UNITAC

Member IMC Group

Direct Mount deep hole drilling tool

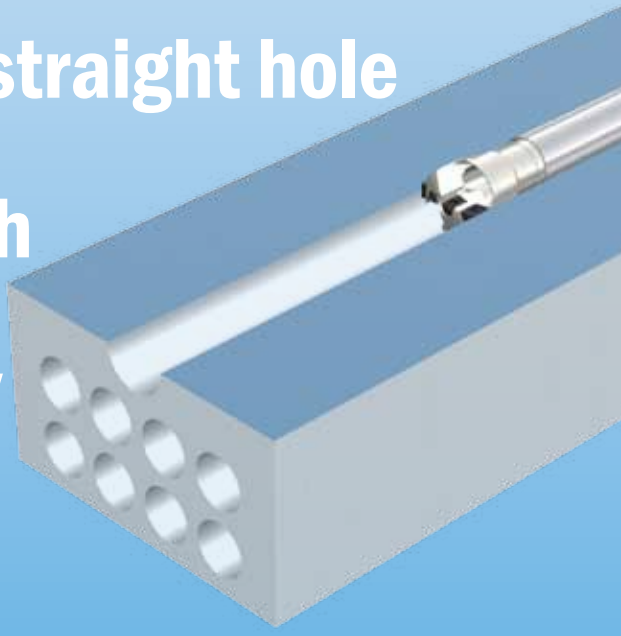
FINE BEAM

NEW

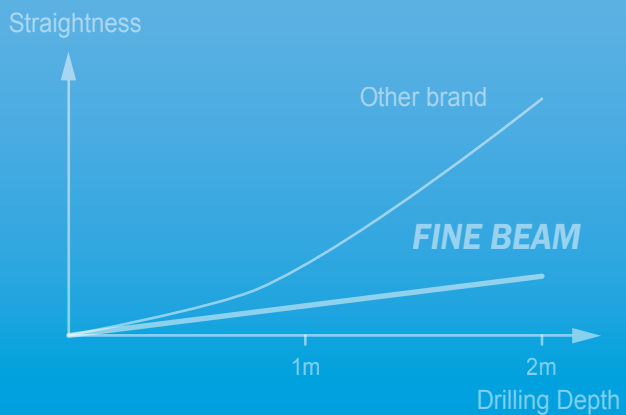
Super straight hole

Excellent surface finish

High productivity



ø 25 ~ 65 mm

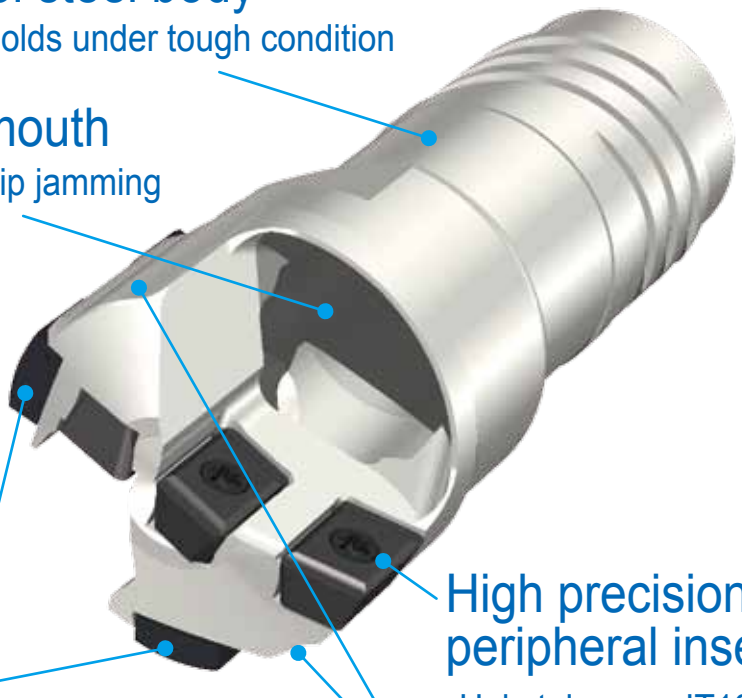


STS Single Tube System

DTS Double Tube System

FINE BEAM

Hole tolerance IT10
Diameter range ø25 ~ 65 mm



Tool steel body
Holds under tough condition

Wide chip mouth
Eliminates chip jamming

High precision peripheral insert (H Class)
Hole tolerance IT10

Precision ground guide pad
- Excellent surface finish
- Good hole straightness

Sufficient Oil Clearance
- Stable chip shape
- Efficient chip evacuation
- Longer tool life of inserts and guide pads

Advantages

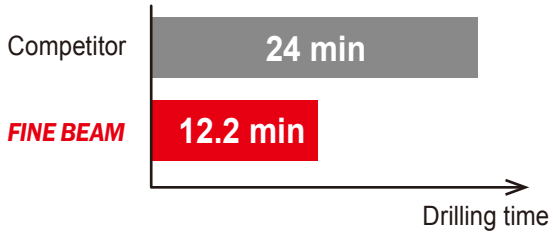
- **Excellent hole accuracy**
  - Hole straightness, Surface finish, Hole diameter
- **High productivity**
- **Easy to use - No diameter setting necessary**
- **Eliminates chip jamming**

Success Case 1 Spindle

High Productivity • **Drilling time reduced by 50%!**

High Accuracy • **Hole straightness improved by 30%!**

Drilling Time



Hole Straightness

Hole Straightness

Competitor	0.26 / 1500 mm
FINE BEAM	Less than 0.2 / 1500 mm

Component	Spindle
Material	Alloyed steel
Application	Solid drilling
Machine	BTA machine
Coolant	Oil based
Tool diameter	32.2 mm
Drilling length	1500 mm

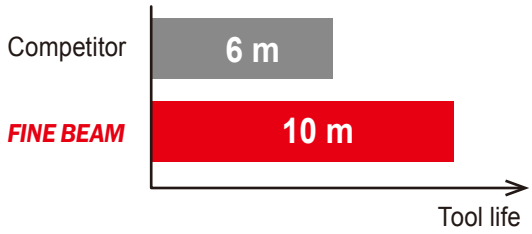
	FINE BEAM	Competitor
Chip Breaker	G	General
Grade (peripheral)	UC2220	ISO P
Cutting Speed Vc	69 m/min	63 m/min
Feed per Revolution fn	0.18 mm/rev	0.1 mm/rev

Success Case 2 Shaft

Economic • **Longer tool life!**

High Accuracy • **Hole straightness improved by 80%!**

Tool Life (Peripheral insert)



Hole Straightness

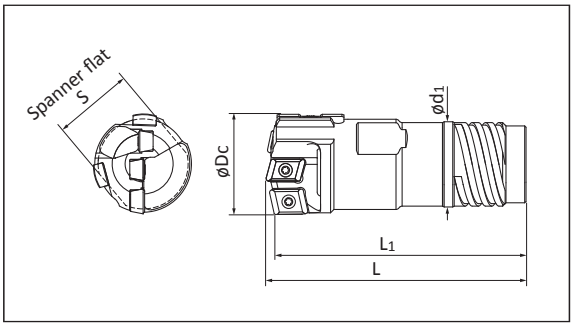
Hole Straightness

Competitor	1.5 / 1000 mm
FINE BEAM	Less than 0.3 / 1000 mm

Component	Shaft
Material	Alloyed steel
Application	Solid drilling
Machine	BTA machine
Coolant	Oil based
Tool diameter	59.75 mm
Drilling length	1000 mm

	FINE BEAM	Competitor
Chip Breaker	G	General
Grade (peripheral)	UC2220	ISO P
Cutting Speed Vc	56 m/min	56 m/min
Feed per Revolution fn	0.16 mm/rev	0.16 mm/rev

FINE BEAM STS Outer Four Start Thread



Drill Head Ordering Code	Diameter øDc (mm)	Drill Tube		Drill Head Dimensions (mm)			
		Ordering Code	Dia. (mm)	L	L_1	d_1	S
FNBM-02S-xx.xx	25.00 - 26.40	ST02	22	73	70	19.5	19
FNBM-03S-xx.xx	26.41 - 28.70	ST03	24	73	70	21	21
FNBM-04S-xx.xx	28.71 - 31.00	ST04	26	78	75	23.5	24
FNBM-05S-xx.xx	31.01 - 33.30	ST05	28	78	75	25.5	26
FNBM-06S-xx.xx	33.31 - 36.20	ST06	30	83	80	28	28
FNBM-07S-xx.xx	36.21 - 39.60	ST07	33	93	90	30	30
FNBM-08S-xx.xx	39.61 - 43.00	ST08	36	99	95	33	32
FNBM-09S-xx.xx	43.01 - 47.00	ST09	39	104	100	36	36
FNBM-10S-xx.xx	47.01 - 51.70	ST10	43	104	100	39	38
FNBM-11S-xx.xx	51.71 - 56.20	ST11	47	114	110	43	46
FNBM-12S-xx.xx	56.21 - 60.60	ST12	51	120	115	47	50
FNBM-13S-xx.xx	60.61 - 65.00	ST13	56	120	115	51	54

Ordering example for DIA=30.00mm : FNBM-04S-30.00

Standard stock (metric)

