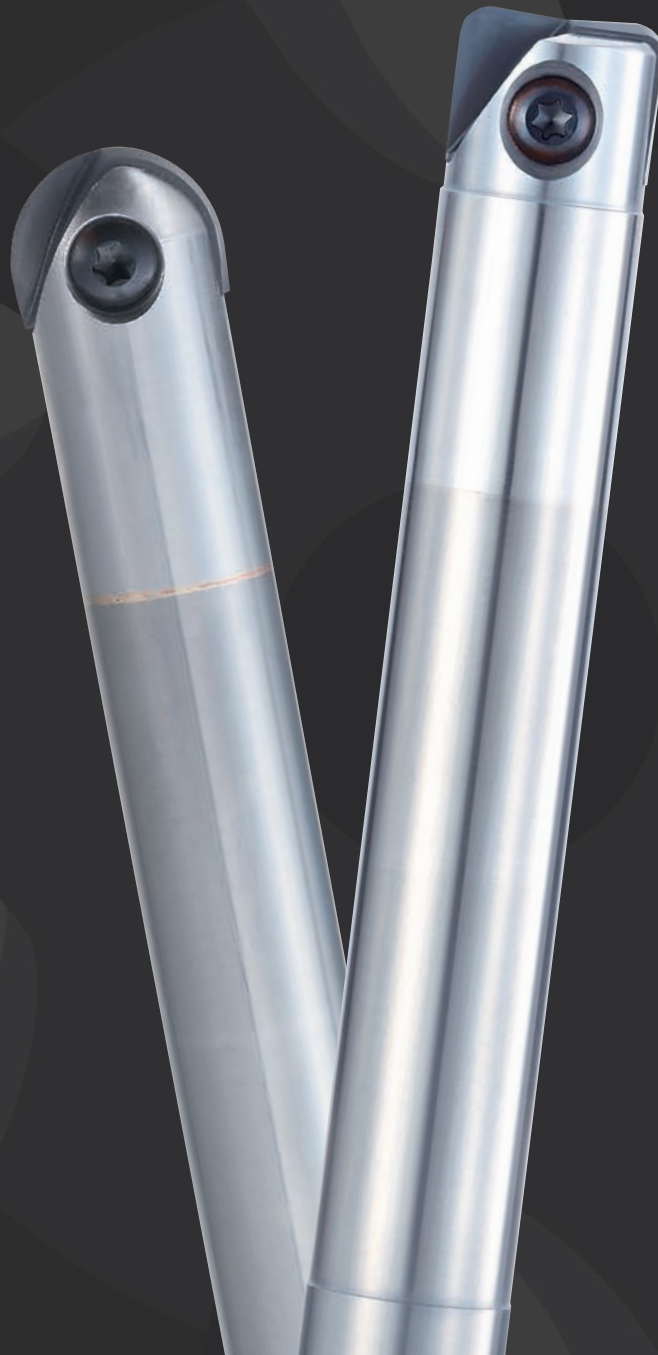




Finishing Ball & Radius End Mill

PHOENIX

PFB PFR

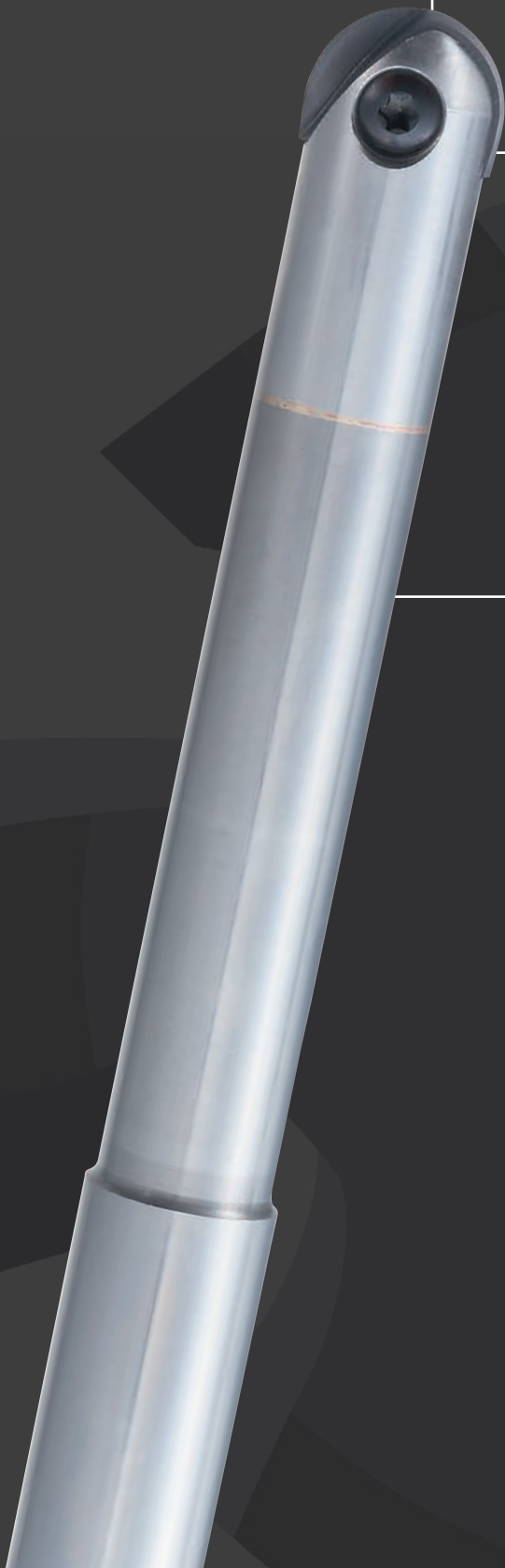


Features : PHOENIX PFB

1 Indexable insert

2 Finish ball nose cutter
2 flutes

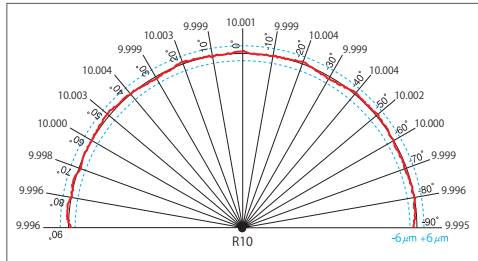
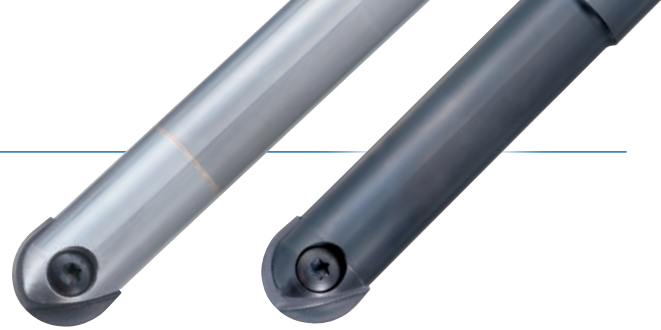
3 Short, long & extra long type
Carbide Shank



PFB INSERTS

High Radius precision

Spiral cutting edge with excellent sharpness



Type

PFB-SP

- Applicable to a wide variety of work materials from mild steel to HRSA
- Sharp but rigid cutting edge
- Excellent chipping resistance

PFB-Q

- Applicable to undercuts with 220° effective cutting edge angle
- No straight cutting edge at the outer peripheral surface, which is applicable to standing wall milling that occurs chattering

PFB-SH

- For milling cast iron, ductile iron and Hardened steel
- Strong cutting edge by the special processing
- Highly resistant carbide material

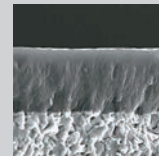
PFB-D

- Sharp cutting edge specialized for milling graphite
- Highly adhesive carbide material for diamond coating

Grade

XP3320 Grade

- For dry milling of steel, stainless steel, and cast iron
- For wet milling of HRSA

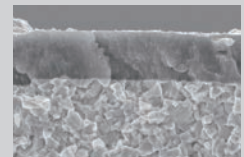


Heat resistant coating

Wear resistant coating

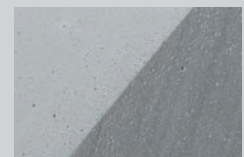
XP3225 Grade

- For stable milling of a wide variety of work materials
- Excellent lubricity and wear resistance
- For wet milling of steel and stainless steel



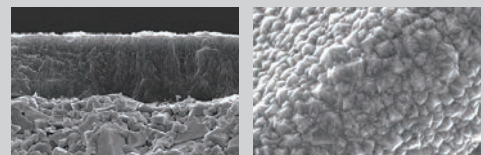
XP3310 Grade

- Ideal for dry milling of high hardened steel and cast iron
- Excellent heat and wear resistance



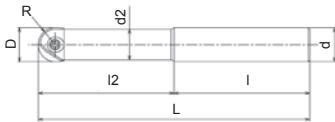
XC4505 Grade

- For milling nonferrous material
- Optimal diamond coating for milling graphite



Phoenix

- High performance
- Finish ball nose cutter
- 2 flutes
- High performance
- Kugelfräser für Schlichtbearbeitungen
- 2 Schneider
- Alta prestazione
- Fresa sferica di finitura
- 2 eliche
- Haute performance
- Fraise hémisphérique pour finition
- 2 dents
- Yüksek performans
- Finiş küre freze
- 2 ağızlı
- High performance
- Radiusfräser til sletbearbejdning
- 2 skær
- High performance
- Fullradiefräs för finishing
- 2 skär
- Altas prestaciones
- Fresa de punta esférica
- 2 labios para acabado
- Высокая производительность
- Чистовая сферическая фреза
- 2-зубая
- Wysoka wydajność
- Frez kulowy, obróbka wykańczająca
- 2-ostrzowy



Steel Shank

EDP	Tool Specification	Z Δ	D	R	l2	l2/D	l	L	d2	d	Price
7801400	PFB-R080SS08-S120	2	8	4	36	4,5	84	120	7	8	
7801401	PFB-R100SS10-S130	2	10	5	45	4,5	85	130	9	10	
7801402	PFB-R120SS12-S130	2	12	6	54	4,5	76	130	11	12	
7801403	PFB-R160SS16-S140	2	16	8	64	4	76	140	14	16	
7801404	PFB-R200SS20-S160	2	20	10	80	4	80	160	18	20	
7801405	PFB-R250SS25-S160	2	25	12,5	75	3	85	160	22	25	
7801406	PFB-R300SS32-S170	2	30	15	90	3	80	170	27	32	
NEW SIZES 7801407	PFB-R320SS32-S180	2	32	16	96	3	84	180	29	32	

Z Δ = Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
 Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

Carbide Shank - Short

EDP	Tool Specification	Z Δ	D	R	l2	l2/D	l	L	d2	d	Price
NEW SIZES 7801429	PFB-R060SS06-S80CS	2	6	3	15	2,5	65	80	5,4	6	
7801430	PFB-R080SS08-S100CS	2	8	4	20	2,5	80	100	7	8	
7801431	PFB-R100SS10-S100CS	2	10	5	25	2,5	75	100	9	10	
7801432	PFB-R120SS12-S110CS	2	12	6	30	2,5	80	110	11	12	
7801433	PFB-R160SS16-S140CS	2	16	8	40	2,5	100	140	14	16	
7801434	PFB-R200SS20-S160CS	2	20	10	50	2,5	110	160	18	20	
7801435	PFB-R250SS25-S160CS	2	25	12,5	62,5	2,5	97,5	160	22	25	
7801436	PFB-R300SS32-S170CS	2	30	15	75	2,5	95	170	27	32	
NEW SIZES 7801437	PFB-R320SS32-S180CS	2	32	16	80	2,5	100	180	29	32	

