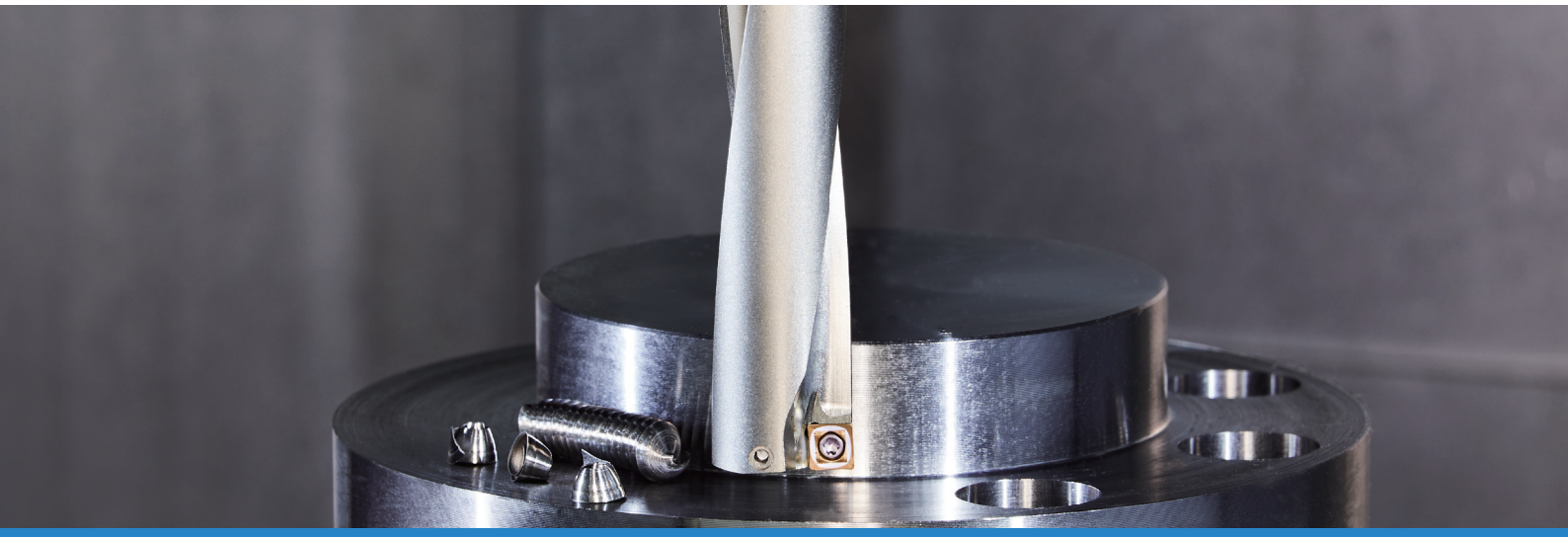
High Efficiency Indexable Insert Drill

MagicDrill DRV



Economical Inserts with 4 Cutting Edges. Excellent Chip Evacuation with 6D Maximum Deep-Hole Drilling

2D to 6D Drilling Lineup 4 Types of Chipbreakers for Various Machining Applications

High Speed and Highly Efficient Machining Available with the Combination of a CVD Outer Insert and PVD Inner Insert

Highly Rigid Design with Chattering Resistance Excellent Hole Accuracy

High Efficiency Indexable Insert Drill

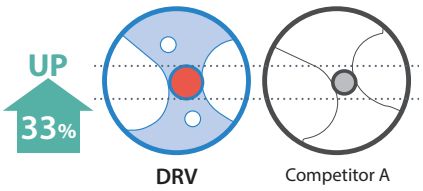
MagicDrill DRV

Economical Inserts with 4 Cutting Edges. Excellent Chip Evacuation with 6D Maximum Deep-Hole Drilling
High Speed and Highly Efficient Machining Available with the Combination of CVD (Outer Edge) and PVD (Inner Edge) Inserts

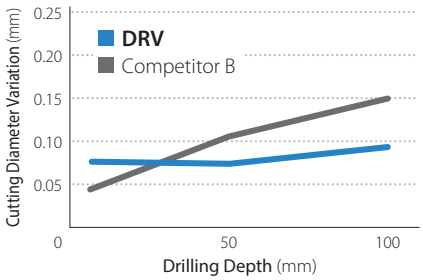
1 Excellent Drilling Precision with Less Variation in Cutting Diameter Up to 6D Drilling Capabilities with a Low Cutting Force Design

Optimal Web Thickness Reduces Chattering with a Low Cutting Force Design

Web Thickness Comparison
(In-house Evaluation)

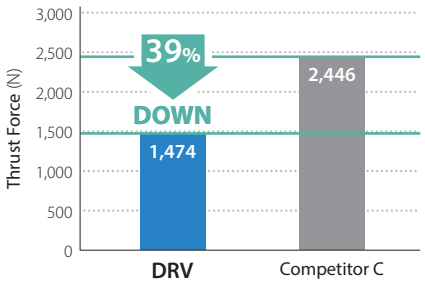


Comparison of Cutting Diameter Variation
(In-house Evaluation)



Cutting Conditions : Vc = 150 m/min, f = 0.06 mm/rev
Cutting Dia. ø20(5D), Wet Workpiece : S50C

Cutting Force Comparison
(In-house Evaluation)



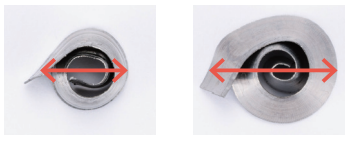
Cutting Conditions : Vc = 200 m/min, f = 0.12 mm/rev
Cutting Dia. ø20(3D), Wet Workpiece : S50C

2 Unique Insert Design to Control Chip Flow

Outer Edge Smooth Chip Evacuation with Compact Chips

Unique Insert Pattern to Differentiate between Outside and Inside Inserts

Chip Shape Comparison of Outter Insert Cutting Edge
(In-house Evaluation)



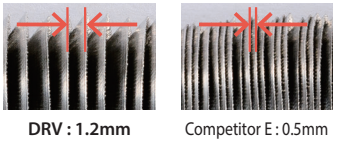
16%
Diameter of Chips

Cutting Conditions : Vc = 150 m/min, f = 0.06 mm/rev, Cutting Dia. ø20(3D), Wet Workpiece : S50C

Inner Edge Excellent Chip Evacuation with 6D Maximum Deep-Hole Drilling

Weight per Unit of Length for Chips Generated by the Inner Edge (In-house Evaluation)

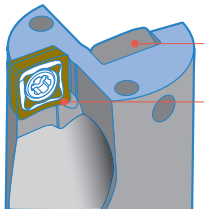
Pitch Comparison of Chips Generated by the Inner Edge (In-house Evaluation)



47%
Weight of Chips

Cutting Conditions : Vc = 250 m/min, f = 0.08 mm/rev, Cutting Dia. ø20(5D), Wet Workpiece : SUS304

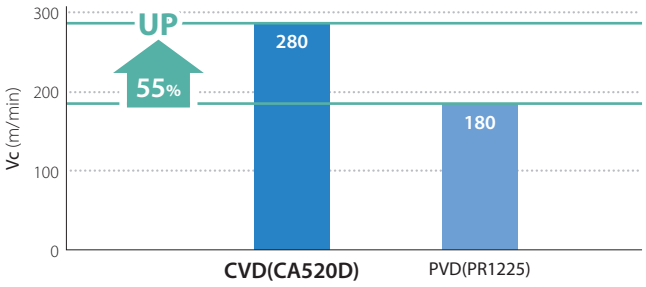
3 CVD Insert on the Outer Edge for Highly Efficient Machining



New Grades Developed for Drilling

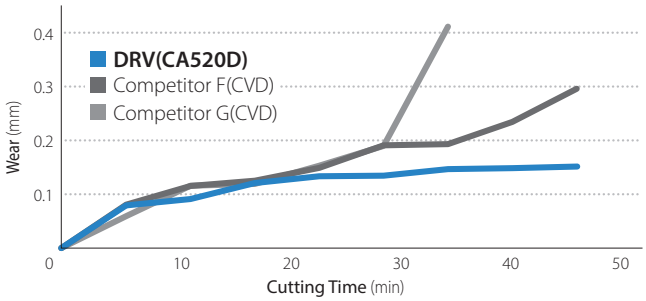
High Speed and Highly Efficient Machining Available with the Combination of CVD (Outer Edge) and PVD (Inner Edge) Inserts

Recommended Cutting Conditions (Maximum Value)



Cutting Dia. ø20(3D) Workpiece : S50C

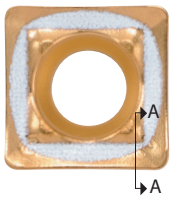
Wear Resistance Comparison (In-house Evaluation)



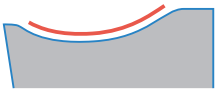
Cutting Conditions : Vc = 200 m/min, f = 0.12 mm/rev, Cutting Dia. ø20(3D) , Wet
Workpiece : SCM440H

