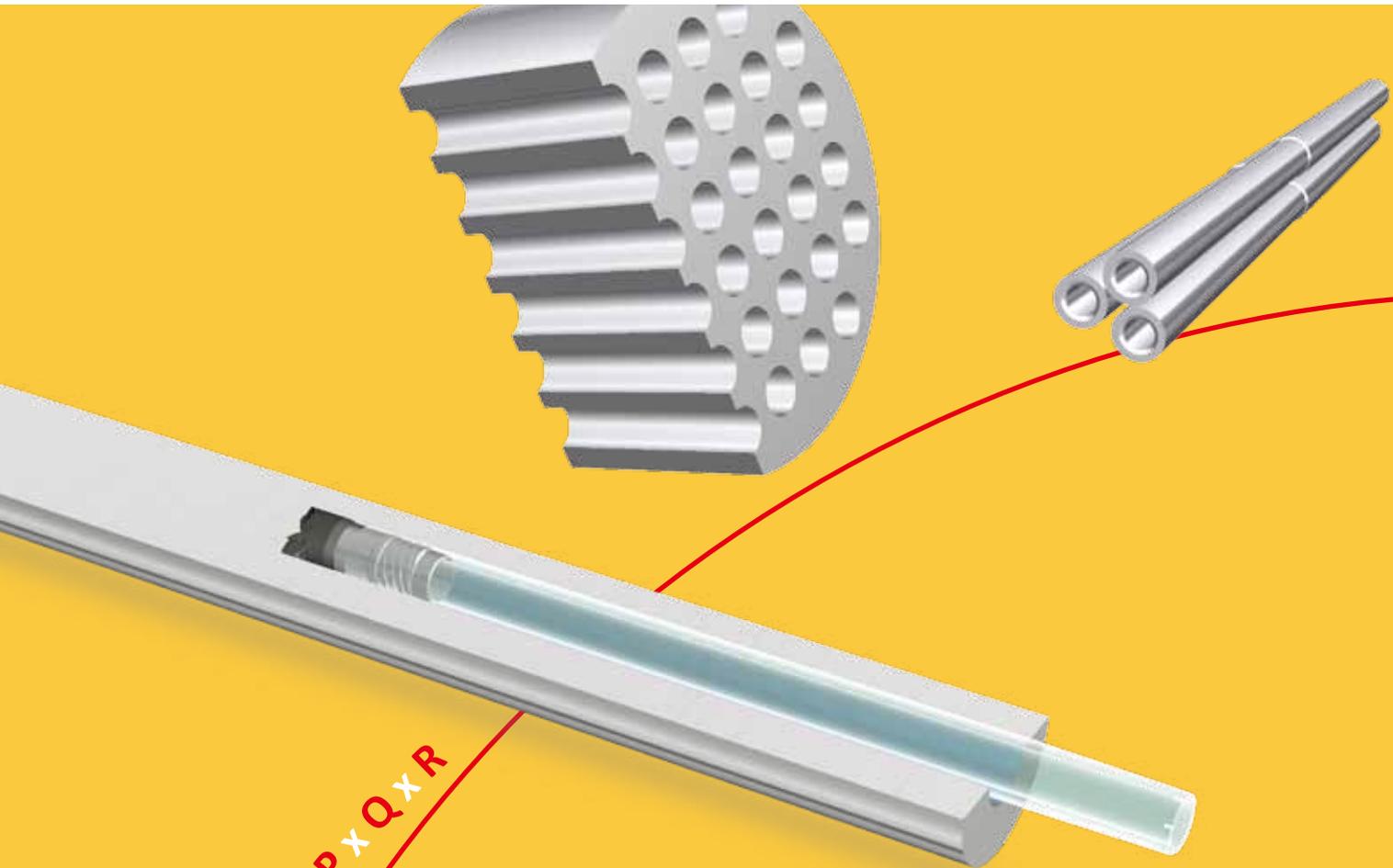




Member IMC Group

High Quality Brazed Drilling Tools

Single Tube System
Double Tube System



Performance = P x Q x R



Ø8 (mm) ~

High **P**roductivity

High **Q**uality

High **R**eliability



Assured Quality and Reliability

Top share in energy industry ⁽¹⁾

UNITAC brazed drill heads get top share in drilling tube sheets for energy industry where there is no margin for error. (according to our statistics)

Performance
= **P**roductivity
Quality
Reliability

One standard tube sheet can contain from 10,000 to 30,000 holes. Not one imperfect hole is permitted. This number of holes is a significant challenge because they must be consistent and accurate. The material is usually inconel or high resistant nickel alloy with a low carbon steel cladding.

⁽¹⁾ in drilling tube sheets for energy industry

Top technology available for all industries

UNITAC has put various technical innovations into our brazed drill heads to answer the strict quality and productivity demands from the energy industry. This advanced technology has been incorporated into all our products, allowing us to improve the productivity and quality in every deep hole drilling application.

All UNITAC products delivered to you offer this reliability which has been validated by the performance in the energy industry.



UNITAC Brazed Drilling Tools

Product information

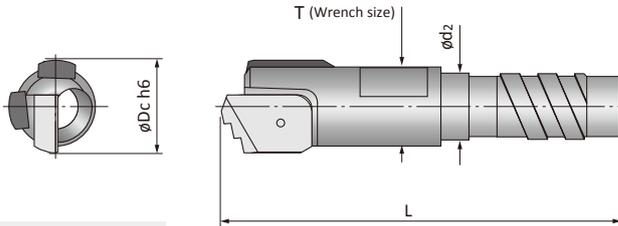
	MBU (ø8.00 - 14.79).....	4
	UTE (ø12.60 - 20.00)	5
	BTU 2 tip type (ø12.60 - 15.59).....	6
	BTU 3 tip type (ø15.60 - 65.00).....	7
	ETU (ø18.40 - 65.00)	8

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TYPE MBU

Thread	Dia. (mm)	Rework service	Use
Outer	8.00 - 14.79	No	Small hole drilling with high productivity



Tolerance: IT9
Surface roughness: Ra 2 μ m

Improves productivity in small hole drilling

STS drilling improves productivity in small hole drilling compared to gundrill

Good chip evacuation

3 step cutting edge breaks chip effectively and large chip mouth eliminates chip jamming

Rigid interface

Unique double pilot interface ensures high rigidity

Product description chart

Dia. Dc (mm) Tolerance h6	Drill head main code	Drill tube		Dimensions (mm)		
		Code	Dia.(mm)	L	d ₂	T
8.00 - 8.99	MBU-0899	UMBB071	7.1	34	6	6
9.00 - 9.99	MBU-0999	UMBB083	8.3	34	7.2	7
10.00 - 10.99	MBU-1099	UMBB090	9.0	34	7.6	8
11.00 - 11.99	MBU-1199	UMBB100	10.0	34	8.6	9
12.00 - 13.49	MBU-1349	UMBB110	11.0	34	9.1	10
13.50 - 14.79	MBU-1449	UMBB120	12.0	34	10.8	11

Note: The drill tube interface is designed with double pilot which is unique to UNITAC. A UNITAC drill tube UMBB must be used with the MBU drill heads. Refer to page 20.

Grade

See page 9 for grade selection chart

Grade	(Previous Grade)	ISO area							
		5	10	15	20	25	30	35	40
P	1122 (PC ZAP)								
M	3112 (TF ZAP)								
K	3112 (TF ZAP)								
N	3112 (TF ZAP)								
S	3112 (TF ZAP)								

• A drill head without coating also available upon request. Please contact us for more detail.

Ordering example

MBU- -

Drill head main code Diameter (mm) Grade

Ordering example : MBU-1099 10.11-1122 20 pcs

- ⚠ Be sure to use a wrench to tighten drill properly to bar.
- For your safety, do not touch the tool or the workpiece when in operation.

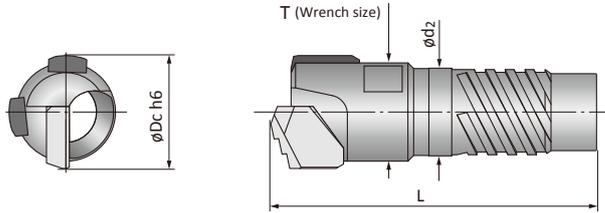
UTE type Drill Head $\phi 12.60 - 20.00$ (mm)



High productivity in small hole drilling with STS

TYPE
UTE

Thread	Dia. (mm)	Rework service	Use
Outer	12.60 - 20.00	Retipping	Small hole drilling with high productivity



Tolerance: IT9
Surface roughness: Ra 2 μ m

Improves productivity in small hole drilling
STS drilling improves productivity in small hole drilling compared to gundrill

Good chip evacuation
3 step cutting edge breaks chip effectively and large chip mouth eliminates chip jamming

Cost efficient retipping service
Retipping of used carbide tips and guide pads and re-coating available

Product description chart

Dia. Dc (mm) Tolerance h6	Drill head main code	Drill tube		Dimensions (mm)		
		Code	Dia.(mm)	L	d ₂	T
12.60 - 13.60	UTE-0094	ST0094	11	40	9.6	10
13.61 - 14.60	UTE-0095	ST0095	12	40	10.6	11
14.61 - 15.59	UTE-0096	ST0096	13	40	11.6	12
15.60 - 16.70	UTE-0097	ST0097	14	40	12.6	13
16.71 - 17.70	UTE-0098	ST0098	15	40	13.6	14
17.71 - 18.90	UTE-0099	ST0099	16	40	14.5	15
18.91 - 20.00	UTE-0000	ST0000	17	40	15.5	16

Grade

See page 9 for grade selection chart

Grade (Previous Grade)	ISO area							
	5	10	15	20	25	30	35	40
P 1122 (UP ZAP)								
M 3112 (TF ZAP)								
K 3112 (TF ZAP)								
N 3112 (TF ZAP)								
S 3132 (TFKS ZAP)								

• A drill head without coating also available upon request. Please contact us for more detail.