Z Δ = Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
 Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

Carbide Shank - Long

EDP	Tool Specification	Z Δ	D	R	l2	l2/D	l	L	d2	d	Price
NEW 7801439	PFB-R060SS06-L100CS	2	6	3	30	5	70	100	5,4	6	
NEW 7801440	PFB-R080SS08-L120CS	2	8	4	40	5	80	120	7	8	
NEW 7801441	PFB-R100SS10-L130CS	2	10	5	50	5	80	130	9	10	
NEW 7801442	PFB-R120SS12-L140CS	2	12	6	60	5	80	140	11	12	
NEW 7801443	PFB-R160SS16-L160CS	2	16	8	72	4,5	88	160	14	16	
NEW 7801444	PFB-R200SS20-L180CS	2	20	10	90	4,5	90	180	18	20	
NEW 7801445	PFB-R250SS25-L200CS	2	25	12,5	100	4	100	200	22	25	
NEW 7801446	PFB-R300SS32-L220CS	2	30	15	120	4	100	220	27	32	
NEW 7801447	PFB-R320SS32-L230CS	2	32	16	128	4	102	230	29	32	

Z Δ = Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
 Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

Carbide Shank - Extra Long

EDP	Tool Specification	Z Δ	D	R	l2	l2/D	l	L	d2	d	Price
NEW SIZES 7801419	PFB-R060SS06-LL120CS	2	6	3	42	7	78	120	5,4	6	
7801420	PFB-R080SS08-LL140CS	2	8	4	56	7	84	140	7	8	
7801421	PFB-R100SS10-LL150CS	2	10	5	70	7	80	150	9	10	
7801422	PFB-R120SS12-LL160CS	2	12	6	84	7	76	160	11	12	
7801423	PFB-R160SS16-LL200CS	2	16	8	96	6	104	200	14	16	
7801424	PFB-R200SS20-LL240CS	2	20	10	120	6	120	240	18	20	
7801425	PFB-R250SS25-LL260CS	2	25	12,5	137,5	5,5	122,5	260	22	25	
7801426	PFB-R300SS32-LL290CS	2	30	15	165	5,5	125	290	27	32	
NEW SIZES 7801427	PFB-R320SS32-LL300CS	2	32	16	176	5,5	124	300	29	32	

Z Δ = Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
 Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

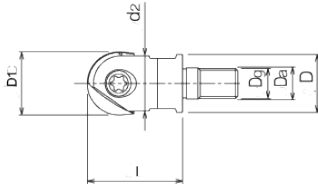


PFB SCREW FIT



Phoenix

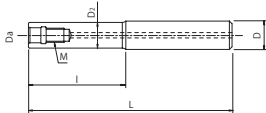
- High performance
- Finish ball nose cutter
- Screw fit type
- High performance
- Kugelfräser für Schlichtbearbeitungen
- Aufschraubkopf
- Alta prestazione
- Fresa sferica di finitura
- Sistema modulare
- Haute performance
- Fraise hémisphérique pour finition
- Tête vissée
- Yüksek performans
- Finiş küre freze
- Vidalı tip
- High performance
- Radiusfräser til sletbearbejdning
- Indskrunings type
- High performance
- Fullradiefräs för finishing
- Med gänginfästning
- Altas prestaciones
- Fresa de punta esférica
- Cabeza roscada
- Высокая производительность
- Чистовая сферическая фреза
- Резьбовая головка
- Wysoka wydajność
- Frez kulowy, obróbka wykańczająca
- Chwył wkręcany



EDP	Designation	ZΔ	D1	Da	Dg	Wrench Size	l	d2	D	Price
7801490	PFB-R100SF6	2	10	6,5	6	7	26	9	9	
7801491	PFB-R120SF6	2	12	6,5	6	7	26	11	11	
7801492	PFB-R160SF8	2	16	8,5	8	10	32	14	14,5	
7801493	PFB-R200SF10	2	20	10,5	10	14	38	18	18	
7801494	PFB-R250SF12	2	25	12,5	12	17	38	22	23	
7801495	PFB-R300SF16	2	30	17	16	22	43	27	28	

ZΔ= Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
 Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

OP-SFA



Straight Arbor for Screw fit tool - Steel Shank

EDP	Designation	D	D2	M	Da	L	l	Price
7801904	SF-M06SS10-4	10	9	6	6,5	104	4	
7801905	SF-M06SS12-10	12	11	6	6,5	104	10	
7801900	SF-M08SS16-15	16	14,5	8	8,5	95	15	
7801901	SF-M10SS20-20	20	18	10	10,5	120	20	
7801902	SF-M12SS25-35	25	23	12	12,5	135	35	
7801903	SF-M16SS32-35	32	28	16	17	155	35	



Straight Arbor for Screw fit tool - Carbide Shank

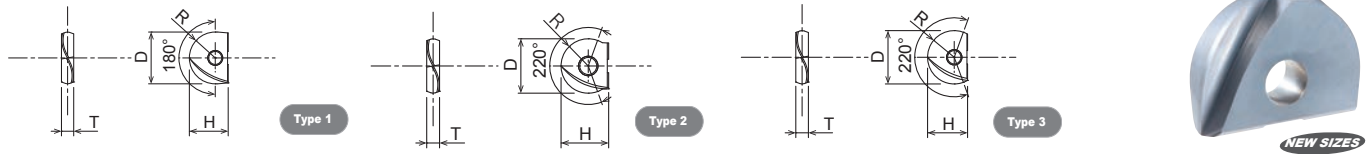
EDP	Designation	D	D2	M	Da	L	l	Price
7801918	SF-M06SS10-24CS	10	9	6	6,5	124	24	
7801919	SF-M06SS12-34CS	12	11	6	6,5	134	34	
7801910	SF-M08SS16-55CS	16	14,5	8	8,5	115	55	
7801911	SF-M08SS16-85CS	16	14,5	8	8,5	145	85	
7801912	SF-M10SS20-70CS	20	18	10	10,5	140	70	
7801913	SF-M10SS20-110CS	20	18	10	10,5	180	110	
7801914	SF-M12SS25-90CS	25	23	12	12,5	170	90	
7801915	SF-M12SS25-140CS	25	23	12	12,5	220	140	
7801916	SF-M16SS32-120CS	32	28	16	17	220	120	
7801917	SF-M16SS32-190CS	32	28	16	17	290	190	



PFB INSERTS

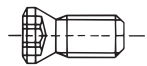
Phoenix

- Applicable insert for Finish Ball Nose Cutter
- Wendeplatten, Kugelfräser PFB
- Inerti applicabili per fresa sferica di finitura
- Choix de plaquettes hémisphériques de finition
- Finiş küre frezeze uygun uç
- Anvendelige skær til radiusfræser
- Utbytbara skärinsatser för fullradiefräs
- Plaquitas para fresa esférica de acabado
- Сменные пластинки для чистовой сферической фрезы
- Płytko do frezów FTB, obróbka wykańczająca



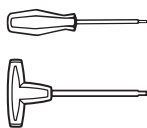
Type	Appearance	Designation	No. of cutting edges	Spec.	R	Insert Size				Grade of Coated material				Price
						D	R	T	H	XP3225	XP3310	XP3320	XC4505	
1		PFB080-SP	2	Spiral Type	180°	8	4	2,4	7	7820030		7820010		
		PFB100-SP	2			10	5	2,6	8,5	7820031		7820011		
		PFB120-SP	2			12	6	3	10	7820032		7820012		
		PFB160-SP	2			16	8	4	12	7820033		7820013		
		PFB200-SP	2			20	10	5	15	7820034		7820014		
		PFB250-SP	2			25	12,5	6	18,5	7820035		7820015		
		PFB300-SP	2			30	15	7	22,5	7820036		7820016		
2		NEW SIZES PFB060-SH	2	Spiral Type (Strengthened edge Type)	180°	6	3	2	5		7820039			
		PFB080-SH	2			8	4	2,4	7		7820040			
		PFB100-SH	2			10	5	2,6	8,5		7820041			
		PFB120-SH	2			12	6	3	10		7820042			
		PFB160-SH	2			16	8	4	12		7820043			
		PFB200-SH	2			20	10	5	15		7820044			
		PFB250-SH	2			25	12,5	6	18,5	7820045				
		PFB300-SH	2			30	15	7	22,5	7820046				
		NEW SIZES PFB320-SH	2			32	16	7	23,5	7820047				
2		NEW SIZES PFB060-D	2	Spiral Type (Diamond coated)	220°	6	3	2	5				7820018	
		NEW SIZES PFB070-D	2			7	3,5	2	5,5			7820019		
		PFB080-D	2			8	4	2,4	7			7820020		
		PFB100-D	2			10	5	2,6	8,5			7820021		
		PFB120-D	2			12	6	3	10			7820022		
		PFB160-D	2			16	8	4	12			7820023		
		PFB200-D	2			20	10	5	15			7820024		
		PFB250-D	2			25	12,5	6	18,5			7820025		
		PFB300-D	2			30	15	7	22,5			7820026		
2		NEW SIZES PFB060-Q	2	Spiral Type (Full Radius Type)	220°	6	3	2	5	7820048				
		NEW SIZES PFB070-Q	2			7	3,5	2	5,5	7820049				
		PFB080-Q	2			8	4	2,4	7	7820050				
		PFB100-Q	2			10	5	2,6	8,5	7820051				
		PFB120-Q	2			12	6	3	10	7820052				
		PFB160-Q	2			16	8	4	12	7820053				
3		PFB200-Q	2			20	10	5	15	7820054				
		PFB250-Q	2			25	12,5	6	18,5	7820055				
		PFB300-Q	2			30	15	7	22,5	7820056				

Accessories



Clamping Screw

EDP	Designation	Applicable Cutters Ø	Recommended tightening torque	Price
7808124	FS20652RB	6	0,8.N.m	
7808123	FS25669RB	8	1N.m	
7808117	FS30686RB	10	1,2N.m	
7808118	FS35610RB	12	2N.m	
7808119	FS40613RB	16	3N.m	
7808120	FS50615RB	20	5N.m	
7808121	FS60620RB	25	5N.m	
7808122	FS80624RB	30, 32	6N.m	



Wrench

EDP	Designation	Applicable Cutters Ø	Price
7808203	T6-D	6	
7808204	T7-D	8	
7808205	T8-D	10	
7808207	T10-D	12	
7808208	T15-D	16	
7808209	T20-D	20, 25	
7808212	T30-T	30, 32	

CONDITIONS

PFB - Recommended Materials by Insert Type

Grade	Appearance	P	M	K	N	S	H
XP3320	PFB-SP	○	○	○		⊙	○
XP3225	PFB-Q	⊙	⊙		⊙*1	○	
XP3310	PFB-SH			⊙			⊙
XC4505	PFB-D				⊙*2		

*1 Best recommended for aluminium and copper alloy
 *2 Best recommended for graphite and CFRP applications

