PCD&PCBN Brazed inserts





	APHT-PCD	APHT-W	APHT-CBN	SEHT-PCD	SEHT-CBN
Page	B182	B182	B182	B198	B198

Inserts for face milling



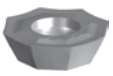
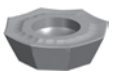





	SEET-CF	SEET-CM	SEET-CR	SEET-DF	SEET-DM	SEET-DR	SEET-EF	SEET-EM
Page	B194	B194	B194	B194	B194	B194	B194	B194





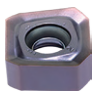





	SEET-LH	SEET-W	SEHT-AL	SEK(E)N	SEKR	OFKT-DF	OFKT-DM	OFKT-LH
Page	B194	B194	B198	B195	B195	B187	B187	B187







	OFKR-DF	OFKR-DM	ONHU-PF	ONHU-PM	ONHU-W	ONHU-GM	SNEG-GM	SNEG-HGR
Page	B188	B188	B188	B188	B188	B189	B197	B197

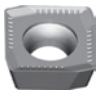







	SNEG-W	HNEX-DF	HNEX-DM	HNEX-DR	PNEG-CF/CM/CR	PNEG-PF/PM/PR	LNKT-ZR	LNKT-ZR
Page	B197	B186	B186	B186	B189	B190	B186	B186





	LNKT-ZR	SPKW	SPKT	SP□N	SPKR-GM	SPEX	SPMR	SP□N
Page	B186	B201	B199	B200	B201	B202	B202	B203

	TPKN	TPGN	TPUN	TPMR	SEET□PER-APF	SEET□PER-APM	SEET□PER-APR	WNHU-GM
Page	B204	B204	B205	B205	B196	B196	B196	B206

Inserts for face milling


RCKT-DM


RCKT-DR


RCKT-ER


RDKW


RCMW-PCBN

Page	B191	B191	B191	B192	B191

Inserts for square shoulder milling


APHT-AL


APKT-APF


APKT-APM


APKT-ALH


APMT□PDR


APMT□PDER


ANGX□PNR-GM


ANGX□PNR-LH

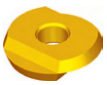
Page	B182	B183	B183	B183	B184	B184	B185	B185

Inserts for profile milling

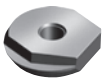

ZDET

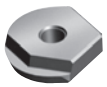

ZPNT


SDMT/SPMT


ROHX


XPHT-GM


ZOHX-GF


ZOHX-GM

Page	B208	B208	B193/B199	B192	B207	B209	B209

Inserts for side and face milling


XSEQ


MPHT

Page	B207	B187

Inserts for milling with high feed rate milling


SDMT-DM

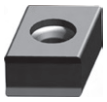

SDMT-PM


WPGT


WPGT-PM

Page	B193	B194	B206	B206

Inserts for boring millers


CNE-A


CNE-B

Page	B185	B185

Inserts for T-slot milling


MPHT

Page	B187

Inserts for helical end mills


APKT-PM/KM


SPMT-PM/KM

Page	B184	B199

Inserts for chamfer milling

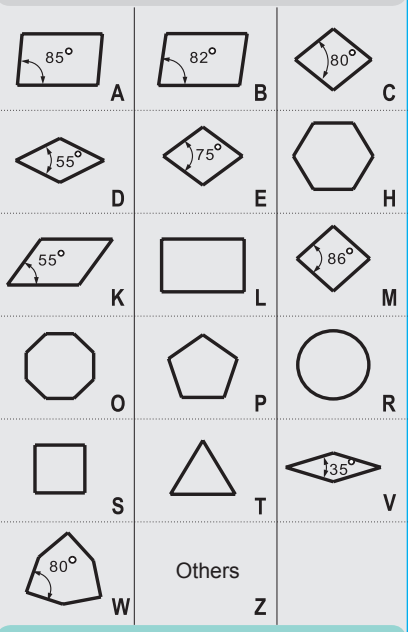

SPMT

Page	B199

Indexable milling inserts code key

Insert shape

Insert Shape / Code



Chipbreaker and clamping system

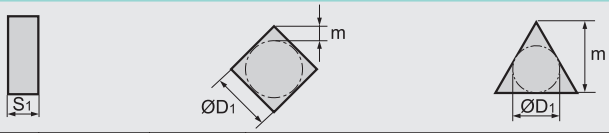
Metric							
Code	With/Without hole	With/Without chipbreaker	Section plane of Insert	Code	With/Without hole	With/Without chipbreaker	Section plane of Insert
B	With	Without	>65°	N	Without	Without	
H	With	Single-side	>65°	R	Without	Single-side	
C	With	Without	>65°	F	Without	Double-side	
J	With	Double-side	>65°	A	With	Without	
W	With	Without	≤65°	M	With	Single-side	
T	With	Single-side	≤65°	G	With	Double-side	
Q	With	Without	≤65°	X	---	---	Special
U	With	Double-side	≤65°				

S P K N

Clearance angle of main cutting edge

Code	Clearance angle	Code	Clearance angle
A	3°	B	5°
C	7°	D	15°
E	20°	F	25°
G	30°	N	0°
P	11°	O	Other clearance angle

Tolerance



Code	Nose height M Tolerance(mm)	Inscribed circle ØD1 Tolerance(mm)	Thickness S Tolerance(mm)
A	±0.005	±0.025	±0.025
F	±0.005	±0.013	±0.025
C	±0.013	±0.025	±0.025
H	±0.013	±0.013	±0.025
E	±0.025	±0.025	±0.025
G	±0.025	±0.025	±0.13
J	±0.005	±0.05-±0.13	±0.025
K	±0.013	±0.05-±0.13	±0.025
L	±0.025	±0.05-±0.13	±0.025
M	±0.08-±0.18	±0.05-±0.13	±0.13
N	±0.08-±0.18	±0.05-±0.13	±0.025
U	±0.13-±0.38	±0.08-±0.25	±0.13

(Reference) details of M-class tolerance (identified by shape and size)

● Nose height tolerance(mm)

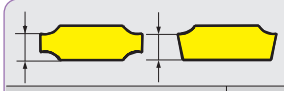
Inscribed circle	Regular triangle	Square	Diamond with 80°	Diamond with 55°	Diamond with 35°	Round
6.35	±0.08	±0.08	±0.08	±0.11	±0.16	---
9.525	±0.08	±0.08	±0.08	±0.11	±0.16	---
12.7	±0.13	±0.13	±0.13	±0.15	---	---
15.875	±0.15	±0.15	±0.15	±0.18	---	---
19.05	±0.15	±0.15	±0.15	±0.18	---	---
25.4	---	±0.18	---	---	---	---

● Tolerance of Inscribed Circle ØD1(mm)

Inscribed circle	Regular triangle	Square	Diamond with 80°	Diamond with 55°	Diamond with 35°	Round
6.35	±0.05	±0.05	±0.05	±0.05	±0.05	---
9.525	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
12.7	±0.08	±0.08	±0.08	±0.08	---	±0.08
15.875	±0.10	±0.10	±0.10	±0.10	---	±0.10
19.05	±0.10	±0.10	±0.10	±0.10	---	±0.10
25.4	---	±0.13	---	---	---	±0.13

Diameter of IC	Insert shape						
	C	D	R	S	T	V	W
3.97					06		
5.0			05				
5.56					09		
6.0			06				
6.35	06	07			11	11	
8.0			08				
9.525	09	11	09	09	16	16	06
10.0			10				
12.0			12				
12.7	12	15	12	12	22	22	08
15.875	16		15	15	27		
16.0		19	16				
19.05	19		19	19	33		
20.0			20				
25.0	25	25	25				
25.4			25	25			
31.75			31				
32			32				

Length of cutting edge



Thickness is defined as the height from the bottom of insert to the highest part of cutting edge

Code	Insert thickness(mm)
00	0.79
T0	0.99
01	1.59
T1	1.98
02	2.38
T2	2.58
03	3.18
T3	3.97
04	4.76
T4	4.96
05	5.96
T5	5.95
06	6.35
T6	6.75
07	7.94
09	9.52
T9	9.72
11	11.11
12	12.70

Insert thickness

12 04 ED T21 R -DM

Wiper

Kr		αn	
A	45°	A	3°
D	60°	B	5°
E	75°	C	7°
F	85°	D	15°
P	90°	E	20°
Z	Others	F	25°
		G	30°
		N	0°
		P	11°
		Z	Others

Chamfer (mm)

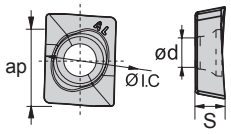
F	0-5°	0-0.10	K
E	1-10°	1-0.15	P
	2-15°	2-0.20	
	3-20°	3-0.25	
T	4-25°	4-0.30	W
	5-30°	5-0.35	
		6-0.40	
S		7-0.45	No mark

Chipbreaker code

Cutting direction

R	Right hand
L	Left hand
N	Neutral

APㅁㅁ



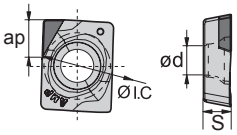
Good working condition | Normal working condition | Bad working condition

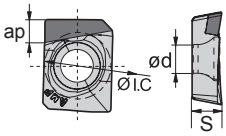
Workpiece material					
H	Super hard material			😐	
K	Cast iron		😊		☹
N	Non ferrous metal	😐			😐