Ordering example

UTE - -

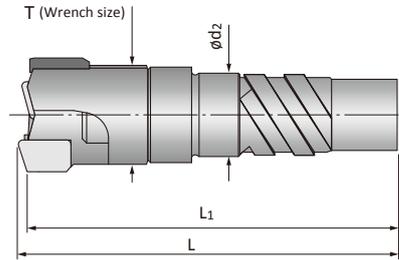
Drill head main code
Diameter (mm)
Grade

Ordering example : UTE-0098 17.55-1122 20 pcs

- Be sure to use a wrench to tighten drill properly to bar.
- For your safety, do not touch the tool or the workpiece when in operation.

TYPE
BTU

Thread	Dia. (mm)	Rework service	Use
Outer	12.60 - 15.59	Retipping	First recommendation in brazed drills



Tolerance: IT9
Surface roughness: Ra 2 μ m

Best suited carbide combination
Best grade available for each workpiece material

Good chip evacuation
Best tip geometry to ensure good chip control and efficient chip exhaust

Cost efficient retipping service
Retipping of used carbide tips and guide pads and re-coating available

Product description chart

Dia. Dc (mm) Tolerance h6	Drill head main code	Drill tube		Dimensions (mm)			
		Code	Dia.(mm)	L	L ₁	d ₂	T
12.60 - 13.10	BTU-00941	ST0094	11	43	41.9	9.6	10
13.11 - 13.60	BTU-00942	ST0094	11	43	41.9	9.6	10
13.61 - 14.10	BTU-00951	ST0095	12	43	41.8	10.6	11
14.11 - 14.60	BTU-00952	ST0095	12	43	41.8	10.6	11
14.61 - 15.10	BTU-00961	ST0096	13	43	41.7	11.6	12
15.11 - 15.59	BTU-00962	ST0096	13	43	41.7	11.6	12

Grade

See page 9 for grade selection chart

Grade	(Previous Grade)	ISO area								
		5	10	15	20	25	30	35	40	
P	1122 (UP ZAP)									
M	2122 (N3 ZAP)									
K	1122 (UP ZAP)									
N	1122 (UP ZAP)									
S	1122 (UP ZAP)									

• A drill head without coating also available upon request. Please contact us for more detail.

Ordering example

BTU - -

Drill head main code Diameter (mm) Grade

Ordering example : BTU-00961 15.00-1122 20 pcs

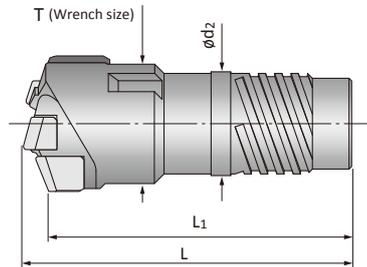
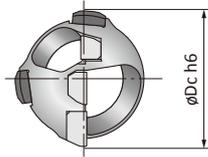
- ⚠ Be sure to use a wrench to tighten drill properly to bar.
- For your safety, do not touch the tool or the workpiece when in operation.

BTU type Drill Head (3 tip type)

First recommendation for $\phi 15.60 - 65.00$ (mm)

TYPE BTU

Thread	Dia. (mm)	Rework service	Use
Outer	15.60 - 65.00	Retipping	First recommendation in brazed drills



Tolerance: IT9
Surface roughness: Ra 2 μ m

Best suited carbide combination
Best grade available for each workpiece material

Good chip evacuation
Best tip geometry to ensure good chip control and efficient chip exhaust

Cost efficient retipping service
Retipping of used carbide tips and guide pads and re-coating available

Product description chart

Dia. Dc (mm) Tolerance h6	Drill head main code	Drill tube		Dimensions (mm)			
		Code	Dia.(mm)	L	L ₁	d ₂	T
15.60 - 16.20	BTU-00971	ST0097	14	43	40.3	12.6	-
16.21 - 16.70	BTU-00972	ST0097	14	43	40.3	12.6	14
16.71 - 17.20	BTU-00981	ST0098	15	43	40.3	13.6	15
17.21 - 17.70	BTU-00982	ST0098	15	43	40.3	13.6	15
17.71 - 18.40	BTU-00991	ST0099	16	47	44.2	14.5	15
18.41 - 18.90	BTU-00992	ST0099	16	47	44.1	14.5	-
18.91 - 19.20	BTU-001	ST0000	17	47	44.1	15.5	17
19.21 - 20.00	BTU-002	ST0000	17	47	44	15.5	18
20.01 - 20.90	BTU-011	ST00	18	52.5	49.4	16	18
20.91 - 21.80	BTU-012	ST00	18	52.5	49.4	16	19
21.81 - 22.90	BTU-021	ST01	20	56	52.8	18	20
22.91 - 24.10	BTU-022	ST01	20	56	52.6	18	21
24.11 - 25.20	BTU-031	ST02	22	57.5	54	19.5	23
25.21 - 26.40	BTU-032	ST02	22	57.5	54	19.5	24
26.41 - 27.50	BTU-041	ST03	24	57.5	53.8	21	25
27.51 - 28.70	BTU-042	ST03	24	57.5	53.8	21	26
28.71 - 29.80	BTU-051	ST04	26	63.5	59.5	23.5	27
29.81 - 31.00	BTU-052	ST04	26	63.5	59.3	23.5	28
31.01 - 32.10	BTU-061	ST05	28	63.5	59.4	25.5	29
32.11 - 33.30	BTU-062	ST05	28	63.5	59.1	25.5	30
33.31 - 34.80	BTU-071	ST06	30	63.5	59	28	32
34.81 - 36.20	BTU-072	ST06	30	63.5	58.9	28	33
36.21 - 37.30	BTU-081	ST07	33	73.5	68.7	30	34
37.31 - 38.40	BTU-082	ST07	33	73.5	68.5	30	35
38.41 - 39.60	BTU-083	ST07	33	73.5	68.3	30	36
39.61 - 40.60	BTU-091	ST08	36	73.5	68.2	33	37
40.61 - 41.80	BTU-092	ST08	36	73.5	68	33	38
41.81 - 43.00	BTU-093	ST08	36	73.5	67.8	33	39
43.01 - 44.30	BTU-101	ST09	39	75	69.5	36	41
44.31 - 45.60	BTU-102	ST09	39	75	69.3	36	42
45.61 - 47.00	BTU-103	ST09	39	75	69.1	36	43
47.01 - 48.50	BTU-111	ST10	43	75	68.8	39	44
48.51 - 50.10	BTU-112	ST10	43	75	68.7	39	46
50.11 - 51.70	BTU-113	ST10	43	75	68.5	39	47
51.71 - 53.20	BTU-121	ST11	47	82	75.2	43	49
53.21 - 54.70	BTU-122	ST11	47	82	75.2	43	50
54.71 - 56.20	BTU-123	ST11	47	82	75.2	43	51
56.21 - 58.40	BTU-131	ST12	51	84	77.4	47	54
58.41 - 60.60	BTU-132	ST12	51	84	76.9	47	55
60.61 - 62.80	BTU-133	ST12	51	84	76.8	47	57
62.81 - 65.00	BTU-134	ST12	51	84	76.5	47	59
60.61 - 62.80	BTU-133L	ST13	56	84	76.8	51	57
62.81 - 65.00	BTU-134L	ST13	56	84	76.5	51	59

Grade

See page 9 for grade selection chart

Grade	(Previous Grade)	ISO area								
		5	10	15	20	25	30	35	40	
P	1122 (UP ZAP)									
	1132 (UX-2 ZAP)									
M	1132 (UX-2 ZAP)									
	2122 (N3 ZAP)									
K	3132 (TFKS ZAP)									
	3132 (TFKS ZAP)									
S	3132 (TFKS ZAP)									
	3132 (TFKS ZAP)									

• A drill head without coating also available upon request. Please contact us for more detail.

Ordering example

BTU - -

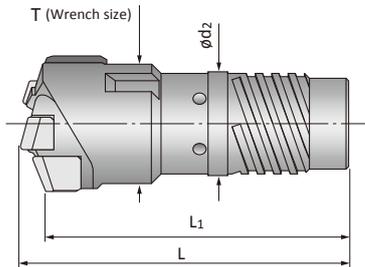
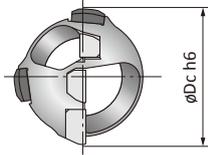
Drill head main code Diameter (mm) Grade

Ordering example 1 : BTU-052 30.00-1132 20 pcs
Ordering example 2 : BTU-133L 62.50-1132 10 pcs

⚠ Be sure to use a wrench to tighten drill properly to bar.
• For your safety, do not touch the tool or the workpiece when in operation.

TYPE
ETU

Thread	Dia. (mm)	Rework service	Use
Outer	18.40 - 65.00	Retipping	First recommendation in brazed drills



Tolerance: IT9
Surface roughness: Ra 2 μ m

Best suited carbide combination
Best grade available for each workpiece material

Good chip evacuation
Best tip geometry to ensure good chip control and efficient chip exhaust

Cost efficient retipping service
Retipping of used carbide tips and guide pads and re-coating available