⊙ First choice
 ○ Second choice

Recommended Conditions PFB-SP, PFB-SH, PFB-Q

	Work Material	Hardness	Vc (m/min) Milling Speed	ap (mm) Depth of Cut	fz (mm/t)			
					D			
					Ø 6,8	Ø 10,12	Ø 16,20	Ø 25-30-32
P	Mild Steel-Carbon Steel (S5400-S10C)	~180HB	300 (200~ 400)	0,02 D	0,1	0,12	0,14	0,18
	Carbon Steel-Alloy Steel (S50C-SCM440)	~280HB	300 (200~ 400)	0,02 D	0,07	0,1	0,12	0,14
	Die Steel (SKD11-SKD61)	~280HB	250 (150 ~ 350)	0,02 D	0,07	0,1	0,12	0,14
M	Stainless Steel (Dry) (SUS304-SUS420)	~250HB	250 (150 ~ 350)	0,02 D	0,07	0,12	0,14	0,17
K	Cast Iron (FC250)	~300N/mm ²	400 (300~ 500)	0,02 D	0,12	0,14	0,18	0,22
	Ductile Cast Iron (FCD400)	~600N/mm ²	300 (200~ 400)	0,02 D	0,1	0,12	0,14	0,18
N	Aluminium Alloy	~13% Si	500 (400~ 600)	0,03 D	0,12	0,14	0,18	0,22
	Copper Alloy (C1100)	-	300 (200 ~ 400)	0,03 D	0,11	0,13	0,17	0,22
S	Heat Resistant Alloys (Inconel 718)	-	50 (25~ 80)	0,015 D	0,04	0,05	0,06	0,06
	Titanium Alloy (Ti-Al-4V)	-	90 (40~120)	0,02 D	0,06	0,08	0,11	0,13
H	Pre-hardened Steel (NAK80, STAVAX)	40~43HRC	200 (100~ 300)	0,015 D	0,06	0,07	0,0,8	0,1
	Steel for Die Casting (DAC55-DH31)	43~48HRC	180 (90 ~ 200)	0,015 D	0,05	0,06	0,07	0,07
	Hardened Steel (SKD11)	50~60HRC	150 (100 ~ 250)	0,01 D	0,05	0,06	0,07	0,07

Recommended Conditions PFB-D

	Work Material	Hardness	Vc (m/min) Milling Speed	ap (mm) Depth of Cut	fz (mm/t)			
					D			
					Ø 6,8	Ø 10,12	Ø 16,20	Ø 25-30-32
N	Graphite	-	500 (400~ 600)	0,03 D	0,14	0,17	0,21	0,25
	Carbon Fiber Reinforced Plastic	-	300 (300 ~ 500)	0,03 D	0,11	0,13	0,17	0,20



CONDITIONS

PFB

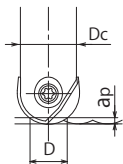
Finish Ball nose cutter - Kugelfräser für Schlichtbearbeitungen - Fresa sferica di finitura - Finition hémisphérique - Finiş küre uçlu kesici - Radiusfräser til sletbearbejdning - Fullradiefräs för finishing, 2-skär - Fresa de punta esférica para acabado - Чистовая сферическая фреза - Frez kulowy, obróbka wykańczająca

Depth of cut & Actual Cutting Diameter

Unit: mm

Depth of cut		Actual cutting diameter														
Dc	R	0,1	0,2	0,3	0,4	0,5	0,8	1	1,5	2	2,5	3	3,5	4	4,5	5
6	3	1,5	2,2	2,6	3	3,3	4,1									
7	3,5	1,6	2,3	2,8	3,3	3,6	4,5									
8	4	1,8	2,5	3	3,5	3,9	4,8									
10	5	2	2,8	3,4	3,9	4,4	5,4	6	7,1							
12	6	2,2	3,1	3,7	4,3	4,8	6	6,6	7,9	8,9						
16	8	2,5	3,6	4,3	5	5,6	7	7,7	9,3	10,6	11,6					
20	10	2,8	4	4,9	5,6	6,2	7,8	8,7	10,5	12	13,2	14,3	15,2			
25	12,5	3,2	4,5	5,4	6,3	7	8,8	9,8	11,9	13,6	15	16,2	17,3	18,3		
30	15	3,5	4,9	6	6,9	7,7	9,7	10,8	13,1	15	16,6	18	19,3	20,4	21,4	22,4
32	16	3,6	5	6,2	7,1	7,9	10	11,1	13,5	15,5	17,2	18,7	20	21,2	22,2	23,2

How to determine actual cutting diameter D



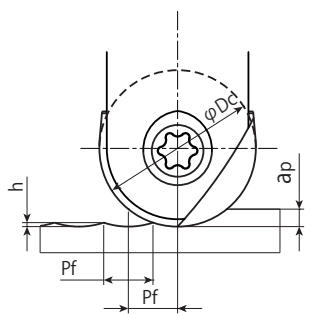
$$D = 2 \sqrt{ap(Dc - ap)}$$

Recommended Pick Feed / Surface Finish

Unit: mm

Dc	6	7	8	10	12	16	20	25	30	32
Pf	0,4	0,45	0,5	0,6	0,7	0,8	1	1,2	1,3	1,4
h	0,007	0,007	0,008	0,009	0,01	0,01	0,012	0,014	0,014	0,015

Theoretical milling surface roughness

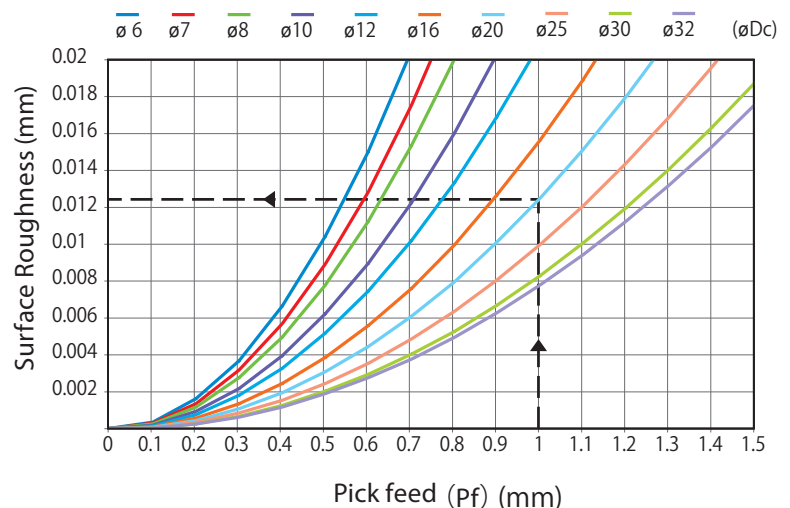


$$h = 0.5 \times (Dc - \sqrt{Dc^2 - Pf^2})$$

Dc = 20mm

Pf = 1mm

→ h = 0.0125mm

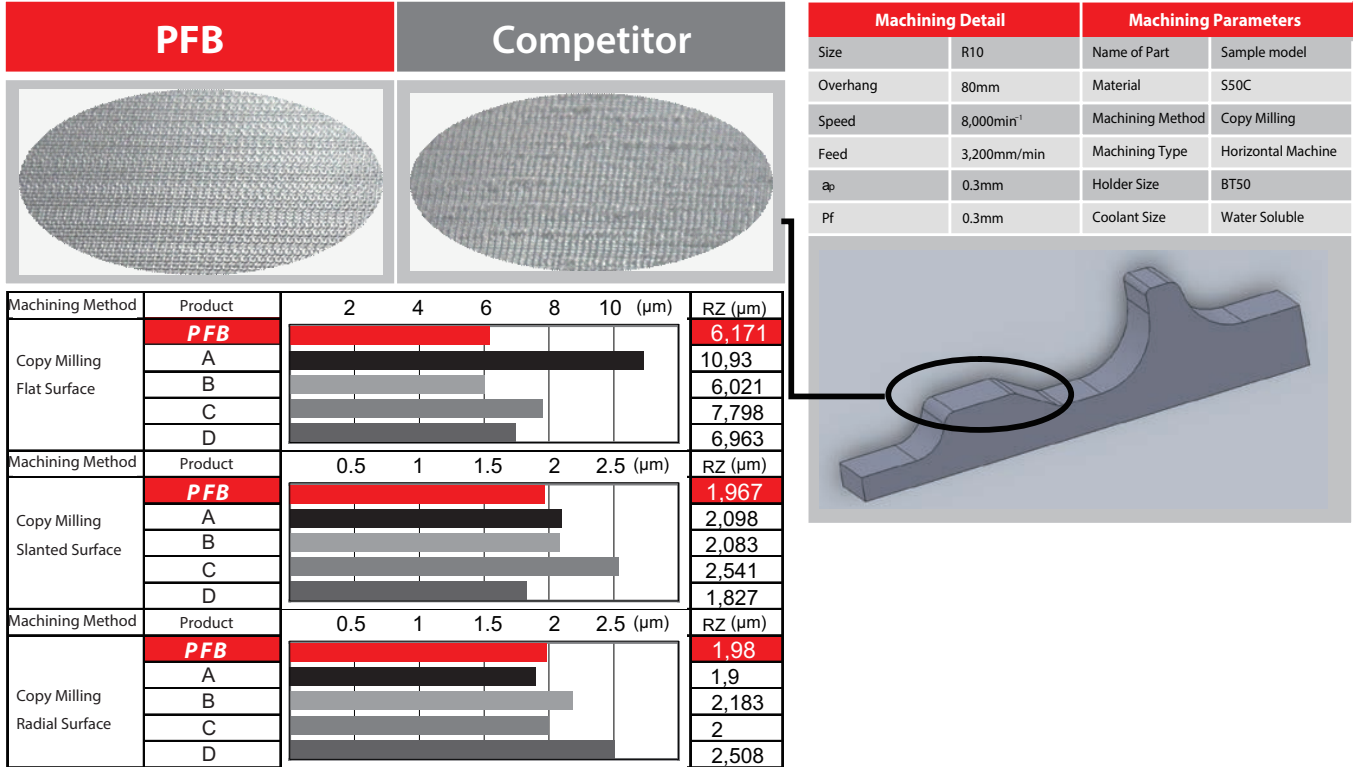


CONDITIONS

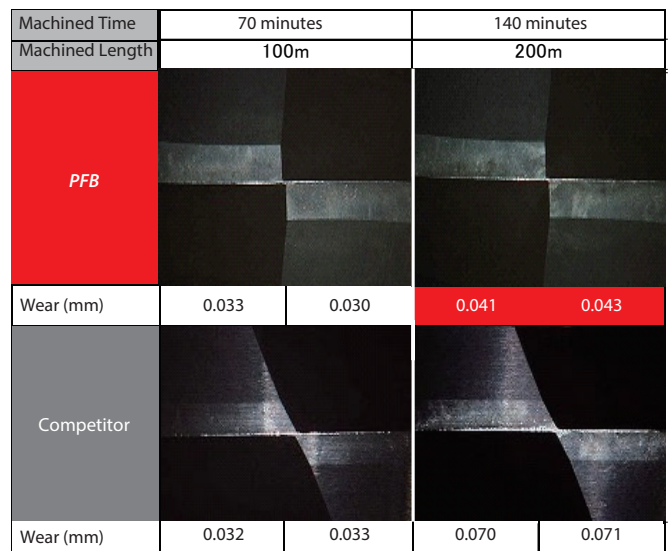
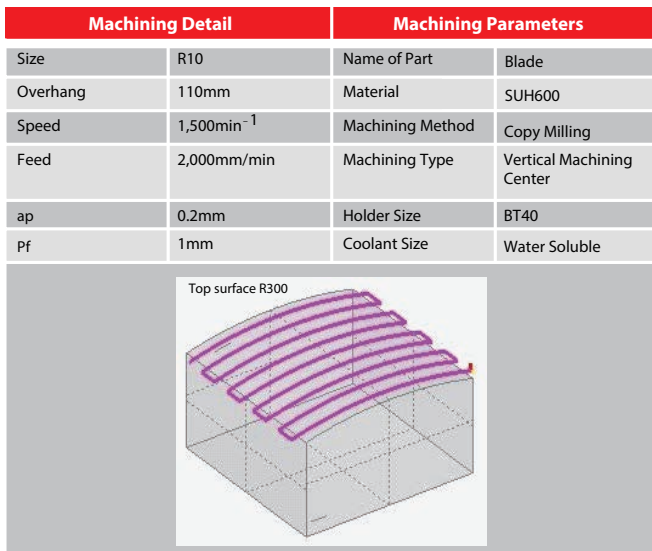
PFB