As of 09-2013

Diameter (mm)	Drill Head Code	Stock
25.00	FNBM-02S-25.00	●
25.40	FNBM-02S-25.40	●
28.00	FNBM-03S-28.00	●
30.00	FNBM-04S-30.00	●
31.75	FNBM-05S-31.75	●
36.50	FNBM-07S-36.50	●
38.00	FNBM-07S-38.00	●
38.10	FNBM-07S-38.10	●
44.45	FNBM-09S-44.45	●
45.00	FNBM-09S-45.00	●
50.00	FNBM-10S-50.00	●
50.80	FNBM-10S-50.80	●
55.55	FNBM-11S-55.55	●
57.15	FNBM-12S-57.15	●
60.00	FNBM-12S-60.00	●
63.50	FNBM-13S-63.50	●
65.00	FNBM-13S-65.00	●

● : Standard stock item

Standard stock (inch)

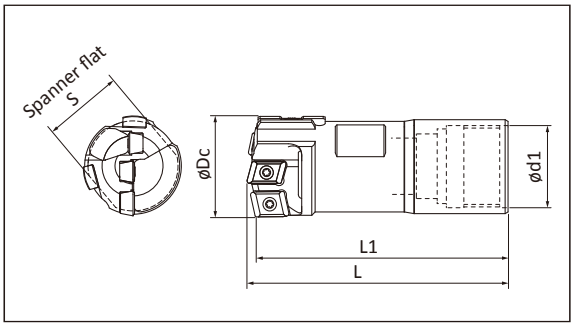
As of 09-2013

Diameter (inch)	Drill Head Code	Stock
1.000	FNBM-02S-1.000	●
1.024	FNBM-02S-1.024	●
1.125	FNBM-03S-1.125	●
1.218	FNBM-04S-1.218	●
1.235	FNBM-05S-1.235	●
1.245	FNBM-05S-1.245	●
1.250	FNBM-05S-1.250	●
1.280	FNBM-05S-1.280	●
1.312	FNBM-06S-1.312	●
1.375	FNBM-06S-1.375	●
1.437	FNBM-07S-1.437	●
1.500	FNBM-07S-1.500	●
1.575	FNBM-08S-1.575	●
1.625	FNBM-08S-1.625	●
1.725	FNBM-09S-1.725	●
1.750	FNBM-09S-1.750	●
1.812	FNBM-09S-1.812	●
1.875	FNBM-10S-1.875	●
1.905	FNBM-10S-1.905	●
1.940	FNBM-10S-1.940	●
1.945	FNBM-10S-1.945	●
1.965	FNBM-10S-1.965	●
1.985	FNBM-10S-1.985	●
2.000	FNBM-10S-2.000	●
2.125	FNBM-11S-2.125	●
2.187	FNBM-11S-2.187	●
2.250	FNBM-12S-2.250	●
2.312	FNBM-12S-2.312	●
2.335	FNBM-12S-2.335	●
2.350	FNBM-12S-2.350	●
2.375	FNBM-12S-2.375	●
2.380	FNBM-12S-2.380	●
2.405	FNBM-13S-2.405	●
2.441	FNBM-13S-2.441	●
2.500	FNBM-13S-2.500	●

● : Standard stock item

• See page 7 for spare parts list.

FINE BEAM STS Inner Single Start Thread



Drill Head Ordering Code	Diameter øDc (mm)	Drill Tube		Drill Head Dimensions (mm)			
		Ordering Code	Dia. (mm)	L	L_1	d_1	S
FNBM-22N-xx.xx	**25.00 - 26.99**	UB22	22	73	70	20	19
FNBM-24N-xx.xx	**27.00 - 29.00**	UB24	24	73	70	22	21
FNBM-24N-xx.xx	**29.01 - 29.99**	UB24	24	73	70	22	24
FNBM-26N-xx.xx	**30.00 - 31.99**	UB26	26	78	75	24	24
FNBM-28N-xx.xx	**32.00 - 33.99**	UB28	28	78	75	26	26
FNBM-30N-xx.xx	**34.00 - 36.99**	UB30	30	93	90	27	28
FNBM-33N-xx.xx	**37.00 - 39.99**	UB33	33	98	95	30	30
FNBM-36N-xx.xx	**40.00 - 43.99**	UB36	36	104	100	33	32
FNBM-39N-xx.xx	**44.00 - 46.99**	UB39	39	109	105	37	36
FNBM-43N-xx.xx	**47.00 - 51.99**	UB43	43	109	105	41	38
FNBM-47N-xx.xx	**52.00 - 56.99**	UB47	47	114	110	44	46
FNBM-51N-xx.xx	**57.00 - 60.99**	UB51	51	120	115	49	46
FNBM-56N-xx.xx	**61.00 - 65.00**	UB56	56	120	115	53	54

Ordering example for DIA=30.00mm : FNBM-26N-30.00

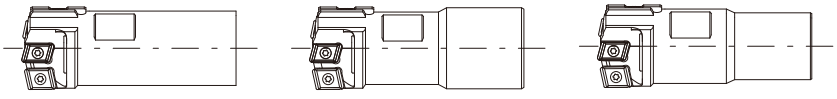
Standard stock (metric)

As of 09-2013

Diameter (mm)	Drill Head Code	Stock
25.00	FNBM-22N-25.00	●
27.00	FNBM-24N-27.00	●
30.00	FNBM-26N-30.00	●
32.00	FNBM-28N-32.00	●
35.00	FNBM-30N-35.00	●
37.00	FNBM-33N-37.00	●
40.00	FNBM-36N-40.00	●
42.00	FNBM-36N-42.00	●
44.00	FNBM-39N-44.00	●
45.00	FNBM-39N-45.00	●
47.00	FNBM-43N-47.00	●
50.00	FNBM-43N-50.00	●
52.00	FNBM-47N-52.00	●
55.00	FNBM-47N-55.00	●
56.00	FNBM-47N-56.00	●
60.00	FNBM-51N-60.00	●
65.00	FNBM-56N-65.00	●

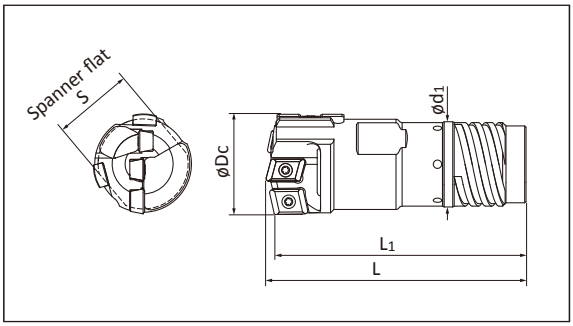
● : Standard stock item

NOTE: There are three types of body geometry for inner thread type according to the combination of drill diameter and thread diameter



• See page 7 for spare parts list.

FINE BEAM DTS Outer Four Start Thread



Drill Head Ordering Code	Diameter øDc (mm)	Outer Tube		Drill Head Dimensions (mm)			
		Ordering Code	Dia. (mm)	L	L_1	d_1	S
FNBM-03D-xx.xx	**25.00 - 26.40**	OT03	23.5	73	70	21	19
FNBM-04D-xx.xx	**26.41 - 28.70**	OT04	26	78	75	23.5	21
FNBM-05D-xx.xx	**28.71 - 31.00**	OT05	28	78	75	25.5	24
FNBM-06D-xx.xx	**31.01 - 33.30**	OT06	30.5	83	80	28	26
FNBM-07D-xx.xx	**33.31 - 36.20**	OT07	33	93	90	30	28
FNBM-08D-xx.xx	**36.21 - 39.60**	OT08	35.5	99	95	33	30
FNBM-09D-xx.xx	**39.61 - 43.00**	OT09	39	104	100	36	32
FNBM-10D-xx.xx	**43.01 - 47.00**	OT10	42.5	104	100	39	36
FNBM-11D-xx.xx	**47.01 - 51.70**	OT11	46.5	114	110	43	38
FNBM-12D-xx.xx	**51.71 - 56.20**	OT12	51	120	115	47.5	46
FNBM-13D-xx.xx	**56.21 - 60.60**	OT13	55.5	120	115	51	50
FNBM-13D-xx.xx	**60.61 - 65.00**	OT13	55.5	120	115	51	54

Ordering example for DIA=30.00mm : FNBM-05D-30.00

Standard stock (metric)

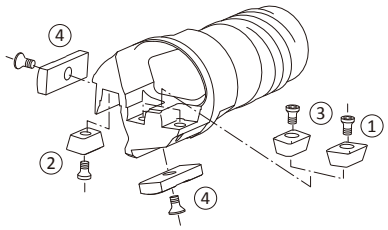
As of 09-2013

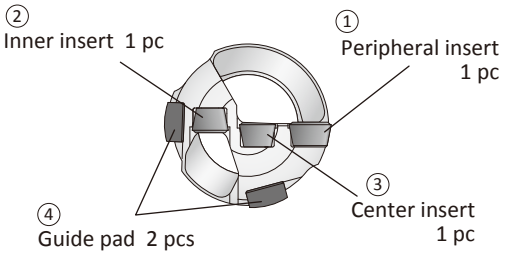
Diameter (mm)	Drill Head Code	Stock
25.00	FNBM-03D-25.00	●
25.40	FNBM-03D-25.40	●
27.00	FNBM-04D-27.00	●
30.00	FNBM-05D-30.00	●
32.00	FNBM-06D-32.00	●
37.00	FNBM-08D-37.00	●
38.10	FNBM-08D-38.10	●
42.00	FNBM-09D-42.00	●
45.00	FNBM-10D-45.00	●
50.00	FNBM-11D-50.00	●

● : Standard stock item

• See page 7 for spare parts list.