4 Economical 4-edge Inserts 4 Types of Chipbreakers for Various Machining Applications

General Purpose GM Chipbreaker



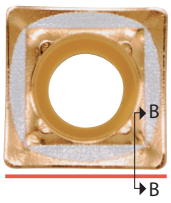
Chipbreaker for Steel Machining
Stable Deep-hole Machining with Low Cutting Force



Edge Shape Optimized for Various Machining Applications

A-A Section

Tough Edge GH Chipbreaker

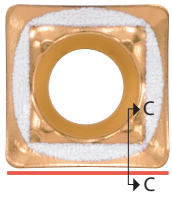


1st Recommendation for Machining Cast Iron
Good for Continuous Steel Machining
Reduced Defects Common in Through-hole Machining

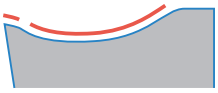
Negative Land with Strong Edge

B-B Section

For Stainless Steel Machining SM Chipbreaker



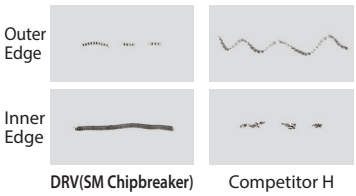
Stable Chip Control when Machining Gummy Stainless Steel
Reduces Chip Clogging in the Holder Body



Sharp Cutting and Large Rake Angle

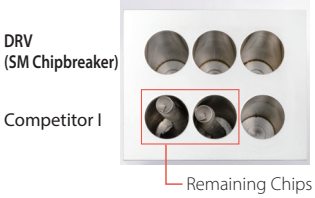
C-C Section

Chip Control Comparison (In-house Evaluation)



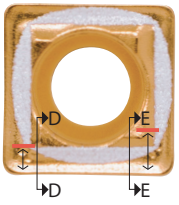
Cutting Conditions : Vc = 100 m/min, f = 0.1 mm/rev
Cutting Dia. ø20(3D), Drilling Depth 60 mm
Wet Workpiece : SUS304

Comparison of Remaining Chips (In-house Evaluation)



Cutting Conditions : Vc = 150 m/min, f = 0.08 mm/rev
Cutting Dia. ø25(5D), Drilling Depth 98 mm
Wet Workpiece : SUS304

For Machining Soft Steel and SS Material XM Chipbreaker

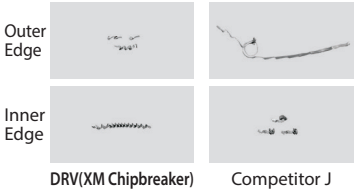


Stable Chip Control of Outer Cutting Edge

Excellent Chip Control with the Changing Width of the Chipbreaker

D-D Section E-E Section

Chip Control Comparison (In-house Evaluation)



Cutting Conditions : Vc = 200 m/min, f = 0.12 mm/rev
Cutting Dia. ø16(3D), Drilling Depth 48 mm
Wet Workpiece : SS400

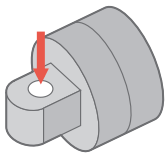
Chipbreaker Selection Chart ➡ P.3

Case Studies

Case Studies

Housing SCM420

Vc = 125 m/min (n = 1,660 min^{-1})
f = 0.08 mm/rev (Vf = 133 mm/min)
Drilling Depth 45 mm
Wet (External Coolant)
S25-DRV240M-4-07
SCMT070310GM-I PR1535
SCMT070305GM-E PR1225



Cutting Time

DRV (ø24-4D) 16 sec

50% or More Cutting Time

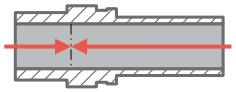
Competitor K (ø24-4D) 35 sec

Chattering and chip biting occurred in low rigidity workpiece of Competitor K. Speed was reduced to V c = 60 m/min. DRV finely divided chips for stable machining at Vc = 125 m/min.

(User Evaluation)

Nipple S20CF

Vc = 230 m/min (n = 3,330 min^{-1})
f = 0.13 mm/rev (Vf = 433 mm/min)
Drilling Depth 60 mm (4D)
30 mm (2D)
Wet (Internal Coolant)
S25-DRV220M-4-06 (4D)
S25-DRV220M-2-06 (2D)
SCMT060210-GM-I PR1535
SCMT060205-GM-E PR1225



Process2 Drilling Depth 30 mm (2D)

Process1 Drilling Depth 60 mm (4D)

Cutting Time

DRV (ø24-4D/2D) 12 sec

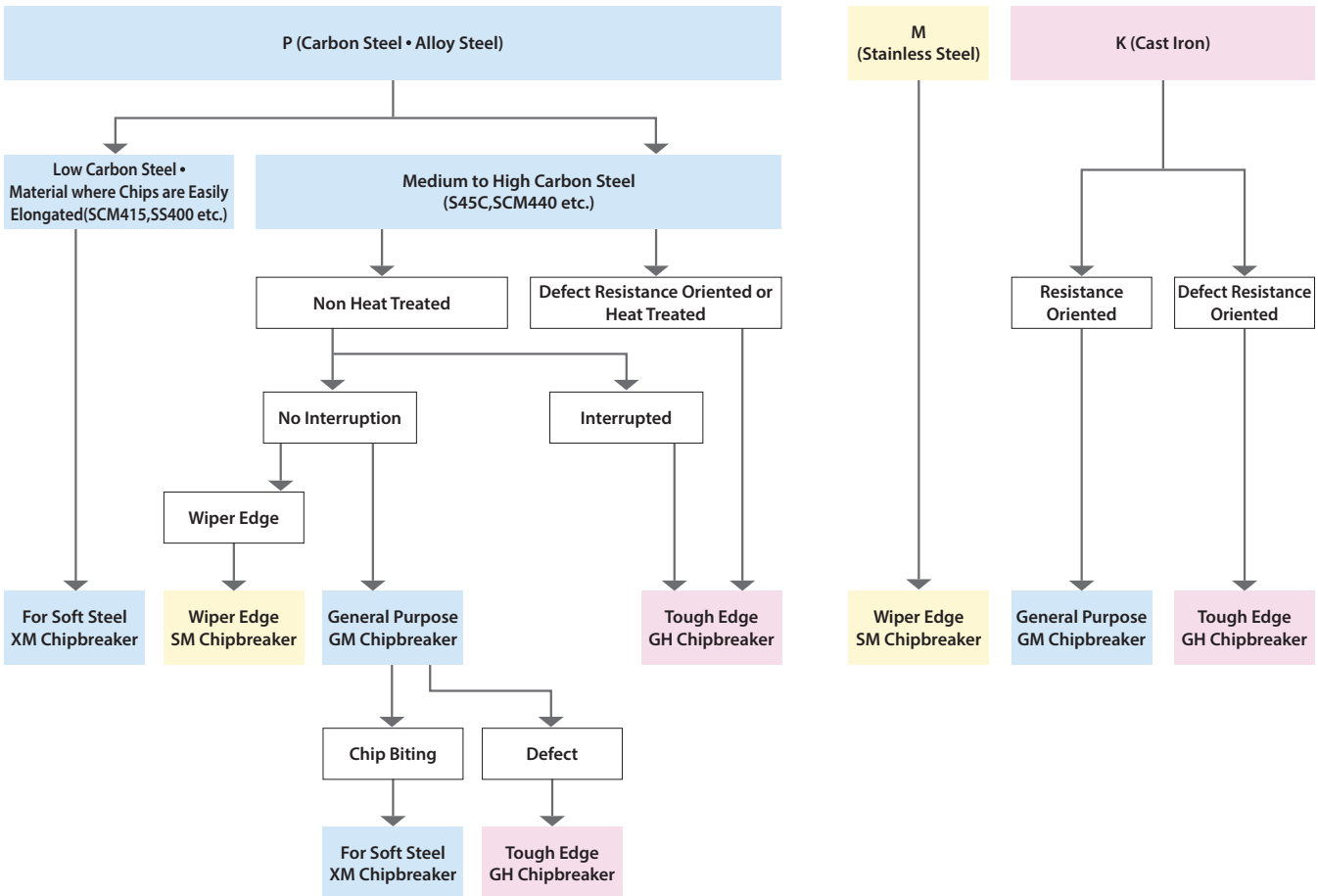
40% Cutting Time

Competitor L (ø22-4D/2D) 20 sec

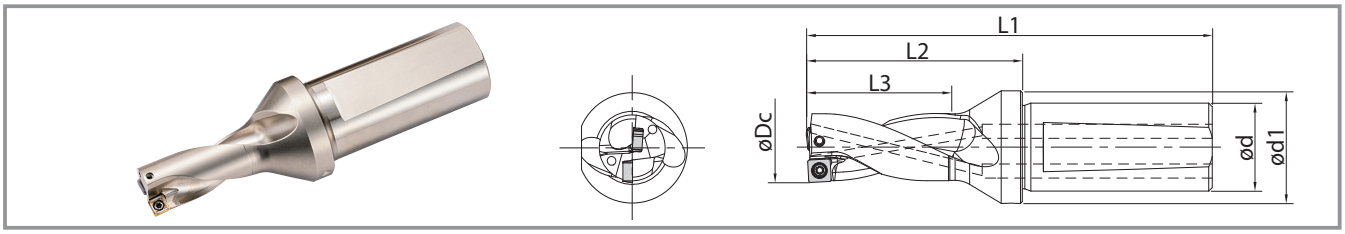
Chattering and deflection occurred with Competitor L. DRV showed stable machining and a shorter cutting time even when the cutting conditions were increased to 1.6 times or more.

