^\circ$	0,4	
	WRCX 12080 RS	●	80	68	76	55	50	12,4	7,0	27	13,5	20	25	6	$148 \pm 11$	$3^\circ 30'$	0,9	
16	WRCX 16063 RS	●	63	47	50	50	40	10,4	6,3	22	11	18	20	3	$110 \pm 15$	$8^\circ$	0,4	1
	WRCX 16080 RS	●	80	64	70	55	50	12,4	7,0	27	13,5	20	25	4	$144 \pm 15$	$5^\circ 30'$	0,8	
	WRCX 16100 RS	●	100	84	90	70	50	14,4	8,5	32	-	46	32	5	$184 \pm 15$	$4^\circ$	1,3	
	WRCX 16125 RS	○	125	109	115	80	63	16,4	9,5	40	-	56	38	5	$234 \pm 15$	$3^\circ$	2,4	2

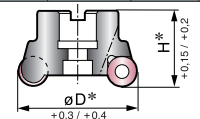
### Close Pitch WRCXF Type

Insert IC (mm)	Cat. No.	Stock	Dimensions (mm)					Mounting						No. of teeth	Helical boring $\phi B$ Standard	Plunging $\alpha$ max.	Weight (Kg)	Fig.
			$\phi D^*$	$\phi C$	$\phi d_1$	$\phi d_2$	$H^*$	a	b	$\phi d_3$	$\phi d_4$	$\phi d_5$	$l_1$					
16	WRCXF 16052 RS	●	52	36	45	45	40	10,4	6,3	22	11	17,7	20	4	$88 \pm 15$	$10^\circ$	0,3	1
	WRCXF 16063 RS	●	63	47	50	50	40	10,4	6,3	22	11	18	20	4	$110 \pm 15$	$8^\circ$	0,4	
	WRCXF 16080 RS	●	80	64	70	55	50	12,4	7,0	27	13,5	20	25	5	$144 \pm 15$	$5^\circ 30'$	0,8	
	WRCXF 16100 RS	●	100	84	90	70	50	14,4	8,5	32	-	46	32	6	$184 \pm 15$	$4^\circ$	1,3	
	WRCXF 16125 RS	●	125	109	115	80	63	16,4	9,5	40	-	52	29	6	$234 \pm 15$	$3^\circ$	2,4	
	WRCXF 16160 RS	●	160	144	150	100	63	16,4	9,5	40	-	93	29	8	$304 \pm 18$	$2^\circ$	4,0	
20	WRCXF 20080 RS	●	80	60	68	55	50	12,4	7,0	27	13,5	20	25	5	$140 \pm 18$	$7^\circ$	0,7	1
	WRCXF 20100 RS	●	100	80	88	70	50	14,4	8,5	32	-	46	32	6	$180 \pm 18$	$5^\circ$	1,1	2
	WRCXF 20125 RS	●	125	105	113	80	63	16,4	9,5	40	29	52	29	6	$230 \pm 18$	$3^\circ 30'$	2,3	1
	WRCXF 20160 RS	●	160	140	148	100	63	16,4	9,5	40	-	93	29	8	$300 \pm 18$	$2^\circ 30'$	3,9	3*

### Extra Close Pitch WRCXX Type

Insert IC (mm)	Cat. No.	Stock	Dimensions (mm)					Mounting						No. of teeth	Helical boring $\phi B$ Standard	Plunging $\alpha$ max.	Weight (Kg)	Fig.
			$\phi D^*$	$\phi C$	$\phi d_1$	$\phi d_2$	$H^*$	a	b	$\phi d_3$	$\phi d_4$	$\phi d_5$	$l_1$					
16	WRCXX 16080 RS	●	80	64	70	55	50	12,4	7,0	27	13,5	20	25	6	$144 \pm 15$	$5^\circ 30'$	0,8	1
	WRCXX 16100 RS	●	100	84	90	70	50	14,4	8,5	32	-	46	32	7	$184 \pm 15$	$4^\circ$	1,3	2