FINE BEAM Assembly





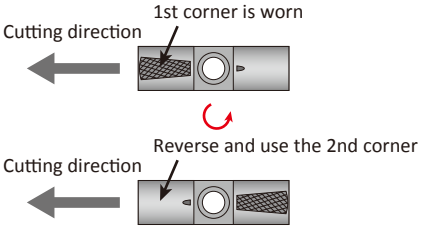
Dia. øDc (mm)	Insert									Guide Pad		
	① Peripheral			② Inner			③ Center			④		
	Insert	Screw	Wrench	Insert	Screw	Wrench	Insert	Screw	Wrench	Guide pad	Screw	Wrench
25.00 - 28.00	FBH06003R	CSTB2.2	T-7F	FBM05503R	CSTB2.2	T-7F	FBM05503L	CSTB2.2	T-7F	GP06	CSTB2.2S	T-7F
28.01 - 29.99	FBH06003R	CSTB2.2	T-7F	FBM05503R	CSTB2.2	T-7F	FBM06504L	CSTB2.5	T-8F	GP06	CSTB2.2S	T-7F
30.00 - 35.00	FBH07504R	CSTB2.5	T-8F	FBM06504R	CSTB2.5	T-8F	FBM06504L	CSTB2.5	T-8F	GP07	CSTB3S	T-9F
35.01 - 38.00	FBH07504R	CSTB2.5	T-8F	FBM06504R	CSTB2.5	T-8F	FBM08004L	CSTB2.5	T-8F	GP07	CSTB3S	T-9F
38.01 - 39.00	FBH09004R	CSTB2.5	T-8F	FBM06504R	CSTB2.5	T-8F	FBM08004L	CSTB2.5	T-8F	GP07	CSTB3S	T-9F
39.01 - 41.00	FBH09004R	CSTB2.5	T-8F	FBM06504R	CSTB2.5	T-8F	FBM08004L	CSTB2.5	T-8F	GP08	CSTB3S	T-9F
41.01 - 44.00	FBH09004R	CSTB2.5	T-8F	FBM08004R	CSTB2.5	T-8F	FBM08004L	CSTB2.5	T-8F	GP08	CSTB3S	T-9F
44.01 - 45.00	FBH09004R	CSTB2.5	T-8F	FBM08004R	CSTB2.5	T-8F	FBM09504L	CSTB2.5	T-8F	GP08	CSTB3S	T-9F
45.01 - 47.00	FBH09004R	CSTB2.5	T-8F	FBM08004R	CSTB2.5	T-8F	FBM09504L	CSTB2.5	T-8F	GP10S	CSTB3.5	T-15F
47.01 - 51.00	FBH11004R	CSTB2.5	T-8F	FBM08004R	CSTB2.5	T-8F	FBM09504L	CSTB2.5	T-8F	GP10S	CSTB3.5	T-15F
51.01 - 54.00	FBH11004R	CSTB2.5	T-8F	FBM09504R	CSTB2.5	T-8F	FBM09504L	CSTB2.5	T-8F	GP10S	CSTB3.5	T-15F
54.01 - 57.00	FBH11004R	CSTB2.5	T-8F	FBM09504R	CSTB2.5	T-8F	FBM12504L	CSTB2.5	T-8F	GP10S	CSTB3.5	T-15F
57.01 - 60.00	FBH11004R	CSTB2.5	T-8F	FBM09504R	CSTB2.5	T-8F	FBM12504L	CSTB2.5	T-8F	GP12	CSTB3.5	T-15F
60.01 - 64.00	FBH13004R	CSTB2.5	T-8F	FBM09504R	CSTB2.5	T-8F	FBM12504L	CSTB2.5	T-8F	GP12	CSTB3.5	T-15F
64.01 - 65.00	FBH13004R	CSTB2.5	T-8F	FBM12504R	CSTB2.5	T-8F	FBM12504L	CSTB2.5	T-8F	GP12	CSTB3.5	T-15F

• See page 8 for grade of insert and guide pad.
• Drill heads come complete with 1 set of spare parts but less inserts and guide pads.

Replacing Guide Pads

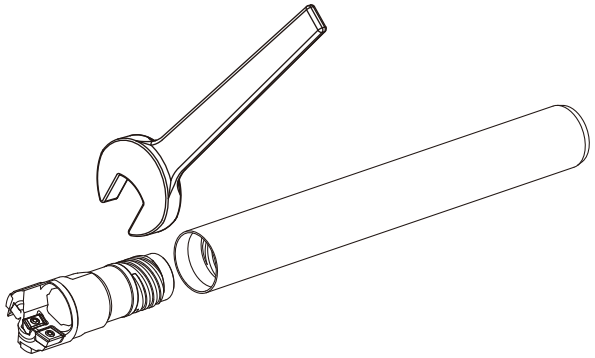
The guide pad is a consumable item as well as the insert

The guide pad has 2 corners.
When the wear comes to 2nd corner, reverse the guide pad.
When the 2nd corner also gets worn, replace the guide pad with a new one.



Setting Up of Drill Head

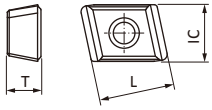
Be sure to use a spanner to tighten drill properly to drill tube.



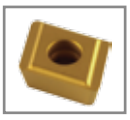
NOTE: A spanner is not included in a drill head set. Please order a spanner separately from drill head if needed.

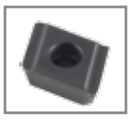
FINE BEAM Spare Parts

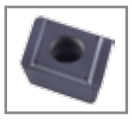
Insert



(This figure shows right hand type)


UC1125 (DLXT)


UC2220 (NLX)


UC3120 (KLXT)

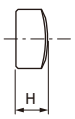
Chipbreaker		Code	Dimensions (mm)			Grade			
			IC	L	t	UC1125 (DLXT)	UC2220 (NLX)	UC3120 (KLXT)	UC3210 (KLXT3)
G	Center	FBM05503LG	5.5	8.0	3.0		●	●	★
		FBM06504LG	6.5	10.0	4.0	●	●	●	●
		FBM08004LG	8.0	10.0	4.0	●	●	●	●
		FBM09504LG	9.5	10.0	4.0	●	●	●	●
		FBM12504LG	12.5	10.0	4.0	●	●	●	●
	Inner	FBM05503RG	5.5	8.0	3.0		●	●	★
		FBM06504RG	6.5	10.0	4.0	●	●	●	●
		FBM08004RG	8.0	10.0	4.0	●	●	●	●
		FBM09504RG	9.5	10.0	4.0	●	●	●	●
		FBM12504RG	12.5	10.0	4.0	●	●	●	●
	Peripheral	FBH06003RG	6.0	8.0	3.0		●	●	★
		FBH07504RG	7.5	10.0	4.0		●	●	★
		FBH09004RG	9.0	10.0	4.0		●	●	★
		FBH11004RG	11.0	10.0	4.0		●	●	★
		FBH13004RG	13.0	10.0	4.0		●	●	★

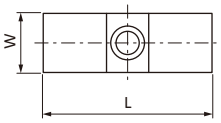
Ordering example: FBH06003RG UC2220 10pcs

● : Standard stock item
★ : Coming soon

	Grade		ISO area							
		(Previous)	5	10	15	20	25	30	35	40
P	UC2220	(NLX)								
	UC1125	(DLXT)								
	UC3120	(KLXT)								
M	UC2220	(NLX)								
	UC3120	(KLXT)								
K	UC3210	(KLXT3)								
	UC2220	(NLX)								
	UC3120	(KLXT)								
S	UC3210	(KLXT3)								
	UC3120	(KLXT)								
	UC2220	(NLX)								
	UC1125	(DLXT)								
N	UC2220	(NLX)								

Guide Pad

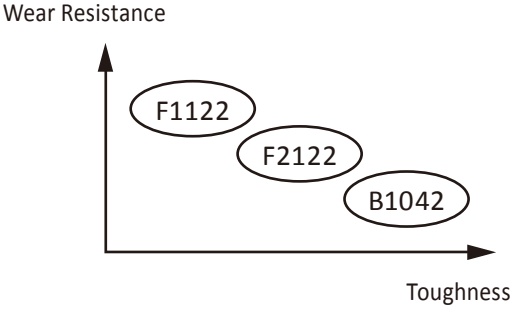




Code	Dimensions (mm)			Grade		
				Full carbide		Brazed
	L	W	H	F1122	F2122	B1042
GP06	20.0	6.0	3.0	●	●	●
GP07	20.0	7.0	3.5	●	●	●
GP08	25.0	8.0	4.5	●	●	●
GP10S	30.0	10.0	4.5	●	●	●
GP12	35.0	12.0	5.5	●	●	●

Ordering example: GP08 F2122 10pcs

- All above grades are coated.
- Other grades are available upon request.