(User Evaluation)

Chipbreaker Selection Chart



DRV Holder



Toolholder Dimensions 2D

(Drilling Depth : 2 × Dc)

Description		Stock	No. of Inserts	Dimensions (mm)						Max. Radial Offset (mm)	Spare Parts		Applicable Inserts
				øDc	L1	L2	L3	ød	ød1		Clamp Screw	Wrench	
S20-	DRV140M-2-04	●	2	14	92	49	28	20	27	+0.40	SB-2037TRP	FTP-6	Outer Edge SCMT040205-□□-E Inner Edge SCMT040209-□□-I
	DRV145M-2-04	●		14.5	93	50	29			+0.35			
	DRV150M-2-04	●		15	94	51	30			+0.30			
	DRV155M-2-04	●		15.5	95	52	31			+0.25			
S25-	DRV160M-2-05	●	2	16	110	56	32	25	32	+0.40	SB-2041TRP	FTP-6	Outer Edge SCMT050205-□□-E Inner Edge SCMT050210-□□-I
	DRV165M-2-05	●		16.5	111	57	33			+0.35			
	DRV170M-2-05	●		17	112	58	34			+0.30			
	DRV175M-2-05	●		17.5	113	59	35			+0.25			
	DRV180M-2-05	●		18	114	60	36			+0.20			
	DRV185M-2-05	●		18.5	115	61	37			+0.15			
S25-	DRV190M-2-06	●	2	19	113	59	38	25	32	+0.65	SB-2555TRP	DTPM-8	Outer Edge SCMT060205-□□-E Inner Edge SCMT060210-□□-I
	DRV195M-2-06	●		19.5	114	60	39			+0.60			
	DRV200M-2-06	●		20	115	61	40			+0.55			
	DRV205M-2-06	●		20.5	116	62	41			+0.50			
	DRV210M-2-06	●		21	117	63	42			+0.45			
	DRV215M-2-06	●		21.5	118	64	43			+0.35			
	DRV220M-2-06	●		22	119	65	44			+0.30			
S25-	DRV225M-2-07	●	2	22.5	120	66	45	25	32	+0.90	SB-3060TRP	DTPM-10	Outer Edge SCMT070305-□□-E Inner Edge SCMT070310-□□-I
	DRV230M-2-07	●		23	121	67	46			+0.80			
	DRV235M-2-07	●		23.5	122	68	47			+0.75			
	DRV240M-2-07	●		24	123	69	48			+0.70			
	DRV245M-2-07	●		24.5	124	70	49			+0.65			
	DRV250M-2-07	●		25	125	71	50			+0.60			
	DRV255M-2-07	●		25.5	126	72	51			+0.50			
	DRV260M-2-07	●		26	127	73	52			+0.45			
S32-	DRV270M-2-09	●	2	27	136	77	54	32	41	+1.05	SB-3573TRP	DTPM-10	Outer Edge SCMT090405-□□-E Inner Edge SCMT090410-□□-I
	DRV280M-2-09	●		28	138	79	56			+0.95			
	DRV290M-2-09	●		29	140	81	58			+0.85			
	DRV300M-2-09	●		30	142	83	60			+0.75			
	DRV310M-2-09	●		31	144	85	62			+0.60			
	DRV320M-2-09	●		32	146	87	64			+0.50			

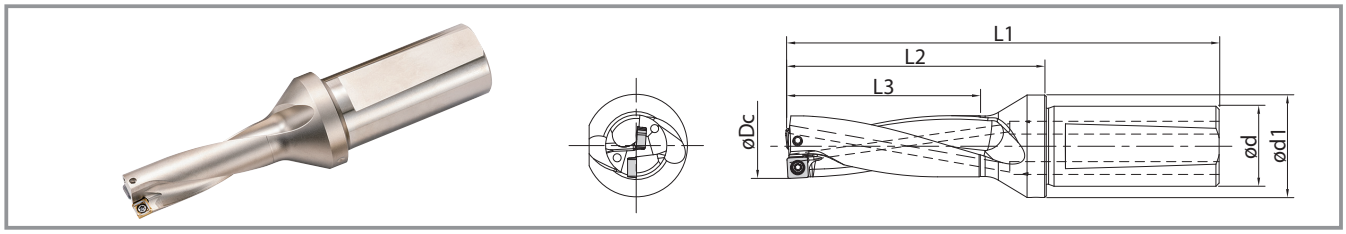
● : Standard Stock

Estimated Cutting Tolerance (2D)

Dc	Estimated Cutting Tolerance (mm)
ø14 - ø32	+0.30 0

The above values are estimates.
These values may change due to machine, workpiece, clamping power, and cutting conditions.

DRV Holder



Toolholder Dimensions 3D

(Drilling Depth : 3 × Dc)

Description		Stock	No. of Inserts	Dimensions (mm)						Max. Radial Offset (mm)	Spare Parts		Applicable Inserts
				øDc	L1	L2	L3	ød	ød1		Clamp Screw	Wrench	
S20-	DRV140M-3-04	●	2	14	106	63	42	20	27	+0.40	SB-2037TRP	FTP-6	Outer Edge SCMT040205-□□-E Inner Edge SCMT040209-□□-I
	DRV145M-3-04	●		14.5	108	65	43.5			+0.35			
	DRV150M-3-04	●		15	109	66	45			+0.30			
	DRV155M-3-04	●		15.5	111	68	46.5			+0.25			
S25-	DRV160M-3-05	●	2	16	126	72	48	25	32	+0.40	SB-2041TRP	FTP-6	Outer Edge SCMT050205-□□-E Inner Edge SCMT050210-□□-I
	DRV165M-3-05	●		16.5	127	73	49.5			+0.35			
	DRV170M-3-05	●		17	129	75	51			+0.30			
	DRV175M-3-05	●		17.5	130	76	52.5			+0.25			
	DRV180M-3-05	●		18	132	78	54			+0.20			
	DRV185M-3-05	●		18.5	133	79	55.5			+0.15			
S25-	DRV190M-3-06	●	2	19	132	78	57	25	32	+0.65	SB-2555TRP	DTPM-8	Outer Edge SCMT060205-□□-E Inner Edge SCMT060210-□□-I
	DRV195M-3-06	●		19.5	134	80	58.5			+0.60			
	DRV200M-3-06	●		20	135	81	60			+0.55			
	DRV205M-3-06	●		20.5	137	83	61.5			+0.50			
	DRV210M-3-06	●		21	138	84	63			+0.45			
	DRV215M-3-06	●		21.5	140	86	64.5			+0.35			
	DRV220M-3-06	●		22	141	87	66			+0.30			
S25-	DRV225M-3-07	●	2	22.5	142	88	67.5	25	32	+0.90	SB-3060TRP	DTPM-10	Outer Edge SCMT070305-□□-E Inner Edge SCMT070310-□□-I
	DRV230M-3-07	●		23	144	90	69			+0.80			
	DRV235M-3-07	●		23.5	145	91	70.5			+0.75			
	DRV240M-3-07	●		24	147	93	72			+0.70			
	DRV245M-3-07	●		24.5	148	94	73.5			+0.65			
	DRV250M-3-07	●		25	150	96	75			+0.60			
	DRV255M-3-07	●		25.5	151	97	76.5			+0.50			
	DRV260M-3-07	●		26	153	99	78			+0.45			
S32-	DRV265M-3-09	●	2	26.5	161	102	79.5	32	41	+1.15	SB-3573TRP	DTPM-10	Outer Edge SCMT090405-□□-E Inner Edge SCMT090410-□□-I
	DRV270M-3-09	●		27	163	104	81			+1.05			
	DRV275M-3-09	●		27.5	164	105	82.5			+1.00			
	DRV280M-3-09	●		28	166	107	84			+0.95			
	DRV285M-3-09	●		28.5	167	108	85.5			+0.90			
	DRV290M-3-09	●		29	169	110	87			+0.85			
	DRV295M-3-09	●		29.5	170	111	88.5			+0.80			
	DRV300M-3-09	●		30	172	113	90			+0.75			
	DRV305M-3-09	●		30.5	173	114	91.5			+0.65			
	DRV310M-3-09	●		31	175	116	93			+0.60			
	DRV315M-3-09	●		31.5	176	117	94.5			+0.55			
	DRV320M-3-09	●		32	178	119	96			+0.50			

