KYOCERA

Economical drilling solution | DRXR

MagicDrill DRX-R *EVOLUTION*

Precise drilling with less vibration and excellent chip evacuation

High efficiency drill with twisted coolant holes
Improved toolholder rigidity and increased reliability
Three chipbreakers to cover various materials

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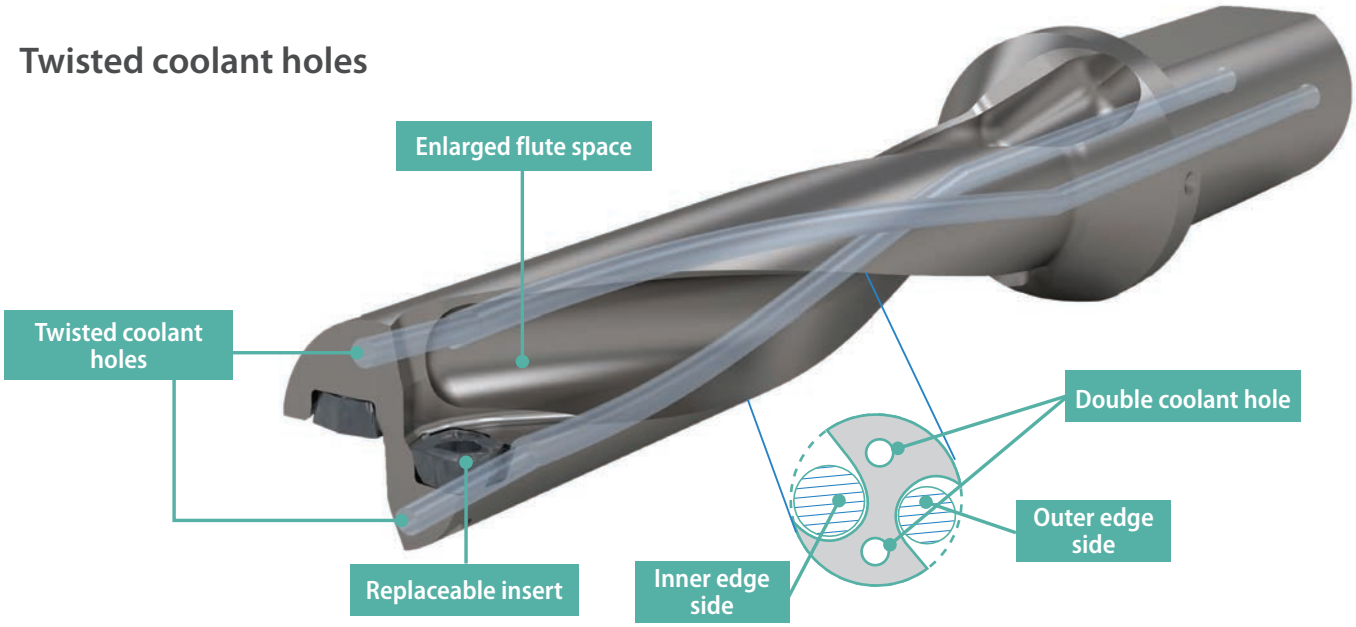
High efficiency indexable drill

MagicDrill DRXR

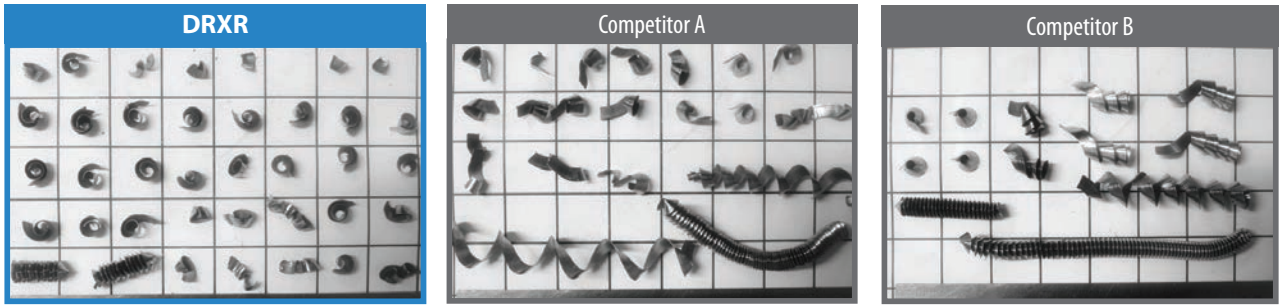
Two twisted coolant holes
Enlarged flute space
Improved and increased reliability

1 Twisted coolant holes



2 Excellent surface finish due to stable chip control

Chip comparison (Internal evaluation)

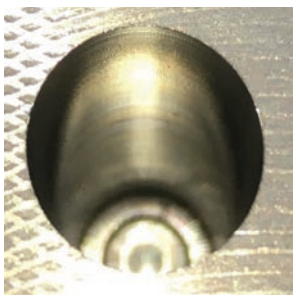


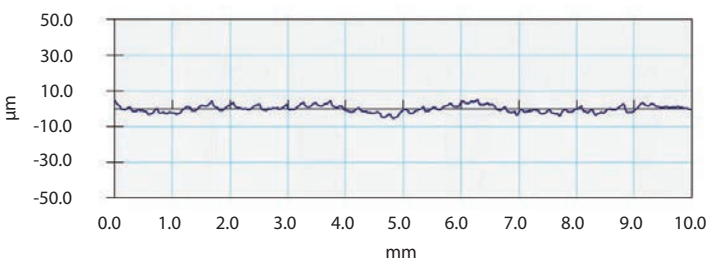
Stable chip control | Unstable chip control | Unstable chip control

Cutting conditions: Workpiece C45, ø14-5D, vc = 150 m/min, f = 0.06 mm/rev, depth = 70 mm, blind hole

DRXR MagicDrill showed greater chip control when compared to competitors A and B.

Hole wall surface finish (Internal evaluation)





Cutting conditions: Workpiece C45, ø14-5D, vc = 150 m/min, f = 0.04 mm/rev, depth = 70 mm, blind hole

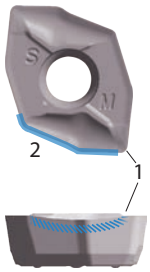
3 Economical 4-edge inserts and 3 types of chipbreakers for various applications

Chipbreaker selection

GM chipbreaker – General use

PR1230 for carbon steel
PR1210 for cast iron

- Wide chipbreaker covers variety of materials.
- Good balance of cutting edge strength and sharp cutting.



SM chipbreaker – Sharper edge

PR1225 for stainless steel and low carbon steel

- U-shaped cutting edge.
- Good chipcontrol at sticky material.
- Sharp cutting by large rake angle.

GH chipbreaker – Tough edge

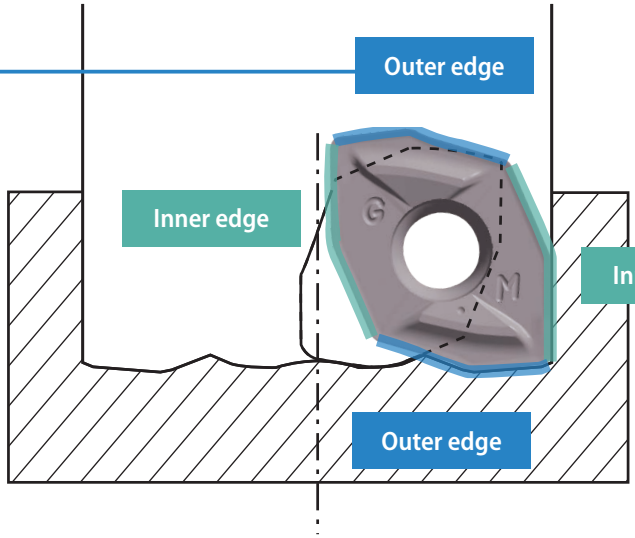
PR1230 for hardened material, with interruption

- Wider chipbreaker prevents breakage by pressed chips.
- Stable cutting edge.