Product description chart

Dia. Dc (mm) Tolerance h6	Drill head main code	Drill tube		Dimensions (mm)			
		Code	Dia.(mm)	L	L ₁	d ₂	T
18.40 - 19.20	ETU-001	OT00	18	50	47.1	16	17
19.21 - 20.00	ETU-002	OT00	18	50	47	16	18
20.01 - 20.90	ETU-011	OT01	20	56	52.8	18	18
20.91 - 21.80	ETU-012	OT01	20	56	52.7	18	19
21.81 - 22.90	ETU-021	OT02	22	56	52.8	19.5	20
22.91 - 24.10	ETU-022	OT02	22	56	52.6	19.5	21
24.11 - 25.20	ETU-031	OT03	24	57.5	54	21	23
25.21 - 26.40	ETU-032	OT03	24	57.5	54	21	24
26.41 - 27.50	ETU-041	OT04	26	60.5	56.8	23.5	25
27.51 - 28.70	ETU-042	OT04	26	60.5	56.8	23.5	26
28.71 - 29.80	ETU-051	OT05	28	63.5	59.5	25.5	27
29.81 - 31.00	ETU-052	OT05	28	63.5	59.3	25.5	28
31.01 - 32.10	ETU-061	OT06	31	63.5	59.4	28	29
32.11 - 33.30	ETU-062	OT06	31	63.5	59.2	28	30
33.31 - 34.80	ETU-071	OT07	33	70.5	66	30	32
34.81 - 36.20	ETU-072	OT07	33	70.5	65.8	30	33
36.21 - 37.30	ETU-081	OT08	36	73.5	68.7	33	34
37.31 - 38.40	ETU-082	OT08	36	73.5	68.5	33	35
38.41 - 39.60	ETU-083	OT08	36	73.5	68.3	33	36
39.61 - 40.60	ETU-091	OT09	39	73.5	68.2	36	37
40.61 - 41.80	ETU-092	OT09	39	73.5	68	36	38
41.81 - 43.00	ETU-093	OT09	39	73.5	67.9	36	39
43.01 - 44.30	ETU-101	OT10	43	75	69.5	39	41
44.31 - 45.60	ETU-102	OT10	43	75	69.3	39	42
45.61 - 47.00	ETU-103	OT10	43	75	69.1	39	43
47.01 - 48.50	ETU-111	OT11	47	79	72.9	43	44
48.51 - 50.10	ETU-112	OT11	47	79	72.8	43	46
50.11 - 51.70	ETU-113	OT11	47	79	72.5	43	47
51.71 - 53.20	ETU-121	OT12	51	82	75.3	47	49
53.21 - 54.70	ETU-122	OT12	51	82	75.5	47	50
54.71 - 56.20	ETU-123	OT12	51	82	75.3	47	51
56.21 - 58.40	ETU-131	OT13	56	84	77.4	51	54
58.41 - 60.60	ETU-132	OT13	56	84	76.9	51	55
60.61 - 62.80	ETU-133	OT13	56	84	77	51	57
62.81 - 65.00	ETU-134	OT13	56	84	76.6	51	59

Grade

See page 9 for grade selection chart

Grade	(Previous Grade)	ISO area							
		5	10	15	20	25	30	35	40
P	1122 (UP ZAP)								
	1132 (UX-2 ZAP)								
M	1132 (UX-2 ZAP)								
	2122 (N3 ZAP)								
K	3132 (TFKS ZAP)								
N	3132 (TFKS ZAP)								
S	3132 (TFKS ZAP)								

• A drill head without coating also available upon request. Please contact us for more detail.

Ordering example

ETU - -

Drill head main code Diameter (mm) Grade

Ordering example : ETU-052 30.00-1132 20 pcs

- Be sure to use a wrench to tighten drill properly to bar.
- For your safety, do not touch the tool or the workpiece when in operation.

Grade Selection Chart

A new designation system introduced for brazed drill head grades

MBU



Workpiece material	First Recommendation	Troubleshooting	
		Chipping	Wear
P • Carbon steel • Alloy steel	1122 (PC ZAP)	(*1)	(*2)
M • Stainless steel	3112 (TF ZAP)	(*1)	(*2)
K • Gray cast iron • Nodular cast iron	3112 (TF ZAP)	(*1)	(*2)
N • Aluminium alloy	3112 (TF ZAP)	(*1)	(*2)
S • Heat resistant super alloy • Titanium alloy	3112 (TF ZAP)	(*1)	(*2)

UTE



Workpiece material	First Recommendation	Troubleshooting	
		Chipping	Wear
P • Carbon steel • Alloy steel	1122 (UP ZAP)	(*1)	(*2)
M • Stainless steel	3112 (TF ZAP)	(*1)	(*2)
K • Gray cast iron • Nodular cast iron	3112 (TF ZAP)	(*1)	(*2)
N • Aluminium alloy	3112 (TF ZAP)	(*1)	(*2)
S • Heat resistant super alloy • Titanium alloy	3132 (TFKS ZAP)	(*1)	(*2)

BTU (2 tip type)



Workpiece material	First Recommendation	Troubleshooting	
		Chipping	Wear
P • Carbon steel • Alloy steel	1122 (UP ZAP)	(*1)	(*2)
M • Stainless steel	2122 (N3 ZAP)	(*1)	(*2)
K • Gray cast iron • Nodular cast iron	1122 (UP ZAP)	2122 (N3 ZAP)	(*2)
N • Aluminium alloy	1122 (UP ZAP)	2122 (N3 ZAP)	(*2)
S • Heat resistant super alloy • Titanium alloy	1122 (UP ZAP)	2122 (N3 ZAP)	(*2)

BTU (3 tip type) / ETU

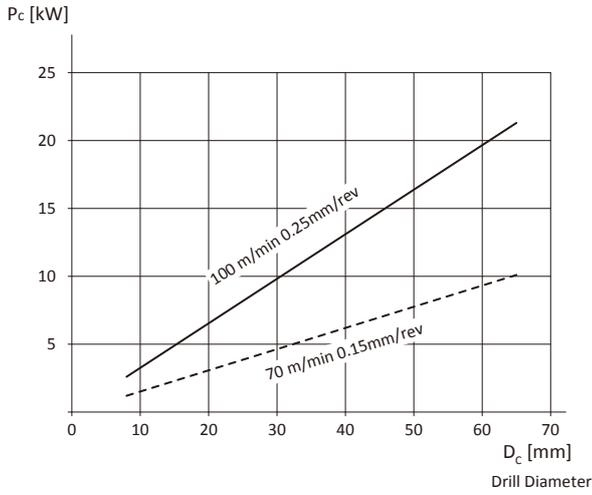


Workpiece material	First Recommendation	Troubleshooting	
		Chipping	Wear
P • Carbon steel • Alloy steel	1132 (UX-2 ZAP)	2122 (N3 ZAP)	1122 (UP ZAP)
M • Stainless steel	1132 (UX-2 ZAP)	2122 (N3 ZAP)	1122 (UP ZAP)
K • Gray cast iron • Nodular cast iron	3132 (TFKS ZAP)	(*1)	(*2)
N • Aluminium alloy	3132 (TFKS ZAP)	(*1)	(*2)
S • Heat resistant super alloy • Titanium alloy	3132 (TFKS ZAP)	(*1)	(*2)

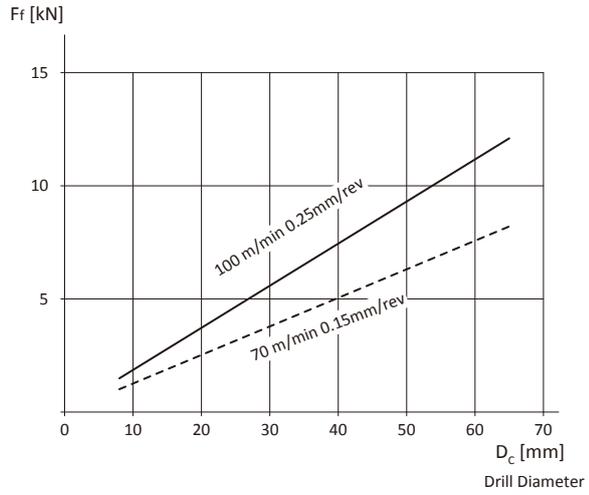
*1: Change cutting conditions (e.g. reduce feed)
 *2: Change cutting conditions (e.g. reduce cutting speed or increase feed)
 Please contact us for more details