Insert shape	Type	Basic dimensions(mm)				PCD	PCBN		Cemented carbide
		ØI.C	S	ød	ap_{max}	YCD011	YCB011	YCB012	YD201
	**APHT12T304PPFR-AL**	12.7	3.97	4.4	12				★

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

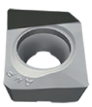
APㅁㅁ





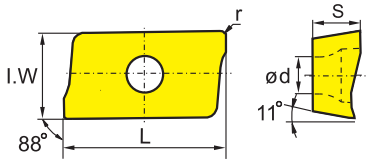
Good working condition | Normal working condition | Bad working condition

Workpiece material					
H	Super hard material			😐	
K	Cast iron		😊		☹
N	Non ferrous metal	😐			😐

Insert shape	Type	Basic dimensions(mm)				PCD	PCBN		Cemented carbide
		ØI.C	S	ød	ap_{max}	YCD011	YCB011	YCB012	YD201
	**APHT12T304PPFR-PCD**	12.7	3.97	4.4	3	★			
	**APHT12T304PPFR-CBN**	12.7	3.97	4.4	2		○	○	
	**APHT12T304-W**	12.7	3.97	4.4	1	★	★	★	

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

APKT□□



Good working condition　Normal working condition　Bad working condition

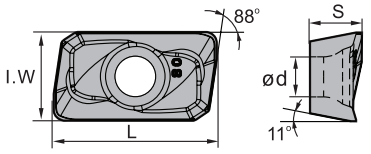
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	I.W	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	APKT11T304-APF	12.24	6.64	3.6	2.8	0.4											★									
	APKT11T308-APF	12.24	6.64	3.6	2.8	0.8											★									
	APKT160408-APF	17.877	9.33	5.76	4.4	0.8											★									
	APKT11T304-APM	12.24	6.64	3.6	2.8	0.4											★									
	APKT11T308-APM	12.24	6.64	3.6	2.8	0.8											★									
	APKT11T312-APM	12.24	6.64	3.6	2.8	1.2											★									
	APKT11T316-APM	12.24	6.64	3.6	2.8	1.6											★									
	APKT11T320-APM	12.24	6.64	3.6	2.8	2											★									
	APKT160408-APM	17.877	9.33	5.76	4.4	0.8											★									
	APKT160416-APM	17.877	9.33	5.76	4.4	1.6											★									
	APKT160420-APM	17.877	9.33	5.76	4.4	2											★									
	APKT160424-APM	17.877	9.33	5.76	4.4	2.4											★									
	APKT160430-APM	17.877	9.33	5.76	4.4	3											★									
	APKT11T304-ALH	12.24	6.64	3.6	2.8	0.4																			★	★
	APKT11T308-ALH	12.24	6.64	3.6	2.8	0.8																			★	○
	APKT160408-ALH	17.877	9.33	5.76	4.4	0.8																			★	★

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

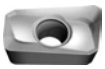
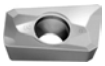
APㅁㅁ



Good working condition Normal working condition Bad working condition

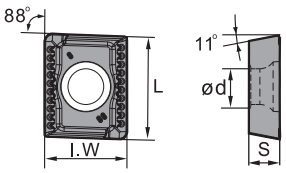
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	I.W	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YBG205	YB9320	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	APMT1135PDR	11.25	6.2	3.5	2.8	0.8			○					○	●	★		○								
	APMT160408PDER	17.25	9.25	4.76	4.4	0.8									●	★		○								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

APㅁㅁ



Good working condition Normal working condition Bad working condition

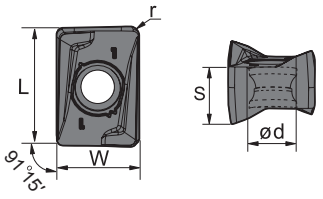
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	I.W	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	APKT150412-PM	16.33	12.7	4.76	5.4	1.2				★								●								
	APKT150412-KM	16.33	12.7	4.76	5.4	1.2												●	○							

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

ANㅁㅁ



Good working condition Normal working condition Bad working condition

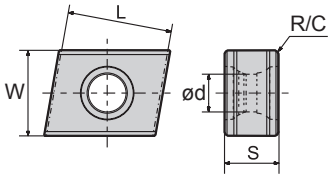
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	W	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	ANGX110504PNR-GM	11.85	8.4	5.7	3.5	0.4				★		★				★	★									
	ANGX110508PNR-GM	11.85	8.4	5.7	3.5	0.8				★		★				★	★									
	ANGX110520PNR-GM	11.85	8.4	5.7	3.5	2.0				★		★	★			★										
	ANGX150608PNR-GM	15.43	11.0	7.3	4.4	0.8				★		★				★	★									
	ANGX150616PNR-GM	15.43	11.0	7.3	4.4	1.6				★		★				★	★									
	ANGX150620PNR-GM	15.43	11.0	7.3	4.4	2.0						★	★			★										
	ANGX110502PNR-LH	11.85	8.4	5.7	3.5	0.2																			★	
	ANGX110504PNR-LH	11.85	8.4	5.7	3.5	0.4																			★	
	ANGX150608PNR-LH	15.43	11.0	7.3	4.4	0.8																			★	

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

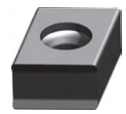
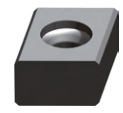
CN



Good working condition Normal working condition Bad working condition

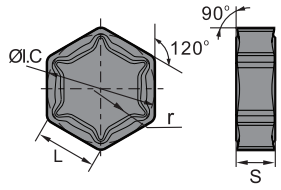
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	W	S	R/C	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	CNE121006A	12.8	10.0	6.35	0.4	4.4				●		○														
	CNE121006B	12.0	10.0	6.35	0.6	4.4				●		○														

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

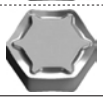
HN□□



Good working condition　Normal working condition　Bad working condition

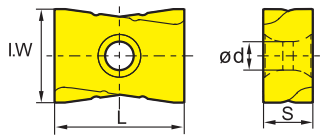
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**HNEX090512-DF**	9.16	15.875	5.56	1.2						★														
	**HNEX090512-DM**	9.16	15.875	5.56	1.2						★														
	**HNEX090512-DR**	9.16	15.875	5.56	1.2						○	★													

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

LN□□



Good working condition　Normal working condition　Bad working condition

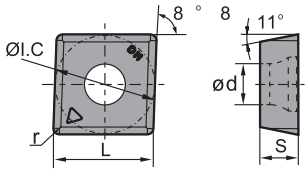
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	I.W	S	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**LNKT1506EN-ZR**	15.875	14	6.35	4.6					○	○						★								
	LNKT2007DN-ZR	20	17	7.94	4.6					○	○						★								
	LNKT2510-ZR	25	18	9.525	5.5					○		○					★								

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

MP□□



Good working condition Normal working condition Bad working condition

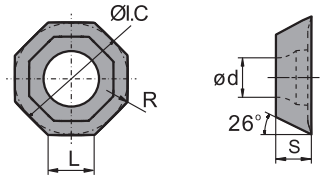
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating						Cermet		Cemented carbide			
		ØI.C	L	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	MPHT060304-DM	6.35	6.35	3.18	2.8	0.4												★								
	MPHT080305-DM	8.3	8.3	3.18	3.4	0.5												★								
	MPHT120408-DM	12.7	12.7	4.76	5.56	0.8												★								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

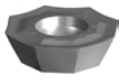
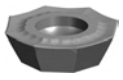
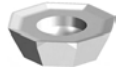
OF□□



Good working condition Normal working condition Bad working condition

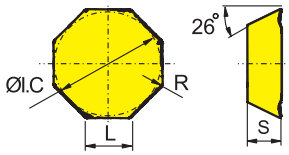
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating						Cermet		Cemented carbide			
		L	ØI.C	S	ød	R	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	OFKT05T3-DF	5.26	12.7	3.97	4.4	0.5								○											
	OFKT05T3-DM	5.26	12.7	3.97	4.4	0.5			○					★				★								
	OFKT05T3-LH	5.26	12.7	3.97	4.4	0.5																			○	

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

OF□□



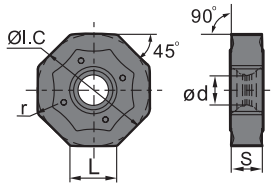
Good working condition 😊 Normal working condition 😐 Bad working condition 😞

Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating						Cermet		Cemented carbide			
		L	ØI.C	S	R	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	OFKR0704-DF	7.45	17.94	4.76	0.8			●	○					○											
	OFKR0704-DM	7.45	17.94	4.76	0.8	●		●	○	●		○	○	★			★								

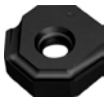
★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

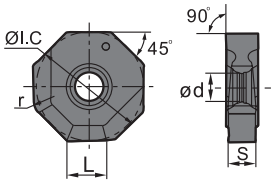
ON□□



Good working condition 😊 Normal working condition 😐 Bad working condition 😞

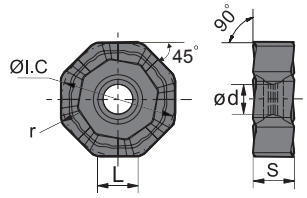
Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	ONHU060408-PF	6.58	15.875	4.76	4.4	0.83		★				★			★											
	ONHU08T508-PF	8.37	20.2	5.77	5.3	0.83		★				★			★											
	ONHU060408-PM	6.58	15.875	4.76	4.4	0.83		★		★		★														
	ONHU08T508-PM	8.37	20.2	5.79	5.3	0.83		★		★		★														
	ONHU08T508-W	6.9	20.5	6.00	5.3	0.80		★				★		★												



★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

ON□□



Good working condition Normal working condition Bad working condition

Workpiece material

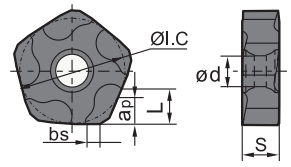
- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**ONHU08T624R-GM**	6.38	20.2	6.3	5.3	2.4				★		★				★										

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

Note: FMA12 is compatible with our ONHU08T508-PF/ONHU08T508-PM inserts.