Features

Wide chipbreaker

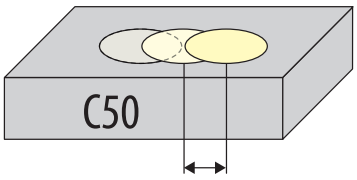
Small chips for better evacuation



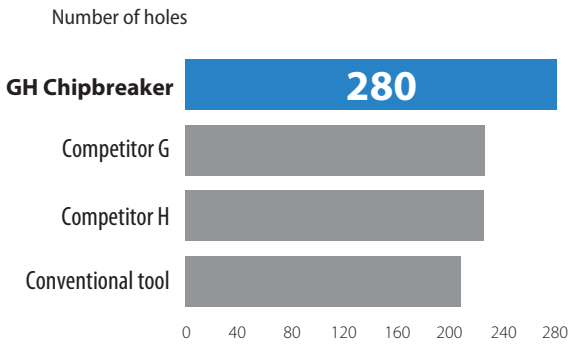
Flat chipbreaker

Ideal continuous chips

Chipping resistance comparison



Interrupted drilling by displacing center of hole by 8 mm.



Cutting conditions Workpiece: C50, with coolant, VC = 80 m/min, f = 0.08 mm/rev, H = 10 mm, Dc = ø20 mm, H = 60 mm

4 Low cutting force

S-shape cutting edge

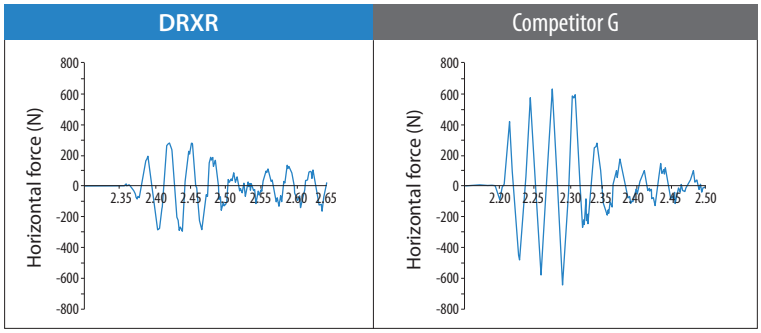
Sharp cutting

Lower impact force at start of drilling

↓

Less sudden breakage

Cutting force comparison



Cutting force comparison of outer edge at the start of drilling.

Cutting conditions: Workpiece C55, with coolant, VC = 120 m/min, f = 0.1 mm/rev, H = 15 mm, ø20-3D

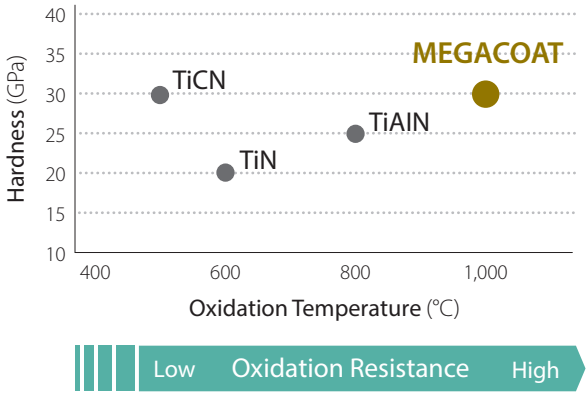
5 MEGACOAT for long tool life and stable machining

PR1230 Stable and high feed drilling of steel with a special tough carbide substrate

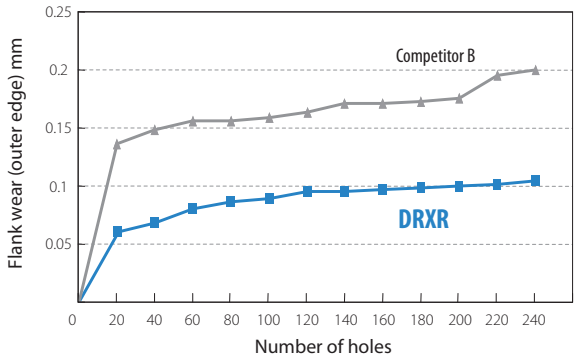
PR1225 Drilling of steel and stainless steel with a micro-grain carbide substrate

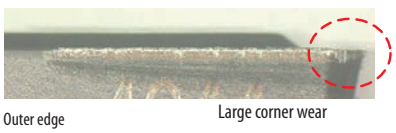
PR1210 Highly efficient stable drilling of gray and nodular cast iron with a special carbide substrate

Coating properties



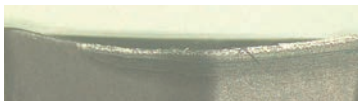
Wear comparison (Internal evaluation)





Outer edge

Large corner wear



Outer edge

Inner edge

Competitor B

Inner edge

DRXR

How to select ZXMT03 type

1) For outer edge, please select "-E" insert from three different chipbreakers for each application.
2) For inner edge, please select "-I" insert (GM chipbreaker only).