Single Tube System

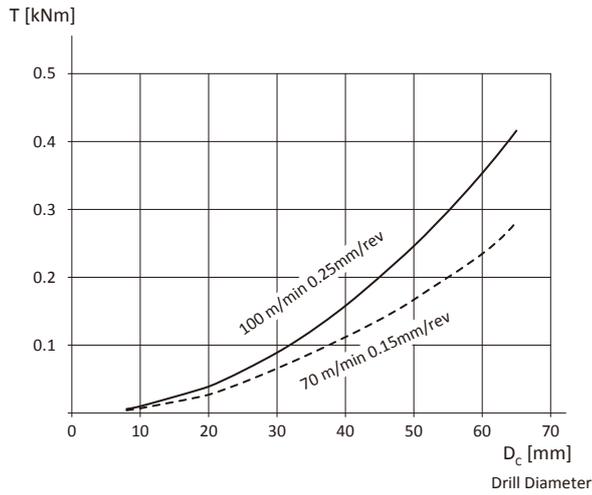
Net Power



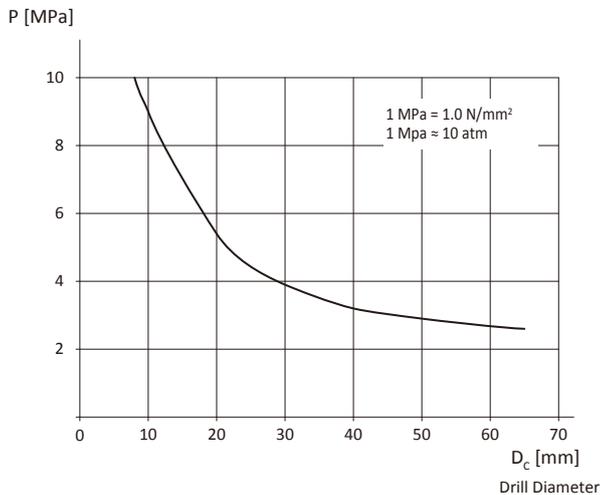
Feed Force



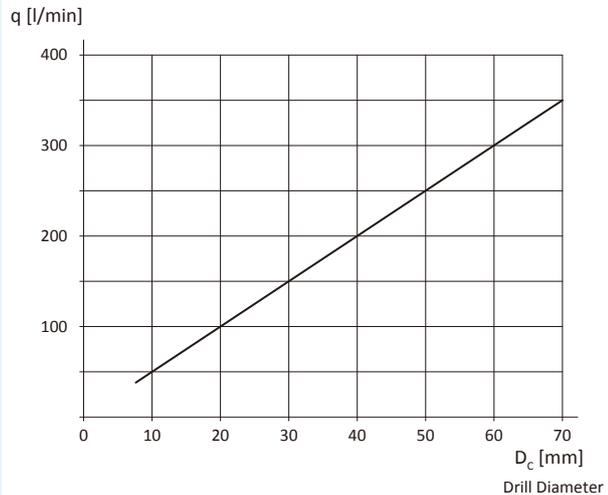
Torque



Cutting Fluid Pressure

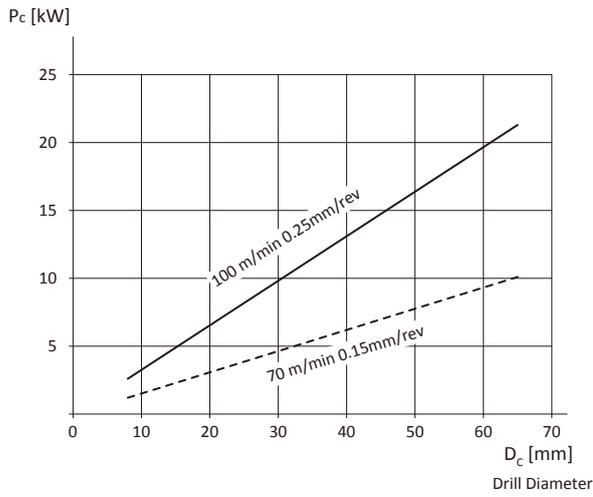


Cutting Fluid Volume

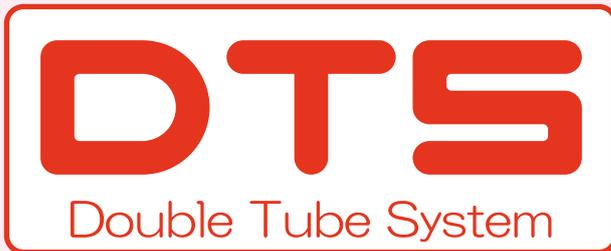
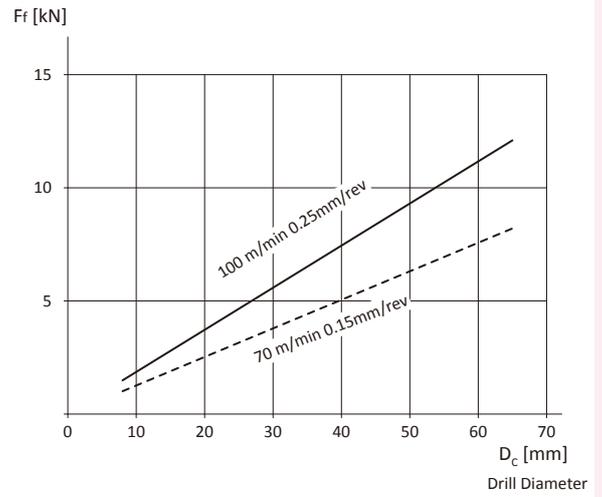


Double Tube System

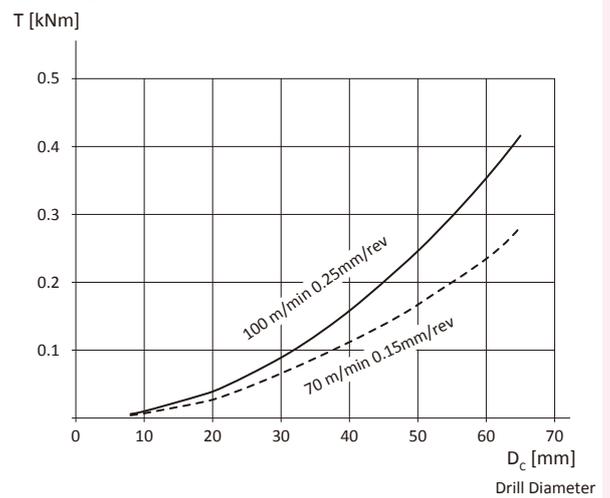
Net Power



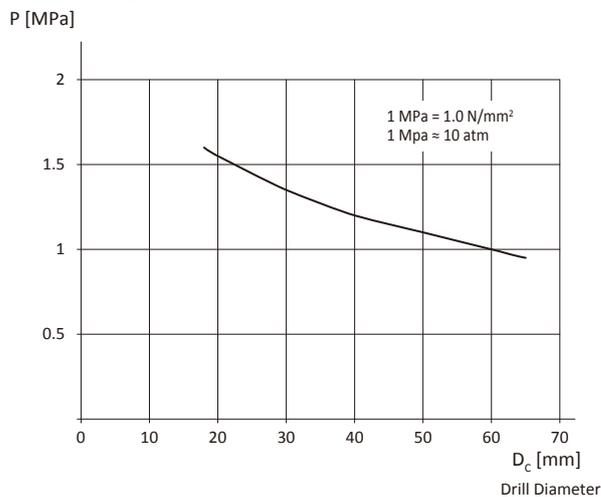
Feed Force



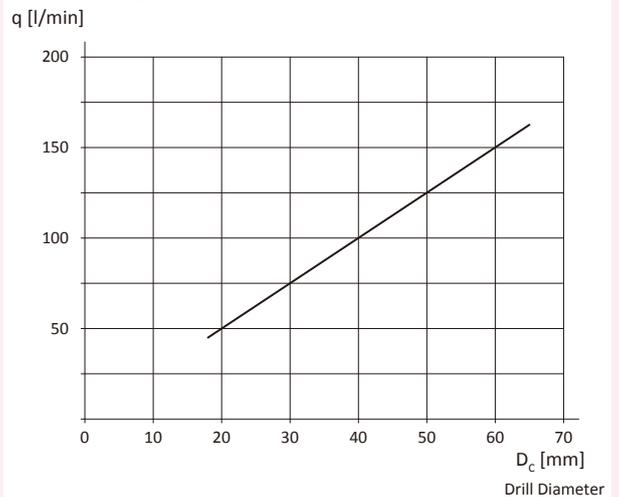
Torque



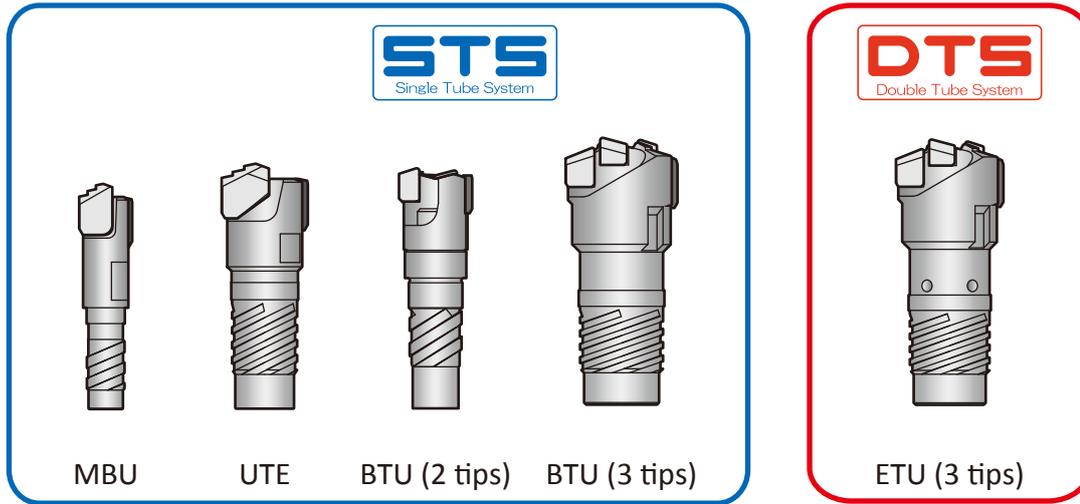
Cutting Fluid Pressure



Cutting Fluid Volume



Recommended Cutting Conditions



ISO	Material	JIS	Condition	Hardness (HB)	Cutting Speed Vc (m/min)	Feed rate fn (mm/rev)					
						Drill Dia. Dc (mm)					
						* 8.00 - 20.00	15.60 - 20.00	20.01 - 31.00	31.01 - 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	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
			0.25 - 0.25 %C Non-hardened	190	70-130	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
		S25C ~ S55C	0.25 - 0.25 %C Hardened and tempered	250	70-130	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
			0.55 - 0.80 %C Non-hardened	220	70-130	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
	Low alloyed (alloying element < 5%)	SNC,DcR,SNCN SCM,SMn	0.55 - 0.80 %C Hardened and tempered	300	70-130	0.05-0.1	0.08-0.12	0.1-0.15	0.13-0.17	0.15-0.28	
			Non-hardened	200	70-110	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
			Hardened and tempered	275	60-110	0.05-0.1	0.08-0.12	0.1-0.15	0.13-0.17	0.15-0.28	
				300	60-110	0.05-0.1	0.08-0.12	0.1-0.15	0.13-0.17	0.15-0.28	
High alloyed Cast iron Tool steel	SNS,SKD,SKT SKH,SK	Non-hardened	200	70-130	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3		
		Hardened and tempered	325	70-130	0.05-0.1	0.08-0.12	0.1-0.15	0.13-0.17	0.15-0.28		
M	Stainless steel	SUS430	Ferritic	200	40-110	0.05-0.13	0.08-0.15	0.1-0.28	0.13-0.3	0.16-0.35	
		SUS410,420J	Martensite	240	40-110	0.05-0.13	0.08-0.15	0.1-0.28	0.13-0.3	0.16-0.35	
		SUS304,SUS316L	Austenite	180	40-110	0.05-0.12	0.05-0.12	0.08-0.25	0.1-0.28	0.15-0.33	
K	Nodular cast iron	FCD400 ~ FCD450	Ferritic/Pearlitic	180	50-110	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
		FCD500 ~ FCD700	Pearlitic	260	50-110	0.05-0.13	0.08-0.15	0.1-0.17	0.13-0.2	0.16-0.3	
	Gray cast iron	FC100 ~ FC200	Low tensile strength	160	60-110	0.05-0.13	0.06-0.13	0.08-0.18	0.1-0.2	0.15-0.25	
		FC250 ~ FC350	High tensile strength	250	60-110	0.05-0.13	0.06-0.13	0.08-0.18	0.1-0.2	0.15-0.25	
	Malleable cast iron	FCMB,FCMW	Ferritic	130	70-110	0.05-0.13	0.06-0.13	0.08-0.18	0.1-0.2	0.15-0.25	
FCMWP,FCMP	Pearlitic	230	70-110	0.05-0.13	0.06-0.13	0.08-0.18	0.1-0.2	0.15-0.25			
N	Aluminum alloy Forging		Non-aged	60	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3	
			Soluted, Aged	100	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3	
	Aluminum alloy Casting		<=12% Si	Non-aged	75	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3
			Soluted, Aged	90	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3	
				>12% Si	High silicon	130	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25
	Copper alloy		>1% Pb	Free cutting copper	110	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3
			Brass, Red brass	90	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3	
Electrolytic copper			100	65-130	0.05-0.13	0.08-0.15	0.1-0.2	0.15-0.25	0.16-0.3		
S	Heat resistant super alloy	Fe base	Non-aged	200	20-50	0.05-0.12	0.06-0.12	0.08-0.15	0.12-0.18	0.15-0.25	
			Soluted, Aged	280	20-50	0.05-0.12	0.06-0.12	0.08-0.15	0.12-0.18	0.15-0.25	
			Non-aged	250	20-50	0.05-0.12	0.06-0.12	0.08-0.15	0.12-0.18	0.15-0.25	
		Ni / Co base	Soluted, Aged	350	20-50	0.05-0.12	0.06-0.12	0.08-0.15	0.12-0.18	0.15-0.25	
			Casted	320	20-50	0.05-0.12	0.06-0.12	0.08-0.15	0.12-0.18	0.15-0.25	
				α	Rm400	30-60	0.05-0.1	0.05-0.1	0.08-0.12	0.1-0.15	0.12-0.2
	Titanium alloy	α-β	Rm1050	30-60	0.05-0.1	0.05-0.1	0.08-0.12	0.1-0.15	0.12-0.2		