PN□□



Good working condition Normal working condition Bad working condition

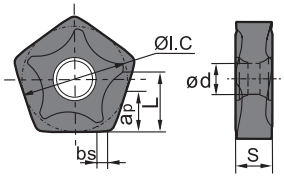
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

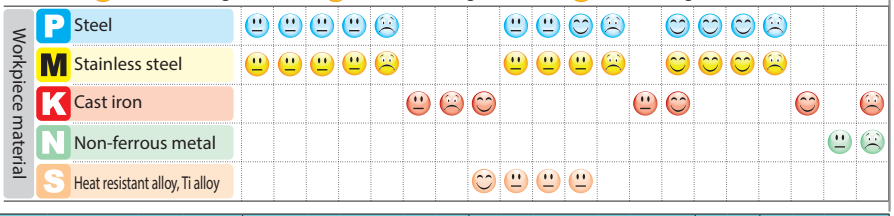
Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	bs	a_{pmax}	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**PNEG110512R-CF**	5.4	15.875	5.56	4.64	1.6	5						●														
	PNEG110512L-CF	5.4	15.875	5.56	4.64	1.6	5						●														
	**PNEG110512R-CM**	5.4	15.875	5.56	4.64	1.6	5						●														
	PNEG110512L-CM	5.4	15.875	5.56	4.64	1.6	5						●														
	**PNEG110512R-CR**	5.4	15.875	5.56	4.64	1.6	5						●														
	PNEG110512L-CR	5.4	15.875	5.56	4.64	1.6	5						●														

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

PN□□

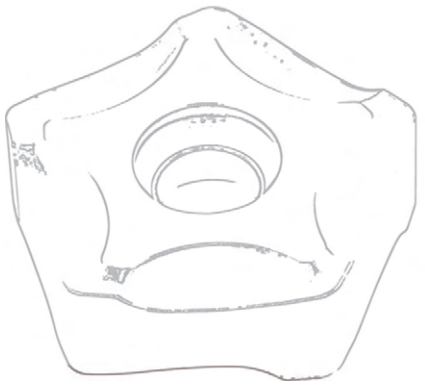


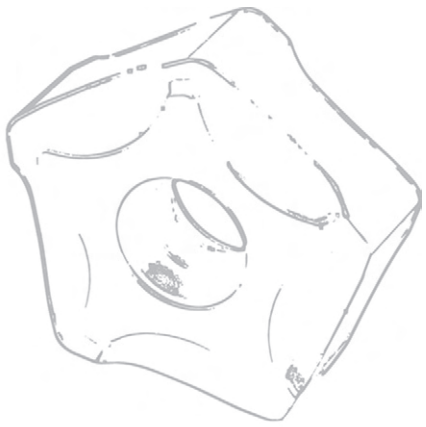
Good working condition Normal working condition Bad working condition



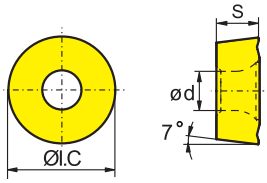
Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	bs	a_{pmax}	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**PNEG110512R-PF**	7.5	15.875	5.56	4.64	1.4	7.5		★		●																
	PNEG110512L-PF	7.5	15.875	5.56	4.64	1.4	7.5		★		●																
	**PNEG110512R-PM**	7.5	15.875	5.56	4.64	1.4	7.5		★		●																
	PNEG110512L-PM	7.5	15.875	5.56	4.64	1.4	7.5		★		●																
	**PNEG110512R-PR**	7.5	15.875	5.56	4.64	1.4	7.5		★		●																
	PNEG110512L-PR	7.5	15.875	5.56	4.64	1.4	7.5		★		●																

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order





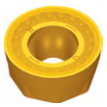
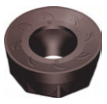
RC□□



Good working condition Normal working condition Bad working condition

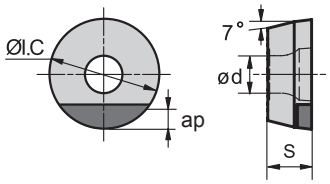
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)			CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	S	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	RCKT10T3MO-DM	10.0	3.97	4.4	●								●	★										
	RCKT1204MO-DM	12.0	4.76	4.0	●		●		●	○			●	★		●								
	RCKT1606MO-DM	16.0	6.35	5.56	●											●								
	RCKT1204MO-DR	12.0	4.76	4.0	○		○		○				●	★										
	RCKT1606MO-DR	16.0	6.35	5.56	●				●		○		●	★										
	RCKT2006MO-DR	20.0	6.35	6.55	●				●		○		○	★		●								
	RCKT1204MO-ER	12.0	4.76	4.0				★																
	RCKT1606MO-ER	16.0	6.35	5.56				★																
	RCKT2006MO-ER	20.0	6.35	6.55				★																

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

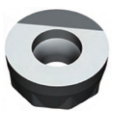
RC□□



Good working condition Normal working condition Bad working condition

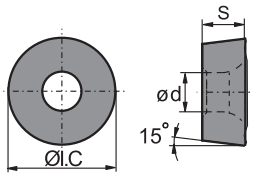
Workpiece material

H	Super hard material
K	Cast iron
N	Non-ferrous metal

Insert shape	Type	Basic dimensions(mm)				PCBN		Cemented carbide		
		ØI.C	S	ød	$a_p$max	YCB011	YCB012	YD051	YD101	YD201
	RCMW1204MO-PCBN	12.0	4.76	4.1	2.7	○	●			

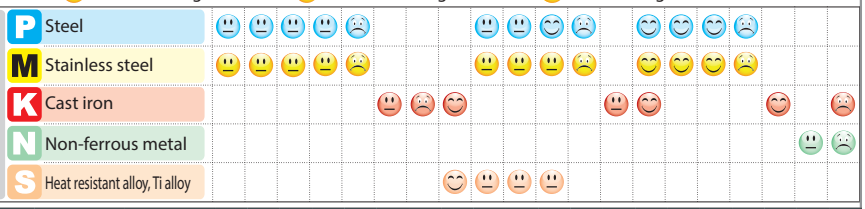
★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

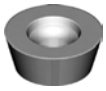
RD□□



Good working condition Normal working condition Bad working condition

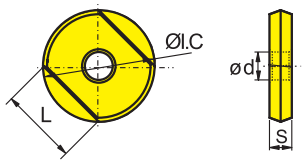
Workpiece material



Insert shape	Type	Basic dimensions(mm)			CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	S	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	RDKW0702MO	7	2.38	2.8			○		●				●											
	RDKW0803MO	8	3.18	3.4	○				○				●	★		○								
	RDKW10T3MO	10	3.97	4.4	○				●				●	★										
	RDKW1204MO	12	4.76	4.4	●		●		●				●	★		●								
	RDKW1605MO	16	5.56	5.5	○				○				○	★		○								
	RDKW2006MO	20	6.35	6.5	○				○					○										

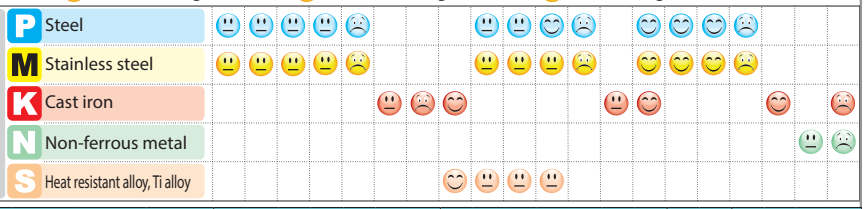
★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

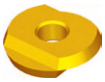
RO□□



Good working condition Normal working condition Bad working condition

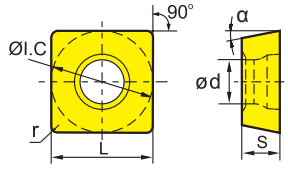
Workpiece material



Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	L	S	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	ROHX1203	12	8.5	3	4														○						
	ROHX1604	16	11.3	4	5														○						
	ROHX2005	20	14.1	5	5														○						

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SD□□



Good working condition Normal working condition Bad working condition

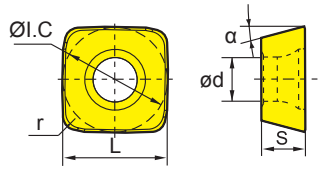
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		r	L	ØI.C	S	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SDMT090308**	0.8	9.525	9.525	3.18	4.4	15°			○									○								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SD□□