Outer edge

ZXMT030203○○-E

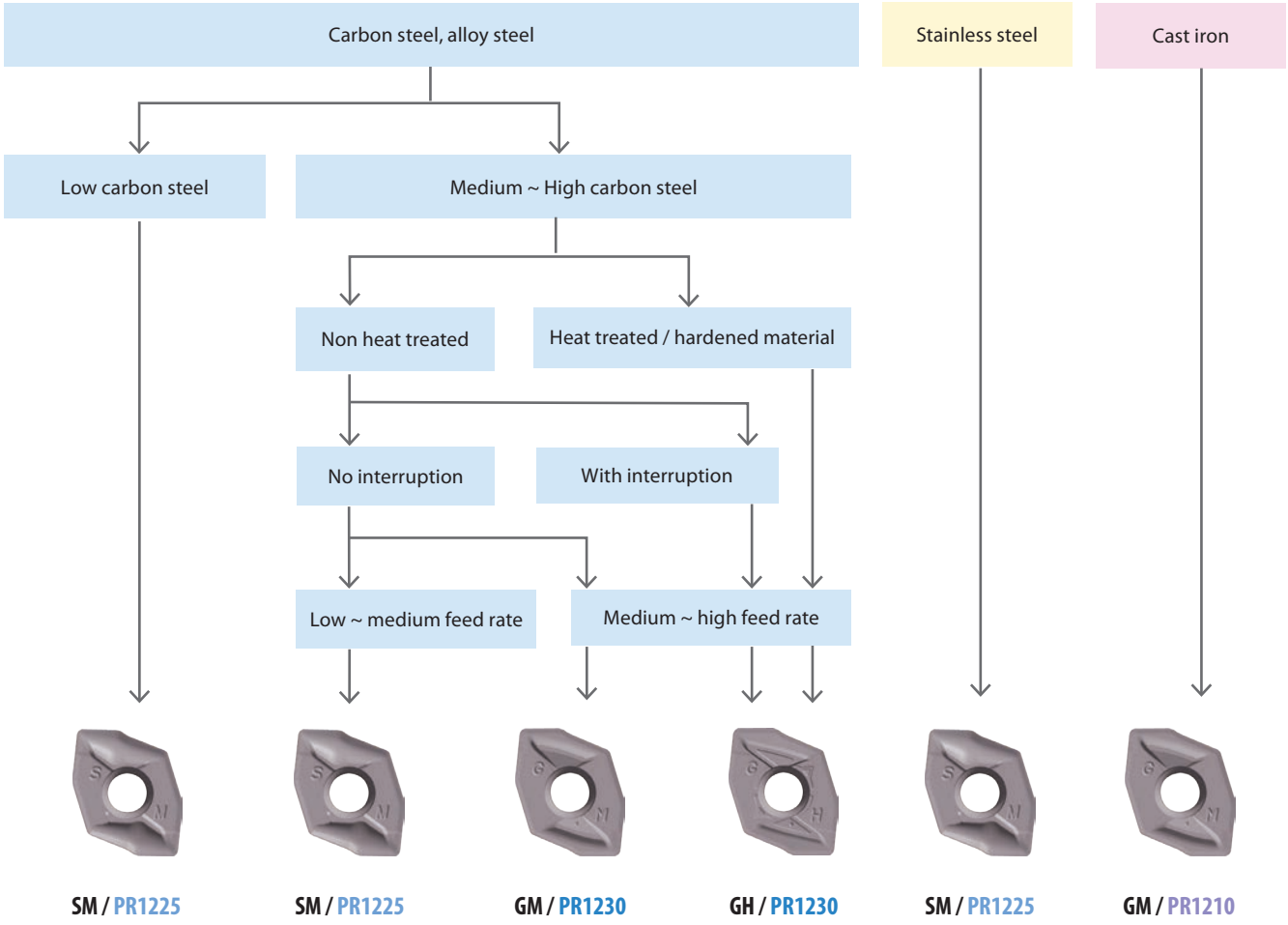
GM-E GH-E SM-E

Inner edge

ZXMT030203GM-I

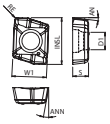
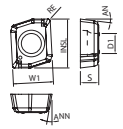
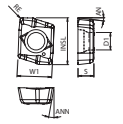
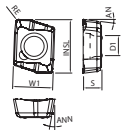
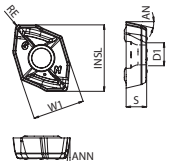
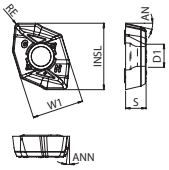
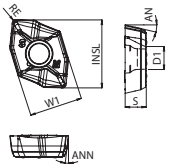
GM-I

Chipbreaker selection



Applicable inserts

Usage classification									
★ : 1st Recommendation (High speed and highly efficient machining) ☆ : 2nd Recommendation (Stable machining oriented)	P	Carbon steel, alloy steel	★	☆		
		Tool steel	★			
	M	Stainless steel	☆	★		
	K	Cast iron			★	
	N	Non-ferrous material				★

Shape		Description		Dimension (mm)					Angle (°)		MEGACOAT			Uncoated carbide
				INSL	S	D1	W1	RE	AN	ANN	PR1230	PR1225	PR1210	GW15
 For outer edge		ZXMT	030203GM-E	6.5	2.30	2.4	4.8	0.3	7°	10°	●		●	
 For inner edge		ZXMT	030203GM-I	5.9	2.30	2.4	4.8	0.3	7°	10°	●	●	●	●
 For outer edge		ZXMT	030203GH-E	6.5	2.30	2.4	4.8	0.3	7°	10°	●			
 For outer edge		ZXMT	030203SM-E	6.5	2.30	2.4	4.8	0.3	7°	10°		●		●
		ZXMT	040203GM	6.2	2.60	2.4	5.1	0.3	13°	10°	●		●	
			05T203GM	7.3	2.74	2.5	5.5	0.3		7°	●		●	
			06T204GM	8.6	2.89	2.8	6.4	0.4			●		●	
			070305GM	10.2	3.24	3.0	8.0	0.5			●		●	
			09T306GM	12.2	4.03	3.6	9.6	0.6			●		●	
			11T306GM	14.5	4.06	4.6	11.6	0.6			●		●	
			140408GM	18.0	4.88	5.7	14.4	0.8			●		●	
			170608GM	22.1	6.58	6.8	17.7	0.8			●		●	
		ZXMT	040203GH	6.2	2.60	2.4	5.1	0.3	13°	10°	●			
			05T203GH	7.3	2.74	2.5	5.5	0.3		7°	●			
			06T204GH	8.6	2.89	2.8	6.4	0.4			●			
			070305GH	10.2	3.24	3.0	8.0	0.5			●			
			09T306GH	12.2	4.03	3.6	9.6	0.6			●			
			11T306GH	14.5	4.06	4.6	11.6	0.6			●			
			140408GH	18.0	4.88	5.7	14.4	0.8			●			
			170608GH	22.1	6.58	6.8	17.7	0.8			●			
		ZXMT	040203SM	6.2	2.60	2.4	5.1	0.3	13°	10°		●		●
			05T203SM	7.3	2.74	2.5	5.5	0.3		7°		●		●
			06T204SM	8.6	2.89	2.8	6.4	0.4				●		●
			070305SM	10.2	3.24	3.0	8.0	0.5				●		●
			09T306SM	12.2	4.03	3.6	9.6	0.6				●		●
			11T306SM	14.5	4.06	4.6	11.6	0.6				●		●
			140408SM	18.0	4.88	5.7	14.4	0.8				●		●
			170608SM	22.1	6.58	6.8	17.7	0.8				●		●

● : Available

Suitable chipbreaker (ZXMT type)

Workpiece material	Insert type	ZXMT											
	Chipbreaker	GM				GH				SM			
	Drilling depth	2D	3D	4D	5D	2D	3D	4D	5D	2D	3D	4D	5D
Low carbon steel (St 44-2, C15, 15CrMo5, 15Cr3)		☆	☆	☆	☆					★	★	★	★
Carbon steel (C45)		★	★	★	☆	☆	☆	☆	☆	☆	☆	☆	★
Alloy steel (42CrMo4, 37Cr4)		★	★	★	☆	☆	☆	☆	☆	☆	☆	☆	★
Tool steel (X100CrMoV5))		☆	☆	☆	☆	★	★	★	★				
Stainless steel (X5CrNi189, X6Cr17, X105CrMo17)										★	★	★	★

Workpiece material	Insert type	ZXMT											
	Chipbreaker	GM				GH				SM			
	Drilling depth	2D	3D	4D	5D	2D	3D	4D	5D	2D	3D	4D	5D
Cast iron (GG-25,)		★	★	★	★								
Aluminum alloy (AlCCuMg1, A1Mg2.5)										★	★	★	★
Brass										★	★	★	★
Titanium alloy										★	★	★	★