* For MBU and UTE

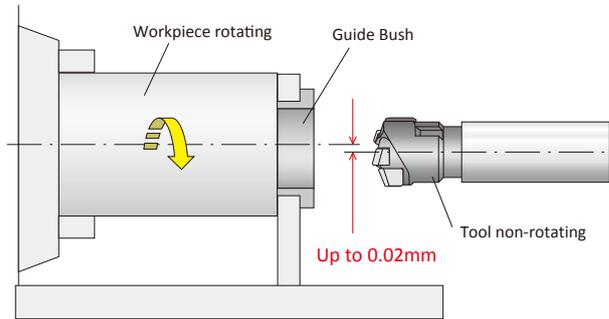
The above values should not be used as the exact recommendations. They may need modification depending on the machining conditions, materials, etc.

Machine Setting Up

Notes for Setting Up STS and DTS Systems

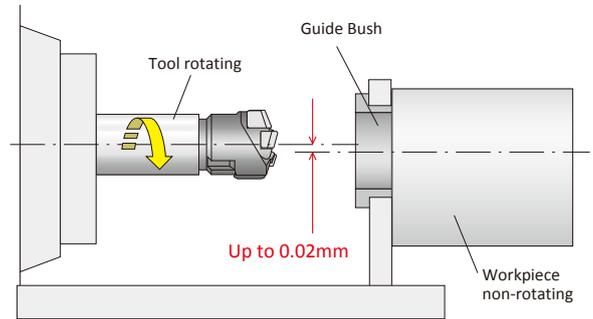


Workpiece rotating system



- 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

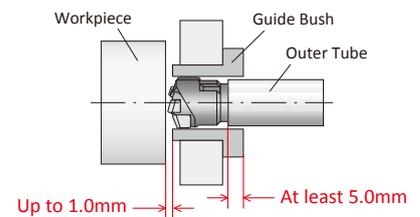


Positioning of outer tube and guide bush

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

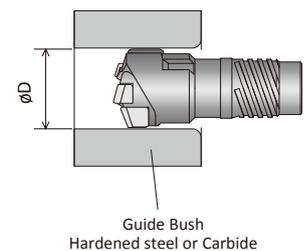
Guide bush size

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

D (mm)	G6 Tolerance (mm)
8.00 - 10.00	+0.005 ~ +0.014
10.01 - 18.00	+0.006 ~ +0.017
18.01 - 30.00	+0.007 ~ +0.020
30.01 - 50.00	+0.009 ~ +0.025
50.01 - 80.00	+0.010 ~ +0.029
80.01 - 120.00	+0.012 ~ +0.034
120.01 - 180.00	+0.014 ~ +0.039
180.01 - 250.00	+0.015 ~ +0.044
250.01 - 315.00	+0.017 ~ +0.049

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.

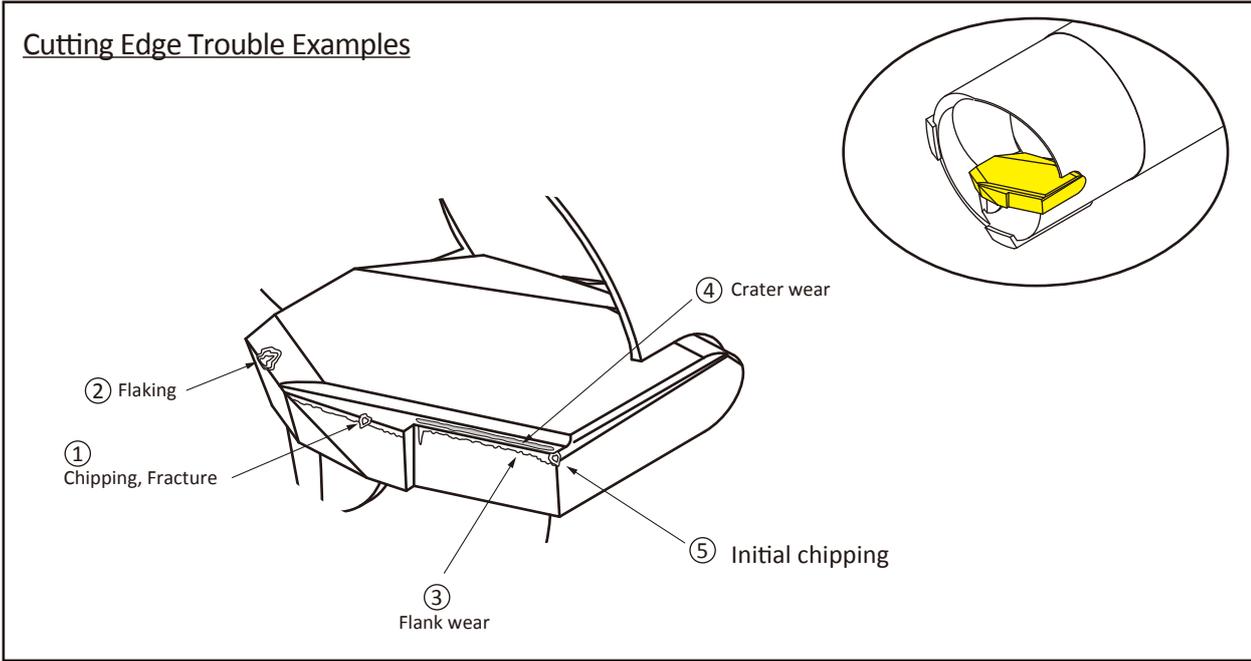
Coolant filtration

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.

Tip Wear Trouble Shooting



Problem	Causes	Solutions	
		Grade	Cutting Conditions / Other
1 Chipping, Fracture	<ul style="list-style-type: none"> Excessive vibration or shock Built-Up-Edge separated 	<ul style="list-style-type: none"> Use tougher grade 	<ul style="list-style-type: none"> Reduce feed rate Remove vibration
2 Flaking	<ul style="list-style-type: none"> Excessive vibration or shock 	<ul style="list-style-type: none"> Use tougher grade 	<ul style="list-style-type: none"> Reduce feed rate Remove vibration
3 Flank wear	<ul style="list-style-type: none"> Cutting speed too high Inadequate tool toughness 	<ul style="list-style-type: none"> Use higher wear resistant grade Use coated grade 	<ul style="list-style-type: none"> Reduce cutting speed Reduce feed rate Use proper cutting fluid
4 Crater wear	<ul style="list-style-type: none"> Cutting speed too high Feed rate too high Inadequate tool toughness 	<ul style="list-style-type: none"> Use higher wear resistant grade Use coated grade 	<ul style="list-style-type: none"> Reduce cutting speed Reduce feed rate Use proper cutting fluid
5 Initial chipping	<ul style="list-style-type: none"> Guide bush or pilot hole is improper size Misalignment 	<ul style="list-style-type: none"> Use tougher grade 	<ul style="list-style-type: none"> 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.

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.

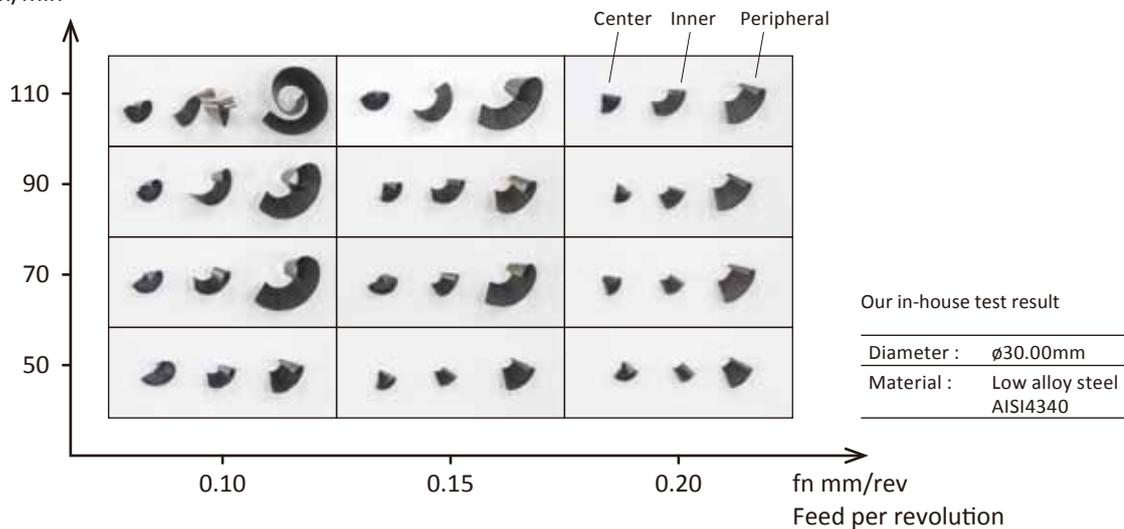
Below picture shows chip formation by cutting speed and feed. Shorter chips are obtained by reducing cutting speed or increasing feed.