Good working condition Normal working condition Bad working condition

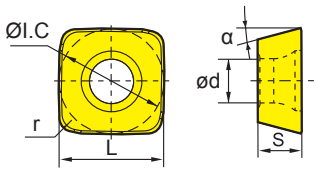
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	L	r	S	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SDMT06T208-DM**	6.35	6.35	0.8	2.58	2.5	15°		★			★							○								
	SDMT09T312-DM	9.525	9.525	1.2	3.97	4.0	15°		★			★							○								
	SDMT120412-DM	12.7	12.7	2.0	4.76	4.4	15°		★			★							○								
	SDMT150520-DM	15.875	15.875	2.0	5.56	5.5	15°		★			★							○								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SD□□



Good working condition Normal working condition Bad working condition

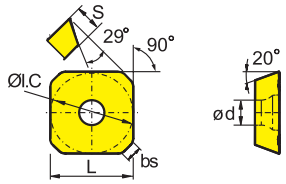
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	L	r	S	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SDMT06T208-PM	6.35	6.35	0.8	2.58	2.5	15°		★		○						●										
	SDMT09T312-PM	9.525	9.525	1.2	3.97	4.0	15°		★		●						●										
	SDMT120412-PM	12.7	12.7	2.0	4.76	4.4	15°		★		●						●										
	SDMT150520-PM	15.875	15.875	2.0	5.56	5.5	15°		★		●						●										

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SE□□

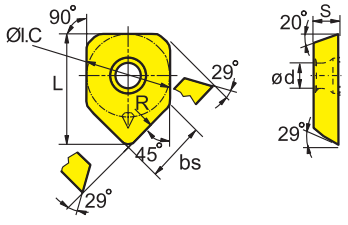


Good working condition Normal working condition Bad working condition

Workpiece material

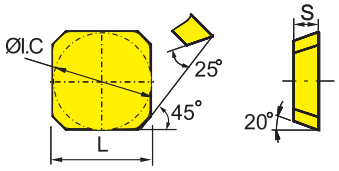
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	bs	R	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SEET12T3-DF	13.40	13.40	3.97	4.1	2.55		●	★	●							★		○								
	SEET12T3-CF	13.40	13.40	3.97	4.1	2.55							○		★		★		○								
	SEET12T3-EF	13.40	13.40	3.97	4.1	2.55											★		○								
	SEET12T3-DM	13.40	13.40	3.97	4.1	2.55		●	★	●		○					★		★								
	SEET18T6-DM	18.00	18.00	6.10	5.5	1.50	1.0										★										
	SEET12T3-CM	13.40	13.40	3.97	4.1	2.55							★				★		○								
	SEET12T3-EM	13.40	13.40	3.97	4.1	2.55				●		●					★		★								
	SEET12T3-DR	13.40	13.40	3.97	4.1	2.55		●	★			●					★		★								
	SEET12T3-CR	13.40	13.40	3.97	4.1	2.55		●					★				★		★								
	SEET12T3-LH	13.40	13.40	3.97	4.1	2.55																				○	★
	SEET12T3-W	17.82	13.40	3.97	4.1	9.46	500		★	●			★				★					★					



★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SE□□



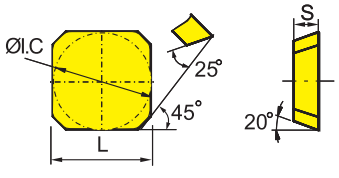
Good working condition　Normal working condition　Bad working condition

Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)			CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SEEN1203AFTN**	12.7	12.7	3.18									○						●					
	SEKN1203AFFN	12.7	12.7	3.18								★												
	SEKN1203AFN	12.7	12.7	3.18	●								○								●			○
	SEKN1203AFTN	12.7	12.7	3.18	●		●		●				★			○					●			●
	SEKN1504AFN	15.875	15.875	4.76	●		●																	●
	SEKN1504AFTN	15.875	15.875	4.76	○		●		●							○					●			●

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

SE□□



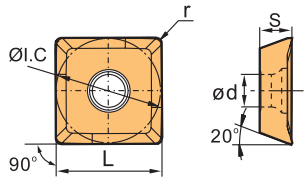
Good working condition　Normal working condition　Bad working condition

Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)			CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SEKR1203AFN**	12.7	12.7	3.18	●								○			○								
	SEKR1504AFN	15.875	15.875	4.76							★					★					●			

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

SE□□



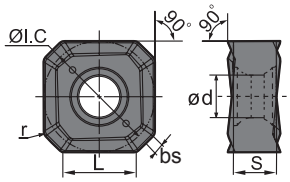
Good working condition Normal working condition Bad working condition

Workpiece material		
P	Steel	😐 😐 😐 😐 ☹ 😐 😐 😊 ☹ 😊 😊 😊 ☹
M	Stainless steel	😐 😐 😐 😐 ☹ 😐 😐 😐 ☹ 😊 😊 😊 ☹
K	Cast iron	😐 ☹ 😊 😐 😊 😐
N	Non-ferrous metal	😐 ☹
S	Heat resistant alloy, Ti alloy	😊 😐 😐 😐

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SEET09T308PER-APF**	9.525	9.525	4.01	3.3	0.8					●	★			●		★									
	SEET120308PER-APF	13.308	13.308	4.04	4.1	0.8					●	★			●		★									
	**SEET09T308PER-APM**	9.525	9.525	4.01	3.3	0.8					●	★			●		★									
	SEET120308PER-APM	13.308	13.308	4.04	4.1	0.8					●	★			●		★									
	**SEET09T308PER-APR**	9.525	9.525	4.01	3.3	0.8					●	★			●		★									
	SEET120308PER-APR	13.308	13.308	4.04	4.1	0.8					●	★			●		★									

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

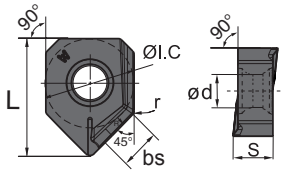
SN□□



Good working condition Normal working condition Bad working condition

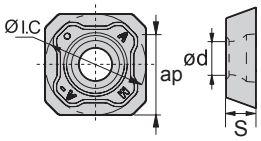
Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide				
		L	ØI.C	S	bs	ød	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SNEG1205ANR-GM	7.6	12.0	4.76	1.05	4.6	0.8		★		★		★				★	★									
	SNEG1506ANR-GM	9.4	15.0	5.54	1.30	5.5	0.9		★		★		★				★	★									
	SNEG1205ANR-HGR	7.6	12.0	4.76	1.05	4.6	0.8		★		★		★	○			★	★									
	SNEG1506ANR-HGR	9.4	15.0	5.54	1.30	5.5	0.9		★		★		★	○			★	★									
	SNEG1907ANR-HGR	12.1	19.0	7.0	1.67	7.2	1.0		★		★		★	○			★	★									
	SNEG1205ANR-W	15.9	12.0	4.76	4.07	4.6	0.6										●										
	SNEG1506ANR-W	19.9	15.0	5.54	4.97	5.5	0.9										●										



★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SE□□



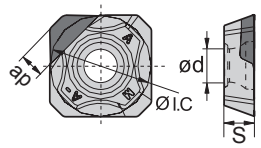
Good working condition | Normal working condition | Bad working condition

Workpiece material					
H	Super hard material			😐	
K	Cast iron		😊		☹
N	Non ferrous metal	😐			😐

Insert shape	Type	Basic dimensions(mm)				PCD	PCBN		Cemented carbide
		ØI.C	S	ød	ap_{max}	YCD011	YCB011	YCB012	YD201
	**SEHT12T3AFFN-AL**	12.7	3.97	4.4	6.6				★

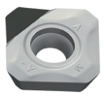
★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SE□□



Good working condition | Normal working condition | Bad working condition

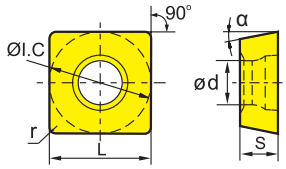
Workpiece material					
H	Super hard material			😐	
K	Cast iron		😊		☹
N	Non ferrous metal	😐			😐

Insert shape	Type	Basic dimensions(mm)				PCD	PCBN		Cemented carbide
		ØI.C	S	ød	ap_{max}	YCD011	YCB011	YCB012	YD201
	**SEHT12T308AFFN-PCD**	12.7	3.97	4.4	2.5	★			
	SEHT12T308AFFN-CBN	12.7	3.97	4.4	2		○	○	

CBN insert edge can be treated as per machining requirements

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

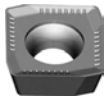
SP□□



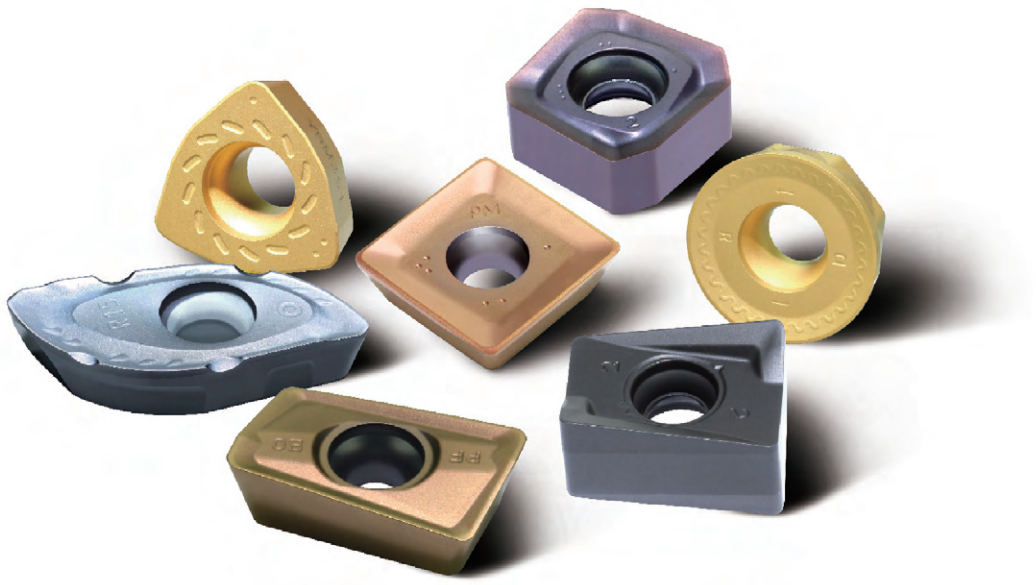
Good working condition Normal working condition Bad working condition