DRXR toolholder line up (2xD) Drilling diameter ø12~ø40

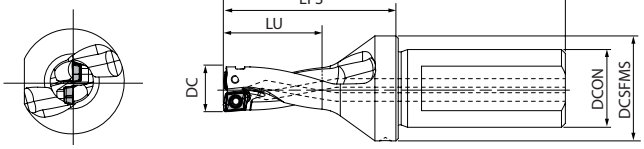


Fig.1

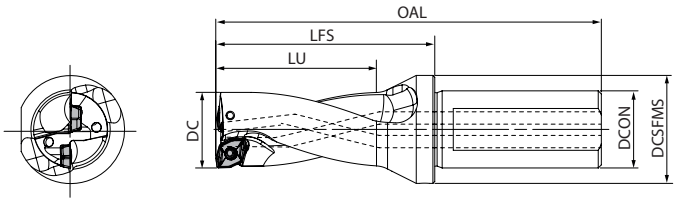


Fig.2

Toolholder dimensions 2D

Description	Availability	No. of inserts	Dimension (mm)						Drawing	Max. offset (Radial) (mm)	Machining hole tolerance* (mm)	Spare parts		Applicable insert
			øDC	OAL	LFS	LU	DCON	DCSFMS				Clamp screw	Wrench	
S20- DRXR120M-2-03	●	2	12	88	45	24	20	27	Fig.1	+0.5	+0.20 – 0.10	SB-2042TRG	FT-06-U	ZXMT030203○○-E (External) ZXMT030203GM-I (Internal)
DRXR130M-2-03	●		13	90	47	26				+0.3				
DRXR140M-2-04	●		14	92	49	28			Fig.2	+0.4				ZXMT040203○○
DRXR150M-2-04	●		15	94	51	30				+0.2				
S25- DRXR160M-2-05	●	2	16	110	56	32	25	32	Fig.2	+0.7		SB-2045TR	FT-06-U	ZXMT05T203○○
DRXR170M-2-05	●		17	112	58	34				+0.4				
DRXR180M-2-05	●		18	114	60	36				+0.2				
DRXR190M-2-06	●		19	113	59	38				+0.8		SB-2250TR	FT-07-U	ZXMT06T204○○
DRXR200M-2-06	●		20	115	61	40				+0.5				
DRXR210M-2-06	●		21	117	63	42				+0.3				
DRXR220M-2-07	●		22	119	65	44	25	35	Fig.2	+1.2		SB-2570TR	FT-08-U	ZXMT070305○○
DRXR230M-2-07	●		23	121	67	46				+0.9				
DRXR240M-2-07	●		24	123	69	48				+0.7				
DRXR250M-2-07	●		25	125	71	50				+0.4				
DRXR260M-2-07	●		26	127	73	52				+0.2				
S32- DRXR270M-2-09	●	2	27	136	77	54	32	42	Fig.2	+1.6	+0.25 – 0.15	SB-3080TR	FT-10-U	ZXMT09T306○○
DRXR280M-2-09	●		28	138	79	56				+1.3				
DRXR290M-2-09	●		29	140	81	58				+1.1				
DRXR300M-2-09	●		30	142	83	60				+0.8				
DRXR310M-2-09	●		31	144	85	62				+0.6				
S40- DRXR320M-2-11	●	2	32	169	100	64	40	50	Fig.2	+2.2		SB-4085TR	FT-15-U	ZXMT11T306○○
DRXR330M-2-11	●		33	171	102	66				+1.9				
DRXR340M-2-11	●		34	173	104	68				+1.7				
DRXR350M-2-11	●		35	175	106	70				+1.4				
DRXR360M-2-11	●		36	177	108	72				+1.2				
DRXR370M-2-11	●		37	179	110	74				+0.9				
DRXR380M-2-11	●		38	181	112	76				+0.7				
DRXR390M-2-14	●		39	179	110	78		55	Fig.2	+2.8	+0.30 – 0.20	SB-5085TR	FT-20-U	ZXMT140408 ○○
DRXR400M-2-14	●		40	181	112	80				+2.5				

When offset machining, reduce feed rate to 0.08 mm/rev. or less. See page 13 for adjustable sleeve SHE.

● : Available

*Tolerance is for reference only. It depends on machine, workpiece material, clamping and cutting condition etc.

Recommended cutting conditions: Page 12
Trouble shooting: Page 11

DRXR toolholder line up (3xD) Drilling diameter ø12~ø40

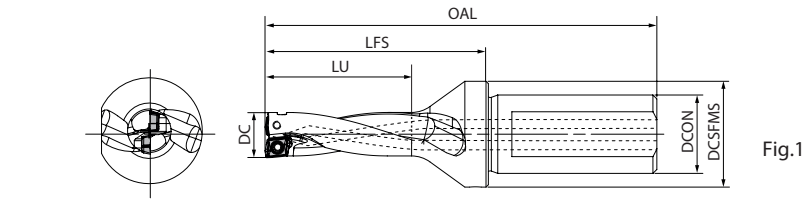


Fig.1

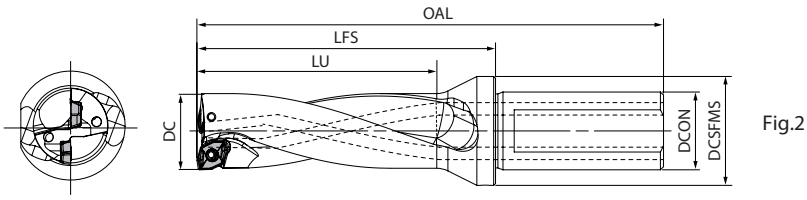


Fig.2

Toolholder dimensions 3D

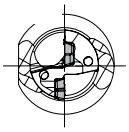
Description	Availability	No. of inserts	Dimension (mm)						Drawing	Max. offset (Radial) (mm)	Machining hole tolerance* (mm)	Spare parts		Applicable insert
			øDC	OAL	LFS	LU	DCON	DCSFMS				Clamp screw	Wrench	
S20- DRXR120M-3-03	●	2	12	100	57	36	20	27	Fig.1	+0.5	+0.20 – 0.10	SB-2042TRG	FT-06-U	ZXMT030203○○-E (External) ZXMT030203GM-I (Internal)
DRXR125M-3-03	●		12.5	102	59	37.5				+0.4				
DRXR130M-3-03	●		13	103	60	39				+0.3				
DRXR135M-3-04	●	2	13.5	105	62	40.5	20	27	Fig.2	+0.5		SB-2042TRG	FT-06-U	ZXMT040203○○
DRXR140M-3-04	●		14	106	63	42				+0.4				
DRXR145M-3-04	●		14.5	108	65	43.5				+0.3				
DRXR150M-3-04	●		15	109	66	45				+0.2				
S25- DRXR155M-3-05	●	2	15.5	124	70	46.5	25	32	Fig.2	+0.8		SB-2045TR	FT-06-U	ZXMT05T203○○
DRXR160M-3-05	●		16	126	72	48				+0.7				
DRXR165M-3-05	●		16.5	127	73	49.5				+0.5				
DRXR170M-3-05	●		17	129	75	51				+0.4				
DRXR175M-3-05	●		17.5	130	76	52.5				+0.3				
DRXR180M-3-05	●		18	132	78	54				+0.2				
DRXR185M-3-06	●	2	18.5	131	77	55.5	25	32	Fig.2	+0.9		SB-2250TR	FT-07-U	ZXMT06T204○○
DRXR190M-3-06	●		19	132	78	57				+0.8				
DRXR195M-3-06	●		19.5	134	80	58.5				+0.7				
DRXR200M-3-06	●		20	135	81	60				+0.5				
DRXR205M-3-06	●		20.5	137	83	61.5				+0.4				
DRXR210M-3-06	●		21	138	84	63				+0.3				
DRXR215M-3-06	●		21.5	140	86	64.5				+0.2				
DRXR220M-3-07	●	2	22	141	87	66	25	35	Fig.2	+1.2		SB-2570TR	FT-08-U	ZXMT070305○○
DRXR225M-3-07	●		22.5	142	88	67.5				+1.0				
DRXR230M-3-07	●		23	144	90	69				+0.9				
DRXR235M-3-07	●		23.5	145	91	70.5				+0.8				
DRXR240M-3-07	●		24	147	93	72				+0.7				
DRXR245M-3-07	●		24.5	148	94	73.5				+0.5				
DRXR250M-3-07	●		25	150	96	75				+0.4				
DRXR255M-3-07	●		25.5	151	97	76.5				+0.3				
DRXR260M-3-07	●		26	153	99	78				+0.2				
S32- DRXR265M-3-09	●	2	26.5	161	102	79.5	32	42	Fig.2	+1.7	+0.25 – 0.15	SB-3080TR	FT-10-U	ZXMT09T306○○
DRXR270M-3-09	●		27	163	104	81				+1.6				
DRXR275M-3-09	●		27.5	164	105	82.5				+1.5				
DRXR280M-3-09	●		28	166	107	84				+1.3				
DRXR285M-3-09	●		28.5	167	108	85.5				+1.2				
DRXR290M-3-09	●		29	169	110	87				+1.1				
DRXR295M-3-09	●		29.5	170	111	88.5			Fig.2	+1.1				
DRXR300M-3-09	●		30	172	113	90				+0.8				
DRXR305M-3-09	●		30.5	173	114	91.5				+0.7				
DRXR310M-3-09	●		31	175	116	93				+0.6				
DRXR315M-3-09	●		31.5	176	117	94.5				+0.5				
S40- DRXR320M-3-11	●	2	32	201	132	96	40	50	Fig.2	+2.2		SB-4085TR	FT-15-U	ZXMT11T306○○
DRXR330M-3-11	●		33	204	135	99				+1.9				
DRXR340M-3-11	●		34	207	138	102				+1.7				
DRXR350M-3-11	●		35	210	141	105				+1.4				
DRXR360M-3-11	●		36	213	144	108		55	Fig.2	+1.2				
DRXR370M-3-11	●		37	216	147	111				+0.9				
DRXR380M-3-11	●		38	219	150	114				+0.7				
DRXR390M-3-14	●		39	218	149	117				+2.8			FT-20-U	
DRXR400M-3-14	●		40	221	152	120				+2.5				

When offset machining, reduce feed rate to 0.08 mm/rev. or less. See page 13 for adjustable sleeve SHE.
*Tolerance is for reference only. It depends on machine, workpiece material, clamping and cutting condition etc.