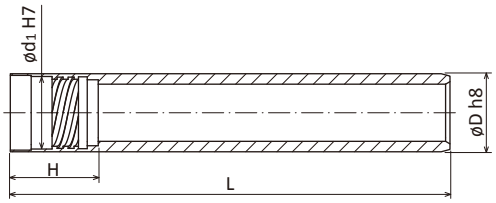


STS Single Tube System

For Single Tube System

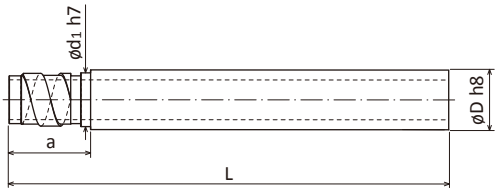
Drill Tube

ST Inner thread connection Four start thread



Drill Range (mm)	Code	L (mm) 2600	L (mm) Special Length	Dimensions (mm) D	d1	H
24.11 - 26.40	**ST02**	●	○	22	19.5	30
26.41 - 28.70	**ST03**	●	○	24	21	30
28.71 - 31.00	**ST04**	●	○	26	23.5	33
31.01 - 33.30	**ST05**	●	○	28	25.5	33
33.31 - 36.20	**ST06**	●	○	30	28	33
36.21 - 39.60	**ST07**	●	○	33	30	40
39.61 - 43.00	**ST08**	●	○	36	33	40
43.01 - 47.00	**ST09**	●	○	39	36	40
47.01 - 51.70	**ST10**	●	○	43	39	40
51.71 - 56.20	**ST11**	●	○	47	43	44
56.21 - 60.60	**ST12**	●	○	51	47	44
60.61 - 65.00	**ST13**		○	56	51	44

UB Outer thread connection Single start thread



Drill Range (mm)	Code	L (mm) Special Length	Dimensions (mm) D	d1	a
25.00 - 26.99	**UB22**	○	22	20	26
27.00 - 29.99	**UB24**	○	24	22	26
30.00 - 31.99	**UB26**	○	26	24	26
32.00 - 33.99	**UB28**	○	28	26	26
34.00 - 36.99	**UB30**	○	30	27	41
37.00 - 39.99	**UB33**	○	33	30	41
40.00 - 43.99	**UB36**	○	36	33	41
44.00 - 46.99	**UB39**	○	39	37	41
47.00 - 51.99	**UB43**	○	43	41	41
52.00 - 56.99	**UB47**	○	47	44	41
57.00 - 60.99	**UB51**	○	51	49	41
61.00 - 67.99	**UB56**	○	56	49	41

- Please indicate the length (L) when ordering.
- Ordering example for drill dia. ø60.00 mm and drill tube length 2600 mm for inner thread connection: ST12X2600
- Other lengths are available upon request. Please contact Unitac sales department for further information.

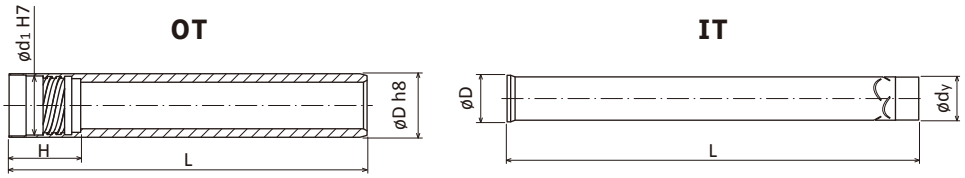
● : Standard Stock item
○ : Special length

DTS Double Tube System

For Double Tube System

Outer Tube & Inner Tube

OT & IT Outer Tube & Inner Tube



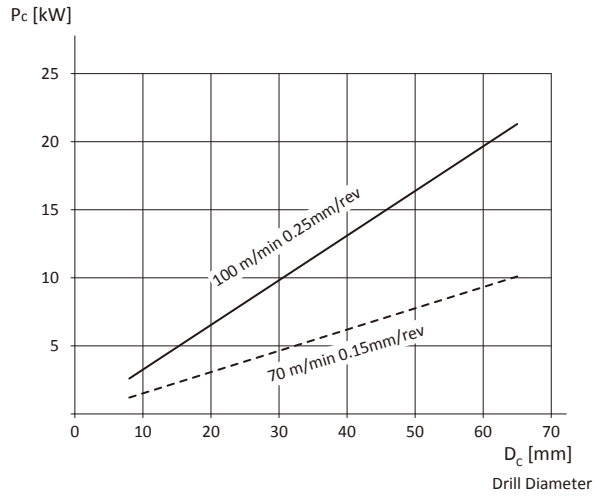
Drill Range (mm)	Outer Tube (OT) Code	L (mm) Special Length	Dimensions (mm) D	d1	H	Inner Tube (IT) Code	L (mm) Special Length	Dimensions (mm) D	dy
24.11 - 26.40	**OT03**	○	23.5	21	30	**IT03**	○	16	14
26.41 - 28.70	**OT04**	○	26	23.5	33	**IT04**	○	18	16
28.71 - 31.00	**OT05**	○	28	25.5	33	**IT05**	○	20	18
31.01 - 33.30	**OT06**	○	30.5	28	33	**IT06**	○	22	20
33.31 - 36.20	**OT07**	○	33	30	40	**IT07**	○	24	22
36.21 - 39.60	**OT08**	○	35.5	33	40	**IT08**	○	26	24
39.61 - 43.00	**OT09**	○	39	36	40	**IT09**	○	29	27
43.01 - 47.00	**OT10**	○	42.5	39	40	**IT10**	○	32	30
47.01 - 51.70	**OT11**	○	46.5	43	44	**IT11**	○	35	32
51.71 - 56.20	**OT12**	○	51	47	44	**IT12**	○	39	36
56.21 - 65.00	**OT13**	○	55.5	51	44	**IT13**	○	43	40

- Please indicate the length when ordering. Ordering example for drill dia. ø60.00 mm and tube length 1070 mm: OT13X1070
- Inner Tube length should be ordered 30mm longer than the outer tube for ranges ø18.40 - 65.00mm (OT00 - OT13)