Workpiece material

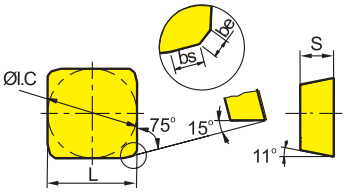
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide				
		r	L	ØI.C	S	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SPMT060304**	0.4	6.35	6.35	3.18	2.8	11°			○									○								
	SPMT120408	0.8	12.7	12.70	4.76	5.5	11°	●		●		●							★					○			
	**SPMT120408-PM**	0.8	12.7	12.70	4.76	5.5	11°				★								●								
	SPMT120408-KM	0.8	12.7	12.70	4.76	5.5	11°												●	○							
	**SPKT1204EDR**	--	12.7	12.7	4.76	5.56	11°									★											

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order



SP□N



Good working condition Normal working condition Bad working condition

Workpiece material

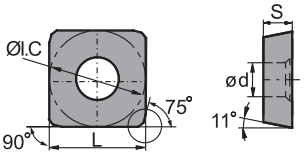
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	be	bs	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SPKN1203EDER	12.7	12.7	3.18	1	1.4									○											
	SPKN1203EDEL	12.7	12.7	3.18	1	1.4									○											
	SPKN1203EDFR	12.7	12.7	3.18	1	1.4								★	○											●
	SPKN1203EDFL	12.7	12.7	3.18	1	1.4								○	○											○
	SPKN1203EDSKR	12.7	12.7	3.18	1	1.4												○					○			
	SPKN1203EDSKL	12.7	12.7	3.18	1	1.4												○					○			
	SPKN1203EDTKR	12.7	12.7	3.18	1	1.4	●				●				○			★					●			○
	SPKN1203EDTKL	12.7	12.7	3.18	1	1.4									○			○					○			○
	SPKN1203EDS31R	12.7	12.7	3.18	1	1.4												○					○			
	SPKN1203EDS31L	12.7	12.7	3.18	1	1.4												○					○			
	SPKN1203EDT31R	12.7	12.7	3.18	1	1.4	●				●				○			★					●			○
	SPKN1203EDT31L	12.7	12.7	3.18	1	1.4									○			○					○			○
	SPKN1504EDER	15.875	15.875	4.76	1	1.4									○											
	SPKN1504EDEL	15.875	15.875	4.76	1	1.4									○											
	SPKN1504EDFR	15.875	15.875	4.76	1	1.4								○	○											○
	SPKN1504EDFL	15.875	15.875	4.76	1	1.4								○	○											○
	SPKN1504EDSKR	15.875	15.875	4.76	1	1.4												○					○			
	SPKN1504EDSKL	15.875	15.875	4.76	1	1.4												○					○			
	SPKN1504EDTKR	15.875	15.875	4.76	1	1.4	●								★			○					●			●
	SPKN1504EDTKL	15.875	15.875	4.76	1	1.4									○			○					○			●
	SPKN1504EDS32R	15.875	15.875	4.76	1	1.4												○					○			
	SPKN1504EDS32L	15.875	15.875	4.76	1	1.4												○					○			
	SPKN1504EDT32R	15.875	15.875	4.76	1	1.4	●								★			○					●			●
	SPKN1504EDT32L	15.875	15.875	4.76	1	1.4									○			○					○			●

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

Ordering guide: **SPKN1203EDT3 1 R** chamfering angle 20°, chamfering width 0.15mm. For other edge shapes, see inserts code key standard.

SP□W



Good working condition Normal working condition Bad working condition

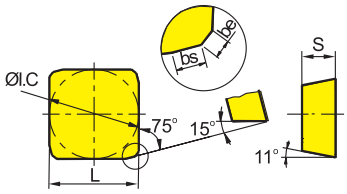
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		r	L	ØI.C	S	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SPKW1204EDFR	---	12.7	12.7	4.76	5.56	11°									○											
	SPKW1204EDSR	---	12.7	12.7	4.76	5.56	11°									○											

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SP□R



Good working condition Normal working condition Bad working condition

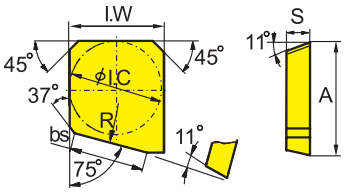
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	be	bs	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SPKR1203EDR-GM	12.7	12.7	3.18	1	1.4			●						★			★					●			●
	SPKR1203EDL-GM	12.7	12.7	3.18	1	1.4			●						★			★					●			●
	SPKR1504EDR-GM	15.875	15.875	4.76	1	1.4			●						★			★					●			●
	SPKR1504EDL-GM	15.875	15.875	4.76	1	1.4			●						★			★					●			●

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

SP□X



Good working condition　Normal working condition　Bad working condition

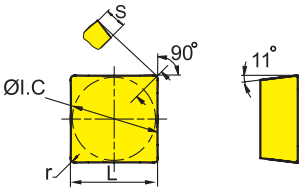
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		A	ØI.C	l.W	S	bs	R	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SPEX1203EDL-1**	15	12.7	12.7	3.18	10	500																				●
	SPEX1203EDR-1	15	12.7	12.7	3.18	10	500																				●
	SPEX1504EDL-1	18.2	15.875	15.875	4.76	10	500																		○		●
	SPEX1504EDR-1	18.2	15.875	15.875	4.76	10	500																		○		●

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

SP□□



Good working condition　Normal working condition　Bad working condition

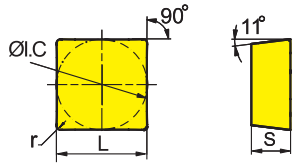
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	s	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	**SPMR090304**	9.525	9.525	3.18	0.4			○												○					
	SPMR09T304	9.525	9.525	3.97	0.4									○											
	SPMR090308	9.525	9.525	3.18	0.8			○																	
	SPMR120304	12.7	12.7	3.18	0.4			○												○					
	SPMR120308	12.7	12.7	3.18	0.8			○																	
	SPMR120312	12.7	12.7	3.18	1.2			○		○				○											

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

SP□□



Good working condition Normal working condition Bad working condition

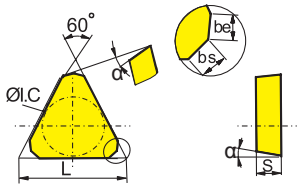
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	s	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	SPUN090304	9.525	9.525	3.18	0.4																		○		
	SPUN090308	9.525	9.525	3.18	0.8																	○		○	
	SPUN120304	12.7	12.7	3.18	0.4															○		○			○
	SPUN120308	12.7	12.7	3.18	0.8			○		○												●		○	○
	SPUN120312	12.7	12.7	3.18	1.2																	○			
	SPUN150408	15.875	15.875	4.76	0.8																	○			○
	SPUN150412	15.875	15.875	4.76	1.2																	○		○	○
	SPUN190408	19.05	19.05	4.76	0.8																	○		○	
	SPUN190412	19.05	19.05	4.76	1.2																	○			
	SPUN190416	19.05	19.05	4.76	1.6																	○			
	SPGN090304	9.525	9.525	3.18	0.4															●				●	
	SPGN090308	9.525	9.525	3.18	0.8																		○	○	○
	SPGN120308	12.7	12.7	3.18	0.8									○								●			●
	SPGN120404	12.7	12.7	4.76	0.4																	○			○
	SPGN120408	12.7	12.7	4.76	0.8								○									○			
	SPGN120412	12.7	12.7	4.76	1.2																	○			○
	SPGN150404	15.875	15.875	4.76	0.4																		●	○	
	SPGN150408	15.875	15.875	4.76	0.8																	●			
	SPGN190408	19.05	19.05	4.76	0.8																			○	
	SPGN190416	19.05	19.05	4.76	1.6								○												

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

TP□□



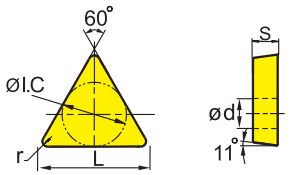
Good working condition Normal working condition Bad working condition

Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	be	bs	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	TPKN2204PDFR	22	12.7	4.76	1.4	0.7	11°								○												○
	TPKN2204PDFL	22	12.7	4.76	1.4	0.7	11°								○												○
	TPKN2204PDR	22	12.7	4.76	1.4	0.7	11°	●				●			★	★			★					●	○	○	●
	TPKN2204PDL	22	12.7	4.76	1.4	0.7	11°																	●			
	TPKN2204PDTR	22	12.7	4.76	1.4	0.7	11°	●																●			
	TPKN2204PDTL	22	12.7	4.76	1.4	0.7	11°	○																○			