Finish Ball nose cutter - Kugelfräser für Schlichtbearbeitungen - Fresa sferica di finitura - Finition hémisphérique - Finiş küre uçlu kesici - Radiusfræser til sletbearbejdning - Fullradiefräs för finishing, 2-skär - Fresa de punta esférica para acabado - Чистовая сферическая фреза - Frez kulowy, obróbka wykańczająca

Surface Finish - PFB



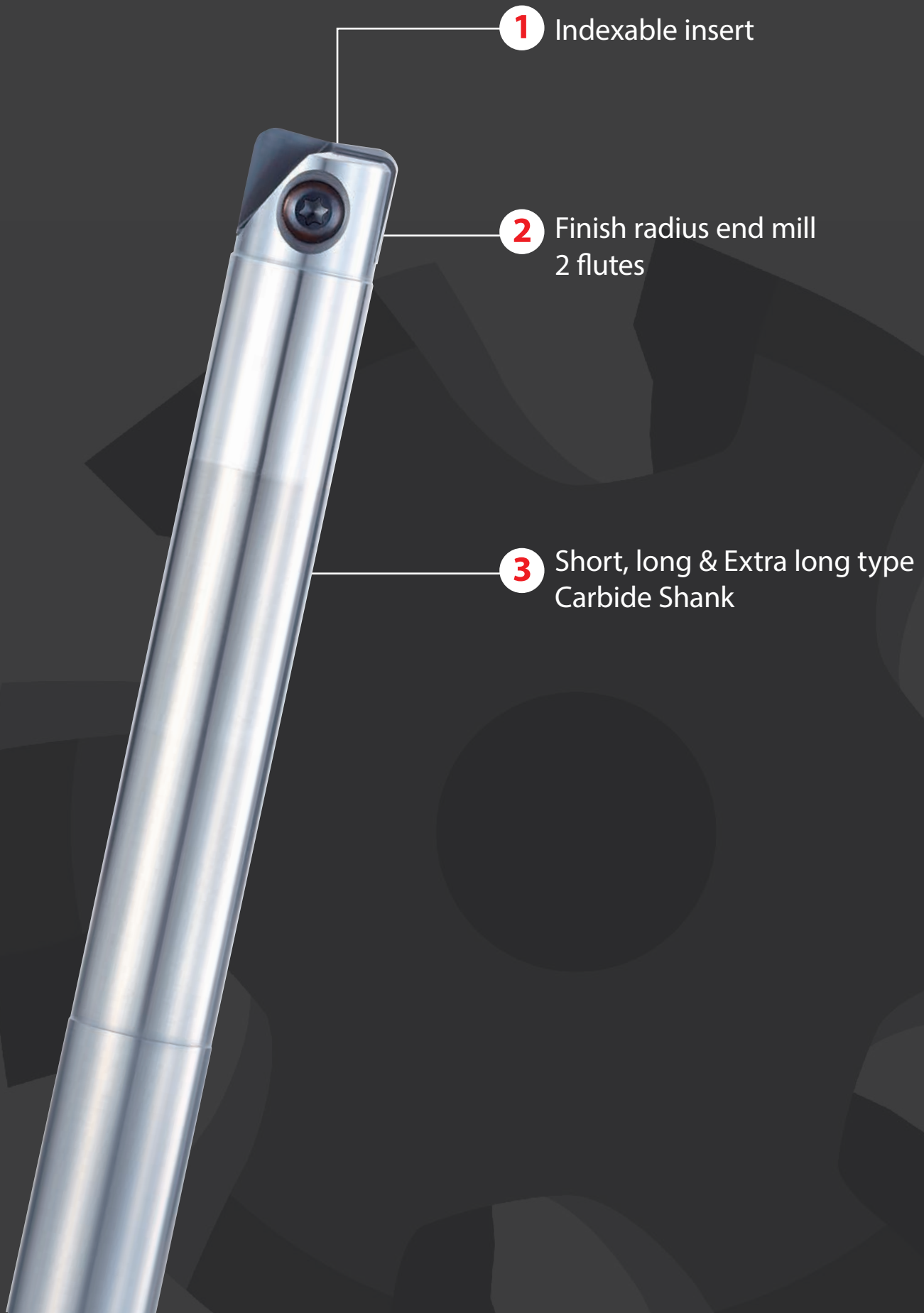
Comparison of tool wear - PFB



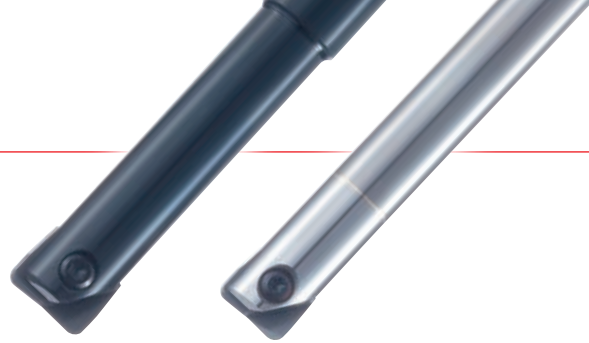
Comparison of tool wear after 200M of machining



Features : PHOENIX PFR



PFR INSERTS

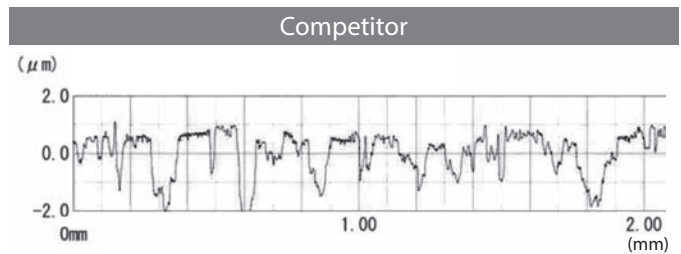
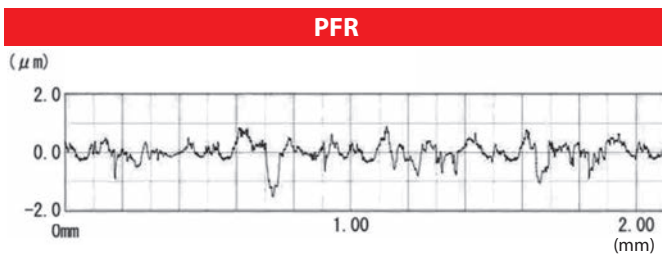


Beautifully finished surfaces

With the advanced grinding technology, PFR inserts have high dimensional accuracy and flat drag on the end cutting edge. It enables outstanding machining precision and finished surface.

- $\pm 8\mu\text{m}$ Corner radius precision: $\pm 8\mu\text{m}$
- $0\sim-0,020\text{mm}$ Tolerance for outer diameter : -0.020 mm

Finished surface roughness curve



Three types of insert are available. All inserts are specially processed

PFR-ST

- Applicable to a wide variety of work materials from mild steel to hardened steel
- Ideal for milling with long overhangs ($L/D \geq 5$)
- Positive rake angle with excellent sharpness and bite

XP3225 Grade

- For stable milling of a wide variety of work materials
- Excellent lubricity and wear resistance

PFR-SH

- For milling cast iron, ductile iron and hardened steel
- High rigid cutting edge with two-dimensional negative chamfer, which is applicable to unstable machining conditions
- Highly resistant carbide material

XP3310 Grade

- Ideal for dry milling of high hardened steel and cast iron
- Excellent heat resistance and wear resistance

PFR-D

- Sharp cutting edge specialized for milling graphite
- Highly adhesive carbide material for diamond coating

XC4505 Grade

- For milling nonferrous material
- Optimal diamond coating for milling graphite



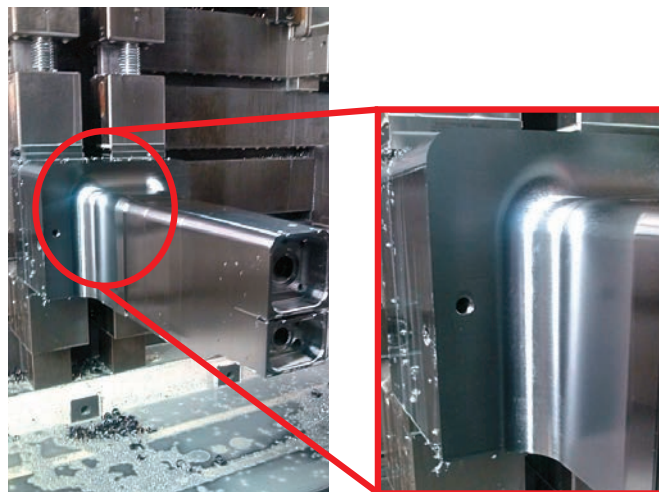
PROCESSING DATA

PX5 (33HRC) Side and Bottom finish for PX5 (pre-hardened steel)

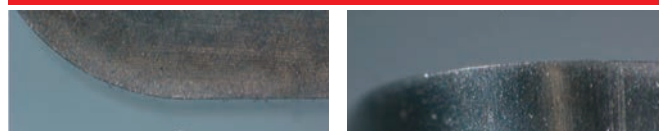
Tool	PFR-R250SS25-LL260CS
Insert (grade)	PFR250R20-ST (XP3225)
Work Material	PX5 (33HRC)
Cutting Speed	82m/min(1,050min ⁻¹)
Feed	500mm/min(0.24mm/t)
Depth of Cut	$a_p=0.5\text{mm}$ $a_e=0.5\sim 1\text{mm}$
Coolant	Water Soluble
Machine	Horizontal Machining Center (BT50)

PFR enabled high precision machining as well as solid carbide tool. With the sharper cutting edge than conventional tools, PFR could be operated stably with deeper depth of cut. As a result, machining time was shortened by reducing semi-finishing process.

Examples from users Machined workpiece: die insert



State of damage to blade edge after 88 m (three hours) of machining on a workpiece



● Rake

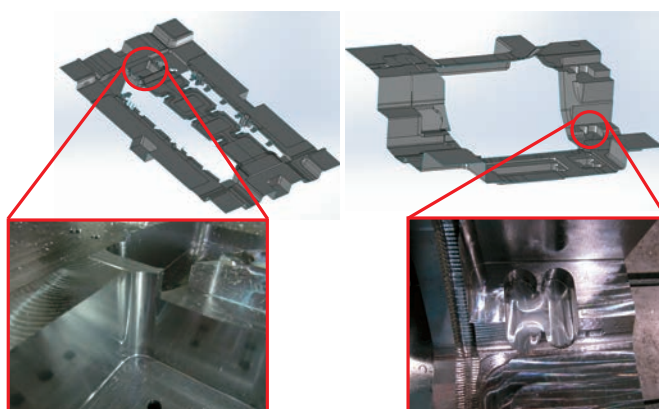
● Flank

Side and Bottom finish for plastic mold steel

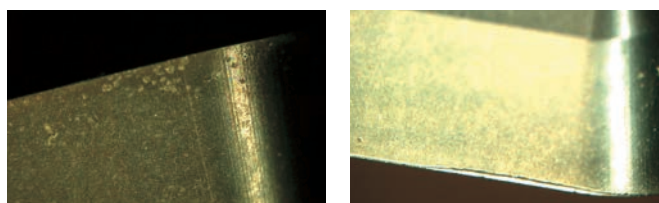
Tool	PFB-R200SS20-LL240CS	
Insert (grade)	PFR200R10-ST (XP3225)	
Work Material	SD18 (JIS S55C)	
Cutting Speed	Side finish section 330m/min(5.250min ⁻¹)	Bottom finish section 100m/min(1.600min ⁻¹)
Feed	2,100mm/min(0,2mm/t)	400mm/min(0,125mm/t)
Depth of Cut	$a_p=1,5\text{mm}$ $a_e=0,05\sim 0,3\text{mm}$	$a_p=0,15\text{mm}$ Semi-finish $a_p=0,05\text{mm}$ Final finish
Coolant	Air Blow	
Machine	Vertical Machining Center (HSK A100)	

With the conventional tool, one insert for semi-finishing and another insert for finishing were consumed. With PFR, one insert could be last until the final finishing process. Furthermore, better finished surface was achieved.