Chip formation

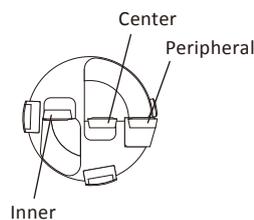
Chip formation is affected by multiple factors such as work material, chipbreaker geometry, cutting speed, feed, type of cutting fluid and cutting fluid temperature. Suitable chip formation depends on cutting situation but is controllable by changing the cutting conditions.

Cutting speed

Vc m/min



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



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

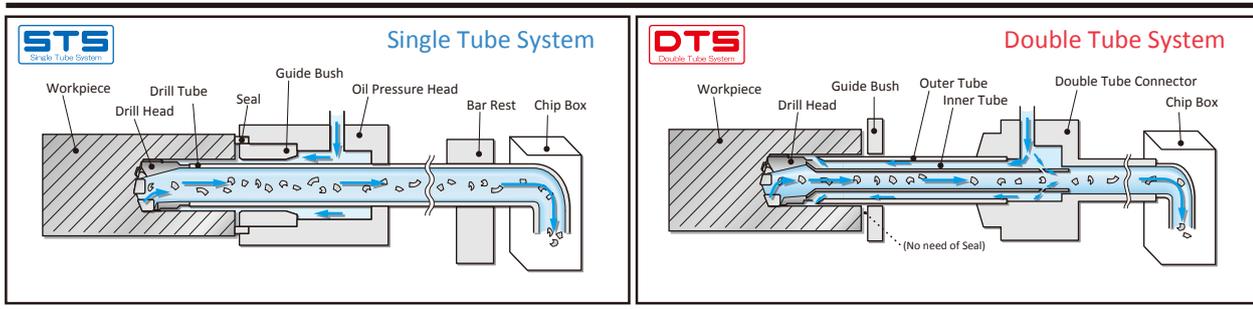
The coolability of cutting fluid depends on thermal characteristics such as thermal conductivity and specific heat. The cutting fluid of good coolability increases tool life, but

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

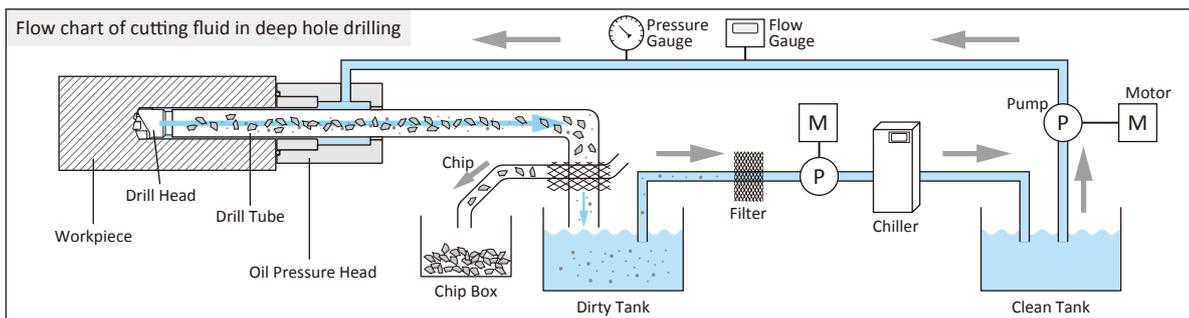
The cutting fluid is heated by the factors such as:

- 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.

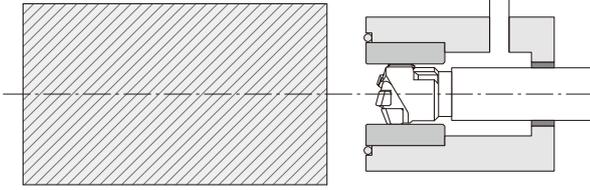
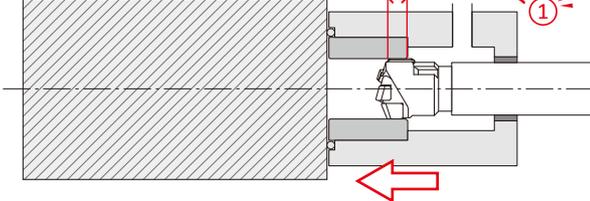
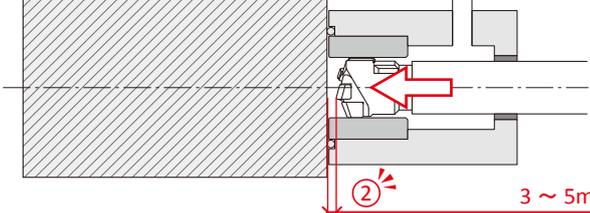
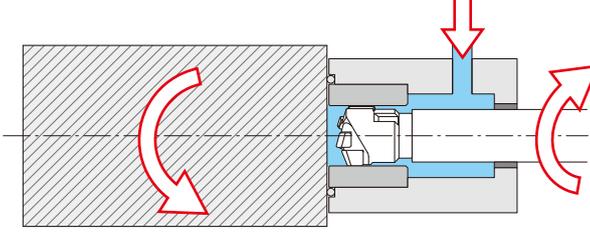
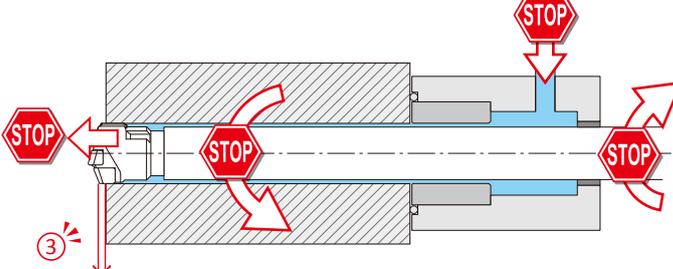
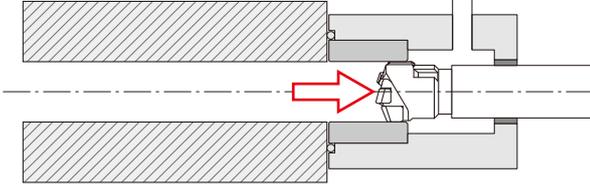
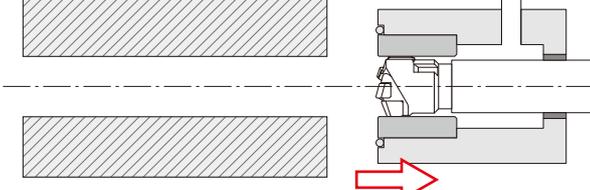
3) Filtration

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.

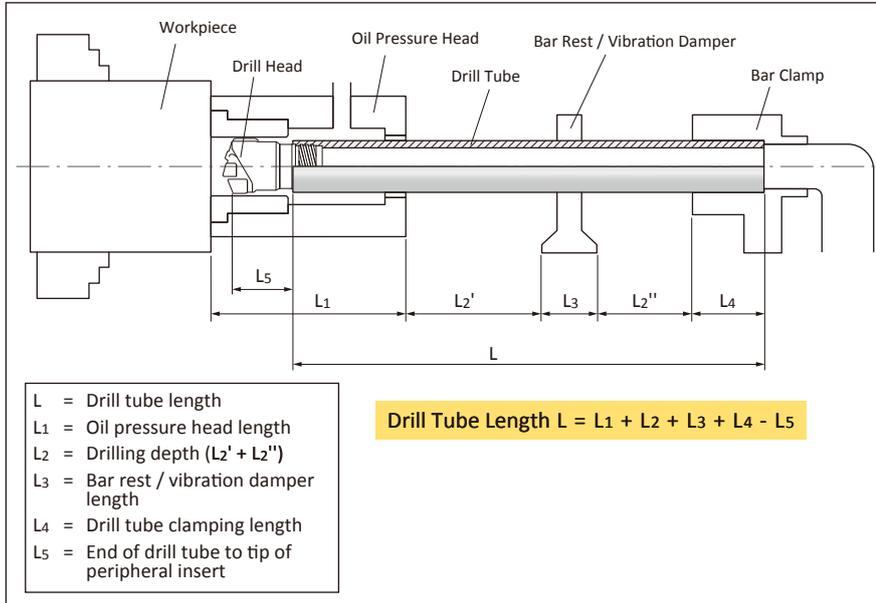
	<p>1. Start NC operation</p>
	<p>2. Oil pressure head approach workpiece</p> <p>① Set the starting point of main axis of the tool to be at a suitable position so that the guide pad remains inside the guide bush when the oil pressure head moves forward.</p>
	<p>3. Tool approach workpiece</p> <p>② Approach and set the tool to a position of 3 to 5 mm distance from the edge of the workpiece.</p> <p>* If the available NC machine can support this approach, the operation process may start from this point</p>
	<p>4. Start cutting</p> <p>4.1 Start coolant supply</p> <p>4.2 Start rotating (tool / workpiece / tool & workpiece)</p> <p>4.3 Start feeding</p>
	<p>5. Stop cutting</p> <p>5.1 Stop feeding</p> <p>5.2 Stop rotating (tool / workpiece / tool & workpiece)</p> <p>5.3 Stop coolant supply</p> <p>③ Stop cutting at the point when the outer tip is at the edge of the workpiece.</p>
	<p>6. Tool main axis back to starting point</p>
	<p>7. Oil pressure head back to starting point</p>

Calculation of special length tube

Drill tubes with other length than standard item are available upon request. Please calculate the tube length as below according to your machine.