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

TP□□



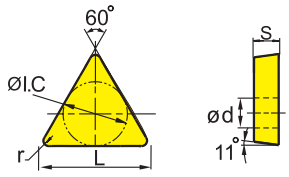
Good working condition Normal working condition Bad working condition

Workpiece material	
P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	s	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	TPGN090204	9.6	5.56	2.38	0.4																			○	
	TPGN090208	9.6	5.56	2.38	0.8																		○		
	TPGN110204	11	6.35	2.38	0.4																			○	
	TPGN110304	11	6.35	3.18	0.4																		○	●	○
	TPGN110308	11	6.35	3.18	0.8																		○		○
	TPGN160304	16.5	9.525	3.18	0.4																	●	○	○	
	TPGN160308	16.5	9.525	3.18	0.8																		○		●
	TPGN160312	16.5	9.525	3.18	1.2																				○
	TPGN160316	16.5	9.525	3.18	1.6																				○
	TPGN220404	22	12.7	4.76	0.4																			○	
	TPGN220408	22	12.7	4.76	0.8																	○			○
	TPGN220412	22	12.7	4.76	1.2																				○
	TPGN270408	27.5	15.875	4.76	0.8																				○

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

TP□□



Good working condition Normal working condition Bad working condition

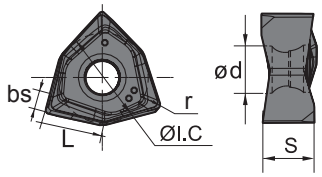
Workpiece material

- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	s	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	TPUN110208	11	6.35	2.38	0.8	○																○			
	TPUN110304	11	6.35	3.18	0.4																	○			
	TPUN110308	11	6.35	3.18	0.8	○																●		○	○
	TPUN160304	16.5	9.525	3.18	0.4			○														○		○	○
	TPUN160308	16.5	9.525	3.18	0.8			○		○												●		●	○
	TPUN160312	16.5	9.525	3.18	1.2			○														●			
	TPUN160408	16.5	9.525	4.76	0.8																	○			○
	TPUN160412	16.5	9.525	4.76	1.2																	○			○
	TPUN220404	22	12.7	4.76	0.4																			○	
	TPUN220408	22	12.7	4.76	0.8	●		○														●		○	
	TPUN220412	22	12.7	4.76	1.2					○												●			○
	TPUN220416	22	12.7	4.76	1.6																				○
	TPMR090204	9.6	5.56	2.38	0.4			○																	
	TPMR110304	11	6.35	3.18	0.4			●												○					
	TPMR110308	11	6.35	3.18	0.8			○												○					
	TPMR160304	16.5	9.525	3.18	0.4			●		○										○		○			
	TPMR160308	16.5	9.525	3.18	0.8			●		●												○			○
	TPMR160312	16.5	9.525	3.18	1.2					○															
	TPMR220412	22	12.7	4.76	1.2					○															
	TPMR330916	33	19.05	9.52	1.6												★								

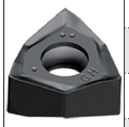
★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

WN□□



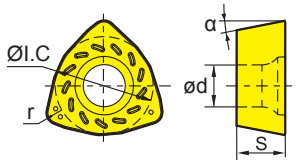
Good working condition 😊 Normal working condition 😐 Bad working condition 😞

Workpiece material																										
P	Steel	😐	😐	😐	😐	😞			😐	😐	😊	😞		😊	😊	😊	😞									
M	Stainless steel	😐	😐	😐	😐	😞			😐	😐	😐	😞		😊	😊	😊	😞									
K	Cast iron						😐	😞	😊					😐	😊					😊		😞				
N	Non-ferrous metal																							😐	😞	
S	Heat resistant alloy, Ti alloy								😊	😐	😐	😐														

Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		L	ØI.C	S	ød	bs	r	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	WNHU060404PNR-GM	5.7	9.525	4.0	3.5	1.35	0.4				★		★				★	★									
	WNHU060408PNR-GM	5.7	9.525	4.0	3.5	1.35	0.8				★		★				★	★									
	WNHU080608PNR-GM	7.7	12.7	5.4	4.4	1.6	0.8				★		★				★	★									
	WNHU080616PNR-GM	7.7	12.7	5.4	4.4	1.6	1.6				★		★				★	★									

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

WP□□



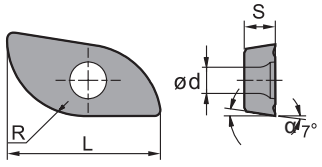
Good working condition 😊 Normal working condition 😐 Bad working condition 😞

Workpiece material																										
P	Steel	😐	😐	😐	😐	😞			😐	😐	😊	😞		😊	😊	😊	😞									
M	Stainless steel	😐	😐	😐	😐	😞			😐	😐	😐	😞		😊	😊	😊	😞									
K	Cast iron						😐	😞	😊					😐	😊					😊		😞				
N	Non-ferrous metal																							😐	😞	
S	Heat resistant alloy, Ti alloy								😊	😐	😐	😐														

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	r	S	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	WPGT050315ZSR	7.94	1.5	3.5	4.0	11°		★			●															
	WPGT060415ZSR	9.525	1.5	4.2	4.4	11°		★			●															
	WPGT080615ZSR	12.85	1.5	6.35	5.5	11°		★			●															
	WPGT090725ZSR	15	2.5	7	5.5	11°		★			●															
	WPGT050315ZSR-PM	7.94	1.5	3.5	4.0	11°		★			●					●										
	WPGT060415ZSR-PM	9.525	1.5	4.2	4.4	11°		★			●					●										
	WPGT080615ZSR-PM	12.85	1.5	6.35	5.5	11°		★			●					●										
	WPGT090725ZSR-PM	15.00	2.5	7.00	5.5	11°		★			●					●										

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

XP□□



Good working condition Normal working condition Bad working condition

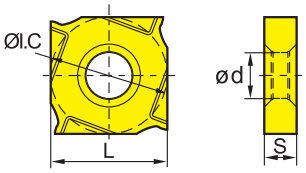
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)					CVD Coating							PVD Coating							Cermet		Cemented carbide			
		R	ød	S	α	L	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	XPHT16R0803-GM	8	3.1	3.18	9°	16												●								
	XPHT20R10T3-GM	10	4.0	3.97	9°	20												●								
	XPHT25R1204-GM	12.5	4.7	4.76	9°	25												●								
	XPHT30R1506-GM	15	5.8	6.35	11°	30												●								
	XPHT32R1606-GM	16	5.8	6.35	9°	32												●								
	XPHT40R2007-GM	20	6.7	7.94	9°	40												●								
	XPHT50R2507-GM	25	9.2	7.94	9°	50												●								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

XS□□



Good working condition Normal working condition Bad working condition

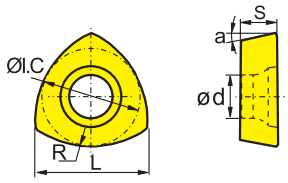
Workpiece material

P	Steel
M	Stainless steel
K	Cast iron
N	Non-ferrous metal
S	Heat resistant alloy, Ti alloy

Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	L	S	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	XSEQ1202	12.7	12.7	2.3	5.0												★								
	XSEQ1203	12.7	12.7	3.0	5.0												★								
	XSEQ12T3	12.7	12.7	3.5	5.0												★								
	XSEQ1204	12.7	12.7	4.0	5.0												★								
	XSEQ12T4	12.7	12.7	4.5	5.0												★								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

ZD□□



Good working condition Normal working condition Bad working condition

Workpiece material

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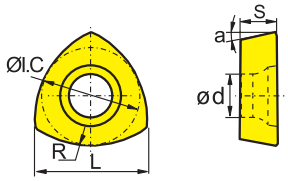
Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	L	S	R	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	ZDET08T2CYR10	6.75	8.4	2.78	10	2.8	14°			○									○								
	ZDET1103CYR12.5	8.5	10.6	3.18	12.5	2.8	14°			○									○								
	ZDET13T3CYR16	10.5	13.2	3.97	16	4.4	14°			○									○								

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

ZP□□



Good working condition Normal working condition Bad working condition

Workpiece material

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M	Stainless steel
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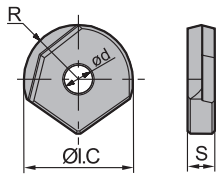
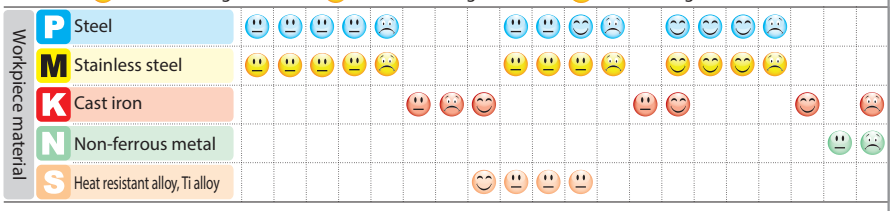
Insert shape	Type	Basic dimensions(mm)						CVD Coating							PVD Coating							Cermet		Cemented carbide			
		ØI.C	L	S	R	ød	α	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	ZPNT2204CY(R20)	12.7	16.1	4.76	20	5.56	11°			○									○								
	ZPNT2204CY(R25)	12.7	16.9	4.76	25	5.56	11°			○									○								
	ZPNT2204CY(R31)	12.7	17.6	4.76	31.5	5.56	11°			○									○								