Examples from users



State of damage after total machining process (90 min)



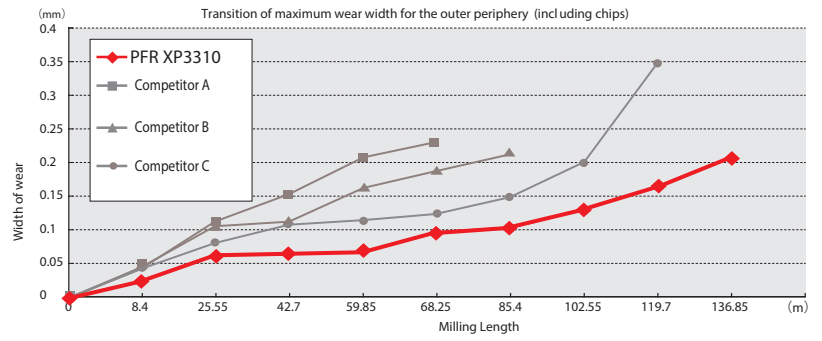
The tip shows normal wear, and there is no chipping despite the long overhang length.

PROCESSING DATA

FCD600 Durability performance evaluation

Tool	PFR-R200SS20-S160
Insert (grade)	PFR200R10-SH (XP3310)
Work Material	FCD600
Cutting Speed	200m/min(3.200min ⁻¹)
Feed	1.280mm/min(0,2mm/t)
Depth of Cut	a _p =1mm a _e =2mm
Coolant	Air Blow
Machine	Horizontal Machining Center (BT40)

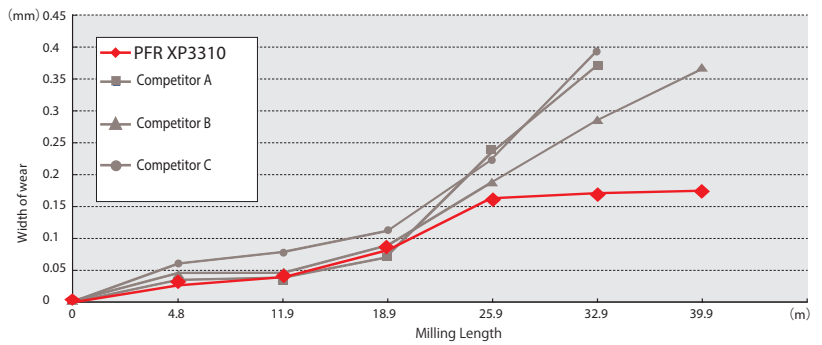
PFR enabled stable machining, and the wear progress had been slow since the early stage.



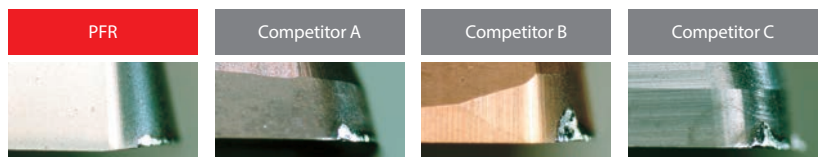
DH31(48HRC) Durability performance evaluation

Tool	PFR-R200SS20-S160
Insert (grade)	PFR200R10-SH (XP3310)
Work Material	DH31(48HRC)
Cutting Speed	60m/min(955min ⁻¹)
Feed	191mm/min(0.1mm/t)
Depth of Cut	a _p =0.5mm a _e =1mm
Coolant	Water Soluble
Machine	Horizontal Machining Center (BT40)

With the special chamfer on the cutting edge, PFR's insert XP3310 have a high chipping resistance. It enabled stable operation in machining hot work tool steel.



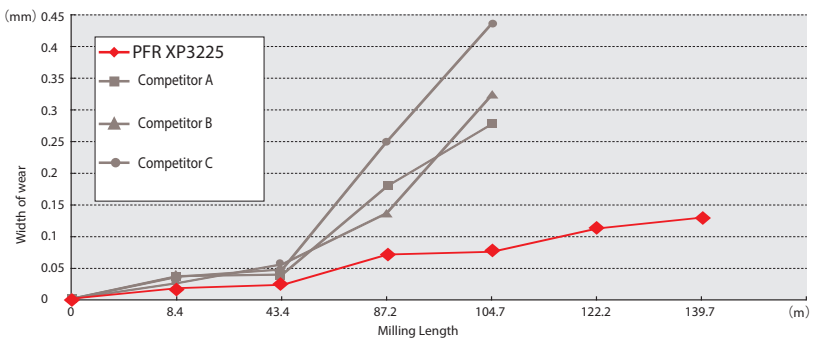
State of damage after 32.9 m of machining



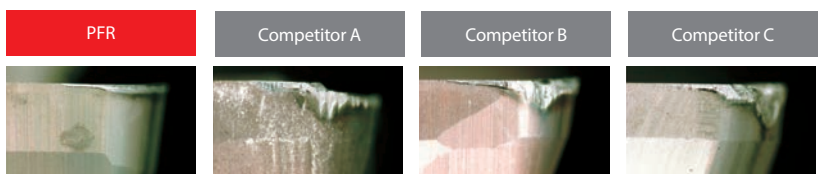
S50C Durability performance evaluation

Tool	PFR-R200SS20-S160
Insert (grade)	PFR200R10-ST (XP3225)
Work Material	S50C
Cutting Speed	200m/min(3,200min ⁻¹)
Feed	1,280mm/min(0.2mm/t)
Depth of Cut	a _p =0.1mma _e =2mm
Coolant	Water Soluble
Machine	Horizontal Machining Center (BT40)

Competitor products showed significant wear when exceeding 43m of milling length. PFR's insert XP3225, however, showed only little wear even after 140m length and remained good.






State of damage after 104.7 m of machining



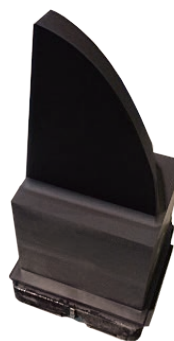
PROCESSING DATA

PFR-D Field data of machining graphite electrode

Tool	PFR-R200SS20-S160CS
Insert (grade)	PFR200R20-D (XC4505)
Work Material	Graphite
Cutting Speed	125m/min(2.000min ⁻¹)
Feed	1.000mm/min(0,25mm/t)
Milling Method	Contour Milling
Depth of Cut	$a_p=1\text{mm}$ $a_e=0,5\text{mm}$
Coolant	None
Machine	Vertical Graphite Milling Machine (BT40)

	Peripheral Cutting Edge	End Teeth	Rake angle
State of damage after 17 hours of machining			
(mm) Frank wear	0,049	0,021	

PFR-D achieved fair finishing surface accuracy versus the competition.
Also machining cost was reduced by applying PFB instead of using solid carbide end mills.

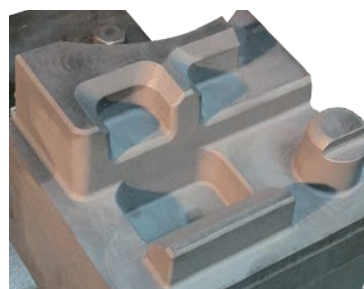


PFR-D Field data of machining die cast mold

Tool	PFR-R160SS-S140CS
Insert (grade)	PFR160R10-D (XC4505)
Work Material	Graphite
Overhang Length	50mm (2,5D)
Cutting Speed	135m/min(2,700min ⁻¹)
Feed	3.330mm/min(0.62mm/t)
Milling Method	Contour Milling
Depth of Cut	$a_p=0,22\sim 0,5\text{mm}$ $a_e=2\sim 8\text{mm}$
Coolant	None
Machine	Vertical Machining center (BT40)

	Peripheral Cutting Edge	End Teeth	Rake angle
State of damage after 10 hours of machining			
(mm) Frank wear	0,062	0,087	

After finish machining of 10 hours, cutting edge was in good shape with normal wear. No abnormal peel off of coating was found. By applying PFR-D, machining time was drastically reduced versus the competitor's diamond coated ball end mill.

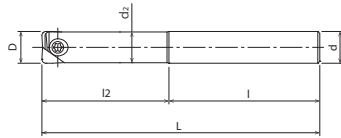


Shape of Test Piece



Phoenix

- High performance
- High performance
- Alta prestazione
- Haute performance
- Yüksek performans
- Finishing radius end mills
- Torusschlichtfräser
- Frese toriche di finitura
- Fraise à rayon pour finition
- Finiş küresel freze
- High performance
- High performance
- Altas prestaciones
- Высокая производительность
- Wysoka wydajność
- Sletfräser med hjørneradius
- Finbearbetningsfräs med hörnradius
- Fresas de acabar con radio de vértice
- Финишная фреза с радиусом на кромке
- Dokončovacie rádiusové frézy



Steel Shank

EDP	Designation	ZΔ	D	L	effective length		d	l	d2	Price
					l2	l2/D				
7832000	PFR-R080SS08-S120	2	8	120	36	4,5	8	84	7,5	
7832001	PFR-R100SS10-S130	2	10	130	45	4,5	10	85	9,5	
7832002	PFR-R120SS12-S130	2	12	130	54	4,5	12	76	11,5	
7832003	PFR-R160SS16-S140	2	16	140	64	4	16	76	15,5	
7832004	PFR-R200SS20-S160	2	20	160	80	4	20	80	19,5	
7832005	PFR-R250SS25-S160	2	25	160	75	3	25	85	24,5	
7832006	PFR-R300SS32-S170	2	30	170	90	3	32	80	29,5	
7832007	PFR-R320SS32-S180	2	32	180	96	3	32	84	31,5	

ZΔ= Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

Carbide Shank Short Type

EDP	Designation	ZΔ	D	L	effective length		d	l	d2	Price
					l2	l2/D				
7832030	PFR-R080SS08-S100CS	2	8	100	20	2,5	8	80	7,5	
7832031	PFR-R100SS10-S100CS	2	10	100	25	2,5	10	75	9,5	
7832032	PFR-R120SS12-S110CS	2	12	110	30	2,5	12	80	11,5	
7832033	PFR-R160SS16-S140CS	2	16	140	40	2,5	16	100	15,5	
7832034	PFR-R200SS20-S160CS	2	20	160	50	2,5	20	110	19,5	
7832035	PFR-R250SS25-S160CS	2	25	160	62,5	2,5	25	97,5	24,5	
7832036	PFR-R300SS32-S170CS	2	30	170	75	2,5	32	95	29,5	
7832037	PFR-R320SS32-S180CS	2	32	180	80	2,5	32	100	31,5	