ST / UMBB

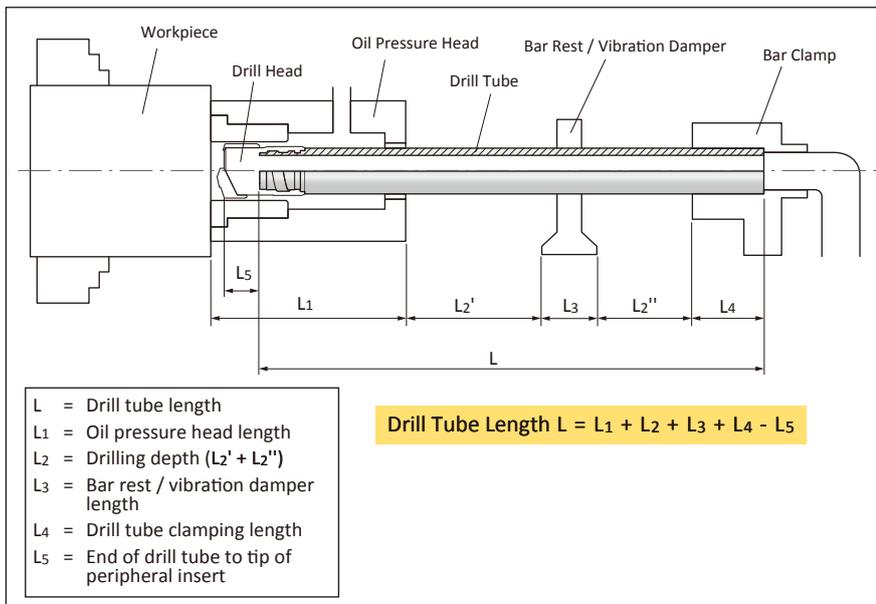
Inner thread connection



* Two start thread is for dia 15.59 and less.

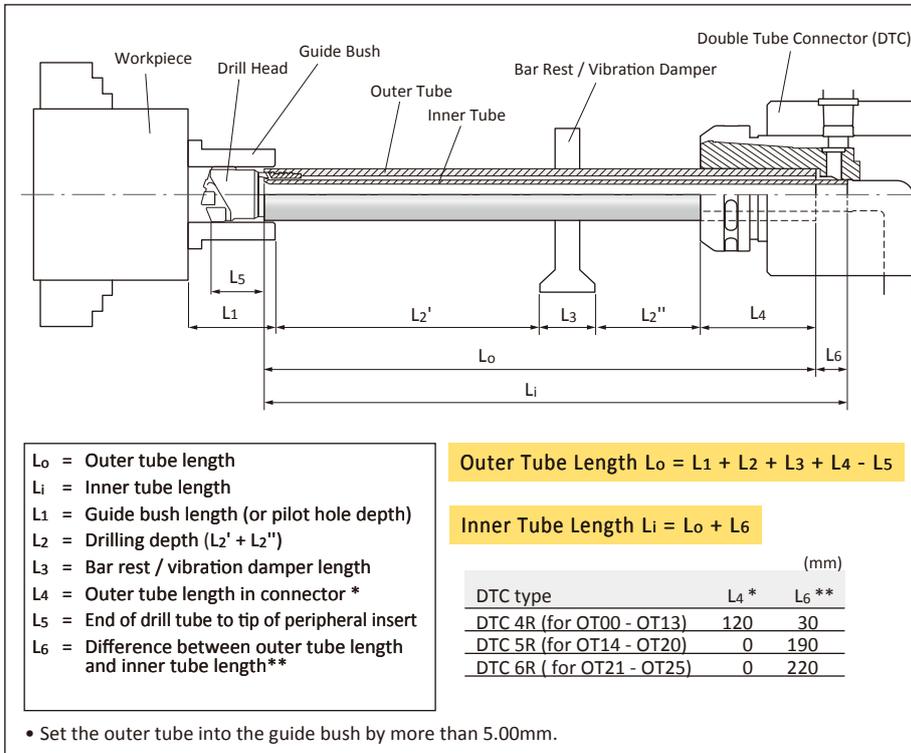
UB

Outer thread connection



Calculation of special length tube

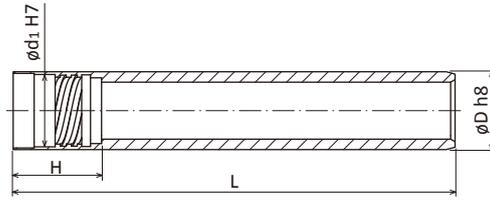
OT & IT



ST

Inner thread connection

Four start thread (for dia. 15.60 and above) / Two start thread (for dia. 15.59 and less)



ST

Drill Range (mm)	Code	L (mm)			Dimensions (mm)			Drill Range (mm)	Code	L (mm) Special Length	Dimensions (mm)		
		1600	2600	Special Length	D	d ₁	H				D	d ₁	H
12.60 - 13.60	ST0094	●		○	11	9.6	22	65.00 - 66.99	ST14	○	56	52	75
13.61 - 14.60	ST0095	●		○	12	10.6	22	67.00 - 72.99	ST15	○	62	58	75
14.61 - 15.59	ST0096	●		○	13	11.6	22	73.00 - 79.99	ST16	○	68	63	75
15.60 - 16.70	ST0097	●		○	14	12.6	21	80.00 - 86.99	ST17	○	75	70	97
16.71 - 17.70	ST0098	●	●	○	15	13.6	21	87.00 - 99.99	ST18	○	82	77	97
17.71 - 18.90	ST0099	●	●	○	16	14.5	22	100.00 - 111.99	ST19	○	94	89	97
18.91 - 20.00	ST0000	●	●	○	17	15.5	22	112.00 - 123.99	ST20	○	106	101	118
20.01 - 21.80	ST00	●	●	○	18	16	27.5	124.00 - 135.99	ST21	○	118	113	118
21.81 - 24.10	ST01		●	○	20	18	30	136.00 - 147.99	ST22	○	130	125	118
24.11 - 26.40	ST02		●	○	22	19.5	30	148.00 - 159.99	ST23	○	142	137	139
26.41 - 28.70	ST03		●	○	24	21	30	160.00 - 171.99	ST24	○	154	149	139
28.71 - 31.00	ST04		●	○	26	23.5	33	172.00 - 183.99	ST25	○	166	161	139
31.01 - 33.30	ST05		●	○	28	25.5	33	184.00 - 195.99	ST26	○	178	173	144
33.31 - 36.20	ST06		●	○	30	28	33	196.00 - 207.99	ST27	○	190	185	144
36.21 - 39.60	ST07		●	○	33	30	40	208.00 - 219.99	ST28	○	202	197	144
39.61 - 43.00	ST08		●	○	36	33	40	220.00 - 231.99	ST29	○	214	208	164
43.01 - 47.00	ST09		●	○	39	36	40	232.00 - 243.99	ST30	○	226	220	164
47.01 - 51.70	ST10		●	○	43	39	40	244.00 - 255.99	ST31	○	238	232	164
51.71 - 56.20	ST11		●	○	47	43	44	256.00 - 267.99	ST32	○	250	244	184
56.21 - 60.60	ST12		●	○	51	47	44	268.00 - 279.99	ST33	○	262	256	184
60.61 - 65.00	ST13			○	56	51	44	280.00 - 291.99	ST34	○	274	268	184

- Please indicate the length (L) when ordering. Ordering example for drill dia. $\varnothing 60.00$ mm and drill tube length 2600 mm: ST12X2600
- Other lengths are available upon request. Please contact Unitac sales department for further information.

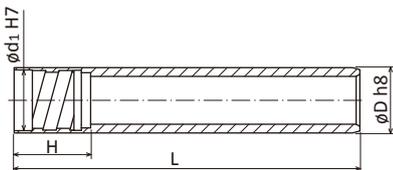
● : Standard Stock item
○ : Special length

UMBB

Inner thread connection

Single start thread

For MBU Drill Head



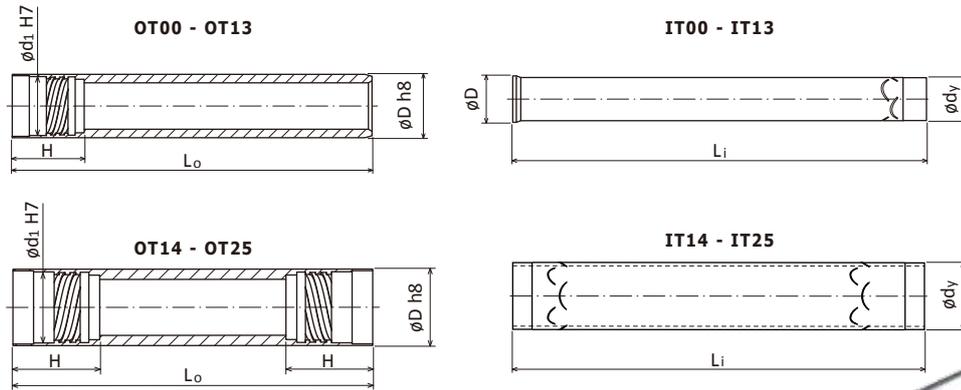
UMBB

Drill Range (mm)	Code	L (mm)	Dimensions (mm)		
		Special Length	D	d ₁	H
8.00 - 8.99	UMBB071	○	7.1	6	16
9.00 - 9.99	UMBB083	○	8.3	7.2	16
10.00 - 10.99	UMBB090	○	9	7.6	16
11.00 - 11.99	UMBB100	○	10	8.6	16
12.00 - 13.49	UMBB110	○	11	9.1	16
13.50 - 14.79	UMBB120	○	12	10.8	16

○ : Special length

- Please indicate the length (L) when ordering. Ordering example for drill dia. $\varnothing 11.00$ mm and drill tube length 1000 mm: UMBB100X1000