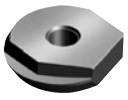
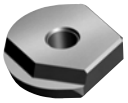
★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

ZO□□



Good working condition Normal working condition Bad working condition



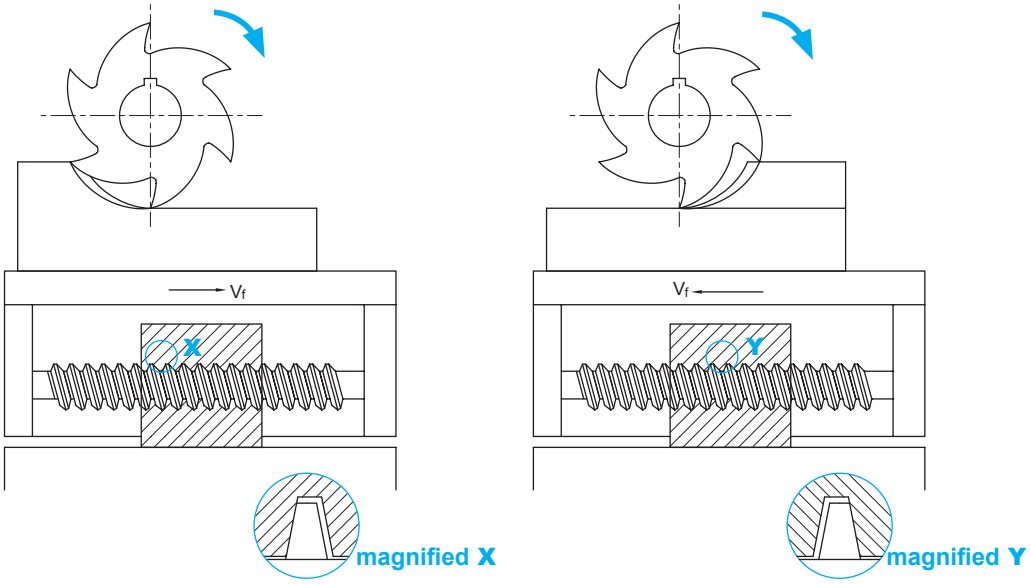
Insert shape	Type	Basic dimensions(mm)				CVD Coating							PVD Coating							Cermet		Cemented carbide			
		R	ØI.C	S	ød	YBC301	YBC302	YBM251	YBM253	YBM351	YBD152	YBD252	YBG102	YBG202	YBG205	YB9320	YBG302	YBG152	YBG252	YNG151	YNG151C	YC30S	YD051	YD101	YD201
	ZOHX1203-GF	6	12	3	4														●						
	ZOHX1604-GF	8	16	4	5														●						
	ZOHX2005-GF	10	20	5	5														●						
	ZOHX2506-GF	12.5	25	6	6														○						
	ZOHX3007-GF	15	30	7	8														○						
	ZOHX3207-GF	16	32	7	8														○						
	ZOHX1203-GM	6	12	3	4														●						
	ZOHX1604-GM	8	16	4	5														●						
	ZOHX2005-GM	10	20	5	5														●						
	ZOHX2506-GM	12.5	25	6	6														●						
	ZOHX3007-GM	15	30	7	8														●						
	ZOHX3207-GM	16	32	7	8														★						

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

Common problems in milling and solutions

Failure		Main points of solution and inspection	Selection of tool material: Material with higher hardness	Selection of tool material: Material with perfect toughness	Cutting condition: Cutting speed	Cutting condition: Feed rate	Cutting condition: Cutting depth	Cutting condition: Change the diameter and width of milling tools	Cutting condition: Cutting liquid	Tool shape: Rake angle	Tool shape: Approach angle	Tool shape: Strength of cutting edge	Tool shape: Number of teeth	Tool shape: Increase the width of chip pocket	Tool shape: Examine the geometry shape of Minor cutting edge.	Tool shape: check the end face run-out	Tool shape: Improve the rigidity of tool	Machine clamping system: Clamping system of workpiece	Machine clamping system: Overhang of tool	Machine clamping system: Power, gap
Fracture of tool nose	severe abrasion on clearance face	Improper cutting condition			↓				✓											
		Unsuitable geometry shape of cutting edge	✓							↑		↓								
	severe abrasion on rake face	Improper cutting condition			↓	↓	↓		✓											
		Unsuitable geometry shape of cutting edge	✓							↑	↓	↓								
	Fracture of cutting edge	Improper cutting condition				↓	↓													
		Unsuitable geometry shape of cutting edge		✓							↓	↑			✓	✓	✓	✓	✓	✓
	Thermal cracking	Improper cutting condition			↓	↓	↓		✓											
		Unsuitable geometry shape of cutting edge								↑		↓								
	Build-up edge	Improper cutting condition			↑	↑			✓											
		Unsuitable geometry shape of cutting edge								↑		↓								
Machining precision	Bad surface roughness	Abrasion of tool Great vibration of milling tool	✓		↑	↓	↓		✓			↓			Wiper	✓				
	Burrs occuring	Unsuitable geometry shape of cutting edge			↓	↓	↓	✓												
		Improper geometry shape of cutting edge								↑	↑	↓			✓					
	Side collapse	Unsuitable geometry shape of cutting edge				↓	↓													
		Unsuitable geometry shape of cutting edge								↑	↓	↓	↑		✓		✓			
	Planeness and parallelism deterioration	Improper geometry Improper technique				↓	↓			↑	↑		↓		✓	✓	✓	✓	✓	✓
Other	Vibration	Cutting condition Improper technology			↓	↓	↓	✓		↑	↑	↓					✓	✓	✓	✓
	Chips twisting and jamming	Improper cutting condition			↑	↑↓		✓	✓				↓							
		Unsuitable geometry shape of cutting edge								↑			↓	✓						

Difference and selection between down milling and up milling



Up milling

Down milling

Climb milling (also called down milling): the feed direction of workpiece is the same as that of the milling rotation at the connecting position.

Conventional milling (also called up milling): the feed direction of workpiece is opposite to that of the milling rotation at the connecting position.

In down milling, the major force of cutting edge is compressive stress, while in up milling the tensile stress. The compressive strength of cemented carbide material is much larger than its tensile strength. In down milling, as chips become thin from thick gradually, cutting edge and workpiece press against each other. The friction between edge and workpiece is small, thus reducing the abrasion of edge, the hardening of workpiece surface and the surface roughness (Ra). In up milling, chips become thick from thin gradually. When the insert is cutting into the workpiece, it produces strong friction and more heat than in down milling, and make workpiece surface hardened.

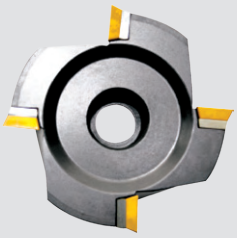
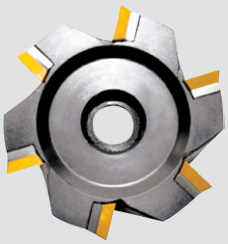
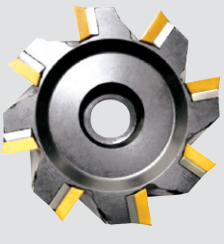
In up milling, because horizontal direction of cutting force milling cutter conducting on workpiece is opposite to the feed direction of workpiece, the lead screw of worktable joints closely with one side of the screw nut. In down milling, the direction of cutting force is the same as the feed direction. When edge's radial force on workpiece is large enough, the worktable will bounce left and right, thus make the gap fall behind. The gap will return to the front side with the continuing rotation of lead screw. At this moment the worktable stops motion, however, it will bounce left and right again when the radial cutting force is large enough again. The periodical bounce of worktable will cause poor surface quality of workpiece and tool breakage.

When using end mills for down milling, the edges always starts cutting at the workpiece surface, therefore end mills are not suitable for machining workpiece with hardened surface.

Up milling is recommended for milling thin-wall components or square milling with high requirement for precision.

Pitch selection

Pitch is the distance between one point on one cutting edge and the same point on the next edge. Milling cutters are mainly classified into coarse, close and extra close pitches.

optimized stability		
L (Low)	**M** (Medium)	**H** (High)
Coarse pitch Unequal pitch design 	**Close pitch** 	**Extra close pitch** 
When the milling width is equal to diameter of cutter, the machining system is stable and main power of machine is sufficient, the use of coarse pitch can achieve high productive efficiency.	Used in general milling and multiple mixed productions.	When the milling width is less than diameter of cutter, cutting by maximum edges can achieve high productive efficiency.

Selection of approach angle

The approach angle is formed by insert and tool body. It affects chip thickness, cutting forces and tool-life. Decreasing the approach angle reduces chip thickness and expands the cutting area between cutting edge and workpiece at a given feed rate.

A smaller approach angle also ensures stable entry into or exiting workpiece, protecting the cutting edge and extending tool life. However, this will increase axial cutting forces on the workpiece, thus is not suitable for machining thin workpiece such as thin plate.