ZΔ= Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

Carbide Shank Long Type NEW

EDP	Designation	ZΔ	D	L	effective length		d	l	d2	Price
					l2	l2/D				
7832040	PFR-R080SS08-L120CS	2	8	120	40	5	8	80	7,5	
7832041	PFR-R100SS10-L130CS	2	10	130	50	5	10	80	9,5	
7832042	PFR-R120SS12-L140CS	2	12	140	60	5	12	80	11,5	
7832043	PFR-R160SS16-L160CS	2	16	160	72	4,5	16	88	15,5	
7832044	PFR-R200SS20-L180CS	2	20	180	90	4,5	20	90	19,5	
7832045	PFR-R250SS25-L200CS	2	25	200	100	4	25	100	24,5	
7832046	PFR-R300SS32-L220CS	2	30	220	120	4	32	100	29,5	
7832047	PFR-R320SS32-L230CS	2	32	230	128	4	32	102	31,5	

ZΔ= Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

Carbide Shank Extra Long Type

EDP	Designation	ZΔ	D	L	effective length		d	l	d2	Price
					l2	l2/D				
7832020	PFR-R080SS08-LL140CS	2	8	140	56	7	8	84	7,5	
7832021	PFR-R100SS10-LL150CS	2	10	150	70	7	10	80	9,5	
7832022	PFR-R120SS12-LL160CS	2	12	160	84	7	12	76	11,5	
7832023	PFR-R160SS16-LL200CS	2	16	200	96	6	16	104	15,5	
7832024	PFR-R200SS20-LL240CS	2	20	240	120	6	20	120	19,5	
7832025	PFR-R250SS25-LL260CS	2	25	260	137,5	5,5	25	122,5	24,5	
7832026	PFR-R300SS32-LL290CS	2	30	290	165	5,5	32	125	29,5	
7832027	PFR-R320SS32-LL300CS	2	32	300	176	5,5	32	124	31,5	

ZΔ= Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

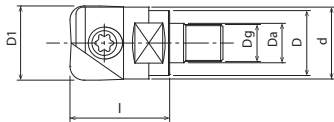


■ PFR SCREW FIT



Phoenix

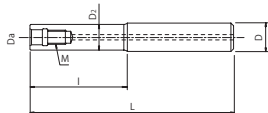
- High performance
- Finishing radius end mills
- Screw fit type
- High performance
- Torusschlichtfräser
- Aufschraubkopf
- Alta prestazione
- Frese toriche di finitura
- Sistema modulare
- Haute performance
- Fraise à rayon pour finition, tête vissée
- Tête vissée
- Yüksek performans
- Finiş küresel freze
- Vidalı tip
- High performance
- Sletfræser med hjørneradius
- Indskrunings type
- High performance
- Finbearbetningsfræs med hornradie
- Med gänginfästning
- Altas prestaciones
- Fresas de acabar con radio de vértice
- Cabeza roscada
- Высокая производительность
- Финишная фреза с радиусом на кромке
- Резьбовая головка
- Wysoka wydajność
- Dokončovací rádiusové frézy
- Chwyt wkręcany



EDP	Designation	ZΔ	D1	Da	Dg	Wrench Size	l	d	D	Price
7832090	PFR-R100SF6	2	10	6,5	6	7	26	9	9	
7832091	PFR-R120SF6	2	12	6,5	6	7	26	11	11	
7832092	PFR-R160SF8	2	16	8,5	8	10	32	15	14,5	
7832093	PFR-R200SF10	2	20	10,5	10	14	38	19	18	
7832094	PFR-R250SF12	2	25	12,5	12	17	38	24	23	
7832095	PFR-R300SF16	2	30	17	16	22	43	29	28	
7832096	PFR-R320SF16	2	32	17	16	22	43	31	28	

ZΔ= Number of flutes - Anzahl Schneiden - Numero di denti - Nombre de lèvres - Liczba ostrzy -
 Antal skær - Antal skär - Numero de ranuras - Число режущих кромок - Kanal sayısı

■ OP-SFA



Straight Arbor for Screw fit tool - Steel Shank

EDP	Designation	D	D2	M	Da	L	l	Price
7801904	SF-M06SS10-4	10	9	6	6,5	104	4	
7801905	SF-M06SS12-10	12	11	6	6,5	104	10	
7801900	SF-M08SS16-15	16	14,5	8	8,5	95	15	
7801901	SF-M10SS20-20	20	18	10	10,5	120	20	
7801902	SF-M12SS25-35	25	23	12	12,5	135	35	
7801903	SF-M16SS32-35	32	28	16	17	155	35	



Straight Arbor for Screw fit tool - Carbide Shank

EDP	Designation	D	D2	M	Da	L	l	Price
7801918	SF-M06SS10-24CS	10	9	6	6,5	124	24	
7801919	SF-M06SS12-34CS	12	11	6	6,5	134	34	
7801910	SF-M08SS16-55CS	16	14,5	8	8,5	115	55	
7801911	SF-M08SS16-85CS	16	14,5	8	8,5	145	85	
7801912	SF-M10SS20-70CS	20	18	10	10,5	140	70	
7801913	SF-M10SS20-110CS	20	18	10	10,5	180	110	
7801914	SF-M12SS25-90CS	25	23	12	12,5	170	90	
7801915	SF-M12SS25-140CS	25	23	12	12,5	220	140	
7801916	SF-M16SS32-120CS	32	28	16	17	220	120	
7801917	SF-M16SS32-190CS	32	28	16	17	290	190	

PFR INSERTS

Phoenix

- Applicable insert
- Multi-purpose type

- Wendeplatten
- universelle Wendschneidplatte für den allgemeinen Einsatz

- Inserti applicabili
- Applicazioni generali

- Choix de plaquettes
- Type multi usage

- Sirt frezisi
- Çok amaçlı tip

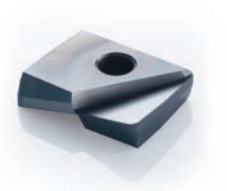
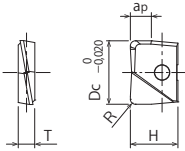
- Anvendelige skær
- Universal type

- Utbytbare skärinsatser
- Universal typ

- Plaquitas
- Tipo multi-función

- Высокая производительность
- Универсальная

- Wysoka wydajność
- Viac účelový typ



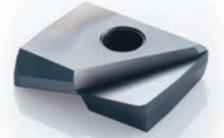
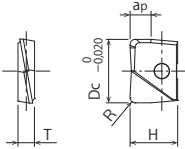
Designation	N° of Cutting Edges	Specifications	Insert Size					Grade of Coated Materials	Price
			Dc	R	ap	T	H		
PFR080R03-ST	2	Multi-purpose Type	8	0,3	2,7	2,4	7	7820200	
PFR080R05-ST	2		8	0,5				7820201	
PFR080R10-ST	2		8	1				7820202	
PFR080R20-ST	2		8	2	7820203				
PFR100R03-ST	2		10	0,3	3,3	2,6	8,5	7820204	
PFR100R05-ST	2		10	0,5				7820205	
PFR100R10-ST	2		10	1				7820206	
PFR100R20-ST	2		10	2	7820207				
PFR120R03-ST	2		12	0,3	4	3	10	7820208	
PFR120R05-ST	2		12	0,5				7820209	
PFR120R10-ST	2		12	1				7820210	
PFR120R20-ST	2		12	2	7820211				
PFR120R30-ST	2		12	3	7820212				
PFR160R03-ST	2		16	0,3	5,3	4	12	7820213	
PFR160R05-ST	2		16	0,5				7820214	
PFR160R10-ST	2		16	1				7820215	
PFR160R20-ST	2		16	2	7820216				
PFR160R30-ST	2		16	3	7820217				
PFR200R03-ST	2		20	0,3	6,7	5	15	7820218	
PFR200R05-ST	2		20	0,5				7820219	
PFR200R10-ST	2		20	1				7820220	
PFR200R20-ST	2		20	2	7820221				
PFR200R30-ST	2		20	3	7820222				
PFR250R03-ST	2		25	0,3	8,3	6	18,5	7820223	
PFR250R05-ST	2		25	0,5				7820224	
PFR250R10-ST	2		25	1				7820225	
PFR250R20-ST	2		25	2	7820226				
PFR250R30-ST	2		25	3	7820227				
PFR300R03-ST	2		30	0,3	10	7	22,5	7820228	
PFR300R05-ST	2		30	0,5				7820229	
PFR300R10-ST	2		30	1				7820230	
PFR300R20-ST	2		30	2	7820231				
PFR300R30-ST	2	30	3	7820232					
PFR320R03-ST	2	32	0,3	10,3	7	23,5	7820233		
PFR320R05-ST	2	32	0,5				7820234		
PFR320R10-ST	2	32	1				7820235		
PFR320R20-ST	2	32	2	7820236					
PFR320R30-ST	2	32	3	7820237					



PFR INSERTS

Phoenix

- Applicable insert
- Strengthened Edge Type
- Wendeplatten
- verstärkte Wendschneidplatte
- Inerti applicabili
- Tagliente rinforzato
- Choix de plaquettes à surfacer, dresser
- Type à arretes de coupe renforcées
- Sirt freziesi
- Güçlendirilmiş köşe tip
- Anvendelige skær
- Forstærket skær
- Utbytbara vändskär
- Förstärkt skäregg
- Plaquitas
- Tipo con filo reforzado
- Высокая производительность
- С усиленной режущей кромкой
- Wysoka wydajność
- Zosilniony typ reznej hrany



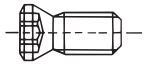
Designation	N° of Cutting Edges	Specifications	Insert Size					Grade of Coated Materials	Price
			Dc	R	ap	T	H		
PFR080R03-SH	2	Strengthened Edge Type	8	0,3	2,7	2,4	7	XP3310	7820250
PFR080R05-SH	2		8	0,5				7820251	
PFR080R10-SH	2		8	1				7820252	
PFR080R20-SH	2		8	2	7820253				
PFR100R03-SH	2		10	0,3	3,3	2,6	8,5	7820254	
PFR100R05-SH	2		10	0,5				7820255	
PFR100R10-SH	2		10	1				7820256	
PFR100R20-SH	2		10	2	7820257				
PFR120R03-SH	2		12	0,3	4	3	10	7820258	
PFR120R05-SH	2		12	0,5				7820259	
PFR120R10-SH	2		12	1				7820260	
PFR120R20-SH	2		12	2	7820261				
PFR120R30-SH	2		12	3	7820262				
PFR160R03-SH	2		16	0,3	5,3	4	12	7820263	
PFR160R05-SH	2		16	0,5				7820264	
PFR160R10-SH	2		16	1				7820265	
PFR160R20-SH	2		16	2	7820266				
PFR160R30-SH	2		16	3	7820267				
PFR200R03-SH	2		20	0,3	6,7	5	15	7820268	
PFR200R05-SH	2		20	0,5				7820269	
PFR200R10-SH	2		20	1				7820270	
PFR200R20-SH	2		20	2	7820271				
PFR200R30-SH	2		20	3	7820272				
PFR250R03-SH	2		25	0,3	8,3	6	18,5	7820273	
PFR250R05-SH	2		25	0,5				7820274	
PFR250R10-SH	2		25	1				7820275	
PFR250R20-SH	2		25	2	7820276				
PFR250R30-SH	2		25	3	7820277				
PFR300R03-SH	2		30	0,3	10	7	22,5	7820278	
PFR300R05-SH	2		30	0,5				7820279	
PFR300R10-SH	2		30	1				7820280	
PFR300R20-SH	2		30	2	7820281				
PFR300R30-SH	2	30	3	7820282					
PFR320R03-SH	2	32	0,3	10,3	7	23,5	7820283		
PFR320R05-SH	2	32	0,5				7820284		
PFR320R10-SH	2	32	1				7820285		
PFR320R20-SH	2	32	2	7820286					
PFR320R30-SH	2	32	3	7820287					