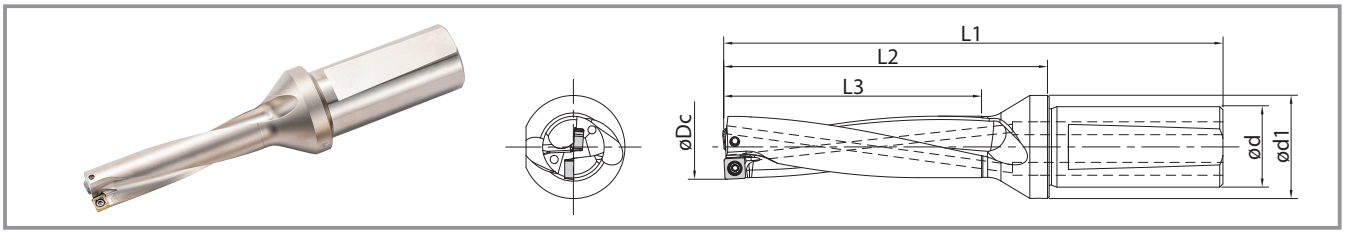
● : Standard Stock

Estimated Cutting Tolerance (3D)

Dc	Estimated Cutting Tolerance (mm)
ø14 - ø32	+0.30 0

The above values are estimates.
These values may change due to machine, workpiece, clamping power, and cutting conditions.

DRV Holder



Toolholder Dimensions 4D

(Drilling Depth : 4 × Dc)

Description		Stock	No. of Inserts	Dimensions (mm)						Max. Radial Offset (mm)	Spare Parts		Applicable Inserts
				øDc	L1	L2	L3	ød	ød1		Clamp Screw	Wrench	
S20-	DRV140M-4-04	●	2	14	120	77	56	20	27	+0.40	SB-2037TRP	FTP-6	Outer Edge SCMT040205-□□-E Inner Edge SCMT040209-□□-I
	DRV145M-4-04	●		14.5	122	79	58			+0.35			
	DRV150M-4-04	●		15	124	81	60			+0.30			
	DRV155M-4-04	●		15.5	126	83	62			+0.25			
S25-	DRV160M-4-05	●	2	16	142	88	64	25	32	+0.40	SB-2041TRP	FTP-6	Outer Edge SCMT050205-□□-E Inner Edge SCMT050210-□□-I
	DRV165M-4-05	●		16.5	144	90	66			+0.35			
	DRV170M-4-05	●		17	146	92	68			+0.30			
	DRV175M-4-05	●		17.5	148	94	70			+0.25			
	DRV180M-4-05	●		18	150	96	72			+0.20			
	DRV185M-4-05	●		18.5	152	98	74			+0.15			
S25-	DRV190M-4-06	●	2	19	151	97	76	25	32	+0.65	SB-2555TRP	DTPM-8	Outer Edge SCMT060205-□□-E Inner Edge SCMT060210-□□-I
	DRV195M-4-06	●		19.5	153	99	78			+0.60			
	DRV200M-4-06	●		20	155	101	80			+0.55			
	DRV205M-4-06	●		20.5	157	103	82			+0.50			
	DRV210M-4-06	●		21	159	105	84			+0.45			
	DRV215M-4-06	●		21.5	161	107	86			+0.35			
	DRV220M-4-06	●		22	163	109	88			+0.30			
S25-	DRV225M-4-07	●	2	22.5	165	111	90	25	32	+0.90	SB-3060TRP	DTPM-10	Outer Edge SCMT070305-□□-E Inner Edge SCMT070310-□□-I
	DRV230M-4-07	●		23	167	113	92			+0.80			
	DRV235M-4-07	●		23.5	169	115	94			+0.75			
	DRV240M-4-07	●		24	171	117	96			+0.70			
	DRV245M-4-07	●		24.5	173	119	98			+0.65			
	DRV250M-4-07	●		25	175	121	100			+0.60			
	DRV255M-4-07	●		25.5	177	123	102			+0.50			
	DRV260M-4-07	●		26	179	125	104			+0.45			
S32-	DRV270M-4-09	●	2	27	190	131	108	32	41	+1.05	SB-3573TRP	DTPM-10	Outer Edge SCMT090405-□□-E Inner Edge SCMT090410-□□-I
	DRV280M-4-09	●		28	194	135	112			+0.95			
	DRV290M-4-09	●		29	198	139	116			+0.85			
	DRV300M-4-09	●		30	202	143	120			+0.75			
	DRV310M-4-09	●		31	206	147	124			+0.60			
	DRV320M-4-09	●		32	210	151	128			+0.50			

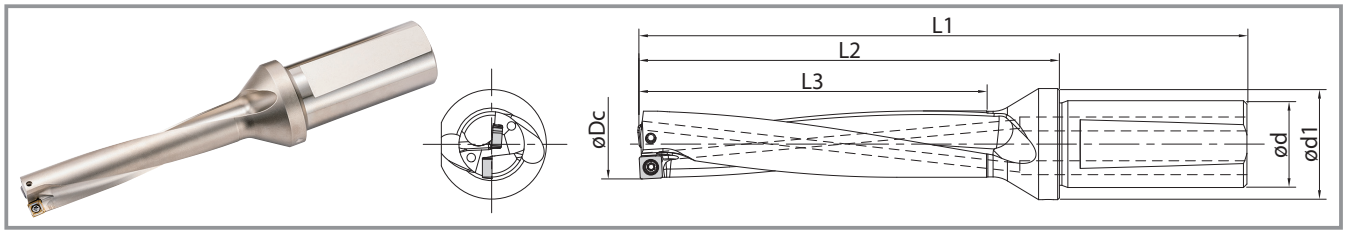
● : Standard Stock

Estimated Cutting Tolerance (4D)

Dc	Estimated Cutting Tolerance (mm)
ø14 - ø32	+0.35 0

The above values are estimates.
These values may change due to machine, workpiece, clamping power, and cutting conditions.

DRV Holder



Toolholder Dimensions 5D

(Drilling Depth : 5 × Dc)

Description		Stock	No. of Inserts	Dimensions (mm)						Max. Radial Offset (mm)	Spare Parts		Applicable Inserts
				øDc	L1	L2	L3	ød	ød1		Clamp Screw	Wrench	
S20-	DRV140M-5-04	●	2	14	134	91	70	20	27	+0.40	SB-2037TRP	FTP-6	Outer Edge SCMT040205-□□-E Inner Edge SCMT040209-□□-I
	DRV150M-5-04	●		15	139	96	75			+0.30			
S25-	DRV160M-5-05	●	2	16	158	104	80	25	32	+0.40	SB-2041TRP	FTP-6	Outer Edge SCMT050205-□□-E Inner Edge SCMT050210-□□-I
	DRV170M-5-05	●		17	163	109	85			+0.30			
	DRV180M-5-05	●		18	168	114	90			+0.20			
S25-	DRV190M-5-06	●	2	19	170	116	95	25	32	+0.65	SB-2555TRP	DTPM-8	Outer Edge SCMT060205-□□-E Inner Edge SCMT060210-□□-I
	DRV200M-5-06	●		20	175	121	100			+0.55			
	DRV210M-5-06	●		21	180	126	105			+0.45			
	DRV220M-5-06	●		22	185	131	110			+0.30			
S25-	DRV230M-5-07	●	2	23	190	136	115	25	32	+0.80	SB-3060TRP	DTPM-10	Outer Edge SCMT070305-□□-E Inner Edge SCMT070310-□□-I
	DRV240M-5-07	●		24	195	141	120			+0.70			
	DRV250M-5-07	●		25	200	146	125			+0.60			
	DRV260M-5-07	●		26	205	151	130			+0.45			
S32-	DRV270M-5-09	●	2	27	217	158	135	32	41	+1.05	SB-3573TRP	DTPM-10	Outer Edge SCMT090405-□□-E Inner Edge SCMT090410-□□-I
	DRV280M-5-09	●		28	222	163	140			+0.95			
	DRV290M-5-09	●		29	227	168	145			+0.85			
	DRV300M-5-09	●		30	232	173	150			+0.75			
	DRV310M-5-09	●		31	237	178	155			+0.60			
	DRV320M-5-09	●		32	242	183	160			+0.50			

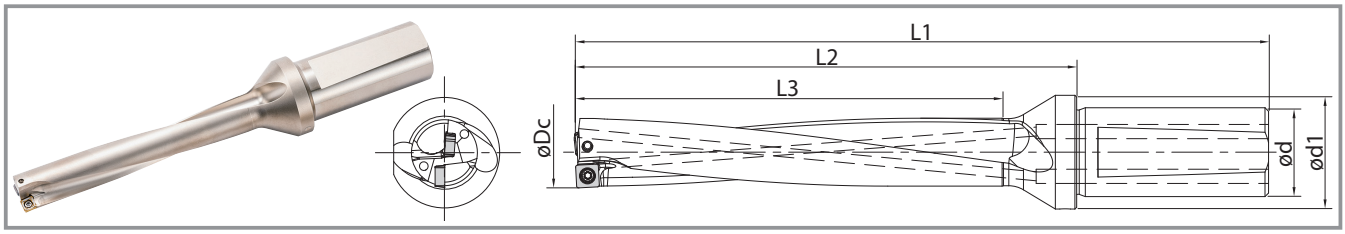
● : Standard Stock

■ Estimated Cutting Tolerance (5D)

Dc	Estimated Cutting Tolerance (mm)
ø14 - ø32	+0.35 0

The above values are estimates.
These values may change due to machine, workpiece, clamping power, and cutting conditions.