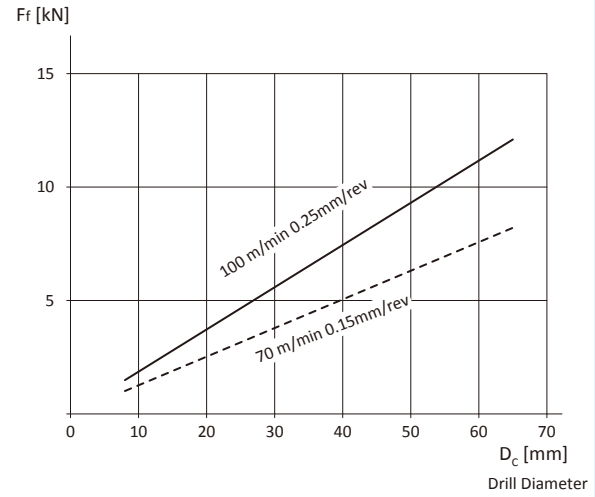
○ : Special length

Single Tube System

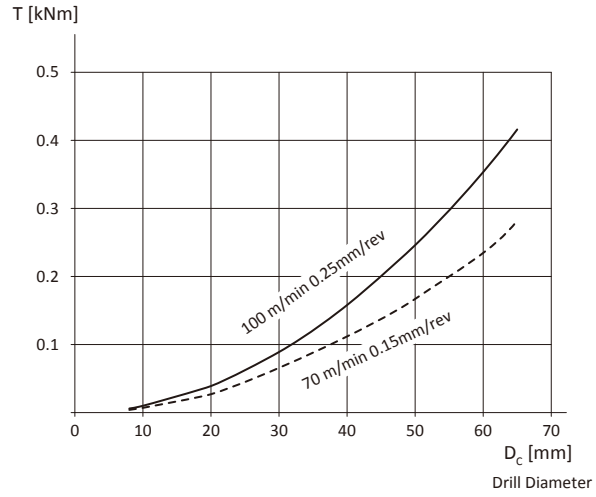
Net Power



Feed Force

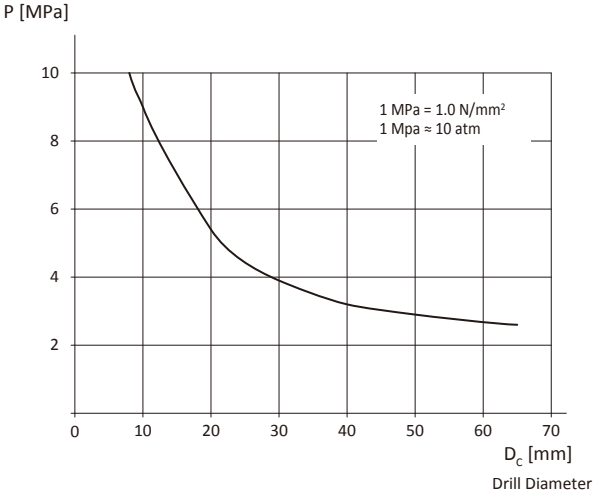


Torque

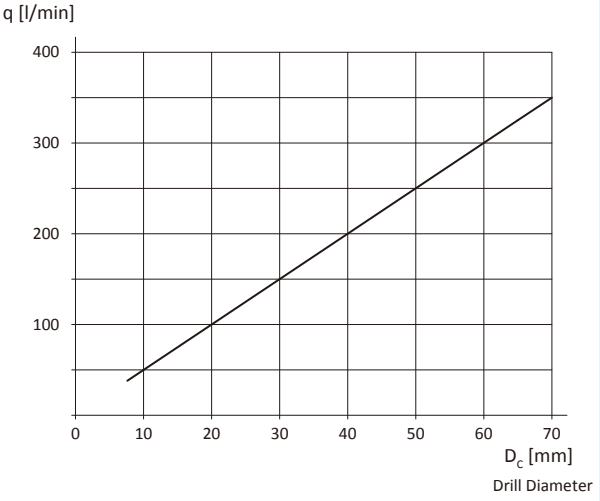


STS
Single Tube System

Cutting Fluid Pressure



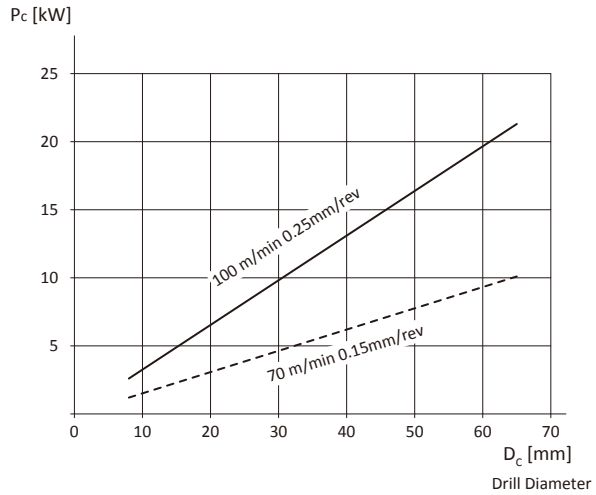
Cutting Fluid Volume



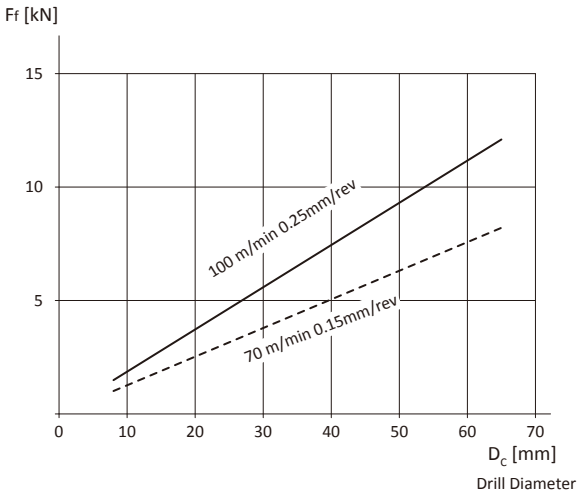
The above values should not be used as the exact recommendations. They may need modification depending on the machining conditions, materials, etc.

Double Tube System

Net Power

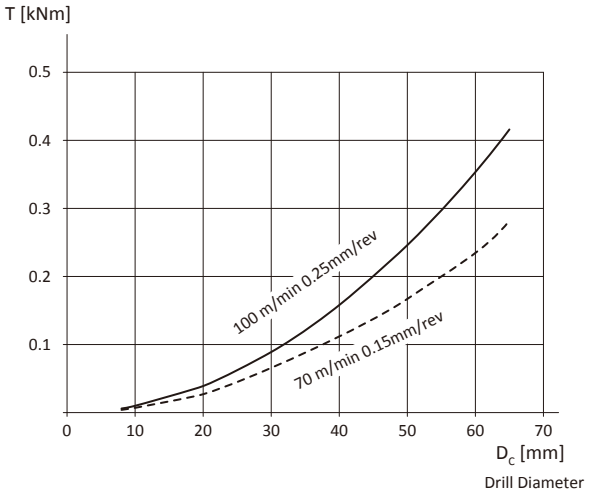


Feed Force

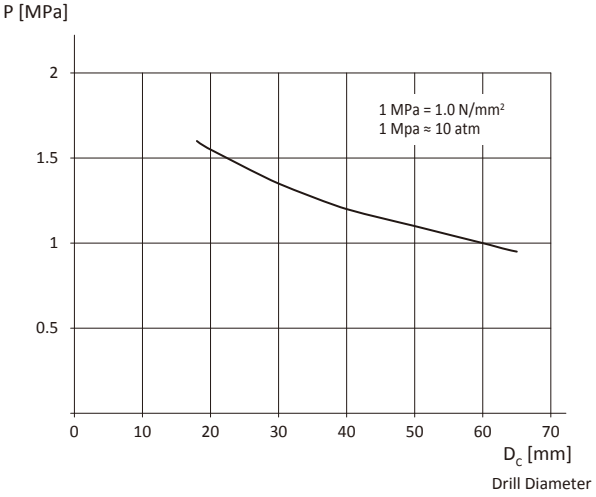


DTS
Double Tube System

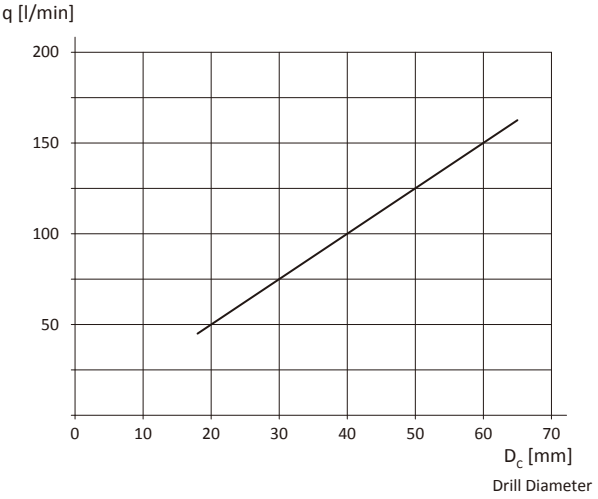
Torque



Cutting Fluid Pressure



Cutting Fluid Volume



The above values should not be used as the exact recommendations. They may need modification depending on the machining conditions, materials, etc.

Recommended Cutting Conditions

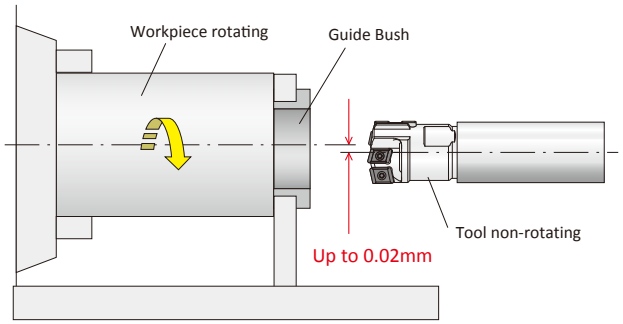
ISO	Material	JIS	Condition		Hardness (HB)	Cutting Speed Vc (m/min)	Feed rate fn (mm/rev) Drill Dia. (mm) 25.00 - 43.00	43.01 - 65.00
P	Carbon steel High carbon Cutting steel	S10C - S25C, SS	0.1 - 0.25 %C	Non-hardened	125	70-130	0.1-0.3	0.12-0.35
		S25C - S55C	0.25 - 0.25 %C	Non-hardened	190	70-130	0.1-0.3	0.12-0.35
			0.25 - 0.25 %C	Hardened and tempered	250	70-130	0.1-0.3	0.12-0.35
		SK	0.55 - 0.80 %C	Non-hardened	220	70-130	0.1-0.3	0.12-0.35
			0.55 - 0.80 %C	Hardened and tempered	300	70-130	0.1-0.3	0.12-0.35
	Low alloyed (alloying element < 5%)	SNC,DCr, SNCN SCM, SMn		Non-hardened	200	70-120	0.1-0.3	0.12-0.35
				Hardened and tempered	275	60-120	0.1-0.3	0.12-0.35
					300	60-120	0.1-0.3	0.12-0.35
					350	60-120	0.1-0.3	0.12-0.35
	High alloyed Cast iron Tool steel	SNS,SKD, SKT SKH, SK		Non-hardened	200	70-130	0.1-0.3	0.12-0.35
				Hardened and tempered	325	70-130	0.1-0.3	0.12-0.35
M	Stainless steel	SUS430		Ferritic	200	70-130	0.1-0.3	0.12-0.35
		SUS410, 420J		Martensite	240	70-130	0.1-0.3	0.12-0.35
		SUS304, SUS316L		Austenite	180	70-130	0.1-0.3	0.12-0.35
K	Nodular cast iron	FCD400 - FCD450		Ferritic/Pearlitic	180	50-110	0.1-0.25	0.12-0.35
		FCD500 - FCD700		Pearlitic	260	50-110	0.1-0.25	0.12-0.35
	Gray cast iron	FC100 - FC200		Low tensile strength	160	60-110	0.1-0.25	0.12-0.35
		FC250 - FC350		High tensile strength	250	60-110	0.1-0.25	0.12-0.35
	Malleable cast iron	FCMB, FCMW		Ferritic	130	70-110	0.1-0.25	0.12-0.35
		FCMWP, FCMP		Pearlitic	230	70-110	0.1-0.25	0.12-0.35
N	Aluminum alloy Forging			Non-aged	60	65-130	0.1-0.25	0.12-0.35
				Soluted, Aged	100	65-130	0.08-0.23	0.12-0.27
	Aluminum alloy Casting		<=12% Si	Non-aged	75	65-130	0.08-0.23	0.12-0.27
				Soluted, Aged	90	65-130	0.08-0.23	0.12-0.27
			>12% Si	High silicon	130	65-130	0.08-0.23	0.12-0.27
	Copper alloy		>1% Pb	Free cutting copper	110	65-130	0.08-0.23	0.12-0.27
				Brass, Red brass	90	65-130	0.08-0.23	0.12-0.27
				Electrolytic copper	100	65-130	0.08-0.23	0.12-0.27
S	Heat resistant super alloy		Fe base	Non-aged	200	20-50	0.08-0.23	0.12-0.27
				Soluted, Aged	280	20-50	0.08-0.23	0.12-0.27
			Ni / Co base	Non-aged	250	20-50	0.08-0.23	0.12-0.27
				Soluted, Aged	350	20-50	0.08-0.23	0.12-0.27
				Casted	320	20-50	0.08-0.23	0.12-0.27
	Titanium alloy		α		Rm400	30-60	0.08-0.23	0.12-0.27
			α - β		Rm1050	30-60	0.08-0.23	0.12-0.27

The above values should not be used as the exact recommendations. They may need modification depending on the machining conditions, materials, etc.