NEW

Designation	N° of Cutting Edges	Specifications	Insert Size					Grade of Coated Materials	Price
			Dc	R	ap	T	H		
PFR080R03-D	2	Diamond Coated	8	0,3	2,7	2,4	7	XC4505	7820300
PFR080R05-D	2		8	0,5				7820301	
PFR080R10-D	2		8	1				7820302	
PFR100R03-D	2		10	0,3	3,3	2,6	8,5	7820303	
PFR100R05-D	2		10	0,5				7820304	
PFR100R10-D	2		10	1				7820305	
PFR120R03-D	2		12	0,3	4	3	10	7820306	
PFR120R05-D	2		12	0,5				7820307	
PFR120R10-D	2		12	1				7820308	
PFR160R03-D	2		16	0,3	5,3	4	12	7820309	
PFR160R05-D	2		16	0,5				7820310	
PFR160R10-D	2		16	1				7820311	
PFR200R03-D	2		20	0,3	6,7	5	15	7820312	
PFR200R05-D	2		20	0,5				7820313	
PFR200R10-D	2		20	1				7820314	

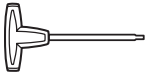
■ PFR INSERTS

Accessories



Clamping Screw

EDP	Designation	Applicable Cutters Ø	Recommended tightening torque	Price
7808123	FS25669RB	8	1N·m	
7808117	FS30686RB	10	1.2N·m	
7808118	FS35610RB	12	2N·m	
7808119	FS40613RB	16	3N·m	
7808120	FS50615RB	20	5N·m	
7808121	FS60620RB	25	5N·m	
7808122	FS80624RB	30,32	6N·m	



Wrench

EDP	Designation	Applicable Cutters Ø	Price
7808204	T7-D	8	
7808205	T8-D	10	
7808207	T10-D	12	
7808208	T15-D	16	
7808209	T20-D	20, 25	
7808212	T30-T	30, 32	

Recommended Grade / Material

Grade	Appearance	P	M	K	N	S	H
XP3225	PFR-ST	⊙	⊙	○	⊙	⊙	○
XP3310	PFR-SH	○	○	⊙	○		⊙
XC4505	PFR-D				⊙		

XP3310 is recommended for intermittent milling
 XP3225 is recommended when L/D ≥ 5

⊙ First choice
 ○ Second choice



CONDITIONS

PFR-ST, PFR-SH Standard conditions

	Work Material	Tensile strength/ Hardness	Cutting Speed Vc (m/min)			Max. depth of Cut apMax (mm)	fz (mm/t)		
			L/D				Dc		
			2,5D	5D	8D		Ø 8,10	Ø 12,16	Ø 20,25,30,32
P	Mild Steel-Carbon Steel SS400 - S10C	~180HB	200 (150~250)	80%	60%	0,05Dc	0,2	0,22	0,25
	Carbon Steel-Alloy Steel S50C - SCM440	~280HB	180 (150~250)			0,05Dc	0,18	0,22	0,25
	Die Steel SKD11 - SKD61	~280HB	150 (120~200)			0,05Dc	0,15	0,18	0,2
M	Stainless Steel (SUS304 - SUS420)	~250HB	150 (100~200)			0,03Dc	0,12	0,15	0,18
K	Cast Iron FC250	~300N/mm ²	200 (150~250)			0,05Dc	0,2	0,25	0,3
	Ductile Cast Iron FCD400	~600N/mm ²	150 (100~200)			0,05Dc	0,15	0,2	0,25
N	Aluminium Alloy	~13%Si	300 (200~400)			0,05Dc	0,25	0,3	0,35
S	Superalloy (Wet) (Inconel 718)	-	30 (20~40)			0,02Dc	0,05	0,08	0,12
	Titanium Alloy (Wet) (Ti-Al-4V)	-	50 (40~60)			0,02Dc	0,08	0,1	0,15
H	Pre-hardened Steel (NAK80, STAVAX)	40 ~ 43HRC	120 (100~150)			0,03Dc	0,1	0,12	0,18
	Die Cast Steel (DAC55, DH31)	43 ~ 48HRC	80 (50~100)			0,025Dc	0,08	0,1	0,15
	Hardened Steel (SKD11)	50 ~ 60HRC	60 (40~80)			0,02Dc	0,05	0,08	0,1

PFR-D

	Work Material	Cutting Speed Vc (m/min)			Max. depth of Cut apMax (mm)	fz (mm/t)		
		L/D				Dc		
		2,5D	5D	8D		Ø 8,10	Ø 12,16	Ø 20,25,30,32
N	Graphite	250 (150~350)	80%	60%	0,1Dc	0,4	0,5	0,5
	CFRP Carbon Fiber Reinforced Plastic	200 (150~250)			0,5Dc	0,1	0,15	0,2

PFR - High speed Finishing conditions Steel Shank

	Work Material	Tensile strength/ Hardness	Vc (m/min) Cutting Speed	ap (mm) Depth of Cut	fz (mm/t)			
					Dc			
					Ø 8	Ø10,12	Ø16,20	Ø25,30,32
P	Mild Steel-Carbon Steel SS400 - S10C	~180HB	450	0,02Dc	0,1	0,12	0,14	0,18
	Carbon Steel-Alloy Steel S50C - SCM440	~280HB	450	0,02Dc	0,07	0,1	0,12	0,14
	Die Steel SKD11 - SKD61	~280HB	375	0,02Dc	0,07	0,1	0,12	0,14
M	Stainless Steel (SUS304 - SUS420)	~250HB	375	0,02Dc	0,07	0,12	0,14	0,17
K	Cast Iron FC250	~300N/mm ²	600	0,02Dc	0,12	0,14	0,18	0,22
	Ductile Cast Iron FCD400	~600N/mm ²	450	0,02Dc	0,1	0,12	0,14	0,18
N	Aluminium Alloy	~13%Si	750	0,03Dc	0,12	0,14	0,18	0,22
S	Superalloy (Wet) (Inconel 718)	-	70	0,015Dc	0,04	0,05	0,06	0,06
	Titanium Alloy (Wet) (Ti-Al-4V)	-	120	0,02Dc	0,06	0,08	0,11	0,13
H	Pre-hardened Steel (NAK80, STAVAX)	40 ~ 43HRC	300	0,015Dc	0,06	0,07	0,08	0,1
	Die Cast Steel (DAC55, DH31)	43 ~ 48HRC	270	0,015Dc	0,05	0,06	0,07	0,07
	Hardened Steel (SKD11)	50 ~ 60HRC	220	0,01Dc	0,05	0,06	0,07	0,07



CONDITIONS

PFR - High speed Finishing conditions

Carbide Shank Short Type

	Work Material	Tensile strength/ Hardness	Vc (m/min) Cutting Speed	ap (mm) Depth of Cut	fz (mm/t)			
					Dc			
					Ø 8	Ø10,12	Ø16,20	Ø25,30,32
P	Mild Steel-Carbon Steel SS400 - S10C	~180HB	540	0,02Dc	0,1	0,12	0,14	0,18
	Carbon Steel-Alloy Steel S50C - SCM440	~280HB	540	0,02Dc	0,07	0,1	0,12	0,14
M	Die Steel SKD11 - SKD61	~280HB	450	0,02Dc	0,07	0,1	0,12	0,14
	Stainless Steel (SUS304 - SUS420)	~250HB	450	0,02Dc	0,07	0,12	0,14	0,17
K	Cast Iron FC250	~300N/mm ²	720	0,02Dc	0,12	0,14	0,18	0,22
	Ductile Cast Iron FCD400	~600N/mm ²	540	0,02Dc	0,1	0,12	0,14	0,18
N	Aluminium Alloy	~13%Si	600	0,03Dc	0,12	0,14	0,18	0,22
S	Superalloy (Wet) (Inconel 718)	-	80	0,015Dc	0,04	0,05	0,06	0,06
	Titanium Alloy (Wet) (Ti-Al-4V)	-	150	0,02Dc	0,06	0,08	0,11	0,13
H	Pre-hardened Steel (NAK80, STAVAX)	40 ~ 43HRC	340	0,015Dc	0,06	0,07	0,08	0,1
	Die Cast Steel (DAC55, DH31)	43 ~ 48HRC	290	0,015Dc	0,05	0,06	0,07	0,07
	Hardened Steel (SKD11)	50 ~ 60HRC	260	0,01Dc	0,05	0,06	0,07	0,07

PFR - High speed Finishing conditions

Carbide Shank Long Type

	Work Material	Tensile strength/ Hardness	Vc (m/min) Cutting Speed	ap (mm) Depth of Cut	fz (mm/t)			
					Dc			
					Ø 8	Ø10,12	Ø16,20	Ø25,30,32
P	Mild Steel-Carbon Steel SS400 - S10C	~180HB	480	0,02Dc	0,1	0,12	0,14	0,18
	Carbon Steel-Alloy Steel S50C - SCM440	~280HB	480	0,02Dc	0,07	0,1	0,12	0,14
M	Die Steel SKD11 - SKD61	~280HB	400	0,02Dc	0,07	0,1	0,12	0,14
	Stainless Steel (SUS304 - SUS420)	~250HB	400	0,02Dc	0,07	0,12	0,14	0,17
K	Cast Iron FC250	~300N/mm ²	640	0,02Dc	0,12	0,14	0,18	0,22
	Ductile Cast Iron FCD400	~600N/mm ²	480	0,02Dc	0,1	0,12	0,14	0,18
N	Aluminium Alloy	~13%Si	800	0,03Dc	0,12	0,14	0,18	0,22
S	Superalloy (Wet) (Inconel 718)	-	80	0,015Dc	0,04	0,05	0,06	0,06
	Titanium Alloy (Wet) (Ti-Al-4V)	-	144	0,02Dc	0,06	0,08	0,11	0,13
H	Pre-hardened Steel (NAK80, STAVAX)	40 ~ 43HRC	320	0,015Dc	0,06	0,07	0,08	0,1
	Die Cast Steel (DAC55, DH31)	43 ~ 48HRC	288	0,015Dc	0,05	0,06	0,07	0,07
	Hardened Steel (SKD11)	50 ~ 60HRC	240	0,01Dc	0,05	0,06	0,07	0,07

PFR - High speed Finishing conditions

Carbide Shank Extra Long Type

	Work Material	Tensile strength/ Hardness	Vc (m/min) Cutting Speed	ap (mm) Depth of Cut	fz (mm/t)			
					Dc			
					Ø 8	Ø10,12	Ø16,20	Ø25,30,32
P	Mild Steel-Carbon Steel SS400 - S10C	~180HB	360	0,02Dc	0,1	0,12	0,14	0,18
	Carbon Steel-Alloy Steel S50C - SCM440	~280HB	360	0,02Dc	0,07	0,1	0,12	0,14
M	Die Steel SKD11 - SKD61	~280HB	300	0,02Dc	0,07	0,1	0,12	0,14
	Stainless Steel (SUS304 - SUS420)	~250HB	300	0,02Dc	0,07	0,12	0,14	0,17
K	Cast Iron FC250	~300N/mm ²	480	0,02Dc	0,12	0,14	0,18	0,22
	Ductile Cast Iron FCD400	~600N/mm ²	360	0,02Dc	0,1	0,12	0,14	0,18
N	Aluminium Alloy	~13%Si	600	0,03Dc	0,12	0,14	0,18	0,22
S	Superalloy (Wet) (Inconel 718)	-	60	0,015Dc	0,04	0,05	0,06	0,06
	Titanium Alloy (Wet) (Ti-Al-4V)	-	110	0,02Dc	0,06	0,08	0,11	0,13
H	Pre-hardened Steel (NAK80, STAVAX)	40 ~ 43HRC	240	0,015Dc	0,06	0,07	0,08	0,1
	Die Cast Steel (DAC55, DH31)	43 ~ 48HRC	220	0,015Dc	0,05	0,06	0,07	0,07
	Hardened Steel (SKD11)	50 ~ 60HRC	180	0,01Dc	0,05	0,06	0,07	0,07