OT & IT Outer Tube & Inner Tube



OT & IT

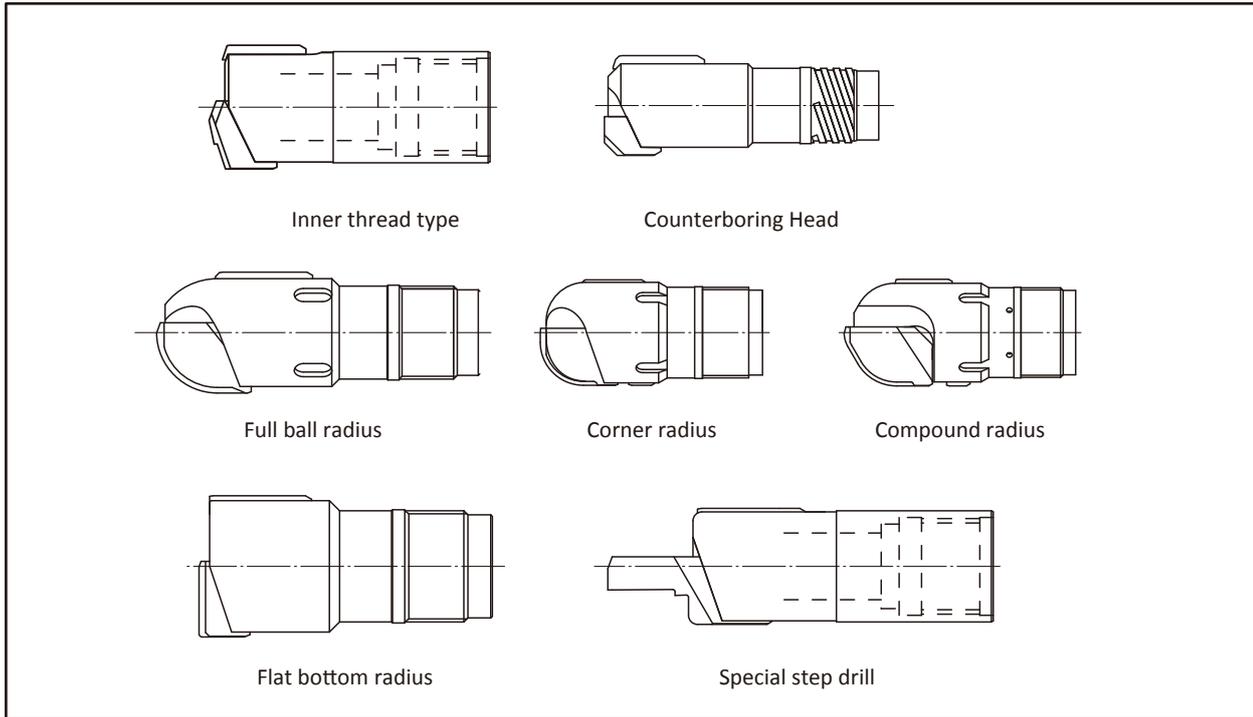


Drill Range (mm)	Outer Tube (OT)			Inner Tube (IT)		
	Code	Lo (mm)	Dimensions (mm)	Code	Li (mm)	Dimensions (mm)
		Special Length	D d1 H		Special Length	D dy
18.40 - 20.00	OT00	○	18 16 27.5	IT00	○	12 10
20.01 - 21.80	OT01	○	19.5 18 30	IT01	○	14 12
21.81 - 24.10	OT02	○	21.5 19.5 30	IT02	○	15 13
24.11 - 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
65.00 - 66.99	OT14	○	56 52 75	IT14	○	- 40
67.00 - 72.99	OT15	○	62 58 75	IT15	○	- 44
73.00 - 79.99	OT16	○	68 63 75	IT16	○	- 48
80.00 - 86.99	OT17	○	75 70 97	IT17	○	- 54
87.00 - 99.99	OT18	○	82 77 97	IT18	○	- 60
100.00 - 111.99	OT19	○	94 89 97	IT19	○	- 70
112.00 - 123.99	OT20	○	106 101 118	IT20	○	- 80
124.00 - 135.99	OT21	○	118 113 118	IT21	○	- 80
136.00 - 147.99	OT22	○	130 125 118	IT22	○	- 95
148.00 - 159.99	OT23	○	142 137 139	IT23	○	- 100
160.00 - 171.99	OT24	○	154 149 139	IT24	○	- 120
172.00 - 183.99	OT25	○	166 161 139	IT25	○	- 130

- Please indicate the length (L) when ordering. Ordering example for drill dia. ø60.00 mm and tube length 1070 mm: OT13X1070 ○ : Special length
- Inner Tube length (Li) should be ordered as follows.
 - ▶ For ranges 18.40 - 65.00 (OT00 - OT13) Inner Tube length (Li) = Outer Tube length (Lo) + 30 mm
 - ▶ For ranges 65.00 - 123.99 (OT14 - OT20) Inner Tube length (Li) = Outer Tube length (Lo) + 190 mm
 - ▶ For ranges 124.00 - 183.99 (OT21 - OT25) Inner Tube length (Li) = Outer Tube length (Lo) + 220 mm

Special Tooling

Various types of special drill heads are available upon request. Some of the examples are shown below. Please contact Unitac sales department for further information.



Special grade

Not only the standard grades and combinations as shown in the catalogue, but also various types of special grades and combinations are available through years of experience and research by Unitac. Applying suitable special grades can make the productivity high and stable with work-piece materials that are difficult to process with standard grades, or even under unstable cutting conditions. Please contact Unitac sales department for further information.

Retipping service of used brazed drill heads



Inspection is conducted for all returned used heads to judge if they are suitable for retipping.



Unitac provides high quality retipping service to our customers.

Unitac provides retipping service of used brazed drill heads for effective utilization of limited resources and to increase economic efficiency. Please contact Unitac sales department for further information.

Notice:

- Retipping service cannot be applied to badly damaged used heads.
- The frequency of retipping will be limited.
- Freight will be charged.

Requested Information Form for Special Tooling



Company Name		Contact Person	
Telephone No.		FAX No.	
Email Address			

Drill Dia.(\emptyset)	
Drill Tube Dia.(\emptyset)	
Quantity	
Request Delivery date	

Description of your sytem in use:

Please sketch your drilling application

Order Sheet



Company Name			Contact Person	
Telephone No.		FAX No.		
Email Address				

STS Brazed Tool				
Drill head main code	Diameter (mm)	Grade	Qty	
MBU - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	- <input type="text"/>	<input type="text"/>	pc
UTE - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	- <input type="text"/>	<input type="text"/>	pc
BTU - <input type="text"/>	<input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	- <input type="text"/>	<input type="text"/>	pc

DTS Brazed Tool				
Drill head main code	Diameter (mm)	Grade	Qty	
ETU - <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	- <input type="text"/>	<input type="text"/>	pc

UNITAC Drill Head Series for Deep Hole Drilling



STS Single Tube System

Solid Drilling

Thread Type	Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	Feature
Outer Thread	MBU		8.00 - 14.79	IT9	2µm	Brazed Tips	<ul style="list-style-type: none"> Higher productivity and better surface finish than gundrill Good chip breaking with 3 step cutting edge design
	UTE		12.60 - 20.00	IT9	2µm		<ul style="list-style-type: none"> Higher productivity and better surface finish than gundrill Good chip breaking with 3 step cutting edge design First recommendation for dia ø12.60 - 15.59mm
	BTU		12.60 - 65.00	IT9	2µm		<ul style="list-style-type: none"> First recommendation for dia ø15.60 or more Good chip breaking with 3 cutting edges (ø12.60 - 15.59mm has 2 cutting edges) Covers all materials with various carbide grade combinations
	KUSTS		38.00 - 247.99	IT10	3µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options
	0124		30.00 - 65.00	IT11	3µm		<ul style="list-style-type: none"> Direct mount type - No diameter setting necessary Improved productivity and safety in deep hole drilling
Inner Thread	KUSTS		38.00 - 245.99	IT10	3µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options
	0124		30.00 - 65.00	IT11	3µm		<ul style="list-style-type: none"> Direct mount type - No diameter setting necessary Improved productivity and safety in deep hole drilling

Counterboring

Thread Type	Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	Feature
Outer Thread	KUSTR		25.00 - 291.99	IT10	1-2µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options
Inner Thread	KUSTR		25.00 - 293.99	IT10	1-2µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options

Trepanning

Thread Type	Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	Feature
Outer Thread	UTT		100.00 - 328.00	IT10	1-2µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options
Inner Thread	UTT		100.00 - 305.99	IT10	1-2µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options

DTS Double Tube System

Solid Drilling

Thread Type	Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	Feature
Outer Thread	ETU		18.40 - 65.00	IT9	2µm	Brazed Tips	<ul style="list-style-type: none"> Good chip breaking with 3 cutting edges Covers all materials with various carbide grade combinations
	KUDTS		38.00 - 183.99	IT10	3µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options
	0124		30.00 - 65.00	IT11	3µm		<ul style="list-style-type: none"> Direct mount type - No diameter setting necessary Improved productivity and safety in deep hole drilling

Counterboring

Thread Type	Code	Appearance	Diameter Range (mm)	Hole Tolerance	Surface Finish(Ra)	Fixture	Feature
Outer Thread	KUDTR		25.00 - 183.99	IT10	1-2µm	Indexable Inserts	<ul style="list-style-type: none"> Cartridge type - Diameter finely adjustable Covers wide application area with various options

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

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 temperature 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 grinding.
- 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.

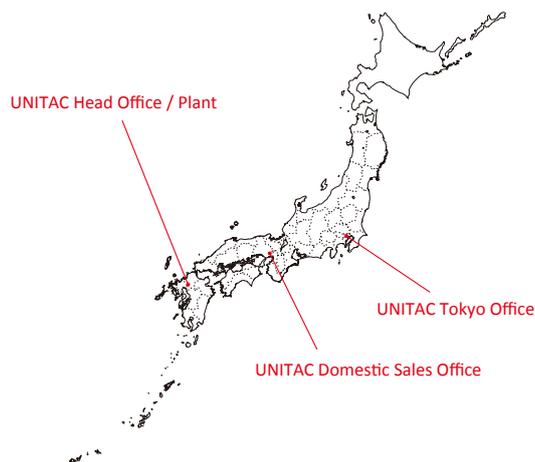
Reference: JAPAN CEMENTED CARBIDE TOOL MANUFACTURERS' ASSOCIATION



UNITAC Head Office / Plant

Located in Kurume Business Park which has a combination of manufacturing and business enterprises near the center of Kurume City, UNITAC manufactures its high quality deep hole drilling tools. This convenient location allows easy access to highways, airports, rail service and Fukuoka Port.

UNITAC has an extensive quarter-century history in this field and as a member of IMC Group we produce and market our products to customers worldwide.



Deep hole tooling Manufacturer
UNITAC INCORPORATED



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Tool specifications are subject to change without notice for the purpose of improvement of the products.