Machine Setting Up

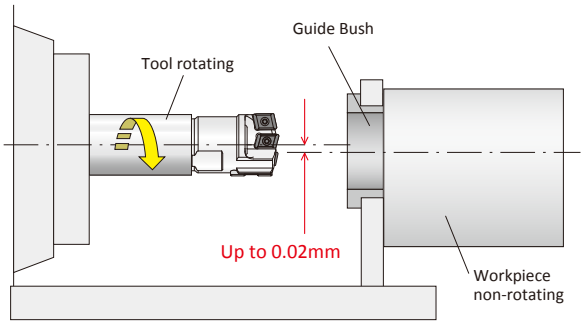
Notes for Setting Up STS and DTS Systems

Workpiece rotating system



- Should be applied only when the workpiece and the tool axis are in line.
- Better result is expected for hole straightness and wear-resistance of the guide bush compared to tool rotating system.
- Keep the alignment between guide bush and spindle within 0.02 mm.

Tool rotating system



- Can be applied when the workpiece and the tool axis are not in line.
- Keep the alignment between guide bush and spindle within 0.02 mm.

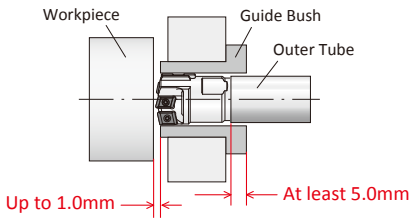
Notes for Setting Up DTS System

Positioning of outer tube and guide bush

Be sure to set the outer tube into the guide bush by more than 5.00 mm so that the coolant will be supplied properly

Positioning of work material and guide bush

Sealing is not required for DTS system because of the vacuum effect, but be sure to keep the gap between the work material and the guide bush 1.0 mm or less.

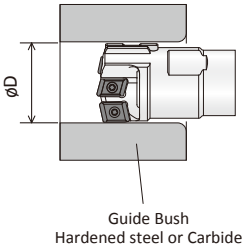


Guide Bush

Guide bush size

Guide bush tolerance should be G6 in order to keep good tool life and cutting accuracy.

D (mm)	G6 Tolerance (mm)
18.01 - 30.00	+0.007 ~ +0.020
30.01 - 50.00	+0.009 ~ +0.025
50.01 - 80.00	+0.010 ~ +0.029



Guide bush material

Guide Bush Material	Method	Advantage
Hardened steel	Workpiece rotating	Economical
Carbide	Tool rotating Workpiece rotating	Long life of guide bush

Coolant Management

Coolant temperature

The suitable coolant temperature is 30 to 40 °C (90 - 100 °F).
If it exceeds this temperature, the coolant will deteriorate which will cause short tool life and poor surface finish.

Coolant filtration

The coolant must be filtered in order to protect the guide pads and the surface finish.

Using water-soluble coolant

The concentration of water-soluble coolant is recommended to be around 10 % (dilution rate 1/10) in order to protect the guide pads.

Cutting Fluid Management

Successful deep hole drilling can be achieved not only by tooling but also by an optimized combination of the tool, the machine and the cutting fluid. The cutting fluid is one of the essential components to obtain safe, stable and cost efficient deep hole drilling. Therefore it is very important to choose and use the cutting fluid correctly.

Cutting Fluid

The cutting fluid plays a large role in lubrication of tool, cooling of cutting edges and chips, and evacuation of chips in deep hole drilling. It also contributes to improved tool life, surface finish and cutting accuracy when being fed continuously during cutting.

1) Lubrication

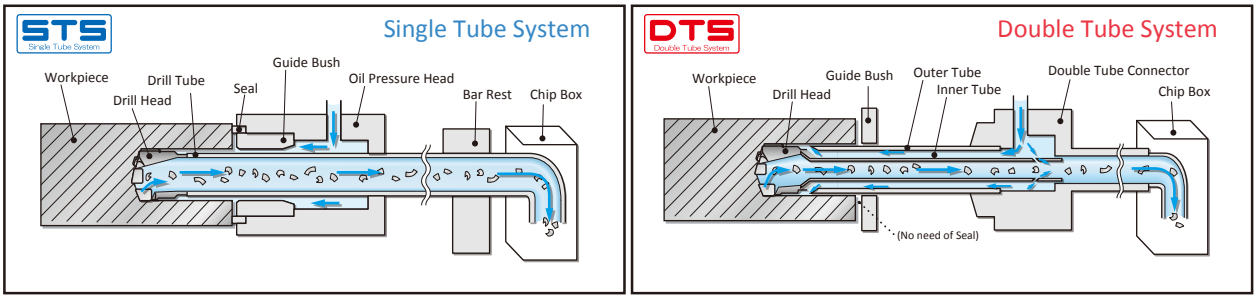
Lubrication of cutting edges and guide pads is necessary in deep hole drilling. To get the efficient lubrication, it is recommended to use EP (Extreme Pressure) additives which contain sulfur or chlorine.

2) Heat Dissipation

The coolability of cutting fluid depends on thermal characteristics such as thermal conductivity and specific heat. The cutting fluid of good coolability increases tool life, but water-soluble type is not preferred in deep hole drilling because of less lubrication effect. If water-soluble fluid is used, the concentration is recommended to be 10% (dilution rate 1/10) or more.
Cooling of chips is important as well as cooling of cutting edges and guide pads in deep hole drilling. Temperature control is also important to keep long tool life, stable cutting conditions and cutting accuracy.

3) Chip Evacuation

Cutting fluid has an important role in deep hole drilling as it evacuates chips through to the back end of boring bar (for STS) or inner tube (for DTS), whereas it finishes its role as soon as the chips are separated from the workpiece in general cutting. It is also important to control the flow and the pressure of cutting fluid.



Coolant Unit

Coolant unit is also important to obtain the optimal effect of cutting fluid which has an important role in deep hole drilling.

1) Supply Cutting Fluid Continuously At Constant Pressure And Flow

Fluid pressure and flow are recommended to be continuously variable and monitored with a pressure gauge and a flow gauge. Recently, screw pumps with an inverter are suitable.

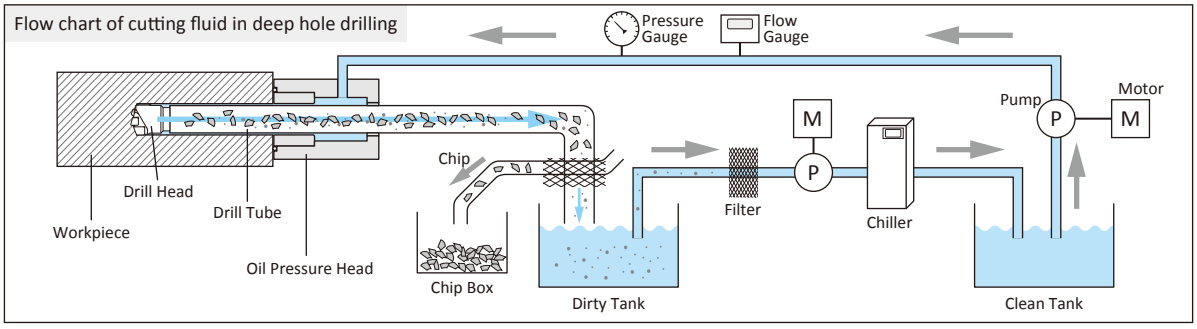
2) Maintain Constant Temperature

The cutting fluid is heated by the factors such as:
- Cutting edge
- Friction of guide pad
- Contact duration of heated chips and cutting fluid
- Pump

Maintaining of the constant cutting fluid temperature is important to keep stable cutting conditions, chip formation and cutting accuracy. The temperature should be lower than 40° C (100° F) for EP additives to provide sufficient lubrication. Therefore the cutting fluid temperature should be kept 30-40 °C (90-100°F) throughout the cutting operation.

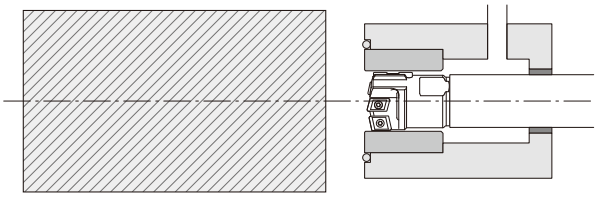
3) Filtration

A lot of particles are contained in cutting fluid after finishing cutting and chip evacuation, thus filtration is necessary to remove them. The filter size should be selected to catch particles but not EP additives. The size depends on the cutting fluid, but generally it is suggested to be around 10-20 µm. For iron-based workpieces, magnetic separator will be helpful which decreases filter maintenance frequency.

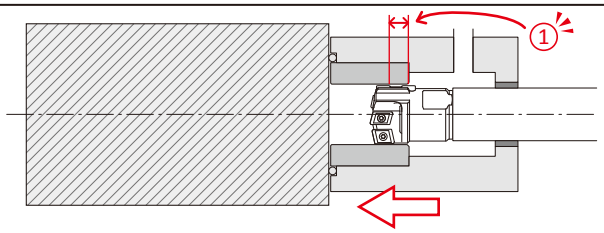


NC Cycle

Use the NC cycle as instructed below in order to optimize the tool performance more safely.