DRV Holder



Toolholder Dimensions 6D

(Drilling Depth : 6 × Dc)

Description		Stock	No. of Inserts	Dimensions (mm)						Max. Radial Offset (mm)	Spare Parts		Applicable Inserts
				øDc	L1	L2	L3	ød	ød1		Clamp Screw	Wrench	
S20-	DRV140M-6-04	●	2	14	148	105	84	20	27	+0.40	SB-2037TRP	FTP-6	Outer Edge SCMT040205-□□-E Inner Edge SCMT040209-□□-I
	DRV150M-6-04	●		15	154	111	90			+0.30			
S25-	DRV160M-6-05	●	2	16	174	120	96	25	32	+0.40	SB-2041TRP	FTP-6	Outer Edge SCMT050205-□□-E Inner Edge SCMT050210-□□-I
	DRV170M-6-05	●		17	180	126	102			+0.30			
	DRV180M-6-05	●		18	186	132	108			+0.20			
S25-	DRV190M-6-06	●	2	19	189	135	114	25	32	+0.65	SB-2555TRP	DTPM-8	Outer Edge SCMT060205-□□-E Inner Edge SCMT060210-□□-I
	DRV200M-6-06	●		20	195	141	120			+0.55			
	DRV210M-6-06	●		21	201	147	126			+0.45			
	DRV220M-6-06	●		22	207	153	132			+0.30			
S25-	DRV230M-6-07	●	2	23	213	159	138	25	32	+0.80	SB-3060TRP	DTPM-10	Outer Edge SCMT070305-□□-E Inner Edge SCMT070310-□□-I
	DRV240M-6-07	●		24	219	165	144			+0.70			
	DRV250M-6-07	●		25	225	171	150			+0.60			
	DRV260M-6-07	●		26	231	177	156			+0.45			
S32-	DRV270M-6-09	●	2	27	244	185	162	32	41	+1.05	SB-3573TRP	DTPM-10	Outer Edge SCMT090405-□□-E Inner Edge SCMT090410-□□-I
	DRV280M-6-09	●		28	250	191	168			+0.95			
	DRV290M-6-09	●		29	256	197	174			+0.85			
	DRV300M-6-09	●		30	262	203	180			+0.75			
	DRV310M-6-09	●		31	268	209	186			+0.60			
	DRV320M-6-09	●		32	274	215	192			+0.50			

● : Standard Stock

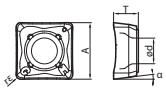
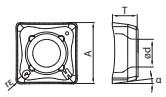
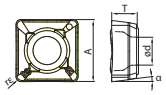
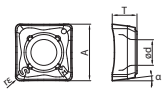
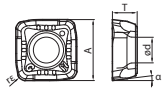
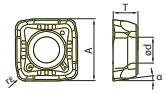
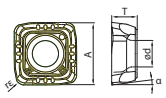
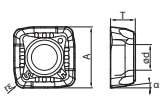
Estimated Cutting Tolerance (6D)

Dc	Estimated Cutting Tolerance (mm)
ø14 - ø32	+0.45 0

The above values are estimates.
These values may change due to machine, workpiece, clamping power, and cutting conditions.

DRV Insert

Usage Classification											
★ : 1st Recommendation (High Speed and Highly Efficient Machining) ☆ : 2nd Recommendation (Stable Machining Oriented)			P	Carbon Steel • Alloy Steel		☆	★		★
				Mold Steel		☆	★		★
			M	Stainless Steel		☆	★		★
			K	Cast Iron		☆		★	★

Shape		Application	Description		Dimensions (mm)				Angle	MEGACOAT	CVD Coated Carbide		MEGACOAT NANO
					A	T	ød	rε	α	PR1225	CA520D	CA415D	PR1535
General Purpose		Outer Edge	SCMT	040205-GM-E	4.80	2.2	2.4	0.5	7°	●	●	●	
				050205-GM-E	5.25	2.6	2.4	0.5	7°	●	●	●	
				060205-GM-E	6.40	2.8	2.9	0.5	7°	●	●	●	
				070305-GM-E	7.65	3.2	3.5	0.5	7°	●	●	●	
				090405-GM-E	9.10	4.1	4.0	0.5	7°	●	●	●	
Tough Edge			SCMT	050205-GH-E	5.25	2.6	2.4	0.5	7°	●	●	●	
				060205-GH-E	6.40	2.8	2.9	0.5	7°	●	●	●	
				070305-GH-E	7.65	3.2	3.5	0.5	7°	●	●	●	
For Soft Steel Machining			SCMT	050205-XM-E	5.25	2.6	2.4	0.5	7°	●	●		
				060205-XM-E	6.40	2.8	2.9	0.5	7°	●	●		
				070305-XM-E	7.65	3.2	3.5	0.5	7°	●	●		
For Stainless Steel Machining			SCMT	040205-SM-E	4.80	2.2	2.4	0.5	7°	●	●		
				050205-SM-E	5.25	2.6	2.4	0.5	7°	●	●		
				060205-SM-E	6.40	2.8	2.9	0.5	7°	●	●		
				070305-SM-E	7.65	3.2	3.5	0.5	7°	●	●		
				090405-SM-E	9.10	4.1	4.0	0.5	7°	●	●		
General Purpose		Inner Edge	SCMT	040209-GM-I	5.00	2.2	2.4	0.9	7°				●
				050210-GM-I	5.70	2.6	2.4	1.0	7°				●
				060210-GM-I	6.90	2.8	2.9	1.0	7°				●
				070310-GM-I	8.20	3.2	3.5	1.0	7°				●
				090410-GM-I	9.80	4.1	4.0	1.0	7°				●
Tough Edge			SCMT	050210-GH-I	5.70	2.6	2.4	1.0	7°				●
				060210-GH-I	6.90	2.8	2.9	1.0	7°				●
				070310-GH-I	8.20	3.2	3.5	1.0	7°				●
For Soft Steel Machining			SCMT	050210-XM-I	5.70	2.6	2.4	1.0	7°				●
				060210-XM-I	6.90	2.8	2.9	1.0	7°				●
				070310-XM-I	8.20	3.2	3.5	1.0	7°				●
For Stainless Steel Machining			SCMT	040209-SM-I	5.00	2.2	2.4	0.9	7°				●
				050210-SM-I	5.70	2.6	2.4	1.0	7°				●
				060210-SM-I	6.90	2.8	2.9	1.0	7°				●
				070310-SM-I	8.20	3.2	3.5	1.0	7°				●
				090410-SM-I	9.80	4.1	4.0	1.0	7°				●

● : Standard Stock

Recommended Cutting Conditions ★ 1st Recommendation ☆ 2nd Recommendation

DRV Recommended Cutting Conditions (Wet)