● : Available

Recommended cutting conditions: Page 12
Trouble shooting: Page 11

DRXR toolholder line up (4xD) Drilling diameter ø 12~ø 40



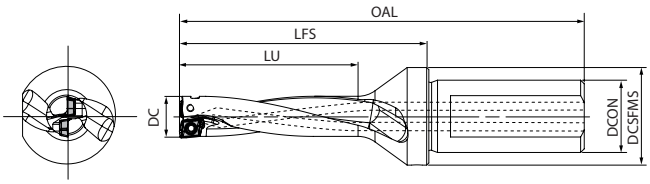


Fig.1

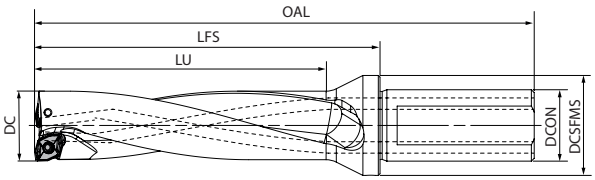


Fig.2

Toolholder dimensions 4D

Description	Availability	No. of inserts	Dimension (mm)						Drawing	Max. offset (Radial) (mm)	Machining hole tolerance* (mm)	Spare parts		Applicable insert
			øDC	OAL	LFS	LU	DCON	DCSFMS				Clamp screw	Wrench	
S20-DRXR120M-4-03	●	2	12	112	69	48	20	27	Fig.1	+0.5	+0.25 – 0.10	SB-2042TRG	FT-06-U	ZXMT030203○○-E (External) ZXMT030203GM-I (Internal)
DRXR125M-4-03	●		12.5	114	71	50				+0.4				
DRXR130M-4-03	●		13	116	73	52				+0.3				
DRXR135M-4-04	●	2	13.5	118	75	54	20	27	Fig.2	+0.5		SB-2042TRG	FT-06-U	ZXMT040203○○
DRXR140M-4-04	●		14	120	77	56				+0.4				
DRXR145M-4-04	●		14.5	122	79	58				+0.3				
DRXR150M-4-04	●		15	124	81	60				+0.2				
S25-DRXR155M-4-05	●	2	15.5	140	86	62	25	32	Fig.2	+0.8		SB-2045TR	FT-06-U	ZXMT05T203○○
DRXR160M-4-05	●		16	142	88	64				+0.7				
DRXR165M-4-05	●		16.5	144	90	66				+0.5				
DRXR170M-4-05	●		17	146	92	68				+0.4				
DRXR175M-4-05	●		17.5	148	94	70				+0.3				
DRXR180M-4-05	●		18	150	96	72				+0.2				
DRXR185M-4-06	●	2	18.5	149	95	74	25	32	Fig.2	+0.9		SB-2250TR	FT-07-U	ZXMT06T204○○
DRXR190M-4-06	●		19	151	97	76				+0.8				
DRXR195M-4-06	●		19.5	153	99	78				+0.7				
DRXR200M-4-06	●		20	155	101	80				+0.5				
DRXR205M-4-06	●		20.5	157	103	82				+0.4				
DRXR210M-4-06	●		21	159	105	84				+0.3				
DRXR215M-4-06	●		21.5	161	107	86				+0.2				
DRXR220M-4-07	●	2	22	163	109	88	25	35	Fig.2	+1.2		SB-2570TR	FT-08-U	ZXMT070305○○
DRXR225M-4-07	●		22.5	165	111	90				+1.0				
DRXR230M-4-07	●		23	167	113	92				+0.9				
DRXR235M-4-07	●		23.5	169	115	94				+0.8				
DRXR240M-4-07	●		24	171	117	96				+0.7				
DRXR245M-4-07	●		24.5	173	119	98				+0.5				
DRXR250M-4-07	●		25	175	121	100				+0.4				
DRXR255M-4-07	●		25.5	177	123	102				+0.3				
DRXR260M-4-07	●		26	179	125	104				+0.2				
S32-DRXR270M-4-09	●		27	190	131	108	32	42	Fig.2	+1.6	+0.30 – 0.15	SB-3080TR	FT-10-U	ZXMT09T306○○
DRXR280M-4-09	●		28	194	135	112				+1.3				
DRXR290M-4-09	●		29	198	139	116				+1.1				
DRXR300M-4-09	●		30	202	143	120		45	Fig.2	+0.8				
DRXR310M-4-09	●		31	206	147	124				+0.6				
S40-DRXR320M-4-11	●	2	32	223	154	128	40	50	Fig.2	+2.2		SB-4085TR	FT-15-U	ZXMT11T306○○
DRXR330M-4-11	●		33	227	158	132				+1.9				
DRXR340M-4-11	●		34	231	162	136				+1.7				
DRXR350M-4-11	●		35	235	166	140				+1.4				
DRXR360M-4-11	●		36	239	170	144				+1.2				
DRXR370M-4-11	●		37	243	174	148				+0.9				
DRXR380M-4-11	●		38	247	178	152				+0.7				
DRXR390M-4-14	●		39	257	188	156		55	Fig.2	+2.8	+0.35 – 0.20	SB-5085TR	FT-20-U	ZXMT140408○○
DRXR400M-4-14	●		40	261	192	160				+2.5				

When offset machining, reduce feed rate to 0.06 mm/rev. or less. See page 13 for adjustable sleeve SHE.

● : Available

*Tolerance is for reference only. It depends on machine, workpiece material, clamping and cutting condition etc.

Recommended cutting conditions: Page 12
Trouble shooting: Page 11

DRXR toolholder line up (5xD) Drilling diameter ø12~ø40

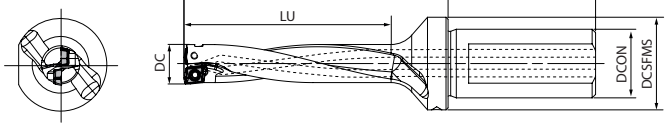


Fig.1

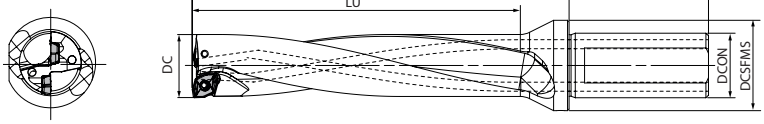


Fig.2

Toolholder dimensions 5D

Description	Availability	No. of inserts	Dimension (mm)						Drawing	Max. offset (Radial) (mm)	Machining hole tolerance* (mm)	Spare parts		Applicable insert
			øDC	OAL	LFS	LU	DCON	DCSFMS				Clamp screw	Wrench	
S20- DRXR120M-5-03	●	2	12	120	77	60	20	27	Fig. 1	+0.5	+0.30 −0.10	SB-2042TRG	FT-06-U	ZXMT030203○○-E (External) ZXMT030203GM-I (Internal)
DRXR130M-5-03	●		13	125	82	65				+0.3				
DRXR140M-5-04	●	2	14	134	91	70	20	27	Fig. 2	+0.4		SB-2042TRG	FT-06-U	ZXMT040203○○
DRXR150M-5-04	●		15	139	96	75				+0.2				
S25- DRXR160M-5-05	●	2	16	158	104	80	25	32	Fig. 2	+0.7		SB-2045TR	FT-06-U	ZXMT05T203○○
DRXR170M-5-05	●		17	163	109	85				+0.4				
DRXR180M-5-05	●		18	168	114	90				+0.2				
DRXR190M-5-06	●	2	19	170	116	95				+0.8		SB-2250TR	FT-07-U	ZXMT06T204○○
DRXR200M-5-06	●		20	175	121	100				+0.5				
DRXR210M-5-06	●		21	180	126	105				+0.3				
DRXR220M-5-07	●	2	22	185	131	110	25	35	Fig. 2	+1.2		SB-2570TR	FT-08-U	ZXMT070305○○
DRXR230M-5-07	●		23	190	136	115				+0.9				
DRXR240M-5-07	●		24	195	141	120				+0.7				
DRXR250M-5-07	●		25	200	146	125				+0.4				
DRXR260M-5-07	●		26	205	151	130				+0.2				
S32- DRXR270M-5-09	●	2	27	217	158	135	32	42	Fig. 2	+1.6		SB-3080TR	FT-10-U	ZXMT09T306○○
DRXR280M-5-09	●		28	222	163	140				+1.3				
DRXR290M-5-09	●		29	227	168	145				+1.1				
DRXR300M-5-09	●		30	232	173	150				+0.8				
DRXR310M-5-09	●		31	237	178	155				+0.6				
S40- DRXR320M-5-11	●	2	32	255	186	160	40	50	Fig. 2	+2.2	+0.35 −0.15	SB-4085TR	FT-15-U	ZXMT11T306○○
DRXR330M-5-11	●		33	260	191	165				+1.9				
DRXR340M-5-11	●		34	265	196	170				+1.7				
DRXR350M-5-11	●		35	270	201	175				+1.4				
DRXR360M-5-11	●		36	275	206	180				+1.2				
DRXR370M-5-11	●		37	280	211	185				+0.9				
DRXR380M-5-11	●		38	285	216	190				+0.7				
DRXR390M-5-14	●	2	39	296	227	195		55	Fig. 2	+2.8	+0.40 −0.20	SB-5085TR	FT-20-U	ZXMT140408○○
DRXR400M-5-14	●		40	301	232	200				+2.5				