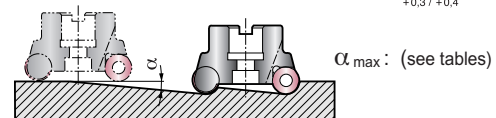
\* Note : When using CP type anti-vibration inserts / IC = 16, please change above dimensions:  $\phi D^* +0,3$  &  $H^* +0,15$  mm  
In case of anti-vibration inserts / IC = 20, please change above dimensions:  $\phi D^* +0,4$  &  $H^* +0,2$  mm



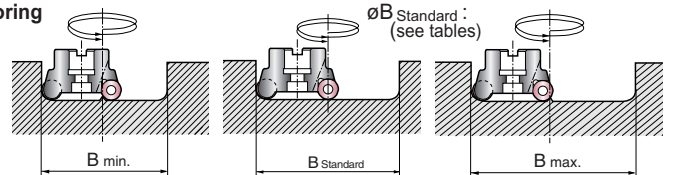
### Maximum Rotation (min<sup>-1</sup>) for Non-ferrous cutting when using QPET Insert

$\phi D$	n	Tool		
		10	12	16
25		28.000		
32		25.000		
40			22.000	
50			20.000	16.000
63			18.000	13.000
80			16.000	12.000
100				10.000
125				9.000
160				8.000

### Plunging



### Helical Boring



### Spare Parts

Cutter	Screw	Screw	
WRCX	12000	BFTX 0409 IP	TRDR 15 IP
WRCX/F-X	16052 ~ 16100	BFTX 0511 IP	TRDR 20 IP
	16125 ~ 16160	BFTX 0513 IP	
WRCX/F	20000	BFTX 0615 IP	TRDR 25 IP

### Recommended Cutting Conditions

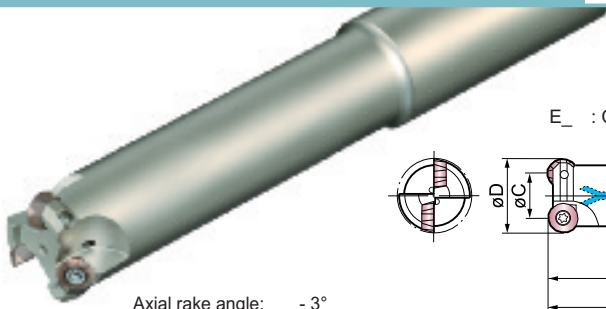
$\phi D$ (mm)	Grade	Material	Carbon steel (ex. C40 ~ C50)	Alloy steel (Below HRC40)	Stainless steel (ex. X10CrNiS18-9)	Cast iron (ex. GG20)	Non-ferrous material
		40 ~ 80	$v_c$	100-160-200	100-140-180	80-120-160	80-120-160
100 ~ 160	$f_t$	0,2-0,4-0,6	0,2-0,3-0,4	0,1-0,2-0,3	0,1-0,2-0,4	0,1-0,3-0,4	
	$v_c$	150-200-250	100-160-200	160-180-200	100-150-200	200-500-1000	
160	$f_t$	0,3-0,4-0,6	0,1-0,3-0,5	0,15-0,2-0,3	0,1-0,15-0,2	0,2-0,3-0,6	

[ $v_c$  = m/min,  $f_t$  = mm/tooth] [min. - optimum - max.]

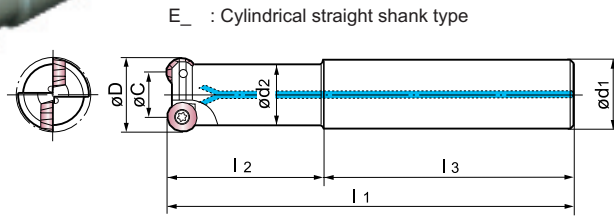
# Wave Radius Mill WRCX 08000/10000/12000 E

## Multi Purpose Endmills with Polygon Inserts

### Shank Type with Small Diameter Inserts

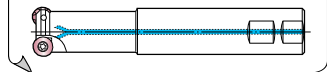


Axial rake angle:  $-3^\circ$   
Radial rake angle:  $0 \sim -35^\circ$



E<sub>-</sub> : Cylindrical straight shank type

EW\*: Weldon shank type



ES : Short type with straight shank  
EM : Middle length type with straight shank  
EL : Long type with straight shank  
EW\* : Weldon shank type