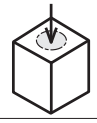
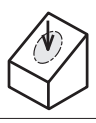
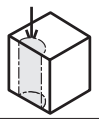
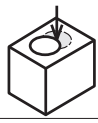
Workpiece	Recommended Insert Grade (Cutting Conditions Vc:m/min)										Cutting Dia. øD (mm)	Holder Type (Drilling Depth)				Holder Type (Drilling Depth)			
	PVD Coated Carbide				CVD Coated Carbide							2D~3D				4D			
	PR1225				CA520D				CA415D			fz f(mm/rev)				fz f(mm/rev)			
	GM	GH	XM	SM	GM	GH	XM	SM	GM	GH		GM	GH	XM	SM	GM	GH	XM	SM
Low Carbon Steel (SS400,S15 etc.)	-	-	★ 120-200	☆ 120-200	-	-	★ 150-280	☆ 150-280	-	-	ø14 - ø15.5	-	-	-	0.04 - 0.10	-	-	-	0.04 - 0.08
											ø16 - ø18.5	-	-	0.04 - 0.10	0.06 - 0.12	-	-	0.04 - 0.08	0.05 - 0.10
											ø19 - ø22	-	-	0.04 - 0.12	0.06 - 0.14	-	-	0.04 - 0.10	0.05 - 0.12
											ø22.5 - ø26	-	-	0.04 - 0.14	0.06 - 0.14	-	-	0.04 - 0.12	0.05 - 0.12
											ø26.5 - ø32	-	-	-	0.06 - 0.14	-	-	-	0.05 - 0.12
Carbon Steel (S45C etc.)	★ 100-180	☆ 100-180	☆ 100-180	☆ 100-180	★ 150-280	☆ 150-280	☆ 150-280	☆ 150-280	-	-	ø14 - ø15.5	0.04 - 0.14	-	-	0.04 - 0.10	0.04 - 0.10	-	-	0.04 - 0.08
											ø16 - ø18.5	0.06 - 0.16	0.06 - 0.16	0.06 - 0.12	0.06 - 0.12	0.05 - 0.12	0.05 - 0.12	0.05 - 0.10	0.05 - 0.10
											ø19 - ø26	0.08 - 0.20	0.08 - 0.20	0.06 - 0.14	0.06 - 0.14	0.07 - 0.16	0.07 - 0.16	0.05 - 0.12	0.05 - 0.12
											ø26.5 - ø32	0.08 - 0.20	-	-	0.06 - 0.14	0.07 - 0.16	-	-	0.05 - 0.12
Alloy Steel (SCM,SCr etc.)	★ 100-160	☆ 100-160	☆ 100-160	-	★ 140-220	☆ 140-220	☆ 140-220	-	-	-	ø14 - ø15.5	0.04 - 0.14	-	-	-	0.04 - 0.10	-	-	-
											ø16 - ø18.5	0.06 - 0.16	0.06 - 0.16	-	-	0.05 - 0.12	0.05 - 0.12	-	-
											ø19 - ø26	0.08 - 0.20	0.08 - 0.20	-	-	0.07 - 0.16	0.07 - 0.16	-	-
											ø26.5 - ø32	0.08 - 0.20	-	-	-	0.07 - 0.16	-	-	-
Mold Steel (SKD etc.)	☆ 80-150	★ 80-150	-	-	☆ 130-210	★ 130-210	-	-	-	-	ø14 - ø15.5	0.04 - 0.08	-	-	-	0.04 - 0.07	-	-	-
											ø16 - ø18.5	0.06 - 0.12	0.06 - 0.12	-	-	0.05 - 0.10	0.06 - 0.12	-	-
											ø19 - ø26	0.08 - 0.15	0.08 - 0.15	-	-	0.06 - 0.12	0.08 - 0.15	-	-
											ø26.5 - ø32	0.08 - 0.15	-	-	-	0.06 - 0.12	-	-	-
Stainless Steel (Austinitic)	-	-	-	★ 70-140	-	-	-	★ 140-200	-	-	ø14 - ø15.5	-	-	-	0.04 - 0.10	-	-	-	0.04 - 0.08
											ø16 - ø18.5	-	-	-	0.06 - 0.12	-	-	-	0.05 - 0.11
											ø19 - ø26	-	-	-	0.06 - 0.14	-	-	-	0.06 - 0.12
											ø26.5 - ø32	-	-	-	0.06 - 0.14	-	-	-	0.06 - 0.12
Gray Cast Iron (FC)	☆ 100-150	★ 100-150	-	-	-	-	-	-	☆ 150-220	★ 150-220	ø14 - ø15.5	0.08 - 0.14	-	-	-	0.06 - 0.12	-	-	-
											ø16 - ø18.5	0.08 - 0.18	0.08 - 0.18	-	-	0.08 - 0.16	0.08 - 0.16	-	-
											ø19 - ø26	0.08 - 0.20	0.08 - 0.20	-	-	0.08 - 0.18	0.08 - 0.18	-	-
											ø26.5 - ø32	0.08 - 0.20	-	-	-	0.08 - 0.18	-	-	-
Nodular Cast Iron (FCD)	☆ 80-120	★ 80-120	-	-	-	-	-	-	☆ 120-180	★ 120-180	ø14 - ø15.5	0.08 - 0.12	-	-	-	0.06 - 0.10	-	-	-
											ø16 - ø18.5	0.08 - 0.16	0.08 - 0.16	-	-	0.08 - 0.14	0.08 - 0.14	-	-
											ø19 - ø26	0.08 - 0.18	0.08 - 0.18	-	-	0.08 - 0.16	0.08 - 0.16	-	-
											ø26.5 - ø32	0.08 - 0.18	-	-	-	0.08 - 0.16	-	-	-

Internal Coolant is Recommended

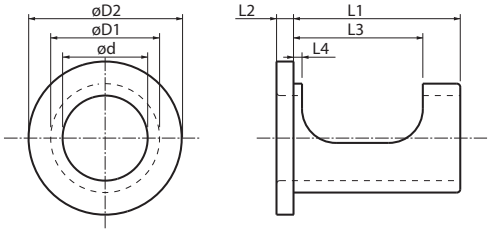
Workpiece	Recommended Insert Grade (Cutting Conditions Vc:m/min)										Cutting Dia. øD (mm)	Holder Type (Drilling Depth)				Holder Type (Drilling Depth)			
	PVD Coated Carbide				CVD Coated Carbide							5D				6D			
	PR1225				CA520D				CA415D			fz f(mm/rev)				fz f(mm/rev)			
	GM	GH	XM	SM	GM	GH	XM	SM	GM	GH		GM	GH	XM	SM	GM	GH	XM	SM
Low Carbon Steel (SS400,S15 etc.)	-	-	★ 120-200	☆ 120-200	-	-	★ 150-280	☆ 150-280	-	-	ø14 - ø15.5	-	-	-	0.04 - 0.08	-	-	-	0.04 - 0.06
											ø16 - ø18.5	-	-	0.04 - 0.08	0.04 - 0.09	-	-	0.04 - 0.06	0.04 - 0.06
											ø19 - ø22	-	-	0.04 - 0.10	0.04 - 0.10	-	-	0.04 - 0.07	0.04 - 0.08
											ø22.5 - ø26	-	-	0.04 - 0.12	0.04 - 0.10	-	-	0.04 - 0.08	0.04 - 0.08
											ø26.5 - ø32	-	-	-	0.04 - 0.10	-	-	-	0.04 - 0.08
Carbon Steel (S45C etc.)	★ 100-180	☆ 100-180	☆ 100-180	☆ 100-180	★ 150-280	☆ 150-280	☆ 150-280	☆ 150-280	-	-	ø14 - ø15.5	0.04 - 0.08	-	-	0.04 - 0.07	0.04 - 0.06	-	-	0.04 - 0.06
											ø16 - ø18.5	0.05 - 0.10	0.05 - 0.10	0.05 - 0.08	0.05 - 0.08	0.05 - 0.08	0.05 - 0.08	0.05 - 0.07	0.05 - 0.07
											ø19 - ø26	0.06 - 0.12	0.06 - 0.12	0.05 - 0.10	0.05 - 0.10	0.06 - 0.10	0.06 - 0.10	0.05 - 0.08	0.05 - 0.08
											ø26.5 - ø32	0.06 - 0.12	-	-	0.05 - 0.10	0.06 - 0.10	-	-	0.05 - 0.08
Alloy Steel (SCM,SCr etc.)	★ 100-160	☆ 100-160	☆ 100-160	-	★ 140-220	☆ 140-220	☆ 140-220	-	-	-	ø14 - ø15.5	0.04 - 0.08	-	-	-	0.04 - 0.06	-	-	-
											ø16 - ø18.5	0.05 - 0.10	0.05 - 0.10	-	-	0.05 - 0.08	0.05 - 0.08	-	-
											ø19 - ø26	0.06 - 0.12	0.06 - 0.12	-	-	0.06 - 0.10	0.06 - 0.10	-	-
											ø26.5 - ø32	0.06 - 0.12	-	-	-	0.06 - 0.10	-	-	-
Mold Steel (SKD etc.)	☆ 80-150	★ 80-150	-	-	☆ 130-210	★ 130-210	-	-	-	-	ø14 - ø15.5	0.04 - 0.06	-	-	-	0.04 - 0.05	-	-	-
											ø16 - ø18.5	0.04 - 0.08	0.04 - 0.08	-	-	0.04 - 0.06	0.04 - 0.06	-	-
											ø19 - ø26	0.05 - 0.10	0.05 - 0.10	-	-	0.05 - 0.08	0.05 - 0.08	-	-
											ø26.5 - ø32	0.05 - 0.10	-	-	-	0.05 - 0.08	-	-	-
Stainless Steel (Austinitic)	-	-	-	★ 70-140	-	-	-	★ 140-200	-	-	ø14 - ø15.5	-	-	-	0.04 - 0.08	-	-	-	0.04 - 0.06
											ø16 - ø18.5	-	-	-	0.04 - 0.10	-	-	-	0.04 - 0.09
											ø19 - ø26	-	-	-	0.06 - 0.12	-	-	-	0.06 - 0.10
											ø26.5 - ø32	-	-	-	0.06 - 0.12	-	-	-	0.06 - 0.10
Gray Cast Iron (FC)	☆ 100-150	★ 100-150	-	-	-	-	-	-	☆ 150-220	★ 150-220	ø14 - ø15.5	0.04 - 0.10	-	-	-	0.04 - 0.08	-	-	-
											ø16 - ø18.5	0.06 - 0.12	0.06 - 0.12	-	-	0.06 - 0.10	0.06 - 0.10	-	-
											ø19 - ø26	0.06 - 0.14	0.06 - 0.14	-	-	0.06 - 0.12	0.06 - 0.12	-	-
											ø26.5 - ø32	0.06 - 0.14	-	-	-	0.06 - 0.12	-	-	-
Nodular Cast Iron (FCD)	☆ 80-120	★ 80-120	-	-	-	-	-	-	☆ 120-180	★ 120-180	ø14 - ø15.5	0.04 - 0.08	-	-	-	0.04 - 0.06	-	-	-
											ø16 - ø18.5	0.06 - 0.10	0.06 - 0.10	-	-	0.06 - 0.08	0.06 - 0.08	-	-
											ø19 - ø26	0.06 - 0.12	0.06 - 0.12	-	-	0.06 - 0.10	0.06 - 0.10	-	-
											ø26.5 - ø32	0.06 - 0.12	-	-	-	0.06 - 0.10	-	-	-