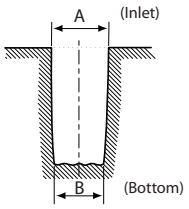
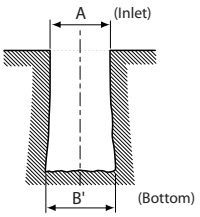
When offset machining, reduce feed rate to 0.05 mm/rev. or less. See page 13 for adjustable sleeve SHE.

● : Available

*Tolerance is for reference only. It depends on machine, workpiece material, clamping and cutting condition etc.

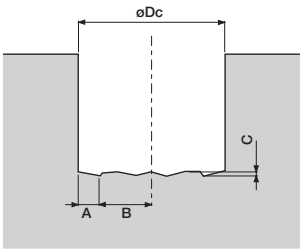
Recommended cutting conditions: Page 12
Trouble shooting: Page 11

Trouble shooting

Problem	Details		Cause	Countermeasure
Hole diameter become smaller at hole bottom		No problem at hole inlet, but hole diameter decreases gradually. A>B	Clogged chip from inner and outer edge.	Change the cutting conditions • Increase the cutting speed • Reduce the feed rate See "Recommended cutting conditions" on page 12.
Hole diameter become larger at hole bottom		No problem at hole inlet, but hole diameter increases gradually. A<B'	Clogged chip from inner edge.	Change the cutting conditions • Increase the cutting speed • Reduce the feed rate See "Recommended cutting conditions" on page 12. • Check the center height See page 13
Hole diameter become smaller from the hole inlet		Hole diameter become smaller from inlet. (at stationary drilling)	Improper cutting dia. adjustment.	When using with lathe, adjust the hole dia. by moving the tool in X-axis direction. See page 14 - 15
			Inner insert is above the center (no core remains).	Adjust the center height. See page 14

Hole bottom shape (mm)

øDc	A	B	C	øDc	A	B	C	øDc	A	B	C
12.0	1.8	4.2	0.5	20.5	2.4	7.9	0.7	29.0	3.9	10.6	1.0
12.5		4.5		21.0		8.1	0.8	29.5		10.9	
13.0		4.7		21.5		8.4		30.0		11.1	1.1
13.5	2	4.8	0.5	22.0	3.2	7.8		30.5		11.4	
14.0		5.0		22.5		8.1		31.0		11.6	
14.5		5.3		23.0		8.3		31.5		11.9	1.2
15.0		5.5		23.5		8.6		32.0	4.7	11.3	1.1
15.5		5.8	0.6	24.0		8.8		33.0		11.8	
16.0		6.0		24.5		9.1		34.0		12.3	
16.5		6.3		25.0		9.3	0.9	35.0		12.8	
17.0		6.5		25.5		9.6		36.0		13.3	1.2
17.5		6.8		26.0		9.8		37.0		13.8	1.3
18.0		7.0	0.7	26.5	3.9	9.4	1.0	38.0		14.3	
18.5	2.4	6.9	0.7	27.0		9.6		39.0	5.8	13.7	1.5
19.0		7.1		27.5		9.9		40.0		14.2	
19.5		7.4		28.0		10.1					
20.0		7.6		28.5		10.4					



Available for 2xD, 3xD, 4xD, 5xD. Figures above are nominal sizes (varies from -0.1 mm to +0.1 mm depending on workpiece material and cutting conditions).

Recommended cutting conditions (with coolant) ★ 1st Recommendation ☆ 2nd Recommendation

Workpiece material	Recommended insert grades (Vc=m/min)				Cutting dia. (mm)	Toolholder type								
	MEGACOAT			Carbide		2D ~ 3D			4D			5D		
	PR1230	PR1225	PR1210	GW15		f (mm/rev)								
	GM GH	SM	GM	SM		GM	GH	SM	GM	GH	SM	GM	GH	SM
Low carbon steel	☆ 120 - 240	★ 120 - 240			ø12 ~ ø15	0.06~0.10	0.06~0.10	0.04~0.10	0.05~0.08	0.05~0.08	0.04~0.08	0.04~0.06	0.04~0.06	0.04~0.07
					ø15.5 ~ ø18	0.06~0.12	0.06~0.12	0.06~0.12	0.05~0.10	0.05~0.10	0.05~0.10	0.05~0.08	0.05~0.08	0.04~0.09
					ø18.5 ~ ø26	0.08~0.14	0.08~0.14	0.06~0.14	0.06~0.12	0.08~0.12	0.05~0.12	0.06~0.10	0.06~0.10	0.04~0.10
					ø26.5 ~ ø40	0.08~0.14	0.08~0.14	0.06~0.14	0.06~0.12	0.08~0.12	0.05~0.12	0.06~0.10	0.06~0.10	0.04~0.10
Carbon steel	★ 100 - 180	☆ 100 - 180			ø12 ~ ø15	0.04~0.14	0.04~0.14	0.04~0.10	0.04~0.10	0.04~0.10	0.04~0.08	0.04~0.06	0.04~0.06	0.04~0.06
					ø15.5 ~ ø18	0.06~0.16	0.06~0.16	0.06~0.12	0.05~0.12	0.05~0.12	0.05~0.10	0.05~0.10	0.05~0.10	0.05~0.08
					ø18.5 ~ ø26	0.08~0.20	0.08~0.20	0.06~0.14	0.07~0.16	0.07~0.16	0.05~0.12	0.06~0.12	0.06~0.12	0.05~0.10
					ø26.5 ~ ø40	0.08~0.20	0.08~0.20	0.06~0.14	0.07~0.16	0.07~0.16	0.05~0.12	0.06~0.12	0.06~0.12	0.05~0.10
Alloy steel	★ 100 - 160	☆ 100 - 160			ø12 ~ ø15	0.04~0.14	0.04~0.14	0.04~0.10	0.04~0.10	0.04~0.10	0.04~0.08	0.04~0.06	0.04~0.06	0.04~0.06
					ø15.5 ~ ø18	0.06~0.16	0.06~0.16	0.06~0.12	0.05~0.12	0.05~0.12	0.05~0.10	0.05~0.10	0.05~0.10	0.05~0.08
					ø18.5 ~ ø26	0.08~0.20	0.08~0.20	0.06~0.14	0.07~0.16	0.07~0.16	0.05~0.12	0.06~0.12	0.06~0.12	0.05~0.10
					ø26.5 ~ ø40	0.08~0.20	0.08~0.20	0.06~0.14	0.07~0.16	0.07~0.16	0.05~0.12	0.06~0.12	0.06~0.12	0.05~0.10
Tool steel	★ 80 - 150	☆ 80 - 150			ø12 ~ ø15	0.04~0.08	0.04~0.08	0.04~0.08	0.04~0.07	0.04~0.07	0.04~0.07	0.03~0.05	0.03~0.05	0.03~0.05
					ø15.5 ~ ø18	0.06~0.12	0.06~0.12	0.06~0.10	0.05~0.10	0.05~0.10	0.05~0.08	0.04~0.08	0.04~0.08	0.04~0.07
					ø18.5 ~ ø26	0.08~0.15	0.08~0.15	0.06~0.12	0.06~0.12	0.06~0.12	0.06~0.10	0.05~0.10	0.05~0.10	0.05~0.08
					ø26.5 ~ ø40	0.08~0.15	0.08~0.15	0.06~0.12	0.06~0.12	0.06~0.12	0.06~0.10	0.05~0.10	0.05~0.10	0.05~0.08
Stainless steel (Austenitic related)	☆ 70 - 140	★ 70 - 140			ø12 ~ ø15	0.06~0.10	0.06~0.10	0.04~0.10	0.05~0.08	0.05~0.08	0.04~0.08	0.04~0.06	0.04~0.06	0.04~0.07
					ø15.5 ~ ø18	0.06~0.10	0.06~0.10	0.06~0.12	0.05~0.08	0.05~0.08	0.05~0.11	0.04~0.07	0.04~0.07	0.04~0.10
					ø18.5 ~ ø26	0.08~0.12	0.08~0.12	0.06~0.14	0.07~0.10	0.07~0.10	0.06~0.12	0.07~0.10	0.07~0.10	0.06~0.12
					ø26.5 ~ ø40	0.08~0.12	0.08~0.12	0.06~0.14	0.07~0.10	0.07~0.10	0.06~0.12	0.07~0.10	0.07~0.10	0.06~0.12
Gray cast iron			★ 100 - 150		ø12 ~ ø15	0.08~0.14			0.06~0.12			0.04~0.10		
					ø15.5 ~ ø18	0.08~0.18			0.08~0.16			0.06~0.12		
					ø18.5 ~ ø26	0.08~0.20			0.08~0.18			0.06~0.14		
					ø26.5 ~ ø40	0.08~0.20			0.08~0.18			0.06~0.14		
Nodular cast iron			★ 80 - 120		ø12 ~ ø15	0.08~0.12			0.06~0.10			0.04~0.08		
					ø15.5 ~ ø18	0.08~0.16			0.08~0.14			0.06~0.10		
					ø18.5 ~ ø26	0.08~0.18			0.08~0.16			0.06~0.12		
					ø26.5 ~ ø40	0.08~0.18			0.08~0.16			0.06~0.12		
Non-ferrous metals				★ 200 - 600	ø12 ~ ø15			0.06~0.12			0.05~0.10			0.04~0.07
					ø15.5 ~ ø18			0.08~0.14			0.06~0.12			0.05~0.10
					ø18.5 ~ ø26			0.08~0.16			0.06~0.14			0.05~0.12
					ø26.5 ~ ø40			0.08~0.20			0.08~0.16			0.07~0.14
Titanium alloys				★ 40 - 70	ø12 ~ ø15			0.05~0.08			0.04~0.07			0.04~0.06
					ø15.5 ~ ø18			0.05~0.08			0.04~0.07			0.04~0.06
					ø18.5 ~ ø26			0.06~0.10			0.06~0.08			0.05~0.07
					ø26.5 ~ ø40			0.06~0.10			0.06~0.08			0.05~0.07