#### ■ BODY

#### ■ Spare Parts

Insert IC (mm)	Cat. No.	Stock	Dimensions (mm)							No. of teeth	Axial rake	Radial rake	Helical boring øB Standard	Plunging α max.		
			øD	øC	ød <sub>1</sub>	ød <sub>2</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>							
8	WRCX 08012 ES	●	12	-	12	9,4	110	40	70	1	-3°	-35°	-	0°30'	BFTX 02505 IP	TRDR 08 IP
	WRCX 08012 EM	●	12	-	12	9,4	150	70	80	1	-3°	-35°	-	0°30'	BFTX 02505 IP	TRDR 08 IP
	WRCX 08016 ES	●	16	-	16	14	120	50	70	1	-3°	-10°	24 <sup>+7</sup> <sub>-4</sub>	5°30'	BFTX 02506 IP	TRDR 08 IP
	WRCX 08016 EM	●	16	-	16	14	150	70	80	1	-3°	-10°	24 <sup>+7</sup> <sub>-4</sub>	5°30'	BFTX 02506 IP	TRDR 08 IP
	WRCX 08020 ES	●	20	12	20	18	130	50	80	2	-3°	-3°	32 ± 7	13°	BFTX 02506 IP	TRDR 08 IP
	WRCX 08020 EM	●	20	12	20	18	180	100	80	2	-3°	-3°	32 ± 7	13°	BFTX 02506 IP	TRDR 08 IP
	WRCX 08020 EL	●	20	12	20	18	250	130	120	2	-3°	-3°	32 ± 7	13°	BFTX 02506 IP	TRDR 08 IP
	WRCX 08025 ES	●	25	17	25	21	130	50	80	3	-3°	0°	42 ± 7	8°20'	BFTX 02506 IP	TRDR 08 IP
10	WRCX 10025 ES	●	25	15	25	21	130	50	80	2	-3°	0°	40 ± 8	13°10'	BFTX 03584 IP	TRDR 15 IP
	WRCX 10025 EM	●	25	15	25	21	180	100	80	2	-3°	0°	40 ± 8	13°10'	BFTX 03584 IP	TRDR 15 IP
	WRCX 10025 EL	●	25	15	25	21	250	130	120	2	-3°	0°	40 ± 8	13°10'	BFTX 03584 IP	TRDR 15 IP
	WRCX 10025 EW*	●	25	15	25	21	160	60	100	2	-3°	0°	40 ± 8	13°10'	BFTX 03584 IP	TRDR 15 IP
	WRCX 10032 ES	●	32	22	32	28	130	50	80	3	-3°	0°	54 ± 8	8°	BFTX 0409 IP	TRDR 15 IP
	WRCX 10032 EM	●	32	22	32	28	200	120	80	3	-3°	0°	54 ± 8	8°	BFTX 0409 IP	TRDR 15 IP
12	WRCX 10032 EL	●	32	22	32	28	300	180	120	3	-3°	0°	54 ± 8	8°	BFTX 0409 IP	TRDR 15 IP
	WRCX 12032 EW*	●	32	20	32	28	180	80	100	2	-3°	0°	52 ± 11	14°30'	BFTX 0409 IP	TRDR 15 IP

#### ■ Recommended cutting conditions

[ $v_c = \text{m/min}$ ,  $f_t = \text{mm/tooth}$ ] [min. - optimum - max.]

Material Grade	Carbon steel (ex. C40 ~ C50)	Alloy steel (Below HRC40)	Stainless steel (ex. X10CrNiS18-9)	Cast iron (ex. GG20)	Non-ferrous material
	ACP100, ACP200	ACP100, ACP200	ACP200, ACP300	ACK200, ACK300	DL1000, H1
12 ~ 32	$v_c$ 80-120-160	60-100-140	60-100-120	60-80-120	200-500-1000
	$f_t$ 0,1-0,3-0,4	0,1-0,2-0,3	0,1-0,15-0,2	0,1-0,2-0,3	0,1-0,2-0,3



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