Internal Coolant is Recommended

Cutting Conditions by Application

Application	Plain Surface	Slant Surface	Half Cylindrical	Hole Expansion	Pre-Drilled Surface	Concave Surface	Stacked Plates
shape of workpiece							
Cutting Conditions Vc(m/min)	See recommended cutting conditions above	120 (PVD insert is recommended for outer edge)					Not Recommended
fz f(mm/rev)	See recommended cutting conditions above	Half of the above recommended conditions is recommended				Concave Surface : Half of the above recommended conditions is recommended Solid Portion : See recommended cutting conditions onditions above	Not Recommended
Coolant (Internal Coolant)	Yes						Not Recommended

Adjustable Sleeve (Cutting Dia./Center Height Adjustment)



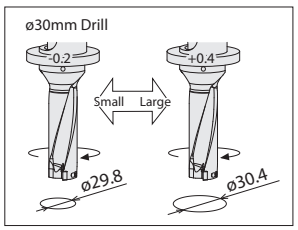
Sleeve Dimensions

Description		Stock	Dimensions (mm)							Dia. Adjustment Range *	Center Height Adjustment Range
			ød	øD1	øD2	L1	L2	L3	L4		
SHE	2025-43	●	20	25	41	43	4	36	3.0	+0.4 ~ –0.2	+0.2 ~ –0.15
	2532-48	●	25	32	49	48	6	38	2.5	+0.4 ~ –0.2	+0.2 ~ –0.15
	3240-53	●	32	40	58	53	6	43	2.5	+0.4 ~ –0.2	+0.2 ~ –0.15
	4050-63	●	40	50	74	63	6	49	3.0	+0.6 ~ –0.2	+0.2 ~ –0.2

* Dia. Adjustment Range refers to the cutting diameter.

● : Standard Stock

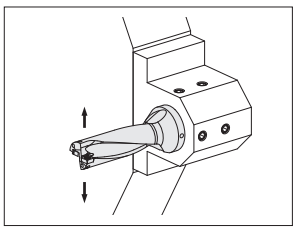
1 Diameter Adjustment ~For Machining Center~



■ Diameter Adjustment Range(mm)

Shank Dia.	Adjustment Range
ø20	+0.4 ~ –0.2
ø25	
ø32	
ø40	+0.6 ~ –0.2

2 Center Height Adjustment ~Fewer height adjustment problems for lathes~



■ Center Height Adjustment Range(mm)

Shank Dia.	Adjustment Range
ø20	+0.2 ~ –0.15
ø25	
ø32	
ø40	+0.3 ~ –0.2

How to Use

1 Hole Diameter Adjustment when Drilling

1. Align the scale at the flange periphery of the sleeve to the center of the coolant plug of the drill.(Fig.1)
2. When making the hole diameter bigger, rotate the sleeve in the (+) direction and to make it smaller, rotate the sleeve in the (-) direction.
3. When rotating the sleeve, insert the wrench supplied with the drill into the hole on the flange periphery to rotate the sleeve.
4. Using the bottom screw of the side-lock arbor, firmly tighten the drill directly through the sleeve's window.
   The upper screw should be tightened slightly so that the sleeve will not be damage.

Caution)
- Not for use with collet chuck type arbor.
- Check the actual cutting diameter after adjusting.

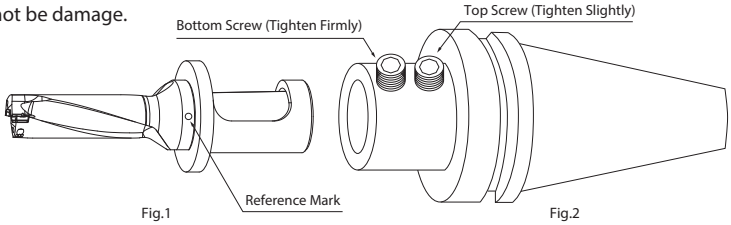


Fig.1 Fig.2

2 Center-Height Adjustment for Lathes

Most of the problems encountered with a turning lathe are center-height deviations.
The center height is appropriate if a core of about 0.5mm diameter remains at the center of the hole.
Center-height adjustment is necessary when no core remains or if the core diameter is more than 1mm.

1. Align the drill with the outer insert face parallel to the X-axis of the tool turret. (Fig.4)
2. Align the scale (for the lathe) on the flange face of the sleeve to the center of the reference mark.
3. When no core remains, rotate the sleeve in the (+) direction to make the core larger, and when the core diameter is more than 1mm, rotate the sleeve in the (-) direction to make the core smaller.
4. When rotating the sleeve, insert the wrench supplied with the drill into the hole of the flange and then rotate the sleeve.
5. After Completing the adjustment, tighten the drill directly through the window on the sleeve.

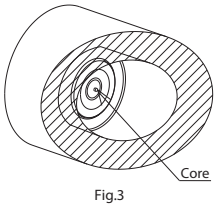


Fig.3

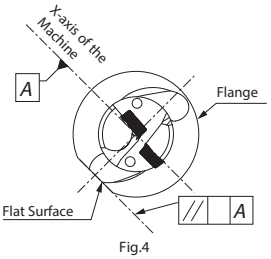


Fig.4

Caution)
Depending on amount of the center height adjustment, the hole diameter may change. It is recommended that the hole diameter is checked after the center height adjustment.

Lathe Installation

1. The top face of the outer insert should be parallel to the X-axis to allow for offset cutting.
   (Cutting diameter can be changed by moving X-axis.)
2. It is recommended to set the outer insert as shown in Fig.1 with the outer insert facing the operator. (Fig.1)
   (It is also possible to use it by setting it in 180° reverse position)
   If the lathe has two turrets, when installing the drill into the lower turret, the outer insert should be set to face the operator.
   (It is also possible to use it by setting at 180° reverse position)

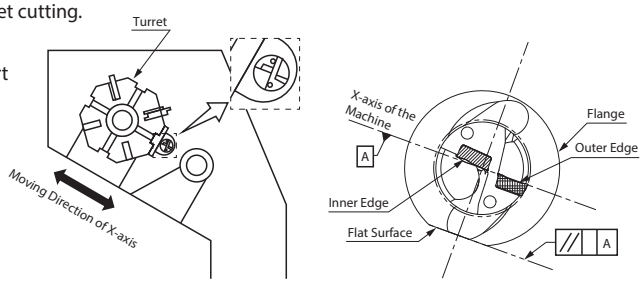


Fig.1 Installed into the Lathe

Cutting Diameter Adjustment

1 Cutting Diameter Adjustment

1. Cutting diameter is adjusted by moving X-axis.
   The moving direction of the X-axis depends on the position of the toolholder.
2. For making the hole diameter larger, slide the tool along the X-axis toward the outer insert side.(Fig.2,Fig.3)
   For making the hole diameter smaller, slide the tool along the X-axis in the opposite direction.
   (This movement of the axis is called "Offset")
   Be sure not to make the hole diameter smaller than the drill diameter by 0.2mm or more. Otherwise, the toolholder will interfere with the drilled hole.(Fig.4)

Ex.) When using ø20 drill, the hole diameter must not be smaller than 19.8mm

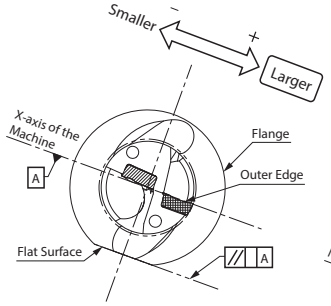


Fig.2 Outer Insert Facing Up

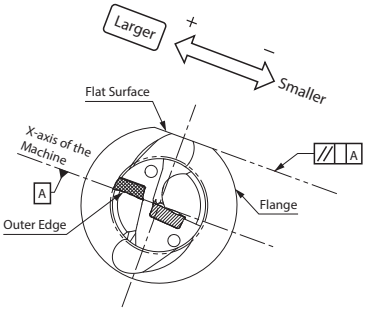


Fig.3 Outer Insert Facing Down

2 Offset Limit of the Cutting Diameter

For the maximum limit of the cutting diameter, refer to "Max. Offset (Radial)" in the Toolholder Dimensions table.
(The figure in the Toolholder Dimensions table shows how much it is possible to offset the drill in the radial direction.)