Cutting conditions by application

(Material: Steel)

Application		Plain surface	Slant surface	Half cylindrical	Hole expansion	Concave surface	Pre-drilled surface	Stacked plates
Shape of workpiece								
DRXR type	Cutting speed (mm/min)	120	120	120	120	120	120	Not available
	Feed rate (mm/rev)	0.1	0.05	0.05	0.05	0.05 (concave surface) 0.1 (solid portion)	0.05	
coolant (internal)		Yes	Yes	Yes	Yes	Yes	Yes	

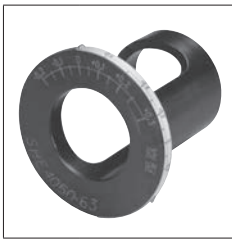
*Cutting width (Torus-shaped part) when machining pre-drilled surface

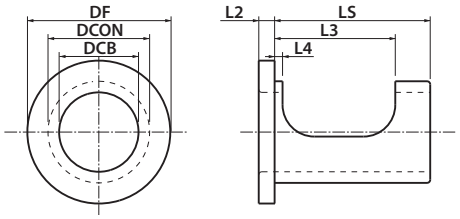
Drill type	2D ~ 3D	4D	5D
Cutting width (Torus-shaped part)	10% of D or smaller	smaller than corner radius	Not recommended

Max. depth with external coolant
When machining with external coolant. Max. depth should be 1.5 times of the cutting diameter.

Adjustable sleeve

SHE type





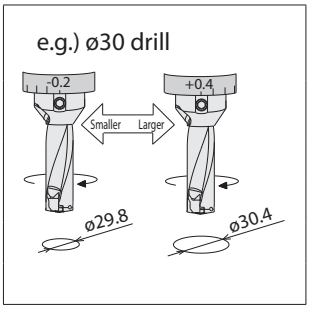
Sleeve dimension

Description		Availability	Dimension(mm)							Dia. adjustment range	Center height adjustment range
			DCB	DCON	DF	LS	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 refer to the cutting diameter.
- SHE type sleeves are only to be used with the Magic Drill (DRV, DRXR and DRZ-type).

● : Available

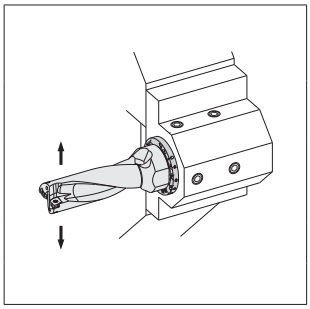
1. Diameter adjustment ~ For machining center ~



Dia. adjustment range (mm)

Shank diameter	Cutting dia.	Adjustment range
ø20	ø12 ~ 15	+0.4 ~ –0.2
ø25	ø15.5 ~ 26	
ø32	ø26.5 ~ 31.5	
ø40	ø32 ~ 60	+0.6 ~ –0.2

2. Center height adjustment ~ Relief troubles by height adjustment at lathes ~



Center height adjustment range (mm)

Shank diameter	Cutting dia.	Adjustment range
ø20	ø12~15	+0.2 ~ –0.15
ø25	ø15.5 ~ 26	
ø32	ø26.5 ~ 31.5	
ø40	ø32 ~ 60	+0.2 ~ –0.2

How to use the adjustable sleeve

Hole diameter adjustment when drilling

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

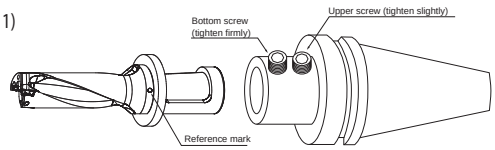


Fig. 1 Fig. 2

Caution:
- Not applicable for Collet Chuck-type arbor.
- Scale on the sleeve is the reference value.
- Check the actual cutting diameter after adjusting.

Center-height adjustment for lathes

1. Most lathe problems occur with center height deviation. The center height is appropriate if a core approximately 0.5 mm diameter remains at the center of the end face. (Fig. 3)
2. Align the drill with the outer insert face parallel to the X-axis of the tool turret. (Fig. 4)
3. Align the scale (for the lathe) on the flange face of the sleeve to the reference mark of the drill.
4. When no core remains, rotate the sleeve to (+) direction to make the core larger, and when the core diameter is more than 1 mm, rotate the sleeve to (-) direction to make the core smaller.
5. When rotating the sleeve, insert the wrench supplied with the drill into the hole at the flange periphery and rotate the sleeve.
6. After completing the adjustment, tighten the drill directly through the window on the sleeve.