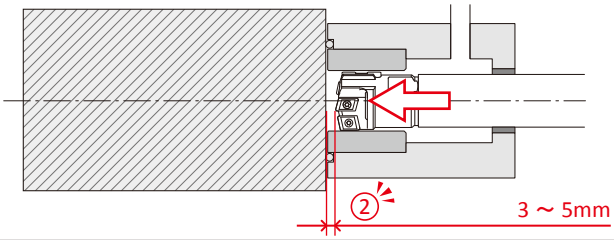


1. Start NC operation



2. Oil pressure head approach workpiece

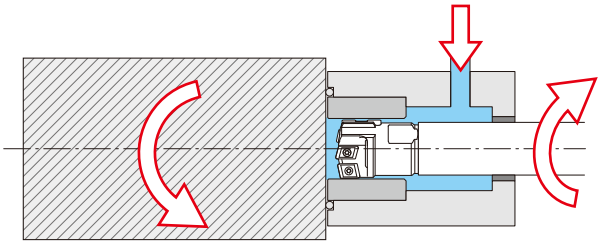
① Set the starting point of main axis of the tool to be at a suitable position so that the guide pad remains inside the guide bush when the oil pressure head moves forward.



3. Tool approach workpiece

② Approach and set the tool to a position of 3 to 5 mm distance from the edge of the workpiece.

* If the available NC machine can support this approach, the operation process may start from this point

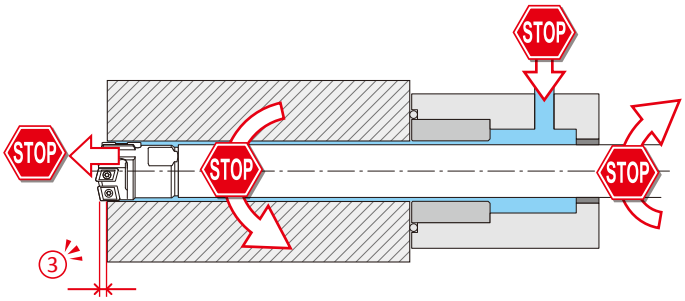


4. Start cutting

4.1 Start coolant supply

4.2 Start rotating
(tool / workpiece / tool & workpiece)

4.3 Start feeding



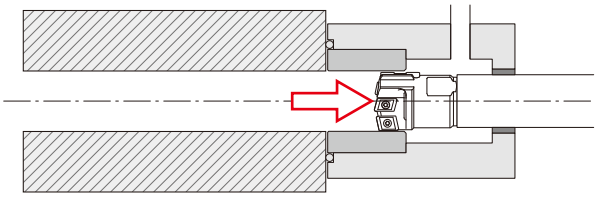
5. Stop cutting

5.1 Stop feeding

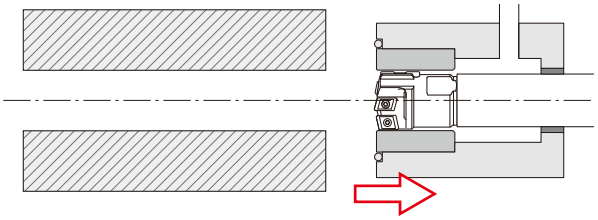
5.2 Stop rotating
(tool / workpiece / tool & workpiece)

5.3 Stop coolant supply

③ Stop cutting at the point when the outer tip is at the edge of the workpiece.



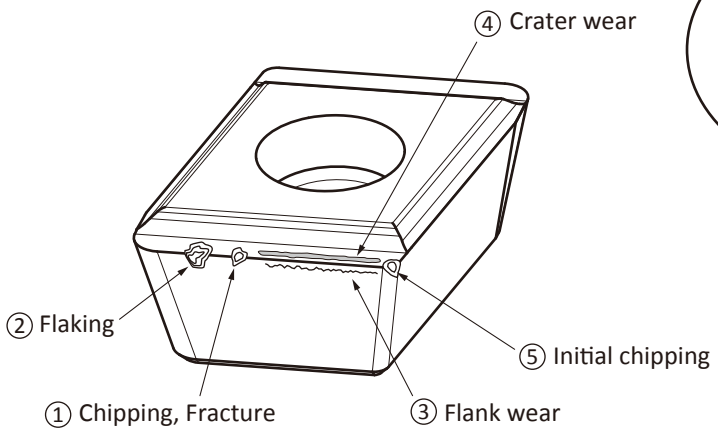
6. Tool main axis back to starting point

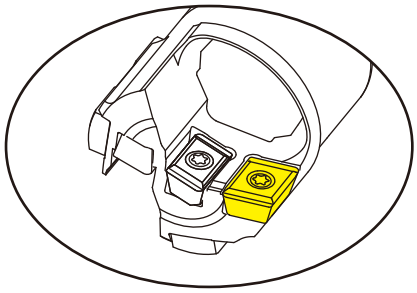


7. Oil pressure head back to starting point

Insert Wear Trouble Shooting

Cutting Edge Trouble Examples





(Peripheral Insert)

	Problem	Causes	Solutions Grade	Cutting Conditions / Other
1	Chipping, Fracture	• Excessive vibration or shock • Built-Up-Edge separated	• Use tougher grade	• Reduce feed rate • Remove vibration
2	Flaking	• Excessive vibration or shock	• Use tougher grade	• Reduce feed rate • Remove vibration
3	Flank wear	• Cutting speed too high • Inadequate tool toughness	• Use higher wear resistant grade • Use coated grade	• Reduce cutting speed • Reduce feed rate • Use proper cutting fluid
4	Crater wear	• Cutting speed too high • Feed rate too high • Inadequate tool toughness	• Use higher wear resistant grade • Use coated grade	• Reduce cutting speed • Reduce feed rate • Use proper cutting fluid
5	Initial chipping	• Guide bush or pilot hole is improper size • Misalignment	• Use tougher grade	• Adjust or change guide bush or pilot hole • Reduce feed rate • Correct misalignment

Cutting condition and chip form

Chip formation in deep hole drilling

Chip formation plays a key role as well as the management of cutting fluid temperature and volume in STS (Single Tube System) and DTS (Double Tube System) which enable deep hole drilling by supplying cutting fluid of large volume and high pressure. As chips are evacuated through tube with cutting fluid in deep hole drilling, smooth and steady chip evacuation can be achieved by proper chip formation.

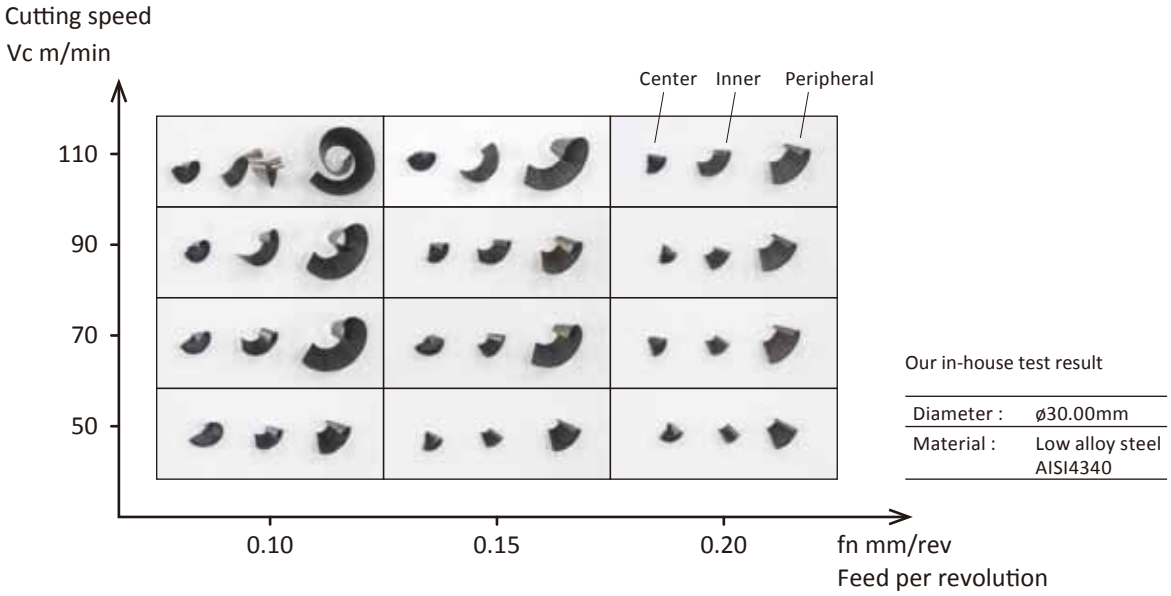
Chip formation

Chip formation is affected by multiple factors such as work material, chipbreaker geometry, cutting speed, feed, type of cutting fluid and cutting fluid temperature. Suitable chip formation depends on cutting situation but is controllable by changing the cutting conditions.

How to decide chip form

Generally chip length should be 3 - 4 times width, but it tends to be longer with difficult-to-cut materials in which case it is better to make chips thinner (reduce feed) so that smooth chip evacuation is obtained.

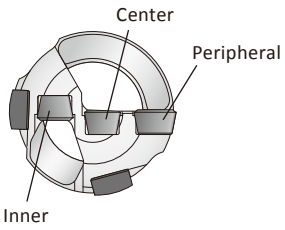
Below picture shows chip formation by cutting speed and feed. Shorter chips are obtained by reducing cutting speed or increasing feed.



Our in-house test result

Diameter :	ø30.00mm
Material :	Low alloy steel AISI4340

From left to right in each box the order is center, inner and peripheral chip.



⚠ Safety Notes

1. Introduction

The following information is provided to be read before using the tool so that the tool is handled properly and safely.