Approach angle	Feed rate per tooth	Real maximum cutting depth
90°	f_z	$h_{ex}=f_z \times sinkr$
75°	f_z	$h_{ex}=0.96 \times f_z$
60°	f_z	$h_{ex}=0.86 \times f_z$
45°	f_z	$h_{ex}=0.707 \times f_z$
Round insert	f_z	$h_{ex}=\frac{\sqrt{iC^2 \times (iC-2a_p)^2}}{iC} \times f_z$

General formula

V_c : cutting speed(m/min)
D_c : nominal diameter of milling tool(mm)
n : spindle speed(rev/min)
z_n : number of teeth
Q : metal removal rate(cm^3/min)
L : Actual working distance(mm)
V_f : feed rate of worktable (feed speed)(mm/min)
f_z : feed rate per tooth(mm/z)
π : circumference ratio≈3.14
T_c : machining time(min)
f_z : feed rate per revolution (mm/rev)

- Cutting speed

$$V_c = \frac{\pi \times D_c \times n}{1000} \text{ (m/min)}$$

- Spindle speed

$$n = \frac{1000 \times V_c}{\pi \times D_c} \text{ (rev/min)}$$

- Feed rate of worktable (feed speed)

$$V_f = f_z \times n \times z_n \text{ (mm/min)}$$

- Feed rate per tooth

$$f_z = \frac{V_f}{n \times Z_n} \text{ (mm/z)}$$

- Feed rate per revolution

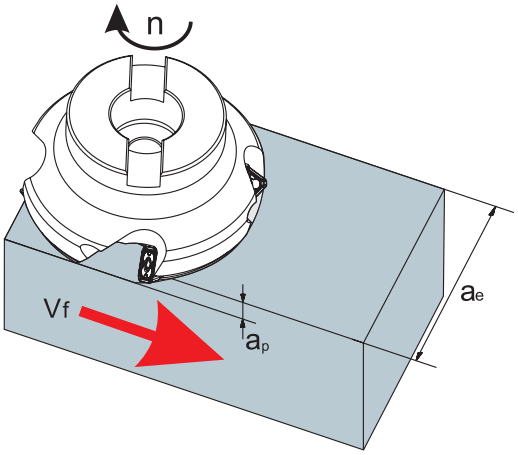
$$f_n = \frac{V_f}{n} \text{ (mm/rev)}$$

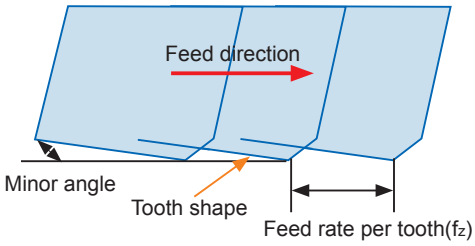
- Machining time

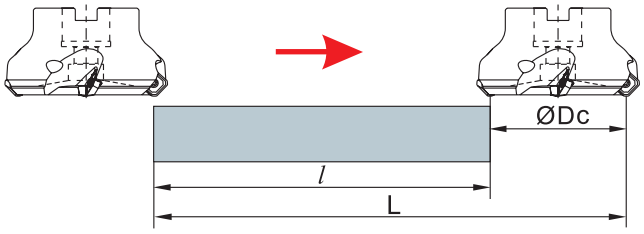
$$T_c = \frac{L}{V_f} \text{ (min)}$$

- Metal removal rate

$$Q = \frac{a_p \times a_e \times V_f}{1000} \text{ (cm}^3\text{/min)}$$

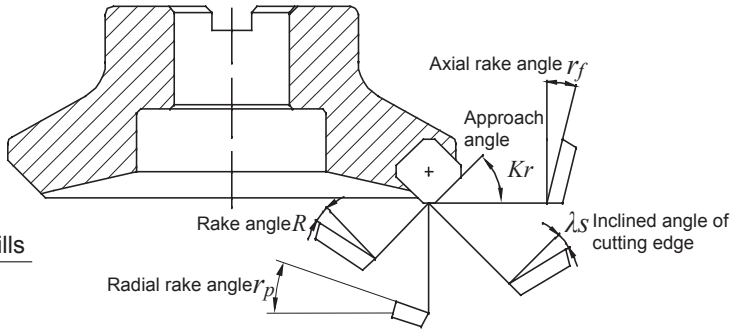






Function of each part in face milling

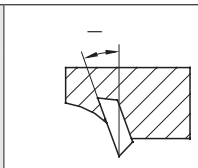
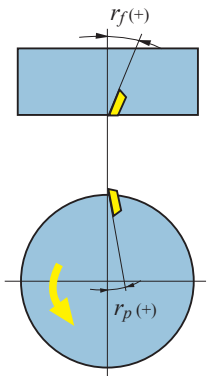
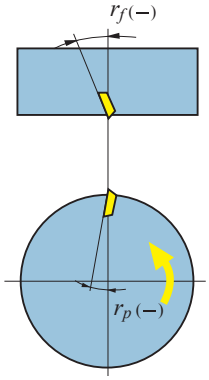
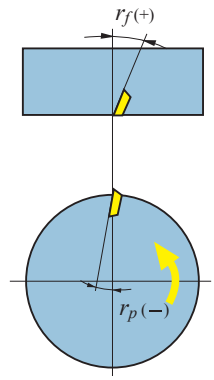
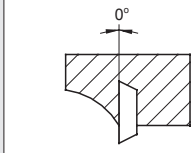
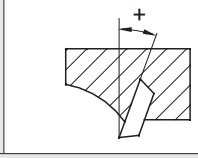
Main angles of face mills



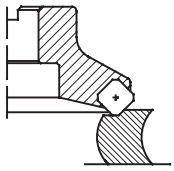
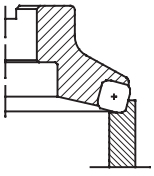
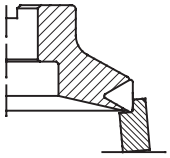
Main angles of face mills

Designation	Function	Effect		
Axial rake angle r_f	Determining the chip direction	Negative angle, excellent capability of chip removal		
Radial rake angle r_p	Determining whether the cutting is easy and fast or not	Positive angle: good cutting performanc		
Approach angle Kr	Determining the chip thickness	Kr↑, chip thickness↑; Kr↓, chip thickness↓;		
Rake angle R	Determining whether easy and fast the cutting is or not	Poor cutting performance, High-strength cutting edge	(−)←0→(+)	Good cutting performance, Low-strength cutting edge
Inclined angle of cutting edge λs	Determining the chip flow direction	Poor capability of chip removal, High-strength cutting edge	(−)←0→(+)	Good performance of chip removal, Low-strength cutting edge

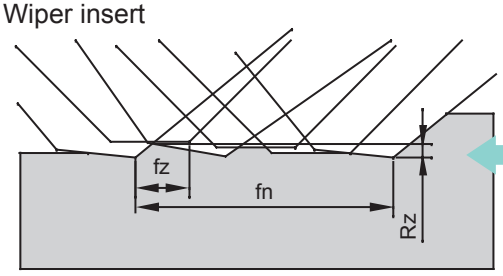
Characteristics of different rake angles combined

		Double positive rake angle	Double negative rake angle	Positive and negative rake angle
Negative rake angle				
0° rake angle				
Positive rake angle				
Axial rake angle r_f		+	−	+
Radial rake angle r_p		+	−	−
Applicable material machined	**P**	✓		✓
	M	✓		✓
	K		✓	✓
	N	✓		
	S	✓		✓

Cutting performances of different approach angles

Approach angle	**45°**	**75°**	**90°**
Schematic diagram			
Instruction	Axial force is the largest. It will bend when machining thin-wall workpiece, reducing the precision of workpiece. It can help avoid fringe breakage of workpiece when machining cast iron.	The main force is radial cutting force. It is often used in general face milling.	The axial force is zero in theory, suitable for milling thin plate workpiece.

Wiper insert

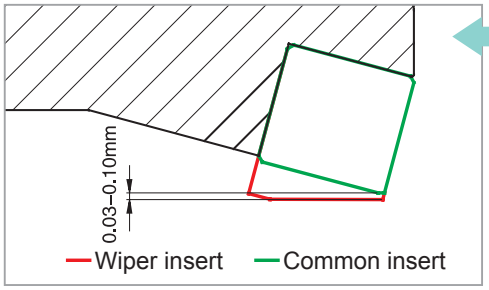


It has axial and radial run-out because tools and inserts have manufacturing tolerance. The axial run-out leads to poor surface roughness.

Solution

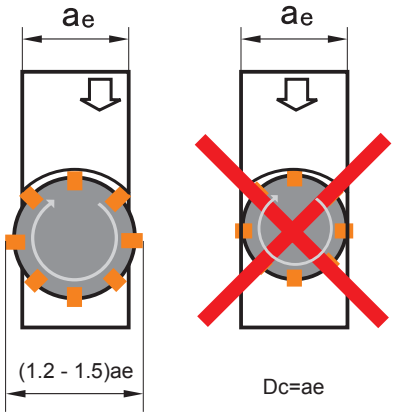
Mounting wiper inserts

usage



The wiper insert must protrude below the other inserts by 0.03-0.10 mm at axial direction, so that the wiping function can take effect. Generally speaking, a cutter just needs only one wiper insert. If the diameter of cutter is much larger or cutter's feed rate per revolution is higher than the length of wiper edge, 2 to 3 wiper inserts can be mounted.

■Selection of cutting width and tool cutting diameter in face milling



Dc：Tool cutting diameter
ae：Cutting width

Generally speaking, the relation between cutting width and tool cutting diameter is Dc=(1.2—1.5) ae.
In practical machining, same center line of tool center and work piece center should be avoided.