Center-height adjustment is necessary if:
No core remains
Core diameter is more than 1 mm

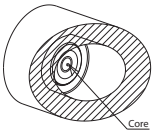


Fig. 3

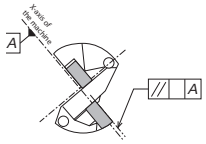


Fig. 4

Note:
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.
2. It is recommended to set the outer insert as shown in Fig.1 with the outer insert facing the operator.(It is also possible to use by setting 180° reverse position). In case of the lathe with two turrets, when installing the drill to the lower turret, the outer insert should be set so as to face the operator. (It is also possible to use it by setting at 180° reverse position)

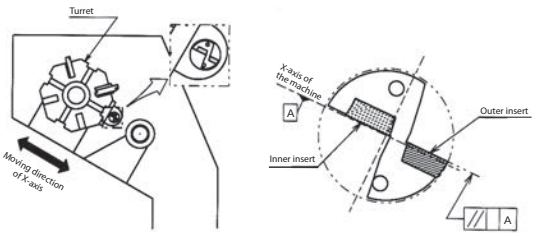


Fig. 1 Installation to the lathe

Center height adjustment

1 Center height of the inner insert

When installing as shown in Fig. 1, the inner insert will be set around 0.2 mm below the center of spindle. (Fig. 5) This is the normal position of the center height and the drill is designed to be handled in this condition. However, in case that the turret of the lathe is out of the center of spindle, sometimes the inner insert may be set above the center, or excessively below the center. For stable machining, it is essential to check the center height carefully.

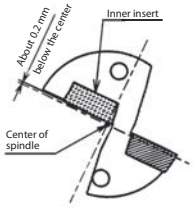


Fig. 5 Front view of the drill

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. (Fig. 6). If the center height is in the normal condition, the core, about 0.5 mm in diameter, will remain after the machining. In the following cases, it is necessary to adjust the center height:

- No core remains
- Core diameter is more than 1 mm.

*To test the center height, drill a shallow hole about 10 mm in depth at low feed rate, less than 0.1 mm/rev.

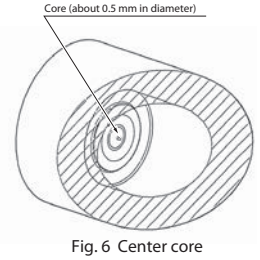


Fig. 6 Center core

3 Center height adjustment

a) No core remains / core with excessively small diameter

This happens when the Inner Insert is set above the center height. In case, adjustment is necessary since insert breakage will be probable at the center of the drill. (Fig. 7)

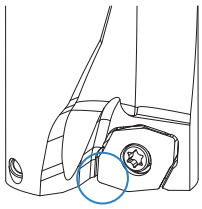


Fig.7 Insert breakage near the center of drill

How to adjust

1. Install the drill rotated 180°. Most problems will be solved by this method. (Fig. 8)
2. 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 insert is positioned lower) and adjust the center height by moving the tool in the X-axis direction. (However, this makes it impossible to adjust the cutting diameter.)

   Caution: In case of installing the drill in the reverse 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 fundamental solution is to readjust the center position of the turret itself.

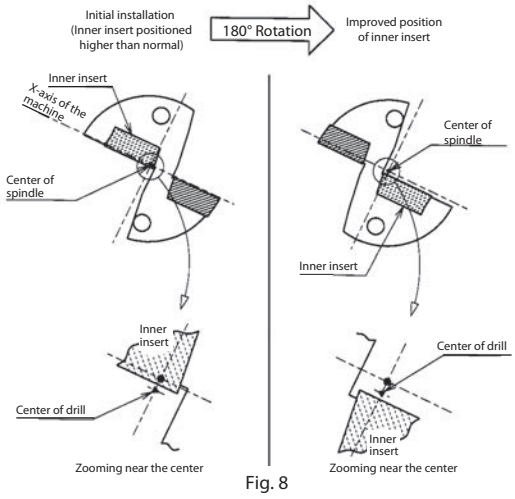
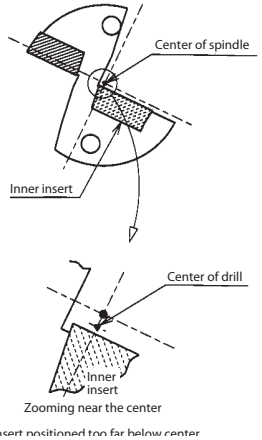


Fig. 8



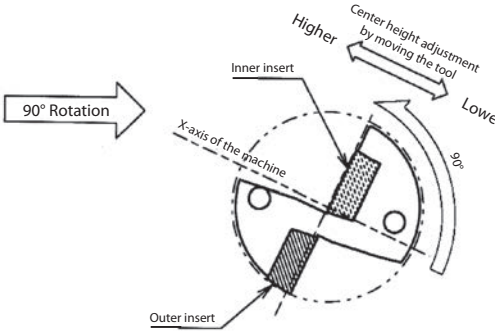


Fig. 9

b) Core with excessively large diameter (more than 1 mm)
This occurs when the inner insert is set excessively below the center. This condition causes poor chip evacuation and on adjustment is required.

How to adjust
Install the drill as shown in Fig.10 (Outer insert is positioned on the upper side), and adjust the center height by moving the tool in the X-axis direction. (However, this makes it impossible to adjust the cutting diameter.)
Caution: When installing the drill in the opposite dierction (outer insert is positioned below), 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.

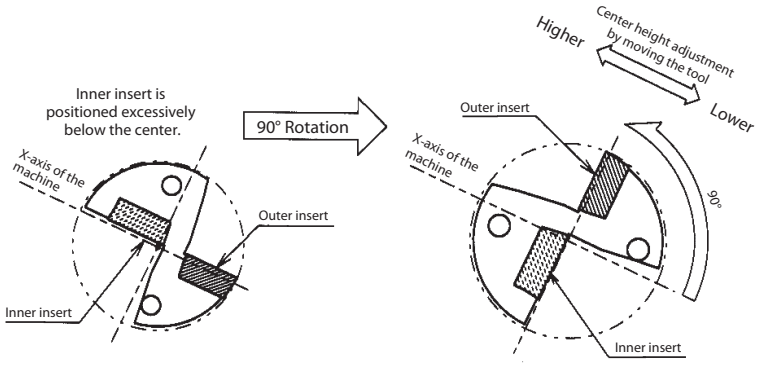


Fig.10

Cutting diameter adjustment

1. The moving direction of the X-axis depends on the position of the toolholder.)
2. In case of 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"). However, be sure not to make the hole diameter smaller than the drill diameter by 0.2 mm or more. Otherwise, the toolholder will interfere with the drilled hole. (Fig. 4) e.g.) in case of using ø20 drill, the hole diameter must not be smaller than 19.8 mm.

Offset limit of the cutting diameter
For the maximum limit of the cutting diameter, refer to "Max. Offset (Radial)" in the toolholder dimension table. (The figure in the table shows how much it is possible the offset the drill in the radial direction.) e.g.) in case of using ø20 drill, it is possible to make a hole up to ø21 since "Max. Offset (Radial)" is +0.5 mm.

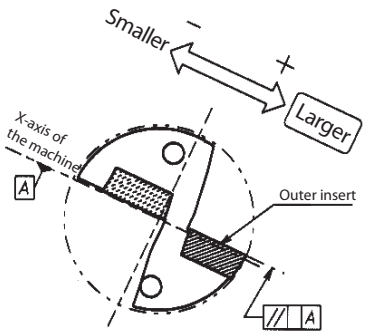


Fig. 2 Outer insert facing up

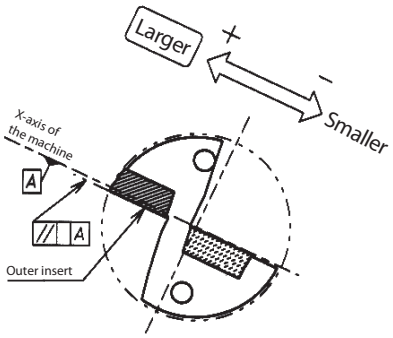


Fig. 3 Outer insert facing down

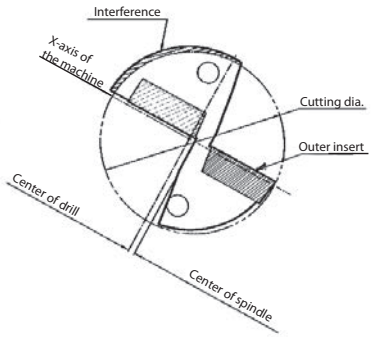


Fig. 4 Excessive offset (for smaller hole diameter)

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