2. Basic Information of Cutting Tool Materials

2-1. Technical Terms

Cutting Tool Material :	General term of tool material, such as Cemented Carbide, Coated Carbide, Cermet, Coated Cermet, Ceramics, CBN and PCD
Carbide Material :	Cemented Carbide with WC (Tungsten Carbide) as the main ingredient

2-2. Physical Property

Appearance :	Depends on materials. (e.g. Gray, Black, Gold, etc.)
Smell :	None
Hardness :	Carbide and Cermet: 5 - 30GPaHV, Ceramic: 10 - 40GPaHV, CBN: 20 - 50GPaHV, PCD: 80 - 120GPaHV
Specific Gravity :	Carbide: 9 - 16, Cermet: 5 - 9, Ceramic: 2 - 7, CBN / PCD: 3 - 5, HSS: 7 - 9, Alloy steel: 7 - 9

2-3. Composition

Carbide, Nitride, Carbon-nitride and Oxide with W, Ti, Al, Si, Ta, B, etc. and metals of Co, Ni, Cr, Mo, etc.

3. Notes for Handling Cutting Tool Materials

- These cutting tool materials are very hard but brittle. They may be broken by shock or excessive clamp force.
- Since cutting tool materials have high specific gravities, they can be heavy. Handle with care when transferring and storing.
- The thermal expansion of cutting tool material is different from that of metal materials. Because of this, for shrink-fit or cooling-fit products, if the usage temperate is slightly higher (lower) than the specified temperature, cracking may occur.
- If cutting tool materials become corroded due to cutting fluid, lubricating agents, or other moisture, their strength will be reduced. Care should be taken regarding storage conditions.

4. Notes for Machining Cutting Tool Materials

- For carbide tool materials, the strength may be slightly reduced due to the surface conditions. For finishing, always use a diamond grinder.
- When cutting tool materials are ground or heated, dust or mist (smoke) occurs. If a lot of it is inhaled, swallowed, or comes in contact with the eyes or skin, it could result in injury to the body. When machining, be careful to avoid exposing your body to the dust or mist; it is recommended that localized ventilation equipment be used and that a protective mask, protective goggles, and protective gloves be worn. In addition, if the dust, etc. comes in contact with your hands, wash them thoroughly with soap and water. Do not drink or eat in the work area, and wash your hands before drinking or eating. Dust on clothes should not be shaken out; use a vacuum, etc. to remove the dust or wash the clothes in a washing machine. If the cobalt contained in the cutting tool material is touched repeatedly or over a long period of time, it has been reported that it may affect the skin, respiratory organs, or heart, etc.
- When performing wet machining of carbide tool materials or brazed tool, the cutting fluid may contain heavy metals and must be disposed of properly.
- When a cutting tool product has been reground, check that there are no cracks after regrinding.
- If a laser or electric pen, etc. is used to mark carbide tool material or products, cracks may form. Do not mark sections which may be subject to stress.
- When electric discharge machining is used on carbide tool materials or products, cracks may form on the surface which cause strength reduction. If this process is necessary, make sure to remove the cracks completely by additional operation such as griding.
- When brazing the carbide tool materials, use the proper temperature to prevent falling off or breaking of the tip.

Precaution for using cutting tools

Items	Issue	Counter measures
General Cutting Tools	◎ Direct touch to a sharp cutting edge may cause injury.	* When setting up tools to the machine or taking them out of the case, please wear protective gloves.
	◎ Misuse or inappropriate working conditions may cause tool breakage or dispersion of broken pieces.	* Please use safety items, such as safety glasses and protective gloves. * Please use safety goods in the area of our recommended cutting condition. See our catalog or instruction manuals.
	◎ Excessive impact or heavy wear will increase cutting resistance and may cause tool breakage and dispersion of broken pieces.	* Please use safety items, such as safety glasses and protective gloves. * Early exchanging tools is preferable.
	◎ Dispersion of hot or long chips may cause injury or burn.	* Please use safety items, such as safety glasses and protective gloves. * When getting rid of chips, please stop operation first and wear safety items and use tools such as nipper and clipper.
	◎ During cutting operation, cutting tools generate high heat. Touching tools immediately after operation may cause burn.	* Please use safety items, such as safety glasses and protective gloves.
	◎ Sparks, generation of heat or chips in high temperature during operation may cause fire.	* Please do not operate around Hazardous zone, in which area there is some possibility of fire or explosion. * In case of using oil-coolant, please be sure there is enough system for fire-prevention.
	◎ Lack of dynamic balance in high-speed revolution cause tool to break due to vibration.	* Please use safety items, such as safety glasses and protective gloves. * Please conduct test-operation before cutting, and confirm that there is no vibration or unusual sound.
	◎ Direct touch to burrs which were generated on the rough surface of the workpiece may cause injury.	* Please do not touch workpiece with bare hand.
Indexable Cutting Tools	◎ If inserts or parts are not clamped well, falling off or dispersion may occur and cause injury.	* Please clean up insert pockets or clamping parts before setting insert. * Please set up inserts with supplied wrench only, and confirm that the inserts or parts are clamped completely.
	◎ If inserts are clamped too tightly by supplementary tools like pipe etc, inserts or body may be broken.	* Please set up with supplied wrench only.
	◎ When inserts are used in high-speed revolution or parts may burst out of the body due to centrifugal force.	* Please use within recommended usage range. See our catalog or instruction.
Milling Cutters and other Milling Tools	◎ Since milling cutters have sharp edges, direct contact with bare hands may cause injury.	* Please use safety items, such as safety glasses and protective gloves.
	◎ If a cutter lacks balance, tools would cause vibration and it may cause injury by dispersion of broken pieces.	* Please use them in the range of our recommended machining condition. * Rotating portion and balancing should be checked regularly to prevent from eccentric rotation or run out due to wear of bearing portion.
Drills	◎ When drilling through hole with rotating workpiece, a disc sometimes flies out from the end of workpiece with high speed. This is very dangerous since the disc has sharp edge.	* Please use safety items, such as safety glasses and protective gloves. Also attach covers on chuck part.
	◎ Some micro drills have sharp edge with the top. Direct touch to tools may cause injury.	* Please use safety items, such as safety glasses and protective gloves.
Brazed Tools	◎ Dispersion or falling off of broken tips may cause injury.	* Please check tips are brazed firmly. * Please do not use brazed tools in the condition that requires high cutting temperature.
Others	◎ If brazing is carried out many times, the strength of carbide tip is deteriorated and becomes easy to be broken during cutting.	* Please do not use carbide tools which are brazed several times since tool strength have been deteriorated.
	◎ It is dangerous to use tools except for the fixed application. It may damage tools and machines.	* Please keep recommended usage of tools.

Reference: JAPAN CEMENTED CARBIDE TOOL MANUFACTURERS' ASSOCIATION

UNITAC Drill Series for Deep Hole Drilling

BTA System (Single Tube System & Double Tube System)

Solid Drilling

Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	STS Outer Thread	STS Inner Thread	DTS	Feature
MBU		8.00 - 14.79	IT9	2μm	Brazed Tips	◯	—	—	• Higher productivity and better surface finish than gundrill • Good chip breaking with 3 step cutting edge design
UTE		12.60 - 20.00	IT9	2μm		◯	—	—	• Higher productivity and better surface finish than gundrill • First recommendation for dia ø12.60 - 15.59mm
BTU		12.60 - 65.00	IT9	2μm		◯	—	—	• First recommendation for dia ø15.60 or more • Covers all materials with various carbide grade combinations
ETU		18.40 - 65.00	IT9	2μm		—	—	◯	• First recommendation for dia ø15.60 or more • Covers all materials with various carbide grade combinations
KUSTS KUDTS		38.00 - 247.99	IT10	3μm	Indexable Inserts	◯	◯	◯	• Cartridge type - Diameter finely adjustable • Covers wide application area with various options
FNTR*		16.00 - 25.00	IT10	3μm		◯	◯	◯	• Direct mount type - No diameter setting necessary • H class 3 corner insert which is the first in the market
FNBM		25.00 - 65.00	IT10	3μm		◯	◯	◯	• Direct mount type - No diameter setting necessary • Highly accurate hole drilling with H class insert

Counterboring

Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	STS Outer Thread	STS Inner Thread	DTS	Feature
KUSTR KUDTR		25.00 - 293.99	IT10	1-2μm	Indexable Inserts	◯	◯	◯	• Cartridge type - Diameter finely adjustable • Covers wide application area with various options

Trepanning

Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	STS Outer Thread	STS Inner Thread	DTS	Feature
UTT		100.00 - 328.00	IT10	1-2μm	Indexable Inserts	◯	◯	—	• Cartridge type - Diameter finely adjustable • Covers wide application area with various options

Indexable Deep Drills for Conventional Machines

Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	Feature
MCTR*		16.00 - 25.00	IT10	3μm	Indexable Inserts	• High productivity for L/D = 8 ~ 25 for conventional machines • H class 3 corner insert which is the first in the market
TRLG*						• High productivity for L/D = 26 ~ for gundrill machine • H class 3 corner insert which is the first in the market
HFBM*		25.00 - 69.00	IT10	3μm		• High productivity for L/D = 6 ~ 15 for M/C and lathe • Highly accurate hole drilling with H class insert

The above values may change depending on the machining conditions, materials, etc.

The products indicated with asterisk (*) will be coming soon.

Deep hole tooling Manufacturer
UNITAC INCORPORATED

Head Office / Kurume Plant
3-7-57 MIYANOJIN KURUME FUKUOKA 839-0801
TEL +81-942-33-4159 FAX +81-942-27-9940

http://www.unitacinc.com

ISO 9001
JQA-QM6991
KYUSHU PLANT

Tool specifications are subject to change without notice.