SWEDEN

Branch office of OSG SCANDINAVIA
Abrahams Gränd 8
295 35 Bromölla
Sweden
Tel: +46 40 41 22 55
Fax: +46 40 41 32 55
osg@osg-scandinavia.com

OSG SCANDINAVIA

(For Scandinavian countries)
Langebjergvaenget 16
4000 Roskilde
Denmark
Tel.: +45 46 75 65 55
Fax: +45 46 75 67 00
osg@osg-scandinavia.com

OSG NETHERLANDS

Bedrijfsweg 5 - 3481 MG Harmelen
Postbus 50 - 3480 DB Harmelen
The Netherlands
Tel.: +31 348 44 2764
Fax: +31 348 44 2144
info@osg-nl.com

OSG UK

Shelton house, 5 Bentalls
Pipps Hill Ind Est, Basildon Essex SS14 3BY
United Kingdom
Tel.: +44 845 305 1066
Fax: +44 845 305 1067
sales@osg-uk.com

OSG EUROPE LOGISTICS

Avenue Lavoisier 1
B-1300 Z.I. Wavre - Nord
Belgium
Tel.: +32 10 23 05 07
Fax: +32 10 23 05 51
info@osgeurope.com

OSG BELUX

Avenue Lavoisier 1
B-1300 Z.I. Wavre - Nord
Belgium
Tel.: +32 10 23 05 11
Fax: +32 10 23 05 31
info@osg-belgium.com

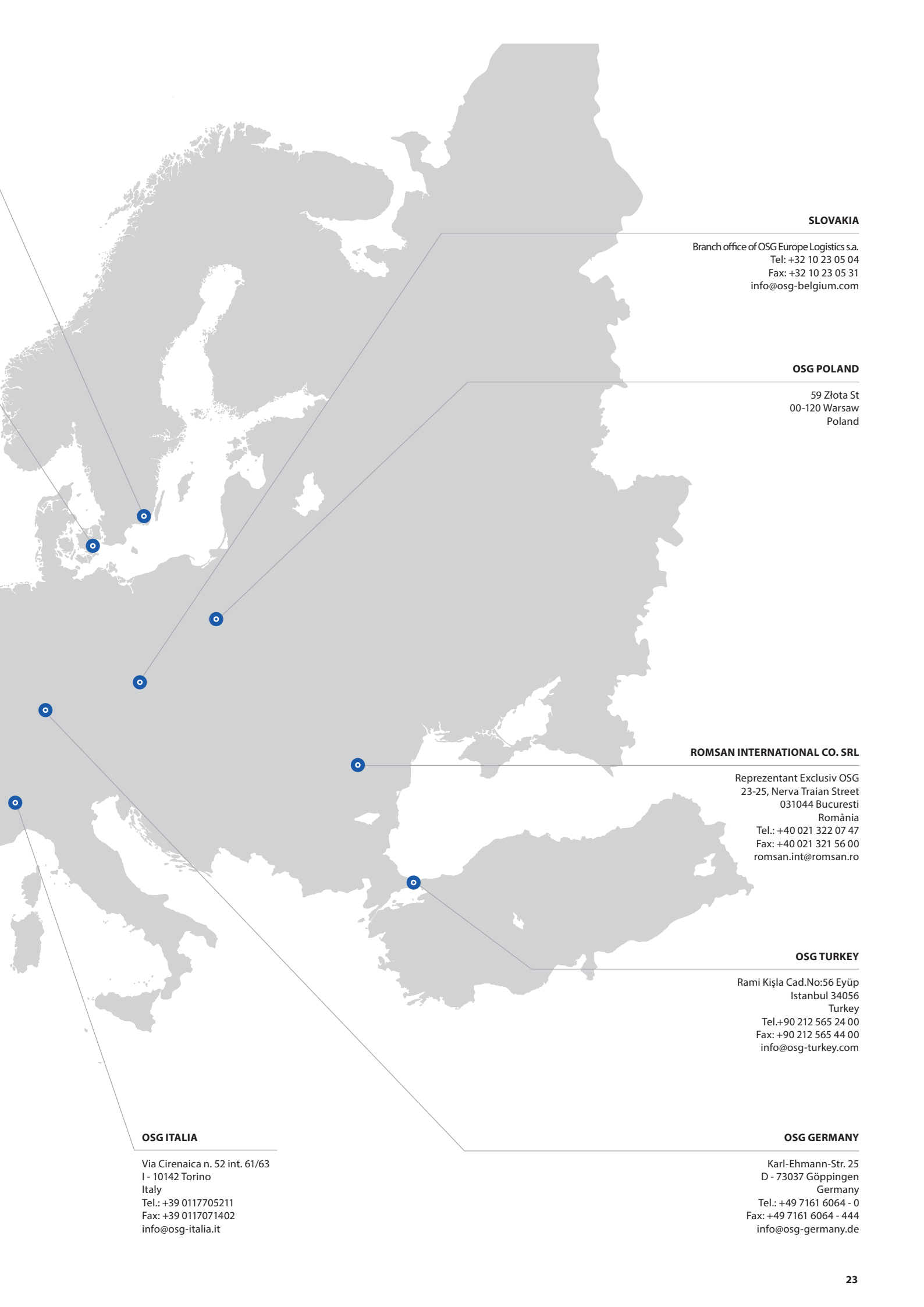
OSG COMAHER

Bekolarra 4
E - 01010 Vitoria-Gasteiz
Spain
Tel.: +34 945 242 400
Fax: +34 945 228 883
osg-comaher@osg-comaher.com

OSG FRANCE

Parc Icade, Paris Nord 2
Immeuble "Le Rimbaud"
22 Avenue des Nations
BP66191 - 93420 Villepinte
France
Tel.: +33 1 49 90 10 10
Fax: +33 1 49 90 10 15
sales@osg-france.com





SLOVAKIA

Branch office of OSG Europe Logistics s.a.
Tel: +32 10 23 05 04
Fax: +32 10 23 05 31
info@osg-belgium.com

OSG POLAND

59 Zlota St
00-120 Warsaw
Poland

ROMSAN INTERNATIONAL CO. SRL

Reprezentant Exclusiv OSG
23-25, Nerva Traian Street
031044 Bucuresti
România
Tel.: +40 021 322 07 47
Fax: +40 021 321 56 00
romsan.int@romsan.ro

OSG TURKEY

Rami Kışla Cad.No:56 Eyüp
Istanbul 34056
Turkey
Tel.+90 212 565 24 00
Fax: +90 212 565 44 00
info@osg-turkey.com

OSG ITALIA

Via Cirenaica n. 52 int. 61/63
I - 10142 Torino
Italy
Tel.: +39 0117705211
Fax: +39 0117071402
info@osg-italia.it

OSG GERMANY

Karl-Ehmann-Str. 25
D - 73037 Göppingen
Germany
Tel.: +49 7161 6064 - 0
Fax: +49 7161 6064 - 444
info@osg-germany.de



shaping your dreams

OSG EUROPE LOGISTICS

Avenue Lavoisier 1
B-1300 Z.I. Wavre - Nord
Belgium
Tel.: +32 10 23 05 07
Fax: +32 10 23 05 51
info@osgeurope.com

OSG BELUX

Avenue Lavoisier 1
B-1300 Z.I. Wavre - Nord
Belgium
Tel.: +32 10 23 05 11
Fax: +32 10 23 05 31
info@osg-belgium.com

OSG FRANCE

Parc Icade, Paris Nord 2
Immeuble "Le Rimbaud"
22 Avenue des Nations
CS66191 - 93420 Villepinte
France
Tel.: +33 1 49 90 10 10
Fax: +33 1 49 90 10 15
sales@osg-france.com

OSG NETHERLANDS

Bedrijfsweg 5 - 3481 MG Harmelen
Postbus 50 - 3480 DB Harmelen
The Netherlands
Tel.: +31 348 44 2764
Fax: +31 348 44 2144
info@osg-nl.com

OSG UK

Shelton house, 5 Bentalls
Pipps Hill Ind Est, Basildon Essex SS14 3BY
United Kingdom
Tel.: +44 845 305 1066
Fax: +44 845 305 1067
sales@osg-uk.com

SLOVAKIA

Branch office of OSG Europe Logistics s.a.
Tel (SK) +421 2 4329 1295
Tel (BE) +32 10 23 05 07
Fax (BE) +32 10 23 05 51
sales-osgsvk@osgeurope.com

OSG POLAND Sp. z.o.o.

ul. Spółdzielcza 57
05-074 Halinów
Poland
Tel: +22 760 82 71
Fax: +22 760 82 71
osg@osg-poland.com

OSG GERMANY

Karl-Ehmann-Str. 25
D - 73037 Göppingen
Germany
Tel.: +49 7161 6064 - 0
Fax: +49 7161 6064 - 444
info@osg-germany.de

OSG SCANDINAVIA

(For Scandinavian countries)
Langebjergvaenget 16
4000 Roskilde
Denmark
Tel.: +45 46 75 65 55
Fax: +45 46 75 67 00
osg@osg-scandinavia.com

SWEDEN

Branch office of OSG SCANDINAVIA
Abrahams Gränd 8
295 35 Bromölla
Sweden
Tel: +46 40 41 22 55
Fax: +46 40 41 32 55
osg@osg-scandinavia.com

OSG COMAHER

Bekolarra 4
E - 01010 Vitoria-Gasteiz
Spain
Tel.: +34 945 242 400
Fax: +34 945 228 883
osg-comaher@osg-comaher.com

OSG ITALIA

Via Cirenaiica n. 52 int. 61/63
I - 10142 Torino
Italy
Tel.: +39 0117705211
Fax: +39 0117071402
info@osg-italia.it

OSG TURKEY

Rami Kışla Cad.No:56 Eyüp
Istanbul 34056
Turkey
Tel.+90 212 565 24 00
Fax: +90 212 565 44 00
info@osg-turkey.com

ROMSAN INTERNATIONAL CO. SRL

Reprezentant Exclusiv OSG
23-25, Nerva Traian Street
031044 Bucuresti
România
Tel.: +40 021 322 07 47
Fax: +40 021 321 56 00
romsan.int@romsan.ro

AUSTRIA

Branch office of OSG GERMANY
Messestraße 11
A-6850 Dornbirn
Tel.: +49 7161 6064-0
Fax: +49 7161 6064-444
info@osg-germany.de

OSG EUROPE LOGISTICS S.A.

All rights reserved. © OSG Europe 2016.

The contents of this catalogue are provided to you for viewing only. They are not intended for reproduction either in part or in whole in this or other medium. They cannot be copied, used to create derivation work or used for any reason, by means without the express, written permission of the copyright owner. If prices are stated, they are netto unit-prices and any eventual tax(es) have to be added. The company is not responsible for any printing error in technical, price and/or any other data.

Tool specifications subject to change without notice.

www.osgeurope.com