Ex.) When using ø20 drill, for example, it is possible to make a hole up to ø21.1 since "Max. Offset (Radial)" is +0.55mm.

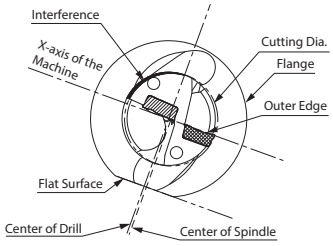


Fig.4 Excessive Offset (For Smaller Hole Diameter)

Center Height Adjustment

1 Center Height of the Inner Insert

When installing inner insert as shown in Fig.1, it will be set around 0.05mm below the Center of Spindle.(Fig.5)
This is the normal position of the center height.
However, in case that the turret of the lathe is out of the Center of Spindle, sometimes the inner insert may be set above or below the center.
For stable machining, it is essential to check the Center Height carefully

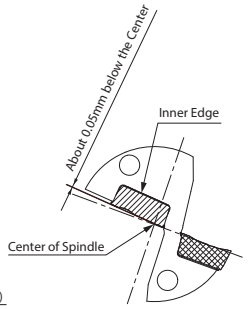


Fig.5 Front View of the Drill

2 How to Check the Center Height

For checking the center height of the inner insert, see the core which remains at the center of the bottom of the drilled hole.
If the center height is in the normal position, a core about 0.5mm in diameter, will remain after machining.(Fig.6)
Adjustment of center height is required if a large core diameter of 1 mm or more remains.

* The drilled hole for verification purposes needs to be machined at approximately 10 mm in depth and at a feed rate of 0.1 mm/rev or lower.

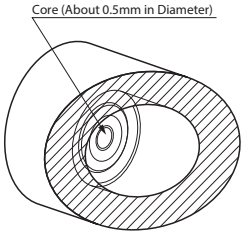


Fig.6 Center Core

3 Center Height Adjustment

1. When there are no remaining cores and the vicinity of the drill center of the inner edge is damaged

This happens when the inner insert is set above the center height.(Fig.7)

How to Adjust
A.Install the drill rotated by 180˚ Most problems will be solved by this method(Fig.8) B.If the core diameter becomes too large after the above adjustment, install the drill by rotating 90° counter-clockwise as shown in Fig.9 (outer edge is positioned lower) and adjust the center height by moving the tool in the X-axis direction. (However, this will make it impossible to adjust the cutting diameter) Caution: When installing the drill in the opposite direction (outer insert is positioned above), the cutting diameter will become smaller, which may cause the drill body to interfere with the drilled hole. The best solution is to readjust the center position of the turret itself.

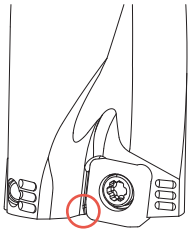


Fig.7 Insert breakage near the center of the drill

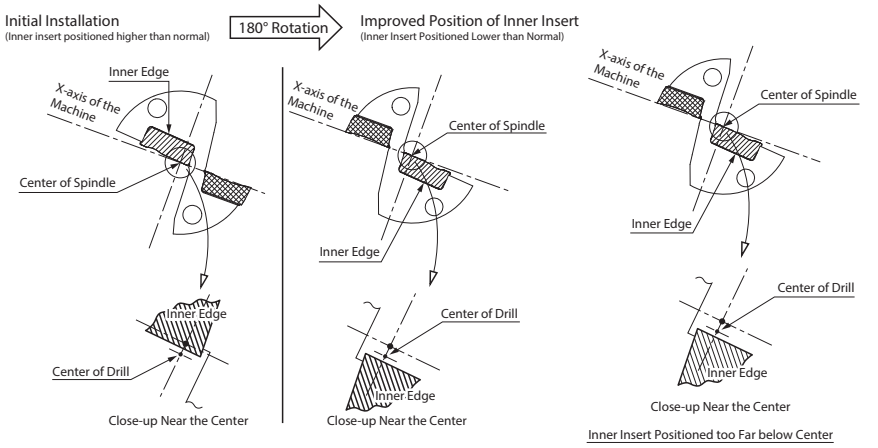


Fig.8

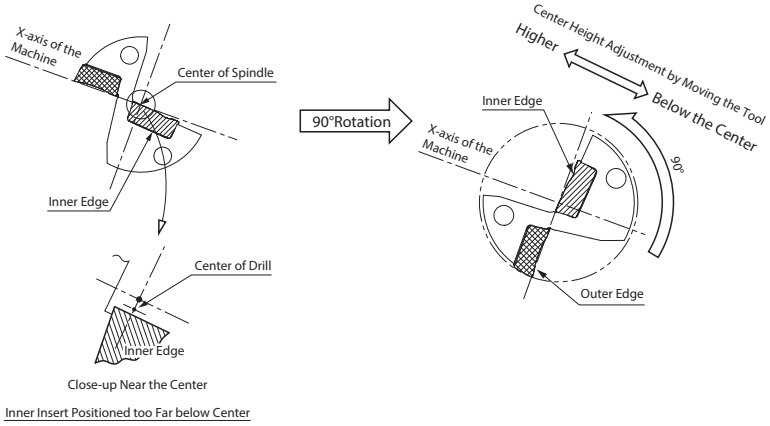


Fig.9

2. Core with Excessively Large Diameter (More than 1mm)

This occurs when the inner insert is excessively below the center
This condition causes poor chip evacuation and an adjustment is required.

How to Adjust
Install the drill rotating 90˚ as shown in Fig.10. (outer insert is positioned on the upper side) and adjust the center height by moving tool in the X-axis direction. (However, this will make it impossible to adjust the cutting diameter) Caution: When installing the drill in the opposite direction (outer insert is positioned lower), the cutting diameter will become smaller, which may cause the drill body to interfere with the drilled hole. The best solution is to readjust the center position of the turret itself.

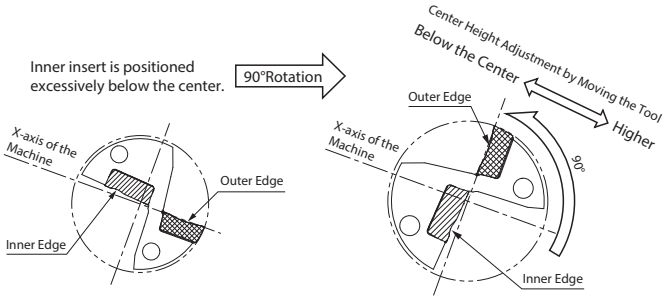


Fig.10

Insert Grade Selection Guide

Select CVD for the outer edge when performing high speed and high efficiency machining. Machining for high efficiency, abrasion resistance and long tool life.
Select PVD for the outer edge when for stable machining and a better surface finish.
PVD is recommended for the outer edge if chattering occurs or machining with lathe is not available even if cutting conditions are increased.

1st Recommendation (High Speed and High Efficiency Machining)

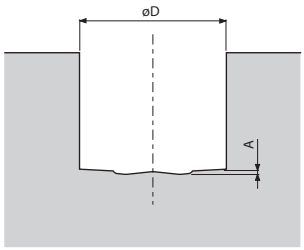
Outer Edge : CVD(CA520D/CA415D) Inner Edge : PVD (PR1535)

Stable Machining Oriented (1st Recommendation for Lathe Machining)

Outer Edge : PVD (PR1225) Inner Edge : PVD (PR1535)

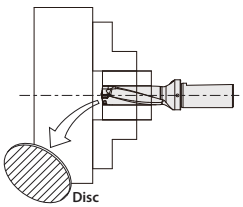
Shape of the Hole Bottom

Chip Size (SCMT...)	øD	A	Chip Size (SCMT...)	øD	A	Chip Size (SCMT...)	øD	A	Chip Size (SCMT...)	øD	A
04	14.0	1.0	06	19.0	1.2	07	22.5	1.2	09	26.5	1.2
	14.5			19.5			23.0			27.0	
	15.0			20.0			23.5			27.5	1.3
	15.5			20.5	1.3		24.0			28.0	
05	16.0	1.1		21.0			24.5	1.3		28.5	
	16.5			21.5			25.0			29.0	
	17.0			22.0			25.5			29.5	1.4
	17.5						26.0			30.0	
	18.0	1.2								30.5	
	18.5									31.0	
										31.5	1.5
										32.0	



Common for 2D, 3D, 4D, 5D and 6D drills.
* The above values are estimate values.
(Varies by approximately ±0.1 mm depending on workpiece and cutting conditions, etc.)

Cautions for Machining



In case of through-hole machining, disc may be generated and ejected outward when drilling a hole.
Be sure to install covers to protect against dangers if using a machine without the covers including general-purpose lathes, etc.

